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^{14}C datings of three mesolithic series of Trento Basin in the Adige Valley (Vatte di Zambana, Pradestel, Romagnano) and comparisons with mesolithic series of other regions

ABSTRACT

Radiocarbon datings of samples from Mesolithic deposits of prehistoric settlements near Trento, along the right side of the Adige Valley (Vatte di Zambana, Pradestel and Romagnano III shelters), are discussed. The following chronology, in terms of conventional ^{14}C ages, is derived for the important Mesolithic sequence of this area: Early Sauveterrian phase industries: 7950 ÷ 7400 B.C.; Middle Sauveterrian phase industries: 7400 ÷ 6550 B.C.; Recent Sauveterrian phase industries: 6550 ÷ 6200 B.C.; Final Sauveterrian phase industries: 6200 ÷ 5800 B.C. The beginning of the early Castelnovian phase is fixed at about 5800 B.C. and that of the middle Castelnovian phase at about 5000 B.C.; the appearance of ceramics associated with a Castelnovian industry is placed at about 4500 B.C.

This chronology agrees with radiometric datings of other deposits in centre-northern Italy containing Sauveterrian and Castelnovian industries and corresponds well to Sauveterrian-Castelnovian sequences of other regions (East Spain, South France).

Finally, the possibility of dating Mesolithic sites in the height range 1800 ÷ 2300 m on the Dolomites and on the Aurine and Sarentine Alps through typologic correlations with the Adige Valley series taken as a reference, is briefly discussed. This allows to suggest a model for the use of the territory by the Mesolithic groups settled in the Adige basin.

The datings of the Mesolithic deposits of the Adige Valley and of the morphologies showing the high altitude Mesolithic deposits on the Alps allow to draw important conclusions concerning the phenomena which determined the present morphology of the Adige Valley and of the mountain areas.

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PRELIMINARY REMARKS

1 – The right side of the Adige Valley, near Trento, shows a large detrital talus generated by degradation of the slope in non-equilibrium conditions, after the retreat of the Würmian glacier (*Bartolomei, 1974*). Quarry work of the detrital materials revealed various deposits in which more or less anthropized layers are interbedded to debris without human evidences. The age of the anthropized deposits is to be placed between the beginning of the Mesolithic and the Roman Era (*Bagolini, 1980*).

From 1967 to 1975 researchers from Museo Tridentino di Scienze Naturali and from the University of Ferrara (A. Broglio, G. Bartolomei, B. Bagolini and coworkers) carried out excavations in three important Mesolithic series discovered in the following regions: small Vatte di Zambana shelter, near Zambana Vecchia, at 220 m above sea level; Pradestel shelter, near Ischia Podetti, north of Trento, at +225 m and, finally, Romagnano shelter, in Loc locality, near Romagnano, at +210 m.

The study of these deposits was carried out with the collaboration of G. Bartolomei (1974) for geomorphology, of M. Cremaschi for sedimentology and pedology, of L. Cattani (1977), M. Follieri and Arl. Leroi-Gourhan for palinology and anthracology, of G. Bartolomei (1974), P. Boscato and B. Sala (1980) for the study of the mammal faunas, of A. Broglio, S.K. Kozlowski (1983), G. Dalmeri and M. Lanzinger for the study of the industries.

Many Mesolithic deposits of the three series

were dated with the ^{14}C method by the University of Rome Laboratory *(Alessio et al., 1969, 1978)*.

2 - The exaration hollow formed along the Adige River Valley between Egna-Neumarkt and Mori having near Trento a maximum depth of 267 m with respect to the ground plain (–74 m with respect to the present sea level) (*G.A. Venzo, 1979*), was invaded, after the retreat of the Würmian glacier, by a large lake basin to which many Mesolithic settlements found on the two sides of the valley (*Broglio, 1980*) are probably connected.

The data taken up to now in the three deposits show the transition from a scarcely forested environment with a flora dominated by *Pinus silvestris-montana* and with stainbock prevailing among the mammals, to an environment characterized by deciduous oak forest, peopled with deer, roebucks and wild-boars.

After an analysis of the industries, it is possible to recognize a continuous Mesolithic series for which the following sequence of phases has been suggested:

a - Old Sauveterrian phase (Romagnano III AF-AE and probably Pradestel M)
b - Middle Sauveterrian phase (Romagnano III AC9-AC3 and Pradestel L14-L1)
c - Recent Sauveterrian phase (Romagnano III AC2-AC1)
d - Final Sauveterrian phase (Vatte di Zambana 10 and 7, Pradestel F)
e - Old Castelnovian phase (Romagnano III AB1-2, possibly Pradestel E)
f - Middle Castelnovian phase (Pradestel D)
g - Recent Castelnovian phase (Romagnano III AA and probably Pradestel A) in which ceramics fragments appear for the first time.

^{14}C DATINGS: TECHNIQUE AND TREATMENT OF DATA

A profitable collaboration, begun in 1968 between the ^{14}C laboratory of the University of Rome and the Istituto di Geologia, Paleontologia e Paleontologia Umana of the University of Ferrara, in particular with A. Broglio and coworkers, has led to the accomplishment of a series of datings defining the chronology of the Mesolithic sequences (Sauveterrian and Castelnovian in particular) of three well known deposits in the Adige Valley and has allowed comparisons with analogous series of other settlements in the Italian territory, also extensible to Europe.

