

# Contribution to the knowledge of selected land gastropods of Galápagos (Ecuador)

(Mollusca, Cycloneritida and Stylommatophora)

Sergio Eduardo Miquel & Henri W. Herrera

Miquel, S. E. & Herrera, H. W. 2019. Contribution to the knowledge of selected land gastropods of Galápagos (Ecuador) (Mollusca, Cycloneritomorpha and Stylommatophora). *Spixiana* 42 (2): 185–191.

The native *Helicina nesiotica* is the first Helicinidae recorded in Pinzón Island, and the non-indigenous *Streptostele musaecola*, found in Santa Cruz, is the first Streptaxidae recorded in the Galápagos archipelago. Other alien species found for the first time are *Ceciliooides (Geostilbia) aperta* (in Santa Cruz Is.) and *Ceciliooides* sp. (in Santiago Is.), both Ferussacidae. Protoconchs, jaws and radulae of species of the Helicinidae, Euconulidae and Zonitidae are described for the first time; *Hyalinia chathamensis* is re-classified into the genus *Glyphyalus*.

Sergio E. Miquel, Museo Argentino de Ciencias Naturales “Bernardino Rivadavia”, Consejo Nacional de Investigaciones Científicas y Tecnológicas, Av. Ángel Gallardo 470, C1405DJR, Ciudad Autónoma de Buenos Aires, Argentina; e-mail: semsnail@yahoo.com.ar

Henri W. Herrera, Terrestrial Invertebrate Collection, Charles Darwin Research Station, Puerto Ayora, Santa Cruz, Galápagos, Charles Darwin Foundation, Ecuador; and Escuela Superior Politécnica de Chimborazo, Facultad de Recursos Naturales, Departamento de Entomología, Panamericana Sur km 1 1/2, Riobamba, Ecuador; e-mail: henri.herrera@fcdarwin.org.ec

