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THE LATE PLEISTOCENE MARINE DEPOSITS OF TORRE CASTIGLIONE (Southern Italy)

ABSTRACT: DAI PRA G., *The late Pleistocene marine deposits of Torre Castiglione (Southern Italy)* (IT ISSN 0084-8948, 1982).

Three distinct late-Pleistocene marine levels, two of which previously dated with the $\text{Th}^{230}/\text{U}^{234}$ ratio, are described. They are located at 40° 17' northern latitude along the Ionian coast of the Salentine Peninsula (Puglia).

The oldest level consists of bioclastic algal limestone, grading laterally into yellowish calcarenites with *Cladocora coespitosa* in growth position. They date back to more than 350,000 years B.P.

Transgressively over the yellowish calcarenites lies a thin deposit of organogenic limestone, with a rich fauna where *Strombus bubonius*, aged 156,000 years B.P., is also found. This level is attributed to the Eutyrrhenian.

The latest marine sediment, overlying the limestones with *Strombus*, represents the Neotyrrhenian. It consists of a breccia with coarse elements of the preceding units, cemented through calcarenite or coquina of a reddish colour.

Post-Eutyrrhenian tectonics result from the differences in heights of the maximum transgression, both of the pre-Eu and of the Eutyrrhenian deposits, along the stretch from Taranto to Torre Castiglione.

RIASSUNTO: DAI PRA G., *I depositi marini tardo-pleistocenici di Torre Castiglione (Italia Meridionale)* (IT ISSN 0084-8948, 1982).

Si descrivono tre distinti livelli marini, tardo-pleistocenici, situati alla latitudine di 40°, 17' Nord, sulla costa ionica della Penisola Salentina (Puglia), due dei quali già datati col metodo $\text{Th}^{230}/\text{U}^{234}$.

Il livello più antico è costituito da calcari bioclastici algali passanti lateralmente a calcareniti giallastre a *Cladocora coespitosa* in posizione fisiologica. L'età è risultata maggiore di 350.000 anni B.P.

Trasgredisce sulle calcareniti giallastre un sottile deposito calcareo organogeno, con ricca fauna tra cui *Strombus bubonius*; l'età è di 156.000 anni B.P. Si attribuisce questo livello all'Eutyrrheniano.

Un ultimo sedimento marino, trasgressivo sul calcare a *Strombus*, rappresenta il Neotirreniano. È costituito da una breccia a grossi elementi dei termini precedenti, cementata da calcarenite o lumachella di colore rossiccio.

Elementi a favore di una Tettonica post-eutirreniana sono forniti dalle differenze di quota dei massimi trasgressivi, sia dei depositi pre-Eutirreniano che di quelli eutirreniani, nel tratto da Taranto a Torre Castiglione.

TERMINI-CHIAVE: Datazioni $\text{Th}^{230}/\text{U}^{234}$; Tirreniano; Neotettonica; Italia Meridionale.

INTRODUCTION

Three marine littoral deposits, referable to the Pleistocene, can be recognized along the Ionian coast of the Salentine Peninsula. It is difficult to trace locally the chronological sequence of these deposits, since they are rarely exposed in succession. Such favourable even exceptional circumstances, are found true at Torre Castiglione. It merits, therefore, a detailed description.

Two of the three outcropping levels in this region were summarily mentioned in a previous study, and these two levels were dated by the $\text{Th}^{230}/\text{U}^{234}$ method (DAI PRA & STEARNS, 1977). *Strombus bubonius* has been recently discovered (April 1981) at an intermediate level. It involves a further element which contributes towards the interpretation of the chronological Stratigraphy of the late Pleistocene sediments.

