The *Ringicula leptocheila* complex, with the description of a new species (Opisthobranchia; Ringiculidae)

Paolo Mariottini, Carlo Smriglio & Marco Oliverio

KEY WORDS: *Ringicula*, new species, taxonomy, lectotype, Mediterranean Sea, Recent, Pliocene.

ABSTRACT: The complex of species related to the taxa *Ringicula leptocheila* Bruguègne, 1873, is revised in the Mediterranean Sea, with notes on some Atlantic species. *R. leptocheila* (lectotype herein selected) is an exclusively fossil (Pliocene) species. In the Mediterranean Sea two species are currently encountered, often misidentified, with: *R. giannini* Nordieck, 1974 and *R. ciommu* n. sp. The new species is characterised morphologically and morphometrically with respect to both *R. giannini* and *R. leptocheila*. The type material of *R. nitida* Verrill, 1872 (lectotype herein selected), *R. peracuta* Watson, 1886 (lectotype herein selected) and *R. pirlina* Locard, 1897 (lectotype herein selected), has been examined and all along with *R. niutita* Locard, 1897, are regarded as valid and different taxa.

RIASSUNTO: Il complesso di *Ringicula leptocheila*, con la descrizione di una nuova specie (Opisthobranchia; Ringiculidae), viene esaminato il complesso di specie mediterranee correlate con il taxa *Ringicula leptocheila* Bruguègne, 1873, con note su alcune specie atlantiche. *R. leptocheila* (di cui viene selezionato il lectotipo) è una specie del Pliocene e l'uso di tale nome è ristretto al solo materiale fossile. Attualmente in Mediterraneo vengono rinvenute due specie recenti solitamente identificate sotto tale nome. L'analisi comparativa di abbondante materiale ha portato a definire l'esistenza di due specie correlate a *leptocheila* ma diverse: *R. giannini* Nordieck, 1974 e *R. ciommu* n. sp. La nuova specie è caratterizzata morfologicamente e morfometricamente rispetto sia a *R. giannini* sia a *R. leptocheila*. Delle varie specie frequentemente poste in sinonimia con *R. leptocheila* è stato esaminato il materiale tipico di *R. nitida* Verrill, 1872, *R. peracuta* Watson, 1886 (lectotipo qui designato) e *R. pirlina* Locard, 1897 (lectotipo qui designato), e tutte (oltre a *R. niutita* Locard, 1897) sono probabilmente da considerare specie diverse e valide.

P. MARIOTTINI, Dipartimento di Biologia, Università di Roma Tre - Via Marconi 446, 00146 Roma, Italy, e-mail: mariottini@uniroma3.it
C. SMRIGLIO, Via di Valle Aurelia 134, 00167 Roma, Italy, e-mail: carlo.smriglio@deagostini.it
M. OLIVERIO, Dipartimento di Biologia Animale e dell’Uomo, Università di Roma “La Sapienza” – V.le dell’Università 32, 00185 Roma, Italy, e-mail: moliverio@uniroma1.it

INTRODUCTION
In the Mediterranean Sea the genus *Ringicula* Deshayes, 1838, is traditionally represented by three species: *R. auriculata* (Ménard de la Gaye, 1811), *R. conformis* Monterosato, 1877 and *R. leptocheila* Bruguègne, 1873 (*SABELLI ET AL.,* 1990, 1992; *BEDULLI ET AL.,* 1995). These check-lists follow largely the opinions of *CICONÉ & SAVONA* (1982) who most recently revised the genus in the Mediterranean Sea and proposed: i) *R. peracuta* Watson, 1886, and *R. giannini* Nordieck, 1974, as synonyms of *R. leptocheila*; ii) *R. nitida* Verrill, 1872, as a separate species from *R. leptocheila*, in spite of the fact that several authors in the past have synonymized them (Dautzenberg & Fischer, 1896; DALL, 1889, Bouchet, 1975); iii) *R. pirlina* Locard, 1897 as a synonym of *R. nitida*. But the complexity of this group is still far from being totally elucidated; in fact the Check List of European Marine Mollusca (CLEMAM: Gofas & Le Renard (eds), home page, http://www.mnhn.fr/base/malaco/html) shows a different taxonomic status for the NE Atlantic/Mediterranean species of this

Table 1. Shell features of 6 species of the *R. leptocheila*-complex plus *Ringicula* sp.

