

AN INTRODUCTION TO
the Land Snails And Slugs
of Malaysia

THOR-SENG LIEW
JUNN-KITT FOON



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55487

Plectostoma siphonostomum
Diplommatinidae

These peculiarly coiled snails live on limestone hills in Pahang.



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67883

Meghimatium uniforme
Philomycidae

This slug feeds on lichens in the montane forests of Mount Kinabalu, Sabah.

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2022

THOR-SENG LIEW
JUNN-KITT FOON



<https://www.mybis.gov.my/pb/4679>



55535

Plectostoma grandispinosum

Diplommatinidae

One of the many fantastically shaped
land snails of Malaysian Borneo.





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67968

Stomacsmethis senyumensis

Alycaeidae

These snails show peculiar behaviours of dangling from rocks with threads of slime they made.

Foreword

First and foremost, I would like to express my gratitude to the authors and everyone who contributed in this eBook for their commendable effort. Their hard work, passion and enthusiasm are depicted through every fascinating and eye capturing picture along with the entertaining yet informative facts making this book enjoyable to read and easy to comprehend.

Malaysia is blessed with several hundred thousand invertebrate species, making it one of the richest biodiversity hotspots in the world. However, many members of this group are being overlooked and sometimes underrated despite ecological importance. This pictorial eBook titled 'An Introduction to the Land Snails and Slugs of Malaysia' serves as a bridge and continuous effort of malacologists to engage citizens in the world of molluscs. As these creatures are often misunderstood and neglected as they are always associated with being unpleasant pests. Therefore, this ebook helps to highlight the colourful and the unique shell structure of gastropods to the public especially for species which can't be captured by direct observation and hardly encountered due to their ecological constraints.

Moreover, as this eBook can be easily downloaded and comes in handy, it will become an essential tool especially in the field as one does not need to carry a physical book. I hope this publication will stimulate the attentiveness of researchers-to-be and academics, and at the same time increase the awareness in appreciating, safeguarding and conserving snails and slugs in Malaysia. Let's support them and make sure they don't get forgotten!

Thank you.

DR ISMAIL B. HJ. PARLAN

Director General

Forest Research Institute Malaysia (FRIM)



67884

Platymma tweediei

Chronidae

An iconic snail from the montane forests of
Titiwangsa Range, Peninsular Malaysia

Photographed by Azrie Alliamat

Preface

Land snails and slugs are the second most abundant invertebrates on land after insects. There are about 800 - 1,000 known species of land snails and slugs in Malaysia. Except for a few introduced species in the gardens around our neighbourhood, land snails and slugs have generally been overlooked by most people. There are a few reasons why most of us are not familiar with land snails and slugs despite their immense diversity in Malaysia. Firstly, almost all native land snails and slugs are found only in the vicinity of or within rainforests where habitats are less accessible to people. Second, most land snail and slug species are tiny (less than 5 mm) and their population densities in their natural habitats are very low, except on limestone karsts where they can be common. Thirdly, most information on Malaysian land snails are published as scientific papers with technical terminologies and format, which are not easily understood for non-specialist audiences such as the general public.

Therefore, we prepared this book as an accessible resource to encourage people's understanding and appreciation of the diversity of land snails and slugs in Malaysia. To that end, we used simple language and minimised technical terminologies. The first part of the book provides a general introduction to land snails and slugs with regards to their classification, species diversity, morphology, sampling methods, ecology and conservation. The second part of the book presents a selection of common and noteworthy land snail and slug genera as well as their representative species.

Acknowledgements

This book was made possible with the support of Kevin Wallace, Donos Akia, Charina Pria, and Azrie Alliamat, who provided us with photographs of some of the land snails and slugs presented herein. We deeply appreciate their contributions.

In addition, some of the photos published in previous publications, namely, Pall-Gergely et al. (2020) and Phung et al. (2017) in Zookeys, Chang et al. (2021) in PeerJ, under CC BY licence were reused in this book. The excerpts of Godwin-Austen (1889) and Stoliczka (1872) in Chapter 2 were obtained from Biodiversity Heritage Library (<https://www.biodiversitylibrary.org/>).

User's Guide Book

- 1 By scanning the QR codes, it will enable readers to find more information related to the species via MyBIS website. The QR code reader app can be downloaded on Google Play Store or Apple App tStore.
- 2 This series number is to help you in searching the species without scanning the QR Code. Go to your internet browser and type www.mybis.gov.my/sp/xxxxx (replace xxxxx with the series number) or open Telegram app on your communication device and search for 'mybis.gov.my'. You can then start searching with this series number.
- 3 Scientific name of the species
- 4 The family of the species
- 5 Brief description of species

LIST OF GENERA	
GENUS NAME	
GENUS LISTED WITHOUT PHOTOS	



65414

Everettia paulbasintali
Dyakiidae

Forest dwelling land snails from Sabah.



1



2

65425

Everettia jucundior

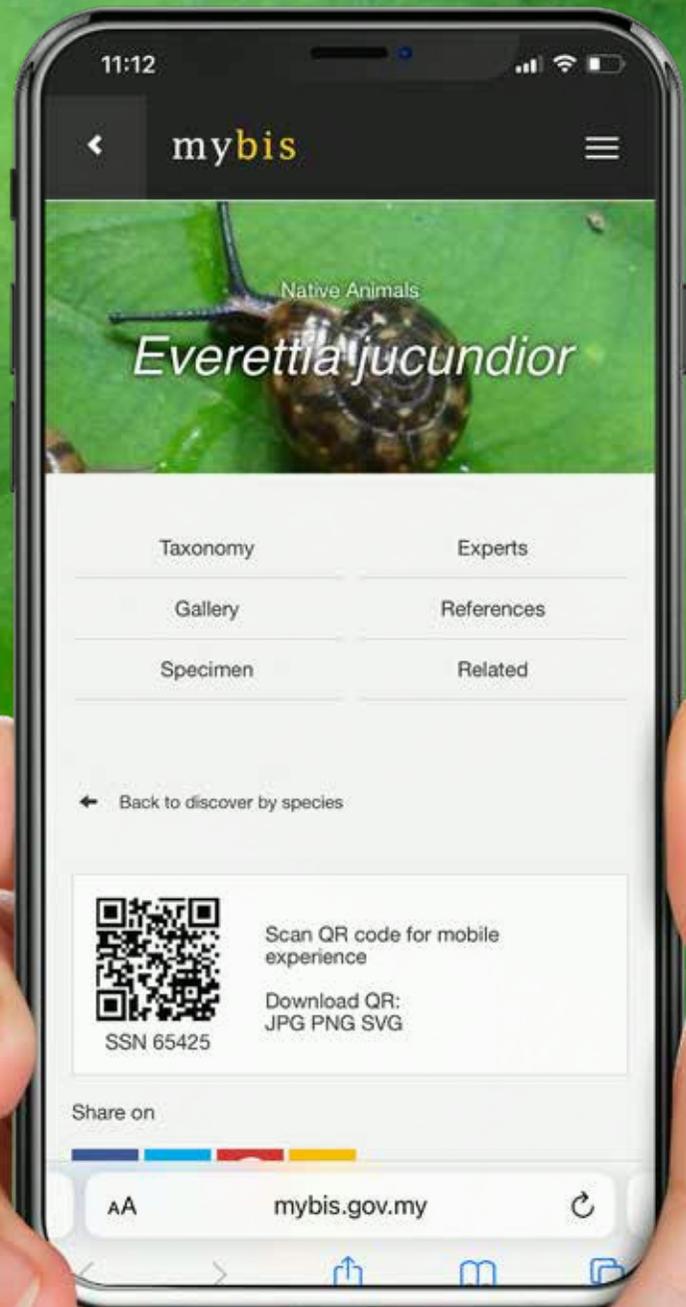
Dyakiidae

3

4

Forest dwelling land snails from Sabah.

5



11:12

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Native Animals

Everettia jucundior

Taxonomy

Experts

Gallery

References

Specimen

Related

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67959

Kalamantania whiteheadi

Dyakiidae

A pulmonated snail.

Atopos sp.
Rathouisiidae



Chapter 1

WHAT ARE LAND SNAILS AND SLUGS?

All snails and slugs belong to the Class Gastropoda in Phylum Mollusca, the second largest phylum of animals after Phylum Arthropoda. There are about 25,000 to 30,000 known species of terrestrial gastropods on Earth, of which about 800 to 1,000 species are found in Malaysia.

Gastropods can be broadly classified into three categories based on their external appearance. A snail is a gastropod with a calcareous coiled shell in which the animal's soft body can fully retract into. A semi-slug is a gastropod with a simple and reduced shell embedded under its mantle tissue in which the animal's soft body cannot retract into. A slug is a gastropod without any shell.

In this book, we will use the term 'snails and slugs' to refer to gastropods in general.



67886

Megaustenia heliciformis
Ariophantidae



64892

Pterocyclos trusanensis
Cyclophoridae

← Snails



Microparmarion sp.
Ariophantidae

Shell only.

Semi Slugs →



67887

Microparmarion malayanus
Ariophantidae



64707

Ibycus rachelae
Helicarionidae



Slugs →



67954
Laevicaulis alte
Veronicellidae



67890
Meghimatium pictum
Philomycidae

Pulmonated Snail →

A



67453

Chloritis sulvana
Camaenidae

A: Snail in retracted position.
B: Snail in extended position.

B



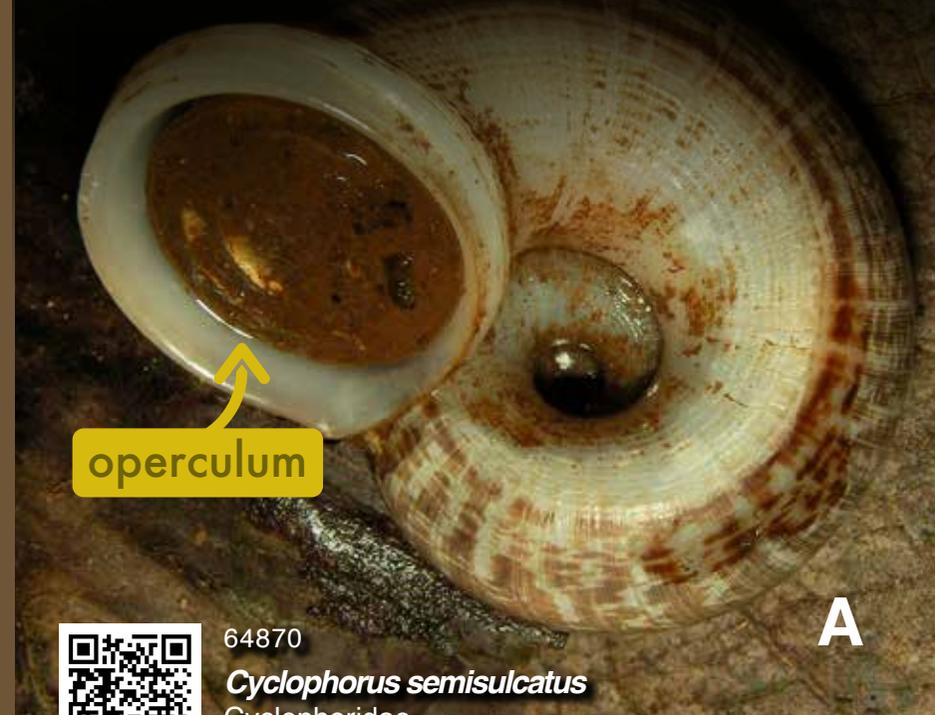
Operculated Snail ↘

PULMONATED VS. OPERCULATED GASTROPODS

Pulmonated snails are a group of snails and slugs in which each individual possesses lung for respiration, has male and female organs within one individual (hermaphroditic), usually has two pairs of tentacles (upper and lower tentacles) with eyes at the tip of the upper pair of tentacles and do not have an operculum.

