


REVISION OF THE GENUS *BOURCIERA* PFEIFFER, 1852 (GASTROPODA: HELICINIDAE), WITH THE DESCRIPTION OF SIX NEW SPECIES FROM ECUADOR AND PERU

REVISIÓN DEL GÉNERO *BOURCIERA* PFEIFFER, 1852 (GASTROPODA: HELICINIDAE), CON LA DESCRIPCIÓN DE SEIS NUEVAS ESPECIES DE ECUADOR Y PERÚ

MARIJN ROOSEN^{1*}, CARLES DORADO²

¹ Malacology, Natural History Museum of Rotterdam, Rotterdam, The Netherlands (e-mail: marijn.roosen@gmail.com);  <https://orcid.org/0000-0001-7651-6685>

² Associació Catalana de Malacologia, Museu Blau, Barcelona, Spain;  <https://orcid.org/0000-0001-5219-2276>

* corresponding author

ABSTRACT: A revision of all known *Bourciera* Pfeiffer, 1852 species is provided and six species are described as new to science: *Bourciera amazonensis* sp. nov., *Bourciera curvidigitata* sp. nov., *Bourciera distincta* sp. nov., *Bourciera imbaburensis* sp. nov., *Bourciera intermedia* sp. nov. and *Bourciera ovata* sp. nov. Based on new material and observations the status of *B. viridissima* Miller, 1879 is clarified and the first photographs of this species are presented. In addition to these, new locality data is reported for most species, the first record of *Bourciera* from Colombia is provided and the known distribution of the genus is extended far into the Amazon.

RESUMEN: Se aporta una revisión de todas las especies conocidas de *Bourciera* Pfeiffer, 1852 y se describen seis nuevas especies para la ciencia: *Bourciera amazonensis* nov. sp., *Bourciera curvidigitata* sp. nov., *Bourciera distincta* sp. nov., *Bourciera imbaburensis* sp. nov., *Bourciera intermedia* sp. nov. y *Bourciera ovata* sp. nov. En base a material nuevo y observaciones se aclara el estado de *B. viridissima* Miller, 1879 y se presentan las primeras fotografías de esta especie. Además de esto, se reportan nuevos datos de localidad precisos para la mayoría de las especies, se proporciona el primer registro de *Bourciera* de Colombia y la distribución conocida del género se amplía hasta el Amazonas.

KEY WORDS: Amazon rainforest; Andes; *Bourciera*; Chocó; Konrad Miller; *Pseudhelicina*; selva amazónica

Publication LSID: [urn:lsid:zoobank.org:pub:185B2B6C-4199-4B7D-BA00-A2C1370167C3](https://zoobank.org/urn:lsid:zoobank.org:pub:185B2B6C-4199-4B7D-BA00-A2C1370167C3)

INTRODUCTION

Bourciera Pfeiffer, 1852 is a genus of Helicinidae so far only known from the Andes of Ecuador and Northern Peru (PFEIFFER 1853, 1859, TROSCHEL 1856–1863, ADAMS 1870, ORTON 1871, MILLER 1879, COUSIN 1887, GERMAIN 1907, RAMÍREZ et al. 2003, CORREOSO 2008, BREURE & ARAUJO 2017, BREURE et al. 2022, RAMIREZ PEREZ & HAUSDORF 2022). Most recent literature figuring species of *Bourciera* only mentions *B. helicinaeformis* Pfeiffer, 1852 and *B. fraseri* (Pfeiffer, 1859) (e.g. CORREOSO 2008), but two addi-

tional species were described by MILLER (1879) from the Pilatón valley (Pichincha province, Ecuador): *B. striatula* Miller, 1879 and *B. viridissima* Miller, 1879. One of these species, *B. viridissima*, was considered identical to *B. fraseri* by GERMAIN (1907), even though the species appear to be distinct and are described from different type localities. Unfortunately it remains unknown in which institute Miller deposited his Neotropical type specimens, including the types of *B. striatula* and *B. viridissima*, even after

an extensive search by BREURE (2019). In addition, odd new records of Amazonian *Bourciera* ssp. have been found while compiling an annotated checklist of all terrestrial gastropods in Ecuador (BREURE et al. 2022), raising questions about the limited distribution of the genus.

To clarify this, all species of *Bourciera* described in previous publications and their distribution are briefly discussed and figured in this paper. The iden-

tity of *Bourciera viridissima* Miller, 1879 is reestablished based on new records of living specimens and museum material. Additionally, six new species are described based on specimens from different regions in Ecuador and Peru and the genus is reported from Colombia for the first time. Other possibly new taxa encountered during this study are also figured and briefly discussed.

MATERIAL AND METHODS

The types of *Bourciera amazonensis* sp. nov., *B. imbaburensis* sp. nov. and the holotype of *B. intermedia* sp. nov. were acquired through shell trade by the second author (CD) and stored in the collection of the Natural History Museum of Rotterdam in Rotterdam (The Netherlands). The holotype of *B. distincta* sp. nov. was found in the collection of Naturalis Biodiversity Center in Leiden (The Netherlands) by the first author (MR). The type specimens of *B. curvigitata* sp. nov. and the paratype of *B. intermedia* sp. nov. were found while studying the collection of The Zoological Museum Hamburg (Germany) and the holotype of *B. ovata* sp. nov. was already present in the DMNH collection. Observations of *Bourciera intermedia* sp. nov. in the “Un poco del Chocó” rainforest reserve form part of a more extensive study on all terrestrial gastropods present in this area (ROOSEN in prep.). Most other records were obtained by accessing museum and iNaturalist records through invertebase.org and literature by both authors. Last, some observations made by the second author (CD) while travelling through Ecuador were also included, even though the specimens could not be collected. Records of unidentified *Bourciera* specimens and unverifiable records were excluded.

Measurements were taken to the nearest 0.1 mm using Vernier calipers. Shell height (H) was meas-

ured from the apex to the lowest part of the inner lip of the aperture. The shell width (W) was measured at the widest section perpendicular to the coiling axis; Height of the aperture (HA) was measured from the lower to the highest extension of the peristome. All measurements are in mm. Whorls were counted to the nearest ¼ whorl following GITTENBERGER et al. (2004).

Type material of the species described in this paper is deposited in the collections of the Delaware Museum of Natural History, Wilmington, Delaware, U.S.A. (DMNH), Natural History Museum Rotterdam, Rotterdam, the Netherlands (NMR), Naturalis Biodiversity Center, Leiden, The Netherlands (RMNH) and the Zoological Museum Hamburg, Hamburg, Germany (ZMH). Additional specimens analyzed were housed in the following collections: Florida Museum of Natural History, Gainesville, Florida, U.S.A. (UF), Senckenberg Natural History Collections Dresden, Dresden, Germany (SNSD), the Natural History Museum, London, England (NHMUK) and the Museum of Natural History Berlin, Berlin, Germany (ZMB).

Abbreviations: a.s.l. – above sea level, Coll. – Collection, obs. – observation, D – diameter, H – shell height, HA – aperture height, TL – type locality, W – shell width.

