

A new species of *Prodentalina* Norling (Foraminiferida) from the Early Jurassic of Umbria-Marche Apennines.

Claudio NINI

Roberto RETTORI

Dipartimento di Scienze della Terra
Università di Perugia

KEY WORDS - Foraminifera, *Prodentalina*, New Species, Morphology, Systematics, Liassic, Umbria-Marche Basin, Northern Apennines.

ABSTRACT - Herein it is described the new species *Prodentalina nocchiae* n. sp., from the Liassic (Late Pliensbachian-Early Toarcian) of the Umbria-Marche Basin. This rare species is morphologically peculiar for the general shape of the test and of the chambers and also for the curved, not depressed sutures.

RIASSUNTO - [Una nuova specie di *Prodentalina* Norling (Foraminiferida) dal Giurassico inferiore dell'Appennino Umbro-Marchigiano] - Viene qui proposta la nuova specie *Prodentalina nocchiae* n. sp., rinvenuta nella porzione basale della formazione delle Marne di Monte Serrone, in quattro diverse sezioni stratigrafiche dell'Umbria centro-meridionale. Questa specie è piuttosto rara e si distingue per la morfologia generale del guscio e delle camere nonché per l'andamento delle suture che si presentano curvate e non depresse.

L'attribuzione della nuova specie al genere *Prodentalina* è basato sulla descrizione generica proposta da Loeblich & Tappan (1986) e su quella di Norling (1972).

INTRODUCTION

The Liassic stratigraphic succession in the Umbria-Marche Basin is represented by open marine sediments, deposited above a Sinemurian-Carixian carbonate platform (Calcere Massiccio lithostratigraphic unit). The Pliensbachian pelagic limestones of the Corniola lithostratigraphic unit are overlain by Toarcian varicoloured marls (Marne di Monte Serrone Formation) and by reddish nodular marls and marly limestones (Rosso Ammonitico lithostratigraphic unit).

The benthic foraminifer species here described has been collected within the lower portion of the Marne di Monte Serrone Formation. This part of the succession is generally constituted by varicoloured or red nodular marls and marly limestones intensely bioturbated, in 10-20 cm layers (marly limestone member, Nini *et al.*, 1995). The thickness of this member is variable from 1 to 4 meters in the different sections and the age is also slightly variable, being referable to the Late Pliensbachian (upper *E. emaciatum* Zone) - Early Toarcian (lower *D. tenuicostatum* Zone) or limited to the Early Toarcian (lower *D. tenuicostatum* Zone).

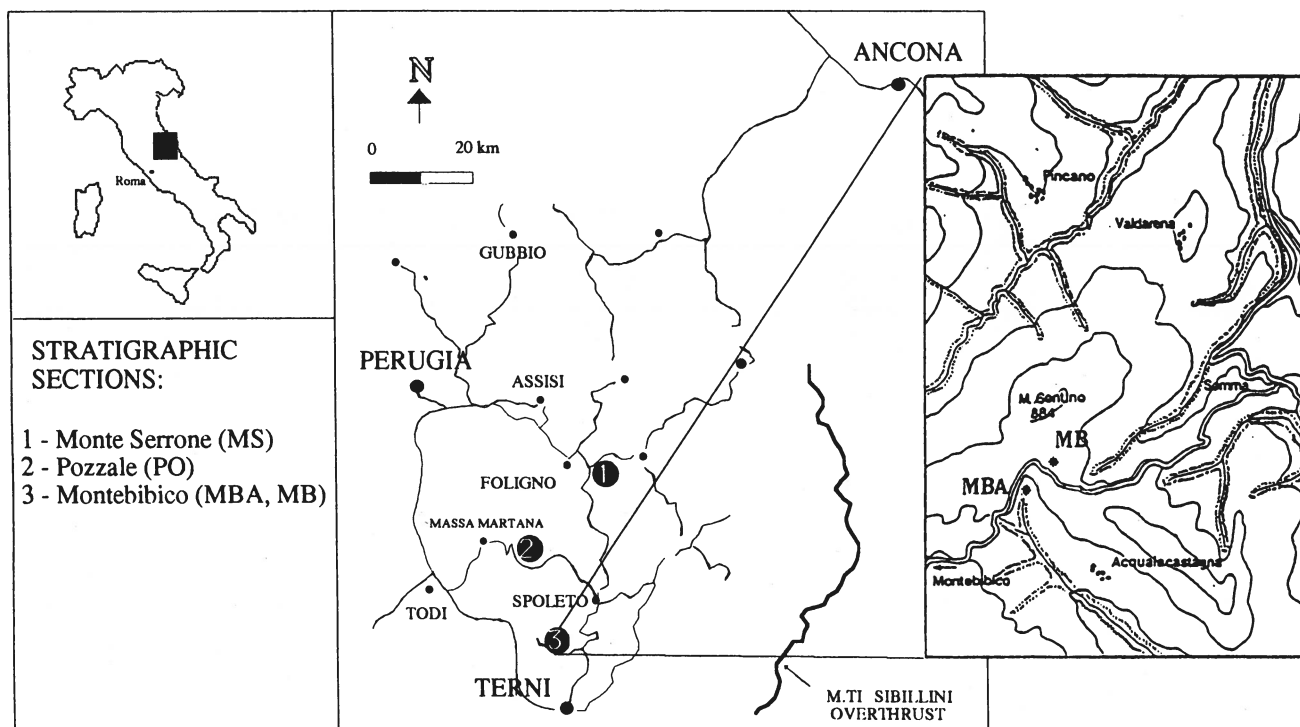
The marly limestone member of the Marne di Monte Serrone Formation is characterised by the presence of a very diversified benthic foraminiferal assemblage (BC of Nocchi, 1992), dominated by large (generally > 250 µm) high sculptured Lagenina and Ammodiscidae, showing Pliensbachian affinity.