<table>
<thead>
<tr>
<th>Shape</th>
<th><em>R. leptocheila</em></th>
<th><em>R. nitida</em></th>
<th><em>R. peracuta</em></th>
<th><em>R. pirlina</em></th>
<th><em>R. giannini</em></th>
<th><em>R. ciommu</em></th>
</tr>
</thead>
<tbody>
<tr>
<td>Spire</td>
<td>conical, elevated</td>
<td>conical, convex</td>
<td>conical, moderately elevated</td>
<td>narrowly conical</td>
<td>narrowly conical</td>
<td>conical</td>
</tr>
<tr>
<td>Suture</td>
<td>well impressed</td>
<td>weakly impressed</td>
<td>well impressed</td>
<td>well impressed</td>
<td>impressed</td>
<td>impressed</td>
</tr>
<tr>
<td>Teleoconch sculpture</td>
<td>about 20 spiral striae, equally spaced</td>
<td>14 spiral striae, equally spaced</td>
<td>about 6 spiral striae, distributed only in lower half of the shell</td>
<td>11 spiral striae, equally spaced</td>
<td>about 8 spiral striae, distributed only in lower half of the shell</td>
<td>about 18 spiral striae, equally spaced</td>
</tr>
<tr>
<td>Aperture</td>
<td>narrow, rounded</td>
<td>large, rounded</td>
<td>large, rounded</td>
<td>large, rounded</td>
<td>large, rounded</td>
<td>large, rounded</td>
</tr>
<tr>
<td>Peristome</td>
<td>thick, angled anteriorly</td>
<td>thick, rounded</td>
<td>moderately thick</td>
<td>thick, sinuous, slightly angled anteriorly</td>
<td>not sharp, rounded</td>
<td>thick, rounded</td>
</tr>
<tr>
<td>Columnellar teeth</td>
<td>absent</td>
<td>present</td>
<td>absent</td>
<td>absent</td>
<td>present</td>
<td>present</td>
</tr>
<tr>
<td>Columnellar folds</td>
<td>two large, the lower larger</td>
<td>two large, equal size</td>
<td>two, equal size</td>
<td>two weak, equal size</td>
<td>two large, lower larger</td>
<td>two large, sometimes the lower larger</td>
</tr>
</tbody>
</table>

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Table 2. Morphometrics of 6 species of the R. leptocheila-complex plus Ringicula sp. (USNM 107921, from off Fernandina, Florida). For R. leptocheila, R. ciommei and R. gianninii the means (with standard deviations in parentheses) are given (individual measurements are available on request from the authors). Abbreviations: N = Sample size; H = Height (mm); W = Width (mm); Ha = Height of aperture (mm); Aa = Apical angle; Nd = Nuclear diameter (μm); Ss = no. of Spiral striae on the body whorl; Ct = Presence (+) or absence (-) of columellar teeth.

<table>
<thead>
<tr>
<th>Species</th>
<th>N</th>
<th>H</th>
<th>W</th>
<th>H/W</th>
<th>Ha</th>
<th>H/Ha</th>
<th>Aa</th>
<th>Ss</th>
<th>Nd</th>
<th>Ct</th>
</tr>
</thead>
<tbody>
<tr>
<td>R. leptocheila</td>
<td>30</td>
<td>4.5</td>
<td>3.2</td>
<td>1.38</td>
<td>2.9</td>
<td>1.55</td>
<td>68.4°</td>
<td>19.6</td>
<td>207.9</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(0.31)</td>
<td>(0.26)</td>
<td>(0.06)</td>
<td>(0.24)</td>
<td>(0.08)</td>
<td>(0.7°)</td>
<td>(0.6)</td>
<td>(2.4)</td>
<td></td>
</tr>
<tr>
<td>R. ciommei</td>
<td>33</td>
<td>4.5</td>
<td>3.2</td>
<td>1.39</td>
<td>2.8</td>
<td>1.59</td>
<td>69.8°</td>
<td>28.4</td>
<td>179.5</td>
<td>+</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(0.43)</td>
<td>(0.27)</td>
<td>(0.07)</td>
<td>(0.23)</td>
<td>(0.06)</td>
<td>(0.6°)</td>
<td>(0.6)</td>
<td>(2.2)</td>
<td></td>
</tr>
<tr>
<td>R. gianninii</td>
<td>46</td>
<td>3.9</td>
<td>2.7</td>
<td>1.46</td>
<td>2.3</td>
<td>1.68</td>
<td>60.9°</td>
<td>18.4</td>
<td>154.5</td>
<td>+</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(0.38)</td>
<td>(0.23)</td>
<td>(0.06)</td>
<td>(0.20)</td>
<td>(0.06)</td>
<td>(0.5°)</td>
<td>(0.5)</td>
<td>(1.9)</td>
<td></td>
</tr>
<tr>
<td>R. nitida</td>
<td>1</td>
<td>4.5</td>
<td>3.5</td>
<td>1.29</td>
<td>3.04</td>
<td>1.47</td>
<td>80°</td>
<td>14</td>
<td>173</td>
<td>-</td>
</tr>
<tr>
<td>R. peracuta</td>
<td>1</td>
<td>4.4</td>
<td>2.9</td>
<td>1.51</td>
<td>2.56</td>
<td>1.70</td>
<td>57°</td>
<td>11</td>
<td>154</td>
<td>-</td>
</tr>
<tr>
<td>R. pirulina</td>
<td>1</td>
<td>5.9</td>
<td>3.8</td>
<td>1.56</td>
<td>3.64</td>
<td>1.62</td>
<td>60°</td>
<td>8*</td>
<td>154</td>
<td>-</td>
</tr>
<tr>
<td>Ringicula sp.</td>
<td>1</td>
<td>5</td>
<td>3.8</td>
<td>1.31</td>
<td>3.08</td>
<td>1.61</td>
<td>70°</td>
<td>6*</td>
<td>230</td>
<td>+</td>
</tr>
</tbody>
</table>

*Only in the lower part of the body whorl.

