

Two new species of *Chordaropa* Stanisic, 2016 from differing bushland habitats in Brisbane City, south-east Queensland (Gastropoda: Eupulmonata: Charopidae)

John STANISIC

Honorary Research Fellow, Biodiversity and Geosciences Program,
Queensland Museum Kurilpa, PO Box 3300, South Brisbane, 4101,
Queensland, Australia.
john.stanisic@qm.qld.gov.au

Lorelle STANISIC (formerly Holcroft)

Adjunct Research Associate, Biodiversity and Geosciences Program,
Queensland Museum Kurilpa, PO Box 3300, South Brisbane, 4101,
Queensland, Australia.

<https://doi.org/10.17082/dvse9171>

Citation: Stanisic, J. & Stanisic, L. (2025). Two new species of *Chordaropa* Stanisic, 2016 from differing bushland habitats in Brisbane City, south-east Queensland (Gastropoda: Eupulmonata: Charopidae). *Memoirs of the Queensland Museum | Nature* 66: 63–72. Brisbane ISSN 2204-1478 (Online), ISSN 0079-8835 (Print). Accepted: 7 August 2025. Published online: 26 August 2025.

Keywords:

pinwheel snails | shell morphology | protoconch sculpture | new species | distribution.

ABSTRACT

Two new species of pinwheel snails, *Chordaropa garethseetoi* sp. nov. and *C. oxleyana* sp. nov. are described from differing Brisbane City bushland habitats based on aspects of shell morphology. Their significance as members of a land snail fauna surviving in an altered city landscape is discussed.

A 2003 invertebrate survey of bushland reserves in Brisbane City conducted by the Queensland Museum for the Brisbane City Council uncovered numerous putative new species of pinwheel snails, most collected as dead shells retrieved from litter that are yet to be formally described (Stanisic et al. 2005). The survey included sites on the coastal plain as well as some in the adjacent D'Aguilar Range (Mt Glorious, Mt Nebo).

An intensive program of scanning electron microscopy was initiated to investigate the protoconch sculpture of the pinwheel snail specimens retrieved from the Brisbane City survey with the aim of describing and illustrating the fauna. Preliminary results demonstrated the presence of several distinct protoconch sculptural types, indicating a high level of generic diversity. This included pinwheel snails with similar protoconch sculpture (pitted cancellate) to *Chordaropa myora* (Stanisic, 2010). Subsequently, the authors located additional pinwheel snails with comparable protoconch characteristics in remnant rainforest habitat in a rainforest gully in Fort Road Reserve, Oxley, Brisbane City, south-east Queensland (SEQ). An additional lot of specimens with *Chordaropa* protoconch features was subsequently discovered among some uncurated land snails in the Queensland Museum collections. These historically significant specimens were collected by C.J. Wild (a museum collector in the 1890s and early 1900s) in a now defunct rainforest patch at Newmarket, Brisbane, SEQ.

From the above material, two new species of pinwheel snail, *Chordaropa garethseetoi* sp. nov. and *C. oxleyana* sp. nov., are described and illustrated. Each of these species lives in geographically isolated bushland habitats in Brisbane City. Although the material is limited to few specimens, their description is considered important in the context of their occurrence in a city landscape with the associated issues of continued development and the conservation of remaining natural areas.

This study is the first in a series that seeks to document the extensive undescribed pinwheel snail fauna of Brisbane City.

MATERIALS AND METHODS

Material used in this study is held in the dry mollusc reference collections (RC) of the Queensland Museum (QMMO). Measurements of shell height, diameter and umbilical width were made using a Wild M5 stereomicroscope with a calibrated eyepiece. Whorl counts were made to the nearest 0.125 whorl. Rib counts were carried out on the first and fourth teleoconch whorls of the shells. First whorl rib counts have been shown to be consistent within a species of *Gyrocochlea*-grade pinwheel snails and were first used by Hedley (1924) in his descriptions of *Gyrocochlea* spp. The fourth whorl was chosen in preference to the body whorl to avoid irregularities resulting from erratic gerontic growth variation in rib deposition. High resolution images of shells (260–600MB) were taken with a Visionary Digital BK-Plus lab system camera setup in the Queensland Museum's Digital Imaging Unit (QMDIU). Shell sculpture was investigated and photographed using a TM-1000 Tabletop Scanning Electron Microscope (SEM) located in the Queensland Museum.