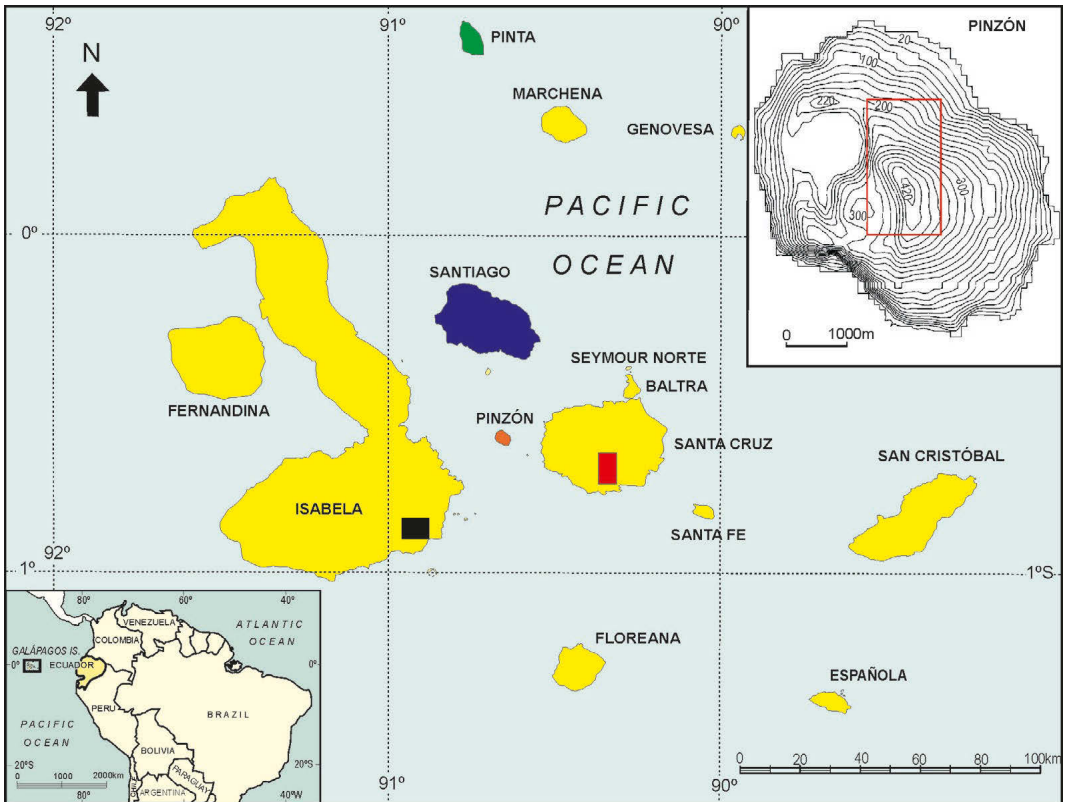
## Introduction

The native land snails of the Galápagos Archipelago (Ecuador) are little diverse, with around 125 species known; exceptionally, the family Bulimulidae has about 100 species (Parent et al. 2016). Native and exotic micromollusk species have recently been reviewed (Miquel & Herrera 2014) and, so far, these gastropods are known only for their shells. In this work, based on new materials collected in the Galápagos Archipelago, we present new records of native and introduced fauna in the archipelago, including the description of soft parts and an update of the systematics of some of them.

## Material and methods

The studied specimens were obtained by different collectors on different dates. The main group was sampled by C. Parent (Texas University, USA) in geo-referenced sites of Pinzón Island in 2012. The specimens of Pinta and Santiago Islands were recovered from the Invertebrate Collection of the Charles Darwin Research Station (ICDRS) (Puerto Ayora, Santa Cruz Island, Galápagos Province, Ecuador), others were collected in Isabela and Santa Cruz Islands.

Many of the specimens analyzed have soft parts. The shells, jaws and radulae illustrated were photographed by Scanning Electronic Microscopy of Bernardino Rivadavia Natural Sciences Museum (Ciudad Autónoma de Buenos Aires, Argentina), after being coated with gold-palladium, and measured



**Fig. 1.** Location of Galápagos archipelago and distribution of new records of landshells in Galápagos Islands, Ecuador. *Helicina nesiotica* Dall, 1892 and *Glyphyalus chathamensis* (Dall, 1893) n. comb. (green); *Cecilioides* sp. (blue); *G. (G.) chathamensis*, *Cecilioides (Geostilbia) aperta* (Swainson, 1840) and *Streptostele musaecola* (Morelet, 1860) (red); *Helicina nesiotica* Dall, 1892, *G. (G.) chathamensis* and *Guppya bauri* (Dall, 1892) (orange).

by means of binocular microscopy. The materials are stored in the ICCDRS. The measurements of specimens are main diameter and height of shells. The classification follows Bouchet et al. (2017).

## Results

Order Cycloneritida Frýda, 1998  
 Superfamily Helicinoidea Férussac, 1822  
 Family Helicinidae Férussac, 1822  
 Subfamily Helicininae Férussac, 1822

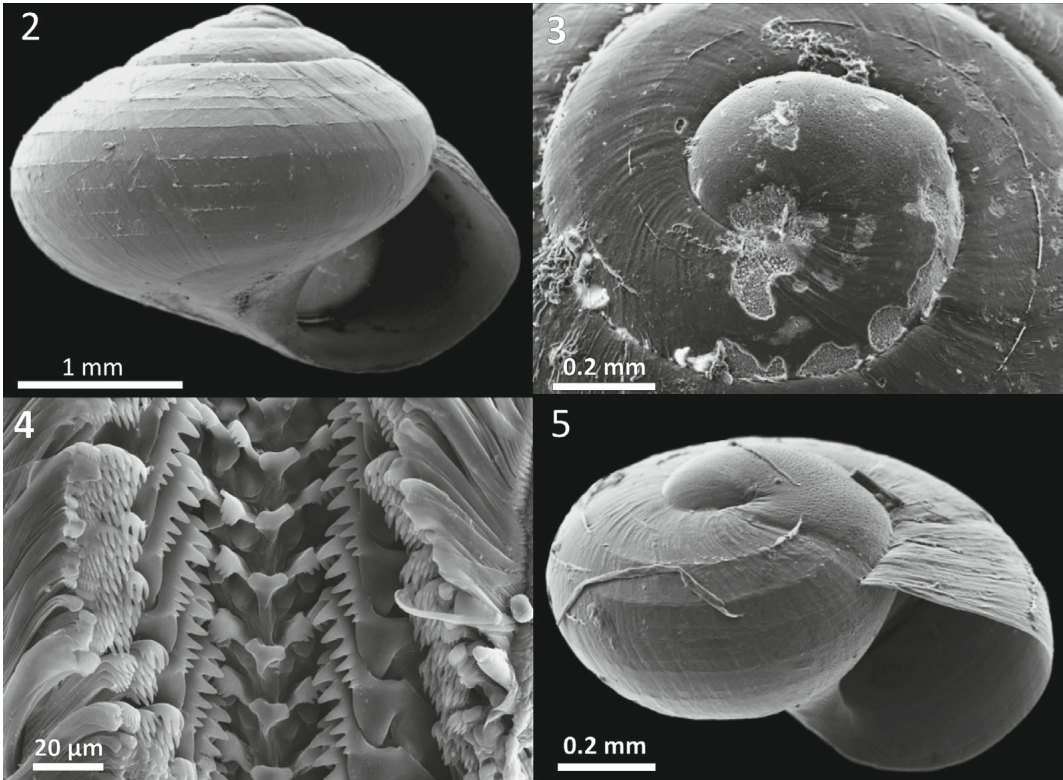
### *Helicina nesiotica* Dall, 1892 Figs 2-5