The samples to be dated consisted of charcoal, carefully collected and often pertaining to units identifiable as hearths; being always related whith certainty to archaeologic findings, these samples were extremely reliable as for their cultural identity. In very few cases the semples were charred bones, equally reliable.

Almost all the samples were provided in large quantities; the following subsequent operations were thus possible:

a) careful selection of the samples;

b) adequate decontamination from possible foreign carbon by means of the usual, and by now standard, acid-basic treatment, which was conveniently carried out;

c) transformation into CO_2 suitable for datings, i.e. containing neither the so-called «electronegative impurities» nor radon-222. This last operation was performed by means of an initial combustion in an oxigen current followed by a sequence of purification operations in a suitable apparatus in which both the last circuit and the final gas storage section are directly connected to the CO_2 proportional counters. These counters measure the residual ^{14}C activity which is then used to calculate the age of the sample (*Alessio et al., 1970*).

In our laboratory, every sample is measured in two different counters and the results are averaged after correcting according to the mass-spectrometrically measured $^{13}C/^{14}C$ ratio (*Alessio et al., 1969*).

To be consistent with «Radiocarbon», the conventional ^{14}C ages were calculated on the basis of the Libby's half-life of 5568±30 years and given both in years before present (B.P.), with 1950 as the standard year for reference, and in the corresponding calendar years, i.e., in our case, before Christ (B.C.).

The problem then existed of establishing whether it was convenient, for a discussion and for comparisons of the obtained Mesolithic chronologies, to calibrate, when possible, the conventional ages, transforming them into «true ages». In fact, as is well known, the discrepancies existing betwen conventional ^{14}C and true ages, evidentiated during the 1960s, are corrected by means of curves and tables giving the correspondence between ^{14}C and absolute dendrochronologic ages. These curves and tables have been available, though not definitive, since the 1970s (*Ralph, Michael, Han, 1973; Klein, Lerman, Demon, Ralph, 1982*). Up to now this calibration is only possible for ages not older than about 7500 years before present. Therefore, in our case, this calibration would be only possible for a very small number of quite recent dates present in very few Mesolithic

series. For this reason we considered it correct not carry out this operation, basing all considerations and comparisons on conventional ^{14}C ages only.

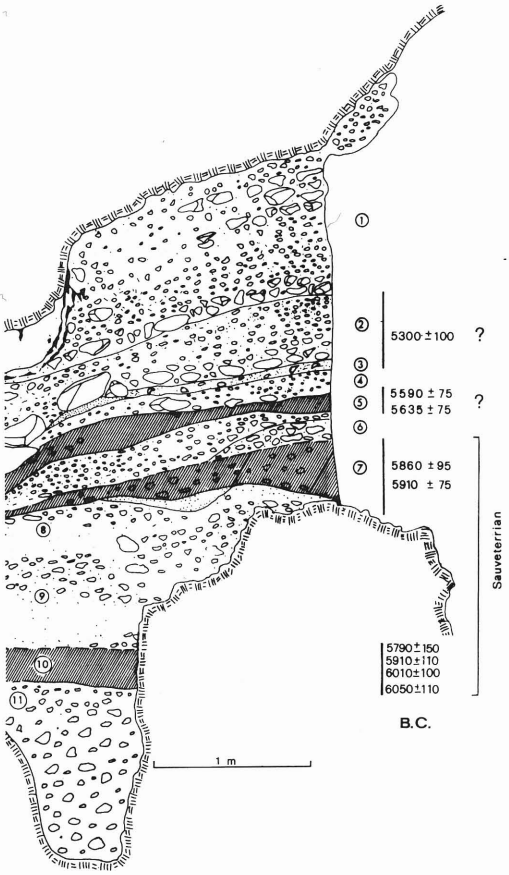

Fig. 1 - Schematic section of the Mesolithic deposits of Vatte di Zambana shelter in which radiometric datings are indicated. - Dashed areas correspond to strongly anthropized deposits (G. Bartolomei's surveys).

THE DEPOSITS: CONSIDERATIONS ON ^{14}C DATINGS

1 - **Vatte di Zambana shelter.** 12 km north of Trento, near the confluence of Noce river with Adige river, at +220 m, an old quarry almost completely removed a debris cone which was hidding, under about 20 m of deposits at about 20 m above the present valley bottom, a small shelter. The anthropic deposits of this shelter, dismantled for the most part by the amateur group who discovered them in 1967, were excavated in 1968 by G. Bartolomei and A. Broglio. Four levels of human settlement (cuts 2-3, 5, 7 and 10) were interbedded along a thickness of about 2.5 m of debris and silt, the lowest level also including a burial (*Corrain, Graziati and Leonardi, 1967*).

Pollen analysis of the deposit corresponding to cut 8 shows the presence of thermophilic mixed oak forest together with *Gramineae* and *Artemisia* (*Cattani, 1977*). *Arvicola,* inhabitant of the Adige alluvial planes, is abundant among micromammals; *Apodemus* from herbaceous and forested environment, and *Crocidura mimula,* dweller or arid stony regions, are frequent *(Bartolomei, 1974).* Hunt mammals are: deer, chamois, stainbock, beaver, brown bear and wild cat *(Boscato and Sala, 1980).* Fresh water mollusks, fen turtle, birds and fish are also present among food refuse.

