The status of the northeastern Atlantic and Mediterranean small mussel drills of the *Ocinebrina aciculata* complex (Mollusca: Gastropoda: Muricidae), with the description of a new species

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SUMMARY: The northeastern Atlantic and Mediterranean small mussel drills of the *Ocinebrina aciculata* complex are here revised and consist of at least 3 species. The type species, *Ocinebrina aciculata* (Lamarck, 1822), characterized by a slender shell with rounded whors and primary and secondary spiral cords of approximately similar size, lives throughout the northeastern Atlantic and Mediterranean Sea at depths usually ranging between 0 and 105 m. Its synonymy is here stabilized by a neotype selection for *Murex corallinus* Scacchi, 1836. *Ocinebrina corallinoides* Pallary, 1912 (= *Ocinebrina buzzurroi* Cecalupo and Mariani, 2008, new synonymy), characterized by a strongly elongate and weakly convex shell and primary and secondary spiral cords of approximately similar size, is endemic to the Gulf of Gabès and is here considered a distinct species, pending genetic studies. *Ocinebrina reinai* n. sp. is here described from the central Mediterranean Sea (where it is sympatric with *O. aciculata*) on the basis of morphological diagnostic features of shell (rarest presence of labral tooth, commoner presence of infrasutural apertural denticle, dark spots on the ribs and spiral sculpture with differently sized primary and secondary cords and smaller threads) and radula, confirmed by genetic data. Divergence in COI sequences with sympatric samples of *O. aciculata* (>7%), confirm their status as a distinct species. A comparative table reporting diagnostic features of the congeneric species of the complex and those with which the new species was previously misidentified is offered.

Keywords: Mollusca, Muricidae, *Ocinebrina aciculata* complex, *Ocinebrina reinai*, new species, Mediterranean Sea.
INTRODUCTION

Molluscs are an important component of the marine fauna, and some groups, such as gastropods, play key roles in the benthic communities. Among them, muricids include predators of interest because of their potential impact on marine resources (oyster drills, mussel drills and rock shells). The taxonomy of the northeastern Atlantic and Mediterranean Muricidae has been recently reviewed (Houart 2001), highlighting the relative richness of this family in the area (ca. 60 species, of which around 40 in the Mediterranean), and the need for a careful revision of several groups. One of the genera still deserving special attention is Ocinebrina Jousseaume, 1880, comprising small species characterized by a fusiform shell up to 26.82 mm high, with a small paucispiral protoconch, 5-6.5 teleoconch whorls in the adults, a short and ventrally flattened siphonal canal and a varicose outer lip, with usually 5-6 internal denticles (Houart 2001). Their anatomy is largely unknown, with the sole exception of some recently figured radulae (e.g. Houart 2001, Bonomolo and Buzzurro 2006, Cecalupo et al. 2008). Thirteen recent species of Ocinebrina are currently listed in the Mediterranean Sea (Houart 2001, Bonomolo and Buzzurro 2006, Cecalupo et al. 2008), split into 2 groups of morphological affinity:

- the Ocinebrina aciculata complex, including O. aciculata (Lamarck, 1822), the type species of the genus; O. buzzurroi Cecalupo and Mariani, 2008; and O. corallinoides Pallary, 1912;

- the Ocinebrina edwardsii complex, including O. edwardsii (Payraudeau, 1826); O. carmelae Cecalupo, Buzzurro and Mariani, 2008; O. erronea (Settepassi, 1977 ex Monterosato ms.); O. helleri (Brusina, 1865); O. hispidula Pallary, 1904; O. hybrida (Aradas and Benoit, 1876); O. ingloria (Crosse, 1865); O. nicolai Monterosato, 1884; O. paddeui Bonomolo and Buzzurro, 2006; and O. piantonii Cecalupo, Buzzurro and Mariani, 2008.

In the present paper we revise the Ocinebrina aciculata complex morphologically. Specimens ascribed to this complex are known throughout the Mediterranean Sea and the adjacent Atlantic waters up to Scilly and the Channel Islands to the north and Mauritania and northern Senegal to the south, at depths ranging between 0 and 105 m. O. aciculata and O. corallinoides share slender shells with rounded whorls, a spiral sculpture of primary and secondary cords of approximately similar size and the presence of an occasional labral tooth. The synonymy of the former is here stabilized by the selection of a neotype for Murex corallinus Scacchi, 1836, while O. buzzurroi is considered as a junior synonym of the latter. Finally, a new species from the central Mediterranean is described on the basis of diagnostic morphological features of shell and soft parts, supported by genetic data on samples strictly sympatric with O. aciculata.

MATERIALS AND METHODS

Sample localities are summarized under each taxon in the Systematics, with detailed listing in Appendix B. Samples used for molecular taxonomy were collected by SCUBA diving in the “Secche di Tor Paterno” Marine Protected Area (Central Tyrrhenian Sea, Italy). Sampling methods include an air-lift suction sampler on coralligenous substrate and in rhizomes of Posidonia oceanica (Linnaeus) Delile, 1813, and a hand net with a 20×40 cm opening on Posidonia leaves (P. G. Albano, L. Argenti, R. Maltini, M. Oliverio leg.).

Radulae were extracted from the buccal mass after tissues had been partly dissolved in a 10% solution of sodium hydroxide (NaOH), then rinsed in distilled water, air dried, mounted on SEM stubs with opercula and protoconchs and gold-palladium coated in an SC7640 Sputter coater for SEM examination with a Jeol JSM-6700 F microscope.

