Australian Journal of Taxonomy
Open-access, online, rapid taxonomy
https://doi.org/10.54102/ajt

Three new species of the terrestrial snail genus *Bothriembryon* (Mollusca: Gastropoda: Bothriembryontidae) from Cape Arid National Park, Bremer Bay and Koolyanobbing, Western Australia.

Corey S. Whisson*, Elise Foley, Palavee Nyayadhish, Yumeng Wang, Peter U. Middelfart and Lisa A. Kirkendale

Collections & Research, Western Australian Museum, 49 Kew St, Welshpool, Western Australia 6106, Australia.
*Corresponding author: Corey.Whisson@museum.wa.gov.au

Corey S. Whisson https://orcid.org/0000-0003-2119-0598; Elise Foley https://orcid.org/0009-0001-6154-4699; Palavee Nyayadhish https://orcid.org/0000-0002-2473-0521; Yumeng Wang https://orcid.org/0009-0002-2095-0911; Peter U. Middelfart https://orcid.org/0000-0002-3191-8434; Lisa A. Kirkendale https://orcid.org/0000-0002-6682-6994

Abstract

The Australian land snail genus *Bothriembryon* Pilsbry, 1894 currently consists of 67 extant species, with 60 found only in Western Australia and of these, 54 are confined to the south-west Western Australia (SWWA) biodiversity hotspot. Based on molecular and morphological data we describe three new species from the SWWA biodiversity hotspot: *B. aridensis* n. sp. from Cape Arid National Park, *B. striatus* n. sp. from the Bremer Bay area and *B. turris* n. sp. from the Koolyanobbing area.

Cite this paper as: Whisson CS et al (2026). Three new species of the terrestrial snail genus *Bothriembryon* (Mollusca: Gastropoda: Bothriembryontidae) from Cape Arid National Park, Bremer Bay and Koolyanobbing, Western Australia.. *Australian Journal of Taxonomy* 125: 1–11. doi: https://doi.org/10.54102/ajt.5bz1q

urn:lsid:zoobank.org:pub:8749CA83-1BCD-4476-B129-477F59BBC6EF

Introduction

Currently 67 extant and eight fossil species are recognised in the genus *Bothriembryon* Pilsbry, 1894 (WoRMS Editorial Board 2026). Most extant species (54, 80.6%) are found within the south-west Western Australia (SWWA) biodiversity hotspot, with only a few members in the more northern Pilbara region (WA), South Australia, lower Northern Territory and south-east Tasmania (Stanisic et al. 2018; Whisson & Ryan 2019; Whisson et al. 2024, 2025).

Following modern reviews of *Bothriembryon* collections (Breure & Ablett 2012; Breure & Whisson 2012; Stanisic et al. 2018), there has been an explosion of new species descriptions (Morrison 2021; Morrison & Schneider 2019, 2021, 2022a-b, 2023a-b; Morrison et al. 2019, 2024; Schneider & Morrison 2018; Whisson & Breure 2016; Whisson et al. 2024), including a new fossil species

This paper was submitted on 20 February 2026 and published on 16 June 2026 (2026-06-16T02:48:23.454Z). It was reviewed by Michael Shae and John Stanisic, and edited by Mark Harvey. Lisa A. Kirkendale is an Editor of the Australian Journal of Taxonomy. She did not at any stage have access to the manuscript while in peer review, and had no influence on its acceptance or handling, as is standard practice for manuscripts submitted by editors. Australian Journal of Taxonomy. ISSN: 2653-4649 (Online).

(Ryan et al. 2024). The first molecular phylogeny of the genus has now been published, revealing many new lineages (Köhler et al. 2025), ten of which have recently been described (Whisson et al. 2025).

Three more lineages of *Bothriembryon* from the SWWA biodiversity hotspot are described herein, including one from the Bremer Bay area, present in the molecular phylogeny (Köhler et al. 2025). One lineage from the Koolyanobbing area was recently discovered during curation of newly deposited Environmental Impact Assessment (EIA) specimens collected by consultants. The remaining lineage from Cape Arid National Park was discovered in the WA Museum *Bothriembryon* collection, with fresh material and additional data obtained during the recent BHP Bush Blitz Kepa Kurl Expedition in 2023. Morphological and molecular examination have confirmed all three lineages as new.

The manuscript forms part of an educational component (internship) of a BHP funded project, from which this research stems. Each intern contributed to the overall manuscript and the entire taxonomic process of one species description, which included collection management, mapping, imaging, measuring and writing. Authorship reflects these contributions.

Methods

Specimens were sequenced through earlier projects (Net Conservation Benefits) or routine sequencing at the WAM Genomic Resources department (GR). Alignment of COI mtDNA sequence data and the COI phylogram was constructed with Geneious using MAFFT software. Evolutionary distances were calculated in MEGA v. 11.0.13 using the P-distance method (Tamura et al. 2013).

Material was compared to described species that were close morphologically and/or geographically, using available literature and type specimens housed at WAM.

Shell measurements of maximum shell height (H), maximum shell diameter (D), aperture height (AH), aperture width (AW), last whorl height (LWH), total number of whorls (TW), protoconch whorls (PW), protoconch diameter (PD), convexity B suture distance (CB), and convexity A distance from outer edge to B (CA) were taken from calibrated shell images using software ImageJ (https://imagej.net/ij/) and followed Whisson et al. (2025). Images of the shells were taken utilising a Canon 6D full frame camera with a Canon 65mm macro lens, mounted on a WeMacro macro rail. The setup was controlled with Helicon Remote software and captured images were focus stacked in HeliconFocus software (see https://www.heliconsoft.com/ for both software packages). All plates were built using GNU Image Manipulation Program (GIMP)(https://www.gimp.org) and Adobe Photoshop v26.2 (htttps://www.adobe.com).

For stability and consistency with recent papers by WAM, whorls were counted from the most readily identifiable shell feature, the outer lip of the protoconch backward toward the embryonic shell. The count includes the earliest suture line, identifiable as the end count. If this is in fact the earliest shell stage then a number will be indicated, e.g. 2.5 whorls, if this is not possible then a + will be indicated, e.g. 2.2+ whorls (Whisson et al. 2025).

Where differential diagnoses include size and shape references to closely similar species, those specific characters may be found in Breure & Whisson (2012) or Breure & Ablett (2012). For taxa described after 2012, subsequent literature with types measured and illustrated were consulted (Morrison et al. 2019, 2024; Stanisic et al. 2018; Whisson et al. 2025). Distributional maps were plotted using QGIS Version 3.40.4 Bratislava (https://qgis.org). Live snail images were typically taken using an Olympus Stylus Camera in the field. For type localities, information not present on the original label is enclosed by square brackets.

