

GIF NATURAL RADIOCARBON MEASUREMENTS IX

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The following list includes ^{14}C measurements of geologic samples, the majority of which pertain to sea-level variations, and of archaeological samples mainly from France, West Africa, and South America. Most of the dates were measured between 1972 and 1973 when installations were not modified. The technique used is described in Radiocarbon, 1972, v 14, p 280-320. Dates were calculated using the ^{14}C half-life of 5568 years; modern standard is 0.95 of the NBS oxalic acid. Reported errors are one standard deviation for 2000 minutes measurements.

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SAMPLE DESCRIPTIONS

I. GEOLOGIC SAMPLES

Most samples were dated to study sea-level variations especially during the Holocene on different coasts of the world.

A. France

Marais de Cessières series, Aisne

Several profiles were studied by pollen analysis and ^{14}C dates in two large acid peat bogs of Cessières marsh (49° 33' 14" N, 3° 31' 38" E), to survey history of this marsh. Samples coll and subm 1969-1974 by F Morand, Inst Geog, Paris.

Gif-1694. Marais de Cessières, 440/110-115 4180 ± 140

Peat 1.1 to 1.15m below surface, Core 440. Pollen zone, Atlantic-Sub-boreal-*Alnus* abundant. *Comment*: at base of important detrital accumulation corresponding to land clearing.

Gif-1695. Marais de Cessières, 040/105-110 1300 ± 100

Peat 1.05 to 1.1m below surface, Core 040. *Comment*: corresponds to period of deforestation and strong erosion (Morand, 1971).

Gif-2779. Marais de Cessières, 108/65 4220 ± 140

Peat 0.65m below surface, Core 108. *Comment*: much older than expected.

Gif-3046. Marais de Cessières, 106/50 2300 ± 100

Peat 0.45 to 0.5m below surface, Core 106.

- Gif-3047. Marais de Cessières, 104.50/50** **250 ± 80**
Peat 0.45 to 0.5m below surface, Profile 104. *Comment:* dates reappearance of *Sylva*, *Pinus*, and *Ericaceum*.
- Gif-3048. Marais de Cessières, 104.51/50** **380 ± 80**
Peat 0.5m below surface, Profile 104.
- Gif-3049. Marais de Cessières, 104.44/50** **1080 ± 90**
Peat 0.5m below surface, Profile 104.
- Gif-2228. Marais de Cessières, 104.5/90** **2850 ± 100**
Peat 0.9m below surface, Profile 104.
- Gif-2230. Marais de Cessières, 104.2/305** **2820 ± 100**
Peat 3.05m below surface, Profile 104.
- Gif-3392. Marais de Cessières, 104.30/310** **4500 ± 250**
Peat 3.1m below surface, Profile 104.
- Gif-2780. Marais de Cessières, 102.1/690-700** **9100 ± 300**
Peat 6.9 to 7m below surface, Profile 102.1.
- Gif-2782. Marais de Cessières, 102.1/800-810** **4890 ± 140**
Peat 8 to 8.1m below surface, Profile 102.1, Pre-boreal zone. *Comment:* age inversion between Gif-2782 and -2780 in Profile 102.1 is unexplained.
- Gif-3390. Marais de Cessières, 102.11/810** **6720 ± 130**
Peat 8.1m below surface, Profile 102.11. *Comment:* either rate of peat formation is very variable in Cessières marsh or sample is contaminated.
- Gif-3391. Marais de Cessières, 102.11/690** **8840 ± 160**
Peat 6.9m below surface, Profile 102.11. *Comment:* beginning of elm.
- Gif-2783. Marais de Cessières, 706/750-760** **10,400 ± 400**
Peat 7.5 to 7.6m below surface, Core 706. From bottom of 2nd large acid peat bog of Cessières marsh.
- Gif-3389. Marais de Cessières, 233/350** **7870 ± 140**
Peat 3.5m below surface, Core 233.
- Gif-3393. Marais de Cessières, 743/285** **9590 ± 170**
Peat 2.85m below surface, Core 743. *Comment:* Boreal-Pre-boreal transition.

General Comment: discrepancy sometimes observed between pollen analysis and ¹⁴C chronology may be attributed to heterogeneity of peat bog and to water transport of pollen.

Forêt de Fontainebleau series, Seine et Marne

Vertical faces in large, currently worked sandpits, in forest of Fontainebleau show some superficial Quaternary formations (grèves) lying *in situ* on Stampian sand. These layered deposits of fine sand and gravels result

from filling of valleys following formation of slopes from gelification (or frostwork) and solifluction (Puyfaucher and Collin, 1971). Bone fragments and well-defined brown organic horizons found in some secs were dated to establish chronology of alluvial periglacial Würmian formations in S Parisian basin. Area loc in Plaine de la Justice, 15km SSW of La Ferté-Alais (48° 29' N, 20° 21' E), Plaine de Chanfroy (48° 24' N, 2° 34' E), and near Chailly-en-Bière (48° 27' N, 2° 37' E) at W border of forêt de Fontainebleau.

Gif-1905. Plaine de Chanfroy, C 1 **22,100 ± 700**

Fine humic sand at depth 4m. Coll and subm 1970 by F Morand. *Comment:* humic acids fraction dated, humin fraction absent. No traces of organic carbon, either soluble or insoluble, were found in overlying sand levels. This indicates that there is no infiltration of recent humic acids from superficial soil and, consequently, that dated organic carbon is probably not contaminated. Age of this level can be taken as true age.

Gif-2509. Plaine de Chanfroy, 1 **14,440 ± 200**
 $\delta^{13}C = -21.6\text{‰}$

Bison rib in fluvial sandy level at depth 2.2m in same sand pit as Gif-1905. Coll and subm 1972 by A Puyfaucher, Inst Geog, Paris (Puyfaucher and Amat, 1972).

Gif-2904. Plaine de la Justice, 16-8/1 **30,200 ± 1100**
 $\delta^{13}C = -30.5\text{‰}$

Upper part of black clayey organic horizon, probably marsh deposit, at depth 3.5m. Coll and subm 1972 by A Puyfaucher. *Comment:* humin fraction dated.

Gif-2458. Plaine de la Justice, 16-8/11 **≥35,700**

Lower part of same horizon as Gif-2904. *Comment:* humin fraction dated.

Gif-2510. Chailly-en-Bière, 2/7-11 **23,350 ± 500**
 $\delta^{13}C = 23.1\text{‰}$

Humic sandy level at depth 2.1m. Coll and subm 1972 by A Puyfaucher. *Comment:* humin fraction dated.

Gif-2913. Chailly-en-Bière, 2/7-11 **22,860 ± 500**

Same level as Gif-2510. *Comment:* humic acids fraction dated. Agreement between dates for soluble and insoluble organic fractions of this paleosol confirms ages for fossil horizons in region.

Gif-2996. Chailly-en-Bière, 2 **20,900 ± 1100**
 $\delta^{13}C = -28.2\text{‰}$

Organic horizon, on millstone. Coll and subm 1974 by A Puyfaucher. *Comment:* humin fraction dated.

Gif-2459. Chailly-en-Bière, 2/5 **≥37,700**

Black organic horizon, overlain by fine sand and gravels, lying on white sand of Fontainebleau. *Comment:* humin fraction dated.

General Comment: dates distinguish periods of periglacial climate from more temperate episodes, indicated by dated paleosols, during recent Würm.

Gif-2871. Erondelles, Somme 2070 ± 100

Shells (*Cardium edule*) in sand underlain by peaty level, at depth 1m, S alluvial plains of low valley of Somme R (50° 5' N, 1° 55' E). Coll and subm 1973 by M Ters, Inst Geog, Paris.

Gif-2872. Salenelles, Somme 180 ± 90

Shells (*Cardium edule*) from sandy bar ca 4m above msl (50° 12' N, 1° 34' E), Somme estuary. Coll and subm 1973 by M Ters.

Gif-1771. Camiers, Pas-de-Calais 2910 ± 100

Sandy peat at top of beach between two brackish clay levels, 2.5m above msl (50° 33' N, 1° 35' E). Coll and subm by H Mariette, Samer, Pas-de-Calais.

Eastern Channel series

Peat from 3 cores from submarine peat bogs off Le Tréport (49° 59' N, 1° 21' E), Eastern Channel. Coll and subm by J P Auffret, Dept Geol, Univ Caen.

Gif-2865. Core 890 (2) 9870 ± 200

Peat, 21m below msl.

Gif-2866. Core 890 (3) 8800 ± 170

Peat, 20.8m below msl.

Gif-2867. Core 585 7470 ± 150

Peat, 18.7m below msl.

General Comment: evidence of sea-level variations at beginning of post-glacial. Dates show sea level was lower than 21m before 8800 BP. Pollen analysis of cores increased understanding of vegetational history from late-glacial to Boreal-Atlantic transition (Huault and Auffret, 1975).

Gif-2860. Lingreville 1, Manche 680 ± 80

Peaty level, 10cm thick, in sand dune, 0.4m above high sea level on shore (48° 57' N, 1° 31' W). Coll and subm 1973 by J P Lautridou, Centre Geomorphol, CNRS, Caen. *Comment:* corresponds to "Dunkerqian III" transgression, in 13th century (Giresse and Lautridou, 1973).

Gif-2862. Lingreville 3, Manche 3880 ± 100

Tree trunk in white sands, 1.5m below high sea level, from beneath Lingreville 1. Coll and subm by P Lautridou. *Comment:* dates stage of Flandrian transgression.

Dol-de-Bretagne series, Ille et Vilaine

Flandrian deposits filling in depression corresponding to present marshes and polderlands around Dol-de-Bretagne (48° 33' N, 1° 45' W),

Ille et Vilaine, consist of marine sediments, sands, and silts with intercalated peat layers. ^{14}C and pollen analyses show that peaty layers were formed at end of Boreal period towards 8200 BP, at end of Atlantic, and beginning of Sub-boreal between 3900 and 3450 BP, and during Subatlantic, from 3000 BP onwards. Dates suggest slowing of transgression (or even regression) to explain peat growth but because of differential compaction of sediments under marshes, precise curve of variations of sea level cannot be drawn. Coll and subm 1970-1971 by G Delibrias. Pollen analysis by M T Morzadec, Univ Rennes (Delibrias and Morzadec, 1975). Measurements are above or below msl in meters.

Gif-957. Boring S 11, +4.8m **3100 ± 110**

Freshwater peat. Pollen zone VIIb-VIII. Sub-boreal.

Gif-958. Boring S 11, +4m **3100 ± 110**

Freshwater peat. Pollen zone VIIb-VIII. Sub-boreal. *Alnus* abundant, *Fagus* present.

Gif-1835. Boring S 11, +1.8m **4400 ± 140**

End of salty peat level. Pollen zone VIIb. Sub-boreal.

Gif-953. Boring S 11, -1.1m **4800 ± 140**

Salty peat. Pollen zone VIIb. Sub-boreal.

Gif 954. Boring S 11, -1.95m **11,600 ± 650**

Freshwater clayey peat. Pollen zone III. Postglacial, Pre-boreal.

Gif-1837. Boring S 12, -1.3m **5500 ± 150**

End of salty peat level. Pollen zone VIIb. Sub-boreal.

Gif-955. Boring S 12, -1.7m **5600 ± 150**

Salty peat. Pollen zone VIIa-VIIb. Sub-boreal.

Gif-1838. Boring S 12, -2.3m **7050 ± 170**

Salty peat. Pollen zone VIIa. Atlantic.

Gif-2185. Boring S 7, +3.2m **3000 ± 100**

Brackish organic sand. Pollen zone late VIIb. Atlantic.

Gif-2186. Boring S 7, +2m **3860 ± 110**

Salty peat. Pollen zone VIIb.

Gif-2187. Boring S 7, -0.5m **5400 ± 120**

Freshwater peat. Pollen zone VIIb. Atlantic.

Gif-2188. Boring S 7, -10m **8200 ± 150**

Peaty clay. Pollen zone VIa. Boreal.

Gif-950. Boring S 10, +2.15m **3900 ± 140**

Salty peat. Pollen zone VIIb. Sub-boreal.

Gif-951. Boring S 10, -0.2m	6750 ± 170
Salty peat. Pollen zone late VIIa. Atlantic.	
Gif-952. Boring S 10, -12m	9800 ± 230
Peaty silt. Pollen zone VIc. Boreal.	
Gif-2189. Boring S 8, +1.8m	3450 ± 100
Brackish organic sand. Pollen zone VIIb. Sub-boreal.	
Gif-947. Boring S 8, +1m	5450 ± 150
Salty peat. Pollen zone VIIb. Sub-boreal.	
Gif-948. Boring S 8, +0.25m	5450 ± 150
Salty peat. Pollen zone late VIIb. Sub-boreal.	
Gif-1833. Boring S 8, -9m	10,100 ± 230
Organic clay. No pollen.	
Gif-2184. Boring S 1, +1.8m	2390 ± 100
Peaty soil. Pollen zone late VIIb. Sub-boreal.	
Gif-943. Boring S 1, +0.5m	5200 ± 150
Salty peat. Pollen zone VIIa. Atlantic.	
Gif-944. Boring S 1, -0.25m	5000 ± 150
Salty peat. Pollen zone VIIa. Atlantic.	
Gif-946. Boring S 1, -3m	6800 ± 170
Marine shells in brackish sand.	
Gif-931. Boring S 9, +2.7m	360 ± 90
Organic soil. Pollen zone VIII. Sub-atlantic.	
Gif-935. Boring S 9, 0.4m	4360 ± 140
Salty peat. Pollen zone VIIa-VIIIb. Limit Sub-boreal-Atlantic.	
Gif-936. Boring S 9, +0.2m	4480 ± 140
Salty peat. Pollen zone VIIa. Atlantic.	
Gif-1834. Boring S 9, -0.1m	5850 ± 150
Salty peat. Pollen zone VIIa. Atlantic.	
Gif-937. Boring S 9, -0.2m	4250 ± 140
Salty peat. Pollen zone VIIa. Atlantic.	
Gif-940. Boring S 9, -9.3m	6900 ± 150
Broken shells in marine sand. No pollen.	
Gif-941. Boring S 9, -10.2m	6200 ± 150
Salty peat. Pollen zone VIc. Boreal.	
Gif-942. Boring S 9, -15m	11,600 ± 270
Broken shells in fluvial sand.	

Gif-1879. Boring S 2, +3.5m **4400 ± 140**
Salty peat. Pollen zone VIIa. Atlantic.

Ver-sur-Mer series, Calvados

Peat from littoral peat bog cropping out on beach (49° 20' N, 0° 30' W). Coll and subm 1972 by C Larssonneur, Inst Geol, Univ Caen.

Gif-2693. V 12 **1080 ± 100**
Pollen zone, Sub-atlantic.

Gif-2695. V 32 **1580 ± 100**
Pollen zone, Sub-atlantic.

Gif-2694. V 28 **2850 ± 110**
Pollen zone, end of Sub-boreal.

General Comment: outcrop overlies archaeol level with Neolithic industry.

Saint Guinoux series, Dol, Ille et Vilaine

Peat from tidal marsh of Dol at Saint Guinoux (48° 33' N, 1° 45' W). Coll and subm 1970 by F Verger, Ecole Pratique Haute Etudes, Paris (Verger, 1971).

Gif-1686. Saint Guinoux, Dol 81 **2720 ± 110**
Peat at depth 1.7 to 1.95m, 1.1km SSW of Saint Guinoux under ancient channel with reversed relief.

Gif-1687. Saint Guinoux, Dol A **3550 ± 110**
Peat at depth 2.8 to 2.9m, 1km SW of Saint Guinoux, under ancient channel with unreversed relief. Coll and subm 1970 by F Verger.
General Comment: dated as part of geomorphol study of region; indicates relief inversion between 3500 and 2700 BP.

Saint Marc-en-Trevenec series, Côtes du Nord

Peat and wood samples from cores in large peat bog covering foreshore in small valley mouth, in cove of Saint Marc-en-Trevenec (48° 40' N, 2° 50' W). Coll and subm 1971-1978 by M Ters. Deposit is ca 15m thick accumulation of peaty and sandy sediments. Dates enable study of sea level rises and development of vegetation during Holocene. Alts are related to msl. Present tidal range on coast is 12.85m.

Gif-2979. S 2-14 **≥90**
Peat, +7.85m.

Gif-2607. M XII **2480 ± 100**
Peat, +6.35m.

Gif-4523. D B **3820 ± 110**
Peat, +4.75m.

Gif-4417. Fu 37	4500 ± 110
Peat, +4.2m.	
Gif-2606. M XII	5080 ± 140
Peat, +1.15m.	
Gif-4416. A 8	5600 ± 120
Tree trunk, +0.5m.	
Gif-4524. D B	5790 ± 130
Peat, +0.35m.	
Gif-2978. B 2-2	6070 ± 130
Peat, -1.9m.	
Gif-2152. I	6400 ± 130
Tree trunk, -1.85m.	
Gif-2527. 43	7050 ± 160
Peat, -5.95m.	
Gif-3792. R 20	7060 ± 160
Peat, -7.3m.	
Gif-3097. C M 38	7370 ± 140
Peat, -7m.	

