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FIELD GUIDE TO THE SHELLED GASTROPODA OF ROCKY SHORES

By E. P. HODGKIN and LOISETTE M. MARSH, with illustrations
by JENNIFER M. ARNOLD, Department of Zoology, University of
Western Australia.

INTRODUCTION

The gastropod molluscs are the most varied and abundant animals of our rocky shores and are moreover those which arouse the greatest general interest among naturalists. Much of this interest has attached to the larger and more conspicuous shells belonging to a few families such as the cowries and volutes, and these are relatively well known. On the other hand the common species, which form by far the greater part of the fauna, are little known. They are often inconspicuous and devoid of the brilliance of colouring and obvious beauty of form that is the fascination of the rarer forms. However, it is just because of their abundance and dominance in the fauna of the rocky shores that these species are of interest to the serious naturalist. Large areas may be populated by a single species of gastropod or by an association of two or three. A succession of species dominate the fauna at different levels in the intertidal belt, and while many are found only on apparently bare rocks others are confined to the weed beds which cover great areas of the reefs, others again will only be found under loose stones on the reef surface. Each has its own preferred habitat. Much of the interest and importance of littoral biology depends on the recognition of the habitats of individual species.

This key has been prepared in order to help naturalists to recognise the principal species that live on the reefs, and is limited to species found in the warm-temperature waters between Geraldton and Cape Leeuwin. Gastropoda are classified mainly on internal structures of the soft parts and no satisfactory general key for their identification can be prepared using the shells alone. However, since we have confined ourselves to the fauna of a particular environment, within a restricted geographical range, it has been possible to construct a workable key for the identification of the species included. Moreover, while this is not a reliable key to the families it will generally be found a satisfactory guide to the true relationships of local species which, although not included in the key, may occasionally turn up on the reefs.

The key is intended for use with living animals and obvious features of the soft parts are employed. Fresh shells can generally be identified if the diagrams are used with discretion. Users must be warned, however, that reliance on the diagrams alone, excellent as they are, will almost inevitably lead to wrong identifications. Two other limitations should be noted. Marine shells are often much eroded or overgrown with an encrustation of coralline algae and the diagnostic features obscured. In a few species the shells of the young animal may be very different in form from that of the mature animal. A more extreme example is that of the common cowrie (*Ravitrona caputserpentis*), the juvenile of which has a shell more like that of *Quibulla*. The key applies only to shells of mature animals. Approximate sizes are indicated by the measurements given; there is of course much variation.

Anyone who has worked with marine gastropods will be well aware of the confusion that exists in the nomenclature and classification of the group. We have done our best to ensure that the names used are "correct"; inevitably some will not be those familiar to collectors and clearly no finality can be claimed for the names or classification employed.

We hope that by making it easier to identify the common gastropods, the publication of this key will stimulate an interest in these animals. There are many biological problems relating to them that call for careful investigation; the limits of their geographical distribution are not well known, very little is known of their breeding either in regard to season or the existence or otherwise of pelagic larval stages, and although the normal habitats of most species are known their relationship to other organisms in those habitats is little understood.

Habitats

Rocky shore habitats may conveniently be classified under the first six headings listed below, to which are added "sandy bottom" and "pelagic" since certain animals characteristic of these habitats are frequently found on the reefs. The type of habitat in which the animals listed normally occur are indicated in the key by the appropriate abbreviation.

- Spl. Splash zone, above high water.
- Int. Intertidal rocks, above the reef flat.
- Alg. Among leafy algae on the reef flat.
- Ro. Bare rock or encrusting algae on the reef flat.
- Sub. Sublittoral, below low water.
- St. Under stones on the reef flat.
- Sd. Sandy bottoms.
- Pel. Pelagic.

GLOSSARY OF TECHNICAL TERMS

Anterior. The front end. The head of the animal emerges near the siphon canal, the spire is **posterior** (at the back end). In limpets the shell apex is usually nearer the anterior end.

Calcareous. Composed of lime.

Columella. Central axis of shell.

Ctenidium. True gill in mantle cavity.

Discoidal. Whorls lying in one plane.

Fusiform. Spindle-shaped, tapering to both ends.

Lamellae. Thin plates.

Mantle. Soft skin covering the internal organs. This secretes the shell and is produced into flaps which may be reflected over the shell. An inpushing of the mantle at the anterior end forms the mantle cavity.

Ovate. Egg-shaped.

Operculum. Plate closing the aperture.

Periostracum. Horny layer covering living shell in some species, e.g., *Mayena*.

Plait. Prominent spiral fold in the columella, as in Volutidae.

Porcellaneous. Like porcelain.

Protoconch. Embryonic spire persisting at apex of shell.

Reflected. Turned backwards.

Siphon. Tubular prolongation of mantle edge to bring water to mantle cavity.

Siphon canal. Groove or tube in shell aperture which accommodates the siphon.

Striae. Very fine lines.

Tetragonal. Four sided.

Tubercle. Small knob.

Turbinate. Top-shaped, e.g., *Senectus*.

Umbilicus. Hollow axis in base of certain shells.

Varix. Prominent ridge formed on outer lip; may be dissolved away before further growth or persist as in *Mayena*.

Whorl. One complete spiral. **Body whorl.** The last whorl with the aperture.

ILLUSTRATIONS

* Most of the species mentioned in the key which follows are figured in the plates accompanying the text. Those species illustrated are marked by capital letters in black type, the letters corresponding to the figures in the plate opposite.

ACKNOWLEDGMENTS

Many of the shells used in the preparation of this key were kindly identified for us by Mr. B. C. Cotton of the South Australian Museum. We are greatly indebted to Miss J. Hope Macpherson, of the National Museum of Victoria, for her help and advice in the preparation of the key. The responsibility for any errors is entirely ours. Acknowledgment is also made of a research grant from the University of Western Australia.

