

The genus *Mercuria* Boeters, 1971 in France (Gastropoda: Caenogastropoda: Hydrobiidae). West-European Hydrobiidae, Part 13

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ABSTRACT

The *Mercuria* Boeters, 1971 species living in the coastal zones of France are reviewed. In the Atlantic zone the genus *Mercuria* comprises four species: *M. anatina* (Poiret, 1801), *M. baudoniana* (Gassies, 1859), *M. bayonnensis* (Locard, 1894) and *M. sarahae* (Paladilhe, 1869); in the Mediterranean zone we discriminate three species: *M. meridionalis* (Risso, 1826), *M. similis* (Draparnaud, 1805), and *M. corsensis* n. sp. *Mercuria sarahae* is represented by two subspecies, *M. s. sarahae* and *M. s. vindilica* (Paladilhe, 1870). *Mercuria corsensis* n. sp., a close sister species to the Sardinian *M. zopissa* (Paulucci, 1882) lives only in the extreme South of Corsica. *Amnicola emiliana* Paladilhe, 1869, does not belong to the genus *Mercuria* but must be attributed to *Pseudamnicola* Paulucci, 1878. Lectotypes for *Bythinia* [sic] *bayonnensis* Locard, 1894, *Bythinia* [sic] *baudoniana* Gassies, 1859, *Amnicola lanceolata* Paladilhe, 1869, *Amnicola sarahae* Paladilhe, 1869, *Amnicola vindilica* Paladilhe, 1870 and *Bithynia meridionalis* Risso, 1826 are designated. For *Amnicola emiliana* a neotype is designated. In addition the systematic position of the genus *Mercuria* is discussed which results in the introduction of a new monotypic subfamily, Mercuriinae n. subfam. The new Corsican species *M. corsensis* n. sp. is with an average height of 3.10 mm and a diameter of 2.20 mm slightly larger and more inflated than *M. zopissa*, which is reflected by a ratio of height of aperture to total height of c. 52% instead of 42–44%. In *M. corsensis* n. sp. the last whorl before the aperture does neither descend nor ascend, while it clearly descends in *M. zopissa*. Further, the identity of the following nominal taxa is discussed: *Bithynia* [sic] *moutonii* Dupuy, 1849, *Amnicola spirata* Paladilhe, 1869, *Paludestrina brevispira* Paladilhe, 1870, *Paludina cerulea* Massot, 1872 and *Amnicola lutetiana* Locard, 1893. Finally, ecological preferences and the endangerment of the species mentioned for France are discussed.

KEY WORDS

Mollusca,
Mercuriinae,
Atlantic coastal area,
Mediterranean coastal area,
lectotypification,
neotypification,
new combination,
new subfamily,
new species.

RÉSUMÉ

Le genre Mercuria Boeters, 1971 en France (Gastropoda: Caenogastropoda: Hydrobiidae). Hydrobiidae Ouest-européennes, Partie 13.

Les espèces du genre *Mercuria* Boeters, 1971, vivant dans les zones côtières de France sont révisées. Dans la zone atlantique, *Mercuria* comprend quatre espèces : *M. anatina* (Poiret, 1801), *M. baudoniana* (Gassies, 1859), *M. bayonnensis* (Locard, 1894), *M. sarahae* (Paladilhe, 1869); dans la zone méditerranéenne, nous différencions trois espèces : *M. meridionalis* (Risso, 1826), *M. similis* (Draparnaud, 1805) et *M. corsensis* n. sp. *Mercuria sarahae* est représentée par deux sous-espèces, *M. s. sarahae* et *M. s. vindilica* (Paladilhe, 1870). *Mercuria corsensis* n. sp., espèce très voisine de l'espèce sarde *M. zopissa* (Paulucci, 1882) se trouve seulement dans l'extrême sud de la Corse. *Amnicola emiliana* Paladilhe, 1869, n'appartient pas au genre *Mercuria*, mais doit être classée dans le genre *Pseudamnicola* Paulucci, 1878. Des lectotypes sont désignés pour *Bythinia* [sic] *bayonnensis* Locard, 1894, *Bythinia* [sic] *baudoniana* Gassies, 1859, *Amnicola lanceolata* Paladilhe, 1869, *Amnicola sarahae* Paladilhe, 1869, *Amnicola vindilica* Paladilhe, 1870 and *Bithynia meridionalis* Risso, 1826. Un néotype est désigné pour *Amnicola emiliana*. La position systématique du genre *Mercuria* est discutée avec pour résultat l'introduction d'une nouvelle sous-famille monotypique, les Mercuriinae n. subfam. La nouvelle espèce de Corse, *M. corsensis* n. sp., avec une hauteur moyenne de 3,10 mm et un diamètre de 2,20 mm, est plus large et plus renflée que *M. zopissa*. Cela se reflète aussi dans le rapport de la hauteur de l'ouverture sur la hauteur de la coquille, *c.* 52 % contre 42-44 % chez la sous-espèce nominale. De plus, chez *M. corsensis* n. sp., le dernier tour de la coquille avant l'ouverture ne descend, ni ne monte, contrairement à *M. zopissa*, chez qui il descend clairement. En outre, l'identité des taxons nominaux suivants est discutée : *Bithynia* [sic] *moutonii* Dupuy, 1849, *Amnicola spirata* Paladilhe, 1869, *Paludestrina brevispira* Paladilhe, 1870, *Paludina cerulea* Massot, 1872, et *Amnicola lutetiana* Locard, 1893. Finalement, les préférences écologiques et les menaces qui pèsent sur les espèces mentionnées pour la France sont discutées.

MOTS CLÉS

Mollusca,
Mercuriinae,
façade atlantique,
façade méditerranéenne,
lectotypification,
neotypification,
combinaison nouvelle,
sous-famille nouvelle,
espèce nouvelle.

INTRODUCTION

A modern review of all species of *Mercuria* Boeters, 1971 living in France does not exist. Not more than scattered contributions to a better understanding have been published since the genus has been recognised as an independent taxonomic unit. First, Boeters in 1971 described the genus *Mercuria* with anatomical and conchological data (Boeters 1971). He based his investigations on a population from Draguignan (Var) and gave a sample to Giusti who confirmed the anatomical characters (Giusti 1979). In 1988, when reviewing Hydrobiidae of the Iberian Peninsula, Boeters reported also species of *Mercuria* at the French Mediterranean coast and mentioned *M. confusa* (Frauenfeld, 1863) and *M. emiliana* (Paladilhe, 1869). Boeters & Falkner (2000) designated the holotype of *Amnicola confusa* as neotype of *Cyclostoma simile*, by which nomenclatural act these long disputed nominal taxa have become objective synonyms. In 2001 Clanzig & Bertrand (2001) tried to improve the understanding of *M. emiliana*. One year later Falkner *et al.* (2002) published a list of all French species of *Mercuria* as a step towards a revision. They supplemented their list by critical comments and especially a discussion of the nomenclatural status of *Mercuria*. Again, two years later Girardi (2004) treated *M. emiliana* as a junior synonym of *M. similis* and stated that the latter species is the only representative of *Mercuria* along the entire French Mediterranean coast. The updated checklist of Gargominy *et al.* (2011: 317, 318) follows Falkner *et al.* (2002) with the only

exception that the authors synonymise *M. emiliana* in the former understanding with *M. similis*. This view urged us to critically check the list as given by Falkner *et al.* (2002) and to complete the announced revision.

Following our present revision, the genus *Mercuria* comprises in France the following seven species: *Mercuria anatina* (Poiret, 1801), *M. baudoniana* (Gassies, 1859), *M. bayonnensis* (Locard, 1894), *M. meridionalis* (Risso, 1826), *M. sarahae* (Paladilhe, 1869), *M. similis* (Draparnaud, 1805), and *M. corsensis* n. sp. *Mercuria sarahae* will be described as a polytypic species with two subspecies, i.e. the nominate subspecies and *M. s. vindilica* (Paladilhe, 1870).

The following differentiation of species is based not only on conchological and anatomical features, but also on ecological data. It cannot be overlooked that the distribution of all representatives of *Mercuria* is restricted to the coastal areas of the Atlantic and Mediterranean zones of France. In these regions, the species do never invade large sections of drainage areas but their populations inhabit diverse biotopes such as springs, brooks, lakes and tidal areas of rivers. These biotopes need not necessarily to be brackish.

MATERIAL AND METHODS

In its essential parts this study is based on materials which have been collected by Boeters since 1969 in all relevant regions of France (Fig. 1). This stock is complemented by donations from colleagues to the Boeters-collection and by

museum-collections, in the first place the Muséum national d'Histoire naturelle at Paris.

For the identification of typical material the collection of Bourguignat is of essential importance, as the revisions and descriptions by Paladilhe, at his time the leading author, depend largely upon material from that collection (see Paladilhe 1869: 225 [separatum: 101], footnote) which is preserved in the Geneva Museum in an excellent curatorial state.

The discrimination of species follows the classical conchological and anatomical methods. Especially the penial morphology proved to be a useful guideline. The aim of the study is thus to reach a level which in future allows a desirable fruitful genetical approach.

Techniques of shell morphology and genital anatomy: as regards shell morphology, the number of whorls was counted in accordance with Gittenberger *et al.* (1998: fig. 9) and Glöer (2002: 40, fig. 16). Height and diameter of shells and measurements of the aperture were measured with a 10 mm grid plate (0.1 mm grading) at magnification 25 ×; measurements were rounded to the nearest 0.05 mm; all measurements were taken parallel or at right angles to the axis (see Tables 1-8). Anatomical investigations were executed in accordance with Boeters (1999). In the terminology of the male copulatory organ we discriminate between the penis per se which contains the vas deferens, and the mostly bulbous appendix. Drawings of shells and animals (Figs 2, 4, 5, 7, 8, 10, 13, 14) and parts thereof were done with ZEISS 45 degree Drawing Prism. Photographs (Figs 3, 6, 9, 11) were taken with a Leica R8 digital system.

ABBREVIATIONS AND ACRONYMS

AH	aperture height;
AW	aperture width;
D	shell diameter;
H	shell height.

Scientific collections

MHNB-BER	Collection Bérillon, Muséum d'Histoire naturelle de Bayonne;
MHNG-BGT	Collection Bourguignat, Muséum d'Histoire naturelle de la Ville de Genève;
MHNT-DUP	Collection Dupuy, Muséum d'Histoire naturelle de Toulouse;
MNHN	Muséum national d'Histoire naturelle, Paris;
MNHN-JOU	Collection Jousseume, MNHN;
MNHN-LOC	Collection Locard, MNHN;
MNHN-PAS	Collection Pascal, MNHN;
MNHN-RIO	Collection Risso, MNHN;
NMW	Naturhistorisches Museum Wien;
NMW-FRD	Collection Frauenfeld, NMW;
PPSUM2-PAL	Collection Paladilhe, Pôle Patrimoine scientifique de l'Université Montpellier 2;
SMF	Senckenberg Museum Frankfurt am Main;
SMNS-FAL	Collection Falkner, Staatliches Museum für Naturkunde Stuttgart;
ZMZ	Zoologisches Museum der Universität Zürich, Zürich-Irchel;
BOE	Collection Boeters, München;
GLÖER	Collection Glöer, Hetlingen.

A list of material arranged by collections is given in the appendix.

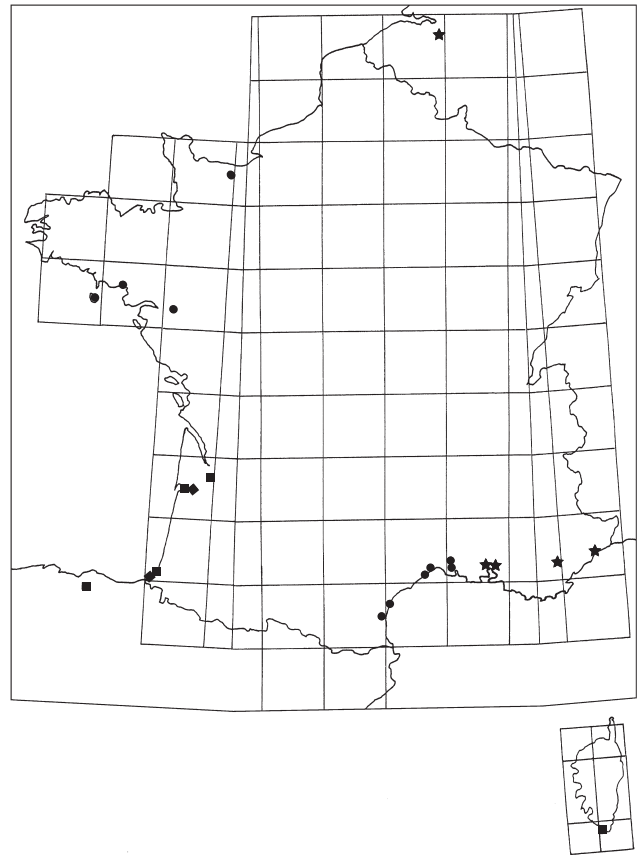


FIG. 1. — UTM squares with finding sites (for details see under "Material"). At the Atlantic coast: 4 ■, *Mercuria bayonnensis* (Locard, 1894); 2 ◆, *M. baudoniana* (Gassies, 1859); 4 ●, *M. sarahae* (Paladilhe, 1869); 1 ★, *M. anatina* (Poiret, 1801). At the Mediterranean coasts: 6 ●, *M. similis* (Draparnaud, 1805); 4 ★, *M. meridionalis* (Risso, 1826); 1 ■, *M. corsensis* n. sp.

SYSTEMATICS

Superorder CAENOGASTROPODA Cox, 1960
 Order LITTORINIMORPHA
 Golikov & Starobogatov, 1975
 Superfamily TRUNCATELLOIDEA J. E. Gray, 1840
 Family HYDROBIIDAE Troschel, 1857

Subfamily MERCURIINAE n. subfam.

TYPE GENUS. — *Mercuria* Boeters, 1971: 175.

DIAGNOSIS. — Small to medium-sized Hydrobiidae (height 2-6 mm), shell ovate-conical with pointed apex, rounded whorls, deep suture and narrowly perforate umbilicus; milky coloured, especially at the base. Operculum corneous, subspiral, slightly concave, with eccentric nucleus, external surface with rough spiral scratches directed to the outer edge; reddish, transparent, nuclear region thickened and more intensely coloured. The foot is provided with lateral foot-wings on both sides of the operculum. Tentacles long and filiform, little pigmented. Mantle dark or blackish, mantle edge with pallial tentacle, which in some species may be reduced to a knob-like protuberance. Ctenidium well developed with 20-30 filaments. Radula taenioglossate with acute mesocones in central and lateral teeth. Intestine coil around style sac tight; intestine in pallial cavity

straight. Female genitalia: renal oviduct coiled, gonopericardial duct present; one seminal receptacle distally positioned to renal oviduct, and lying against funnel-like basis of bursa copulatrix at junction with bursal duct; bursa copulatrix distally positioned to renal oviduct, and lying against albumen gland, ventral wall of pallial oviduct closed. Male reproductive organ bilobed, penial appendix bulbous without distinct glandular structures, penis proper and branching region pigmented with black. Habitat: Coastal, often fluctuating waterbodies, springs and their outflow, tide areas of rivers, brooks, coastal lakes and swamps.

DIFFERENTIATING FEATURES

Versus *Nymphophilinae* Taylor, 1966: according to Hershler *et al.* (2003: 362) the monophyletic North American *Nymphophilinae* are characterised by the unique presence of surficial glandular fields on the penis which are completely absent in all anatomically studied species of *Mercuria*. *Nymphophilinae* have a multispiral operculum, e.g., *Nymphophilus minckleyi* Taylor, 1966, the monotype of *Nymphophilus* Taylor, 1966, has an operculum with about 6 whorls (Taylor 1966: 200, fig. 20; Thompson 1979: 42, 46). In *Mercuria*, in all species the number of whorls of the operculum is less than 2 (e.g., Adam 1940: 4, fig. 2B). In the radula of *Nymphophilinae* the central tooth often tends to form a broadened and rounded mesocone; especially in *Nymphophilus minckleyi* the central tooth and the lateral tooth bear a large blunt-edged mesocone (Thompson 1979: 42, 44, fig. 10), whereas in *Mercuria* the mesocones of these teeth are acute (Adam 1940: 4, fig. 2A; Giusti 1979: 9, figs 5A, B, 11, fig. 6C).

Versus *Pseudamnicolinae* Radoman, 1977: in representatives of the *Pseudamnicolinae* the shell is brownish while in *Mercuria* it is milky. In males of *Pseudamnicola* such as *P. lucensis* (Issel, 1866), the type species, the penis is simple without any lobe (Boeters 1971: 178, fig. 3). In *Mercuria* the verge is bifurcated, composed of the penis and a lobe (e.g., Boeters 1971: 178, fig. 7). In females the duct of the seminal receptacle (RS1 sensu Radoman 1983) branches off the renal oviduct at a distance of the coiled section of the renal oviduct and closely in front of the duct of the bursa copulatrix (Boeters 1971: 178, fig. 4). In *Mercuria* the receptaculum seminis (RS2 sensu Radoman 1983) is positioned at the distal end of the coiled section of the renal oviduct (Boeters 1971: 178, fig. 8).

Genus *Mercuria* Boeters, 1971

Mercuria Boeters, 1971: 175. Type species: *Ammicola confusa* Frauenfeld, 1863, by original designation. Declared *nomen protectum* vs *Cyriacana nomen oblitum* under Art. 23.9 by Falkner *et al.*, 2002: 76.

Cyriacana Fagot, 1892: 23 [separatum: 138]. Type species: *Ammicola lanceolata* Paladilhe, 1869, by monotypy. Declared *nomen oblitum* vs *Mercuria nomen protectum* under art. 23.9 by Falkner *et al.* 2002: 76; 1893: 253 [separatum: 22].

Similiana Fagot, 1892: 24 [separatum: 139]. Invalid: junior homonym of *Similiana* Fagot, 1891 [Chondrinidae]; 1893: 253 [separatum: 22]. — Caziot 1910: 471, 541.

Anatiniana Fagot, 1892: 24 [separatum: 139]. Invalid: junior homonym of *Anatiniana* Bourguignat, 1881 [Unionidae]; 1893: 253 [separatum: 22] as *Ataninana*.

TYPE SPECIES. — *Ammicola confusa* Frauenfeld, 1863, France, recent (by original designation).

REMARKS ON THE SYSTEMATIC POSITION OF *MERCURIA*

When introducing the name *Mercuria*, Boeters (1971: 177) attributed the new genus to the family Hydrobiidae without assignment to one of the then accepted subfamilies. Some years later Thompson (1979: 47) placed *Mercuria* together with several other European genera in the redefined subfamily *Nymphophilinae*, but this concept of a European branch of the predominantly North American *Nymphophilinae* was either neglected or abandoned by European authors (Giusti & Pezzoli 1985: 120; Bodon & Giusti 1991: 27; Bernasconi 1992: 6; Boeters 1998: 23). In a molecular genetic study which was based on mitochondrial and nuclear DNA sequences Wilke *et al.* (2000: 455, 456) obtained no clear position of *Mercuria* within the Hydrobiidae, but formally still retained this genus within the *Nymphophilinae*. In a subsequent more comprehensive analysis Wilke *et al.* (2001: 9) could not assign *Mercuria* unambiguously to one of the anatomically defined and genetically corroborated subfamilies within the Hydrobiidae and for the first time expressed the supposition that *Mercuria* might belong to a new subfamily. In a monographic study on the *Nymphophilinae* Hershler *et al.* (2003: 362) did not definitely reject the attribution of *Mercuria* to this subfamily. They saw a sister or otherwise close relationship but at the same time they stressed the strong differentiation between North American and European faunas which may even date back to the opening of the North-Central Atlantic Ocean. Finally, with a larger data set Wilke *et al.* (2012: 718, fig. 2, 722) confirmed the position of *Mercuria* as an independent clade of the Hydrobiidae which, in their Bayesian tree, formed a strongly supported sister taxon to the *Nymphophilinae*. Consequentially with this publication we described a new monotypic subfamily for *Mercuria*.

Mercuria bayonnensis (Locard, 1894)

(Figs 2A-E, 3A-E; Table 1)

Bythinia [sic] *bayonnensis* Locard, 1894: 89, 114, pl. 6, fig. 18.

ORIGINAL INDICATION OF THE TYPE LOCALITY. — “Lac de la Négresse près Bayonne (Basses-Pyrénées)”.

