

MONACO RADIOCARBON MEASUREMENTS IV

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The following list of dates includes most of the samples processed from 1968 to 1972. Proportional counting is used and the counting gas is CO₂ at constant filling pressure of 740mmHg at 22°C (Thommeret *et al.*, 1969). Samples are counted at least twice on two different counters and errors quoted are averages of standard deviations obtained on each counting.

In 1970 the installations were entirely rebuilt and 3 quartz-lined proportional counters of 1.2L were constructed in the laboratory and are now in use. Counting results are periodically punched on tape and the dates calculated with the help of a small calculator.

ACKNOWLEDGMENTS

We gratefully acknowledge the help of J. L. Rapaire in setting up the equipment, J. Galliot for electronics maintenance, Miss G. Hugues for samples preparations, and all submitters who added their comments.

SAMPLE DESCRIPTIONS

I. GEOLOGIC SAMPLES

A. France

Continental shelf of Roussillon, Pyrénées Orientales

Between Bear Cape (42° 31' 00" N Lat, 3° 08' 20" E Long) and Leucate Cape (42° 55' 10" N Lat, 3° 03' 30" E Long), the continental shelf (down to -120m) is spotted with Quaternary remnants. Some are crowned with large coral concretions that are covered by more recent sediment. Invasion of post-Würm sea shaped marine terraces and deposited layers of sand. Many cores 5 to 10m long, coll. from 1965 to 1970 and subm. by A. Monaco, Centre Recherches Séd. Marine, UER Sci., Perpignan, Pyrénées Orientales.

MC-468. Core CLK 3, 155 to 175cm **≥35,000**

Shell (*Cyprina islandica*) 155 to 175cm in Core CLK 3 (42° 55' 35" N Lat, 3° 29' 00" E Long), water depth 95m.

MC-469. Core CLK 3, 330 to 350cm **≥35,000**

Shell (*Cyprina islandica*) in deepest sandy to gravelly horizon, 330 to 350cm in core.

MC-465. Core F 123, 210 to 230cm **≥35,000**

Mixed marine shells (*Cyprina islandica*, *Turritella*, *Mytilus sp.*) in Core F 123 (42° 35' 40" N Lat, 3° 17' 00" E Long), 210 to 220cm in core, water depth 82m.

MC-331. Core S 11, 250 to 300cm **≥35,000**

Shelly sand, heterogeneous horizon, 250 to 300cm in Core S 11

(42° 41' 30" N Lat, 3° 16' 15" E Long), water depth 90m. *Comment* (A.M.): stratigraphically equivalent to MC-468 and MC-469.

27,200 ± 1000

MC-250. Core C 29

25,250 B.C.

Shell fragments (*Chlamys sp.*) included in siliceous eolian-sand matrix appearing as pebbles in several levels of Core C 29 (42° 43' 10" N Lat, 3° 7' 35" E Long) near outcropping rock of littoral zone, water depth 47m. *Comment* (A.M.): if the organisms, during their life, became embedded in the sandy matrix, age of gritty sediment agrees with paleogeographic data deduced from cores and seismic records.

23,800 ± 1000

MC-467. Core F 129, 510 to 540cm

21,850 B.C.

Mixed marine shells (*Venus*, *Turritella*, *Mytilus*) from whole sandy lower part, 510 to 540cm in Core F 129 (42° 31' 40" N Lat, 3° 13' 00" E Long), water depth 78m. *Comment* (A.M.): medium- to coarse-grained sand horizon pertains to facies called "offshore sands" or "Würm relict sands."

18,300 ± 750

MC-330. Core S 9, 50cm

16,350 B.C.

Shelly sand from depth 50cm in Core S 9 (42° 40' 10" N Lat, 3° 26' 40" E Long), water depth 90m. *Comment* (A.M.): dates gravelly sand horizon marking late Würm regression at outer border of Continental slope.

12,900 ± 200

MC-334. Core S 17, 400 to 450cm

10,950 B.C.

Shelly sand in 450cm long Core S 17 (42° 36' 50" N Lat, 3° 12' 15" E Long), 400 to 450cm in core, water depth 72m. *Comment* (A.M.): should date horizon of -70m submarine terrace shaped during postglacial transgression.

10,500 ± 150

MC-335. Core S 19, 850cm

8550 B.C.

Shelly sand from lower sand horizon in Core S 19, 850cm long. (42° 49' 30" N Lat, 3° 12' 50" E Long), water depth 60m. *Comment* (A.M.): could be same age as terrace at -55m.

8400 ± 150

MC-466. Core F 128, 860 to 878cm

6450 B.C.

Mixed shells (*Chlamys*, *Cardium*, *Venus*) in Core F 128 (all sand) (42° 31' 10" N Lat, 3° 9' 00" E Long), 860 to 878cm in core, water depth 40m. *Comment* (A.M.): date corresponds to stand of sea level characterized by bulky sand that projects through silt mantle in places (Bear and Leucate Capes).

6000 ± 100

MC-332. Core S 13, 230 to 300cm

4050 B.C.

Silty, shelly sand in Core S 13, 250cm long (42° 37' 22" N Lat, 3°

07' 50" E Long), 120 to 235cm in core, water depth 38m. *Comment* (A.M.): Flandrian silty facies.

MC-303. Core C 29, 340 to 350cm **1350 ± 60**
A.D. 600

Tiny lamellibranch and gasteropod shells in Core C 29 (42° 43' 10" N Lat, 3° 7' 35" E Long), 340 to 350cm in core, water depth 47m. *Comment* (A.M.): possible reworking of sediment in vicinity of Roche Lannier, an outcropping reef.

MC-304. Dredging 5 $\delta C^{14}/\text{‰} = +13 \pm 10$

Lamellibranchs (*Pecten*, *Anomya*) form a dredged superficial deposit (42° 41' 40" N Lat, 3° 7' 45" E Long), water depth 45m, near Roche Lannier.

General Comment (A.M.): due to complexity of Quaternary stratigraphy and paleogeography shaped by eustatic sea levels on Roussillon continental shelf, interpretation of dates requires a large set of various analyses (Monaco, 1971; Monaco and Thommeret, 1969; Monaco *et al.*, 1972).

Saint-Nazaire shore-pond sediment series

Shells from various cores from coastal lake of Saint-Nazaire, coll. and subm. by F. Gadel, Centre Recherches Séd. Marine, UER Sci., Perpignan.

MC-397. Saint-Nazaire 1 **2750 ± 90**
800 B.C.

Shells (*Cardium*) in a transition shell layer, from depth 235cm in Core CM (42° 39' 3" N Lat, 3° 15' E Long). Coll. 1967.

MC-396. Saint-Nazaire 2 **4360 ± 90**
2410 B.C.

Shells (*Cardium*) in a transition shell layer, from 380cm in same core as MC-397.

MC-517. Saint-Nazaire 3 **2870 ± 90**
920 B.C.

Shells (*Cardium*) from depth 205 to 220cm in Core CH (42° 39' 40" N Lat, 3° 1' 20" E Long). Coll. 1968.

MC-518. Saint-Nazaire 4 **4300 ± 70**
2350 B.C.