The occurrence of the BC assemblage is related to a well oxygenated environment established at the beginning of the Late Pliensbachian - Early Toarcian transgressive event, which caused a considerable input of clay minerals and an abrupt sedimentary change in the Umbria-Marche Basin. Anyway, the developing of the transgressive event successively provoked the establishment of dysoxic (*sensu* Wignall, 1994) conditions in many sectors of the basin during the upper part of the *D. tenuicostatum* Zone, leading to the extinction of many benthic foraminiferal species and the disappearance of the BC assemblage (Bartolini *et al.*, 1992).

Prodentalina nocchiae n. sp., has been collected up to now from four stratigraphic sections in the central and southern part of Umbria (Central Italy): Montebibico sections (MBA and MB), Pozzale section (PO) and Monte Serrone section (CB). The location of the four sections is shown in Text-fig. 1.

The schematic log of the Montebibico section (MB), showing the main lithological characteristics, is reported in Text-fig. 2.

In the Monte Serrone succession the marly limestone member, where the new species is usually recovered, is substituted by grey non nodular marls. In this lithotype the foraminiferal assemblage is represented by rare individuals, and it can less clearly attributed to the BC assemblage, but some specimens of *Prodentalina nocchiae* n. sp., have been recovered as well.



Text-fig. 1 - Location map of the four stratigraphic sections where *Prodentalina nocchiae* n. sp. has been recovered, in detail the location of the type locality of the new species.

Suborder LAGENINA Delage & Hérouard, 1896
 Superfamily ROBULOIDACEA Reiss, 1963
 Family ICHTHYOLARIIDAE Loeblich & Tappan, 1986
 Genus PRODENTALINA Norling, 1968

