

1.5 Key to Recent Cephalopod Groups and Families

- 1a. More than ten (63 to 94) circumoral appendages; suckers absent; chambered, coiled external shell . . . **Nautiloidea**
Family Nautilidae (Fig. 44)
- 1b. Eight or ten circumoral appendages; suckers (and/or hooks) present; no external shell **Coleoidea** → 2

- 2a. Suckers stalked with chitinous rings; 10 circumoral appendages, 8 arms and 2 ventrolateral tentacles (tentacles may be lost in some species). Mantle cavity communicates with the exterior via 3 openings **Cuttlefishes, Bobtail squids, Bottletail squids, Pigmy squids, Ram's Horn squid, Myopsid squids, Oegopsid squids** → 3
- 2b. Suckers without stalks, bases sometimes constricted in finned (cirrate) octopods and vampires, without chitinous rings; 8 arms, no ventrolateral tentacles. Mantle cavity communicates with the exterior via one opening, rarely 2 **Octopods and Vampires** → 4

- 3a. Internal shell straight, laminate, calcified (**Sepiidae**), coiled, chambered (**Spirulidae**), rudimentary, straight and chitinous (**Sepiolidae**) or absent (**Sepiadariidae, Idiosepiidae**); tentacles contractile and retractile into pockets between arms III and IV; fins not joined posteriorly; mantle edge near mantle cartilages straight **Cuttlefishes, Bobtail squids, Bottletail squids, Pigmy squids, Ram's Horn squid** → 5
- 3b. Internal shell straight, feather- or rod-shaped, chitinous; tentacles contractile, not retractile, no pockets; fins usually joined posteriorly; mantle edge near mantle cartilages with small projections or 'angles' **Myopsid squids, Oegopsid squids** → 7

- 4a. Internal shell a chitinous, thin, broad plate; a pair of small filamentous appendages in pouches between bases of arms I and II; light organ (photophore) present at base of each fin and medial to each eye dorsally; colour black to dark red or brown **Vampires (monotypic)**
Family Vampyroteuthidae (Fig. 45)
- 4b. Internal shell vestige either small cartilaginous rods or a U-shaped support or absent; secondary filamentous appendages absent; suckers sessile, without stalks and without chitinous rings; colour extremely variable but never black **Octopods** → 36

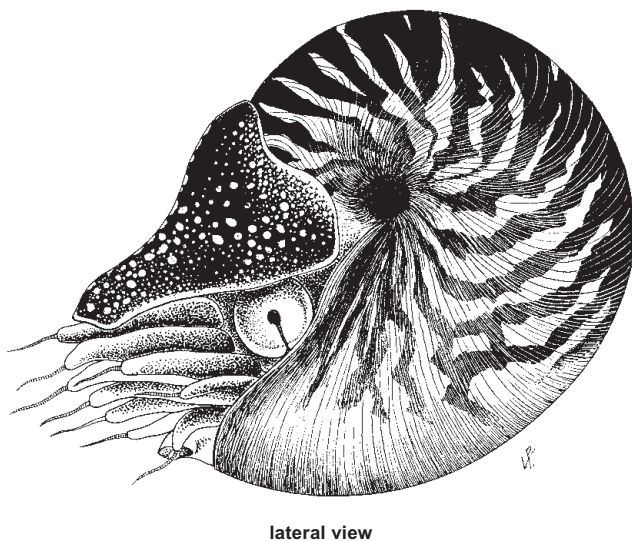


Fig. 44 Nautilidae (*Nautilus*)

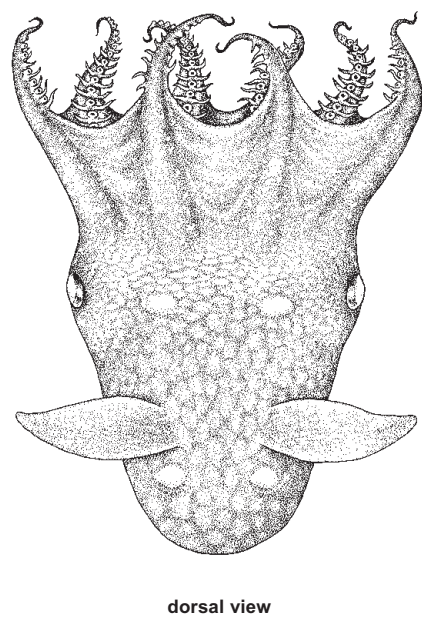


Fig. 45 Vampyroteuthidae (*Vampyroteuthis*)

- 5a. Internal shell calcified, coiled, chambered **Family Spirulidae** (Fig. 46)
- 5b. Internal shell calcified, straight, laminate, chalky **Family Sepiidae** (Fig. 47)
- 5c. Internal shell (gladius) chitinous (except *Euprymna*); one only or both dorsal arms or one dorsolateral arm hectocotyized **Family Sepiolidae** (Fig. 48)
- 5d. Internal shell (gladius) absent. → 6

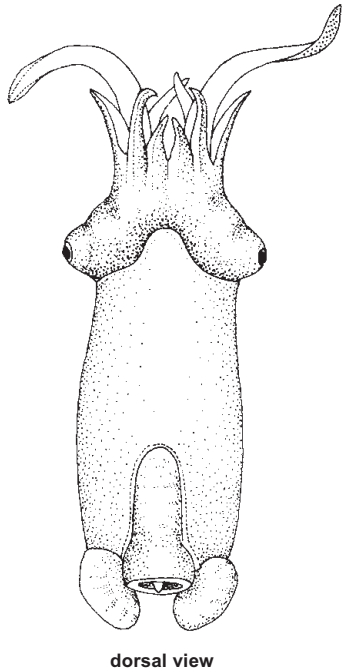


Fig. 46 Spirulidae (*Spirula*)

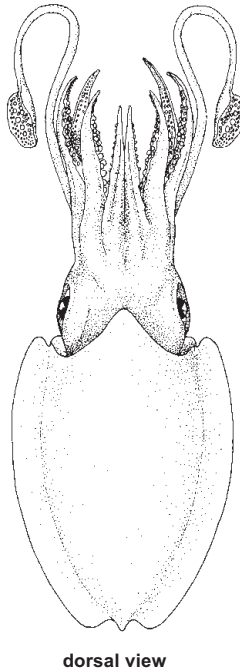


Fig. 47 Sepiidae (*Sepia*)

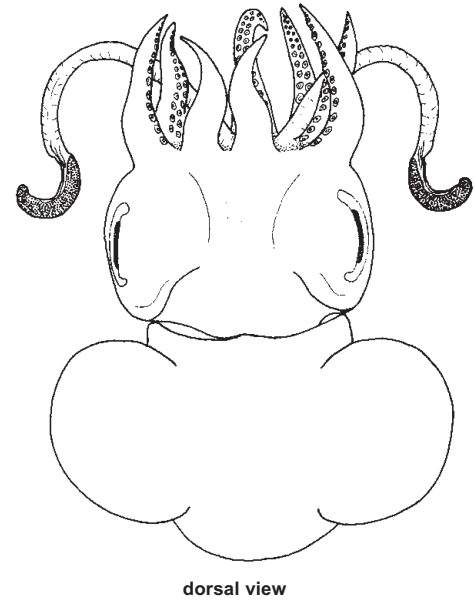


Fig. 48 Sepiolidae (*Rossia*)

- 6a. Left ventral arm hectocotyized; dorsal border of mantle fused with head **Family Sepiadariidae** (Fig. 49)
- 6b. Both ventral arms hectocotyized; dorsal border of mantle free (unfused) from head **Family Idiosepiidae** (Fig. 50)

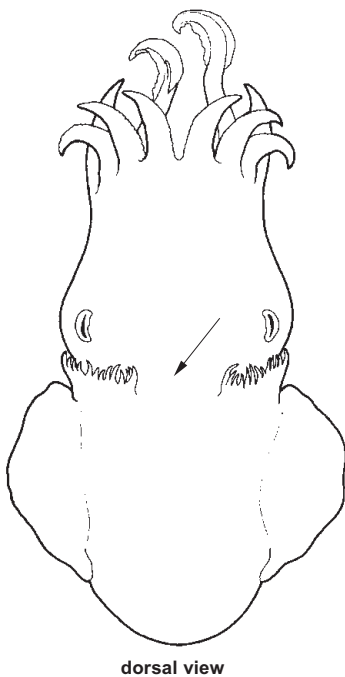


Fig. 49 Sepiadariidae (*Sepioloidea*)

