

# ***Boucardicus victorhernandezi*, a new, endangered species of cyclophorid land snail from Madagascar**

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**Abstract:** *Boucardicus victorhernandezi* sp. nov. is known from only four mountains in the Vohimena chain, which stretches for 75 km between the Indian Ocean coast and the Anosy chain, north of Tolagnaro (Fort Dauphin), Madagascar. Vohimena-chain forests, of which less than 500 km<sup>2</sup> remain, are effectively unprotected and are being deforested rapidly.

**Key words:** Gastropoda, Cyclophoridae, tropical rainforest

This paper describes a new, recently discovered species of land snail from primary rainforest in southeastern Madagascar. This species is known only from the Vohimena mountain chain, north of Tolagnaro (Fort Dauphin). The remnant forests of the Vohimena chain are now under 500 km<sup>2</sup> in extent, are under no special protection, and are undergoing rapid deforestation (Emberton, 1997; Emberton *et al.*, in press). In the current Red List of Threatened Animals (IUCN, 1996), Madagascar currently has four land-snail species listed: two Endangered and two Vulnerable. The new species described herein is proposed for listing as Endangered.

The cyclophorid genus *Boucardicus* Fischer-Piette and Bedoucha, 1965, is known only from Madagascar, where it ranges throughout much of the island (Fischer-Piette *et al.*, 1993; Emberton, 1995, in press). Morphologically, the *Boucardicus* shell varies from globose to high-spired, from about 1-8 mm in greatest dimension, from dentate to edentate, from double- to single-lipped, from unlobed to trilobed lip, etc., with complex variations in body-whorl constriction, post-constriction ribbing, apertural configuration, microsculpture, etc. The new species described herein expands the known variation in shell form to include a bilobed apertural lip.

Ecologically, *Boucardicus* seems to represent the most diverse land-snail radiation of Madagascar's rainforests, as well as their strongest indicator of ecological degradation (Emberton, 1997, in press; Pearce and Emberton, unpub.). For conservation biology, *Boucardicus* qualifies well as an indicator/target taxon (di Castri *et al.*,

1992; Kremen, 1994), because it is an endemic, species-rich, well-defined clade, with species readily identifiable by shells alone (Emberton, 1996). For biogeography, *Boucardicus* ranks among the most informative of Madagascar's land-snail taxa (Emberton and Rakotomalala, 1996). This new species increases the number of described *Boucardicus* species from 39 (Fischer-Piette *et al.*, 1993; Emberton, 1994) to 40.

## **METHODS AND MATERIALS**

Drawings by camera lucida and measurements by ocular micrometer are all by the author, using a Wild M5A dissecting microscope. Some measurements were taken from photographs of the holotype to be published separately in a systematic treatment of Vohimena chain-Anosy chain *Boucardicus* (Emberton and Pearce, in press).

The description was prepared in part using DELTA (Dallwitz *et al.*, 1993). The description is conchological only.

Endangered-species status was evaluated using the latest categories and criteria of the International Union for the Conservation of Nature (IUCN, 1996). Rainforest extent and decline were assessed using Green and Sussman (1990), Sussman *et al.* (1994), and the most recently available topographic maps.

## **SYSTEMATICS**

Higher classification follows Vaught (1989) and



Ponder and Lindberg (1997). Types are placed in the National Museum of Natural History, Washington, D. C. (USNM); the Muséum national d'Histoire naturelle, Paris (MNHN, which does not assign catalog numbers to its types); the Australian Museum, Sydney (AMS); and, temporarily, the Molluscan Biodiversity Institute (MBI). All MBI collections are destined in the near future for USNM (MBI 373-379) and the Academy of Natural Sciences of Philadelphia (ANSP) (MBI 1419-1445).

Class GASTROPODA

Clade CAENOGASTROPODA

Superfamily CYCLOPHOROIDEA

Family CYCLOPHORIDAE

Genus *Boucardicus* Fischer-Piette and Bedoucha, 1965

*Boucardicus victorhernandezi* sp. nov.

Figs. 1-2

*Boucardicus* sp. 5. -Emberton *et al.*, 1996: 210; Emberton, 1997: 1147; Emberton *et al.*, in press: table 2.

**HOLOTYPE.** USNM 860775 (ex MBI 381.02DH, 1 adult shell, illustrated): 24°51'39"S, 47°00'46"E, Madagascar, Tulear Province, N of Fort Dauphin, W of village of Mahialambo, Mount Ilapiry, ESE slope, 200 m, primary rainforest, 02 Feb 1995.

