Hemicycla nisamarae (Gastropoda: Helicidae), a new species from La Gomera (Canary Islands)

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Key words: Helicidae, *Hemicycla*, La Gomera, Canary Islands, Macaronesia.

Hemicycla nisamarae spec. nov. is described and compared with other *Hemicycla* species from the Canarian Archipelago. Information is given about the shell, external morphology, genitals, jaw, radula, ecology, and distribution.

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INTRODUCTION

The genus *Hemicycla* Swainson, 1840 is endemic to the Canary Islands (Bank et al., 2002; Neiber et al., 2021). Alonso & Ibáñez (2007) provided an overview of 43 extant and fossil species, with six of them classified in two or more subspecies (14 in total). They also mentioned eight species as being doubtful. One doubt is dispelled by Yanes et al. (2009), describing the rediscovery of *H. eurythyra* O. Boettger, 1908 on Tenerife. Of the remaining doubtful cases, only *H. collarifera* O. Boettger, 1908 is included in later lists (MolluscaBase, Helixebas, 2023). A few new species followed in later years: *H. pouchadan* Ibáñez & M. R. Alonso, 2007, *H. melchori* R. Vega-Luz & R. Vega-Luz, 2008, *H. diegoi* Neiber, R. Vega-Luz, R. Vega-Luz & Koenemann, 2011, *H. fuenterroquensis* Castro, Yanes, M. R. Alonso & Ibáñez, 2012 and *H. idairae* Verbinnen & Swinnen, 2014. It should be noted that *H. idairae* is a junior synonym of *H. gaudryi* (d'Orbigny, 1839), a species that was originally described by d'Orbigny from La Gomera. The species under the putative name *H. gaudryi* from Gran Canaria has to be renamed; possible candidates are the nominal species *Helix ripochi* Mabille, 1882, *H. ledrui* Mabille, 1883a, *H. amblasmodon* Mabille, 1883b, *H. janthina* Mabille, 1883b, *H. themera* Mabille, 1883b, and *H. zorgia* Mabille, 1883b.

Of all 50 species, eight species and two subspecies have only been found as fossils. Fossil specimens of some extant species are also known (Mousson, 1872; Wollaston, 1878; Groh, 1985; Groh et al., 1996; Yanes et al., 2004, 2005; Beck & Rähle, 2006; Alonso & Ibáñez, 2007; Talaván Serna & Talaván Gómez, 2008; Castillo et al., 2008; Vázquez Campos, 2016; Neubert et al., 2023).

Some species described in the 19th century have not or only rarely been recorded since. The relationships and systematics of many species are often unclear and for many species there is hardly any information about anatomical characteristics. Molecular research has been conducted on some species to obtain insights into the phylogeny of the genus (Neiber et al., 2011; Bober et al., 2021; Neiber et al., 2021).

On the relatively small island of La Gomera, 15 *Hemicycla* species have been identified. This concerns five species that have only been found as fossils: *H. digna* (Mousson, 1872), *H. merita* (Mousson, 1872), *H. moussoniana* (Wollaston, 1878), *H. montefortiana* Beck & Rähle, 2006, and *H. semitecta* (Mousson, 1872). In addition, ten extant species have been identified: *H. distensa* (Mousson, 1872), *H. efferata* (Mousson, 1872), *H. fritschi* (Mousson, 1872), *H. gaudryi* (d'Orbigny, 1839), *H. gomerensis* (Morelet, 1864), *H. hedybia*

(Mabille, 1882), *H. laurijona* M. R. Alonso & Ibáñez, 2007, *H. paivanopsis* (Mabille, 1882), *H. planorbella* (Lamarck, 1822) and *H. quadricincta* (Morelet, 1864) with the two subspecies *H. q. quadricincta* and *H. q. subaucta* (Wollaston, 1878).

