

UNIVERSITY OF ROME RADIOCARBON DATES XVII

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This list includes dates from Italy, Libyan Sahara, Niger and the Dahlak Islands, obtained from 1976 to 1980, using the benzene scintillation method.

Chemical processing from sample to benzene follows procedures of Alessio *et al* (1978a). Standard pretreatment for wood and charcoal included boiling with 5–10% HCL.

Pretreatment for α -labeled samples underwent leaching with 0.2N NaOH. Since the last date list, Lecroy NIM modules have replaced the original recording electronics for the liquid scintillation detection system, described in Alessio *et al* (1973, 1976). Benzene sample volumes up to 4.5ml, with appropriate amounts of NE 216 scintillator (Nuclear Enterprises, Ltd) yielded the best figure-of-merit ($E^2/B = 2300$) for 2ml benzene and an efficiency of 72%. Age calculations comply with standard *Radiocarbon* protocol, as Stuiver and Polach (1977) recommended, including normalization by mass spectrometrically determined $\delta^{13}C$ (Alessio *et al* 1969).

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ARCHAEOLOGIC SAMPLES

Italy

Bolsena Lake series

In 1975–76–77 excavations were continued (Alessio *et al* 1978) by A Fioravanti with Gruppo Archeosub Lombardo in basal sediments of Bolsena Crater Lake.

Bolsena Lake, Loc Gran Carro

At Gran Carro, Viterbo province, Latium (42°35'23" N, 13°35'E) artifacts were collected from Villanovan culture.

R-1210. Gran Carro

2740 ± 50

Burned food remains found in Villanovan pottery.

$\delta^{13}C = -24.8\text{‰}$

Bolsena Lake Loc Traversa

Napoleonic keel found at Traversa (42°37'41"N, 13°35'35"E) underwater, at 2m depth, 30m from bank.

R-1230. Traversa	<130
Wood from submerged keel.	$\delta^{13}C = -24.1\%$
R-1231. Traversa	<170
Wood from submerged keel. Very scanty sample.	$\delta^{13}C = -24.1\%$

Bolsena Lake Loc Tempietto

Numerous piles recovered at Tempietto (42°38'42.7"N, 13°34'55.5"E) along ancient coastline at 7.50m depth.

	<130
R-1226-α. Tempietto	$\delta^{13}C = -29.7\%$
	360 \pm 50
R-1227-α. Tempietto	$\delta^{13}C = -26.7\%$
	450 \pm 50
R-1228-α. Tempietto	$\delta^{13}C = -26.5\%$
	810 \pm 50
R-1229-α. Tempietto	$\delta^{13}C = -24.7\%$

General Comment: abundant pottery finds attribute Gran Carro to Villanovan culture (Alessio et al 1978). R-1210 date, above, agrees. R-1226- α – 1229- α ranging from Middle Ages to present, suggest rehandling of coast works more recent than expected. R-1230 and -1231 dates may attribute submerged keel to Napoleonic period.

Garigliano River series

In 1967, underwater excavations in Garigliano River at Minturno, near Naples (41°14'43"N, 13°46'4"E.) (Johnson 1933) were undertaken by J Huston, Council of Underwater Archaeology, and continued by SD Ruegg for St Mary's College, Moraga, California. His purpose was to establish site of ancient Roman port and position of bridge of Appian Way, which reached Minturno in 312 BC. At ca 300m from west gate of Roman Castrum, on right river bank, cluster of ca 120 oak piles was found, probably part of first pier of bridge mentioned by Cicero in 44 BC. Fourteen oak piles were dated in Hannover, Tokyo and Rome; 28 were calibrated into an absolute chronology (Ruegg 1982, 1983). Samples dated in Rome cannot be securely compared with tree-ring analyses because they were taken at random inside piles.

R-1154.	2380 \pm 120
Pier DU from Sec E-111.	

Comment: sample fits tree-ring analysis.

R-1155.	2650 \pm 100
Pier DI from Sec G-112.	