Operculated snails are a group of snails in which each individual possesses gills for respiration, has male or female organs in separate individuals (dioecious), has one pair of tentacles with eyes at their bases and an operculum.

Nevertheless, these groupings should be considered as mere simplifications of the taxonomic classification for snails and slugs. Species from one group are not necessarily more closely related to each other than species from the other group.



64870

Cyclophorus semisulcatus

Cyclophoridae



ON THE LAND SHELLS OF PENANG ISLAND, WITH DESCRIPTIONS OF THE ANIMALS AND ANATOMICAL NOTES; *part first*, CYCLOSTOMACEA, by DR. F. STOLICZKA.

(Read and received 6th August, 1872).

[With plate X.]

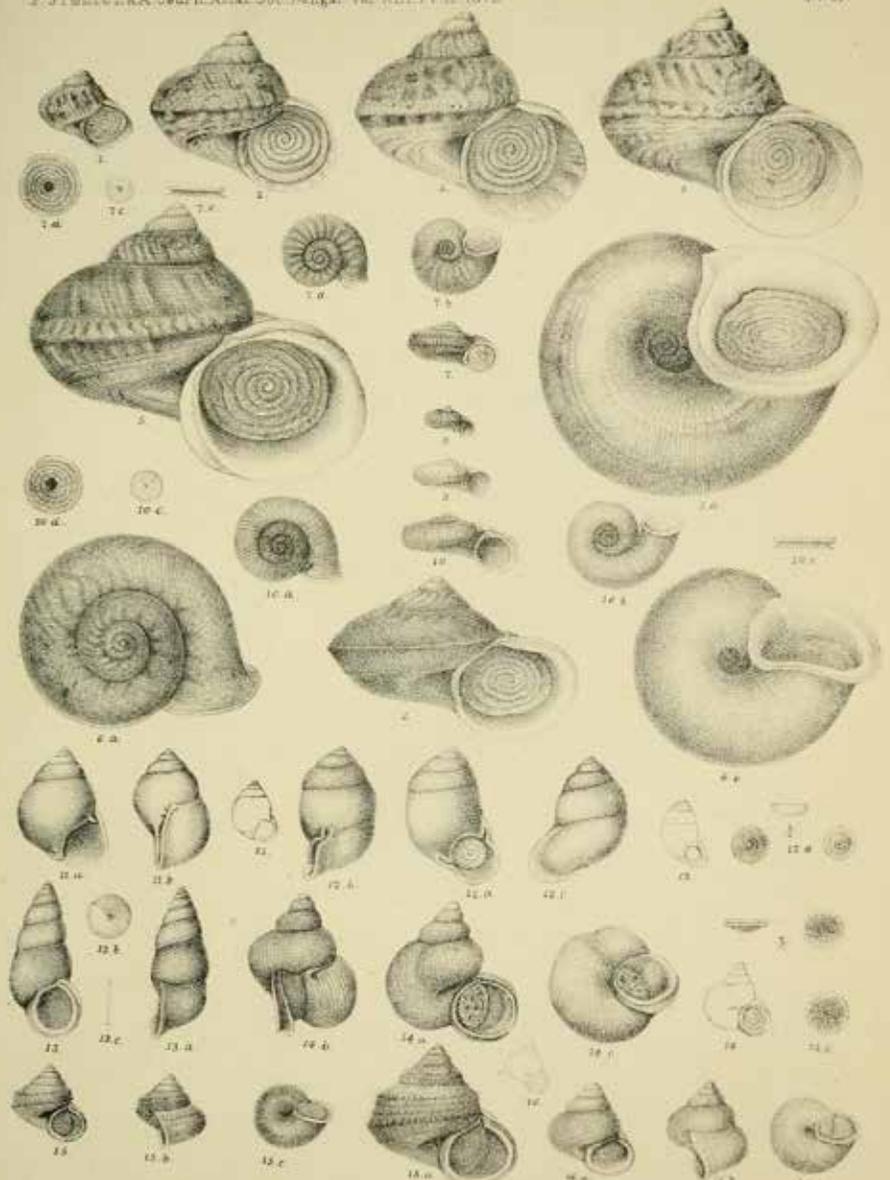
Penang, or Prince of Wales island, although possessing a rich vegetation, growing on old metamorphic soil, a moderately hilly ground, and a moist warm climate,—all elements most favorable to Molluscous life,—has up the present time yielded a comparatively very small number of land shells, and this in spite of the repeated visits which it had received from numerous travellers to the East. I can scarcely find record of more than ten species of both CYCLOSTOMACEA and HELICACEA, which had been reported to occur on Penang. The paucity of shells seemed to me scarcely credible; but, when visiting the island in 1869, I was not a little astonished to meet for days with nothing else except *Bulimus atricallosus* and *citrinus*, and *Helix similis* in the low country, cultivated with coco-palms and nutmegs, while in the hills the only common species were a *Rotula* and *Cycloph. Malayanus*, Benson's *Helix Cymatium*, described from Lancavi, being much rarer. After many days wanderings I noticed that all those portions of the ground, which at any, even remote, time shewed signs of having been once under cultivation, were hopeless in a malacological point of view, and I turned into the more wild and deep ravines of the North-Western part of the island. There, after some days search, particularly in the extensive and very dense forests along the edges of more open tracks, abounding with a rich under-vegetation, I was more successful by adding a good number of land shells to the few already known. Many of these are new to science, and as I had obtained all the species alive, and noted the peculiarities of the structure of the animals, my observations, even as regards the few formerly described species, may be useful in supplementing the information which we already possess.

I shall begin in this first part of the paper with the CYCLOSTOMACEA, of which ten species will be reported. My remarks will on this occasion not enter into anatomical details, because I wish to reserve these for a comprehensive study on the anatomy of all the Indian and Barmese species of this group, and the isolated facts would not prove equally interesting as when related in connection with others.

In the second part, which will treat of the HELICACEA, I will, however, give all those anatomical details, which are in many instances essential for the correct determination of the different genera.

F. STOLICZKA, Journ. Anni. Soc. Bengal, Vol. XLII. Pt. II. 1872.

Pl. X.



1-5 *Cyclophorus Malayanus*, p. 262. 13 *Cyclostomastoma sectilabrum*, p. 267.
 6 " *Borneensis*, p. 263. 14 *Stycicus gibbosulus*, p. 268.
 7 *Opistheporus Penangensis*, p. 264. 15 *Lagocheilus trochoides*, p. 270.
 8-10 " *solutus*, p. 264. 16 " *striolatus*, p. 271.
 11-12 *Pupina aureola*, p. 267.

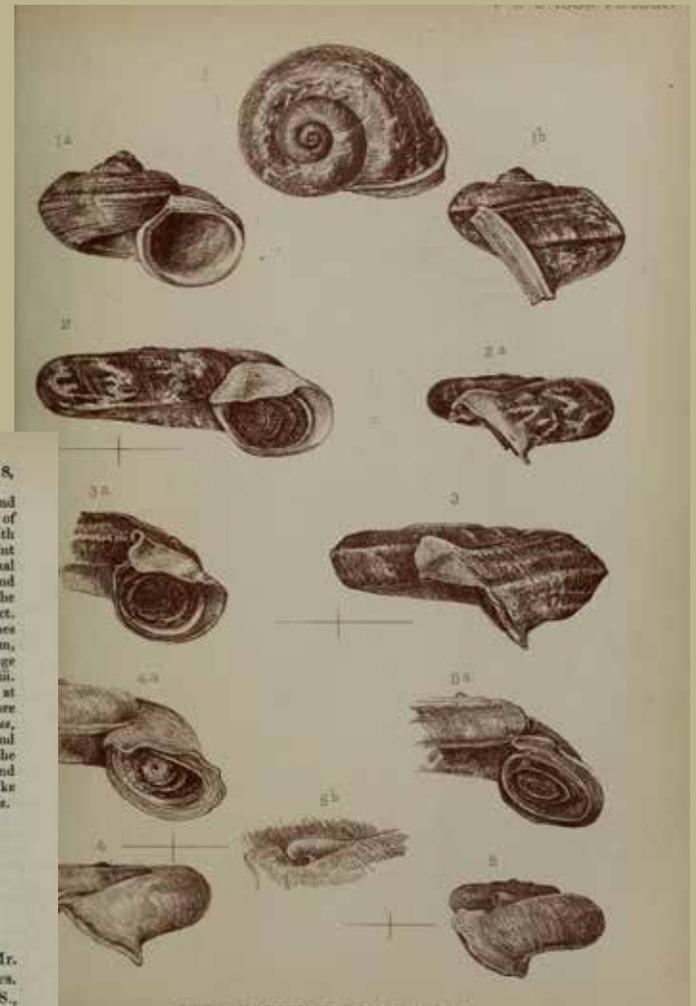
Chapter 2

THE DIVERSITY OF LAND SNAILS AND SLUGS IN MALAYSIA

Scientists estimate that there are 800 to 1,000 species belonging to 130 to 140 genera from 36 families in Malaysia.

Malaysia's land snails and slugs have been studied for more than 150 years. Much of these works were done independently by various researchers in different locations between the 1870s and 1990s, mostly at accessible sites along pre-colonial trade routes (such as rivers, portage and foot trails), new transport routes (such as railways and roads) and administrative stations (such as settlements, trading posts and hill stations). These species were documented in hundreds of publications as textual descriptions which often come with no illustrations. Since the start of the 21st Century, technological advancements in modern microscope imaging, genetic techniques and data sharing have enabled scientists to revise land snails and slugs in Malaysia at the species, genus and even family levels to verify the validity of these taxa. The taxonomy of land snails and slugs is now undergoing a renaissance with multiple ongoing studies across Malaysia.