The industries of cuts 10 and 7 represent the final phase of the Sauveterrian series, though some doubts exist concerning cut 7 in which scarce artefacts were found. The artefacts collected in situ in cuts 5 and 3-2 are too few to allow a diagnosis; however, fragments of a tool, probably testifying a trapeze industry *(Broglio, 1971, p. 150, fig. 7/8)* were also identified among the artefacts collected by sifting the mould left behind after the first excavations and probably coming from cuts 7 and 5.

^{14}C datings place Vatte di Zambana series in the VIth millennium B.C. *(Alessio et al., 1969).*

R-487	cuts 2-3	7250±110 B.P. 5300±110 B.C.
R-488	cut 5	7540± 75 B.P. 5590± 75 B.C.
R-488 α	cut 5	7585± 75 B.P. 5635± 75 B.C.
R-489	cut 7	7860± 75 B.P. 5910± 75 B.C.
R-489 α	cut 7	7810± 95 B.P. 5860± 95 B.C.
R-490	cut 10	7860±110 B.P. 5910±110 B.C.
R-490 α	cut 10	7960±100 B.P. 6010±100 B.C.
R-491	cut 10 (burial)	8000±110 B.P. 6050±110 B.C.
R-491 α	cut 10 (burial)	7740±150 B.P. 5790±150 B.C.

2 - **Pradestel shelter.** 6 km North of Trento, in Ischia Podetti locality, quarry, work deeply impaired two large adjacent debris cones revealing, between them, a small rock shelter at +225 m. Under this shelter detrital and silty deposits are interbedded to anthropized levels along a thickness of about 5 m. Research, begun by B. Bagolini in 1973-74, was subsequently carried out by A. Broglio, G. Bartolomei, C. Peretto, L. Cattani and B. Sala in 1975.

The Pradestel series is very long and seems to cover the same period of the Mesolithic series of Romagnano III; some phases, however, appear in considerably different ways. The deposits consist of debris and fine sediments (layers L4, I, E) *(Bartolomei, 1974; Cattani, 1977; Boscato and Sala, 1980).*

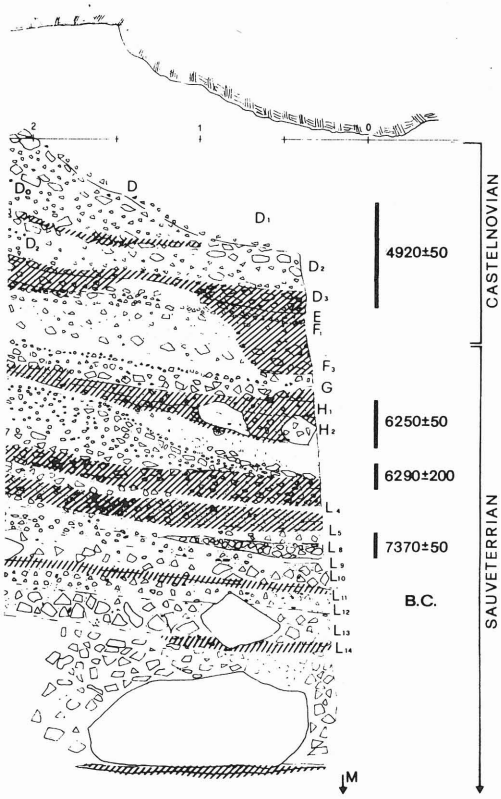

Fig. 2 - Schematic section of the Mesolithic deposits of Pradestel shelter and radiometric datings (G. Bartolomei's surveys).

The lowest layer M, consisting of fine rubble and silt, and scarcely anthropized, shows a flora association with *Pinus silvestris montana* dominant. The few artefacts recall the old Sauveterrian phase of Romagnano III.

The upper layer L, subdivided into 16 cuts (L16-L1), shows in its lower part (L16-L7) *Pinus* together with scarce thermophilic trees. The following micromammals are present: dormouse, squirrel, *Arvicola, Apodemus* and *Microtus nivalis.* The macromammals are: deer and stainbock. The industries of this cuts are attributable to the middle Sauveterrian phase. Charcoals from the most recent cuts of this complex have been dated with the ^{14}C method with the following result:

R-1151	Pradestel, L7, L7C, L8	9320± 50 B.P. 7370± 50 B.C.

In the upper cuts of the L layer (L6-L1), as well as in cuts I and H, Pine tree decreases abruptly giving place to a thermophilic deciduous oak forest. There is a strong decrease in *Microtus nivalis* among the micromammals and in stainbock among the macromammals. The industries are to be considered as pertaining to the middle and recent phases of the Sauveterrian sequence. Charcoals from the upper cut of layer L and from layer H have been dated:

R-1150	Pradestel, L1	8240±200 B.P. 6290±200 B.C.
R-1149	Pradestel, H-H2	8200± 50 B.P. 6250± 50 B.C.

The vegetation maintains the same characteristics in the upper layer G, F and E. Deer strongly prevails among hunt mammals, followed by roebuck and boar; stainbock is still present, though with few specimens. Industries of F layer are attributable to the final Sauveterrian phase; those of layer E, instead, represent the old Castelnovian phase.

Granules in the upper debris were too scarce to allow a pollen analysis of these layers. Remains of hunt mammals pertain to deer, roe-buck and stainbock. The industries of the D layer represent the middle phase of the Castelnovian sequence; this layer has been dated as follows:

R-1148	Pradestel, D1-D3	6870± 50 B.P. 4920± 50 B.C.

