



SHELLS OF THE SRI LANKA SEASHORE

Including some mangrove
and brackish-water forms

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The Author

Malik Fernando is a medical doctor whose lifelong passion has been the outdoors and the animals and plants that inhabit Sri Lanka. He had his medical training in the UK, where he learned SCUBA diving, having been a snorkel diver since his mid teens. Back in Sri Lanka he pursued his interest in the marine invertebrates and seaweeds of the country, about which little is known, as a leisure activity.

Molluscs – snails and clams – are just one group that he studied, making his own collections while diving and beach-combing. Identifying the specimens, without access to collections in foreign institutions, was a difficult task. This book is the result of many years work, done in his own time and with his own resources. All the photography was done by him using specimens from his own collection.

He is currently studying the mollusc fauna of lagoons as shown by net fishing by-catch that is deposited in trash piles at boat landing sites and by mollusc remains on the shoreline such as those stranded by receding water, or cast ashore by wave action.

When not engaged in the study of aquatic fauna and flora he is active in the Council of the Sri Lanka Medical Association and some of its subcommittees. He is Chair of the Ethics Committee, member of the Ethical Review Committee and Secretary of the Expert Committee on Snakebite.

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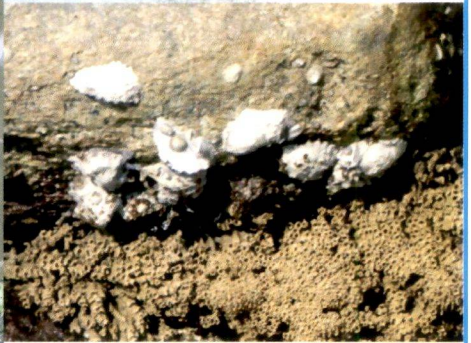
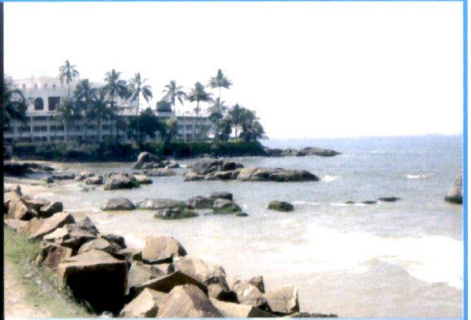


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Malik Fernando

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**Biodiversity Secretariat
Ministry of Environment**

SHELLS OF THE SRI LANKA SEASHORE

Including some mangrove
and brackish-water forms

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Foreword

Sri Lanka is an island, surrounded by sea rich with colourful marine biodiversity. But it is the least studied out of the ecosystems in Sri Lanka. Many of us have collected seashells from the beach as children, and this interest has continued into adulthood. In spite of this, publications on the subject are few and we know very little about the identity or the ecology of these seashells.

Therefore, it is with great feeling that the Biodiversity Secretariat of the Ministry of Environment thanks Dr Malik Fernando who agreed to write a book on the seashells of the intertidal zone, well illustrated with colour plates, descriptions of the shells, and a simple identification key. This will surely add to the knowledge of the Island's marine shell fauna that was first described by Mr. P. Kirtisinghe in his book *Sea shells of Sri Lanka* published in 1978 that has been out of print for many years.

This book is intended primarily for the general public, to create an interest in the subject. However, it is hoped that the book will also stimulate and facilitate study of intertidal molluscs and related fauna and flora by undergraduates. The book discourages collection but on the other hand encourages observation, identification and conservation; the provision of good quality colour illustrations is to enable identification of shells in their undisturbed habitat.

The book is unique in that many sections are in Sinhala and Tamil as well as English, making it useful to a wider public. For this the Biodiversity Secretariat acknowledges with thanks the work of Mr. Naalin Perera and Dr. S Krishnarajah for the Sinhala and Tamil translations respectively, as well as Dr. Jayantha Wattavidanage for his valuable comments. The production of the book was ably co-ordinated by Ms. Hasula Wickremasinghe (Programme Assistant) of the Biodiversity Secretariat.

The Biodiversity Secretariat of the Ministry of Environment takes this opportunity to commemorate the International Year of Biodiversity (2010) by publishing this book as a landmark conservation activity in Sri Lanka.

Gamini Gamage
Director
Biodiversity Secretariat
Ministry of Environment

Acknowledgements

This book would not have seen the light of day if not for the encouragement and help given me by Gamini Gamage, the Director of the Biodiversity Secretariat of the Ministry of Environment and Hasula Wickremasinghe of the same department. Hasula made many suggestions that enhanced the quality of the final product and overlooked the translations into Sinhala and Tamil, besides prodding me to complete the book on time.

Professor T. B. Wanninayake of the Wayamba University supplied a vital paper that enabled confident identification of some specimens and made helpful suggestions. Laksiri Karunaratne provided copies of useful papers from the Smithsonian Institution Library. Nileendra Senanayake provided shell books from his library.

Kamini de Soysa and Jayantha Jayewardena read the English drafts and corrected my mistakes and made suggestions to improve readability.

Dr. S. R. Krishnarajah translated the English text into Tamil and Naalin Perera into Sinhala. Dr. Jayantha Wattavidanage reviewed the Sinhala text.

Many diving and natural history colleagues helped me during the many years that I spent in building up my shell collection. I would like to mention a few to whom I am especially indebted: Arjan Rajasuriya, who made me a member of his diving team thereby enabling me to visit places I would otherwise not have seen and Chaminda Karunarathna, both of NARA; Andrew and Simone Christoffelsz for introducing me to Vanathavillu and Sanjiv de Silva who facilitated my repeat visit; Upali Mallikarachchi who presented me with a large collection of shells from the beaches of Kalpitiya and Ananda Thenabadu who gave me his collection from a wider field, both with useful specimens in them; and lastly, Amila, Ayesha, Sanjeewa and the late Ranuka, members of my foster family, who were of immense help during my collecting trips at Beruwela.

To all these people, as well as Sunil and Sarath who kept me supplied with tea, coffee and toast during the long hours at the computer, I express my sincere thanks.

Malik Fernando
Colombo
November, 2009

Introduction

Seashells are the calcareous external coverings of two groups of animals belonging to the Phylum Mollusca, or molluscs. These two groups are the snails or gastropods, with shells formed in spirals, and the clams or bivalves, with shells in two halves joined by a hinge. Initially information about the animals that had occupied the shells found on the beach, such as their names, habits and food was difficult to find. What books were available dealt with shells of other lands and other oceans. With the publication of Parakrama Kirtisinghe's book 'SEA SHELLS OF SRI LANKA' in 1978, it became possible to name many shells – but there was no information about where they lived or their relationships with other shells, such as the families to which they belonged. That information was gathered slowly by referring to numerous books – both popular guides to shells as well as scientific publications. This book is a distillation of such information obtained from many sources as well as the author's field observations; it has been written principally for the naturalist interested in seashore life.

Scope

Very little work has been done in Sri Lanka concerning the diversity and distribution of its marine fauna, apart from a few groups such as hard corals and reef fishes. In an attempt to generate an interest in shelled mollusc diversity and distribution, the idea of a field guide of shells was suggested by some enthusiasts. It was hoped that such a book would enable interested people to identify shells from around the Island, adding to our knowledge of their distribution. Such knowledge would, in time, help scientists to assess whether the survival of any species is threatened by natural phenomena or human impact. An advantage that marine species have over terrestrial species is that most have a planktonic larval stage: the microscopic larvae that hatch from the eggs drift with ocean currents till they are large enough to settle on any suitable substrate. This results in wide dispersal, even to neighbouring lands with suitable habitats and weather patterns. As a result, we are unable to say that any particular mollusc is endemic to Sri Lanka i.e. found only in this country.

There is an abundance of seashells around the coasts of Sri Lanka. Kirtisinghe (1978) has described and illustrated over 450 in his book, but suggests that the complete list of Sri Lanka species could be well over 1500. For this book the field was narrowed to "shells of the seashore" as it was felt that this habitat was suitable for exploration by a greater number of people without recourse to specialised techniques such as scuba diving and dredging. The definition of shells of the seashore for this purpose includes those forms that live on that part of the coast that is periodically covered and uncovered by waves and the rising and falling of tides (intertidal habitats). This excludes empty shells found on beaches that were occupied by animals living in totally

Shells of the Sri Lanka Seashore

submerged (subtidal) habitats. However, a few species that live totally submerged in very shallow water have been included (see below). Shells living in supratidal habitats are included – they live above the high tide level but are periodically washed by breaking waves, usually during high tides. This was a convenient way of making the project manageable.

A primary concern of the author was not to promote collection of live animals but, on the contrary, to encourage observation with minimal habitat disturbance. To this end it was decided to illustrate with colour photographs, including when necessary, examples of variations in colour and pattern and supplement with descriptions. As the book progressed, the seashore mollusc fauna was widened to include shells in mangroves and subsequently again widened to include some brackish water forms that live in lagoons and the lower reaches of rivers and canals influenced by tides. A further expansion of scope was to include certain species that had been collected in shallow water, down to a depth of 1 metre. The criterion for selection was either that the species was related to an intertidal form or was commonly encountered when wading or was collected for consumption. These would be accessible to snorkel divers with little experience; some of these species also occur in pools along the seashore and on exposed reefs. In many parts of the coastline in Sri Lanka, the seashore merges with mangroves; and there is a similarity between some of the animals that live in the brackish water of mangroves and in lagoons.

This book does not describe all the intertidal, mangrove and lagoon species in Sri Lanka. The species included here are those that have been either collected or observed by the author. It is hoped that users of this book will add to the list of such species and document their distribution. All the plates have been prepared from the author's photographs. The entire collection is labelled with their names (where available) and preserved together with find data as a reference collection.

Respect for nature

It is necessary to collect live specimens when assembling study collections. However, it is not always necessary to collect when making surveys of the biodiversity of an area, or when studying the distribution of known species. The purpose of this book is to encourage students and interested people to observe the seashore in an informed manner and to be able to recognise the molluscs they find. No harm is done if empty shells are picked up off the beach – but please replace live shells where you found them, should you pick any. It is better not to disturb them at all as they may be washed away before they are able to reattach themselves.

Classification and naming of shells

Shelled molluscs are classified using shell characters as well as the anatomy of the body. Fortunately for conchologists (people who study shells) shell characters are generally sufficiently specific to enable identification. However, it is necessary sometimes for malacologists (those who study the whole animal, including the anatomy of the body) to dissect and study the animal to enable accurate identification. Shells of an individual species are often variable as regards size, shape and colouration throughout their geographical range or between locations and habitats. Study of the animals by dissection is necessary to decide whether these somewhat similar shells belong to the same species or whether they should be considered a subspecies or a different species altogether. To enable such work to be done, scientific collections of shells are always backed up by collections of the animals preserved together with their shells. Periodic revision of nomenclature following scientific study can result in some confusion for the amateur, especially if use is made of old publications for identification. Recent work has reduced many species and subspecies names that were assigned years ago based on shell characters to synonyms (equivalent names) of one name, based on the anatomy of the animal. Likewise, animals grouped under one genus have sometimes been separated into two or more genera. Science has now gone a step further and DNA studies are helping to define relationships and resolve problems of identity.

All living things are named according to the binomial (two-name) system first used by Carolus Linnaeus in 1753: a generic name and a specific name. The genus and the species names are followed by the name of the author i.e. the person who assigned that name and the year of publication of the journal or book in which that name was first used. This helps to resolve confusion at times, when a single species appears in different publications under different generic names. The author's name and date are placed within parentheses when the generic name has been changed at a later date while preserving the species name. Related genera are grouped under subfamilies (name ending *-inae*), families (name ending *-idae*), orders (name ending *-da*) and so on. In this book, the species described are grouped into families; the authors' names are excluded from the text pages, but included in the classification and the list of plates. A simple system of classification is adopted; the names used are usually those found in shell books and encyclopaedias for collectors. For instance, families that contain a large number of species, like Conidae (cones) and Cypraeidae (cowries), are often subdivided into subfamilies, genera and subgenera. But in this book, they are treated under the two genera *Cypraea* and *Conus* in the two families Cypraeidae and Conidae. In the more scholarly works different generic and subgeneric names might be used for the shells described in this book, but the species names would remain the same. Where the names differ from those used in recent Sri Lanka literature, an explanation is given.

The Plates

Colour photographs showing two or more views illustrate all the species described. Gastropod shells are orientated with the apex of the shell above and the base that contains the aperture below (see figures and glossary for explanation of terms). The uncoiled shells of limpets are positioned with the anterior above. Bivalves are positioned with the anterior to the left and the dorsal aspect above. The photographs of gastropod shells show views of the aperture and the upper side and wherever possible the operculum (see figure 1 and the glossary). Those of bivalves show the exterior and the interior and a dorsal view showing the hinge area. In some species other views are included. Most figures have a white or black scale bar that equals 1 centimetre; others indicate 3 centimetres. In species where colour and pattern is variable, a selection of such variations is shown as space permits.

Descriptive Text

The descriptive text is written based on shells in the author's collection and is brief when identification can be done readily by comparing a specimen with the colour photograph – e.g. the cones and the cowries. Where identification is more dependent on surface features and subtle differences of shape, the description is more detailed. This is especially so as regards the unidentified shells, when a lot of detail is provided. The use of a magnifying glass is often necessary. Technical terms have been kept to a minimum, but where these have been used, an explanation will be found in the glossary and the accompanying figures.

The size range – lowest to highest in millimetres (mm) – of the specimens examined is included in the description of each species. Where three sizes are given (e.g. 10 – 17 – 21) the middle numeral indicates the most commonly found size in a large series. The final portion of the description indicates the collection location, listed in order from the northernmost site on the west coast in counter-clockwise direction to the east coast. Each entry is broken up as follows:

- ❖ Location – the nearest town;
- ❖ Site – within brackets, named rocks, islands, bays, lagoons etc;
- ❖ Habitat – includes substrate, and depth if subtidal.

Habitats

The terms used to describe the habitats of seashore dwellers are based on geographic features of the site as well as the influence of tides and waves. The following terms are used:

- ❖ Rocky shore - a shoreline consisting principally of rocks;
- ❖ Sandy shore - a shoreline consisting principally of a sandy beach;
- ❖ Beach - the area, usually consisting of sand, between what is considered "land" with typical terrestrial vegetation and the waterline;
- ❖ Upper shore - the upper part of the beach adjacent to terrestrial vegetation, sometimes lined by rocks;
- ❖ Lower shore - the lower part of the beach adjacent to the waterline;
- ❖ Tide pool - pools of water that collect in depressions along the rocky shore or on summits of rocky islets and reefs that are periodically replenished during high tides or by breaking waves;
- ❖ Supratidal - that area above the reach of the highest tides, but washed by breaking waves;
- ❖ Intertidal - that area lying between the limits of the lowest and the highest tides, periodically submerged and exposed;
- ❖ Subtidal - that part of the coast lying below the level of the lowest tides, permanently submerged.

The Rocky Shore at Mount Lavinia, its habitats, and the molluscs found there are described in a subsequent section.

Shell descriptive terms

The figures on the following three pages show a gastropod shell (figure 1) and some bivalves (figure 2 (a) to (f)) labelled to show the terms used in describing them. These terms are further explained in the glossary.

Figure 1: The Gastropod Shell

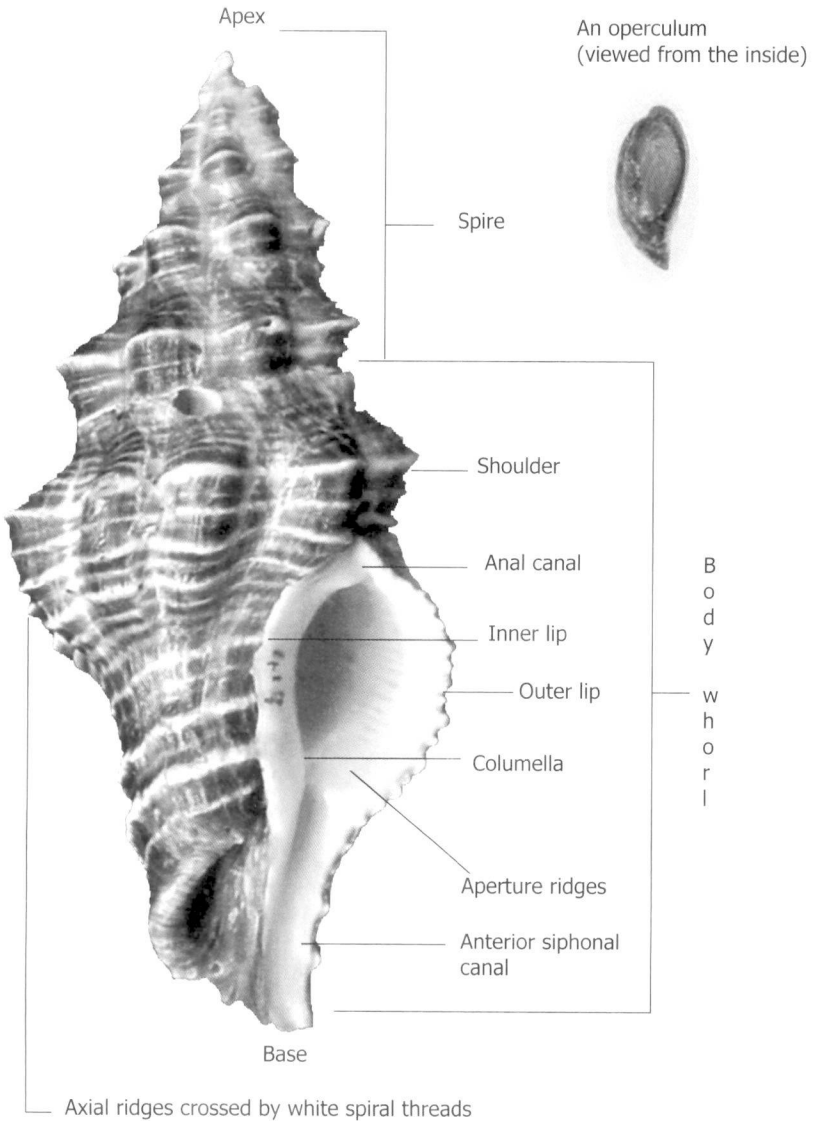
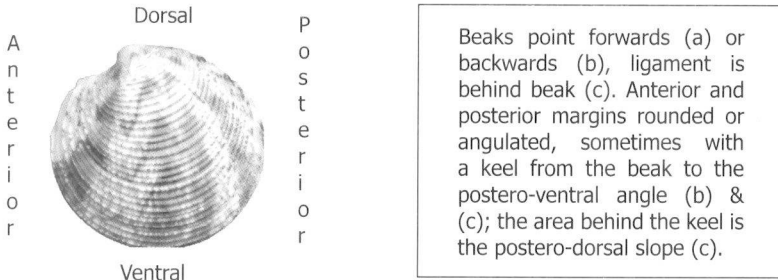
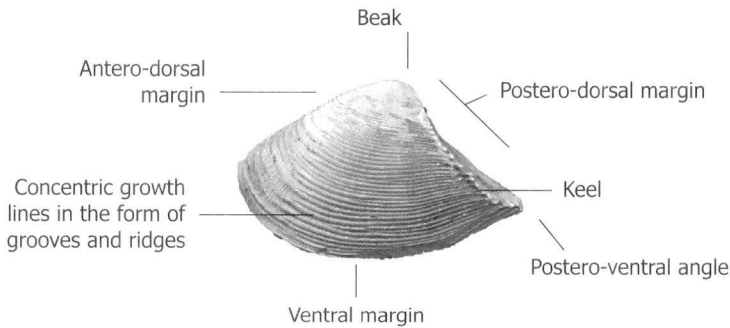


Figure 2: The Bivalve Shell

(a) Exterior from the left side



(b)



(c) Dorsal views of exterior

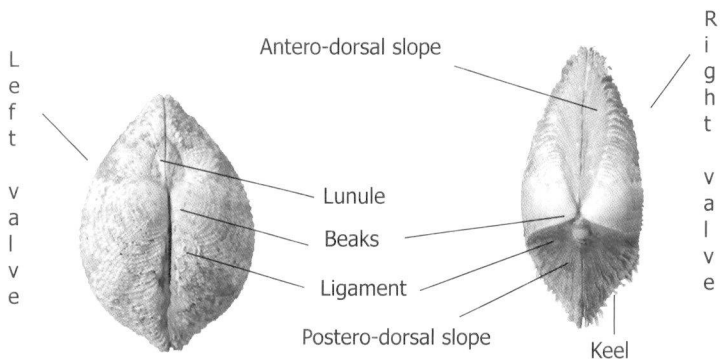
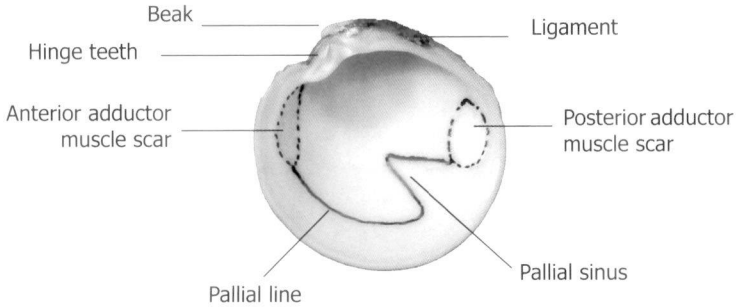
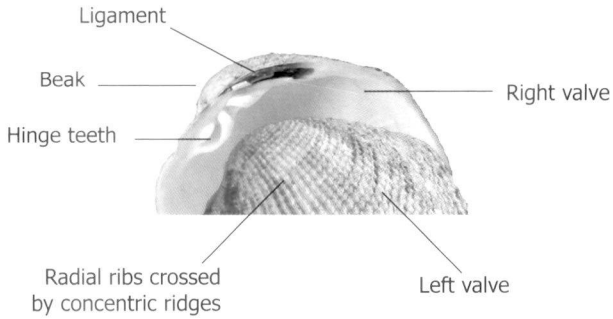


Figure 2 continued

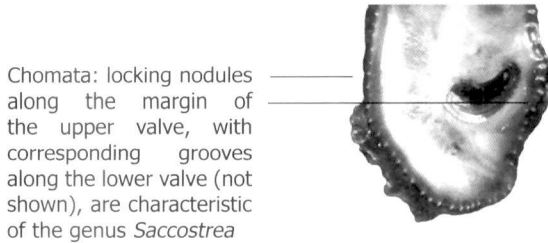
(d) Interior of right valve



(e) Detail of hinge



(f) Interior of upper valve of a rock oyster



The Rocky Shore at Mount Lavinia

Much of the studies that led to this book were carried out at Mount Lavinia, on a stretch of beach north of the hotel that bears this name. A description of this area is given below, since it is a good place to study shells in their natural habitat.

The rocky shore and adjoining beach stretching northwards from the little bay by the Mount Lavinia Hotel is rich in intertidal molluscs. Many of the species described in this book were first found there; some were found only there. The habitat notes in the text refer to specific sites at Mount Lavinia – usually named rock groups. The sketch map at the end of this section shows the location of these rocks. The names are largely those used by the local fishermen. The study group coined other names.¹ The sketches below show three rock groups located on the map as seen from the beach.

Figure 3: Dig Gala



Dig Gala is a low sheet of rock with a rough surface that includes a deep tide pool and numerous shallow gullies. During the southwest monsoon it is thickly covered with green algae and supports large numbers of barnacles, oysters and limpets (see photograph 4 of the frontispiece). At times, the ribbed mussel (*Brachiodontes* sp.) settles on it in large numbers.

¹ The Sri Lanka Sub-Aqua Club and the S. Thomas' College Sub-Aqua Club jointly carried out a survey of the fauna and flora in this area in 1995-1997. The map (figure 6), sketches (figures 3 to 5), and the melampus habitat (Box A) were drawn as part of that Marine Biodiversity Mapping Project (MBIOD). The photograph on plate 19, figure 7 was taken for that study.

Figure 4: Bakamuna Gala



Figure 5: Ora Gala or Split Rock



Bakamuna Gala and Ora Gala² are two rock groups that stand at the edge of the waterline. They are 2 to 3 metres tall and are exposed to the full force of breaking waves on the seaward side. The bases of these rocks are usually covered by water and at low tide it is possible to see clearly the vertical zonation of algae and molluscs (see figure 3 on plate 17). Some species of periwinkles – those that require a wetter environment like *Nodilittorina* sp. – may be seen on these in addition to limpets etc.

² Figures 3, 4 and 5 were drawn by Priya Mapitigama for MBIOD.

Littoraria undulata are seen mostly on Pavilion Rocks and Lovers' Rocks that are set further back from breaking waves. They are often found resting in groups in the supratidal zone (see figure 4 on plate 17). They may also be seen on Darren's rock at times, when the weather is such that waves are able to reach it. The rock group named Keti Ketiya rises to about 3 metres and has a shallow tide pool on the summit as well as a water-filled fissure. This tide pool is replenished by the splash from waves that break on its seaward side and is the habitat of Say's false limpet (*Siphonaria alternata*). Limpets are plentiful on the exposed northwest side. Two rock shells can be found on most of these rocks: the granular drupe (*Morula granulata*) is common in crevices; the toad purple (*Thais bufo*) is less common, usually in water-filled crevices and gullies.

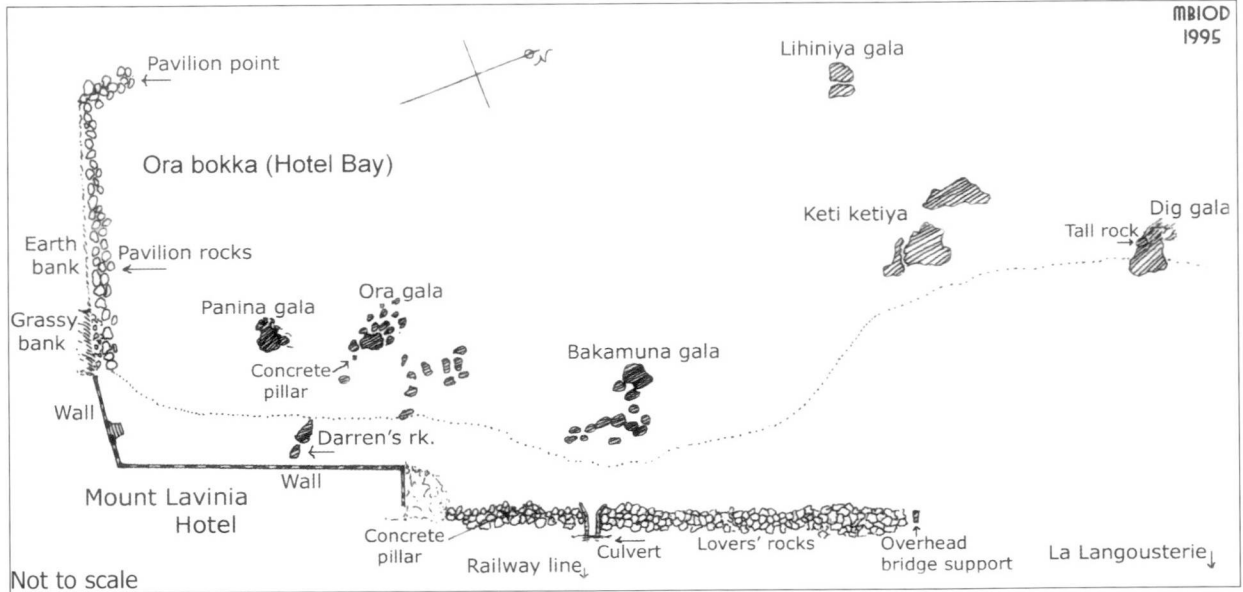
The Grassy Bank on the boundary of the Mount Lavinia Hotel is where the banded melampus (*Melampus fasciatus*) is to be found. The amount of grass on this bank has since reduced. The snails will be found under rotting fallen leaves amongst the wet rocks at the foot of the bank.

The text refers to a site at Mount Lavinia by the name of Bellangala that is not shown on the sketch map. This is a rocky islet about 2 km north of the rock groups described above and a few hundred metres off shore, a little north of the Surf Club. It is part of the reef referred to as the "1st reef" at Mount Lavinia and Dehiwela and the "Kinross 1st reef" at Wellawatte. Bellangala rises about 2 metres above the water level and supports large numbers of oysters and the brown mussel (*Perna perna*). The latter are harvested by local residents during the month of December, as soon as the southwest monsoon abates and the sea becomes calm enough to climb on to the rock.

The sandy shore north of the Surf Club is different in character to that to the south. The beach is wide and slopes gently down to the sea. It is also polluted with human excrement. This stretch of beach is where the wedge clams (*Donax deltoides* and *Donax cuneatus*) as well as the common olive (*Oliva oliva*) ride the waves and burrow into the sand.

The Rocky Shore at Mount Lavinia

Figure 6 :



Classification of the Molluscs in this book

CLASS: Gastropoda³

ORDER: PATELLOGASTROPODA

Family: Acmaeidae

Patelloida striata Quoy and Gaimard, 1834

Patellidae

Cellana rota (Gmelin, 1791)

Patella flexuosa Quoy and Gaimard, 1834

ORDER: NERITOIDA

Family: Neritidae

Nerita albicilla Linnaeus, 1758

Nerita articulata Gould, 1847

Nerita chamaeleon Linnaeus, 1758

Nerita plicata Linnaeus, 1758

Nerita polita Linnaeus, 1758

Neritina auriculata Lamarck, 1826

Septaria lineata (Lamarck, 1816)

ORDER: VETIGASTROPODA

Family: Fissurellidae

Clypidina notata (Linnaeus, 1758)

Emarginula fissurata Holten, 1802

Trochidae

Trochus radiatus Gmelin, 1791

Umbonium vestiarum Linnaeus, 1758

ORDER: CAENOGASTROPODA

Family: Thiaridae

Faunus ater (Born, 1778)

³ The classification adopted here is based on those followed by the following authors:

De Silva, Dharshani (2006). Current Status of Taxonomy and Ecology of Marine Molluscs in Sri Lanka, in Ed. C. N. B. Bambaradeniya, The Fauna of Sri Lanka (2006) pp. 274 – 287.

Starmühlner, Ferdinand (1974). The Freshwater Gastropods of Ceylon. Bulletin of the Fisheries Research Station, Sri Lanka (Ceylon) Vol. 25, Nos. 1 and 2, pp. 97 – 181.

Shells of the Sri Lanka Seashore

Cerithiidae

Cerithium obeliscus Bruguiere

Clypeomorus sp.1

Clypeomorus batillariaeformis (Habe and Kosuge, 1966)

Clypeomorus sp.3

Clypeomorus sp.4

Potamididae

Cerithidea cingulata Gmelin 1791

Cerithidea sp.

Terebralia palustris (Linnaeus, 1767)

Telescopium telescopium (Linnaeus, 1758)

Planaxidae

Planaxis niger Quoy & Gaimard, 1834

Planaxis sulcatus (Born, 1778)

Littorinidae

Echinolittorina millegrana (Philippi, 1848)

Littoraria intermedia (Philippi)

Littoraria undulata (Gray, 1839)

Littoraria scabra (Linnaeus, 1758)

Nodilittorina quadricincta (von Mühlfeldt, 1824)

Nodilittorina trochoides (Gray, 1839)

Cypraeidae

Cypraea arabica Linnaeus, 1758

Cypraea felina listeri (Gray, 1825)

Cypraea moneta Linnaeus, 1758

Cypraea staphylaea Linnaeus, 1758

Muricidae

Morula granulata (Duclos, 1832)

Morula margariticola Broderip, 1832

Morula serrialis (Laborde?)

Morula sp.

Thais tissoti Petit, 1852

Thais bufo (Lamarck, 1822)

Purpura persica (Linnaeus, 1758)

Nassariidae

Bullia vittata Linnaeus

Olividae

Oliva oliva Linnaeus, 1758

Conidae

Conus ceylanensis Hwass, 1792

Conus coronatus Gmelin, 1791

Conus ebraeus Linnaeus, 1758

Conus musicus Hwass, 1792

Conus rattus Hwass, 1792

ORDER: OPISTHOBRANCHIA

Family: Haminoeidae

Haminoea crocata Pease, 1860

ORDER: PULMONATA

Family: Ellobiidae

Cassidula nucleus (Gmelin, 1791)

Ellobium gangeticum (Pfeiffer, 1855)

Melampus fasciatus (Deshayes, 1830)

Melampus sp.

Pythia plicata (de Ferrusac) Gray, 1825

Siphonariidae

Siphonaria alternata Say, 1826

Siphonaria javanica (Lamarck, 1819)

Siphonaria sp.

CLASS: Bivalvia

ORDER: MYTILOIDA

Family: Mytilidae

Brachiodontes sp.1

Brachiodontes sp.2

Perna perna (Linnaeus, 1758)

Septifer virgatus (Weigmann)

ORDER: OSTREOIDA

Family: Ostreidae

Crassostrea cf. *madrasensis* (Preston) (?)

Saccostrea cucullata (Born, 1778)

Saccostrea mordax (Gould, 1850)

Saccostrea sp.

ORDER: VENEROIDA

Family: Chamidae

Chama fragum Reeve

Chama reflexa Reeve, 1846

Donacidae

Donax cuneatus Linnaeus, 1758

Donax deltoides Lamarck, 1818

Donax faba Gmelin, 1791

Corbiculidae

Geloina coaxans (Gmelin, 1791)

Veneridae

Gafrarium tumidum Roding, 1798

Meretrix casta Gmelin

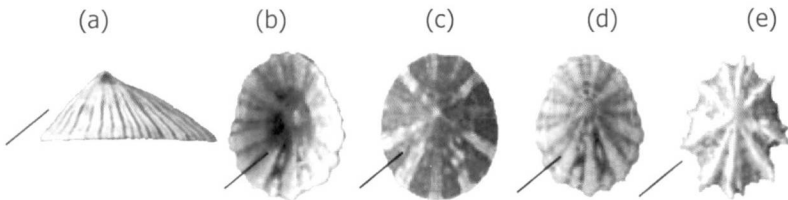
Meretrix sp.



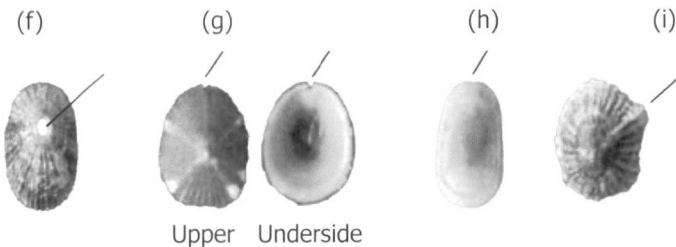
Key to the Families

This key will enable identification of the family to which a shell belongs, if it is described in this book, and refer the reader to the relevant plate. Follow the steps in sequence. Lines point to identification features that are underlined in the description.

- 1 Shell in one piece: Gastropods go to 3
- 2 Shell in two halves joined by a hinge: Bivalves .. go to 13
- 3 (A) Shell uncoiled, cap-shaped, a low cone in side view (a), aperture occupies the whole of the underside (b): Limpets – Outline oval with fine radial ribs (c) or coarse ribs (d) or outline jagged (e): PATELLIDAE and ACMAEIDAE [true limpets] Plates 1 and 2;



or with an apical perforation (f), anterior marginal slit (g), shallow anterior groove on the inside or shallow anterior notch (h): FISSURELLIDAE [keyhole limpets] Plate 2;

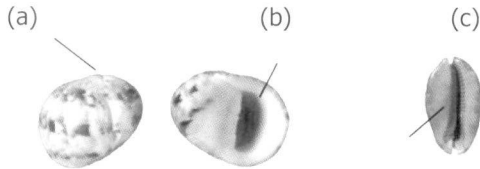


or outline with a marginal bulge on the right side (i): SIPHONARIIDAE [false limpets] Plate 2.

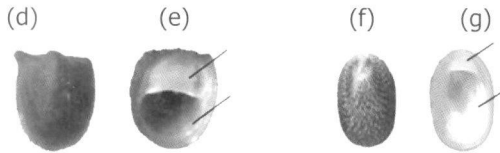
- (B) Shell not like this go to 4
- 4 (A) Shell coiled, but this may be obscure, spire low, flat or hidden, apex insignificant go to 5
- (B) Shell clearly coiled, spire low or high, apex pointed go to 7

Shells of the Sri Lanka Seashore

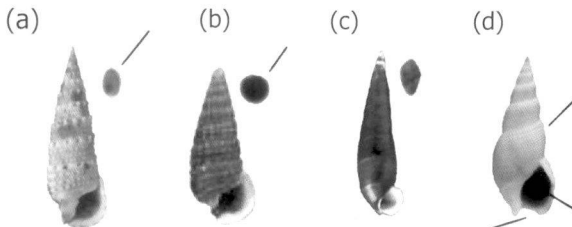
- 5 (A) Shell very thin, translucent, fragile, long aperture with outer lip that extends beyond the sunken apex: HAMINOEIDAE [paper bubbles] Plate 3.
- (B) Shell thick or thin but strong go to 6 →
- 6 (A) Shell strong and heavy, globular, low or flat spire, aperture semicircular, flat columellar callus (a) and (b): NERITIDAE – *Nerita* [marine nerites] Plate 4;



- (B) Shell strong, spire buried under body whorl, oval in shape with dorsal hump and flattened underside with linear aperture extending the whole length down its centre (c): CYPRAEIDAE [cowries] Plate 8.
- (C) Shell thin and light, shield-shaped, semicircular aperture, wide, flat columellar shelf (d) and (e) or oval, very large aperture, narrow columellar shelf (f) and (g): NERITIDAE – *Neritina* [non-marine nerites] Plate 4.



- 7 (A) Shell with very tall spire:
 Granular sculpture, oblique aperture, narrowed siphonal canal, oval operculum (a): CERITHIIDAE [ceriths] Plate 10;
 Granular sculpture, oblique aperture, narrowed siphonal canal, circular operculum (b): POTAMIDIDAE [mud creepers] Plate 11;

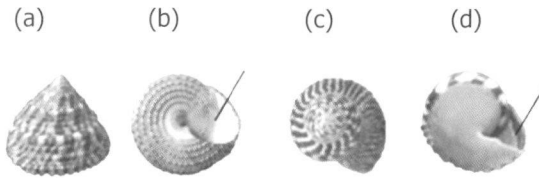


Smooth exterior, wide siphonal canal, overhanging outer lip, elliptical operculum (c): THIARIDAE [non-marine *Faunus*] Plate 11;

Sides of whorls rounded, 2-3 rows of granules below suture, aperture bee hive-shaped with wide open siphonal canal (d): NASSARIIDAE [basket shells, *Bullia*] Plate 6.

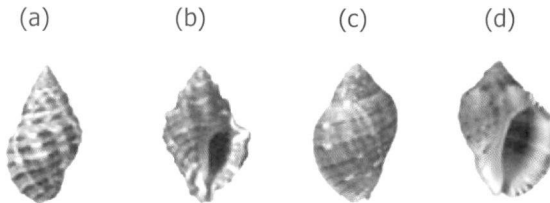
(B) Shell with moderately tall or low spire go to 8

- 8 (A) Shell top-shaped (a) and (b) or button-shaped (c) and (d), the aperture opening on the flat underside: TROCHIDAE [top shells] Plate 6.



(B) Shell not like this go to 9

- 9 (A) Shell fusiform or biconical, aperture comparatively large, shell widest in the middle tapering upwards and downwards (a) and (b), sometimes a bit swollen (c) and (d): Muricidae (Thaididae) [rock shells] Plates 8 and 9.



(B) Shell not like this go to 10

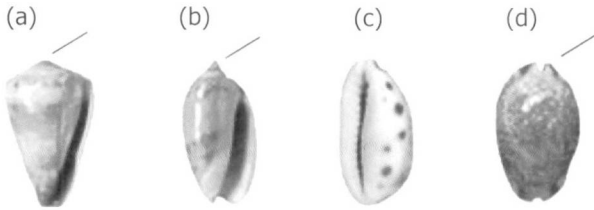
- 10 (A) Aperture a linear slit nearly as long as the shell –

Shell cone-shaped with very low spire (a): CONIDAE [cones] Plate 7;

Shell gracefully (bullet) shaped, short, pointed spire (b): OLIVIDAE [olives] Plate 6;

Shell thick, oval, spire buried by the body whorl, dorsally humped, the aperture occupying the centre of the flattened underside (c) and (d): CYPRAEIDAE [cowries] Plate 8.

Shells of the Sri Lanka Seashore

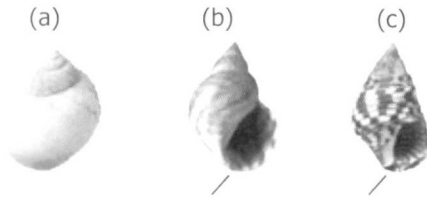


(B) Aperture not like this go to 11

11 (A) Aperture broadly oval, body whorl rather swollen, spire short and distinct, pointed –

Outer lip of aperture thin, teeth absent, siphonal canal absent (a) and (b): LITTORINIDAE [periwinkles] Plate 5;

Outer lip thickened, teeth present, siphonal canal present (c): PLANAXIDE [clusterwinks] Plate 6.

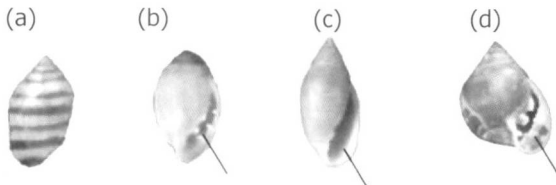


(B) Aperture not like this go to 12

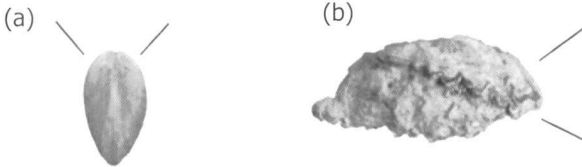
12 (A) Shell oval, spire small, pointed, aperture narrow and further narrowed by projecting teeth on both outer and inner lips (a) and (b);

or shell slender, elongated, narrow elliptical aperture, no teeth on outer lip, a few folds on columella (c);

or shell bulbous, small pointed spire, flattened dorso-ventrally, outer lip expanded, large projecting columella teeth (d): ELLOBIIDAE [coffee beans and ear shells] Plate 3.

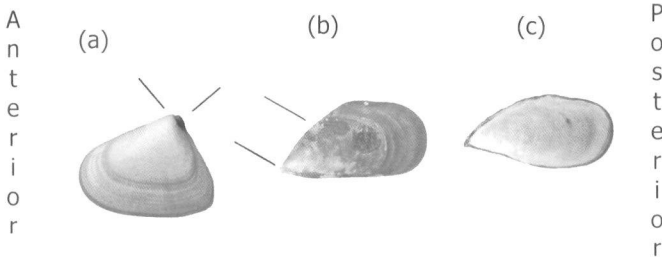


- 13 (A) Shell in right-left halves (valves) when viewed from above, both valves more or less identical in size and ornamentation, with or without a gap below for a byssal attachment between the two valves (a) go to 14

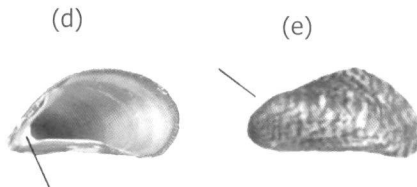


- (B) Shell in top-bottom halves (valves) when viewed from the side, the valves very dissimilar in size, the lower valve cemented to the substrate (b: viewed from the right side) go to 16

- 14 (A) Shell triangular, umbones dorsal, anterior part of shell extensive, the ligament external on the postero-dorsal slope (a): DONACIDAE [wedge clams] Plate 12;



- (B) Shell elongated tapering to pointed umbones at anterior extremity, rounded behind, the dorsal margin humped or rounded, the ligament on the antero-dorsal slope (b), interior devoid of teeth or other structures (c): MYTILIDAE, *Perna* [mussels] Plate 12;



- (C) As in (B) above but interior with a shelf-like partition in the anterior (d): MYTILIDAE, *Septifer* [deck mussels] Plate 12;

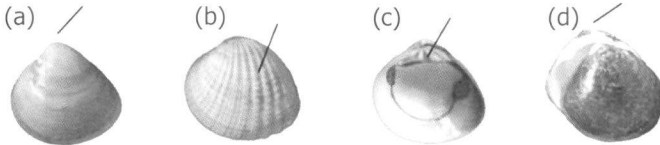
Shells of the Sri Lanka Seashore

(D) Shell resembles (B) and (C) above but small, thin-shelled, fragile, elongated, umbones dorsal to the rounded anterior extremity, no internal shelf (e): MYTILIDAE, *Brachiodontes* [ribbed mussels, marine and non-marine] Plate 13.

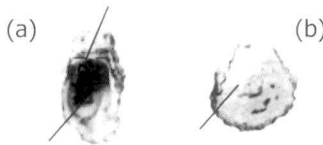
(E) Shell not like this go to 15

15 (A) Shell thick and heavy, swollen, rather triangular with narrowed umbones dorsal, ventral margin rounded, the ligament behind the umbones on the postero-dorsal slope, externally smooth and shiny (a) or rough with nodular ribs radiating from the umbones (b), internally with a strong hinge plate bearing strong teeth (c): VENERIDAE [venus clams] Plate 13; or

(B) Shell nearly circular with small umbones dorsally (d), externally with concentric growth lines, in the fresh state covered with blackish-brown periostracum raised into concentric frills along the growth lines: CORBICULIDAE, *Geloina* [marsh clams] Plate 13.

