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SPECIES OF THE GENUS *MERCURIA* BOETERS, 1971 (CAENOGASTROPODA: TRUNCATELLOIDEA: HYDROBIIDAE) FROM THE EUROPEAN MEDITERRANEAN REGION, MOROCCO AND MADEIRA, WITH DESCRIPTIONS OF NEW SPECIES

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ABSTRACT: Anatomy and morphology of *Mercuria* species of the Mediterranean region and Madeira were examined. Four new species of *Mercuria*, *M. rolani* n. sp., *M. tingitana* n. sp., *M. bakeri* n. sp. and *M. targuasensis* n. sp., are described based on conchological and anatomical evidence. An identification key and a distribution map of *Mercuria* of the Mediterranean region and Madeira are also provided.

KEY WORDS: *Mercuria,* distribution, Mediterranean region, Madeira, new descriptions

INTRODUCTION

Representatives of the genus *Mercuria* Boeters, 1971 are widely distributed in the Atlantic coastal regions from Ireland, Great Britain (KERNEY 1999), The Netherlands (GITTENBERGER et al. 1998) and France (BOETERS 1971) to Portugal and Morocco (BACKHUYS & BOETERS 1974, BOETERS 1988), as well as in the Mediterranean region from France (BOETERS 1971, CLANZIG & BERTRAND 2001, GIRARDI 2003) to North Africa (BOETERS 1976, GLÖER et al. 2010). Species of this genus also occur in the islands of the Mediterranean region (BOETERS 1988).

When BACKHUYS & BOETERS (1974) published their results of an expedition to Morocco, they listed *Mercuria confusa* Frauenfeld, 1863 as the only member of the genus. BOETERS (1976, 1988) mentioned *M. balearica* (Paladilhe, 1869) and *M. emiliana* (Paladilhe, 1869) from Spain, and *M. confusa* and *M. punica* (Letourneux et Bourguignat, 1887) from Tunisia. GLÖER et al. (2010) added *M. pycnocheilia* (Bourguignat, 1862), *M. globulina* (Letourneux et Bourguignat, 1887), *M. saharica* (Bourguignat, 1887), *M. bourguignati* Glöer, Bouzid et Boeters, 2010 and *M. gauthieri* Glöer, Bouzid et Boeters, 2010 from Algeria.

BOETERS (in BECKMANN 1987: 8) reported *M. confusa* and BOETERS & BECKMANN (1991) *M. kobelti* (Westerlund, 1892) from Malta, both treated by GIUSTI et al. (1995) as *M.* cf. *similis* (Draparnaud, 1805). From the Balearic Islands, BECKMANN (2007) listed *M. balearica* from Menorca and PATZNER & GLÖER (2013) added *M. balearica* from Ibiza as a new record. ROLÁN (1998) reported on finding *M. balearica* in Madeira.

Because the type material of *Cyclostoma simile* in Draparnaud's collection was lost, BOETERS & FALKNER (2000) designated the lectotype of *Mercuria confusa* (Frauenfeld, 1863) [*Amnicola*] as the neotype of *Cyclostoma simile* Draparnaud, 1805. GIRARDI (2003) synonymised *M. emiliana* as a junior synonym of *M. similis*. He examined two French populations, that is from the Bouches-du-Rhône and from the Pyrénées-Orientales. BODON's (in GIRARDI 2003: 86,

figs 2A–B) anatomical drawings show a slight variation of penis morphology between different localities and also within populations.

The aim of this paper is to elucidate the controversial taxonomic interpretations of *Mercuria* species as well as to describe new species of the genus from Morocco and Madeira.

MATERIAL AND METHODS

The new material was collected with a sieve and preserved in 75% ethanol. Dissections and measurements of the shells and genitalia were carried out using a stereo microscope, photographs were taken with a Leica digital camera system. In addition, we used literature sources and materials listed in the text. All the geographical coordinates are in WGS84 standard.

We do not follow the standard terminology for hydrobiid morphological descriptions of HERSHLER & PONDER (1998), because it is too rough and not suitable to describe small differences in the shell shape of the *Mercuria* species under discussion. We add terms ovate and short-conical to those used by HERSHLER & PONDER (1998: 6).

Abbreviations: BOE – HANS BOETERS Collection (München); Coll. Glöer – PETER GLÖER Collection (Hetlingen); FWE – FRANK WALTHER Collection (Essen); MHNG-BGT – BOURGUIGNAT Collection (Muséum d'Histoire Naturelle de Genève); MNHN – Muséum National d'Histoire Naturelle (Paris); SMF – Forschungsinstitut Senckenberg (Frankfurt am Main); SMNS – Staatliches Museum für Naturkunde Stuttgart; SMNS-FAL – GERHARD FALKNER Collection (Staatliches Museum für Naturkunde Stuttgart); ZMH – Zoological Museum, Centre of Natural History, University of Hamburg.

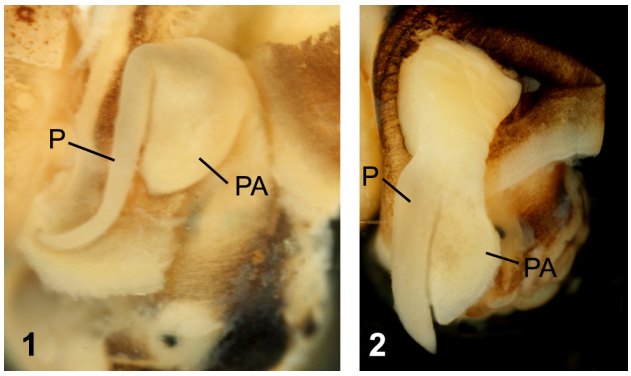
SYSTEMATIC PART

Family: Hydrobiidae Stimpson, 1865

Genus: *Mercuria* Boeters, 1971

Type species: *Mercuria similis* (Draparnaud, 1805) [= *Cyclostoma simile* Draparnaud, 1805]

The genus *Mercuria* can be identified based on the morphology of the partly black pigmented penis lacking any outgrowth, but provided with a more or less broad lap-like appendix. The penis can be long and slim (Fig. 1) or as short as the penial appendix (Fig. 2). The bursa copulatrix is nearly cylindrical, and the female reproductive tract bears one small receptaculum. The shell is whitish translucent, especially in the region of aperture and columella.



Figs 1–2. Penis types of *Mercuria* species: 1 – *M. similis*, Spain, Mallorca, La Albufera, Canal de Sivana (BOE 1150), 2 – *M. balearica*, Spain, Menorca, Mahon, Colarsega river (BOE 2330 ex 0966). Abbreviations: P – penis, PA – penial appendix

The following species live in the European Mediterranean region, in Morocco, Algeria, Tunisia, and on Madeira (Fig. 3).

Mercuria similis (Draparnaud, 1805)

Cyclostoma simile DRAPARNAUD 1805: 34, pl. 1, fig. 15. Type locality [restricted for *Amnicola confusa* by BOETERS (1971: 175)]: "Gallia mer.[idionalis]".
Amnicola confusa FRAUENFELD 1863: 1029. Original sites: "[1] aus Frankreich [label: "Gallia mer.[idionalis]"] and [2] Sicilien".
Mercuria confusa – BOETERS 1971: 178 and 179, fig. 10.
Mercuria emiliana – BOETERS 1988: 208, figs 92–93; 210, figs 118 and 125; 211 and pl. 3, fig. 34.
Mercuria similis – BOETERS & FALKNER 2000: 37.
Mercuria emiliana – CLANZIG & BERTRAND 2001: 45, fig. 1.
Mercuria similis [partim] – GIRARDI 2003: 83–86, figs 1 A–C and E–F.
Mercuria similis – GARGOMINY et al. 2011: 317.