Layer A, containing very few founds and in which ceramics of early Neolithic appears, close the Pradestel series. Remains of beaver are present throughout this series; there are also remains of fish and fresh-water mollusks in the lower part and of birds in the upper part.

3 - **Romagnano III shelter.** Various prehistorical sites have been identified on the cone of Rio Bondone, right tributary of Adige river, in locality Loc of Romagnano, 12 km South of Trento. The deposit of Romagnano III is situated at the top of the cone, near the right bank of Rio Bondone, under a small rocky wall. Deposits have been discovered along a thickness of 8 m, which pertain to the following periods: Mesolithic (layers AF, AE, AC, AB and AA), Lower Neolithic (layers T3-T4), Middle Neolithic (layers T2-T1), Upper Neolithic (layers R-Q), Bronze Age (layers P, O, N, M), Final Bronze Age (layers L-I) and Iron Age (layer H) *(Perini, 1971; Broglio, 1971).* R. Perini carried out

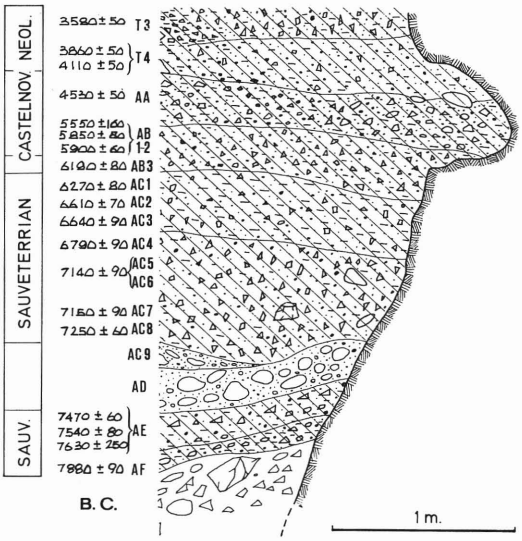

Fig. 3 - Schematic section of the Mesolithic and Early Neolithic deposits of Romagnano III shelter with radiometric datings.

excavations of the more recent among the above mentioned deposits in 1970, while A. Broglio, G. Bartolomei, P. Biagi, A. Guerreschi, C. Peretto and B. Sala excavated the Mesolithic ones in 1971-73.

The sedimentologic and palinologic study of the Mesolithic deposits is being carried out by M. Cremaschi, M. Follieri and Arl. Leroi-Gourhan; micromammals *(Bartolomei, 1974)* and hunt mammals *(Boscato and Sala, 1980)* have been identified; in addition to that, the important series of industries has been studied *(Broglio and S.K. Kozlowski, 1983).*

The Mesolithic deposits consist mainly of debris with abundant anthropic remains (layers AF, AE, AC, AB an AA) with an alluvial deposit inserted (layer AD).

Micromammals *(Bartolomei, 1974)* in the lower layers (AE and AC) are represented by *Arvicola, Apodemus, Sciurus, Evotomys* and *Microtus nivalis.* In the upper layers (AB and AA) the *Microtus nivalis* is replaced by *Crocidura.* These associations testify a morphologically differentiated environment with a wet forested valley floor and slopes of arid-mountain climate in the first phase and arid-warm climate in the second phase.

At first (layers AF and AE), among hunt mammals *(Boscato and Sala, 1980)* stainbock strongly prevails over deer, roe-buck and boar; then it progressively decreases (layers AC and AB) and finally disappears (layer AA) while deer and roebuck increase. Chamois is always present in these layers; in the upper layers one can also find wild cat, marten and fox.

Remains of turtle, birds, fish and fresh-water mollusks are present throughout the series.

The sequence of the Mesolithic industries *(Broglio and S.K. Kozlowski, 1983)* is among the most complete and rich in Europe. Its common tools testify the persistence of a local tradition, while the microliths allow the identification of various phases within the series, namely: old Sauveterrian phase in layers AF and AE; middle Sauveterrian phase in layers AC8-AC3; recent Sauveterrian phase in layers AC2-AC1; Castelnovian phase in layers AB1-2; final Castelnovian phase, in which ceramics is present for the first time, in layer AA.

^{14}C datings of the series of Mesolithic industries are the following:

a) Old Sauveterrian phase

R-1147	Romagnano III AF	9830± 90 B.P. 7880± 90 B.C.
R-1146B	Romagnano III AE	9490± 80 B.P. 7540± 80 B.C.
R-1146 α	Romagnano III AE1-5	9420± 60 B.P. 7470± 60 B.C.
R-1146A α	Romagnano III AE1-4	9580±250 B.P. 7630±250 B.C.

b) Middle Sauveterrian phase

R-1145 α	Romagnano III AC8-9	9200± 60 B.P. 7250± 60 B.C.
R-1145	Romagnano III AC8-9	9200± 60 B.P. 7250± 60 B.C.
R-1144 α	Romagnano III AC7	9100± 90 B.P. 7150± 90 B.C.
R-1143 α	Romagnano III AC5-6	9090± 90 B.P. 7140± 90 B.C.
R-1142	Romagnano III AC4	8740± 90 B.P. 6790± 90 B.C.
R-1141	Romagnano III AC3	8590± 90 B.P. 6640± 90 B.C.

c) Recent Sauveterrian phase

R-1140	Romagnano III AC2	8560± 70 B.P. 6610± 70 B.C.
R-1139	Romagnano III AC1	8220± 70 B.P. 6270± 70 B.C.

d) Deposit with reworked Sauveterrian and Castelnovian industries

R-1138	Romagnano III AB3	8140± 80 B.P. 6190± 80 B.C.

e) Old Castelnovian phase

R-1137	Romagnano III AB1-2	7850± 60 B.P. 5900± 60 B.C.
R-1137A	Romagnano III AB1-2	7500±160 B.P. 5550±160 B.C.
R-1137B	Romagnano III AB1-2	7800± 80 B.P. 5850± 80 B.C.

f) Recent Castelnovian phase in which ceramics appears

R-1136	Romagnano III AA1-2	6480± 50 B.P. 4530± 50 B.C.