MATERIAL EXAMINED. — **France.** (i)-(v) Pyrénées-Atlantiques, (i) Bidart, brook Ouhabia and Herigoïn, respectively, depth about 1 m and diameter about 2 m, upstream of the mill south of Mas Bassilour about 3 km East of the coast [distance to (v) 2.5 km; UTM XP11] (BOE 2250 animals and 3185 shells ex 0364), leg. Boeters 22.IX.1970; (ii) Biarritz, “source dans la falaise” [UTM XP11] (MNHN), leg. Letellier 1949; (iii) Bayonne, district Saint-Esprit [UTM XP11] (2 samples MNHN); (iv) La Nive close to Bayonne [UTM XP11] (MHNG-BGT 5483/4 shells with dried soft parts; Bourguignat’s label: “De la Nive, près de Bayonne.- (Bass.-Pyr.)”); (v) Bayonne, Lac de la Négresse [Lac Mouriscot; UTM XP11] (MHNG-BGT 4943/3 syntypes). — Landes, (vi) Le Teich [UTM

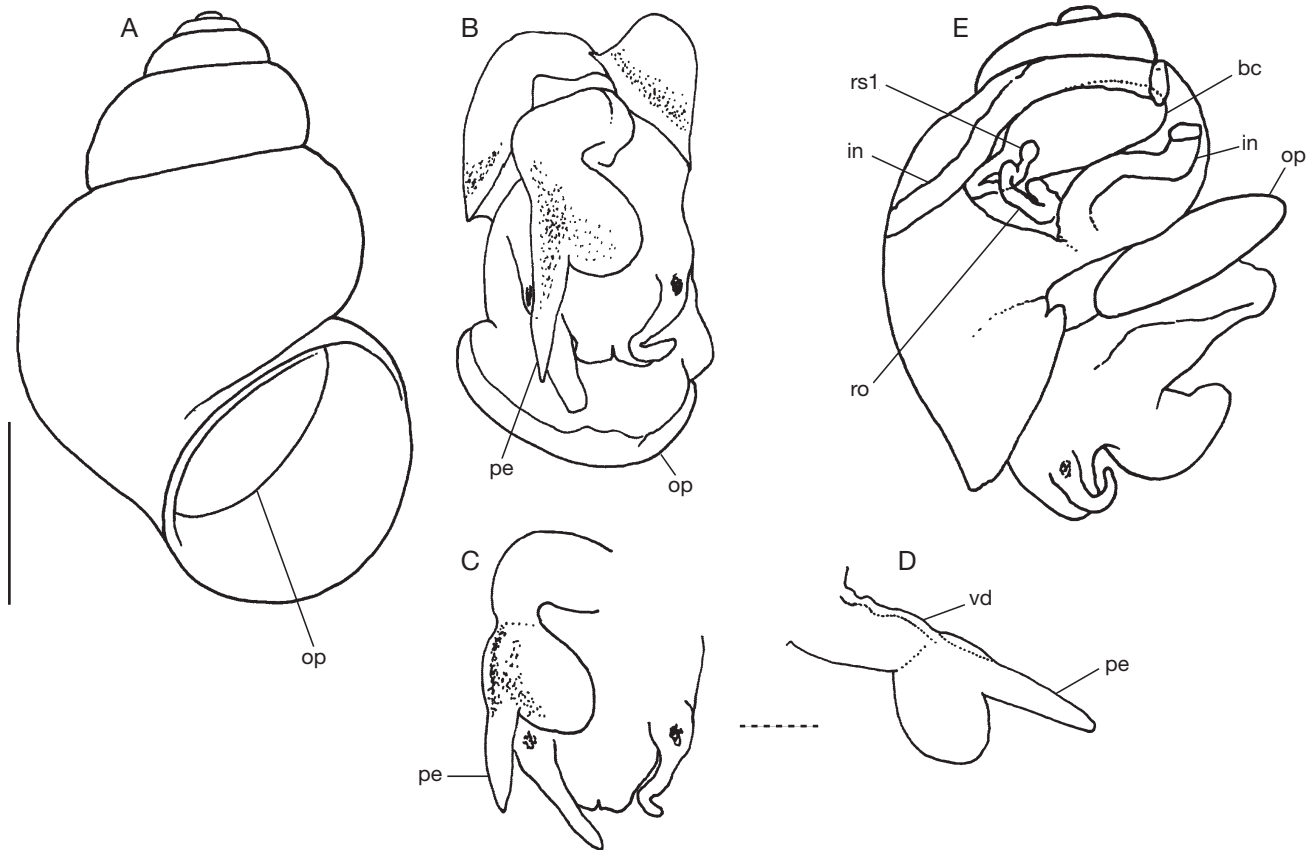


FIG. 2. — *Mercuria bayonnensis* (Locard, 1894): France, Pyrénées-Atlantiques, Bidart, farm Bassillour, river Ouhabia: Herigoïn (BOE 2250 ex 0364); **A**, shell; **B**, ♂: head and foot with copulatory organ exposed through slit in mantle; **C**, **D**, ♂ head with copulatory organ, ventral (**C**) and dorsal view (**D**); **E**, ♀, body lumen opened to show renal oviductus with receptaculum seminis (**rs1**) and bursa copulatrix surrounded by intestinal section (partially removed). Abbreviations: **bc**, bursa copulatrix; **in**, intestine; **op**, operculum; **pe**, penis; **ro**, renal oviductus; **rs1**, single receptaculum seminis; **vd**, vas deferens. Scale bar: 1 mm.

XQ54] (MNHN-PAS/3 ex de Folin [8], de Folin's label: "*Amnicola similis* var. *Baudoniana* Gassies ex auctore ipso Le Teich Gironde"). — Gironde, (vii) La Tresne [Latrese; district of Bordeaux right from the Garonne] [UTM XQ96] (MNHN-PAS/4 ex de Folin [4]). **Spain**. Vizcaya, Bilbao [UTM WN08] (NMW 92605/3, sub *anatina*), leg. Willkomm 1850.

LECTOTYPE. — MHNG-BGT 4943a (ex 4943/3); H: 3.55 mm, D: 2.47 mm, 4.8 whorls (here designated).

DISTRIBUTION AND ECOLOGY. — Neighbouring Spain, Pyrénées-Atlantiques, Landes and Gironde. *Mercuria bayonnensis* lives in coastal running waters up to springs; during the last decades it could still be collected alive in a brook at Bidart and in a coastal spring at Biarritz. At Bidart in the brook Ouhabia (Herigoïn, respectively) collected with shells of *Alzoniella haicabia* Boeters, 2000; in any case sympatric with *Theodoxus* sp. (cf. already Folin & Bérillon 1877: 453 [separatum: 31]) and *Potamopyrgus antipodarum* (Gray, 1843). As regards reports of *M. bayonnensis* from the Lac de la Négresse, Le Teich and the district Latresse in Bordeaux, the exact biotopes are unclear.

DESCRIPTION

Shell

Conical, with pointed apex and straight sidelines; last whorl about 46-47% of total height of shell; umbilicated; of transparent milky colour; 4.25-4.50 whorls, swollen and very

convex, respectively, separated by a deep suture; last whorl before the aperture neither ascending nor descending on shell wall; aperture obliquely broad ovate, a little narrowed above; peristome continuous, usually touching the shell wall over a short distance; outer margin simple, basal margin and columellar edge faintly broadened, palatal, basal and columellar margin at best slightly thickened.

Measurements

See Table 1.

Operculum

Pale reddish.

Animal

External characters. Pallial tentacle not seen. Pigmented black on both flanks of the head, on both flanks of the foot, on its sole and on the skirt of the mantle. Ctenidium with 24 gill filaments (1 ♂).

Male copulatory organ. Penis with appendix, appendix with a weak bulge; black pigment along the vas deferens and towards the appendix.

TABLE 1. — Measurements of *Mercuria bayonnensis* (Locard, 1894).

Locality	specimens measured	Shell (mm)		Aperture (mm)	
		Height	Diameter	Height	Diameter
Négresse	Lectotype	3.55	2.50	1.65	1.45
Syntypes	Paralectotype 1	3.30	2.40	1.60	1.45
MHNG-	Paralectotype 2	4.25	2.70	—	—
BGT 4943/3	Mean	3.70	2.53	—	—
(n = 3)	Range	3.30-4.25	2.40-2.70	—	—
Bidart	Specimen 1	3.30	2.30	1.65	1.45
BOE 3185	Specimen 2	3.25	—	1.65	—
(n = 4)	Specimen 3	3.55	2.50	1.75	1.45
	Specimen 4	3.10	2.20	1.65	1.25
	Mean	3.30	2.33	1.67	1.38
	Range	3.10-3.55	2.20-2.50	1.65-1.75	1.25-1.45
Biarritz	Specimen 1	2.95	2.00	1.30	1.40
MNHN	Specimen 2	2.80	2.15	1.45	1.25
(n = 24)	Specimen 3	2.90	—	1.35	—
	Specimen 4	2.95	2.05	1.40	1.15
	Specimen 5	2.90	2.05	1.40	1.20
	Specimen 6	2.90	1.90	1.35	1.15
	Specimen 7	3.00	2.10	1.45	1.25
	Specimen 8	2.70	1.90	1.25	1.15
	Specimen 9	3.10	2.20	1.45	1.25
	Specimen 10	3.00	2.10	1.40	1.35
	Specimen 11	2.50	1.90	1.20	1.15
	Specimen 12	2.60	1.90	1.30	1.10
	Specimen 13	2.85	2.00	1.35	1.20
	Specimen 14	2.95	2.15	1.50	1.30
	Specimen 15	2.85	2.00	1.45	1.25
	Specimen 16	3.15	2.10	1.50	1.30
	Specimen 17	3.05	2.05	1.50	1.20
	Specimen 18	2.35	1.85	1.30	1.10
	Specimen 19	2.90	2.15	1.45	1.30
	Specimen 20	2.65	1.90	1.35	1.15
	Specimen 21	3.00	2.00	1.40	1.20
	Specimen 22	2.70	2.00	1.45	1.25
	Specimen 23	3.10	2.25	1.45	1.25
	Specimen 24	3.10	2.15	1.45	1.30
	Mean	2.87	2.04	1.39	1.23
	Range	2.35-3.15	1.85-2.25	1.20-1.50	1.10-1.40

Female genital tract. Bursa copulatrix and one receptaculum seminis.

DIFFERENTIATING FEATURES

The shape of the shell of *M. bayonnensis* varies from less elongated to rather globular which allows a separation from *M. baudoniana* (Gassies, 1859), since the shell of *M. baudoniana* is even more elongated than that of the most elongated specimens of *M. bayonnensis*. Further, a striking feature of differentiation can be seen in the fact that *M. bayonnensis* can be accompanied by *Theodoxus* sp., whereas *M. baudoniana* is accompanied by *Anisus spirorbis* (Linnaeus, 1758) and *Omphiscola glabra* (O.F. Müller, 1774) which tolerate falling of water bodies to dryness which does not apply to *Theodoxus* sp.

In *Mercuria bayonnensis* the last two whorls are more or less smooth (as from the Nive and at Bidart and Biarritz), except for some irregularities of growth whereas in both subspecies of *M. sarahae* at least these whorls are striatulate (as at Thouaré-sur-Loire and Locmaria). Further, in males of *M. sarahae* the appendix of the copulatory organ shows a comparatively pronounced lateral bulge (compare 2B-D with Figures 4B, C and 5B-D).

REMARKS

Locard's description (1894) of his *Bythinia bayonnensis* was based on a sample in Bourguignat's collection. This type series comprises three specimens with a reddish paucispiral operculum. Thus, Locard was in error when stating: "Opercule assez enfoncé dans l'intérieur de l'ouverture, orné de stries concentriques peu fortes, presque de même teinte que le reste du test."

As regards the syntypes, one of them reminds with its elongated shell of *M. baudoniana* as described by Paladilhe in 1869 as *Amnicola lanceolata* from Saint-Jean-de-Luz about 10 km distant from the Lac de la Négresse, the type locality of *M. bayonnensis*. The other two less elongated syntypes (lectotype and one paralectotype) allow us, however, to acknowledge *Bythinia bayonnensis* as differentiated on species level from *M. baudoniana* and to attribute all other records of *Mercuria* from the Pyrénées-Atlantiques to *M. bayonnensis*. Nevertheless, it is open to question whether *M. bayonnensis* in our present understanding covers more than one species, since it has been reported from quite different biotopes such as springs, a small river (BOE 0364), and also the river Nive. Unfortunately, topotypes of *Bythinia* [sic] *bayonnensis* have not yet been collected and Locard's brief indication of the type locality as "Lac de la Négresse" leaves it open whether the three syntypes have been collected in a spring bordering the lake (such as *Alzoniella perisii* [Dupuy, 1851]), the lake itself, a tributary or an outflow.

In view of the fact that the syntypes in comparison to all other examined samples are conchologically not very homogeneous, further investigations are necessary to clarify whether these peculiarities reflect a great variability of *M. bayonnensis* or whether the syntypes must be attributed to more than one species.

The distribution area of *M. bayonnensis* extends at least up to Bordeaux. Nevertheless, a sample with shells of *Mercuria* from Plassac at the Gironde [UTM XQ89] (MNHN-PAS/4 ex de Folin) could not be attributed to this species with certainty since the whorls are somewhat striatulate as in *M. sarahae*.

The occurrence at Bayonne, Saint-Pierre-d'Irube, Bramepan [UTM XP21] (Folin & Bérillon 1877: 453 [separatum: 31]) could not be confirmed by Boeters on 28.IX.1968 (see Boeters 2000: 160; the area has meanwhile been destroyed [Gittenberger verbally]).

Mercuria baudoniana (Gassies, 1859)
(Fig. 3F-K; Table 2)

Bythinia [sic] *baudoniana* Gassies, 1859: 289-290; 1867: 129-130, pl. 1, fig. 7.

Amnicola lanceolata Paladilhe, 1869: 228, pl. 19, figs 8, 9 [separatum: 105, pl. 5, figs 8, 9].

ORIGINAL INDICATIONS OF THE TYPE LOCALITIES. — *Bythinia* [sic] *baudoniana*: "Habite : les fossés de la grande Lande voisine des prés salés, au Teich." — *Amnicola lanceolata*: "L. A. lanceolata habite les environs de Saint-Jean-de-Luz (Basses-Pyrénées)".

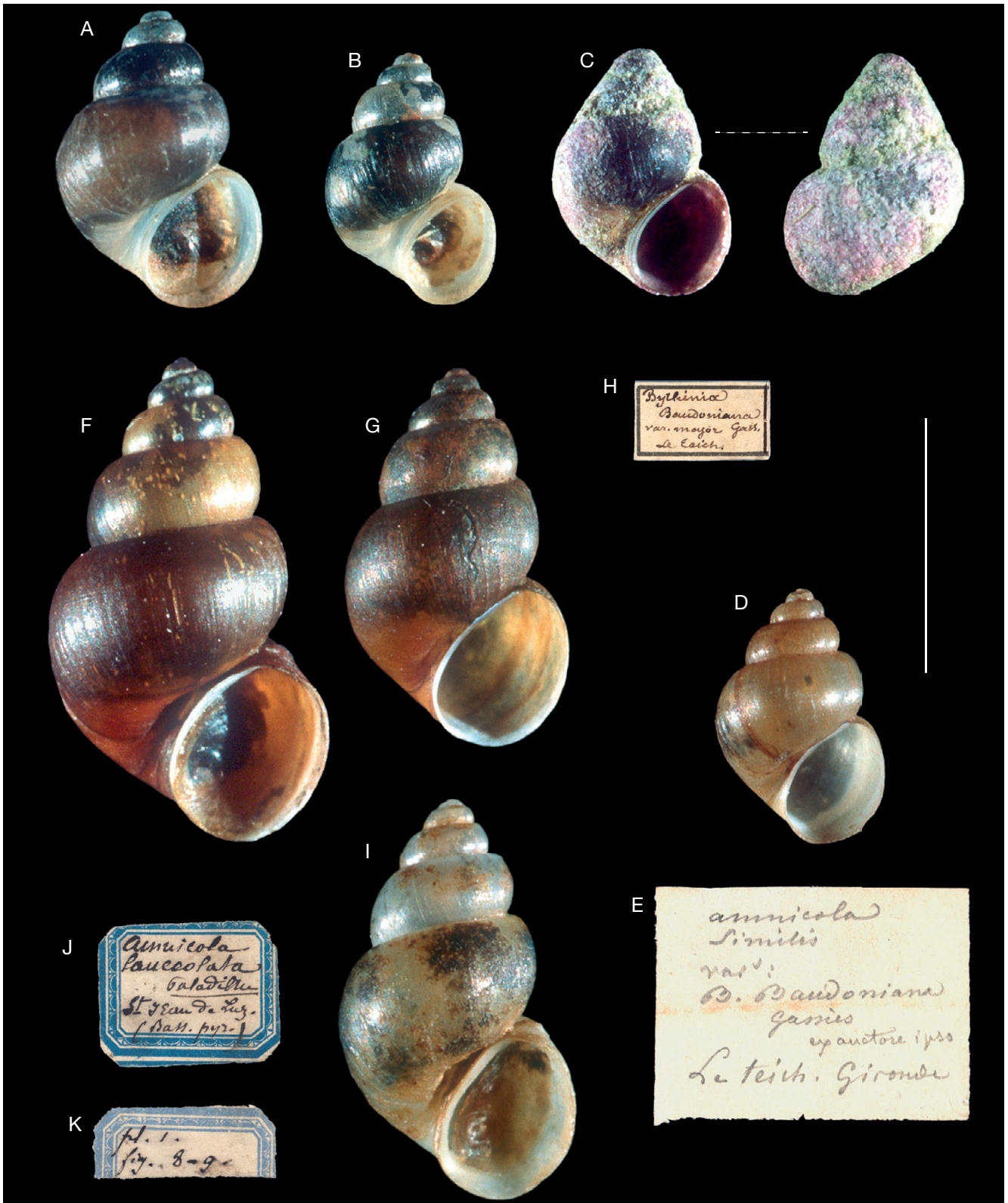


FIG. 3. — **A-E**, *Mercuria bayonnensis* (Locard, 1894): **A**, lectotype of *Bythinia* [sic] *bayonnensis*, France, Pyrénées-Atlantiques, Lac de la Négresse près Bayonne (Biarritz) (MHNG-BGT 4943a); **B, C**, France, Pyrénées-Atlantiques, Biarritz, source dans la falaise, leg. Letellier 1949 (MNHN); **B**, cleaned; **C**, specimen with camouflage, front view and back view; **D, E**, paralectotype (?) of *Bythinia* [sic] *baudoniana* Gassies, 1859 (MNHN-PAS ex de Folin), allegedly: Gironde, Le Teich; **E**, de Folin's label ["ex auctore ipso"]; **F-H**, *Mercuria baudoniana* (Gassies, 1859); **F-H**, syntypes of *Bythinia baudoniana*, France, Gironde, Le Teich, fossés de la Grande Lande voisins des près salés (MNHN); **F**, lectotype (MNHN-IM-2000-32542); **G**, paralectotype; **H**, Gassies' label; **I-K**, lectotype of *Amnicola lanceolata* (Paladilhe, 1869), France, Pyrénées-Atlantiques, Saint-Jean-de-Luz (MHNG-BGT 5437); **J, K**, Bourguignat's labels on the tube of the holotype. Scale bar: 3 mm. All reproductions of labels in this and the following figures are in natural size.

TABLE 2. — Measurements of *Mercuria baudoniana* (Gassies, 1859). * Paralectotypes 1 and 4: apex broken, height estimated.

Locality	Specimens measured	Shell (mm)		Aperture (mm)	
		Height	Diameter	Height	Diameter
Le Teich	Lectotype	5.95	3.40	2.10	2.00
MNHN (n = 6)	Paralectotype 1*	5.90	3.45	2.15	1.60
	Paralectotype 2	4.95	3.10	2.15	1.80
	Paralectotype 3	4.70	2.90	2.05	1.65
	Paralectotype 4*	4.50	2.90	2.15	1.65
	Paralectotype 5	4.60	2.75	2.05	1.70
	Mean	5.10	3.08	2.11	1.73
	Range	4.50-5.95	2.75-3.45	2.05-2.15	1.60-2.00
St Jean-de-Luz	Lectotype of	4.95	2.97	2.09	1.72
MHNG-BGT	<i>A. lanceolata</i>				
5437/1	Paladilhe, 1869				

MATERIAL EXAMINED. — France. (i) Landes, Le Teich [UTM XQ54] (MNHN/6 syntypes, label: “*Bythinia Baudoniana* var. *major* GASS. Le Taich [sic]”). — (ii) Pyrénées-Atlantiques, Saint-Jean-de-Luz [UTM XP00] (MHNG-BGT 5437/1 syntype of *Ammicola lanceolata* Paladilhe, 1869).

LECTOTYPES. — *Bythinia* [sic] *baudoniana*, MNHN-IM-2000-32542; H: 5.70 mm, D: 3.15 mm, 5.75 whorls (here designated). — *Ammicola lanceolata*, MHNG-BGT 5473/1 (orig. fig.); H: 4.70 mm, D: 2.65 mm, 5.6 whorls (here designated).

DISTRIBUTION AND ECOLOGY. — Reported only from the type localities in Landes and Pyrénées-Atlantiques. At Le Teich in ditches of saline meadows, sympatric with Planorbidae and Lymnaeidae (*Anisus spirorbis* and *Omphiscola glabra*; cf. Gassies 1859: 290).

DESCRIPTION

Shell

Elongated conical with pointed apex and straight sidelines; last whorl about 57-59% of total height of shell; umbilicated; 5.38 [5.0-5.75] whorls [n = 4], swollen and very convex, respectively, separated by a deep suture; last whorl towards aperture neither ascending nor descending; aperture obliquely broad ovate, a little narrowed above; peristome continuous, usually touching the shell wall over a short distance; outer margin, basal margin and columellar edge simple, palatal, basal and columellar margin not even slightly thickened.

Measurements

See Table 2.

Operculum

According to Gassies (1859: 290) “opercule corné, mince, d’un beau rouge orange, à spire complète”.

Animal

External features: “gris enfumé, presque noir sous le pied dont les bords sont plus pâles; tentacules filiformes, blanchâtres, gélatineux, yeux très-noirs situés à la base postérieure, mufle proboscidiiforme, noir, ridé transversalement en dessus; mâchoire, cornée, rougeâtre, arquée légèrement” (Gassies 1859: 289).

TABLE 3. — Measurements of *Mercuria sarahae sarahae* (Paladilhe, 1869).

