Marine Decapod Crustacea of Southern Australia

A Guide to Identification

With chapter on Stomatopoda by Shane Ahyong

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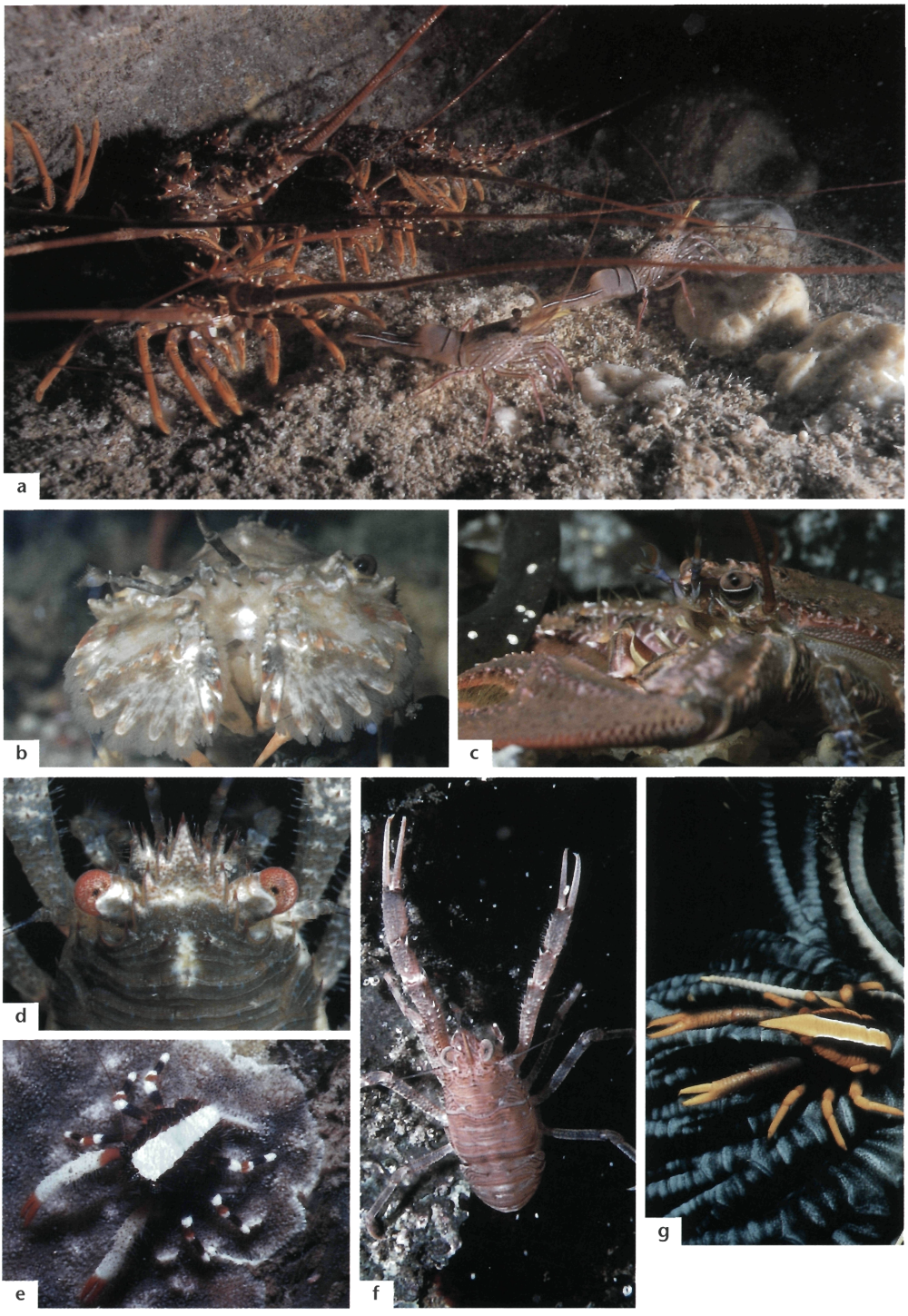

Plate 13. **Palinura Palinuridae**. a, *Jasus edwardsii novaehollandiae* (in typical reef shelter with *Rhynchocinetes australis*). **Scyllaridae**. b, *Crenarctus crenatus*. **Anomura Galatheidae**. c, *Munida gregaria*. d, *Galathea australiensis*. e, *Galathea magnifica*. f, *Munida gregaria*. g, *Allogalathea elegans*.

10. ANOMURA – HERMIT CRABS, PORCELAIN CRABS AND SQUAT LOBSTERS

The Anomura McLeay, 1838 are a group of decapods which on first appearance seem to have little in common; some look like crabs, others are hermit crabs, others resemble small lobsters, and others not easily placed in one or other of these well-known crustacean types. The only easy character uniting them is the small fifth thoracic leg. To further complicate the issue, animals of any one of these forms cannot easily be placed in one or other of the three superfamilies into which the infraorder is classified. Crab-like forms occur in the Paguroidea, Galatheoidea and Hippoidea. None of the anomuran lobster-like crustaceans have strong abdomens like lobsters but some galatheoids are often called squat lobsters. And shell-carrying hermit crabs, easily recognisable as such, belong in four families. Two boxes are useful for the anomuran groups. One is for six-legged crabs and the other, a quick key to hermits. The key to superfamilies should be used to be sure of an identification.

New evidence based on molecular evidence goes some way to explaining the uncertainty surrounding the relationships of the established anomuran families and superfamilies. Pérez-Losada et al. (2002) reviewed the views based on morphology dating from the middle of the nineteenth century and provided a new interpretation based on 18S ribosomal DNA. They confirmed the accepted composition of Galatheoidea (Porcellanidae, Chirostylidae, Galatheidae and Aeglidae) and differed only in the relative position of the families from earlier studies (Martin & Abele, 1986; Tudge, 1997). Pérez-Losada et al. (2002) found that Galatheoidea and Paguroidea more related to each other than to Hippoidea, a view not shared by Morrison et al. (2002) who placed Hippoidea closest to Paguroidea. Clearly, more work will be completed before there is general agreement on higher relationships.

It has long been recognised that the larvae of the crab-like lithodids resemble those of the pagurid hermit crabs. Cunningham et al.'s (1992) cladogram based on DNA sequences from the gene encoding mitochondrial large-unit ribosomal RNA placed two genera of Lithodidae within the genus *Pagurus*, a finding which at least reinforces the polyphyly of this large genus and of the Paguridae. It seems certain that carcinisation, return to a crab-like habitus, has evolved several times in the Anomura. This phenomenon was discussed in detail by McLaughlin & Lemaitre (1997) and McLaughlin et al. (2004) but they disagreed with Cunningham et al.'s conclusions.

The name of this group has been debated and sometimes termed Anomala and has variously included several groups of anomalous decapods. McLaughlin & Holthuis (1985) agreed on the widely used name Anomura which is now confined to the three superfamilies, Paguroidea for hermit crabs, Galatheoidea and Hippoidea. They fixed on the authorship and date of the name. From time to time other superfamilies have been included or the families differently arranged. Thalassinoidea, once thought to be anomuran, are here placed in a separate suborder Thalassinidea. The classification used here is based on McLaughlin's (1983a) phylogenetic reappraisal supported by Martin & Abele's (1986) analysis. It was followed by Martin & Davis (2001) and McLaughlin (2003) but not by Davie (2002) who recognised two superfamilies for hermit crabs, Paguroidea (including Lithodidae) and Coenobitoidea (including Lomisidae). His classification was supported by Forest (1987 citing unpublished work by M. de Saint Laurent) and McLaughlin & Lemaitre (2001) who all relied on undocumented evidence from the skeleton.

The enigmatic monotypic family Lomisidae has often been treated as a superfamily (McLaughlin, 1983b; Martin & Davis, 2001) but is almost certainly a highly derived hermit crab, possibly related to Lithodidae on the basis of larval morphology. Its place in the key to superfamilies is quite artificial. Given the present-day confusion, the superfamily Coenobitoidea is not recognised here; its members are placed with the Paguroidea.

The key and diagnoses of the superfamilies were derived using characters from McLaughlin (1983a, 1983b, 2003). Davie (2002) has given more extended diagnoses of all the families.

Diagnosis. Epistome protected by sides of carapace. Pereopod 5 reduced and its somite (thoracic somite 8) loosely connected to the preceding one. Uropodal exopod without suture. Innervation of abdominal somite 1 from ganglion attached to thoracic ganglionic mass.

Key to superfamilies of Anomura (and *Lomis*)

1. Abdomen asymmetrical (symmetrical in most Pylochelidae); pereopod 4 reduced, smaller than 2 and 3 (except in Lithodidae); ocular scales present (reduced in Lithodidae) ..... Paguroidea ... p. 250
— Abdomen symmetrical; pereopod 4 ambulatory, like 2 and 3; ocular scales absent 2
2. Uropods absent (or invisible in natural view and pleopod-like only in female) ..... *Lomis hirta* ... p. 240
— Uropods present as part of tail-fan and visible in natural position 3
3. Pereopods 1 elongate chelipeds; pereopods 2–4 with claw-like dactyli; telson and uropods forming tail-fan ..... Galatheoidea ... p. 219
— Pereopods 1 short, chelate or subchelate; pereopods 2–4 with flattened dactyli; telson longer than wide, not forming tail-fan with uropods ..... Hippoidea ... p. 247

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QUICK KEY TO HERMITS

Hermit crabs (Paguroidea) are not the only crustaceans which use shells as homes. Some tanaidaceans do too and look like hermits crabs until they are removed from the shell. Of course, tanaidaceans are tiny, in shells never more than about 5 mm long. They are not decapods so are not covered in this book. Some amphipods carry fragments of bivalve shells as temporary homes and others live commensally in the deeper cavities of gastropods with hermit crabs. Some crabs carry bivalves. A first step is to check that your animal is a hermit crab and then to determine which of the two common families it belongs to. Deep-water species, those from depths greater than 200 m, may belong to other families not in these keys.

1. Thorax segmented dorsally, without carapace; with chelipeds plus 6 pairs of walking legs ..... .not a hermit crab – Tanaidacea: Pagurapseudidae

— Thorax covered dorsally by carapace shield; with chelipeds, 3 pairs of walking legs, fifth legs reduced ..... Paguroidea ... 2

2. Chelipeds of distinctly different size, right always the larger; maxillipeds 3 widely spaced at base ..... Paguridae

— Chelipeds equal or subequal in size, or left distinctly larger; maxillipeds adjacent at base ..... .Diogenidae

PAGURIDAE (RIGHT-HANDED HERMIT CRABS)

Large (5 cm overall) right-handed hermit crabs from shallow water usually belong to the genus *Pagurus* but it appears that most species in southern Australia are undescribed. Small right-handed hermit crabs are more tricky and a microscope is needed.

1. Ocular scale multispinose and with a pair of small lobes between ..... *Micropagurus acantholepis*

— Ocular scale simple, without lobes between 2

2. Small left chela with dorsal ridge; subtidal; south-east only ..... *Lophopagurus nanus*

— Small left chela smoothly rounded dorsally; some species common intertidally ..... *Pagurixus* (several species, some geographically restricted)

DIOGENIDAE (LEFT- OR EQUAL-HANDED HERMIT CRABS)

The technical key can be difficult without a microscope and some knowledge of hermit crab anatomy. Here is a rough key which eliminates unusual species first. It is necessary to check the species in the main text.