Material examined: (i) France, Bouches-du-Rhône, Stes.-Maries de la Mer, brook ca. 2.5 km NW village; M. FALKNER & G. FALKNER leg., 15.06.2002; coll. Glöer, SMNS-FAL and BOE 2612. (ii)–(iv) Spain, Mallorca: (ii) La Albufera, brook at Puebla; E. G. BURMEISTER leg., 05.03.1983; BOE 1148; (iii) La Albufera, Canal de Sivana, W. RÄHLE leg., 05.03.1983; BOE 1150; (iv)

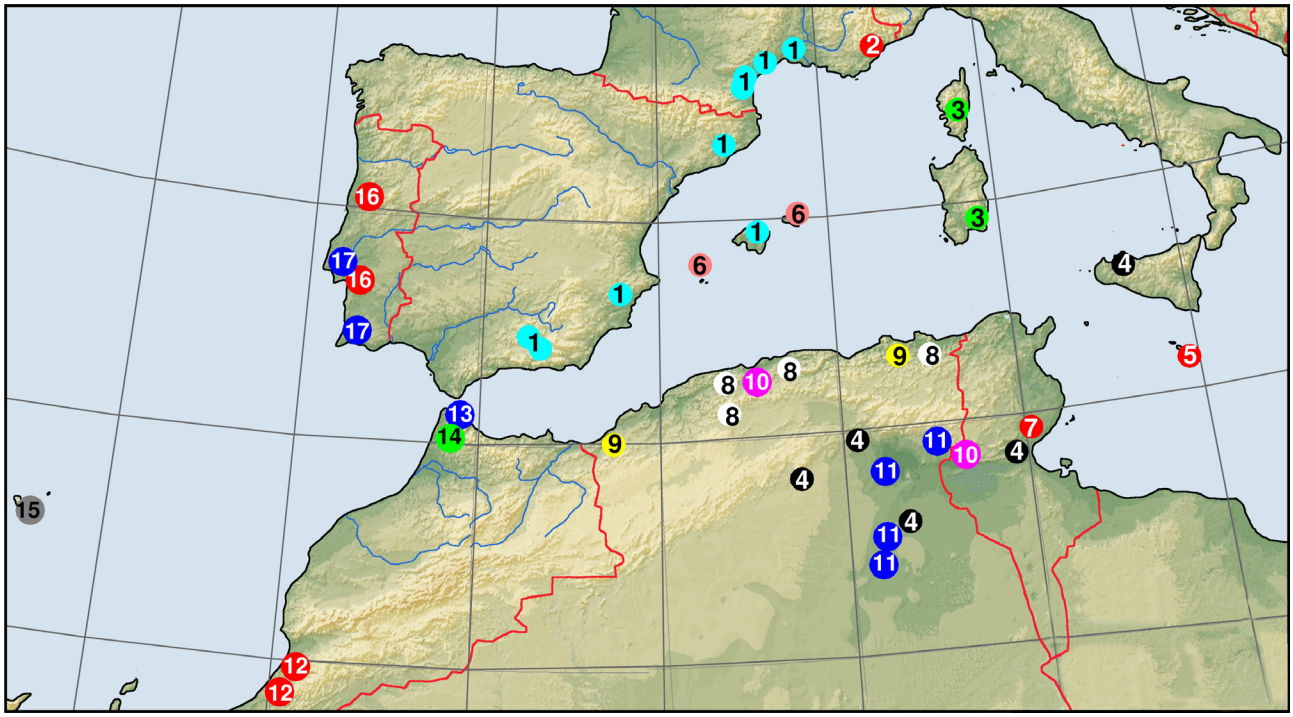


Fig. 3. Distribution of *Mercuria* species in the Mediterranean region and Madeira: 1 – *M. similis*, 2 – *M. meridionalis*, 3 – *M. zopissa*, 4 – *M. saharica*, 5 – *M. melitensis*, 6 – *M. balearica*, 7 – *M. punica*, 8 – *M. globulina*, 9 – *M. gauthieri*, 10 – *M. bourguignati*, 11 – *M. pycnocheilia*, 12 – *M. targouasensis* n. sp., 13 – *M. tingitana* n. sp., 14 – *M. bakeri* n. sp., 15 – *M. rolani* n. sp., 16 – *M. tachoensis*, 17 – *M. edmundi*

Pto de Pollenca, E. G. BURMEISTER leg., 01.03.1983; BOE 2989.
Shell (Fig. 4): The shell is short-conical, with a large oval aperture.
Penis (Fig. 1): The penis is long and slim, acute at its distal end, the penial appendix is broad and shorter than the penis which lies on the appendix (GIRARDI 2003: figs 1 A–C and E–F).
Distribution (Fig. 3): *M. similis* is distributed along the western Mediterranean coastal region of France. According to BOETERS & FALKNER (2000: 39) at least specimens from the Étang de Scamandre (Bouches-du-Rhône) are certainly conspecific. BOETERS (1988: 212) mentioned this species as *M. emiliana* also from Mallorca and the Spanish Mediterranean coast.
Remarks: It is assumed that the neotype of *M. similis* was collected on the French Mediterranean coast in the environs of Montpellier where Draparnaud lived. The shells of *M. similis* from the Étang de Scamandre (Bouches-du-Rhône) east of Montpellier are 3.8–4.8 mm high (BOETERS & FALKNER 2000: 39). The shells of *M. similis* from Vic-la-Gardiole (Hérault) west of Montpellier are 3.90–4.50 mm high (BOE 3200).

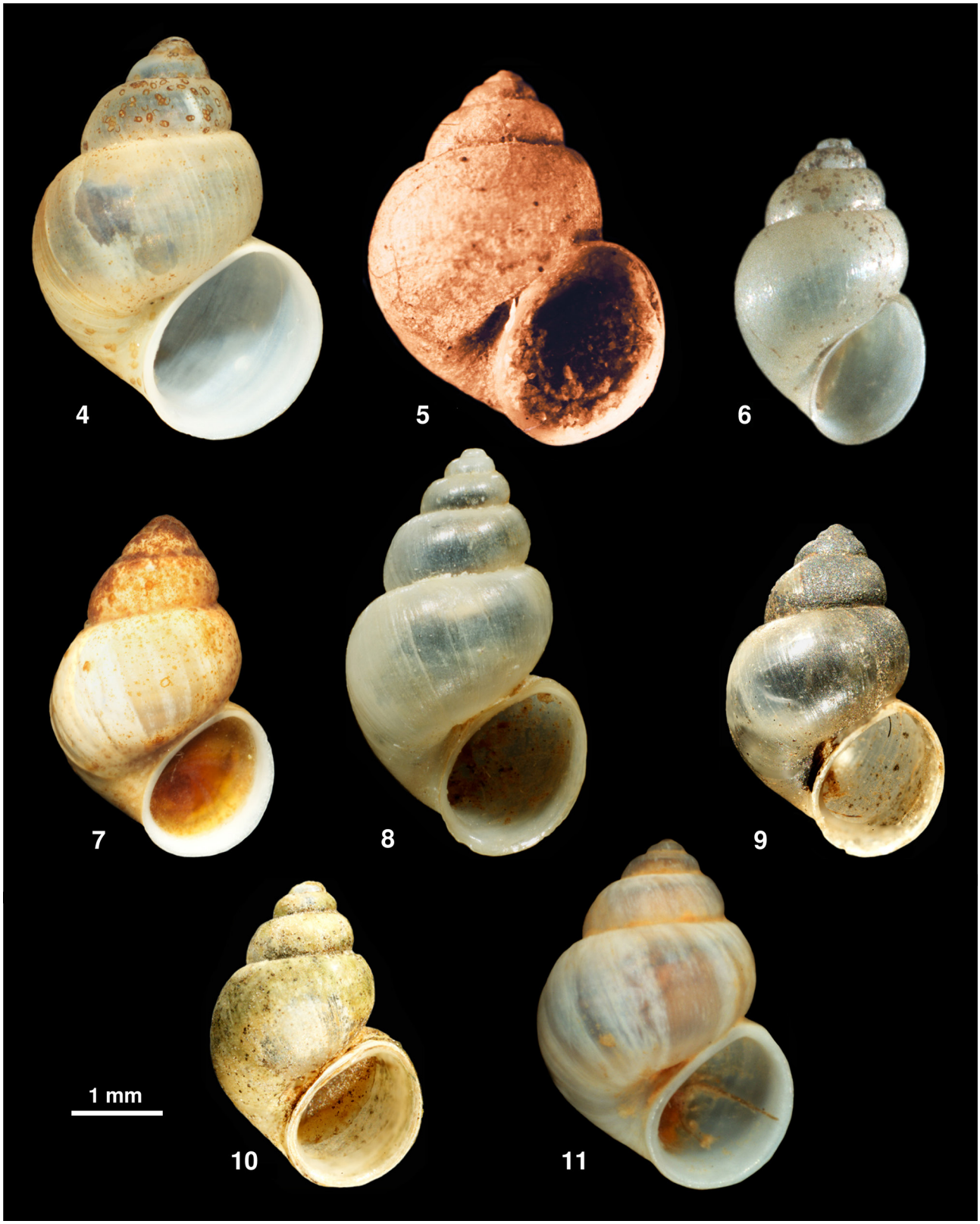
Mercuria meridionalis (Risso, 1826)