*Helicina (Idesa) nesiotica* Dall, 1892: 97.

*Helicina nesiotica* Miquel & Herrera, 2014: 109, figs 1-2, map 2; Villarruel Oviedo & de la Torre, 2014: B23.

**Description of shell** (Figs 2, 3, 5). For description of teleoconch and operculum, see Miquel & Herrera (2014). Embryonic shell of a bit more than one whorl, showing a sculpture with small holes, irregularly distributed; the second whorl has spiral costulae crossed by irregular growth wrinkles.

**Description of radula** (Fig. 4). Rhipidoglossate: 23-D-3-C-3-D-23. Central area formed by a triangular central or rachidian tooth, with a vertex downward, three teeth arranged on the sides, the two ones closer to rachidian have a morphology of “inverted boot”, the third one is smaller and lanceolated, all of them have 4-5 cusps or denticles; latero-marginal plate or capitulum complex (Baker 1923, Mclean 2011) with seven cups, being the second, third and fourth ones more developed, this plate is continued in a basal extension, like a strong ribbon (formed by one piece); marginal complex with 23 marginal large and curved teeth (Boss & Jacobson 1973), each tooth



**Figs 2–4.** *Helicina nesiotica* Dall, 1892: ICCDRS 41929. Pinzón Island, Galápagos, Ecuador. **2.** General morphology. **3.** Detail of the protoconch. **4.** Radula rhipidoglossate.  
**Fig. 5.** *Helicina nesiotica* Dall, 1892: ICCDRS 40529. Isabela Island, Galápagos, Ecuador. Alfagia, agricultural area.

has delicate cusps, 5 in the innermost and up to 10 in the outer teeth.

**Remarks.** This is the first description of the protoconch and radula of a Helicinidae species from the Galápagos Archipelago. For Galápagos, the genus has been used in combination with the subgenus *Idea* H. & A. Adams, 1856 (Miquel & Herrera 2014). Richling & Glaubrecht (2008) arranged the South American species in *Helicina*, but these authors did not mention – specifically – the species living in Galápagos.

**Measurements of illustrated specimen.** ICCDRS 41929: length: 2.75, diameter: 1.70 mm; 4 whorls; ICCDRS 40529: length: 0.95 mm.

**Distribution.** Ecuador, Galápagos: Floreana, Isabela, San Cristóbal and Santa Cruz (Miquel & Herrera 2014). This is the first record of the family in Pinzón Island.