1. Living in a stone ..... *Cancellus typus* (and another rare species in WA)

— Living in a shell 2

2. Insides of chelae with wash-board-like ridges (presumably to rub together for sound) ..... *Trizopagurus strigimanus* (large, common shelf species; one other rarer species)

— Chelae variously ornamented but never with regular ridges 3

3. Tips of fingers white, calcareous ..... *Calcinus* spp.

— Tips of fingers black, corneous 4

4. Small; female with dorsal brood-pouch; sometimes intertidal species ..... *Paguristes* spp. (*P. frontalis* and *P. squamosus* the only intertidal species)

— Usually large, subtidal species 5

5. Rostrum hinged; drab ..... *Diogenes* spp. (in NSW, *D. senex*, intertidal; others in WA, subtidal)

— Rostrum fixed; colourful 6

6. Shield with a Y-shaped groove; chelipeds unequal; subtidal ..... *Dardanus* spp.

— Shield without Y-shaped groove; chelipeds equal ..... *Clibanarius* spp.

SIX-LEGGED CRABS

Most, but not all, crabs with only three pairs of walking legs are anomurans, or not true crabs. Some deep-water crabs appear to have only three pairs of legs. Lithodids, for example, are anomuran crabs. But members of brachyurans families, Homolidae and the like, and the rare Dynomenidae which may occur in shallow water have the fifth legs reduced or held erect and only slightly smaller than the others. On the shore and subtidally, small crab-like forms are commonly encountered in which the fifth leg is invisible or tiny. They could belong to one of several families separated as follows.

1. Abdomen tightly held under carapace, especially in male; chela roughly cylindrical ..... Brachyura: Hexapodidae ... 2

— Abdomen loosely held under carapace; chela flattened ..... Anomura ... 3

2. Sternum in male without grooves at end of abdomen ..... *Hexapinus granuliferus*

— Sternum in male with broad deep oblique grooves running between bases of maxillipeds 3 and end of abdomen ..... *Hexapus sexpes*

3. Digging in sand 4

— Under rocks or subtidal 5

4. Carapace flat, square ..... *Austrolepidopa trigonops* (Albuneidae)

— Carapace oval ..... *Hippa* spp. (Hippidae)

5. Hairy; limbs compact; with bright blue antennae ..... *Lomis hirta* (Lomisidae)

— Smooth: limbs, especially chelae elongate; antennae with long filtering setae ..... Porcellanidae ... 6

6. Subtidal, muddy sediments ..... *Polyonyx transversus*

— Intertidal, rocky shores and subtidal 7

7. Chelae spiky ..... *Petrocheles australiensis*

— Chelae smooth ..... *Petrolisthes elongatus* (Tas. only) or *Pidisia dispar* (WA only)

Superfamily **Galatheoidea** Samouelle, 1819

The Galatheoidea comprise four families of unusual decapods, some crab-like and others more lobster-like. They share with all anomurans only four pairs of well-developed legs of which the first is a stronger cheliped. The fifth leg is weak and often hidden under the carapace. Galatheoids are symmetrical (unlike hermit crabs) and the uropods and telson form a broad tailfan at the end of the depressed abdomen which folds up against itself or the thorax.

There are four families. One, Aeglidae Dana, 1852, is confined to freshwater environments in South America. The other three are marine and occur in Australia. Martin & Abele's (1986) study of this family confirmed its placement in this superfamily. The Galatheidae (squat lobsters) and Porcellanidae (false crabs or porcelain crabs) are common in southern Australia and the Chirostylidae (also squat lobsters) are most common in deep water. A guide to the most common shallow shelf taxa can be found in the box 'Miniature lobsters with long chelae'.

Diagnosis. Body symmetrical. Uropods spatulate, forming tail-fan. Pleopods 3–5 paired. Male gonopods often present. Female pleopods 1 absent. Ocular scales absent. 4–5 antennal peduncle articles. Epistome unarmed. 11–14 pairs of gills. Pereopods 2–5 dactyli with claw, 4 ambulatory.

Key to Australian families of Galatheoidea

1. Abdomen folded up against thorax; body crab-like; chelipeds moderately elongate, stout or flattened ..... Porcellanidae ... p. 242
— Abdomen folded up against itself (not against thorax); body shrimp-like; chelipeds greatly elongate, slender 2
2. Telson with a transverse suture (sometimes difficult to see) and folded beneath the preceding abdominal somites with the tailfan; without sternal plate on last thoracic somite (no plate between the last legs); usually with antennal scale ..... Chirostylidae ... p. 220
— Telson without a transverse suture and not folded beneath the preceding abdominal somites with the tailfan; with well developed sternal plate on last thoracic somite between last legs; without antennal scale ..... Galatheidae ... p. 228

Reference

Martin, J.W., & Abele, L.G. 1986. Phylogenetic relationships of the genus *Aegla* (Decapoda: Anomura: Aeglidae), with comments on anomuran phylogeny. *Journal of Crustacean Biology* 6: 576–616.

MINIATURE LOBSTERS WITH LONG CHELAE

No members of the Galatheidae are found intertidally in Australia but galatheids are among the most common of all decapods on shelf sediments. Large lobster-like animals with long chelae are found only in the deep sea. These are members of the Polychelidae (Polychelida), quite a different group from those in shallower water, usually squat lobsters (Superfamily Galatheoidea). Galatheoids are easy to recognise but the species can be difficult to distinguish, especially in the tropics.

This is a rough guide to the commonest species of the shallow shelf.

1. Rostrum of 3 spines ..... *Munida* spp. (*M. haswelli* is the most common species)
— Rostrum triangular 2
2. Rostrum extremely elongate ..... *Allogalathea elegans* (WA only)
— Rostrum only a bit elongate 3
3. Rostrum with lateral teeth ..... *Galathea* spp. (*G. australiensis* is the most common)
— Rostrum leaf-like ..... *Phylladiorhynchus pusillus*

The family Chirostylidae and the galatheid genus *Munidopsis* occur only at slope depths and beyond.

Chirostylidae Ortmann, 1892

Chirostylids look superficially much like galatheids but generally occur in deeper shelf waters and beyond. These squat lobsters are often collected associated with soft corals, antipatharians and gorgonians. The fifth legs attaching free, and without a sternal plate between, distinguishes them. The definitive work on the systematics of the Chirostylidae was by Baba (1988) who recognised five genera and more than 100 species worldwide. There are many described species particularly in the Indo-West Pacific region which is the centre of richest diversity. The fauna of southern Australian slopes and seamounts is better known than that of tropical seas although some of the species reported by Baba (1991 and in paper in press in Galathea Reports) might be expected also. Numerous species of four genera have been reported (Poore et al., 1998; Ahyong & Poore, 2004). The key to these genera and to a fifth from Hawaii is from Baba (1988).

Diagnosis. Body shrimp-like. Telson with a transverse suture (sometimes difficult to see) and folded beneath the preceding abdominal somites with the tail-fan. Chelipeds elongate, slender. Without sternal plate on last thoracic somite. Usually with antennal scale.

Key to genera of Chirostylidae

1. 1 or 2 pairs of supraocular spines on margin of carapace; mandible smooth or feebly dentate on incisor margin 2
— No supraocular spines (may be spines behind eyes on carapace); mandible strongly dentate on incisor margin 3
2. 2 pairs of supraocular spines; 3 pairs of hepatic spines in oblique line ..... *Eumunida*
— 1 pair of supraocular spines; hepatic spines absent ..... *Pseudomunida* (Hawaii only)
3. Pereopods usually spinose and slender 4
— Pereopods not extremely spinose, short or of moderate length ..... *Uroptychus*
4. Rostrum absent ..... *Chirostylus* (not in Australia)
— Rostrum present ..... *Gastroptychus*

Eumunida Smith, 1883

The genus of mostly deep-water squat lobsters is recognised by the combination of five rostral and supraocular spines and oblique rows of three spines just posterior to these. Twenty-four species in the Indo-West Pacific are known (de Saint Laurent & Macpherson, 1990a, b; de Saint Laurent & Poupin, 1996), including at least two from tropical Australia.

Diagnosis. Rostrum present. 2 pairs of supraocular spines. 3 pairs of hepatic spines in oblique rows. Mandible smooth or weakly dentate on incisor margin. Pereopods with spinose merus and carpus.

Eumunida australis de Saint Laurent & Macpherson, 1990 (Fig. 60a). Carapace with 2 pairs of anterolateral spines, 4 pairs of lateral spines, first hepatic spine stronger than following 2; cheliped merus with 2 longitudinal rows of spines. 25 mm. Qld (off Southport), NSW (to 35°S); continental slope, 300–685 m depth.

Gastroptychus Caullery, 1896

Baba (1988, 1991) stated that there are 17 described species and later described the first from southern Australia (Baba, 2000). Ahyong & Poore's (2004) key to species of the Indo-West Pacific included 13 species. Most species have a spinose carapace, the Australian species especially so.

Diagnosis. Rostrum present. No supraocular spines. Mandible strongly dentate on incisor margin. Pereopods spinose, slender.

Key to southern Australian species of *Gastroptychus*

1. Abdominal somites 2–5 without transverse rows of spines .... *Gastroptychus sternoornatus*
— Abdominal somites 2–5 with transverse rows of spines 2

2. Abdominal somite 3 without spines except on pleura; maxilliped 3 without spines on propodus and carpus ..... *Gastroptychus hendersoni*
— Abdominal somite 3 with spines all over; maxilliped 3 with spines on propodus and carpus ..... *Gastroptychus rogeri*

Gastroptychus hendersoni (Alcock & Anderson, 1899). Carapace with spines over whole surface, especially prominent medially; abdominal somite 3 without spines, except small spines on pleura. 37 mm. Indo-West Pacific, Tas.; 787–1469 m depth.

Gastroptychus rogeri Baba, 2000 (Fig. 60b). Carapace with spines over whole surface, especially prominent medially; all abdominal somites spinose. 28 mm. NSW, Tas.; 476–1000 m depth.

Gastroptychus sternoornatus (Van Dam, 1933). Carapace with spines over whole surface, especially prominent behind eyes, medially on gastric region and near posterior margin; all abdominal somites unarmed. Indo-West Pacific, Tas.; 787–1469 m depth.

Uroptychus Henderson, 1888

This is by far the most common genus of Chirostylidae in southern Australian collections from deep water, Twenty new species were described by Ahyong & Poore (2004) from south-eastern and southern Australia of which 14, plus three others, occur in our region. Carapace length does not include the rostrum.

Diagnosis. Rostrum present. No supraocular spines. Mandible strongly dentate on incisor margin. Pereopods not extremely spinose, short or of moderate length.