Abbreviations used for depositories: WAM, Western Australian Museum, Perth, Australia.

Discussion

This paper is the second in a series documenting new *Bothriembryon* species in Western Australia, underpinned by a robust molecular phylogeny (Köhler et al. 2025). Part one of the series described ten new *Bothriembryon* species from the SWWA biodiversity hotspot (Whisson et al. 2025).

All three species treated herein were discovered during recent biodiversity surveys, highlighting that many gaps still exist in documenting the *Bothriembryon* fauna in SWWA. The two south coast species *B. aridensis* n. sp. and *B. striatus* n. sp. were collected by WAM in 2006 during a regional invertebrate survey funded by the South Coast Natural Resource Management (NRM) group, and *B. turris* n. sp. was collected in 2023 during a faunal survey to assess the environmental impacts of mining at Koolyanobbing. Recently funded surveys, such as the two-week BHP Bush Blitz Kepa Kurl Expedition in 2023, enabled WAM staff to collect additional materal suitable for genetic and taxonomic work.

The high diversity of *Bothriembryon* species (Köhler et al. 2025), many with short ranges, highlights the need for ongoing faunal surveys, taxonomic work and conservation management. Land clearing for agricultural, urban or mining developments, bushfires, as well as climate change resulting in increased temperatures and reduced rainfall, continues to place significant pressure on this and other groups with Gondwanan heritage (Whisson et al. 2025).

Table 1. Summary of P-distances between *Bothriembryon* species used in this study (COI). Max: maximum intraspecific variation. Min: minimum interspecific variation. Blank cells indicate that only one COI sequence was available.

Species	**Comparative Taxa**				
	max	min	min	min	min
	B. aridensis n.sp.	*B. esperantia*	*B. simoneae*	*B. fragilis*	
B. aridensis n.sp.	1.47%	14.66%	16.03%	20.61%	
	B. striatus n.sp.	*B. onslowi*	*B. kingii*	*B. melo*	
B. striatus n.sp.	-	19.39%	21.83%	22.14%	
	B. turris n.sp.	*B. connori*	*B. harveyi*	*B. christineae*	*B. brunneus*
B. turris n.sp.	1.99%	14.05%	17.10%	17.25%	22.90%

Table 2. Summary of shell measurements (mm) and ratios for the type material of three new species of *Bothriembryon*. H, maximum shell height; D, maximum shell diameter; H/D, height to diameter ratio; TW, total number of whorls; PW, number of protoconch whorls; PD, protoconch diameter; AH, aperture height; AD, aperture diameter; AH/AD, aperture height to aperture diameter ratio; AH/H, aperture height to height ratio; LWH, last whorl height; LWH/H, last whorl height to height ratio; CA, convexity A, distance from outer edge to B; CB, convexity B suture distance; C, convexity; SA, spire angle

Taxa		H	D	H/D	TW	PW	PD	AH	AD	AH/AD	AH/H	LWH	LWH/H	CA	CB	C	SA
B. aridensis n.sp.	Holotype	13.8	9.4	1.5	4.6	1.9	2.8	7.8	5.4	1.4	0.6	11.3	0.8	0.6	0.2	0.2	81.0
n = 7	Minimum	7.5	5.4	1.3	3.4	1.8	2.6	6.0	4.0	1.4	0.6	5.5	0.7	0.1	1.0	0.1	74.4
	Maximum	14.5	9.5	1.6	4.9	2.3	3.0	8.6	5.5	1.6	0.7	12.3	0.8	0.6	3.7	0.2	85.9
	Average	11.8	8.1	1.5	4.4	2.0	2.8	7.6	5.0	1.5	0.6	9.8	0.8	0.3	2.4	0.1	81.7
B. striatus n.sp.	Holotype	12.4	7.5	1.7	4.4	2.0	2.2	6.8	4.4	1.6	0.6	10.0	0.8	0.3	2.7	0.1	71.5
n = 8	Minimum	12.4	7.5	1.7	4.4	2.0	2.2	6.8	4.4	1.4	0.5	10.0	0.8	0.3	2.7	0.1	63.5
	Maximum	18.5	10.0	1.9	5.0	2.3	2.8	9.4	6.0	1.6	0.6	14.4	0.8	0.5	4.3	0.1	71.5
	Average	16.0	8.9	1.8	4.8	2.1	2.5	8.3	5.3	1.5	0.5	12.7	0.8	0.4	3.8	0.1	67.5
B. turris n.sp.	Holotype	13.3	7.1	1.9	4.6	2.1	2.4	6.0	3.8	1.6	0.5	10.0	0.8	0.4	3.5	0.1	58.3
n = 7	Minimum	11.7	5.9	1.9	4.6	2.0	2.0	5.1	3.1	1.5	0.4	8.8	0.8	0.4	3.0	0.1	50.8
	Maximum	14.0	7.1	2.0	4.9	2.2	2.5	6.0	3.8	1.6	0.5	10.1	0.8	0.5	3.7	0.1	58.6
	Average	12.7	6.5	1.9	4.8	2.1	2.2	5.6	3.6	1.6	0.4	9.4	0.8	0.4	3.4	0.1	54.8

Table 3. GenBank Numbers for the mitochondrial and nuclear sequences used in this study.

Species Name	Museum Voucher	COI	16S	ANT
B. aridensis n.sp.	WAMS112428	PZ025726	PZ025103	-
B. aridensis n.sp.	WAMS112430	PZ025727	PZ025104	-
B. aridensis n.sp.	WAMS112431	PZ025728	PZ025105	-
B. striatus n.sp.	WAMS32008	PQ537942	PQ725260	PV186905
B. striatus n.sp.	WAMS95742 (ex. WAMS32008_2)	PQ537943	PQ725261	PV186906
B. striatus n.sp.	WAMS32035	PQ538090	PQ725045	PV157647
B. turris n.sp.	WAMS88564	PZ025725	PZ025102	-
B. turris n.sp.	WAMS115042	PZ025729	PZ025106	-