The Tyrrhenian deposits of the area have been studied by GIGNOUX (1913), BLANC (1953), GIGOUT (1960a; 1960b; 1960c; 1962), RICCHETTI (1972), COTECCHIA & alii (1969; 1971), BRUCKNER (1980). The stratigraphical and environmental situation of the levels present at Mar Piccolo of Taranto, based upon 15 dates obtained from the $\text{Th}^{230}/\text{U}^{234}$ ratio on coral, has been discussed by DAI PRA & STEARNS (1977): the oldest episode, called "Paleo Tyrrhenian" transgressive over silty clays with *H. baltica* directly precedes the *Strombus bubonius* episode, resulting as $>350,000$ years B. P. It is made up of deposits of the reef building organism type ("calcari bioclastici") which form a vast carbonate platform outlining the coastline stretching from Taranto to Torre Colimena. The maximum transgressive altitudes, range from 40 m at the farm S. Pietro (northern shore of the Mar Piccolo) to 35-40 m at Pulsano and Lizzano-Torre Castelluccia, and to 20 m at Maruggio and Torre Colimena (47 km

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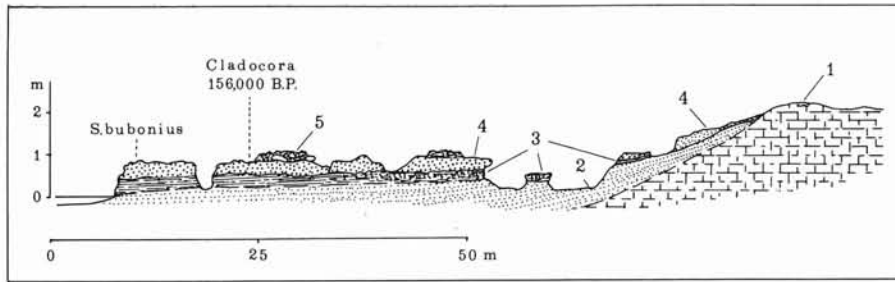


FIG. 1 - Geological section: 1) algal limestones and detrital-organogenic limestones; 2) yellowish organogenic limestones and calcarenites (pre-Eutyrrhenian); 3) red detrital limestones with bioturbation structures and red sandstones; 4) organogenic-detrital limestones with *Strombus bubonius* (Eutyrrhenian); 5) breccia (Neotyrrhenian).

ESE of Taranto). At a short distance (6,550 m) from the latter locality (i.e. at Torre Castiglione), it does not exceed a height of 5 m above sea level.

The level with the rich Senegalese fauna, often known as Eutyrrhenian, is well exposed at "il Fronte" (southern shore of the Mar Piccolo). Its age ranges from 154,000 to 87,000 years B. P., with a transgressive maximum of about 142,000 years B. P. (DAI PRA & STEARNS, 1977, f. 3) ⁽¹⁾.

The sea level maximum of the Eutyrrhenian episode ranges from 28 m at farm S. Pietro, to 28 m at Torre Castelluccia-Lizzano, 20-25 m at Maruggio and 15-20 m at Torre Colimena, falling to 2 m above sea level at Torre Castiglione.

STRATIGRAPHIC FEATURES

The examined area is located exactly 750 m ESE from Torre Castiglione (54 km ESE of Taranto), at a northern latitude of 40° 17'.

It is possible to observe three directly interrelated marine deposits. The calcareous and calcarenitic deposits considered here are exposed in a limited space along the coast (formed of a very irregular and continuous succession of small creeks and promontories) and shaped in the lower terrace consisting of the bank of bioclastic limestones ("Paleotyrrhenian"), directly transgressive on the Cenomanian limestones.

The following lithological units have been traced from bottom to top (fig. 1):

— 1) Algal limestones, organogenic-detrital limestones with vacuolar structure, light gray, sometimes dark, almost black. They correspond to the "calari bioclastici" (COTECCHIA & *alii*, 1969) and to the Q² of the Carta Geologica d'Italia, sheet 213. They are generally very rich in *Astrarium rugosum*. They form the above-mentioned

vast marine terrace, which along this stretch of the coast does not exceed a height of 5 m above sea level, and is directly transgressive on Cretaceous limestones. Their age is certainly post-Calabrian, as they are transgressive over the silty clays with *H. baltica* along the total stretch from Taranto to Torre Colimena.