In Malaysian Borneo, scientists are preparing a comprehensive book - "Land snails and slugs of Sabah and Labuan (Malaysia)", containing detailed descriptions,



332 LIEUT.-COL. H. H. GODWIN-AUSTEN ON [June 18,

smaller specimens; the transverse dark bands on the body and blotches along the median fins are faintly marked. The paddles of the ventral fins are tipped with blackish brown, and were edged with violet in the fresh specimen; the general colour of which was a faint pink, with yellowish tinge along the basal half of the dorsal and anal fins. The abdominal cone is bright silvery; it has no trace of a hind marginal membrane. The caudal is subtruncate; and, lastly, the cylindrical hyaline warts on the nape are very prominent and distinct.

I believe that *Eretmophorus* belongs to the GADIDAE and approaches that section to which *Haloporphyrus* and *Physiculus* belong. I am, however, inclined to think that its nearest ally may be the strange pelagic Gadoid described a few years ago ('Naturalista Siciliano,' iii. pl. 2) by my friend Dr. L. Facioli, from a single specimen got also at Messina, and named *Hypirrhynchus hepaticus*, Faci. Later two more specimens were got at Naples, and I have one. *Hypirrhynchus*, which deserves to be more fully described, has much the size and shape of *Eretmophorus*, but there is no abdominal cone and the ventrals have seven rays, some of which are slightly prolonged and end in a rounded head; but no fish that I know of possesses anything like the beautiful lanceolate ventral paddle-like blades of *Eretmophorus*.

EXPLANATION OF PLATE XXXIV.

- Fig. 1. Enlarged scales of *Eretmophorus Heimbeyeri*.
2. Younger specimen, natural size.
3. Nearly adult specimen, slightly enlarged.
4. Oldest or adult specimen, same and a half natural size.

2. On a Collection of Land-Shells made in Borneo by Mr. A. Everett, with Descriptions of supposed new Species. By Lieut.-Col. H. H. GODWIN-AUSTEN, F.R.S., F.Z.S., &c.—Part I. Cyclostomacea.

[Received June 1, 1889.]

(Plates XXXV.—XXXIX.)

INTRODUCTION.

This truly fine collection was brought home in 1888 by Mr. A. Everett, and he very kindly let me see it, and handed it over to me for the identification of the species. In this work, which has been delayed from various causes, I have been assisted very materially by Dr. B. Hungerford, who had a better and previous knowledge of the shells from that part of the world, and had in his collection examples of a good many Bornean species obtained from Sir James Low, Mr. Boxall, and other sources. Mr. Edgar Smith has also given me much aid in looking over and comparing these shells with those in the British Museum collection, and to both my sincere thanks

An excerpt of Godwin-Austen (1889) describing land snails of Borneo. source: <https://www.biodiversitylibrary.org/>

illustrations and distributions of all 343 land snail and slug species in the region, belonging to 96 genera and 32 families. This extensive study is based on specimens deposited in various institutional collections, especially the BORNEENSIS collection of the Institute for Tropical Biology and Conservation, Universiti Malaysia Sabah. Established in 2001, the BORNEENSIS collection is the most comprehensive land snail and slug reference collection in Malaysia - a testament to the decades of meticulous collecting and curation by Menno Schilthuizen, Thor-Seng Liew, Jaap Vermeulen as well as numerous students and field assistants. Among the 343 land snail and slug species, 66 species (about 20%) were new and have only been described since 2008.



A life-sized comparison of Malaysian land snail shells.

A close-up view of land snails in the 5 mm size class.

Meanwhile in the state of Sarawak, Malaysian Borneo, a recent survey of land snails and slugs in the district of Bau revealed 122 land snail species belonging to 57 genera from 24 families. Albeit covering just a small section of the state, the documented species in the survey constitutes about one-third of the known species in Sarawak, with 13 new species described.

For Peninsular Malaysia, the most recent documentation of land snails was conducted in Kinta Valley, Perak, in which 122 land snail species belonging to 47 genera and 23 families were recorded, accounting for about one-third of the total species recorded in Peninsular Malaysia.

With these three publications, approximately half of all Malaysian species and almost all genera and families have been documented with high-quality illustrations and photographs. With the ongoing land snail and slug studies by Thor-Seng Liew and Junn-Kitt Foon in Peninsular Malaysia and Sabah, as well as Mohammad Effendi bin Marzuki in Sarawak, it is expected that the documentation of land snails across Malaysia will be completed along with the descriptions of several dozen new land snail species.



A close-up view of land snails in the 10 mm size class.



A close-up view of land snails in the 2.5 mm size class.





67997

Rhinocochlis chlorosoma

Dyakiidae

The posterior of a living land snail.

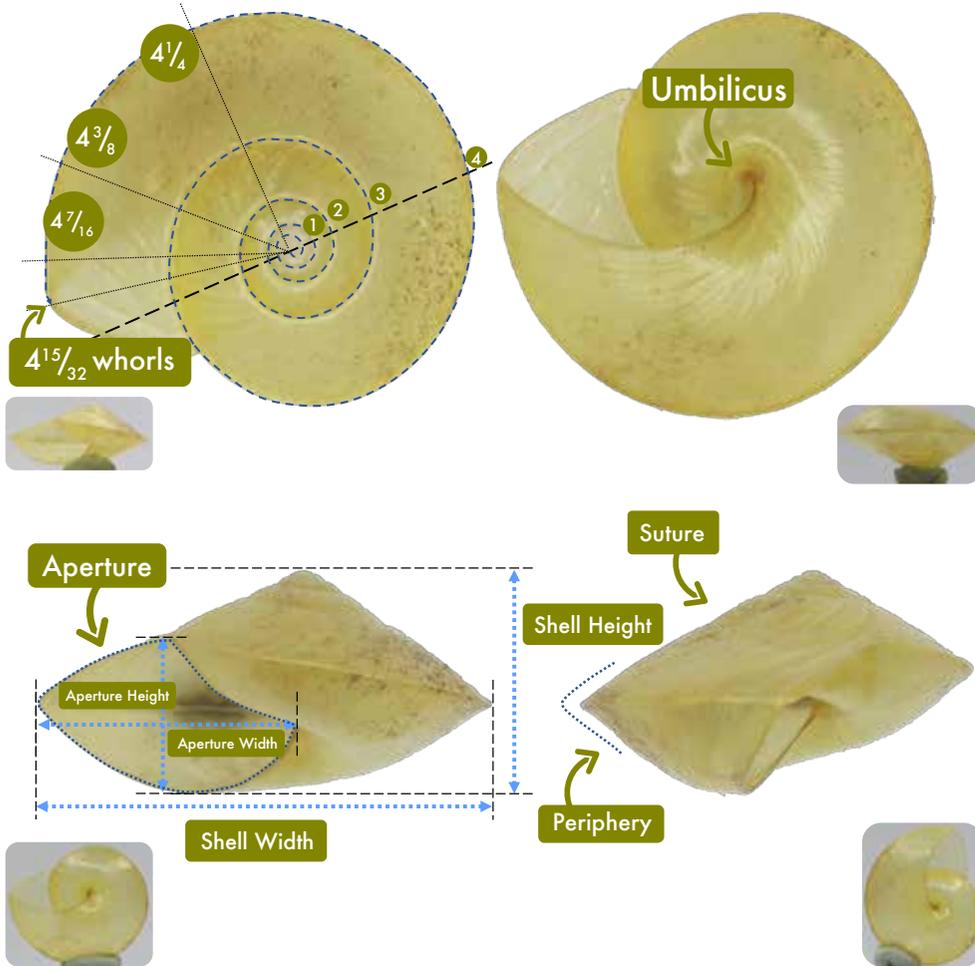
Chapter 3

THE APPEARANCE OF LAND SNAIL SHELLS

Land snail and slug species display an astounding diversity of colours, shapes, and sizes in their shells and soft bodies.

Out in the wild, we generally observe and photograph land snails from their natural postures, which are usually their dorsal sides. However, in order to accurately identify land snails using their shell shape and size, we need to position the shell in a series of standard views, as used in all taxonomic references, so that we can compare photographs of the creature to these references for species identification.

The description of a land snail species always begins with the description of the entire shell in terms of: (1) linear measurements in millimetres, of various parts of a shell namely the entire shell, the shell opening or aperture and the umbilicus (Figure on the left); (2) the shell's external appearance - its overall shape, colour, colour pattern, number of whorls and coiling direction.



A diagram of standard shell views and characters used to measure and identify land snails, as exemplified by the shell of the species *Rhinocochlis chlorosoma*.

SHELL SHAPE & COILING DIRECTION

DEXTRAL (RIGHT-HANDED) SHELL



64907

Videna bicolor
Trochomorphidae

Disc shaped.



66269

Pupina hosei
Pupinidae

Teardrop shaped.



68061

Coneuplecta calculosa
Euconulidae

Conical shaped.

SINISTRAL (LEFT-HANDED) SHELL



64871

Dyakia hugonis
Dyakiidae



67783

Diplommatina sinistra
Diplommatinidae

COILING



67893

Rhiostoma chupingense
Cyclophoridae

A unique species with a detached last whorl.

50065

Whittenia gittenbergeri
Diplommatinidae

A unique species that grows its shell in three different coiling axes.



67894

Ditropopsis davisoni
Cyclophoridae

A unique species with mostly detached whorls.



67788

Discartemon plussensis
Streptaxidae

With two dentitions as apertural barriers.



67894

Gastrocopta avanica
Gastrocoptidae

With five dentitions as apertural barriers.



64923

Gulella bicolor
Streptaxidae

With four dentitions as apertural barriers.

In addition to these features, we should also examine more detailed shell features such as: (1) shell whorls in terms of periphery shape, suture and detachment; (2) aperture in terms of shape, dentition, peristome, and tube; (3) operculum in terms of type and structure.

Finally, very fine details of the shell such as surface sculpture are also important features that can be used to identify species.

APERTURE

OPERCULUM & TUBE



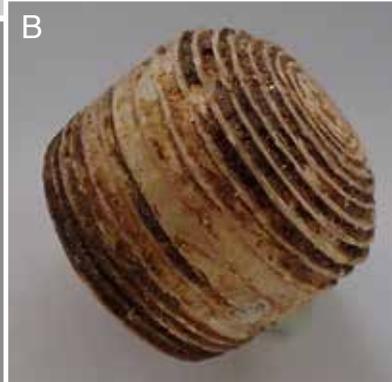
A



67893

Rhiostruma chupingense
Cyclophoridae

A: Showing the detached last whorl.
B: Operculum.