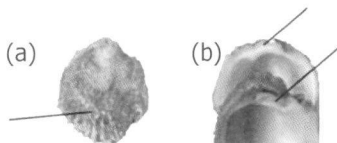


16 (A) Shell of various shapes (triangular, rounded or slipper-shaped) with a toothless hinge, lower valve deeply cupped (a), upper valve flat or convex fitting like a lid (b), marginal scallops (crenulations) interlocking or margin smooth: OSTREIDAE [oysters] Plate 14;



(B) Shell not like this go to 17

17 Shell rounded or heart-shaped (a), the valves thick, strong sausage-shaped hinge teeth that interlock placed parallel to the dorsal margin (b: upper valve above, lower below), the lower valve deeply cupped, the upper valve thin, flat or convex fitting like a lid, sculpture consisting of concentric rows of scales and spines: CHAMIDAE [jewel boxes] Plate 15.



ශ්‍රී ලංකාවේ වෙරළ කලාපයේ බෙල්ලන්

හැඳින්වීම

හැඳින්වීම

මොලොස්කා වංශයේ කාණ්ඩ දෙකකට අයත් කැල්සිනිකුක ඛාහිර ආවරණයක් සහිත සත්ත්වයන් මුහුදු කවචයන් (මුහුදු බෙල්ලන් සහ දෙපියන් බෙල්ලන්) ලෙස හඳුන්වනු ලැබේ. මුහුදු බෙල්ලන් හෙවත් ගැස්ට්‍රොපෝඩාවන් (සර්පිලාකාර ලෙස කවචය සකස් වූ) සහ දෙපියන් බෙල්ලන් හෙවත් සිප්පි (කවච දෙකක් එකට සවි වී නිර්මාණය වූ) මෙම කාණ්ඩ දෙක වේ. වෙරළේදී හමු විය හැකි මෙවැනි කවච සහිත සතුන්ගේ තොරතුරු එනම්, ඔවුන්ගේ නාමය, ජීවන තොරතුරු සහ ආහාර රටාව වැනි විස්තර ලබා ගැනීම අපහසු කරුණකි. විවිධ රටවලට අයත් සාගරවල වාසය කරන මුහුදු කවචයන් පිළිබඳ ග්‍රන්ථ ප්‍රකාශයට පත් කර ඇත. 1978 වර්ෂයේදී ප්‍රකාශයට පත් කළ පරාක්‍රම කීර්තිසිංහගේ, 'ශ්‍රී ලංකාවේ මුහුදු කවච,' යන ග්‍රන්ථය මගින් බොහෝමයක් මොලොස්කා විශේෂවල නම් දැනගත හැකි වුවත්, එම විශේෂවල ව්‍යාප්තිය, අනෙකුත් විශේෂ සමඟ ඇති පරිණාමික බන්ධුතාවය, එනම් ඔවුන් අයත්වන කුලය වැනි විස්තර සඳහන් වී නොමැත. සතුන් පිළිබඳව ලියවී ඇති මාර්ගෝපදේශක ග්‍රන්ථ, ලිපි සහ විද්‍යාත්මක ප්‍රකාශන පරිශීලනය කරමින් ශ්‍රී ලංකාවේ මුහුදු කවච පිළිබඳ තොරතුරු ක්‍රම ක්‍රමයෙන් එක් රැස් කර ගන්නා ලදී. කතුචරයාගේ ක්ෂේත්‍ර නිරීක්ෂණ මෙන්ම විවිධ මූලාශ්‍රවලින් එක් රැස් කර ගන්නා ලද තොරතුරු ද මෙම ප්‍රකාශනයට අන්තර්ගත කර ඇත. මුහුදු වෙරළ කලාපයේ ජීවීන් පිළිබඳව උනන්දු වන ස්වභාවධර්මවේදීන්ගේ ප්‍රයෝජනය පිණිස මුහුදු කවච පිළිබඳව වන මෙම පොත ප්‍රකාශයට පත් කෙරේ.

විෂය පරාසය

දෘඪ කොරල් සහ පර ආශ්‍රිත මසුන් හැර සාගරවාසී අනෙකුත් සත්ත්වයින්ගේ විවිධත්වය සහ ව්‍යාප්තිය පිළිබඳව ශ්‍රී ලංකාව තුළ පර්යේෂණ කෙරී ඇත්තේ ඉතා සුළු ප්‍රමාණයකි. කවචධාරී මොලොස්කාවන්ගේ විවිධත්වය සහ ව්‍යාප්තිය පිළිබඳව උනන්දුවක් ඇති කිරීම සඳහා ක්ෂේත්‍ර මාර්ගෝපදේශකයක් නිර්මාණය කිරීමට මෙම විෂය ක්ෂේත්‍රය පිළිබඳව අවධානයක් ඇති කිහිපදෙනෙකුම යෝජනා කරන ලදී. මෙම ක්ෂේත්‍රය පිළිබඳව උනන්දු වන පිරිසට දිවයින වටා මුහුදු තීරයේ හමුවන මොලොස්කා කවච හඳුනා ගැනීමටද, එම මොලොස්කාවන්ගේ ව්‍යාප්තිය පිළිබඳ දත්ත එක් රැස් කිරීමටද මෙම පොත පිටුවහලක් වනු ඇත. යම් මොලොස්කා විශේෂයක පැවැත්මට ඕනිසාගෙන් හෝ ස්වභාවික ක්‍රියාවලියක බලපෑමෙන් තර්ජනයට ලක් වී පවතීද යන කරුණ තහවුරු කිරීමටද ඉහත එක් රැස් කර ගන්නා තොරතුරු භාවිත කළ හැකිය. භෞමික සත්ත්ව විශේෂයකට සාපේක්ෂව සාගරවාසී සත්ත්ව විශේෂයකට සුවිශේෂිත වාසියක් ඇත. සාගරවාසී ජීවී විශේෂවලට ජලවාගමය ජීවන අවස්ථාවක් ඇති අතර, මේ හේතුවෙන් සාගරික දියවැල් සමඟ විශාල දුර ප්‍රමාණයක් ප්‍රමාණවත් වර්ධනයක් ඇති වන තෙක් පාචී ගොස් සුදුසු උපස්තරයක් මත තැන්පත් වී වර්ධනය විය හැකිය. මෙහි ප්‍රතිඵලයක් ලෙස සුදුසු පාරිසරික තත්ත්ව සහ දේශගුණයක් පවතින අසල්වැසි සාගර කලාපවලද පුළුල් ලෙස ව්‍යාප්ත වීමට සාගරවාසී ජීවී විශේෂවලට අවස්ථාවක් ඇත. මෙහි ප්‍රතිඵලයක් ලෙස යම් මොලොස්කා විශේෂයක් ශ්‍රී ලංකාවේ පමණක් හමුවන, ආවේනික විශේෂයක් ලෙස නම් කිරීමේ හැකියාවක් නොමැත.

ශ්‍රී ලංකාව අවට මුහුදු තීරයේ මොලොස්කා විශේෂවල විවිධත්වය ඉහළ මට්ටමක පවතී. කීර්තිසිංහ (1978) විසින් ප්‍රකාශයට පත්කළ ග්‍රන්ථයෙහි ශ්‍රී ලංකාවෙන් වාර්තා වන විශේෂ 450 ක් පිළිබඳව විස්තර සහ රූප සටහන් ඇත. එතෙක් ඔහු යෝජනා කරන පරිදි ශ්‍රී ලංකාවේ සාගරවාසී මොලොස්කා විශේෂ සංඛ්‍යාව 1500 කට අධික විය හැකිය. මෙම ග්‍රන්ථය මගින් මුහුදු වෙරළ ආශ්‍රිතව ජීවත් වන කවච පිළිබඳව වැඩි අවධානය යොමු කෙරේ. කිම්දීම සහ

ශ්‍රී ලංකාවේ වෙරළ කලාපයේ බෙල්ලන්

මුහුදු පතුල හැරීම වැනි විශේෂිත තාක්ෂණ ක්‍රම භාවිත නොකර වැඩි පුද්ගලයන් පිරිසකට මුහුදු මොලස්කාවන් පිළිබඳව අධ්‍යයනය කිරීමේ ආරම්භක පියවරක් ලෙස වෙරළාශ්‍රිත කවච අධ්‍යයනය කළ හැකිය. මෙම පොතෙහි වෙරළාශ්‍රිත කවච ලෙස සඳහන් කරනු ලබන්නේ මුහුදු වෙරළේ අන්තර් උදම් කලාපයේ එනම්, උදම් රළ මගින් වඩිදියෙහි ජලයෙන් යටවන, බාදියේදී නැවත නිරාවරණය වන වෙරළ කලාපයේ වාසය කරන කවචධාරී මොලස්කාවන්ය. ජලයෙන් සම්පූර්ණයෙන් යටවී ඇති සාගරික ප්‍රදේශවල ජීවත්ව මැරුණු පසු වෙරළේදී හමුවන මොලස්කා කවච පිළිබඳව කරුණු මෙම පොතෙහි අඩංගු නොවේ. එහෙත් නොගැඹුරු සාගරික කලාපවල සම්පූර්ණ ජලයෙන් යටවී ඇති පරිසර පද්ධතිවල වාසය කරන විශේෂ කිහිපයක් පිළිබඳව විස්තර ඇතුලත් කර ඇත. (පහත විස්තරය බලන්න) උපරි උදම් කලාපීය පරිසර පද්ධතිවල එනම් ඉහළ උදම් සීමාවෙන් එපිට පිහිටා ඇති වරින් වර මුහුදු රළට සේදෙමින් පවතින පරිසර පද්ධති ආශ්‍රිතව වාසය කරන මොලස්කාවන්ගේ තොරතුරු ද මෙහි අඩංගු වන අතර පොතට කරුණු අඩංගු කළ හැකි විධාන් සුදුසු ආකාරය ඉහත ආකාරයට වේ.

කතුවරයාගේ මූලික ඉලක්කය ජීවි නිදර්ශක එකතු කිරීම සඳහා පෙළඹවීමක් ඇති කිරීම නොව, පරිසර පද්ධතීන්ට අවම හානියක් වන අයුරින් නිරීක්ෂණ සිදුකිරීම සඳහා උනන්දු කරවීම බව සඳහන් කළ යුතුය. මෙම කරුණ සාක්ෂාත් කර ගැනීම සඳහා වර්ණ ඡායාරූප සහිතව විස්තර ඉදිරිපත් කර ඇත. පොතෙහි තත්ත්වය තවත් වැඩි දියුණු කිරීම සඳහා, වෙරළ කලාපයේ මොලස්කාවන්ට අමතරව කඩොලාන පරිසර පද්ධතිවල වාසය කරන මොලස්කාවන් සහ උදම් බලපෑම් පවතින කලපු සහ ගංඟා සහ ඇල මාර්ගවල පහළ සීමාවන්ගේ කිවුල්දියා පරිසර පද්ධතිවල ජීවත්වන මොලස්කාවන් පිළිබඳව විස්තරද අඩංගු කර ඇත. මෙම පොතෙහි විෂය පථය තවත් පුළුල් කිරීම සඳහා මීටර එකකට අඩු, නොගැඹුරු සාගරික පරිසර පද්ධතිවල වාසය කරන මොලස්කාවන් කිහිප දෙනෙකුගේ විස්තරද ඇතුළත් කර ඇත. අන්තර් උදම් කලාපයේ විශේෂවලට බන්ධුතාවයක් පැවතීම, නොගැඹුරු ජලයේ කිම්දෙන විට සුළඟව හමුවීම හෝ පරිභෝජනය සඳහා එකතු කිරීම යන කරුණු පදනම් කර ඉහත සඳහන් මොලස්කාවන් මෙම පොතෙහි විස්තර කිරීම සඳහා තෝරාගෙන ඇත. මුහුදේ කිම්දීම පිළිබඳව අඩු අත්දැකීම් සහිත වෙරළාශ්‍රිතව සතුන් අධ්‍යනය කරන පුද්ගලයන්ට මෙවැනි විශේෂ හමුවිය හැක. වෙරළකීරයේ සහ නිරාවරණය වූ පර මතු පිට පිහිටා ඇති තටාකවලද මෙවැනි මොලස්කා විශේෂ වාසය කළ හැකිය. ශ්‍රී ලංකාවේ වෙරළ තීරයේ ස්ථාන බොහෝමයක කඩොලාන දැකගත හැකි අතර, කිවුල් දිය සහිත කඩෝලාන සහ කලපු පද්ධතිවලද විවිධ විශේෂවලට අයත් මොලස්කාවන් දැකගත හැකිය.

ශ්‍රී ලංකාවේ කඩොලාන සහ කලපු පරිසර පද්ධතිවල වාර්තාවන සියළුම අන්තර් උදම් කලාපීය මොලස්කාවන් පිළිබඳව කරුණු මෙහි අඩංගු නොවේ. කතුවරයා විසින් නිදර්ශක එකතු කර ඇති හෝ නිරීක්ෂණය කර ඇති විශේෂ පිළිබඳව පමණක් තොරතුරු මෙහි අඩංගු කර ඇත. මෙම පොත භාවිත කරන පුද්ගලයන් ඔවුන්ගේ අධ්‍යයනයන් තුළින් එවැනි විශේෂවල ව්‍යාප්තිය තවදුරටත් වාර්තා කරනු ඇතැයි අපි බලාපොරොත්තු වෙමු. කතුවරයා විසින් ගන්නා ලද වර්ණ ඡායාරූප උපයෝගී කරගෙන සියළුම එලක නිර්මාණය කර ඇත. කතුවරයා සතු නිදර්ශක එකතුවම් අදාළ විශේෂ නාමය සමඟ (විශේෂ නාමයක් ඇත්නම්) පවතින අතර, එමර්ශන එකතුවකට අවශ්‍ය පරිදි වන සියළුම තොරතුරුද නිදර්ශක සමඟ වාර්තා කර ඇත.

සොබා දහමට එකඟව කටයුතු කිරීම

අධ්‍යයන එකතුවක් පවත්වා ගෙන යාම සඳහා ජීවි නිදර්ශක එකතු කිරීම අත්‍යවශ්‍ය කරුණක් වේ. එහෙත් යම් ප්‍රදේශක පෞච්චි විවිධත්වය අධ්‍යයනය කිරීම සහ දැනටමත් හඳුනාගෙන ඇති

විශේෂයක ව්‍යාප්තිය අධ්‍යයන කිරීම වැනි පර්යේෂණවලදී ජීවී නිදර්ශක එකතු කිරීම අත්‍යවශ්‍ය නොවේ. මෙම පොතෙහි අරමුණ වනුයේ සියුන් සහ මේ පිළිබඳව උනන්දුවක් දක්වන පුද්ගලයන්ට වෙරළ කලාපයේ මොලස්කාවන් පිළිබඳව අධ්‍යයනය කිරීමට සහ හඳුනාගැනීමට පෙළඹවීම වේ. අපිවී නිදර්ශක අධ්‍යයනයන් සඳහා එකතු කිරීම ගැටළුවක් නොවන නමුත් ඔබ නිරීක්ෂණය කරන ජීවී නිදර්ශක එම ස්ථානයට නැවත දැමීම ඔබේ වගකීමක් වේ. එහෙත් ජීවී නිදර්ශකවලට බාධා නොකිරීම වඩාත් සුදුසු ක්‍රියාමාර්ගය වන අතර, නැතහොත් එම සතුන් පරිසර අත් හළ මොහොතේ මුහුදු රළින් වෙනත් ස්ථානයකට ගසාගෙන යාමට ඉඩ ඇත.

කවචවල වර්ගීකරණය සහ නාමකරණය

කවචධාරී මොලස්කාවන්, කවචවල ලක්ෂණ සහ දේහයේ කායික විද්‍යාත්මක ලක්ෂණ අනුව වර්ගීකරණය කරනු ලැබේ. කවච විශේෂඥයින්ට කවචවල බාහිර ලක්ෂණවලින් විශේෂ හඳුනා ගත හැකි වුවත් මොලස්කා විද්‍යාඥයින් (දේහයේ කායික විද්‍යාව සහ ජීවියාගේ ශරීරයේ සියළු කොටස් අධ්‍යයන කරන්නන්) විශේෂ නිවැරදිව හඳුනා ගනු ලබන්නේ නිදර්ශක විච්ඡේදනය කිරීමෙන් අනතුරුව වේ. වාසය කරන ප්‍රදේශයේ හෝ වාසස්ථානයේ ලක්ෂණ අනුව එක් විශේෂයක් තුළ වුවද කවචවල ප්‍රමාණය, වර්ණය සහ හැඩයේදී වෙනස්කම් පැවතිය හැකිය. මෙහිදී සමහර නිදර්ශක එක් විශේෂයකට අයත් වේද නැතහොත් වෙනත් විශේෂයකට අයත්ද යන කරුණ සනාථ කිරීම සඳහා එම සතුන් විච්ඡේදනය කිරීම අවශ්‍ය විය හැකිය. මෙවැනි ක්‍රමයක් අනුගමනය සඳහා විද්‍යාත්මක පදනමක් මත සතුන් එකතු කිරීම සහ එකතු කරන ලද නිදර්ශක ආරක්ෂා කිරීම කළ යුතුය. විවිධ කාලවලදී සිදු කෙරෙන විද්‍යාත්මක පර්යේෂණවලින් අනතුරුව කාලීනව නාමකරණයේ වෙනස්වීම් සිදුවිය හැකි අතර, මෙහිදී විෂයට අදාළ පැරණි ප්‍රකාශන පරිශීලනය කරන නවකයින්ට නාමකරණ ගැටළුවලට මුහුණ දීමට සිදුවිය හැකිය. කවචවල බාහිර ලක්ෂණ අනුව විවිධ විශේෂවලට සහ උප විශේෂවලට වර්ග කර තිබූ සතුන් මෑත කාලීන වහුරු විද්‍යා පර්යේෂණවලට අනුව එක් විශේෂයක් යටතේ වර්ග කර පැවතිය හැකිය. මෙහිදී කවචවල ලක්ෂණ අනුව පෙරදී නම් කර තිබූ විශේෂවල නාම සමනාමයන් ලෙස හැඳින්වේ. මේ ආකාරයටම එක් ගණයකට අයත්ව තිබූ සතුන් ගණ දෙකකට හෝ වැඩි ප්‍රමාණයකට වෙන් විය හැකිය. ප්‍රවේනික ද්‍රව්‍ය (DNA) අධ්‍යයන මත පදනම්ව සත්ත්ව විශේෂ අතර බන්ධුතාවය නිවැරදිව දැන ගැනීමට සහ විශේෂ හඳුනාගැනීමේ ගැටළු නිරාකරණයට හැකියාව ලැබී ඇත.

කාල් ලිනියස් විසින් 1753 වර්ෂයේදී හඳුන්වා දුන් ද්වි පද නාමකරණයට අනුව ගණ නාමයක් සහ විශේෂ නාමයක් සහිතව ජීවී විශේෂ නම් කරනු ලැබේ. ගණ නාමය සහ විශේෂ නාමයට පසුව එම විශේෂය නම් කරන ලද පුද්ගලයාගේ නම සහ එම විද්‍යාත්මක නාමය ප්‍රථමයෙන් භාවිත කළ විද්‍යාත්මක ප්‍රකාශනය නිකුත් වූ වර්ෂය සඳහන් කර ඇත. විවිධ කාලවලදී ප්‍රකාශයට පත් කළ පොත් සහ පර්යේෂණ පත්‍රිකාවලදී එකම සත්ත්ව විශේෂය විවිධ නම්වලින් හඳුන්වා දී ඇති අවස්ථාවලදී ඇතිවන ගැටළු නිරාකරණය කර ගැනීමට ඉහත ආකාරයට විද්‍යාත්මක නම සඳහන් කිරීම වැදගත් වේ. පසු කාලයේදී යම් සත්ත්ව විශේෂයක ගණ නාමය වෙනස් වී එහෙත් විශේෂ නාමය වෙනස් නොවී පවතින අවස්ථාවලදී කර්තෘගේ නම සහ ප්‍රකාශන වර්ෂය වරහන් තුළ සඳහන් කර ඇත. එකිනෙකට බන්ධුතාවයක් දක්වන ගණ, උප කුල (-inae ලෙස අවසන් වන), කුල (-idae ලෙස නම අවසන් වන) සහ යෝත්‍ර (-da ලෙස නම අවසන් වන) ආදී ලෙස වර්ග කරනු ලැබේ. මෙම ප්‍රකාශනයේදී විස්තර කෙරෙන විශේෂ කුල යටතේ දක්වා ඇත. මොලොස්කාවන් පිළිබඳව විස්තර කෙරෙන ඡේදවල විද්‍යාත්මක නම භාවිත කිරීමේදී කතෘගේ නම සහ වර්ෂය ඉවත් කර ඇති නමුත් වර්ගීකරණයේදී සහ විද්‍යාත්මක නම් ආකාරයට පෙළඟැස්වීමේදී එය සඳහන් කර ඇත. මෙම ප්‍රකාශනයේදී සරල වර්ගීකරණ ක්‍රමයක් භාවිත කර ඇත. සමහර

විද්‍යාත්මක ප්‍රකාශනවලදී මෙම ප්‍රකාශනයේ සඳහන් නොවන ගණනාම සහ උප ගණනාම වෙනස් ලෙස සඳහන් කර පැවතිය හැකි අතර එහෙත් විශේෂ නාමය වෙනස් නොවේ. උදාහරණයක් ලෙස කවඬි සහ කේතුකයන් අයත් කුලවලට විශේෂ විශාල සංඛ්‍යාවක් අයත් වේ. ඉහත කුලයේ සතුන් තව දුරටත් උප කුල සහ උප ගණවලට බෙදා ඇත. මෙම ප්‍රකාශනයේදී *Cypraeidae* (කවඬි) හා *Conidae* (කේතුකයන්) යන කුල දෙකට සහ *Cypraea* (කවඬි) හා *Conus* (කේතුකයන්) යන ගණ දෙක යටතේ පමණක් ඉහත මොලස්කාවන් වර්ගීකරණය කර ඇත.

එලක

මෙහි විස්තර කර ඇති සියළුම විශේෂවල ස්වරූපය පැති දෙකකින් හෝ වැඩි ප්‍රමාණයකින් දැක්වෙන පරිදි ඡායාරූප ඇතුළත් කර ඇත. ග්‍රැස්ට්‍රොපෝඩා කවචවල ඉහළින් සහ විවරය පෙනෙන ලෙස පහළින් ලබා ගත් ඡායාරූප ඇතුළත් කර ඇත. (තාක්ෂණික වචනවල විස්තර සඳහා පාරිභාෂික ශබ්දමාලාව සහ රූප සටහන් බලන්න) දැනට නොහැසී ඇති ලිම්පට් විශේෂවල කවචය පුර්ව පෙදෙස ඉහළට යොමුවන සේ සිටුවා ඡායාරූප ගත කර ඇත. දෙපියන් බෙල්ලන් (සිප්පි) ඡායාරූප ගත කිරීමේදී ඔවුන්ගේ පුර්ව පෙදෙස වමට සහ පෘෂ්ඨීය පැත්ත ඉහළට පෙනෙන ලෙස සිටුවා ඡායාරූප ගත කර ඇත. ගැස්ට්‍රොපෝඩා කවචවල ඉහළ ප්‍රදේශය සහ විවරය (හැකි සෑම විටකදීම පිධානයද) පෙන්වා ඇත. සිප්පිගේ බාහිර සහ අභ්‍යන්තරය දැක්වෙන ආකාරයට සහ පියන් එකතු වී ඇති ආකාරය දැක්වෙන ඡායාරූපද දක්වා ඇත. සමහර විශේෂ සඳහා වෙනත් පැති දැක්වෙන ඡායාරූපද ඉදිරිපත් කර ඇත. සෙමී. එකක දිගකින් යුතු කළු හෝ සුදු පැහැ පරිමාණ දර්ශකයක් බොහෝ ඡායාරූප සඳහා භාවිත කර ඇත, අනෙකුත් අවස්ථාවලදී සෙමී. තුනක දිගකින් යුතු පරිමාණයක් භාවිත කර ඇත. ඉඩ ඇති පරිදි වර්ණයේ සහ හැඩයේ වෙනස්කම් සහිත විශේෂවල එම වෙනස්කම් දැක්වෙන ඡායාරූපද දක්වා ඇත.

සතුන් පිළිබඳ විස්තරය

කතු වරයාගේ කවච එකතුවේ ඇති නිදර්ශක මත පදනම්ව එක් එක් විශේෂය සඳහා හඳුනා ගැනීමේ විස්තරයක් ඉදිරිපත් කර ඇති අතර, වර්ණ ඡායාරූපයද විස්තර සමඟ සැසදීමෙන් නිදර්ශක හඳුනාගත හැකිය. උදාහරණයක් ලෙස කවඬි සහ කේතුකයන් හඳුනා ගැනීම සඳහා කවචයේ මතුපිට ලක්ෂණවලට වඩාත් ප්‍රමුඛත්වය දිය යුතු විට වඩා ගැඹුරු විස්තරයක් ඉදිරිපත් කර ඇත. හඳුනා නොගත් කවචවල විස්තර වැඩි ප්‍රමාණයක් දක්වා ඇත. අධ්‍යයන සඳහා විශාලත කාචයක් භාවිත කිරීම අත්‍යවශ්‍ය වේ. මෙම පොත සඳහා තාක්ෂණික වචන භාවිත කිරීම අවම මට්ටමකින් පවත්වා ගැනීමට උත්සාහ දරා ඇති අතර අවශ්‍ය විට පාරිභාෂික ශබ්දමාලාව සහ ඒ සමඟ ඇති රූප සටහන් මගින් මේ පිළිබඳව පැහැදිලි කිරීම් ලබා ගත හැකිය.

එක් එක් සත්ත්ව විශේෂය පිළිබඳ කෙරෙන විස්තරයේදී අධ්‍යයනය කර ඇති නිදර්ශකවලට අදාළව සතුන්ගේ කවචයේ ප්‍රමාණය අවම අගයේ සිට උපරිමය දක්වා මිලි මීටර්වලින් (mm) සඳහන් කර ඇත. ප්‍රමාණ කිහිපයක් දක්වා ඇති විට (උදා 10-17-21) එහි මධ්‍ය සංඛ්‍යාවෙන්, විශාල නිදර්ශක එකතුවක වඩාත් සුලභ ප්‍රමාණය නිරූපණය වේ. විස්තරයේ අවසාන කොටසෙහි නිදර්ශක එකතු කර ඇති ස්ථාන පිළිබඳව සඳහන් කර ඇත. මෙහිදී නිදර්ශක හමු වී ඇති බවහිට වෙරළෙහි උතුරුම කෙළවරෙහි සිට මහාවර්තව නැගෙනහිර වෙරළ දක්වා ස්ථාන නාම සඳහන් කර ඇත. සෑම ස්ථාන නාමයක්ම පහත පරිදි විස්තර කර ඇත.

- ❖ ප්‍රදේශය - ආසන්නම නගරය
- ❖ ස්ථානය - (වරහන් තුළ, ගලෙහි හම, දූපත්, බොක්ක, කලපුව ආදී වශයෙන්)
- ❖ වාසස්ථානය - උපස්ථරය සහ උප උදම් කලාපයේ ගැඹුර

වාසස්ථාන

මුහුදු වෙරළේ ජීවත් වන විශේෂවල වාසස්ථානය විස්තර කිරීමේදී එහි භූ විෂමතා ලක්ෂණ මෙන්ම උදම් සහ මුහුදු රළෙහි බලපෑමද සැලකීමට භාජනය කර ඇත. මෙහිදී භාවිත කර ඇති වදන් පහත පරදී වේ.

- ❖ ගල්පර වෙරළ - ප්‍රධාන වශයෙන් ගල්පර පිහිටා ඇති වෙරළ
- ❖ වැලි සහිත වෙරළ - ප්‍රධාන වශයෙන් මුහුදු වැලිල ඇති වෙරළ කලාපය
- ❖ වෙරළ - ගොඩබිම ලෙස හඳුන්වන දුර්භීය භෞමික ශාක ප්‍රජාව සහ මුහුදේ ජල සීමාව අතර පිහිටා ඇති වැලි සහිත කලාපය
- ❖ ඉහළ වෙරළ - ගොඩබිම ශාක ප්‍රජාව ආශ්‍රිතව ඇති මුහුදු වෙරළ කලාපය, සමහර විට ගල්පර දක්නට ඇත
- ❖ පහළ වෙරළ - ජල තීරය ආශ්‍රිතව ඇති වෙරළේ පහළ කලාපය
- ❖ උදම් තටාක - ගල්පර දූපත්, පර හෝ ගල් පර සහිත වෙරළ කලාපවල ආවාට හෝ විවරයන්හි ජලය රැඳී තටාක වේ. වඩදිය හෝ මුහුදු රළ මගින් මෙම තටාකවල ඇති ජලය කාලීනව අළුත් වේ.
- ❖ උපර් උදම් කලාපය - උදම් රළෙහි බලපෑමට ලක් නොවන එහෙත් වෙරළට පහිත වන මුහුදු රළින් සේදීමට භාජනය වන කලාපය වේ
- ❖ අන්තර් උදම් කලාපය - කාලීනව ජලයෙන් යටවන සහ නිරාවරණය වන, වඩදිය සහ බාදිය සීමා අතර පිහිටා ඇති කලාපය වේ.
- ❖ උප-උදම් කලාපය - ස්ථීරව ජලයෙන් යටවී ඇති බාදිය මට්ටමට පහළින් පිහිටා ඇති කලාපය

කවච විස්තර කරන පද

පිටු 6-8 මගින් ගැස්ට්‍රෝපෝඩ් බෙල්ලකුගේ කවචයක් (රූපය 1) සහ සමහර දෛපියන් බෙල්ලන්ගේ කවචවල (රූපය 2 a සිට f දක්වා) කොටස් නම් කර ඇත. මෙසේ නම් කර ඇති පද පාරිභාෂිත ශබ්ද මාලාවේ දී තව දුරටත් විස්තර කර ඇත.

ගල්කිස්ස ගල් පර වෙරළ

මෙම පොතෙහි සඳහන් කරුණුවලට මුලාශ්‍ර සපයන අධ්‍යයන වැඩි ප්‍රමාණයක් සිදුකරන ලද්දේ ගල්කිස්ස හෝටලයට උතුරෙන් වන ගල්කිස්ස වෙරළ යන නමින් හඳුන්වන ප්‍රදේශයේය. ස්වභාවික පරිසරයක් තුළදීම මොලස්කාවන් අධ්‍යයනය සඳහා මෙම ප්‍රදේශය ඉතාමත් යෝග්‍ය වන බැවින් ප්‍රදේශයේ විස්තරයක් මෙහි සඳහන් කර ඇත. ගල්කිස්ස හෝටලය පිහිටා ඇති ස්ථානයේ ගල්පර සහිත මුහුදු වෙරළක සිට වැලි සහිත වෙරළක් දක්වා උතුරු දිශාවට යොමුව මුහුදු බොක්කක් නිර්මාණය කරන ගල්කිස්ස වෙරළ තීරය අන්තර් උදම් කලාපීය මොලස්කාවන් අධ්‍යයනය සඳහා කදිම ස්ථානයකි. වාසස්ථානය පිළිබඳ කෙරෙන විස්තරයේදී ගල් පර්වතවලට යෙදෙන විශේෂිත නම්වලින් හඳුන්වා ඇති නිසා මෙම පරිච්චේදය අවසානයේ ඇති රූ සටහන් තුළින් එම ගල් සමූහයන් පිළිබඳ විස්තර කෙරේ. මෙහිදී භාවිත කෙරෙන නම් බොහෝමයක් ධීවරයන් භාවිත කරන පාරම්පරික නම් වන අතර, සමහරක් පමණක් අධ්‍යයන කණ්ඩායම¹ විසින් යොදාගත් නම් වේ. සිතියමේ විස්තර කර ඇති ගල් සමූහ තුනකට අයත් රූ සටහන් මෙහි දක්වා ඇත. වෙරළේ සිට මෙම ගල් සමූහයන් නිරූපනය වන ආකාරයට රූ සටහන් නිර්මාණය කර ඇත.

දිග්ගල

රළු මතුපිටක් නිර්මාණය වන පරිදි පහත් ගල් තලාවකින් දිග්ගල නිර්මාණය වී ඇත. මෙහි ගැඹුරු උදම් තටාක සහ නොගැඹුරු ඇලු පිහිටා ඇත. නිරිතදිග මෝසම් සමයේ මෙය සහ ඇල්ගී තට්ටුවකින් ආවරණය වන අතර ලිම්පට්, බානකල්ස් සහ ඔයිස්ටර්ස් විශාල ප්‍රමාණයක්ද දැකගත හැකිය (පොතේ මුල ඇති 4වන ඡායාරූපය බලන්න) සමහර කාලවල රිබ්ඩ් මසල්ස් *Brachiodontes* විශාල ප්‍රමාණයක් සිටිනු දැක ගත හැකිය.

බකමුණු ගල සහ ඕරා ගල¹

ජල සීමාව අද්දර බකමුණු ගල සහ ඕරා ගල පිහිටා ඇත. මෙම ගල මීටර 2-3 පමණ උස් වන අතර වෙරළේ බිඳෙන රළ මුහුදට ගලා යන අවසාන සීමාවේ දී මෙම ගල නිරාවරණය වේ. මෙම ගල් සමූහයේ පාදම සම්පූර්ණයෙන්ම ජලයෙන් වැසී පවතින අතර බාදිය අවස්ථාවේදී ඇලුගි සහ මොලස්කා කවචවල සිරස් කලාපනයක් නිරීක්ෂණය කළ හැකිය (ඵලක 17 හි රූපය 3 බලන්න) වඩාත් තෙත් වාසස්ථාන ප්‍රිය කරන *Nodilittoria sp* වැනි පෙරවින්කල්ස් විශේෂ සහ ලිම්පට් විශේෂ ද දැකගත හැකිය.

ජල බිඳෙන සීමාවට වඩාත් පිටුපසින් පිහිටා ඇති ආදර්වන්තයින්ගේ ගලෙහි (Lover's Rock) සහ නැරඹුම් ගලෙහි (Pavilion Rock) *Littoraria undulata* විශේෂය වැඩි වශයෙන් දැකගත හැකිය. මොවුන් සමූහ වශයෙන් උපරි උදම් කලාපයේ සිටිනු නිරීක්ෂණය කළ හැකිය (ඵලකය 17 හි

¹ 1995-1997 කාලයේදී ශ්‍රී ලංකා ජලජ ක්‍රීඩා සමාජය සහ ශාන්ත තෝමස් විද්‍යාලීය ජලජ ක්‍රීඩා සමාජය එක්ව මෙම ප්‍රදේශයේ ශාක සහ සත්ත්ව විවිධත්ව පිළිබඳ අධ්‍යනයක් සිදුකරන ලදී. මෙහි දැක්වෙන *Melampus* ගේ වාසස්ථානය (කොටුව A) සිතියම (රූපය 6), රූ සටහන් (රූපය 3 සහ 5) එම සාගර ප්‍රදේශ විවිධත්වය සිතියම ගත කිරීමේ අධ්‍යනයේදී සකසන ලදී. ඵලක 19, රූපය 7 දැක්වෙන ඡායාරූපය මෙම අධ්‍යනයේදී ගන්නා ලදී. ප්‍රියා මාපිට්ගම විසින් රූපය 3,4 සහ 5 MBIOD සඳහා අඳින ලදී.

රූපය 4 බලන්න) තවද කාලගුණය මත 'බැරන්' ගලට මුහුදු රළ තදින් පතිත වන කාලවලදී එය මතද ඉහත මොලස්කා විශේෂ නිරීක්ෂණය කළ හැකිය. 'කැති කැටිය' ගල ලෙස හඳුන්වන ගල් සමූහය මීටර් 3ක් පමණ උස් ගලක් වන අතර එහි මුදුනේ නොගැඹුරු උදුම් තටාකයක් සහ ජලය රැඳී විවරයන් පවතී. දියඹේ සිට ගොඩට පැමිණෙන මුහුදු රළ මෙම ගලෙහි හැපීමෙන් විසිරෙන ජලයෙන් තටාකයේ ජලය නිතරම අළුත් වෙමින් පවතින අතර සෙයිස් ගෝල්ස් ලිම්පට් (*Siphonaria alternata*) ලෙසින් හඳුන්වන විශේෂයේ වාසස්ථානය වේ. මෙම ගලෙහි නිරාවරණය වී ඇති වයඹ කොටසේ ලිම්පට් විශේෂ බහුලව හමුවේ. මෙම ගල් ආශ්‍රිතව ගල් මොලස්කා විශේෂ දෙකක් නිරීක්ෂණය කළ හැකිය. ගල් කුහර තුළ ගුනියුලා ඩුප් (*Morula granulata*) බහුල වන අතර ජලය රැඳෙන විවර සහ අගල් තුළ ටෝඩ් පර්පල් (*Thais bufo*) විශේෂය අඩු බහුලතාවයකින් හමුවේ.

ගල්කිස්ස හෝටලයට අයත් තණකොළ වැවී ඇති ඉවුරු සීමාවේ බෑන්ඩඩ් මෙලාම්පස් (*Melampus fasciatus*) විශේෂය හමුවේ. මෙම ඉවුරේ වැවී ඇති තණකොළ ප්‍රමාණය ක්‍රමයෙන් අඩු වෙමින් පවතින බැවින් ඉහත මොලස්කාවන් ඉවුර පාමුල තෙත ගල් හලාවේ වැටී ඇති කොළ යට පීවත් වේ.

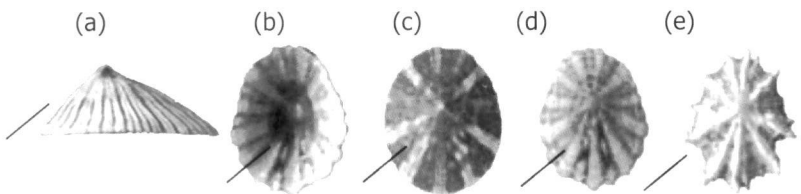
ගල්කිස්ස වෙරළ පිළිබඳ පරිච්ඡේදයේ සඳහන් වන 'බෙල්ලන්ගල' රූ සටහන් සිතියමේ දක්වා නොමැත. මෙම ගල ඉහත සඳහන් කර ඇති ගල් සමූහයට කිලෝ මීටර දෙකක් පමණ උතුරින් ජලප ක්‍රීඩා සමාජය පිහිටා ඇති ස්ථානයෙන් මීටර් දෙකක් සියයක් දියඹට වන්නට පිහිටා ඇති පාෂාණමය දූපත් කොටසක් වේ. මෙය දෙහිවල ගල්කිස්ස පළමු පරය සහ වැල්ලවත්ත පළමු කින්රෝස් පරයේ කොටසක් වේ. මෙය ජල තලයෙන් මීටර දෙකක් පමණ ඉහළට නැගෙන අතර ඔයිස්ටර්ස් සහ ඩුවුන් මසල්ස් (*Perna perna*) විශාල ගහන වාසය කරයි. නිරිතදිග මෝසම අවසන් වන දෙසැම්බර් මාසයේදී ගලට නැගීමට හැකි වූ විගස ප්‍රදේශවාසීන් ඩුවුන් මසල්ස් එකතු කරනු ලැබේ.

ජලප ක්‍රීඩා සමාජය පිහිටි ස්ථානයෙන් උතුරු දිශාවේ මුහුදු වෙරළ වඩාත් පළල් සහ මද බෑවුමක් සහිත වේ. මෙහි මිනිස් අපද්‍රව්‍ය බහුලව ඇත. මුහුදු රළ මගින් පෙරලී ඇවිත් වැල්ලු හාරාගෙන නොපෙනී යන *Donax deltoides* සහ *Donax cuneatus* විශේෂවලට අයත් වෙළු ක්ලෑම්ප් සහ කොමන් ඔලිව් *Oliva oliva* මෙම වෙරළ තීරයේ දක්නට ලැබේ.

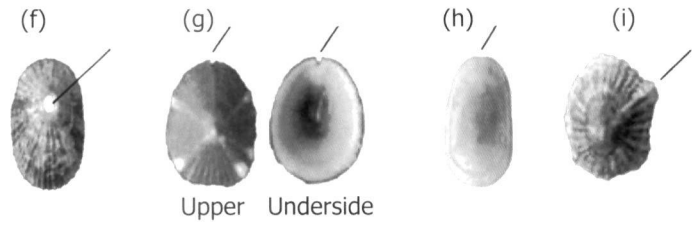
හඳුනා ගැනීමේ සුවිස

මෙම පොතෙහි විස්තර කර ඇති කවච අයත්වන කුල හඳුනා ගැනීම සඳහා මෙම සුවිස උපකාරී වේ. මෙහිදී විස්තර කර ඇති ලක්ෂණ අදාළ ඵලකය සමඟ සැසඳිය යුතුය. මෙහි දක්වා ඇති පියවර අනුගමනය කළ යුතු අතර හඳුනා ගැනීමට විශේෂයෙන් සැලකිය යුතු ලක්ෂණය යටින් ඉරක් ඇඳ ඇත.

- 1 තනි කවචයක් ඇත: ගැස්ට්‍රොපෝඩා..... 30 යන්ත
- 2 කවච යුගලක් ඇත: එක් ස්ථානයකින් සම්බන්ධ වී ඇත. බයිවැල්ව්..... 130 යන්ත
- 3 (A) කවචය දැරුණු නොවේ, හිස් වැස්මක් හැඩයට පාර්ශ්විකව නොඋස් කේතුවක් ලෙස දර්ශනය වේ (a) යටි පැත්ත සම්පූර්ණයෙන් කවච විවරයෙන් යුක්ත වේ (b) Limpets - බාහිර හැඩය ඕවලාකාර වන අතර සියුම් අර්ධ නාරටි ඇත (c) හෝ රළු නාරටි ඇත (d) හෝ බාහිර දාරය නැමුම් සහිතය (e): PATELLIDAE සහ ACMAEIDAE [true limpets] ඵලකය 1 සහ 2;



හෝ මුදුන් සිදුරක් ඇත (f), පූර්ව කෙළවරේ පැල්මක් ඇත (g), ඇතුළු පැත්තේ නොගැඹුරු පූර්ව ඇලියක් හෝ නොගැඹුරු පූර්ව නෙරුමක් ඇත (h): FISSURELLIDAE [keyhole limpets] ඵලකය 2;



හෝ කවච දාරයේ දකුණු පැත්තේ පිම්ඹීමක් ඇත (i): SIPHONARIIDAE [false limpets] ඵලකය 2.

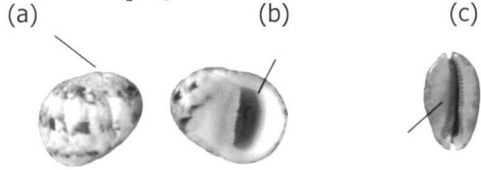
- (B) කවචය මේ ආකාර නොවේ..... 40 යන්ත
- 4 (A) කවචය දැරුණු නොවේ නමුත් මෙය පැහැදිලිව දිස් නොවිය හැකිය කවච දැරුණු උස් නොවන පැත්තේ හෝ සැතව පැවතිය හැකිය, කවචයේ මුදුන පැහැදිලි නොවේ..... 50 යන්ත
- (B) කවචය පැහැදිලි ලෙසම දැරුණු නොවේ කවච දැරුණු උස් හෝ උස් නොවිය හැකි අතර කවචයේ මුදුන තියුණුය 70 යන්ත.