**PARATYPES.** MNHN (1 adult shell, ex MBI 1447.01DP): 24°26'15"S, 47°13'10"E, Madagascar, Tulear Province, N of Fort Dauphin, NE of village of Esetra, Mount Mahermana, W slope, ca. 250 m, primary rainforest, 15 Oct 1992. AMS C.203423 (1 adult shell, ex MBI 380.08DP): 24°51'36"S, 47°00'40"E, Madagascar, Tulear Province, N of Fort Dauphin, W of village of Mahialambo, Mount Ilapiry, S slope, 300 m, primary rainforest, 02 Feb 1995. MBI 373.23AP, destined for USNM (1 adult female, alcohol preserved): 24°26'12"S, 47°13'13"E, Madagascar, Tulear Province, N of Fort Dauphin, NE of village of Esetra, Mount Mahermana, summit, 340 m, primary rainforest, 25 Jan 1995. MBI 376.20AP, destined for USNM (1 adult female, alcohol preserved): 24°26'22"S, 47°12'41"E, Madagascar, Tulear Province, N of Fort Dauphin, NE of village of Esetra, Mount Mahermana, valley in NW slope, 100 m, primary rainforest, 27 Jan 1995. MBI 377.07DP, destined for USNM (1 adult shell): 24°51'40"S, 47°00'20"E, Madagascar, Tulear Province, N of Fort Dauphin, W of village of Mahialambo, Mount Ilapiry, summit, 540 m, primary rainforest, 30 Jan 1995. MBI 379.33AP, destined for USNM (1 adult female, alcohol preserved): 24°51'27"S, 47°00'38"E, Madagascar, Tulear Province, N of Fort Dauphin, W of Mahialambo, Mount Ilapiry, SE slope, 400 m, primary rainforest, 31 Jan 1995. MBI 1419.01DPR, destined for ANSP (1 adult shell, illus-

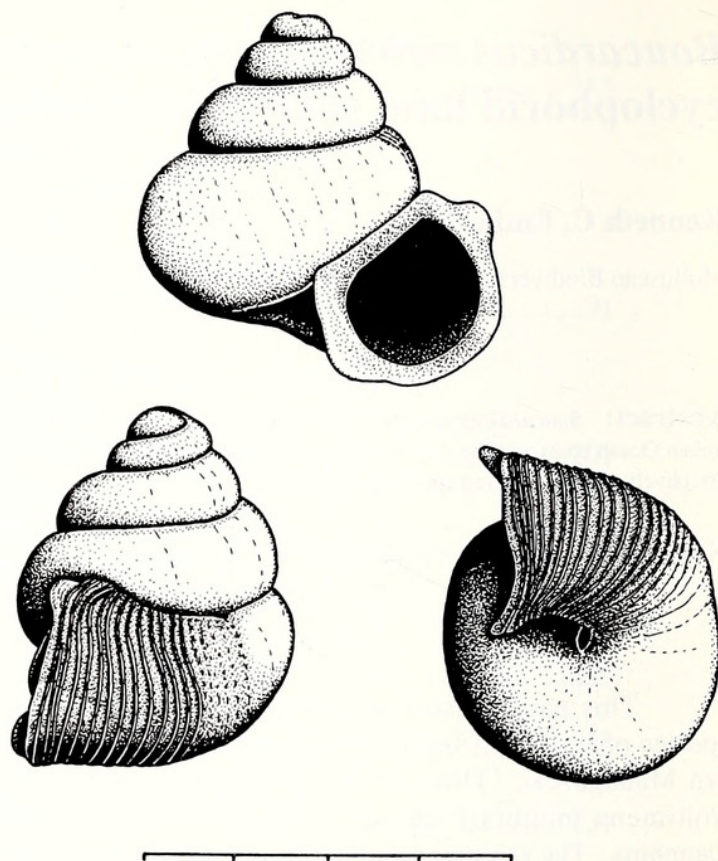


Fig. 1. Holotype, *Boucardicus victorhernandezi*, from Mt. Ilapiry (USNM 860775). Scale bar = 4 mm.