B



breathing tube

breathing tube

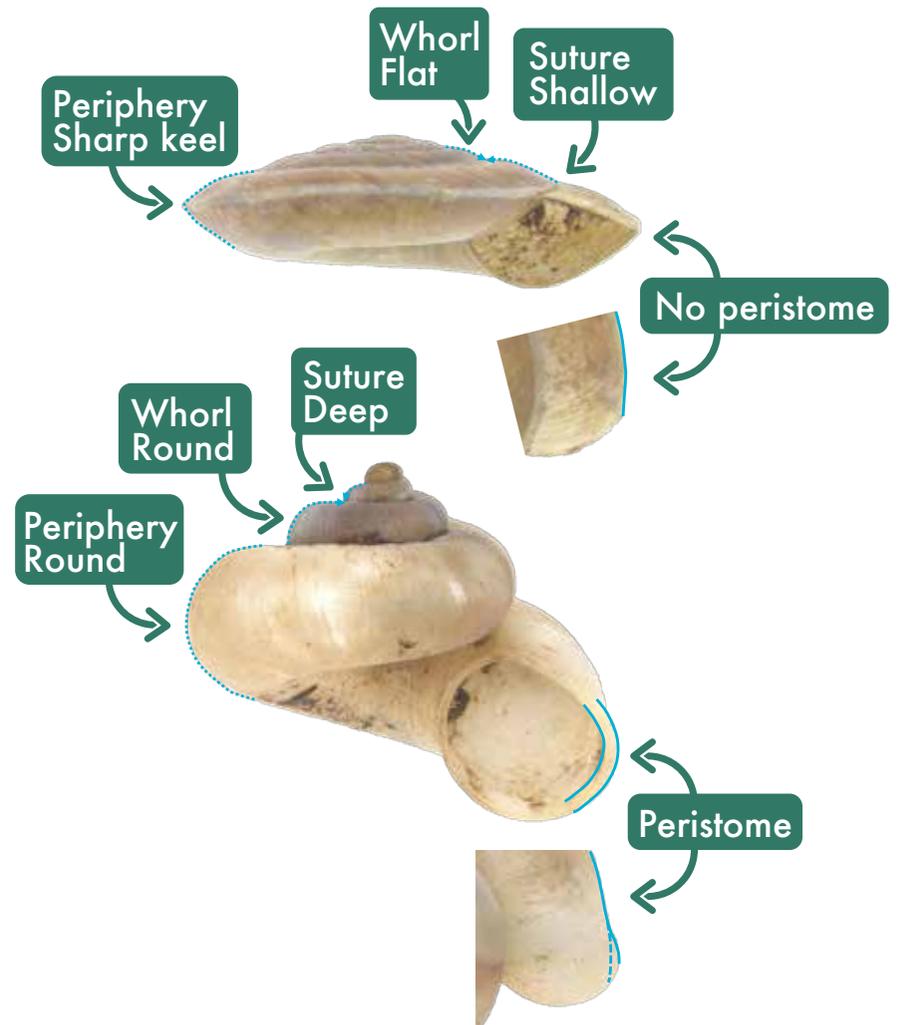


67817

Rhiostruma jousseaumei
Cyclophoridae

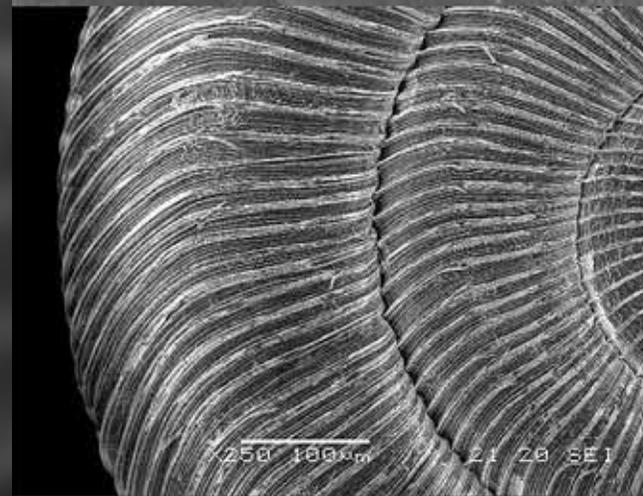
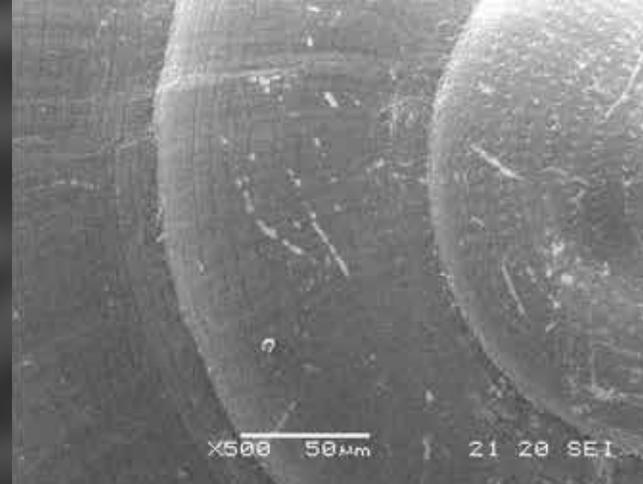
Showing the breathing tube at the detached last whorl.

PERISTOME, SUTURE, WHORL, PERIPHERY SHAPE



The shell characters of peristome, suture, whorl shape and periphery shape used in identifying land snails, as exemplified by the species *Videna repanda* and *Platyrhaphe bicolor*.

SHELL SCULPTURE



Examples of shell sculpture (top to bottom):
Microcystina sinica, *Discocharopa aperta*, *Sitalinopsis conulus* and *Corinomala kobelti*.



***Glyptaulax* sp.**
Charopidae



67616

Plectostoma everetti
Diplommatinidae



67821

Sinoennea subcylindrica
Diapheridae



67593

Diplommantina toretos
Diplommatinidae

The variety of shell shapes, colour and sizes ranging from 0.7 mm to 80 mm give land snails unique characters and external appearances.

Yet, this may be the first time readers realise the extraordinary diversity of native land snail shells in Malaysia. This is not surprising as most people may not have seen these land snails because almost all of them are found only in natural habitats and most of them are smaller than 5 mm, which can be easily overlooked.

Examples of shell sculpture.

KARST FOREST



Limestone karsts provide excellent habitats for land snails because they are rich in calcium and have many wet and cool refuges.

Chapter 4

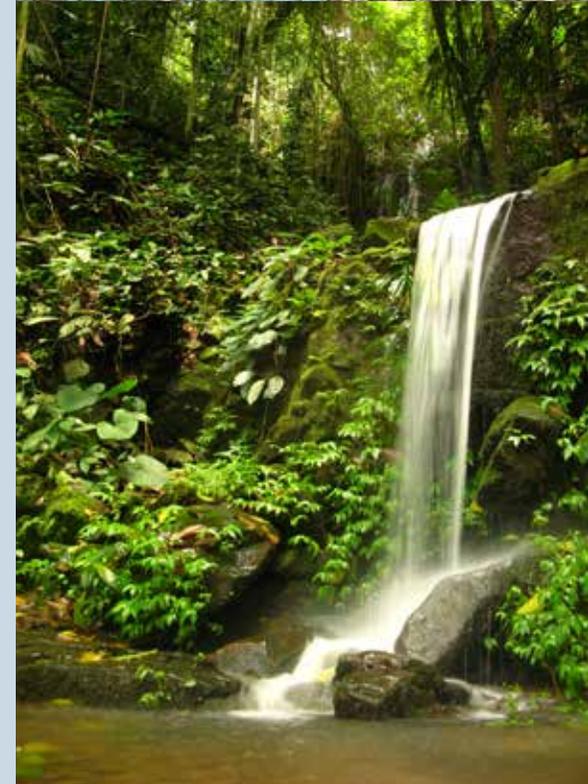
HOW TO STUDY LAND SNAILS AND SLUGS AND WHERE TO FIND THEM?

There are over 800 species of land snails and slugs in Malaysia and between 30 to 60 species can be found in an area just the size of a basketball court! Yet, readers may not have seen that many land snail species at one spot, besides a few introduced species. There are a few reasons why the diversity of land snail species is less noticeable to most people. First, almost all land snail species are found in natural forests away from human settlements. Second, the sizes of most land snail species are smaller than 5 mm and cannot be easily seen with a naked eye. Third, the population density of land snails in non-limestone forests is usually very low (except for forests on limestone outcrops where land snails can be abundant). Fourth, almost all species are active only after rain or at night when the temperature is low and the humidity is high, which coincides with the time when humans are usually staying indoors.

Therefore, it is rare to find land snails in the forest and a deliberate targeted search is required if the reader wishes to find them. Since land snails can vary in size from a few millimetres to a few centimetres, there are two ways to find these snails, depending on their sizes. For snails larger than 5 mm (macro snails), we can search directly with the naked eye and a flashlight to compensate for the poor lighting under forests with dense canopy. It is good to search all habitats of land snails such as fallen trees, rotten wood, all parts of living plants, leaf litter on the ground, as well as on fungi and rock surfaces. For snails smaller than 5 mm (micro snails), we can collect up to five litres of loose topsoil and leaf litter from the same habitats. The samples must be dried before the tiny snails are picked up using soft forceps under a stereo microscope or magnifying glass.

NON-KARST FOREST

Forests with rock piles and thick leaf litter also provide good snail habitats.



Non limestone forests also provide suitable habitats for land snails especially near wet and cool refuges like waterfalls.

SAMPLING IN THE FIELD



VEGETATION



GROUND



ROCK



LEAF LITTER



A fine soft tweezer is used to delicately extract microsnails from the leaf litter.



Land snail shells sorted from the leaf litter collected on a limestone hill.

SORTING IN THE LABORATORY



Sorting land snail shells with a stereo microscope in the laboratory.

Photographed by Charina Pria

Most of the land snails encountered during a search in the day are empty shells left after snails have died. In a limestone forest, a thorough search in a small area of about 2 metres by 4 metres may yield a fairly good number of specimens, whereas more effort is required in a non-limestone forest, where searches are usually conducted for two hours in an area of 20 metres by 20 metres. Sampling in a limestone forest may yield dozens of macro snails and hundreds to thousands of micro snails, whereas the numbers are much lower in a non-limestone forest, where rarely more than one or two dozen macro snails and several dozen micro snails can be found. The reader can use this book to identify land snails at least to their genus and then refer to more technical sources for further identification based on the description of shell characteristics as presented in Chapter 3.



67999

Geotrochus haptoderma

2100-3400m



67900

Geotrochus kitteli

1500 - 2400m



67899

Geotrochus labuanensis

Below 1500m



67998

Geotrochus trachus

Below 1500-1900m



67898

Geotrochus paraguensis

Below 1500m

Chapter 5

THE DISTRIBUTION AND HABITAT OF LAND SNAILS AND SLUGS

Land snails and slugs are not evenly distributed across Malaysia. There is minimal overlap in species composition between West Malaysia (Peninsular Malaysia) and East Malaysia (Malaysian Borneo: Sabah, Sarawak and Labuan). While West and East Malaysia individually harbours unique species, the species composition also shows distribution patterns clustered along the altitudinal gradient as well as limestone and non-limestone forests.