SYSTEMATIC PART

Family: Helicinidae Férussac, 1822

Genus: *Bourciera* Pfeiffer, 1852

Type species: *Bourciera helicinaeformis* Pfeiffer, 1852b

Bourciera – PFEIFFER 1852a: 178

Bourciera Pfeiffer (non Bonaparte, 1850) – SYKES 1907: p. 312 (incorrect subsequent spelling of *Bouciera*)

Pseudhelicina – SYKES 1907: p. 312 (unnecessary replacement name)

Pseudohelicina – CORREOSO 2008: pp. 59–61 (incorrect subsequent spelling of *Pseudhelicina*)

Diagnosis. Body bicoloured, yellowish light-grey on the outer edge, dark grey or black in the middle. Eyes are positioned at the base of the stalks, stalks are grey to black in colour. A dark grey line is present between the dark part of the foot and the stalks. Above and below its eyes, its head has the same colour as the outer edge of its body.

Shell small to medium sized, depressed conical-globular, with a large aperture. Periostracum coloured. Nucleus large, protoconch-teleoconch transition unclear. Peristome extended in adult specimens, with projection on the base of the columella. Aperture closed by a corneous, paucispiral operculum.



Remarks. SYKES (1907) proposed *Pseudhelicina* as a replacement name for *Bourciera* based on incorrect subsequent spelling of the genus as *Bourciera*. This spelling mistake was only found in SYKES (1907) publication. It is true that *Bourciera* was already introduced by BONAPARTE (1850) as a genus of birds, but as the spelling of Pfeiffer's genus differs it should be considered valid as BAKER (1922) proposed. Regardless, *Pseudhelicina* and other variants of Sykes' name occasionally show up in literature (e.g. THIELE 1935, CORREOSO 2008).

The paucispiral operculum indicates that *Bourciera* is one of the most basal genera of Helicinidae according to BAKER (1922). *Bourciera* was absent from Wagner's monograph on Helicinidae (WAGNER 1911). All species of which multiple specimens are available show little intraspecific variation, aside from slight differences in dimensions.

Key to the species:

1. The shape of the aperture is:
 - a. circular to subcircular 2
 - b. ovate to ovate-drop shaped 5
2. The spire is:
 - a. elevated, with slightly depressed or flattened whorls 3
 - b. depressed, with convex whorls 4
3. The width is:
 - a. less than 11 mm . *Bourciera amazonensis* sp. nov.
 - b. more than 11 mm . . . *Bourciera distincta* sp. nov.
4. The projection on the lower left part of the peristome is:
 - a. large, angulate, curved forward
. *Bourciera curvidigitata* sp. nov.
 - b. small, rounded. *Bourciera fraseri* (Pfeiffer, 1859)
5. The spire is:
 - a. more than 25% of total height, with slightly depressed whorls 6
 - b. between 18 and 25% of total height 7
 - c. less than 18% of total height, with convex spire whorls 8
6. The shell has:
 - a. a green periostracum, large aperture and medium sized triangular projection
. *Bourciera intermedia* sp. nov.
 - b. a yellow periostracum, medium sized aperture and small, delimited projection.
. *Bourciera helicinaeformis* Pfeiffer, 1852b
7. The projection on the lower part of the peristome is:
 - a. present *Bourciera ovata* sp. nov.
 - b. absent *Bourciera imbaburensis* sp. nov.
8. The shell has:
 - a. a green periostracum and rounded bulge instead of a more typical projection
. *Bourciera striatula* Miller, 1879

- b. a brown periostracum and small, pointed upward projection
. *Bourciera* aff. *striatula* Miller, 1879
- c. a green periostracum and large, triangular projection *Bourciera viridissima* Miller, 1879

Bourciera amazonensis sp. nov.

Figs 1–3, 17, 20, 22

urn:lsid:zoobank.org:act:735E0D5E-90F5-4593-A87B-C90D2BF420AE

Type material. Holotype: NMR 9930-00192199 (dry shell) Ecuador, Sucumbios province, Cantón Cuyabeno, Parroquia Tarapoa, Precoperativa San José; paratype(s): NMR 9930-00192200 (1 dry shell), same data as the holotype; NMR 9930-00192201 (1 dry shell), same data as the holotype; NMR 9930-00192203 (1 dry shell), same data as the holotype.

Additional material. UF139094 (1 dry shell) Ecuador, Morona-Santiago province, 2 km W of Patuca, 400 m a.s.l.

Type locality. Ecuador, Sucumbios province, Cantón Cuyabeno, Parroquia Tarapoa, Precoperativa San José.

Description. Small, medium-depressed conical-globular shell with slightly flattened spire whorls. Spire elevated, 35–39% of total height. Sculpture consists of weak axial growth striae. Aperture small, subcircular to drop shaped. Peristome well developed. Projection on the posterior edge of the peristome limited to a small bulge. Operculum corneous, paucispiral, consisting of two densely coiled volutions. Umbilicus closed by umbilical callus. Periostracum thin, light-brown to orange, with irregular translucent streaks.

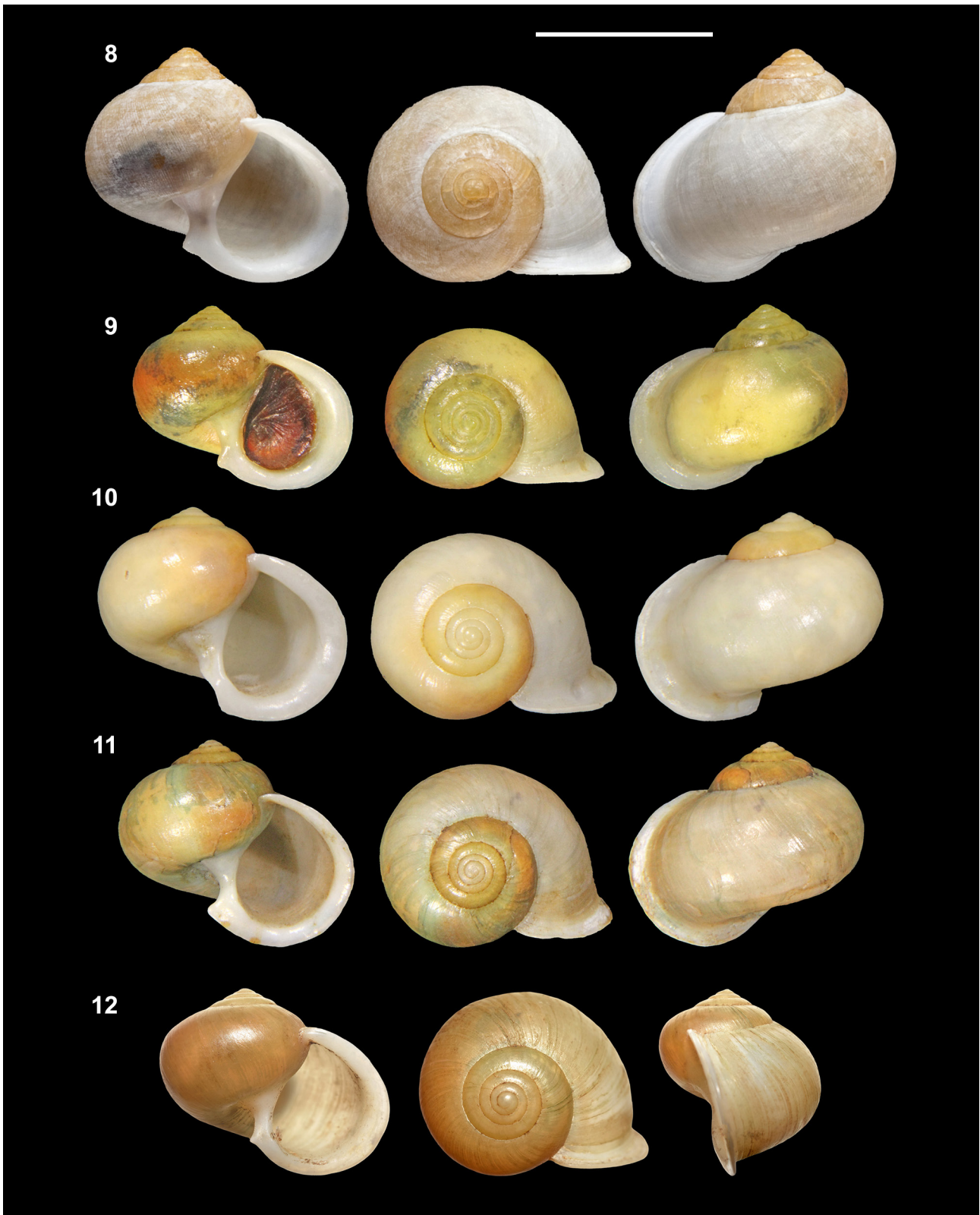
Dimensions. H: 7.2–7.5 mm; W: 8.1–8.7 mm; HA: 4.8–5.5 mm; whorls: 4¼–4½.