Shells (*Cardium*) from depth 370 to 390cm in same core as MC-517.

MC-519. Saint-Nazaire 5 **3670 ± 80**
1720 B.C.

Marine shells of lagoonal ooze in Core CD (42° 41' 10" N Lat, 3° 0' 10" E Long), from depth 186 to 200cm. Coll. 1967.

MC-417. Saint-Nazaire 6 **4800 ± 150**
2850 B.C.

Marine shells in silty Core CK (42° 40' 40" N Lat, 3° 30' E Long), depth 50cm in core. Coll. 1968.

General Comment (F.G.): in central part of Saint-Nazaire shore-pond, sedimentation rates in recent layers are from 75 to 80cm/millennium (CH and CK cores) in comparison to 90 to 110cm for deeper oozes in same cores, suggesting quieter conditions for former deposits. In N part of lagoon a slower rate (40cm/millennium in Cores CD and CJ) was found despite fluvial supplies. This may be explained by temporary summer uncovering periods inducing compaction of dry sediment followed by wind erosion.

Golfe du Lion α core series

Piston core 19m long, coll. 1969 on continental shelf of Golfe du Lion (43° 13' 25" N Lat, 4° 10' 45" E Long), water depth 88m, by O. V. Terebel for CFP and subm. by F. Gadel.

MC-413. Golfe du Lion α core 7.00m **7780 \pm 100**
5830 B.C.

Shells (*Turritella*) in gray silt at 7.00m below surface sediment.

MC-414. Golfe du Lion α core 12.80m **12,240 \pm 180**
10,290 B.C.

Serpulid calcareous tubes at core depth 12.80m.

MC-415. Golfe du Lion α core 17.50m **25,300 \pm 800**
23,350 B.C.

Shell fragments at core depth 17.50m.

General Comment (F.G.): since 12,000 B.P. sedimentation rate in this place is 1m/millennium. Before 12,000 B.P., sedimentation rate was 35 to 40cm/millennium; but compaction must be considered.

Bages-Sigean shore-pond sediment series

MC-515. Bages-Sigean E 3 **1250 \pm 70**
A.D. 700

Mixed marine shells (*Rissoa*, *Lucina*, *Cardium*) from depth 80 to 90cm in silt, Sta. E, water depth 1m (43° 6' 20" N Lat, 3° 0' E Long). Coll. 1968 by G. Cahet, Lab. Arago, Banyuls sur Mer, Pyrénées Orientales.

MC-516. Bages-Sigean C 3 **650 \pm 60**
A.D. 1300

Mixed marine shells (*Rissoa*, *Lucina*, *Cardium*) from depth 80 to 90cm in sediment, Sta. C, water depth 2m (43° 5' 25" N Lat, 2° 59' 29" E Long). Coll. 1968 by G. Cahet.

General Comment (F.G.): sedimentation rate depends on position in lagoon and water depth. Rates near shore at Sta. C, which is influenced by fluvial supplies from the Berre R., are twice as great as in the shallow water of Sta. E.

Continental shelf of Provence

Between Rhône delta and S shore of Massif des Maures at depths from 200 to 300m are found, as fossils, North Atlantic shell species, now

extinct in the Mediterranean. Cores and dredging from continental slope or from canyon rims yielded shells of these species, subm. 1967 to 1971 by C. Froget, Lab. Géol. Marine, Univ. Marseille-Luminy (Blanc, Froget, and Gien, 1967).

Provence Core B 11-67 series

Piston core of silty sand, coll. and subm. 1967, in upper part of continental slope (43° 08' 40" N Lat, 5° 25' 30" E Long) S of Bec de Sormiou, water depth 90m.

MC-243. Core B 11-67, 210cm **13,050 ± 300**
11,100 B.C.
Shells (*Cyprina islandica*), 210cm in core.

MC-242. Core B 11-67, 250cm **12,170 ± 300**
10,220 B.C.
Shells (*Cyprina islandica*), 250cm in core.

General Comment (C.F.): ages do not agree with depth in sediment. Reworking is a possible explanation.

Provence shelf Core series

Sandy and silty piston core (42° 58' 49" N Lat, 3° 58' 26" E Long) in S of delta of Rhône R., water depth 96m.

MC-356. Provence shelf Core, 90cm **10,350 ± 200**
8400 B.C.
Shell (*Cyprina islandica*), 90cm in core.

MC-357. Provence shelf Core, 230cm **21,300 ± 700**
19,350 B.C.
Shell (*Cyprina islandica*), 230cm in core.

Provence continental shelf dredging series

MC-348. Dredging R 30 **12,200 ± 300**
10,250 B.C.
Shells (*Venus casina*) dredged Sept. 1966 (42° 58' 10" N Lat, 5° 42' 30" E Long), water depth 250m, on the E border of Plateau des Blauquières.

MC-245 A. Dredging S of Bandol, Var **13,140 ± 160**
11,190 B.C.
Shells (*Venus casina*) dredged Sept. 1966 (42° 58' 15" N Lat, 5° 41' 30" E Long), water depth ca. 250m.

MC-245 B. Dredging S of Bandol **12,470 ± 190**
10,520 B.C.
Shells (*Glycimeris glycimeris*) from same dredging as MC-245.

MC-244. Dredging Cassidaigne, Bouches du Rhône **13,095 ± 300**
11,145 B.C.
Shells (*Cyprina islandica*) dredged Oct. 1967 (43° 07' 30" N Lat, 5° 26' 10" E Long), water depth from 300 to 150m on W rim of Canyon de Cassidaigne.

- MC-246 A. Dredging Cassidaigne CF 86** **6400 ± 100**
4450 B.C.
 Shells (*Venus casina*) dredged April 1967 (43° 05' 00" N Lat, 5° 31' 00" E Long), water depth from 250 to 200m on E rim of Canyon de Cassidaigne, sample deeply worm-pitted.
- MC-246 B. Dredging Cassidaigne CF 86** **6970 ± 100**
5020 B.C.
 Uncorroded shell (*Venus casina*). *Comment*: no significant age difference between corroded and non-corroded shells.
- MC-247. Dredging Cassidaigne CF 16** **9600 ± 100**
7650 B.C.
 Calcareous tubes of shell-worm (*Ditrupea arietina*) dredged (43° 01' 15" N Lat, 5° 30' 10" E Long), water depth from 240 to 220m on E edge of Canyon de Cassidaigne.
- MC-248. Dredging Cassidaigne R 178** **5600 ± 100**
3650 B.C.
 Shells of unid. large oysters, supposedly of Tertiary age dredged 1966 (43° 07' 30" N Lat, 5° 29' 00" E Long), water depth from 600 to 500m. *Comment* (C.F.): quoted age is probably correct, though estimated age was much greater. Oysters were attached to sandstone block dated 27,900 B.P. (MC-434).
- MC-358. Dredging Cassidaigne F 5** **10,000 ± 150**
8050 B.C.
 Shells (*Modiolus modiolus*) dredged Jan. 1967 (43° 06' 10" N Lat, 05° 27' 20" E Long), water depth from 250 to 150m, on W rim of Canyon de Cassidaigne.
- MC-359. Dredging Cassidaigne F 4** **≥35,000**
 Shell (*Cyprina islandica*). Coll. March 1969 in same zone as Dredging F 5, water depth ca. 345m. Shell all pitted and bored by worms.
- MC-360. Dredging Cassidaigne F 3** **11,000 ± 200**
9050 B.C.
 Shell (*Panopea norvegica*) dredged Aug. 1967 (43° 05' N Lat, 5° 30' 50" E Long), water depth from 350 to 150m.
- MC-361. Dredging Cassidaigne F 2** **9800 ± 200**
7850 B.C.
 Shell (*Buccinum undatum*). Coll. March 1968 (43° 06' 40" N Lat, 5° 32' E Long).
- MC-362. Dredging Cassidaigne F 1** **δC¹⁴‰ = + 21 ± 8**
 Shells (*Venus casina*) coll. alive May 1969 (43° 07' N Lat, 5° 32' 30" E Long) in dredging of same zone as F 4 (MC-359) and F 5 (MC-358), water depth ca. 135m on E edge of Canyon de Cassidaigne.
General Comment (C.F.): North Atlantic species of shells cored or dredged in top part of continental slope (Plateau des Blauquières, top of Canyon de Cassidaigne) at depth from 300 to 200m and dated as Würm