Total genomic DNA was extracted using a standard proteinase K phenol-chloroform method with ethanol precipitation, as reported in Oliverio and Mariottini (2001). The DNA barcode fragments of the mitochondrial cytochrome oxidase I (COI) was amplified by polymerase chain reaction (PCR) using the universal primers LCO1490 and HCO2198 (Folmer et al. 1994). PCR conditions were 30 amplification cycles [30 s at 94°C, 30 s at 60°C, 1 min and 30 s at 72°C]. PCR products were purified using Exosap-IT (USB Corporation) and sequenced by Macrogen Inc. (Seoul, S. Korea). Sequences were readily aligned by hand. Base composition of nucleotide sequences was analysed with MEGA 5.0 (Tamura et al. 2007, 2011). Nucleotide homogeneity was tested with the χ² statistics implemented in PAUP* (v. 4.0b10: Swofford 2002). Genetic variation (nucleotide diversity, haplotype diversity and nucleotide differences) was calculated using DnaSP 5.10 (Librado and Rozas 2009).

Phylogenetic relationships among the sequences were inferred by the neighbour-joining method, using the Kimura-2-Parameters (K2P) nucleotide substitution model, as implemented in the MEGA 5.0 software (Tamura et al. 2007, 2011). Relationships between individual sequences were also inferred on networks of haplotypes by statistical parsimony (by TCS v. June 2008: Jobb 2008).

Abbreviations

Abbreviations used for spiral cords and internal denticles in Muricidae follow Merle (2001, 2005) and are illustrated in Figure 2C: (IP) infrasutural primary cord, (adis) adapical infrasutural secondary cord, (abis) abapical infrasutural secondary cord, (P1–P6) primary cords of the convex part of the teleoconch whorl, (s1–s6) secondary cords of the convex part of the teleoconch whorl, (t) threads, (ID) infrasutural apertural denticle on ventral face, and (D1–D5) apertural denticles of the convex part of the whorl on ventral face.
Other abbreviations: CAS, Chicago Academy of Science (Chicago, Illinois); MHNG, Muséum d’Histoire Naturelle de Genève (Genève, Switzerland); MNHM, Museo Civico di Storia Naturale (Milano, Italy); MNHN, Muséum national d’Histoire naturelle (Paris, France); MSNT, Museo di Storia Naturale (Trieste, Italy); MSNEV, Museo di Storia Naturale (Venizia, Italy); MZN, Museo Zoologico, Centro Museale Università degli Studi di Napoli Federico II (Naples, Italy); NHMUK, The Natural History Museum (London, U.K.); SZN, Stazione Zoologica Anton Dohrn (Naples, Italy); PAP, Paolo Giulio Albano private collection (Bologna, Italy); GBP, Giuseppe Bonomolo private collection (Jesi, Italy); FCP, Fabio Crocetta private collection (Naples, Italy); FDP, Fabio Daga private collection (Carbonia, Italy); SDP, Sergio Duraccio private collection (Naples, Italy); WHP, Winfried Engl private collection (Düsseldorf, Germany); GFP, Giuseppe Fasulo private collection (Naples, Italy); RHP, Roland Houart private collection (Landen, Belgium); MOP, Marco Oliverio private collection (Rome, Italy); MRP, Michele Reina private collection (Palermo, Italy); PSP, Paolo Sordino private collection (Naples, Italy); TH, total height; TW, total width; dd, empty shell(s); lv, live collected specimen(s).

**SYSTEMATICS**

**Family Muricidae** Rafinesque, 1815

**Subfamily OCINEBRINAE** Cosman, 1903

**Genus Ocinebrina** Jousseaume, 1880

Type species by original designation: *Fusus corallinus* [sic!] Scacchi (= *Murex corallinus* Scacchi, 1836 = *Murex aciculatus* Lamarck, 1822)

*Ocinebrina aciculata* (Lamarck, 1822)  
(Figs 1 A-H; 2 G, J)

*Murex aciculatus* Lamarck, 1822: 176.
*Murex corallinus* Scacchi, 1836: 12.
*Murex inconspicuos* Sowerby G.B.JI., 1834: 5 (67), Fig. 81.

**Morphology.** Shell of medium size for the genus, TH up to 18 mm, fusiform and solid. Protoconch pauci-spiral of 1.25-1.5 rounded whorls, globose, apparently smooth but with a microsculpture of small granules often arranged in spiral rows. Teleoconch uniformly pale brown, dark brown, reddish, pinkish or orangeish, occasionally black or white, usually of 6 convex whorls at maturity, slightly elongate and usually rounded, with the last whorl consisting of about ¾ of total height in adult specimens. Subsutural ramp rounded with impressed suture. Spiral sculpture in the convex part of the whorl consisting of 6 low, weakly squamose and rounded primary cords and approximately equally sized secondary cords. P1 and P2 start in the early teleoconch, IP starts at half of the first teleoconch whorl, while s1, s2 and abis start at half of the second teleoconch whorl. Axial sculpture consisting of low, weak, broad, rounded ribs: 9-15 on the first teleoconch whorl; 15-18 on the second whorl; 13-16 on the third whorl; 11-16 on the fourth whorl; 11-15 on the fifth whorl; 9-13 on the last whorl. Outer lip weakly crenulate and with 5 weak to strong internal denticles (some could appear double), occasionally with a labral tooth, formed by the extension of P4. Labral varix slightly nodose, weak, narrow and rounded. Columellar lip moderately expanded ventrally, smooth, adherent adapically and slightly erect abapically. Aperture from narrow to moderately large, elongate-ovate, from pinkish to whitish coloured inside. Siphonal canal short, narrow, straight, ventrally sealed. Animal reddish. Operculum cono-vehicle from pale to dark brown, D-shaped-ovate, with subterminal nucleus surrounded by many concentric ridges. Radula typical of Ocinebrinae, with sickle-shaped lateral teeth with a broad base, rachidian bearing short and thick central and lateral cups with a short and thick inner lateral denticle on the base. Marginal area with short denticles and a thick marginal cusp.