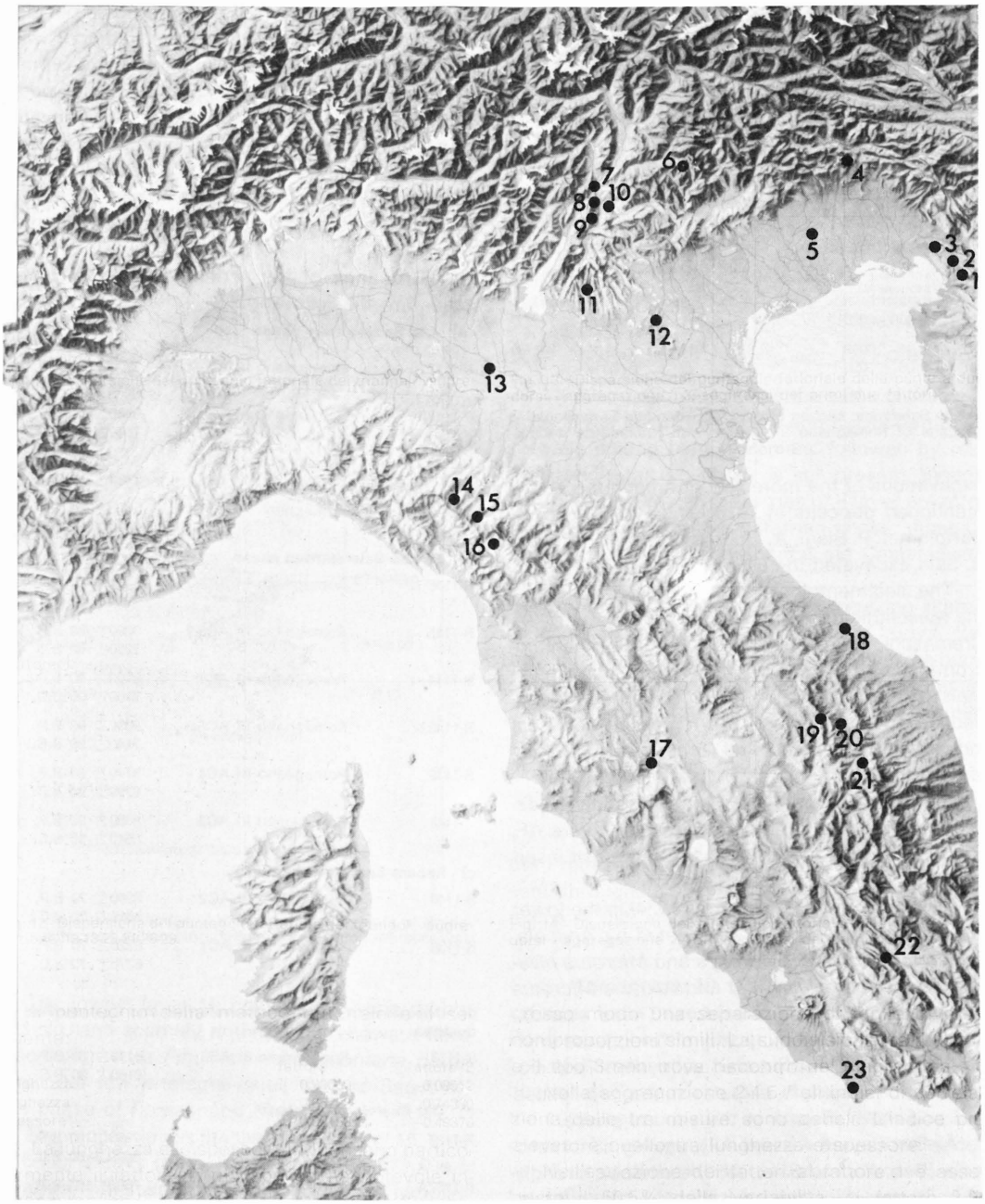

Fig. 4 - Distribution of the final Epigravettian, Mesolithic and Early Neolithic deposits of centre-north Italy (leaving out Liguria) radiometrically dated between 9000 and 4000 B.C. 1: Ciclami cave; Zingari cave; 3: Benussi cave; 4: Verdi di Pradis caves; 5: Fagnigola; 6: Colbricon; 7: Vatte di Zambana shelter; 8: Pradestel shelter; 9: Romagnano III shelter; 10: Gaban shelter; 11: Tagliente shelter; 12: Covoloni del Broion little cave; 13: Vho di Piadena; 14: Bagioletto Alto; 15: Passo della Comunella; 16; Isola Santa; 17: Sarteano; 18: Ripabianca di Monterado; 19; Prete cave; 20: Ferrovia cave; 21: Maddalena di Muccia; 22: Peschio Ranaro; 23: Blanc shelter.