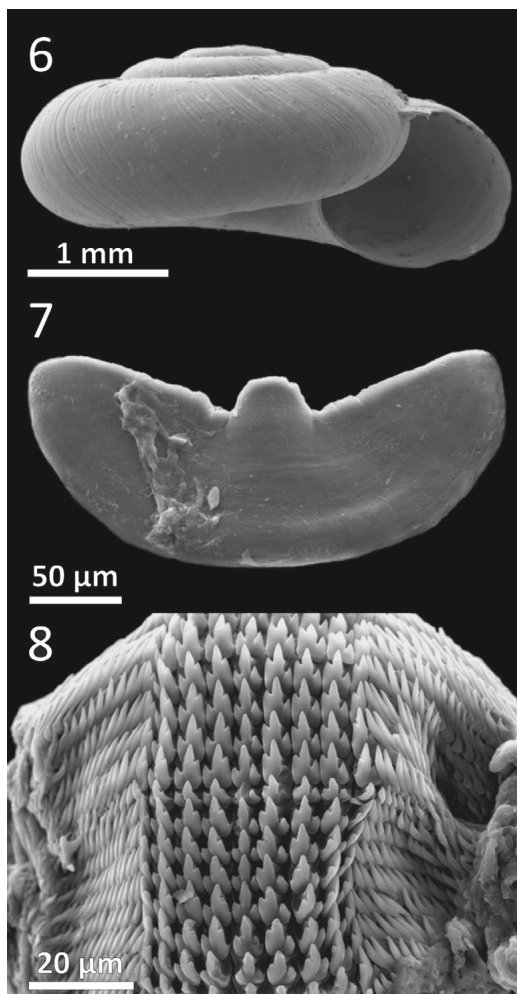
**Studied materials:** Dry: Isabela. ICCDRS 40529. Alfagia, agricultural area. 1 ex. juv. frag. Col. H. W. Herrera,

01/II/2014. Pinzón. ICCDRS 40471. [–0.61256 –90.66553]. 1 ex. 6/XI/2012. ICCDRS 41925. [–0.61789 –90.66763], 325 m. 1 ex. 4/XI/2012. In ethanol: Pinzón. ICCDRS 41926. [–0.61562 –90.66109], 378 m. 23 exs. 5/XI/2012. ICCDRS 41927. [–0.61739 –90.66176], 398 m. 6 exs. 5/XI/2012. ICCDRS 41928. [–0.61802 –90.66214], 204 m. 2 exs. 4/XI/2012. ICCDRS 41929. [–0.61719 –90.66383], 427 m. 9 exs. 5/XI/2012. ICCDRS 41930. [–0.61462 –90.66517], 439 m. 34 exs. 5/XI/2012.

Order Stylommatophora A. Schmidt, 1855  
 Family Oxychilidae Hesse, 1927  
 Genus *Glyphyalus* Baker, 1931

***Glyphyalus chathamensis* (Dall, 1893) n. comb.**  
 Figs 6–8

*Hyalinia chathamensis* Dall, 1893: 54.  
*Glyphyalinia chathamensis* Vagvolgyi, 1979: 63.  
*Retinella? chathamensis* Miquel & Herrera, 2014: 118, fig. 25, map 6.



**Fig. 6.** *Glyphyalus chathamensis* (Dall, 1893) n. comb. ICCDRS 40460. Pinzón Island, Galápagos, Ecuador. **Figs 7–8.** *Glyphyalus chathamensis* (Dall, 1893) n. comb. ICCDRS 41923. Pinzón Island, Galápagos, Ecuador. 7. Jaw. 8. Radula.

**Description of the shell** (Fig. 6). See Miquel & Herrera (2014).

**Description of the buccal apparatus** (Figs 7–8). Jaw *oxygnatha*; radula with central and lateral teeth tricuspid and marginal teeth monocuspid (14–4–C–4–14).

**Measurements of illustrated specimen.** ICCDRS 40460: 1.55 × 3.65 mm; 4.25 whorls.

**Distribution. Ecuador, Galápagos:** Isabela, San Cristóbal, and Santiago Islands (Miquel & Herrera 2014). This is the first record for this species in Pinta, Pinzón and Santa Cruz islands.

**Remarks.** The new combination is based on the taxonomic arrangement of Zilch (1959), according to which *Retinella* Fischer in Suttleworth, 1877 is a genus restricted to the Old World; so, Vagvolgyi's generic arrangement (1979) is confirmed. The radular formula belongs to the genus *Glyphyalus* Baker, 1931, with tricuspid central and lateral teeth and aciculi-form (thorn-shaped) marginal teeth (Pilsbry 1946).