In recent years, in addition to all these species, living specimens and shells of a species not yet known to science have been found on La Gomera. In this article this species is described as *H. nisamarae* spec. nov. and compared with other *Hemicycla* species. The genitals of the new species are compared with the published descriptions and figures in Ibáñez et al. (1987), Ibáñez et al. (1988), Alonso et al. (1991), Alonso & Ibáñez (2007), Ibáñez & Alonso (2007), Yanes et al. (2009), Neiber et al. (2011) and Castro et al. (2012).

SYSTEMATIC PART

Class Gastropoda Cuvier, 1795
Superfamily Helicoidea Rafinesque, 1815
Family Helicidae Rafinesque, 1815
Subfamily Helicinae Rafinesque, 1815

Genus *Hemicycla* Swainson, 1840

Hemicycla Swainson, 1840: 164. Type species (by monotypy): *Helix plicaria* Lamarck, 1816.

***Hemicycla nisamarae* spec. nov.**

Figs 1-8, 11-12

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Type locality. — Arguayoda, in the southwest of La Gomera, Canary Islands, Spain, on a dry slope close to rocks (28.054083° -17.289694°, alt. 309 m a.s.l., Fig. 1).

Type material. — Holotype (preserved in 70% alcohol): leg. I. & K. Margry, 15.xii.2023 (RMNH.MOL.453876; Figs 3a-c). Paratypes: from the type locality: 15.xii.2023: 8 living specimens (2 dissected, Figs 5, 12), 24 adult and 7 juvenile empty shells, leg. I. & K. Margry (RMNH.MOL.453877); La Caldera (28.0303° -17.2627°, alt. 291 m a.s.l.), 21.viii.1988, 19 empty shells, leg. V. Voggenreiter, coll. K. Groh KG 03038; Barranco del Charco Azul, east of Quise (helocrene spring, 28.047417° -17.253680°, alt. 450 m a.s.l.), 21.viii.1988, 4 fresh dead, 3 empty shells, leg. V. Voggenreiter, coll. K. Groh KG 03039; La Dama (28.0569° -17.2992°, alt. 290 m), 24.vi.2016, 1 living specimen, leg. J. Santana Benítez; Barranco de Rajita, east of La Dama (28.057972° -17.298167°, alt. 313 m a.s.l.), ii.2018, 5 empty shells, leg. M. Artiles, coll. F. Swinnen; Quise, west of village, hiking trail to La Cantera (28.0481° -17.2589°, alt. 480 m), 16.ix.2018, 122 shells, leg. M.T. Neiber; La Dama (28.064025° -17.295065°, alt 409 m a.s.l.), 21.ix.2018, 45 shells, leg. & coll. M. Artiles; Barranco de Almagrero (28.064030° -17.264970°, alt. 392 m a.s.l.), 8.iii.2020, 12 bleached shells, leg. I. & K. Margry (RMNH.MOL.453878); La Manteca, northeast of Arguayoda, close to Barranco de Almagrero, dry landscape with terraces (28.066083° -17.272306°, alt. 580 m a.s.l., Fig. 2), 5.iii.2023, 6 fresh shells (one specimen in Figs 4a-c), leg. I. & K. Margry (RMNH.MOL.453879) + 15.xii.2023, 29 adult and 6 juvenile shells, leg. I. & K. Margry (RMNH.MOL.453880); Arguayoda, close to hamlet (28.059694° -17.284889°, alt. 397 m a.s.l.), 15.xii.2023, 12 bleached empty shells, leg. I. & K. Margry (RMNH.MOL.453881).

Additional material. — Bleached and sometimes damaged shells, leg. I. & K. Margry: from the type locality, 15.xii.2023, 114 empty shells; La Manteca, northeast of Arguayoda, close to Barranco de Almagrero, dry landscape with terraces (28.066083° -17.272306°, alt. 580 m a.s.l., Fig. 2), 8.iii.2020, 21 empty shells + 5.iii.2023, 65 empty shells + 15.xii.2023, 101 empty shells.

Fig. 1. Type locality, south of the hamlet Arguayoda, where on 15.xii.2023 living *Hemicycla nisamarae* spec. nov. were found. Photo: Ingrid Margry-Moonen.