Locality	specimens measured	Shell (mm)		Aperture (mm)	
		Height	Diameter	Height	Diameter
Erdre à Nantes	Lectotype	3.20	2.25	1.50	1.45
MHN-BGT					
5459/1					
Thouaré-sur-Loire	Specimen 1	3.35	2.50	1.80	1.49
	Specimen 2	3.25	2.28	1.58	1.29
BOE 2415	Specimen 3	2.97	2.02	1.43	1.29
(n = 4)	Specimen 4	2.95	2.00	1.43	1.23
	Mean	3.13	2.20	1.56	1.32
	Range	2.95-3.35	2.00-2.50	1.43-1.80	1.23-1.49

Anatomy

Unknown.

DIFFERENTIATING FEATURES

M. baudoniana can be distinguished from *M. bayonnensis* and *M. sarahae* by a more elongated shape of its shell. This is reflected by a ratio H : D (height: diameter of shell) of 1.61-1.67 in *M. baudoniana*, whereas in *M. s. sarahae* it is 1.54 and in *M. bayonnensis* 1.38-1.46.

REMARKS

As regards the attribute “var. *major*” on the label of the syntypes of *Bythinia* [sic] *baudoniana*, a varietas “*major*” has never been described by Gassies. Thus, this attribute is regarded as a mere descriptive term which later has been abandoned in the description.

Gassies (1859: 290 and 1867: 130) mentions as measurements of the shell of his *Bythinia* [sic] *baudoniana* “Haut. 8-12 mill. Diamètre 6-7 mill.” which neither applies to the syntypes nor to the figure given by Gassies (1867: pl. 1, fig. 7), having a height of about 6 mm. Further, the figured shell, showing a concentrically ringed operculum is in clear contradiction to the description “à spire complète”.

There is a sample with three empty shells in the collection Pascal (MNHN-PAS), received from de Folin, which might be regarded as syntypes; de Folin’s label reads: “*Ammicola similis* var. *Baudoniana* Gassies ex auctore ipso Le Teich Gironde”. However, these three shells belong to *M. bayonnensis*. Remarkably, all these three shells are empty, whereas the lectotype and the five paralectotypes show operculum and dried animals. It is open to question whether de Folin himself added “Le Teich” bona fide.

Paladilhe’s description of his *Ammicola lanceolata* was very probably based on a single specimen from Bourguignat’s collection since it is possible to identify this specimen with Paladilhe’s figures disregard of the fact that the label refers to these figures. But as Paladilhe indicated a variation in the number of whorls it cannot be excluded that he had further specimens at his disposal. Therefore we prefer to designate the specimen from Bourguignat’s collection as Lectotype.

Topotypes of *Ammicola lanceolata* have not yet been collected. From the biotope described by Gassies for his *M. baudoniana* it might, however, be concluded that this species

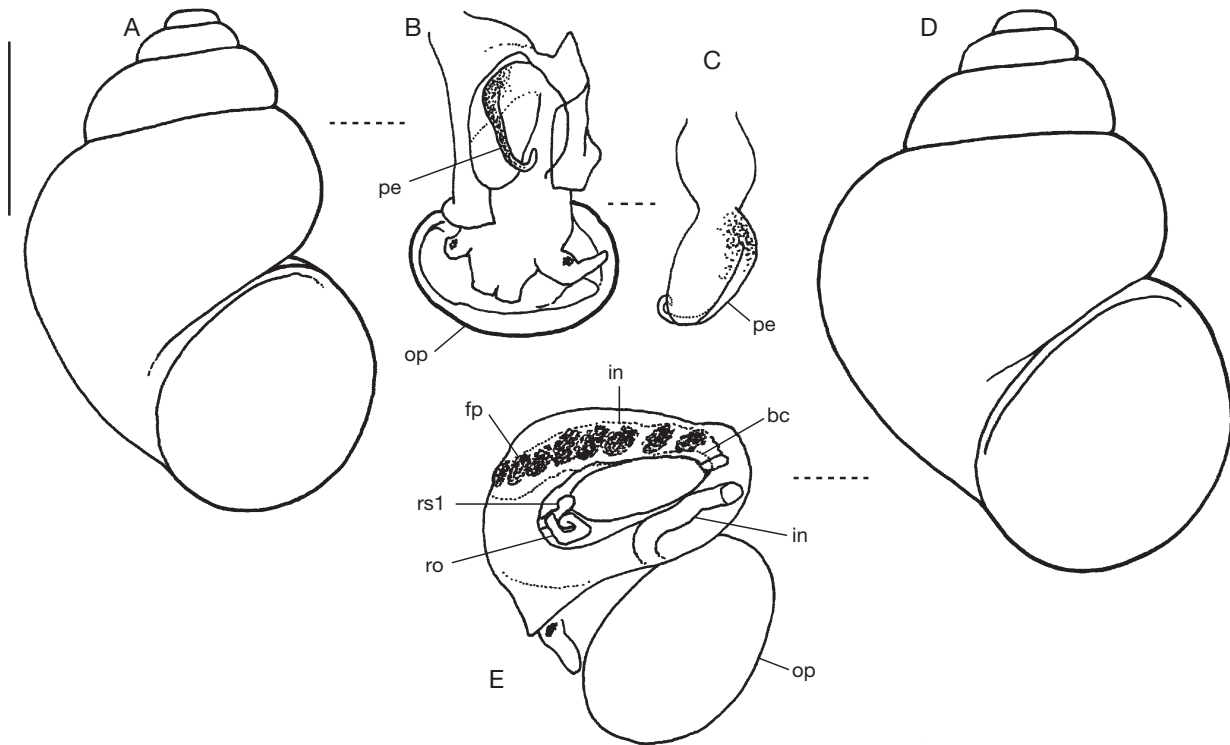


FIG. 4. — *Mercuria sarahae sarahae* (Paladilhe, 1869), France, Loire-Inférieure, Thouaré-sur-Loire, river Loire (BOE 1478 ex SMNS-FAL); **A-C**, ♂; **A**, shell; **B, C**, head and foot with copulatory organ exposed through slit in mantle, ventral (**B**) and dorsal view (**C**); **D, E** (♀); **D**, shell; **E**, body lumen opened to show renal oviductus with receptaculum seminis (rs1) and bursa copulatrix surrounded by intestinal section (partially removed). Abbreviations: **bc**, bursa copulatrix; **fp**, fecal pellet; **in**, intestine; **op**, operculum; **pe**, penis; **ro**, renal oviductus; **rs1**, single receptaculum seminis. Scale bar: 1 mm.

inhabits or inhabited in the environment of Saint-Jean-de-Luz water bodies which may occasionally fall to dryness. For further investigations it is worth mentioning that before 1971, Boeters saw a sample in Bérillon's collection (MHNB-BER) with a label reading “*Amnicola lanceolata* Ruisseau près le parc aux huitres St Jean de Luz vieille route du Boucau [district of Bayonne]”.

Since the shells of the types of *Bythinia* [sic] *baudoniana* are covered by a brownish coat, at a glance they might be taken as shells of a species of *Pseudamnicola*; however, at least one shell has spotwise lost its cover and shows the milky colour characteristic of *Mercuria*.

Mercuria sarahae (Paladilhe, 1869)

This species, distributed in northwestern France, comprises two subspecies, that is the nominate subspecies and *Mercuria sarahae vindilica* (Paladilhe, 1870).

Mercuria sarahae sarahae (Paladilhe, 1869) (Figs 4, 6A-G; Table 3)

Amnicola sarahae Paladilhe, 1869: 233, pl. 19, figs 12, 13 [separatum: 109, pl. 5, figs 12, 13].

ORIGINAL INDICATION OF THE TYPE LOCALITY. — “[...] vit dans l’Erdre et la Loire aux environs de Nantes.”

MATERIAL EXAMINED. — **France**. (i-iii) Calvados, (i) (SMF 142038/13 and 244634/22; NMW/2 and NMW/9 both ex Terver and paralectotypes of *Amnicola confusa* Frauenfeld, 1863); (ii) Blainville[-sur-Orne] [UTM XV95] (MNHN-PAS/5 ex de Folin [2]); (iii) Caen [UTM XV95] (MNHN-PAS/5 ex de Folin [3], de Folin's label: “*Amnicola similis* Drap. var. Bord de l’Orne sous les cours Caffarelli”. — Loire-Atlantique, (iv) “Erdre à Nantes” [UTM XT13] (MHNG-BGT 54591/1 lectotype; PPSUM2-PAL/2 syntypes); (v) Loire upstream of Nantes, Thouaré-sur-Loire [UTM XT13] (SMNS-FAL and BOE 1478 animals and 2415 shells), leg. G. and M. Falkner 26.V.1999.

LECTOTYPE. — MHNG-BGT 5459/1 (orig. fig.) (here designated).

DISTRIBUTION AND ECOLOGY. — Calvados (Orne at Caen), Morbihan (“marais dunaire à Pénestin” [UTM WT36]; Pasco in litt.), Loire-Atlantique (Loire and Erdre as its tributary at Nantes). Biotope: Tide area of rivers, in the Loire together with *Potamopyrgus antipodarum* (Gray, 1843).

DESCRIPTION

Shell

Conical with pointed apex and straight sidelines; last whorl striatulate and of about 48-54% of total height of shell; umbilicated; of transparent milky colour; 4.7-5.0 whorls, swollen and very convex, respectively, separated by a deep

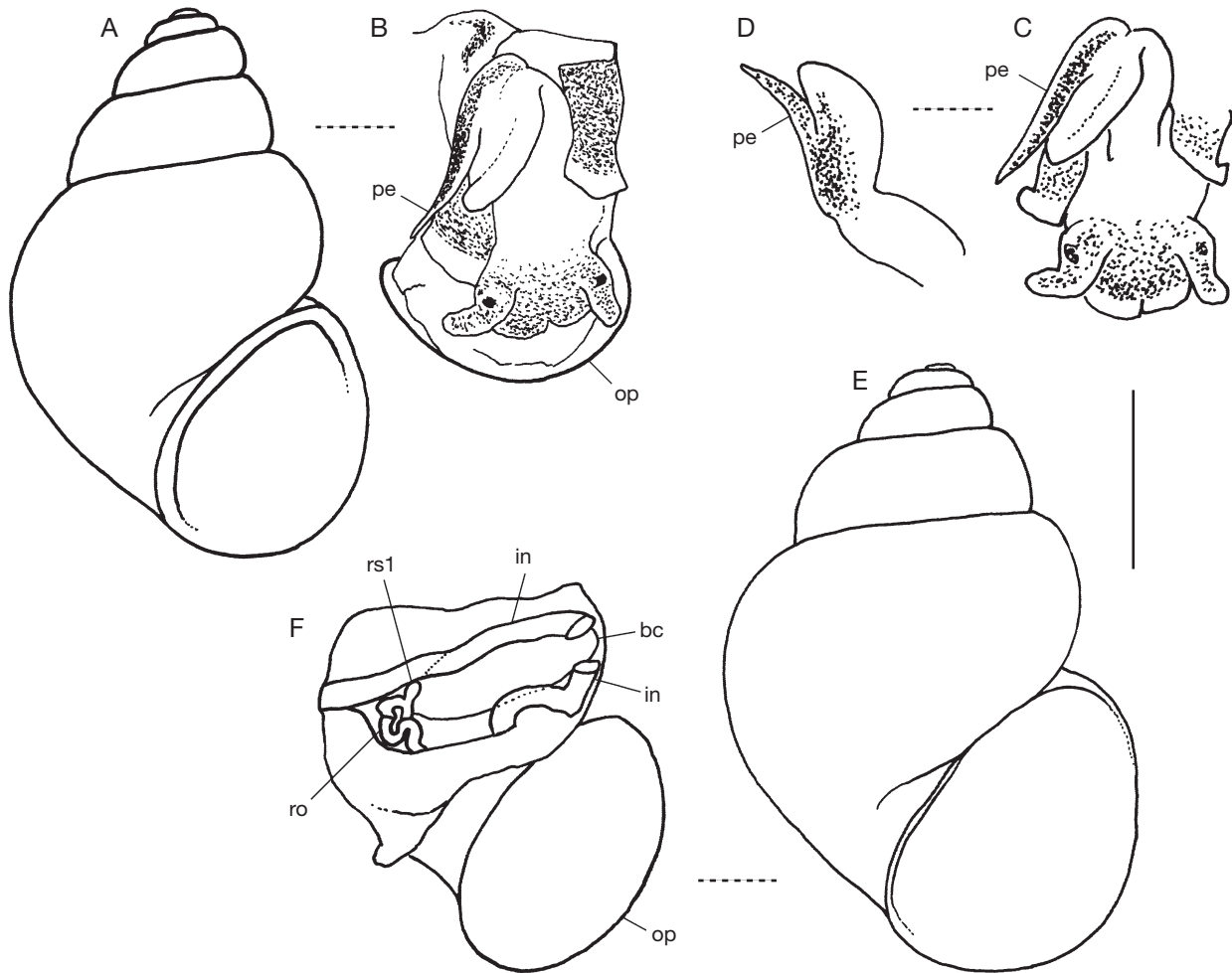


FIG. 5. — *Mercuria sarahae vindilica* (Paladilhe, 1870), France, Morbihan, Locmaria [Belle-Île-en-Mer] (BOE 1448); **A, B**, ♂; **A**, shell; **B**, head and foot with copulatory organ exposed through slit in mantle; **C, D**, ♂: head with copulatory organ, ventral (**C**) and dorsal view (**D**); **E, F** (♀); **E**, shell; **F**, body lumen opened to show renal oviductus with receptaculum seminis (**rs1**) and bursa copulatrix surrounded by intestinal section (partially removed). Abbreviations: **bc**, bursa copulatrix; **in**, intestine; **op**, operculum; **pe**, penis; **ro**, renal oviductus; **rs1**, single receptaculum seminis. Scale bar: 1 mm.

suture; last whorl towards aperture neither ascending nor descending; aperture obliquely broad ovate, a little narrowed above; peristome continuous, usually touching the shell wall over a short distance; outer margin simple, basal margin and columellar edge faintly reflexed, columellar edge slightly thickened.

Measurements

See Table 3.

Operculum

Reddish, nucleus even more intensely coloured.

Animal

External characters. Pallial tentacle not seen. Black pigment to be found merely on the mantle at its border and in the neighbourhood of the intestine and the gill. Ctenidium with 25 (1 ♀) and 21 gill filaments (1 ♂).

Male copulatory organ. Penis blackish pigmented, of about the same length as the appendix. Appendix with a lateral bulge like an abutment for the penis.

Female genital tract. Bursa copulatrix and one receptaculum seminis.

DIFFERENTIATING FEATURES

Versus *M. s. vindilica*: The nominotypical subspecies cannot be distinguished by conchological or anatomical characters, however, *M. s. vindilica* does not live on the mainland of France but on the Belle-Île and, further, does it not inhabit the tide areas of rivers but lives in springs.

Versus *M. baudoniana*: in *M. s. sarahae* the spire of shell is less elongated and more conical such that the last whorl forms about 48.1 to 53.7% (n = 4) of the total height of the shell and not merely about 38.0 to 46.2% (n = 5 syntypes of *M. baudoniana*).

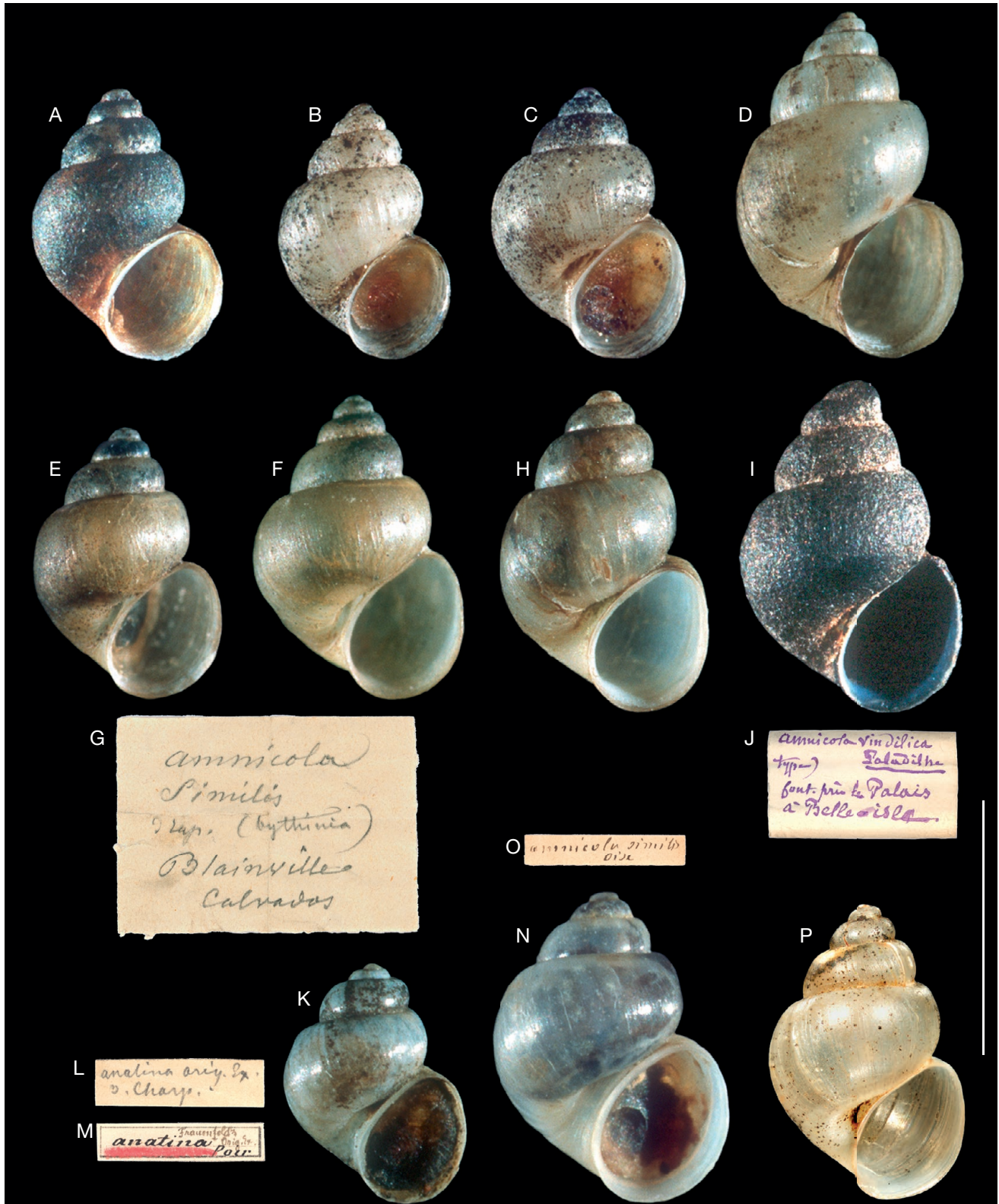


FIG. 6. — **A-G**, *Mercuria sarahae sarahae* (Paladilhe, 1869): **A**, lectotype of *Amnicola sarahae*, France, Loire-Atlantique, Loire près de Nantes (MHNG-BGT 5459); **B-D**, France, Loire-Atlantique, Thouaré-sur-Loire, bras mort de la Sauterelle, leg. G. and M. Falkner 26.V.1999 (SMNS-FAL); **B**, ♂; **C**, ♀; **D**, excessively grown specimen [überwüchsig]; **E-G**, France, Calvados, Blainville-sur-Orne (MNHN-PAS ex de Folin); **E**, ♂; **F**, ♀; **G**, de Folin's label; **H-J**, *Mercuria sarahae vindilica* (Paladilhe, 1870): **H**, France, Morbihan, Belle-Île-en-Mer, shell cleaned (MNHN-PAS ex de Folin, "déterminée par Paladilhe"); **I**, **J**, lectotype of *Amnicola vindilica*, France, Morbihan, Belle-Île-en-Mer, fontaine près Le Palais (MHNG-BGT 5479); **J**, Bourguignat's label; **K-M**, *Mercuria* (or *Pseudamnicola*) sp.: **K**, questionable syntype of *Bulimus anatinus* Poiret, 1801 (NMW-FRA); **L**, **M**, labels of the questionable syntype; **L**, Frauenfeld's label; **M**, Sturany's label (handwriting of Sturany's calligrapher Matzka and of Sturany himself); **N-P**, *Mercuria anatina* (?) (Poiret, 1801); **N**, **O**, France, Oise, northern tributary of the Seine downriver of Paris (MNHN-LOC); **O**, Locard's label; **P**, the Netherlands, Zuid-Holland, Oude Maas at Hoogvliet [right side of Oude Maas SW Rotterdam], leg. Backhuys 30.X.1965 (BOE 0133). Scale bar: 3 mm.

TABLE 4. – Measurements of *Mercuria sarahae vindilica* (Paladilhe, 1870).

Locality	specimens measured	Shell (mm)		Aperture (mm)	
		Height	Diameter	Height	Diameter
Fontaine près Le Palais MHNG-BGT 5479/1	Lectotype	3.90	2.60	1.85	1.50
Locmaria	Specimen 1	3.20	2.45	1.85	1.35
BOE 2415 (n = 5)	Specimen 2	3.65	2.55	1.75	1.60
	Specimen 3	3.80	2.50	1.90	1.50
	Specimen 4	4.30	2.55	1.90	1.40
	Specimen 5	4.00	2.50	1.90	1.45
	Mean	3.79	2.51	1.86	1.46
	Range	3.20-4.30	2.45-2.55	1.75-1.90	1.35-1.60

Versus *M. bayonnensis*: in *M. s. sarahae* at least the last two whorls are striatulate (as at Thouaré-sur-Loire), however, in *M. bayonnensis* these whorls are more or less smooth (as at Bidart and Biarritz), except for some irregularities of growth. Further, the male copulatory organ of *M. s. sarahae* shows a comparatively pronounced indication of a bulge (compare Figures 4 and 7).