— 2) Yellowish, medium-grained organogenic calcarenites to the West of the outcrop, are very rich in tufts of *Cladocora coespitosa* in growth position. The contact with 1) on the East, is sharp, and such that the yellowish calcarenites fill up the depressions in the bioclastic limestone framing them, yet without any signs of a transgressions. They might be coeval to the bioclastic limestones, or slightly posterior, as they could represent the detrital sedimentation in a sheer carbonatic environment.

For the sample LJ426 (fig. 2) and LJ416, an age >350,000 years B. P. (DAI PRA & STEARNS, 1977) has been evaluated by means of Th²³⁰/U²³⁴ ratio.

— 3) At the summit of deposit 2) and with a maximum thickness of 20-30 cms, the yellowish calcarenites are substituted by a deposit of pale brown colour. This is a detrital organogenic marly limestone, with a marly-clayey matrix rich in embedded organic remnants; for about 60% it is affected by burrow casts, mainly vertical, but with frequent biforcations. It dips slightly seawards, and in the outcrops along the coastline, it changes to a mainly quartzitic sandstone of brownish colour, without visible bioturbations.

— 4) Clearly unconformably over unit 3), lies a coarse organogenic detrital limestone with a micritic matrix very rich in embedded angular fragments of mollusks. *Lithothamnium* occurs abundantly and is rich in clastic material from unit 1). The fauna is very abundant, among which the genera: *Cladocora*, *Spondylus*, *Conus*, *Glycymeris*, *Arca*, and one specimen of *Strombus bubonius* certainly not reworked. A sample of *Cladocora* yielded with the Th²³⁰/U²³⁴ ratio, an age of 156,000 ± 20,000 years B. P. (sample LJ423) ⁽²⁾.

⁽¹⁾ The thin pyroclastic levels shown in f. 3, were dated by CAPALDI & *alii* (1979) and reported in DE CASTRO-COPPA (1979). The K/Ar age is 1,15 ± 0,07 M.Y.

⁽²⁾ Complete radiometric data reported by DAI PRA & STEARNS (1977) are:

n.	elev. m	lat. 40° N	arag. %	calcite %	U ppm	$\frac{U^{234}}{U^{238}}$	$\frac{Th^{230}}{U^{234}}$	age x 10 ³ years
LJ423	0,90	17°00"	97	3	2,5	1,13 ± 0,05	0,78 ± 0,04	156 ± 20
LJ426	0,23	17°02"	100	0	2,2	1,10 ± 0,04	1,07 ± 0,05	>350
LJ416	1,00	17°13"	95	5	2,6	1,03 ± 0,04	1,05 ± 0,05	>350