Fig. 2. Locality between Arguayoda and Manteca, where significant numbers of empty bleached shells were found in the terrassed landscape. Photo: Ingrid Margry-Moonen.

Figs 3a-c. *Hemicycla nisamarae* spec. nov., holotype, south of Arguayoda, La Gomera, Canary Islands, 15.xii.2023. **a:** Right side of the living snail; **b:** left side of the snail; **c:** the foot. Photos: Ingrid Margry-Moonen.

The holotype and paratypes collected by I. & K. Margry are stored in the collection of Naturalis Biodiversity Center (RMNH), Leiden, The Netherlands.

Animal (holotype; Fig. 3). — The sides and top of the body and head are brown with irregularly distributed dark brown microscopic spots. At the tail there is a transition to beige. The tentacles are transparent, making the dark brown to black retractor muscle visible. The sole of the foot is light brown at the edges, changing to a darker brown shade towards its middle.

Shell (description based on the paratype depicted in Fig. 4). — The shell is depressed-globular and 10.9 mm high and 18.0 mm wide. It has 4.5 convex evenly increasing whorls and a somewhat impressed suture. Close to the aperture the body whorl bends down. The aperture is oval U-shaped, 6.7 mm high and 7.8 mm wide. Its margin is distinctly reflected. A thin parietal callus connects the insertion points of the apertural margin. The umbilicus is completely covered by the wide, reflected columellar margin, which is also equipped with a weak bulge-like thickening in its middle portion.

The protoconch has irregular rows of small, elongated granules. After about two whorls, these rows continue onto the teleoconch and fine regular smooth ribs start to develop. Towards the aperture, elongated small pits and granules are increasingly present on these ribs. On the last part of the body whorl, the ribs become coarser and tend to be set further apart. On the ventral side, the ribs become progressively weaker towards the umbilical area. The ribs can also be traced back into the aperture, where they can be seen through the thin parietal callus. The periphery of the body whorl is rounded. Sometimes the ribs are, however, slightly angled at the periphery or very little, bulge-like thickenings are present in addition to the ribs in this area. The colour of the protoconch ranges from dark brown to light brown. On the teleoconch this changes to a light brown colour, with four darker brown bands; one wide band just below the suture, two narrower bands just above the periphery of the shell and one narrow band on the dirty white ventral side of the shell. The radial ribs are dirty white, also where they cross the brown spiral bands. The peristome is dirty white.

Shell variability (Figs 8, 11). — All paratypes have essentially the same ribs and colour bands. However, the shells vary considerably in height. In Fig. 8, the width relative to the height of 101 shells of *H. nisamarae* spec. nov. is shown. In mature animals with a reflected peristome, the umbilicus is normally closed. In one case, the umbilicus is still partially visible. In juvenile specimens, the umbilicus is still open. The faint bulge-like thickening on the columellar side varies considerably in size. One small specimen (15.xii.2023, La Manteca) even has a distinct tooth (Fig. 11).

Genitals (paratype; Fig. 5). — In this paper we refer to the

Figs 4a-c. *Hemicycla nisamarae* spec. nov., paratype, La Manteca, La Gomera, Canary Islands, 5.iii.2023. **a:** Dorsal side; **b:** side view; **c:** ventral side. Scale bar = 10 mm. Photos: Ingrid Margry-Moonen.

proximal part of the genitals as being located closer to the hermaphroditic gland and the distal part as being located closer to the genital orifice.

The ductus hermaphroditicus is strongly tortuous. The albumen gland is elongated and curved. The long spermoviduct is twisted. The free oviduct is approximately as long as the dart sac. The vagina is short. No love darts were found in the thick-walled dart sac. The bursa copulatrix complex abuts the spermoviduct, with the bursa reaching to the ductus hermaphroditicus. The diverticulum splits from the common stalk after about a quarter of its total length and continues on the other side of the spermoviduct. The diverticulum is slightly shorter than the pedunculus and bursa combined. On either side of the dart sac are paired glandulae mucosae. In one pair, both tubuli are approximately of the same length, in the other pair one tubulus is distinctly shorter than the other. The vas deferens inserts into the epiphallus. The flagellum is longer than the penis and half as long as the diverticulum. The penis retractor muscle is short and pointed towards its attachment to the body wall. The distal part of the penis is widened. The atrium is short.