**Studied materials:** Dry: Pinta. ICCDRS 36594 (ex 1225). 1300 ft asl. 7/II/1982. 3 exs.; ICCDRS 36590 (ex 1218). 1500 ft asl. Soil samples. 9/II/1982. 4 exs.; Pinzón. ICCDRS 40438. [–0.61789 –90.66763], 325 m. 1 ex. 4/XI/2012; ICCDRS 40440. [–0.61986 –90.66743]. 6 exs.; Santa Cruz. ICCDRS 40557. Col. A. de Roy, X/1974. 1 ex.; In ethanol: Pinzón. ICCDRS 40444. [–0.61712 –90.66624], 356 m. 1 ex. 4/XI/2012. ICCDRS 40453. [–0.61802 –90.66214], 204 m. 1 ex. 5/XI/2012. ICCDRS 40460. [–0.61529 –90.67202], 324 m. 2 exs. 6/XI/2012. ICCDRS 41923. [–0.61562 –90.66109], 378 m. 1 ex. 5/XI/2012. ICCDRS 41924. [–0.61719 –90.66383], 427 m. 1 ex. 5/XI/2012.

Family Euconulidae H. B. Baker, 1928

*Guppy bauri* (Dall, 1892)

Figs 9–11

Zonites (Hyalinia) Baueri Dall, 1892: 98.

Zonites (Hyalinia) Bauri Stearns, 1894: 418 (emendation).

*Guppy bauri* Miquel & Herrera, 2014: 120, figs 31–32, map 7.

**Description of the shell** (Figs 9, 10). For the description of the teleoconch, see Miquel & Herrera (2014). Protoconch flat-convex, with near to 25 spiral incisure.

**Description of radula** (Fig. 11). It belongs to the generic type: C/3 – L5/3 – M13/3 (Pilsbry 1946), with tricuspid teeth, being the central cusp bigger.

**Measurements of illustrated specimen.** ICCDRS 41933: 3.50 × 2.50 mm, 3.75 whorls.

**Distribution. Ecuador, Galápagos:** Española, Genovesa, Isabela, Pinta, Pinzón and Santa Cruz Islands (Miquel & Herrera 2014).

**Remarks.** This is the first description of the protoconch and radula of this species. The specimens show a similar sculpture and radular formula to other species of genus, e. g., in *G. gundlachi* (Pfeiffer, 1840), from North and Central America (Pilsbry 1946).

**Studied materials:** Dry: Isabela, Alfagia, agricultural area. 1 ex. juv. fragm. Col. H.W. Herrera, 01/II/2014. Pinzón. ICCDRS 41934. [–0.61789 –90.66763], 325 m. 1 ex. 4/XI/2012. ICCDRS 41933. [–0.61719 –90.66383], 427 m. 1 ex. 5/XI/2012. ICCDRS 41932 (ex ICCDRS



40529). 1 ex. In ethanol: Pinzón. ICCDRS 40452. [-0.61802 -90.66214], 204 m. 2 exs. 5/XI/2012. ICCDRS 41931 [-0.61719 -90.66383], 427 m. 2 exs. 5/XI/2012.

Family Streptaxidae Gray, 1860

*Streptostele musaecola* (Morelet, 1860)

Figs 12–13

*Achatina musaecola* Morelet, 1860: 190.

*Streptostele (Tomostele) musaecola* Pilsbry, 1919, 40: 191, pl. 21, fig. 11; Hausdorf & Medina Bermúdez, 2003: 185, figs 1–3; Robinson et al., 2009: 635, figs 7C, 8C.

*Streptostele musaecola* Brodie & Barker, 2012: 6, fig.

**Description of the shell** (Figs 12, 13). Shell turrit, imperforate, slender, crystalline, with whorls moderately convex; first two whorls smooth; subsequent whorls having a sculpture of strong, rounded ribs, with smooth intervals; the aperture is almost trapezoidal; the outer lip is blunt, a little thickened and straightened or bent inward in the middle; the basal margin is rounded, well expanded; columellar margin subvertical; the parietal callus is rather thick.