The record of many shells/specimens of a Ringicula of the R. leptocheila/R. nitida group that resulted hard to identify within both of the above taxonomic schemes, prompted us to attempt the revision of the group. We based the study on hundreds shells/specimens (including fossil shells), the original material of almost all the taxa involved in the proposed synonymsies (R. leptocheila Brugnone, 1873, R. nitida Verrill, 1872, R. peracuta Watson, 1886, R. pirulina Locard, 1897), and a critical analysis of the original literature of R. minutula and R. gianninii.

The study focused on shell characters only, because live collected specimens are rare, and this hampered also definition of the habitat for nearly all the species studied. A morphological analysis of shell features (Fig. 2) resulted in the recognition of three entities within our Mediterranean fossil and Recent material (see the Remarks in the Systematics section for the detailed comparisons). In Table 1 a comparison of the morphological features of the species dealt with herein is summarised. The fossil shells, for which only we adopt the name Ringicula leptocheila Brugnone, 1873, have a larger nuclear diameter and lack the columellar teeth which are, on the contrary, well defined in Recent shells. Among the Recent material, we have been able to distinguish two species based on the shell features. One is slender, with a smaller nucleus, and fewer spiral striae on body-whorl: there is an available name for it among the alleged synonyms of leptocheila, namely R. gianninii Nordsieck, 1974, whose original description and figure leave no doubt about the identification. The other species, with the shell outline closer (although not identical) to that of the fossil leptocheila, but with a nuclear diameter intermediate between gianninii and leptocheila, lacks a name and is here described as new.

We have analysed six morphometrics for the three species and their means (Table 2) resulted significantly different in an analysis of variance (see Table 3). We have also performed a multivariate Principal Component analysis on the morphometrics available for 109 shells (30 fossils and 89 Recent). In Fig. 1 the scores of the 109 shells are plotted on the 2nd and 3rd axis (the first one has been excluded given the bias it incorporated by the size-effect); the three groups identified by qualitative inspection of shell morphology have clearly different centroids and are scorable also in the plot.

**Systematics**

Family: Ringiculoideae, Philippi, 1853
Genus: Ringicula Deshayes, 1838

*Ringicula leptocheila* Brugnone, 1873 (Figs. 3-6, 38-42)
Original description

(BRUGNONE, 1873: Miscellanea Malachologica, Pars I, p. 11, fig. 18)
Longitudo mill. 5, latitudi mill.4 - (Fossilis pleistoecaena, et recens)

Diagnosis
Shell of medium size for the genus (4.1-5.2 mm in length), globose. Spire conical. Whorls moderately convex, suture well impressed. Aperture narrow, squared, peristome thick, angled anteriorly. Columnar teeth absent, two large columnar folds, the lower larger. About 20 spiral striae on the teleoconch, equally spaced.

Type Material
The type material of R. leptochaeta analyzed comprised the lectotype (MCZ), herein designated, 4.5 x 3.2 mm, and 204 paratypes (30 of them measured for statistical analysis) from Ficarazi, Sicily (Italy), including original label in Brugnone’s handwriting.

Type locality
Ficarazi (Sicily), Italy, Pliocene.

Material examined
Only the type material.

Distribution
So far known with certainty only from the type locality. The records from other fossil deposits must be checked, because the actual number of fossil species (still not revised) in the complex is not known.

Remarks
Type material of R. leptochaeta belonging to the Brugnone collection held in the Museo Civico di Zoologia di Roma, Italy, agrees well with the original figure (Fig. 3) and description by BRUGNONE (1873). We have designated a lectotype of R. leptochaeta from the type material of the Brugnone collection. One point of discrepancy between the original description and the analysis of the type material is in the nature of the spiral furrows. Although Brugnone’s description mentions “subtilissime transversim striato-punctata”, we could not observe anything like that in all the shells examined. The spiral striae, even at high magnification, look like regular furrows, very similar to the ones of present in R. giannini and the new species. In our opinion the possible “striato-punctata” look of these striae could be derived by the examination of some Recent shells, as stated by Brugnone himself “fossilis pleistoecaena, et recens”, which apparently show a reticulated sculpture, due to the crossing of spiral striae and growth lines, (see Figs. 27-28 and 29-31 for the Recent species). We do not know which Recent species was examined by Brugnone, but the fossil material clearly do not present this morphological feature. It is worth mentioning that this shell character was utilized by LOCARD (1897) to separate R. leptochaeta from R. nitida, but without analyzing the type material of these taxon.

In fact, Locard separated the two species on the ground of shell morphology comparison based only on the figures of R. nitida by Verrill and Pillsbury: “M. Pillsbury a cru devoir réunir cette espéce au Ringcula nitida de M. Verrill. Nous n’avons pu nous procurer le type américain de cette dernière espéce, mais si, comme nous avons tout lieu de le croire, les figurations qui en ont été données par MM. Verrill et Pillsbury sont exactes, nous constaterons sans peine que le Ringcula leptochaeta se sépare du R. nitida: par son galbe bien plus élané, comme le montre du reste très bien la figuration de l’abbé Brugnone; par sa spire plus haute, plus acuminée; par son dernier tour également plus haut et bien moins ventru, par ses tours supérieurs plus développés, à profil moins convexe; par son ouverture bien moins arrondie, toujours beaucoup plus haute que large; par son bord externe bien plus haut et bien plus droit, par son test finement décoré de stries décurentes transverses à la façon du Scaphander punctostriatus, etc.” LOCARD (1897). The analysis of the type material has confirmed this point of view, in spite of the fact that R. leptochaeta does not show any spiral furrows “à la façon du Scaphander punctostriatus”.

