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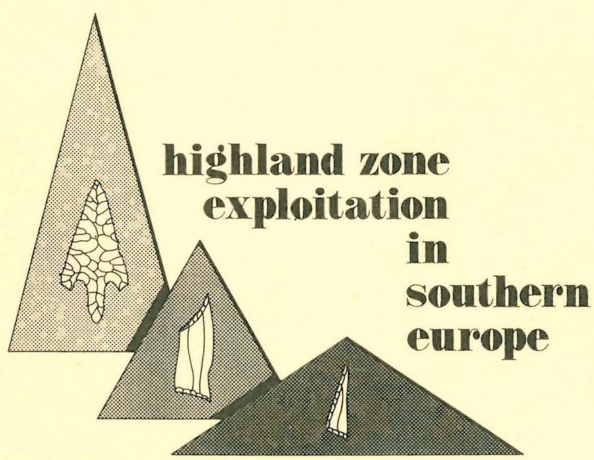
MUSEO CIVICO DI SCIENZE NATURALI DI BRESCIA

HIGHLAND ZONE EXPLOITATION IN SOUTHERN EUROPE

edited by
PAOLO BIAGI and JOHN NANDRIS



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20
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HIGHLAND ZONE EXPLOITATION
IN SOUTHERN EUROPE

International Round Table «Highland Zone Exploitation in Southern Europe»
Brescia, 29 April – 1 May 1993

Edited by
Paolo Biagi and John Nandris

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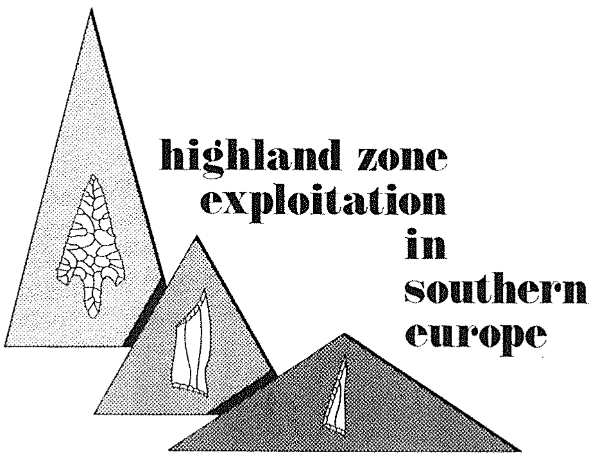

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CONTENTS

EDITORIAL FOREWARD

The papers presented in this volume were delivered at the International Round Table on «Highland Zone Exploitation in Southern Europe», held in the auditorium of the Natural Science Museum of Brescia between April 29th and May 1st, 1993.

In northern Italy, since the end of the 1960s a great deal of special attention has been devoted to the discovery of high-altitude prehistoric sites in the east-central Alpine area. Since then the number of Palaeolithic, Mesolithic and later settlements has greatly increased, as a result of field survey and excavation carried out by many different scholars in this part of the Alps and in other territories.

The 1993 Brescia Round Table is the fifth in a series of meetings organized in the last decade in northern Italy with the aim of examining the results of these discoveries, and setting them in their wider context. These *Tavole Rotonde* were held in Trento in 1983, Brescia in 1988, Chiavari in 1989 and again in Trento in 1992. While they dealt with a variety of themes, all were essentially devoted to the archaeology of the European mountain and highland zone landscape. All were notably successful in re-uniting scholars from different scientific fields, and resulted in useful publications.

The thematic proposal for the 1993 meeting was an examination of the ways in which over the course of the time man has exploited the plant, animal and mineral resources of the highland zone; and the impact of such activity on this specialized environment.

The aim of the meeting was to achieve and publish an improved synthesis between the different disciplinary contributions, which include archaeologists, geographers, archaeo-zoologists and archaeo-botanists; and to extend discussion beyond the emphasis on pastoralism as a mode of exploiting the highland zone, and to define the conditions governing its exploitation and environment.

The 1993 papers were delivered in five sessions, chaired respectively by S. Thiébault (General themes), J.J. Lowe (Environmental problems), K. Oeggl (Apennine archaeology), J.K. Kozłowski (Alpine archaeology in Italy) and G. Barker (Archaeology and subsistence).

Scholars from eight countries participated. The first session, included an introductory paper by M. Chardon on the environmental changes of a French Alpine landscape consequent upon human interference in prehistoric, historic and sub-recent times. Further papers by J. Nandris dealt with the comparative ethnoarchaeology of Daghestan and the Balkans; and by M. Kaczanowska and J.K. Kozłowski with the exploitation of the highland zone in the western Carpathians during the Neolithic.

The session on Environmental problems included five papers by S. Thiébault, H. Küster,

K. Oeggl, L. Wick and P. Biagi *et al.* It almost exclusively concerned themes dealing with the relationships between the Alpine environments and human settlement in different regions of the Alps, as recorded by archaeobotanical research.

The session on Apennine archaeology was introduced by two papers by the team of J. Lowe, on the vegetation and human impact in the north Italian Apennines. Three more papers on Apennine archaeology were delivered, by L. Castelletti and C. Tozzi, on the Late Palaeolithic and Mesolithic exploitation of the Tuscan chain; by G. Barker on his researches in the Biferno Valley; and by R. Drescher-Schneider who presented the preliminary results of a palynological core from a south Calabrian lake basin.

Alpine archaeology in Italy was discussed by M. Peresani, with his presentation of the Aurignacian and Mesolithic flint quarrying in the Venetian Pre-Alps. Other papers in the same session were delivered by M. Cremaschi *et al.* with their contribution to the knowledge of environmental changes occurring in Val Biandino near Como; and by R. Nisbet, with the results of excavations carried out at the middle Bronze age site of Roc del Col in the Piedmontese Alps.

The last session on Archaeology and subsistence was composed of four papers; by F. de Lanfranchi on the transhumance in Corsica; by N. Vutiropulos on pastoralism on the Island Euboea; by P. Baker on the results of her archaeo-zoological researches on medieval faunal assemblages from northern Italy; and by S.M. Hassan on the «accumulation strategies» of Alpine communities in Valais in Switzerland.

The editors are particularly grateful to the Amministrazione Civica di Brescia, which met the full cost of the entire Round Table and of publication of the Proceedings, as well as to P. Blesio, former Director of the Museo Civico di Scienze Naturali, who promoted the meeting.

13 June 1994

Paolo Biagi
University of Venice

J. Nandris
University of London

Radiocarbon dates: throughout the text, BP refers to uncalibrated radiocarbon dates; BC ans AD are used to indicate calibrated radiocarbon dates and calendric dates.

Note: the final date for revision by Authors of their contributions to this volume was 30 July 1994

P. BIAGI and J. NANDRIS (eds.) Highland Zone Exploitation in Southern Europe
MONOGRAFIE DI «NATURA BRESCIANA», 20, 1994: 9-20

MICHEL CHARDON*

L'EXPLOITATION DE LA HAUTE MONTAGNE, L'UTILISATION DES EAUX ET LES CHANGEMENTS DE PAYSAGE DANS LA RÉGION DE L'ALPE D'HUEZ (ALPES, FRANCE)

SUMMARY – *Highland zone exploitation, water supply and changing landscapes in Alpe d'Huez mountains (Alpes de Dauphiné, France).* The Rousses mountains, located in the northern french Alps culminate at 3465 metres , and are known for the ski ressort of the Alpe d'Huez. Landscapes and geographical parameters are outlined: for centuries the forests have almost entirely disappeared and treeless meadows cover large areas. Over the course of the last two millennia, different types of human settlement and exploitation of natural resources have changed the landscape. In the Roman period, deforestation began along the timber-line. During the XIII and XIV centuries, silver mining and deforestation were important, while hydraulic plans were built. In recent centuries, the agro-pastoral economic system was using water for irrigation, extend fields and maedows, while coal mining was developing up to 2600 metres. The most important revolution is tourism which, in a few years, has transformed the landscape. The sites and the resourches have been always exploited in relation to the economic requirements of social organizations, political states and powers. The influence of climatic change on the landscape formation is limited during historic times compared with human impact.

RIASSUNTO – *Sfruttamento dell'alta montagna, rifornimento idrico e variazioni ambientali nell'Alpe d'Huez (Alpi del Delfinato, Francia).* Il gruppo del Rousses, nelle Alpi francesi settentrionali, raggiunge i 3465 metri di altezza ed è famoso per la stazione sciistica dell' Alpe d' Huez. In questa regione le foreste sono quasi del tutto scomparse da secoli e la prateria alpina ricopre oggi ampie zone. Durante gli ultimi due millenni gli insediamenti umani e lo sfruttamento delle risorse naturali hanno trasformato il territorio. La deforestazione ebbe inizio in epoca romana lungo il limite forestale più elevato. Durante il XIII ed il XIV secolo lo sfruttamento delle miniere d'argento e la deforestazione furono due fattori importanti; nello stesso periodo vennero costruiti alcuni sistemi di irrigazione. Nei secoli più recenti il sistema agropastorale ha utilizzato impianti per irrigare i campi e le aree prative, mentre il carbone veniva estratto dalla miniere che erano state aperte sino ad un'altezza di 2600 metri. La rivoluzione più importante è stata l'industria turistica che, in pochi anni, ha trasformato il territorio. Gli ambienti e le risorse disponibili sono sempre stati sfruttati in seguito alle richieste economiche delle organizzazioni sociali, politiche e di potere. L'influenza del clima sul cambiamento dell'aspetto del territorio è stata minima duranti tempi storici se paragonata a quella dell'impatto antropico.

Le massif des Rousses se trouve dans la partie centrale des Alpes françaises du Dauphiné, entre les vallées de la Romanche et de l'Eau d'Olle. Géographiquement et historiquement il appartient à une région de haute montagne; l'Oisans, définie comme le bassin versant de la Romanche en amont de Séchilienne. Aujourd'hui les Rousses sont connues principalement par la présence d'une grande station touristique et de sports d'hiver: l'Alpe d'Huez (1800 m). En

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réalité, c'est une montagne occupée et aménagée par l'homme au moins depuis la période romaine. Les mises en valeur successives répondaient à des objectifs économiques et sociaux différents; les unes après les autres, elles ont modifié l'aspect d'une région de haute montagne pour donner les paysages actuels. C'est sur le bord méridional de cette montagne, autour de l'Alpe d'Huez que ces mutations ont été les plus profondes et qu'elles sont les plus caractéristiques de l'exploitation de la haute montagne. Comment et pourquoi, pendant deux millénaires, avec une intensité et des modalités différentes les hommes exploitent-ils la montagne au dessus de 1800 m, c'est-à-dire dans des conditions difficiles avant les progrès techniques du XX° siècle ? Nous l'envisagerons à travers quatre phases: l'époque romaine, l'exploitation minière aux XIII-XIV siècles, la civilisation agro-pastorale et les mines du XIX° siècle, enfin le tourisme de sports d'hiver et l'urbanisation actuelle de cette montagne. La mise en valeur repose sur l'exploitation des ressources naturelles: les prairies, la forêt, le plomb argentifère, la houille, les terres arables, et maintenant la neige et les glaciers. Elle implique une utilisation des transports pour rompre l'isolement géographique et une maîtrise des ressources en eau.

LES PARAMÈTRES GÉOGRAPHIQUES DE LA HAUTE MONTAGNE AUTOUR DE L'ALPE D'HUEZ

L'arête Nord-Sud des Grandes Rouses culmine à 3465 m au Pic Bayle. Elle est bordée par une suite de cirques glaciaires, encore occupés par des glaciers sur les faces sud et ouest (Sarenne, Herpie, Rousses...) dominant les versants et le plateau de l'Alpe d'Huez (1800 m à la mairie). En contre-bas des glaciers, deux gradins forment des sites favorables à la présence de lacs naturels qui sont autant de réservoirs facilement accessibles: Lac Blanc, Lac Besson... Au dessous de 2200 m, vers le sud et le sud- ouest se développe un espace aux formes plus douces autour de l'Alpe d'Huez et du Rif Nel, en amont des gorges de la Sarenne. La zone entre 1700 et 2200 m apparaît propice à une occupation humaine (exposition Sud, faibles pentes, prairies, circulation aisée...) en dépit des conditions climatiques (fig. 1).

Dans cette haute montagne des moyennes latitudes (45°5' N) elles étaient diffilciles pour l'homme avant les progrès techniques récents. Des mesures météorologiques récentes et éparses montrent qu'à 1800 m, en adret, la température moyenne annuelle est de l'ordre de 2,6° C (1981) à 4,8°C (1991). L'hiver reste long et rigoureux avec des températures moyennes mensuelles inférieures à 0°C de Décembre à Avril à l'Alpe d'Huez, en dépit d'un ensoleillement exceptionnel (2300 heures/année). L'été est relativement tempéré: pendant trois mois la température moyenne mensuelle dépasse 10°C. Mais au total on compte 180 jours de gel à 1800 m. A la même altitude, les précipitations sont modérées sur le versant sud (1200 mm) abondantes à l'Ouest et au nord (1800 à 2000 mm/an) où la rivière l'Eau d'Olle évacue 1429 mm. La neige tient une place importante (en moyenne 9 m de hauteur cumulée à 1860 m) et se maintient 5 à 6 mois.

Ces indications permettent de situer l isotherme annuelle 0°C vers 2500 m, la limite des neiges permanentes sur glacier vers 3000 m. Au total, compte tenu du récent réchauffement climatique, dans le passé le climat rendait difficile toute occupation permanente à 1800 m et au-delà. La briéveté de l'été limitait les cultures. La neige constituait un handicap sérieux avant de devenir un atout. Hier comme aujourd'hui, seule la forte valorisation d'une ressource

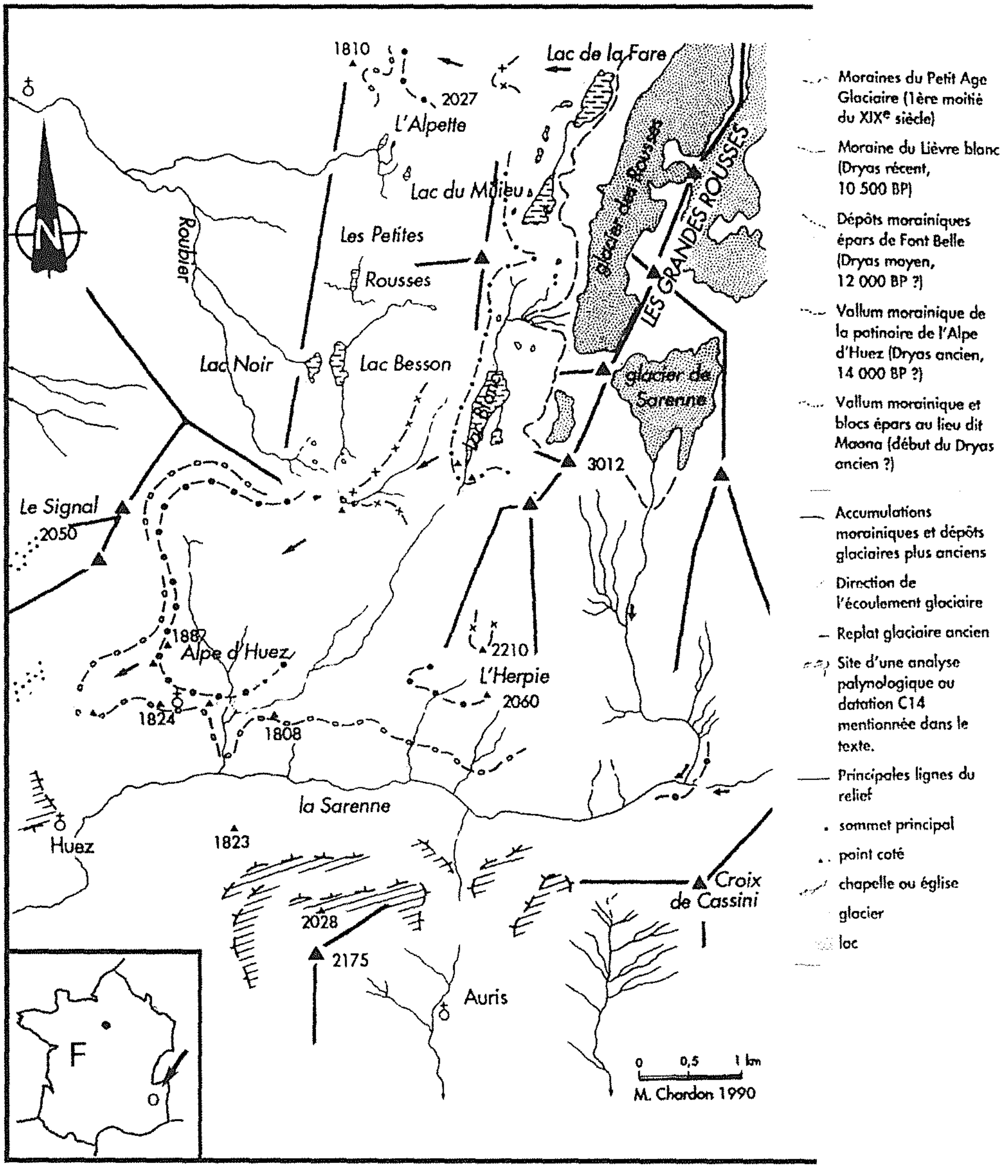

Fig. 1 - Le plateau de l'Alpe d'Huez et le sud-ouest du massif des Rousses avec les stades de retrati tardiglaciaire et Holocéne des glaciers.

naturelle (argent, houille, neige...), liée à un système économique, justifiait les moyens financiers et matériels considérables d'une présence humaine permanente.

LES PAYSAGES MONTAGNARDS À L'HOLOCÈNE ET UNE PREMIÈRE OCCUPATION D'ÂGE ROMAIN

Les recherches menées dans l'Oisans (COUTEAUX, 1982; EDOUARD, 1978) et, plus précisément dans les Rousses (CHARDON, 1991 et fig. 1) s'accordent pour considérer que la déglaciation des grandes vallées était avancée dès 15000 BP. Au Dryas ancien (14000 BP) ils se trouvaient sur l'emplacement actuel de la station touristique de l'Alpe d'Huez. Vers 10500 BP, les glaciers des Rousses et de l'Herpie se sont retirés en avant du Lac Blanc, de la Fare et du Milieu. Ils ne connaîtront plus d'avancée avant celle du Petit Age Glaciaire (XVII-XIX° siècles). La déglaciation s'accompagne d'une reconquête végétale rapide du Dryas récent au Suboréal tandis qu'au Subatlantique se mettent en place des étages de végétation (WEGMÜLLER, 1977). A l'Atlantique et au Suboréal, la limite supérieure de la forêt a dépassé 2000 m.

Dans les Rousses comme dans la plus grande partie de l'Oisans, au début de ce siècle la forêt avait presque totalement disparu sur les adrets. Tout le problème est de savoir quand a commencé cette déforestation d'origine anthropique. Les documents historiques prouvent qu'elle était largement avancée au XVII° siècle et au Moyen-Age.

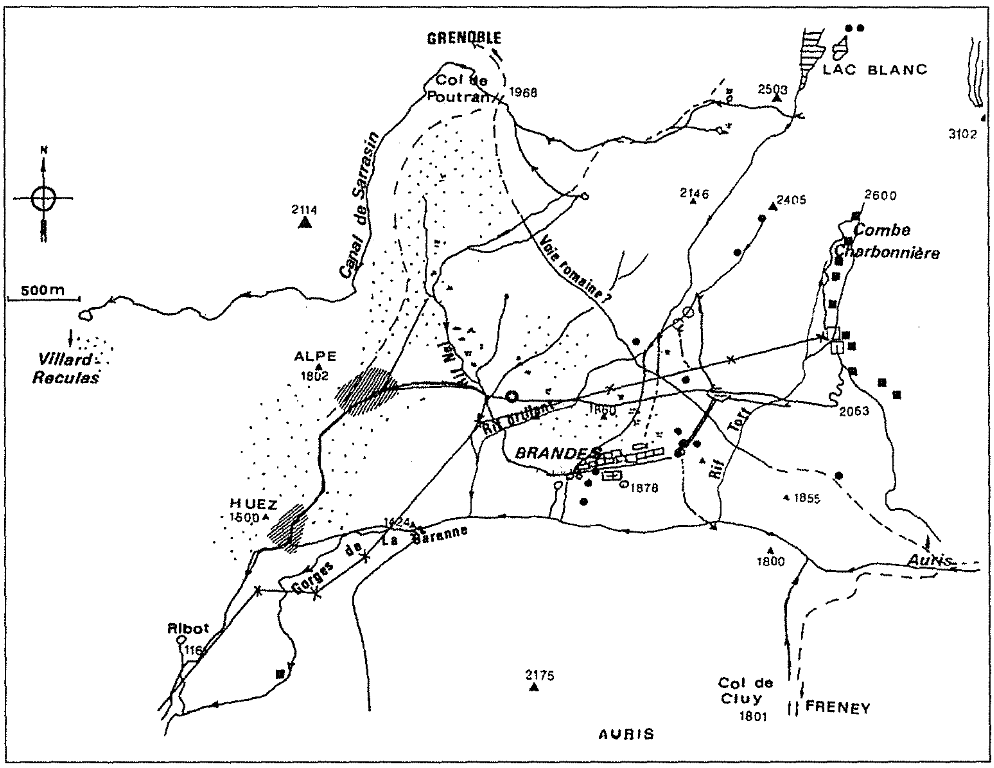

Fig. 2 - Les amènagements anciens autour de l'Alpe d'Huez. Légende: Pointillés: zone de cultures au XIX° et début du XX° siècles; Traits obliques serrés: habitats permanents et temporaires; Points ronds noirs: ancienne mines d'argent; Carrés noirs: mines de houille; Trait rectiligne à croix oblique: ancien téléphérique des mines de charbon; Etoile blanche: lieu de datation 14C; Traits fléchés: cours d'eau; Rectangles blancs: ancien village minier de Brande.

L'ancienneté de l'occupation humaine des adrets parait certaine. On a pu avancer l'origine celtique du nom Huez, la présence d'une ancienne voie romaine sur les prairies de l'Alpe d'Huez. La découverte d'une monnaie romaine et de quelques vestiges peuvent soutenir l'hypothèse d'une route qui de Briançon à Vienne joignait l'Italie et la capitale des Gaules (Rousset, 1972). A partir du Lautaret, par le plateau d'En-Paris et le col de Sarenne, ou plus vraisemblablement depuis Auris par le col de Cluy, un chemin conduisait à l'Alpe d'Huez, puis par le col de Poutran, vers les vallées de l'Eau d'Olle et de la Romanche jusqu'à Grenoble. Cet itinéraire très utilisé au Moyen Age et à l'époque moderne, l'a été sans doute dès l'Antiquité; cependant sa fréquentation était médiocre comme le prouve la rareté des restes archéologiques. C'était une voie secondaire et difficile entre l'Italie et Vienne, suivant ici la limite supérieure de la forêt (fig. 2).

Récemment, des travaux de terrassement entrepris à l'Alpe d'Huez (élargissement de la route de l'altiport, hôtel de l'Ours blanc...) ont mis à jour des restes de bois, de petite taille (10 cm au plus) dans la partie superficielle (40 à 60 cm) et remaniée des accumulations morainiques. Conservés en milieu hydromorphe, ils se désagrègent à l'air libre. Un remaniement superficiel des versants a induit un colluvionnement vers les cuvettes, dépressions et talwegs. Le caractère très fragmentaire de ces bois peut être un argument en faveur d'une origine anthropique: ils ne seraient que les débris d'une forêt détruite par les hommes. Un seul reste ligneux a pu être daté, fournissant un âge de 1930±180 BP (LY-3910) ce qui le situe au début du premier millénaire.

Vraisemblablement ici comme dans d'autres régions alpines, la période romaine a vu progresser l'occupation humaine de la montagne, d'où des défrichements à la limite supérieure de la forêt pour accroitre les pâturages. Une économie pastorale, des déplacements et des transports limités sur une route de montagne ne permettaient que la présence d'une population diffuse et temporaire. Nous n'avons aucun vestige d'exploitation minière, aucun reste d'armes ou d'outils, aucune trace d'une organisation sociale structurée.

UNE PREMIÈRE EXPLOITATION PERMANENTE ET ORGANISÉE DE LA HAUTE MONTAGNE: LE VILLAGE MINIER DE BRANDES (XIII-XIV° SIÈCLES)

D'après les documents historiques, il est certain que le versant Sud des Rousses est défriché et exploité au dessous de 1000 mètres dès le X° siècle. Sans doute la partie haute est elle toujours utilisée pour les troupeaux et les cultures (au moins partiellement). Mais au début du XII° siècle l'exploitation d'un filon de barytine à Brandes amène une véritable révolution minière et industrielle dans la montagne, (Bailly-Maitre, 1987) (fig. 2).

Le socle de terrains primaires des Rousses est parcouru sur son versant méridional par des filons de barytine contenant du plomb argentifère. Ils affleurent autour de Brandes, de l'actuel altiport et sur les versants du Lac Blanc. Certains recoupent la voie romaine et peut-être ont ils été exploités dès cette époque bien que nous n'en ayons aucune trace. En dépit de leur teneur en argent assez faible, c'est leur facilité d'exploitation et la présence de l'eau, nécessaire pour les opérations de triage et de lavage, qui paraissent avoir été les motifs fondamentaux d'une exploitation justifiée et décidée par les besoins en métaux précieux aux XI-XIII° siècles, en particulier ceux de la puissance féodale, le dauphin. Il s'agit clairement d'une volonté politique comme le prouvent l'importance des moyens mis en oeuvre. Au moins à partir du XII° siècle et jusqu'en 1331, ces mines sont intensément exploitées en faisant appel à des spécialistes étrangers.

Pour ce qui est de notre propos, pendant cette période, l'exploitation transforme le paysage montagnard:

1°) par l'ouverture d'excavations à ciel ouvert (Brandes) et souterraines (galeries proches de Brandes et du Lac Blanc) la création d'un réseau de chemins d'accès, la formation de terrils, de déblais... toujours visibles dans le paysage;

2°) par la construction d'un village de mineurs (Brandes avait au moins 80 habitations) d'une motte castrale (le chateau du Roi Ladre) d'une église et d'un cimetière proches. C'est un village minier, avec une organisation sociale forte à 1800 m d'altitude alors que dans l'Oisans les habitats ne dépassent pas 1600 m. L'occupation est permanente et le travail s'effectue entre 1800 et 2700 m, sans doute seulement pendant l'été au dessus de 2000 m;

- la création du centre minier et l'exploitation créent des besoins qui modifient également le paysage: apparition de routes et de chemins (outre la voie romaine, ceux du plateau de Brandes, de Huez, La Garde...) un développement des cultures et de l'élevage à proximité du site, une utilisation du bois et de la forêt à la fois pour le chauffage domestique, le boisage des galeries. Cette activité explique une intense déforestation puisque la forêt a disparu sur les versants Nord proches. Elle a contribué à créer ce paysage denudé, a-sylvatique caractéristique de cette partie de l'Oisans au dessus de 1500 mètres;
- le traitement du minerai (concassage, lavage) comme les besoins des ateliers (forges) et tout simplement ceux des hommes sont à l'origine d'une remarquable maitrise de l'eau et de son utilisation rationnelle. Cette organisation se retrouve dans le paysage actuel (fig. 2);
- les ressources en eau sont constituées par le Lac Blanc, situé à 2500 m, dont l'émissaire naturel le Rif brillant, renforcé par quelques sources, coule immédiatement à l'ouest de la zone minière. A l'est, le Rif Tort, descendu de la Combe Charbonnière évite également celle-ci. Leur régime est de type nival avec de hautes eaux de printemps et d'été, mais un débit très réduit en hiver et secondairement en automne. Des pertes karstiques existent vers 1980 m sur le Rif Brillant.

La zone minière de Brandes, située sur un interfluve surbaissé, devait se procurer ces eaux. La pente permettait de produire une énergie d'origine hydraulique susceptible d'être utilisée. Enfin il fallait domestiquer ces apports d'eau en fonction des besoins de traitement du minerai et des hommes. Pour relever ce défi, un habile système de captages-conduits d'amenée ou canaux – réservoir vannes – chutes a été imaginé et réalisé.

a) Vers 1920 m, sur le Rif Brillant, près de la route romaine un captage détournait les eaux et les amenait par un chenal jusqu'à l'extrémité Ouest du village de Brandes, là où les fouilles ont permis de retrouver des ateliers de concassage, de lavage, des meules... Par écoulement souterrain, elles contribuent à alimenter la source pérenne de Font Morelle utilisée pour des besoins domestiques. L'absence de réservoir de régularisation semble prouver qu'il s'agit de l'installation la plus ancienne et la plus rudimentaire.

b) Vers 1940-1950 m une prise d'eau alimentait un canal de petites dimensions (largeur 40 cm, profondeur 50 cm). Il descendait dans la pente à l'est du précédent et aboutissait à un réservoir de forme rectangulaire située au dessus de la partie est du village, proche de l'atelier du forgeron. Un draînage existait dans les habitations, sans doute relié à un chenal: est- ouest situé en bordure du réservoir. Ce système avait pour but de pourvoir aux besoins des artisans et peut-être de la consommation humaine.

c) Un troisième système plus complexe alimentait les installations de traitement proches du Rocher du Goulet. Les eaux du Rif Brillant captées vers 2040 m étaient amenées par un canal au bassin de l'Ecluse (1950 m). Celui-ci était également alimenté par une dérivation des eaux du Rif Tort: ce canal est encore visible sur la bordure Nord du chemin actuel de la mine de l'Herpie. Le bassin de l'Ecluse est réduit et en partie colmaté, mais par une vanne sommaire, il était possible de commander l'écoulement de l'eau dans le chenal dit de l'Ecluse. A l'aval, après utilisation, l'eau était évacuée par un canal de fuite (ravin de l'Ecluse) hors de la zone habitée.

Au total, ce complexe minier est fondé sur l'exploitation de quelques filons importants, l'utilisation rationnelle des ressources hydrauliques, le développement d'un réseau de chemins et sans doute les possibilités agro-pastorales du plateau. Si l'exploitation cesse dès 1331, elle n'en a pas moins marqué fortement la montagne. Elle est le résulat d'une action extérieure et volontariste dont l'origine est dans le pouvoir politique du dauphin, dans le cadre d'une société terrienne où la carence de métaux précieux commande une entreprise menée dans des conditions difficiles. Cette installation pionnière, extérieure à la région, est quasiment «coloniale» (importation de techniciens, outils...). Ces caractères se retrouvent dans les installations ou les tentatives d'exploitation minière des Alpes jusqu'à nos jours, mais aussi dans le développement du ski et des stations.

L'EXPLOITATION AGRO-PASTORALE DE LA MONTAGNE DU XIX° SIÈCLE SE COMBINE AVEC CELLE DES MINES D'ANTHRACITE: UN NOUVEL ÉQUILIBRE

En dépit de la venue de spécialistes étrangers, les mines furent abandonnées en 1331 et le site de Brandes déserté. L'épuisement des réserves fit échouer des tentatives de reprise pendant les siècles suivants. La région redevint purement rurale et les témoignages – notamment au XVII° siècles – laissent l'image d'une grande pauvreté et d'un isolement, source de retard (fig. 2).

A la fin du XVIII° siècle et au XIX° siècle, grace aux progrès techniques, au développement des moyens de circulation, à l'accroissement de la population va apparaître et s'affirmer une nouvelle maîtrise de l'espace dans la haute montagne. Son «âge d'or» se place entre 1850 et 1900, mais elle se prolonge au delà même si depuis 50 ans le tourisme a boulversé cet héritage paysager. Les cartes topographiques, en particulier le 1/80.000 de 1883, tous les documents icono-géographiques, les photographies aériennes, les paysages en témoignent. Pour faire vivre une population nombreuse, les ressources de la terre utilisées de façon optimale se conjuguent avec celles des mines de charbon.

a) L'occupation humaine permanente se concentre à Huez (1500 m) mais l'Alpe d'Huez, occupé une partie de l'année, s'agrandit et se développe (carte de 1883). La population locale (480 habitants en 1856) optimise ses ressources agricoles par:
- une culture essentiellement céréalière en terrasses qui se hissent jusqu'à 1700-1800 m;
- des cultures et des prairies de fauche développées entre 1800 et 2000 m;
- un développement du pastoralisme au delà de 2000 m.

b) Cette économie agro-pastorale entraine une nouvelle maîtrise de l'eau, dans les villages (captages, fontaines) mais aussi en altitude. Sur cet adret, l'été et l'automne connaissent des périodes de sécheresse: il faut pouvoir irriguer grâce aux ressources de la haute montagne. Les eaux du Lac Blanc sont en partie détournées vers le col de Poutran où elles confluent avec celles captées à la source de Font Belle. Le canal dit de Sarrazin les conduit du col de Poutran (1990 m) jusqu'au bassin de Laugaret (1626 m) au dessus de Villard-Reculas après un trajet de l'ordre de 6 km. Ce canal rudimentaire est une pièce essentielle dans l'organisation du terroir de l'Alpe: au dessous prairies et champs humides, au delà alpages et troupeaux. En été, la vie est active entre 1800 et 2500 m: population, bétail, cultures.

c) Les mines de la Combe charbonnière. Les revenus de l'économie agricole et pastorale sont complétés par l'exploitation des gisements houillers de la Combe charbonnière. Dès la fin du XVIII° siècle, apparaissent des mines dites «paysannes», à ciel ouvert. L'exploitation devient plus rationnelle et industrielle à la fin du XIX° siècle, quand elle se concentre sur les veines d'anthracite. En 1908 un téléphérique descend le charbon jusqu'à Bourg d'Oisans. La production atteint 8.000 tonnes en 1910; elle se poursuivra jusqu'en 1952.

Cette activitée est modeste; à l'origine elle est due à des initiatives locales, relayées par des capitaux régionaux. Elle permet le maintien d'une partie de la population (une soixantaine de mineurs y travaillaient 8 mois par an). D'importance purement régionale, complémentaire de l'agriculture, elle a laissé son empreinte dans le paysage: excavations, talus de déblais, batiment des mineurs et centre de triage aujourd'hui transformés, routes... Les infrastructures du téléphérique, de transport (rails et autres...) ont presque totalement disparu.

La vie rurale traditionnelle de cette zone, associée à une exploitation minière complémentaire, s'est perpétuée jusqu'au milieu de ce siècle. Elle combinait les avantages d'un site en adret permettant une mise en valeur des potentialités agricoles de la montagne et des ressources minérales limitées. Elle marque le paysage. Les installations minières sont toujours apparentes. La déforestation est importante, l'arbre se réduit à des bosquets dans un paysage «ouvert» de champs en terrasses, de prairies et de pierriers. Cette montagne a-sylvatique se transforme au XX° siècle. L'ouverture des voies de communication, l'accroissement de l'exode rural, le développement de l'industrie dans la vallée de la Romanche amenaient le déclin progressif de cette économie agro-pastorale.

LE DÉVELOPPEMENT D'UNE STATION DE SPORTS D'HIVER ET L'ORIENTATION VERS LA MONO-ACTIVITÉ TOURISTIQUE: LA NOUVELLE ORGANISATION ET L'UTILISATION DE L'ESPACE DE HAUTE MONTAGNE

Après 1920, le déclin de la vie rurale se combine avec le développement touristique, de façon limitée jusqu'en 1950, puis celui-ci éclipse toute autre activité (fig. 3).

La pratique du ski apparaît en France à la fin du XIX° siècle et reste jusqu'en 1914 un sport et une activité militaire. A partir de 1920 elle connait un développement modeste lié à une certaine prospérité, à des loisirs plus nombreux, à des progrés techniques dans la fabrication des skis et des remontées mécaniques. C'est un phénomène de société concernant d'abord une élite de gens fortunés, puis s'élargissant à une population plus vaste, celle des classes aisées puis des classes moyennes à partir de 1960. Ce résumé a pour but de rappeler que l'impulsion est venue d'ailleurs. Cette activité, véritable mode sportive et sociale, est un phénomène de civilisation qui bouleverse les demandes sociales, crée des besoins et une industrie de loisirs.

L'Alpe d'Huez va passer de l'habitat temporaire d'altitude à la situation de «station vedette» en quelques décennies parce qu'elle rassemble, sur le plan des conditions géographiques, un certain nombre de caractères qui répondent à cette demande:

- le relief lui assure un enneigement long et abondant, condition fondamentale. La neige est la matière première;
- les pentes faibles conviennent bien à la pratique du ski à ses débuts quant les remontées mécaniques sont inexistantes ou rares;
- la station est facilement accessible depuis Grenoble et Bourg d'Oisans par une route achevée en 1935;
- l'ensoleillement exceptionnel en fait un site recherché par une clientèle fortunée avide de bronzage hivernal, signe de distinction sociale;
- enfin un équipement précoce en moyens de remontées, la possibilité de les étendre jusqu'à 3300 m (ce qui est fait dès 1954) l'aménagement «poussé» des pistes, le ski d'été (jusqu'en 1990) et de grandes possibilités de loisirs et d'accueil transforment l'ancien habitat temporaire en une véritable ville touristique de montagne. Les équipements, l'habitat, l'utilisation des ressources naturelles (l'eau, les prairies, la forêt) sont au service d'une

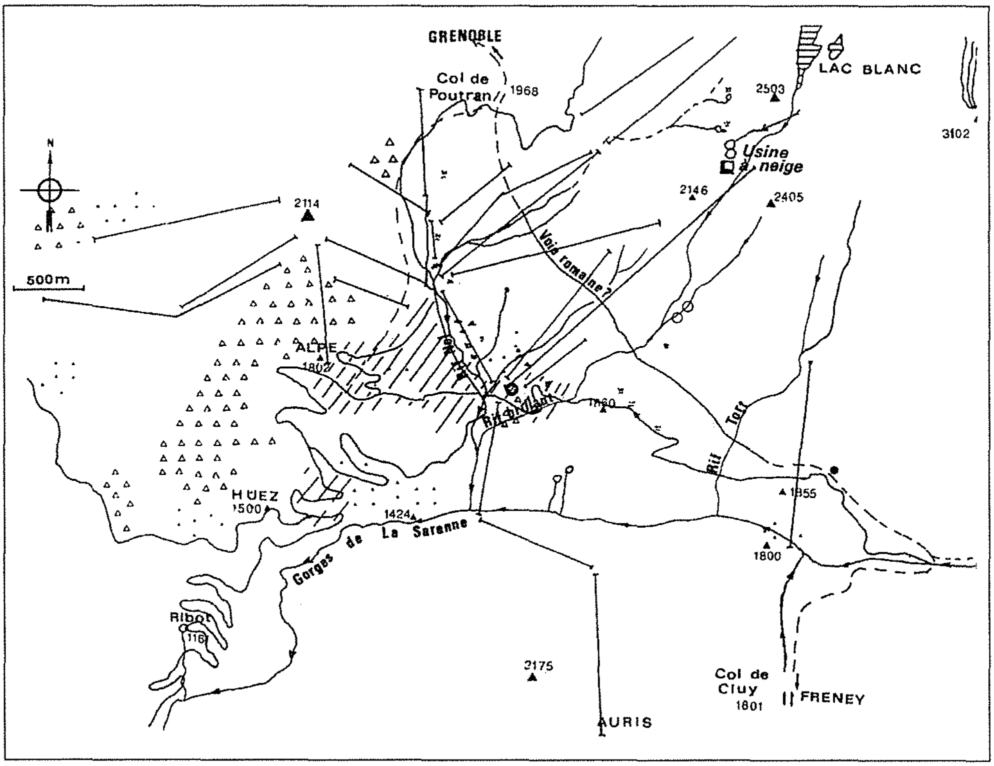

Fig. 3 - Les aménagements touristiques récentes à l'Alpe d'Huez. Légende: Traits obliques: zone d'urbanisation; Traits rectiligne bornés: remontées mécaniques, téléphériquess; Triangles blancs: reboisements organisés; Pointillés: reboisement spontané.

mono-activité touristique.

Cet extraordinaire développement vient de ce que le site naturel de l'Alpe d'Huez offrait la possibilité de répondre à la demande d'une clientèle exigeante, à la recherche d'un vaste domaine skiable, aux innovations techniques:

- de 1920 à 1940, possibilité d'un ski de proximité sur de faibles pentes bien enneigées (2200 m);
- de 1945 à 1955, les remontées permettent d'agrandir un domaine skiable, dont les pistes plus variées, et de l'exploiter jusqu'à 2800 m;
- de 1955 à 1975 le domaine skiable s'étend et se développe en altitude (3300 m) grace aux «gros porteurs» permettant d'ouvrir un espace de haute altitude et de pistes de haut niveau sportif;
- de 1975 à 1985, la recherche de grands espaces conduit à l'équipement d'une partie du massif et de ses abords (Vaujany, Auris, Maronne...);
- de 1985 à 1992 «les années sans neige» contrarient cet essor. Toutefois la mise en place rapide d'un système d'enneigement artificiel permet de surmonter les difficultés. Celui-ci n'est possible que grace à l'utilisation d'une ressource naturelle abondante: l'eau et la réserve du Lac Blanc. Une nouvelle maitrise de l'utilisation de l'eau se fait jour: captage des sources pour l'alimentation urbaine, utilisation du lac alimentant l'usine à neige des Marmottes et le réseau de canons de neige.

La fin de l'économie agro-pastorale et le développement du tourisme amènent une recomposition artificielle du paysage. Celui-ci se fait de multiples façons:

- l'urbanisation croissante de l'habitat humain;
- la modification sensible du relief par des travaux de génie civil destinés à améliorer l'espace skiable;
- l'artificialisation du paysage sous l'effet d'un dense réseau de cables, pylônes, constructions diverses;
- des modifications importantes dans l'écoulement des eaux, au moins en hiver, pour la production de neige de culture;
- la dégradation d'espaces de prairies d'altitude, de milieux périglaciaires ou glaciaires;
- la composition d'un paysage forestier artificiel: reboisements organisés en espèces étrangères adaptées au climat et de pousse rapide (mélèze, pins, essences américaines...). Celui-ci répond à une double demande touristique: mode écologique de l'arbre et de la forêt, protection contre les avalanches.

Le développement et le succès d'une station de sports d'hiver d'altitude correspondent à l'adéquation entre les potentialités du milieu de haute montagne et les besoins, l'attente d'une demande sociale stimulée par le progrès technique. Dans ce milieu anthropisé, l'adaptation doit se faire constamment au risque d'être devancé et marginalisé par des concurrents plus dynamiques.

L'artificialisation à outrance est l'aspect le plus voyant d'une exploitation intensive du milieu. Celle-ci est de type industriel parce qu'elle propose un produit à consommer, de façon répétitive et standard (le ski) en quelque sorte en série ou à la chaîne. Sa matière première est le milieu naturel avec des ressources renouvelables; la neige, le relief et le soleil. Elle nécessite des investissements constants pour suivre les progrès techniques et si possible les initier, voire les précéder. Tout retard est un signe d'obsolescence et de déclin. Une telle exploitation de la haute montagne est loin de celles qui l'ont précédée. Ce n'est pas une ressource, ni une partie de l'espace qui sont en cause mais la totalité d'un milieu:

1) Elle est de plus en plus consommatrice d'espaces.
2) Elle modifie radicalement les paysages hérités d'une transformation séculaire.
3) Elle est génératrice de dégradations profondes du relief, de l'écoulement, de la faune.
4) Elle apporte une anthropisation jusque là inconnue dans la haute montagne.
5) Elle est plus fragile que d'autres activités et que les mises en valeur plus anciennes puisqu'elle ne vise pas à satisfaire un besoin fondamental.

Jamais depuis l'arrivée des hommes dans les Alpes, un tel boulversement de l'utilisation de la haute montagne ne s'est produit en un laps de temps aussi réduit. L'exemple de l'Alpe d'Huez n'est pas démonstratif de l'ensemble. La haute montagne aménagée pour le ski ne compte que pour 5 % de la surface totale des Alpes françaises et aujourd'hui rien ne laisse prévoir son extension.

CONCLUSION

Les paysages de la háute montagne alpine mise en valeur, humanisée, occupée par les hommes sont le résultat des aménagements des milieux naturels conduits depuis plus de 2 000 ans en fonction de la pression anthropique et des besoins des systèmes économiques et sociaux.

Les paysages actuels du sud des Rousses n'ont de naturel que les grands agencements du relief de la haute montagne. La végétation, les sols, l'écoulement des eaux ont été plus ou moins modifiés. A tout moment, dans la mise en valeur, la maîrise de l'eau a été un élément déterminant, quelque soit l'objectif.

En définitive ce sont les besoins de sociétés, de civilisations et d'états politiques extérieurs à la montagne qui ont organisé l'exploitation de la haute montagne. Celle-ci s'est faite que lorsque les conditions naturelles le permettaient et que les ressources ou les possibilités répondaient à des besoins définis. L'homme est parfois allé à la limite des possibilités biologiques et naturelles: mines à 2700 m du XII-XIII° siècles, cultures jusqu'à 2000 m au moment du Petit Age Glaciaire... La mise en valeur agro-pastorale a été progressive: elle a transformé le paysage par la disparition de la forêt. L'exploitation minière a été rapide et momentanée: 1 à 2 siècles mais sa trâce est durable. La révolution du tourisme et de la neige a été rapide, et dans sa poussée extrême, elle tend à supplanter en quelques décennies toutes les traces du passé millénaire de la haute montagne.

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THE LAND OF MOUNTAINS IN THE ISLAND OF LANGUAGES: ASPECTS OF COMPARATIVE ETHNOARCHAEOLOGY IN DAGHESTAN AND THE CAUCASUS

SUMMARY – *The land of mountains in the island of languages: aspects of comparative ethnoarchaeology in Daghestan and the Caucasus.* The THEME proposed for the Brescia *Tavola Rotonda* in 1993 was an examination of different ways in which man has exploited plant, animal and mineral resources of the highland zone over the course of time; and the impact of such activities on this specialized environment.
The AIM of the meeting was to achieve and publish an improved synthesis between the different disciplinary contributions; to extend the discussion beyond an emphasis on pastoralism, so as to embrace varied resources of the highland zone; and to define the changing conditions governing highland zone exploitation and environment through time. These objectives correspond in essentials to those of the Highland Zone Ethnoarchaeology Project (HZEP).
The 1993 *Tavola Rotonda* included both highly specialized contributions and ones with wider scope. It seemed appropriate here to consider some comparative themes arising from ethnoarchaeological fieldwork in the major areas of the Balkan and Caucasus.
The present paper raises some of the methodological principles of comparative ethnoarchaeology in the highland zone. It goes on to discuss aspects of the Caucasus as a whole, of Daghestan in particular, and of one Daghestani village at Khuti.
The paper is centred on the Caucasus because fieldwork in that area was the most recent season of the Highland Zone Ethnoarchaeology Project. The region had only recently become accessible in 1991, and the work was undertaken with the aim of assessing its ethnoarchaeological potential. The intention was also to test the wider validity of field methods evolved for the HZEP within south-east Europe (eg., NANDRIS, 1985; 1988; 1992) and to elicit contrasts and comparisons between the areas.

RIASSUNTO – *Il paese delle montagne nell'isola delle lingue: aspetti dell'etnoarcheologia di comparazione in Daghestan e nel Caucaso.* Il presente lavoro si propone di richiamare alcuni principi metodologici dell'etnoarcheologia di comparazione nelle regioni montane. Ne discute quindi alcuni aspetti riguardanti il Caucaso, in generale, e il Daghestan, in particolare, principalmente per quanto concerne il villaggio di Khuti.
Il lavoro riguarda il Caucaso, oggetto delle ricerche più recenti del Progetto Etnoarcheologico nelle Zone d'Alta Quota (HZEP). Questa regione è divenuta accessibile solo nel 1991 ed il lavoro è stato condotto con l'intento di controllare le potenzialità etnoarcheologiche del territorio. L'idea è anche stata quella di controllare la validità dei metodi di lavoro sul campo elaborati per il Progetto nell'Europa sudorientale (NANDRIS, 1985; 1988; 1992) e di verificare differenze e paragoni fra le due aree.

INTRODUCTION

An exploratory season of fieldwork in Daghestan was undertaken at short notice in 1991, using horses to range widely in the mountains for six weeks. At that time the Caucasus was just

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opening up following a collapse of central authority in Russia, and indeed the fieldwork coincided with the attempted coup of August 1991. It was even claimed in some of the highland villages of Daghestan, which are called *aul,* that the author was the first westerner to visit the area for perhaps a century. It may just be that, as with the renowned longevity of the Caucasians, memories are somewhat vague and documentation, such as birth certificates, not highly regarded. However the warmth of the hospitality extended by the people of Daghestan is no illusion, and may constitute some evidence for the novelty of ethnoarchaeologists in the region.

The failure of Russian socialism saw a prompt resurgence of more ancient and effective mechanisms of social control, which have their parallels in the Balkans, notably eg., in Albania. The Caucasus has an active structure of strong clan and family loyalties, with eg., the automatic support of brothers in any dispute. In this is embedded the authority of the father and of regional Big Men, the «*Khun Butta*» or Big Father, along with the seldom invoked caveat of the blood feud. The transition from Big Brother to *Khun Butta* symbolizes rejection of the remote centralized authority of the failed communist system and its discredited militia, in favour of regionalism; while weapons are abundant if not conspicuous.

The re-activation of Islam is another striking development, not without its Balkan parallels. There is a great range of ethnic and religious sub-groups to which we may refer below, but to which justice cannot be done here except by way of listing them (Appendix A).

A further analogy between the Balkans and the Caucasus can be found in the wonderful regional, linguistic and cultural diversity, which makes eg., Daghestan a rich field for comparative ethnoarchaeological studies. The intrinsic importance of the Caucasus for linguistic and environmental questions, and the very obvious potential of the emergent archaeological sequence, make the region a prime target for ethnoarchaeological work. The value of a sound appreciation of regional variety and of the basis of the identity of the human group, can hardly be over-emphasized in the present condition of society in eastern and central Europe.

The term Balkans is used as a necessary shorthand to signify the highlands of south-east Europe which lie south of the Danube, as far afield as the Pindus and the Velebit, complementing the Carpathians to the north of the river. We are seeking to place the Caucasus in this comparative framework.

Comparative Ethnoarchaeology implies a methodological reality which transcends the regional Caucasian or Balkan situations. The operational principle in highland zone ethnoarchaeology is to consider the evidence on a comparative basis, decoding it at one level within the region, and using it at another for external comparison. In this way evidence of varying quality can be merged and construed to cumulative effect at the appropriate level of interpretation. The approach seeks fruitful alternatives rather than barren certainties.

It is characteristic of highland zone studies that individual sites or even whole regions appear relatively poor in data. This impression of poverty is usually a misleading construct. Poverty of data is a relative concept. The data within and between ostensibly richer and poorer regions can be read at different levels. The simplest and poorest of ethnoarchaeological situations regularly discloses complexity on closer appreciation, just as age itself lends significance to the plainest of data. If these sites were not effective adaptations they would not even appear in the record.

The principles of comparative ethnoarchaeology ought in theory to be equally valid for archaeological sites; but the almost biological investment in large-scale archaeological excavation is so great that, in order to justify it there is a temptation to assign inflated levels of significance to quite banal archaeological sites and data.

In highland zone research, economy of method is enforced by logistics. This in itself is a key to the understanding of the culture of highland zone societies. One methodological advantage of Highland Zone Ethnoarchaeology is that it can be carried out much more economically than most archaeological excavation, with less danger of forcing an excess of attributed meaning upon a finite piece of research.

Scale is an important factor in any consideration of the exploitation of the highland zone. By virtue of their sheer scale some mountains, such as the Caucasus or the the Himalayas, prescribe fundamental adaptations. Up to a certain altitude, which varies regionally, for argument's sake from *ca.* 1500-2000 metres, fundamental adaptations are not usually necessary. Occupational sub-groups of regional peasant society may be able profitably to exploit additional resources offered by adjacent highlands on a seasonal basis, without undergoing very profound adaptations of culture or technology.

This is not true of eg., the Himalayas, High Caucasus, or Andes. Around 8,000 ft is a base level at which high-altitude adaptations acquire importance. By 12,000 ft altitude sickness can become an important factor. Where altitude begins to have physiological implications, exploitation of the mountain zone demands greater commitment. The mountains of Daghestan rising to 4500 metres (14,700 feet) demand a degree of physical adaptation. It will be recalled that the modern Chinese invaders of Tibet may have succeeded in destroying a highly adapted and individual highland culture; but having done so they are finding difficulty in reproducing biologically at that altitude, and must retire to the lowlands for the purpose.

A classificatory distinction should thus be drawn between societies which have made the commitment of adaptation, and those which exploit the resources of accessible highlands on an opportunistic basis. Within the framework of explanation developed by the Highland Zone Ethnoarchaeology Project (HZEP) these can be seen as examples of K- and r- strategies operating within the respective cultures (eg., NANDRIS, 1985; 1988; 1992). In practice the field methods of the HZEP in Europe and Sinai proved applicable with few modifications in the new highland zone.

Because historical change has now attained such exceptional intensity, all ethnoarchaeology is effectively rescue ethnoarchaeology. The Carpathians, the Balkans and the Caucasus have been chosen because these three major regions still retain immense ethnoarchaeological interest and potential. Their comparability resides in the fact that all are more or less temperate highland zones. Direct comparison is not possible with some other regions in which the field-work of the HZEP has been carried out, eg., the case of Sinai (NANDRIS, 1990) since this involves a highland zone desert environment and quite specific ethnohistorical themes.

Even at an initial stage of research the relationships of the Caucasian to the south-east European technocomplex raise interesting questions. By contrast the European Alps lie outside the immediate sphere of the ancient near eastern pastoral technocomplex which links the other three regions.

It can already be proposed, on the basis both of archaeology and of resemblances in material culture and pastoral practice between the near-eastern pastoral technocomplexes and those of south-east Europe and the Caucasus, that triangular relationships have existed between these regions since prehistoric times. These extend at least as far back as the eigth MBP, when during the Greek Early Neolithic and the First Temperate Neolithic (the FTN) of south-east Europe, bone assemblages dominated by sheep were introduced into south-east Europe from the near east, along with the Neolithic itself. The relationship is reinforced by other culturally related complex traits, such as figurines (NANDRIS, 1970).

THE CAUCASUS

The Caucasus appears in some respects as a western extension of the Himalayan technocomplex, for example in the forms of its flat-roofed mountain villages; while in other respects it is considered to fall on the borders of Europe and Asia. Any argument about whether it lies in «Europe» or not, simply serves to emphasize this transitional importance. The Caucasus participated in Near Eastern and Anatolian history and prehistory to an extent which was consciously obscured by Soviet scholarship for many decades after the Russian Empire succeeded temporarily in repressing the region. At the same time the Caucasus contains elements which are not unfamiliar in a European context.

The Caucasus is of central importance for its extraordinary linguistic diversity and hence for eg., Indo-European studies. Some of the Caucasian languages are pre-Indo-European, and exhibit extraordinary features. Ubykh like others of its north-western Caucasian Abkhaz grouping has only two vowels, but up to eighty consonants. SHAUMYAN (1941) distinguishes twenty-seven cases of the Agyl noun. Even Strabo speaks of seventy «nations» in the market place at Sukhumi.

Pliny remarks that *«we Romans managed to do business in the Caucasus with the aid of 130 interpreters»* (PLINY, vi 5; HERVAS, Catalogo, i 118) and that in Colchis there were mopre than three hundred tribes speaking different dialects. Herodotus (iv 24) recounts how Greek merchants following the Volga up to the Urals were accompanied by seven interpreters in different languages; this linguistic problem also inconvenienced the Argonauts (HERODOTUS, i 73). Max Müller, in his seminal Lectures on the Science of Language , delivered at Oxford in the 1850's, and dedicated to the University (MÜLLER, 1885: 57 and 98) reminds us that the natives of the Caucasus then still referred to it as *«The Island of Languages»*.

There are today 32 language groups in Daghestan alone (Appendix B). These for the most part represent real linguistic differences and not merely dialects. Sometimes single villages will effectively speak their own language (cf. pl. 2a).

The tool of Language is integral to the Ethnoarchaeological evidence; eg., it played a crucial role in explication of the case of the Jebaliyeh Bedouin in Sinai (NANDRIS, 1990).

The Caucasus displays geographical and cultural variation on a grand scale. Mount El'brus is 5642 m (18,500 feet), and there are many peaks between 4000 and 5000 m (13,100-14,700 feet), while Dyul'tydag in Daghestan reaches 4131 m (13,550 feet).

By comparison the Făgăraş Mountains in the southern Carpathians reach over 2500 m (8200 feet) while, south of the Danube, Musala in the Rila at 2925 m (9596 feet) tops Olympus at 2917 m (9570 feet), the Šar Planina at 2702 m (8864 feet), Smolikas at 2633 m (8638 feet), and Durmitor in Montenegro at 2522 m (8274 feet).

The many natural resources of the eastern Caucasus include such exotic features as the natural gas flares still springing from the earth, which were implicated in the emergence of

Zoroastrianism. The richness of fauna and bird life may perhaps be illustrated by my sighting in 1991 of fourteen Golden Eagles airborne at one time, over the pastures of Khun Zunta. The flora of the Caucasus is exceptionally abundant, although the areas in which the field work was carried out were almost devoid of trees. VAVILOV (eg., 1990: 313; 1993: 438-439) was moved to stress the great variety and plasticity of wheat species in Transcaucasia, especially in Armenia, and in Daghestan. Much work still remains to be done on the range and variety of plant exploitation in the Caucasian mountain villages. It will be of particular interest to track agricultural strategies, during the current period of their re-activation, especially bringing the high terraces and their villages back to life after the ravages of communism.

The Nogai Steppe lies to the east of the Caspian, extending northwards from the waste of giant dunes called Sari Kum, composed of sand blown out from the valleys of the Caucasus and deposited at their base. Here, west of Makhachkala, the sharp boundary between the foothills of Daghestan and the Nogai Steppe to the north, can be comprised in one view, which effectively encompasses the boundary between highlands of the Near East and the steppes of Eurasia.

It was the nomadic Turkic peoples, the Nogai, who gave their name to this steppe, and to the solid bricks of Nogai Tea (pl. 4a). They came with the Golden Horde of Ghengis Khan to the NE Caspian. They speak three dialects; Nogay proper and White and Black Nogai (BASKAKOV, 1940).

Initially, up to the beginning of the seventeenth century, the Nogai gave their name to the steppes on the left bank of the Irtysh river (MÜLLER, 1885: 348). It was Peter the Great who transferred them thence to the steppe north of the Caucasus which they still inhabit, and they remained nomadic until quite recently.

The Agrakhansky Poluostrov, a peninsula *ca.* 50 kms long, projects from the Nogai Steppe into the Caspian. Some of the Daghestani mountain villages descend to this peninsula for their winter grazing, and stages of the movement were plotted during the 1991 season.

The incorporation of this steppe region into Daghestan is rooted not in regular historical processes of diffusion and differentiation but in the Stalinist strategy of «deport and rule», whose resolution forms a portion of the peace dividend of Marxism, and continues to bring suffering and conflict to the people of the region; for example in Ossetia and Chechen-Ingushetia. It is nowhere possible to study the ethnoarchaeology of traditional societies while ignoring such violent historical distortions of the normal processes which can be expected in course of their development. Like the invasion hypothesis, these cannot be accepted as an explanatory norm.

The ethnoarchaeology of the Caucasus incorporates material which is potentially of comparative importance for neighbouring regions such as Anatolia, and as far afield as south-east Europe. This potential is confirmed by comparative studies already extant in the literature: eg., KRASCHENINNIKOVA (1957) in relation to near eastern archaeology; MINORSKY (1978) on mediaeval Turkey and Iran; DAVITAJA (1981) on the Alps; or de PLANHOL (1956) comparing Anatolian and Caucasian pastoralism. SAGONA (1984) discusses the Early Bronze Age in the Caucasus; while CRIBB (1991: 220-221) discusses Anatolia, and the possibly nomadic nature of the Kura-Araxes culture (5300-4200 BP).

DAGHESTAN

«Dagh» means «Mountain»; and Daghestan is therefore the «Land of Mountains». It occupies the eastern end of the high Caucasus, to the north of Azerbaijan and north-east of Georgia; and borders to the east on the Caspian shore, along which one branch of the so-called «Silk Roads» of southern Eurasia ran though Derbent (fig. 1).

The 1991 season in Daghestan covered mainly the Lek territories, with parts of the neighbouring lands of the Lesghi (pl. 1a), Avar, and Derghi people.

In the Lek language of Daghestan there is no generalized word for «there». It is necessary to specify:

«There upwards»	=	gía
«There on the level»	=	gíku
«There downwards»	=	gílu

This seems to be a rather striking linguistic testimony to the fact that the Lek people may have inhabited their mountainous country with its abrupt relief for a very long time.

Daghestan is bound up with the history of many peoples and cultures, and the degree of regional differentiation even between adjacent valleys is remarkable. In this respect it recalls our central focus of interest in the Balkans. Undoubtedly the application of human DNA analysis in both areas will be of great interest.

Specific regions of Daghestan at various times formed part of the homelands of the Bulgars, the Khazars, and of the Turkic-speaking Nogai nomads of the Golden Horde. The secondary colonization of what we today think of as Bulgaria, originated in a small area around modern Makhachkala, together with the southern delta of the Terek and the lowlands inland and to the south.

The Bulgars preceded the Khazars, who also centred on Makhachkala during the 7th-8th centuries AD, and later settled on the Volga at Itil, in the 9th-11th centuries. The two main Khazar sites were captured by Knez Alek in the 11th century, and many Khazars converted to Judaism in the 11th century, before the Mongol invasion which may have driven them into eastern Europe. Peoples, like the Khazars, and regions, like «Bulgaria», change their nomenclature and allegiances.

«Albania» was the ancient name for an area of the Caucasus which included Derbent and Lek territory with northern Azerbaijan and a small portion of Georgia. The Georgians are those «Iberians», who gave their name to the monastery of Iviron on Mount Athos. The Chechens, like the Leks, Avars and other Daghestanis were also native to the region, before historical circumstances in the shape of Stalin forced them as we have seen into Chechen-Ingushetia. Other groups include the Turkish-speaking Kumiki (eg., in the village of Turki near Makhachkala); as well as the Balkhars (around Nal'chik); and the Cherkessi, who came from Polovtsia on the Dniepr and are now centred around Cherkessk. It is possible only to summarize the variety of these peoples here, by enumerating them and their languages (Appendix A and B).

The task of building up an overall archaeological and environmental framework for Daghestan has begun, although there is room for significant developments. Twelve-metre deep peat bogs which could initiate an environmental sequence were located during our fieldwork,

Map to show location of Daghestan: Highland Zone Ethnoarchaeology Project 1991

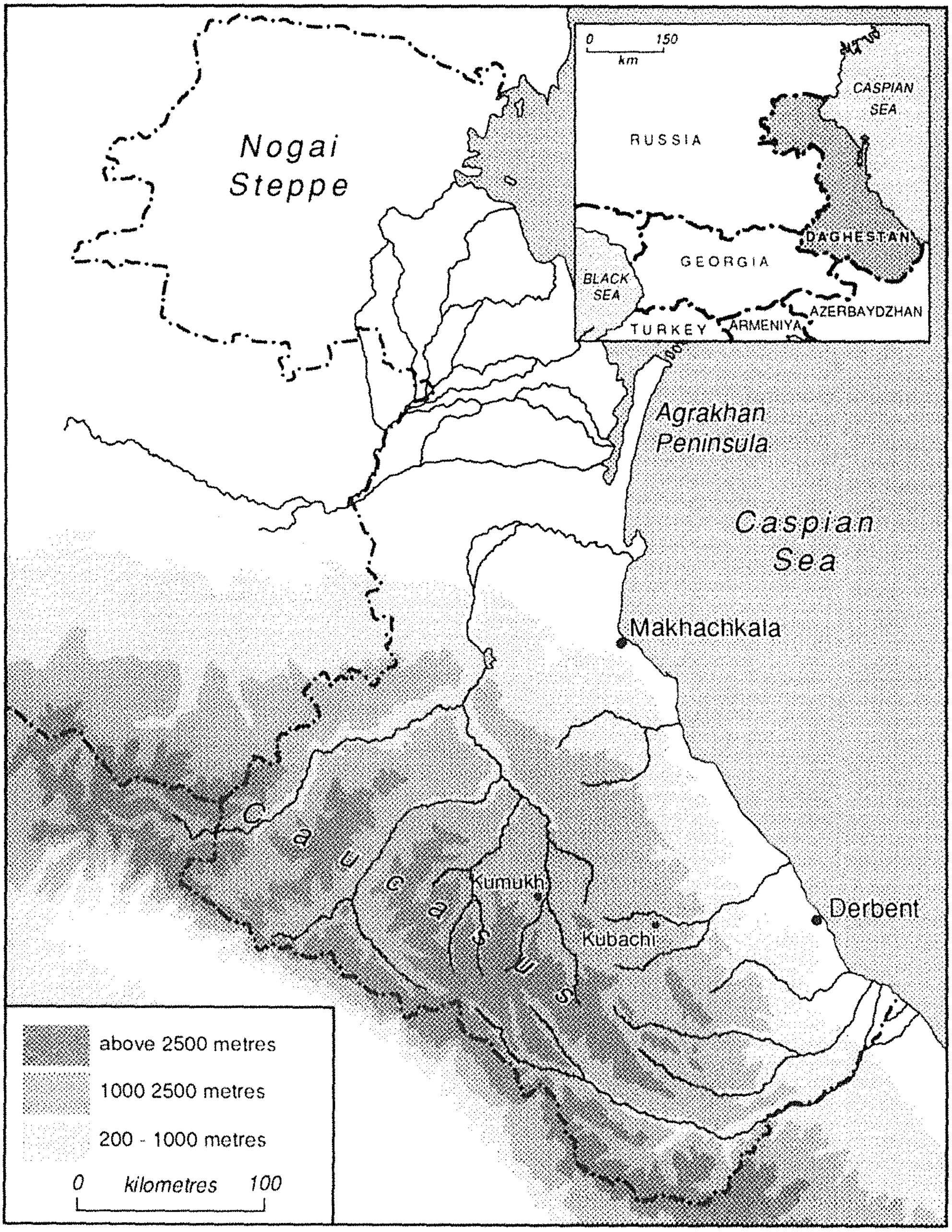

Fig. 1.

eg., at 2400 m asl., between Kuli and Kubachi. We may expect to find Palaeolithic and almost certainly Mesolithic occupation in Daghestan, given that further to the west the Caucasus has already produced unique high-altitude Acheulian material at *ca.* 2000 metres. The Chokhskaya Neolithic is already known from a few sites, and there are hints of a Bronze Age with sites located at altitudes up to at least 2200 metres. Both rock-engravings and paintings are claimed to be Neolithic and/or Bronze Age. There is a considerable literature on this area of the Caucasus, some reference to which is made in the attached bibliography.

Daghestan embodies important historical topics in Islamic archaeology. A branch of the great Silk Road ran along the Caspian-shore. To avoid taxation at Derbent there were inland branches of the Silk Road through the highland zone, running eg., through Vachi and Kumukh. Important settlement sites, cemeteries, watch-towers, and fortifications are still detectable on this axis.

Derbent dominated the coastal route, intersecting and controlling it in a manner similar to other towns such as eg., Thessaloniki, with town walls running up from the sea to an upper citadel. The Sassanid walls and fortress are preceded by a sequence of LBA, IA, Sarmatian, Scythian and Khazar remains. These are succeeded by Islam, with one of the oldest mosques of the region, and by the Ottoman Turks.

Daghestani and many other Caucasian villages appear as an extension of a Himalayan and near-eastern technocomplex, rather than of European and certainly not of south Russian models. These *aul* are highly nucleated, defensively oriented (pl. 2c), and perennially occupied. They may cling to ravines (pl. 2d) and cliff faces where, as at eg., Shangoda, they can climb to five or six stories, and extend inwards into caves and recesses. The pattern of the Lek village tends to be more concentrated, while around Avar villages a number of satellite settlements are usually found.

The traditional flat roof is of compacted clay, a technique found widely from the near east to eg., the limestone *tauf* of Malta. This has to be renewed annually using a stone roller, which is typically left lying on the roof. Its presence would clearly constitute archaeologically suggestive evidence for roofing technique.

Building stones are skilfully flaked (pl. 3a) but of very variable size, while their surface is often left rough. Great use is made of features such as arches, supporting pillars, cellars (used both for storage and for animals) and covered walkways between the houses, so that the settlement attains the agglomerated complexity of a Pueblo. Particularly important buildings such as mosques, or eg., the house dedicated by the inhabitants of Kumukh to their eminent native citizen the Cosmonaut Musa Manarov, are dignified with stone rings.

The Daghestani *aul* differs in some important respects from the stone villages of the Aromâni in the Pindus or Albania. Those are essentially seasonally occupied, and comprise substantial houses of ashlar masonry, with pitched roofs and gable ends, round windows, and arches.

In the southern and eastern Carpathians the settlement pattern is altogether different again, having being based probably since the Iron Age on a dispersal of function across the landscape, with scattered thatched or shingle-roofed wooden houses, orchards, pastures and sheepfolds (eg., NANDRIS, 1976), and not on stone-built villages at high altitude. These various resources are exploited on seasonally-based tidal pattern, ebbing and flowing into the mountains, with the *stîne* or sheepfolds at the high tide mark, and a whole series of other settlement types such as the *salash* and the *katun* expressing functional and formal variety at different levels. I believe that such classifications will be confirmed in the Daghestani context on the basis of further work.

The pastoral sites of Daghestan are called *kosh*, a word which like so much pastoral terminology is widespread in the near east. Here there are both similarities with and differences from our other comparanda in the Atlas, Pindus or Carpathians. The *kosh* equate functionally but not usually structurally with eg., the Romanian *stîna*. They tend nowadays to be provisional tented sites without significant associated structures, but a greater variety certainly exists than was possible to survey in the time available. It was possible however to visit both functional *kosh* and transit sites (pl. 2b).

The Leks take their sheep down to lowland *kutan* sites for the winter, especially the Caspian steppe, and the *Agrakhansky Poluostrov* projecting into the Caspian. Transhumance to these pastures (fig. 2) used to take 10-15 days on foot, depending on the weather. The sheep were on pasture east of the high mountain of Dyultidagh during June, July and August. Around the 10th September they would leave, arriving in about three days at Khuti, on *c* 13th-15th September. There they stayed until the very beginning of November when they left for the Caspian lowland, taking routes and using overnight stops which were traditional from at least the nineteenth century.

Payment was made to villages along the route, and in places there are sheep drove roads *ca.* 200 metres wide.

During the stay in the *poluostrov* lambing takes place between the 15th March and the 30th April, after 5 months pregnancy. Shearing took place *ca.* 1-15th May, and the flock started back *ca.* 17th May. They would again stop over in Khuti for 5-10 days, waiting for the summer shepherds. The sheep of an Avar village, such as Shangoda, would pasture in summer on the high Caucasus near the Georgian frontier, wintering not on the *poluostrov* where the Leks go but further inland west of the Caspian on the Nogai steppe.

Other distinctive forms of settlement are found over the Caucasus as a whole. The remarkable structures called *darbazi* are characteristic primarily of the high plateaux of Armenia, and of Georgia. These *darbazi*, eg., that of Chachkari in Georgia (pl. 5d) are massive semi-subterranean wooden structures with corbelled roofs under tumuli. The same regions of the Caucasus present storage structures of wood and wattle on four posts, cf. the Romanian *camara*. The villages of the Svanetians in Georgia are particularly noted for their high watch-towers, whose upper rooms are used for winter quarters (pl. 3b).

The wooden *darbazi* recall both prehistoric and recent European domed and corbelled stone structures: for example such megalithic tombs as *New Grange* in Ireland, or the *navetas* of Menorca, along with the domed stone *trulli* of S Italy; *tholoi* in Greece; *mitates* in Crete; *kyphes* in the Dodekanese (Moutsopoulos, 1989); *kazuni* in Istria; or the *bories* of Provence.

Prehistoric ritual structures and tombs were themselves often skeuomorphic of domestic houses. For example, the great Iron Age monuments of Sarmizegetusa in the southern Romanian Carpathians, at 1100 metres asl., include both circular and rectangular arrangements of finely dressed andesite, often interpreted as sanctuaries. The circular ones strikingly replicate excavated high-altitude Dacian Iron Age shepherd huts, like those of *Meleia* and *Rudele* (Nandris, 1981).

In variance of declared ethnoarchaeological principle we could look far afield, to the *Shosoin* at Nara in Japan, for elucidation of the rectangular Dacian structures at Sarmizegetusa. The *Shosoin* is a massive Imperial Treasury dating from the 8th century AD, built on a platform

Autumn Transhumance Route of Abdul Karim

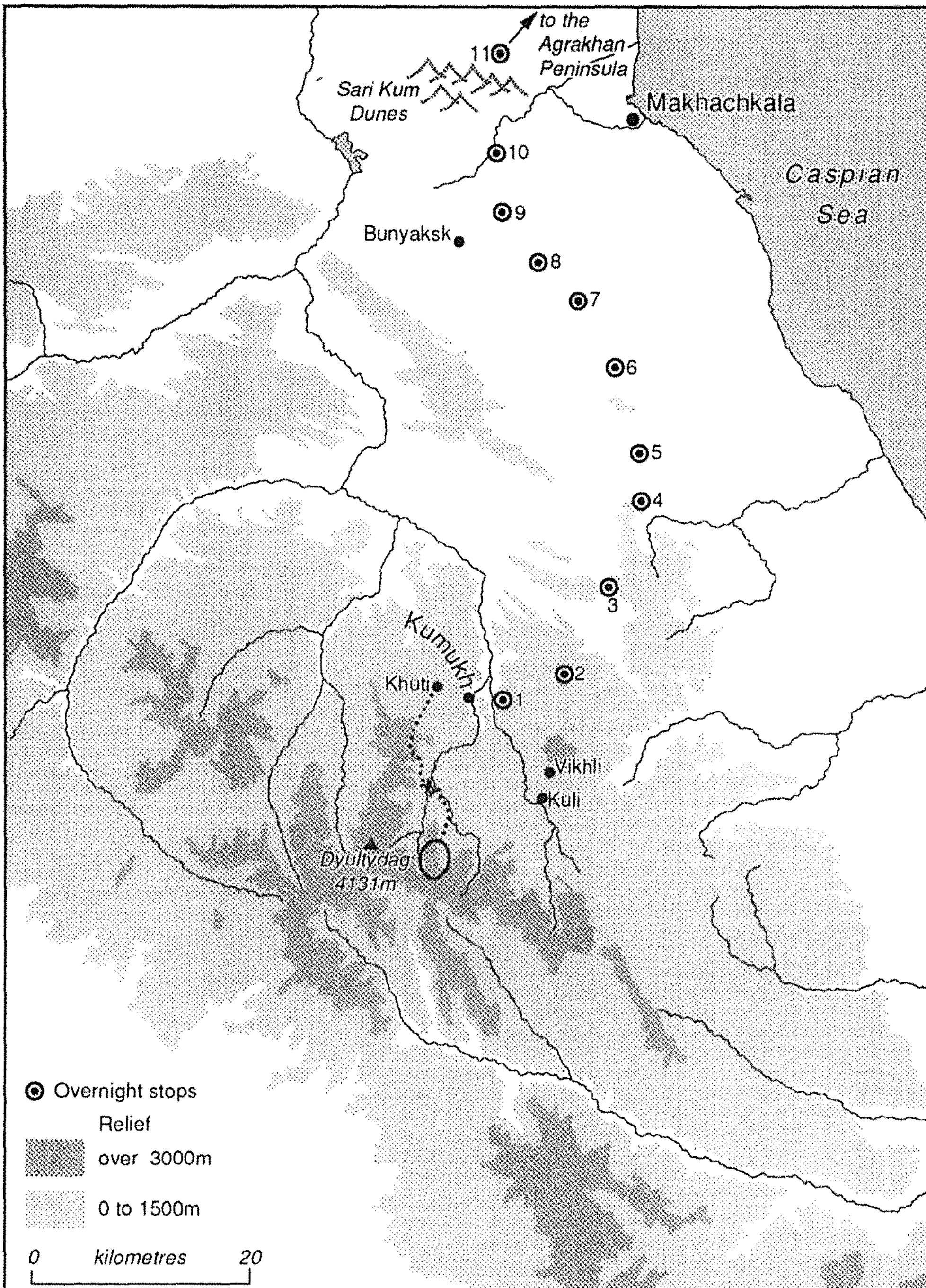

Fig. 2.

108 feet (33 metres) long. The whole building is supported nine feet above the ground by forty massive wooden columns about three feet in diameter. These were deliberately split and then re-bound with iron bands.

In the case of the Dacian Iron Age sites the andesite «column bases» of Sarmizegetusa would form an ideal basis for such a structure. The raising of timber elements on stone to preserve them from damp in the mountain environment has demonstrably been established practice in the region from the Iron Age until more recently.

The spacious Mycenaean tomb near Mycenae known as the *«Treasury of Atreus»* is another example. Its corbelled dome almost certainly replicates a contemporary 4th MBP (fourth millennium BP) tradition of domed round huts, similar to the *colibe* of the modern Aromâni in Greece, or to the *kalyvia* of the Sarakatsani, and it is specially relevant to the *darbazi* of the Caucasus.

It was remarkable to find *stupa*-like structures in highland Daghestan, sometimes with the addition of rags fluttering on sticks; eg., in the village of Khosrech near Kuli (pl. 1b). Despite appearances these are neither Buddhist monuments nor are the rags prayer flags. The *stupa* is vaguely associated with good luck and well-being, while the practice of tying rags to holy trees, near water sources, or near the tombs of holy men is a widespread ritual in Europe and Asia, and extends through the Near East and into Tibet. Examples have been met in the course of HZEP fieldwork, over an area ranging from Ireland and Denmark into central and south-east Europe, Greece and Anatolia. In Daghestan they appeared eg., on the sacred tree in the village of Tsukhadar (pl. 5c), and on the tomb of a holy man said to be an effective rain-maker, located in a cemetery near the village of Vachi.

The horse is still the most effective means of communication in the mountains, although roads now reach some of the villages. The highest village in Daghestan, and probably in the Caucasus or Europe, is Khurrush, to the south and west of Derbent close to Azerbaijan, where *ca.* 80 families live at *ca.* 3000 metres (9800 feet). There is no road for the last 18 kms., and access is only by horse or on foot.

Terrace cultivation in Daghestan goes up to easily 2200 metres as defined using an accurate altimeter. Disused terraces are one of the most notable feature of parts of the Daghestani landscape, while there are also terraces within villages. Vines are said to have been significant in the past, but there was a wide range of cultivars. In some areas the use of narrow terraces for high altitude cultivation of steep slopes is on an almost South American scale (pl. 2a). No very great antiquity can be demonstrated at present for the terraces themselves. Their floruit probably relates to a period of breakdown of traditional agriculture, at a time well before the the whole system was deliberately destroyed under socialism.

Another feature of Daghestani highland agriculture is field clearance for tillage or pasture. Large heaps of field stones are found, eg., at 1850 metres near Vachir Baku below Ts'îshi and the mountain of Khun Zunta. Vachir Baku is itself a great mound representing the robbed masonry of a fortified Pre-Islamic watch tower or fort of *ca.* 8th-9th centuries AD, overlooking its associated settlement. Excavations in the region by Munchaev in the 1960's produced quantities of Byzantine goldwork. Burials from the ravine below Khaimi village nearby yielded bronze bracelets.

Vachir Baku lies where the road leaves the plateau, and it dominates one of the inland branches of the Silk Road. These passed through the valleys to Kumukh, partly to avoid taxation at Derbent which commanded the coastal route. Watch towers, or their sites, are common adjuncts of village defences. One such notable site occurs as a mound at the end of a long spur dominating the valley below the *aul* of Buhkti. An ancient round watchtower existed in Kuli until it collapsed during the night of the 8th September 1958.

Certain of the Daghestani villages still specialize in making pottery (at Balchar), or the felt cloaks called in Lek *varsi* (=Russian *burka*) which are made at Andi and still used by the shepherds. Kubachi is specially famous for its metal work. Important items of masculine culture were silver-mounted *tur* (Caucasian mountain goat) horns, swords, and *kindjhal* daggers (pl. 1d and 6c); while soumak-weave kilims, felt patterns, carpets, and the dress items characteristic of the Caucasus were often (but not exclusively) a feminine contribution. When Kubachi was flourishing it imported pottery and other items which document its trading relationships.

A constant factor affecting highland zone prosperity, whether in the prehistoric or historic context, is the close relationship always apparent to developments in the lowlands. In considering the exploitation of the highland zone it is necessary to recall how, despite having no obvious physical advantages, certain mountain villages rise historically to importance, as commercial centres with far-flung connections. This reflects two characteristics of the highland zone itself, its high connectivity, and the stimulus to human initiative afforded by impoverished resources. For example, the hermit in Sinai, the muleteer of the Pindus, the Mijaci of the Drin valley at Galičnik in Macedonia, the Aromâni in their Balkan settlements like Moschopolje in Albania, and Aminciu, Siracu, or Calarli in the Pindus ; just like the potter of Balchar, or the metalworker of Kubachi in the Caucasus: all of these created something out of nothing, in regions which were conspicuously devoid of natural resources.

By contrast when human initiative was stifled under communism, whole regions intrinsically endowed with immense natural and cultural wealth, such as the Caucasian or Carpathian highlands, saw men living in conditions of abject poverty. Irrespective of theory, this proved to be the actual practice.

THE DAGHESTANI VILLAGE OF KHUTI

Although by no means the highest or most dramatically situated of the mountain villages of Daghestan, Khuti near the ancient capital of Kumukh may serve as an introduction to the characteristics and the potential for wealth and improvement of such villages.

Kumukh itself is an important inland settlement, which could be regarded as in reality the capital of Daghestan, since the port of Makhachkala is an artificial Soviet creation. Kumukh is an historic site, lying between two deeply incised rivers, on an inland section of the Silk Road which branches away from the Caspian coast. Many caravans chose to take this route in preference to paying taxes at Derbent, which straddles the coastal route. The ancient mosque of Kumukh contains a number of items such as a shield, an inscribed helmet (pl. 6a) and a shirt of chain mail (pl. 6b). Such items were being used in the Caucasus as late as the last century. Harry Luke (1924: 204) even alludes to a wearing of chain mail in combination with adherence to the doctrines of Karl Marx.

Khuti lies at *ca.* 1740 metres asl., in a wide treeless valley. It has a good microclimate on a south-facing slope with very little wind, and *ca.* 300 sunny days in the year, even when snow is lying on the ground. The catchment includes good pasture land, and agricultural terraces on which a species of wheat is grown which was introduced from the Altai, as well as a very wide range of root crops and vegetables. Reaping by hand is still practised in several areas of Daghestan (pl. 5b).

During August 1991 Khuti was occupied by ten families, totalling about 20-25 people, mainly women, and including 8-10 children. Many of the houses are derelict, and it might technically be classified as a semi-deserted village, but it is by no means abandoned in fact or in spirit. The physical dereliction is in large part the result of socialist policies of expropriation and centralization during the Soviet occupation of Daghestan, which led to the final abandonment of the terrace system. The inhabitants of Khuti, as of many other localities, now wish to return and to revive their village. In historical perspective it has after all been destroyed and re-built frequently, or as the inhabitants put it «seven times».

Just like many of the villages of south-east Europe, Khuti has moved its location in course of time, so that the village territory in effect contains a number of deserted village sites, a fact of which any form of catchment analysis should take account.

The central position, and proximity to the old mosque, of the Dibirov house in Khuti, which was made available as a base during our work, makes it explicit that this house belongs to an important man. It has big arched stone cellars in which cattle are stalled in winter. In the courtyard there are an inhabitable outhouse used eg., by visitors or older female relations, and a summer kitchen abutting on stone-arched store-rooms with arches, some of which lead to a rear entrance on a lower level. The summer kitchen is in the open but under the arches leading to the cellars (pl. 4c).

Storage as a fundamental attribute of the house, and one which has profoundly influenced behaviour since Neolithic times, has been somewhat neglected. It had an impact not only in the economic sphere but also bio-socially, facilitating womens' role at home and as mothers, and probably extending their reproductive life.

A distinction has to be drawn within the Daghestani *aul* between storage of provisions, and store rooms for valuables. At Khuti a small winter kitchen in the cellars is used as a food storeroom. It contains large old storage jars made in the potting village of Balchar, and has culinary plants hanging round the walls, large wooden flour chests which are often carved, and covered storage pits for root vegetables and potatoes. The provisions stores are in cooler locations and contain such items.

Store rooms for valuables are in secure not necessarily cool locations within the buildings, and may contain all sorts of wealth items ; such as copper water jars, whose typology varies from village to village, and lacquer or pottery vessels, kilims and shoulder bags (cf. *torba*), samovars, felt boots (pl. 1c); or the mounted or unmounted horns of the *túr* or wild goat (pl. 1d) which are prestige items. Other prestige valuables, such as Kubachi-mounted swords (pl. 6c) will be secreted around the house. There will also be functional items such as horse-hair (pl. 6d) or sinew sieves, while the odd side of dried meat or bundle of plants may be present. A significant feature in these store rooms, is the use of bundles of certain species of dried plants for quite specific functions such as to repel mice, or moths. This urgently demands investigations which could establish their real properties.

A regular feature of many well-off Daghestani houses is the metal-covered wooden chest (*butt tukha* or *sunduk*) used for storing valuables and clothing. The chest in the Dibirov house in Kumukh measured 1.40 m long x 60 cms high and 70 cms deep (pl. 3c). The current fashion in these chests is for a wooden base covered in sheet metal, stained golden red and decorated with thin (1-2 mm wide) contrasting strips of bright-coloured metal. These are hammered on with tiny disk-headed black nails to create lattice patterns. At each short end there are two handles. There are usually three clasps for padlocks, or for a bar which passes through all three and can be sealed.

The storage chest is a common feature of European peasant culture, eg., the *lada cu zestre* or dowry chest of Romania, the Greek *larnax,* or indeed the Renaissance Italian *cassone,* and widely distributed as far as central and northern countries.

Stone stairs against an outside wall in the courtyard at Khuti lead to a wooden balcony which is at the level of the main entrance from the upper roadway, and to the living rooms, of which there are four. These intercommunicate, in one case through the rear of a low cupboard behind hangings. The floors are of beaten clay, covered with old carpets.

There are four main types of such weaveries, which may also serve as wall coverings:

1) The characteristic Daghestani soumak-weave kilims, in which the weft threads are twisted around the warp.
2) Regular kilims.
3) Regular pile carpets.
4) Embroidered and cut-out felt hangings, or kaitag.

These each embody in their own way a set of ancient Eurasian traditions, and the fact that they here coincide epitomizes the position of Daghestan as a reservoir of variety set in a cultural ecotone. In this respect it is comparable with south-east Europe.

The ceilings have wooden beams, supporting a pitched attic roof open at both ends under which at least ten species of dried plants were hanging, with others spread to dry on the floor. The word used for this covered but airy space under the roof is *cherdakh.* This name is present in south-east Europe in shepherding terminology for the roofed structure set up on posts without walls to provide shade for the sheep at mid-day: eg., the Romanian *cerdac,* the Hungarian *csardak,* or the Greek *tsardaki.*

The diet contains large quantities of meat; mainly mutton, and often boiled. There are also pitta-like breads, thin hot cheese pittas, sour cream, honeycombs and honey. Radish is often eaten with the honey. Pitta bread ovens (eg., in the village of Bukhti, pl. 4d) are open-topped domes of *pisé,* deeply grooved on the interior, with incised designs whose functionality the archaeologist would have to be attentive to appreciate if they were found in a fragmentary state. He would be wrong for example to interpret them as wall decoration.

The dough is prepared with oil and yoghourt, and the oven itself is coated with an oil and butter mixture. The flat pittas then adhere to the walls of the oven (pl. 4d) which are pre-heated with a brushwood and grass fire, and they drop off when golden brown. Like the domed *gastra* or *testa* found in south-east Europe at least as far back as the Iron Age, or the metal baking domes covered in ash used by Bedouin, this is another effective variant method for baking pitta. Fuel in the largely treeless environment of the Daghestani village is usually provided by cakes of dung (pls. 3d and 5a).

Hinkal, the Daghestani variant of pasta, is almost a national dish, and comes in various shapes and sizes. These may vary from fist-sized lumps among the shepherds to something more refined in the household, and is usually eaten with *adjica* (a hot tomato sauce). There are red and green peppers, tomatoes, black pepper, egg-plants, potatoes, and rice; to mention only some of the great variety available. Some of this was produced within the traditional economy based on the high terrace cultivation, and some is more recent. Beehives are tended in the valley below Khuti, on a prominent hillock between two streams a kilometre below the village, where the bees have a rich range of herbs and flowers upon which to draw.

Tea cultivation is potentially a significant resource in the Caucasus. Among the varied ethnoarchaeological uses of plants in Daghestan the infusion of herb and steppe teas is important. There are two main tea plants: *uzul Likhri* (Likhri's leg), which has yellow flowers; and *kkhio-kkhio-mari,* with blue flowers. The Steppe tea, also known as «Georgian» or Nogai tea, comes in hard compact bricks of *ca.* 36x17x4 cms (pl. 4a) incorporating the twigs as well as the leaves. Scrapings from these bricks are boiled and prepared in a bowl with milk, pepper, and melted butter or, in Kalmykia to the north between the *Nogai* Steppe and the Volga, with mutton fat, to make a highly palatable drink (pl. 4b).

As already noted, certain plants are used as insecticides, some to repel moths from the storerooms, and others to discourage mice. It would be important to isolate the active principle if any in such compounds, bearing in mind how eg., Pyrethrum has provided a benign alternative insecticide to DDT. Medicinal plant use is another dimension of the culture. Gelatine in milk, very likely *isinglas* from sturgeon swim-bladders, was offered for an indisposition. Goat fat was also proferred, for massaging a shoulder after a fall from a horse; but it proved possible to avert this cure by insisting that only bear's fat would be acceptable. Many other plants are in use for a wide range of purposes; eg., the dried roots of devyatsil (Latin: *Inula,* Russian: *Devyasil* or *Devyatisil* = Scabwort, Golden Saxifrage, or Elecampane) the smoke from which is an effective decongestant when inhaled.

There was no intention in this paper to undertake systematic comparisons or to draw overall conclusions. This would be pretentious before further long-term work can been done. The aim was to refer to some methodological principles and to draw attention to the very striking ethnoarchaeology and potential archaeological importance of the Caucasus, with its rich human and natural variety; and especially to Daghestan as the Land of Mountains in the Island of Languages.

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I retain singular impressions of the skills of the leading metal-workers of Kubachi, and notably of the hospitality of

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Plate 1 - a) Lesghian warriors (CHANTRE, 1887: Vol. 3). Cartridge bandoliers, weapons, fob watches, tools of a trade, walking compasses, or other status items and personal attributes, would be represented on their grave stelae. b) *Stupa* (non-Buddhist) near the cemetery in the village of Khosrech. Rags are attached. The woman carries a water jar, the forms of which vary locally. c) Quilted winter boots of felt, from the storerooms of Megamet Gadji, Headman or *Khun Butta* of the village of Kuli. Womens' boots (left) are cut away under the knee, while Mens' (right) rise up in front of it. The soles are reinforced with pitch. c) Prestige items: sword and sabre of Kubachi metalwork, and a *kindzhal* (right) or Caucasian dagger. The Drinking Horns of the *túr* or Caucasian wild goat are scraped with a glass edge, highly polished, and mounted in silver.

Plate 2 - a) Intensive and extensive terracing around Meghib village, seen from the mountain of Turkche Dag. This single Avar village speaks its own language, Meghib. b) A *kosh* or shepherd site between Kuli and Kubachi; in transit, with no structures, and *burka* (capes) and other equipment strewn on the ground. c) Fortified house in old Vachi, at *ca.* 2100 metres (6890 feet). d) The architecture of Mukhar, above a ravine; note the beehives (lower centre).

Plate 3 - a) Dressed stonework at the house of the Khun Butta Headman of the village of Uri. b) Winter living quarters on the upper floor of a tower-dwelling of the Svanetians, with bunks and storage spaces (ALPAGO-NOVELLO *et al.*, 1980). c) *Butt tukha* or big metal-lined chest for storage, from the house of a prominent family in Kumukh. d) Aerated storage wall of dung cakes in Khuti. In the treeless landscape of Daghestan these constitute a major fuel resource (see pl. 5a).

Plate 4 - a) Bricks of *Nogai* steppe tea (scale in text), stamped with hammer and sickle and details of origin. b) Bowl of *Nogai* tea, with milk, pepper, and butter. c) Cooking oven, fired by brush and grasses, in a summer kitchen in Khuti, under cover but open to the courtyard. d) Bread oven at Bukhti; a conical dome with an open top. The interior is incised so that *pitta* breads stick to the heated pisé wall (see text).

Plate 5 - a) Cakes of dung with finger impressions drying on a wall in Mukhar. The devices made from tyres are not drinking troughs. They stand on the wooden feet, so that sheep can be inverted into them for human convenience during shearing. b) Reaping by hand at Vachi; 1990 metres (6529 ft.) asl. c) Cult tree with rags at the Derghi village of Tsukhadar. d) Corbelled wooden interior of a semi-subterranean Georgian *Darbazi* at Chachkari (after ALPAGO-NOVELLO *et al.*, 1980).

Plate 6 - a) Persian helmet from the mosque museum at Kumukh. b) Chain mail from the mosque museum at Kumukh. c) Inscribed niello silver hilt of a Kubachi metalwork sword belonging to Megamet Gadji, Khun Butta of Kuli. d) Horsehair sieve from the storerooms of Megamet Gadji. The threads are twisted from several horsehairs.

(Photographs by the Author, apart from pls. 1a, 3b and 5d).

Plate 1.

Plate 2.

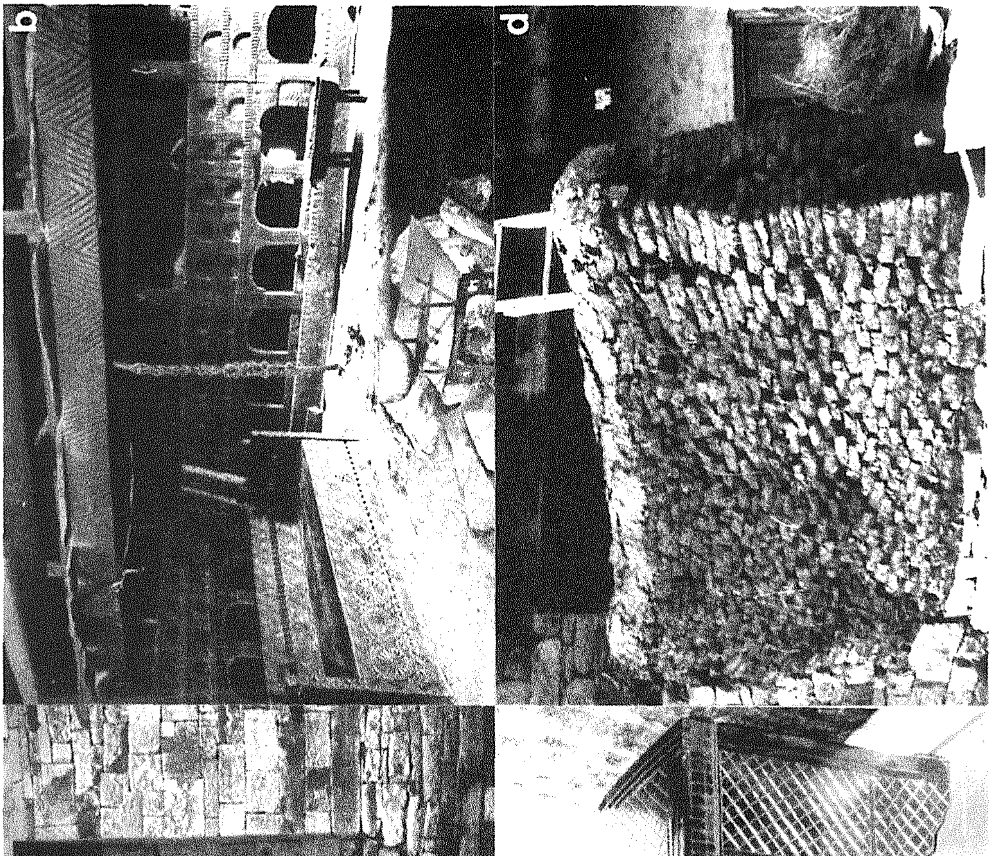

Plate 3.

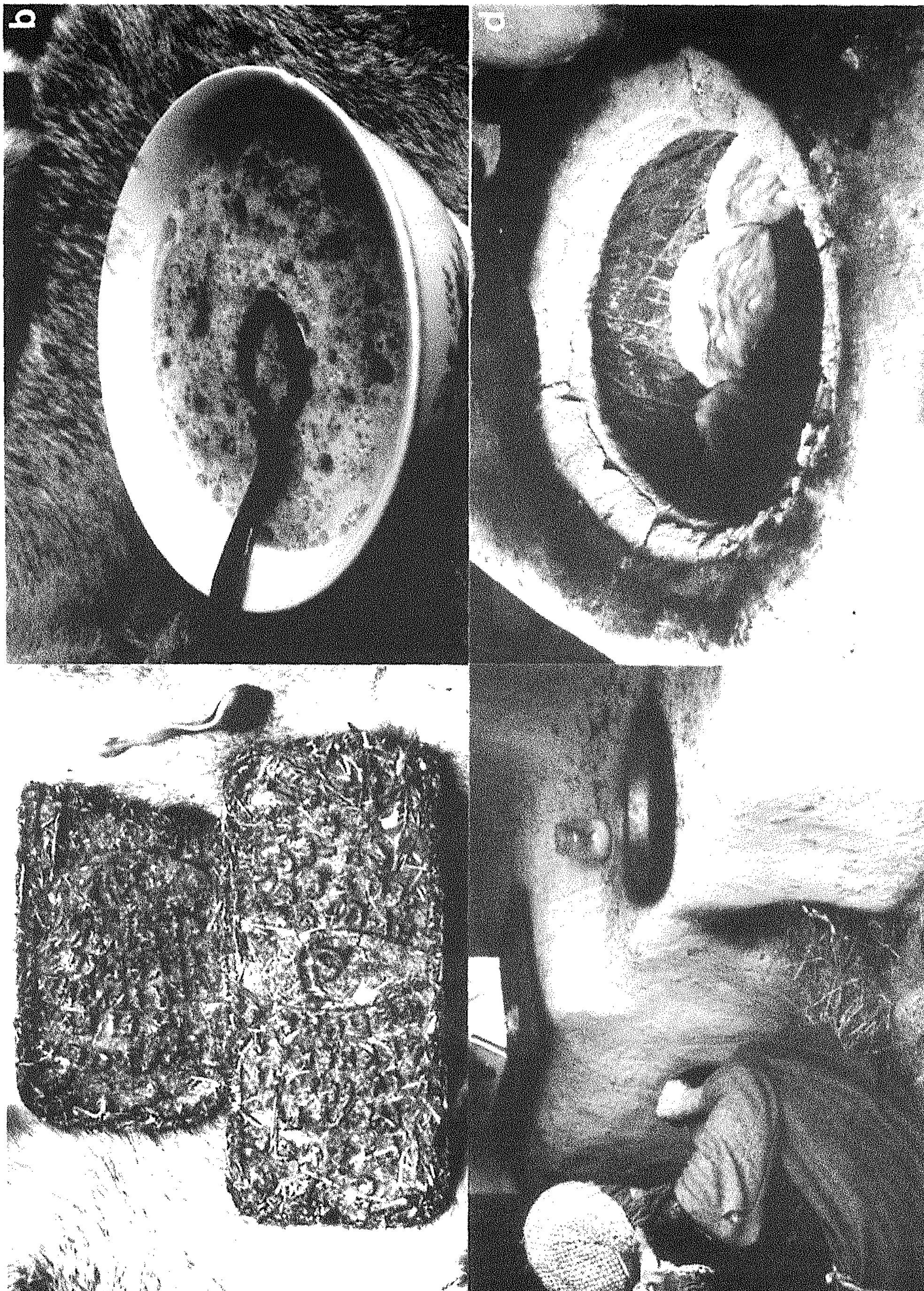

Plate 4.

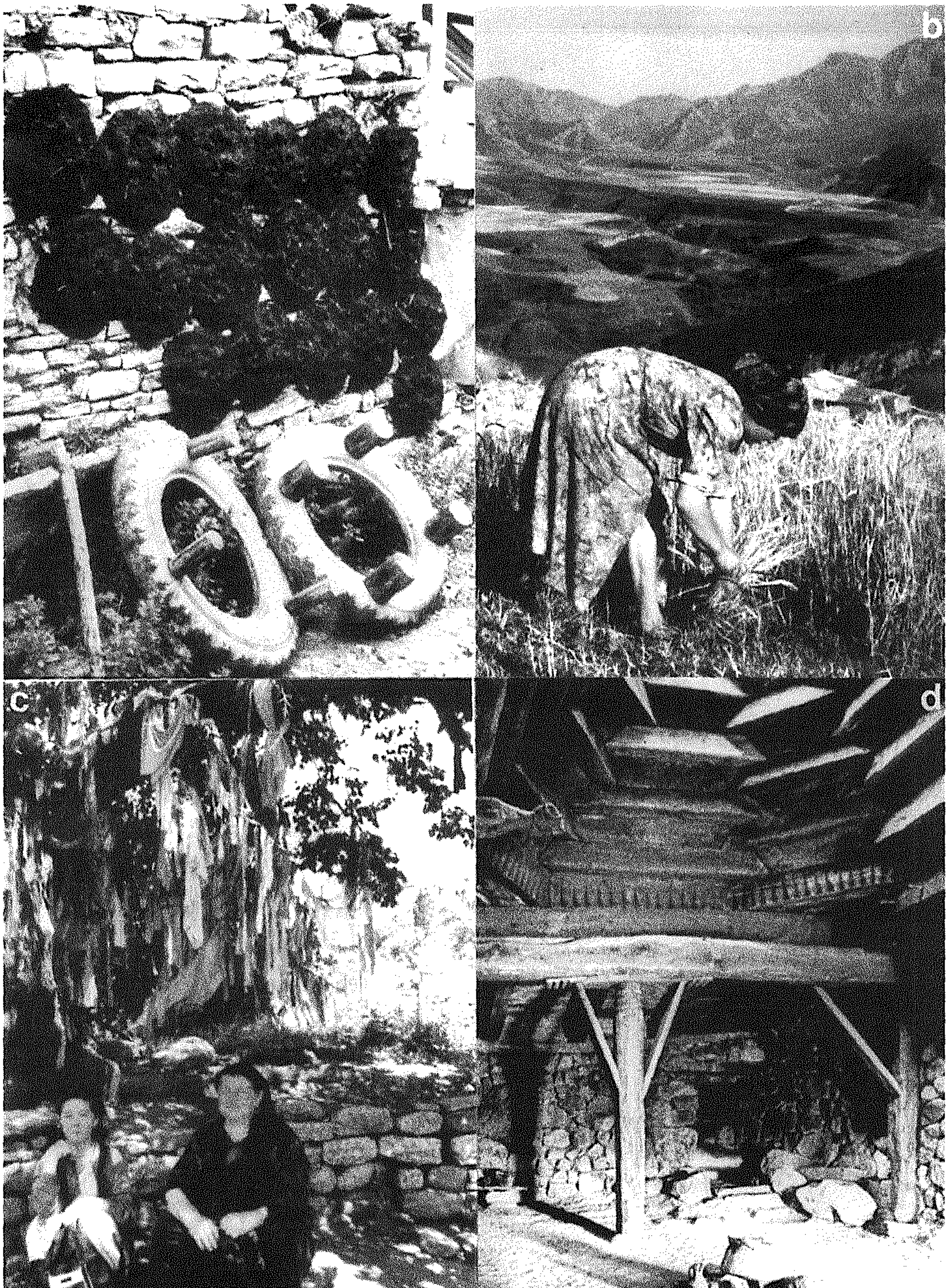

Plate 5.

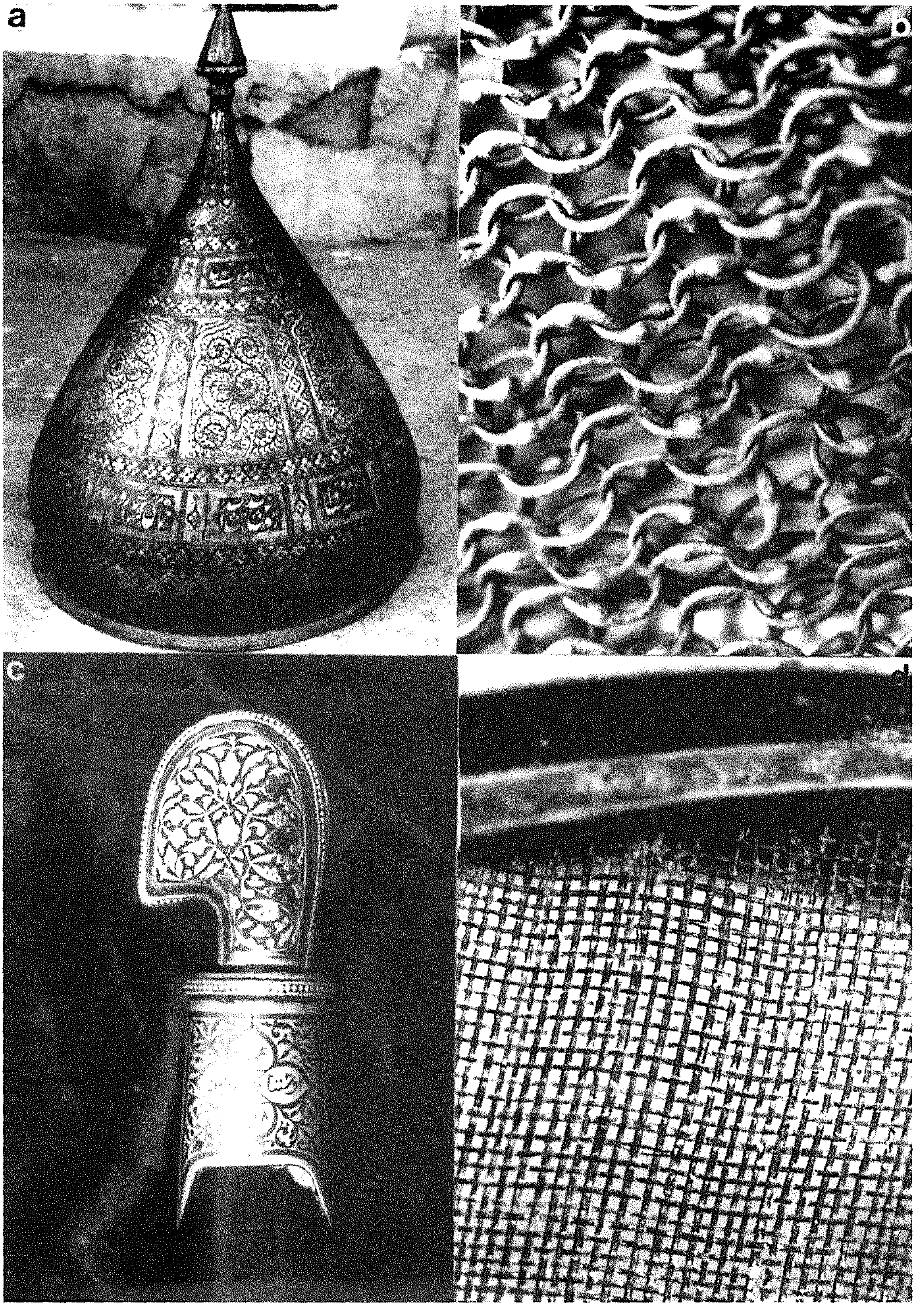

Plate 6.

APPENDIX A

PEOPLES OF THE CAUCASUS
(With a list of some travellers)

This list based on that drawn up by ERCKERT (1887) for the peoples of the Caucasus is not intended as a scientific classification, but it gives some indication of the range and variety of human groups as perceived in the region at that time.

«ARYANS»

Russians	Ossetians
Kurds	Germans
Tat	Greeks
Romanen (*sic*, Gypsies)	Talys
Armenians	

GEORGIA

Georgian	Pshavi
Imeri & Guri	Tushi
Lazi	Mingreltsi
Svanetian	

URAL-ALTAI

Tatars	Kalmyk
Azerbaijan-Tatars/Tatars	Ehsten (Finnen)
Turkmen & Kirghiz	Karachai

Kumikh eg., Turki village near Makhachkala
(The Kumikh are Turkish speakers divided into two very similar dialects)
Nogai & Edissani
(These are Turkic speakers. The tent-dwelling Nogai formed part of the Mongol «Golden Horde»)

LESGHI (DAGHESTANI)

The Lesghi are found in southern Daghestan. There is a literary language and 10 dialects.

1 SE gp = Kürin
2 NE gp = Gargua (Derghi)
3 Central gp = Lek (Kazikumukh)
4 Western gp = Avar & Dido & Andi
5 Plus the Cherkez (Adighé), the Avkhazi, and the Chechen-Ingus (who also belong to the Daghestani language group)

The region of «Bolshaya Kabarda» was one of the artificial units established by Stalin. It incorporated the north and west Caucasian region containing the Cherkez people, with one language and its dialects: consisting of the:

Avkhazi
Abadzini
Abadzekhi
Ubîchi (now apparently extinct)
Adîghi
Kabardinsti
Cherkessi

Other groups include e.g., Gypsies, Jews. There are two Jewish high villages in the mountains. The Dati were Jews converted to Islam.

Classification of the Lesghi

KÜRIN or SE group

Kürini
Aguli
Dscheki & Krys
Buduchi
Rutuli
Zachuri
Khinalugi
Artschini
Tabassarani (SW Caspian coastal area)
Udeni

W group

Avars (northern & southern groups)

The Avars call themselves Merula; the Leks call them Yerusa; Avar is the Russian term. There are 14 Avar groups; or rather a literary language and 13 dialects. They tend occupationally to gravitate into politics.

Dido	Kaputschini Dido Chwarshi
Andi	The village specialises in making felt burkha cloaks

NE group

Derghi

Derginci is a Russian term, and they have 3 dialects: the White Derghi, Black Derghi, and that of Kubachi, the metal-working village. They tended to gravitate into the army, KGB and police.

CENTRAL group

Leks

There are 2 dialects: the Black Leks, ie., the Kulinci from Kuli; and the Kumukhtsi from Kumukh = Kazikumukh.

Some Travellers in the Caucasus	*Century*
Istarchi, Masudi	10th
Marco Polo	14th
A Nikitin	15th
Chelyabi, Olearius	17th
Salmonov, Peter I, Gmeli	18th
John Dos Pasos visited Daghestan	*ca.* 1920

APPENDIX B

Language Groups

«LESGHI or DAGHESTANI»

NE Group or Dargua (Derghi)

Kaitach	Madjalis)
Kaitach	
Kubachi	
Warkun Dargua	(Ashti)
Akusha-Kaba	(Akusha)
Akusha-Kaba	(Khurilashi or Hyrcanian)

SE Group or Kürini

Kürini	(Achti)
Kürini	(northern group)
Aguli	(Agul-Koshari)
Aguli	(western)
Dzhek	
Budukh	
Rutuli	
Zakuri	
Khinalugi	
Ardzhini	
Tabassaran	(Chushni)
Tabassaran	(southern)

Central or Lek group

Lek or Kazikumukh
Lek or Kazikumukh (northern)
(The Lek language has a number of distinctive sounds and uses a special variant of the Russian alphabet)

Western Group

Avar	
Avar	(northern, in Khunsach)
Avar	(eastern, in Chirkei)
Andi	
Andi or Kuanal	
Botli or Buyukhadi	
Godoberi	
Karata or Kira	
Kuanada or Bagulai	
Hihatl or Chamalai	
Tindi or Idi or Tindal	
Dido	
Khvarshi	
Dido, in Kuderi	
Hunsal in Nachada	

OTHER CAUCASIANS

Georgian	
Cherkess or Adighé	(Shapsughi)
Chechen	(Itskheri)

$\Sigma = ca.\ 32$

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P. BIAGI and J. NANDRIS (eds.) Highland Zone Exploitation in Southern Europe
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ENVIRONMENT AND HIGHLAND ZONE EXPLOITATION IN THE WESTERN CARPATHIANS (VII-VI MILLENNIUM BP)

SUMMARY - *Environment and highland zone exploitation in the western Carpathians (VII-VI millennium BP).* The starting point of this paper is the situation in the late Mesolithic when the Western Carpathians constituted an important cultural boundary between the Janislawice Culture in the northern and western technocomplex (the Sauveterrian and the Beuron-Coincy Culture) in the south. At the same time the presence of obsidian artefacts north of the Carpathians may indicate contacts between hunter-gatherers and the farming groups of the Danubian Neolithic. However these contacts did not exist in the oldest phase of the Linear Pottery Culture. The role of the Carpathians as an unpermeable cultural boundary persisted in the period of the Early Linear Pottery Culture inside the Carpathian range. The first penetration of neolithic settlement into the intermontane basins from the south is seen in the period of the Late Linear Tiszadob group which reached the Šariš Basin, and from the north, from upper Vistula Basin, the Western Linear Pottery Culture reaching the Spiš basin. The next phase of settlement in the Carpathians is represented by the Bükk Culture in the Šariš basin, and can also be seen on the northern borders of the eastern Slovakian Lowland. The Bükk Culture influenced the natural environment primarily by initiating the process of deforestation. Following the Bükk Culture occupation a settlement hiatus takes place and there are no attempts to settle mid-mountain valleys from the south. On the other hand, penetration of settlement from the north (from the Vistula and San basins) via the Carpathians can also be observed. This diffusion of settlement is represented by the groups of Malice Culture and the Lengyel Culture groups of the Vistula basin. The occupation of these regions comes to an end in the middle of the sixth millennium BP and a hiatus continues up to the Eneolithic when population groups of the Funnel Beaker Culture again penetrate into the Carpathians from the north. Our considerations have been based on the analysis of the influence of anthropogenic factors on the natural environment, interregional links reflected in the distribution of lithic raw materials, and on the analysis of settlement patterns.

RIASSUNTO - *Ambiente e sfruttamento montano nei Carpazi occidentali durante il settimo e il sesto millennio BP.* Il primo punto affrontato in questo lavoro riguarda la situazione nel Mesolitico recente, quando i Carpazi occidentali costituivano un importante confine culturale fra la Cultura di Janislavice, a nord e ad occidente, e le Culture Sauveterriana e di Beuron-Coincy, a sud. Durante lo stesso periodo, la presenza di manufatti di ossidiana a nord dei Carpazi indicherebbe l'instaurazione di contatti fra cacciatori-raccoglitori mesolitici e comunità neolitiche danubiane. Questi contatti, in ogni caso, non sono documentati nel momento più antico della Linearbandkeramik. Il ruolo dei Carpazi, come confine insuperabile persiste, all'interno del bacino carpatico, sino all'inizio della Cultura della Bandkeramik. La prima documentazione di insediamenti neolitici di provenienza meridionale, nel bacino dei Carpazi, è testimoniata a partire dal periodo di fioritura del Gruppo di Tiszadob che raggiunse il Bacino di Šariš; mentre a nord la Bandkeramik occidentale, dal Bacino della Vistola, raggiungeva lo Spiš. La fase successiva di insediamento nei Carpazi è rappresentata dalla Cultura di Bükk, nel Bacino di Šariš; mentre sono noti alcuni siti anche nelle pianure della Slovacchia orientale. L'impatto sull'ambiente dei portatori della Cultura di Bükk è evidente nell'inizio del processo di deforestazione. Posteriormente alla Cultura di Bükk, si assiste ad uno iato abitativo e non si conoscono tentativi di insediamento nelle valli di media montagna, partendo da sud. D'altra parte, dai Bacini della Vistola e di San, siti a nord, si assiste ad una penetrazione insediativa. La diffusione degli abitati è documentata dai villaggi della Cultura di Malice e di Lengyel provenienti dal Bacino della Vistola. L'occupazione di questi territori termina verso la metà del sesto

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millennio BP. Lo iato si protrae sino al Calcolitico, quando popolazioni della Cultura TRB raggiunsero i Carpazi, da nord. Le nostre considerazioni sono basate sull'analisi dell'influenza dei fattori antropogenici sull'ambiente naturale, sui contatti interregionali interpretati sulla base della distribuzione dei materiali litici e sull'analisi della distribuzione degli insediamenti.

INTRODUCTION

The mountain range of the Western Carpathians occupies a key position in the territorial pattern of Neolithization in Central Europe. The main ridge of the Western Carpathians constitutes the watershed between the Vistula and the Danube basins, the line which marked the boundary between the South-east European First Temperate Neolithic (FTN) and the Danubian «Bandkeramik» which emerged in the zone south-west of the Western Carpathians.

The Western Carpathian range is made up of a number of separate groups of high mountains, the Tatras being the highest among them (up to 2900 metres). These groups are separated by tectonic depressions, surrounded by large territories with lower mountains where the vegetation-landscape belts are weekly marked. These pass into hilly plateaus, levelled by denudation processes, rising to 500 metres. The northern slopes of the Western Carpathians are cut by meridional valleys of the Vistula tributaries, whereas the southern slopes are cut by the valleys of the Danube and Tisza tributaries. Basically, they are also meridional, but sometimes, in tectonic depressions their course is latitudinal and they broaden into mid-mountain basins.

The distinct ecological setting of the Carpathians can be seen not only in the tiers of vegetation belts, but also in the greater humidity in comparison with the surrounding plains. Distinctly continental conditions are more conspicuous in the mid-mountain basins and on the southern edge of the Carpathians, notably in the Tisza basin.

During the Early and the Middle Holocene we can divide the Western Carpathians into two periods in terms of settlement pattern (VALDE-NOWAK, 1988):

1. The Neolithic, when settlement was limited to sub-Carpathian regions, primarily the loess areas on both sides of the Carpathians and to the edge of alluvial valleys. Except for the initial period, this is the time of development of trans-Carpathian contacts.
2. The Eneolithic (starting from end of the sixth millenium BP) when settlement encroaches into the highland zone extending beyond the range of loess plateau and foothills. Trans-Carpathian contacts intensified at that time.

The objective of this paper is to analyse, first of all, the variability of human occupations and activities in the territories situated on both sides of the Carpathians in the first period mentioned above, and to look into the interaction of cultural systems in the territories in question, particulary in terms of settlement/subsistance strategies. Such interaction must have reflected the possibilities and usefulness of crossing the barrier of the Carpathians. Moreover, it must mirror the forms of social organization and subsistance strategies facilitating trans-Carpathian contacts.

From the point of view of inter-dependence of cultural systems on both sides of the Carpathians we can distinguish three types of relations, in which:

1. The Carpathians constitute an impermeable barrier between various archaeological taxonomic units. An example, described in detail later in this paper, is the situation in Late Mesolithic and the Earliest Neolithic. In the latter period the Carpathians were crossed

exclusively via the western, extra-Carpathian route, through the Moravian Gate.

2. The Carpathians were crossed from the north to the south by population groups belonging to cultural units which formed west and north of the Carpathians. An example of a situation like this is the penetration of Linear Pottery (LP) people from the Upper Vistula Basin in the direction of the Poprad Valley, and the people of the Malice Culture in the direction of the Upper Tisza Basin.
3. Bilateral contacts were maintained via the Western Carpathians, registered in archaeological sources through exchange of some goods (pottery, lithic artefacts). This situation is observed in the period of the Younger Phase of LP among various taxonomic units representing the Western and the Eastern LP. It requires explanation in the context of raw material procurement systems embedded in other aspects of subsistance/settlement strategies and social complexity.

MESOLITHIC AND INITIAL NEOLITHIC

In the Mesolithic, particularly in its late phase, the Western Carpathians were an impenetrable barrier between the Janislawice Culture in the Upper Vistula basin and the cultures of the Western Technocomplex (Beuron-Coincy) and – possibly – the Epitardigravettian found in the Carpathian Basin as far as the Upper Tisza basin (Kozłowski S.K., 1981). So far no sites have been discovered within the Carpathian basin that would belong to the Janislawice Culture representing the Eastern Technocomplex and associated with the Rudoostrov Culture in the Dnieper basin.

Within the Carpathian basin Mesolithic sites are relatively rare in comparison with the settlements of the Janislawice Culture in the Upper Vistula basin. South of the Carpathian ridge we have only single Mesolithic inventories resembling the Beuron-Coincy complex (e.g. Barca I in the Košice Basin: Bárta, 1966). This situation, however, may in part reflect the asymmetry of the chronological position of Late Mesolithic sites on the two sides of the Western Carpathians. Thus most of the sites of the Janislawice Culture in the Upper Vistula basin may (Kozłowski S.K., 1969) be contemporaneous with the settlement of the earliest phase of the Eastern Linear Pottery Culture (ELP) within the Carpathian basin, and with enclaves of the settlement of the earliest Western Linear Pottery Culture (WLP) in the Upper Vistula Basin. In this light, finds of individual obsidian artefacts on the sites of the Janislawice Culture in Ranižów in the San basin and in Grzybowa Góra, site XIII/59 in the Kamienna Valley may be the effect of contacts between the mesolithic population and the people of the LP in the second half of the seventh millenium BP, when obsidian artefacts from the Zemplin-Tokaj Plateau appeared in the LP (Kozłowski S.K., 1989: 157).

