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Ecological and cultural relevance of the recent new radiocarbon dates from Libyan Sahara

During the 1970's the Mission of the Istituto di Paletnologia of the University of Rome [1] carried out systematic exploration of the Auis area, on the eastern side of Tadrart Acacus, discovering settlements of which a complete report has been made in an earlier work (Barich, 1974).

The paper quotes an interesting series of dates belonging to 7th millennium B.C. Such an antiquity has been backed up by the results of a new deposit located during the 1978 campaign in the Wadi Ti-n-Torha II, an overall exploration of which is under way. Therefore, here we shall deal only with a presentation of the new series of dates and their comments on the ecological-cultural level. Further details are in preparation for publishing.

The material studied in this paper, coming from the settlement called "Ti-n-Torha--Two Caves", consists of nine charcoal samples. The dates have been processed by Belluomini-Alessio-Manfra in the ^{14}C Laboratory of the Istitute di Geochimica and Fisica of the University of Rome (Belluomini *et al.*, 1978).

During the excavation the deposit was divided into three sectors: west, centre and east (Table 1). In particular, 5 samples from the west sector have been analyzed (R-1407 and R-1405 from level 1; R-1408 from level 2; R-1404 *bis* from level 3). Four samples have dated the east sector (R-1403 from level 1; R-1406 and R-1409 from level 2; R-1402 from level 3). Unfortunately, no datings of the centre sector have been possible because of the poor quantity of carbonaceous presence in every sample, mostly made of earthly material.

The samples of the west sector show ages comprised in a small range of time, about the middle of the 7th millennium B. C. The samples from the eastern sector levels, however, show a significant chronological difference, their ages ranging from the middle of the 8th to the end of the 5th millennium B. C. Sample R-1403 in particular

[1] The Mission acts as a multidisciplinary group under the supervision of Prof. F. Mori (Section of prehistoric art) and Doc. B. E. Barich (Section of excavations).

Table 1

Radiocarbon dates from Wadi Ti-n-Torha Two Caves (Tadrart Acacus, Libya)

Sample (all charcoal)	Location	5,568 Half-life		5,730 Half-life	
		B.P. 1950	B.C.	B.P. 1950	B.C.
R-1405	West Sector Level 1, sieve	8,840 ± 60*	6,890	9,110 ± 60	7,160
R-1407	West Sector Level 1, layer	8,520 ± 60	6,570	8,780 ± 60	6,830
R-1408	West Sector Level 2, layer −38 cm	8,450 ± 60	6,500	8,700 ± 60	6,750
R-1404	West Sector Level 3, layer −70 cm	8,630 ± 50	6,680	8,890 ± 50	6,940
R-1404 bis	West Sector Level 3, sieve	8,400 ± 90	6,450	8,650 ± 90	6,700
R-1403	East Sector Level 1, layer	6,230 ± 50	4,280	6,420 ± 50	4,470
R-1406	East Sector Level 2 base, layer −35 cm	8,620 ± 50	6,670	8,880 ± 50	6,930
R-1409	East Sector Level 2, layer −40 cm	8,650 ± 105	6,700	8,900 ± 105	6,950
R-1402	East Sector Level 3, sieve	9,350 ± 110	7,400	9,630 ± 110	7,680

* The one-sigma (1σ) error term indicates a 68.3% probability that the radiocarbon date lies between the upper and lower limits of the error bar

gives an age of about the end of the 5th millennium, significantly younger than the rest of the samples of the whole site. The samples of level 2 (R-1406 and R-1409) show the same age of the western sector samples. Sample R-1402 from level 3, the deepest one, belongs to the middle of the 8th millennium B. C. and, therefore, is one of the oldest known findings from the Acacus massif and the whole of the "Saharo-Sudanese" sphere.