General Comment: palynol study indicates: upper part of peat, +7.45 to 5m is Sub-atlantic and Sub-boreal. Lower part of peat and underlying clay are Atlantic. Some short-term oscillations of sea level during Holocene transgression were established, high levels ca 6200 BP at -8m, ca 4900 BP at -5m, ca 3350 BP at -2.5m, and low level occurred ca 7400 BP at -15m, just before minor transgression (Ters, 1973).

Anse du Palus series, Côte du Nord

Peat from peaty layer lying on shelly sand, 2m below msl (48° 40' N, 2° 56' W). Coll and subm 1972 by M Ters.

Gif-3474. Job 1	3580 ± 110
Peaty black clay from top of peaty layer.	
Gif-3475. Job 44	5330 ± 140
Peat from base of peaty layer.	

Gif-2953. Croesty-en-Arzon, Morbihan **3130 ± 100**
Peaty clay under marine sand, in marsh (47° 32' N, 2° 54' W). Coll and subm 1973 by M Ters. *Comment:* dates continental episode correlated with minor regression of sea.

Gif-2528. Saint-Nazaire, Loire Atlantique **5220 ± 130**
Oyster shells at depth 30m in sediments from Loire valley (47° 17' N, 2° 10' W). Coll and subm 1972 by M Ters. *Comment:* estimates rate of valley filling.

Brétignolles series, Vendée

Wood and peat on foreshore of beach of Brétignolles (46° 38' N, 1° 52' W). Coll and subm 1972-1974 by M Ters.

Gif-3421. 85R **3430 ± 110**

Tree trunk *in situ*, 1m above msl, lying on peat dated at 4990 ± 120 (Gif-2109) and 4900 ± 1120 (Gif-2108) (R, 1974, v 16, p 65).

Gif-2525. 14 **5900 ± 140**

Peat, 4m below msl.

Gif-3420. La Grande Poissolière, Vendée **7600 ± 170**

Wood in peat layer intercalated between periglacial alluvium of Auzance R and Holocene alluvium inland (46° 24' N, 1° 40' W). Coll and subm 1974 by M Ters. *Comment*: dates beginning of valley filling resulting from Holocene rise of sea.

Sonneville series, Charente

Typical formations of Charente region composed of deposits of alternately fine- and coarse-layered sands are called "grèzes litées". They result from action of snow on slopes in limestone environment and from drift caused by a sheet flood phenomenon during periglacial period. These sandstone-like formations are often cut by organic horizons, pseudo-paleosols, resulting from soils developed on high part of slope during favorable climatic periods and swept down slope by action of snow when climatic conditions deteriorated. Dates obtained from mollusk shells and organic matter from paleosols. Coll in sandpit of Sonneville (45° 35' N, 0° 11' W) and subm 1972-1975 by Y Guillien, CNRS, Paris (Guillien and Puissegur, 1969; Guillien, 1975).

Gif-2417. Sonneville 3 **26,600 ± 760**

Mollusk shell from basal level of Upper Mesowürmian Paleosol 3. *Comment*: molluscan fauna is characteristic of cold steppe.

Gif-2675. Sonneville 3 **25,600 ± 900**

Humin fraction from top of Upper Paleosol 3, same level as mollusks (Gif-2417). *Comment*: soluble organic fraction dated at 27,080 ± 350, Gif-2675bis, $\delta^{13}\text{C} = -25.3\text{‰}$. Good agreement between two dates indicates that organic horizon is free of recent contamination.

Gif-2951. Sonneville 3 **26,590 ± 750**

Humin fraction coll from same level as Gif-2675.

Gif-3423. Sonneville 3 **25,400 ± 1000**

Humin fraction from basal level of Upper Paleosol 3. *Comment*: agrees within limits of statistical errors with other dates from this soil. Humic acids absent.

Gif-3274. Sonneville 2 **20,000 ± 600**

Humin fraction from paleosol above Sonneville 3. *Comment*: humic acids absent.

Gif-3273. Sonneville 1a + 1b **21,600 ± 600**

Humin fraction from paleosol above Sonneville 2. *Comment:* humic acids absent.

Gif-3537. Sonneville II-III **8790 ± 400**

Humin fraction from more superficial organic horizon. *Comment:* very low percentage of organic C, 0.06%.

Gif-3538. Sonneville II-III, 20-21-22 **9230 ± 400**

Humin fraction, from same level as Gif-3537. *Comment:* very low percentage of organic C, 0.1%. Date confirms that of Gif-3537. Obvious circulation of water through this level suggests recent contamination.

General Comment: dates approx end of soil development period and change in climatic conditions that initiated slope instability. Sonneville dates generally agree with known chronology for Upper Pleniglacial in Europe. Well-dated 1.4m thick Upper Paleosol 3, corresponds to important Würmian Interstadial ca 26,000 BP.

Charente valley series, Charente Maritime

Samples from muddy sediments of lower valley of Charente R, Charente Maritime. Coll and subm 1975 by C Gabet, Rochefort, Charente Maritime.

Gif-3757. Brouage 1 **2770 ± 100**

Shells from shelly sand, 20m below msl at Brouage (45° 52' N, 0° 44' W).

Gif-3758. Brouage 2 **1790 ± 100**

Shells from shelly sand, 23m below msl.

Gif-3756. Rochefort, Vieille Forme **3530 ± 110**

Shells from shelly sand, 25.4m below msl (45° 57' N, 0° 57' W).

Gif-3755. Rochefort, Corderie **≥30,000**

Peaty sand overlying black clay, 28.2m below msl (45° 56' N, 0° 57' W).

General Comment: samples dated to trace Holocene transgression on coast, but precise sea level is difficult to deduce from depth of these samples coll in marshes and tidal channels where near-shore sedimentation is important factor. Dates show formation of estuary of Charente R.

Gif-2555. Marsh of Arvert, Saintonge, Charente Maritime**4290 ± 120**

Shells from ancient littoral offshore bar, 9m below msl (45° 47' N, 1° 15' W). Coll and subm 1972 by C Gabet (1978). *Comment:* dates stage in formation of Marsh of Saintonge; difficult to relate to precise sea level.

La Péroche series, Oléron Island

Salty peat bog on strand overlying marine sand layer, S La Péroche (46° 54' N, 4° 18' W), Charente Maritime. Coll and subm 1972 by C Gabet (1974).

Gif-2679. La Péroche 1 **4920 ± 110**

Peat at base, 1.3m below msl.

Gif-2680. La Péroche 2 **3600 ± 100**

Peat at 0.3m below msl.

Gif-4234. La Péroche 3 **1730 ± 100**

Peat from upper layer.

General Comment: dates agree with known sea-level variations during Holocene on British and Channel littorals.

Gif-2987. Tonnay, Charente **3660 ± 110**

Oyster shells from shelly deposit 0.6m thick, at 9m depth in maritime plain of Charente (45° 57' N, 0° 53' W). Coll and subm by C Gabet. *Comment:* dates stage in formation of maritime plain of Charente. Dates a little younger than expected from Neolithic industry assoc; difficult to relate to precise sea level.

Saint Georges d'Oléron series, Oléron Island

Littoral deposits from Marais des Salines (45° 58' N, 2° 16' W). Coll and subm 1974 by C Gabet to determine stages of forward advance of coast in NE part of isle.

Gif-3382. Marais des Salines, 1 **2880 ± 100**

Marine shells from offshore bar, La Moulinade 2km inland from coast, 2m above msl.

Gif-3383. Marais des Salines, 2 **2040 ± 90**

Peat from sandy peat in marsh between shelly deposits, 4m below msl, on offshore bar.

Gif-4393. Marais des Salines, 3 **2710 ± 100**

Marine shells from offshore bar off La Moulinade, 1.5m above msl.

Gif-4394. Marais des Salines, 4 **Modern**

Marine shells in marsh at foot of offshore bar, La Moulinade. *Comment:* shells probably deposited by very high tide.

Gif-4395. Marais des Salines, 5 **700 ± 90**

Marine shells from offshore bar des Arceaux, 2.5m above msl.

General Comment: dates trace formation of Marais des Salines, built from deposition of three shelly bars which were remains of ancient shorelines and by sediment-filled pond that formed between bars. Dates indicate stages of coastal aggradation in NE part of Oléron I.

Gif-4418. Oléron Island **3430 ± 110**

Peat layer between two marine deposits 0.5m below msl, in filling of small valley, Oléron I. Coll and subm by M Ters. *Comment:* dates minor regression of sea between two transgressive episodes. Probably dates same fluctuations of sea as Gif-2953 and -3421.

Gif-2767. Bidart, Pyrénées Atlantiques $\geq 35,000$

Wood from fossil tree trunk in coastal alluvial nappe deformed by tectonics, at Bidart (43° 26' N, 1° 36' W). Coll and subm 1973 by G Viers, Fac Lettres, Toulouse. *Comment*: date confirms old age of this formation.

B. Spain and Portugal

Gif-2707. La Franca, Asturias $\geq 35,000$

Peat overlying marine pebble deposit on marine abrasion surface, covered by consolidated marine material 6 to 8m above msl, on beach of La Franca (43° 23' N, 4° 36' W). Coll 1970 and subm 1973 by G Mary, Coll Sci Univ, Le Mans. *Comment*: confirmed expectation that this is old level (probably Tyrrenniam III) and not result of recent tectonic movements. Pollen analysis: *Betula* and *Alnus* dominant.

Llano Ronanzas series, Asturias

Peaty formation, 2.5m thick, on remote plateau at alt 250m in hinterland, Llano Ronanza (43° 23' N, 4° 23' W), La Borbolla. Coll 1970 and subm 1972 by G Mary.

Gif-2337. Llano Ronanzas 350 ± 80

Peat at 0 to 0.2m above surface.

Gif-2336. Llano Ronanzas 1450 ± 90

Peat at 1.1 to 1.5m above surface.

Gif-2335. Llano Ronanzas 3210 ± 100

Peat at 2.2 to 2.5m above surface.

General Comment: *Corylus* abundant at all levels.

Asturian coastal series, Spain

Peat on beach and cliff of Jerra (43° 28' N, 3° 48' W) and of San Vicente de la Barquera (43° 23' N, 4° 24' W) on Asturian coast bordering Bay of Biscay, N Spain. Coll and subm 1970 to 1972 by G Mary.

Gif-2635. Jerra 1 5880 ± 130

Peat from outcropping 60cm above present bar at cliff base. *Comment*: indicates marine environment.

Gif-1893. Jerra 2 5250 ± 90

Submerged peat with hazelnuts, 25m from foot of cliff.

Gif-2917. Jerra 3 5300 ± 120

Peat close to Gif-1893.

Gif-3050. Jerra 4 5850 ± 200

Submerged peat, 150m from foot of cliff.

Gif-2636. Rio Bederna, San Vicente de la Barquera Beach 4770 ± 110

Peat bog on pebble bar, 1.1 to 2m above high sea level, exposed at mouth of Rio Bederna.

General Comment: Asturian coast, contrary to French coast, has kept traces of recent high sea levels (Mary, Médus, and Delibrias, 1975). Pollen in dated peats would indicate phytodynamic delay during Holocene with regard to French Basque country.

Torremolinos series, Spain

Shells from marine formation at Torremolinos (36° 38' N, 4° 30' W), near Malaga. Coll and subm 1972 by R Lhenaff, Inst Geog, Lille.

Gif-2690. Torremolinos 1 **1350 ± 90**

Shells from bottom of red detrital continental formation, lying on lumachelle.

Gif-2691. Torremolinos 2 **≥30,000**

Shells in lumachelle, 1 to 2m above msl.

Azores series, Portugal

Core K 11, 3550m depth (36° 47' 7" N, 27° 22' 3" W), near Azores Islands, Atlantic Ocean. Subm 1972 by L Pastouret, CNEXO, Plouzané. Total inorganic carbon was used to date samples.

Gif-2522. 5 to 16cm **4150 ± 110**

Gif-2523. 61 to 75cm **21,850 ± 570**

C. Austria

Linz series

Fossil wood from recent alluvial plains of Donau R, in Linz region. Coll by H Kohl and subm 1971 by M Leger, Inst Geog, Paris (Leger, 1965).

Gif-2252. Pleschinger Au, 63 **1490 ± 90**

Fossil wood (*Fagus* sp), at depth 6 to 7m in alluvial plain of Donau (48° 19' N, 14° 20' E).

Gif-2253. Pleschinger Au, 69 **1440 ± 90**

Fossil wood (*Ulmus* sp), at depth 6 to 7m in alluvial plain of Donau.

Gif-2251. Pleschinger Au, 52 **3640 ± 110**

Fossil wood (*Quercus* sp), at depth 6 to 7m in alluvial plain of Donau.

Gif-2249. Asten Fischeing, 9 **2390 ± 100**

Fossil wood (*Fraxinus* sp), at depth 10 to 11m in lowest terrace at Asten Fischeing (48° 14' N, 14° 25' E).

Gif-2250. Asten Fischeing, 10 **2600 ± 100**

Fossil wood (*Ulmus* sp), at depth 10 to 11m in lowest terrace.

Gif-2254. Hirschgasse, Linz, 75 **12,100 ± 220**

Fossil wood (*Populus* sp), in organic horizon in silty upper deposit of low terrace, at 2m depth, Hirschgasse (48° 18' N, 14° 16' E).

*D. North Africa***Gif-1891. Sebkhet-en-Noual, Tunisia** **300 ± 90**

Ostrich egg shell from ground surface at top of terrace, Sebkhet-en-Noual (34° 24' N, 9° 52' E). Coll and subm 1970 by J P Ballais, Univ Caen. *Comment*: indicates recent existence of ostrich in region.

Bou-Regreg series, Morocco

Oyster shells in marine alluvium in mouth of Bou-Regreg wadi near Rabat (34° 02' N, 6° 51' W). Coll and subm 1973 by J Riser, Fac Sci St Jérôme, Marseille.

Gif-2851. Bou-Regreg 1 **8770 ± 200**

From base of oyster shell level, 25 to 1m below msl.

Gif-2852. Bou-Regreg 3 **6490 ± 160**

From top of same oyster shell level.

General Comment: dates corroborate rapid rise of sea level during "Melahien" (Flandrian on these coasts).

*E. West Africa***Dakar, Core 40 S 43 series**

Samples from marine Core 40 S 43, 4.2km off Dakar (14° 36' 60" N, 17° 14' 58" W), at depth 15.8m, in old marigot (estuarine marsh). Coll by Mission Rosilda and subm 1973 to date Holocene transgression.

Gif-2824. 340 to 330cm **8400 ± 180**

Clayey peat with coarse sand from base of peat at bottom of core.

Gif-2856. 300 to 290cm **8180 ± 180**

Oyster shells from upper part of peat level.

Gif-2823. 40 to 30cm **8150 ± 180**

Peaty clay from top of core, separated from low peaty horizon by 1.5m oyster mud level.

General Comment: dates suggest very rapid rise of sea level ca 8000 BP.

Louti series, Cameroon

Calcareous nodules in vertisol from low terrace of right bank of Mayo Louti R (10° 46' N, 13° 55' E), at Figuil, Benoue. Coll and subm 1971 by A Marliac, ORSTOM, Yaounde, Cameroon.

Gif-2233. Louti, 70 AK 9 11 **8400 ± 110**
 $\delta^{13}C = -10.3\text{‰}$

Calcareous nodules in ocher sandy-silty vertisol lying on pebble level at depth 2m, Profile 9. Site subject to seasonal floods.

Gif-2234. Louti, 70 AK 9 111 **14,720 ± 200**
 $\delta^{13}C = -9.4\text{‰}$

Calcareous nodules 50cm below Gif-2233, Profile AK 9. Site subject to seasonal floods.

- Gif-2235. Louti, 71 F 2 bis 111a** **9480 ± 120**
 $\delta^{13}C = -10.2\text{‰}$
Calcareous nodules in gray-black vertisol, overlain by colluvium at depth 4m, Profile F 2. Above seasonal flood level.
- Gif-2236. Louti, 71 F 2 bis 111b** **15,320 ± 210**
 $\delta^{13}C = -10.7\text{‰}$
Calcareous nodules from 90cm below Gif-2235, Profile F 2.
- Gif-2237. Louti, 71 F 2 bis V c** **8690 ± 110**
 $\delta^{13}C = -8.9\text{‰}$
Calcareous nodules from yellow sandy-silty horizon at depth 3m under Gif-2236, Profile F 2. Site may be subject to floods.
- Gif-2238. Louti, 71 F 4 111 a** **7030 ± 100**
 $\delta^{13}C = -9.8\text{‰}$
Calcareous nodules in gray-black vertisol in sandy gritty colluvium at depth 7m, Profile F 4. Above seasonal flood level.
- Gif-2239. Louti, 71 F 4 V b** **6450 ± 90**
 $\delta^{13}C = -11.7\text{‰}$
Calcareous nodules from 5m below Gif-2238, Profile 4. Above seasonal flood level.