The Earliest Neolithic on the two sides of the Carpathians is represented by two approximately synchronous but taxonomically different Linear Cultures: south-west and north of the Carpathians by the WLP and in the Tisza Basin by the Eastern ELP. The latter culture shares many more characteristic features with the First Temperate Neolithic of the Balkan-Danubian type (Starčevo-Körös Complex) observable in the technology and morphology of chipped stone industries, settlement pattern, dwelling construction and subsistance (Kalicz and Makkay, 1977; Šiška, 1989; Kozłowski S.K., 1989). Pottery of the earliest phase of the ELP from the Košice Basin (the so-called Proto-linear Phase) bears closest resemblance to the Szatmár group of the Great Hungarian Plain (Šiška, 1979). In the Early Phase ELP settlement is restricted to the Košice Basin and the Eastern Slovakian Plain. It is only at the end of the Early Phase that the boundaries of this settlement shift slightly to the north in the valleys of the Torysa and Laborec rivers reaching the southern edge of the Šariš Basin.

In that period the systems of raw materials procurement rely almost entirely on raw materials from the Tisza Basin (Kozłowski S.K., 1989): in the Košice Basin these are mainly limnoquartzites (*ca.* 65%) and obsidian (30%), whereas in the Eastern Slovakian Plain almost exclusively obsidian (95%). Each of the raw materials is represented in equal proportions in all the stages of the operational chain from unworked nodules to retouched tools. Thus, there is no indication of specialization, and particular groups obtained their materials directly from the outcrops. The site representing the end of the Early Phase of the ELP situated farthest to the north i.e. Prešov-Šarišské Lúky, does not differ from this picture (Šiška, 1976; Kozłowski S.K., 1989), while the relatively higher ratio of obsidian than that in the Košice Basin is accidental, caused by the small sample of artefacts. This points to the regional circumscription of the ELP groups, for whom even the middle range mountains of Northern Slovakia constituted a barrier, not only beyond their adaptional abilities but discouraging even seasonal penetration (fig. 1).

The settlement of the Upper Vistula Basin by first farmers- breeders should, beyond doubt, be related to the influx of new people via the Moravian Gate from the territory of Moravia in the pre-Notenkopf Phase of the LBP (Kulczycka-Leciejowiczowa, 1989). Individual sites from that period are known in the Vistula terrace east of Kraków (Nowa Huta, Zofipole) and in the Sandomierz Plateau (Samborzec), although the Kraków-Czestochowa Plateau was also the area of penetration (the Okopy Wielkie Cave). Throughout assemblages of the pre-Notenkopf Phase, starting from south-western Slovakia and Moravia, lithic artefacts are very rare (Lech, 1985). This creates an impression that in their first phase of expansion these population groups had not yet made a reconnaisance of sources of raw materials. A good example is a small series of lithic artefacts from the Pre-Notenkopf Phase from Nowa Huta sites 12, 15 and 62. The artefacts are made entirely from flint obtained from alluvia located west of the sites during migrations. Here we have to do with the simplest system of procurement, namely: random collection of rocks which occurred locally along the route of migration (Caspar *et al.*, 1989; Kaczanowska *et al.*, 1987). Similarly, in northern Moravia – the initial region of migration – artefacts are found made from local flints from glacio-fluvial deposits. Single artefacts made in Swieciechów flint which are found in Mohelnice are the evidence of maintaining contact with the region of origin of migration (Kozłowski J.K., 1970). In the situation of small-scale production, absence of specialization, lack of knowledge of deposits, the circulation of individual artefacts made in extralocal materials may be explained as the evidence of unsystematic contacts between newly settled territories and the original region. Contacts like this were maintained along the route from northern Moravia to the Upper Vistula Basin.

In the same period the western Carpathians constituted an obstacle to settlement from the north. Settlement spread in the river valleys intersecting the *loess* plateaus, and south of the Little and White Carpathians was limited to lowland territories.

THE YOUNGER PHASE OF THE EASTERN LINEAR POTTERY (ELP) AND THE NOTENKOPF PHASE OF THE LINEAR POTTERY CULTURE (LP)

From the point of view of the distribution of settlement in the Western Carpathians this is the first period when settlement makes an irruption into mid-mountain valleys on the southern side of the main Carpathian ridge. Those could be valleys surrounded by middle range mountains (Šariš Basin) or directly neighbouring the high massifs (Poprad Basin). In terms of cultural taxonomy this is related to two main Linear Complexes that continue developing on

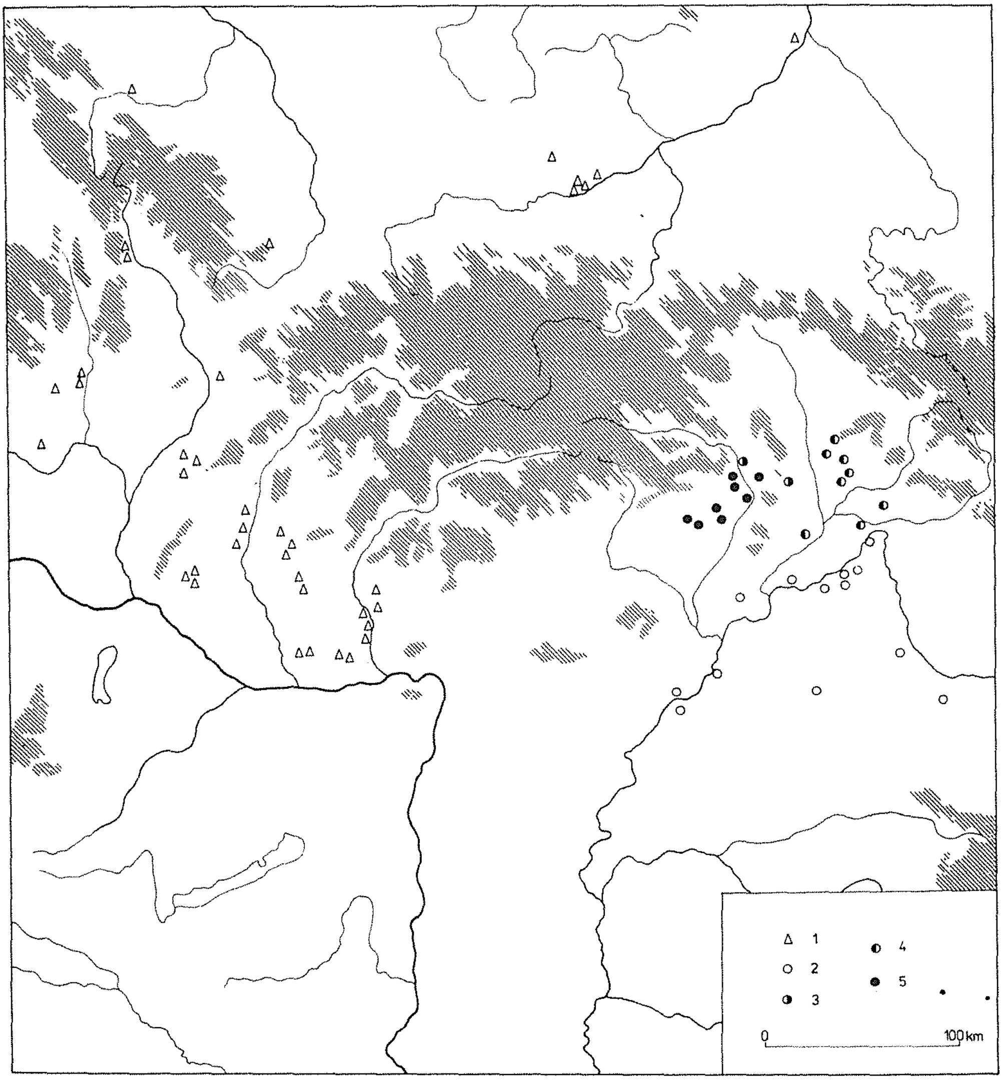

Fig. 1 - Site distribution map of the first chronological horizon: 1) oldest phase of the Linear Pottery Culture (LP), 2) Szatmar Group, 3) protolinear phase of the eastern Linear Complex, 4) Kopčany Group of the ELP, 5) Barca III Group of the ELP.

both sides of the Western Carpathians.

A characteristic feature of the ELP is the shift of Tiszadob group settlement, originating from the Košice Basin, as far as the northern edge of the Šariš Basin. In the southern part of the Šariš Basin the density of settlement is greater (7 sites). At the same time settlement from the Eastern Slovakian Plain diffuses deep into the Carpathians along the valleys of Topla and Laborec rivers. However, in the Šariš Basin the Linear Pottery preserves incised motifs of Tiszadob type. In the Topla and Laborec valley, on the other hand, both incised decoration and a predominant role of black painted ornaments of the Raškovce type (Šiška, 1989) can be seen. Possibly, in the course of the northern expansion of the ELP contacts were initiated between the Torysa and Topla valleys, and the Tiszadob groups which migrated from north to south along the Topla valley (fig. 2).

The occupation of the northern part of the Šariš Basin was undoubtedly of a permanent character. Thus, the size of the settlement at Šarišské Michal'any is fairly large, where 16 features have been excavated, but a much bigger settlement of the Tiszadob group was established on the oposite bank of the valley (Šiška, 1986). The settlement consisted of overground houses observable as rectangular surfaces, up to 25 metres long, surrounded with pits. Places where ovens had been destroyed are another indication of the existence of a house (Kaczanowska *et al.,* 1993).

Subsistence economy in that period, had not yet caused major changes in the landscape. Two types of wheat were sown (emmer and einkorn) in fields located closest to the settlement, in all likelihood in very wet areas, periodically even flooded – as is shown by the presence of macroremains of *Chenopodium album* (Hajnalová, 1977; 1993). This confirms that agricultural activity was limited to lower parts of the valley. Stock-breeding shows domination of pigs, followed by cattle, with sheep/goat only in the third position. The ratio of wild animals is in that period minimal. The breeding structure indicates adaptation to local conditions i.e.: instead of cattle-breeding (which was most important in the Košice Basin and the Eastern Slovakian Plain) pig breeding acquires importance. Excellent fodder was provided for this by the oak woods in the Šariš Basin, whereas the Eastern Slovakian Plain contained mostly marshy riverside forests.

Raw material procurement at Šarišské Michal'any mainly exploited the local Carpathians radiolarites. This material is followed by extralocal obsidian from the Zemplin-Tokaj Plateau and Jurassic flint from southern Poland. All these raw materials are represented throughout the complete operational chain. In the northern part of the Šariš Basin, with a high ratio of Jurassic flint and radiolarite, the raw material structure is different from that in the late ELP of the Košice Basin with its domination of limnoquartzites, or from the Eastern Slovakian Plain, with its almost exclusive use of obsidian.

The simplest explanation of the occurrence of Jurassic flint at well above trace quantities in Tiszadob group sites located farthest to the north, is to assume that there may have existed contacts between the Tiszadob group people in the Šariš Basin and the settlers of the Notenkopf Phase of the LP from Spiš and the Poprad Basin, who arrived in the Poprad Basin from the territories of the Upper Vistula Basin. Another piece of evidence to confirm contacts like this in the Spiš Basin is a site at Smizany near Spišská Nová Ves, where together with pottery of the Notenkopf Phase sherds were also found decorated with typical Tiszadob ornamentation. Unfortunately, this multiculture site is known only from rescue excavation (Šiška, 1989: 165-167).

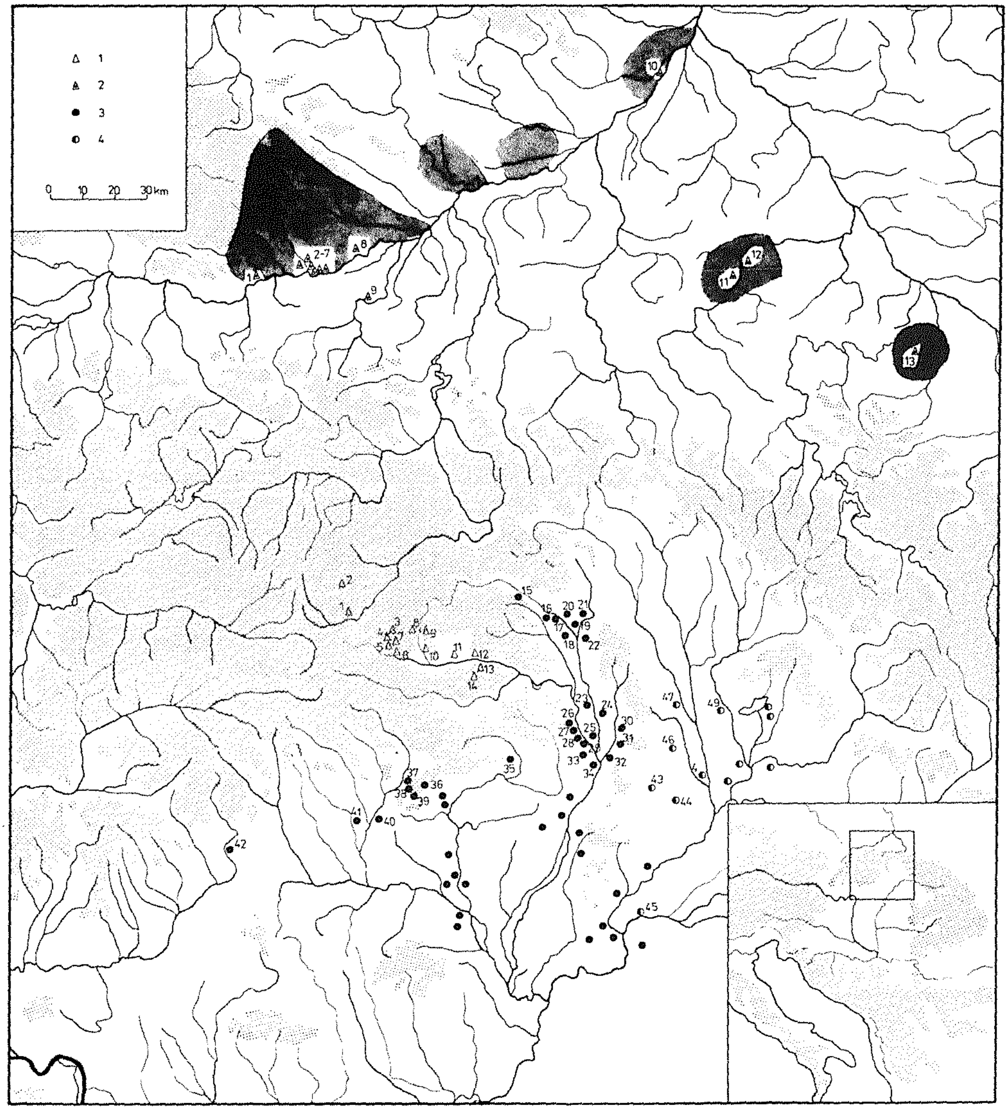

Fig. 2 - Site distribution map of the Notenkopf phase of the LP and the younger phase of the ELP. Carpathian Basin sites: 1) Poprad-Matejovce, 2) Lomnica (?), 3) Vlkova, 4) Janovce, 5) Spišsky Stiavnik, 6) Smizany, 7) Vydrnik, 8) Levoca, 9) Dlhe Staze, 10) Dolany (?), 11) Klcov, 12) Spišské Vlahy, 13) Olcnava, 14) Porac, 15) Močidl'any, 16-17) Ostrovany, 18-19) Velky Šariš, 20) Šarišské Michal'any, 21) Kapušany, 22) Prešov, 23) Budmir, 24) Rozhanovce, 25) Barca-Svetla, 26-29) Košice, 30) Ruskov, 31) Blazice, 32) Nizna Mysla, 33) Hutniky, 34) Sebastovce, 35) Peder, 36) Silica, 37) Ardovó, 38) Kecovo-Ciertova diera, 39) Domica, 40) Vcelice, 41) Stránska, 42) Pinciná, 43) Lastovce, 44) Hrcel, 45) Streda, 46) Zemplinská Nová Ves, 47) Secovská Polianka, 48) Sirnik, 49) Michalovce, 50) Kopčany, 51) Velké Raškovce, 52-53) Lúcky, 54) Pavlovce. Sites of the Notenkopf phase of the LP in the Upper Vistula Basin with obsidian and ceramic imports of the Tiszadob Group: 1) Olszanica, 2-7) Kraków-Nowa Huta complex of sites, 8) Zlotniki, 9) Targowisko, 10) Rzeszów-Staromiescie, 11) Trzebieslawice, 12) Boguchwala, 13) Kormanice.
The hatched area marks settlement concentrations of the LP in the upper Vistula Basin. 1) LP sites, 2) LP sites with obsidian and ceramic Tiszadob Group imports, 3) Tiszadob Group sites, 4) Raskovce Group sites.

The occurrence of the complete operational chain of Jurassic flint processing which was brought as unprepared nodules both to the sites of the LP in the Spiš and Poprad Basin, as well as to the sites of the Tiszadob group in the Šariš Basin is the evidence of the absence of specialized production for exchange. In view of that we may conjecture that this flint found its way to the Poprad Basin by direct procurement, whereas the barrier of the watershed between the rivers Poprad and Torysa was crossed in the course of random, probably accidental contacts between the people of the two cultures (i.e. LP and ELP). The distribution of obsidian into the Poprad Basin took place along the opposite route following the similar sequence of procurement methods (fig. 3).

The model of direct procurement in combination with non-systematic, random contacts (eg. during pig herding, gathering plant foods or hunting) at the boundaries of mid-mountain valleys cannot, however, be used to explain the presence of some of obsidian. Trace quantities of this material are invariably accompanied by single sherds with Tiszadob style ornaments recorded on the sites of the Notenkopf Phase in the Upper Vistula Basin (fig. 4), and by relatively higher ratios of obsidian in the San and Wisloka Basins. The model, suggested by J. LECH (1990) of indirect exchange with «social meaning only» (i.e. without economic importance) does not account for the extensive and multidirectional distribution of obsidian within the context of nearly all settlement agglomerations of the Notenkopf Phase in the valleys of the Vistula, San and Wisloka rivers. At the same time, the precise social context of such an

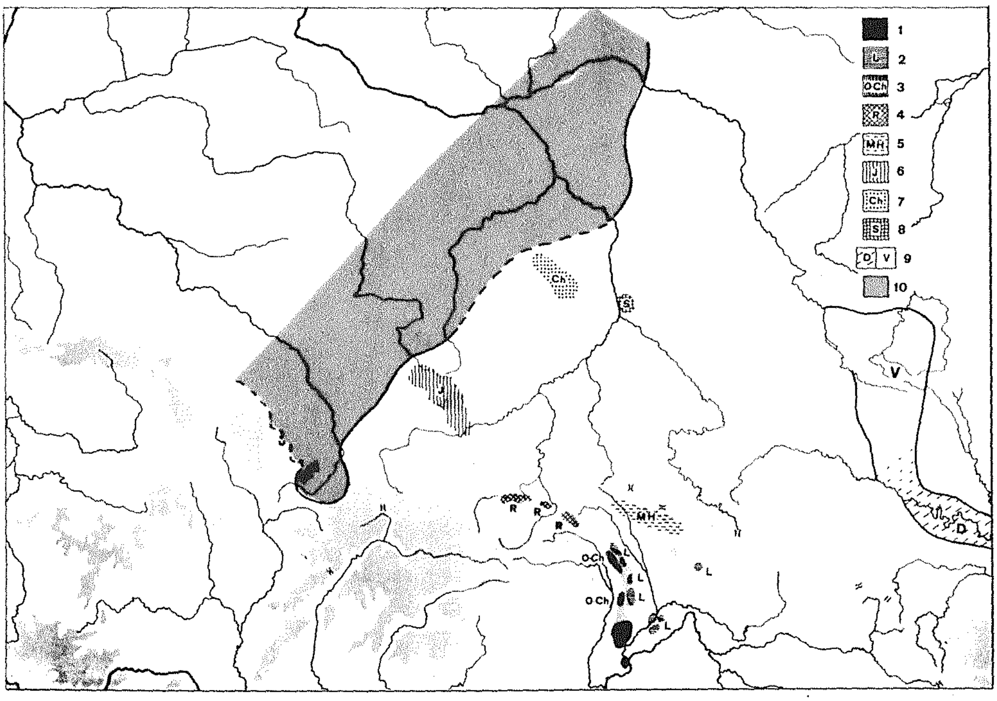

Fig. 3 - Map of the main raw material sources in the Western Carpathians and adjacent areas: 1) obsidian, 2) limnoquartzite, 3) opales and chalcedony, 4) radiolarite, 5) menilithic hornstones, 6) Jurassic flint, 7) «chocolate» flint, 8) Swieciechów flint, 9) Dniester and Volhynian Cretaceous flint, 10) marginal zone of the distribution of the «Northern» (erratic) flint.

exchange would be of great interest considering absence of specialization in exploitation or processing of obsidian among people of the Late Phase of the ELP. The greatest importance of obsidian is restricted to the Eastern Slovakian Plain, and a fall-off from 80 or 90% to 30% in this raw material took place in the neighbouring river valleys and mid-mountain basins. In view of the above: had there indeed existed a regular, down-the-line exchange between ELP and the WLP, on both sides of the Carpathians then the functioning of an exchange like this would have had to be justified by the exchange of some other valuable goods which left no traces in archaeological records.

One of the most interesting discoveries concerning the Neolithic in the Western Carpathians was the LP settlement identified in the Poprad valley, directly on the footslopes of the High Tatras and in the Spiš Basin. Groups of sites in this territories are situated at a considerable

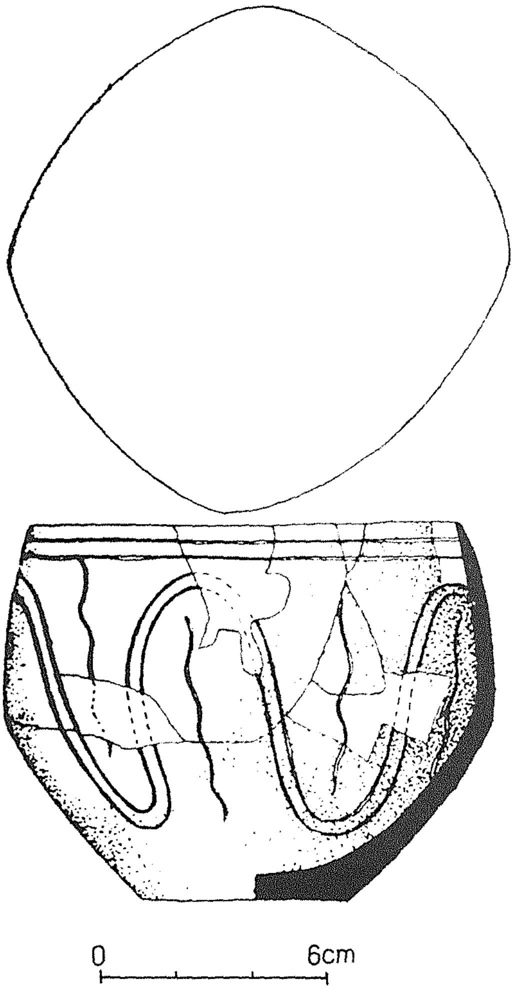

Fig. 4 - Kraków-Nowa Huta (Pleszów, site 18). Tiszadob Group vessel found in the feature of LP (Notenkopf Phase).

distance from clusters of the LP settlement, at the elevation of 500-600 metres or higher. Regrettably, sites in these groups are known primarily from rescue excavation and surface surveys. Only the settlement at Matejovce, located at 650 metres asl has been systematically explored. The general picture of the settlement indicates permanent occupation of the territory, with long rectangular houses similar to others on LP sites. At 10 – 15 metres long (exceptionally 20 metres), these are slightly shorter than in Bohemia and Poland where the average length of houses at Bylany and Olszanica is 17 metres. The differences in the construction are that at Matejovce stones were used to secure posts in the postholes and that between houses ditches had been dug to drain off rainwater (Novotný, 1982; 1983).

The cluster of LP settlement under discussion is located at a distance of about 100 kilometres from northernmost settlement of this culture in the territory of western Slovakia. These settlements are cut off by a mountain pass between the Poprad Basin (which belongs to the Vistula catchment area) and the Orava Valley, belonging to the Danube catchment area. On the other hand communication with LP agglomeration in the Upper Vistula Basin was easily established via the Poprad Gate, east of the Tatras. Considerable data confirms that it was precisely along this route that settlement of Spiš and the Poprad Basin from the north progressed. Some of the arguments in favour are:

- ceramics from Matejovce, which in general represent the Notenkopf style, include many thin-walled vessels made of clay with sandy temper, decorated with ledges and bosses typical of the Kraków LP agglomeration, but unknown in Slovakia,
- large quantities of Jurassic flint are present in Matejovce (72% in pits, 63% in the culture layer), and this was brought as cortical nodules from the neighbourhood of Kraków. This raw material is represented by the complete operational chain from unworked nodules to retouched tools. A structure like this is basically the same as the structure of LP inventories in the immediate vicinity of Jurassic flint deposits (eg., in Olszanica near Kraków). Such inventories are regarded by J. Lech (1990) as specialized workshops for flint processing which played an important role in the export of flint to other LP centres. The proportion of flint at Matejovce markedly exceeds the proportion of obsidian, which reaches 9% in pits and 23% in the culture layer. It is interesting that radiolarite is of little significance (2-7%) if we consider that its deposits are found only 30-40 kilometres away in the limestone belt of the Pieniny Mountains (fig. 5).

As we have already mentioned, the sites in the Poprad Basin and in Spiš may have played a role in the transit of Jurassic flint to the territory of the ELP, and – in the opposite direction – in the transit of obsidian to LP settlement centres in the Upper Vistula Basin. It does not seem likely, however, that the centre in the Poprad Basin should play a similar role in the transit of Jurassic flint to western Slovakia which obtained Jurassic flint via the Moravian Gate. Generally, it seems that the western direction of export of Jurassic flint was more systematic and was related to a certain degree of specialization of production, possibly already in the Notenkopf Phase (Lech, 1990).

A basic question is whether the subsistence economy of the people of the LP inhabiting the Poprad Basin and Spis shows modifications facilitating adaptation to submontane conditions. Unquestionably, farming continued to be the foundation of subsistence economy. Of this we have the evidence of grain macro remains, storage pits, harvesting tools and the location itself of sites in the areas protected from wind, more suitable for farming. It should be remembered, however, that in the Atlantic period the territory under discussion was covered by a fairly dense oak and beech forest, and required deforestation. Slight oscillations in tree pollen frequence from some peat-bogs in Spiš (e.g. Spišská Belá), at the borderline between the Atlantic and the Sub-Boreal periods, may indicate human activity, but at the same time point to its transitory and repetitive nature (KRIPPEL, 1986) (fig.6).

There are no analyses of fauna from Spiš and the Poprad Basin and for this reason evaluation of the role of stock-breeding is not possible. Lack of permanently deforested areas, and a higher tree line in the Atlantic period, did not favour intensive stock-breeding. Possibly, the habitat of the oak wood created better conditions for pig raising.

To sum up: we find that the LP settlement did not cause any permanent modification in the landscape of the Poprad Basin, nor did this settlement initiate processes of deeper change in the structure of the subsistence economy, which could have led to an adaptation to submontane conditions.

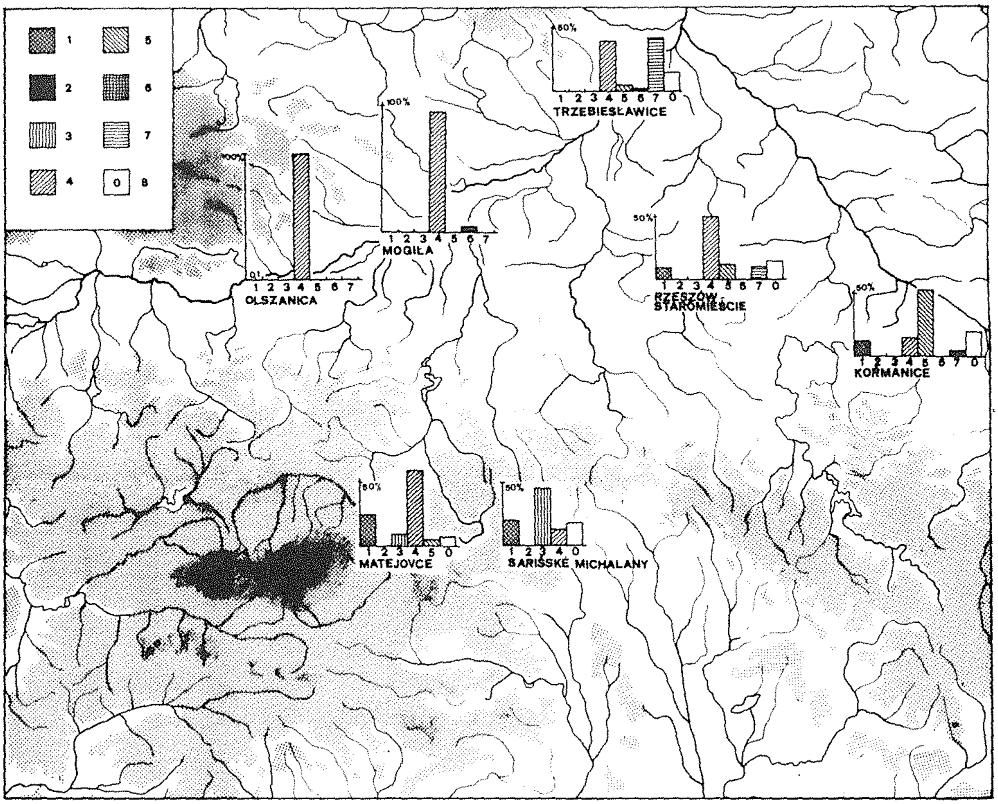

Fig. 5 - Raw material frequency in some LPC (Notenkopf phase) sites (Olszanica, Mogila, Trzebieslawice, Rzeszów-Staromiescie, Kormanice, Matejovce) and ELP (Tiszadob Group) sites (Šarišské Michal'any): 1) obsidian, 2) limnoquartzite, 3) radiolarite, 4) Jurassic flint, 5) Dniester flint, 6) «chocolate» flint, 7) Swieciechów flint, 8) others.

THE BÜKK CULTURE AND THE ZELIEZOVCE PHASE OF THE LP

The Bükk Culture developed on the base of younger ELP groups (Tiszadob and Raskovce), regarded by Hungarian scholars (KALICZ and MAKKAY, 1977) as one of the late local groups of the ELP. It is distributed across the northern part of Alföld, in the Bükk mountains, the Slovakian Karst, and the Eastern Slovakian Plain, reaching in the north the Šariš Basin, and the eastern part of the Ondava Plateau near Humenne. In comparison to Tiszadob settlement

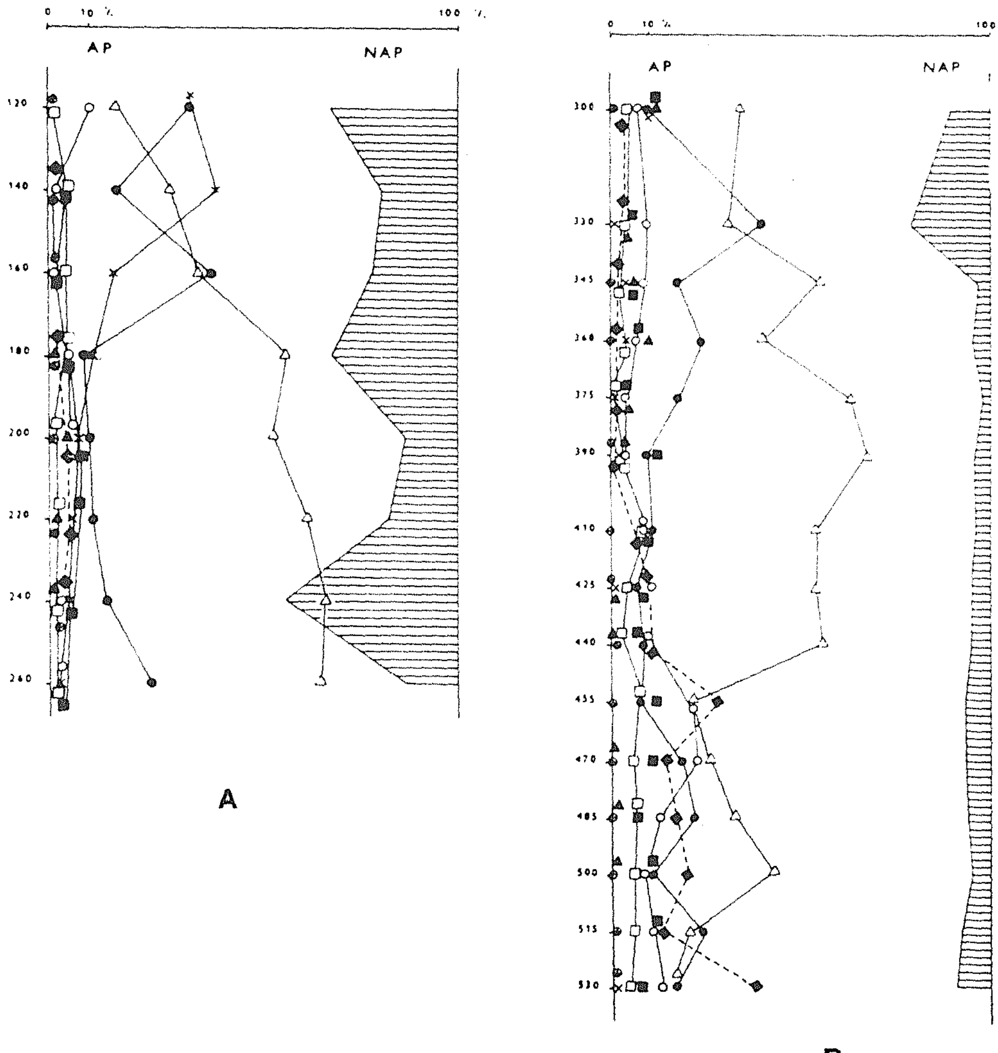

Fig. 6 - Pollen diagrams of the Atlantic period from the Spiš Basin (Špišska Belá – A) in the LP settlement region and from the Tatra Mountains (Štrbske Pleso – B) in the region unsettled until the Protohistoric period. Correlations between both diagrams are based on the *Picea* (Δ) and *Corylus* (•) frequences. Fluctuations in AP/NAP ratios can be observed. NAP in Špišska Belá are represented mainly by *Poaceae* (after KRIPPEL, 1986).

the expansion to north-east along the Laborec River and the marked intensity of settlement in the Šariš Basin are noteworthy. In the north the Bükk Culture did not cross the Western Carpathians, although numerous imports of pottery of this culture were recorded in the LP settlements in southern Poland. The population of the two cultures met in the territory of Spiš, which in that period was occupied by the people of the LP.

While in the Košice Basin and in the Eastern Slovakian Plain the Bükk Culture is present from the very moment of its emergence, it appeared in the Šariš Basin slightly later, in its second phase of development (ŠIŠKA, 1979a; 1979b) (fig. 7).

In the mountain basins, at more than 300 metres asl Bükk Culture settlement is fairly frequently found. Among others it was recovered in the caves of Slovakian Karst (Domica and Ardovo caves: LICHARDUS, 1968) and in the Bükk Mountains (KOREK and PATAY, 1958).

Most territories occupied by the Bükk Culture remained without settlement for some time after it had suddenly vanished. This hiatus was shortest in the Eastern Slovakian Plain, whereas in the Slovakian Karst it lasted until the Early Bronze Age i.e. for about 2700 years.

The fact that the Slovakian Karst was inhabited indicates, according to some authors (PAVÚK, 1982: LOZEK, 1977), that the climate became very dry, and that soils covering the karstic plateau were able to retain humidity for a long time. Open-air sites of the Bükk Culture were variously located in this region. On plateaux they are found on tops of hills dominating the terrain, in lowland areas they are found close to rivers, at the footslopes of the hills. There was a particular preference for islands of brown soil on which the majority of settlements concentrated. The settlements are small as a rule, with two types of building construction: small houses of rectangular outline, or oval semi-dugouts with a roof resembling a tent, supported by a centrally positioned post. Rectangular houses with rounded corners have a different construction from the LP houses. They are usually slightly sunk into the ground, but there are no observable traces of posts supporting the roofs. The dimensions of the houses vary from 300x500 cms in the case of the largest houses, to 270x470 cms in the case of average size house. On the sites of the Bükk Culture farthest to the north, in the Šariš Basin, larger constructions were also recorded measuring 414x635 cms, or even 470x700 cms. Those houses were divided by a clay wall into two compartments. Posts were sometimes used along the periphery of the house, but there were no posts inside to support the ridge roof.

In the literature of the subject two local groups of the Bükk Culture have been isolated so far (ŠIŠKA, 1979): the eastern group grown out of the Sátoraljaújehly-Raškovce group of the ELP, and the western group emerged on the base of the Tiszadob group and the Gemer group of the ELP. Some local features can be seen in the Bükk Culture from the Šariš Basin, yet this group seems to be more strongly related to the western group of the Bükk Culture.

Use of a variety of raw materials for tool production is a characteristic feature of the Bükk Culture, but on all its sites a greater or lesser proportion of obsidian is always present. The literature of the subject considers the people of the Bükk Culture to have been specialized in the exploitation and distribution of obsidian (KALICZ and MAKKAY, 1977). However, it should be born in mind that this raw material predominates primarily in assemblages from the Eastern Slovakian Plain, i.e. at a fairly small distance from obsidian sources. In the inventories of the western group of this culture, distributed in the Košice Basin, in northern Hungary to the west of the Tokaj-Zemplin Plateau, other raw materials were used, particularly limnoquartzites. In the Šariš Basin, radiolarites from the Carpathian Limestone Belt are of greatest importance. The demand for fairly long blade blanks meant that raw materials which occurred as larger nodules

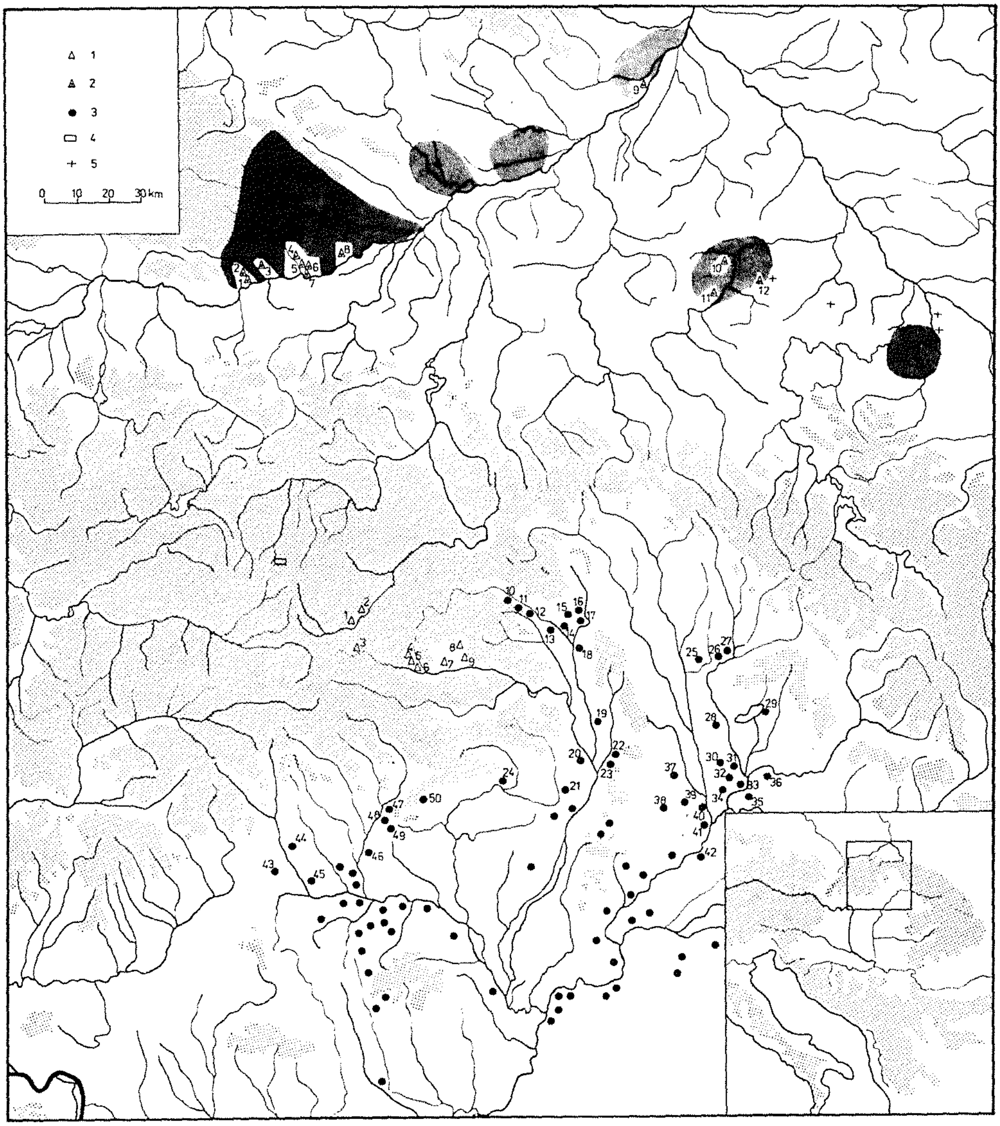

Fig. 7 - Distribution map of the LP Želiezovce and Bükk Culture sites. Sites in the Carpathian Basin: 1) Stráže, 2) Mlynice, 3) Gánovce, 4) Kurimany, 5) Spišská Nová Ves, 6) Kapustnice, 7) Vrbov, 8) Bijacovce, 9) Žehra, 10) Močidl'any, 11-12) Ostrovany, 13-14) Vel'ky Šariš, 15) Šarišské Michal'any, 16) Fulianka, 17) Kapušany, 18) Prešov-Šarišské Lúky, 19) Rozhanovce, 20) Košice-Barca, 21) Hutniki, 22) Bohdanovce, 23) Blažice, 24) Peder, 25) Brestov, 26-27) Humenné, 28) Michalovce-Hrádok, 29) Hnojné, 30) Malčice, 31) Kopčany, 32) Malé Raškovce, 33) Vel'ké Raškovce, 34) Oborin, 35) Beša, 36) Čierne Pole, 37) Zemplinské Hradiste, 38) Trna, 39) Kašov, 40) Sirnik, 41) Zemplin, 42) Streda, 43) Oždany, 44) Vel'ké Teriakovce, 45) Rimavské Jánovce, 46) Včelince, 47) Čertova Peč, 48) Ardovo, 49) Domica, 50) Silica. Sites of the Želiezovce Phase of the LP in the Upper Vistula Basin with obsidian and ceramic Bükk Culture imports: 1) Olszanica, 2) Giebultów, 3) Szyce, 4-7) Kraków-Nowa Huta complex of sites, 8) Zlotniki, 9) Zlota, 1o) Rzeszów-Piastów, 11) Boguchwala, 12) Kraczkowa. The hatched area marks settlement concentrations of the LP in the Upper Vistula Basin: 1) LP sites, 2) LP sites with obsidian and ceramic Bükk Culture imports, 3) Bükk Culture sites, 4) Find of a Jurassic flint core, probably LP, in the Tatra Mountains, 5) finds of LP shoe-last adzes from the northern edge of the Western Carpathians.

were attractive. Although the obsidian sources farthest away are located at a distance of only 75 kilometres from Bükk Culture sites, yet already at a distance of 35-40 kilometres obsidian loses its dominant position. The belief that the Bükk Culture people were specialized knappers and traders in obsidian has been based on the presence of deposits of blades and cores, regarded as «trade hoards». But whether some of these caches, for example from Nyirlugos, indeed represent the Bükk Culture is questionable. Other caches, as detailed use-wear analyses for the site of Šarišské Michal'any have shown, are in fact specialized tool-kits for woodworking possibly produced by their user (fig. 8).

Analysis of the lithic industry and the system of raw materials procurement has enabled us to distinguish the following types of settlement:

1. Settlements with a distinct predominance of one raw material and with traces of the complete operational chain on the site. All major technological groups are represented, but flakes are dominant. We believe that the main bulk of the blades produced on the site was used directly by the inhabitants of a given settlement. Settlements of this type are located in the immediate vicinity of raw material deposits, at a distance of no more than 10-15 kms.
2. Settlements with a distinct predominance of one raw material, but characterized by a high ratio of blades, higher than that of flakes. Raw material was brought in the form of prepared cores and used as required.
3. Settlements where ascendancy of one type of raw material is less marked, with another raw material too showing a high proportion. At the same time a strongly diversified group of extralocal raw material is present, probably imported over long distances through indirect trade. The raw materials whose index is highest were brought to the site as prepared cores.

As we can see (fig. 9), a complete operational chain is found only in settlements located in the immediate vicinity of deposits (up to 10-15 kilometres). Inhabitants of settlements further

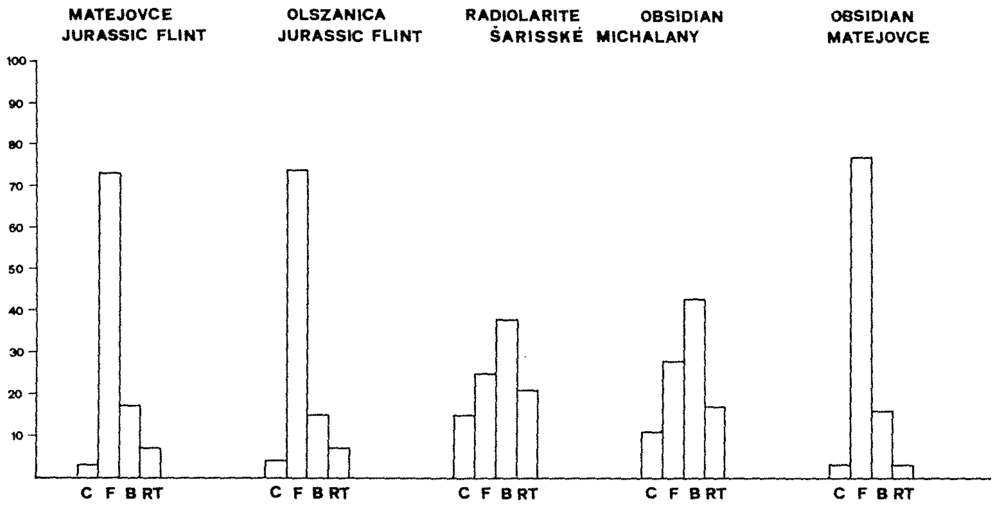

Fig. 8 - Diagram showing the differences in major technological groups frequency between LP sites (Notenkopf Phase): Matejovice, Olszanica and Bükk Culture site (Šarišské Michal'any). C) cores, F) flakes, B) blades, RT) retouched tools.

away made trips into regions of deposits. They obtained prepared cores either by producing them at the extraction point or by exchange (trading) in the villages situated close to raw materials deposits. The first possibility seems more plausible since obsidian cores and blades from settlements closest to the extraction points differ distinctly in their dimensions and technological features from those coming from more distant settlements. Such a model of raw material procurement is very different from that found in the LP. Inhabitants of the LP villages, located at a distance of even more than a hundred kilometres from deposits, went in search of raw materials and obtained nodules which were further worked after the group had returned to their own settlement. The situation which can be seen in the Bükk Culture suggests the realization of the operational chain in several working stages and episodes, with the initial stage (the shaping of cores) performed outside the settlement near the deposits, and the blank production stage (coring, and blank and tool production) carried out gradually in the area of the settlement in several working episodes. In the settlement at Šarišské Michal'any cores in caches (5-20 specimens in different phases of preparation and exploitation) were exploited gradually. As need arose a small series of blades was detached, while the core itself was preserved as stock of raw material. When required, core rejuvenation techniques were employed (KACZANOWSKA *et al.*, 1993). All this bears witness to extremely high skill of individual knappers, but is too

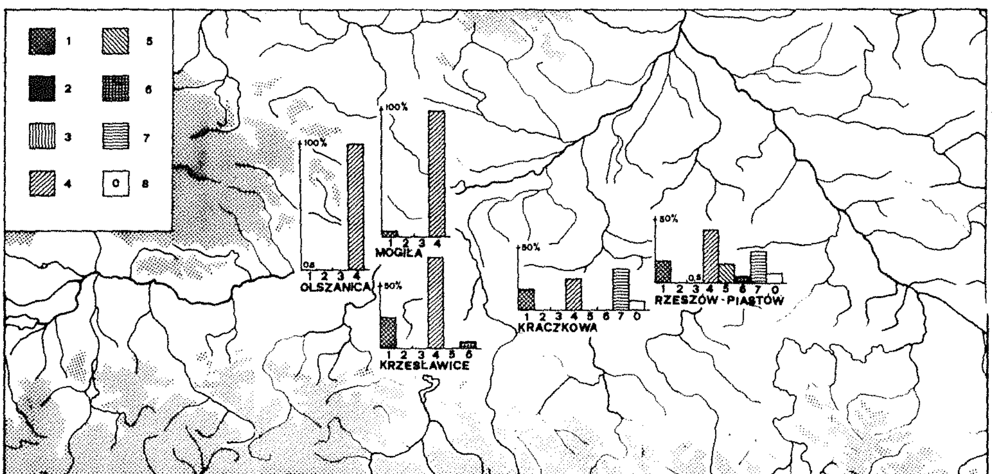

Fig. 9 - Raw materials frequency at some LPC (Želiezovce Phase) and Bükk Culture sites: 1) obsidian, 2) limnoquartzite, 3) radiolarite, 4) Jurassic flint, 5) Dniester flint, 6) «chocolate» flint, 7) Swieciechów flint, 8) others.

weak a proof of the existence of specialization resulting from social complexity. On the other hand, the separation of zones for initial production from residential areas may constitute evidence of tendencies which facilitated formation of task groups. Task groups moved about the landscape procuring resources and transporting them back to residential sites. Even if obsidian did not play a major role in the chipped stone industry of the Bükk Culture, with the exception of sites in the Eastern Slovakia Plain, yet it was probably a raw material sought for by other culture groups. For this reason obsidian spread within a fairly broad range to the north and west of the Carpathians (KULCZYCKZA-LECIEJEWICZOWA and KOZŁOWSKI, 1960; GODLOWSKA, 1986).

Contacts between the Bükk Culture people and the LP continued at the border of the Šariš Basin and Spiš and the Poprad Basin where another wave of the LP people related to the Želiezovce Phase migrated into that area. Stylistic motifs here are much closer to the ornamentation of ceramics from the Upper Vistula than to that from Western Slovakia. Settlement of the Želiezovce Phase, still little known, was distributed in the region of Gánovce – possibly attracted by thermal springs – and fairly deep into the Spiš Basin concentrating on the left bank of the Hornad river. The evidence of contacts with the Bükk Culture is the presence of sherds of this culture on the sites of the Želiezovce Phase in Spiš. It is likely that the population of the LP in Spiš may have mediated in the transmission of obsidian imports to the Upper Vistula Basin (near Kraków and Sandomierz). A more complex explanation would be required to answer the question: how did larger quantities of obsidian invariably found together with Bükk Culture sherds, find its way to the basin of the Wisloka and San rivers? The latter settlements, in turn, may have contributed to the transfer of Cretaceous flint from the Dniester Basin to the sites of the Bükk Culture in Eastern Slovakia (Šarišske Michal'any 1 artefact, Cierne Pole – 5 artefacts). Cretaceous flint reached those sites in the form of finished tools, which were repeatedly rejuvenated and carefully curated.

Although the number of obsidian artefacts found on sites of the LP on the northern side of the Carpathians is small, yet they appear in almost all regional agglomerations of the Želiezovce Phase. Considering that it has not been possible to mark out permanent routes along which the ratio of obsidian would proportionally decrease, the diffusion of obsidian – we must infer – could not have been the result of a systematic down-the-line exchange. More likely, this diffusion was the effect of accidental encounters of the population of the LP and the Bükk Culture people who obtained obsidian by direct procurement. Encounters like this may have taken place precisely in the western Carpathians, not necessarily exclusively in the LP enclave in the Spiš Basin. In the same period the Carpathians may have been penetrated by LP settlement from centres in the Wisloka and San Basin.

Farming was of primary importance for the subsistence economy of the Bükk Culture in the territories of intermontane basins as well as in the Eastern Slovakia Plain. Palaeobotanical examinations of materials from Šarišske Michal'any indicate that fields were located in open areas near built-up zones. The presence of some weeds confirms the presence of forest in the vicinity. Spring wheat was cultivated – mainly *Triticum diccocum* and *Triticum monoccocum* – and barley, *Hordeum vulgare*. Moreover, beans and flax were grown. The groups of weeds accompanying cultivated plants are typical of a fairly wet habitat. Among wild plants the presence of *Trapa* sp. is interesting (HAJNALOVÁ, 1993). For its growth it needs either running water or a reservoir of stagnant water 1-2 metres deep. Near the site and in the whole of the Šariš Basin there were deciduous forests with predominantly sycamore-maple and oak, with some ash, hornbeam and lime. This forest composition favoured the development of stock-breeding, especially pig, raising which is seen in bone materials indicating the dominance of pig. The structure of the bones of game from the site at Šarišske Michal'any shows the presence of both species belonging to the forest habitat (bear, wild boar, deer) and species found in open habitats (hare); however forest species are dominant.

Exploration of other Bükk Culture sites has provided a different picture of stock-breeding. For example at Borsod, in NE Hungary, cattle distinctly predominate (72.24%), goat and sheep are 14.28% and pig only 12.98%. A relatively rich series from the Domica Cave in the Slovakian Karst has yielded more bones of game than of animals raised by men. Among stock in this series bones of sheep/goat are as much as 89.47%, pig is 7.89 and cattle 0.38% (LICHARDUS, 1974). J. Lichardus believes that the territory of Slovakian Karst was inhabited by groups whose subsistence economy was based on tending flocks. Palaeobotanical material shows the presence of dense forests with maple, beech, oak, sometimes pine and birch. The forest floor was overgrown with *Euonymus*. This does not indicate the existence of wide, open areas which could be used for shepherding of large flocks. The high proportion of sheep/goat is – in the view of other scholars – the consequence of the cultural tradition inherited from the FTN Starčevo-Körös complex. H.J. DÖHLE (1990) has drawn attention to the differences in the structure of stock-breeding in the LP, in which the dominance of cattle over other species is stable, and the ELP where the tradition of the FTN Starčevo-Körös Culture is much stronger and is manifestated in the greater importance of sheep/goat. Dohle ascertains that on the sites inhabited by groups affiliated to the ELP and situated in the northern part of the territory of this culture the role of pig breeding grows. In the light of data at our disposal the allegedly shepherding subsistence economy of the Bükk Culture groups inhabiting the Slovakian Karst has not been convincingly proved. We can only establish with all certainty the bigger role of hunting. Moreover, it seems that the composition of stock which was bred in the Bükk Culture varied considerably. Apart from the earlier tradition local environmental conditions must have had a strong influence.

Summing up: our review of neolithic cultures which expanded into the territories of inter-montane basins, entitles us to say that these cultures did not basically change their life style or economy in comparison to the economic structure reconstructed in the groups of the same cultures in their original territories. The expansion into the Western Carpathians was an attempt at conquering new environments, in all likelihood at a favourable climatic phase before the end of Atlantic period. But, with the unchanged subsistence economy this conquest must have failed. Population groups withdrew from the Western Carpathians for at least several hundred years, until the moment when thanks to changes in the economic system, a fuller exploitation of the resources of the highland zone became realistic.

A problem which requires further investigation is the disappearance of the Bükk Culture. This happened suddenly, and in some of the settlements there is evidence of catastrophic events. Subsequently some territories remained uninhabited such as eg. the Šariš Basin, and in some few regions where the hiatus is relatively short, e.g. in the Eastern Slovakian Plain, the next chronological horizon is represented by cultures arriving from outside, which have no links with the Bükk Culture. Slovakian scholars, for example ŠIŠKA(1979b) – among others – tend to associate the dramatic decline of the Bükk Culture with the change of climatic conditions at the transition of the Atlantic/Sub-boreal periods. Possibly climatic change was only one of the causes which released other agents still unknown, for the change of climatic conditions took place over large territories, and nowhere did it result in such a dramatic vanishing of settlement.

STROKE ORNAMENTED POTTERY HORIZON

After the Linear Pottery Cultures had vanished the territories of intermontane basins remained unsettled for a very long time (fig. 10). The situation was different in the Eastern Slovakian Plain. From the south this territory was penetrated by groups of the Theiss Culture occupying areas along the river Tisza as far as the confluence of Tisza and the river Bodrog.

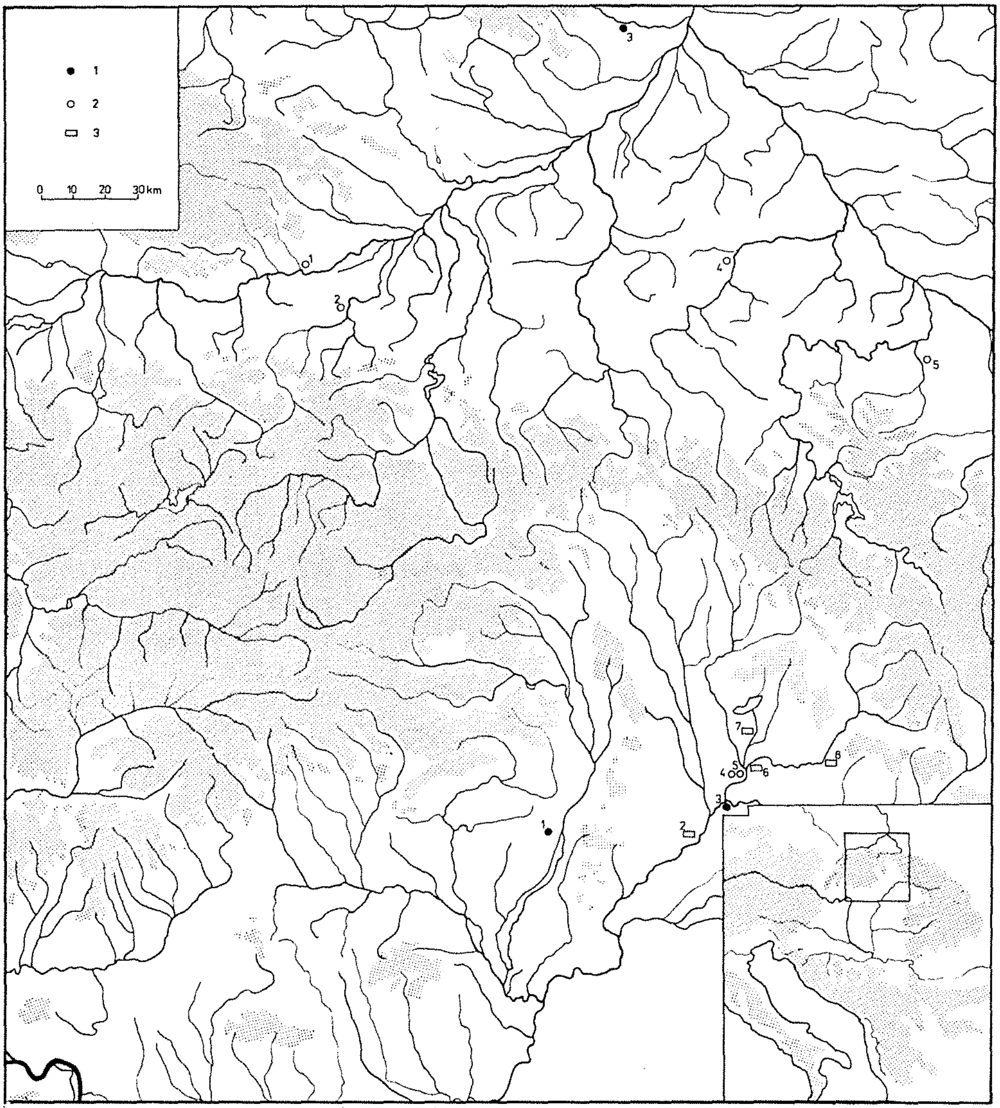

Fig. 10 - Distribution map of the Stroke ornamented Pottery sites. Sites in the Carpathian Basin: 1) Gönz, 2) Zemplin, 3) Izkovce, 4) Malé Raškovce, 5) Vel'ké Raškovce, 6) Oborin, 7) Lucky, 8) Mukacevo, 9) Malice and Early Lengyel sites with obsidian in the Upper Vistula Basin: 1) Kraków-Nowa Huta (Mogila 48), 2) Targowisko, 3) Opatów, 4) Rzeszów-Piastów, 5) Fredropol. Key: 1) Early Lengyel, 2) Malice Culture, 3) Theiss Culture.

Finds of individual inventories of the Csöshalom-Oborin type recorded in Eastern Slovakian Plain are worthy of notice. Recently settlements have been discovered in this region which confirm migrations from Lesser Poland of people belonging to the Malice Culture and a local Lengyel group from Lesser Poland via mountain passes of Dukla or Lupków. Although we do not have a series of C14 dates from Lesser Poland or Eastern Slovakia the first wave of migration is represented by materials of the Ižkovce type. J. VIZDAL (1986) anticipates further discoveries of inventories of this type and, for this reason, proposes that they should be referred to as «the Early Lengyel Ižkovce group». The ceramic inventory of this group shows the presence of the following elements:

1. Potsherds decorated with stroke ornament. This type of ornamentation occurs frequently in southern Poland (Malopolska) in the inventories of the local Early Lengyel group.
2. Vessels with undulating profiles, with stroke ornaments such as spirals or – less often – meanders. On the bellies, in the most flared part, three small bosses are stuck. These vessels are similar to vessels known on the sites of the Early Phase of the Lengyel Culture.
3. Vessels with square mouth, frequently decorated with black painted broad bands. This type of ornament is known only from Aszód in central Hungary and from sites in southern Poland (KALICZ, 1976; 1985).

Among flint artefacts chocolate flint is dominant, brought from the northern edge of the Holy Cross Mountains. This raw material played a major role also in the inventories of sites of the same chronological horizon in south-eastern Poland (KACZANOWSKA, 1985). Materials of the type similar to the Izkovce group were also discovered on the site of Gönc in Hungary (for this information we were obliged to N. Kalicz). On that site pottery decorated with black paint and sherds with stroke ornaments are accompanied by artefacts made in chocolate flint.

The Early Lengyel Ižkovce group emerged in the territory of crossing influences of various environments namely: Lengyel, represented by the eastern group of this culture, the Theiss-Herpály complex with a distinct contribution of groups migrating from southern Poland. The formation of syncretic groups like this in Eastern Slovakian Plain is not an isolated phenomenon. The same mechanism formed another group containing elements from southern Poland, namely the Raskovce group. A separate work has been devoted to this group (KACZANOWSKA *et al.*, 1986) and we may quote here the conclusion. The Raškovce group formed due to migrations of people of the Malice group from southern Poland, most probably from the region of Rzeszów, into the territory of Eastern Slovakian Plain where some local traditions were adopted, for example black paint. At the moment it seems that the presence of these groups had no influence on the further cultural development of this territory.

The presence of these two syncretic groups, Raškovce and Ižkovce, is important because certain ideas are being transmitted, for example pottery ornamentation from the northern part of the Theiss Basin to southern Poland. This phenomenon has been observed for a long time, but only recent discoveries have made a fuller interpretation possible. Moreover, by analogy with the two above-mentioned groups we are able to trace a mechanism for the formation of syncretic groups whose definition in respect of cultural affiliation still causes a number of difficulties. Within the chronological horizon under discussion many groups like this emerged: from the Samborzec-Opatów group (ascribed by Polish scholars to the Lengyel Culture and by some Bohemian archaeologists to the Stroke Ornamented Pottery) to the Ižkovce and Raškovce groups, and finally the Iclod group in Romania.

At the end of the Middle Neolithic small groups from the territory of southern Poland migrate across the Carpathians. However, they do not settle the intermontane basins which had been previously inhabited, but move further south to the Eastern Slovakian Plain. But neither the Carpathians nor the submontane territories were settled in the period under discussion. Although the Carpathians did not constitute a barrier for migration to the south, yet the highland zone was not sufficiently attractive to settlement which in the Carpathians began only in the Middle Eneolithic (fig. 11).

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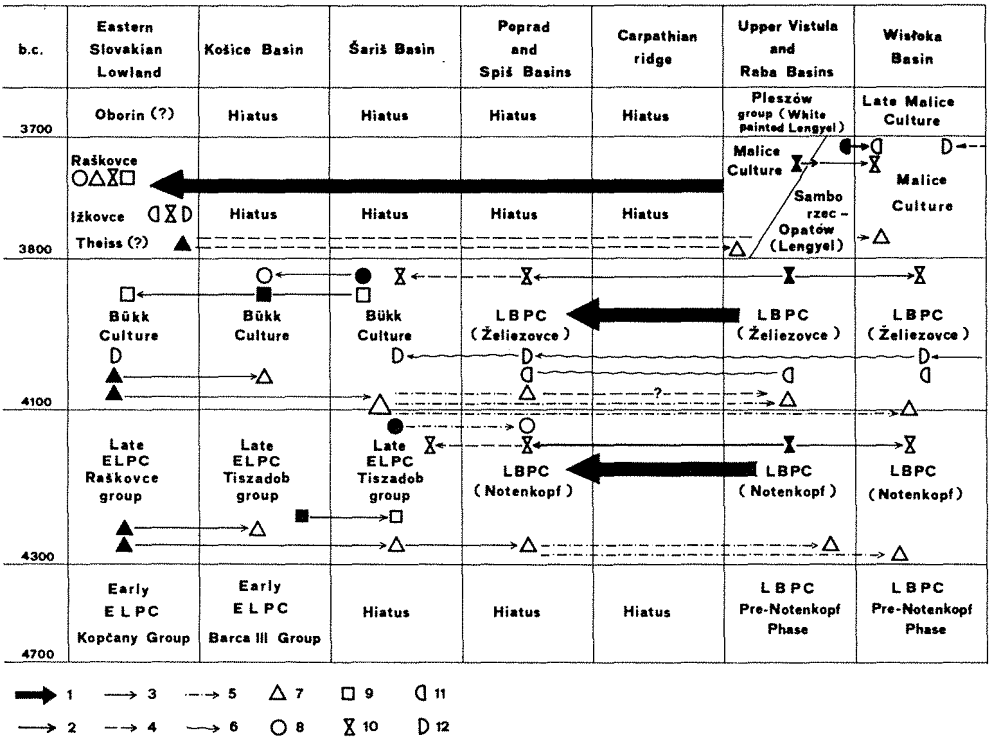

Fig. 11 - Interrelationships between settlement systems in the Upper Theiss and Upper Vistula Basins in the Early and Middle Neolithic. Key: 1) Transcarpathian migrations, 2-6) raw material procurement systems (2) direct procurement, 3) direct procurement or exchange with sites close to outcrops, 4) unsystematic exchange of small quantities of nodules, shaped cores or blades, 5) unsystematic exchange of raw material and pottery, 6) unsystematic exchange of small quantities of blanks ore retouched tools), 7) obsidian, 8) radiolarite, 9) limnoquartzite, 10) Jurassic flint, 11) «chocolate» flint, 12) Dniester flint. Black = oucrops in the area of a given group.

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P. BIAGI and J. NANDRIS (eds.) Highland Zone Exploitation in Southern Europe
MONOGRAFIE DI «NATURA BRESCIANA», 20, 1994: 73-93

STEFANIE THIEBAULT*

L'EXPLOITATION DES HAUTES TERRES: L'EXEMPLE DES PREALPES SUD-OCCIDENTALES FRANÇAISES - L'APPORT DE L'ANTHRACOLOGIE

SUMMARY – *Highland zone exploitation: the example of the south-west French Alpine Foreland and the contribution of charcoal analysis.* Charcoal analysis makes an essential contribution to our knowledge of ancient vegetations and their managment by prehistoric man. In the south-west French Alpine Foreland about ten sites located in the departments of Drôme, Isère and Haute-Savoie at altitudes between 500 and 1200 m were analysed. Most of them, in caves or rock-shelters, contain numerous layers from the end of the Palaeolithic to the Bronze age. They illustrate human impact more particularly from the Neolithic. In this highland area, not so far from the Mediterranean sea, the climatic or human origin of some species is not easy to definite. Nowadays synthesis indicates, in some areas, vegetation cycles characterized by a fall in the oak curve from the Neolithic, and a new start of this curve at the end of the Bronze age. This first synthesis allows to propose some species as indicators of human impact, like *Buxus*, *Juniperus* and *Corylus* or *Pinus sylvestris* when it comes on exploited soils and Fabaceae such as *Laburnum*. In most of the sites, one can observed the importance of *Taxus baccata*, often accompanied by *Fraxinus*. In this area, from the Mesolithic to the Bronze age there is a real phase with *Taxus*.

RIASSUNTO – *Lo sfruttamento delle zone montane: un esempio per le Alpi francesi sudoccidentali: il contributo delle analisi antracologiche.* L'apporto dello studio dei carboni di legna è indispensabile alla conoscenza delle coperture vegetazionali del passato e del loro utilizzo da parte dell'uomo. Nelle prealpi francesi sudoccidentali sono stati analizzati più di dieci giacimenti, situati ad un'altezza compresa fra i 500 ed i 1200 metri, nei distretti della Drôme, dell'Isère e della Savoia. Questi giacimenti, in grotta o in riparo, che contengono delle serie stratigrafiche dalla fine del Paleolitico all'età del Bronzo, permettono di seguire l'interferenza dell'uomo sull'ambiente a partire dal Neolitico. In queste zone montane perimediterranee, l'origine antropica o climatica di alcune specie non è del tutto chiara. La sintesi dei risultati sinora ottenuti sembra indicare dei cicli vegetazionali caratterizzati dalla flessione della curva della Quercia a foglie caduche, a partire dall'epoca neolitica, e della sua risalita a partire dalla fine dell'età dei metalli. Questa prima sintesi permette di proporre alcune specie come indicatori dell'impatto antropico, quali *Buxus*, *Juniperus* o *Pinus sylvetris*, nel caso di suoli sfruttati, e di Fabaceae come *Laburnum*. Nella maggior parte dei siti si osservare l'incidenza di *Taxus baccata*, spesso accompagnato da *Fraxinus*. In questa regione, dalla fine del Mesolitico all'età del Bronzo, si può riconoscere una vera e propria fase a *Taxus*.

INTRODUCTION

Depuis maintenant une quinzaine d'années l'intérêt de l'analyse anthracologique comme mode de connaissance des végétations du passé n'est plus à démontrer. Nous allons tout d'abord présenter, dans un cadre géographique précis, les Préalpes sud-occidentales, une synthèse des résultats obtenus à partir de l'analyse anthracologique d'une dizaine de gisements archéologiques

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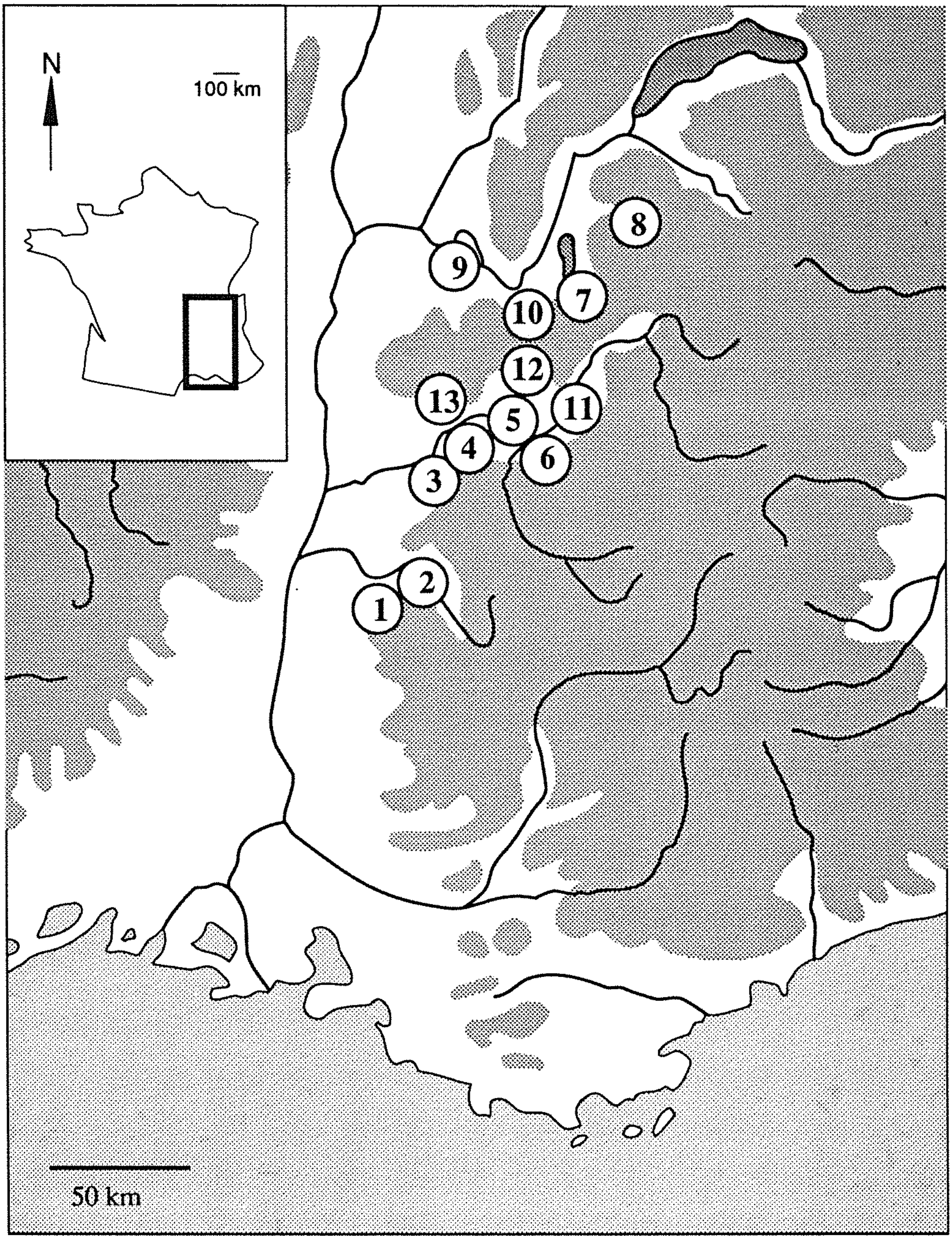

Fig. 1 - Localisation des principaux sites mentionnés dans le texte: 1) Beaume Claire et Beaume Sourde; 2) Antonnaire; 3) Pas de la Charmate; 4) Cirque de Choranche; 5) La Grande Rivoire; 6) Les Sarrasins; 7) Saint-Thibaud de Couz; 8) La Balme de Thuy; 9) Hières sur Amby; 10) Grand Lemps; 11) Saint-Julien de Ratz; 12) Saint-Sixte; 13) Grand Ratz.

offrant, pour la plupart, des stratigraphies recélant plusieurs millénaires d'occupations humaines. Ces gisements, situés à des altitudes variables, s'inscrivent dans des zones fréquentées et occupées depuis que les conditions climatiques le permettent. Nous chercherons ensuite à déterminer de quelle façon, du point de vue de la végétation, l'Homme a, au cours du temps, peu à peu modifié son environnement. Pour ce faire un certain nombre de taxons marqueurs ont été mis en évidence; la part entre le déterminisme climatique et le déterminisme anthropique de certaines espèces sera discutée.

CADRE GEOGRAPHIQUE DE L'ETUDE

La région étudiée se situe dans les Préalpes sud-occidentales françaises prises au sens large (fig. 1). Les sites les plus méridionaux appartiennent au secteur Haut-Provençal des Préalpes calcaires du Sud; les plus au nord appartiennent à l'étage montagnard. Il s'agit d'un grand rectangle qui, du sud vers le nord, s'étend depuis la région de Die, dans le département de la Drôme à la latitude de Livron, jusqu'à la Haute-Savoie, latitude d'Annecy, suivant un axe qui passe par le Vercors et Grenoble. Grâce aux programmes d'inventaire systématique menés depuis quelques années par le centre d'Archéologie préhistorique de Valence sous la direction d'A. Beeching et de J. L. Brochier et les fouilles et prospections effectuées par l'équipe grenobloise menée par P. Bintz, de très nombreux sites ont pu être aujourd'hui repérés et un certain nombre analysé par l'anthracologie.

I - LES PRINCIPAUX GISEMENTS ETUDIES

1) Beaume Claire et Beaume Sourde (Francillon sur Roubion, Drôme)

Ces deux gisements font partie d'un même réseau karstique qui se développe sous le versant nord de la colline de Quinson que longe la rivière le Roubion. Les premières fouilles menées en 1956 avaient permis la découverte d'occupations du Chasséen à l'âge du Bronze. Le Centre Préhistorique de Valence a, par la suite, repris l'étude des gisements dans le but de retrouver des couches en place et de procéder aux prélèvements nécessaires à la reconstitution des paléoenvironnements (Brochier *et al.*, 1984).

Situés à 350 m d'altitude ces gisements se trouvent en situation collinéenne, dans la série du Chêne pubescent, étage supraméditerranéen de type occidental.

L'analyse anthracologique réalisée par Ch. Heinz (1988) a permis l'identification de 21 taxons sur l'ensemble de la séquence. Certains sont associés à l'étage montagnard, comme: *Fagus sylvatica, Taxus baccata, Crataegus sp., Sorbus sp., Juniperus sp.* d'autres à l'étage supraméditerranéen: *Quercus* cf. *pubescens, Corylus avellana, Buxus sempervirens, Acer campestre, Acer monspessulanum, Ligustrum vulgare, Prunus spinosa, Prunus mahaleb, Viburnum lantana, Juniperus sp., Crataegus sp., Sorbus sp.* d'autres encore sont caractéristiques du mésoméditerranéen ainsi *Quercus pubescens, Quercus ilex-coccifera, Pistacia terebinthus, Rhamnus alaternus, Juniperus sp., Phillyrea sp.* d'autres enfin sont associés à la ripisylve: *Fraxinus excelsior, Alnus sp.*

L'analyse anthracologique de Beaume Sourde (fig. 2) a porté sur 1346 fragments. L'auteur a pu mettre en évidence 2 ensembles: le premier concerne les niveaux 12 (daté de: Ly-3598: 4990±120 BP), 11 (Ly-3597: 4160±120 BP) et 10 dans lesquels les vestiges du Chasséen ont été découverts. La permanence de la chênaie caducifoliée et de taxons mésophiles, avec le Frêne et l'Erable, le Noisetier, l'Aubépine et le Buis, caractérisent cet ensemble. Certains taxons montagnards comme le Hêtre et l'If ou thermophiles comme les Chênes verts, Pistachiers ou Filaires ont été identifiés. L'ensemble 2 concerne les niveaux Néolithique final 9, 8 et 7. Il montre quelques variations dans la courbe des Chênes à feuillage caduc, du Frêne, du Noisetier et de l'Erable, une augmentation des pourcentages du Buis et des Chênes verts entre les niveaux 9 et 8 .

L'analyse anthracologique de Beaume Claire (fig. 3) a porté sur 616 fragments répartis sur 2 niveaux attribués aux Chasséen-Néolithique final. Les résultats rapprochent les niveaux 1 et 2 de Beaume Claire de l'ensemble 2 de Beaume Sourde.

D'après l'auteur, les fluctuations des occurences du Chêne pubescent doivent être interprétées comme une conséquence de l'action de l'Homme sur son environnement. La poussée du Noisetier, marqueur de reconquête forestière, dans les niveaux 8 et 7 de Beaume Sourde, semble aller dans ce sens.

L'analyse palynologique effectuée par J. Argant confirme ces données (ARGANT, 1986; 1989). Selon la palynologie l'environnement paraît plus boisé à la base de la séquence, une accentuation des défrichements intervenant à partir de la couche 10. Les pollens trouvés dans les couches 9 et 10 indiqueraient une utilisation de la grotte plutôt centrée sur l'élevage.

2) ANTONNAIRE (Montmaur en Diois, Drôme)

La grotte d'Antonnaire s'ouvre à 1172 m d'altitude dans les calcaires tithoniques qui forment le plateau de Solaure, au sud du massif du Vercors, sur la rive gauche de la Drôme. Elle se situe dans l'étage montagnard inférieur, dans la série mésophile du Hêtre.

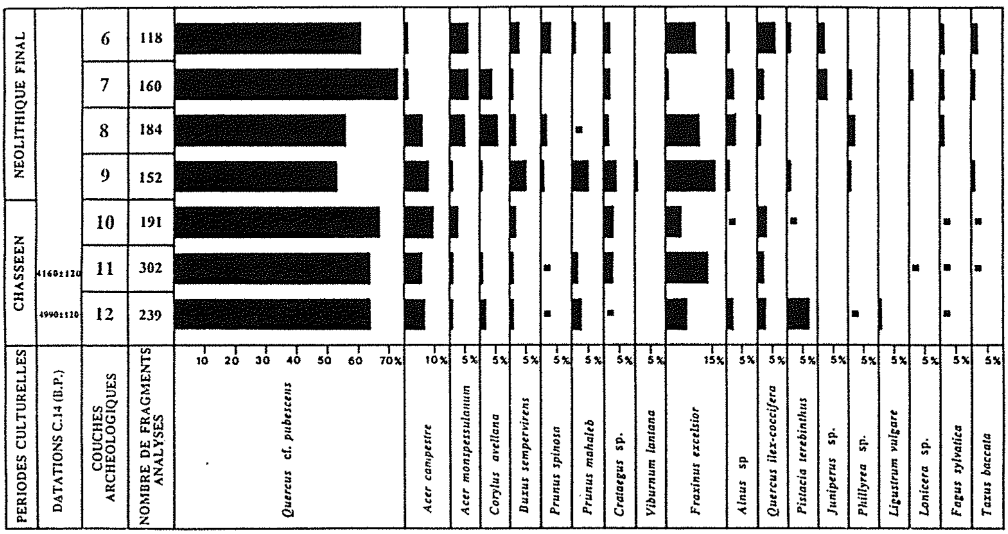

Fig. 2 - Diagramme anthracologique du site de Beaume Claire, (HEINZ, 1988).

Une couche chasséenne avait fait l'objet d'une première fouille en 1967-1969 par A. Héritier. Dans le cadre du programme de recherche sur la moyenne vallée du Rhône, J.-L. Brochier et S. Matteucci reprirent les fouilles en 1985.

L'analyse anthracologique, qui a porté sur 1455 fragments, a été effectuée par Ch. Heinz (1988; 1989). Du point de vue qualitatif, les résultats montrent deux ensembles floristiques très imbriqués l'un dans l'autre, l'un caractérise l'étage montagnard avec *Pinus sylvestris, Abies alba, Fagus sylvatica, Taxus baccata, Ribes alpinum, Juniperus sp., Crataegus sp.* l'autre le supraméditerranéen avec *Quercus* f.c., *Acer campestre, Buxus sempervirens, Prunus spinosa, Crataegus sp., Sorbus sp., Corylus avellana, Ulmus minor, Tilia sp., Ilex aquifolium, Viburnum lantana, Juniperus sp.* La ripisylve est présente avec *Populus sp., Fraxinus excelsior, Sambucus sp., Lonicera sp.*

La stratigraphie s'étend sur plusieurs niveaux. Le premier (C7) n'a pas été caractérisé culturellement mais a livré des charbons de bois parmi lesquels le Pin sylvestre, L'If et le Genévrier ont été reconnus. L'auteur, grâce à la zonation de la végétation effectuée sur le Midi méditerranéen (Vernet *et al.*, 1987; Vernet et Thiebault, 1987), attribue cette phase à la période 12000-9000 BP. Nous sommes en accord avec cette attribution abondant plutôt pour la période la plus récente de cet intervalle en fonction de la présence de l'If.

Les résultats anthracologiques (fig. 4) montrent une phase de végétation comprenant les niveaux C5 (daté de: Ly-4081: 5570±150 BP) à C2, attribués au Chasséen. Toujours selon l'auteur, la chênaie caducifoliée et ses compagnons sont modestes à la base de cet ensemble. La richesse floristique de la chênaie en taxons médioeuropéens traduit l'humidité du climat de même que l'occurence notable de *Taxus*. Le Frêne peut être associé à la ripisylve en bordure de la Drôme. Le Sapin est présent mais ne joue qu'un rôle effacé. Le Pin sylvestre et le Genévrier, dont l'installation est bien antérieure à celle de la chênaie caducifoliée, sont inscrits dans la végétation située plus en altitude. Leurs fréquences s'équilibrent avec celles de la chênaie, témoignant ainsi de la juxtaposition, à proximité du site, de deux étages de végétation dont les inter-relations semblent manifestes. L'existence d'un milieu ouvert peut être corrélée en partie à l'intervention de l'Homme sur le milieu, favorisant ainsi le Pin sylvestre et le Genévrier déjà présents (Heinz, 1988).

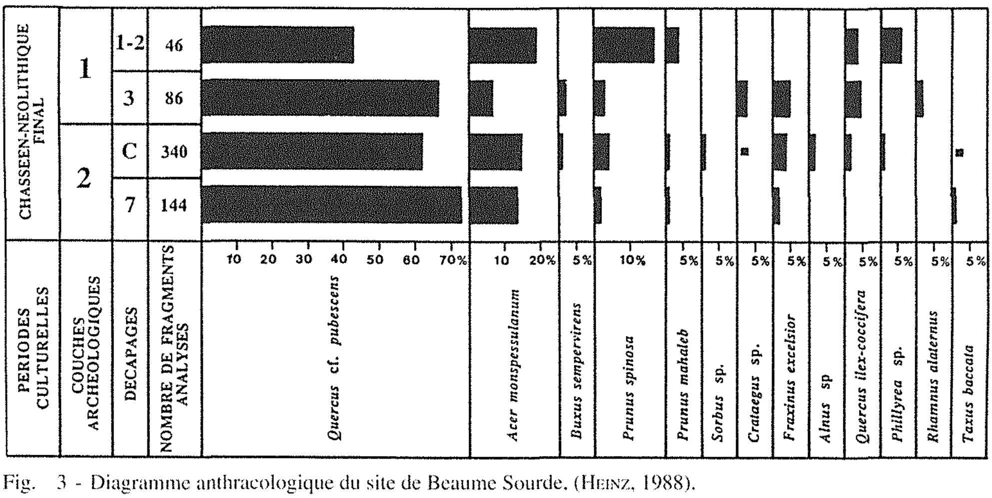

Fig. 3 - Diagramme anthracologique du site de Beaume Sourde. (Heinz, 1988).

Dans les niveaux Chasséen et Néolithique final, couches C3-3 et C3-2 (datée de: Ly-4079: 4890±150BP) on assiste à une reconquête forestière qui se traduit par le développement de la chênaie caducifoliée et la régression du Genévrier. Dans la partie supérieure de la séquence, correspondant aux niveaux du Bronze final, on s'aperçoit que les taxons forestiers qui dominaient dans la phase précédente, sont en nette régression. On assiste à l'évolution régressive de la chênaie, marquée par le développement des groupements arbustifs à Buis. L'intervention humaine, déjà notable au Néolithique est ici directement en cause. L'analyse palynologique effectuée par J. Argant (1989) nous donne des informations sur l'utilisation de la grotte qui, selon cet auteur, devait servir de refuge saisonnier pour les moutons venant estiver à partir de la vallée.

3) Le Pas de la Charmate (Saint-Julien en Vercors, Drôme)

Dans le Vercors, à une cinquantaine de kilomètres au nord des gisements précédents, se situe le Pas de la Charmate. Ce gisement, orienté plein nord, s'étend sous un vaste abri sous roche à 1100 m d'altitude. Il est localisé dans l'étage montagnard inférieur dans la série mésophile du Hêtre.

Le site, fouillé de 1985 à 1992 par P. Bintz et son équipe, a livré une stratigraphie présentant des niveaux d'occupation allant de l'Epipaléolithique au Néolithique moyen. Le diagramme anthracologique a porté sur l'identification de plus de 2300 fragments de charbons de bois.

Comme à Antonnaire les végétations présentent de fortes interactions entre l'étage collinéen et l'étage montagnard avec pour le montagnard: *Pinus sylvestris, Taxus baccata, Acer platanoides, Sorbus* cf. *aucuparia, Ulmus* cf. *montana* et le collinéen: *Quercus* à feuillage caduc, *Acer campestre, Corylus avellana, Silex aquifolium, Prunus sp., Sorbus sp., Tilia sp., Ulmus minor, Juniperus sp.* La ripisylve est représentée par *Populus sp.* et *Fraxinus excelsior.*

Le diagramme anthracologique (fig. 5) propose trois phases dans l'évolution de la végétation: la première dans laquelle prédomine le Pin sylvestre correspond aux occupations Epipaléolithique couche D datée de Ly-4203: 9890±140 BP et C3 Mésolithique ancien datée

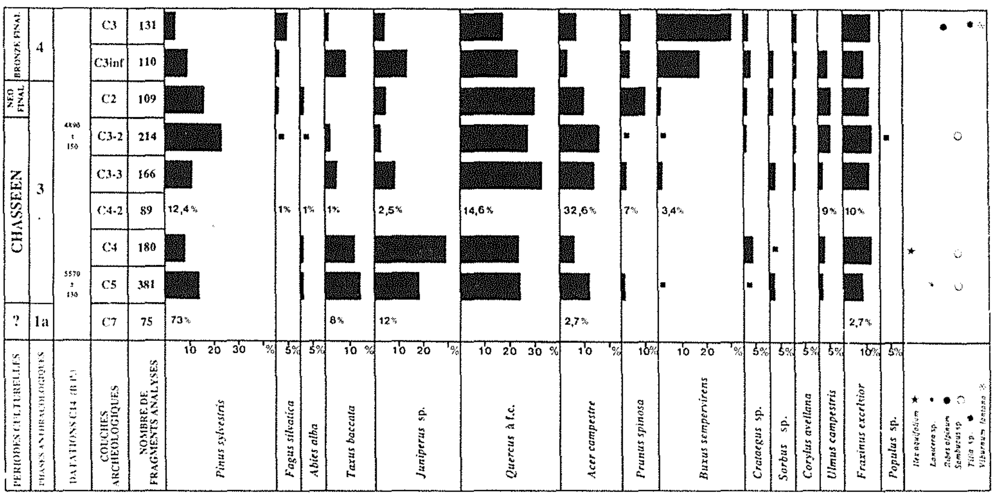

Fig. 4 - Diagramme anthracologique du site d'Antonnaire (Heinz, 1988).

de Ly-5245: 9100±250 BP; la seconde est caractérisée par l'installation de la chênaie caducifoliée, elle correspond au Sauveterrien, couches C2< datée de Ly-4204: 8240±260 BP et C2> datée de Ly-5662: 8100±100 BP au Castelnovien C1/C2 datée de Ly-4380: 7950±100 BP et C1 datée de Ly-3786: 7820±120 BP. Enfin, la troisième phase se différencie par la disparition des Chênes à feuillage caduc et la prédominance de l'If et du Genévrier, elle se situe dans la couche attribuée au Néolithique moyen: B3 datée de Ly-3785: 5680±130 BP et le foyer F38 daté de Ly-4381: 5630±110 BP.

Les résultats obtenus à Charmate posent quelques points d'interrogations. En effet, si dans les niveaux les plus anciens, Epipaléolithique et Mésolithique ancien, la végétation est conforme à celle connue sur les autres gisements de la région avec la prédominance des gymnospermes et notamment du Pin sylvestre caractérisant le début du Postglaciaire, les datations venant confirmer cette attribution, la phase suivante, qui se place, du point de vue chronologique, dans le Boréal (8700-7400 BP), voit la régression de la courbe des Pins sylvestres au profit de l'installation de la chênaie caducifoliée accompagnée de l'Orme, Tilleul, Noisetier et Rosacées. Cette phase liée à la chênaie caducifoliée s'amenuise lors de l'occupation castelnovienne vers 7820 pour laisser la place à une végétation appauvrie taxonomiquement et composée principalement de gymnospermes avec *Taxus,* accompagnées, dans une moindre mesure, de *Juniperus* et de *Pinus sylvestris.* Tout se passe comme si l'influence montagnarde devenait beaucoup plus importante. Il nous paraît, dans ce cas, difficile d'imputer à l'action humaine ce changement dans la composition de la végétation. Il n'existe encore nulle part de réelles preuves de néolithisation pour cette culture. Si nous refusons, *a priori,* une origine anthropique à ce changement, il faut alors invoquer une origine climatique dûe à une péjoration du climat.

4) Le Cirque de Choranche (Choranche, Isère)

Situé face au Pas de la Charmate dont il est séparé par la vallée de la Bourne, le cirque de Choranche a permis à P. Bintz et son équipe de découvrir et de fouiller trois gisements: Balme-Rousse, Coufin 1 et 2. Le cirque de Choranche est situé dans l'étage collinéen dans la série

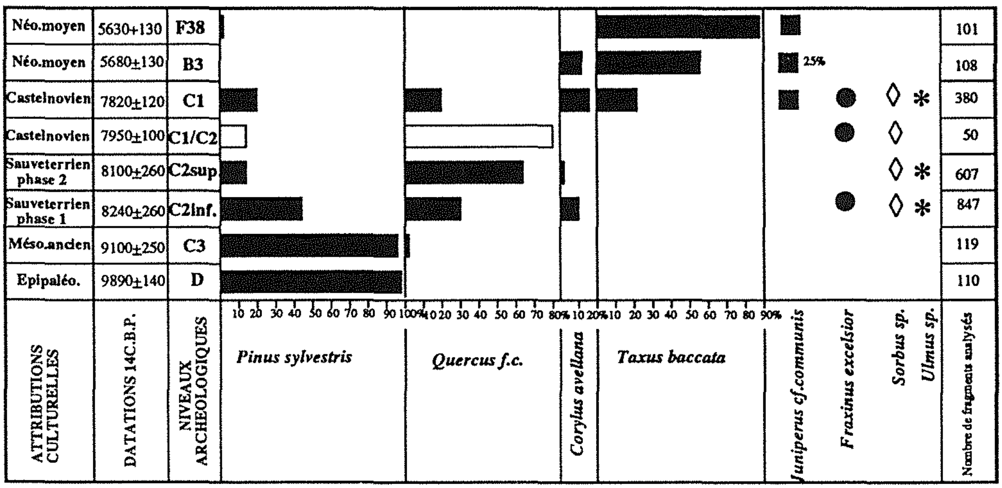

Fig. 5 - Diagramme anthracologique du site du Pas de la Charmate (Thiebault, 1992 inédit).

xérophile et mésoxérophile du Chêne pubescent.

La grotte de Balme Rousse est une vaste cavité qui s'ouvre plein sud, au pied de la falaise de Presles à 650 m d'altitude. Fouillée de 1981 à 1985 elle a livré une stratigraphie témoignant d'occupations attribuées aux Mésolithiques ancien et récent, puis aux Chalcolithique et Bronzes ancien et final ainsi qu'au Moyen-Age.

Comme dans la plupart des gisements les résultats, qui portent sur l'identification de plus de 940 fragments, indiquent que les influences s'interpénètrent puisque l'étage montagnard est caractérisé par: *Pinus sylvestris, Taxus baccata, Fagus sylvatica, Laburnum* cf. *anagyroides, Sorbus* cf. *aucuparia.;* le collinéen par *Quercus* f.c., *Acer campestre, Buxus sempervirens, Corylus avellana, Ilex aquifolium, Prunus sp., Sorbus sp., Ulmus minor* et la ripisylve par *Salix sp.* et *Fraxinus excelsior.*

L'analyse anthracologique (Thiebault, 1988) montre (fig. 6), après un début désormais classique où la végétation au Mésolithique est dominée par le Pin sylvestre, une montée rapide de l'If dans des proportions très importantes au Mésolithique récent: C1 datée de 6020±150 BP. Si la chênaie caducifoliée n'est jamais très développée elle est néanmoins présente dans la séquence jusqu'au Bronze final. Bien qu'aucune occupation néolithique n'ait été mise au jour il est intéressant de constater que l'ouverture des milieux, corollaire de l'utilisation de son environnement par l'Homme, est déjà bien entamée dès le Chalcolithique. La courbe de l'If, en effet, est en nette régression et le développement des courbes des Buis et Noisetier avec, pour les niveaux du Moyen-Age, le Genévrier et le Cytise témoigne de l'anthropisation. Il faut noter l'apparition de *Fagus* autour de 6000 BP

Les gisements de Coufin 1 et Coufin 2 situés à un kilomètre environ de Balme-Rousse et à une altitude de 580m vont être présentés ensembles. Le premier s'ouvre au sud-ouest, c'est un large abri proposant un vaste porche semi-circulaire. La cavité fit l'objet d'un sondage en 1977 puis de 2 campagnes de fouille par P.Bintz permettant la mise au jour de 11 niveaux d'occupations mésolithiques.

A 25 m de Coufin 1, l'abri de Coufin 2 s'ouvre plein sud. Fouillée, de 1980 à 1982 sous la direction de P. Bintz, une belle séquence stratigraphique s'étendant sur l'Holocène vient compléter les données obtenues à Coufin 1. Le diagramme anthracologique (fig. 7), qui repose sur l'identification de plus de 3900 fragments, considère les deux gisements en superposant leurs résultats. Une flore appartenant aux étages proches a été observée; pour l'étage montagnard il s'agit de: *Taxus baccata, Acer pseudoplatanus, Fagus sylvatica, Sorbus aucuparia, Abies alba, Laburnum* anagyroides... le Pin sylvestre est absent. Pour le collinéen il s'agit de:

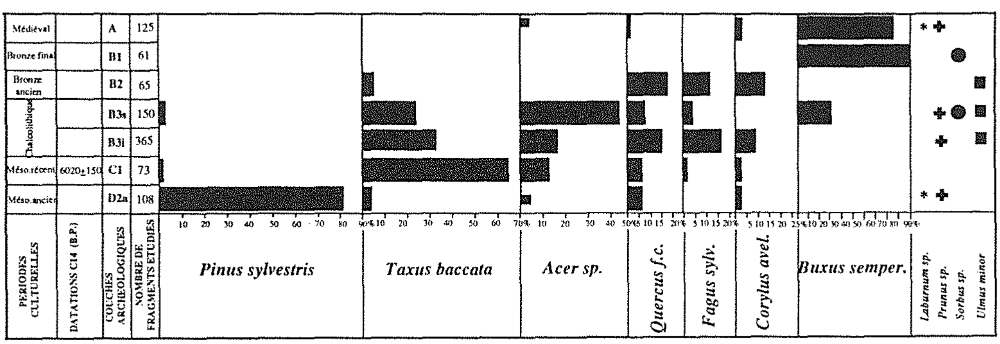

Fig. 6 - Diagramme anthracologique du site de Balme-Rousse (Thiebault, 1988).

Quercus f.c., *Juniperus* cf. *communis, Acer campestre, Buxus sempervirens, Carpinus, Corylus, Prunus* cf. *spinosa, Ulmus minor, Viburnum sp., Tilia sp., Sambucus sp.,* enfin la ripisylve: *Fraxinus excelsior, Populus sp.*

Le diagramme anthracologique des gisements de Coufin attire notre attention sur différents points (Thiebault, 1988). Le premier concerne l'installation de la chênaie caducifoliée qui est en place dès le début de la séquence vers Ly-2106: 8200±140 BP, et qui va perdurer pendant toute l'occupation mésolithique. Le développement précoce et important de la chênaie caducifoliée est sans doute dû à la localisation du site qui, de part son exposition plein sud, au pied des falaises de Presles, reçoit les derniers vestiges des influences méditerranéennes. Cela peut expliquer l'absence de taxons comme le Pin sylvestre alors que les analyses régionales montrent au contraire son ampleur, ainsi que la discrétion d'*Abies* (1 seul fragment).

A partir du Néolithique moyen (F9 daté de Ly-3321: 5260±120 BP) la courbe de l'If débute dans de fortes proportions ; après quelques fluctuations elle se poursuit jusqu'au Gallo-Romain. Bien qu'un fragment ait été identifié dans le Mésolithique de Coufin 1 (F4), l'If apparaît, en courbe continue, plus tardivement que dans le site voisin de Balme-Rousse où il était présent depuis le Mésolithique ancien. Cependant, si l'on considère le déclin de la courbe de la chênaie caducifoliée comme un indicateur, l'intervention humaine sur le milieu se lit à Coufin dès l'installation des Néolithiques moyens. Ce déclin, comme nous l'avions remarqué à Charmate, est lié à l'accroissement de l'If. Si à Charmate le rôle de l'homme peut être mis en doute, ce n'est pas le cas à Coufin où les espèces de reconquête comme le Genévrier apparaissent dès la fin du Néolithique pour se développer et devenir prédominantes à la fin de la séquence avec le Buis,

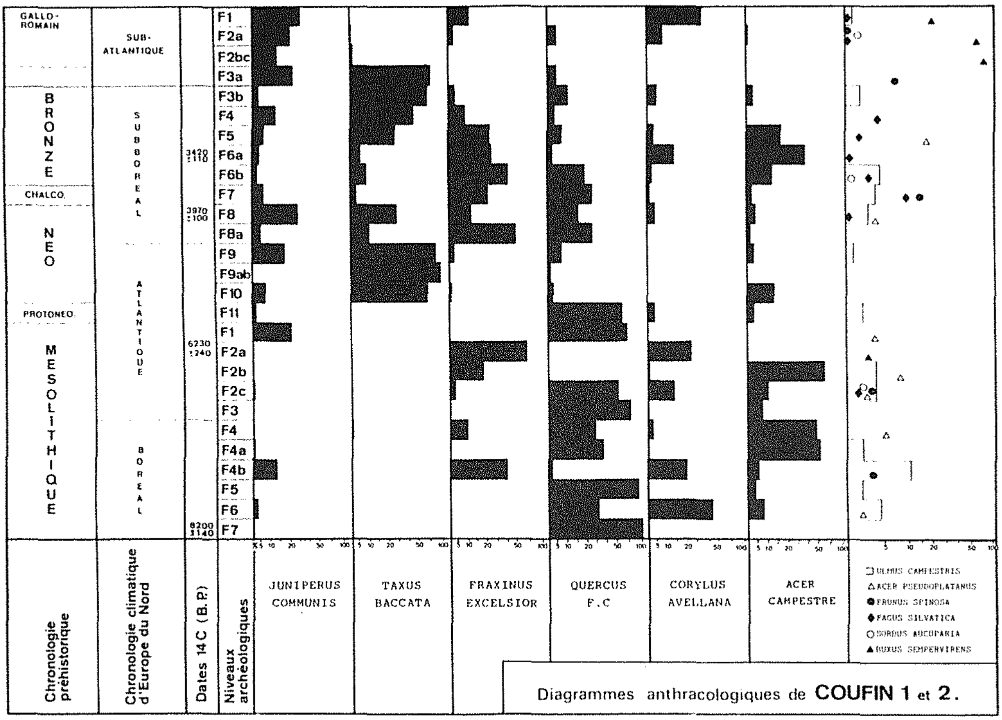

Fig. 7 - Diagramme anthracologique des sites de Coufin 1 et 2 (Thiebault, 1988).

le Noisetier et l'amenuisement de la chênaie caducifoliée à l'âge des métaux.

La palynologie, pour sa part (Bui-Thi-Mai *et al.*, 1987), montre qu'au début du Préboréal la phase à Pin se développe, très rapidement relayée par l'installation de la chênaie caducifoliée. Les auteurs signalent que la limite Préboréal-Boréal est marquée par une réduction spectaculaire des taux de *Pinus*. Pendant la seconde partie de l'Atlantique la palynologie montre le développement du Sapin qui, selon les auteurs, correspond à un net accroissement de l'humidité avec des températures assez fraîches. Ce type d'ambiance ne peut qu'encourager le développement de l'If. Des traces de céréales au Néolithique moyen (F9b) sont à noter.

5) La Grande Rivoire (Sassenage, Isère)

L'abri sous roche de la Grande-Rivoire est un site de bordure de massif situé à 580 m d'altitude, dans un rétrécissement des gorges du Furon. L'abri, orienté au sud, est surplombé par une falaise d'une quarantaine de mètres de haut constituée de calcaire sénonien à silex. Il est actuellement localisé dans l'étage collinéen dans la série du Chêne pubescent.

Découvert en 1986, ce gisement a fait l'objet de 4 campagnes de fouilles de sauvetage sous la direction de R. Picavet, qui ont permis la découverte d'une puissante séquence stratigraphique avec 13 niveaux d'occupation allant du Mésolithique au Gallo-romain (Picavet, 1991).

L'analyse anthracologique (fig. 8) a identifié plus de 2730 fragments de charbons, ils montrent une bonne diversité taxonomique puisque 30 genres ou espèces différents ont été déterminés. Là encore ils appartiennent principalement à deux étages: le montagnard avec *Pinus sylvestris, Abies alba, Taxus baccata, Acer platanoides/pseudoplatanus,* cf. *Laburnum anagyroides, Fagus sylvatica, Sorbus aucuparia*... et le collinéen: *Quercus* f.c., *Acer campestre, Buxus, Carpinus, Ligustrum, Ilex aquifolium, Clematis, Corylus avellana,* divers *Prunus, Tilia, Ulmus minor*... ainsi qu'à la ripisylve avec *Fraxinus excelsior, Sambucus sp., Salix* et *Populus.*

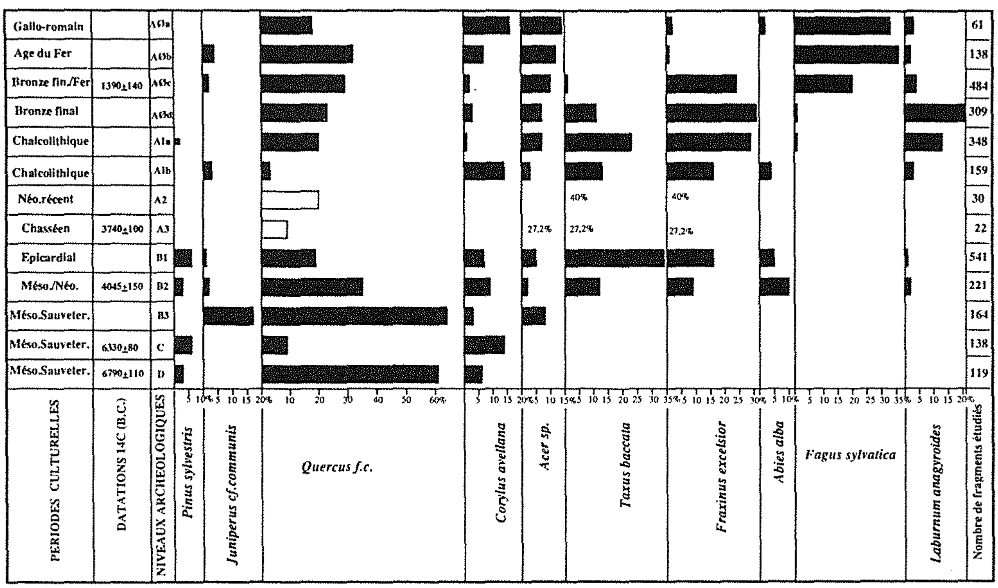

Fig. 8 - Diagramme anthracologique du site de La Grande-Rivoire (Thiebault, 1992 inédit).

Les occupations les plus anciennes de l'abri ont été attribuées aux Mésolithiques sauveterriens et datées de Ly-5434: 8740±110 BP pour la couche D et de Ly-5433: 8280±80 BP pour la C. La végétation est constituée par la Chênaie caducifoliée avec quelques reliques des végétations antérieures puisque le Pin sylvestre n'a pas entièrement disparu. Le Chêne à feuillage caduc accompagné du Noisetier se développe pendant toute la première partie de cette séquence. C'est lors de la transition Mésolithique/Néolithique vers Ly-5099: 5995±150 BP couche B2, que le Sapin apparaît en même temps que démarrent les courbes de l'If et du Frêne, ce qui a pour corollaire une diminution des valeurs relatives du Chêne; le Pin est toujours présent. La courbe de l'If se développe entre la transition Mésolithique/Néolithique et le Bronze final, couche A0c datée de Ly-5184: 3340±140 BP, dans des proportions plus modestes que dans le cirque de Choranche. Une fois encore la courbe de l'If est simultanée de celle du Frêne, elle même contemporaine des premiers indices de domestication animale donnés par l'archéozoologie.

La troisième partie de la séquence est caractérisée par le développement du Hêtre au moment de la transition Chalcolithique/Bronze ancien (C.AIa). Cette phase voit une légère reprise de la courbe des Chênes à feuillage caduc, la régression de celles de l'If et du Frêne et le développement de celle de Fagus et surtout de celle des Fabacées comme *Laburnum anagyroides*.

6) Grotte Des Sarrasins (Seyssinet-Pariset, Isère)

A quelques kilomètres de la Grande-Rivoire, à l'ouest de Grenoble, sur la rive gauche du Drac, s'ouvre la grotte des Sarrasins. Connue depuis le XIXème siècle cette grotte fit l'objet de fouilles à la fin des années soixante par A. Bocquet et son équipe (Bocquet, 1976). Elles permirent la mise au jour de 16 niveaux d'occupation du Néolithique récent jusqu'au Gallo-romain. Cette vaste cavité s'ouvre au sud-ouest dans un entonnoir exposé au nord, à 596 m d'altitude. Elle se situe dans l'étage collinéen, série du Chêne pubescent. Plus de 4550 fragments de charbons de bois furent analysés, ils montrent l'influence et la proximité des étages de végétation comme le montagnard avec *Abies alba, Pinus sylvestris, Taxus baccata, Acer pseudoplatanus, Laburnum anagyroides, Fagus sylvatica, Sorbus* cf. *aucuparia* ou le collinéen avec: *Quercus* f.c., *Acer campestre, Corylus avellana, Crataegus, Pirus malus,* divers *Prunus, Rhamnus sp., Tilia sp., Ulmus minor* et la ripisylve: *Fraxinus excelsior, Populus sp., Salix sp., Viburnum sp.*

La séquence débute (fig. 9), au Néolithique récent, par un environnement marqué par l'If et le Frêne, dans lequel la hêtraie sapinière est présente et où la chênaie caducifoliée n'est pas l'élément prépondérant. Cette phase prend en compte les occupations du Néolithique récent, du Chalcolithique (S7 daté de 3900±120 BP) et s'étend jusqu'à la fin du Bronze ancien couche S.4d. Nous pouvons y remarquer une phase d'exploitation de la chênaie marquée par un maximum de Frêne, du Néolithique récent au Bronze moyen. La seconde phase voit, après un épisode où le Noisetier et les Fabacées jouent un rôle important de restauration de la forêt, la reprise de la chênaie caducifoliée jusqu'à l'âge du Fer, la disparition de *Taxus* au Bronze moyen, et le maintien de *Fagus* pendant toute la séquence.

L'analyse anthracologique montre qu'après une phase d'exploitation qui pourrait se situer à la fin du Néolithique, le milieu se referme, les défrichements de l'âge du Bronze sont difficiles à mettre en évidence (Thiebault, 1988). Ceci milite davantage pour voir, par la suite, une ouverture récente du milieu et une exploitation historique des terres. Les analyses palynologiques de ce gisement ont été effectuées par J.-L. Borel (1973; 1976). Leurs résultats sont très similaires à ceux de l'anthracologie et aboutissent aux mêmes conclusions avec une courbe des céréales allant du Néolithique récent au Bronze ancien. Ils confirment notamment qu'après le Bronze final: *«les activités du groupe ne se portent plus vers la culture céréalière»* (Borel, 1973: 243). Il semble donc que la vocation agricole des habitants des Sarrasins ait été de courte durée.

7) St-Thibaud de Couz (Savoie)

Les deux sites de St-Thibaud de Couz, Jean-Pierre 1 et Jean-Pierre 2, ont été découverts en 1965 par A.Bocquet et fouillés de 1969 à 1974 (Girard *et al.*, 1981). Situés à 10 km au sud-ouest de Chambéry sur le rebord occidental du massif de la Grande Chartreuse sur le versant oriental de la vallée de l'Hyère, les grottes s'ouvrent à 500 m. d'altitude dans l'étage collinéen, série du Chêne pubescent. Vers 600 m se développe la série mésophile du Charme.

La fouille du remplissage de la grotte Jean-Pierre 1 a permis la découverte de 11 niveaux d'habitats. Ils correspondent plus particulièrement à des occupations magdaléniennes et épipaléolithiques. Les charbons ont été analysés par J.-L.Vernet mais aucun diagramme n'a pu être établi car le nombre de fragments étudiés est trop faible (Thiebault, 1988). Les résultats de l'analyse se divisent en plusieurs parties: des couches 9 à 7 (C9 est datée de Ly-830: 13070±210 BP, Magdalénien final, et 7 datée de Ly-625: 10470±200 BP) dans lesquelles *Juniperus* est l'essence la mieux représentée, accompagnée des Bouleau, Chêne, Sapin et Pin sylvestre. Dans la couche 9, le Genévrier et le Bouleau traduisent un paysage ouvert, développé sous un climat froid. La couche 8 voit un réchauffement caractérisé par un premier développement

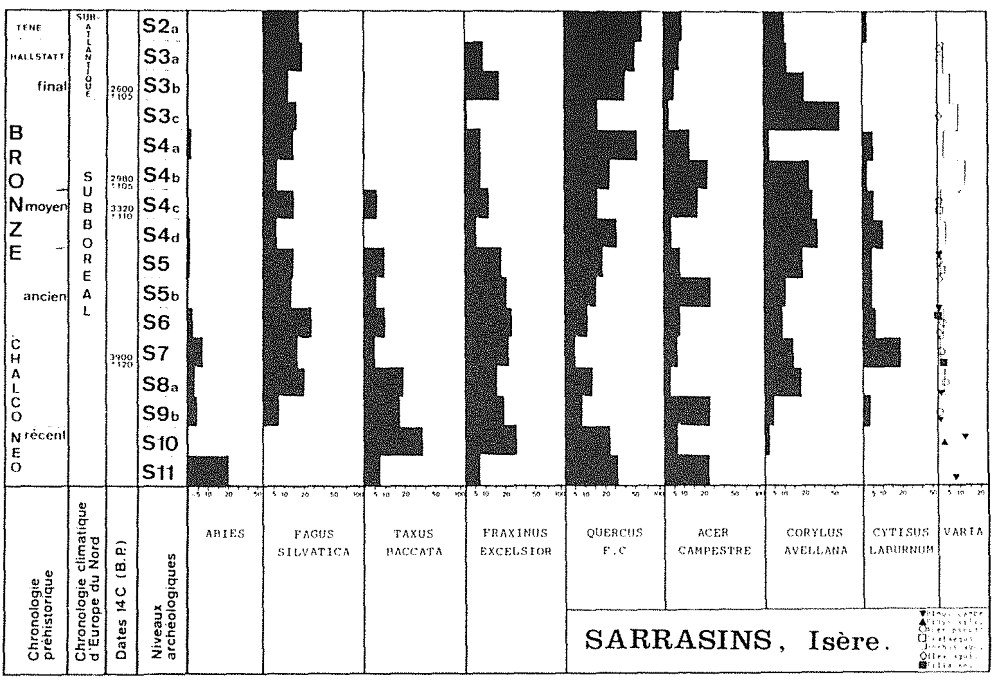

Fig. 9 - Diagramme anthracologique du site des Sarrasins (Thiebault, 1988).

du Pin sylvestre accompagné de feuillus comme le Chêne et les *Prunus*. La persistance du Chêne et la présence du Sapin dans la couche 7 montrent la constance du réchauffement. A partir de la couche 6, l'auteur voit, avec le développement du Pin sylvestre et la disparition du Bouleau, les prémices de la phase de recolonisation du début de l'Holocène. Dès la couche 5a, datée de Ly-428: 9050±260 BP, l'If et le Frêne sont présents. Les analyses polliniques (GIRARD *et al.*, 1981) vont, pour l'essentiel, dans le même sens que l'anthracologie, notamment pour ce qui concerne le passage du Tardi. au Postglaciaire. Les résultats de St-Thibaud confirment ceux déjà obtenus pour les périodes assez reculées, notamment avec l'ancienneté des Pins et Genévriers, alors qu'ici l'apparition du Chêne confère un cachet thermophile au Tardiglaciaire. Dans plusieurs niveaux deux espèces de Pins ont été déterminées: *Pinus sylvestris* et *Pinus uncinata* ce qui permet à l'auteur d'émettre l'hypothèse selon laquelle la récolte du bois s'effectuait sur un parcours présentant un dénivelé important.

8) LA VIEILLE EGLISE A LA BALME DE THUY (Haute-Savoie)

Dans les Alpes du nord la station de «La Vieille Eglise» est située sur la commune de la Balme de Thuy, nom sous lequel elle est d'ailleurs plus connue, à 3 km à l'ouest de Thônes, sur la rive droite du Fier qui coule à proximité. C'est un vaste abri sous roche qui s'ouvre au sud, à une altitude de 620 m. Cette cavité a été creusée au pied d'une falaise urgonienne appartenant aux unités géologiques «Bornes-Aravis» dans les couches marno-calcaires du rhodanien. Le site, connu depuis plus d'un siècle, a été fouillé par J. Hubert puis par J.P. Ginestet de 1970 à 1990. Le gisement offre une séquence présentant 13 niveaux stratigraphiques (GINESTET *et al.*, 1984).

Le site est actuellement localisé à la charnière supérieure de l'étage collinéen, série septentrionale du Chêne pubescent et de l'étage montagnard. La carte de végétation (RICHARD et HAINARD, 1979) montre un environnement très contrasté. L'analyse anthracologique du gisement de la Balme de Thuy (fig. 10) repose sur l'identification de plus de 3700 charbons de bois parmi lesquels 31 taxons ont été reconnus. Certains appartiennent à la flore montagnarde comme: *Abies alba, Pinus sylvestris, Taxus baccata, Acer pseudoplatanus, Fagus sylvatica, Sorbus aucuparia*... d'autres à l'étage collinéen: *Acer campestre, Juniperus communis, Carpinus betulus, Corylus, Ligustrum sp., Pirus sp., Prunus sp., Quercus* f.c., *Tilia sp., Ulmus minor*... ou à la ripisylve: cf. *Hippophae rhamnoides, Fraxinus excelsior, Populus, Sambucus sp., Salix.*

L'allure générale du diagramme montre, de l'Azilien au Campaniforme, un déclin de la courbe du Pin, qui s'accroît à nouveau au Bronze final. La présence de cette essence, dans les niveaux les plus anciens, indique qu'elle caractérise bien la formation végétale présente à la fin du Tardiglaciaire autour du site. Sa diminution se justifie par le réchauffement climatique holocène et la mise en place de la forêt caducifoliée. Son maintien dans des pourcentages très bas, s'explique par sa présence dans l'étage montagnard situé à proximité du site. Au Mésolithique, le déclin du Pin est relayé par l'augmentation de l'If accompagné du Frêne et des Erables. Le Sapin apparaît dès le Néolithique ancien, C5B datée de 6255±100 BP; le Hêtre au Chasséen, C5A datée autour de 5290±70 BP, il se développe jusqu'au Bronze final où il représente plus de 30% des essences identifiées. Le Chêne, enfin, ne figure que dans les niveaux chasséen et campaniforme, il n'a été reconnu ni avant ni après. Cette apparition tardive, par rapport aux gisements déjà présentés serait le résultat (cela à titre d'hypothèse) d'un ramassage dans un lieu plus éloigné du site.

Les résultats de l'analyse anthracologique d'une dizaine de gisements, étayés par plus de 37 datations 14C. et par les résultats d'un grand nombre d'analyses palynologiques, nous permettent, aujourd'hui, de mieux entrevoir la dynamique des végétations dans cette région et surtout comment peu à peu l'empreinte de l'Homme a marqué le milieu.

II - DU CLIMATIQUE A L'ANTHROPIQUE

Après avoir exposé, dans leurs grandes lignes, les résultats obtenus par l'analyse anthracologique nous allons tenter d'évaluer les indices nous permettant de savoir si, à partir du Néolithique plus particulièrement, les changements de végétations sont dus plus strictement à des fluctuations climatiques ou bien à l'action de l'Homme; quelle est la contribution de l'intervention humaine et comment a-t-elle pu participer à ces changements? Il s'agit donc de faire la part entre le déterminisme climatique et le déterminisme anthropique afin d'expliquer la mise en place des végétations et leur dynamique.

Chacun des gisements étudiés présente, de façon plus ou moins évidente, des témoins de l'anthropisation du milieu du point de vue de la végétation. Ces observations sont fondées sur la présence ou l'absence et les fluctuations de taxons marqueurs. Nous allons maintenant les exposer et les discuter.