Abbreviations: D/U, diameter/umbilical width ratio; H/D, height/diameter ratio; NSW, New South Wales; QMDIU, Queensland Museum Digital Imaging Unit; Qld, Queensland; QM, Queensland Museum; RC, dry mollusc reference collection; SC, mollusc spirit collection; SEM, scanning electron microscopy; SEQ, south-east Queensland.

Generic differentiation and species delimitation: Protoconch sculptural patterns in the Charopidae are generically diagnostic (Stanisic 1990, Hyman & Stanisic 2005, Shea et al. 2012). Protoconch sculpture was first given taxonomic prominence in Australian Charopidae by Stanisic (1990), and even greater significance by Hyman & Stanisic (2005), meaning this character became the key generic

descriptor in elucidating the phylogeny of several limestone-associated charopids from eastern NSW. The limited molecular analyses carried out by Shea et al. (2012) to unravel the catch-all genus *Gyrocochlea* offered further support for using this as the primary character in the generic diagnoses of Australian Charopidae.

A formal framework for using protoconch sculptural patterns as generic signatures was established by Holcroft (2018a) and subsequently used in the revision of the mid-eastern Queensland charopid fauna (Holcroft 2018b, c) and in a more recent study of brigalow charopids (Stanisic 2020). Combined with secondary characters such as teleoconch sculpture and coiling pattern, this approach affords a method for not only describing species but also for constructing an informative supra-specific framework of the taxa when only dead shells are available for study. This is considered a significant measure for the description and generic allocation of species of a mega-diverse family of Australian snails chiefly collected as dead shells from litter sorting. As an emergent hypothesis it will ultimately be tested by the additional descriptions of many

more genera. Historically, generic placement in the Charopidae was at best ad hoc and simply based on overall similarity in shell form. Species delimitation is based on shell morphology comprising differences in size, coiling pattern, spire protrusion and teleoconch sculpture.

SYSTEMATICS

Infraorder EUPULMONATA

Superfamily PUNCTOIDEA

Family CHAROPIDAE

Chordaropa Stanisic, 2016

Chordaropa Stanisic, 2016: p. 6.

Type species: *Gyrocochlea myora* Stanisic, 2010 — original designation.

Diagnosis: Shell tiny, brown, discoidal with a flat to slightly sunken spire; protoconch sculpture pitted cancellate consisting of low, broad spiral cords and weaker, curved radial ridges that become increasingly prominent toward the protoconch-teleoconch boundary; umbilicus wide U-shaped.



Figure 1. Map showing distribution of *Chordaropa* species. Created with Microsoft Excel 3D Maps (Microsoft Corporation, 2025).

Remarks: Stanisic (2016) introduced *Chordaropa* for *Gyrocochlea myora* Stanisic, 2010 based on the species having protoconch sculpture consisting of 16–20 low, broad crowded spiral cords combined with protractively sinuate radial ribs producing a pitted cancellate appearance. This contrasted with the finely cancellate protoconch of *Gyrocochlea* s.s. as defined by Shea et al. (2012).

Following SEM examination of extensive charopid material in the QM collections from the wider south-east Queensland region, it appears that *Chordaropa* is restricted to the greater Brisbane area and Minjerribah (North Stradbroke Island), SEQ.

***Chordaropa garethseetoi* sp. nov.**

(Figs 1, 2A, 4A–B)

Material examined: *Holotype:* QMMO76854, 1RC, Brisbane City, Bulimba Creek, SEQ (27°30'09" S, 153°06'34" E), Forest Red Gum association on river flats, under logs. Coll. QM Party, 22.iv.2003. Height of shell 2.76 mm, diameter 5.16 mm, width of umbilicus 1.23 mm, D/U 4.20, H/D 0.54, whorls 4.75.