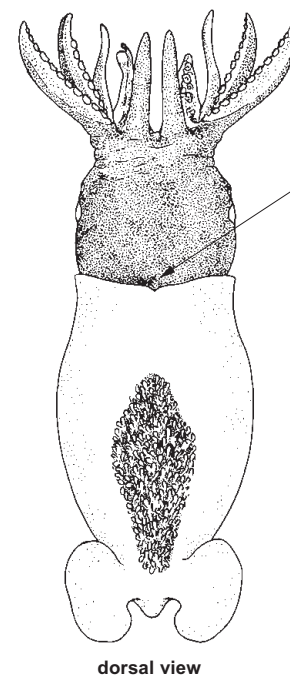


Fig. 50 Idiosepiidae (*Idiosepius*)

- 7a. Eye covered by transparent membrane (cornea) (Fig. 51a)
 **Myopsid squids** → **8**
- 7b. Eye without cornea; lens in open contact with seawater (Fig. 51b)
 **Oegopsids squids**^{1/} → **9**

- 8a. Four longitudinal rows (series) of suckers on manus of tentacular clubs; fins united at posterior end of mantle; medial posterior border of fins concave (Fig. 52)
 **Family Loliginidae**
- 8b. Two longitudinal rows (series) off suckers on manus of tentacular clubs; fins not united at posterior end of mantle; medial posterior borders of fins convex (Fig. 53)
 **Pickfordiateuthis**^{2/}

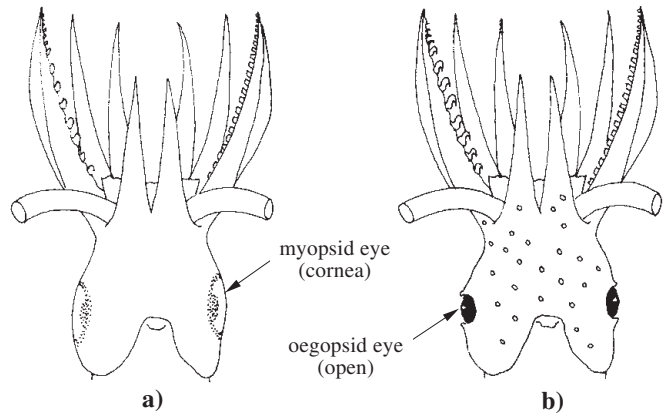


Fig. 51

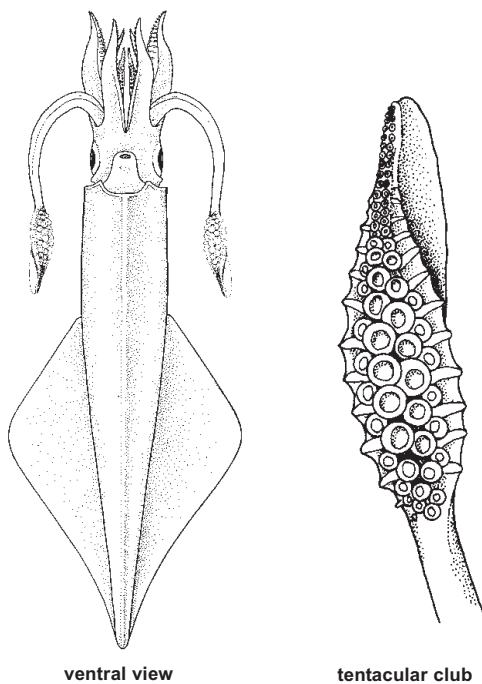


Fig. 52 Loliginidae (*Loligo*)

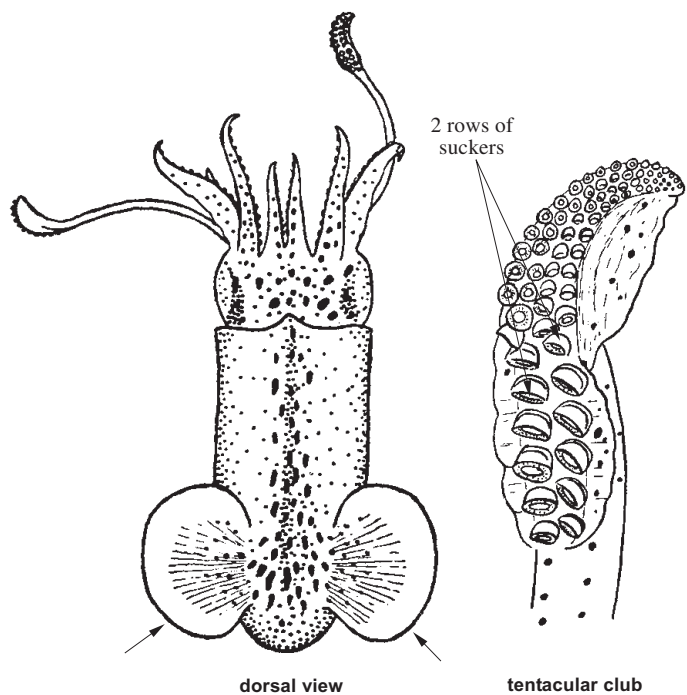


Fig. 53 Pickfordiateuthidae (*Pickfordiateuthis*)

- 9a. Funnel free from mantle; funnel-mantle locking apparatus present → **10**
- 9b. Funnel fused to mantle on each side^{3/}; no funnel-mantle locking apparatus present → **35**

^{1/} A new family of oegopsid squid has been recognized from Australian waters by C.C. Lu (personal communication). The description for publication is currently in press.

^{2/} *Pickfordiateuthis*, the sole genus in a formally recognized family, recently has been placed in the family Loliginidae; it is included in the Key to indicate its unique characters within the Loliginids.

^{3/} Fusion of the mantle to the funnel also occurs in adults of two Ommastrephid species: *Sthenoteuthis oualaniensis* and *Eucleoteuthis luminosa*.

- 10a. Funnel-locking apparatus a simple, straight groove and ridge^{1/} (Fig. 54) → 11
- 10b. Funnel-locking apparatus not a simple, straight groove and ridge → 28

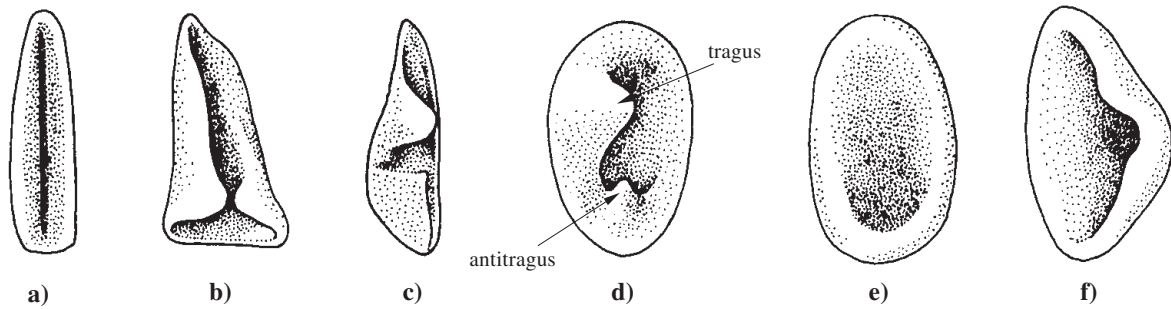


Fig. 54 Funnel-locking apparatus

- 11a. Arms with hooks or with suckers in 4 longitudinal rows on proximal half of ventral arms → 12
- 11b. Arms without hooks and with suckers in 2 longitudinal rows on proximal half of ventral arms → 16

- 12a. Armature (suckers, hooks) of arms in 2 rows → 13
- 12b. Armature (suckers, hooks) of arms in 4 rows (Fig. 55). **Family Gonatidae**

- 13a. Tentacles and clubs absent in adults although present in larvae or occasionally in juveniles (*Taningia*) but, when present, always with rudimentary clubs armed with few suckers (Fig. 56) **Family Octopoteuthidae**
- 13b. Tentacles present; fully developed clubs present (Fig. 57) → 14