**Remarks.** Shells of this species are easily diagnosed from most of the other *Ocinebrina* spp. by the rounded primary cords and equally sized secondary spiral cords.
Fig. 1. – Shells of species of the *Ocinebrina aciculata* complex. A, B, *O. aciculata*, Erquy, Brittany, France (height 15.8 mm), RHP; C, D, *O. aciculata*, Fuengirola, Spain (height 11.1 mm), RHP; E, F, *O. aciculata*, Siracusa, Sicily, Italy (height 8.7 mm), RHP; G, H, *O. aciculata*, Scacchetello, Baia, Naples, Italy (height 11.9 mm), neotype of *Murex corallinus* Scacchi, MZN Z7010; I, J, *O. corallinoides*, Sfax, Tunisia (height 9.6 mm), holotype of *O. aciculata exilis* Houart, MNHN 0362; K, L, *O. reinai* n. sp., Procida Island, Naples, Italy, holotype (height 9.9 mm), MNHN 24566.
(Houart 2001), a character shared only with Ocinebrina corallinoides Pallary, 1912 (see below). Similarly to most common and widespread northeastern Atlantic and Mediterranean species, the nomenclatural history of Ocinebrina aciculata is somewhat complicated by a long list of synonyms (see Houart 2001 and the Appendix A herein for additional comments). Among the synonyms, Murex corallinus Scacchi, 1836 is the only taxon described from within the geographic range of the new species we describe herein (see below) that shows constant, yet subtle morphological differences from Ocinebrina aciculata. The description of Murex corallinus...
Scacchi, 1836 was explicitly based on specimens with clean shells not incrusted by sponges (Scacchi 1836) and both the original description (no dark spots on the ribs) and the drawings (similarly sized primary and secondary spiral cords are evident) clearly indicate the typical Ocinebrina aciculata. As no type material of Murex corallinus Scacchi, 1836 (Cretella et al. 2005, N. Maio, pers. comm.) has been found to stabilize this synonymy, we have here designated as neotype a shell of 11.9x6.5 mm (Figs. 1 G, H) from Scacchettiello (Baia, Naples) (MZN Z7010). Admittedly, a neotype selection for Murex aciculatus Lamarck, 1822 would also be desirable. However, given the evidence that in Ocinebrina some hidden biodiversity can be uncovered only with a genetic approach, we prefer to leave this designation to a future genetic and morphological revision of Ocinebrina aciculata throughout its entire range.

Ocinebrina corallinoides Pallary, 1912
(Figs 1 I, J; 2 H, K)
Ocinebrina corallinoides Pallary, 1912: 221, plate - Fig. 48.
Ocinebrina aciculata corallinoides Nordsieck, 1968: 120, plate 19 - Fig. 71.11.

Type material. Ocinebrina corallinoides: not found; Ocinebrina aciculata exilis: holotype (MNHN 0362) (Figs. 1 I, J); Ocinebrina buzzurroi: holotype (MNHN 33489).

Type localities. Ocinebrina corallinoides: near Sfax, Gulf of Gabès (Tunisia); Ocinebrina aciculata exilis: NW of Bou Grara Sea (Tunisia); Ocinebrina buzzurroi: Borj el Hissar (Tunisia).

Material examined. The available type material and specimens and shells from the Gulf of Gabès (Tunisia) (Kerkennah, Sfax, Djerba and Bou Grara) (see details in Appendix B).

Distribution. Currently known only from the Gulf of Gabès (Tunisia) (Pallary 1912, Houart 2001, Cecalupo et al. 2008) (Fig. 3).

Morphology. Shell of medium size for the genus, TN up to 14.2 mm at maturity, slender and lanceolate. Protoconch paucispiral of 1.5-1.75 rounded whorls, globose, apparently smooth but with weak, low, spiral threads. Teleoconch uniformly light tan, yellowish speckled with subterminal nucleus, surrounded by concentric ridges. Radula conocephal, brown, D-shaped/ovate, with subterminal nucleus, surrounded by concentric ridges. Aperture pale, moderately large and ovate. Siphonal canal short, narrow, straight, ventrally sealed. Animal reddish, with sparse whitish or yellowish speckles. Operculum conocephal, brown, D-shaped/ovate, with subterminal nucleus, surrounded by concentric ridges. Radula typical of Ocinebrinae, with sickle-shaped lateral teeth with a broad base, radian bearing elongate, but quite thick, central and lateral cups with an elongate inner lateral denticle on base. Marginal area with short denticles and a thick marginal cusp.

Remarks. December 15, 1912 is the date of publication of O. corallinoides as reported into the original frontispiece, and not 1910 or 1920 as erroneously reported elsewhere (see Bonomo and Buzzurro 2006, Cecalupo et al. 2008, Bank and Menkhorst 2009). This taxon was then reported and illustrated as subspecies of O. aciculata by Nordsieck (1968), who assigned it to Monterosato, following Pallary (1912), who probably referred to a name in Monterosato’s manuscript. In the last revision of the European Muricidae, this taxon was rediscovered and described as O. aciculata exilis Houart, 2001 (see Houart 2001). Because of the reported occurrence of O. aciculata (Lamarck, 1822) in the Gulf of Gabès (Pallary 1912; Cecalupo et al. 2008) and to its peculiar morphological and radular features, O. aciculata exilis was raised to species level and then synonymized with Ocinebrina corallinoides Pallary, 1912 (Bonomolo and Buzzurro 2006; Cecalupo et al. 2008). Finally, Cecalupo and Mariani (in Cecalupo et al. 2008) described O. buzzurroi, from Sfax, which was evidently based on juveniles of O. corallinoides. The reported diagnostic features are mostly size-related (smaller size, fewer whorls), the results of miscounting (more numerous axial ribs), or within the range of variation of O. corallinoides (stronger P4, ending with a labral tooth, thicker shell).

