

Bollettino

della

Società Paleontologica Italiana

Pubblicato sotto gli auspici e col contributo
del Consiglio Nazionale delle Ricerche

Volume 40, n. 3, 2001

MUCCHI - MODENA

Kelliella ruggierii, a new deep-sea bivalve from the Mediterranean Pliocene

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KEY WORDS – *Bivalvia*, *Kelliellidae*, *New taxon*, *Deep sea*, *Pliocene*, *Emilia-Romagna*, *Italy*.

ABSTRACT – A new species of *Kelliella* (*Bivalvia*, *Veneroida*) from the Po Basin Pliocene is described. Due to the paleobathymetric range of the fossil assemblages associated with this small bivalve, *Kelliella ruggierii* sp. nov. seems to be exclusive of the deepest Pliocene mud-bottoms from the Po Basin. Moreover, this species shows remarkable affinities with some bathyal and abyssal living *Kelliellidae* from Atlantic and Pacific Oceans.

RIASSUNTO – [*Kelliella ruggierii* n. sp., un nuovo bivalve profondo del Pliocene Mediterraneo] – Viene descritta una nuova specie di *Kelliella* (*Bivalvia*, *Veneroida*) del Pliocene del Bacino Padano. In base alla paleobatimetria delle faune associate a questo bivalve di piccole dimensioni, *Kelliella ruggierii* sp. nov. risulterebbe esclusiva delle facies fangose più profonde del Pliocene Padano. E' rilevante inoltre l'affinità di questa specie con alcune *Kelliellidae* batiali ed abissali viventi degli Oceani Atlantico e Pacifico.

INTRODUCTION

Studies on deep sea Plio-Pleistocene malacofaunas began during the 1800s especially with the contributions by Giuseppe Seguenza. Subsequently, the interest was renewed by Giuliano Ruggieri and other authors. In the last decades a surprising high number of new deep-sea Pliocene taxa has been described (Ruggieri, 1950, 1957, 1962; Robba, 1981; Della Bella & Tabanelli, 1986; Bernasconi, 1989; Tabanelli, 1981, 1993, 1998; Di Geronimo & La Perna, 1997; Bertolaso & Palazzi, 1999, among the others).

This paper presents the first result of a wider research dealing with the paleoenvironmental analysis of the Pliocene deep-sea settings of the Po Basin. During this analysis a number of bivalve and gastropod taxa was recognized as never described in literature so far. Here we describe a new deep-sea species pertaining to the genus *Kelliella* Sars, 1865 (*Bivalvia*, *Kelliellidae*), recovered from Piacenzian beds of Santerno River section, Rio Gambellaro section, Rio Cugno section, and Marecchia river section (Calieri and Vaiani, 2000, pers. comm.) (Text-fig.1). From genus *Kelliella* (Sars, 1865), only the extant *K. abyssicola* (Forbes, 1844) is known from the Mediterranean Sea to date, being recovered from the Neogene-Recent circalittoral and bathyal soft-bottom environments.

TAXONOMIC SETTING

Phylum MOLLUSCA Linné, 1758
Classis BIVALVIA Linné, 1758
Subclassis HETERODONTA Neumayr, 1884
Ordo VENEROIDA H. & A. Adams, 1857

Familia KELLIELLIDAE Fischer, 1887

Genus KELLIELLA Sars, 1865

KELLIELLA RUGGIERII sp. nov.

Pl.1, figs.1a-d

Material – Fifty-four specimens (type material included) have been collected so far. This material has been partly recovered from late Piacenzian sections along Rio Cugno and Rio Gambellaro (Ravenna), Marecchia (Rimini) and Santerno (Imola, Bologna) rivers.

Type material – Holotype: cat. n. 23950 -MB23 (complete): L = 1.44 mm; H = 1.41 mm

Paratypes:

cat. n. 23951 -MB24:

A. Left valve: L = 0.99 mm; H = 0.91 mm

B. Left valve: L = 1.06 mm; H = 0.95 mm

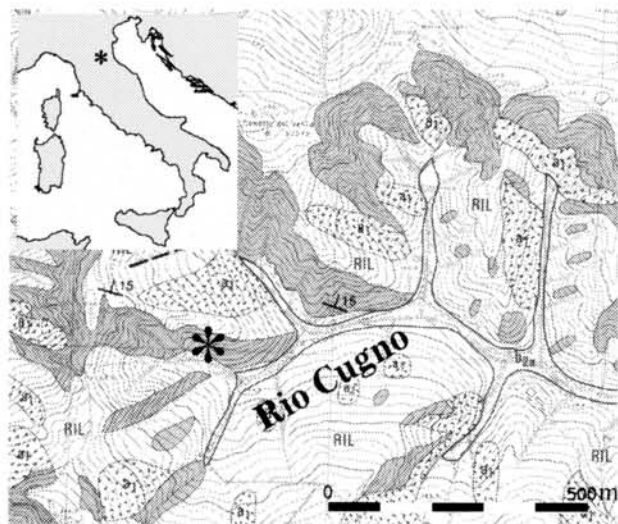
C. Right valve: L = 1.29 mm; H = 1.25 mm