Gif-2240. Louti, 71 F 4 V**Modern**

Organic matter from vertisol just above nodules Gif-2239, Profile 4.
Comment: no carbonate in this level. Organic carbon content 0.1%; inactive CO₂ added for measurement.

General Comment: dates are inconsistent both within same profile and between profiles which may be caused by presence of Cretaceous calcareous sediment in part of drainage basin, and by active formation of calcareous deposits in profiles (F4 and F2 bis) observed since 1971. Modern age of organic matter from base of Profile F4, though not explained (Gif-2240) shows contamination of these levels. Study indicates unreliability of ¹⁴C ages for this type of material in equatorial regions.

York Island series, Sierra Leone

Vermets from York I. (8° 30' N, 13° 17' W). Coll and subm 1971 by J Laborel, Fac d'Aix, Marseille. Alts are above biol level of living vermets.

Gif-2404. York I., SL 1**650 ± 90**

Fossil formation, 1 ± 0.5m, found in fissure.

Gif-2405. York I., SL 2**1420 ± 100**

Fossil formation, 2 ± 0.5m.

Gif-2406. York I., SL 3**740 ± 90**

Fossil formation, 1.5 ± 0.5m from Sussex Islet, between Freetow and York I.

General Comment: if compared with results obtained for fossil vermets along coast of Brazil at same date, sea level seems 0.5 to 1m higher on W African coast (Laborel and Delibrias, 1976).

Ivory Coast series

Shells coll and subm 1973 by R Pomel, Dept Géog, Univ Clermont-Ferrand, to date recent minor transgression of littoral zone of Ivory Coast.

Gif-2864. Dabou 1 **2020 ± 100**

Shells from shelly sand mounds (faluns) with lagoon shells and anthropol deposits, at depth 2.5m, Dabou (5° 19' N, 4° 23' W).

Gif-2863. Dabou 11 **1970 ± 100**

Shells from basal level of same shelly mounds as Gif-2864.

Gif-3377. N'Gaty **1950 ± 90**

Shells from falun, N'Gaty (5° 19' N, 4° 21' W).

Gif-3379. Bandama **>90**

Oyster shell from falun on right bank of Bandama R near Lahou (5° 08' N, 4° 49' W).

Gif-3360. Digboue **>80**

Oyster shell in falun, Digboue lagoon, near Balmer (4° 43' N, 6° 39' W). *Comment* for Gif-2864, -2863, -3360, -3377, -3379: samples date formation of these anthropol deposits, positions of which suggest minor transgression.

Gif-3361. Grand-Berebi **270 ± 80**

Vermetidae, 0.5m above high sea level, Grand-Berebi (4° 39' N, 6° 55' W).

Gif-3362. Dogbale 1 **760 ± 80**

Vermetidae, 1.5m above high sea level, Dogbale-Oulidie (4° 37' N, 6° 57' W).

Gif-3363. Dogbale 2 **1920 ± 90**

Vermetidae, 3m above high sea level.

South Benin series

Samples to study recent Holocene formation of S Benin, shoreline resulting from fluvial, lagoonal, and estuarine sedimentation.

Gif-2847. N Ahémé Lake **5700 ± 140**

Peat at depth 160 to 200cm in Core L 4 b-I, ca 1m above msl, from peat bog in ancient mangrove lagoon, probably developed at time of max of Nouakchottian transgression, N Ahémé Lake (6° 36' N, 2° 00' E). Coll and subm 1973 by P Germain, Lab Radioecol, Cherbourg (Germain, 1975).

Gif-2848. S Porto-Novo **5430 ± 140**

Peat at depth 150 to 200cm in Core P N 2 C-7, at ca msl, S Porto-Novo (6° 26' N, 2° 36' E). Coll and subm 1973 by P Germain.

- Gif-2849. Near Cotonou, C 1** **2000 ± 100**
Shells at depth 630 to 660cm in Core C 1, 1 to 2m below msl, in sandy seastrand near Cotonou (6° 21' N, 2° 25' E). Coll and subm 1973 by P Germain.
- Gif-2850. Near Cotonou, S 3** **2750 ± 100**
Shells at depth 970 to 1070m in Core S 3, ca 6m below msl in S sandy seastrand near Cotonou (6° 21' N, 2° 26' E). Coll and subm by P Germain. *Comment:* Gif-2849 and -2850 date levels corresponding to transition between fine marine sandy deposit and coarser sedimentation which marks beginning of formation of littoral seastrand.
- Gif-3347. Bembe, P N 4 a** **2670 ± 100**
Shells in black clay from fluvial-lagoonal formation on left bank of Oueme R at Bembe (6° 32' N, 2° 32' E). Coll and subm 1974 by G Paradis, Univ Benin, Cotonou.
- Gif-3348. Zoumbodji** **1250 ± 90**
Shells (*Arca senelis*), N coastal lagoon, Zoumbodji (6° 20' N, 2° 06' E). Coll and subm 1974 by G Paradis.
- Gif-3972. Cotonou, 13** **3200 ± 100**
Marine shells in coarse littoral sand, 12 to 13.5m depth, ca 6m below msl, Cotonou (6° 21' N, 2° 26' E). Coll and subm 1976 by G Paradis.
- Gif-3974. Cotonou, 15** **1490 ± 90**
Marine shells from shelly beds, 1.5m thick, in gray sand 1m above msl, from ancient beach (6° 21' N, 2° 23' E). Coll and subm by G Paradis.
- Gif-3973. Kraké** **830 ± 90**
Charcoal with pottery assoc at depth 0.6m, in sandy seastrand, Kraké (6° 23' N, 2° 41' E). Coll and subm 1976 by G Paradis. *Comment:* sample of archaeol interest.
- Gif-3349. Kpodji 1a** **970 ± 90**
Shells (*Macra* sp), from shelly sand level beneath clay, Kpodji (6° 23' N, 2° 35' E), Dahomey. Coll and subm 1974 by G Paradis.
- Gif-3350. Kpodji 1b** **1120 ± 90**
Shells (*Pachymeliana aurita*), from same level as Gif-3349.
General Comment: samples date environmental changes shown by sediment and faunal studies (Paradis, 1975; 1978) resulting from change in lagoon formation.
- Ponta de San Jeronimo series, Sao Thome Island, Gulf of Guinea**
Lithotamnies from raised beach at Ponta San Jeronimo (0° 19' 55" N, 6° 44' 50" E). Coll by M Cornen and subm 1973 by P Giresse, Univ Perpignan.
- Gif-2998. Ponta de San Jeronimo, S T 1** **3900 ± 100**
Shells from base of raised beach, 0.5m above msl.

Gif-2999. Ponta de San Jeronimo, S T 2 2300 ± 100

Shells from top of raised beach, 1.5m above msl.

General Comment: island is tectonically active and not suitable for study of small variations in sea level.**Gif-2948. Pointe Noire, Congo 1890 ± 90**Charcoal lying on ocher sands covered by white sands at 5 to 7m above msl (4° 46' 30" S, 11° 52' 10" E). Coll and subm 1973 by P Giresse. *Comment:* dates deposition of white sands at end of Holocene.**Kouilou estuary series, Congo**

Six 30m borehole cores were taken in Holocene filling of Kouilou estuary valley to study most recent shoreline oscillations. Coll and subm 1974 by P Giresse.

Gif-3451. Kouilou estuary, BK 1 D 610 ± 90Organic remains in black clay, 6m below high sea level (4° 28' 40" S, 11° 36' E), in Core BK 1 D. *Comment:* sediment studies indicate this level corresponds to max of transgression.**Gif-3453. Kouilou estuary, BK 2 H 920 ± 90**Peaty clay, 10.5m below high sea level (4° 28' 40" S, 11° 36' E), 50m from Core BK 1 D. *Comment:* corresponds to beginning of new marshy phase.**Gif-3733. Kouilou estuary, BK 2 Y 6640 ± 140**

Organic remains in gray clay, 19m below high sea level (4° 28' 30" S, 11° 43' 20" E).

Gif-3735. Kouilou estuary, BK 3 H 8810 ± 180

Wood, 14.5 to 17.5m below high sea level.

Gif-3734. Kouilou estuary, BK 6 I ≥35,000Clayey peat, 26m below high sea level (4° 28' S, 11° 43' 20" E). *Comment:* corresponds to preceding transgression.**Gif-3452. Kouilou estuary, BK 1 L ≥35,000**Peaty clay, 30m below high sea level (4° 28' 40" S, 11° 43' 20" E). *Comment:* corresponds to preceding transgression.**Gif-2949. "Côte Sauvage", Congo Modern**Shells (*Ostrea denticulata* sp) from offshore bar, 3m above msl (4° 48' 37" S, 11° 51' 10" E). Coll by G Kouyoumontzakis and subm 1973 by P Giresse. *Comment:* oyster shells are not good indicators of sea levels.**Gif-3736. Congo, 1172 C ≥25,000**Organic remains in clay at depth 50m on continental shelf (5° 32' S, 11° 56' E). Coll and subm 1974 by P Giresse. *Comment:* corresponds to preceding transgression.

Gif-3449. Loango, Congo **520 ± 50**

Organic clay, 0.5m below high sea level (4° 39' 30" S, 11° 47' 25" E). Coll and subm 1974 by P Giresse. *Comment*: corresponds to slightly lower sea level than at present.

Gif-3450. Songololo R, Congo **2920 ± 110**

Organic clay, ca high sea level, from mouth of Songololo R (4° 45' 20" S, 11° 51' 00" E). Coll and subm 1974 by P Giresse. *Comment*: corresponds to slightly lower sea level than at present.

Gif-2564. Congo, P G 596 **11,980 ± 250**

Amphistegines from sediment dredged from Congo continental shelf (4° 14' 5" S, 11° 04' 6" E), at depth 112m. Subm 1972 by P Giresse. *Comment*: *Amphistegines* are large foraminifera living at depth of 55m or less. It can be deduced that sea level was ca -60m (Delibrias, Giresse, and Kouyoumontzakis, 1973).

Gif-3479. Baia Forta, Angola **3400 ± 100**

Shells (*Arca senilis*) from midden at 20m above msl (12° 40' S, 13° 12' E), S W Benguela. Coll and subm 1974 by G Kouyoumontzakis, Lab Geol, Univ Brazzaville, Congo. *Comment*: corresponds to max of Nouakahottian transgression (Giresse, Kouyoumontzakis, and Delibrias, 1976).

Gif-3477. Baia Azul, Angola **20,600 ± 400**

Shells (*Arca senilis*), at 10 to 12m above msl (12° 38' S, 13° 15' E). Coll and subm 1974 by G Kouyoumontzakis. *Comment*: aberrant date that cannot be explained by recrystallization of shells, which were 100% aragonite; probably mixing of shells from different levels occurred.

Gif-2944. Praia Amelia, Mossamedes, Angola
GKAN 10 **18,200 ± 400**

Beach deposit with *Strombusbubonius*, *Arca senilis*, *Conus* spp, 1.5 to 2.5m above msl, Praia Amelia (15° 12' S, 12° 06' E), S Mossamedes. Coll by G Kouyoumontzakis and subm 1973 by P Giresse. *Comment*: date disagrees with known sea level at 18,000 BP; probably mixing of ancient and more recent shells occurred.

Gif-3732. Angola, GKAN 54 **≥35,000**

Marine shells from uplifted level at 20m above msl (12° 35' S, 13° 25' E). Coll and subm 1975 by P Giresse. *Comment*: corresponds to ancient high sea level, probably from Ouljian transgression.

Gif-2945. Ponta da Giraul, N Mossamedes, Angola **3430 ± 100**

Broken shell in raised beach, at 5m above msl (15° 06' S, 12° 07' E). Coll and subm 1973 by P Giresse. *Comment*: dates one of raised beaches observed in S Angola, which disappear towards N Angola.

Gif-2946. Praia des Conchas, N Mossamedes, Angola **3040 ± 100**

Serpulides tubicoles lumachelle, 2 to 4m thick at 3m above msl (15° 05' S, 12° 08' E). Coll and subm 1973 by P Giresse. *Comment*: same as for Gif-2945 (Giresse, Kouyoumontzakis, and Delibrias, 1973).

Gif-2947. Baia Forta, Angola **≥35,000**

Shell interbedded in coarse sand, 2 to 3m above msl (12° 37' S, 13° 12' E). Coll and subm 1973 by P Giresse. *Comment*: corresponds to Ouljian transgression.

Gif-3230. Praia Amelia, Angola **1620 ± 80**

Marine shells, at 5 ± 2m above msl (15° 12' S, 12° 06' E). Coll and subm 1974 by G Kouyoumontzakis.

Gif-3231. Paia des Conchas, Angola **Modern**

Shell remains, at 2 to 3m above msl (15° 05' S, 12° 08' E). Coll and subm 1974 by G Kouyoumontzakis. *Comment*: corresponds to high sea level.

Gif-3478. Baia du Pipas, Angola **≥35,000**

Marine shells, at 15m above msl (15° 07' S, 12° 12' E). Coll and subm 1974 by G Kouyoumontzakis. *Comment*: corresponds to ancient high sea level, probably from Ouljian transgression.

*F. East Africa and Madagascar***Gif-2559. N coast Ghoubbet al Karab, W Djibouti, Ethiopia** **27,600 ± 1500**

Shells sampled at alt 10m, from tectonically uplifted fringe reef, 60m high, N coast of Ghoubbat al Karab (11° 32' N, 42° 32' E), Tadjoura Gulf. Coll and subm 1972 by L Stieltjes, BRGM, La Reunion. *Comment*: inconsistent with uplift rates of this littoral zone deduced from ⁴³⁰Th/²³⁴U dates on corals (Faure, Hoang, and Lalou, 1980). Results from light contamination of shells by recent carbon. Date must be taken as min (Stieltjes, 1973).

Gif-2558. N coast Ghoubbet al Karab, W Djibouti, Ethiopia **7810 ± 150**

Shells from lacustrine deposit assoc with max SE extension of Lake Asal (11° 35' N, 42° 30' E), Tadjoura Gulf. Coll and subm 1972 by L Stieljes.

Gif-2554. Ghoubbet al Karab, Afar, Ethiopia **7400 ± 110**

Shells (*Melania*) from lacustrine sediments under basaltic flow, in open fissure in lava (11° 30' N, 42° 30' E). Coll and subm 1972 by M Marinelli, Inst Min Petrog, Pisa. *Comment*: eolian sediment is interbedded between lava and lacustrine deposit. Date is max for basaltic flow, one of last of Ghoubbet, which is probably younger than 7000 BP. With width of fissure at ca 40m it is possible to calculate min spreading rate of ca 1cm/yr for Asal ridge (Delibrias, Marinelli, and Stieljes, 1974).

Fort-Dauphin series, Madagascar

Fossil vermetid shells from Fort-Dauphin region (25° 01' S, 47° 00' E). Coll and subm 1973 by J Laborel, Sta marine d'Endoume, Marseille. Alt given above biol level of living vermet.

- Gif-2838. Fort Dauphin 1** **980 ± 90**
Fossil formation, 2 ± 0.5m.
- Gif-2839. Fort-Dauphin 3** **1920 ± 90**
Fossil formation, 2.5 ± 0.5m.
- Gif-2449. Sambava, Madagascar** **2020 ± 90**
Shells in sandy bar, at approx msl (14° 16' S, 50° 10' E), NE Madagascar. Coll and subm 1973 by R Battistini, Dept Géog, Univ d'Orléans.
General Comment for Madagascar samples: evidence of high sea levels during Holocene is observed along coast of Madagascar.
- Tulear series, Madagascar**
Littoral samples from Tulear region, SW Madagascar. Coll and subm 1972 by M Pichon, Sta marine d'Endoume, Marseille.
- Gif-2520. Tulear, MP/D 29** **1870 ± 100**
Organogenic sandstone of recent formation dredged from depth 40 to 45m near Tulear (23° 24' 9" S, 43° 38' 4" E), SW Madagascar.
- Gif-2519. Tulear, 4-MP/A1** **4800 ± 130**
Thick pieces of *Aepyornis* egg shells, coll from yellow dune largely consisting of quartz sands.
- Gif-2521. Tulear, 4-MP/A2** **1530 ± 110**
Thin pieces of *Aepyornis* egg shells, coll from white dune largely consisting of organogenic limestone, near Tulear (23° 17' 8" S, 43° 38' 5" E).
General Comment: eggs date littoral dune systems. Organogenic limestone in white dunes comes from coral indicating coral littoral formation between 4800 and 1530 BP, existence of which is proven by dredged sample. *Aepyornis* is now extinct in Madagascar; birds were still extant when first Europeans arrived. Thinness of shells (Gif-2521) is considered evidence of degenerative stage of sp (M P).
- Gif-2391. Vavatenina region, Madagascar IFB13** **2270 ± 90**
B horizon from podzol lying on alluvial terrace (17° 27' S, 49° 20' E). Coll and subm 1971 by F Bourgeat, Ecole Sup Nat Agron, Paris. *Comment:* date is upper limit for end of terrace formation.