CONCLUSION

1 - The Mesolithic series represented in the three deposits of Trento is certainly one of the most important in Europe. From the numerous radiometric datings it follows that its duration is over 3000 years, with the following subdivision of the evolution phases, only taking into account the conventional dates:

a) Old Sauveterrian phase
about 7950 - 7400 B.C.
b) Middle Sauveterrian phase
about 7400 - 6550 B.C.
c) Recent Sauveterrian phase
about 6550 - 6200 B.C.
d) Final Sauveterrian phase
about 6200 - 5800 B.C.
e) Old Castelnovian phase
about 5800 B.C.
f) Middle Castelnovian phase
around 5000 B.C.
g) Recent Castelnovian phase
around 4500 B.C.

A comparison of the radiometric datings of the three deposits has confirmed the correlation between industries performed on the basis of technical, typologic and typometric criteria, and has effectively contributed to establishing that the industry of layer AB3 of Romagnano III, previously considered a transition industry between Sauveterrian and Castelnovian, is, in reality, nonhomogeneous (*Broglio and S.K. Kozlowski, 1983*).

2 - The datings of the three series of Trentino are confirmed by many Mesolithic anthropic deposits in centre-north Italy, so confirming the validity of the chronologic picture of the Mesolithic in the Trento basin, as well as its applicability to the whole area. A review of the conventional ^{14}C datings measured for the following deposits is now given:

a) TRENTINO - ALTO ADIGE

Colbricon. The industry of site 1 typologically represents a period of transition from the old to the middle Sauveterrian phase defined in the Trento basin. The ^{14}C dating R-895 α, 9370±130 B.P. (7420±130 B.C.) is in perfect agreement with this diagnosis.

b) VENETO

Covoloni del Broion little cave. The industry is referable to the Castelnovian, but, for lack of implements and of microliths, a better definition is impossible on topological basis. The radiocarbon dating R-892, 6930±60 B.P. (4980±60 B.C.) suggests its attribution to the middle Castelnovian phase.

c) FRIULI - VENEZIA GIULIA

Zingari Cave. The industry is probably referable to the Sauveterrian, but a more precise diagnosis is impossible for lack of findings. The ^{14}C dating of cut 7: R-971 α, 9570±80 B.P. (7620±80 B.C.) suggests the presence of an industry pertaining to the old Sauveterrian phase.

Benussi cave series. The Mesolithic series of this site subdivided into four artificial cuts (3-6), falls, typologically, between the recent Sauveterrian and the middle Castelnovian:

Castelnovian Mesolithic industry		
R-1043	Benussi Cut 3	7050± 60 B.P. 5100± 60 B.C.
Castelnovian Mesolithic industry		
R-1042	Benussi Cuts 3-4	7230±140 B.P. 5280±140 B.C.
Castelnovian Mesolithic industry		
R-1044	Benussi Cut 4	7620±150 B.P. 5670±150 B.C.
Recent Sauveterrian phase industry		
R-1045	Benussi Cut 5	8380± 60 B.P. 6430± 60 B.C.
Recent Sauveterrian phase industry		
R-1045A	Benussi Cuts 5-6	8650± 70 B.P. 6700± 70 B.C.

The dating of the samples coming from cuts 6 and 5: R-1045A, 6700±70 B.C., seems to be a little older than one could expect; the other two datings are in agreement with the diagnoses of the industries.

Ciclamini cave. Although poor, this industry can be attributed to the recent Sauveterrian phase. The dating confirms this diagnosis: R-1041, Ciclamini Cut 9, 8260±60 B.P. (6310±60 B.C.).

d) EMILIA - ROMAGNA

Bagioletto Alto and Passo della Comunella. The datings of the two sites in the Tuscany and Emilia Appennines, with Castelnovian industries, are in agreement with the respective diagnosis.

Bagioletto Alto.

I-12520	B.A. q9	7630±120 B.P. 5680±120 B.C.
I-12687	B.A. q3+q8	7670±120 B.P. 5720±120 B.C.

(Cremaschi et al., in press).

Passo della Comunella

Birm-830	P.C.	6960±130 B.P. 5010±130 B.C.

(Biagi et al., 1980).

e) TUSCANY

Isola Santa series *(Biagi et al., 1980)*

Cuts 4a to 4e; R-1525 α, 7380±130 B.P. (5430±130 B.C.); R-1526 α, 8840±120 B.P. (6890±120 B.C.); R-1527 α, 8590±90 B.P. (6640±90 B.C.); R-1528 α, 8780±110 B.P. (6830±110 B.C.); R.1529 α, 9220±90 B.P. (7270±90 B.C.); Cut 5: R-1524, 10720±140 B.P. (8770±140 B.C.).