Other material: QMMO76883, 1RC, Brisbane City, Ransome Bushland Reserve, SEQ (27°29'34" S, 153°11'05" E), *Casuarina* ecotone, under logs. Coll. QM Party, 10.ii.2003.

Diagnosis: Shell tiny, diameter 5.16 mm; protoconch sculptured with 18–20 low, broad spiral cords; teleoconch with 57–59 (mean 58) radial ribs on first whorl, 103–119 on fourth whorl, umbilicus wide U-shaped, diameter 1.23 mm.

Description: Shell tiny, brown, discoidal with a flat to slightly sunken spire; whorls 4.75, tightly coiled, shouldered above and rounded below the periphery, last slowly descending in front; sutures strongly impressed. Diameter of shell 5.16 mm, height 2.79 mm, H/D 0.54. Protoconch 1.5 whorls, diameter 490 µm, pitted cancellate sculptured with low, broad spiral cords and weak, curved radial ridges that become increasingly prominent toward the protoconch-teleoconch boundary; teleoconch with very crowded, protractively sinuate radial ribs, 57–59 (mean 58) on first adult whorl, 103–119 (mean 111) on fourth whorl, microsculpture of numerous very fine radial riblets, approximately 5–7 between each pair of major ribs, and low spiral cords forming elongate beads at their intersection.

Aperture ovately lunate, lip simple. Umbilicus wide U-shaped, diameter 1.23 mm, D/U 4.20. Reproductive anatomy unknown.

Distribution and habitat: Known from Bulimba Creek Reserve and Ransome Bushland Reserve, Brisbane, SEQ; collected among litter in disturbed riparian vegetation comprising Forest Red Gums with understorey rainforest elements, and moist eucalypt bushland encompassing a *Casuarina* ecotone.

Remarks: *Chordaropa garethseetoi* sp. nov. differs from *C. myora* (Stanisic, 2010) by having looser coiling, a less sunken spire and fewer crowded radial ribs on the first and fourth teleoconch whorls. In comparison, *C. oxleyana* sp. nov. has a smaller shell with a greater number of ribs on both the first and fourth teleoconch whorls.

Riparian habitats are not considered the primary habitat for any eastern Australian land snail. However, they are important dispersal corridors from a snail's core habitat. The discovery of *C. garethseetoi* along Bulimba Creek may indicate dispersal from the nearby Belmont Hills Bushland Reserve that contains the headwaters of Bulimba Creek. This site was surveyed as part of the Brisbane City survey and protects several vegetation communities including rainforest. Many pinwheel snails were located at the Belmont Hills site but not *Chordaropa* spp. Additional survey work may determine whether *C. garethseetoi* occurs in the reserve.

Etymology: Named for Gareth Seeto, a member of the Rotaract Club of Paddington who won the naming rights in a fundraising raffle for voluntary work on a Rotary project in the Solomon Islands.

Preferred common name: Gareth Seeto's Pinwheel Snail.

***Chordaropa oxleyana* sp. nov.**

(Figs 1, 2B, 3A, 4C–D)

Material examined: *Holotype:* QMMO86973, 1RC, Fort Road Reserve, Oxley, SEQ (27°33'00" S, 152°57'50" E), gully rainforest with *Araucaria*, under logs and rocks. Coll. J. Stanisic, L. Holcroft, 22.vii.2019. Height of shell 2.58 mm, diameter 4.18 mm, width of umbilicus 1.23 mm, D/U 3.40, H/D 0.57, whorls 4.25.

Paratype: QMMO86091, 1RC, subadult, same data as holotype.