Ocinebrina reinai Bonomo and Crocetta n. sp.
(Figs 1 K, L; 2 A-F, I-L)

Ocinebrina aciculata corallinoides sensu Parenzan 1970: p. 167, Fig. 648 (not Ocinebrina corallinoides Pallary, 1912).
Ocinebrina helleri (Brusina, 1865) sensu Houart 2001 (in part): 180, Figs. 344, 345, 346, 347 only (not Fasus helleri Brusina, 1865).
Ocinebrina aciculata (Lamarck, 1822) sensu Giannuzzi-Savelli, Pusateri, Palmeri and Ebreo 2003 (in part): 61, Fig. 84 only.
Ocinebrina aciculata (Lamarck, 1822) sensu Alban and Sabelli 2009 (in part): 61 (upper image only?) (not Murex aciculatus Lamarck, 1822).

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Type material. Holotype: Procida Island, 40°46’N, 014°01’E: MNHN 24566, lv (9.9 x 5.1 mm), 40 m depth, September 2010, F. Crocetta leg. (Figs. 1 K, L); Paratypes: A: Procida Island, 40°46”N, 014°01’ E, MZN Z7008, 1 dd (8.8 x 4.5 mm) and radula and operculum mounted and coated, 40 m depth, September 2010, F. Crocetta leg.; B: Gulf of Naples, SZN MOL 677, 1 dd (9.2 x 4.9 mm), C. Praus Franceschini leg.; C: Gulf of Naples, SZN MOL 677, 1 dd (9.1 x 4.7 mm), C. Praus Franceschini leg.; D: Gulf of Naples, SZN MOL 686, 1 dd (8.4 x 4.5 mm), C. Praus Franceschini leg.; E: Gulf of Naples, SZN MOL 686, 1 dd (8.5 x 4.3 mm), C. Praus Franceschini leg.; F: Gulf of Naples, SZN MOL 686, 1 dd (6.1 x 3.3 mm), C. Praus Franceschini leg.

Type locality. Procida Island (Naples, Campania, Italy), 40°46’N, 014°01’E, 40 m depth.

Material examined. The type material and 25 specimens and 18 shells from Italy (Tuscany, Latium, Campania and Sardinia) (see details in Appendix B).

Description. Shell of medium size for the genus, TH up to 12.3 mm and TW 5.5 mm (9.9 x 5.1 in the holotype), fusiform, solid and with slightly scalariform appearance. Protoconch paucispiral of 1.5-1.75 rounded whorls (1.75 in the holotype), amber in colour, globose, apparently smooth but with a microsculpture of several irregularly-shaped granules, ca. 10 µm in diameter. Weak growth lines and horizontal veins sometimes present only in very well preserved specimens. Teleoconch uniformly pale brown, reddish or orange, occasionally with a very tiny, whitish spiral band in the median zone; dark spots on ribs, in proximity of the spiral cords, more evident in freshly collected specimens. Teleoconch of 4.5-5.5 convex whorls (5 in the holotype) at maturity, slightly elongated but rounded and broad in the median zone, with the last whorl consisting of ca. 2/3 of TH. Subsutural ramp slightly angled, broad, with adpressed suture. Spiral sculpture in the convex part of the whorl consisting of 6 nodose and rounded primary cords stronger than secondary cords, and often smaller threads (present in the holotype). P1 and P2 start in the early teleoconch, IP on the second whorl, soon followed by s1, s2 and abis that can start from the second to the third whorl (holotype: s1 from the half of the second whorl, s2 and abis from the third whorl). Axial sculpture consisting of low, rounded and nodose ribs: 13-15 on the first teleoconch whorl; 10-13 on the second whorl; 10-11 on the third whorl; 9-11 on the fourth whorl; 8-10 on the last whorl (in the holotype: 13 on the first whorl, 11 on the second whorl; 10 on the third whorl; 10 on the fourth whorl; 9 on the last whorl). Outer lip crenulate, erect, with 5 internal denticles (sometimes one could appear double) and an additional ID on the ventral face of the infrasutural ramp (as in the holotype). The ID can be reduced, or occasionally absent in some specimens, as in the paratype A and in specimens with a not completely formed lip. Labral varix nodose, weak, narrow and rounded. Columellar lip slightly expanded ventrally, smooth, adherent adapically and weakly erect abapically. Aperture moderately narrow, elongate-ovate, lucid, pale violet. Labral tooth, formed by the extension of P4, rarely present (absent in the holotype). Siphonal canal moderately long for the genus, ventrally sealed and dorsally spirally sculptured. Animal reddish. Operculum corneous from pale to dark brown, D-shaped/ovate, with subterminal nucleus surrounded by many concentric ridges.
Table 1. – Comparative table of the species of the *Ocinebrina aciculata* complex and those with which *Ocinebrina reinai* was previously misidentified (data amended from Houart 2001, Cecalupo *et al.* 2008, Afonso *et al.* 2010).