D. Right valve: L = 1.52 mm; H = 1.48 mm

cat. n. 23952 -MB25 L = 1.79 mm; H = 1.71 mm
[left valve]cat. n. 23953 -MB26 L = 1.82 mm; H = 1.79 mm
[right valve]

Malacological collection - Museo di Geologia e Paleontologia "Giovanni Capellini", University of Bologna.

Locus typicus – Rio del Cugno, "Tavoletta" I.G.M. 1:25.000 "Castel Bolognese" (99/I/NO); lat.: 44° 15' 06" N, long.: 0°44'17" W from M. Mario; approx. alt.: 175 m (Text-fig.1).



Text-fig. 1 - Type-locality map. Grey areas correspond to outcrops. From the "Carta Geologica dell'Appennino Emiliano-Romagnolo" 1:10000 - "Riolo Terme", modified.

Grey-blue clays, outcropping in a badland at the base of which the Cugno stream takes origin. The locality lies on the territory of Riolo Terme. These laminated clays, inclined towards the Po Plain, are reported as "Argille e Marne di Riolo Terme" (RIL) from the "Carta Geologica dell'Appennino Emiliano-Romagnolo" 1:10000 - sez. 239090 "Riolo Terme" - pertaining to the "Argille Grigio-Azzurre" formation.

Derivatio nominis - Named after Prof. Giuliano Ruggieri, author of fundamental studies of stratigraphy and paleontology (Molluscs and Ostracods) on the Mediterranean Neogene and Pleistocene.

Diagnosis - A small *Kelliella* with a trigonal, convex and solid shell, having an inflated, large umbo as well as a well-developed concentric sculpture consisting of regular narrow bands which are more widely

spaced towards the periphery. The hinge is formed by two solid teeth on each valve.

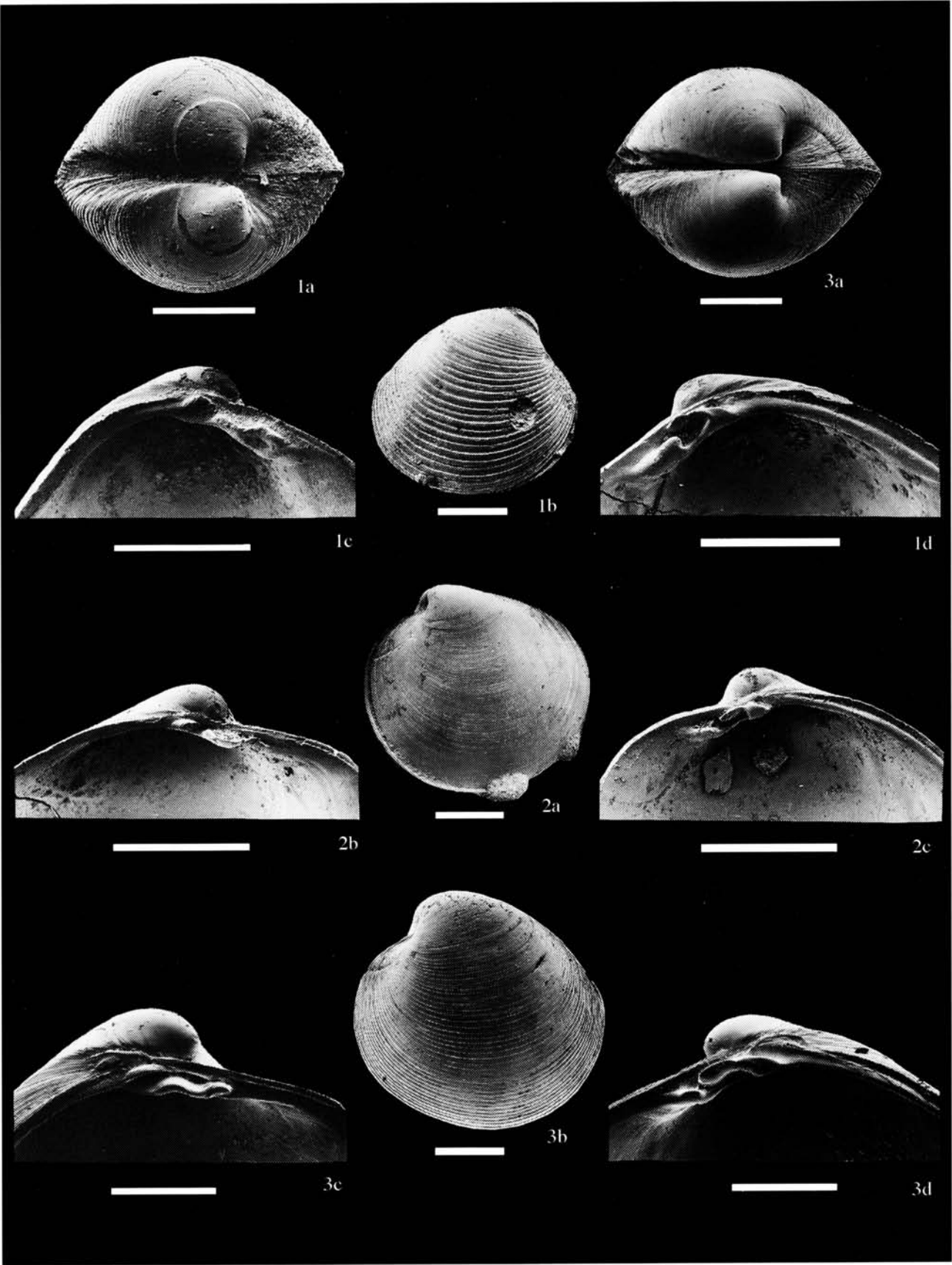
Description - The shell is inflated and inaequilateral. The lunula is demarcated by a distinct, sharp groove. The sculpture consists of quite regular concentric flat bands covering the whole surface, which are separated by narrow grooves, except for the uppermost part of the umbo which is smooth. These bands become more irregular across the posterior ridge. The prodissoconch is nearly smooth, and in most of the examined specimens, a clear metamorphosis line is followed by a more or less prominent series of close-set bands. The hinge is solid. The anterior tooth of the right valve is crescent-shaped and a deep socket, which receives the anterior hinge tooth of the left valve, is dorsal to it. The posterior tooth of the right valve, which has a prominent anterior part, is elongate and curved, roughly following the ventral edge of the hinge. This tooth is divided into two parts by a faint constriction. An elongate and deep socket receiving the posterior tooth of the left valve, is dorsal to the posterior part of the hinge. The anterior hinge tooth of the left valve is undulate and it is located at the ventral edge of the hinge. The posterior tooth is curved and ventral to the ligament. Both valves have a large cardinal platform and a faint rounded edge continuing the anterior part of the hinge and becoming obsolete in correspondence of the lunular notch, which is rather distinct.