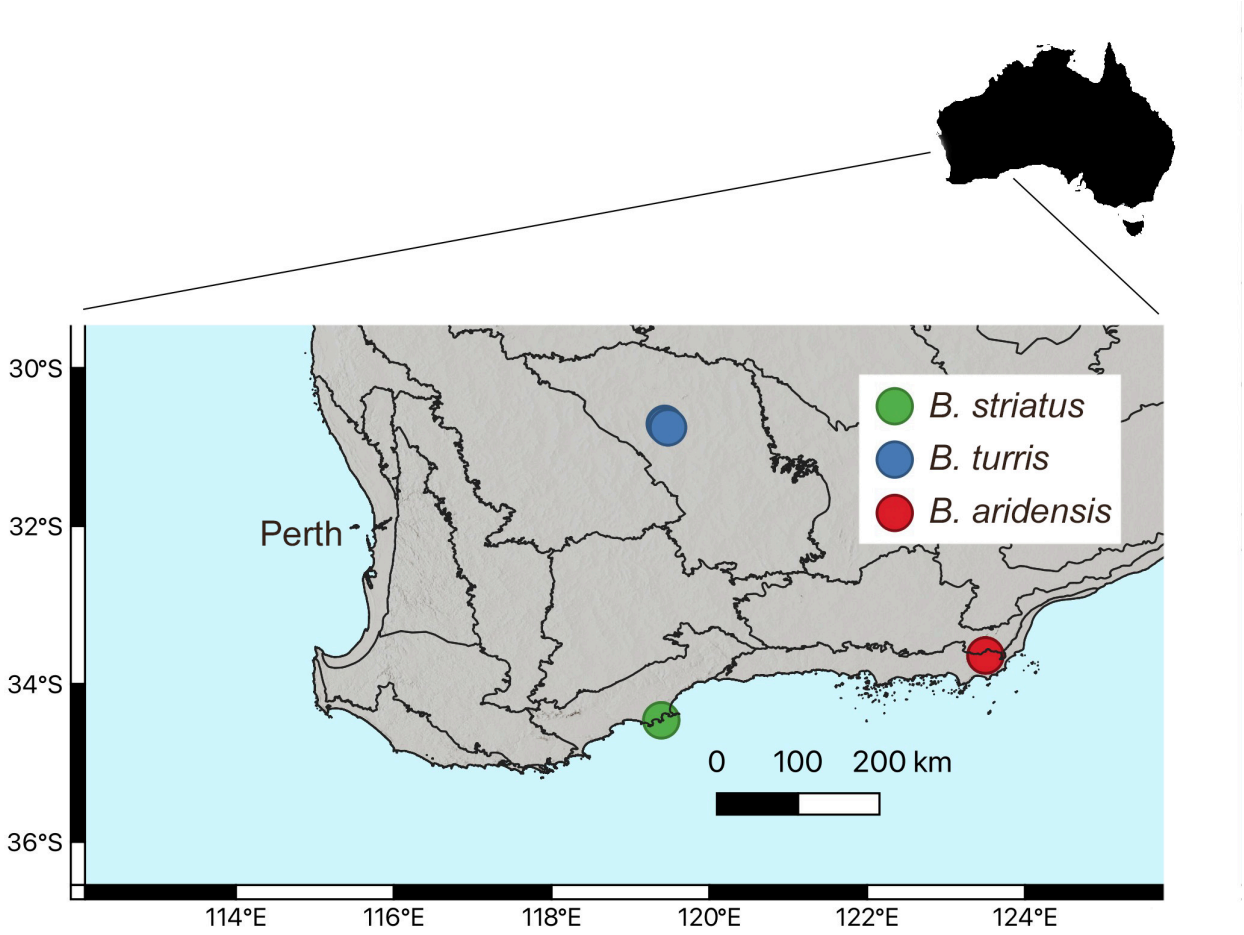

Figure 1. Distribution of three new *Bothriembryon* species.

Taxonomy

Family BOTHRIEMBRYONTIDAE Iredale, 1937

Subfamily BOTHRIEMBRYONTINAE Iredale, 1937

Bothriembryon Pilsbry, 1894

https://zoobank.org/NomenclaturalActs/c4754cd8-6fd5-4b61-bf1e-33fec4714012

Bothriembryon Pilsbry, 1894: 36

Liparus Albers, 1850: 172 (non Olivier, 1807)

Hartogembryon Iredale, 1933: 41

Larapintembryon Iredale, 1933: 41

Satagembryon Iredale, 1933: 41

Tasmanembryon Iredale, 1933: 41

Type species: *Helix melo* Quoy & Gaimard, 1832, by original designation.

Bothriembryon aridensis n. sp. Whisson, Middelfart, Foley and Kirkendale

Figure 2

urn:lsid:zoobank.org:act:DDDDAEB9-B3EC-4F13-9065-DF70D86ADAD8

Holotype: AUSTRALIA, Western Australia: Cape Arid National Park, Mt Diamond, S facing scree slope about half way up, 33.637332°S, 123.498579°E, Site WK019-002, under quartzite rocks, low open *Eucalyptus* thickets, small grasses and shrubs, 1 April 2023, C.S. Whisson, F. Köhler, wet/dry (WAM S112431).

Paratypes: AUSTRALIA, Western Australia: From type locality, Site WK019-001, 1 wet (WAM S112430); Cape Arid National Park, Mt Diamond, S facing scree slope about two-thirds way up, 33.63735°S, 123.497826°E, site WK018-001, on broken shell, quartzite boulders and stones, low open *Eucalyptus* thickets, small grasses and shrubs, 1 April 2023, C.S. Whisson, F. Köhler, 1 wet/dry (WAM S112428); same locality, 33°38'17.0"S, 123°29'49.05"E, under rocks, 5 June 2007, M.L. Moir, M.C. Leng, 1 wet each (WAM S27684, WAM S27685, WAM S59414), 1 dry (WAM S59418).