<table>
<thead>
<tr>
<th></th>
<th><em>O. aciculata</em> (Lamarck, 1822)</th>
<th><em>O. corallinoides</em> Pallary, 1912</th>
<th><em>O. reinai</em> Bonomolo and Crocetta n. sp</th>
<th><em>O. helleri</em> (Brusina, 1865)</th>
<th><em>O. nicolai</em> Monterosato, 1884</th>
</tr>
</thead>
<tbody>
<tr>
<td>Shell TH (in mm)</td>
<td>up to 18</td>
<td>up to 14.2</td>
<td>up to 12.3</td>
<td>up to 20</td>
<td>up to 16</td>
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<tr>
<td>Protoconch</td>
<td>m: small granules or rows of small granules</td>
<td>m: weak, low, spiral threads</td>
<td>m: growth lines from weak to absent, small irregularly-shaped granules and occasionally weak veins</td>
<td>w: 1.5</td>
<td>w: 1.5</td>
</tr>
<tr>
<td>w: whorls</td>
<td>w: 1.25-1.5</td>
<td>m: small granules or rows of small granules</td>
<td>m: weak, low, spiral threads</td>
<td>m: unknown</td>
<td>m: unknown</td>
</tr>
<tr>
<td>m: microsculpture</td>
<td></td>
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</tr>
<tr>
<td>Teleoconch</td>
<td>ga: slender with rounded whorls</td>
<td>ga: strongly elongate and weakly convex</td>
<td>ga: fusiform and with slightly scalariform appearance</td>
<td>ga: slender and scalariform</td>
<td>ga: broadly ovate, fusiform, tuberculated</td>
</tr>
<tr>
<td>ga: general aspect</td>
<td>w: up to 6</td>
<td>w: up to 5</td>
<td>w: up to 5.5</td>
<td>w: up to 6.5</td>
<td>w: up to 5</td>
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<tr>
<td>w: whorls</td>
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<td>cp: uniformly pale brown, dark brown, reddish, pinkish or orangeish, occasionally black or white</td>
<td>cp: light tan, yellow-tan or pale brown</td>
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<td>cp: colour pattern</td>
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<tr>
<td>Teleoconch sculpture of the convex part of the last whorl</td>
<td>a: 9-13 low, broad, rounded ribs, varix absent</td>
<td>a: 9-11 low, broad, rounded ribs, varix absent</td>
<td>a: 8-10 low and broad ribs, varix absent</td>
<td>a: 11-13 broad, rounded, nodose ribs, occasionally with an erratically placed varix</td>
<td>a: 7-11 low ribs, occasionally with an erratically placed varix</td>
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<td>a: axial</td>
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<td>s: spiral</td>
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<td></td>
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<tr>
<td>t: threads</td>
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<tr>
<td>Aperture</td>
<td>ga: from small to moderately large, elongate-ovate, from pinkish to whitish coloured inside</td>
<td>ga: moderately large, ovate, pale violet with purple internal colour</td>
<td>ga: elongate-ovate, narrow, pale violet with purple internal colour</td>
<td>ga: moderately large, ovate, white with brown internal colour</td>
<td>ga: small, ovate, whitish with light pale pinkish-orange tan</td>
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<td>ga: general aspect</td>
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<tr>
<td>cl: columnar lip</td>
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<td>ol: outer lip</td>
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<tr>
<td>d: denticles</td>
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<tr>
<td>ID: infrasutural</td>
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<tr>
<td>apertural denticule</td>
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<td>lt: labral tooth</td>
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<tr>
<td>Radula</td>
<td>c: short and thick</td>
<td>C: elongate but quite thick</td>
<td>c: elongate</td>
<td>unknown</td>
<td>unknown</td>
</tr>
<tr>
<td>Rachidian cusps</td>
<td>l: short and thick</td>
<td>l: elongate but quite thick</td>
<td>l: elongate</td>
<td>l: absent</td>
<td>lt: absent</td>
</tr>
<tr>
<td>c: central</td>
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<tr>
<td>l: lateral</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Animal colour</td>
<td>reddish</td>
<td>reddish</td>
<td>reddish</td>
<td>creamish</td>
<td>creamish</td>
</tr>
<tr>
<td>pattern</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Depth range (in m)</td>
<td>0-105</td>
<td>6-15</td>
<td>3-70</td>
<td>40-50</td>
<td>5-50</td>
</tr>
</tbody>
</table>
Internal surface usually with 3 or 4 growth lines and a callous rim. Radula typical of Ocinebrinae, with sickle-shaped lateral teeth with a broad base, rachidian bearing elongated central and lateral cups, with very elongated inner lateral denticles on base. Marginal area with short denticles and a thick marginal cusp.

Etymology. Named after Michele Reina (Palermo, Italy), Sicilian malacologist, palaeontologist and naturalist.

Distribution. The species is currently known from the central Mediterranean Sea, from 43°33'N to 40°34'N and from 010°13'E to 014°12'E (Fig. 3). At Procida Island (type locality), where most observations were carried out, it is rather common at depths from 20 m down to ca. 40 m, with rare specimens collected alive up to 3 m and down to ca. 70 m depth. The specimen figured by Giannuzzi-Savelli et al. (2003: Figs. 105a, 105b, 105c, as O. nicolai) is stated to come from Malaga (southern Spain), where despite extensive surveys O. reinai has never been found. We therefore prefer to keep that record as likely erroneous.

Remarks. Ocinebrina reinai is clearly part of the O. aciculata complex, given the similar shell shape (with rounded teleoconch whorls and occasional presence of labral tooth) and the reddish colour of the animal, but it also resembles O. helleri and O. nicolai in the spiral sculpture. In fact, it has been misidentified under all these names in the recent literature (see synonymies). It mainly differs from O. aciculata and O. corallinoides in 2 constant teleoconch features: the dark spots on the ribs, more evident in living specimens, and the spiral sculpture, with differently sized primary and secondary cords and smaller threads. It also differs from O. nicolai in the absence of nodose varices and the presence of low and weak ribs, the occasional presence of ID and labral tooth, the spiral sculpture, the dark spots on the ribs and the reddish colour (whitish in O. nicolai) of the animal (Houart 2001, Bonomolo and Buzzurro 2006, Afonso et al. 2010); and from O. helleri in the less rounded whorls, the weaker spiral sculpture, the occasional presence of ID and labral tooth, the absence of spinelets on labral varix, the dark spots on the ribs, and the reddish colour of the animal (whitish in O. helleri) (Houart 2001, Bonomolo and Crocetta, unpublished data). In Table 1 differences from these congeneric species are summarized.