PRODENTALINA NOCCHIAE n. sp.
 Pl. 1, figs. 1-12; Text-figs. 3-4

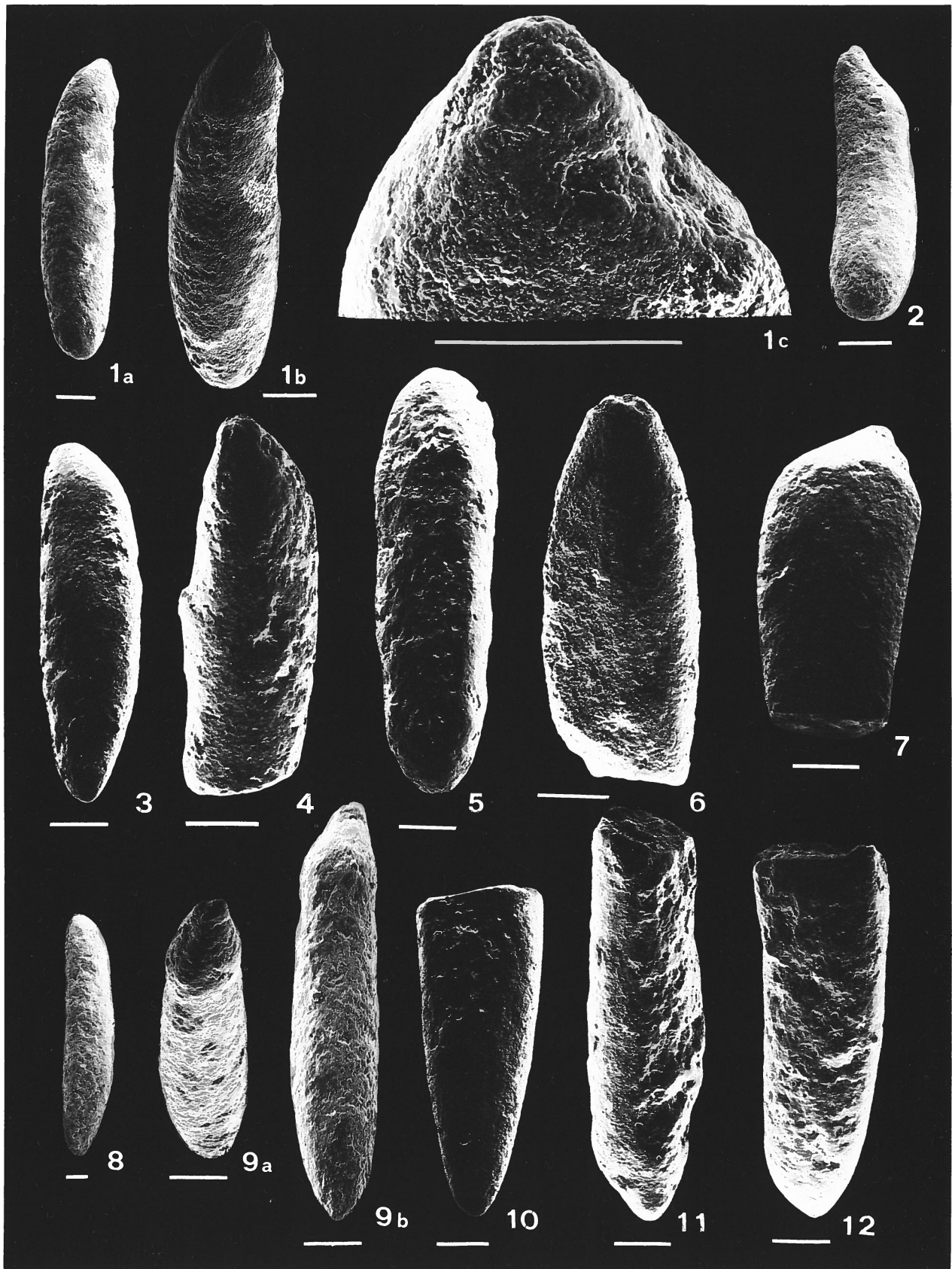
1995 *Prodentalina* sp. 1 NINI, BALDANZA & NOCCHI, p. 312, pl. 3, fig. 10; pl. 6, fig. 5

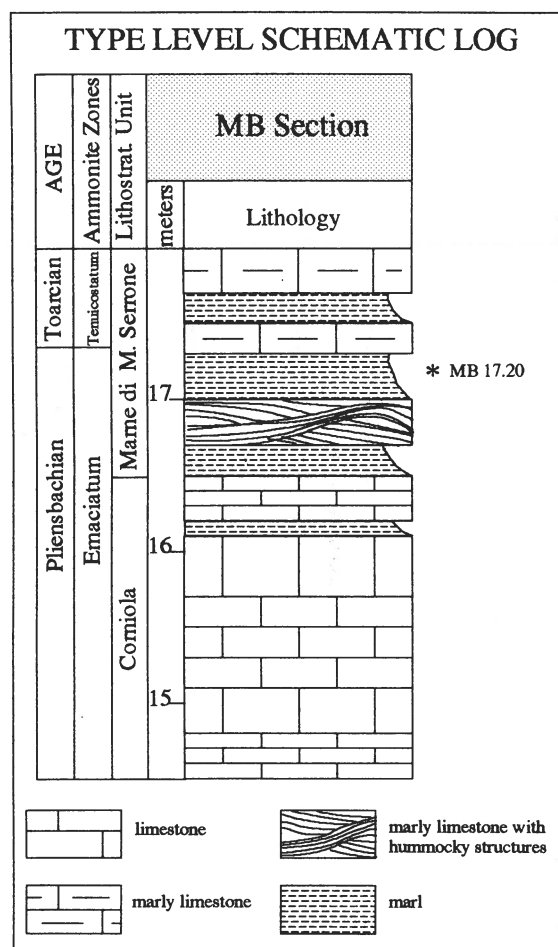
Derivation of name - The new species is dedicated to Prof. Marisa Nocchi (University of Perugia) for her great contribution to the study of the Jurassic stratigraphy of the Umbria - Marche Basin.