Les Chenes a Feuillage Caduc

Nous commencerons par la mise en évidence de l'un des critères fondamentaux:

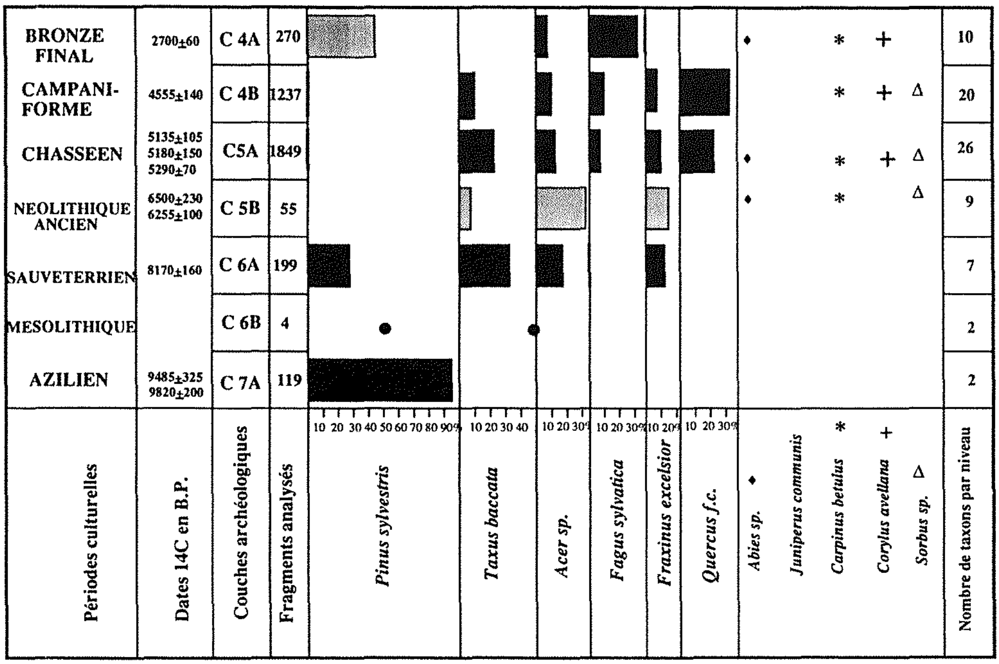

Fig. 10 - Diagramme anthracologique du site de La Balme de Thuy (Thiebault, 1992 inédit).

l'observation des fluctuations des occurences des Chênes à feuillage caduc. Ils constituent un indice important comme les études en région méditerranéenne l'ont montré (Vernet et Thiebault, 1987). Au vue des différents résultats obtenus et des diverses synthèses (Thiebault, 1988; 1991a), il est maintenant à peu près établi que les végétations pionnières du Tardiglaciaire et du début de l'Holocène étaient constituées par les Pins sylvestres, de façon assez homogène, sur tout le territoire étudié, accompagnés parfois du Genévrier comme à St-Thibaud ou à Antonnaire. C'est dès 9500 BP que, dans la plupart des stations, démarre la courbe des Chênes à feuillage caduc. Ce départ s'effectue souvent, d'après l'anthracologie, de façon plus précoce et plus imposante que ne le laissent penser les résultats de la palynologie. Puis, dans la majorité des sites on assiste à un déclin, d'importance variable, de la courbe des Chênes. Ainsi, lorsque l'on examine les courbes du Chêne dans les différents gisements présentés (fig. 11), il apparaît qu'à Beaume Sourde le Chêne a de forts pourcentages (entre 50 et 75%) tout au long de la séquence, amorçant toutefois un léger déclin au Néolithique final. A Beaume Claire cette régression est mieux marquée pour la dernière couche, elle date aussi du Néolithique final. Ces deux gisements montrent l'importance du développement de la chênaie caducifoliée lors du réchauffement climatique holocène. A Antonnaire les occurences du Chênes ne dépassent pas 35%. Après un net fléchissement au Chasséen, la courbe s'accroît au Néolithique final pour à nouveau fléchir à la fin de la séquence. Ces trois gisements témoignent de l'importance de la mise en place de la chênaie caducifoliée holocène et montrent que son exploitation par l'Homme, qui a sans doute été progressive, peut se lire à partir des niveaux attribués au Néolithique final. En réalité, les meilleurs indices donnés par l'observation de la courbe des Chênes se situent sur les gisements de Coufin 1 et 2 où elle atteint des taux très bas pendant le Néolithique et repart dans des proportions très moyennes pendant le Chalcolithique (< à 20%) pour diminuer encore à partir du Bronze et avoir des taux insignifiants à l'âge du Fer. Une observation assez similaire peut être effectuée à la Grande-Rivoire où la courbe amorce un déclin continu à partir de la transition Mésolithique/Néolithique et les occurences ne dépassent plus, par la suite, 30%. La courbe proposée par les Sarrasins montre que le déclin est bien amorcé au Néolithique récent et qu'après une phase de reconquête, elle démarre à nouveau au Bronze moyen ce qui est interprété comme une phase d'abandon des terres.

Force est de constater que, dans la majorité des sites, la diminution des pourcentages s'effectue de façon très progressive. Il n'y a pas les ruptures nettes que l'on peut parfois mettre en évidence dans des sites plus méditerranéens (Thiebault, 1991b). Si la courbe des chênes est un bon indice, il est loin d'être le seul. En effet, parmi les marqueurs classiques de l'anthropisation, utilisés par l'anthracologie, outre le déclin des valeurs du Chêne, sont prises en compte les essences liées à la reconquête forestière.

Les Essences de Reconquete

Dans la région considérée, le Buis, le Noisetier et le Genévrier ou, dans certains endroits les fabacées comme *Laburnum* et même le Pin sylvestre, sont interprétés comme telles. Dans la plupart des gisements étudiés, en effet, ces essences apparaissent en courbes plus ou moins continues, avec des pourcentages plus ou moins importants à partir du Néolithique final.

Ainsi, le Buis a été remarqué à Beaume Claire, Beaume Sourde, Balme-Rousse et Coufin 2. S'il est présent dès le Néolithique moyen dans les 2 gisements les plus méridionaux, il ne se développe réellement qu'à partir du Chalcolithique plus au nord, témoignant à partir de cette époque, d'une forte utilisation des terres.

Le Noisetier, pour sa part, est présent dans la quasi-totalité des gisements (sauf à Beaume Claire). Sa courbe est souvent continue car, espèce pionnière, elle apparaît lors de la mise en place des Chênaies caducifoliées dans des pourcentages peu importants (<à 15%). Cependant, sa courbe se développe à partir du Chalcolithique, dans la majorité des sites. Cette essence ne

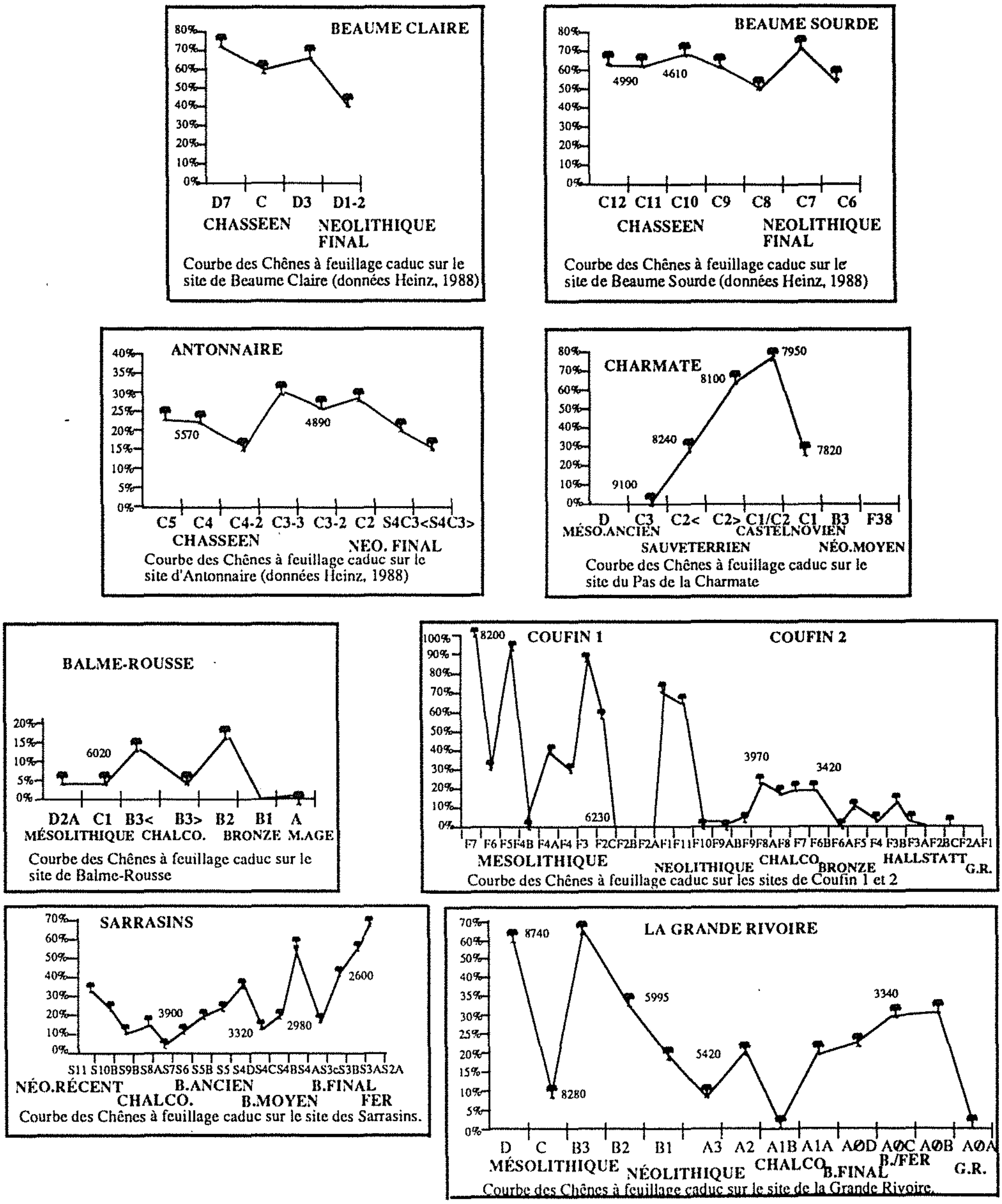

Fig. 11 - Evolution de la courbe des Chênes à feuillage caduc dans les principaux gisements étudiés.

doit plus être alors considérée comme strictement inféodée à la Chênaie mais comme une essence de reconquête forestière.

Un processus semblable semble s'appliquer au Genévrier qui, appartenant aux végétations pionnières de la fin du Tardiglaciaire, joue ce même rôle lorsque l'Homme provoque l'ouverture des milieux. Il a été observé à Beaume Sourde au Néolithique final, à Antonnaire pendant toute la séquence, dans les niveaux supérieurs du Pas de la Charmate (Castelnovien et Néolithique moyen); présent à Coufin 2, sa courbe augmente à partir du Néolithique, en revanche il est sporadique à la Grande-Rivoire et à la Balme de Thuy où il est observé dans les niveaux les plus récents. Ainsi, comme le Pin sylvestre remarqué dans les niveaux protohistoriques de La Balme de Thuy ou d'Antonnaire, ces espèces peuvent-être considérées comme pionnières de l'établissement de forêts de substitution, ayant pour origine l'anthropisation du milieu.

Une courbe continue de *Laburnum* a été mise en évidence dans les deux gisements proches des Sarrasins et de la Grande-Rivoire, du Chalcolithique au Bronze final pour le premier, du Chalcolithique au Gallo-romain pour le second. Le développement de cette Légumineuse peu exigeante est, selon nous, à mettre en relation avec les défrichements qui se produisent à partir du Chalcolithique.

Le Hetre

Nous ne ferons ici qu'évoquer le problème de l'installation des hêtraies qui, pour certains serait favorisée par l'anthropisation (Thiebault, 1988). Les analyses palynologiques régionales montrent que l'arrivée du Hêtre, à l'étage collinéen, se situe aux alentours de 7000 BP (Clerc, 1988). Sa présence, vers 6000 BP à Choranche n'a donc rien de surprenant. Sa courbe s'accroît ensuite, atteint son maximum et fluctue dans les différents diagrammes palynologiques ce qui a pour effet des interprétations diverses. Ainsi, certains palynologues associent la chute de ce taxon aux déforestations *«La chute de* Fagus *est toujours causée par les premières déforestations anthropiques qu'elles soient protohistoriques comme à Hières-sur-Amby entre 4760±220 BP et 4110±170 BP ou gallo-romaines comme au Grand Lemps 1550±170 BP...»* (Clerc, 1988: 130). D'autres pensent au contraire que: *«l'essor de* Fagus *n'est pas étranger à une action anthropique»* (Triat-Laval, 1978: 89). Pour les uns, la diffusion du Hêtre serait donc liée à un changement climatique, pour les autres à l'intervention de l'Homme sur le milieu. Pour notre part, nous ne pouvons que mettre en évidence son développement ou son maintien dans les sites analysés comme aux Sarrasins, à Balme Rousse où à la Grande-Rivoire et la Balme de Thuy où il se développe dans de fortes proportions à partir de l'Age du Bronze. Ces observations militent en faveur de la seconde hypothèse et attribuent à l'Homme la cause de l'essor de cette essence dans les zones de basse altitude. Le Hêtre cependant ne peut pas encore être considéré comme un marqueur anthropique fiable.

Le cas de l'If

Une essence, plus caractéristique encore de la région étudiée, a son origine ici discutée: il s'agit de l'If. Dans la région présentée, cette espèce joue un rôle intéressant, plusieurs fois mentionné (Thiebault, 1983; 1988; 1991a). Il s'agit maintenant de savoir si l'If doit être considéré comme un marqueur climatique témoignant d'un rafraîchissement du climat au Boréal et si il peut être, par la suite, considéré comme un marqueur de l'anthropisation, du Néolithique notamment.

Ce taxon a été identifié dans tous les gisements étudiés et son histoire semble être partout la même (fig. 12). Identifié dans des proportions inférieures à 5% par Ch. Heinz dans les Néolithiques moyen et final de Beaume Sourde et Beaume Claire, il existe en courbe presque continue à Antonnaire, où sa courbe décline du Néolithique moyen à l'âge du Bronze (HEINZ, 1988). A Charmate, s'il n'apparaît que dans la couche 1 datée de 7820±120 BP, il atteint de très fortes proportions dans le foyer Néolithique moyen. Ces pourcentages élevés ont aussi été observés: à Balme-Rousse au Mésolithique récent, où il n'est plus observé au Bronze final; à Coufin 2 où sa courbe est très fluctuante (THIEBAULT, 1988) et s'éteint au Gallo-romain. A la Grande-Rivoire, il survient lors de la transition Mésolithique/Néolithique et connaît ses occurences les plus fortes au Néolithique, puis décline et disparaît au Bronze final. Cette observation est valable aux Sarrasins où l'If est en courbe presque continue du Néolithique récent au Bronze moyen. Il faut signaler sa présence dans la couche 5A de St-Thibaud de Couz datée de 9050 BP. Enfin, à la Balme de Thuy il est présent au Mésolithique et s'efface au Campaniforme.

Pour le moment cette essence n'a été mise en évidence, dans des proportions aussi importantes, que dans cette région des Préalpes. Elle a aussi été remarquée par la palynologie. Ainsi, l'If est considéré, par certains palynologues (REILLE, 1975), comme une essence liée à la chênaie caducifoliée et par d'autres (CLERC, 1988) comme liée à la chênaie mais annonciatrice de la sapinière dans laquelle elle prospère. L'If, dans ce dernier cas serait, en revanche, gêné par la progression de la hêtraie. Dans le Bas-Dauphiné cette espèce a été identifiée lors de l'analyse palynologique de 5 tourbières (CLERC, 1988). Ainsi, à Hières-sur-Amby (212 m d'altitude, Isère) l'If est reconnu dès le Boréal, dans de faibles proportions, son développement s'effectuant surtout à l'Atlantique. A St-Sixte (650 m, Isère) il apparaît aux alentours de 5600 BP, à St-Julien-de-Ratz (650 m, Isère) il est présent à la fin du Boréal, au Grand Ratz (650 m, Isère) aux alentours de 7760 BP. Au Grand Lemps (500 m, Isère) enfin, il est assez tardif puisqu'il n'est repéré qu'à la fin de l'Atlantique. Chronologiquement, l'anthracologie identifie l'If à des époques plus anciennes que la palynologie.

Les résultats que nous proposons ici montrent bien que sa présence n'est pas forcément liée à la chênaie caducifoliée. Au contraire, il semble prospérer d'autant plus que la courbe des Chênes régresse. Cela a été observé à Choranche, Charmate, la Grande Rivoire et à la Balme de Thuy où les Chênes n'apparaissent que tardivement. En tout état de cause, dans cette région des Préalpes et de la Savoie, l'accroissement de l'If semble de plus en plus caractériser la fin du Mésolithique et surtout le Néolithique.

Concernant l'apparition, le développement et la disparition de cette essence, nous souhaitons maintenant, analyse après analyse, synthèse après synthèse, proposer, à titre d'hypothèse, le scénario suivant. Tout se passe comme si, peut-être à la faveur d'une légère péjoration climatique au Boréal, l'If apparaît. Cette essence se développe, elle est souvent ramassée par les Mésolithiques car elle appartient à la flore disponible à proximité des gisements. Rapidement, elle est remarquée pour la qualité de son bois qui devient l'une des matières premières privilégiée de l'industrie du bois dans ces régions. Les quelques témoignages d'arc qui nous sont parvenus montrent bien son utilisation pour la fabrication d'arcs mais aussi des flèches. A partir de là l'If aurait été largement exploité et donc, dans un premier temps, favorisé par l'Homme. Cependant, bien que fournissant un excellent bois n'oublions pas l'autre propriété de l'If liée à sa toxicité. Ainsi, il nous a paru possible de proposer la sélection de Frêne pour servir de nourriture aux bovins lors des phases à If sur le site de Coufin 2 (THIEBAULT, 1988). Nous ne revenons pas ici sur les multiples descriptions d'empoisonnement par l'If, de Strabon

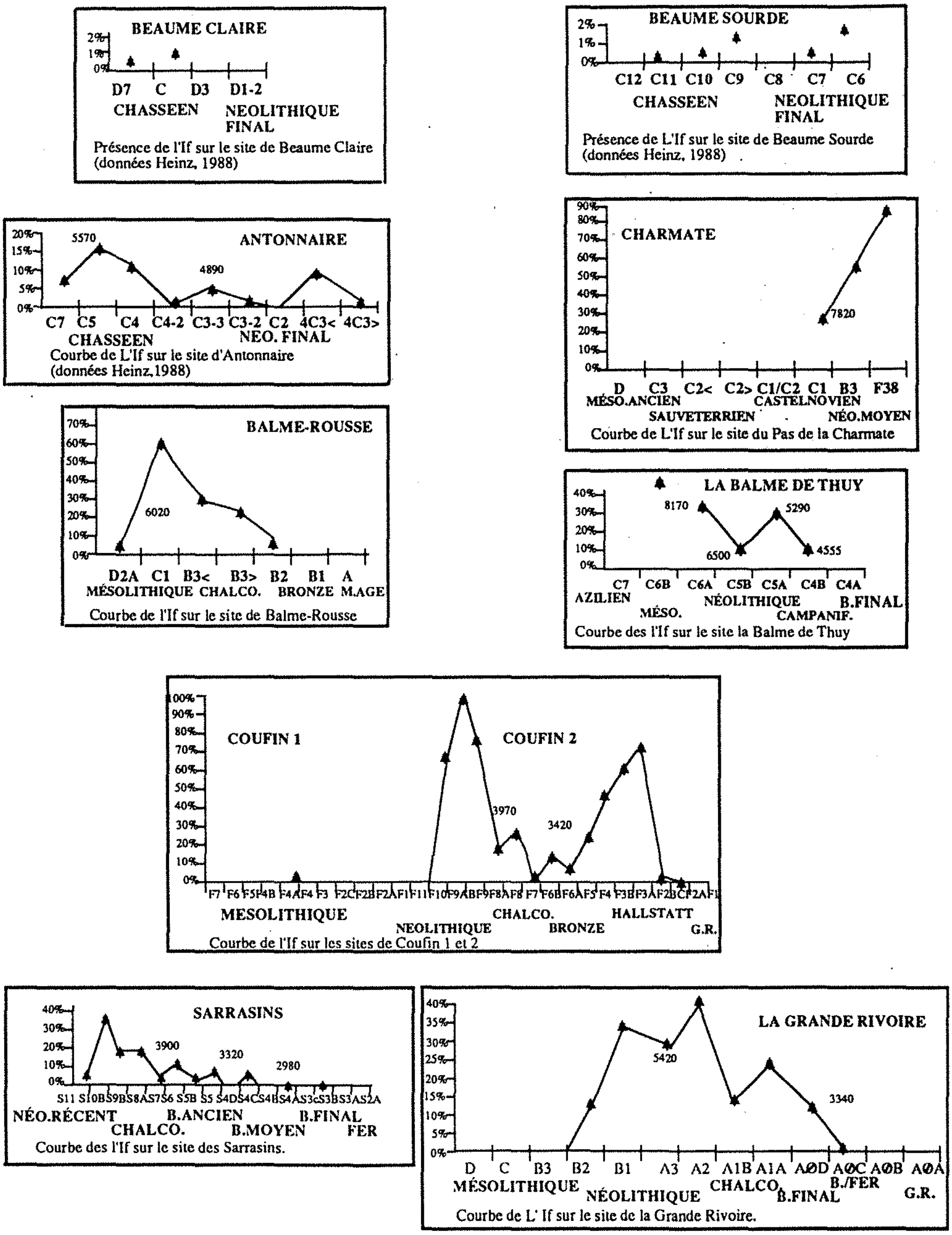

Fig. 12 - Evolution de la courbe de l'If dans les principaux gisements étudiés.

à Hamlet de Shakespeare, de Dioscoride à Sextius Niger (Brosse, 1987). Force est de constater que sa disparition des diagrammes anthracologiques est relativement synchrone, aux Bronzes moyen ou final, sur la plupart des gisements. Cette disparition ne pourrait-elle pas résulter d'une éradication par l'homme, dont la cause serait soit sa toxicité, soit sa surexploitation pour son bois? Il est historiquement connu que la guerre de Cent Ans a fait disparaître cette essence de certaines régions du Nord de la France.

Quoi qu'il en soit, cette espèce bien répandue en Dauphiné et en Savoie, du Mésolithique à l'Age du Bronze semble revêtir une signification très symbolique, et cela depuis la Préhistoire; son développement et sa disparition sont très profondément liés à l'Homme.

III - DISCUSSION

Au terme de cette présentation nous pouvons maintenant proposer quelques hypothèses concernant l'exploitation des zones de hautes terres. L'analyse anthracologique apporte des informations qu'il s'agit de corréler avec les renseignements fournis par les autres disciplines. L'hégémonie du Pin sylvestre sur la région n'est plus à remettre en doute de même que l'installation précoce des chênaies caducifoliées dans les zones les plus méridionales. Nous avons pu voir que, selon les sites, les fluctuations des courbes des Chênes sont très variables et que si la tendance générale se dirige vers une diminution de cette espèce celle-ci est progressive et peu synchrone de site à site. La même réflexion peut être faite à propos de l'apparition des taxons marqueurs de reconquête forestière. Nous pouvons donc, à juste titre, suggérer que le déclin de la courbe du Chêne répondrait plutôt à un mode de gestion du territoire. C'est-à-dire, plus qu'à une réponse liée à la localisation des sites ou au strict potentiel de régénérescence de la végétation ou des sols, il pourrait s'agir d'une différence dans les modes d'utilisation des milieux. Une corrélation entre le statut économique du site et le degré d'anthropisation (les activités pastorales n'ont pas le même impact que les activités agricoles sur l'ouverture des milieux, les premières sont beaucoup plus progressives) doit, dans la mesure du possible, être tentée.

Comme l'anthracologie, les premiers indices donnés par la palynologie (travaux de J. Argant, Bui-Thi-Mai, M. Girard et J. L. Borel) montrent que l'ouverture des milieux n'est vraiment lisible qu'à l'âge du Bronze, les traces de céréales n'apparaissant que tardivement. A Beaume Sourde, Beaume Claire et Antonnaire, J. Argant a montré, à travers l'analyse des pollens, l'utilisation de ces grottes comme habitats saisonniers plutôt par des populations de pasteurs, que par des agriculteurs (Argant, 1989).

Dans cette région de collines et de montagnes tout laisse à penser, en effet, que les premiers Néolithiques sont avant tout des pasteurs, qu'ils ne deviennent agriculteurs que plus tard, au Néolithique final voir même au Chalcolithique et que, par conséquent, l'ampleur des déforestations, notamment au Néolithique moyen est beaucoup moins importante que les ruptures mises en évidence, à la même période, dans la région méditerranéenne par exemple (Vernet et Thiebault, 1987; Thiebault, 1991b; Thiebault et Vernet, 1993).

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P. BIAGI and J. NANDRIS (eds.) Highland Zone Exploitation in Southern Europe
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HIGHLAND AND LOWLAND EXPLOITATION IN THE ALPS: THE EVIDENCE FROM POLLEN DATA

SUMMARY – *Highland and lowland exploitation in the Alps: the evidence from pollen data.* The vegetation history of the Alps is difficult to interpret, for several reasons. There are local wind systems transporting pollen grains from the valleys to the hills and *vice versa;* and there are many different stands neighbouring each other, such as forests, natural open lands above the timberline and in the river beds, rock communities, fens and bogs. For these reasons it is very difficult to determine from pollen analytical data when the first farmers came to the Alps. There is pollen analytical evidence for Early Neolithic farming in the Alps; the archaeological evidence for this is scanty, but increasing. In lowland localities *Cerealia* pollen grains are noticed in earlier stages of the vegetation history than those of *Plantago lanceolata*, whereas the opposite is the case in pollen diagrams from highland localities. It can be suggested that the early alpine farming took place on both lowland and highland stands: agriculture was practised in the valleys; animals were brought to the natural open land above the timberline for summer grazing. As a result of grazing *Plantago lanceolata* spread in the highland areas.

RIASSUNTO – *Lo sfruttamento delle regioni alpine montane e vallive: i dati pollinici.* La storia vegetazionale delle Alpi è di difficile interpretazione per diversi motivi. Soffiano venti locali che trasportano granuli pollinici dalle valli alle colline e vice versa; esistono inoltre ambienti diversi e contigui come quelli forestali, le praterie alpine, i corsi fluviali, le aree rocciose e quelle intorbate. Per tutti questi motivi è molto difficile stabilire quando i primi agricoltori giunsero sulle Alpi. Da un punto di vista dell'analisi pollinica esistono dei dati che ci informano circa le più antiche tracce di agricoltura neolitica; mentre i dati archeologici a questo riguardo sono molto limitati. Nelle zone più basse i pollini di *Cerealia* sono presenti sin dai momenti più antichi della storia vegetazionale; mentre quelli di *Plantago lanceolata* sono documentati per gli stessi periodi nelle zone montane. Si può supporre che la prima agricoltura neolitica fu praticata nelle aree vallive; gli animali venivano condotti nelle praterie sovrastanti la linea vegetazionale per le pasture estive. *Plantago lanceolata* si distribuì nei territori montani d'alta quota in seguito al pascolamento.

INTRODUCTION

The Alps are one of the most famous montane landscapes in Europe forming the boundary between Central Europe and the Mediterranean Southern Europe. There are not only mountains but also valleys, plains in lower and higher altitudes, fertile and infertile areas, and together they form a colourful landscape mosaic of arable fields and traditional grazing meadows. Submediterranean and Alpine vegetation types are situated very close to each other, which is often noted in botanical and geographical descriptions of this exciting landscape (Rikli, 1912). Therefore numerous possible economic uses of the Alpine landscape come into question.

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Today the milk and cheese production of Alpine summer farms is famous, as is chestnut cultivation and olive and apple production in the Ticino or South Tyrol. Crop cultivation also plays an important role in the Alps, such as that found in the dry inner alpine basins in the western Alps. From today's diverse cultural landscapes one can infer that several different economic exploitation strategies were practiced in the Alpine landscape in former times.

ARCHAEOLOGICAL EVIDENCE

Archaeological evidence for this assertation, however, is scanty, for several reasons. Most significant is the difficulty of locating well preserved settlements, due to movement of soil particles downslope. Soil erosion in the higher altitudes and soil accumulation in the valleys were enormous. In the Reichenhall basin at the Northern border of the Alps, for instance, approximately 15 m of sediment have been accumulated since the Bronze Age (BRUNNACKER *et al.,* 1976). It is very difficult if not impossible to find settlement structures which can be excavated. At higher altitudes very many prehistoric settlement layers have been certainly destroyed by intensive soil erosion, and in the valleys ancient cultural features have been buried by many metres of soil and gravel.

POLLEN EVIDENCE

It is also not easy to trace early human influence in pollen diagrams derived from bogs and lakes in the Alps. Some plants whose pollen grains are normally regarded as cultural indicators in pollen diagrams (BEHRE, 1981) have natural stands in the Alpine region, for instance *Artemisia, Plantago lanceolata* and *Centaurea cyanus* (KÜSTER, 1988). Possibly some Alpine grasses produce cereal-like pollen grains (BEUG, 1964), so that some pollen analysts are sceptical whether a record of a cereal pollen type in a profile from the Alps actually indicates that crop cultivation took place in the region (BEUG 1964; 1986). There are strong winds from the hill summits to the valley bottoms and *vice versa,* which can transport pollen grains in both directions, so that cereal pollen grains can be found in the actual pollen rain both near fields and villages (VUORELA, 1970) and near the summits of hills and mountains (JOCHIMSEN, 1986; KÜSTER, 1988). It therefore seems to be questionable whether Alpine agriculture can be accurately reconstructed by pollen analysis.

Nevertheless, pollen data shows that very often cereal pollen grains indicating the beginning of farming economy in the Alps appeared earlier than archaeologists have assumed on the basis of excavated evidence in the Alpine region (KÜSTER, 1989). If the cereal pollen identifications and the dating of these pollen records are correct, and if at least some of these cereal pollen grains were derived locally, an early beginning of arable exploitation in the Alpine landscape is evident. If this is the case, then the palynological data documenting the beginning of Neolithic agriculture in the Alps are very similar to those from areas South and North of the Alps.

THE BEGINNING OF NEOLITHIC IN THE ALPS

Very interesting 14C dates for the beginning of the Neolithic at several localities immediately South of the Alps have recently been published (CHAPMAN and MÜLLER, 1990). As early as in the seventh millennium BP Neolithic culture is evident at the southern border of the Alps. This early date corraborates those from Alpine pollen diagrams which were until recently doubted by many archaeologists and palynologists. But now some evidence for the reliability of the pollen analytical evidence for early farming in the Alps is coming from archaeological sources. For example, the early C14 dates for the beginning of the Neolithic in the pollen diagram of Lac du Mont d'Orge in the Valois (WELTEN, 1977; 1982a), were skeptically regarded by archaeologists until a Neolithic settlement of the same age under five metre thick layers of Rhône gravel in Sion-Planta was-detected (GALLAY, 1986). The settlement Sion-Planta provided an uncalibrated radiocarbon date of approximately 6500 BP or calibrated to the early fifth millennium BC.

The ceramic materials resemble late Early Neolithic pottery from northern Italy (Vhò, Gaban, Fiorano). Settlements of a similar age could be detected in the Ticino (GALLAY, 1986) and in the Adige Valley (ALESSIO *et al.*, 1984). It is apparent that the pollen data suggesting an early beginning for Neolithic agriculture in the Alpine region can be confirmed by archaeological excavations. Still it is very clear that for the reasons stated above unambigous archaeological and palynological evidence is difficult to obtain.

DIFFERENT PATTERNS OF EXPLOITATION IN HIGHLAND AND LOWLAND POLLEN SITES

Looking closer at the pollen diagrams from the Alpine region, characteristic difference in the first appearances of certain cultural indicators become evident. The pollen diagram from Lac du Mont d'Orge shows very early cereal pollen grains dated to the Atlantic age (fig. 1). Lac du Mont d'Orge is situated in the lowland Valois, in a very wide inner alpine valley, a dry area predestined for agriculture. The 14C dates are certainly several centuries too old, as calcareous layers in lake sediments tend to produce abnormally old 14C dates, but they were certainly accumulated at a time contemporaneous with the Early Neolithic, both south and north of the Alps. While the cereal pollen grains at Lac du Mont d'Orge appear relatively early, other cultural indicators such as *Plantago lanceolata* are recorded only in the more recent layers of the pollen diagram.

In pollen diagrams from higher altitudes the earliest occurrences of cultural indicator pollen grains show a different pattern from those at lower altitudes. For instance in the diagram from Rotmoos-Eriz (HEEB and WELTEN, 1972), pollen grains of *Plantago lanceolata* are recorded in the older layers, and cereal pollen grains are normally found in only the more recent layers. Pollen grains of cultural indicators are not recorded for the early Neolithic at these altitudes: The oldest evidence for exploitation of the landscape dates either to the late Neolithic, or they show the beginnings of rural activity appear in the Bronze Age. Comparing Alpine pollen diagrams (table 1) it becomes obvious that in lowland pollen diagrams from locations below 700/800 m asl cereal pollen grains (marked with a cross) appear before pollen grains of Plantago lanceolata. In pollen diagrams from locations between 700/800 m and *ca.* 1600 m *Plantago lanceolata* appears first, and cereal pollen grains appear only in somewhat more recent layers.

In pollen diagrams from higher altitudes, this pattern of first occurrence is not visible. In these diagrams sometimes *Plantago lanceolata* and sometimes Cerealia are recorded in the older layers.

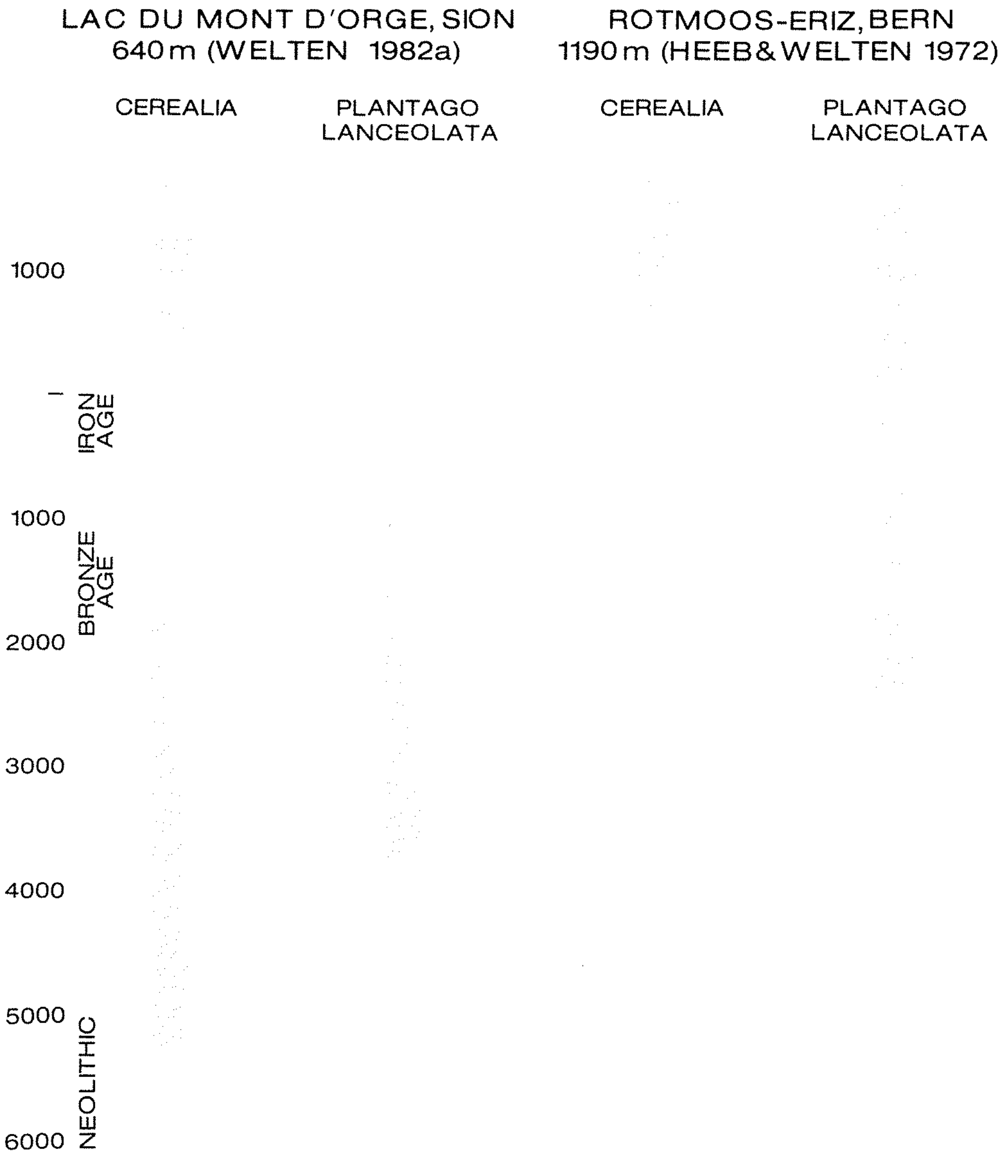

Fig. 1 - Presence of cereal and *Plantago lanceolata* pollen grains through time as recorded in diagrams from Lac du Mont d'Orge (WELTEN, 1977; 1982a) and Rotmoos-Eriz (HEEB and WELTEN, 1972).

This pattern of occurrence of cultural indicator pollen grains is shown by a graph in which the dating of the pollen records is included (fig. 2). In the left part of the diagram pollen data is included where Cerealia pollen grains are recorded earlier. Each dash marks one pollen diagram. The left end of the dash marks the oldest occurrence of cereal pollen grains, the right end the first occurrence of *Plantago lanceolata*. On the right side of the figure, pollen diagrams are represented where *Plantago lanceolata* (left end of the dashes) precedes cereal pollen grains (right end of the dashes). Sites where cereal and *Plantago lanceolata* pollen grains are recorded at the same age for the first time, are marked with a dot.

A regular pattern for the beginnings of the rural exploitation in the Alps is visible. In locations below 700/800 m cereal pollen grains are normally recorded earlier than *Plantago lanceolata* pollen. The beginning of agriculture at these altitudes can be dated to the Atlantic, or in terms of archaeology the Neolithic period. In pollen diagrams from profiles of sites which have an altitude between 700/800 and 1600 m asl *Plantago lanceolata* pollen grains are always recorded in layers which are older than those in which cereal pollen grains are detected. The first occurrence of *Plantago lanceolata* pollen grains can normally be dated to the late Atlantic or the Subboreal; this is the late Neolithic or the Bronze Age.

In some pollen diagrams from higher altitudes cereal pollen grains precede *Plantago lanceolata*, and sometimes the first appearance of *Plantago lanceolata* precedes cereal pollen grains. The first occurrence of one or other of these pollen types varies in time from diagram to diagram.

This irregularity in the first occurrence of cultural indicators in places just below and above the timberline can have several reasons. *Plantago lanceolata* has natural stands in high Alpine altitudes, and it may have been present at these altitudes before human impact started.

Other pollen occurrences seen in the spectra may be caused by long distance transport, either from low altitudes in the vicinity of the profile, or from regions which are situated farther away. This is consistent with the fact that cereals and other pollen grains which are regarded as parts of long distance transport are often recorded in the modern pollen rain in high altitudes (Jochimsen, 1986). Over representation of extra-local pollen grains in pollen counts from Alpine regions is a result of the low pollen production of treeless landscapes combined with the reduced pollen production of locally growing trees in these regions.

THE INTERPRETATION OF THE POLLEN DATA

It is striking that the pollen grains of Cerealia and *Plantago lanceolata* first appear at different times in different altitudes, and one must take into account the several reasons for this. At altitudes below 1600 m the Alpine wind systems do not significantly affect pollen transport, and local pollen rain prevails in the deposited sediment layers. The easiest way of explaining this is that crop fields were situated only at locations below 700/800 m in the Neolithic, whereas exploitation at higher altitudes started somewhat later with predominantly grazing activities which favoured the dissemination of grassland species such as *Plantago lanceolata*. Secondly, wheat and barley pollen grains are best detected not in the vicinity of fields, but near the settlements, where crops have been processed. Threshing, dehusking, and winnowing of cereals leads to a high release of cereal pollen grains (Vuorela, 1970). Pollen evidence

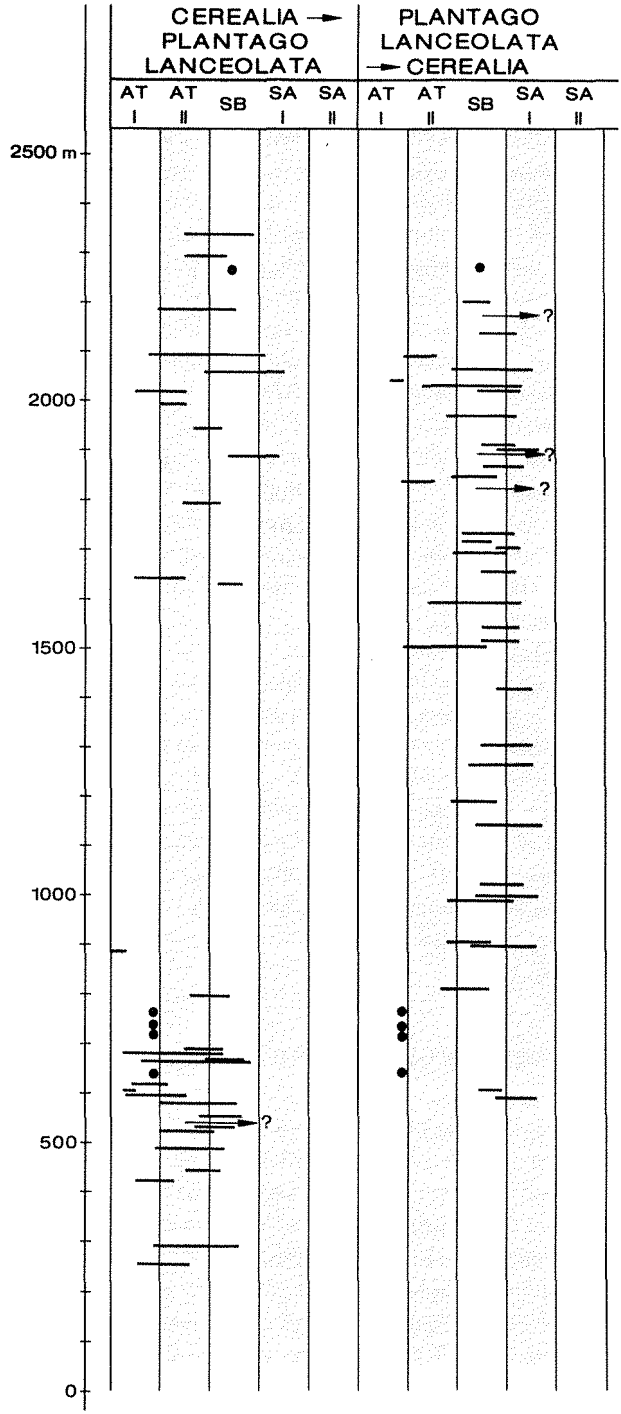

Fig. 2 - Summary of Alpine pollen diagrams showing relationship between altitude and the first occurrence of *Cerealia* and *Plantago lanceolata.* Edges of the dashes in left column indicate first appearance of *Cerealia* (left) and first appearance of *Plantago lanceolata* (right). The edges of the dashes in the right column indicate the first appearance of *Plantago lanceolata* (left) and *Cerealia* (right). Legend: AT = Atlantic, SB = Subboreal, SA = Subatlantic.

suggests, that Neolithic settlements and threshing places were situated at low altitudes during the Neolithic.

On the other hand, *Plantago lanceolata* is not only a grassland species, but also occurs on fallow land within the arable landscape (BURRICHTER, 1969; BEHRE, 1981). Extensive cereal crop production in connection with fallow phases can also lead to great dispersal of *Plantago lanceolata,* the effect of which was intensified by the pasturing of livestock on fallow land (BEHRE, 1981). Grazing (summer farming?) and/or cereal production in higher altitudes started later, mostly not before the Bronze Age. This is the period for which the beginning of summer farming in the Alps is normally considered (WYSS, 1971; ZOLLER, 1983).

So the history of the exploitation of the Alpine landscape can be outlined as follows, from palynological data. Farming started in the early Neolithic in places below 700/800 m nearly contemporaneous with the earliest evidence of agriculture South and North of the Alps, at around the seventh millennium BP. At this time the settlements and most likely the crop fields, were situated below 800 m. Later on, in the late Neolithic and in most cases during the Bronze Age, a more extensive exploitation of the landscape at montane altitudes above 800 m began. This was characterized by livestock grazing in connection with summer farming, and possibly also by extensive cereal crop production. For the higher Subalpine regions and Alpine areas below and above the timberline the pollen data are ambiguous. Certainly summer farming with grazing was also practised here, but sometimes cereal pollen grains from long distance pollen transport were also recorded very early at these altitudes.

This is clear evidence that agriculture began at low altitudes, and that the early cereal pollen records from these altitudes are certainly not an effect of the long distance transport of pollen grains. The very clear pattern of the pollen sedimentation of cultural indicators with regard to altitude is striking evidence that local agriculture took place in the Alps during the Neolithic.

Agriculture and animal breeding expanded to higher altitudes later on. As a consequence of the different patterns of exploitation of the Alpine landscape by agriculturalists and animal breeders perhaps the cultural differences, which have played an important role in the history of landscape exploitation around the Mediterranean Sea for millennia (BRAUDEL, 1949) also appeared.

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Table 1 - Alpine pollen diagrams showing clear evidence for the beginning of farming, characterized by either cereal or *Plantago lanceolata* pollen grains (marked with a «+») as the earliest appearing cultural indicator.

	Altitude (m)	*Cerealia*	*Plantago lanceolata*
Belalp ob Blatten N Brig (WELTEN, 1982a)	2330	+	
Mont Carré S Sion (WELTEN, 1982a)	2290	+	
Buntes Moor/Stubai (WEIRICH and BORTENSCHLAGER, 1980)	2280	=	=
Grünaumoor/Stubai (WEIRICH and BORTENSCHLAGER, 1980)	2190		+
Motta Naluns/Unterengadin (WELTEN, 1982b)	2170	+	
Franz-Senn-H./Stubai (WEIRICH and BORTENSCHLAGER, 1980)	2155		+
Dosde/Südrätische Alpen (BURGA, 1987)	2135		+
Böhnigsee ob Bürchen/Wallis (MARKGRAF, 1969)	2095		+
Duramoor/Südtirol (SEIWALD, 1980)	2080	+	
Moosalp ob Bürchen (MARKGRAF, 1969)	2050		+
Malschöscher Hotter/Südtirol (SEIWALD,1980)	2033	+	
Schwarzsee/Südtirol (SEIWALD, 1980)	2033	+	
Simplon-Hopschensee S Brig (WELTEN, 1982a)	2017		+
Aletschwald N Brig (WELTEN, 1982a)	2017		+
Alp Marschol/Graubünden (BURGA, 1980)	2010		+
Lai da Vons/Graubünden (BURGA, 1980)	1991	+	
Moräne Marschol/Graubünden (BURGA,1980)	1985		+
Greicheralp NE Brig (WELTEN, 1982a)	1910	+	
Plansena/Südrätische Alpen (BURGA, 1987)	1892		+
Robiei, Val Bavona/Tessin (WELTEN, 1982a)	1892		+
Segnes/Vorderrhein-Lukmanier (MÜLLER, 1972)	1880		+
Alpenrose/Zillertal (WEIRICH and BORTENSCHLAGER, 1980)	1880	+	
Maloja-Riegel/Oberengadin (KLEIBER, 1974)	1870		+
Grünsee/Tirol (WELTEN, 1982b)	1836		+
Palé Digl Urs/Graubünden (BURGA, 1980)	1834		+
Rinderplatz/Südtirol (SEIWALD, 1980)	1780	+	
Acquacalda/Vorderrhein-Lukmanier (MÜLLER, 1972)	1730		+
Dossaccio/Veltlin (WELTEN, 1982b)	1730		+
Grächensee SW Brig (WELTEN, 1982a)	1710		+
Pillon S Saanen (WELTEN, 1982a)	1700		+
Mutschnengia/Vorderrhein-Lukmanier (MÜLLER, 1972)	1650		+
Eggen ob Blatten N Brig (WELTEN, 1982a)	1645	+	
Gondo-Alpje SW Brig (WELTEN, 1982a)	1635	+	
Nassfeld/Karnische Alpen (FRITZ, 1976)	1580		+
Lai Nair/Tarasp, Engadin (WELTEN, 1982b)	1546		+
Brigels/Vorderrhein-Lukmanier (MÜLLER, 1972)	1520		+
Zeneggen-Hellelen SW Brig (WELTEN, 1982a)	1510		+
Campra/Vorderrhein-Lukmanier (MÜLLER, 1972)	1420		+
Affeier/Vorderrhein-Lukmanier (MÜLLER, 1972)	1300		+
Hängstli Gde. Eggiwil BE (HEEB and WELTEN, 1972)	1260		+
Rotmoos-Eriz/Schwarzenegg BE (HEEB and WELTEN, 1972)	1190		+
Sattlermoos/Ammergebirge (BLUDAU, 1985)	1140		+
Wasserfilz/Ammergebirge (BLUDAU, 1985)	1020		+
Wachseldorn BE (HEEB and WELTEN, 1972)	980		+
Gola di Lago/Ticino (ZOLLER and KLEIBER, 1971)	970		+
Linden/Schwarzenegg (HEEB and WELTEN, 1972)	900		+
Schwarzer See E Grainbach (SCHMEIDL, 1980)	896		+
Sommersüss/Südtirol (SEIWALD, 1980)	870	+	
Hochmoos/Bischofshofen (WAHLMÜLLER, 1988)	800		+
Gänsemoos/Schwarzenburg BE (WELTEN, 1982a)	795	+	

	Altitude (m)	*Cerealia*	*Plantago lanceolata*
Langegger Filz/Auerberg (Küster, 1988)	785	=	=
Haslacher See/Auerberg (Küster, 1988)	765	=	=
Geltnachmoor/Auerberg (Küster, 1988)	732	=	=
Spitzenmoos SW Wädenswil (Hufschmid, 1983)	668	+	
Ried b. Oberschan N Sargans (H.P. Wegmüller, 1976)	660	+	
Hüttner See S Wädenswil (Hufschmid, 1983)	658	+	
Lago di Ledro/Gardasee (Beug, 1964)	655	+	
Amsoldinger See b. Thun (Lotter, 1985)	641	=	=
Lac du Mont d'Orge/Wallis (Welten, 1982a)	640	+	
Bärnsee/Chiemgau (Rausch, 1975)	600		+
Allmannshausen/STA (Kossack and Schmeidl, 1974-75)	600	+	
Bachhausen/Starnberg (Kossack and Schmeidl, 1974-75)	600	+	
Stöttener Filz/Chiemgau (Rausch, 1975)	575		+
Seeweidsee NE Stafa (Hufschmid, 1983)	550	+	
Kirchseeon/München (Rausch, 1975)	550	+	
Ueziker Ried NE Stäfa (Hufschmid, 1983)	545	+	
Rottauer Filze/Chiemsee (Schmeidl and Kossack, 1967-68)	530	+	
Lobsigensee SE Aarberg (Ammann *et al.*, 1985)	514	+	
Egelsee N Rapperswil (Hufschmid, 1983)	495	+	
Chatzensee N Zürich (Hufschmid, 1983)	439	+	
Nussbaumer Seen (Rösch, 1983)	434	+	
Donaumoos/Ingolstadt (Bakels, 1978)	380	+	
Heiligenstädter Moos/Regensburg (Bakels, 1978)	350	+	

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THE PALYNOLOGICAL RECORD OF HUMAN IMPACT ON HIGHLAND ZONE ECOSYSTEMS

SUMMARY – *The palynological record of human impact on highland zone ecosystems.* A review of the palynological record of human impact on highland environments is given. Methodological problems concerning the nature of the palynological record are discussed. The chronological order of sites with anthropogenic influence shows that anthropogenic disturbance of the alpine regions starts in the Neolithic period, and is gradually displaced to lower regions, up to recent times.

RIASSUNTO – *L'impatto antropico nell'ecosistema alpino secondo i dati palinologici.* L'Autore fornisce un aggiornamento dei dati pollinici riguardanti l'impatto antropico nell'ecosistema alpino. Vengono discussi alcuni problemi metodologici riguardanti la natura dei dati stessi. L'ordinamento cronologico dei siti influenzati dall'antropizzazione dimostra che, nelle regioni alpine, i mutamenti antropogenici, ebbero inizio durante il Neolitico, e si distribuirono in seguito nei territori a quota più bassa.

INTRODUCTION

The Alps hold a special position among the orobioms of the Earth. There is scarcely a mountain range in the world, which is so fashioned by human interference as the Alps. Today's alpine landscape is the result of a long-term economic use of the highlands. From the Palaeolithic up to the Neolithic periods onward hunter and gatherer societies frequented the timber-line ecotone and the alpine patches. Later these natural grasslands shaped the economic interests of agricultural communities. For economic reasons it has to be assumed that pasturing of the uplands already started with the neolithization of the Alps. Early farming cultures were reliant on their own produce. Their fodder production was low. Driving the stock to pasture on the alpine grasslands liberates fodder production in the valley bottoms, and most of the area near the farm can then be tilled. The economic advantage is evident: if 100% of the animal stock is put on pastures during the summer, 27% more animals can be wintered than without alpine pasture. Even if only 60% are driven up to the highlands, still 18% more can be wintered (PENZ, 1978).

Today the most profitable grazing grounds are located in the subalpine zone on potential woodland. Therefore anthropogenic interference in the highlands is narrowly linked with timber-line fluctuations. It is well known that even specialists encounter difficulties in the interpretation of alpine pollen diagrams. For this reasons some methodological aspects will be

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discussed, before a review of the palynological record of human impact in alpine regions is given, and a conclusion is drawn from the vegetation patterns in time and space.

METHODOLOGICAL ASPECTS

The timberline is a significant vegetation limit in mountain areas. Its physiognomy is determined by several factors: topography, macroclimate, site-conditions, seed production, snow-cover dynamics, forest fires and human impact (STERN, 1983). A major fact in the development of the timberline is climate, respectively the abbreviation of the growing period with advancing altitude (LARCHER, 1963; TRANQUILLINI, 1976; 1979).

There exist different hypotheses about the nature of the alpine timber-line under natural conditions without human disturbance. One opinion postulates a transition zone. This timber-line ecotone varies from dense forest to a more and more open structured woodland, up to the tree-line, where individual trees could still exist. Another view says, that forests always reach their upper climatic limit in a dense stand. Above this acute vegetation limit the growth of individual groups of trees is possible (STERN, 1983). The comparison with mountain ranges without human impact provides evidence that several varieties of these two hypotheses are possible. An acute straight-lined limit, where the timber-line coincides with the tree-line, occurs only in mountains with favourable homogenous soil conditions. Already minor disturbances like avalanches are sufficient to open up the straight-lined limit. In most cases mosaic structures of dense forest, bushes and alpine grasslands are noticeable. The opening up of dense forest into individual stands is known from highlands with a strained water economy (mediterranean, arid areas). Even within the Alps all the formations of the timber-line mentioned above are observeable (KLÖTZLI, 1991).

Above the timber-line evergreen needle-leaved or cold-deciduous shrublands, tall-forb formations, dwarf scrub, and alpine mats, expand according to relief, soil and microclimate. The last mentioned alpine mats, or so-called *«Urwiesen»*, are important areas for grazing. Even before human interference, floods, avalanches and game are able to put enough nutrients into the root area to support stands with the character of natural pasture in the alpine regions, e.g. a forb-rich *Trisetetum*. In principle, no new plant communities are created with the penetration of prehistoric man into the highlands. Some already existing and some new selection factors, like irrigation, pasture, fertilization, mowing, etc., become more effective. This causes a large-scale expansion of existing nutrient-rich plant communities in alpine regions, which is in contrary to valley bottom regions where new plant communities were created by the activity of man. Only the basic species-combination becomes modified by stronger effective selection factors (KLÖTZLI, 1991). Many alpine plants respond to the anthropogenic selection factors mentioned above with an enhanced competitiveness. Tables 1-4 present an overview of these alpine plant species.

Now another aspect of the methods of palynology comes into question. How can the pollen of these alpine plant species be registered, and how representative is their occurrence as indicator species for human impact in highland pollen diagrams? Pollen recruitment in alpine tarns and mires represents a special case. Pollen deposition in a sedimentation basin consists of a local, extra local, regional and extra regional component (TAUBER, 1965). The different manifestation of these single components in a deposit depends essentially upon the area of the sedimentation basin (JANSSEN, 1973; JACOBSON and BRADSHAW, 1981). Lowland lakes and mires with a diameter <100 metres are characterized by the local and extra-local components, and therefore sites of such sizes are chosen for the reconstruction of local vegetational changes. On the contrary, in highland zones the regional and extra-regional components dominate, according to wind direction (JOCHIMSEN, 1986; KÜTTEL, 1974; LANG, 1993). In consideration of the low pollen production of alpine plant communities, the significance of the extra-regional component should not be underrated (BORTENSCHLAGER, 1992). Pollen analyses of firn snow profiles from alpine glaciers provide interesting data for the annual extra-regional pollen component in alpine environments (BORTENSCHLAGER, 1967; 1970; AMBACH *et al.*, 1969). The annual pollen accumulation on a glacier surface can be equated with the amount of the extra-regional pollen component. BORTENSCHLAGER (1970) found out that the mean annual pollen accumulation rate comes to 470 pollen grains cm^2 in the Ötz valley. This is as much as the annual pollen deposition of a forest tundra (BIRKS, 1973; HICKS, 1986). Due to the different manifestation of the pollen components, and the low pollen productivity of the local alpine flora, the relation between site size and pollen source area has only a restricted validity in high alpine regions. Therefore, the interpretation of highland pollen diagrams, especially percentage diagrams, has to be made with extra caution, because a knowledge mainly of the local vegetation record is needed for the evidence of vegetational changes in alpine environments.

taxon	pollination mechanism	pollen source area	pollen represen-tation	pollen-type
Trisetum flavescens, Dactylis glomerata, Agrostis tenuis, Phleum alpinum, Poa alpina	anemogamous	(L) ,ER	O	Gramineae
Rumex acetosa	anemogamous	(L),ER	x	*Rumex; Rumex acetosa*-Typ
Alchemilla vulgaris	entomogamous	L	U	*Alchemilla*-Typ; Rosaceae
Trifolium badium, Trifolium pratense, Trifolium repens	entomogamous	L	U	*Trifolium*, Papilionaceae
Geranium sylvaticum,	entomogamous	x	x	*Geranium*
Heracleum sphondylium	entomogamous	(L),ER	U	*Heracleum*-Typ, Umbelliferae
Plantago media	entomogamous	(L),ER	x	*Plantago, Plantago major*-Typ
Campanula rhomboidalis, Phyteuma orbiculare	entomogamous	L	U	Campanulaceae
Leontodon hispidus, Taraxacum officinale, Tragopogon major	entomogamous	L	U	Cichoriaceae
Chrysanthemum leucathemum,	entomogamous	L	U	Asteraceae

Table 1 - Alpine plant species stimulated by irrigation, their pollination mechanism, pollen representation, and pollen-types: L=local, R=regional, ER=extra-regional sources; ()=minor component, O=overrepresented, U=underrepresented, x=no specification (particular items according to BIRKS, 1973; BURGA, 1984; JOCHIMSEN, 1986; KRAL, 1971; SCHRÖTER, 1926).

Tables 1-4 show all the alpine plant species which react positive to human interference. Their pollination mechanisms, place of origin (in the sense of local, extra-local, regional and extra-regional sources) and their pollen representation, are all shown. These data enable us to assess the validity of a palynological record of local vegetation changes in highland zones. Over-represented pollen types of mainly extra-regional origin (such as Gramineae or Urticaceae) are bad indicators. Under-represented pollen-types from regional sources (such as *Artemisia, Calluna,* Caryophyllaceae, Chenopodiaceae, Cruciferae, *Juniperus, Plantago,* Ranunculaceae, and *Rumex*) are of limited value. A good indicator for human interference in alpine ecostems is the under-representation of pollen-types from local source areas, such as Asteraceae, Campanulaceae, Cichoriaceae, Ericaceae, Gentianaceae, *Geranium, Ligusticum*-type, *Ligusticum mutellina,* Liliaceae-type, Papilionaceae, Primulacae, Rosaceae, Saxifragaceae, Scrophulariaceae, *Vaccinium* and Valerianaceae. Since these entomogamous plant species are always under-represented in pollen diagrams, an increase of the counted pollen sum has to be considered, in order to get more significant data for the reconstruction of the local alpine vegetation. Such local vegetation reconstruction is nearly impossible with the use of pollen analyses (i.e., percentage diagrams) alone (Jochimsen, 1972; Lang, 1993). It requires the application of other palaeoecological methods, such as pollen accumulation rates, macrofossil analyses etc. For that reason, in the following compilation only sites with pollen diagrams supported by at least one of these methods are taken into consideration.

taxon	pollination mechanism	pollen source area	pollen represen-tation	pollen-type
Rumex alpinus, Rumex arifolius	anemogamous	(L),ER	x	*Rumex*
Urtica dioica	anemogamous	ER	O	*Urtica,* Urticaceae
Chenopodium bonus-henricus	anemogamous	ER	O	Chenopodiaceae
Poa pratensis, *Trisetum flavescens*	anemogamous	(L),ER	O	Gramineae
Stellaria nemorum *Cerastium caespitosum*	entomogamous	(L),ER	U	Caryophyllaceae
Capsella bursa-pastoris	entomogamous	R,ER	U	Cruciferae
Primula elatior	entomogamous	L		Primulaceae
Alchemilla subcrenata, *A. vulgaris, A. hybrida*	entomogamous	L,(ER)	U	*Alchemilla*-type, Rosaceae
Pimpinella sarifraga	entomogamous	(L),ER	U	*Pimpinella major*-type *Chaerophyllum*-type, Umbelliferae
Veronica chamaedrys	entomogamous	L,	x	Scrophulariaceae
Mentha longifolia	entomogamous	L	U	Lamlaceae
Veratrum album	entomogamous	(L),ER	x	Liliaceae-type

Table 2 - Alpine plant species stimulated by fertilisation, their pollination mechanism, pollen representation, and pollen-types: L=local, R=regional, ER=extra-regional sources; ()=minor component, O=overrepresented, U=underrepresented, x=no specification (particular items according to Birks, 1973; Burga, 1984; Jochimsen, 1986; Kral, 1971; Schröter, 1926).

taxon	pollination mechanism	pollen source area	pollen represen-tation	pollen-type
Pteridophytes	anemochor	L,R	x	*Botrychium* monolete spores Pteridophyta
Juniperus sp.	anemogamous		L	*Juniperus*
Chenopodium sp.	anemogamous	(L),ER	O	Chenopodiaceae-type
Rumex sp.	anemogamous	(L),ER	x	*Rumex*
Calluna vulgaris	anemogamous	(L),ER	x	*Calluna vulgaris* Ericaceae
Empetrum sp.	anemo- and entomogamous	L	U	*Empetrum*-type Ericaceae
Artemisia sp.	anemogamous	(L),ER	x	*Artemisia*
Nardus stricta, Festuca alpina	anemogamous	(L),ER	O	Gramineae
C yperaceae	anemogamous	L,ER	U	Cyperaceae
Aconitum, Anemone sp. *Ranunculaceae*	entomogamous	L,(ER)	U	*Aconitum*-type, *Anemone nemorosa*-type, Ranunculaceae
Papaver sp.	entomogamous	x	x	*Papaver*
Cerastium alpinum, Stellaria nemorum	entomogamous	ER,L	U	Caryophyllaceae *Cerastium*
Arabis alpina, Cruciferae *Biscutella* sp., *Draba* sp.	entomogamous	R,ER	U	Cruciferae
Primula farinosa, P. integrifolia, Primula viscosa, Soldanella sp.	entomogamous	L	x	*Primula farinosa*-type, *Primula hirsuta*-type, *Soldanella* Primulaceae
Arctostaphylos sp., *Erica* sp., *Rhododendron* sp., *Loiseleuna procumbens, Vaccinium* sp.	entomogamous	L	U	*Arctostaphylos,* *Vaccinium*-type Ericaceae
Sedum sp.	entomogamous	L	x	*Sedum*
Sempervivum sp.	entomogamous	L	x	*Sempervivum*
Saxifraga sp.	entomogamous	L	U	Saxifragaceae
Potentilla sp. *Alchemilla* sp.	entomogamous	L,(ER)	U	*Potentilla*-type *Alchemilla*-type Rosaceae
Oxytropis montana	entomogamous	(L),ER	U	*Oxytropis*-type Papillionaceae
Polygala sp.	entomogamous	x	x	*Polygala*
Thesium sp.	entomogamous	x	x	*Thesium*
Daphne sp.	entomogamous	L	x	Thymeleaceae
Gentiana sp., *Gentianella* sp.	entomogamous	L	x	*Gentianella campstris*-type Gentianaceae
Valeriana sp.	entomogamous	L	x	*Valeriana* Valerianaceae
Bartsia sp., *Euphrasia* sp., *Pedicularis* sp., *Rhinanthus* sp.	entomogamous	L,(ER)	U	*Bartsia*-type, *Euphrasia,* *Pedicularis,* *Rhinanthus,* Scrophulariaceae
Pinguicula sp.	entomogamous	x	x	*Pinguicula*
Campanula thyrsoidea	entomogamous	L	U	*Campanula* Campanulaceae
Achillea nana, A. moschata, Adenostyles sp., *Antennaria* sp., *Arnica* sp., *Carlina* sp., *Cirsium* sp., *Gnaphalium* sp., *Homogyne* sp., *Senecio doronicum, S. alpinus, S. uniflorus, S. incanus*	entomogamous	L,(ER)	U	*Achillea*-type *Adenostyles*-type *Carlina, Cirsium,* *Cirsium*-type, *Homogyne*-type, *Homogyne* *Senecio*-type Asteraceae
Hieracium	entomogamous	L	U	Cichoriaceae
Allium, Crocus, Gagea, Lloydia serotina, Paradisia, Tofieldia, Veratrum, Colchicum	entomogamous	(L),ER	x	*Allium*-type, *Paris*-type, Crocus, *Tofieldia,* *Lloydia serotina* *Paradisia liliastrum,* Liliaceae-type

Table 3 - Pasture weeds of alpine grasslands, their pollination mechanism, pollen representation, and pollen-types: L=local, R=regional, ER=extraregional sources; ()=minor component, O=overrepresented, U=underrepresented, x=no specification (particular items according to Birks, 1973; Burga, 1984; Jochimsen, 1986; Kral, 1971; Schröter, 1926).

THE PALYNOLOGICAL RECORD OF HUMAN IMPACT IN THE HIGHLAND ZONES OF THE ALPS

The pollen diagram of a tarn on the Hirschbichl (2150 m) in Osttirol is shown (figs. 1 and 2) as representative for vegetation development in the highland zone of the eastern Alps. As is known from the Western Alps, the primary succession starts with forb-rich dwarf-scrub communities, in which birch *(Betula)* and willow *(Salix)* were growing. These pioneer-communities are superseded by a birch-larch-woodland (*Betula-Larix*-woodland) that turns either into a *Larix-Pinus cembra*-wood or in a *Pinus cembra*-wood (WELTEN, 1982; ZOLLER and BROMBACHER, 1984). In theory the succession in the Eastern Alps follows the same model, with the exception of a distinct initial dwarf-scrub-phase, which has not yet been found by now (OEGGL and WAHLMÜLLER, 1993, SEIWALD, 1980). However, the Eastern and the Western Alps have in common the fact that coniferous trees were forming a woodland above 2000 metres from the mid-Preboreal (Chronozone *sensu* MANGERUD *et al.*, 1974) onwards (MARKGRAF, 1969; MÜLLER, 1972; OEGGL and WAHLMÜLLER, 1993; SEIWALD, 1980; WEGMÜLLER, 1976; WELTEN, 1982; ZOLLER and BROMBACHER, 1984). Due to the immigration of spruce *(Picea)* differences began to exist between the vegetational development of the Eastern and Western Alps. At the end of the Boreal Chronozone, *Picea-Larix-Pinus cembra* woods are affected by the the expansion of spruce *(Picea)* in the Eastern Alps.

Evidence of human interference is known from the earliest Holocene times. In the Insubrian part of Switzerland, ZOLLER (1960) explains the occurrence of hemerophilous pollen-types (*Artemisia,* Campanulaceae, Cichoriaceae, Cruciferae, *Epilobium angustifolium, Humulus/ Cannabis,* Papilionaceae, Ranunculaceae, Rosaceae, *Thalictrum, Vitis*) in Preboreal charcoal layers by anthopogenic forest fires. In particular, ZOLLER (1960) argues, that the absence of fire disturbance in earlier layers supports the idea that these charcoals are caused by mesolithic man-made fires. On the contrary KOFLER (1992) has done charcoal analyses accompanied by pollen analyses of two highland sites in the Trentino (northern Italy). These analyses show a permanent curve of charcoal particles from the Late-Glacial up to now. KOFLER (1992) supposes that the fire frequency is climatically modulated. Coincident with the establishment of

taxon	pollination mechanism	pollen source area	pollen represen-tation	pollen-type
Plantango sp.	anemogamous	(L),ER		*Plantago*
Papillionaceae	entomogamous	(L),ER	U	Papillionaceae
Umbelliferae *(Ligusticum mutellina!)*,	entomogamous	(L),ER	U	*Ligusticum*-type, *Ligusticum mutellina* Umbelliferae
Campanulaceae	entomogamous	L	U	Campanulaceae
Compositae	entomogamous	L	U	Cichoriaceae Asteraceae

Table 4 - Forage plants of alpine grassland, their pollination mechanism, pollen representation, and pollen-types: L=local, R=regional, ER=extra-regional sources; ()=minor component, O=overrepresented, U=underrepresented, x=no specification (particular items according to BIRKS, 1973; BURGA, 1984; JOCHIMSEN, 1986; KRAL, 1971; SCHRÖTER, 1926).

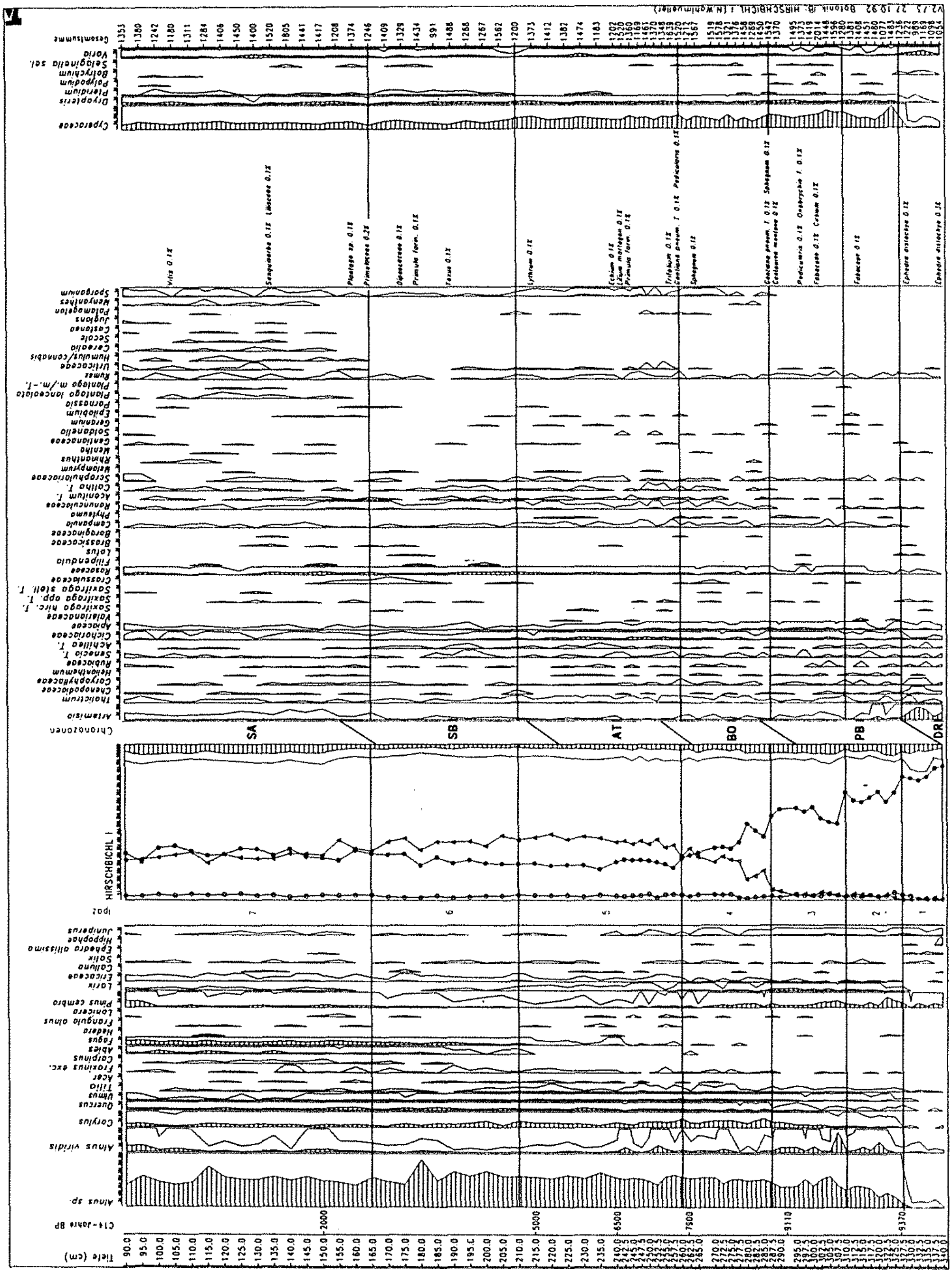
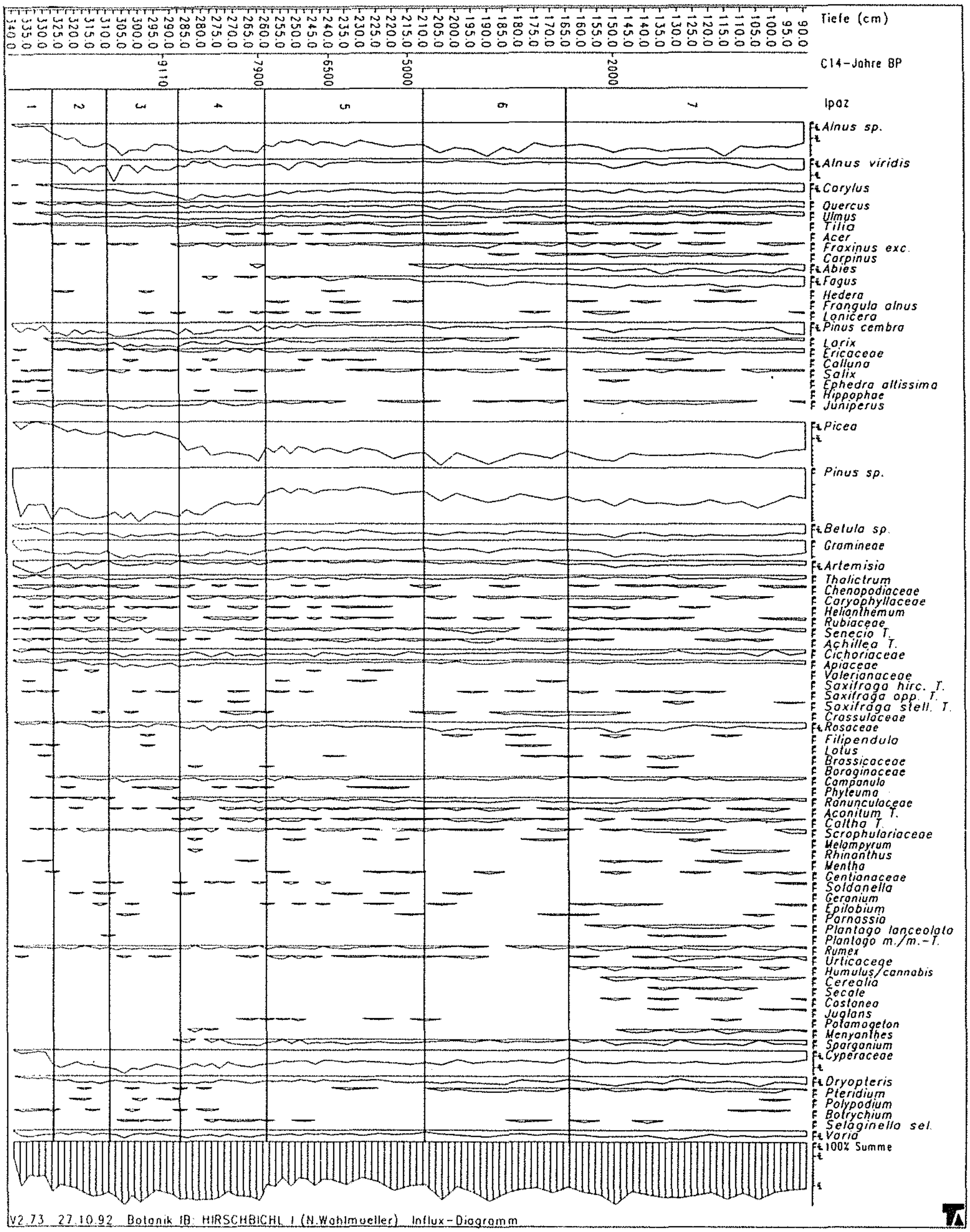


Fig. 1 - Pollen percentage diagram for Hirschbichl I, showing the relative frequencies of the pollen types found in the lake deposits. The radiocarbon dates are shown as uncorrected 14C dates BP. *) correlated radiocarbon dates.

Fig. 2 - Pollen influx diagram for Hirschbichl I showing the absolute frequencies of the pollentypes (pollen grains/ cmq yr).



coniferous forest the frequencies of charcoal particles rise and they decrease during periods of wetter climate.

The palaeoecological investigation of a tarn near a mesolithic camp site on the Hirschbichl (Osttirol) provides additional data related to this topic. Palynological and plant macrofossil analyses of the lake sediments make possible a detailed local vegetation reconstruction. In the highlands of the Hirschbichl area the transition from alpine grassland to a *Larix-Pinus cembra* woodland takes place at 9370±170 BP (VRI-1137). The woodland itself had an open structure, scince species of open habitats (*Artemisia*, Caryophyllaceae, *Helianthemum, Thalictrum*) and of tall-forb formations (Apiaceae, Cichoriaceae, Rosaceae, *Rumex, Senecio*-type) are frequent (figs. 1 and 2). During the Boreal Chronozone, spruce *(Picea)* becomes a component of these woodlands. Throughout this chronozone spruce *(Picea)* spreads at the altitude of the investigated site and becomes dominant at the beginning of the Atlantic. These results are confirmed by plant macrofossil analyses. An interesting fact is that the plant macrofossil diagram shows distinct increases in charcoal frequencies in two layers: at 310 cm and 290 cm depth (figs. 3a and 3b). The detailed palynological record of this event is as follows: in 310 cm a marked decrease of *Pinus diploxylon*-type occurs. In consequence the values of *Alnus viridis, Betula, Juniperus, Larix* and *Pinus cembra* rise. Pollen types of tall forb-formations (Apiaceae, *Epilobium, Geranium, Rumex*) and alpine mat vegetation (Gentianaceae, Gramineae, *Botrychium, Selaginella selaginoides*) are frequent. One stratum above this, the values for the *Pinus diploxylon*-type rise again, and those for light demanding species decline. Taken together this is a reflection of an opening-up of the woodland by fire, followed by a complete secondary succession, starting with Alnus viridis, superseded by a *Betula-Larix-Pinus* cembra woodland, and finally by *Larix-Pinus cembra* woodland (Oeggl and Wahlmüller, 1993).

The crucial question is, whether this fire disturbance is natural or man-made. The answer is closely related to the stand of timber at that time. Open forests support a grass- and herb-rich ground cover, contrary to dense forests. The pollen accumulation rates in the influx diagram show that the tree population *(Alnus, Pinus, Pinus cembra, Picea)* was growing exponentially during the early Holocene. This means that during the Preboreal not all niches of the ecosystem were occupied. Now, the nature of a plant community is characterized by competition. By the factor of interspecific competition between the climax tree-species of an area, the forest-line can be located. In the Hirschbichl profiles the first signs of interspecific competition between *Picea* and *Pinus* are visible in the pollen accumulation rates during the Boreal Chronozone, but significant competition occurs only after 7900 BP. According to this, a dense forest at these altitudes can be expected at earliest at the beginning of the Atlantic. These results are confirmed by several others from of the Western Alps, where the sub-alpine forests become dense tree populations with increasing occurrence of *Picea* (Burga, 1980; Wegmüller and Lotter, 1991; Welten, 1982). Before the Atlantic, the woodland was open-structured at the site investigated on the Hirschbichl. These open woodlands, with a rich grass ground cover, provide enough favourable stands for game, and there is no necessity for burning.

On the other hand, if fire was a method used by mesolithic hunters and gatherers to influence the subalpine environment on the Hirschbichl, periodic burning would have been necessary to maintain an open structure of the subalpine forests. But, the investigation on the Hirschbichl shows that extensive fires occurred at such long intervals that a complete succession to a mature forest could take place after the disturbance. This makes it unlikely, that these fires were caused by man (Oeggl and Wahlmüller, 1993).

The eldest evidences for human impact on alpine vegetation in the Eastern Alps is provided by the pollen diagrams from mires in the Ötz valley (north Tyrol). The mire on the «Rofenberg» (2760 m) is the highest so far located in the Eastern Alps. Human interference is visible in the increase of Papilionaceae, *Plantago,* Rosaceae, *Trifolium* and Umbelliferae (*Ligusticum*-type). BORTENSCHLAGER (1993) considers this as the first sign of pasture in alpine regions. A radiocarbon date of this event is absent, but it is bio-stratigraphically correlated with another pollen diagram from the nearby Gurgler Alm, which places this vegetation change in neolithic times. The Gurgler Alm is situated at 2255 metres in the subalpine region of the Ötz valley. In this pollen profile of the nearby bog, the increase in *Ligusticum*-type pollen indicating pasture is chronologically defined by two radiocarbon-dates, i.e. 5450 BP and 3090 BP (VORREN *et al.,* 1993). By interpolation of these data the rise of the *Ligusticum*-type can be located at 4600 BP.

In the Lienzer Dolomiten, in the eastern Tyrol, human interference in the subalpine region is known from the Iron Age. In the Hirschbichl diagram, at 2150 metres, the rise in the pollen curves of *Artemisia,* Caryophyllaceae, Cichoriaceae, Gramineae, *Plantago lanceolata, Rumex* and Urticaceae indicates the presence of man. Additionally pollen of cultural plants as *Cerealia, Castanea, Humulus/Cannabis, Juglans* and *Secale* of regional origin occur (fig. 1). In the species composition of the subalpine forests a change is also recognizeable. The

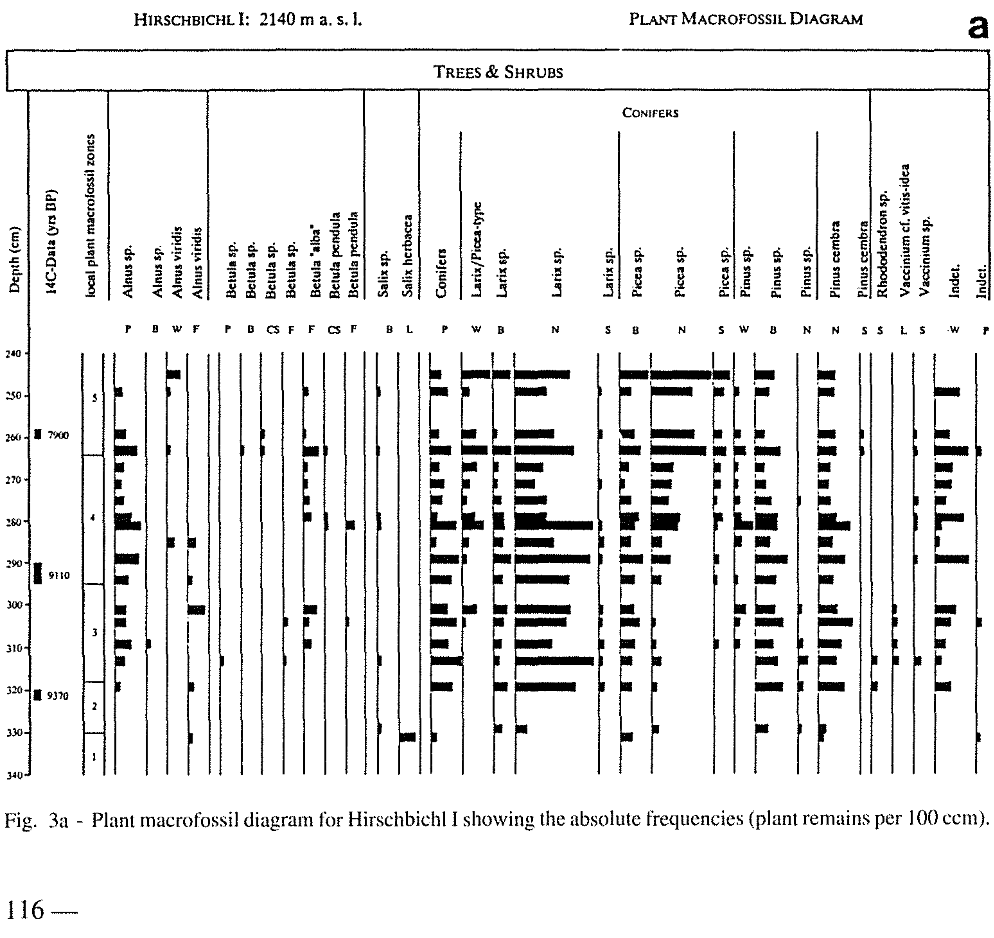


Fig. 3a - Plant macrofossil diagram for Hirschbichl I showing the absolute frequencies (plant remains per 100 ccm).

values for spruce *(Picea)* decline, and on the contrary larch *(Larix)* increases again. *Larix decidua* forms light stands of timber with grass in the ground cover. Therefore *Larix* forests are favoured for alpine pasture (Zoller and Brombacher, 1984).

Seiwald (1980) documents human interference in the subalpine regions of the Villanderer Berg near Bressanone (south Tyrol, Italy). The Duramoor, located at 2080 metres, is the highest investigated site. At 4500 BP an increase of *Plantago alpina, Rumex* and *Urtica* mark a disturbance of the vegetation. At 2000 BP the first pollen grains of *Plantago lanceolata* are found. A distinct clearance is proven at 1220±80 BP (VRI-552) and subsequently a rise *Larix* is identifiable. This development is confirmed by the pollen diagram of the Schwarzsee (2033 m), where clearance is dated to 1550±75 BP (HV-8472). In a third profile from this area at 2050m altitude at the Malschötscher Hotter, indicators of pasture appear frequently from 2730±95 BP (HV-8464) onwards. At 2000 BP there is also a peak in larch *(Larix decidua).* At the lowest-lying site, the Rinderplatz at 1780 metres, human impact starts with forest clearance in Roman Times. This disturbance is manifested palynologically by a fall in the pollen values of *Picea* and *Pinus cembra,* and in the contrasted rise in the curves of *Larix* and *Juniperus.* Pasture is indicated by *Artemisia,* Cichoraceae, Cruciferae, *Plantago alpina, P. lanceolata, P.*

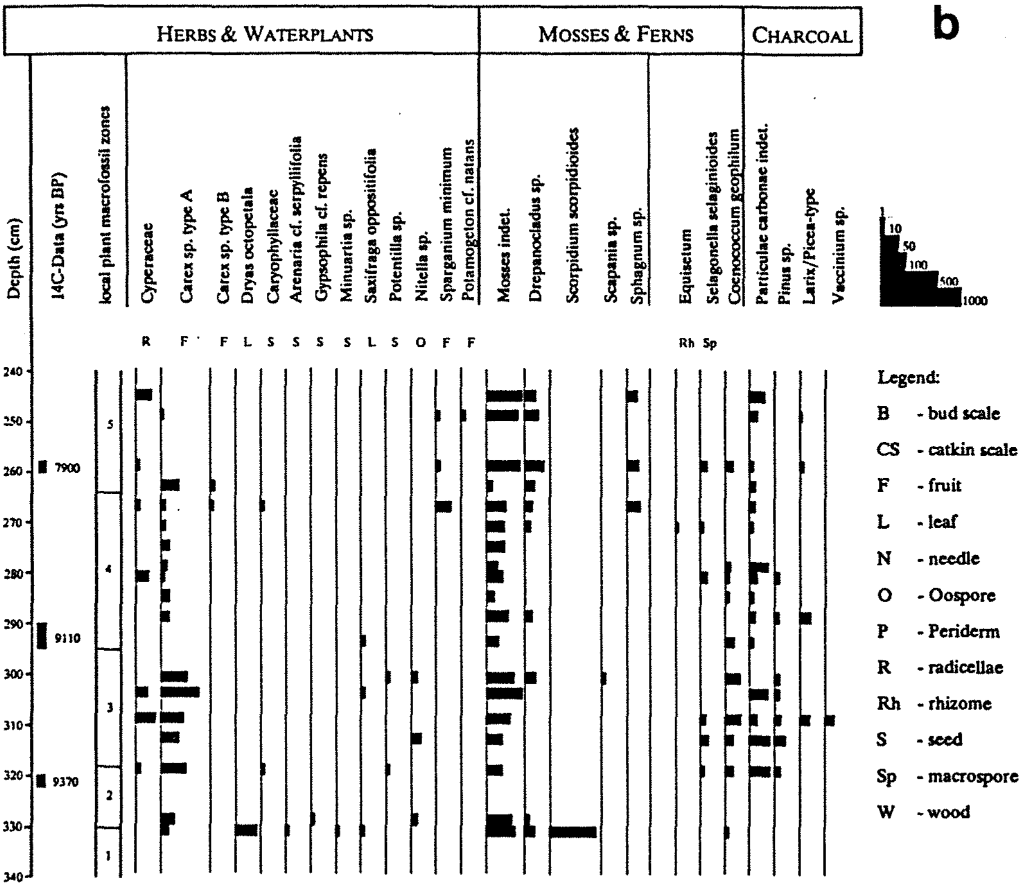


Fig. 3b - Plant macrofossil diagram for Hirschbichl I showing the absolute frequencies (plant remains per 100 ccm).

major, Rumex, Umbelliferae and Urticaceae. From Roman times onwards, the occurrence of *Calluna* and Ericaceae characterizes the establishment of alpine heathland, which expands from the Middle Ages onwards.

In the Zillertaler Alpen, pollen analyses of the Waxeckalm mire (1875 m, HÜTTEMANN and BORTENSCHLAGER, 1987) give evidences for a climatically controlled timber-line depression at 3450±90 BP (VRI-703). The high value for human indicators in this part of the diagram comes from extra-regional sources. Because of the low pollen production of the local vegetation they are registrated in a pronounced way. Nevertheless, local human clearance for alpine pasture was undertaken at 760±80 BP (VRI-702) and expressed in a NAP-maximum with pasture indicators (HÜTTEMANN and BORTENSCHLAGER, 1987).

In the Kühtai, a side-valley of the Inn in the northern Tyrol, palynological investigation of a mire near the Dortmunder Hütte (1880 m) shows vegetational changes accompanied by alpine pasture during Roman times. Within the subalpine forests, *Picea* is diminished and looses its dominant position, while *Larix* and *Pinus cembra* retain their stands (HÜTTEMANN and BORTENSCHLAGER, 1987).

From the Western Alps the oldest neolithic influences on highland vegetation are known from Graubünden (Switzerland). In a lake above the timber-line, the Lai da Vons (1991 m), BURGA (1980) noticed pollen grains of cultural indicators (Cerealia, *Linum usitatissimum, Plantago lanceolata, Secale*) and charcoal particles at 4770±90 BP (B-2641), but BURGA (1980) has certain doubts about this early occurrence of human indicators. He considers climatic reasons as well as human impact to be responsible.

The other palynological records of man-induced vegetational changes in the San Bernadino-area are younger. In the subalpine fen of Palé digl Urs, located at 1834 metres, the first cultural indicators are found at 2510±95 BP (UZ-200). From the same period come pollen grains of *Cerealia, Humulus/Cannabis, Castanea,* and *Juglans* in the diagram from Alp Marschol (2010 m). But in both cases the occurrences of these cultural plants in the subalpine zone is a manifestation of long distance transport. The only indication of human interference is a decrease of *Picea* pollen, but this starts already at 4260±80 BP (B-3254) due to a climatic deterioration (BURGA, 1980).

Precise results for human activity in this area come from the investigations of HEITZ (1975). In three diagrams the development of the highland environment in the Oberhalbstein is shown. Again the first traces of anthropogenic disturbance are recorded in the highest-lying site, Stallerberg (2450 m). Bronze Age clearance at the timber-line is also registered by a decrease in AP, and the increase of Compositae, Ericaceae, *Plantago,* Ranunculaceae and Umbelliferae. At the same time the pollen concentration increases too. This clearance phase is confirmed by the diagram from Bivio (2136 m), where the increase in species of alpine pastures is radiocarbon dated to 3160±100 BP (B-2346). In the lower subalpine region in the diagram from Sur (1780 m), the first alpine pasture is documented from the Iron Age. The AP (eg. *Picea*) retreat, and Campanulaceae, Compositae, *Plantago,* Rosaceae, Ranunculaceae and Umbelliferae start to rise.

ZOLLER and BROMBACHER (1984) describe in detail the palynological record of farming near St. Moritz. In the diagram from «Chavalus» (1800 m) two phases of utilization are identified palynostratigraphically. In the late Bronze Age (before 2020±40 BP; B-4230) alpine pasture is indicated by the selective deforestation of spruce *(Picea)* and green alder *(Alnus viridis).* By that means larch *(Larix decidua)* is indirectly promoted. Among the NAP pollen Umbelliferae appear at higher values. A light larch-wood is created, which is used for forest-pasture. During the Middle Ages (1170±40 BP; B-4231) the cultivation of larch-forest is intensified. The change in the economic utilization is documented by the increase of Cichoriaceae and Asteraceae, and the decrease of Ericaceae. This reflects the change from forest-pasture to meadows.

From the Lake Böhnig (2095 m), in the Valais, MARKGRAF (1969) reports several forest fires from the Neolithic in the subalpine regions. The charcoal horizons are radiocarbon dated to 4300 BP (3350±100 BC: B-790) and 3600 BP (2220±100 BC: B-791). In the pollen diagram these charcoal layers are visible in a *Pinus* decline, the occurrence of cultural indicators and an increase of the pollen concentration. In each case a secondary succession from open areas to a mature subalpine forest takes place. This disturbance of the subalpine forests of the Valais is confirmed by the palynological investigations of WELTEN (1982). In four diagrams WELTEN (1982) demonstrates human activity at and above the timber-line from 4000 BP onwards. Again the first traces appear in the highest-lying mire of «Aletschwald» (2017 m), where a first phase of forest-pasture is documented from 3400-1900 BP. *Pinus cembra* decreases, and indicators for pasture rise. The second phase of utilization continues from 1900 BP till today, and shows a spread of larch *(Larix decidua),* and a decrease of green alder *(Alnus viridis)* and cembra pine *(Pinus cembra).* In two mires from the lower subalpine zone, at Wallbach (1885 m) and Robbiei (1895 m), human impact is not in evidence before 2600 BP, eg., 1500 BP.

GENERAL PATTERNS

The review of pollen diagrams from the highland zones of the eastern and western Alps shows some general patterns:

in chronological, order the first palynological record of human interference in highland zones is detected in the Neolithic period. Obviously the disturbance by man of the alpine environment has intensified with the transition to a productive economy, which leads to the first changes of the alpine vegetation. The increase of pasture weeds and plants from nutrient-rich stands gives evidence that the alpine mats were used for grazing. Gradually human impact becomes visible at lower altitudes. From the Bronze Age the subalpine woods were used for forest-pasture, as is shown by the increase of pasture weeds. At this stage the extensive forest-pasture at the timber-line does not effect the natural rejuvenation of tree populations (*cf.* KLÖTZI, 1991). During the Late Bronze Age, spruce *(Picea)* is felled selectively at the timber-line, and therefore larch *(Larix decidua)* is favoured indirectly. The light stands of Larch-forest are rich in grass in the ground cover, and are the prefered pasture areas. Extensive clearance at the timber-line becomes necessary with the establishment of Alpine pastures. Evidence for Alpine pasture («Almwirtschaft» in a narrow sense) exists from the Late Bronze Age in the western Alps (WEGMÜLLER, 1976). In the estern Alps the earliest indication of Alpine pasture originates from the Ötz valley. BORTENSCHLAGER (unpublished diagram) registered a clearance phase at 2875±25 BP in the pollen diagram from «Grüner» (1980 m) near Obergurgl. Following a charcoal layer, the AP of subalpine trees declines and NAP rises, especially indicators for pasture. The next expansion of the managed area happens during Roman times. Clearances are recognizeable in almost every diagram from alpine or subalpine regions. Extensive destruction of subalpine forests occurs from the Middle Ages onwards. Large areas of subalpine forest are turned into grazing areas. This intensification of stock-farming leads to a timber-line depression of several hundred metres.

Whether the Subboreal restriction of spruce *(Picea)* is caused by the interference of man, remains to be checked. The decline of spruce is also recognizeable in pollen diagrams without evidence of human impact, from the beginning of the Subboreal. Therefore a co-evolution of alpine grass-ecosystems and the economic interests of man has to be considered. The decline of *Picea* is also an indicator of climatic deterioration. In consequence of the resulting timber-

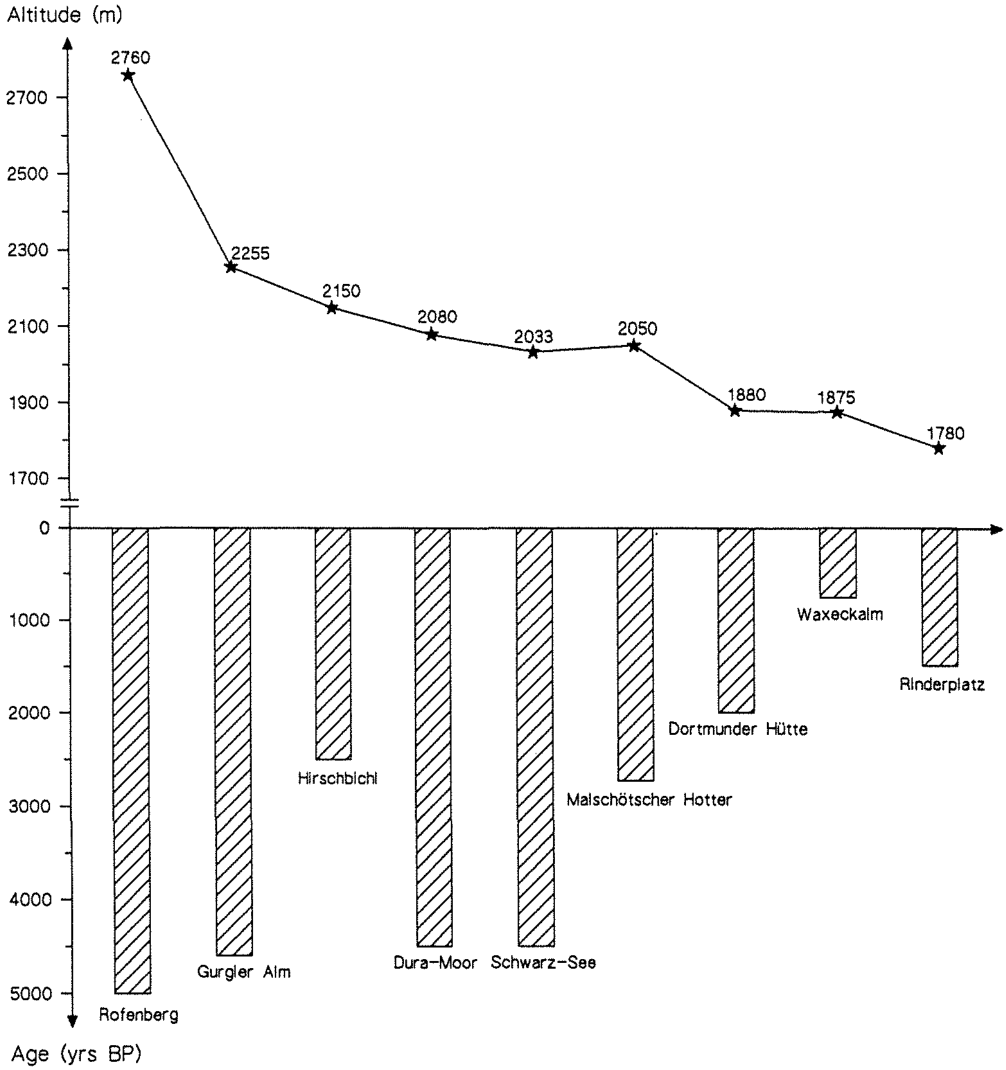


Fig. 4 - The first occurrence of anthropogenic disturbance visible in the pollen diagrams of the eastern Alps ordered in altitudinal sequence.

line depression the alpine mats expand, and form ideal pasture for prehistoric farmers.

The chronological sequence of anthropogenic influence on the highlands shows that the areas of pasture were gradually displaced to lower regions (fig. 4). This pattern reflects advances in stock-breeding. The implication is that the yield per unit area increases with decreasing altitude (ELLENBERG, 1982; PENZ, 1978). This kind of utilization of the uplands is documented until recent historical times (STERN, 1983). It is abandoned when the farmers give up the principle of self-sufficiency. Accordingly, in some areas a reforestation of the subalpine region can be recognized in the pollen diagrams.

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VEGETATION DEVELOPMENT AND HUMAN IMPACT AT THE FOREST LIMIT: PALAEOECOLOGICAL STUDIES IN THE SPLÜGEN PASS AREA (NORTH ITALY)

SUMMARY – *Vegetation development and human impact at the forest limit: palaeoecological studies in the Splügen Pass area (North Italy).* Regional and local vegetation history has been studied for two lakes at 2303 and 2250 m asl respectively in the Splügen Pass area. The forest limit formed mainly by *Larix decidua* and *Pinus cembra* rose very quickly in the Preboreal and was located at minimum a height of 2250-2303 m asl during the Boreal and Atlantic (9000-5000 BP). Fluctuations of the forest limit recorded in this period can be related to both climatic change and human impact in the Mesolithic and Neolithic. The forest limit then began to decrease steadily, and by about 3500 BP it finally dropped down to a level below 2250 m asl. The pressure on the subalpine forest since the Bronze Age can be attributed to intensified use of the area for pasture.

RIASSUNTO – *Sviluppo della vegetazione ed impatto antropico presso il limite forestale: analisi paleoecologiche al Passo dello Spluga.* La storia della vegetazione del territorio circostante il Passo dello Spluga è stata studiata attraverso l'analisi di due bacini lacustri. Il limite forestale, composto per lo più di Larici e Cembri, si è innalzato velocemente nel Preboreale e si trovava ad un'altitudine di 2250-2303 metri durante il Boreale e l'Atlantico (9000-5000 BP). Le fluttuazioni del limite forestale di questo periodo furono causate sia da fattori climatici che dall'impatto dell'uomo mesolitico e neolitico sull'ambiente. In conseguenza di ciò il limite forestale si abbassò rapidamente e, intorno a 3500 BP scese ad un livello inferiore ai 2250 metri. La pressione dell'attività antropica sulla foresta subalpina a partire dall'età del Bronzo può essere attribuita all'intensificazione dell'uso del territorio per il pascolamento.

INTRODUCTION

The alpine forest limit is a very attractive area for palaeoecological investigations, because it is extremely sensitive to climatic and other environmental changes. According to LANG (1993) and TALLIS (1991) the forest limit is the upper limit of the closed subalpine forest. The timberline includes the area between the forest limit and the tree limit. It is not clear, whether such transitional zones in the alpine areas are caused by human impact or whether they would also exist under natural conditions.

Our knowledge of Holocene vegetation dynamics at the alpine forest limit is still incomplete. The present state of knowledge in the Swiss Alps is summarized by LANG (1993). The interpretation of pollen diagrams from high altitude is not easy, because pollen transported from lower areas by wind makes it difficult to reconstruct local vegetation development. It may also be difficult or even impossible to relate vegetation change at the forest limit to climatic

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change, human impact, or other ecological factors.

Many authors have pointed out that Holocene timberline fluctuations were caused by climatic change. In the Austrian Alps PATZELT and BORTENSCHLAGER (1973) showed that Holocene glacier advances coincided with the depressions of the forest limit that are indicated in the pollen diagrams by decreasing tree pollen and increasing grass and herb pollen. Holocene climatic changes and glacier oscillations in the Swiss Alps are summarized and discussed by ZOLLER (1977).

Although the dependence of the forest limit on climate is evident, human influence on the subalpine forests has to be taken into account as well. The location of the modern timberline in many parts of the Alps results from increasing use of subalpine and alpine areas for pasture during the last few thousand years. In pollen diagrams from the Swiss Central Alps the earliest human impacts on the subalpine forests, as recorded by indicators of pasture and changes in tree pollen, date back to the Neolithic (BURGA, 1980; MARKGRAF, 1969; WELTEN, 1982). Early-Holocene charcoal layers found in sediments from the Southern Swiss Alps are believed to be due to human activity since the Mesolithic (ZOLLER, 1960). However, we know hardly anything about the scale of prehistoric human influence on the subalpine and alpine vegetation.

In the Splügen pass area (northern Italy) an opportunity was given to correlate archaeological and palaeobotanical investigations in order to evaluate palaeoenvironmental changes and human impact at timberline. In 1986 archaeological surveys and excavations led by Prof. F. Fedele (University of Naples) were started in the area. They revealed traces of human presence dating back to the early Holocene. Many of the prehistoric sites are Epipalaeolithic or Mesolithic. The results of the first years of archaeological investigations in the area are summarized by FEDELE (1991; 1992). Palaeoecological studies of peat and lake sediments to decipher the Holocene vegetation development, forest limit fluctuations, and human impact on the subalpine and alpine vegetation at different altitudes are in progress in Bergen (D. Moe) and Bern. First results from two lakes are presented in this paper.

INVESTIGATION AREA

The investigation area is situated in the upper San Giacomo valley near the Swiss border (fig. 1). The bedrock is mainly formed by *Penninicum* metamorphic gneiss (LABHART, 1992). Archaeological and palaeoecological investigations are concentrated on a limestone plateau at 2000-2300 m asl called Pian dei Cavalli (plateau of the horses), where most of the prehistoric sites were found.

The modern forest limit formed by *Larix* and *Picea* is at 1900-2000 m asl. On the steep slopes of the Febbraro valley *Alnus viridis* shrubs are present. The alpine meadows are intensively grazed by cattle, horses, and goats.

The palynological studies presented here have been made on sediments from Lago Grande (2303 m asl) and Lago Basso (2250 m asl). Lago Grande is situated at the upper end of the Febbraro valley near the Baldiscio pass. The maximum water depth is about 5 m, and the sediments (*ca.* 4.60 m) consist mainly of silt and sand.

Lago Basso is a small lake about 30 m in diameter and 0.80 m deep without a permanent inlet or outlet. It is situated close to the northwestern border of Pian dei Cavalli and about 50 m above the major Mesolithic site CA1 (fig. 1). The sediments (3.55 m) consist of silt and sand at the base (Late-glacial) and finedetritus *gyttja* with only slight minerogenic input in the Holocene part. Due to water-level fluctuations and probably also complete freezing in the winter the sediment accumulation during the younger Holocene was very irregular.

METHODS

The sediment cores were taken from the central parts of the lakes by a Streif-Livingstone piston sampler. For pollen analysis the material was treated with HF 40% and acetolysis.

Stomata and charcoal particles were counted on the pollen slides and calculated as percentages of the total pollen sum (AP+NAP = 100%). Pollen from plants growing in the lower areas (*Corylus*, mixed oak forest, cultural plants, etc.), are excluded from the pollen sum, as well as water plants and spores.

RADIOCARBON DATES

From Lago Basso six AMS radiocarbon dates were obtained on terrestrial plant remains by G. BONANI, ETH Zürich (table 1). The date for 343 cm and probably also the one for 259 cm

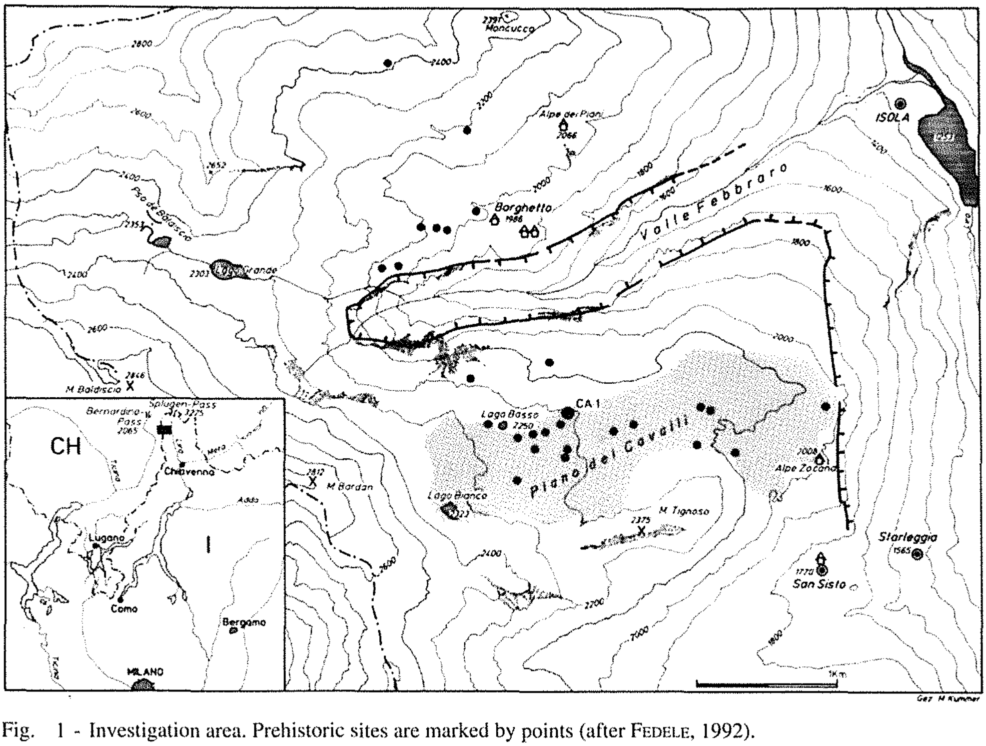

Fig. 1 - Investigation area. Prehistoric sites are marked by points (after FEDELE, 1992).

are considered to be too young. A new series of datings is expected to confirm this.

Table 1 - AMS radiocarbon dates obtained from G. Bonani, ETH Zürich.

Lab N°	Sample N°	Age (y BP)	∂13C (‰)	Cal. Age (BC)
ETH-8997	LB 80 cm	3345±80	-25.9±2.4	1877-1455
ETH-8998LB	150 cm	5815±80	-26.5±1.4	4898-4502
ETH-8999LB	181-183 cm	6880±85	-25.7±1.2	5964-5583
ETH-9000LB	235 cm	8525±95	-23.5±1.2	7719-7255
ETH-9001LB	259 cm	7850±80	-22.4±11.5	7031-6488
ETH-9002LB	343 cm	8175±80	-20.0±1.2	7370-6830

RESULTS

The regional vegetation development

A preliminary simplified pollen diagram from Lago Grande (2303 m asl) shows the regional vegetation development in the Splügen Pass area (fig. 2). The diagram is divided into pollen zones (PZ) marking changes in the subalpine and alpine vegetation. The chronology is estimated by correlation with pollen curves for plants growing in lower areas and by correlation with dated pollen diagrams in the Southern Alps.

PZ A is dominated by Gramineae, *Artemisia*, Chenopodiaceae, and other pioneer plants. It can be correlated with the end of the Younger Dryas.

At the beginning of the Holocene (PZ B) the forest limit formed by *Pinus*, *Larix* (usually under-represented in pollen diagrams due to relatively low pollen production and poor dispearsal), and *Betula* rose very quickly to an altitude that probably was somewhat below Lago Grande. Sparse finds of *Larix* and *Pinus* stomata might indicate the presence of single trees or groups of trees near the lake. The local pioneer vegetation was replaced by a mosaic of well-developed speciesrich meadow-, tall herb-, and dwarf shrub communities.

PZ C is characterized by the expansion of *Picea* in the subalpine forest and the beginning of a continuous decrease in *Pinus cembra*. In the upper Mesocco valley, west of the investigation area, the increase in *Picea* is dated to 6800 BP – 6450 BP (Burga, 1980; Zoller and Kleiber, 1971).

A strong increase in *Alnus viridis* pollen (PZ D) indicates a massive expansion of green alder at the timberline in the middle Holocene. This event, which is recorded in many pollen diagrams from the Swiss and Italian Alps, is dated to around 5000 BP and was probably accompanied by a general decrease in the forest limit (Lang, 1993). The first pollen grains of cereals indicate the beginning of Neolithic agriculture in the valley. Indicators of pasture in this pollen zone (*Plantago*, Fabaceae, Chenopodiaceae) suggest extensive use of the subalpine/alpine area for grazing during the Neolithic.

At the beginning of PZ E the low pollen percentages of *Larix*, *Pinus cembra*, and *Picea* and a remarkable increase in NAP suggest that the forest limit was pushed farther down at the beginning of PZ E. Increasing indicators of pasture (Compositae, Ranunculaceae, Campanulaceae, *Plantago alpina*, *Juniperus*) and a decrease in *Alnus viridis* indicate human impact on the subalpine and alpine vegetation during the Bronze Age and Iron Age.

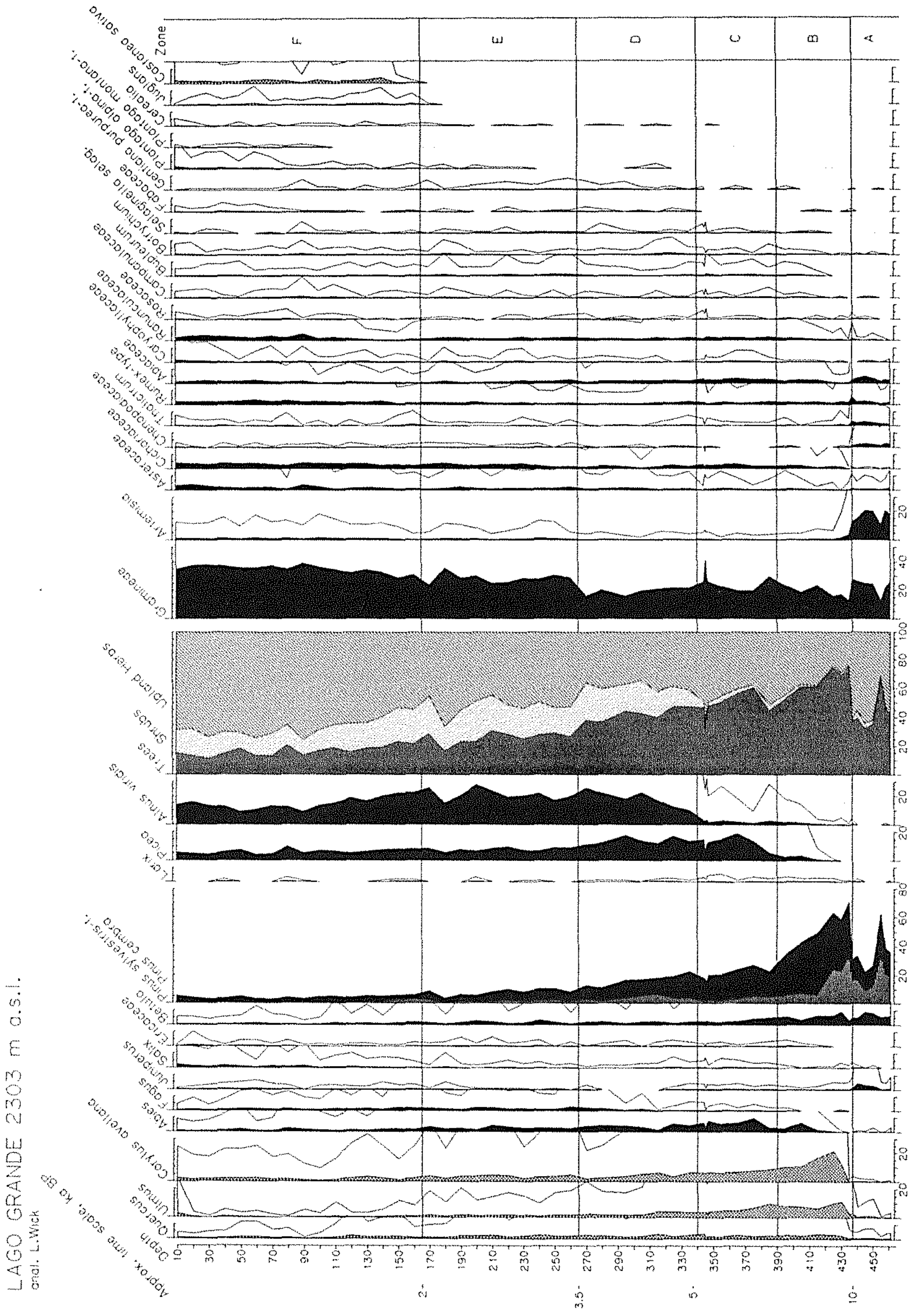

Fig. 2 - Preliminary pollen diagram from Lago Grande (2303 m asl) showing only the most important taxa.

The beginning of PZ F is dated to the Roman settlement on the basis of long-distance transport of *Castanea* and *Juglans* pollen. A further decrease in *Alnus viridis* and a strong increase in indicators for pasture in this pollen zone indicate increasing importance of cattle breeding since the Middle Ages and the development of intensive summer farming in the area.

EARLY HOLOCENE VEGETATION CHANGES AT THE FOREST LIMIT

Because of the small size and the situation of Lago Basso its pollen diagram (fig. 3) represents the more local vegetation development in the northwestern part of Piano dei Cavalli.

The base of the profile dates to the end of the Late-glacial, when open pioneer vegetation dominated in the area (PZ 1). Then the lake sediments grade from silt to fine-detritus gyttja. A strong increase in *Pinus* pollen, and a decrease in pioneer plants at the transition from PZ 1 to PZ 2 indicate rapid climatic warming and reforestation at the beginning of the Holocene. The first trees to arrive near the lake are recorded in the Preboreal by stomata of *Pinus cembra* and *Larix* needles. Between about 9000 BP and 8500 BP (PZ 3) an open *Larix-Pinus cembra* forest with a very rich herb and dwarf shrub vegetation in its undergrowth covered the area. Tall herb communities dominated by Apiaceae *(Chaerophyllum hirsutum, Peucedanum* cf. *ostruthium)* probably played a major role in this early-Holocene subalpine forest.

In PZ 4 two periods of forest limit depression or forest opening are recorded. The first lasted from about 8500 BP to 8000 BP (PZ 4-I) and is marked by decreases in stomata and pollen of *Larix* and *Pinus cembra* and small increases in *Picea* and *Alnus viridis.* At the same time a change in the composition of the herb vegetation can be observed. *Chaerophyllum hirsutum* and other Apiaceae belonging to the tall herbs decrease whereas *Veratrum album, Bupleurum, Ligusticum mutellina*-type, *Meum,* and some other indicators of open grassland start with more or less continuous pollen curves. An increase in large charcoal particles (>30 μm) in the upper part of this period points to human activity in the area (small charcoal particles can be due to long-distance transport). The major Mesolithic site CA1 at Pian dei Cavalli, dated to 7960±260 BP (FEDELE, 1992), can be correlated with this first charcoal peak. Another decrease in *Larix* and *Pinus cembra,* accompagnied with increases in *Picea* and charcoal, is recorded in PZ 4-II (*ca.* 7500 BP – 7200 BP).

PZ 5 and PZ 6 show the expansion of *Picea* in the subalpine forest and the beginning of a decrease of the forest limit indicated by decreases in pollen and stomata of *Larix* and *Pinus* cembra. *Alnus viridis* starts to expand at timberline. High charcoal percentages indicate human impact on the subalpine forest in this period. The first cereal pollen grains occur in PZ 6. A continuous depression of the forest limit and the mass expansion of *Alnus viridis* are recorded in PZ 7. The stomata curves break off at about 3500 BP, when the forest limit was finally lowered to a level below Lago Basso at the beginning of the Bronze Age. A decrease in *Alnus viridis* and a strong increase in Gramineae and other NAP in the uppermost part of the pollen diagram show intensive human impact during the Bronze Age.

DISCUSSION

The pollen diagrams from the Splügen pass area show a rapid reforestation up to about the present level of the forest limit in the Preboreal, as it is recorded in many other localities in the

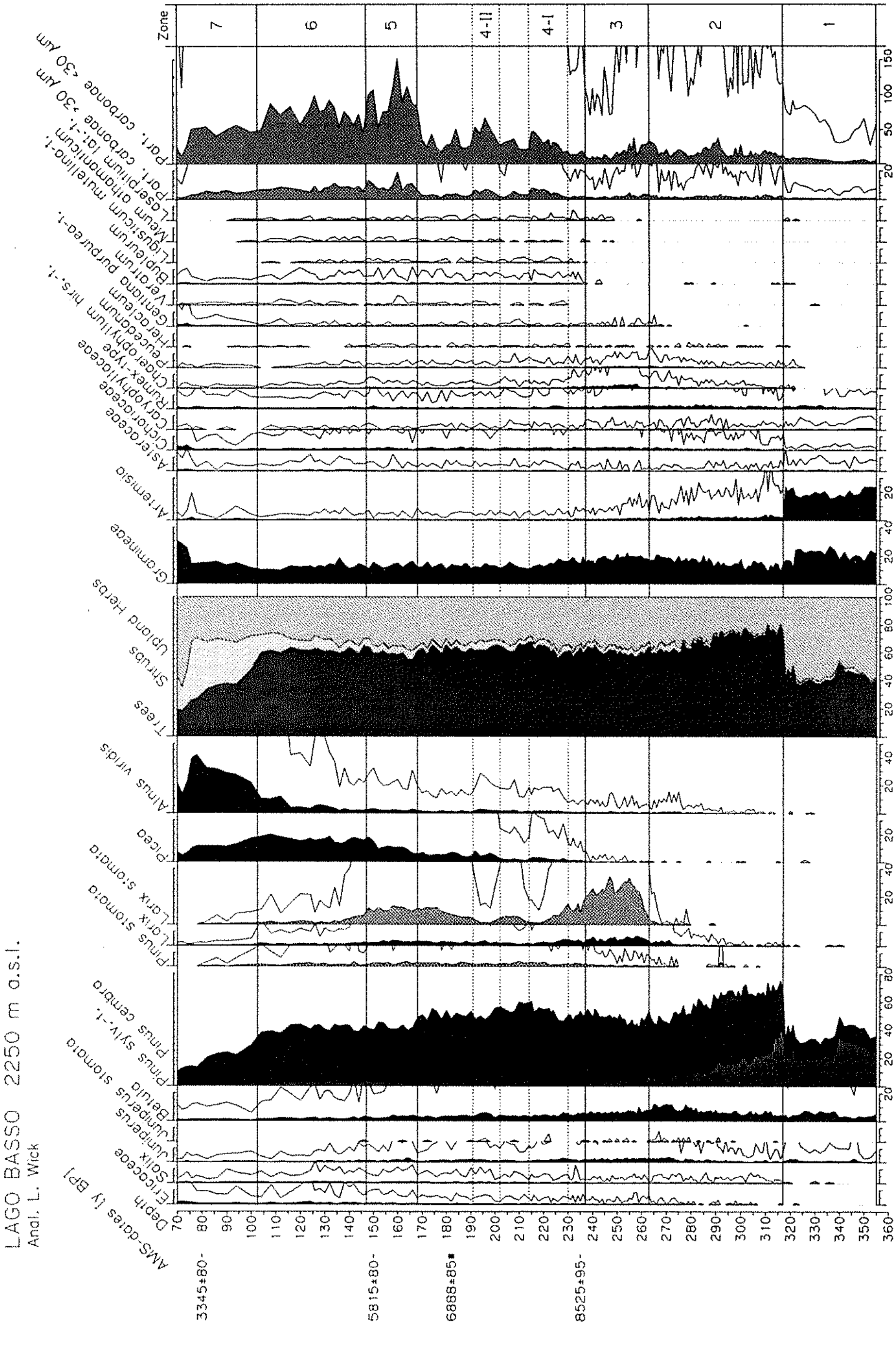

Fig. 3 - Simplified pollen diagram from Lago Basso (2250 m asl).