A muricid taxon from Capri, apparently named in schedis by Monterosato, was listed by Praus Franceschini (1906) as Ocinebrina bellini and by Bellini (1929) as Ocinebrina aciculata var. bellinii. These names were never accompanied by a valid description, and thus remain nomina nuda (ICZN, 1999: Art. 12 and Glossary). No material is preserved at MZN with this name (N. Maio, pers. comm.), but 2 specimens of O. reinai were deposited at SZN by Praus Franceschini under the name Tritonalia (Ocinebrina) aciculata var. bellinii (MOL 677). However, the 3 specimens deposited as Tritonalia (Ocinebrina) aciculata (MOL 686) by the same Praus Franceschini also belong to O. reinai, and thus there is no certainty that a name in honour of Bellini was used, in the past, to unequivocally identify the new species. Finally, Ocinebrina reinai was presumably described and figured by Parenzan (1970) as Ocinebrina aciculata corallinoides (Monterosato), a junior primary homonym of Ocinebrina corallinoides Pallary, 1912, and by Settepassi (1977) as Ocinebrina nicolai forma longicauda, an infrasubspecific rank name and thus not available (ICZN, 1999: Art. 45.5, 45.6).

Molecular Taxonomy

Partial sequences of the mtDNA encoding the COI were obtained from 16 specimens, collected at a single locality in the central Tyrrhenian Sea and morphologically ascribed to O. aciculata (Lamarck, 1822) (8 spms) and O. reinai Bonomolo and Crocetta n. sp. (8 spms). The sequences have been deposited at the European Molecular Biology Laboratory (EMBL - Accession numbers Ocinebrina aciculata: FR851899-FR851906; Ocinebrina reinai: FR851907-FR851914). A total of 658 bp were unambiguously aligned, without gaps, with 53 variable positions, resulting in 10 distinct haplotypes (total haplotype diversity, Hd: 0.9; total nucleotide diversity, π: 0.03849: see Table 2 for values of each species). Six haplotypes were exclusive of O. aciculata and 4 of O. reinai, without shared haplotypes, and with one distinct network of haplotypes for each species (Fig. 4).

The mean genetic distance (K2P) within each species was 0.003 (SD 0.001) in O. aciculata, and 0.002 (SD 0.001) in O. reinai. The distance between the 2 species was 0.072 (SD 0.011), with an Fst of 0.965 (Hudson et al. 1992). A neighbour-joining tree portraying the genetic distance between each individual sequence is reported in Figure 4.

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Table 2. – DNA diversity in sympatric samples of Ocinebrina aciculata and O. reinai.

<table>
<thead>
<tr>
<th>Species</th>
<th>N</th>
<th>Haplotypes and haplotype diversity - Hd</th>
<th>Nucleotide diversity - π</th>
<th>Mean genetic distance - K2P</th>
</tr>
</thead>
<tbody>
<tr>
<td>O. aciculata (Lamarck, 1822)</td>
<td>8</td>
<td>6</td>
<td>0.00331</td>
<td>0.003 (0.001)</td>
</tr>
<tr>
<td>O. reinai Bonomolo and Crocetta n. sp.</td>
<td>8</td>
<td>4</td>
<td>0.00152</td>
<td>0.002 (0.001)</td>
</tr>
</tbody>
</table>
DISCUSSION

Recent estimates report approximately 17000 species of marine organisms in the Mediterranean, and molluscs are one of the most diverse group (12.4%) in term of species number (Coll et al. 2010). The marine mollusc fauna of the Mediterranean Sea is commonly considered as the best known in the world (Oliverio 2003). Nevertheless, the pace at which new taxa are discovered and described every year is still remarkably high. During the last 10 years (2001-2010), a total of 103 new species of molluscs have been described from the Mediterranean Sea (S. Gofas and M. Oliverio, unpublished data). The large majority of these new taxa have been described solely on the basis of morphology, and also in the present case O. reinai n. sp. was initially differentiated by morphological traits only from the very similar O. aciculata. The genetic divergence found between strictly sympatric samples of the 2 species in the COI fragment used as DNA barcode (over 7%) is well over the threshold commonly accepted for species distinction (i.e. >3%: Hebert et al. 2003). Nevertheless, in many cases, intra- vs. interspecific morphological variation is hardly separated, and genetic data can be crucial. The ongoing research with a combined study by morphology and molecular taxonomy of the small Ocinebrina species of the northeastern Atlantic and Mediterranean Sea (this study and unpublished data from the authors and M. Oliverio’s laboratory) is also revealing an unexpected diversity with interesting biogeographic implications, definitively addressing the need for a thorough redefinition of the patterns of diversity of northeastern Atlantic and Mediterranean muricids.

ACKNOWLEDGEMENTS

We thank all colleagues who provided samples and bibliography for this study, in particular: Silvia Alfinito (Rome, Italy), Darija Caleta (Zagreb, Croatia), Miquel Capdevila (Reus, Spain), Paolo Crovato (Naples, Italy), Sergio Duraccio (Naples, Italy), Giuseppe Fasulo (Naples, Italy), Bruno Fumanti (Rome, Italy), Walter Renda (Amantea, Italy), Paolo Russo (Venice, Italy), Paolo Sordino (Naples, Italy) and Ermanno Quaggiotto (Longare, Italy). Franco Iamunno (Naples, Italy), Francesco Toscano (Naples, Italy), Andrea Warén (Stockholm, Sweden) and Julien Cillis (Brussels, Belgium) are thanked for the SEM photographs; Serge Gofas (Malaga, Spain) provided unpublished data on the new species described from the Mediterranean Sea; and Flegra Bentivegna (Naples, Italy), Andrea Colla (Trieste, Italy), Yves Finet (Geneva, Switzerland), Gerardo Gustato (Naples, Italy), Nicola Maio (Naples, Italy), Luca Mizzan (Venice, Italy), Andrea Travaglini (Naples, Italy) and Cecilia Vianello (Venice, Italy) allowed consultation or provided information regarding museum collections. The first author thanks his family for their continuous support.