Versus *M. anatina*: in *M. s. sarahae* the angle of the aperture is fairly rounded and not rather narrow leading over to the palatal border shoulder-like; border of the angle not only straight but sometimes even slightly broadened. Male copulatory organ smaller than in *M. anatina*, penis shaped rather vermiform, not wedge-like, appendix with a lateral bulge like an abutment for the penis, which is missing in *M. anatina*.

REMARKS

As already mentioned for *M. bayonnensis*, since this species and *M. s. sarahae* can clearly be distinguished by anatomical characters, but not in any case by their shell, we must leave it open to question to which species records from the interjacent regions belong, except for *M. baudoniana*. Reference is made to the last paragraph of the chapter Taxa uncertain.

Mercuria sarahae vindilica (Paladilhe, 1870)
(Figs 5A-F, 6H-J; Table 4)

Amnicola vindilica Paladilhe, 1870: 189 [no figs; separatum: 23]; 1874: 1-38, pl. 3, figs 1, 2.

ORIGINAL INDICATION OF THE TYPE LOCALITY. — “[...] de Belle-Isle-en-Mer (Vindilis des anciens), où elle a été recueillie près de Palais (village principal de l’île)”.

MATERIAL EXAMINED. — **France.** (i-ii) Morbihan, (i) (locus typicus; destroyed) “font[aine] près le Palais” [UTM VT84] (MHNG-BGT 5479/1 syntype, becomes Lectotype); (ii) Belle-Île-en-Mer [UTM VT84] (MNHN-PAS/2 ex de Folin [10]). — (iii) Locmaria, outflow of a captured spring [UTM VT93] (BOE 1448 animals and 2418 shells), leg. Boeters VII.1994.

LECTOTYPE. — MHNG-BGT 5479/1 (here designated).

DESCRIPTION

Shell

Conical with pointed apex and straight sidelines; last whorl about 45-47% of total height of shell; umbilicated; of transparent milky colour; 4 ½ whorls, swollen and very convex, respectively, separated by a deep suture; last whorl shortly in front of aperture occasionally descending on shell wall; aperture obliquely broad ovate, a little narrowed above; peristome continuous, usually touching the shell wall over a short distance; outer margin simple, basal margin and columellar edge faintly broadened, palatal, basal and columellar edge slightly thickened.

Measurements

See Table 4.

Operculum

Coloured like horn, utmost yellowish, not reddish.

Animal

External characters. Pallial tentacle not seen. Strongly pigmented black; position of the different glands of the pallial oviductus and of the intestine towards the stomach cannot be seen through the mantle and the body wall. Ctenidium with 23 (1 ♀) and 24 gill filaments (1 ♂).

Male copulatory organ. Penis and appendix like forefinger and thumb, appendix with a slight indication of a bulge; penis blackish (1 ♂).

Female genital tract. Bursa copulatrix plus one receptaculum seminis.

DIFFERENTIATING FEATURES

The more or less pronounced bulge in the penial appendix discriminates this subspecies (as well as *M. s. sarahae*) from all congeners of the Atlantic slope. *M. s. vindilica* is ecologically specialised to springs and does not inhabit the tide zone of rivers where *M. s. sarahae* lives.

Paladilhe himself distinguished *Mercuria s. vindilica* from *M. baudoniana* only in the following way: “On la distinguera de l’*Amn. lanceolata* par sa spire moins élançée; son dernier tour plus ventru, non détaché près de l’ouverture; son ouverture non saillante en dehors, moins anguleuse, plus régulièrement arrondie et bien moins oblique.”

DISTRIBUTION AND ECOLOGY. — Morbihan (Belle-Île-en-Mer). In springs; at Locmaria together with a representative of the Lymnaeidae.

REMARKS

It is assumed that the “font[aine]” mentioned on the label of the lectotype (MHNG-BGT 5479) refers to a nowadays completely sealed spring in the parc of Le Palais.

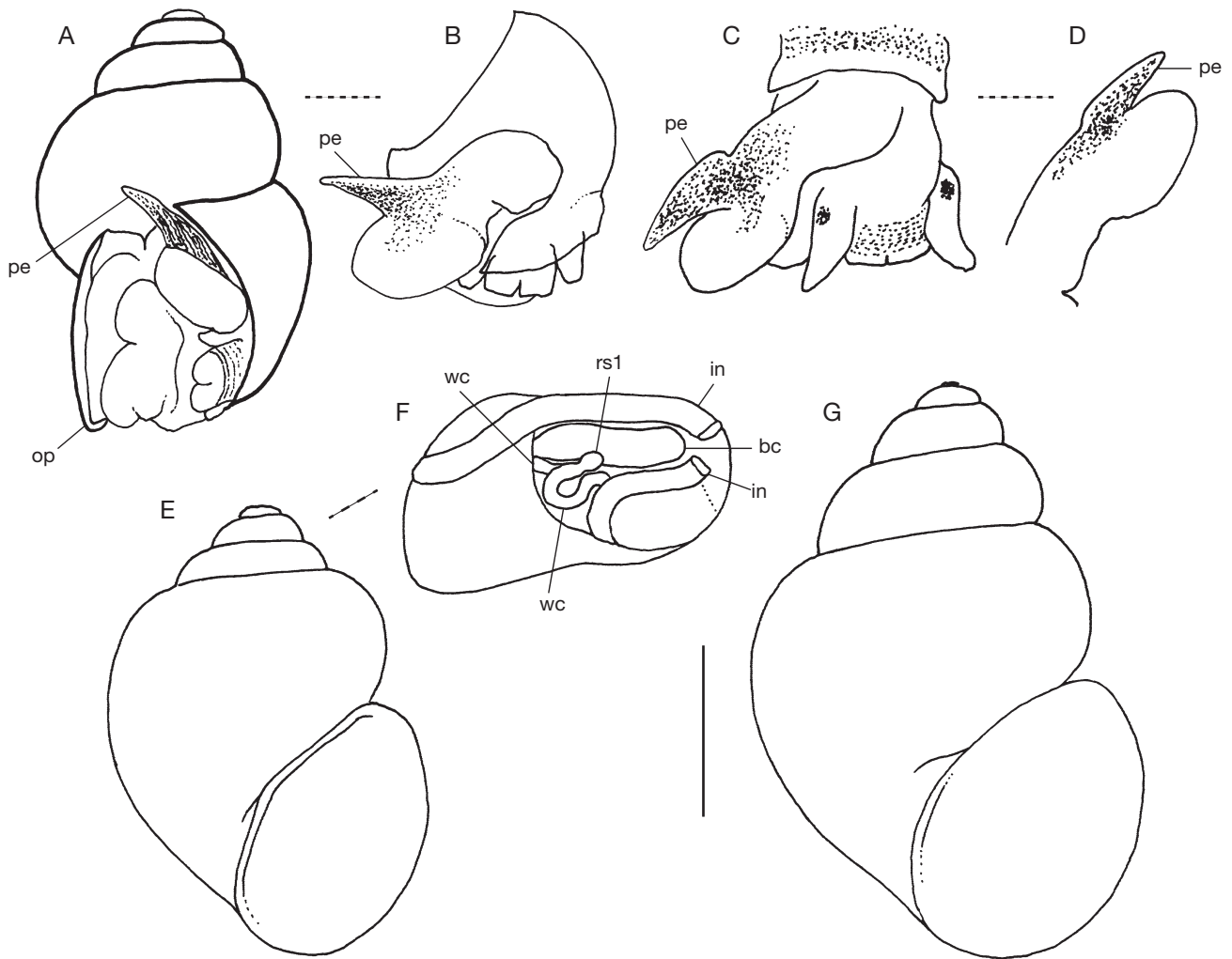


FIG. 7. — *Mercuria anatina* (Poiret, 1801): **A-F**, the Netherlands, Biesbosch (BOE 0271); **A, B**, ♂; **A**, shell with partially retracted animal; **B**, head with copulatory organ exposed through slit in mantle; **C, D**, ♂: head with copulatory organ, dorsal (**C**) and ventral view (**D**); **E, F**, ♀; **E**, shell; **F**, body lumen opened to show renal oviductus with receptaculum seminis (**rs1**) and bursa copulatrix surrounded by intestinal section (partially removed); **G**, the Netherlands, Oude Maas at Hoogvliet (BOE 0133): shell. Abbreviations: **bc**, bursa copulatrix; **in**, intestine; **op**, operculum; **pe**, penis; **ro**, renal oviductus; **rs1**, single receptaculum seminis; **wc**, wall of mantle cavity. Scale bar: 1 mm.

Mercuria anatina (Poiret, 1801)
(Figs 6K-P, 7A-G; Table 5)

Bulimus anatinus Poiret, 1801: 47.

Paludina anatina – Garnier in Picard 1841: 301.

Pseudamnicola confusa – Adam 1940: 1.

Mercuria confusa – Gittenberger *et al.* 1998: 82. — Boeters 1998: 25 [partim], 50, pl. F, figs 6-10, 60, pl. N, fig. 6.

ORIGINAL INDICATIONS OF THE TYPE LOCALITIES. — [1] “L.[ieu] n.[atal] Les environs de Paris; [2] La variété A se trouve à l’embouchure de la Somme.”

MATERIAL EXAMINED. — **The Netherlands.** (i) Zuid-Holland, Oude Maas at Hoogvliet [right side of Oude Maas SW Rotterdam] [UTM ET95] (BOE 0133), leg. Backhuys 30.X.1965; (ii) Biesbosch [SE Dordrecht] [UTM FT24] (BOE 0271 animals and 3186 shells), leg. Butor 1959; (iii) Spijkenisse [left side of Oude Maas SW Rot-

terdam] [UTM ET95] (BOE 1477), leg. Boeters 9.V.1970; (iv) “Zuid Holland, Goudswaard, rietpoel in de uiterward” [reed puddle in foreland of dam] [UTM ET94]; NN leg. 26.V.1960 (RMNH MOL 124 746/30 ex collection Delta Instituut).

Belgium. Anvers (Antwerpen) r[ive] g[auche], “fossé eaux saumâtre” [UTM ES97] (BOE 3203), leg. Giltay 2.IV.1927.

IDENTIFICATION. — Frauenfeld’s collection comprises one single shell which he obtained from Charpentier who received it from Férussac fils (NMW-FRD 92601; label: “*anatina* Orig. Ex. v[on] Charp[entier]” (Fig. 6K). However, we hesitate to base our understanding of the species on this putative syntype since we have not been able to find any *Mercuria*-Population which convincingly matches the character combination of this specimen (a check with *Pseudamnicola* was also negative). Especially the shell does not show an aperture as outlined below as characteristic of *M. anatina*. Also the inflated second whorl does neither fit *Mercuria* nor *Pseudamnicola*, it is best interpreted as an anomaly of growth. Nevertheless, the predominantly milky colour of the shell and the whitish surrounding of the umbilicus in combination with the chestnut-reddish operculum are characters which clearly speak for the belonging to *Mercuria*.

TABLE 5. — Measurements of *Mercuria anatina* (Poiret, 1801).

Locality	Specimens measured	Shell (mm)		Aperture (mm)		
		Height	Diameter	Height	Diameter	
Biesbosch BOE 3186	Specimen 1	2.95	2.05	1.65	1.20	
Hoogvliet BOE 0133	Specimen 1	3.55	2.30	1.70	1.35	
	Specimen 2	3.45	2.25	1.70	1.35	
	(n = 2)	Mean	3.50	2.28	1.70	1.35
	Range	3.45-3.55	2.25-2.30	1.70-1.70	1.35-1.35	
Anvers BOE 3203	Specimen 1	2.90	2.15	1.55	1.30	
	Specimen 2	3.15	2.15	1.60	1.30	
	(n = 5)	Specimen 3	3.05	2.25	1.60	1.35
		Specimen 4	3.30	2.35	1.60	1.45
	Specimen 5	2.90	2.00	1.55	1.25	
	Mean	3.06	2.18	1.58	1.33	
Range	2.90-3.30	2.00-2.35	1.55-1.60	1.25-1.45		

A strong support for the identification of *Bulimus anatinus* as belonging to *Mercuria* is the figure given by Draparnaud (1805: pl. 1, figs 24, 25). The shell figured there under the name *Cyclostoma anatinum* doubtlessly belongs to *Mercuria*. This specimen was considered by Kadolsky (2011: 70 legend of fig. 2A; 71 right column) to represent another possible syntype of Poiret's *Bulimus anatinus*.

Mercuria anatina has never been reported from “Les environs de Paris”, except for Poiret and with reservation. As regards the “embouchure de la Somme”, Cucherat (in litt. 15.IV.2002) and later on in X.2002 G. and M. Falkner have made attempts to recollect the snail, but without any success. In Kadolsky's opinion the supposed origin of *M. anatina* in northern France is incorrect. “Les environs de Paris?” has to be treated as erroneous (2011: 71 left column) and Picard's record of *M. anatina* from the other type locality, i.e. “baie de Somme, à l'embouchure de cette rivière” (Garnier in Picard 1841: 302), concerned rather *Peringia ulvae* (Pennant, 1777). Kadolsky refers to Garnier's statement (in Picard 1841: 302) “tentacles grey with a black circle at their extremities” [“tentacles gris avec un cercle noir à l'extrémité”] which applies to *P. ulvae* (see e.g., Seifert 1935: 233, fig. 1). This, however, overlooks Garnier's description of the operculum as of dark brown [“d'un brun foncé”]. This feature is characteristic of *Mercuria* species, whereas in *P. ulvae* the operculum is yellowish in its center and colourless towards its periphery (Meyer & Möbius 1872: 37) or the operculum is horny (Fretter & Graham 1978: 123). Thus Garnier's description might cover two different species, but without any doubt *M. anatina* as one of them. Further, Garnier described the last whorl as “légèrement caréné” and the aperture of the shell as “ovale, presque arrondie à droite, un peu rétrécie vers la haut”. This slight keel of the last whorl and correspondingly slight flattening of the right border of the aperture in frontal view is not shown by *M. sarabae* distributed in North-West France, but by *Mercuria* living in neighboured Belgium and the Netherlands; see Adam (1940: 3, fig. 1) for Belgium and Boeters (1998: 60, fig. N6) for the Netherlands. This encourages us to base the following description of *M. anatina* not only on Poiret's (1801) and Garnier's (in Picard 1841) publications, but also on material from Belgium and the Netherlands.

DISTRIBUTION AND ECOLOGY. — No French locality is known where the species still lives. It has been reported in France from the surrounding of Paris with reservation, from the Somme and from the basin of the Escaut. In Belgium in the river Escaut at Anvers (Schelde at Antwerpen, Adam 1940; recently not refound, Bruyne & Geene 1998: 102). In the Netherlands in the delta areas of the rivers Rhine and Maas; Gittenberger *et al.* 1998 (figs 130, 131) give maps of distribution. Biotope: Tide areas of rivers; see Butot (1960), Hartog (1960: 72, fig. 3 with tide limits) and Bruyne & Geene (1998); salt

concentration indicated as 0.3-3.0 ‰ (Bruyne & Geene 1998: 101) or 0.5-5.4 ‰ (Gittenberger *et al.* 1998: 82).

DESCRIPTION

Shell and operculum

Shell with 4.5-4.75 whorls (BOE 0133).

Measurements

See Table 5.

In view of the fact that the identification of this species cannot be based with certainty on type material, Poiret's and Garnier's descriptions are given:

Poiret 1801: “Coquille presque conique, un peu aigue; ouverture arrondie. 4 tours et demi de spire. Diam. près de 2 millim. Haut. environ 3 millim. Testa subconica, subacuta; apertura subrotunda. Long. 2 lin. Diam. 1 lin.

[La variété] A. Le même un peu plus grand à 5 tours de spire. A. Idem major, anfractibus quinque.”

Garnier 1841: “Long. 2 à 5 m [sic], Larg. 1 à 2 ½. Coquille très-petite, allongée, blanche où d'un jaune-pâle quand elle est dépouillée de l'enveloppe verdâtre dont elle est recouverte; la spire est composée de six tours et non de sept à huit suivant de M. Deshayes [1832: 693], ou de quatre demi-tours, comme le dit Draparnaud [sic] [1805: 37]; elle est très-finement striée longitudinalement, à suture peu marquée, le dernier tour légèrement caréné; bord simple, épais, blanchâtre; l'ouverture est ovale, presque arrondie à droite, un peu rétrécie vers le haut, avec les bords presque continus; ombilic formant une fente très-peu profonde, mais parfaitement visible; l'opercule est d'un brun-foncé, cornée et très-mince.”

Variability

In the Netherlands SE Dordrecht in the Biesbosch with remarkably depressed spire (cf. Boeters 1998: 50, fig. F8); ratio height of aperture: total height of shell *c.* 56% compared to *c.* 49% at other Dutch localities.

Animal

External characters. In the following Garnier's description of the animal is supplemented by anatomical data of a Dutch sample (BOE 0271). “Animal gris, rayé de noir; tête noirâtre, avec la trompe très allongée et violette; tentacles gris avec un cercle noir à l'extrémité; yeux noir, pédonculés, situés à la base externe; plan locomoteur coupé carrément à l'extrémité antérieure, arrondie postérieurement, large et blanchâtre” (Garnier 1841: 302). Pallial tentacle not seen; remarkably the ctenidium shows only 16 gill filaments (1 ♂; BOE 0271). Radula figured by Adam (1940: 4, fig. 2A).

Male copulatory organ. Penis blackish, appendix like an elliptical disc (Boeters 1998: 50, fig. F9).

Female genital tract. Bursa copulatrix and one receptaculum seminis (Boeters 1998: 50, fig. F10). It is noticeable that the receptaculum flanks the bursa and is not embedded as usual in the angle formed by the insertion of the pedunculus into the bursa.

DIFFERENTIATING FEATURES

M. anatina in our present perception can be distinguished from *M. sarahae* in that the shell of the latter one shows a well rounded and not flattened aperture. The male genitalia of *M. sarahae* shows a bulge which is missing in *M. anatina*.

REMARKS

For the sake of correctness a sample of a species of *Mercuria* in the collection Locard (MNHN-LOC/5, Fig. 6N-O) should be mentioned since it had been collected at a locality between the Somme and Paris. Its label reads “*Ammicola similis* Oise”. The Oise is a northern tributary of the Seine downriver of Paris and is quite near to the river system of the Escaut where historical occurrences are reported by Potiez & Michaud (1838: 254) from the Hainaut, Douai and Valenciennes, to which Norguet (1872: 282 [Separatum p. 22]) added Cambrai. As Norguet, who uses the generic name *Bythinia*, discriminates between *leachii* and *similis*, it can be taken for sure, that his indications really concern a species of *Mercuria*. However, the shells from the Oise do not show an aperture as characteristic of *M. anatina* in our understanding (see Fig. 6N). Further, in the Netherlands, Belgium and Northeast France *Mercuria* lives exclusively in tide areas of rivers. If our understanding that the distribution of *M. anatina* extends from the Netherlands across Belgium to Northeast France should be incorrect, rather the sample from the Oise represents *M. anatina*, the species living in the Netherlands and Belgium would have to be described as a new representative of *Mercuria*.

The findings upstream of the tide area of the Escaut and the alledged occurrence of *M. anatina* in the “Oise” (MNHN-LOC/5) as a tributary river of the Seine are to be confirmed. A confirmation would mean that the species invades rivers also upstream of their tide areas. Further, Poirer’s first indication “Les environs de Paris” would gain importance.

The locality of Calais as given by Locard (1882: 225) results from a printing error and should read “Le Palais”; cf. under *M. sarahae vindilica*.

Mercuria similis (Draparnaud, 1805)
(Figs 8A-G, 9A-C; Table 6)

Cyclostoma simile Draparnaud, 1805: 34, pl. 1, fig. 15.

Ammicola confusa Frauenfeld, 1863: 1029.

Mercuria confusa – Boeters 1971: 178, 179, fig. 10.

Mercuria emiliana – Boeters 1988: 208: figs 92, 93; 210: figs 118, 125; 211; pl. 3, fig. 34. — Clanzig & Bertrand 2001: 45, fig. 1.

Mercuria similis – Boeters & Falkner 2000: 37. — Girardi 2004: 83-86 [partim]; fig. 1A-C, E-F.

ORIGINAL INDICATIONS OF THE TYPE LOCALITIES. — *Cyclostoma simile*: “France” (title of the book). — *Ammicola confusa*: “Gallia mer. [idionalis]”, restricted by Lectotype designation (Boeters 1971: 175).