Cross-Diagnosis. Differs from *B. helicinaeformis*, *B. imbaburensis* sp. nov., *B. intermedia* sp. nov., *B. ovata* sp. nov., *B. striatula* and *B. viridissima* by its near circular aperture, smaller size and dark brown periostracum. Moreover, most of these species were described from the west side of the Andes, clearly separating their populations from those of the new species that occurs on the east side. *Bourciera curvidigitata* sp. nov. and *B. fraseri* are most similar, as they also have a relatively small aperture and are of the same size. However, these species have a more depressed, wider shell, have more convex whorls and lack the depression on the side of the aperture. In addition, the projection of *B. curvidigitata* sp. nov. is much larger and more angulate. *Bourciera distincta* sp. nov. is much larger, has a more angulate projection and lacks the depression on the side of the aperture.

Habitat and ecology. The species was found alive by the second author (CD) in the understory of



Figs. 1–7. Shells of *Bourciera* species: 1 – *Bourciera amazonensis* sp. nov., holotype, NMR 9930-192199, from Ecuador, Sucumbios province, Cantón Cuyabeno, Parroquia Tarapoa, Preecooperativa San José (H: 7.5 mm; W: 8.7 mm); 2 – operculum of *Bourciera amazonensis* sp. nov.; 3 – *Bourciera amazonensis* sp. nov., specimen (UF139094) from Ecuador, Morona-Santiago province, 2 km west of Patuca, 400 m a.s.l. (H: 8.2 mm; W: 9.5 mm); 4 – *Bourciera curvidigitata* sp. nov., holotype: ZMH 38322, from Peru, San Martín, Rioja, Cueva Santuario de la Amazona, 76 km NW of Moyobamba, 400 m a.s.l., 05°43'31"S, 77°34'33"W, leg. GUEVARA 08.03.2001 (H: 8.2 mm; W: 10.8 mm); 5 – paratype (ZMH 10179), *Bourciera curvidigitata* sp. nov., same data as the holotype (H: 7.1 mm; W: 9.5 mm); 6 – *Bourciera distincta* sp. nov., holotype, RMNH.MOL.152706, Ecuador, unknown locality, leg. SOWERBY & FULTON, 1917 (H: 11.2 mm; W: 14.5 mm); 7 – *Bourciera fraseri* (Pfeiffer, 1859), syntype, NHMUK 20130063, Ecuador, Azuay province, Cuenca (H: 6.7 mm; W: 9.5 mm). Scale bar 10 mm



Figs 8–12. Shells of *Bourciera* species: 8 – *Bourciera helicinaeformis* Pfeiffer, 1852, syntype, NHMUK 20120062, from Ecuador, Pichincha province, Yaraqui Valley (H: 12.0 mm; W: 14.9 mm); 9 – *Bourciera helicinaeformis* Pfeiffer, 1852, specimen NMR 9930-00201568, from Ecuador, Pichincha province, Tandayapa (H: 11.0 mm; W: 12.5 mm); 10 – *Bourciera imbaburensis* sp. nov., holotype, NMR 9930-00198034, from Ecuador, Imbabura province, El Chontal (H: 11.8 mm; W: 14.1 mm); 11 – *Bourciera intermedia* sp. nov., specimen NMR9930-198033 from Ecuador, Pichincha province, Nanegal (H: 11.3 mm; W: 13.3 mm); 12 – *Bourciera ovata* sp. nov., specimen DMNH 10926 from Ecuador, Pastaza province, Puyo (H: 11.0 mm; W: 13.0 mm). Scale bar 10 mm

Terra Firme forest near the Cuyabeno nature reserve (Ecuador, Sucumbios province, Figs 20, 22).

Distribution. Ecuador: Morona-Santiago – 2 km W of Patuca, 400 m a.s.l. (UF139094); Pastaza – Canelos (DMNH164017); Sucumbios – Cantón Cuyabeno, Parroquia Tarapoa, Precooperativa San José.

Etymology. The specific epithet refers to the Amazon rainforest, the ecoregion its type locality and all other known localities are within it.

Remarks. The current record greatly extends the distribution of *Bourciera* into the Amazon rainforest.

***Bourciera curvidigitata* sp. nov.**

Figs 4–5, 17

urn:lsid:zoobank.org:act:CC184AC9-F69B-4A1C-B296-5446035CE1DD

Helicina (*Euneritella*) cf. *rhodostoma* – GUEVARA 2008: pp. 95–97 (non Gray, 1824).

Type material. Holotype: ZMH 38322 (dry shell) Peru, San Martin, Rioja, Cueva Santuario de la Amazona, 76 km NW of Moyobamba, 400 m a.s.l., 05°43'31"S, 77°34'33"W, leg. GUEVARA 08.03.2001; paratypes ZMH 10179 (4 dry shells), same data as the holotype.

Type locality. Peru, San Martin, Rioja, Cueva Santuario de la Amazona, 76 km NW of Moyobamba, 400 m a.s.l., 05°43'31"S, 77°34'33"W.

Description. Shell depressed conical-globular, relatively broad. Spire elevated, 22–23% of total height. Whorls convex, sculpture consists of indistinct growth lines. Last whorl relatively large, aperture subcircular. Peristome broadly extended, with a large, acute, elongate triangular, forward curved projection near the base of the shell. Umbilicus closed by umbilical callus. Periostracum yellowish brown.

Dimensions. H: 7.1–8.2 mm; W: 9.5–10.8 mm; HA: 6.2–7.4 mm; whorls: 4¼–4½.

Cross-Diagnosis. The new species seems to be closely allied to *B. distincta* sp. nov., which is larger, has less convex whorls, a drop shaped aperture and smaller projection. *Bourciera fraseri* is also similar, but it differs by its smaller size and small, rounded projection. *Bourciera amazonensis* sp. nov. differs most notably by its higher spire, flattened whorls and small rounded projection. *Bourciera ovata* sp. nov. is larger, has a smaller projection and has a larger, more ovate aperture. All other species have an ovate or drop shaped aperture, are distinctly larger, generally have less convex whorls and occur only on the western side of the Andes in Ecuador.