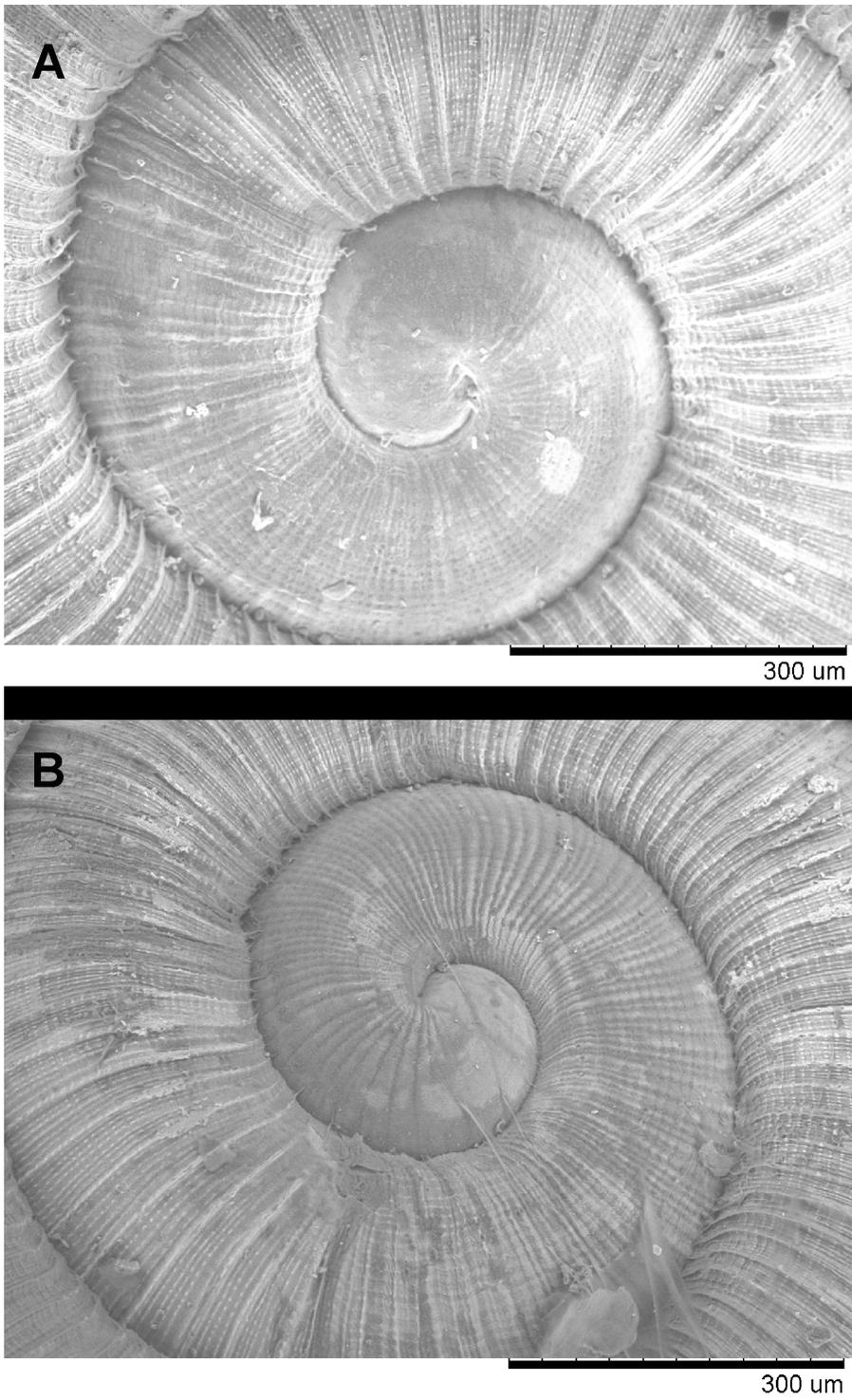


Figure 2. Protoconch sculpture. **A** *C. garethseetoi* sp. nov., holotype, QMMO76854 (x300); **B** *C. oxleyana* sp. nov., holotype, QMMO86973 (x250).