Holotype - The holotype is an isolated specimen figured in Pl. 1, figs. 1a-c; Text-fig. 3a; Text-fig. 4a-b, from sample MB 17.20.

EXPLANATION OF PLATE 1

- Figs. 1-12 - *Prodentalina nocchiae* n. sp.
 1a-c) Holotype, sample: MB 17.20; Late Pliensbachian (*E. emaciatum* Zone), a: lateral view, b: apertural-lateral view, c: detail of the aperture.
 2) Paratype, lateral view, sample: MB 17.20; Late Pliensbachian (*E. emaciatum* Zone).
 3) Paratype, lateral view, sample: MB 17.20; Late Pliensbachian (*E. emaciatum* Zone).
 4) Paratype, lateral view, sample: MB 17.20; Late Pliensbachian (*E. emaciatum* Zone).
 5) Paratype, sample: MB 17.20; Late Pliensbachian (*E. emaciatum* Zone), peripheral-ventral view.
 6) Paratype, lateral view, sample: MB 17.20; Late Pliensbachian (*E. emaciatum* Zone).
 7) Paratype, lateral view, sample: MB 17.20; Late Pliensbachian (*E. emaciatum* Zone).
 8) Specimen from sample CB 3; Late Pliensbachian (*E. emaciatum* Zone), lateral view.
 9a-b) Specimen from sample MBA 5.85; Early Toarcian (*D. tenuicostatum* Zone); a: lateral-apertural view; b: lateral view.
 10) Specimen from PO 2.45; Early Toarcian (*D. tenuicostatum* Zone), lateral view.
 11) Specimen from PO 2.45; Early Toarcian (*D. tenuicostatum* Zone), lateral view.
 12) Specimen from PO 2.45; Early Toarcian (*D. tenuicostatum* Zone), lateral view.
 SEM photographs. Scale bar = 100 μ m.





Text-fig. 2 - Schematic log of the stratigraphic section where the type material of *Prodentalina nocchiai* n. sp., has been recovered. Asterisk indicates the position of the type level.

Paratypes - Specimens figured in Pl. 1, figs. 2-7; Text-fig. 3b,c.

Type locality - Base of the Marne di Monte Serrone Formation outcropping along the road to Montebibico at the coordinates 42° 39' 39" N and 12° 12' 46" E, Umbria-Marche Basin, Northern Apennines, Italy (Text-fig. 1).

Type level - Base of the Marne di Monte Serrone Formation, marly limestone member.

This lithological member is constituted by intensely bioturbated, red or varicoloured marls and limestones in 10 - 20 cm thick layers. The microfaunal assemblage is mainly represented by taxa of Pliensbachian affinity comprising characteristic sculptured Lagenina such as *Astaculus inaequistriatus* (Terquem), *Paralingulina testudinaria* (Franke), *Ichthyolaria intumescens* (Bornemann),

Nodosaria biloculina Franke, *Nodosaria fontinensis* Terquem etc.; Ammodiscidae and peculiar large ostracodes among which *Hermiella comes* (Malz), *Bairdia rostrata* Issler, *Ogmoconcha* spp.. The age of this level is Late Pliensbachian on the basis of the FO of *Lotharingius hauffi* Grün & Zweili (MB 17.20) an event characterizing the Late Domerian (*E. emaciatum* Zone) (Nini et al., 1995) (Text-fig. 2).

