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Documenting Endemic, Rare, and Red-Listed Species: Informing Conservation

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Endemic Species of the Land Snail Genus *Diplommatina* in Sarawak

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The genus *Diplommatina* (family Diplommatinidae) is a highly diverse group of micro land snails widely distributed across Asia and the Indo-Australian Archipelago, with Borneo recognised as one of its major centres of diversity. Among the 29 species currently recorded from Sarawak, several are known only from the state. Members of this genus are generally characterised by small conical shells, radial ribs, a lipped aperture, and an operculum, with most species measuring less than 10 mm in shell height. They occur in a variety of habitats ranging from lowland to montane forests and are commonly found in leaf litter, although some species may also inhabit limestone surfaces, vegetation, deadwood, and other substrates. Five representative endemic species are highlighted here: *Diplommatina azlani*, *D. goliath*, *D. niahensis*, *D. onyx*, and *D. rumbangensis*. These species were documented during land snail surveys conducted across Sarawak and identified using available taxonomic references. Voucher specimens were deposited in the Zoological Museum UNIMAS (MZU).



Diplommatina niahensis. Left: Live specimen foraging on limestone karst. Right: Standard diagnostic views of the shell specimen (apertural, abapertural, apical, and umbilical views). Scale bar = 1 mm.



Diplommatina goliath. Left: Live specimen foraging on forest leaf litter. Right: Standard diagnostic views of the shell specimen (apertural, abapertural, apical, and umbilical views). Scale bar = 1 mm.



Diplommatina azlani. Left: Live specimen foraging on forest leaf litter. Right: Standard diagnostic views of the shell specimen (apertural, abapertural, apical, and umbilical views). Scale bar = 1 mm.



Diplommatina onyx. Left: Live specimen foraging on forest leaf litter. Right: Standard diagnostic views of the shell specimen (apertural, abapertural, apical, and umbilical views). Scale bar = 1 mm.

The endemic diplommatinids recorded presented here exhibited considerable variation in shell morphology and size. Firstly, *D. azlani* (Figure 1) is a very small sinistral species distinguished by its dark red conical shell, closed umbilicus, and inconspicuous radial sculpture, measuring 3.2–3.7 mm in height and 1.8–1.9 mm in width; the animal has a creamy-white head with black tentacles. Secondly, *D. goliath* (Figure 2) possesses a medium-sized sinistral shell with a fusiform spire, impressed suture, closed umbilicus, and inconspicuous radial ribs, measuring 10.0–11.5 mm in height and 4.3–5.0 mm in width. Thirdly, *D. niahensis* (Figure 3) is a small conical species with slightly concave spire sides, weak shell sculpture, a closed umbilicus, and dimensions ranging from 3.0–4.2 mm in height and 1.5–2.0 mm in width. Fourthly, *D. onyx* (Figure 4) is a very small dextral species characterized by a fusiform spire, convex whorls, closed umbilicus, and moderately spaced radial ribs, with shell dimensions of 2.2–3.0 mm in height and 1.1–1.5 mm in width. Finally, *D. rumbangensis* (Figure 5) is a small dextral species with a fusiform to moderately conical reddish-orange shell, impressed suture, narrow open umbilicus, and sparse radial ornamentation mainly restricted to the upper whorls.

Diplommatinids are an important component of Sarawak's terrestrial malacofauna due to their high endemism, restricted distributions, and association with forest and limestone habitats. The species highlighted here show varying distribution patterns. *Diplommatina azlani* (Gunung Santubong and Bako), *D. goliath* (Padawan), *D. niahensis* (Niah National Park), and *D. rumbangensis* (Gua Rumbang, Padawan) are currently known from single or limited localities, whereas *D. onyx* has been recorded from several areas across Sarawak. None of these species has yet been evaluated for the International Union for Conservation of Nature Red List of Threatened Species. Their occurrence in leaf litter, limestone surfaces, and vegetation suggests an affinity for humid environments that provide suitable conditions for shelter, feeding, and reproduction. Such habitat associations are commonly observed among members of the family Diplommatinidae, many of which have limited dispersal capabilities and localised distributions.



Diplommatina rumbangensis. Standard diagnostic views of the shell specimen (apertural, abapertural, apical, and umbilical views). Scale bar = 1 mm.

The occurrence of several endemic *Diplommatina* species in restricted localities highlights the distinctive land snail diversity of Sarawak. Continued surveys, particularly in underexplored forests and limestone areas, are likely to improve our understanding of their distribution and ecological requirements. Documenting these species provides an important foundation for future studies on the biodiversity and conservation of Sarawak's terrestrial molluscs.



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