5 (A) කවචය ඉතා තුනීය, විනිවිද පෙනෙන සුළිය, කැඩෙන සුළිය, මුදුන ගිලී පවතින කවච විවරය ඉතා දිගුවන අතර එය කවචයේ පූර්ව කෙළවරට වඩා දික්ව පවතී: HAMINOEIDAE [paper bubbles] ඵලකය 3

(B) කවචය සන හෝ තුනී වන අතර, එහෙත් ශක්තිමත්ය 6 ට යන්න

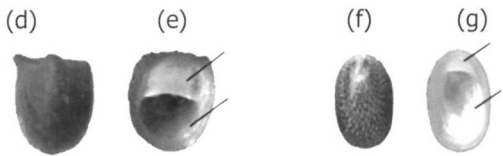


6 (A) කවචය ශක්තිමත් සහ දැඩිය, ගෝලාකාරය, කවච දඟරය උස් නොවන හෝ පැතලි වේ. කවච විවරය අර්ධ ගෝලාකාරය ස්ඵර්ෂිකා කිණිකය (columella callus) පැතලිය (a) සහ (b): NERITIDAE – *Nerita* [සාගර nerites] ඵලකය 4:



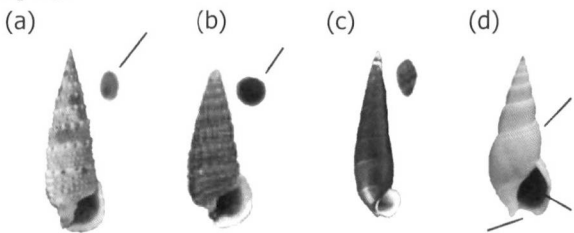
(B) කවචය ශක්තිමත් කවච දේහයේ කවච දඟරය ගිලී ඇත, ඕවලාකාරය, පෘෂ්ඨීය ඉදිමුමක් සහිතය, පහළ ප්‍රදේශය පැතලි වන අතර මධ්‍යයේ සිට සම්පූර්ණ දිගට විනිද යන සිහින් කවච විවරයක් පවතී. (c): CYPRAEIDAE [cowries] ඵලකය 8

(C) කවචය සිහින් සහ සැහැල්ලුය. පළිහක් ආකාර වේ, අර්ධ කවාකාර කවච විවරයක් ඇත. පුළුල්, පැතලි ස්පර්ෂිකා කුහරයක් ඇත (d) සහ (e) හෝ ඕවලාකාර, විශාල කවච විවරයක් සහිත පටු කුහරයක් ඇත (f) සහ (g): NERITIDAE – *Neritina* [සාගර nerites] ඵලකය 4



7 (A) කවච දඟරය ඉතා උස්ය: කවචයේ මතුපිට ගැටිති සහිතය, කවච විවරය ඇලව පිහිටා ඇත siphonal ඇලිය පටුය, කවච විවරය ඕවලාකාරය (a): CERITHIIDAE [ceriths] ඵලකය 10:

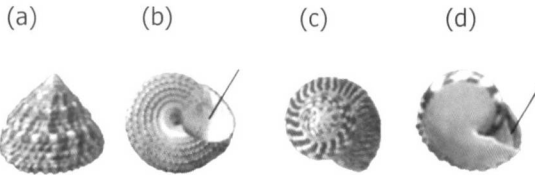
කවචයේ මතුපිට ගැටිති සහිතය, කවච විවරය ඇලව පිහිටා ඇත නිනාල (siphonal canal) ඇලිය පටුය, කවච විවරය වෘත්තාකාරය (b): POTAMIDIDAE [mud creepers] ඵලකය 11:



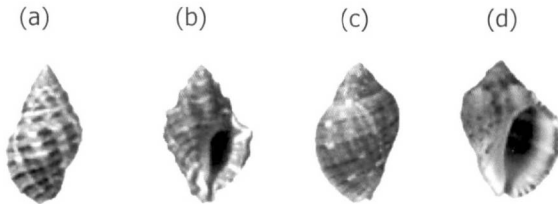
කවචයේ බාහිරය සිතිදිය, නිනාල ඇලිය පුළුල්ය, බාහිර තොල පිටතට නෙරා ඇත. කවච විවරය ඉලිප්සාකාරය (c): **THIARIDAE** [සාගරික නොවන *Faunus*] ඵලකය 11:

කවච දේහය පාර්ශ්විකව රවුම්ය, සිවනියට පහළින් ගැටිති පේළි 2-3ක් පවතී, කවච විවරය මී වදයක ස්වරූපය ගන්නා අතර නිනාල ඇලිය පුළුල්ව විවෘත වේ: (d) **NASSARIIDAE** [basket shells, *Bullia*] ඵලකය 6

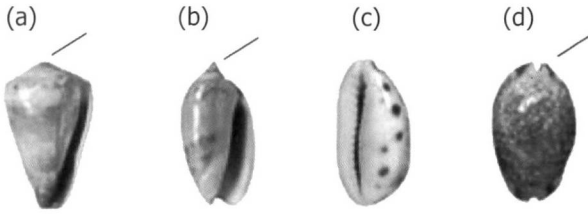
- (B) කවචය මධ්‍ය වශයෙන් උස් හෝ උස් නොවන කවච දැරුයකින් යුක්ත වේ..... 8ට යන්න
- 8 (A) කවචය බඹරයක් හැඩති (a) සහ (b) හෝ බොත්තමක හැඩති වේ (c) සහ (d), කවච විවරය පැතලි යටි පැත්තේ පිහිටා ඇත: **TROCHIDAE** [top shells] ඵලකය 6



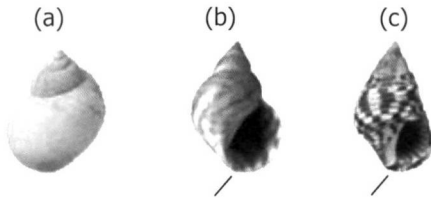
- (B) කවචය මේ ආකාර නොවේ 9 ට යන්න
- 9 (A) කවචය තර්කුරූපී හෝ ද්විකේතුකාකාර වේ කවච විවරය සාපෙක්ෂව විශාලය කවචය මධ්‍යයේ විශාල වන අතර ඉහළ සහ පහළ ක්‍රමයෙන් කුඩා වේ (a) සහ (b), සමහර විට මදක් ඉදිමී ඇත (c) සහ (d): **Muricidae (Thaididae)** [rock shells] ඵලක 8 සහ 9



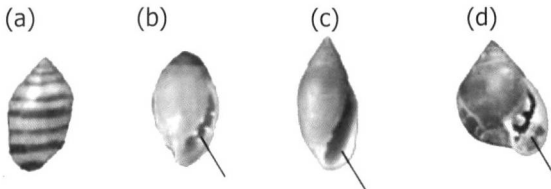
- (B) කවචය මේ ආකාර නොවේ 10 ට යන්න
- 10 (A) කවච විවරය කවචයේ දිගට සමාන සිහින් විවරයකින් යුක්ත වේ කවචය කේතු ආකාර ගන්නා අතර ඉතා කෙටි කවච දැරුයක් ඇත (a): **CONIDAE** [cones] ඵලකය 7; කවචය දිගටි ඕවලාකාරය (බුලටි හැඩති) කෙටි සහ උල් කවච දැරුයක් ඇත (b): **OLIVIDAE** [olives] ඵලකය 6; කවචය ඝනකමැතිය, ඕවලාකාරය, කවච ගෝලයේ කවච දැරුය ගිලී ඇත පෘෂ්ඨය ඉදිමුමක් ඇත, පැතලි යටි පැත්ත මධ්‍යයේ කවච විවරය ඇත (c) සහ (d): **CYPRAEIDAE** [cowries] ඵලකය 8



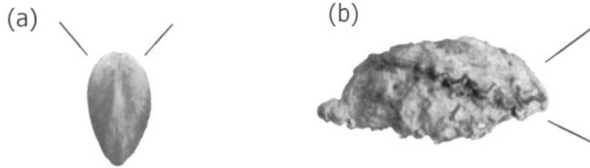
- (B) කවච විවරය මේ ආකාර නොවේ 11 ට යන්න
- 11 (A) කවච විවරය පුළුල් ඕවලාකාරය. කවච ගෝලය තරමක් ඉදිමුණු ස්වභාවයේ ඇත, කවච දූෂරය කෙටි සහ පැහැදිලිව දිස් වේ උල්ය.
- කවච විවරයේ බාහිර තොල සිහින්ය, දත් රහිතය, නිනාල ඇලියක් රහිතය (a) සහ (b): LITTORINIDAE [periwinkles] ඵලකය 5;
- කවච විවරයේ බාහිර තොල ඝනකය, දත් සහිතය, නිනාල ඇලියක් ඇත (c): PLANAXIDE [clusterwinks] ඵලකය 6



- (B) කවච විවරය මේ ආකාර නොවේ 12 ට යන්න
- 12 (A) කවචය ඕවලාකාරය, දූෂරය කෙටිය, උල්ය, කවච විවරය පටු වන අතර බාහිර සහ අභ්‍යන්තර නොල් මත පවතින දත් හේතුවෙන් තවත් පටු වී ඇත (a) සහ (b);
- කවචය සිහින්ය දිගටිය, පටු බිඳුණු හැඩ ගන්නා විවරයක්, බාහිර තොලෙහි දත් පිහිටා නැත, ස්නම්නිකාවෙහි නැමුම් කිහිපයකි (c); හෝ කවචය බල්බාකාර වේ, උල් වූ කෙටි කවච දූෂරයක් ඇත. පෘෂ්ඨයේදී පැහැලිය බාහිර තොල පිටතට නෙරා ඇත. විශාල ලෙස නෙරා ඇති දත් ඇත. (d): ELLOBIIDAE [coffee beans and ear shells] ඵලකය 3

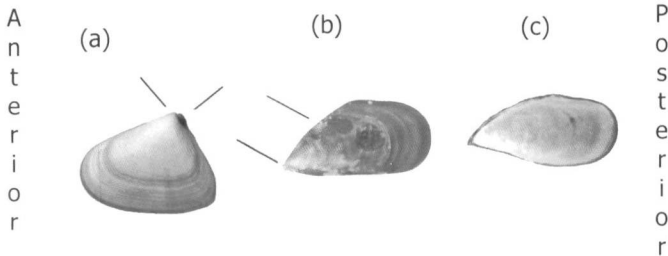


- 13 (A) ඉහළින් නිරීක්ෂණය කරන විට කවචය වම් සහ දකුණු අර්ධ ලෙස කොටස් දෙකකින් (කපාට) සමන්විත වේ මෙම කපාට දෙකම ප්‍රමාණයෙන් සහ ස්වරූපයෙන් වැඩි හෝ අඩු වශයෙන් එකිනෙකට සමාන වේ මෙම කොටස් දෙක එකිනෙකට සම්බන්ධ වීම සඳහා පහළින් ඉඩක් තිබිය හෝ නොතිබිය හැකිය (a)14 ට යන්න

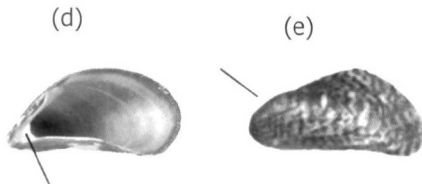


- (B) පාර්ශ්විකව නිරීක්ෂණය කරන විට කවචය ඉහළ සහ පහළ අර්ධ දෙකකින් සමන්විතය, මෙම කවච ප්‍රමාණයෙන් එකිනෙකට අසමාන වන අතර පහළ අර්ධය උපස්ථරයට සවි වී ඇත (b: පාර්ශ්වික දර්ශනය) 16 ට යන්න

- 14 (A) කවචය කෝනාකාරය, Umbones පෘෂ්ඨියව ඇත, කවචයේ ඉදිරි කොටස විශාලය, සම්බන්ධකය (Ligaments) අපර-පෘෂ්ඨිය බැවුමේ බාහිරව පිහිටා ඇත. (a): DONACIDAE [wedge clams] ඵලකය 12



- (B) කවචය දිගට් ඔවලාකාර ලෙස සිහින් වන අතර umbones පුර්ව අන්තයේ පිහිටයි, පිටුපස රවුම් පෘෂ්ඨිය දාරය ඉදිමුණ හෝ රවුම් ස්වභාවයක් ගනී, සම්බන්ධකය (Ligaments) පුර්ව පෘෂ්ඨිය බැවුමේ පිහිටයි (b), අභ්‍යන්තරය දත් හෝ අනෙකුත් ව්‍යුහයන්ගෙන් තොරය (c): MYTILIDAE, Perna [mussels] ඵලකය 12



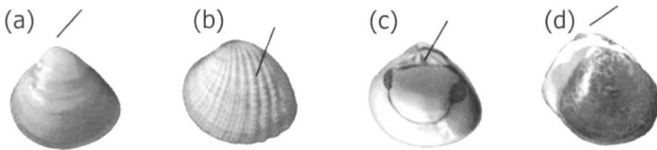
- (C) ඉහත (B) ආකාර වේ නමුත් පුර්ව අභ්‍යන්තරයේ රාක්ක ආකාර කුටීරයක් ඇත. (d): MYTILIDAE, Septifer [deck mussels] ඵලකය 12

(D) කවච ඉහත (A) සහ (B) ට සමාන වේ නමුත් කුඩා තුනී කවච සහිත කැබෙන සුළු දිගු පෘෂ්ඨීය ප්‍රදේශයේ සිට රවුම් පූර්ව අන්තය දක්වා umbones සහිතය. රාක්ක ආකාර කුහරයක් නොපවතී. (e): MYTILIDAE, *Brachiodontes* [ribbed mussels, marine and non-marine] ඵලකය 13

(E) කවචය මේ ආකාර නොවේ 15 ට යන්න

15 (A) කවචය ඝන සහ ශක්තිමත්ය ඉදිමී ඇත තරමක් ත්‍රිකෝණාකාරය, පටු පෘෂ්ඨීය umbones ඇත, උදරීය දාරය රවුම්ය, umbones පිටුපස ඇති සම්බන්ධකය අපර-පෘෂ්ඨීය බැවුමේ පිහිටා ඇත. බාහිරින් සිහින් සහ දිලිසෙන සුළුය (a) හෝ මතුපිට රළු වන අතර umbones සිට ගැටිති රේඛාවන් විහිදේ (b), අභ්‍යන්තරයේ ශක්තිමත් අසඵල තැටියක් (Hinge plate) ඇත. (c): VENERIDAE [venus clams] ඵලකය 13;

(B) කවචය ආසන්න වශයෙන් රවුම්ය, පෘෂ්ඨීයව කුඩා umbones ඇත (d), බාහිරින් සමකේන්ද්‍රීය වර්ධන රේඛා දැක ගත හැකිය නැවුම් අවස්ථාවේදී වර්ධන රේඛාවල සමකේන්ද්‍රීයව පවතින රැලි දිගේ පවතින පරිකවචයක් දැක ගත හැකිය: CORBICULIDAE, *Geloina* [marsh clams] ඵලකය 13.

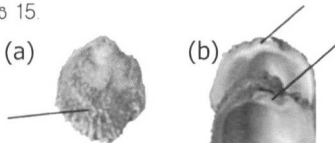


16 (A) කවචය විවිධ හැඩ ගනී, (කෝණාකාර රවුම් හෝ සෙරප්පු ආකාර) දැන් රහිත කවච අසඵලක් (Hinge) ඇත. පහළ කපාටය ගැඹුරු කෝප්පාකාරය (a), ඉහළ කපාටය පැතලි හෝ අවතල වේ. පියනක් ආකාරය (b), කවච දාරයේ රැලි එකිනෙක අතිපිහිත ලෙස පැවති හැකි අතර නැතහොත් සිහින් දාරයකි: OSTREIDAE [oysters] ඵලකය 14



(B) කවචය මේ ආකාර නොවේ17 ට යන්න

17 කවචය රවුම් හෝ හෘදාකාරය (a), කවච ඝනකම්භේය. ශක්තිමත් සොසේපස් ආකාර අසඵල දැන් පෘෂ්ඨීය දාරයට සමාන්තරව අතිපිහිත ලෙස පිහිටා ඇත (b: ඉහළ කපාටය උඩින් පිහිටන අතර පහළ කපාටය යටින් පිහිටයි), පහළ කපාටය ගැඹුරු කෝප්පාකාරය ඉහළ කපාටය තුනී පැතලි හෝ අවතල පියනක් ආකාරයෙන් සම්බන්ධ වී ඇත. කවචයේ මතුපිට සමකේන්ද්‍රීය, උල් හෝ නෙරුම් රේඛා ඇත: CHAMIDAE [jewel boxes] ඵලකය 15



இலங்கைக் கடற்கரையிலுள்ள ஓடுகள்

அறிமுகம்

அறிமுகம்

கணம் - Mollusca or Molluscs இற்கு சார்ந்துள்ள விலங்குகளின் இரு கூட்டங்களது சண்ணாம்பாலான வெளிப்புற போர்வைகளாக கடலோடுகள் இருக்கின்றன. இவ்விரு கூட்டங்கள் நத்தைகள் (அல்லது சுருளிகளில் தோற்றுவிக்கப்பட்ட ஓடுகளை கொண்ட gastropod கள் அல்லது பெருஞ்சிப்பிகள் (அல்லது ஒரு பிணையலினால் இரு அரைப் பகுதிகளை கொண்ட ஓடுகள் பிணைக்கப்பட்டிருக்கும் bivalve களாகும். கடற்கரைகளில் காணப்படும் ஓடுகளை கொண்டிருக்கும் விலங்குகளின் தகவல் அதாவது அவற்றின் பெயர்கள், வாழிடங்கள், உணவு முறைகள் பற்றி ஆராய்வது கடினமாக இருந்தது. கிடைக்கக்கூடியதாக இருந்த புத்தகங்கள் தரைவாழ், சமுத்திரத்தில் வாழும் ஓடுகள் பற்றியே தொடர்புடையதாக இருந்தது. "Sea Shells of Sri Lanka" என்ற பராக்கிரம கீர்த்திசிங்கவின் புத்தகத்தின் வெளியீட்டினால் பல ஓடுகளை பெயரிடுவதற்கு சாத்தியமானது. இவ் ஓடுகள் எக் குடும்பத்தினை சார்ந்தன போன்றனவும், மற்றைய ஓடுகளுடன் அவற்றின் தொடர்புகளும் அல்லது அவை எங்கே வாழ்கின்றன போன்ற தகவல்களும் இல்லை. இப்பேறப்பட்ட தகவல் ஓடுகளுக்கான பிரபலமான வழிகாட்டிகள், விஞ்ஞானப் பிரகாரங்கள் ஆகிய இரண்டின் பல்வேறு புத்தகங்களை ஆராய்வதால் மெதுவாக சேகரிக்கப்பட்டது. ஆசிரியரின் கள அவதானிப்பு போன்ற வளங்களில் இருந்து பெறப்பட்ட தகவல்களின் ஒரு வழிகாட்டலாக இப்புத்தகம் இருக்கின்றது. கடற்கரையில் உள்ள உயிர் வாழிகளின் சுவாரஸ்யம் கொண்ட இயற்கைவியலாளருக்காக இது எழுதப்பட்டுள்ளது.

நோக்கம்

வன் முருகைக் கற்களும் பாறை தொடர் மீன்களும் போன்ற ஒரு சில மீன்களை தவிர இலங்கையில் உள்ள கடல்வாழ் உயிரினங்களின் பல்வகைமையையும் கருத்திற் கொண்டு இலங்கையில் மிக சிறிதளவு ஆய்வுகளை நாடாத்தப்பட்டுள்ளன. ஓடுகள் கொண்ட mollusca களின் பல்வகைமையிலும் ஒரு ஆர்வத்தினை பிறப்பிப்பதற்கு ஒரு முயற்சியின் இலட்சியம். ஆர்வம் கொண்டவர்களால் எடுத்துக் கூறப்பட்டுள்ளது. ஓடுகளின் பரம்பல் பற்றிய எமது அறிவினை சேர்த்துக் கொள்வதற்கு இத்தீவினை சுற்றி உள்ள ஓடுகளை இனங்கண்டறிவதற்கு ஆர்வம் கொண்ட மக்களை ஏதுவாக்கக்கூடிய இப்பேறப்பட்ட புத்தகம் உதவியது. இப்பேறப்பட்ட அறிவு நேர காலத்தில் ஏதாவது இனங்களின் வாழ்க்கைத் தரம் இயற்கையின் காரணத்தினால் அல்லது மனிதனின் தாக்கத்தால் அச்சுறுத்தலாக்கப்படுகிறது என அறிவதற்கு விஞ்ஞானிகளிற்கு உதவும். தரைவாழ் இனங்களிலும் பார்க்க கடல்வாழ் உயிரினம் கொண்டிருக்கும் அனுசுலமாக அநேகமானவை பிளாந்தனுக்குரிய குடம்பி நிலையினை கொண்டிருத்தலாகும். முட்டையிலிருந்து பெரித்த நுணுக்குக்காட்டிக்குரிய குடம்பிகள் ஏதாவது உகந்த அடிப்படையின் மேல் பதித்துக் கொள்வதற்கு அவை பொருத்தமானதாக இருக்கும் வரை சமுத்திர நீரோட்டங்களுடன் இழுத்துச் செல்லப்படுகின்றன. இது பரந்தளவிலான பரவுதலுக்கு முடிவுறும் உகந்த வாழிடங்களையும் காலநிலை மாதிரிகளையும் கொண்ட அயல் தரைகளிலும் கூட ஏற்படும். இதன் விளைவாக நான் இலங்கைக்கே இந் நாட்டுக்குரிய இனமாக mollusc ஏதாவது குறிப்பிட்ட இருக்கின்றதென்று கூறுவதற்கு இயலாமல் இருக்கின்றது.

இலங்கைக் கடற்கரையினைச் சுற்றி கடல்வாழ் ஓடுகள் ஒரு பரந்தளவில் இருக்கின்றன. கீர்த்திசிங்க (1978) அவரது புத்தகத்தில் 450ற்கும் மேற்பட்டனவற்றை விபரித்து எடுத்துக் காட்டியுள்ளார். ஆனால், இலங்கையின் பூரணமான பட்டியல் 1500 றிலும் பார்க்க உண்மையில்

இலங்கைக் கடற்கரையிலுள்ள ஓடுகள்

அதிகமாக இருக்கக்கூடுமென கூறப்பட்டிருக்கின்றது. இப் புத்தகத்திற்காக "கடற்கரையிலுள்ள கடல்வாழ் ஓடுகள்" எனும் தொகுப்பானது ஒடுக்கப்பட்டுள்ளது. ஏனெனில், scuba சுனியோடுதலும் வருடி இழுத்தல் போன்ற சிறப்படைந்த தொழில்நுட்பங்களுக்கு வளத்திணையின்றி மக்களின் ஒருபெரும் எண்ணிக்கையானோர்களினும் ஆராய்ந்து கொள்வதற்காக இவ்வாழிடம் ஏற்றதாக இருந்தது என்பதனை உணர்ந்து கொண்டதினாலாகும். இந் நோக்கத்திற்காக கடற்கரையிலுள்ள கடல்வாழ் ஓடுகளினது வரைவிலக்கணம் வற்றுப்பெருக்குகளின் எழுச்சியினாலும் தாழ்வடைதினாலும் வற்றுப்பெருக்கு (அல்லது நெய்தனிலத்திற்கு வாழிடங்கள்) அலைகளினாலும் பருவ நிகழ்வீரீதியில் மூடப்படும் மூடப்படாமலும் இருப்பதென்பதனால் கடற்கரையின் பகுதியின் மேல் வாழ்கின்ற அவ்வகைகளை உள்ளடக்குகின்றது. உபவற்றுப் பெருக்கு (அல்லது உப நெய்தனிலத்திற்குரிய) இடமான முற்றிலும் அமிழ்ந்துள்ள வாழிடங்களில் வாழ்கின்ற விலங்குகளினால் வாழிடத்திற்குள்ளாக்கப்பட்ட கடற்கரைகளில் காணப்படும் வெற்று கடல் வாழ் ஓடுகள் இங்கு தவிர்க்கப்பட்டிருக்கின்றது எவ்வாறியனும், மிகவும் ஆழமற்ற நீரில் முற்றிலும் அமிழ்ந்து வாழ்கின்ற ஒருசில இனங்கள் உள்ளடக்கப்பட்டிருக்கின்றன. (கீழே பார்க்கவும்). அதிமேல் வற்றுப்பெருக்கு வாழிடங்களில் வாழ்கின்ற ஓடுகள் உள்ளடக்கப்பட்டுள்ளன. உயர் வற்றுப்பெருக்கு மட்டத்திற்கு மேலே இவை வாழ்கின்றன. ஆனால், பருவ நிகழ்வு ரீதியில் வழமையாக உயர் வற்றுப்பெருக்கு நேரங்களில் முடிவடையும் அலைகளினால் அடித்துச் செல்லப்படுகின்றன. ஆராய்ச்சித் திட்டத்தினை முகாமைத்துவம் செய்தலில் இது ஒரு வசதியான வழியாக இருந்தது.

ஆசிரியரின் ஒரு முதலான நோக்கம் உயிர்வாழ் விலங்குகளை சேகரித்தலை மேம்படுத்துவதாக இருந்ததில்லை. ஆனால், குறைந்தளவு வாழிட குழப்பத்துடன் அவதானிப்பினை ஆர்வப்படுவதற்கு மாறானதாகும். இதனை முடிப்பதற்கு நிற்ப் புகைப்படங்களுடன் தேவையான இடத்து நிறங்களையும் மாதிரி வடிவங்களிலும் உதாரணங்களை உள்ளடங்கலாகவும் விபரங்களைக் கொண்ட இணைப்புக்களை உள்ளடங்கலாக எடுத்துக் காட்டுவதற்குத் தீர்மானிக்கப்பட்டது. இந்நூலானது தயாரிப்பு நிலையில் இருக்கையில் கடற்கரை mollusc விலங்குகள் கண்டல்களிலுள்ளனவற்றையும் உள்ளடக்குவது விரிவாக்கப்பட்டதுடன் தொடர்ந்து பின்பு கடல்வீரிகளிலும், வற்றுப்பெருக்கினால் செவ்வாக்குள்ளாக்கப்படும் ஆறுகளினதும், கால்வாய்களினதும் தாழ்வான அணமித்தல்களிலும் வாழ்கின்ற சில உவர்நீர் வகைகளும் உள்ளடக்கப்படுவதற்கு விரிவாக்கப்பட்டது. ஒரு நோக்கத்திற்கான விரிவாக்கம் ஆழமற்ற நீரிலும் அதாவது 1 மீற்றர் வரை ஆழமான இடத்திலிருந்து சேகரிக்கப்பட்டிருக்கின்ற குறிப்பிட்ட சில இனங்களை உள்ளடக்கப்படுவதற்கும் இருந்தது. தேர்வுக்கான சில விதிமுறை ஒரு இன வற்றுப்பெருக்க வலய வகைகளுடன் தொடர்புபட்டதாக உணவாக உட்கொள்ளப்படுவதற்காக சேகரிக்கப்பட்டதாகவோ அல்லது அலைந்து திரியும்பொழுது பொதுவாக எதிர்கொள்ளப்பட்டன இவை சிறிதளவு அனுபவமுள்ள snorkel சுழியோடிகளுக்கு இலகுவாக எடுக்க முடியும். இந்த இனங்கள் சில கடற்கரையோரங்களிலுள்ள நீர்க்குழிகளிலும் வெளியாக மேலேயுள்ள பாறைத் தொடர்களிலுள்ள நீர்க்குழிகளிலும் காணப்படுகின்றன. இலங்கையிலுள்ள, கடற்கரை வழியேயுள்ள பல பகுதிகளில் கண்டல்களைக் கொண்ட கடற்கரைகள் எழுகின்றன அத்துடன் கண்டல்களிலும் கடலேரிகளிலுமுள்ள உவர்நீரில் வாழ்கின்ற விலங்குகளில் சிலவற்றிற்கிடையே ஒரு ஒத்தன்மை இருக்கின்றது.

இந்நூல் இலங்கையிலுள்ள வற்றுப்பெருக்கு இடங்களிலும் கண்டல்களிலும், கடலேரிகளிலும் உள்ள இனங்களை விபரிக்கவில்லை. இங்கே உள்ளடக்கப்பட்ட இனங்கள் ஆசிரியரினால் சேகரிக்கப்பட்டனவாகவோ அன்றி அவதானிக்கப்பட்டனவாகவோ உள்ளன இந் நூலினைப்

பாவிப்பவர்கள் இது போன்ற இனங்களில் இடப்பட்டியலிற்கு அவற்றின் பரம்பலையும் சேர்த்துக் கொள்ளலாம். எல்லாத் தட்டுருக்களும் ஆசிரியரின் புகைப் படங்களிலிருந்தே தயாரிக்கப்பட்டன. எல்லாச் சேகரிப்பும் அவர்களைக் கொண்டே பெயரிடப்பட்டிருப்பதுடன் (கிடைக்கக்கூடிய இடத்து) ஒரு ஆதார சேகரிப்பான கண்டுபிடிப்புத் தரவுகளுடன் சேர்த்து ஒன்றாக பாதுகாக்கப்பட்டிருக்கின்றன.

இயற்கைக்கான மதிப்பு :

ஆய்வு சேகரிப்புக்களின் ஒன்று சேர்த்தலின் பொழுது உயிருள்ள மாதிரிகளைச் சேகரிப்பதற்கு தேவை ஏற்படுகின்றது. எவ்வாறாயினும், ஒரு இடத்தில் உயிர்வகைமையினை ஆய்வு செய்யும்பொழுது அல்லது அறிந்துள்ள இனத்தின் பரம்பலை ஆய்வு செய்யும்பொழுது எப்பொழுதும் தேவையேற்படுவதில்லை. இந் நூலின் நோக்கம் மாணவர்களையும் ஆர்வமுள்ள மக்களையும் ஒரு அறிவுறுத்தும் முறையில் கடற்கரையில் அவதானிப்பதற்கு உற்சாகப்படுத்துவதற்கும் அவர்கள் கண்டுபிடித்த mollusc க்களை இனங்கண்டறிவதற்கு ஏற்றதாகுவதற்கும் இருக்கின்றது. கடற்கரையிலிருந்து வெற்றுக் கடல் ஓடுகள் பொறுக்கி எடுக்கப்பட்டால் எதுவித தீங்குமில்லை. ஆனால், தயவுசெய்து இங்கே நீங்கள் உயிர்வாழ் கடல் ஓடுகளை கண்டால் அதை எடுக்காமல் திரும்பவும் அதே இடத்தில் விட்டுவிடவும். அவற்றை குழப்பத்திற்குள்ளாக்காமல் இருக்கவிடுவது நன்மையானதாகும். ஏனெனில் அதை தாமதவே திரும்ப பதிந்து கொள்வதற்கு முன்பு அவை அடித்துச் செல்லப்படக் கூடும்

கடல்வாழ் ஓடுகளின் பாகுபாடும் பெயரிடுதலும் :

ஓடுகள் கொண்ட mollusc கள் உடலின் உடலமைப்புகளைப் போன்று ஒட்டிக் கொள்ளும் இயல்புகளைக் கொண்டும் பாகுபடுத்தப்படுகின்றன. அதிர்ஷ்டவசமாக நத்தை ஓட்டு இயலாளர்கள் (conchologists) - நத்தை ஓடுகளை ஆய்வு நடாத்தபவர்கள்) இனங்கண்டறிவதற்கு ஏதுவாக ஓடுகளின் இயல்புகள் பொதுவாக போதுமானதாக சிறப்பாக இருக்கின்றன (ஆனால் சில வேளைகளில் நத்தை இயலாளர்களுக்கு இது தேவையாக இருக்கின்றது). முழு விலங்கினையும், உடலின் உடலமைப்பு உள்ளடங்கலாக ஆய்வு செய்பவர்கள். அதாவது வெட்டிப் பரிசோதனை செய்து முறைப்படி சரியான இனங்கண்டறிதலை செய்வதற்கு விலங்கினை ஆய்வு செய்வது ஒரு தனியான இனத்தின் ஓடு அதன் பருமன், உருவம், நிறம் போன்றன இருக்கும் இடங்களுக்கும் வாழிடங்களுக்கும் அல்லது அவற்றின் புவியியலில் வீச்சுக்கும் முற்றுமுழுதாக அனேகமாக மாற்றமடையக்கூடியன. வெட்டிப் பரிசோதித்தலினால் விலங்குகளை ஆய்வுசெய்தல் இவ்வாறான சிறிதளவு ஒத்ததாக இருக்கின்ற ஓடுகள் ஒரே இனத்தினைச் சார்ந்தனவாக அல்லது அவை ஒரு உப இனமாக இருக்கின்றதா அல்லது முற்றிலும் ஒரு வேறுபட்ட இனமா எனத் தீர்மானிப்பதற்கு தேவையானதாக இருக்கின்றது. இது போன்ற வேலையினைச் செய்வதற்கு ஓடுகளின் விஞ்ஞானரீதியான சேகரிப்புக்கள் அவற்றின் ஓடுகளுடன் விலங்குகள் பாதுகாக்கப்பட்ட சேகரிப்புகள் எப்பொழுதும் சேர்த்துக்கொள்ளப்படல் வேண்டும். விஞ்ஞானரீதியான ஆய்வினைப் பின்பற்றி காலாகாலம் மீளாய்வு செய்தல், இனங்கண்டறிவதற்கான பழைய பிரகாரங்களினைப் பாவித்தால் ஆரம்ப ஆய்வாளர்களுக்கு சில தடுமாற்றத்தில் முடிவுறுக்கூடும். அண்மைகால ஆய்வு பல இனங்களையும் உப இனங்களையும் குறைப்பு செய்திருப்பதுடன் ஒரு பெயருக்கு (சமனான பெயர்) ஒத்த பெயர்களுக்கு (synonyms) ஓடுகளின் இயல்புகளை அடிப்படையாகக் கொண்டு ஏற்படுத்தப்பட்டவயினாலாகும். இவ்வாறே

இலங்கைக் கடற்கரையிலுள்ள ஓடுகள்

ஒரு சாதியின் கீழ் கூட்டமாக்கப்பட்ட விலங்குகள் சில வேளைகளில் இரண்டு அல்லது மேற்பட்ட சாதிகளாக வேறுபடுத்தப்பட்டிருக்கின்றன. விஞ்ஞானமானது ஒருபடி மேலே தற்பொழுது சென்றிருக்கின்றது. அத்துடன் DNA ஆய்வுகள் தொடர்புகளுக்கு வரைவிலக்கணப்படுத்துவதற்கு உதவுவதுடன் அடையாளத்தின் பிரச்சினைகளை தீர்க்கவும் செய்கின்றது.

எல்லா உயிர்வாழ்கின்ற பொருட்கள் 1753இல் கரோலஸ் இலினியஸ்னால் (Carolus Linnaeus) முதன் முறையாகப் பாவிக்கப்பட்ட இரு சொற்பெயரிட்டு முறையிற்கு இணங்க பெயரிடப்படுகின்றன. அதாவது ஒரு சாதிப் பெயரும் ஒரு தற்சிறப்பு பெயரும் ஆகும். சாதியினதும் இனத்தினதும் பெயர்கள் ஆசிரியரின் பெயரினாலும் அப்பெயரினையும் விஞ்ஞான சஞ்சிகையின் அல்லது நூலின் பிரசுரிக்கப்பட்ட வரும் வழங்கியவரினது பின்பற்றப்படுகின்றது. அதாவது காலத்துக் காலம் மேலும் தடுமாற்றத்தினை தீர்த்துக்கொள்வதற்கு இது உதவுகின்றது. அதாவது ஒரு தனியான இனம் வேறுபட்ட பெயரின் கீழ் வெவ்வேறான பிரசுரங்களில் தோன்றும்பொழுதாகும். சாதியின் பெயர் பாதுகாக்கப்படுகையில் பிந்திய ஒரு தேதியில் சாதிப் பெயரானது மாற்றமடையும்பொழுது சொற்றொடரினுள் ஆசிரியரின் பெயரும் தேதியும் இடப்படுகின்றன. சம்பந்தப்பட்ட சாதிப் பெயர்கள் உப குடும்பங்களின் கீழ் (inae இல் முடிவடைகின்ற பெயர்) குடும்பம் (idae இல் முடிவடைகின்ற பெயர்) வருணங்கள் (idae இல் முடிவடைகின்ற பெயர்) ஆகியவற்றிற்குக் கீழ் இவ்வாறே கூட்டமாக்கப்படுகின்றன. இந் நூலில் விபரிக்கப்பட்ட இனங்கள் குடும்பங்களாக கூட்டமாக்கப்பட்டுள்ளன. ஆசிரியரின் பெயர்கள் பாட உள்ளடக்கப் பக்கங்களிலிருந்து தவிர்க்கப்பட்டுள்ளன. ஆனால், அத்துடன் அகரவரிசைப்படி சுட்டி விஞ்ஞானப் பெயர்களுக்கும் பாகுபாட்டிலும் ஒரு எளிய தொகுதி ஏற்படுத்தப்பட்டிருக்கின்றது. பாவிக்கப்பட்ட பெயர்கள் ஓடுகளில் நூலிலும் சேகரிப்பவர்களின் கலைக் களஞ்சியங்களிலும் காணப்படுவனவற்றிற்கு வழமையாகப் பாவிக்கப்பட்டிருக்கின்றன. மிகவும் புலமை கொண்ட ஆய்வுகளில் வெவ்வேறான சாதிப் பெயர்களும் உபசாதிப் பெயர்களும் இந்நூலில் விபரிக்கப்பட்ட ஓடுகளுக்காக பாவிக்கப்படக்கூடும் ஆனால், இனப் பெயர்கள் அதேமாதிரியாகவே இருக்கும். உதாரணமாக உப குடும்பங்களினதும் சாதியினதும் உப சாதியினதும் ஒரு எண்ணிக்கையில் அனேகமாக உப பிரிவாக்கப்பட்ட இனங்களின் பெரும் எண்ணிக்கையினைக் கொண்டிருக்கின்ற cowrie களும், cone களும் உள்ளடங்குகின்றனவற்றைப் போன்ற குடும்பங்களாகும். இந்நூலில் இரு குடும்பங்களான Cypraea யும் (cowrie கள்) Conidae யும் (கூம்புகள்) அத்துடன் இரு சாதிகளான Cypraea வும் Conus உம் ஆகியனவற்றிற்குக் கீழ் இவை கருத்திற்குக் கொள்ளப்படுகின்றன.

தட்டுருக்கள்

விபரிக்கப்பட்ட எல்லா இனங்களையும் இரண்டு அல்லது மேற்பட்ட பக்கத்தோற்றத்தினைக் காட்டுகின்ற வர்ணப் புகைப்படங்கள் எடுத்துக் காட்டுக்கின்றன. Gastropod ஓடுகள், ஓட்டின் உச்சி மேலேயும், கீழ்வாய் துவாரம் கொண்டிருக்கின்ற அடிப்பகுதியைக் கொண்டு திசை அமைக்கப்பட்டிருக்கின்றன. (உருவங்களையும் பதங்களுக்கான விளக்கத்திற்காக கலைச் சொற்களையும் பாவிக்கவும்) limpet களின் சுருள்கற்றப்பட்ட ஓடுகள் முன்புறம் மேல்நோக்கி நிலையமைக்கப்பட்டிருக்கின்றன. Bivalve கள் முன்புறம் இடதுபக்கத்திற்கும் மேற்புற அமைப்பு மேலேயும் கொண்டு நிலையமைக்கப்பட்டிருக்கின்றன. ஓடுகளின் புகைப்படங்கள் வாய்துவாரத்தின் தோற்றப் பார்வையும் மேற்புறப் பக்கத்தையும் காட்டுகின்றது. (அத்துடன் சாத்தியமானவிடத்து மூடிவற்றும்) bivalve களானவை வெளிப்புறத்தினையும் அகப்புறத்தினையும்

பிணையல் இடத்தினையும் காட்டுகின்ற ஒரு முதுகுப்புற தோற்றத்தையும் காட்டுகின்றன. சில இனங்களில் மற்றைய தோற்றப் பார்வைகள் உள்ளடக்கப்பட்டிருக்கின்றன. அனேகமான உருவங்கள் 1 செ.மீ க்கு சமனாக இருக்கின்ற வெள்ளைநிற கறுப்பு அளவுத்திட்ட சட்டத்தினைக் கொண்டிருக்கின்றன. மற்றையவைகள் 3 செ.மீ யை குறிப்பிடுகின்றன. நிறமும் மாதிரித் திட்டவடிவமைப்பும் மாறுபடாக இருக்கின்ற இனங்களில் இப்பேற்பட்ட மாறுபாடுகளின் ஒரு தேர்வு இடவசதி இருக்குமிடத்து காட்டப்படுகின்றது.

விபரிக்கும் பாடத்தொகுப்பு

விபரிக்கும் பாடத்தொகுப்பு ஆசிரியரின் சேகரிப்பிலுள்ள ஓடுகளை அடிப்படையாகக் கொண்டு எழுதப்பட்டிருக்கின்றது. அத்துடன், சுருக்கமாக வர்ணப் புகைப்படங்களுடன் உ + ம் : cone களும், cowrie களும் ஒரு மாதிரியினை ஒப்பிடுவதனால் இனங்கண்டறிதலானது உடனடியாக செய்ய முடியும். மேற்பரப்பின் இயல்புகளிலும் உருவத்தின் நுட்பமான வேறுபாடுகளிலும் இனங்கண்டறிதலானது மிகவும் ஆழமாக இருக்கின்றது. பெருமளவு விபரங்கள் வழங்கப்படும்பொழுது இனங்கண்டறியப்படாத ஓடுகள் சம்பந்தமாக இது விடேமாக இருக்கின்றது. ஒரு உருப்பெருக்கின்ற கண்ணாடியினைப் பாவிப்பது மிகவும் அத்தியாவசியமாக இருக்கின்றது. தொழிநுட்பத்திற்குரிய பதங்கள் குறைந்தளவிற்கே கொண்டிருக்கின்றது. ஆனால், இவை பாவிக்கப்பட்டிருக்கும் இடத்து ஒரு விளக்கமானது கலைச் சொற்களில் காணப்படுவதுடன் பின்னிணைப்பாக உருவங்களும் காணப்படும்.

பருமனின் வீச்சு - மிகக் குறைந்ததிலிருந்து மிகக் கூடியதற்கு மில்லி மீற்றரில் (mm) பரிட்சிக்கப்பட்ட மாதிரிகள். ஒவ்வொரு இனத்திற்கும் விபரிப்புகளில் உள்ளடக்கப்பட்டிருக்கின்றது. மூன்று பருமன் வழங்கப்பட்டிருக்குமிடத்து (உ + ம் 10-17-21) நடுவிலுள்ள எண், ஒரு பெரிய தொடரில் மிகவும் பொதுவாகக் காணப்படும் பருமனைக் குறிப்பிடுகின்றது. விபரிப்பின் இறுதிப்பகுதி சேகரிக்கப்பட்ட இடம், கிழக்குக் கரையிற்கு மணிக்கூட்டுத் திசைக்கு நேராக மேற்கு கரையிலுள்ள வடக்கு மேலிருந்து வரிசையில் பட்டியலிடப்பட்டு குறிப்பிடப்படுகின்றது. ஒவ்வொரு பதிவும் பின்வருமாறு குறிக்கப்பட்டு இருக்கின்றது.

- ❖ இடம் - மிக அண்மையிலுள்ள நகரம்
- ❖ குறிப்பிடம் - பெயரிடப்பட்ட பாரைகளிலும், தீவுகளிலும், குடாக்களிலும், கடலோரங்களிலும், பெயரிடப்பட்ட அமைப்பு குறியினுள்.
- ❖ வாழ்விடம் - அடிப்படையையும் உபவற்றுப்பெருக்கு இருந்தால் ஆழமும் உள்ளடக்கப்படுகின்றது.

வாழ்விடங்கள் :

கடற்கரையில் வாழ்வனவற்றின் வாழிடங்களை விபரிப்பதற்கு பாவிக்கப்படும் பதங்கள், வற்றுப்பெருக்குகளும் அலைகளில் செல்வாக்கு உள்ளாகுகின்றதைப் போன்று இடங்களின் புவிச்சரித்திர இயல்புகளை அடிப்படையாகக் கொண்டிருக்கின்றன. பின்வரும் பதங்கள் பாவிக்கப்படுகின்றன.

இலங்கைக் கடற்கரையிலுள்ள ஓடுகள்

- ❖ பாறைக் கடற்கரை - பாறைகளை முக்கியமாகக் கொண்டிருக்கின்ற கரையோரம் வரை.
- ❖ மணற் கடற்கரை - மணலான கடற்கரையினை முக்கியமாகக் கொண்டிருக்கின்ற கரையோரம் வரை
- ❖ கடற்கரை - மாதிரி தரைத் தாவர வர்க்கத்தினையும் நீர் வரையினையும் கொண்ட தரை எனக் கருதப்படுகின்றவற்றிற்கு இடைப்பட்ட மணலினைக் வழமையாகக் கொண்டிருக்கின்ற பரப்பு.
- ❖ மேற் கடற்கரை - தரைவாழ் தாவர வர்க்கத்திற்கு அடுத்துள்ள சில வேளைகளில் பாறைகளினால் வரையறுக்கப்பட்ட மேற்பரப்புப் பகுதி
- ❖ கீழ்க் கடற்கரை - நீர் வரையிற்கு அடுத்துள்ள கடற்கரையின் பகுதி
- ❖ வற்றுப் பெருக்கு சிறுகுளம் - உயர்ந்த வற்றுப்பெருக்கின் பொழுது அல்லது முறிவடையும் அலைகளின் பொழுது காலத்துக் காலம் நிரப்பப்படுகின்ற பாறைச் சிறு தீவுகளின் உச்சிகளில் பாறைக் கடற்கரைவழியே அல்லது தாழ்வான உள்ள பகுதிகளில் சேகரிக்கப்படுகின்ற நீர் சிறுகுளம்.
- ❖ மேல் உயர் வற்றுப்பெருக்கு - மிக உயர்ந்த ஆனால் முறிவடையும் அலைகளினால் அடித்து செல்லப்படும் வற்றுப்பெருக்குகளின் எல்லைக்கு மேலேயுள்ள பரப்பு.
- ❖ இடைவற்றுப் பெருக்கு - மிகவும் தாழ்வானதற்கும் உயர்வானதற்குமான வற்றுப்பெருக்குகளின் எல்லைகளுக்கிடையே அமைந்திருக்கும் பரப்பு அத்துடன் காலத்துக்கு காலம் அமிழ்ந்தும் வெளிக் கிளம்பியும் இருக்கின்ற இடம்.
- ❖ உபவற்றுப் பெருக்கு - மிகவும் தாழ்வானவற்றுப் பெருக்குகளுக்கு கீழே அமைந்திருக்கும் கரையின் பரப்பு அத்துடன் நிரந்தரமாக அமிழ்ந்திருக்கும் பகுதி.