Diagnosis

Shell characterized by the globose shape with convex, inflated whorls, fine nodulose teleoconch sculpture arranged in spiral rows and mottled dark brown-cream

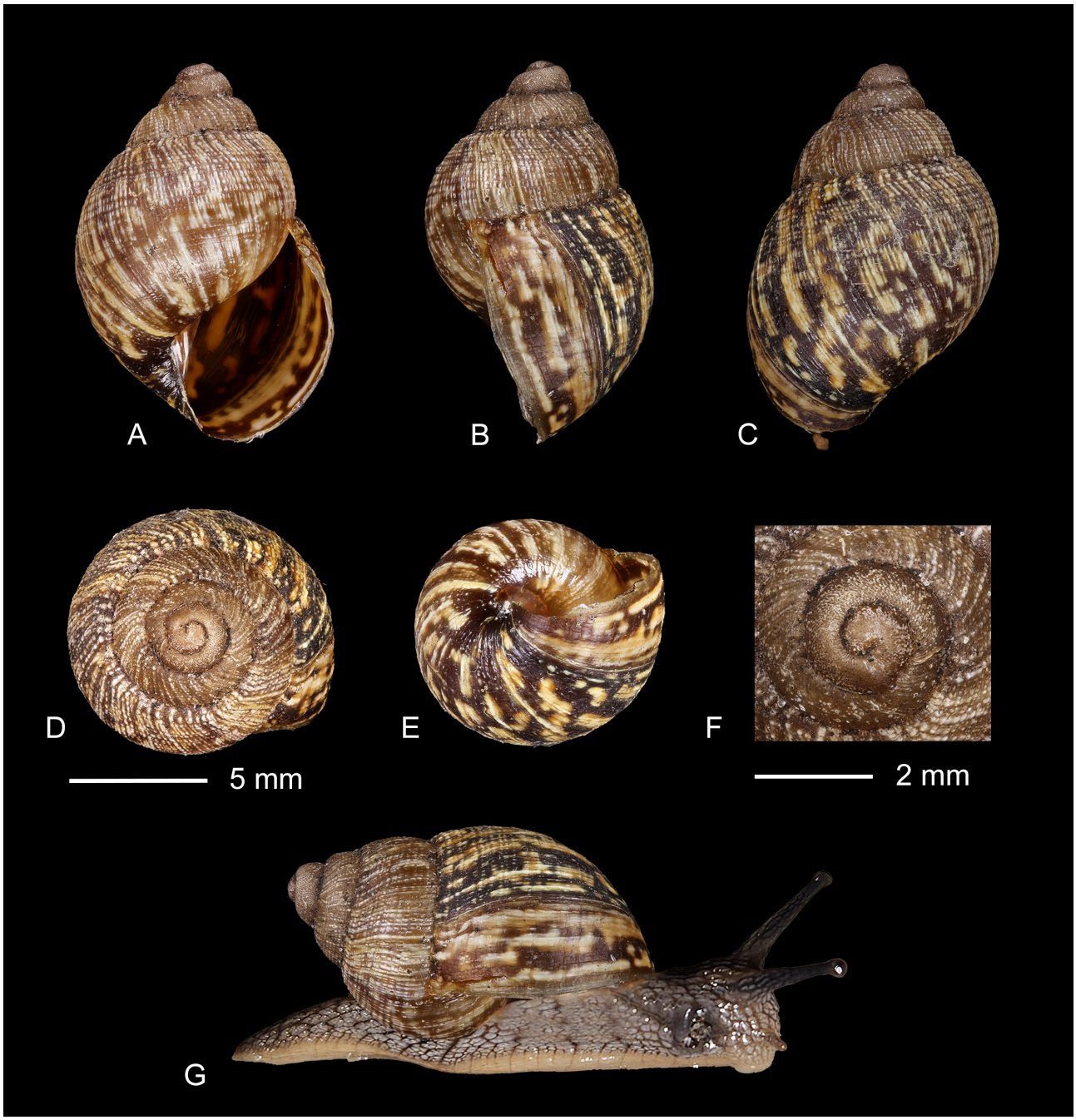

Figure 2. *Bothriembryon aridensis* n. sp. Holotype WAM S112431; A, apertural view; B, lateral view; C, dorsal view; D, apical view; E, basal view; F, sculpture on teleoconch and protoconch whorls; G, live view (photo G by F. Köhler).

coloration, often forming axial streaks and blotches. *Bothriembryon aridensis* shells differ from the geographical closest species *B. fragilis* by the globose shape and shorter spire, less impressed sutures and prominent nodulose teleoconch sculpture. Compared to *B. simoneae* and *B. esperantia*, the shell is smaller, thinner and less elongated, has more prominent nodulose teleoconch sculpture and a more intense mottled colour pattern, never with spiral banding.

Genetic Diagnosis

Sequenced specimens of *B. aridensis* exhibited the smallest interspecific evolutionary distance from *B. esperantia*. *Bothriembryon aridensis* is most morphologically similar to *B. simoneae*, and *B. fragilis* is the nearest species geographically to *B. aridensis* (P-distances listed in Table 1 for comparison).

Mitochondrial: Cytochrome c oxidase subunit 1 (CO1): WAM S112428, WAM S112430, WAM S112431; 16S ribosomal RNA (16S): WAM S112428, WAM S112430, WAM S112431. Nuclear: Adenine nucleotide translocases (ANT): WAM S112428, WAMS112430, WAMS112431. GenBank numbers provided in Table 3.

Description

Shell (type series): Shell bulimoid to globose with convex whorls, thin, fragile, sutures well impressed. Height