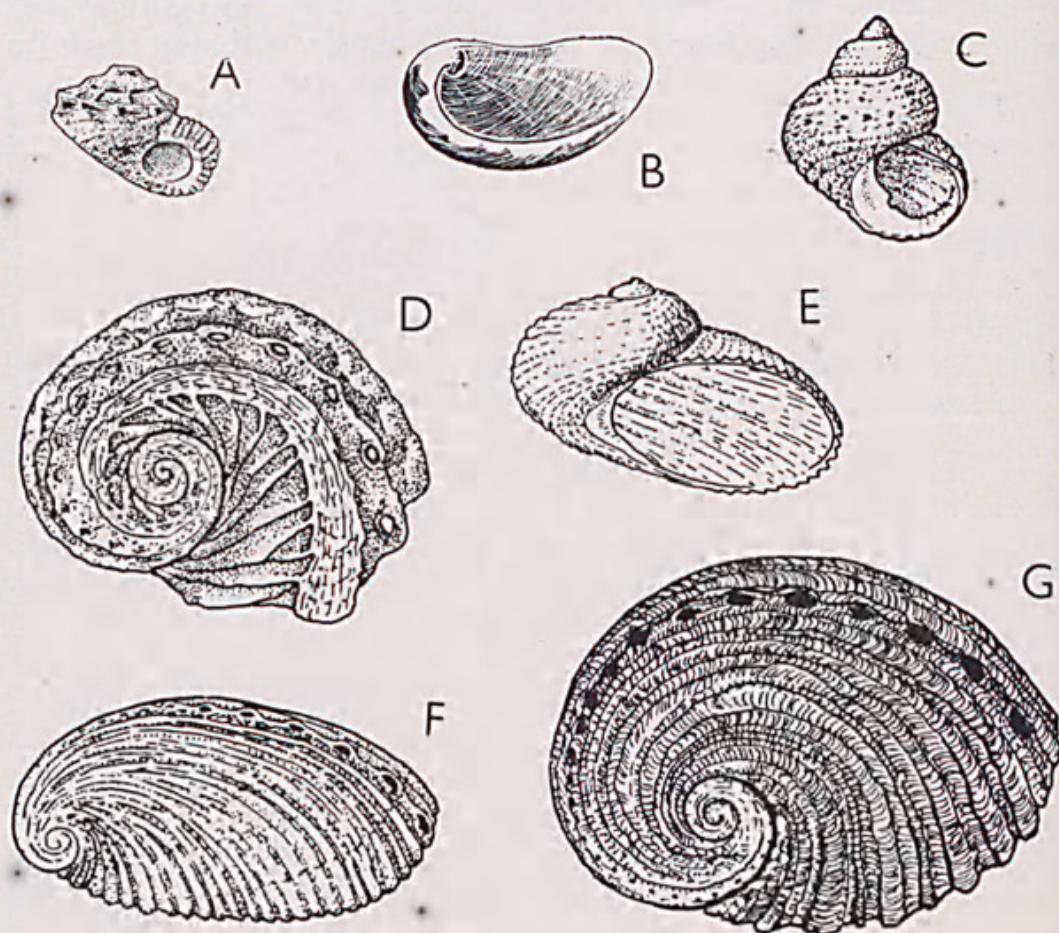
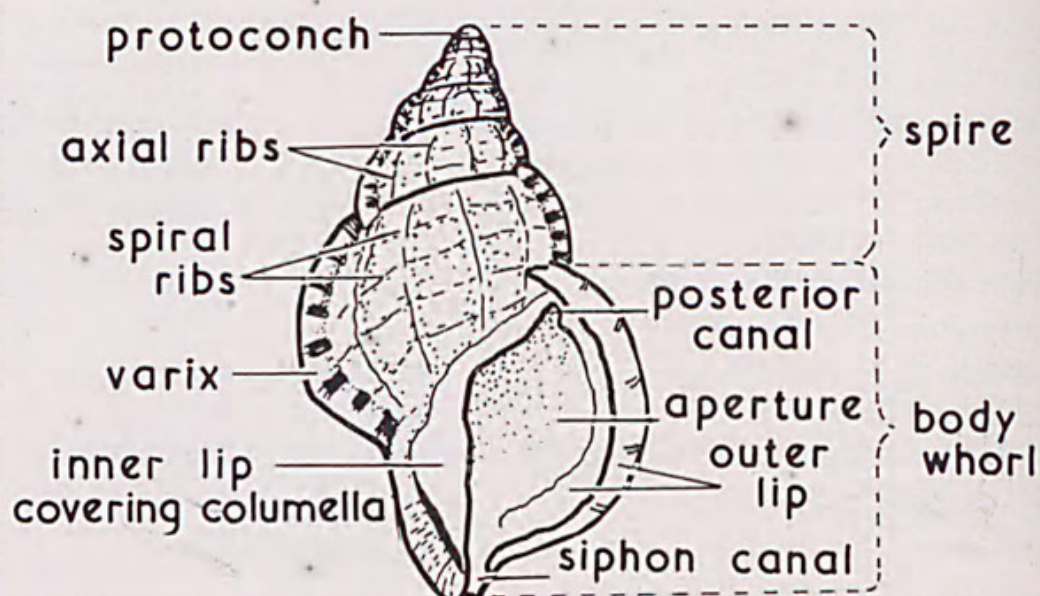
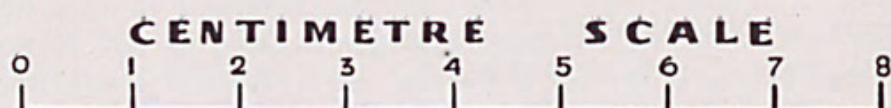


Plate 1

KEY

- Shell nacreous (pearly) internally Section I
- Shell not nacreous:
- Shell without a spire; may be conical, horn-shaped, or flattened; aperture covers whole of lower surface Section II
- Spire evident Section III
- Spire enclosed by body whorl (involute) Section IV

SECTION I

1. With an operculum 2
- Without an operculum 3
2. Operculum heavy, calcareous, with thin horny layer internally 3
- Fam. TURBINIDAE. See Section III, No. 5
- Operculum horny, circular, thin. Shell variable in shape; conical, subglobular or turbinate Fam. TROCHIDAE 5
- Operculum horny with a calcareous layer of pearly particles spirally arranged. Shell very small, turbinate or discoidal, light coloured Fam. LIOTIDAE
- Mundita botanica*. 0.5 cm. Sculpturing a fine network.
- Sub A
- Pseudoliota peronii*. 1 cm. Prominent ribs and tubercles.
3. Shell completely covers body when retracted 4
- Shell smooth, does not completely cover body. False ear shells Fam. STOMATIDAE
- Gena auricula*. 1.5 cm. Shell brownish, variable in colour.
- Sub B
4. Shell rounded, ridged, without holes ... Fam. STOMATELLIDAE
- Stomatella imbricata*. 3 cm. Spire depressed; shell sand-coloured. Sub. E
- Herpetopoma aspersa*. 1.5 cm. Spire elevated; shell sand-coloured with some brown or pink patterning. Sub. C
- Shell with small spire, body whorl large and depressed, a row of holes along left side. Ear shells Fam. HALIOTIDAE
- Haliotis roei*. 9 cm. Shell pink, animal green; ribbing coarse (often very eroded). Ro. G
- H. scalaris*. 8 cm. Shell pink, with prominent spiral ridges and radiating lamellae. Sub. St. D
- H. elegans*. 7 cm. Shell mottled orange; ribbing moderately fine. Sub. F
- H. squamata*. 7 cm. Shell brown with irregular pale radiating bands; ribbing finer than in *H. elegans*. Sub.
- H. viridrata*. 15 cm. Shell pink with darker mottling; ribbing very fine. Sub.