Central and Southern Alps (LANG and TOBOLSKI, 1985; WELTEN, 1982; ZOLLER, 1987). The maximum elevation of the forest limit in the area is not yet known.

Most likely the decrease of the forest limit in the middle Holocene was caused by both climatic change and Neolithic human impact. The continuous decrease of *Pinus cembra*, which is not present in the area anymore, and the expansion of *Alnus viridis* point to a more oceanic climate. An estimation of the extent of human impact in the Neolithic cannot be given, but most likely it was considerably less than during the Bronze Age and the Iron Age. Palaeoecological investigations in other parts of the Alps confirm a Neolithic beginning of human impact on the subalpine and alpine vegetation, followed by increasing pressure of man on the forest limit since the metal ages (DE BEAULIEU *et al.*, 1990; BORTENSCHLAGER, 1993; BURGA, 1980; MARKGRAF, 1969; WELTEN, 1982).

The interpretation of the early Holocene timberline fluctuations or forest openings recorded in the pollen diagram from Lago Basso is difficult, because they could have been caused by climatic changes as well as by Mesolithic man. There is a fairly good correlation between PZ 4-I and the major Mesolithic site at Pian dei Cavalli (CA 1, 7960±260 BP) on the basis of radiocarbon dates and charcoal, although the decreases in stomata and pollen of *Larix* and *Pinus cembra* obviously began earlier than the rise of charcoal particles. That may indicate that the forest opening there was not only caused by Mesolithic human impact but also by a climatic deterioration. The decreases in *Larix* and *Pinus cembra* correspond quite well with the Venediger oscillation (8800 BP – 8000 BP) recorded in the Austrian Alps (BORTENSCHLAGER, 1977; PATZELT and BORTENSCHLAGER, 1973). A correlation between the younger period of forest deterioration (PZ 4-II) and a climatic change is not evident, but the vegetation could have been influenced to some extent by the Misoxer oscillations between 7500 BP and 6500 BP (ZOLLER, 1960; ZOLLER *et al.*, 1966).

In many pollen diagrams from the subalpine and alpine area climatic oscillations are indicated by high percentages of Gramineae and other NAP (PATZELT and BORTENSCHLAGER, 1973; ZOLLER, 1960). In the pollen diagram from Lago Basso the NAP percentages fluctuate very little during the early Holocene. The environmental changes at the timberline mainly around 8500 BP are indicated by a decrease in *Larix* stomata and by changes in the composition of the herb vegetation. Some of the new species occurring at that time, such as *Ligusticum mutellina* and *Veratrum album*, are very frequent on recent subalpine and alpine pastures. It is uncertain, however, whether they can be regarded as indicators of Mesolithic human impact as well.

At the present stage of the investigations it is not possible to give reliable details about the maximum altitude of the forest limit in the Splügen pass area and the scale of Holocene fluctuations of the forest limit caused by climate, but a range of about 100-150 m in height, as estimated by LANG (1993), is probably realistic.

The extent of forest limit fluctuations and forest openings cannot be evaluated from pollen percentages only. Pollen-influx calculations based on a sufficient number of radiocarbon dates and macrofossil analyses are absolutely necessary.

SUMMARY

Two pollen diagrams from the Splügen pass area represent Holocene vegetation developments near the alpine forest limit. The upper limit of the subalpine *Larix-Pinus cembra* forest was at least as high as 2250 – 2300 m asl in the Boreal and Atlantic (9000 BP – 5000 BP). At the end of the Atlantic it started to drop down to a level below 2250 m asl, as *Alnus viridis* expanded. These major vegetation changes in the middle Holocene were probably caused by both Neolithic human impact and climatic change. Due to increasing use of the subalpine and alpine area for pasture since the Bronze Age the location of the forest limit most likely has been more influenced by man than by climate during the late Holocene.

Early-Holocene vegetation changes and forest limit fluctuations shown in the pollen diagram from Lago Basso can be partly correlated with climatic changes indicated by glacier oscillations in the Alps, but there is a good correlation with Mesolithic human impact by charcoal and radiocarbon dates as well. Pollen percentages alone do not provide reliable evidence of the scale of timberline fluctuations and of changes in the structure of the subalpine forest caused by climatic change and human impact. Pollen-influx calculations and macrofossil analyses are expected to give more information.

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P. BIAGI and J. NANDRIS (eds.) Highland Zone Exploitation in Southern Europe
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MAN AND VEGETATION IN THE SOUTHERN ALPS: THE VALCAMONICA-VALTROMPIA-VALSABBIA WATERSHED (NORTHERN ITALY)

SUMMARY – *Man and vegetation in the southern Alps: the Valcamonica-Valtrompia-Valsabbia watershed (northern Italy).* This paper presents an overview of ongoing archaeological survey being carried out along the Valcamonica-Valtrompia-Valsabbia watershed. Archaeological excavations of three sites has been accompanied by analyses of associated plant remains (pollen, seeds, wood and charcoal), soils and sediments. An early Mesolithic (Sauveterrian) encampement at Rondeneto has been dated to the Boreal period (8880±150 BP: GrN-19590). The site has yielded some 165 artefacts of typical character. Sauveterrian artefacts have similarly been found at Vaiale where excavation also produced Iron age material dated between 2405±35 BP (GrN-18988) and 2100±70 BP (GrN-19592). A later Mesolithic site at Laghetti del Crestoso has provided archaeological and palaeobotanical evidence for ephemeral, seasonal encampments of the Castelnovian Culture. Palynological and 14C evidence from a number of sites shows an early Holocene hiatus in peat and sediment accumulation. This is attributed to a period of climatic dryness which may have favoured high altitude occupation. It is suggested that Mesolithic occupation was influenced by the presence of water sources, altitude, aspect and the ecotonal belt between upper montane grassland and lower altitude woodland.

RIASSUNTO – *Impatto antropico e vegetazione nelle Alpi meridionali: lo spartiacque Valcamonica-Valtrompia-Valsabbia.* Il presentelavoro riguarda la ricerca archeologica tuttora in corso lungo lo spartiacque Valcamonica-Valtrompia-Valsabbia. Lo scavo di tre siti è stato integrato dall'analisi dei resti paletnobotanici (pollini, semi, legni e carboni vegetali), dei suoli e dei sedimenti. Un accampamento Mesolitico Sauveterriano, presso il Lago di Rondeneto, ha fornito una datazione radiometrica di 8880±150 BP (GrN-19590) inquadrabile in un momento del Boreale. Il sito ha restituito 165 manufatti in selce caratteristici. Manufatti sauveterriani sono stati raccolti anche nel sito di media quota di Vaiale dove gli scavi hanno dato anche materiali dell'età del Ferro datati fra 2405±35 BP (GrN-18988) e 2100±70 BP (GrN-19592). Un accampamento mesolitico più recente, attribuito alla Cultura Castelnoviana, è stato scavato lungo la sponda del laghetto basso del Crestoso. L'analisi palinologica e le datazioni radiometriche ottenute in diversi siti, hanno messo in evidenza uno iato sia nell'accumulo dei sedimenti che in quello dei depositi di torba. Questo fenomeno è il prodotto di un periodo climatico caratterizzato da siccità che può aver favorito l'insediamento ad alta quota. Sembra proponibile che quest'ultimo, durante il Mesolitico, sia stato influenzato da diversi fattori quali la presenza di bacinetti lacustri, l'altezza, l'ubicazione e la fascia ecotonica situata fra l'alta prateria montana e la foresta distribuita a quota più bassa.

INTRODUCTION

Archaeological surveys carried out between 1988 and 1993 by the Natural Science Museum of Brescia along the Valcamonica-Valtrompia-Valsabbia watershed (Biagi, 1992),

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led to the discovery of 27 Mesolithic, 7 Bronze age and 1 Iron age sites. The watershed extends for some thirty kilometres between Lake Iseo to the west and Lake Idro to the east. In this region, deeply modelled by glacial action, core samples have been taken from 12 sedimentary basins, from which some sixty radiocarbon dates have been obtained so far. The principal aims of the project have been to place the Mesolithic and later occupations associated with these peat mires and lakes in an environmental context; to understand the timberline variation between the Late Glacial and the beginning of historical times, and to establish a chronology of vegetation change in this region for the Holocene.

Three sites have been excavated so far: Vaiale, Rondeneto and Laghetti del Crestoso (fig. 1).

1) Vaiale

Vaiale is at an altitude of 830 metres, on the right bank of the river Abbioccolo at its confluence with the river Valle della Spina, some 7 kilometres, as the crow flies, to the west of Lake Idro (fig. 2). Excavations were conducted over a surface of 36 square metres. The Mesolithic sites, probably to be attributed to the Sauveterrian Culture, produced 138 flint artefacts among which were one hypermicrolithic scalene triangle, microburins, cores and core trimmming flakes and shatters. The material which is slightly weathered was mainly concentrated over a surface of 15 square metres. The Mesolithic site was later eroded and partly destroyed by Iron age activity as demonstrated by the presence of an erosional channel containing potsherds and charcoals from which three radiocarbon dates have been obtained: GrN-19591 (2100±70 BP); GrN-19592 (2200±40 BP) and GrN-18988 (2405±35 BP).

To the north of the site lies a small peat-basin from which a date (GrN-18988) of 1790±50 BP was obtained from the basal level at 100-96 centimetres, indicating that the peat started to accumulate in the historical period.

The analysis of about 400 fragments of charred wood from the erosional channel (Iron age) gives a picture of pine/beech wood (*Pinus sylvestris/mugo*, 63%; *Fagus sylvatica* 29%) with minor frequences of a few mixed woodland species, including ash *(Fraxinus excelsior)*, elm

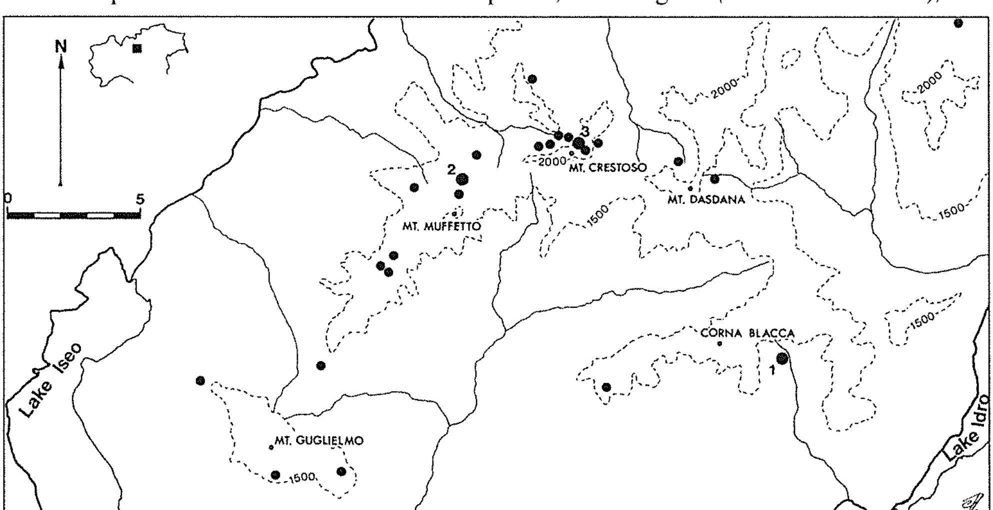

Fig. 1 - Distribution map of the Mesolithic sites so far discovered along the Valcamonica-Valtrompia-Valsabbia watershed. 1) Vaiale, 2) Rondeneto, 3) Laghetti del Crestoso.

(Ulmus), maple *(Acer)* and hornbeam *(Carpinus).* No elements related to cultivation were found; however, a few seeds of weeds (Labiatae) were collected from the sample by flotation. Some fragments of hazelnut shells *(Corylus avellana)* are the only remains related to the human food consumption.

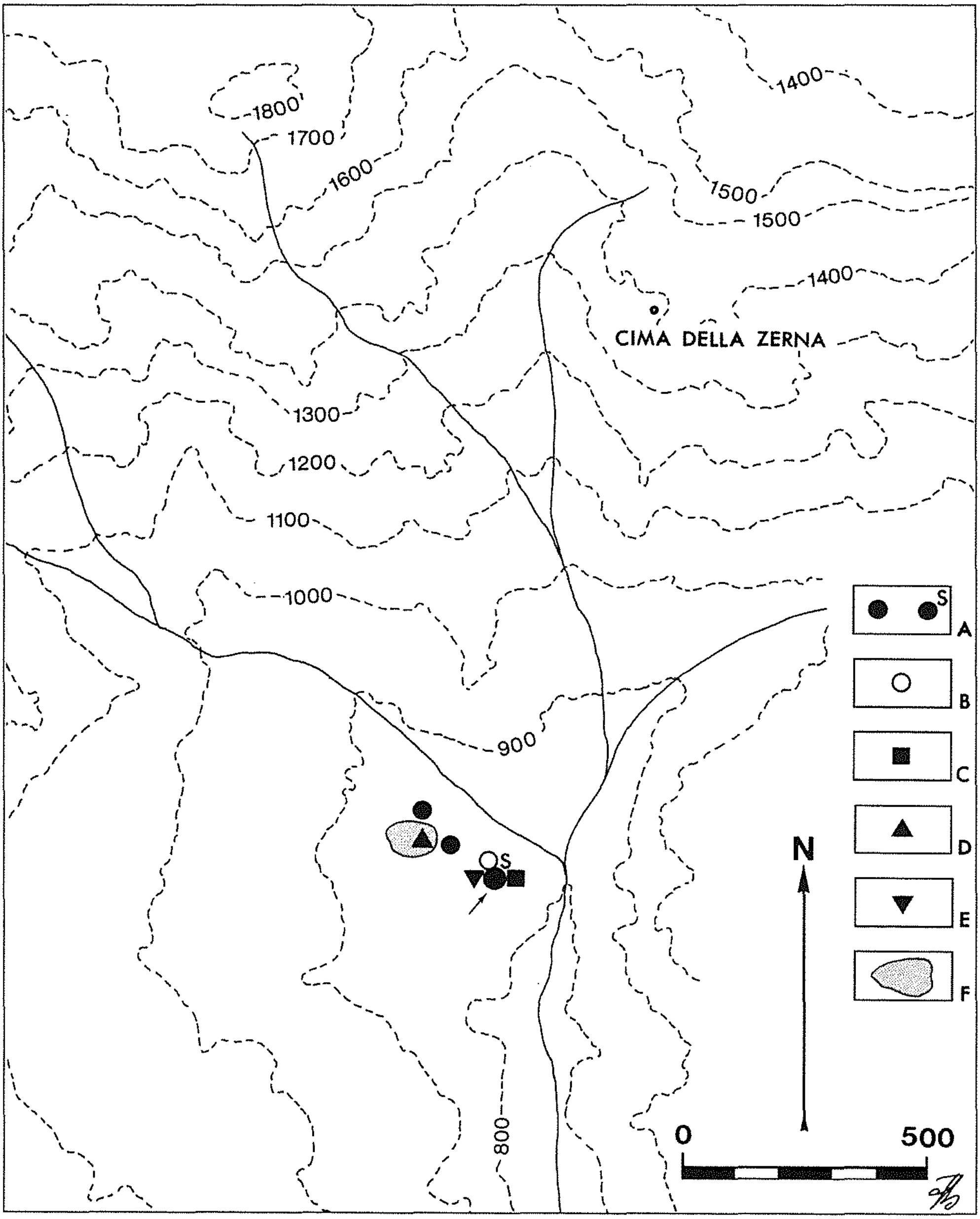

Fig. 2 - Vaiale, site location (arrow). A) Mesolithic sites (S=Sauveterrian), B) Iron age site, C) soil sampling, D) pollen sampling, E) charcoal sampling, F) peat basin.

2) RONDENETO

The site of Rondeneto is located in middle Valcamonica at an altitude of 1780 metres (fig. 2). Excavations of this site revealed that a Mesolithic «band» of the Sauveterrian Culture settled there around the beginning of the Boreal climatic period. This has been confirmed by a

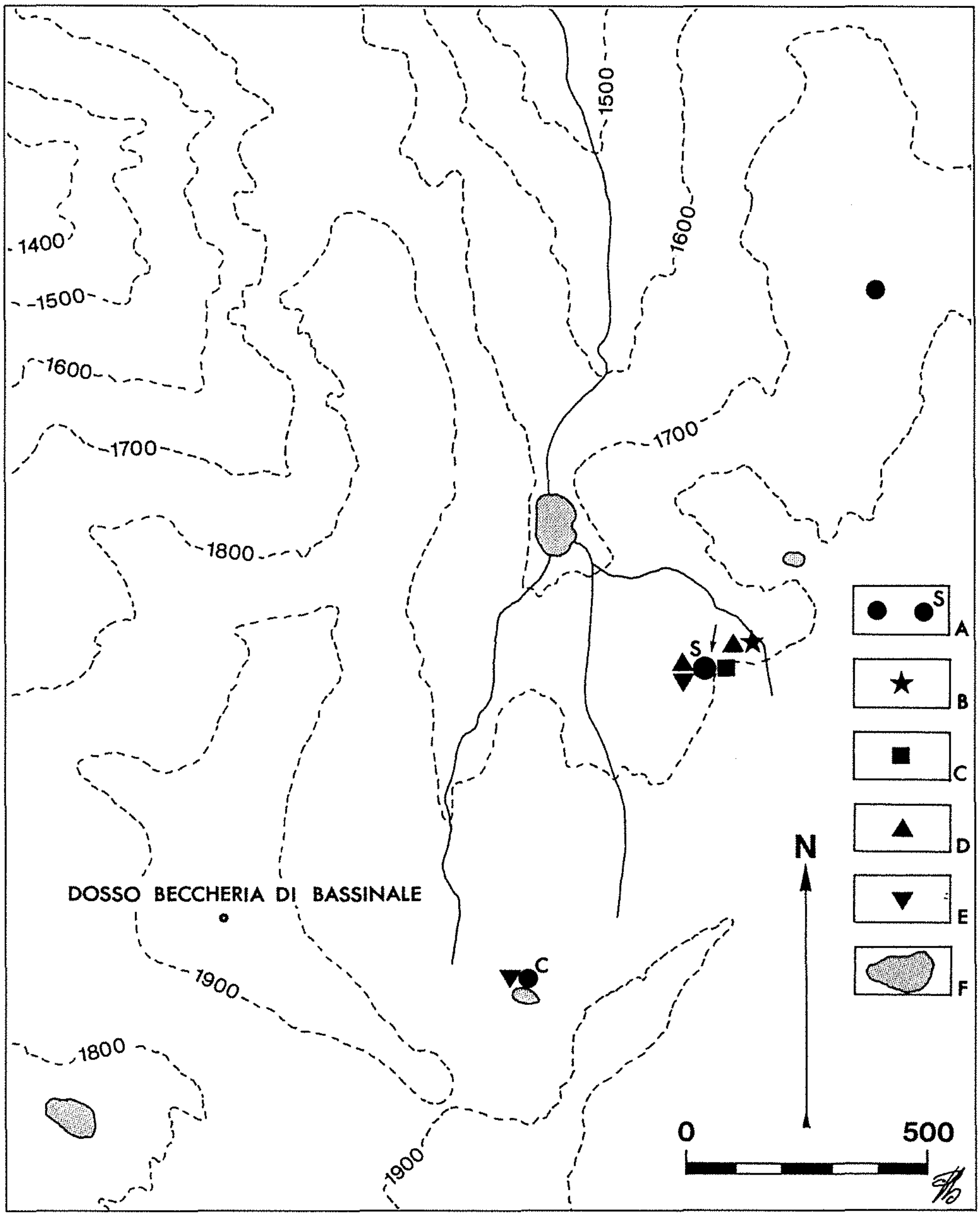

Fig. 3 - Rondeneto, site location (arrow). A) Mesolithic sites (S=Sauveterrian, C=Castelnovian), B) entomological sampling, C) soil sampling, D) pollen sampling, E) charcoal sampling, F) small basins.

radiocarbon date of 8880±150 BP (GrN-19590). The associated flint assemblage was distributed over six square metres around a small fireplace made entirely of spruce *(Picea)* and larch *(Larix)* charcoal. In this context were found several charred round sporangia from the fern *Botrychium lunaria*. These have seasonal connotations and may indicate summer occupation of this site.

A total of 165 artefacts including hypermicrolithic scalene triangles, backed blades and points, side scarpers, microburins and one core were recorded *in situ*. Some 200 more shatters, coming from two square metres around the fireplace were collected by water sieving at 0.5 millimetres mesh size, indicating the local manufacture of flint tools. The artefacts at the top of a podzolic soil horizon were later covered by peat accumulation, the lowermost level of which gave radiocarbon dates of 2780±25 BP (GrN-19587) and 2830±50 BP (GrN-19812).

A few metres to the north of the site, a relatively thick deposit of peat was discovered in 1990. This lies on a sequence of lacustrine silts and banded organic layers, one of which, 10 centimetres above the bedrock, gave a radiocarbon date of 10560±120 BP (GrN-19589). Pollen analysis has shown that whilst the area around the site at this date was an open herbaceous community, at low altitudes, *Pinus* was dominant. This has also been evidenced at other sites such as Laghetti del Crestoso (Scaife, 1991). Peat accumulation at this site started around the end of the ninth millennium BP: 8170±80 BP (GrN-19813) and 7900±60 (GrN-19588). The levels above produced the remains of a well-preserved spruce forest attributed to the Atlantic period on the basis of two radiocarbon dates (GrN-18252: 7710±50 BP and GrN-18253: 7175±50 BP). Macro-remains are mostly from well-preserved cones, branches and stems of *Picea excelsa*. Palynological data similarly show the local dominance of *Picea* at this time.

3) Laghetti del Crestoso

The only excavated site of the late Mesolithic Castelnovian Culture is that of the Laghetti del Crestoso at an altitude of 2000 metres (fig. 4), while three more sites of this culture have recently been recognized by surface finds at San Glisente (2000 m), Stanga di Bassinale (1880 m) and Cascina Val Maione (1780 m).

In many cases, these high-altitude sites show definite concentrations of charcoal associated with flint implements. Apart from those already mentioned (Rondeneto, Crestoso), three other early Holocene sites have provided palaeovegetational information through charcoal analysis, i.e. Laghetti di Bruffione (1790 m), Stanga di Bassinale (1880 m) and Laghetti di Ravenole (1943 m). All these sites show the presence of *Picea* and *Larix* wood, with charcoal generally originated from stem wood and in some cases with evidence of fungal attack (Ravenole).

The site of Laghetti del Crestoso is located on the northern shore of a peat-lake basin (Baroni *et al.*, 1990). It was excavated between 1987 and 1989 over a surface of 50 square metres. It produced 12 structures including fireplaces, pits and postholes; 650 flint artefacts of exotic provenance were recorded *in situ*, mainly distributed around a large fireplace (structure 1) dated to 6790±120 BP (HAR-8871). Structure 10, a pit filled with charcoals of *Pinus sylvestris/mugo* and *Picea/Larix*, gave an almost identical date (GrN-18091: 6870±70 BP). The presence of *Laburnum* and *Betula* charcoal in other areas of this site raises the crucial problem of the fluctuation of the upper tree-line since the first Holocene aforestation. At this site, dating of peat at horizons containing microscopic charcoal in the pollen core profile taken from the corrie basin at 230-236 cm (Beta-35217: 6680±180 BP), has been correlated with radiocarbon dates from charcoal excavated from the occupation area. As noted in earlier work (Scaife, 1991) there was no apparent effect of this Mesolithic activity on the environment that has been seen in the pollen data. This is, however, not surprising since it is considered likely that these sites were ephemeral encampments along the fringes of the upper tree line; that is in the ecotonal belt (between lower woodland and upper montane grassland) which may have been used for hunting purposes.

DISCUSSION

1) The Mesolithic

For the early Sauveterrian Mesolithic, corresponding to the Preboreal and Boreal periods, interpretation of the environment is problematic because of the absence of peat and sediment accumulation spanning this period. This is highlighted by the study of the Rondeneto site and associated peat/sediment basin. It is now widely recognised that peat or lacustrine accumulations spanning the early Holocene are rare in north west Italy and adjacent areas (DE BEAULIEU, 1977; CRUISE, 1990; PONEL and LOWE, 1992) and this is the case in this study region. At Crestoso and Rondeneto, Late Glacial sediments are present. Palynological analyses typically show the dominance of *Pinus* at lower altitudes and an open herbaceous environment in the montane zone. With the onset of Holocene conditions, there was a cessation of sedimentation. This can be viewed in terms of possibly (a) stabilisation of the interfluve soils by *Betula* and *Pinus* especially at lower altitudes and (b) dry climatic conditions negating peat accumulation and causing the drying out of lake basins. Because of the general absence of sediments of early Holocene age (Pre-Boreal/early Boreal) in the smaller high altitude basins over a wide

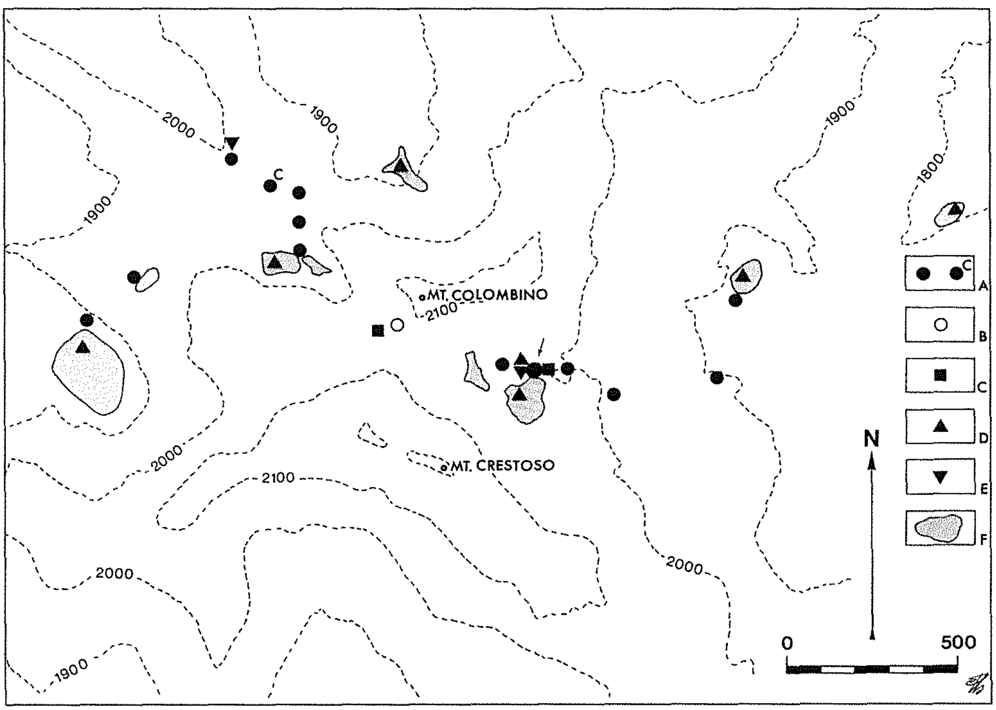

Fig. 4 - Distribution map of the Mesolithic and later finds around Laghetti del Crestoso (arrow). A) Mesolithic sites (C=Castelnovian), B) Bronze age arrowhead, C) soil sampling, D) pollen sampling, E) charcoal sampling, F) peat basins.

geographic area, the second of these possibilities is considered more likely. At Crestoso, radiocarbon dating of the basal levels makes this point clear with a marked hiatus present in the profile between 265-267 and 274-280 centimetres for which C14 dates of 7630±300 BP (GrN-18094) and 9590±180 BP (Beta-35219) respectively, have been obtained. A similar situation occurs at Rondeneto where pollen analysis of the basal sequence of laminated silts and organic layers, dated to 10560±120 BP (GrN-19589) shows characteristic dominance of *Pinus* woodland at the end of the Late Würmian Glacial. This is overlain by peats dated to 8170±80 (GrN-19183) and 7900±60 BP (GrN-19588), thus giving a hiatus of more than 2000 years spanning the Pre-Boreal and most of the Boreal periods.

In more extreme cases, topographically suitable basins for organic accumulation have been cored and radiocarbon dates show that organic accumulation principally occurred during the period 8000-6000 BP at the majority of sites examined. Shallower peat sequences have not at this stage been fully examined, except for Vaiale, but as with stratigraphical changes in sites listed in table 1, it is expected that peat accumulation started at a later date and possibly in response to both climatic deterioration and local anthropogenic factors.

From table 1 below, it is apparent that peat and organic lacustrine sediments started to accumulate from the period *ca.* 8000 BP onwards. There is no uniform date for this and the dates show asynchroneity. Suggestions that initiation of the peat accumulation may have resulted resulted from anthropogenic activity by Cruise (1990) in Liguria and from work in Britain (Moore and Willmott, 1976; Scaife, 1980; 1987) seem unlikely for the Mesolithic period although local effects on mire ecology have been noted in upland zones of Europe (Simmons *et al.*, 1975). Later prehistoric deforestation with consequent reduction in evotranspiration rates, higher ground water table and increased surface run-off, may have been responsible for localised peat formation in topographic basins.

Table 1 - 14C dates obtained for the initiation of peat accumulation in selected sites of the Valcamonica-Valtrompia-Valsabbia watershed.

Site name	Altitude	Sample depth	Date BP	Date cal BC/AD	Lab number
L. Rondeneto	(1780 m)	(90-92 cm)	8170±80	7290 (7190, 7140, 7120, 7060) 7036	GrN-19813
		(90-92 cm)	7900±60	6994 (6690, 6680, 6660) 6605	GrN-19588
L. Rosellino	(1875 m)	(379-384 cm)	7890±150	7009 (6650) 6486	GrN-18249
L. Crestoso	(2000 m)	(265-267 cm)	7630±300	6756 (6450, 6440, 6430) 6169	GrN-18094
L. Ma	(1880 m)	(140-145 cm)	7580±110	6465 (6410) 6423	GrN-18983
L. Dasdana	(1875 m)	(118-122 cm)	6400±130	5440 (5320) 5229	Beta-35223
Dosso dell'Asino	(1830 m)	(68-69 cm)	5820±45	4768 (4712) 4612	GrN-18089
L. Gabbia	(1900 m)	(244-250 cm)	5160±100	4040 (3970) 3808	GrN-18987
San Glisente	(1975 m)	(96-100 cm)	3270±70	1619 (1520) 1442	GrN-19657
L. Vaiale	(850 m)	(95-100 cm)	1790±50	213 (244) 329	GrN-18988

Understanding the earlier Mesolithic environment, is a problem since no suitable polliniferous deposits spanning this period have yet been found in this region at these altitudes. It is, however, possible that this period of Alpine aridity and higher temperatures during the period 9500-8000 BP may have presented conditions suited to Mesolithic exploitation of the high montane zone. At present it is not clear to what altitude woodland reached. However, given suitable phytogeographical parameters (refugia, migration rates and soils) it is likely that woodland may have reached higher altitudes than previously suspected for the early Holocene.

This must, however, remain speculative until suitable organic accumulations are found in areas where local hydrological conditions allowed peat/lacustrine sediment accumulation. Effects of man on the vegetation as noted above have not yet been seen in the pollen record even though peat/lake basin sites examined have archaeological material in close proximity. A number of peat basins have, however, yielded detailed pollen data which span the period of Castelnovian activity. These data suggest that encampments were ephemeral and seasonal and were influenced by the presence of freshwater supply and proximity to the ecotonal belt of the upper tree line offering better hunting potential.

2) The later prehistoric period

No high altitude Neolithic or Copper age site has been discovered in this region so far. On the contrary, several flint arrowheads have been collected from the surface from footpaths along the watershed at altitudes between 1700 and 2100 metres. This may indicate that some of the actual paths were already being used by the beginning of the fourth millennium BP. Of particular interest is an Early Bronze age site at an altitude of 1750 metres just to the east of the region under study. A site discovered in the late 1960's, close to a spring along the southern slopes of Monte Tombea, yielded several bifacial sickle blades, arrowheads and a few potsherds, probably indicating the presence of a terraced site. Along with the cultural remains, large pieces of charred woods provide evidence of an alpine wood dominated by larch *(Larix)*. From one fragment of *Cytisus alpinum* it is suggested that there were locally open areas, possibly close to the upper fringe of the woodland. Evidence of Iron age activity is attested only from two sites: Vaiale (830 m) and San Glisente (2000 m). The latter produced only one fireplace with charcoal of *Pinus sylvestris/mugo* along the footpath section. This has been dated dated to (GrN-18980) 2895±35 BP.

CONCLUSION

To date, the evidence available from both archaeological and archaeobotanical data indicates that human activity along the watershed spans the period between the Late Würmian Glacial and the Iron Age. The majority of sites so far discovered are late Mesolithic, Castelnovian encampments, even though early Boreal camps, such as that of Rondeneto, are also attested. No traces of human occupation are known for the period between the Neolithic and the beginning of the metal ages. Sporadic archaeological finds indicate that Bronze age hunters travelled along the watershed during the first half of the fourth millennium BP even though no traces of their passage are recorded in the pollen diagrams. Forest clearence by Iron age communities is documented from the middle altitude site of Vaiale that led to the disturbance of a previous early Mesolithic site.

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POLLEN ANALYSIS OF THE RONDENETO MESOLITHIC SITE AND DATING OF PEAT ACCUMULATION IN THE VALCAMONICA REGION (NORTHERN ITALY)

SUMMARY – *Pollen analysis of the Rondeneto Mesolithic site and dating of peat accumulation in the Valcamonica region (northern Italy).* Excavation of the early Holocene (Sauveterrian) site of Rondeneto has been carried out in conjunction with environmental analyses including pedological and sedimentological studies, plant macrofossil, radiocarbon and pollen analysis. This contribution provides pollen data obtained from the analysis of the 'on-site' podzolic soils and from an adjacent sedimentary basin. Vegetation data for the late Würmian and early to middle Holocene is presented. Radiocarbon dating has drawn attention to a hiatus in sediment/peat deposition which occurred in the earliest phase of the Holocene.

RIASSUNTO – *Analisi polliniche nel sito Mesolitico di Rondeneto e datazione dei depositi torbosi della Valcamonica.* Lo scavo del sito Mesolitico Sauveterriano di Rondeneto è stato condotto nel quadro di una serie di indagini ambientalistiche comprendenti analisi pedologiche e sedimentologiche, antracologiche, polliniche e radiometriche. Questo lavoro riguarda le serie polliniche dell'accampamento Mesolitico e dei sedimenti individuati nel bacino adiacente. Vengono presentati i risultati dello studio dei depositi tardiglaciali e dell'Olocene antico e medio. Le datazioni radiometriche hanno permesso di riconoscere uno iato, nella formazione torbosa, da attribuire all'inizio dell'Olocene.

INTRODUCTION

BIAGI *et al.* (1994) have discussed recent archaeological excavations which have been carried out in the watershed bounded by Valcamonica, Valtrompia and Valsabbia of the southern Alps in northern Italy. One of the principal sites investigated is that of Rondeneto, an early (Sauveterrian) Mesolithic occupation site in middle Valcamonica. This site is at an altitude of 1780 metres (fig. 1a) and was excavated in 1992. The occupation site was typically found in close proximity to a water source in a small topographic basin; in the latter, Late-Würmian and Holocene sediments and peat have accumulated.

Samples for pollen, plant macro-fossil analyses, insect and radiocarbon dating have been taken from these Holocene peats and palaeo-lacustrine sediments (fig. 1b) and from the archaeological excavation of the early Mesolithic site. The analyses of these sequences forms part of a broader regional study of Holocene vegetation and environmental change of the region which focuses on the environment of Mesolithic occupation and altitudinal fluctuations of the

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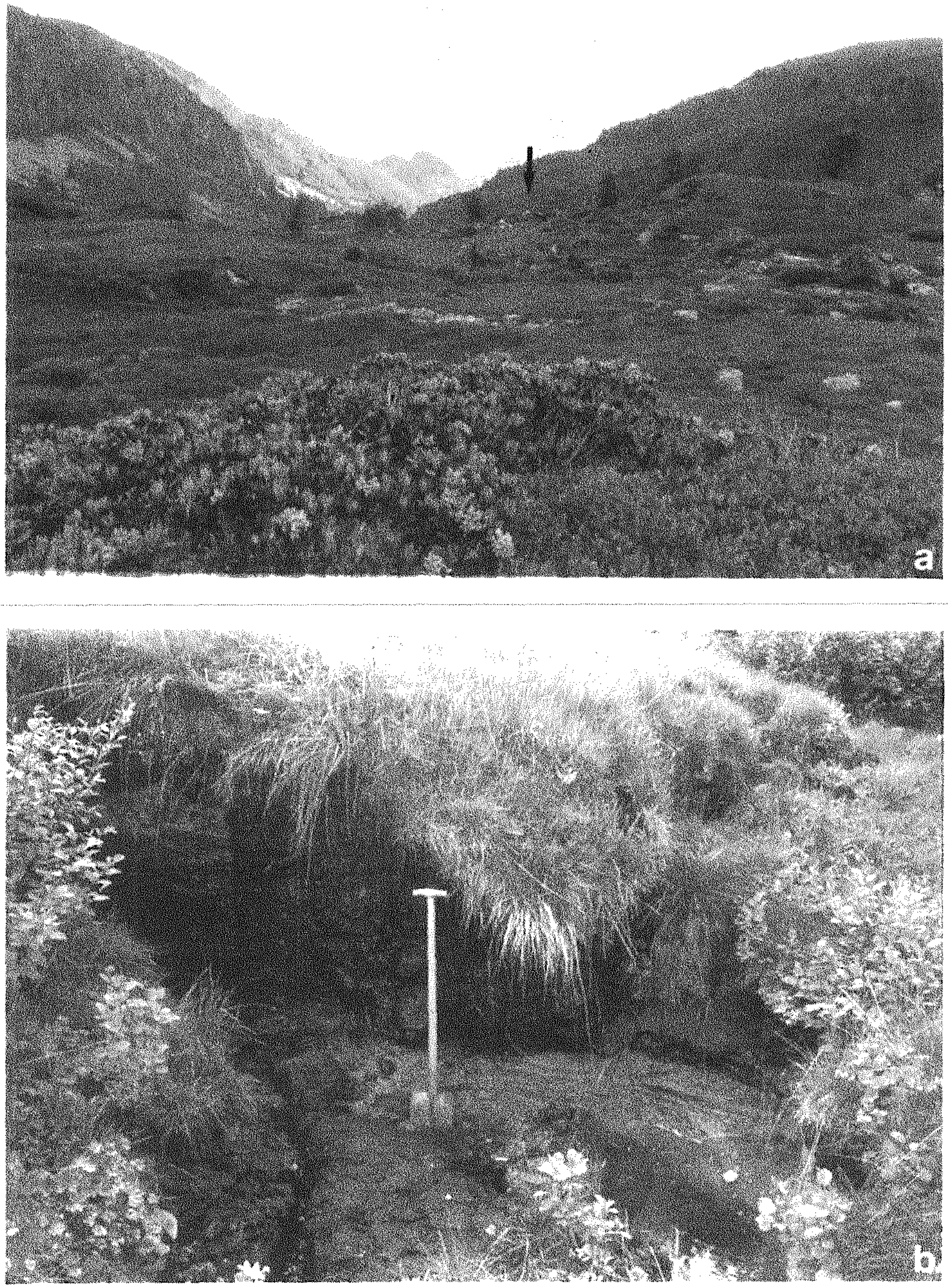


Fig. 1 - Location of the Mesolithic site (arrow) of Rondeneto (a) and Pollen Section 1 (b) *(photos by P. Biagi).*

upper limit of the growth. A radiocarbon dated chronology of vegetation changes is being constructed from a number of these high altitude topographical basins containing Holocene peat and sediments. These include Laghetti del Crestoso, Lago Ma, Lago Dasdana, Vaiale, Lago Rosellino and Dosso dell'Asino. The close proximity of Mesolithic sites to a number of these sediment basins also enables in some cases the study of the «on-site» pollen sequence with those obtained from a longer temporal sequence of the lacustrine sediments and organic peats. Data from Laghetti del Crestoso have previously been presented (Scaife, 1991). Here, new pollen data backed by radiocarbon dates are examined for the site of Rondeneto located in middle Valcamonica at an altitude of 1780 metres.

METHODOLOGY

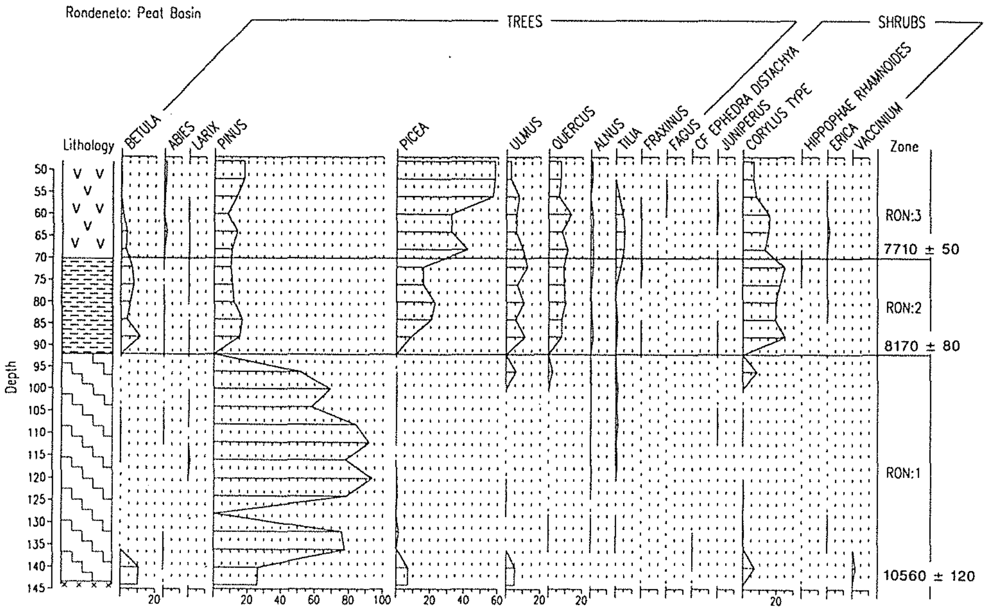
Samples for analysis were taken from open sections in the archaeological excavation and from a stream-cut gully through the peat and sediment basin. Standard pollen extraction techniques were used for the concentration of the pollen and spores (Moore *et al.*, 1991). This included treatment with NaOh; HF and Erdtmans' acetolysis. Identification and counting was carried out at x400 and x1000 with phase contrast facility. These analyses were carried out in the Quaternary Environmental Change Research Unit of the Department of Geography, University of Southampton, England. A summary of the pollen data is given here and full data will be provided at a later date. Pollen diagrams (figs. 2 and 3) derive from a pollen sum of 500 grains minimum with calculations based on percentage of total pollen and spores as a percentage of total pollen plus spores.

POLLEN ANALYSIS AND THE VEGETATIONAL RECORD

Pollen analysis has been carried out on two sections. Section 1 consists of sediments which rest on coarse grit and sand of glacial origin (fig. 1b). These fill a shallow topographical basin formed by glacial scouring. Overlying the silts are organic muds and fibrous peats containing monocotyledonous and detrital material with a distinct horizon of abundant, buried tree trunks and macrofossil cones of *Picea*. Radiocarbon dating places the beginning of peat accumulation to 8170±80 BP (GrN-19813) and 7900±60 BP (GrN-19588) with the forest horizon at 7710±50 BP (GrN-18252) to 7175±50 BP (GrN-18253). Pollen section 2 is a 26 cm deep soil section lying up-slope of the peat bog (section 1) and in the area of the Mesolithic encampment. The sequence comprises basal grey sand and silts of a podzolic soil which is sealed with a veneer of dark black, highly humified detrital peat. Of value was a Mesolithic microlith found in the section used for pollen analysis. This occurred in the top few centimetres of the podzol and the relationship between the archaeology and the pollen sequence is discussed below. The vegetation history and character of these two sites are described in more detail as follows:

Section 1: the Rondeneto basin peats and sediments

Five major stratigraphical divisions are present from the base of the profile at 144 cm to



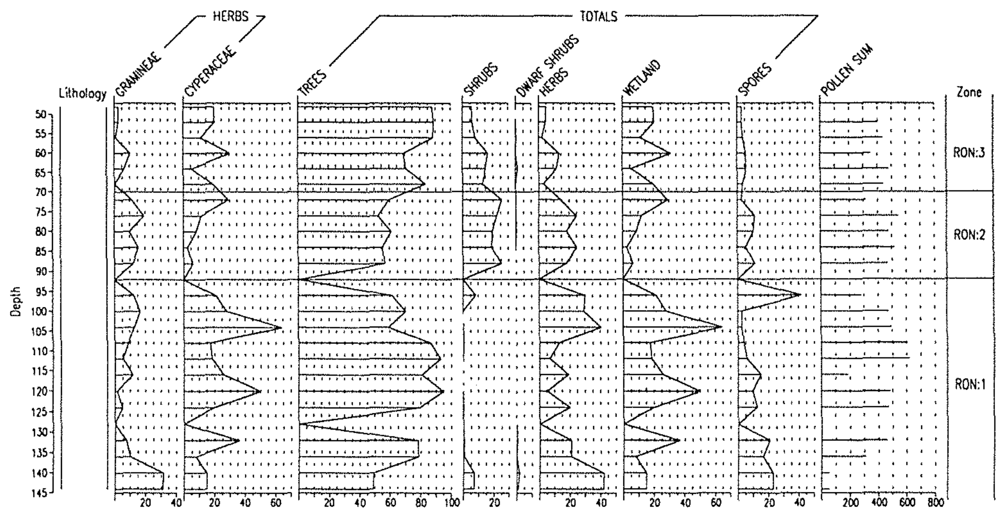


Fig. 2 - Pollen diagram (selected taxa) from the Rondeneto corrie basin.

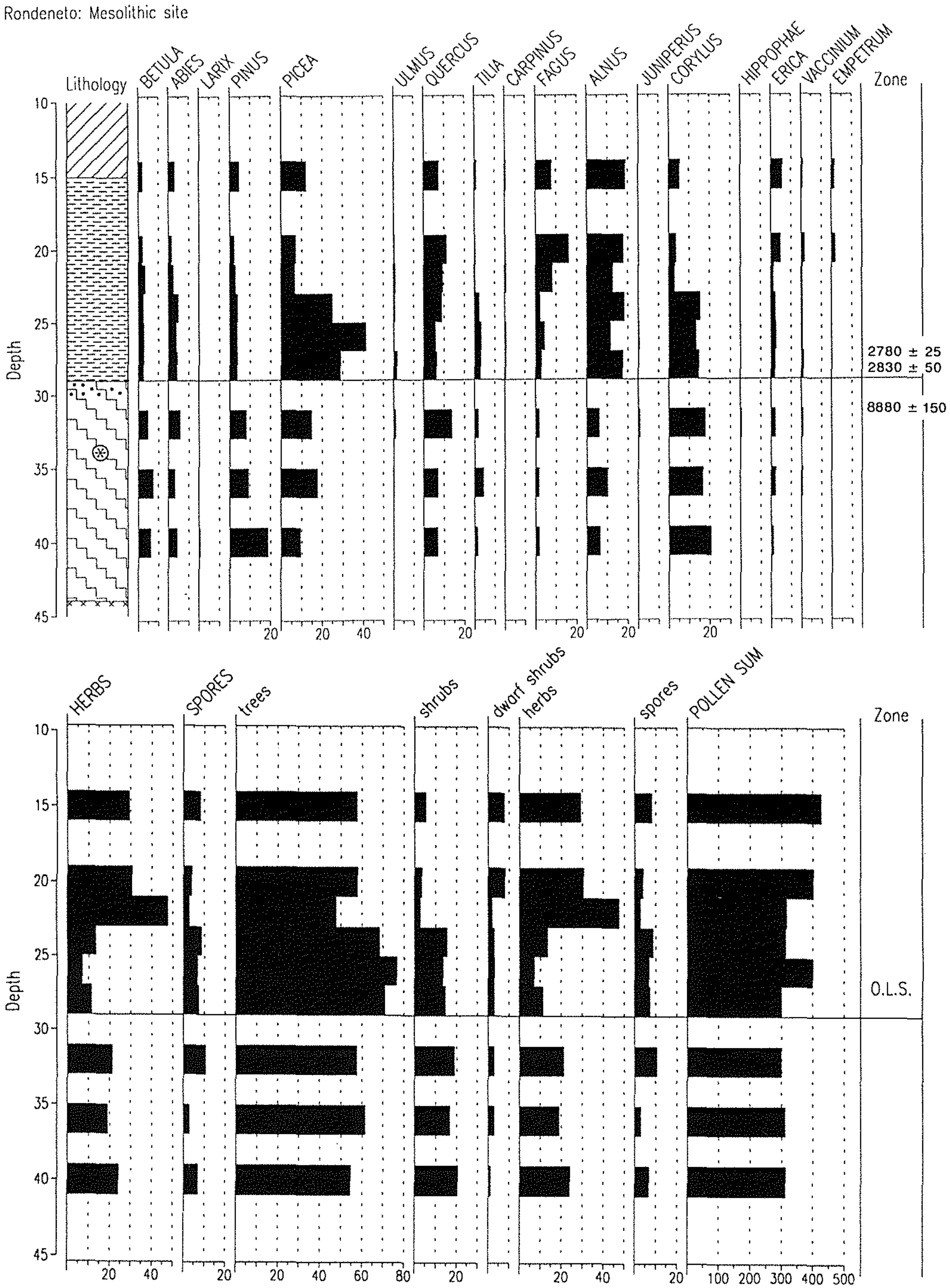


Fig. 3 - Pollen diagram (selected taxa) from the Rondeneto Mesolithic site. Asterisk indicates the microlithic artefact.

the present mire surface. The principal characteristics and radiocarbon dates of the stratigraphy and transitions are as follows:

144-136 cm: Coarse sand and grit; friable with pink inclusions: rotted bedrock?

136-92 cm: Light grey, fine-medium silt with banding of darker (grey) horizons 1-2 cm thick. A radiocarbon date of 10,560±120 BP (GrN-19589) was obtained from wood at 135 cm.

92-70 cm: Transition spanning 5 cm to highly organic detrital peats and ?freshwater muds containing monocot. debris. Transition to these organics at 90-92 cm has been dated to between 8170±80 BP (GrN-19813) for the residue fraction and 7900±60 BP (GrN-19588) for the extract.

70-34 cm: Forest horizon with tree trunks, branches and *Picea* cones in brown detrital peat matrix. The horizon is bracketed between 7710±50 BP (GrN-18252) and 7175±50 BP (GrN-18253) for the lower and upper levels respectively. GrN-18253 is for wood.

34-0 cm: Fibrous monocot. peat; dark brown to surface. Upper 20 cm penetrated by roots from present vegetation. Dated between 12-14 cm at 3435±50 BP (GrN-18254).

Pollen data presented here concentrates on the lower part of the pollen profile. These data are displayed in fig. 2 spanning the depth from 50 cm to the base of the profile (140 cm) at 4 cm intervals. The complete diagram will be published subsequently in association with data from other sites forming part of this regional analysis. Three pollen assemblage zones have been recognised.

Pollen Zone RON:1 (145-92 cm): This zone corresponds with the basal inorganic deposits. Pollen assemblages are dominated throughout by *Pinus* which attains high values (to 90% of total pollen). There are few other trees with only sporadic representation of *Betula, Abies, Larix, Picea, Ulmus, Quercus, Alnus* and *Tilia*. Non arboreal pollen forms up to 40 % (TP) at 104 cm and 140 cm. These comprise Gramineae, Cyperaceae, Compositae, Liguliflorae and Tubuliflorae and Caryophyllaceae (*Dianthus/Silene* type). Spores of ferns, *Botrychium lunaria*, and monolete *Dryopteris* type are important.

Pollen Zone RON:2 (92-70 cm): *Pinus* values decline sharply from the previous zone whilst values of *Betula* (10%), *Picea* (to 22%), *Ulmus* (10%), *Quercus* (10%) and *Corylus* type (25%) become important. Herbs remain dominated by taxa noted in the previous zone. Spores of *Botrychium lunaria* occur only sporadically.

Pollen Zone RON:3 (70-50 cm): This zone is characterised by a decline in *Betula* and *Corylus* type but marked increases in *Picea* (to 58%), *Tilia* (to 65%) and Cyperaceae (to 30%). This pollen assemblage zone corresponds with the «forest» layer.

DISCUSSION: THE MESOLITHIC

There is a clear distinction between the lower pollen assemblage zone RON:1 and zones RON:2 and RON:3 above. Pollen assemblage zone 1 has been C14 dated at 135 cm to 10560±120 BP GrN-19589. The stratigraphical characteristics of the pollen zone 1 are similarly commensurate with a late-glacial age for the sediments which are in general low in organic content but show distinct banding. Pollen evidence clearly illustrates the importance of *Pinus* at this time and has similarly been noted at other sites such as Laghetti del Crestoso (Scaife, 1991). The long distance transportation abilities of pine pollen may, however, indicate that this represents growth at lower altitudes and at some distance from the site; that is pollen transported by up-drafting from lower altitudes. The local vegetation comprised open herbaceous grassland on drier soils surrounding the sediment basin with wetland habitats adjacent to the basin and in flush areas. The environment of deposition of these sediments appears to have been a shallow water lacustrine habitat which suffered periodic drying out (hence relatively poor pollen preservation in some levels). The basal level (140 cm) shows some differences from the rest of this zone. This difference corresponds with the «grit» lower level of the stratigraphy. The presence of pollen of *Betula, Picea, Ulmus,* and *Corylus* type is tentatively attributed to contamination from the relatively free passage of water through this lower stratigraphy.

The transition to peat at 92 cm represents a major temporal hiatus in the lithostratigraphy and biostratigraphy. The absence of pollen at 92 cm possibly results from cessation of sedimentation and drying out of the upper sediment levels which resulted in oxidation and destruction of the pollen. This lapse in sediment accumulation may have occurred at the start of the Holocene when tree migration (*Betula* etc.) stabilised the interfluves with a consequent reduction of sediment transfer to the basin. It appears that early Holocene vegetation succession is absent here. This phenomenon has been noted elsewhere (Cruise, 1990; Ponel and Lowe, 1992) and in this region at Lago d'Iseo (Bertoldi and Consolini, 1989) and Laghetti del Crestoso (Scaife, 1991) where early Holocene sediments are similarly not present until the late Boreal or Atlantic periods. This absence may be attributed to an early Holocene period of reduced precipitation (Cohmap Members, 1988). Initiation of organic accumulation occurred on this surface with development of sedge mire at *ca.* 8000 BP. The vegetation of the late Boreal and mid-Holocene period is illustrated by the two pollen assemblage zones 2 and 3. RON:2 shows clearly, the range of deciduous and coniferous woodland elements present. However, it is likely that the pollen assemblages represent vegetation communities at different altitudes ie. vertical zonation. Wood remains have not been found in the peats of zone RON:2 and it is suggested that during the period of this accumulation the site was above the tree line. At lower altitudes zones of *Larix, Pinus-Picea-Abies* and *Quercus-Ulmus-Corylus* occurred. Pollen zone 3, however, is markedly different showing the dominance of *Picea* growing on and adjacent to the site from *ca.* 7700 to 7200 BP. Numerous macro fossils of *Picea* have been recovered from the forest layer of this zone. As with pollen assemblage zone 2, there is evidence of additional elements including the thermophiles, *Tilia, Fraxinus* and *Fagus.* These are similarly attributed to growth at lower altitude with their pollen being transported by anabatic winds to higher altitude. However, the higher values of these in zone RON:3 may indicate growth at higher altitudes and in closer proximity to Rondeneto.

The occurrence of a *Picea* forest zone in the peats at Rondeneto is mirrored at Dosso dell'Asino at similar altitude but which has been dated to the later Mid-Holocene period (5820±45 BP: GrN-18089). This highlights the complexity of attempting to study long term vegetation changes and chronology from the higher Alpine zone. Variations in altitude, aspect, slope steepness, soils and lithology and plant migration factors have resulted in the arrival of different woodland elements at differing time periods. It is anticipated that when analyses of sites noted above have been finished, a fuller idea of such spatial and temporal variations will have been obtained.

At Rondeneto, it is concluded that during the early Holocene (*ca.* 10000 to 8000 BP) conditions at this site were too dry for organic accumulation or deposition of lacustrine sediments. Peat accumulation started during the period *ca.* 8000-7700 BP in response to increased wetness in the basin. The cause of this seems to have been climatic through increased precipitation. Whilst anthropogenic causation has been considered, the Mesolithic occupation was at an earlier date. Initially, there is evidence of open landscape followed by migration of *Picea* into this altitudinal zone during the late Boreal from 7700-7200 BP. This is possibly attributable to warmer and drier conditions during the Boreal and the migration patterns of Picea allowing colonisation at higher altitudes than before or at present. Subsequently, in the mid-Holocene, there is a change in stratigraphy to grass/sedge peat with no evidence of trees in the peat. Pollen evidence, however, shows, that *Fagus* woodland with *Alnus, Abies* and *Picea* was growing in the in the surrounding area.

SECTION 2: THE MESOLITHIC SITE AND ITS ENVIRONMENT

Excavation of the Mesolithic site by BIAGI (1992) produced a substantial number of artefacts (see BIAGI *et al.*, 1994) attributed to the earlier Mesolithic Sauveterrian Culture radiocarbon dated from charcoal to 8880±150 BP (GrN-19590). The possibility of relating the 'on site' pollen stratigraphy to the vegetation and environment illustrated by analysis of the mire section was facilitated by the archaeological soils (acid podzol) of the site being sealed by peats of later date. Pollen analysis was thus carried out on the lower 30 cm of the soil profile. Fig. 3 is a summary diagram of the results obtained. The profile can be discussed in terms of the two major stratigraphic divisions present.

41-29 cm: This lower horizon comprises grey silt and sand resting on rotted bedrock. Mesolithic artefacts and charcoal were present especially in the upper part of this zone. This forms the Ea horizons of an acid podzol. A microlith was recovered from the pollen section at 34 cm and as with other artefacts excavated, comes from the upper few cm's of the podzol. Palynologically the soil is characterised by arboreal pollen to 60% of total pollen, shrubs (20%) and herbs (22%). Trees are dominated by *Pinus* (especially in the lowest level), *Picea* (19%) with *Betula* (8%), *Abies* (5%), *Quercus* (13%), *Tilia* (4%), *Alnus* (10%) and sporadic *Larix* and *Fagus*. There is a diverse range of herbs dominated by Gramineae but with a range of wet and dry grassland communities and heath/dwarf shrub elements represented.

29-16 cm: Comprises black, highly humified peats overlying the lower inorganic soil horizons with a sharp transition indicating a hiatus. Two radio-carbon date of 2780±25 BP (GrN-19587) and 2830±50 BP (GrN-19812) were obtained from a same sample taken from the base of the peat. Pollen assemblages are broadly similar to those of the soils below but with an increase in the abundance of *Picea* (to 40%). Tree pollen attains 75% at 26-28 cm declining upwards through the profile. Herbs become increasingly important (to 47% at 22-24 cm) with again a marked diversity of taxa representing montane herb-rich pasture. Above this peat accumulation is a modern soil profile developed in the top of the peat which has an increase of mineral content.

With regard to the Mesolithic occupation and environment of the site, two factors must be considered. Firstly, are the artefacts, soil/sediment and pollen contemporaneous, allowing interpretation of the environment. Secondly, is the period of Mesolithic habitation represented in the longer temporal sequence obtained from the adjacent peat/sediment basin? Slight variation in the vertical stratigraphical position of the Mesolithic artefacts suggests that some disturbance of the soil has taken place. Pollen may also not be directly contemporaneous with the deposition of the artefacts. If the pollen is broadly contemporaneous with the archaeology it appears that the environment was of open montane pasture just above the upper altitudinal limit of tree growth or in an ecotonal belt of open woodland and pasture. The upper woodland elements consisted of *Picea, Abies* and *Alnus* with possibly *Larix,* although pollen of the latter is not well represented in pollen spectra. Undoubtedly there was a rich herb flora also present at this altitude and as suggested elsewhere (SCAIFE, 1991) that Mesolithic cultures were utilising this upper tree zone at the boundary of the upper tree limit (ecotonal area) for hunting and seasonal habitation.

Radiocarbon dating has shown that the period of occupation relates to the period of climatic dryness during the early Boreal period which caused a hiatus in peat/sediment accumulation in the adjacent basin (ie. between pollen zone 1 and 2). This period of dryness also noted in Liguria (Cruise, 1990) and the northern Appenines (Ponel and Lowe, 1992) and was possibly favourable for human occupation at this altitude. Furthermore, the pollen spectra from section 2, correlate with pollen assemblage zone 2 in section 1 showing growth of *Betula, Pinus, Picea, Quercus, Alnus* and *Corylus* but with a strong herb component. The peat overlying the archaeological contexts has been dated to 2780±25 BP (GrN-19587) and 2830±50 BP (GrN-19812) and there was thus a substantial time-span between the dated archaeology and the formation of late Holocene peat. At present, it is concluded that the soil is a truncated podzol and the contained pollen is that which has accumulated through progressive downward mixing through the soil (Dimbleby, 1985). As the buried land-surface may have been exposed for a long period after Mesolithic habitation, it is likely that the pollen contained in the soil may post-date the period of occupation.

CONCLUSION

Sediments dated to the end of the last glacial have been found in a number of topographic basins. Dry climatic conditions during the early Holocene prevented peat accumulation and caused lakes to dry out. This period was perhaps suited to high altitude Mesolithic occupation. The vegetation environment at these altitudes is thus, not yet understood in the region under discussion although it is hoped that suitable sites will be found. From researches in other regions where hiatuses also appear, it seems that this is a widespread phenomenon which should be considered when examining early Holocene pollen profiles (see Biagi *et al.,* 1994). Radiocarbon dating may be required to establish if such temporal hiatuses are present. Peat accumulation started from *ca.* 8000 BP in response to climatic changes and increased humidity. Whilst earlier Mesolithic (Sauveterrian) sites may not be represented in peat and sediment stratigraphy, later Mesolithic sites (Castelnovian) of the Atlantic period have been found and correlated with peat sequences. Evidence to date, indicates that these cultures were utilising the ecotonal belt between the tree line and upper montane pasture. Their ephemeral encampments were sited adjacent to small lake basins in this zone. Pollen analysis of these basins indicates that their impact on the local vegetation was negligible.

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CLARE WATSON* – NICHOLAS BRANCH* and JOHN J. LOWE*

THE VEGETATION HISTORY OF THE NORTHERN APENNINES DURING THE HOLOCENE

SUMMARY – *The vegetation history of the northern Apennines during the Holocene.* Pollen-stratigraphic evidence, supported by 48 radiocarbon dates, from 17 sites in the Northern Apennines has been used to establish a general outline of vegetational change in the region during the last 14000 years. Some information is available on pre-Holocene vegetational history from 4 sites, but most of the evidence concerns the Holocene, and especially the mid to late Holocene when it is believed that the vegetation was affected by human activity. The extent of the influence of anthropogenic disturbance on the vegetation of this region is examined in more detail by Lowe *et al.* (1994) in this volume.

RIASSUNTO – *La storia della vegetazione dell'Appennino settentrionale durante l'Olocene.* Le serie polliniche di 17 siti dell'Appennino settentrionale, datate con il metodo del radiocarbonio, sono state impiegate per impostare un quadro generale dei cambiamenti vegetazionali succedutisi nella regione negli ultimi 14000 anni. Quattro siti hanno fornito informazioni riguardanti la storia vegetazionale anteriore all'inizio dell'Olocene; mentre la maggior parte dei dati riguardano l'Olocene medio e recente, quando la copertura vegetazionale appare condizionata dall'attività dell'uomo. L'incidenza dell'impatto antropico sulla vegetazione della regione viene comunque esaminata in maggiore dettaglio nel lavoro di Lowe *et al.* (1994) in questo stesso volume.

INTRODUCTION

The aim of this paper is to review the information available on the vegetational history of the northern Apennines since the end of the last glacial stage, approximately 14000 years ago. The objective is to provide a regional framework for (a) reconstructing the pattern and timing of principal vegetation changes during the Holocene, (b) assessing the influence of human activity upon the vegetation in this area, and (c) understanding the evolution of the present vegetation cover. In this paper the principal vegetation stages that can be inferred from pollen-stratigraphic data are described. The evidence for human disturbance of the vegetation is discussed in more detail by Lowe *et al.* (1994) in the subsequent paper in this volume.

The area under investigation includes the Ligurian, Emilia-Romagnan and north Tuscan Apennines (fig. 1). The sites referred to lie in the mountainous districts between Monte Antola, Liguria, and the Pavullo area in Emilia-Romagna and range from 700-1550 metres in altitude. The area is characterised by deeply-dissected terrain which rises rapidly from the Mediterranean coast, usually exceeding 500 m at 10 km inland, and reaching a maximum altitude of 2165 m

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at Monte Cimone, the highest peak in the northern Apennines. The region has a complex geology and has been affected by tectonic activity since the Pliocene. Continuing neotectonic movements trigger landslides and rock falls which are frequent in the area (GOSSEAUME, 1979). At altitudes over approximately 800 m there is evidence for glaciation during the late Quaternary, including sharply-delimited moraines and cirques which usually occur on the north side of the watershed (GRUPPO RICERCA GEOMORFOLOGIA CNR, 1982; 1988; LOWE, 1992).

At the present time woodland is discontinuous and the regional vegetation has been extensively modified by human activity. At altitudes between approximately 200 and 800 m, *Quercus* dominates woodland stands, though little woodland remains at these altitudes due to cultivation and pastoral activity. Dense *Fagus* woodland is common between 800 m and the treeline (*ca.* 1700 m) and in the upper part of this zone *Fagus* is often mixed with *Abies alba. Vaccinium* heathland forms the natural vegetation above the treeline, but this zone has been modified by pastoral activity and open grassland has replaced heathland in many areas (FERRARINI, 1982). Further evidence for modification by human activity is shown by areas of *Castanea* which are relics of cultivated woodland and also by areas of *Fagus* which appear to be of uniform age and suggest either secondary regeneration on abandoned pastoral land or some abandoned management of *Fagus* woodland. Juniper scrub is common on recently disturbed land, especially where landslips have occurred.

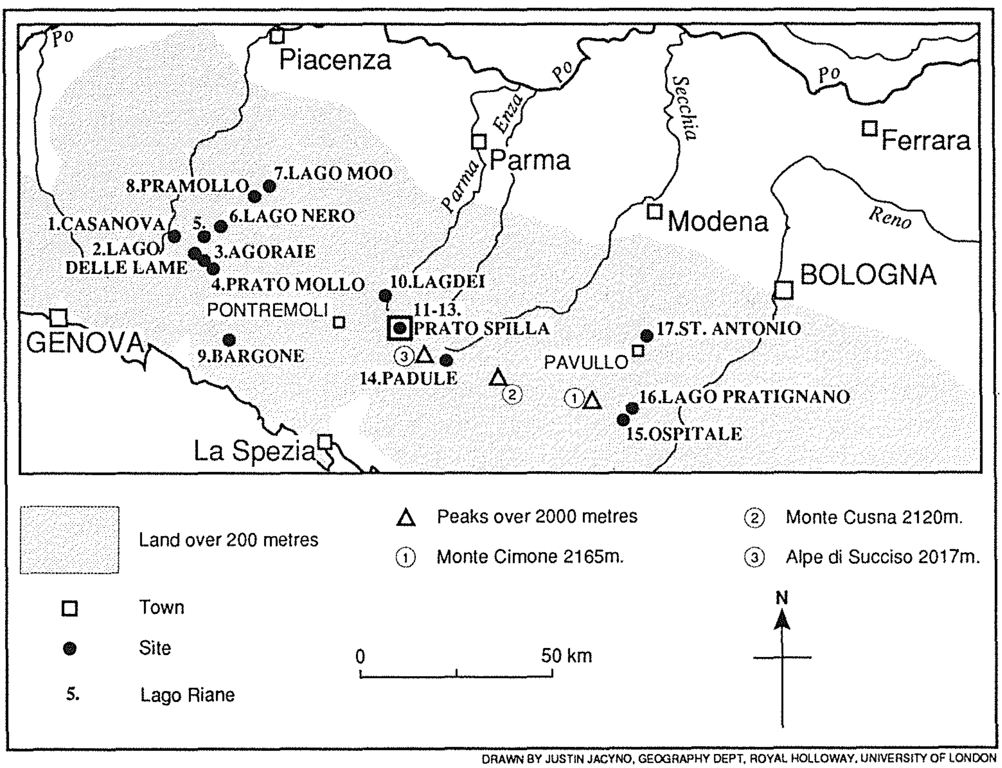

Fig. 1 - Location of study area and of sites referred to in text.

What still remains to be established is a detailed history of vegetation change and the extent and timing of the human influences. When did they begin, and what, if anything, is the natural component of the present vegetation cover? The recent pollen-stratigraphic investigations in the region have been undertaken to address questions such as these.

POLLEN STRATIGRAPHY OF THE NORTHERN APENNINES

The first attempt to summarise the Holocene vegetational history of the northern Apennines was by CHIARUGI in 1936 and was based upon some rather limited pollen data. Since then, few pollen diagrams from the region were published until the late 1970's, but in the last 20 years or so the number of published pollen diagrams has increased significantly. To date, the authors have identified 23 published pollen diagrams from sites in the region. The quality of these records, however, varies markedly.

Some of the records, for example, provide little information on the lithostratigraphy of the sites examined, relatively few pollen spectra have been obtained from the different lithostratigraphic units at some sites, pollen counts are low (usually 100 pollen grains or less per sample) and the resulting pollen diagrams provide information on only a few (normally arboreal) taxa (e.g. CHIARUGI, 1936; 1950; MARCHESONI, 1957; FERRARINI, 1962; 1981; BERTOLANI-MARCHETTI, 1963; BRAGGIO MORUCCHIO and GUIDO, 1975; BRAGGIO MORUCCHIO *et al.*, 1978; 1980). By modern standards, such information is statistically inadequate and is weakened further because a Hiller corer has been the most commonly employed sediment sampler and this machine can introduce contamination through the downward carriage of sediment. A further problem is the lack of independent dating upon which to base site comparisons and vegetational reconstructions.

Other studies, such as at La Chiggiola near Pavullo (BERTOLANI-MARCHETTI *et al.*, 1977) and Pratignano (VARI *et al.*, 1981) in Emilia-Romagna, have focused on the very recent history and the modern ecology of the sites, and therefore provide limited information on vegetation history.

More detailed information has been provided in studies of a number of sites in eastern Liguria and western Emilia-Romagna, such as Lagdei (BERTOLDI, 1980), Lago Riane (GENTILE *et al.*, 1988), Lago Moo and Pramollo (BRAGGIO MORUCCHIO *et al.*, 1991). The most detailed pollen-stratigraphical studies in Liguria have been undertaken by MACPHAIL (1988), who provided pollen diagrams for 6 Holocene sites, supplemented by 12 radiocarbon dates (see also CRUISE, 1990a and 1990b). Russian and piston samplers were used for this work, and studies of pollen concentration and degree of preservation were also included. LOWE (1992) has examined 3 sites in the Prato Spilla area of western Emilia-Romagna. This study has provided the first comprehensive, radiocarbon-dated pollen stratigraphy of the pre-Holocene sediments of the region (see also PONEL and LOWE, 1992), as well as definitions of Regional Pollen Assemblage Zones for the Holocene of the northern Apennines (LOWE, 1992). These investigations were also based upon samples obtained by Russian and piston samplers, which reduces the risks of contamination, especially important in the collection of samples for radiocarbon dating.

Three new sites in Emilia-Romagna and one in north Tuscany have been examined by

WATSON (1994; see also LOWE and WATSON, 1993), all of which were sampled using Russian and piston corers. Three of the sites provide detailed information on the Holocene, and one has a sedimentary record representing full glacial times, dating back to before 23000 BP. The pollen evidence from these sites is supported by 27 radiocarbon dates. Examination of the pollen records from cave sediments in western Liguria, as well as a re-investigation of long sediment records from sites such as Lago Riane in eastern Liguria, are presently being undertaken by BRANCH (nd).

The records available for reconstructing the vegetational history of the northern Apennines are varied in terms of the time-span represented at each site, the stratigraphic resolution achieved and the reliability of the field and laboratory methods adopted. For these reasons a number of the records have been ignored in the overview presented in this paper, and attention has been focused on those records that meet specified criteria, which are defined in the following section.

DATA SELECTION AND POTENTIAL

Of the 23 published records containing pollen-stratigraphic evidence obtained from sites in the northern Apennines, those that meet all 6 of the following criteria have been selected for detailed comparisons and the interpretation of the regional vegetational history:

1. There must be unambiguous and detailed information on the location (precise grid references) and topographic context (e.g. dimensions of basin, catchment details) of each site
2. There must be adequate information on the full lithostratigraphic succession contained in each site and on sampling methods
3. The sampling interval for pollen spectra must provide a reasonable resolution of the major pollen percentage changes within each lithostratigraphic unit
4. Pollen counts should be a minimum of 200 TLP (total land pollen)
5. Pollen diagrams should provide data for all of the main plant groups (Trees, Shrubs, Herbs, Aquatics) for all taxa recorded at 2% TLP or greater
6. The laboratory methods for pollen analysis, the pollen sums and the basis for constructing the pollen diagram must be specified and unambiguous.

The published accounts of 17 sites meet all of these criteria, and these sites are shown on fig. 1. Some of the information available on the physical characteristics and location of these sites is summarised in table 1. The sites vary in altitude from 713 to 1550 m and are of several different types, including dry bogs, active (moist) mires, peat-filled former lake depressions and present-day lakes. Table 2 summarises the time-span represented by each sediment record and the type of scientific information published so far. 'Pollen' in this table refers to standard relative pollen data.

Fig. 2 shows diagrammatically the altitudes and the approximate distances between sites. The distribution of the sites is uneven, as they are clustered in eastern Liguria (sites 1-9), western Emilia-Romagna and north Tuscany (sites 10-14), and the Pavullo area (sites 15-17).

Table 1 - Summary of local physical setting of sites selected for regional synthesis.

Site	Site Name	Altitude	Site Geology	Present day Vegetation	Site Type
1	Casanova	1056	Glacial Drift	Patches of Fagus and Juniperus	Bog, Infilled lake
2	Lago Delle Lame	1050	Glacial Drift	Picea Plantation	Peat filled depression
3	Agoraie	1335	Glacial Drift	Picea Plantation	Bog, Infilled Lake
4	Prato Mollo	1481	Serpentinite	Open Grassland and Fagus	Shallow Peat
5	Lago Riane	1279	Limestone	Fagus/Alnus associations	Bog
6	Lago Nero	1479	Glacial Drift	Abies,Pinus and Fagus	Peat Bog
7	Lago Moo	1106	Serpentinite	Grassland with shrubs	Lake
8	Pramollo	1375	Serpentinite	Coppiced Fagus and Grassland	Bog
9	Bargone	831	Landslide Debris	Grassland and Shrubs	Peat filled Hollow
10	Lagdei	1254	Glacial Drift	Mixed Abies and Fagus Woodland	Bog
11	Prato Spilla A	1550	Glacial Drift	Fagus Woodland	Bog, Infilled Lake
12	Prato Spilla C	1350	Galcial Drift	Fagus Woodland	Infilled Lake, Dry Bog surface
13	Prato Spilla D	1280	Glacial Drift	Fagus Woodland	Section in River bank
14	Padule	1187	Limestone	Fagus Woodland	Lake
15	Ospitale	1225	Glacial Drift	Abies and Fagus Woodland	Bog
16	Pratignano	1307	Sandstone	Abies and Fagus Woodland	Raised bog
17	St Antonio	713	Sandstone	Rough Grassland	Dry mire

Table 2 - Types of stratigraphic information available from selected sites.

Site	Site Name	Depth	Period Rep	C14	Types of Analysis
1	Casanova	503	0-5000	1	Pollen, LOI, Deteriorated Pollen, Pollen Concentration, Charcoal counts, Abies alba wood macrofossils
2	Lago Delle Lame	260	0-3500	2	Pollen, LOI, Deteriorated Pollen
3	Agoraie	690	0-4200	3	Pollen, LOI, Pollen Concentration, Pollen Preservation.
4	Prato Mollo	95	0-4300	2	Pollen, LOI, Deteriorated Pollen, Pollen Concentration
5	Lago Riane	790	0-7000	1	Pollen
6	Lago Nero	110	0-4900	2	Pollen, LOI, Deteriorated Pollen, Pollen Concentration, Charcoal counts
7	Lago Moo	1340	(0-8000)	0	Pollen
8	Pramollo	580	0-7000	1	Pollen
9	Bargone	382	0-8450	2	Pollen, LOI, Deteriorated Pollen, Pollen Concentration
10	Lagdei	1250	(0-11000)	0	Pollen
11	Prato Spilla A	920	0-10600	6	Pollen
12	Prato Spilla C	519	3000-12500	8	Pollen
13	Prato Spilla D	150	8500-11800	4	Pollen, Sediment Geochemistry (ICP-MS), % Organic Carbon, Beetles
14	Padule	1248	0-10000	7	Pollen, Sediment Geochemistry (ICP-MS), % Organic Carbon, Magnetic Susceptibility, X-Ray of Core
15	Ospitale	780	0-4500	2	Pollen
16	Pratignano	1544	0-5500	2	Pollen
17	St Antonio	900	> 23000	5	Pollen, % Organic Carbon

(LOI = Loss on Ignition)

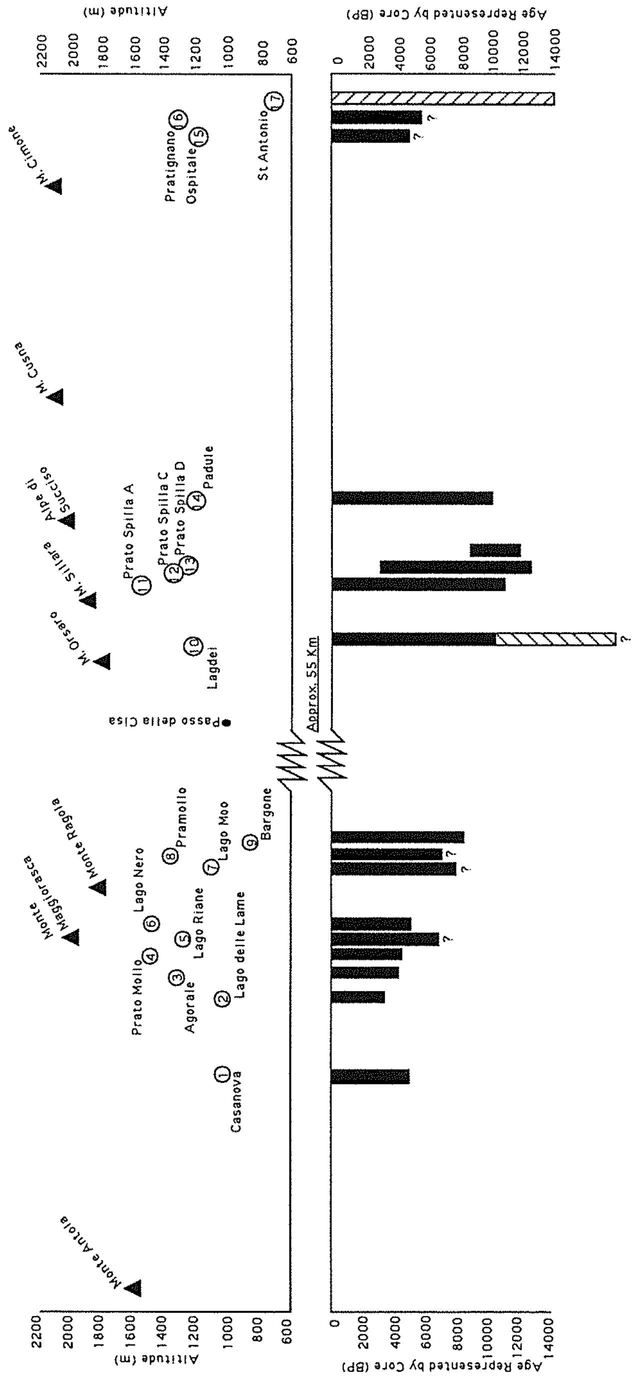

Fig. 2 - Schematic diagram showing site altitude and approximate distances between sites. The lower section of the diagram illustrates the approximate age range represented by the cores obtained from each site.

There is very little information available for two large areas, one centred on the Passo della Cisa and the other around Monte Cusna. In both of these areas extensive reconnaissance by the authors in 1991 and 1992 failed to locate sites with suitable long sedimentary records, though some minor basins with peat and/or lake sediments are known.

The lower part of fig. 2 shows schematically the approximate period represented by each sediment record. Thirteen of the sites contain Holocene sediments only, and 7 of these contain only mid to late Holocene records. The oldest sediments recovered from Liguria have been radiocarbon dated to 8450±80 BP, the date of peat initiation at the site of Bargone. In other sites in Liguria peat initiation was usually delayed until the mid-Holocene (CRUISE, 1990a), though there is some suggestion of disturbed and discontinuous Lateglacial or early Holocene sediments in the Casanova and Bargone basins (MACPHAIL, 1988). The sedimentary records from Pratignano and Ospitale in eastern Emilia-Romagna also represent the mid to late Holocene only.

Six sites provide evidence of the vegetation history of the early Holocene or earlier. The Prato Spilla A (LOWE, 1992) and Lago Padule (LOWE and WATSON, 1993) sites contain full Holocene records. The Prato Spilla C (LOWE, 1992) and Lagdei (BERTOLDI, 1980) sites contain sediment records which represent the Lateglacial period (*ca.* 13-10 ka BP), though the reliability of the results of pollen analysis of the basal section of the Lagdei record is questioned by LOWE (1992). The Prato Spilla D record is the only exposure of Lateglacial sediments known from the northern Apennines. This is an important record as the pollen evidence is supported by coleopteran data and by several radiocarbon dates based upon large samples free of the problems of sampling contamination sometimes introduced by coring (PONEL and LOWE, 1992). The record is curtailed, however, during the early Holocene, due to erosion by fluvial gravels during the mid or late Holocene.

Altogether 48 radiocarbon dates have been obtained from the sites listed in table 1, 14 from sites in Liguria and 34 from sites in Emilia-Romagna/Tuscany. The number of dates available from each site is provided in table 2. They range in age from 1165±55 to 23150±125 radiocarbon years BP, and provide a provisional chronology for pollen assemblage zones and hence vegetation history. The stratigraphic contexts and reliability of the dates is discussed in detail in LOWE *et al.* (1994).

The only record not introduced so far is that from site 17, S. Antonio. This site is unusual since it contains thick, blue/ grey, almost pure, silts that alternate with organic-rich horizons, one of which has been dated to 23150 BP. Older sediments have been recovered from the site, though the maximum age is not yet known. The results of additional radiocarbon measurements are currently awaited (WATSON, 1994). The lower part of the sequence is therefore much older than the other sequences known from this region. In addition, the succession is not continuous. The integration of the stratigraphic information from S. Antonio with that available from other sites in the northern Apennines is therefore not straightforward and is not attempted in the synthesis presented below.

The available pollen-stratigraphic records provide a rather uneven data-base of information, both in terms of temporal and geographical spread. Nevertheless, a synthesis of this information is valuable in providing a preliminary foundation for reconstructing the vegetational history of the region and evaluating the effects of human activities on vegetation. Further studies of additional sites, to increase the density of records, could provide a greater resolution of the spatial and temporal changes. This may lead to the identification of any aberrant or unusual records of local importance only. Our synthesis should be viewed as a first approximation only, and may be subject to modifications in the future as new results become available. The reviews of pollen-stratigraphic variations and vegetational history which follow refer to a number of regional variations which could reflect geological, pedological, local climatic and other

Regional Pollen Zones	Generalised Time Scale
Ap Pm 8 Significatly reduced woodland: Anthropogenic land scape: Scattered *Fagus* and *Quercus* woods	2000 to present
Ap Pm 7 *Fagus-Abies-Quercus (-Alnus)*	4000 to 2000
Ap Pm 6 *Abies-Quercus*	7500 to 4000
Ap Pm 5 *Abies-Quercus-Ulmus*	10 300 to 7500
Ap Pm 4 *Quercus-Betula-Fraxinus-Corylus*	10 600 to 10 300
Ap Pm 3 *Pinus-Abies*-herb associations	11 600 to 10 600
Ap Pm 2 *Abies-Pinus-Quercus-Corylus*	>12 360 to 11 600
Ap Pm 1 *Pinus-Quercus*-Compositae	Not Dated

Table 3 - Regional Pollen Assemblage Zones for the Appennino Parmense (after LOWE, 1992).

environmental variables. Further detailed studies are required to improve understanding of the effects of these various influences.

REGIONAL POLLEN ZONES

A series of Regional Pollen Assemblage Zones (PAZs) has been proposed by LOWE (1992) for the Appennino Parmense (table 3). These summarise the main pollen-stratigraphic signatures recognised for the period 13000 BP to present. In this section a summary of the main pollen-stratigraphic changes recognised in the sites from the northern Apennines as a whole is presented, using Lowe's PAZ scheme as a basis for comparison. The main changes will be described for five broad chronozones, defined in uncalibrated radiocarbon years BP:

a. The Lateglacial Interstadial (*ca.* 13000-11000)
b. The Younger Dryas Stadial (*ca.* 11000-10000)
c. The early Holocene (*ca.* 10000-7500)
d. The mid to late Holocene (*ca.* 7500-2000)
e. The last two millennia (historical period).

Reference is made to one Lateglacial pollen diagram (Prato Spilla C, fig. 3) and two full Holocene pollen diagrams (Prato Spilla A, fig. 4 and Lago Padule, fig. 5) to illustrate the PAZ characteristics.

a. The Lateglacial Interstadial (13000-11000 BP)

Regional PAZs ApPm-1 and ApPm-2 (table 3) correspond to the interstadial chronozone. The pollen spectra are represented at Prato Spilla C by local pollen assemblage zones (lpaz) PSpC-1 and PSpC-2 (fig. 3). Equivalent biozones are recognised at Prato Spilla D (PONEL and LOWE, 1992) and comparable biozones are recognised at Lagdei by LOWE (1992), but through a different interpretation of the sequence to the original of BERTOLDI (1980). An initial biozone of *Pinus-Quercus*-Compositae is succeeded by one dominated by *Abies* pollen and characterised by an *Abies-Pinus-Quercus-Corylus* assemblage. The maximum representation of deciduous trees occurred during the later part of the interstadial chronozone.

b. The Younger Dryas Stadial (11000-10000 BP)

Regional PAZ ApPm-3 (fig. 3) corresponds to the stadial chronozone and is represented by lpaz PSpC-3. Pollen spectra are dominated by *Pinus, Abies* and herb taxa, and there is a marked decline, or even loss, of pollen of deciduous taxa such as *Ulmus, Tilia, Fraxinus* and *Alnus.* Equivalent biozones are recognised at Prato Spilla D and Lagdei.

c. The early Holocene (10000-7500 BP)

Regional PAZs ApPm-4 and ApPm-5 (fig. 3) correspond to the early Holocene chronozone, represented, for example, by lpaz PSpC-4. The beginning of the Holocene is characterised by a small but clear *Betula* peak, associated with increased representations of *Quercus* and *Corylus* and then of *Fraxinus, Ulmus* and *Alnus.* By the close of this chronozone the pollen spectra are dominated by 4 tree taxa: *Abies, Quercus, Ulmus* and *Corylus.* This pattern can also be identified in other sites where a good resolution of the early Holocene is preserved (i.e. at Prato

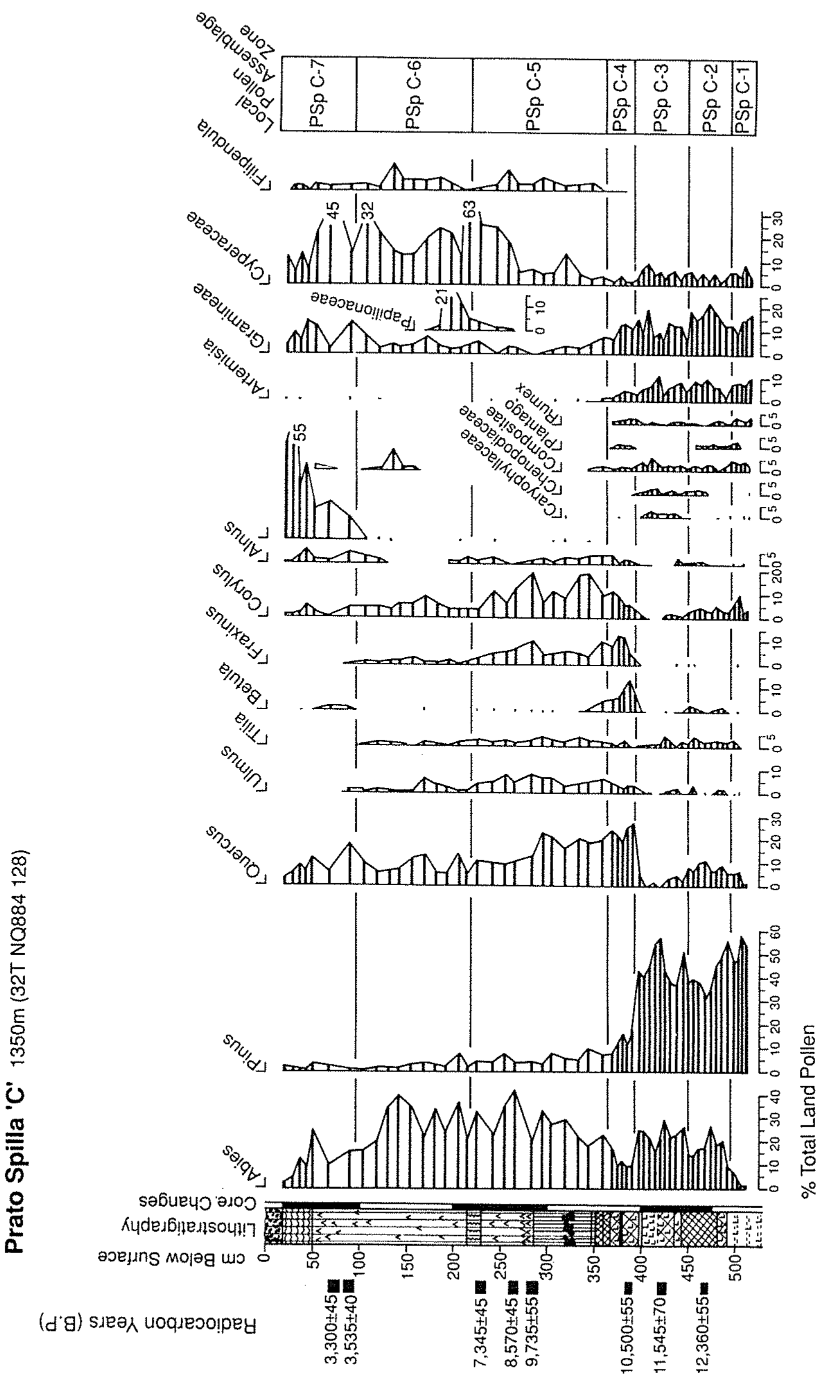

Fig. 3 - Relative pollen diagram of Lateglacial and early Holocene succession, Prato Spilla C, Appennino Parmense. Percentages are of total land pollen; only the principal taxa, recording 2% or greater, are shown. (Reprinted from Lowe, 1992: 200, by kind permission of Scandinavian University Press, Norway).

Spilla A, fig. 4; Lago Padule, fig. 5; Lagdei: BERTOLDI, 1980; and Prato Spilla D: PONEL and LOWE, 1992).

d. Mid to late Holocene (7500-2000 BP)

Regional PAzs ApPm-6 and ApPm-7 correspond to the mid to late Holocene chronozone. The pollen spectra continue to be dominated by *Abies* and *Quercus,* with pollen of *Tilia, Acer, Ulmus* and *Fraxinus* also represented. The most marked feature in the chronozone, however, recorded in virtually every site in the region, is a very sharp rise in *Fagus* pollen which usually, but not always, coincides with an equally marked decline in *Abies* pollen. These features are clearly marked at the PSpC-6/PSpC-7 boundary in the Prato Spilla C pollen diagram (fig. 3), at the PSpA-4/PSpA-5 boundary at Prato Spilla A (fig. 4) and the LPD-4/LPD-5 boundary at Lago Padule (fig. 5). It has also been identified at virtually all of the sites listed in table 1. The age of the expansion of Fagus is usually around 5000-4000 BP, though there is some regional variation (MACPHAIL, 1988; see also «Vegetational History» below), and care must be exercised in correlating between sites on biostratigraphic criteria alone. *Quercus* continues to be an important component of the pollen spectra throughout this chronozone at most of the sites.

e. The last two millennia (historical period)

Regional PAZ ApPm-8 corresponds to this chronozone (table 3) and is represented by lpaz's PSpA-7 and PSpA-8 in the Prato Spilla A diagram (fig. 4) and LPD-6 in the Lago Padule diagram (fig. 5). Other sites with pollen records for this chronozone include Lago Pratignano and Ospitale in Emilia-Romagna (WATSON, 1994) and the majority of the sites in Liguria (MACPHAIL, 1988; GENTILE *et al.*, 1988; BRAGGIO MORUCCHIO *et al.*, 1991; CRUISE, 1992). The pollen record is characterised by evidence for forest disturbance, often marked by sharp reductions in percentages of *Abies, Quercus* and *Fagus* (e.g. fig. 4). The intensity of deforestation and the relative decline of individual taxa varied throughout the region, however, as there is clear disparity between the available pollen records.

VEGETATION HISTORY

On the basis of the pollen evidence reviewed in the preceding section, a summary of the vegetation history of the region will now be presented.

a. The Lateglacial Interstadial

The evidence from three sites, Prato Spilla C, Prato Spilla D and Lagdei indicates that woodland, including both coniferous and deciduous species, thrived within the valleys of the northern Apennines during the Lateglacial Interstadial (13000-11000 BP). Coleopteran records from one of the sites include a number of beetle types that are specific to a variety of trees and which require deep forest litter or bark for survival (PONEL and LOWE, 1992). The coleopteran evidence indicates that a rich woodland flora existed in the vicinity at this time, with abundant leaf litter. This therefore supports the pollen evidence which indicates that oak, elm, lime and hazel were present, along with pine and fir during the period 13000-11000 BP.

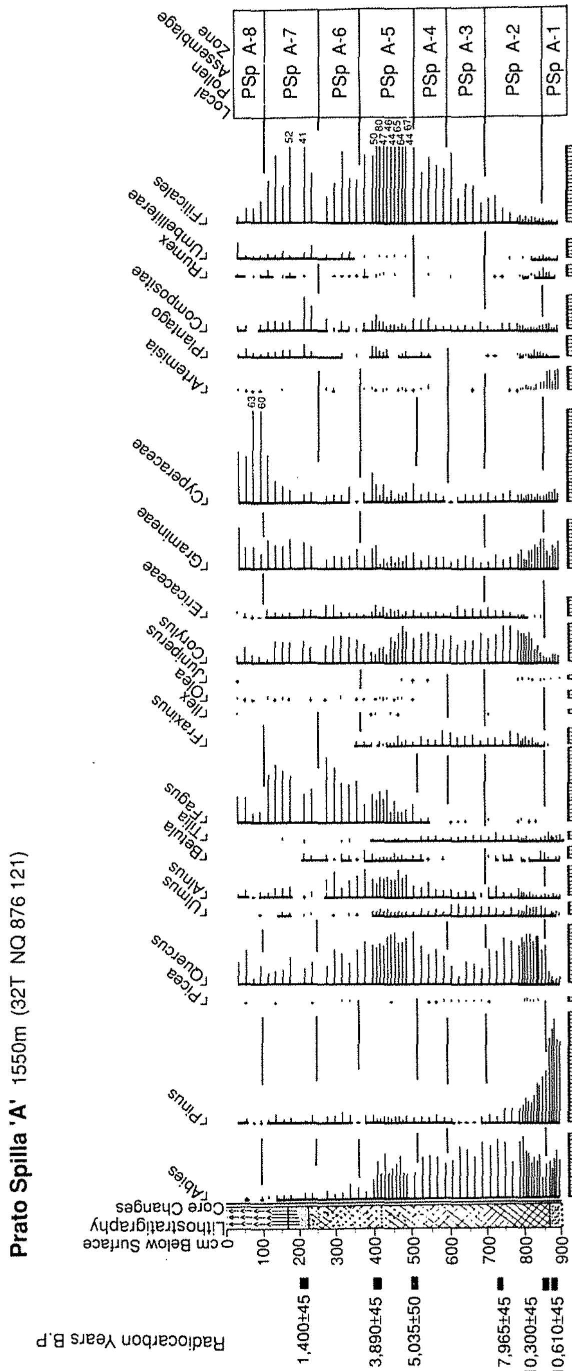

Fig. 4 - Relative pollen diagram from Prato Spilla A, Appennino Parmense. Percentages are of total land pollen; only the principal taxa, recording 2% or greater, are shown (Reprinted from LOWE, 1992: 198, by kind permission of Scandinavian University Press, Norway).

b. The Younger Dryas Stadial

During the Younger Dryas chronozone (11000-10000 BP) there was probably a decrease in the altitude of the treeline, though this is difficult to measure. What is clear is that the deciduous trees were more seriously affected than the conifers by the Younger Dryas cold climatic conditions, as pollen of deciduous tree pollen almost disappear from the pollen spectra, while pollen of *Pinus* and, to a lesser extent, *Abies,* remain important (LOWE, 1992). However, it is likely that stands of deciduous trees survived in parts of the region, probably on lower slopes in the main valleys, in view of the apparent very sudden development of deciduous woodland at the beginning of the Holocene.

c. The Early Holocene

The sudden increase in pollen percentages of a number of tree taxa during the early Holocene (*ca.* 10000-7500 BP) and the heterogeneous nature of the arboreal pollen component suggests the development of a rich mosaic of woodland types. It seems likely that trees responded rapidly to climatic warming at the start of the Holocene by migrating quickly from refugia within the region. The early Holocene was probably a period of great variety in the prevailing biota, with light-demanding species (e.g. *Fraxinus, Betula* and *Corylus*) temporarily able to survive in areas not yet reached or fully exploited by the taxa better adapted and more able to compete successffully in this environment. This was probably the acme period in terms of forest diversity in the region during the last 13000 years.

By about 7500 BP the pollen spectra had become much less diverse and there is greater uniformity between sites. Four taxa dominate: *Abies, Quercus, Ulmus* and *Corylus.* This suggests that two types of forest began to dominate in the region: *Abies* woodland on the more exposed slopes and areas of poor soils, and mixed deciduous woodland, dominated by *Quercus,* on slopes with higher insolation and/or richer soils. Pine appears to have occupied only very marginal locations by about 7500 BP.

d. The mid to late Holocene

The pattern established around 7500 BP, of *Abies* woodland dominating the higher slopes and poorer soils and mixed mesophilous forests, with oak species particularly important, dominating the lower areas and richer soils, was maintained in the region until the mid Holocene, when this balance was severely disrupted by the abrupt arrival of *Fagus.* Beech immigration appears to have been particularly successful in the mid Holocene *Abies* belts of Emilia-Romagna, whereas *Abies* was not significantly affected until as late as 2000 BP at one site (Agoraie) in eastern Liguria. Indeed, beech seems never to have been abundant at another Ligurian site, Casanova, during the Holocene (MACPHAIL, 1988).

The present importance of *Fagus* in the landscape of the northern Apennines appears, therefore, to have been a relatively recent development. CRUISE (1990a) has reviewed the evidence and concluded that during the mid Holocene the montane forests were dominated by *Abies* growing with *Fagus,* but by about 2000 BP fragmentation of the *Abies* forests was widespread in the region and *Fagus* began to form the monotonous woodland that is characteristic of many parts of the present landscape. The reasons for the sudden expansion of *Fagus* in the mid Holocene, which was characteristic of the whole of southern Europe at around this time, are presently debated. There is evidence to suggest that it resulted almost exclusively from human influences (REILLE and LOWE, 1993; LOWE *et al.,* 1994) but it may also have

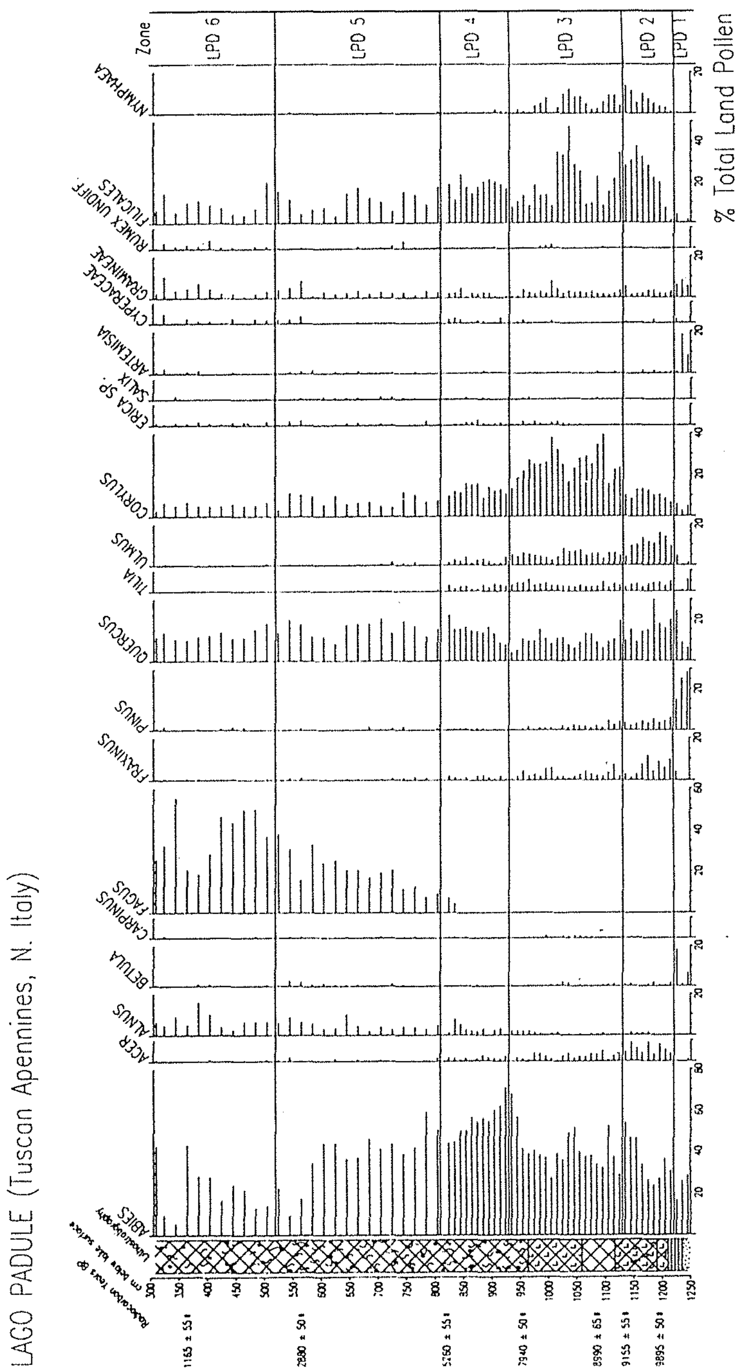

Fig. 5 - Relative pollen diagram from Lago Padule, N. Tuscany. Percentages are of total land pollen; selected principal taxa only.

responded to significant environmental changes, such as an increasingly cooler and wetter climate (CRUISE, 1990a).

e. Last two millennia (historical period)

By about 2000 BP there was extensive disturbance of forests. The intensity of changes in forest composition and cover varied significantly throughout the region. In the vicinity of Prato Spilla in western Emilia-Romagna, for example, deforestation appears to have been very marked indeed, to have been initiated by human activities, and to have resulted in soil degradation (LOWE *et al.*, 1994). Similar developments appear to have characterised parts of upland Liguria (MACPHAIL, 1988). On the other hand, evidence for deforestation at Lago Padule in northern Tuscany is less compelling, with pollen of *Abies* and *Fagus* being strongly recorded in the sediment column more or less continuously right up to the modern lake sediment surface (fig. 5).

It is evident that the deforestation recorded, being related to the exploitation of the montane slopes for pasture land and woodland management. But how are these effects to be measured, and isolated from natural forest changes during the late Holocene? That is the theme of the paper by LOWE *et al.* (1994, this volume), which follows.

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P. BIAGI and J. NANDRIS (eds.) Highland Zone Exploitation in Southern Europe
MONOGRAFIE DI «NATURA BRESCIANA», 20, 1994: 169-187

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THE CHRONOLOGY OF HUMAN DISTURBANCE OF THE VEGETATION OF THE NORTHERN APENNINES DURING THE HOLOCENE

SUMMARY – *The chronology of human disturbance of the vegetation of the northern Apennines during the Holocene.* A number of criteria that have been used by pollen analysts to suggest the influence of humans on the vegetation of Europe are defined, and these criteria are applied to pollen and associated sedimentary records from the northern Apennines. The main criteria are: forest disturbance indicators, incidence of pollen of «ruderal» taxa, incidence of pollen of cultivated species, an «elm decline», expansion of *Fagus*, peat initiation, incidence of charcoal and inwash of mineral sediments. Evidence for these features in the records of those sites included in the data-base of WATSON *et al.* (1994, this volume) are reviewed. The chronology of these events, based upon 48 radiocarbon dates obtained from 15 sites, is examined in the light of problems affecting the interpretation of dates obtained from Holocene peats and lake sediments. A generalised model is presented of the intensity and timing of human interference on the vegetation of the northern Apennines based upon the evidence obtained from selected sites.

RIASSUNTO – *La cronologia dell'impatto antropico sull'ambiente vegetazionale dell'Appennino settentrionale durante l'Olocene.* Alcuni criteri impiegati dai palinologi per interpretare gli effetti dell'impatto antropico sulla vegetazione in Europa vengono applicati ai depositi dell'Appennino settentrionale. I criteri principali sono i seguenti: indicatori di disturbo forestale, incidenza di taxa ruderali, incidenza di specie coltivate, curva discendente dell'olmo, espansione del faggio, inizio della formazione di torbe, presenza di carboni e di sedimenti minerali illuviali. La cronologia di questi eventi, basata su di un numero di 48 datazioni radiometriche ottenute in 15 siti, viene esaminata alla luce dei problemi che riguardano l'interpretazione delle date ottenute dai depositi olocenici torbosi e lacustri. Viene presentato un modello generale dell'intensità e della cadenza dell'interferenza antropica basata sui dati ottenuti da una selezione di siti.

INTRODUCTION

WATSON *et al.* (1994, this volume) have reviewed the palynological evidence available from sites in the northern Apennines and presented a synopsis of the evolution of the vegetation of the region during the Holocene. This body of evidence, together with associated sedimentary evidence from the sites, may also provide insight into the way the vegetation has been modified by human activities. Indeed, some authors have already concluded that humans have significantly altered vegetation, soils and the local hydrological balance in parts of the region on the basis wholly or partly of pollen-stratigraphic evidence (e.g. MACPHAIL, 1988; CRUISE, 1990a; 1992; LOWE *et al.*, 1994). Here we review the specific indicators used to infer human disturbance of the vegetation of the northern Apennines and attempt to evaluate the spatial and temporal

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intensity of human influences.

The sites considered for this review are those selected by Watson et al. (1994, this volume, tables 1 and 2) using criteria of representative stratigraphic sampling and statistical detail in pollen and sediment analysis. 17 sites from the Ligurian, Emilia-Romagnan and north Tuscan Apennines, and ranging in altitude between 713 and 1550 metres, are included (fig. 1). In addition, reference is made to pollen records from the cave site of Arene Candide, close to Finale Ligure in Liguria, since they provide additional evidence of human activity and a wider context for our conclusions.

48 radiocarbon dates have been obtained from key horizons from 15 of the 17 sites (table 1). Of these, 36 have been obtained from Holocene sediments and 4 from deposits dating to the Lateglacial-Holocene transition (*ca.* 10600 to 10000 BP). All of the dates have been obtained using bulk sediment samples (peat or organic lake muds) and radiometric methods of activity determination. At the time of writing, no dates have been obtained from plant or other macrofossils, though a few are based on peat samples that are rich in detrital wood remains. In this paper, age estimates are quoted in conventional radiocarbon years BP throughout. Calibrations, using dendrochronology-based curves to correct for atmospheric radiocarbon variations, have not been made.

The mean age estimates of the radiocarbon measures are plotted on fig. 2 against the overall age spans of the sediments that have accumulated at each site. The evidence combined

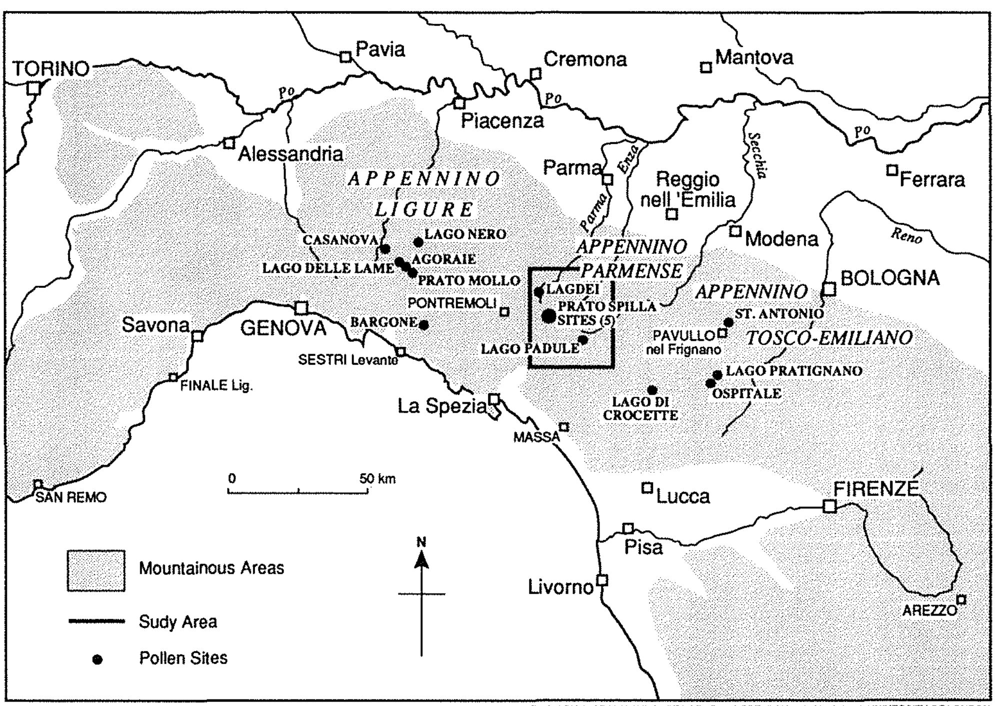

Fig. 1 - Location of study area and of sites referred to in text.

from these sites enables a reconstruction of the chronology of events for the region as a whole from the last full glacial (> 23150 BP) to historical times. However, the available data are heavily skewed towards particular sites and parts of this time period. Thus 30 of the 48 dates have been obtained from only 5 sites (Prato Spilla A, Prato Spilla C, Prato Spilla D, Lago Padule and St. Antonio) where much of the attention has been focussed on pre-Holocene events (LOWE, 1992a; PONEL and LOWE, 1992; LOWE and WATSON, 1993). Only 2 sites provide a series of dates through the full Holocene sequence (Prato Spilla A and Lago Padule). In addition, although 15 of the 17 sequences contain sediments of mid to late Holocene age (covering approximately the last 5000 years), many with a very high stratigraphic resolution, only 22 of the 48 dates lie within the range 5100 to 0 BP. The data-base may therefore be statistically inadequate and is certainly too uneven to represent the full sequence of Holocene changes within such a large region as the northern Apennines. Nonetheless some preliminary assessments can be made of regional patterns in the data.

In this paper we focus on those features in the data that are traditionally considered to indicate a possible human influence, the so-called «anthropogenic indicators». Table 1 lists the specific events dated at each site and, in conjunction with the greater detail supplied in the pollen diagrams available for each site (WATSON *et al.*, 1994), the ages of the «anthropogenic indicators» in these data can be compared. Before doing this, however, the criteria used to infer human influences are briefly defined. We close with a review of the limitations affecting the interpretation of dates obtained from bulk sediment samples and an assessment of the overall extent of human interference in the vegetation of the northern Apennines during the Holocene.

ANTHROPOGENIC INDICATORS

The main stratigraphic indicators used by pollen analysts to infer human interference on the vegetation history of a region and, by implication, on associated variables such as soil

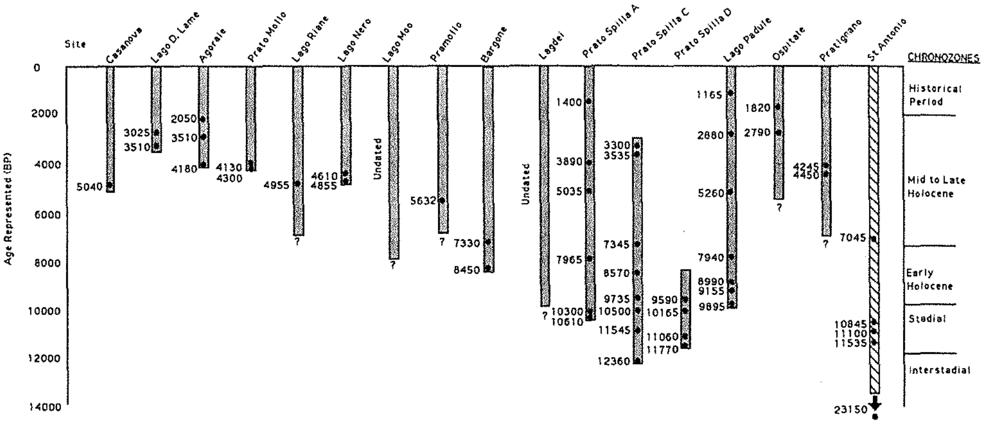

Fig. 2 - The radiocarbon dates reviewed in this paper plotted against the complete age-spans represented by the sediment record at each site.

stability and soil or near-surface hydrological conditions, are defined in this section. The main criteria are:

a/ evidence from pollen diagrams:
i. forest disturbance phases
ii. ruderal («weed») species
iii. cultivated species
iv. elm decline
v. regional *Fagus* expansion

b/ associated sedimentary evidence:
vi. peat initiation
vii. incidence of charcoal
viii. inwash of mineral sediments

Each of these will be examined in turn.

i. Forest disturbance phases

Sudden, irregular declines in pollen percentages of trees in general, or of individual arboreal taxa, may reflect human interference through forest burning, coppicing, leaf harvesting, grazing (preventing regeneration) and felling. An opening in the forest canopy may be reflected in increased pollen percentages of light-demanding taxa, such as *Corylus, Betula, Fraxinus,* Ericaceae or herbaceous taxa. Possible examples of this can be seen in the Prato Spilla A pollen diagram (fig. 3, horizon labelled M-1) at approximately 600 cm depth, where a marked drop in *Quercus* and *Corylus* percentages is accompanied by rises in pollen of Ericaceae and *Fraxinus* or between 500 and 200 cm in the same profile where oscillations in *Fagus* and other trees are paralleled by oscillations in *Corylus,* Ericaceae, Gramineae and various herb taxa (Lowe *et al.,* 1994). Other examples may be recorded in the Lago Padule pollen diagram (fig. 4: 600-300 cm) and dated to between 2925±70 to 1225±75 BP.

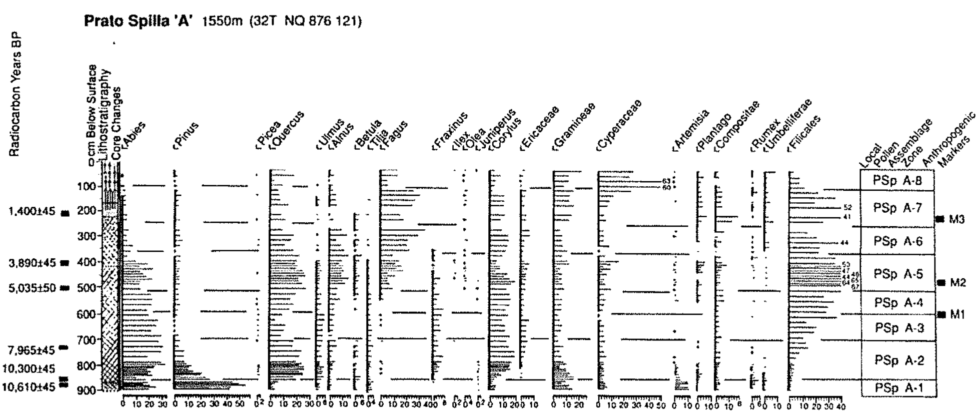

Fig. 3 - Relative pollen diagram from Prato Spilla A, Appennino Parmense. Percentages are of total land pollen; only the principal taxa, recording 2% or greater, are shown (Reprinted from Lowe, 1992a: 198, by kind permission of Scandinavian University Press, Norway).

This type of evidence is often equivocal, however, for it is difficult to separate human-induced effects from natural succession using the available data. Thus, for example, there are significant declines in percentages of *Abies* and *Quercus* at Lago Padule between 8990±105 and 7970±65 BP which are associated with a marked increase in *Corylus* percentages (fig. 4). Whether this indicates the influence of Mesolithic communities or varying competition between these taxa at a high mountain site is difficult to establish at present. Supporting lines of evidence for human activity are required.

Irregular variations in arboreal pollen percentages are also recorded from a number of other sites, such as those in Liguria (Macphail, 1988; Gentile *et al.*, 1988; Braggio Morucchio *et al.*, 1991) but none are adequately defined or dated. The most distinctive and best-dated deforestation signatures recorded in the region are plotted on fig. 5.

ii. Ruderal or «weed» taxa

The idea that deforestation phases indicate human activity may be strengthened where these are accompanied by significant records of taxa associated with cultivation or pastoralist activity, the so-called «ruderal» (1) or «weed» taxa (e.g. *Plantago* spp., *Rumex* spp., *Artemisia*, Compositae spp., *Melampyrum* and Chenopodiaceae spp.). This is illustrated, for example, by the marked rise in pollen of Compositae, *Plantago* and Umbelliferae pollen which coincides with reduced tree pollen percentages at Prato Spilla A, dated to *ca.* 1400±45 and 3890±45 BP (fig. 3, horizon labelled M-3).

Similar associations have been recorded for several sites in Liguria (Macphail, 1988) and generally dated to within the last 4000 years. In most of the sites from the northern Apennines, however, pollen percentages of these taxa are usually subdued, rarely rising significantly above the low values commonly recorded throughout the Holocene profiles. In addition, the taxonomic precision afforded by pollen analysis is usually too coarse to enable species of plants to be identified, which limits the inferences that can be made. Pollen of taxa such as Compositae, *Rumex*, Caryophyllaceae and *Plantago* may reflect plant associations colonising naturally disturbed ground (land-slip areas, ground burned by natural fires, intensively grazed vegetation) or occupying under-storey or open-canopy niches. It is also difficult to link assemblages of «ruderal» pollen to particular types of land use or vegetation types (see Behre, 1981; Groenmand-Van Waateringe, 1986; Lowe, 1991). In view of these difficulties and the generally low percentages recorded from sites in the northern Apennines, there is a likelihood of over-interpretation of the data when using this line of evidence to infer human activity. Except where the records of «ruderal» taxa record marked increases in the pollen diagrams *and* are supported by other lines of evidence, such as inwashed sediments in the case of the Prato Spilla A sequence (see below), little significance is attached to variations in percentages of the pollen of such taxa.

iii. Cultivated plants

Where pollen records can be attributed to cultivated plants, such as cereal grasses, root crops (e.g. *Vicia, Castanea, Juglans, Vitis* and *Olea*), then an association with human activity may be more certain. Pollen of these plants are, however, rare or absent in the pollen diagrams

(1) «ruderal» is used in a wide sense here to note both ruderal (*sensu stricto*) and segetal taxa; these categories are usually impossible to differentiate on the basis of pollen analysis.