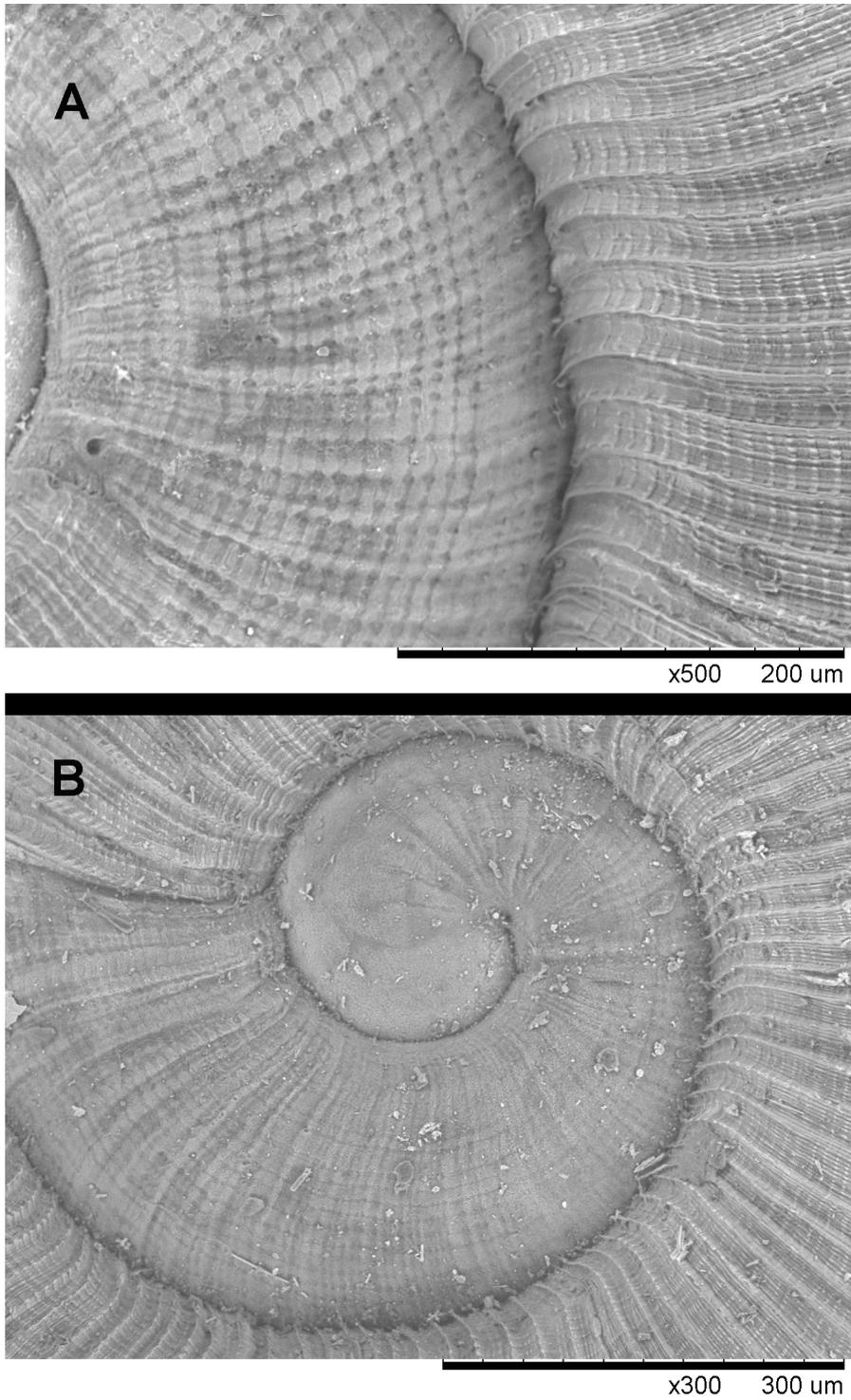


Figure 3. Protoconch sculpture. **A** *C. oxleyana* sp. nov., paratype, QMMO86091 (x500); **B** *C. myora* (Stanisic, 2010), paratype, QMMO16819 (x300).

Other material: QMMO87867, 6RC, Three Mile Scrub, Enoggera Creek, Newmarket, Brisbane, SEQ (27.430896° S, 152.99701° E), rainforest with *Araucaria*, under logs. Coll. C.J. Wild, c. 1900.