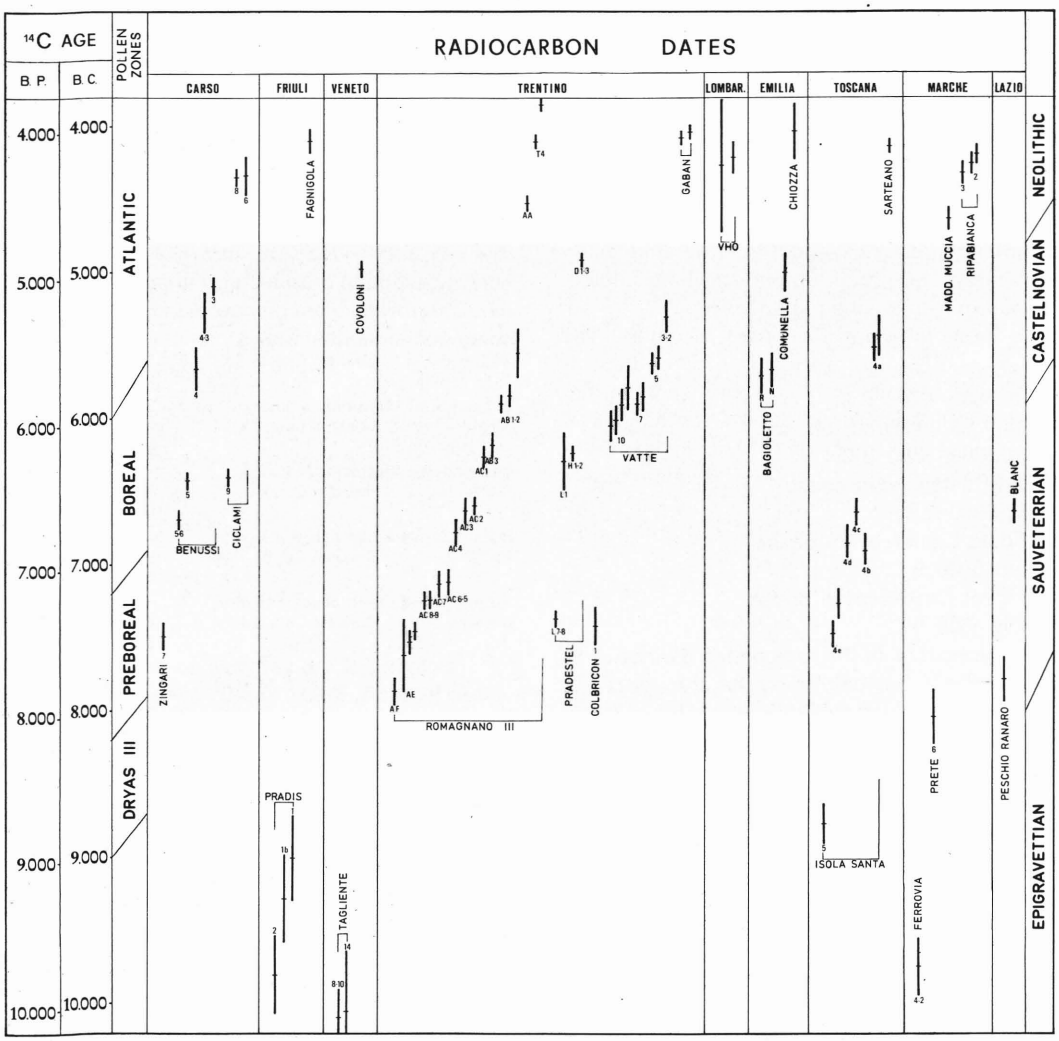

Fig. 5 - Chronology of the Final Epigravettian Mesolithic and Early Neolithic deposits in centre-north Italy (leaving out Liguria) radiometrically dated between 9000 and 4000 B.C.

The industry of layer 5 pertains to the final Italic Epigravettian; this diagnosis perfectly agrees with the dating, which attributes it to a final period of the late glacial Würmian. The industries of the five cuts of layer 4 (4e, 4d, 4c, 4b and 4a) represent, on the contrary, a Mesolithic series tightly related to the one of Trento basin. The industry of cut 4e, dated 7470±90 B.C., is very similar to the coeval Romagnano III AE industry, especially as far as the microliths are concerned. The industries of the upper cuts correspond to the middle and final phases of the Sauveterrian sequence and to the beginning of the Castelnovian, in agreement with the radiometric datings.

The Italian Mesolithic Sauveterrian and Castelnovian industries have so found a precise chronologic arrangement. In our opinion, also the date R-341, 8560±80 B.P., relative to the Sauveterroid industry of Blanc shelter (A. Broglio's intervention on A. Bietti's communication, 1984) has now found an explanation. On the contrary, the problem of the persistence of final Italian Epigravettian industries in the VIIth millennium B.C. along Campania and Liguria coasts is still an open one; this persistence has been established on the basis of some ^{14}C datings, though recent Mesolithic findings *(Broglio, 1980)* seem to contradict this view, at least as far as Liguria is concerned.

Particularly interesting among the possible comparisons of datings referring to Mesolithic deposits of the Sauveterrian and western Castelnovian areas *(Delibrias et al., 1976)* are: a) comparisons with Rouffignac series (GrN-2913; GrN-2895; GrN-2880; GrN-5513; GrN-5514) whose industries, though pertaining to a different facies, share with Romagnano industries backed blades of Rouffignac type; b) comparisons with recent Sauveterrian and Castelnovian facies of Provence (Montclusien and Castelnovien according to M. Escalon de Fonton, 1976) showing a strict similarity with coeval Italic facies.

An extension of these comparisons to ^{14}C datings referring to the European Mesolithic *(S.K. Kozlowski, 1976)* shows the great technologic transformation of the industries, connected to the introduction of trapezes between microliths, in the Italic Sauveterrian region, at the beginning of the Atlantic.

Finally, R-1136 dating, referring to layer AA of Romagnano III allows the determination of the beginning of the Neolithic in the Adige basin in terms of ^{14}C chronology.