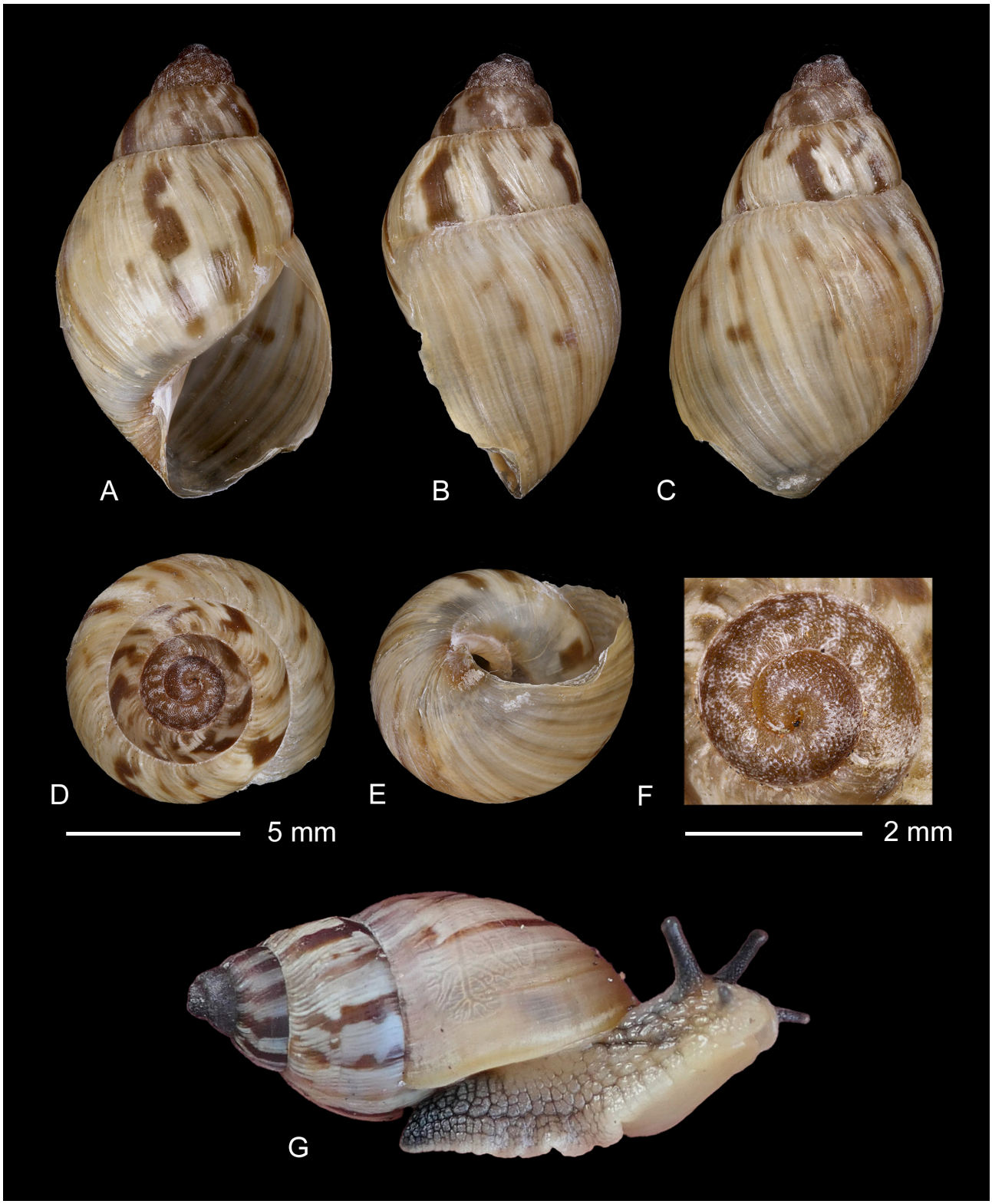

Figure 3. *Bothriembryon striatus* n. sp. Holotype WAM S32008; A, apertural view; B, lateral view; C, dorsal view; D, apical view; E, basal view; F, sculpture on teleoconch and protoconch whorls; paratype WAM S95734; G, live view, not to scale (photo G by K. Gray).

7.5–14.5 mm (mean 11.8 mm), diameter 5.4–9.5 mm (mean 8.1 mm) with 3.4–4.9 whorls (mean 4.4) and a H/W ratio of 1.3–1.6 (mean 1.5) (Table 2). Protoconch of 1.8–2.3 whorls (mean 2.0) with axial wrinkles extending approximately one quarter of whorl depth from suture, before coalescing into a glossy light brown honeycomb matrix. Teleoconch sculpture consists of low axial ribs broken into nodules by incised spiral lines, arranged into evenly spaced spiral rows, becoming less obvious toward the anterior end of the body whorl. On the penultimate whorl, approximately 12–14 spiral rows are present. Body whorl inflated prominent with short,

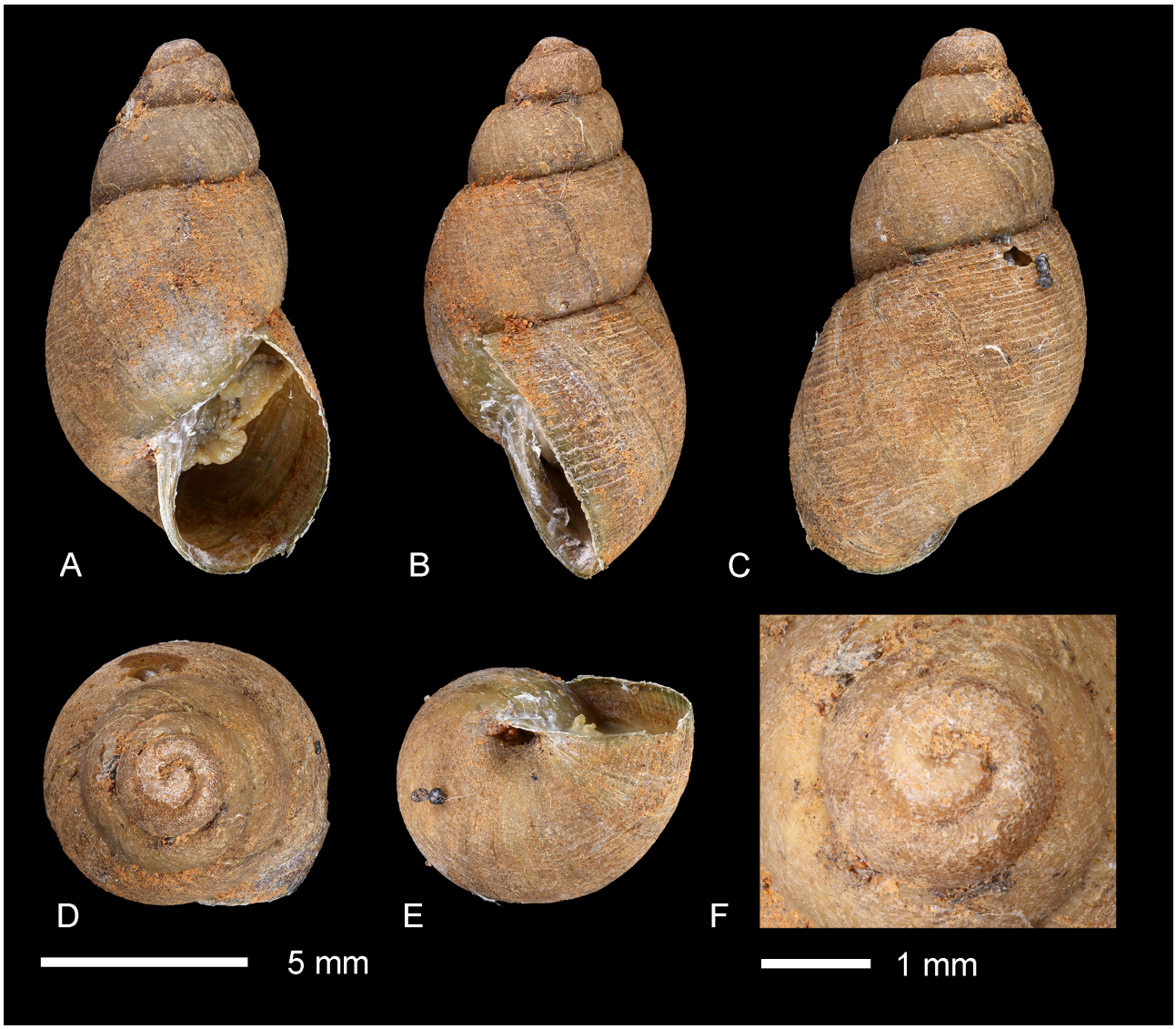

Figure 4. *Bothriembryon turris* n. sp. Holotype WAM S115042; A, apertural view; B, lateral view; C, dorsal view; D, apical view; E, basal view; F, sculpture on teleoconch and protoconch whorls.