The hermaphroditic gland is dark brown, the albumen gland is yellow brown, the bursa copulatrix complex is dirty white coloured. All other parts of the genitalia are whitish.

The genitals of a juvenile specimen (shell width 13.9 mm and height 8.0 mm) are hardly developed. The flagellum is still short, the retractor penis relatively long. The spermoviduct is hardly wider than the parallel pedunculus and the diverticulum (Fig. 12).

Jaw (Fig. 6). — The odontognathous jaw is 1.5 mm wide, has 2 larger and three smaller projecting ribs and has an orange to red brown colour.

Radula (Fig. 7). — The radula has in every row on each side of the central tooth approximately 12 laterals that gradually transition into 21-25 marginals. The central tooth has a rounded mesocone, lacks ectocones and is smaller than the lateral teeth. The lateral teeth have a rounded mesocone, lack an endocone, and have a large ectocone (Fig. 7a). In the transition to the marginal teeth, the mesocone becomes smaller, an endocone appears and develops into a second rounded tip, while the ectocone increases in size (Figs 7b-c). Towards the outer edge of the radular ribbon, the teeth become smaller, the tips narrower and more pointed, and the ectocones more irregular in number and shape (Fig. 7d).

Derivatio nominis. — The species epithet refers to Nisamar Artiles, the daughter of Miguel Artiles.

Discussion. — The new species appeared to be the sister taxon of the geographically adjacent *Hemicycla gaudryi* (pers. com. M. T. Neiber, unpublished genetic data). Both species can, however, easily distinguished by their shells. *Hemicycla gaudryi* (Fig. 9) has hardly any ribbing on the shell and is smooth on the underside. In addition, the fresh shells are often shiny. In measurements of the width versus the height (Fig. 8), the shells have a considerable overlap but *H. nisamarae* is more variable with regard to shell height. The shell of *H. nisamarae* spec. nov. shares some features with that of *H. planorbella* (Fig. 10) as well. Both species have distinct ribs and continuous bands on their shells. In measurements of the width versus the height (Fig. 8), *H. planorbella* is usually larger and more flattened. *Hemicycla nisamarae* spec. nov. is usually smaller and is more variable with regard to shell height. Although there is some overlap between *H. nisamarae* spec. nov. and *H. planorbella*, an important difference remains that the umbilicus is open in *H. planorbella* and closed in *H. nisamarae* spec. nov. In immature shells, there is more overlap in sizes and the umbilicus is not yet closed in *H. nisamarae* spec. nov. In such cases, doubts about the identification may remain and mature shells at the site should be the deciding factor.

