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ON IBERIAN COCHLICOPIDAE AND THE GENUS *CRYPTAZECA* (GASTROPODA, PULMONATA)

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With 13 text-figures

ABSTRACT

Some new data concerning the four species of Cochlicopidae known from the Iberian peninsula, viz., *Azeca goodalli*, *Hypnophila boissii*, *Cochlicopa lubrica*, and *C. lubricella*, are presented. In addition, *Hypnophila malagana* spec. nov. is described (by Gittenberger & Menkhorst).

Cochlicopa lubrica (Müller, 1774) is designated (by Gittenberger & Waldén) as the type-species of *Cochlicopa* Férussac, April 1821. It is shown that the genus name *Cionella* Jeffreys, 1829, should not be used instead of *Cochlicopa* Férussac, April 1821.

The genus *Cryptazeca*, still of uncertain systematic position, but conchologically similar to the Cochlicopidae, is revised. Anatomical characters could not be used. The data concerning *Cryptazeca monodonta*, *C. subcylindrica*, and *C. vasconica* are summarized. In addition *C. kobelti* spec. nov. is described.

INTRODUCTION

Four species of Cochlicopidae are known to occur on the Iberian peninsula; a fifth species is described as new in the present paper. Distribution maps (50 km UTM-grid) are given for all species; these may cover the entire range of the species or only the Iberian part of it. The locality data in the text are provided with the 10 km or 1 km UTM-grid code. In addition to the distributional data, various notes are given, depending on the state of our knowledge concerning the species in question. Synonyms are only cited as far as that is considered useful in the context.

The species of *Cryptazeca*, a genus of uncertain systematic position, conchologically similar to Cochlicopidae, are also dealt with. Four *Cryptazeca* species are recognized, one of which is new to science.

Apart from the literature, material from the following collections could be used for study: J. C. A. Eikenboom, Hellevoetsluis (EH); G. Falkner, Hörkofen, B. R. D. (FH); W. J. M. Maassen, Duivendrecht (MD); Ir. H. P. M. G. Menkhorst, Krimpen aan de IJssel (MK); Muséum national d'Histoire Naturelle, Paris (MNHN); W. H. Neuteboom, Heemskerk (NH); J. G. M. Raven, Leidschendam (RL); Th. E. J. Ripken, Delft (RD); Rijksmuseum van Natuurlijke Historie, Leiden (RMNH); Senckenberg-Museum, Frankfurt am Main (SMF); J. J. Vermeulen, Leiden (VL); A. J. de Winter, Renkum (WR).

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COCHLICOPIDAE

Azeca Fleming, 1828

There is only a single, easily recognizable, recent species of *Azeca* Fleming, 1828. Its shell has a very characteristic aperture with various denticles and an uninterrupted peristome (fig. 1). An elaborate description has been given by Paul (1974).

Germain (1930: 453) considered both *Turbo tridens* Pulteney, 1799 (not Gmelin, 1791), and *Bulimus menkeanus* var. *nouletianus* Moquin-Tandon, 1855, synonyms of *A. goodalli*; I see no reasons to doubt the correctness of this assumption. Paul (1974) clearly demonstrated that *Azeca goodalli* (Férussac, 1821) and *A. menkeana* (C. Pfeiffer, 1821) cannot be considered separate species or subspecies; the former name has priority (Paul, 1974: 170).

Azeca goodalli (Férussac, 1821)

(figs. 1, 2)

Azeca tridens — Hidalgo, 1875: 182.

Azeca nouletiana — Fagot, 1891: 231.

Azeca menkeana goodalli — Haas, 1929: 349.

Azeca (Azeca) nouletiana — Bofill, Haas & Aguilar Amat, 1918: 49.

Azeca (Azeca) goodalli — Ortiz de Zárate López & Ortiz de Zárate Rocandio, 1950: 432.

Azeca menkeana — Körnig, 1966: 84, fig. 19.

Azeca menkeana goodalli — Larraz & Campoy, 1980: 6, fig. 4.

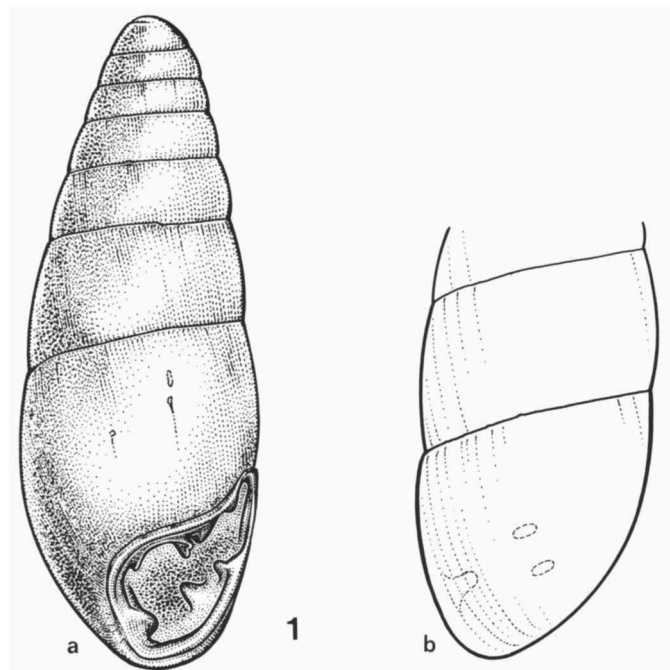


Fig. 1. *Azeca goodalli* (Férussac); Spain, province of Santander, between Pesués and Puentenansa; J. J. Vermeulen leg.; actual height, 6.3 mm. In fig. 1b the location of the inner palatal denticles is indicated. J. J. Vermeulen del.

Azeca menkei — Anadon & Anadon, 1978: 130.

Azeca goodalli — Paul, 1974. Kerney & Cameron, 1979: 62, pl. 1 fig. 9.

Castillejo Murillo, 1981: 47, pl. 7, pl. 123 figs. 11, 12, map 4.

The foregoing synonymy-list shows the variety of names under which this characteristic species has been cited from northern Spain, as well as in some other relevant papers.

Although Körnig (1966: 84, fig. 19), while summarizing the range of *A. goodalli* on a map, did not yet indicate its occurrence in northern Spain, the species is known now from Huesca westward as far as Lugo (fig. 2). According to Haas (1929: 349) *A. goodalli* probably occurs in Cataluña as well; there are no records for this region, however.

Iberian records (fig. 2). — Province of Alava: Puerto de Peñacerrada, WN22 (Ortiz de Zárate López & Ortiz de Zárate Rocandio, 1950: 432). Province of Guipuzcoa: 8 km W of Zumaya, WN59 (MK). Province of Huesca: upper part of the Esera valley between Benasque and the Pico de la Maladeta (variously described), CHO2 (Hidalgo, 1875: 182; Fagot, 1891: 231; Bofill, Haas & Aguilar-Amat, 1918: 49). Province of Lugo: Borqueria (Becerreá), PH54 (Castillejo Murillo,

1981: 47). Province of Navarra: Quinto Real, XN26 (Larraz & Campoy, 1980: 6). Province of Oviedo: Buelles, 20 km ESE of Llanes, UN79 (EH, MK); Caldas de Oviedo, 7 km WSW of Oviedo, TP60 (RL); Llanes, UP50 (RMNH); 8 km NW of Mieres, TN69 (Anadon & Anadon, 1978: 130); Puentelles, 20 km ESE of Llanes, UN79 (EH, MK, RMNH); Ribadesella, UP31 (MK, RMNH); Santa Maria del Naranco, 5 km W of Oviedo, TP60 (RL); Villanueva, 4 km SSW of Grado, QJ30 (RL). Province of Santander: between Pesués and Puenteansa, near the side road to Albanillas, UN79 (RMNH, VL); north of the Portilla de la Sia, 15 km SW of Ramales de la Victoria, VN68 (EH, MK, RMNH); near the cave NW of Puente-Viesgo, VN29 (RD); 10 km W of Torrelavega, VN09 (MK).