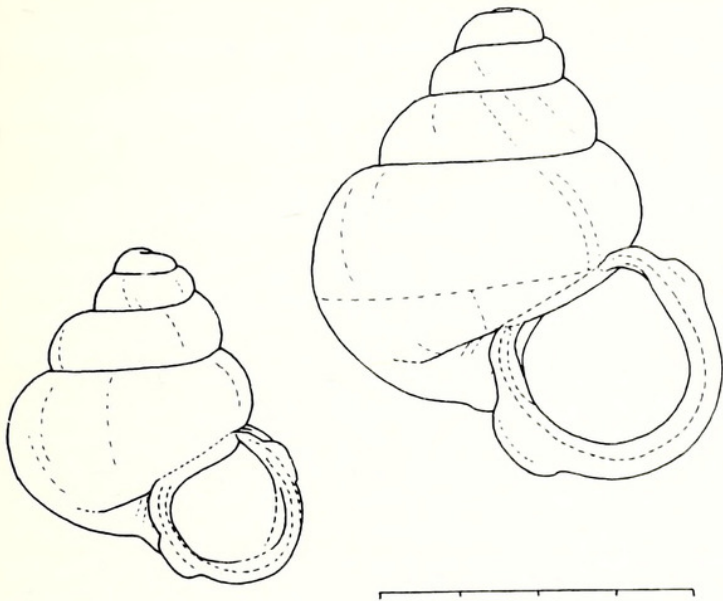
trated): 25°00'30"S, 46°57'45"E, Madagascar, Tulear Province, NW of Fort Dauphin, Pic Saint Louis, near summit, ca. 500 m, small remnant patch of primary rainforest, 10 Oct 1992. MBI 1439.01AP, destined for ANSP (7 adults and 2 juveniles, plus 1 adult body, alcohol preserved); MBI 1439.01DP (1 dead juvenile); MBI 1439.01DPR (1 adult shell, illustrated; 1 juvenile shell): 24°22'05"S, 47°08'00"E, Madagascar, Tulear Province, N of Fort Dauphin, S of village of Esetra, Mount Vohibololo (local name), summit, 430 m, primary rainforest, 14 Oct 1992. MBI 1445.01AP, destined for ANSP (1 adult, alcohol preserved): 24°26'12"S, 47°13'13"E, Madagascar, Tulear Province, N of Fort Dauphin, NE of village of Esetra, Mount Mahermana, summit, 340 m, primary rainforest, 15 Oct 1992.

**TYPE LOCALITY.** Madagascar, Tulear Province, N of Fort Dauphin, W of village of Mahialambo, Mount Ilapiry, ESE slope, 200 m, 24°51'39"S, 47°00'46"E.

**DIAGNOSIS.** A *Boucardicus* with bilobed apertural lip and strongly ribbed preapertural sculpture.

**DESCRIPTION OF HOLOTYPE.** Shell size and shape.





**Fig. 2.** Paratypes, *Boucardicus victorhernandezi*, from Pic St. Louis (left, MBI 1419.01DPR) and Mt. Vohibololo (right, MBI 1439.01DPR). Scale bar = 4 mm.

Diameter 3.7 mm; height 3.8 mm. Height-diameter ratio 1.0. Spire angle  $80^\circ$ . Whorl periphery round. Whorl shoulder round. Umbilicus before body whorl constriction 0% of shell diameter. Final umbilicus 29% of shell diameter. Whorls 4.5.

**Aperture.** Aperture width parallel to parietal callus 38% of shell diameter. Aperture height-width ratio (height measured perpendicular to parietal callus) 0.87. Columellar plica absent. Apertural plane inclined upward;  $5^\circ$  from rotational axis. No apertural anal notch. No baso-columellar denticle. No basal denticle. No upper palatal denticle. Ratio of aperture plus peristome greatest width (measured parallel to or within  $40^\circ$  of parietal-callus line) to aperture width 1.54. Aperture plus peristome greatest dimension angled outward from rotational axis  $35^\circ$ . Ratio of aperture plus peristome greatest width to aperture plus peristome greatest height as measured perpendicular to width line 1.32. Peristome baso-palatal indentation 23% of basal peristome width. Peristome upper curl extending forward 17% of upper peristome width. Inner, second peristome present, projecting less than 0.01 whorl.

**Apex.** Embryonic whorls 2.0. Embryonic sculpture granular with faint traces of growth lines. First whorl diameter 0.75 mm. First three whorls diameter 2.10 mm.

**Sculpture** on last tenth of penultimate whorl. Transverse ribs 22; rib height less than 0.05% of shell diameter. No complete spiral grooves between sutures. No short spiral grooves between sutures. No spiral ridges between sutures. No spiral lines of punctae between sutures. No herringbone sculpture; no honeycomb sculpture.