Diagnosis: Shell tiny, diameter 4.10–4.51 mm; protoconch sculptured with 18–20 low, broad spiral cords; teleoconch with 67–83 radial ribs on first whorl, 113–132 on fourth whorl; umbilicus wide U-shaped, diameter 1.22 mm.

Description: Shell tiny, brown, discoidal with a flat to slightly sunken spire; whorls 4.0–4.5 (mean 4.25), tightly coiled, shouldered above and rounded below the periphery, last slowly descending in front; sutures strongly impressed. Diameter of shell 4.10–4.51 (mean 4.26) mm, height 2.21–2.62 (mean 2.40) mm, H/D 0.53–0.60 (mean 0.56). Protoconch 1.5 whorls, diameter 490 µm, pitted cancellate sculptured with low, broad spiral cords and sinuate radial ridges that become increasingly prominent toward the protoconch-teleoconch boundary; teleoconch with very crowded, protractively sinuate radial ribs, 67–83 (mean 71) on first adult whorl, 113–132 (mean 122) on fourth whorl, microsculpture of numerous very fine radial riblets, approximately 5–7 between each pair of major ribs, and low spiral cords forming elongate beads at their intersection. Aperture ovately lunate, lip simple. Umbilicus wide U-shaped, diameter 1.15–1.39 (mean 1.22) mm, D/U 3.24–3.79 (mean 3.52). Based on six measured adult shells (QMMO86091, QMMO86973, QMMO87867). Reproductive anatomy unknown.

Distribution and habitat: Known from the Fort Road Reserve, Oxley and historically from the now cleared Three Mile Scrub, Newmarket, Brisbane, SEQ; living under logs in rainforest with araucarian emergents.

Remarks: *Chordaropa oxleyana* sp. nov. has a smaller shell than *C. garethseotoi* sp. nov. with a greater number of ribs on both the first and fourth teleoconch whorls. The shell of *C. oxleyana* is also smaller than that of *C. myora*, which has more tightly coiled whorls and more numerous ribs on the fourth teleoconch whorl.

The habitat at Fort Road Reserve preserves a remnant of the araucarian notophyll vine forest that was once commonplace along the Brisbane River and some of its tributaries. Most of this rainforest

type has been cleared in the lowland areas of Greater Brisbane but is still largely preserved in the uplands of the D'Aguilar National Park (Mt Nebo, Mt Glorious).

Chordaropa oxleyana was previously also known to occur in the Three Mile Scrub, Enoggera Creek, Newmarket, SEQ and was collected from the site by Queensland Museum collector C.J. Wild around 1900, though an exact date is not known. This area of lush rainforest, characterised by tall hoop pines (*Araucaria cunninghamii*), has disappeared through early timber harvesting and subsequent development of the Newmarket/Enoggera Creek area. The Banks Street Reserve preserves some examples of the original trees. However, it is unlikely that the Oxley Pinwheel Snail survives in the area.

Etymology: Named for the locality of Oxley, Brisbane City.

Preferred common name: Oxley Pinwheel Snail.

***Chordaropa myora* (Stanislac, 2010)**

(Figs 1, 3B, 4E–F)

Gyrocochlea myora Stanislac, 2010 (in Stanislac et al. 2010), sp. 286 — Myora, Minjerribah, SEQ.

Chordaropa myora (Stanislac, 2010), Stanislac 2016, p. 6.

Material examined: *Holotype:* QMMO20783, c. 2 km NE Dunwich on Dunwich-Myora Road, Minjerribah, SEQ (27°29' S, 153°24' E), rainforest, in litter, coll. J. Stanislac, 23.iii.1989. Height of shell 3.03 mm, diameter 5.16 mm, width of umbilicus 1.23 mm, D/U 4.20, H/D 0.59, whorls 4.75.

Paratypes: QMMO78948, 2RC, same data as holotype; QMMO16819, 19RC/6SC, Myora, Minjerribah, SEQ, rainforest, under logs, coll. J. Stanislac, 29.i.1984.