Distribution. Peru: San Martin – Rioja, Cueva Santuario de la Amazona.

Etymology. The specific epithet refers to the shape of its projection, which is reminiscent of a curved (*curvum*) finger (*digitus*).

Remarks. GUEVARA (2008) identified the type specimens as *Helicina* (*Euneritella*) cf. *rhodostoma* (Gray,

1824), a highly variable, colorful helicimid from Dominica which has very little to do with *Bourciera* in general. MOGOLLÓN & BREURE (2019) demonstrated that several similar faulty identifications were present in Guevara's paper.

The new species represents the first accurate locality record for a *Bourciera* species in Peru. It is possible that the specimens reported from northern Peru by ADAMS (1870) as *B. fraseri* Pfeiffer, 1859 are misidentified, but we could not locate his material for further study.

***Bourciera distincta* sp. nov.**

Figs 6, 17

urn:lsid:zoobank.org:act:ADCA66E3-7C8D-4611-A2E6-FCC31D1319C5

Type material. Holotype: RMNH.MOL.152706 (dry shell) Ecuador, without specific locality (leg. SOWERBY & FULTON 1917).

Type locality. Ecuador

Description. Relatively large, depressed conical-globular shell, with slightly flattened spire whorls. Spire elevated, 30% of total height. Faint axial growth striae cover the entire teleoconch, oblique striae visible on the last ¼ whorl. Aperture medium sized, circular in shape. Peristome extended with a small pointed projection in the lower left corner. The umbilicus is closed by umbilical callus. Periostracum orange-brown, intersected by translucent streaks.

Dimensions. Holotype: H: 11.2 mm; W: 14.5 mm; HA: 9.9 mm; whorls: 5¼.

Cross-Diagnosis. The new species is most similar to *B. amazonensis* sp. nov., *B. curvidigitata* sp. nov. and *B. fraseri* as these also have a more or less circular aperture and medium depressed spire. However, *B. distincta* sp. nov. is much larger than all these taxa and has less convex whorls. Moreover, *B. amazonensis* sp. nov. and *B. fraseri* have a smaller, more rounded projection. *Bourciera curvidigitata* sp. nov. does have an angulate projection, but it is comparatively larger than the projection of *B. distincta* sp. nov. In size and general shape, it compares best to *B. ovata* sp. nov. which has a wider shell, more ovate aperture and smaller projection. *Bourciera imbaburensis* sp. nov., *B. intermedia* and *B. helicinaeformis* are overall more slender and have a larger, more ovate aperture. *Bourciera striatula* and *B. viridissima* have a more depressed spire, convex whorls and larger, more ovate apertures.

Distribution. Ecuador.

Etymology. The specific epithet refers to the distinctive properties of this species, which make it easy to separate from the other taxa described in this paper.

Remarks. The species is described based on one shell present in the historical collection of Naturalis Biodiversity Center.

***Bourciera fraseri* (Pfeiffer, 1859)**

Figs 7, 17

Cyclostoma (*Bourciera*) *fraseri* – PFEIFFER 1859: p. 28, pl. 44, fig. 1.

Bourciera fraseri (Pfeiffer, 1859) – MILLER 1879: p. 146.

Bourciera fraseri (Pfeiffer, 1859) – COUSIN 1887: p. 87.

Bourciera fraseri (Pfeiffer, 1859) – GERMAIN 1907: p. 62 (= *Bourciera viridissima* Miller, 1879?).

Bourciera fraseri (Pfeiffer, 1859) – CORREOSO 2008: p. 60.

Bourciera fraseri (Pfeiffer, 1859) – BREURE et al. 2022: p. 19, fig. 4.

Studied material. NHMUK 20130063 (syntype, 1 shell, dry), Ecuador, Azuay province, Cuenca; ZMB 50854 (2 shells, dry), Colombia, Narino or Putumayo department, between Pasto and Mocoa, leg. HOPKE.

Redescription. Shell depressed conical-globular, relatively broad, with convex spire whorls. Spire elevated, up to 31% of total height. Sculpture consists of indistinct growth lines. Last whorl of medium size, aperture subcircular. Peristome well developed, with a small rounded projection near the base of the shell. Umbilicus closed by callus. No periostracum preserved.

Dimensions. H: 6.7 mm; W: 9.5 mm; HA: 5.6 mm; whorls 4½.

Cross-Diagnosis. In size and general shape it resembles *B. amazonensis* sp. nov., but *B. fraseri* can be distinguished by its lower spire, wider shell and more convex whorls. *Bourciera curvidigitata* sp. nov. and *B. distincta* sp. nov. are also similar, but these species become larger and have larger, angulate projections. All other known taxa are much larger than *B. fraseri* and have a more ovate, larger aperture.

Distribution. Colombia: Narino or Putumayo – between Pasto and Mocoa (ZMB 50854); Ecuador: Azuay – Cuenca (TL); Morona-Santiago – Bomboisa (iNaturalist obs. 86714606); Peru: Eastern slopes of the Andes (ADAMS 1870, RAMÍREZ et al. 2003).

Remarks. *Bourciera fraseri* is the only *Bourciera* species known from Colombia, Ecuador and Peru. Based on new observations of a living individual of *B. fraseri* (iNaturalist obs. 86714606), it is likely that it inhabits the rainforest on the eastern slopes of the Andes. It is possible that records from Peru are misidentified *B. curvidigitata* sp. nov. or another Amazonian species.

GERMAIN (1907) also reported this species from the west side of the Andes, but also mentioned that he did not see any differences between *B. fraseri* and *B. viridissima*. Therefore we suspect his record is more likely a misidentified *B. viridissima*.

***Bourciera helicinaeformis* Pfeiffer, 1852**

Figs 8–9, 17, 18

Bourciera helicinaeformis Pfeiffer, 1852 – PFEIFFER 1852a: p. 178 (nomen nudum).

Bourciera helicinaeformis – PFEIFFER 1852b: pp. 312–313.

Cyclostoma heliciniforme – PFEIFFER 1853: pp. 151–152.

Bourciera helicinaeformis Pfeiffer – MILLER 1879: p. 145.

Bourciera helicinaeformis Pfeiffer – COUSIN 1887: pp. 273–274.

Bourciera helicinaeformis Pfeiffer, 1852 – GERMAIN 1907: p. 62.

Pseudhelicina helicinaeformis (Pfeiffer) – SYKES 1907: p. 312.

Bourciera helicinaeformis (Pfeiffer, 1852) – CORREOSO 2008: pp. 59–61, figs 1–4.

Pseudhelicina helicinaeformis (Pfeiffer, 1852) – CORREOSO 2008: pp. 59–61, figs 1–4.

Bourciera heliciniforme Pfeiffer, 1853 – BREURE & ARAUJO 2017: pp. 17–18, fig. 9.

Bourciera helicinaeformis Pfeiffer, 1852 – BREURE et al. 2022: pp. 19–20, fig. 5.

Studied material. NHMUK 20130062 (syntypes, 3 shells, dry), Ecuador, Pichincha province, Yaraqui Valley; NHMUK 1862.4.24.1 (2 shells, dry), Ecuador; NMR 9930-201568 (1 shell, dry), Ecuador, Pichincha province, Tandayapa.