acuminate spire (mean LWH/H 0.8). Aperture roundly-ovate, over half of shell height (mean AH/H 0.6) with a thin, simple lip. Parietal wall smooth, typically a mottled colour, usually indiscernible from the body whorl although sometimes bordered by a thin white line that extends from the junction of the outer lip to the junction of the inner columellar wall. Columellar wall transparent brown to cream, relatively long and triangular, dilated toward the parietal wall with a keeled, slightly reflected inner edge bordering the narrow umbilicus. Shell colour mottled cream, caramel and chocolate brown often forming axial streaks and blotches.

Animal (holotype): Dorsal region of foot, head and tentacles overall light grey, with dark brown venation pattern. Sides and base of foot cream in colour. Cephalic tentacles and distal end eye spots a darker grey colour. Posterior foot strongly acuminate.

Distribution, Habitat and Cultural Significance

Bothriembryon aridensis is only known from Mount Diamond within the Cape Arid National Park, Western Australia in the Esperance Plains (ESP-02) IBRA subregion (Figure 1). It has been found under quartzite rocks and boulders on the upper slopes of Mount Diamond, surrounded by low open *Eucalyptus* thickets, small grasses and shrubs.

Etymology

Named after Cape Arid National Park, which includes the type locality Mount Diamond.

Remarks

Previously assigned the OTU code GAS076 at WAM. A live *B. aridensis* (WAMS112428) was collected whilst rasping a dead shell of the same species. Few dead shells of *B. aridensis* or the sympatric *Basedowena elfina* were seen, suggesting calcium may be low in this envi-

ronment and calcium-rich shells are therefore routinely recycled.

Bothriembryon striatus n.sp. Whisson, Middelfart, Nyayadhish and Kirkendale

Figure 3

urn:lsid:zoobank.org:act:E72E82C5-94A7-469D-AD31-9C460287BB6B

Holotype: AUSTRALIA, Western Australia: Bremer Bay, end of Point Gordon Road, 34°27'30"S, 119°23'24"E, site 04, sand, coastal *Melaleuca* woodland, under leaf litter and on plants, 21 November 2006, M.L. Moir, 1 wet (WAM S32008).

Paratypes: AUSTRALIA, Western Australia: From type locality, 4 dry (WAM S27465); 1 dry (WAM S34976); 1 wet (WAM S32035); same locality, 34°27'31.0"S, 119°23'20.0"E, low shrubs, under 3-4m *Agonis flexuosa* trees or on bark trunk, 18 June 2025, K. Gray, 1 wet/dry (WAM S95731); 1 wet (WAM S95732); 1 wet/dry (WAM S95733); 1 wet (WAM S95734); Banky Beach, 34°27'32"S, 119°23'47"E, sand dune, *Melaleuca lanceolata*, *Westringia dampieri*, 26 June 2006, B. Miller, 6 dry (WAM S59433).

Diagnosis

Shell characterized by the elongate-conical shape, subsutural axial teleoconch sculpture, light brown to cream colour with dark brown axial flames or blotches, a brown umbilical patch and dark brown and white protoconch. *Bothriembryon striatus* shells differs from the morphological similar *B. kingii* at Albany by the slightly smaller size, more convex whorls, shorter, more acuminate spire and flared outer lip. They can be difficult to distinguish from *B. kingii* west of Pallinup River, but the shells are slightly smaller, have a shorter spire and the axial flames and protoconch are darker brown. The shell of *Bothriembryon striatus* differs from the geographically close *B. melo* by the much narrower size, elongate-conical shape, axial flames, brown umbilical patch and lack of spiral banding. The shells differ from the geographically close *B. richeanus* by the smaller size, considerably less convex whorls, prominent axial flames and the lack of nodulose teleoconch sculpture.

Genetic Diagnosis

Sequenced specimens of *B. striatus* exhibited the smallest interspecific evolutionary distance from *B. onslowi*. *Bothriembryon striatus* is most morphologically similar to *B. kingii*, and *B. melo* is the nearest species geographically to *B. striatus* (P-distances listed in Table 1 for comparison). *Bothriembryon richeanus* is geographically close to *B. striatus* but genetic data for that species is not available.

Mitochondrial: CO1: WAM S32008, WAM S32008_2 (now WAM S95742), WAM S32035; 16S: WAM S32008, WAM S95742, WAM S32035; Nuclear: ANT: WAM S32008, WAM S95742, WAM S32035. GenBank numbers provided in Table 3, see also Köhler et al. (2025).

Description

Shell (type series): Shell elongate-conical with slightly convex whorls, thin. Height 12.4–18.5 mm (mean 16.0 mm, diameter 7.5–10.0 mm (mean 8.9 mm) with 4.4–5.0 whorls (mean 4.8) and a H/D ratio of 1.7–1.9 (mean 1.8) (Table 2). Protoconch of 2.0–2.3 whorls (mean 2.1) with with axial wrinkles extending approximately one quarter of whorl depth from suture, before coalescing into a finely pitted honeycomb matrix. Teleoconch sculpture consists of coarse, subsutural axial ribs becoming less obvious towards the base of whorl (particularly the body whorl), where they are crossed by narrow, incised spiral lines. Body whorl prominent with short, acuminate spire (mean LWH/H 0.8). Aperture elongate-ovate, about half the shell height (mean AH/H 0.5) with a thin, simple lip, slightly flared outwards near the base. Parietal wall smooth, uniformly pale grey to cream, sometimes bordered by a thin white line that extends from the junction of the outer lip to the junction of the inner columellar wall. Columellar wall transparent light brown to cream, relatively long and triangular, dilated toward the parietal wall with a keeled, slightly reflected inner edge. Umbilicus narrow, bordered by a semi-circular brown area that is surrounded by a pale grey margin that blends into the parietal wall. Shell colour light brown to cream with dark brown axial flames (sometimes zigzag) or blotches, becoming less obvious toward the base of the body whorl. Protoconch dark brown with white axial flames.