- 14a. Photophores on viscera and on mantle or surface of head or arms **Family Pyroteuthidae (Fig. 57)**
- 14b. Photophores on mantle and surface of head and arms but not on viscera → 15

armature elements (suckers and hooks) in 4 rows

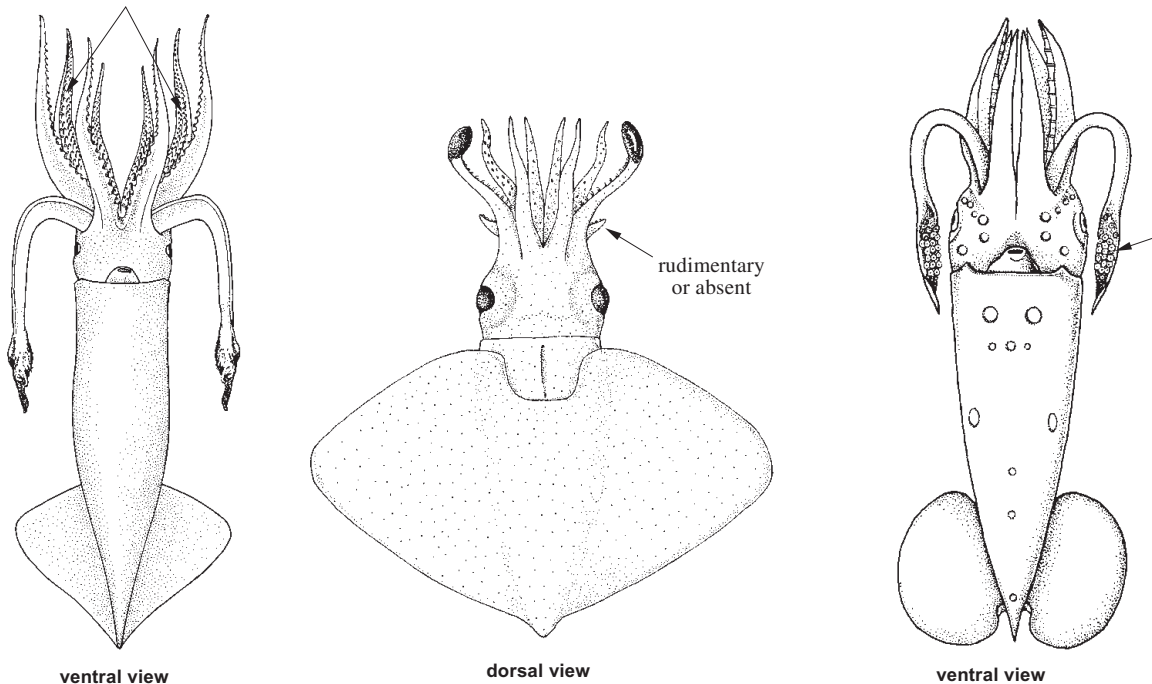


Fig. 55 Gonatidae (*Gonatus*) Fig. 56 Octopoteuthidae (*Taningia*) Fig. 57 Pyroteuthidae (*Pterygioteuthis*)

^{1/} The classification 'simple and straight' includes some locking apparatuses that show considerable variation. For example, in the Octopoteuthidae and the Histiotteuthidae the central groove is fairly broad and may curve slightly. The homogeneity of this classification becomes apparent when this type of locking cartilage is compared to the more highly specialized types (Fig. 54).

- 15a. Photophores on tentacles but not on eyeballs **Family Ancistrocheiridae (Fig. 58)**
 15b. Photophores on ventral eyeballs but not on tentacles. **Family Enoploteuthidae (Fig. 59)**
- 16a. Buccal membrane connectives attach to ventral sides of arms IV (Fig. 60b) → **17**
 16b. Buccal membrane connectives attach to dorsal sides of arms IV^{1/} (Fig. 60a) → **23**

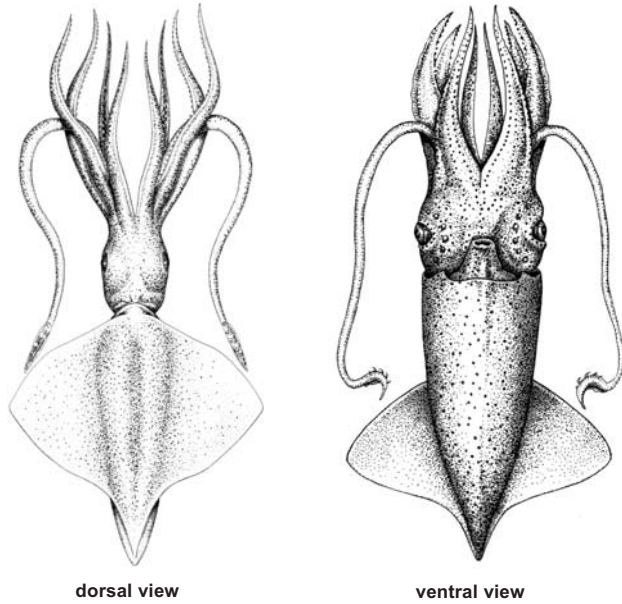


Fig. 58 *Ancistrocheiridae* (*Ancistrocheirus*) **Fig. 59** *Enoploteuthidae* (*Abralia*)

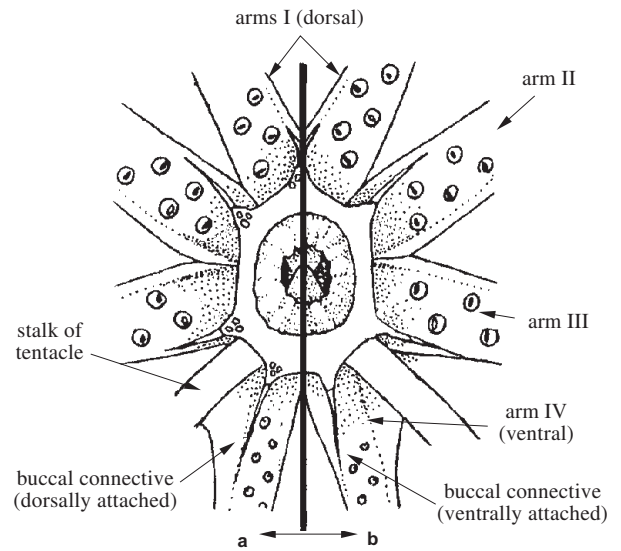


Fig. 60 Oral view

- 17a. Hooks present on tentacular clubs (Fig. 61a and b); tentacles and clubs are lost in mature females (Fig. 61c) **Family Onychoteuthidae**
 17b. Hooks lacking on tentacular clubs → **18**
- 18a. Cartilaginous scales present on mantle (may be minute); tentacular clubs with 4 longitudinal rows of suckers → **19**
 18b. Cartilaginous scales lacking; tentacular clubs with more than 4 longitudinal rows of suckers on some areas → **20**

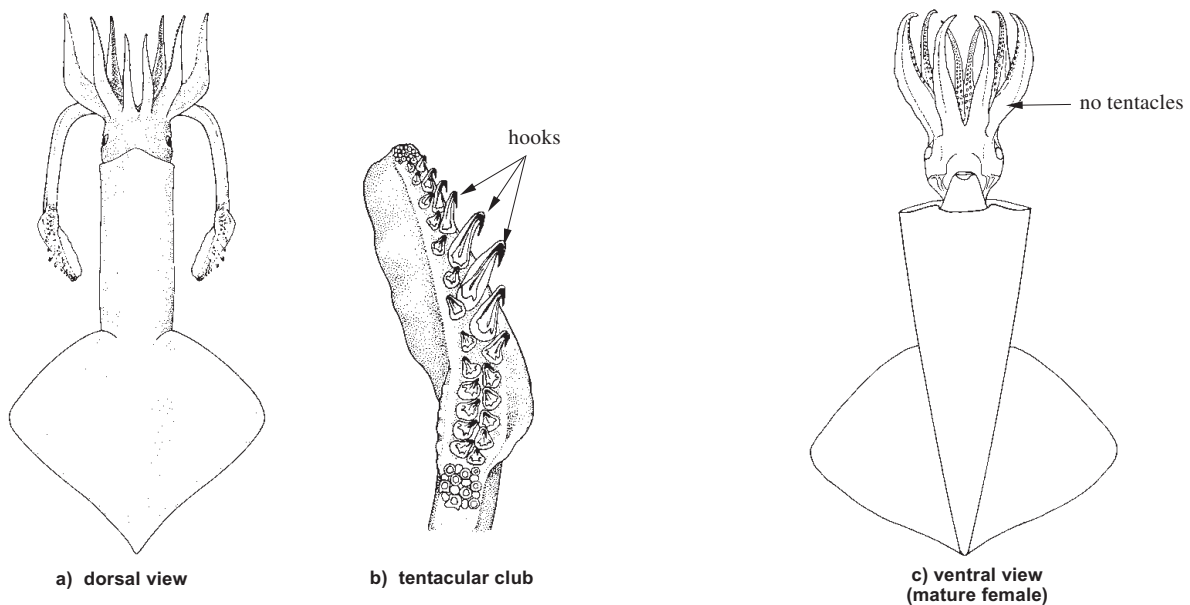


Fig. 61 *Onychoteuthidae* (*Onychoteuthis*)

^{1/} This character is difficult to detect in some histioteuthids that have secondary modifications to the buccal membrane connectives.