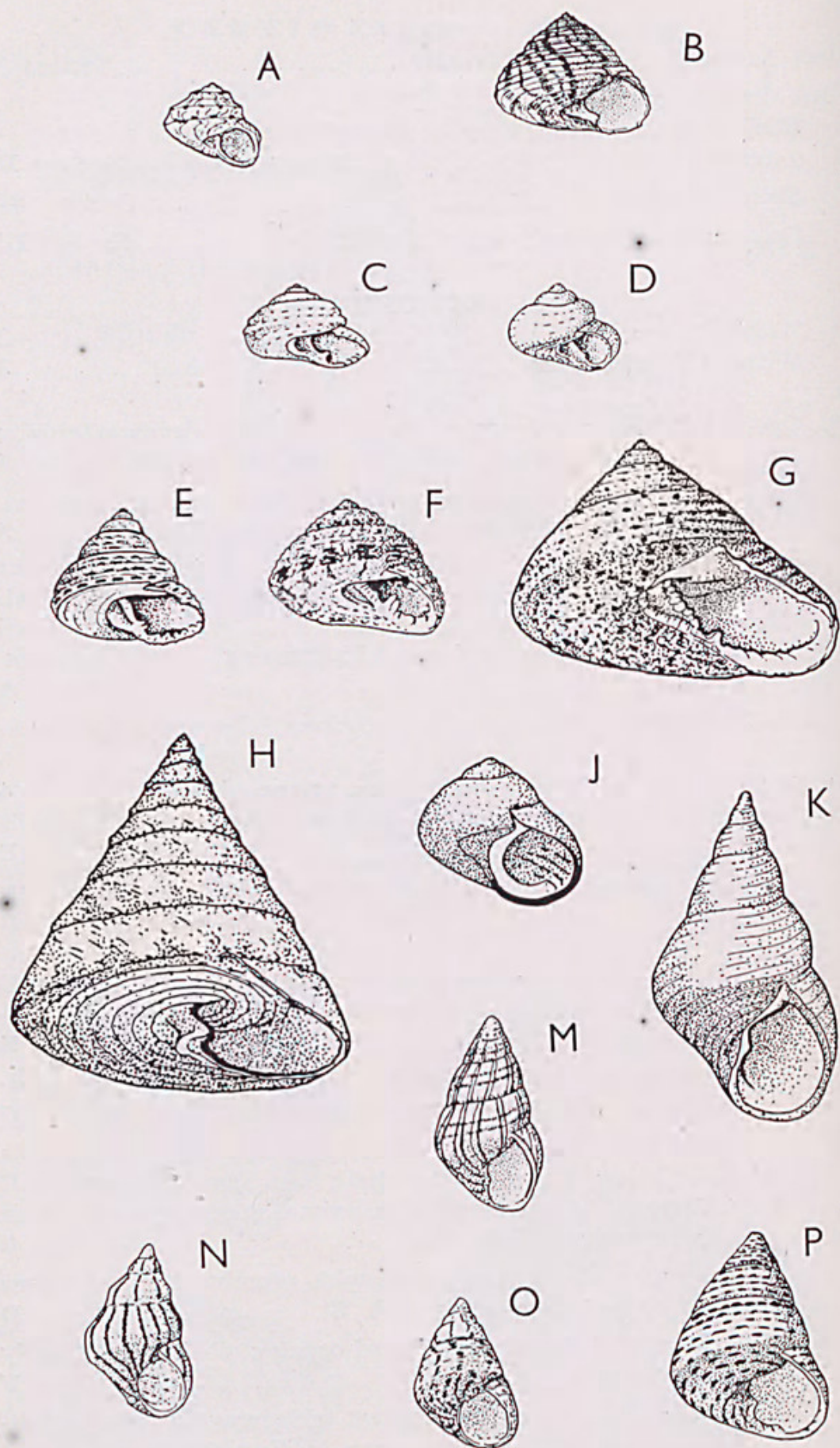


Plate 2

Fam. TROCHIDAE

5. With umbilicus 6
 Without umbilicus 7

6. Aperture smooth:
 - Gibbula preissiana*. 1 cm. Shell with two spiral ribs to each whorl; fine brown lines and spots. Alg. **A**
 - G. lehmani*. 1 cm. Whorls more rounded; base patterned in red, spire in black and red. Alg.
 - Tallopia callifera*. 1.5 cm. Many spiral ribs; irregular radiating brown lines **B**
- Aperture toothed:
 - Clanculus consobrinus*. 1 cm. Shell with fine spiral ribs and tubercles; reddish-brown with dark flecks **C**
 - C. denticulatus*. 1 cm. Similar to above, but without dark flecks **D**
 - C. personatus*. 1.5 cm. Ribs and tubercles coarse, base of shell somewhat flattened; inner lip with prominent double tooth. Pinkish-brown mottling on white **F**
 - C. limbatus*. 2 cm. Tubercles finer, base of shell with an angular margin; prominent double tooth. Fawn coloured with darker blotches **E**
 - C. occidius*. 3 cm. Tubercles fine; inner lip with prominent single tooth. Pale brown with reddish flecks **G**

7. Shell heavy, angular, with broad flat base:
 - Tectus obeliscus*. 5 cm. Alg. Sub. **H**
- Shell heavy, whorls rounded, margin of aperture black:
 - Austrocochlea rudis*. 2.5 cm. Int. **J**
- Shell without broad flat base or black margin to aperture 8

8. Shell smooth:
 - Phasianotrochus eximius*. 3 cm. Shell brown **K**
 - P. irisodontes*. 1.5 cm. Shell brownish with axial lines. (On sea grass) **M**
- Shell sculptured, rough:
 - Prothallotia pulcherrima*. 1.5 cm. Shell reddish with green nacre. Alg. **O**
 - P. lehmani*. 1.5 cm. Shell with pattern of vertical lines. Alg. **N**
 - Thalotia conica*. 2 cm. Shell with rectangular reddish flecks, aperture toothed. Alg. **P**
 - Calliostoma interruptum*. 1.5 cm. Shell grey-green with darker flecks; base more flattened than preceding three species. (On sea grass.)