Animal (paratype): Dorsal region of foot and head overall light cream with grey venation pattern. Side and base of foot strongly cream. Broad, black nape stripe. Cephalic tentacles darker grey to black terminating with pale grey eye spots at distal end. Posterior foot strongly acuminate.

Other material examined: AUSTRALIA, Western Australia: same as type locality, 1 wet consumed (WAM S95742); Same locality, 34°27'52"S, 119°23'09"E, 10 September 2022, K. Gray, 17 dry (WAM S27538); Bremer Bay area, most likely Southern Caravan Park, 34°25'41.84"S, 119°22'33.83"E, M. Wellstead, August 2007, 8 dry (WAM S59420).

Distribution, Habitat and Cultural Significance

Bothriembryon striatus is only known from southern Bremer Bay and its immediate surroundings in the Fitzgerald (ESP01) IBRA subregion (Figure 1). It is usually found in sand or under leaf litter and plants, with the surrounding vegetation consisting of *Melaleuca* woodland, *Westringia dampieri*, *Agonis flexuosa* trees and low shrubs.

Etymology

The species epithet is an adjective that refers to the axial streaks on the teleoconch of this species (striatus, Latin, streaks) (Brown 1954).

Remarks

Previously assigned the OTU code GAS031 in Köhler et al. (2025). *Bothriembryon striatus* is variable in the frequency of the axial streaks. It forms part of the widely distributed south coast *B. kingii* group.

Bothriembryon turris n.sp. Whisson, Middelfart, Wang and Kirkendale

Figure 4

urn:lsid:zoobank.org:act:CDD81667-18DB-41FC-B748-0DCC3C94E047

Holotype: AUSTRALIA, Western Australia: Koolyanobbing Range, 30°44'53.34"S, 119°28'29.86"E, Phoenix site NKR005, rocky granite and ironstone ridge line, red brown clay loam soil, tall *Allocasuarina* shrubland, 21 July 2023, W. Purser, wet (WAM S115042).

Paratypes: AUSTRALIA, Western Australia: From type locality, 1 wet (WAM S88563); same locality, 30°44'54.96"S, 119°28'31.31"E, Phoenix site NKR005, 21 July 2023, W. Purser, 1 wet each (WAM S88564, WAM S115041); Koolyanobbing Range, 30°42’13.01"S, 119°26’00.54"E, Phoenix site NKR007, in depression between two ridge lines, red-brown clay loam, open mallee *Eucalyptus* woodland over mixed *Acacia*, 21 July 2023, W. Purser, 2 dry (WAM S88558); same locality, 30°43'10.16"S, 119°26'35.06"E, Phoenix site NKR011, base of ridgeline, red-brown clay loam, ironstone rocks and gravel, mid to tall *Acacia* shrubland, 21 July 2023, B. Thomson, 1 wet (WAM S88560).

Diagnosis

Shell characterised by the slender size, elongate-conical to turreted shape, convex whorls with strongly impressed sutures, deep umbilicus, spiral teleoconch sculpture and light to dark brown colouration. *Bothriembryon turris* shells differ from the morphologically similar species *B. connori* by the more elongated shape, extended spire, less inflated body whorl and non-pillared teleoconch sculpture. The shell differs from the morphologically similar species *B. harveyi* by the more elongated shape, extended spire, less inflated body whorl and wider umbilicus. The shell differs from the geographically close species *B. christineae* by the more elongated shape, less inflated body whorl, non-pillared teleoconch sculpture and lack of white axial streaks. The shell differs from the geographical close species *B. brunneus* by the more elongated-conical shape, significantly more extended spire, less inflated body whorl, lack of nodulose teleoconch sculpture and lighter colouration.

Genetic Diagnosis

Sequenced specimens of *B. turris* exhibited the smallest interspecific evolutionary distance from *B. connori* and *B. harveyi*. *Bothriembryon turris* is most morphologically similar to *B. connori* and *B. harveyi*, and *B. christineae* and *B. brunneus* are the nearest species geographically to *B. turris* (P-distances listed in Table 1 for comparison).

Mitochondrial: CO1: WAM S88564, WAM S115042; 16S: WAM S88564, WAM S115042. GenBank numbers provided in Table 3.

Description

Shell (type series): Shell elongate-conical to turriform with moderately convex whorls, thin, fragile, sutures strongly impressed. Height 11.7-14.0 mm (mean 12.7mm), diameter 5.9–7.1 mm (mean 6.5 mm), with 4.6–4.9 whorls (mean 4.8) and a H/D ratio of 1.9–2.0 (mean 1.9) (Table 2). Protoconch large, inflated, of 2.0–2.2 whorls (mean 2.1) with coarse axial wrinkles extending ca. one third of whorl depth from suture, before coalescing irregularly to form a honeycomb matrix on the lower part. At ca. 1.5 protoconch whorls, the axial wrinkles cease and remainder of protoconch is a honeycomb matrix sculpture, colour light to medium brown, often bleached white. Teleconch sculpture consists of very low axial ribs crossed by evenly spaced, narrow to coarse spiral cords or nodules. On the penultimate whorl, approximately 13-14 spiral cords. Body whorl slender, prominent with extended spire (mean LWH/H 0.8). Aperture medium, ovate, less than half of shell height (mean AH/H 0.4) with a thin simple lip. Parietal wall has smooth, thin, white to brown callus, sometimes bordered by a thin white line, which on the body whorl extends from the junction of the outer lip to the junction of the inner columellar wall. Columellar wall is transparent brown to white in colour, relatively long and triangular, dilated toward the parietal wall with a slightly reflected inner edge bordering the deep, wide umbilicus. Shell colour light to dark brown.

Distribution, Habitat and Cultural Significance

Bothriembryon turris is only known from the narrow Koolyanobbing Range and its drainages north-west of Koolyanobbing in the Southern Cross (COO-03) IBPA subregion, a linear distance of 6.5km (Figure 1). It has been found toward the crest of the steep range, on rocky granite ironstone ridge lines and red-brown soils in *Allocasuarina* and *Acacia* shrubland.

Etymology

The species epithet is an adjective that refers to the slender and turreted shape of this species (*turris*, Latin, tower) (Brown, 1954).

Remarks

Previously assigned the OTU code GAS135 at WAM. The slender turreted shape of *B. turris* may be advantageous for living in crevices of rocks, as suggested by Whisson and Breure (2016) for the similarly-shaped *B. sophiarum*.