Bithynia meridionalis RISSO 1826: 100. Original area: "de l'Europe méridionale et particulièrement de celles des environs de Nice et des Alpes Maritimes" [title]; "Fossés aquatiques. App. Printemps".
Amnicola similis – CAZIOT 1910: 471, pl. 8, figs 2 and 5.
Amnicola moutonii – CAZIOT 1910: 471, pl. 8, figs 3–4.
Mercuria confusa [partim] – BOETERS 1971: 175.
Mercuria similis – GIUSTI 1979: 7 figs 4c1–4c4.
Mercuria meridionalis – GARGOMINY et al. 2011: 317.

Material examined: France, Alpes-Maritimes, Nice; SMF 119 945/20 and 266 447/3.
Shell (Fig. 5): The shell is short-conical, with a large oval aperture.
Penis: The penis has a broad lap-like appendix of about the same length as the penis (BOETERS 1971: 178, fig. 7, GIUSTI 1979: 7, figs 4c1–4c4).
Distribution (Fig. 3): This species has been reported from the French departments Var and Alpes-Maritimes. It is (if not extinct) distributed along the eastern Mediterranean coastal region of France.

Mercuria zopissa (Paulucci, 1882)

Amnicola zopissa PAULUCCI 1882: 338–339, pl. 9, fig. 9. Type locality: "Habitat in Mons Sette Fratelli dicto. Sardiniae. ... Tutte venero raccolte in una pozza sul monte dei sette Fratelli." [All of them have been collected in a pool on the Mountain of the Seven Brothers.]
Thermhydrobia zinnigasensis PAULUCCI 1882: 340, pl. 9, fig. 7. Type locality: "Habitat in fons thermalis prope Zinnigas Sardiniae".
Mercuria zopissa – GIUSTI 1979: 1–14, figs 1–6.



Figs 4–11. Shells of *Mercuria* species of the European Mediterranean region, Morocco and Madeira: 4 – *M. similis*, Spain, Mallorca, La Albufera, Canal de Sivana (BOE 1150), 5 – *M. meridionalis*, France, Alpes-Maritimes, Nice (SMF 119 945), 6 – *M. zopissa*, Italy, Sardinia, Monte dei Sette Fratelli (SMF 252 038), 7 – *M. balearica*, Spain, Menorca, Mahon, Colarsega river (BOE 2330 ex 0966), 8 – *M. rolani* n. sp., Madeira, Madalena do Mar (BOE 3337), 9 – *M. tingitana* n. sp., Morocco, Tangier-Tétouan, Tangier towards Ksar es Seghir (coastal road at km 11), 10 – *M. bakeri* n. sp., Morocco, Tangier-Tétouan, Taghramt 3.5 km towards N, 11 – *M. targouasensis* n. sp., Morocco, W Targouasensis and NW Goulimine (BOE 0570)

Mercuria zopissa – GIUSTI & PEZZOLI 1980: 23, figs 9A–E.

Material examined: Italy, Sardinia, Monte dei Sette Fratelli; F. GIUSTI leg.; SMF 252 038/7.
Shell (Fig. 6): The shell is ovate, 2.8–3.6 mm in height.
Penis: The penis is as long as the penial appendix.
Distribution (Fig. 3): *M. zopissa* is distributed in Corsica (FALKNER et al. 2002) and Sardinia and seems to be restricted to these islands.

Mercuria balearica (Paladilhe, 1869)

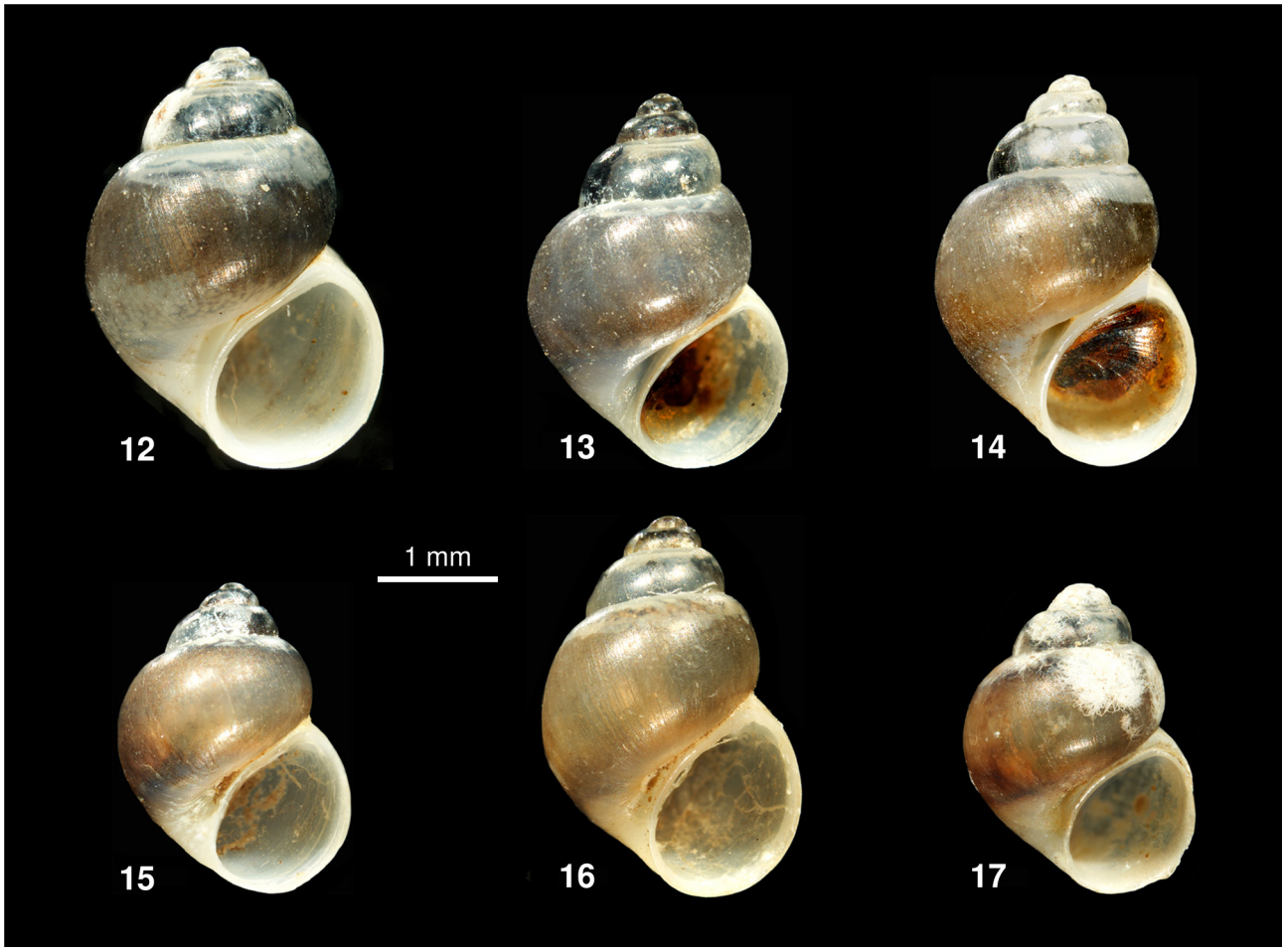
Amnicola balearica PALADILHE 1869: 237 [113]. Type locality: "de Port-Mahon [Menorca] (îles Baléares)".
Mercuria balearica – BOETERS 1988: 208, figs 104–107; 210, figs 114–117, 128; pl. 3, fig. 32.
Mercuria balearica – BECKMANN 2007: 39, fig. 15.