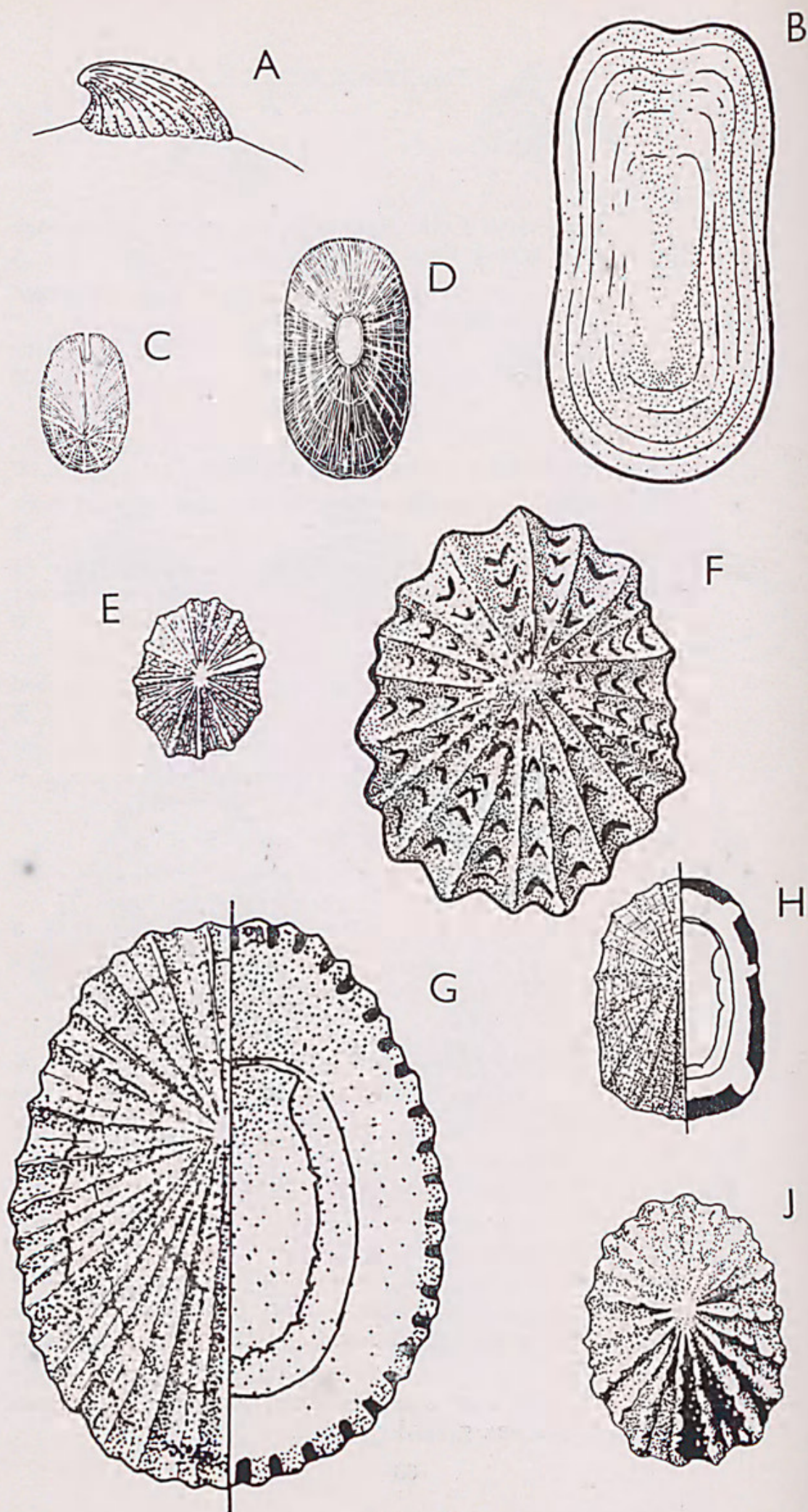


Plate 3

SECTION II

1. Shell imperforate, conical, encloses animal. Limpets 2
 Shell horn-shaped, encloses animal; protoconch spiral (in juveniles). Habitat—on shells of other gastropods
Fam. HIPPONICIDAE

Sabia conica. 2 cm. Shell fawn; ribbed **A**

Antisabia erma. 1 cm. Shell white; with circular ridges like overlapping plates.

Shell does not enclose animal; has a central hole, an anterior slit, or an indentation for the anus. Bilaterally symmetrical

Fam. FISSURELLIDAE

Scutus anatinus. 10 cm. Shell imperforate, a slight indentation only. Shell white, animal black, mantle reflected over shell. Elephant shell. St. **B**

Entomella candida. 1 cm. Shell with an anterior slit; with five radiating ribs, cross lines form a lacework pattern. St. **C**

Sophismalepas nigrata. 2 cm. Shell with a central oval perforation. Fawn to pink; fine radiating striae and circular growth lines. Marginal processes of mantle overlap edge of shell. St. **D**

2. No siphon, ridging regular. True limpets 3
 Siphon present; siphonal canal shows as a double ridge on anterior right side of shell. Pulmonate limpets.

Siphonaria luzonica. 1.5 cm. Shell with coarse ridges. Black flecks round edge of foot. Int. **E**

S. baconi. 1.5 cm. Ridges fine. No black flecks. Int.

3. Single ctenidium on left side (in mantle cavity). Shell is never iridescent within. Fam. ACMAEIDAE

Patelloida alticostata. 3 cm. Strong ridges, black flecks between ridges. Int. **F**

P. nigrosulcata. 3 cm. On shells.

Notoacmea onychitis. 2 cm. Fine ridges, shell margin often black inside. Int. **H**

No true ctenidium, secondary gills attached to body between mantle and foot. Shell may be iridescent within

Fam. PATELLIDAE

Patellanax laticostata. 10 cm. Many simple ridges. Int. Ro. **G**

P. peroni. 2.5 cm. Ridging coarse, tuberculate, or black and white striped. Int. Ro. **J**

SECTION III

1. No siphon canal or posterior canal 2
 Siphon canal and/or posterior canal present 11
2. Operculum present 3
 Operculum absent 10
3. Operculum calcareous 4
 Operculum horny 6