G. Pacific Coasts

Reef Island series, Bank Island Group, New Hebrides

Samples of coral and shell from Reef I. (13° 37' S, 167° 32' E), Bank I. Group, New Hebrides. Coll and subm 1972 by A Guilcher, Fac Lettres Sci Humaines, Brest.

- Gif-2535. Reef 2** **4320 ± 80**
Coral, E Wosou, mid-tide level.
- Gif-2536. Reef 3** **5980 ± 90**
Coral, NE Wosou, mid-tide level.

Gif-2531. Reef 8	4570 ± 80
Shell (<i>Tridacne</i>), SW Wosou, just above mid-tide level.	
Gif-2532. Reef 17	4150 ± 80
Shell (<i>Pemphis</i>), NW Reef I., mid-tide level.	
Gif-2534. Reef 18	4970 ± 80
Shell (<i>Tridacne</i>), NW Reef I., same level as Reef 17.	
Gif-2533. Reef 45	6640 ± 100
Coral, S Rowa I., mean high-tide level.	
Gif-2624. Reef 44	3270 ± 100
Coral, S Rowa I., filling of pipe.	
Gif-2625. Reef 43	20,600 ± 320
Coral, from outer edge of reef Rowa I.	

General Comment: dates indicate that old reef was formed during Holocene when sea level was 0.5m to 1.5m higher than at present. Seismicity of archipelago is high; thus it is impossible to know that alt of corals is due only to sea-level variations. All dated corals were in growth position except for Gif-2625, which results from mixture with older corals. Reef I. probably had shallow Pleistocene basement (Guilcher, 1974).

Gif-3566. Farquhar I., Seychelles **3640 ± 100**

Sample of coralline limestone 2.5m above sea level, from rim of Farquhar atoll (10° S, 51° E). Coll and subm 1975 by R Battistini. *Comment:* two U-Th dates for same coral sample, 4700 ± 600 and 3100 ± 700 BP (Battistini, Delibrias, and Laborel, 1976), show good correlation obtainable between ¹⁴C and U-Th dates for young coral samples.

New Caledonia series

Peat samples from mangrove peat bogs on W coast of New Caledonia. Coll and subm 1973 by F Baltzer, Fac Sci Orsay, Essonne.

Gif-2929. Nessadiou 10 E	5930 ± 120
Peat (21° 38' S, 168° 28' 30" E).	
Gif-2930. Marais de Mara, 4-1	5330 ± 120
Peat (21° 45' S, 165° 41' 30" E).	
Gif-2932. Boulouhari, 104	2900 ± 100
Peat (21° 55' S, 165° 56' E).	
Gif-2931. Marais de Mara, 4-2	430 ± 80
Peat (21° 45' S, 165° 41' 30" E).	

General Comment: dates stages of regression of sea during Holocene transgression.

Gif-2392. La Reunion, LRZ443 **1330 ± 90**

B horizon from podzol (21° 6' 13" S, 55° 21' 26" E), 16 to 26 cm below surface, at alt 1650m. Coll and subm 1971 by C Zebrowski, ORSTOM, Paris.

Gif-2393. La Reunion, LRZ463 **2100 ± 90**

B horizon from podzol (21° 10' 53" S, 55° 37' 50"), at depth 80 to 95cm from under volcanic ejecta. Coll and subm 1971 by C Zebrowski.
Comment: dates upper limit of volcanic event.

Vietnam series

During Holocene transgression, sea submerged present coastal plains in Vietnam, especially Mekong Delta. Much archaeol and geol evidence of ancient coastline exists and indicates higher sea levels than at present (Fontaine and Delibrias, 1974). Coll and subm 1972-1974 by H Fontaine, Serv Geol, Saigon.

Gif-2647. Ben-Dô **3000 ± 110**

Organic remains in ceramic debris, from archaeol site in highlands Mekong Delta (10° 52' N, 106° 51' E). As lowlands were probably being submerged or were marshy, prehistoric people settled areas bordering Mekong Delta.

Gif-2394. Rach-Nui **2400 ± 100**

Shells in kitchen refuse, from site believed to be earliest settlement in lowlands of Mekong Delta (10° 33' N, 106° 40' 30" E).

Gif-2648. Nha-Trang, Ire Island **3090 ± 110**

Emerged coral from Nha-Trang, Ire I.

Gif-2474. Ca-Na **2490 ± 100**

Coral from "Terrace" (11° 20' N, 108° 51' E), ca 2m above msl. "Terraces" are accumulation of cemented coral debris and shells on high beach.

Gif-2475. Ca-Na **4200 ± 110**

Coral from "new terrace" (11° 20' N, 108° 52' 30" E), ca 2m above msl.

Gif-2476. Ca-Na **900 ± 90**

Shells and coral from "terrace", Đông-Hai (12° 30' N, 109° 18' E), 1.2m above msl.

*H. Brazil***Bahia series**

Shelly sandstone from ancient littoral zone 1.5m above msl, near Bahia (13° S, 38° W). Coll and subm 1971 by T Da Silva, Univ Bahia, Salvador, Brazil.

Gif-2149. Bahia I **2150 ± 100**

Calcareous cement of sandstone.

Gif-2150. Bahia 2 **3780 ± 130**

Shell extracted from sandstone. *Comment*: discrepancy between two ages means either successive recrystallization of cement results in younger dates, or older shells were cemented into sandstone.

Gif-2957. Porto de Galinhas, Pernambuco **980 ± 90**

Sandstone with *Halimeda* sp on coral slab, 0.5m above msl. Coll and subm 1973 by J Laborel. *Comment*: validity of date on carbonate from sandstone is impossible to evaluate because of possible incorporation of ancient carbonate; however, date is acceptable.

*I. Canada***Quebec city area series**

Peat bogs from Quebec city area. Coll and subm 1970 by P Richard, Univ Quebec, Chicoutimi, Canada (Richard, 1971).

Gif-1756. Saint-Jean, Ile d'Orléans, J1 **1180 ± 100**

Peat from depth 70 to 85cm from Saint-Jean bog, 4.2m thick, on Orléans I., in St Lawrence R, E Quebec city (47° 56' N, 71° 56' W). *Comment*: pollen analysis indicates *Tsuga canadensis* max.

Gif-1757. Saint-Jean, Ile d'Orléans, J2 **3800 ± 140**

Peat from depth 270 to 285cm from same peat bog. *Comment*: pollen analysis indicates *Fagus* increase; *Acer* forest prevails.

Gif-1758. Saint-Jean, Ile d'Orléans, J3 **6100 ± 160**

Peat from depth 320 to 335cm from same peat bog. *Comment*: pollen analysis indicates *Pinus strobus* max, *Acer*, *Tilia*, and *Fagus* appearance. End of *Betula* forest.

Gif-1759. Saint-Raymond, Portneuf, RAY 1 **3550 ± 120**

Peat from depth 270 to 285cm from Saint-Raymond peat bog, Portneuf (46° 53' N, 71° 48' W). *Comment*: high pollen frequency level, not correlated with J3 level as expected. Bottom of RAY profile dated to 7970 ± 140 BP (GSC-1400).

II. ARCHAEOLOGIC SAMPLES

*A. France***Wissant series, Nord**

Littoral archaeol sites of interest to both archaeol and sea-level studies at Wissant (50° 53' N, 0° 42' E), Pas-de-Calais. Samples coll and subm 1969-1972 by H Mariette, Samer, Pas-de-Calais.

Gif-1598. Wissant 1 **4520 ± 120**

Shell (*Cardium*) from brackish clay level with scrobiculaires, on fore-shore at msl.

Gif-1768. Wissant 2 3610 ± 110

Sandy peat lying on sand, at top of beach 2.7m above msl. *Comment:* considering tidal range of 7m, date corresponds to lowering of 0.8m below msl; agrees with assoc of Neolithic industry.

Gif-2678. Wissant 3 1840 ± 90

Charcoal in clayey level in sand cliff; assoc with ceramics difficult to date by archaeol estimates.

Hardelot series, Pas-de-Calais

Samples from archaeol littoral site, interbedded in sand on beach (50° 36' N, 0° 45' E). Coll and subm 1969-1970 by H Mariette.

Gif-1770. Hardelot 1 2740 ± 100

Humic sand, 7m above msl. *Comment:* agrees with assoc of 1st Iron age industry.

Gif-1600. Hardelot 3 2950 ± 110

Sandy peat, 6.5m above msl.

Gif-1599. Hardelot 2 3000 ± 110

Sandy peat, 6m above msl.

Gif-1769. Hardelot 4 2930 ± 100

Peaty sand, 4m above msl. *Comment:* presence of potsherds of Bronze age should date sample some hundreds of years older.

Gif-2557. Wimereux, Pas-de-Calais 3620 ± 110

Wood in peat containing tree trunks, at top of beach 3m above msl (56° 43' N, 0° 81' E). Coll and subm 1971 by H Mariette. *Comment:* peat layer was between 2 levels of Neolithic and La Tène periods. Date is consistent with this archaeol evidence.

Gif-2677. Etaples, Pas-de-Calais 3420 ± 100

Charcoal from site *Etaples* (50° 31' N, 1° 38' E). Coll 1956 and subm 1972 by H Mariette. *Comment:* date agrees with Campaniforme ceramics assoc, similar to "Bell beaker" types from Netherlands (Mariette, 1959).

Noisy-sur-Ecole series, Seine et Marne

Charcoal from collective tomb of SOM (Seine-Oise-Marne) Neolithic type (48° 21' N, 2° 27' E). Coll and subm 1971 by M Brézillon, Antiquités Préhist, Paris.

Gif-2241. Noisy-sur-Ecole, A 4480 ± 110

Charcoal coll in rectangular room at depth 1m, assoc with two human skeletons.

Gif-2242. Noisy-sur-Ecole, B 4530 ± 110

Charcoal mixed with human bones around well, in 2nd elliptical room.

Gif-2243. Noisy-sur-Ecole, C 2970 ± 100

Charcoal in well at depth 3 to 4m, under remains of domestic fauna, atypical stone industry, and pottery of Hallstatt period.

General Comment: Gif-2241 and -2242 agree with archaeol evidence for SOM Neolithic civilization. Gif-2243 was expected to be 500 yr younger.

Gif-2365. Cannes-Ecluse, Seine et Marne 1970 ± 70

Charcoal from Late Bronze age site at depth 70cm, "Les Baigneux" (48° 22' N, 3° 05' E). Coll by C Mordant and subm 1971 by M Brézillon.

Comment: dates conflict with archaeol evidence; no explanation offered.

Gif-2366. Misy, Seine et Marne 540 ± 60

Charcoal from Middle Bronze age site at depth 40cm, "Bois des Refuges", Misy-sur-Yonne (48° 20' N, 3° 05' E). Coll by C Mordant and subm 1971 by M Brézillon.

Comment: date strongly conflicts with archaeol evidence.

Gif-2721. Sèvres, Hauts de Seine 5190 ± 130

Charcoal from gallery for flint quarrying from chalk formation (48° 20' N, 2° 27' E). Coll by J L Maire and subm 1972 by M Brézillon.

Comment: date agrees with expected age.

Gif-2723. Germigny-L'Evêque, Seine et Marne 3970 ± 120

Charcoal from hearth in collective tomb of SOM Neolithic type (48° 59' N, 2° 56' E). Coll by J Tarrête and subm 1973 by M Brézillon.

Comment: date agrees with expected age.

Gif-2169. Loisy-en-Brie, Marne 3690 ± 100

Bones from collective tomb in hypogeum of Loisy-en-Brie (48° 54' N, 4° E), in rich archaeol context of SOM culture. Subm by M Joffroy, Saint-Germain-en-Laye.

Comment: date agrees well with archaeol data.

Gif-1604. Le Rozel, Manche 17,000 ± 700

Organic horizon in Upper Paleolithic rockshelter in natural fault in vertical cliff, at Pointe du Rozel (49° 28' N, 1° 50' 30" W), coast of Cotentin. Coll and subm 1970 by F Scuvée, Digosville, Manche.

Comment: dated as expected although very poor industry of site did not allow accurate archaeol interpretation.

Gif-2291. Gaignog Island, Landeda, Finistère 1470 ± 100

Charcoal from Dark age site in Gaignog I. (48° 35' N, 4° 35' W). Coll and subm 1971 by P R Giot, Fac des Sci, Rennes.

Comment: charcoal is related to oldest enclosure of site.

Gif-2293. Kerascoët, Saint Segal, Finistère 970 ± 90

Charcoal from surrounding wall of camp of Kerascoët (48° 15' N, 4° 3' W). Coll by L E Gall and subm 1971 by R Sanquer, Fac Lettres, Brest.

Comment: gives early medieval date for this type of circular camp.

Saint-Urnel, Plomeur series, Finistère

Littoral necropolis of Saint-Urnel, Plomeur (47° 55' N, 4° 20' W) is famous cemetery. Its numerous skeletons, interbedded in dune were well studied to determine origin of settlement in Brittany. Lying on Bronze age soil, it was first attributed to Iron age (Giot and Cogné, 1951). Samples coll and subm 1971-1976 by P R Giot.

Gif-2296. Saint-Urnel, S U 1	970 ± 90
Human bones from upper level.	
Gif-2681. Saint-Urnel, S U 2	980 ± 90
Human bones from same level as Gif-2296.	
Gif-3079. Saint-Urnel, S U 1973	900 ± 90
Charcoal from furnace used in bronze metallurgy for casting bells.	
Gif-3584. Saint-Urnel, S U 74-109	1630 ± 90
Human bones from one of most ancient sepultures.	
Gif-3745. Saint-Urnel, S U 75, 7.8.9/CD	1300 ± 90
Charcoal from oratory in center of necropolis.	
Gif-3795. Saint-Urnel, S U 74-61	1400 ± 90
Human bones from ancient sepulture.	
Gif-4071. Saint-Urnel, S U 74 151B	1310 ± 90
Human bones under post hole of oratory.	

General Comment: dates necropolis to Dark age and High Middle age which is also period of arrival of Breton people in region (Giot and Monnier, 1977; 1978).

Gif-2326. Saint-Servan, Ille et Vilaine	1860 ± 90
Wood from worked piece of machinery engine (Roman pump) from big tank embedded into gneiss rock, at Saint-Servan-Saint Malo (48° 38' N, 2° 02' W) (Langouët and Meury, 1973). Coll and subm 1971 by L Langouët, Fac Sci, Rennes. <i>Comment:</i> date agrees with expected age.	

Gif-2327. Kerbat-Plouyé, Finistère	2380 ± 70
Charcoal from Iron age souterrain (underground tunnel) (48° 19' N, 3° 43' W). Coll and subm 1971 by C T Le Roux, Fac Sci, Rennes. <i>Comment:</i> fits with archaeol evidence.	

Kerlande series, Brandivy, Finistère

Charcoal from late Bronze age site at Kerlande (47° 46' N, 2° 54' W). Coll by J Lecornec and subm 1971 by P R Giot.

Gif-2379. Kerlande, C'2-27	860 ± 90
Charcoal.	
Gif-2331. Kerlande, 1	1800 ± 90
Charcoal.	

Gif-2378. Kerlande, A'4-90 2820 ± 100
Charcoal.

General Comment: Gif-2379 and -2331 date some recent periods of occupation of this enclosed site of Late Bronze age which were not revealed during excavation. Gif-2378 agrees with expected age (Lecornec, 1973).

Kerviny barrow series, Poullan, Finistère

Charcoal from Early Bronze age barrow (48° 3' 14" N, 4° 22' 51" W). Coll and subm 1971 by J Briard, Fac Sci, Rennes.

Gif-2374. Kerviny 2 1760 ± 90
Charcoal from hearth.

Gif-2480. Kerviny 1 Modern
Charcoal.

Gif-2481. Kerviny 3 3510 ± 100
Charcoal.

General Comment: only Gif-2481 gives expected age of barrow; Gif-2374 and -2481 indicate later re-occupations (Briard, 1972).

Kerviny settlement series, Poullan, Finistère

Charcoal from proto-historic enclosure beside barrow at Kerviny. Coll and subm 1971 by J Briard.

Gif-2377. Kerviny 6 940 ± 90
Charcoal.

Gif-2375. Kerviny 4 1430 ± 90
Charcoal.

Gif-2376. Kerviny 5 1600 ± 90
Charcoal.

General Comment: dates indicate long and continual settlement of site.

Gif-2380. Meilars, Penguilly, Finistère 2500 ± 100
Charcoal from barrow of Penguilly (48° 4' N, 4° 26' W). Coll and subm by J Briard. *Comment:* typical monument of Bronze age (Briard and Penziat, 1972).