Hypnophila Bourguignat, 1858

After Pilsbry's (1908) monographic treatment of *Hypnophila* Bourguignat, 1858, and *Gomphroa* Westerlund, 1902, which he considered both subgenera of *Azeca* Fleming, 1828, for a long time hardly anything new was published on this group of snails. Giusti (1973, 1976) demonstrated their zoogeographical interest and taxonomical complexity, adding substantially to our knowledge of the western species of *Hypnophila*, which he considered a separate genus with *Gomphroa* as a junior synonym, an opinion shared by Gittenberger (1980: 228).

In the present paper a new *Hypnophila* species is described from the province of Málaga, Spain, ca. 750 km SE of the range of *H. boissii* (Dupuy, 1850), the other Iberian representative of the genus. The range of both species is represented on a UTM 50-kilometre map (fig. 2). See also the notes on the genus *Cryptazeca*, p. 311.

It should be emphasized that the following description of *H. malagana* spec. nov. has been prepared by the present author and H. P. M. G. Menkhorst. Consequently the species should be cited as *H. malagana* Gittenberger & Menkhorst.

***Hypnophila malagana* spec. nov.**

(figs. 2, 3)

Gomphroa boissyi — S. H. Jaekel, 1967: 193 ("Marbella [province of Málaga, Spain]"). Not *H. boissii* (Dupuy, 1850).

The glossy, slender, spindle-shaped shell has 6 to 7½ whorls (counted as indicated by Kerney & Cameron, 1979: 13), separated by shallow sutures. As in *H. boissii* there is a micro-sculpture of irregular spiral lines. The thread-like front of the parietal callus rises into a marked angularis. The columella is not truncate at its base; the columellar callus forms an erect margin rising nearly straight forward, i.e., not reclining against the lower part of the body whorl. The umbilicus is closed. The basal part of the aperture is narrowed obliquely.

In juvenile shells of up to c. five whorls there is a thick columellar callus in

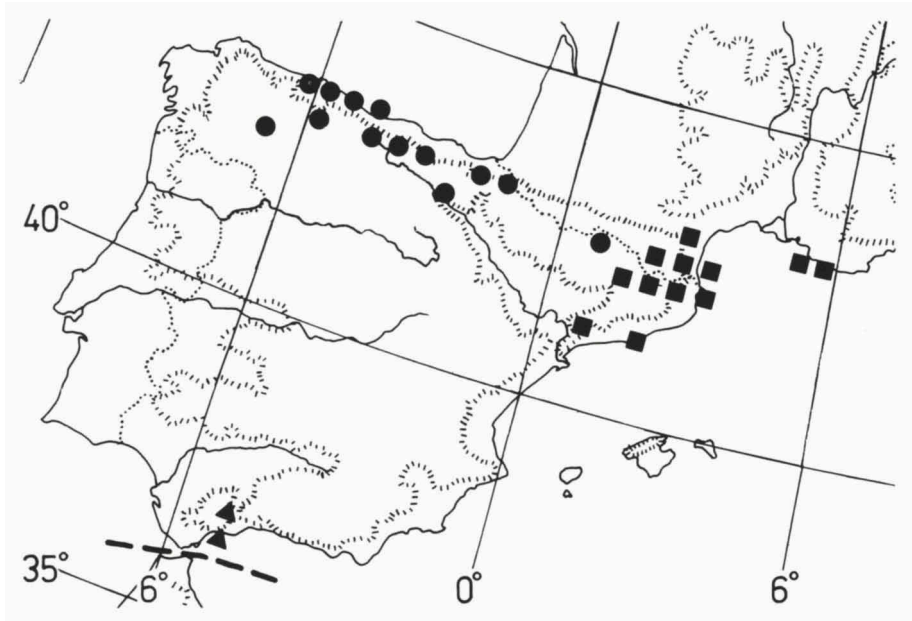


Fig. 2. UTM 50 km grid map, indicating: (1) the Iberian records of *Azeca goodalli* (Férussac) [dots] and all records known of (2) *Hypnophila boissii* (Dupuy) [squares] and (3) *H. malagana spec. nov.* [triangles].

the aperture and the base of the columella is conspicuously truncate. While growing further to maturity, the columellar base becomes less clearly marked. Additional callus formation starts when the shell is nearly full-grown.

Height, 4.8 to 6.2 mm; width, 1.9 to 2.0 mm.

H. malagana differs from *H. boissii* most clearly by the structure of the apertural callus. In the latter species there is no angularis and the columellar callus is more reflexed and attached to the body whorl. *H. dohrni* (Paulucci, 1882) from the Arcipelago Toscano and Sardegna, *H. incerta* (Bourguignat, 1858) from the Isole Eolie and *H. remyi* (C. R. Boettger, 1949) from Corse have slightly less cylindrical shells as compared to *H. malagana*, which also differs from these species, as well as from *H. boissii*, by the less oblique sutures and somewhat more tightly coiled whorls. In *H. dohrni* the apertural callus is very similar to that of *H. malagana*. See Giusti (1973: 128–134, figs. 5, 6; 1976: 147–159, fig. 9, tab. 1) for more data on this complex of closely related taxa.

Although *H. maroccana* (Mousson, 1873), based on a single damaged specimen and never figured, is badly known, its dimensions (height 5.2 mm and width 2.5 mm) indicate that this species clearly differs from *H. malagana*. Mousson (1874: 154) mentions *Cionella (Azeca) maroccana* from the “Travertin

des Rerayathales", cited as "Rerey Valley, on travertine" by Pilsbry (1908: 306). Most probably the Gorges de Moulay Brahim, ca. 30 km S of Marrakech are meant, forming part of the valley of the Oued Reraïa (= Oued Rhirhaïa, = Oued Moulay Brahim).

Material. — All specimens have been found in the province of Málaga, Spain, by the late Prof. Dr. S. H. Jaeckel, H. P. M. G. Menkhorst, and A. J. de Winter, respectively.

Holotype: 30 km N of San Pedro de Alcantara along the road C339 to Ronda, in rock crevices, UF15 (RMNH 55604). Paratypes: with the holotype (MK/3, one of which juvenile); Marbella, UF34 (SMF 204660/7, three of which not fully adult); 3 km N of Marbella, near Ojen, in rock crevices, UF34 (MK/1); W of Torremolinos, from rock crevice in dry calcareous slope, 250 m alt., UF65 (WR/25, 11 of which juvenile; RMNH 55605/5, two of which juvenile); dry calcareous rocks at El Chorro, 11 km NNW of Alora, 500 m alt., UF48 (WR/2).

Remarks. — Apparently *H. malagana* has been overlooked for a long time. Prior to Jaeckel (1967) no records are known for the species, which differs so clearly from other Iberian gastropods, except *H. boissii*, that confusion in the literature with any of these seems quite unlikely.

The epithet *malagana* is chosen because of the occurrence of the species in the province of Málaga, where it might be endemic.

***Hypnophila boissii* (Dupuy, 1850)**

(figs. 2, 4)

Zua boissii Dupuy, 1850: 332, pl. 15 fig. 9. Locard, 1894: 248, figs. 341, 342.

Zua dupuyana Locard, 1894: 249.

Zua cylindrica Locard, 1894: 249.

Azeca boissy — Bourguignat, 1860: 187. Pilsbry, 1908: 307, pl. 48 fig. 20. Germain, 1913: 212, fig. 212.

Gomphroa boissii — Haas, 1929: 350. Zilch, 1959: 144, fig. 485.