- 19a. Tentacles present with numerous laterally compressed club suckers **Family Pholidoteuthidae** (Fig. 62)
 19b. Tentacles lost in adults; tentacles in juveniles small and weak, with a few (about 6) poorly differentiated suckers **Family Lepidoteuthidae** (Fig. 63)

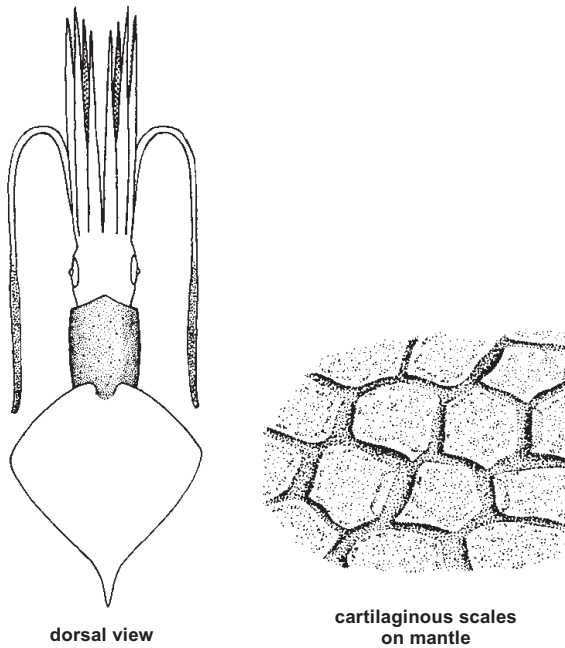


Fig. 62 Pholidoteuthidae (*Pholidoteuthis*)

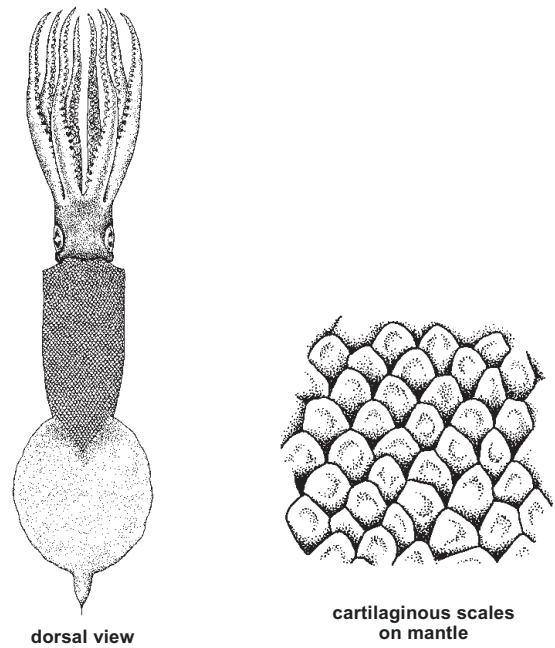


Fig. 63 Lepidoteuthidae (*Lepidoteuthis*)

- 20a. Fin nearly as long as mantle, supported by strong, transverse, muscular ribs; minute suckers present on oral surface of buccal lappets (Fig. 64) **Family Ctenopterygidae**
 20b. Fins less than half the body length and without supporting ribs; no suckers on buccal lappets → 21
- 21a. Tentacular clubs with 6 uniform longitudinal rows of suckers; a long, spike-like tail present greater than fin length (Fig. 65) **Family Batoteuthidae**
 21b. Tentacular clubs with 2 or 4 longitudinal rows of suckers → 22

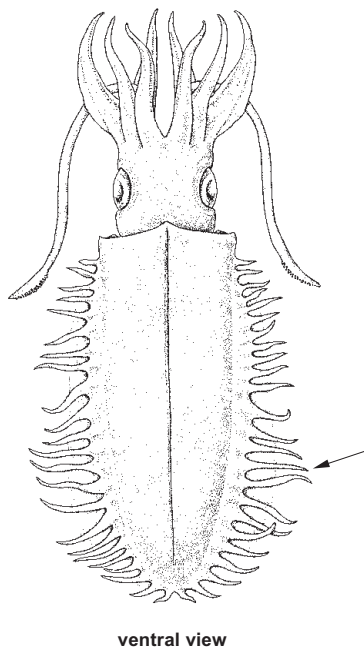


Fig. 64 Ctenopterygidae (*Ctenopteryx*)

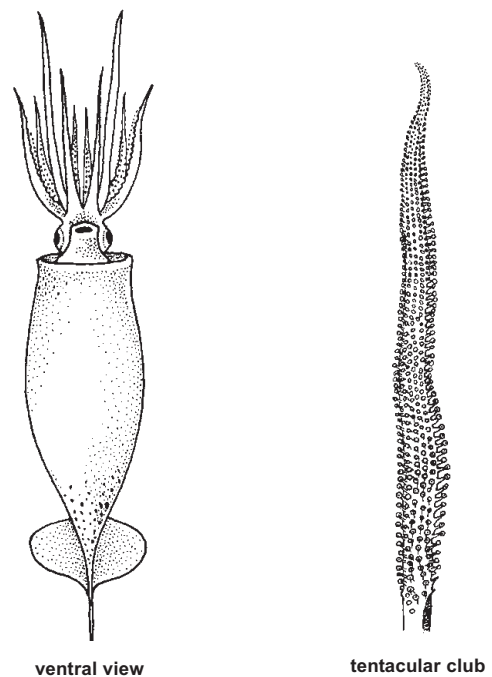


Fig. 65 Batoteuthidae (*Batoteuthis*)

- 22a. Tentacular clubs with 4 longitudinal rows of suckers on distal portion, numerous rows on proximal portion; no long, spike-like tail (Fig. 66) **Family Brachioteuthidae**
- 22b. Tentacular clubs with 2 longitudinal rows of very widely spaced, tiny suckers; mantle broad, bluntly rounded posteriorly; fin short, wide, transversely oval (Fig. 67) **Family Walvisteuthidae**

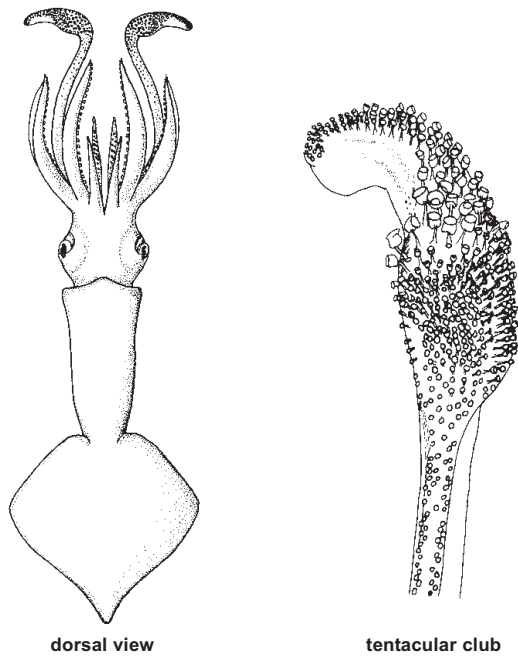


Fig. 66 Brachioteuthidae (*Brachioteuthis*)

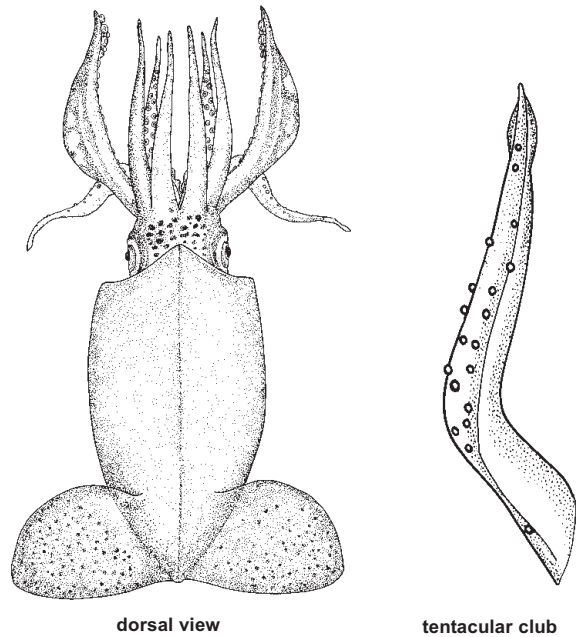


Fig. 67 Walvisteuthidae (*Walvisteuthis*)

- 23a. Ventral surface of eye with a row of photophores; buccal membrane with 8 separate lappets (Fig. 68) **Family Lycoteuthidae**
- 23b. No photophores on eyes; buccal membrane with 7 lappets or less → 24
- 24a. Surface of mantle, head and arms covered with numerous photophores (usually large and distinct) (Fig. 69) **Family Histioteuthidae**
- 24b. Surface of mantle and head without photophores (arms may have a few photophores) → 25