Gif-2381. Plourin-Ploudalmezeau, Milinigou, Finistère 950 ± 90
Charcoal from Bronze age sepulture of Milinigou (48° 30' 25" N, 4° 39' 37" W). Coll and subm 1971 by J Briard. *Comment:* dates re-use of monument.

Gif-2382. Plonéis, Penanguer, Finistère 2380 ± 100
Wood from piles in ancient marsh (48° 03' N, 4° 13' W). Coll by J Garrec and subm 1971 by P R Giot.

Gif-2383. Plouguerneau, Kerazan-Bras, Finistère 2350 ± 100

Charcoal from hearth under Roman bldg near Lilia, Plouguerneau (48° 38' N, 4° 34' W). Coll and subm 1971 by R Sanquer, Fac Sci, Brest. *Comment*: slightly older than expected.

Ploudaniel series, Finistère

Charcoal from tombstones in Bronze age barrow at Kerno, Ploudaniel (48° 33' 24" N, 4° 19' 22" W). Coll and subm 1971 by J Briard.

Gif-2292. Ploudaniel, Kerno A 2830 ± 110

Charcoal.

Gif-2421. Ploudaniel, Kerno B 3450 ± 100

Charcoal.

General Comment: Kerno B gives expected date for this Bronze age monument; charcoal from Kerno A is probably contaminated (Briard and Gouletquer, 1972).

Gif-2471. Grande Brière, Loire Atlantique 4680 ± 110

Human bones in sepulture at depth 0.9m in peat bog of La Grande Brière (47° 08' N, 1° 96' W). Coll by G Bellancourt and subm 1972 by J L'Helgouach, Antiquités Prehist Pays Loire, Nantes. *Comment*: date is similar to those of peat and wood coll elsewhere in peat bog, dated by Sa-39-41-42-46:4630, 4480, 4100, 4260 BP (R, 1964, v 6, p 234).

Gif-2472. Pleneuf, Nantois, Côtes du Nord ≥40,000

Peaty silt in littoral cutting beneath 8m of sand, soils, silt, loess, and solifluction formations (48° 36' N, 2° 51' 20" W). Coll and subm 1972 by J L Monnier, Fac Sci, Rennes. *Comment*: consistent with geol estimate which places soil in Eemian interglacial.

Gif-2473. Kerjouanno, Arzon, Morbihan 2570 ± 100

Charcoal in old soil under dune of Kerjouanno (47° 32' N, 2° 52' W). Coll 1970 by P L Gouletquer and subm 1972 by P R Giot. *Comment*: unrelated to Mesolithic site found under same dune.

Gif-2631. Crann, La Forêt-Landerneau, Finistère 7580 ± 110

Charcoal from quartzite chipping workshop in quarry (48° 25' N, 4° 21' W). Coll by P R Giot, B Hallegouët and J L Monnier and subm 1972 by P R Giot. *Comment*: date for crude lithic industry.

Gif-2685. Les Touches, Mohon, Morbihan 2300 ± 100

Charcoal from Iron age souterrain (48° 35' N, 2° 32' W). Coll by J Lecornec and subm 1972 by P R Giot. *Comment*: date agrees with archaeol data.

Saint-Jude, Bourbriac series, Côtes du Nord

Charcoal from different parts of barrow of Saint-Jude, at Bourbriac (48° 27' 18" N, 3° 8' 24" W). Coll and subm 1972 by J Briard (Briard *et al*, 1977).

- Gif-2686. Saint-Jude, B 1** **3780 ± 100**
Charcoal.
- Gif-2687. Saint-Jude, B 2** **3870 ± 100**
Charcoal.
- Gif-2688. Saint-Jude, B 3** **3760 ± 100**
Charcoal.

General Comment: dates show that this early Bronze age monument was built in one phase.

Gif-2689. Pont-Croix, Finistère **1900 ± 100**

Charcoal from Romano-Gallic villa, at Kervenennec, Pont-Croix (48° 2' N, 4° 33' W). Coll and subm 1972 by R Sanquer. *Comment:* appears slightly older than expected from ceramics and coins found on site. Date was estimated at ca AD 250-275.

Gif-2765. Longeville, Vendée **2610 ± 110**

Charcoal from Hearth A IV with four whole pots, ca 1m below high sea level, on beach of Longeville (46° 24' 15" N, 1° 30' 12" W). Coll and subm 1973 by J L'Helgouach. *Comment:* date is appropriate for early Iron age in Vendée; shows sea level was lower than at present.

Gif-2766. Athée, "la Petite Gaudinière", Mayenne **390 ± 90**

Wood from ancient gold mine at "la Petite Gaudinière" (47° 52' N, 0° 54' 20" W). Coll and subm 1973 by J L'Helgouach. *Comment:* date indicates recent exploitation of gold in Mayenne.

Plussulien series, Côtes du Nord

Charcoal from Neolithic factory for roughed-out axes of dolerites at Seledin, Plussulien (48° 13' N, 3° 03' W). Dates extend series from site, 1st series pub in R, 1974, v 16, p 17; Delibrias and Le Roux (1975). Coll and subm 1972-1976 by C T Le Roux.

- Gif-2682. Plussulien, N, SE** **4940 ± 120**
Charcoal.
- Gif-2683. Plussulien, N, SW** **4350 ± 120**
Charcoal.
- Gif-2684. Plussulien, 02, NE** **4940 ± 120**
Charcoal.
- Gif-3098. Plussulien, 03, NW** **4420 ± 110**
Charcoal.
- Gif-4079. Plussulien, 1976** **4730 ± 110**
Charcoal.

General Comment: dates and stratigraphic study provide coherent history of site. Three important phases of activity were id and dated from 4350 to 5270 BP (not calibrated).

Gif-3550. Piedmont, Port des Barques, Charente Maritime **4290 ± 110**

Wood from refuse pit on foreshore at Piedmont (45° 57' N, 1° 05' W). Coll and subm 1975 by C Gabet. Assoc with Artenac ceramics. *Comment*: confirms old age of Artenac culture.

Gif-3702. Chatelaillon E 7, Charente Maritime **820 ± 90**

Human bone found in monolithic sarcophagus of ancient necropolis of Chatelaillon (46° 4' N, 1° 5' W). Coll and subm 1975 by C Gabet. *Comment*: expected date: 7th century AD. Date may indicate re-use in Middle ages of this Merovingian sarcophagus.

La Sauzaie series, Soubise, Charente Maritime

Marine shells from Peu-Richardien site (45° 53' N, 0° 50' W). Coll by J Gachima and subm 1972 by Y Guillien.

Gif-2608. La Sauzaie, 4 **4410 ± 120**

Marine shells from basal level, beginning of settlement.

Gif-2610. La Sauzaie, 6 **4360 ± 120**

Marine shells.

Gif-2609. La Sauzaie, 9 **2930 ± 100**

Marine shells from ashy level. *Comment*: date suggests late occupation of site.

General Comment: dates agree with Gif-1557:4500 ± 140 previously obtained for site. Gif-2610 (4360 ± 120) dates end of Peu-Richardien culture.

Gif-2414. La Grotte du Loup, Brive, Corrèze **≥40,000**

Carbonaceous earth from Level 5b in Grotte du Loup (45° 09' N, 1° 32' E). Coll and subm 1972 by G Maziere, Limoges. Level attributed to Chatelperronian, *ie*, Upper Perigordian period.

Grotte de Pégourié series, Caniac du Causse, Lot

Samples from Grotte de Pégourié (44° 37' 30" N, 1° 39' E). Coll and subm 1972-1973 by R Seronie-Vivien, Bordeaux.

Gif-2568. Grotte de Pégourié, C5 **8450 ± 250**

Gasteropod shells from Layer 5. Assoc with Azilian industry.

Gif-2822. Grotte de Pégourié, C7 **12,250 ± 350**

Charcoal from Layer 7. From earliest Azilian occupation, just above late Magdalenian.

General Comment: wide range of dates between these two levels may be due to some recent contamination.

Grotte des Cloups series, Caniac du Causse, Lot

Charcoal from Grotte des Cloups (44° 37' 55" N, 1° 39' 45" E). Coll and subm 1975 by J Clottes, Dir Antiquités Prehist Midi-Pyrénées, Foix, Ariège.

Gif-3569. Grotte des Cloups, Level 5 2750 ± 100

Charcoal from Late Bronze age level.

Gif-3568. Grotte des Cloups, Level 2 3210 ± 110Charcoal from Middle Bronze age level. *Comment:* consistent with dates of Middle Bronze age of Quercy region; Grotte du Noyer, 3150 ± 110, Gif-1631, and 3250 ± 110, Gif-1159 (R, 1972, v 14, p 280-320).**Gif-3578. Grotte de la Cabillière, Saint-Simon, Lot 2840 ± 100**

Charcoal from hearth in Late Bronze age level (44° 42' 30" N, 1° 50' E). Coll by L Genot and subm 1975 by J Clottes.

Gif-2396. "Petite Caougne", Niaux, Ariège 3110 ± 100

Charcoal from Chassean site (42° 51' N, 1° 35' E) at foot of cliff. Coll and subm 1979 by J Clottes.

Capdenac-Le-Haut series, Lot

Charcoal from Neolithic site with Chassean level, 1m thick, containing rich industry, at Capdenac-Le-Haut (44° 35' N, 2° 4' E). Coll and subm 1972-1975 by J Clottes.

Gif-2632. Capdenac-Le-Haut 5100 ± 140

Charcoal from upper part of Chassean level.

Gif-3713. Capdenac-Le-Haut, Level 9 4870 ± 110

Charcoal.

Gif-3714. Capdenac-Le-Haut, Level 16 5190 ± 120

Charcoal.

Gif-3715. Capdenac-Le-Haut, Level 20 5140 ± 120

Charcoal.

General Comment: dates indicate very short occupation of site; impossible to establish chronography of this important Chassean layer.**Gif-3712. Capdenac-Le-Haut, Lot, Excavation B 2640 ± 90**

Charcoal from 2nd excavation, 10m from main excavation. Very rich Late Bronze Age III industry. Coll and subm 1975 by J Clottes.

Grotte des Eglises series, Ussat, Ariège

Charcoal from Magdalenian site (42° 49' N, 1° 37' E). Coll and subm by J Clottes.

Gif-3922. Grotte des Eglises, Layer 1 2160 ± 90Charcoal. *Comment:* date conflicts with expected Bronze age.**Gif-4360. Grotte des Eglises, hearth 4610 ± 120**Charcoal from site without industry, separated from Layer 1 by sterile level. *Comment:* probable movement of Neolithic intrusion into supposed Bronze age level.

Gif-3923. Grotte des Eglises, Layer 8 bis 12,900 ± 220

Charcoal from Magdalenian level. *Comment:* date agrees with 1st age, 11,800 ± 500, Gif-1434, obtained for level, using undersized sample (R, 1972, v 14, p 287).

Grotte de Gazel series, Sallèles Cabardès, Aude

Grotte de Gazel (43° 19' N, 2° 25' E) contains all archaeol levels from Medieval to Upper Magdalenian. Charcoal coll and subm 1970 by D Sacchi, CNRS, Carcassonne, Aude.

Gif-2401. Grotte de Gazel, Level 4 6810 ± 130

Charcoal. *Comment:* attributed to Epipaleolithic but probably contaminated by overlying level.

Gif-2653. Grotte de Gazel, Level 5 10,080 ± 190

Charcoal from important Epimagdalenian horizon.

Gif-2654. Grotte de Gazel, Level 6 10,760 ± 190

Charcoal from important Epipaleolithic horizon.

Gif-2655. Grotte de Gazel, Level 7 15,070 ± 270

Charcoal from basal level of stratigraphy. Corresponds to Magdalenian IV-V.

General Comment: 1st chronologic data for Upper Paleolithic in W Languedoc. Dates agree with archaeol records.

Grotte de Canecaude series, Villardonnell, Aude

Samples from Canecaude cave (43° 19' N, 2° 19' E). Coll and subm 1969-1972 by D Sacchi.

Gif-2402. Canecaude, Level 2/2 670 ± 80

Charcoal from hearth. *Comment:* date indicates intrusion of recent charcoal in this level attributed to Magdalenian III.

Gif-2708. Canecaude, Level 2/2 14,230 ± 160

Bones from Magdalenian III level. *Comment:* dates agree with archaeol evidence.

Gif-2155. Canecaude, Level 2/1 20,800 ± 550

Bones from Magdalenian Level 2/1. *Comment:* date in strong conflict with expected age; may be explained by mixing with lower levels due to difficulty of coll in one level only.

Gif-2709. Canecaude, Level 3 22,230 ± 330

Bones from Upper Aurignacian level.

Gif-2710. Canecaude, Level 4 24,510 ± 400

Bones from Aurignacian level.

Gif-2415. La Cauna d'Arques, Aude, A 8920 ± 200

Shells (*Helix*) from Level 2b, from "escargotière" in cave (42° 55' N, 2° 23' E). Coll and subm 1972 by D Sacchi. *Comment*: date agrees with assoc Mesolithic industry (Sacchi, 1972).

Gif-2416. La Cauna d'Arques, Aude, B 1480 ± 90

Charcoal from crucible of bronze foundry contiguous to Mesolithic "escargotière", Level 2 (Gif-2415:8920 ± 200). Coll and subm 1971 by D Sacchi. *Comment*: date agrees with assoc protohistoric ceramics.

Gif-2758. La Fontaine, Place du Palais, Avignon, Var 3750 ± 110

Charcoal in silt from open-air site at foot of Palais des Papes (43° 56' N, 4° 48' E). Coll and subm 1972 by J Courtin, Marseille. *Comment*: assoc with 20 to 30 entire vessels, with typical Chalcolithic characters.

Gif-2759. San Sebastien, Plan de la Tour, Var 750 ± 110

Burned bones from Dolmen 2, Layer 1 (43° 21' N, 6° 33' E). Coll and subm 1972 by J Courtin. *Comment*: dolmen attributed to Chalcolithic period. Date probably corresponds to late occupation.

La Baume Fontbregoua series, Salernes, Var

Charcoal from La Baume Fontbregoua (43° 33' N, 6° 14' E) coll and subm 1972-1973 by J Courtin. Site is archaeol sequence, 8m thick, from SE France, containing level of Neolithic artifacts, 4m thick, with Chassean, Cardial, and Chalcolithic pottery levels, and level of Mesolithic and late Paleolithic hearths, 4m thick, at bottom. Excavation begun in 1969 and continued in 1972-1973. Some dates obtained for Neolithic levels are pub (R, 1974, v 16, p 32).

Gif-2432. La Baume Fontbregoua, 9 5100 ± 110

Charcoal from Late Chassean industry.

Gif-2433. La Baume Fontbregoua, 12 4880 ± 110

Charcoal from Late Chassean industry.

Gif-2434. La Baume Fontbregoua, 18 5040 ± 110

Charcoal from Late Chassean industry separated from lower levels by falling stones.

Gif-2435. La Baume Fontbregoua, 21 5430 ± 120

Charcoal from layer with abundant Chassean ceramics.

Gif-2436. La Baume Fontbregoua, 25 5600 ± 120

Charcoal from Chassean industry.

Gif-2437. La Baume Fontbregoua, 27 5420 ± 120

Charcoal from Early Chassean industry, separated from lower level by falling stones.

Gif-2754. La Baume Fontbregoua, 31 5660 ± 130

Charcoal from Middle Neolithic with Early Chassean industry.

- Gif-2755. La Baume Fontbregoua, 33** **5610 ± 130**
Charcoal from Middle Neolithic with Early Chassean industry.
- Gif-2756. La Baume Fontbregoua, 40** **5690 ± 130**
Charcoal from Early Neolithic with late Cardial industry.
- Gif-2757. La Baume Fontbregoua, 42** **5690 ± 190**
Charcoal from Early Neolithic with late Cardial industry.
- Gif-2988. La Baume Fontbregoua, 43** **5700 ± 150**
Charcoal assoc with late Cardial Neolithic industry.
- Gif-2989. La Baume Fontbregoua, 45** **6180 ± 120**
Charcoal from Early Neolithic with Cardial industry.
- Gif-2990. La Baume Fontbregoua, 47** **6700 ± 100**
Charcoal from Early Neolithic with Cardial industry, separated from lower level by 1m sterile sand.
- Gif-2991. La Baume Fontbregoua, 51** **7600 ± 100**
Charcoal from Mesolithic industry.
- Gif-2992. La Baume Fontbregoua, 54** **8400 ± 110**
Charcoal from Mesolithic industry.
- Gif-2993. La Baume Fontbregoua, 61** **9570 ± 120**
Charcoal from Early Mesolithic without microliths.
- Gif-2753. La Baume Fontbregoua, Hearth A** **9410 ± 160**
Charcoal from S excavation. Early Mesolithic with archaic lithic industry, without domestic fauna or pottery.
- Gif-2994. La Baume Fontbregoua, 70** **11,200 ± 150**
Charcoal from Late Paleolithic, with bone industry.