MATERIAL EXAMINED. — France. (i) Gallia mer. [idionalis] (NMW-FRD/1 neotype of *Cyclostoma simile*, also lectotype of *Ammicola confusa* and NMW/1 paralectotype of *Ammicola confusa*). — (ii)-(iv)

Pyrénées-Orientales: (ii) Salses [UTM DH94] (MNHN-PAS/4 ex de Folin [6] and MNHN-PAS/5 ex de Folin [7]); (iii) Salses, Font Estramar [UTM DH94] (BOE 0281, 0513 and 2167 ex 281b), leg. Meier-Brook 9.VI.1963 and leg. Boeters 7.IX.1972 and 4.IX.1980; (iv) Salses, ditch at Font Dame [UTM DH94] (BOE 3208 ex 0999), leg. Boeters 4.IX.1980. — (v)-(vi) Aude, Port-la-Nouvelle [UTM EH06]: (v) (BOE 2607), collection unknown; (vi) brackish [?] ponds at the foot of limestone rocks (BOE 1193), leg. de Winter 19.VI.1979. — (vii)-(ix) Hérault: (vii) Vic-la-Gardiole, La Robine [UTM EJ61] (BOE 3200), leg. Boeters 4.VI.2011; (viii) Montpellier (NMW 92604/6 paralectotypes of *Ammicola confusa*, label: “*Paludina similis* Drap. var. *major*”). — (ix) Cette [modern spelling: Sète] [UTM EJ50] (MNHN), leg. Paladihe. — (x)-(xi) Gard, between Saint-Gilles and Aigues-Mortes: (x) Étang de Scamandre [UTM FJ03] (BOE 0534), leg. Vala & Monod 12.V.1973; (xi) area of the Syndicat Mixte Camargue Gardoise (Centre du Scamandre) (BOE 3197), leg. Boeters 1.VI.2011. — (xii)-(xiii) Bouches-du-Rhône: (xii) Aigues-Mortes [UTM EJ92] (MNHN); (xiii) Stes-Maries-de-la-Mer [UTM FJ11] (SMNS-FAL and BOE 2612, NMW 108871/10), leg. G. and M. Falkner 15.VI.2002).

NEOTYPE. — France, “Gallia mer. [idionalis]” (NMW-FRD; the lectotype of *Ammicola confusa* has been designated as neotype of *Cyclostoma simile*; Boeters & Falkner 2000).

IDENTIFICATION. — The distribution boundary of *M. similis* and *M. meridionalis* runs between the delta of the Rhône and the Étang de Berre. *M. similis* lives in the French Mediterranean coastal area from the Pyrénées up to the delta of the Rhône. Contrary to *M. similis*, *M. meridionalis* lives or lived, respectively, in the French Mediterranean coastal area from the Étang de Berre up to the mouth of the Var at Nice. The restricted type locality of *Ammicola similis* “Gallia mer. [idionalis]”, which is identical with that of *Ammicola confusa*, would cover both areas. However, since Draparnaud lived in Montpellier, it is assumed that his description of *Cyclostoma simile* was based on material collected in the Hérault, in the surrounding of Montpellier. Potiez & Michaud (1838: 254) give the following information on the provenance and identity of Draparnaud’s material: “La coquille qui vit à Cette (Hérault), et qui a servi de type à Draparnaud, est bien différente de celles que l’on rencontre dans le Périgord, en Belgique, et dans les autres parties de la France; elle est plus courte, plus solide, et sa couleur est d’un vert tendre tirant sur le blanc; la suture est moins prononcée.”

A thorough reassessment of the handwriting on the label of the *similis*-neotype revealed that it stems from Dupuy (see Fig. 9B). The only sample of authentic *M. similis* (under the name *Hydrobia similis*) known to Dupuy at the time when he wrote his *Histoire*, was that collected by de Boissy in “les environs de Montpellier” (Dupuy 1851: 553). As Dupuy considered still in 1849 the Material collected by Mouton near Grasse as specifically distinct, it is most likely, that he gave under the name *similis* specimens from Montpellier to his exchange partners. This coincides with our decision to consider the *Mercuria* from the Étang de Scamandre as conspecific with the neotype of *Cyclostoma simile* (Boeters & Falkner 2000: 39). Although we admit that with our present knowledge we cannot distinguish with absolute certainty between *M. similis* and *M. meridionalis* on conchological characters only, the circumstances clearly speak for an origin of the neotype from the Montpellier region. The distance of the centres of Montpellier and Sète (former spelling: Cette) is about 25 km, but suitable biotopes where the species can be expected to live or to have lived and which can be attributed either to Sète or to the environs of Montpellier can be found at distances of about 10 km bordering the same lagoary system.

DISTRIBUTION AND ECOLOGY. — Pyrénées-Orientales, Aude, Hérault, Gard and Bouches-du-Rhône. Stagnant waters as of, for example, ditches and coastal lakes (étangs) within the delta of the Rhône river. In the outflow of large karstic springs such as La Robine at Vic-la-Gardiole and Font Estramar at Salses. Immediately

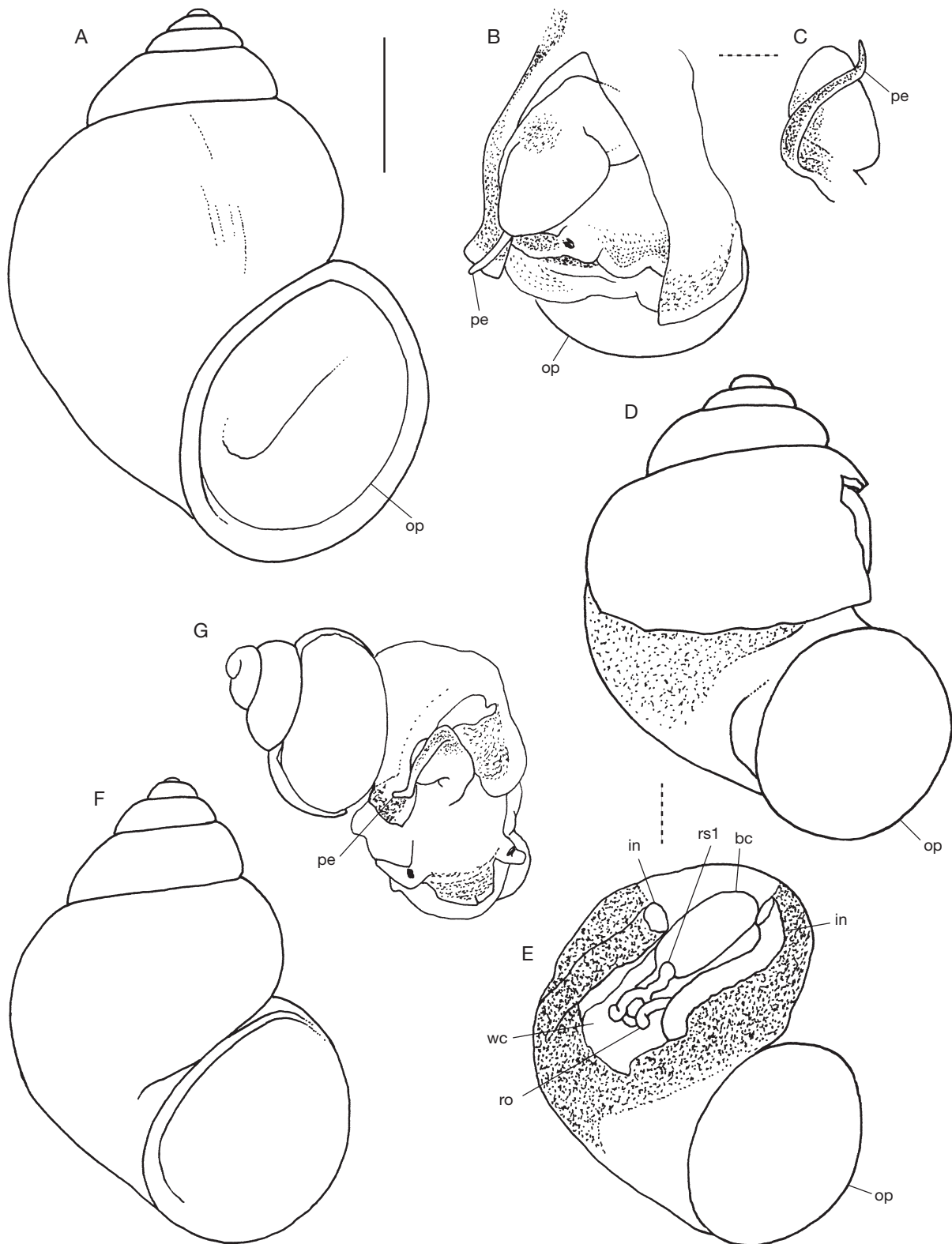


FIG. 8. — *Mercuria similis* (Draparnaud, 1805): **A-E**, France, Gard, between Saint-Gilles and Aigues-Mortes, Étang de Scamandre (BOE 0534); **A**, shell; **B, C**, ♂ head and foot with copulatory organ exposed through slit in mantle, dorsal (**B**) and ventral view (**C**); **D, E**, ♀; **D**, shell (partially broken away); **E**, body lumen opened to show renal oviductus with receptaculum seminis (rs1) and bursa copulatrix surrounded by intestinal section (partially removed); **F, G**, France, Pyrénées-Orientales, Salses, Fontaine-de-Salses: Font Estramar; **F**, BOE 2167 ex 0281b, shell; **G**, ♂, BOE 0513, shell partially broken away and mantle slit to expose copulatory organ. Abbreviations: **bc**: bursa copulatrix; **in**, intestine; **op**, operculum; **pe**, penis; **ro**, renal oviductus; **rs1**, single receptaculum seminis; **wc**, wall of mantle cavity. Scale bar: 1 mm.

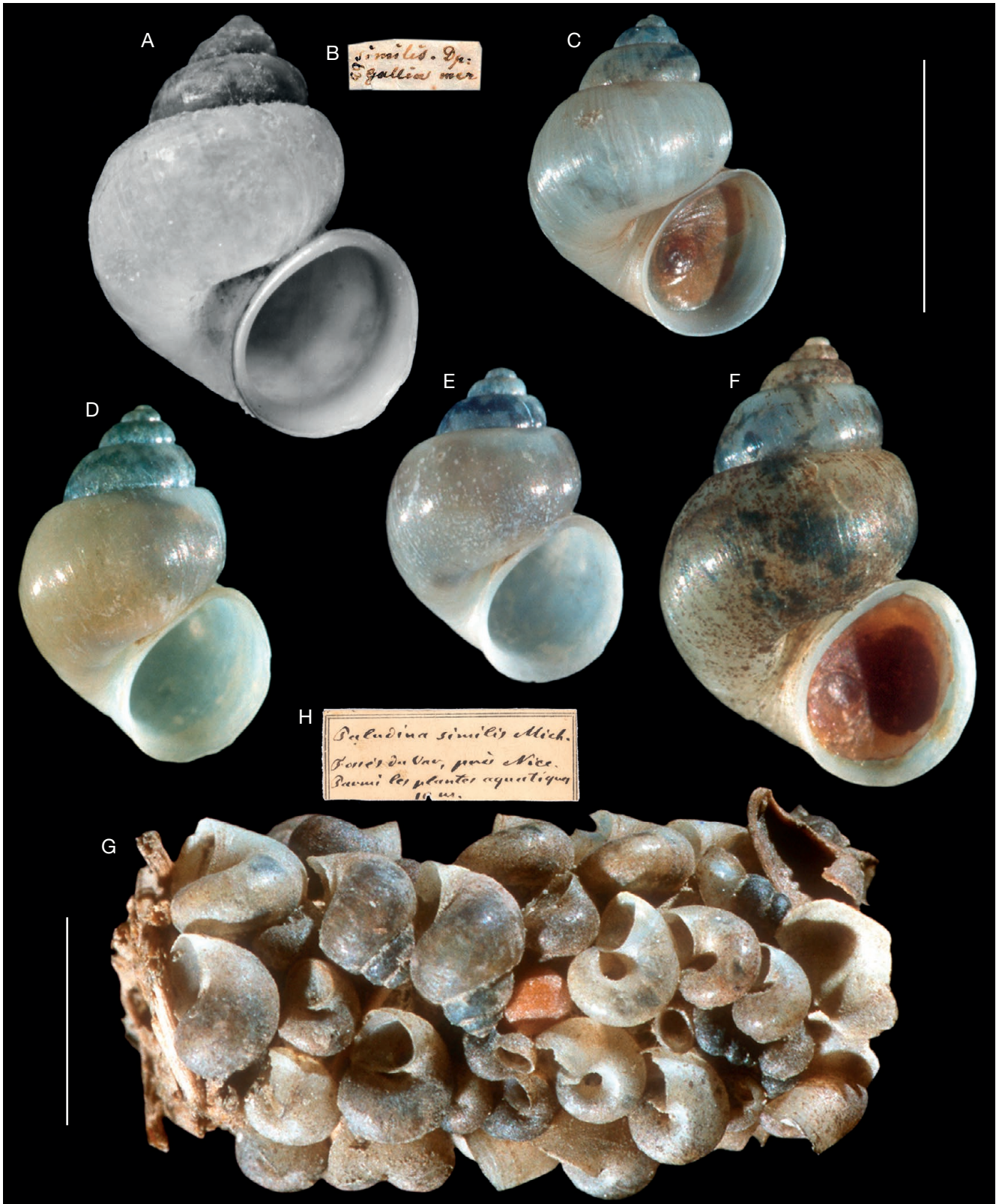


FIG. 9. — **A-C**, *Mercuria similis* (Draparnaud, 1805): **A**, "*Gallia mer.[idionalis]*", most likely Montpellier (NMW-FRD/1 neotype of *Cyclostoma simile*: lectotype of *Amnicola confusa* (cleaned); **B**, Dupuy's label; **C**, France, Bouches-du-Rhône, Saintes-Maries-de-la-Mer, ditch NW of the village, leg. G. and M. Falkner 15.VI.2002 (Coll. P. Glöer); **D-H**, *Mercuria meridionalis* (Risso, 1826): **D**, **E**, syntypes of *Bithynia meridionalis*, France, Alpes-Maritimes, most likely Nice (MNHN-RIO); **D**, lectotype ♀ (MNHN-IM-2000-32539); **E**, paralectotype (MNHN-IM-2000-32540), ♂; **F**, France, Alpes-Maritimes, Nice, large ♀ (MNHN ex Caziot); **G**, **H**, portable case of a Trichoptera-larva with several specimens of *Mercuria meridionalis*, *Belgrandia varica* (J. Paget, 1854), and a taxonomically problematic *Valvata* sp., glued living on it, Fossés du Var près Nice, leg. G. de Mortillet 1851 (MNHN); **H**, de Mortillet's label. Scale bars: 3 mm.

TABLE 6. – Measurements of *Mercuria similis* (Draparnaud, 1805).

Locality	Material	Shell (mm)		Aperture (mm)	
		Height	Diameter	Height	Diameter
Font	Specimen 1	3.50	2.46	1.72	1.58
Estramar	Specimen 2	3.55	2.85	1.95	1.60
BOE 2167 (n = 7)	Specimen 3	3.40	2.70	1.80	1.65
	Specimen 4	3.45	2.55	1.80	1.55
	Specimen 5	3.35	2.50	1.80	1.55
	Specimen 6	3.40	2.45	1.70	1.55
	Specimen 7	3.70	2.65	1.95	1.55
	Mean	3.48	2.59	1.82	1.58
	Range	3.35-3.70	2.45-2.85	1.70-1.95	1.55-1.65
Port-La- Nouvelle BOE 1193 (n = 4)	Specimen 1	3.85	2.80	1.90	1.70
	Specimen 2	3.05	2.35	1.65	1.40
	Specimen 3	2.75	2.25	1.55	1.30
	Specimen 4	3.05	2.45	1.60	1.40
	Mean	3.17	2.46	1.67	1.45
Range	2.75-3.85	2.25-2.80	1.55-1.90	1.30-1.70	
La Robine BOE 3200 (n = 3)	Specimen 1	3.90	3.13	2.15	1.84
	Specimen 2	4.50	3.28	2.23	1.97
	Specimen 3	4.40	3.13	2.12	1.79
	Mean	4.30	3.18	2.17	1.87
Range	3.90-4.50	3.13-3.28	2.12-2.23	1.79-1.97	
Étang de Scamandre BOE 0543 (n = 7)	Specimen 1	3.60	–	–	–
	Specimen 2	3.90	2.80	2.00	1.80
	Specimen 3	4.35	3.45	2.35	2.05
	Specimen 4	4.35	3.15	2.20	1.85
	Specimen 5	4.20	3.10	2.25	1.85
	Specimen 6	3.75	2.85	2.00	1.65
	Specimen 7	3.75	3.05	2.10	1.80
	Mean	3.98	3.07	2.15	1.83
Range	3.60-4.35	2.80-3.45	2.00-2.35	1.65-2.05	
France; Draparnaud 1805, pl. 1, fig. 15		4.50	3.20	c. 2.3	c. 1.9
Gallia mer. NMW- FRD; label “Gallia mer. [idionalis]”	neotype	5.10	4.20	2.55	2.25

downstream of the large spring basin of La Robine in its section of the outflow free of vegetation but still in front of its section flanked by reeds, on the underside of stones as far as they are not sunk into mud. In both karstic springs together with *Semisalsa* sp., in the Font Estramar also together with *Theodoxus* sp. and *Belgrandia* cf. *gibba* (Draparnaud, 1805). In the étang de Scamandre sympatrically with *Semisalsa scamandri* (Boeters, Monod & Vala, 1977) (the generic allocation follows Kroll *et al.* 2012: 1521), and a representative of the Planorbidae between *Phragmites communis*, also on *Chara* sp. and *Cladophora* sp.; salinity 0.4-0.5%, pH 7.5-8 (Boeters *et al.* 1977: 48).

DESCRIPTION

Shell

Shape of shell: conical with pointed apex and straight sidelines, umbilicated; of transparent milky colour; 4.55 [4.50-4.75] (n = 4) whorls, swollen and very convex, respectively, separated by a deep suture; last whorl towards aperture neither ascending nor descending; aperture obliquely broad ovate, a little narrowed above; peristome continuous, usually touching the shell wall over a short distance, outer margin simple,

basal margin and columellar edge faintly reflexed, columellar edge slightly thickened.

Measurements

See Table 6.

Operculum

Yellowish with chestnut-brown nucleus.

Animal

External characters. Pallial tentacle present. Snout at least with a blackish band; blackish pigmentation of the ommatophores can be missing; visceral hump more or less black-cloudy to brownish. Ctenidium with 21 gill filaments (1 ♂ ex BOE 0513) and 22 gill filaments (1 ♀ ex BOE 0534).

Male copulatory organ. Penis extends clearly beyond its appendix; area of their furcation blackish (Boeters 1988: 210, fig. 118; Girardi 2004: 86, fig. 2A, B).

Female genital tract. Bursa copulatrix and one receptaculum seminis (Boeters 1988: 210, fig. 125; Girardi 2004: 86, fig. 2A, B).

DIFFERENTIATING FEATURES

Versus *M. meridionalis*: other than in *M. meridionalis*, penis extends beyond appendix. Contrary to *M. meridionalis* slow running or even stagnant waters as those of ditches or étangs are preferred.

REMARK

The fact that *M. similis* inhabits in France the coastal area from the Basses-Pyrénées to Bouches-du-Rhône leads to the question whether this species lives also in Spanish coastal areas. Reference is made to *Amnicola maceana* Paladilhe, 1869 from “Antunez, près de Barcelone” which might be a synonym of *M. similis* (cf. photograph of a syntype in Boeters 1988: pl. 3, fig. 16).

Mercuria meridionalis (Risso, 1826)

(Figs 9D-H, 10, 11A-C; Table 7)

Bithynia meridionalis Risso, 1826: 100, pl. 3, fig. 28.

Mercuria confusa – Boeters 1971: 175 [partim].

Mercuria similis – Giusti 1979: 7, figs 4c1-4c4. Erroneous determination.

ORIGINAL INDICATION OF THE TYPE LOCALITY. — “[...] de l’Europe méridionale et particulièrement de celles des environs de Nice et des Alpes Maritimes” (title of the book) and “Fossés aquatiques. App.[arition] Printemps”.

MATERIAL EXAMINED. — **France.** (i)-(iii) Bouches-du-Rhône, Région Étang de Berre: (i) between Port-de-Beau-Rivage and Mauran, Merveille, “ruisselets se jettant dans l’étang” [UTM FJ62] (BOE 0315/shells), leg. Berner 25.X.1967; (ii) outflow of

a spring below road from La Fare-les-Oliviers to Saint-Chamas between Mas Suriane and Mas Meyroux [UTM FJ62] (BOE 3205 ex 0262), leg. Boeters 28.IX.1969; (iii) Source-du-Canet South of road from La Fare-les-Oliviers to Saint-Chamas [UTM FJ62] (BOE 0263), leg. Boeters 28.IX.1969. — (iv) Var, Draguignan, Foux-de-Draguignan [UTM KP92] (BOE 0302 ex Meier-Brook), leg. Berner V.1930; (BOE 2151/animals and 2414/shells ex 0261), leg. Boeters 27.IX.1969. — (v)-(viii) Alpes-Maritimes: (v) Nice? [UTM LP53] (MNHN-RIO/4 syntypes of *Bithynia meridionalis* Risso 1826); (vi) “marais des Environs de Nice” [UTM LP53] (MNHN/204), leg. Risso; (vii) “Fossés du Var près Nice” [UTM LP53] (MNHN); (viii) Nice [UTM LP53] (MNHN/22 ex Caziot; MNHN-LOC/5; MNHN-PAS/4 ex de Folin [11]; SMF 119945/20 and 266447/3).

TYPES. — France, Alpes-Maritimes, Nice? MNHN-RIO/4 shells and 4 preparations of rehydrated soft parts; original historical label: “*Bythynia* [sic] *Meridionalis* Risso”. Lectotype [MNHN-IM-2000-32539](#) [H: 4.35 mm, D: 3.05 mm, 5.0 whorls] and 3 paralectotypes [MNHN-IM-2000-32540](#) preselected by Giusti in 1998 (here designated).