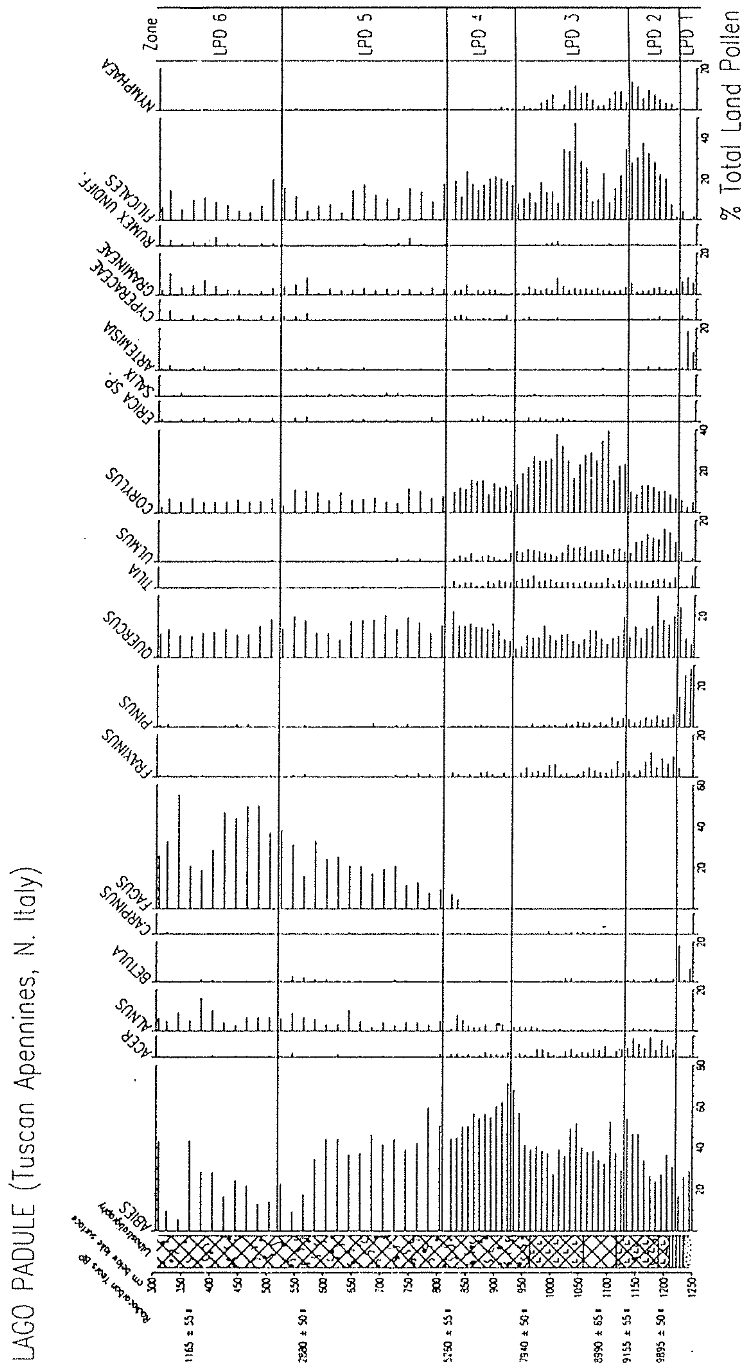

Fig. 4 - Relative pollen diagram from Lago Padule, N. Tuscany. Percentages are of total land pollen; selected principal taxa only.

obtained from the mountainous parts of Liguria and Emilia-Romagna. Where pollen of cultivated trees such as *Juglans* and *Olea* occur, as for example in the near-surface, late Holocene peats of some sites in Liguria, they are considered likely to have been derived by long-distance transfer (MACPHAIL, 1988). *Olea* in particular is very easily dispersed (DE BEAULIEU, 1977; REILLE and LOWE, 1993). These records may reflect either (a) progressive deforestation in the mountains which led to a reduced local pollen rain and allowed pollen derived by up-valley winds from plants cultivated at lower altitudes to be over-represented in late Holocene sediments (*cf.* MACPHAIL, 1988), or (b) an increasing pollen output from these plants as cultivation became more intense in the lower regions. It is only in the cave deposits of lowland, coastal Liguria, such as the site of Arene Candide, that high percentages of pollen of cultivated plants have been recorded (BRANCH, nd). The records of pollen of cereal grasses at Arene Candide occur in association with charred plant evidence for *Triticum dicoccum* (Emmer) and *Hordeum* (barley) in deposits dated to around 5900 BP (EVETT and RENFREW, 1971).

In conclusion, therefore, no clear evidence of the local presence of cultivated plants has yet been recovered from the mountains of Liguria and Emilia-Romagna prior to the historical period. In prehistoric times, cultivation appears to have been confined to lowland coastal localities or the Po Plain.

iv. Elm Decline

A sharp reduction in pollen of elm has been identified in a large number of pollen diagrams from sites across Europe, and is generally dated to between 5300 and 5000 BP. Originally this was regarded as a single, synchronous event, though mutliple elm declines are now recognised in some sites. The cause of the declines are also much debated, with climatic, anthropogenic and pathogenic effects advocated by different authorities to explain the phenomena (see e.g. GROENMAN-VAN WAATERINGE, 1983; 1988; EDWARDS, 1982). Presently the weight of evidence seems to be swinging in favour of pathogenic attack as the primary cause (RACKHAM, 1980; PEGLAR, 1993).

Elm pollen is generally recorded in very low percentages in the Holocene sediments of the northern Apennines. However, a clear and abrupt fall in elm pollen is recorded at 4 sites, Lago Padule, Prato Spilla A, Prato Spilla C and Pratignano. At all 4 sites these reductions coincide with marked reductions in pollen of *Fraxinus, Corylus* and *Tilia* (figs. 3 and 4), which, together with elm, are trees which were widely used for leaf fodder (TROELS-SMITH, 1960; ROBINSON and RASMUSSEN, 1989). Moreover, several archaeological records from the region demonstrate that leaf gathering of taxa such as *Fraxinus* was employed (MAGGI and NISBET, 1990). The possibility cannot be excluded, therefore, that these pollen-stratigraphic features may signal human interference in the woodlands of northern Italy.

Radiocarbon dates for the «elm declines» and associated pollen-stratigraphic changes are available from three sites, Lago Padule, Prato Spilla A and Prato Spilla C (fig. 5). The age of the «elm decline» at Pratignano is currently being investigated, but is known to be older than 4265±50 BP (WATSON, unpublished). An estimate of the age of the horizon at Pratignano is shown on fig. 5. Clearly there is no support for a synchronous elm decline within the northern Apennines and it is entirely possible that the demise of *Ulmus,* along with *Tilia* and *Fraxinus,* could be related to competition or local ecological (successional) changes. However, *if* the features were anthropogenically-induced, then the evidence would indicate diachronous, Mesolithic woodland interference.

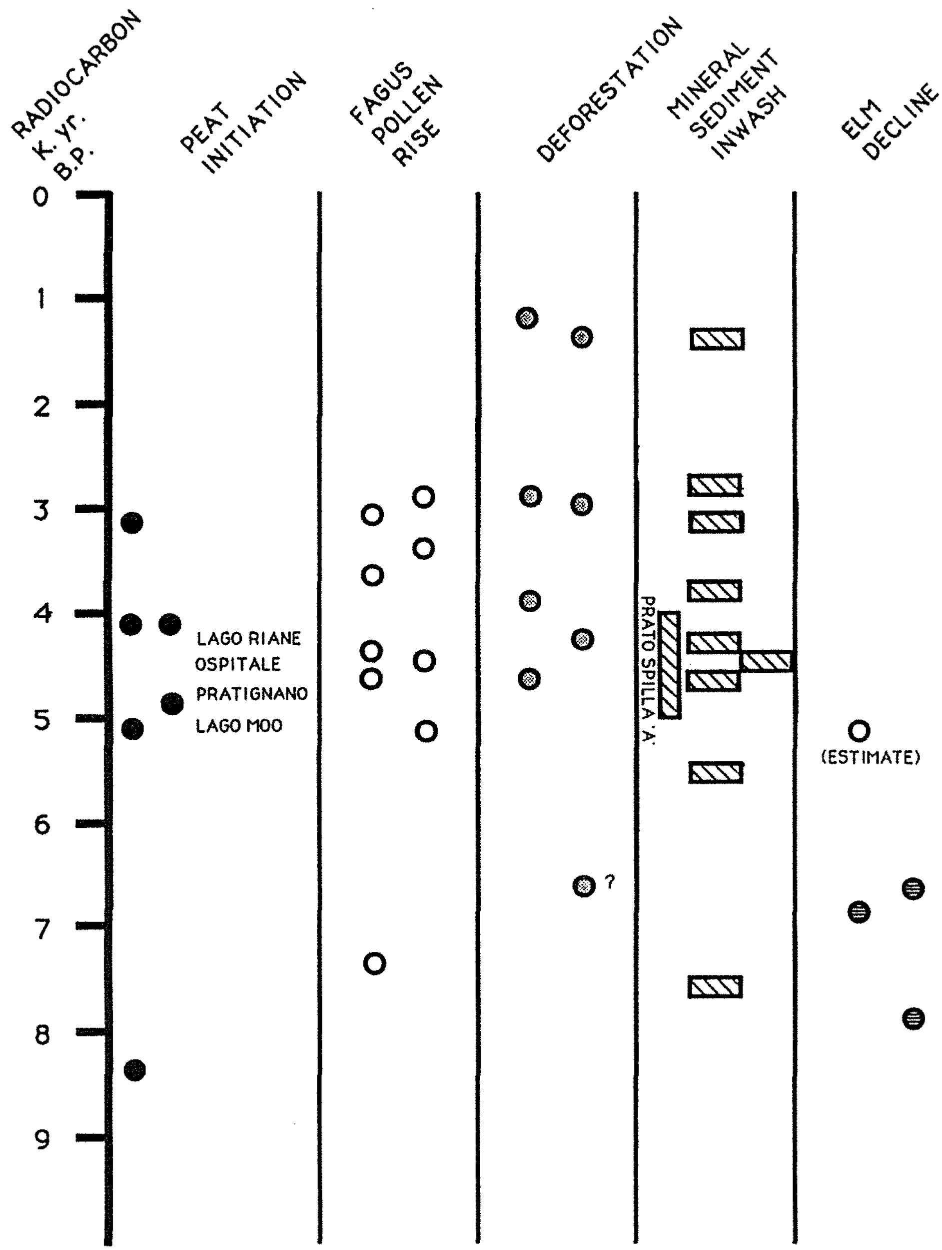

Fig. 5 - Radiocarbon dates (uncalibrated radiocarbon years BP) obtained for the «anthropogenic indicators» recognised in those stratigraphic sequences reviewed in this paper where the features are clearly defined. The centres of the circles or rectangles represent mean ages. No dates are available for peat initiation at Lago Riane, Ospitale, Pratignano and Lago Moo, but pollen-stratigraphic correlations indicate that ages of between 5 and 4 ka BP should be obtained for this feature at these sites.

v. Expansion of Fagus woodland

A major expansion of *Fagus* woodland occurred across parts of southern Europe during the mid to late Holocene (Schneider, 1978; Huntley and Birks, 1983; Macphail, 1988; Reille and Lowe, 1993). Although Fagus has been recorded in early Holocene sediments from the lower Rhone valley (Triat-Laval, 1978), southern Italy (Watts, 1985) and in cave sediments from the Maritime Alps (Renault-Miskovsky, 1972; Vernet, 1970), it failed to dominate the landscape until around 6000 to 5000 BP when it expanded quite suddenly to form a continuous belt from the Carpathians in the east to the Massif Central and the Pyrenees in the west. It was most prevalent in the montane zones, though it did extend onto lower-lying regions of northern Italy and southern France (Schneider, 1978; Triat-Laval, 1978).

The spread of *Fagus* has already been shown by Macphail (1988; Cruise, 1990b) to be quite variable in age in Liguria. Our data show a wide variation in the dates for the main rise of *Fagus* pollen, from *ca.* 7300 BP at Bargone in Liguria to 2880 BP at Lago Padule in Tuscany (table 1; fig. 5).

In most sites the rise in *Fagus,* which in the northern Apennines coincides with a concomitant decline in relative *Abies* pollen percentages, is an abrupt marker horizon. *Fagus* often becomes the dominant tree after this event, maintaining its importance in the landscape in some areas right up to the present day. Why this should have occurred is still not fully understood. Schneider (1978) and others have suggested that *Fagus* was responding to a climatic influence, becoming more competitive under an increasingly cooler and wetter climate in the latter half of the Holocene. Others have noted that the *Fagus* rise almost invariably coincides with pollen-stratigraphic indicators of forest clearances (Triat-Laval, 1978; Macphail, 1988; Reille and De Beaulieu, 1990). In the eastern Pyrenees, the transition from *Abies* to *Fagus* woodland generally occurs immediately following the first records of cereal pollen (Reille and Lowe, 1993). An alternative explanation, therefore, is that the *Fagus* rise may have been human-induced, either directly, its spread being actively encouraged, or indirectly as an opportunist, taking advantage of woodland clearance by humans. Reille (in Reille and Lowe, 1993) points out that *Fagus* behaves differently in the Holocene by comparison with its behaviour in earlier Interglacials. It is only in the Holocene that it adopts a montane distribution, having previously been limited to low, hilly regions. Reille believes, therefore, that this indicates a new factor controlling the more recent distribution of *Fagus,* and that this new factor is some form of human control.

The available radiocarbon dates for the horizons recording a major increase in *Fagus* pollen in sites from the northern Apennines are plotted on fig. 5. All except one plot approximately to between 5000 and 3000 BP. This in no way shows conclusively that the *Fagus* rise can be regarded as an anthropogenic marker, but the growing evidence from Europe for its coincidence with other indicators of human activity seems to be strengthening the case. On the other hand, the migration of *Fagus* may have been triggered by some other factor, such as climatic change, and its association with evidence for human activities at some sites may be largely coincidental.

vi. Peat initiation

Cruise (1990a) has obtained dates from the basal organic sediments of six peat-filled sites in the Ligurian Apennines and demonstrated that peat deposits began to accumulate in that region within the last 5000 years. After reviewing the factors that may have controlled peat

Table 1 - Summary of stratigraphic context of samples from which radiocarbon dates have been obtained from sites in the northern Apennines.

No	Name	Strat Pos	Sediment Type	Mean	S D	Event
1	Casanova	465-470	Peat	5040	100	Peat Initiation
2	Lago Delle Lame	150-160	Organic silt	3025	50	Rise in *Fagus*, Peat initiation
2	Lago Delle Lame	90-96	Detrital Peat	3510	35	*Abies* reduction
3	Agoraie	325-330	Fibrous Peat	2050	50	Sharp *Abies* reduction
3	Agoraie	435-440	Wood Peat	3510	60	A *Fagus* peak
3	Agoraie	638-643	Detrital Peat	4180	60	Start of Peat Formation
4	Prato Mollo	80-83	Silty Peat	4130	60	Peat Initiation
4	Prato Mollo	37-90	Silty Peat	4300	60	*Abies* decline, *Fagus* rise
5	Lago Riane			4955	130	
6	Lago Nero	34-38	Peat with Roots	4610	40	Fall in *Abies*, Just before *Fagus* rise
6	Lago Nero	105-109	Organic Silt	4855	40	Peat Initiation, High *Abies*
8	Pramollo	380		5632	210	
9	Bargone	335-340	Peat	7330	70	Fall in *Abies*, Just before *Fagus* rise
9	Bargone	375-380	Peat	8450	80	Peat Initiation
11	Prato Spilla A	203-213	Coarse Peat	1400	45	Anthropogenic marker horizon
11	Prato Spilla A	400-415	Coarse Peat	3890	45	*Abies* decline
11	Prato Spilla A	500-510	Fine Mud	5035	50	Anthro marker horizon
11	Prato Spilla A	730-740	Fine Mud	7965	45	*Quercus* decline
11	Prato Spilla A	850-860	*Gyttja*	10300	45	*Pinus* fall, *Quercus* rise
11	Prato Spilla A	860-870	*Gyttja*	10610	45	1st org sed. YD/EH *Pinus* Phase
12	Prato Spilla C	70-80	Coarse Peat	3300	45	*Fagus* Rise
12	Prato Spilla C	85-95	Coarse Peat	3535	40	*Fagus* Rise
12	Prato Spilla C	225-235	Fine Peat	7345	45	Herb Peak; *Frax* decline
12	Prato Spilla C	280-265	*Gyttja*	8570	45	*Abies* Max.; *Ulmus* decline
12	Prato Spilla C	280-290	*Gyttja* with Wood	9735	55	*Corylus* Max; *Quercus* decline
12	Prato Spilla C	385-390	*Gyttja*	10500	55	End of Y.D.; Rise in *Quercus*
12	Prato Spilla C	417-425	*Gyttja*	11545	70	Mid Y.D.; High *Pinus*
12	Prato Spilla C	467-470	*Gyttja*	12360	55	Interstadial *Quercus* max
13	Prato Spilla D	30-35	Organic mud	9590	60	EH *Fraxinus* Maximum
13	Prato Spilla D	41-47	Organic mud	10165	50	EH Rise of *Quercus*
13	Prato Spilla D	53.5-55	Mica rich Org Mud	11060	50	Start of Y.D.; fall in *Quercus*
13	Prato Spilla D	58.5-60	Organic Mud	11770	50	Interstadial *Corylus* Maximum
14	Padule	360-370	Organic Mud + Clay	1165	55	Change from *Abies* to *Fagus*
14	Padule	560-570	Organic mud	2880	50	Change from *Abies* to *Fagus*
14	Padule	815-825	*Gyttja*	5260	55	First *Fagus* in Pollen record
14	Padule	950-960	*Gyttja*	7940	50	Start of main *Abies* Rise
14	Padule	1080-1090	Organic Mud	8990	65	Low Aquatic Pollen
14	Padule	1130-1140	Organic Mud	9155	55	Sharp *Abies* Decline
14	Padule	1190-1200	Organic Mud	9895	50	Deepest Sedime without CaCo3
15	Ospitale	470-480	Fine Peat	1820	45	
15	Ospitale	535-545	Fine Peat	2790	45	Base of Russian core
16	Pratignano	235-1245	Peat	4245	50	Base of Russian core
16	Pratignano	1210-1 220	Peat	4450	50	Estab. of *Abies/Fagus* Forest
17	St Antonio	105-115	Peat	7045	45	Min age of hiatus at 122 cm
17	St Antonio	130-140	*Gyttja*	10845	70	
17	St Antonio	125-135	Peat	11100	45	Max age of Hiatus at 122 cm
17	St Antonio	140-150	Peat	11535	45	Min age of Silt Deposit
17	St Antonio	355-365	Peat	23150	125	

development, she concluded that peat formation in the mountains of Liguria only occurred after significant disruption of local soils which she attributed to human disturbance of vegetation, mainly during the Chalcolithic period (see also MACPHAIL, 1988).

Subsequent research has added new sites, both in Liguria and Emilia-Romagna (table 1). However, a number of these are relatively deep basins that originally contained lakes (e.g. Prato Spilla A, Prato Spilla C, Pramollo) which have gradually become infilled with peat. They cannot be compared directly with the rather shallow basin peats studied by Cruise (1990a). On the other hand a number of the new sites contain peats that appear to have started to accumulate during the mid Holocene (e.g. Lago Pratignano, Ospitale, Lago Riane, Lago Moo – table 1 and fig. 2). However, the base of the peats at these sites has not yet been dated. They do suggest, though, that either peat was initiated at around 5000 BP or later, or that peat accumulation rates increased dramatically during the mid Holocene. The depths of sediments of mid to late Holocene age are 790 cm at Lago Riane, 1340 cm at Lago Moo, 1544 cm at Pratignano and 780 cm at Ospitale. These sites record some of the highest rates of sedimentation in north Italy for the mid to late Holocene (illustrated very schematically in fig. 6).

The dates obtained for peat initiation at sites in Liguria are plotted on fig. 5. The names of the sites Ospitale, Lago Riane, Pratignano and Lago Moo are added within the time band 5000-4000 BP, as it is anticipated that dates of peat initiation or of greatly increased rates of peat accumulation from these four sites will plot within this interval. If this interpretation is correct, 8 of the 10 radiocarbon dates for peat initiation would plot within this millennium, which supports CRUISE's (1990a) general observation but does not necessarily support the view that human actions were the principal cause. A change to a cooler and wetter climate could have initiated higher water tables and thus higher rates of peat accumulation.

vii. Incidence of charcoal

Many of the peat sequences contain abundant fragments of microscopic charcoal and occasional horizons rich in macroscopic charcoal. The only systematic counting of charcoal from sites in the region were undertaken by MACPHAIL (1988) who found high concentrations of charcoal at the base of the Prato Mollo (*Alnus* and unidentified coniferous wood) and Lago Nero (unidentified) sites and at several horizons in the lower part of the Casanova sediment succession (unidentified). The charcoal records from these sites may in part reflect human activity. At Prato Mollo the charcoal evidence coincides with evidence of soil disturbance and finds of Chalcolithic flints (MACPHAIL, 1988).

Fagus charcoal, radiocarbon dated to 3790±100 BP has been found in association with late Copper Age artefacts at the site of Bagioletto, where there is also evidence for significant soil erosion (CREMASCHI *et al.*, 1984). Sporadic charcoal fragments (unidentified) were also recorded from the Prato Spilla A succession, in the parts of the sequence dated to between 3890 and 1400 BP (fig. 3), the sediments of which also provide evidence of significant local soil erosion.

The strong association between significant charcoal levels in sediments and independent evidence for soil disturbance and woodland clearance indicates that the charcoals were not derived from ephemeral, natural fires, but from sustained burning by human populations. This contention needs to be tested, however, more rigorously than has been attempted so far for sites in this region. A more systematic and detailed examination of charcoal records in peats and lake sediments, including direct dating of charcoal, is required.

viii. Inwashed mineral sediments

A number of sites in the region show evidence of inwashed mineral detritus which sometimes take the form of distinct mineral-rich bands within organic sediments. Soil micromorphological analysis of several sites in Liguria has shown that peat initiation was often preceded by the inwashing of silt and soil fragments (MACPHAIL, 1988). In other sites (Ospitale, Pratignano) single, very thin clay-dominated bands occur within the mid to late Holocene. At Prato Spilla A, however, in western Emilia-Romagna, a very distinct silt-dominated band occurs at around 1400 BP, and this is preceded by thinner clay-dominated bands dated to between *ca.* 5000 and 3890 BP. These are denoted as the M2 and M3 «marker horizons» on fig. 3, and they are believed to reflect the influence of humans on the local vegetation and soils (LOWE *et al.*, 1994). They are consistent with archaeological evidence indicating that the higher

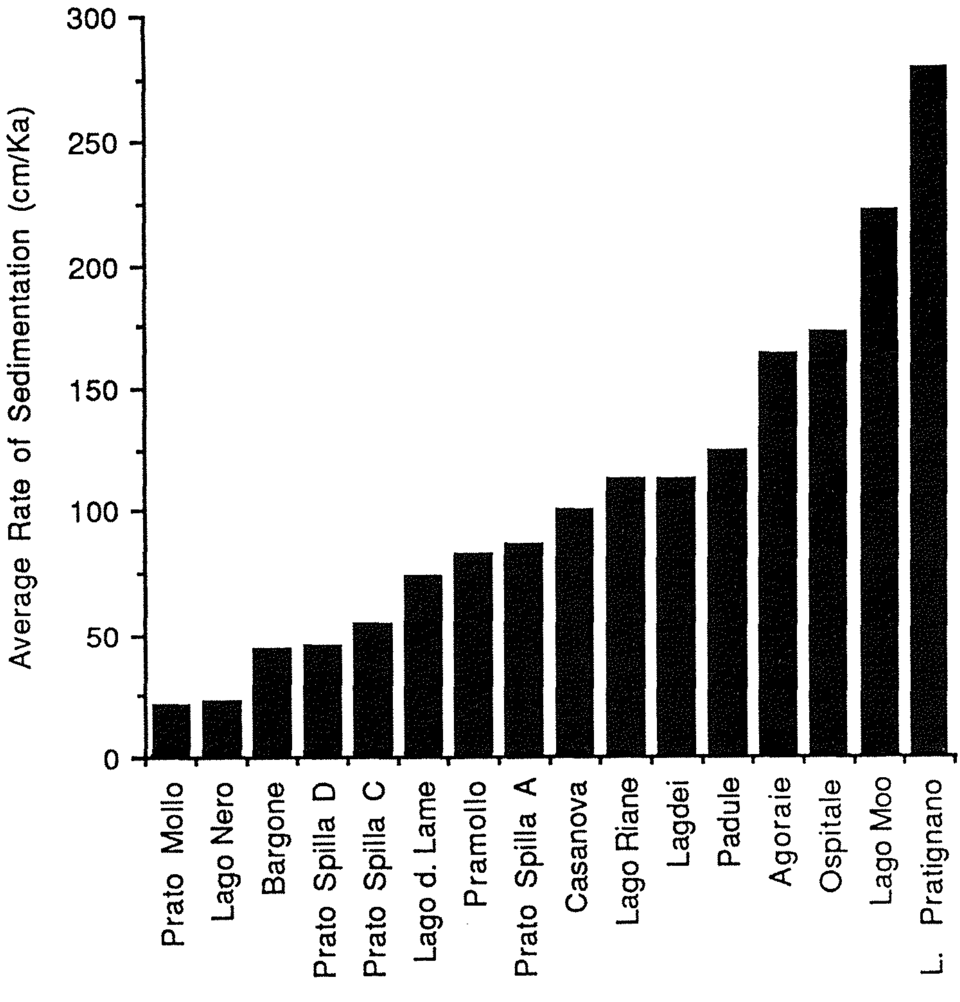

Fig. 6 - Graph to show schematically the rates of sedimentation at sites in the northern Apennines. The sites are arranged in order of average rate of sedimentation; constant sedimentation rates have been assumed.

parts of the mountains in this district, close to the tree-line, were subject to intense summer grazing during the late Neolithic through to the Copper Age and during the immediate post-Roman period.

The approximate dates of clearly-defined mineral inwash bands are shown schematically on fig. 5 for those sites where the evidence has been dated directly. Similar isolated mineral bands are known from other sites, but these have not yet been dated adequately, though they are clearly of mid to late Holocene age.

QUALITY OF THE RADIOCARBON DATES

Before presenting our overall conclusions on the chronology and intensity of human effects on the vegetation of northern Italy, it is important to assess the reliability of the radiocarbon dates. A number of limitations can be identified:

1. Imprecise laboratory measures

Several dates have standard errors equal to or greater than ±70, which is rather imprecise by modern standards (table 1). At two standard deviations the error bands for these dates measure 280 years or greater (in the case of the Pramollo date, 840 years).

2. Accuracy of laboratory measures

Too little information is supplied for a number of the dates to assess accuracy of the laboratory measures. For more than half of the dates the following information is not supplied: pretreatment procedures, basis of radiometric determinations, value of ∂13C ratio, weight of organic carbon measured, organic carbon content of sample analysed and whether total carbon or a fraction of the total has been measured. Without this information it is not possible to assess the relative reliability of the data (Waterbolk, 1983). In addition, a number of different laboratories have been used, and it is not known whether they all contribute to the intercomparison exercise organised by radiocarbon laboratories, and how each laboratory scores in this exercise in relation to precision and accuracy (Scott *et al.*, 1990a; 1990b; 1991).

3. Sample integrity

All of the dates have been based upon bulk sediment measures (peats or organic lake muds). Each sample therefore has the potential of representing mixed detritus of different ages, for lake sediments can recycle older organic components, and peats can be subject to younger root growth. Much more information is needed on the precise nature of materials submitted for dating. In addition, a knowledge of the field collection methods is also important. Some of the dates appear to be based on samples collected by a Hiller coring device, which is notorious for introducing contaminant material.

4. Younging effects

In addition to the possible action of root penetration, mentioned above, a number of the dates may be subject to «younging» effects due to groundwater penetration. This is especially likely in the case of shallow peats which are subject to periodic drying, such as Lago Nero, Prato

Mollo (MACPHAIL, 1988), Prato Spilla D and, perhaps, Lago delle Lame and in the case of near-surface peats at any of the sites.

5. Ageing effects

Some of the samples may be subject to ageing effects through the traditional «hardwater» effect, since parts of the region are highly calcareous. The sediments at Lago Padule, for example, are known to be quite calcareous (WATSON, 1994). In addition, an ageing effect can be introduced by finely comminuted mineral matter, which liberates fine mineral carbon. This process is considered to be a common source of error in dates of Late Weichselian Lateglacial and early Holocene age, since sediments commonly contain a high mineral component (LOWE, 1991). It is also possible that the mid to late Holocene mineral inwash bands referred to in the present paper have introduced a «mineral carbon error».

Because of these various uncertainties, therefore, no attempt has been made to apply corrections to the dates using calibration curves. It is likely that the errors in measurement far outweigh those introduced by temporal atmospheric radiocarbon variations. In order to improve the geochronological data-base, future research should aim to meet the following objectives:

- clearer guidelines on sample descriptions, sample integrity, laboratory procedures and reliability of measurements
- in the case of bulk sediment dates, separation into humin and humic organic carbon fractions and/or separate measurements of fine and coarse-detrital organic matter, in order to assess the consistency of radiocarbon activity measures at important horizons
- where possible, the selection of plant macrofossils for dating by radiometric or AMS methods, and comparison of these with bulk sediment dates
- where possible, the measurement of a series of dates per site, so that the ages of all the main events recorded at each site can be assessed, and in order to identify any aberrant measurements.

Until these improvements can be made the existing data are used to provide a general outline of developments in the region only. This provides a framework for informing future research, allowing definition of the events and processes that need to be examined in more detail.

CHRONOLOGY AND INTENSITY OF HUMAN INTERFERENCE ON THE VEGETATION

Fig. 5 summarises the age estimates obtained for the main anthropogenic indicators defined earlier in this paper. Not all of the available evidence is represented here, either because the evidence is rather weak at some sites, or because it is not possible to obtain a reasonable estimate of age. It is believed, however, that more precise dating of these features is likely to consolidate the general pattern illustrated in fig. 5 and outlined below.

The most notable feature of fig. 5 is the concurrence of several lines of evidence indicating significant changes in the landscape from 5000 BP onwards. The majority of dates obtained for peat initiation, the rise in the *Fagus* pollen curve, pollen-stratigraphic evidence for deforestation and mineral sediment inwash bands fall within the period approximately 5000 to 2700 BP. While any single line of evidence is equivocal in the extent to which it necessarily indicates human activities, the combined evidence seems persuasive. Especially important in this respect are those sites recording a strong association between several processes, such as at some of the sites in Liguria where soil disturbance, charcoal concentrations, marked vegetation changes and finds of flint implements all date to the same period (MACPHAIL, 1988).

The record of the earlier part of the Holocene is more difficult to interpret. There are single radiocarbon measures of peat initiation and of a Fagus rise that pre-date 7000 BP. The reliability of these dates and their regional significance remains to be tested. There are also three dates for elm declines that considerably pre-date 5000 BP. Whether this indicates Mesolithic influences on the regional vegetation is difficult to determine at present. However, there is pollen-stratigraphic evidence for irregular variations in woodland cover, associated with increased representation of light-demanding taxa, from several sites in the region and which considerably pre-dates 5000 BP. (LOWE *et al.*, 1994; WATSON, 1994). An anthropogenic explanation for these features cannot be discounted.

An important site within the region is that of Prato Spilla A.This site has furnished a detailed pollen stratigraphy, clear mineral inwash bands and a detailed series of radiocarbon dates (LOWE, 1992a; 1992b). Three periods of anthropogenic activity are inferred, termed «marker horizons» (M1 to M3, fig. 3), and this evidence can be compared with the archaeological evidence available from that region (LOWE *et al.*, 1994). The earliest (M1) marker horizon is dated by interpolation to around 6300 BP. There is no strong archaeological support for activity in the mountains around this time, since Mesolithic groups appear to have abandoned the region before this period (MAGGI, 1984; 1990). It is possible that the date for M-1 is in error, and that the evidence relates to sporadic Mesolithic activities in the mountains.

The M-2 marker is dated to 5035±50 BP, to the end of the Neolithic and the start of the Copper Age. This is in good accord with archaeological evidence, which indicates that burning and soil instability became widespread in Liguria at about this time, while in Tosco-Emilia soil disturbance intensified through the Copper and Bronze Ages (CREMASCHI, 1990; CREMASCHI *et al.*, 1984; 1992a; 1992b). The Prato Spilla evidence suggests that anthropogenic disturbances commenced around 5000 BP, towards the end of the Neolithic, and then intensified by around 4000 BP, the Copper/early Bronze Age.

The most marked inwash band at Prato Spilla A is dated to around 1400 BP, which dates to the «Lombard Age», an age of documented settlement in the northern Apennines (WICKHAM, 1988). LOWE *et al.* (1994) believe that the evidence from Prato Spilla A points to intensified use of the upper meadows for transhumance practices during the immediate post-Roman period, which supports the view of DAVITE (1987; 1988) that the level of exploitation of upland pastures increased in the immediate post-Roman era. Previously it was assumed that the mountainous parts of the Ligurian chain were depopulated in the Roman era (MANNONI, 1983; CRUSI and FERRANDO CABONA, 1980). It is concluded by LOWE *et al.* (1994) that a system of land management was practised during the summer season in the uplands during the Lombard Age that was very similar to that documented for the region during the Medievil and post-Medievil periods, involving long fallow, common pastures and the use of scattered beech trees. No evidence has ever been found for permanent settlement above an altitude of 600 m in the region. The evidence from Prato Spilla A for intensive summer grazing at around 1400 BP also accords with archaeological evidence for the expansion of marshland areas about or shortly after the third to fourth centuries AD, following the abandonement of Roman «ager» towns such as Brixellum and Tannetum (Bottazzi, 1990; Ward-Perkins, 1983). The evidence overall is thought to indicate the establishment of a transhumance system between «Alpes» (mountain summer pastures) and «valle» (lowland marshlands and lakes).

CONCLUSIONS

The stratigraphic data-base available for the evaluation of the effects of human activities on the vegetation and, by implication, the landscape of the northern Apennines is somewhat limited in terms of site density and includes site records that are highly variable in quality and site detail. Nevertheless a number of broad conclusions can be made. These are seen as interim statements, pending the results of more carefully targetted research in the area, and they rely on:

a. the use of Prato Spilla A as a preliminary regional type-site for Holocene pollen stratigraphy and the chronology of vegetation disturbance
b. the reliability of fig. 5 as a summary of major events that are in some way related to human influences on the landscape and
c. an emphasis on selected site records, such as Lago Nero and Prato Mollo in Liguria, where there is clear correspondence between pollen-stratigraphic and other lines of evidence for disturbance or human presence.

The principal conclusions are as follows:

1. Mesolithic

It is possible that there was sporadic activity in the mountains during the Mesolithic. It is not possible to judge what kind of activities were practised, but all of the evidence points to very slight effects on the vegetation, if any. No artefacts suitable for tree cutting have been discovered from Mesolithic deposits. Charcoal remains recovered from prehistoric hearths all indicate (a) that small branches were used for burning and (b) that these have traces of fungal hyphae, indicating that the wood was gathered from the ground surface (Castelletti, 1984; Castelletti in Cremaschi *et al.*, 1984). There is no evidence for any sustained human action during the Mesolithic in any of the sites investigated so far.

2. Late Neolithic to Copper Age

Evidence for significant disturbance of forests, burning, flint scatters and soil erosion all indicate much more intensive activity in the mountain zone commencing in the Late Neolithic and becoming more intensive in the Chalcolithic to Bronze Ages. The evidence, suggests, however, that this activity was geographically selective – some sites provide marked evidence for disturbance during this period, while others bear slight indications only.

3. Roman-Lombard Ages

Very severe dusruption of soils occurred in some parts of the mountains during the immediate post-Roman period, which possibly commenced during the Roman period. The evidence indicates intense summer pasture activities, perhaps leading to over-grazing in the more accessible and/or suitable areas for pasture.

4. A pastoral regime

There is no evidence either from palynological records or historical accounts of any cultivation anywhere in the mountain zone. The mountain zone, certainly above *ca.* 600 metres in altitude, seems always to have been used as part of a pastoral, transhumance system.

Future work will aim at improving the data-base by increasing the number of sites to provide a more representative network, developing more reliable radiocarbon age measurements and dating strategies, improving the stratigraphic framework (for example by including systematic analyses of charcoal and the analysis of plant macro-fossils where feasible), and establishing site transects linking the stratigraphic information from the montane zone with that from the lowlands.

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IL POPOLAMENTO DELLA VALLE DEL SERCHIO (TOSCANA SETTENTRIONALE) DURANTE IL TARDIGLACIALE WÜRMIANO E L'OLOCENE ANTICO

SUMMARY – *The peopling of the Valle del Serchio in northern Tuscany (central Italy) during the Late Glacial and the Early Holocene.* The region surrounding the Valle del Serchio in north-western Tuscany, was almost completely covered with ice during the II Würmian pleniglacial. No trace of human settlement is known for this period. Bands of final Epigravettian hunter-gatherers make their appearance during the Dryas II, the Allerød and the Dryas III as documented by a few cave camps and open air sites located close to the valley bottom. The woodland cover is almost absent with rare low altitude forests composed of hazelnut, maple, ash, spruce and oak. During the Preboreal, the Boreal and the beginnings of the Atlantic, oak and *Abies alba* increase at low and middle altitude, while the higher Apennines are covered with a sparse and bushy vegetation with *Laburnum,* maple and ash. The Mesolithic bands reached an altitude of some 1500 metres as attested by a few base camps and several small high altitude camps located near passes, on morainic deposits and along the shore of glacial lakes. During the Sauveterrian the base camps are mainly distributed both in the valley bottoms and at middle altitudes, while during the Castelnovian some base camps lie at high elevation. During the Neolithic the territory is depopulated. At the start of the metal ages the area is populated again as indicated by the discovery of valley bottom and high altitude sites. The Subboreal is characterized by the diffusion of beech-forest. During this period an intense woodland clearance caused by agricultural and mining activities is evidenced by erosional and colluvial phenomena.

RIASSUNTO – *Il popolamento della Valle del Serchio (Toscana settentrionale) durante il tardiglaciale würmiano e l'Olocene antico.* L'area in esame risulta estesamente glacializzata durante il II pleniglaciale würmiano e non vi sono tracce di popolamento umano in questo periodo. Gruppi di cacciatori-raccoglitori dell'Epigravettiano finale compaiono durante il Dryas II, l'Allerød e il Dryas III con pochi insediamenti in grotta ed all'aperto posti in prossimità dei fondovalle. L'ambiente è prevalentemente aperto con boschi radi, alle quote più basse, di laburno, nocciolo, acero, frassino, abete e quercia. Durante il Preboreale, il Boreale e gli inizi dell'Atlantico la quercia e l'abete bianco aumentano alle quote medie e basse, mentre alle quote più elevate dell'Appennino permane una vegetazione rada e cespugliosa con laburno, acero e frassino. I gruppi mesolitici si spingono fin oltre i 1500 metri con un sistema d'insediamento articolato in pochi campi base e in numerosi piccoli bivacchi posti in prossimità di valichi, su depositi morenici e sulle rive di laghetti glaciali. Durante il Sauveterriano i campi base sono ancora prevalentemente nei fondovalle e alle quote intermedie, mentre con il Castelnoviano anche alcuni campi base sono localizzati ad alta quota. Durante il Neolitico l'area si spopola, ma con l'età dei metalli si assiste ad una nuova diffusione del popolamento, con un bipolarismo degli insediamenti situati prevalentemente in prossimità dei fondovalle e ad alta quota. A partire dal Subboreale si diffonde la faggeta ed estesi disboscamenti a scopo agricolo, per il pascolo e per l'attività mineraria sono evidenziati in molti siti da fenomeni di erosione e di colluvio.

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L'area presa in esame comprende l'alta e media Valle del Serchio fino alla confluenza con il Fiume Lima ed è compresa tra la dorsale appenninica ad est e la catena delle Alpi Apuane ad ovest. La zona è stata oggetto di ripetute ed accurate prospezioni di superficie a partire dagli inizi degli anni Settanta, che hanno portato alla scoperta di numerosi resti preistorici la cui distribuzione è indicativa delle diverse modalità di occupazione del territorio nelle varie epoche (fig. 1). I siti contenuti in depositi in posto sono stati oggetto di scavi da parte della Soprintendenza Archeologica della Toscana, dell'Istituto di Antropologia e Paleontologia Umana dell'Università di Pisa, poi confluito nel Dipartimento di Scienze Archeologiche, e da parte del Museo Civico di Reggio Emilia (Biagi *et al.*, 1981; Cremaschi e Castelletti, 1975; Castelletti *et al.*, 1976; Cremaschi *et al.*, 1981-82; Guidi, 1989; Guidi e Rossi, 1984; Guidi *et al.*, 1985; Notini, 1973; 1983; Tozzi, 1980). In questa nota sono considerati non solo i siti

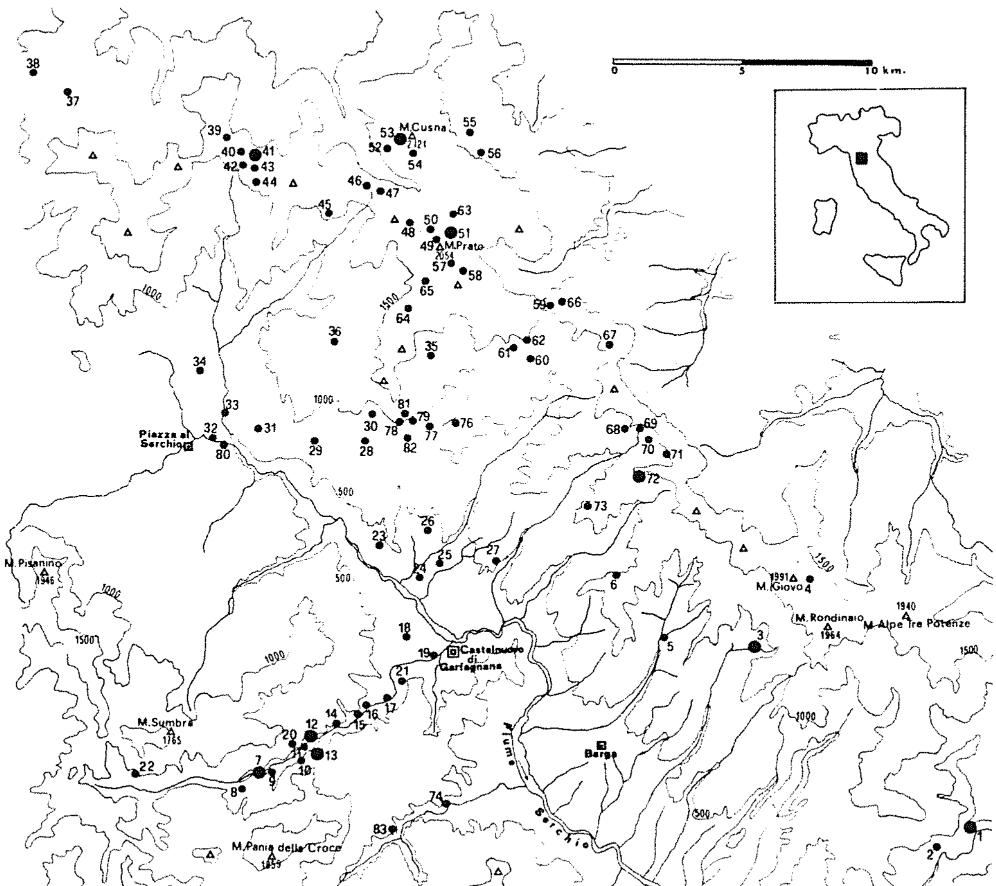

Fig. 1 - Distribuzione dei siti archeologici elencati nell'Appendice.

compresi entro il bacino idrografico del Serchio, ma anche quelli ubicati sulla parte sommitale del versante emiliano dell'Appennino. Per quanto riguarda le Apuane nessun sito è stato finora individuato sul versante occidentale della catena.

L'AMBIENTE FISICO

In questo tratto si trovano le maggiori culminazioni dell'Appennino settentrionale con cime che superano, seppur di poco i 2000 metri (M. Cusna, M. Prado) e varie che sono comprese tra i 1900 e i 2000 metri; mediamente il crinale corre intorno ai 1800 metri. Le Alpi Apuane hanno altezza di poco inferiore, ma hanno una morfologia molto più accidentata essendo formate da un nucleo metamorfico a cui si sovrappongono le formazioni non metamorfosate della Serie Toscana. Le due catene corrono parallele e sono separate da una depressione tettonica in cui scorre profondamente incassato il Serchio. La neotettonica è stata molto attiva durante il Quaternario e lo è tuttora, contribuendo a dare a tutta l'area una morfologia «giovane» con dislivelli molto accentuati.

Durante il Pleniglaciale würmiano la media e alta Valle del Serchio si presentava fortemente glacializzata, specialmente sul versante esposto a nord, assai più di quanto era stato precedentemente ipotizzato (Braschi *et al.,* 1987; Bertolini e Trevisan, 1985). Sul versante apuano i ghiacciai maggiori erano quelli di Gramolazzo, quello di Gorfigliano e quello di Vagli. Nella Valle della Turrite Secca, oltre al già noto ghiacciaio che partendo dal Monte Altissimo aveva la sua morena frontale a Campagrina, numerose lingue glaciali erano attestate su entrambi i fianchi della valle e quelle che partivano dal Monte Corchia e dal massiccio delle Panie giungevano a circa un chilometro da Isola Santa. Le lingue più basse scendevano fino a 600-700 metri di quota. Per l' Appennino non abbiamo una ricostruzione altrettanto dettagliata in corrispondenza della Valle del Serchio, ma poco più a nord il complesso glaciale del M. Molinatico scendeva a 900 metri di quota sul versante sud e a circa 800 sul versante nord; il limite nivale era posto all'altitudine di circa 1200 metri (Bertolini e Trevisan, 1985). Analogo limite nivale è stato calcolato per il ghiacciaio della Val Parma, la cui fronte scendeva a circa 750 metri di quota (Federici e Tellini, 1983). Pertanto si può ritenere che anche in corrispondenza della Valle del Serchio le fronti glaciali dei due versanti dell'Appennino si trovassero a quote simili durante l'acme würmiano.

Al di fuori delle aree direttamente occupate dai ghiacci è ben attestata la presenza di estesi fenomeni periglaciali costituiti da depositi di *loess,* presente alla base della serie di Isola Santa, da importanti accumuli di detriti di falda, da depositi fluvioglaciali, come il conoide di Piazzana nell'alta Valle dell'Ania.

L'intensa neotettonica del Pleistocene superiore e anche postpleistocenica ha inoltre accentuato ulteriormente i fenomeni erosivi e di instabilità dei versanti (Puccinelli, 1987).

Le fasi di ritiro dei ghiacciai non sono attualmente note nel dettaglio, ma nonostante il forte regresso subito nel corso del riscaldamento climatico seguito al Dryas II (Federici, 1979; Losacco, 1949; 1982), vi sono elementi per ritenere che piccoli ghiacciai siano persistiti fino al Dryas III, come indicano i recenti dati di Prato Spilla sull'Appennino parmense (Lowe, 1992).

Nella Valle della Turrite Secca due ripari sotto roccia, il Riparo di Piastricoli (Guidi, 1989) e il Riparo Fredian (scavi inediti a cura di C. Tozzi) attestano tuttavia che fenomeni di sedimentazione grossolana di tipo crioclastico erano ancora attivi nelle fasi finali del Tardiglaciale e solo con il Preboreale avanzato e con il Boreale al Riparo Fredian cambia il tipo di sedimentazione con formazione di depositi prevalentemente fini. Nelle Apuane (Isola Santa) e nell'Appennino, vari siti evidenziano un inizio di pedogenesi e di stabilizzazione dei versanti a bassa quota all'inizio dell'Olocene, mentre nei depositi di alta montagna permane la prevalenza dei fenomeni erosivi o colluviali. La stabilizzazione dei versanti raggiunge il massimo durante l'Atlantico con formazione di suoli bruni anche ad alta quota, come al Passo della Comunella, a Lama Lite, a Monte Bagioletto (Biagi *et al.*, 1981; Cremaschi e Castelletti, 1975; Castelletti *et al.*, 1976; Cremaschi *et al.*, 1981-82; Cremaschi, 1990).

Una ripresa della instabilità dei versanti con erosioni e colluvi si manifesta nuovamente in vari siti nel Subboreale per la concomitanza di cause antropiche e climatiche.

LA FAUNA

I resti faunistici sono piuttosto scarsi e provengono dai Ripari Fredian e Piastricoli nella Valle della Turrite Secca e dalle grotte di Ponte Nero e delle Campane nella Valle della Lima, dove rappresentano i residui di pasto di gruppi umani del Paleolitico superiore finale. L'età di questi resti è presumibilmente compresa tra il Dryas II (Ponte Nero) e il Dryas III/Preboreale (Fredian) (Biagi *et al.*, 1981; Guidi, 1989). Vari inghiottitoi nelle Apuane hanno restituito resti faunistici, ma la loro cronologia è del tutto indeterminata.

Nei depositi citati lo stambecco è sempre l'animale dominante, seguito dal cervo e, a notevole distanza, da cinghiale e capriolo; molto rari sono il camoscio e l'uro (tab. 1). Tra i carnivori sono presenti il lupo e l'orso e nello strato 4 del Riparo Fredian anche il leone, la cui sopravvivenza nella zona può essere legata all'abbondanza dello stambecco. Si tratta dei resti più recenti finora segnalati in Italia di leone delle caverne, la cui presenza fino alla fase di

	Fredian	Fredian	Fredian	Piastricoli	Piastricoli	Piastricoli	Piastricoli	Piastricoli	P. Nero	P. Nero	P. Nero	Campane
strato	5	4	3	823	822	821	820	800-811	B	C	F	
	%	%	N.	%	%	%	%	%	N.	N.	N.	
Canis lupus	1,2	-	-	0,6	-	0,6	0,6	2,7	1	1	-	-
Ursus arctos	0,3	9,3	1	-	0,2	1,1	0,6	5,4	-	-	-	-
Panthera leo	-	2,1	-	-	-	-	-	-	-	-	-	-
Marmota m.	-	-	-	-	-	-	-	-	1	5	2	-
Sus scrofa	2,4	3,1	-	1,2	1,2	4	1,9	-	5	16	4	c.
Capreolus c.	-	1	-	-	1,3	-	0,8	-	-	-	1	r.
Cervus elaphus (1)	11,8	35,4	1	7,8	8,4	10,2	6,7	5,4	2	4	4	c.
Bos primigenius	0,3	1	-	-	-	-	0,2	-	-	-	-	r.
Capra ibex (1)	83,9	47,9	8	89,7	88,7	80	87,9	86,1	10	67	25	m.a.
Rupicapra r.	-	-	-	-	1,3	-	0,8	-	-	-	-	r.

Tab. 1 - Composizione faunistica dei siti tardiglaciali della Valle del Serchio. (1) La percentuale è calcolata escludendo i frammenti di corna. c.= comune; r.= raro; m.a.= molto abbondante.

Allerød era testimoniata dalla raffigurazione su una placchetta incisa proveniente dal Riparo Tagliente. La marmotta, presente a Ponte Nero e rarissima nella parte inferiore del deposito della Grotta delle Campane, indica condizioni ancora glaciali e una probabile maggior antichità di Ponte Nero rispetto agli altri depositi. La forte riduzione dello stambecco e l'aumento del cervo dallo strato 5 allo strato 4 del Riparo Fredian segna probabilmente il passaggio dal Dryas III al Preboreale.

Nel complesso l'associazione faunistica, con l'alta frequenza dello stambecco, indica un ambiente ancora dominato dalla vegetazione erbacea, mentre la vegetazione arborea andava lentamente colonizzando il fondo valle e i versanti meglio esposti. La mancanza di resti faunistici nei siti olocenici non consente di seguire le tappe della sostituzione dello stambecco da parte del cervo.

LA VEGETAZIONE

Le sequenze polliniche nell'area considerata non sono molto numerose per difetto di successioni sedimentarie lacustri ben conservate; attualmente la più completa e meglio datata è quella di Prato Spilla, vicino alla Val Parma, poco a nord-ovest della zona in esame (Lowe, 1992).

Le successioni registrate dai pollini indicano: il declino delle curve di *Pinus* e *Artemisia* verso il 10600-10300 BP, cioè alla transizione Tardiglaciale-Olocene; lo sviluppo della fase ad *Abies* e *Quercus* (con altre latifoglie come olmo, tiglio, frassino) a partire da tale data e sino al 4000 BP; e infine la dominanza del faggio dal 4000 BP e sino ai nostri giorni.

Lo studio dei carboni raccolti in diversi siti (tabb. 2 e 3) permette alcune considerazioni che possono esser utilizzate complementarmente rispetto a quelle polliniche.

Nella fase di transizione dal Tardiglaciale all'Olocene gli spettri antracologici (fig. 2) indicano la presenza localmente di querce e altre latifoglie in siti a quote medio-basse con una buona rappresentanza di abete. I valori di abete si alzano decisamente nella fase corrispondente al Preboreale e al Boreale, soprattutto a quote superiori. Durante il Boreale, nelle aree oltre i 1500 metri, la fisionomia della compagine boschiva è caratterizzata da frassino con acero in subordine e abbondanti cespugli di laburno. Nell'Atlantico alle quote medio-basse si incrementa la quercia mentre a quote elevate permane il bosco prima indicato. La dominanza del faggio è documentata, ad alta quota, in focolari dell'età dei metalli o più recenti ed è datata 3790±100 BP (I-12687) al Bagioletto, dove i carboni di faggio utilizzati sono stati selezionati in contesto mesolitico, a riprova delle note dislocazioni di carboni dall'alto in basso in seno a questi depositi (Cremaschi *et al.*, 1981-82). Questa data concorda comunque con quella ricavata dalle analisi polliniche di Prato Spilla ed è singolare la concomitanza della diffusione del faggio con la più antica rifrequentazione antropica delle zone culminali.

Esaminiamo ora in dettaglio la situazione dei dati antracologici procedendo per ogni fase dai siti più bassi a quelli più elevati (tabb. 2 e 3; fig. 2).

Nella prima fase, anteriore al Preboreale, a Isola Santa prevale una copertura arborea rada con cespugli di laburno e nocciòlo, con specie arboree più o meno eliofile come frassino e acero, relativa abbondanza di abete bianco e presenza di quercia. Al riparo di Piastricoli si nota una dominanza della quercia con corteggio di cespugli di laburno e nocciòlo e tracce di abete. Al Riparo Fredian, la quercia è praticamente assente nella fase più antica, mentre compaiono pino silvestre e betulla, specie microtermiche e pioniere, forse corrispondenti al raffreddamento del Dryas III, o legate a condizioni locali di substrato; nella fase più recente, in accordo con la diminuzione di stambecco e aumento di cervo, emerge la quercia e aumenta l'abete bianco. In questa fase l'abete bianco cresce a Isola Santa mentre a Piazzana l'abete è molto più abbondante e la quercia è scarsa.

Nella fase corrispondente all'Atlantico si osserva al Riparo Fredian molta quercia e poco abete, e a Isola Santa molto abete seguito da quercia; a Piazzana, infine, moltissimo abete e quercia scarsa e comparsa di piante cespugliose.

Alle quote elevate dei crinali appenninici l'abete bianco è assente o scarso mentre la vegetazione è più rada e cespugliosa con laburno, acero e frassino.

Nell'età dei metalli si assiste, come si è detto, al prevalere di faggete quasi pure. Al Riparo Fredian si evidenzia la presenza del pino mediterraneo, quasi certamente alloctono (rami resinosi accesi in grotta), mentre non compaiono nei carboni tracce di leccio *(Quercus ilex)*, attualmente presente, con discreta abbondanza, nella bassa valle.

Tab. 2 - Percentuali dei carboni nei siti con numero significativo di frammenti esaminati (*= solo «terre nere» ; **= solo tagli 4b, 5, 6). Ab.= *Abies*, Bet.= *Betula*, Cor.= *Corylus*, Fag.= *Fagus*, Quer.= *Quercus*, Pom.= Pomoideae, Lab.= *Laburnum*, Ac.= *Acer*, Fr.= *Fraxinus*; t.= numero complessivo di carboni esaminati.

	Ab.	Bet.	Cor.	Fag.	Quer.	Pom.	Lab.	Ac.	Fr.	t.
ISOLA S. 4abc	63	–	–	–	25	–	–	–	–	570
ISOLA S. 4de (da 9420±90 a 7380±120 BP)	44	–	–	–	15	–	9	–	5	414
ISOLA S. 5 (10720±40 BP)	19	–	19	–	7	5	36	10	–	1241
PIAZZANA 3Ai (7330±75 BP)	70	–	–	–	12	–	5	10	–	89
PIAZZANA 3B-3I 65 (da 8990±90 a 8090±90 BP)	–	–	–	11	–	14	–	6	1145	
COMUNELLA (7060±130 BP)	–	–	–	–	–	–	–	7	93	688
BAGIOL.ALTO* (8260±60 BP)	–	–	–	–	–	–	27	8	63	1004
LAMA LITE** (6620±80 BP)	–	–	–	–	–	–	47	31	22	342

Tab. 3 - Numero di carboni dei siti Riparo Fredian e Riparo di Piastricoli. Abbreviazioni come in tab. 2; inoltre: Pin.= *Pinus*, Sal.= *Salix*, Al.= *Alnus*, CO= *Carpinus/Ostrya*.

	Ab.	Pin.	Sal.	Bet.	Al.	CO	Cor.	Fag.	Quer.	Pom.	Lab.	Ac.	Fr.
FREDIAN 04	9	4	–	2	1	–	1	–	13	–	2	–	4
FREDIAN 08-05	1	12	1	13	–	6	2	1	–	4	15	1	1
PIASTRICOLI	2	1	–	–	–	–	11	–	50	3	15	–	4

IL POPOLAMENTO

Durante il Paleolitico medio e la fase antica del Paleolitico superiore si hanno solo sporadiche testimonianze della presenza dell'uomo. Si tratta di pochi manufatti di tecnica *levallois* raccolti in superficie nelle stazioni di Verrucole, di Forcola e di Sillicagnana; un grossolano grattatoio carenato raccolto a Verrucole potrebbe molto dubitativamente indicarne una frequentazione durante l'Aurignaziano (NOTINI, 1974). Questi reperti possono essere attribuiti in base alla tipologia all'interpleniglaciale würmiano, durante il quale il miglioramento delle condizioni climatiche può aver spinto i gruppi umani che frequentavano intensamente le aree costiere della Versilia a fare saltuarie spedizioni verso l'interno. Nessuna traccia di presenza umana può finora essere riferita al II Pleniglaciale, quando solo una fascia stretta e inospitale rimaneva libera dai ghiacci tra le Apuane e l'Appennino. Al termine della glaciazione, con l'Epigravettiano finale, l'uomo compare di nuovo nella Valle del Serchio e una intensa frequentazione delle aree montane si sviluppa durante il Mesolitico. Con il Neolitico le tracce della presenza umana si rarefanno o scompaiono, mentre con l'età dei metalli inizia il popolamento stabile e continuo della regione.

Complessivamente i siti segnalati sono 83 e alcuni di essi sono stati frequentati in periodi diversi (Appendice A); pur non essendo certamente la totalità dei siti esistenti, tuttavia la sistematicità delle ricerche e il numero elevato forniscono un quadro attendibile delle caratteristiche del popolamento nelle varie epoche. La distribuzione dei siti in base all'altitudine e alla situazione geomorfologica è assai differenziata: vi sono giacimenti in grotte e ripari, giacimenti su cresta e/o dorsale sia dello spartiacque appenninico principale sia di quelli secondari;

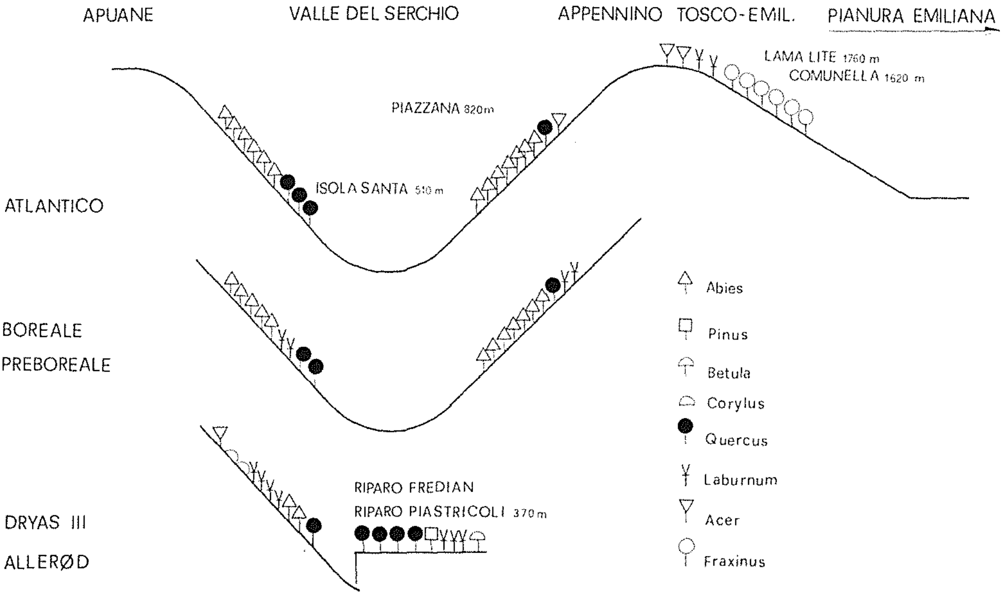

Fig. 2 - Distribuzioni dei carboni nei siti delle Apuane e dell'Appennino Tosco-Emiliano, basate sulle percentuali dei taxa più significativi.

giacimenti su ripiani e su bordi di conche glaciali; giacimenti di valico; giacimenti su pianori e su rotture di pendio di solito posti a mezza costa; giacimenti su terrazzi fluviali recenti in prossimità del fondovalle. In base alla quota si sono distinti giacimenti posti a meno di 500 metri, tra 500 e 1000 metri, tra 1000 e 1500 metri e oltre i 1500 metri.

Per quanto si tratti di limiti di comodo essi corrispondono abbastanza bene alla situazione geomorfologica e in parte anche a quella vegetazionale. I giacimenti in grotta e su terrazzi fluviali recenti sono di solito a quota inferiore a 500 metri, i giacimenti su pianoro sono di solito tra 500 e 1000 metri e tra 1000 e 1500. I giacimenti di valico, su morfologie glaciali e su cresta o dorsale sono spesso posti a quote superiori a 1500 metri. Intorno ai 1000 metri si trova il limite inferiore attuale della faggeta e poco oltre i 1500 si ha il limite superiore della vegetazione arborea.

I siti che hanno restituito manufatti riferibili all'Epigravettiano finale sono in totale 11. Sette di essi sono situati a quote inferiori a 500 metri (tab. 5), 3 sono situati tra 500 e 1000 metri ed 1 solo (Casini di Corte) oltre i 1000 metri. Quest'ultima località può essere considerata come una stazione officina posta su un pianoro alla quota di 1160 metri in prossimità di affioramenti di rocce silicee della Serie Toscana. Degli altri siti, 2 sono su pianori a mezza costa, 3 su terrazzi fluviali di fondo valle e 4 in grotta o riparo (tab. 4).

Durante il Mesolitico si registra un forte incremento della presenza umana, passando da 11 a 65 siti. Di questi 15 sono attribuibili al Sauveterriano, 13 al Castelnoviano e 37 a un Mesolitico generico essendo privi di elementi diagnostici. Esaminando la distribuzione in quota, si osserva che 4 siti sauveterriani sono a meno di 500 metri, 4 sono ubicati tra 500 e 100 metri, 3 tra 1000 e 1500 metri e 4 oltre i 1500 metri; per il Castelnoviano si osserva che solo 2 siti si trovano a meno di 500 metri, 3 sono compresi tra 500 e 1000 metri, 2 tra 1000 e 1500 metri e ben 6 oltre i 1500 metri. Anche per il Mesolitico generico si ha una forte presenza alle quote più elevate dell'Appennino con 11 siti tra i 1000 e 1500 metri e 16 oltre i 1500 metri. Per

	EPIGRAVETTIANO	*SAUVETERRIANO*	*CASTELNOVIANO*	*MESOLITICO GEN.*	*ETA' DEI METALLI*
GIACIMENTI	*n.*	*n.*	*n.*	*n.*	*n.*
terrazzo fluviale	3	5	4	7	7
pianoro	3	4	1	9	1
valico	-	1	1	4	-
conca/ripiano glaciale	-	2	6	5	2
cresta/dorsale	1 (?)	2	1	12	5
grotta/riparo	4	1	-	-	2 (+9)
Tot.	11	15	13	37	17 (+9)

Tab. 4 - Valle del Serchio e Appennino Tosco-Emiliano: localizzazione dei giacimenti.

ciò che riguarda la geomorfologia (tab. 4), osserviamo un sostanziale abbandono delle grotte e dei ripari, in quanto una sporadica presenza durante il Sauveterriano è attestata solo nel Riparo Fredian. Nel Mesolitico antico sono insediati prevalentemente i terrazzi fluviali di fondo valle e i pianori a mezza costa; durante il Castelnoviano sono frequentati prevalentemente i bordi e i ripiani di conche glaciali, occupate da laghetti e da acquitrini, e i depositi morenici, seguiti dai terrazzi di fondovalle.

Durante il Neolitico la valle sembra essere stata quasi del tutto abbandonata poiché solo pochi frammenti di ceramica tardoneolitica provengono dalla grotta delle Campane, mentre con l'età dei metalli, sopratutto Eneolitico e Bronzo antico, inizia una nuova fase di intenso popolamento che sfocerà negli insediamenti dell'età del Ferro e di età classica; il numero degli insediamenti più recenti qui riportato è solo indicativo e non tiene conto di ritrovamenti ancora inediti fatti recentemente (Notini, com. pers. 1992). I resti dell'età dei metalli si trovano prevalentemente sui terrazzi di fondovalle e sulle creste e/o dorsali, a cui corrisponde una analoga polarizzazione in base alla quota, di solito inferiore ai 500 metri o superiore ai 1500 metri. Le grotte tornano a essere frequentate, ma con utilizzo prevalente a scopo funerario o rituale.

La diversa ubicazione e intensità del popolamento è certamente una conseguenza delle trasformazioni ambientali avvenute a partire dal Tardiglaciale, e delle diverse modalità di sfruttamento delle risorse naturali nei vari periodi. Dopo le fugaci apparizioni durante il Paleolitico medio, l'uomo ricompare nella Valle del Serchio alla fine della glaciazione in concomitanza con il sensibile miglioramento climatico avvenuto a partire dal Dryas II. In questa fase gli insediamenti restano tuttavia a quote medio-base e lo stambecco ancora numeroso nelle estese praterie montane è l'animale cacciato più frequentemente; la raccolta di prodotti vegetali è testimoniata dalla presenza di gusci di nocciole carbonizzate nel Riparo Piastricoli, nel Riparo Fredian, nello strato 5 di Isola Santa, a Bagioletto e a Piazzana, ma certamente venivano raccolte molte altre specie che non hanno lasciato traccia nei depositi.

	EPIGRAVETTIANO	*SAUVETERRIANO*	*CASTELNOVIANO*	*MESOLITICO GEN.*	*ETA' DEI METALLI*
QUOTA s.l.m.	*n.*	*n.*	*n.*	*n.*	*n.*
< 500 m.	7	4	2	5	8
500 - 1000 m.	3	4	3	5	3 (+9)
1000 - 1500 m.	1	3	2	11	-
> 1500 m.	-	4	6	16	6
Tot.	11	15	13	37	17 (+9)

Tab. 5 - Valle del Serchio e Appennino Tosco-Emiliano: distribuzione dei siti in base all'altitudine.

Con il successivo ulteriore innalzamento termico e inaridimento del clima durante il Boreale e il Preboreale piccoli gruppi di cacciatori-raccoglitori sauveterriani e castelnoviani si spingono più in alto, stabilendo i loro accampamenti sui depositi morenici e ai bordi delle conche glaciali. Il fenomeno è ancora limitato durante il Sauveterriano e registra un notevole incremento durante il Castelnoviano. Si può supporre che il principale motivo di attrazione risiedesse nell'ambiente ancora aperto alle quote più elevate della dorsale appenninica, costituito da un bosco rado di frassino, laburno e acero. La caccia al cervo, che sostituisce lo stambecco nell'Olocene antico, e di altri ungulati che compiono spostamenti stagionali in quota, rappresenta la base della sussistenza; importante, pur non avendone la testimonianza diretta, doveva essere lo sfruttamento delle abbondanti risorse vegetali costituite da bacche e da frutti spontanei; alle quote medio basse (Piazzana e Isola Santa, strato 4) è ben testimoniata una intensa raccolta di nocciole.

Molto evidente durante il Mesolitico è la gerarchia degli insediamenti: alle quote medie e basse prevalgono i campi base, caratterizzati da industria litica abbondante e in cui sono rappresentate tutte le classi di strumenti, indicante una frequentazione intensa, con ritorni periodici sempre nella medesima località; alle quote più elevate gli insediamenti sono numerosi e dispersi, spesso testimoniati solo da pochi manufatti; la frequentazione era quindi diffusa, ma di breve o di brevissima durata; i pochi campi base sono attribuibili, uno alla fine del Boreale (Bagioletto Alto - Sauveterriano) e due all'Atlantico (Passo della Comunella e Lama Lite - Castelnoviano).

Con il passaggio all'economia produttiva, la Toscana settentrionale rientra inizialmente nell'orbita della facies tirrenica della corrente culturale della Ceramica Impressa; successivamente prevalgono le influenze settentrionali, rappresentate dalla Cultura di Fiorano e poi dalla Cultura Chassey-Lagozza. In questo periodo la Valle del Serchio e dei suoi affluenti sembra essere del tutto prive di insediamenti stabili, essendo poco adatta alle attività agricole per motivi climatici e morfologici. Sembra tuttavia aver avuto un modesto ruolo come via di comunicazione transappenninica; infatti la Grotta delle Campane (Malatesta, 1951) posta sul percorso che conduce all'importante valico dell'Abetone, è l'unico sito che ha fornito una modesta quantità di ceramica neolitica, tra cui due frammenti di ceramica dipinta della Cultura di Ripoli (Bernabò Brea, 1956). È quindi possibile che sia questa una delle vie seguite nella diffusione di questa ceramica commerciata anche al di fuori della zona di origine fino alla Liguria e alla Padania.

Con l'età dei metalli le tracce della presenza umana ritornano frequenti e diffuse. Le segnalazioni sono concentrate sui terrazzi fluviali a quota inferiore a 500 metri, uniche aree idonee a una modesta attività agricola, e in località oltre i 1500 metri, prevalentemente sulle creste e dorsali appenniniche. Le grotte e i ripari, ubicati prevalentemente sul versante apuano tra i 500 e i 1000 metri di quota, sono utilizzati principalmente a scopo sepolcrale e cultuale. Sono comunque indicativi di una frequentazione che sulle Apuane è legata soprattutto allo sfruttamento minerario e al conseguente utilizzo delle ampie disponibilità di legname. Le presenze in area appenninica sono invece più probabilmente legate allo sfruttamento estivo dei pascoli d'alta quota a partire da sedi permanenti ubicate sui terrazzi di fondovalle e sulle aree collinari del Pedeappennino Emiliano.

OSSERVAZIONI CONCLUSIVE

Le ricerche e i ritrovamenti di questi ultimi anni hanno certamente arricchito e precisato, ma non sostanzialmente modificato, il quadro del popolamento dell'Appennino Tosco-Emiliano durante il Tardiglaciale e l'Olocene antico a suo tempo presentato da BIAGI *et al.* (1981). La penetrazione di gruppi epigravettiani nella Valle del Serchio e nelle aree montuose circostanti inizia durante il Dryas II e si sviluppa in maniera consistente durante le fasi di Allerød e del Dryas III in concomitanza del ritiro dei ghiacci, che tuttavia probabilmente persistono sulle parti più elevate degli Appennini e delle Apuane fino a tutto il Dryas III. La presenza di una marcata componente romanelliana nell'industria della Grotta delle Campane e molto più tenue negli altri giacimenti (Riparo Piastricoli, Riparo Fredian, Isola Santa, Piazzana) fa supporre una provenienza diversa dei vari gruppi, una dalla Liguria dove la *facies* a grattatoi circolari è ben rappresentata, un'altra forse dalla Toscana dove l'Epigravettiano finale è in genere povero di grattatoi circolari. In ogni caso i contatti con la costa sono attestati dalla presenza di conchiglie marine forate *(Columbella)* a Piastricoli e al Riparo Fredian. La sussistenza di questi gruppi era basata sulla caccia allo stambecco, che raggiunge percentuali comprese tra l'80 e il 90%. I campi base erano situati in grotta e all'aperto in prossimità dei fondovalle (Grotta delle Campane, Piazzana, Riparo Fredian, Riparo Piastricoli) e l'abbondanza di industria litica fa supporre un ritorno periodico sempre nei medesimi siti per lunghi periodi di tempo. L'ambiente vegetale era costituito da praterie montane estese e da boschi di pino, abete e latifoglie, tra cui quercia e nocciolo. Durante il Dryas III si ha una riduzione delle latifoglie e un'incremento delle conifere (LOWE, 1992).

Con l'inizio dell'Olocene i ghiacciai residui si sciolgono totalmente; le conche glaciali vengono occupate da laghetti sulle cui rive sostano i gruppi mesolitici, che frequentano anche il crinale e i valichi appenninici. Il fenomeno è ancora limitato nel Preboreale e nel Boreale, ma si sviluppa notevolmente alla fine del Boreale e agli inizi dell'Atlantico. I carboni degli insediamenti di alta quota indicano localmente l'esistenza di un bosco rado di laburno, frassino e acero che perdura fino all'Atlantico, mentre a mezza costa sia sugli Appennini che sulle Apuane si sviluppa nel Preboreale e nel Boreale un bosco misto di conifere e latifoglie, che nell'Atlantico a Piazzana si trasforma in una abetina quasi pura (CASTELLETTI, 1983; LOWE, 1992). Il cervo sostituisce lo stambecco come principale oggetto di caccia e un indizio di ciò si ha nella flessione di quest'ultimo nello strato 4 del Riparo Fredian nel Preboreale.

Il sistema d'insediamento è articolato in pochi campi base intensamente frequentati e in numerosi piccoli bivacchi testimoniati solo da pochi manufatti, spesso di difficile attribuzione cronologica e culturale. Durante il Sauveterriano i campi base sono ancora prevalentemente sui fondovalle e a quote intermedie (Isola Santa, Piazzana), mentre solo Bagioletto Alto, attribuibile al Sauveterriano finale si trova a quota elevata. Con il Castelnoviano i campi base si spostano ad alta quota (Lama Lite, Passo della Comunella) o restano alle quote intermedie. Una marcata differenza nelle modalità d'insediamento sembra caratterizzare le Apuane e l'Appennino per motivi attualmente non ipotizzabili. Nelle Apuane tutti i siti sono concentrati solo sul fondovalle della Turrite Secca sul versante orientale; mancano completamente gli insediamenti in quota e nelle valli adiacenti per quanto siano state anche esse oggetto di accurate prospezioni. Sull'Appennino gli insediamenti sono molto più diffusi dal fondovalle al crinale e si estendono verso nord-ovest all'Appennino ligure (BIAGI e MAGGI, 1983; GHIRETTI e GUERRESCHI, 1988). Verso sud non si hanno dati poiché la dorsale appenninica non è stata finora oggetto di indagini sistematiche. Il modello d'insediamento riscontrabile sull'Appennino Tosco-Emiliano ricalca abbastanza fedelmente quanto osservato nell'area alpina (Bagolini e Broglio, 1985; Broglio e Lanzinger, 1990; Baroni *et al.*, 1990). Ad una prima ed ancora limitata penetrazione durante l'Epigravettiano finale è seguita una intensa frequentazione durante il Mesolitico, legata ad un nomadismo stagionale ad ampio raggio tra la Valle del Serchio, la dorsale appenninica e l'alta pianura reggiana, nomadismo evidenziato dalla provenienza e dalla dispersione dei litotipi silicei utilizzati nella fabbricazione dei manufatti (Biagi *et al.*, 1981). L'attrazione esercitata dalle aree montane è probabilmente dovuta al permanere di paesaggi aperti, che durante la glaciazione erano presenti anche nella fascia pedemontana, e alle buone possibilità di sussistenza che essi fornivano. Un elemento di divergenza rispetto all'area alpina è costituito dal fatto che la frequentazione più intensa avviene non durante il Preboreale/Boreale ma alla fine del Boreale e durante l'Atlantico ad opera di gruppi del Sauveterriano finale e castelnoviani. Questo fenomeno non è limitato alla zona da noi presa in esame, ma è stato riscontrato anche sull'Appennino ligure (Ghiretti e Guerreschi, 1988). La spiegazione di ciò, in via molto ipotetica, potrebbe essere trovata non tanto in un modello insediativo e di sfruttamento del territorio diverso rispetto all'area alpina, come è stato suggerito da Ghiretti e Guerreschi (1988: 99), quanto nel fatto che durante l'Atlantico sulla dorsale appenninica permaneva un paesaggio più aperto di quello esistente a mezza costa e sul fondovalle (Castelletti, 1983). Inoltre la presenza di una abetina quasi pura intorno all'insediamento castelnoviano di Piazzana fa supporre relazioni con l'ambiente assai più complesse e diversificate di quanto siamo oggi in grado di ricostruire, analogamente a quanto osservato ai Laghetti del Crestoso (BS), dove il campo castelnoviano era posto al limite di un ambiente densamente forestato (Baroni *et al.*, 1990).

A partire dal Subboreale, la Valle del Serchio acquisisce i caratteri vegetazionali e paesaggistici ancor oggi esistenti. Sopra l'orizzonte del querceto misto si diffonde la faggeta e si riduce l'abetina. L'intervento umano diviene sempre più massiccio con estesi disboscamenti a scopo agricolo, per il pascolo e per l'attività mineraria, evidenziato in molti siti da fenomeni di erosione e di colluvio che si sovrappongono ai suoli sviluppatisi durante l'Atlantico (Monte Bagioletto, Piazzana, Lama Lite, Isola Santa).

APPENDICE. ELENCO DEI SITI PREISTORICI DELLA VALLE DEL SERCHIO E DELL'APPENNINO TOSCO-EMILIANO.

1) Grotta delle Campane, m 325, Epigravettiano finale, Neolitico, Eneolitico (Malatesta, 1951; Palma Di Cesnola, 1962).
2) Grotte di Ponte Nero, m 250, Epigravettiano finale (Mencacci e Zecchini, 1976; Biagi *et al.*, 1981).
3) Piazzana, m 820, terrazzo fluviale, Epigravettiano finale, Sauveterriano (8990±90 BP: R-399; 8890±90 BP: R-397; 8780±90 BP: R-398; 8450±90 BP: R-396; 8080±90: R-395), Castelnoviano (7330±85 BP: R-400), Eneolitico (Biagi *et al.*, 1981).
4) Lago Baccio, m 1560, conca glaciale, Castelnoviano (Lera, 1977; Biagi *et al.*, 1981).
5) Montebono, m 550, terrazzo fluviale, Mesolitico generico (Tozzi, inedito).
6) Capanne delle Prate, m 1050, pianoro su fianco valle, Mesolitico generico (Guidi *et al.*, 1985).
7) Isola Santa, m 500, ripiano su fianco valle, Epigravettiano finale (10720±140 BP: R-1524), Sauveterriano (9420±90 BP: R-1529; 9220±100 BP: R-1529α; 8780±110 BP: R-1528α; 8590±90 BP: R-1527α; 8840±170 BP: R-1526α; 7460±90: R-1525; 7380±130 BP: R-1525α)(Biagi *et al.*, 1981; Castelletti, 1983; Alessio *et al.*, 1983).
8) La Pollaccia, m 625, terrazzo fluviale, Mesolitico generico (Guidi *et al.*, 1985).
9) Le Pierme, m 450, terrazzo fluviale, Mesolitico generico, Eneolitico-Bronzo (Guidi *et al.*, 1985).
10) La Pianaccia, m 350, terrazzo fluviale, Sauveterriano (Guidi *et al.*, 1985).
11) Locanda Piastricoli, m 360, terrazzo fluviale, Sauveterriano, Castelnoviano (Guidi *et al.*, 1985).
12) Riparo Piastricoli, m 360, Epigravettiano finale (11010±315 BP: GX-14717; 10340±360 BP: GX-14718)(Guidi *et al.*, 1985).
13) Riparo Fredian, m 360, Epigravettiano finale (10870±119 BP: AA-10952), Sauveterriano (9458±91 BP: AA-10951), età dei metalli (Tozzi, inedito).
14) Le Peschiere, m 360, terrazzo fluviale, Mesolitico generico (Guidi *et al.*, 1985).
15) Il Calorino, m 350, terrazzo fluviale, Sauveterriano (Guidi *et al.*, 1985).
16) Molino del Riccio, m 350, terrazzo fluviale, Mesolitico generico (Guidi *et al.*, 1985).
17) Casa Pantano al Fiume, m 300, terrazzo fluviale, Castelnoviano (Guidi *et al.*, 1985).
18) Piano dell'Uomo, m 506, pianoro, Epigravettiano (Guidi *et al.*, 1985).
19) Pianettora, m 300, terrazzo fluviale, età dei metalli (?) (Guidi *et al.*, 1985).
20) Grotticella del Giacchio, m 650, Eneolitico (Guidi *et al.*, 1985).
21) Molino di Sassi, m 300, ripiano su fianco valle, età del Bronzo (Guidi *et al.*, 1985).
22) Casa La Rocchetta, m 940, ripiano su fianco valle, età del Bronzo (Guidi *et al.*, 1985).
23) Colle Freddino, m 450/540, cresta, Epigravettiano (?), Mesolitico generico, età dei metalli (Notini, 1973).
24) Piano di sotto di Piano di Cerreto, m 375/424, terrazzo fluviale, Musteriano, Epigravettiano finale, Eneolitico (Guidi *et al.*, 1985).
25) Solceta, m 328/362, terrazzo fluviale, Musteriano, Epigravettiano finale, Eneolitico (Guidi e Rossi, 1984; Guidi *et al.*, 1985).
26) Piano di Villa Collemandina, m 456/529, terrazzo fluviale, Musteriano (?), Epigravettiano, Eneolitico (Guidi e Rossi, 1984; Guidi *et al.*, 1985).
27) Anguillina, m 490, terrazzo fluviale, Eneolitico, Bronzo (Notini, 1973).
28) Monte Tignoso, m 856, pianoro su fianco valle, Eneolitico (Notini, 1973).
29) Verrucole, m 780, cresta, Musteriano, Aurignaziano (?), Mesolitico generico (Notini, 1973).
30) Sulcina, m 1000, pianoro, Epigravettiano finale, Mesolitico generico (Notini, 1973).
31) Orzaglia, m 540, terrazzo fluviale, Mesolitico generico (Notini, 1973).
32) Piazza al Serchio, m 561, terrazzo fluviale, Mesolitico generico (Notini, 1973).
33) Forcola, m 650/680, pianoro, Musteriano, Sauveterriano, Castelnoviano (Notini, 1973).
34) S. Anastasio, m 815/826, terrazzo fluviale, Sauveterriano, Castelnoviano (Notini, 1973).
35) Campaiana, m 1400, pianoro, Sauveterriano (Biagi *et al.*, 1981).
36) Casini di Corte, m 1160, pianoro, Epigravettiano finale (Notini, 1973).
37) Passo del Cerreto, m 1325, valico, Sauveterriano (Biagi *et al.*, 1981).
38) Passo dell'Ospedalaccio, m 1271, valico, Mesolitico generico (Cremaschi, 1976).
39) Passo Pradarena, m 1579, valico, Mesolitico generico (Cremaschi, 1975; Notini, 1983).
40) Monte Asinara, m 1666, cresta, Mesolitico generico (Notini, 1983).

41) Passo della Comunella, m 1619, valico, Castelnoviano (6960±130 BP: Birm-830) (Cremaschi e Castelletti, 1975).
42) La Paduletta I, m 1693, dorsale, Sauveterriano (?) (Notini, 1983).
43) La Paduletta II, m 1693, ripiano glaciale, Mesolitico generico (Notini, 1983).
44) Monte Spasina, m 1625, cresta, età del Ferro (Notini, 1983).
45) Capanne di Camporanda, m 1375, pianoro, Sauveterriano (Notini, 1983).
46) San Bartolomeo, m 1680, conca glaciale, Mesolitico generico (Notini, 1983).
47) Passo di Romecchio, m 1675, valico, Mesolitico generico (Notini, 1983).
48) Monte Castellino, m 1921, cresta, Mesolitico generico (Notini, 1983).
49) Bargetina, m 1780, conca glaciale, Sauveterriano (Notini, 1983).
50) Prato al Buzzo, m 1725, ripiano glaciale, Mesolitico generico, età dei metalli (Notini, 1983).
51) Lama Lite I, m 1764, cresta, Mesolitico generico, età dei metalli (Notini, 1983). Lama Lite II, m 1764, ripiano glaciale, Castelnoviano (6620±80 BP: R-1394), età del Ferro (Castelletti *et al.*, 1976; Notini, 1983).
52) Lago del Caricatore, m 1610, conca glaciale, Castelnoviano (Biagi *et al.*, 1981).
53) Monte Bagioletto, m 1650/1700, ripiano glaciale, Sauveterriano, Eneolitico, età del Ferro, Romano (8260±BP: Bln-2839; 7670±120 BP: I-12687; 7630±120 BP: I-12520; 3790±100 BP: I-12687) (Cremaschi *et al.*, 1981-82).
54) Rio Grande, m 1360, ripiano glaciale, Mesolitico generico (Biagi *et al.*, 1981).
55) Pian Vallese, m 1303, cordone morenico al margine di conca glaciale, Mesolitico generico (Biagi *et al.*, 1981).
56) Corni Piccoli, m 1398, conca glaciale, Castelnoviano (Biagi *et al.*, 1981).
57) Monte Prado-Monte Vecchio, m 2054/1982, dorsale, Mesolitico generico (Notini, 1983).
58) Sasso Fratto, m 1756, conca glaciale, Castelnoviano, Eneolitico (Notini, 1983).
59) Le Forbici, m 1834, cresta, Mesolitico generico, età dei metalli (Notini, 1983).
60) Casone di Profecchia I, m 1370, pianoro, Sauveterriano, età dei metalli (?) (Notini, 1983).
61) Casone di Profecchia II, m 1400, pianoro, Mesolitico generico (Notini, 1983).
62) Casone di Profecchia III, m 1290, pianoro, Mesolitico generico (Notini, 1983).
63) Il Passone, m 1847, dorsale, Mesolitico generico (Guidi *et al.*, 1985).
64) Lama Rossa I, m 1496, pianoro, Mesolitico generico (Guidi *et al.*, 1985).
65) Lama Rossa II, m 1391, pianoro, Mesolitico generico (Guidi *et al.*, 1985).
66) Monte Giovarello, m 1633, cresta, Mesolitico generico (Guidi *et al.*, 1985).
67) Passo delle Radici, m 1526, ripiano glaciale, Mesolitico generico (Guidi *et al.*, 1985).
68) Casa Ceppeta, m 1200, ripiano su fianco valle, Mesolitico generico (Guidi *et al.*, 1985).
69) Casa Burigone, m 1400, ripiano glaciale, Mesolitico generico (Guidi *et al.*, 1985).
70) Casa Pianaccione, m 1429, ripiano glaciale, Mesolitico generico (Guidi *et al.*, 1985).
71) Prati Solcati, m 1613, dorsale, Mesolitico generico (Guidi *et al.*, 1985).
72) Le Coste, m 1400, ripiano glaciale, Castelnoviano, età del ferro (Guidi *et al.*, 1985).
73) Sturatella, m 930, pianoro su fianco valle, Mesolitico generico (Guidi *et al.*, 1985).
74) Buca delle Fate di Calomini, m 525, grotta sepolcrale, Eneolitico, età del Bronzo (Formicola e Grifoni Cremonesi, 1979; Guidi e Rossi, 1984).
75) Buca di Castevenere, m 650, grotta, Eneolitico, età del Ferro (Mencacci e Zecchini, 1976; Guidi e Rossi, 1984).
76) Grotta della Guerra, m 730, Eneolitico, età del Ferro (Grifoni Cremonesi, 1971; Guidi e Rossi, 1984).
77) Grotta della Penna Gialla, m 930, età dei metalli (Guidi e Rossi, 1984).
78) Tana del Cerro, m 900 circa, età del Bronzo, età del Ferro (Guidi e Rossi, 1984).
79) Grotticella del Pugnale, m 900 circa, Eneolitico (Guidi e Rossi, 1984).
80) Grotta di Monte Croce, m 550, Eneolitico, età del Ferro (Guidi e Rossi, 1984).
81) Tana Grande, m 700, età del Ferro (Guidi e Rossi, 1984).
82) Grotta dei Pipistrelli, m 778, età del Bronzo, età del Ferro (Guidi e Rossi, 1984).
83) Grotta dell'Anello, m 400 circa, età del Bronzo (Guidi e Rossi, 1984).

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P. BIAGI and J. NANDRIS (eds.) Highland Zone Exploitation in Southern Europe
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GRAEME BARKER*

THE EXPLOITATION OF THE MATESE MOUNTAIN AND UPPER BIFERNO VALLEY FROM PREHISTORIC TIMES TO THE PRESENT DAY: ENVIRONMENT, ECONOMY AND SOCIETY

SUMMARY – *The exploitation of the Matese Mountain and upper Biferno Valley from prehistoric times to the present day: environment, economy and society.* The purpose of this paper is to discuss the extent to which we can use archaeology and history to assess the long-term interplay between environmental structure and human behaviour in one particular Apennine landscape, the Matese mountain and the upper Biferno valley. The results of an inter-disciplinary study of this landscape centred on a programme of archaeological survey and excavation are briefly described. These show that, whilst this upland landscape offered particular constraints and opportunities for settlement and land use, the role of this *«longue durée»* cannot be reduced to simple environmental determinism. For one thing, the landscape changed over time as a result of climatic change and human exploitation, so responses had to change. Whether the landscape was stable or unstable, however, the prime determinants of the human responses to it have been the social institutions and economic structures of the period in question.

RIASSUNTO – *Lo sfruttamento delle montagne del Matese e dell'alta Valle del Biferno dalla preistoria al giorno d'oggi: ambiente, economia e società.* Il presente lavoro si propone di discutere come l'archeologia e la storia possano venire impiegate per valutare l'interconnessione fra ambiente e comportamento umano in un territorio ben definito dell'Appennino centrale: le montagne del Matese e l'alta Valle del Biferno. L'Autore analizza i risultati di uno studio interdisciplinare eseguito in questo territorio, con un programma di ricognizioni e di scavi archeologici. Questi hanno dimostrato che, sebbene la regione abbia offerto particolari opportunità di insediamento e di sfruttamento territoriale, questa lungo processo non può essere ridotto a semplice determinismo. Il territorio mutò nel tempo a causa delle variazioni climatiche e dell'attività di sfruttamento da parte dell'uomo. Stabilità del territorio o meno, gli effetti principali dell'attività dell'uomo furono le istituzioni sociali e le strutture economiche.

INTRODUCTION

In his sweeping history of the Mediterranean world in the 16th century, the French historian Fernand Braudel lamented how the lowlands had tended to dominate most previous studies focussing more on political history: *«the historian is not unlike the traveller. He tends to linger over the plain, which is the setting for the leading actors of the day, and does not seem eager to approach the high mountains nearby. More than one historian who has never left the towns and their archives would be surprised to discover their existence»* (BRAUDEL, 1972: 29). In fact, he argued, the mountains, plateaus and plains of the Mediterranean landscape have always been inextricably related in the history of human settlement: the changing relationship between the uplands and lowlands was like the ebb and flow of a wave, perhaps the most

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important «slow-furling wave» of Mediterranean history.

The investigation of this relationship was a central theme of an inter-disciplinary study of the Biferno valley in Molise in central-southern Italy (Barker, 1991) (fig. 1). The cornerstone of the project was an archaeological field survey to map the surface evidence for changing settlement patterns from prehistoric to recent times (fig. 2). The survey was integrated with geophysical analyses and excavations of prehistoric, classical and medieval settlements discovered during the programme, investigations of environmental history (geomorphology, palynology etc.), and documentary studies. The principal fieldwork was undertaken during the 1970's, but the final report now in press also integrates the findings of the project with other archaeological work undertaken in the valley in the 1980's and 1990's (Barker, nd).

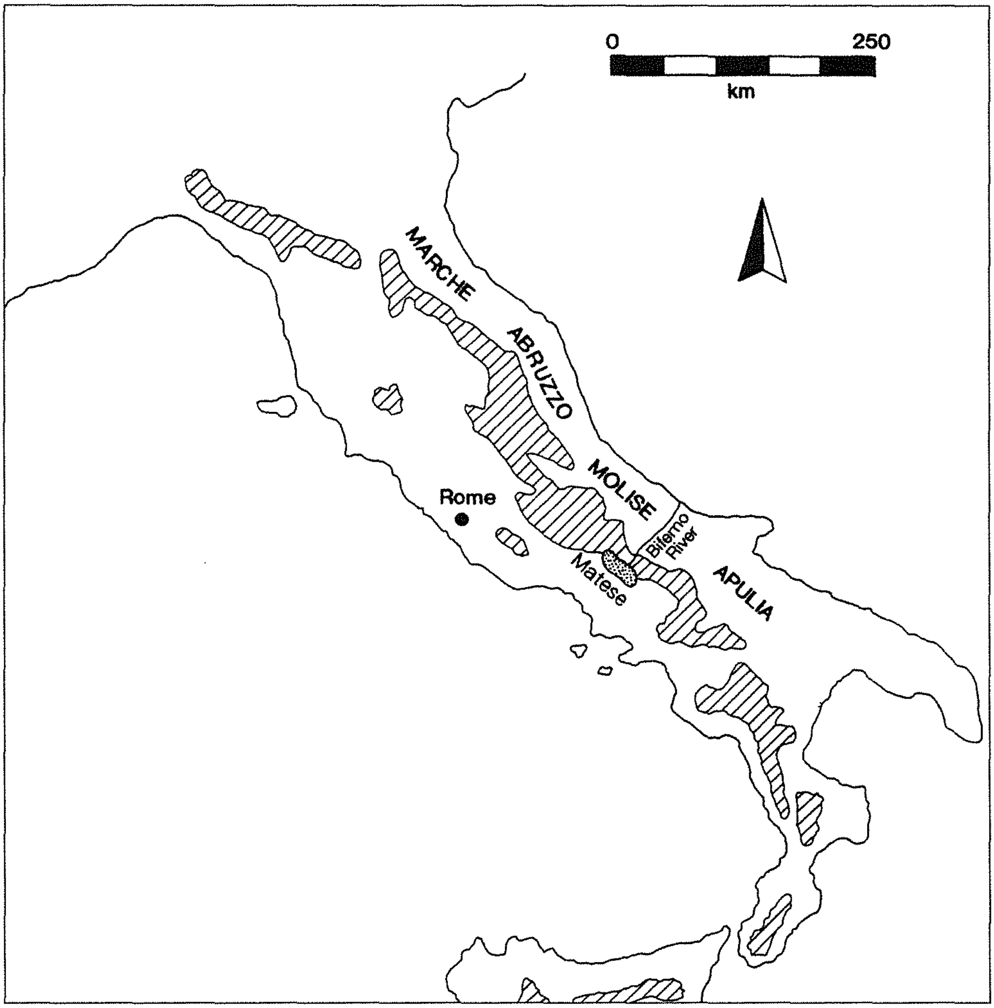

Fig. 1 - The Italian peninsula, showing the location of the Matese mountain and Biferno valley. Cross-hatching indicates land over 1000 metres above sealevel.

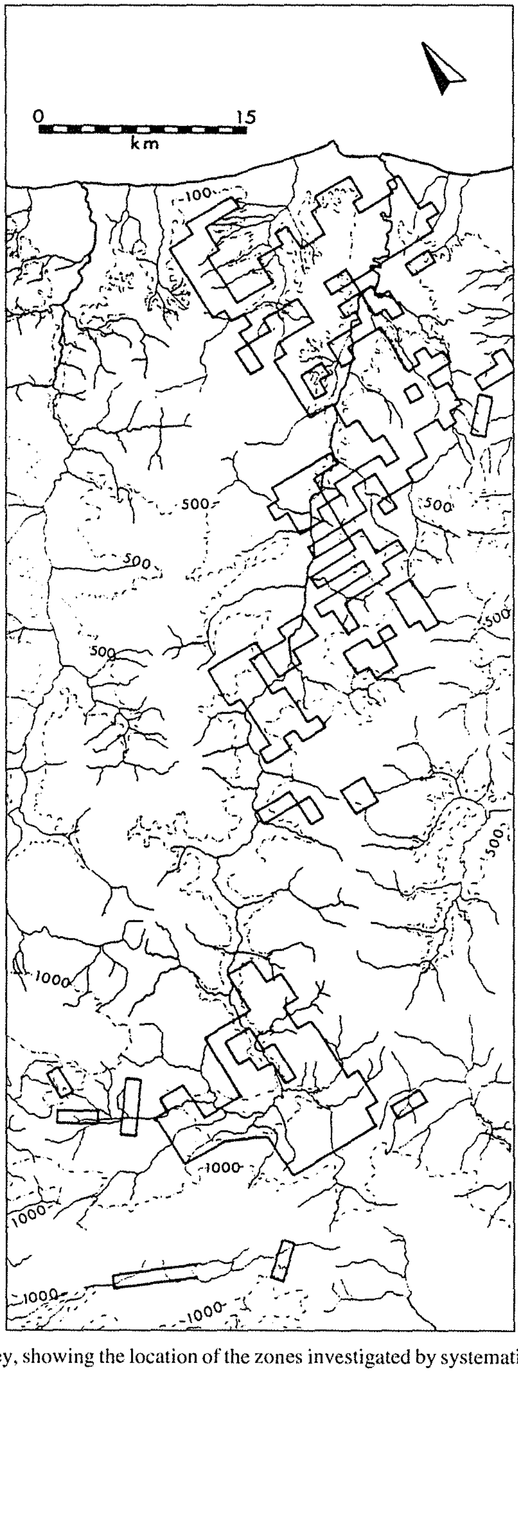

Fig. 2 - The Biferno valley, showing the location of the zones investigated by systematic field-walking; contours in metres.

Braudel characterised history as consisting of the interplay of three different kinds of historical process operating at different timescales: the *longue durée,* long term processes such as the influence of climate, seasonality, and topography on settlement, land use and communications; *conjonctures,* social and economic changes operating over a generation or so; and *événements,* the events of political and military history. As several archaeologists have argued in recent years, archaeological data are in many respects well suited to the same kind of holistic analysis of past societies and landscapes, particularly when studied at the regional scale (BINTLIFF, 1991; HODGES, 1986; KNAPP, 1992).

A major criticism of Braudel's history has been that he did not really consider in detail how the different processes might actually have interacted together. In reality he placed most emphasis on the *longue durée,* a «structure» of history which for many historians and archaeologists has seemed simply environmental determinism by another name. As MORELAND (1992: 125) argues in the case of the emergence of medieval villages in central Italy, *«although people worked within and through structures, they were not structure-bound. They could and did take action, and even used facilities...that constituted elements of structure to further their own ends».* The purpose of this paper is to discuss the extent to which we can use archaeology and history to assess the long-term interplay between environmental structure and human behaviour in one particular Apennine landscape, the Matese mountain and the upper Biferno valley (fig. 3).

THE LANDSCAPE

The Apennine chain that forms the backbone of the Italian peninsula is at its narrowest at the Matese – some 20 kilometres wide. *«The view from its summit, when favoured by a clear atmosphere and serene weather (circumstances of rare occurrence) is extremely extensive; embracing both seas, and, it is said, occasionally the coast of Dalmatia beyond the Adriatic»* (CRAVEN, 1838: 130). The structure is typical of the limestone Apennines: steep ridges rising to some 2000 metres above sea level enclose a series of karstic basins or *altipiani,* the floors of which are at about 1000 metres above sea level. There are five principal basins, the largest of which has an enclosed catchment which feeds the only permanent lake, the Lago del Matese (fig. 3). Three others lie to its west, and provide the headwaters of the Lete river, which flows westwards out of the Matese into the Volturno and hence to the Tyrrhenian sea north of Naples. The ridge on the northern side of all four basins rises to the summit of the Matese, Monte Miletto (2050 m), which forms the watershed between the Adriatic (Biferno) and Tyrrhenian (Volturno) river systems. The fifth basin lies at 1400 metres, on the northern flank of Monte Miletto and has been developed as the modern ski resort of Campitello.

The tributary streams of the Biferno gather in a large intermontane basin north of the Matese named after its principal settlement, Boiano. As his carriage came down into the basin from Campobasso, CRAVEN (1838: 165) was moved by the magnificent vista before him: *«the serrated peaks of the towering Matese, the magnificent forests that stretch along its indented and precipitous flanks, and the transparent rills that issue from its roots and meander over a surface of such verdure such as is never seen in the summer of the South».* The flanks of the Matese here were *«as impressive as gloomy: dark and yawning recesses, extending apparently* *into the bowels of the mountain, protrude huge buttresses of naked rock into the flat; while these narrow glens are thickly clothed with impenetrable thickets, which appear to climb up the higher fissures as far as the most elevated point, Monte Miletto»* (CRAVEN, 1838: 159).

Two of the Matese basins support permanent villages, Letino (1046 m) and Gallo (877 m). The Matese climate is too harsh for the cultivation of the olive, vine and fig, and the villagers can only grow a few hardy cereals, potatoes and so on. Until the 1960's the Matese *altipiani* were also used extensively every summer by transhumant shepherds: their flocks were mostly taken down to the Tavoliere plain around Foggia in Apulia some 80-100 kilometres away, though those belonging to the villages on the southern flanks of the Matese were taken southwards to Campania (SPRENGEL, 1975) (fig. 4). Most of the flocks belonged to the Matese villages or those on the Matese flanks, some to landowners in Apulia. The villages of the Boiano basin also practised *stanziale* grazing (BARKER and GRANT, 1991) involving either daily journeys into the mountains or summer camps on the Matese, the stock being stalled in the villages in winter.

Although the Boiano basin can seem an isolated world cut off from the outside world by the Matese on the one side and the unstable landscape of the middle Biferno on the other, in fact

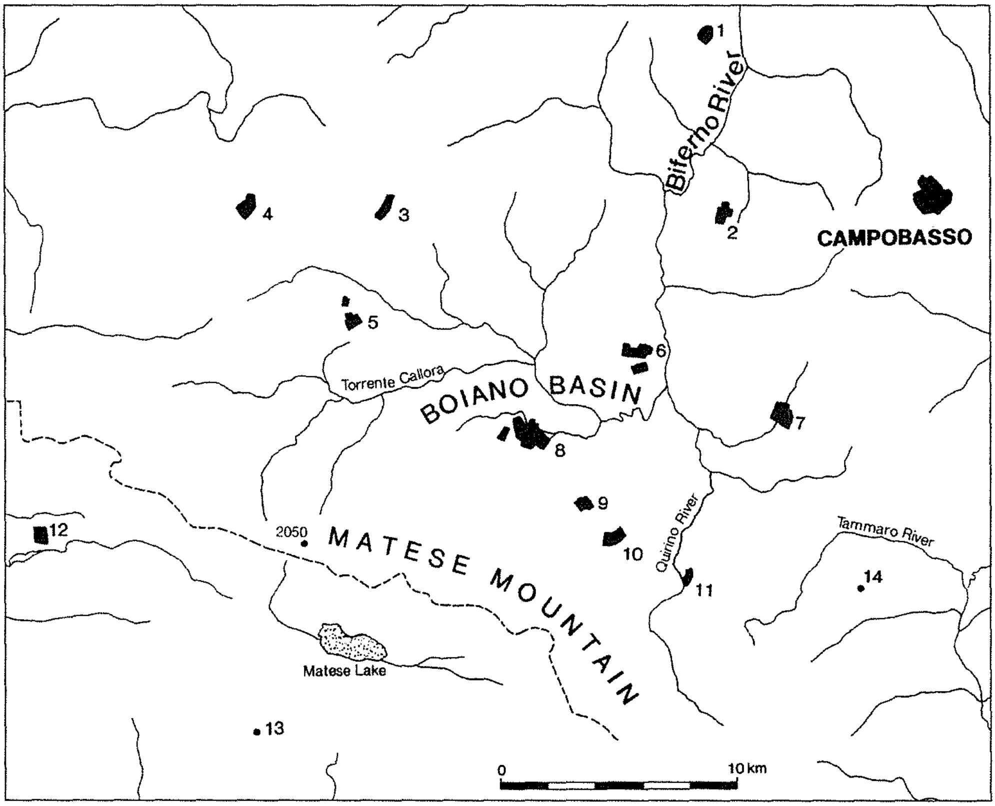

Fig. 3 - The Matese and upper Biferno valley: topography and principal settlements: 1) Castropignano, 2) Oratino, 3) Macchiagodena, 4) Castelpetroso, 5) Cantalupo, 6) Colle d'Anchise, 7) Vinchiaturo, 8) Boiano, 9) S. Polomatese, 10) Campochiaro, 11) Guardiaregia, 12) Letino, 13) S. Gregorio, 14) Saepinum (Roman town).

communications are relatively easy from it to the western side of the peninsula. Before modern times it was relatively simple in most weathers for travellers to by-pass the Matese by crossing the low watersheds separating the Biferno from the Volturno and Tammaro rivers, at the western and eastern ends respectively of the Boiano basin. From spring to autumn it was also possible to cross the Matese from one *altipiano* to another, following the shepherd tracks that linked the mountains with the communities either side. *«Rugged and impracticable as the passage over the highest extremities of the Matese may seem, it is in use at almost every season of the year by the natives of the south and northern sides of the mountains, who drive their beasts of burden, laden with various articles of commerce or produce, close to the most elevated of its pinnacles. The ascent (from the south) does not employ more than five hours; and much less is required to descend into the valley of Boiano»* (CRAVEN, 1838: 166).

The pattern of recent land use is the first indication of the potential complexity of upland-lowland relationships in the past – the nearest winter pastures from the Matese are those of the lower Biferno valley, but in fact the latter region provided the winter pasture for flocks from the Monti della Laga 150 kilometres north of the Matese in northern Abruzzo (SPRENGEL, 1975). Although at the outset of the project I had assumed that the Biferno valley provided an integral upland/lowland unit of study, in fact the «badlands» of the middle valley meant that communications from the upper valley are often easier with the western side of the peninsula (whether directly across the Matese or round it) than with the lower valley, and from the lower valley with the Adriatic littoral to the north and south than with the upper valley. Only the construction of the modern *Bifernina* highway in the 1970's has overcome the natural barrier to communications within the valley system.

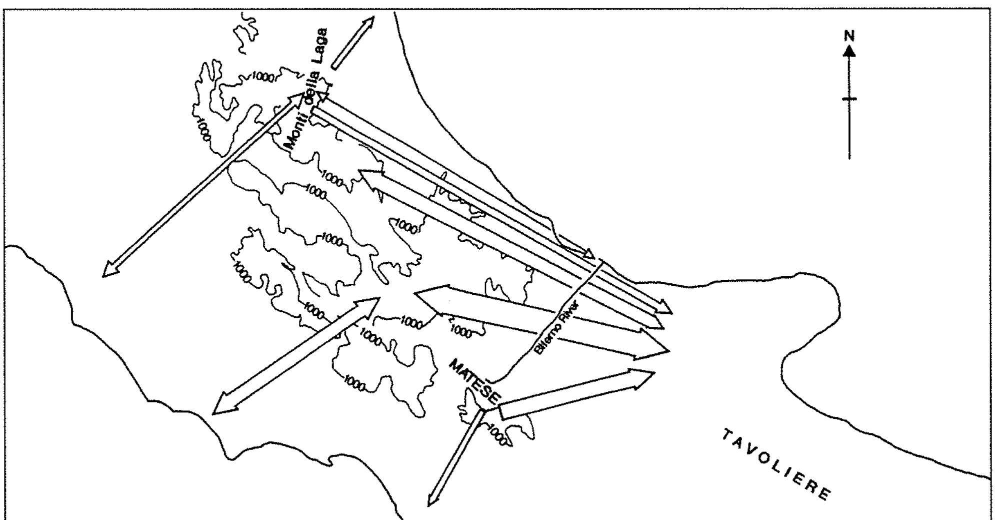

Fig. 4 - Recent transhumance patterns in central-southern Italy (after SPRENGEL, 1975).

PREHISTORIC SETTLEMENT

The lithic material collected by the Biferno valley survey indicates that, prior to the Upper Palaeolithic, settlement was largely restricted to the lower valley, with a variety of subsistence tasks being practised there. Upper palaeolithic settlement also concentrated in the lower valley, but forays were also made to the Boiano basin. Pollen analyses indicate a predominantly open landscape at this time (ALESSIO *et al.*, 1986; FOLLIERI *et al.*, 1988; FRANK, 1969; HUNT and EISNER, 1991; WATTS, 1985), though in maximum glacial conditions, permanent snow-lines are assumed to have been about 1700 metres above present sea-level and winter snow-lines at about 500 metres (MALATESTA, 1985), so we must assume that most of the forays inland were in summer. It seems unlikely that hunting parties made much use of the Matese at this time. In the Epipalaeolithic, the major focus of settlement seems to have been the present coastal plain and probably as well the adjacent zones now submerged.

The main neolithic (*ca.* 6500-5000 BP) settlements were situated in both the lower and middle valley (fig. 5), and off-site activities that created spreads of lithic material – presumably hunting and herding – ranged throughout the valley up to the Boiano basin. We obtained good botanical and faunal samples from several sites which indicated a subsistence system dominated by mixed farming, especially crop farming, though with animal secondary products of increasing importance over time (BARKER, nd). The trend is reflected in the use of a small rock shelter excavated at Ponte Regio in the upper valley, used as a temporary campsite (BARKER, 1974). The intensification in the subsistence base was paralleled by a variety of evidence for social elaboration.

The absence of neolithic lithic material from the Matese mountains suggests that subsistence activities did not yet make use of the high Apennines. Pollen analyses from the Matese (HUNT, unpublished), as elsewhere in central Italy (ALESSIO *et al.*, 1986; KELLY and HUNTLEY, 1991; WATTS, 1985), in fact indicate that, in the relatively humid climate of this period, the upland landscape was generally heavily wooded. The evidence for exchange systems also emphasises that contacts between lowland neolithic communities were along the Adriatic littoral rather than over the Apennines.

The lower valley remained the major zone of permanent settlement until the fifth millennium BP. During the fourth millennium, bronze age settlement extended into the middle valley as well and to a limited extent into the upper valley (fig. 5), and off-site activities for the first time reached into the Matese mountains. On the evidence of excavation and geophysical survey, the main settlements consisted of several huts, social units of perhaps three to five family groups (BARKER, 1988-89). The agricultural system was fundamentally the same as that practised by the later neolithic communities. Although most pottery was locally produced, the decoration shows that there were now well established communication systems from the valley not only up and down the coastal zone but also from the upper valley across the Apennines to Campania. The Biferno valley data correlate well with the general settlement trends observed throughout central Italy in the fifth and fourth millennia BP of a filling out of the landscape and the first systematic use of the Apennine mountains, the latter perhaps reflecting the development of some kind of transhumant pastoralism, albeit on a very small scale (BARKER, 1981; BARKER and GRANT, 1991).

The process of settlement expansion continued through the first half of the third millennium BP, the Iron Age (fig. 5), but there were substantial changes in settlement forms, social systems, and land use. Cemeteries provide clear signs of a markedly stratified society throughout the valley (Di Niro, 1981). Moreover, two clear settlement hierarchies can be discerned at either end of the valley, dominated by substantial villages in the lower valley and probably the first hillfort settlements in the upper valley. No definite settlements were found on the Matese for this period, though iron age sherds on later Samnite hillforts on the edge of the Matese (for example, above the Roman town of Saepinum and in the Campochiaro sanctuary) make it likely that the upland pastures were being used at this time by the people living in the Boiano basin for activities such as stanziale-type shepherding. The agricultural base continued as before, though in the lower valley there is evidence for wine production for the elites to indulge in Greek-style *symposia.* The distribution of fine pottery and bronzes indicates that the elites of the lower valley were linked in gift exchange networks with their neighbours along the Adriatic littoral and those of the upper valley with people on the other side of the Apennines, the same exchange pathways observed in the Neolithic and Bronze Age.

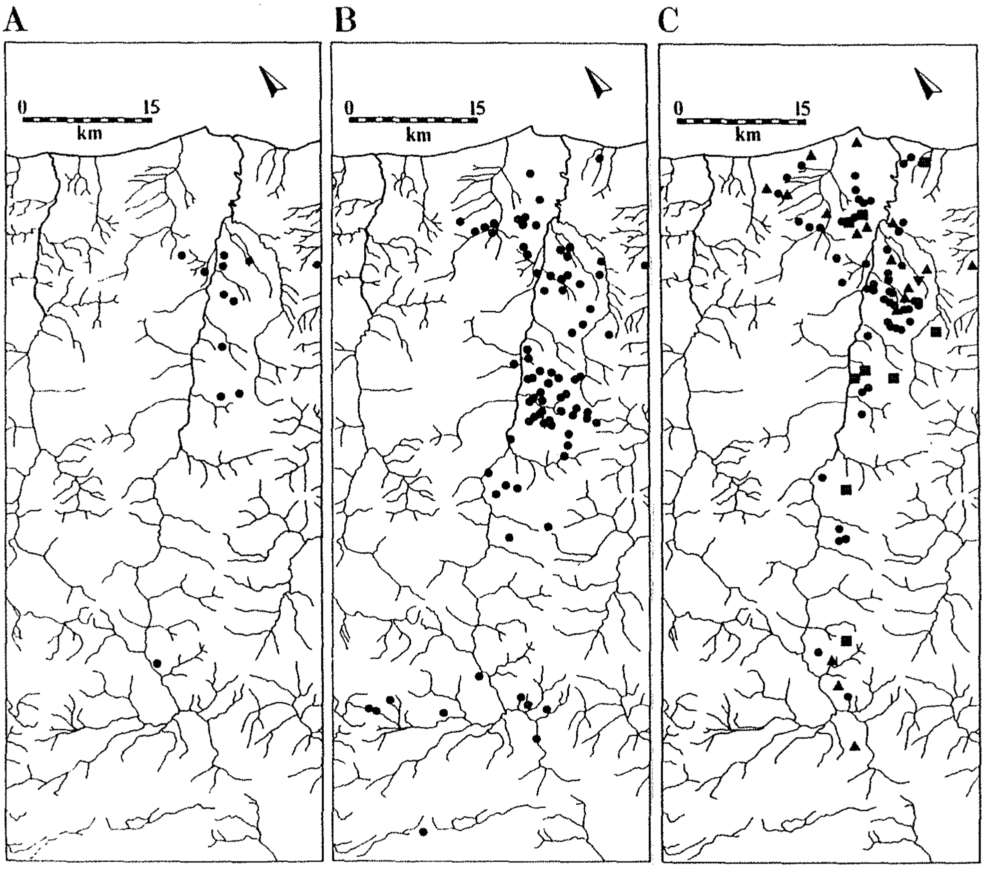

Fig. 5 - Principal archaeological settlements located by the field survey in the Biferno valley: (A) neolithic; (B) bronze age; (C) iron age. The circles denote small settlements interpreted as farms or hamlets; in Map C the squares denote large settlements interpreted as villages and the triangles denote cemeteries.

SAMNITE SETTLEMENT

The Biferno valley in the second half of the third millennium BP was part of ancient Samnium, the Pentri tribe of the Samnites living in the upper valley and the Frentani living on the lowlands (Salmon, 1967). The ancient sources record how the rising population of Samnium led to emigration over the mountains to the western side of the Italian peninsula, where the Samnites came into conflict with Rome, losing three bitter wars with the Romans between 343 and 290 BC. Although urbanization on the Graeco-Roman model did not develop until the first century BC, after the devastations by the Romans following the Social War (91-82 BC), the archaeological survey demonstrated a huge rise in rural settlement in the Biferno valley during the period of black glaze pottery production (the late 4th to the end of the 1st centuries BC), filling out the countryside to a level unparalleled in the valley's history perhaps until the early modern period (Lloyd, 1991), and the archaeological evidence from the survey and from excavations of Samnite settlements makes it clear that, by the eve of Romanisation, there were already economic, social and cultural structures characteristic of urbanisation.

The Samnite period of settlement in the upper valley is chiefly remarkable for the appearance of numerous fortified centres, equated by modern scholars with the Samnite *oppida* and *castella* referred to by the classical writers (fig. 6). The leading Pentrian settlement was Bovianum above modern Boiano. Largest of all, however, and best known archaeologically, is Monte Vairano near Campobasso, its *ca.* 50 hectares defended by walls stretching three kilometres, containing an array of public and domestic buildings and evidence for religious activity and a surprising range and scale of crafts (De Benedettis, 1980; 1988; 1991a; 1991b). There were villages or *vici* including one under modern Boiano, another on the edge of the Boiano basin floor near Campochiaro and another under the later Roman town of Saepinum, and numerous dispersed farms. There was also a highly structured ideological landscape, with a major sanctuary above Campochiaro on the flanks of the Matese, second-order local sanctuaries such as Colle Sparanise on the other side of the Boiano basin, and probably a third or more primitive category of *loca sacra* with guardian spirits venerated by local farmers and shepherds.

The transformation in the economic systems in which the upper valley now participated is evidenced by finds from Monte Vairano which include coarse pottery from northern Campania, marine foods presumably from the Adriatic, fine pottery from Apulia, and amphorae from southern Italy, Rhodes, western Turkey and the Black Sea. Coins reached the upper valley mainly from the mints of Rome and Campania but also from southern Italy, Sicily and Spain. A leading Pentrian family from the upper Biferno valley is attested trading on the Greek island of Delos in the 2nd century BC. The region was clearly now for the first time part of a «world system».

Cereals, legumes and vines were grown in the upper valley, and sheep, goats, and pigs were the principal stock, cattle kept mainly as plough animals (Lloyd, 1991). Whilst many Samnite farmers probably operated at a subsistence level, the wealthier landowners were producing surplus commodities, particularly stock, which they used to trade for exotic luxuries or as benefactions for religious sanctuaries to legitimate their authority over the peasantry (Barker, 1989). Long-distance transhumant systems under Roman control are attested in Italy by the Roman writers from soon after the Second Punic War (Pasquinucci, 1979). It has been argued that Samnite hillforts may have been located to protect the droveroads (De Benedettis, 1991c), and although it is impossible to demonstrate the existence of long-distance droveroads crossing the valley at this time as in later history, the small hillforts very high on the Matese must have controlled access to the upland grazing there as well as the routes across. Direct Pentrian involvement in such transhumance seems rather unlikely, but there must have been smaller scale systems moving animals and animal products to lowland markets – there is documentary and artifactual evidence for the intensified processing of wool in the lower valley at this time (LLOYD, nd).

ROMANISATION

With full Romanization in the later 1st century BC, urban centres were established in the upper Biferno valley (LLOYD, 1991) (fig. 7). The survey indicates a major restructuring of the landscape by the early imperial period: sites with Italian terra sigillata pottery number only a third of those with black glazed pottery. The trend indicates in part a decline in the rural population but more the development of large estates, as noted elsewhere in Italy at this time. The Samnite farm of Matrice was rebuilt in the early 1st century AD, not only substantially enlarged but also elaborately refurbished both in the living quarters but also the working area, where pressing equipment, probably for wine, was installed (LLOYD and RATHBONE, 1984). The

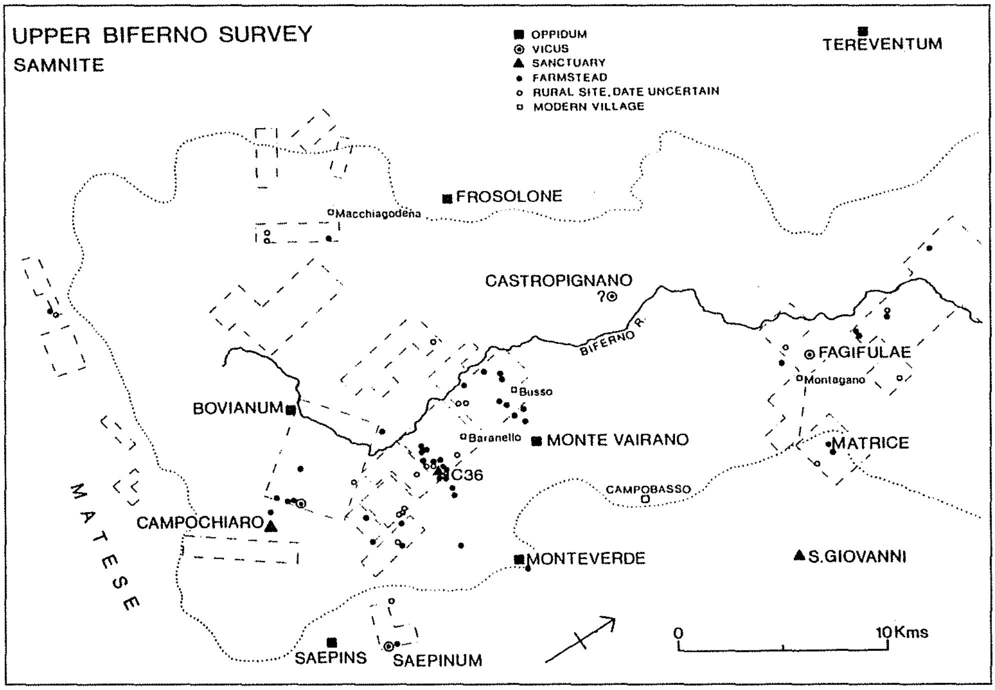

Fig. 6 - The Matese and upper Biferno valley in the later Samnite period (3rd to 1st centuries BC): principal settlements and survey blocks (after LLOYD, 1991).

documentary sources for the period show the emergence of increasingly powerful families in the upper valley, and the faunal and botanical residues and material culture from the excavated sites make it clear that the villa estates were involved in intensive agricultural production for external markets.