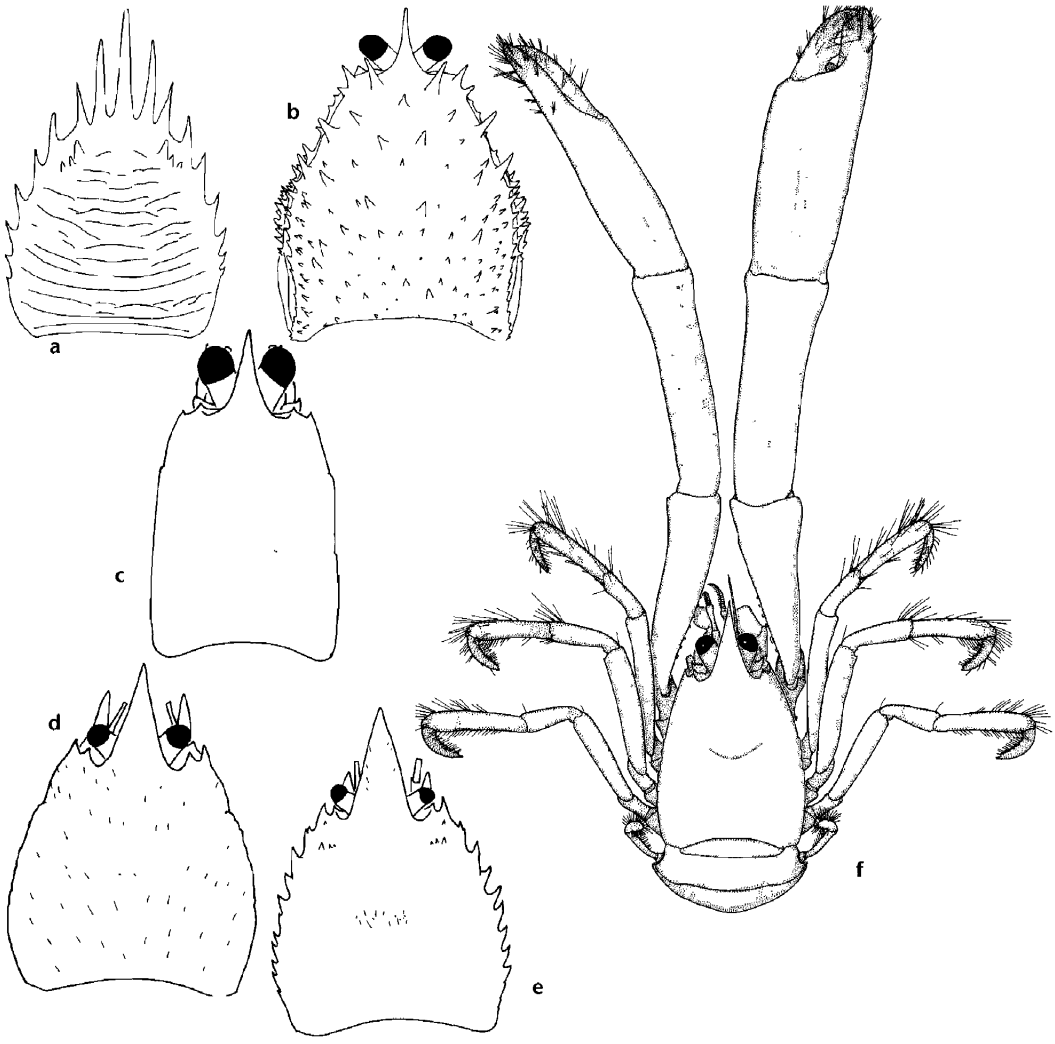

Fig. 60. **Chirostylidae**. a, *Eumunida australis*. b, *Gastroptychus rogeri*. c, *Uroptychus australis*. d, *Uroptychus babai*. e, *Uroptychus calcar*. f, *Uroptychus litosus*.

Key to southern Australian species of *Uroptychus*

1. Carapace with lateral margins smooth or crenulate 2
— Carapace with lateral margins dentate or spinose 11

2. Carapace with lateral margins smooth or crenulate 3
— Carapace (excluding rostrum) length equal to or greater than width 8

3. Walking legs with dactyli having 2 distal spines ..... *Uroptychus pilosus*
— Walking legs with dactyli having more than 8 spines or denticles along lower margin 4

4. Antennal peduncle having last and second-last articles each with distal spine 5
— Antennal peduncle having last and second-last articles each without distal spine 6

5. Antennal peduncle having basal article with outer spine ..... *Uroptychus latus*
— Antennal peduncle having basal article without outer spine ..... *Uroptychus laperousazi*

6. Antennal scale overreaching apex of distal peduncle article; basal antennal artcles with small outer spine; outer orbital angle acute ..... *U. babai*
— Antennal scale reaching to about midlength of distal peduncle article; basal antennal article without outer spine; outer orbital angle rounded 7

7. Cheliped about 3 times carapace length; dorsal margin of propodal palm about 2.5 times as long as dactylus; teeth lining flexor margins of dactyli of walking legs slender and longer than wide ..... *Uroptychus longvae*
— Cheliped about twice carapace length; dorsal margin of propodal palm about 2.5 times as long as dactylus; teeth lining flexor margin of dactyli of walking legs short, about as long as wide ..... *Uroptychus patulus*

8. Walking legs dactyli having spines along inner margin oriented parallel to margin ..... *Uroptychus australis*
— Walking legs dactyli having spines along inner margin oriented oblique to margin 9

9. Chelipeds robust, about 3 times carapace length; carapace margins divergent ..... *Uroptychus litosus*
— Chelipeds slender, about 3.5–4 times carapace length; carapace margins subparallel 10

10. Walking leg 3 merus about half length of merus of walking leg 2; sternite 4 with field of granules ..... *Uroptychus empheres*
— Walking leg 3 merus about two-thirds length of merus of walking leg 2; sternite 4 smooth ..... *Uroptychus gracilimanus*

11. Carapace lateral margin with single strong spine above base of walking leg 1 ..... *Uroptychus raymondi*
— Carapace lateral margin with more than 1spine or tooth 12

12. Walking leg 1 markedly more slender than walking leg 2 ..... *Uroptychus nowra*
— Walking leg 1 similar to walking leg 2 13

13. Antennal peduncle with second last article unarmed distally, about quarter length of last ..... *Uroptychus flindersi*
— Antennal peduncle with second last article with distal spine, half or more as long as last .14

14. Antennal scale reaching to midlength of last peduncle article; second last article with distal spine; last article unarmed ..... *Uroptychus calcar*
— Antennal scale reaching to midlength of last peduncle article; second last article with distal spine; last article unarmed 15

15. Carapace with lateral margins denticulate or with small spines 16
— Carapace with lateral margins with strong spines 17

16. Outer orbital angle rounded; carapace setose ..... *Uroptychus hesperius*
— Outer orbital angle spiniform; carapace not setose ..... *Uroptychus subsolanus*

17. Walking legs dactyli with 8–10 strong spines on inner margin; carapace smooth except for epigastric spines ..... *Uroptychus zeidleri*
— Walking legs dactyli with 16–20 small spines on inner margin; carapace rugose, setose ..... *Uroptychus cardus*

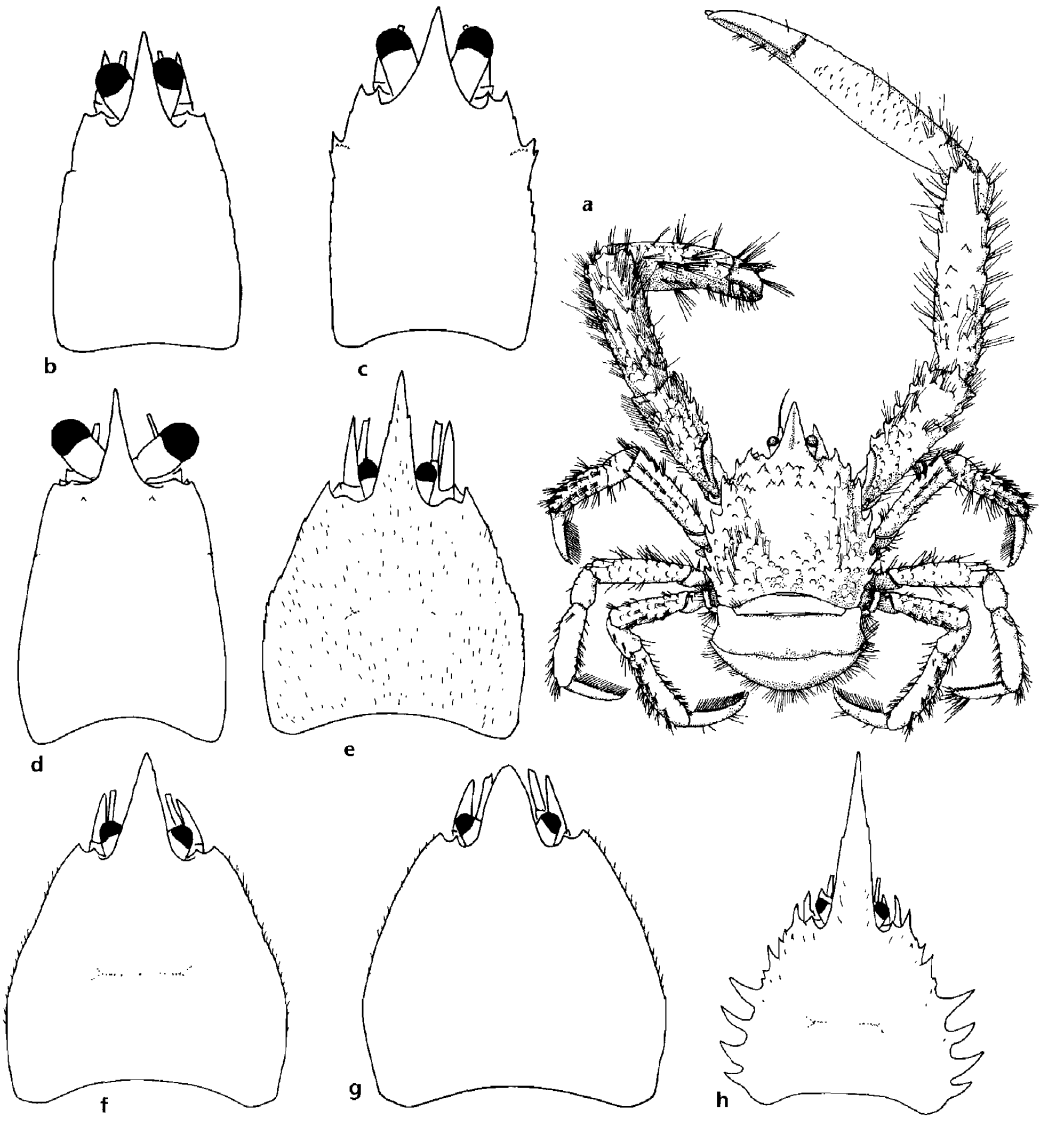

Fig. 61. **Chirostylidae**. a, *Uroptychus cardus*. b, *Uroptychus empheres*. c, *Uroptychus flindersi*. d, *Uroptychus gracilimanus*. e, *Uroptychus hesperius*. f, *Uroptychus laperousazi*. g, *Uroptychus latus*. h, *Uroptychus nowra*.

Uroptychus australis (Henderson, 1885) (Figs 60c, 62f). Carapace longer than broad; lateral margins unarmed. Antennal basal article with distinct outer spine; ultimate and penultimate articles unarmed. Chelipeds about 3.5–4 times carapace length; merus usually with cluster of tubercles on inner proximal margin. Pereopods 2–4 dactyli with 7–9 small spines on inner margin, oriented parallel to dactylar margin. Northern New Zealand, Indonesia, NSW, Vic., Tas., Tasmanian Seamounts; 458–1800 m depth, the most common species of the genus in south-eastern Australia.