R-1156.	2820 ± 110
Pier CM from Sec G-110.	
R-1083.	2080 ± 60
Pier EQ from Sec G-110.	$\delta^{13}C = -28.6\text{‰}$
<i>Comment:</i> sample fits tree-ring analysis.	
R-1085-α.	2340 ± 50
Pier ET from Sec G-110.	$\delta^{13}C = -26.9\text{‰}$
R-1084-α.	2160 ± 80
Pier CE from Sec F-111.	
<i>Comment:</i> sample fits tree-ring analysis.	
R-1087.	2680 ± 60
Pier CS from Sec E-111.	$\delta^{13}C = -26.5\text{‰}$
<i>Comment:</i> calibrated age of this sample is older than tree-ring date.	
R-1088.	1990 ± 60
Pier CH from Sec E-111.	$\delta^{13}C = -27.5\text{‰}$
<i>Comment:</i> possibly belongs to different pier set.	
R-1089.	2040 ± 70
Pier EF from Sec E-111.	$\delta^{13}C = -29.6\text{‰}$
<i>Comment:</i> dated in Tokyo with same result (GAK-4318, 2070 ± 100).	
R-1082-α.	1980 ± 60
Post from underwater wall 350m south of Castrum.	
R-1086-α.	2210 ± 70
Post from underwater wall 1500m south of Castrum.	$\delta^{13}C = -25.9\text{‰}$
<i>General Comment:</i> all dated piers seem to belong to Roman structure built in 3rd century BC and used until 2nd–3rd century AD. Most ^{14}C dates agree with tree-ring analyses.	

Lavagnone series

Two excavations were made in Lavagnone peatbog, ancient intermorainic lake, 5km south of Desenzano, Brescia province, Lombardia (45°26'N, 10°35'E). The first, in 1971, was organized by O Acanfora, Sopr Preistoria e Etnografia, Museo Pigorini, Roma, and conducted by B Barich, Ist Paleontologia, Univ Roma, and the second, in 1974, by R Perini, Mus Sci Nat, Trento. Aim was to ascertain stratigraphy of zone where materials attributable to Early Bronze Age (Polada culture) were found during quarrying.

1971 Excavations

Two sections opened. Sec I, four layers from top to bottom: Layer 1, grayish mold with charcoal and emerging vertical stakes; Layer 2, mold with pleached wickers and many seeds over horizontal stakes; Layer 3, compact peat; Layer 4, clay. Sec II, three layers: Layer 1, grayish mold with charcoal and emerging vertical stakes; Layer 2A, brown-blackish clayey ground with sand traces and shell fragments and, at 50cm from top, aligned vertical stakes; Layer 2B, ground similar to Layer 2A with crossed horizontal stakes. Samples subm Dec 1974.

R-1258-α. Lavagnone	3340 ± 50
Charcoal from Sec I, Layer 1.	$\delta^{13}C = -27.1\text{‰}$
R-1256-α. Lavagnone	3470 ± 60
Charcoal from Sec I, Layer 1.	$\delta^{13}C = -27.1\text{‰}$
R-1257-α. Lavagnone	3450 ± 50
Charcoal from Sec I, Layer 2.	$\delta^{13}C = -27.2\text{‰}$
R-1254. Lavagnone	3590 ± 50
Charcoal from Sec I, basal level of Layer 2.	$\delta^{13}C = -27.6\text{‰}$
R-1261. Lavagnone	3630 ± 50
Charcoal from Sec I, basal level of Layer 2.	$\delta^{13}C = -26.7\text{‰}$
R-1260. Lavagnone	3900 ± 50
Charcoal from Sec I, 78cm depth.	$\delta^{13}C = -27.4\text{‰}$
R-1255. Lavagnone	3120 ± 50
Charcoal from Sec II, Layer 1.	
R-1259-α. Lavagnone	3150 ± 50
Sec II, Layer 2A.	$\delta^{13}C = -27.6\text{‰}$
R-1264. Lavagnone	3190 ± 60
Sec II, Layer 2B.	