கல்கிசையிலுள்ள பாறை கடற்கரையும், அதன் வாழிடங்களும், அங்கே காணப்படும் mollusc க்களும் பின்வரும் பிரிவுகளில் விபரிக்கப்படுகின்றன.

கல்கிசையிலுள்ள பாறைக் கடற்கரை

இந்நூலில் உள்ளடக்கப்பட்ட ஆய்வுகளில் பெரும்பகுதி, இப்பெயரினைக் கொண்டிருக்கும் விடுதிச் சாலையின் வடக்கு கடற்கரையின் நெடுக்கேயுள்ள கல்கிசையில் நடாத்தப்பட்டனவாகும். இப்பரப்பின் ஒரு விபரிப்பு கீழே தரப்பட்டிருக்கின்றது, ஏனெனில், ஓடுகளைப்பற்றி அவற்றின் இயற்கையான வாழிடத்தில் ஆய்வு செய்வதற்கு ஒரு நல்ல இடமாக இருப்பதனாலாகும்.

பாறைக் கடற்கரையும் சிறிய குடாவிலிருந்து Mount Lavinia Hotel அண்மையாகவுள்ள வடக்கு நோக்கி நீண்ட அடுத்துள்ள கடற்கரை வற்றுப்பெருக்கிலுள்ள mollusc களினால் அதிகமாக இருக்கின்றது. இந்நூலில் விபரிக்கப்பட்ட இனங்களில் பல இங்கேயே முதலில் காணப்பட்டன. சில இங்கேயே மாத்திரம் காணப்பட்டது. பாடவிடத்திலுள்ள வாழிடக் குறிப்புகள் கல்கிசையிலுள்ள சிறப்பாக குறிப்பிட்ட இடங்களையே கருதுகின்றன - அதாவது வழமையாக பெயரிடப்பட்ட பாறைகள் பகுதி முடிவில் புனையான வரைப்படம் இப்பாறைகளின் இடங்களைக் காட்டுகின்றன. அவ்விடத்து மீனவர்களினால் பாவிக்கப்படும் பெயர்களே பெருமளவில் பாவிக்கப்படுகின்றன. மற்றைய புனைக்கப்பட்ட ஆய்வுக் கூட்டங்கள் கீழேயுள்ள புனையான வரைபுகள், கடற்கரையிலிருந்து காணப்படுவதைப் போன்று வரைப்படத்தில் இருக்கின்ற மூன்று பாறைக் கூட்டங்கள் காட்டப்படுகின்றது.

டிக் கல - Dig Gala

ஒரு ஆழமான வற்றுப்பெருக்கு குளத்தினையும் பல எண்ணிக்கையின் ஆழமற்ற வடிகால்களையும் உள்ளடக்குகின்ற ஒரு மளமளப்பற்ற மேற்பரப்பைக் கொண்ட பாறையின் ஒரு தாழ்ந்ததாக Dig Gala இருக்கின்றது. தென்மேற்கு பருவப் பெயர்ச்சிக் காலத்தின்பொழுது இது தடிப்பாக பச்சை அல்காக்களினால் மூடப்பட்டிருக்கின்றது. Barnacle கள், oyster கள், limpet கள் போன்றவற்றில் பெரு எண்ணிக்கையிற்கு ஆதாரமளிக்கின்றது (வாயில் முகப்பின் 4 புகைப்படங்களைப் பார்க்கவும்). ஒரு காலத்தில் விலாக்கொண்ட கருநீலச் சிப்பியான *Brachiodontes* களின் இனங்கள் பெரும் எண்ணிக்கையில் இதன் மேல் பதிந்திருக்கின்றன.

ஆந்தை முகக்கல் / ஓறா கல்¹

ஆந்தை முகக்கல்லும் பிளவுப் பாறைக்கல்லும் நீர் வரைவின் விழிப்பில் நிற்கும் இரு பாறைக் கூட்டங்களாகும்.

இவை 2 - 3 மீற்றர் உயரமுடையனவையாக இருப்பதுடன் கடலை நோக்கிய பக்கத்தில் முறிவடைகின்ற அலைகளின் முழுவிசையினை எதிர்கொள்ளப்படுகின்றது. இப்பாறைகளின் அடிப்பகுதிகள் நீரினால் வழமையாக மூடப்பட்டு இருப்பதுடன் தாழ்ந்த வற்றுப்பெருக்கில் இது அல்காக்களினதும் molluscs களினதும் நிலைக்குத்தான வலயமாக்கலை தெளிவாகப் பார்ப்பதற்கு ஏற்றதாகவும் இருக்கின்றது. (தட்டுரு 17ல் உருவம் 3ஐப் பார்க்கவும்). Periwinkle இன் சில

¹ MBIOD பிரியா மாப்பிட்டிகமலினால் உருவங்கள் 3, 4, 5 வரையப்பட்டன

இனங்கள், அதாவது *Nodilittorina* இனம் போன்ற ஈரலிப்பான சுற்றாடலைத் தேவைப்படுகின்றவை *limpet* கள் போன்றவற்றிற்கு மேலதிகமாக அவைகளின் மேல் காணப்படலாம்.

முறிவடைகின்ற அலைகளிலிருந்து மேலும் பின்னால் சென்றடைகின்ற பாறைகளின் மேலும் *Lover* களின் பாறைகளின் மேலும் அனேகமாக *Littoraria undulata* காணப்படுகின்றன. மேலதிக வற்றுப் பெருக்கு வலயத்தில் கூட்டங்களாக ஓய்வெடுத்துக் கொண்டு இவை அடிக்கடி காணப்படுகின்ற (தட்டுரு 17ல் உருவம் 4ஐப் பார்க்கவும்) சில சந்தர்ப்பங்களில் *Darren* களின் பாறையின் மேலும் இவை காணப்படலாம். அதாவது காலநிலையானது அலைகள் இதனைச் சென்றடைவதற்கு ஏற்றதாக இருப்பது போன்ற நிலையில் காணப்படுகின்றன. *Keti Ketiya* எனப் பெயரிடப்பட்ட பாறைக் கூட்டம் நீர் நிரப்பப்பட்ட பிளவுகளைப் போன்று உச்சியிலுள்ள ஒரு ஆழமற்ற வற்றுப்பெருக்கு சிறு குளத்தினை கொண்டிருக்கின்றன. இந்த வற்றுப்பெருக்கு சிறு குளம், அதன் கடல் பக்கமாகவுள்ள பக்கத்தில் முறிவடைகின்ற அலைகளிலிருந்து சிதறியடிக்கப்படுகின்றதனால் மீள் நிரப்பப்படுகின்றது. அத்துடன் இது நாம் *Say's false limpet* என அழைக்கின்ற (*Siphonaria alternata*) இன் ஒரு இனத்தின் வாழிடமாகவும் இருக்கின்றது. வெளித் தெரியும் வடமேற்குப் பக்கத்தில் *limpet* கள் ஏரளமாக இருக்கின்றன. இரண்டு பாறை ஓடுகள், இப்பாறைகளின் அனேகமானவற்றில் காணப்படும். மணியுருவான *drupe* (*Morula granulata*) பிளவுகளில் பொதுவான இருக்கின்றது. *Toad purple* என்ற *Thais bufo* பொதுவாக நீர் நிரப்பப்பட்ட பிளவுகளிலும் வடிகால்களிலும் குறைவாக இருக்கின்றது.

Mount Lavinia Hotel இன் *Grassy Bank* எல்லையில் பட்டிகள் கொண்ட *melampus* காணப்படும் (*Melampus fasciatus*) இடமாகும். இக் கரையின் மேலுள்ள புற்களின் அளவு குறைக்கப்பட்டு இருத்தலினால் நத்தையின் வரம்புக் கரையின் அடியின் ஈரமான பாறைகளுக்கிடையே விழுந்து அழுகலடைகின்ற இலைகளுக்குக் கீழே காணப்படும்.

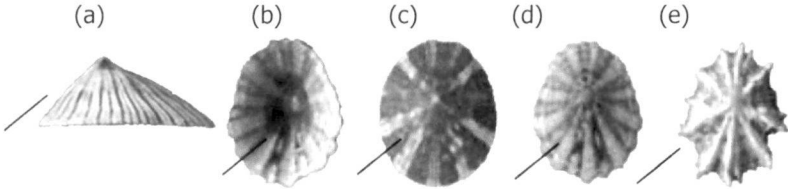
புனை வரைப்படத்தில் காட்டப்படாது இருக்கின்ற *Bellangala* இன் பெயரினால் *Mount Lavinia* இல் ஒரு இடத்தில் இப்பாட உள்ளடக்கம் குறிப்பிடுகின்றது. *Surf Club* இற்கு சற்று வடக்கே கடற்கரைக்கு அப்பால் ஒரு சில நூறு மீற்றரிலும் மேலே விபரிக்கப்பட்ட பாறைக் கூட்டங்களின் வடக்கே கிட்டத்தட்ட 2 km இல் ஒரு பாறைச் சிறுதீவாக இது இருக்கின்றது. *Mount Lavinia* லும், தெகிவளையிலும் உள்ள முதற் பாறைத் தொடராக குறிப்பிடப்படுகின்ற பாறைத் தொடரின் பகுதியாக இது இருக்கின்றது. அத்துடன், வெள்ளவத்தையிலுள்ள *Kinross* பாறையுடான *Bellangala* நீர் மட்டத்திற்கு மேலே கிட்டத்தட்ட 2 மீற்றர்களுக்கு மேலே எழுக்கின்றதுடன் *oyster* (சிப்பிகள்) களில் பெரும் எண்ணிக்கையும் *Perna perna* என்ற கபிலநிறச் சிப்பிகளையும் ஆதாரமளிக்கின்றது. தென்மேற்குப் பருவப்பெயர்ச்சிக் காலநிலை குறைந்து பாறைகளின் மேல் ஏறுவதற்கு கூடல் போதியளவு அமைதியானதும் டிசெம்பர் மாத காலப் பகுதியில் அவ்விடத்தில் வதிவோர்களினால் கபிலநிறச் சிப்பிகள் அறுவடை செய்யப்படுகின்றன.

Surf Club இன் மணற்பாங்கான வடக்குத் திசை கடற்கரை தெற்குக்கு தற்சிறப்பான வேறுபாடாக இருக்கின்றது. கடற்கரை அகலமாக இருப்பதுடன் கடலுக்கு மெதுவாகக் கீழே சரிந்துள்ளது. மனிதக் கழிவுகளினால் இதுவும் மிகவும் மாசுபடுத்தப்பட்டிருக்கின்றது. கடற்கரையில் இந்த நீள் தொடர் ஆய்வு *clam* களான *Donax deltooides* வும் *Donax cuneata* வும் அதேபோன்றது *olive* (*Oliva oliva*) அலைகளை ஒட்டி மண்ணிலும் அவை தோன்றுவதற்கு உகந்த இடமாக இருக்கின்றது.

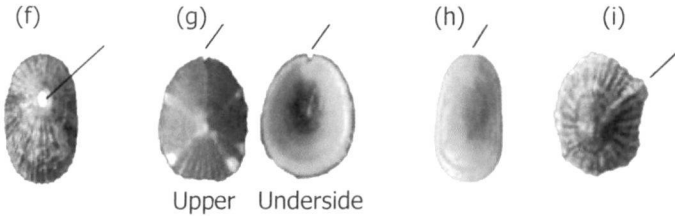
இனங்கண்டறிவதற்கான சாவி

இந்நூலில் ஏதாவது விபரிக்கப்பட்டிருந்தால் இக் குடும்பத்திற்கு ஒரு ஓடு சார்ந்திருக்கும் இனங்கண்டறிதலை இச் சாவியானது ஏதுவாக்கும். அத்துடன் பொருத்தமான தட்டுருவினை வாசிப்போர் பார்க்கவும் வேண்டும். தொடர் முறையில் படிகளைப் பின்பற்ற வேண்டும். விபரிப்புக்களில் கீழ் கோடிடப்பட்டிருக்கின்ற இனங்கண்டறியும் இயல்புகளை கோடுகள் குறிப்பிடுகின்றன.

- 1 ஒரு துண்டான ஓடு 3 இற்குப் போகவும்
- 2 ஒரு பிணையலினால் தொடுக்கப்பட்ட இரு அரைப் பகுதிகளைக் கொண்ட ஓடு..... 13 இற்குப் போகவும்.
- 3 (A) பக்கத் தோற்றத்தில் ஒரு தாழ்வான கூம்பையும் மூடி உருவமுடையதும் சுருட்டப்படாத ஓடு, (a) வாய்த் துவாரம் கீழ்ப் பக்கத்தில் எல்லா இடத்தையும் கொண்டிருக்கின்றது. (b) நுண்ணிய ஆரைக்குரிய விலாக்களைக் கொண்ட நீண்ட வட்ட சுற்றுவரைப் (c) அல்லது கரடுமுரடான விலாக்கள் (d) அல்லது பற்கள் போன்ற சுற்றுவரை PATELLIDAE யும் ACMAEIDAE யும் [மெய்யான Limpet கள்] தட்டுருக்கள் 1 & 2



அல்லது ஒரு உச்சிக்கூரிய துவாரத்தினைக் கொண்டது. (f) முற்புறமான ஆழமற்ற தாவளிப்பு (g) அகப்புறம் அல்லது ஆழமற்ற முற்புறமான ஓரத்திற்குரிய வெட்டு (h) FISSURELLIDAE [சாவித்துவார limpet கள்] தட்டுரு 2



Upper Underside

அல்லது வலதுபக்க முற்புறத்தில் ஒரு ஓரத்திற்குரிய வீக்கத்தினைக் கொண்ட சுற்றுவரைப். SIPHONARIDAE மெய்யற்ற Limpet கள் தட்டுரு 2.

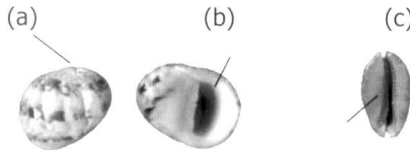
- (B) இது போன்ற ஓடு அற்றது 4 இற்குப் போகவும்.
- 4 (A) ஓடு சுருளியாக்கப்பட்டது. ஆனால், இது தெளிவற்றதாக இருக்கலாம், கோபுரம் தாழ்வானது, தட்டையாக அல்லது மறைக்கப்பட்டது. உச்சி முக்கியத்துவமற்றது.5 இற்குப் போகவும்.
- (B) ஒரு தெளிவாகச் சுருளியாக்கப்பட்டது, கோபுரம் தாழ்வானது அல்லது உயர்ந்தது உச்சிமுனைப் முனைவாக்கப்பட்டது.....7 இற்குப் போகவும்

- 5 (A) ஒரு மிகவும் மெல்லியது, மறைந்துள்ளது, நொருங்கக்கூடியது, உச்சி புதைப்பட்டது, ஓட்டின் முற்புறமான முனைக்கு பின்னால் பரந்திருக்கின்ற வெளிப்புற உதட்டினைக் கொண்ட நீண்ட வாய்த்துவாரம்: **HAMINOEIDAE** [காகிதக் குமிழ்] தட்டுரு 3.



- (B) ஒரு தடித்தது அல்லது மெல்லியது ஆனால் வன்மையானது..... 6 இற்குப் போகவும்

- 6 (A) ஒரு வலிமையானது அல்லது கடினமானது, கோள உருவமானது, தாழ்வான அல்லது தட்டையான கோபுரம், வாய்த்துவாரம் அரைவட்ட வடிவமானது, தட்டையான சிறுகம்பக் காய்வு (a) & (b) **NERITIDAE** - *Nerita* கடலுக்குரிய *nerite* கள் தட்டுரு 4



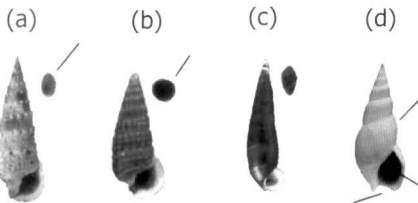
- (B) ஒரு வலிமையானது, உடற்கூற்றினுள் புதைக்கப்பட்ட சுற்று, முகப்புறமான திமில் கொண்ட நீள்வட்டமானது, மெல்லிய வாய்த்துவாரம் அதன் மையப்பகுதி வரை, முழு நீளம் வரை நீண்டிருக்கின்ற நேர்கோட்டுக்குரியதான தட்டையாக்கப்பட்ட கீழ்ப்பக்கம். (C): **CYPRAEIDAE** [Cowrie கள்] தட்டுரு 8

- (C) ஒரு மெல்லியதும், பாரமற்றதும், கேடயம் போன்ற உருவமுடையது, அரைவட்டமான வாய்த்துவாரம், பரந்தது, தட்டையான சிறுகம்பத் தட்டு (d) & (e) அல்லது நீள்வட்டமானது, மிகவும் பெரிய வாய்த்துவாரம், ஒடுங்கிய சிறுகம்பத்திற்குரிய தட்டு (f) & (g): **NERITIDAE** - *Neritina* (கடல் வாழ்க்கையற்ற *nerite* கள்) தட்டுரு 4



- 7 (A) மிகவும் உயர்ந்த கோபுரத்தினைக் கொண்ட ஒரு மணியுருவான சித்திரவேலைப்பாடு, சாய்வான வாய்த்துவாரம், ஒடுக்கப்பட்ட ஓட்டுக்குழாய்க்குரிய கால்வாய், நீள்வட்டமான மூடியுரு (a) **CERITHIIDAE** [Cerith கள்] தட்டுரு 10

- மணியுருவான சித்திரவேலைப்பாடு, சாய்வான வாய்த்துவாரம் ஒடுக்கப்பட்ட ஓட்டுக்குழாய்க்குரிய கால்வாய், வட்டமான மூடியுரு, (b) [**POTAMIDIDAE** சேற்று படரிகள்] தட்டுரு 11



மளமளப்பான வெளிப்புறம், பரந்த ஓட்டுக்குழாய்க்குரிய கால்வாய், மேல் தொங்குகின்ற வெளிப்புற உதடு, நீள்வளையமான மூடியுரு. (C) THIARIDAE [கடல் வாழ்க்கையற்ற விலங்குகள்] தட்டுரு 11

கோபுரங்களின் பக்கங்கள் வட்டமாக்கப்பட்டன, பொருத்துக் கீழே மணியுருக்களின் 2-3 வரிசைகள் பரந்த திறந்த ஓட்டுக் குழாய்க்குரிய கால்வாயினைக் கொண்ட தேனீக்களின் கூட்டின் உருவத்தினைப் போன்ற வாய்த்துவாரம் (d) NASSARIIDAE [கடை ஓடுகள், *Bullia*] தட்டுரு 6

(B) நடுத்தர உயரத்தினை அல்லது, கோபுரத்தினைக் கொண்ட ஓடு.....8 இற்குப் போகவும்.

8 (A) ஓடு உயர்ந்த உருவங் கொண்டது (a) யும் (b) யும் அல்லது பொத்தான் உருவம் கொண்டது (c) யும் (d) யும் தட்டையான கீழ்ப்பக்கத்தின் மேல் வாய்த்துவாரம் திறக்கின்றது. TROCHIDAE [மேல் ஓடுகள்] தட்டுரு 6

(a) (b) (c) (d)



(B) இது போன்ற ஓடு இல்லை9 இற்குப் போகவும்

9 (A) இரு முனையும் கூம்பிய ஓடு அல்லது இருகூம்புக்குரியது, வாய்த்துவாரம் ஒப்பீட்டளவில் பெரியது, ஒரு மேற்பக்கமும் கீழ்ப்பக்கமும் கூர்முனையாக்கப்பட்ட நடுப்பகுதியில் மிகப் பரந்த ஓடு (a) & (b) சில வேளைகளில் சற்று வீங்கியது (C) & (d) MURICIDAE (THAIDIDAE) [பாறை ஓடுகள்] தட்டுருக்கள் 8உம் 9உம்.

(a) (b) (c) (d)



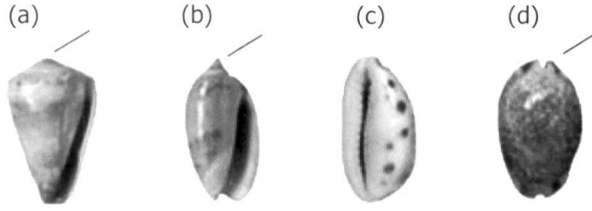
(B) இது போன்ற ஓடு இல்லை.....10 இற்குப் போகவும்.

10 (A) ஓட்டினைப் போன்று அண்மையாக ஒரு நேர்கோட்டிற்குரிய வாய்த்துவாரம். (a) மிகவும் தாழ்வான கோபுரத்தினைக் கொண்ட கூம்புருவமான ஓடு: CONIDAE (கூம்புகள்) தட்டுரு 7

(b) ஒரு வசீகரமான (துவக்கு சன்னம்) உருவம் கொண்டது, குறுகிய கூராக்கப்பட்ட கோபுரம் : OLIVIDAE (oliveகள்) தட்டுரு 6

(c) & (d) ஓடு தடிப்பானது, நீள்வட்டமானது, உடற்கற்றிணுள் புதைக்கப்பட்ட கோபுரம், முதுகுப்புறமான திமில் கொண்டது, வாய்த்துவாரம், வெளிபக்கமாக தட்டையாக்கப்பட்ட மையத்தினை இடங்கொள்ளுகின்றது. CYPRAEIDAE (Cowrie கள்) தட்டுரு 8

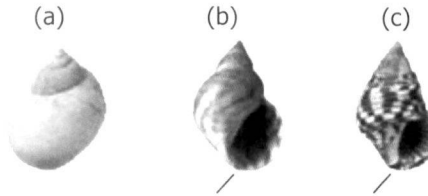
இலங்கைக் கடற்கரையிலுள்ள ஓடுகள்



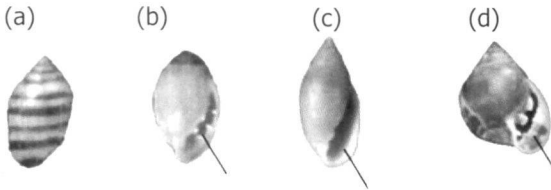
- (B) வாய்த்துவாரம் இது போன்று இல்லை.....11 இற்குப் போகவும்
 11 (A) வாய்த்துவாரம் பரந்தளவில் நீள்வட்டமானது. உடற்கற்று சற்று வீக்கமானது. கோபுரம் குறுகியதும் முனைப்பானதும் முனையாக்கப்பட்டதும்.

(a) & (b) வாய்த்துவாரத்தின் வெளிப்புறமான உதடு மெல்லியது. பற்கள் இல்லை. ஓட்டுக்குழாய்க் கால்வாய் இல்லை. LITTORINIDAE [Periwinkle கள்] தட்டுரு 5.

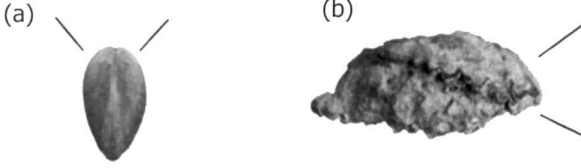
வெளிப்புற உதடு தடித்தது. பற்கள் உண்டு. ஓட்டுக்குழாய்க் கால்வாய் உண்டு. (C) PLANAXIDAE [Clusterwink கள்] தட்டுரு 6



- (B) வாய்த்துவாரம் இது போன்றில்லை12 இற்குப் போகவும்.
 12 (A) ஓடு நீள்வட்டமானது. கோபுரம் சிறியது கூராக்கப்பட்டது. வாய்த்துவாரம் ஓடுங்கியது. வெளிப்புற, உட்புற உதடுகளில் வெளியே நீட்டப்படுகின்ற பற்களினால் மேலும் ஓடுக்கப்பட்டுள்ளது. (a) யும் (b) யும் அல்லது ஓடு நலிந்தது. நீண்டது. நீள்வட்டமான வாய்த்துவாரம். பற்கள் இல்லை. வெளிப்புற உதடு சிறுகம்பத்தில் ஒரு சில மடிப்புக்கள் (C) அல்லது ஓடு குமிழியுள்ளது. சிறிய கூர்மையான கோபுரம். தட்டையாக்கப்பட்ட முதுகுப்புற வயிறுப்புறம், வெளிப்புற உதடு விரிவாக்கப்பட்டது. பெரியது. சிறுகம்பப் பற்கள் நீட்டப்பட்டன (d) ELLOBIIDAE [கோப்பி அவரைகளும் காசு ஓடுகளும்] தட்டுரு 3

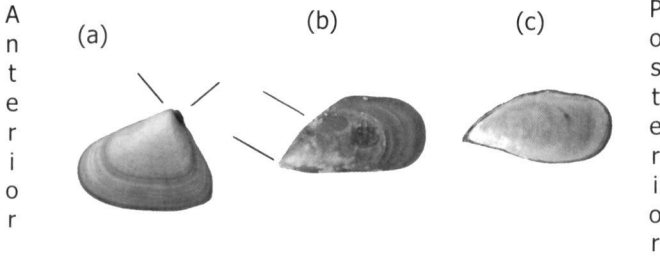


- 13 (A) மேலேயிருந்து பார்க்கும் பொழுது இடது - வலது அரைப்பகுதிகளில் (வால்வுகள்) ஒரு இருக்கின்றது. இரு வால்வுகளும் கிட்டத்தட்ட ஒரே மாதிரியாகப் பருமனில் இருப்பதன் அலங்காரப்படுத்தலையும் கொண்டன. இரு வால்வுகளுக்கும் இடையே ஒரு பட்டுக் கற்றையின் தொடுப்புக்காக கீழே இரு இடைவெளியினைக் கொண்டிருக்கவோ அல்லது சுற்றோ உள்ளது. (a).....14 இற்குப் போகவும்

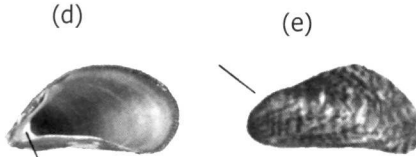


- (B) பக்கமாகப் பார்க்கும் போது மேல் அடித்தள அரைப்பகுதிகளில் ஒரு பருமனில் மிகவும் ஒத்ததல்லாமல் உள்ள வால்வுகள், அடிப்படையுடன் கீழேயுள்ள வால்வு சீமெந்து இடப்பட்டுள்ளது. இடது பக்கத்திலிருந்து காட்டப்பட்டது.....16 இற்குப் போகவும்.

- 14 (A) ஒரு முக்கோணமானது, பரிசை முனைகள் முதுகுப்புறமானது. ஓட்டின் முன்புறமான பகுதி பரப்பப்பட்டது. பின்புறமான - முதுகுப்புறமான சரிவின் மேல் வெளிப்புறமான இணையம் (a): DONACIDAE [ஆப்பு Clam கள்] தட்டுரு 12



- (B) முன்புற கடைசி முனைவரையில் முனைவாக்கப்பட்ட பரிசை முனைகளுக்கு இருமுனையும் கூம்பிய நீண்ட ஒரு பின்புறமாக வட்டமாக்கப்பட்டது. முதுகுப்புற ஓரம் திமில் கொண்டதாகவோ அல்லது வட்டமாகவோ ஆக்கப்பட்டது. முன்புற - முதுகுப்புற சரிவில் இணையம் உட்புறத்தில் பற்கள் அல்லது மற்றைய கட்டமைப்புகள் அற்றது. (c): MYTILIDAE, [சிப்பிகள்] தட்டுரு 12



- (C) மேலேயுள்ள (b) இல் உள்ளதைப் போன்று ஆனால் முன்புறத்தில் ஒரு தட்டுப் போன்ற பிரிக்கப்படுதலைக் கொண்ட உட்புறம். (d): MYTILIDAE, Septifer [மேற்றளச் சிப்பிகள்] தட்டுரு 12

(D) மேலேயுள்ள (a) யும் (b) யும் ஓடு ஒத்தனவாக இருக்கின்றன ஆனால் சிறியது, மெல்லிய ஓடு, ஓடியக்கூடியது, நீட்டப்பட்டது, பரிசை முனைகள் முதுகுப் பக்கத்திலிருந்து வட்டமாக்கப்பட்ட முன்புறக் கடைசி முனைகள் வரை அகப்புறமான தட்டின் மேல் (e): **MYTILIDAE Brachiodontes** கள் [விலாக்கொண்ட சிப்பிகள் கடலுக்குரியனவும் கடல் வாழ்க்கையற்றனவும்] தட்டுரு 13

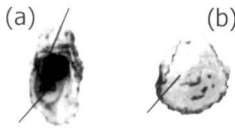
(E) இதனைப் போன்ற ஓடு இல்லை..... 15 இற்குப் போகவும்

15 (A) ஓடு தடித்ததும் பாரமானதும் வீங்கியதும் மிகவும் முக்கோணமானதும் முதுகுப்புறமான ஓடுக்கப்பட்ட பரிசை முனைகளையும் கொண்டது. வயிறுப்புற ஓரம் வட்டமாக்கப்பட்டது, பின்புற - முதுகுப்புற சரிவின் மேல் பரிசை முனைகளுக்குப் பின்னால் இணையம், வெளிப்புறமாக மளமளப்பானதும் மினுமினுப்பானதும் ஆகும். (a) அல்லது பரிசை முனைகளிலிருந்து பிரிந்து செல்கின்ற சிறுகணுக்கள் கொண்ட விலாக்களைக் கொண்ட கருமுரடானது. (b) வலிமையான பிணையல் தட்டினைக் கொண்ட அகப்புறம். (c): **VENERIDAE** [வினஸ் / Venus Clam கள்] தட்டுரு 13:

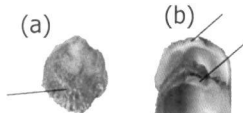
(B) பல்வேறு உருவங்கள் கொண்ட ஓடு (முக்கோணமானது, வட்டமாக்கப்பட்டது, அல்லது வழுக்கும் தன்மையான ஒருவம் கொண்டது). பற்களற்ற ஒரு பிணையலைக் கொண்டது. கீழ்புறவால்பு ஆழமாக கிண்ணமாக்கப்பட்டது, மேல்புறத்தின் வால்வு தட்டையானது அல்லது குவிவானது. ஒரு மூடி போன்ற பொருத்துக்கள் (b) ஓரத்திற்குரிய விசிறிகள் போன்றது (**crenulations** - மணியுருக்கள் கொண்டது). இடைப்பூட்டுக் கொண்டதாகவோ அல்லது ஓரம் மழுமழப்பானது: **OSTREIDAE** [சிப்பிகள்] ஓடு இல்லைதட்டுரு 13



16 (A) இது போன்ற ஓடு இல்லை.....16 இற்குப் போகவும்



(B) ஓடு வட்டமாக்கப்பட்டது அல்லது இதய உருவங் கொண்டது வால்வுகள் தடித்தது, வலிமையானது, முதுகுப்புற ஓரத்திற்கு சமாதரமாக இடைப்பூட்டு இடைப்பட்ட சொசேஸ் உருவங் கொண்ட பிணையல் (b): மேல்புற வால்வு மேலேயும் கீழ்ப்புற வால்வு கீழேயும் உள்ளது) கீழ்பக்க வால்வு ஆழமாக கிண்ணமாக்கப்பட்டது, மேல்புறவால்வு மெல்லியது, தட்டையானது, அல்லது ஒரு மூடி போன்று குவிவான பொருத்தியிருந்தால். சித்திர வேலைப்பாடு, செதில்களினதும் முட்களினதும் மையத்தினைக் கொண்டிருக்கின்ற வரிசைகளைக் கொண்டிருக்கின்றது: **CHAMIDAE** [நகைப் பெட்டிகள்] தட்டுரு 15



List of Plates

Plate 1: Limpets (part)

PATELLIDAE

1. Rayed limpet *Cellana rota* (Gmelin, 1791)
2. Rayed limpet *Cellana rota* (Gmelin, 1791)
3. Rayed limpet *Cellana rota* (Gmelin, 1791)
4. Star-shaped limpet *Patella flexuosa* Quoy and Gaimard, 1834
5. Star-shaped limpet *Patella flexuosa* Quoy and Gaimard, 1834

ACMAEIDAE

6. Striate limpet *Patelloida striata* Quoy and Gaimard, 1834

Plate 2: Limpets (part), keyhole limpets and false limpets

ACMAEIDAE

1. Striate limpet *Patelloida striata* Quoy and Gaimard, 1834

FISSURELLIDAE

2. Remarkable limpet *Clypidina notata* (Linnaeus, 1758)
3. Slit emarginula *Emarginula fissurata* Holten, 1802

SIPHONARIIDAE

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5. Pigeon Islands' false limpet *Siphonaria* sp.
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Plate 3: Coffee bean shells, ear shells and paper bubbles

ELLOBIIDAE (=MELAMPIDAE)

1. Banded melampus *Melampus fasciatus* (Deshayes, 1830)
2. Marsh coffee bean shell *Melampus* sp.
3. Nucleus cassidula *Cassidula nucleus* (Gmelin, 1791)
4. Plicate ear shell *Pythia plicata* (de Ferrusac) Gray, 1825
5. Ganges ear shell *Ellobium gangeticum* (Pfeiffer, 1855)

HAMINOEIDAE

6. Pease's paper bubble *Haminoea crocata* Pease, 1860

Shells of the Sri Lanka Seashore

Plate 4: Nerites (part)

NERITIDAE

1. Ox-palate or tubercular nerite *Nerita albicilla* Linnaeus, 1758
2. Lined nerite *Nerita articulata* Gould, 1847
3. Chamaeleon nerite *Nerita chamaeleon* Linnaeus, 1758
4. Plicate nerite *Nerita plicata* Linnaeus, 1758
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Plate 5: Periwinkles

LITTORINIDAE

1. Undulate periwinkle *Littoraria undulata* (Gray, 1839)
2. Intermediate periwinkle *Littoraria intermedia* (Philippi)
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6. Conical periwinkle *Nodilittorina trochoides* (Gray, 1839)

Plate 6: Basket shells, clusterwinks, olives and top shells

NASSARIIDAE

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PLANAXIDAE

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3. Brown clusterwink *Planaxis niger* Quoy & Gaimard, 1834

OLIVIDAE

4. Common olive *Oliva oliva* Linnaeus, 1758

TROCHIDAE

5. Vesta's button top *Umbonium vestiarum* Linnaeus, 1758
6. Radiate top shell *Trochus radiatus* Gmelin, 1791

Plate 7: Cones and nerites (part)

CONIDAE

1. Ceylon cone *Conus ceylanensis* Hwass, 1792
2. Coronate or crowned cone *Conus coronatus* Gmelin, 1791
3. Hebrew cone *Conus ebraeus* Linnaeus, 1758
4. Music cone *Conus musicus* Hwass, 1792
5. Rat cone *Conus rattus* Hwass, 1792
6. Chequered or lined nerite *Septaria lineata* (Lamarck, 1816) (non marine)

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1. Cat or kitten cowrie *Cypraea felina listeri* (Gray, 1825)
2. Money cowrie *Cypraea moneta* Linnaeus, 1758
3. Grape or pustulose cowrie *Cypraea staphylaea* Linnaeus, 1758
4. Arabian cowrie *Cypraea arabica* Linnaeus, 1758

MURICIDAE OR THAIDIDAE

5. Granular drupe *Morula granulata* (Duclos, 1832)
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MURICIDAE OR THAIDIDAE

1. *Morula serrialis* (Laborde?)
2. *Morula* sp.
3. Tissot's rock shell *Thais tissoti* Petit, 1852
4. Tissot's rock shell *Thais tissoti* Petit, 1852
5. Toad purple *Thais bufo* (Lamarck, 1822)
6. Princely purple *Purpura persica* (Linnaeus, 1758)

Plate 10: Horn shells (part)

CERITHIIDAE

1. Common cerith *Cerithium obeliscus* Bruguiere
2. *Clypeomorus* sp.1

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3. Necklace cerith *Clypeomorus batillariaeformis* (Habe and Kosuge, 1966)
4. *Clypeomorus* sp.3
5. Golden horn shell *Clypeomorus* sp.4

Plate 11: Horn shells (part)

POTAMIDIDAE

1. Girdled horn shell *Cerithidea cingulata* Gmelin 1791
2. Lesser horn shell *Cerithidea* sp.
3. Northern mud creeper *Terebralia palustris* (Linnaeus, 1767)
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5. Black faunus *Faunus ater* (Born, 1778)

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DONACIDAE

1. Goolwa donax *Donax deltoides* Lamarck, 1818
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VENERIDAE

3. Tumid venus *Gafrarium tumidum* Roding, 1798
4. Common meretrix *Meretrix casta* Gmelin
5. Rekawa meretrix *Meretrix* sp.

CORBICULIDAE – non marine

6. Common geloina *Geloina coaxans* (Gmelin, 1791)

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OSTREIDAE

1. Rock, hooded or Bombay oyster *Saccostrea cucullata* (Born, 1778)
2. Mordax rock oyster *Saccostrea mordax* (Gould, 1850)
3. *Saccostrea* sp.
4. Madras oyster *Crassostrea* cf. *madrasensis* (Preston) (?)

Plate 15: Jewel boxes

CHAMIDAE

1. Reflexed jewel box *Chama reflexa* Reeve, 1846
2. Fragum jewel box *Chama fragum* Reeve

Habitats

Plate 16:

1. Tide pools on Barberyn Reef, Beruwela
2. Oysters in tide pool, Talpe

Plate 17:

3. Vertical zonation of molluscs on an intertidal rock, Mount Lavinia
4. Supratidal periwinkles, Mount Lavinia

Plate 18

5. Salt marsh pools and mangrove, Puttalam Lagoon
6. Horn shells on the muddy bottom of a pool

Plate 19:

7. Mussels on intertidal rock, Mount Lavinia
8. Oyster on rock, Palatupana Lagoon



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Species Descriptions

බෙල්ලන් පිළිබඳ සටහන්

இனங்களின் விவரணங்கள்

Chapter 1

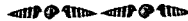
Limpets: True Limpets, Keyhole Limpets and False Limpets

PATELLIDAE, ACMAEIDAE, FISSURELLIDAE and SIPHONARIIDAE

Plates 1 and 2

Grouped together on plates 1 and 2 are members of four families. The Patellidae and Acmaeidae are true limpets. Members of the family Fissurellidae are of varied form, some resembling the true limpets. The principal characteristic of this family is the presence of an opening at the summit of the conical shell through which water exits after circulating over the gills, giving rise to the common name keyhole limpet (see figure 7). In some genera – like those illustrated here – the apical opening is absent; instead there is a shallow groove from the apex to the anterior margin on the interior surface (*Clypidina*) or a small slit in the anterior margin of the shell (*Emarginula*). The false limpets of the family Siphonariidae are 'air-breathers' belonging to the order Pulmonata (subclass of some authors); the other pulmonate family described elsewhere in this guide is Ellobiidae (also called Melampidae) containing inhabitants of mangroves and salt marshes.

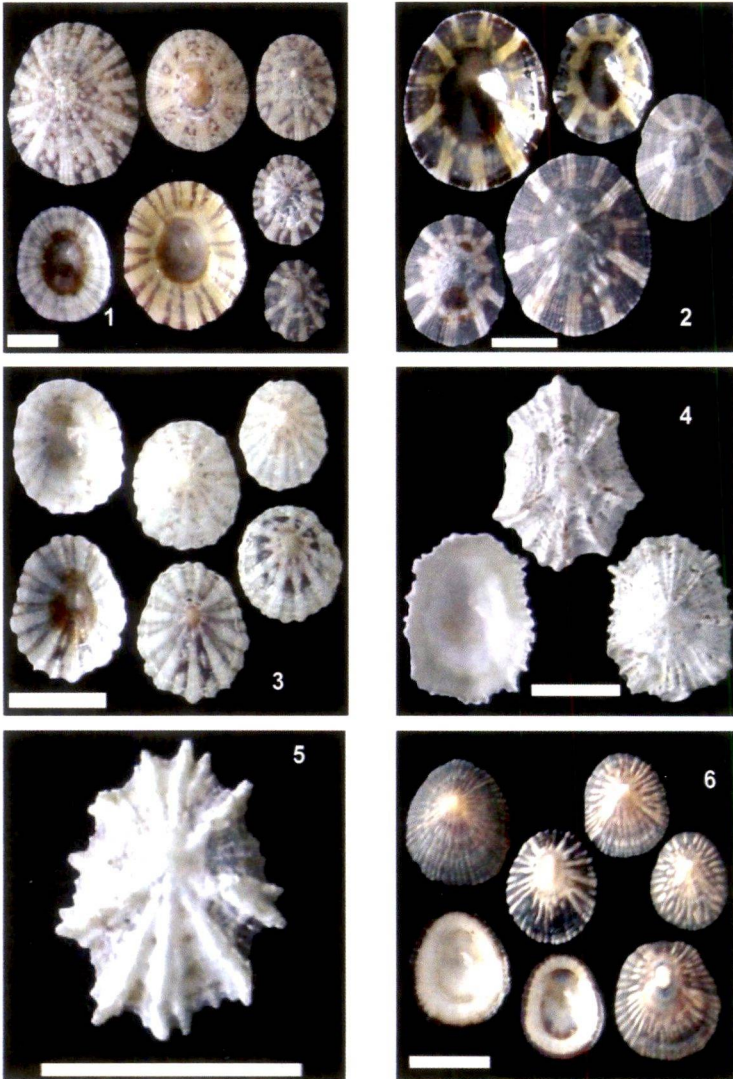
Limpet shells share a common shape, all being small and cone-shaped with oval apertures and no evidence of coiling. The apex is usually a little in front of the center. Limpets usually live attached to rocks in the intertidal zone, exposed to the full force of breaking waves. They are able to cling to the substrate very strongly by means of their large, oval feet and so resist being washed away, aided by their low, streamlined profile. They are often encrusted with calcium deposits; older shells have eroded apices. They graze on algae, moving about their home rocks at night.



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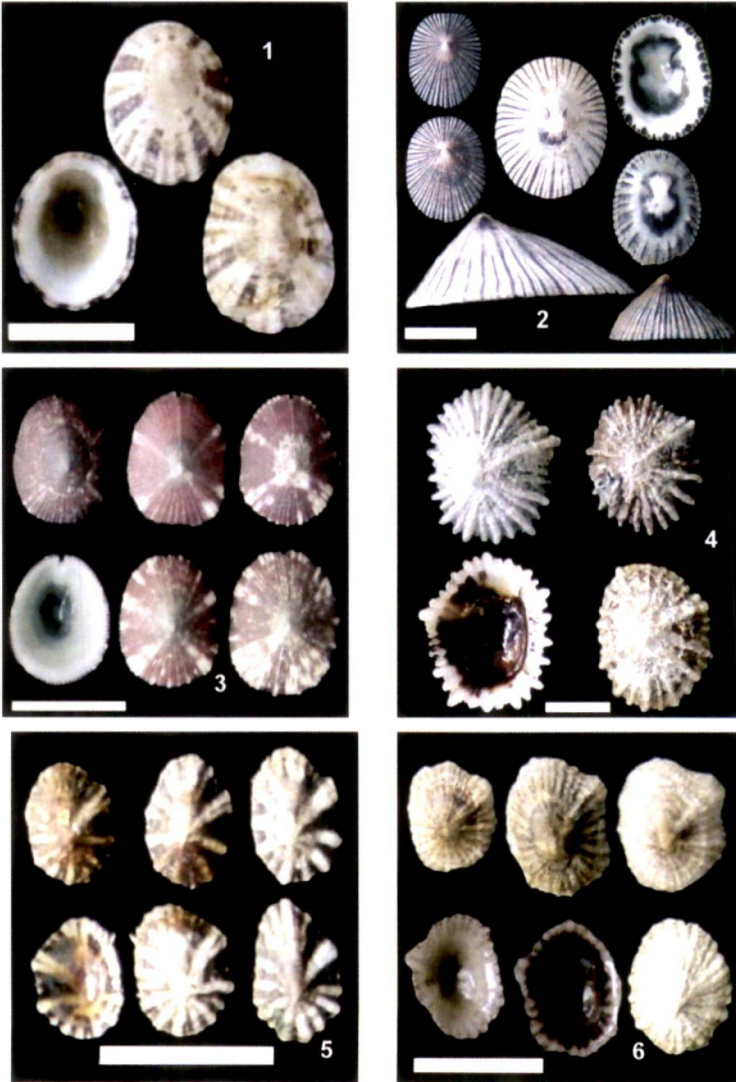
කුල හතරකට අයත් වන මොලස්කා විශේෂ මෙම රූප ගොනු දෙකට ඇතුළත් කර ඇත. Patellidae සහ Acmaeidae යන කුලවලට සත්‍ය තුන්තුඹුවන් (true limpets) විශේෂ අයත් වේ. සත්‍ය තුන්තුඹු විශේෂවලට සමානව දිස්වන Fissurellidae කුලයේ සාමාජිකයන් ලක්ෂණ කිහිපයකින් මොවුන්ගෙන් වෙනස් වේ. කෝනාකාර කවචය මුදුනේ විවරයක් පැවැතීම මෙම කුලයේ ප්‍රධාන ලක්ෂණය වන අතර කරමල් හරහා ගමන් කරන ජලය මෙම විවරය හරහා බාහිරට නිදහස් වේ. මෙම ලක්ෂණය නිසා Fissurellidae කුලයේ විශේෂ කෙසි සිදුරු තුන්තුඹුවන් (keyhole limpets) ලෙස හඳුන්වනු ලැබේ. එහෙත් සමහර කෙසි සිදුරු තුන්තුඹුවන් ගතවල

Plate 1: limpets – PATELLIDAE and ACMAEIDAE (part)



(1) *Cellana rota*; (2) *Cellana rota*; (3) *Cellana rota*; (4) *Patella flexuosa*; (5) *Patella flexuosa*; (6) *Patelloida striata*

Plate 2: limpets – ACMAEIDAE (part), FISSURELLIDAE (keyhole limpets) and SIPHONARIIDAE (false limpets)



(1) *Patelloida striata*; (2) *Clypidina notata*; (3) *Emarginula fissurata*; (4) *Siphonaria javanica*; (5) *Siphonaria* sp. ; (6) *Siphonaria alternata*

எதிர்கொள்ளப்படும் இடைவற்றுப் பெருக்கு வலயத்திலுள்ள பாறைகளில் வழமையாக பிணைக்கப்பட்டு வாழ்கின்றன. அவற்றின் பெரிய நீள் வட்டமான பாதம் மிகவும் வன்மையான அடிப்படைக்கும் இவை உறுதியாகப் பற்றிக் கொள்வதற்கு ஏற்றனவாக இருக்கின்றன. அத்துடன், அவற்றின் தாழ்வான அருவிக் கோட்டிற்குரிய தோற்றத்தினால் உதவப்படுவதனால் கொல்லப்படுவதிலிருந்து தடுக்கப்படுகின்றது. இவை எப்பொழுதும் கல்சியப் படிவுகளினால் பொருக்குக் கொள்ளப்படுகின்றன. பழைய ஓடுகள் உச்சிகளை அழித்து நீக்கியிருக்கின்றன. இவை இரவு நேரங்களில் அவற்றின் வாழிடப் பாறைகளைச் சுற்றி அசைந்து திரிந்து அல்காக்களை மேய்ந்து உண்ணுகின்றன.