Uroptychus babai Ahyong & Poore, 2004 (Figs 60d, 62i). Carapace slightly broader than long; lateral margins irregular, crenulate, distinctly convex, broadest posterior to midlength; with distinct, anteriorly directed anterolateral spine. Basal antennal article with distinct outer spine; ultimate and penultimate articles unarmed; scale longer than peduncle. NSW; 880–920 m depth.

Uroptychus calcar Ahyong & Poore, 2004 (Fig. 60e). Carapace longer than broad; lateral margins with anterolateral spine and 7–12 lateral spines; dorsum smooth, with cluster of 3–4 small epigastric spines on each side. Antennal basal article with outer spine; penultimate article with distal spine. Chelipeds about 3 times carapace length; all articles glabrous. NSW, Vic.; 326–461 m depth.

Uroptychus cardus Ahyong & Poore, 2004 (Fig. 61a). Carapace longer than broad; lateral margins with anterolateral spine and 7–8 lateral spines; dorsum rugose. Antennal basal article with outer spine; ultimate and penultimate articles with distal spine. Chelipeds about 3.5 times carapace length; all articles acutely rugose and sparsely setose; inner margin of merus 2 rows of stout spines. Tasmanian Seamounts; 987–1200 m depth.

Uroptychus empheres Ahyong & Poore, 2004 (Fig. 61b). Carapace longer than broad; margins slightly divergent, irregularly tuberculate behind base of cervical groove; without posterolateral ridge; anterolateral spine small. Outer orbital spine extending to level of anterolateral spine. Basal antennal article with lateral spine; ultimate and penultimate articles unarmed; ultimate article slightly exceeding twice length of penultimate article. Cheliped 3.5–4 times carapace length; distal 3 articles glabrous on upper outer margin; inner and ventral margin of propodal palm, carpus and merus granular. Tasmanian Seamounts; 800 m depth.

Uroptychus flindersi Ahyong & Poore, 2004 (Fig. 61c). Carapace distinctly longer than broad; lateral margins with anterolateral spine and distinct, bifid spine at base of cervical groove followed by 7–8 small teeth or serrations. Antennal basal article with acute tooth on outer margin; ultimate peduncle article with small distal spine; penultimate article unarmed. Chelipeds about 3.5 times carapace length; articles rugose ventrally, with distinct scales. Tas., WA; 520–714 m depth.

Uroptychus gracilimanus (Henderson, 1885) (Fig. 61d). Carapace longer than broad; lateral margins subparallel or slightly divergent, unarmed; with small anterolateral spine; posterior quarter with low but distinct ridge; outer orbital angle produced to small spine. Antennal basal article with distinct outer spine; ultimate and penultimate articles unarmed. Chelipeds 3.5–4 times carapace length; merus with tubercles on inner proximal margin. Indo-West Pacific, 421–1668 m; NSW (off Port Jackson); 750 m depth.

Uroptychus hesperius Ahyong & Poore, 2004 (Fig. 61e). Carapace broader than long; lateral margins serrated, convex, divergent, broadest posterior to midlength; with strong anteriorly directed anterolateral spine; outer orbital angle rounded; dorsum finely setose. Ultimate and penultimate articles of antennal peduncle with distal spine. Cheliped slender, about twice carapace length; all articles rugose and sparsely setose; propodal palm about 3 times as long as fixed finger. Southern WA; 1011–1020 m depth.

Uroptychus laperousazi Ahyong & Poore, 2004 (Figs 61f, 62k). Carapace distinctly broader than long; lateral margins slightly crenulate, distinctly convex, broadest posterior to midlength; with short, anteriorly directed anterolateral spine; posterior fifth with low, indistinct ridge. Outer orbital angle produced to small tooth, not extending anteriorly beyond anterolateral spine. Basal antennal article without outer spine; ultimate and penultimate articles armed. Cheliped about 2 times carapace length. SA; 984–1110 m depth.

Uroptychus latus Ahyong & Poore, 2004 (Figs 61g, 62j). Carapace distinctly broader than long; lateral margins smooth or slightly irregular, distinctly convex, broadest posterior to midlength; with short, anteriorly directed anterolateral spine; posterior fifth with low, indistinct ridge; outer orbital angle produced to small tooth, not extending anteriorly beyond

anterolateral spine; dorsum minutely punctate, finely but sparsely-setose, unarmed. Basal antennal article with outer spine; ultimate and penultimate articles armed; antennal scale extending almost to apex of ultimate peduncle article. Chelipeds about 3 times carapace length. Vic; 1073 m depth.

Uroptychus litosus Ahyong & Poore, 2004 (Figs 60f, 62j). Carapace as long as broad; lateral margins distinctly convex, with irregular tubercles along margin; with anterolateral spine; outer orbital angle produced to small spine. Basal antennal article with distinct outer spine; ultimate and penultimate articles unarmed; ultimate article about twice length of penultimate article. Chelipeds robust, slightly compressed, about 3 times carapace length; merus and ischium with distinct tubercles on inner proximal margin. Tasmanian Seamounts; 800–1120 m depth.

Uroptychus longvae Ahyong & Poore, 2004. Carapace as broad as long (similar to *U. patulus*); lateral margins smooth, distinctly convex, broadest posterior to midlength; with triangular anterolateral spine; outer orbital angle sharp; dorsum finely but sparsely-setose, unarmed. Basal antennal article without outer spine; ultimate and penultimate articles unarmed. Antennal scale extending about to third of ultimate peduncle article. Chelipeds about 3 times carapace length. Teeth on dactyli of walking legs slender and longer than wide. SA (Great Australian Bight); 805–816 m depth.

Uroptychus nowra Ahyong & Poore, 2004 (Fig. 61h). Carapace broader than long; lateral margins convex, divergent; with strong anteriorly directed anterolateral spine and 9 lateral spines; anterior 2 lateral spines small, third spine large, stout, at base of indistinct cervical groove, followed by 2 small spines and 4 large spines. Outer orbital angle produced to a small spine. Basal antennal article with inner and outer spine; ultimate article of antennal peduncle about twice as long as penultimate article, both with distal spine. Cheliped slender, all articles rugose and sparsely setose. NSW; 1100 m depth.

Uroptychus patulus Ahyong & Poore, 2004 (Fig. 62a). Carapace distinctly broader than long; lateral margins smooth, distinctly convex, broadest posterior to midlength; with distinct, slightly incurved anterolateral spine; posterior fifth with low, indistinct ridge; outer orbital angle rounded, unarmed; dorsum minutely punctate, finely but sparsely-setose, unarmed. Basal antennal article without outer spine; ultimate and penultimate articles unarmed. Antennal scale extending about to midlength of ultimate peduncle article. Chelipeds about 2.5 times carapace length. Teeth on dactyli of walking legs short, about as long as wide. Vic., Tas.; 955–1190 m depth.

Uroptychus pilosus Baba, 1981 (Fig. 62b). Body entirely covered with fine setae. Carapace slightly wider than long, widest near midlength; with small anterolateral spinules; dorsum and lateral margins unarmed, pilose. Basal antennal article with outer spine; antennal scale as long as or slightly longer than penultimate peduncle article. Chelipeds slender, subcylindrical; 4–5 times carapace length; setose. Japan, NSW; 987–1160 m depth.

Uroptychus raymondi Baba, 2000. (Fig. 62c). Carapace slightly broader than long; lateral margins convex, irregularly tuberculate, with strong midlateral spine; anterolateral spine stout; outer orbital angle triangular; dorsum setose and sparsely tuberculate. Basal antennal article with lateral tooth; ultimate and penultimate articles with distal tubercle. Antennal scale extending beyond midlength of ultimate peduncle article. Chelipeds setose, not more than 5 times carapace length, carpus and merus distally dentate. Vic., Tas.; 644–650 m depth.

Uroptychus subsolanus Ahyong & Poore, 2004 (Fig. 62d). Carapace broader than long; lateral margins serrated, convex, divergent, broadest posterior to midlength; with strong anteriorly directed anterolateral spine and distinct spine at base of cervical groove; outer orbital angle produced to a small spine not reaching beyond midlength of anterolateral spine; dorsum minutely punctate, without setae; lateral margins sparsely setose. Ultimate and penultimate article of antennal peduncle with distal spine. Cheliped slender, about twice carapace length;

propodal palm about 2 times as long as fixed finger. Pereopods with propodus broadened distally, bearing 6–8 moveable spines on lower distal margin, distalmost paired; dactylus with 7–8 triangular, corneous, obliquely directed spines on inner margin. Vic., SA; 999–1110 m depth.

Uroptychus zeidleri Ahyong & Poore, 2004 (Fig. 62e). Carapace broader than long; lateral margins divergent; with anterolateral spine and 11–15 lateral spines; anterior 2 lateral spines small, third spine large, stout, at base of indistinct cervical groove, remainder stout, closely spaced, decreasing in size posteriorly; outer orbital angle produced to small acute spine. Basal antennal article with 1 or 2 small outer spines; ultimate and penultimate articles with distal spine. Chelipeds about 3 times carapace length; propodus with scales; carpus and merus with setose scales or small spinules, distal margin spinose. Tas.; 520 m depth.

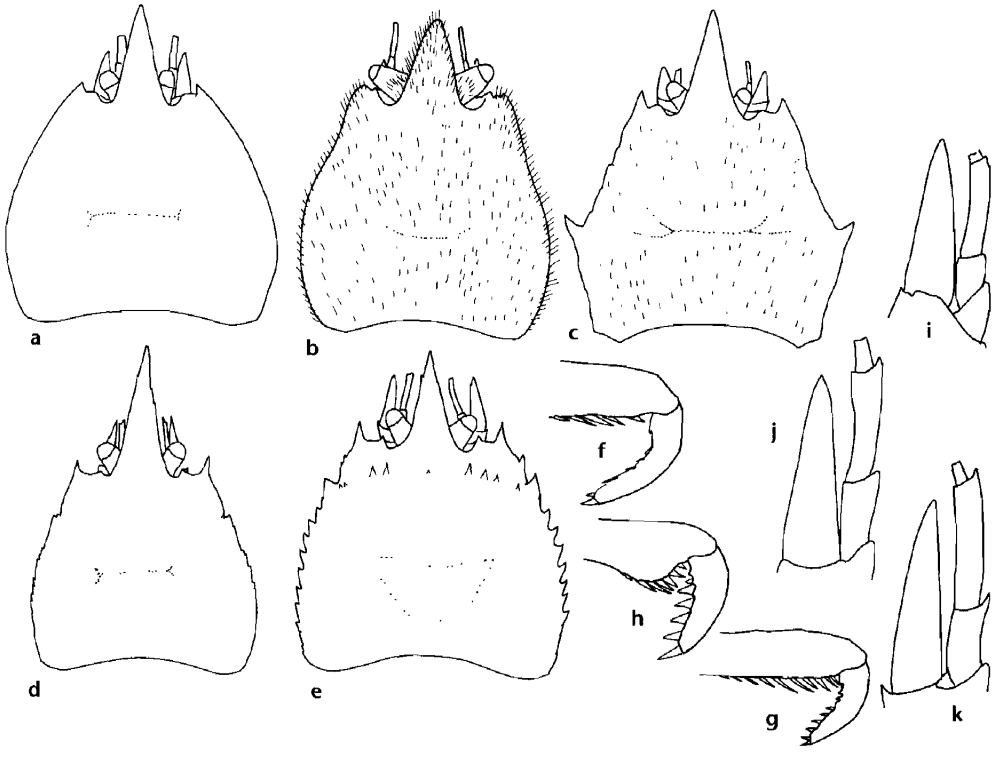

Fig. 62. **Chirostylidae.** a, *Uroptychus patulus*. b, *Uroptychus pilosus*. c, *Uroptychus raymondi*. d, *Uroptychus subsolanus*. e, *Uroptychus zeidleri*. Distal articles of walking leg: f, *Uroptychus australis*. g, *Uroptychus litosus*. h, *Uroptychus subsolanus*. Antennal scale and peduncle: i, *Uroptychus baba*. j, *Uroptychus laperousazi*. k, *Uroptychus latus*.