These results indicate that people must have been present in this area mostly around the middle of the 8th millennium B. C. On the other hand, the two samples (R-1402 and R-1403) show the presence of a population in a much wider range of time (from the 8th to the 5th millennium B. C.) This is compatible with previous data obtained for two neighbouring archaeological sites (named "North Shelter", see Table 2 and "East Shelter", see Table 3; (Belluomini *et al.*, in: Barich, 1974). The data reported in Tables 1 - 3 show that the Two Caves and East Shelter samples, mainly ranging from the 8th and the 7th millennium B. C., are homogeneous and earlier than the "North Shelter" samples, ranging from the end of the 6th to the 4th millennium B. C.

The ages presented in this work concord with the 14C dates obtained by other scientists for settlements containing pottery and located few kilometers away from Ti-n-Torha (see Table 4).

It is particularly interesting to note the age of sample R-1402 (see Tab. 1), of about the middle of the 8th millennium B. C., one of the earliest, as mentioned above,

Table 2

Radiocarbon dates from Wadi Ti-n-Torha (Tadrart Acacus, Libya), North Shelter

Sample	Material	5,568 Half-life		5,730 Half-life		MASCA correction B.C.
		B.P. 1950	B.C.	B.P. 1950	B.C.	
R-1028	Pen	5,600 ± 50	3,650	5,770 ± 50	3,820	4,520 – 4,440
R-1029	Pen	5,260 ± 130	3,310	5,420 ± 130	3,470	4,350 – 3,930
R-1030	Pen	5,360 ± 120	3,410	5,520 ± 120	3,570	4,410 – 4,040
R-1031α	Charcoal	5,970 ± 50	4,020	6,120 ± 50	4,170	4,960 – 4,730
R-1164α	Charcoal	6,540 ± 50	4,590	6,740 ± 50	4,790	> 5350
R-1032	Charcoal	7,070 ± 60	5,120	7,290 ± 60	5,340	–

Table 3

Radiocarbon dates from Wadi Ti-n-Torha (Tadrart Acacus, Libya), East Shelter

Sample (all charcoal)	5,568 Half-life		5,730 Half-life	
	B.P. 1950	B.C.	B.P. 1950	B.C.
R-1033α	8,460 ± 60	6,510	8,650 ± 60	6,700
R-1034α	7,990 ± 70	6,040	8,230 ± 70	6,280
R-1035α	8,640 ± 70	6,690	8,910 ± 70	6,960
R-1036α	9,080 ± 70	7,130	9,350 ± 70	7,400
R-1158α	7,330 ± 80	5,380	7,550 ± 80	5,600
R-1160α	8,540 ± 140	6,590	8,800 ± 140	6,850
R-1161α	8,460 ± 50	6,510	8,710 ± 50	6,760
R-1162α	8,440 ± 50	6,490	8,690 ± 50	6,740
R-1163α	8,670 ± 60	6,720	8,930 ± 60	6,980

Table 4

Libyan Sahara radiocarbon dates

Sample	Location	B.P. age	B.C. age	Material
Geo	Uan Telocat	6,745 ± 175	4,795	Charcoal
Geo	Uan Muhuggiag	4,730 ± 310	2,780	Charcoal
Pi	Uan Muhuggiag	5,405 ± 180	3,455	Leather
Pi	Uan Muhuggiag	5,952 ± 120	4,002	Charcoal
Pi	Uan Muhuggiag	7,438 ± 120	5,488	Charcoal
Geo	Uan Tabu	7,045 ± 175	5,095	Charcoal
Pi	Fozzigiaren sup.	7,900	5,950	Charcoal
Pi	Fozzigiaren inf.	8,072 ± 100	6,122	Charcoal

Geo: Geochron Laboratories Cambridge, Mass., USA
Pi: Pisa

among those studied in the Acacus massif. That value confirms the age previously found for the sample R-1036 (see Tab. 3) of East Shelter and both make acceptable those obtained by some samples of Site Launay (Ahaggar) and Tamaya Mellet (Niger), of 7,260±115 and 7,400±170 B. C. respectively (Belluomini *et al.*, *op. cit.*). Till now these datings have been believed to be too early for pottery cultures.