General Comment: thickness of upper part of site provides good chronology of evolution of Neolithic industries in SE France. Dates agree with archaeol data for whole sequence (Courtin, 1973).

Entzheim series, Sablière Oesch, Bas Rhin

Charcoal from pits of open-air Neolithic site at sandpit Oesch, Entzheim (48° 32' 40" N, 7° 39' 45" E). Coll by G Schmitt and subm 1971 by A G Thévenin, Dir Antiquités Prehist Alsace, Strasbourg (Thévenin, 1970).

- Gif-2246. Entzheim, Pit 21** **4300 ± 190**
Charcoal at depth 0.8 to 1m in loam. Assoc with late Neolithic ceramics called Micheleberg. Inert CO₂ added for measurement.
- Gif-2247. Entzheim, Pit 21** **4340 ± 190**
Charcoal. Inert CO₂ added for measurement.

Gif-2386. Entzheim, Pit 55 3850 ± 110

Charcoal assoc with ceramics of Roessen-Michelsberg limit. *Comment*: date expected to be a little older than Gif-2246 and -2247. Sample probably contaminated.

Gif-2248. Entzheim, Pit 40 2390 ± 110

Charcoal at depth 0.8 to 1m in loam. *Comment* (AGT): date explained by re-occupation of site during La Tène period.

Oberlag series, Haut Rhin

Charcoal from Rockshelter Mannlefelden I., Oberlag (47° 27' 25" N, 7° 14' 21" E) (Thévenin and Sainty, 1972). Subm 1972 by A G Thévenin. Lowest level of cave was dated by Nancy lab:10,220 ± 330 (unpub) and intermediate levels by Lyon lab (R, 1978, v 20, p 19-57).

Gif-2634. Oberlag, O B 5 5140 ± 140

Charcoal from Level G assoc with Rubane-Hinkelstein ceramics. Coll by J Sainty. *Comment*: date agrees with archaeol data for this industry.

Gif-2387. Oberlag, O B, Sq V5 9030 ± 160

Charcoal from Level Q I assoc with Epipaleolithic Tardenoisian industry. Coll by A G Thévenin.

Gif-2530. Rochedane, Villars-sous-Dampjoux, Doubs 9210 ± 120

Bone from Level B in rockshelter at Rochedane (47° 42' N, 5° 25' E). Azilian industry with engraved pebble (Thévenin and Sainty, 1972). Coll and subm 1972 by A G Thévenin. *Comment*: dates for lowest level given by Evin, Marien, and Pachiaudi, 1978.

*B. Morocco***Grotte de Taforalt series**

Grotte de Taforalt (34° 49' N, 2° 24' W) is in mt group of Beni-Snassen, alt 750m, 60km NW Oujda. Site has most extensive and complete stratigraphy of Upper, Middle Paleolithic, and Epipaleolithic of Maghreb. From upper levels, above Epipaleolithic-Aterian transition, dates were obtained on charcoal; from lower levels charcoal remains were very rare and gasteropod shells were dated. Samples coll and subm from 1970 to 1972 by J Roche, CNRS, Paris.

Gif-2267. Grotte de Taforalt, Level 10, F G 16-17 13,140 ± 150

Charcoal. Early Epipaleolithic level.

Gif-2268. Grotte de Taforalt, Level 10, H 16-17 13,500 ± 150
Charcoal.**Gif-2269. Grotte de Taforalt, Level 11, F G 16-17 14,130 ± 160
14,020 ± 160**

Charcoal, two determinations.

Gif-2270.	Grotte de Taforalt, Level 11, H 16-17	15,240 ± 180
	Charcoal.	
Gif-2271.	Grotte de Taforalt, transition Level 11-12, H 15	15,700 ± 180
	Charcoal.	
Gif-2272.	Grotte de Taforalt, Level 12, H 16-17	15,460 ± 180
	Charcoal.	
Gif-2273.	Grotte de Taforalt, Level 12, I J K 18-19	15,500 ± 180
	Charcoal. <i>Comment:</i> date for same level obtained by Köln Lab: 16,050 ± 190 (Kn-1559).	
Gif-2586.	Grotte de Taforalt, Level 14, H I	21,100 ± 400
	Charcoal.	
Gif-2587.	Grotte de Taforalt, Levels 15-16, G 13-14	21,900 ± 400
	Carbonaceous earth.	
		+ 2470
		≥32,370
		- 1890
Gif-2276.	Grotte de Taforalt, H K 22	$\delta^{13}C = -11.8\text{‰}$
	Gasteropod shells, in transition level corresponding to Epipaleolithic- Aterian contact.	
		+ 3200
		≥34,550
Gif-2277.	Grotte de Taforalt, Level 19, G K 19-20	- 2280 $\delta^{13}C = -7.5\text{‰}$
	Gasteropod shells assoc with Upper Aterian industry.	
Gif-2588.	Grotte de Taforalt, base, Level 19, M 20-21	≥40,000
	Carbonaceous earth.	
Gif-2589.	Grotte de Taforalt, top, Level 19, M 20-21	≥40,000
	Carbonaceous earth.	
Gif-2278.	Grotte de Taforalt, Level 21, I K 19-21	19,080 ± 250 19,400 ± 250 $\delta^{13}C = -7.6\text{‰}$
	Gasteropod shells, two determinations.	
Gif-2279.	Grotte de Taforalt, Level 23, G K 20-21	≥40,000 $\delta^{13}C = -7.6\text{‰}$
	Gasteropod shells assoc with Aterian industry.	
Gif-2280.	Grotte de Taforalt, Level 26, I K 19-21	21,860 ± 330 $\delta^{13}C = -10.4\text{‰}$
	Gasteropod shells.	

General Comment: overlying levels previously dated by Sa-13: 10,800 ± 400 Level 2, L-399 E: 11,900 ± 240 Necropolis level, Sa-14: 12,070 ± 400 Level 6, Sa-15: 10,500 ± 400 Level 8 (R, 1964, v 6, p 233-250). Dates provide coherent chronology of occupation of cave by Epipaleolithic Mangrabins. Dates for shells are questionable. In Taforalt stratigraphy, two dates for Aterian Levels 21 and 26, respectively, 19,080 (Gif-2278) and 21,860 (Gif-2280) are obviously aberrant. Thinness of gasteropod shells prohibited complete removal of external part by acid pretreatment. Gif-2276, 32,370 and Gif-2277, 34,550 BP are only min ages (Roche, 1976; Delibrias and Roche, 1976).

Grotte des Contrebandiers series, Temara

Site is on Atlantic coast, in marine terrace at alt 14m, 17km SW Rabat (33° 24' N, 7° W). Grotto was filled with abundant remains of Epipaleolithic industry, and in Aterian level at bottom, inferior human maxilla and cranium, "The man of Temara", were found (Roche and Texier, 1976).

- Gif-2576. Grotte des Contrebandiers, Level 8, J K 20 22,630 ± 500**
Marine shells. U-Th date: 137,000 ± 17,000 yr.
- Gif-2577. Grotte des Contrebandiers, Level 8, J K 20 12,500 ± 170**
 $\delta^{13}C = -24.7\text{‰}$
Bone splinters.
- Gif-2578. Grotte des Contrebandiers, Level 9, J K 20 35,200 ± 2100**
 $\delta^{13}C = +0.4\text{‰}$
Marine shells. U-Th date: 138,000 ± 17,000 yr.
- Gif-2579. Grotte des Contrebandiers, Level 9, J H 20 14,460 ± 200**
Bone splinters.
- Gif-2580. Grotte des Contrebandiers, Level 10, J H 20 12,320 ± 600**
 $\delta^{13}C = -30.8\text{‰}$
Bone splinters. Undersized sample; inert CO₂ added for measurement.
Comment: probably not good date.
- Gif-2581. Grotte des Contrebandiers, Level 11, G 20 >40,000**
Marine shells.
- Gif-2582. Grotte des Contrebandiers, Level 11, J 20 24,500 ± 600**
Bone splinters.
- Gif-2583. Grotte des Contrebandiers, Level 12, G 20 12,170 ± 160**
Bone splinters.

Gif-2584. Grotte des Contrebandiers, Level 12, G 20 >35,000
Marine shells.

**Gif-2585. Grotte des Contrebandiers, Level 12,
E 18 23,700 ± 1000**

Carbonaceous earth.

General Comment: sequence is dated by ages of bones which agree with archaeol research. Gif-2582: 24,500 BP for bones is confirmed by Gif-2585: 23,700 BP obtained for carbonaceous material and validates results. Yet, Gif-2583: 12,170 BP is aberrant for Level 12 and may be explained in two ways: either samples Gif-2582 and -2583 were confused or bones intruded from Level 10 into Level 12. ¹⁴C dates for shells are unacceptable as they disagree with dates of bones and U-Th dates for same shells. Dated shellfish, then, were not consumed by inhabitants of cave but come from walls of cave, deposited into different levels during occupation of site. Gif-2576: 22,630 BP demonstrates recent contamination of shells in upper Level 8. Moreover, marine terrace where cave is, dated at 137,000 yr old, which means it belongs to Ouljian transgression; U-Th dates are from Hoang, CFR, CNRS, Gif-sur-Yvette.

Tarfaya region series

Littoral Neolithic sites are frequently found in SW Morocco. Region near Tarfaya, E Juby Cape was surveyed and many samples were coll in 1973-1974 by N Petit-Maire, CNRS, Marseille Luminy and L. Ortlieb, ORSTOM, Paris (Delibrias, Ortlieb, and Petit-Maire, 1976).

Gif-2905. Tarfaya region, Site F, 4 Modern
Burned shell (*Cymbium* sp) from beach (27° 58' N, 12° 49' W).

Gif-2906. Tarfaya region, Site F, 4 Modern
Human bones.

Gif-2908. Tarfaya region, Site 11/2 9450 ± 160
Charcoal at depth 0.7m in dune on beach (28° 01' N, 12° 30' W).

Gif-2909. Tarfaya region, Site 11/1a 10,430 ± 180
Human bones in burial site, depth 1.3m.

Gif-2910. Tarfaya region, Site 11/1b 6100 ± 120
Charcoal at depth 0.1m. *Comment:* Gif-2910 and -2909 are superimposed in dune; Gif-2908 is dispersed more superficially. If date of bones is accurate and dates for collagen of bones are generally reliable, especially in arid regions, charcoal from ancient superficial site was probably buried at time of interment 6000 yr ago. Date of charcoal suggests that human occupation at Juby Cape dates to 10,000 yr ago (Charon, Ortlieb, and Petit-Maire, 1973).

Gif-2911. Tarfaya region, Site 11 4450 ± 110
Charcoal on beach (27° 45' N, 13° 43' W) assoc with hippopotamus bones.

Gif-2821. Tarfaya region 3300 ± 100

Charcoal in great littoral Kjokenmödding (shell midden), 1km S Tafaya. Coll by M Mateu.

Gif-2912. Foum-el-Arjam 2360 ± 250

Human bones in barrow at Foum-el-Arjam, S Zagora (30° 22' N, 5° 50' W). Coll 1971 by A Simoneau. Subm 1973 by N Petit-Maire.

Gif-3013. El Ouaâr, Site G 3550 ± 120

Shells (*Mytilus* sp) at depth 1m, coll from Neolithic site at El Ouaâr (28° 10' N, 11° 52' W).

*C. West Africa**Mauritania*

Important Neolithic sites with numerous sepultures and rich industry, similar to those in SW Morocco, were found distributed along ancient shores of Nouakchottian Sea in Mauritania. Two main sites, Chami and Tintane, were studied from 1970-1972 by N Petit-Maire (human morphol, ecol, and vertebrate paleontol), H Faure and L Hebrard, CNRS, Marseille (geol), P Elouard, Fac Sci, Lyon (vertebrate paleontol), E Maquet and C Lecour (ceramics). Because of wind erosion many skeletons were partly uncovered and splinters of bone were found scattered on ground surface. Dated bones came mainly from skeletons still underground at depth 10 to 100cm. Some Kjökkenmödding were also dated. In order to make statistical study of human ecology in Late Quaternary of W Africa, many dates were necessary to demonstrate that samples were contemporaneous (Petit-Maire, 1979).

Chami series

Samples coll from Neolithic sites on fossil dunes, 30km around Chami well (20° 4' N, 15° 58' W). Except where otherwise stated, samples coll 1970-1971 by N Petit-Maire.

Gif-1762. Chami, Fossil Dune 15a 3100 ± 120
 $\delta^{13}C = -14.6\%$

Faunal bones.

Gif-1856. Chami, Fossil Dune 15a 3950 ± 80

Shells.

Gif-1970. Chami, Fossil Dune 15a 3650 ± 140

Organic remains in ceramic debris introduced into clay at time of manufacture.

Gif-2161. Chami, Fossil Dune 15a, H 7 2170 ± 100

Human bones.

Gif-2162. Chami, Fossil Dune 15a, H 8 2500 ± 100

Human bones.

Gif-2166. Chami, Fossil Dune 15a, G 2290 ± 130

Bones from large mammal.

- Gif-2488. Chami, Fossil Dune 15a** **3450 ± 110**
Shell (*Cymbium*) assoc with skull and jar.
- Gif-2492. Chami, Fossil Dune 15a** **3500 ± 120**
Charcoal remains in sand (? hearth) assoc with gray ceramics. Coll 1971 by G Delibrias.
- Gif-2163. Chami, Fossil Dune 15b, T₁-1** **2100 ± 180**
Human bones.
- Gif-2164. Chami, Fossil Dune 15b, T₁-2** **2360 ± 100**
Shell (*Cymbium*) lying on ground above Sepulture T₁. *Comment:* large *Cymbium* shells were often used for tomb marking. Dates obtained for shell and bones (Gif-2163) agree well.
- Gif-2489. Chami, Fossil Dune 15b** **2090 ± 120**
Human bones. $\delta^{13}C = -16.8\text{‰}$
- Gif-2168. Chami, Fossil Dune 6, T₃** **2450 ± 130**
Human bones.
- Gif-2167. Chami, Fossil Dune 6, top** **3310 ± 240**
Human bones from sepulture at top of mound.
- Gif-1764. Chami, Fossil Dune 7, 5** **400 ± 90**
Faunal bones found on surface. *Comment:* unrelated to ancient site occupation. $\delta^{13}C = -23.1\text{‰}$
- Gif-1765. Chami, Fossil Dune 7, 6** **2500 ± 100**
Human bones dispersed on surface. $\delta^{13}C = -12.6\text{‰}$
- Gif-2165. Chami, Fossil Dune 7** **6580 ± 350**
Human bones from top of dune. *Comment:* inactive CO₂ was added for measurement. One of the earliest dates found for Mauritania; requires confirmation.
- Gif-3060. Chami, Fossil Dune 7, top** **3530 ± 220**
Human bones.
- Gif-2333. Chami, Fossil Dune 7, GP 11** **4190 ± 130**
Human bones dispersed on surface.
- Gif-2334. Chami, Fossil Dune 7** **1870 ± 240**
Organic remains in ceramic debris. *Comment:* undersized sample, inactive CO₂ was added for measurement.
- Gif-2486. Chami, Fossil Dune 8** **3850 ± 120**
Human bones from sepulture with two skeletons. $\delta^{13}C = -16.5\text{‰}$

- Gif-2487. Chami, Fossil Dune 8** **3220 ± 110**
Shell (*Cymbium*) beneath skull.
- Gif-2491. Chami, Fossil Dune 11a** **2960 ± 110**
Ostrich eggshell assoc with pearl in Sepulture T8.
- Gif-1763. Chami, Fossil Dune 1** **2450 ± 110**
Human bones.
- Gif-1857. Chami, Fossil Dune 1** **2380 ± 200**
Human bones. *Comment:* inactive CO₂ was added for measurement.
- Gif-1859. Chami, Fossil Dune 1** **1520 ± 140**
Human bones.

Tintane series

Tintane site is similar to Chami site because of abundant Neolithic industry. At Tintane, sepultures appear with structured tombs and vertebrate faunal remains are absent. Samples coll 1970-1971 by N Petit-Maire except where otherwise stated.