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Galatheidae Samouelle, 1819

Galatheids are commonly called squat lobsters although the names, plated lobsters, lobster krill and craylets, have been used. All the species are benthic on rough sedimentary bottoms at shelf and greater depths. The family is one of the most diverse of all decapods and is one of the most obvious in photographs taken of hydrothermal vents at abyssal depths. In southern New Zealand, as in other places, some species of galatheids swarm in astronomical numbers forming 'red tides' near the coast. This phenomenon has not been reported in Australia but several species are very common in dredge samples from the shelf.

Baba (1988) reviewed the systematics of the Galatheidae and provided a key to the 16 genera known. Nine genera have been added since then by Baba (1991; 1993; 1996) and Macpherson & Machordom (2000). Five occur in both the Atlantic and Indo-West Pacific and the remainder are confined to the Indo-West Pacific. Hundreds of species are known, including many undescribed from the tropical South Pacific (see Macpherson, 2004). At least ten genera are present in Australia, some represented by undescribed species. The Australian fauna is richest in northern waters (Haig, 1974; Baba, 1988) but numerous species have been recorded from the southern coast. Six species were recorded from the Tasmanian Seamounts (Poore et al., 1998) and recently described (Ahyong & Poore, 2004). Genera and species are distinguished by the shape of the rostrum and the arrangement of spines on the carapace and abdominal somites. Note that abdominal somite 1 is easily overlooked when the animal is viewed from dorsal view. The spines on the end of both the antennule and antenna are sometimes important.

Diagnosis. Body shrimp-like. Telson without a transverse suture and not folded beneath the preceding abdominal somites with the tail-fan. Chelipeds elongate, slender.

Key to southern Australian genera of Galatheidae

1. Eyes usually reduced, not pigmented; maxilliped 1 exopod without flagellum ..... *Munidopsis* ... p. 235
— Eyes usually well-developed, pigmented; maxilliped 1 exopod with flagellum 2
2. Rostrum spiniform, distinct from supraorbital spines (if triangular not tapering from orbit) 5

— Rostrum triangular, evenly tapering from orbit and including supraorbital spines 3

3. Rostrum extremely elongate, with 5–9 lateral teeth ..... *Allogalathea* ... p. 231
— Rostrum moderately elongate, with 2–5 lateral teeth 4

4. Rostrum leaflet-like with tiny distolateral and distinct basilateral teeth ..... *Phylladiorhynchus* ... p. 238
— Rostrum with 4 distinct lateral teeth ..... *Galathea* ... p. 231

5. Pereopods 1–3 with epipod; frontal margin of carapace with spine mesiad to anterolateral spine ..... *Raymunida* ... p. 239
— Pereopods 1–3 without epipod. Frontal margin of carapace without spine mesiad to anterolateral spine 6

6. Carapace with row of spines across epigastric region, sometimes pair more developed; sometimes with pair of postcervical spines; male gonopod 1 present .... *Munida* ... p. 232
— Carapace with pair of epigastric spines behind supraocular spines and with pair of postcervical spines; male gonopod absent 7

7. Carapace with clear transverse ridges; dactyli of walking legs compressed laterally, without lateral ridge ..... *Agononida* ... p. 229
— Carapace without clear transverse ridges, with scales or short ridges; dactyli of walking legs depressed vertically, with lateral and mesial ridges ..... *Paramunida* ... p. 238

Agononida Baba & de Saint Laurent, 1996

Species of *Agononida* belong to a group of deep-water genera without a second male gonopod. They can be separated from the more abundant *Munida* by fewer carapace spines, dominated by the pairs of epigastric and postcervical spines sometimes other pairs in between. Ahyong & Poore (2004) discussed variability in Australian species. Macpherson (2004) listed many species from Tonga and Fiji.

Diagnosis. Eyes well-developed. Rostrum spiniform, well-developed, remote from supraocular spines. Carapace with distinct transverse ridges, with pair of epigastric spines behind supraocular spines, and with pair of postcervical spines. Pereopods 1–3 without epipod; dactyli of walking legs compressed laterally, without lateral ridge. Frontal margin of carapace without spine mesiad to anterolateral spine. Male gonopod 1 absent.

Key to southern Australian species of *Agononida*

1. Antenna with basal article produced as long slender spine beyond eyes 2
— Antenna with basal article produced as short triangular spine, not beyond eyes 4

2. Carapace without cardiac spines ..... *Agononida incerta*
— Carapace with cardiac spines 3

3. Carapace with median mesogastric spines ..... *Agononida eminens*
— Carapace without median mesogastric spines ..... *Agononida marini*

4. Carapace with pair of protogastric spines behind pair of epigastric spines; with 2–4 cardiac spines ..... *Agononida procera*
— Carapace without protogastric spines; with single median gastric spine . *Agononida squamosa*

Agononida eminens (Baba, 1988) (Fig. 63a). Carapace with pair of epigastric spines; without hepatic spine; with 1 or 2 medial cardiac spines; with pair of postcervical spines followed by line of 2 branchiocardiac spines each side; posterior margin with 2–4 antrorse spines; lateral

margin of carapace anterior to cervical groove with 2 spines (including anterolateral) and 4 spines posterior to cervical groove. 29 mm. Philippines, Indonesia, New Caledonia, Qld, NSW; 564–1051 m depth.

Agononida incerta (Henderson, 1888). Carapace with pair of epigastric spines; without protogastric, hepatic and cardiac spines; with pair of postcervical spines followed by line of 2 branchiocardiac spines each side; posterior margin without spines; lateral margin of carapace anterior to cervical groove with 2 spines (including anterolateral) and 4 spines posterior to cervical groove. 34 mm. Indo-West Pacific, WA, Qld, NSW; 17–720 m depth. Two forms of this species differ in colour and spination (Ahyong & Poore, 2004).

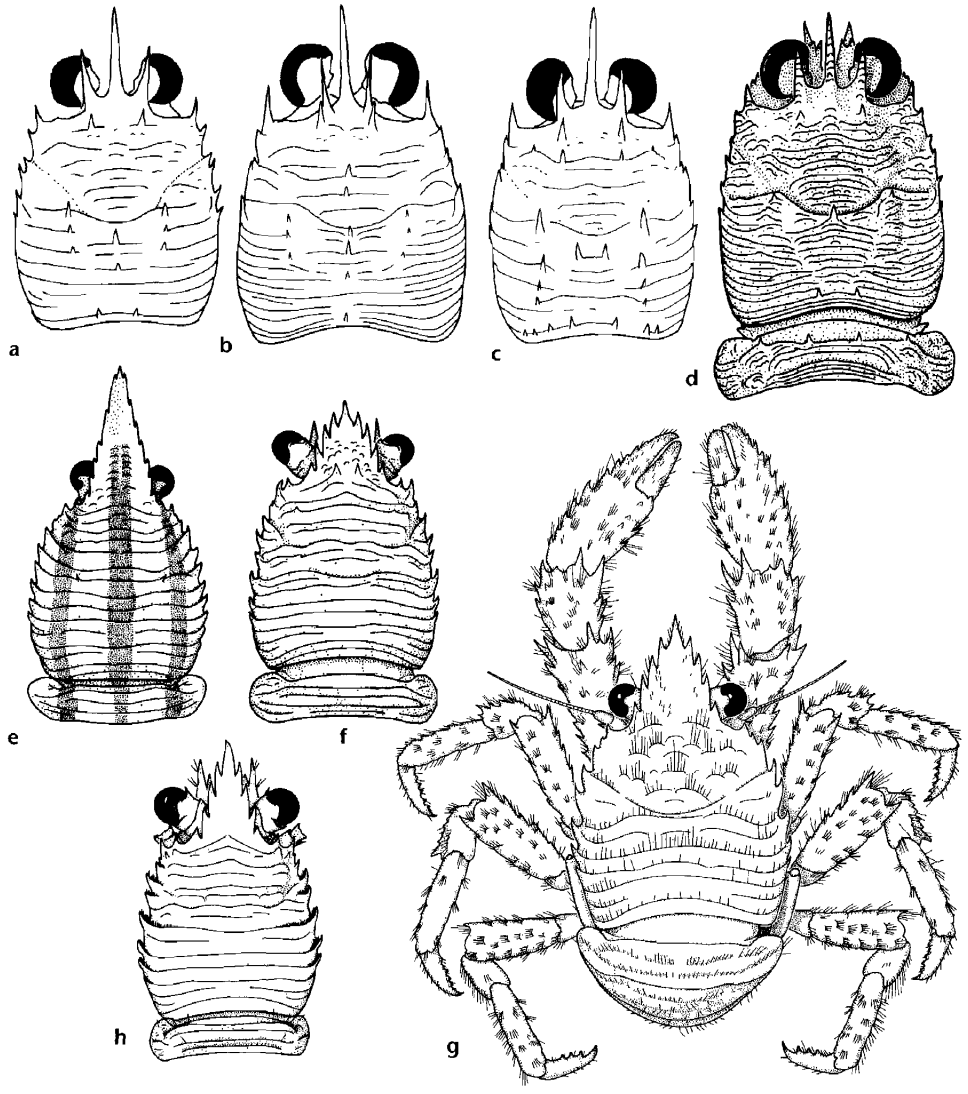

Fig. 63. **Galatheidae**. a, *Agononida eminens*. b, *Agononida marini*. c, *Agononida procera*. d, *Agononida squamosa*. e, *Allogalathea elegans*. f, *Galathea australiensis*. g, *Galathea magnifica*. h, *Galathea whiteleggii*.

Agononida marini Macpherson, 1994 (Fig. 63b). Carapace with pair of epigastric spines, without protogastric and hepatic spines; with 3 median cardiac spines; with pair of postcervical spines followed by 2 branchiocardiac spines each side; posterior margin with 1 antrorse spines; lateral margin of carapace anterior to cervical groove with 4 spines (including long anterolateral) and 1 spine posterior to cervical groove. 27 mm. New Caledonia, Qld, NSW; 457–548 m depth.

Agononida procera Ahyong & Poore, 2004 (Fig. 63c). Carapace with pairs of epigastric and protogastric spines; small hepatic spine; with 1 or 2 pairs of cardiac spines; with pair of postcervical spines with line of 2–3 branchiocardiac spines each side; posterior margin with 4–13 antrorse spines; lateral margin of carapace anterior to cervical groove with 2 spines (including anterolateral) and 4 spines posterior to cervical groove. 23 mm. Qld, NSW; 675–824 m depth.