are also found as shell accumulations, dated from 13,000 to 10,000 B.P., corresponding to milder postglacial climate (Dryas I, Allerød, Dryas II) that induced their extinction. At that time, sea level was 80m lower than at present. Some species (*Venus casina*, *Glycimeris glycimeris*, *Ditrupa arietina*), always present in the Mediterranean, survived these climatic changes up to the present, although they are found at unusual depth. *Venus casina*, coll. alive is relic of these populations (Froget *et al.*, 1972).

Provence continental shelf Core D 11-67 series

Piston core 370cm long coll. 1967 (43° 04' 30" N Lat, 5° 22' E Long) water depth 140m on ridge of continental shelf, S of Marseille, Bouches du Rhône, subm. by C. Froget.

MC-351. Core D 11-67, 0 to 11cm	16,200 ± 360
Free calcareous algae.	14,250 B.C.
MC-352. Core D 11-67, 22 to 35cm	16,100 ± 360
Free calcareous algae.	14,150 B.C.
MC-439. Core D 11-67, 40 to 50cm	19,350 ± 700
Calcareous algae.	17,400 B.C.
MC-438. Core D 11-67, 50 to 60m	27,700 ± 1500
Calcareous algae.	25,750 B.C.
MC-437. Core D 11-67, 70 to 80cm	27,200 ± 1500
Mixed sample of polychaete worm tubes (<i>Salmacina</i>) and bryozoan tubes (<i>Hippodiplosia fascialis</i> P).	25,250 B.C.
MC-436. Core D 11-67, 80 to 90cm	30,700 ± 1800
Coarse calcareous sand, grain-size fraction > 0.5mm.	28,750 B.C.
MC-435. Core D 11-67, 90 to 100cm	30,300 ± 1800
Bryozoans.	28,350 B.C.
MC-353. Core D 11-67, 120 to 130cm	28,000 ± 1700
Calcareous sand, grain-size fraction > 2mm.	26,050 B.C.
MC-355. Core D 11-67, 340 to 350cm	29,300 ± 1600
Bryozoans (<i>Hippodiplosia fascialis</i>).	27,350 B.C.

General Comment (C.F.): dating technique probably reaches its limit at core depth 1m. Thus, calculated sedimentation rate is poor and variable: ca. 12cm/1000 yr from 0 to 50cm and 2 to 3cm/1000 yr from 40 to 60cm. Results agree with pteropod distributions in core: N Atlantic pteropod (*Spiratella retroversa*) is only species found at core depths > 40cm.

Golfe du Lion Piston Core 9-68 series

Piston core 1850cm long, coll. Sept. 1968 (43° 13' 25" N Lat, 4° 10' 45" E Long), water depth 88m, ca. 50km SE Montpellier. Sandy silt, mostly from Rhône Delta, with shell debris. Subm. 1971 by C. Froget.

MC-428. Core 9-68, 300cm	6900 ± 150 4950 B.C.
Unid. shell fragments.	
MC-429. Core 9-68, 700cm	7700 ± 140 5750 B.C.
Unid. shell fragments.	
MC-430. Core 9-68, 1500cm	19,000 ± 250 17,050 B.C.
Shell fragments (<i>Cyprina islandica</i>).	
MC-431. Core 9-68, 1700cm	31,500 ± 3000 29,550 B.C.
Shell fragments (<i>Cyprina islandica</i>).	
MC-432. Core 9-68, 1800cm	13,300 ± 250 11,350 B.C.
Unid. shell fragments.	

General Comment (C.F.): compared to Core D 11-67, sedimentation rate is much higher (ca. 1m/1000 yr) from 300 to 1500cm. The 1700cm level (MC-431) appears older than surrounding ones: 1500cm (MC-430) and 1800cm (MC-432) suggesting reworking. Appearance of N Atlantic pteropod (*Spiratella retroversa*), 900cm, agrees with age in core.

Provence littoral zone consolidated formations

MC-347. Saint-Cyr-les-Lecques, Var	≥35,000
Shells (<i>Patella ferruginea</i>) from fossil beach of cemented sand and pebbles covered by consolidated dune sand formation (43° 10' 20" N Lat, 5° 41' 40" E Long), alt. +3m. Coll. and subm. 1969 by C. Froget.	
MC-433. Cavalaire, Var	24,400 ± 1000 22,450 B.C.
Fragments of dredged shelly sandstone (43° 06' 30" N Lat, 6° 33' 30" E Long), water depth 220m, S of Cap Cavalaire. Coll. and subm. 1969 by C. Froget. <i>Comment</i> : dates a submarine lithification.	
MC-434. Cassidaigne, Bouches du Rhône	27,900 ± 1100 25,950 B.C.
Unid. shell fragments extracted from dredged sandstone cobbles (43° 07' N Lat, 5° 31' E Long), water depth from 400 to 350m, in Canyon de Cassidaigne. Coll. and subm. 1969 by C. Froget. <i>Comment</i> (C.F.): dates a submarine lithification.	
MC-349. Isle of Riou I	1200 ± 130 A.D. 750
Calcareous, slightly cemented algae from sea floor, -18m, Plateau	

des Chèvres (43° 11' 10" N Lat, 5° 24' 30" E Long) near Isle of Riou, Bouches du Rhône. Coll. and subm. 1969 by C. Froget.

MC-350. Isle of Riou 2**1300 ± 130****A.D. 650**

Calcareous algae from area of MC-349, water depth 15m. Coll. and subm. 1969 by C. Froget. *Comment* (C.F.): dates for submarine rocks (MC-454, -434, -349, -350) vary from 1200 to 27,900 yr B.P. and confirm a submarine medium of consolidation if their present depth is considered. They aid study of diagenesis of carbonaceous sediment in this medium.