- Gif-1761. Tintane, Txx, 2** **2470 ± 100**
 $\delta^{13}C = -13.0\text{‰}$
Human bones from Sepulture Txx, at Tintane necropolis (20° 55' N, 16° 40' W).
- Gif-1824. Tintane, Txx, 52** **2460 ± 100**
Organic remains in ceramic debris, around Sepulture Txx. *Comment:* date agrees well with bones from Gif-1761.
- Gif-2484. Tintane, S₁** **3240 ± 100**
 $\delta^{13}C = -13.9\text{‰}$
Human bones from Skeleton S₁. Coll 1971 by J M Casiez, Fac Sci, Paris.
- Gif-2490. Near Tintane** **Modern**
Ostrich egg shell from surface, near Tintane (20° 49' N, 16° 07' W), near three large, half-buried, unbroken clay jars. Coll 1971 by G Delibrias. *Comment:* ostriches disappeared very recently from this region; egg shells are unrelated to site.
- Gif-2493. Near Tintane** **2810 ± 100**
 $\delta^{13}C = -21.0\text{‰}$
Fine charcoal remains in sand at depth ca 20cm, same site as Gif-2490, near three large unbroken clay jars. Coll 1971 by G Delibrias.
- Gif-2485. Tintane, N Fossil dune** **3930 ± 80**
Oyster shell on top of N Fossil dune.
- Gif-2494. Baie de L'Etoile** **5730 ± 120**
Shell (*Arca senilis*) from Kjökkenmödding, 15km N Nouadhibou, (21° 02' N, 17° 02' W), ca 3m above msl. Coll 1971 by G Delibrias. *Comment:* dates occupation of Nouakchottian shoreline.

Baie de Saint Jean series

Kjökkenmödding with shells (mainly *Arca senilis*) and some ceramics but no furniture, chipped flint implements, or sepultures, at Cape Tafarit. Coll and subm 1971 by G Delibrias.

Gif-2496. Tafarit 1 **3220 ± 110**

Shell (*Arca senilis*) from surface. *Comment:* Kjökkenmödding nearby was dated at 6130 BP, Ly-345. Large discrepancy between these dates may show successive occupations.

Gif-2524. Tafarit 2 **3410 ± 110**

Shell (*Arca senilis*) at depth 1.5m beneath Gif-2496. *Comment:* shells mixed with black sand represent lowest level of midden deposit on sandbar.

Gif-2497. Tafarit 3 **3080 ± 110**

Sandy black soil from basal level of Kjökkenmödding dated by Gif-2496 and -2524. Gif-2524 assoc with this sample.

General Comment: dates indicate 400-yr occupation of site. Younger date for soil is probably age of last surface soil that gradually penetrated through shells, because 1st m is shell deposit only.

Anate series, Agneitir Hills

Sand dune bar, 10km along ancient Nouakchottian gulf at 15 to 20m above msl, covered by shells eaten by people living on coast at Anate, 24km from Nouanghar, near Cap Timiris.

Gif-2498. Anate **4350 ± 120**

Shells (*Arca senilis*) from surface.

Gif-2499. Anate **4670 ± 130**

Shells (*Arca senilis*) at depth 1m.

General Comment: occupation lasted 600 yr at most. 40% of shells removed by acid before dating.

Atlantic Sahara

Human occupation during Holocene between Seguiet el Hamra and Cape Blanc along Atlantic coast of Sahara is mostly characterized by numerous shell middens. Traces of occupation by man are also abundant along coastal sebkhas (dry lagoons). As noted in Mauritania, evolution of Saharan coast and of human occupation are often parallel and closely related to climatic variation. Samples coll 1973-1974 by N Petit-Maire and L Ortlieb.

Gif-3259. Sebkha Amtal, 64280 **2000 ± 90**

Shell (*Arca senilis*) in midden on banks of Sebkha Amtal (23° 54' N, 16° 13' W).

Gif-3260. Sebkha Akhful, RNT 114 **4300 ± 110**

Lagoonal shells in littoral sebkha, at depth 0.2m (26° 15' N, 14° 25' W).

- Gif-3261. Sebkha Akhful, RNT 115** **4030 ± 110**
Shell (*Arca senilis*) in littoral sebkha, on surface (26° 15' N, 14° 26' W).
- Gif-3262. Medano Santiago, RNT 83** **3150 ± 100**
Consumed shells (*Mytilus* sp) in continental deposit on coast, at depth 0.5m (26° 55' N, 13° 30' W).
- Gif-3264. Sebkha Amtal, RNT 138** **3070 ± 100**
Marine shells at base of fossiliferous sandy deposit, at depth 0.3m (23° 10' N, 16° 10' W).
- Gif-3265. Sebkha Amtal, RNT 137** **3300 ± 100**
Marine shells in same deposit as Gif-3264, at depth of 0.1 to 0.3m.
- Gif-3266. Sebkha Amtal, RNT 149** **3070 ± 100**
Littoral marine shells in green clay level, on surface (23° 10' N, 16° 10' W).
- Gif-3466. Sebkha Amtal, H 1** **1780 ± 100**
Human bones from sepulture in shell midden (23° 10' N, 16° 10' W).
Comment: date too young because of Neolithic cultural context.
- Gif-3267. Sidi Bou-Maleh, RNT 200** **≥35,000**
Marine shells in sandstone on shore at high tide level (28° 24' N, 11° 24' W). *Comment:* corresponds to ancient high sea level, probably Ouljian transgression.
- Gif-3269. Sebkha Laasailia, 63293** **2740 ± 110**
Human bones from sepulture under large flat stones (26° 55' N, 13° 30' W).
- Gif-3464. Sebkha Laasailia, H 6** **Modern**
Human bones from sepulture in eolian sand above sebkha.
- Gif-3465. Sebkha Laasailia, H 10** **3100 ± 110**
Human bones from sepulture under large flat stones, on bank of sebkha.
- Gif-3461. Sebkha Edjaila, H 2** **3020 ± 100**
Human bones from sepulture in dune sand (21° 45' N, 16° 25' W).
- Gif-3462. Sebkha Edjaila, H 3** **3310 ± 110**
Human bones from sepulture near Gif-3463.
- Gif-3514. Sebkha Edjaila, SE 166** **4440 ± 110**
Lagoonal-marine shells at depth 0.2 to 0.5m, in bottom of sebkha, alt ca -0.5m (21° 45' N, 16° 25' W).
- Gif-3510. Sebkha Edjaila, SE 161** **4850 ± 110**
Shells (*Cardium edule*) interbedded in green clay at depth 0.15 to 0.5m, in bottom of sebkha, alt ca 1m (21° 45' N, 16° 25' W).

- Gif-3508. Sebkha Edjaila, SE 170** **540 ± 80**
Shells (*Arca noae*) from emerged lagoonal marine deposit at depth 0.3 to 0.5m, in bottom of sebkha (21° 48' N, 16° 27' W), alt ca 0m. *Comment*: dates closure of the Nouackchottian paleogulf.
- Gif-3467. Sebkha Mahariat, H 11** **1080 ± 100**
Human bones from sepulture in shell midden (22° 16' N, 16° 33' W). *Comment*: skull morphology very primitive; contradicts date.
- Gif-3503. Sebkha Mahariat, 4741** **5360 ± 120**
Consumed shells (*Arca senilis*) in fireplace on top of dune, on surface of offshore bar.
- Gif-3504. Sebkha Mahariat, 4841** **6180 ± 130**
Consumed shells (*Arca senilis*, *Cymbium* sp) in shell midden from surface at top of ancient dune.
- Gif-3511. Sebkha Mahariat, SE 115** **5040 ± 110**
Shells (*Cardium edule*) in sand, alt ca 1m, from bottom of sebkha, at depth 0.5m (22° 14' N, 16° 35' W).
- Gif-3512. Sebkha Mahariat, SE 149** **5250 ± 110**
Shells from bottom of sebkha, close to surface, alt ca 2m.
- Gif-3515. Sebkha Mahariat, SE 108** **4100 ± 110**
Shells (*Arca senilis*) in salty clay sediment from surface of bottom of sebkha, alt ca 0m. *Comment*: dates dessication of lagoon.
- Gif-3507. Sebkha Lemheiris, SE 138** **4350 ± 150**
Shells (*Cardium edule*, *Arca senilis*) from surface of bottom of sebkha (22° 06' N, 16° 48' W). *Comment*: dates dessication of lagoon.
- Gif-3505. Sebkha Lemheiris, SE 131** **5810 ± 120**
Lagoonal marine shells from green silty sand at depth 0.75m, in bottom of sebkha.
- Gif-3509. Sebkha Lemheiris, SE 137** **6150 ± 130**
Shells in littoral sandy deposit at depth 0.7m, in bottom of sebkha.
- Gif-3463. Sebkha Lemheiris** **3740 ± 130**
Human bones from sepulture under large flat stones (22° 06' N, 16° 48' W) in dune sand.
- Gif-3468. Aadeim, H 4** **Modern**
Human bones from sepulture near Aadeim (25° 48' N, 14° 56' W).
- Gif-3513. Aadeim, SE 73** **≥35,000**
Fragments of shells (*Mytilus* sp) in littoral silty deposit, 2m above msl on beach of Aadeim. *Comment*: probably corresponds to Ouljian transgression.

*Cameroon***Gif-2232. Maroua** **1720 ± 90**

Charcoal from cutting-chipping factory cropping out of surface of Tsanaga plain at Maroua, Diamare Dept (10° 35' N, 14° 15' 14" E). Coll and subm 1971 by A Marliac, ORSTOM, Yaoundé, Cameroon. *Comment:* late Neolithic industry.

*D. Syria***Aswad series**

Charcoal from preceramic Neolithic site, Tell Aswad (33° 35' N, 36° 32' E). Two phases, Aswad II and Aswad I are discernible from their flints. Industry of upper level is similar to that of Ramadi, Syria, and flint industry of lower level is similar to that of Munhata and Beidha sites, Palestine, assoc with baked-clay figurines of sitting women (de Contenson, 1976). Coll 1971-1972 by F Valla and subm by H de Contenson, Mission archéol Française Ras Shamra, Syria.

Gif-2373. Aswad, W 1 **8560 ± 110**

Charcoal from last preserved level, in W part of site, at depth 0.3m, Aswad II.

Gif-2369. Aswad, E 1 **8540 ± 110**

Charcoal from last occupation at depth 0.25m, in E part of site, Aswad II.

Gif-2370. Aswad, E 2 **9340 ± 120**

Charcoal from middle of lower level, at depth 1.75m, Aswad I.

Gif-2371. Aswad, E 3 **9270 ± 120**

Charcoal from lowest part of lower level, at depth 2.35m, Aswad I.

Gif-2372. Aswad, E 4 **9640 ± 120**

Charcoal from beginning of occupation, at depth 2.45m, Aswad I.

Gif-2633. Aswad, E 5 **9730 ± 120**

Charcoal from beginning of occupation, at depth 3.2m.

General Comment: W part of site was studied by Groningen lab. Dates are from 8650 BP at 0.4m depth, GrN-6676, (compared with 8560 at 0.3m depth, Gif-2373), to 8875 BP at 1.3m depth, GrN-6678. Dates suggest shift of settlement W-ward, older settlement in E part of site (de Contenson, 1973).

Choraifé series

Tell 15km N of Tell Aswad. Three stages were recorded at this site in 1974: uppermost stage, frequently disturbed by more recent sepultures, and two lower Neolithic levels with lithic industry and clay objects. These two levels provide interesting correlations with Aswad and Ramad nearby. Charcoal coll and subm 1974 by H de Contenson.

- Gif-3371. Ghoraifé, GH 1** **6940 ± 190**
Charcoal from depth 1.7m, dating end of continuous occupation of site. *Comment:* abundant rootlets suggest contamination.
- Gif-3372. Ghoraifé, GH 2** **8150 ± 190**
Charcoal from depth 3m. Phase II, faunal remains and bone industry, abundant obsidian.
- Gif-3374. Ghoraifé, GH 4** **8400 ± 190**
Charcoal from depth 5.5m. Beginning of ancient Phase I.
- Gif-3375. Ghoraifé, GH 6** **8460 ± 190**
Charcoal from depth 6m. Beginning of ancient Phase I.
- Gif-3376. Ghoraifé, GH 7** **8710 ± 190**
Charcoal from depth 6.2m. Phase I: bone industry and fauna scarce; lithic industry and baked clay figures similar to those of Aswad abundant in lower part of site.
General Comment: dates, together with those of Aswad and Ramad (GrN dates) establish continuous chronologic sequence from beginning of 8th millennium to middle of 6th millennium (de Contenson, 1976).

E. Ethiopia

Harrar series

Charcoal from megalithic monuments near Dobba (4° 32' N, 47° 32' E). Coll and subm 1970-1973 by R. Joussaume, Inst Paleontol Humaine, Paris.

- Gif-1895. Tchaffe** **500 ± 80**
Charcoal from Type II circular barrow, with circular rooms and exit passage. *Comment:* agrees with assoc industry.
- Gif-2397. Tchalalaka** **Modern**
Charcoal from Type I monument, with rectangular room under large slab. *Comment:* Type I megalithic monument was expected to be older than Type II. Some are still used as places of worship (Joussaume, 1971).

F. Central America

La Lagunita series, Guatemala

Samples from Pre-Classic site of La Lagunita (15° 17' N, 91° 50' W), in El Quiché area, W part of Guatemala Highlands. Coll and subm 1973-1978 by H. Lehmann and A. Ichon, CNRS, Mission Sci Franco-Guatemal-tique, Guatemala (Ichon, 1977).

- Gif-2834. La Lagunita T₂, G9, -110** **3960 ± 130**
Charcoal under stone flags, Level -110, ceremonial Pyramid 5. *Comment:* no archaeol assoc. Date corresponds to Late Archaic period.

- Gif-2835. La Lagunita T₃, S₃, -590** **1930 ± 100**
Charcoal with offerings from Level -150, Pyramid 5. *Comment:* assoc with Pre-Classic industry. Corresponds to building stage of this structure.
- Gif-4553. La Lagunita, Cave C 48, B8/25** **1610 ± 80**
Charcoal in jar, N wall of underground room for offerings.
- Gif-4554. La Lagunita, Cave C 48, E4/10** **1640 ± 80**
Charcoal in jar, W wall of cave.
- Gif-4555. La Lagunita, Cave C 48, C2/18** **1650 ± 80**
Charcoal in jar, S wall of cave.
- Gif-4227. La Lagunita, Cave C 48/108** **1350 ± 90**
Charcoal in earth floor of cave. *Comment:* disagrees with Late Classic ceramics from cave, well-dated by Gif-4553 to -4555.
- Gif-4556. La Lagunita, EJ 16** **1900 ± 90**
Charcoal in sterile level, from S-N trench in center of ceremonial place of La Lagunita site, at bottom of offering of stone statuettes.
- Gif-4228. La Lagunita, C44/183** **1630 ± 90**
Charcoal in ceramic bowl, at level of Tomb 4 of "La Pila 3", Level -30.
- Gif-4229. La Lagunita, C44/B4-1** **1480 ± 90**
Charcoal in another ceramic bowl, in Tomb 4, Level -260.
- Gif-4230. La Lagunita, C47/513** **1640 ± 90**
Charcoal in ceramic bowl with cover, in Pyramid 7, Level +520.
- Gif-4231. La Lagunita, C47/52** **1870 ± 100**
Charcoal from hearth in Pyramid 7, Level +160, assoc with Pre-Classic sepulture.

General Comment: results agree with archaeol date for Cave C 48, but Gif-4227 and those from Pyramid 7 indicate that ceremonial center of La Lagunita was at its height during Classic period, ca 1600 to 1700 BP. Gif-4556: 1900 ± 90 and Gif-4231: 1830 + 100 confirm Pre-Classic settlement of site.

San Andrés Sajcabaja series, Guatemala

Samples from Pre-Classic monticule (artificial mound) (15° 10' N, 90° 57' W) in Quiché area, W part of Guatemala Highlands. Coll and subm 1971 by A Ichon.

- Gif-2833. San Andrés F2 (A2)** **2580 ± 100**
Charcoal in pit-hole, from oldest phase of building.
- Gif-2832. San Andrés F2 (E3)** **2510 ± 100**
Charcoal on top of stone box, probably used as sarcophagus.

Gif-2478. San Andrés, Str 1 1750 ± 150

Charcoal, from 4th phase of building of monticule.

General Comment: 3 of 5 building phases recognized in this structure were dated. Occupation of site lasted from Middle Pre-Classic to Late Pre-Classic periods. Dates agree well with bichrome ceramics industry found in these levels.

Chimistan series, Guatemala

Samples from Monticule 2 of site (15° 19' N, 91° 41' W). Coll and subm 1971 by A Ichon.

Gif-2836. Chimistan F₃ G (-250) 2170 ± 100

Charcoal from level with abundant kitchen refuse just above sterile sand. Corresponds to first occupation of site.

Gif-2837. Chimistan F₃ J (-130) 2200 ± 100

Charcoal from same level as Gif-2835.

General Comment: this monticule is dated from beginning of Late Pre-Classic period, as expected from ceramics.

Gif-2346. Nata, Coelé, Panama 1640 ± 90

Charcoal from refuse level assoc with potsherds of Giron and Escota styles, near Nata (8° 8' N, 80° 38' W). Coll and subm 1971 by R C Cooke, Inst Archaeol, London. *Comment:* this layer is overlain by level corresponding to beginning of polychrome pottery similar to those from Tonosi, Guatemala, suggesting close relations between countries.

*G. South America***Huancavelica series, Peru**

Charcoal from high alt sites in Huancavelica Dept, Central Andes. Coll 1970 and subm 1971 by M Julien and D Lavallée, CNRS, Paris. Dated to determine duration of "Intermediate Recent" period in Central Andes.