General Comment: dates agree with stratigraphy in both sections; all Sec II dates are more recent than Sec I dates. The whole excavated complex ranges from Ancient to Recent Subalpine Po Valley Bronze Age.

1974 Excavations

Two new sections were opened, near previous ones: Sec I, 3m thick, shows continuous settlement from Ancient to Recent Southalpine Bronze Age; Sec II includes remains of pile buildings attributable to Polada culture, A-B phases transition. Most samples from Sec II, Layers

D3 and E2 (Middle Bronze), and deeper Layer G2; one, R-1248- α , from Sec I, Layer G2 (Ancient Bronze, perhaps Polada A).

R-1247-α. Lavagnone A	3550 \pm 50
Wood. Sec II, Level E 2.	$\delta^{13}C = -31.4\%$
R-1248-α. Lavagnone B	3700 \pm 50
Wood. Sec I, Level G2 (140cm depth).	
R-1249-α. Lavagnone	3750 \pm 50
Charred wood. Sec II, Level G2, 140cm depth.	$\delta^{13}C = -26.4\%$
R-1250-α. Lavagnone C/1	3590 \pm 50
Burned board fragment. Sec II, Level G2, 140cm depth.	$\delta^{13}C = -28.2\%$
R-1251-α. Lavagnone D	3700 \pm 50
Charcoal. Sec II, Level E, 125cm depth.	
R-1252-α. Lavagnone E	3760 \pm 50
Charred wood. Sec II, 100cm depth.	$\delta^{13}C = -27.3\%$
R-1253-α. Lavagnone F	3430 \pm 50
Wood. Sec II, Level D3, 110cm depth.	$\delta^{13}C = -29.2\%$

General Comment: very good agreement among R-1252- α , 1251- α and 1249- α from Sec II, as well as with R-1248- α , from Sec I (Perini 1982). These dates agree with R-769 Romagnano III 3, P1 and R-770- α Romagnano III 4-7, P 2-3 (Alessio *et al* 1987b). R-1253- α and 1247- α dates may fit Polada culture advanced period.

Monte Venere cave

Charcoal samples coll from Monte Venere cave, Cimini Mts, Lazio (46°50'N, 12°15'E), from stratified deposit. Charcoal was mixed with ash and pottery fragments decorated with brown, angled stripes. Pottery is attributable to Neolithic "facies" of Sasso di Furbara (Delpino & Fugazzola-Delpino 1982). Two sections were explored, A-B and C, under surface soil; in each, seven layers were defined. Samples coll 1972 by F Delpino and MA Fugazzola-Delpino, Sopr Archaeol Etruria Meridionale. Subm by F Delpino.

R-1168-α. Monte Venere A - B 2	4990 \pm 50
Two pieces of charcoal from Sec A - B, Layer 2.	$\delta^{13}C = -26.7\%$
R-1169-α. Monte Venere A - B 3	5770 \pm 50
Three pieces of charcoal from Sec A - B, Layer 3.	$\delta^{13}C = -25.0\%$

Comment: date agrees with R-1174, coll in corresponding layer, Sec C.

- R-1171. Monte Venere B 4** 5270 ± 60
Two pieces of charcoal from Layer 4.
Comment: more recent than upper layers; sample is possibly contaminated.
- R-1167. Monte Venere A 4 - 6** 6860 ± 60
Charcoal at bottom of Layer 4. $\delta^{13}C = -25.9\%$
Comment: date agrees with R-1175, Sec C, Layer 4.
- R-1170. Monte Venere A - B 6** 8000 ± 160
Charcoal from upper level of Layer 6. No archaeological material found.
- R-1173. Monte Venere C 2** 5900 ± 300
Charcoal from Layer 2.
Comment: better agreement with Sec C, Layer 3 than with Sec A - B, Layer 2. Possibly attributable to the beginning of Layer 2 formation.
- R-1174. Monte Venere C 3** 5800 ± 60
Charcoal from Layer 3. $\delta^{13}C = -25.1\%$
Comment: agrees with Sec A - B, Layer 3.
- R-1175. Monte Venere C 4** 6940 ± 100
Charcoal from Layer 4.
Comment: see Comment to R-1167, above.
- R-1176. Monte Venere C 7** 5650 ± 100
Charcoal from Layer 7, underlying hard and compact clay.
Comment: does not agree with samples from same section.
- R-1177- α . Monte Venere B 5** 310 ± 50
Charcoal. $\delta^{13}C = -24.9\%$
Comment: see R-1178- α .
- R-1178- α . Monte Venere C 5** 280 ± 50
Charcoal. This sample and preceding one were coll from layer of two sections. $\delta^{13}C = -24.9\%$
Comment: no agreement with other results.
General Comment: oldest date obtained, R-1170, must be considered only as “post quem” for formation of upper antropic layers.
The agreement between R-1169- α and -1174, from Layer 3 of two different sections, is important basis for interpretation of whole stratigraphic sequence.

