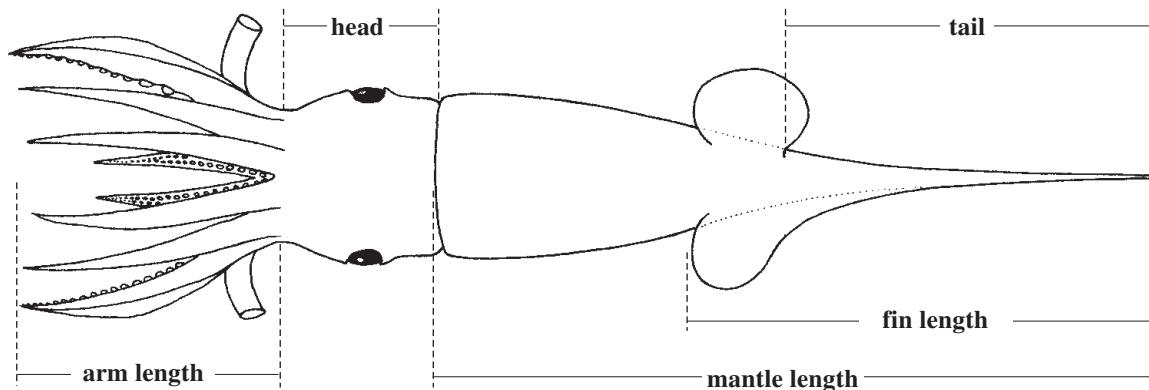
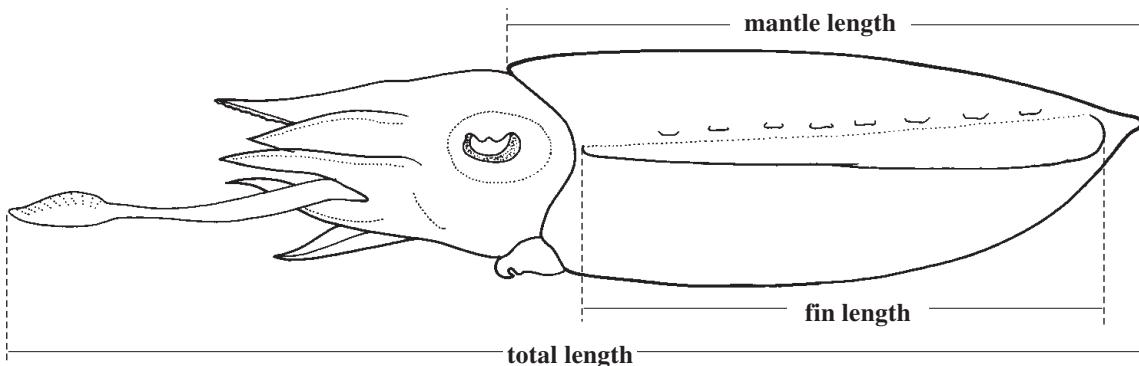


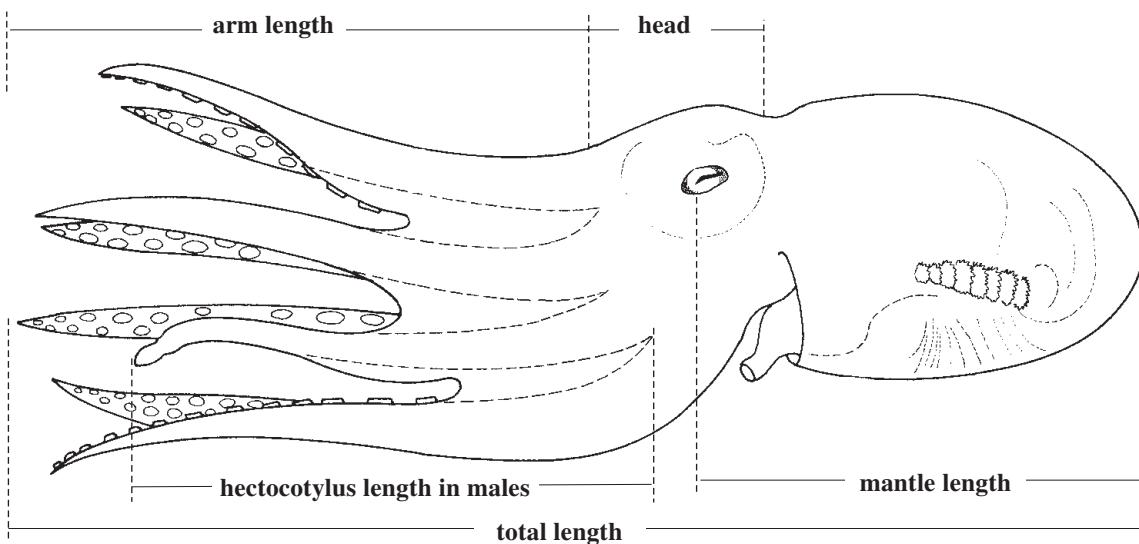
1.4 Illustrated Glossary of Technical Terms and Measurements



a) Schematic illustration of a squid



b) Schematic illustration of a cuttlefish



c) Schematic illustration of an octopus

Abdominal septum – Median septum that traverses the mantle cavity parallel to the body axis. It extends from the visceral mass to the ventral mantle wall. The ventral mantle artery runs along the dorsal edge of this septum.