Remarks - *Kelliella ruggierii* differs from the Mediterranean and Atlantic *K. abyssicola* (Forbes, 1844) by a more solid, trigonal shell, the robust teeth, a larger hinge plate (Pl. 1, figs. 2a-c), and the well-developed concentric sculpture. *K. ruggierii* shows a remarkable affinity with extant *K. (Vesicomya) atlantica* (E.A. Smith, 1885) (Pl. 1, figs. 3a-d), a little known species that lives in depths of 1000-2500 m in the North Atlantic, from East Indies to Iceland. It was also reported from the Azores (Moore, 1969; Warén, 2001, pers. comm.). 129 complete specimens

EXPLANATION OF PLATE 1

- Figs. 1a-d - *Kelliella ruggierii*, n. sp. Late Piacenzian, Rio Cugno.
 1a,b) Holotype (cat.n. 23950 - MB23), complete specimen.
 1c) Paratype (cat.n. 23952 - MB25), left valve.
 1d) Paratype (cat.n. 23953 - MB26), right valve.
 Figs. 2a-c - *Kelliella abyssicola*. Middle Pliocene (Piacenzian).
 2a) Campore, Parma. Italy, complete specimen.
 2b) Middle Pliocene (Piacenzian) - Rio Merli, Ravenna. Italy, left valve.
 2c) Middle Pliocene (Piacenzian) - Rio Merli, Ravenna. Italy, right valve.
 Figs. 3a-d - *Kelliella atlantica*. Recent. Off Iceland, 2400m depth.
 3a,b) Complete specimen;
 3c) left valve;
 3d) right valve.

Scale bars correspond to 0.5mm.



of *K. atlantica* kindly placed at our disposal by Dr. Anders Warén (Swedish Museum of Natural History), have been examined altogether.

This species is significantly similar to *K. ruggierii* in shape and ornamentation, but some marked differences are observable:

Size – At about 20% of the *K. atlantica* specimens examined reaches a length (L) of 3–4 mm and a height (H) of 2.5–3 mm, and the average values (considering only adult valves) are of about 2.8–3.0 mm and 2.3–2.5 mm respectively. The smallest juvenile specimen examined measures 1.77 mm (L) and 1.70 mm (H). The greatest *K. ruggierii* measured (a paratype – right valve), reaches 1.82 mm (L) and 1.79 mm (H), but the mean size of adult specimens are: 1.42 mm (L), 1.36 (H).