In general, different land snail and slug communities are found in three different altitudinal zones, namely lowland zone (habitats at altitudes less than 1500 m), upland zone (habitats at altitudes between 1500 m and 2500 m), and subalpine zone (habitats at altitudes between 2500 m and 4000 m).

Lowland habitats include various types of tropical lowland rainforests and submontane forests, where most widespread land snails and some smaller ranged land snails are found. Here, a few closely related species within the same genus or a group of related subspecies may have patchy or localised distribution patterns due to geographic barriers such as the sea separating islands from the mainland or mountain ranges separating lowland valleys from each other.

Upland or highland habitats include upper montane forests where clouds are a constant feature and the soil is often waterlogged. These highland habitats in the extensive mountain ranges of Malaysia support many small-bodied land snail and slug species and provide better conditions for many semi-slug species compared to lowland and subalpine habitats. In many cases, land snails and slugs are endemic to a particular mountain range because the mountains are like islands in the sky where it is not possible for the highland land snails and slugs with specific environmental requirements to disperse between different mountain ranges that are surrounded by inhospitable lowland habitats.

Unlike the lowland and highland habitats found in both East and West Malaysia, subalpine habitats in Malaysia are confined to the upper elevations of Mount Kinabalu in Sabah only. Almost all species and even some genera of land snails and slugs in these habitats are endemic. Many of these land snails and slugs may be relics of ancient climate changes, where subalpine habitats have provided refuge for them since at least the last ice age.



55517
Plectostoma kubuensis



55510
Plectostoma ikanensis



55504
Plectostoma relauensis



55496
Plectostoma tohchinyawi



55503
Plectostoma palinhelix



55484
Plectostoma sinyumensis



55476
Plectostoma retrovertens



55480
Plectostoma mengaburensis

Google Earth

Data SIO, NOAA, U.S. Navy, NGA, GEBCO
Image Landsat / Copernicus

The distribution of endemic *Plectostoma* land snail species at isolated limestone outcrops across Peninsular Malaysia.

A satellite-style map of Southeast Asia, showing the Malay Peninsula and the Indonesian archipelago. The landmasses are green, and the surrounding water is blue. Several limestone outcrops are highlighted as distinct green islands or patches, scattered across the region. The text is overlaid on the right side of the map.

Besides changes in distribution patterns and habitats along the altitudinal gradient, land snail population density and size is much higher in limestone habitats than in non-limestone habitats. This is because limestone habitats have higher content of calcium carbonate and more basic soils (higher pH) whereas non-limestone habitats are generally poor in calcium carbonate and have more acidic soils (lower pH).

In Malaysia, there are more than a thousand limestone outcrops. These limestone outcrops are like islands isolated from each other by the surrounding acidic non-limestone habitats. Many land snail species, especially micro-land snails that live exclusively on limestone (called limestone-obligates), are endemic and have very narrow and restricted distributions. These endemic limestone-obligate land snails may only be found on a single limestone outcrop or a cluster of nearby limestone outcrops. Usually, more isolated limestone outcrops tend to have more endemic land snail species.



Chapter 6

LAND SNAILS ARE THE MOST ENDANGERED TERRESTRIAL ANIMAL GROUP IN MALAYSIA

When we talk about critically endangered animals in Malaysia, our first impressions are usually charismatic large mammal species such as the Tiger, Javan Rhinoceros, Sunda Pangolin, Sumatran Rhinoceros, Bornean Orangutan and Bornean Banded Langur. However, these mammal species account for less than ten percent of all critically endangered terrestrial animal species in Malaysia. In fact, there are twice as many other critically endangered vertebrate species as there are mammal species, not to mention that most of the critically endangered species in Malaysia are actually invertebrates.

Most notably, the International Union for Conservation of Nature (IUCN) Red List recognises that the only extinct (EX) terrestrial animal species endemic to Malaysia is a land snail - *Plectostoma sciaphilum*. This extinct species was first described by the researcher Wouter van Benthem-Jutting in 1952 and can only be found on one limestone outcrop - Bukit Panching, near Kuantan, Pahang. This limestone outcrop was completely quarried away by 2007, thus permanently destroying the only known location of this species.

Malaysia's first globally extinct species!!



55460

Plectostoma sciaphilum

The land snail, is endemic to Bukit Panching



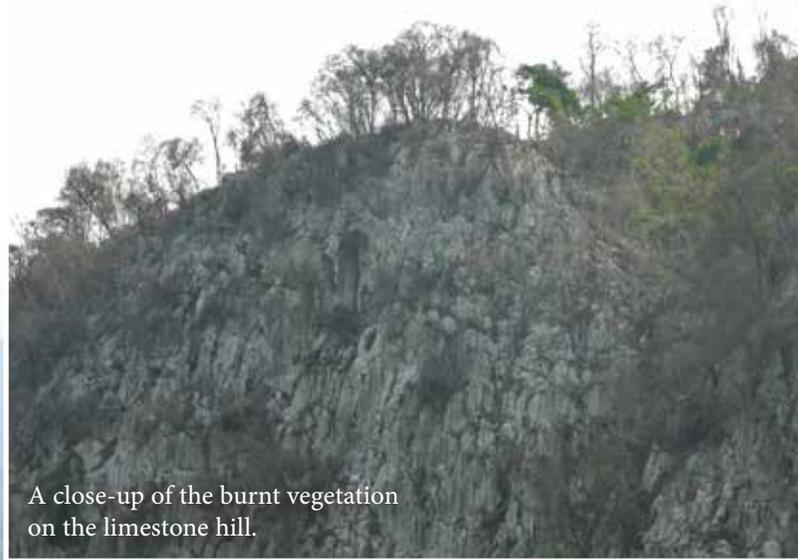
Bukit Panching was quarried for limestone used in construction work.

Once standing tall over the plains, Bukit Panching is now merely a water-filled depression.

A LIST OF EXTINCT AND CRITICALLY ENDANGERED LAND SNAILS IN MALAYSIA

Species	Status	Location
<i>Arinia boreoborneensis</i>	CR	limestone outcrops W of Kudat; southernmost point of P. Banggi - mykarst-603 Karakit
<i>Arinia dentifera</i>	CR	limestone outcrops NW. of road Lahad Datu-Sandakan crossing with Segama R
<i>Arinia oviformis</i>	CR	1 km SE. of Simatuoh, 10 km ESE. of Sepulut
<i>Arinia simplex</i>	CR	Bt. Gomantong, 30 km S. of Sandakan
<i>Chamalycaeus microconus</i>	CR	Prk 55 G. Pondok
<i>Chamalycaeus mixtus</i>	CR	Prk 55 G. Pondok
<i>Charopa lafargei</i>	CR	mykarst-027
<i>Gyliotrachela luctans</i>	CR	Prk 55 G. Pondok
<i>Boysidia elephas</i>	CR	Phg 75 Bt Tenggek
<i>Plectostoma decrespignyi</i>	CR	Labuan
<i>Plectostoma fraternum</i>	CR	mykarst-720 Bukit Tomanggong Besar
<i>Plectostoma inornatum</i>	CR	Sepulut
<i>Plectostoma jucundum</i>	CR	mykarst-589 Mantanani Besar
<i>Plectostoma mirabile</i>	CR	Suan Lamba, Kinabatangan
<i>Plectostoma otostoma</i>	CR	Islets off Labuan
<i>Plectostoma perspectivum</i>	CR	mykarst-652 Batu Punggul
<i>Plectostoma thersites</i>	CR	Phg 72 Bt Panching (not updated since 2007)
<i>Opisthostoma trapezium</i>	CR	Prk 47 Kanthan
<i>Paraboysidia serpa</i>	CR	Kdh 01 Bt Baling
<i>Plectostoma charasense</i>	CR	Phg 72 Bt Panching; Phg 73 Bt Charas
<i>Plectostoma dindingensis</i>	CR	Kampung Bukit Dinding, Pahang
<i>Plectostoma retrovertens</i>	CR	Phg 05 Bt. Cintamanis
<i>Plectostoma sciaphilum</i>	EX	Phg 72 Bt Panching
<i>Plectostoma tenggekensis</i>	CR	Phg 75 Bt Tenggek
<i>Plectostoma turriforme</i>	CR	Phg 75 Bt Tenggek; Phg 74 Bt Sagu
<i>Plectostoma umbilicatum</i>	CR	Phg 01 Kota Gelanggi
<i>Stomacosmethis balingensis</i>	CR	Kdh 01 Bt Baling

According to the IUCN Red List as of 28 Jul 2021, 28 of the total 69 terrestrial animal species (40%) in the Critically Endangered (CR) category are land snails. The IUCN Red List defines Critically Endangered species as those that face extremely high risk of extinction in the wild. All 28 species listed are micro land snails, and three-quarters of them belong to the family Diplommatinidae, while the remaining seven species belong to the families Alycaidae, Charopidae and Gastrocoptidae. Each of the 28 micro-land snail species are endemic to a single limestone outcrop or a cluster of limestone outcrops which are experiencing habitat loss due to fires, forest clearing and irreversible environmental alteration through limestone quarrying.



A close-up of the burnt vegetation on the limestone hill.



Land snails can get killed by fires or subsequent exposure to dry and hot conditions after fires.

The limestone quarry at Bukit Baling.



The limestone quarry at Bukit Tenggek has almost completely removed all the natural vegetation on the limestone hill.



66505

Arinia simplex
Diplommatinidae



63203

Plectostoma mirabile
Diplommatinidae



63199

Opisthostoma trapezium
Diplommatinidae



55476

Plectostoma retrovertens
Diplommatinidae



55485

Plectostoma umbilicatum
Diplommatinidae



67793

Gyliotrachela luctans
Gastrocoptidae



68066

Boysidia elephas
Gastrocoptidae



67970

Chamalycaeus mixtus
Alycaeidae



55465

Charopa lafargei
Charopidae

Photo by Barna Páll-Gergely, courtesy of Ronald Janssen.



63193

Parabosidia serpa
Gastrocoptidae



67759

Chamalycaeus microconus
Alycaeidae



68060

Stomacosmethis balingensis
Alycaeidae



Chapter 7

COMMON LAND SNAIL AND SLUG GENERA AND THEIR SPECIES IN MALAYSIA

There are more than 800 species of land snails and slugs belonging to at least 130 genera from 36 families in Malaysia. It is not possible to include all the families and genera, not to mention all species, in this small book. Instead, we have only included species that are of general interest to the public.

First, we present a selection of land snails and slugs categorised into topics of interest rather than taxonomy. These are: land snails and slugs that are common in gardens, macro land snails and slugs that are common in the forest and a selection of main semi-slug and slug genera.

Second, we present a selection of genera and species representing the majority of land snails in Malaysia based on the criteria of high endemism, high species richness and high diversity of shell forms. These include taxa in the families: Diplommatinidae, Camaenidae, Cyclophoridae, Pupinidae, Streptaxidae, Diapheridae and Alycaeidae.