PATELLIDAE

true limpets

1.1 *Cellana rota*

rayed limpet

Very common, found in groups on wet intertidal rocks. Pattern and colouration variable. The surface covered by numerous broad ribs made up of low radial riblets. The shell thin and translucent, the interior metallic, glazed, iridescent, the exterior pattern showing through. No. 1.2 shows shells from a single locality with a distinct colour pattern, representing the darkest forms of this variable species. Often encrusted with calcium deposits. 10 – 30 – 35 mm.

Found on the intertidal rocky shore at: Negombo (Duwa); Hendala (beach rock platform); Mount Lavinia; Kirinda (Amaduwa); Trincomalee (Nilaveli, Pigeon Islands – no. 1.2).

1.3 *Cellana rota*

rayed limpet

High cones with oval apertures, the sides rounded in profile, apices anterior. Numerous broad ribs made up of riblets, with narrow interspaces; margin smooth, scalloped to correspond with rib ends. Colour white with irregular brown chevrons, dots or lines in interspaces. Interior silvery glaze; body scar pale – yellowish or brown. Heavily encrusted with lime and covered by green and red algae. This is one extreme of the colour variation of this species. 10 – 13 – 15 mm.

Found at: Mount Lavinia (Bellangala).

Note: The genera *Cellana* (ribbed limpets of the Indo-Pacific) and *Nacella* (metallic limpets of the Antarctic) are placed in a family of their own – Nacellidae – in more recent literature (De Bruyne, 2003). The correct name of the shell called *C. radiata* in Sri Lanka (Kirtisinghe, 1978) is *C. rota* (Poutiers, 1998b).

1.4 *Patella flexuosa*

star-shaped limpet

Shell thick, opaque, rather flat, anterior narrow, the margin irregular. Strong radial ribs (7 to 9 in number) of unequal length, with scaly riblets in between, project at the margin. Whitish with dark patches, interior porcellaneous white. 15 – 21 mm.

Found at: Mount Lavinia (Bellangala), intertidal rock ledge.

1.5 *Patella flexuosa*

star-shaped limpet

Another form of this variable species. Shell an oval, flattened cone. Many projecting radial ribs of unequal length give a jagged margin. Whitish with dark patches, interior white. 11 mm.

Found at: Galle, in a pool below the ramparts, at a depth of 1 m.

Note: *Penepatella optima* and *Penepatella stellaeformis* (in Kirtisinghe, 1978) have been reduced to synonyms of *P. flexuosa* (Poutiers, 1998b).

The classification of limpets has seen many changes. A simple classification of the true limpets is adopted here, placing them in the two families Acmaeidae and Patellidae. Outwardly the members of these families are similar, being cap-shaped with radial sculpture. The interiors of the shells however, differ. They may be metallic and iridescent (*Cellana*) or porcellaneous, those of Acmaeidae usually with a pigmented margin different in colour to the rest of the interior. The principal difference between the two families lies in the soft tissue. In Acmaeidae there is a single primitive gill (ctenidium) in the mantle cavity. True gills are absent in Patellidae being replaced by a ring of respiratory tentacles around the animal between the mantle and the foot. Opercula are absent in both families.

Members of both families live on exposed rocks in the intertidal zone in gregarious colonies, often mixed. The fissurellid *Clypidina notata* is also found associated with these, but nearer the low water mark.

Poutiers (1998b) refers to the family Acmaeidae as Lottiidae (Lottiid limpets). More recently (De Bruyne, 2003) the genus *Cellana* has been moved to a new family Nacellidae (metallic limpets) based on the presence of the iridescent, metallic interior; the families Patellidae (true limpets - shallow water) and Acmaeidae (true limpets - tide pools) are retained. The family name Lottiidae (lid limpets) is used, in this classification, to include a group of animals in which the micro-sculpture of the shell differs from those of the members of other limpet families.

ACMAEIDAE

true limpets

1.6 *Patelloida striata***striate limpet**

Shells are high cones, aperture ovoid with narrower anterior, apex anterior. Margin smooth. Numerous low, rounded radial ribs and threads crossed by growth lines. Ground colour creamy white overlaid to varying degrees by chocolate brown radial rays, sometimes coalescing to hide the ground colour. Interior porcellaneous, white with chocolate brown margin. Apices sometimes eroded. Common, found in groups on wet intertidal rocks together with other limpets. 10 – 18 mm.

Found on the intertidal rocky shore at: Negombo (Duwa), Hendala (beach rock platform), Mount Lavinia.

2.1 *Patelloida striata***striate limpet**

Shells are high cones, aperture oval, apex anterior. Apices eroded. Only growth lines, no radial sculpture (these may have been obliterated by vigorous scraping of heavy encrustations). Wide red-brown radial wedges running from the apex to the margin alternate with shorter narrow ones with white in between. Only two specimens have been collected. 13 & 14 mm.

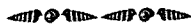
Found at: Mount Lavinia (Bellangala), intertidal rock ledge.

Note: *P. striata* appears to be variable as regards aperture shape (broadly oval to ovate) and colouration (Hardy's Internet Guide accessed 8.10.2008). Numbers 1.6 from the rocky shore and 2.1 from a rocky islet are referred to the same species.

FISSURELLIDAE

keyhole limpets

Two species belonging to this family have been collected. One species is common and found on exposed intertidal rocks in association with other limpets, usually nearer the low water mark than the true limpets. The other species has been found subtidally in shallow water. Neither possesses the apical opening typical of this family (figure 7). Opercula are not present.



Found on the intertidal rocky shore at: Mount Lavinia; Dondra (base of lighthouse); Trincomalee (Nilaveli, Pigeon Islands).

2.3 *Emarginula fissurata*

slit emarginula

Shells thick, conical, aperture ovate, anterior narrow, apex pointing backwards. There is no apical opening in the shell, but a groove on the inner aspect leads from the apex to a short slit in the anterior margin. There are numerous rough radial ribs coloured cinnamon with variable white rays (4 to 6) usually visible as short lines at the periphery. Interior porcellaneous, blue-grey in colour. 9.5 – 13.5 mm.

Found at: Trincomalee (Kinniya, Turtle Lodge Island) at a depth of 1 m, under small rocks on a sand bottom.

SIPHONARIIDAE

false limpets

Most members of the order Pulmonata are fresh water or terrestrial forms. The false limpets however, live in intertidal marine environments and may even be submerged in shallow water. The shells of these animals resemble those of limpets, but are easily identified as siphonariids because the margin of the shell has a distinct bulge on the right side anteriorly (the lateral lobe) that accommodates the groove on the inner aspect in which lies the siphon (the "breathing" tube). A single or double rib overlies the lateral lobe. Opercula are absent, like in all other pulmonates.



Pulmonata ගෝලයට අයත් විශේෂ වැඩි ප්‍රමාණයක් මිරිදිය හෝ භෞමික වාසීන් වේ. එහෙත් ව්‍යාජ තුන්තුඹු (false limpets) විශේෂ අන්තර් උදම් කලාපීය සාගරික වාසීන්වනවල පීච්ච් වන අතර සමහර විශේෂ උප උදම් කලාපයේ නොගැඹුරු ප්‍රදේශ හමුවේ. මෙම කුලයට අයත් විශේෂවල කවච තුන්තුඹු විශේෂවල කවච මෙන් පෙනුනත් නිසාලය හෙවත් ශ්වසන නාලය පිහිටන පීච්ච්ච් සඳහා කවචයේ දකුණු පූර්ව කොටසේ පැහැදිලි තෙරුමක් පැවැතීමෙන් Siphonariid කවච පහසුවෙන් හඳුනා ගත හැකිය. කවචයේ උදරීය අර්ධයේ තනි හෝ යුගල වශයෙන් ඇති කාර්ට් (ribs) පවතී. අනෙකුත් Pulmonataවන් මෙන් පිටතය රහිත වේ.



වරුණම Pulmonataஇன் அனேகமான அங்கத்தினர்கள் நன்னீர் அல்லது புவிக்குரிய வகைகளாக இருக்கின்றன. மெய்யற்ற இலிம்பெற்றுக்கள் எவ்வாறாயினும், வற்றுப்பெருக்கு கடற் சுற்றாடல்களில் வாழ்வதுடன் ஆழமற்ற நீரில் அமிழ்ந்தும் இருக்கலாம். இவ் விலங்கின் ஓடுகள் இலிம்பெற்றுக்களினை ஒத்தனவாக இருக்கின்றன. ஆனால், Siphonariidae கள் என இலகுவில் இனங்கண்டறியப்படுகின்றன. ஏனெனில், ஓட்டின் எல்லையானது ஓட்டுக் குழாயினது பதிந்திருக்கும் அகப்பறமான முனையில் தவாழ்ப்பினை இடம் கொண்டிருக்கும் பக்கச் சோனையான வலது பக்கத்திற்கு முன்பறமாக ஒரு தெளிவான வீக்கத்தினை

கொண்டிருப்பதனாலாகும். தனியான அல்லது இரட்டையான விலா பக்கச் சோனையின் மேலமைந்திருக்கின்றது. மற்றைய எல்லா Pulmonateகளைப் போன்று காணப்படுவதில்லை.

2.4 *Siphonaria javanica*

Javanese false limpet

Oval shells with 20 to 35 strong ribs of unequal length projecting at the margin. A double rib over the lateral lobe. Ground colour cinnamon, ribs white. Usually encrusted with greyish calcareous deposits. Interior coloured cinnamon centrally, grey or white margins in various proportions. 13 – 25 mm.

Found at: Trincomalee (Clappenberg bay, on small stones lying on an intertidal silt and sand beach; Kinniya and Nilaveli, Pigeon Islands, intertidal rocky shore).

2.5 *Siphonaria* sp.

Pigeon Islands' false limpet

Small, fragile, elongate-oval shells with smooth margins and weak ribs; are difficult to collect without damaging the margin. Two series of weak ribs: 11 to 13 low, rounded, wide ribs coloured white with narrow, indistinct, chocolate brown riblets in between that are especially numerous either side of the double rib over the lateral lobe. Interior coloured with alternating streaks and wedges of reddish-brown and golden yellow. 6 – 8 mm.

Found at: Trincomalee (Nilaveli, Pigeon Islands), intertidal rocky shore.

2.6 *Siphonaria alternata*

Say's false limpet

Small, broadly oval shells with smooth margins and a distinct lateral lobe. Ribs weak, 23 to 30, a double rib over the lateral lobe. Ground colour cream to cinnamon, the ribs greyish to cream. Interior likewise varies from silvery cream with light brown streaks and blotches to brown with white margins. Encrusted with calcium salts.

This siphonariid was observed over many seasons on the summit of a tall rock at the seaward edge of the beach at Mount Lavinia. The colony was always small, scattered on the wet horizontal rock surface or in shallow pools and water-filled fissures. The rock being 2 – 3 m tall, the summit receives water only from spray when waves break against the seaward side; in rough weather waves sometimes break over the top. The young of *Siphonaria* are said to hatch as free-swimming larvae or crawling juveniles (Siddiqui et al, 2007). 7 – 11 mm.

Found at: Negombo (Duwa); Mount Lavinia (summit of Keti Ketiya rock).



Chapter 2

Coffee Bean Shells, Ear Shells and Paper Bubbles

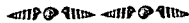
ELLOBIIDAE or MELAMPIDAE (Pulmonata) and HAMINOEIDAE (Opisthobranchia)

Plate 3

ELLOBIIDAE

coffee bean shells and ear shells

The snails of the family Ellobiidae (also called Melampidae), inhabiting mangroves and salt marshes, are 'air-breathers' belonging to the order Pulmonata (subclass of some authors). Another pulmonate family – Siphonariidae, the false limpets – is described with the limpets that they resemble. The shells of these snails are either lightweight with thin outer lips and small teeth (*Melampus*), more solidly formed with thickened outer lips and prominent teeth, at least in the adult shells (*Cassidula* and *Pythia*), or slender and elongate with smooth thin lips and two folds on the columella (*Ellobium*). Juvenile *Cassidula* shells may be confused with *Melampus* as both are similarly shaped and coloured: a single colour or with a pattern of spiral bands. *Ellobium* resemble olive shells, but have a short pointed spire of a few whorls. One species of *Melampus* remains undetermined. They feed on algae, detritus and minute animals they encounter in their habitat.



රූප ගොමුව 3

Ellobidae (Melampidae) කුලයට අයත්වන බෙල්ලන් කඩොලාන සහ ලවණ හැල් පරිසර පද්ධතිවල වාසය කරන අතර වායුගෝලීය ශ්වසනය සිදුකරන්නන් වේ. මොවුන් Pulmonata ගෝත්‍රයට (සමහර කතුවරුන්ට අනුව උප කුලය) අයත් වේ. තවත් Pulmonata කුලයක් වන Siphonariidae කුලයේ විශේෂ තුන්තුඹු විශේෂවලට සමාන වන බැවින් තුන්තුඹුවන් සමඟ මෙහි විස්තර කර ඇති අතර ව්‍යාජ තුන්තුඹු (false limpets) ලෙස මොවුන් හඳුන්වනු ලබයි. සිහින් බාහිර තොලක් සහ කුඩා දත්වලින් සමන්විත සැහැල්ලු කවච දරණ *Melampus* වැනි විශේෂ හෝ අඩු වශයෙන් වැඩිහිටි අවස්ථාවේදී වත් ඝන බාහිර තොලක්, ප්‍රමුඛ දත් සහ ඝනකම් කවචයක් පවතින *Cassidula* සහ *Pythia* වැනි විශේෂද මෙම කුලයට අයත් වේ. මීට අමතරව ස්තම්භිකාවේ (columella) නැමුම් දෙකක් සහිත වන, සිහිදු එනම් ඝන නොවන තොලක් සහ සිහින් දික් වූ කවච දරණ *Ellobium* වැනි විශේෂද මෙම කුලයට අයත් වේ. නොවැඩුණු *Cassidula* කවච වයට හැඩයෙන් සහ වර්ණ රටාවෙන් (තනි වර්ණයක් හෝ දැහැරමය වර්ණ පට්ටලින් යුක්ත) සමාන *Melampus* විශේෂ සමඟ හඳුනා ගැනීමේදී ගැටළු මතු විය හැකිය. *Ellobium* රූපාකාරයෙන් olive shells මෙන් දිස්වන අතර එහෙත් ජේලි කිහිපයකට සැකසුණ කෙටි කණ්ඨකාකාර පැවැතීමෙන් වයින් වෙනස් වේ. එක් *Melampus* විශේෂයක් නිශ්චිතව හඳුනා ගෙන නැත.



**Plate 3: coffee bean shells, ear shells – ELLOBIIDAE (or MELAMPIDAE)
and paper bubbles – HAMINOEIDAE**



(1) *Melampus fasciatus*; (2) *Melampus* sp.; (3) *Cassidula nucleus*; (4) *Pythia plicata*; (5) *Ellobium gangeticum*; (6) *Haminoea crocata*

வருணம் Pulmonata (சில ஆசிரியர்களின்படி உபவகுப்பு) (Cassidula உம் Pythia) னைச் சார்ந்திருக்கின்ற “வெளியினைச் சுவாசிப்பவாக” உப்புச் சதுப்பு நிலங்களிலும் கண்டல் பிரதேசங்களிலும் வாழ்கின்ற குடும்பம் *Ellobiidae* (*Melampidae*) எனவும் அழைக்கப்படும்) நத்தைகள் இருக்கின்றன. இன்னுமொரு Pulmonata குடும்பமான Siphonaridae யின் மெய்யற்ற இலிம்பெற்றுக்கள் அவை ஒத்திருக்கின்ற இலிம்பெற்றுக்களுடன் விபரிக்கின்றது. இந் நத்தைகளின் ஓடுகள் நிறைவுடலி ஓடுகளில் குறைந்தது தெளிவான பற்களையும். தடிப்படைந்த வெளிப்புறமான உதடுகளையும் கொண்ட மிகவும் திண்மமாகத் தோற்றுவிக்கப்பட்ட சிறிய பற்களையும் (*Melampus*) மெல்லிய வெளிப்புறமாகவுள்ள உதட்டினைக் கொண்ட பாரம் குறைவானதாகவோ அன்றி உருளையுருவானதாகவும் மளமளப்பான மெல்லிய உதடுகளைக் கொண்ட நீண்டதாகவும் இருக்கின்றன. நிறைவுடலி ஓடுகளில் குறைந்தது (*Cassidula* உம் *Pythia*) அல்லது மெல்லிய நீண்ட மளமளப்பான மெல்லிய உதடுகளையும். சிறுகம்பத்தின் மேல் இரு மடிப்புக்களையும் கொண்டதாகவோ (*Ellobium*) இருக்கின்றன. இளம் *Cassidula* வின் ஓடுகள் *Melampus* உடன் தடுமாற்றத்திற்குள்ளாக்கப்படலாம். ஏனெனில் இரண்டும் ஒத்தமாதிரியான உருவமைப்பையும் நிறத்தினையும் கொண்டதாக இருப்பதனாலாகும். அதாவது. ஒரு தனியான நிறத்தினையோ அன்றி சுருளியான பட்டிகளைக் கொண்ட ஒரு மாதிரி வடிவத்தினையோ கொண்டிருக்கின்றன. *Ellobium olive* இன் ஓடுகளை ஒத்ததாக இருக்கின்றன. ஆனால், ஒரு சில சுற்றுக்களின் ஒரு குறுகிய கூர்மையாக்கப்பட்ட கோபுரத்தினைக் கொண்டிருக்கின்றன. *Melampus* இன் ஒரு இனம் தீர்மானிக்கப்படாமல் இருக்கின்றது.

3.1 *Melampus fasciatus*

banded melampus

Large tapering body whorl with straight sides, low straight-sided conical spire and rounded, sub-angular shoulder. Aperture elongated and narrow, the anterior part wider and rounded. Outer lip thin, entire, 6, 7, or 8 white teeth on a recessed thickened white coloured linear platform that is thin posteriorly, thicker anteriorly and curving inside the anterior extremity to merge with the columella. Three columellar folds, a gap separating the most anterior one from the other two. Cinnamon, tan or white, or spirally banded in these colours. 6 – 14 mm.

This species distinguished from the marsh coffee-bean snail by the following characters: a distinct shoulder placed closer to the spire, the body whorl tapering anteriorly, columella not callus, its folds low, outer lip teeth low, generally even, reducing in size anterior to posterior, sometimes with interposed smaller teeth.

Found at: Maggona (Diyalagoda, Dummalamodera Ganga), on mangrove plant stems; Mount Lavinia (Hotel Bay, Pavilion Rocks), supratidal damp earth bank, amongst leaf litter.⁴

⁴ See box A

3.2 *Melampus* sp. 1

marsh coffee bean snail

Is similar to *M. fasciatus* but the shells ovate and slender, without a distinct shoulder angulation. Prominent jagged teeth border the narrow aperture on both sides. Outer lip with 2 – 3 strong, widely spaced teeth with smaller ones placed irregularly in between forming a jagged row; basal platform usually weak. Columellar folds strong, teeth-like: one anterior at end of columella, the next strong, followed by a row of teeth of decreasing size almost to the posterior end of the columella. Pale tan or white, or spirally banded, all with purplish spires. 9.5 – 13 mm.

Found at: Kalpitiya (Puttalam Lagoon, western shore), amongst leaf litter on wet mud of mangrove, in shade; Puttalam (Vanathavillu, Pubudugama Totupola, Puttalam Lagoon, eastern shore), on damp stems of mangrove vegetation up to 20 – 30 cm above water level and in leaf litter on wet mud.

3.3 *Cassidula nucleus*

nucleus cassidula

Short-spined, robust shells with rounded, tapering body whorls. Outer lip thick and flange-like with an indentation at the posterior end; two columellar teeth. Brown, white, or banded brown and white. Juveniles have thin lips. A thin brownish outer covering (the periostracum) is present in adults, reduced to spiral rows of spaced hairs in juveniles. 14 – 20 mm. (Note: *musterina*/*mustelina* are synonyms for *nucleus*.)

Found at: Kalpitiya (Puttalam Lagoon, western shore), amongst leaf litter on wet mud of mangrove, in shade; Maggona (Diyalagoda, Dummalamodera Ganga), on the stems of mangrove vegetation up to 2 m above ground; Kaluamodera (banks of Kaluamodera Ganga), on mangrove roots and stems.

3.4 *Pythia plicata*

plicate ear shell

Shell ovate, spire short and pointed, body whorl rounded, somewhat flattened dorso-ventrally, outer lip thin, prolonged anteriorly. Remnants of earlier lips arranged 180° apart along the two edges. Outer lip teeth small, recessed (set back from the edge), three very large columellar teeth. Brown with bluish highlights or purplish. Outer lip white with brown patches anteriorly, columella brown with white teeth. 12 – 18 mm.

Found at: Puttalam (Vanathavillu, Pubudugama Totupola, Puttalam Lagoon, eastern shore), landward fringe of mangrove, on dry stems of vegetation up to 1 m above water level and in leaf litter on wet mud; Balapitiya, (Maduganga), mangrove stems on an island, above water level; Akurala, mangrove, empty shell of dead animal.

Box A**The Melampus habitat at Mount Lavinia**

Seen in the foreground at right is the shoreward end of Pavilion Rocks, the beach is at left. In the background is the Mount Lavinia Hotel. The vegetation covered earth bank behind the rocks is the habitat occupied by a colony of coffee-bean snails (*Melampus fasciatus*). They live amongst rotting fallen leaves (that is also their food) at the foot of the bank. In dry weather they tend to retreat up the bank and hide in the shade under creepers and grass.

The natural habitat of coffee-bean snails is amongst mangrove vegetation; this habitat was probably colonized by animals that were washed ashore on floating vegetation carried by coastal currents from an unknown location. Three species of nerites and a clusterwink (all described elsewhere) have been found on the rocks of this shore following storms, but none have survived. The colony was first observed in 1980 and is still present at the time of writing at the close of 2007. (Drawn in 1995)

3.5 *Ellobium gangeticum*

Ganges ear shell

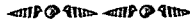
Shell lightweight, translucent, fusiform with a short pointed spire, aperture narrow, elongate. Outer lip thin, simple (no teeth), columella with two anterior folds. The shell is coloured white and covered with a straw coloured periostracum. The live shell containing the animal is darker, especially in the apical parts, on account of the viscera showing through; the head and foot are white. 11 – 23 mm.

Found at: Puttalam (Vanathavillu, Pubudugama Totupola, Puttalam Lagoon, eastern shore), landward fringe of mangrove, in leaf litter on wet mud.

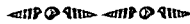
HAMINOEIDAE

paper bubbles

The family Haminoeidae (also known as Atyidae) is a member of the order Opisthobranchia (subclass of some authors) that groups together a variety of species that have reduced shells or no shells at all – like the nudibranchs. Opisthobranchia means “rear gills” referring to the position of the gills in relation to the heart.



Nudibranchs විශේෂ මෙන් කවච කිසිසේත් නොපවතින හෝ ක්ෂීණ වූ කවච ඇති විවිධ ආකාර වූ විශේෂ අයත් වන Opisthobranchia ගෝත්‍රයට (සමහර කතෘවරුන්ට අනුව උප විරූය) අයත් Haminoeidae කුලයේ (Atyidae කුලය ලෙසද හඳුන්වනු ලැබේ) සාමාජිකයන් වේ. Opisthobranchia යන්නෙහි අර්ථය “අපර කර්මල” වන අතර කෘදයට සාපේක්ෂව කර්මලවල පැවතීම මෙයින් තීරණය වේ.



குடும்பம் Haminoeidae (Atyidae) எனவும் அறியப்படும்). ஒடுக்கப்பட்ட ஓடுகளை அல்லது ஒரு போதும் ஓடுகளைக் கொண்டிராததாகவோ Nudibranchia களைப் போன்று கொண்டிருக்கின்ற இனத்தின ஒரு பல்வேறு பட்டதினை ஒன்றாக கூட்டமாக்கப்படும் வருணம் Opisthobranchia (சில ஆசிரியர்களினால் உபவகுப்பு எனப்படும்) களின் ஒரு அங்கத்தினராக இருக்கின்றது. Opisthobranchia “பின்புறமாகவுள்ள பூக்கள்” அதாவது. இதயத்திற்கு தொடர்பாக பூக்களின் நிலைப்பாட்டிற்கு ஆதாரமாகக் கொண்டு கருதப்படுகின்றது.

3.6 *Haminoea crocata*

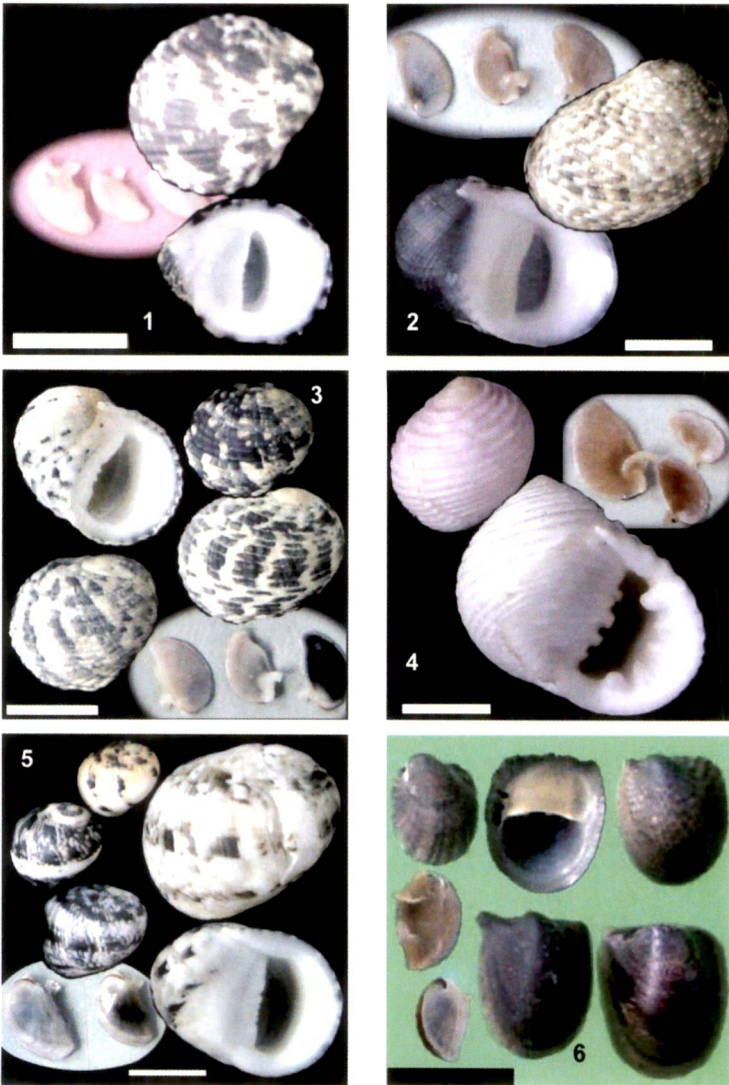
Pease's paper bubble

Shells fragile, whitish, translucent, covered by thin, dark yellowish periostracum. The body whorl is large, the outer lip thin and long, extending beyond the apex that is sunken. The animals are much larger than their shells and unable to withdraw completely. The soft tissues (mantles) are dark, mottled blackish brown. They may be observed crawling about on the muddy bottom of shallow salt marsh pools, their colour blending with the background; however, the white empty shells are clearly visible. They are detritus (organic debris) feeders. 13 – 15.5 mm.

Found at: Puttalam (Karaitivu, Serrakkuli, Puttalam Lagoon, eastern shore), on cyanobacteria-covered mud bottoms of pools with a few centimetres of water in a salt marsh fringing the lagoon, associated with an undetermined *Cerithidea* species; Mundal, (Mundal Lagoon, eastern shore), empty shells on mud near receding water line.



Plate 4: nerites – NERITIDAE (part)



(1) *Nerita albicilla*; (2) *Nerita articulata*; (3) *Nerita chamaeleon*; (4) *Nerita plicata*; (5) *Nerita polita*; (6) *Neritina auriculata*

Chapter 3

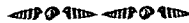
Nerites

NERITIDAE

Plates 4 and 7

Nerites are found in marine intertidal habitats, brackish and fresh-water bodies and mangroves. The marine forms have thick, oval shells with flattened spires or small pointed spires (Figure 8, at left); the non-marine forms have thin, smooth shells and often little evidence of coiling. The aperture is semicircular, guarded by strong teeth on both sides; but these are poorly developed in some species, particularly the non-marine forms. The columella is usually thickly covered by callus and shelf-like. The external sculpture consists of spiral cords or well-developed ridges in the marine forms, smooth in the others.

The opercula are characteristically calcareous, granular on the outside and with a curved prong (apophysis) on the inside in *Nerita* (Figure 8, at right) and two prongs (apophyses) in the non-marine genus *Neritina*. The marine nerites are sombrely coloured in shades of off-white, brownish-green, grey and black. Some are tinted with pink or orange. The opercula are greenish, pinkish or bluish. The marine forms occur in the intertidal zone on rocky or gravelly shores. They are often seen immobile out of the water at low tide and become active when submerged, especially at night. They are herbivores browsing on fine algae.

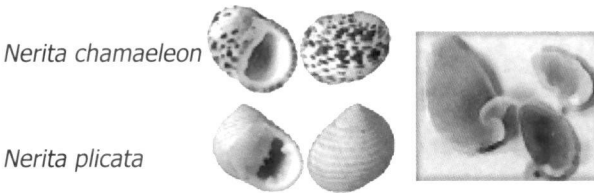


රූප ගොනු 4 සහ 7

අන්තර් උදම් වාසස්ථාන, කිවුල්දිය සහ මිරිදිය පරිසර පද්ධති සහ කඩොලානවල nerites විශේෂ දක්නට ලැබේ. සාගරවාසී විශේෂ ඝන ඕවලාකාර කවච දරණ අතර එහි සර්පිලාකාර කොටස (spire) පැහැලි හෝ කුඩා කණ්ඨකමය ආකාරයේ වේ. (රූපය 8හි වම්පස) සාගරික නොවන විශේෂවල පවතින්නේ තුනී සිනිඳු කවච වන අතර දැහර ගැසී ඇත්තේද සුළු වශයෙන් වේ. කවච විවරය අර්ධ කවාකාර වේ. එහි දෙපසම ශක්තිමත් දත් මගින් ආරක්ෂා වී ඇති නමුත් සමහර විශේෂවල එනම් වැඩි වශයෙන් සාගරික නොවන විශේෂවල ඉතා දුර්වල ලෙස වර්ධනය වී ඇත. (collumella) ස්තම්භිකාව ඝන වන අතර මෙය රාක්ක ආකාර කුහරයක් ලෙස කිණිකයකින් (callus) ආවරණය වී පිහිටා ඇත. සාගරික විශේෂවල කවචයේ බාහිරය (sculpture) හොඳින් වර්ධනය වී ඇති අතර නෙරුම් හෝ ගැටි පිහිටා ඇත. අනෙකුත් ආකාරවල බාහිර පෘෂ්ඨය සිහිඳු වේ.

පිටානය ලාක්ෂණික ආකාරයට කැල්සිනිකවනය වී ඇති අතර *Nerita* විශේෂයේ පිටානයේ පිටත පෘෂ්ඨය රළු වන අතර ඇතුළත වක් වූ අපවර්ධය (apophysis) සමන්විත වන අතර (රෂපය 8හි දැකුණු පැත්ත) සාගරික නොවන ගනයක් වන *Neritina* ගේ අපවර්ධ (apophysis) දෙකක් ඇත. සාගරික විශේෂ අඳුරු-සුදු, දුඹුරු-කොළ, අළු හෝ කළු වැනි අඳුරු වර්ණ සහිත වේ. සමහර විශේෂවල තැඹිලි හෝ රෝස වර්ණ තැවිරී ඇත. පිටානය කොළ, රෝස හෝ නිල් පැහැති වේ. අන්තර් උදම් කලාපීය ගල්පර හෝ ගල් කැට සහිත වෙරළ කලාපවල සාගරික විශේෂ වාසය කරති. ඩාදිය අවස්ථාවේ නිරාවරණය වී ඇති වෙරළේදී මොවුන් නිශ්චලව සිටින අතර වාසය කරන ස්ථාන ජලයෙන් යටවූ පසුව විශේෂයෙන්ම රාත්‍රී කාලයේ දී ක්‍රියාශීලී වේ. ශාක හක්ෂකයින් වන අතර කුඩා ඇලුගි වර්ග ආහාර කර ගනී.

Figure 8



Most nerites have low or flattened spires, some have small pointed spires. *Nerita opercula* (at right, inner aspect left, outer aspect right) are calcareous with a curved prong (apophysis) on the inner aspect.

රෂපය 8 බොහෝ nerite විශේෂවල කවචයේ සර්පිලාකාර කොටස (spire) පැතලි වන අතර සමහර විශේෂවල සුළු ප්‍රමාණයක් නෙරා ඇත. *Nerita* පිටානය (ඉහත දැකුණු පස ඇති රෂපයේ, කවචයේ අභ්‍යන්තර දර්ශනය වම් පැත්තේද පිටත දර්ශනය දකුණු පැත්තේද දක්වා ඇත) කැල්සිනිකවනය වී ඇති අතර එහි ඇතුළු පැත්තේ අපවර්ධයක්/උලක් (apophysis) පිහිටා ඇත.

தமிழ்ந் அல்லது தட்டையாக்கப்பட்ட கோபுரத்தினைக் அனைக Neriteகள் கொண்டிருக்கின்றன. சில சிறிய கூராக்கப்பட்ட சுருள்களைக் கொண்டிருக்கின்றன. *Nerita opercula* (இடது பக்கத்தில்) வலது அகப்புறப் பார்வை, வெளிப்புறமான (இடது பார்வை) உட்புறப் பார்வையில் ஒரு வளைந்த கவர்முள்ளைக் கொண்டு (வெளிவளரி) சுண்ணாம்பாலனதாக இருக்கின்றன.

தட்டுரு 4ம் 7ம்

கடலின் வற்றுப்பெருக்கு வாழிடங்களிலும், உவர்நீரிலும், நன்னீர் நிலைகளிலும், கண்டல்களிலும் காணப்படுகின்றன. கடல் வாழ் வகைகள் தட்டையாக்கப்பட்ட கூர்முனைகளைக் கொண்ட தடிப்பானதும் நீள்வட்டமான ஓடுகளை அல்லது சிறிய கூர்மையாக்கப்பட்ட கூர்முனைகளை (உருவம் 8, இடது பக்கத்தில்) கொண்டிருக்கின்றன. கடல் வாழ்க்கையற்ற வகைகள் மெல்லிய மளமளப்பான ஓடுகளைக் கொண்டிருப்பதுடன், அனேகமாக சுருளலிற்கான சான்று சிறிதள வினையே கொண்டிருக்கின்றன. வாய்த்துவாரம், இருபக்கங்களிமுள்ள வலிமையான பற்களினால் பாதுகாக்கப்பட்ட அரைவட்டவடிவாக இருக்கின்றது. ஆனால், இவை சில இனங்களில் குறிப்பாக கடல் வாழ்க்கையற்ற வகைகளில் குறைவாக விருத்தியடைந்திருக்கின்றன. சிறுகம்பம் மூடுபடையினால் வழமையாக தடிப்பாக போர்க்கப்பட்டிருப்பதுடன் தட்டுப் போன்றும் உள்ளது. வெளிப்புறமான சிற்ப அமைப்பு சுருளியான நாண்களையும் அல்லது கடல்வாழ் வகைகளில் நன்கு விருத்தியடைந்த முகடுகளையும், மற்றையவற்றில் கொண்டிருக்கின்றது.

மூடியிருக்கள் வெளிப் பக்கத்தில் சுண்ணாம்பாக இருக்கின்றதுடன், ஒரு வளைந்த (வெளிவளரி) கவர்முள்ளினை *Nerita* இன் உட்பக்கத்தில் கொண்டிருக்கின்றது. (உருவம் 8, வலது பக்கத்தில்) அத்துடன், சாதி *Neritina* என்ற கடல் வாழ்க்கையற்றவற்றில் இருகவர் முட்களை கொண்டிருக்கின்றது. (வெளிவளரிகள்) கடல்வாழ் *Nerite*கள் மழுங்கிய வெள்ளை, கபிலநிறப் பச்சை, நரை நிறமும் கரிய நிறத்தினதும் சாயல்களில் மங்கலாக நிறங் கொண்டிருக்கின்றன, சில மென்சிகப்பு அல்லது ஆரஞ்சு நிறக் கலப்பைக் கொண்டிருக்கின்றன. மூடியிருக்கள் பச்சையானதாகவும் மென்சிகப்பாகவும் அல்லது நீலநிறமாகவும் இருக்கின்றன. கடல்வாழ் வகைகள் பாறைகளின் மேல் அல்லது சரளைக் கல்லான கடற்கரைகளில் வற்றுப்பெருக்கு வலயங்களில் காணப்படுகின்றன. தாழ்ந்த வற்றுப்பெருக்கில் நீரிற்ரு வெளியே அசைவற்றதாகக் காணப்படுகின்றன அத்துடன் விசேடமாக இரவு நேரங்களில் அமிழ்ந்திருக்கும்பொழுது உயிர்ப்படையதாக இருக்கும். நுண்ணிய அல்காக்களை மேய்ந்து கொண்டு இவை இலையுண்ணிகளாக இருக்கின்றன.

Marine nerites

4.1 *Nerita albicilla*

ox-palate or tubercular nerite

Somewhat hemi-spherical with expanded body whorl, depressed (flattened) spire and flat, horseshoe shaped base, making the shell longer than tall. The surface covered by smooth, low, rounded cords with no interspaces. Outer lip bevelled with a sharp edge and a row of numerous tiny teeth with two larger ones on either side. The underside granular, the columella with 3 to 4 small teeth at the centre. All teeth are more developed in older shells. The ground colour is white with varying degrees of black patterning. The overall effect ranges from white with black spiral streaks, white with transverse black bars to black shells with white transverse streaks. Interior and base white. Operculum granular, white or pinkish shaded with blue-grey. 14.2 x 11.3 to 31 x 22.5 mm (length x height). (Height is the vertical measurement from the apex to the base, length is at right angles to this axis from the edge of the outer lip to the margin of the body whorl.)

Shells of the Sri Lanka Seashore

Found, intertidal zone, at: West coast, unknown location, washed ashore at Mount Lavinia (Lovers' Rocks), on rocks and drift weed (transient); Galle (Unawatuna), rocky shore; Tangalle (no details); Trincomalee (Clappenberg Bay), stony gravel beach.

4.2 *Nerita articulata*

lined nerite

Synonym: *N. lineata*

Shells oval, obliquely elongated, spires depressed. Distinctly longer than tall. Surface covered by smooth, evenly spaced raised cords. Outer lip bevelled with sharp edge, smooth; underside smooth; columella with 2 - 3 teeth that are mere irregularities at the edge. Ground colour grey, the cords dark grey to black broken up by short white dashes. Cord colour sometimes spreading on to the interspaces giving an overall effect of two or three dark spiral bands crossed by oblique axial stripes of alternating grey-black & narrow white. Some shells much darker with little show of a pattern. Interior white, underside & columella cream. Operculum granular, pinkish, shaded with blue. 20.4 x 14.4 to 25.4 x 17.5 mm (length x height).

Found at: West coast, unknown location, washed ashore at Mount Lavinia (Lovers' Rocks), intertidal, rocks and drift weed (transient).

4.3 *Nerita chamaeleon*

chamaeleon nerite

Somewhat oval shell with depressed but clearly defined spire. Longer than tall. Surface covered by cords of varying thickness with no interspaces, crossed by fine growth lines making them rough. Lip bevelled with sharp edge, numerous weak but long teeth. Spiral cords carried over on to posterior part of underside, the anterior part granular. Columella with three teeth. Base colour white with black streaks on the cords in varying proportions. Overall effect ranges from white shells with irregular black streaks through white shells with oblique black axial bars to black shells with white speckles, streaks or zigzags (two collections from the same site). Operculum granular, whitish-pink shaded with blue-grey to dark blue-black. 8 x 7.2 to 20 x 14.8 mm (length x height).

Found, intertidal zone, at: Trincomalee, (Cod Bay, Mud Cove), muddy gravel, on small stones, (Cod Point), sandy beach amongst rocks.

4.4 *Nerita plicata*

pligate nerite

Shell globular, spire low with pointed apex. Taller than long. Coarse spiral ridges with deep rounded grooves in between. Outer lip thick with 5 - 7 strong teeth, the two outermost larger. Columella with 4 - 5 strong teeth. Underside ridged and granular. Cream coloured, apical region blushed with rose in some. Interior and columella

white. Operculum smooth, pinkish. Other authors, including Kirtisinghe, describe varying degrees of black on this species. 13 x 14 to 26.8 x 28.3 mm (length x height).

Found, intertidal zone, at: West coast, unknown location, washed ashore at Mount Lavinia (Pavilion Rocks), rocky shore (transient); Kaluamodera, rocky shore.

4.5 *Nerita polita*

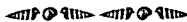
polished nerite

Bulbous oval shell, spire depressed and flush with body whorl. A bit longer than tall. Surface smooth and polished with fine growth lines. Bevelled lip with sharp edge, numerous fine teeth in large shells. Underside smooth, 3 to 4 small teeth on columella. Ground colour white with black patterning; some shells suffused with pink. Many patterns: mottled black/white with black spiral bands, black/white axial streaks with narrow or wide white spiral bands or black mottled with white. Interior and base white. Operculum polished, blue-grey with a greyish marginal band of oblique ridges. 10 x 9.7 to 25.7 x 24.2 mm (length x height).

Found, intertidal zone, at: Trincomalee (Clappenberg Bay), stony gravel beach, (Marble Bay), sandy shore, (Kinniya), rocky shore.

Non-marine nerites

Two non-marine nerites found in brackish water are described below. These are fresh water species that are said to occur in the lower reaches of streams not very far from their mouths, and able to tolerate slightly brackish water. They differ in appearance from the marine species, the shells being thin and flattened with no obvious spiral growth form, and with no sculpture. They resemble the marine species in possessing a flat, shelf-like columella and a calcareous operculum with processes. They are herbivores.



සාගරික නොවන nerites විශේෂ

කිවුල්දිය පරිසර පද්ධතිවල වාසය කරන සාගරික නොවන nerites විශේෂ දෙකක් මෙහි විස්තර කර ඇත. මෙම විශේෂ තරමක් දුරට ලවණතාවය දරා ගත හැකි මීර්දිය ආකාර වන අතර මෝයට ආසන්නව දිය පහරවල පහළ ප්‍රදේශවල ජීවත් වේ. කවචය තුනී සහ පැතලි විමද පැහැදිලිව පෙනෙන අයුරින් සර්පිලාකාර වර්ධනයක් නොමැති වීම සහ කවච බාහිර ස්වරූපය (sculpture) මනා ලෙස නොපැවතීම යන ලක්ෂණ හේතුවෙන් සාගරික විශේෂවලින් වෙනස් වන අතර රාක්ක ආකාර (shelf-like) පැතලි ස්තම්භිකාවක් පැවතීම සහ කැල්සනීභවනය වූ පිධානයක් (operculum) පැවතීම යන ලක්ෂණවලින් සාගරික විශේෂවලට සමාන වේ. මොවුන් ශාක භක්ෂකයින් වේ.