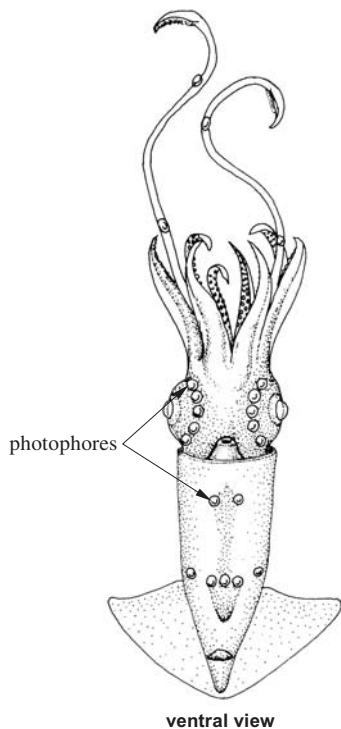


Fig. 68 Lycoteuthidae (*Lycoteuthis*)

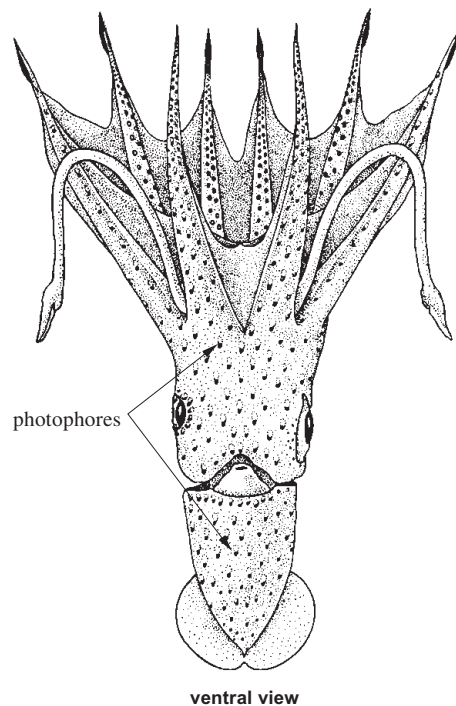


Fig. 69 Histioteuthidae (*Histioteuthis*)

- 25a. Minute suckers present on oral surface of buccal membrane (Fig. 70) **Family Bathyteuthidae**
 25b. No suckers on oral surface of buccal lappets → 26

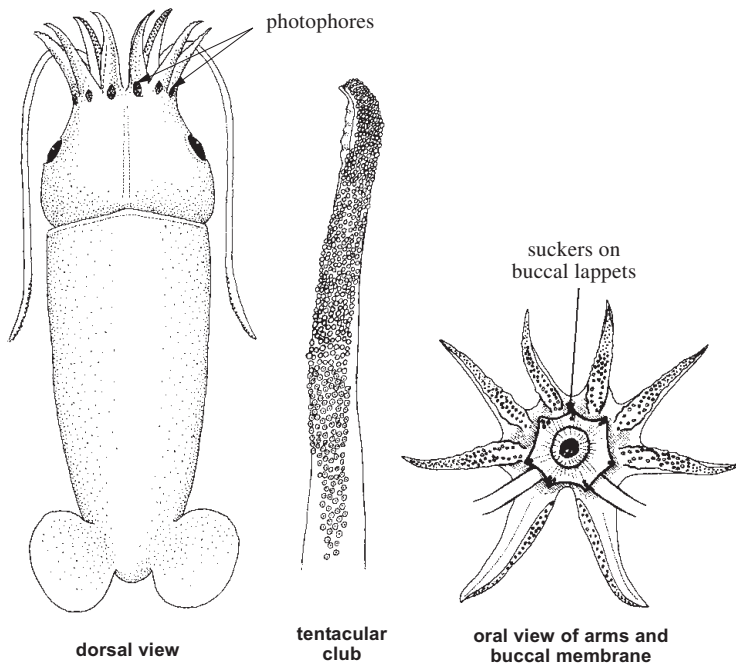


Fig. 70 Bathyteuthidae (*Bathyteuthis*)

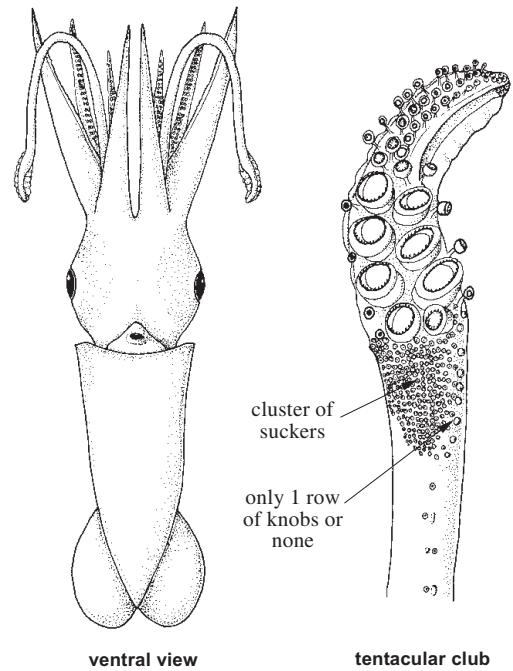


Fig. 71 Neoteuthidae (*Alluroteuthis*)

- 26a. Many small to minute suckers (or suckers and knobs) at proximal end of manus (Figs 71 and 72) → 27
 26b. No cluster of small suckers at proximal end of manus (Fig. 73) **Family Psychroteuthidae**

- 27a. Posterior borders of fins slightly convex; carpal knobs in a single dorsal row or absent; adults attain small size (Fig. 71) **Family Neoteuthidae**
 27b. Posterior borders of fins concave; carpal knobs in a cluster alternating with carpal suckers; adults attain gigantic size (Fig. 72) **Family Architeuthidae**

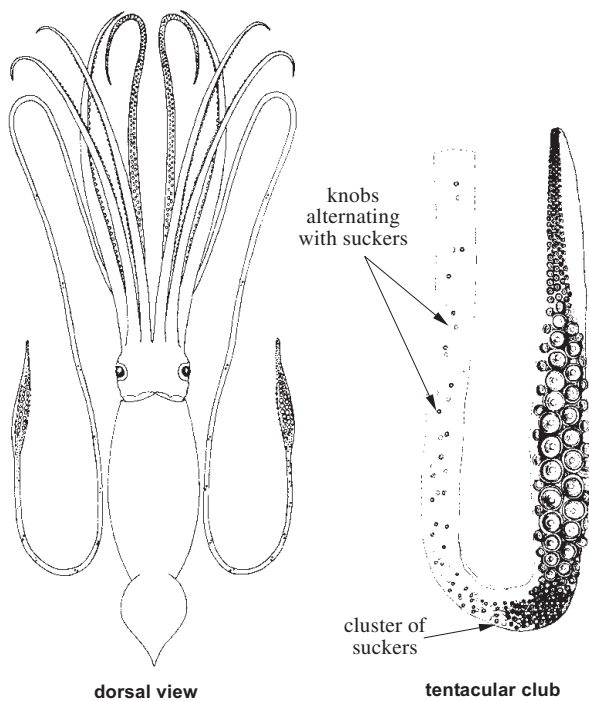


Fig. 72 Architeuthidae (*Architeuthis*)

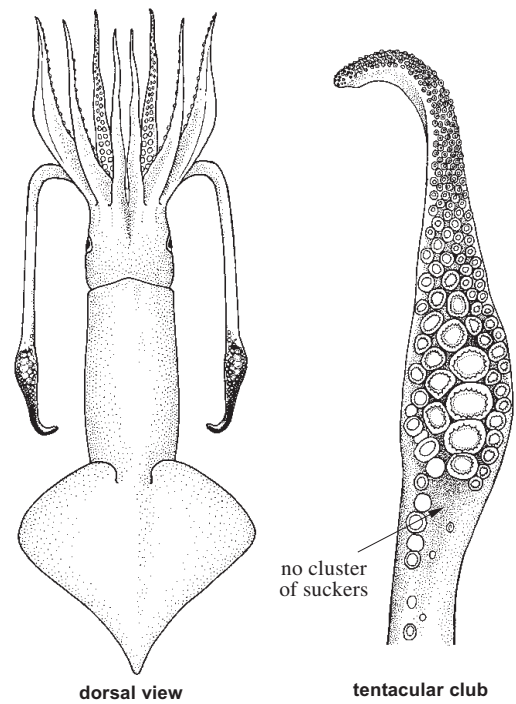


Fig. 73 Psychroteuthidae (*Psychroteuthis*)