Material examined: Spain, Menorca, Mahon, Colarsega river; H. D. BOETERS leg., 06.1980; BOE 2330 ex 0966.
Shell (Fig. 7): The shell is ovate-conical.
Penis (Fig. 2): The penial appendix does not branch off in the same plane, but the penis is positioned on the appendix (BOETERS 1988: 210, figs 114–117).
Distribution (Fig. 3): This species is known from Menorca and Ibiza. The record from Granada given by BOETERS (1988: 209) requires confirmation.
Remark: ROLÁN (1998) reported this species also from Madeira and described it as having an elongated conical shell, up to 4.5 mm high, and a long and thin penis with a broad penial appendix. However, as regards Menorca, the original description mentions shell height of 3 mm, which was confirmed by BOETERS (1988: pl. 3, fig. 32) and BECKMANN (2007: 39). Thus, the species inhabiting Madeira cannot be regarded as *M. balearica*, but will be described below as *M. rolani* n. sp.

Mercuria melitensis (Paladilhe, 1869) comb. nov.

Amnicola melitensis PALADILHE 1869: 235, pl. 19, figs 16–17 [Sep.: 111, pl. 5 figs 16–17]. Type locality: "de Malte, Large Valley près La Valette".
Mercuria cf. *confusa* and *Mercuria* sp. – BECKMANN 1987: 7, 8, fig. 3; pl. 1, figs 1–2.
Mercuria cf. *confusa* and *Mercuria kobelti* – BOETERS & BECKMANN 1991: 181, figs 1–2; 182, figs 3–4.
Mercuria cf. *similis* – GIUSTI et al. 1995: 131, figs 57–63; 133, figs 68–71; 135, figs 72–79.

Material examined: (i)–(ii) Island Malta, Wied-tal Bahrija [corr.: non Wied-Tal Mthaleb; cf. BOETERS & BECKMANN 1989]: (i) C.I. SAMMUT leg., 10.1986; SMF 309 200; BOE 1361/shells and 3111/shells; (ii) C.I. SAMMUT leg., ?1988; BOE 2992/shells and 1412/animals. (iii) Gozo, Munxar, Slendi river; E. G. BECKMANN leg., 16.11.1986; SMF 309 199; BOE 2644/animals ex 1362.
Shell (Figs 12–17): ovate-conical, more or less tumid, opaque white, surface smooth, with thin growth lines, not very glossy; spire formed by 4–5 convex whorls, body whorl 3/4 of shell height; umbilicus open; aperture oval-pyriform, upper margin angled; peristome continuous, thickened, sometimes doubled, slightly reflected at lower and columellar margins; upper angled margin of peristome not reflected, inside usually thickened, outside with growth striae (mainly after GIUSTI et al. 1995: 130). Height 2.9–3.8 mm, diameter 1.9–2.8 mm (GIUSTI et al. 1995: 130).
Operculum: Chestnut-coloured.
Animal: Mantle with black pigmentation. Ctenidium with 26 lamellae (1 ♀; GIUSTI et al. 1995: 133. fig. 69).
Male: The base of penis is corrugated, the penis itself is slender and of the same length as the appendix, which is flat, leaf-like, rhombic or triangular; penis and neighbouring area of appendix are slightly black pigmented.
Female: Renal oviduct with small receptaculum arising from the oviduct proximally close to the duct of the large sac-like bursa (GIUSTI et al. 1995: 133. figs 69, 71).
Habitat and distribution (Fig. 3): In springs and brooks in Malta and Gozo, often together with *Pseudamnicola moussonii magozensis* (BOETERS & GLÖER 2015).
Differential diagnosis: Specimens of *M. melitensis* from the Maltese Islands have the shell height of 2.9–3.8 mm, i.e. they are smaller than the shells of *M. similis* (3.8–4.8 mm, see above). Furthermore, the shell of *M. similis* is conical, while in the species from the Maltese Islands it is elongated conical to elongated oval. A thickened peristome (see GIUSTI et al. 1995: 131, figs 57–63) is characteristic of the specimens from the Maltese Islands. The penial appendix in *M. similis* shows a marginal bulge (GIRARDI 2003: 86, fig. 2A centre and right) which is absent in *M. melitensis*. The females of *M. similis* have an elongated oval bursa (GIRARDI 2003: 86, figs 2A–B); in the female specimens from the Maltese Islands the bursa is less elongated (BOETERS & BECKMANN 1991: 180, fig. 2; GIUSTI et al. 1995: 133. figs 69 and 71.
Remarks: BOETERS (in BECKMANN 1987) recorded *M.* cf. *similis* (as *M.* cf. *confusa*) from the Maltese Islands, i.e. Gozo, and BOETERS & BECKMANN (1991) added *M. kobelti* from Malta. GIUSTI et al. (1995) confirmed *M.* cf. *similis* for the Maltese Islands and treated *Amnicola melitensis* Paladilhe, 1869 and *Paludinella* (*P.*) *kobelti* Westerlund, 1892 as its junior synonyms. Meanwhile BOETERS & FALKNER (2000) and GIRARDI (2003) improved our knowledge of *M. similis*. Consequently, the species inhabiting the Maltese Islands cannot be regarded as *M. similis*.



Figs 12–17. Shells of *M. melitensis,* Maltese Islands, Malta, La Valette, Large Valley (syntypes of *Amnicola melitensis* Paladilhe, 1869; MHNG-BGT/9)

Three out of the seven shells depicted by GIUSTI et al. (1995: 131, figs 61–63) are syntypes of *Amnicola melitensis* Paladilhe, 1869 and they seem to represent the same species as the remaining four shells referred to as *M.* cf. *similis* (GIUSTI et al. 1995: 131, figs 57–60). The fact that *Amnicola melitensis* is a representative of the genus *Mercuria* is indicated by the whitish bases of the shells of the syntypes, especially in the region of the umbilicus. We believe that the specimens from Malta, anatomically identified as *Mercuria*, are conspecific with the syntypes of *Amnicola melitensis*.

"Mercuria" kobelti (Westerlund, 1892)

Paludinella (*Pseudamnicola*) *kobelti* WESTERLUND 1892: 199.