Morphology – Both species are characterized by an evident concentric sculpture on the external side, with the exception of the prodissoconch which is often completely smooth. However, *K. ruggierii* is always more inflated and triangular than *K. atlantica*, and the hinge of the former is particularly solid. The posterior teeth of both right and left valves of *K. ruggierii* are quite equal to those of *K. atlantica*, but the anterior teeth of *K. ruggierii* are stronger in both valves, with a more prominent tooth in right valve and consequently a deeper socket in the correspondent tooth of the left valve.

K. ruggierii seems also to be similar to the living abyssal *K. galathea* Knudsen, 1970, and *K. indica* Knudsen, 1970, known from the Pacific and Central Indian Ocean. However, marked differences are found in size, shape and sculpture of the external shell and in the hinge: these species are much larger (see Knudsen, 1970) than *K. ruggierii* and *K. atlantica*; moreover, the anterior teeth are always stronger in *K. ruggierii* than in any other species. In *Kelliella ruggierii* the shell is less triangular than in *K. indica*, even if the concentric sculpture is quite similar. *K. ruggierii* differs also from *K. galathea* by having a more evident concentric sculpture and a different hinge (see above).

STRATIGRAPHIC AND PALEOECOLOGICAL SETTING

The examined material has been recovered from the late Piacenzian (Middle/Upper Pliocene) silty-clay of the Rio Cugno Section (type locality), and from other late Piacenzian sections cropping out along Marecchia river, Rio Gambellaro, Santerno river (Romagna). Paleoenvironmentally, these beds belong to bathyal conditions, they are characterized by *Kelliella abyssicola* and by highly diverse proto-branch assemblages, such as *Bathyspinula excisa* (Philippi, 1844), *Austrotindaria pusio salicensis* (Seguenza G., 1877), *Ledella messanensis* (Jeffreys, 1870 ex-Seguenza G., m.s.), *Jupiteria gibba* (Seguenza G., 1877) and *Brevinucula glabra* (Philippi, 1844). Gastropods are mainly represented by *Skenea robbai* Bernasconi, 1989, *Pseudavena olivoides* (De Cristofori

& Jan, 1832), *Alvania diadema* (De Stefani, 1874, ex-Doderlein m.s.), *Nassarius cabrierensis italicus* (Mayer, 1876), *Benthomangelia echinata* (Seguenza G., 1880) and *Gymnobela pliorecens* (Ruggieri, 1957). In the type locality the most representative taxa are *B. excisa* with 22 as “dominance” (D) value (expressed as the percentage ratio of a species in a sample), *L. messanensis* (D=10.4), *A. pusio salicensis* (D=11), whereas *K. abyssicola* has D=8.5 and *K. ruggierii* has D=4.2.

According to Knudsen (1970, 1979), the family Kelliellidae is represented by deep-sea (mostly abyssal and hadal) filter-feeders. On the other hand, we point out that *K. abyssicola* is a widespread eurybathyc bivalve (from 50 to about 1200 m both in NE Atlantic and in Mediterranean basin), with an infault, filter-feeding strategy of life and a preferential VTC (“Vases Terrigènes Côtières” *sensu* Pérès & Picard, 1964)-VP (“Vases Profondes” or else “Vases Bathyales” *sensu* Pérès & Picard, 1964) environmental setting (Robba, 1981; Sørensen, 1984; Di Geronimo & Bellagamba, 1986).

At present, considering the assemblages in which this new species has been recovered, and the strong analogies with living bathyal and abyssal Kelliellidae, we retain that this mollusc lived in the deepest bottoms of the Po Basin and Sicily (La Perna, 2000, pers. comm.), probably linked to a psychrospheric context during the Pliocene. The morphological affinity between this species and the living bathyal and abyssal *K. atlantica*, *K. indica*, and *K. galathea* might then be a matter of further discussion.

ACKNOWLEDGEMENTS

We thank Prof. Sergio Raffi for critically appraising each draft of this paper, Prof. Roberto Barbieri, Dr. Marco Passamonti and Prof. Rafael La Perna for their accurate and useful suggestions, Dr. Roberta Calieri and Dr. Stefano Claudio Vaiani for supplying information on biostratigraphic setting. Dr. Anders Warén is especially thanked for his thorough review of this manuscript and for lending a sample of *K. atlantica* (including those here figured). Prof. Elio Robba also contributed to improve this manuscript. The skilful photographer Paolo Ferrieri made the S.E.M. pictures of these plates.

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(manuscript received October 9, 2000
accepted May 3, 2001)

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