IDENTIFICATION. — In the Mediterranean coastal area two species of *Mercuria* can be distinguished, *M. similis* with a whip-like penis and the species in question with a wedge-like penis. From the west to the East, *M. similis* is distributed in the departments Pyrénées-Orientales, Aude, Hérault, Gard and Bouches-du-Rhône, but does not reach the Étang-de-Berre, whereas the species in question lives farther East, nowadays in the department Bouches-du-Rhône at the shore of the Étang-de-Berre, and at least in the department Var. From two paralectotypes of *Bithynia meridionalis* from presumably Nice, male soft parts have been isolated by Giusti, one of them in such a good condition that the wedge-like penis can be seen (see Fig. 12).

DISTRIBUTION AND ECOLOGY. — In the department Alpes-Maritimes likely to be extinct. In the department Var collected live at one single locality (Foux-de-Draguignan) and in the department Bouches-du-Rhône live at two localities (shore of Étang-de-Berre).

In the department Alpes-Maritimes, fossés at the destroyed mouth of river Var, accompanied by *Valvata* sp., *Bithynia* sp. and *Belgrandia varica* (J. Paget, 1854). A portable case of a Trichoptera-larva with several specimens of *Mercuria meridionalis* glued living on it, with *Belgrandia varica* and a taxonomically problematic *Valvata* sp., collected by G. de Mortillet in 1851 (MNHN) shows the former richness of those lost biotopes (Fig. 9G-H).

Caziot (1910: 471) described the occurrence of *Mercuria* in the destroyed “Fossés aquatiques” at Nice, as follows: “Espèce très commune dans tous les fossés de la rive gauche du Var, près de son embouchure”. These “fossés” were the “fossés de Californie”, ditches or side-brooks with running water, indicated by by Caziot (1910: 474, 476) also for “*Valvata piscinalis*” (O. F. Müller, 1774), “*Valvata depressa*” C. Pfeiffer, 1821 and “*Neritina fluviatilis niciensis* Caziot, 1910”.

In the departments Var and Bouches-du-Rhône in springs and their outflow, in the Foux-de-Draguignan sometimes amphibious; temperature 21°C (one single determination; BOE 0262).

In the department Var sympatric with *Theodoxus* sp., *Corrosella astierii* (Dupuy, 1851) (the generic allocation follows Delicado *et al.* 2015: 414) and *Belgrandia marginata* (Michaud, 1831) (all BOE 2151).

In the department Bouches-du-Rhône occasionally sympatric with *Theodoxus* sp. (BOE 0263), *Potamopyrgus antipodarum* (Gray, 1843) (BOE 0263) and *Pseudamnicola* (*P.*) *chamasensis* Boeters, 2000 (BOE 0262). For further information on former or recent biotopes in Bouches-du-Rhône and for accompanying molluscs see Coutagne (1881: 23).

TABLE 7. — Measurements of *Mercuria meridionalis* (Risso, 1826).

Locality	Specimens measured	Shell (mm)		Aperture (mm)	
		Height	Diameter	Height	Diameter
St Chamas BOE 3205 (n = 2)	Specimen 1	3.35	2.64	1.69	1.51
	Specimen 2	3.40	2.50	1.80	1.45
	Mean	3.37	2.57	1.74	1.48
	Range	3.35-3.40	2.50-2.64	1.69-1.80	1.45-1.51
Source-du-Canet BOE 0263 (n = 5)	Specimen 1	3.10	2.54	1.66	1.50
	Specimen 2	2.90	2.19	1.54	1.20
	Specimen 3	2.85	2.29	1.57	1.31
	Specimen 4	3.50	2.75	1.95	1.55
	Specimen 5	3.05	2.35	1.55	1.40
	Mean	3.08	2.42	1.65	1.39
	Range	2.85-3.50	2.19-2.75	1.54-1.95	1.20-1.55
Foux-de-Draguignan BOE 2151 (n = 5)	Specimen 1	3.65	2.70	1.95	1.65
	Specimen 2	3.10	2.35	1.65	1.45
	Specimen 3	3.65	2.60	1.85	1.60
	Specimen 4	4.10	2.85	1.95	1.75
	Specimen 5	4.00	2.85	1.90	1.70
	Mean	3.70	2.67	1.86	1.63
	Range	3.10-4.10	2.35-2.85	1.65-1.95	1.45-1.75
Nice, MNHN (n = 4)	Lectotype	4.35	3.05	2.20	1.85
	Paralectotype 1	3.80	2.80	2.10	1.75
	Syntypes/Paralectotype 2	4.00	—	2.20	—
	Paralectotype 3	3.55	2.70	1.90	1.55
	Mean	3.92	2.85	2.10	1.72
	Range	3.55-4.35	2.70-3.05	1.90-2.20	1.55-1.85

DESCRIPTION

Shell

Conical with pointed apex and straight sidelines (as for *M. similis*); last whorl about 49-53% of total height of shell; umbilicated; of transparent milky colour; 4.67 [4.5-5.0] (n = 3) whorls, swollen and very convex, respectively, separated by a deep suture; last whorl towards aperture neither ascending nor descending; aperture obliquely broad ovate, a little narrowed above; peristome continuous, usually touching the shell wall over a short distance, outer margin simple, basal margin and columellar edge faintly reflexed, columellar edge slightly thickened.

Measurements

See Table 7.

Operculum

Colour of horn up to weak chestnut-reddish.

Animal

External characters. Pallial tentacle present. Except for a weak band on the snout, head and ommatophores pigmentless; mantle with the exception of its skirt, and visceral hump not brownish but blackish. Ctenidium with 22-24 gill filaments (Boeters 1971: 178 and fig. 6, ♂).

Male copulatory organ. Penis short and wedge-like, not extending beyond its appendix, both of about the same length; socket of the copulatory organ in its inactive state with transversal folds, immediately in front of the appendix



FIG. 10. — *Mercuria meridionalis* (Risso, 1826): **A-C**, France, Nice (?) (MNHN-RIO, paralectotypes, MNHN-IM-2000-32540); **A, B**, 2 ♂: 2 shells, one of them belongs to the soft parts of Fig. 13C; **C**, ♂, double magnification compared to shells: view of soft parts showing copulatory organ, head and foot [Giusti separated soft parts of 1 ♀ and 2 ♂ from the shells of 3 paralectotypes but did not attribute each soft body to its shell; he stated only that the female soft body belongs to the largest shell; thus the figured ♂ soft body belongs to one of the two smaller shells of Fig. 13A, B]; **D, E**, ♂, France, Bouches-du-Rhône, at road from La Fareles-Oliviers to Saint-Chamas between Mas Suriane and Mas Moyroux (BOE 3205 ex 0262); **D**, shell; **E**, copulatory organ exposed through slit in mantle (shell partially removed). Abbreviations and scale bars, see continuation page 21.



Fig. 10. — Continuation. *Mercuria meridionalis* (Risso, 1826): **F, G**, ♂, France, Bouches-du-Rhône, between La-Fare-les Oliviers and Saint-Chamas, Source-du-Canet (BOE 0263); **F**, shell with partially retracted animal; **G**, head with copulatory organ exposed through slit in mantle; **H-L**, France, Var, Draguignan, La Foux-de-Dranguignan (BOE 2151 ex 0261); **H**, ♂, shell partially broken away and mantle slitted to expose copulatory organ; **I-J**, ♂, copulatory organ (dorsal and ventral view); **K-L**, ♀; **K**, shell with partially retracted animal; **L**, body lumen opened to show renal oviduct with receptaculum seminis (rs1) and bursa copulatrix surrounded by intestinal section. Abbreviations: **bc**, bursa copulatrix; **in**, intestine; **op**, operculum; **pe**, penis; **pl**, pedal lobe; **ro**, renal oviduct; **rs1**, single receptaculum seminis. Scale bars: 1 mm.



FIG. 11. — **A-C**, *Mercuria meridionalis* (Risso, 1826), France, Var, Foux de Draguignan, leg. Boeters 27.IX.1969, BOE 2414 ex 0261 (**A, B**); BOE 2151 ex 0261 (**C**); **A**, ♀; **B**, ♂; **C**, ♂, pallial tentacle, copulatory organ and pedal lobe clearly to be seen; **D, E**, *Mercuria* sp., presumable topotypes of *Bithinia* [sic] *moutonii* Dupuy, 1849; **D**, France, Alpes-Maritimes, Cannes (i.e. Mandelieu-la-Napoule [Népoule sensu Dupuy]), ♀ (MNHN-LOC); **E**, France, Var, Grasse (MNHN-JOU); **F**, *Mercuria corsensis* n. sp. France, Corse-du-Sud, Bonifacio, Couvent de la Trinité, leg Boeters IX.1979 (holotype MNHN-IM-2000-31951 ex BOE 0916); **G-H**, *Mercuria zopissa* (Paulucci, 1882), Italy, Sardinia, Monte dei Sette Fratelli, leg Giusti, Topotypes ex SMF 252038/7; **G**, globular shell; **H**, slender shell; **I-J**, *Pseudamnicola emiliana* (Paladilhe 1869); **I**, Neotype ex Topotype; France, Hérault, ruisseau [d'eaux douces] près de Balaruc (MNHN-IM-2000-32541 ex de Folin); **J**, de Folin's label ["determ. par Paladilhe", handwriting of Folin]. Scale bars: A, B, D-I, 3 mm; C, 1 mm.

with a dorsal thickening; appendix like a disk with a lateral bulge; area of the furcation of penis and appendix blackish (Fig. 11D; Boeters 1971: 178, fig. 7; Giusti 1979: 7, figs 4c2 and 4c4).

Female genital tract. Bursa copulatrix and one receptaculum seminis (Boeters 1971: 178, fig. 8; Giusti 1979: 7, fig. 4c3).

DIFFERENTIATING FEATURES

Versus *M. similis*: Penis does not extend beyond appendix as in *M. similis*. *Mercuria meridionalis* prefers running waters whereas *M. similis* is also known from stagnant water bodies.

REMARKS

Draguignan is already of record in the Collection Dupuy (Toulouse).

Béranguier (1882: 42-44) gave a detailed description of the Foux-de-Draguignan and listed *Amnicola compacta* Paladilhe, 1869 and *Amnicola anatina* as from Trans[-en-Provence]. One should know that the Foux is situated South-East of Draguignan immediately in front of Trans-en-Provence.

A photograph of a shell of this species from Le Muy about 8 km far from Draguignan can be found in Germain (1931: pl. 17, fig. 496). We have not checked whether *M. meridionalis* still lives there.

For records of *Mercuria* from the Alpes-Maritimes which we could not definitely attribute to *M. meridionalis* see discussion under *Bithinia* [sic] *moutonii* Dupuy, 1849, first paragraph of the chapter "Taxa uncertain".

Mercuria corsensis n. sp.
(Figs 11F; 13A-F; Table 8)

TYPES. — Holotype MNHN-IM-2000-31951 (Fig. 11G), paratypes BOE 0916/animals.

TYPE LOCALITY AND MATERIAL EXAMINED. — Only the type series is known. **France.** Corsica, Bonifacio, spring East of the road towards Couvent de la Trinité about 500 m South of the road Ajaccio-Bonifacio [UTM NL08] (BOE 0916, leg. Boeters IX.1979; the locality is already mentioned by Caziot (1903: 325) as the finding place of an enigmatic "*Valvata*" which was not refound.

ETYMOLOGY. — Derived from Corsis, greek-latin, a variant of Corsica, combined with the suffix -ensis which indicates the origin.

DISTRIBUTION AND ECOLOGY. — In France only at the southern tip of Corsica at La Trinité. Found only in a single spring together with representatives of the Limnaeidae Lamarck, 1799 and the Planorbidae Rafinesque, 1815. The ecology of the closely related *M. zopissa* in Sardinia is described as follows: "Vive in ruscelli e torrenti, tra la vegetazione della riva o attaccata ai ciottoli del fondo. Alcune popolazioni si rinvencono in tazze sorgentizie (Monte dei Sette Fratelli, Sarrabus)" [Lives in brooks and torrents, between the vegetation of the borders or sticking on gravels of the ground. Some populations live in spring ponds (at Monte dei Sette Fratelli, Sarrabus)] (Giusti & Pezzoli 1980: 23).

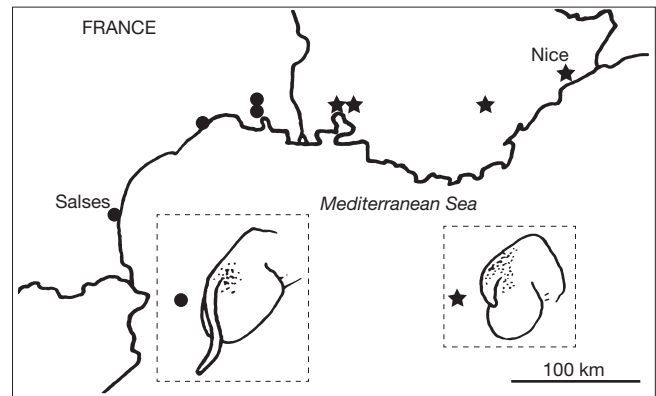


FIG. 12. — Distribution of *Mercuria similis* (Draparnaud, 1805) and *M. meridionalis* (Risso, 1826). Symbols: ●, four finding sites of *M. similis* with anatomically examined male copulatory organ (Font Estramar at Salses; La Robine at Vic-la-Gardiole, Étang de Scamandre at St Gilles, Étang du Charnier (see Girardi 2003: 86 Fig. 2A); ★, four finding sites of *M. meridionalis* with anatomically examined male copulatory organ (two sites at Étang de Berre, Foux-de-Draguignan between Draguignan and Trans-le-Provence, Var at Nice [?]).

TABLE 8. — Measurements of *Mercuria corsensis* n. sp.

Locality	Specimens measured	Shell (mm)		Aperture (mm)	
		Height	Diameter	Height	Diameter
Bonifacio, La Trinité (MNHN)	Holotype	3.50	2.30	1.70	1.45
BOE 0916 (n = 8)	Paratype 1	3.25	2.30	1.65	1.35
	Paratype 2	2.85	2.05	1.45	1.35
	Paratype 3	3.00	2.20	1.65	1.35
	Paratype 4	3.00	2.30	1.60	1.35
	Paratype 5	3.25	2.15	1.55	1.30
	Paratype 6	2.85	2.10	1.60	1.30
	Paratype 7	3.00	2.20	1.60	1.35
	Mean	3.09	2.20	1.60	1.35
Range		2.85-3.50	2.05-2.30	1.45-1.70	1.30-1.45

DESCRIPTION

Shell

Shape of shell broadly conical to slightly ovoid with rounded apex and convex sidelines; height 3.10 mm [2.85-3.50 mm] and diameter 2.20 mm [2.05-2.30 mm] (n = 8); last whorl about 51.8% [47.2-56.1%] (n = 8) of total height of shell; umbilicated; shell colour transparent milky, shell surface usually with dark-brown or ochreous iron-manganese coating; 3.75-4.0 whorls, slightly swollen and convex, separated by a shallow suture; last whorl towards aperture neither ascending nor descending; aperture obliquely broad ovate, forming at the top a blunt and nearly rectangular angle; peristome continuous, usually touching the shell wall over a short and slightly convex bent distance; outer margin simple, basal margin and columellar edge faintly reflexed, columellar edge slightly thickened.

Measurements

See Table 8.

Operculum

Pale reddish.

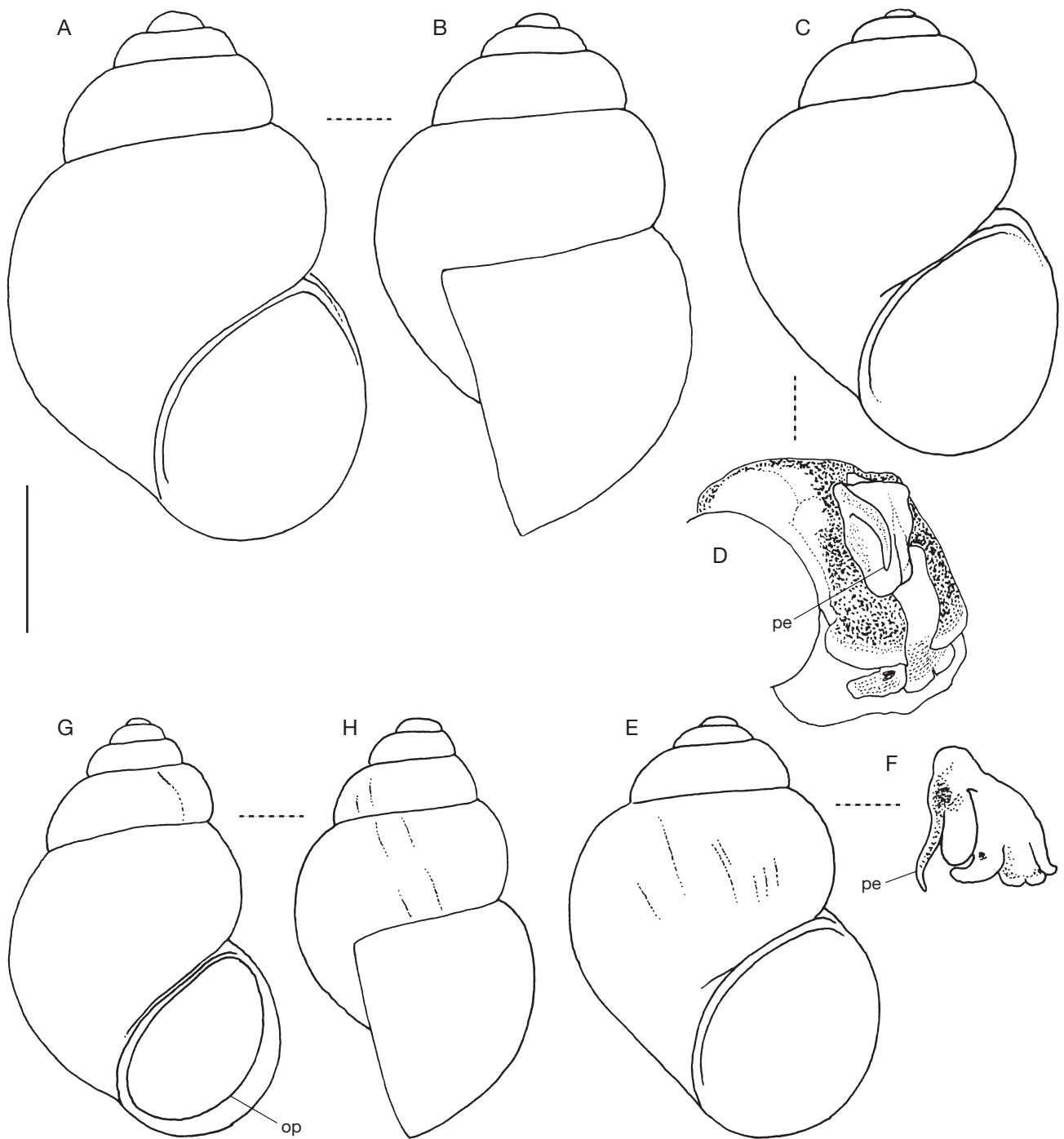


FIG. 13. — *Mercuria corsensis* n. sp. and *M. zopissa* (Paulucci, 1882): **A-F**, *M. corsensis* n. sp.; France, Corse, Bonifacio, Couvent de la Trinité (BOE 0916); **A, B**, shell probable ♀, frontal (**A**) and lateral view (**B**); **C, D**, ♂; **C**, shell; **D**, head with copulatory organ exposed through slit in mantle; **E, F**, ♂; **E**, shell; **F**, head with copulatory organ; **G, H**, *M. zopissa*; Italy, Sardinia, 60 km NW Cagliari, label “Ruscello presso Grotta ‘Su Mannau’ c/o Fluminimaggiore (Iglesiente)” (BOE 0893 ex Giusti); shell frontal (**G**) and lateral view (**H**). Abbreviations: **op**, operculum; **pe**, penis. Scale bar: 1 mm.

Animal

External characters. Pallial tentacle not seen. Mantle strongly blackish pigmented. Ctenidium with 23 to 24 gill filaments.

Male copulatory organ. Penis short but slender and rather whip-like, not extending beyond the elliptical appendix or only slightly longer. Penis blackish pigmented, appendix merely at its branching off.

The female genital tract. Not examined.

DIFFERENTIATING FEATURES

Compared to shells of the Sardinian *M. zopissa* (Paulucci, 1882) (Fig. 11G-H; Fig. 13G-H) the shells of *M. corsensis* n. sp. with a height of 3.10 mm [2.85-3.50 mm] and a diameter of 2.20 mm [2.05-2.30 mm] (n = 8) are slightly larger and more ovate, which is reflected by a ratio of height of aperture to total height of c. 52% instead of 42% (females) and 44% (males) in *M. zopissa*. For example, the shell of a male of *M. corsensis* n. sp. showed the following measurements: height 2.90 mm, diameter 2.05 mm and height of aperture to total height of 51.6%. Further, whereas in *M. corsensis* n. sp. the last whorl before the aperture neither descends nor ascends, in *M. zopissa* the last whorl often descends clearly immediately before the aperture, as can be deduced, for example, even from the frontal view in Fig. 11H. A character which discriminates *Mercuria corsensis* n. sp. as well as *M. zopissa* from all other *Mercuria* species is the shallow suture in combination with the ovate shape.