Azeca (Gomphroa) boissy — Germain, 1930: 455, fig. 423, pl. 8 fig. 231.

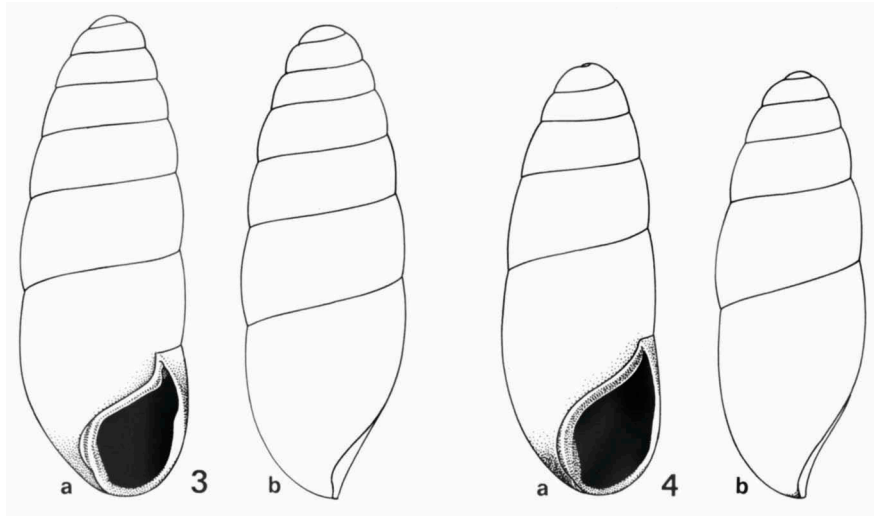
Hypnophila boissy — Gittenberger, 1980: 228, fig.

Various good figures and descriptions of the shell of this species can be found in the literature. In the present paper *H. boissii* has been compared with *H. malagana* spec. nov.

Most unfortunately anatomical data on *H. boissii* have not yet been published (see also p. 312).

The synonymy-list presented above is based on Germain (1930: 455), with some additions for the more recent literature. The original spelling *boissii*, not *boissy*, should be used for the species.

H. boissii is known from the eastern part of the Pyrenees and from at least one locality in the department Var (Bérenquier, 1900: pl. 11 fig. 15), confirmed by Dupuy himself (cf. Margier, 1913: 162), i.e., from behind the garden of the hospital at Saint-Mandrier. According to Germain (1930: 455), who refers



Figs. 3, 4. The Iberian *Hypnophila* species. 3, *H. malagana* spec. nov., holotype; Spain, province of Málaga, 30 km N of San Pedro de Alcántara; H. P. M. G. Menkhorst leg.; actual height, 6.0 mm (RMNH 55604). 4, *H. boissii* (Dupuy); Spain, province of Barcelona, Vallvidrera; C. Altimira leg.; actual height, 5.4 mm (RMNH). W. C. G. Gertenaar del.

to “P. Bérenguier”, *H. boissii* is also known from “Toulon”; I could not find this record in any of Bérenguier’s papers, however. A third locality in the department of Var, Callelongue, is mentioned with some doubt by Margier (1913: 162), because he could not check this record himself. In a paper apparently overlooked by Germain (1930), Martel (1917: 9) mentions a specimen of *H. boissii* among shells of “*Cionella subcylindrica*” (= *Cochlicopa* spec.) found at Cancale, department of Ille-et-Vilaine. Most probably the author misinterpreted an elongated specimen of *Cochlicopa* spec.

Zoogeographically *H. boissii* reminds of *Mastigophallus rangianus* (Férussac, 1822), a helicid species also found in the department of Pyrénées-Orientales and Var.

Records (fig. 2). — France, department of Aude: Maisons, 8 km NW of Tuchan, DH75 (WR). Department of Pyrénées-Orientales: Mas d’Amont near Coustouges, DG79 (Margier, 1913: 161); near Banyuls-sur-Mer, direction Cerbère, EH10 (Margier, 1913: 162); Gorges de Galamus, 5 km NNW of St. Paul-de-Fenouillet, DH54 (WR); Notre-Dame-de-Consolation near Collioure, EH00 (Margier, 1913: 162); Tour de la Massane, Albères Mts., DH90 (Margier, 1913: 162); Port-Vendres, at 385 m alt., EH00 (Margier, 1913: 162); La Preste, DG59 (Margier, 1913: 162); Vernet-les-Bains, DH41 (Margier, 1913: 161; RMNH); Villefranche-de-Conflent, DH41 (RMNH). Department of Var: Callelongue, S of Marseille, FH98 (Margier, 1913: 162); Saint-Mandrier, GH37 (Margier, 1913: 162); Toulon, GH38 (Germain, 1930: 455).

Spain, province of Barcelona: Bellmunt, DG45 (RMNH); Borredá, DG16 (RMNH); Gavà, DF17 (RMNH); Vallirana, DF18 (RMNH); Vallvidrera, DF28 (RMNH). Province of Gerona: Port-Bou, EG19 (RMNH); Riera de Cala Nans near Cadaqués, EG28 (RMNH); Llaers, DG36 (RMNH); Olot, DG57 (RMNH). Province of Lérida: Odén, CG66 (RMNH). Province of Tarragona: La Riba, CF47 (RMNH).

Remarks. — See also the notes on *Cryptazeca*, p. 311.

Cochlicopa Férussac, April 1821

Cochlicopa Férussac, April 1821: 28.

Cionella Jeffreys, 1830: 347. Not 1829 (see Kennard & Woodward, 1926: 386).

The use of *Cionella* Jeffreys, 1830, instead of *Cochlicopa* Férussac, April 1821, is based on Kennard's (1942b: 113) arguing that "*Cochlicopa* is a substitute name for *Polyphemus* Montfort 1810". This cannot be accepted. Without any doubt, Férussac had a larger species group in mind. As Kennard (1942b: 113) correctly stated, *Cochlicopa* has been introduced for both "Les Polyphèmes, Polyphemae, Montf." and "Les Styloïdes, Styloïdes". The fact that the latter taxon is "not defined" (Kennard, 1942b: 113), does not mean that it can simply be neglected; apart from that, the former taxon, sensu Férussac, is equally obscure. Férussac (April 1821: 28) gave a description for *Cochlicopa*, which as such makes the name available. In addition, not a single species is indicated, but only the two taxa of the genus-group mentioned before, without any bibliographical reference enabling their interpretation. Consequently, there are no "originally included species [ICZN-Art. 69 (a) (i)]" in *Cochlicopa* Férussac, April 1821. There is no article in the ICZN which demands to violate the obvious intention of the original author in this case, i.e., to consider *Cochlicopa* a substitute name for *Polyphemus*.

The nominal species "first subsequently referred to the genus [ICZN-Art. 69 (a)]" are those mentioned with *Cochlicopa* by Férussac (May 1821: 54, 55), among which is *C. lubrica*. Because earlier type-species selections for *Cochlicopa* might be considered invalid, since they do not clearly apply to the nominal taxon introduced in April 1821, Int. H. W. Waldén and I here select *Cochlicopa lubrica* (Müller, 1774) as the type-species of *Cochlicopa* Férussac, April 1821. By doing so, the genus name *Cochlicopa*, widely used in European literature is saved, the stability in nomenclature is promoted, and *Cionella*, once "snatched from the graveyard of synonymy" by Pilsbry (1948: 1047), with regret, can go back to where it belongs.

The views concerning *Cochlicopa* presented above, were gained while corresponding on this matter with Int. H. W. Waldén, who fully agrees with the final conclusion.

On the Iberian peninsula at least two different *Cochlicopa* species are found, viz., *C. lubrica* and *C. lubricella*. Because both species are living here at the border of their range, their distribution might be of some interest. Unfortunately it proved to be impossible to interpret most of the literature data concerning Iberian *Cochlicopa* species. Frequently the two taxa are lumped to-

gether in the literature, or it remains obscure whether this has been done or not. In the present paper nearly only personally checked records are given.