Finally, we present a selection of other smaller but remarkable land snail genera and species, namely from the families: Vertiginidae, Gastrocoptidae, Trochomorphidae, Dyakiidae, Helicinidae, Hydrocenidae, Clausiliidae, Achatinidae, Ariophantidae, Euconulidae, Chronidae, Plectopylidae, Endodontidae, Charopidae, Valloniidae, Assimineidae and Achatinellidae.



67636

Lissachatina fulica

Achatinidae

Originated from East Africa.



Succinea sp.

Succineidae

Origins unknown.

COMMON GARDEN LAND SNAILS AND SLUGS

Most readers are familiar with the common land snails and slugs around our homes in suburban gardens, parks and agricultural lands. Snails and slugs in these areas are usually highly adapted to and tolerant of extreme environmental conditions such as heat and human-made infrastructure. Many of these species are not native to Malaysia and instead were introduced from elsewhere around the world. They were often introduced by accident through the transport of soil or agricultural materials where they can conceal themselves. Their adaptability to human-modified landscapes have made some of them among the world's most invasive species.



64860

Macrochlamys indica

Arlophantiidae

Possibly originated from India.



64857

Bradybaena similaris

Camaenidae

Originated from East Asia.



64923

Gulella bicolor
Streptaxidae

Originated from India.



64694

Valiguna flava
Veronicellidae

Originated from Southeast Asia.



67954

Laevicaulis alte
Veronicellidae

Possibly originated from Africa.

A: Dorsal (top) view.
B: Ventral (bottom) view.



64706

Parmarion martensi
Ariophantidae

Possibly originated from Southeast Asia.



64705

Semperula wallacei
Veronicellidae

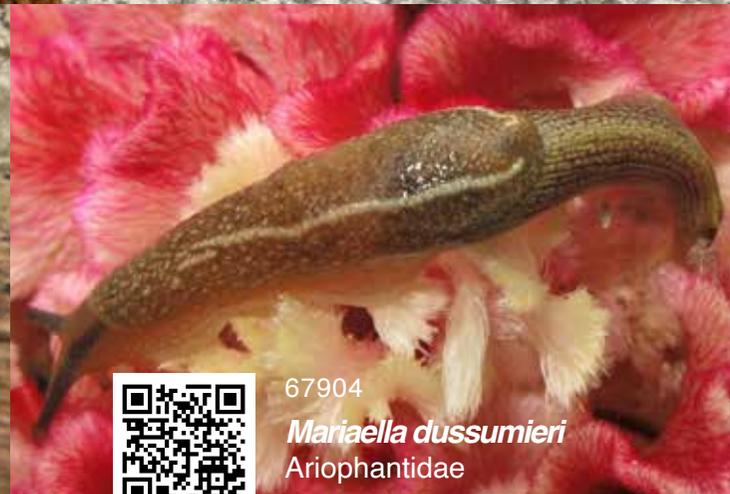
Originated from Borneo.



67955

Deroceras laeve
Agriolimacidae

Originated from Europe.



67904

Mariaella dussumieri
Ariophantidae

Originated from India.

COMMON MACRO LAND SNAIL SPECIES IN THE FOREST

Most of the land snails encountered by people in the forests of Malaysia are the large sized (macro) species as they can be easily spotted with the naked eye. Macro land snails are often seen crawling around their habitats after rains and on night walks.

Ground dwelling macro land snails such as those in the families Dyakiidae, Ariophantidae, Chronidae, Pupinidae, Cyclophoridae and Camaenidae (genus *Chloritis*) tend to have shells with brown and mottled patterns that match their leaf litter habitat.

Tree and shrub dwelling macro land snails such as those in the family Camaenidae (genera *Amphidromus*) tend to have more colourful shells that match the verdant forest canopy.



67657

Quantula striata
Dyakiidae

LIST OF GENERA

QUANTULA	COCHLOSTYLA
EVERETTIA	AMPHIDROMUS
DYAKIA	CHLORITIS
HEMIPLECTA	EXRHYSOTA
PLATYMMA	POLLICARIA
MACROCHLAMYS	RHIOSTOMA
CYCLOPHORUS	CYCLOPHORUS
PTEROCYCLOS	PTEROCYCLOS
	OPISTHOPORUS

Did you know?

Quantula striata is the world's only known bioluminescent land snail. Adults and juveniles can be seen generating faint flashes of lights at night. Its eggs also glow in the dark.



64872

Everettia subconsul
Dyakiidae



Dyakia sp.
Dyakiidae



68062
Hemiplecta lahatensis
Ariophantidae



67905
Hemiplecta malaouyi
Ariophantidae



67994
Macrochlamys trilobata
Ariophantidae



Macrochlamys sp.
Ariophantidae



67884
Platymma tweediei
Chronidae

Photographed by Azrie Alliamat

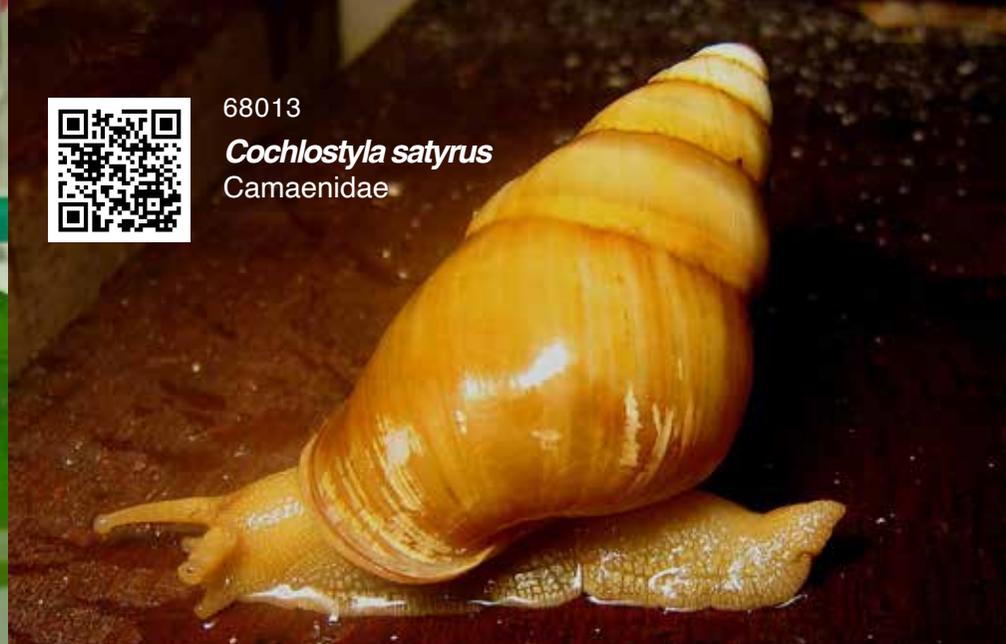
A: Ventral view
B: Dorsal view





64900

Cochlostyla trailli
Camaenidae



68013

Cochlostyla satyrus
Camaenidae



67906

Chloritis bifoveata
Camaenidae



64901

Chloritis sibuensis
Camaenidae



67575

Cyclophorus perdix tuba
Cyclophoridae



64870

Cyclophorus semisulcatus
Cyclophoridae



64889

Amphidromus adamsii
Camaenidae



67661

Exrhysota brookei
Chronidae



Amphidromus sp.
Camaenidae



67893

Rhiostoma chupingense
Cyclophoridae



64866

Amphidromus martensi
Camaenidae



67811

Pollicaria elephas
Pupinidae



Pterocyclos sp.
Cyclophoridae



64887
Opisthoporus iris
Cyclophoridae



64892
Pterocyclos trusanensis
Cyclophoridae



66250
Opisthoporus pterocycloides
Cyclophoridae



67910
Opisthoporus bialatus
Cyclophoridae



67804
Opisthoporus solutus subsolutus
Cyclophoridae



67909
Pterocyclos diluvium
Cyclophoridae



SEMI-SLUGS

Each semi-slug has a simple and reduced shell embedded under its mantle tissue in which the animal's soft body cannot retract into. As they are unable to retract into their shells during droughts, semi-slugs tend to be especially sensitive to heat and moisture loss. Unsurprisingly, they are generally found in areas that are cool, have higher rainfall and retain moisture over longer time periods such as in highland forests and limestone outcrops.



67914

Ibycus perakensis
Helicarionidae



67913

Durgella densestriata
Helicarionidae



67995

Microparmarion convolutus
Ariophantidae

LIST OF GENERA

DAMAYANTIA	
DURGELLA	
IBYCUS	
MEGAUSTENIA	
MICROPARMARION	
SABALIMAX	

Did you know?

The semi-slug *Ibycus rachelae* will aggressively swing its shell and twist its body rapidly when disturbed, presumably as a mechanism to defend itself and escape from predators such as beetles.



67915

Microparmarion simrothi
Ariophantidae



67886

Megaustenia heliciformis
Ariophantidae



67962

Sabalimax pantherina
Euconulidae

SLUGS

Slugs are gastropods without any shell. Similar to semi-slugs, slugs are also sensitive to temperature and humidity changes, and are thus usually found in forests at higher elevations and with more rainfall.



Atopos sp.
Rathouisiidae

Did you know?

Atopos slugs prey on snails by either directly crawling into the prey's shell or drilling a hole in the shell to access the prey's soft body. This behaviour has led to the evolution of *Plectostoma* snails with spiny shells that discourages predation by *Atopos* slugs.

LIST OF GENERA

MEGHIMATIUM

PHILIPPINELLA

DEROCERAS

SEMPERULA

VALIGUNA



67996

Atopos rapax
Rathouisiidae

Predating a *Plectostoma* sp. snail by drilling a hole in the shell.



67890

Meghimatium pictum
Philomycidae



67883

Meghimatium uniforme
Philomycidae

DIPLOMMATINIDAE

This family of operculated micro snails are remarkably diverse in shell shape and coiling directions. Some genera in this family are habitat specialists. *Plectostoma* and *Whittenia* species live only on limestone outcrops while *Arinia*, *Diplommatina* and *Opisthostoma* live in both limestone and non-limestone forests.

Did you know?

Whittenia vermicula is the only known land snail species in the world that coils in four different axes. The evolution of this bizarre species baffles scientists. Maybe it is driven by *Atopos* slug predation?

LIST OF GENERA

ARINIA	NIAHIA	
DIPLOMMATINA	NOTHARINIA	
MOUSSONIA	OPISTHOSTOMA	
PLECTOSTOMA	WHITTENIA	



66504
Arinia turgida



64864
Diplommatina rubicunda



67917
Plectostoma pulchellum



67916
Diplommatina canaliculata



55475
Plectostoma whitteni



Diplommatina sp.