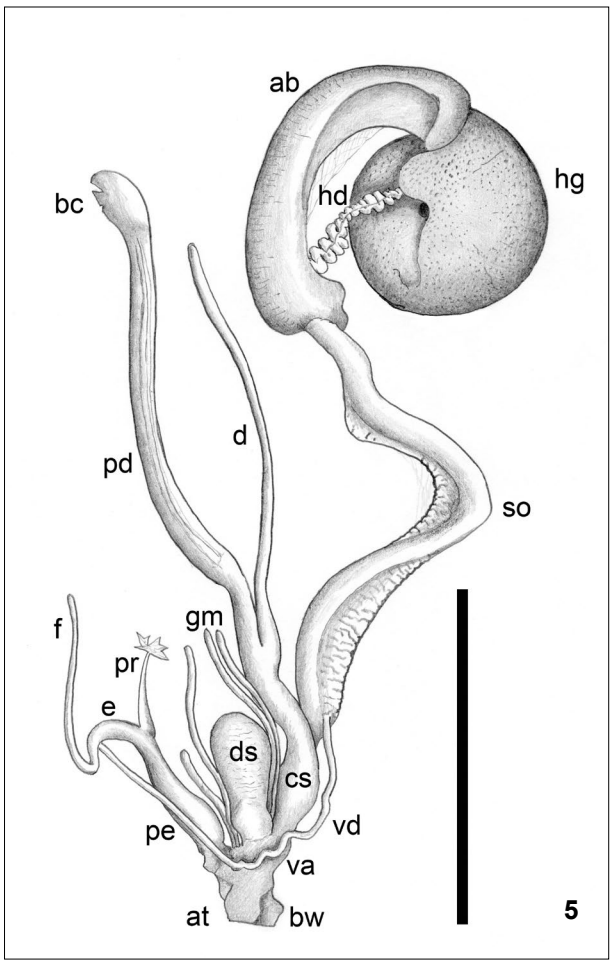
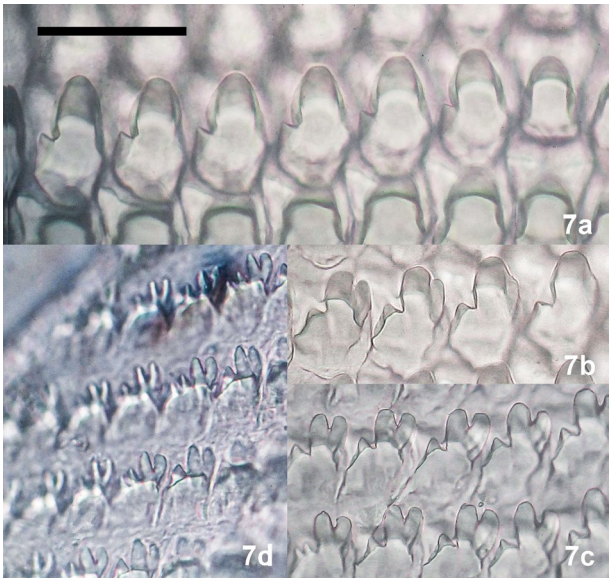


Fig. 5. *Hemicycla nisamarae* spec. nov., genital system of a paratype from the type locality, 15.xii.2023. Shell wide 15.9 mm, height 11.0 mm. ab = albumen gland, at = atrium, bc = bursa copulatrix, bw = body wall, cs, common stalk of the bursa copulatrix complex, d = diverticulum, ds = dart sac, e = epiphallus, f = flagellum, gm = glandula mucosa, hd = hermaphrodite duct, hg = hermaphrodite gland, pd = pedunculus (= bursa duct), pe = penis, pr = penial retractor, so = spermoviduct, va = vagina, vd = vas deferens. The free oviduct is located behind the common stalk of the bursa copulatrix complex. Scale bar = 10 mm. Drawing: Kees Margry.

Fig. 6. Jaw of *Hemicycla nisamarae* spec. nov. from the specimen of Fig. 5. Scale bar = 1.0 mm. Photo: Ingrid Margry-Moonen.



Figs 7a-d. Radula of *Hemicycla nisamarae* spec. nov. from the specimen of Fig. 5. **a:** Central tooth with six laterals on the left; **b:** transition to the left from laterals to marginals; **c:** marginals; **d:** marginals on the outer edge. Scale bar = 50 µm. Photos: Kees Margry.

However, no overlap in the distribution of the two species has yet been recorded.

The new species does not closely resemble any other *Hemicycla* species from La Gomera. The shell of the new species is somewhat similar to that of *H. bethencourtiana* (Shuttleworth, 1852) from Tenerife, but that species has fewer ribs on the body whorl and the aperture is relatively larger. All other species of *Hemicycla* differ from the new species in features such as a more flattened shell, a distinct keel, an open or only partly covered umbilicus, a proportionately larger aperture, a thicker peristome, teeth in the aperture, a shell surface with more, fewer, no or coarser ribs, a glossy surface, a malleate sculpture or teardrop-like structures or a different banding pattern. Sometimes shells are much larger.