The surplus on estates such as Matrice was probably produced largely by animal husbandry, and it is likely that transhumant systems were an integral part of estate management. The presence of occasional sherds of Roman fine wares on the Matese presumably indicates the use of the pastures there for summer by shepherds and herdsmen from estates such as Matrice. Field survey at comparable altitudes in northern Molise and in the Cicolano mountains in the central Apennines has also found even clearer evidence for seasonal encampments in this period presumed to be the vestiges of transhumance from estates at lower altitudes – sherds of Roman fine wares associated with rock enclosures and hut footings (BARKER and GRANT, 1991).

MEDIEVAL SETTLEMENT

As in the rest of Italy, the middle centuries of the first millennium AD were characterized by a massive decline in population (HODGES and WICKHAM, nd). The major towns were deserted by about AD 550, except as homesteads for the elite. The countryside was almost deserted, with

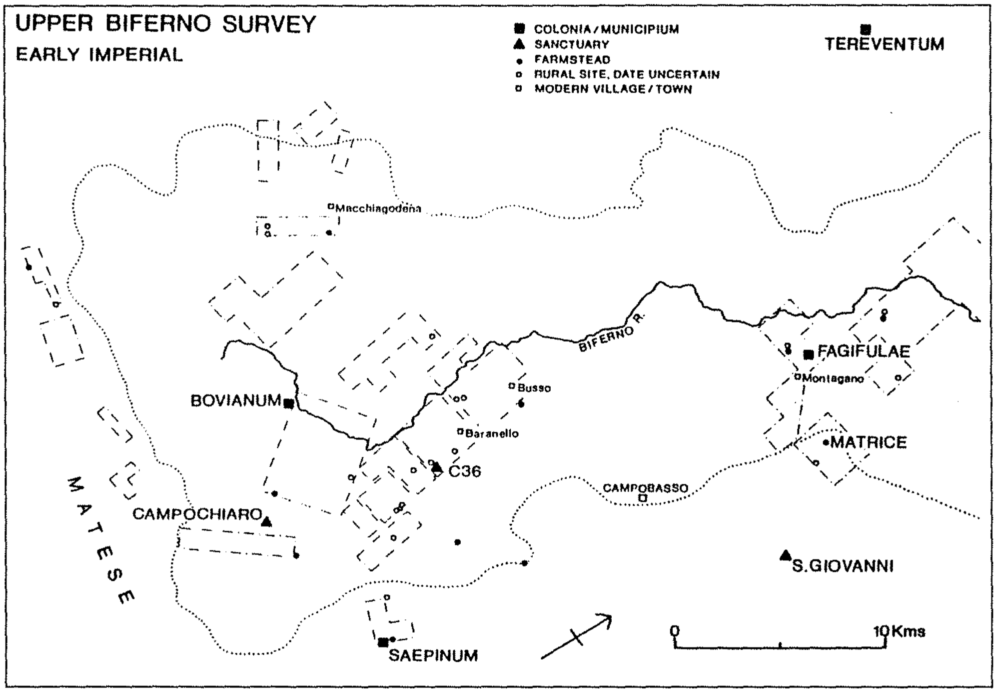

Fig. 7 - The Matese and upper Biferno valley in the early Principate (1st and 2nd centuries AD): principal settlements and survey blocks (after LLOYD, 1991).

rural settlements being small, defended, and widely scattered. The survey found only one site for the sixth to eighth centuries AD (Hodges *et al.*, 1980), and scarcely half a dozen for the ninth. It was not until the tenth century AD that the basic pattern of the modern hill villages was established, including those of the Matese and Boiano basin. The eleventh and twelfth centuries were marked by further settlement expansion, with numerous communities establishing other villages in marginal situations, but in the following centuries most of them were abandoned as the settlement system contracted once more.

The feudal lords living in their castles at key location points were relatively wealthy: Boiano castle, for example, clearly benefited from its control of the main route from Benevento to Cassino through the Boiano basin, and has produced quantities of imported fine wares from Apulia. Around them, however, the economic system of the early and high medieval periods contracted to a subsistence level. A typical abandoned village of the period in the region, Monteverde, consisted of a huddle of primitive houses round a church at the end of a rocky spur 900 metres above sea level. The houses were small, two storey, the household living on the first floor above their animals, products and equipment. The whole community probably consisted of about 100 persons. Agriculture was at a subsistence level, the only imported goods being coarse domestic pottery from the local production centre, Campobasso. Land use on the Matese at this time almost certainly contracted to small scale farming and stanziale shepherding.

In the later medieval period long-distance transhumance revived once more, in response to normal control of the territory and stimulated by the growth of a market for wool in the burgeoning cities of the north (Wickham, 1982: 50-58). Long-distance droveroads once again crossed the valley, connecting Apulia with Abruzzo (Clementi, 1984). Isolated fortifications, churches, crosses and shrines mark the routes across the valley. The documentary record indicates that the Matese was used by shepherds both from Apulia and Campania, though we found no archaeological evidence for their activities.

POST-MEDIEVAL AND RECENT SETTLEMENT

The 15th-17th centuries were the heyday of large scale transhumance, when millions of sheep were driven each year between the central Apennines and Apulia under the control of the Dogana delle Pecore (Braudel, 1972: 85-89). The Matese was part of this system, the documentary records showing the flocks being taken down to the Ofanto valley in particular (Di Iorio, 1984); presumably small scale pastoralism was also continued by the communities living in and around the Matese, but we know very little of this. Large-scale transhumance flourished because of blatant protectionism by the state, that caused enormous resentment amongst the impoverished peasantry.

During the 19th century the economic conditions of the peasantry in Molise, already amongst the worst in Europe with the continuation of feudalism in reality if not in name, got steadily worse as populations continued to rise. The brigandage of the Mezzogiorno that so frightened north Europeans on their Grand Tours had its roots in the rural unrest that was endemic. When the Hon. Keppel Craven visited Molise in the 1830's the Matese was notorious for its ferocious brigands. For many peasants emigration became the only other alternative to starvation – by the late 19th century tens of thousands of peasants were leaving Molise each year, leaving an archaeology of huge areas of abandoned terraces on the flanks of the Matese.

Throughout these centuries the inland and coastal parts of the valley demonstrate the predicted economic inter-dependency of uplands and lowlands, but – as in classical and medieval times – more commonly with adjacent regions than with each other. There were still only two roads in Molise in the 18th century, one from Abruzzo to Naples passing through Isernia near the head of the valley, the other along the coast, so there were no effective routes down the Biferno. Most of the Matese flocks were taken to Apulia, though there are a few records of flocks being taken to the lower valley. The upper valley villages provided seasonal labour for Apulia, the lower valley farms taking in seasonal labour from Abruzzo (LALLI, 1978). Communications improved during the 19th century with the construction of state highways and the railway down the valley, but both followed tortuous routes along the watershed at a distance from many of the villages. Although the inland villages provided special privileges to olive sellers to obtain the oil that could not be grown at such an altitude, the bulk of the trade remained either cross-country along the droveroads or with Campania, rather than with the olive-growing regions of the lower valley.

CONCLUSIONS

The role of the *longue durée* in the settlement history of the Matese mountain and Boiano basin has obviously been extraordinarily profound. This mountain landscape was not a simple backdrop to the human stage. Its particular topography, climate, resources and natural communications offered different constraints and opportunities for settlement and land use, and from early prehistory to the present day different societies have had to adapt to these. At the same time, however, the role of the landscape cannot be reduced to crude environmental determinism, and another thread running through the story has been the role of changing social institutions in shaping the responses to the changing constraints and opportunities of the valley environment.

The Matese environment offers extensive woodland and pasture in the summer, but is inhospitable for human exploitation in winter because of the severe weather conditions at this altitude. In fact changing vegetation in response to climatic change meant that in earlier prehistory it was sometimes accessible for grazing animals, but for long periods not, so that for long periods of human settlement it was only used occasionally for occasional hunting and pastoralism. These activities increased in the fourth millennium BP, and may have been a factor in the opening up of the landscape. The Matese was then used for local pastoralism and woodland exploitation, and for contact with neighbouring communities, but in classical times (perhaps in the Samnite period, certainly after Romanisation) its summer pastures were incorporated within long-distance systems of transhumance, though the local communities continued to make use of the mountain. Between the Roman and modern periods the nature and scale of pastoralism in the Matese have fluctuated in response to regional, national and increasingly international economic and political structures. The local communities have made constant use of the mountain's resources throughout this time, though in the more recent past the traditional sources of revenue for them have expanded from agriculture, pastoralism and charcoal production to brigandage and, most latterly, tourism. Only with the construction of the

Bifernina road in the 1970's has an economic infrastructure started to develop linking the Matese and upper valley with the lower valley, altering the direction of the «slow-furling» wave of upland-lowland relationships in this part of Italy more fundamentally than at any time in the past.

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FLINT EXPLOITATION AT EPIGRAVETTIAN AND MESOLITHIC SITES ON THE ASIAGO PLATEAU (VENETO PREALPS)

SUMMARY – *Flint exploitation at Epigravettian and Mesolithic sites on the Asiago Plateau (Veneto Prealps).* The paper describes raw material provisioning at the open sites of Val Lastari and Battaglia Rockshelter (Late Epigravettian), Cima XII 3 (CD3) and Cima XII 4 (CD4) (Early Mesolithic). In the Epigravettian sites, on-site chipping of local raw material is represented by blades and bladelets, cores at different stages of exploitation and preparation flakes. At Val Lastari, the presence of areas dedicated to working flint and the composition of the lithic assemblage testify that the principal activity performed on the site was the production of standardised laminar products, which were then exported from the site. The main characteristics of the lithic assemblage from Battaglia Rockshelter are discussed. In the Mesolithic sites the collection of flint was practised in a more *ad hoc* manner, whereby small blocks of flint were collected by the hunter-gatherers at outcrops encountered in the course of their movements. Furthermore, a first examination of the lithic assemblages suggests that the flint collected was destined exclusively for the needs of the site.

RIASSUNTO – *Lo sfruttamento della selce nei siti epigravettiani e mesolitici dell'Altipiano di Asiago (Prealpi Venete).* Questo lavoro concerne lo sfruttamento della materia prima nei siti all'aperto di Val Lastari e del Riparo Battaglia (Epigravettiano finale), di Cima XII 3 (CD3) e Cima XII 4 (CD4) (Mesolitico antico). La scheggiatura della selce sul posto è rappresentata, nei siti epigravettiani, da lame e lamelle, nuclei a diversi stadi di sfruttamento e schegge di preparazione. A Val Lastari, la presenza di aree di scheggiatura e la composizione dell'insieme, dimostrano che l'attività principale era la confezione di prodotti laminari destinati all'esportazione. Vengono in seguito discusse le caratteristiche dell'insieme litico del Riparo Battaglia. Nel caso dei siti mesolitici, la raccolta della materia prima aveva luogo in affioramenti incontrati durante gli spostamenti periodici. Un esame preliminare delle industrie fa inoltre pensare che la selce veniva destinata esclusivamente alle necessità intrinseche della stazione.

THE DISTRIBUTION OF FLINT IN THE ASIAGO PLATEAU

The Asiago Plateau is a vast calcareous mass which extends for circa 600 km^2. It is a wide undulating plateau with altitudes of around 1000 metres; in the northern part the mountains are higher than 2000 metres (Cima XII, 2343 m) while in the southern part the altitudes range between 1000 and 1500 metres.

Among the different rocks constituting the plateau, there are Mesozoic limestones which contain flint: Rosso Ammonitico Veronese (Late Jurassic) and Biancone (Early Cretaceous), which outcrop over a vast surface of 200 square kilometres; and Scaglia Rossa (Late Cretaceous), which outcrops in a central area of the plateau and in a band of *ca.* 300 metres along its southern slope (fig. 1).

In the Rosso Ammonitico Veronese, flint is particularly abundant in the siliceous stratified

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lithofacies. It has a dark red colour which is slightly variegated and it is deeply fractured.

Concerning the Biancone, in the lower part of this formation there are large compact nodules and thin (*ca.* 5 cms) deeply fractured beds of flint. The colour of this flint is red and it is variegated with light grey or light yellowish-brown mottling. The flint is rich in calcareous inclusions of around 1 centimetre in size. In the middle part of the Biancone the flint is light grey in colour, the nodules are smaller in size and fractures are less frequent. In the upper part the flint is slightly fractured and is dark grey and greyish-brown in colour; angular calcareous inclusions are abundant.

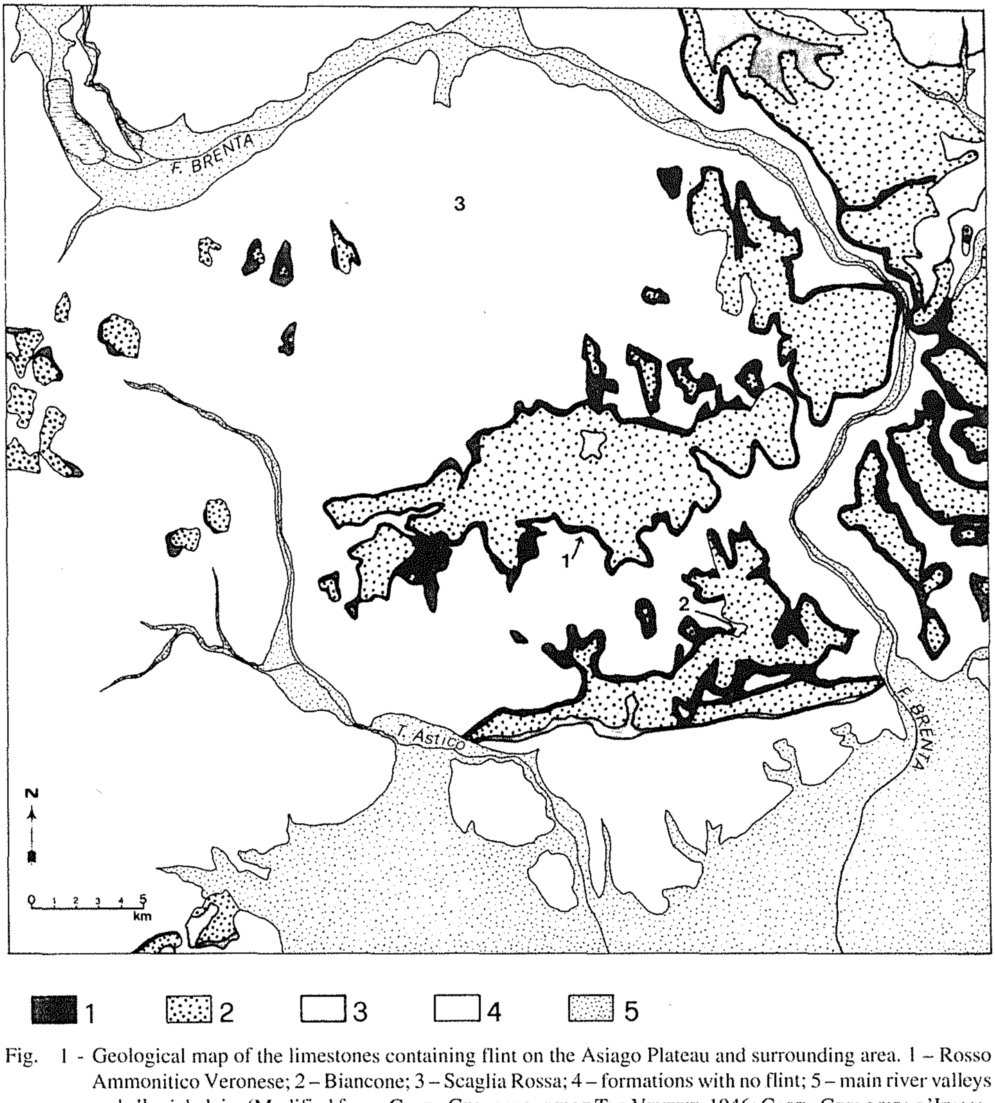

Fig. 1 - Geological map of the limestones containing flint on the Asiago Plateau and surrounding area. 1 – Rosso Ammonitico Veronese; 2 – Biancone; 3 – Scaglia Rossa; 4 – formations with no flint; 5 – main river valleys and alluvial plain. (Modified from: CARTA GEOLOGICA DELLE TRE VENEZIE, 1946; CARTA GEOLOGICA D'ITALIA, 1968; 1968a; 1970). The arrows indicate the sites: 1 – Battaglia Rockshelter; 2 – Val Lastari; 3 – Mesolithic sites of Cima XII.

In the Scaglia Rossa, the flint is homogeneously reddish-brown in colour with abundant pointed calcareous inclusions; fractures are scarce, and cortex is generally thick.

Large quantities of flint are abundant in the regoliths which are derived from the weathering of the limestones. These regoliths, which fill the valley-bottoms or cover the karst surfaces, contain abundant blocks of flint of around ten centimeters in size with cortex covered by a film of iron-manganese oxide; moreover the surfaces of the fractures show whitish-yellow or reddish-brown coloured patinas. A lot of these blocks are deeply fractured, but among them those suitable for flaking are covered by cortex on more than half of their surface. As regards the frequencies of the different classes of flint it appears that the blocks of 10 to 15 centimetres in size are constituted mainly by grey and dark grey flint and to a lesser extent by variagated red flint. Owing to the high occurrence of fracturing, the flint of other classes is present in the form of flakes and blocks which are smaller in size.

From this point of view the Asiago plateau is a vast potential source for exploitation of raw material. The aim of this preliminary report is to describe the differences between flint exploitation strategies during the Late Epigravettian and the Early Mesolithic. Concerning the Late Epigravettian, we will take into account some data which stems from research on two Epigravettian sites which are attributed to the Alleröd interstadial: the open site of Val Lastari, where the research began in 1990 (Broglio *et al.*, 1992; Peresani, 1992), and the Battaglia Rockshelter, where the research was carried out between 1962 and 1964 (Broglio, 1964). Concerning the Early Mesolithic, a few sites recently discovered (Frigo and Martello, 1991) on the southern slope of Cima XII at altitudes ranging between 2040 and 2070 metres will be taken into account.

THE EPIGRAVETTIAN SITES

From the point of view of their topographic positions, the sites of Val Lastari and Battaglia Rockshelter share a settlement model which is also common to many Epigravettian sites situated in the open on the lower-middle mountain slopes, at altitudes of between 1000 and 1600 metres and close to small lakes or springs (Broglio, 1984; Broglio and Lanzinger, 1990).

The site of Val Lastari

The Epigravettian site of Val Lastari is situated at 1060 metres asl and close to a small limestone outcrop on the edge of a swallow-hole. Val Lastari, which is an ancient valley presently inactive owing to karstic evolution, is very rich in flint: on the slopes there are large outcrops of Biancone and the wide and irregular valley-bottom consists of a regolith which is rich in flint.

The site, which has been explored over a surface of 60 square metres (Broglio *et al.*, 1992), has a deposit constituted at its base, near the calcareous outcrop, by a silty clay colluvium which covers the karstic rock substratum. At the same level, 5 metres away from the calcareous outcrop, there is a skeleta rich colluvium which lies on the regolith of the valley-bottom and which is rich in flint. These colluvia are covered by a loessic layer of variable thickness of between 0.6 metres and 1.6 metres, inside which a palaeo-living floor is intercalated. Three charcoal samples collected in the archaeological layer were dated by the AMS radiocarbon method to 11800±150 BP (UtC-2687), 11390±110 BP (UtC-1773) and 11010±90 BP (UtC-2041). The upper part of the deposit was reworked during the First World War. The rich archaeological evidence from the site allows us to reconstruct the flint exploitation strategy.

Raw material provisioning

As regards the raw material, the frequency of dark grey flint from the Biancone is dominant over the other classes (91.1%), followed by the red variagated flint from the nodules at the base of the Biancone (6.0%), the reddish-brown flint from the Scaglia Rossa (2.0%), the light grey flint from the Biancone (0.6%), and finally the red flint from the Rosso Ammonitico Veronese (0.3%) (fig. 2).

From the macroscopic examination of the blocks, pre-cores and cores, it seems that the provisioning of raw material principally took place from the residual detritus of the valley-bottom and along the valley slopes. Other provisioning sources, which were however little exploited, were the outcrops of Rosso Ammonitico and Scaglia Rossa and the fluvial deposits situated at a long distance away from the site.

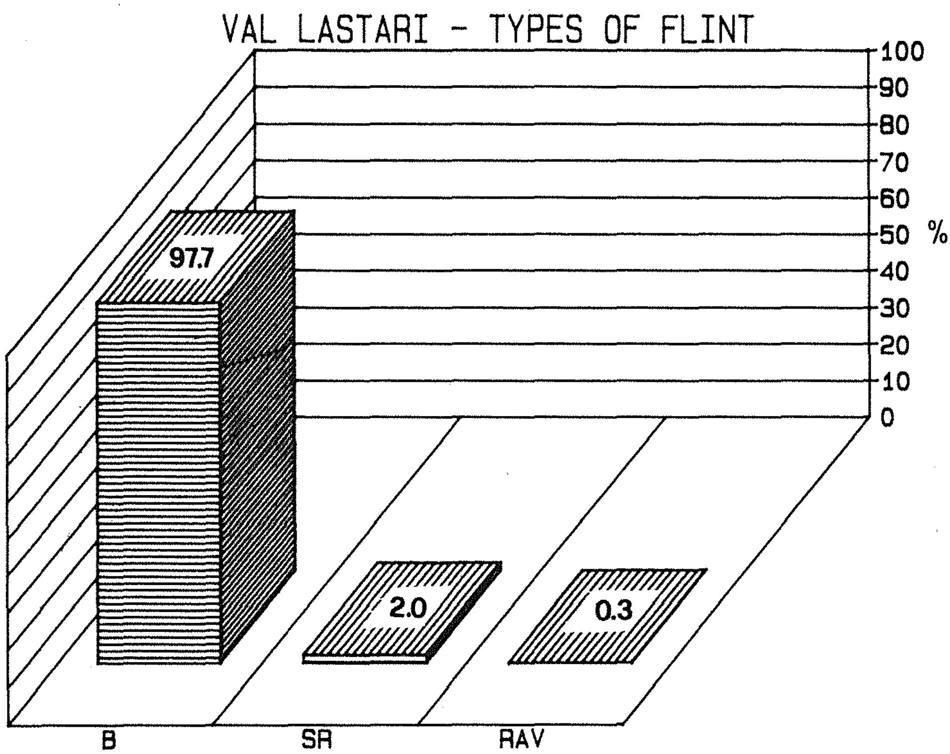

Fig. 2 - Val Lastari. Lithological composition of the lithic assemblage (B: Biancone; SR: Scaglia Rossa; RAV: Rosso Ammonitico Veronese).

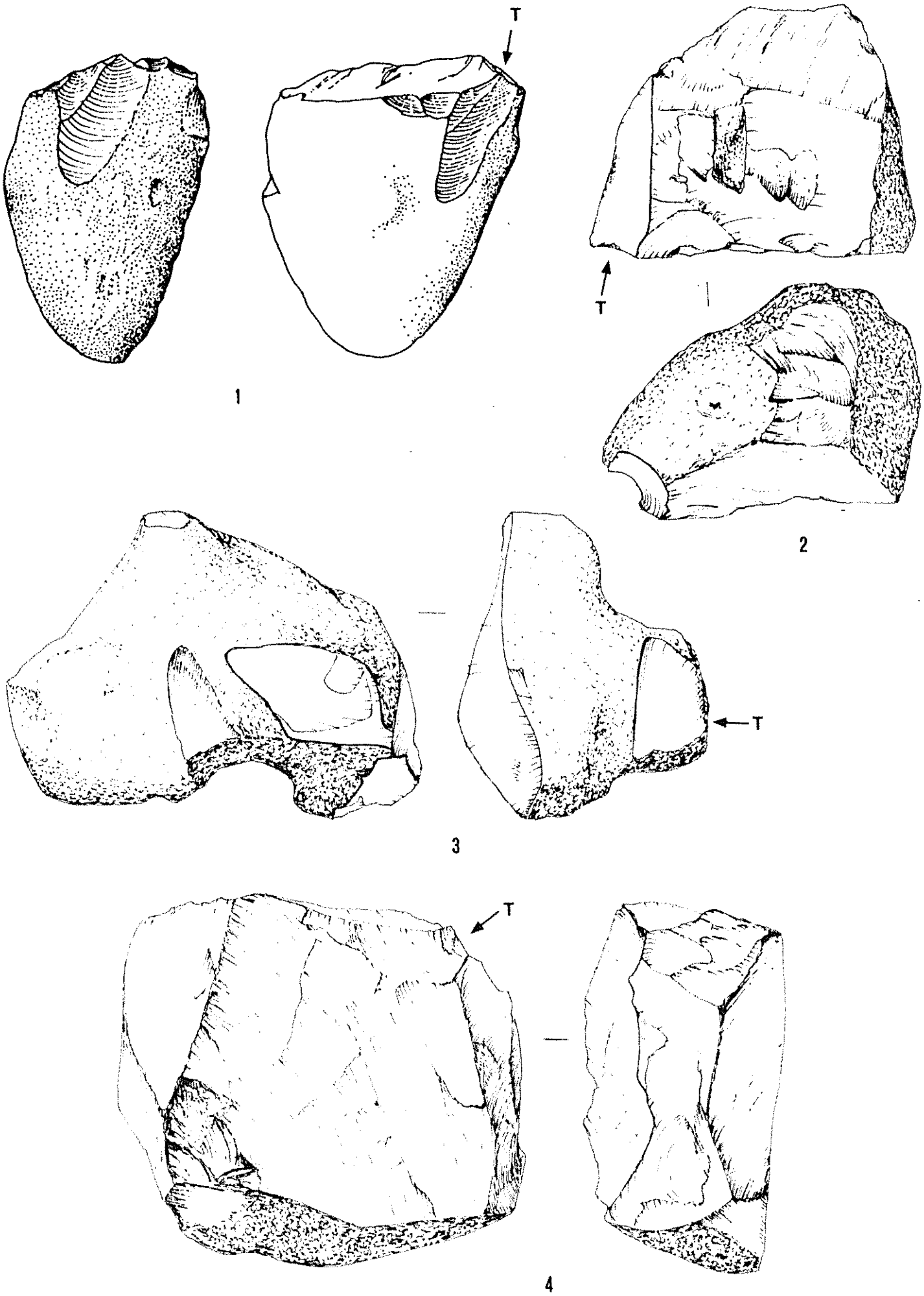

Fig. 3 - Blocks of flint with tests for flaking suitability (indicated by the arrow); Val Lastari, (1-3), Battaglia Rockshelter, (4) (2:3).

The lithic assemblage

As regards the lithic assemblage, the research has allowed us to collect a high quantity of lithic artifacts (faunal remains have been dissolved by pedogenetic processes) which represents all the flint working phases:

- hammers, sometimes using old prismatic cores or sandstone pebbles;
- blocks and nodules of flint which are around ten centimeters in size and which show traces

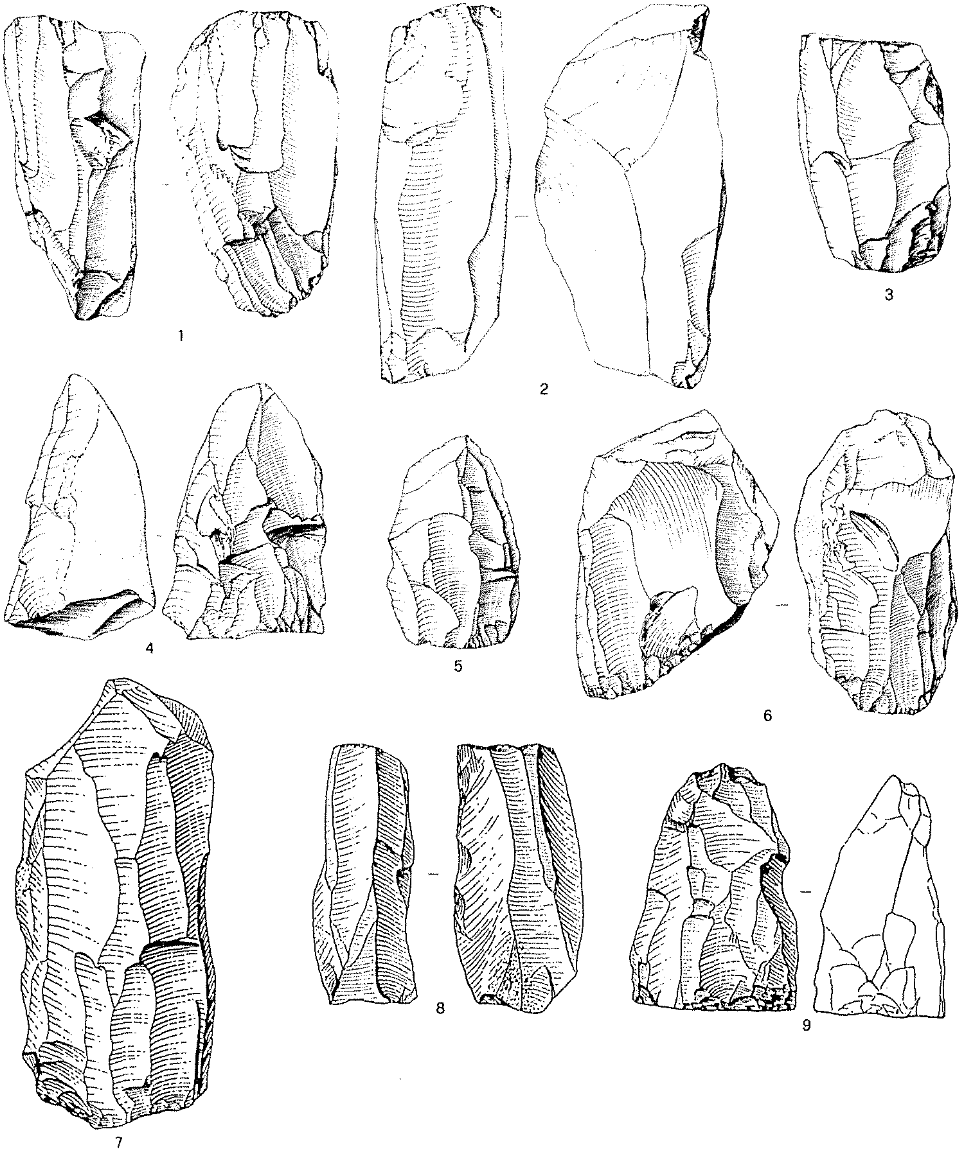

Fig. 4 - Bladelet cores: prismatic with one plane of percussion (7), with two opposed planes of percussion (1-3, 8), subpyramidal (4, 5, 9), carinated (6). Val Lastari, 1-6; Battaglia Rockshelter, 7, 9 (2:3).

of flaking tests (fig. 3);

- pre-cores, represented either by blocks with a large flake removal lying perpendicular to the natural edge or by nodules with a plane of percussion perpendicular to a crest;
- cores, mainly blade and bladelet cores, prismatic, subpyramidal, globular and discoidal (flaking products/cores ratio = 12.8) (fig. 4);
- flaking products. These show a low standardisation of shape and size. There are large flakes chipped from the raw block of flint; blades with a crest and blades with a natural edge; flakes chipped during the rejuvenation of the planes of percussion; blades and bladelets designed for the production of tools and microliths. Moreover, there is a high number of hinged and plunged flakes and the products with cortex show an irregular shape and section. The distribution of the archaeometric values of width and length covers a wide area (correlation index: 0.383) (fig. 5). As regards the blades and bladelets with regular shape and section, whose production is testified by a high number of cores (731), we suppose that these were

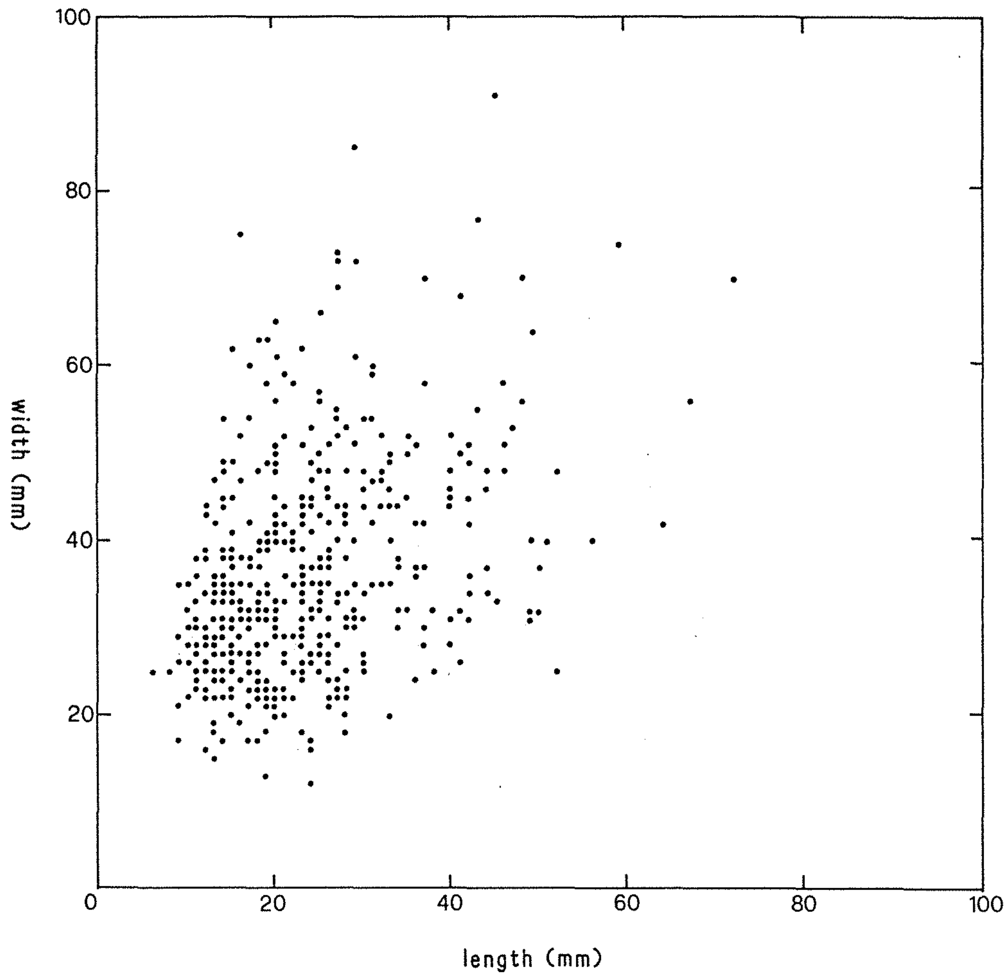

Fig. 5 - Val Lastari. Scatter-plot for the length and width variables (in mm) of 466 unretouched artifacts.

also exported from the site as half-finished products, as well as having been used at the site for the production of tools and microliths. In fact, considering the number of tools and microliths made on blade and bladelet blanks (523 in total), and the number of unretouched blade and bladelet products with regular shapes and sections (1179 in total), the notable discrepancy in relation to the number of blade and bladelet cores is very evident.

The flint working areas

Flint working is also documented by the presence of structures situated near the limestone outcrop.

Structure I (fig. 6). This is a pit excavated in the colluvium along the eastern wall of a *rundkarren*. The pit is 65 centimetres in length, 15 to 25 centimetres in width, and 30 to 35 centimetres deep. The infill is constituted by three small flakes, one prismatic core and 56 blocks, plaquettes or nodules, which show similar characteristics: they weigh between 100 and 200 grams, and measure between 55 and 90 millimetres in length; on the basis of the

Fig. 6 - Val Lastari. Structure I.

characteristics of the natural surfaces, which show whitish-yellowish or reddish patinas, and a film of iron-manganese, we can hypothesize that they were collected on the valley-bottom. Between them, 40 flints show traces of breaking, and 37 show one, two or sometimes three flake removals which appear to be tests for flaking suitability (fig. 3).

Structure II. It is an assemblage of 974 flints heterogeneously distributed over an area of 12 square metres; 657 of these flints are concentrated in a rectangular area one metre in length delimited by the rock wall and a few large calcareous stones, among which there is an allochthonous limestone slab. Beyond these stones the frequency of the flints decreases dramatically. The flints are represented by: blocks with or without tests for the suitability of flaking, by shatter derived from the fracturing of the largest blocks and nodules, by pre-cores, by cores, by large cortical flakes, by flakes and blades, by hammer stones and by some tools. Most of them are concentrated in four areas located one next to the other at the same distance from the rock wall. The refitting of some of the artifacts confirms the existence of these areas (fig. 7). A fifth area, named structure VI, is located beyond the stones.

Structure III. This is a pit, located in the same area as structure II, which is rectangular in shape (100 by 40 centimetres) and located next to the rock outcrop, and which seems to extend into an area which has not yet been excavated. The maximum depth, very close to the rock wall, measures 25 centimetres. The refill is constituted by 2 raw blocks of flint, 49 cores, 3 pre-cores, 783 flaking products and 966 fragments, part of which were also produced from the cores of structure II. These finds, among which were charcoal and strongly weathered teeth, suggest that structure III was used as a waste pit.

As regards the organization of the site, the presence of structures and the composition of the lithic assemblage show that in the area adjacent to the rock wall activities related to flint flaking were carried out. In fact, the concentrations observed inside structure II seem to be the result of the accumulation of products derived from the fracturing of nodules and large blocks of which the flaking suitability had already been tested, by the preparation of cores and by their exploitation. The presence of structure I suggests the practice of the conservation of flint with a view to future exploitation.

The Battaglia Rockshelter

The Battaglia Rockshelter lies at an altitude of 1050 metres and is located at a distance of a few hundred metres from the nearest raw material sources, which are in this case represented by outcrops of Biancone and Rosso Ammonitico Veronese, and by residual detrital deposits which cover the karstic calcareous rock. The flint was collected close to the site both from the residual detritus and from the limestone outcrops, and it was tested before it was brought onto the site (fig. 3). The lithic assemblage is constituted by a large concentration of artifacts which provide evidence for the in situ working of flint (flaking products/cores ratio = 15.7). According to the classification presented by Broglio (1964) the blade and bladelet cores, which are very abundant, are above all represented by prismatic forms with one plane of percussion. The other types of cores, which are less frequent, are prismatic with two planes of percussion, subdiscoidal and subpyramidal, globular and on flake (fig. 4). The flaking products are represented by flakes, blades and bladelets, of which only a small part have been used for the production of tools and microliths.

The study of the raw material provisioning systems at this site is at present limited to a preliminary observation of the types of flint and of the characteristics of their surfaces. From

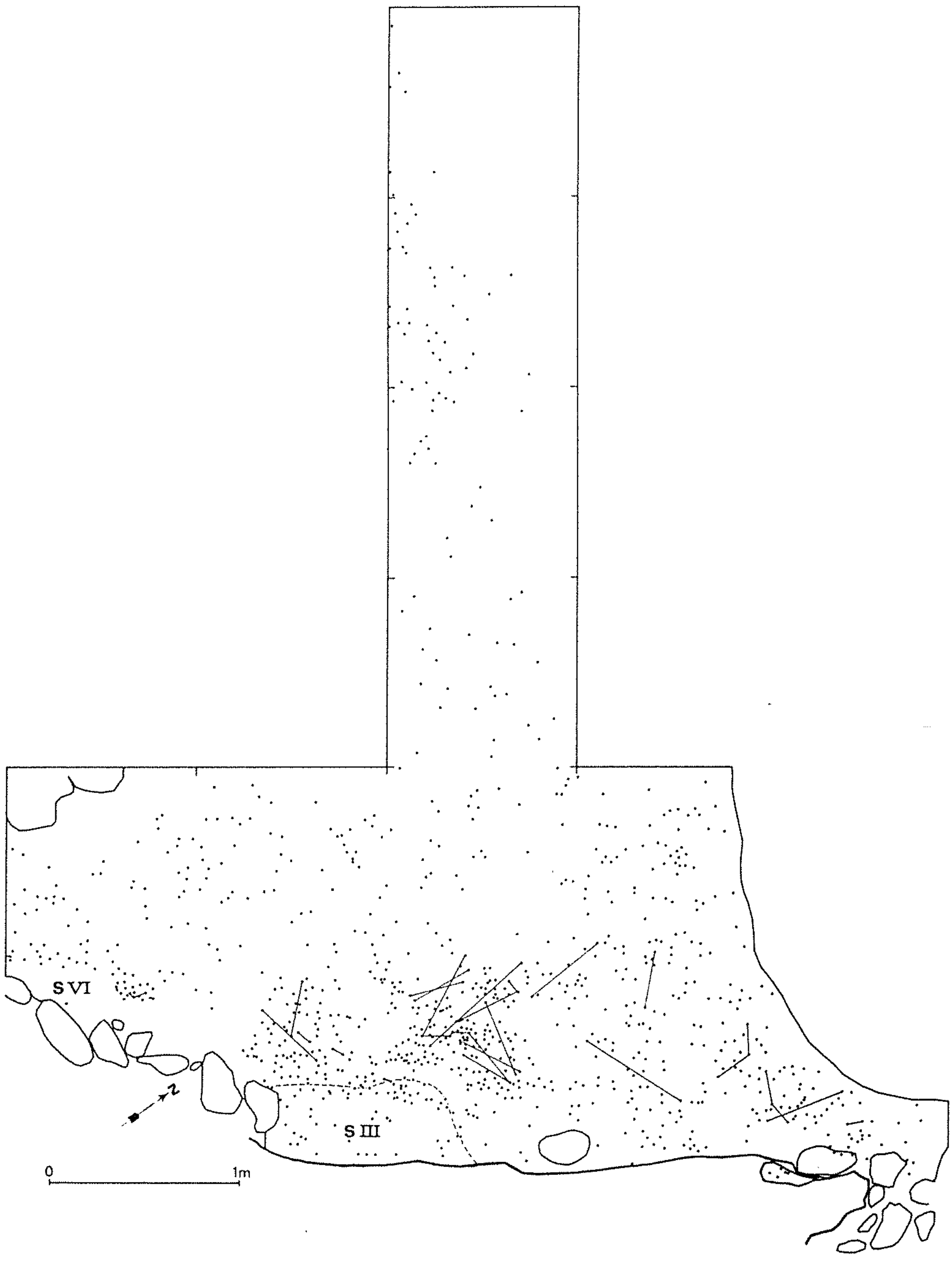

Fig. 7 - Val Lastari. The distribution of the artifacts in the structures II and VI. Continuous lines indicate refittings between the artifacts. The dotted line indicates the position of Structure III.

these first impressions we suggest that the flint, collected close to the site both from the residual detritus and from the limestone outcrops, was tested before it was brought onto the site. These initial observations on the finds from the Battaglia Rockshelter highlight the similarities with the system of raw material provisioning that was adopted at Val Lastari.

THE MESOLITHIC SITES

The Mesolithic sites of Cima XII are distributed within an altitudinal zone comprised between 2040 and 2070 m, in areas lacking flint. Their presence has been known for some time (Broglio, 1987), but only recently have detailed surveys been carried out which have led to the discovery of other sites in the same area (Frigo and Martello, 1992). Following these discoveries, a first excavation was carried out during the summer of 1993 at sites CD3 and CD4, which led to the recovery of a large number of lithic artifacts (faunal remains are absent as a result of pedogenesis). On the basis of the typology of the tools and microliths, the lithic assemblages from the sites of Cima XII can be attributed to the Sauveterrian in general, and sites CD3 and CD4 are referred to the middle phase of the Sauveterrian (end of the Preboreal).

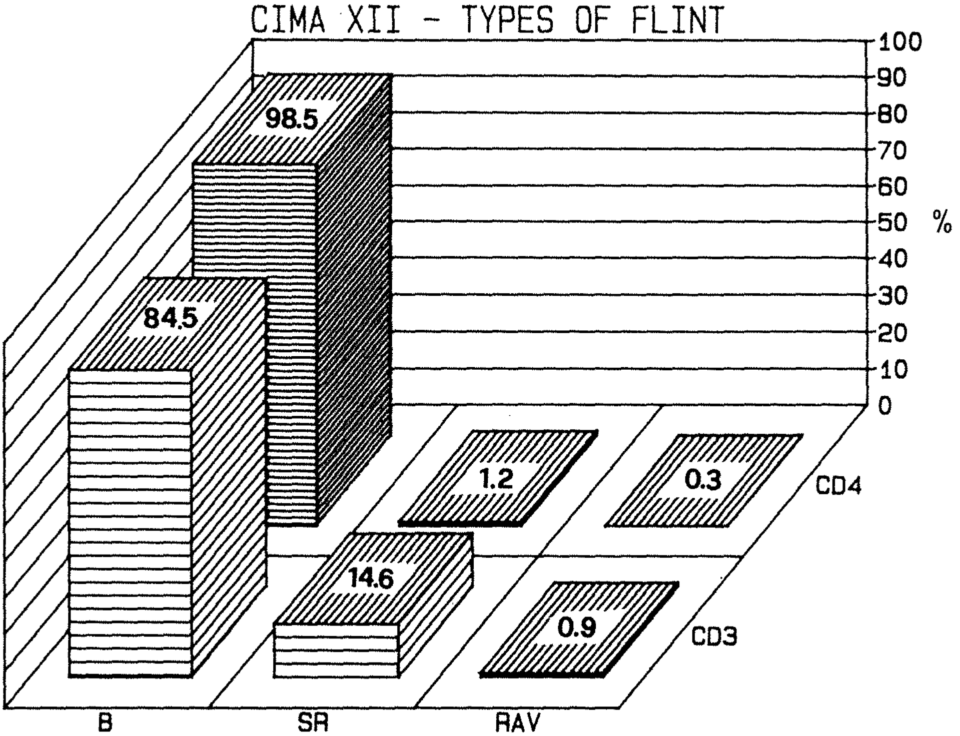

Fig. 8 - Mesolithic sites CD3 and CD4. Lithological composition of the lithic assemblages (B: Biancone; SR: Scaglia Rossa; RAV: Rosso Ammonitico Veronese).

As regards the exploitation of the flint, preliminary observations on the assemblages from CD3 and CD4 suggest the following:

- the most widely used flint type is that from the Biancone (CD3=84.5%; CD4=98.5%), followed by that from the Scaglia Rossa (CD3=14.6%; CD4=1.2%) and the RAV (CD3=0.9%; CD4=0.3%); (fig. 8)
- the morphology of the natural surfaces of the artifacts suggests that the flint was collected in an ad hoc manner, with the collection of small blocks from the outcrops encountered during the group's movements;
- the composition of the two assemblages indicate in situ working of the flint according to a sequence of operations, from the shaping of the raw material block to the production of tools and microliths; pre-cores, cores (fig. 9), cortical flakes, bladelets, tools, microliths and waste were produced. The high values of the relative frequency of cores in relation to flaking products (flaking products/cores ratio: CD3=88.7; CD4=99.0) do not seem to indicate that flint was exported from the site.

CONSIDERATIONS

Concerning the Epigravettian sites, the presence of an organized distribution of lithic artifacts within a site like Val Lastari is of great interest for the study of settlement systems in mountain areas. In fact, at the Epigravettian open sites of the Alps and the Pre-Alps the artifacts have a chaotic distribution of great thickness, which is due to the actions of cryoturbation and bioturbation, and which therefore makes it difficult to recognize different activity zones within

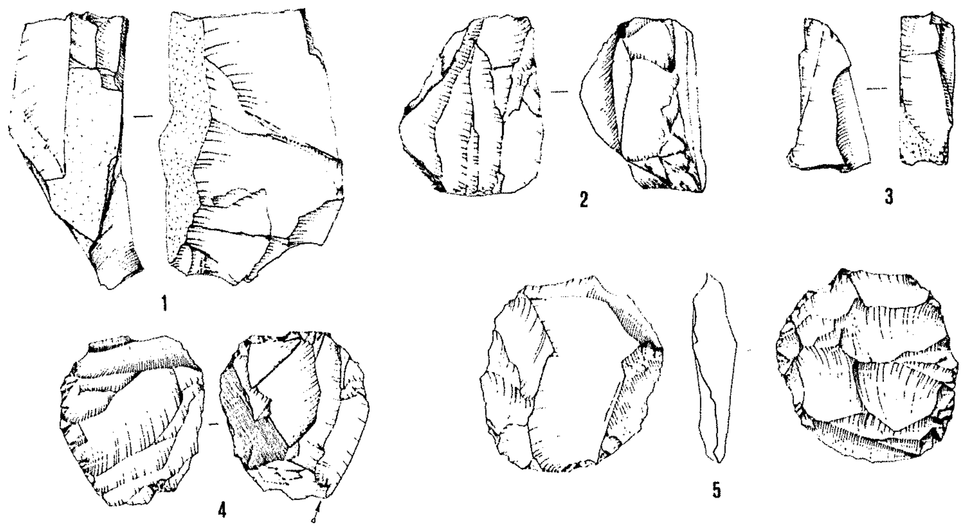

Fig. 9 - Mesolithic site CD3. Pre-core (1); Bladelet cores: prismatic with one plane of percussion (2), with two opposed planes of percussion (3), on flake (4); subdiscoidal flake core (5) (2:3).

the sites. In those sites where various distinct concentrations of lithic artifacts have been found, it is possible to hypothesize the presence of various habitation units, without however being able to clarify their temporal relationships. If one hypothesizes a reoccupation of these sites in successive seasons, it would not be possible to recognize these different phases of habitation which took place over such a short span of time, because of the presence of these powerful mechanisms of disturbance.

In the case of the sites of Val Lastari and Battaglia Rockshelter, the easy recovery of abundant raw material presumably constituted an important factor for the Palaeolithic occupation of the Plateau. In fact, given the large quantity of flaked flint, one could ask whether the flaking products and the prepared cores were not in fact completely exploited at other sites where flint was more scarce.

Moreover these preliminary results show that during the Epigravettian precise strategies of raw material provisioning were adopted in the Asiago plateau, and that these strategies, which were developed only as a result of a good knowledge of the territory and of its resources, were systematically adopted in the sites close to the abundant sources of raw material. The presence of a precise flint provisioning strategy is, at the present state of research in the Epigravettian sites in mountain environments, a new discovery.

As regards comparisons with the Mesolithic sites, it seems that there are real differences between the flint exploitation strategies of the Epigravettian and Mesolithic sites on the Asiago Plateau concerning both the strategies of raw material provisioning and the production and destination of the flaking products. As we have seen, the Epigravettian sites seem to be distinguished by a complexity of structures and organization of living space by contrast with the Mesolithic sites; and to demonstrate a flint exploitation strategy which seems to have been independent of the simple subsistence activities within a site. The Mesolithic sites, on the other hand, seem to be characterised by flint exploitation strategies that were limited by the range of the subsistence activities (1).

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P. BIAGI and J. NANDRIS (eds.) Highland Zone Exploitation in Southern Europe
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IL SITO PREISTORICO DI CASERE SASSO IN ALTA VAL BIANDINO (COMO): MUTAMENTI AMBIENTALI E FREQUENTAZIONE ANTROPICA NELLE PREALPI LOMBARDE DURANTE L'OLOCENE ANTICO E MEDIO

SUMMARY - *The prehistoric site of Casere Sasso in the upper Val Biandino (Como, norhern Italy). Environmental changes and human impact in the Lombard pre-Alps during the early and middle Holocene.* In the upper Val Biandino, near Como in northern Italy, a Bronze age site has been excavated which is related to highland exploitaton by pastoralism. It consits of stone structures lying upon rock outcrops, which are related to several superposed living floors and hearths. The archaeological finds include sherds and flint artifacts ranging in age from the early Bronze Age to the late Bronze Age. The site has been buried by colluvial deposits turned by weathering into hydromorphic soil. The charcoal fragments collected in he hearths indicate an open degraded wood dominated by spruce fir. Bisequa observed two main degradational phases of the forest cover in soil profiles of the area. The first one is dated to the Sub-boreal period, and was induced by forest clearance related to intensive pastoralism. The second to the late Mediaeval period and is related to wood cutting for ore processing.

RIASSUNTO - *Il sito preistorico di Casere Sasso in alta Val Biandino (Como): mutamenti ambientali e frequentazione antropica nelle prealpi lombarde durante l'Olocene antico e medio.* Nell'alta Val Biandino è stato esplorato un sito stratificato dell'età del Bronzo. Il sito consiste in una struttura in pietra addossata ad una lastra naturale di roccia e presenta differenti piani d'uso, focolari e crolli. Il materiale archeologico in essa contenuto, ceramica ed industria litica, attribuiti al Bronzo antico e finale, fanno pensare ad una frequentazione ripetuta e prolungata. La struttura archeologica è sepolta da depositi colluviali e suoli idromorfi. I numerosi carboni inclusi nei focolari indicano un ambiente aperto di pecceta degradata con acero, ontano verde e maggiociondolo. Lo studio dei suoli circostanti il sito ha rivelato come molti di questi presentino sequenze di orizzonti complesse, originate in fasi alterne di stabilità e degradazione, sempre con carboni. Un suolo sepolto, tipo *ranker*, contenente soltanto carboni di abete, testimonia una fase di stabilità e di densa copertura arborea per il periodo Atlantico. Per quello Subboreale, i profili pedologici aperti sia alla base dei versanti che nelle torbiere, indicano condizione di bosco aperto dovute al disboscamento per incendio, atto ad estendere le superfici pascolabili. Un più recente sfruttamento sistematico del bosco è documentato da piani di carbonaia osservati in corrispondenza di superfici erosionali alla base dell'orizzonte eluviale di alcuni suoli podzolici; tale episodio, che ha provocato un notevole dissesto dei versanti della valle, è correlato con lo sfruttamento delle vicine miniere di ferro ed è attribuito al periodo compreso tra i secoli XV-XVII AD.

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PREMESSA (1)

La Val Biandino (fig. 1) è una laterale della Val Sassina, accessibile soltanto attraverso una angusta forra. È sbarrata da rilievi che raggiungono i 2500 metri di quota, invalicabili se non attraverso passi di difficile accesso che la mettono in comunicazione con la Val Gerola e di lì con la Valtellina. Malgrado la sfavorevole situazione fisiografica, la Valle Biandino contiene un sito archeologico pluristratificato dell'età del Bronzo che dimostra, come durante la tarda Preistoria, fosse già capillare la penetrazione dei gruppi umani nella media montagna, anche lontano dalle principali vie di transito, già ampiamente utilizzate in questo periodo (POGGIANI KELLER, 1989).

IL CONTESTO FISIOGRAFICO

La Val Biandino è scavata in rocce sia paleozoiche (Verrucano lombardo) che triassiche (formazione del Servino) (CASATI e GNACCOLINI, 1967); gli affioramenti di rocce carbonatiche sono limitati e consistono di Carniole triassiche. Dal punto di vista geomorfologico è una tipica valle di erosione glaciale, il cui fondovalle, ampio e pianeggiante, si trova ad una quota media di 1500 metri. La glaciazione würmiana ha lasciato molte tracce variamente distribuite nella valle (circhi di erosione, rocce montonate, gradino sottoglaciale) ed alcuni cordoni morenici di ritiro. Il fondo valle, nell'area del Rifugio Biandino, è composto di depositi alluvionali e di torbiere che testimoniano l'esistenza di un bacino palustre non ancora totalmente interrato.

I versanti fortemente acclivi hanno consentito soltanto l'accumulo di esigue coperture detritiche messe in posto da processi di *debris flow*. I suoli sono in genere poco evoluti: la maggior parte dell'area è dominata da litosuoli, suoli colluviali e *rankers*. Sulle morfologie più dolci, alla base dei versanti, vi sono suoli bruni il cui orizzonte di alterazione (Bw) scende fino alla profondità di alcune decine di centimetri (fig. 1).

Vi sono inoltre suoli bruni acidi debolmente lisciviati, caratterizzati da profili assai più profondi, contenenti al loro intero orizzonti sepolti che ne indicano una evoluzione complessa. Quasi esclusivamente sul versante meridionale della valle si trovano suoli bruni ocracei, suoli intergradi verso i suoli bruni podzolizzati, che possono considerare delle variazioni locali dei bruni acidi debolmente lisciviati, determinate dalla minore xericità e dalla più lunga permanenza della neve sul versante meridionale della valle. Con i suoli bruni acidi debolmente lisciviati condividono una certa complessità del profilo, dato che, molto spesso, alla base dell'orizzonte eluviale sono stati osservati resti di antiche carbonaie. Il fondo della valle è dominato dai suoli alluvionali, in genere poco evoluti, con profili A/C, che si sviluppano principalmente sui terrazzi fluviali al margine del Torrente Troggia. Sulle superfici dei depositi tardiglaciali vi sono invece suoli idromorfi e torbe, talora con profili complessi.

Dal punto di vista vegetazionale la valle è localizzata fra il piano montano ed il piano subalpino. La differente esposizione dei versanti influisce sulla distribuzione delle specie

(1) Il presente lavoro è stato redatto a cura di M. Cremaschi; di M. Rottoli è la parte antracologica, di R. Poggiani Keller lo studio del materiale archeologico, di M. Cremaschi e L. Zuccoli le considerazioni relative alla stratigrafia del sito e dei suoli circostanti. I disegni dei reperti archeologici sono di F. Magri che gli Autori vivamente ringraziano.

arboree: queste predominano nel versante meridionale, mentre in quello settentrionale, più soleggiato, sono più numerosi i pascoli. La specie arborea attualmente più diffusa è il larice. Verso lo sbocco della valle e sul versante meridionale, il bosco è pressoché puro e verso occidente si arricchisce di altre specie come aceri, ontani e faggi; sul versante settentrionale e sul fondo valle, tra Madonna della Neve e Casere Sasso, è presente una vegetazione caratteristica da un parco di larici, inframezzata di aree a graminacee, *Nardus stricta* e vegetazione tipica degli accumuli azotati e delle aree idromorfe.

IL SITO DI CASERE SASSO

Il sito si trova poco a valle della strada sterrata che collega Madonna della Neve a Casere Sasso (2), circa 300 metri ad ovest di queste, a quota m 1622 slm (fig. 2). In questo punto il versante di fa meno ripido e dà luogo ad un terrazzo delimitato, verso sud, da una piccola scarpata, in parte coincidente con dossi di scisti sericitici della formazione di Servino, allungati in direzione N-S. Il terrazzo si raccorda al versante mediante una falda detritica oggi inattiva. Sulla superficie del terrazzo prevalgono i suoli idromorfi che sono particolarmente profondi

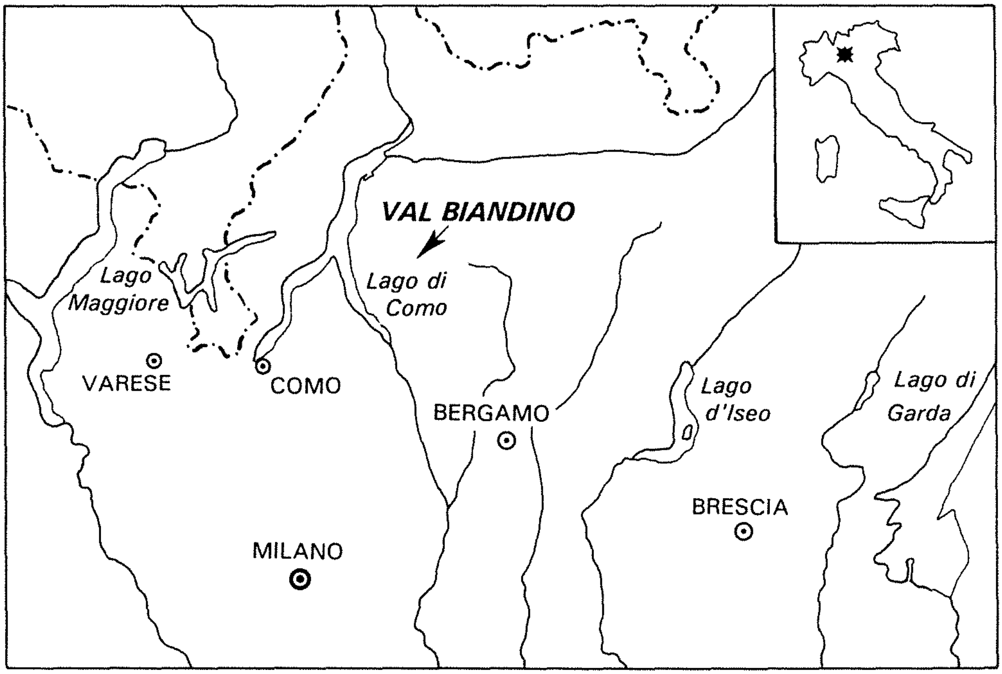

Fig. 1 - Localizzazione della Val Biandino

(2) Il sito è stato scoperto nel 1984 durante uno *stage* naturalistico del Corso di Laurea in Scienze Naturali dell'Università di Milano ed esplorato nel 1986 nel corso di uno *stage* successivo dal Centro CNR per la Stratigrafia e Petrografia delle Alpi centrali e dal Museo Archeologico di Como. Allo scavo, oltre agli scriventi hanno preso parte il dott. L. Castelletti e numerosi studenti del Corso di Laurea in Scienze Naturali.

nell'area delimitata dai due affioramenti di Servino, all'interno della quale i sondaggi pedologici condotti mediante trivella a mano hanno rilevato la presenza di una serie archeologica. In corrispondenza di questi saggi è stato aperto un saggio di scavo, su di una superficie di 8 mq, all'interno del quale sono state poste in luce le unità stratigrafiche di seguito commentate, la cui descrizione analitica è riportata in Appendice 1 (figg. 3-5); un limitato saggio di scavo è stato aperto cinque metri ad ovest dello scavo principale; anche in questo è stata messa in luce la medesima successione stratigrafica.

US0 e US1: corrispondono rispettivamente agli orizzonti A1 e C g del suolo idromorfo, espressione della pedogenesi attuale nell'area; il substrato pedogenetico è costituito da sabbie di apporto colluviale, frammiste a clasti di media pezzatura, che rappresentano la parte distale della falda detritica.

US2 e US2b: costituiscono due corpi sedimentari cuneiformi, di modesto spessore, molto appiattiti, derivanti dalla degradazione del masso di servino che delimita a S la struttura archeologica (US2B) e dal crollo di un muro a secco che ne costituiva il limite N.

US3: si tratta di un sottile strato archeologico (fig. 3) sottoposto all'US2 a N, mentre a S, al di sotto dell'US2B, giunge a contatto con l'affioramento di roccia che limita la struttura. Contiene un piccolo focolare delimitato da lastre di pietra. Le numerose pietre venute in luce al centro dell'unità appartengono probabilmente ad una struttura crollata: un piccolo muro a secco o forse al basamento di un pilastro.

US4 e US5: sono piani d'uso, costituiti da lenti planari di sedimento sabbioso, alternate ad altre in cui la frazione

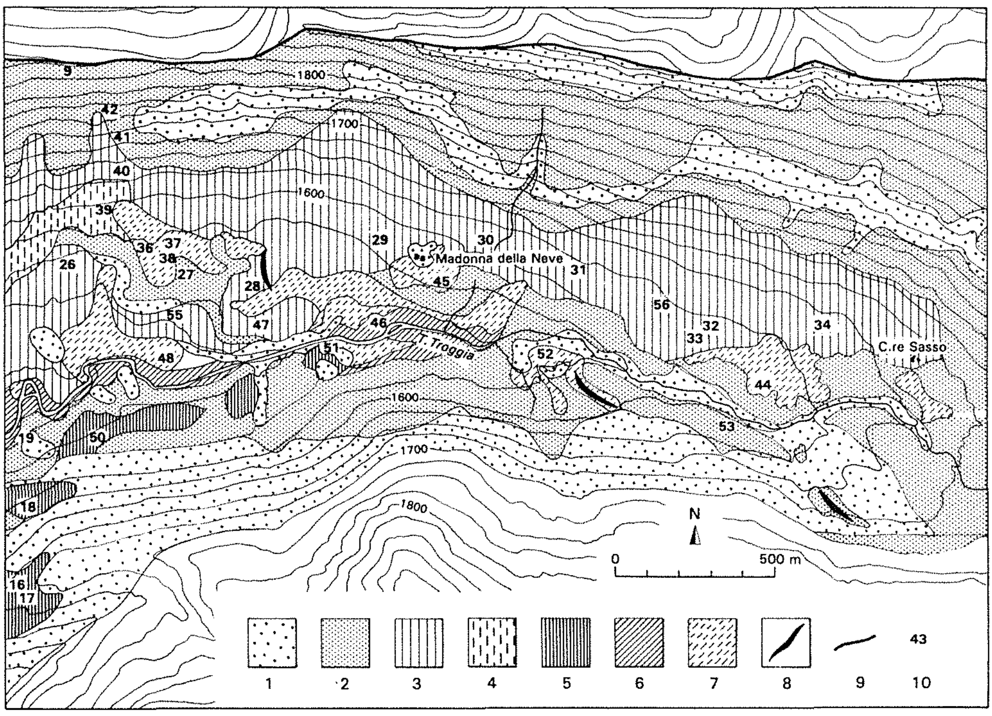

Fig. 2 - Carta schematica dei suoli dell'alta Val Biandino. 1) litosuoli; 2) *rankers* e suoli colluviali; 3) suoli bruni; 4) suoli bruno acidi debolmente lisciviati; 5) suoli bruni ocracei; 6) suoli alluvionali; 7) suoli idromorfi e torbiere; 8) morene tardiglaciali; 9) linea dello spartiacque; 10) ubicazione dei profili.

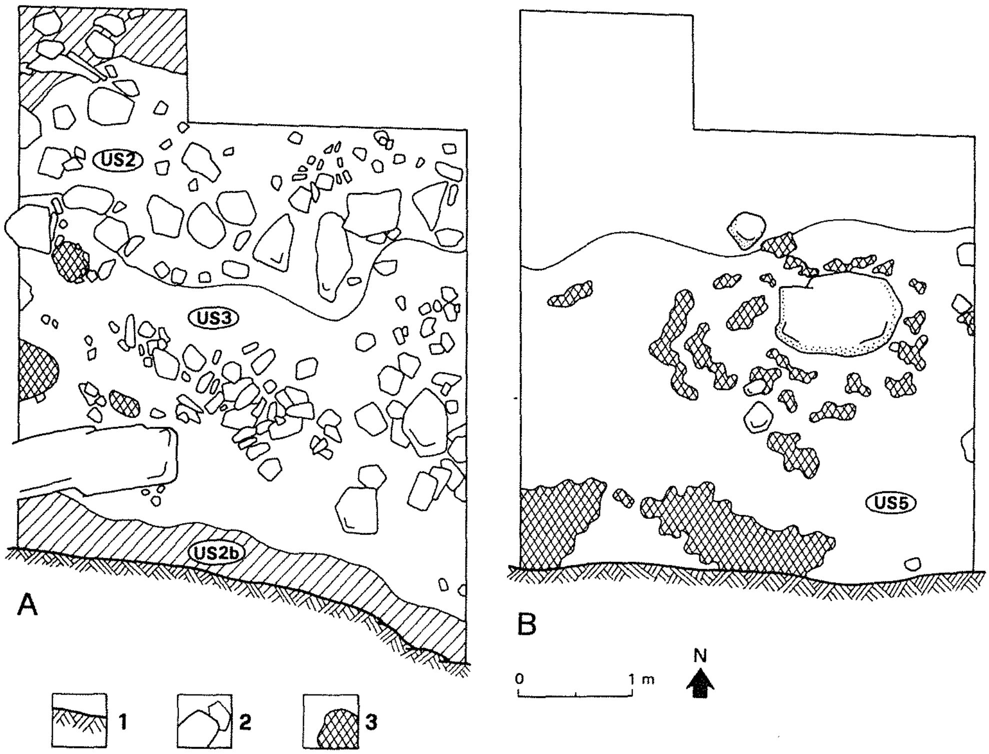

Fig. 3 - Planimetria del sito di Casere Sasso. A) US2 e US3; B) US5.

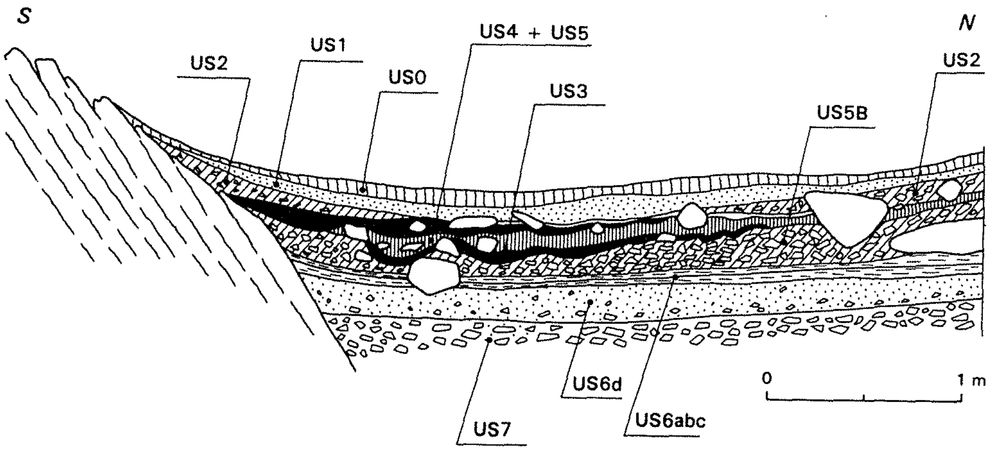

Fig. 4 - Sezione stratigrafica del sito di Casere Sasso.

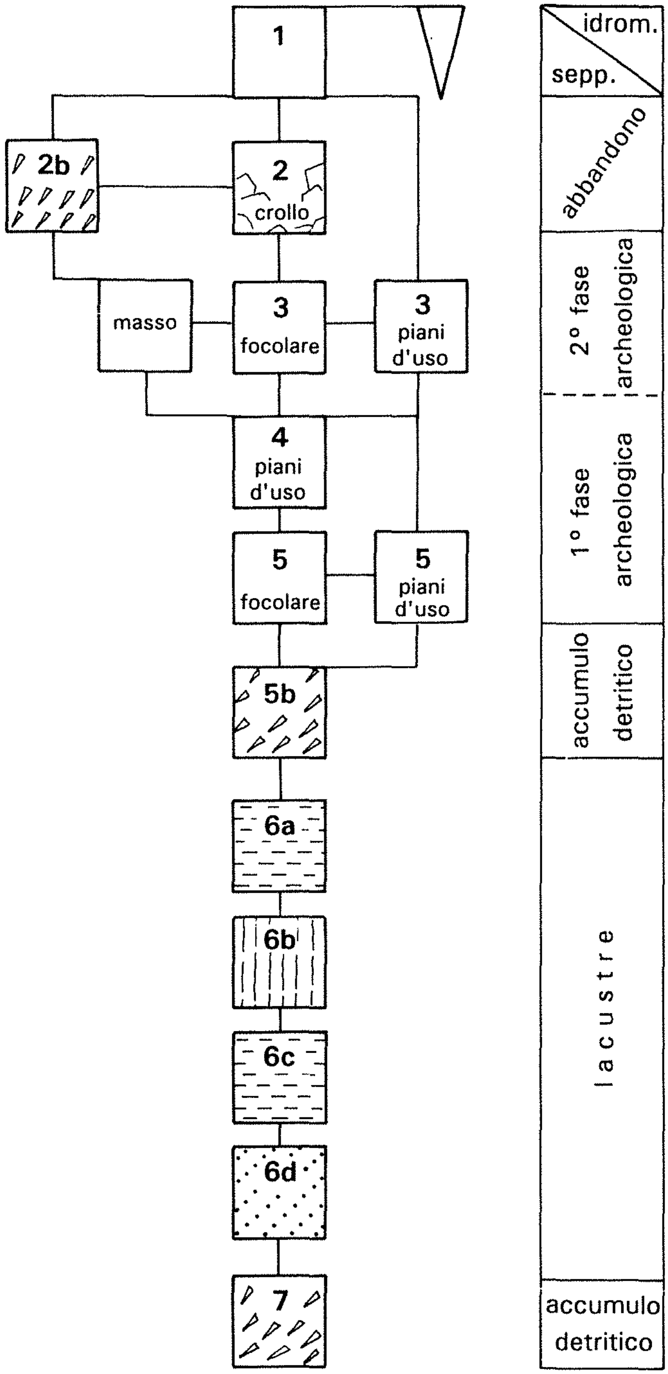

Fig. 5 - Diagramma dei rapporti stratigrafici del sito di Casere Sasso.

carboniosa prevale largamente. In fase con l'unità 5 (figg. 2 e 3) è stato rinvenuta una ampia pietra disposta per il piatto che ha servito di base ad un focolare più volte acceso; attorno ad essa vi sono lenti carboniose a disposizione concentrica, una delle quali ha fornito la data di 3300±90 BP (GX-19121). La base della successione stratigrafica è costituita da una breccia (US5B e US7), cui si intercalano sedimenti lacustri (US6).

L'insediamento consiste in una costruzione in pietra a secco, addossata al dosso di scisti di Servino che la delimita a sud. La struttura, a causa dell'alta quota e degli inverni nevosi e rigidi, non è stata occupata certamente durante l'intero arco dell'anno; il succedersi di almeno tre livelli di piani d'uso e di focolari indica che essa è stata ripetutamente frequentata, forse anche per un periodo assai lungo.

La serie archeologica ed i livelli d'abbandono che la ricoprono (US2-US5) dimostrano di essersi formati in un ambiente asciutto, che non ha permesso la conservazione della sostanza organica ossidabile, tanto meno dei resti ossei. Le unità US1 e USO hanno invece caratteri idromorfi fortemente espressi. Dopo l'abbandono del sito, devono infatti essere intervenute condizioni locali tali da rendere il drenaggio del suolo notevolmente deficitario; queste sono forse spiegabili con un generale aumento di umidità nell'area.

IL MATERIALE ARCHEOLOGICO

Tutte le unità archeologiche (US2-US5) contengono, seppure in numero assai limitato, reperti litici e ceramici, più numerosi nei livelli inferiori (US4 e US5). I frammenti ceramici, in base al tipo di impasto, sono riferibili a sei recipienti, dei quali tuttavia non sono ricostruibili le forme, dato che di ogni vaso si sono conservati solo pochissimi frammenti.

Nell'US1, superficiale, si è raccolto un minuto frammento di ceramica preistorica di impasto, decorato da un fascio di leggere solcature orizzontali (fig. 6/3), ed un chiodo in ferro con capocchia sferica sfaccettata ad estremità inferiore ripiegata a ricciolo, di età più recente.

Dall'US2 provengono frammenti ceramici attribuibili a due soli recipienti. Il primo (Vaso A), presumibilmente un'olla con orlo everso, di forma forse ovoide o biconica, è di impasto abbastanza depurato, con inclusi litici isolati ed anche crateri prodotti dalla materia organica combusta durante la cottura. Presenta una superficie di color marroncino-avana con chiazze bruno chiaro sia all'interno sia all'esterno, lisciata a spazzola all'esterno ed a mano all'interno (si osservano tracce di polpastrello). Di questa olla si conservano un frammento di orlo everso (fig. 6/1) con bordo decorato, nella parte superiore con piccole tacche che gli conferiscono un andamento ondulato, e parte della spalla raccordata all'orlo con gola accentuata. Sembrano attribuibili al medesimo recipiente anche tre frammenti ricomposti del ventre (fig. 6/2), nonché altri modesti frammenti della parete.

Del secondo recipiente (Vaso B) si conserva solo un frammento di orlo e, forse, di parete. È in ceramica di impasto di colore grigio, ben depurato, con minutissimi inclusi micacei. L'orlo (fig. 6/4), apparentemente ad andamento verticale, presenta un leggero ingrossamento sotto il bordo che forse presenta traccia (?) di decorazione a tacche.

Dall'US3, che rappresenta un livello d'uso, provengono scarsissimi reperti: una piccola punta di freccia peduncolata (fig. 8/2) in selce di colore grigio verde, con alette appena ripiegate verso il basso, ottenuta con ritocco sommario, bifacciale, coprente; tre frammenti ceramici, di cui un orlo (fig. 7/1) sicuramente attribuibile all'olla (Vaso A dell'US2) con orlo everso decorato a tacche; gli altri due, uno dei quali reca tracce di combustione, appartengono ad un terzo recipiente (Vaso C) di impasto con inclusi calcarei millimetrici, superficie esterna di colore rosso, interna di colore nero. Frammenti dello stesso vaso sono stati raccolti, come accennato più avanti, anche nell'US5.

Le US4 e US5, anch'esse piani d'uso, hanno restituito il maggior numero di reperti, esclusivamente ceramici, e resti archeobotanici.

Dall'US4 provengono complessivamente 11 frammenti ceramici di tre distinti recipienti del tutto diversi, per impasto ed esecuzione, da quelli rinvenuti nelle US2 e US3.

Allo stesso recipiente (Vaso D) sono riferibili un frammento di orlo a bordo ingrossato (fig. 7/2), decorato a tacche, in ceramica grigia con minutissimi inclusi litici e, probabilmente, anche un frammento, forse un fondo di vaso deformato dal fuoco. Dall' US4, ma più specificamente dall'interfaccia fra la medesima e la sottostante US5, si sono raccolti, oltre a frustuli non attribuibili a nessuno dei tre suddetti recipienti, cinque frammenti di parete in ceramica grossolana (Vaso E) con superficie esterna di colore rosso, interna di colore nero, con grossi inclusi calcarei che fuoriescono sulla superficie punteggiandola con forte contrasto cromatico. Sempre dall'interfaccia proviene anche un frammento di fondo con parte della parete (fig. 7/3) in ceramica grossolana con grossi inclusi in litici scistosi (Vaso F). Frammenti dei vasi E ed F si raccolgono anche nella sottostante US5. Oltre ai numerosi carboni, si è rinvenuta pure una piccola scoria vetrosa, da determinare.

Nell'US5, il livello d'uso più basso, contrassegnato da un'ampio focolare, compaiono cocci pertinenti ad almeno tre distinti recipienti, già presenti in altre US: due frammenti di parete sono molto simili al frammento combusto dell'US3 (Vaso C); quattro frammenti di parete appartengono allo stesso vaso a superficie rossa punteggiata di inclusi calcarei

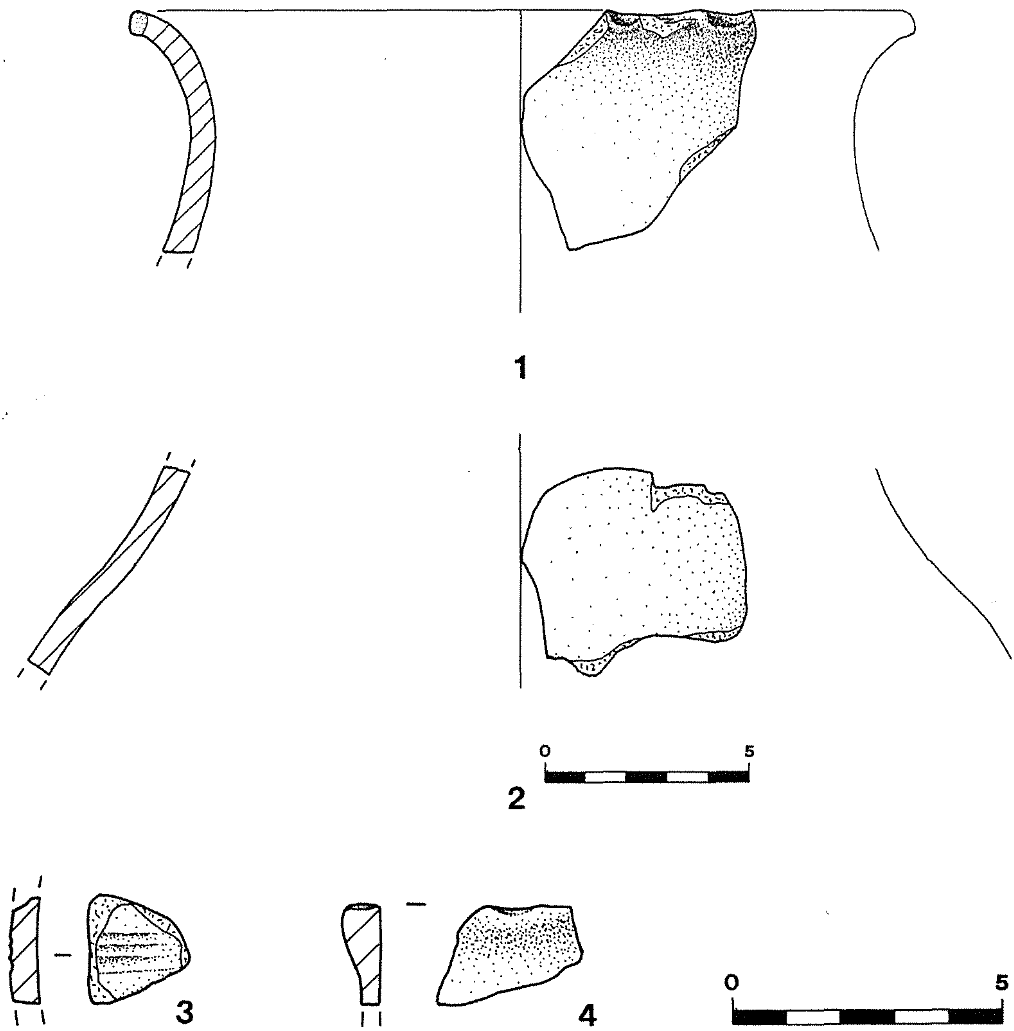

Fig. 6 - Sito di Casere Sasso. Frammenti ceramici dall'US1 (1) e US2 (2-4).

rinvenuto all'interfaccia tra US4 e US5 (Vaso E); otto frammenti infine sono riferibili ad un recipiente in ceramica grossolana con grossi inclusi litici scistosi (Vaso F) che disseminano anche la superficie scabra esterna di colore rosso, mentre l'interno è di colore nero. Questo tipo d'impasto compare solo nell'US5 (1 frammento anche nell'interfaccia con la US4) e nel gruppo raccolto alla base della sequenza stratigrafica. I frammenti significativi del vaso F, una forma chiusa, sono un pezzo di orlo (fig. 7/4) appena everso con bordo leggermente ingrossato, decorato a tacche nella parte esterna del bordo, ed una parte del fondo con porzione della parete uniformemente rettilinea (fig. 7/5).

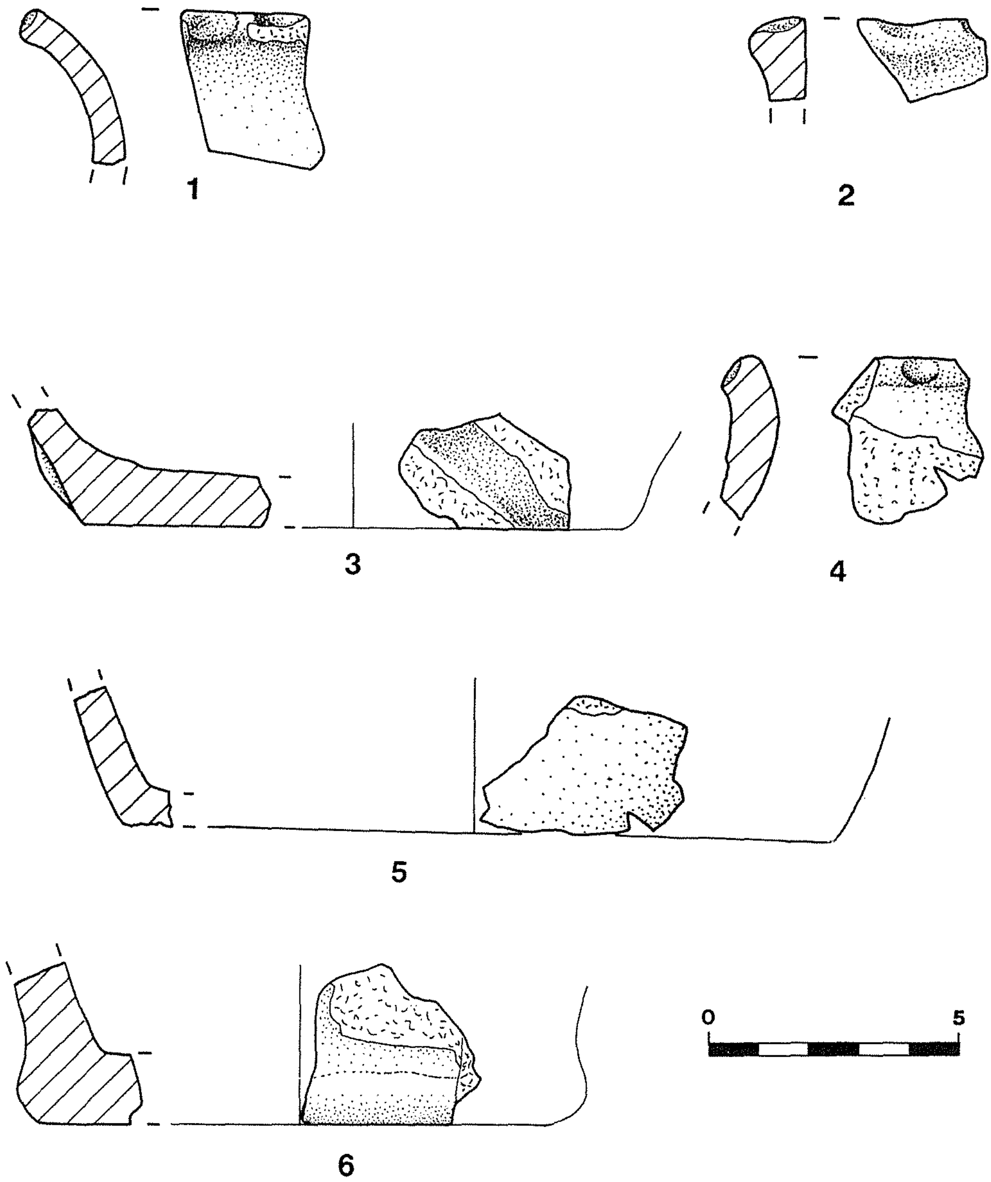

Fig. 7 - Sito di Casere Sasso . Frammenti ceramici dall'US3 (1 e 2), dall'US4 (3 e 4), dall'US5 (5). Il 6, dal saggio ovest, appartiene al vaso C, presente prevalentemente nell'US5.

I pochi altri frustoli ceramici non sono riferibili a tipi particolari; forse uno, di colore marroncino, per le tracce di lisciatura a spazzola e polpastrello, mostra analogie con l'olla con orlo everso (Vaso A) dell'US2.

Dalle unità basali del sito (US4 e US5) provengono pochi altri elementi di industria litica. Si tratta di una lamella (fig. 8/1) non ritoccata in selce grigia e di uno strumento su scheggia in selce grigio-beige con ritocco piatto, marginale, diretto e semplice, marginale, inverso, sinistro (fig. 8/3).

Il complesso dei reperti, assai scarsi e tipologicamente poco significativi, permette poche considerazioni e lascia aperti molti dubbi sull'inquadramento cronologico del sito che, a nostro parere, potrebbe conservare almeno due distinte fasi di frequentazione distanziate nel tempo. Infatti nei livelli superiori (US1, US2 e US3), all'interno dei quali fu riconosciuto un piano d'uso con focolare (US3), con resti di muro a secco o pilastro centrale relativi ad una struttura abitativa in parte addossata ad un'emergenza rocciosa ed in parte perimetrata con muro a secco, si sono raccolti i frammenti di un'olla con orlo everso decorato a tacche (Vaso A: fig. 6/1 e 6/2; fig. 7/1), di fattura abbastanza accurata: un tipo di recipiente che, seppure di forma piuttosto generica, pare attribuibile ad un arco di tempo compreso fra il Bronzo tardo e gli inizi della I età del Ferro. Esemplari simili compaiono infatti tanto nei depositi dell'età del Bronzo (*cfr.* ad esempio l'abitato di Padnal presso Savognin nei Grigioni (Oberhalbstein), orizzonte C (BzC) (Rageth, 1986: 77, Abb. 13); l'insediamento di Montlinger Berg, livelli HaA (Frei, 1954-55: Abb. 17/15); di Villa Pleif-St.Vincentius (Grigioni) del Bronzo finale (Rageth, 1987: Abb. 15/15 e 20); il deposito

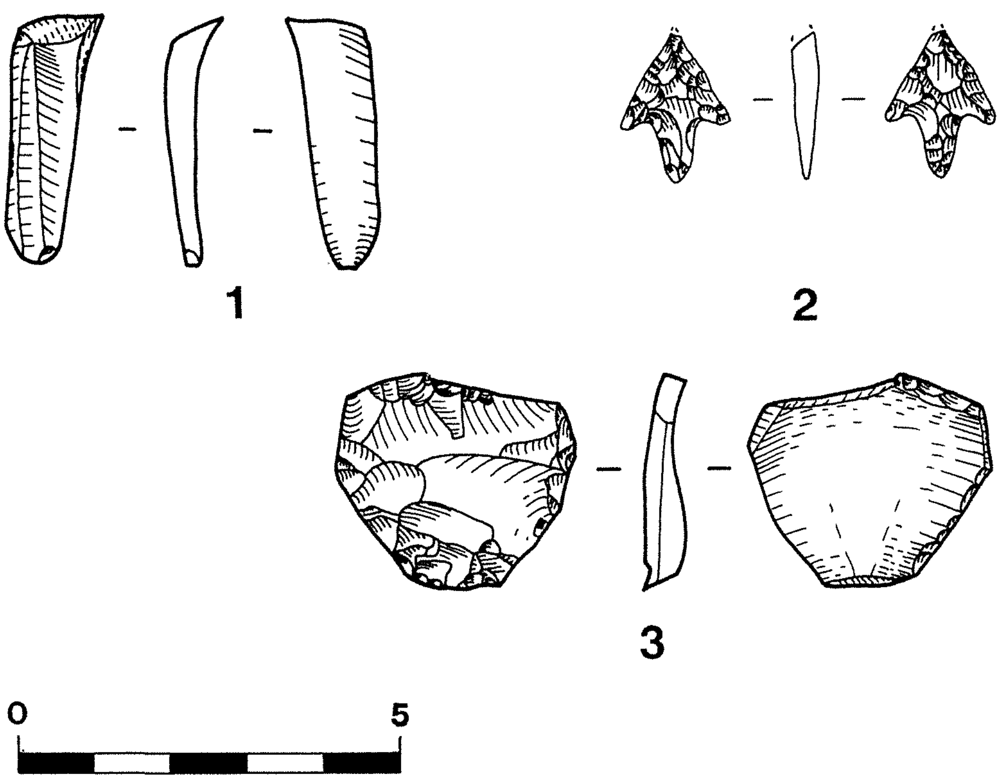

Fig. 8 - Sito di Casere Sasso. Industria litica dall'US5.

cultuale della Grotta Tomba dei Polacchi (BG), livelli del Bronzo Finale avanzato (POGGIANI KELLER, 1982: fig. 8)) quanto in depositi delle prime fasi dell'età del Ferro (*cfr.* ad esempio la già citata Grotta Tomba dei Polacchi (POGGIANI KELLER, 1979; 1982); S. Giorgio di Valpolicella, località Prè (VR) degli inizi dell'età del Ferro (SALZANI, 1981: 87, fig. 5).

Contrasta con tale, seppur ampia, datazione l'altro elemento tipologicamente significativo: la cuspide di freccia peduncolata (fig. 8/1). Manufatti di questo tipo si collocano infatti nelle prime età dei metalli, tra età del Rame ed antica età del Bronzo (BIAGI, 1979). La sua presenza nell'US3 potrebbe essere attribuita, più che ad una persistenza o riutilizzo di uno strumento sporadico, all'affioramento di sottostanti, più antichi livelli di frequentazione (US4 e US5), che contengono altra industria litica, durante l'impianto della struttura in pietra relativa alla sequenza stratigrafica superiore (US1-US3).

I frammenti ceramici di impasto ben più grossolano, rinvenuti nei più profondi livelli d'uso, con i focolari 4 e 5, meglio si associano infatti a tale materiale litico. In particolare, pur non essendoci nelle suddette US reperti ceramici tipologicamente significativi, possiamo rilevare nell'impasto con grossi inclusi calcarei biancastri del Vaso E, una certa assonanza con l'impasto White Ware dell'età del Rame, per quanto la datazione radiometrica (GX-19121) li collochi nel pieno Bronzo medio. Non si può escludere, seppure la povertà dei dati ci induca ad avanzare questa ipotesi con cautela, che su più antichi livelli di frequentazione stagionale, radiodatati alla media età del Bronzo, e riferibili a strutture povere in legno (?) addossate alle emergenze di roccia naturale, si sia impostata secoli dopo una struttura stabile, sia pur frequentata stagionalmente, perimetrata da rocce e muri a secco la cui fondazione, oltre che il calpestio, in parte intaccò, in parte sigillò i più antichi piani d'uso.

I RESTI ANTRACOLOGICI

I carboni analizzati dal sito di Casere Sasso (3) (*cfr.* Appendice 2) e dal profilo 32 ad esso correlabile (tab. 1) sono, secondo la terminologia antracologica, carboni «dispersi» cioè derivati dal progressivo accumulo degli scarti dei focolari. Non sono stati infatti riscontrati resti di strutture lignee combuste sullo scavo, nè carboni con pezzature sufficientemente ampie. La notevole presenza di ife e di fori di organismi lignivori, insieme al modesto diametro originale dei frammenti, sono elementi sufficienti per ritenere che il combustibile derivi per lo più dalla raccolta di legna morta in bosco; modalità sufficiente a coprire i fabbisogni per l'occupazione di un sito stagionale da parte di un piccolo gruppo umano. Il modello di approvvigionamento pur essere quindi ricondotto a quello proposto da CASTELLETTI (1984) per i siti mesolitici dell'Italia settentrionale in quota, anche in presenza, nell'età del Bronzo, di strumenti efficaci per il taglio del legname. Secondo questo schema, la raccolta di legna a terra in bosco, e più in generale la raccolta per la legna da fuoco testimoniata da carboni «dispersi» (BADAL GARCIA, 1992), non sembra costituire un elemento significativo di selezione sullo spettro delle specie presenti presso il sito, almeno dal punto di vista qualitativo. I risultati sono quindi interpretabili

(3) Lavoro eseguito presso il Laboratorio di Archeobiologia dei Musei Civici di Como nell'ambito del progetto finalizzato «Uso del combustibile legnoso ed evoluzione della vegetazione forestale in Italia nel Würm e nell'Olocene antico» (contributo CNR CT 15, 92.02312).

in prima approssimazione in senso ecologico, per la ricostruzione della copertura forestale. Il dato quantitativo è assai più aleatorio per la presenza di molti fattori non facilmente stimabili che producono forti deformazioni. La diversa frammentazione e la diversa riduzione di massa delle specie durante la combustione (CHABAL, 1992) sono infatti fenomeni ancora da indagare. Ad esempio, relativamente al sito in oggetto, sono stati notati risultati diversi, a seconda delle modalità di campionatura, sulla presenza percentuale del maggiociondolo *(Laburnum)*, sfavorito nei campioni lavati sullo scavo per la fragilità dei resti, e la maggiore tendenza, rispetto alle altre specie, dei resti di conifere a fratturarsi in più schegge durante le manipolazioni. Relativamente ai dati quantitativi, oltre ai fattori tafonomici, e al numero non troppo elevato di carboni analizzati, è necessario tener conto anche di altre ipotesi di lavoro più significative. La colletta «casuale» del legname può infatti favorire, in maniera del tutto istintiva, come già suggerito da CASTELLETTI (1984) specie quali il maggiociondolo che presenta polloni morti che si staccano dalla pianta e si spezzano con facilità. Ma soprattutto, in rapporto al tipo di insediamento, è possibile ricollegare l'elevata percentuale di acero (*Acer* cfr. *pseudoplatanus*) a pratiche pastorali. L'alimentazione del bestiame con foglie di acero *(A. pseudoplatanus, A. platanoides)* e di frassino (*Fraxinus,* non presente in Val Biandino) è segnalata in letteratura (MAGGI e NISBET, 1991) anche attualmente in pascoli alpini verso la fine della stagione estiva. Anche la presenza di carboni di olivella spinosa *(Hippophae rhamnoides)* nell'US2 può essere collegata all'attività pastorale. La sua presenza nello spettro antracologico pur essere connessa all'eliminazione di cespugli operata con il fuoco per ottenere aree a pascolo (è infatti specie evitata dal bestiame), oppure accidentalmente connessa all'uso alimentare umano dei frutti, acidi ma ricchi di vitamina C (DALLA FIOR, 1981). Pianta spinosa, e quindi indubbiamente poco ricercata come legna da focolare, l'*Hippophae* è specie relativamente xerofila, attualmente assente in Val Biandino (GOTTIFREDI, 1982-83), tipica dei greti fluviali. Essa poteva facilmente vegetare sul versante esposto a sud in aree con suoli molto immaturi e potrebbe segnalare anche una fase climatica relativamente più asciutta. Oltre alle pratiche per favorire il pascolo, un prolungamento del ristagno di neve e l'approfondimento dei solchi di ruscellamento potrebbero essere la causa della sua scomparsa nella valle a favore di piante più adatte come l'ontano verde (SERPIERI e SCALCINI, 1912).

Tab. 1 - Sito di Casere Sasso: analisi antracologiche.

Taxon/US	P32		US2	US3	US4-5
prof.	-6	-39			
Abies alba	1	4	3	1	6
Abies/Juniperus	1	6	–	–	–
Picea/Larix	8	9	10	6	19
Pinus sylv/montana	–	–	–	–	2
CONIFERAE	5	–	1	–	1
Alnus viridis	–	–	4	3	12
Pomoideae (cfr. *Sorbus*)	–	–	1	–	1
Laburnum sp.	1	22	–	–	6
Acer cfr. *Pseudoplatanus*	2	19	6	–	37
Hippophae rhamnoides	–	–	1	–	–
TOTALE	18	60	26	10	84

In sintesi è da ritenersi, sulla base dei dati antracologici, che durante la frequentazione del sito di Casere Sasso, la copertura forestale fosse piuttosto limitata e caratterizzata per larghi tratti da una boscaglia rada ad acero (*Acer* cfr. *pseudoplatanus*), maggiociondolo (*Laburnum* sp. L) e ontano verde *(Alnus viridis)*. Tale boscaglia, con la presenza accessoria di cespugli e piccoli alberi di sorbo (*Pomoideae* cfr. *Sorbus* sp.), olivella e pino *(Pinus sylvestris/montana)*, poteva essere derivata dal diradamento artificiale di un consorzio di conifere con peccio e/o larice dominante e poco abete, consorzio che all'epoca dell'insediamento non doveva costituire più una formazione fitta (tanto più se era presente il larice) nè particolarmente coprente. Considerazioni sulla posizione del sito e sulla morfologia della valle fanno ritenere che i dati antracologici riflettano la situazione della vegetazione presente sul versante esposto a sud, più facilmente raggiungibile e percorribile del versante opposto per la raccolta della legna e più fortemente modificato in rapporto all'attività pastorale.

Durante la frequentazione del sito non sono documentati sostanziali cambiamenti di questi aspetti della vegetazione. La mancanza di resti di cibo, accidentalmente combusti, di origine vegetale (semi, cariossidi e frutti), di per sè già significativa fa ritenere, per analogia con l'attuale sistema pastorale, che la dieta del gruppo umano, fosse improntata durante il periodo di occupazione del sito al consumo di prodotti di origine animale.

I SUOLI CIRCOSTANTI IL SITO

Il sito di Casere Sasso pare legato, già per elementi intrinseci, all'attività pastorale stagionale e transumante. Tale destinazione d'uso appare ancora più convincente quando si esamini il rapporto fra siti e suoli circostanti, in termini di capacità d'uso del suolo.

Nessuno dei suoli dell'area (fig. 2), tenuto conto anche dell'altitudine e del clima rigido, ha alcuna capacità d'impiego agricolo, sia pure marginale. Gran parte di essi, inoltre, è poco adatta al pascolo, o perché posti su versanti troppo ripidi o perché troppo pietrosi o perché troppo saturi d'acqua. Fa eccezione la fascia di suoli brunificati che evolve sul detrito ai piedi del fianco settentrionale della valle. È proprio all'estremità orientale di questa unità che è ubicato il sito. Qui i suoli sono profondi e mostrano profili cumulici, formati cioè da alternanze di orizzonti A sepolti e accumuli detritici, indicanti fasi alterne di stabilità e dissesto dei versanti. In gran parte dei profili, a partire dagli orizzonti più profondi, a contatto con la roccia del substrato pedogenetico, sono stati raccolti frammenti di carbone che testimoniano come, nella valle, la regimazione del bosco mediante incendio sia antica di molti millenni.

Il profilo 55 (fig. 9) ha fornito l'evidenza più antica, che consiste in un *ranker* sepolto assai ricco in argilla e sostanza organica, di spessore decimetrico, al di sotto di una coltre detritica sulla quale evolve il suolo attuale che consiste di nuovo di un *ranker*, ma assai meno sviluppato.

Nel *ranker* sepolto sono stati raccolti 27 carboni di abete bianco *(Abies alba)* e 4 carboni di peccio/larice *(Picea/Larix)* (tab. 2). La presenza elevata di abete costituisce un elemento distintivo da tutte le altre campionature nelle quali l'abete, quando presente, è elemento accessorio. I resti di una abetina quasi pura suggeriscono di attribuire il suolo sepolto all'età Atlantica in accordo sia con i dati pollinici (Schneider, 1985), sia con i dati di altri siti prealpini indagati dal punto di vista antracologico (Fienile Rossino, m 925 slm: Castelletti e Leoni, 1987; Cornizzolo, m 1100 slm: Castelletti *et al.*, 1984). In base a questi dati il dominio dell'abete dura per tutto il periodo Atlantico, mentre con il Subboreale ad esso si sostituisce generalmente la pecceta intorno ai 1000-1600 metri slm e la faggeta a quote inferiori. In Val Biandino l'assenza di *Fagus* in tutti i profili, ad eccezione delle carbonaie, può essere motivata non tanto dal limite altitudinale di questa specie, che si spinge normalmente fino ai 1600 (1800) metri slm, ma dalla presenza di un certo grado di continentalità climatica che si esprime nella valle, per l'andamento est-ovest di questa, oltre Bocca Biandino. Anche attualmente il faggio non riesce a superare questo limite, mentre la sua presenza è assai cospicua nella Valle della Troggia.

Tab. 2 - Val Biandino, analisi antracologiche: tabella complessiva.

Taxon/Profilo	P55	P43		P45	P24	P25	P32	C.Sasso	P17	P56	P7	P8	P12
cronologia	Atlan?						Subboreal?						
tipologia	prof.	torbe		torbe	prof.	prof.	arch.	arch.	carbonaie				
profondità		-50	-35										
Abies alba	27	–	–	–	2	–	5	10	–	–	8	7	–
Abies/Juniperus	–	–	–	–	–	–	7	–	–	–	–	–	1
Picea abies	–	*	*	–	–	–	–	–	–	–	–	–	–
Larix decidua	–	*	–	–	–	–	–	–	–	–	–	–	–
Picea/Larix	4	5**	5**	24**	17	–	17	35	3	22	7	6	11
Pinus sylv/montana	–	–	–	–	–	–	–	2	12***	2	–	–	–
CONIFERAE	–	–	–	–	3	3	5	2	–	2	4	7	–
Alnus viridis	–	2**	–	–	–	–	–	19	–	–	–	–	4
Fagus sylvatica	–	–	–	–	–	–	–	–	–	–	1	1	–
Pomoideae (cfr. *Sorbus*)	–	–	–	–	–	–	–	2	–	–	–	–	–
Laburnum sp.	–	–	–	–	–	–	23	6	–	1	1	1	–
Acer cfr. *pseudoplatanus*	–	–	–	–	–	–	21	43	–	2	1	–	–
Hippophae rhamnoides	–	–	–	–	–	3	–	1	–	–	–	–	–
Latifoglia nd	–	–	–	–	–	–	–	–	–	1	–	–	–
TOTALE	31	7**	5**	24**	22	6	78	120	15	30	22	22	16

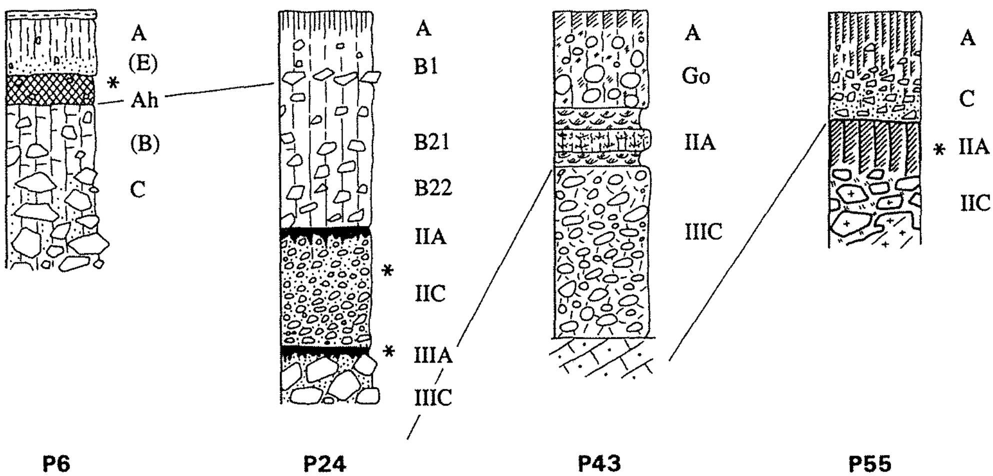

Fig. 9 - Profili pedologici dell'alta Val Biandino e loro correlazione.

I profili 24 e 25 (fig. 9) sono sviluppati su di una falda detritica particolarmente spessa ed hanno un profilo cumulativo che include polisequenze di orizzonti pedologici.

Il profilo 24 presenta una prima discontinuità a cm 20 di profondità, sottolineata da un allineamento di pietre, ed una seconda a cm 110, al di sotto della quale un sottile orizzonte A (IIIA1) poggia sulla breccia del substrato. In base alle caratteristiche pedologiche, il profilo comprende un ranker debolmente evoluto alla base (IIIA1), sepolto da depositi di versante debolmente pedogenizzati (IIA/IIC), troncato al tetto, e di nuovo sepolto da depositi di versante a loro volta pedogenizzati in un suolo bruno acido (A1/B21); esso testimonia pertanto il succedersi di distinti cicli di stabilità/degrado dei versanti.

Nel sottile orizzonte organico alla base del profilo è stato possibile isolare un campione di 22 carboni, nel quale domina il peccio/larice *(Picea/Larix)* sull'abete *(Abies)*. Nell'orizzonte IIC sono stati raccolti carboni di conifera (*Picea/Larix*, verosimilmente). Il vicino profilo 25 è correlabile con il sequum superiore del profilo 24 e nell'orizzonte B22 sono stati raccolti alcuni carboni, attribuibili genericamente a conifere, tra i quali compare l'*Hippophä*. La presenza di carboni in questi suoli è sicuramente da collegare con opere di disboscamento per fare spazio ai pascoli. Le associazioni di carboni riscontrate nei profili 24 e 25, in relazione ai dati pedologici, sono attribuibili ad una fase successiva rispetto al profilo 55 presumibilmente relativa al Subboreale. I dati rivelano dapprima l'avvenuta sostituzione dell'abetina atlantica da parte della pecceta/lariceta e successivamente sembrano indicare ambienti più degradati ed aperti correlabili con quelli testimoniati dal sito di Casere Sasso. Il motivo della rapida diminuzione di *Abies*, testimoniata dai dati pollinici e antracologici, e della sua scomparsa alle basse quote, sarebbe connessa a fattori ambientali e antropici. Il peso di ciascun fattore deve essere meglio indagato, specialmente in ambito alpino. Le ricerche recenti degli autori inglesi, sviluppate in particolare in ambito appenninico (Cruise, 1992) dimostrano la complessità del problema e la lunga durata del processo.

Nella piccola torbiera del profilo 43 sono stati raccolti rami e aghi di peccio *(Picea abies)* e larice *(Larix decidua)* in associazione a ontano verde *(Alnus viridis)*. La presenza di *Alnus viridis* data il livello inferiore del profilo dopo l'inizio del Subboreale e quindi in una fase che può essere coeva all'insediamento o più tarda. Nei diagrammi pollinici del Canton Ticino e del Varesotto (Zoller, 1967; Schneider, 1978) la diffusione massiccia sul versante meridionale delle Alpi dell'ontano verde è stata infatti datata attorno al 4500 BP.

Dal punto di vista dell'evoluzione del suolo, il livello di sabbie grossolane compreso fra 32 e 51 centimetri indica che vi fu almeno una fase di dissesto dei versanti nell'evoluzione della torbiera e che questa venne estinta per interramento, anch'esso determinato da una ulteriore fase di dissesto dei versanti, più recente del Subboreale, ma non databile con precisione.

LE CARBONAIE: UNA FASE DI DISSESTO DEI VERSANTI IN ETÀ STORICA

Gran parte dei profili aperti lungo i versanti presentano sistematicamente una discontinuità a pochi decimetri di profondità (fig. 9: profilo 6). Su di essa poggiano delle lenti di carboni di ampiezza talora metrica e di spessore decimetrico interpretate come la base di carbonaie. Queste a loro volta sono sepolte da una coltre decimetrica di depositi colluviali, sui quali si imposta l'orizzonte eluviale, comunque debolmente espresso.

I carboni raccolti nelle carbonaie presentano aspetto fresco e ben conservato, sono mediamente più grandi di quelli degli altri contesti e occasionalmente recano tracce di tagli per la preparazione di adeguate pezzature per la catasta. Vi dominano le conifere, in particolare peccio/larice *(Picea/Larix)*, entrambi buoni combustibili, ma sono presenti, seppure con un ruolo secondario, anche altre specie *(Acer, Laburnum, Alnus)* con caratteristiche tecnologiche piuttosto scadenti. Solo in questi ambiti compare il faggio, specie pregiata come combustibile, raccolto forse a più bassa quota o ai limiti superiori di crescita all'interno della valle.

Il rapporto biunivoco fra carbonaie e superficie di erosione indica che la messa in posto delle carbonaie si correla ad una sensibile fase di dissesto dei versanti. La loro distribuzione (fig. 10) fra quota 1400 e 1625 metri slm, almeno centocinquanta metri al di sopra del limite attuale del bosco, significa una più ampia estensione di questo al momento della loro formazione. Una selezione non particolarmente spinta delle specie presenti, al contrario di quanto osservato in altri contesti archeologici (*cfr.* Monte Barro: Castelletti e Castiglioni, 1991), può essere collegata, in mancanza di una sufficiente copertura forestale, alla forte domanda di combustibile, richiesto dall'attività mineraria (kg 2150/2330 di carbone di legna per tonnellata di ghisa, secondo Curioni (1877). Tale attività (estrazione e lavorazione di minerali di ferro e piomboargentiferi) è documentata in Val Biandino sicuramente dal XVI secolo fino al XIX AD, ma nelle immediate vicinanze (Val Varrone, Valtorta e Valsassina in generale) almeno dal IX secolo AD (Rottoli, 1984-85) e forse già nella tarda età del Ferro (Tizzoni, 1984). Il forte prelievo di legname della valle è responsabile sia della degradazione dei versanti, sia dell'arretramento del bosco, che non ha ancora riguadagnato le sue originarie posizioni. Sebbene non vi siano elementi diretti per datare le carbonaie, alcuni dati storici aiutano ad

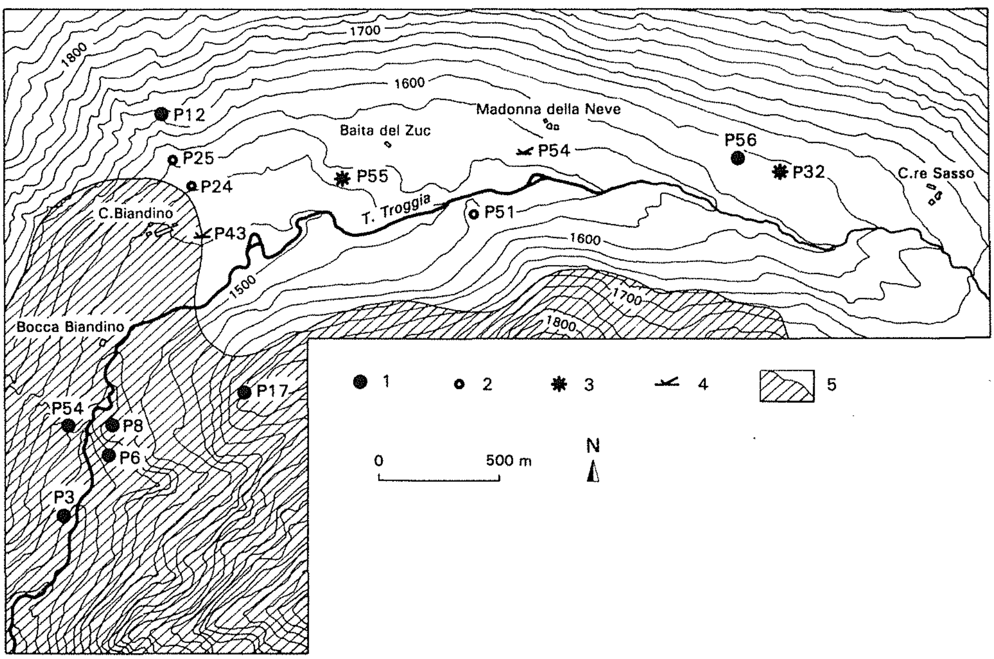

Fig. 10 - Distribuzione delle carbonaie e dei profili con carboni. 1) carbonaie; 2) profili con carboni; 3) sito di Casere Sasso; 4) torbiere; 5) attuale limite del bosco.

inquadrare il fenomeno. Ad esempio, nel 1572-73, il concessionario della miniera del Lago di Sasso lamenta la penuria di boschi della valle, conseguente alla fase di massima attività delle miniere fra XIII-XV secolo AD (FRUMENTO, 1963). I dati raccolti durante l'amministrazione austriaca segnalano costantemente la scarsità di superfici boscate. I rilevamenti di questo secolo (SERPIERI e SCALCINI, 1912; FENAROLI, 1936) descrivono un ulteriore depauperamento della superficie forestale anche sul versante esposto a nord. Gli effetti del disboscamento sono stati conservati dal sistematico pascolamento stagionale, ancora fortemente attivo nell'area.

CONCLUSIONI

Il suolo sepolto del profilo 55 è probabilmente testimonianza di stabilità geomorfologica e pedogenesi nell'Olocene antico fino in età atlantica, con copertura boschiva chiusa con abete dominante. La base del profilo 24 ancora configura una fase di stabilità in un ambiente di bosco chiuso in cui tuttavia vi è lo scambio fra larice e peccio che diventa dominante a detrimento dell'abete. Successivamente viene documentata una fase di dissesto generalizzata dei versanti che coincide anche con la vita del sito archeologico di Casere Sasso, che appare assai prolungata poiché sembra documentata, sia pure in modo discontinuo, almeno per l'intera durata dell'età del Bronzo.

Tale fase è documentata sia nelle torbiere in cui la sedimentazione organica viene interrotta da apporti clastici, sia nel sito di Casere Sasso in cui i resti paleobotanici indicano un ambiente aperto di bosco degradato sia nei profili 24 e 25 che documentano una generale instabilità. La presenza in essi di *Hippophae rhamnoides*, specie indicatrice di scarsa copertura arborea, che si trova anche nel sito archeologico, fornisce ulteriori indizi della contemporaneità di questi eventi.

Bisogna notare inoltre che tale fase di degradazione non sembra collocarsi in un quadro di aumentate precipitazioni, ma al contrario in un momento apparentemente più xerico dell'attuale. Tale circostanza, unita alla presenza di una struttura certamente legata ad attività pastorale ed alla forte presenza di carboni nei profili per l'età Subboreale, fortemente indizia che il diradamento del bosco, almeno localmente, sia dovuto ad incendi operati con l'obiettivo dell'ampiamento dei pascoli.

Il fenomeno riscontrato in Val Biandino sembra estendibile a gran parte dell'Italia settentrionale. Nel Subboreale si assiste ad un generalizzato cambiamento o diradamento del bosco, sia sull'Appennino Ligure (MAGGI *et al.,* 1992; MAGGI in CREMASCHI, 1989; CRUISE, 1992) nell'Appennino Tosco-Emiliano (CREMASCHI *et al.,* 1984) e nelle Alpi Piemontesi. In ogni caso citato le evidenze di dissesto dei versanti e colluvio dei suoli (CRUISE, 1992), si accompagnano ad una ripresa della frequentazione antropica di aree che risultano abbandonate con la fine del Mesolitico.

Non è possibile dirimere, in base alla sola evidenza di Biandino, la questione, spesso dibattuta, se il mutamento ambientale responsabile del dissesto dei versanti e del diradamento della copertura forestale, dipenda da una modificazione climatica o soltanto da un esteso disboscamento della montagna per l'attuazione di ampi pascoli necessari alle nuove strategie di sussistenza dell'età del Bronzo.

Sembra probabile, dai dati disponibili (CREMASCHI, 1992), che anche nella Pianura Padana la prima fase di disboscamento che imprime tracce permanenti sui suoli non avvenga in età neolitica (Cremaschi, 1990), ma sia già avviata nella media età del Bronzo e probabilmente avvenga in età calcolitica o nella prima età del Bronzo. Il diradamento delle coperture boschive in età Subboreale, fenomeno generale per il sistema padano, appare troppo rapido per essere semplicemente stato determinato da un cambiamento climatico; è probabile quindi che attività antropica e deterioramento climatico abbiano agito in modo sinergico, come già osservato per altri periodi (*cfr.* ad esempio Cremaschi e Gasperi, 1991) dando luogo ad effetti particolarmente appariscenti sul piano geopedologico.

Una più recente fase di dissesto, in cui l'impatto antropico è da considerare il principale se non l'esclusivo motore, è legata allo sfruttamento medievale del bosco per la lavorazione del minerale di ferro. Le caratteristiche tecnologiche del legno impiegato sono sufficienti a dimostrare un uso sistematico del bosco, estraneo alle strategie di sussistenza preistorica. A causa di tale sfruttamento il bosco perde terreno che non riguadagnerà più, se non in parte negli ultissimi anni, poiché anche attualmente l'area lasciata libera dalle piante viene ancora sfruttato per il pascolo stagionale dell'alpeggio.

APPENDICE 1. DESCRIZIONE DEI PROFILI PEDOLOGICI

Sito di Casere Sasso. Profilo rilevato a m 1650 di quota in area pianeggiante, con rocce affioranti della formazione Servino.

US0: include l'orizzonte A0 (cm 0-6) costituito da un feltro di radici mediamente decomposte e scarsa materia minerale *(idromor)* e l'orizzonte A1g, di tessitura franco limosa colore 2.5Y 3/2, screziature rosse, aggregazione grumosa debolmente espressa, privo di materiale archeologico, il limite inferiore è chiaro planare a:

US1: tessitura sabbiosa franca massiva, colore grigio con screziature rossigne, ha spessore decimetrico ed aumenta sensibilmente da E verso W, le pietre vi sono scarse, ma aumentono fortemente verso il margine meridionale dello scavo, approssimandosi all'affioramento di roccia in posto della formazione Servino che ne costituisce il limite; il materiale archeologico è rappresentato da un solo frammento ceramico; il limite inferiore è irregolare chiaro.

US2: tessitura sabbioso franca, pietre molto abbondanti, dal 60 al 90%, ivi comprese grandi sfaldature fino ad m 1 di larghezza; ha spessore decimetrico ai margini N e S dello scavo, mentre si assottiglia fino a scomparire al centro, al margine NE è costituita da massi derivanti dal crollo di un muro a secco orientato, alcuni di questi da considerarsi ancora in posto, affondano negli strati sottostanti; inseriti fra i massi, sono stati raccolti alcuni frammenti ceramici; al margine SW, limite inferiore concavo verso il centro dello scavo, chiaro; l'unità ricopre in parte le US3 e US4.

US3: tessitura franco sabbiosa, colore 10YR 3/3 nero, pietre minute da scarse a comuni, molto ricca di carboni, ha forma lenticolare, allungata in senso E-W ed occupa la parte centrale dello scavo, contiene, nella sua parte meridionale, un accumulo di medie e grosse pietre allineate in direzione E-W che potrebbero rappresentare una struttura in pietra crollata e dispersa; si osservi come molte pietre siano giustapposte (figg. 3 e 4); tre frammenti ceramici ed una cuspide penducolata in selce sono i materiali archeologici raccolti nell'unità; limiti chiari lineari; in parte ricopre l'US4 e appoggia sull'unità US5.

US4: tessitura sabbioso franca, colore nero, pietre abbondanti spigolose minute, ha forma lenticolare, spessore decimetrico ed è più spessa ai margini S ed E.