Ringcula nitida Verrill, 1872
(Figs. 7-9)

Original description

[(Verrill, 1872 (1873): The American Journal of Science and Arts, New Haven, Third Series, 5 (25-30): not figured)]
Shell small, white, smooth, broad oval, with five whorls, spire rapidly and regurally tapered, sub-acute, shorter than the aperture. Whorls very convex, regularly rounded, the sutures well impressed, a well marked. Impressed, revolving line just below

Table 3. Fischer test (alpha parameter 0.05): +/- indicate a significant/not-significant difference in the mean for this pairwise comparison. Abbreviations as in Table 2.

<table>
<thead>
<tr>
<th></th>
<th>H</th>
<th>Aa</th>
<th>W</th>
<th>Ss</th>
<th>HA</th>
<th>ND</th>
</tr>
</thead>
<tbody>
<tr>
<td>R. giannini</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>R. cinnamomei</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>R. leptochaeta</td>
<td></td>
<td></td>
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<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

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the suture; the surface otherwise nearly smooth, but with more or less distinct, distant, microscopic revolving lines, most distinct anteriorly. Aperture somewhat crescent-shaped. Outer lip evenly rounded, forming the segment of a circle, the border regularly thickened, receding a little posteriorly, near the suture. Callus on the body whorl narrow, nearly even, but a little swollen in the middle and slightly raised. Columella stout, recurved at the end, with two strong, very prominent, equal, spiral folds, the anterior one projecting beyond the canal, with the end rounded. Length \( \cdot 17 \) of an inch; breadth \( \cdot 125 \); length of aperture \( \cdot 10 \); breadth of same \( \cdot 043 \). Two living specimens from (o) 110 and (s) 150 fathoms, muddy bottom.

**Diagnosis**


**Type Material**

At present, the type material of *R. nitida* is the lectotype (YPM 15776), 4.5 X 3.5 mm, collected by: A. S. Packard aboard U.S. Fish Commission Steer. "Bache." Date: September 11, 1872. Atlantic Ocean, including original labels.

**Type Locality**

The original description reports two stations Northeast of George's Bank for the two original shells, U.S.F.C. Stas. 89-91 (o) 110 fathoms, N 42°05', W 67°49'; stas. 96-97 (s) 150 fathoms, N 42°11', W 67°17'. Atlantic Ocean. We prefer to designate as type locality the entire area inclusive of the five stations.

**Material Examined**

The type material and *Ringulula* sp., seven shells (USNM 107921), U.S.F.C. Sta. 2668, 294 fms. Off Fernandina, Florida.

**Distribution**

The species is known with certainty only from the type locality.

**Remarks**

The year of issuing for *R. nitida* is indeed 1872 because separate copies of the work were distributed on December 13, 1872; while the whole volume V of The American Journal of Science and Arts was published from January to June 1873. When Verrill described this species, he was clearly referring to two shells, which indicates syntype status. Johnson (1989) was not able to locate the second shell at the National Museum of Natural History and therefore regarded as the holotype the remaining shell (YPM 15776); this is in fact, a lectotype designation according to ICZN Art. 72. According to Dall (1889), *R. nitida* would be a synonym of *R. leptochelina* and of *R. peracuta*: "I have satisfied myself by a comparison of authentic shells that the species of Verrill and Brugnonne are the same, the former name having priority. The locality, description, and figure of *R. peracuta* agree well with some varieties of *R. nitida*, with which it does not seem to have been compared. The elevation and the extent of the spiral groove differ in different individuals, as observed with species of *Acteon*. Although fossil in the Italian Pliocene, this species has not yet been recorded from the so-called Pliocene of America." (Dall, 1889). As mentioned above, (Remarks of *R. leptochelina*), Locard (1897) on the contrary, commenting *R. leptochelina* had a different opinion. Later on, other authors have reconsidered *R. nitida* as a synonym of *R. leptochelina* (Dautzenberg & Fischer, 1896; Bouchet, 1975). In their revision Ciccone & Savona (1982) discussed shell morphological differences occurring between the two taxa, which are again separated as distinct species. In the CLEMAM, the group *R. leptochelina*, *R. peracuta*, *R. perulina*, *R. minutula* and *R. giamminii* is synonymized with *R. nitida*. The analysis of the lectotype of *R. nitida* (Fig. 7) has revealed that this taxon is indeed different from *R. leptochelina* on the ground of shell morphology: *R. nitida* is more globose, possessing a smaller number of whorls (the last one is about \( 1/5 \) of the entire length), a nuclear diameter of about 170 \( \mu \m), two equal col umellar folds, aperture half-moon shaped and more regularly rounded, and fewer spiral striae (14). We also had the opportunity to examine seven shells of a *Ringulula* sp., labelled *R. nitida* (USNM 107921), which in fact resemble *R. nitida* (Fig. 10). The shell outline is anyway more elongated and less globose, the teleoconch is very light, almost transparent (the columella is visible through the whorls!), the few spiral striae (about 6) cover only half of the last whorl on the siphonal portion, a not-prominent columellar tooth is visible internally (shell feature present only in *R. giamminii* and the new species, see text below), the nuclear diameter is larger (about 230 \( \mu \m)).