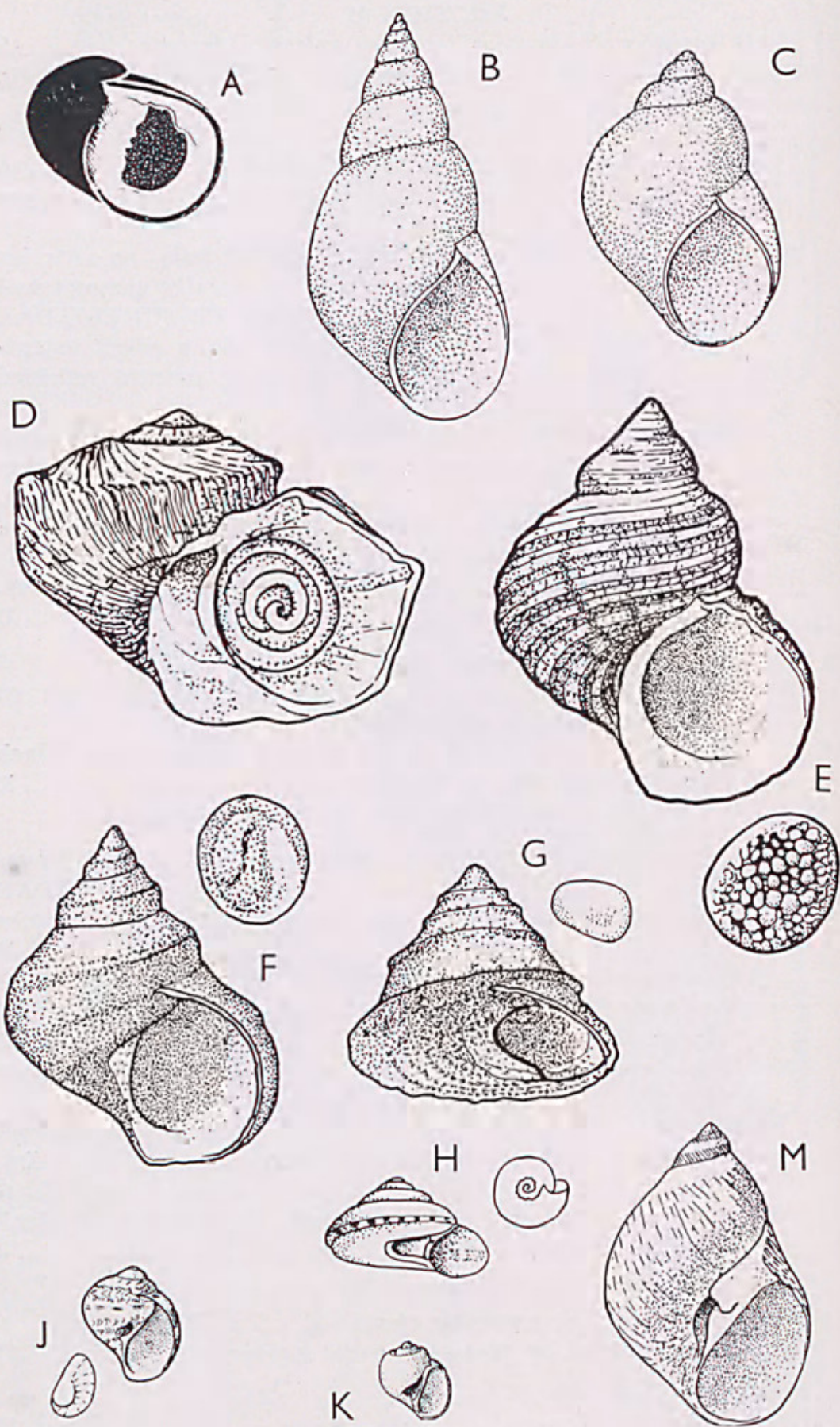


Plate 4

4. Spire well developed; shell turbate or pyramidal in shape 5
 Spire very small, shell sub-globular in shape; shell porcellanous internally, generally thick; aperture semicircular. Operculum forms a false hinge with inner lip Fam. NERITIDAE
Melanerita melanotragus. 3 cm. Shell and operculum black, fairly smooth. Int. A
5. Shell fairly thin, polished, variably coloured and patterned. Operculum oval Fam. EUTROPIIDAE
Phasianella australis. 6 cm. Spire fairly long; shell patterned in pink, red, brown, yellow and purple. Sd. B
P. ventricosa. 4 cm. Similar to *P. australis* but spire shorter. Sd. C
 Shell solid, smooth or rough, not polished; aperture circular, oval or sub-tetragonal. Operculum heavy, calcareous with thin horny layer internally Fam. TURBINIDAE
Ninella whitleyi. 7 cm. Shell sand coloured with green mottling in young shells. Operculum with spiral ridges. Alg. D
Senectus intercostalis. 7 cm. Shell fawn with darker mottling, sculptured with revolving ridges. Operculum tuberculate. Alg. E
Dinassovica jourdani. 15 cm. Juvenile: shell orange to reddish brown, slightly ribbed. Adult: shell rich brown, smooth. Operculum white, porcellanous. Alg. Sub. F
Bellastrea kesteveni. 3 cm. Spire low; base of shell flat, margin of last whorl produced into thin shelf-like projection. Operculum porcellanous, white. Shell sand coloured to white. Ro. Sub.
Bellastrea sp. indet. 4 cm. Spire high; base of shell flat. Operculum porcellanous, blue or white, shell sand coloured. Sub. G
6. Shell irregularly coiled Fam. VERMETIDAE
 Shell coiled normally 7
7. Shell with an umbilicus 8
 Shell without an umbilicus 9
8. Umbilicus wide and deep with corrugated margins. Shell turbate, with a flattened spire, or discoidal Fam. SOLARIIDAE
Philippia lutea. 1.5 cm. Shell brown, fairly smooth H
 Inner lip reflected over umbilicus. Shell with short spire, turbate, sub-globular; smooth. Aperture entire, outer lip sharp Fam. NATICIDAE
Notocochlis sagittata. 1 cm. Shell white, nearly covered with fine brown pattern. St. Sd. J
Uber conicum. 3 cm. Shell pale brown, paler spiral line. Sd. M
Friginatica beddomei. 1 cm. Shell white; a marked groove round top of whorls. Sd. K

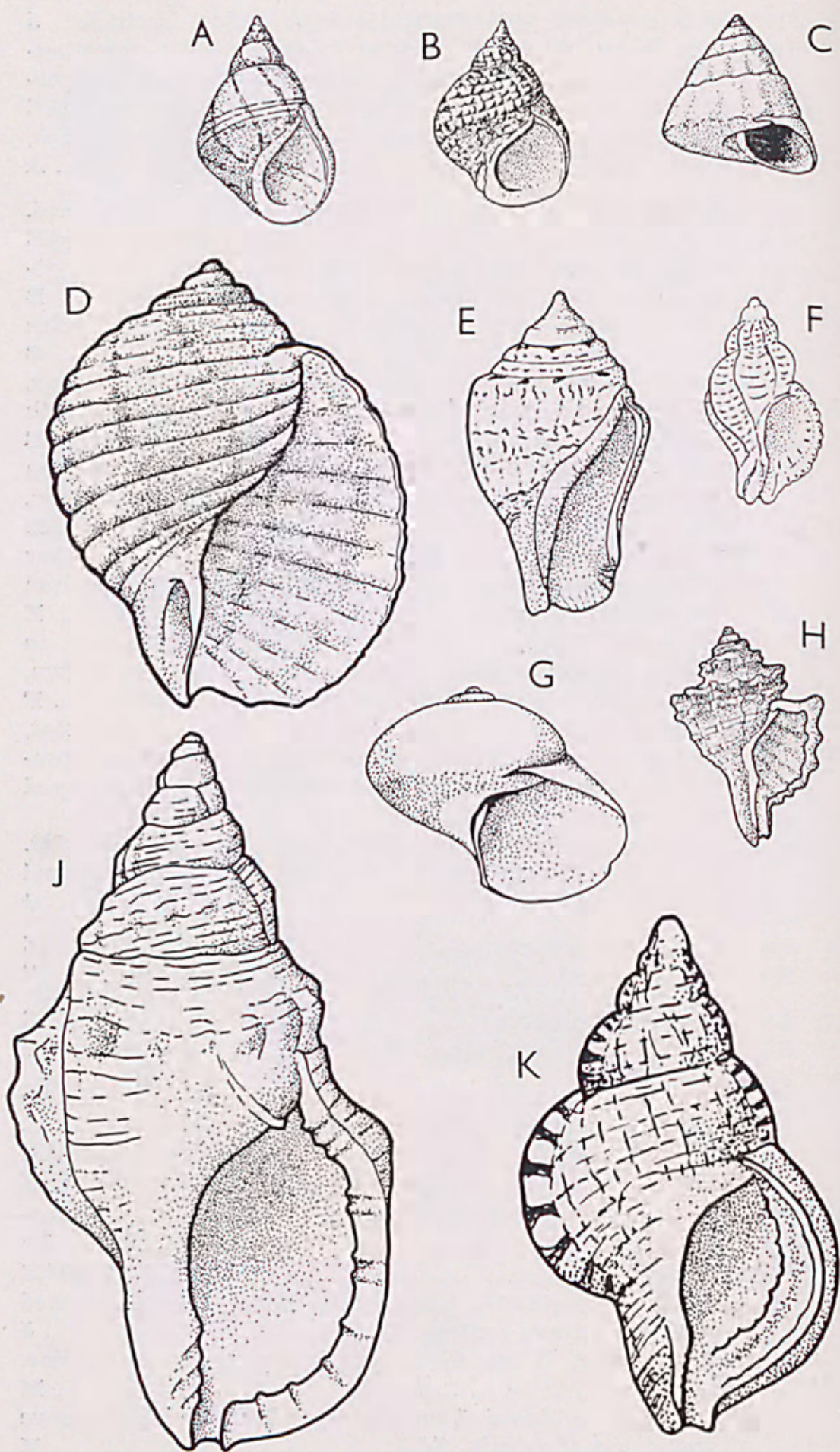


Plate 5

9. Shell minute, thin, smooth, folded or spirally striate Fam. LITIOPIDAE

Diala varia. 0.5 cm. Shell black. Alg.

Shell of small to moderate size, turbinate or pyramidal; aperture rounded. Periwinkles Fam. LITTORINIDAE

Melaraphe unifasciata. 2 cm. Shell light grey-blue, smooth.

Spl. A

Tectarius rugosus. 2 cm. Shell fawn to bluish. Has revolving lines and may or may not have radiating folds or small tubercles. Spl. B

Bembicium aurantium. 2 cm. Shell with base flattened; axial ridges or tubercles C

(*Austrocochlea rudis* (Trochidae) see Section I, No. 7.)