REMARKS

The new species has been considered by Falkner *et al.* (2002: 79) as conspecific with *Mercuria zopissa* (Paulucci, 1882) from Sardinia, but a new evaluation of its characters led us to acknowledge it as a distinct species. Judging from the nevertheless existing striking morphological similarities, *M. zopissa* and *M. corsensis* n. sp. must be considered as closely related sister species. This means they form a group which is differentiated with a significant gap against all other *Mercuria*-species of France and Spain. As they are exclusively confined to Corsica and Sardinia it can be assumed that their evolution is correlated to the well known Tertiary plate tectonics and the complex palaeogeographic history of the two islands (as for example outlined with instructive maps in de Jong 1998: 113-118). They must share a common ancestral species which lived on the Corso-Sardinian microplate when it became separated from the South European continental margin. As the distance between the northernmost occurrences of *M. zopissa* and the type locality of *M. corsensis* n. sp. is about 220 km, the split of the two sister species must predate the younger pleistocene glaciation cycles, otherwise the large gap in the distribution areas can not be explained. In all circumstances today's occurrences of both species must be considered as relicts of former larger distribution areas on both islands.

TAXA UNCERTAIN, INSUFFICIENTLY KNOWN OR CONFUSED

Bithinia moutonii Dupuy, 1849
(Fig. 11D, E)

Bithinia [sic] *moutonii* Dupuy, 1849: [1].

TYPE LOCALITY. — Not mentioned in the original description, but “Galliae” according to title of Catalogus. From Dupuy (1851: 553) the following type locality can be reconstructed: “Habit. Les eaux tranquilles de la France méditerranéenne, les environs de Grasse, marais de la Népoule (Mouton), etc.”

TYPES. — Syntypes unknown. For topotypes compare Fig. 11D (“Cannes” corresponds to Siagne at Mandelieu-la-Napoule; MNHN-LOC) and Fig. 11E (Var, Grasse; MNHN-JOU).

REMARKS

It would be of interest to clarify whether the ecological indication “les eaux tranquilles” might differentiate Dupuy's species from *M. meridionalis*.

A sample in the Collection Dupuy (MHNT-DUP) (Astre 1921: 262) from Draguignan is not regarded as syntypes, since it does not come from the reconstructed type locality.

Grasse was the domicile of the collector Mouton and the “marais de la Népoule” is surely identical with the historical Étang de la Napoule which is described by Desmarest (1811: 98) as “ancien lit” of the lower course of the river Siagne and as a pestilential swamp consisting of “une infinité de petites mares”. The spelling variant “Népoule” instead of “Napoule” is at least documented by the geologist Coquand (1836: 111). In this context it should finally be mentioned that the Collection Pascal (MNHN-PAS) comprises a sample of *Mercuria* from Mandelieu[-la-Napoule] (MNHN-PAS/3 ex de Folin [5]).

A large sample has been collected before 1875 by A. Macé in the Siagne near its embouchure between Cannes and La Napoule; from this material a large lot of 149 specimens was donated to Mousson (ZMH 524050 and 524051). As the shells with indication of locality “Cannes” in the collection Locard (MNHN-LOC) show an identical mud coating it can be presumed that they stem from the same sampling.

There do not exist any recent reports of *Mercuria* from Grasse and its environs.

Pseudamnicola (Pseudamnicola) emilianus
(Paladilhe, 1869) n. comb.
(Fig. 11I-J)

Amnicola emiliana Paladilhe, 1869: 229, pl. 19, figs 22, 23 [separatum: 106, pl. 5, figs 22, 23].

Amnicola confusa – Moitessier 1867: 437, pl. 22, figs 15-17 [separatum: 69, pl. 1, figs 15-17].

Mercuria similis [partim] – Girardi 2004: 83-86, fig. 1D.

TABLE 9. — Measurements of *Amnicola emiliana* Paladilhe, 1869 from the type locality.

Specimen	Height	Diameter	Whorls
neotype	2.75	2.20	3.75
juv. 1	2.55	2.05	3.7
juv. 2	2.15	1.75	3.25

ORIGINAL INDICATION OF THE TYPE LOCALITY. — “[1] Cette espèce se trouve dans un ruisseau d’eaux douces des environs de Balaruc (Hérault), [2] [...] des environs de Salces [sic] (Pyrénées-Orientales), [3] de Vendrelle (Catalogne) et [4] des San Giuliano près de Gènes (Italie).”

TYPE LOCALITY AFTER DESIGNATION OF A NEOTYPE. — “[...] habite le ruisseau de Balaruc-les-Bains. Nous l’avons recueillie en abondance sur les bords de ce ruisseau au-dessus du moulin” (Moitessier 1867: 437 [separatum: 69]).

MATERIAL EXAMINED. — France. (i) Pyrénées-Orientales, Salses, ditch at path from Route nationale to Fontdame [UTM DH94] (BOE 0998/animals and 3201/shells), leg. Boeters 4.IX.1980. — (ii) Hérault, ruisseau [d’eaux douces] près de Balaruc [UTM EJ51] (MNHN-PAS/3 ex de Folin [1], de Folin’s label: “*Amnicola Emiliana* Palad. ruisseau près de Balaruc – Hérau[1]t déterm.[iné] par Paladilhe. Je ne puis vous offrir plus, possédant fort peu d’individus”).

NEOTYPE. — MNHN-IM-2000-32541, France, Hérault, Balaruc-les-Bains (Pascal ex de Folin) (here designated). Measurements see below. The description by Paladilhe of *Amnicola emiliana* is essentially based on material which Moitessier collected in the “ruisseau de Balaruc” and determined as *Amnicola confusa* (cf. Paladilhe 1867: 48 [separatum: 47]; 1869: 231 [separatum: 107]; Moitessier 1867: 437 [separatum: 69]; the figure of Paladilhe is copied from Moitessier, with a correction of the opercular spiral, but the wrong position of the nucleus has been maintained). Moitessier donated material from this original lot to his close friends Bourguignat and Paladilhe. Paladilhe later included Material from other localities in the type series (see above). Unambiguous syntypes have up to now not been found. In the collection of Paladilhe no original material was traceable in 1968 when Boeters visited the collection. The lot in the collection of Bourguignat with the erroneous determination of Moitessier (MHNG-BGT 5429) was received by Bourguignat before the species was described as new by Paladilhe. Therefore it constitutes no part of the type series, but must be qualified as “topotypes from the original lot”. The specimens which de Folin gave to Pascal stem from the same original finding place and may form part of the type series, but it cannot be evidenced that they have been used in the original description. The notice of de Folin “déterm. par Paladilhe” may also be interpreted in the way that Paladilhe has identified this material later with his species. Therefore we prefer to designate a specimen from this material as neotype.

The need to select a neotype results from the fact, that two biological species are involved in the interpretation of the nominal species *Amnicola emiliana*, and that the species has been misinterpreted until now.

The sample from which the neotype has been selected comprises altogether three shells (Table 9). All these three shells belong to the same species. Among these three shells the neotype is the only adult specimen. The measurements [mm] are as follows:

According to Paladilhe the shell measurements are “Haut., 2 1/2 – 3 mm; - diam., 2 mm”. Thus, the measurements of the neotype are satisfactorily in accordance with Paladilhe’s description but not with 3.84 [2.8-5.1] mm for *M. similis*; cf. Table 6 (n = 19). The shell of the neotype and the shells of the 2 juvenile specimens are

coloured like horn in accordance with the term “cornée” of the original description, and not milky as in *Mercuria*. The operculum is also coloured like horn and not yellowish with chestnut-brown nucleus as for *M. similis*.

DESCRIPTION

After Paladilhe

“Coquille ovoïde-ventrue, à fente ombilicale bien distincte, cornée, en peu transparente, légèrement brillante, presque lisse; – spire assez aigue, à sommet petit; – 4 tours ½ assez convexes, aplatis en dessus et comme canaliculés vers la suture qui est bien marquée; dernier tour très-grand relativement, ovoïde, égalant ou même dépassant en hauteur la ½ de la hauteur totale, descendant à peine vers l’ouverture; bord libre vertical, à peine sinué. – Ouverture allongée-elleptique, à peine oblique, à extrémité supérieur de l’ellipse un peu saillante et légèrement anguleuse à cause de l’aplatissement supérieur du dernier tour; péristome droit, à peine épaissi; bord columellaire en peu réfléchi; bord externe faiblement arqué.

Opercule elliptique, à peine anguleux supérieurement, d’une couleur marron, brillant, mince, marqués de stries spirescentes très-légères, très-profondément situées.

Haut., 2 1/2-3 mm; - diam., 2 mm.”

Based on MNHN-PAS/3 including neotype

The shell is coloured like horn and not milky as in *Mercuria*. The operculum is also coloured like horn and not yellowish with chestnut-brown nucleus as for *M. similis*. Height of shell 2.75 mm (n = 1) compared to 3.84 [2.8-5.1] mm for *M. similis*; cf. Table 6 (n = 19).

REMARKS

Up to now, *Amnicola emiliana* has not been interpreted as a species of *Pseudamnicola*, but of *Mercuria* (see Boeters 1988: 211; Girardi 2004; Clanzig & Bertrand 2001; Falkner *et al.* 2002: 29). The fact that *Amnicola emiliana* belongs to *Pseudamnicola* confronts us with a lot of questions which can only be mentioned in this context but will not be solved here. The importance of these questions results from the fact that still up to now species of *Mercuria* have been mixed up with those of *Pseudamnicola* and even *Bithynia*. This difficulty, as already realised by Frauenfeld (1863) when describing his *Amnicola confusa* [!], has even nowadays not completely been overcome. Under this aspect, it is still necessary to improve our knowledge not only of all relevant species regarded as representatives of *Mercuria*, the same applies simultaneously to *Pseudamnicola*, to make clear what we are speaking about. In the Mediterranean area only an adequate redescription and delimitation of all species of *Pseudamnicola* will lead to a correct understanding of *Mercuria* and vice versa.

The type locality “le ruisseau de Balaruc-les-Bains [...] au-dessus du moulin” must be seen critically. We will not exclude that the brook is not to be searched for at Balaruc-les-Bains, but it might be the outflow of the karstic spring area Issanca at Balaruc-le-Vieux. However, recent attempts to collect *Mercuria* or *Pseudamnicola* there have not been successful (Berner in 1967; Boeters in 1980 and 2011; Git-

tenberger in 1980). Thus, at present *Amnicola emiliana* can be redescribed only by shell characters but not by anatomical or genetic characters.

It cannot be overlooked that Paladilhe based his description not only on material from Balaruc but also from three other localities including Salses. However, at Salses *Mercuria similis* and a species of *Pseudamnicola* as well coexist. Reference is made to Girardi (2004: 85, Fig. 1D in comparison to Fig. 1A-C, E-F) and to Fig. 14A, B. Thus, the relationship of *Amnicola emiliana* to *Amnicola spirata* Paladilhe, 1869 should be clarified since Salses is also one of the original finding sites of the latter and since it has been redescribed by Boeters (1988: 199) from its original finding site in Spain as *Pseudamnicola spirata*.

When describing *Pseudamnicola chamasensis* in 2000, Boeters was the first to report the existence of a representative of *Pseudamnicola* s. str. in France. Meanwhile we know, that in the Mediterranean area *Pseudamnicola* lives or lived not only in the department Bouches-du-Rhône as *Pseudamnicola chamasensis* does, but also in the departments Hérault at Balaruc and Pyrénées-Orientales at Salses (apart from the mysterious *Amnicola pisolena* Paladilhe, 1876, in the Hautes-Alpes). This means, the relationship of *Amnicola emiliana* not only to *Amnicola spirata* must be clarified but also to *Pseudamnicola chamasensis*.

Finally, Girardi *et al.* (2009: 135) regard *Pseudamnicola chamasensis* from mainland France and *Pseudamnicola cyrniacus* (Mabille, 1869) from Corsica as synonyms of *Pseudamnicola moussonii* (Calcara, 1841) which has been described from Sicily. Detailed confirmation is requested.

Pseudamnicola (Pseudamnicola) spiratus
(Paladilhe, 1869)

Amnicola spirata Paladilhe, 1869: 231, pl. 19, figs 10-11 [separatum: 108, pl. 5, figs 10-11].

Pseudamnicola spirata – Boeters 1988: 199.

ORIGINAL INDICATION OF THE TYPE LOCALITY. — “[1] [...] aux environs de Bañolas (Catalogne) et [2] près de Salces [sic] (Pyrénées-Orientales).”

TYPES. — Unknown.

IDENTIFICATION OF THE TAXON

Based on topotypes from one of the original finding sites [1], Boeters (1988: 199) identified and redescribed this species as belonging to *Pseudamnicola*. Since we now know that also *Amnicola emiliana* belongs to *Pseudamnicola* and since the descriptions of both taxa comprise also Salses as original finding site, it is to be clarified whether there live at Bañolas, Salses and Balaruc-les-Bains (the restricted type locality of *Amnicola emiliana*), more than one species or only one species. In the latter case one of the two names must be given precedence. Paladilhe himself distinguishes between *Amnicola emiliana*

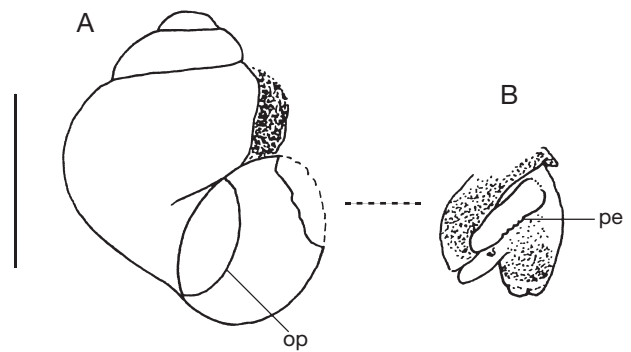


FIG. 14. — *Pseudamnicola* sp., France, Pyrénées-Orientales, Salses, ditch at path from Route nationale to Fontdame (BOE 0998), (juvenile ♂): **A**, shell (partially destroyed); **B**, copulatory organ exposed through slit in mantle. Abbreviations: **op**, operculum; **pe**, penis. Scale bar: 1 mm.

and *Amnicola spirata* as follows but does not give any further details for their alleged sympatric occurrence at Salses:

“elle [*Amnicola spirata*] diffère aussi de l’*A. emiliana* par son ouverture presque ronde et le mode d’accroissement de ses tours”.

NOMENCLATURE REMARKS

In Spanish literature it has during the last decade become customary to use the name *Pseudamnicola (P.) subproducta* (Paladilhe, 1869) instead of *spirata* [recte *spiratus*] (Soler *et al.* 2006: 212; Alba *et al.* 2011: 42-43; Delicado *et al.* 2011: 779; Álvarez Halcón *et al.* 2012: 58; Delicado *et al.* 2014: 39, 60; Delicado *et al.* 2015: 413). We cannot see any detailed argument given by Soler *et al.* in 2006 (: 212) or Delicado *et al.* 2014 (: 39, 60 with reference to Soler *et al.* 2006) for validating *P. (P.) subproducta* instead of *P. (P.) spirata*. Apparently these authors acted on two wrong assumptions, namely they considered the renaming act of Paladilhe as justified and they believed the two names to be simultaneously published (erroneously indicated as “feb. 1869”). In reality Paladilhe described *Amnicola spirata* in the June fascicle of 1869 (p. 231, later reprinted in the Separatum: 108). In the same year later on (after October) in a note additionnelle (Separatum only: 140) he replaced the name with *Amnicola subproducta* after having become aware of *Paludina spirata* described by Requier in 1848 (p. 51). However, *Paludina spirata* is neither a homonym nor the same species. *Paludina spirata* is a marine and not a freshwater species as can be deduced from Requier’s indication “marina” in his description. Alba *et al.* (2011: 43) rejected the supposed homonymy but accepted nevertheless the simultaneousness of publication. Because of this feigned simultaneousness they see in Nevill (1885: 55, wrongly cited as published in 1884) the First Reviser who used the name *subproducta* as valid and cited *spirata* as its synonym. This search for a First Reviser is unnecessary as *subproducta* is an objective younger synonym of *spirata*, and there is no reason to validate this superfluous name which owes its origin to an error of Paladilhe.

Paludestrina brevispira Paladilhe, 1870

Paludestrina brevispira Paladilhe, 1870: 243 [separatum: 77]; 1874: pl. 3, figs 27, 28 [figs only].

ORIGINAL INDICATION OF THE TYPE LOCALITY. — “[...] dans les fonds de drague [Brague] venant d’Antibes (Alpes-Maritimes), où elle habite, sans doute, des eaux saumâtres, d’où elle aura pu être entraînée par des cours d’eau.”

TYPES. — About 25 syntypes in PPSUM2-PAL; label: “*Pal.rina brevispira* Fonds de dragues [sic] venant d’Antibes”.

For the operculum and the shell Paladilhe gives the following description: “Opércule vitré, assez solide, légèrement marqué de stries spirales, peu enfoncé. Animal inconnu. Haut. 6 millim. 2, diam. 1 1/5.” The indication of the Measurements must be erroneous as the figure in natural size (Paladilhe 1874: pl. 3, fig. 28) shows a shell height of only 2 mm. The shells of 2 syntypes photographed by Boeters have a height of 1.82 and 1.87 mm, respectively. Because of the comparatively small size of the shell and the colourless operculum it is assumed that the species belongs to *Pseudamnicola* and not to *Mercuria*.

Paludina cerulea Massot, 1872

Paludina cerulea Massot, 1872: 123 [separatum: 91].

ORIGINAL INDICATION OF THE TYPE LOCALITY. — “[...] dans des eaux très limpides qui coulent dans des rigoles, près de l’étang de Salses [étang de Leucate ou de Salses], sur le point où la route nationale passe sous le chemin de fer du Midi.”

MATERIAL EXAMINED. — France. Pyrénées-Orientales, Salses; (i) ditch at path from Route nationale to Fontdame [UTM DH94] (BOE 0998/ animals and 3201/shells [both *Pseudamnicola* sp.]), leg. Boeters 4.IX.1980; (ii) ditch at Font Dame [UTM DH94] (BOE 0999 [*Pseudamnicola* sp.] and BOE 3208 ex 0999 [*Mercuria similis*]), leg. Boeters 4.IX.1980.

TYPES. — Unknown.

DESCRIPTION (BY MASSOT 1872)

“Sa couleur bleunâtre m’engagea à lui donner le nom de *Paludina cerulea*, et de distinguer deux variétés [de *Amnicola similis* Draparnaud].”

REMARKS

The complete name of the “étang de Salses” is “étang de Leucate ou de Salses”. Further, “le point où la route nationale passe sous le chemin de fer du Midi” refers precisely to the Fontdame and not to the about 2 km distant Font Estramar.

Massot describes his *Paludina cerulea* under “*Amnicola similis* Draparnaud” and as one of “deux variétés”, but he does not give any description of *Amnicola similis* in his understanding. However, it should not be overlooked that Draparnaud described his *Cyclostoma simile* (1805: 34) as “verdâtre”. In a ditch “où la route nationale passe sous le chemin de fer du Midi” *Pseudamnicola* sp., and down-ditch at Fontdame in addition to *Pseudamnicola* sp. also *M. similis* could be collected. For *Pseudamnicola* sp., the black mantle and buccal mass of the animals can be seen through the slightly horn-like coloured transparent shell wall; compare the colour photographs given by Girardi (2004: 85, fig. 1D). However, the milky shell wall

of *M. similis* hides the black mantle and buccal mass of the animals, and if the shells have lost their periostracum and are slightly corroded, they might be seen as coloured “bleunâtre”.

Amnicola lutetiana Locard, 1893

Amnicola lutetiana Locard, 1893: 78.

ORIGINAL INDICATION OF THE TYPE LOCALITY. — “Conduites d’eau de la ville de Paris.”

TYPES. — Unknown.

Possibly belonging to *Avenionia* Nicolas, 1882.

Mercuria indet.

(*Mercuria bayonnensis* or *Mercuria sarahae*).

MATERIAL EXAMINED. — The following samples from the French Atlantic coast belong to *Mercuria*, but since there are no anatomical and ecological data available, a safe determination as *M. bayonnensis* or *M. sarahae* is not yet possible: (i) Gironde, Plassac (in the river Gironde?) [UTM XQ89] (MNHN-PAS/4 ex de Folin [9]); (ii) Charente-Maritime, surrounding of Rochefort (in the river Charente?) [UTM XR58] (MNHN).

DISCUSSION

TAXA

For France, the following nominal taxa can be attributed to species of *Mercuria*: *Bythinia* [sic] *bayonnensis* Locard, 1894, *Bythinia* [sic] *baudoniana* Gassies, 1859, *Amnicola lanceolata* Paladilhe, 1869, *Amnicola sarahae* Paladilhe, 1869, *Amnicola vindilica* Paladilhe, 1870, *Bulimus anatinus* Poiret, 1801, *Cyclostoma simile* Draparnaud, 1805, *Bithynia meridionalis* Risso, 1826, and *Amnicola confusa* Frauenfeld, 1863.

Amnicola lanceolata is treated as synonym of *M. baudoniana*, further, *Amnicola confusa* as synonym of *M. similis*.

Finally, *Amnicola emiliana* Paladilhe, 1869, always understood as *Mercuria*, could be identified as *Pseudamnicola*.