*Ringulula peracuta* Watson, 1886

(Figs. 11-13)

**Original Description**

(Watson, 1886: Scientific report of the voyage of H.M.S. Challenger during the years 1873-76. Report on the Scaphoda and Gastropoda XV, London, p.636, plate XLVII, fig. 11.)

Shell. -Ovate, with a somewhat high conical small-pointed spire,

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<Figure 2 - Shell morphology of *Ringulula* spp.: H. Height; W. Width; Ha. Height aperture; As. Apical angle; Sq. Spiral striae; Nd. Nuclear diameter; Ct. Columellar teeth. Figures 3-6 - *R. leptochelina*. 3. Type figure after Brugnonne (1873). 4-5. Lectotype (MCZ). Ventral and dorsal views, 4.5 X 3.2 mm. *Ficarazo* (Sicily), Italy, Pliocene. 6. Original label in Brugnonne's handwriting. Figure 7-9 - *R. nitida*. 7. Lectotype (YPM 15776). Ventral view, 4.5 X 3.5 mm. Atlantic Ocean. 8-9. Original labels. Figure 10 - *Ringulula* sp. (USNM 107921). Ventral view, 5.0 X 3.8 mm. Off Fernandina, Florida. Figures 11-13 - *R. peracuta*. 11. Type figure after Watson (1886). 12. Lectotype (NHM 1887.2.9.2145). Ventral view, 4.4 X 2.9 mm. Off Bermuda. 13. Original label. Figures 14-16 - *R. perulina*. 14. Type figure after Locard (1886). 15. Lectotype (MNHM). Ventral view, 5.9 X 3.8 mm. West Morocco. 16. Original label. Figure 17 - *R. minutula*. Type figure after Locard (1886). Scale bar 1 mm (Figs 4-5, 7, 10, 12, 15).
smooth and glossy, spirally furrowed below the periphery, with a margined suture and a largish mouth. Sculpture: Longitudinals—the whole surface is pretty regularly scored with distinct, but not sharp, shallow furrows on the lines of growth. Spirals just below the suture is a fine furrow fictitiously strengthened by the shining through of the superior whorl; from the periphery to the point of the base there are rather remote spiral furrows, which seem to vary as usual in number and in distinctness. Colour glossy white, with a faint bluish tinge. Spire rather high, conical, scarcely subscalar. Apex sharp; for though the extreme tip is a little tumid, it stands well up and is rounded. Whorls 5, conical, slightly convex; the last is a little tumid above, but a little way behind the outer lip it becomes contracted and flattened. Suture distinct. Mouth rather large, not very oblique. Outer lip very oblique to the axis of the shell, slightly thickened, toothed and prominent in the middle, with large open sinus above, and a very slight one in front. Inner lip: there is rather a slight callus with a small tooth about the middle, the pillar-teeth, which are very far from parallel, are nearly equal. H. 0.18 in. B. 0.1. Mouth, height 0.1, breadth 0.07.

Diagnosis

Type material
The type material of *R. peracuta* is the lectotype (NHM 1887.2.9.2145), herein designated, 4.4 X 2.9 mm, Station 56: Lat. 32° 8’ 45” N, long. 64° 59’ 35” W, off Bermudas, 1075 fathoms; five paralectotypes (NHM 1887.2.9.2142–4) Station 24: 18°38’30” N, 65°5’30” W, North of Culebra Island, West Indies, 390 fathoms; one paralectotype (NHM 1887.2.9.2146), Station 122: 9°5’ N, 34°50’ W, off Pernambuco, 350 fathoms. Including original labels.

Type locality
Station 56: Lat. 32° 8’ 45” N, long. 64° 59’ 35” W, off Bermudas, 1075 fathoms.

Material examined
Only the type material.

Distribution
Caribbean area.

Remarks
In Fig. 11 is given the type figure of *R. peracuta* after Watson (1886). As already mentioned above, this species has been considered in the past by some Authors as a synonym of *R. nitida* (Dall, 1889; Ciccone & Savona, 1982, CLEMAM). The analysis of the types of *R. peracuta* (Fig. 12) has revealed that this taxon is easy distinguishable from both *R. leptochelae* and *R. nitida*. In fact, *R. peracuta* has a different shell shape, slender, showing less convex whorls, with the outer lip bearing a diagnostic V-shaped callus located in the middle, which conforms to the aperture a narrower and sigmoid shape. Furthermore, it has a slightly smaller nuclear diameter (about 154 μm).