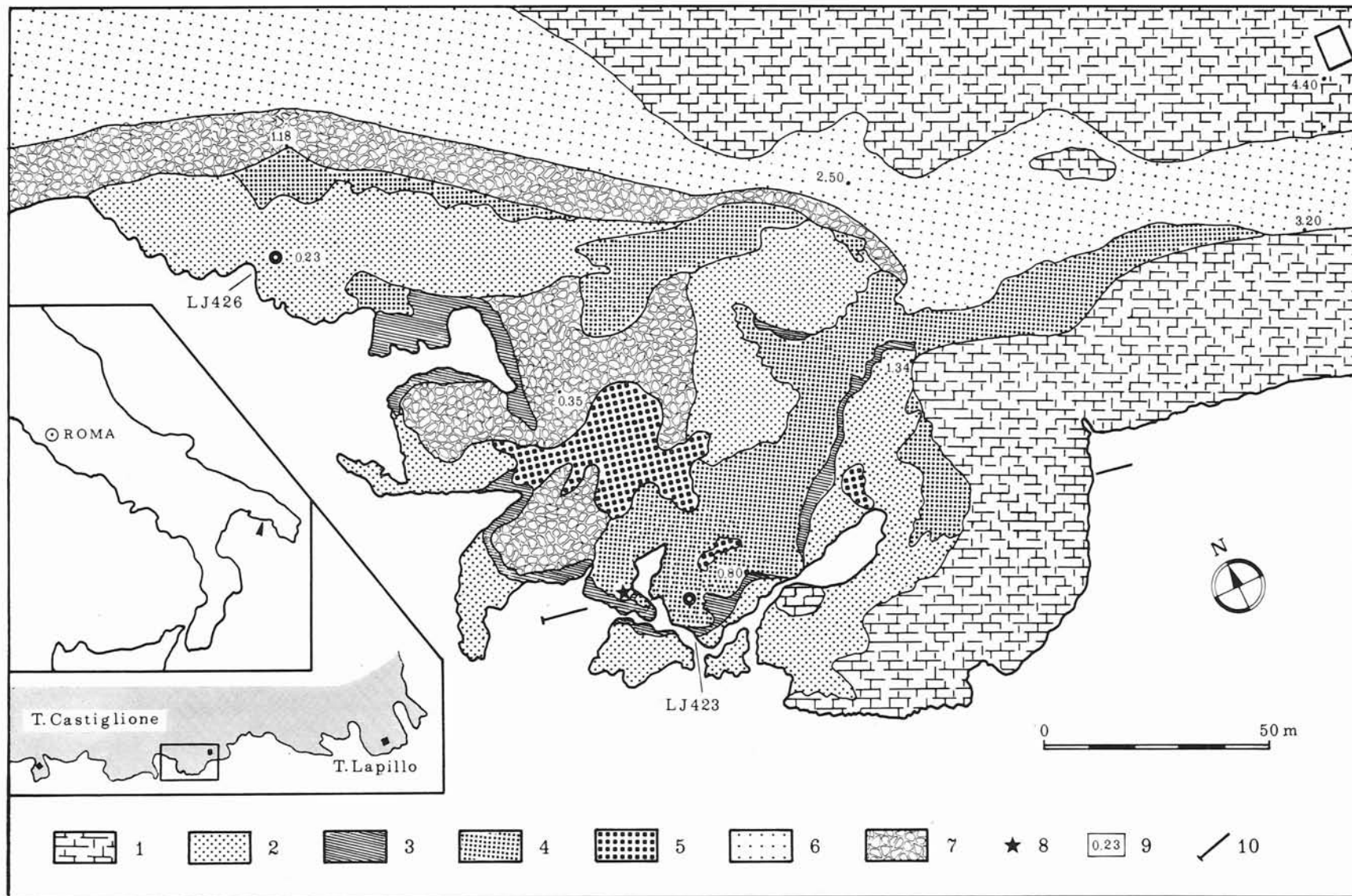


FIG. 2 - Geological map: 1) algal limestones and detrital-organogenic limestones; 2) yellowish organogenic limestones and calcarenites (pre-Eutyrrhenian); 3) red detrital limestones with bioturbation structures and red sandstones; 4) organogenic-detrital limestones with *Strombus bubonius* (Eutyrrhenian); 5) breccia (Neotyrrhenian); 6) eolian sands (865 - 1,995 years B. P.); 7) beach sands, gravels and boulders; 8) *Strombus bubonius* occurrence; 9) elevation a.s.l.; 10) section of fig. 1.

Towards the upper part of the creek, the sediment with *Strombus bubonius* thins out over a short distance, passing into pseudo-oolitic limestones of pale red colour, ending in thin beds with intercalated calcareous crusts that cover small calcareous pebbles showing no signs of transport in water.