Agononida squamosa (Henderson, 1885) (Fig. 63d). Carapace with pair of epigastric spines; without protogastric and hepatic spines; with 1 median cardiac spine; with pair of postcervical spines; posterior margin with 2 antrorse spines; lateral margin of carapace anterior to cervical groove with 2 spines (including anterolateral) and 3 or 4 spines posterior to cervical groove. 30 mm. South-West Pacific, NSW; 156–752 m depth.

Allogalathea Baba, 1969

The genus is monotypic.

Diagnosis. Eyes well-developed. Maxilliped 1 exopod with flagellum. Rostrum triangular, elongate, with 5–9 lateral teeth.

Allogalathea elegans (Adams & White, 1848) (Fig. 63e, Pl. 13f). The elongate rostrum and longitudinal dark stripes immediately characterise this species. It is believed to associate with comatulid crinoids (Baba, 1979). There are various colour forms but the specimen in Jones & Morgan's (2002) photograph has a yellow median stripe and yellow legs to match its host. 22 mm. Red Sea, E coast of Africa to Japan and Fiji, Qld, NT, WA (rarely S to Cockburn Sound); intertidal to 146 m.

Galathea Fabricius, 1793

Haig (1972) listed eight species of *Galathea* from north-western Australia and later (1973) provided a key to all nine from eastern Australia; recent collecting suggests the fauna is considerably larger in tropical Australia. Only four species have been recorded from southern Australia but there is a good chance that more of the WA species occur in the southern part of this state. Haig (1973) provided more detailed descriptions and synonymies for some species.

Diagnosis. Eyes well-developed. Maxilliped 1 exopod with flagellum. Rostrum triangular, with 4 (rarely 3–5) distinct lateral teeth.

Key to southern Australian species of *Galathea*

1. Anterior half of carapace with short, curved scales only 2
— Anterior half of carapace with uninterrupted transverse striae 3

2. Fingers of cheliped more than half as long as propodus; maxilliped 3 merus with spines on outer margin; pereopods 1–3 with epipod ..... *Galathea subsquamata*
— Fingers of cheliped half as long as propodus; maxilliped 3 merus unarmed on outer margin; only cheliped with epipod ..... *Galathea magnifica*

3. Rostrum as long as broad at base, with pair of gastric spines near base ..... *Galathea australiensis*
— Rostrum longer than broad at base, without pair of gastric spines near base ..... *Galathea whiteleggii*

Galathea australiensis Stimpson, 1858 (Fig. 63f, Pl. 13d). Rostrum as long as broad at base. Carapace with transverse striae and pair of anterior gastric spines. 7 mm. Central NSW, Vic., Tas., SA, WA (N to Shark Bay); common at shelf depths.

Galathea magnifica Haswell, 1882 (Fig. 63g, Pl. 13e). Carapace with short curved scales. Pair of anterior gastric spines. Fingers of cheliped half as long as propodus. Dark brown with broad stripe down back; white bands on legs. 13 mm. Qld, NSW, Vic., SA, WA (S coast); shelf to 110 m depth.

Galathea subsquamata Stimpson, 1858. Carapace with squamiform striae in gastric region; body and limbs with more stiff hairs than other species. Pair of anterior gastric spines. Fingers of cheliped more than half as long as propodus. 13 mm. Japan, eastern Pacific, NT, Qld, WA (S to Rottnest I.); shore to 238 m. This species was known as *G. aculeata* Haswell, 1882 in earlier literature.

Galathea whiteleggii Grant & McCulloch, 1906 (Fig. 63h). Rostrum longer than width at base. Carapace with transverse striae and with only weak pair of anterior gastric spines if present. 5 mm. Qld, NSW; shallow shelf depths.

Munida Leach, 1820

Munida is a genus of more than 120 species recognisable by its spiniform rostrum and distinct transverse ridges on the carapace. More than half the species live in the Indo-West Pacific at shelf depths and beyond. None are found in less than 100 m depth in Australia although *M. gregaria* can be exceptionally abundant in shallow water in southern New Zealand and Chile. So abundant that the sea and shore can be red with millions of individuals. Such 'red tides' have not been reported in Australia. Keys to the identification of Indo-West Pacific species were provided by Baba (1988) and Macpherson & Baba (1993), Macpherson & de Saint Laurent (2002) for the western and southern Indian Ocean, and Ahyong & Poore (2004) for Australian species. Macpherson (2004) described more from Tonga and Fiji. Seven new species from eastern Australia were described by Ahyong & Poore (2004) and some of those might yet be discovered further south. Identification depends on careful attention to spines on the carapace and antennules.

Diagnosis. Eyes well-developed. Maxilliped 1 exopod with flagellum. Rostrum spiniform, well-developed. Carapace with distinct transverse ridges. Pereopods 1–3 without epipod. Frontal margin of carapace without spine mesiad to anterolateral spine. Male gonopod 1 present.

Key to southern Australian species of *Munida*

1. Carapace with lateral margin having 3 spines behind cervical groove ..... *Munida kapala*
— Carapace with lateral margin having 4 spines behind cervical groove ..... *Munida rogeri*
— Carapace with lateral margin having 5 spines behind cervical groove 2

2. Abdominal somite 3 with spines on anterior margin 3
— Abdominal somite 3 without spines on anterior margin 5

3. Abdominal somite 4 with pair of spines on anterior margin ..... *Munida gregaria*
— Abdominal somite 4 without pair of spines on anterior margin 4

4. Antennular basal article with inner distal spine longer than outer ..... *Munida chydaea*
— Antennular basal article with inner distal spine shorter than outer ..... *Munida asprosoma*

5. Antennular basal article with inner distal spine as long as outer; rostrum laterally compressed ..... *Munida rubridigitalis*
— Antennular basal article with inner distal spine unequal to outer; rostrum spiniform 6

6. Antennular basal article with inner distal spine longer than outer ..... *Munida haswelli*
— Antennular basal article with inner distal spine shorter than outer 7

7. Sternite 7 with patch of granules laterally ..... *Munida spinicruris*
— Sternite 7 without patch of granules laterally 8
8. Cornea as wide or little wider than eyestalk ..... *Munida endeavourae*
— Cornea much wider than eyestalk ..... *Munida isos*

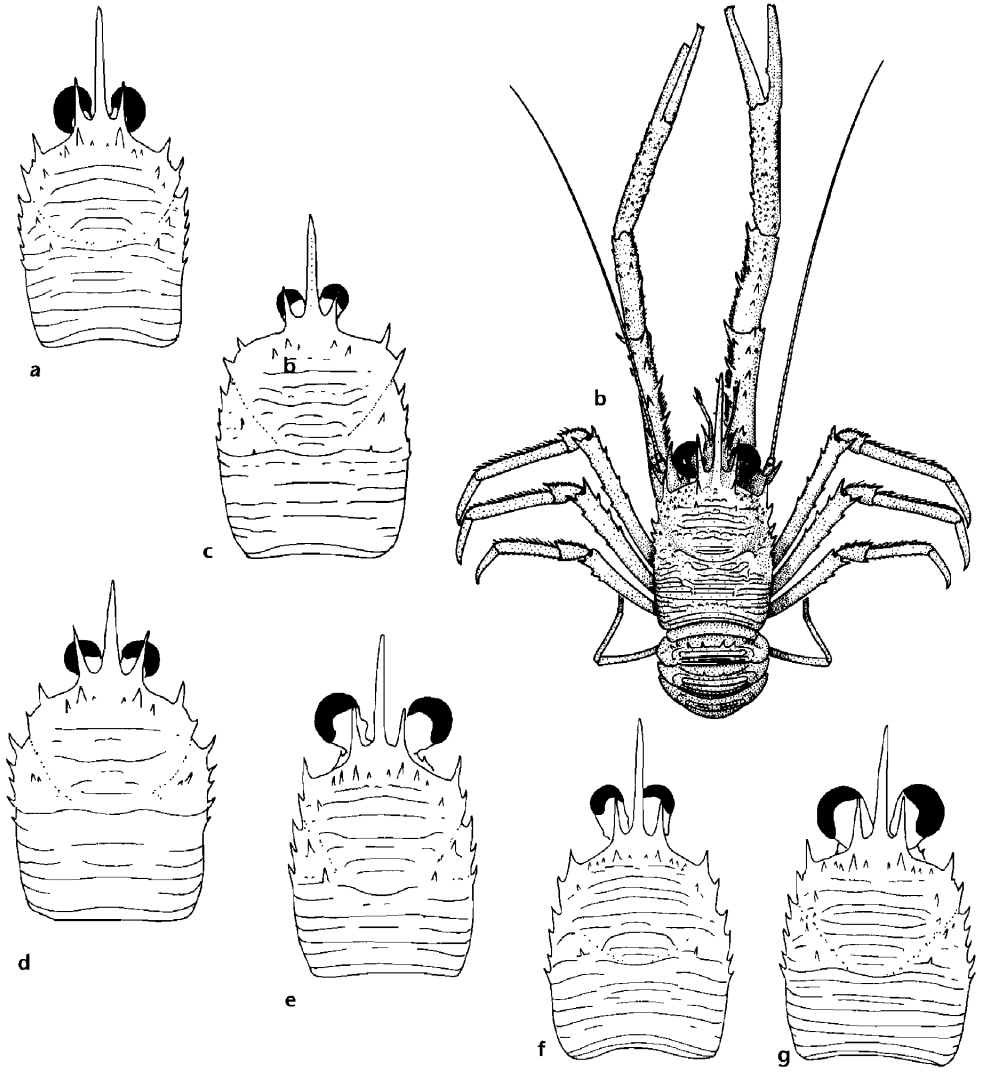

Fig. 64. **Galatheidae**. a, *Munida asprosoma*. b, *Munida chydaea*. c, *Munida endeavourae*. d, *Munida isos*. e, *Munida kapala*. f, *Munida rogeri*. g, *Munida spinicruris*.

Munida asprosoma Ahyong & Poore, 2004 (Fig. 64a). Carapace with 4 or 5 pairs of epigastric spines in addition to smaller scattered spinules; with paired parahepatic, paired anterior branchial and paired postcervical spines; lateral margins of carapace with 5 spines posterior to cervical groove. Eyes much wider than eyestalk. Antennular basal article with 2 distal spines, outer longer. Abdominal somite 2 with 10 spines; somite 3 with 2 spines on anterior border. 29 mm. Qld, NSW; 823–1053 m depth.

Munida chydaea Ahyong & Poore, 2004 (Fig. 64b). Carapace with pairs of epigastric and protogastric spines and numerous spinules on anterior quarter of carapace; with paired parahepatic, paired anterior branchial and paired postcervical spines; lateral margins of carapace with 5 spines posterior to cervical groove. Eyes much wider than eyestalk. Antennular basal article with distomesial spine longer than distolateral spine. Abdominal somite 2 with 8–10 anterior spines; somite 2 with 2 spines. 44 mm. NSW (N to Sydney), Vic., Tas., SA; 146–700 m depth. This is the most common species of *Munida* in south-eastern Australia, frequently misidentified as *M. haswelli*.