*Ringulica pirlulina* Locard, 1897
(Figs 14-16)

Original description
(Locard, 1897: Expéditions scientifiques du Travailleur et du Talisman pendant les années 1880, 1881, 1882, 1883, Molusques testacés, Paris, p.87-88, planche XIV, figs 1-6). Coquille de petite taille, d’un galbe piriforme bien ventru, arrondi dans le bas, fortement acuminé dans le haut. Spire relativement très haute, à profil latéral nettement concave, composée de cinq à six tours très faiblement convexes, peu distincts, non étagés, à croissance régulière et progressive, dernier tour égal en hauteur aux trois quarts de la hauteur totale, très gros, bien arrondi, piliforme, faiblement atténué dans le bas, terminé par un canal court, droit, étroit, bien ouvert. Suture linéaire peu sensible. Sommet très petit, légèrement mamelonné. Ouverture sensiblement égale à la demi-hauteur totale, sub-semilunaire, peu large, mais notablement plus rétrécie en haut qu’en bas. Péristome à bords subcontinus; bord externe évasé et renversé sur toute sa périphérie, à profil latéral bien arrondi, le tout inscrit dans un plan vertical; bord columellaire arrondi dans le haut, court et droit dans le bas, muni dans le haut d’un épais callus portant dans le milieu une petite saillie dentiforme très obuste, accompagné dans le bas de deux plis, le pli basal épais, très tordu et remuant, le pli supérieur moins fort et plus oblique-ascendant. Test solide, épais, sub-opaque, d’un blanc très brillant, un peu jaunâtre, orné de stries décurentes très éfaccées, régulières, bien espacées, dont une ou deux à peine un peu plus accusées vers le haut. Dimensions - Hauteur totale 7 millimètres. Diamètre maximum 5 millimètres.

Diagnosis
Shell of moderately large size for the genus (5.9 mm in length), globose-cylindrical. Spire narrow. Whorls neatly convex, suture well impressed. Aperture large, squared, peristome not very
sharp, rounded. Columellar teeth absent, two weak columellar folds of equal size. About 8 spiral striae on the teleoconch, only on the lower part of the whorl.

**Type Material**
The type material of *R. pirulina* is the lectotype (MNHN), here-in designated, 5.9 X 3.8 mm and one paralectotype (MNHN), Talisman, 1883, Drageage 33, West Morocco, including original label.

**Type locality**
Station: Talisman, 1883. Drageage 33. - Profondeur 1,350 m. A l’Ouest du Maroc.

**Material examined**
Only the type material.

**Distribution**
So far known only from West Morocco.

**Remarks**
In Fig. 14 one of the type figures of *R. pirulina* is illustrated after LOCARD (1897), who has separated this taxon from *R. peracuta*: “Le Ringulica peracuta du Rév. Boog Watson seul a quelque analogie avec notre coquille; mais cette dernière a un galbe encore plus globuleux, une spire plus acuminée et différemment profilée, des tours moins distincts, moins étagés. moins convexes, une ouverture moins étroite, des plus colubrilaires moins parallèles, etc.” We agree in considering this species separable from *R. peracuta* and in a more general view, from the whole *R. leptochelaisulitida* group. According to the original description and the various original figures published by LOCARD (1897), this species, which is rather larger (up to 7 mm in height!) than the other claimed synonyms of *R. leptochelaisulitida* (see text above), is clearly distinguishable from these. Furthermore, we analyzed the types that confirm that this is indeed a valid taxon, different from all the other species previously discussed. In fact, *R. pirulina* has a peculiar shell shape, upper whorls very slender and turriculated, with the last whorl globose and about 3/4 of the entire length, in spite of its big size the shell is light, few spiral striae (8 in the lectotype) covering only half of the last whorl on the siphonal portion.

**Ringulaca minutula** Locard, 1897
(Fig. 17)

**Original description**
(Locard, 1897: Expéditions scientifiques du Travailleur et du Talisman pendant les années 1880, 1881, 1882, 1883, Molusques testacés, Paris, p.89-90, planche XV, figs 7-9).

Coquille de très petite taille, d’un galbe ovoide-ventru, un peu allongé, un peu plus développé et acuminé en dessus qu’en dessous. Spire peu haute, composée de cinq tours très étagés, à profil arrondi dans le haut, droit latéralement, à croissance un peu rapide; dernier tour un peu plus petit que les deux tiers de la hauteur totale, un peu ventru dans la partie médiane, à profil latéral, du coté opposé au bord externe, un peu étroitement convexe, lentement et progressivement atténué dans le bas: Suture linéaire, marquée, très accusée. Sommet très petit, obtus, un peu mamelonné. Ouverture plus petite que la demi-hauteur totale, étroitement piriforme, rétrécie dans le haut, arrondie dans le bas, presque droite. Péristome à bords subcontinus; bord externe simple, épais, mais non réfléchi, très étroitement arrondi en haut, presque droit latéralement, bien arrondi dans le bas; bord colubrilaire un peu arqué dans la partie supérieure, droit et court à la base, accompagné dans le haut d’épais calum, portant dans sa partie médiane une saillie subtruberculée peu haute, large et très sensible, et dans le bas deux plis, le plus inférieur fortement tordu, le second rapproché, moins fort et plus ascendant. Test solide, épais, subopaque, d’un blanc grisâtre un peu terne, orné de nombreuses stries décurrentes, régulières, continues, assez rapprochées, recouvrant tout le test, mais devenant un peu plus fortes à la base. Coloration d’un blanc grisâtre. Dimensions - Hauteur totale 2.1/2 millimètres. Diamètre maximum 1 millimètres.

**Diagnosis**
Shell of small size for the genus (2.5 mm in length), rather cylindrical. Spire narrow. Whorls convex, suture apparently well impressed. Aperture large, squared, peristome sharp, angled anteriorly. Columellar teeth absent, two columellar folds of equal size. Spiral striae on the teleoconch.