In the western corner of the outcrop, the sediment is represented by 10-20 cm thick slabs of a pink organogenic detrital limestone, with a microgranular matrix, containing shells of lamellibranches with closed valves. It overlies unconformably the yellowish calcarenites with *Cladocora*, exposed to intensive erosion before the transgression, as confirmed by erosion channels perpendicular to the coastline and by the horizontal truncation of the numerous *Cladocora* tufts.

— 5) A younger marine sediment is represented by a breccia with some elements of 4) and less of 1); they are not rounded, almost of decimeter-size, sometimes reaching meter-size and cemented by very coarse reddish cement or coquina. In a few points fractures in the blocks of the limestone slab 4) filled up by fossiliferous detrital sediment of a reddish colour, are clearly observed.

— 6) Towards the inner border of the creek, the rocky outcrops are obliterated by incoherent dune deposits, much better exposed about 400 m NW of Torre Castiglione (dated with C^{14} on *Helix* from 865 to 1,995 years B.P. by COTECCHIA & *alii*, 1969, f. 7).

— 7) The recent beach deposits are made up of medium-fine calcareous sands, of coarse pebbles or even completely of the shells of small gasteropods and fragments of various shell-types. The beach is situated at a height of about 2 m above sea level, and coincides roughly with the internal margin of the Tyrrhenian deposits.

Morphological features or deposits of the Holocene age have been cancelled by the present sea action.

CONCLUSIONS

Three clearly independent marine levels have been recognized at Torre Castiglione. The oldest one, dated with $Th^{230}/U^{234} > 350,000$ years B. P., may be assigned to a pre-Eutyrrhenian episode.

The deposit with *Cladocora* and *Strombus bubonius*, with an age of $156,000 \pm 20,000$ years B. P., is assigned to the classical Eutyrrhenian.

A younger episode (calcareous breccias of unit 5) belong to the Neotyrrhenian. The stratigraphic position of this deposit, commonly associated with reddish soils, could be related to the *Chebba* Formation of PASKOFF & SANLAVILLE (1976; 1980). In many sites along the Salentine Ionian coast, in rocky creeks, the reddish beach deposits are exposed (COTECCHIA & *alii*, 1969).

In Italy, *Strombus bubonius* is rarely found in Neotyrrhenian deposits; at Torre Sabea of Gallipoli the latest littoral deposits consist of reddish calcarenites very rich in a possibly reworked *Strombus* (³).

Although the existence of a transgressive episode stratigraphically independent and successive to the Eutyrrhenian, has largely been demonstrated (PASKOFF & SANLAVILLE, 1976; 1980; DAI PRA & STEARNS, 1977; DAI PRA, 1978; CONATO & DAI PRA, 1980), its age is still under discussion.

STEARNS (1980; 1981) states that the identification of Neotyrrhenian should be based only on the local stratigraphic relationship to the Eutyrrhenian, and he proposes for dating the use of both Th^{230}/U^{234} and Pa^{231}/U^{235} ratios on mollusk samples in addition to that on coral samples.

A post-Eutyrrhenian tectonic phase is shown by the differences in the maximum height of transgression, both of the pre-Eutyrrhenian and Eutyrrhenian coastline along the stretch of the coast from Taranto to Torre Castiglione.

In times following the Neotyrrhenian, no notable differences are found between the maximum heights of transgression. Both the fossil beaches of Torre Castelluccia (COTECCHIA & *alii*, 1969, t. 1a; DAI PRA & STEARNS, 1977, f. 2, n. 2) and Torre Castiglione (unit 5, fig. 1) show the same height above sea level.

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(³) COTECCHIA & *alii* (1969) obtained an age of approximately 30,000 years B.P. for these sediments, established on molluscs with C^{14} method. It is believed today, in agreement with DAVIES (1981), that for Neotyrrhenian "finite C^{14} dates are almost certainly false" and moreover it contains usually "a banal fauna with perhaps a few Senegalese molluscs, mostly much corroded and almost certainly derived from the higher level".

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