55535
Plectostoma grandispinosum



55469
Plectostoma christae



55494
Plectostoma laidlawi





67918

Opisthostoma platycephalum



69902

Whittenia vermicula

CAMAENIDAE

This family of pulmonated snails comprises medium to large sized species with flat or tall-spired shells. They dwell on the forest floor as well as on trees and shrubs.

LIST OF GENERA

CHLORAEA	
GANESELLA	
KENYIRUS	✍
LANDOURIA	
OBBA	
TRACHIA	✍
BRADYBAENA	
AMPHIDROMUS	
CHLORITIS	
COCHLOSTYLA	



67919

Chloraea puella



67645

Landouria winteriana



67920

Obba marginata





64873

Ganesella acris



CYCLOPHORIDAE

This family of operculated snails exhibits a remarkable diversity of shell shapes. They dwell on the forest floor as well as on trees and shrubs.

Did you know?

The operculated land snails in the families Cyclophoridae, Diplommatinidae and Pupinidae have ancient origins, with fossils dating back to around 100 million years ago.

LIST OF GENERA

JAPONIA/LAGOCHILUS

LEPTOPOMA

CRASPEDOTROPIS

CYCLOPHORUS

OPISTHOPORUS

PTEROCYCLOS

RHIOSTOMA

DITROPOPSIS

MYXOSTOMA

PLATYRHAPHE



67577

Japonia barbata



64862

Leptopoma undatum



67921

Lagocheilus rollei



66543

Japonia trilirata kinabaluensis



67922

Leptopoma atricapillum



67574

Craspedotropis borneensis



67810

Platyrrhaphe lowi



65488

Ditropopsis koperbergi





67810

Platyrrhaphe lowi

In leaf litter.



67923

Myxostoma petiverianum tenggolense



PUPINIDAE

This family of operculated snails usually has a tall spired shell. They dwell on the forest floor in leaf litter and under dead logs.

LIST OF GENERA

COPTOCHEILUS

PUPINA

PUPINELLA



RHAPHAULUS



TORTULOSA

POLLICARIA



68063

Coptocheilus sectilabris

Pupina sp.





67924

Coptocheilus anostomus



66269

Pupina hosei



67925

Tortulosa tortuosa



67927

Discartemon collingei

STREPTAXIDAE

The families Streptaxidae and Diapheridae are pulmonated snails with flat or tall-spired shells. They are carnivorous and prey on other land snails and invertebrates on the forest floor.

LIST OF GENERA

DISCARTEMON

OOPHANA

GULELLA





Discartemon sp.



67963

Oophana tiomanensis



67929

Oophana atopospira

DIAPHERIDAE

LIST OF GENERA

BRUGGENEA



DIAPHERA



PLATYCOCLIUM



SINOENEA



67930

Sinoenea callizonus

ALYCAEIDAE

This family of operculated snails has flat to tall-spined shells. *Alycaeus*, *Chamalycaeus* and *Dicharax* species can be found living on the forest floor or on limestone outcrops while *Pinerna* species are limestone outcrop and shrub-dwellers. *Stomacosmethis* species can mostly be found living on limestone outcrops.

LIST OF GENERA

ALYCAEUS

PINCERNA

STOMACOSMETHIS



67765

Alycaeus jousseaumei



67971

Stomacosmethis kelantanensis expansus



67571

Pincerna globosa



68064

Stomacosmethis perakensis

ALYCAEIDAE

LIST OF GENERA

CHAMALYCAEUS

DICHARAX



67973

Chamalycaeus everetti



68065

Dicharax diplochilus



VERTIGINIDAE

This family of pulmonated micro snails has tall-spired shells. They tend to occur in coastal forests and limestone outcrops. They generally possess shells with dentitions in the aperture.

LIST OF GENERA

NESOPUPA



64910

Nesopupa moreleti



64911

Nesopupa malayana

Photographed by Phung Chee Chean

GASTROCOPTIDAE

This family of pulmonated micro snails has shells with flat or tall spire and dentitions in the aperture. They are usually found living on rock surfaces of limestone outcrops, with some being highly endemic to individual limestone hills.

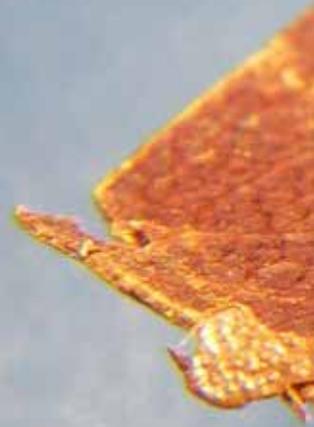
LIST OF GENERA

BOYSIDIA

GASTROCOPTA

GYLIOTRACHELA

PARABOYSIDIA



64909

Gastrocopta avanica



67792

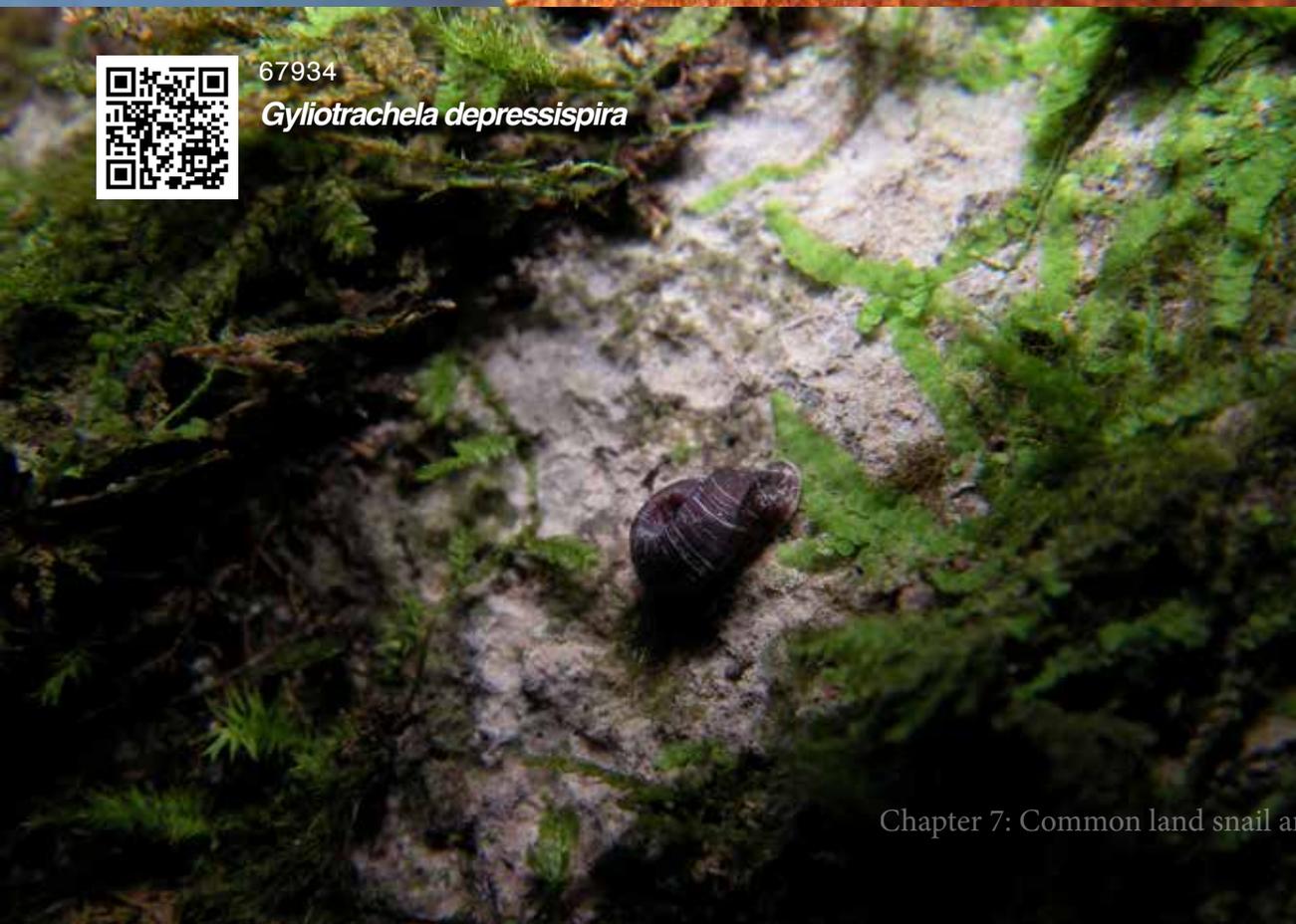
Gyliotrachela hungerfordiana





67932

Boysidia ringens



67934

Gylotrachela depressispira



Paraboysidia sp.

TROCHOMORPHIDAE

This family of pulmonated snails are characterised by their flat spired shells. They are often found living under bracket fungi and rotten logs.

LIST OF GENERA

GEOTROCHUS

VIDENA



67898

Geotrochus paraguensis



67659

Geotrochus subscalaris



64907

Videna bicolor



64908

Videna repanda





67656

Rhinocochlis nasuta

DYAKIIDAE

This family of pulmonated snails have shells with variable spire height. They are usually ground dwellers, except for *Rhinocochlis nasuta* and a few other species that live on trees.

LIST OF GENERA

KALAMANTANIA

PSEUDOPLECTA

RHINOCOCHLIS

DYAKIA

QUANTULA

EVERETTIA



67959

Kalamantania whiteheadi



67812

Pseudoplecta bijuga



HELICINIDAE

This family of operculated snails has conical or teardrop shaped shells. They are generally ground and shrub dwellers.

LIST OF GENERA

APHANOCONIA

GEOPHORUS



SULFURINA



66344

Aphanoconia usukanensis



64865

Sulfurina martensi



67790

Georissa monterosatiانا

A: Juvenile
B: Adult

A

HYDROCENIDAE

This family of operculated micro snails has tall-spired shells. They are almost always found living on limestone outcrops.

LIST OF GENERA

GEORISSA



B

CLAUSILIIDAE

In Malaysia, this family of pulmonated snails can be distinguished by their unmistakably left-coiling, screw-shaped shell with dentitions at the aperture. They usually live under rotten logs, on tree trunks and rock surfaces.

LIST OF GENERA

OOSPIRA



PHAEDUSA

PARAPHAEDUSA



67808

Phaedusa filicostata



67936

Phaedusa kelantanensis



ACHATINIDAE

This family of pulmonated snails can be distinguished by their right-coiling, screw-shaped shell and usually without any dentitions at the aperture. They are leaf litter dwellers.

LIST OF GENERA

ALLOPEAS	✓
CURVELLA	✓
PAROPEAS	
PLICAXIS	
LISSACHATINA	
OPEAS	✓
SUBULINA	✓



67807

Paropeas tchehelense



67937

Plicaxis mirabilis



67938

Baiaplecta lowi

ARIOPHANTIDAE

This family of pulmonated gastropods are very diverse in external appearance and can range from snail to semi-slug, with varying degrees of reduction in shell size and shape.