**Measurements of illustrated specimen.** ICCDRS 40530: 6.7 × 1.55 mm; 8.75 whorls.

**Distribution.** West Africa; introduced into Australia, Melanesia and Polynesia, and throughout the Caribbean Basin and Central America (Hausdorf & Medina Bermúdez 2003, Robinson et al. 2009).

**Ecuador, Galápagos:** Santa Cruz. This is the first record of this species in the Galápagos Archipelago.

**Studied materials:** Dry: Santa Cruz. ICCDRS 40513. Bellavista. On the ground, in the garden of a house. Col. S. E. Miquel & X. Pilataxi, 18-IX-2013. 1 ex. ICCDRS 40530. Guayabillos. Humid zone [-0.69926 -90.343044], 201 m. Col. X. Pilataxi. 5 exs.

Family Ferussaciidae Bourguignat, 1883

*Ceciloides (Geostilbia) aperta*  
(Guilding in Swainson, 1840)

Fig. 14

*Macrospira aperta* Guilding in Swainson, 1840: 335, figs 97e,f.

*Ceciloides (Geostilbia) aperta* Miquel & Herrera, 2014: 122, fig. 35.

**Description of the shell** (Fig. 14). See Miquel & Herrera (2014).

**Measurements of illustrated specimen.** ICCDRS 40531: 1.55 × 1.05 mm; 3.5 whorls.

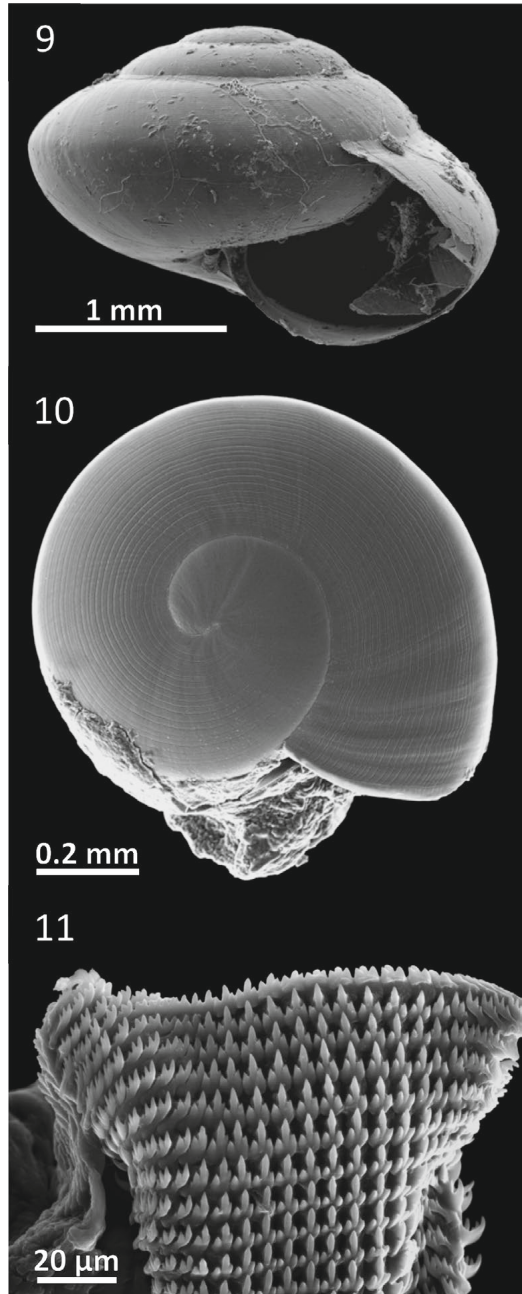
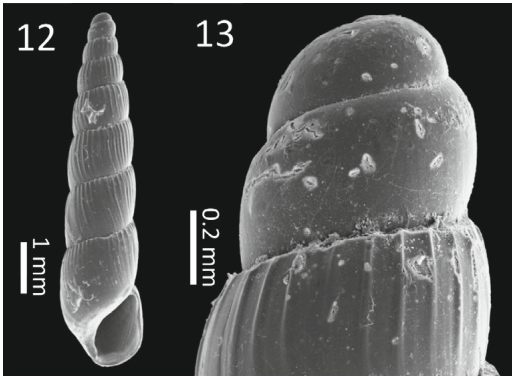


Fig. 9. *Guppya bauri* (Dall, 1892): ICCDRS 41933. Pinzón Island, Galápagos, Ecuador.