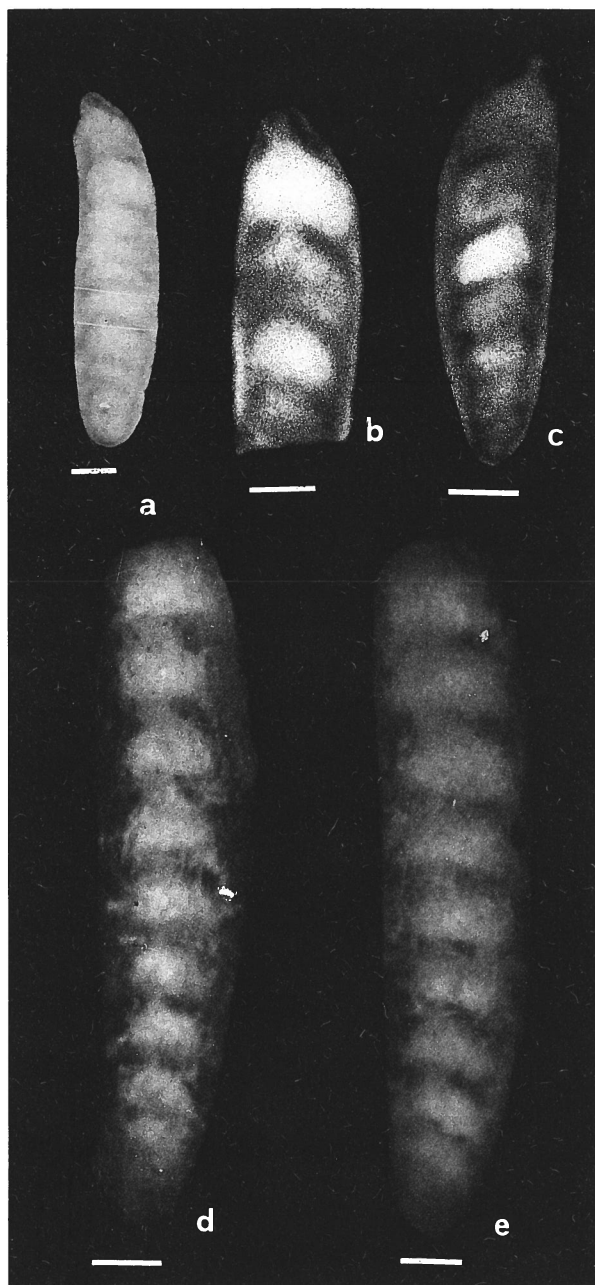
Material - *Prodentalina nocchiai* n. sp. has been rarely recovered from washed residues > 150 µm (samples: MB 17.20; MBA 3.70; MBA 5.85; MBA 6.65, PO 2.45, PO 2.65, CB 3). The type-material is deposited at the Dipartimento di Scienze della Terra of the University of Perugia. The material is often recrystallised and the specimens are generally broken due to the length of the test so that only a few whole individuals have been used for a detailed taxonomic analysis of the new species.

Association - *Prodentalina nocchiai* n. sp., is associated with abundant high sculptured and smooth Lagenina: *Astaculus inaequistriatus* (Terquem), *Paralingulina testudinaria* (Franke), *Ichthyolaria intumescens* (Bornemann), *Nodosaria biloculina* Franke, *Nodosaria fontinensis* Terquem, *Vaginulina listi* (Bornemann), *Prodentalina obscura* (Terquem) *Marginulina* spp., biconvex lenticulinas and agglutinated foraminifers referable to *Ammodiscus* spp., *Glomospira* spp., *Glomospirella* spp., *Jaculella anulata* Barbieri and *Ammobaculites fontinensis* (Terquem). Other associated organisms are also very abundant and they are represented by large ostracods, crinoid articles, echinoid and ophiuroid fragments, rare holothurian sclerites, small brachiopods and flat smooth bivalves.

Diagnosis - Test free, elongate, rectilinear to slightly curved and produced terminally at the aperture towards the dorsal side, rounded to oval in section. The specimens are usually rounded, sometimes tapering, at the beginning. Globular proloculus followed by a series of chambers (8 - 10 in adult specimens) uniserially arranged.

The chambers are inflated and kidney-shaped, wider than high, slowly increasing in size, so that the test has almost parallel sides in its middle-later portion. The average value of the height / breadth of the chambers is 1/3. The last chamber, sometimes distinct from the rest of the test, shows a dorsal side aligned with the profile of the previous chambers and a ventral side tilting towards the dorsal side of the test. The sutures are curved and not depressed, clearly visible only on wet specimens.