US5: tessitura franco sabbiosa e franco limosa colore prevalente nero, spessore decimetrico, estesa su tutta la superficie dello scavo, è costituita dall'alternanza di sottili lenti carbonoise e di sedimento limoso-sabbioso; contiene quasi al centro dello scavo una grossa pietra disposta orrizzontalmente sulla quale si concentravano i carboni e tracce di bruciatura, che risulta circondata da lenti di carboni; alcuni frammenti ceramici e manufatti litici, limite inferiore chiaro lineare.

US5B: tessitura sabbiosa, colore 2.5Y 5/4, clasti medi e minuti spigolosi, prevalenti sulla matrice, spesso a contatto fra di loro, limite graduale.

L'unità US5B rappresenta la base della serie archeologica. Al di sotto di questa, in un limitato saggio condotto al centro dell'area scavata, è stata messa in luce la seguente stratigrafia:

US6A-C: alternanza di strati planari centimetrici limosabbiosi di colori oliva chiaro e bruni, contenente al tetto qualche carbone non determinabile.

US6D: sabbie massive con screziature rosse e verdi contengono comuni clasti spigolosi, limite graduale.

US7: breccia spigolosa grossolana a supporto clastico.

Profilo 24

Profilo rilevato a circa m 1530 di quota su di un versante a detrito di creep e debris flow ormai stabilizzato. Esposizione S; vegetazione a prato di monte.

A1: 0-5 cm. Bruno scuro (10YR 4/3); franco-limoso; pietrosità 15%; aggregazione ben espressa, poliedrica, subangolare minuta; molto debole; presenza di fessure comuni e di radici; poco umido; pH 5; limite inferiore chiaro.

B1: 5-20 cm. Bruno giallastro scuro (10YR 4/4); franco; pietre spigolose comuni ; aggregazione poliedrica subangolare poco espressa; debole; fessure comuni; umido; pH 5.2; stone line alla base; limite inferiore chiaro.

IIB2/1: 20-40 cm. Bruno forte (7.5YR 5/6); franco-sabbioso-limoso; pietrosità 35%; aggregazione poliedrica subangolare meglio espressa; moderatamente debole; pori comuni e piccoli; moderatamente debole; umido; pH 5; presenza di carboni sparsi; limite inferiore graduale.

IIB2/2: 40-70 cm. Bruno forte-bruno scuro (7.5YR 5/6-7.5YR 4/4); franco-sabbioso-argilloso; pietrosità 40% con clasti di argilloscisti spigolosi; aggregazione poliedrica angolare media e minuta ben espressa; debolmente resistente; pori minuti e comuni; patine argillose scarse e discontinue nei pori; umido; pH 4.8; limite inferiore abrupto.

IIB2/3: 70-72 cm. Bruno scuro (7.5YR 4/2); franco-argilloso; scheletro scarso con carboni piccoli e arrotondati aggregazione poliedrica angolare minuta molto debolmente espressa o massiva; debolmente resistente; pori scarsi e minuti; umido; pH 5; limite inferiore graduale.

IIC: 72-110 cm. Bruno giallastro scuro (10YR 4/4-10YR 4/6); sabbioso; minute sfaldature di argilloscisti debolmente arrotondati; friabile; pH 5.4; limite inferiore chiaro.

IIIA1b: 110-112 cm. Bruno molto scuro (10YR 2/2); franco-limoso; aggregazione evidente granosa e minuta; bagnato; pH 5.6; limite inferiore graduale.

IIIC: 112 cm-non rilevato. Grosse sfaldature con matrice interstiziale di argilloscisti; pH 5.5.

Profilo 25

Profilo rilevato a m 1568 di quota su un terrazzamento decorticato. Esposizione S; vegetazione a prato di monte.

A1: 0-25 cm. Bruno scuro (7.5YR 3/3-7.5YR 3/4); franco-sabbioso; pietrosità 20%, rari blocchi; aggregazione moderatamente espressa; pori comuni e piuttosto grossi; debole; umido; pH 5.4; limite inferiore graduale.

B1: 25-57 cm. Bruno scuro (7.5YR 4/4); franco-sabbioso-argilloso; aggregazione poliedrica subangolare minuta poco espressa; pori comuni e piuttosto grossi; debole; umido; pH 5.4; limite inferiore graduale.

B2: 57-140 cm. Bruno scuro (7.5YR 4/4); franco-sabbioso-argilloso; pietrosità 50% con grossi blocchi spigolosi; moderatamente debole; umido; pH 5; presenza di carboni; limite inferiore diffuso.

R: 140 cm-non rilevato.

Profilo 6

Profilo con carbonaia rilevato a m 1450 di quota sulla sinistra del torrente Troggia, presso Baite della Scala; frana che ricopre materiale morenico; vegetazione a bosco misto montano; esposizione N-W.

A1: 0-20 cm. Bruno rossastro scuro (5YR 3/4-5YR 3/3); sabbioso-franco; pietrosità 10-15%; pietre piccole; aggregazione subangolare, fine, debolmente espressa; molto poroso; friabile; umido; presenza di radici; pH 5; limite inferiore abrupto leggermente ondulato.

Carbonaia: 20-32 cm. Grigio bruno (10YR 5/2); franco-limoso-sabbioso; pietrosità 30% con pietre piccole o medie e grossi clasti spigolosi rari; aggregazione granulare; umido; pH 5; limite inferiore chiaro.

B: 32-53 cm. Bruno scuro (7.5YR 4/4); sabbioso-limoso; pietrosità 40%; presenza di grossi blocchi sparsi di roccia alterata; aggregazione poliedrica angolare moderatamente espressa; porosità abbondante e minuta; consistenza debole; limite inferiore graduale.

C: 52 cm.-non rilevato. Sabbioso; pietrosità 75%; materiale eterometrico arrotondato o spigoloso; sciolto; poroso; umido; limite inferiore sconosciuto.

PROFILO 43
Torbiera rilevata a m 1496 di quota in località Bocca Biandino, su un versante poco acclive nelle vicinanze del Torrente Troggia. Esposizione S; vegetazione a prato di monte.

A1: 0-6 cm. Bruno scuro (7.5YR 3/2); sabbioso-franco; pietrosità 25% con presenza di massi piuttosto grossi; aggregazione poliedrica minuta debolmente espressa; pori comuni e minuti; pH 7.6; limite inferiore chiaro.

G0: 6-32 cm. Grigio (10YR 5/1); sabbioso; pietrosità 75% con grossi clasti ben arrotondati; massivo; presenza di screziature di colore bruno rossastro scuro (5YR 3/3); limite inferiore abrupto.

IIA1b: 32-33 cm. Livello organico di colore nero scuro.

IIIC: 33-35 cm. Grigio bruno pallido (10YR 6/2); sabbia fine e limosa ben classata con clasti di Servino e Verrucano completamente alterati; materiale massiccio e senza struttura; limite inferiore abrupto.

IVA1b: 35-40 cm. Nero (5YR 2/1); livello organico di torba feltrosa maleodorante, probabilmente di sfagni, senza legno, poco compatta e soffice; limite inferiore abrupto.

VC1: 40-47 cm. Grigio bruno (10YR 5/2); livello di sabbie medie limose abbastanza ben classate, massive e con laminazioni piano parallele con sottili livelli di torba interni.

VC2: 47-51 cm. Nero (10YR 2/1); livello di torba con legno e aghi di conifere. I rami sono coricati e di dimensioni variabili tendenti a grossolane; lo spessore dello strato non è costante; presenza di locali screziature di colore bruno molto scuro (10YR 2/2).

VIGr: 51-101 cm. Rosso molto cupo (2.5YR 2/2); abbondanti clasti di Servino e Verrucano, prevalentemente piccoli, subarrotondati e isoorientati, immersi in una matrice limoso sabbiosa argillosa; il sedimento è compatto e particolarmente addensato.

R: 110 cm.-non rilevato. Verrucano con superficie levigata e striata dal ghiacciaio pleistocenico.

APPENDICE 2. I RESTI VEGETALI

Campionatura e Metodologia Analitica

I carboni presenti nei profili derivano in parte da campionature a vista, in parte dal lavaggio effettuato in laboratorio di quantità limitate di sedimento (gr 250 circa per campione). I resti carbonizzati del sito di Casere Sasso derivano invece per la maggior parte da sedimento (alcune decine di kg) lavato su setacci di 2 mm e separato direttamente sullo scavo. Solo un campione di sedimento dell'US4 (gr 850) e uno dell'US5 (gr 3500) sono stati lavati e separati in laboratorio. Per questi campioni il lavaggio è stato effettuato sotto getto d'acqua su setaccio fine (0.5 mm). I campioni, una volta asciutti, sono stati separati su colonna di setacci di 4-2-1-0.5 mm. L'analisi dei carboni è stata effettuata in microscopia ottica a luce riflessa; per la visione in sezione trasversale i campioni sono stati imbiancati con ammonio cloruro (Castelletti, 1977). Per i profili l'analisi ha riguardato tutti i carboni estratti; per il sito di Casere Sasso, considerato il numero assai elevato di carboni, si è operata una sottocampionatura utilizzando per l'analisi, anche per le US4 e US5, solo carboni delle frazione superiore ai 2 mm.

I frammenti lignei sono stati raccolti a vista da sezioni aperte nelle torbiere o prelevati con trivella a mano. L'analisi è stata effettuata in luce trasmessa previa colorazione delle sezioni sottili con verde metile.

Il campione di sedimento dell'US5, separato in laboratorio, h stato parzialmente vagliato al binoculare (I frazione, in totò; II frazione, gr 20; III frazione, gr 20; IV frazione, gr 5) per la ricerca di eventuali altri resti vegetali (cariossidi, semi e frutti). La ricerca ha dato esito negativo.

Problemi di Determinazione

Relativamente alle specie osservate è da segnalare la consueta difficoltà di distinzione fra *Larix* e *Picea,* aumentata dalla piccola originale pezzatura dei frammenti analizzati. In tutti i casi si è preferito lasciare la denominazione binomia. Nei profili rilevati nelle torbiere sono stati osservati resti delle foglie: questo per controllare la presenza effettiva di una o entrambe le specie.

In qualche caso si è avuta difficoltà di distinzione fra *Abies* e *Juniperus:* i due generi tendono a presentare caratteristiche anatomiche simili nel caso di piccoli rami carbonizzati (Castelletti e Leoni, 1987). Non sembra essere possibile la distinzione specifica tra *Pinus sylvestris* e *P. montana.* L'attribuzione di *Acer* a *A.* cfr. *pseudoplatanus* e di *Pomoideae* a *Sorbus* sp. è motivata dalla contemporanea presenza di alcune caratteristiche anatomiche e da considerazioni di carattere ecologico.

Le analisi

Nella tabella 1 sono presentati in dettaglio i risultati delle analisi relative a legni e carboni prelevati dal sito di Casere Sasso; nella tabella 2 sono invece riassunti i dati di tutti i contesti esaminati.

I contesti archeologici

1) Casere Sasso

Sono stati determinati 120 carboni provenienti dall'US2 (26 carboni), dall'US3 (10 carboni) e dall'US4+US5 (84 carboni). Si tratta di frammenti generalmente pertinenti a rami di pochi cm di diametro (0.6-4 cm, ma mediamente di 1-2 cm; 43 carboni con curvatura misurata, ma è sempre assente la corteccia), elevata frequenza di ife e talvolta fori di organismi lignivori (questi ultimi riscontrati su carboni di *Acer*). Le caratteristiche sono quindi riferibili a quelle della legna morta raccolta a terra in bosco. Per *Acer* si può eventualmente ipotizzare la presenza di fascine defoliate accatastate per qualche tempo presso il sito. Non vi sono argomenti per collegare i frammenti a strutture bruciate o a legname ricavato in altro modo (mancano curvature sicuramente ampie). Le US esaminate presentano un discreto grado di somiglianza ad eccezione dell'US3 che però presenta un'esigua quantità di carboni determinati. Dominanti sono *Acer* (35%), *Picea/Larix* (29%), e *Alnus viridis* (15%); mediamente rappresentato *Abies* (8%) e *Laburnum* sp. (5%), scarsi *Pinus, Pomoideae* (cfr. *Sorbus* sp.) e *Hippophae.* Il profilo 32, profilo assimilabile allo stesso contesto archeologico per la presenza di materiale ceramico, presenta dati relativamente analoghi: in questo caso è assente *Alnus* e domina *Laburnum.* Le differenze sembrano essere dovute alle modalità di campionamento: *Laburnum,* che presenta mediamente carboni fragili e mal conservati, tende a essere sottostimato nel materiale separato sullo scavo.

2) Profilo 55

Dal profilo 55, insieme ad alcuni manufatti mesolitici, provengono 27 carboni di *Abies alba* e 4 carboni di *Picea/ Larix.* La presenza elevata di *Abies* costituisce un elemento distintivo da tutte le altre campionature, nelle quali l'abete, quando presente, è in genere elemento accessorio (fanno eccezione solo le due carbonaie recenti poste a quota inferiore, profili 7 e 8).

Le torbiere, i profili e le carbonaie

Dai due profili aperti nelle torbiere provengono rami di *Picea/Larix* (10 frammenti nel profilo 43 e 24 nel profilo 45); solo nel profilo 43 è stata riscontrata la presenza di rami di *Alnus viridis*. Nello stesso profilo sono inoltre presenti aghi sia di *Picea* che di *Larix;* aghi di *Larix* sono invece assenti nel profilo 45. Più variegata la situazione riscontrata nelle carbonaie dove oltre a *Picea/Larix* dominante sono presenti altre specie *(Abies, Pinus, Alnus, Laburnum, Acer)* ma soprattutto compare anche *Fagus* specie pregiata come combustibile. I carboni in questo caso sono generalmente più grandi e meglio conservati, ma solo occasionalmente si è potuta osservare qualche traccia di tagli per la preparazione di adeguate pezzature per la catasta.

Picea/Larix domina anche nel profilo 24; nel vicino profilo 25 compare *Hippophä,* mentre per 3 dei 6 carboni esaminati nello stesso profilo non si è riusciti a giungere ad una migliore distinzione all'interno del gruppo delle conifere.

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RENATO NISBET*

ALCUNI ASPETTI DELL'AMBIENTE UMANO NELLE ALPI COZIE FRA QUINTO E QUARTO MILLENNIO BP

SUMMARY – *Some aspects of the human environment in the Cottian Alps between the fifth and the fourth millennium BP.* During the eighties, extensive fieldwork was conducted in the central Cottian Alps (Pinerolo region). Several years of survey, as well as extensive excavations provide a good deal of new data. Two of the excavated sites in the Val Chisone give information on the period between the end of the fifth and the mid fourth millennia BP. Palaeoenvironmental studies show that an increasing human impact on the upper slopes starts at least from the late Copper Age, when on the lower slopes (Balm'Chanto rock shelter, 1400 metres asl) groups practising a mixed economy (hunting, farming and small-scale pasture) were present. Towards the middle of the fourth millennium BP there seems to have been a preference for higher pastures, as best documented at the site of Roc del Col, above 2000 metres, where a narrow rocky ridge was largely settled leaving evidence of crops (spelt). Though limited to a few sites, the present evidence shows some interesting points. So far it is impossible to determine the presence of major sites on the valley floor. Other problems arise from the conflict between the economic data of the two sites, namely mixed economy at Balm'Chanto and «specialization» at Roc del Col. The isolation of sites in rather inaccessible zones and some particular aspects of the polished stone technology reflect an adaptation to the local geology.

RIASSUNTO – *Alcuni aspetti dell'ambiente umano nelle Alpi Cozie fra quinto e quarto millennio BP.* Durante gli anni Ottanta è stato condotto un esteso lavoro sul campo nel territorio delle Alpi Cozie centrali. Alcuni anni di prospezione archeologica e di scavi hanno fornito una quantità di nuovi dati. Due siti archeologici situati in Val Chisone sono stati oggetto di indagine ed hanno fornito informazioni circa il periodo compreso fra la fine del quinto e la fine del quarto millennio BP. Gli studi archeoambientali hanno dimostrato un incremento dell'impatto antropico lungo i declivi più alti almeno a partire dalla fine dell'età del Rame; mentre lungo i pendi più bassi (riparo sotto roccia di Balm'Chanto a m 1400 di quota) si trovavano gruppi umani che praticavano un'economia mista di caccia, agricoltura e, in parte, allevamento. Verso la metà del quarto millennio BP, sembra che la scelta si sia spostata verso i pascoli più elevati come è documentato dai ritrovamenti di Roc del Col, ad oltre 2000 metri di quota. Qui è stato scavato uno stretto pianoro roccioso abitato intensamente come indicato anche dalla presenza di cereali domestici *(Triticum spelta)*. Sebbene la nostra conoscenza sia limitata ai dati forniti da pochi insediamenti, vi sono alcuni punti interessanti da sottolineare. Sino ad oggi è stato impossibile rinvenire siti più estesi nel fondovalle. Altri problemi sono sollevati dai dati contrastanti circa l'economia di sussistenza dei due siti: mista a Balm'Chanto e «specializzata» a Roc del Col. L'isolamento di alcuni abitati in zone difficilmente accessibili ed alcuni aspetti peculiari dell'industria su pietra levigata riflettono un modello di adattamento alle condizioni geologiche locali.

INTRODUZIONE

Durante gli anni Ottanta una attività di ricerca sul terreno piuttosto intensa ha caratterizzato alcune zone delle Alpi Cozie, fino a quel momento pressoché inesplorate da un punto di vista archeologico. In particolare sulle montagne del Pinerolese, e soprattutto in Val Chisone,

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si sono svolte a più riprese campagne di rilevamento superficiale, dirette dalla Soprintendenza Archeologica del Piemonte e realizzate da membri e simpatizzanti del Centro Studi e Museo di Arte Preistorica di Pinerolo. Queste ricerche erano orientate all'individuazione di siti, ma anche e soprattutto all'analisi delle potenzialità del territorio montano in funzione paleoeconomica e paleoambientale. Nel corso di tali operazioni, numerosi insediamenti perlopiù di piccole dimensioni ed ascrivibili cronologicamente alla tarda preistoria sono stati individuati, quasi esclusivamente da M. Cinquetti, soprattutto sulle zone di spartiacque ad altezze non elevate, in ciò che oggi appartiene alla fascia vegetazionale del castagneto. Essi si collocano spesso su creste o sommità di disagevole accesso, o su pendii a forte acclività, comunque sempre ad una certa distanza dalla pianura (fig. 1). Di tali ricerche è stata data notizia a più riprese in sede locale (Cinquetti, 1987-88; 1989; Nisbet, 1989); non si è potuto dar seguito negli anni successivi ad esplorazioni più estese, nonostante l'evidente interesse dei ritrovamenti (1).

PITTURE RUPESTRI

In origine, queste prospezioni erano mirate ad accrescere le conoscenze sulle incisioni rupestri, per le quali tutta l'area è nota da molti decenni (Pons, 1940; Seglie *et al.*, 1973). I dati ottenuti in questa direzione non sono risultati privi di interesse, come dimostrano i diversi

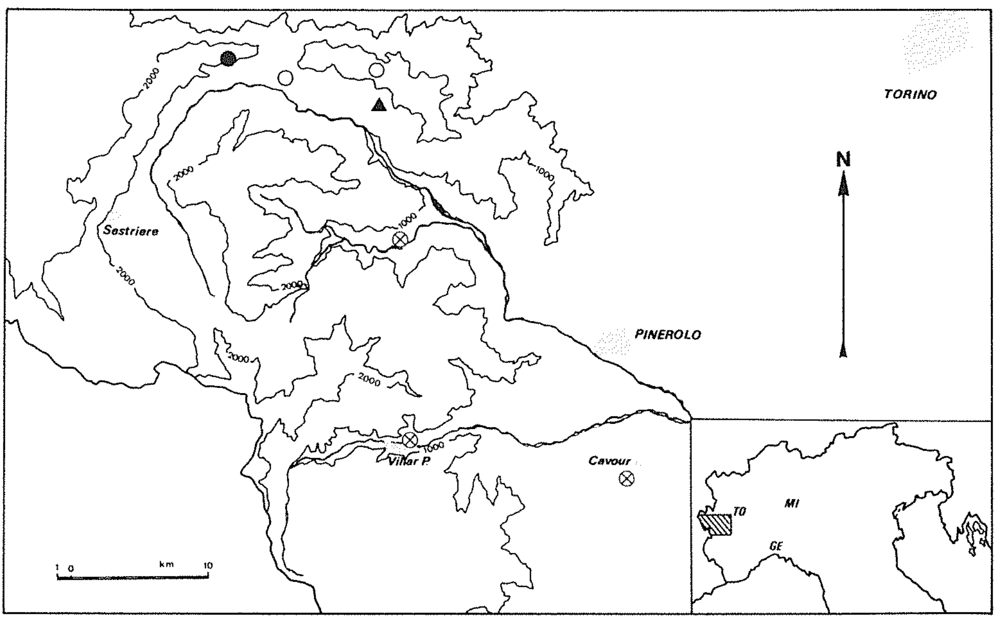

Fig. 1 - Ubicazione di alcuni dei siti del Pinerolese menzionati nel testo. Triangolo: Balm'Chanto; punto: Roc del Col; circoli vuoti: campionature polliniche; asterischi: pitture rupestri.

(1) L'organizzazione degli scavi e del rilevamento di cui si parla in questo lavoro è stata curata dal Centro Studi e Museo di Arte Preistorica di Pinerolo. I disegni dei materiali di Roc del Col sono di M. Cima (ceramica) e L. Mano (litica); la fotografia di Roc del Col è di M. Cinquetti.

repertori pubblicati anche in anni recenti (si vedano in COISSON, 1987-88; 1989 con bibliografia) e, in modo particolare, le recenti scoperte di pitture su pareti rocciose di ripari, che pongono peraltro ardui problemi di interpretazione e datazione.

Le due rappresentazioni pittoriche finora pubblicate, sulla Rocca di Cavour (GAMBARI, 1992) e nella bassa Val Germanasca (PONS, 1938), presentano indubbiamente caratteristiche tecniche, figurative e simbologiche assai diverse. Recentemente il fortuito ritrovamento di una nuova composizione pittorica nella media Val Pellice (fig. 2) ripropone problemi cronologici ed interpretativi, dal momento che i dati rimangono troppo scarsi in confronto, ad esempio, alla situazione che si presenta nella Francia sud-orientale (HAMEAU, 1989; 1992).

Il dipinto in questione orna la bancata rocciosa sovrastante un piccolo riparo sotto roccia, che oggi ospita i ruderi di un minuscolo edificio in pietra a secco, di probabile funzione pastorale o agroforestale, nel comune di Villar Pellice (Torino) (2). Esso fu casualmente identificato da un naturalista locale, R. Rivoiro, nel corso di ricerche faunistiche, nel 1992. La pittura occupa una superficie grossolanamente rettangolare, dell'altezza di circa cm 60, della larghezza di circa cm 120 e si trova ad un'altezza di circa cm 350 dall'attuale piano di calpestio. La composizione è dominata nella sua parte centrale da tre grandi figure rettangolari o quadrate riempite da linee parallele verticali. A partire dall'estrema destra, si osserva una breve linea verticale spezzata, a Y capovolta, forse una freccia. Seguono due macchie rosso scure, a

Fig. 2 - Pitture rupestri di Villar Pellice.

(2) Numerosi episodi di vandalismo avvenuti in tutto il mondo, non escluso il Pinerolese, aventi come oggetto pitture e incisioni preistoriche, hanno convinto la maggior parte degli specialisti (BEDNARIK, 1992) a non fornire indicazioni precise in merito all'ubicazione dei reperti, se non addirittura a tenere segreta la scoperta. Ci atteniamo a questo criterio.

contorno ellittico o rotondo, parzialmente coprenti una figura reticolata, la maggiore sormontata da una corta freccia verticale, alla cui sinistra si trova una seconda freccia, parallela alla prima ma più lunga. Una possibile terza freccia non è chiaramente identificabile. A sinistra della macchia maggiore si trova un rettangolo riempito da 13, forse 14 tratti verticali. Esso è largo circa cm 31, è alto circa cm 19. Sotto a questo è presente, molto mal leggibile, una linea a zigzag, formata dalla successione di cinque o sei frecce corte rivolte verso l'alto. Fra questo rettangolo e il successivo, lo spazio roccioso contiene in basso due piccoli tratti obliqui, forse da interpretare come frecce; in alto sono presenti ancora due piccole frecce codate. A sinistra di queste, vi sono due altri rettangoli sovrapposti, quello inferiore con 11 linee verticali, quello superiore con 10; va osservato tuttavia che la parte di sinistra è coperta da una strato carbonatico piuttosto spesso, che ha mascherato ulteriori probabili raffigurazioni. Al di sopra delle frecce codate, si osserva ancora una breve serie di quattro corte frecce rivolte verso l'alto. Infine, nel registro superiore destro, sopra una piccola frattura naturale del micascisto in cui è formato il riparo, si osservano ancora uno, forse due brevi tratti obliqui.

Il colore della composizione, genericamente rosso è, come si è detto, parzialmente mascherato dalla concrezione; esso varia da 10R 3/2 *(dusky red)* a 10R 4/6 *(red)* della Munsell Color Chart. A prescindere da elementi pittorici in qualche modo simili a questo nell'area mediterranea occidentale, è evidente che questa rappresentazione pittorica schematica trova un primo immediato riscontro in quelle di Ponte Raut, nella Val Germanasca (Pons, 1938), anche se molto diversi sono i materiali utilizzati nelle decorazioni, ciò che conferisce ovviamente un effetto cromatico differente (rosso in Val Pellice, bianco in Val Germanasca). Nei due siti la rappresentazione dominante è quella geometrico-lineare, benché a Ponte Raut i motivi siano a reticolo; nei due casi compaiono, sempre nella parte destra della figurazione, «macchie» di grandi dimensioni; sono assenti invece in Val Pellice le figure a due diametri inscritti in circonferenze più o meno complesse e circonvolute, numerose a Ponte Raut, e in parte sostituite nel nostro riparo da frecce.

Lo stile geometrico schematico di queste raffigurazioni è presente solo in modo piuttosto sporadico tra i motivi iconografici delle incisioni pinerolesi; si può anzi osservare che nelle pitture di quest'area, come pure in quelle recentemente descritte in Valsusa (Arcà, 1990), a Bessan nell'alta Moriana (Nehl, 1983), e, più lontano, quelle della valle delle Meraviglie (Vicino e Bernardini, 1973) ricorrono generalmente motivi non rappresentati nelle incisioni rupestri locali, ciò che sembra indicare nelle due tecniche iconografiche funzioni e significati totalmente diversi.

IL RILEVAMENTO TERRITORIALE

Le indagini territoriali furono mirate soprattutto all'individuazione di bacini intorbati allo scopo di completare eventualmente le informazioni paleoecologiche ottenute da analisi polliniche, iniziate nei depositi dell'età del Rame del riparo sotto roccia di Balm'Chanto, e di stabilire una cronologia radiocarbonica sulle principali fasi di intorbamento in alta quota. Benché, per una serie di ragioni di organizzazione e di costi questo progetto non abbia potuto essere portato a termine, si sono comunque individuate diverse aree di potenziale interesse, ubicate perlopiù a quote comprese fra i 2200 e i 2500 metri; alcuni di questi siti sono stati campionati. Assai rari sono, al contrario, i depositi posti a quote inferiori, sui medi versanti; essi sono generalmente poco potenti e probabilmente più recenti. Inoltre, l'acclività dei versanti generalmente ha sfavorito l'accumulazione di torba che solo in un caso ha potuto essere campionata (area di Pra Catinat, m 2035; analisi R. Scaife).

IL LAGO DELLA MANICA E LE ANALISI POLLINICHE

Le analisi polliniche condotte all'interno del riparo di Balm'Chanto e sulle sponde intorbate di un laghetto (La Manica) a m 2365 nella regione dei pascoli, sulla parte alta dello stesso versante, congiuntamente a quelle pedologiche, hanno permesso di chiarire (Scaife, 1987) alcuni dei momenti significativi nella storia paleoambientale del versante in rapporto con la presenza umana preistorica. In particolare, per quanto riguarda la zona superiore, una serie di datazioni radiocarboniche sulla torba permette una migliore comprensione dell'evoluzione locale della vegetazione. L'inizio dell'intorbamento è datato Bln-3133: 6290±60 BP. Ciò avvenne in condizioni di forestazione a conifere, di modo che risulta evidente che la linea superiore della vegetazione correva, durante l'Olocene medio, ad almeno 200 m sopra il limite attuale. Successivamente (Bln-3134: 4430±60 BP; Bln-3205: 4360±50 BP) una graduale riduzione della copertura arborea, cui può non essere estraneo l'intervento umano, ha creato nella stessa area condizioni di prateria alpina, che sono rimaste sostanzialmente immutate fino ad oggi. È interessante il fatto che, mentre nel basso versante la presenza umana nel riparo di Balm'Chanto è documentata alla fine del terzo millennio BP, il profilo pollinico ottenuto sulla torba mostra che l'inizio del declino della foresta di conifere in alta quota deve essere iniziato almeno qualche secolo prima, in una fase tuttavia non ancora correlabile con alcun insediamento noto della valle. Non si può stabilire quindi un chiaro rapporto di causa ed effetto fra un'ipotetica presenza tardoneolitica sugli alti versanti e la progressiva deforestazione di questi. È opportuno rilevare comunque che la presenza di un sito neolitico con materiali attribuiti allo Chasseano (Bertone, 1988) nell'alta Valsusa (Chiomonte), a quote non elevate (m 720) ma in un ambiente già francamente alpino non distante dalla testata della Val Chisone, indica una qualche forma di controllo umano sull'ecosistema montano durante tutto l'arco del quinto millennio BP.

IL CONTESTO ARCHEOLOGICO

La sola documentazione archeologica su basi stratigrafiche e cronologie assolute proviene da due siti di alta quota estesamente scavati: il riparo sottoroccia di Balm'Chanto, nella media valle (m 1450), che ha fornito materiali datati dall'Epigravettiano finale alla tarda protostoria, ma che documenta soprattutto un importante momento insediativo durante l'età del Rame; e il sito a cielo aperto di Roc del Col, nell'alta valle, a oltre 2000 metri di quota e in posizione di cresta rocciosa, quasi interamente riferibile alla media età del Bronzo. Questi due insediamenti si inseriscono, come si è detto, all'interno di una rete di siti d'altura individuati ma non scavati, spesso di dimensioni ridotte. Benché dunque la documentazione sia tuttora lacunosa sia per quanto riguarda la successione culturale che il significato funzionale dei siti, sembra di poter osservare un certo grado di specializzazione territoriale almeno a partire dall'età del Rame, con un graduale controllo dell'ambiente alpino.

IL RIPARO SOTTOROCCIA DI BALM'CHANTO

Poiché il sito di Balm'Chanto è già stato studiato in dettaglio sia dal punto di vista archeologico-culturale che da quello paleoecologico (NISBET e BIAGI, 1987), ci limitiamo a riassumere brevemente gli elementi che sembrano di maggiore rilevanza in rapporto con il tema proposto dalla Tavola Rotonda.

1. Due livelli sovrapposti (strati 6 e 10) hanno fornito una notevole quantità di resti culturali attribuibili per via tipologica alla tarda età del Rame (BIAGI e ISETTI, 1987). Le datazioni radiometriche dei due livelli di occupazione hanno pienamente confermato questa attribuzione. Esse sono infatti:

strato 6: Bln-2838: 4010±60 BP; strato 10: Bln-3285: 4090±70 BP.

Tali date, le prime ottenute in Piemonte relativamente al periodo in questione, permettono anche di assegnare l'origine dello spesso strato di blocchi crollati dalla volta del riparo, che separa i due livelli antropici, ad un evento improvviso, probabilmente sismico, di elevata violenza.

2. Considerazioni basate sulla presenza di resti faunistici nel deposito indicano (RIEDEL, 1987) che l'economia era basata principalmente sulla pastorizia (caprovini e, in subordine, bovini); la caccia era praticata in modo non sporadico (stambecco, cervo e camoscio principalmente).

3. Sono presenti elementi riferibili alla filatura e alla tessitura, come fuserole in pietra e una possibile navetta in osso (MANO, 1990-91).

4. L'agricoltura, conosciuta anche se forse non praticata nell'area circostante il riparo, è documentata (NISBET, 1987) da resti carbonizzati di frumento tenero e orzo nudo (*Triticum aestivo-compactum* Schiem. e *Hordeum vulgare* L.).

5. L'adattamento più spiccato all'ambiente locale è costituito dalla caratteristica tecnologia della pietra verde che, in assenza di selce nelle formazioni geologiche alpine regionali, costituisce la quasi totalità della materia prima utilizzata per la fabbricazione di strumenti litici (asce, accette, scalpelli e punte di freccia). Di queste ultime si è potuto studiare (ISETTI, 1987) tutto il processo produttivo, grazie alla presenza di numerosi sbozzi assieme al prodotto finito.

6. Indagini paleoecologiche sull'intero versante hanno rilevato una complessa storia evolutiva dei suoli e della vegetazione. La parte più elevata del versante (sopra i m 2350) oggi costituita dalle associazioni erbacee dei pascoli alpini, comprende un mosaico di suoli bruni e podzoli; più in basso la fascia forestale a larice si è almeno parzialmente sviluppata su antichi pascoli e un complesso di suoli più antichi e con caratteristiche diverse. Nella parte inferiore del versante, infine, dominata oggi dal bosco a latifoglie, i suoli sono bruni acidi con forte intervento antropico consistente in coltivazioni e in serie di terrazzamenti. Gli studi micromorfologici su sezioni di suolo del versante suggeriscono (MACPHAIL, 1987; COURTY *et al.*, 1989) che nella zona del riparo e nelle zone superiori si sia sviluppata durante l'età del Rame

una fascia di vegetazione erbacea all'interno dell'orizzonte a conifere, con conseguente passaggio da podzoli a più ricchi suoli bruni.

ROC DEL COL

Questo singolare insediamento preistorico si trova sulla cresta rocciosa, formata da serpentiniti, che separa la Val Chisone da un valloncello laterale di origine glaciale. Il sito, ad una quota di m 2083 (fig. 3), fu individuato da M. Cinquetti, nel corso di una serie di rilevamenti di superficie effettuati nel 1979 (Fozzati e Nisbet, 1984). Lo scavo ebbe luogo nel 1983 in tre punti della cresta: una trincea principale di mq 42; un sondaggio minore, prossimo alla trincea, di mq 2; una ispezione del deposito ai piedi di un piccolo riparo, posto poco sotto la cresta sul versante S (Fozzati e Nisbet 1984).

I risultati emersi dallo scavo (fig. 4) hanno confermato la presenza non saltuaria di qualche gruppo umano durante la media età del Bronzo. Il deposito è sottile e in alcuni punti il livello di occupazione preistorico affiorava in superficie. Un'area centrale fu rioccupata in età storica per la sistemazione di una piazzuola delimitata da muretti di pietra; la presenza in tale settore di materiali militari suggerisce che la località sia stata occupata per operazioni difensive sabaude in occasione di scontri con l'esercito francese nel 1747 (battaglia dell'Assietta). Nonostante questa rioccupazione recente, la maggior parte del deposito preistorico non sembra aver subìto importanti rimaneggiamenti, dal momento che si sono recuperati frammenti ceramici ancora in coesione e sono state individuate strutture sepolte integre. Tra i materiali si segnalano 5861 frammenti ceramici, la maggior parte dei quali concentrati in una zona ristretta, prossima ad una fossa poco profonda (fig. 5). Fra le forme più significative si menzionano (fig. 6) olle a pareti verticali con due cordoni applicati, impressi a ditate, di cui uno ad anello attorno alla bocca; vasi troncoconici ad impasto fine e con decorazioni formate da serie di impressioni verticali parallele sulla gola e su parte del corpo; boccali globosi a bordo diritto con ansa a nastro

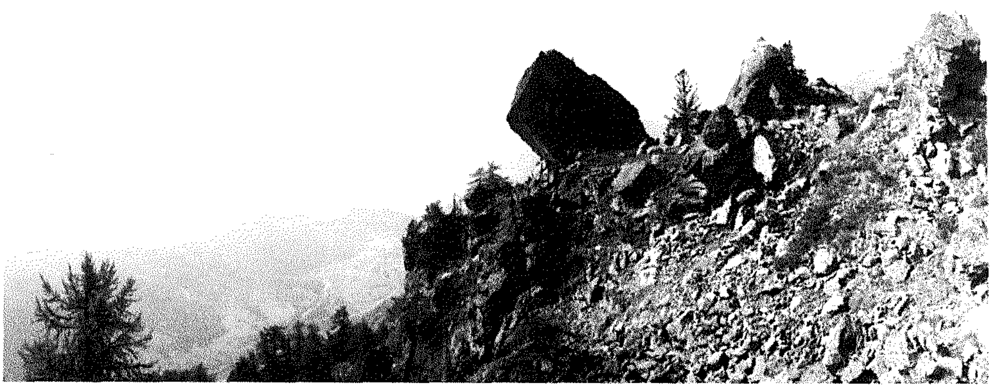

Fig. 3 - La cresta di Roc del Col. Sullo sfondo il Colle del Sestriere.

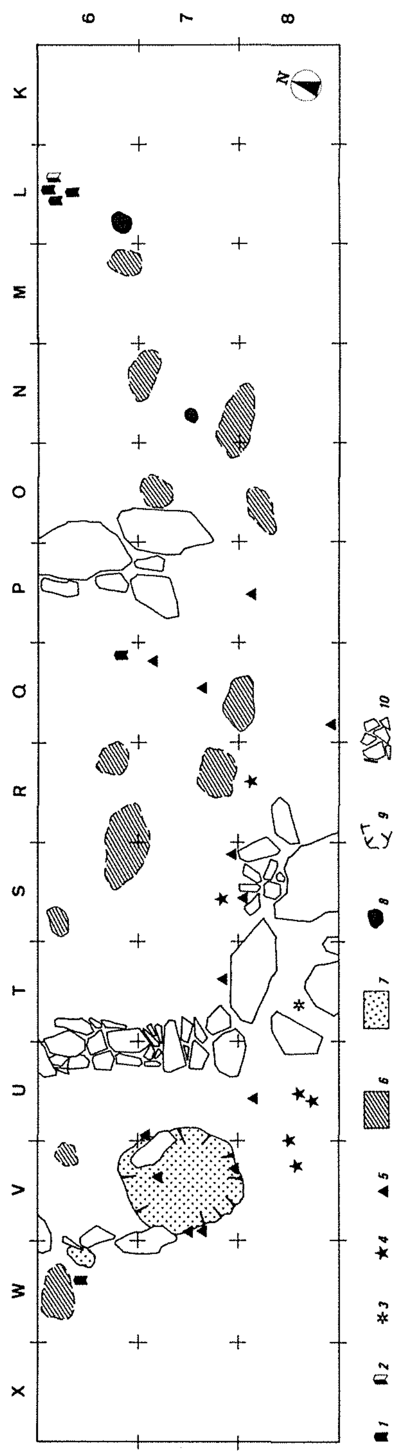

Fig. 4 - L'area di scavo del sito di Roc del Col. 1) asce in pietra verde; 2) scalpello; 3) fuserola in pietra; 4) macinelli; 5) frammenti di macine; 6) buche con carboni; 7) buche con semi; 8) buche di palo; 9) buca profonda; 10) strutture in pietra di costruzione di età storica.

impostata sull'orlo; olle troncoconiche a bocca ristretta, con un cordone liscio orizzontale posto poco sotto il bordo e con serie di impressioni circolari poco profonde, poste in più file, sotto il cordone; fondi piatti a superficie lucidata, con decorazione esterna formata da tre serie di solcature larghe; tazze carenate ad orlo estroflesso e larghe solcature a circoli concentrici. Alcune decine di oggetti litici (macine, macinelli, asce, scalpelli, fuserole), una rilevante quantità di cariossidi di frumento carbonizzate, contenute principalmente in una larga fossa e parzialmente disperse sulla paleosuperficie, costituiscono ulteriori elementi della cultura materiale. Le evidenze paleoambientali si limitano alla presenza di carboni (esclusivamente di Larice); quasi completamente assente risulta la documentazione faunistica.

Una datazione radiocarbonica (Beta-48687: 3420±70 BP) è stata ottenuta dai carboni di larice della fossa a cereali. Questa, di forma ovale, con una profondità massima di cm 30 e una larghezza di circa cm 125 presentava la peculiarità di essere delimitata da un certo numero di lastre litiche fra le quali alcune macine spaccate e conficcate verticalmente ai bordi della struttura. È interessante la cospicua presenza, in un sito ad oltre 2000 metri di quota, di macine e frammenti di macine. Di rilievo una macina a sella, trovata in due frammenti, di grandi dimensioni. Da osservare anche la quantità di cariossidi (circa mezzo litro) fra le quali alcune glume indicano la presenza di spelta *(Triticum aestivum subsp. spelta* (L.) Thell.), un frumento esaploide vestito, solo occasionalmente descritto nella paletnobotanica italiana ma coltivato in Europa centrale almeno fino al secolo scorso. Con l'eccezione dei siti neolitici dell'Italia meridionale (dubitativamente Coppa Nevigata, Sargent, 1987; dubitativamente Passo di Corvo, Follieri, 1973 e Rendina di Melfi, Follieri, 1977-82; Uzzo, Costantini, 1983) le uniche segnalazioni per l'età del Bronzo sono quelle di Belverde (Oliva, 1939), di Luni sul Mignone (Helbaek, 1967) e di Fiavè (Jones e Rowley Conwy, 1984). Pinto (1981) ne segnala la diffusa coltivazione nell'Italia centrale durante l'alto medioevo. Di un certo interesse è pure la presenza di un'impronta di orzo interamente compresa nello spessore di un frammento ceramico, in cui la cariosside fu inclusa al momento della confezione del vaso.

Non vi sono elementi conclusivi, fra i materiali contenuti nel deposito, per definire la funzione di questo sito d'alta quota. In particolare, l'assenza quasi totale di resti faunistici impedisce di stabilire l'incidenza dell'attività di caccia, mentre risulta sorprendente la qualità

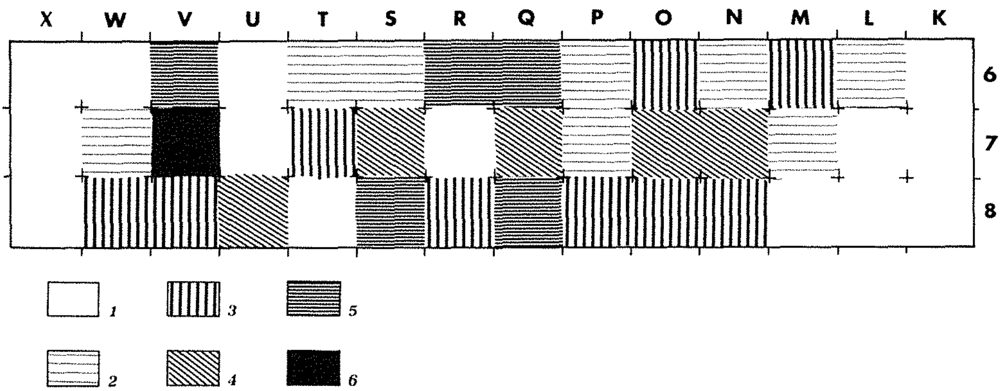

Fig. 5 - Distribuzione delle ceramiche nello scavo. 1) da 0 a 50 frammenti; 2) da 51 a 100; 3) da 101 a 200; 4) da 201 a 300; 5) da 301 a 500; 6) >500.

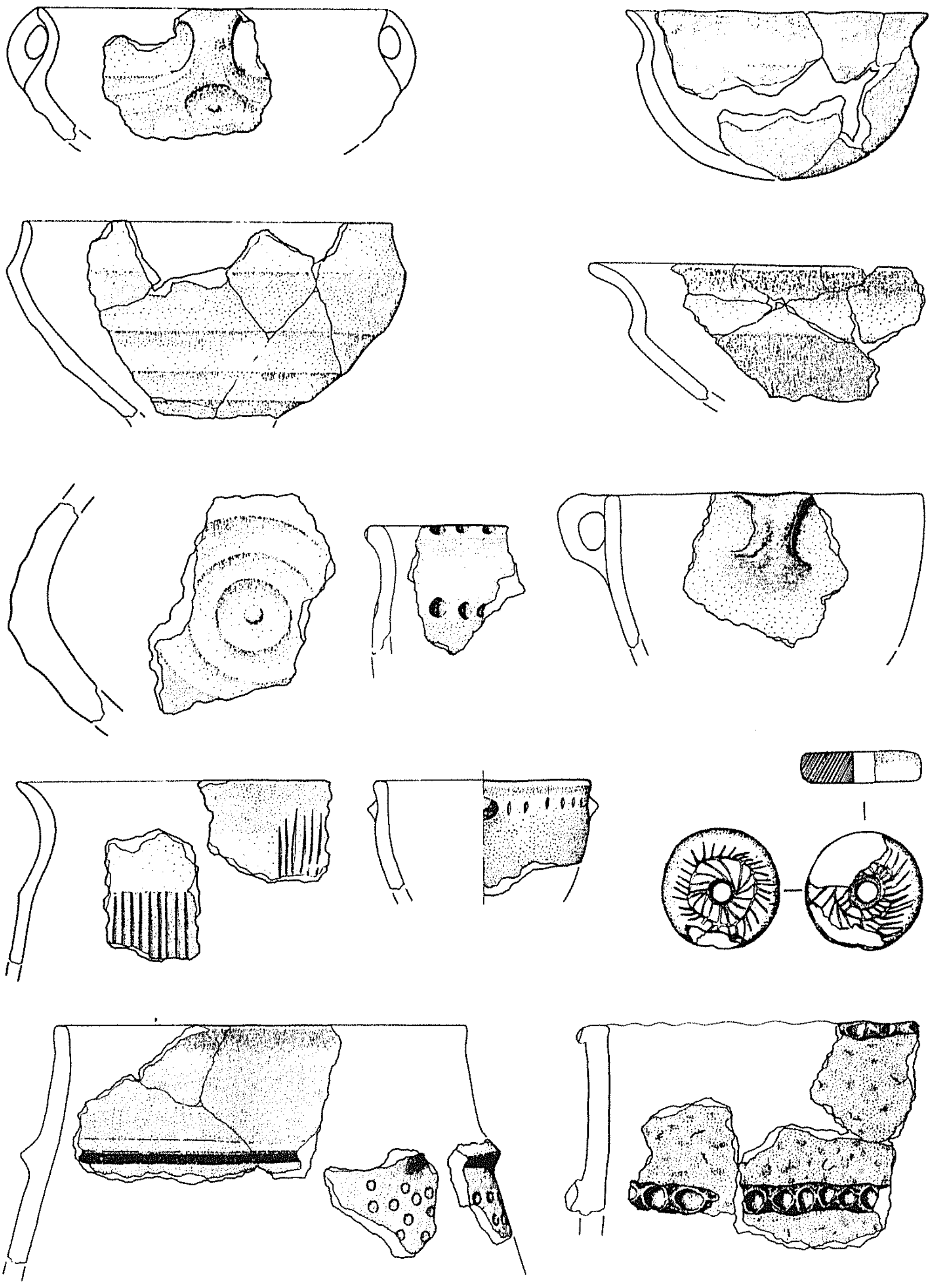

Fig. 6 - Elementi di tipologie ceramiche di Roc del Col e fusarola litica decorata (1:2,5; i due vasi in basso 1: 3,5).

e la quantità della ceramica. L'industria litica ha anch'essa caratteristiche totalmente diverse da quelle osservate a Balm'Chanto, e in particolare è scomparsa la tecnica di produzione delle punte di freccia in pietra verde.

CONCLUSIONI

I problemi posti da questi due siti, benché molto diversi per età e cultura materiale, hanno evidentemente in comune l'orientamento alpino e l'adattamento alla stagionalità e alla quota elevata. A Balm'Chanto ciò risulta particolarmente evidente dalla presenza di elementi culturali che si possono riferire a un'economia di tipo misto, con una rilevante incidenza della pastorizia, e con un'evidente interrelazione fra economia, topografia, ecologia e geologia. L'industria su pietra verde utilizza risorse locali, così come locali sono le terre di cui sono fatte le ceramiche (D'Ambrosio, 1987). In un certo senso, il riparo riassume le caratteristiche dell'ambiente circostante e la sua scelta non appare affatto casuale, collocato com'è nella zona di tensione fra ecosistemi assai precisamente differenziati. Sotto quest'aspetto è probabile che molti insediamenti alpini dell'età del Rame presentino analoghe caratteristiche di adattamento all'ambiente e, almeno relativamente a questo settore delle Alpi, l'estrema povertà di documentazione archeologica renderebbe quanto meno inopportunamente prematuro il tentativo di inquadrare in una *facies* culturale definita i rarissimi siti, di qua e di là delle Alpi, peraltro ancora non oggetto di seria pubblicazione.

Confrontando il sito di Balm'Chanto con quello di Roc del Col, non possono sfuggire alcune indicazioni contraddittorie. Quanto Balm'Chanto appare inserito nel suo ambiente, tanto Roc del Col ne sembra isolato. Pochissimi sono gli elementi della cultura materiale di questo sito che trovano immediato riscontro nel territorio, dalle ceramiche ai resti agricoli. È possibile che l'industria litica, peraltro di qualità e di tecnica totalmente diverse da quelle di Balm'Chanto, utilizzi supporti locali, ma è impossibile individuare, in assenza di altri dati di contesto, una motivazione economica per questo sito, isolato com'è da insediamenti alpini coevi.

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FRANÇOIS DE LANFRANCHI*

PASTORALISME ET PAYSANNERIE A L'AUBE DE L'AGE DU BRONZE

SUMMARY – *Pastoralism and peasants at the dawn of the Bronze Age.* In Corsica the flock was established by selection in which the sheperds were primariy interested in the gregarious behaviour of the sheep. Thanks to conservatism and insularity, it is certainly possible to speak of a Corsican breed or relict flock. Since the time when the first sheep were introduced to Corsica during the Neolithic an insular cheptel has been created possessing certain arcaic traits that were specific to it. The pastoral system established in Corsica from Neolithic times is characterized by exploitation of herding behaviour of sheep, by the existence of a maquis sustained by annual clearance and burning, and by the practice of the peculiar herding technique termed the *invistita.* Corsican sheep are distinguished by ancient genetic traits notably the colour of the fleece and above all by a special form of behaviour. It was possible to study the *invistita* or dialy trajectory of the flock across the landscape in the region of Sagona to the south of the Bay of Lava. The daily route taken by the unaccompained flock passes by a number of archaeological sites. It occurred to us that it would be of interest to look at the distribution of prehistoric sites in relation to such an *invistita.* In other words, was there a relationship between the use of space by a Neolithic society and the use of pastoral territory by a flock?

RIASSUNTO – *Pastoralismo e attività contadina agli albori dell'età del Bronzo.* In Corsica, le greggi ovine sono il prodotto di una selezione che tiene conto soprattutto del carattere gregario della specie. Grazie alla situazione particolare dell'isola si può parlare di una vera e propria razza corsa, come gregge relitto. Da quando le prime greggi ovine vennero introdotte in Corsica nel Neolitico, si è venuta a costituire una razza insulare con caratteri specifici. Il sistema pastorale venutosi a creare in Corsica a partire dal Neolitico è caratterizzato dal comportamento delle greggi di pecore e dalla macchia, annualmente diboscata e bruciata, e da una pratica pastorale peculiare del territorio, detta *invistita.* È stato possibile studiare l'*invistita,* vale a dire il territorio attraversato ogni giorno dalle greggi nella regione della Baia di Lava. Questo interessa ogni giorno numerosi siti archeologici. È interessante controllare la distribuzione dei siti archeologici in relazione all'*invistita.* In altri termini: esiste realmente una relazione fra lo spazio utilizzato dalle comunità neolitiche e l'utilizzo di un territorio da parte dei pastori per il pascolamento?

L'approche ethnoarchéologique du pastoralisme est une des démarches scientifiques la plus exaltante car elle est riche en potentialités de recherche. La Corse, comme d'ailleurs toutes les autres îles de la Méditerranée, est un conservatoire des coutumes et des traditions. Pour cette raison, elle est un terrain privilégié des sciences humaines. On y observe des phénomènes de permanence ou de rémanence exceptionnels.

Nous avons présenté en 1989, au Colloque international de Chiavari sur le pastoralisme, l'étude d'une pratique pastorale propre à la Corse et qui concerne l'errance quotidienne du troupeau ou *invistita.* Nous avons montré qu'il existait entre le territoire sur lequel se pratiquait

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cette technique pastorale et les aires riches en vestiges archéologiques, d'indéniables relations. Rencontre fortuite entre deux phénomènes indépendants l'un de l'autre ou relation de cause à effet? Il est difficile de le dire, bien que le lien existant entre les deux phénomènes soit réel. En effet, là où se pratique l'*invistita,* on retrouve des monuments mégalithiques et vice versa, à savoir que les territoires sur lesquels se dressent des monuments mégalithiques sont également ceux d'une *invistita.*

L'étude des rapports probables entre pastoralisme et préhistoire s'est affinée et enrichie de nouvelles découvertes et interprétations que nous proposons dans la présente communication.

Auparavant et pour la clarté de notre propos, revenons brièvement sur cette forme de pastoralisme. Pour comprendre les principaux aspects de ce mode d'élevage extensif fondé exclusivement sur l'exploitation des ressources naturelles, il faut examiner successivement le troupeau d'ovins, les pâturages et la technique de l'*invistita.*

Les ovins de la Corse traditionnelle constituent un patrimoine génétique irremplaçable. Les zoologistes (Faucher, 1934; Lauvergne, 1975) reconnaîssent dans le troupeau de Corse une spécificité due, probablement, à l'archaïsme du cheptel.

«C'est un troupeau traditionnel, d'un intérêt scientifique et culturel exceptionnel» (Lauvergne, 1975: 19).

La composition du troupeau a été réalisée par une sélection fondée sur des critères traditionnels de rendement laitier, certes, mais surtout sur le grégarisme de l'espèce. L'instinct grégaire des ovicaprinés est exploité au maximum, au point que l'on aboutit à une manière de conservatisme exacerbé par le phénomène de l'insularité. A ce stade, on peut parler d'une race corse, mais également d'un troupeau relique.

Ce patrimoine zoologique tire son archaïsme et sa rusticité de l'insularité:

«... depuis des millénaires, les populations corses se sont reproduites et développées en milieu fermé» (Ravis-Giordani, 1983: 38).

Le système pastoral est donc fondé sur le grégarisme des ovins en vue de l'exploitation par ces derniers des ressources naturelles.

Avec grand nombre de chercheurs, Ravis-Giordani a mis en évidence dans cette forme d'élevage, l'exploitation du maquis qui n'est autre qu'une production spontanée post-culturale ou qu'une végétation post-forestière.

Compte tenu du climat méditerranéen, de la nature du sol et de l'absence de toute action anthropique, le couvert végétal tend à la forêt d'Yeuse (Contandriopoulos, 1962: 71). L'action humaine s'exerce en deux directions: déforestation d'une zone en vue d'une activité agricole, et/ou action du feu (écobuage) pour entretenir les pâturages dont la forme est plus généralement celle d'un maquis aux espaces herbeux plus ou moins grands. Ces deux types d'intervention sur le couvert végétal aboutissent à la création d'un maquis qui constitue le pâturage insulaire du monde rural traditionnel avec ses trois niveaux de production:

«... les herbes annuelles ou vivaces et diverses plantes associées broutées au sol; les feuilles, les bourgeons et même parfois les branchages; les fleurs et les fruits des mêmes arbustes...» (Viale, 1977: 58).

Le maquis est entretenu par des actions indirectes: ramée pour la nourriture d'appoint du bétail, coupe du bois pour les besoins ménagers, aménagement des espaces destinés à la culture. Il l'est également par des actions directes comme l'écobuage qui fournit la première année une herbe où abonde le trèfle, puis, progressivement la ronce se développe et tend à former des buissons impénétrables. Le berger répète alors l'écobuage qui tend ainsi à devenir une opération annuelle.

Le mode de conduite du troupeau constitue le troisième volet de cette étude. Des mouvements de deux ordres sont à considérer: l'un saisonnier ou transhumance et l'autre, l'errance quotidienne ou invistita. Le pastoralisme insulaire est fondé sur l'abandon apparent du troupeau qui est, en réalité, contrôlé par la constitution de la bande de brebis. C'est donc une technique cohérente (SANTUCCI, 1983).

La survivance d'une telle pratique est une aubaine pour le chercheur car elle se prête à l'étude approfondie d'un aspect du pastoralisme en Corse.

Le rayon d'action d'une *invistita* varie en fonction des données climatiques qui concernent la zone, depuis la fin du printemps jusqu'au début de l'automne. La sécheresse n'a pas toujours la même durée et la même intensité durant les périodes estivales ce qui explique les différences constatées d'une année à l'autre. L'état physiologique du troupeau est un autre paramètre non négligeable.

L'aspect juridique de l'*invistita,* est également à prendre en considération à propos de l'occupation de l'espace. A ce titre on peut rappeler que ces pratiques *«... renvoient à de multiples niveaux de détermination et de médiation dans lesquels s'enracinent techniques, pratique et droit»* (RAVIS-GIORDANI, 1983: 258).

L'errance quotidienne du troupeau et la surveillance de l'évolution des espèces végétales destinées à l'alimentation des bêtes, supposent la maîtrise des propriétés communautaires ou privées. Effectivement, l'existence de parcelles ouvertes, libres de toute clôture, est la condition nécessaire pour que puisse être pratiquée l'*invistita.* La propriété enclose, à vocation agricole, est une entrave au libre parcours des bêtes, et, somme toute, une résistance à l'invistita. Cette dernière s'oppose donc à l'appropriation du sol par les paysans. Le dualisme berger-paysan repose donc en premier lieu sur l'utilisation différente de l'espace.

Cette perduration d'un proto-élevage

«... lié à l'interférence de deux systèmes de valeurs: les caractères biologiques et biogéographiques de l'espèce élevée et le niveau techno-économique de l'éleveur» (LEROI-GOURHAN, 1964: 306, note 12).

Le troupeau relique possède des caractères génétiques qui ont été, depuis les origines de l'élevage en Corse, mis en valeur par l'homme. Quant au niveau techno-économique, il repose sur l'exploitation des aptitudes naturelles de l'espèce ovine et sur la technique de l'*invistita.*

Constater que sur le territoire de l'*invistita* se dressent des monuments mégalithiques est une chose; prouver l'existence de relations entre les deux en est une autre. Devant l'impossible démonstration, force est d'admettre le postulat. Dans ces conditions, le problème doit être posé en d'autres termes. Quelles sont les relations entre pastoralisme et fait mégalithique?

Dans l'Inventaire des monuments mégalithiques de la Corse (LANFRANCHI, 1987), la carte de répartition des monuments dolméniques montre que ces tombes se dressent dans les vallées de la côte occidentale (région de Sagone, Ajaccio, Taravu, Sartenais y compris l'Alta Rocca et Figari) et dans la région du Nebbiu.

L'étude de la répartition altimétrique des statues-menhirs (fig. 1), des dolmens, des torre et des casteddi nous semble édifiante (table 1). Le schéma didactique suivant l'atteste. En effet, l'inégalité existant entre les trois étages différenciés ouvre de nouveaux horizons à l'interprétation de certains faits archéologiques.

Dans la zone I, de 0 à 600 m, on a recensé 54 statues-menhirs (32 dans la Taravu, 20 dans le Sartenais, 2 dans la dépression Figari-Porto Vecchio). Elle comprend de nombreux casteddi

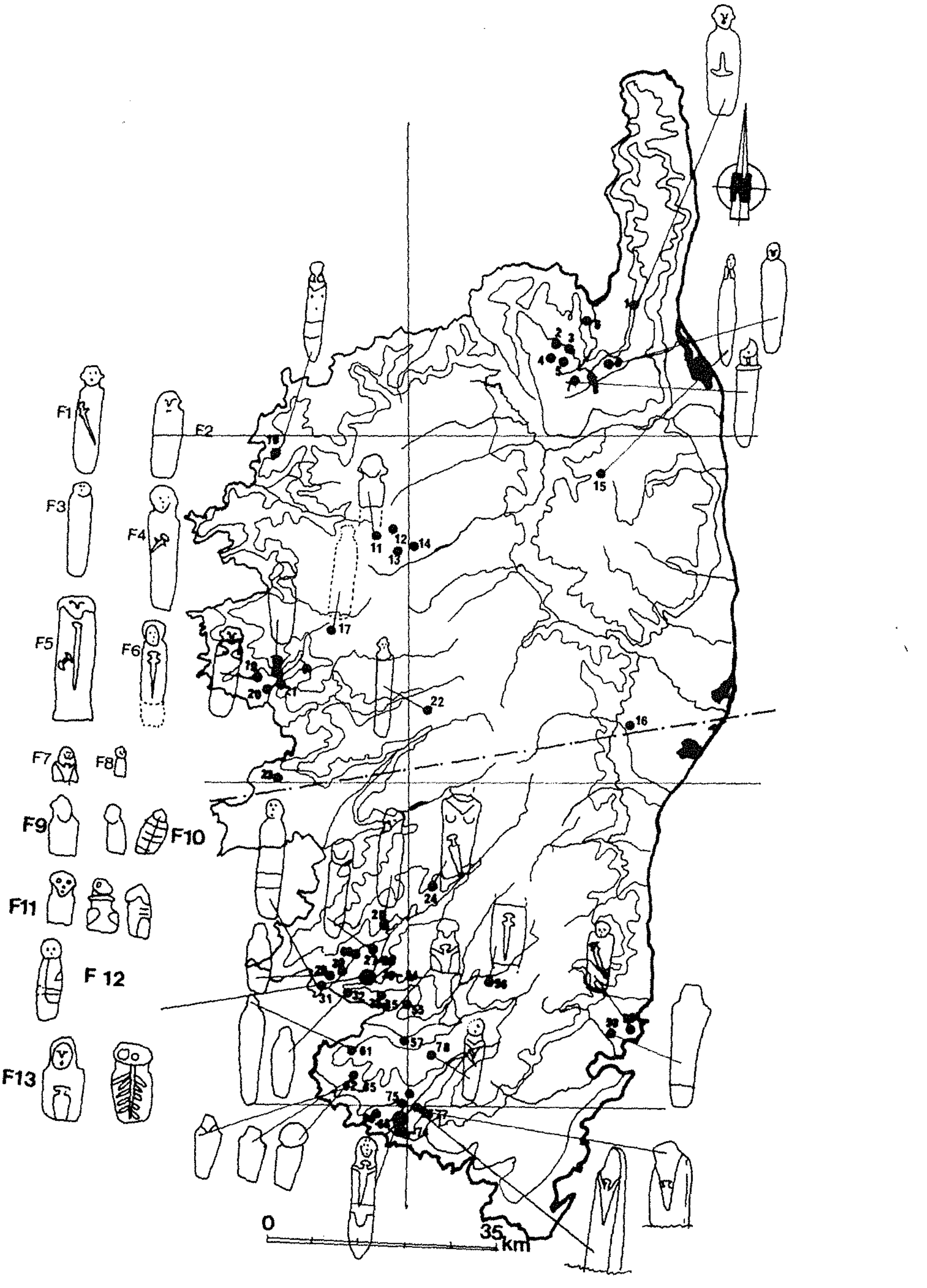

Fig. 1 - Carte de répartition géographique et altimétrique des statues-menhirs de la Corse (Echelle 1:700.000).

parmi lesquels Ceccia, Bruschiccia, Tappa, Araghju, Torre, Valle (Vaddi), etc.

La zone II, de 600 à 1000 m, accuse une nette différenciation par rapport à la précédente. En effet, si l'on repère encore de rares casteddi et quelques torre, on ne trouve plus que 2 statues-menhirs, et plus de dolmen. Cet étage méditerranéen d'altitude correspond à l'Alta Rocca qui, sur le plan administratif couvre les cantons de Tallano-Scopamena et de Levie. Une dizaine de casteddi (Cucuruzzu, Capula, Sadisè, Milaonu, Evini, etc.) un millier de sites archéologiques (les abris sous roche de Curacchiaghju, Sapara Alta de Paccionitoli, etc.), des villages préhistoriques, des tombes en abris sous roche, des complexes monumentaux (Zoppo, Caleca, etc.). Entre le groupe de la *piaghja* de Figari-Porto Vecchio, et celui de l'Alta Rocca, se dressent des casteddi-relais en bordure des anciennes voies de transhumance. Vers Cagna, celui de Quirghinu Visconti; vers l'ospedale, A Tia, A Meda; vers l'Alta Rocca, l'Accintu, par exemple. Cet étage reste encore celui des menhirs et des statues-menhirs. On a recensé d'intéressants alignements à Stantare, par exemple. Mais, d'une manière générale, les menhirs bordent les voies à Bulgara, à Stantare de Zonza. D'autres sont sur le territoire des invistiti. Nous citerons, par exemple, Aqua Sparta près de A Pila.

Table 1 - Corrélations entre les étages climatiques et la répartition en altitude des monuments mégalithiques.

HAUTE CORSE	CORSE DU SUD	
NEBBIU	**TARAVU**	54-f.6
1-Nativu	24-Castaldu	60-Trameddu I
2-Capu Castincu I	25-U Cantonu	**VALINCU**
3-Capu Castincu II	26-Trameddu I	55-Santa Naria
4-Capu Castincu III	27-Tappa I	**ALTA ROCCA**
5-Capu Castincu IV	28-Tappa II	56-Capula
6-Murellu	Z9-Taravu I	**RIZZANESE**
7-Bucentone	30-Taravu II	57-Muntagnoli
8-Murtola	31-Paladinu	**PORTO VECCHIO**
9-E Collule	32-Musolu	58-Valle (Vaddi)
BALAGNA	33-Scalsa Murta (Olmetu)	59-Torre
10-Luzzipeu	34-Olmetu II	**SARTENAIS**
NIOLU	35-Olmetu III	61-Capu di Logu
11-Curnadoghja I	36-Filitosa I (F.I)	62-Venturosu I (V.I)
12-Curnadoghja II	37-F.II	63-V.II
13-Curnadoghja III	38-F.III	64-V.III
14-Curnadoghja IV	39-F.IV	65-V.IV
15-Santa Maria	40-F.V	66-Padaghju I (P.I)
FIUMORBU	41-F.VI	67-P.II
16-Inzecca	42-F.VII	68-P.III
17-Renno	43-F.VIII	69-Cauria I (C.I)
18-Appriciani ou Sagone	44-F.IX	70-C.II
19-Sagone II	45-F.X	71-C.III
20-Sagone III	46-FXI	72-C.IV
21-Renicciu	47-F.XII	73-C.V
22-Tavera	48-F.XIII	74-C.VI
23-Lava	49-f.1	75-Rinaiu
	50-f.2	76-Apazzu I (A.I)
	51-f.3	77-A.II
	52-f.4	78-Petra Pinzuta
	53-f.5	

La zone III, au-dessus de 1000 m, ne possède plus de casteddi, ni de torre, ni de statue-menhir, ni de dolmen. Cet étage montagnard, est celui du Coscionu, le plus vaste plateau de Corse. Sur le plan climatique, il offre une tonalité alpine (de 1000 à 2700 m). Au moment de l'estive s'opérait l'un des plus grands mouvements de population que la Corse pouvait offrir. De ce point de une, on peut affirmer que le Coscionu et Zicavu étaient à la Corse du Sud ce que Calacuccia et le Niolu sont à la Corse septentrionale, un réservoir de population.

Les Zicavais ont essaimé du Valincu à Solaro. Durant les trois derniers millénaires avant notre ère, les grandes voies de pénétration depuis la côte (tyrrhénienne et méditerranéenne) jusqu'au Coscionu ont été fréquentées. Lors de l'étude de l'Age du Fer de la Corse (LANFRANCHI, 1972), nous avons montré que les dépôts funéraires disséminés de Solaro à Zonza, par exemple, constituaient des jalons attestant la fréquentation continue de ces grands axes de circulation. Ces aspects subactuels du peuplement de la Corse méridionale constituent des modèles qui peuvent donc expliquer certains phénomènes pré- ou protohistoriques.

Jusque dans les années cinquante, les bergers empruntaient ces voies pour atteindre le Coscionu (fig. 2), ce haut plateau pénéplainé qui s'étend du haut Taravu à l'Incudine (2134 m). Il se situe à une hauteur moyenne variant entre 1400 et 1700 m. Le réseau hydrographique s'organise en deux grands systèmes: l'un, au sud, avec les affluents du Rizzanese; l'autre, au nord, avec ceux du Travu (versant tyrrhénien) et du Taravu (versant méditerranéen). Curieusement, les bergers du Sartenais (au sens le plus large du terme, c'est-à-dire y compris la zone du Valincu), transhumaient dans la partie septentrionale du Coscionu, alors que ceux de la dépression de Figari (de Porto Vecchio à Figari et Bonifacio) s'installaient dans la partie méridionale du Coscionu. Cet étage montagnard n'a révélé, à ce jour, ni casteddu, ni torre, ni dolmen, ni statue-menhir, ainsi que nous l'avons précisé.

Les études archéologiques apportent d'autres témoignages qui corroborent ceux fournis par les travaux ethnoarchéologiques. C'est ainsi, par exemple, que les sites de l'Age du Bronze (IIe millénaire avant J.-C.) restituent à la fouille de nombreux ossements de bovinés, alors qu'au Néolithique, les restes d'ovicaprinés étaient les plus abondants.

Les diverses observations réalisées aussi bien sur le terrain que lors des fouilles invitent à voir deux grands systèmes économiques. L'un, fondé sur la culture des céréales et sur l'élevage des bovinés, des porcins et des caprins, est le fait des habitants des casteddi ceux-là même qui ont construit les torre. L'autre est une économie fondée sur le pastoralisme qui s'exerce sur des territoires propices à la pratique de l'invistita, l'été à la montagne et l'automne venu, dans les régions de piaghja. La cohabitation de deux groupes humains qui, en principe gèrent différemment les potentialités agro-pastorales des territoires qu'ils occupent, constitue le modèle de gestion de la Corse du Sud par deux groupes humains distincts. Le premier gère un parcellaire enclos; le second, un territoire ouvert.

Il ne fait aucun doute que cette coexistence passe probablement par des moments de crise, lorsque les conditions économiques ou climatiques (péjoration, par exemple), deviennent défavorables.

L'archéologie préhistorique se doit de vérifier l'hypothétique partage du monde rural en paysans et en bergers et de définir les apports culturels des uns et des autres.

Pour ce faire, reprenons les trois zones que nous venons de distinguer en Corse méridionale. Le Coscionu ou zone III est, nous l'avons vu, privé des quatre familles monumentales que nous avons pris en considération. C'est une aire qui ne semble donc pas avoir été structurée par les bergers ou par les paysans préhistoriques. Une telle carence pourrait se justifier par la relative

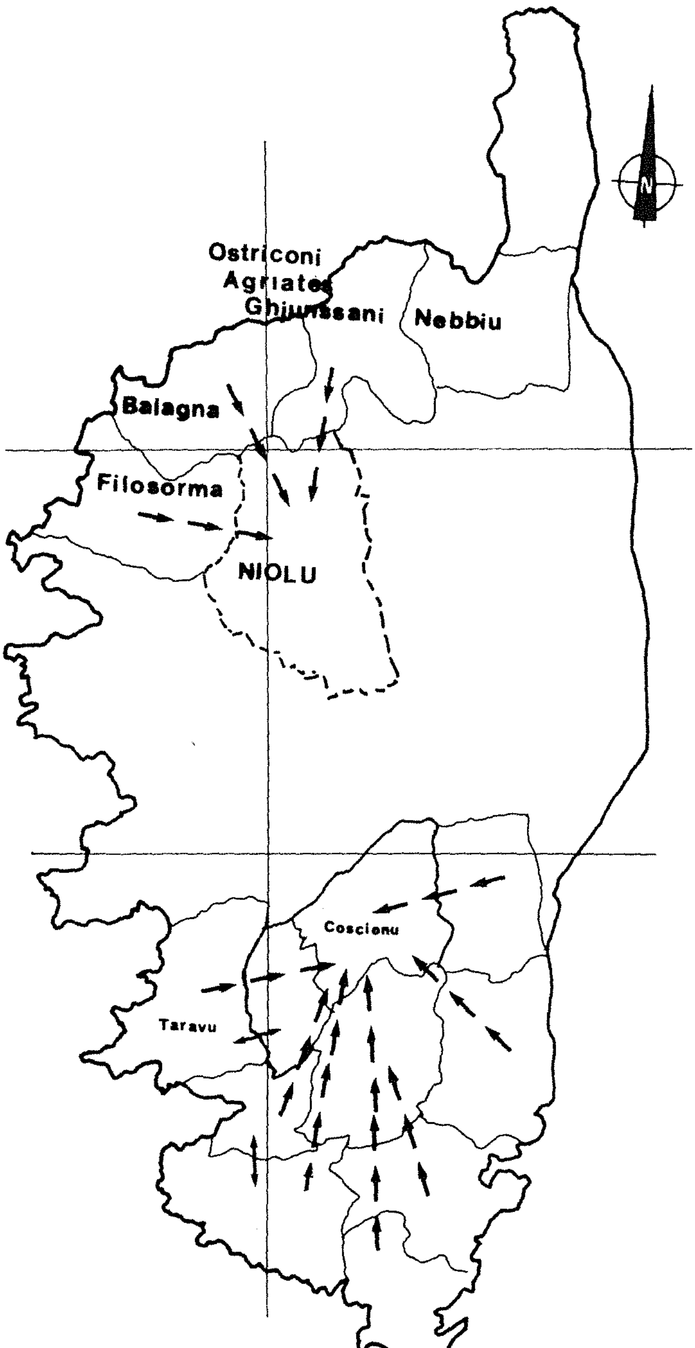

Fig. 2 - Deux grands centres de transhumance de la Corse: le Niolu au nord et le Coscionu au sud.

brièveté de l' estive, à cause des conditions climatiques assez capricieuses sur le Coscionu. Mais on pourrait tout aussi bien évoquer le fait que le Coscionu est, durant trois mois, le point de rassemblement de populations venues de tout le sud de la Corse (parties orientale, méridionale et occidentale). Le peuplement y est important, si bien que, personnes et bêtes, réduisent considérablement les espaces réservés à chaque troupeau. On peut donc penser que l'on se garde bien de le réduire encore plus par la création d'aires mégalithiques qui ne peuvent qu'empiéter sur le territoire des *invistiti.*

La zone II ou Alta Rocca est occupée par une population de paysans sédentaires. Seules des aires particulières, assez réduites, comme la Sarado, le Pianu, Zoppu, etc., étaient réservées au pastoralisme. Aujourd'hui, on peut voir encore les maisonnettes qui abritaient durant l'été les familles de bergers qui, l'été venu, montaient des *piaghji* de Figari et de Sotta. Sur ces même territoires, on retrouve des agglomérations de cabanes datant probablement de l'Age du Bronze. Cette permanence de l'habitat est remarquable. L'été venu, le contact avec les paysans y était quotidien alors que sur le plateau du Coscionu, il était exceptionnel et plus précisément inexistant.

La dizaine de casteddi protohistoriques de l'Alta Rocca (50% du total), les 4 casteddi «relais» qui bordent les grands axes de circulation (A Ria, Meda, Quirghinu Visconti, Accintu, soit 20%) et les six de la piaghja du canton Levie-Figari (Ceccia, Bruschiccia, Tappa, Araghju, Torre, Valle ou Vaddi, soit 30%), sont des structures paysannes. Les torre, notamment, étaient des centres de transformation des céréales. Les graines que l'on conservait dans des jarres-silos, étaient broyées dans des meules en pierre.

Par contre, la quasi totalité des statues-menhirs de la Corse méridionale (53 sur 55) se trouve dans la zone I, de 0 à 600 m d'altitude, soit 96,36% du total, et 2 seulement (Capula et Ciamannacce I ou Castaldu) sont au-dessous de 600 m soit 0,36%. En Haute Corse, sept statues-menhirs sur 23 sont situées au-dessous de 700m (Bucentone, Curnadoghja I, C.II, C.III, C.IV, Santa Maria, Renno) soit 69,56% du total, et 16 éléments, soit 30,43% du total pour celles situées au-dessus de 700 m. Ainsi, en Corse septentrionale, le nombre de statues-menhirs repérées dans l'étage méditerranéen inférieur est proportionnel au temps passé par les bergers dans la *piaghja.* Autrement dit, sur 12 mois de l'année, 8 (66,66%) le sont à la *piaghja,* et 4 (33,33%) à la montagne. Par contre, toutes les statues-menhirs de la Corse méridionale sont dans la zone des casteddi, entre 0 et 700 m d'altitude.

Il existe bien deux Corse au IIe millénaire avant notre ère: l'une, septentrionale où les activités économiques sont à dominante pastorale; l'autre, méridionale, terre des paysans qui s'organisent dans le cadre des casteddi en une proto-féodalité (table 2).

Table 2 - Inventaire des statues menhirs de la Corse.

Zone	Monuments	Altitude
III	ni casteddu	1.700 m
	ni torre	
	ni dolmen	
	ni statue-menhir	
II	des casteddi	1.000 m
	des torre	
	pas de dolmen	
	deux statues-menhirs	
I	des casteddi	600 m
	des torre	
	des dolmens	
	des statues-menhirs	0 m

L'analyse peut être affinée en ajoutant qu'à l'opposition bien tranchée entre le Nord, pays des bergers, et le Sud domaine des paysans s'ajoute celle qui, dans la seule Corse méridionale, marque la distinction entre bergers et paysans. Ces derniers, cultivateurs et éleveurs, sont les occupants des casteddi et des torre.

A l'Age du Bronze, la dichotomie entre deux systèmes économiques est donc bien marquée. Sur le plan de l'habitat, les casteddi de la Corse méridionale, se dressent, ainsi que nous l'avons vu, presque exclusivement dans l'étage méditerranéen inférieur (de 0 à 600 m), avec toutefois un léger débordement sur l'étage supérieur, entre 700 et 800 m.

En Haute Corse, au contraire, point de casteddi ni de torre mais des habitats du type camp comme au Monte Ortu. Or, ce type d'habitat existe en Corse méridionale, où il est daté du Néolithique final-Chalcolithique. Il n'a pratiquement plus d'existence à l'Age du Bronze. Cumpulaghja (Santa Lucia di Tallà) est un camp du Néolithique final-Chalcolithique, absolument semblable à celui du Monte Ortu, avec la seule différence qu'il n'a plus connu d'occupation à partir de l'Age du Bronze. En somme, ce qui est commun à ces deux sites, pourtant très éloignés, c'est la même dominante économique, à savoir le pastoralisme.

Le casteddu de Valle (Vaddi) dans la région de Porto Vecchio, avec sa statue-menhir, serait à la *piaghja,* ce que Capula est à la montagne. Ce sont en effet les deux seuls casteddi à avoir livré une statue-menhir. Nous écartons celle de Torre qui est anthropomorphe par son seul support alors que les deux autres comportent des attributs sculptés en bas relief, et notamment des armes. De surcroît, Torre fut trouvée en bordure d'une mare et, de ce fait, semble plutôt liée à l'eau. La symbolique nous semble totalement différente.

La présence d'une statue-menhir dans chacun des deux casteddi de Vaddi et de Capula, s'inscrit dans une problématique encore plus large. La découverte dans la zone du Rizzanese, du casteddu de Pozzone et de la statue-menhir de I Montagnoli, conforte l'idée de la hiérarchisation des sites. Filitosa, toutefois, n'entre pas tout à fait dans ce cadre, car le nombre exceptionnel de statues-menhirs mises au jour sur a sans doute une autre signification. On notera également que c'est le seul site de Corse où les fragments de monolithes ont été remployés dans des monuments protohistoriques. Il faut souligner tout particulièrement cette nuance, car l'on retrouve également des éléments de la statuaire de Corse en remploi dans des monuments du Moyen Age (Capula, Sagone).

Les fait que nous venons de présenter ne peuvent faire avancer la connaissance historique s'ils ne sont accompagnés d'un essai d'interprétation. A ce stade de la recherche, la prudence du préhistorien ne saurait se passer d'une manière d'exégèse. C'est la raison pour laquelle nous proposerons une hypothèse heuristique qui interprète les faits archéologiques comme étant une appropriation d'une symbolique pastorale par le monde paysan de l'Age du Bronze. Nous fondons notre glose sur plusieurs faits d'observation.

Les plus anciennes statues-menhirs de la Corse apparaîssent probablement au Chalcolithique. On voit, en effet, à Apazzu, un poignard à très large lame représenté en bas-relief sur l'une des deux statues-menhirs, attestant ainsi que ce modèle pourrait fort bien se situer dans un tel contexte.

Un second argument concerne l'insertion des statues-menhirs armées de la Corse méridionale, dans des alignements de menhirs qui se dressent dans des aires traditionnellement réservées à l'élevage des ovinés. A Cauria, par exemple, des statues-menhirs de l'Age du Bronze ont été insérées dans des alignements de menhirs du Néolithique final-Chalcolithique.

D'autres arguments pourraient être proposés. Nous retiendrons toutefois le fait qu'en

Haute Corse, l'absence de statues-menhirs armées, peut être le corollaire de l'inexistence des casteddi. De surcroît, comme ce dernier est la concrétisation d'un mode d'exploitation de l'espace rural du paysan-éleveur, il est normal que d'autres groupes humains dont l'économie est fondée sur le pastoralisme, en soient dépourvus.

Sur le plan stylistique, les statues-menhirs de la Corse septentrionale sont anthropomorphes, comportent des attributs anatomiques, mais ne sont point armées. Très homogènes, elles montrent des oreilles proéminentes, des arcades sourcilières accusées, un menton bien marqué, au point que d'aucuns ont voulu y voir une barbe. Les gravures linéaires sur la tête de la statue-menhir de Tavera, ont été interprétées comme une résille. Parfois les clavicules, les omoplates et la colonne vertébrale sont sculptées.

En Corse méridionale, les statues-menhirs ne se limitent pas à la seule région de l'Alta Rocca et de sa piaghja, de Porto Vecchio à Bonifacio, mais pratiquement à tout le Sud de la Corse. Nous avons identifié au moins deux grands systèmes (au sens de *«principes coordonnés de façon à former un tout scientifique»* Larousse): le Sartenais et le Taravais. L'étude de l'aire de répartition de la statuaire de la Corse, met en évidence deux caractéristiques fondamentales. La première concerne l'existence de zones à forte concentration de monolithes. La seconde, la présence de groupes stylistiques distincts.

Dans le Sartenais proprement dit (Sartene, Grossa, Ortolu, Belvedere-Campomoro), les statues-menhirs sont nombreuses et diversement situées. Elles peuvent être dans le contexte des casteddi ou incluses dans des alignements de monolithes, dressées à proximité de cols, à proximité immédiate de voies de passage. Les casteddi qui possèdent des statues-menhirs sont peu nombreux; Petra Pinzuta et Muntagnoli, par exemple. Par contre, la grande originalité du Sartenais est l'exceptionnelle concentration de statues-menhirs insérées dans des alignements de menhirs. Paddaghju compte 258 monolithes, Cauria 66, Rinaghju 43, Stantari 23, Apazzu 2, etc. Tous illustrent l'exceptionnelle richesse de cette zone. Toutefois, la présence de statues-menhirs dans des alignements n'est pas une constante du Sartenais, puisque les alignements de menhirs de Paccionitoli, par exemple, en Alta Rocca, au lieu-dit Stantare, n'en comptent aucune.

La région du Taravu présente une distribution de statues-menhirs assez semblable à celle du Sartenais. Comme elle est, sur le plan géographique, mieux délimitée(il s'agit du bassin du Taravu), les phénomènes sont étudiés dans un contexte géographique homogène. La grande originalité de cette aire est liée à la présence du site de Filitosa où se trouve le seul casteddu de Corse à offrir un aussi grand nombre de statues-menhirs incluses dans son enceinte. L'inventaire annexé à notre texte montre que, outre FV trouvée *in situ,* et cinq statues aujourd'hui dressées dans la vallée de Barcajolu (FIII, FIV, FI, TI, FII), six ont été remployées dans le monument central (FVII, FVIII, FIX, FX, FXI, FXII), ainsi que six fragments numérotés de 1 à 6. On ajoutera à cet inventaire exhaustif FXIII remployée dans la bergerie du site et 32 fragments de menhirs également dégagés du parement du monument central. Tappa II (TII) se trouve à l'intérieur du dépôt-Musée. Tous ces documents auxquels s'ajoutent ceux provenant des environs immédiats (Scalsa Murta, Olmetu, Micalona, etc.), témoignent de l'importance du site mégalithique de Filitosa. En 1966, R. Grosjean suggérait, à juste titre, nous semble-t-il, que les monolithes étaient antérieurs à la construction puisqu'après avoir été brisés ils ont été remployés comme matériau de construction. A partir de ce fait archéologique, il distingua dans l'histoire monumentale de Filitosa, deux périodes: Filitosa 2 (1400-1200) et Filitosa 3 (1200-1100).

Ces diverses observations autorisent une tentative de restitution de l'état des lieux avant la construction des tours. Sur le site s'élevaient donc de nombreux menhirs et statues-menhirs qui devaient avoir été dressés à l'emplacement même de ce que l'on nomme le complexe monumental de Filitosa, mais également dans la vallée de Barcajolo, jusqu'à Tappa, où ils ont été découverts *«disséminés sur une surface de dix hectares»* (GROSJEAN, 1961). En contrebas de l'éperon rocheux, cinq statues furent redressées après 1954 et disposées en ligne. Il existait donc dans cette vallée du Taravu au moins deux aires planes (a piana) à forte concentration de menhirs et de statues-menhirs dont une grande partie fut détruite. Les fragments servirent de matériau de construction pour élever les tours, et ce remploi se situerait à la fin du IIe millénaire avant J.-C., c'est-à-dire lors de la dernière phase de l'Age du Bronze. Par contre la fracture des monolithes n'est pas datée. Si l'on préfère, on peut poser la question différemment en se demandant combien de temps s'est écoulé entre le bris des statues-menhirs et leur remploi.

La destruction des menhirs et des statues-menhirs (on se gardera d'omettre lors de l'élaboration de synthèses sur le sujet le sort réservé aux menhirs et aux meules, privilégiant ainsi les seules statues-menhirs), marque la fin de l'évolution mégalithique sur le site de Filitosa. On peut donc considérer que la destruction ou plutôt l'utilisation des fragments dans la construction des torre, constitue les prémices d'une nouvelle phase, celle de l'Age du Bronze final (1200/1100 avant J.-C.).

La rupture entre la fin de la phase mégalithique artistique, religieuse et culturelle, et le début de la phase monumentale est un fait archéologique propre au site de Filitosa. Sur le plan archéologique proprement dit, cela correspond à l'époque subapenninique qui a ses correspondances à Contorba, chambre 1b (3110±60 BP, Alo, monument est (3100±110 BP), Filitosa 2 (3080±110 BP), Araguina-Sennola VIa (3040±110 BP), foyer d'Araghju (2890±110 BP), Capula (2960±100 BP), Cucuruzzu, etc.

Pour le site de Filitosa, le passage de la phase mégalithique de l'Age du Bronze moyen à celle monumentale de l'Age du Bronze final ou, si l'on préfère du stade apenninique (1400-1200) à celui subapenninique (1200-1000) constituait un «évènement» de nature à engendrer de nombreuses hypothèses à propos desquelles nous avons présenté, en son temps (LANFRANCHI, 1972), des réserves.

La théorie évènementielle (GROSJEAN, 1966) était fondée sur la destruction des statues-menhirs et leur remploi dans la construction des torre du site de Filitosa. D'abord, le raisonnement était fondé sur la prise en considération des seules statues-menhirs et par l'omission caractérisée des menhirs qui eux aussi avaient été fracturés. C'est la première lacune de l'argumentation.

Ensuite, l'attribution de cette destruction à des envahisseurs belliqueux porteurs d'une culture de l'Age du Bronze, et qui auraient exercé leur action iconoclaste à l'encontre des réalisations d'une autre population *«mégalithique»* (?) ne trouva jamais sa confirmation archéologique. L'inadéquation entre les hypothèses et les faits archéologiques constituèrent la seconde faiblesse de la théorie. D'autant que le fait d'avoir voulu reconnaître dans ces *«envahisseurs»* l'un des Peuples de la Mer, les Shardanes, ne reposait sur aucun indice archéologique.

Enfin (si l'on peut dire), le fait que cette destruction des menhirs et des statues-menhirs n'ait été constatée qu'à Filitosa, plaide en faveur d'un évènement local qui ne pouvait être en aucune façon extrapolé au reste de la Corse. Les avatars des statues-menhirs et des menhirs de Filitosa sont sévères car on les voit passer par deux stades: à l'origine, ce sont des oeuvres d'art, des sculptures chargées de symboles, des monuments dressés sur la plate-forme supérieure du vaste éperon et, même dans la vallée du Barcajolu; à la fin, les fragments des monolithes ne sont plus que de vulgaires matériaux de construction, de la pierre à bâtir. Ce phénomène très localisé, ne concerne en Corse que le site de Filitosa.

On aimerait pouvoir disposer d'informations archéologiques pertinentes sur cette période charnière du passage de l'Age du Bronze moyen à l'Age du Bronze final. Force est d'admettre qu'elles sont fort rares. Aussi, pour pallier cette lacune, nous prendrons comme exemple les résultats de la fouille pluridisciplinaire que nous avons dirigée dans l'abri sous roche 1 du chantier 3 du site de Cucuruzzu (fig. 3). La paléozoologie, la palynologie, la paléobotanique, les mesures d'âge radiométriques, par exemple, apportent, avec l'étude du mobilier, d'exceptionnelles informations sur cette tranche de vie à l'Age du Bronze final de Cucuruzzu.

Les terrasses aménagées par des murs de soutènement en gros appareil, s'étendent au nord de ce casteddu. Elles supportent des constructions diverses dont des arases de cabanes (Lanfranchi, 1982). L'abri 1 (chantier 3), qui fut fouillé de 1980 à 1984, est en bordure du mur d'enceinte du village et s'ouvre à l'ouest.

Un remplissage étudié sur plus de 3,75m d'épaisseur révéla trois grands niveaux d'occupation de l'Age du Bronze et un de l'Age du Fer. Les mesures d'âge obtenues à partir des charbons de bois des foyers nous offrent un cadre chronologique fort précis.

Pour l'abri 2, nous avons, de haut en bas:

couche 2a (elle correspond à la couche 1a de l'abri 1): 340±130 BP, plages de dates de 500 à 0 en BP (Ly-3196).

Les résultats de l'abri 1 sont les suivants:

Premier niveau: couche 1a (2e Age du Fer) 2200±100 BP (Gif-5462); couche 1b, -155 cm: (1er Age du Fer) 2680±60 BP (Gif- 5461), plage dates 2750-2000 BP.

Deuxième niveau: couche 1c, -185cm (Age du Bronze final) 2830±60 BP (Gif-5657), plage dates 4000-2750 BP; couche 2a, 180cm (Age du Bronze final) 2990±90 BP (Gif-5658), plage dates 4000-2750 BP; couche 1c à -185cm (Age du Bronze final) 3080±60 BP (Gif-5457) plage dates 4000-2750 BP; couche 2b, foyer F2 (Age du Bronze final) 2980±110 BP (Ly-3197), plage dates 4000-2750 BP; couche 2a, de -180 à -190cm (Age du Bronze moyen) 3220±90 BP (Gif-5660) plage dates 4000-2750 BP.

Troisième niveau: couche 2b, de -190 à 207cm, 3140±110 BP (Ly-3198) plage dates 4000-2750, en BP; couche 2c, de 210 à -225 cm, 3370±140 BP (Ly-3199), plage dates 4000-2750 BP; couche 3, de 226 à 280cm, 3140±120 BP (Ly-3200) plage dates 4000-2750, en BP.

Quatrième niveau: couche 4, de 274 à 375cm, 3700±190 BP (Ly-3238) plage dates 4000-2750 BP.

Si l'on fait exception de la fréquentation historique, on distingue aisément quatre grandes périodes:

- l'Age du Fer: le premier dans la couche 1a et le second dans la couche 1b (1100, 540);
- l'Age du Bronze final dans les couches 1c (1205, 855) et 2a, 2b (1425, 975);
- l'Age du Bronze moyen dans les couches 2c et 3 (1675, 1125);
- l'Age du Bronze ancien dans la couche 4 (2635, 1685).

On a pu observer deux grandes perturbation dans la stratigraphie: la première concerne la couche superficielle 1a qui était la plus exposée du fait qu'elle occupait la partie supérieure du remplissage et qui a été surtout remaniée durant le Premier Age du Fer 2200±100 BP); la seconde dans la couche 1b (vers -155 cm), au Premier Age du Fer (2680±100 BP).

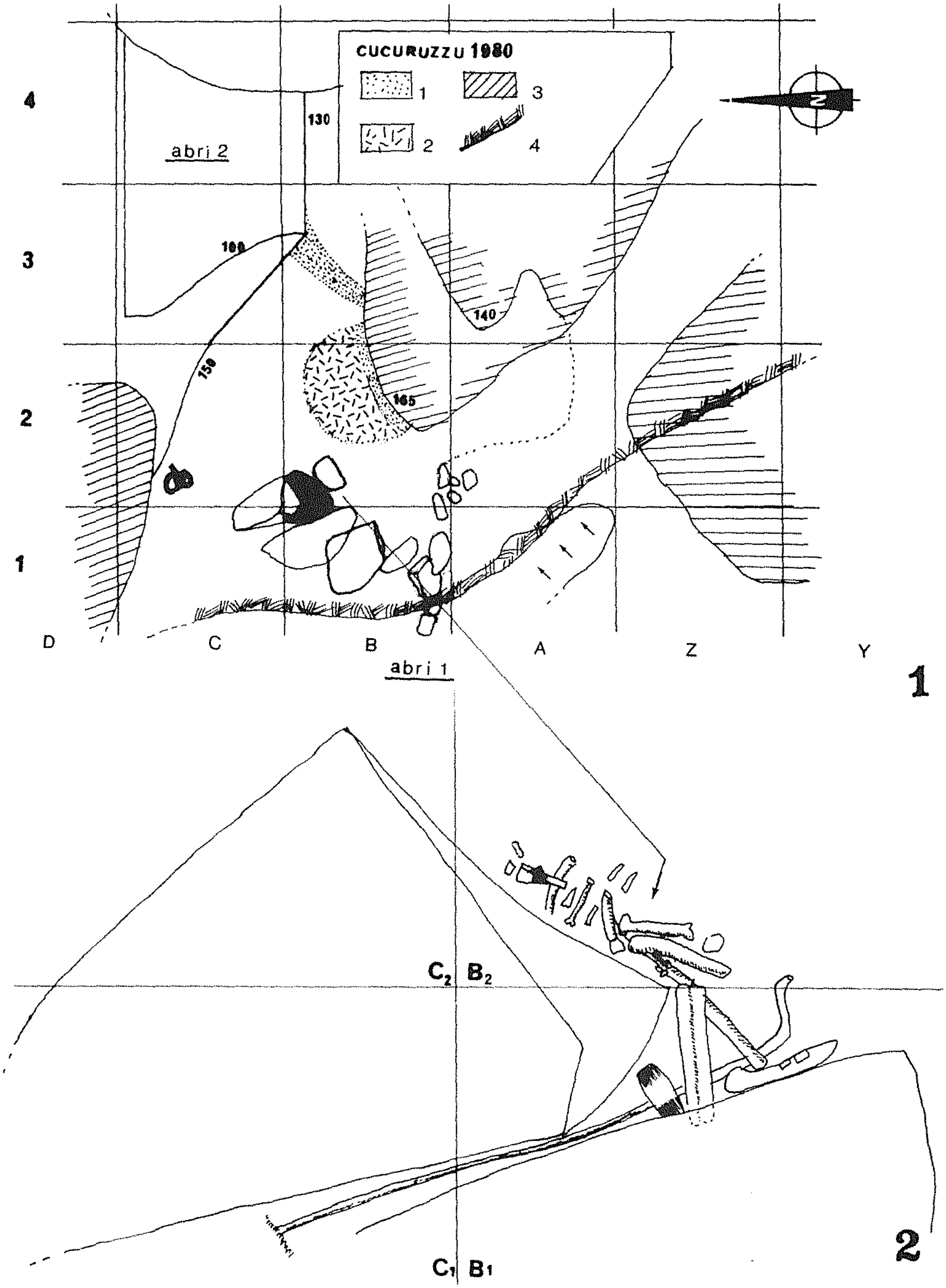

Fig. 3 - Structures de l'abri saisonnier de Cucuruzzu (couches 1b.1c, abri 1, chantier 3). En bas, topographie de la sépulture de l'Age du Bronze final en B1/B2.

L'étude des restes osseux trouvés dans/autour des foyers a permis (VIGNE, 1988) un éclairage original sur les activités humaines du Groupe de Cucuruzzu durant la Protohistoire.

Couche 1c (de -175 à -167 cm): une occupation de courte durée (quelques mois) par un petit nombre de personnes qui a consommé deux jeunes ovins, un foetus de Capriné, un porc, un *Prolagus.*

Couche 1b/1c (de -167 à -163 cm): couche d'abandon.

Couche 1b2 (de -167 à -165 cm):occupation de l'abri par un petit groupe humain et durant un temps relativement court. Il a consommé un veau, trois caprinés, un jeune porc, un *Prolagus.* Des ossements attestent le dépôt d'un corps durant une phase d'abandon. L'abri a donc servi de sépulture ce qui témoigne de l'alternance de son l'occupation durant ces périodes très courtes qui ne sauraient excéder 3 à 4 mois. On peut inférer de cette brève durée de l'occupation de l'abri qu'il s'agissait probablement de l'occupation du site durant la période estivale.

Couche 1b1/1b2 (de -150 à -145 cm): couche d'abandon.

Couche 1b1 (de -145 à -138 cm): couche d'occupation durant laquelle on a consommé trois caprinés, un gros suiné.

Les informations paléobotaniques concernent la présence de grains de blé, d'orge, de sclérotes de champignons. L'abondance de macro-restes végétaux nous invitent à proposer pour cet abri une autre destination, à savoir la conservation des grains dans des jarres-silos.

Le mobilier, extrêmement abondant, comprenait surtout des tessons de vases en argile modelée. Les documents céramiques, succinctement détaillés, mettent en évidence le nombre limité de types vasculaires.

Couche 1a: 1971 documents, dont 1947 tessons appartenant à 14 jarres (45%), 7 plats (22%), 10 coupes ou bols (32%), soit 31 formes restituées.

Couche 1b: 3531 documents. 49 formes ont été reconnues: 19 jarres (39%), 7 plats (14%), 23 coupes (46%).

Couche 1c: 1804 documents. 57 formes de vases ont été reconstituées dont 21 jarres (39%), 5 plats (8%), 13 coupes (22%), 2 écuelles (3%), 12 vases à bord droit (20%), 3 bols (5%), 1 gobelet (1%).

Couche 2a: 1854 documents. 29 formes de vases dont 13 jarres (44%), 3 plats (10%), 1 coupe (3%), 9 vases à bord droit (31%), 2 bols (6%).

La composition du mobilier de cet abri montre qu'à tous les niveaux les jarres représentent entre 40 et 45% des récipients utilisés. Dans les deux premières couches (1a et 1b, de l'Age du Fer) les formes sont au nombre de trois: les jarres, les plats et les coupes. En 1c et 2a (Age du Bronze final), elles sont au nombre de cinq, car aux trois premières s'ajoutent des écuelles ou des bols et des bases à bord droit. En conclusion, aux vases à solides (jarres-silos) viennent s'ajouter les vases à liquide (coupes, bols, gobelet). Donc, les récipients à usage collectif voisinent ceux à usage individuel comme les assiettes.

*«Les analyses polliniques de Cucuruzzu (*BUI THI MAI, pers. comm. 1993) *ont permis de distinguer quatre phases:*

1e phase : -305 à -246cm. Le couvert arboréen est faible; les pollens d'arbres (AP) varient de 2 à 20% (exception faite pour les échantillons -195cm où AP atteint 53%, et sont représentées par des Chênes verts (Quercus t. ilex) *et des Aulnes* (Alnus). *Durant cet épisode on note la présence de tilleul* (Tilia), *de Saule* (Salix) *et des plantes de la garrigue comme les* Phyllirea *et les Ericacées. La strate herbacée est dominée par les Cichoriées; les Céréales sont bien représentées (3%) ainsi qu'un certain nombre de plantes d'espaces ouverts: Graminées,* *Anthémidées, Carduacées, etc. On remarque la présence de pollens de Lin. Les spores de fougères sont rares.*

Cette phase correspond à une période d'occupation intense: les habitants du Bronze ancien et du Bronze moyen ont défriché et commencé à cultiver les champs de céréales (la mauvaise conservation des pollens ne nous a pas permis d'en déterminer les espèces.

2e phase: -236 à -180cm. Le couvert arboréen augmente régulièrement et atteint 79%. La strate boisée est surtout peuplée de Chênes verts. Le Pin (Pinus) *augmente, le Noisetier* (Corylus) *et le Frêne* (Fraxinus) *apparaissent.* Phyllirea *est bien représenté et atteint 5% à la fin de la phase. Les céréales ont pratiquement disparu. Les plantes basses sont représentées par des Cichoriées accompagnées par des Graminées, des Anthémidées, des Ericacées. Les Fougères commencent à prendre de l'importance.*

L'occupation humaine, contemporaine de Bronze moyen et du début du Bronze final, a été faible durant cette phase.

3e phase: -180 à -155cm. Le couvert arboréen se réduit considérablement (AP: 26%). Les pollens de Céréales réapparaissent de nouveau. Les Cichoriées dominent largement la strate herbacée. Les hautes herbes sont représentées par les Anthémidées, les Ericacées et les Plantains. Les Fougères se maintiennent.

Pendant cette phase, l'action anthropique s'est intensifiée; elle correspond à une importante occupation de l'Age du Bronze final.

4e phase: -155 à -110 cm. Le couvert arboréen se développe à nouveau: (AP: 70%). Les bois de Chênes reprennent de l'importance. Le Pin, l'Aulne, le Lierre (Hedera) *sont assez bien représentés. On note la présence de quelques pollens de Noisetier, de Tilleul, d'Orme* (Ulmus), *de Charme* (Carpinus), *de Noyer* (Juglans) *et de Charme-Houblon* (Ostrya). *La garrigue, représentée par les* Phillyrea *et les Ericacées, semble avoir occupé plus de surface. La strate herbacée devient moins importante. Les Cichoriées disparaissent pratiquement: 0,7%. Les Fougères atteignent leur maximum et sont représentées par des spores monolètes indéterminables, par* Pieris aquilinum *et* Polypodium.

Le site est presque abandonné durant cette phase contemporaine de l'Age du Fer».

CONCLUSION

L'abri sous roche 1 de Cucuruzzu a été occupé pendant plus d'un millénaire durant une période qui s'étend de 4000 BP environ jusque vers 2200 BP et qui correspond à la seconde partie du Sub-Boréal et au début du Sub-Atlantique. Le climat a connu un certain nombre de changements dont les variations ont pu être suivies dans les tourbières des montagnes voisines du site (Massif de l'Incudine et Montagne de Cagna).

Le Sub-Boréal est caractérisé par un climat frais et sec, qui provoque, en montagne, le remplacement de l'Aulne par le Bouleau et, à moyenne altitude, l'extension de l'Yeuse *(Quercus ilex)* au détriment de la Bruyère arborescente. Au cours de cette période, l'action anthropique est déjà sensible. M. Reille note la présence de pollen de Céréales indiquant une activité culturale et une augmentation des courbes de Composées démontrant une certaine rudéralisation.

Au début du Sub-Atlantique, en montagne, le Sapin qui se développe et l'Aulne qui reprend de l'importance, sont des signes de l'augmentation de l'humidité atmosphérique. L'intensification de l'activité humaine se traduit dans les spectres par une augmentation des pollens d'herbacées tels que Plantain lancéolé, Oseille, Armoise, Cichoriées et Chénopodiacées.

Au cours de cette période, l'intensité de l'occupation humaine du gisement de Cucuruzzu a beaucoup varié. Elle a été importante au Bronze ancien, au début du Bronze moyen (vers 3370 BP) ainsi qu'à la fin du Bronze final. Ces populations ont défriché la Chênaie sempervirente et ont mis en culture les nouveaux espaces gagnés sur la forêt. Ils ont également aménagé de grandes prairies (de fauche ou de pacage) autour du site comme l'attestent les taux élevés de Composées. A l'usage, la terre s'est appauvrie et les cultures ont fini par devenir improductives ce qui a entraîné, au bout de quelques siècles, l'abandon du site. Les bois de Chênes, et la garrigue, favorisés par l'augmentation de l'humidité, se sont reconstituées comme ce fut le cas au cours du Bronze final et à l'Age du Fer (Bui Thi Mai, pers. comm. 1993).

Dans le cadre limité de cette communication, il ne saurait être question de présenter tous les résultats scientifiques obtenus. C'est la raison pour laquelle nous avons sélectionné quelques informations inédites afin d'étayer notre raisonnement par des faits scientifiques.

Nous avons vu, d'abord que l'abri sous roche n°1 de Cucuruzzu se trouvait en bordure du mur qui cerne le village du casteddu du même nom. Les pierres de fondation reposaient sur la couche 4 datent donc le mur d'enceinte de 3700±190 BP. C'est la première fois en Corse que nous pouvons inscrire dans un cadre chronologique précis cet élément monumental d'un village protohistorique.

L'on voit, ensuite, que l'abri n'a connu qu'une occupation saisonnière. Comme on l'a estimée à trois ou quatre mois, on peut penser à une présence humaine durant l'été. Cette hypothèse est corroborée par l'abondance des céréales recueillies lors des fouilles.

Ce constat est d'une exceptionnelle importance car si l'on peut évoquer une fréquentation estivale du site, on peut en déduire que durant le reste de l'année, soit environ 8 ou 9 mois, le groupe de Cucuruzzu descendait à la *piaghja*. Les relations *piaghja*-montagne sont ainsi prouvées. L'on pourrait également ajouter que la présence de coquillages marins et, éventuellement de *Prolagus* (dont la présence à la *piaghja* est bien attestée) conforte cette interprétation.

Quelques habitants de Cucuruzzu rangeaient donc dans cet abri des céréales dans des jarres-silos, les «grillaient» puis les transformaient en farine (présence d'éléments de broyage). Les glands étaient également torréfiés. Les foyers étaient utilisés surtout à des fins culinaires. Bien plus qu'une restitution de l'histoire du petit groupe humain ayant occupé cet abri sous roche, c'est l'évocation des réalités quotidiennes que nous proposons. Les espèces élevées (suinés, caprinés bovinés) aussi bien que les pâturages (enclos) témoignent d'activités de paysans (culture des céréales) éleveurs. Cet aspect de la vie économique autour du casteddu a pu être inféré des diverses informations, surtout palynologiques et paléozoologiques.

Des changements sont également intervenus dans le domaine des croyances et des pratiques cultelles. Dans ces conditions, une partie de l'ensemble monumental de Filitosa, n'est autre qu'un aménagement tardif du casteddu. Quant aux statues-menhirs du stade 2, pour reprendre la terminologie de R. Grosjean, elles doivent être nettement détachées du casteddu qui lui, est du stade 3.

Ces modifications sont également perçues dans la céramique du Bronze final qui s'inscrit dans un cadre culturel subapenninique.

Dans de telles conditions, on comprend que les statues-menhirs de Filitosa n'ont peut être pas la même signification que celles recensées sur les autres casteddi de Corse méridionale. En effet, la présence d'un seul monolithe sculpté dans certains d'entre eux contraste avec le nombre imposant de statues-menhirs trouvées à Filitosa.

La répartition des statues-menhirs dans l'île de Corse impose plusieurs réflexions. D'abord, l'absence de casteddi en Corse septentrionale tout comme celle de statues-menhirs armées, rend impossible toute corrélation entre ces deux sortes de vestiges. Il faudra toutefois tenter de comprendre les rapports entre l'habitat que l'on peut regrouper dans le terme générique de collines aménagées et les statues-menhirs non armées.

On admet en outre que les statues-menhirs de Corse septentrionale seraient plus récentes que celles de la Corse méridionale (on les situe habituellement entre la fin du IIe, début du Ier millénaire avant notre ère). Elles caractériseraient une phase tardive de la statuaire. Si le fait est plausible, il faut bien admettre qu'une telle démonstration n'a jamais été proposée. C'est la raison pour laquelle on ne doit donc accepter cette interprétation qu'avec les plus grandes réserves.

L'étude des pourcentages a montré que la répartition des monolithes de la Corse septentrionale est de 30,43% avec 7 éléments situés entre 700, et 1050 m, de 39,13% pour 9 éléments dressés entre 400 et 600 m, et de 30,43% pour 7 éléments trouvés entre 0 et 200m. Si l'on regroupe les 16 statues-menhirs situées entre 0 et 600 m, nous voyons que les 23 statues représentent 69,50% du total. Le temps passé à la *piaghja* est de huit mois, soit 66,6% des douze mois de l'année, alors que le séjour à la montagne n'est plus que de quatre mois, soit 33,3% de l'année. La superposition des résultats obtenus par l'étude de la répartition altimétrique et ceux qui concernent la durée de l'occupation des habitations de *piaghja* ou de montagne est édifiante. On admettra donc que le nombre de statues-menhirs de Haute Corse est proportionnel à la répartition des habitations. Ainsi, l'on ne peut nier les relations établies entre les monolithes sculptés et le mode de vie fondé sur le pastoralisme. De surcroît, on peut préciser que ces sculptures sont bien le fait de bergers.

En Corse méridionale, la répartition altimétrique des monolithes qui s'inscrit dans un tout autre régistre, invite à envisager l'existence d'un double système (fig. 4).

Le premier, selon le modèle qui se développe sur la partie orientale de la Corse est fondé sur une gestion de l'espace *piaghja*-montagne avec différenciation des trois grands niveaux naturels que nous avons pris en considération. Il s'agit de l'étage supérieur, constitué par le Coscionu, de l'étage moyen occupé par l'Alta Rocca et l'étage inférieur qui n'est autre que la dépression de Figari-Porto Vecchio dite encore Pian d'Avretu (fig. 5).

Le second système est représenté par les grandes concentrations du Sartenais proprement dit et du Taravais. Dans le Sartenais, la statue-menhir de Petra Pinzuta, par exemple, est associée au casteddu de Punta Pastania (320 m); celle de Muntagnoli au casteddu de Pozzone. Le Sartenais est le pays des alignements de menhirs et de statues-menhirs (Paddaghju, Appazzu, Cauria). On y rencontre, comme ailleurs, des couples de monolithes, plus particulièrement la statue accouplée au menhir (Muntagnoli, etc.).

Dans le Taravu, il faut distinguer d'une part les alignements et, d'autre part, les statues-menhirs *«isolées»*. Celle de Santa Naria, par exemple, se dresse à 85m au-dessus du niveau de la mer, à un kilomètre environ à vol d'oiseau du rivage. En se déplaçant vers l'ouest, on rencontre successivement celles de Micalona (73 m), de Scalsa Murta (85 m), d'Olmetu I et d'Olmetu II (70 m) qui se dressent sur la rive gauche du Taravu, et non loin de son embouchure. Plus au nord, la statue-menhir del'Isula (25m) et plus au nord encore celle de Tappa (80 m) puis

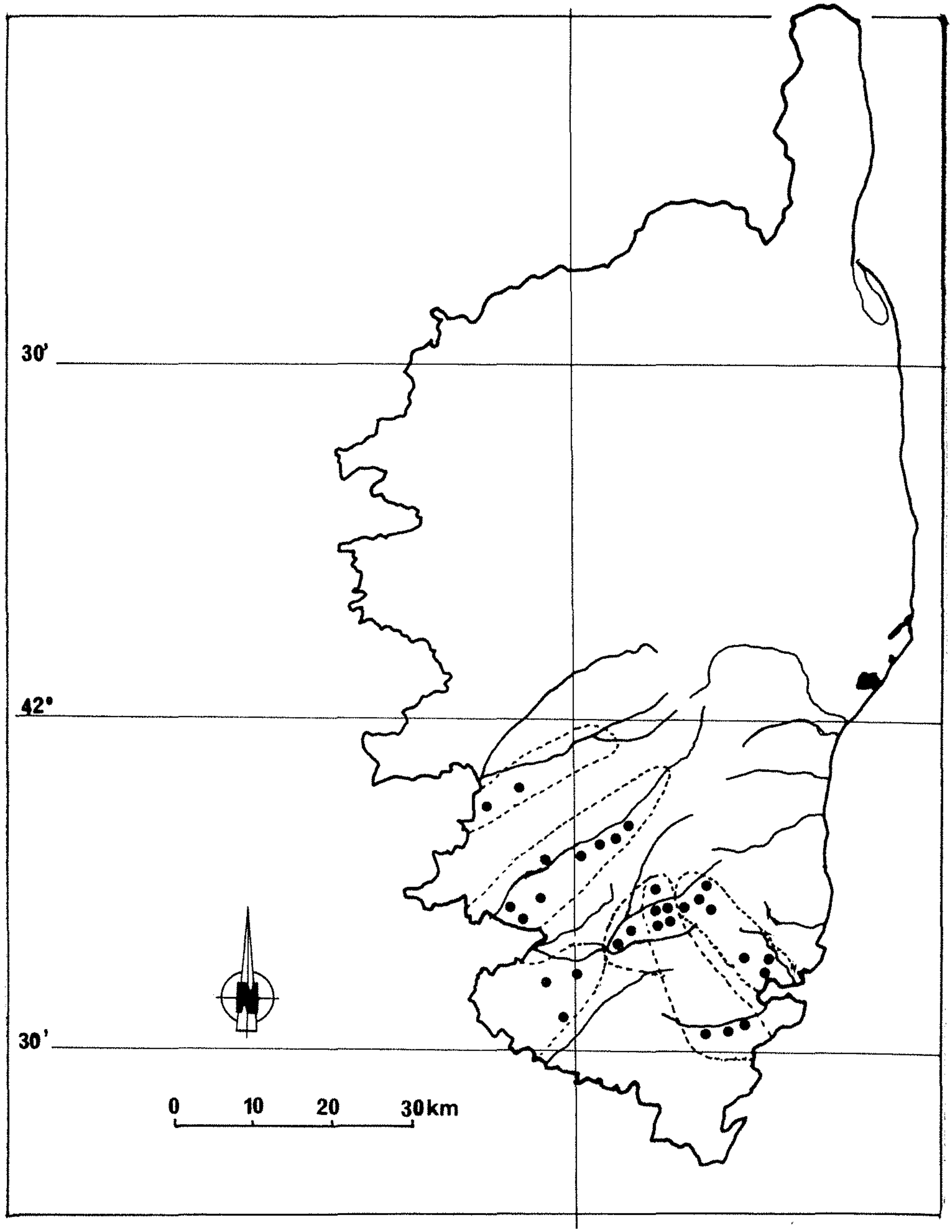

Fig. 4 - Les torre de Corse dans leur contexte géographique

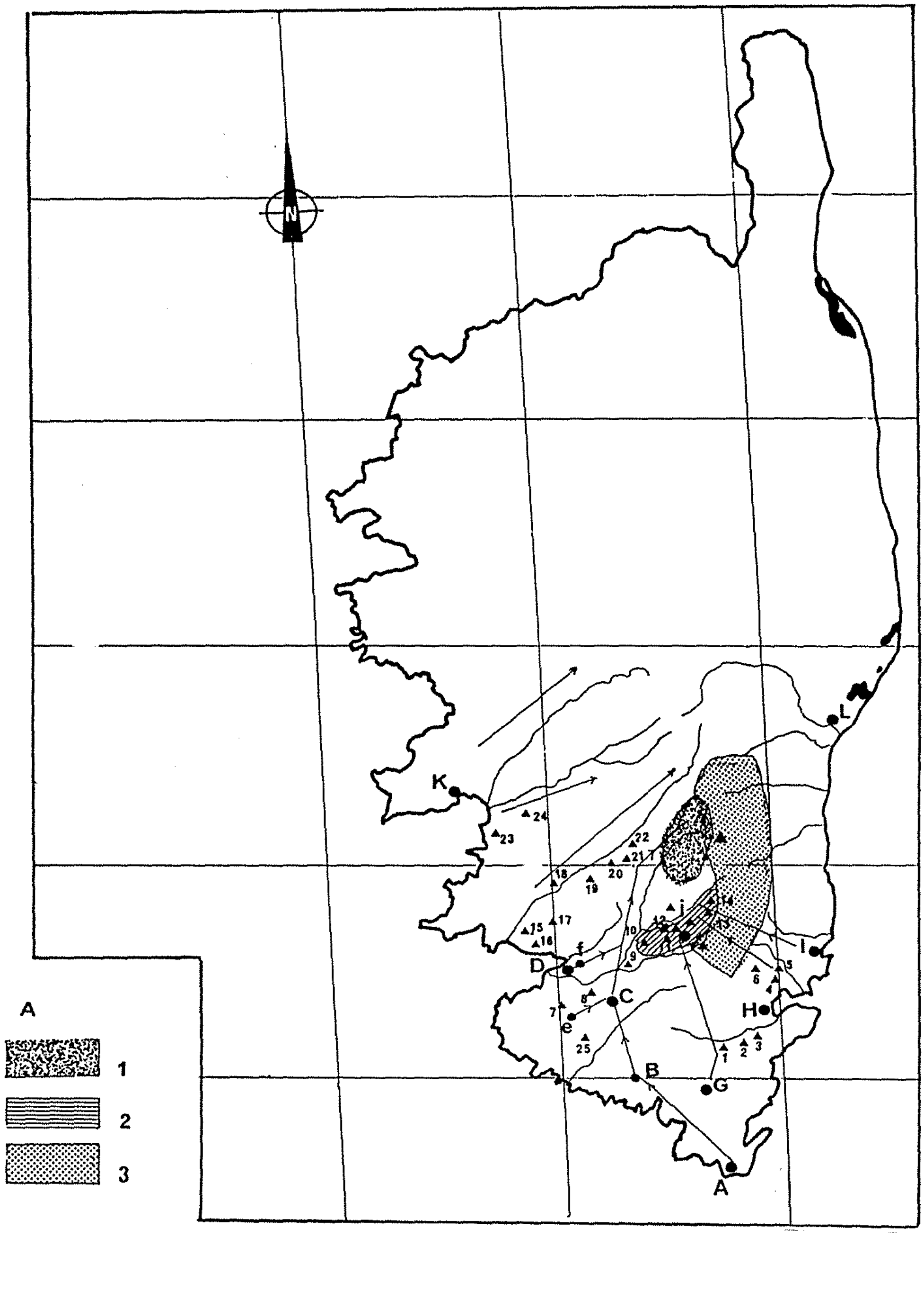

Fig. 5 - Les voies de transhumance. A: Bonifacio; B: Monacia; C: Sartene; e: Grossa; f: Vighjanellu; G: Figari; H: Porto Vecchio; I: Santa Lucia di Porto Vecchio; J: Alta Rocca; K: d'Ajaccio vers Vizzavona; L: de la Côte orientale vers le centre.

de toute la statuaire de Filitosa (67 m). Si l'on ajoute celles de la rive droite, Tappa I (80 m), non armée, U Paladinu (10 m), on constarera que la disposition de ces statues-menhirs est ordonnée, dans la mesure où elles délimitent un territoire extrêmement riche en sites préhistoriques monumentaux.

Il n'est pas audacieux de penser que les statues-menhirs, armées pour la plupart, peuvent avoir eu pour les Protohistoriques taravais, une sorte de pouvoir ambivalent: protecteur de la population autochtone, et en même temps dissuasif pour les *«étrangers»,* mais en même temps marqueur d'un territoire.

Ainsi se dessinent les grandes provinces de l'Age du Bronze de la Corse méridionale avec le Sartenais, le Taravais, l'Alta Rocca et ses *piaghja.*

Une telle variation sur le thème des représentations iconographiques a déjà été noté par nos soins dans la région de Solenzara grâce à une légende qui nous fut rapportée par des paysans. Elle faisait état d'une expédition punitive conduite par la population de la côte orientale contre les «géants» vivant dans l'intérieur de l'île, dans les zones montagneuses du territoire de la commune de Solaro. *«Il suffisait de les (les Géants) faire tomber pour les rendre inoffensifs car ils ne pouvaient plus se relever».* Cette image pouvait s'appliquer, à notre avis, aux statues-menhirs dans lesquelles les populations de la côte orientale voyaient des géants. Comme ils étaient en pierre, ils ne pouvaient donc plus se relever.

Dans la région de Serra di Ferro, les habitants avaient, tout comme ceux de la côte orientale, conservé la mémoire de *«géants»* qui, la nuit venue, descendaient de leur montagne pour combattre les groupes qui terrorisaient les populations des *piaghja.* Aux *Paladins,* car c'est ainsi qu'on les nommait, se rattachait donc dans cette région du Taravu, une image de géants protecteurs des populations autochtones, alors que sur la côte orientale, ils étaient des ennemis de la population.

Pour revenir aux deux systèmes sartenais et taravais, fort proches au demeurant, des aires d'assez grande superficie offrent d'importantes concentrations de statues-menhirs. Le choix intentionnel de ces vastes espaces plats constitue un critère d'ordre géographique. Les alignements de monolithes *(filarati)* constituaient, parfois, de fortes concentrations de pierres dressées où, comme à Padaghju, on a recencé 259 unités. La présence de menhirs témoigne d'une utilisation du site au Néolithique final-Chalcolithique ainsi que l'attestent les découvertes archéologiques de Cauria. Les statues-menhirs qui s'insèrent dans ces alignements montrent qu'à l'Age du Bronze, ancien et moyen, es traditions ont perduré.