Fig. 10. *Guppya bauri* (Dall, 1892): ICCDRS 40452. Pinzón Island, Galápagos, Ecuador. Apical view of an embryo obtained from dissection of an adult specimen.

Fig. 11. *Guppya bauri* (Dall, 1892): ICCDRS 41931. Pinzón Island, Galápagos, Ecuador. Radula.



**Figs 12–13.** *Streptostele musaecola* (Morelet, 1860): ICCDRS 40530. Santa Cruz Island, Galápagos, Ecuador. Humid zone, Guayabillos. **12.** General morphology. **13.** Detail of first whorls.

**Distribution.** West Indies: Cuba, Jamaica and Haiti. Distributed worldwide by human transport (United States of America, Panama, Brazil, Saint Helena, New Caledonia) (Cowie 1997). **Ecuador, Galápagos:** Santa Cruz. This is the first record of this species in the Galápagos Archipelago.

**Studied material:** Santa Cruz. ICCDRS 40531. Guayabillos, Humid zone. [−0.696260 −90.346245]. 204 m. Col. X. Pilataxi. 1 ex.

*Cecilioides* sp.  
Fig. 15

**Description of the shell (fragment)** (Fig. 15). Last 2 whorls showing a long aperture, truncated columella, and slightly convex whorls.

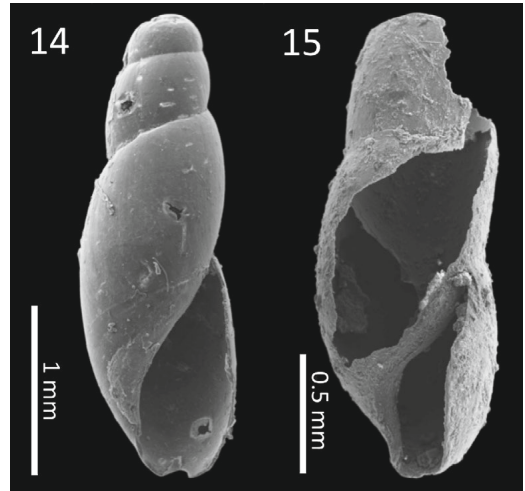
**Measurements of illustrated specimen.** ICCDRS 40555: 1.95 × 0.90 mm, broken.

**Distribution.** The genus *Cecilioides* is distributed in large areas of the world (Zilch 1959). **Ecuador, Galápagos:** Cited for Floreana Island (Smith 1966). This is the first record of the family and genus for Santiago Island.

**Studied material:** Dry: Santiago. ICCDRS 40555. First big hill behind of cave of Bucanero. Col. A. de Roy, 1 ex. fragm.

**Acknowledgements**

We are thankful to the authorities and personal of National Park Galápagos (DPNG) and Charles Darwin Foundation (CDF) for allowing this research; to C. Parent for the samples of micromollusks collected in Pinzón; to X. Pilataxi for helping collecting specimens in



**Fig. 14.** *Cecilioides (Geostilbia) aperta* (Swainson, 1840). ICCDRS 40531. Santa Cruz Island, Galápagos, Ecuador. Humid zone, Guayabillos.

**Fig. 15.** *Cecilioides* sp. ICCDRS 40555. Santiago Island, Galápagos, Ecuador. First big hill behind Buccanero cave.

Santa Cruz; to I. Richling (Staatliches Museum für Naturkunde, Stuttgart, Germany) for her comments about the family Helicinidae; to D. Maceira (Centro Oriental de Ecosistemas y Biodiversidad, Cuba) and G. Rosenberg (Academy of Natural Sciences of Philadelphia, USA) for the confirmation of the identity of *S. musaecola*; to CDF for its institutional support; for the permission for sampling (Plan Operativo Anual (POA/2015)); and to F. Tricárico for the microphotographs obtained in scanning electronic microscopy of Museo Argentino de Ciencias Naturales. This publication is contribution number 2199 of the Charles Darwin Foundation for the Galapagos Islands.