As far as known, *C. lubrica* and *C. lubricella*, widely accepted as separate species because of their sympatric occurrence in large areas, differ conchologically only in dimensions, especially the width of the shell, and general shape, i.e., slenderness. The shell of *C. lubrica*, 2.5 to 2.9 mm wide, is less slender than that of *C. lubricella*, which is 2.0 to 2.5 mm wide. (It remains questionable whether *C. repentina* Hudec, 1960, never reported from the Iberian peninsula, does indeed represent a separate intermediate species). Single specimens cannot always be identified without doubt. However, mixed populations of the two species, without intermediate forms, are not rare. See also Kerney & Cameron (1979: 62, pl. 1).

***Cochlicopa lubrica* (Müller, 1774)**

(figs. 5, 7)

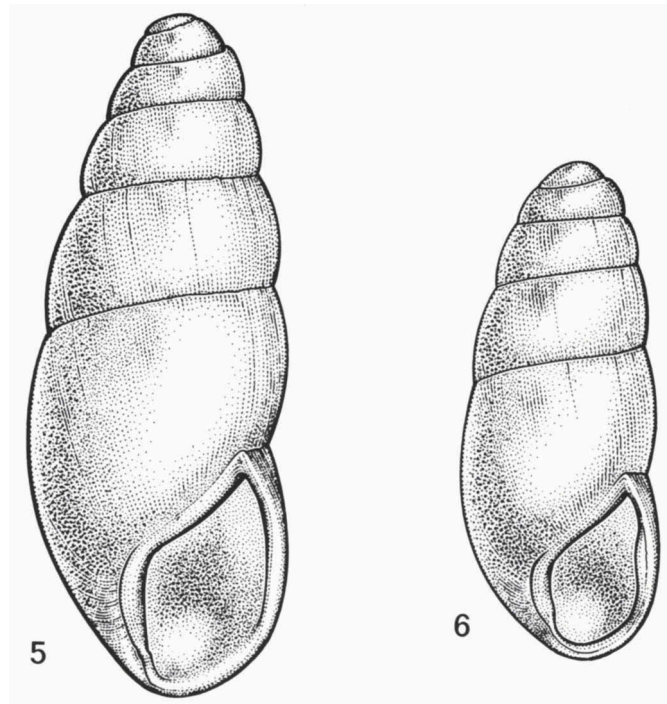
Iberian records. — Portugal, province of Beira Litoral: 1 km S of Mira, 30 km NW of Coimbra, NE27 (MK). Province of Minho: 6 km NE of Braga, 250 m alt., NG50 (MK).

Spain, province of Barcelona: Casa Antuñez, Barcelona, DF27 (RMNH); Prat de Llobregat, 4 km S of Barcelona, DF27 (RMNH). Province of Burgos: Santo Domingo de Silos, 50 km SSE of Burgos, VM64 (RMNH); N of Huermeceles, VN3708 (VL). Province of Gerona: Pardinás, 12 km N of Ripoll, DG38 (RMNH); Olot, DG57 (RMNH); La Escala, 20 km SE of Figueras, EG06 (RMNH). Province of Granada: Atarfe, 9 km NW of Granada, VG42 (RMNH); Lapeza, 1000 m alt., VG72 (FH). Province of Huesca: Broto, YN32 (RMNH); Bujaruelo, 38 km NE of Jaca, YN33 (RMNH); Candanchu, 24 km N of Jaca, YN03 (RMNH). Province of León: Crémenes, UN2552 (RL); NE of Sabero, UN2545 (RL, VL); 12 km N of Puente Villarente, UN0314 (RL). Province of Lérida: Bohí, 20 km SSE of Viella, CH21 (RMNH); Embalse de Oliana, 32 km SSW of Seo de Urgel, CG66 (RMNH). Province of Lugo: Village, SW of Villaoz, PH49 (RMNH). Province of Madrid: Aranjuez, VK43 (FH). Province of Navarra: Tolosa, WN7475 (RL). Province of Oviedo: Buelles, 20 km ESE of Llanes, UN7599 (EH); 4 km S of Cangas de Onís, along the road C637, UN29 (MK); along the Rio Deva between Panes and Estaguerña, UN79 (VL); Espinedo, 1.5 km W of Cornellado, QJ2810 (RL); La Torre, W of Ribadesella, UP2715 (RL); Villanueva, 4 km SSW of Grado, QJ3704 (RL). Province of Palencia: E of Triollo, UN65 (VL); Ventanilla, 5 km WNW of Cervera de Pisuerga, UN74 (VL). Province of Santander: Caranceja, W of Torrelavega, VN0599 (EH); between Dobarganes and Puerto de San Glorio, UN6072 (RL); Fuente de la Mesa, 4 km SSE of Cabezón de Liébana, UN7273 (RL); La Pesquera, Laredo, VP6406 (EH); 1 km N of Ramales de la Victoria, VN69 (MK); 10 km E of San Vicente de la Barquera, VP0100 (EH, MK, RMNH). Province of Tarragona: La Riba, 23 km NNW of Tarragona, CF47 (RMNH). Province of Teruel: Beceite, El Prot, BF62 (RMNH); SW of Oliete, XL9340 (RL). Province of Zaragoza: Monasterio de Piedra, 25 km SW of Calatayud, XL0161 (RL).

***Cochlicopa lubricella* (Porro, 1838)**

(figs. 6, 7)

Iberian records. — Spain, province of Alicante: Bañeres, 17 km W of Alcoy, YH08 (Gasull, 1975: 31 "*C. lubrica*. . . Diám. 2.2 mm"). Province of Burgos: N of the Puerto de Orduña, 800 m alt., VN95 (MK). Province of Castellón (after Gasull, 1981: 61 "*Cochlicopa lubrica*. . . Diám. 2.2 mm"): Arañuel, 25 km N of Segorbe, YK13; Caudiel and Viver, 15 km NW of Segorbe, YK22;



Figs. 5, 6. The Iberian *Cochlicopa* species. 5. *C. lubrica* (Müller); Spain, province of Barcelona, Barcelona, Casa Antuñez; C. Altimira leg.; actual height, 6.8 mm (RMNH). 6. *C. lubricella* (Porro); Spain, province of Lérida, Aigües Tortes, near E. Liebreta; C. Altimira leg.; actual height, 5.1 mm (RMNH). J. J. Vermeulen del.