Redescription. Shell somewhat elongate, with an elevated spire that is 25–31% of total height. Whorls convex, slightly flattened from above. Sculpture consists of indistinct growth lines. Last whorl large, aperture ovate drop shaped. Peristome broad, with a small triangular projection near the base of the shell. Umbilicus closed by callus. Operculum paucispiral, densely coiled, corneous (obs. C. DORADO 2018). Periostracum yellow-brown (e.g. CORREOSO 2008).

Dimensions. H: 12.0 mm; W: 14.9 mm; HA: 10.3 mm; whorls 5¼–5½.

Cross-diagnosis. *Bourciera intermedia* sp. nov. can be separated from *B. helicinaeformis* by its green periostracum, larger aperture and larger triangular projection. Another similar species is *B. imbaburensis* sp. nov., which lacks a projection on the lower left corner of the peristome, has a higher, more ovate aperture and has a distinctly lower spire. *Bourciera ovata* sp. nov., *B. striatula* and *B. viridissima* differ by their lower spire, more convex whorls and larger, more ovate apertures. *Bourciera amazonensis* sp. nov., *B. curvidigitata* sp. nov., *B. distincta* sp. nov. and *B. fraseri* differ from *B. helicinaeformis* by their relatively small, circular aperture. Moreover, most of these species, with exception of *B. distincta* sp. nov., are much smaller than *B. helicinaeformis*.

Distribution. Ecuador: Cotopaxi – Sigchos, near Latacunga (DMNH 151934); San Francisco de la Pampas, Otonga Nature Reserve (ZMH 124773, ZMH 124774, ZMH 124775); Imbabura – without specific locality (CORREOSO 2008); Manduriacu (iNaturalist obs. 4839118, 4839117, 4839116); Pichincha – Yaraqui Valley (TL); Los Puentes (COUSIN 1887); Nanegal (MARTENS 1885); San Tadeo, chemin de



Figs 13–16. Shells of *Bourciera* species: 13 – *Bourciera striatula* Miller, 1878, original figure from MILLER (1878), Ecuador, Pichincha province, Pilatón valley; 14 – *Bourciera* aff. *striatula* Miller, 1878, living specimen, leg. KRISTIINA OVASKA, from Ecuador, Esmeraldas province, Canande reserve (H: 16 mm; W: 18 mm – extrapolated from photograph); 15 – *Bourciera viridissima* Miller, 1878, “Brazil”, unknown locality, NHMUK 20130111 (H: 12.6 mm; W: 16.7 mm); 16 – *Bourciera viridissima* Miller, 1878, specimen SNSD MTD 55927 from Ecuador, Santo Domingo de Los Tsáchilas province, Santo Domingo (H: 13.4 mm; W: 13.4 mm). Scale bar 10 mm

Pachajal (GERMAIN 1907); Tandayapa (NMR 9930-00201568); Mindo (DMNH 151928).

Remarks. The second author (CD) visited Tandayapa in 2021 to photograph living *B. helicinaeformis* based on the locality data of NMR 9930-00201568. One specimen was found and photographed (Fig. 18). It was covered with lichen, which we have not seen in any other *Bourciera* specimens or in literature. At the moment the ecological relationship between *Bourciera* and the lichen is unclear and requires further study.

CORREOSO (2008) also figured living specimens with a reddish periostracum as *B. helicinaeformis*, but they could be misidentified *B. imbaburensis* sp. nov. However, based on the pictures provided the specimens cannot be identified with any certainty.

The specimens collected from the Otonga Nature Reserve differ from the typical specimens of *B. helicinaeformis* by reaching 1.5 times the size at equal or less volutions. As there are no other distinguishing characteristics in the shell and the anatomy cannot be studied, we refrain from describing it as a new (sub)species.

Bourciera imbaburensis sp. nov.

Figs 10, 17

urn:lsid:zoobank.org:act:D63A0807-A0F2-4440-A5E4-82658270ACF0

Type material. Holotype: NMR 9930-00198034 (1 shell, dry) Ecuador, Imbabura Province, El Chontal; paratype(s): NMR 9930-00198035 (1 shell, dry), same data as the holotype.

Type locality. Ecuador, Imbabura Province, El Chontal.

Description. Medium sized, slender, elongate shell, with an elevated spire. Spire 22% of total height. Faint axial growth striae cover the entire teleoconch. Spire whorls are convex. Aperture large, oval in shape. Peristome well developed, relatively thin, concave at the posterior side. Umbilicus closed by umbilical callus. Remnants of a reddish-yellowish periostracum are present on both type specimens.

Dimensions. H: 11.8–12.1 mm; W: 14.1–14.6 mm; HA: 10.2–10.4 mm; whorls: 4½–4¾.

Cross-Diagnosis. Differs from most species by its slender shell, convex whorls and peristome without projection. *Bourciera striatula* Miller, 1879 was drawn without a projection on its peristome, but a small projection is mentioned in the description. In addition, this species is larger and has a relatively low spire, resulting in a less slender appearance.

Distribution. Ecuador: Imbabura – El Chontal.

Etymology. The specific epithet refers to its type locality, which is located in the Imbabura province.

Remarks. CORREOSO (2008) reports specimens of *B. helicinaeformis* from the type locality of the *B. imbaburensis* sp. nov., but no pictures of these specimens are provided in this publication.

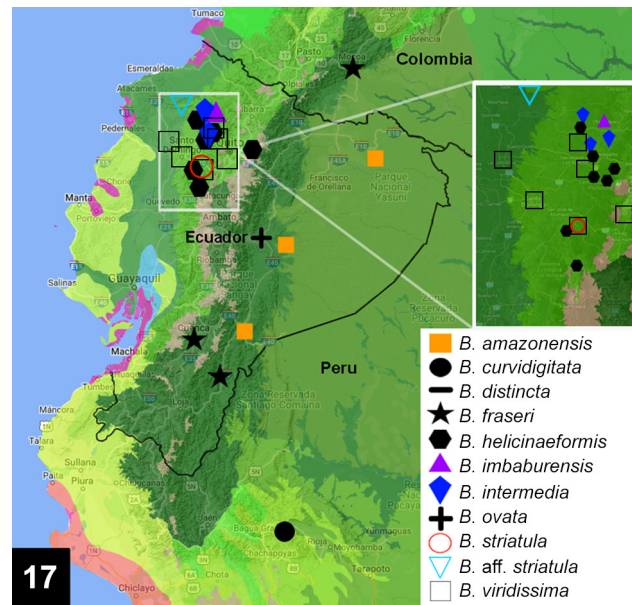


Fig. 17. Distribution map of all *Bourciera* species

Bourciera intermedia sp. nov.

Figs 11, 17

urn:lsid:zoobank.org:act:83D97C4B-92A4-4148-8168-7DF2CA8D373F

Type material. Holotype: NMR9930-198033 (1 shell, dry), Ecuador, Pichincha province, Nanegal; Paratype: ZMH 143663 (1 shell, dry), Ecuador, Imbabura province, Los Cedros reserve, 1300 m a.s.l.

Type locality. Ecuador, Pichincha province, Nanegal.

Additional material. RMNH.MOL.152707 (1 shell, dry), “Ecuador”; ZMA.MOL.316032 (2 shells, dry) “Ecuador”.

Description. Shell broad, depressed conical-globular. Spire 28% of total height. Whorls convex, slightly flattened from above. Sculpture consists of indistinct growth lines. Last whorl large, aperture ovate drop shaped. Peristome well-developed, with a medium sized triangular projection near the base of the shell. Umbilicus closed by callus. Periostracum dark green to yellow in colour.