Isle of Riou Cardial site series, Bouches du Rhône

Marine shells from open-air habitat, nearly destroyed by removal of sand from a 19th century sand pit (43° 10' 50" N Lat, 5° 23' E Long), alt. ca. +25m in NW Isle of Riou, near Marseille. Rough early cardial pottery and poor lithic industry remains: milling stones cut in Quaternary sandstone blocks not found on island. Coll. and subm. by C. Froget.

MC-440. Isle of Riou Cardial Site 1**7600 ± 100****5650 B.C.**

Shells (*Patella caerulea*).

MC-441. Isle of Riou Cardial Site 2**7400 ± 100****5450 B.C.**

Shells (*Patella lusitanica*).

General Comment (C.F.): dates agree with pottery for early cardial camp-site. At that time sea level was ca. 20m lower than at present and island was connected to land (Courtin and Froget, 1970).

Cap Ragnon cave, Bouches du Rhône

Shells from early cardial Neolithic habitat in cave of Cap Ragnon, Le Rove, NW coast, bay of Marseille (43° 21' N Lat, 5° 16' E Long). Coll. 1970 and subm. 1971 by J. Courtin, CNRS, Marseille.

MC-500 A.**7970 ± 130****6020 B.C.**

Shells (*Patella caerulea*).

MC-500 B.**7650 ± 150****5700 B.C.**

Shells (*Trochocochlea turbinata*).

Comment: dates agree with others of cardial site in Ile Riou (MC-440: 7600 B.P.; MC-441: 7400 B.P.).

Grotte des Trémies, Cassis, Bouches du Rhône

Large submarine cave (43° 12' 12" N Lat, 5° 30' 42" E Long), at base of overhanging cliff. In midst of cave at -18m a 50cm diam. well, cored with a sucking pump in Versilian sediment 5m thick, stopped at -24m depth on large blocks and hard cryoclastic sediments of Würm age. Samples coll. and subm. 1970 by E. Bonifay, lab. Géol. Marine, Univ. Marseille-Luminy.

MC-377 A. Grotte des Trémies, 50 to 100cm Coral (<i>Corallium rubrum</i>), 50 to 100cm in core.	1290 ± 90 A.D. 660
MC-377 B. Grotte des Trémies, 50 to 100cm Opercula of <i>Turbo opercularis</i> .	1200 ± 70 A.D. 750
MC-378 A. Grotte des Trémies, 100 to 150cm Coral (<i>Corallium rubrum</i>).	1980 ± 90 30 B.C.
MC-378 B. Grotte des Trémies, 100 to 150cm Opercula of <i>Turbo</i> .	2040 ± 80 90 B.C.
MC-379. Grotte des Trémies, 150 to 200cm Opercula of <i>Turbo</i> .	2730 ± 80 780 B.C.
MC-380. Grotte des Trémies, 200 to 250cm Opercula of <i>Turbo</i> .	4050 ± 100 2100 B.C.
MC-381. Grotte des Trémies, 250 to 300cm Opercula of <i>Turbo</i> .	4760 ± 100 2810 B.C.
MC-382. Grotte des Trémies, 300 to 350cm Opercula of <i>Turbo</i> .	4820 ± 100 2870 B.C.
MC-383. Grotte des Trémies, 350 to 400cm Opercula of <i>Turbo</i> .	5520 ± 100 3570 B.C.
MC-384. Grotte des Trémies, 400 to 450cm Opercula of <i>Turbo</i> .	5720 ± 100 3770 B.C.
MC-385. Grotte des Trémies, 450 to 500cm Opercula of <i>Turbo</i> .	5730 ± 100 3780 B.C.

General Comment (E.B., J.T.): in Grotte des Trémies Versilian sedimentation begins ca. 5800 B.P. (−23m). First appearance of coral (200 to 250cm) only begins after complete submergence of cave, *i.e.*, −7m sea level ca. 4000 B.P. (MC-380). Reduced sedimentation rate above −7m sea level should indicate a longer stand of sea at that level (Bonifay *et al.*, 1971).

MC-329. Golfe de Frejus, Var	11,800 ± 200 9850 B.C.
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Lamellibranch shells (*Cardium glaucum*) in upper silty sand 43 to 51cm in Core DRA P 20 (43° 23' N Lat, 6° 45' 42" E Long), 3km offshore Saint Aygulf, Var. Core from top of continental slope, water depth 100m.

Coll. and subm. 1967 by G. Bellaiche, Centre de Recherches Géodynamiques, Villefranche-sur-Mer. *Comment* (G.B.): silty sand corresponding to an acoustic-reflection layer detected throughout Gulf by "mud penetrator," was deposited, as supposed, at end of Würm IV, more precisely during Dryas (Bellaiche *et al.*, 1969).

11,700 ± 100

MC-314. Saint Tropez, Var

9750 B.C.

Shells (*Venus casina*) from a shelly sand 315 to 320cm in Core DRA P 71 (43° 18' N Lat, 6° 40' E Long), water depth 100m. Coll. and subm. 1967 by G. Bellaiche. *Comment* (G.B.): structure and age of sandy layer dated in DRA P 20 (MC-329) from lower Argens Valley are very similar to this layer from top of canyon of Saint Tropez (Bellaiche, 1971).

MC-315. Open-sea core DRA P 5

≥30,000

Fraction > 40 μ shelly sand from 610 to 615cm, in Core CAP P 5 (42° 58' N Lat, 6° 48' E Long), water depth 2500m. Abyssal plain of Isle of Levant. Coll. and subm. 1967 by G. Bellaiche.

Grotte du Corail, Villefranche-sur-Mer

Grotte du Corail, a submarine cave, (43° 41' 30" N Lat, 7° 18' 30" E Long), in bay of Villefranche, Alpes Maritimes, at foot of Mont Boron, opens at ca. -26m. Silty sediment of floor of cave, manually cored down to bedrock by divers, yielded many shell remains. Core 69 coll. and subm. 1969; Core 70 coll. and subm. 1970 by H. De Lumley, Fac. Sci., Marseille.

Grotte du Corail Core 69 series

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|--|-------------------|
| | 3150 ± 80 |
| MC-371. Grotte du Corail C 69, 35cm | 1200 B.C. |
| Lamellibranch and gastropod shells, level 35cm in core, water depth (absolute level) 22.75m. | |
| | 5040 ± 100 |
| MC-370. Grotte du Corail C 69, 120cm | 3090 B.C. |
| Madreporeans, water depth 23.60m. | |
| | 5650 ± 80 |
| MC-369. Grotte du Corail C 69, 160cm | 3700 B.C. |
| Madreporeans, water depth 24m. | |
| | 5850 ± 70 |
| MC-368. Grotte du Corail C 69, 200cm | 3900 B.C. |
| Lamellibranch shells, water depth 24.40m. | |
| | 6100 ± 100 |
| MC-367. Grotte du Corail, C 69, 250cm | 4150 B.C. |
| Lamellibranch shells, water depth 24.90m. | |
| | 5650 ± 100 |
| MC-366. Grotte du Corail C 69, 310cm | 3700 B.C. |
| Lamellibranch and gastropod shells, water depth 25.50m. Difficulties encountered in coring disturbed the sampling. | |