Navajas, 5 km NW of Segorbe, YK11. Province of La Coruña: Punta de Frouxeira, Valdoviño, NJ 72 (EH). Province of Huesca: Candanchu, M. Tobazo, YN03 (RMNH); San Juan de la Peña, 20 km SW of Jaca, XN80 (RMNH). Province of León: S of Alejico, 4 km N of Cistierna, UN24 (VL); Arroyo de Pardominos, 8 km N of Bonar, UN1454 (RL); NE of Sabero, UN2545 (RL, VL); S of Sabero, UN2544 (RL); Villar del Puerto, 7 km NE of La Pobra de Gordón, 1150 m alt., TN85 (RMNH); Yugueros, 4 km W of Cistierna, UN2242 (RL). Province of Lérida: 10 km NE of Barruera, Aigües Tortes, near E. Liebreta, CH21 (RMNH). Province of Navarra: Quinto Real, XN26 (Larraz & Campoy, 1980: 6 "*Cochlicopa lubrica*... D = 2.1-2.3 mm"). Province of Oviedo: 2.4 km S of Amandi, = 6 km S of Villaviciosa, UP01 (NH); Buelles, 20 km ESE of Llanes, UN7599 (EH, MK); 4 km S of Cangas de Onís, along the road C637, UN29 (MK); El Mazo, 3 km E of Panes, UN7498 (NH, RL); Puentelles, 20 km ESE of Llanes, UN7095 (MK); Ribadesella, UP31 (MK); La Torre, W of Ribadesella, UP2715 (RL). Province of Palencia: between Cervera de Pisuerga and Ruesga, UN7746 (VL); 2 km NW of Triollo, UN6155 (VL); Ventanilla, 5 km WNW of Cervera de Pisuerga, UN74 (VL). Province of Santander: between Castillo and Noja, 20 km E of Santander, VP5613 (RL); Isla, VP5315 (EH); Piedras Luengas, 16 km SE of Potes, UN76 (VL); Puerto de San Glorío, UN56 (VL); near Ramales de la Victoria, along the road S561, NV68 (MK); 2 km N of San Roque, VN4288 (EH); 10 km E of San Vicente de la Barquera, VP0100 (EH, MK, RMNH); 7 km SW of San Vicente de la Barquera, between Puentenansa and Pesues, UN89 (VL); 10 km W of Torrelavega, VN09 (MK). Province of Valencia: Montaverner, NW of Albaida, YJ10 (Gasull, 1975: 31 "*C. lubrica*... Diám. 2.2 mm"). Province of Vizcaya: Güeñes, VN98 (NH); S of Durango along the road C2611 to the Puerto de Urquila, WN27 (MK).



Fig. 7. UTM 50 km grid map with revised records of Iberian *Cochlicopa* species: as may be concluded from the part of the literature that could not be used, the results presented here are more influenced by human activity than by the actual distribution of the species involved (see the text). *C. lubrica*, triangles; *C. lubricella*, dots; both *Cochlicopa* species, squares.

SUBULINIDAE

Cryptazeca De Folin & Bérillon, 1877

Cryptazeca De Folin & Bérillon, 1877g: 3.

De Folin & Bérillon (1877c: 199; 1877d: 1) described "*Azeca monodonta*" after two empty shells, collected near Bayonne in the department of Pyrénées-Atlantiques. Shortly afterwards the same authors (1877g: 3) introduced the "sous-genre" *Cryptazeca* for the species, adding some notes on its anatomy. Some more data concerning the anatomy were given by Barrois and added to various papers of De Folin & Bérillon and De Folin (see Gittenberger & Kosten, 1983: 323). Most unfortunately, however, the structure of the genitalia and the pallial organs remained unknown. Until nearly a century after its description *Cryptazeca* was considered monotypic.

Zilch (1973: 106) classified a second species with *Cryptazeca*, i.e., *C. vasconica*. Previous authors, e.g. Pilsbry (1908: 308) and Germain (1930: 455), considered *C. vasconica* congeneric with *Hypnophila boissii*, not with *C. monodonta*. In the present paper two more *Cryptazeca* species are recognized, viz., *C.*

subcylindrica (originally described as only a form of *C. monodonta*) and *C. kobelti* spec. nov.

The genus *Cryptazeca* is assigned to the Subulinidae, subordo Sigmurethra by Zilch (1959: 341). This assignment is based on the anatomical data mentioned before and summarized by Pilsbry (1908: 282). The genus *Hypnophila* belongs to another subordo, i.e., the Orthurethra, family Cochlicopidae (e.g. Zilch, 1959: 144).

There is no large conchological gap between *Cryptazeca* and *Hypnophila*. Species classified with the former genus have shells that are less than 5 mm high, with a palatal border of the aperture of which the upper half is slightly concave or straight in side-view and inclined backward, whereas the lower half is straight and symmetrically, but slightly less, inclined backward. In *Hypnophila* the shells are somewhat larger and the palatal border of the aperture is more straight in side-view.

In both *Hypnophila* and *Cryptazeca* a columellar denticle may be developed and the central part of the outer lip is slightly curved inward, somewhat narrowing the aperture. *H. boissii* (fig. 4), which comes closest of all *Hypnophila* species to the range of the genus *Cryptazeca*, is similar to the latter group by the lack of an angularis, a character by which this species stands apart in *Hypnophila*.

With the available anatomical data I consider the classification of the genus *Cryptazeca* insufficiently argued and, at least to me, the question remains whether the observed conchological similarities between *Hypnophila* and *Cryptazeca* are due to convergent evolution, or to a phylogenetic relationship closer than that suggested by classifying these genera in different suborders.

The four *Cryptazeca* species recognized in the present paper are mainly different in general shape and dimensions. Although the differences are not very conspicuous, they enabled an identification of every single shell that could be studied. The geographical distribution of the four forms makes that a classification at the subspecies level becomes very subjective or impossible. Both *C. monodonta* and *C. subcylindrica*, as well as *C. vasconica* and *C. kobelti* spec. nov., are (partly) sympatric. There are no good arguments enabling a decision in the question whether *C. monodonta* or *C. subcylindrica* should be considered conspecific with either *C. vasconica* or *C. kobelti* spec. nov. Therefore, the four taxa are dealt with as full species.

There might not be a simple explanation for the fact that the rare *Cryptazeca* species, if they are found, often occur as a couple.

Cryptazeca kobelti spec. nov.

(figs. 8, 13)

Cryptazeca monodonta — Kobelt, 1894: 37, 38, pl. 188 fig. 1201 ("an den grasbewachsenen Berglehnen [grassy slopes], welche die Conca d'Orduña umgeben [Orduña, province of Navarra, Spain]"). Pilsbry, 1908: 282 (part.), pl. 48 fig. 22. Zilch, 1959: 341 (part.), fig. 1252; 1973: 106 (part.), pl. 4 fig. 7. Not *C. monodonta* (De Folin & Bérillon, 1877).

The glossy, translucent, pale yellowish-brown, broad conical-oval shell has $5 \frac{1}{4}$ to $5 \frac{1}{2}$ slightly convex whorls, with a vague transverse sculpture (most clearly developed just below the sutures) and a microsculpture of sharp spiral lines. Except for the upper half or less of its palatal part, the outer lip is slightly curved inward, somewhat narrowing the aperture. At the columellar base there is a denticle belonging to what might be called the primary callus of the aperture (figured in fig. 8); in only one of the four specimens studied there is a well-developed additional secondary callus, thickening the inner lip of the aperture as in the other figured shells of *Cryptazeca* species (figs. 9–12). Apparently this secondary callus is only formed in fully adult specimens. In side-view the upper half of the palatal border of the aperture is slightly convex and inclined backward; the lower half is more straight but similarly, symmetrically, inclined backward.

Height, 3.5 to 3.7 mm; width, 1.65 to 1.7 mm.

C. kobelti differs from the other *Cryptazeca* species most clearly by its comparatively broad conical-oval general shape. The sympatric *C. vasconica* is more slender, ovoid-conical. *C. monodonta* is more spindle-shaped and less pale in colouration (judging after only one fresh specimen of *C. kobelti* and several of *C. monodonta*). *C. subcylindrica* is much more slender, narrowly conical, and its transverse sculpture is more prominent.