- 28a. Funnel-locking cartilage with a longitudinal and a transverse groove \perp -shaped or \lrcorner -shaped (Fig. 54b and c) \rightarrow 29
- 28b. Funnel-locking cartilage oval, triangular, or oval with inward projecting knobs (Fig. 54d, e and f) \rightarrow 30

- 29a. Funnel-locking cartilage with a longitudinal groove crossed by a transverse groove at its posterior end, \perp -shaped; fins less than 60% of mantle length (Fig. 74) **Family Ommastrephidae**
- 29b. Funnel-locking cartilage with a longitudinal groove from which a shorter groove branches medially, \lrcorner -shaped; fins more than 80% of mantle length (Fig. 75) **Family Thysanoteuthidae**

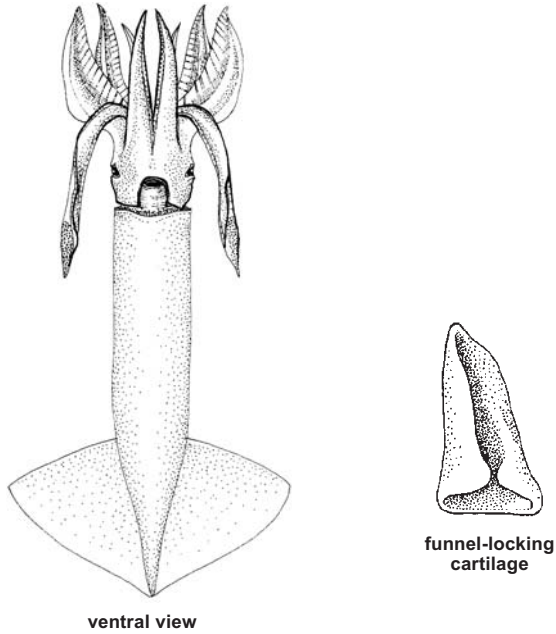


Fig. 74 Ommastrephidae (*Ommastrephes*)

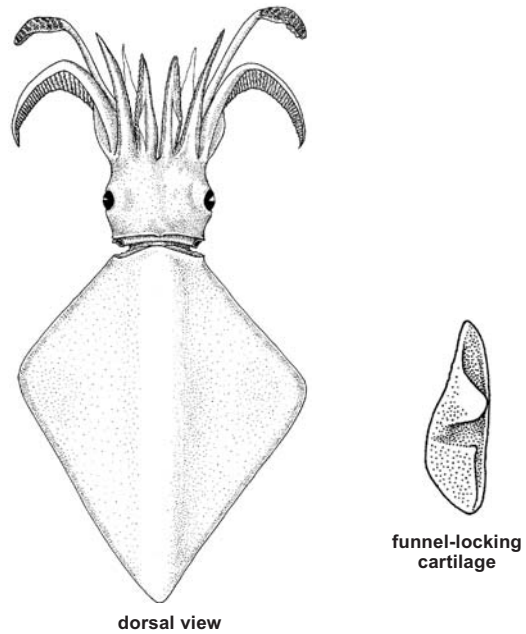


Fig. 75 Thysanoteuthidae (*Thysanoteuthis*)

- 30a. Funnel-locking cartilage oval with 1 or 2 knobs directed toward the centre of the concavity (Fig. 54d) \rightarrow 31
- 30b. Funnel-locking cartilage oval or subtriangular, without knobs (Fig. 54e and f) \rightarrow 32

- 31a. Club with only 4 longitudinal rows (series) of suckers (Fig. 76) **Family Chiroteuthidae**
- 31b. Club with many (more than 15) longitudinal rows (series) of minute suckers (Fig. 77) . **Family Mastigoteuthidae**

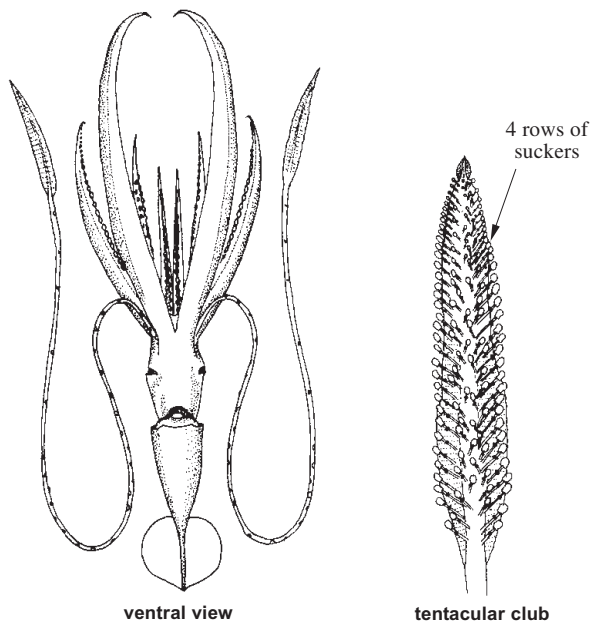


Fig. 76 Chiroteuthidae (*Chiroteuthis*)

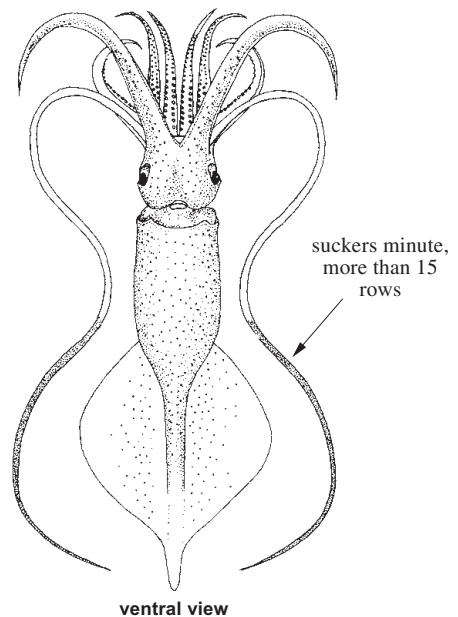


Fig. 77 Mastigoteuthidae (*Mastigoteuthis*)

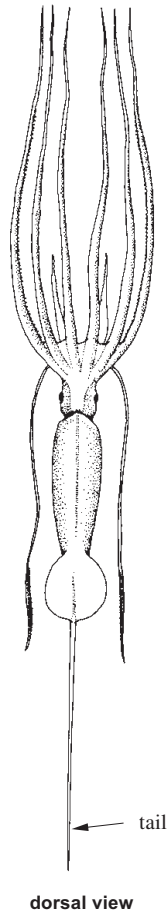
- 32a. Suckers on arms in 4 to 6 longitudinal rows (series) → 33
- 32b. Suckers on arms in 2 rows; tail short (less than half of mantle length) or absent → 34

33a. Six longitudinal rows of suckers on arms I to III, 4 longitudinal rows of suckers on arms IV; tail extremely long (greater than mantle length), as a spike-like extension of the gladius; no fins on tail (Fig. 78) **Family Joubiniteuthidae**

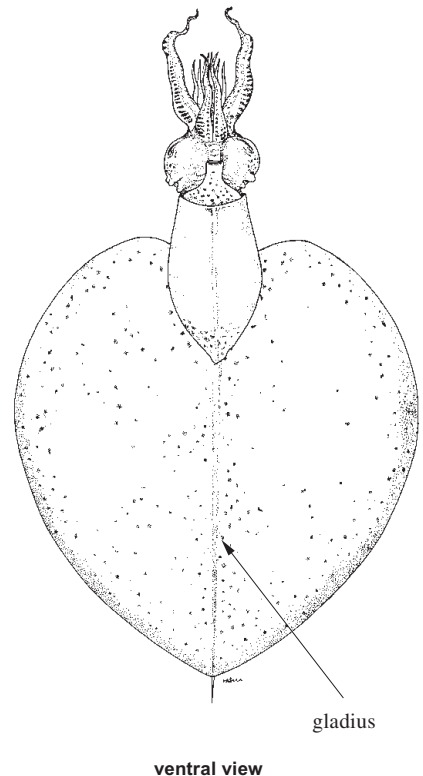
33b. Three or 4 longitudinal rows of suckers proximally on all arms; fins terminal, extremely long and broad, extend far posterior to mantle; gladius incorporated in fins to posterior tip (Fig. 79) **Family Magnapinnidae**

34a. Suckers on tentacular club in 4 longitudinal rows (series); mantle free dorsally (Fig. 80) . . **Family Cycloteuthidae**

34b. Suckers on tentacular club in 8 or more longitudinal rows (series); mantle fused dorsally to head (Fig. 81) **Family Promachoteuthidae**