Munida endeavourae Ahyong & Poore, 2004 (Fig. 64c). Carapace with transverse row of 4–6 epigastric spines; with 0–3 minute spinules behind epigastric spines; with 0–1 minute parahepatic spinules, 1–3 pairs of anterior branchial and 1–2 pairs of postcervical spines; margins of carapace with 5 spines posterior to cervical groove. Eyes scarcely wider than eyestalk. Antennular basal article with 2 distal spines, mesial shorter. Abdominal somite 2 with 6–8 anterior spines. 26 mm. NSW (N to Green Cape), Vic., Tas.; 860–1169 m depth. The species has been previously reported as *M. microps*.

Munida gregaria (Fabricius, 1793) (Pl. 13c). Carapace dorsally rugose and spinulose; 1 spine plus 1–2 spinules on each side of epigastric area, spinule on end of first stria; 1 protogastric, 1 anterior branchial and 2 postcervical spines on each side; anterolateral spine strong. Supraocular spines about third length of spiniform rostrum. Abdominal somite 2 with 4 spines, somite 3 with 2–4 spines, somite 4 with 2 spines. 25 mm. New Zealand, southern South America to 1100 m depth; southern NSW, eastern Vic., eastern Tas.; 7–429 m depth.

Munida haswelli Henderson, 1885. Carapace dorsally rugose and spinulose, striae numerous; 1 epigastric spine, 1 protogastric, 1 or more anterior branchial and 1 postcervical spines on each side. Anterolateral spine stronger than other laterals. Abdominal somite 2 with 6–10 spines, somite 3 without spines. 22 mm. NSW (N to Sydney), Vic., Tas., SA, WA (to central Great Australian Bight); 121–329 m depth. This species superficially resembles *M. chydaea* but lacks spines on the abdominal margin of the third abdominal somite. Its maximum size is half that of *M. chydaea*.

Munida isos Ahyong & Poore, 2004 (Fig. 64d). Carapace with long, scattered setae; with transverse row of 6–7 (usually 6) epigastric spines; with numerous granules on anterolateral region; with 1–2 anterior branchial spines; with or without postcervical spine; margins of carapace with 5 spines posterior to cervical groove. Eye much wider than eyestalk. Antennular basal article with 2 distal spines, mesial shorter. Abdominal somite 2 with 6 anterior spines. 21 mm. NSW (N to Broken Bay), Tas.; 732–1281 m depth.

Munida kapala Ahyong & Poore, 2004 (Fig. 64e). Carapace with 4 pairs of epigastric spines; margins of carapace anterior to cervical groove with 2 spines (including anterolateral); with 3 spines posterior to cervical groove. Abdominal somite 2 with 8 spines on anterior border; other abdominal somites unarmed. Eyes much wider than eyestalk. Antennular basal article with 2 distal spines, mesial shorter; with 2 lateral spines. 11 mm. Qld, NSW, Taupo Seamount; 244–549 m depth.

Munida rogeri Macpherson, 1994 (Fig. 64f). Carapace dorsally rugose; 10 epigastric spines on first stria, 1 anterior branchial and 1 postcervical spines on each side. Supraocular spines subparallel, about half or less length of spiniform rostrum. Abdominal somite 2 with 8 anterior spines. 13 mm. New Caledonia, Chesterfield Is, WA (S to Perth); 146–390 m depth. Previous records of *Munida japonica* from Australia are referable to *M. rogeri*.

Munida rubridigitalis Baba, 1994. Carapace dorsally rugose, striae numerous and closely spaced; 6 epigastric spines. Rostrum laterally compressed, not spiniform. Antennular basal article with inner distal spine as long as outer. Abdominal somite 2 with 8 spines, somite 3 without spines. Chela stout, distinctly shorter than body length. 18 mm. Coral Sea, NSW (S to Long Reef); 156–549 m depth.

Munida spinicruris Ahyong & Poore, 2004 (Fig. 64g). Carapace with 5–6 pairs of epigastric spines; with several spinules on lateral anterior quarter of carapace in addition to paired parahepatic, paired anterior branchial and paired postcervical spines; margins of carapace with 5 spines posterior to cervical groove. Last sternite with coarse granules laterally. Abdominal somite 2 with 6–8 spines on anterior border. Eyes wider than eyestalks. Antennular basal article with 2 distal spines, mesial longer. 13 mm. Taupo Seamount; 143 m depth.

Munidopsis Whiteaves, 1874

There are more than 150 described species of *Munidopsis* (Baba, 1988) of which 17 are now reported from Australia (Baba, 1994; Baba & Poore, 2002; Ahyong & Poore, 2004). All Australian species are from deep water on the continental slope or seamounts. The key is an artificial one and the older literature needs to be consulted for accurate identifications. General carapace shape is the most useful means of recognising the species.

Diagnosis. Eyes small, eyestalks often produced as spines. Maxilliped 1 exopod without flagellum. Rostrum variable, often flattened.

Key to southern Australian species of *Munidopsis*

1. Rostrum with prominent lateral oblique spines, its apex upturned; carapace with 2 strong median spines and otherwise dorsally microscopically tuberculate .... *Munidopsis rostrata*
— Rostrum simply triangular or with subapical notches; carapace without strong spines 2

2. Rostrum with subapical notch separating apex from triangular tooth 3
— Rostrum simple, triangular 4

3. Carapace with 4 lateral spines, including anterolateral ..... *Munidopsis serricornis*
— Carapace with 3 lateral spines, including anterolateral ..... *Munidopsis treis*

4. Eyestalks barely visible under rostrum which is expanded subproximally; carapace granular ..... *Munidopsis marginata*
— Eyestalks clearly visible alongside narrow rostrum; carapace smooth or hirsute 5

5. Carapace with pair of prominent spines at base of rostrum 6
— Carapace with pair of weak tubercles or no spines at base of rostrum 9

6. Spines at base of rostrum sharp 7
— Spines at base of rostrum blunt 8

7. Rostrum quarter length of rest of carapace ; all limbs without epipods .. *Munidopsis verrilli*
— Rostrum half length of rest of carapace; cheliped with epipod .... *Munidopsis subsquamosa*

8. Cheliped palm about 4 times as long as high; antennal process of carapace sharp ..... *Munidopsis proales*
— Cheliped palm about twice as long as high; antennal process of carapace broadly blunt ..... *Munidopsis tasmaniae*

9. Without spine at end of narrow eyestalk ..... *Munidopsis kensleyi*
— With spine at end of short, broad eyestalk 10

10. Carapace without dense coat of fine setae, with squamae only .... *Munidopsis bispinoculata*
— Carapace densely covered with fine setae 11

11. Anterolateral margin of carapace convex, denticulate, separated by notch from posterolateral margin; eyestalk with prominent spine, cornea lateral ..... *Munidopsis edwardsii*
— Anterolateral and posterolateral margins of carapace largely continuous, together weakly convex; eyestalk with major and minor terminal spines ..... *Munidopsis victoriae*

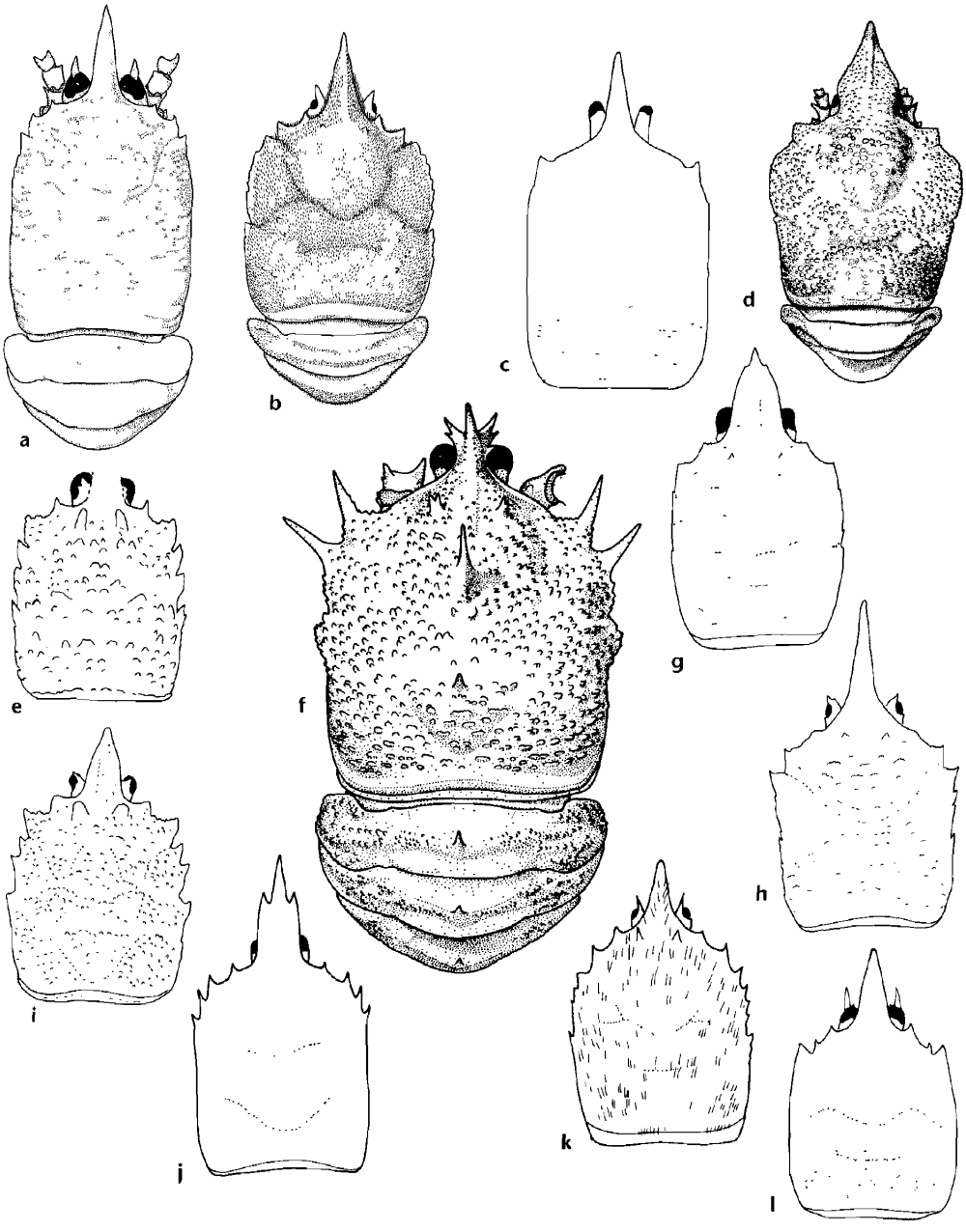

Fig. 65. **Galatheidae**. a, *Munidopsis bispinoculata*. b, *Munidopsis edwardsii*. c, *Munidopsis kensleyi*. d, *Munidopsis marginata*. e, *Munidopsis proales*. f, *Munidopsis rostrata*. g, *Munidopsis serricornis*. h, *Munidopsis subsquamosa*. i, *Munidopsis tasmaniae*. j, *Munidopsis treis*. k, *Munidopsis verrilli*. l, *Munidopsis victoriae*.

Munidopsis bispinoculata Baba, 1988 (Fig. 65a). Carapace smooth, with interrupted ridges posteriorly, lateral margins with anterolateral and smaller spines, anterior margin with supraocular and larger antennal spine. Rostrum carinate. Abdominal somites 2 and 3 each with 2 transverse ridges. Eyestalks immoveable, with 2 distal spines, inner one ventral and smaller. Pereopods without epipods. 15 mm. Indonesia, NSW slope; 933–2363 m depth.