**Pre-Apertural Morphology.** Body whorl constricted 0.3 whorl before aperture; constricting by 11% of whorl diameter. Body whorl sculpture not diminishing before constriction. Post-constriction body whorl swollen by 10% of constriction diameter. No secondary body-whorl constriction. Transverse ribs on post-constrictional swelling numbering 10 in 0.1 whorl; rib height 1.1% of shell diameter; ribs slanting forward  $80^\circ$ .

**Color.** Basic color brown-red. Apex dark brown-red. One spiral color band; color white. Pre-apertural constriction white. Peristome (excluding periostracum) white and red-brown.

**VARIATION.** Shell size varies considerably, up to 6.0 mm in height (Fig. 2). Shape variation is minimal (Figs. 1-2).

**COMPARISONS.** Unique among all known *Boucardicus* in its bilobed apertural lip and in the strongly ribbed sculpture of its preapertural body whorl.

**DISTRIBUTION.** Known only from the Vohimena mountain chain, southeastern Madagascar.

**ETYMOLOGY.** For Victor Lee Hernandez, amateur naturalist and invertebrate enthusiast, of Commerce, California. On the occasion of his 30th birthday, Christmas Day, 1997, Victor's friends sponsor this species on his behalf.

## ENDANGERED STATUS

Evaluation must rely on IUCN's (1996) Criterion B: Small Distribution and Decline or Fluctuation. Use of other IUCN criteria is not possible, because population levels and rates of decline are unknown for this species (or for any other Madagascan land-snail species).

Madagascar has been sufficiently surveyed now for land snails (Emberton, in press), so that the range of *Boucardicus victorhernandezi* can be delimited to the Vohimena mountain chain. Extensive collections north (closest: mountains near Midongy Atsimo and eastward), east (coastal forests, including Sainte Luce), west (several transects in the Anosy chain, including two in Andohahela National Park, and one transect through the mountain ridge joining the Anosies and the Vohimenas), and south (coastal forests) of the Vohimenas, all failed to turn up a single specimen of *B. victorhernandezi*.

*Boucardicus victorhernandezi* is known from only four mountains within the Vohimena chain: Pic Saint Louis and Mounts Vohibololo, Mahermana, and Ilapiry. Extensive collections from five other mountains in the chain - Pic Saint Jacques ( $24^\circ 58'S$ ,  $46^\circ 58'E$ ) and Mounts Varabe ( $24^\circ 49'S$ ,  $47^\circ 04'E$ ), Teloboko ( $24^\circ 28'S$ ,  $47^\circ 11'E$ ),



Rianabo (24°29'S, 47°11'E), and Mahiamalo (24°26'S, 47°11'E) - were devoid of this species. On two of the four mountains from which it is known, *B. victorhernandezii* is known from just a single locality at or near the summit: Pic Saint Louis and Mount Vohibololo.

The Vohimena mountain chain starts at about latitude 24°25'S and stretches south-southeast, parallel to the nearby Indian Ocean coastline, to about latitude 25°01'S. Its length is approximately 75 km. The Vohimena chain's remaining rainforest coverage in 1950 (date of the aerial photos upon which current topographic maps are based) occurred along its entire length and varied in width from 4-16 km, averaging about 10 km. Thus the 1950 area of Vohimena-chain rainforests was approximately 750 km<sup>2</sup>.

By 1985, these rainforests had been reduced by about a third, to approximately 500 km<sup>2</sup>, judging from satellite-imagery interpretations by Green and Sussman (1990: fig. 1) and Sussman *et al.* (1994: fig. 1). Vohimena-chain rainforests continue to decline at an ever accelerating rate because of timber concessions and slash-and-burn agriculture (Emberton, 1997, pers. obs.; M. Fenn, World Wildlife Fund, pers. comm.). Current plans by an international mining company to begin exploiting nearby titanium resources will dramatically increase the already rapidly growing local human population, leading to even greater rates of forest-clearing (M. Fenn, pers. comm.).

Thus *Boucardicus victorhernandezii* meets strictest IUCN (1996) criteria for Endangered status. Its area of occupancy (Criterion B) is less than 500 km<sup>2</sup>. Its distribution is severely fragmented, and it is known to exist at fewer than five locations (Criterion B.1). Its extent of habitat is continuing to decline (Criterion B.2). *B. victorhernandezii* is clearly an Endangered species.

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