Diagnosis: Shell tiny, diameter 4.09–5.84 mm; protoconch sculptured with 18–20 low, broad spiral cords; teleoconch with 90–110 radial ribs on first whorl, 210–240 on fourth whorl; umbilicus wide U-shaped, diameter 1.30 mm.

Distribution and habitat: Known only from Myora, Minjerribah, SEQ; living under logs in notophyll vine forest.

Remarks: *Chordaropa myora* (Stanislac, 2010) is readily distinguished from the two new species

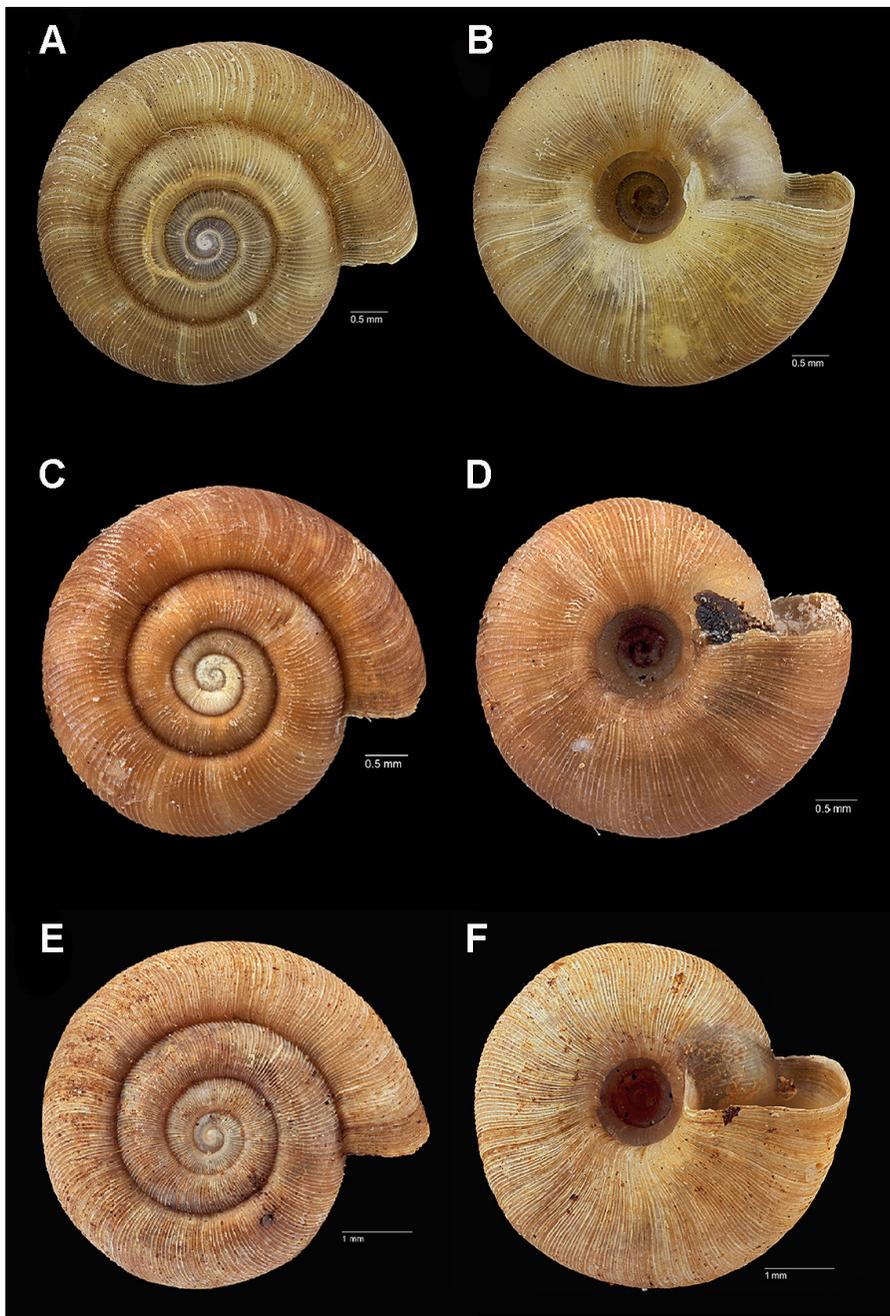


Figure 4. Apical and umbilical shell views. **A-B** *Chordaropa garehseetoi* sp. nov., holotype, QMMO76854, Bulimba Creek, Brisbane, SEQ [QMDIU5314]; **C-D** *C. oxleyana* sp. nov., holotype, QMMO86973, Fort Road Reserve, Brisbane, SEQ [QMDIU5315]; **E-F** *C. myora* (Stanisic, 2010), holotype, QMMO20783, Myora, Minjerribah, SEQ [QMDIU20783].

described here by the greater number of radial ribs on the fourth whorl. *Chordaropa myora* has more tightly coiled whorls and a more depressed spire than *C. garethseetoi* sp. nov. but has similar coiling and spire protrusion to *C. oxleyana* sp. nov.

Minjerribah is the second largest sand island in the world with a complex geological history. Connections to the mainland would have occurred during the glacial phases of the Quaternary. The island supports several differing vegetation communities ranging from wallum and heath to wet and dry eucalypt forest with small patches of rainforest occurring along the eastern edge at Eighteen Mile Swamp and on the western side of the island at Myora near Dunwich. Pinwheel snails have been recovered from both these rainforest patches, but the current species is known only from Myora.

Common name: Myora Pinwheel Snail.

DISCUSSION

Chordaropa garethseetoi sp. nov. and *C. oxleyana* sp. nov. extend the distribution of the genus beyond its initial restriction to Minjerribah by Stanisic et al. (2010). This taxonomic association evokes a former important biogeographical association between the island and the mainland. Connections between Minjerribah and the mainland would have occurred during the many glacial stages of the Quaternary. This is exemplified by the more recent Last Glacial Maximum (approximately 20,000 years before present day) when sea levels were 100–150 metres below present levels and much of Australia's continental shelf was exposed (Nott 2016).