**Type locality**
Station: Talisman, 1883. Drageage 84. - Profondeur 860 m. Tropiques.

**Material examined**
We have not examined the type material nor any sample referable to this taxon, but only the original figure and description.

**Remarks**
In Fig. 17 is illustrated one of the original figures of *R. minutula* after LOCARD (1897). The single type shell is probably a juvenile. After the drawing, the outline is somewhat similar to *R. pirulina* but without examining the specimen we cannot take a final decision. Certainly, it is quite different from the juveniles of all other species dealt with herein and particularly of the two Mediterranean species.

**Ringulaca gianninii** Nordsieck, 1974
(Figs 18-28,43-47)

< Figures 38-42 - *R. leptochelaisulitida* Paralectotype B (MCZ), Ficarazzi, Sicily (Italy), Pliocene (42 details of the sculpture). Figures 43-47 - *R. gianninii*. Off Latium coast (Tor Vajnica (RM)), Central Tyrrenhian Sea, Italy (47 details of the sculpture). Figures 48-52 - *R. conoidea*. Paratype O, off Latium coast (41°51’N 11°28'E), Central Tyrrenhian Sea, Italy, (52 details of the sculpture). Scale bars 1 mm (Figs. 38-39, 43-44, 48-49); 200 µm (Figs. 40-42, 45-47, 50-52).>
Original description

(NORDSIECK, 1974: La Conchiglia, Roma, VI (61); p. 13, figs 19-20)

"Ringicula (Rinigicula) giannini" n. sp. 5.2/3.4 mm. Monotipo nella coll. Giannini presenta tutti caratteri del sottogenere di MONTEROSATO ringicula. La bocca inizia un pò sopra la metà dell'altezza della conchiglia, ma distante dalla sutura dell'ultimo giro. Il labbro forma un ampio seno, poi è compreso, a metà circa della bocca. Il canale è molto corto e stretto. La callosità parietale non è molto estesa. presenta un bordo e una forte denticolazione a metà altezza circa. Differisce da leptochaeta BRUGNONE, 1873 (tipo del genere) per i seguenti caratteri: 1. La conchiglia è molto più slanciata. 2. I tratti spiralì sono più fitti e non pungenti, raggiunti da linee di accrescimento distanziate. 3. La columella è più lunga e le due pliche sono ineguali, quella inferiore è più forte e più dritta verso l’alto. Giri armonicamente arrondati, labbro moderatamente varicoso, non ripiegato, parete semitransparente."

Diagnosis

Shell of medium size for the genus (3.2-4.1 mm in length), globose. Spire narrowly conical. Whorls convex, suture impressed. Aperture narrow, rounded, peristome thick, rounded. Cologenlar teeth present, two large colunmella folds, the lower larger. About 18 spiral striae on the teleoconch, equally spaced.

Type Material

The Giannini collection has recently been sold and we have been so far unable to trace the holotype.

Type locality

Bocche di Bonifacio, stazione K1, Capo Comino, 200/220 m.

Material examined

Thirty shells from the Central Tyrrhenian Sea, offshore coast of Tor Vajana, (RM), Latium, 180 m depth; 6 shells from the Central Tyrrhenian Sea, offshore coast of Fiumicino (RM), Latium, 200 m depth, 1 shell from the Northen Tyrrhenian Sea, off Montecristo Island, Tuscany Archipelago, 200 m depth; 5 shells from the Strait of Sicily, R.V. "Urania", Stn #288-CS 96, 300 m depth; 2 shells (MNHN) from NW "Canyon de la Cassidagone" (1 juvenile: 45°06.6'N – 005°27.5'E 200-300 m depth, H. Zibrowius leg.; 1 fragm.: 43°06.7'N – 005°33.0'E 150-250 m depth, H. Zibrowius leg.); 6 shells (MNHN) from "Golf de Gasogne", R/V "Thalassa" research campaign (1 shell stn. W441 44°10'N – 007°41'W 440-445 m depth, 3 shells stn. Z442 48°20'N – 009°38'W 507 m depth, 1 shell stn. Z437 48°35'N – 010°24'W 610 m depth, 1 fragm. stn. DS 52 44°06'N – 004°22'W 2006 m depth, 1 shell (MNHN) from West Galice, R/V "Thalassa" research campaign (T482 44°02'N – 008°44'W 489-492 m depth), 1 fragm (MNHN) from "Banc Le Danois", R/V "Thalassa" research campaign (stn. X345 44°06'N – 004°41'W 525-550 m depth).

Distribution

Tyrrhenian Sea and Strait of Sicily within the Mediterranean basin. Atlantic Ocean.

Remarks

In Figs. 18-19 the original figures of R. giannini are reported after NORDSIECK (1974). This is the last taxon synonymized with the R. leptochaeta/ntida group according to several authors (Ciccone & Savona, 1982; Sabeli et al., 1990, 1992; Bedel et al., 1995, CLEMAM). As previously mentioned (see Remarks on R. leptochaeta), this taxon is clearly distinguishable from the fossil R. leptochaeta and we agree with the original description given by Nordsieck, who specified the shell differences occurring between the two taxa. Furthermore, R. giannini is also different from all recent supposed synonyms discussed in this work; the shell outline of R. giannini (Figs. 27-28) resembles the one of R. peracosta (Fig. 12), but it has a clear inner lip teeth, larger colunmellar folds, a bigger aperture and a more open siphonal canal. We consider R. giannini a valid taxon.