Dimensions. H: 11.3–12.9 mm; W: 13.3–17.0 mm; HA: 10.0–12.8 mm; whorls: 4½–5.

Cross-Diagnosis. This form is closely allied to *B. helicinaeformis* and *B. imbaburensis* sp. nov., but differs in having a comparatively large projection, higher aperture, wider shell and green periostracum. It is also reminiscent of *B. striatula* and *B. viridissima*, but these species typically have more convex spire whorls, a lower spire and more extended peristome. *Bourciera ovata* sp. nov. also has a wider shell, but differs from *B. intermedia* sp. nov. in its more ovate aperture, thin peristome with small projection and brown periostracum. All other taxa differ clearly by their more circular, smaller aperture.

Distribution. Ecuador: Imbabura – Los Cedros reserve, 1300 m a.s.l. (ZMH 143663); Pichincha – Nanegal (NMR9930-198033); Un poco del Chocó reserve, near Las Tolas, Gualea, 1200 m a.s.l. (obs. M. T. ROOSEN 2019)

Etymology. The specific epithet refers to its shell characteristics, which seem intermediate to that of *B. helicinaeformis* and *B. viridissima*.

Remarks. *Bourciera intermedia* sp. nov. is very similar to both *B. helicinaeformis* and *B. viridissima* sp. nov. It is possible that the new species was confused with these taxa in the past.

Bourciera ovata sp. nov.

Figs 12, 17

urn:lsid:zoobank.org:act:CC12942F-4697-4388-A2F7-36F1487F08CC

Type material. Holotype: DMNH 151926 (1 shell, dry), Ecuador, Pastaza province, Puyo.

Type locality. Ecuador, Pastaza province, Puyo.

Description. Shell depressed conical-globular, relatively wide. Spire 22% of total height, whorls convex. Sculpture consists of indistinct growth lines. Last whorl large, aperture high ovate in shape. Peristome well-developed, with a small, pointed projection below the columella. Umbilicus closed by callus, periostracum light brown.

Dimensions. H: 11.0 mm; W: 13.0 mm; HA: 8.6 mm, whorls 4½ (pers. com. KITTLE 2022).

Cross-Diagnosis. It is most reminiscent of *B. imbaburensis* sp. nov., which differs by its more elongate shell and the lack of a projection while the peristome is properly developed. *Bourciera ovata* sp. nov. has a more ovate aperture, wider shell and more convex spire whorls than *B. helicinaeformis* and *B. intermedia* sp. nov. Another similar species is *B. distincta* sp. nov. which also has a wider shell, but differs from *B. ovata* sp. nov. by its less convex whorls, less ovate aperture and translucent streaks on the periostracum. *Bourciera striatula* and *B. viridissima* have a more depressed spire, larger aperture, more extended peristome and green periostracum. In addition, *B. viridissima* has a much larger, more triangular projection. *Bourciera amazonensis* sp. nov., *B. curvidigitata* sp. nov. and *B. fraseri* occur in more or less the same area as *B. ovata*, but they are all smaller and have more circular apertures.

Distribution. Ecuador: Pastaza – Puyo.

Etymology. The specific epithet refers to its ovate aperture, which is one of the key characteristics of the new species.

Remarks. Only one specimen of this type is available at the moment, but as it represents the only larger species with an ovate aperture on the east side of the Andes its description is justified.

Bourciera striatula Miller, 1879

Figs 13, 17

Bourciera striatula – MILLER 1879: p. 145, pl. 5, fig. 6. *Bourciera striatula* Miller, 1879 – COUSIN 1887: p. 274. *Bourciera striatula* Miller, 1879 – BREURE 2019: p. 135. *Bourciera striatula* Miller, 1879 – BREURE et al. 2022: p. 20, fig. 6A.

Diagnosis. See MILLER (1879).

Dimensions. H: 11 mm; D(maximum): 18 mm; D(minimum): 13 mm; whorls: unknown (MILLER 1879).

Cross-Diagnosis. As the characteristics of this species are still unclear, the only specimen known is lost and the drawing does not match its description, it cannot be properly compared to other taxa. Based on Miller's description, the species is very similar to *B. viridissima* and differs only by its smaller projection, larger aperture and overall larger size.

Distribution. Ecuador: Pichincha – Pilatón valley (TL).

Remarks. No specimens could be found exhibiting the same characteristics as Miller described and the holotype is lost. Without any type material and with only poor drawings available, we cannot be sure about the identity of *B. striatula*. Based on Miller's description, it could be a valid species (MILLER 1879).

Bourciera aff. *striatula* Miller, 1879

Figs 14, 17

Studied material. Only observations.

Dimensions. H: 16 mm; W: 18 mm; HA: 14 mm, whorls 5 (extrapolated from photograph).

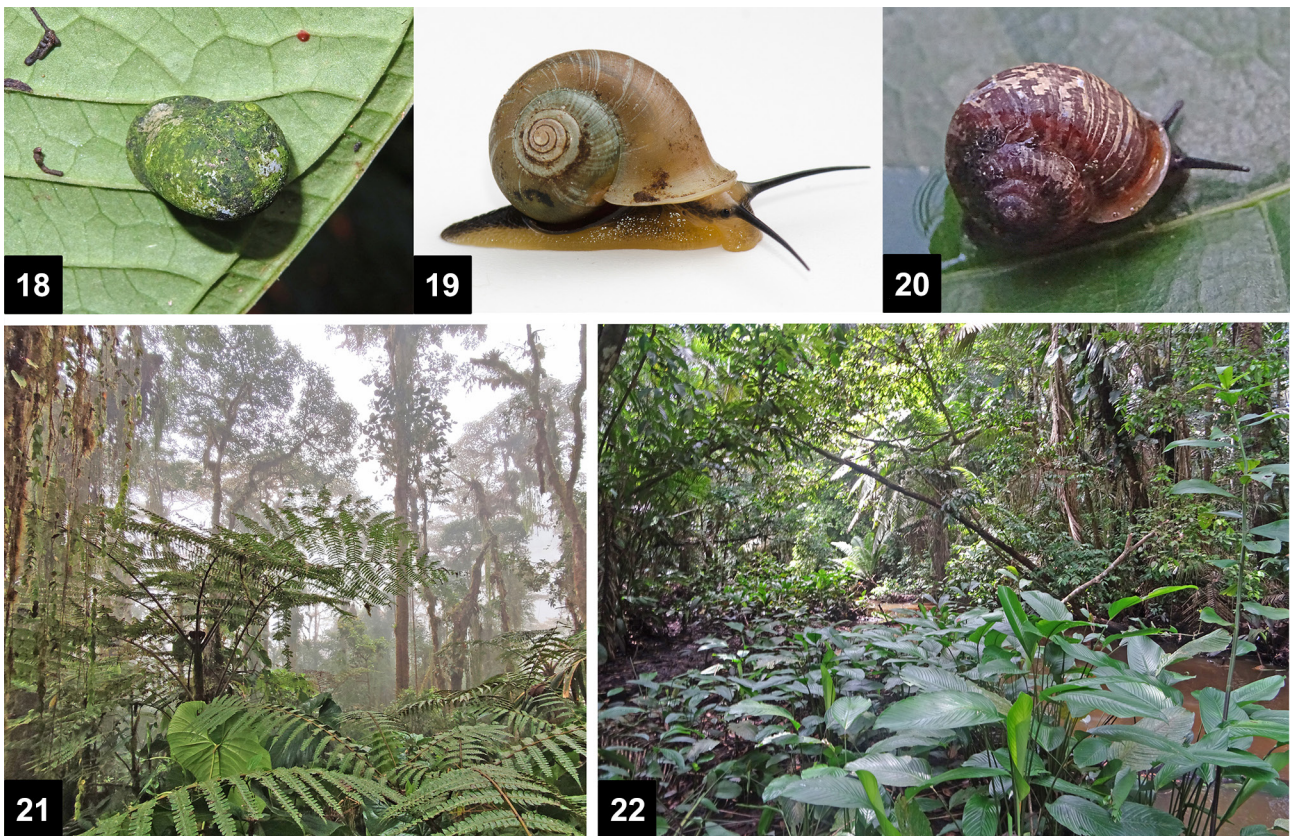
Distribution. Ecuador: Esmeraldas – Canande Reserve (iNaturalist obs. 4871733).