Disclosures

There are no conflicts of interest.

Acknowledgments

We would like to thank previous malacological workers at the WAM who helped build and curate the large *Both-*

riembryon collection, namely Shirley Slack-Smith, George Kendrick and Hillary Merrifeld. Hugh Morrison has provided guidance regarding *Bothriembryon* taxonomy, ecology, and morphology. The Bush Blitz Kepa Kurl program, run by the Australian Government, Parks Australia, BHP and Earthwatch, supported fieldwork that collected additional material. Frank Köhler and Kath Gray assisted with fieldwork and supplied images. Molecular data was generated by staff at the WAM GR, namely Mel Danks and Rachel Camilleri, and funded by the Gorgon Project's Barrow Island Net Conservation Benefits (NCB) Fund and the BHP Social Investment Fund. Taxonomic work was supported and funded by the BHP Social Investment Fund.

References

Breure, ASH (1974) Caribbean land molluscs: Bulimulidae, I. Bulimulus. *Studies on the Fauna of Curaçao and Caribbean Islands* 45: 1–80.

Breure ASH & Ablett JD (2012) Annotated type catalogue of the Bothriembryontidae and Odontostomidae (Mollusca, Gastropoda, Orthalicoidea) in the Natural History Museum, London. *ZooKeys* 182: 1–70.

Breure ASH & Whisson CS (2012) Annotated type catalogue of *Bothriembryon* (Mollusca, Gastropoda, Orthalicoidea) in Australian museums, with a compilation of types in other museums. *ZooKeys* 194: 41–80.

Köhler F, Whisson CS, Wilson NG, Hosie AM, Breure ASH & Kirkendale LA (2025). Aridification Shaped the Diversification of *Bothriembryon* Land Snails in a Global Biodiversity Hotspot. *Journal of Biogeography*

52(1–2): 1–20. https://doi.org/10.1111/jbi.70095

Morrison HM (2021) Description of two new species of *Bothriembryon* (Gastropoda: Stylommatophora: Brothriembryontidae) from the semi-arid zone of the south-east corner of Western Australia. *Conchylia* 52(1–2): 3–18.

Morrison HM & Schneider B (2019) Description of two new species of the genus *Bothriembryon* (Gastropoda, Pulmonata: Bothriembryontidae) from the Fitzgerald River National Park on the south coast of Western Australia. *Conchylia* 50(1–4): 129–142.

Morrison HM & Schneider B (2021) Description of a new species of *Bothriembryon* (Gastropoda: Stylommatophora: Bothriembryontidae) from the western side of the Nullarbor Plain, Western Australia. *Conchylia* 51(3–4): 23–33.

Morrison HM & Schneider B (2022a) Description of a new species of *Bothriembryon* (Gastropoda, Stylommatophora: Bothriembryontidae) from the eastern tip of Two Peoples Bay, near Albany, Western Australia. *Conchylia* 52(3–4): 3–14.

Morrison HM & Schneider B (2022b) Description of two New Species of *Bothriembryon* (Gastropoda, Stylommatophora: Bothriembryontidae) from near Kalbarri in the Mid West Region of Western Australia. *Conchylia* 52(3–4): 15–30.

Morrison HM & Schneider B (2023a) The description of three new species of *Bothriembryon* (Gastropoda, Stylommatophora: Bothriembryontidae) from the South West of Western Australia. *Conchylia* 53(3–4): 53–69.

Morrison HM & Schneider B (2023b) Description of three new species of *Bothriembryon* (Gastropoda, Stylommatophora: Bothriembryontidae) from Dundas Shire in the south-east of Western Australia. *Conchylia* 54(1–2): 71–84.

Morrison HM, Schneider B & Whisson CS (2019) A new species of the genus *Bothriembryon* (Gastropoda: Bothriembryontidae) from the shire of Esperance, Western Australia. *Conchylia* 50(1–4): 15–24.

Morrison HM, Schneider B & Whisson CS (2024) Description of three new species of *Bothriembryon* (Gastropoda, Stylommatophora: Bothriembryontidae) from the Great Southern Region of Western Australia. *Conchylia* 55(1-2): 59–75.

Ryan HE, Travouillon, KJ, Milne LA, Martin SK, Thorn KM & Whisson CS (2024) A new *Bothriembryon* from the Nullarbor Plain, Western Australia, with insights on the age of Bothriembryon praecursor from Kangaroo Well, Northern Territory. *Alcheringa* 1–16. https://doi.org/10.1080/03115518.2024.2323472.

Schneider B & Morrison H (2018) A new species of the genus *Bothriembryon* (Gastropoda, Stylommatophora: Bothriembryontidae) from South Eastern Western Australia. *Conchylia* 49(3–4): 1–11.

Stanisic J, Shea M, Potter D & Griffiths O (2018). Australian Land Snails Volume 2. A field guide to southern, central and western species. Mauritius: Bioculture Press, pp. 1-594.

Tamura K, Stecher G, Peterson D, Filipski A & Kumar S (2013) MEGA6: Molecular evolutionary genetics analysis version 6.0. *Molecular Biology and Evolution* 30(12): 2725–2729.

Whisson CS & Breure AS (2016) A new species of *Bothriembryon* (Mollusca, Gastropoda, Bothriembryontidae) from south-eastern Western Australia. *ZooKeys* 581: 127-140.

Whisson CS & Ryan HE (2019) Review of the fossil record of the Australian land snail genus *Bothriembryon* Pilsbry, 1894 (Mollusca: Gastropoda: Bothriembryontidae): new distributional and geological data. *Records of the Western Australian Museum* 34: 38-50.

Whisson CS, Breure ASH & Kirkendale LA (2024) *Bothriembryon rocketi* n.sp. (Mollusca, Gastropoda, Bothriembryontidae) from the semi-arid Pilbara region of Western Australia. *Australian Journal of Taxonomy* 60: 1-10. https://doi.org/10.54102/ajt.1y4jy.

Whisson CS, Middelfart PU & Kirkendale LA (2025) New species of the land snail genus *Bothriembryon* Pilsbry, 1894 (Mollusca: Gastropoda: Bothriembryontidae) from south-west Western Australia. *Australian Journal of Taxonomy* 107: 1–26. doi: https://doi.org/10.54102/ajt.a31d8.

WoRMS Editorial Board (2026). World Register of Marine Species. Available from http://www.marinespecies.org at VLIZ. Accessed [2026-02-03]. doi:10.14284/170.

This paper was typeset using Prince

www.princexml.com