3 - The datings of the three Trentine deposits also allow to establish a chronology, still in terms of conventional ^{14}C datings, of the phenomena which, in the Trento basin, indicate climatic modifications of Preboreal, Boreal and Atlantic; in particular, they allow the determination of the age of the rise of temperate environment vegetation and of the fauna typical of broad-leafed tree forests, so contributing strongly to the present knowledge in this field.

Finally, using the datings of the three Trentine deposits, and correlating the technical, typologic, typometric and structural characteristics of the industries, it is possible to establish a chronology for the Mesolithic industries found in various Dolomitic sites at +1900-2300 m *(Bagolini, Broglio and Lunz, 1983).* The validity of this correlation is confirmed by date R-895, 9370±130 B.P., referring to site 1 of Colbricon. The presence of settlements of Mesolithic hunters on the Dolomites in the Preboreal and Boreal ages suggests that, since the very beginning of the Olocene, the alpine prairie had reached the height range relative to these findings; this may be consistent with a chronology of the stadial moraine arcs of the Dolomites area different from the traditional one and similar to that recently proposed for the north side of the Alps *(Andersen , 1981; Zoller, 1977)* and confirmed by the pollen analysis series of the Sarentini mountains *(Seiwald, 1980).*

RIASSUNTO

Gli Autori commentano le datazioni radiometriche ottenute col metodo del carbonio 14 da campioni provenienti dai depositi mesolitici di tre giacimenti preistorici che si trovano nei dintorni di Trento, lungo il fianco destro della Valle dell'Adige (ripari di Vatte di Zambana, Pradestel e Romagnano III). Le datazioni consentono di inquadrare cronologicamente l'importante sequenza mesolitica dell'area, collocando tra 7950 e 7400 anni a.C. (in termini di cronologia del carbonio 14 non calibrata) le industrie della fase sauveterriana antica, tra 7400 e 6550 anni a.C. le industrie della fase sauveterriana media, tra 6550 e 6200 anni a.C. le industrie della fase sauveterriana recente, tra 6200 e 5800 anni a.C. le industrie della fase sauveterriana finale, fissando attorno a 5800 anni a.C. l'inizio della fase castelnoviana antica, attorno a 5000 anni a.C. la fase castelnoviana media e attorno a 4500 anni a.C. la comparsa della ceramica associata ad una industria castelnoviana.

Questo quadro cronologico in accordo con le datazioni radiometriche di altri depositi dell'Italia centro-settentrionale contenenti industrie sauveterriane e castelnoviane, trova confronti nelle sequense sauveterriane-castelnoviane di altre aree (Levante Spagnolo, Francia Meridionale).

Gli Autori accennano infine alla possibilità di datare, attraverso correlazioni tipologiche con la sequenza della Valle dell'Adige, assunta come riferimento, i siti mesolitici posti tra 1800 e 2300 m di altezza sulle Dolomiti e sulle Alpi Aurine e Sarentine. Ciò consente di proporre un modello della gestione del territorio attuata dai gruppi mesolitici insediati nel bacino dell'Adige.

Le datazioni dei depositi mesolitici della Valle dell'Adige e delle morfologie che ospitano depositi mesolitici di alta quota sulle Alpi permettono di trarre importanti conclusioni sull'età dei fenomeni che hanno determinato l'attuale assetto morfologico della Valle dell'Adige e delle aree montane.

RÉSUMÉ

Les auteurs commentent les datations obtenues par la méthode du carbone-14 à partir d'échantillons provenant des dépôts mésolithiques de trois gisements préhistoriques qui se trouvent aux environs de Trente, le long du flanc droit de la Vallée de l'Adige (Abri de Vatte de Zambana, Pradestel et Romagnano III). Les datations permettent d'encadrer chronologiquement la séquence mésolithique importante de la zone, en faisant remonter les industries de la phase sauveterrienne ancienne entre 7950 et 7400 ans avJ.C. (en terme de chronologie du carbone14 non calibrée), les industries de la phase sauveterrienne moyenne entre 7400 et 6550 ans avJ.C., les industries de la phase sauveterrienne récente entre 6550 et 6200 ans avJ.C., les industries de la phase sauveterrienne finale entre 6200 et 5800 ans avJ.C.; en fixant aux environs de 5800 ans avJ.C. le début de la phase castelnovienne ancienne, aux environs de 5000 ans avJ.C. la phase castelnovienne moyenne et aux environs de 4500 ans avJ.C. l'apparition de la céramique associée à une industrie castelnovienne.

Ce cadre chronologique est en accord avec les datations radiométriques d'autres dépôts de l'Italie Centre-Septentrionale et d'autres zones (Levant Espagnol, France méridionale) contenant des industries sauveterriennes-castelnoviennes.

Les auteurs parlent enfin de la possibilité de dater les sites mésolithiques situés entre 1800 et 2300 m d'altitude sur le Dolomites et sur les Alpes Aurine et Sarentine et ceci au moyen de corrélations typologiques avec la séquence de la Vallée de l'Adige, considérée comme donnée de référence. Cela permet de proposer un modèle de la gestion du territoire pratiquée par les groupes mésolithiques installés dans le bassin de l'Adige.

Les datations des dépôts mésolithiques de la Vallée de l'Adige et des morphologies qui présentent des dépôts mésolithiques à une altitude élevée sur les Alpes, permettent de tirer des conclusions importantes concernant l'âge des phénomènes qui ont déterminé la disposition morphologique actuelle de la Vallée de l'Adige et des zones montagneuses.

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