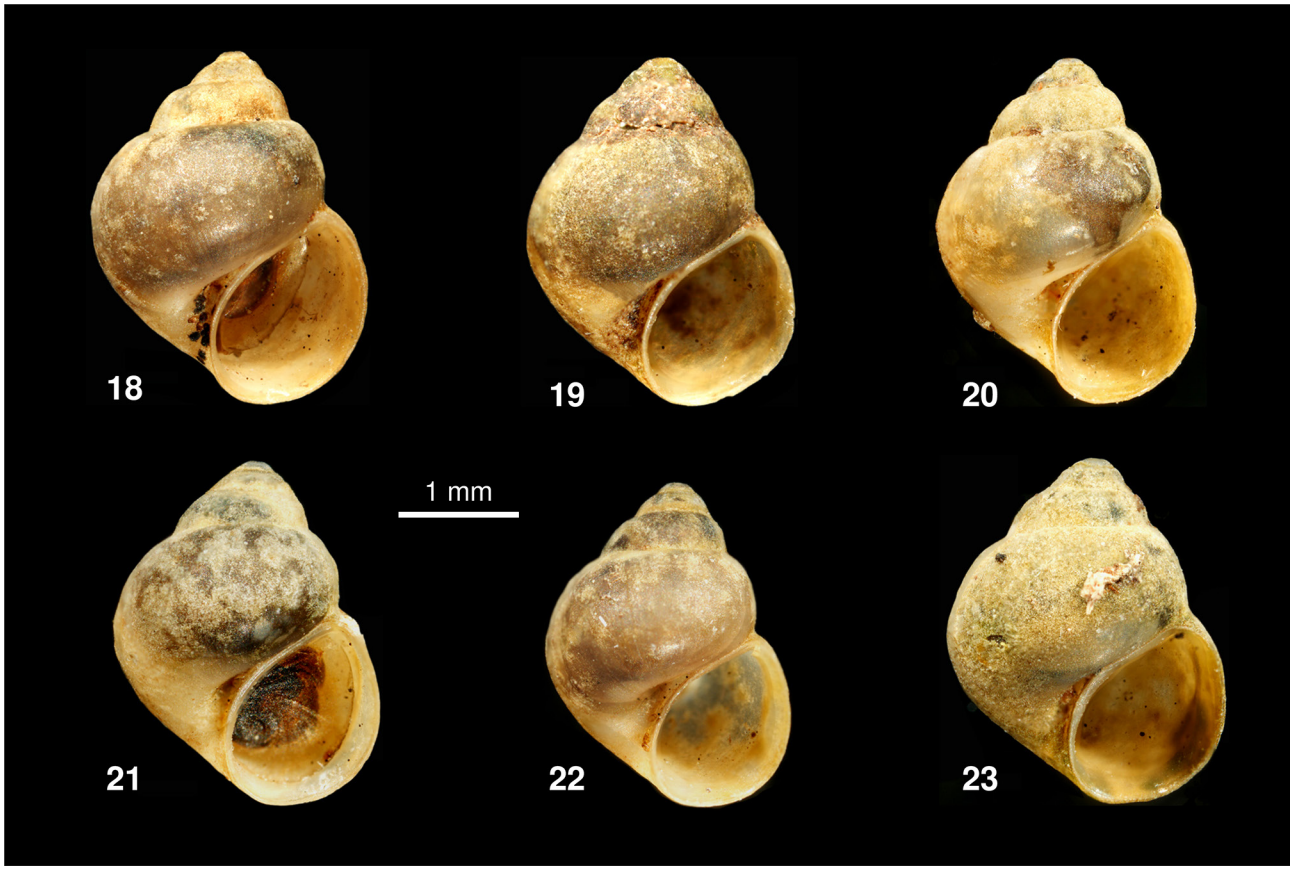
WESTERLUND (1892) described *P.* (*P.*) *kobelti* with reference to a shell figured by KOBELT (in ROSSMÄSSLER 1891) as *Pseudamnicola cochii* Benoit [Code 12 and 16 (a) (i)]. Six shells are deposited under SMF 142 144 (Figs 18–23). Their three labels read:

– *Paludina Cocchii* Benoit Malta
– *Pseudamnicola cocchii* (Benoit) Orig. Ic. 834 (Syntypen) Malta ex Benoit [handwriting Zilch]
– *Mercuria* cfr. *similis* (Drap.) = M. cfr. *confusa* sensu Boeters F. GIUSTI & C. MANGANELLI rev. 1991

Whereas KOBELT (in ROSSMÄSSLER 1891) described the shell as greenish horn-coloured [grünlich hornfarben], the six shells deposited at the SMF (Figs 18–23) are whitish opaque, but inside partially covered by black tissue remains. In none of the six specimens is the thickening of the peristome as pronounced as in *M. melitensis*. Their measurements are given in Table 1. KOBELT (in ROSSMÄSSLER 1891) mentioned height of 3 mm and diameter of 2.5 mm.

Table 1. Shell measurements of *Paludinella kobelti* Westerlund, 1892 (SMF 142 144/6)

	height (h) [mm]	diameter (d) [mm]	h : d
	2.80	2.15	1.30
	2.80	2.16	1.30
	2.95	2.35	1.26
	3.025	2.50	1.21
	3.05	2.35	1.30
	3.05	2.375	1.28
mean	2.995	2.371	



Figs 18–23. Shells of *Mercuria* sp. [Maltese Islands; label: "Malta"] (syntypes of *Paludinella* (*Pseudamnicola*) *kobelti* Westerlund, 1892; SMF 142 144/6)

For the shell figured by KOBELT (in ROSSMÄSSLER 1891: pl. 134, fig. 834) the height : diameter ratio is 1.28. Since the shells do not show a thickened peristome which is characteristic of *M. melitensis*, we doubt if they represent this species. Finding new material and redescription of *Paludinella* (*Pseudamnicola*) *kobelti* are highly desirable.

Mercuria edmundi (Boeters, 1986)

Shell: The shell is ovate-conical with 4.5 convex whorls separated by a deep suture. Shell height 3.0–3.5 mm, width 2.2–2.5 mm.
Penis: Penis as long as the penial appendix (BOETERS 1986: 126, figs 4–6, 1988: pl. 3, fig. 33).
Distribution (Fig. 3): Portugal.

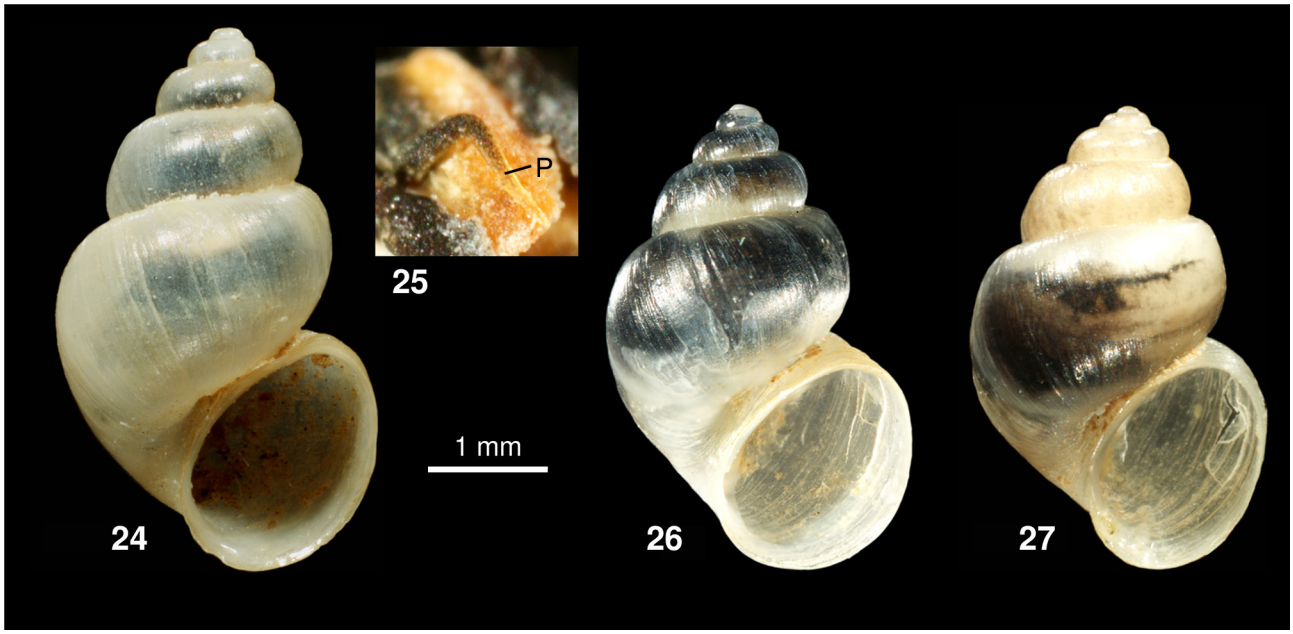
Mercuria tachoensis (Frauenfeld, 1865)

Shell: The shell is conical with 4.5 slightly convex whorls, small, 2.9 mm in height and 1.5 mm in width.
Penis: The penis is longer than the penial appendix, the penis lies beside or beneath the appendix (BOETERS 1988: 210, figs 108–111, pl. 3, figs 30–31).
Distribution (Fig. 3): Portugal.