Ages of samples R-1175 and-1167, ca 1000 years older than those from Layer 3, attribute them to Layer 5 rather than Layer 4, as believed during excavations.

Brindisi series

Wood samples, one partially charred, from presumably medieval boat found in 1979 in Pigonati channel (40°38'N, 17°56'E) port of Brindisi, at 3.5m depth. Pigonati channel, blocked in Roman times during civil war between Caesar and Pompeius, was reopened under Angioins' rule and blocked again for defense in AD 1400; finally reopened in 1800. Coll and subm by B Sciarra, Archaeol Prov Museum, Brindisi.

R-1521.	Brindisi I	750 ± 60
Partially charred wood.		$\delta^{13}C = -26.6\text{‰}$
R-1522.	Brindisi II	660 ± 60
Wood board fragment.		$\delta^{13}C = -26.6\text{‰}$
R-1523.	Brindisi III	880 ± 60
Wood board fragment.		$\delta^{13}C = -26.6\text{‰}$

General Comment: dates confirm Middle Age date.

Africa

Uadi-Ti-n-Torha

In Uadi Ti-n-Torha zone (25°00'N, 10°20'E), Tradart Acacus massif, Libyan Sahara, excavations were conducted previously, 1971–72, by F Mori and B Barich, Inst Paletnol, Univ Roma, to study human settlements. A new excavation was undertaken in 1978 to learn more about deposit found in “East Riparo” (Alessio *et al* 1978b), and to study “Ti-n-Torha-Due Cave” settlement (Barich *et al* 1984). Site was divided into three sections: west, center and east. No sample of sufficient size for dating was found in center section.

Uadi-Ti-n-Torha - Due Cave series

All samples are charcoal.

R-1405.	Ti-n-Torha	8840 ± 60
West sec, Level 1.		$\delta^{13}C = -26.7\text{‰}$
R-1407.	Ti-n-Torha	8520 ± 60
West sec, Level 1.		$\delta^{13}C = -26.6\text{‰}$
R-1408.	Ti-n-Torha	8450 ± 60
West sec, Level 2, -38cm depth.		$\delta^{13}C = -25.0\text{‰}$
R-1404.	Ti-n-Torha	8630 ± 50
West sec, Level 3, -70cm depth.		

R-1404 bis. Ti-n-Torha	8400 ± 90
West sec, Level 3.	$\delta^{13}C = -24.6\%$
R-1403. Ti-n-Torha	6230 ± 50
East sec, Level 1.	$\delta^{13}C = -24.5\%$
R-1406. Ti-n-Torha	8620 ± 50
East sec, Level 2, basal layer, -35cm depth.	
R-1409. Ti-n-Torha	8650 ± 100
East sec, Level 2, -40cm depth.	
R-1402. Ti-n-Torha	9350 ± 110
East sec, Level 3.	$\delta^{13}C = -26.3\%$

Uadi Ti-n-Torha - East Riparo series

All samples are charcoal.