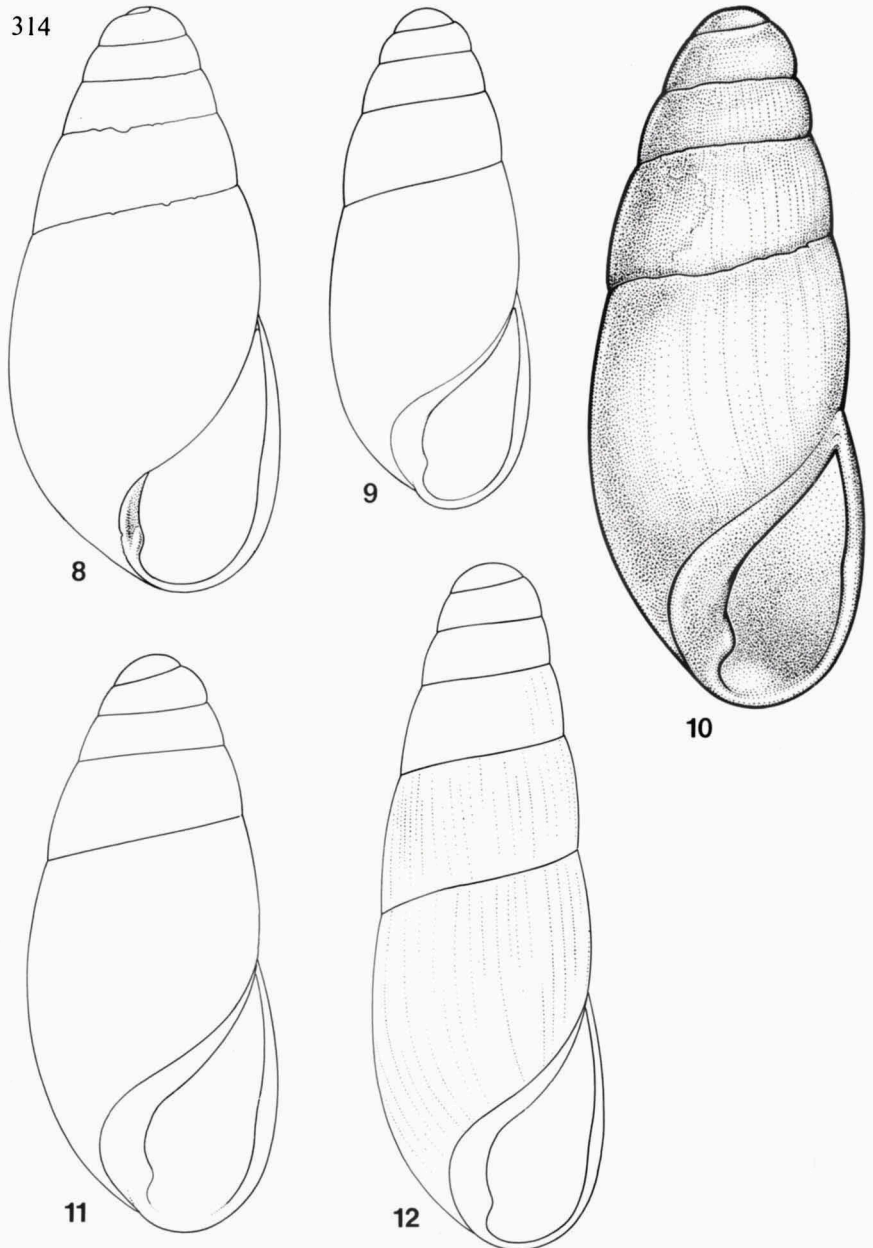
Material. — Holotype and three paratypes: Conca de Orduña, province of Navarra, Spain, VN95; W. Kobelt leg. (SMF 157233a and 157233b/3, respectively).

Remarks. — *C. kobelti* spec. nov. is dedicated to the late Dr. W. Kobelt, the only malacologist who ever collected this species. Some Dutch malacologists looked for it near Orduña, but in vain.

According to Kobelt (1894: 37) the four shells of this species were found on grassy slopes. Nothing is said about a high humidity. Maybe *C. kobelti* occurs in a less humid habitat than *C. monodonta* and *C. subcylindrica*, resembling *C. vasconica* in this respect.

C. kobelti is sympatric with *C. vasconica*. The latter species is more widely distributed, however.

Photographs of the holotype of *C. kobelti* have been published by Zilch



Figs. 8–12. *Cryptazeca* species; all specimens $\times 23$. 8, *C. kobelti* spec. nov., holotype; Spain, province of Navarra, Orduña; W. Kobelt leg.; actual height, 3.5 mm (SMF 157233a). 9, 10, *C. vasconica* (Kobelt). 9, lectotype; Spain, province of Navarra, Orduña; W. Kobelt leg.; actual height, 2.9 mm (SMF 166396). 10, Spain, province of Santander, Celis, between Pesués and Puentenansa; J. J. Vermeulen leg.; actual height, 3.9 mm (VL). 11, *C. monodonta* (De Folin & Bérillon), lectotype; France, department of Pyrénées-Atlantiques, St. Pierre-d'Irube; ex coll. De Folin; actual height, 3.6 mm (MNHN). 12, *C. subcylindrica* De Folin & Bérillon, lectotype; France, department of Pyrénées-Atlantiques, St. Pierre-d'Irube; ex coll. De Folin; actual height, 4.3 mm (MNHN). Figs. 8, 9, 11, 12, W. C. G. Gertenaar del.; fig. 10, J. J. Vermeulen del.

(1959: fig. 1252; 1973: pl. 4 fig. 7) as *Cryptazeca monodonta*.

See also the general remarks concerning the genus.

***Cryptazeca monodonta* (De Folin & Bérillon, 1877)**

(figs. 11, 13)

Azeca monodonta De Folin & Bérillon, 1877c: 199 (1877d: 1), pl. [1] figs. 1, 2. Lectotype, design. nov.: MNHN (fig. 11).

Cryptazeca monodonta — De Folin & Bérillon, 1877h: 439 (1877i: 17), pl. 3 figs. 4, 5. Pilsbry, 1908: 282 (part.), not pl. 48 fig. 22 (= *C. kobelti* spec. nov.). Zilch, 1959: 341 (part.), not fig. 1252 (= *C. kobelti* spec. nov.); 1973: 106 (part.), not pl. 4 fig. 7 (= *C. kobelti* spec. nov.). Kerney & Cameron, 1979: 150, fig.

C. monodonta is characterized by a spindle-shaped, warm to more pale corneous brown shell with 5 to 5 ½ whorls, provided with an obsolete transverse sculpture.

Height, 3.15 to 3.8 mm; width, 1.55 to 1.7 mm.

The sympatric *C. subcylindrica* is colourless and more narrowly conical, its spire is more elongated and there are 5 ½ to 6 ¼ whorls. See also the general remarks concerning the genus.

Material. — All specimens have been found in the department of Pyrénées-Atlantiques, France, during the last quarter of the 19th century.

Lectotype, design. nov.: “Bramepan”, St. Pierre-d’Irube SE of Bayonne, XP21 (MNHN). SE of Cambo-les-Bains, XP 04 (De Folin, 1891: 265; 1892: 328 — see remarks). “Olhaco-Jhara, Cambo” [? = SE of Cambo-les-Bains] (MNHN/22, 1 [glued on glass below 4 *C. subcylindrica* apparently to demonstrate the differences between the forms], 11; RMNH/2), material from the collections of De Folin and Bérillon, respectively.

Remarks. — *C. monodonta* is not easy to find. De Folin & Bérillon (1877c: 199) first reported the species from near Bayonne; later on (1877h: 447) this locality was described in detail as “Bramepan”, a private property at St. Pierre-d’Irube along the Adour, E of Bayonne. While visiting St. Pierre-d’Irube I learned at the village-hall that the former “Bramepan” is called now “Villa Cantegril” and used as a mental hospital. Having taken some precautions, I tried in vain to find *C. monodonta* inside the walls around the area of the mental hospital.

De Folin (1891: 265; 1892: 328) described another locality where *C. monodonta* was found (alive), SE of Cambo-les-Bains in the very humid and cool valley of a brooklet debouching into the Nive, at the foot of the Oursouïa. Although I found sites near Cambo-les-Bains to which De Folin’s description applied, *C. monodonta* could not be collected there. The indication “Olhaco, Jhara, Cambo”, found on labels in MNHN, remains obscure.