Chacun s'accorde à reconnaître l'extrême prudence qu'impose à la recherche le rapprochement de faits actuels ou d'un passé très proche avec ceux qui remontent à plusieurs millénaires. Malgré la conscience que nous avons d'une telle difficulté, nous prenons quand même en considération une série d'informations relatives au pastoralisme car elles sont à l'origine d'une hypothèse de travail sur les relations qui ont pu s'établir,durant la préhistoire insulaire, entre pastoralisme et paysannerie. A la suite d'un long travail de recherche (Lanfranchi, 1987), nous avons pu dépasser ce premier niveau en envisageant une mise en relation entre pastoralisme et monuments mégalithiques.

Pour élargir notre champ d'investigation, nous avons étudié certains aspects de la préhistoire sarde et nous avons pu, dans le domaine particulier des statues-menhirs de cette île faire d'intéressantes observations.

Dans la dernière édition de la Civiltà dei Sardi (Lilliu, 1988), l'Auteur mentionne 45 statues-menhirs masculines et 4 féminines, inventoriées dans l'île. Depuis, le nombre de monolithes s'est encore accru à la suite de nouvelles découvertes. On trouve ces documents en divers lieux, surtout à leur emplacement originel, dans la campagne de Laconi, Barili-Monte Feurreddu, Montes, Perda Iddocca, Sa Corte Noa, Corte e Pranu Maore, Genna'e Arrele. Certains ont été remployés dans la tombe de Giganti d'Aiodda et dans le nuraghe Orrubiu.

La région centro-méridionale et plus précisément le Sarcidano offre à l'étude un exceptionnel champ exploratoire. Le plateau de Genna'e Arrele, à 400m au-dessus du niveau de la mer a livré les premières statues-menhirs de l'île (Atzeni, 1973-74).

D'une manière générale, la forme du monolithe est constante et tend vers l'ogive. Sa section est plan-convexe. On observe à l'extrémité supérieure de l'ogive une tête au visage stylisé en T. Sur la poitrine, un motif *«a tridente»* est interprété comme un schéma anthropomorphe *«capovolto»* (tête en bas) ou *«ancoriforme»*.

A mi-hauteur, une cannelure marque la ceinture. Au-dessous, un nouveau motif en bas relief est considéré comme la représentation de *«deux poignards horizontaux opposés, semblables à l'un des motifs historiés du Monte Bego»*. On a reconnu dans ce poignard un type rémédellien en silex.

Une autre découverte qui s'inscrit dans ce contexte a été réalisée à l'occasion de la fouille de la *«tomba dei Giganti»* d'Aiodda-Nurrallào (Atzeni, 1979-1980). On a utilisé pour la construction de cette tombe, datée de l'Age du Bronze ancien par le mobilier, un matériau de construction qui comprenait un grand nombre de fragments de statues-menhirs assez semblables à celles de Laconi.

Nous avons donc, avec les statues-menhirs et les *tombe dei Giganti,* deux types monumentaux, le premier antérieur au second. Les statues-menhirs seraient au moins chalcolithiques alors que la tombe daterait (le mobilier l'atteste) du Bronze ancien.

Lors d'une visite de ce site, en compagnie de G. Manca, nous avons eu une autre lecture de la sculpture située sous la ceinture. En effet, le fragment de statue-menhir dressé à droite de l'entrée de la tombe présente un motif disposé horizontalement. L'observation attentive du tracé révèle deux éléments qui, de gauche à droite, comportent respectivement une extrémité convexe prolongée, après un rétrécissement, par une sorte de cylindre terminé par une pointe; le second, une sculpture en V horizontal, sert de réceptacle au premier. Il s'agirait donc d'un corps inséré dans un second.

De toute évidence, il ne peut s'agir d'un double poignard.

L'interprétation que l'on peut proposer s'inscrit parfaitement dans la syntaxe décorative proposée par l'ensemble des attributs de la statue-menhir. La forme ogivale du support est une tête stylisée, partie d'une représentation humaine. La cannelure disposée horizontalement au niveau de la ceinture sépare la statue en deux zones, l'une, supérieure, la poitrine, montre un motif capovolto qui évoquerait le dernier moment de la vie, à savoir la mort. Au-dessous de la ceinture, le motif sculpté en bas-relief pourrait suggérer l'acte de procréation, plus précisément, le premier moment de la vie d'un être humain.

Quoi que l'on puisse penser de cette interprétation, il ne fait aucun doute que la statuaire s'inscrit dans un contexte religieux avec un symbolisme bien particulier. De surcroît, les statues-menhirs de la Sardaigne seraient produites par un groupe dont l'économie est fondée sur le pastoralisme. Quant à leur datation, il faudrait donc revoir les critères sur lesquels on s'appuyait pour les situer dans un contexte chalcolithique.

Leur remploi au Bronze ancien est le fait de paysans éleveurs, vivant dans des nuraghi et enterrant leurs morts dans des *tombe dei Giganti* et qui ont réutilisé des fragments de statues-menhirs pour construire le petit nuraghe d'Orrubiu (Laconi), par exemple. Les nuragiques sont donc bien les auteurs de deux faits: d'une part, de l'utilisation de fragments de statues-menhirs dans leurs constructions, et, d'autre part, de la construction de deux types monumentaux, les *nuraghi* et les *tombe dei Giganti.*

Un phénomène identique se produit en Corse, avec, semble-t-il, un léger décalage chronologique. En effet, les statues-menhirs et les menhirs brisés ont été utilisés comme pierre à bâtir dans le monument de Filitosa, daté de l'Age du Bronze final. Une rupture se produit donc, sur ce site, entre 1200 et 1000 avant notre ère. Les paysans-éleveurs, constructeurs des torre, réutilisent les monolithes dressés par les bergers porteurs d'une culture chalcolithique ou de l'Age du Bronze ancien. Le site lui-même, qui comportait des alignements de menhirs et de statues-menhirs, était, comme Cauria ou à Paddaghju, un espace où se rassemblaient dans certaines occasions, les populations dont l'activité économique fondamentale était fondée sur le pastoralisme.

En Sardaigne, la *tomba dei Giganti* de Aiodda-Nurallào a été construite par des paysans-éleveurs, également bâtisseurs de nuraghi, qui ont utilisé les fragments de statues-menhirs dressées sur ce site.

On peut proposer pour la compréhension d'un tel fait, deux explications: la première d'ordre religieux témoignerait d'une mutation intervenue dans le domaine des croyances (remploi de statues-menhirs brisées dans la construction d'une tombe ou d'un nuraghe); la seconde par la confrontation entre deux groupes humains, porteurs d'une même culture, mais se distinguant par des activités économiques bien distinctes, les uns étant des paysans et les autres des bergers.

La destruction des statues-menhirs de Corse comme de Sardaigne n'est pas un phénomène généralisé, ce qui tendrait à prouver que les traditions se sont perpétuées selon les lieux. Le phénomène de perduration, voire de rémanence, par exemple, est parfaitement attesté par la présence de certains bronzetti ithyphalliques. Le joueur de flûte exposé au Museo Archeologico Nazionale de Cagliari en témoigne.

On peut donc proposer, pour conclure, que l'histoire du pastoralisme et de la paysannerie permet de mieux comprendre les phénomènes mégalithiques et facilite une approche des croyances des IIIe-IIe millénaires avant notre ère.

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EVIDENCE OF NEOLITHIC PASTORALISM IN GREECE ON THE ISLAND OF EUBOEA

SUMMARY – *Evidence of Neolithic pastoralism in Greece on the Island of Euboea.* Prehistoric investigation in the Greek mountains during the last ten years gives evidence of human settlement and exploitation of the highland zone as early as the late Neolithic period. The results of surveys in the mountains of the northern Peloponnese and central Euboea indicate the use of caves and small sites away from agricultural territories during the late Neolithic. Finds from semi-mountainous sites of the island indicate that shepherding and agriculture were practised at high altitudes. In this paper the available archaeological evidence will be presented, and its connections with the problems of prehistoric pastoralism will be discussed.

RIASSUNTO – *Il pastoralismo in Grecia durante il Neolitico: alcuni esempi nell'Isola di Eubea.* Le ricerche preistoriche condotte durante l'ultimo decennio nelle montagne della Grecia hanno fornito alcuni dati relativi al popolamento umano e allo sfruttamento del territorio a partire dal Neolitico recente. I risultati delle prospezioni archeologiche eseguite nel Peloponneso settentrionale e nell'Isola di Eubea dimostrano che, durante il Neolitico recente, erano state abitate caverne e piccole stazioni site ad una certa distanza dai territori coltivati. Ritrovamenti archeologici nelle zone collinari dell'Eubea indicherebbero che il pascolamento e l'agricoltura venivano praticati anche nelle zone montane. In questo articolo vengono presentati i dati archeologici disponibili e viene discusso il problema del pastoralismo in epoca preistorica.

INTRODUCTION

The question of the origin of animal domestication and the beginnings of pastoralism dominates the archaeological perspectives of the last twenty years.

Ethnological research on traditional nomads, faunal analysis and ecological models have been used in understanding the past system of animal husbandry. Although this heavy emphasis upon pastoralism has posed important questions about prehistoric economy and has provided valuable information, clear archaeological evidence based on surveys, excavations and artifactual analysis is hard to find. The purpose of this paper is not to give an answer to the complex problem of pastoralism but to ascertain the intrinsic limitations of the methods used in explaining its appearance in the Greek area. On the other hand, material from surveys and excavations in the mountains of central Euboea offers a new basis for the study of prehistoric pastoral systems.

Greek and Mediterranean nomadic pastoralism is often viewed as an evolutionary stage from Neolithic mixed farming and herding systems to the complex of economy of the urban centres.

* Athens

Under this formulation, traditional transhumant pastoralists should be seen as a relatively new phenomenon, connected with various socio-economic and political circumstances. On the other hand, the transition from mixed farming and herding economy to pastoral specialization remains relatively unexplored. According to HALSTEAD (1987), the strategy of prehistoric pastoralism in the Mediterranean region is of farmers having specialized shepherds, or a small number of animals. By using environmental models, Halstead assumes that in *«later prehistory, at least, the ecological niche occupied by traditional transhumant pastoralists simply did not exist»* because mountain pasture must have been very limited in extent. Halstead has argued against the existence of transhumance as a response to specific economic and political conditions which cannot be demonstrated for earlier periods.

First of all there is little actual palaeoenvironmental evidence to show that natural grazing areas did not exist in the prehistoric past. In Palaeolithic times, sites on the mountains of north-west Greece, where large-scale transhumance still exists, point to the presence of small social groups exploiting upland environments. Hunting was the main subsistence activity.

According to Higgs, it is possible that the deforestation of upland areas and the creation of pastures had already begun during Palaeolithic times (HIGGS *et al.,* 1967). Secondly, it is difficult to compare evidence of mediaeval or modern pastoralism with prehistoric herding systems. That prehistoric pastoralists behave similarly to pastoralists of the present is a plausible view and perhaps necessary by comparing similar phenomena from different areas, which must not however be overestimated. For example, the distribution of early Neolithic Impressed Ware has been regarded as a result of movements of transhumant pastoralists, but after new discoveries this hypothesis must be rejected (CHAPMAN and MÜLLER, 1990). According to JACOBSEN (1984), the distribution of middle Neolithic Urfirnis pottery to the north of the Peloponnese, is closely connected with pastoral exchange systems. Jacobsen regards the middle Neolithic finds discovered in the area near the routes of modern pastoralists, as an indication of Neolithic pastoral activities, an assumption based on the unfounded argument that prehistoric pastoral routes should be identical to the recent ones. Environmentally, the northern Peloponnnese offers excellent pasture lands in the mountains of Aroania and Kyllini, and some prehistoric sites are already known from that area (SAMPSON, 1986), but at the present stage of research it is quite difficult to identify those sites as pastoral sites only because of their location. Other scholars have emphasised the dependence of transhumance upon a wide market system (BAILEY *et al.,* 1983).

Specialized pastoralism has also been proposed for later prehistory. KILLEN (1964), working on the Linear B tablets of the palace of Knossos, concluded that the high number of males recorded in the flocks was evidence of increased wool production. This case suggests that a control of the palace elite over marginal resources must have existed, but it is not indicative of full-scale transhumant pastoralism, such as we know from ethnographic or modern parallels. This has been proposed by KILIAN (1973) for the Iron Age, on the basis of metal objects from north-west Greece identified as imports from the north Balkan area.

It is far beyond the scope of this paper to discuss all the archaeological or historical accounts of transhumance, but some facts must be mentioned. The gap from prehistoric times up to the first documentation of the traditional Greek nomads, the Sarakatsani, is very large, and little indeed has been done to fill it. Documentation of early historic pastoralism can be found in the Odyssey, in the description of the life of the mythical tribe of the Cyclops. The Cyclops appear as pure pastoralists living in caves and keeping large herds of sheep and goats.

References to them are common in ancient greek poetry, and there are several indications of economic and domestic life. For instance, Euripides in his satyrical drama «Cyclops» reveals a noticeable experience of pastoral life. Ancient historians, eg., Hecataeus, Milesius and Skylax, write about numerous flocks grazing in beautiful meadows with tall grass in north-west Greece. Historical accounts from the Byzantine period provide secure evidence for a substantial presence of pastoralists in the central and southern Balkan area, particularly during the XI and XII centuries, during the conflicts of the Byzantines against the Bulgarians. From that era we have the earliest documentation of pastoralists called Vlachs who probably migrated already during Roman times.

The military essay of Ioannis Kekaumenos (XI century AD), apart from the important descriptions of the habits and activities of the Vlachs, informs us about their participation in military events and political developments at the time of the Macedonian dynasty. The socio-economic developments following the liberation of Greece as also the general political situation in the Balkans during the last two centuries radically influenced pastoral life. After the First World War, landed property was given to nomad pastoralists who became in the following years less pastoral and less nomadic.

After this brief history of the Greek pastoralism and the theories about its origin, two main questions arise: how old is pastoralism, and what does a prehistoric pastoral site look like? No definite answer can be given yet. It seems logical to hypothesize that during the first stage of neolithisation, if not earlier, some specialisation of animal husbandry, at least locally, existed.

On the other hand, archaeologists recognize a site as used by pastoralists mainly on the basis of its location and the number of animal bones unearthed.

In Greece the problem is more complex, and the pastoral question is connected with the problem of the origins of the Greek Neolithic. However, archaeologists have emphasized the great dependence of the Neolithic population upon domestic animals during late Neolithic times (Renfrew, 1972). From this era we have evidence for pastoral activities in the mountainous region of the central part of the Island of Euboea, as suggested by sites found there.

SITES AND FINDS

The mountain of Dirfys with its impressive peak 1750 metres high, predominates in central Euboea and extends up to the Aegean Sea. On the west, at the foot of the Dirfys begins the Leleandean Plain, the largest in Euboea, which extends to the Euboean Gulf and is interrupted on the east by the mountain of Olympos. Small rivers flow through the hilly areas of central Euboea and create a system of deep gorges where a few plains can be found near the coasts (fig. 1). Today this region is covered mainly by bushy vegetation and olive groves, while forest exists only over 800 metres. A main feature of this region is the absence of extensive arable land, a factor which during historical times led the two great Euboean cities, Chalkis and Eretreia, to war. Prehistoric investigations are mainly confined to the coasts and the hilly region to the south of the Dirfys massive. Up to now over thirty Neolithic sites are known, from which just few have been partly excavated and belong to the late Neolithic period. The area which concerns us here, extends east of the mountain of Olympos to the south and south-east branches of Dirfys where eight Neolithic sites give evidence for pastoral activities and have been interpreted as stations of transhumants.

When we speak about pastoralism or economy, in general, it is however necessary to have an idea about the physical environment of the study region and period. Reconstructing past environments is not an easy task, and corresponding data are not available in our area. Transhumance is mainly based on the existence of pasturelands, but up to now little indeed can be definitely said about the time of their creation, since there is a lack of pollen data from the Aegean. Changes in climate and vegetation of southern Greece have been recorded from a core from Lake Kopais (TURNER and GREIG, 1974). Around 5000 BP dramatic changes, including deforestation, took place in the vegetational history of southern Greece, as evidence from Franchthi Cave suggests (VAN ANDEL and SUTTON, 1987). Apart from any climatic or environmental changes, geological factors can be also a guide to hypothetical patterns of regional economic integration in the prehistoric past. The sites, listed below, are situated on rocky terrain, in areas not especially ideal for farming. The character of such landscapes with thin soils if any, can be projected into the last Glacial period, although it is possible that the present appearance may have caused by relatively new erosion.

The erosion of terra rossa took place not only in limestone uplands, but also in semi-mountainous and lowland areas of central Euboea. Rocky surfaces and bushy vegetation are two characteristic features of the southern part of central Euboea. If we come to hypothesize

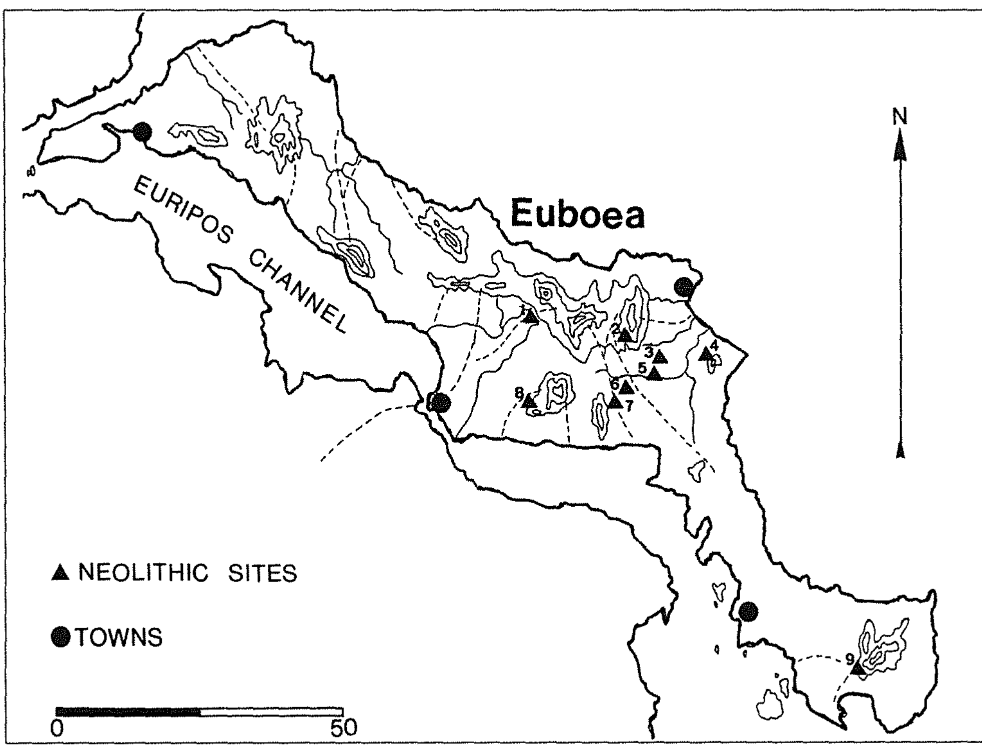

Fig. 1 - Distribution of Neolithic pastoral sites and modern pastoral routes (after SAMPSON, 1992): 1) Meriani cave, 2) Mt. Skoteini, 3) Dragonara, 4) Graspilia, 5) Turkospilia, 6) Skoteini cave, 7) Erimokastro, 8) Voudochi, 9) Aghia Triada.

that such surface morphology existed to some extent during prehistoric times, this can suggest the seasonal pattern of inland economies. Human interference, either through fire or through intensive grazing, is a major factor in forest clearance. Although there are many difficulties in considering highland zone exploitation in prehistoric Euboea, the archaeological data nevertheless suggest increasing economic productivity in the hinterland, and it is a task of future research to define the character of individual sites and to clarify the nature of late Neolithic exploitation patterns.

1) Skoteini Cave

Neolithic remains from this cave were known since 1974, but systematic excavations were undertaken ten years later. The cave is situated below a rocky plateau at 450 metres asl, 3 kilometres to the south of Tharrounia village. Three trenches were dug, uncovering a three metre stratigraphic sequence from the late Neo lithic. Several floors were unearthed below the late Neolithic II occupation levels, while an absence of floors was noticed in Trench A in the early phase of the late Neolithic II, something that has been interpreted by the excavator as caused by the temporary use of the cave (Sampson, 1982).

This suggestion concerns only Trench A, since an absence of floors was not attested in other trenches , if one judges from the publication of the stratigraphy. Some hearths were also found. The late Neolithic I pottery is matt-painted and black-burnished ware, while pattern-burnished ware prevails during the late Neolithic II. A class of peculiar vases called scoops is typical for both phases and connects central Euboea with the Attica-Kephala Culture and Thessaly. The great number of pithoi unhearthed indicates that the cave with its steady temperature of 16°'was also used as a storage place. A number of stone and clay figurines was found which show similarities to figurine material from mainland Greece and the Aegean islands. A stone figurine of phallus shape has a remarkable correspondence to one from Kitsos Cave in Attica. Not far away from the cave, parts of walls belonging to late Neolithic II buildings and a cemetery of the same age came to light. Radiocarbon dates suggest a span of two millennia for the two cultural phases with their subdivisions (LN I A-B and LN II A-B), from around 5200 BC to 3300 BC in calibrated terms.

Sampson (1982), considering the habitation layers as rather poor, the conditions inside the cave as too cold and the permanent residence in the surrounding areas as impossible, assumes that the cave must have served as a temporary refuge for shepherds. The finds suggest the existence of continuous contacts with the Attica-Kephala Culture and Peloponnnese from one side and with Thessaly and mainland Greece from the other. Otherwise, the three metres sequence is not so poor, and the absence of living floors in the more recent Neolithic levels can have other reasons. Second, living inside the cave during the winter months is preferable than outside. The occurrence of several haerths in all Neolithic levels may be explained through this fact. Generally, in late Neolithic times there is evidence for a more intensive cave use throughout Greece (Wikens, 1986), something that has not yet been explained. On the contrary, there can be found enough arguments to interpret this cave as a permanent settlement. The cemetery and the stone foundations outside the cave, the great number of storage pots and stone implements as axes, millstones and grinders, along with the fact that such stone tools were made locally, all this suggests that the cave must rather have served as a permanent settlement. In fact, the Neolithic inhabitants of Skoteini, must have been agro-pastoralists, if one judges from the great quantities of seeds and animal bones found during the excavations. The distances between plains and upland meadows in Euboea are very short, which means that transhumance as a cyclical phenomenon of migration movements, as we know it from ethnographic parallels, is not necessary. The settlement outside the cave might indicate an increase of the number of people in the community.

2) Meriani Cave

The Meriani Cave is situated on the top of a hill, 500 metres in altitude, near the modern village of Mistros. A trial excavation brought to light some sherds that date to the beginning of the late Neolithic (Sampson, 1981).

3) Voudochi

A few sherds of coarse ware and many obsidian pieces were collected near the cave, high on the mountain Voudochi, 800 metres in altitude. Voudochi is the western branch of Mt. Olympos and is located to the north of Eretreia (Sampson, 1981).

4) Erimokastro

On the top of a rocky hill, called Erimikastro, 3 kilometres to the west of Partheni village, a few sherds, fragments of obsidian tools and one piece of a millstone were found during a survey (Sampson, 1981). It is noticeable that many semi-mountainous sites have produced millstones and stone axes, Such finds suggest that agriculture was practised at high altitudes as early as the late Neolithic period.

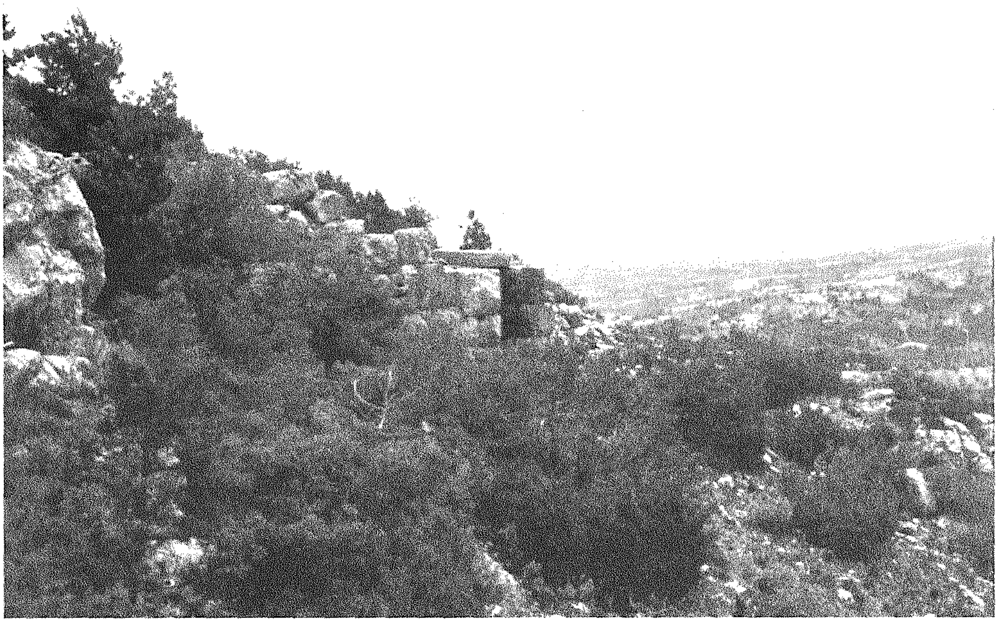

Fig. 2 - Fortification and gate of the medieval acropolis of Dragonara.

5) Dragonara

The River Manikias which springs from Mt. Skoteini flows though an impressive gorge between Manikia and Vrysi village. At the end and on the northern side of the gorge, a Mediaeval acropolis named Dragonara (fig. 2) is situated on a rocky plateau, 400 metres in altitude. Some late Neolithic sherds and a fragment of a stone axe were found during a survey in this area (Sampson, 1981).

6) Turkospilia

Not far from Dragonara on the southern side of the gorge a cave called Turkospilia is located at the edge of a precipice (fig. 3). Late Neolithic sherds with impressed decoration were collecetd from the surface of the cave (Sampson, 1981). Recent sheperds from Manikia village, using a dangerous route, lead their animals into this cave. Because of its strategic position Turkospilia could also have been used as an observation post of Neolithic hunters.

7) Skoteini Mountain

From a plateau on Skoteini Mountain, over 1000 metres high, some late Neolithic sherds are known and suggest Neolithic activities in upland areas, probably pastoral activities (Sampson, pers. comm. 1993). It is one of the highest Neolithic sites in Greece and the highest in Euboea.

8) Graspilia

Cave on a hill, 400 metres high, to the east of Ochthonia village. Sherds collected from the surface show a continuous habitation throughout prehistory (Sampson, 1981).

Fig. 3 - Turkospilia cave.

9) Aghia Triada

Altough this cave is situated in southern Euboea and not in the region discussed here, it is important for its role within the territoria system of Neolithic pastoralists. There is evidence for continuous occupation during the late Neolithic, as suggested by finds from the area near the entrance of the cave (Sampson, 1981).

AN INTERPRETATION

The picture that we have of Euboea during earlier Neolithic times is of a few agrarian communities living near the coasts and having close contacts with Attica. Toward the beginning of the late Neolithic the population increased and for unknown reasons people began to live in caves in the interior part of the island. This phase marks the appearance of more complex contacts with Thessaly and Peloponnese, with Attica and the Aegean islands, as suggested by the finds from Skoteini Cave and other sites. Our explanation of the use of the caves discussed above is however a different one. Otherwise the archaeological data are admittedly not enough, and information about the Neolithic environment is not available. This means that we can only have an hypothetical picture of the subsistence economy of the Neolithic inhabitants of Euboea.

The increase of population in the late Neolithic is very striking, and this must have had a number of social and economic consequences, one of which must have been the pressure on the land and the need of exploiting new arable and grazing areas. This scenario is at the moment very general, but some explanation of this kind could make clear for us why people began to live in the interior part of the island. The distribution of caves used by the late Neolithic population is interesting. They are situated at a distance of at least 10 kilometres in straight line from each other – only the distance between the Tharrounia caves is shorter – in places close to upland pastures. That most of them were used for a long span of time, along with the fact that from the point where the caves are one is able to make one-day journeys to graze his animals, are two factors which may indicate that these caves were some kind of permanent centres within territories where flocks were grazing or land was cultivated. As recognized, there is a tendency of human population to stabilize in areas where a full exploitation of the available food resources is possible.

The available room in all the caves is enough for 5/6 families. Given between 30 and 50 people living in each territory we could expect a Neolithic population in the mountains of central Euboea, in an area of some 1000 square kilometres, of between 200 and 300 persons. This is, of course, an hypothetical number of people which reflects our present knowledge about the demographic situation in Neolithic Euboea and remains to be examined by future research. These groups were by no means living in isolation, but during their movements they had the possibility to contact other communities on the coasts and in the plains. The geography of Euboea facilitates contact and movement, and upland areas offer a panoramic view to the sea. Of particular note is the actual distance between highland and lowland areas, about 20 kilometres or one day's journey.

This picture is however hypothetical, and its greatest part remains untested against the archaeological evidence for Neolithic habitation in mountainous areas. On the other hand, the situation of recent pastoralists in Euboea is not very different. A few families live in small villages in the same areas, and undertake small-distance journeys to grazing their flocks. Their territories are well defined and are considered as a kind of family property, while sometimes they rent pasture land from farmers during their stay in the lowland. Such villages also exist in the northern part of the island. Some Sarakatsan families lived there until recently, while others from eastern Boeotia moved twice a year to Mt. Dirfys (SAMPSON, 1992). About 20000 people or 11% of the entire population of Euboea live today in mountainous areas (STATISTICAL YEARBOOK OF GREECE, 1989). Evidence of historic pastoralism is absent, but we know that after the liberation of Greece, when the population of Euboea was considerably diminished, about 2200 sheperds were living in the island (GOUNAROPOULOS, 1930).

The permanent organization of storing goods in Skoteini Cave may indicate that sedentism supported by storage of food encouraged trade contacts, as the stone pendants or the scoops testify.

Avowedly it is a simplification to think in terms of trade or exchange, in order to explain similarities between different sites, but it is also too early to understand the complexity of the economic behaviour of the Neolithic inhabitants of Euboea. Since close contacts between Euboea and Attica are attested during the late Neolithic it would be useful to mention that Attica is the department with the greatest number of sheep and goats in Greece (STATISTICAL YEARBOOK OF GREECE, 1989).

Because of its fine climate, Attica is an attractive place for pastoralists from central Greece, who traditionally use to stay there during the winter months. It should also be noted that ancient Athens sent her flocks for seasonal grazing to the summer pastures of Euboea. These two factors should be considered in a future study of the interrelations between Attica and Euboea in connection with the problem of prehistoric pastoralism in central Greece.

The Korykeian Cave on Parnassos is another example and the Neolithic material shows that this place wass used by herdsmen. The situation in Thessaly is vaguer, since most emphasis has been given to typological criteria, and many caves and upland areas remain unknown to archaeologists. The Neolithic material from the caves of Za on Naxos and Ida on Crete must however be re-examined in view of the evidence for pastoral activities. Although the Neolithic house of Gyali looks like a campsite (SAMPSON, 1988), this observation alone is not indicative of nomadic pastoralism.

To finish this discussion it would be necessary to comment on some views that have motivated us to engage in the pastoral question. Valid criticism has been made by HALSTEAD (1987) about the methods of considering animal husbandry and its close relation to agriculture.

As concerns transhumance, Halsteald seems to be categorical and argues that *«the wholesale seasonal removal of livestock from arable lowlands was probably not commonplace in antiquity»* (HALSTEAD, 1987). In recent years, surveys in upland areas give evidence for Neolithic habitations in mountains. Results from surveys in Euboea and the Peloponnese describe the use of caves and small sites away from agricultural territories during the late Neolithic. Sampson has argued for a seasonal use of caves and settelements, but their location and finds rather indicate a permanent use. Short-distance movements would have allowed pastoralists to participate in both herding and farming economies of the late Neolithic period, a fact that may suggest the pattern of permanent settling within certain territories. Although such surveys have introduced interesting questions about pastoralism in Greece, there is need for more complete documentation of the pastoral sites themselves.

There is no need for historical and archeological research on more recent pastoralists

(EVSTRATIOU, 1988). The model of sedentary pastoralism with short-distance movements proposed here should be considered as complementary to the pattern of long-distance pastoral mobility. Further archaeological and palaeoenvironmental investigations are necessary for understanding prehistoric herding systems. The island of Euboea is a good area for study and its mountain terrain is not difficult for archaeological research.

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POLYDORA BAKER*

A PRELIMINARY ASSESSMENT OF THE ROLE OF HUNTING IN EARLY MEDIEVAL SUBSISTENCE IN THE ALPINE, PREALPINE AND LOWLAND AREAS OF NORTHERN ITALY ON THE BASIS OF ZOOARCHAEOLOGICAL DATA

SUMMARY – *A preliminary assessment of the role of hunting in early Medieval subsistence in the alpine, prealpine and lowland areas of northern Italy on the basis of zooarchaeological data.* Studies based on documentary evidence suggest that hunting was an important subsistence activity for all socioeconomic classes during the Early Medieval period in northern Italy. Comparison of the assemblages from sites located in the lowland, prealpine and alpine zones reveals that the remains of wild species constitute a minimal part of the bone refuse in all areas. Species and element distributions however, differ between zones. Evidence from sites located in alpine ranges indicates that large game was hunted and whole carcasses returned to site; this contrasts with evidence from the prealpine area and Po Plain which documents the gathering of antler or the preparing of skins and to a lesser degree the consumption of whole animals. The importance of wild birds and fish is more difficult to assess as fine sieving or flotation were undertaken on only at few sites. Various aspects of the data are examined in an attempt to explain the similarities and differences noted between the different areas.

RIASSUNTO – *L'incidenza della caccia nell'economia di sussistenza in Italia settentrionale all'inizio del Medioevo sulla base dei dati archeozoologici.* Le informazioni a nostra disposizione dimostrano che, in Italia settentrionale, la caccia ha giocato un ruolo di primaria importanza nell'economia di sussistenza di tutte le classi sociali, all'inizio del medioevo. Confrontando i complessi faunistici di alcuni siti ubicati in pianura, nelle prealpi e nella zona alpina, si è constatato che i resti di animali selvatici costituiscono solo una minima parte dei rifiuti disponibili. Le specie rappresentate e la loro distribuzione differiscono comunque zona per zona. I dati forniti dai siti alpini dimostrano che qui venivano cacciate le specie più grandi e che le loro carcasse venivano poi trasportate negli abitati; questi risultati contrastano con quelli ottenuti dai siti prealpini e della Pianura Padana nei quali sono documentate principalmente la raccolta delle corna e la preparazione delle pelli. L'importanza dell'uccellagione e della pesca è più difficile da stabilire in quanto la raccolta completa dei reperti a mezzo di setacciatura a maglie fini e di flottazione è stata applicata solamente in un numero limitato di siti. L'autore prende in considerazione diverse informazioni disponibili per cercare di interpretare le differenze riscontrate nelle riverse regioni esaminate.

INTRODUCTION

According to analyses of written records dating to the Early Medieval period, hunting was an important subsistence activity for all socio-economic classes in Northern Italy until the end of the first millenium. In the last fifteen years, zooarchaeological analysis has been undertaken for a number of sites dating to the Early Middle Ages and the availability of faunal data allows a reassessment of the role of hunting in various geographical areas during this period.

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The present discussion focuses on the modern regions of Liguria, Piedmont, Lombardy, Emilia-Romagna, Friuli-Veneto, South Tyrol and Trentino. The chronological period under consideration spans the 6th to 11th centuries; data from sites for which occupation overlaps the ealier and later periods have also been included in order to increase the database.

The main objective of this study is to provide a preliminary assessment of the importance of game and fish in Early Medieval subsistence in northern Italy, to contrast the historical and zooarchaeological data and to compare the evidence available for sites located in different geographical areas. The discussion focuses on sites located in the alpine range, prealpine area and lowland zone *(«Pianura Padana»)* and is of a general nature as the database for each area is sparse. Furthermore, site types differ between the lowland, prealpine and alpine zones. The lowland and prealpine sites consist primarily of urban settlements and *castra* whereas three of the four sites in the alpine zone are identified as rural communities. Variables such as site type, site environment, sample size and excavation techniques are considered in the interpretation of the data.

THE HISTORICAL DATA

The historical documents upon which conclusions concerning the importance of hunting are based include royal edicts, barbarian lawcodes, ecclesiastical property lists and private land sales contracts (FUMAGALLI, 1988; 1993; GRAND and DELATOUCHE, 1950; MONTANARI, 1979; 1988; PANERO, 1988). Few of these records, other than the lawcodes, make direct reference to hunting (MONTANARI, 1979: 268-269; PACAUT, 1980). Rather, the documents form a body of data from which indirect conclusions are drawn concerning the value of different environments and of the activities undertaken within these areas (WICKHAM, 1990: 528-529).

The picture provided by historical research is that of environments offering a rich variety and abundance of large and small game which were exploited regularly by all classes of Early Medieval society. Game and fish are said to have constituted an important dietary component for peasants and elite alike (FUMAGALLI, 1988: 101; MONTANARI, 1979: 88) emphasise this abundance and importance). These interpretations are problematic however for a number of reasons.

For example, although archaeologists and historians agree that large tracts of land were covered by forest, marsh areas and abandoned agricultural fields in northern Italy during the Early Medieval period (BARKER, 1989; FUMAGALLI, 1993; HODGES, 1990; NEGRO-PONZI MANCINI, 1988; RANDSBORG, 1991; WICKHAM, 1990), details concerning the size of landholdings, the organisation of properties (whether contiguous or separated), the extent of woods and forest and the population density within the «wilderness» areas are not easily deduced from the documents (eg. PANERO, 1988: 145-146). It is thus difficult to ascertain whether adequate *«refugia»* would have been available for different game species, particularly large animals.

The conclusion that hunting was practiced by all social classes is based more on the lack of laws which restricted access to this activity or to non-agricultural lands rather than on specific statements to the affirmative (GRAND and DELATOUCHE, 1950; PACAUT, 1980: 332-333; MONTANARI, 1979: 250, 270; WICKHAM, 1990: 529). The regular practice of this activity is inferred from the large number of regulations in the Germanic lawcodes which pertain to the proper behaviour of hunters (Fumagalli, 1988; Grand and Delatouche, 1950; Montanari, 1979; Pacaut, 1980). This latter argument is particularly weak as it is based on lawcodes which pertain to specific ethnic groups and which might not be applicable to non-Germanic sectors of the population or to different chronological periods (eg. Wickham, 1981: 96; Azzara and Gasparri, 1992: xxxi). The limitations of the available historical data for building models of «collective» subsistence have been noted by Mazzi (1991: 101-102).

The discrepancy noted between the historical data and the faunal evidence available for this period may be explained in part by the above problems. However, excavation techniques, analytical methodologies and the nature of the faunal data must also be assessed.

THE ZOOARCHAEOLOGICAL EVIDENCE

In order to assess the importance of game, wildfowl and fish at Early Medieval sites (fig. 1), the zooarchaeological data from published reports and some preliminary analyses have been summarised (table 1). The number of identified elements is used rather than the number of individuals or meat weight as these latter measures are not provided in all reports. For those analyses in which different quantification methods are used, the results differ very little. Statistical comparison of the data was not undertaken given the wide range in collection size and differences in recovery techniques used during excavation.

The sites surveyed in this analysis are grouped into alpine, prealpine and lowland areas.

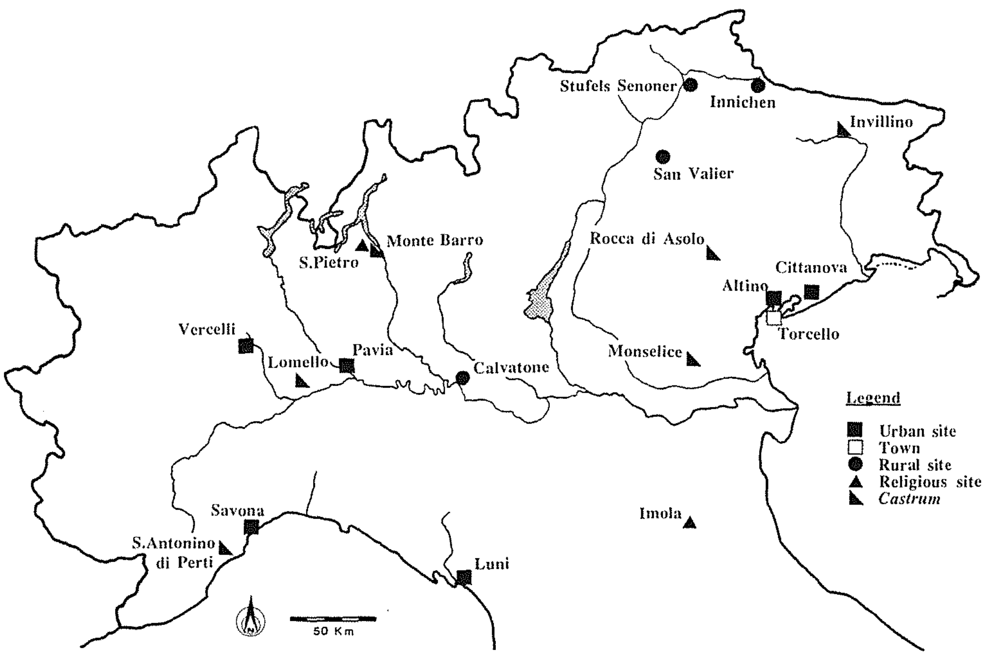

Fig. 1 - Distribution of Late Roman – Early Medieval sites in northern Italy.

The sites located in the alpine zone are not at high altitude, however they are situated in alpine valleys surrounded by high mountains. Elevation ranges from 570 m asl (Stufels) to *ca.* 1250 m asl (Innichen) (RIEDEL, 1986: 132). Invillino and San Valier are situated at *ca.* 700 m and 920 m respectively.

The relative importance of the wild mammals and birds is expressed as a percentage of the summed domestic and wild animals, for each class respectively. For fish, only the number of bones is provided. The bone counts in some of the preliminary analyses are approximate and the species identifications must be confirmed. It is possible that the frequency of wild taxa increases once these analyses are completed.

The animals included in the domestic categories include cattle, ovicaprines and swine for mammals and domestic chicken, goose and duck (these latter two only when the domestic form is indicated) for birds. The taxa included in the game category include red deer (*Cervus elaphus* L.), fallow deer (*Dama dama* L.), roe deer (*Capreolus capreolus* L.), chamois (*Rupicapra rupicapra* L.), wild boar (*Sus scrofa* L.), lagomorph species (including hare *Lepus capensis* L.) and bear (*Ursus arctos* L.). Animals such as fox (*Vulpes vulpes* L.), wolf (*Canis lupus* L.) and wild cat (*Felis sylvestris* L.) are not included. Some of these may have been hunted preferably for their fur, while others may have been hunted in order to protect livestock and human populations. Rodents are also excluded. The taxa included in the categories presented in this paper differ slightly from those in a previous discussion (*cf.* BAKER, 1993).

Although for some sites, such as Invillino or Monte Barro, the raw bone counts are moderate to high, the relative frequency of wild mammal remains is very low in comparison to that of domestic mammals. Game represents generally less than 2-3% of mammal bones. As mentioned above, even for those sites in which the meat value is calculated, as in the studies by RIEDEL (1979; 1986) for settlements in the alpine area of Northeastern Italy, the relative importance of wild species does not exceed 3%.

Comparison of the results from the different geographical areas indicates little difference between sites. The relative importance of wild mammal remains is similar for sites located in the alpine, prealpine and lowland zones. Taxonomic variability however does differ. Wild boar is identified at most alpine sites (osteometric distinction). Species such as the chamois which live at high altitudes (this species descends to *ca.* 800 m in the summer; CORBET and OVENDEN, 1986: 231) is identified exclusively in an alpine assemblage. Although brown bear inhabits mountain forests and areas above the tree line (CORBET and OVENDEN, 1986: 200), this species has been identified at Invillino as well as in a collection from Pavia. In the latter case, the remains consist of metapodials which may indicate the trading of skins and not necessarily a complete carcass. Cervids and *lagomorpha* have been identified in collections from sites in all areas. These taxa adapt to a variety of environments and may be found at different altitudes.

Less data is available for birds than for mammals. This may be due, in part, to recovery techniques or preservation (smaller size and greater fragility). Species of similar size, for example Galliformes and *Anatidae* species, suffer similar recovery bias, however the very small species may be underrepresented. The most commonly identified taxa include *Tetraonidae, Phasianidae* and *Anatidae* species as well as some passerines. The importance of wild bird remains ranges from 0.1% to 50% of domestic and wild avian bones however frequencies based on very low totals are probably not representative of species importance. Although admittedly limited, the avian data suggests a greater variability for the importance of wild taxa. High altitude species such as *Gypaetos barbatus* (BRUHN and SINGER, 1991: 70), and grouse *(Tetrao* *urogallus)* and *Bonasa Bonasia* which inhabit coniferous forests in the alpine areas, (BRUHN and SINGER, 1991: 96) are identified exclusively in the Invillino assemblage.

Fish bones have been recovered on few sites. As in most cases recovery techniques excluded fine sieving or flotation, it is impossible to evaluate the importance of this resource in different settlements and areas. Although fish probably did not compete with the meat of domestic mammals as a dietary staple, it is possibile that on some sites, such as Monte Barro and Monselice, they were consumed regularly.

Certain aspects of the zooarchaeological material must be examined in order to better understand the potential and limitations of the data. The first concerns the relationship between sample size and the numeric frequency of wild species (table 1). The size of the collections varies between less than 100 and more than 5000 specimens. In large collections such as those

Table 1 - Distribution of faunal remains from Late Roman and Early Medieval sites in northern Italy.

Site	Period	Dom. mamm. n.	Game n.	Game %	Dom. bird n.	Wild bird n.	Wild bird %	Fish n.
ALPINE ZONE								
Invillino–Ibligo	I-IV c.	4703	48	1.0	267	7	2.6	3
(STORK and VON DEN DRIESCH, 1987)	V-VII c.	3325	74	2.2	92	1	1.1	2
Stufels–Stremitzer (RIEDEL, 1979a)	X-XI c.	915	4	0.4	–	–	–	–
Stufels–Senoner (RIEDEL, 1986)	II-IV c.	1508	28	1.8	?	?	–	?
Innichen (RIEDEL, 1986)	II-V c.	731	7	0.9	?	?	–	?
San Valier (RIEDEL, 1987)	VI-X c.	1462	26	1.7	?	?	–	?
PREALPINE ZONE								
Rocca di Asolo (BEDINI, 1989)	VI-X c.	89	–	–	12	7	36.8	–
	VII-XI c.	17	–	–	2?	?	–	–
Monte Barro (BAKER, 1991a; 1991b)	VI c.	991	34	3.3	130	21	13.9	91
S. Pietro al Monte *	VI-X c.	*c.*210	*c.*6?	2.8?	105?	?	–	*c.*145
LOWLAND ZONE								
Altino (RIEDEL, 1985a)	III-IV c.	732	–	–	–	–	–	–
Torcello (RIEDEL, 1979b)	V-XII c.	1677	11	0.6	?	?	–	?
Monselice *	VI-VII c.	*c.*250	1	0.4	*c.*110	*c.*2/3	2.6?	*c.*95
Via Alberto Mario *	VI-VII c.	*c.*230	6	2.6	–	–	–	–
Calvatone (WILKENS, 1990)	IV-V c.	4158	–	–	15	5	25.0	–
Pavia, Broletto (CARTLEDGE, nda)	VI-X c.	13	–	–	1	–	–	–
	I-XI c.	300	2	0.7	38	6	13.6	8
Pavia, S. Maria Gualtieri (CARTLEDGE, ndb)	V-X c.	158	–	–	6?	?	–	–
Lomello (KING, 1987)	Late Roman	264	–	–	10	–	–	22
Lomello *	VI-VII c.	*c.*50	1	2.0	–	–	–	–
		*c.*107	–	–	1	1	50	–
Vercelli (D'ERRICO *et al.*, 1984)	I-III c.	44	–	–	6	–	–	–
Imola (FARELLO, 1989a; 1989b)	VI c.	25	–	–	3	–	–	16
	X-XI c.	146	3	2.0	8	–	–	–
Luni (BARKER, 1977)	*c.*2-500	180	1	0.6	9	–	–	–
	*c.*6-700	1311	2	0.2	187	–	–	–
	*c.*1000	310	–	–	51	–	–	–
S. Antonino di Perti (GIOVINAZZO, 1992)	VI-VII c.	5757	14	0.2	234?	?	–	–

* preliminary analysis
? domestic and wild species not specified

of Invillino, Monte Barro and S. Antonino, wild mammals represent no more than 3% of domestic and wild species together. For wild bird species, the situation is similar with little correlation being noted between collection size and the number of bones of wild taxa. Avian data for three of the four alpine area sites was not available, thus limiting comparison between zones.

The second question pertains to recovery techniques and species representation (table 2). For those sites where sieving was undertaken, including Pavia, Luni and S. Antonino, large and small game are represented by very few remains or are entirely absent. On the other hand, the sieved deposits of Monte Barro, S. Pietro and Monselice yielded a moderate to large number of fish remains but few wild mammal bones. Hence, even on those sites where «complete» recovery was attempted, wild mammals and in some cases game birds are poorly represented.

The third point of interest pertains to site type. The only sites which yield substantial evidence for the hunting and consumption of large game include the rural settlements and castrum located in the alpine area. The prealpine and lowland sites which include primarily urban centres, cult sites and castra yield less evidence for the consumption of whole animals. The special character of religious settlements may have inhibited the hunting of game (Montanari, 1988; Galloni, 1993). Meat from large animals may have been sold in deboned bone form on the urban market and hence would be unrecognisable in the archaeological record. Alternatively, game did not constitute an important dietary component for town and city dwellers. The data for the castra are surprising in that only one, Ivillino of which the site type is debated, yields substantial evidence for the hunting of large game. The assemblage from Monselice includes limbbones of roe deer and beaver indicating the importation of carcasses to the settlement, although to a much more limited degree than at Invillino. In the case of Monte

Table 2 - Distribution of commestible wild mammal species represented in Late Roman – Early Medieval sites in northern Italy.

Site	Wild taxa Total	*Cervus elaphus*	*Capreolus capreolus*	*Cervidae*	*Rupicapra rupicapra*	*Sus scrofa*	*Lepus/ lagomorpha*	*Ursus arctos*	*Castor fiber*
Alpine Zone									
Invillino-Ibligo	44	30	3	–	1	4	6	–	–
	71	64	2	–	1	3	1	–	–
Stufels Stremitzer	4	2	–	–	–	2	–	–	–
Stufels-Senoner	28	5	–	–	–	11	12	–	–
Innichen	7	2	–	–	–	4	1	–	–
San Valier	26	26	–	–	–	–	–	–	–
Prealpine Zone									
Monte Barro	34	–	–	33	–	–	1	–	–
Lowland Zone									
Torcello	11	8	2	–	–	–	1	–	–
Monselice	1	–	–	–	–	–	–	–	1
Via Alberto Mario	8	4	3	–	–	–	1	–	–
Pavia-Broletto	2	–	1	–	–	–	–	1	–
Imola (X-XI c.)	3	2	–	–	–	1	–	–	–
Luni (*c.*2-500)	1	–	–	–	–	–	1	–	–
Luni (*c.*6-700)	2	–	1	–	–	–	1	–	–
S. Antonino	14	13	–	–	–	–	1	–	–

Barro, a garrison or «*refugium*» inhabited by soldiers and their families (BROGIOLO, 1991; 1993), the surrounding environment may not have supported large populations of cervids. However, the abundant forests of oak and chestnut would have favored the presence of wild boar. The morphological or osteometric distinction between wild and domestic pig is problematic due to potential cross breeding. High fragmentation rates and small sample size increase the difficulties of identification. At both Monte Barro and Monselice, fish and wildfowl were probably consumed on a regular basis. The site sample is small and ideally more rural sites should be examined. It is possible that non-specialist farming communities relied to a greater degree on additional dietary income from the hunting of small game than urban sites or military garrisons.

When discussing species importance, one must also take into consideration element distribution (table 3). Although cervids are identifed in most site collections, the majority of the remains consist of antler fragments. For example, at Invillino-Ibligo, one half of the red deer finds consist of antler fragments. At Monte Barro in Lombardy and at S. Antonino di Perti in Liguria, all of the red deer remains are antler. In general, antler appears in most collections indicating the importance of this material for bone working but not the importance of venison in the subsistence economy. To further support this hypothesis, many of the antler fragments are from shed racks indicating the gathering of raw materials but not necessarily hunting. The presence at some sites of other non-meat bearing bones, such as extremity bones, suggests the working of skins. At Torcello, Pavia, and Via Alberto Mario, Brescia, the cervid remains include phalanges and carpal bones and/or antler, cranial and mandibular fragments, suggesting the importation of skins and trophies but not whole carcasses. The presence of antler and extremity bones but absence of postcranial elements has been noted for various sites in Britain and Europe (Britain, ARMITAGE, 1982: 96; BOURDILLON, 1992: 128; GRANT 1981; Northwestern Europe, LUFF, 1982: 308-311). Invillino and San Valier located in the alpine area are the only sites which yield the major limb bones of red deer, suggesting the procurement of whole animals. Less evidence for the importation of carcasses is available for lowland or prealpine sites.

Table 3 - Distribution of deer and chamois elements.

Site	Taxa	Bones n.	Antler	Cranial/ Dental	Vert./ Ribs	Longbones	Extrem.
Torcello	*C. elaphus*	8	3	1	–	–	4
	C. capreolus	2	–	1	–	1	–
Invillino-Ibligo	*C. elaphus*	238	81	22	3	56	76
(period I-III)	*C. capreolus*	5	1	2	3	–	1
	R. rupicapra	2	–	–	–	–	–
Stufels Stremitzer	*C. elaphus*	2	2	–	–	–	–
Stufels Senoner	*C. elaphus*	5	5	–	–	–	–
San Valier	*C. elaphus*	26	13	7	–	4	2
Via Alberto Mario	*C. capreolus*	3	–	–	–	2	1
	C. elaphus	4	3	1	–	–	–
Monte Barro	*Cervidae*	33	33	–	–	–	–
Pavia	*C. capreolus*	1	–	–	–	–	–
Imola	*C. elaphus*	2	1	–	–	–	1
Luni (6-700)	*C. capreolus*	1	–	–	–	–	–
S. Antonino	*C. elaphus*	13	13	–	–	–	–

DISCUSSION

Comparison of species distributions for the alpine, prealpine and lowland sites is problematic given the differences in sample size, recovery techniques and site type. Taxonomic variety appears to be somewhat greater for settlements in the alpine area although this may be due to sample size in the case of Invillino. At the latter site, the presence of chamois, bear and certain avian species is related in part to the proximity of habitats which include high altitude or isolated areas, however, the movement of goods such as skins may have occurred over long distances as suggested by the presence of bear metapodials in the Pavia assemblage . The frequent identification of wild boar in alpine sites may also be related to the greater availability of this species in the site territory. However, as noted by RIEDEL (1986), subsistence choices are based less on environmental factors than on traditional cultural choices of the site inhabitants. As yet, isolated high altitude settlements have not been investigated thus limiting our knowledge of subsistence variability, particularly for rural settlements.

Although the landscape of the Early Medieval period was characterised by the presence of vast tracts of forest and other wilderness areas, we can not as yet evaluate the density of settlement nor the size and character of properties during this period. Unlike in central and southern Italy where important survey projects have been undertaken (BARKER, 1989), in northern Italy no similar project has been started. Only one small survey of Roman and Early Medieval settlement has been completed in the Lake Garda area (BROGIOLO, 1983). Settlement data are essential for understanding the role of different environments and the potential economic activities which may have been undertaken within the latter. If large uncultivated tracts of land were available in the Po Plain, the prealpine and alpine range, game must also have been present. However, in areas of dense settlement, wild environments may have been overexploited thus limiting available resources (CHERUBINI, 1972; WICKHAM, 1990: 541-542). Woods and non-agricultural lands may not have provided adequate refugia for large game.

The natural population density of cervids is low as these animals require large territories for maintaining health and reproductive rates (REICHELT and GAETANI, 1982). Unlike the later medieval period when the hunting of game was restricted in order to ensure population renewal and stability (and a constant supply of venison for the elite), perhaps during the Early Medieval period substantial populations of large game thrived only in the more isolated and less densely populated areas, such as the alluvial plain of the Po river or in highland zones (or valleys within the latter). The results obtained for Invillino and San Valier suggest that at least in the alpine valleys, large game was hunted and consumed on site. If hunting was undertaken far afield from settlement nuclei, it is possible that carcass preparation was also undertaken at the hunting location. The deboning of carcasses at the kill site would subsequently limit element representation to antler, cranium and extremities (skins) at the location of consumption. Distribution of body parts between potential hunting companions would also reduce the amount of bone which reached individual habitation sites and discard locations. Small mammals, game birds and fish may have provided a more ready source of food for the inhabitants of rural areas than would have large ungulates as suggested by the evidence from Monte Barro and Monselice.

Many generalisations about subsistence have been made for a poorly documented time period on the basis of very specific and possibly biased texts (eg. the Longobard lawcodes). These have been repeated in historical syntheses without verifying the original interpretations nor referring to the available zooarchaeological evidence. The low representation of wild species (mammal, bird and fish) in most Early Medieval sites contrasts with historical interpretation and may find explanation in a number of factors, including archaeological methods and sample size or in the nature and location of the sites themselves. In order to recover bone samples which may be compared and for which the presence or absence of large and small fauna may be assessed, controlled sieving or flotation must be undertaken routinely on site. Improvement in identification methods may also help to distinguish between the wild and domestic forms of certain species. Regional surveys such as those undertaken in Central Italy would also allow an assessment of settlement density in different areas and chronological periods.

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P. BIAGI and J. NANDRIS (eds.) Highland Zone Exploitation in Southern Europe
MONOGRAFIE DI «NATURA BRESCIANA», 20, 1994: 317-338

HASSAN SIDI MAAMAR*

LA CONSERVATION ET LE STOCKAGE DES VIANDES: TECHNIQUES PASTORALES ET GESTION DES BIENS ALIMENTAIRES DANS LES SOCIÉTÉS PAYSANNES ALPINES (VALAIS). ESSAI D'INTERPRETATION ZOO-ETHNOARCHÉOLOGIQUE

SUMMARY – *Meat conservation and storage: pastoral techniques and utilisation of food supplies in the alpine societies of Valais (Switzerland). A zoo-ethnoarchaeological interpretation.* Traditional technics of meat conservation and storage are still practiced in the Upper Valais in Switzerland. A zoo-ethnoarchaeological study of these processing techniques permitted us to construct a reference model which, when applied to known historical facts, allow us to propose explicatory hypotheses. Our approach underlines the necessity of introducing technical evidence and considering the potentiel of the usage/exchange value of dried meat when attempting an interpretation of zoo-archaeological evidence. Hypotheses are advanced concerning the relationship between dried meat production, a pastoral product, and trade during protohistorical times.

RIASSUNTO – *La conservazione e lo stoccaggio della carne: tecniche pastorali e gestione dei beni alimentari nelle società alpine del Vallese (CH): un'interpretazione zooetnoarcheologica.* Nell'alto Vallese sono tuttora in uso alcune tecniche tradizionali di conservazione della carne. Uno studio zooetnoarcheologico di queste tecniche ha permesso la ricostruzione di un modello di confronto che, una volta applicato agli eventi storici, può favorire la formulazione di alcune ipotesi esplicative. Il nostro approccio metodologico sottolinea la necessità di introdurre delle tecniche chiare e tiene inoltre in considerazione la probabile importanza dell'utilizzo e del commercio delle carni disseccate nell'interpretazione dell'evidenza archeologica. L'Autore formula anche alcune ipotesi circa le relazioni fra produzione di carni disseccate, un prodotto pastorale, ed il loro commercio in epoca protostorica.

INTRODUCTION

Conserver des vivres et des produits alimentaires est l'une des préoccupations majeures des sociétés paysannes, l'analyser, celle des anthropologues. Depuis les cachettes de glace des Inuit Eskimos aux grandes chambres froides des boucheries, en passant par les frigos domestiques et les étalages de jambons sur nos marchés, on constate l'importance capitale des modes de conservation dans l'économie. Cependant, quand on se penche sur certains aspects historiques et socio-économiques de ces techniques de conservation, et en particulier pour les périodes pré-et protohistoriques qui n'ont pas de documentation écrite, les questions se multiplient et se complexifient.

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Dans cette optique et conjointement à notre étude archéozoologique de la faune de l'habitat protohistorique (Age du Fer) de Brig-Glis «Waldmatte» (Valais, Suisse), nous avons mené des enquêtes ethnographiques concernant certaines techniques pastorales et vivrières. Dans cet article, on tentera de confronter quelques résultats archéozoologiques aux informations ethnographiques, et plus particulièrement dans le domaine de la production des viandes séchées et salées en Haut-Valais (fig. 1) (1). Dans notre développement, nous tiendrons compte, des impératifs et mutations, socio-économiques du Valais, afin d'élargir nos connaissances et de ne pas nous baser sur les simples «régularités culturelles». Dans cet essai comparatif, nous prenons conscience des difficultés que pose ce mode de réflexion ethnohistorique ainsi que

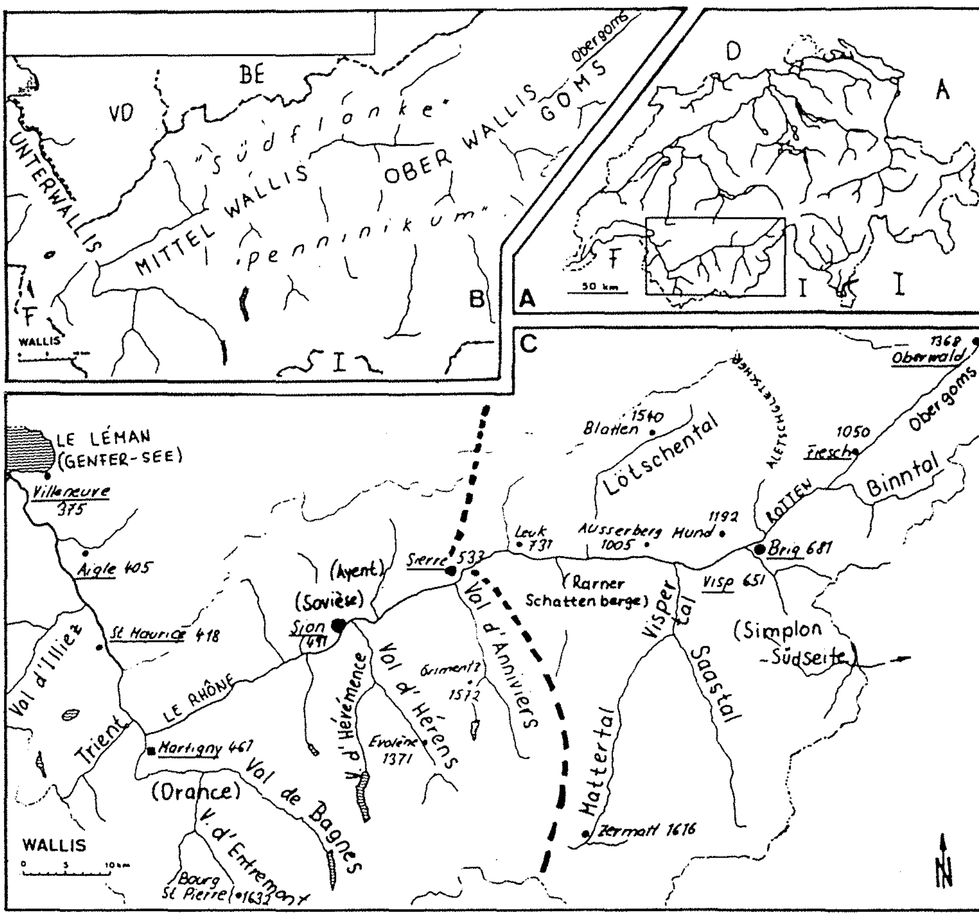

Fig. 1 - Situation géographique du Valais, la partie germanophone (Haut-Valais) est en amont de la ville de Sierre (extrait de Waldis, 1987).

(1) Le Haut-Valais étant la partie germanophone du Valais. Nous tenons à remercier nos informateurs et nos interprètes, pour le patience et l'intérêt qu'ils ont témoigné à l'égard de notre recherche. Raphaella Noti (Brig, alt. m 684), Lotti Stüder (Visperterminen, alt. m 1336), Marcel Jossen (Naters, alt. m 700) et Walter Imhof (Blatten, alt. m 1327).

l'élaboration d'un système analogique entre nos interprétations basées sur le matériel archéozoologique et les informations ethnologiques. D'ailleurs, dans cette perspective comparative il devient nécessaire que les approches ethnoarchéologiques s'emploient désormais à mettre en évidence des hypothèses explicatives, tout en tenant compte des évolutions historiques, au lieu de se contenter de régularités descriptives (Boyer, 1991: 158-160).

LE CONTEXTE ARCHÉOLOGIQUE

Le site de Brig-Glis «Waldmatte» se trouve dans le canton du Valais (fig. 2) dans la haute vallée du Rhône à quelques kilomètres de la ville de Brig, au pied du col du Simplon. Il est localisé sur le versant sud (ubac) de la vallée au-dessus de la plaine du Rhône, au pied du versant du Glishorn, à proximité du village de Gamsen à une altitude d'environ 700 mètres.

Dans le cadre des fouilles de sauvetage en relation avec la construction de l'autoroute N 9 (Sion-Brig), des travaux archéologiques sont menés depuis 1988 par une équipe pluridisciplinaire (ARIA) (2) qui s'est constituée à cet effet sous l'impulsion de Curdy, Mottet et Nicoud.

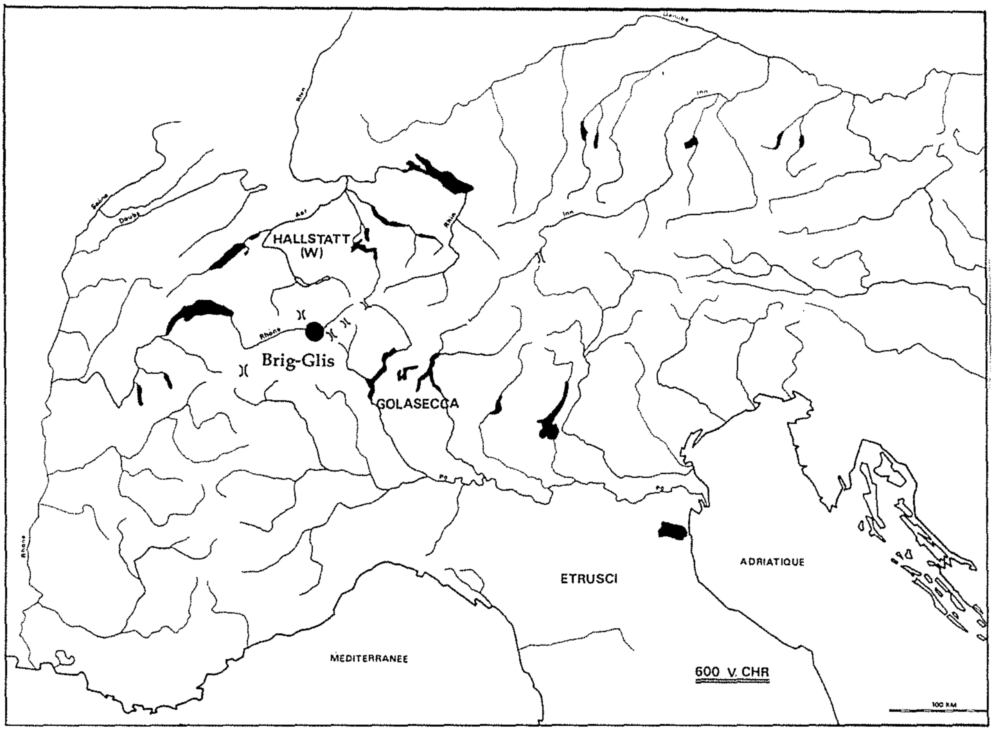

Fig. 2 - Localisation du site de Brig-Glis (Haut-Valais, Suisse).

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(2) ARIA: Archéologie et Recherches Interdisciplinaires dans les Alpes, 5 F.O. Strasse, 3904, Naters, Valais (CH).

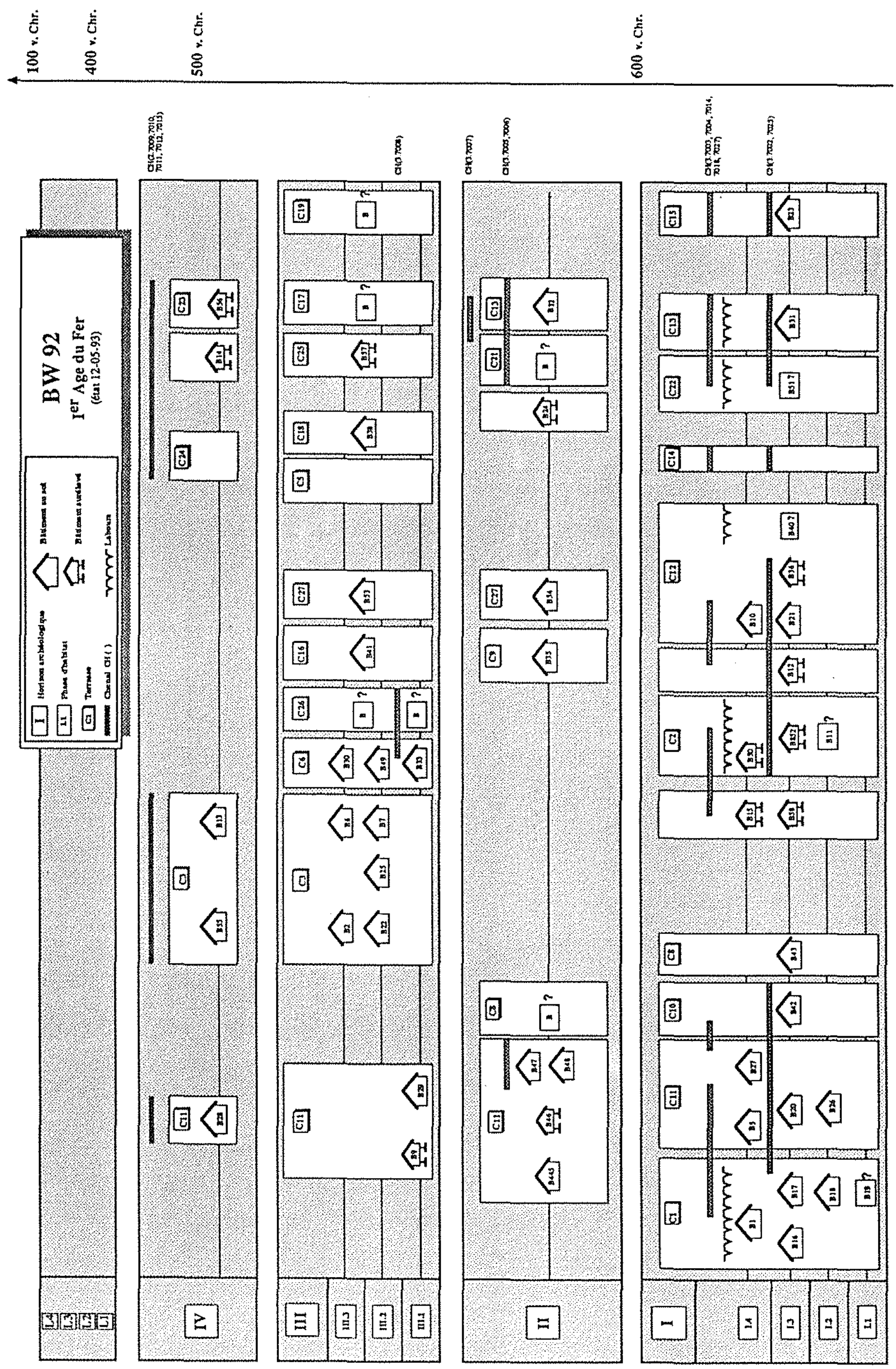


Fig. 3 - Tableau récapitulatif des phases d'habitat et des épisodes torrentiels du 1er Age du Fer.

Ces recherches concernent plusieurs villages ou habitats établis à cet endroit depuis le 7 ème siècle av/J.C. jusqu'à la fin de l'époque romaine (3). Ces villages ont été installés sur des terrasses artificielles (jusqu'à quinze bâtiments contemporains pour certaines phases). Certains bâtiments correspondant à des habitations ou ateliers constitués à même le sol, avec un plancher surélevé, pourraient être interpretés comme des greniers (cette fonction est attestée en certains cas par la grande quantité de graines carbonisées retrouvées dans les décombres incendiés).

Le premier habitat installé vers la fin du 7ème siècle est occupé pendant plus de deux siècles, jusqu'au milieu du 5 ème siècle BC. Cet habitat est subdivisé en 10 phases de constructions s'étalant sur deux siècles environ (fig. 3).

Vers le milieu du 5 ème siècle, cette agglomération est déplacée légèrement en amont. Ce deuxième habitat dont la fouille extensive a débuté en 1992, présente schématiquement environ 8 phases d'occupations avec également une série de bâtiments étagés sur la pente.

LES PREUVES MATÉRIELLES ET L'APPROCHE ZOOETHNOARCHÉOLOGIQUE

Nous tenterons de mettre l'accent sur certaines preuves matérielles pouvant témoigner de la pratique de la conservation des viandes (4). Dans notre cas, il faut rappeler que ces preuves matérielles (témoins archéozoologiques) dépendent essentiellement de l'état de conservation des vestiges osseux.

Le premier aspect abordé est celui des traces de découpe directement observables sur les os. Ces traces de boucherie sont cependant assez fugaces et ne livrent en majorité que peu d'informations. La distinction entre de simples traces de décarnisation et celles imputables à l'exploitation des viandes séchées demeure assez difficile. Cependant, certains éclaircissements peuvent être apportés par les démarches expérimentales (recherche en cours).

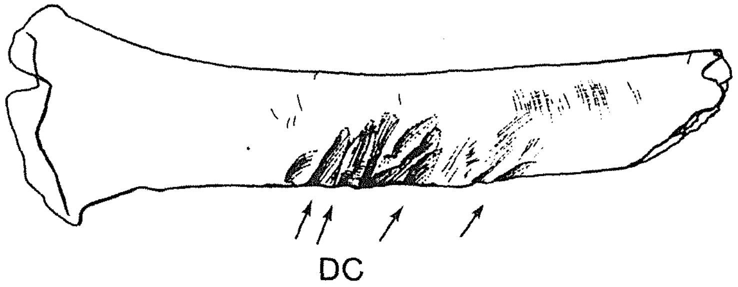


Fig. 4 - Stries de décarnisation (DC) sur un radius de mouton: leur alignement parallèle indique un éventuel prélèvement de viande séchée.

(3) La fouille et l'élaboration des données du site romain sont à la charge d'une équipe oeuvrant sous la tutelle de l'Office des Recherches Archéologiques du Canton du Valais.

(4) Les recherches ethnologiques sur la conservation et le stockage dans les sociétés de chasseurs cueilleurs sont assez nombreuses. Nous renvoyons à la récentee synthèse bibliographique de DUCATEAU (1990). Dans la perspective archéologique, la récente publication de ROWLEY-CONWY et ZVELEBIL (1989) montre bien l'intérêt de ce type d'approche dans les restitutions paléoéconomiques entre autres.

Dans la faune de Brig-Glis (Age du Fer), certains vestiges osseux portant des traces de découpes, indiquent une éventuelle exploitation liée aux viandes séchées (fig. 4), comme le suggèrent les recherches de JOURDAN (1976: 319) sur la faune gallo-romaine de la Bourse à Marseille.

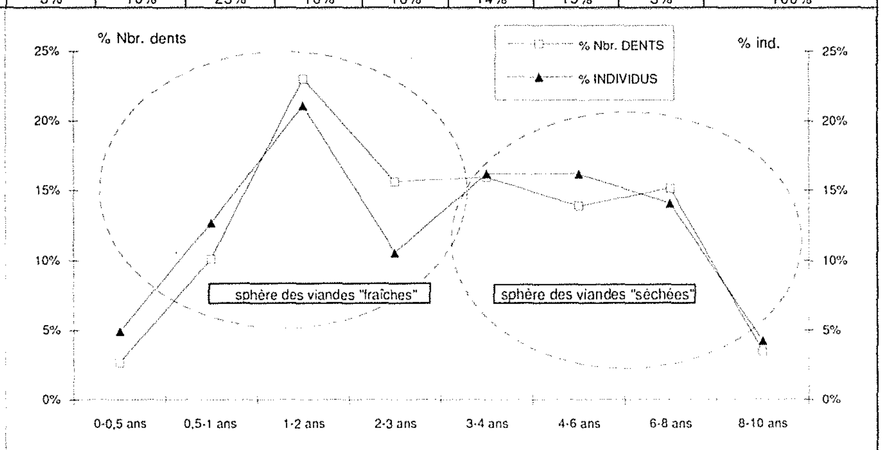
Dans ses travaux sur les viandes séchées chez les Nunamiut, BINFORD (1978; 1981) (5) insiste sur la variabilité de cette exploitation, souvent liée à l'acquisition différentielle des animaux d'une année sur l'autre, ainsi qu'au rôle des carnivores qui détruisent souvent les stocks. Il indique par ailleurs que, certaines années, les fluctuations climatiques ont porté atteinte à certains stocks de viandes séchées.

Dans notre analyse des vestiges osseux de caprinés de Brig-Glis, nous avons essayé d'utiliser d'autres paramètres pouvant contribuer à la mise en évidence de cette technique de conservation.

L'un deux, relatif aux courbes d'abattage, nous fut initialement suggéré par les résultats d'enquêtes ethnographiques menées en Haut-Valais . L'analyse de cette courbe (fig. 5) montre une certaine augmentation de la classe d'âge comprise entre quatre et dix ans. Si l'on se contentait d'une interprétation «classique» de ce type de gestion du cheptel caprin, on serait amené à conclure schématiquement à une exploitation des produits seconds (lait et laine) ou à un éventuel maintien des individus âgés pour la reproduction. Dans certains cas, la présence d'un fort pourcentage de vieux caprins est interprétée comme une forme de «transition» vers

Années	0-0,5 ans	0,5-1 ans	1-2 ans	2-3 ans	3-4 ans	4-6 ans	6-8 ans	8-10 ans	Total
Nbr. dts. Inf.	17	64	146	99	101	88	96	22	633
%	3%	10%	23%	16%	16%	14%	15%	3%	100%

% Nb. Dt.



Individus	7	18	30	15	23	23	20	6	142
% Indiv.	5%	13%	21%	11%	16%	16%	14%	4%	100%

Fig. 5 - Courbe d'abattage des caprinés de l'habitat du 1er Age du Fer de Brig-Glis.

(5) Dans les deux ouvrages que BINFORD (1978; 1981) consacre aux techniques de boucherie des Nunamiut, et malgré la richesse de ses travaux comparatif, l'auteur ne mentionne pas le «possibles» critères pour distinguer l'exploitation des viandes fraîches de celles das viandes séchées.

une économie laitière et s'oppose dans les faits archéozoologiques à une production carnée pressentie par la forte présence de jeunes individus. Ces interprétations paléoéconomiques, d'une logique parfois irréprochable, s'inspirent le plus souvent du modèle proposé par PAYNE (1973: 281-303) et contesté par CHANG et KOSTER (1986: 97-147), qui qualifient ce type de démarche de «modèle putatif», réduisant les autres possibilités interprétatives.

Par ailleurs, les informations ethnographiques (6) montrent que l'une des exploitations d'individus âgés au minimum de quatre ans, est liée à la pratique des viandes séchées. Effectivement, l'un des critères majeurs retenus par nos informateurs pour abattre des bêtes, dont la viande est séchée concerne les animaux âgés (réformés). Ce type de gestion montre le souci d'une certaine rentabilité bouchère recherchée par les populations paysannes, pour éviter un abattage désorganisant le rythme des mises bas et pour un meilleur contrôle zootechnique du bétail caprin. Ces abattages se font essentiellement en automne pour une meilleure gestion du bétail, ainsi que des foins, pendant la période de stabulation (hivernage). Cet abattage concerne essentiellement les individus âgés (mâles et femelles) dont le maintien n'est plus rentable pour la reproduction du cheptel.

Observons maintenant un autre type de documents pouvant nous livrer des informations supplémentaires. Le diagramme représentant le rapport entre le poids et le nombre des restes, par partie anatomique du cheptel caprin (fig. 6), appelle les remarques suivantes:

Les résultats semblent obéir à une «loi normale» régie par la conservation différentielle (dominante des parties les plus solides: mandibules, dents jugales supérieures et inférieures, distums d'humérus et de tibias, proximums de fémurs et de radius, métapodes, phalanges, etc.). Ce diagramme préliminaire démontre que l'exploitation des différentes parties du squelette a eu lieu sur le site. Le rapport absence/présence ne semble pas indiquer de distribution

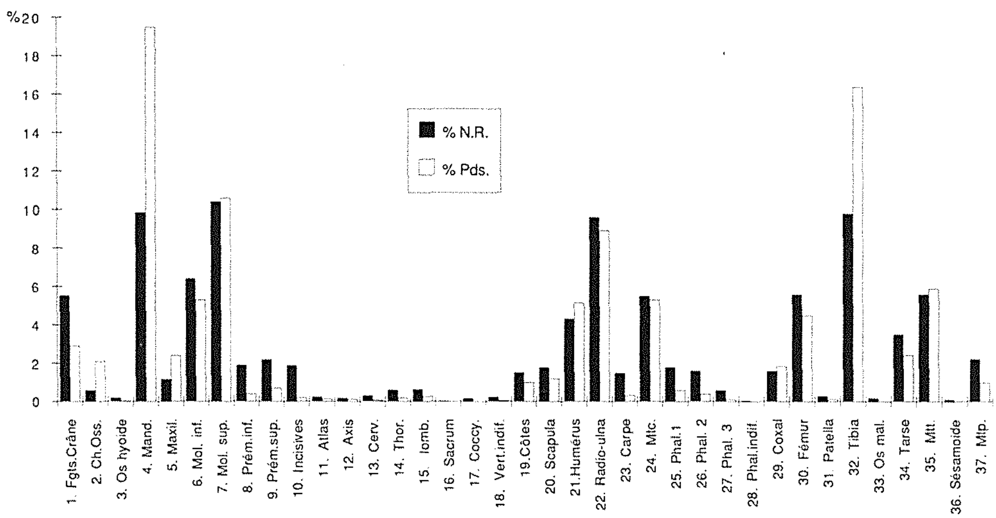


Fig. 6 - Histogramme de la représentation des restes de caprinés (poids et nombre de restes) par partie anatomique.

(6) Nos enquêtes ont principalement porté sur la préparation des viandes de caprinés domestiques (moutons et chèvres).

différentielle des parties anatomiques, impliquant une importation ou une spécialisation dans la production des viandes, à des fins d'échange. Cette distribution des rejets indique, par ailleurs, que la totalité des parties anatomiques est exploitée localement et reflète le produit d'un bestiaire de la table appartenant à cette communauté paysanne de l'Age du Fer, ce qui n'exclut pas, par ailleurs, une production de viandes séchées destinée à une consommation locale. Il faudrait signaler que ce tableau représente la totalité des couches d'occupation, donc une tendance assez générale qui sera réajustée après l'attribution des ossements aux différentes phases d'occupation et leur dispersion spatiale à l'échelle du site (7). La faible représentation du rachis et des grils costaux est imputable à la forte fragmentation de ces derniers (8), ainsi qu'aux différents processus post-dépositionnels particuliers aux sites terrestres.

Les informations ethnographiques (9) concernant la production de la viande séchée (fig. 7), laissent entrevoir que les espèces utilisées pour ce type de pratique dans le Haut-Valais se présentent dans l'ordre préférentiel suivant:

1) les caprinés (moutons et chèvres)
2) les bovins et les suidés

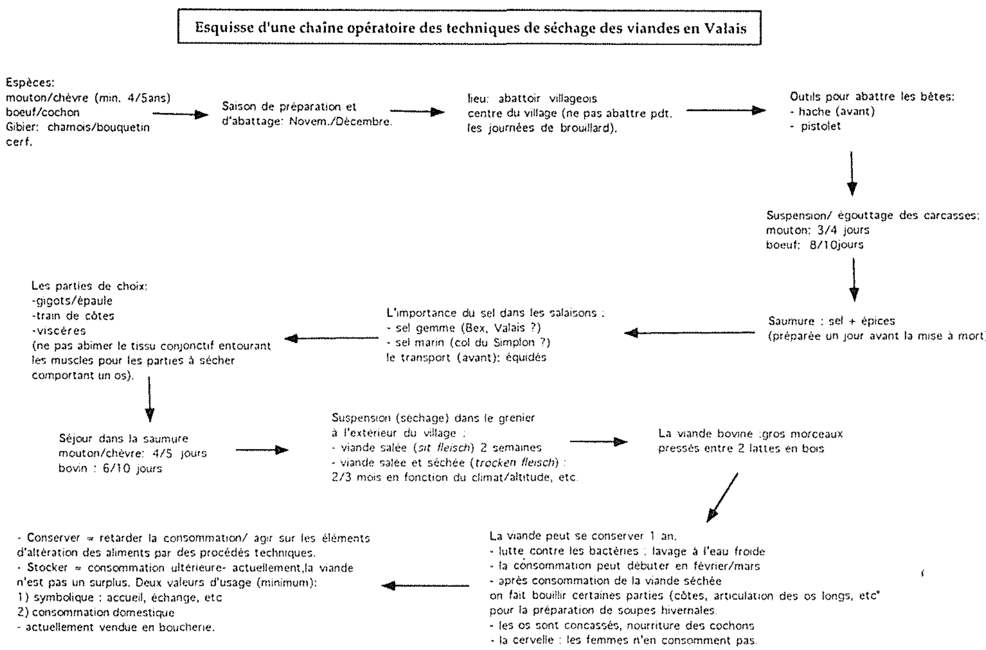


Fig. 7 - Chaîne opératoire des techniques de préparation des viandes séchées.

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(7) Cette recherche est menée dans la cadre d'une thèse en Archéozoologie (Paris 1), dont intitulé est: «Approche Anthropozoologique d'une communauté villageoise alpine à l'age du Fer: analyse de la faune du site de Brig-Glis «Waldmatte», Valais, Suisse».

(8) Lors des déterminations,l'état souvent fragmentaire des vertebrès et des côtes nous oblige à les ranger dans deux grandes classes (petits et grand mammifères) ne tenant pas compte de leurs attributions spécifiques.

(9) Afin de ne pas alourdir le texte de descriptions ethnographiques, nous avons adopté la solution qui consiste à schématiser la totalité des actes techniques liés à la production des viandes séchées.

3) le gibier (chamois, bouquetin et cerf).

Selon nos informateurs, les parties conservées chez les caprinés sont les gigots et les épaules, les trains de côtes, mais aussi les viscères (foie, poumons, etc.) (fig. 8).

Une analyse classique, qui voudrait mettre en évidence les taux de représentation par partie anatomique, selon une hiérarchie distinguant les parties porteuses de viande des parties non porteuses, risquerait de se heurter à une vision anthropocentrique et économiquement réductrice, ne favorisant le plus souvent que certaines parties nobles comme les gigots et les épaules, par exemple.

Nos enquêtes en Haut-Valais, comme nos recherches comparatives (Chaix et Sidi Maamar, 1992; Sidi Maamar, 1993) montrent que la quasi-totalité de l'animal est consommée (crâne, métapodes, viscères etc.).

A cet effet, une restitution des quantités de viandes consommées sur le site protohistorique de Brig-Glis doit tenir compte de ce type de gestion de la masse carnée et des abats (Vigne, 1988: 203-205).

On remarquera aussi qu'actuellement la majorité des viandes est conservée à l'extérieur des maisons, dans des greniers surélevés (fig. 9 et 10) qui servent aussi au stockage des céréales et d'autres denrées alimentaires. Ce type de structure est attestée sur le site de Brig-Glis, grâce à sa particularité architecturale et à son contenu de graines carbonisées.

Les conditions (taux d'humidité, altitude,exposition au soleil, etc.) et les lieux de conservation jouent un rôle primordial dans cette chaîne opératoire.

Ce type d'analyse, même ponctuel, indique l'étroite interaction des facteurs écologiques et techno-économiques dans l'étude des chaînes alimentaires actuelles ou protohistoriques.

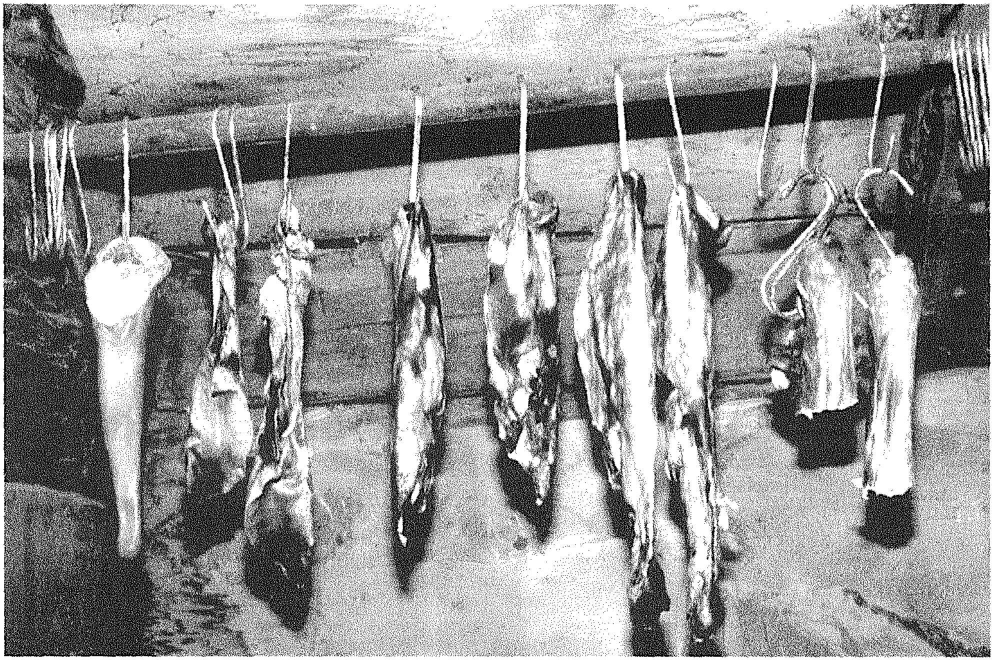

Fig. 8 - Langue et viscères en cours de séchage dans un grenier familial à Visperterminen (Haut-Valais).

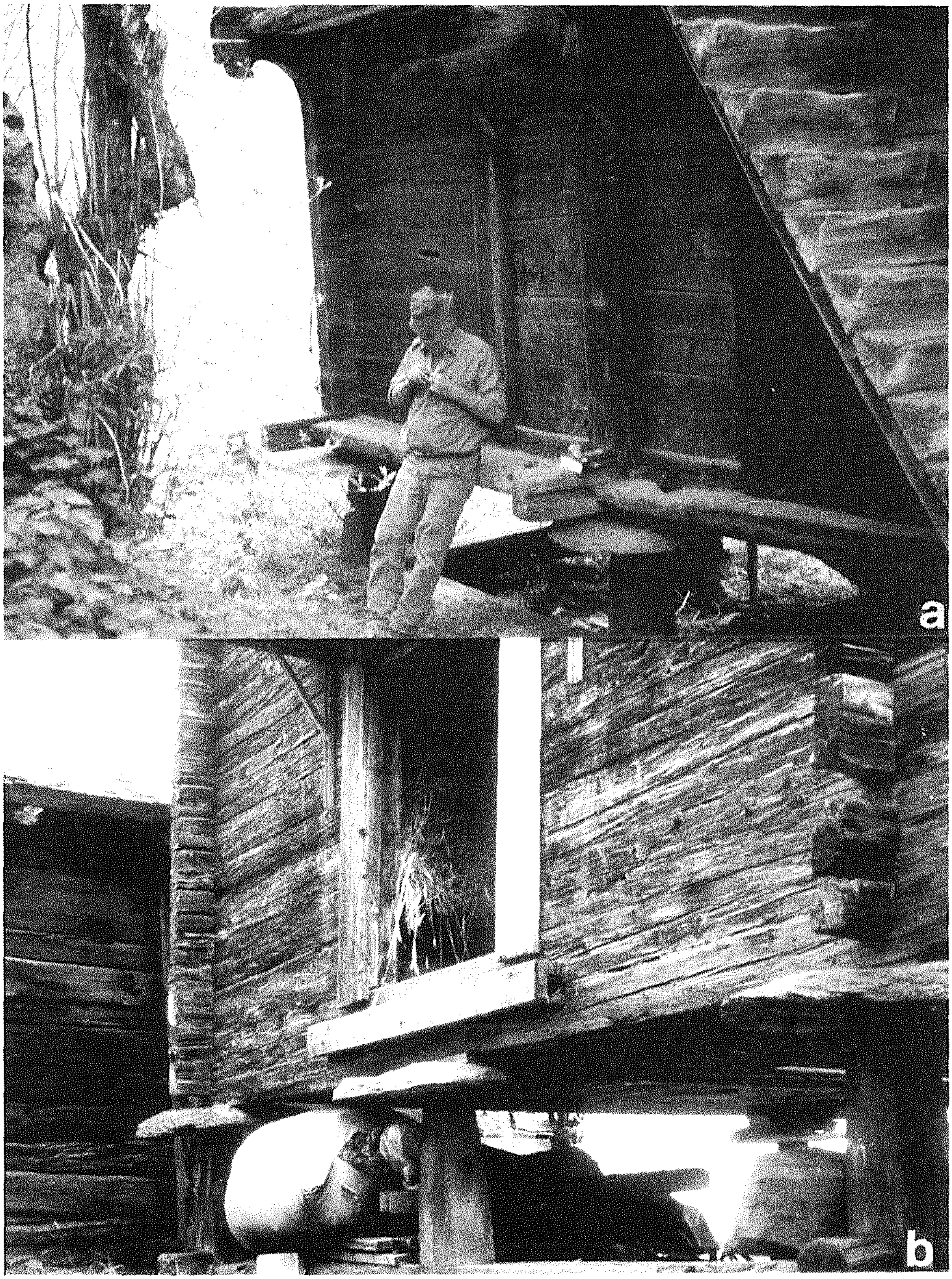

Fig. 9a/b – Greniers surélevés pour le stockage des viandes (Blatten, Naters) ou des céréales (Hegdorn, Naters) en Haut-Valais.

LA VIANDE SÉCHÉE: UN FAIT TECHNIQUE

L'analyse des modes de transformation des produits carnés (viandes fraîches) en denrées alimentaires, pour une consommation ultérieure, ne peut être perçue comme un simple acte technique distinct du produit achevé. L'étude des différents processus techniques mis en place, depuis le choix de la bête (espèce, âge, sexe, robustesse, etc.) et les techniques de mise à mort jusqu'à l'efficacité des modes de conservation, est une somme de travail répondant à un besoin social et débouchant sur une pratique technique avec son efficacité et ses expériences, pour la production d'un bien social ayant son propre système de valeurs.

Cette activité technique ne peut être interprétée sans se référer à la totalité des pratiques pastorales et vivrières: de la gestion du cheptel à l'exploitation des produits seconds (lait, peau, viande, excréments, laine, sang, os) que cette dernière soit matérielle ou idéelle (DESCOLA, 1986; GODELIER, 1984).

Pour l'Europe septentrionale, SHERRATT (1981: 261-305; 1983: 90-104) postule que c'est à l'Age du Bronze (1er millénaire av/J.C.) que ce type d'activités acquiert un statut social mobilisant tout un ensemble de savoirs et de techniques et appelant de surcroît une certaine spécialisation dans les pratiques pastorales. A cet égard, BAILLOUD (1975: 185-186) est très explicite, car il mentionne: *«A l'âge du bronze enfin, le troupeau n'est plus seulement fournisseur de viande. Nous avons déjà parlé de l'emploi du boeuf et du cheval pour le trait et la monte. L'utilisation du lait se généralise, et l'on retrouve maintenant partout des faisselles pour la fabrication du fromage. Les fusaïoles, qui se multiplient à partir du début de l'âge du bronze, attestent le développement de l'industrie du textile».*

La préparation des viandes séchées, salées ou fumées semble d'une relative «simplicité», mais en la restituant dans un procès de travail, elle manifeste une diversité des traitements qui détermine, en partie, la forme du processus technique. Un exemple socio-historique cité par LÉVI-STRAUSS (1968: 396) peut illustrer cette diversité de traitements: *«C'est sous l'influence italienne que la cuisine française a découvert la riche panoplie des viandes crues...».* Le carpaccio, le jambon de Parme, le Jambon d'Aoste, la pancetta et la coppa illustrent bien cette variété de la charcuterie italienne.

Dans un article consacré aux techniques de fumage chez les romains, N. BLANC (1989: 76-77) s'appuie sur les textes des agromones grecques et latins (Strabon, Varron) pour indiquer l'importance des procédés techniques liés aux fumages et aux salaisons des viandes de porc essentiellement dans les économies rurales et domestiques du 2 ème et du1 er siècles av/J.C.

C'est ce procès de travail qui détermine le moment où sont mis en oeuvre les moyens techniques (savoirs, gestes et outils) et c'est là que le fait technique prend toute sa dimension de fait social (BONTE, 1985b: 19-48). Ce fait socio-technique ne peut être analysé sans tenir compte du système de valeurs sociales qu'il introduit (BARRAU *et al.*, 1973).

Ce système de valeurs, qu'on peut accorder aux viandes séchées comme produits alimentaires, contribue à la caractérisation du fait technique.

Les valeurs attribuées à la viande (MÉNIEL, 1987: 67), qu'elle soit fraîche ou séchée, dépendent essentiellement de la place qu'occupe ce produit carné dans les valeurs d'usage et d'échange à l'époque protohistorique et historique (VIALLES, 1988: 86-96; ETHNOZOOTECHNIE, 1992; BRUN, 1989: 47-48).

A cet effet, on voudrait mettre en évidence l'impact de certaines techniques de conservation des viandes et le transfert de ce produit d'une catégorie de valeurs vers une autre et comment s'articulent entre elles ces différentes valeurs.

VIANDES SÉCHÉES: VALEUR D'USAGE ET VALEUR D'ÉCHANGE

D'abord, rappelons que la viande n'est viande (que ce soit la langue de boeuf, le steak ou le filet) que lorsqu'elle est consommée comme telle; ce qui lui attribue une valeur d'usage alimentaire étroitement liée à son mode de consommation. Cependant, la viande fraîche sans aucune transformation technique au préalable demeure une denrée périssable, dont la valeur d'échange peut-être réduite dans les échanges à longue distance. On pourrait dire que sa valeur d'échange se limite au rayon domestique ou villageois.

Par ailleurs, avec l'avènement et la diffusion des techniques de salaison, les viandes séchées peuvent non seulement être consommées à l'échelle domestique et villageoise, mais acquièrent une certaine capacité au transport, ce qui leur attribue une valeur d'échange. Cette valeur d'échange est certes abstraite, car il ne peut y avoir de valeur d'échange sans valeur d'usage.

Cette dernière (valeur d'usage) ne s'inscrit pas dans le champ de l'économie marchande, contrairement à la valeur d'échange que peuvent introduire les viandes ayant subi un processus technique leur permettant une longue conservation (fig. 10).

Après ces formulations et avec une certaine prudence, on peut donc considérer qu'à

Fig. 10 - Différents morceaux de viande (porc et mouton) en cours de séchage (décembre) dans un grenier à Visperterminen.

l'époque protohistorique les viandes séchées, salées et fumées s'inscrivent dans le vaste champ d'échange et de commerce, comme le suggère BAILLOUD (1975: 194): *« Une industrie alimentaire qui se développe dès le début de l'âge du fer est celle du sel et des salaisons; de très nombreuses installations de fabrication du sel (...). Le sel fait l'objet d'un négoce actif et son usage se répand partout. Outre l'assaisonnement des mets, on l'utilise à saler la viande qui, mise en conserve dans de grands saloirs en terre cuite, peut pour la première fois être aisément commercialisée».*

Pour que les viandes, comme le bétail ou le sel puissent obtenir une valeur d'échange, il faut qu'ils soient pensés et rationalisés en terme d'utilité.

Par ailleurs, c'est dans ce système d'interactions que l'on peut évaluer l'une des valeurs marchandes du sel dans l'histoire des communautés protohistoriques.

Evoquons au passage qu'actuellement la production des viandes séchées s'inscrit dans les quatre logiques suivantes, selon le schéma conceptuel proposé par BAUDRILLARD (1972: 154-168):

1) la logique des opérations pratiques où l'on consomme la viande à l'échelle domestique et villageoise;
2) la logique de l'équivalence où cette denrée acquiert une valeur d'échange (on peut l'échanger contre une autre denrée alimentaire ou contre un service rendu);
3) la viande séchée apparaît actuellement comme un véritable médiateur lors des fêtes villageoises, des banquets, etc. Elle assume donc le rôle d'un objet dans un circuit d'échange symbolique;
4) On constate qu'aujourd'hui en Valais, les viandes séchées comme le bétail bovin (race d'Hérens) et ovin (mouton à nez noir) ont acquis un certain pouvoir «fétichiste» et s'inscrivent par cette modalité dans une logique de différence/distinction. Pour illustrer cette logique de valeur/signe, il suffit de noter les réticences que témoignent les Valaisans quand on confond la viande séchée du Valais avec celle des Grisons (canton en Suisse orientale).

Notons au passage que dans l'échange symbolique, tel qu'il a été défini par MAUSS (1985: 145-279), les viandes peuvent ne pas avoir une réelle valeur d'échange. Cependant, à l'époque protohistorique, nous sommes à une période charnière où l'économie-monde (BRUN, 1987) se met en place par de multiples stratégies commerciales qui nous autorisent à concevoir les viandes séchées, fumées ou salées comme un «objet» d'échange.

A propos de la notion d'économie-monde (BRUN, 1992: 189-190), met en garde le lecteur sur les éventuelles confusions qu'elle peut introduire quant à son application aux époques protohistoriques et antiques. Il souligne les positions théoriques de BRAUDEL (1979) qui divergent de celle de WALLERSTEIN (1980). Ce dernier réduit cette notion au système capitaliste et à son émergence à la fin du 15 ème siècle. Pour notre part, on trouve cette notion d'une grande fécondité théorique dans les problématiques anthropozoologiques. Elle introduit le bétail et son système de valeur dans une réflexion plus large: celle de le voir participer aux économies vivrières et aux échanges entre les cités et les agglomérations (centre, semi-périphérie et périphérie) protohistoriques et antiques (SIDI MAAMAR, 1990: 26-27). A cet égard, il serait fructueux d'envisager par exemple les différents degrés de la diffusion des équidés à l'échelle continentale (Europe), en tenant compte du rôle prépondérant de certaines sociétés dans ce vaste système d'échange de biens (bétail) et de connaissances (savoirs zootechniques) à des périodes précédant parfois les économies monétaires.

LA VIANDE SÉCHÉE: PRODUCTION SOCIO-ÉCONOMIQUE

Dans un souci de formulation théorique et pratique des biens de consommation, nous voudrions présenter quelques réflexions concernant les viandes séchées dans le vaste champ de l'économie domestique. Dans les tentatives d'interprétation sociologique, l'archéologie s'est souvent accaparée certains concepts de l'anthropologie économique sans se soucier de leurs modalités d'usage (10). Il est certes difficile dans le cadre de cet article de cerner la totalité des notions utilisées tel le surplus (HALSTEAD, 1989: 68-80), l'économie d'autosubsistance, la thésaurisation, le stockage, l'échange, etc.

Fig. 11 - Conservation du Pain de seigle (arrière plan) et des viandes dans un grenier à Visperterminen.

(10) Voir à ce sujet, l'aperçu épistémologique de TILLEY (1981) sur le différentes orientations d'»Ecoles» dans les interprétations économiques appliquées aux sciences sociales.

Le stockage des denrées alimentaires et leur consommation à l'échelle de l'unité domestique sont une activité spécifiquement économique. Les prestations de cadeau, l'échange d'objets ordinaires ou de prestige, les compétitions qu'introduisent le don et le contre-don, ainsi que les offrandes rituelles ou autres, sont des réalités sociales dont l'objectif n'est pas seulement économique, mais appartient à la complexité du fait social. L'activité économique peut être définie comme la production, la répartition et la consommation des biens et des services (GODELIER, 1965: 35).

Dans cette perspective, la production des viandes séchées n'est envisageable qu'en étroite interaction avec les productions pastorales.

La préparation des viandes séchées, dans les sociétés paysannes actuelles en Valais, constitue un stock alimentaire à l'échelle de la maisonnée. Ce stock est principalement consommé dans le cadre de la famille, réduite ou élargie. Il est rarement commercialisable, il peut cependant intervenir dans les réseaux d'échange. Il assure une certaine dimension «sécuritaire» pour subvenir aux besoins des familles pendant les saisons creuses (hiver, début du printemps) (fig. 11).

A l'échelle domestique, ce stock n'est jamais considéré comme un surplus (11). A l'échelle d'une maisonnée ou d'un village il assume sa valeur d'usage alimentaire. La constitution des ces stocks n'est pas considérée comme une forme de thésaurisation de biens. En revanche, elle a une répercussion directe sur les techniques de gestion du cheptel avec des dates d'abattage bien réparties sur l'année (novembre essentiellement et quelques bêtes au printemps). Ces mêmes stocks constituent une alternative qui n'implique pas seulement un moyen de contourner les disettes, comme l'a suggéré O'SHEA (1981: 167-183). Ces stocks sont aussi un moyen de régulation et de gestion des produits vivriers. Le souci de gestion et de conservations des biens alimentaires (viandes) est dèja bien présent en Valais au 14 ème siècle, comme nous le signale DUBUIS (1990: 212): *«La grande préoccupation du paysan est de faire durer le peu de viande qu'il retire de ses bêtes, en la conservant, par dessication, par salaison ou, pourquoi pas, en profitant du froid de l'hiver montagnard».*

Stocker de la viande, dans la société agro-pastorale valaisanne, permettait (et permet encore de nos jours, dans certains cas) au groupe domestique de disposer de viande pendant la période couvrant les mois de mars à novembre, soit une durée d'environ neuf mois. La commercialisation actuelle des viandes séchées (importation d'Argentine, entre autres) sur le marché a quelque peu modifié ces habitudes. Ce monopole commercial excercé par les étals de bouchers est déjà présent au 13 ème siècle en Valais, sous l'impulsion des seigneuries rurales (DUBUIS, 1990: 263-265).

Ces mêmes stocks permettent à certains membres du groupe domestique de se nourrir lors de leurs déplacements, liés aux activités agro-pastorales (jardinage, fourrage, transhumance, etc.) et donc de jouir de ces denrées pendant leur mobilité saisonnière. La gestion de ces stocks exige une grande dextérité, car le procès de consommation est presque «quantifié» pour une meilleure répartition des réserves sur le reste de l'année.

Cependant, certains de nos informateurs nous précisent que ce calcul est aléatoire, car il était quelquefois perturbé par les fêtes, les naissances, ou des périodes de disette où le partage communautaire s'imposait. Actuellement, l'activité de stockage des denrées alimentaires est une forme de «capital» domestique n'impliquant pas forcément une hiérarchisation sociale complexe.

(11) Selon SAHLINS (1976), le mode de production domestique s'oppose dans son principe à la constitution de surplus.

Nous pensons que c'est plutôt l'appropriation du bétail ainsi que son statut symbolique qui ont pu jouer un rôle important dans l'organisation de la famille et du pouvoir politique et villageois à l'époque protohistorique, comme le suggère l'exemple de certaines sociétés pastorales d'Afrique de l'Est (Bonte, 1985a).

C'est dans cette dimension économique des faits sociaux, que l'utilisation des viandes séchées devient une stratégie de production et de consommation des biens alimentaires dans les sociétés agro-pastorales.

LES VIANDES SÉCHÉES, LE SEL ET LES ÉQUIDÉS

Sans détailler l'importance des échanges et du commerce dans la constitution des agglomérations protohistoriques (Brun, 1992: 189-205) on voudrait attirer l'attention sur la place qu'occupent le bétail et la viande dans le monde celtique. L'étude de la faune de Brig-Glis «Waldmatte» étant en cours, il est difficile d'envisager le rôle économique du bétail ou des viandes séchées dans le réseau d'échange local, régional et intra-alpin. Cependant, la multiplicité et la richesse des questions historiques, nous incite à développer certaines considérations théoriques.

Dans leur ouvrage sur les villes, villages et campagnes de l'Europe celtique, Audouze et Buschsenschutz (1989: 158) signalent que la salaison est attestée chez les Gaulois et que cette technique a dû se répandre dès le Hallstatt ou même à l'Age du Bronze final au moment où les briqueteries et les mines de sel se sont développées. Ce point de vue est fort suggestif, car il suppose qu'il existe probablement une relation structurelle entre l'exploitation du sel et les techniques de salaison d'une part, l'exploitation du sel et l'intensification de l'utilisation et de la diffusion des chevaux comme moyen de transport, d'autre part (Méniel, 1987: 33-46). L'image du cheval perçu comme un bien de prestige et outil de guerre en Protohistoire et dans le bestiaire celtique a souvent occulté un autre aspect plus matérialiste: celui de le voir participer au quotidien à une économie domestique. Le problème de l'introduction du cheval en Valais inspire à Jacky (1943: 497) la réflexion suivante: *«Mais, nous avons tout lieu d'admettre que la production de ces animaux au pays même était minime et que, de tout temps, les habitants ont préféré se pourvoir au dehors, en Chablais, par les cols alpins, avec les populations des versants sud des Alpes pennines, régions dans lesquelles l'élevage des espèces chevaline, asine et mulassière surtout a été pratiqué dès les temps les plus anciens».*

Malgré l'importance des chevaux dans les cultures celtiques, les sociétés montagnardes recherchent davantage les hybrides (Bonte, 1981: 33-49) appréciés pour leur robustesse et leur résistance aux intempéries, et leur adaptation aux reliefs escarpés, etc. (Guénon, in Jacky, 1943: 562-563; Blanc, 1983: 222). La fragilité physique du cheval ne lui a laissé que peu d'alternatives dans le milieu alpin. Une «innovation» zootechnique, celle de la «création» d'un équidé hybride, le mulet, prend le relais dans les cultures montagnardes où il assurait, avec une certaine réussite, le rôle d'animal transporteur avant l'avènement de l'hélicoptère...

Néanmoins, ce postulat demeure seulement vérifiable pour les périodes historiques (archives, textes etc.). Pour l'Age du Fer il reste à l'état hypothétique, car la question du mulet et la proximité de sa morphologie osseuse avec le cheval rend la distinction des deux assez difficile. Dans l'arc alpin, cet aspect de la recherche anthropozoologique est encore mal documenté. Par ailleurs, la présence du mulet dans les Alpes cache un autre problème archéozoologique qui est celui de l'un de ses ancêtres: l'âne. Les différentes modalités de l'introduction des asiniens en Europe occidentale demeurent une question ouverte (MÉNIEL, 1987: 37, pour la France; ALTUNA et MARIEZKURRENA, 1986: 125-130, pour le Pays Basque), même si certaines sources (VOLF, 1974: 489-490) désignent les Etrusques comme les potentiels introducteurs de cette espèce en Etrurie pendant l'Age du Bronze. Dans cette perspective, il serait souhaitable de documenter cet aspect historique par l'analyse des faunes étrusques pour apporter quelques éclaircissements archéozoologiques à ce vaste dossier.

Dans un autre registre, la place et le rôle du sel sont assez bien documentés pour les périodes historiques et préhistoriques (BERGIER, 1982; GOULETQUER et KLEINMANN, 1972; GOULETQUER, 1988), cependant, l'histoire du sel dans les Alpes et dans les sociétés montagnardes (NANDRIS, 1990: 7-22) aux époques protohistorique et historique mériterait plus d'attention.

L'importance de cette denrée dans les économies domestiques et villageoises n'est plus à démontrer. En Valais, l'exemple du monopole exercé par la famille Stockalper sur le commerce du sel à Brig, au 17 ème siècle, est une bonne illustration du statut du sel dans les économies montagnardes. C'est dans cette perspective historique qu'une ethnohistoire du sel (LEMONNIER, 1991: 658-659) dans l'espace alpin serait un terrain de recherche riche de promesses. Comme nous venons de le voir, l'association du sel, des salaisons et des équidés est une hypothèse historique, pour tenter d'expliquer le rayonnement et le développement techno-économiques des civilisations alpines à l'époque protohistorique.

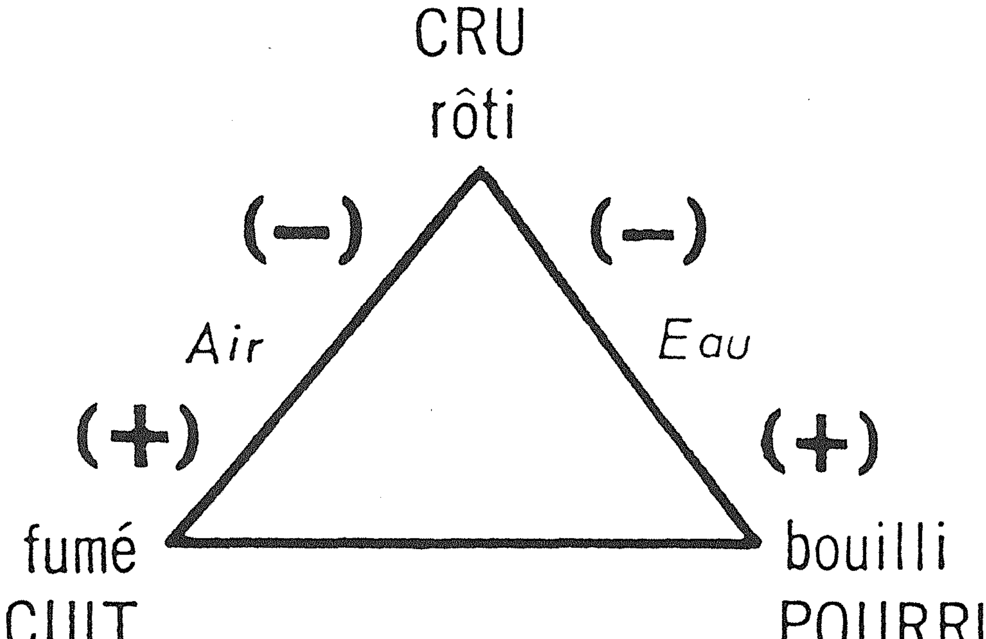

Fig. 12 - Le triangle culinaire selon LEVI-STRAUSS (1968: 406).

LE STATUS DES VIANDES SÉCHÉES DANS LA LITTÉRATURE ANTHROPOLOGIQUE: QUELQUES REPAIRES

Dans son chapitre consacré à l'origine des manières de la table, LÉVI-STRAUSS (1968) établit une classification des différentes modalités de préparation des viandes. Il introduit ce chapitre en précisant que les nourritures se présentent à l'homme dans les trois formes suivantes: crues, cuites et pourries. Sa classification oppose le rôti, qui appartient à la nature, au bouilli, qui appartient à la culture. Le rôti est relégué au stade de la nature, car le contact au feu n'est pas considéré, par l'auteur, comme un mode de transformation culinaire digne de la culture. En effet, Lévi-Strauss définit le feu comme un élément physique évacuant la dimension culturelle des nourritures.

Dans sa conceptualisation des préparations alimentaires sous forme de triangle culinaire (fig. 12), l'auteur mentionne le voisinage du rôti et du cru d'un côté et celui du bouilli et de la viande fumée de l'autre. La dichotomie établie entre le cru (naturel) d'un côté et le cuit (culturel) réduit la multiplicité des pratiques alimentaires. A cet effet, il faudrait songer à la cuisine japonaise qui présente le poisson cru comme un met hautement élaboré...

En abordant les viandes fumées, Lévi-Strauss se contente d'indiquer la distinction technique avec les viandes rôties. Il précise à se sujet que la couche d'air qui s'interpose au moment du rôtissage est minimale par rapport à celle qui s'interpose au fumage. La viande

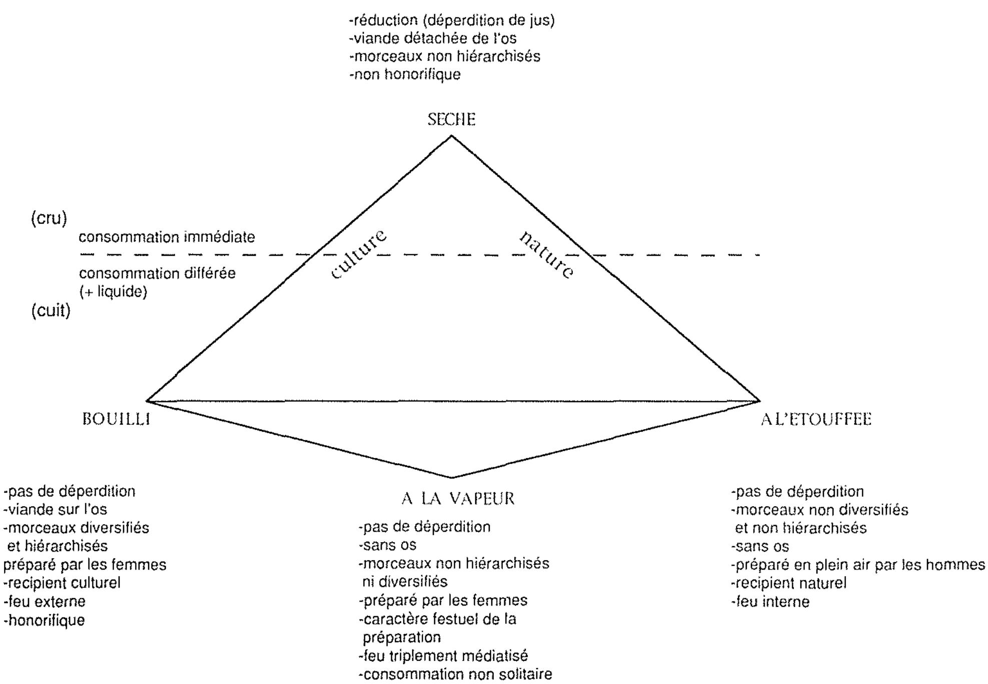

Fig. 13 - Le «double losange» mongol: les différentes préparations des viandes en Mongolie (extrait de HAMAYON, 1975: 115).

séchée ne trouve pas de catégorie stable dans les classifications qu'il préconise. Il se contente de noter que les viandes séchées à l'air libre se décomposent plus vite que les viandes préalablement salées ou fumées. Il mentionne par ailleurs que la viande séchée est éloignée du rôti et du bouilli, car elle ne subit pas l'action du feu, il la range dans une catégorie intermédiaire en lui accordant le statut de viande presque crue.

C'est simplement en abordant les techniques de préparation des viandes séchées à l'air libre que l'auteur établit un rapprochement entre la viande fumée et la viande salée.

En traitant des techniques de préparations alimentaires et culinaires chez les mongoles, HAMAYON (1975: 99-122) précise le statut des procédés de séchage et de fermentation et leur importance dans le quotidien. Pour mieux conceptualiser ses observation HAMAYON (1975: 115) revoit et reconsidère le triangle culinaire de Lévi-Strauss, en lui accordant une dimension géométrique supplémentaire et une profondeur explicative enrichissante (fig. 13).

Cette incursion nous a permis de mettre l'accent sur la difficulté classificatoire du traitement des produits carnés (VIALLES, 1987) dans le vaste champ anthropologique.

Le problème classificatoire de la conservation des viandes a été également abordé par LEROI-GOURHAN (1973: 171) qui signale le point suivant: *«Il serait utile d'établir une classification culinaire en rôtis, bouillis, ragoûts, fritures etc., mais les documents sont encore incomplets et l'effort n'a que rarement été tenté».*

Pour notre part, nous proposons que ces dernières soit subdivisées selon leurs procédés techniques, de la manière suivante:
- les viandes séchées sans aucun adjuvant;
- les viandes salées (à sec ou avec macération);
- les viandes fumées.

Ces catégories peuvent aussi être associées l'une à l'autre. Par ailleurs, nous indiquerons que ces techniques de conservation sont indépendantes des lieux où les viandes seront entreposées (à l'air libre, en grenier, en cave, etc.), ainsi que des différents traitements culinaires que ces dernières peuvent subir par la suite: consommées telles quelles ou avec des liquides (huile, vinaigre, etc.). Ces opérations interviennent donc différemment dans l'analyse de leur chaîne opératoire, bien qu'elles soient en étroite interaction dans la vie domestique.

CONCLUSION

A travers cette expérience alpine, on voudrait conclure sur un aspect qui peut sembler éloigné de nos préoccupations mais qui n'en est pas moins un de nos soucis majeurs: celui de la prise en considération des populations locales vivant sur le territoire de l'investigation archéologique. L'archéologue s'interrogeant sur une culture matérielle du passé, s'intéresse essentiellement aux individus ayant conçu cette culture. Cependant, la communauté archéologique devrait attacher plus d'intérêt à la compréhension de la gestion matérielle et idéelle de la culture des populations actuelles dans leurs zone de travail, dont elle étudie le passé. Dans cette «rencontre» permanente, on ne doit pas négliger les connaissances que peuvent nous procurer ces populations sur leur quotidien, afin d'élargir nos connaissances historiques.

Ces savoirs et ces connaissances sont les éléments majeurs de nos raisonnements analogiques. Le choix d'une information (base) archéologique ou archéozoologique pour atteindre de nouvelles connaissances sur un objet moins connu (cible) utilise la démarche comparative comme moyen d'enrichir les scénarios possibles, que le raisonnement déductif ne peut plus fournir (BOURRELY et CHOURAQUI, 1992: 33).

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