R-1158-α. Ti-n-Torha	7330 ± 80
East sec.	$\delta^{13}C = -23.9\%$
R-1160-α. Ti-n-Torha	8540 ± 140
East sec, C 2, Level III.	$\delta^{13}C = -25.7\%$
R-1161-α. Ti-n-Torha	8460 ± 50
East sec, C 3, Level I A..	$\delta^{13}C = -25.5\%$
R-1162-α. Ti-n-Torha	8440 ± 50
East sec, C 3, Level I B.	$\delta^{13}C = -25.7\%$
R-1163-α. Ti-n-Torha	8670 ± 60
East sec, C 3, Level IV.	$\delta^{13}C = -24.8\%$

General Comment: East Shelter dates agree very well with previous dates for that site (Alessio et al 1978a) and confirm occupation for 2000 years, ca 8th–7th millennia BC. Ages of West sec Uadi Ti-n-Torha-Due Cave samples range around middle of 7th millennium BC; ages of East sec samples range from 7th–5th millennia BC; of these, R-1402 is one of oldest samples in entire Saharian-Soudanes area (Camps 1968, 1974). Taking into account previous dates, we conclude that Uadi Ti-n-Torha area has been inhabited most intensively from 8th–6th millennia BC in East Shelter and Ti-n-Torha-Due Cave sites; North Shelter site was occupied later, between 6th and 4th millennia BC. Area may have been abandoned and then repopulated, probably in relation to climatic changes.

Tenere' - Niger series

Wood samples from two "dead" towns in Tenere' desert, Niger. R-1266 from window lintel in Diabessa (20°50'N, 12°14'E), at east edge of the Tenere' desert. Diabessa is part of group of dead towns built on high ground, similar to castle towns. R-1268 from Assode' (18°30'N, 8°48'E), in desert mountainous area of Air.

R-1266. Diabessa **420 ± 50**

Wood fragment from window lintel. $\delta^{13}C = -27.7\text{‰}$

R-1268. Assode' **360 ± 50**

Wood fragment. $\delta^{13}C = -26.0\text{‰}$

General Comment: different structure of two towns and lack of fortifications at Assode' led us to believe they might be from different historic period. Dates do not confirm this hypothesis, suggesting they are from "Islamic Middle Age."

GEOLOGIC SAMPLES

Rovagnate series

Organic material in Rovagnate (Como, Italy) lacustrine sediments, deposited in intermorainic basin of Würmian cluster of Brianza, Lombardia. Excavation was conducted 1976 and 1977 by G Orombelli, Ist Geol, Univ Milano, who coll and subm samples from center of lacustrine basin (45°44'44"N, 09°21'12"E). For dates from previous excavation, see Alessio *et al* (1975). For description of stratigraphic sequence, see Riva (1941, 1954, 1957), Gabert (1962), Gnaccolini and Orombelli (1976), and Orombelli (1978).

R-1207-α. Rovagnate **7160 ± 50**

Peat from Layer 2, 0–80cm depth. $\delta^{13}C = -26.4\text{‰}$

R-1208. Rovagnate **9260 ± 70**

Shells from Layer 3. $\delta^{13}C = -23.9\text{‰}$

R-1241 A+B. Rovagnate **9680 ± 60**

Shells from Layer 3.

R-1242 A. Rovagnate **10,620 ± 60**

Shells from Layer 3. $\delta^{13}C = -22.6\text{‰}$

General Comment: last three samples of *Gastropoda* and *Lamellibranchia* shells, from Layer 3, 100–160cm depth. Dates of last three samples agree with stratigraphy. Series establishes Quaternary stratigraphy of this zone; for more dates, see Bertoldi (1968).

Dahlak Islands

Malacofauna formed by terrestrial, fresh-brackish water gastropods, found in surface deposit in Dahlak Kebir Island, Red Sea (15°48'N, 40°14'E) (Belluomini *et al* 1980). Coll and subm by D Esu and R Matteucci, Dept Scienze della Terra, Univ Roma.

R-1395. Dahlak

6480 ± 70

Gastropod shells.

 $\delta^{13}\text{C} = +3.7\text{‰}$

Comment: date agrees with others relating to great Humid Panafrican phase, 9000–4500 BP (Butzer *et al* 1972). Evidence that event may extend to Dahlak Islands.

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