De Folin (1892) considered *C. monodonta*, *Elona quimperiana* (Férussac,

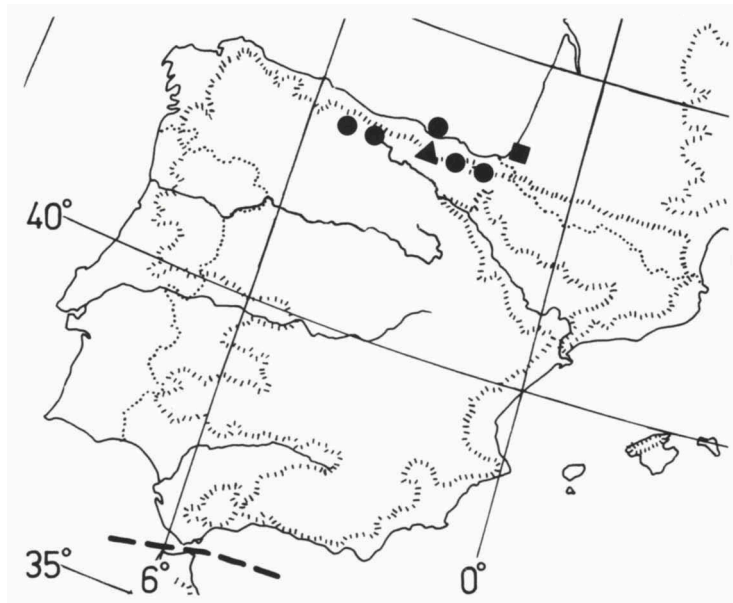


Fig. 13. UTM 50 km grid map with records of *Cryptazeca* species. Dots, *C. vasconica* (Kobelt) only; triangle, *C. vasconica* and *C. kobelti* spec. nov.; square, *C. monodonta* (De Folin & Bérillon) and *C. subcylindrica* De Folin & Bérillon.

1821), *Trissexodon constrictus* (Boubée, 1836), and *Laminifera (Neniatlanta) pauli* (Mabille, 1865), strange elements in the western Pyrenees, which might have been introduced there by the descendants of the people of Atlantis, i.e. the Basque people in his working hypothesis: (p. 329) "Si en effet les Atlantes ont colonisé les territoires pyrénéens, les Basques descendraient de cette émigration des peuples de l'Atlantide, on expliquerait aisément l'introduction avec eux des mollusques en question, et le continent d'origine ayant disparu, l'anéantissement des familles souches s'expliquerait également."

***Cryptazeca subcylindrica* De Folin & Bérillon, 1877**

(figs. 12, 13)

Cryptazeca monodonta var. *subcylindrica* De Folin & Bérillon, 1877h: 443 (1877i: 21), pl. 3 fig. 6.

Lectotype, design. nov.: MNHN (fig. 12).

Cryptazeca monodonta var. *hyalina* De Folin & Bérillon, 1877h: 443 (1877i: 21). Lectotype, design. nov.: MNHN.

C. subcylindrica is characterized by a narrowly conical, colourless shell with $5\frac{1}{2}$ to $6\frac{1}{4}$ whorls, provided with a sculpture of rather conspicuous but unsharp, transverse lines, running all over the whorls.

Height, 3.5 to 4.55 mm; width, 1.25 to 1.5 mm.

See also the description of the sympatric *C. monodonta* and the general remarks concerning the genus.

Material. — All specimens have been found in the department of Pyrénées-Atlantiques, France, during the last quarter of the 19th century.

Lectotype and 4 paralectotypes, design. nov.: “Bramepan”, St. Pierre-d’Irube SE of Bayonne, XP21 (MNHN). “Propriété Duclerc” [= “Bramepan”, cf. De Folin & Bérillon, 1877h: 447; 1877i: 25], XP21 (MNHN/8, 3; RMNH/1). “Bois d’Urdanch près Bayonne”, ? XP21 (lectotype of var. *hyalina*; MNHN). “Olhaco-Jhara, Cambo” [? = SE of Cambo-les-Bains], ? XP04 (MNHN/11, 2, 4 [glued on glass above 1 *C. monodonta*, apparently to demonstrate the differences between the forms]).

Remarks. — *C. subcylindrica* is said to be more common than *C. monodonta* at “Bramepan” (De Folin & Bérillon, 1877h: 451; 1877i: 29), which could have been concluded also from the amount of specimens in MNHN. Nevertheless, *C. subcylindrica* too, has not yet been refound during the 20th century.

A single specimen from the collection Bérillon, labeled as “var. alba” (an unpublished name), clearly belonging to *C. subcylindrica* and kept apart for unclear reasons, has been re-labeled in MNHN as syntype of the published var. *hyalina*. No specimens originally labelled as var. *hyalina* could be found and one might argue that the specimen considered the lectotype of this taxon should in fact be considered a neotype.

***Cryptazeca vasconica* (Kobelt, 1894)**

(figs. 9, 10, 13)

Ferussacia (*Hypnophila*?) *vasconica* Kobelt, 1894: 37, pl. 188 fig. 1200. Lectotype, design. Zilch (1973: 106); SMF 166396 (fig. 9).

Azeca (*Gomphroa*) *vasconica* — Pilsbry, 1908: 308, pl. 48 fig. 21. Germain, 1930: 455, fig. 424.

Cryptazeca vasconica — Zilch, 1973: 106, pl. 4 fig. 8 (lectotype).

C. vasconica is characterized by a colourless or corneous brown, slender ovoid-conical shell with 5 to 5 ½ whorls, provided with a sculpture of unsharp transverse lines which usually are most prominent just below the sutures.

The specimens classified with this species vary considerably, especially in shell dimensions. The lectotype of *C. vasconica* is 2.9 mm high and 1.2 mm wide; although this specimen is considerably smaller than most of the shells recently collected at other localities, it is not clearly aberrant in any other character, as may be concluded while comparing figs. 9 and 10. The specimen in MD, which is provided with a conspicuous transverse sculpture all over the shell, measures 3.1 × 1.3 mm; a specimen in RL measures 4.0 × 1.5 mm; for the two adult specimens in VL 3.9 × 1.55 mm and 4.3 × 1.7 mm were found (see “material” for the localities). The paralectotype has not been measured,

but because Kobelt (1894: 37) indicated "Alt. 3, diam. 1 mm", it most probably is not much larger than the lectotype.

The sympatric *C. kobelti* spec. nov. (fig. 8) is quite different in general shape; Kobelt (1894: 37) even assigned the two taxa to different genera.

C. monodonta differs from *C. vasconica* by its more spindle-shaped shell, provided with more obsolete transverse striae. *C. subcylindrica* differs clearly in shape, has in general a slightly more prominent transverse sculpture and up to 6 ¼ whorls.

Material. — Lectotype and paralectotype, design. Zilch (1973: 106): Spain, province of Alava, Orduña, VN95 (SMF 166396 and 166397, respectively).

Additional material has been collected recently in some northern provinces of Spain. Province of Alava: Embalse del Gorbea, WN2161 (RL/1 juv.). Province of Navarra: Puerto de Usategueta, WN9272 (RL/1). Province of Oviedo: 2 km S of Ceneya near "Concejo de Amieva" along the road C637, 14 km S of Cangas de Onis, UN38 (MK/2 juv.). Province of Santander: Celis, between Pesués and Puentenansa, UN8493 (VL/2, 1 juv.); Mioño, 2.5 km SE of Castro Urdiales, VP80 (MD/1).

Remarks. — Kobelt (1894: 37) collected *C. vasconica* on grassy slopes near Orduña, whereas Maassen, Menkhorst, Raven and Vermeulen discovered five additional localities in Spain, all in calcareous areas which are not particularly humid. Some of these records, however, are based on juvenile *Cryptazeca* specimens and, therefore, need to be confirmed. Apparently, *C. vasconica* is not restricted to very humid areas, in contrast to what has been published concerning both *C. monodonta* and *C. subcylindrica*.