- 6080 ± 100**
4130 B.C.
- MC-365. Grotte du Corail C 69, 350cm**
Lamellibranch shells, water depth 25.90m. Same remark as for MC-366.
- Grotte du Corail Core 70 series**
- 3060 ± 60**
1110 B.C.
- MC-449. Grotte du Corail C 70, 50cm**
Opercula of *Turbo* and lamellibranch shells, depth 50cm in core, water depth (absolute level) 21.10m.
- 3800 ± 90**
1850 B.C.
- MC-450. Grotte du Corail C 70, 100cm**
Opercula of *Turbo*, water depth 21.60m.
- 4750 ± 100**
2800 B.C.
- MC-452. Grotte du Corail C 70, 150cm**
Opercula of *Turbo* and lamellibranch shells, water depth 22.10m.
- 4930 ± 100**
2980 B.C.
- MC-454. Grotte du Corail C 70, 200cm**
Lamellibranch shells and corals (*Corallium rubrum*), water depth 22.60m.
- 5670 ± 110**
3720 B.C.
- MC-456. Grotte du Corail C 70, 250cm**
Opercula of *Turbo* and *Arca* sp. shells, water depth 23.10m.
- 7150 ± 130**
5200 B.C.
- MC-458. Grotte du Corail C 70, 300cm**
Fraction of shelly sand > 0.75mm, water depth 23.60m.
- General Comment* (H.L.): cave was filled by silty submarine sediment from 6080 (middle Atlantic) to 3060 B.P. (end of Boreal). Results show that sea level was already higher than -26m (floor of cave) ca. 6100 B.P.
- Grotte du Mérou, Core M 70 series, Villefranche-sur-Mer**
Submarine cave (43° 41' 30" N Lat, 7° 19' 13" E Long) on W cliff of Cap Ferrat in bay of Villefranche. Opening ca. -26m. Many similarities with Grotte du Corail in same bay. Sediment Coring M 70 by free divers yielded many shells, subm. 1971 by H. de Lumley.
- 1900 ± 70**
A.D. 50
- MC-443. Grotte du Mérou M 70, 70cm**
Opercula of *Turbo*, depth 70cm in core, water depth 24.80m.
- 3030 ± 80**
1080 B.C.
- MC-444. Grotte du Mérou M 70, 100cm**
Opercula of *Turbo*, water depth 25.10m.
- 5860 ± 100**
3910 B.C.
- MC-446. Grotte du Mérou M 70, 120cm**
Lamellibranch shells and opercula of *Turbo*, water depth 25.30m.

MC-447. Grotte du Mérou M 70, 150cm **6050 ± 100**
4100 B.C.
 Lamellibranch and gastropod shells, water depth 25.60m.

MC-448. Grotte du Mérou M 70, 170cm **5320 ± 110**
3370 B.C.
 Gastropod shells, water depth 25.80m.

General Comment (H.L.): disturbed chronology of sediments probably results from difficulties in manual coring. Chronology of filling similar to Grotte du Corail; same conclusion applies.

Grotte Huet series, Golfe Juan

Submarine cave opening at -30m on cliff wall of submerged reef le Secanion (43° 32' 29" N Lat, 7° 6' 7" E Long) offshore Juan les Pins, Alpes Maritimes. At base of cave, 18m from entrance, continental deposits hardened in breccia and covered with flowstone dated older to younger Dryas 14,690 B.P. (Ly-403) and 10,500 B.P. (Ly-404) by J. Evin. Free divers manually cored silty marine sediments beneath porch of cave and found many shells; subm. 1972 by H. de Lumley.

MC-535. Grotte Huet 3 C, 50cm **2670 ± 90**
720 B.C.
 Gastropod shells, water depth 27.50m.

MC-538. Grotte Huet 9 C, 160cm **3810 ± 70**
1860 B.C.
 Lamellibranch shells and opercula of *Turbo*, water depth 28.60m.

MC-539. Grotte Huet 11 C, 200cm **4340 ± 100**
2390 B.C.
 Lamellibranch shells, water depth 29m.

MC-543. Grotte Huet 25 C, 270cm **4900 ± 100**
2950 B.C.
 Gastropod and lamellibranch shells, water depth 29.70m.

MC-544. Grotte Huet 26 C, 280cm **5000 ± 100**
3050 B.C.
 Gastropod and lamellibranch shells, water depth 29.80m.

MC-545. Grotte Huet 27 C, 300cm **5480 ± 100**
3530 B.C.
 Gastropod and lamellibranch shells, water depth 30m.

MC-546. Grotte Huet 28 C, 315cm **6050 ± 130**
4100 B.C.
 Gastropod and lamellibranch shells, water depth 30.15m.

General Comment (H.L.): invasion of Flandrian sea in cave occurred during Preboreal or Boreal.

B. Other Countries

Capo Mele series, Ligurian Sea, Italy

Calcareous organic matter from Core DRA P 10 (43° 55' N Lat, 8° 14' E Long) in Ligurian Sea, offshore Capo Mele, water depth 284m. Coll. and subm. 1968 by C. Vergnaud-Grazzini, Lab. Géol. Dynamique, Fac. Sci., Paris.

MC-249A. Capo Mele 1 **18,300 ± 300**
16,350 B.C.

Tests of Madreporans (*Retepora cellulosa*) in top of sediment.

MC-249B. Capo Mele 2 **16,800 ± 500**
14,850 B.C.

Serpulid tubes from same horizon as MC-249 A. Diluted sample, 48% inactive gas.

MC-286. Capo Mele 3 **27,400 ± 1100**
25,450 B.C.

Mixed marine shells, 415 to 420cm in core.

MC-288. Capo Mele 4 **≥35,000**

Lamellibranch shells and serpulid tubes at base of core (depth > 480cm).

General Comment (C.V.G.): mean paleotemperature of sea surface (+9°C) recorded on foraminiferal species from whole core, lower ca. 10°C from mean present surface temperature, indicates complete deposit of sediment during cold Würm III and agrees with dates (Vergnaud-Grazzini *et al.*, 1970).

MC-336. Lignano Beach, North Adriatic Sea, Italy **3200 ± 90**
1250 B.C.

Marine shells of submerged beach offshore Lignano barrier (45° 42' N Lat, 13° 14' E Long), water depth not > 10m. May date old coastline. Coll. 1967 and subm. 1969 by A. Stefanon, Ist. Biol. Mare, Venezia, Italy.

Mar Menor series, Murcia, Spain

Marine shells (mostly *Cardium*) of Cores M 6, M 45, M 47, M 61, in coastal lake Mar Menor, Prov. Murcia, Spain. Coll. 1969 and subm. 1971 by J. Simonneau, Centre Recherches Séd. Marine, UER Sci. Perpignan, Pyrénées Orientales.

MC-470. Mar Menor M 6, 66 to 119cm **3600 ± 80**
1650 B.C.

Shells (*Cerithium vulgatum*) Core M 6 (37° 40' 22" N Lat, 0° 53' 30" E Long), 66 to 119cm in core.