Remarks. It is likely that several observations from the western lowlands of Ecuador belong to this species, but only on one occasion the aperture was photographed which allowed identification as an undescribed species, likely allied to *Bourciera striatula* Miller, 1879. It differs from Miller's description of *B. striatula* by its brown periostracal colour and different shaped projection, which is only a small, rounded bulge in *B. striatula*. The broad shell, low spire, ovate aperture and small, pointed, upward projection seem to distinguish *B. aff. striatula* from all other species from Western Ecuador. Material should be collected to confirm it is a different species and describe it as such.

Bourciera viridissima Miller, 1879

Figs 15–16, 17

Bourciera viridissima – MILLER 1879: p. 146, pl. 5, fig. 5. *Bourciera viridissima* Miller, 1879 – COUSIN 1887: p. 274. *Bourciera viridissima* Miller, 1879 – BREURE 2019: p. 135.



Figs 18–22. Living specimens (18–20) and habitat (21–22) of *Bourciera* species: 18–19 – *Bourciera helicinaeformis* Pfeiffer, 1852 (18 – Ecuador, Pichincha province, Tandayapa; 19 – Ecuador, Imbabura province, Manduriacu (photo by Kristiina Ovaska)); 20 – *Bourciera amazonensis* sp. nov., from the Sucumbios province (pers. obs. CARLES DORADO 2018); 21 – habitat of *Bourciera helicinaeformis* (Pfeiffer, 1852), cloud forest in Pichincha Province, Tandayapa; 22 – habitat of *Bourciera amazonensis* sp. nov., Amazon rainforest in Ecuador, Sucumbios province, Cantón Cuyabeno

Bourciera viridissima Miller, 1879 – BREURE et al. 2022: p. 20, fig. 6B.

Studied material. NHMUK 20130111 (1 shell, dry) “Brazil”; SNSD MTD 55927 (1 shell, dry) Ecuador, Santo Domingo de Los Tsáchilas, Santo Domingo.

Redescription. Shell depressed with convex whorls and bright green periostracum. Spire 14–18% of total height. Sculpture consists of indistinct growth lines. Aperture large, subcircular to ovate with broad peristome and large triangular projection near the base of the shell. Upper part of the peristome can extend above the apex. Umbilicus closed by umbilical callus. **Dimensions.** H: 12.6 mm; W: 16.7 mm; HA: 13.7 mm, whorls 4½.

Cross-Diagnosis. Although distribution of *B. viridissima* overlaps with that of *B. helicinaeformis* and *B. intermedia* sp. nov., it can be distinguished by its more depressed spire, more convex spire whorls, rounder aperture, broader peristome and larger projection in adult specimens. In addition, so far there are no specimens of *B. helicinaeformis* known with a green periostracum. It differs from *B. imbaburensis* sp. nov. in having a projection on the peristome, having a lower spire and less convex spire whorls. *Bourciera*

striatula and *B. aff. striatula* are larger and have a smaller projection that differs in shape from that of *B. viridissima*. Moreover, *B. aff. striatula* has a brown periostracum. *Bourciera ovata* sp. nov. has a smaller, more ovate aperture, smaller projection and light brown periostracum in comparison to *B. viridissima*. All other known species have a smaller, circular to drop-shaped aperture, smaller projection and are generally smaller than *B. viridissima*.

GERMAIN (1907) saw no differences between *B. viridissima* and *B. fraseri*, but the latter is smaller, occurs on the east side of the Andes, has a more elevated spire and a smaller, more circular aperture than *B. viridissima*.

Distribution. Ecuador: Esmeraldas – near La Concordia (pers. com. BREURE 2022); Imbabura – Cotacachi (iNaturalist obs. 41301754; 36380240); Pichincha – Pilatón valley (TL); San Nicolas (COUSIN 1887); Santo Domingo De Los Tsáchilas – Santo Domingo (SNSD MTD 55927).

Remarks. The specimen from Santo Domingo (SNSD MTD 55927) is part of the collection of Reibisch. Both Reibisch and Miller received their Ecuadorian material from Wolf and it is likely they all knew each

other (MILLER 1878, 1879, REIBISCH 1896). Based on this we suspect that SNSD MTD 55927 represents true *Bourciera viridissima* as Miller intended the species, even though its locality data differs from the type locality of *B. viridissima*. The large projection typical for this species is broken off.

DISCUSSION

The occurrence of *Bourciera amazonensis* sp. nov., *B. curvidigitata* sp. nov., *B. fraseri* and *Bourciera ovata* sp. nov. in the Amazon rainforest proves that the genus has a much wider distribution than previously assumed (CORREOSO 2008). Based on these records, it is possible that the genus occurs in a larger part of the Amazonian basin, although it was not recorded in the study in the Peruvian Amazon by WENDEBOURG & HAUSDORF (2019). Additional surveys in the Amazon rainforest of Brazil, Colombia, Ecuador, Peru and other countries should be conducted to corroborate this.

As demonstrated, there are also indications of additional new species of *Bourciera* in Ecuador and it is likely there will be more. Most of Ecuador remains under sampled for smaller terrestrial gastropods and it seems that each species of *Bourciera* has a relatively limited distribution, with exception of *B. amazonensis* sp. nov., *B. fraseri* and *B. helicinaeformis* (Pfeiffer, 1852b). It is expected that further studies will reveal more new *Bourciera* species.

New records of *B. viridissima* Miller, 1879 support it is a valid species. This together with the newly published pictures of the NHMUK and SNSD specimens should help other malacologists to correctly identify *Bourciera viridissima* during succeeding studies. Hopefully *B. striatula* Miller, 1879 will also be rediscovered after this publication, if only to assess its validity. Thus, including the six newly described species, 10 species level taxa of *Bourciera* are reported in this paper. The distribution of the genus is greatly

NHMUK 20130111 shows the same characteristics as the specimens from Santo Domingo and La Concordia. It is likely that its locality data (Brazil) is a proxy for an unknown locality in South-America and the shell could be from Ecuador as well, although there is a small possibility that a similar species occurs somewhere in Brazil.

extended to the lowlands of West-Ecuador and the Amazon rainforest of Colombia, Ecuador and Peru. Its range likely extends further into the Amazon rainforest. Further research should teach us more about their ecology, distribution and will probably yield additional species of *Bourciera*.