Mercuria rolani n. sp.

Mercuria balearica – ROLÁN 1998: 25.

Material examined: (i) CHANOINE BARRETO GOUVEIA leg. (MNHN-Colas/1); (ii) R. SOYER leg. (MNHN-Soyer/1); (iii) Arco do Calheta, wet rocky wall in village [label: "quellige Felswand im Ort"]; U. JUEG leg., 23.07.2011; coll. Glöer; (iv) Madalena de Mar, high rocks with water trickling from a spring [label: "hohe überrieselte Felsen"], W. RÄHLE leg., 07.04.1984; BOE 3337.
Holotype: shell height 4.70 mm, diameter 2.80 mm, ZMH 79914.
Paratypes: 1 ex. ZMH 79915, 1 ex. coll. Glöer; 74 ex. BOE 3337.
Type locality: Madeira, Madalena do Mar, 32°42'00.49"N, 17°08'03.12"W.
Etymology: Named after Emilio Rolán, who published this species for the first time.
Shell (Figs 8, 24, 26–27): The greyish to whitish shell is conical. The 5.5 whorls are convex with a deep suture. The aperture is oval and slightly diagonal, the peristome is thickened at the columella, the umbilicus is slit-like. Shell height 4.0–4.7 mm, diameter 2.7 mm, shell height : width ratio 1.7, aperture height : shell height 0.4, spire height to shell height 0.3.



Figs 24–27. *Mercuria rolani* n. sp.: 24 – holotype, 25 – penis of a dried specimen, 26, 27 – paratypes; Madeira, Madalena do Mar (BOE 3337). Abbreviation: P – penis

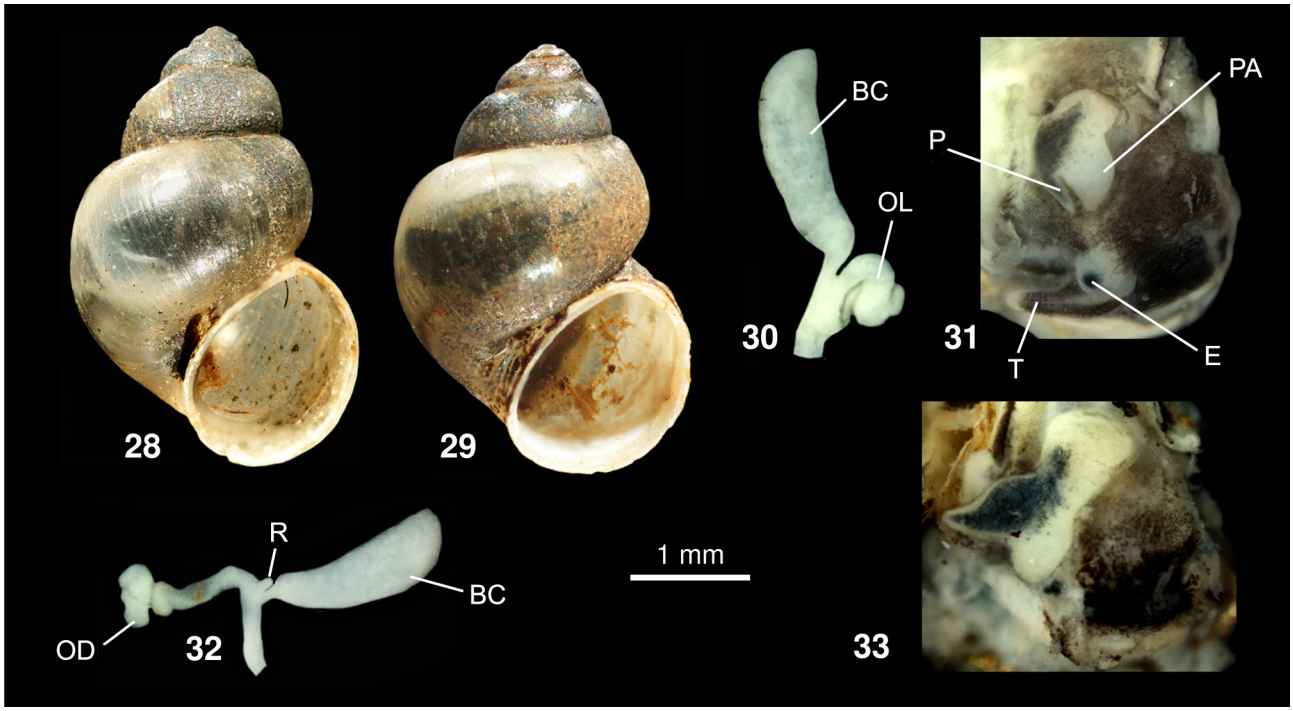
Operculum: Light orange.
Animal: Unknown except for the long, slanted, blackish pigmented penis (Fig. 25).
Habitat and distribution (Fig. 3): In both known localities on wet rocky ground. Known from the type locality and Arco do Calheta.
Differential diagnosis: The shell resembles slightly the Moroccan *M. bakeri* n. sp., but *M. rolani* n. sp. is much larger.

Mercuria tingitana n. sp.

Holotype: shell height 3.8 mm, diameter 2.4 mm, ZMH 79910.
Paratypes: 20 ex. ZMH 79911, 18 ex. coll. Glöer, 40 ex. FWE.
Type locality: Morocco, Tangier-Tétouan, Tangier towards Ksar es Seghir at km 11 (coastal road), 35°49'00.5"N, 5°43'38.6"W, 90 m a.s.l.
Etymology: The name *tingitana* derives from Tingis, the ancient name of Tangier.
Shell (Figs 9, 28, 29): The conical shell is greyish to whitish and somewhat variable with respect to the height : width ratio. The 5.5 whorls are slightly convex with a shallow suture. The body whorl is prominent. The aperture is oval and the peristome slightly flanged at the columella, the umbilicus is open. Shell height 3.5–3.8 mm, diameter 2.4–2.5 mm. Shell height to width ratio 1.5, aperture height to shell height 0.5, spire height to shell height 0.3.
Operculum: Dark orange.
Animal: The mantle is dark brown with a white border. The head is black, with eye spots visible. Penis (Figs 31, 33) short and dark pigmented at the right side and as long as the whitish penial appendix (n = 2 ♂♂). The female genital tract (Figs 30, 32) has a large bursa copulatrix and one small receptaculum.
Habitat and distribution (Fig. 3): The new species was found in a swampy area around a small artificial pond. Only known from the type locality.
Associated species: *Physa acuta*.
Differential diagnosis: The penis morphology resembles that of *M. meridionalis*. *M. tingitana* n. sp. can be distinguished from *M. meridionalis* and also *M. similis* due to its smaller size (see: Fig. 9 versus Figs 4 and 5). In *M. balearica* the whorls are much more vaulted. In *M. edmundi* the whorls are more convex with a deeper suture. The shell is slightly smaller, at most 3.5 mm in height. *M. tachoensis* is much smaller than *M. tingitana*, with the maximum shell height of 2.9 mm and width of 1.5 mm, and the penis is longer than the penial appendix. The Algerian species differ in their shell shape.