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**APPENDIX A. – Additional nomenclatural notes on *Ocinebrina aciculata* (Lamarck, 1822)**

Several authors reported *Fusus gyrinus* Brown, 1827 among the synonyms of *O. aciculata*, but Brown (1827) was referring to *Murex gyrinus* Montagu, 1808. Montagu (1808) originally referred to *Murex gyrinus* Linnaeus, 1758, a Ranellidae, *Gyrineum gyrinum* (Linnaeus, 1758). The same holds for *Fusus lavatus* Philippi, 1836. Philippi (1836) was referring his living *O. aciculata* to *Fusus lavatus* as figured in Basterot (1825), which may or may not be a fossil specimen of *Ocinebrina aciculata* from the “basin tertiaire du sud-ouest de la France”. Unfortunately, the same Basterot (1825) was originally referring to *Buccinum lavatum* Brander (1766) and to Sowerby J.D.C. (1825), that clearly were using the name for a buccinid or a fasciolariid, not a Muricidae. Neither Basterot’s nor Philippi’s use of *lavatum* could thus result in a valid name for whatever species. *Fusus minutus* Deshayes, 1833 has been indicated as a junior synonym of *O. aciculata* (Lamarck, 1822). Deshayes (1833) was actually referring to *Fusus minutus* Lamarck, 1803 from the Eocene of Paris, which is, however, invalid as a junior primary homonym of the buccinid *Fusus minutus* Röding, 1798. *Murex badius* Reeve, 1845, described with unknown distributional data, has been often reported as a junior synonym of *O. aciculata* (Lamarck, 1822). It is now *Orania badia* (Reeve, 1845). *Murex aciculatus* var. *badia* Jeffreys, 1867, *Ocinebrina corallina* var. *major* Pallary, 1900, *Ocinebra* (Ocinebrina) *pseudoscalaris* Coen, 1914, *Ocinebra* (Ocinebrina) *corallina* var. *scalariformis* Coen, 1914, *Ocinebra* (Ocinebrina) *corallum* var. *atra* Coen, 1914, *Ocinebra* (Corallinia) *aciculatum* var. *scalariformis* Coen, 1933 are *nomina nuda* (ICZN, 1999: Art. 12 and Glossary). *Murex aciculatus* var. *curta* Bucquoy, Dautzenberg and Dollfus, 1882 and *Murex aciculatus* var. *minor* Bucquoy, Dautzenberg and Dollfus, 1882, *Ocinebra aciculata* var. *cingulifera* Pallary, 1920 and *Ocinebra aciculata* var. *elongata* Pallary, 1920 have infrasubspecific rank and are thus not available (ICZN, 1999: Art. 45.5, 45.6). Other names, all manuscript names of Monterosso, introduced as varietal names (explicitly and as unambiguously revealed by the content of the work) by Settepassi (1977) have infrasubspecific rank and are thus also not available (ICZN, 1999: Art. 45.5, 45.6): *Ocinebrina* (Corallinia) *titii* minor, *Ocinebrina* (Corallinia) *corallina* elongata, *Ocinebra* (Corallinia) *corallina* spongiderma and *Ocinebra* (Corallinia) *corallina* scalariformis. Settepassi (1977) also figured and described specimens of *O. aciculata* as subspecies *elongata* and subspecies *inflata* of *Ocinebrina halleriana* [sic!], an unjustified emendation of *Fusus helleri* Brusina, 1865 = *Ocinebrina helleri* (Brusina, 1865). We feel that also for these names an infrasubspecific rank could be applied as unambiguously revealed by the content of the work (both are cited as found together with the nominotypical, so we could assume that Settepassi considered them as forms of *O. helleri*). In any case they would be invalid as junior synonyms of *O. aciculata*. In addition, Settepassi (1977) did not consistently use binomial nomenclature. Although there is not yet a specific decision of ICZN, there are precedents of works that were rejected on such grounds.
APPENDIX B. – Additional material examined.