**References**

- Baker, H. B. 1923. Notes on the radula of the Helicinidae. Proceedings of the Academy of Natural Sciences of Philadelphia 74: 29–67, pls. 3–7.
- Boss, K. J. & Jacobson, M. K. 1973. Monograph of the Genus *Alcadia* in Cuba (Mollusca: Prosobranchia: Helicinidae). Bulletin of the Museum of Comparative Zoology 145(7): 311–358.
- Bouchet, P., Rocroi, J.-P., Hausdorf, B., Kaim, A., Kano, Y., Nützel, A., Parkhaev, P., Schrödl M. & Strong, E. E. 2017. Revised classification, nomenclator and typification of Gastropod and Monoplacophoran families. Malacologia 61: 1–526.
- Brodie, G. & Barker, G. M. 2012. *Streptostele musaecola* (Morelet, 1860). Family Streptaxidae. USP Introduced land snails of the Fiji Islands Fact Sheet Series, 6. 2 pp.

- Cowie, R. H. 1997. Catalogue and bibliography of the non-indigenous non-marine snails and slugs of the Hawaiian Islands. Bishop Museum Occasional Papers 50: 1-66.
- Hausdorf, B. & Medina Bermúdez, C. I. 2003. *Luntia insignis* Smith, 1898, is a synonym of *Streptostele* (*Tomostele*) *musaeola* (Morelet, 1860) (Gastropoda: Streptaxidae) – an African tramp and its distribution in America. *Malacologia* 45(1): 185-187.
- McLean, J. H. 2011. Reinstatement of the fissurellid subfamily Hemitominae, with the description of new genera, and proposed evolutionary lineage, based on morphological characters of shell and radula (Gastropoda: Vetigastropoda). *Malacologia* 54(2): 407-427.
- Miquel, S. E. & Herrera, H. W. 2014. Catalogue of terrestrial gastropods from Galápagos (except Bulimulidae and Succineidae) with description of a new species of *Ambrosiella* Odhner (Achatinellidae) (Mollusca: Gastropoda). *Archiv für Molluskenkunde* 143(2): 107-133.
- Parent, C. E., Miquel, S. E., Coppois, G. 2016. CDF Checklist of Galapagos terrestrial and brackish water snails. <http://darwinfoundation.org/datazone/checklists/terrestrial-invertebrates/gastropoda/> Last updated 29 Sep 2016.
- Pilsbry, H. A. 1919. A review of the land mollusks of Belgian Congo chiefly based on the collections of the American Museum Congo Expedition, 1909-1915. *Bulletin of the American Museum of natural History* 40: 1-370, pls. 1-23.
- 1946. Land Mollusca of North America (north of Mexico) 2(1). 520 pp., Philadelphia (The Academy of Natural Sciences of Philadelphia).
- Richling, I. & Glaubrecht, M. 2008. The types of Neotropical Helicinidae (Mollusca, Gastropoda, Neritopsina) in the Malacological Collection of the Museum für Naturkunde Berlin: an annotated catalogue, with emphasis on Cuban land snails. *Zoosystematics and Evolution* 84(2): 265-310.
- Robinson, D. G., Hovestadt, A., Fields, A. & Breure, A. S. H. 2009. The land Mollusca of Dominica (Lesser Antilles), with notes on some enigmatic or rare species. *Zoologische Mededelingen Leiden* 83: 615-650.
- Smith, A. G. 1966. Land Snails of the Galápagos. Pp. 240-251 in: *The Galápagos. Proceedings of the Symposia of the Galápagos International Scientific Project*. Brussels (R. I. Bowman).
- Vagvolgyi, J. 1979. Systematics and Evolution of Galapagos *Gastrocopta*. *Bulletin of the American Malacological Union* 1979: 63.
- Villarruel Oviedo, I. & de la Torre, S. 2014. Estudio preliminar de caracoles terrestres en la isla San Cristóbal, Galápagos. *Avances en Ciencias e Ingeniería* 6(2): B20-B25.
- Zilch, A. 1959-60. Gastropoda Euthyneura. In: *Handbuch der Paläozoologie* 6(2). 834 pp., Berlin-Nikolassee (O. H. Schindewolf).