Munidopsis edwardsii (Wood-Mason, 1891) (Fig. 65b). Carapace covered with fine setae, with ripples posteriorly, lateral margins subparallel, with anterolateral spine anteriorly, anterior margin without supraocular or antennal spine. Rostrum carinate. Abdominal somites 2 and 3 each with 2 transverse ridges. Eyestalks slightly moveable, with dominating distal spine, cornea lateral. 28 mm. Indian Ocean, NSW; 1896–2610 m depth.

Munidopsis kensleyi Ahyong & Poore, 2004 (Fig. 65c). Carapace longer than wide, covered with plumose setae, smooth except for 2–5 spines on posterior margin, anterior margin oblique, anterolateral and posterolateral margins parallel, barely distinct; with anterolateral spine anteriorly. Rostrum carinate, unarmed. Abdominal somites 2 and 3 each with 2 transverse ridges. Eyestalks slender, without distal spines. Chelipeds with epipods. 25 mm. NSW; 214–1939 m depth (reported as *M. dasypus* by Baba & Poore, 2002).

Munidopsis marginata (Henderson, 1885) (Fig. 65d). Carapace granular, lateral margins flanged behind prominent triangular lobe, anterior margin without supraocular or antennal spines. Rostrum broad subproximally, flattened and carinate. Abdominal somites 2 and 3 each with 2 transverse ridges. Eyes fused to side of rostrum, with small distal spine. Pereopods without epipods. 15 mm. New Zealand, NSW slope; about 2000 m depth.

Munidopsis proales Ahyong & Poore, 2004 (Fig. 65e). Carapace excluding rostrum longer than wide, with strongly rugose squamae and tubercles; cervical groove distinct; regions well-defined; with pair of blunt epigastric processes; frontal margin with blunt antennal process; lateral margins with 4 large, anterolaterally directed teeth; posterior margin unarmed. Rostrum unknown. Abdominal somites unarmed. Eyestalk moveable, with short dorsal processes. Pereopods 1–3 with epipod. 9 mm. WA (S coast); 513–540 m depth.

Munidopsis rostrata (Milne Edwards, 1880) (Fig. 65f). Carapace with tubercles, armed with 2 small epigastric, 1 strong mesogastric and 1 cardiac spines; lateral margin with 2 prominent spines anteriorly. Rostrum with lateral spines, upturned apically. Abdominal somites 2–4 each with median spine. Pereopods 1–3 with epipods. 38 mm. Widespread in Atlantic, Indo-Pacific and Southern Ocean; Qld, NSW and Vic. slope; 1650–3294 m.

Munidopsis serricornis (Lovén, 1852) (Fig. 65g). Carapace, with obsolete interrupted transverse ridges posteriorly, lateral margins subparallel, with 3–4 spines, anterior margin with antennal spine. Rostrum carinate, distally trifid. Abdomen unarmed. Eyestalks moveable, without distal spine, cornea distal. Pereopods without epipods. 15 mm. Atlantic Ocean, Indo-Pacific, Vic., Tas. Seamounts, Cascade Plateau; 100 m in Norway, to 2165 m depth.

Munidopsis subsquamosa Henderson, 1885 (Fig. 65h). Carapace with pair of epigastric spines, interrupted ridges all over; anterior margin with broad antennal spine; lateral margin with anterolateral spine, 3 spines plus fourth and others behind cervical constriction; posterior margin unarmed. Rostrum carinate, upturned, unarmed. Abdominal somites 2 and 3 each with 2 transverse ridges. Eyestalks with 2 distal spines, inner one larger. Cheliped with epipod. 40 mm. East and west Pacific, NSW; 2690–3430 m depth.

Munidopsis tasmaniae Ahyong & Poore, 2004 (Fig. 65i). Carapace with sparsely setose squamae and tubercles; with pair of broad, blunt, flattened epigastric processes; frontal margin with blunt antennal process; lateral margins with 4 blunt teeth; posterior margin unarmed. Rostrum triangular, about one-third remaining carapace length, broad basally, margins convex and serrate, carinate, sparsely tuberculate. Abdominal somites unarmed. Eyestalk moveable, with short, papillate, tubercular process mesiodorsally. Pereopods 1–3 with epipod. 16 mm. Tas.; 1100–1135 m depth.

Munidopsis treis Ahyong & Poore, 2004 (Fig. 65j). Carapace without dorsal spines; frontal margins oblique, with slender antennal spine, strong anterolateral spine, 2 strong spines on hepatic margin. Rostrum broad, trifid distally. Abdominal somites unarmed. Eyestalk unarmed. Pereopods without epipod. 16 mm. Tas., Tasmanian Seamounts, SA; 366–820 m depth (reported as *M. serricornis* by Baba & Poore, 2002).

Munidopsis verrilli Benedict, 1902 (Fig. 65k). Carapace with stiff setae, with 2 epigastric spines, interrupted transverse ridges posteriorly, lateral margins convex, with 5 prominent spines, anterior margin with antennal spine. Rostrum carinate, distally upturned. Abdomen unarmed. Eyestalks moveable, with 2 distal spines, mesial one larger, cornea between spines. Pereopods without epipods. 29 mm. North-eastern Pacific Ocean (off USA), Tas.; 1500–2010 m depth.

Munidopsis victoriae Baba & Poore, 2002 (Fig. 65l). Carapace with short pilosity, smooth, lateral margin with prominent anterolateral spine, anterior margin with supraocular and smaller antennal spine. Rostrum carinate. Abdominal somites 2–4 each with transverse ridge and groove. Eyestalks immoveable, with 2 distal spines, inner one ventral and smaller. Pereopods without epipods. 24 mm. Western Vic.; 990 m depth.

Paramunida Baba, 1988

Ahyong & Poore (2004) recorded three species of *Paramunida* from Australia and Macpherson (2004) several from Tonga and Fiji. All are from deep water. The genus differs from *Munida* in having a plate-like base to the rostrum and supraocular spines.

Diagnosis. Eyes well-developed. Rostrum spiniform, short, fused basally with supraocular spines. Carapace without clear transverse ridges, with scales or short ridges, with pair of epigastric spines behind supraocular spines, and with pair of postcervical spines. Pereopods 1–3 without epipod; dactyli of walking legs compressed dactyli of walking legs depressed vertically, with lateral and mesial ridges. Frontal margin of carapace without spine mesiad to anterolateral spine. Male gonopod 1 absent.

Paramunida antipodes Ahyong & Poore, 2004 (Fig. 66a). Carapace with pair of epigastric spines, protogastric spines, large mesogastric spine; cardiac region with longitudinal row of 2–3 spines; posterior margin with median spine; branchiocardiac region with longitudinal row of 3 spines on each side. Antennular basal article lateral margin with 4–5 small spines. Antennal article 1 with long, sinuous mesial spine; article 2 with sharp apex on mesial spine. 13 mm. NSW; 420–548 m depth.

Phylladiorhynchus Baba, 1969

Of the three Indo-Pacific species only one occurs in Australia (Baba, 1969, 1991, 1993).

Diagnosis. Eyes well-developed; maxilliped 1 exopod with flagellum; rostrum leaf-like, with tiny distolateral and distinct basilateral teeth; carapace with distinct transverse striae anteriorly.

Phylladiorhynchus pusillus (Henderson, 1885) (Fig. 66b). Rostrum with marginal spine near apex. 1–2 pairs protogastric spines. Abdominal somites 2 and 3 with median transverse groove. Pereopods without epipods. 7 mm. Eastern Indian Ocean, Japan, New Caledonia, New Zealand, southern Qld, NSW, Vic., Tas., SA, WA (N to Shark Bay); intertidal to 310 m depth. This small species is distinguishable from all other galatheids in southern Australia by the form of the rostrum. See Haig (1973) for synonymy, and Baba (1991).

Raymunida Macpherson & Machordom, 2000

Eight species of the *Raymunida* are presently recognised (Macpherson & Machordom, 2000, 2001 Lin et al., 2004). A phylogenetic analysis based on morphology and molecular data confirmed the importance of colour as a taxonomic character (Macpherson & Machordom, 2001). The small spine in the orbit is diagnostic of the genus. Dorsal ornamentation of the two southern Australian species is very similar.

Diagnosis. Eyes well-developed. Maxilliped 1 exopod with flagellum. Rostrum spiniform, well-developed. Carapace with distinct transverse ridges. Pereopods 1–3 with epipod. Frontal margin of carapace with spine mesiad to anterolateral spine.

Key to southern Australian species of *Raymunida*

1. Antennal peduncle first article with mesial spine overreaching basal article of antennular peduncle ..... *Raymunida formosanus*
— Antennal peduncle first article with mesial spine not reaching basal article of antennular peduncle ..... *Raymunida elegantissima*

Raymunida elegantissima (De Man, 1902). Carapace dorsally rugose; 10 epigastric spines; 1 lateral protogastric, 2 anterior branchial and 1 postcervical spines on each side. Antennal peduncle first article with mesial spine not reaching basal article of antennular peduncle. 14 mm. Indian Ocean, Indonesia, Japan, WA (S to Perth), NT, Qld (S to Cape Moreton); 20–200 m depth.

Raymunida formosanus Lin, Chan & Chu, 2004 (Fig. 66c, d). Carapace dorsally striate; 12 epigastric spines; 1 lateral protogastric, 2 anterior branchial and 1 postcervical spines on each side. Walking legs with distinct scale-like striae. Antennal peduncle first article with mesial spine overreaching basal article of antennular peduncle. 20 mm. Taiwan, NSW; 104 m depth.

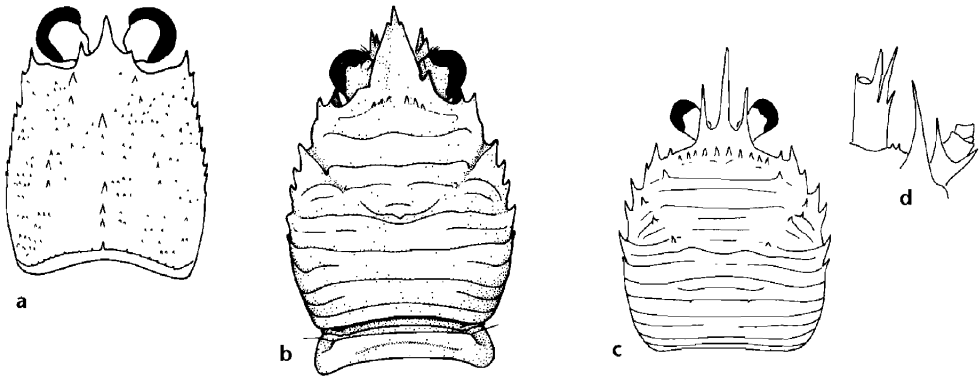

Fig. 66. **Galatheidae.** a, *Paramunida antipodes.* b, *Phylladiorhynchus pusillus.* c, d, *Raymunida formosanus* (with right antennule and antenna).

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Lomisidae Bouvier, 1895

The family is monotypic. The family name has alternatively been spelt Lomidae (occasionally since 1969) but in the opinion of Dr L. Holthuis, considered the world expert on crustacean names, the spelling Lomisidae is to be preferred. The reason for this is that *Lomis* is not a Greek or