கடல் வாழ்க்கையற்ற nerite கள்

உவர் நீரில் காணப்படும் இரு கடல்வாழ்க்கையற்ற Nerite கள் விபரிக்கப்பட்டுள்ளன. இவை நன்னீர் இனங்களாகும். அருவிகளின் வாயிலிருந்து மிகவும் தொலைவில் அல்லாமல் அருவிகளில் தாழ்ந்த எல்லைகளில் காணப்படுவதாகக் கூறப்படுகின்றது. அத்துடன். சற்று உவர் நீரினை தாக்குப்பிடிக்கும் ஆற்றலையும் கொண்டிருக்கின்றன. ஓடுகள் மெல்லியதாகவும் தெளிவான சுருளியிருவான வளர்ச்சி வகையினைக் கொண்ட தட்டையாக்கப்பட்டதும். சிற்பவேலைப்பாட்டினை கொண்டிராததினாலும் கடல் வாழ் இனங்களிலிருந்து இவை தோற்றத்தில் வேறுபடுகின்றன. இவை ஒரு தட்டையான தட்டுப் போன்ற சிறு கம்பத்தினையும். வெளி நீட்டங்களையும் கொண்டிருக்கும். சுண்ணாம்பாலான ஒரு மூடியிருவையும் கொண்டிருப்பதனால் கடல்வாழ் இனங்களை ஒத்திருக்கின்றன. இவை இலையுண்ணிகளாகும்.

4.6 *Neritina auriculata*

eared nerite

Shells small, shield-shaped, corners prolonged to varying degrees, being longer in smaller (younger) shells. The upper surface humped, the lower surface flat, recessed and surrounded by a raised rim. No sculpture. The aperture is semi-circular, the columella flat, smooth and shelf-like. The outer lip is smooth, the middle part of the columella edge finely toothed. The teeth vary with the locality and habitat, ranging from strong to barely visible. Dark brown. Variable pattern of a dark network on a lighter background, more marked on older parts of the shell, fading or merging into a series of light and dark spiral stripes towards the outer lip. Columella dark brown in larger and greyish in smaller shells, interior bluish-white. The two-pronged calcareous operculum is pink on the inside and pink with blue tones or brownish stripes on the outside. 8.3 x 7.5 to 18.3 x 12 mm.

Found at: Kaluamodera (Kaluamodera Ganga mangrove), on the stem of a plant, above the water level; Hendala (Hamilton Canal embankment), under stones; Piliyandala (Bolgoda Lake, San Michelle island), on wooden piles.

7.6 *Septaria lineata*

chequered or lined nerite

(See plate 7)

Shells oval, cap-like, the spire a small raised swelling at one end (the posterior). The aperture large with a small, smooth, semi-circular, shelf-like columella situated at the posterior end. The posterior narrowly rounded, anterior broadly rounded, the sides convex, the upper surface domed. Surface smooth and glossy. Brown, striped with yellow, breaking up to form a chequered pattern. Apices eroded. Opercula not seen; said to be irregularly squarish with two pointed lobes. 29.6 x 19.25 to 13.8 x 8.7 mm.

Found at: Piliyandala (Bolgoda Lake, San Michelle island), on wooden piles, at water level.



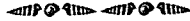
Chapter 4

Periwinkles

LITTORINIDAE

Plate 5

Periwinkles are snails with small conical shells, though some species have large body whorls and small spires making them globular. The aperture is without an anterior siphonal canal and is guarded by an operculum. They are intertidal species, some extending their range well above the high tide level on rock surfaces splashed by breaking waves or sea spray. Two species have been found many metres above sea level around the blowhole at Kudawella, on rock surfaces that receive spray when the blowhole is active. Some species may also be found on rocks of the upper beach that are within reach of breaking waves. One species (*L. scabra*) is an exclusive inhabitant on mangrove vegetation; the others are usually found on rocky shores, man-made structures such as piers, exposed parts of wrecked boats and some species on mangrove vegetation as well. They are herbivorous, browsing on algae.

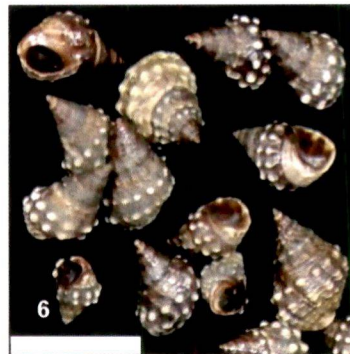
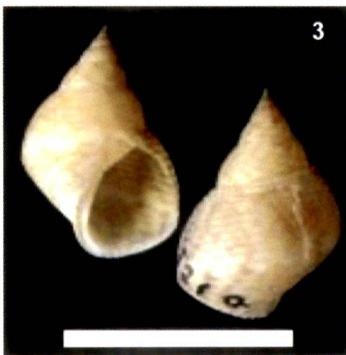


රූප ගොමුව 5

කුඩා කෝනාකාර කවච දරණ බෙල්ලන් කාණ්ඩයක් වන අතර සමහර විශේෂවලට විශාල ගෝලාකාර දේහ රවුමක් (body whorls) සහ උල්වූ කොනක් ඇති අතර විවෘත කවචය ගෝලාකාර ලෙස දිස් වේ. කවච විවරයේ පූර්ව නිකාල ඇලියක් නොපවතින අතර කවච විවරය පිධානයෙන් (operculum) ආරක්ෂා වී ඇත. මොවුන් අන්තර් උදම් කලාපයේ වාසය කරන අතර සමහර විශේෂ වඩදිය සීමාවෙන් පිටත පිහිටා ඇති මුහුදු රළේ බලපෑමට ලක්වන ගල්පර මත වාසය කරයි. මුහුදු මට්ටමේ සිට මීටර කිහිපයක් ඉහළින් පිහිටා ඇති කුඩාවැරදුලු ක්ෂුණිකයන් ඉහළ විවරය පිහිටා ඇති ගල් උපස්ථරය මතද Periwinkles විශේෂ දෙකක් ජීවත් වේ. මෙම විශේෂ වාසය කරන උපස්ථරය ක්ෂුණිකයන් පලය ඉහළට විදින විට නෙමීමට ලක් වේ. සමහර විශේෂ මුහුදු වෙරළේ ඉහළ සීමාවේ පිහිටා ඇති මුහුදු රළ ළඟා විය හැකි ගල් පර මත වාසය කරති. එක් විශේෂයක් (*L. scabra*) කඩොලාන පර්සර පද්ධතිවල පමණක් වාසය කරන අතර අනෙක් විශේෂ ගල්පර සහිත මුහුදු වෙරළාශ්‍රිතව මිනිසා විසින් නිර්මාණය කරන ලද දිය කඩන සහ කැඩී ඇති යාත්‍රාවල නිරාවරණය වූ ස්ථාන ආශ්‍රිතවද දක්නට ලැබේ. මෙම මොලස්කාවන් ශාකක්ෂකයින් වන අතර ඇලුම් උලා කමින් ජීවත් වේ.



Plate 5: periwinkles – LITTORINIDAE



(1) *Littoraria undulata*; (2) *Littoraria intermedia*; (3) *Littoraria scabra*; (4) *Echinolittorina millegrana*; (5) *Nodilittorina quadricincta*; (6) *Nodilittorina trochoides*

தட்டுரு 5

Periwinkle கள் இவற்றின் சில இனங்கள் பெரிய உடற் கோபுரத்தினையும் கோள உருவமாக அவற்றினை ஆக்குகின்ற சிறிய சுருளிகளையும் கொண்டிருந்தாலும், சிறிய கூம்புருவான ஓடுகளைக் கொண்ட நத்தைகளாகும். வாய்த்துவாரம் ஒரு முன்புறமான ஓட்டுக் குழாய்க் கால்வாயினைக் கொண்டிருப்பதில்லை. அத்துடன் ஒரு முடியுருவினால் பாதுகாக்கப்படுகின்றது. இவை வற்றுப்பெருக்குக்குரிய இனங்களாகும். சிலவற்றின் முறிவடைகின்ற அலைகளினால் அல்லது கடல் தாவுதலினால் விசிறியடிக்கப்படும் பாறையின் மேற்பரப்புக்களின் மேல் உயர் வற்றுப்பெருக்குக் மேல் மட்டத்தில் அவற்றின் பரம்பல் வீச்சுக்கள் நீடிக்கப்பட்டிருக்கின்றன. குடாவெலவிலுள்ள புகைவழி (blowhole) உச்சநிலையில் செயற்படும் பொழுது வீச்சுக்களை பெறுகின்ற பாறைகளில் மேற்பரப்புக்களில் புகைவழியினைச் சூழ்ந்த கடல் மட்டத்திற்கு மேலே பல மீற்றர்களுக்கு மேல் இரு இனங்கள் காணப்பட்டுள்ளன. அலைகள் முறிவடைதலின் எல்லைகளினுள் இருக்கின்ற மேற் கடற்கரையிலுள்ள பாறைகளின் மேல் சில இனங்கள் காணப்படலாம். ஒரு இனம் (*L. scabra*) கண்டல் தாவரங்களின் மேல் முற்றுமுழுதாக வாழ்பனவாகும். மற்றையன வழக்கமாக பாறைக் கடற்கரைகளிலும், தூண்கள் போன்ற மனிதனால் ஆக்கப்பட்ட கட்டமைப்புகளிலும், கப்பல்களின் அடிப்பாடுகளின் வெளியாக்கப்பட்ட பகுதிகளிலும் கண்டல் தாவரவாக்கங்களைப் போன்ற சில இனங்களிலும் காணப்படுகின்றன. இவை அல்காக்களை மேய்கின்ற இலையுண்ணிகளாகும்.

5.1 *Littoraria undulata***undulate periwinkle**

Shell conical with a moderate turreted spire, sides of whorls rounded. Aperture ovate, thin outer lip bulging somewhat. Columella smooth. Shell smooth, encircled by faint incised grooves that may be absent. Ground colour whitish with pinkish, brownish or purplish oblique lines and patches forming various patterns. No uniformity of colour or pattern within a colony. Usually found in small clusters well above the high tide level, where they dry out in the absence of breaking waves. In dry conditions the animal cements the edge of the outer lip of the shell to the substrate and seals itself in with the tight-fitting operculum. In wet conditions they are attached to the substrate by means of the foot. 8 – 19 mm.

Found at: Mount Lavinia (Hotel Bay, Pavilion rocks etc); Kaluamodera (island at the mouth of Bentara Ganga); Hikkaduwa (cement retaining wall, upper beach), 1.5 m above sand level; Galle (below ramparts), wall of rock pool; Dickwella (Kudawella), wet rock around blowhole; Trincomalee (Nilaveli, Pigeon Islands). Unless stated otherwise, all were found supratidal on the rocky shore.

5.2 *Littoraria intermedia*

intermediate periwinkle

Shell conical with fairly tall pointed spire. Aperture ovate, outer lip thin, columella smooth. Shallow incised grooves encircle whorls, the intervening cords flat so that the shell is smooth to touch. Ground colour bluish-white to yellowish-brown. Cinnamon coloured dashes on the cords are aligned to form oblique lines and zigzags. Colour and general pattern seem to vary with location, but more or less uniform within the colony. 7 – 19.5 mm.

Found at: Kalpitiya (Puttalam Lagoon, western shore), supratidal, near-shore boat wreckage; Kaluamodera (Kaluamodera Ganga), mangrove stems and leaves up to 1.3 m above water level; Maggona (Diyalagoda, Dummalamodera Ganga), mangrove stems and leaves, 0.3 to 0.4 m above water level; Kirinda (Palatupana Lagoon), dead, on shore; Trincomalee (Clappenberg Bay), supratidal, concrete piers of jetty, (Cod Bay, Mud Cove), mangrove roots and leaves, 0.3 m above mud.

5.3 *Littoraria scabra*

rough periwinkle

Shell conical, spire pointed, the body whorl more inflated than other similar species. Encircled by incised spiral grooves, the intervening cords rounded giving a rough exterior. 10.2 mm.

Found at: Trincomalee (Cod Bay, Mud Cove), on mangrove plant stem. This species is confined to mangroves.

5.4 *Echinolittorina millegrana*

New Zealand periwinkle

Synonym: Echinolittorina novaezelandiae

Shell small with a large globose body whorl, spire short, turreted. Sides of whorls rounded. Close-set shallow spiral grooves encircle whorls. Outer lip thin, columella smooth. Off-white, interior and columella brown, inner edge of lip white. Operculum semicircular with an eccentric nucleus. 4.5 – 12.3 mm.

Found, supratidal zone, at: Mount Lavinia (Ora Gala and Lovers' Rocks), two transient specimens many years apart; Galle (below ramparts), rocky shore; Trincomalee (Clappenberg Bay), rocks and concrete piers; Nilaveli (Pigeon Islands), rocky shore, walls of pools.

5.5 *Nodilittorina quadricincta*

globular periwinkle

Shell small with globose body whorl, spire short, no sculpture. Black, with spiral rows of white dashes, rectangles, chevrons and slashes forming patterned bands. Locally abundant in clusters, often mixed with *N. trochoides* or *L. undulata*. 6 – 10 mm.

Found at: Negombo (Duwa), intertidal rocky shore; Hendala (beach rock platform), intertidal; Mount Lavinia (Ora Gala), supratidal; Hikkaduwa (cement retaining wall, upper beach), 1.5 m above sand level; Galle, supratidal rocky shore; Trincomalee (Nilaveli, Pigeon Islands), supratidal rocky shore, walls of pools.

5.6 *Nodilittorina trochoides*

conical periwinkle

Shell small, conical, moderate spire, apex pointed. Whorls encircled by spiral threads, two rows of rounded granules at middle of whorl, each as wide as 2 threads, the rows 2 to 3 threads apart. Colour varies from grey to black, the granules white, often lightly encrusted and/or coated with deposits. Interior & columella purple. Locally abundant, in clusters. 4 – 13 mm.

Found at: Negombo (Duwa), intertidal rocky shore; Hikkaduwa (cement retaining wall, upper beach), up to 2 m above sand level; Galle, supratidal rocky shore; Dickwella (Kudawella), wet rock around blowhole; Trincomalee (Nilaveli, Pigeon Islands), supratidal rocky shore, walls of pools.

Note: *N. trochoides* (Gray, 1839) and the similar *N. pyramidalis* (Quoy and Gaimard, 1833) are both illustrated in Hardy's Internet Guide. Poutiers (1998) lists only *N. pyramidalis* with a distribution from the west coast of India eastwards as far as Australia and Norfolk Island. *Trochoides* is not listed in the synonymy by him, but *Trochus nodulosus* is; this is listed as a synonym of *N. trochoides* by Hardy. The ovate aperture shape of the Sri Lanka shells agrees better with the figures of *trochoides* than with those of *pyramidalis* that appear to have a round aperture.



Plate 6: basket shells – NASSARIIDAE, clusterwinks – PLANAXIDAE, olives – OLIVIDAE and top shells – TROCHIDAE

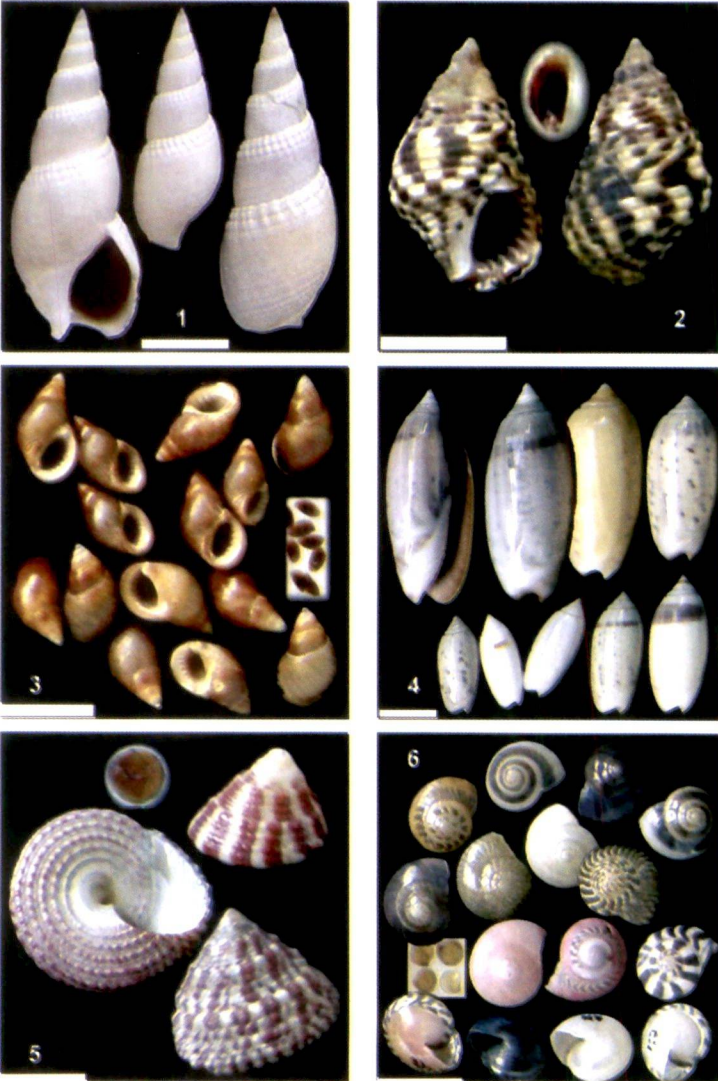


Plate 6: (1) *Bullia vittata*; (2) *Planaxis sulcatus*; (3) *Planaxis niger*; (4) *Oliva oliva*; (5) *Trochus radiatus*; (6) *Umbonium vestiarum*

Chapter 5

Basket Shells, Clusterwinks, Olives and Top Shells

NASSARIIDAE, PLANAXIDAE, OLIVIDAE and TROCHIDAE

Plate 6

NASSARIIDAE

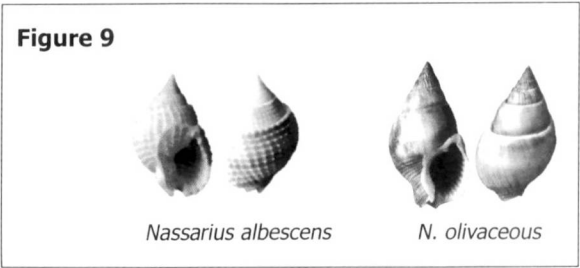
basket shells

These snails are also known as dog whelks or nassa mud snails. The shells are small, globose or conical, smooth or strongly ornamented. They usually burrow in shallow mud or sand bottoms. Active usually at night, they are carnivorous or scavengers. Two of the more typical forms are shown in figure 9. *Bullia vittata* is unusual in that they were collected in the daytime riding waves onto the beach where they quickly used their large, white, discoid feet to dig into the sand rapidly as the waves receded (similar to *Oliva oliva* and the wedge clams *Donax* – described elsewhere in this book).



රූප ගොමුව 6

මෙම බෙල්ලන් විශේෂ dog whelks සහ nassa mud snails ලෙසද හඳුන්වනු ලැබේ. මෙම විශේෂවල කවච කුඩා ප්‍රමාණයේ, ගෝලාකාර හෝ කෝනාකාර වන අතර මතුපිට පෘෂ්ඨය සිනිදු හෝ විවිධ අලංකාර හැඩ සහිත වේ. මොවුන් සාමාන්‍යයෙන් මඩ හෝ වැලි සහිත උපස්ථරයන් හාරා ඒ තුළ ජීවත් වේ. සාමාන්‍යයෙන් රාත්‍රියේදී ක්‍රියාශ්‍රීලී වන අතර විලෝපික හෝ කසල හක්ෂක හෝජන විලාශයක් ඇත. වඩාත් සුලභ ආකාර දෙකක් රූපය 9 මගින් දක්වා ඇත. *Bullia vittata* විශේෂය මෙම මොලස්කාවන් අතරින් වඩාත් අසාමාන්‍ය වන අතර දිවා කාලයේ මුහුදු රළ මගින් වෙරළට පෙරළෙමින් පැමිණ රළ මුහුදට නැවත යාමට පෙර ඔවුන්ගේ විශාල සුදු පැහැ පාදය මගින් වැල්ල භාරාගෙන ඒ තුළට ගමන් කරනු ලැබේ. (මෙම පොතෙහි වෙනත් ස්ථානයක සඳහන් කර ඇති *Oliva oliva* සහ wedge clams *Donax* යන විශේෂද මෙයට සමාන වර්ගවත් සහිත වේ.)



Clusterwink கள் periwinkles களை உருவத்தில் ஒத்ததாக இருப்பதுடன், ஒத்த வாழிடங்களிலும் வாழ்கின்றன (வேறிடத்தில் periwinkle கள் விபரிக்கப்படுகின்றன). ஓடுகள் எவ்வாறாயினும் தடிப்பானதாகவும், வலிமையானதாகவும் ஒரு தடிப்படைந்த வெளிப்புறமான உதட்டினையும் கொண்டிருப்பதுடன் ஒரு குறுகிய ஆனால் தெளிவான முன்புறமாகவுள்ள ஓட்டுக்குழாய்க் கால்வாயினையும் கொண்டிருக்கின்றன (periwinklesகளில் காணப்படுவதில்லை). மேற்பரப்பு அழுத்தமானதாக இருக்கின்றது அல்லது சுருளியான நாண்களை அல்லது தவாழிப்புக்களைக் கொண்டிருக்கின்றது. அகப்புறமானது lirate ஆக இருக்கின்றது. இவை இலையுண்ணிகளாக இருப்பதுடன். வற்றுப்பெருக்கு வலயத்திலும், கண்டல்களிலும் காணப்படும்.

6.2 *Planaxis sulcatus*

ribbed clusterwink sulcate planaxis

Shell heavy, conical, apex pointed, strong spiral cords. Columella smooth, interior lirate. Blackish, with wavy white axial streaks. Apices often covered by encrustations. 9 – 20 mm.

Found at: Trincomalee (Cod Bay, Mud Cove and Clappenberg Bay), intertidal, on small stones, exposed at low tide.

6.3 *Planaxis niger*

brown clusterwink black-brown planaxis

Seen only once, at Mount Lavinia, in the general vicinity of the coffee bean snails. They had probably been washed ashore on floating vegetation; their point of origin and definitive habitat is unknown. They formed a cluster of many individuals actively moving about over wet rock near the water level. They failed to establish a permanent colony.

Shell fusiform, solidly built with a short pointed spire. Sides of whorls rounded, body whorl inflated. Spiral cords visible faintly under magnification, 5 to 6 stronger ones anteriorly. Outer lip thick, bevelled, 9 to 10 strong teeth; columella concave, smooth, a rounded tooth posteriorly bordering a short anal canal; anterior canal short. Reddish brown, interior white to brown. Operculum elliptical, nucleus eccentric. 10 – 12 mm.

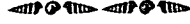
Found at: Mount Lavinia (Hotel Bay, foot of Pavilion Rocks), washed ashore from unknown west coast location, intertidal, transient.

Found at: Dehiwela (Auburnside beach), intertidal, burrowing in sand, lower shore. Also subtidal: off Colombo (Diyambin Gala), at depth 13 m, sand bottom.

TROCHIDAE

top shells

Top shells usually inhabit rocky bottoms, grazing on algae. Typical top shells are, as the name suggests, top-shaped, with flat bases. Some genera, like the button tops, have domed upper surfaces. The operculum is thin and circular.



Top shells විශේෂ සාමාන්‍යයෙන් ගල් සහිත ස්ථානවල හමුවන අතර ඇල්ගී විශේෂ උලා කමීන් ජීවත් වේ. Top shells විශේෂවල කවච උල් හැඩයක් ගන්නා අතර පාදම කොටස පැතලි වන බැවින් මෙම නම භාවිත කරයි. පීඩනය තුනී සහ කවාකාර වේ.



உயர்ந்த ஓடுகள் வழமையாக அல்காக்களை மேய்ந்து கொண்டு பாறையான அடித்தளங்களில் வாழ்கின்றன. உயர்ந்த ஓடுகள் அதன் பெயர் எடுத்துக் கூறுவதைப் போன்று தட்டையான அடிப்பாகத்தினையும் உயர்ந்த உருவத்தையும் கொண்டதாக இருக்கின்றன. சில சாதிகள் சட்டைப் பொத்தான் மேல் பகுதியைப் போன்று (button topsகள்) குவிமாடம் கொண்ட மேல் மேற்பரப்புக்களைக் கொண்டிருக்கின்றன.

6.5 *Trochus radiatus*

radiate top shell

Shell conical, straight-sided with pointed apex and wide circular base. The aperture opens on the underside. Whorls encircled by granular cords.

A typical top shell that is commonly found cast up on beaches; these are axially striped red and white. In life the colouring is dull, but removal of the outer layers by abrasion in the process of being carried along the seabed brightens the colours. A subtidal dweller of rocky substrates that may, however, be seen at low tide on rocky shores, always covered by water. Illustrated at top right is an abraded beach specimen. 21 x 17 to 29 x 20 mm (height x base diameter).

Found at: Mount Lavinia (Pavilion Rocks), at the foot of a rock, barely exposed between waves at low tide. Usually found in deeper water, commonly sheltering in burrows of the sea urchin *Stomopneustes variolaris*.

6.6 *Umbonium vestiarum*

Vesta's button top

Shell small, discoidal with domed upper surface, rounded edges. The aperture opens on the underside, as in all members of the family, and is guarded by a thin, circular operculum. Glossy, brilliantly coloured and marked with streaks of contrasting colour; the underside is not patterned. Some populations are more uniformly coloured in shades of light and dark brown. These shells live on sandy mud bottoms and burrow into it. 7 – 12 mm (diameter).

Found at: Mannar Island (Old Dutch Tower beach), empty shells on beach; Kalpitiya (Puttalam Lagoon, western shore), subtidal, burrowing in sand at water's edge



Chapter 6

Cones

CONIDAE

Plate 7

The cone shell family is large with shells ranging in size from c. 1 cm to c. 20 cm. They are generally conical in shape, the upper ends being wide with flat or very low spires and pointed bases, while others are more slender and somewhat cylindrical with taller spires (see figure 10). The aperture is a narrow slit in most species, being wider in larger forms that prey on fish. The shells are usually smooth, patterned in various colours, with or without a periostracum. Some have narrow, linear opercula that are not large enough to close the opening. Cone shells are carnivorous, hunting a variety of prey – usually worms, other molluscs and small fish – using venom soaked darts. The largest – belonging to the textile and geography cone groups – are venomous to humans. They live submerged, in crevices on rocky substrates or on sandy bottoms near reefs, where they burrow just below the surface, leaving trails as they move about. Some can be found in tide pools on exposed reefs.

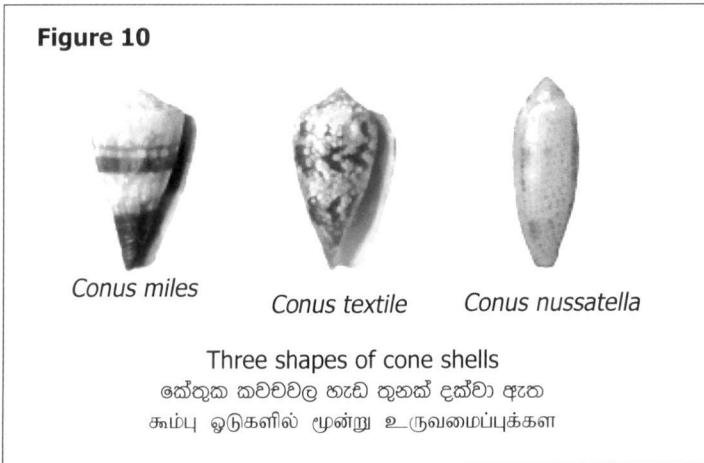


Plate 7: cones – CONIDAE, nerites – NERITIDAE (part)



(1) *Conus ceylanensis*; (2) *Conus coronatus*; (3) *Conus ebraeus*; (4) *Conus musicus*; (5) *Conus rattus*; (6) *Septaria lineata*

அடித்தளங்களில் அமிழ்ந்து வாழ்கின்றன. பாறைத் தொடர்களுக்கு வெளியே தென்படும் வற்றுப்பெருக்கு குளங்களில் சில காணப்படலாம்.

7.1 *Conus ceylanensis*

Ceylon cone

Shell small, conical with angled shoulder and low, coronated spire (crown-like, shoulder edge nodular). Granular spiral threads at anterior end. White, with two broad pink-brown spiral bands crossed by irregular, wavy axial streaks. A row of brown spots in between the shoulder coronations. Anterior extremity and interior purplish. The animal pink in colour. 12 – 21 mm.

Found at: Beruwela (Barberyn Reef), tide pools on summit. Also subtidal: Mount Lavinia (1st reef), at depth 5 m.

7.2 *Conus coronatus*

coronate or crowned cone

Synonym: *C. aristophanes*

A variable species with closely related forms and sub-species. The shape varies from slender to chunky. The body whorl encircled by spiral threads, more marked anteriorly. Colouration variable: generally blue-grey with a white shoulder band and another anterior band, the spiral threads coloured with white and brown-red dashes; or with purplish-black blotches in two bands; or with light brownish blotches on the blue-grey ground colour. The operculum is small and linear. 18 – 20 mm.

Found at: Kaluamodera (Bentara Ganga island), intertidal pool. Also subtidal: Mount Lavinia (inshore of Bellangala), at depth 5 m, under stones; Tangalle, no habitat data.

7.3 *Conus ebraeus*

Hebrew cone

Shell squat, chunky with low coronated spire that may be obscured by calcareous deposits. Creamy white with three bands of rectangular to chevron-shaped black patches on the body as well as some markings on the shoulder and the anterior end. Fresh specimens usually covered by a thin, yellowish periostracum. 18 – 25 mm.

Found at: Beruwela (Barberyn Reef), tide pools on summit.

7.4 *Conus musicus*

music cone

Shell small, slender, conical with gently curved sides. White, the anterior part of the body whorl suffused with pale blue, the anterior extremity purplish black. Spotted with deep brown. 14 – 17 mm.

Found at: Beruwela (Barberyn Reef), tide pools on summit.

7.5 *Conus rattus***rat cone**

Shell conical with low spire, the shoulder angulated, rounded below, the body whorl spirally grooved anteriorly. Bluish-white with two purplish-brown bands on body whorl that are crossed by numerous spiral rows of white dashes. Interior purplish. Periostracum slightly hairy, thin, translucent. Operculum narrow, elliptical. 19 – 24 mm.

Found at: Beruwela (Barberyn Reef), tide pools on summit. Also subtidal: Dehiwela (1st reef, inshore), at depth 2 to 3 m, on rock; Mount Lavinia (Bellangala, inshore), at depth 3 m, on rocks amongst algae.

(7.6 is described together with other nerites following Plate 4)



Plate 8: cowries – CYPRAEIDAE and rock shells – MURICIDAE (or THAIDIDAE) part



(1) *Cypraea felina listeri*; (2) *Cypraea moneta*; (3) *Cypraea staphylaea*; (4) *Cypraea arabica*; (5) *Morula granulata*; (6) *Morula margaritcola*

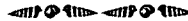
Chapter 7

Cowries

CYPRAEIDAE

Plate 8

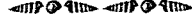
Cowries are popular with collectors and non-collectors alike on account of their glossy, brightly coloured and patterned shells. They range in size from c. 1 cm to c. 10 cm and are usually found on shallow hard substrates. The shells grow in a spiral fashion like those of other snails until the animal reaches maturity, when growth ceases and the outer lip thickens and turns in, leaving a narrow, linear aperture that is usually bordered by teeth on both sides. The adult colouration is laid down at this time and in the process of final development, with the deposition of callus, the apex of the spire – that was never prominent in the juvenile shell – is more or less buried (immersed). The resulting shell is oval or cylindrical in shape with a domed upper side and a more or less flattened underside, usually differently coloured, where the aperture is located. The shell retains its high gloss throughout life as it is covered by two fleshy lobes of the body (the mantle) that keeps it protected. The left hand image of the bottom row of figure 3 on plate 8 illustrates a juvenile shell. Cowries are active by night, browsing on algae.



රූප ගොමුව 8

මෙම කුලයේ කවචවල දක්නට ලැබෙන දිලිසෙන වර්ණ රටා සහ විශේෂිත වූ හැඩය නිසා කවච චිකතු කරන්නන් අතර පමණක් නොව සාමාන්‍ය ජනතාව අතර ද ප්‍රචලිත මොලස්කාවන් කාණ්ඩයක් වේ. මෙම විශේෂවලට සෙ.මී. එකක සිට සෙ.මී. 10 දක්වා පරාසයක කවච පවතින අතර නොගැඹුරු දෘඪ උපස්ථරයක් සහිත මුහුදු ප්‍රදේශවල හමුවේ. සුහුඹුල් අවස්ථාවට පත් වන තෙක් මෙම කවච සාමාන්‍ය ආකාරයේ බෙල්ලෙන් මෙන් සර්පිලාකාරව වර්ධනය වන අතර පසුව වර්ධනය ඇණ හිට බාහිර තොල් සහ තත්ත්වට පත් වේ. මෙහිදී පටු සිහින් විවරයක් පමණක් ඉතිරි වන අතර මෙම විවරයේ දෙපස දත් සහිත චාර පිහිටා ඇත. මෙම අවස්ථාවේදී වැඩිහිටි වර්ණ රටාවද වර්ධනය වන අතර කුඩා අවදියේ කවචවල ප්‍රමුඛව දක්නට නොලැබෙන කිණකය සහ කවච දුඟරයේ මුදුන් කොටස (spire) කවචය තුළ ගිලී වර්ධනය වේ. මෙම අවස්ථාවෙන් පසුව ඇති වන කවචය ඕවලාකාර හෝ සිලින්ඩරාකාර වන අතර පෘෂ්ඨීය හැඩය බුබුලාකාර (dome) සහ කවච විවරය සහිත උදරීය ප්‍රදේශය පැතලි ස්වභාවයක් ගනී. සාමාන්‍යයෙන් පෘෂ්ඨීය සහ උදරීය වර්ණ එකිනෙකට වෙනස් වේ. කවචයේ ආරක්ෂාව සඳහා ප්‍රාවරණය (mantle) මගින් ස්‍රාවය කරන මාංසල බණ්ඩිකා දෙකකින් (fleshy lobes) කවචය ආවරණය වී පැවතීම නිසා ජීවිත කාලය තුළදීම දිලිසෙන ස්වභාවයෙන් පවතී. රූප ගොමුව 8 හි 3 වන රූපයට අයත් පහළ රූප පෙළෙහි

විච්චස නොවැඩුනු කවචයක රූපයක් දක්වා ඇත. මොවුන් රාත්‍රියේදී ක්‍රියාශීලී වන අතර ඇල්ගී උලා කමිස් ජීවින් වේ



தட்டுரு 8

Cowrie அவற்றின் பளபளப்பான தன்மையினதும், பிரகாசமான நிறங் கொண்டிருப்பதனாலும் வழவமைப்புக் கொண்ட ஓட்டினை கொண்டிருப்பதாலும் ஓடுகளைச் சேகரிப்போர்களுக்கும், சேகரிக்காதவர்களுக்கும் பிரபல்யம் வாய்ந்ததாக இருக்கின்றன. 1cm இலிருந்து 10cm வரையில் இதன் பருமன் வேறுபடுவதுடன், ஆழமற்ற கடினமான அடிப்படைகளில் வழமையாகக் காணப்படுகின்றன. இவை முதிர்ச்சி நிலையடையும் வரை மற்றைய நத்தைகளில் உள்ளதைப் போன்று ஒரு சுருளியான முறையில் ஓடுகள் வளர்கின்றன. வளர்ச்சி முடிவடைந்ததும் வெளிப்புறமான உதடு தடிப்படைந்து உட்பக்கமாக திரும்பி ஓடு ஓடுங்கிய இரு பக்கத்திலும் பற்களினால் வழமையாக எல்லைப்படுத்தப்படுகின்றதும் நேர்கோட்டிற்குரிய வாய்துவாரத்தினை ஏற்படுத்துகின்றது. நிறைவுடலியின் நிறப்பாடுகள் இவ்வேளையில் சுருள்களின் உச்சியான இழைப்பொருளின் படிவறுதலுடன் இறுதியான விருத்தியின் செயன்முறையிலும் இடப்படுகின்றது. அத்துடன் இது ஒரு பொது இளநிலையான ஓட்டில் தெளிவாக இருப்பதில்லை அதாவது ஏறத்தாழ புதைக்கப்பட்டிருக்கும் (அமிழ்த்தப்பட்டு) முடிவுறும் தருவாயில் ஒரு உருவமைப்பில் மேற்பக்கத்தில் கீழ்ப்பக்கம் கிட்டத்தட்ட தட்டையாக்கப்படும் குவி, கிடமாகவுள்ள நீள் வட்டமாகவோ அல்லது உருளையுருவாகவோ இருப்பதுடன், வழமையாக வாய்த்துவாரம் அமைந்துள்ள இடத்தில் வேறுபட்ட விதத்தில் நிறம் கொண்டதாகவோ இருக்கும். ஓடு அதனை பாதுகாப்பதற்காக உடலின் (மென்மூடி) இரு திசை கொண்ட சோனைகளினால் போர்க்கப்பட்டிருப்பதனால் வாழ்க்கை யூராகவும் அதன் உன்னத பளபளப்பான தன்மையைக் கொண்டிருக்கின்றது. தட்டுரு 8 இலுள்ள உருவம் 3 இன் அடித்தள வரிசையிலுள்ள இடதுகை விம்பம் ஒரு இளநிலை ஓட்டினை எடுத்துக் காட்டுகின்றது. cowrie கள், அல்காக்களை மேய்ந்து கொண்டு இரவு நேரங்களில் துடிப்பாக இருக்கின்றன.

8.1 *Cypraea felina listeri*

cat or kitten cowrie

A variable species, *C. f. listeri* is a slender Indian Ocean form. The largest form is ovate and is from E. Africa. Shell cylindrical with flat underside, especially anteriorly. Numerous fine teeth on both lips. Dorsally blue-green to blue overlaid by fine brown speckles and crossed by about 3 dark bands and one indistinct white band towards the anterior. Margins and underside white with a series of strong blackish spots along both sides that is characteristic. 14 – 16mm.

Found at: Beruwela (Barberyn Reef), tide pool; Galle (tide pool below ramparts), at depth 1.5 m, under rock; Kirinda, beach specimens.

8.2 *Cypraea moneta***money cowrie**

These cowries are variable in shape and colour. Usually smoothly ovate, some develop a thickened margin that may be so exaggerated as to form lumps giving the shell a kite shape. The colour varies from pale whitish yellow to dark yellow with some grey banding across the central portion, sometimes with an orange ring similar to *C. annulus*. The mantle of the animal is grey-black with yellow streaks and spots, expanded even during the day. 13 – 24 mm.

Found at: Galle (below ramparts), tide pool. Also subtidal: Mount Lavinia (1st reef), at depth 1 to 3 m, in crevices and hollows.

8.3 *Cypraea staphylaea***grape or pustulose cowrie**

Shell small, ovate, covered in tiny pimple-like swellings. The teeth extend across the whole width of the underside of the shell as ridges. Dorsally purplish misted with white, the two ends cinnamon, the underside cream. Juvenile shells smooth, cinnamon coloured with cream ends (bottom left image). 12 – 17 mm.

Found at: Galle (below ramparts), at depth 2 m, intertidal pool. Also subtidal: Mount Lavinia (Hotel Bay), at depth 2 m, underneath small rocks, (Bellangala), at depth 3 to 4 m, underneath small rocks, (1st reef, seaward edge), at depth 8 m, inside dead oyster shell.

8.4 *Cypraea arabica***Arabian cowrie**

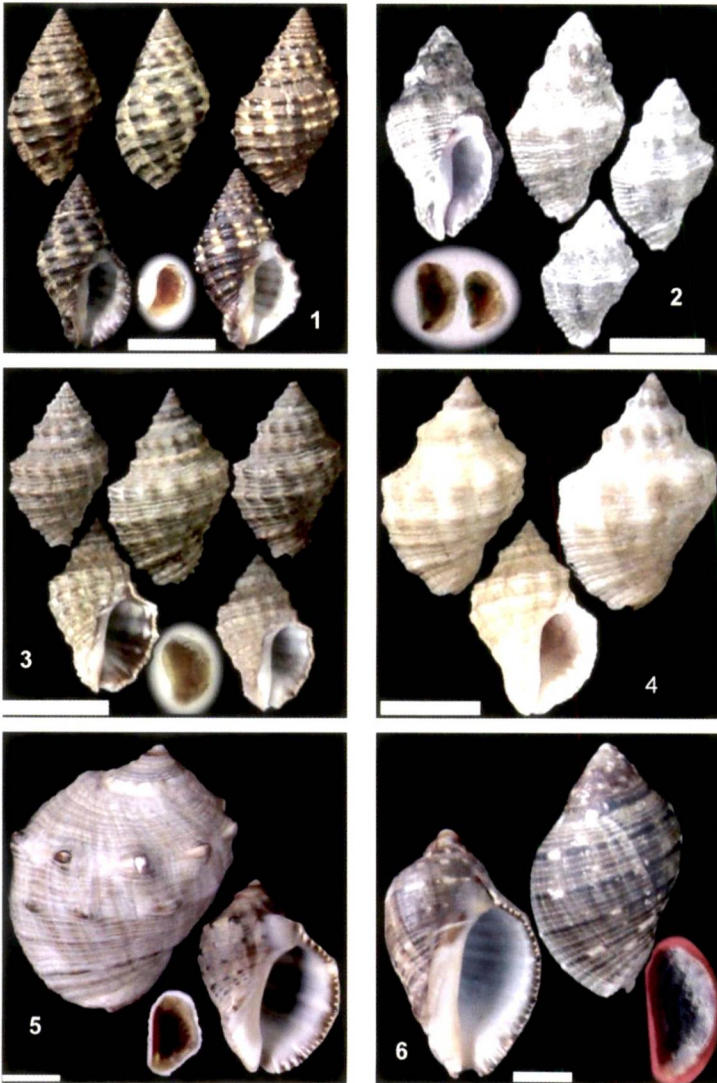
Shell moderately large. Flesh-coloured, overlaid on the dorsum with close-set cinnamon lines: long axial ones crossed by short transverse ones, leaving bare areas where the base colour shows as small circular or oval patches. The underside is flesh-coloured with blackish spots along the margins visible on the sides. The teeth orange-brown. Some variation is seen in the markings that influence the overall colour: those with fine lines are light coloured and those with thick lines and more prominent spots along the basal margins appear dark coloured. 39 – 67 mm.

Found at: Mount Lavinia (rocky shore), rock crevice, below tide level. Also subtidal: Mount Lavinia (1st reef), at depth 2 to 3 m on algae covered rock; Dickwella (Kudawella Bay), at depth 3 m, amongst rocks.

(8.5 and 8.6 are described with other MURICIDAE following Plate 9)



Plate 9: rock shells – MURICIDAE (OR THAIDIDAE) part



(1) *Morula serrialis*; (2) *Morula* sp.; (3) *Thais tissoti*; (4) *Thais tissoti*; (5) *Thais bufo*; (6) *Purpura persica*

Chapter 8

Rock Shells

MURICIDAE (also THAIDIDAE)

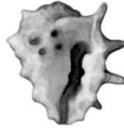
Plates 8 and 9

Rock shells or dogwinkles are treated in the subfamily Thaidinae (or Purpurinae) of the large family Muricidae, or in their own family Thaididae (or Purpuridae). Older books list many of the shells in this section under the generic name *Drupa*: this name is now only used for shells with long processes on the outer lip and *Morula* for those without. The genus *Murex* includes some of the most striking shells (figure 11).

Rock shells are rather solid, small to medium-sized shells with wide apertures, low spires and no varices (remnants of previous lips that persist as prominent axial ridges). They live on rocks in the intertidal zone and subtidally in shallow water. They are carnivorous, drilling holes in the shells of other molluscs – usually mussels, oysters and periwinkles – to feed on the tissues inside.

Figure 11

Drupa ricina



Murex tribulus



Murex shells have varices – previous lips that remain and contribute their persistent frills and spines to ornament the shell. *Drupes* lose the processes on their previous lips as the shell grows. *Morulas* have no processes at all.

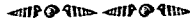
Murex கவலவடே பர சவலி துலேலு ஷேஷயன் (varices)பிதிடு ஈகி ஈகர லெலகித் கவலவடே ருலு சக கஷ்டிக கிரலாஸய பீ ஈக. *Drupa* பிஷேஷலு கவலவ லர்டிகய பிஷேலு பர சவலி துலேலு ஷேஷயன் (varices) க்ஷிஸு பீ யலு லுலே. *Morula* பிஷேஷலு கரேலு டுக்லி கலுலுலே.