MC-471. Mar Menor M 45, 20 to 35cm **δC¹⁴‰ = + 99 ± 15**
Shells (*Cardium*) Core M 45, (37° 40' N Lat, 2° 56' 35" E Long).

MC-472. Mar Menor M 45, 35 to 55cm **δC¹⁴‰ = + 40 ± 8**

- MC-473. Mar Menor M 45, 70 to 91cm** **1420 ± 80**
A.D. 530
- MC-474. Mar Menor M 45, 125 to 149cm** **2200 ± 100**
250 B.C.
- MC-475. Mar Menor M 45, 149 to 180cm** **2700 ± 100**
750 B.C.
- MC-476. Mar Menor M 47, 0 to 24cm** $\delta C^{14}\text{‰} = +7 \pm 7$
Shells (*Cardium*), Core M 47 (37° 40' N Lat, 0° 55' 26" E Long).
- MC-477. Mar Menor M 47, 70 to 90cm** **635 ± 60**
A.D. 1315
- MC-478. Mar Menor M 47, 90 to 113cm** **2300 ± 90**
350 B.C.
- MC-480. Mar Menor M 61, 20 to 40cm** **60 ± 60**
A.D. 1890
Shells (*Cardium*), Core M 61 (37° 43' 23" N Lat, 0° 53' 16" E Long).
- MC-481. Mar Menor M 61, 89 to 147cm** **1600 ± 80**
A.D. 350
Mixed marine shells.
- MC-363. Bay of Dumbea, New Caledonia** **4690 ± 90**
2740 B.C.
Coral at base of 260cm long Core 9 (22° 13' 30" S Lat, 166° 22' 40" E Long), water depth 15m Bay of Dumbea. Coll. 1968 and subm. 1970 by J. Launay, ORSTOM, Nouméa, New Caledonia. *Comment* (J.L.): although sample was cored in hard coral reef surface, beneath 260cm of sediment, no conclusion can be drawn about sea level. A mean rate of 50cm/millennium can be assessed at the site for accumulation of Dumbea R. sediments (Launay, 1971).

II. ARCHAEOLOGIC SAMPLES

A. France

Abri de Saint Mitre No. 3 series, Basses Alpes

Charcoal from several hearths in No. 3 shelter of Saint Mitre (43° 53' N Lat, 5° 39' E Long). Coll. and subm. by A. Calvet, CEA, Cadarache, Bouches du Rhône.

- MC-263. Abri de Saint Mitre No. 3, 1** **6400 ± 100**
4450 B.C.
Layer Y 10, Hearth 3.

- MC-264. Abri de Saint Mitre No. 3, 2** **6700 ± 130**
4750 B.C.
Layer Z 8/9, elliptical Hearth 3: 2x1m covered with 10cm thick stone layer.

- 6100 ± 120**
4150 B.C.
- MC-265. Abri de Saint Mitre No. 3, 3**
Layer Y 11, Hearth 6.
General Comment (A.C.): date, 4000 B.C. (MC-202) for Hearth F 4 in same shelter suggests continuous human occupation for at least 750 yr. Dates agree with Cardial pottery sherds (Calvet and Guilaine, 1970).
- Shelter of Font-Juvénal series, Conques, Aude**
Charcoal from archaeological layers of rich stratigraphic sequence in rock shelter of Font-Juvénal (43° 17' 46" N Lat, 2° 20' 54" E Long), Conques, Aude. Coll. and subm. 1971 by J. Guilaine, CNRS, Carcassonne, Aude.
- 4400 ± 100**
2450 B.C.
- MC-490. Font-Juvénal, C 2 b**
Charcoal from Layer C 2 b (H 6, H 7), with Campaniform vases of Pyrenean design.
- 4200 ± 90**
2250 B.C.
- MC-491. Font-Juvénal, C 3**
Charcoal from Layer C 3 (H 7). Verazian level, characterized by late Neolithic "pastoral" facies as found in W Languedoc, France.
- 3620 ± 90**
1670 B.C.
- MC-492. Font-Juvénal C 4**
Charcoal from hearth in Layer C 4 (H 6). Verazian level.
- 4490 ± 80**
2540 B.C.
- MC-493. Font-Juvénal, C 5**
Charcoal from Layer C 5 (H 7). Two cultural groups present in same layer: Gourgasian (awry point) and Ferrières (incised chevron adorned pottery).
- 4570 ± 90**
2620 B.C.
- MC-494. Font-Juvénal, C 12**
Charcoal from Layer C 6 (H 7). Transitional level above Upper Chassean facies.
- 4860 ± 90**
2910 B.C.
- MC-495. Font-Juvénal, C 7 a**
Charcoal from Layer C 7 a (H 7). Upper Chassean facies.
- 4800 ± 150**
2850 B.C.
- MC-496. Font-Juvénal, C 8**
Charcoal from Layer C 8 (H 6). Upper Chassean facies.
- 5350 ± 100**
3400 B.C.
- MC-497. Font-Juvénal, C 10**
Charcoal from base of Layer C 10 (H 8). Furniture pertains to classical Chassean culture of Languedoc, similar to La Madeleine type: engraved ornaments on plates and clear-silex tools.

MC-498. Font-Juvénal, C 11 **5540 ± 100**
3590 B.C.

Charcoal from hearth in Layer C 11 (H 8). Chassean horizon with smooth pottery, anterior to typical "Languedocian" facies.

MC-499. Font-Juvénal, C 12 **5850 ± 100**
3900 B.C.

Charcoal from Layer C 12 (H 8). Epicardial industry anterior to older Chassean.

General Comment (J.G.): chronologic sequence yields dates for several Languedocian civilizations at site: Chassean, Gourgasian, Ferrières, Vérazian, Campaniform.

B. Italy

MC-402. Grotte des Enfants, Grimaldi **12,200 ± 400**
10,250 B.C.

Shells (*Monodonta turbinata*) from burial level of female skeleton, Hearth B, Grotte des Enfants (43° 47' 00" N Lat, 7° 32' 20" E Long), Grimaldi, near Vintimiglia, Italy. Coll. by E. Rivière and subm. 1971 by L. Barral, Mus. Anthropol. Monaco. *Comment:* age agrees with Mesolithic industry and with fauna colder than present (*Cervus elaphus*, *Rangifer tarandus* . . .).

C. Lebanon

Ksar'Aqil series

Bones and terrestrial shells from shelter cave of Ksar'Aqil (33° 55' N Lat, 35° 37' E Long) Antelias, 10km from Beirut, Lebanon. Coll. 1970 and subm. by J. Tixier, Mus. Hist. Nat., Inst. Paleontol. Humaine, Paris (Braidwood *et al.*, 1951; Tixier, 1970).

MC-411. Ksar'Aqil, I 4, IV-VII **14,100 ± 500**
12,150 B.C.

Bones from Layer C, 350 to 355cm. *Comment:* organic fraction. Agrees with relative chronology.

MC-410. Ksar'Aqil, J 8-9, 3b medium **24,400 ± 900**
22,450 B.C.