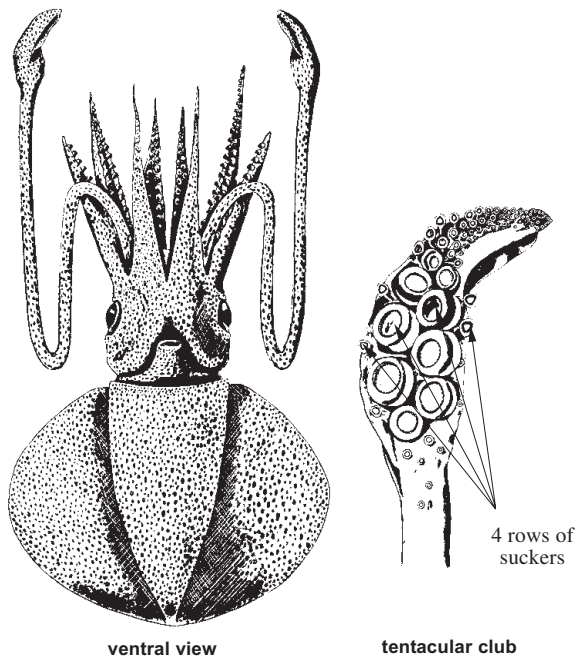
dorsal view



ventral view

Fig. 78
Joubiniteuthidae
(*Joubiniteuthis*)

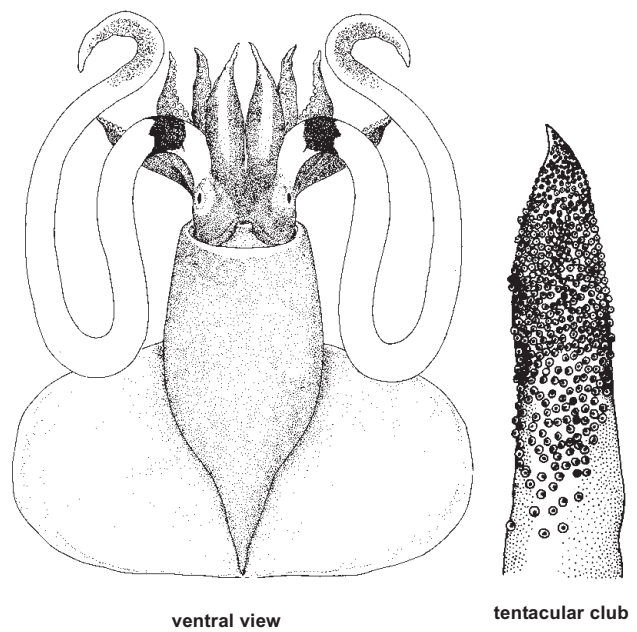
Fig. 79 Magnapinnidae
(*Magnapinna*)



ventral view

tentacular club

Fig. 80 Cycloteuthidae (*Discoteuthis*)

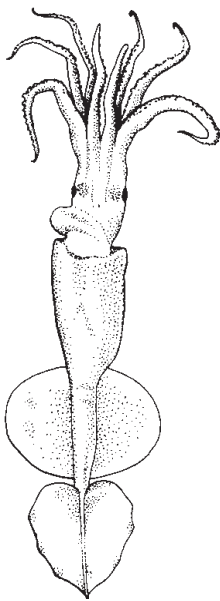


ventral view

tentacular club

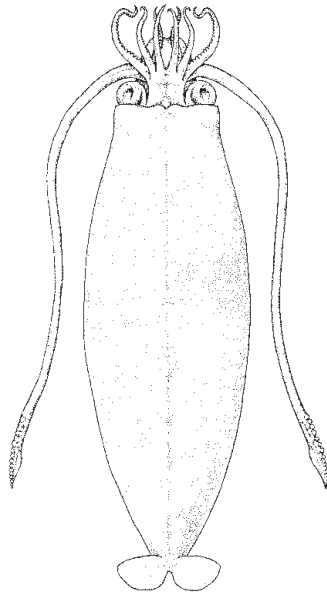
Fig. 81 Promachoteuthidae (*Promachoteuthis*)

- 35a. Mantle free dorsally, articulates with head by ridge and groove (Fig. 82) **Family Grimalditeuthidae**
 35b. Mantle fused dorsally with head (Fig. 83) **Family Cranchiidae**
- 36a. Fins present on mantle; cirri on arms **Cirrate Octopods** → 37
 36b. Fins absent and cirri absent **Incirrate Octopods** → 39
- 37a. Web attaches directly to arms **Family Opisthoteuthidae** (Fig. 84)
 37b. Contractile intermediate membrane ('secondary web') present between each arm and the primary web → 38



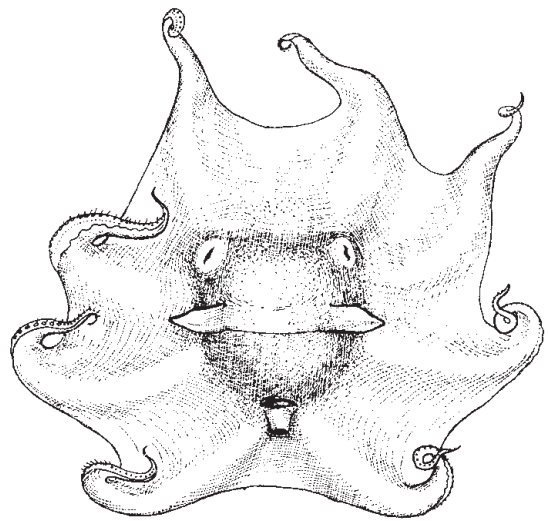
ventral view

Fig. 82 Grimalditeuthidae (*Grimalditeuthis*)



dorsal view

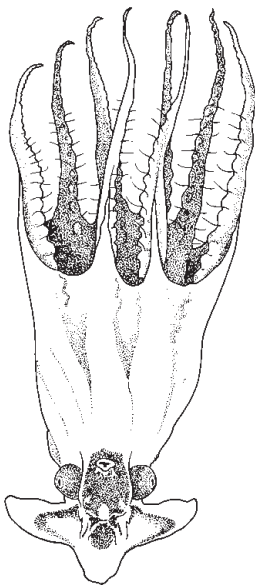
Fig. 83 Cranchiidae (*Helicocranchia*)



top view

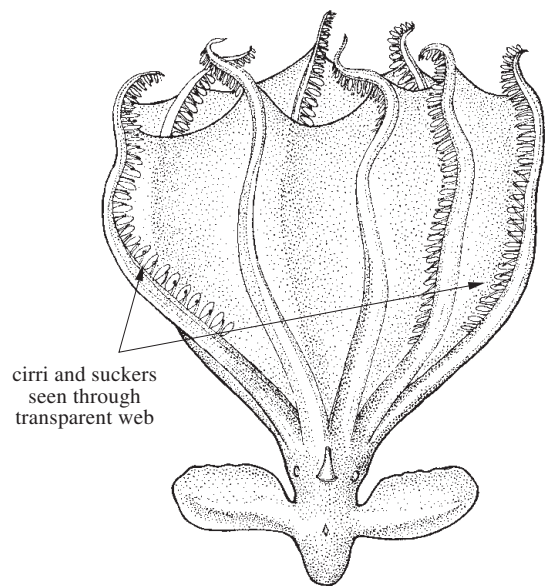
Fig. 84 Opisthoteuthidae (*Opisthoteuthis*)

- 38a. Shell (cartilaginous fin support) simple, U-shaped **Family Stauroteuthidae** (Fig. 85)
 38b. Shell more complex, with expanded fin-attachment areas **Family Cirroteuthidae** (Fig. 86)



dorsal view

Fig. 85 Stauroteuthidae (*Stauroteuthis*)



ventral view

Fig. 86 Cirroteuthidae (*Cirrothauma*)

- 39a. Muscle tissue of body gelatinous, often transparent in life → 40
- 39b. Muscle tissue of body firm (may be covered by gelatinous subdermal layer) → 43

- 40a. Suckers biserial distal to edge of web (Fig. 87). **Family Alloposidae**
- 40b. Suckers uniserial along entire length of arms (Fig. 88) → 41

- 41a. Eyes tubular, mantle fused to funnel base forming 2 openings to mantle cavity (Fig. 89) . **Family Amphitretidae**
- 41b. Eyes not tubular, though not necessarily round, single opening to mantle cavity → 42