Murex ஓடுகள் விளிம்புக் கோடுகளைக் கொண்டிருக்கின்றன. ஓட்டினை அலங்காரப்படுத்துவதற்கு முட்களையும் கொய்களையும் அவற்றில் நிலைத்திருப்பதற்கு பங்களித்து தங்கவைக்கும் முந்திய உதடுகள் *Drupa* கள் ஒரு வளர்ச்சியடைகையில் அவற்றின் முந்திய உதடுகளில் வெளி நீட்டங்களை இழக்கின்றன. *Morulas* கள் வெளிநீட்டங்களைக் கொண்டிருப்பதில்லை.

රූප ගොනු 8 සහ 9

Rock shells හෝ dogwinkles ලෙස හඳුන්වන මොලස්කා කාණ්ඩය විශාල මොලොස්කා කුලයක් වන Muricidaeහි උපකුලයක් වන Thaidinae (හෝ Purpurinae) යටතේ හෝ Thaididae (හෝ Purpuridae) නමින් වෙනම කුලයක් ලෙස වර්ග කර ඇත. බොහෝ පැරණි පොත්වල මේ යටතේ ඇති විශේෂ රාශියක් *Drupa* යන ගත නාමය යටතේ සඳහන් කර ඇත. එහෙත් වර්තමානයේ මෙම ගත නාමය භාවිත කරන්නේ බාහිර තොල් තෙරුම් සහිත වන විශේෂවලට පමණක් වන අතර එසේ නොමැති විශේෂ සඳහා *Morula* යන ගත නාමය භාවිත කරයි. *Murex* යන ගත නාමය යටතට වඩාත් ආකර්ෂණීය කවච ඇතුළත් කර ඇත. (රූපය 11)

Rock shells යටතට තරමක් ශක්තිමත් කවච අයත් වන අතර කුඩා සහ මධ්‍යම ප්‍රමාණයේ කවචධාරීන් වේ. කවච විවරය සාපේක්ෂව පුළුල් වන අතර කවචයේ දැරුමය ස්වභාවය අඩු වේ. ප්‍රමුඛ මධ්‍ය තෙරුමක් ලෙස පිහිටා ඇති පූර්ව තොල්වල ශේෂයන් (varices) පිහිටා නැත. මෙම මොලස්කාවන් විශේෂ අන්තර් උළුම් කලාපීය ගල්පර මත සහ නොගැඹුරු සාගරික ප්‍රදේශවල වාසය කරයි. මාංශකක්ෂකයින් වන අතර අනෙකුත් මොලස්කාවන්ගේ එනම් mussels, කාලාටියන් (oysters) සහ periwinkles කවච සීදුරු කර දේහ පටක ආකාරයට ගනු ලැබේ.



තட்டுරුකුකු 8ම, 9ම

පාறை ඉඳුකු (Rock shells) අල්ලතු dog winkles කු පෙරිය කුරුමපමාන Muricidae අල්ලතු අචුරුහින් සොරුතුකු කුරුමපමාන Thaididae (අල්ලතු Purpuridae)හින් උප කුරුමපමාන Thaididae (අල්ලතු Purpuridae) ඉල් චෙකුකුපුපුඳුකුකුකුකුකු. සාතිපුපෙරු *Drupa* ඉන් කීඳු ඉපු පකුතියිල් ඉඳුකුකුල් පල පමුරු නුරාලුකු පඳුරුකුලිකුකුකු. ඉපු පෙරු චෙලිපුඳුරු උතඳුඳුල් මාතිරුරු නුණඳු චෙලිනිඳුඳුකුකුකු කොණඳු ඉඳුකුකුකුකුකු *Morula* චෙලුචු තරුපොරුතු පාචිකුකුපුඳුකුකුකු. සාති *Murex* මිකචුචු කචරුතූපරුකුකුකු ඉඳුකුකුකුල් සිචෙචුරු උඳුඳුකුකුකුකු (උරුචු 11).

පාறை ඉඳුකු සරුරු තිණමමාන සිරියචෙචුරුලිඳුරුතූ නඳුතිරුපුරුකුකුකු පරුනු තූරුතූචෙචුකුකු කොණඳු ඉඳුකුකුකුකු. අතිතූඳු ඉචෙ තූරුනු තුරුකුකුකුකු චෙලිපුකු කොකුකු අල්ලාමුකු (තෙලිචෙචු අසුකුකුරුකු මුකකුකුකුකු නිචෙලුතිරුකුකුකුකු මුරුතූ උතඳුකුකුකු මීතිකු) කොණඳුකුකුකුකු. ඉචෙ චෙරුරුපුපෙරුකුකු චෙලුතිරුකුකුකුකු අඳුරුරු නුඳුකු උපචෙරුරුපු පෙරුකුකුකුකුකු පාරුකුකුකුකු මෙල් චෙරුකුකුකු. ඉචෙ උඳුරුකුකුකුකු. චෙරුකුකුකු කුරුලසුසිපුකු. සිපුකුකු perwinkles කු පොරු මරුරුකු Molluscs කුකුකුකු ඉඳුකුකුකු උඳුපකුකුතිරුකුකු ඉඳුකුකුකුකු උඳුකොචුචෙරුකුකු තූචෙචුකුකු කොචුකුකුකු.

8.5 *Morula granulata*
(See Plate 8)

granular drupe

Small, thick-shelled, with oblique spiral rows of squarish black nodules on a white ground. The exterior often heavily encrusted on the upper side obscuring the sculpture. The outer lip thick. Operculum thin. 16 – 22 mm.

Found at: Uswetikeyawa, intertidal pool; Mount Lavinia (Hotel Bay), intertidal rocky shore.

8.6 *Morula margariticola*
(See Plate 8)

shouldered castor bean

Shell biconical, the well developed spire about half the shell height, with an angulated shoulder. Scaly spiral threads cover the surface (but the scales may be indistinct due to weathering or encrustations), crossed by 8 strong axial ribs that bear about 5 nodules, the highest at the shoulder. Outer lip thickened with 5 recessed (set back) teeth, interior lirate. Purplish-brown with a creamy-white spiral band around the shoulder and another, but indistinct, band around the third row of nodules. Columella smooth, purplish. Interior blue-white, the teeth and adjacent outer lip as well as the lirae purple-brown. 21 – 25 mm.

Found at: Trincomalee (Cod Bay, Mud Cove), intertidal coarse gravel strewn with stones.

9.1 *Morula serrialis*

Shell fusiform, 8 to 9 oblique axial ribs crossed by 7 spiral cords forming transversely elongated nodules where they cross, with scaly spiral threads in between the cords. A gap between the 1st & 2nd spiral cords; the 2nd, 3rd and 4th cords the strongest. Only the upper three cords are visible on the spire whorls. The outer lip bevelled, 5 to 6 teeth with lirae within. Columella with 1 to 2 weak folds. Chocolate brown to grey-brown, nodules black, the cords white or yellow in the grooves between the ribs. Interior grey. 18 – 22 mm.

Found at: Mount Lavinia (Hotel Bay), intertidal rocky shore; Weligama (Kapparatota), rocky shore; Ussangoda, empty beach specimen of dead shell.

9.2 *Morula* sp.

An undetermined species that was collected from a shallow subtidal sandy bottom near the beach. Shell solid, biconical, widest at the angulated shoulder. Encircled by scaly spiral threads. The first one-third of the body whorl below the suture (the sub-sutural area) is concave ending in a row of 9 tubercles at the shoulder that continue

as straight axial ribs for another one-third the distance; the anterior (basal) one-third is concave. Outer lip crenulate, bevelled, with 5 long recessed teeth. Columella with 2 weak teeth at the anterior end. Grey, aperture violet. Coated with fine algae and silt. 15 – 22 mm.

Found at: Trincomalee (Clappenberg Bay), at depth 0.5 m, sand bottom, on stones and fine sand.

9.3 & 9.4 *Thais tissoti*

Tissot's drupe

Figures 3 and 4 on plate 9 are of the same species, the smaller shells in figure 3 being juveniles. These have thinner outer lips, more sharply defined sculpture and darker colouration.

Spire moderate, pointed, body whorl inflated. Shoulder somewhat rounded. Surface encircled by more or less equal sized scaly spiral threads (the scales mostly weathered) of which four rows are distinctly enlarged: at the shoulder and three equally spaced below. They are crossed by axial ribs that are raised into nodules where they cross the enlarged spiral threads: the heaviest are at the shoulder and the row below, equal in size, the next two much smaller. The outer lip is thin-edged, crenulate, bevelled, with three pairs of long, recessed teeth. The teeth are well developed only in the largest specimen, in the smaller ones they are more like lirae. The columella is smooth with a swelling at the posterior end that borders an anal canal. The small shells (19 mm and below) are reddish brown with yellow spots between the nodules; the large shells are flesh coloured, darker on the nodules. The interior is greyish in the small shells, flesh coloured in the others. Mount Lavinia (No. 3): 12 – 17 mm, Uswetikeyawa (No. 4): 19 – 22 – 28 mm.

Found at: Hendala (Uswetikeyawa), intertidal rock pool; Mount Lavinia, intertidal rocky shore.

9.5 *Thais bufo*

toad purple

Shell low spired, large inflated body whorl with wide aperture. Flat spiral cords of varying widths cover the surface interrupted by four low spiral ridges with prominent tubercles; the lower two ridges sometimes reduced or absent. Smooth columella, denticulate (finely toothed) lip. Pinkish brown, the tubercles darker, columella light apricot. Interior cream, the outside colour showing through. May be found exposed at low tide in crevices and depressions. 28 – 47 mm.

Found at: Mount Lavinia, intertidal rocky shore.

9.6 *Purpura persica*

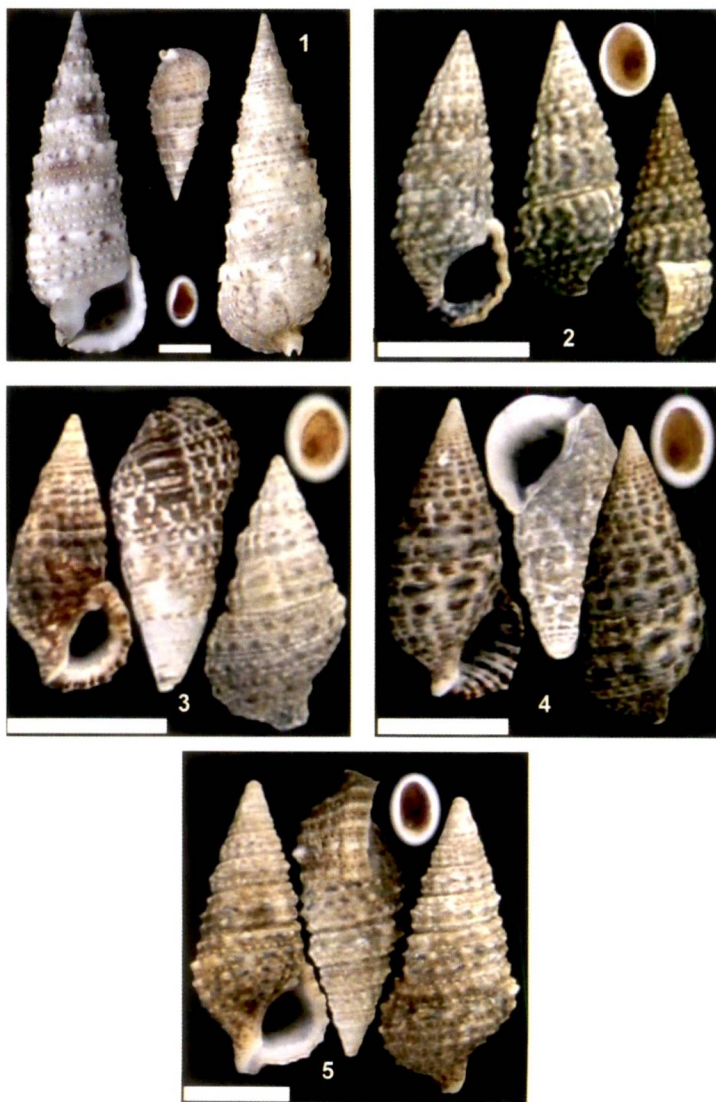
princely purple, Persian purpura

Shell elongated oval with short spire, large body whorl, rounded shoulder and large aperture. Encircled by flat spiral cords, some wider and elevated: one at the shoulder and others below. General colour grey-brown, the heavier cords blackish with interrupted cream dashes. Columella smooth, flesh coloured. Outer lip lirate with dark margin, interior blue-white. 28 – 55 mm.

Found at: Mount Lavinia (Bellangala), summit rock pool, (Hotel Bay), rocky shore near low tide level; Kaluamodera, intertidal rock pool.



Plate 10: Horn shells (part) – CERITHIIDAE



(1) *Cerithium obeliscus*; (2) *Clypeomorus* sp. 1; (3) *Clypeomorus batillariaeformis*; (4) *Clypeomorus* sp. 3; (5) *Clypeomorus* sp. 4

රූප කොම 10 සහ 11

කුල දෙකකට අයත් මොලස්කාවන් හැඳින්වීම සඳහා horn shell යන නම භාවිත කරනු ලැබේ. Cerithiidae කුලයේ විශේෂ horn shell ලෙස හෝ ceriths වශයෙන්ද Potamididae කුලයේ විශේෂ horn shell, mud creepers හෝ telescope shells වශයෙන්ද හඳුන්වයි. මෙම කුල දෙකමට අයත් විශේෂවල කවචවල උස්, අධික දඟර සහිත සහ ශක්තිමත් බාහිර ස්වරූපයක් (sculptured) ඇත.

Cerithiidae කුලයේ විශේෂවල ඕවලාකාර කවච පිටතයක් (operculum) පවතින අතර කවච විවර නිකාලය (siphonal canal) කෙටි සහ උඩට වක්වු ආකාරයට හෝ දික් සෘජු ආකාරයට පිහිටා ඇත (රූපය 12 හි වම් පස නිදර්ශනය). කවච විවරය තේරුම් සහිත වන අතර තුනී සහ ඕවලාකාර වේ. මෙම විශේෂ වැලි සහිත පත්ලක් සහිත තොගැඹුරු සාගරික ප්‍රදේශවල වාසය කරන අතර ශාක හත්ෂක වේ. ඇල්ගී සහ පත්ලේ වික් රැස් වන ද්‍රව්‍ය ආහාර වේ.

Potamididae කුලයේ විශේෂවල විශාල කවච විවරයක් ඇති අතර කවච විවර නිකාලය (siphonal canal) කැරකැවී පිහිටා ඇත. (රූපය 12 හි දකුණු පස නිදර්ශනය) කවච විවරය තේරුම් සහිත සහ වෘත්තාකාර වේ. කඩොලාන සහ කලපු ආශ්‍රිත කිවුල්දිය පරිසර පද්ධතිවල මඩ සහිත පත්ලක් සහිත උපස්ථරවල වාසය කරයි මෙම විශේෂ ශාක හත්ෂකයින් වේ.



தட்டுருக்கள் 10ம், 11ம்

பிரபல்யமான பெயரான horn shell இரு குடும்பங்களான – Cerithiidae (horn shells அல்லது ceriths கள்) உம் Potamididae (horn தொலைநோக்கிற்குரிய (telescope) shells) சேற்று ஊரிகள் அல்லது telescope இன் அங்கத்தினர்களுக்காகப் பாவிக்கப்படுகின்றது. இரு குடும்பங்களினதும் ஓடுகள் உயர்ந்தனவாகவும் பல் சுற்றுக்கள் கொண்ட சுருளிகளின் கூம்புதலையும் உடையதாக இருப்பதுடன் அனேகமாக வன்மையான சித்திரவேலைப்பாடு கொண்டதாகவும் இருக்கின்றன.

Cerithiidae நீள்வட்டமான சரிவான வாய்த் துவாரங்களையும் குறுகியதும் வளைந்ததுமாக இருக்கின்ற ஓட்டுக்குழாய்க் கால்வாய் அல்லது நீளமானதும் நேரானதுமான ஓட்டுக்குழாய்க் கால்வாயைக் கொண்டிருக்கின்றது (உருவம் 12 இடது பக்கத்தில்). மூடியிரு கொண்டிருப்புவான மெல்லிய உருவத்தில் நீள்வட்டமாக இருக்கின்றது. இவை ஆழமற்ற மணலான கடல்வாழிடங்களில் காணப்படுவதுடன், அல்காக்களையும் குப்பைகளையும் உண்ணுகின்ற இலையுண்ணிகளாகவும் இருக்கின்றன.

Potamididae வழமையாக குறுகிய முறுகலடைந்த ஓட்டுக்குழாய்க் கால்வாய்களையும் கொண்ட பெரிய வாய்த் துவாரங்களைக் கொண்டிருக்கின்றன (உருவங்கள் 12 வலது பக்கத்தில்). மூடியிரு கொண்ட வட்டவடிவமாக இருக்கின்றன. இவை உவ்ரீரில் வாழ்பனவாக இருக்கின்றன. கண்டல்களிலும் பொங்குமுகங்களிலும் சேறான அடித்தளங்களில் காணப்படுவனவாகவுள்ளன. இவை இலையுண்ணிகளாகும்.

CERITHIIDAE

horn shells, ceriths

10.1 *Cerithium obeliscus***common cerith**

Shell with a tall many-whorled pointed spire, oblique elliptical aperture with an anal canal and an upturned siphonal canal. The inner lip reflected on to the lowest part of the body whorl, columella with two folds. Sculpture of spiral rows of granules, the uppermost row enlarged into pointed nodules. Operculum oval, thin, brown and horny. Upper surface of the shell may be encrusted and the nodules eroded, the underside usually clean. Whitish with brown dots on the spiral rows, the upper surface discoloured dirty grey; greenish in fresh specimens coated with algae. 29 – 62 mm.

Found at: Mount Lavinia, no data; Galle (Unawatuna), intertidal rock pool; Weligama (Kapparatota), at depth 1 m, in sand filled rock cavity; Tangalle, no data; Kalkudah, beach, empty.

10.2 *Clypeomorus sp. 1***Palatupana horn shell**

Shell slender, conical, with tall pointed spire and rounded base. No varices. Aperture ovate, siphonal canal short, anal canal poorly developed. Columella concave, a weak swelling posteriorly. Outer lip with weak, irregular teeth. Encircled by oblique axial ridges crossed by spiral grooves to form three rows of squarish, rounded nodules per whorl increasing in size downwards, separated by spiral threads. The body whorl has in addition 4 to 5 rows of granular threads below. Dark grey-brown, nodules white. Spiral threads banded brown/white; reddish-brown/white on the body whorl. Columella pale. Colour and sculpture obscured by algal or calcareous encrustations. 16.18 – 19.1 x 6.68 – 9.08 mm (range of heights and widths). Ratio ht/w = 2.17 to 2.34, mean 2.25. (Height more than double the width.)

Found at: Kirinda (Palatupana Lagoon), wet muddy sand above water level down to depth of 0.3 m below water level of the seaward lagoonal remnant of the saltern complex, as well as in shallow pools on the sandy/muddy shore.

10.3 *Clypeomorus batillariaeformis***necklace cerith**

Shell short, spire pointed with scattered varices, a large one on the inflated body whorl. Aperture oblique; short anterior siphonal and anal canals, the anterior canal turned 45° to the shell axis. Outer lip thickened, bevelled, lirate within. The columella concave, two rounded swellings at both ends bordering the siphonal and anal canals, the posterior swelling stronger. Three rows of rounded nodules encircle each whorl separated by one or two spiral threads; the body whorl has in addition 3 rows of granular threads below (the nodules are not aligned to form axial ridges). Colour obscured by encrustations, but appears to be grey with blackish nodules. Interior white, edge of lip with cinnamon spots or coloured cinnamon. 12.63 – 18.29 x 6.5

– 9.66 mm (range of heights and widths). Ratio ht/w = 1.94 to 2.14, mean 1.99. (Height about double the width.)

Found at: Trincomalee (Clappenberg Bay), intertidal shingle beach, (Cod Bay, Mud Cove), intertidal mud and gravel, near rocks.

10.4 *Clypeomorus* sp. 3

Clappenberg Bay horn shell

Shell conical with a swollen base and a relatively short pointed spire. One varix on the body whorl in shells with fully formed lips. Aperture oblique, elliptical. Lip slightly thickened, bevelled, with a number of long, weak teeth. Columella concave, rounded swellings at both ends beside the siphonal and anal canals. Three rows of strong triangular nodules with rounded apices encircle each whorl, the middle row being the strongest. Numerous spiral threads of varying size pass over and in between the nodules: usually more than three in between rows. Ground colour white, spirally lined with cinnamon in irregular patches, the nodules tipped with black. Mature shells with formed lips encrusted and eroded, the nodules worn. Colour and tubercle details clearly seen in young shells. 19.52 – 20.9 x 11.68 – 12.12 mm; 20 – 21.34 x 10 – 11.24 mm (with apices eroded, nodules worn); 15 – 23 x 9.5 – 11.4 mm (juveniles with unformed lips). Ratio ht/w = 1.69 to 2.10, mean 1.90. (Height less than double the width.)

Found at: Trincomalee (Clappenberg Bay), intertidal shingle beach.

10.5 *Clypeomorus* sp. 4

golden horn shell

Shell conical, spire tall with straight sides, body whorl somewhat inflated. Encircled by granular spiral threads of which some are enlarged forming nodular cords: three on each spire whorl, the body whorl with 4 to 5 additional rows. The nodules triangular, those on the second row the largest – on the body whorl particularly so – followed by the third row and the uppermost row with the smallest. Outer lip thickened, bevelled, crenulate with weak folds corresponding to the crenulations; no teeth. Varices present: on the body whorl opposite the lip and on the earlier whorls. Columella concave, smooth apart from a nodule, being the end of an internal ridge, forming the parietal boundary of the anal canal. Ground colour white with spiral dashes of golden-brown, the nodules and larger granules tipped with grey. Interior white. 26.8 x 13.24 mm. Ratio ht/w = 2.04.

Found at: Trincomalee (Clappenberg Bay), at depth 0.5 m, on silted sand, near the shore, a single specimen covered by a light growth of algae and a few calcareous encrustations on the upper part of the spire.

POTAMIDIDAE

horn shells, mud creepers and telescope shells

11.1 *Cerithidea cingulata***girdled horn shell**

Shell conical, spire tall with flat-sided whorls, apices often eroded. Adult shells with a varix opposite the lip on the body whorl, some with varix-like thickenings scattered irregularly over the spire. Whorls encircled by 3 flat spiral cords, the subsutural cord separated from the next by an incised groove, all beaded by axially aligned elevations that form discontinuous axial ribs. Beyond the varix on the body whorl the subsutural cord alone persists, with a row of rounded beads; the anterior part of the shell over the lip is smooth and spirally lined, contrasting with the strongly sculptured spire. Lip thickened, anterior canal a deep notch with over-hanging lip, short posterior canal. Lip and columella smooth. Operculum circular with a central nucleus and few whorls. Shades of brown to grey, some suffused with red, the subsutural cord often of a lighter colour – white, yellow or tan, the anterior end similarly lightly coloured with dark spiral lines. Interior whitish, external pattern showing through. 14.75 x 6.38 mm to 25.74 x 9.2 mm (height x width). (Ratio ht/w = 2.18 to 2.80, mean 2.47.) (Height about two and a half times the width.)

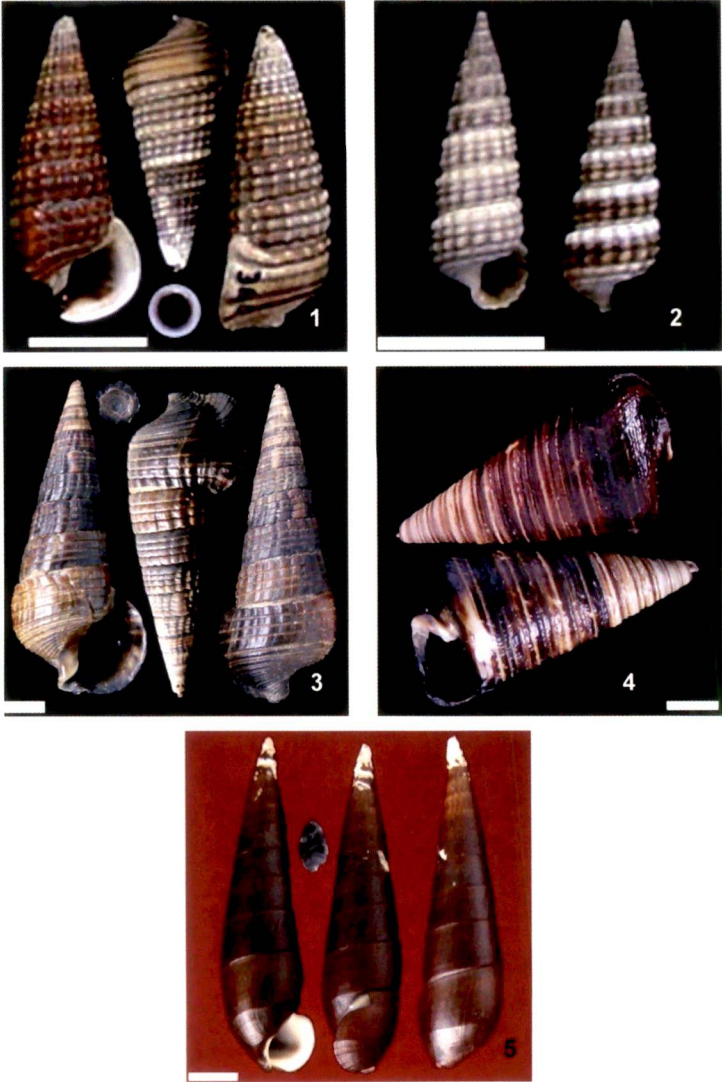
Found at: Mannar Island, mud in abandoned fish ponds; Kalpitiya (Puttalam Lagoon, western shore), intertidal mud flat and shallow pools, upper shore and at depth 0.3 to 0.5 m, edge of lagoon, muddy sand; Puttalam (Karaitivu, Serrakkuli, Puttalam Lagoon, eastern shore), sandy bed of creek flowing across beach; Mundal (Mundal Lagoon, eastern shore), mud flats and muddy banks of water channels; Trincomalee (Cod Bay, Mud Cove), intertidal mudflat, in and out of water at edge.

11.2 *Cerithidea* sp.**lesser horn shell**

Shell slender, high conical with tall spire. Whorls encircled by axial ribs separated from each other by wide grooves, crossed by shallow spiral grooves breaking them up into three rows of beaded cords. The beads transversely elongated, the subsutural row the strongest and most distinct, the lower two rows sometimes hardly divided. Three to four spiral threads below the beaded cords on the body whorl; only the uppermost visible on the spire whorls above the suture. Generally brownish to greyish and blackish, sometimes with reddish tints, white subsutural beads, the tops of other beads and the threads whitish. 12.0 x 4.34 to 19.30 x 6.30 mm. (Ratio ht/w = 2.70 to 3.06, mean 2.81.) Shells with thin lips. (Height between two and a half times and three times the width.)

Found at: Mannar? Delft Island?, shallow inland pools in arid sandy landscape; Puttalam (Karaitivu, Serrakkuli, Puttalam Lagoon, eastern shore), mud bottom, salt marsh pools fringing mangrove along shoreline.

Plate 11: horn shells (part) – POTAMIDIDAE and THIARIDAE (non marine)



(1) *Cerithidea cingulata*; (2) *Cerithidea* sp.; (3) *Terebralia palustris*; (4) *Telescopium telescopium*; (5) *Faunus ater*

11.3 *Terebralia palustris***northern mud creeper**

Shell large, heavy, conical with tall spire, the base rounded with flared outer lip in adults. Three deeply incised spiral lines divide the whorls into four flat cords that are crossed by a series of axial ribs. Body whorl with low varix opposite the lip in adults. Columella smooth, pale, the siphonal canal very short. Operculum circular, thin, brown and horny with central nucleus and many whorls. 46 – 72 mm (immature) to 79 mm (mature).

Found at: Kalpitiya (Puttalam Lagoon, western shore), muddy bank of dried up creek at edge of mangrove, the animal drawn up deep within the shell, sealed against desiccation by the tight-fitting operculum; Puttalam (Vanathavillu, Pubudugama Totupola, Puttalam Lagoon, eastern shore), mud bottom of creeks and bed of fringing mangrove along shoreline, submerged in shallow water (few cm deep); Trincomalee (Kinniya), crab occupied in tide pool, (Cod Bay, Mud Cove), intertidal mudflat.

11.4 *Telescopium telescopium***telescope shell**

Shell large, heavy, conical with tall straight-sided spire, the base squared off. Four flat spiral cords per whorl. The columella twisted. Operculum circular. Reddish-brown, the interior purplish. To 100 mm.

Found on mudflats bordering lagoons and water channels at Batticaloa and Trincomalee, but not collected. The photograph is of beach specimens from an unknown location.

THIARIDAE

theora shells

Snails of the family Thiariidae are fresh water inhabitants. The genera *Thiara*, *Melanooides*, *Paludomus* and *Faunus* occur in Sri Lanka. *Faunus ater* also occurs in the brackish water of lagoons and mangroves.



Thiariidae කුලයට අයත් බෙල්ලන් විශේෂ මිරිදිය පරිසර පද්ධති වාසීන් වේ. ශ්‍රී ලංකාවේ *Thiara*, *Melanooides*, *Paludomus* සහ *Faunus* ගැන වාර්තා වී ඇත. *Faunus ater* විශේෂය කලපු සහ කඩොලාන ආශ්‍රිත කිවුල්දිය පරිසර පද්ධතිවලින්ද වාර්තා වී ඇත.



குடும்பம் Thiariidae இன் நத்தைகள் நன்னீரில் வாழ்பனவாக இருக்கின்றன. சாதிகள் *Thiara*, *Melanooides*, *Paludomus*, *Faunus* ஆகியன இலங்கையில் காணப்படுகின்றன. *Faunus ater* உம் கடலேரிகளினதும் கண்டல்களினதும் உவரில் காணப்படுகின்றது.

Figure 13

Thiara scabra
17 mm



Thiara scabra, a fresh water snail, has spiny shoulders, unlike *Melanooides* spp. (also in the subfamily Thiarinae) that are more slender with variable sculpture; *Paludomus* shells are globular. *Faunus* (in the subfamily Melanopsinae) is devoid of sculpture.

Thiara scabra කවච මධ්‍යයේ කණ්ඨක පෙළක් ඇති අතර මීර්දිය වාසීන් වේ. මෙම විශේෂ සාපේක්ෂව සිහින් සහ වෙනස් වන බාහිර ස්වරූපයක් (sculpture) සහිත *Melanooides* විශේෂ (සහ Thiarinae උප කුලය) ශෝලාකාර *Paludomus* කවචවලින් සහ දුර්වල බාහිර ස්වරූපයක් ඇති *Faunus* (Melanopsinae උප කුලයට අයත්) කවචවලට වඩා වෙනස් වේ.

பல்வேறான சித்திரவேலைப்பாட்டினைக் கொண்ட மிகவும் ஒல்லியானதாக இருக்கின்ற *Melanooides* இனங்களைப் போலன்றி ஒரு நன்னீர் நத்தையான *Thiara scabra* முட்கொண்ட தோள்களைக் கொண்டிருக்கின்றது (உப குடும்பம் Thiarinae இலும் கூட); *Paludomus* ஒருகள் கோளவுருவானதாக இருக்கின்றன. *Faunus* (உப குடும்பம் Melanopsinae இலுள்ள) சித்திரவேலைப்பாடற்றதாக இருக்கின்றது.

11.5 *Faunus ater*

black faunus

Shell tapering with tall, straight-sided spire of many whorls. Apex usually eroded. Surface of whorls smooth and shiny or with faint spiral cords. Aperture ovate. The outer lip tongue-shaped, the margin convex and overhanging the aperture. Columella concave, smooth. Chocolate brown to blackish, interior white. Operculum ovate. 66 – 71 mm.

Found at: Negombo (Negombo lagoon), at depth under 1 m, mud bottom near sea grass bed; Maggona (Maggona Ganga), at depth under 1 m, mud bottom.



Chapter 10

Wedge Clams and Mussels

DONACIDAE and MYTILIDAE

Plates 12 and 13

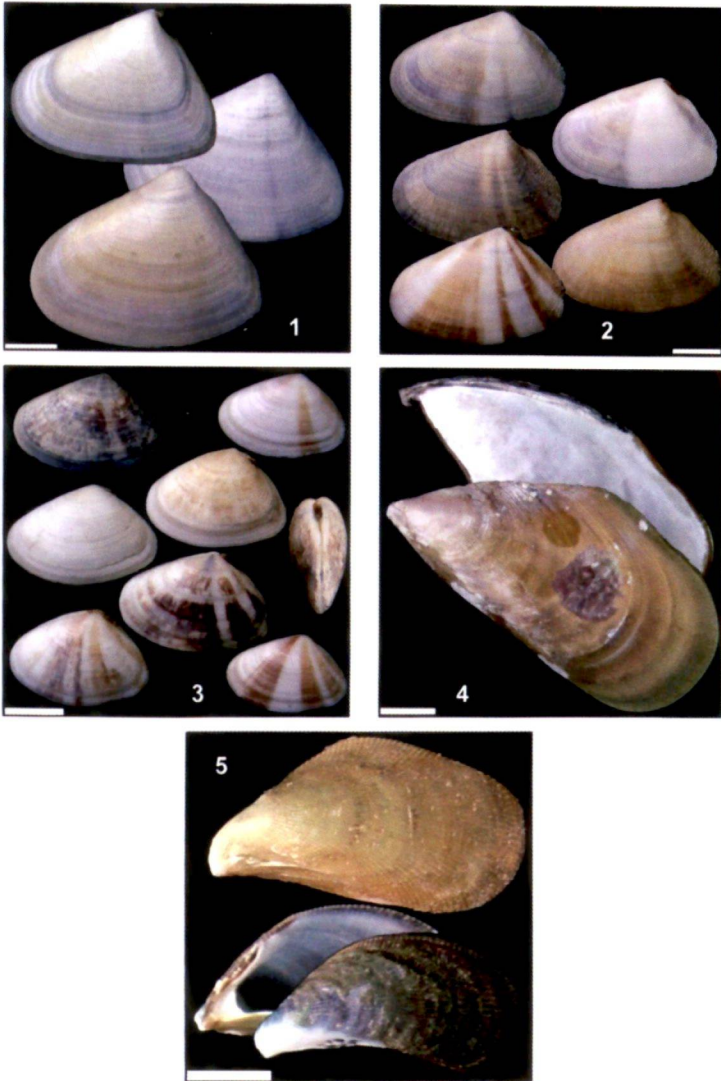
DONACIDAE

wedge clams

The three species described live in shallow inshore waters off gently sloping sandy beaches, where they burrow into the sand. They use waves to migrate up and down the beach: emerging from the sand, they catch a breaking wave to be carried up the beach where they quickly dig into the sand as the wave recedes. As waves break higher and higher with rising tides the animals work their way up the beach and as the tide falls, they catch receding waves to work their way down the beach and avoid being stranded on dry sand. Like most bivalves they are filter feeders, using two siphons (tubes formed by tissue folds) thrust out of the sand, from where they lie buried: one to suck water in and the other to expel the water after it has circulated around the gills. The shells are wedge shaped with the beak at the largest angle and an external ligament behind. The shells are smooth and glossy, some species brightly coloured with variable white rays fanning out from the beak. The photographs illustrate only a selection of the great variety of colour schemes and patterns that are seen. These clams are edible.

The differentiation of these clams from similar species depends on the number and arrangement of the hinge teeth, the nature and extent of the pallial sinus and the nature of the inner valve margins in addition to the shape. They all have large, rounded pallial sinuses (figure 14). These species have been described in some detail to avoid confusion with shells of other species, similar in shape but smaller, that are often found on beaches.

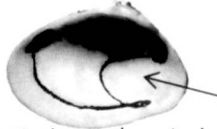
Plate 12: wedge clams – DONACIDAE and mussels – MYTILIDAE (part)



(1) *Donax deltoides*; (2) *Donax cuneatus*; (3) *Donax faba*; (4) *Perna perna*; (5) *Septifer virgatus*

Figure 14

Donax faba
Interior of right valve



The pallial line and the anterior and posterior adductor muscle scars are outlined. The deep, rounded pallial sinus (arrowed) is characteristic of *Donax*.

ප්‍රාවරණ රේඛාව, පූර්ව හා අපර අභිනායක ජේෂී සලකුණ වැටී සටහනකින් පෙන්වා ඇත. ප්‍රමාණයෙන් විශාල ප්‍රාවරණ කෝටරකය *Donax* හි ප්‍රධාන ලක්ෂණය වේ.

ஆவரணக் கோடும் முன்புறமான, பிற்புறமான தசையின் புறம் வரையப்பட்டிருக்கின்றன. ஆழமான வட்டமான ஆவரணக்குடா (அம்புக் குறியிடப்பட்டது) *Donax* இன் தற்சிறப்பான தன்மையாகும்.

රූප ගොමු 12 සහ 13

මද බෑවුම් සහිත වැලි සහිත මුහුදු වෙරළ කලාපවල වැලි තුළ ජීවත් වන විශේෂ තුනක් විස්තර කර ඇත. මෙම විශේෂ මුහුදු වෙරළේ සංවරණය සඳහා රළ උපයෝගී කර ගන්නා අතර ගොඩබිම දෙසට පැමිණෙන රළ සමග වෙරළේ ඉහළට පැමිණ, රළ ආපසු ගමන් කිරීමට ප්‍රථම වැලි තාරා ගෙන සැතවී යනු ලැබේ. උදුම් රළ වෙරළේ ඉහළට ගමන් කරන විට මෙම විශේෂද වෙරළේ ඉහළට ගමන් කරන අතර පහළ මට්ටමට පැමිණීමේදී විශ්ලී වැල්ල මත රැදීම වැළැක්වීම සඳහා නැවත රළත් සමග පහළට එනු ලැබේ. අනෙකුත් බොහෝ දෙපියන් බෙල්ලන් විශේෂ මෙන්ම මෙම විශේෂද පෙරා බුදින්නන් වේ (filter feeder). මොවුන්ගේ කවචයෙන් පිටතට විවෘත වන හිනාල (siphon) වැලිවලින් පිටතට තෙරපා හැර එක් නාළයක් මගින් ගන්නා ජලය කරමල් තරහා ගමන් කර අනෙක් නාළයෙන් පිට කර ආහාර පෙරා ගනු ලැබේ. කවචවල හැඩය කුඤ්ඤාකාර වන අතර කවච තුඩට විනාම පිටුපසින් බාහිර සම්බන්ධක පටක විශාල කෝණයක් ආකාරයට පිහිටා ඇත. මෙම කවචවල මතුපිට සිහින් සහ දිලිසෙන සුළු වේ. සමහර විශේෂවල කවච තුඩේ සිට විහිදෙන සුදු පැහැ රේඛාවක් සහිත දීප්තිමත් වර්ණ ඇත. මොවුන්ගේ ඇති පුළුල් පරාසයක වර්ණ රටා අතරින් ආකාර කිහිපයක ජායාරූප පමණක් මෙහි දක්වා ඇත. මෙම clam විශේෂ මිනිස් ආහාරයක් ලෙසද භාවිත කෙරේ.

කවචයේ ස්වභාවයට අමතරව කවච එකිනෙකට සම්බන්ධ වන ස්ථානයේ අසවි (hinge) ඇති දත්වල ප්‍රමාණය සහ පිහිටා ඇති ආකාරය ප්‍රාවරණක කෝටරකය (pallial sinuses) හි ස්වභාවය සහ ව්‍යාප්තව ඇති ආකාරය සහ අභ්‍යන්තර කවච දාරයේ ස්වභාවය අනුව මෙම මට්ටම් (clams) විශේෂ සමාන විශේෂවලින් වෙනස් වේ. මෙම සෑම විශේෂයකටම ප්‍රමාණයෙන් විශාල රටුම් හැඩති ප්‍රාවරණ කෝටරකය (pallial sinuses) පිහිටා ඇත. (රූපය 14) මෙම විශේෂවලට හැඩයෙන් සමාන වන ප්‍රමාණයෙන් කුඩා මුහුදු වෙරළාශ්‍රිතව නිරන්තරයෙන් හමුවන සමාන විශේෂවලින් පහසුවෙන් වෙන් කර හඳුනා ගැනීම සඳහා මෙම විශේෂ පිළිබඳව වැඩි විස්තරයක් දක්වා ඇත.



தட்டுருக்கள் 12ம், 13ம்

சாதுவான சரிவாகின்ற மணற்பாங்கான கடற்கரைகளில் ஆழமற்ற உட்கடற்கரை நீரில் விபரிக்கப்பட்ட மூன்று இனங்கள் வாழ்கின்றன. இங்கு இவை மணலினுள் வளை தோண்டுகின்றன. மணலிருந்து மேலே எழுந்து கடற்கரையில் மேலும் கீழுமாக இடம்பெயர்வதற்கு இவை இலைகளைப் பாவிக்கின்றன. அலை பின்வாங்கப்படுகையில் மணலினுள் இவை உடனடியாகத் தோண்டுவதற்கு கடற்கரையில் ஒரு முறிவடைகின்ற அலை மேலே எடுத்துச் செல்வதற்கு இவை பிடித்துக் கொள்கின்றன. எழுகின்றவற்றுப் பெருக்குகளுடன் மேலே மேலே அலைகள் முறிவடைகையில் விவங்குகள் கடற்கரையிற்கு அவற்றின் வழியே மேலே ஏற்படுத்திக்கொள்வதுடன் வற்றுப்பெருக்கு வீழ்ச்சியடைகையில் அவை கடற்கரையிற்கு கீழே அவற்றின் வழியினை ஏற்படுத்துவதற்கு பின்வாங்குகின்ற அலைகள் இவை பெற்றுக்கொள்வதுடன் வரண்ட மணலில் முடங்கிக் கொள்வதை தவிர்ந்துக் கொள்கின்றன. அனேகமான **bivalve** களைப் போன்று இவை வடித்துண்ணிகளாகும். இவை புதைந்து கிடக்கும் இடத்திலிருந்து மணலிற்கு வெளியே தள்ளப்பட்டிருக்கும் இரு ஓட்டுக் குழாய்களைப் பாவித்து (இழையங்களின் மடிப்புக்களால் தோற்றுவிக்கப்படும் குழாய்கள்) வடித்துண்ணுகின்றன. ஒரு குழாய் நீரினை உள்ளூறிஞ்சுவதற்கும் மற்றையது பூக்களைச் சுற்றி சுற்றோட்டமடைந்ததன் பின்பு நீரினை வெளியகற்றுவதற்கும் பாவிக்கப்படுகின்றன. மிகப்பெரிய கோணத்திலும் ஒரு வெளிப்புறமாகவுள்ள இளையத்தின் பின்பக்கமாக அலகினைக் கொண்ட ஆப்பு உருவம் கொண்ட ஓடுகளாகும். ஓடுகள் அழுத்தமானதாகவும் மளமளப்பானதாகவும் இருக்கின்றன. சில இனங்கள் அலகிலிருந்து கதிகள் பல்வேறான வெண்மையான வெளியே விசிற்றி ஏறியப்படுவதைக் கொண்ட பிரகாசமான நிறங்கொண்டவையாக இருக்கின்றன. புகைப்படங்கள் காணப்படுகின்ற நிறுத் திட்டங்களினதும் மாதிரிப் படவங்களினதும் பெரும் வகைகளின் ஒரு தேர்வினை மாதிரம் எடுத்துக்காட்டுகின்றன. இப்பெரும் சிப்பிகள் உணவாக உட்கொள்ளப்படுவனவாகும்.

ஒத்த இனங்களிலிருந்து இக் **clam** களின் வேறுபாடுகள் பிணையற்றங்களினது தன்மையிலும். ஆவரணக் குடாவின் எந்தளவு என்பதிலும் உருவத்திற்கு மேலதிகமாக உட்புறவால்வின் எல்லைகளின் தன்மையிலும் எண்ணிக்கையிலும் ஒழுங்கமைப்பிலும் தங்கியிருக்கின்றது. இவை யாவும் பெரிய வட்டமான ஆவரணக் குடாக்களையும் (உருவம் 14) கொண்டிருக்கின்றன. இவ் இனங்கள் கடற்கரைகளில் அடிக்கடி காணப்படுகின்ற மற்றைய ஒத்த உருவத்திலும் ஆனால் பருமனில் சிறியதாகவும் இருக்கின்ற ஓடுகளுடன் ஒப்பிடுகையில் தடுமாற்றத்தினைத் தவிர்ப்பதற்கு சில விபரங்கள் விபரிக்கப்பட்டிருக்கின்றன.

12.1 *Donax deltoides*

Goolwa donax

The largest of the wedge clams. Shell a right angle triangle with a straight hinge margin. A rounded keel passes from the beak to the postero-ventral angle. The portion behind the keel is somewhat narrow and rough. Hinge: two cardinal teeth in the left valve, one strong tooth in the right; a posterior lateral tooth in each valve. The internal margin is smooth. Soberly coloured in shades of blue, cream and brownish-grey with darker concentric lines and bands. The interior is pale violet. 22.6 x 16.2 to 43.6 x 33 mm (length x height).

Found, intertidal beach, burrowing in sand, lower shore at: Dehiwela (Auburnside); Beruwela; Alutgama.