Terrestrial shells (*Helix* sp.) from Layer 3b, 280 to 290cm. *Comment:* carbonate fraction. Diasagrees with expected date and should be rejected.

D. Algeria

Medjez II series, Saint Arnaud, Sétif

Charcoal from large snailery of El Eulma, Sétif, E Algeria (36° 08' N Lat, 5° 40' E Long). Continuous stratigraphic layers 365cm thick showing evolution of lithic and bone tools throughout more than 2000 yr of Upper Capsian civilization. Coll. and subm. 1969 by G. Camps, LAPEMO, Aix en Provence, France, (Camps *et al.*, 1968).

MC-318. Medjez II, 10, 100 to 125cm **7030 ± 120**
5080 B.C.

- | | | |
|---|---|-------------------|
| | | 7570 ± 160 |
| MC-319. | Medjez II, 11, 125 to 150cm | 5620 B.C. |
| | | 8230 ± 130 |
| MC-320. | Medjez II, 12, 150 to 175cm | 6280 B.C. |
| | | 7280 ± 140 |
| MC-321. | Medjez, II, 13, 175 to 200cm | 5330 B.C. |
| | | 7610 ± 140 |
| MC-322. | Medjez II, 14, 200 to 225cm | 5660 B.C. |
| | | 7280 ± 120 |
| MC-323. | Medjez II, 15, 225 to 250cm | 5330 B.C. |
| | | 7860 ± 120 |
| MC-325. | Medjez II, 17, 275 to 300cm | 5910 B.C. |
| | | 8550 ± 150 |
| MC-326. | Medjez II, 18, 300 to 325cm | 6600 B.C. |
| | | 8860 ± 150 |
| MC-327. | Medjez II, 19, 325 to 350cm | 6910 B.C. |
| <i>General Comment (G.C.):</i> complete chronology of site, rich in Microlithic industry, should characterize a regional facies of Upper Capsian: "Setifian." Cf. R., 1972, v. 14, p. 292, (Camps-Fabrer, 1968). | | |
| | | 7920 ± 100 |
| MC-281. | Rabah 11, Ouled Djellal, Batna | 5970 B.C. |
| Terrestrial shells (<i>Helix</i> sp.) from 10 to 20cm from terrace bordering Oued Djedi near Ouled Djellal, Batna (34° 26' N Lat, 5° 8' E Long). Coll. and subm. 1968 by G. Camps. | | |
| | | 9180 ± 130 |
| MC-283. | Rabah 4, Ouled Djellal, Batna | 7230 B.C. |
| Terrestrial shells (<i>Helix</i>) from 30 to 40cm in same place as MC-281. <i>Comment:</i> date too old to match this Upper Capsian site. | | |
| | | 8410 ± 130 |
| MC-285. | El Mermouta, Ouled Djellal, Batna | 6460 B.C. |
| Terrestrial shells (<i>Helix</i>) from Neolithic settlement on border of Oued Djedi near Ouled Djellal, Batna (34° 35' N Lat, 5° 21' E Long). Coll. and subm. 1968 by G. Camps. <i>Comment (G.C.):</i> industry is characterized by small and short stone triangles similar to those from Rabah site. | | |
| | | 6880 ± 100 |
| MC-328. | Botma si Mamar, Ouled Djellal, Batna | 4930 B.C. |
| Terrestrial shells (<i>Helix</i>) from Neolithic settlement near Ouled Djellal, Batna (34° 22' N Lat, 4° 53' E Long). Coll. and subm. 1969 by G. Camps (Grébenart, 1970). | | |

MC-280. Safiet Bou Rhenan, Messad, Médéa **7220 ± 100**
5270 B.C.

Terrestrial shells (*Helix*) from Neolithic settlement near Messad, Médéa (34° 11' N Lat, 3° 31' E Long). Coll. and subm. 1968 by G. Camps. *Comment* (G.C.): MC-328 and MC-280 pertain to peculiar Neolithic facies different from Capsian tradition (Grébenart, 1970).

MC-279. Aïn Guettara, Oasis **5950 ± 100**
4000 B.C.

Charcoal from Neolithic settlement of Capsian tradition, S border of Tademaït Plateau, Oasis (28° 02' N Lat, 3° 06' E Long). Coll. and subm. by G. Camps. *Comment* (G.C.): agrees with Gif-1223: 3980 B.C., unpub.

MC-399. Bouh Behl, Oasis **6290 ± 120**
4340 B.C.

Fragments of ostrich eggs in layers of Hadjarian campsite, Bouh Behl, Oasis (31° 48' N Lat, 5° 14' E Long). Lithic industry with geometrical microliths. No pottery. Coll. and subm. 1971 by G. Camps. *Comment*: agrees with dates from Protoneolithic facies.

MC-400. El Hadjar, dismantled, Oasis **8050 ± 100**
6100 B.C.

Fragments of ostrich eggs at Neolithic settlement, El Hadjar, Oasis (31° 32' N Lat, 4° 47' 30" E Long). Industry lacking pottery (Hadjarian). Coll. by G. Aumassip and subm. by G. Camps. *Comment* (G.C.): date appears very old compared to charcoal from adjoining Epipalaeolithic site (Gif-880: 7300 ± 170, R., 1972, v. 14, p. 293) but different stratigraphic position.

MC-398. El Hadjar, Oasis **6670 ± 100**
4720 B.C.

Fragments of ostrich eggs, aceramic Neolithic. Coll. by G. Aumassip and subm. by G. Camps.

MC-401. Khellal, Oasis **7750 ± 100**
5800 B.C.

Fragments of ostrich eggs in Saharian campsite of Khellal, Oasis (30° 31' N Lat, 5° 53' E Long). Coll. by G. Aumassip and subm. 1971 by G. Camps. *Comment*: only one lithic industry which is poorly typed.

Ahaggar series

Charcoal from hearths in various sites of Ahaggar area in Central Sahara (Maitre, 1969). Coll. 1964 to 1967 and subm. by J. P. Maitre, LAPEMO, Aix en Provence, France.

MC-483. Ahaggar, Timidouin, 155-30 **6050 ± 120**
4100 B.C.

Charcoal, 15 to 30cm in Timidouin site (24° 20' N Lat, 5° 35' E Long), Tefedest, ca. 300km N Tamanrasset, alt. 1800m.