The genital anatomy has the general characteristics of already investigated species of *Hemicycla* that possess a diverticulum (formerly *Hemicycla* s. str.). Other species that possess a diverticulum usually have more strongly branched glandulae mucosae and often a longer to much longer flagellum.

Distribution. — The distribution area of the new species is rather small. It is found in the southwestern part of La Gomera. The area extends from La Dama on the northwestern side to the barranco east of Quise on the eastern side. Given the large number of bleached and sometimes damaged empty shells (301 specimens) found next to the paratypes at

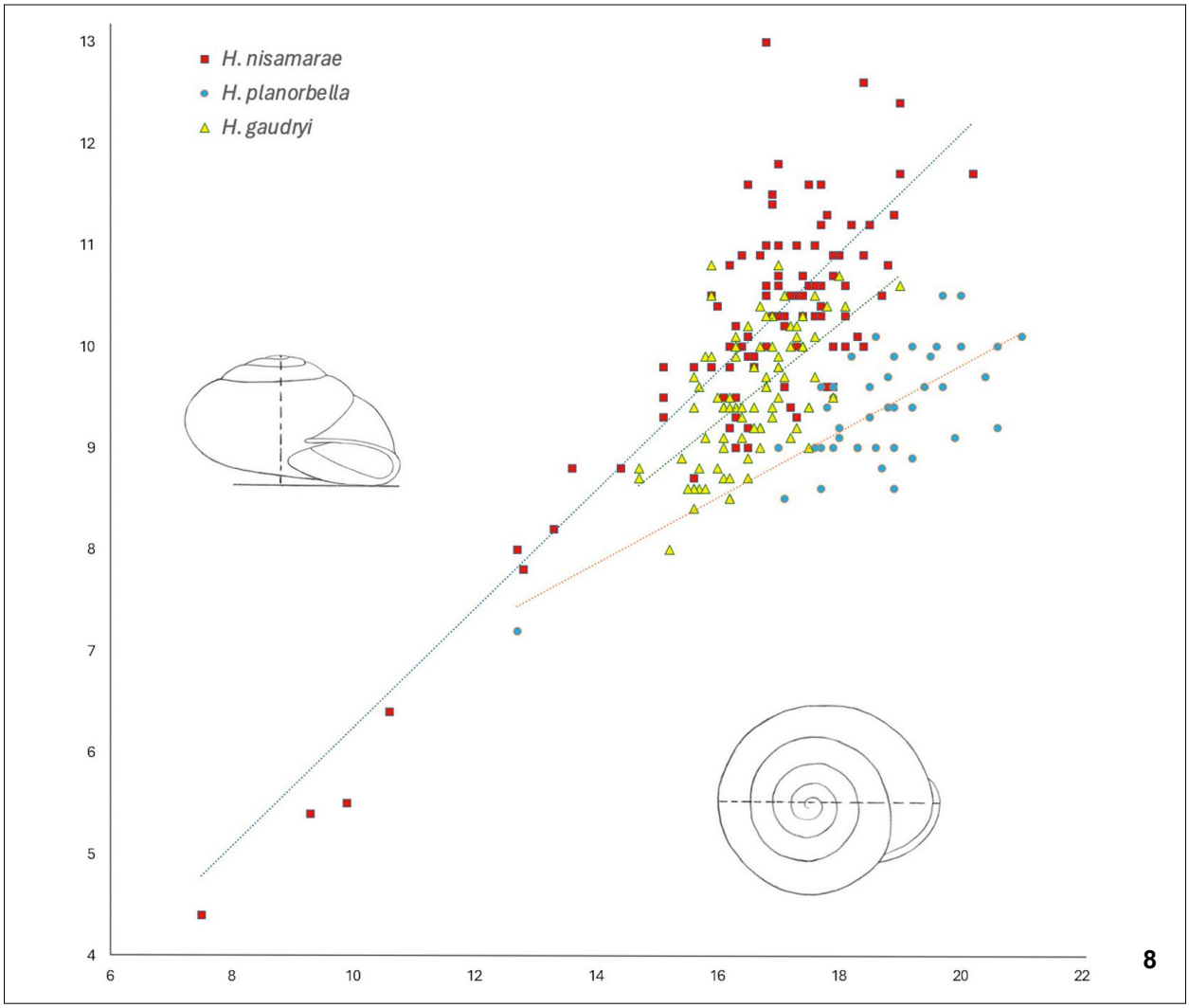
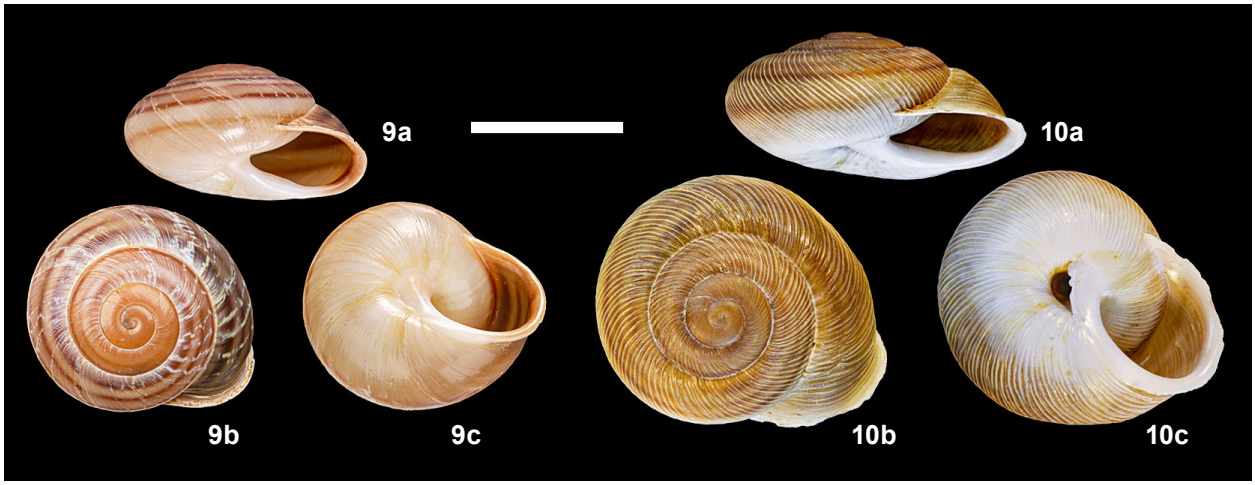