Mercuria bakeri n. sp.

Holotype: Shell height 3.5 mm, diameter 2.2 mm, ZMH 79912.
Paratypes: 4 ex. ZMH 79913, 1 ex. coll. Glöer, 3 ex. FWE, 4 ex. destroyed by dissection.
Type locality: Morocco, Tangier-Tetouan, Taghramt 3.5 km towards N, 35°48'54.7"N, 5°27'37.1"W, 450 m a.s.l.
Etymology: Dedicated to Roy Baker in recognition of his support of Boeters' investigations of *Mercuria anatina*.
Shell (Figs 10, 34, 35): The conical shell is greyish to whitish. The 5.5 whorls are slightly convex with



Figs 28–33. *Mercuria tingitana* n. sp.: 28 – holotype, 29 – paratype, 30, 32 – female genital tract, 31, 33 – penis in situ; Morocco, Tangier-Tetouan, Tangier towards Ksar es Seghir (coastal road at km 11). Abbreviations: BC – bursa copulatrix, E – eye spot, OL – oviducal loop, P – penis, PA – penial appendix, R – receptaculum, T – tentacle

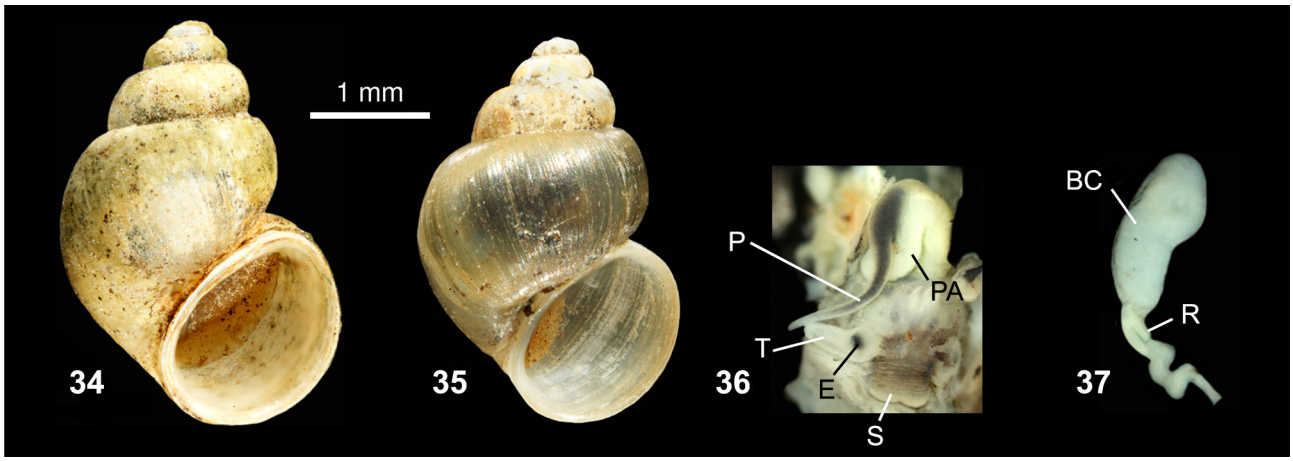
a deep suture. The body whorl is prominent. The aperture is oval and the peristome thickened at the columella, the umbilicus is slit-like to closed. Shell height 3.0–3.5 mm, width 2.2–2.3 mm. Shell height to width ratio 1.5, aperture height to shell height 0.4, spire height to shell height 0.2.

Operculum: Light orange.

Animal: The mantle is black with a white border. The head is dark grey, with eye spots visible. The penis (Fig. 36) is thin and dark pigmented and twice longer than the whitish penial appendix. Female genital tract (Fig. 37) with a large bursa copulatrix and one small receptaculum.

Habitat and distribution (Fig. 3): The species was found in masses of filamentous algae within a small natural spring surrounded by barren slopes. The habitat covers less 0.5 m^2 and is therefore highly endangered by grazing cattle. Only known from the type locality.

Differential diagnosis: The shell resembles slightly that of *M. tachoensis* (Frauenfeld, 1865), but in *M. bakeri* n. sp. the penis lies above the penial appendix and not beside it. In addition in females of *M. bakeri* n. sp. the receptaculum is larger. It can be distinguished from *M. similis, M. balearica* and *M. tingitana* n. sp. due to its long and slim penis. It differs from *M. edmundi*



Figs 34–37. *Mercuria bakeri* n. sp.: 34 – holotype, 35 – paratype, 36 – head with penis in situ, 37 – female genital tract; Morocco, Tangier-Tetouan, Taghramt 3.5 km towards N. Abbreviations: BC – bursa copulatrix, E – eye, P – penis, PA – penial appendix, R – receptaculum, S – snout, T – tentacle

in the penis morphology: the penis is as long as the penial appendix. In *M. tachoensis* the penis lies behind or in the same plane as the penial appendix and not above it as in *M. bakeri* n. sp. In addition *M. tachoensis* is much smaller than *M. bakeri* n. sp. with the shell height of max. 2.9 mm and the width of 1.5 mm. The Algerian species differ in shell shape.

Mercuria targouasensis n. sp.

Mercuria confusa – BACKHUYS & BOETERS 1974: 113.

Holotype: shell height 4 mm, diameter 2.9 mm, ZMH 79917.
Paratypes: 5 ex. ZMH 79917, 39 ex. BOE 0570.
Type locality: Morocco, W Targouasensis and NW Goulimime at ford Oued Assaka; 29°05'31.89"N, 10°20'23.09"W; W. BACKHUYS leg., 04.03.1971; BOE 0570.
Etymology: Named after the type locality.
Shell (Fig. 11, 38, 40): The conical, tumid shell is greyish to whitish. The 5.5 whorls are slightly convex with a deep suture. The body whorl is prominent. The aperture is oval and the peristome thickened at the columella, the umbilicus is open to slit-like open. Shell height 3.1–4.0 mm, diameter 2.1–2.9 mm. Shell height to width ratio 1.4, aperture height to shell height 0.5, spire height to shell height 0.3.
Operculum: Light orange.
Animal: The penis (Figs 39, 41) is thin and dark pigmented and longer than the penial appendix. Female genitalia unknown.
Habitat and distribution (Fig. 3): In the river, Oued Assaka, at waterfalls on stones and in wet mosses. Only known from South Morocco.

Differential diagnosis: The shell is somewhat similar to *M. meridionalis* and *M. similis*, but both are larger (see: Fig. 11 versus Figs 4 and 5).

Mercuria punica (Letourneux et Bourguignat, 1887)

Peringia punica LETOURNEUX & BOURGUIGNAT 1887: 154–155.
Mercuria punica – BOETERS 1976: 96, figs 8–9; 97, 99, figs 19–22.

Type locality: "Cours d'eau aux alentours de Kebilli, dans le Nefzaoua".
Distribution (Figs. 3): The type locality is the only known site of occurrence.