**Ocinebrina aciculata** (Lamarck, 1822)

Channel Islands: Guernsey, 3 lv (RHP).
France: Erquy, on harbour wall at very low tide, 6 lv (RHP), 3 lv, 3 dd (GBP); Le Verdelet, 3 lv (RHP); St. Lunaire, 3 lv (RHP); Roscoff, 5 lv (RHP). Corsica, region of Calvi, 1 lv, 1 dd (RHP); Calvi, many lv and dd (RHP); Barneville (Normandie), on rocks at low tide, 4 lv (GBP); L’Arcouest, on rocks at low tide, 2 lv (GBP); Painpelt, -15 m among oysters, 2 lv, 2 dd (GBP); Mont S. Michel, beach, 1 dd (GBP).
Italy: Gallipoli, scuba diving -8/14 m, 1 lv (PAP); Messina, Gallipoli, coralligenous, 4 lv (GFP); Porto Cesareo, from fishermen, 3 lv (PSP); Monopoli, beached, 2 dd (PAP); 56 lv and dd (SDP); Li Galli/Vetara, - 39m: 1 dd (SDP); Catanzaro Ischia Island, -10 m, 1 dd (PSP); Marina di Puolo, from fishermen, 94 dd (GFP), 4 dd (SDP), 4 dd (GBP); Vivara Island, -10/15 m, (PSP); Procida Island, shell grit, -2/3 m, 9 dd (PSP), 75 dd (FCP), lipo, beached, 12 dd (GFP); Secca di Miseno, gill nets, -30 m, 1 dd (SP4-13, SP5-03, R2-01, S8-BAU1037, S9-BAU-1042.1); Posilipo, suction sampler, 8 lv used for genetics (SP4-19, R2-03, SP4-15, SP4-13, SP5-03, R2-01, S8-BAU1037, S9-BAU-1042.1); Posidonia meadows -6/7 m, 6 lv (FCP); Messina, from fishermen, -80/20 m, 2 lv (GBP); Cannizzaro (Catania), -40/45 m, 4 lv, 6 dd (GBP); Pozzillo, scuba diving -10/20 m, 1 lv (PAP); Siracusa, 5 lv (RHP), 7 dd (GBP); Acitrezza, -9/19 m, 5 lv (RHP); Brucoli, 8 lv and dd (RHP), 4 dd (GBP); Marettimo Is., -15/40 m, 3 dd (MOP); Favignana Is. -15/30 m, 1 dd (PAP); Golofo di Carini, from fishermen, -50/70 m, 41 lv, 14 dd (GBP); Grado, 3 lv (GBP); Chioggia, 1 lv (RHP), 1 lv (PAP); Lido di Venezia, -28 m, 2 lv, 1 dd (RHP); Falconara Marittima, Ancona, beach, 3 dd (GBP); Silvi Marina, Pescara, 2 dd (GBP); Cupra Marittima, beach, 2 dd (GBP).
Tunisia: Bizerta, 1 lv (GFP).
Malta: St. Julian’s Bay, shell grit -15 m, 1 dd (PAP); Wied-izz-Zurrieq, shell grit -36 m, 1 dd (PAP).
Slovenia: Punta Grossa, -2 m, on algae, 4 lv (GBP); Punta Grossa -23 m amidst Cystoseira, 4 lv (FCP); Portorose, shell grit, 1 dd (GBP).
Croation: Salvore, from fishermen, 14 lv, 7 dd (GBP); Salvore, from fishermen, -20 m, 2 lv (FCP); Spalato, from fishermen, -60 m, 2 lv (GBP); Zadar, -1/5 m, under rocks, 2 lv (FCP); Rovinj, from fishermen, 1 lv (PAP).
Greece: Saronikos Gulf, from fishermen, 2 dd (GBP).
Turkey: Tenedos (Bozcaada), from fishermen, -60 m, 3 lv (GBP).

**Ocinebrina corallinoides** (Pallary, 1912)

Tunisia: Gulf of Gabès: Kerkennah, beach, 4 dd (GBP); Sidi Youssef, beach, 11 dd (SDP), 19 dd (GBP); Sfax, fishing nets residuals, 1 lv (MOP); Borj Djillidj, Djerba, 2 lv (GBP); Bou Grara, littoral, 3 lv (RHP); NW of Bou Grara Sea, -10/15 m, 2 paratypes of *O. aciculata exilis* Houart, 2001 (RHP).

**Ocinebrina reinai** Bonomolo and Crocetta n. sp.

Italy: Livorno, 43°33’33”, 010°13’E trawler residuals, 1 dd (RHP), 1 dd (WHP); Capraia Island, 43°01’N, 009°51’E, 4 lv, 1 dd (GBP), 1 dd (FCP), 1 dd (MRP), 1 dd (FDP); Montalto di Castro, 42°18’N, 011°33’E, shell grit nets, 1 dd (GBP); off Ladiospili, gill nets, 3 lv, 1 dd (GBP); “Secche di Tor Paterno” Marine Protected Area: Stn R2 (41°36’13”N, 012°20’30”E, *Posidonia oceanica* patches on hard substratum, foliar layer, -24 m); Stns SP4-SP5 (41°36’13”N, 12°20’30”E, *P. oceanica* field on soft substratum, rhizome layer, -26 m) Stn S1 (41°36’13”N, -12°20’30”E, horizontal coralligenous substratum with rare *Eunicella* spp., -25 m), Stn S22 (41°36’13”N, 012°20’30”E, horizontal coralligenous substratum with rare *Eunicella* spp., -20 m), Stn R2 (41°36’13”N, 012°20’30”E, *Posidonia oceanica* patches on hard substratum, foliar layer, -24 m); Stns SP2-SP3 (41°36’21”N, 012°20’28”E, *P. oceanica* patches on hard substratum, rhizome layer, -26 m), Stns SP4-SP5 (41°36’13”N, 12°20’30”E, *P. oceanica* field on soft substratum, rhizome layer, -26 m) 8 lv used for genetics (SP3-04, R2-02, SP4-02, SP4-17, SP4-18, SP3-02, S1/BAU1038, S22/BAU1039); Pozzuoli, 40°48’N, 104°06’E, gill nets, 2 lv (PSP); Procida Island, 40°46’N, 014°01’E, snorkelling, in *P. oceanica* patches, 1 lv, (GFP); -38 m, dredge, 1 dd (GBP); Marina di Paio, 40°37’N, 014°18’E, gill nets, 2 lv (SDP); Mergellina, 40°49’N, 14°13’E beached, 4 dd (GBP); Capri Island, 40°34’N, 014°12’ E, 1 lv, 4 dd (GBP), 2 lv, -10 m, shell grit (GBP); Tavolara Island (Sardinia), 40°54’N, 009°42’E, 1 lv, 1 dd (GBP).

**Ocinebrina aciculata** (Lamarck, 1822)

Channel Islands: Guernsey, 3 lv (RHP).
France: Erquy, on harbour wall at very low tide, 6 lv (RHP), 3 lv, 3 dd (GBP); Le Verdelet, 3 lv (RHP); St. Lunaire, 3 lv (RHP); Roscoff, 5 lv (RHP). Corsica, region of Calvi, 1 lv, 1 dd (RHP); Calvi, many lv and dd (RHP); Barneville (Normandie), on rocks at low tide, 4 lv (GBP); L’Arcouest, on rocks at low tide, 2 lv (GBP); Painpelt, -15 m among oysters, 2 lv, 2 dd (GBP); Mont S. Michel, beach, 1 dd (GBP).