12.2 *Donax cuneatus*

cuneate donax

Differs from *D. deltoides* in being a more elongated triangle. The sloping postero-dorsal margin meets a short vertical posterior margin, the keel sharp, the postero-dorsal slope markedly rough and wider than in *D. deltoides*. The hinge margin somewhat convex. The exterior covered by fine concentric grooves that are strong and rough behind the keel; fine radial threads cover the sides anterior to the keel, the most posterior ones at the keel standing out, not crossed by the rough concentric grooves. Hinge: two cardinal teeth in the left valve, one tooth in the right; one anterior and one posterior lateral tooth in the left valve, one anterior and two posterior laterals in the right valve. Interior margin smooth. Strikingly coloured in a wide range of colours from creamy white through pink-orange, orange-brown, blues, to purples, mostly with white or pale rays fanning out from the beak to the periphery. Interior white. 20.7 x 14.1 to 38.3 x 23.6 mm (length x height).

Found, intertidal beach, burrowing in sand, lower shore at: Jaffna; Dehiwela (Auburnside); Mount Lavinia (Surf Club beach); Beruwela (harbour beach); Kalmunai.

12.3 *Donax faba*

Pacific bean donax

Small triangulo-ovate shells with no keel. Posterior slightly rough, the hinge margin more or less straight. Fine concentric lines cover the surface, becoming strong and somewhat lamellar behind, crossed by fine radial threads. Hinge: two cardinal teeth in the left valve, one tooth in the right; one anterior and one posterior lateral tooth in the left valve, one anterior and two posterior laterals in the right valve. Interior margin smooth. Whitish, mottled to varying degrees with orange, blues and browns, with white rays or not. Some show solid colours with white rays resembling *D. cuneatus*, but distinguishable by the different shape. Interior white. Illustration includes a view of the hinge margin from behind, showing the external ligament. 17 x 10.6 to 25.7 x 17.3 mm (length x height).

Found at: Mannar Island (near Old Dutch Tower), intertidal beach, burrowing in sand, lower shore; Trincomalee (Kinniya, Turtle Bay), at depth 0.3 m, up to 1 m from shore, in a bay where there was no surf.

வளர்க்கப்படுவனவாகவோ இருக்கின்றன. இடைவற்றுப்பெருக்கு வலயத்திலும் உபவற்றுக்குரிய நீரிலும் இவை வாழ்கின்றன. **Mytilid** களின் மூன்று சாதிகள் இங்கே விபரிக்கப்பட்டுள்ளன.

true mussels

12.4 *Perna perna*

brown mussel

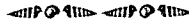
Shell medium sized with slender, pointed, down-turned beaks in front and a wide rounded rear. The dorsal outline is angulated with the slightly convex hinge margin in front and the postero-dorsal margin straight at first then sloping downwards to a broadly rounded posterior. The ventral margin is more or less straight or slightly concave in front. The shell is covered with an adherent thin, glossy, brown periostracum often with green tints behind. The interior is pearly white, the brownish outer colour showing through. The shells are often misshapen when growing in crowded conditions and usually heavily encrusted. In young shells (e.g. shell length 37 mm) the part behind the hinge slopes down without the straight segment as seen in mature shells. 37 x 21 to 78 x 33 mm (length x height).

Found at: Mount Lavinia (Bellangala summit and rocky shore) intertidal, exposed rock and pools, also subtidal on the first reef, at depth 4 – 6 m, in rocky hollows and crevices facing the open sea; Bundala, intertidal, exposed emergent rock in shallows (see frontispiece no. 5).

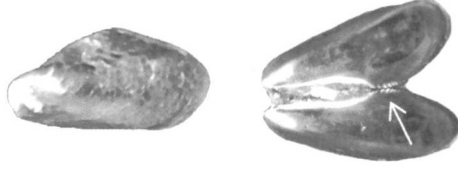
Edible, collected for eating. *Perna viridis*, the green lipped mussel is also edible and grows to a larger size.

deck mussels

Deck mussels are so called on account of the deck-like shelf that fills the angle below the beaks in the interior of the valves (seen as a white triangular patch in the interior view in figure 12.5). They are attached by a byssus to hard substrates where they are always submerged. The species described was found at a depth of 1 m near the beach. Two species occur in Sri Lanka and they are very similar to each other. The shells are variable in shape as they often live in cramped crevices and become misshapen during growth.



கவலி தூவி (beak) பதலித் தவலக தலிடுலக ஈகாரடே கௌகார தவலகத் தலகித திசு deck mussels லெச தடதலிது லுலே (ரஃதய 12.5 ி ஈதர் துரீகதடேடீ துட தஃக துிகௌகார துடேதகத் லெச டித் லே). லௌலித் தலச துட தலகத் லாசக தரத ஈதர் byssus ஈடாரடேத் லததரடரட சலி லி லாசக தரடி. லெகி லிதர தர ஈகி லிசேத லுது லேரலு ஈகததல லேர

Figure 15*Modiolus auriculatus*

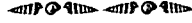
Modiolus (at left, viewed from the left side) resembles *Brachiodontes*. The umboes are dorsal near the anterior extremity and the dorsal margin is humped. The hinge line is on the forward-facing antero-dorsal margin. *Brachiodontes* (at right) is shown from the interior with the articulated valves wide open. The arrow points to the crenulations (the series of white marks) that lie just behind the hinge. These are characteristic of *Brachiodontes* and are absent in *Modiolus*.

Modiolus விசேஷ (வழி ரகசய) *Brachiodontes* விசேஷவலு மாகிரிசு சலாககமகன் டகன்வகி. Umbo சாக்டீயவ சிகிடு ஈகி ஈகர் சாக்டீய டூர்ய ஓடிதீ ஈக. கவவ ஈசலீலீ (hinge) ரீமவ ஓடிர்யடு மிஈலலா சூர்வ-சாக்டீய டூர்யே சிகிடு ஈக. ஈககன்நர்யே ஈகி சிகிடுககடு மகி சலிசிக கலாடுய சேககை சர்டி சூலிடு டுச சிவாக சி ஈகி *Brachiodontes* (டகஈலு ரகசய) கிடர்ஈகககன் டகன்லா ஈக. ரீகடு கவ மகி கவவ சலீமன்டககடு வலாடு சஈசுசிக சிகிடு ஈகி டன் ஈககார கரீகி (ஈசு சகககககன் டர்ஈலாக வக) சிகிடு ஈக. டேய *Brachiodontes* சலாககன் டகன்டு டககெ ஈகர் *Modiolus* கீ ஓலாசலி.

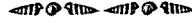
Modiolus (இடது பக்கத்தில், வலது பக்கத்திலிருந்து காட்டப்பட்டுள்ளது) *Brachiodontes* இளை ஒத்ததாக இருக்கின்றது. முற்புறமுனையிற்கு சேய்மையிற்கு மேற்புறத்திற்கு அண்மையாக பரிசைமுனைகள் இருக்கின்றன. பிணையல் கோடு முற்புற – மேற்புற எல்லையினை முன்னோக்கி எதிர்கொள்கின்றதாக இருக்கின்றது. *Brachiodontes* (வலது பக்கத்தில்) பரந்து திறந்துள்ள மூடப்பட்டுள்ள வால்வுகளைக் கொண்ட அகப்புறத்தில் காட்டப்பட்டிருக்கின்றது. பிணையலுக்கு சற்று பின்னாக அமைந்திருக்கின்ற பல்விளிம்புகளுக்கு (வெள்ளைப் புள்ளிகளின் தொடர்) அம்பு குறிப்பிடுகின்றது. இவை *Brachiodontes* இல் சிறப்பாக இருப்பதுடன் *Modiolus* இல் காணப்படுவதில்லை

ribbed mussels

Ribbed mussels of the genus *Brachiodontes* resemble the horse mussels of the genus *Modiolus* in shape, and are distinguished by the presence of teeth-like crenulations along the dorsal edges of the valves behind the ligament (figure 15). Sculpture consists of riblets crossed by growth lines radiating from the beaks. Two species are described - one marine and one from slightly brackish water.



Brachiodontes ගහයට අයත් වන ribbed mussels විශේෂ වීඛි බාහිර ස්වරූපයෙන් *Modiolus* ගණයේ horse mussels විශේෂවලට සමාන වන අතර කවචයේ දෙපියන් සමීඛන්ධ කරන ඛන්ධනය (ligaments) පිටුපසින් කපාටයේ පෘෂ්ඨය දාරයේ දුන් ආකාරයේ තෙරැඹී පැවතීම මගින් වෙන් කර හඳුනා ගත හැකිය. (රූපය 15) කවචයේ පිහිටා ඇති කුඩා නාරටි (riblets) තුඩේ සිට අරයන් ඔස්සේ විහිදී ඇති වර්ධන රේඛාවන්ගෙන් කැපී පිහිටා ඇත. සාගරික විශේෂයක් සහ තරමක් දුරට කිවුල් ස්වභාවයක් පවතින පලයේ වාසය කරන විශේෂයක් මෙහි විස්තර කර ඇත.



சாதி *Brachiodontes* இன் ribbed mussel கள் உருவத்தில் சாதி *Modiolus* இன் horse mussel களினை ஒத்திருப்பதுடன் இணையத்திற்குப் பின்னாக வால்வுகளின் முதுகுப்புற விழிம்புகளின் வழியே பற்கள் போன்ற பல்விளிம்புகள் இருத்தலினால் வேறுபடுத்தப்படுகின்றன. சித்திரவேலைப்பாடு அலகுகளிலிருந்து வளர்ச்சிக் குறுக்காக்கப்படும் விலாத்துண்டு பரவுகின்ற கோடுகளினால் புள்விலாக்களினை கொண்டிருக்கின்றது. இரு இனங்கள் விபரிக்கப்பட்டிருக்கின்றன. ஒன்று கடலில் வாழ்வது மற்றையது சற்று உவர் நீரிலிருந்து பெற்றது.

13.1 *Brachiodontes* sp. 1
(See plate 13)

brown ribbed mussel

Shell stubby, quite strong and inflated, anterior obtuse, posterior rounded, dorsal elevation low, ventral margin nearly straight. Marginal crenulations behind ligament strong. Beaks are about level with anterior end. A rounded keel extends from the umbo to the postero-ventral angle. Crowded riblets, crossed by growth lines, radiate from beaks to dorsal, posterior & ventral margins; the ventral riblets fade anteriorly but reappear as an isolated group of about 4 to 5 that curve forwards into the anterior extremity. Dark brown to light brown, glossy. The underlying colour shows through the thin translucent periostracum. The largest collected 11.0 x 5.3 x 5.2 to 16.5 x 6.0 x 6.3 mm (length x height x width).

Found at: Hendala (beach rock formation) intertidal, buried under thick algal tufts; Mount Lavinia (Dig Gala) intertidal, on bare rock, in large colonies.

13.2 *Brachiodontes* sp. 2
(See plate 13) (non-marine)

estuarine ribbed mussel

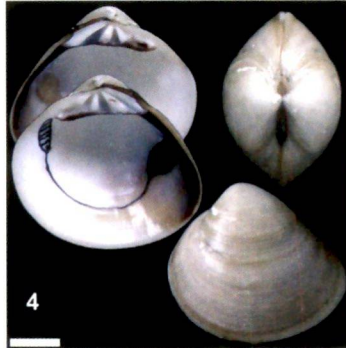
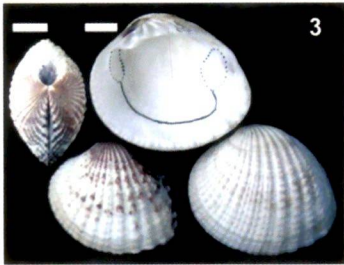
Shell thin, fragile, elongated, slender, somewhat inflated, anterior obtuse, the posterior drawn out, dorsal elevation rounded, the ventral margin concave. Marginal crenulations behind ligament weak. The beaks are behind the anterior extremity. A rounded keel from the umbo to the postero-ventral angle. Crowded riblets, crossed by growth lines, radiate from beaks to dorsal, posterior & ventral margins; the ventral riblets fade anteriorly to reappear as an isolated group of 9-10 that curve into the anterior extremity. Periostracum dusky brown, dull, the striped pattern of the shell showing through at the margins. Shell glossy, whitish with a "turkey wing" pattern of variable cinnamon coloured wavy, concentric lines tending to smudge behind the keel in some making the dorsal aspect darker.

This species differs from the former (marine) species in being more slender with a drawn out posterior and a protuberant anterior, beaks behind the anterior extremity on the dorsal aspect and 9-10 riblets curving forwards into it (as against 4-5). Interiorly the marginal crenulations behind the ligament are weak (as against strong in the other). It is also attractively patterned underneath the dull, dusky brown periostracum. The largest collected at Hendala: 12.3 x 5.8 x 4.5 to 13.9 x 6.7 x 4.6 mm; at Mundal: 16 x 7.4 x 5.5 mm (length x height x width).

Found at: Hendala (Hamilton Canal, 1/2km from its mouth at the Kelani Ganga), embankment, under rocks; Mundal (Mundal Lagoon, eastern shore), empty, amongst dead *Halophila* sp. and empty oyster valves attached to mangrove air roots marooned by receding water level.



Plate 13: mussels – MYTILIDAE (part), Venus clams – VENERIDAE and marsh clams – CORBICULIDAE (non- marine)



(1) *Brachiodontes* sp. 1; (2) *Brachiodontes* sp. 2; (3) *Gafrarium tumidum*; (4) *Meretrix casta*; (5) *Meretrix* sp.; (6) *Geloina coaxans*

area is covered by calcareous deposits, indicating that the shell was buried with just this part protruding above the sand or mud. The interior margin crenulated. Mostly white with some black along the posterior margin extending to the inside. Some shells with orange or brick red around the beak, the colour spreading downwards for varying distances. Not collected alive. 34.3 x 30 to 46.46 x 41.8 mm (length x height).

Found at: Kalpitiya (Puttalam Lagoon), dead shells in shallows, also kitchen trash, collected for eating; Trincomalee (Kinniya), collected for eating. (Leonard Pinto (1986) reports that this species occurs in mangroves.)

The illustration shows an interior view of the right valve with the anterior and posterior adductor muscle scars and the indented pallial line between them outlined.

13.4 *Meretrix casta*

common meretrix

Shell thick, inflated; umbones low, rounded, beaks incurved, touching each other. Ligament external, lunule absent or faintly outlined in some, elongated elliptical. Exterior marked by irregular growth lines, surface uneven, somewhat glossy. Umbones eroded in older shells. Hinge plate strong, deep, with strong teeth. Posterior lateral tooth in the left valve and the corresponding groove in the right valve striate, rasp-like. Pallial line indented.

External colour tan with irregular dark concentric bands, the posterior sometimes dark; periostracum thin, adherent and yellowish. The bared shell ivory with pinkish tints and blackish posterior margin. Interior white, the posterior suffused with pink-brown or purple, becoming chocolate along the margin, spreading to involve the hinge plate to various degrees, in extreme cases the hinge plate and teeth are chocolate brown and the interior margin external to the pallial line is light purplish. 18 x 15.5 to 44 x 37 mm (length x height).

Found at: Kalpitiya (Puttalam Lagoon, western shore), dead shells in shallows; Puttalam (Karaitivu, Serrakkuli, Puttalam Lagoon, eastern shore), single valves, much weathered, washed ashore from the lagoon; Mundal (Mundal Lagoon, eastern shore), empty shells at edge of water on mud, live shells snagged on bottom set fishing net; Negombo (Negombo Lagoon, Kadolkelle), empty shells on mud, shallows at edge; Koggala (Koggala Lagoon, Gan Duwa), empty, in shallows; Kirinda (Palatupana Lagoon), empty shells on shore.

This species differs from the larger *M. meretrix* (*M. lusoria* in older books) in having a shorter, less drawn out postero-ventral angle. *M. meretrix* is said to be highly variable as regards shape and colour resulting in the description of many varieties (Dey, 2006).

13.5 *Meretrix* sp.

Rekawa meretrix

Shell similar to *Meretrix casta* but differs in being thin-shelled and lighter with narrow hinge plates. Umbones narrower and taller, lunule more heavily imprinted and wider. Teeth similar (including rasp-like posterior lateral tooth and groove) but not as strong. Pallial line indented at posterior. Shell smoother but marked by growth lines. Bared shell ivory-cream with blackish posterior, the umbones eroded; thin adherent periostracum imparts a dark tan hue. Interior creamy-white, posterior margin purplish-cinnamon sometimes spreading on to the hinge plate. 29 x 15 to 33 x 28 mm (length x height).

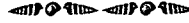
The identity of this shell is unclear: it may be a form of *M. casta* or another species. The characters of the teeth and the indented pallial sinus indicate that it is a species of *Meretrix*.

Found at: Rekawa Lagoon, at depth 1 to 1.5 m, mud, under algal blanket.

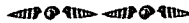
CORBICULIDAE

marsh clams

Two families of non-marine bivalves comprising five species in four genera have been described from Sri Lanka; of these, four species inhabit fresh water. The species described here is found in the brackish water of mangroves and in rivers and streams near their mouths.



සාගරවාසී කොවන දෙපියන් බෙල්ලන් විශේෂ පහක් ශ්‍රී ලංකාවෙන් වාර්තා වී ඇත. මෙම විශේෂ කුල දෙකකට අයත් ගත තතරක් යටතේ වර්ග කර ඇත. මෙයින් විශේෂ 4ක් මීරිදිය පරිසර පද්ධතීන්ට වාර්තා වී ඇත. මෙහි විස්තර කර ඇති විශේෂය කඩොලාන සහ ගංගා ඇල මාර්ගවල මෝය ආශ්‍රිත වාසස්ථානවල ජීවත් වේ.



සෞඛ්‍යමය clam කள் නානු සාතිකලිස් ඝුණු ඉනාංකලාක් කොණ්ඩුරුක්කිණ්ණ කුල් වාමුකකයණ්ණ ඉරු කුරුමපාංකුල් ඉලාංකයලිලිණ්ණු වලිලිකපුටුරුක්කිණ්ණ. ඉවණ්ණලිස් නානු ඉනාංකුල් නණ්ණලිස් වාමුකිණ්ණ. ඉඹුකේ වලිලිකපුටුරු ඉනාං කණ්ණලිලිකිණ්ණුම අණුකලිණ්ණුම අරුකලිණ්ණුම අවණ්ණලිස් වාමුකු අණ්ණයාක ඉවණ්ණලිස් කාණ්ණලිලිකිණ්ණ.

13.6 *Geloina coaxans*

common geloina

A non-marine clam inhabiting brackish water living on muddy bottoms. Shell heavy, nearly circular, inflated, with the beaks pointing forwards. Ligament external. Covered by close-set growth lines giving a rough surface. Adherent dark brown periostracum is raised into frilled lamellae along the growth lines; may be rubbed smooth and absent in old shells. Beaks eroded to varying degrees, baring the white shell. Interior white. Photo shows a young shell 54 x 51 x 30 mm (length x height x width) with intact periostracum and frilled lamellae. Larger shells 87 x 78 x 52 to 107 x 92 x 58 mm show eroded beaks and smoother surfaces. Edible.

Found at: Maggona (Diyalagoda, Dummalamodera Ganga), mud, in mangrove; Kaluamodera (Kaluamodera Ganga), buried in mud, brackish water mangrove; Trincomalee (Cod Bay, Mud Cove), mud, roadside ditch.



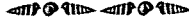
Chapter 12

Oysters and Jewel Boxes

OSTREIDAE and CHAMIDAE

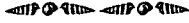
Plates 14 and 15

Oysters and jewel boxes are bivalves that are cemented to the substrate by one valve – the anatomical left. Thorny oysters of the family Spondylidae live similarly attached (but by the anatomical right valve). Oysters and jewel boxes are found in the intertidal zone as well as in deeper water. Members of the three families may be distinguished by the nature of the hinge (figure 16). When they die, the attached valves are often left in place on the substrate where they lived.



රූප 14 සහ 15

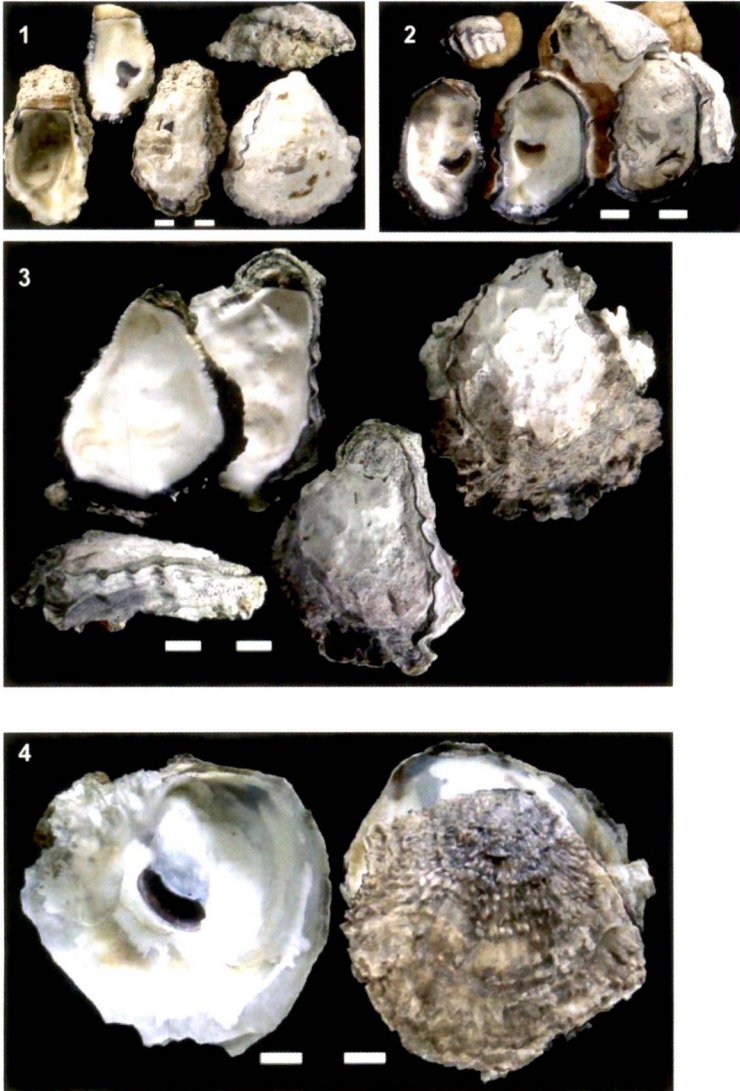
Oysters සහ jewel boxes විශේෂ වීක් පියල්ලක් මගින් (ව්‍යුහ විද්‍යාත්මකව වම් පියල්ල) උපස්ථරයට සම්බන්ධ වී ඇත. Spondylidae කුලයට අයත් Thorny Oysters විශේෂ උපස්ථරයට සවි වී ඇත්තේ ව්‍යුහ විද්‍යාත්මකව දකුණු පියල්ලෙනි. Oysters සහ jewel boxes විශේෂ අන්තර් උදම් කලාපයේ මෙන්ම ගැඹුරු සාගරික ප්‍රදේශවලදී ජීවත් වේ. කුල තුනට අයත් වන සාමාජිකයන්ගේ අසවි (hinge) වල ආකාරය අනුව වර්ග කල හැකිය (රූපය 16 බලන්න). මෙම විශේෂ මල පසුත් ඔවුන්ගේ උපස්ථරයට සවි වී පැවැති පියල්ල විලෝපම දැකගත හැකිය.



තட்டுරූප 14, 15

Oyster කලාපය සහ jewel box කලාපය bivalve කලාපයකි. இவை ஒரு வால்வினால் அதாவது உடலமைப்பு ரீதியில் இடது பக்க வால்வு அடிப்படையுடன் சீமெந்து பதிக்கப்பட்டிருக்கின்றன. குடும்பம் Spondylidae யிலுள்ள முட்கொண்ட oyster கள் இதேவாறே பிணைக்கப்பட்டு வாழ்கின்றன (ஆனால் உடலமைப்பு ரீதியில் வலது பக்க வால்வினால்). oyster களும் jewel பெட்டிகளும் வற்றுப்பெருக்கு வலயங்களிலும் அழமான நீரிலும் காணப்படுகின்றன. மூன்று குடும்பங்களின் அங்கத்தினர்கள் பிணைப்பின் தன்மையினால் வேறுபடுத்தப்பட முடியும் (உருவம் 16). அவை இறக்கும்பொழுது அவை வாழ்ந்த இடத்து அடிப்படையில் அனேகமாக பிணைக்கப்பட்ட வால்வுகள் விட்டுவிடப்படுகின்றன.

Plate 14: oysters – OSTREIDAE



(1) *Saccostrea cucullata*; (2) *Saccostrea mordax*; (3) *Saccostrea* sp.;
(4) *Crassostrea* cf. *madrasensis*

வலயத்திருந்து கீழே தாழ்ப்பமற்ற பகுதி வரை கண்டல்களும் கூட காணப்படுகின்றன. பல இனங்கள் உணவாக உட்கொள்ளப்படக்கூடியனவாக இருக்கின்றன. சாதி *Saccostrea* இன் **rock oyster** கள் கடினமான அடிப்படைகளுக்கு தொடுக்கப்படும் கண்டல்களில் தாவரங்களின் வேர்களுக்கு தொடுக்கப்படும் வற்றுப்பெருக்கு வலயத்தில் வாழ்கின்றன. மையவகற்சிக்குரிய சிறுநீரக உருவில்கொண்ட நிறப்பொருள் கொண்ட உள்வாங்கித் தசைகளின் தழும்புகளை கொண்ட **Oyster** களின் ஒரு சாதியாக *Crassostrea* இருக்கின்றது. சாதி **Oystrea** நிறப்பொருளற்ற மையத்திற்குரிய தழும்புகளைக் கொண்டிருக்கின்றன. இந்த இரு சாதிகளின் அனேகமான அங்கத்தினர்கள் கடல்வாழ்க்கைக்குரியன. *Crassostrea* ஒரு கடல் வாழ்க்கையற்ற உவாநீர்க்குரிய **Oystrea** ஆகும். சமுதாயங்களாக வாழ்கின்ற கீழ்புற வால்வுகளினால் வன்மையாகப் பதிக்கப்பட்டிருக்கின்றது.

rock oysters

14.1 *Saccostrea cucullata*

rock, hooded or Bombay oyster

Occurs as gregarious colonies on wave lashed intertidal and supratidal rocks firmly attached by the entire left valve. Solid, thick-shelled, small to medium sized, the shape often determined by degree of crowding and substrate contours. Generally triangular-spathulate or linear and slipper-shaped, sometimes curved to one side. Lower valve (LV) thick, deeply cupped, greatly prolonged beyond the hinge, the deep umbonal cavity extending well beyond the ligament; margins raised and plicate. Upper valve (UV) thin, flat or slightly convex, margins sinuate, fitting like a lid. UV sculpture usually obscured by erosion but shows lamellae; LV has radial ridges corresponding to the marginal plications that are seen on the upturned edges. Chalky white with dark blackish-brown margin externally. Interior white with dark margin to UV, muscle scar eccentric, the one on the UV pigmented. A row of tubular teeth at right angles to the edge (chomata) is present along the margin of the UV, strongest towards the hinge, with corresponding grooves on the lower. 20 x 35 to 72 x 75 mm (length x height).

Found at: Mount Lavinia (Bellangala), summit and flanks above water level, intertidal, attached to rock, (rocky shore), supratidal splash zone up to 2 m above high tide, horizontal, vertical and near vertical rock faces; Talpe, intertidal rocky shore, horizontal surfaces and shallow tide pools.

14.2 *Saccostrea mordax*

mordax rock oyster

Shell small, thin but strong, firmly cemented by the whole length and posterior of the left valve, the anterior, and to a lesser extent the ventral margins, raised. Generally elongate oval, some triangular-spathulate. Lower valve (LV) hinge more or less flush with the rounded margin, the shell not protruding beyond (no umbonal cavity). Cupped anteriorly with raised, rounded, plicate margin; the posterior margin hardly raised, plications less regular. Upper valve (UV) flat or slightly convex, margins

sinuate, fitting like a lid. A row of short tubular teeth (chomata) at right angles to the edge on the UV and a row of corresponding grooves on the lower. Muscle scars eccentric, pigmented. External sculpture of UV obscured by erosion. Chalky white with dark edge; LV sculptured by a series of radial ridges corresponding to the plications. Interior white with blackish margin showing externally as a black line. 20 x 30 to 28 x 40 mm (length x height).

Found at: Trincomalee (Cod Bay, Mud Cove), intertidal, in clusters on quartz pebbles lying on muddy sand, in calm sheltered bay, exposed at low tide.

14.3 *Saccostrea* sp.

Shell thin but strong, growing in crowded colonies firmly cemented to the substrate by the whole of the left valve. More or less symmetrical, triangular-spathulate or with longer rounded anterior margin and shorter posterior. The hinge margin of the lower valve (LV) is narrow, the shell protruding a little beyond the ligament, the umbonal cavity shallow, not deep as in *S. cucullata*. It is slightly cupped anteriorly with a raised margin that is weakly plicate, the posterior margin hardly raised, usually flush with the substrate. The upper valve (UV) is thin with a sinuate margin and fits like a lid. The UV surface is irregular: encrusted, eroded or laminated, coloured white or grey with dark periphery. LV with concentric lamellae, margin weakly folded with corresponding radial ridges. Interior white with a wide blackish margin, the muscle scar D-shaped, eccentric, unpigmented. A row of short, tubular teeth (chomata) in a circumferential row on the UV with corresponding grooves on the lower. 52 x 82 x 19 mm, 60 x 64 x 23 mm, 70 x 74 x 20 mm (length x height x breadth of the three largest shells examined).

Found at: Trincomalee (Clappenberg Bay), intertidal, on the vertical face of a concrete pier.

The rock oysters of the genus *Saccostrea* are extremely variable throughout their geographic distribution. Ecological factors affecting variability include wave exposure and water salinity. Crowding and substrate contour influence their shape. Genetic factors have been studied recently and it is concluded that a number of forms that have been described as separate species could be included under *S. cucullata*. However, *S. mordax* is a distinct species, identifiable by the presence of radial grooves from the beak to the periphery of the upper valve and a regularly plicate lower valve margin (Lam & Morton, 2006). The specimens examined are too eroded to show radial grooves, but the plicate (folded) margin is clear.

Number 14.3 is included with the rock oysters as it shares certain characteristics, such as an umbonal cavity that extends beyond the line of the hinge, folded lower valve margins and the presence of chomata. Its definitive identity is unclear; it may be an ecological variety of *S. cucullata*.

Crassostrea is a genus of oysters with eccentric, kidney-shaped, pigmented adductor muscle scars. The genus *Ostrea* has unpigmented central muscle scars. Most members of these two genera are marine forms. *C. madrasensis* is a non-marine, brackish water oyster, firmly cemented by the lower valve, living in colonies.

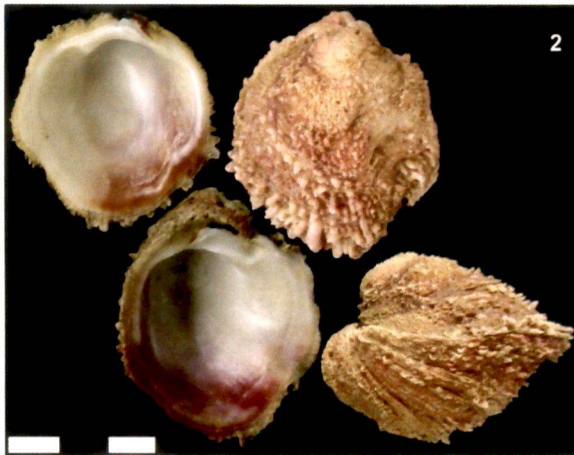
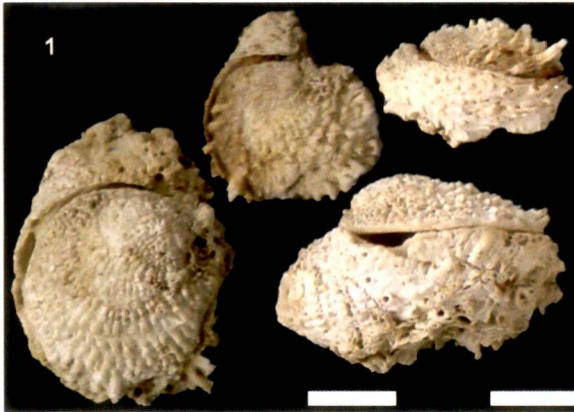
14.4 *Crassostrea madrasensis*

Madras oyster

Valves thin and flattish, circular, oval or triangular in outline according to the contour of the substrate, the hinge narrow. Lower valve cupped, the upper flat or convex near the narrow hinge. Muscle scar eccentric, kidney-shaped, pigmented. Upper valve covered with pinkish-brown fringed, overlapping lamellae; brittle when dry. 50 x 72 to 85 x 95 mm (length x height), circular shells 70 to 75 mm diameter.

Found at: Kirinda (Palatupana Lagoon), on rocks along the shore at the water's edge. Mostly dead, marooned by receding water level, a few found alive underwater. (The identification is based on the description and figure in Kirtisinghe, 1978. Leonard Pinto (1986) describes both this species as well as *S. cucullata* attaching to the roots of mangrove plants.)

Plate 15: jewel boxes – CHAMIDAE



(1) *Chama reflexa*; (2) *Chama fragum*

CHAMIDAE

jewel boxes

15.1 *Chama reflexa***reflexed jewel box**

Shell attached to rock substrate or friable encrustations like worm tubes by anterior half of deeply cupped left valve that has a prominent umbonal swelling; right (upper) valve flattish, round to squarish or somewhat rectangular with rounded corners. Valve margins crenulate. Covered by ruffled concentric lamellae, the margins prolonged into scales, some spine-like. This species is recognisable by its bulbous lower valve with flattish upper valve. All specimens examined were discoloured, one showing a pinkish blush over the posterior. Described in literature as whitish or reddish. 20 x 20 mm, 24 x 30 mm, 41 x 50 mm (length x height of three specimens).

Found at: Mount Lavinia (Bellangala), intertidal pool on the summit. Also subtidal, from shallow water in the same area.

15.2 *Chama fragum***fragum jewel box**

Shell thick, globular, growing to a large size. Left valve deeply cupped, with a deep umbonal cavity and umbonal swelling, attached to rock substrate along the anterior half. Right (upper) valve nearly circular, cupped, large umbonal swelling. Valve margins crenulate. Surface covered by concentric lamellae, the margins fringed with flattened, spine-like scales. In the largest specimen examined (75 x 100 mm) from a subtidal habitat the lamellae were very thick and the scales quite flat and stout. This species is recognisable by the prominent umbonal swellings on both upper and lower valves. Deep brownish red, the umbo and anterior margin paler, the colour extending to the postero-ventral interior. The specimens from subtidal habitats rather eroded and discoloured. 28 x 32 mm, 41 x 50 mm, 55 x 66 mm, 75 x 100 mm (length x height of four specimens).

Found at: Mount Lavinia (Bellangala), intertidal pool on the summit. Also subtidal at depth 5 m in the same area; off Colombo (Kelani Gala) at depth 17 m from a vertical rock face.



Mollusc Habitats

Plate 16



Figure 1: The Barbeyrn Reef at Beruwela with large tide pools on its summit.



Figure 2: The rock oyster *Saccostrea cucullata* in a tide pool of a rock shelf on the lower shore at Talpe. The green alga *Enteromorpha compressa* covers the bottom.

Plate 17



Figure 3: Vertical zonation seen in a photograph taken at low tide: red algae at low tide level, green algae intertidal, limpets near high tide level and oysters supratidal.



Figure 4: A cluster of the periwinkle *Littoraria undulata* sheltering in a supratidal niche at the Pavilion Rocks, Mount Lavinia. The lowermost dark brown shell is *Patelloida striata*, a limpet.

Plate 18



Figure 5: A salt marsh flanking a mangrove bordering the eastern shore of the Puttalam Lagoon. The mudflats and pools are mollusc habitats.

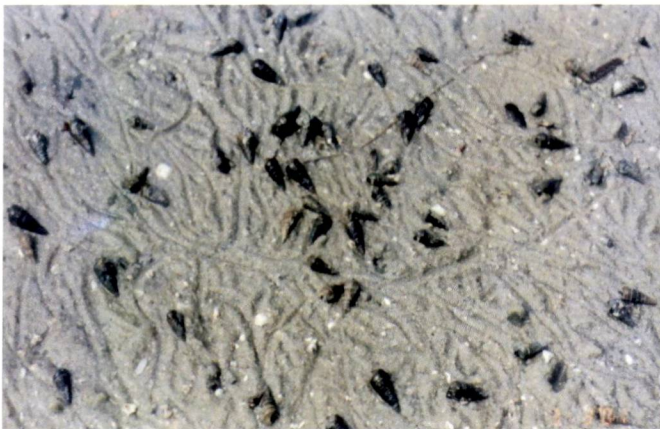


Figure 6: The horn shell *Cerithidea cingulata* on the mud bottom of a pool on the upper beach at Kalpitiya, adjacent to a mangrove, on the western shore of the Puttalam Lagoon.

Plate 19



Figure 7: The mussel *Perna perna* growing on the intertidal rocky shore at Mount Lavinia. Photo Srilal Perera, MBIOD



Figure 8: The oyster *Crassostrea madrasensis* on a rock bordering the Palatupana Lagoon.

Glossary of Shell Terms

These terms are illustrated in the section Shell Descriptive Terms, Figures 1 and 2

Adductor muscle scars

The place of attachment of the anterior and posterior adductor muscles that remain visible on the inside of bivalve shells.

Anal canal (posterior canal)

A groove at the posterior end of the gastropod aperture in which the posterior siphon, through which solid waste matter is discharged, is located.

Apex

First formed end of gastropod shell. Usually pointed.

Aperture

Opening of a gastropod shell, providing outlet for soft parts; the mouth of the shell.

Axis

Imaginary line through apex around which whorls are coiled.

Axial

Parallel to the axis, e.g. axial ribs, ridges, streaks etc.

Base

The most recently formed part of the gastropod shell. Where the aperture is located.

Bead

Protuberant sculptural element on the surface of gastropod shell. A rounded bead-like nodule, larger than a granule but smaller than a tubercle.

Beak

Referring to the point representing the earliest stages of a bivalve shell; the narrowed extremity of the umbo.

Body whorl

Last formed complete turn of gastropod shell; the last whorl.

Biconical

The shape resulting when the wide ends of two cones are placed end to end, the junction being angular.

Byssus

Fibrous strands secreted by the foot with which some bivalves attach to the substrate.

Callus

Smooth interior lining of pale shelly matter, frequently obvious within the mouth; sometimes spilling over on to the exterior over the columella.

Chomata

Short, tube-like, locking nodules along the valve margins of some bivalves (e.g. rock oysters), with corresponding grooves in the other valve.

Columella (plural: columellae)

Solid or hollow pillar surrounding axis in coiled shells, formed by the inner walls of the whorls. Forms the inner border of the aperture.

Columellar

Referring to that part of the interior surface of the shell, comprising the columella.

Concentric

Referring to ridges or grooves parallel to the lower margin of the bivalve shell. Follows the direction of growth lines.

Cords

Spiral sculptural elements on the surface of a gastropod shell. "Cords" are thicker than "threads" but thinner than "ridges."

Crenulate

Thrown into fine folds. Usually referring to lip margins of gastropods or valve margins of bivalves.

Ctenidium

A primitive gill found in the limpet family Acmaeidae.

Discoidal

Approaching a disc in form; axially compressed gastropod.

Divaricate

Referring to ribs (of bivalves) that diverge from the general direction.

Fold

Spiral ridge on interior of shell wall; usually on the columella.

Fusiform

Spindle-shaped; tapering at both ends, the middle rounded.

Globose

Globe-shaped, spherical. Referring to the shape of the shell.

Granule

A sculptural element on the surface of a shell, similar to a bead but smaller.

Growth lines

Surface markings left in former positions of the aperture edge in gastropods or the valve margin in bivalves.

Inflated

Swollen.

Incised

Referring to grooves that are fine, as if cut.

Inner lip

Referring to that part of the aperture margin from the base of the columella to the suture, and consisting of columellar and parietal parts (q.v.).

Keel

Literally a sharp ridge. Refers to a sharp or rounded ridge that extends from the beak to the postero-ventral angle in some bivalves.

Lamellae (plural)

Thin layers. Refers to successive layers of shelly material deposited with each growth season in a bivalve that remain visible, usually at the former margins, as raised rims.

Ligament

An elastic membrane that joins the two halves of a bivalve shell. They can be internal or external. Elastic recoil of the ligament opens the valves passively; they are shut by the active contraction of the adductor muscles.

Lines

Very fine surface markings; thinner than threads.

Lip/s

The outer and inner margins of gastropod apertures. Thickened or reflected (q.v.) outer lips present only in adult shells of some species.

Lirae (plural)

Fine spiral ridges on the inside of the outer lip of gastropod shells extending into the interior. Often continuous with teeth found on the lip.

Lirate

Referring to the presence of lirae.

Lunule

An elliptical or heart-shaped flattened area in front of the beak of bivalves, one half on each valve, enclosed by growth lines. Not present in all species.

Mantle

An anatomical part of the animal that covers the body mass and which secretes the shell.

Operculum (plural: opercula)

Horny or calcareous (shelly) plate carried by the foot of the gastropod snail and serving to close the aperture when the animal is withdrawn into the shell.

Outer lip

Referring to that part of the aperture margin from the suture to the base of the columella; the outer margin.

Ovate

Egg-shaped. Asymmetrical oval where one end is broader than the other. Describes shape of apertures and opercula.

Pallial line

The line of attachment of the mantle edge on the inside of a bivalve, extending between the anterior and posterior adductor muscle scars.

Pallial sinus

An indentation of the posterior part of the pallial line; an anatomical feature that results from the arrangement of the mantle to form the siphons. Shells that burrow deeply have longer siphons, and consequently deeper pallial sinuses, than those that do not.

Parietal

Referring to that part of the interior surface of the shell between the columella and the suture – in effect, formerly the external surface of earlier formed whorls.

Periostracum

Horny organic coat covering the shell or ostracum. Not present in all species, may be thin and translucent or thick and opaque, sometimes hairy.

Plicate

Folded. Refers to the surface of the shell being raised into a series of ridges with similar grooves in between (sine wave-like). Also “plications” as on the columella.

Posterior canal

See anal canal.

Recessed

As in recessed teeth. The condition where teeth on the outer lip are set back from the very edge.

Recurved

With the end turned away from the shell axis. (As in “recurved siphonal canal”: turned upwards and not straight.)

Reflected

Turned outward or backward. (As in “the outer lip margin reflected”: the edge turned back on itself.)

Reniform

Kidney-shaped.

Reticulate

Forming a network of obliquely intersecting sculptural elements. E. g. as a result of axial ribs crossing spiral cords.

Rib

Projecting ridge on surface of shell, usually axial in gastropods and radiating from the umbo to the shell margin in bivalves.

Riblet

A fine rib. Often found in between ribs.

Scales

Upturned, semicircular projections on the surface of shells. Formed along growth lines. Sometimes elongated and spine-like.

Scaly

Referring to the presence of scales.

Sculpture

Relief pattern on shell surface.

Shoulder

Angulation near upper margin of whorl.

Sinuate

Wavy.

Siphon

A respiratory tube formed by the mantle through which the animal draws in water for respiration and discharge of waste material. Bivalves possess paired siphons – inhalant and exhalant. Gastropods have a long or short siphon within a siphonal canal.

Siphonal canal

The part of a gastropod shell, usually in the form of a groove at the anterior end, in which the siphon lies.

Spathulate

Expanding from a narrow base to a wider rounded apex.

Spiral

Passing continuously around whorls, parallel to the suture. (cf. Transverse)

Spire

Visible part of all the whorls except the last.

Striae

Fine incised (q.v.) grooves on shell surface.

Striate

Refers to surface covered by a series of fine parallel grooves and ridges.

Subsutural

Immediately below the suture. Referring to the uppermost band of sculpture on a whorl or the shell profile.

Suture

Continuous spiral line on shell surface where whorls adjoin.

Thread/s

Fine spiral ridges on the surface of a gastropod shell, narrower than cords.

Tooth

General term for shelly prominence on interior surface of shell. In gastropods on the outer and inner lips (columellae). In bivalves the hinge is formed of interlocking – cardinal and lateral – teeth.

Transverse

Crossing direction of shell growth, usually parallel with growth lines (cf. Spiral).

Truncate

Referring to the appearance of the ends of bivalves. As if cut off, as against smoothly rounded.

Tubercle

A protuberant, rounded nodule, being a sculptural element. Usually formed at the intersections of axial and spiral ridges and cords on the shells of gastropods, larger than beads. Often at the shoulder.

Turreted

High-spired, with a stepped series of whorls.

Umbo (plural: umbones)

The rounded swelling consisting of early stages of a bivalve shell. Includes the beak, which is the extremity of the umbo; the terms sometimes used to mean each other. Also 'umbonal swelling' and 'umbonal cavity'.

Valve/s

In the singular one half of a bivalve shell, right valve or left valve. When attached by one valve to the substrate, upper and lower valves.

Varix (plural: varices)

Previous lip margins that persist as ribs on the surface of some gastropod species.

Whorl

Any complete coil of shell.



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