Fig. 8. The width (x-axis) compared to the height (y-axis) in mm of 101 shells of *Hemicycla nisamarae* spec. nov. (red squares), 85 shells of *H. gaudryi* (yellow triangles), and 43 shells of *H. planorbella* (blue circles) with their regression line.



Figs 9a-c. Shell of *Hemicycla gaudryi* (d'Orbigny, 1839). 5.x.2022, north of airport, La Gomera, Canary Islands. **Figs 10a-c.** Shell of *H. planorbella* (Lamarck, 1822). 10.xi.2021, La Mérica, La Gomera, Canary Islands. Scale bar = 10 mm. Photos: Ingrid Margry-Moonen.

Fig. 11. *Hemicycla nisamarae* spec. nov., a specimen with the bulge on the columella that has grown into a long tooth (15.xii.2023, La Manteca, leg. I. & K. Margry). Scale bar = 10 mm. Photo: Ingrid Margry-Moonen.

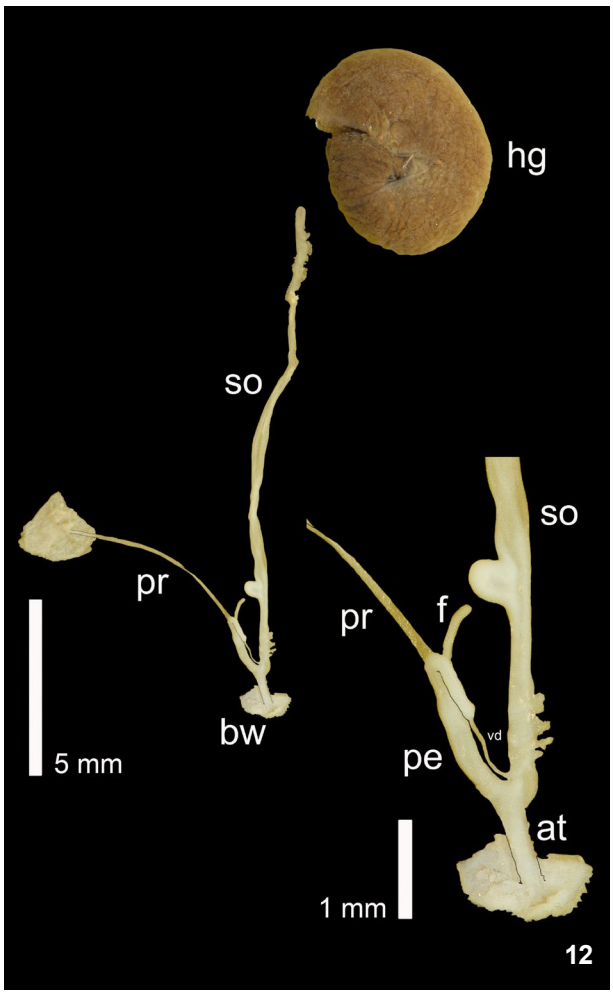


Fig. 12. *Hemicycla nisamarae* spec. nov., genitals from a juvenile specimen (Arguayoda, La Gomera, Canary Islands, 15.xii.2023) with at the right corner a magnification of the distal part. Photo: Ingrid Margry-Moonen. For abbreviations, see Fig. 5.

the Arguayoda region, it is assumed that the species is not rare. However, there are threats. Because of the changes in agriculture, there is a decline of the rock walls that delimit the terraces. The introduction of the *Rumina decollata* (Linnaeus, 1758) which occurs in large quantities in the area may be problematic considering it's thought to prey on other land snails. Due to these threats and its limited distribution area (< 20 km²), we propose to designate *Hemicycla nisamarae* spec. nov. in the Red List Category as Vulnerable D2.

Ecology. — *Hemicycla nisamarae* spec. nov. is a xerophilous species and has been found in an arid terraced landscape with stones and stacked walls. The vegetation consists mainly of *Euphorbia* spec., *Neochamaelea pulverulenta*, and *Launaea arborescens*. Living animals hide under piles of stones. The following land snail species have been found together with the new species: *Pomatias* spec. (type locality), *Granopupa granum* (Draparnaud, 1801) (Manteca), *Napaeus magnus* Yanes, Deniz, M. R. Alonso & Ibáñez, 2013 (Almagrero, Manteca, Arguayoda), *Rumina decollata* (Almagrero, Manteca), *Caracollina lenticula* (Michaud, 1831) (Almagrero, Manteca, Arguayoda), *Canariella multigranosa* (Mousson, 1872) (Almagrero, Manteca, Arguayoda), *Canariella discobolus* (Shuttleworth, 1852) (Almagrero, Manteca), *Obelus mirandae* (R. T. Lowe, 1861) (Almagrero, Manteca, Arguayoda) and *Hemicycla fritschi* (Manteca).

FINAL REMARKS

Including *Hemicycla nisamarae* spec. nov., 51 species of *Hemicycla* are known from the Canary Islands. With 16 species of this genus, the relatively small island of La Gomera is almost as rich in *Hemicycla* species as the adjacent, much larger island of Tenerife. More fieldwork may yield rediscoveries of the essentially unknown *H. gomerensis* and *H semitecta*. La Gomera is rightly known as an island with high biodiversity.

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