10. Shell large, ovate or sub-globose. Spire short, body whorl very large with revolving ribs. Tun shells Fam. TONNIDAE

Tonna variegata. 7 cm. Shell yellow and brown with spiral ribs all equal. Sub. D

Shell turbinate, thin, whitish or purplish. Columella slightly twisted. Foot secretes a float of bubbles. Pelagic violet snails

..... Fam. JANTHINIDAE

Janthina globosa. 3 cm. Height and width of shell nearly equal. Pel.

Janthina violacea. 3 cm. Shell flatter than *J. globosa*.

Width is $1\frac{1}{2}$ times height. Pel. G

11. Operculum claw-shaped, usually with a serrated edge. Aperture narrow; outer lip expanded, with a notch anteriorly. Shell variable in shape, ovate, turreted or fusiform Fam. STROMBIDAE

Strombus floridus. 3 cm. Shell patterned in alternate bands of light brown and speckled brown on a white ground; aperture pink inside. Alg. Ro. E

Operculum otherwise, if present 12

12. Shell with varices and thickened or reflected outer lip 13

Shell without varices 14

13. Siphon canal usually long, often closed to form a tube. Shell often ornamented with ribs and spines. Shape fusiform with a moderately long spire. (The species listed here is somewhat atypical of the family) Fam. MURICIDAE

Murexsul fimbriatus. 1.5 cm. Shell greyish. Sculpturing of many varices and fine but prominent spiral ribs. Outer lip curved F

Siphon canal of variable length, not closed. Aperture oval, outer lip thickened exteriorly, toothed inside. Periostracum persistent, thick Fam. CYMATHIDAE

Charonia rubicunda. 13 cm. Shell patterned with dark brown and white; varices irregular J

Mayena australasia. 8 cm. Shell brown, covered with a

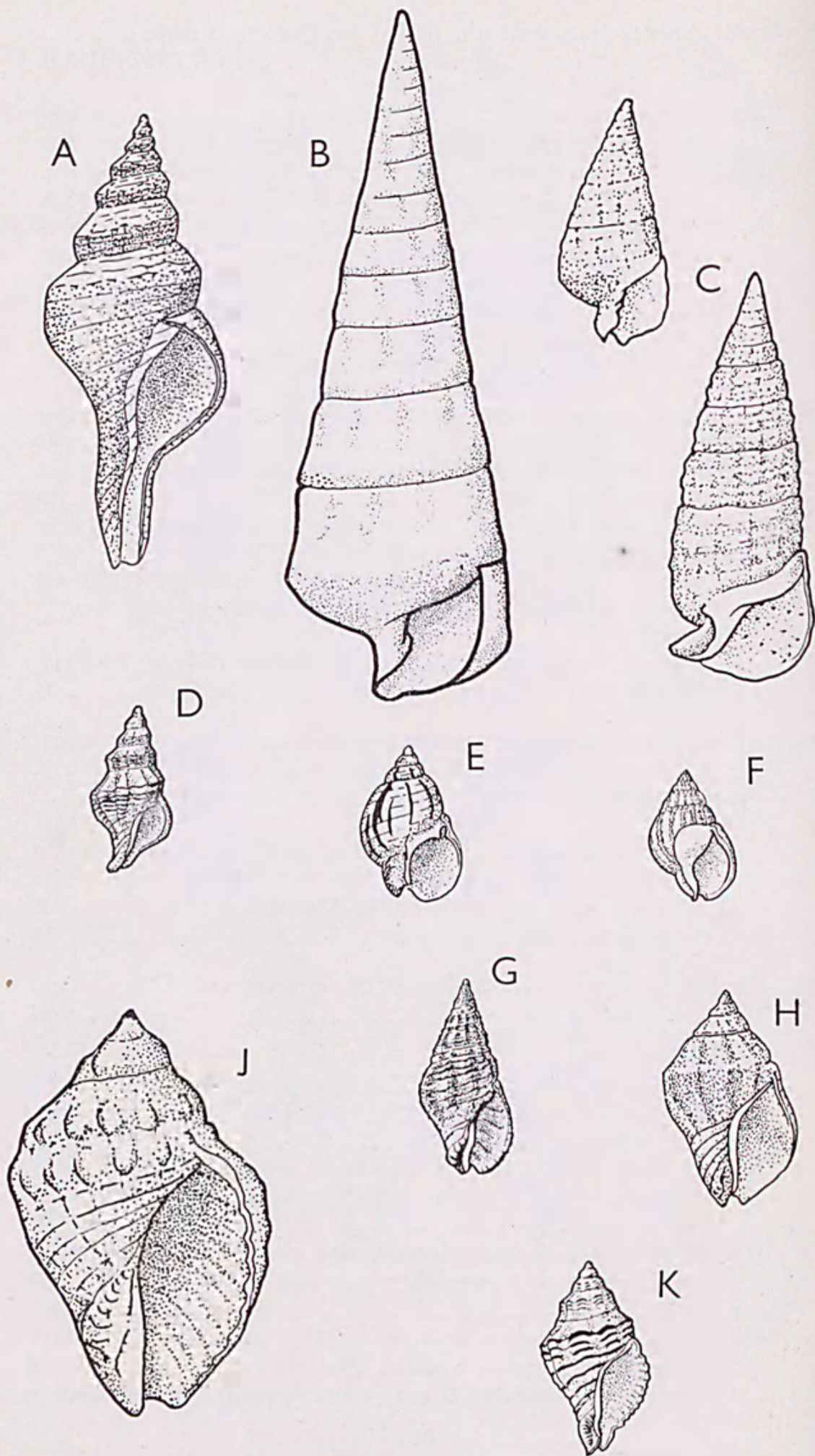


Plate 6

furry periostracum (when fresh); varices 2 to a whorl.
Alg. **K** (on Pl. 5)

Cabestanimorpha tabulata. 2.5 cm. Shell with prominent spiral ridges and tubercles; spire angular (varices not present in juveniles) **H** (on Pl. 5)

14. Aperture (apart from siphon canal) rounded, not much longer than wide. Columella without plaits 15
Aperture elongate, length 2 or more times width 18
15. Siphon canal short 16
Siphon canal long, as long as aperture or longer.

Fam. COLIDAE

Propefusus profundior. 6 cm. Shell brown, covered with furry periostracum. Ro. **A**

Microcolus lincolnensis. 1.5 cm. Axial ribs prominent, whorls angular. Shell pale with indistinct spiral brown line **D**

Fam. TURBINELLIDAE

Megalatractus aruanus. Shell very large, 25 cm. Sub.

16. Spire more than twice height of body whorl; many whorls **Fam. CERITHIIDAE**

Campanile symbolicum. 12 cm. Spire has about 16 whorls. Shell white, fairly smooth. Alg. Sub. **B**

Vertagus asper. 4 cm. Spire has about 12 whorls. Shell cream coloured, sculptured with revolving lines of tubercles. Ro. **C**

Spire less than twice height of body whorl 17

17. Whorls and aperture rounded **Fam. NASSARIIDAE**

Nassarius rufula. 2 cm. Shell smooth, fawn or brown, with a pattern of brown bands or lines. Alg. Sd. **E**

Parcanassa pauperata. 1.5 cm. Shell with axial ribs, brown, unicolorous. Sd. **F**

Whorls angular, aperture more elongate.