LIST OF GENERA

BAIAPLECTA		ARIOPHANTA	
MICROCYSTINA	✘	HEMIPLECTA	
CRYPTOZONA		DAMAYANTIA	✘
RAHULA	✘	IBYCUS	
SITALINOPSIS	✘	MEGAUSTENIA	
SARIKA		MICROPARMARION	
WIEGMANNIA	✘	PHILIPPINELLA	
VITRINULA		MACROCHLAMYS	
CRYPTOSEMELUS		PARMARION	



Sarika sp.



67940

Vitrinula glutinosa



67939
Cryptozona siamensis



67794
Helicarion permolle



68145
Cryptosemelus gracilis



67965
Vitrinula padasensis



67945

Kaliella punctata*Kaliella* sp.

CHRONIDAE

This is a family of pulmonated snails with extreme size variations from micro-sized *Kaliella* species to the largest land snails in Malaysia - the palm-sized *Exrhysota brookei* and *Platymma tweediei*. They live on the forest floor and on shrubs.

LIST OF GENERA

KALIELLA

VITRINOPSIS

EXRHYSOTA

PLATYMMA



67943

Kaliella dendrobates

67941

Kaliella accepta

63561

Kaliella doliolum

EUCONULIDAE

This is a family of pulmonated micro snails. They live on the forest floor and on shrubs.

LIST OF GENERA

CONEULECTA



68061

Coneuplecta calculosa



PLECTOPYLIDAE

This is a family of pulmonated snails with flat spired shells. It has a wide distribution across South and East Asia. There is only one species in Malaysia - *Plectopylis malayana*, distinguished by its disc-shaped and left-coiling shell. It lives on the limestone outcrops of Perlis.

LIST OF GENERA

PLECTOPYLIS



67948

Plectopylis malayana



67650

Beilania philippinensis



ENDODONTIDAE

This is a family of pulmonated micro snails with flat spired shells and dentition at the aperture. It has a wide distribution with many species across islands in the Pacific Ocean. In Malaysia, there is only one species - *Beilania philippinensis*.

LIST OF GENERA

BEILANIA

CHAROPIDAE

This is a family of pulmonated micro snails with tall to flat spired shells. It lives in leaf litter.

LIST OF GENERA

CHAROPA	
CORINOMALA	✓
DISCOCHAROPA	✓
GLYPTAULAX	✓
LEUCOCHAROPION	✓
PHILALANKA	
SUNDACHAROPA	✓
TERACHAROPA	✓



Charopa sp.



67950

Philalanka rugulosa



Philalanka sp.



64903

Philalanka kusana



63555

Ptychopatala orcula

VALLONIIDAE

This is a family of pulmonated micro snails with tall to flat spired shells. It lives in leaf litter, on shrubs and on limestone outcrops.

LIST OF GENERA

PTYCHOPATULA

PUPISOMA



Photographed by Phung Chee Chean

ASSIMINEIDAE

This is a family of operculated micro snails with tall spired shells. It lives in leaf litter and on limestone outcrops.

LIST OF GENERA

ACMELLA

ANAGLYPHULA

ASSIMINEA

OPTEDICEROS

OVASSIMINEA

SCULPTASSIMINEA

SOLENOMPHALA

TAIWANASSIMINEA

OPTEDICEROS



67951

Acmeilla polita

64890

Assiminea nitida

67621

Acmeilla cyrtoglyphe



67953

Elasmias manilense



ACHATINELLIDAE

This is a family of pulmonated micro snails with tall spired shells and a dentition at the aperture. It lives in leaf litter, on shrubs and on limestone outcrops.

LIST OF GENERA

ELASMIAS

Bibliography

Barker GM (2001) *The Biology of Terrestrial Molluscs*. CABI Publishing, Wallingford, 572 pp. <https://doi.org/10.1079/9780851993188.0001>

Barker GM (2004) *The biology of terrestrial molluscs*. CABI Publishing, Wallingford, 640 pp. <https://doi.org/10.1079/9780851993195.0000>

Chang Z, Liew T (2021) A molecular phylogeny of *Geotrochus* and *Trochomorpha* species (Gastropoda: Trochomorphidae) in Sabah, Malaysia reveals convergent evolution of shell morphology driven by environmental influences. *PeerJ* 9: e10526 <https://doi.org/10.7717/peerj.10526>

Clements R, Schilthuizen M (2008a) Tracking land snail extinctions from space. *Tentacle* 16: 8–9. https://www.researchgate.net/profile/Gopalasamy-Reuben-Clements/publication/271702822_Tracking_land_snail_extinctions_from_space/links/54cf97e40cf298d65664685d/Tracking-land-snail-extinctions-from-space.pdf

Clements R, Liew T-S, Vermeulen JJ, Schilthuizen M (2008b) Further twists in gastropod shell evolution. *Biology Letters* 4: 179–182. <https://doi.org/10.1098/rsbl.2007.0602>

Clements R, Ng PK, Lu XX, Ambu S, Schilthuizen M, Bradshaw CJ (2008c) Using biogeographical patterns of endemic land snails to improve conservation planning for limestone karsts. *Biological Conservation* 141(11): 2751–2764. <https://doi.org/10.1016/j.biocon.2008.08.011>

Copeland J, Daston MM (1989) Bioluminescence in the terrestrial snail *Quantula (Dyakia) striata*. *Malacologia* 30(1–2): 317–324. <https://www.biodiversitylibrary.org/item/47004#page/329>

Foon JK, Clements GR, Liew T-S (2017) Diversity and biogeography of land snails (Mollusca, Gastropoda) in the limestone hills of Perak, Peninsular Malaysia. *ZooKeys* 682: 1–94. <https://doi.org/10.3897/zookeys.682.12999>

Hirano T, Asato K, Yamamoto S, Takahashi Y, Chiba S (2019) Cretaceous amber fossils highlight the evolutionary history and morphological conservatism of land snails. *Scientific Reports* 9: 15886. <https://doi.org/10.1038/s41598-019-51840-3>

Liew TS, Clements R, Schilthuizen M (2008) Sampling micromolluscs in tropical forests: one size does not fit all. *Zoosymposia* 1: 271–280. https://www.researchgate.net/profile/Menno-Schilthuizen/publication/215781668_Sampling_micromolluscs_in_tropical_forests_one_size_does_not_fit_all/links/0deec51ba042102da3000000/Sampling-micromolluscs-in-tropical-forests-one-size-does-not-fit-all.pdf

Liew TS, Schilthuizen M, Bin Lakim M (2010) The determinants of land snail diversity along a tropical elevational gradient: insularity, geometry and niches. *Journal of Biogeography* 37(6): 1071–1078. <https://doi.org/10.1111/j.1365-2699.2009.02243.x>

Liew TS, Vermeulen JJ, Marzuki ME, Schilthuizen M (2014a) A cybertaxonomic revision of the micro-landsnail genus *Plectostoma* Adam (Mollusca, Caenogastropoda, Diplommatinidae), from Peninsular Malaysia, Sumatra and Indochina. *ZooKeys* 393: 1–109. <https://doi.org/10.3897/zookeys.393.6717>

Liew TS, Schilthuizen M (2014) Association between shell morphology of micro-land snails (genus *Plectostoma*) and their predator's predatory behaviour. *PeerJ* 2: e329 <https://doi.org/10.7717/peerj.329>

- Liew TS, Marzuki ME, Schilthuizen M, Chen Y, Vermeulen JJ, Mohd-Azlan J (2020) Molecular phylogenetics and evolutionary history of the endemic land snail genus *Everettia* in northern Borneo. *PeerJ* 8: e9416 <https://doi.org/10.7717/peerj.9416>
- Liew TS, Phung C, Mat Said MA, Hoo PK (2021) Distribution and abundance of the land snail *Pollicaria elephas* (Gastropoda: Pupinidae) in limestone habitats in Perak, Malaysia. *PeerJ* 9: e11886 <https://doi.org/10.7717/peerj.11886>
- Luyt B (2018) Michael Tweedie, Woutera van Benthem Jutting and the Mollusca of Malaya's limestone hills. *Archives of Natural History* 45(2): 245–259. <https://doi.org/10.3366/anh.2018.0517>
- Maassen WJM (2001) A preliminary checklist of the non-marine molluscs of West Malaysia. *De Kreukel* (extra edition 2001), 2001: 1–155.
- Marzuki ME, Liew T-S, Mohd-Azlan J (2021) Land snails and slugs of Bau limestone hills, Sarawak (Malaysia, Borneo), with the descriptions of 13 new species. *ZooKeys* 1035: 1–113. <https://doi.org/10.3897/zookeys.1035.60843>
- Morii Y, Prozorova L, Chiba S (2016) Parallel evolution of passive and active defence in land snails. *Scientific Reports* 6: 35600. <https://doi.org/10.1038/srep35600>
- Ponder WF, Lindberg DR, Ponder JM (2020a) *Biology and evolution of the Mollusca*. Volume 1. CRC Press, Boca Raton, 924 pp. <https://doi.org/10.1201/9781351115667>
- Ponder WF, Lindberg DR, Ponder JM (2020b) *Biology and evolution of the Mollusca*. Volume 2. CRC Press, Boca Raton, 890 pp. <https://doi.org/10.1201/9781351115254>
- Schilthuizen M, Liew TS, Elahan B, Lackman-Ancrenaz I (2005) Effects of karst forest degradation on Pulmonate and Prosobranch land snail communities in Sabah, Malaysian Borneo. *Conservation Biology* 19: 949–954. https://www.researchgate.net/profile/Menno-Schilthuizen/publication/282124100_Effects_of_karst_forest_degradation_on_pulmonate_and_prosobranch_land_snail_communities_in_Sabah_Malaysian_Borneo/links/5a4202eb458515f6b04dd1da/Effects-of-karst-forest-degradation-on-pulmonate-and-prosobranch-land-snail-communities-in-Sabah-Malaysian-Borneo.pdf
- Schilthuizen M, Liew TS (2008) The slugs and semislugs of Sabah, Malaysian Borneo (Gastropoda, Pulmonata: Veronicellidae, Rathousiidae, Ariophantidae, Limacidae, Philomycidae). *Basteria* 72: 287–306. <http://natuurtijdschriften.nl/record/643872>
- Vermeulen JJ, Liew TS, Schilthuizen M (2015) Additions to the knowledge of the land snails of Sabah (Malaysia, Borneo), including 48 new species. *ZooKeys* 531: 1–139. <https://doi.org/10.3897/zookeys.531.6097>



67883

Meghimatium uniforme
Dyakiidae



67812

Pseudoplecta bijuga

Dyakiidae



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67656

Rhinocochlis nasuta
Dyakiidae

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Australian Museum





67959

Kalamantania whiteheadi

Dyakiidae



67962

Sabalimax pantherina

Euconulidae



64707

Ibycus rachelae
Helicarionidae

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