Gif-1987. Chuntamarca, 3110 B 750 ± 90

Charcoal from floor of House B, 0.25m below ground level (12° 38' S, 75° 10' W), alt 4400m.

Gif-1988. Laiwe, 3476 970 ± 90

Charcoal from floor of House B, 0.4m below ground level (12° 25' S, 75° 9' W), alt 3700m. Human burial place in same level.

Gif-2604. Laiwe, 3475 720 ± 90

Charcoal from floor of House E, 0.4m below ground level, near Gif-1988.

Gif-2603. Shanki 970 ± 90

Charcoal from hearth, 0.5m below ground level (12° 25' S, 75° 8' W), alt 3750m.

Gif-1989. Cuto-Cuto, 3496 A **780 ± 90**

Charcoal, from Hearth A (12° 32' S, 75° 10' W), alt 4000m.

Gif-2389. Cuto-Cuto, 3490 D **750 ± 90**

Charcoal, from House D.

General Comment: samples date period of "Intermediate Recent" in Central Andes between AD 1100/1200 and 1530.

Oloma Bajada series, Argentina

Charcoal in artificial refuse mound with ceramics and bones, Prov Santiago del Estero (28° 30' S, 63° W). Coll 1971 and subm 1972 by A M Lorandi. Pottery belongs to Sunchituyo culture that is similar to pottery of Quimili Paso, and to Averias culture.

Gif-2619. Oloma Bajada, Site I, 13 **340 ± 90**

Charcoal from depth 0.4 to 0.6m.

Gif-2620. Oloma Bajada, Site II, 12 **460 ± 90**

Charcoal from depth 0.2 to 0.4m.

Gif-2621. Oloma Bajada, Site II, 13 **530 ± 90**

Charcoal from depth 0.4 to 0.6m.

Gif-2728. Lauta, Navarino Island, Chile **280 ± 90**

Shells from lower layer in one of numerous shell middens, Seno del Lauta, near Puerto Williams, Beagle Channel (54° 55' S, 67° 40' W). Coll 1971 by O R Ortiz-Troncoso and subm by A Laming-Emperaire. *Comment:* Lauta dates are quoted by Rapaire and Hugues, 1977, in connection with Lancha Packewaia series, Tierra del Fuego, on opposite shore of Beagle Channel (Ortiz-Troncoso, 1977-78; 1978).

Gif-2729. Lauta, Navarino I., Chile, Pit 3 **2780 ± 110**

Shells coll in similar conditions to those of Gif-2728 from another site at Seno del Lauta, subm by A Laming-Emperaire. *Comment:* date represents relatively early occupation phase of that coast.

Gif-2927. Bahia Buena, Chilean Patagonia **5210 ± 110**

Charcoal from oldest occupation layer of shell midden overlying old shoreline, 10.5 to 12m above msl, 400m from Magellan Strait (53° 36' S, 70° 59' W). Coll 1973 by O R Ortiz-Troncoso and subm by A Laming-Emperaire. *Comment:* stratigraphic sequence of site indicates lower cultural layer (II) overlying clayey substratum of morainic origin (or Layer I), two middle sub-layers (III & IIIb), and upper or most recent layer (IV). Components of deposits are shells, bones (mammals and birds), fish remains, sea urchin remains, sand, gravel, stones, ash, and charcoal. Most important characteristic of lithic industry is large percentage of obsidian. Typical artifacts of bone industry are harpoon heads with bilaterally lobed tangs, multibarbed harpoon heads, and other tools with incised decorations. Cultural assemblage related to that from Englefield I

site (Emperaire and Laming, 1961); Punta Santa Ana site (Ortiz-Troncoso, 1975; 1977-78; 1978; 1979); and Lancha Packewaia and Tunel (Orquera *et al*, 1978, R, 1977, v 19, p 49-61). Date confirmed by GrN-7613 and -7614: 5770 ± 110 and 5895 ± 65 BP.

Gif-2928. Punta Santa Ana, Chilean Patagonia 5620 \pm 120

Shells from oldest occupation layer of shell midden overlying clayey substratum of morainic origin, 12m above msl ($53^{\circ} 37' S$, $70^{\circ} 58' W$). Coll 1972 by O R Ortiz-Troncoso and subm by A Laming-Emperaire. *Comment*: stratigraphic sequence and components of deposits are quite similar to those of neighboring Bahia Buena site, Gif-2927. Another date for this layer is GrN-7612: 6410 ± 70 BP.

REFERENCES

- Battistini, R, Delibrias, G, and Laborel, J, 1976, Datation des niveaux holocènes à Madagascar: Soc Géol France Compte rendu somm, fasc 6, p 284-285.
- Briard, J, 1972, Les tumulus de Kervin en Poullan: Soc Archéol Bull Finistère, v 98, p 21-38.
- Briard, J, Bourhis, J, Le Provost, F, and Onnée, Y, 1977, Un tumulus du bronze ancien avec maison funéraire à Saint-Jude, Bourbriac, Côtes du Nord: Soc Préhist Fr Bull, v 74, p 622-664.
- Briard, J and Gouletquer, P L, 1972, Découverte d'une tombe de l'âge du Bronze à Kerno en Ploudaniel, Finistère: Annales Bretagne, v 79, p 49-60.
- Briard, J and Penziat, J, 1972, Le tumulus de Penguilly en Meilars, Finistère: Annales Bretagne, v 79, no. 1, p 63-72.
- Charon, M, Ortlieb, L, and Petit-Maire, N, 1973, Occupation humaine holocène de la région du Cap Jubé: Soc Anthropol Paris Bull et Mém, v 10, ser 12, p 379-412.
- Courtin, J, 1973, Datation C^{14} du Mésolithique de la Baume Fontbrégoua à Salernes, Var: Soc Préhist Fr Bull, v 70, no. 4, p 99-100.
- Contenson, H, de, 1973, Chronologie absolue de Tell Aswad (Damascène, Syrie): Soc Préhist Fr Bull, v 70, CRSM, no. 8.
- 1976, Nouvelles données sur le Néolithique précéramique dans la région de Damas (Syrie) d'après les fouilles de Ghoraiyé en 1974: Soc Préhist Fr Bull, v 73, ORSM no. 3.
- Delibrias, G, Giresse, P, and Kouyoumouzakakis, G, 1973, Géochronologie des divers stades de la transgression holocène au large du Congo: Acad Sci [Paris] Comptes rendus, v 276, p 1389-1391.
- Delibrias, G, Guillier, M T, and Labeyrie, J, 1964, Saclay natural radiocarbon measurements I: Radiocarbon, v 6, p 233-250.
- 1972, Gif natural radiocarbon measurements VII: Radiocarbon, v 14, p 280-320.
- 1974, Gif natural radiocarbon measurements VII: Radiocarbon, v 16, p 15-94.
- Delibrias, G and Le Roux, C T, 1975, Un exemple d'application des datations radiocarbones à l'interprétation d'une stratigraphie complexe: la fouille des ateliers de Plussulien, Côtes du Nord: Soc Préhist Fr Bull, v 72, p 78-82.
- Delibrias, G, Marinelli, G, and Stieljes, L, 1974, Spreading rate of the Asal Rift: a geological approach: Internatl symposium on Afar region and related rift problems, Proc: Bad Bergzabern, West Germany, v 1, p 212-221.
- Delibrias, G and Morzadec-Kerfourn, M T, 1975, Evolution du Marais de Dol de Bretagne au Flandrien, Ille et Vilaine, France: Assoc Fr Etude Quaternaire Bull, v 2, p 59-70.
- Delibrias, G, Ortlieb, L, and Petit-Maire, N, 1976, New ^{14}C data for the Atlantic Sahara (Holocène). Tentative paleoclimatic interpretation: Human evol Jour, v 5, p 535-546.
- Delibrias, G and Roche, J, 1976, Datations absolues de l'Épipaléolithique marocain: Archéol Marocaine Bull, v 10, p 11-24.
- Emperaire, J and Laming, A, 1961, Les gisements des îles Englefield et Vivian dans la mer d'Otway, Patagonie australe: Soc Américanistes Jour, ns, v 50, p 7-75.
- Evin, J, Marien, G, and Pachiaudi, Ch, 1978, Lyon natural radiocarbon measurements VII: Radiocarbon, v 20, p 19-57.
- Faure, H, Hoang, C T, and Lalou, C, 1980, Datations $^{230}Th/^{234}U$ des calcaires coralliens et mouvements verticaux à Djibouti: Soc Géol France Bull, v 22, no. 7, p 959-962.

- Fontaine, H and Delibrias, G, 1974, Niveaux marins pendant le Quaternaire au Viet-Nam: Archéol Géol Viet-Nam, Saigon, v 17, p 35-44.
- Gabet, C, 1974, Le banc de tourbe sur l'estran de la baie de Perroche (Ile d'Oléron): Soc Archéol Hist Charente Maritime Rec, v 25, p 297-306.
- 1978, Note sur les marais de Saint-Augustin et d'Arvert (Charente Maritime): Poitiers, Norois, v 100, p 609-614.
- Germain, P, 1975, Contribution à la connaissance du Quaternaire récent du littoral Dahomien: Assoc Sénégal Quaternaire Afr, liaison Sénégal Bull, v 44, p 33-45.
- Giot, P R and Cogné, J, 1951, La Nécropole de Saint-Urnel en Plomeur, fouilles de 1946-1950: Gallia, v 9, p 1-19.
- Giot, P R and Monnier, J L, 1977, Le cimetière des anciens Bretons de Saint-Urnel ou Saint-Saturnin en Plomeur, Finistère: Gallia, v 35, p 141-171.
- 1978, Les oratoires des anciens Bretons de Saint-Urnel ou Saint-Saturnin en Plomeur, Finistère: Archéol Médiévale, v 8, p 55-93.
- Giresse, P, Kouyoumontzakis, G, and Delibrias G, 1976, La transgression fini-holocène en Angola, aspects chronologique, eustatique, paléoclimatique et épirogénique: Acad Sci [Paris] Comptes rendus, v 283, p 1157-1160.
- Giresse, P and Lautridou, J P, 1973, Les formations quaternaires du littoral du Golfe Normand-Breton entre Coutainville et Avranches: Assoc Fr Quaternaire Bull, v 2, p 2-89.
- Guilcher, A, 1974, Coral reefs of the New Hebrides Melanesia, with particular reference to open-sea, not fringing reefs: Internatl Coral Reef symposium, 2nd, Proc: Great Barrier Reef Comm, Brisbane, p 523-535.
- Guillien, Y, 1975, Caractère cyclothémique et datation absolue intragrésieux de Sonnevillie, Charente: Cong natl Soc Savantes, 99th, Actes: Besançon, v 1, p 65-70.
- Guillien, Y and Puisségur, J J, 1969, Géomorphologie et malacologie de quelques dépôts de pente charentais: Acad Sci [Paris] Comptes rendus, v 268, p 24-27.
- Huault, M F and Auffret, J P, 1975, Etudes de dépôts quaternaires sous-marins en Manche orientale: Assoc Fr Quaternaire Bull, v 1, p 43-49.
- Ichon, A, 1977, Les sculptures de La Lagunita, El Quiché, Guatemala, in Piedra Santa, ed, Guatemala, 73 p.
- Joussaume, R, 1971, Les monuments mégalithiques du Harrar, Ethiopie: L'Anthropologie, v 15, no. 3-4, p 177-190.
- Laborel, J and Delibrias, G, 1976, Niveaux marins récents à vermetidae du littoral Ouest Africain, comparaison avec les niveaux homologues des Côtes du Brésil: Assoc Sénégal Quaternaire Afr, liaison Sénégal Bull, v 47, p 97-110.
- Langouët, L and Meury, J L, 1973, La machinerie en bois du Haut Empire retrouvée à Alet: Annales Bretagne, v 80, no. 1, p 163-184.
- Lecornec, J, 1973, Le site à enclos de Kerlande à Brandivy, Morbihan: Annales Bretagne, v 80, p 61-70.
- Léger, M, 1965, Les terrasses du Danube de Regensburg à Pleinting: Assoc Fr Etude Quaternaire Bull, v 3, p 153-164.
- Mariette, H, 1959, Civilisation des Gobelets de la région boulonnaise: Cong Préhist, 16th sess, p 853-859.
- Mary, G, Medus, J, and Delibrias, G, 1975, Le Quaternaire de la côte Asturienne, Espagne: Assoc Fr Etude Quaternaire Bull, v 1, p 13-23.
- Morand, F, 1971, Contribution à l'étude de la formation des marais et tourbières de Cessières et Montbavin, Aisne: Assoc Géol Fr Bull, no. 387-388, p 97-116.
- Orquera, L A, Sala, A E, Piana, E L, and Tapia, A H, 1978, Lancha Packewaia: Arqueologia de los canales fueguinos: Buenos Aires, Argentina, Ed Huemul, S A.
- Ortiz-Troncoso, C R, 1975, Los yacimientos de Punta Santa Ana y Bahía Puenca, Patagonia austral. Excavaciones y fechados radiocarbonicos: Inst Patagonia Anales, v 6, p 93-122.
- 1977-78, Nuevas dataciones radiocarbonicas para Chile austral, Patagonia y Tierra des Fuegos: Mus Arqueol Serena Bol, no. 16, p 244-250.
- 1978, Nuevo fechado radiocarbonico para la isla Englefield, seno Otway, Patagonia austral: Soc Argentina Antropol Rel, ns, v 12, p 243-244.
- 1979, Punta Santa Ana et Bahía Buena: deux gisements sur une ancienne ligne de rivage dans le détroit de Magellan: Soc Américanistes Jour, ns, v 66, p 133-204.
- Paradis, G, ms, 1975, Recherches sur le Quaternaire récent du sud de la République du Bénin, ex Dahomey: Etude de thanatocénoses de mollusques: Thesis, 3rd cycle, Univ Paris Sud, Orsay.
- 1978, Interprétation paléocécologique et paléogéographique des Taphocénoses de l'Holocène récent du sud Bénin, à partir de la répartition actuelle des mollusques littoraux et lagunaires d'Afrique occidentale: Géobios, v 2, no. 6, p 867-891.

- Petit-Maire, N, 1979, Le Sahara atlantique à l'Holocène. Peuplement et écologie: Centre recherche anthrop préhist ethnol mém, v 28, Algiers.
- Puyfaucher, A and Amat, J P, 1972, Fragments d'os et silex taillés découverts dans la plaine de Chanfroy: Inf Géol Bass Paris, v 32, p 53-55.
- Puyfaucher, A and Collin, F, 1971, Les grèves des plaines de Chanfroy, de la Feuillardière et du Cul du Chaudron, Forêt de Fontainebleau: Assoc Fr Etude Quaternaire Bull, v 4, p 241-249.
- Rapaire, J L and Hugues, G, 1977, Monaco radiocarbon measurements V: Radiocarbon, v 19, p 49-61.
- Richard, P, 1971, Two pollen diagrams from the Québec city area, Canada: Pollen et Spores, v 13, no. 4, p 523-559.
- Roche, J, 1976, Cadre chronologique de l'Epipaléolithique marocain, chronologie et synchronisme dans la Préhistoire circum-méditerranéenne: Cong UISIPP, 9th, Nice, Colloque II, p 153-167.
- Roche, J and Texier, J P, 1976, Découverte de restes humains dans un niveau atérien supérieur de la grotte des Contrebandiers, à Tamara, Maroc: Acad Sci [Paris] Comptes rendus, v 282, ser D, p 45-47.
- Sacchi, D, 1972, Datage ¹⁴C d'un gisement mésolithique des Corbières, La Cauna d'Arques, Aude: Soc Préhist Fr Bull, v 69, no. 8, p 7.
- Stieljes, L, 1973, Evolution tectonique récente du rift d'Asal TFAI: Rev Géog Phys Géol Dynamique, v 15, no. 4, p 425-436.
- Ters, M, 1973, Les variations du niveau marin depuis 10.000 ans le long du littoral atlantique français: Le Quaternaire géodynamique, stratigraphie et environnement: Cong internatl INQUA, 9th, Christchurch, New Zealand.
- Thévenin, A G, 1970, Lingolsheim, informations archéologiques: Gallia Préhist, v 13, fasc 2, p 397.
- Thévenin, A G and Sainty, J, 1972, Une nouvelle stratigraphie du Post Glaciaire: l'abri du Mannlefelsen I, à Oberlag, Haut Rhin: Soc Préhist Fr Bull, v 69, CRSM no. 1, p 6-7.
- _____ 1972, L'abri de Rochedane à Villars-sous-Dempjoux, Doubs: Rev Archéol Est, v 23, fasc 1, p 7-22.
- Vergier, F, 1971, Présentation taxonomique des formes des marais maritimes tempérés: Rev Géog Phys Géol Dynamique, v 13, no. 2, p 163-171.