Fam. BUCCINIDAE

Josepha tasmanica. 2 cm. Spire high, about equal to body whorl, angle about 40°. Sculpturing of axial ribs and fine spiral lines. Shell mottled brown. Sd. **G**

Cominella sp. 2-3 cm. Spire only about 2/3 length of body whorl, angle 60° to 80°. Shell brown, with white or orange lines. Alg. **H**

Fam. THAIDIDAE

Dicathais aegrota. 6 cm. Shell cream coloured, aperture darker. Shell marked with spiral lines and ribs, with or without tubercles. Int. Alg. Ro. **J**

Lepsiella vinosa. 1.5 cm. Shell dark brown, with thick and thin lines and axial ribs. Alg. Ro. **K**

L. flindersi. 2 cm. Shell pale, fine axial striations prominent, outer lip heavier. Alg. Ro.

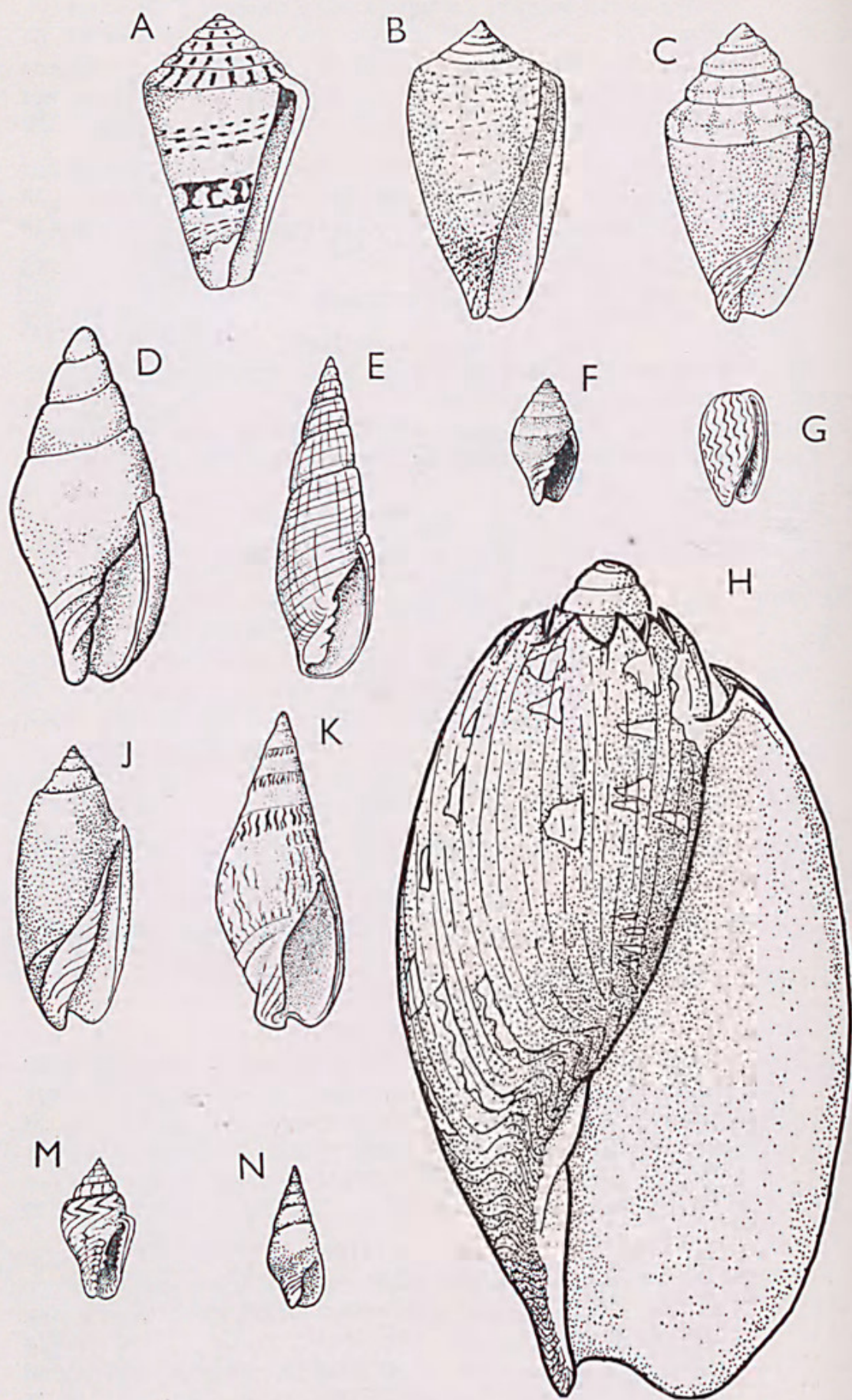


Plate 7

18. Columella with prominent folds or teeth, if without them spire is high 19
 Columella smooth, without plaits or teeth, aperture elongate, spire low (half or less length of aperture). Shell covered with a smooth periostracum Fam. CONIDAE
Rhizoconus klemæ. 5 cm. Angle of spire about 90°. Shell pinky-brown, often with three coarsely-mottled bands on body whorl. Sub. A
Floraconus novaehollandiæ. 4 cm. Spire flatter than *R. klemæ*, about 130°. Shell creamy-grey with darker mottling. *F. anemone* is similar but has orange coloration. Alg. Ro. B
Parviconus rutilus. 1 cm. Spire low, as in *Floraconus*. Shell pink to brown, with interrupted narrow dark bands.
Dyraspis doreensis. 4 cm. Spire angle about 80°. Shell fawn or brown with narrow dark band at top of whorl (often lost). Shell heavy. Alg. Ro. C
19. Spire shorter than body whorl or if longer then columella lacks prominent folds 20
 Spire equal to or longer than body whorl, columella with prominent folds Fam. MITRIDAE
Mitra rosettae. 3 cm. Shell brown smooth. Alg. D
Proximitra pica. 1 cm. Shell black and white with fine dark pattern on white parts. Alg. F
Mitra glabra. 5 cm. Brown with fine darker revolving lines E
20. Aperture full height of shell, spire inconspicuous
 Fam. MARGINELLIDAE
Marginella pulchella. 0.7 cm. Shell cream with fine brown pattern G
 Aperture not as above, spire evident 21
21. Columella twisted with 3-5 plaits. Large body whorl with a simple outer lip. Spire short Fam. VOLUTIDAE
Melo miltonis. 10+ cm. Body whorl with spikes from upper edge; brown with triangular white flecks. Upper spire smooth, rounded. Sd. H
 Columella wrinkled, not plaited. Spire short or of moderate length. Shell polished, porcellanous Fam. OLIVIDAE
Oliva australis. 3 cm. Shell cream to white with brown speckling. Aperture about $\frac{3}{4}$ length of shell. Sd. J
Baryspira marginata. 3 cm. Similar to *O. australis*, but aperture about half length of shell. Sd. K
 Columella has teeth or ribs, not plaits. Spiral lines around base of shell Fam. PYRENIDAE
Euplica bidentata. 1.5 cm. Aperture long and narrow, both lips toothed. Shell fawn with brown zig-zag patterns. Alg. M
Pyrene spp. 1.5 cm. Spire high, smooth. Shell mauve to brown, may be patterned. Columella teeth not evident. Alg. N