REFERENCES

- ANADON, N. & E. ANADON, 1978. Estudios sobre los efectos del aislamiento en poblaciones de gasteropodos terrestres Asturianos. I. Composición específica de las poblaciones. — Supl. Cien. Bol. Idea, 23: 121–142.
- BÉRENGUIER, P., 1900. Malacographie du département du Var. Mollusques terrestres et des eaux douces et saumâtres. Atlas de XXII planches dessinées sous la direction de l'auteur: pls. 1–22, with unpagéd legends. Draguignan.
- BOFILL, A., F. HAAS & J. B. AGUILAR AMAT, 1918. Fauna malacològica del Pirineu Català, I. Estudi sobre la fauna malacològica de la Vall de l'Essera. — Treb. Inst. Catalana Hist. nat., 4: 9–110, pls. 1–4.
- BOURGUIGNAT, J. R., 1860. Aménités malacologiques, 2 (85): 186–188. Paris.
- CASTILLEJO MURILLO, D. J., 1981. Los moluscos terrestres de Galicia (Subclase Pulmonata): 13 pp., 1–499, 138 pls., 72 maps. Santiago de Compostela. (Tesis).
- DUPUY, D., 1850. Histoire naturelle des mollusques terrestres et d'eau douce qui vivent en France, 4: 331–458, pls. 15–21. Paris.
- FAGOT, P., 1891. Histoire malacologique des Pyrénées françaises et espagnoles (part.). — Bull. Soc. Ramond, 26: 215–233.
- FÉRUSSAC, J. B. L. D'AUDEBARD DE, April 1821. Tableau systematique de la famille des Limaçons, Cochleae, (folio ed.) Livr. 9: 1–32. (See A. S. Kennard, 1942a).
- , May 1821. Idem, (folio ed.) Livr. 10: 33–56. (See A. S. Kennard, 1942a).

- FOLIN, [L.] DE & [F.] BÉRILLON. 1877. See Gittenberger & Kosten (1983).
- FOLIN, [L.] DE. 1891–1893. See Gittenberger & Kosten (1983).
- GASULL, L.. 1975. Fauna malacológica terrestre del sudeste Ibérico. — *Bol. Soc. Hist. Nat. Baleares*, 20: 5–155.
- . 1981. Fauna malacológica terrestre y de agua dulce de la provincia de Castellón de la Plana. — *Bol. Soc. Hist. Nat. Baleares*, 25: 53–101.
- GERMAIN, L.. 1913. Mollusques de la France et des régions voisines. 2. Gastéropodes pulmonés et prosobranches terrestres et fluviatiles: 1–374. *Encyclop. Sci.*, Paris.
- . 1930. Mollusques terrestres et fluviatiles (première partie). — *Faune de France*, 21: 1–477, i–viii, pls. 1–13.
- GITTENBERGER, E.. 1980. Elseviers slakkengids: 1–310. Amsterdam, Brussel. (Dutch edition of Kerney & Cameron, 1979).
- GITTENBERGER, E. & A. P. W. M. KOSTEN, 1983. Bibliographical notes on De Folin & Bérillon's malacological papers concerning "la région extrême S.-O. de la France and related publications by De Folin and Barrois. — *Zool. Meded.*, 57-(24): 321–324.
- GIUSTI, F.. 1973. Notulae malacologicae XVIII. I molluschi terrestri e salmastri delle Isole Eolie. — *Lav. Soc. ital. Biogeogr.*, (N.S.) 3: 113–306.
- . 1976. Notulae malacologicae XXIII. I molluschi terrestri, salmastri e di acqua dolce dell'Elba, Giannutri e scogli minori dell'Arcipelago Toscano. — *Lav. Soc. ital. Biogeogr.*, (N.S.) 5: 97–355.
- HAAS, F.. 1929. Fauna malacológica terrestre y de agua dulce de Cataluña. — *Trab. Mus. Cienc. Nat. Barcelona*, 13: 1–491, 187 figs.
- HIDALGO, J. G.. 1875. Catálogo iconográfico y descriptivo de los moluscos terrestres de España, Portugal y las Baleares. 1: 1–224, 24 pls. Madrid.
- JAECKEL, S. H.. 1967. Zur Kenntnis der Mollusken der Provinz Malaga. — *Mitt. dtsh. malakozool. Ges.*, [1](10): 193–196.
- JEFFREYS, J. G.. 1830. A synopsis of the testaceous pneumobranchous mollusca of Great Britain. — *Trans. Linn. Soc. London*, 16 (2): 323–392.
- KENNARD, A. S.. 1942a. The Histoire and Prodrome of Férussac. Part II. — *Proc. Malac. Soc. London*, 25 (3): 105–110.
- . 1942b. Idem. Part III. The divisional names. — *Ibidem*, 25 (3): 111–118.
- KENNARD, A. S. & B. B. WOODWARD. 1926. Synonymy of the British non-marine Mollusca (recent and post-tertiary): i–xxiv, 1–447. London.
- KERNEY, M. P. & R. A. D. CAMERON. 1979. A field guide to the land snails of Britain and North-West Europe: 1–288. London.
- KOBELT, W.. 1894. In: E. A. ROSSMÄSSLER, *Icon. Land- & Süßw.-Moll.*, (N. F.) 7 (1–4): 1–56.
- KÖRNIG, G.. 1966. Die Molluskengesellschaften des mitteleuropäischen Hügellandes. — *Malakol. Abh.*, 2: 1–112.
- LARRAZ, M. & A. CAMPOY. 1980. Estudio faunístico del macizo de Quinto Real, II: Moluscos (Mollusca). — *Publ. Biol. Univ. Navarra*, 3: 1–19.
- LOCARD, A.. 1894. Les coquilles terrestres de France: 1–370. Paris.
- MARGIER, E.. 1913. L'Hypnophila Boissyi Dupuy. — *Feuille jeunes Nat.*, (5) 43: 161–162.
- MARTEL, H.. 1917. Coquilles de Cancale: Note sur la dispersion géographique du Gompbroa boissyi Dupuy. — *Journ. Conchyl.*, 63: 9.
- MOUSSON, A.. 1873. Diagnosen neuer Mollusken aus West-Marocco. — *Malakozool. Bl.*, 21: 149–157.
- . 1874. Bemerkungen über die von Hrn. Dr. von Fritsch und Dr. Rein aus West-Marocco 1872 zurückgebrachten Land- und Süßwasser-Mollusken. — *Jahrb. dtsh. malakozool. Ges.*, 1: 81–107.
- ORTIZ DE ZÁRATE LÓPEZ, A. & A. ORTIZ DE ZÁRATE ROCANDIO. 1950. Contribución al conocimiento de la distribución de los moluscos terrestres en las provincias vascongadas y Norte de Navarra. — *Bol. R. Soc. Española Hist. nat.*, 47: 397–432.

- PAUL, C. R. C., 1974. Azeca in Britain. — Journ. Conch. London, 28: 155–172, pl. 5.
- PILSBRY, H. A., 1908. Manual Conch., 19 (76): 193–366.
- , 1948. Land Mollusca of North America (north of Mexico), 2 (2). — Monogr. Acad. Nat. Sci. Philadelphia, 3: i–xlvii, 521–1113.
- ZILCH, A., 1959. Euthyneura. In: W. WENZ. Gastropoda. — Handb. Paläozool., 6 (2) (1–2): 1–400.
- , 1973. Die Typen und Typoide des Natur-Museums Senckenberg, 51: Mollusca: Achatinacea (2): Ferrussaciidae, Subulinidae. — Arch. Moll., 103 (1–3): 99–152.