Ringicula ciommei" n. sp.

(Figs. 29-37, 48-52)

Description

Shell small, light, globose-ovate, upper part slender and conical, suture well-defined. Shells range from 4.0 to 4.9 mm in length, the holotype measures 4.9 mm in length and 3.2 mm in width. Protoconch of 11/2 whorls, smooth, without microsculpture even at high magnification. Teleconch of 4-41/2 whorls, bearing from 24 to 34 spiral furrows well-marked and equally spaced, crossing very fine growth striae irregularly distributed. Aperture about 2/3 of the total height, half-moon shaped, with two evident colunmellar plicae at the base of the colunmellar callus. On the inner lip of the aperture, at about 2/3 of its length, a tiny tooth protrudes from the thin colunmellar callus only in the adult shells. Peristome slightly thickened and bent toward the internal side. In fresh shells, through the aperture, the spiral furrows are visible in the internal surface of the last whorl by transparency. Siphonal canal very short, no umbilicus. The color is uniformly milky-white. Shell translucent and shiny, semi-transparent in fresh shells, turning to glossy milky-white in dead shells.

Diagnosis

Shell of medium size for the genus (4.0-4.9 mm in length), globose. Spire conical. Whorls convex, suture impressed. Aperture large, squared, peristome usually not very thick, angled anteriorly. Columellar teeth present, two large colunmellar folds, sometimes the lower larger. About 28 spiral striae on the teleoconch, equally spaced.

Type Material

The type material of R. ciommei consists in the following shells. The holotype, 4.9 X 3.2 mm, with dried soft parts, and the paratypes A, 4.4 X 3.0 mm; B, 4.6 X 3.4 mm; C, 4.2 X 3.1 mm; D, 3.3 X 2.4 mm; E, 4.5 X 3.1 mm; F, 4.0 X 2.7 mm; G, 4.2 X 3.0 mm; H, 4.1 X 2.9 mm; I, 4.0 X 2.8 mm; J, 4.3 X 3.1 mm; K, 4.8 X 3.3 mm; L, 4.2 X 2.9 mm; M, 4.3 X 3.1 mm; N, 4.2 X 2.9 mm; O, 4.6 X 3.4 mm, from the Central
Tyrrenian Sea (coast of Latium, 41°51′N, 11°28′E, 360-600 m depth). The holotype and paratypes A-C are deposited in the malacological collection of the Museo di Zoologia dell' Università di Bologna (MZB), Italy, with the numbers MZB 11298, 11290-11292, respectively. The paratypes D-H are in the private collection of Francesco Giusti, Livorno, Italy. The paratypes I-O are in the Author’s collection, Roma, Italy.

**Type locality**
Central Tyrrenian Sea off coast of Latium (41°51′N 11°28′E; 360-600 m).

**Material examined**
Other material examined of *R. cionmeei*: about 300 shells (15 of them measured, together with the type material, for statistical analysis) from the Central Tyrrenian Sea (off Latium coast, 41°51′N, 011°28′E, 41°24′N, 012°03′E, 360-600 m depth), 3 shells from the Northern Tyrrenian Sea (off Tuscany coast, 400-600 m depth); 2 shells from the Strait of Sicily, off Pantelleria Island, 36°51′N 012°03′E, bioclastic sands, R/V "Urania", Sta. CS96b119, 331 m depth.

**Habitat**
Muddy-bathyal bottoms surrounding deep-sea coral banks.

**Distribution**
Tyrrenian Sea, Strait of Sicily and Spanish Mediterranean coast (El Garraf, Barcelona).

**Etymology**
This species is named in memory of Cesare Cionmei, expert malacologist, with whom we have had much pleasure searching Mediterranean shells.

**Remarks**
*R. cionmeei* is conchologically clearly distinguishable from all other Mediterranean Rangiculae and in particular from the fossil *R. leptochela* and the Recent *R. gianninis*, as summarized in Tables I and II and as previously discussed (see *R. leptochela* and *R. gianninis* Remarks). For an easier comparison of shell characters of these three taxa see Figs. 38-52.

According to the large number of shells/specimens of the two Recent Mediterranean species we have examined from various sites, the specific shell features outlined in this work seem to be very constant and we could not observe any intermediate forms between *R. cionmeei* and *R. gianninis*. Also the iconography found in the literature examined so far, corroborates the assumption that the conchological characters of the two species are constant, regardless of the collecting area.

*R. cionmeei* in the Northern and Central Tyrrenian Sea belong to the faunal assemblages of the muddy-bathyal bottoms surrounding deep-sea coral banks, from 360 to 600 m depth. A young shell of *R. cionmeei* (2.57 mm in length) has been reported by Giribet & Penas (1997) from the Garraf coast, as *R. cfr. leptochela* (p. 55, 77; figs 78, 81, and not 79). Also for this record the collecting site ("El Parrusset", NE Iberian Peninsula) is located in a submarine canyon, at a depth of 200-450 m, hosting white coral banks.

The scattered distribution so far outlined for *R. cionmeei* is likely to change and the gaps in the range to be filled with the characterization of other Mediterranean deep-water assemblages, and after re-checking of private and museum collections of the *R. leptochela*-group.

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**REFERENCES**