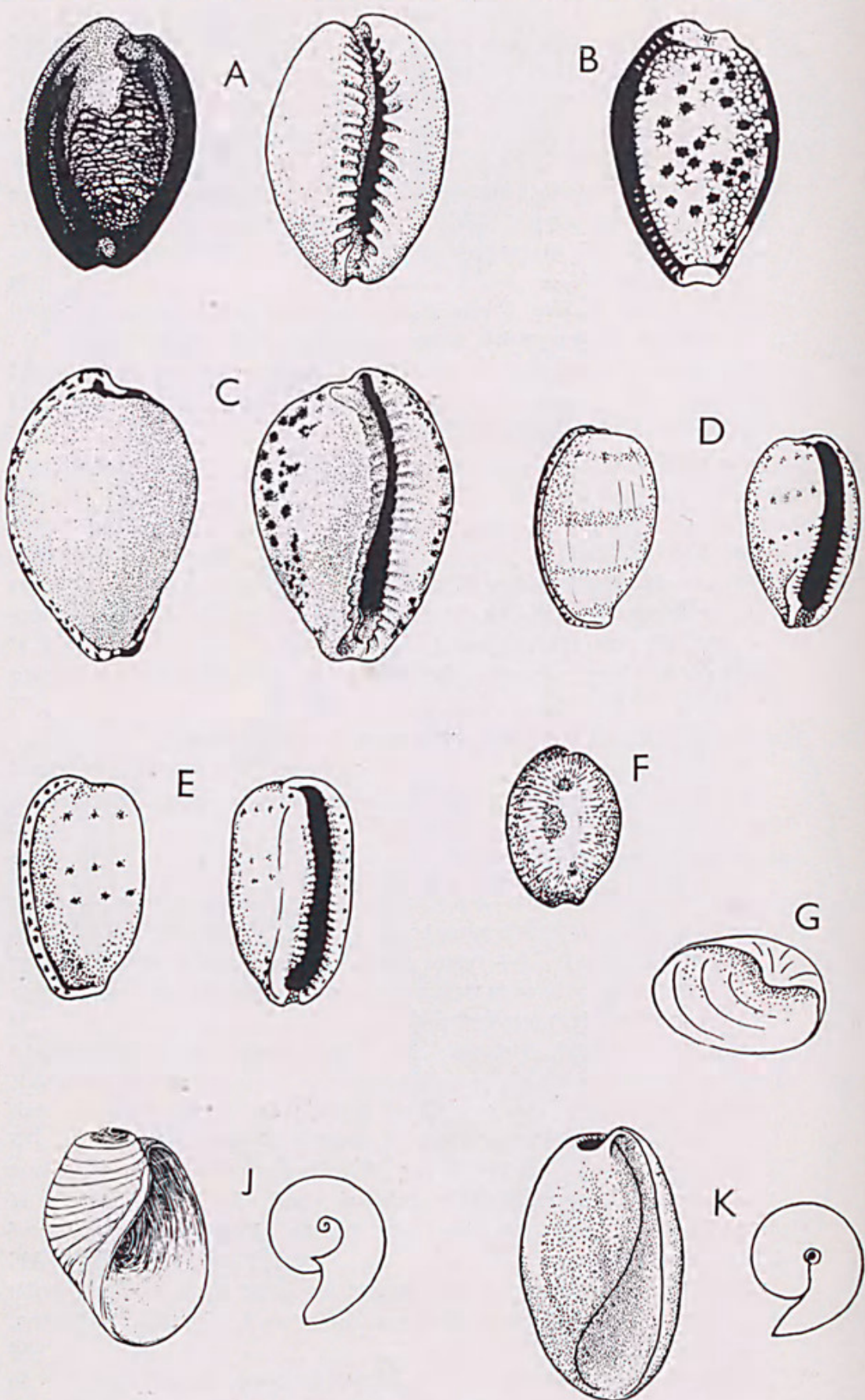


Plate 8

SECTION IV

1. Shell completely involute, spire sunken 3
 Shell not completely involute, spire visible 2

2. Shell encloses animal. Shell thick; columella with folds at anterior end Fam. MARGINELLIDAE
 See Section III, No. 20
 Shell does not enclose animal. Shell very thin; columella without folds Fam. HYDATINIDAE
 Hydatina physis. 3 cm. Shell white with spiral brown lines. Alg. J

3. Aperture to one side, without teeth; shell thin 4
 Aperture an elongate ventral toothed slit. Shell porcellanous, polished. Mantle encloses shell when extended. Cowries
 Fam. CYPRAEIDAE
 Ravitrana caputserpentis. 3.5 cm. Shell dark brown, top of shell dotted with white. Alg. Ro. A
 R. helvola. 3 cm. Shell pale brown with mauve tint at ends. Alg. Ro. B
 Notocyprea piperita. 2.5 cm. Fawn with brown spots. Shell rounded D
 N. pulicaria. 2 cm. Fawn to white with faint brown spots. Shell more parallel sided than *N. piperita* E
 N. angustata. 3 cm. Upper surface uniformly brown, margins white with brown spots C
 Ellatrivia merces. 1 cm. White with spots of deep pink. Shell sculptured with fine cross lines F

4. Aperture width about $\frac{1}{2}$ width of shell. Shell brownish
 Fam. BULLIDAE
 Quibulla tenuissima. 2.5 cm. Shell mottled light and dark brown, smooth, polished, thin. Animal light brown. Alg. Sd. K
 Q. botanica. 4 cm. Shell larger and heavier. Animal orange. Sd. (Estuarine).
 Aperture width about $\frac{3}{4}$ width of shell Fam. PHILINIDAE
 Philine angasi. 2 cm. Shell white, translucent. Mantle partially encloses shell. Sd. G

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THE FIRST PROJAPYGIDAE FROM WESTERN AUSTRALIA, WITH SOME ADDITIONAL NOTES ON THE FAMILY AND ITS ALLIES

By G. F. BORNEMISSZA,* Department of Zoology, University of Western Australia.

During my survey of the soil fauna of the Kimberley Division in February, 1954, one specimen of the family Projapygidae was extracted from a soil sample collected on the bank of the Ord River opposite Ivanhoe Station. This specimen, identified as *Symphylurinus* sp. nov., constitutes the first record of the family from Western Australia and the second record from Australia.

The Projapygidae have a world-wide distribution; the genus *Symphylurinus* is known from China, India, West Africa and Brazil. The first representative (*Symphylurinus swani* Wom.) of this family from Australia was collected as recently as 1945 by Mr. D. C. Swan at Atherton, north Queensland (Womersley, 1945).

The family, established by Cook in 1896, was founded on specimens (*Projapyx stylifer* Cook) collected from humus in a tropical rain forest in Liberia. The phylogenetic significance of the family, with its suggestive similarities to the Symphyla as well as to the Campodeidae and the Japygidae, was quickly realised, particularly by Silvestri (1901). Verhoeff (1903) questioned the validity of the new family, considering the described species to be no more than juvenile forms of certain japygids. By examining several specimens Silvestri (1905) produced ample evidence to justify its retention. The Projapygidae is now accepted by all entomologists.

At the beginning of the century the Projapygidae was placed in the order Thysanura, together with the silver fish (family Lepis-

* Present address: C.S.I.R.O., Division of Entomology, Canberra, A.C.T.



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