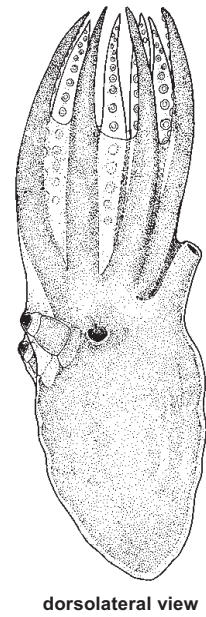
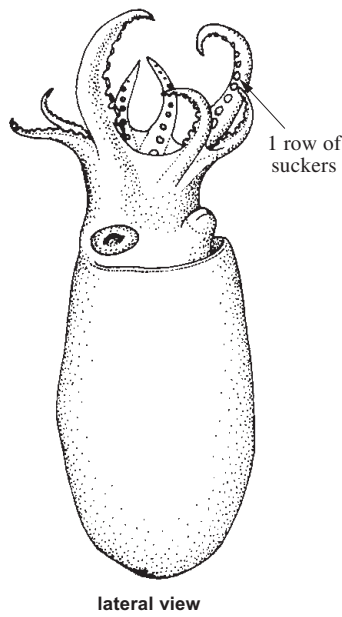
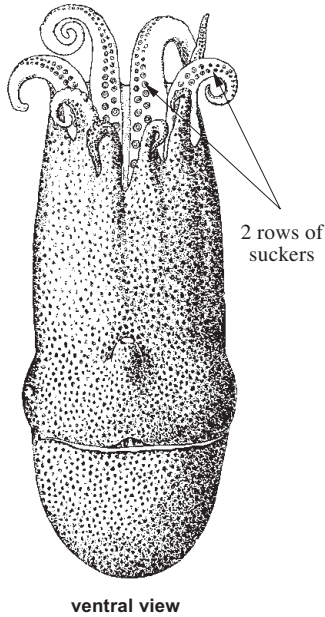


Fig. 87 Alloposidae (*Alloposus*) **Fig. 88** Bolitaenidae (*Japetella*) **Fig. 89** Amphitretidae (*Amphitretus*)

- 42a. Digestive gland very elongate, spindle-shaped, pointed at one end **Family Vitreledonellidae** (Fig. 90)
- 42b. Digestive gland oblong, not pointed at end **Family Bolitenidae** (Fig. 88)

- 43a. Funnel-locking apparatus absent; water pores on head absent; males not very much smaller than females, with left or right ventrolateral arm hectocotylized (never in pocket), with spoon-shaped, non-filamentous tip; females without dorsal arm flaps or permanent reticulate sculpturing of ventral mantle **Family Octopodidae** (Fig. 91)
- 43b. Funnel-locking apparatus present; dwarf males very much smaller than females; hectocotylus (left or right ventrolateral arm) temporarily coiled in sac below eye, with extremely long filamentous tip → 44

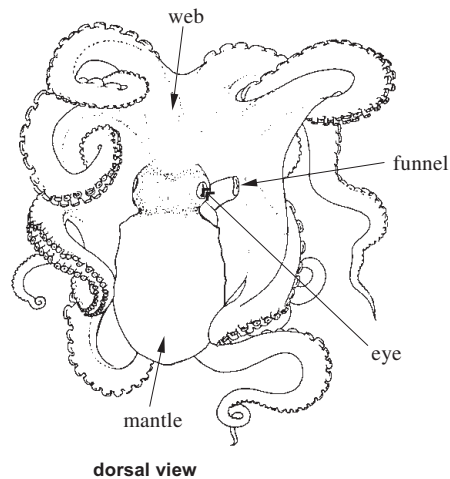
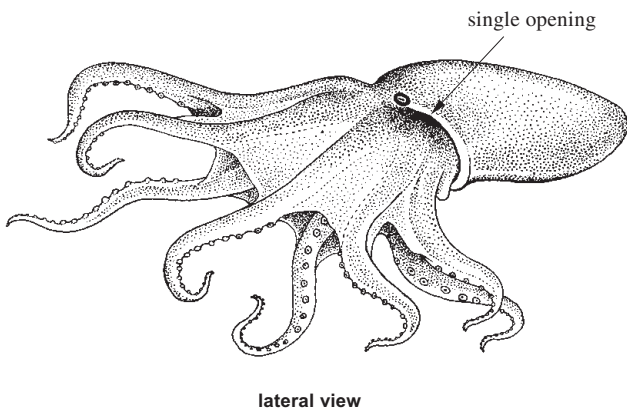


Fig. 90 Vitreledonellidae (*Vitreledonella*)

Fig. 91 Octopodidae (*Octopus*)

- 44a. Water pores present on head at bases of both dorsal and ventral arms; dorsal and dorsolateral arms of females joined by very deep, thin web **Family Tremoctopodidae (Fig. 92)**
- 44b. Dorsal water pores absent; web, when present, not as above → 45

- 45a. Females with broad, membranous flap that secretes and holds a thin, shell-like egg case; males with hectocotylus in non-stalked sac beneath eye. **Family Argonautidae (Fig. 93)**
- 45b. Females with permanent reticulate sculpturing on ventral mantle; dorsal (first) arms of females lack broad, membranous flap; no shell-like egg case; males with hectocotylus in stalked sac beneath eye (Fig. 94) . . . **Family Ocythoidae**

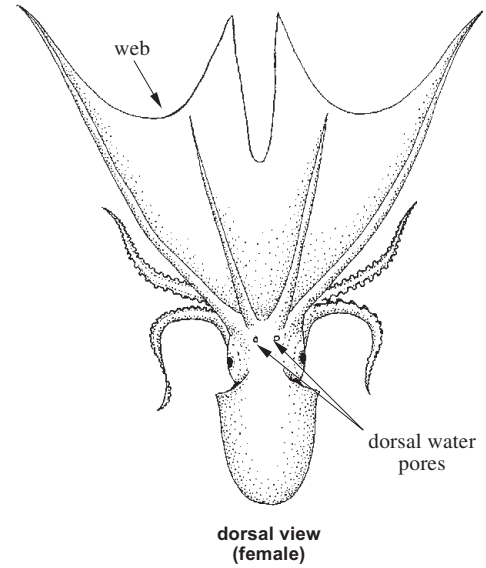


Fig. 92 Tremoctopodidae (*Tremoctopus*)

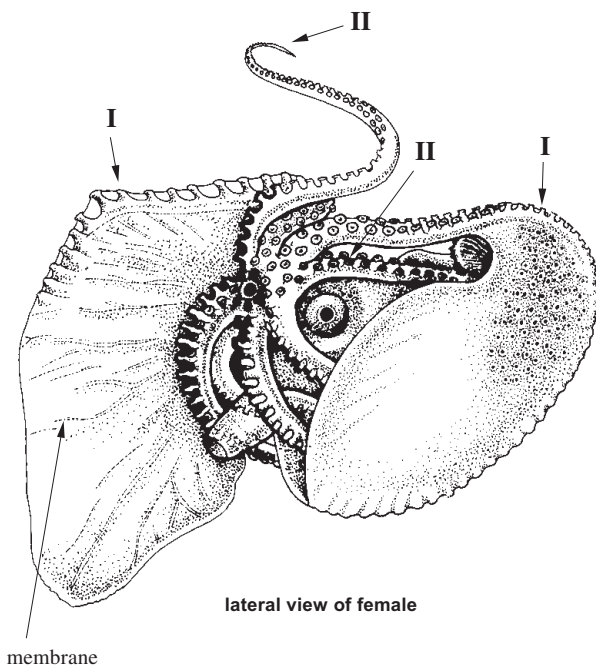


Fig. 93 Argonautidae (*Argonauta*)

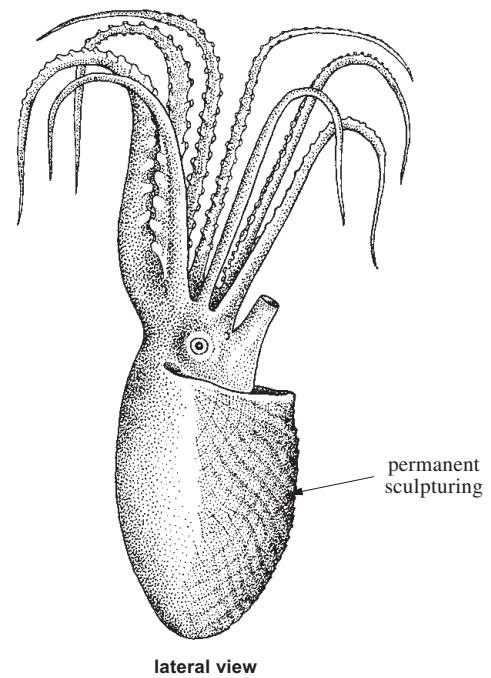


Fig. 94 Ocythoidae (*Ocythoe*)