The interpretation of our data from the palaeoecological point of view promotes a widening of our study towards the more central-Saharan areas, particularly to the Chad-Tibesti system. It is known that during one of the coldest moments in the last glaciation, Lake Chad must have been a very large inner sea (similar to the actual Caspian Sea). Some of its branches extended to 10°N 18°E, 13°N 11°E, 18°N 14°E and from there to 20°E (nearly lapping the Tibesti region) with a shoreline at least 50 m above the present level. It seems that these sizes did not change until 8,500 years ago.

Precipitations must have been greater in that period in the central Sahara plateau than today and the water contribution to Lake Chad from the north must have come from regions like Tibesti, Ahaggar and Acacus. We must also emphasize the fact that most of this contribution came, perhaps, from the South. Such a large extent of water near the regions we are interested in justifies the supposition (expressed in some of our previous works) of the presence of very rich vegetation in the Wadi Ti-n--Torha, the centre of our most recent research, favourable – at the beginning – to a hunting and hunting-fishing economy and later, around 6,000 years ago, to the development of stock-raising.

Variations of the Chad lake level must also be noted, the sharpest of which was recorded between 4,000 and 3,000 years ago (Fig. 1).

Moreover, if we take into consideration the climatic evolution of Tibesti, we find some important climatic stages which are strictly related to Lake Chad events, and to those which were observed in the Ti-n-Torha area. These climatic events can be deduced exclusively from the palaeomorphology, from faunal findings and from the position of dwellings relative to the base level of wadi surrounding the archaeological site. The pollen diagrams, which could better illustrate the climatic evolution, are still lacking.

Aridity periods of Tibesti, with consequent erosion, have been dated at 9,300 - - 9,200 B. P. and 7,600 - 7,300 B. P. (period D; Maley, 1977). Such two aridity periods correspond to Lake Chad decrease which, in any case, was still higher than at present.

"Huts" of the kind already noted in the near Torha East Shelter – also found in the new Two Caves settlement – have been discovered in the wadi bottom of this period. The climate ranged from levels with a high degree of humidity (between 10,000 B.P. and 8,000 B.P.) which correspond to high levels of Lake Chad (+40 m more than the present one), to drier stages which did not reach the present climatic conditions. Both the fish remains (*Clarias* sp.) which have been found in Torha East levels (Cassoli-Durante, in: Barich, 1974), which show that streams ware present

in this zone, and the bird and mammal fauna (*Francolinus*, *Panthera leo*, *Ammotragus*) indicate a close resemblance with the fauna of the present tropical Eastern African savanna.

Conglomerates (6,500 B. P.) have been found in the Middle Terrace series of Tibesti which indicate a recurrence of strong and abundant precipitations at the end of this period and hence the return of a damp climate. From this time there was a swelling of Lake Chad and an increase of stream levels in our zone with consequent abandonment of "huts".

The possibility of exploiting water sources, available in abundance around 9,000 years ago, induced semi-sedentary settlement. At first this occured in the form of dwellings at the wadi bottom without protection, then stone screens and defences were introduced with the increase of abundant precipitation, as testified by the Middle Terrace of Tibesti (7th millennium B. P.).

The kind of economy based on small animal hunting and on hunting-fishing practised in lake basins and in the rivers is proved by the type of stone industry which specialized in microlithic backed bladelets for utilization in series in tools like harpoons as well as by the faunal remains.