Mercuria gauthieri Glöer, Bouzid et Boeters, 2010

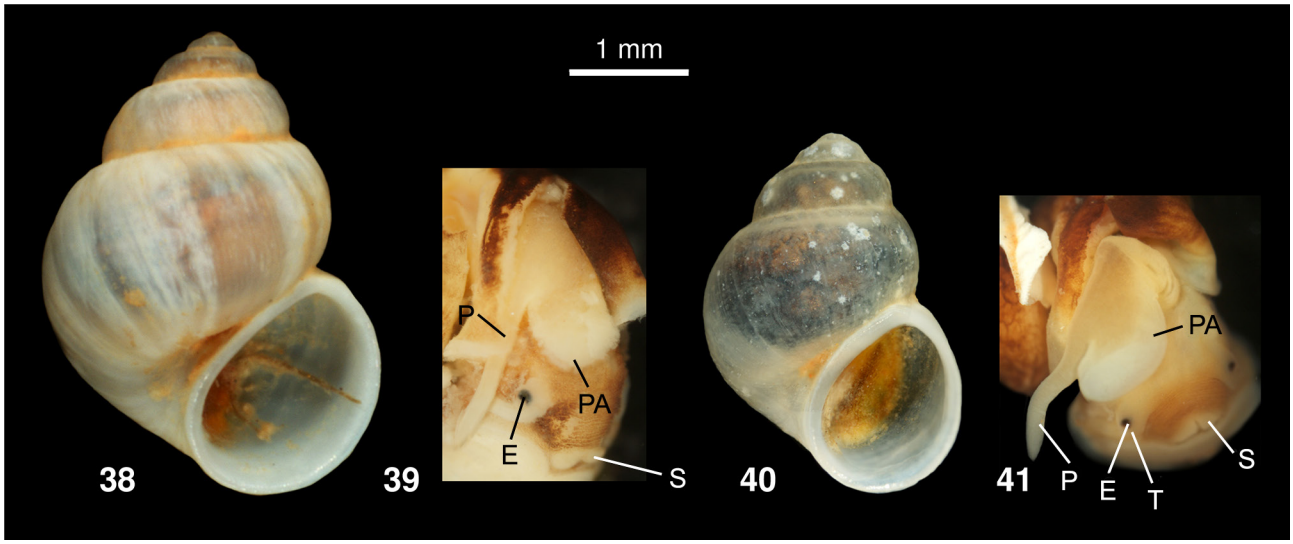
Mercuria gauthieri GLÖER et al. 2010: 17, fig. 75; 19, figs 91–94; 20.

Type locality: "près de Nemours [Ghazaouet]".
Distribution (Fig. 3): This species is apparently confined to the westernmost part of the Algerian coast (GLÖER et al. 2010: 20).

Mercuria pycnocheilia (Bourguignat, 1862)

Bythinia [sic] *pycnocheilia* BOURGUIGNAT 1862: 103.
Mercuria pycnocheilia – GLÖER et al. 2010: 16–17, figs 74, 79–82.

Type locality: "à Temascin [Temacin], près de Tuggurt [Touggourt]."



Figs 38–41. *Mercuria targouasensis* n. sp.: 38 – holotype, 39, 41 – head with penis in situ, 40 – paratype; Morocco, W Targouasensis and NW Goulimine (BOE 0570). Abbreviations: E – eye, P – penis, PA – penial appendix, S – snout, T – tentacle

Distribution (Fig. 3): Sahara depression and adjacent areas (GLÖER et al. 2010: 16).

Mercuria globulina (Letourneux et Bourguignat, 1887)

Amnicola globulina LETOURNEUX & BOURGUIGNAT 1887: 147.
Mercuria globulina – GLÖER et al. 2010: 17, figs 77, 83–84.

Original localities: "Tala, El-Kis, près de Feriana, ainsi que dans le bassin du temple du Djebel Zaghouan".
Distribution (Fig. 3): Central and eastern parts of the Tell (GLÖER et al. 2010: 17).

Mercuria saharica (Letourneux et Bourguignat, 1887)

Amnicola saharica LETOURNEUX & BOURGUIGNAT 1887: 144.
Amnicola subscalaris LETOURNEUX & BOURGUIGNAT 1887: 144.
Mercuria confusa – BOETERS 1976: 96.
Mercuria saharica – GLÖER et al. 2010: 17–19, figs 76, 85–88.

Type locality: *A. saharica* "dans les eaux des puits artésiens de Sidi-Reched", *A. subscalaris* "en Algerie à Mokta-el-Qued, entre Djelfa et Boghar".
Distribution: Sahara depression and adjacent areas, central Hauts Plateaux and coastal regions of Algeria and Tunisia (GLÖER et al. 2010: 19).

Mercuria bourguignati Glöer, Bouzid et Boeters, 2010

Mercuria bourguignati GLÖER et al. 2010: 17, fig. 78; 19, figs 89–90.

Type locality: "Ksar el Boukhari".
Distribution (Fig. 3) : Eastern and central Tell and central Hauts Plateaux (GLÖER et al. 2010: 20).

Table 2. Identification key for the Mediterranean *Mercuria* spp. from Europe and Morocco*:

01.	Shell conical, 4.8 mm in height, aperture height to shell height 0.4, Madeira	*Mercuria rolani*
01'.	Shell smaller than 4.8 mm	2
02.	Shell conical, up to 4.5 mm, broad body whorl, large aperture, penis longer than penial appendix	*Mercuria similis*
02'.	Shell smaller than 4.5 mm	3
03.	Shell conical, up to 4.1 mm, aperture large, broad body whorl, penis as long as penial appendix, Mediterranean coast of France and Spain, Mallorca	*Mercuria meridionalis*
03'.	Body whorl not broad	4
04.	Shell short-conical, up to 4 mm, aperture height to shell height 0.4, penis longer than penial appendix, S-Morocco	*Mercuria targouasensis*
04'.	Shell smaller than 4 mm	5
05.	Shell height up to 2.9 mm, 1.5 mm in width, conical, penis longer than penial appendix, Portugal	*Mercuria tachoensis*
05'.	Shell larger than 2.9 mm in height and broader than 1.5 mm	6
06.	Shell ovate, up to 3.6 mm, aperture height to shell height 0.5, penis as long as penial appendix, Corsica and Sardinia	*Mercuria zopissa*
06'.	Shell ovate-conical or conical	7
07.	Shell ovate-conical	8
07'.	Shell conical	9
08.	Shell up to 3.8 mm, aperture height to shell height 0.5, penis as long as penial appendix, Malta	*Mercuria melitensis*
08'.	Shell up to 3.5 mm, aperture height to shell height 0.4, penis as long as penial appendix, Portugal	*Mercuria edmundi*
09.	Shell conical, up to 3.8 mm, aperture height to shell height 0.5, penis as long as penial appendix, Menorca and Ibiza	*Mercuria balearica*
09'.	N-Morocco	10
10.	Shell conical, up to 3.8 mm, aperture height to shell height 0.4, penis as long as penial appendix	*Mercuria tingitana*
10'.	Shell conical, up to 3.5 mm, aperture height to shell height 0.5, penis longer than penial appendix	*Mercuria bakeri*

* For identification key of the Algerian species see: GLÖER et al. 2010.

(?) *Mercuria* sp. (1)

Material examined: Morocco, S-Morocco, Mirhleft, along Oued Salogmad borders, in the river and in water basins [label: "im Fluss und in Wasserbecken"]; W. BACKHUYS leg., 05.03.1971; BOE 0488.

BACKHUYS & BOETERS (1974: 113) mentioned a Moroccan occurrence of *Mercuria,* as *M. confusa* from Mirhleft, but the question of its identity requires further investigations.

(?) *Mercuria* sp. (2)

Material examined: Western Sahara / Sahara occidentale (under Moroccan administration), southern bord [borde meridionale] of Saguia El-Hamra, 15 km E of El Aaiún, El Meseier (manantial); A. COBOS leg., 20.02.1975; BOE 0656/animals and 2420/shells.

Mercuria has not been reported from the Western Sahara. The question of its identity remains open.

For the identification key to all the Mediterranean species of *Mercuria* from Europe and from Morocco see Table 2.

DISCUSSION

We compared the new species of *Mercuria* with all other *Mercuria* species known from the Mediterranean region. The penis morphology in combination with the shell characters are sufficient for species identification. There are species with a conical shell which have a long and slender penis as well as species with very similar shells but with penis as short as the penial appendix. Thus it is hardly possible to distinguish species based their shells only.

It should be noted that while some *Mercuria* species are widely distributed, others seem to be regionally restricted in their occurrence (Fig. 3). On most islands representatives of the genus *Mercuria* seem to be endemic, such as *M. balearica* in Menorca and Ibiza, *M. melitensis* in the Maltese Islands and *M. rolani* n. sp. in Madeira.

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