ACKNOWLEDGEMENTS

We would like to thank A. S. H. BREURE for value feedback on an early version of the manuscript and pictures of the ZMB specimens, SERGIO QUIÑONERO for helping us to improve the current paper, BERNHARD HAUSDORF for sending us the *Bourciera* specimens from the ZMH for further study and providing feedback during peer-review, KRISTIINA OVASKA from the Royal BC Museum, BC, Canada for delivering additional information on the observation of *Bourciera* aff. *striatula* Miller, 1879 from the Canande reserve (Esmeraldas, Ecuador), JOHN SLAPCINSKY from the UF for pictures of the *B. amazonensis* sp. nov. specimen in the UF collection, ALEX KITTLE from the DMNH and KATRIN SCHNIEBS from the SNSD for providing additional pictures of their *Bourciera* samples, JONATHAN ABLETT for providing pictures of the NHMUK specimens, including the type specimens of Pfeiffer's taxa, two anonymous reviewers for their critical remarks on our manuscript and the contributors of iNaturalist for providing new data on the distribution of *Bourciera* species.

REFERENCES

- ADAMS H. 1870. List of additional species of land and freshwater shells collected by Mr. E. Bartlett in Eastern Peru, with descriptions of new species. *Proceedings of the Zoological Society of London* 38: 374–376. <https://www.biodiversitylibrary.org/page/28555222>
- BAKER H. B. 1922. Notes on the radula of Helicinidae. *Proceedings of the Academy of Natural Sciences of Philadelphia* 74: 29–67.
- BONAPARTE C. L. 1850. *Conspectus Generum Avium*, Tom. 1. E. J. Brill, Academiae Typographum, Lugduni Batavorum (Leiden, The Netherlands).
- BREURE A. S. H. 2019. A little-known German naturalist: Konrad Miller (1844 – 1933) and his malacological contributions. *Archiv für Molluskenkunde* 148: 129–136. <https://doi.org/10.1127/arch.moll/148/129-136>
- BREURE A. S. H., ARAUJO R. 2017. The Neotropical land snails (Mollusca, Gastropoda) collected by the 'Comisión Científica del Pacífico'. *PeerJ* 5: e3065. <https://doi.org/10.7717/peerj.3065>
- BREURE A. S. H., ROOSEN M. T., ABLETT J. D. 2022. Land and freshwater molluscs of mainland Ecuador: An illustrated checklist. *Iberus* 40: 1–290.



- CORREOSO M. 2008. Los moluscos terrestres y fluviales del Ecuador continental. La biodiversidad desconocida. 1st ed. SIMBIOE, Quito.
- COUSIN A. 1887. Faune malacologique de la République de l'Équateur. Bulletin de la Société zoologique de France 12: 187–287.
- GERMAIN L. 1907. Sur quelques mollusques de la République de l'Équateur (Mission de M. le Dr Rivet). Bulletin Du Muséum National d'Histoire Naturelle 13: 52–64.
<https://www.biodiversitylibrary.org/page/5042419#page/64/mode/1up>
- GITTENBERGER E., JANSSEN A. W., KUIJPER W. J., KUIPER J. G. J., MEIJER T., VAN DER VELDE G., DE VRIES J. N. 2004. De Nederlandse zoetwatermollusken: recente en fossiele weekdieren uit zoet en brak water. Naturalis, Leiden.
- GRAY J. E. 1824. Monograph of the genus *Helicina*. Zoological Journal, London 1: 62–71, pl. 6 [„1825”].
<https://www.biodiversitylibrary.org/page/27570789>
- GUEVARA S. 2008. Estudio taxonómico y sistemático de las familias Helicinidae y Ceresidae (Mollusca: Gastropoda: Neritopsina) y el género *Drymaeus* (Gastropoda: Pulmonata: Bulimulidae), en tres zonas de la Reserva Amazónica de Perú. PhD Thesis. Fachbereich Geowissenschaften der Universität Hamburg, Hamburg / Berlin [2005, unpublished] / Verlag im Internet GmbH [2008].
https://www.si.edu/object/siris_sil_1000521
- MARTENS E. VON 1885. Uebersicht der von Herrn Dr. Alfred Stübel im nordlichen Theil von Süd-Amerika gesammelten Binnen-Conchilien. Conchologische Mittheilungen 2: 155–170.
- MILLER K. 1878. Die Binnenmollusken von Ecuador. Malakozoologische Blätter 25: 153–199.
- MILLER K. 1879. Die Binnenmollusken von Ecuador (Schluss). Malakozoologische Blätter 26: 117–203.
- MOGOLLÓN A. V., BREURE A. S. H. 2019. Notes on *Drymaeus* species from Peru (Mollusca, Gastropoda, Bulimulidae), and description of a new species. Basteria 83: 13–18.
- ORTON 1871. Contributions to the natural history of the valley of Quito No II. The American Naturalist 5: 693–698.
<https://www.jstor.org/stable/2447160>
- PFEIFFER L. 1852a. Conspectus Cyclostomaceorum (Schluss). Zeitschrift vor Malakozoologie 8: 177–178.
<https://www.biodiversitylibrary.org/page/16300645>
- PFEIFFER L. 1852b. Monographiae pneumoporum viventium. Sistens: descriptiones systematicas et criticas omnium hujus ordinis generum et specierum hodie cognitatarum, accedente fossilium enumeratione. Cassellis, London, Paris.
- PFEIFFER L. 1853. Description of 19 new species of land shells, collected by M. Bourcier, Consul-General, Quito. Proceedings of the Zoological Society of London 13(147): 151–156.
<https://www.biodiversitylibrary.org/page/12862539>
- PFEIFFER L. 1859. Descriptions of twenty-seven new species of land-shells from the collection of H. Cuming. Proceedings of the Zoological Society of London 21: 23–29.
<https://doi.org/10.1111/j.1469-7998.1853.tb07179.x>
- RAMIREZ PEREZ M. C., HAUSDORF B. 2022. Low abundance but high land snail diversity in montane rainforest on the western slope of the Andes in Ecuador. Journal of Molluscan Studies 88: eyab048.
<https://doi.org/10.1093/mollus/eyab048>
- RAMÍREZ R., PAREDES C., ARENAS J. 2003. Moluscos del Perú. Revista de Biología Tropical 51: 225–284.
- REIBISCH T. 1896. Binnenmollusken von Ecuador. Abhandlungen des Naturwissenschaftliche Gesellschaft Isis, Dresden 7: 53–63.
- SYKES E. R. 1907. The name *Bourciera*. Proceedings of the Malacological Society of London 7: 312.
<https://www.biodiversitylibrary.org/page/15797796>
- THIELE J. 1935. Handbuch der systematischen Weichtierkunde (English translation). Smithsonian Institution Libraries, Washington D.C., United States of America.
- TROSCHER 1856–1863. Das Gebiss der Schnecken, zur Begründung einer natürlichen Classification, Erster Band. Nicolaische Verlagsbuchhandlung, Berlin.
- WAGNER A. 1911. Die Familie der Helicinidae: neue Folge. von Bauer & Raspe, Nürnberg.
- WENDEBOURG B., HAUSDORF B. 2019. The land snail fauna of a South American rainforest biodiversity hotspot: the Panguana conservation area in the Peruvian Amazon. Journal of Molluscan Studies 85: 311–318.
<https://doi.org/10.1093/mollus/eyz014>

Received: June 7th, 2022

Revised: July 30th, 2022

Accepted: August 8th, 2022

Published on-line: September 2nd, 2022