Wall thick, calcareous hyaline, perforate, surface



Text-fig. 3a-e - Lateral views in reflected light (wet specimens) showing the internal features of *Prodentalina nocchiae* n. sp.

- a) Holotype: same specimen of Pl. 1, figs. 1a-c.
 - b) Paratype: same specimen of Pl. 1, fig. 4.
 - c) Paratype: same specimen of Pl. 1, fig. 3
 - d, e) Specimens from sample PO2.45; Early Toarcian (*D. tenuicostatum* Zone).
- Scale bar = 100 µm.

unornamented; no lamination seems to be present.

Aperture terminal, excentric, radiate, protruding on a short neck.

Dimensions of the holotype - Length of the test: 970 µm; chamber height / chamber breadth: 1/3; proloculus size: height 71 µm, breadth 86 µm; wall thickness: 30 µm.

Remarks - In some sample we have recorded associated specimens of *Prodentalina nocchiae* n. sp., with both tapering and rounded initial stages. The differentiated initial part could be related to microspheric (Pl. 1, figs. 3, 8, 9a-b, 10, 12; Text-fig. 3c) and macrospheric (Pl. 1, figs. 1a-b, 2, 5; Text-fig. 3a; Text-fig. 4a-b) generations of the species. In fact, the constancy of other features such as the distinction of the last chamber, general test morphology, chamber shape and dimensions, sutures and aperture position allow to refer all the specimens to the same taxon. However, the scarcity of the individuals could not allow us to recognize the intraspecific variability of *Prodentalina nocchiae* n. sp..

Prodentalina nocchiae n. sp., can be distinguished from *Prodentalina obscura* (Terquem, 1858) from the Jurassic of France, because the latter has a higher number of chambers (14 - 16), which are higher than wide, the last chamber is pear-shaped and the sutures are slightly depressed.

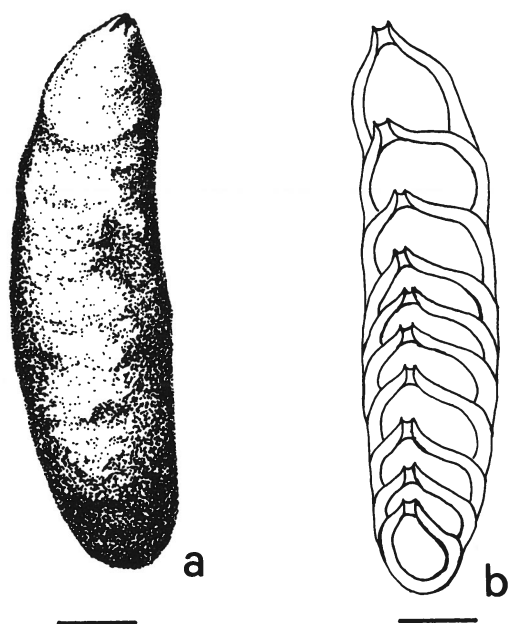
The new species can also be distinguished from *Prodentalina subulata* (Franke, 1936) from the Liassic of Germany, because the latter has straight sutures and the test is slender.

Prodentalina nocchiae n. sp., is morphologically very similar to the specimen figured by Barbieri (1964; Pl. 57, figs. 1a-b) as *Dentalina obscura* Terquem, 1858, from the Liassic of Sicily. Anyway the Author affirm that the sutures, even if not always clearly visible, should be subhorizontal as probably shown in Text-fig. 15 (p. 729).

The new species is also morphologically similar to the specimen figured by Riegraf (1985; Pl. 7, fig. 31) as *Dentalina integra* (Kübler & Zwingli, 1866) from the Toarcian of Southwest Germany, but this species differs from *Prodentalina nocchiae* n. sp., in having slightly depressed sutures which should be subhorizontal and in having the last chamber very elongated.

Remarks on the generic attribution - *Prodentalina nocchiae* n. sp., has been referred to the genus *Prodentalina* Norling, mainly according to Loeblich & Tappan (1986) who restricted the genus *Dentalina* Risso, 1826 to those species with longitudinal costate surface.

The observed specimens of *Prodentalina nocchiae* n. sp., do not show any lamellar test wall, so that also the criterion of Norling (1972) can be used in the generic attribution of our new species. In fact,



Text-fig. 4a-b - a) Reconstruction of external morphology of *Prodentalina nocchiae* n. sp.
b) Reconstruction of longitudinal section showing internal features.
Holotype.
Scale bar = 100 μ m.