Taking into account the antiquity of our industry, its location, the inferable economic system, it appears that the Upper Palaeolithic hunters' environment of the

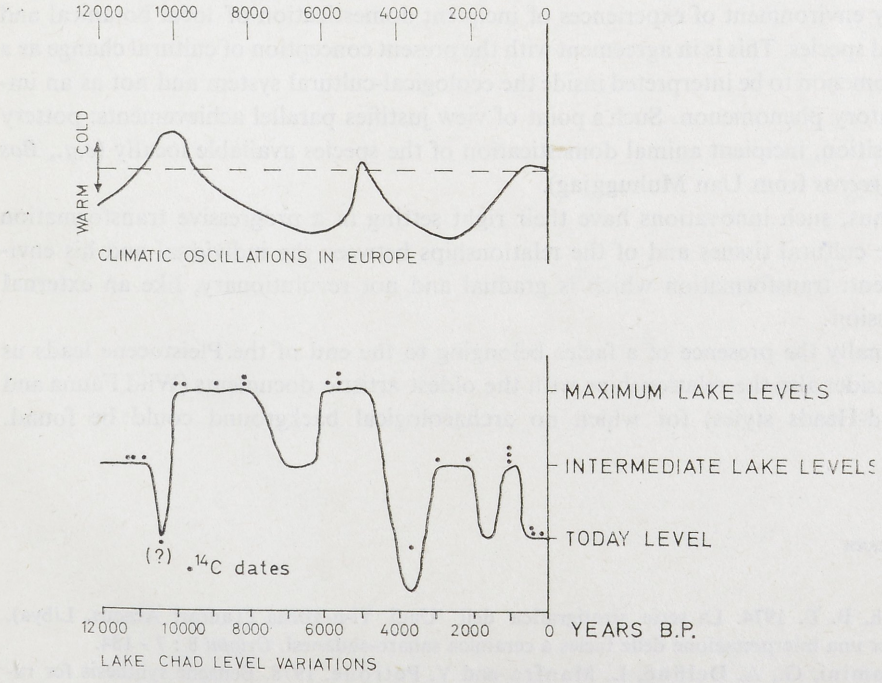

FIG. 1. Comparison between climate of temperate regions and level variations of Lake Chad from 12,000 years B. P. until today (data from Lamb, 1977; Jeje, 1980)

Western Sahara is the milieu one more reasonably turns to. On the other hand, we consider the reference to the so-called "Epi-gravettiens Africains" complexes, whose pluriform aspect is emphasized by Camps (1974) to be very vague, as is the claim of special facies (Elkabien, Natufian) which show immediate and easy similarities with our industry. As regards this subject, we find ourselves in agreement with Vermeersch (1979) that a direct contact between the Nile Valley Epipalaeolithic and the Iberomaurusian or Upper Capsian is quite unlikely and that one should, in this case, look into the hows and whys of the multiplicity of bladelet industries.

On the plane of more general comments, the Ti-n-Torha facies authorizes various study perspectives.

The peopling of 9,000 - 6,000 years ago confirms the hypothesis of the considerable antiquity of the western Saharan groups, as it could already be inferred from findings like Amekni, Site Launey and Tamaya Mellet. This at first leads to a different reflection of the central Saharan cultures, challenging the artificious unity of the "Saharo-Sudanese" area and leading to a better definition of the development and of the enucleation of each cultural group. Consequently, the problem arises of the substratum to which the groups with bladelet technique must be connected, because we go back to immediately post-Pleistocene spheres.

The semi-sedentary characteristics which are mentioned above (and on which we dwell in another paper included in these Proceedings) lead us to think of a preparatory environment of experiences of incipient domestication of local botanical and faunal species. This is in agreement with the present conception of cultural change as a phenomenon to be interpreted inside the ecological-cultural system and not as an immigratory phenomenon. Such a point of view justifies parallel achievements: pottery acquisition, incipient animal domestication of the species available locally (*e.g.*, *Bos brachyceros* from Uan Muhuggiag).

Thus, such innovations have their right setting in a progressive transformation of the cultural tissues and of the relationships between the individual and his environment: transformation which is gradual and not revolutionary, like an external immission.

Finally the presence of a facies belonging to the end of the Pleistocene leads us to consider also the relationships with the oldest artistic documents (Wild Fauna and Round-Heads styles) for which no archaeological background could be found.

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