Although the new species are in relatively close geographic proximity to each other they occur in quite different habitats (araucarian vine forest and moist eucalypt forest) formed over a long period of environmental sifting that separated these two biomes. Among the tiny charopids these differences in habitat, even in geographic proximity, usually denote the presence of morphologically distinct congeners (see Holcroft 2018b, c; Stanisic 2020). The *Chordaropa* species are a distinctive but relatively minor component of the Brisbane City charopid fauna judging by the small number of specimens discovered among the many available

for study. However, scarcity of material should not detract from the significance of differences in coiling pattern and rib spacing that are noted between the species. These are considered the key differentiating characters among charopid species.

The three species of *Chordaropa* are rainforest dwellers with some propensity for survival in transitional habitats such as dense riparian forest along watercourses and wet sclerophyll forest. Therefore, their evolution and survival are inextricably tied to the climate-induced restriction of mesic biota in Australia since the late Miocene period (Martin 2006). This is when the aridification of the continent began in earnest and Gondwanan fauna such as charopid land snails would have been profoundly affected by habitat contraction. The distribution of the *Chordaropa* spp. in isolated and refugial rainforest patches, scattered among a much larger and drier biome, is clearly the result of this change in the Australian landscape. Their predicament has been exacerbated by an added anthropogenic impact that has led to a further reduction in living space.

These newly described species of *Chordaropa* are a tiny part of an extensive and still largely undescribed Brisbane City pinwheel snail fauna. Nonetheless, these few species poignantly demonstrate the fragility of existence in a city landscape beset with ongoing development and the collateral loss of natural habitat. The survival of native snails in small, disturbed habitats within Brisbane City demonstrates the resilience of many invertebrates when patches of natural vegetation are retained. The Brisbane City Council has a bushland management program that seeks to preserve remaining green space in the city.

ACKNOWLEDGEMENTS

Thanks are due to Lily Kumpe and Geoff Thompson of the Queensland Museum Digital Imaging Unit for providing the high-resolution images of the species discussed here. We also thank the anonymous reviewers whose comments improved the presentation of the paper.

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