The following list lists name-bearing types which have been designated or mentioned:

<i>Bythinia bayonnensis</i>	Lectotype MHNG-BGT 4943a
<i>Bythinia baudoniana</i>	Lectotype MNHN-IM-2000-32542
<i>Amnicola lanceolata</i>	Lectotype MHNG-BGT 5473/1
<i>Amnicola sarahae</i>	Lectotype MHNG-BGT 5459/1
<i>Amnicola vindilica</i>	Lectotype MHNG-BGT 5479/1
<i>Cyclostoma simile</i>	Neotype NMW 92596 (Boeters & Falkner 2000), also Lectotype of <i>Amnicola confusa</i>
<i>Amnicola confusa</i>	Lectotype NMW (Boeters 1971) = Neotype <i>Cyclostoma simile</i>
<i>Bithynia meridionalis</i>	Lectotype MNHN-IM-2000-32539 (pre-designated by Giusti)
<i>Mercuria corsensis</i> n. sp.	Holotype MNHN-IM-2000-31951
<i>Amnicola emiliana</i>	Neotype MNHN-IM-2000-32541

SPECIES OF *MERCURIA* IN FRANCE AND THEIR DIFFERENTIATION

This work deals with *M. bayonnensis*, *M. baudoniana*, *M. sarahae sarahae*, *M. sarahae vindilica*, *M. anatina*, *M. similis*, *M. meridionalis* and *M. corsensis* n. sp. Altogether seven species of *Mercuria* are acknowledged for France. *Mercuria sarahae* is represented with two subspecies, *M. s. sarahae* and *M. sarahae vindilica*. Further, an endemic Corsican species has been described as *M. corsensis* n. sp., which is closely related to the endemic Sardinian *M. zopissa*.

Representatives of *Mercuria* are poor in characters which show clear differences between different species. In some cases it is difficult to distinguish neighbouring species of *Mercuria* based only on conchological characters. However, in such cases differences in the characters of the male copulatory organ allow a satisfying differentiation. This applies to *M. bayonnensis* versus *M. sarahae*, *M. sarahae* versus *M. anatina* and *M. similis* versus *M. meridionalis*.

Anatomy

Pallial tentacle. This tentacle first reported by Boeters in 1971 (p. 179) could be confirmed only for *M. similis* and *M. meridionalis*.

Male copulatory organ. This organ allows to clearly distinguish between neighbouring species.

In species of the Atlantic coast. Compared to *M. sarahae*, in *M. bayonnensis* the penis is thicker and the lateral bulge of the appendix hardly pronounced. In *M. sarahae* the male copulatory organ is smaller in *M. anatina*, the penis shaped rather vermiform, not wedge-like, and the appendix shows a pronounced lateral bulge which is missing in *M. anatina*.

In species of the Mediterranean coast: in comparison to males of *M. meridionalis* with their short penis, the penis of males of *M. similis* is long and vermiform.

Female genital tract. At least four species of *Mercuria* from northern Africa it is known that females may have one or two receptacula seminis in addition to their bursa copulatrix (Backhuys & Boeters 1974: 113 and 1976: 95). As regards females of all examined French species only one single receptaculum could be found or confirmed (rs1); this applies for *M. bayonnensis*, *M. sarahae*, *M. anatina*, *M. similis*, *M. meridionalis* and presumably *M. corsensis* n. sp.

Distribution and ecology

In France, all representatives of *Mercuria* live in coastal regions. They can be found in springs and their outflow, such as *M. bayonnensis* and *M. sarahae vindilica* at Atlantic coasts and *M. similis*, *M. meridionalis* and *M. corsensis* n. sp. at Mediterranean coasts. Or at Atlantic coasts they can or could be collected in large rivers, even in their tide areas, such as *M. bayonnensis*, *M. s. sarahae* and *M. anatina*. Or they can or could be met in brooks, such as *M. bayonnensis*, or side-brooks of rivers, such as *M. s. sarahae*, both at the Atlantic coast, or as *M. meridionalis* in side-brooks of river Var at the Mediterranean coast. Or they live even in stagnant waters as of, for

example, ditches, such as *M. baudoniana*, or coastal lakes, such as *M. similis*. It is obvious that the variety of biotopes from fresh water springs to tide areas or coastal lakes (étangs) must correspond to a salinity gradient. Thus, for tide areas with *M. anatina* a salinity of 0.5-5.4 ‰ and for a coastal lake (étang) with *M. similis* a salinity of 4-5 ‰ have been reported.

In correspondence to the different biotopes mentioned, the accompanying mollusc fauna varies, if *Potamopyrgus antipodarum* (Gray, 1843) is disregarded. In springs, their outflow and brooks at the Atlantic coastal region species of *Mercuria* can be collected together with *Theodoxus* sp., at the Mediterranean coastal region with *Theodoxus* sp., *Semisalsa* sp., *Pseudamnicola* (*Pseudamnicola*) sp., *Corrosella astierii* (Dupuy, 1851) and *Belgrandia* sp. In stagnant waters at the Atlantic coastal region with *Anisus spirorbis* (Linnaeus, 1758) and *Omphiscola glabra* (O.F. Müller, 1774), at the Mediterranean coastal region with *Semisalsa scamandri* (Boeters *et al.*, 1977).

Nowadays *Potamopyrgus antipodarum* (Gray, 1843) is a usual accompanying snail at all biotopes. However, in comparison to all *Mercuria* species, two peculiarities apply. First, as mentioned, all representatives of *Mercuria* live in coastal regions only. Further, whereas *P. antipodarum* generally colonises the total drainage area of a river, each population of all representatives of *Mercuria* always seems to be restricted to a specific type of biotope such as spring, brook, river, ditch or coastal lake. This nourishes the impression that populations of a *Mercuria*-species inhabiting ecologically distinct biotopes might be subject to a speciation process. This assumption will be supported as follows.

We have become aware of only three cases where species of *Mercuria* live or lived restricted to one type of biotope only, that is *M. s. vindilica* at Belle-Île-en-Mer, *M. corsensis* n. sp. at Corsica in springs and *A. anatina* in estuaries of the Somme in France, the Escaut (Schelde) in Belgium and Rhine and Maas in the Netherlands. All other species appear in several different biotope types but have never colonised a complete drainage area as *P. antipodarum* does. This will be illustrated as follows:

- *M. bayonnensis*. This species has definitely been collected in a spring at Biarritz, in a brook in the surrounding of Bayonne and in the Nive at Bayonne. However, it has also been reported but without any ecological details from the Lac Négresse at Bayonne, Le Teich in Landes and from La Tresne [Latresne], today a district of Bordeaux. Except for these three records, this species inhabits or inhabited such different localities as springs, brooks and rivers.
- *M. s. sarahae*. We can also not exclude that this nominate subspecies inhabits places other than the tide areas of the Loire and the Erdre, one of the tributaries of the Loire, and at least side-brooks or ditches bordering the Orne. There are cryptic reports of *Mercuria* from the Atlantic coast at Rochefort and the mouth area of the Garonne.
- *M. similis*. This species lives in large karstic springs, in stagnant waters of coastal lakes, so-called étangs, and in ditches.
- *M. meridionalis*. This species lives or lived in small springs on the border of the Étang de Berre, a karstic spring at

Draguignan and in side-brooks, so-called fossés supplemented by running water, at the mouth of the river Var. If it turned out that *Bithinia* [sic] *moutonii* Dupuy, 1849, reported from stagnant waters, is a junior synonym of *M. meridionalis*, the biotopes of the latter species were the same as for *M. similis*.

Remaining questions

Since we have not been able to trace and collect, respectively, types or topotypes of *Bulimus anatinus* Poirlet, 1801, the identity of this taxon could not be clarified with absolute certainty. Thus, we cannot exclude that the species living in the Netherlands and Belgium is not *Mercuria anatina* as in our present understanding, but a species not yet described.

Further, it is our present understanding that the distribution area of *M. bayonnensis* comprises that of *M. baudoniana*. Whereas the distribution area of *M. baudoniana* extends from Saint-Jean-de-Luz in the Pyrénées-Atlantiques to Le Teich in Landes, that of *M. bayonnensis* extends from Bilbao in the Spanish province Vizcaya to Bordeaux. However, we have not been able to recollect *M. baudoniana* and to distinguish it from *M. bayonnensis* by anatomical characters. The three syntypes of *Ammicola bayonnensis* Locard, 1894, from its type locality, the Lac de la Négresse, show such a remarkable variability that its most elongated shell lets one think of an extremely short shell of *M. baudoniana*. However, our understanding of two different species is strongly supported by samples of both species from the same locality, that is Le Teich. Further investigations are appreciated.

Finally, we have not yet been able to say with absolute certainty whether the neotype of *Cyclostoma simile* Draparnaud, 1805 with its poor geographic indication “Gallia mer.” really represents *Mercuria similis* or rather *Mercuria meridionalis*, although an origin in the Montpellier region is highly probable. However, based on anatomical characters we have shown that the eastern distribution boundary of *M. similis* lies in the Rhône delta, whereas the western distribution boundary of *M. meridionalis* is the surrounding of the Étang de Berre. It would be desirable to reach an understanding of both species that allows a differentiation not only on anatomical but also on conchological characters and thereby to confirm the specific attribution of the neotype.

Conservation status

In addition to the newly described *Mercuria corsensis* n. sp., this publication deals with seven taxa of *Mercuria* with original finding sites in France. Due to progressive environmental destructions and pollution, attempts to recollect *Mercuria* at those sites have been successful only for *M. s. sarahae*, if *M. similis* is disregarded. At the Atlantic coast attempts to recollect *M. bayonnensis* at the formerly polluted Lac de la Négresse (by G. Falkner in 1999 and by Boeters in 2000), *M. baudoniana* at Le Teich (by Boeters in 2001 and by G. and M. Falkner in 2002), *M. vindilica* at Le Palais (by Boeters in 1994) and *M. anatina* in the Somme (by G. and M. Falkner in 2002) were not successful. Further, at the Mediterranean coast, attempts to recollect *M. meridionalis* at Nice and *Bith-*

inia [sic] *moutonii* in the Étang de la Napoule [corresponding to “marais de la Népoule”] and at Grasse (both by Boeters in 1969 and by M. and G. Falkner in IX.2000) were also not successful. Also the type locality of *Mercuria corsensis* n. sp. in Corsica near Bonifacio is no longer a biotope in which *Mercuria* can be expected to live (visited by G. Falkner and C. M. Brandstetter in 2014).

This gives the impression that in not so distant future *Mercuria* might completely become extinct in France.

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APPENDIX
MATERIAL ARRANGED BY COLLECTIONS

Collection Boeters (BOE)

- (i) Bidart, brook Ouhabia and Herigoin, respectively, depth about 1 m and diameter about 2 m, upstram of the mill south of Mas Bassillour about 3 km East of the coast [distance to (v) 2.5 km; UTM XP11] (BOE 2250 animals and 3185 shells ex 0364), leg. Boeters 22.IX.1970.
- (ii) Loire-Atlantique, Loire upstream of Nantes, Thouaré-sur-Loire [UTM XT13] (collection Falkner, SMNS-FAL., and BOE 1478 animals and 2415 shells), leg. G. and M. Falkner 26.V.1999.
- (iii) Locmaria, outflow of a captured spring [UTM VT93] (BOE 1448 animals and 2418 shells), leg. Boeters VII.1994.
- (iv)-(vi) NL; (iv) Oude Maas at Hoogvliet [right side of Oude Maas SW Rotterdam] (BOE 0133), leg. Backhuys 30.X.1965; (v) Biesbosch [SE Dordrecht] (BOE 0271 animals and 3186 shells), leg. Butot 1959; (vi) Spijkenisse [left side of Oude Maas SW Rotterdam] (BOE 1477), leg. Boeters 9.V.1970.
- (vii) Salses, Font Estramar [UTM DH94] (BOE 0281, 0513 and 2167 ex 281b), leg. Meier-Brook 9.VI.1963 and leg. Boeters 7.IX.1972 and 4.IX.1980.
- (viii) Salses, Font Dame [UTM DH94] (BOE 0998 and 0999), leg. Boeters 4.IX.1980.
- (ix) Aude, Port-la-Nouvelle [UTM EH06], brackish [?] ponds at the foot of limestone rocks (BOE 1193), leg. de Winter 19.VI.1979.
- (x) Bouches-du-Rhône, between Saint-Gilles and Aigues-Mortes, Étang de Scamandre [UTM FJ03] (BOE 0534), leg. Vala and Monod 12.V.1973.
- (xi) Bouches-du-Rhône, Stes-Maries-de-la-Mer [UTM FJ11] (2612), leg. G. and M. Falkner 15.VI.2002.
- (xii) between Port-de-Beau-Rivage and Mauran, Merveille, “ruisselets se jettant dans l'étang” [UTM FJ62] (BOE 0315), leg. Berner 25.X.1967;
- (xiii) outflow of a spring below road from La Fare-les-Oliviers to Saint-Chamas between Mas Suriane and Mas Meyroux [UTM FJ62] (BOE 0262), leg. Boeters 28.IX.1969.
- (xiv) Source-du-Canet south of road from La Fare-les-Oliviers to Saint-Chamas [UTM FJ62] (BOE 0263), leg. Boeters 28.IX.1969.
- (xv) Draguignan, Foux-de-Draguignan [UTM KP92] (BOE 2151 ex 0261), leg. Boeters 27.IX.1969, and (BOE 0302 ex Meier-Brook), leg. Berner V.1930.
- (xvi) FR, Corse, Bonifacio, spring East of the road towards Couvent de la Trinité about 500 m south of the road Ajaccio/Bonifacio [UTM NL08] (BOE 0916), leg. Boeters IX.1979.

Muséum national d'Histoire naturelle, Paris

- (i) Landes, Le Teich [UTM XQ54] (6 syntypes MNHN, “*Bythinia Baudoniana* var. *major* GASS. Le Taich [sic]”).
- (ii) Biarritz, “source dans la falaise” [UTM XP11] (MNHN/26), leg. Letellier 1949.
- (iii) Hérault, Cette [modern spelling; Sète] [UTM EJ50], leg. Paladilhe (MNHN/7), Paladilhe's label: “*Amnicola similis*, Drap. (*Cyclostoma*) Cette (Hérault) Pal.”.
- (iv) Bouches-du-Rhône, Aigues-Mortes [UTM FJ03?] (MNHN/18).

- (iv) Alpes-Maritimes, Nice [UTM LP53], Coll. Férussac ex Risso, Férussac's label: “marais des Environs de Nice / Risso”, (MNHN/204 + 9 Ex Rissooidea indet.).
- (vi) Alpes-Maritimes, Nice [UTM LP53] (MNHN/22 ex Caziot).
- (vii) Alpes-Maritimes, “Fossés du Var près Nice” [UTM LP53] (MNHN/10 + Trichoptera-case), leg. Mortillet.
- (viii) Bayonne, Saint-Esprit [UTM XP11] (2 samples MNHN).
- (ix) Charente-Maritime, surrounding of Rochefort (in the river Charente?) [UTM XR58] (MNHN).

Muséum national d'Histoire naturelle, Paris (MNHN-JOU)

- (i) Var, Grasse [UTM LP32] (topotypes of *Bithynia moutonii* Dupuy, 1849; collection Jousseau, MNHN-JOU/6).

Muséum national d'Histoire naturelle, Paris (MNHN-LOC)

- (i) FR; Oise (collection Locard, MNHN-LOC/5), Locard's label: “*Amnicola similis* Oise”.
- (ii) Alpes-Maritimes, Nice [UTM LP53] (collection Locard, MNHN-LOC/5).
- (iii) Alpes-Maritimes, Cannes [UTM LP32] (collection Locard, MNHN-LOC/6).

Muséum national d'Histoire naturelle, Paris (MNHN-PAS)

- (i) Hérault, ruisseau [d'eaux douces] près de Balaruc [UTM EJ51] (collection Pascal ex de Folin [1], MNHN-PAS/3, de Folin's label: “*Amnicola Emiliana* Palad. ruisseau près de Balaruc – Hérau [t. Déterminé par Paladilhe. Je ne puis vous offrir plus, possédant fort peu d'individus”).
- (ii) Calvados, Blainville[-sur-Orne] [UTM XV95] (collection Pascal ex de Folin [2], MNHN-PAS/5).
- (iii) Calvados, Caen (collection Pascal, MNHN-PAS/5 ex de Folin [3], de Folin's label: “*Amnicola similis* Drap. var. Bord de l'Orne sous les cours Caffarelli”).
- (iv) Gironde, La Tresne [Latresne; district of Bordeaux right from the Garonne] (collection Pascal ex de Folin [4], MNHN-PAS/4).
- (v) Mandelieu (collection Pascal, MNHN-PAS/3 ex de Folin [5]).
- (vi)-(vii) Salses (collection Pascal, MNHN-PAS/4 ex de Folin [6] and MNHN-PAS/5 ex de Folin [7]).
- (viii) Landes, Le Teich [UTM XQ54] (collection Pascal ex de Folin [8], MNHN-PAS/3, de Folin's label: “*Amnicola similis* var. *Baudoniana* Gassies ex auctore ipso Le Teich Gironde”).
- (ix) Gironde, Plassac (collection Pascal ex de Folin [9], MNHN-PAS/4).
- (x) Belle-Île-en-Mer [UTM VT84] (collection Pascal ex de Folin [10], MNHN-PAS/2).
- (xi) Alpes-Maritimes, Nice [UTM LP53] (collection Pascal ex de Folin [11], MNHN-PAS/4).

Muséum national d'Histoire naturelle, Paris (MNHN-RIO)

- (i) Alpes-Maritimes, Nice [UTM LP53] (4 syntypes of *Bithynia meridionalis* Risso 1826 [4 shells and 4 preparations of soft parts in altogether 4 tubes]; MNHN-RIO).

Muséum d'histoire naturelle de la Ville de Genève
(MHNG-BGT)

- (i) La Nive close to Bayonne [UTM XP11] (collection Bourguignat, MHNG-BGT 5483).
- (ii) Bayonne, Lac de la Négresse [Lac Mouriscot; UTM XP11] (3 syntypes of *Bythinia bayonnensis*; collection Bourguignat, MHNG-BGT 4943/3).
- (iii) Pyrénées-Atlantiques, Saint-Jean-de-Luz [UTM XP00] (1 syntype of *Ammicola lanceolata* Paladilhe 1869; collection Bourguignat, MHNG-BGT 5437/1).
- (iv) Loire-Inférieure, “Erdre à Nantes” [UTM XT13] (lectotype of *Ammicola sarahae* Paladilhe 1869; collection Bourguignat, MHNG-BGT 5459/1).
- (v) Belle-Île-en-Mer, “font près le Palais” [UTM VT84] (locus typicus) (1 syntype of *Ammicola vindilica* Paladilhe 1870; collection BOURGUIGNAT, MHNG-BGT 5479/1).

Naturhistorisches Museum Wien (NMW general collection)

- (i) ES, Bilbao, leg. Willkomm ex Rossmässler (NMW 92605/3, sub *anatina*).
- (ii) FR, Montpellier, collection Rušnov ex Käufel (NMW 92603/5, sub *confusa*).
- (iii) Bouches-du-Rhône, Stes-Maries-de-la-Mer, leg. G. and M. Falkner 15.VI.2002 [UTM FJ11] ex Falkner, see SMNS-FAL and BOE 2612 (NMW 108871/10).

Naturhistorisches Museum Wien (NMW-FRD)

- (i) FR? Syntype? *Paludina anatina*; NMW-FRD: “*anatina* Orig. Ex. v[on] Charp[entier]” (NMW 92601).
- (ii) Gallia mer.[idionalis], ex Dupuy (Neotype of *Cyclostoma simile* and Lectotype of *Ammicola confusa*; NMW 92596).
- (iii) FR, Montpellier (Paralectotypes of *Ammicola confusa*; NMW 92604/6 “*Paludina similis* Drap. var. major”) (see Boeters & Falkner 2000).
- (iv)-(v) Calvados (Paralectotypes of *Ammicola confusa*; NMW 92598/9 and NMW 92599/2 each ex Terver) (see Boeters & Falkner 2000).

Pôle Patrimoine scientifique de l'Université Montpellier 2
(PPSUM2-PAL)

- (i) Loire-Inférieure, “Erdre à Nantes” [UTM XT13] (2 syntypes of *Ammicola sarahae*, collection Paladilhe, PPSUM2-PAL).
- (ii) Antibes (about 25 syntypes of *Paludestrina brevispira*, text of original label: “Fonds de dragues [sic] venant d'Antibes”, collection Paladilhe, PPSUM2-PAL).

Senckenberg Forschungsinstitut und Naturmuseum, Frankfurt a. M. (SMF)

- (i)-(ii) Alpes-Maritimes, Nice [UTM LP53] (SMF 119945/20 and 266447/3).
- (iii) IT, Sardinia, Monte dei Sette Fratelli (topotypes of *Ammicola zopissa*, SMF 252038/7), leg. Giusti 25.IX.1974.
- [(iv)-(ix) England (6 lots)].
- (x)-(xi) Calvados (SMF 142038/13 and 244634/22).

Zoologisches Museum der Universität Zürich (ZMZ)

- (i) “Siagne Cannes / Macé ‘75” [UTM LP32] (collection Mousson ZMZ 524050 and ZMZ 524051, one lot in two tubes, together 149 specimens).

Staatliches Museum für Naturkunde Stuttgart (SMNS-FAL)
Collection Falkner

- (i) Loire-Atlantique, Loire upstream of Nantes, Thouaré-sur-Loire [UTM XT13] (collection Falkner, SMNS-FAL., and BOE 1478 animals and 2415 shells), leg. G. and M. Falkner 26.V.1999.
- (ii) Bouches-du-Rhône, Stes-Maries-de-la-Mer [UTM FJ11] (collection Falkner, SMNS-FAL., and BOE 2612), leg. G. and M. Falkner 15.VI.2002).