- 8100 ± 130**
6150 B.C.
- MC-484. Ahaggar, Timidouin, 155-32**
Charcoal, 30 to 60cm in same site as MC-483. *Comment:* dates of MC-483 and MC-484 appear rather old in comparison with ceramics.
- 6050 ± 100**
4100 B.C.
- MC-485. Ahaggar, Ideles I, 20 to 50cm**
Charcoal, 20 to 50cm from small cave of Ideles (23° 52' N Lat, 5° 55' E Long) Arechchoum, 200km N NE Tamanrasset, alt. 1450m.
- 5300 ± 110**
3350 B.C.
- MC-486. Ahaggar, Ideles, 25 to 40cm**
Charcoal, 25 to 40cm in cave of Ideles.
- 6500 ± 250**
4550 B.C.
- MC-488. Ahaggar, Tin Amenser**
Charcoal, 20 to 70cm in Tin Amenser site (22° 55' N Lat, 5° 06' E Long) Afedafeda, ca. 40km NW Tamanrasset, alt. 1400m. *Comment:* further excavation is expected at site.
- 3900 ± 100**
1950 B.C.
- MC-487. Ahaggar, Tamanrasset II**
Charcoal, 45 to 50cm level in Tamanrasset site (22° 50' N Lat, 5° 28' E Long) Oua-Helledjen, 16km NW Tamanrasset, alt. 1470m. Neolithic industry and remains of Mediterranean flora. *Comment:* although too young to agree with ceramics and palynology, date compares with Gif-357: 3330 B.P. (R., 1970, v. 12, p. 437).
- 4320 ± 100**
2370 B.C.
- MC-489. Ahaggar, Tadjard Todjdjet**
Charcoal, 0 to 20cm level in Tadjard Todjdjet site (22° 45' N Lat, 5° 30' E Long) Oua-Helledjen 5km W Tamanrasset, alt. 1350m. *Comment:* date confirms late Neolithic as expected.
- General Comment:* sites dated in Ahaggar Mts. correspond to Neolithic of Sudan tradition which began early 6th millennium and ended late 1000 B.C., with full development during 4th millennium B.C. (Camps *et al.*, 1968).
- Aïn Dokkara series, Tebessa**
Terrestrial shells (*Helix*) and charcoal from "Escargotière du Chacal" a large snail-shell deposit of Aïn Dokkara, Tebessa, NE Algeria (35° 20' N Lat, 8° 16' E Long). Coll. 1968 by C. Roubet and subm. by L. Balout, Inst. Paleontol. Humaine, Paris. Two sections dated: 1) Aïn Dokkara S sec., cut 1949, 130cm thick, at base of which a human Capsian skeleton was unearthed by L. Balout; 2) Aïn Dokkara N sec. parallel 25cm to N trench of 1951.
- 7485 ± 100**
5535 B.C.
- MC-337. Aïn Dokkara, S sec. 30 to 60cm**
Helix shells, S section 1949, layer 30 to 60cm.

MC-338.	Aïn Dokkara, S sec. 90 to 110cm	7990 ± 100
	<i>Helix</i> shells.	6040 B.C.
MC-339.	Aïn Dokkara, S sec. 110 to 130cm	8530 ± 120
		6580 B.C.
MC-340.	Aïn Dokkara, S sec., 90 to 120cm	7090 ± 100
	Charcoal.	5140 B.C.
MC-372.	Aïn Dokkara N sec., 20cm	7260 ± 120
	<i>Helix</i> shells, section parallel 25cm S to N trench of 1951.	5310 B.C.
MC-373.	Aïn Dokkara, N sec., 20 to 40cm	7280 ± 120
	<i>Helix</i> shells.	5330 B.C.
MC-374.	Aïn Dokkara, N sec., 40 to 60cm	7570 ± 120
	<i>Helix</i> shells.	5620 B.C.
MC-375.	Aïn Dokkara, N sec., 60 to 80cm	8030 ± 120
	<i>Helix</i> shells.	6080 B.C.
MC-376.	Aïn Dokkara, N sec., 80 to 100cm	8345 ± 120
	<i>Helix</i> shells.	6395 B.C.

General Comment (L.B.): imperceptible evolution of industry through 1300 yr occupation of this typical Capsian site (Balout and Roubet, 1970).

E. Cambodia

Laang Spean series

Laang Spean cave (12° 51' N Lat, 102° 55' E Long) in Battambang dist., 28km from B., Cambodia, a Neolithic settlement dug in Permian limestone. Charcoal from 3 out of 9 principal layers in 2 borings 140cm long. Coll. and subm. 1968 by R. and C. Mourer, Univ. Phnom Penh.

MC-270.	Laang Spean, CRS	1200 ± 70
		A.D. 750

Charcoal from central boring in upper red layer, 2 to 10cm with sherds of ornated and shaped stone flakes.

MC-271.	Laang Spean, CRa	1120 ± 60
		A.D. 830

Charcoal from entrance boring. Upper red layer, 2 to 15cm.

MC-272.	Laang Spean, CRb	2450 ± 90
		500 B.C.

Charcoal from entrance boring. Red layer, 15 to 30cm.

MC-269. Laang Spean, CRM **4000 ± 90**
2050 B.C.

Charcoal from central boring. Red layer, 12 to 30cm. Pottery assoc. with crude industry of hoabinian type, using large tools and atypical stone flakes.

MC-274. Laang Spean CRc **3970 ± 90**
2020 B.C.

Charcoal from entrance boring. Lower red layer under 30cm.

MC-273. Laang Spean, CN **6240 ± 70**
4290 B.C.

Charcoal from central boring. Black layer, 30 to 50cm with burnt bones, crude tools and few pottery sherds.

General Comment (C.M., R.M.): uninterrupted occupation of cave from 5th millennium to 9th century. Ceramics in black layer dated 4290 B.C. (MC-273) shows that Neolithic in SE Asia is older than formerly supposed (Mourer *et al.*, 1970).

III. MISCELLANEOUS SAMPLES

MC-418. Paper **200 ± 30**
A.D. 1750

Cloth paper from old Archives dated 1749. Coll. and subm. 1970 by J. Thommeret. *Comment*: test of accuracy for recent samples.

Atmospheric radiocarbon activity series, Monaco

This series of C¹⁴ content measured in atmospheric CO₂ periodically coll. on roof of Mus. Océanog. Monaco (43° 43' N Lat, 7° 25' E Long) alt. 80m, is continuation of previous results (R., 1966, v. 8, p. 290-291; R., 1969, v. 11, p. 127-128).

Sample no.	Coll. date	δC ¹⁴ ‰
MC-261.	Aug. 1968	+593 ± 15
MC-310.	Feb. 1969	+507 ± 15
MC-311.	May 1969	+512 ± 15
MC-312.	Aug. 1969	+502 ± 15
MC-313.	Nov. 1969	+502 ± 15
MC-390.	April 1970	+550 ± 15
MC-391.	Aug. 1970	+590 ± 15
MC-392.	Nov. 1970	+500 ± 15
MC-393.	March 1971	+515 ± 15
MC-394.	July 1971	+490 ± 10
MC-395.	Nov. 1971	+542 ± 10
MC-547.	April 1972	+480 ± 10
MC-548.	Aug. 1972	+500 ± 10

Seawater series

This series continues the list of previous results (R., 1969, v. 11, p. 128).

MC-267. Seawater 2000m $\delta C^{14}\text{‰} = +20 \pm 7$

Coll. May 1968, 20km S Monaco.

MC-419. Seawater 1700m $\delta C^{14}\text{‰} = +19 \pm 7$

Coll. June 1971, 20km S Monaco.

MC-550. Seawater 2500m $\delta C^{14}\text{‰} = -50 \pm 10$

Coll. June 1972, 30km S Monaco.

Correction

In previous list of seawater measurements (*ibid.*, above) values given as $C^{14}\text{‰}$ should be $\delta C^{14}\text{‰}$.

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