Norling (1972) distinguished the genus *Prodentalina* on the basis of the non lamellarity of the test wall. Furthermore the thickness of the test wall is constant from the proximal to the distal chamber testifying that there is not any increasing of the wall thickness as on the contrary it is shown in plurilamellar tests (Norling, 1972, figs. 30 A-D).

Geographic and stratigraphic distribution - *Prodentalina nocchiae* n. sp., has been recovered in three different localities of the Umbria-Marche Basin, Northern Apennines, Italy. Its stratigraphic range spans from the Late Pliensbachian (*E. emaciatum* Zone) to the Early Toarcian (*D. tenuicostatum* Zone). Due to the peculiar internal features of the species shown in Text-figs. 3a-e, 4b, the longitudinal sections of *Prodentalina nocchiae* n. sp., can be easily recognised. Therefore it can be used as a stratigraphic index also in thin sections from hard lithotypes. The biostratigraphy of the sections, where samples have been collected, is based on both ammonites and calcareous nannofossils (Bucefalo Palliani & Mattioli, 1994; Nini *et al.*, 1995; Venturi and Baldanza, personal communications).

ACKNOWLEDGEMENTS

This work was supported by M.U.R.S.T. 60% grant to Prof. M. Nocchi.

REFERENCES

- BARBIERI, F., 1964, Micropaleontologia del Lias e Dogger del Pozzo Ragusa 1 (Sicilia): Riv. It. Paleont. Strat., 70 (49): 709-830.
- BARTOLINI, A., NOCCHI, M., BALDANZA, A. & PARISI, G., 1992, Benthic life during the Early Toarcian anoxic event in the Southwestern Tethyan Umbria-Marche Basin, Central Italy. In Takayanagi, Y. & Saito, T. (ed.), Studies in Benthic Foraminifera: Proc. 4^o Int. Symp. on Benthic Foraminifera. Benthos 90, Sendai: 323-338.
- BUCEFALO PALLIANI, R. & MATTIOLI, E., 1994, Enrichment in organic matter within the Early Toarcian Marne di Monte Serrone Formation: a synchronous event in the Umbria-Marche Basin (Central Italy): Paleopelagos, 4: 129-140.
- FRANKE, A., 1936, Die Foraminiferen des deutschen Lias: Abh. Preuss. Geol. Landesanst., Berlin, N.F., 169: 138 pp.
- KÜBLER, J. & ZWINGLI, H., 1866, Mikroskopische Bilder aus der Umwelt der Schweiz. Mikroskopische Mitteilungen. H. 2: Neujahrsbl. Bürgersbibliothek, Winterthur.
- LOEBLICH, A. R. & TAPPAN, H., 1986, Some new and revised genera and families of hyaline calcareous Foraminiferida (Protozoa): Transactions Am. Microscop. Soc., 105: 239-265.
- NINI, C., BALDANZA, A. & NOCCHI, M., 1995, Late Domerian - Toarcian nannofossil biostratigraphy, benthic foraminiferal assemblages and their paleoenvironmental implications. Montebibico area (Spoleto, Central Italy): Rev. Paléobiol., 14 (2): 271-319.
- NOCCHI, M., 1992, Associazioni a foraminiferi del Bacino Umbro-Marchigiano: Paleopelagos, 2: 37-53.
- NORLING, E., 1972, Jurassic stratigraphy and foraminifera of Western Scania, Southern Sweden: Sveriges Geol. Unders., 47: 120 pp.
- RIEGRAF, W., 1985, Mikrofauna, Biostratigraphie und Fazies im Unteren Toarcium Südwestdeutschlands und vergleiche mit Benachbarten Gebieten: Tübinger mikropaläont. Mitt., 3: 232 pp.
- TERQUEM, O., 1858, Reserches sur les foraminifères du Lias du Département de la Moselle: Mém. Acad. Imp. Metz, 42: 563-656.
- WIGNALL, P. B., 1994, Black shales: Clarendon Press, Oxford: 124 pp.

(manuscript received March 5, 1996
accepted September 4, 1996)

Claudio NINI
Roberto RETTORI

Dipartimento di Scienze della Terra
Università di Perugia
Piazza Università, 4
06100 Perugia, Italy