Aboral – Away from or opposite to the mouth.

Abyssal – The great depths of the ocean: from 2 000 to 6 000 m.

Accessory nidamental glands – Glands of unknown function; consist of tubules containing symbiotic bacteria. Found in all **decapodiformes** except oegopsid squids.

Adult – A female that has mature eggs (these frequently are stored in the oviducts), or a male that has produced spermatophores (these are stored in Needham's sac).

Afferent blood vessel – Artery vessel carrying blood toward an organ.

Afferent nerve – Nerve carrying impulses toward the brain or specific ganglia.

Anal flaps – A pair of fleshy papillae involved in directing releases of ink, one flap situated at each side of the anus (Fig. 7).

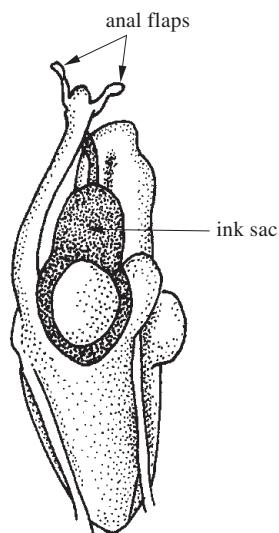


Fig. 7 Terminal portion of the digestive tract

Anal pads – Ovoid pads of unknown function, apparently glandular, one located on each side of the anus in some squids (e.g. bobtail squids).

Anterior – Toward the head-end or toward the arm-tips of cephalopods.

Anterior salivary glands – Glands on or in the buccal mass that aid in preliminary digestion.

Antitragus – Knob that projects inward from the posterior surface of the central depression in the funnel-locking cartilage of some squids (Fig. 8).

Anus – Terminal opening of the digestive tract in the anterior mantle cavity, sometimes extending to inside the funnel, through which digestive waste products, as well as ink, are expelled.

Apomorphic – Derived from a more ancestral condition. Loosely considered the 'advanced' condition.

Arm – One of the circumoral appendages of cephalopods. Arms are designated by the numbers I to IV, starting with I as the dorsal (or upper) pair. In **decapodiformes** each appendage of the fourth original pair is modified to form a tentacle. The second pair of arms is modified in vampires into a long filamentous structure. It has been lost in cirrate and incirrate octopods.

Arm formula – Comparative length of the 4 pairs of arms expressed numerically in decreasing order: the largest arm is indicated first and the shortest last, e.g. IV>III>II>I. If IV>III=II>I, then arm IV is the longest, followed by arm III which is the same size as arm II and both are longer than arm I. In octopods, the non-hectocotylized arm III is used in this formula.

Armature – The grappling structures of the arms and tentacular clubs, including suckers and/or hooks.

Bactritida – A fossil taxon that existed about 428 to 216 million years ago and is thought to be the ancestral stock of the Ammonoidea and Coleoidea.

Bathypelagic – The deep midwater region of the ocean.

Beak – One of the 2 chitinous jaws of cephalopods, bound in powerful muscles. The dorsal beak is referred to as the 'upper' beak and it inserts within the 'lower' (ventral) beak to tear tissue with a scissors-like cutting action.

Belemnoidea – A fossil group of cephalopods that is thought to be the sister group of the Coleoidea. Belemnoids are distinguished by the presence of hook-like structures on the arms rather than suckers.

Benthopelagic – A free-swimming animal that lives just above the ocean floor but rarely rests on the ocean floor.

Bilateral symmetry – The symmetry exhibited by an organism or an organ if only one plane can divide the animal structure into 2 halves that are mirror images of each other.

Bioluminescence – The production of light by living organisms, sometimes called 'living light'. The light is produced through a chemical reaction that generally takes place in complex organs called photophores or light organs.

Brachial – Pertaining to the arms.

Brachial crown – The combination of arms and tentacles that surround the mouth.

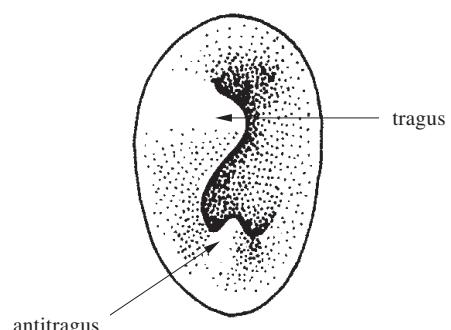


Fig. 8 Funnel-locking cartilage

Brachial lobe (of the brain) – The anteriormost part of the brain located ventral to the oesophagus. The large axial nerve cords that run down the centres of the arms connect to this lobe. The proper name is 'anterior suboesophageal mass'.

Brachial photophore – Photophore located on the arms.

Brachial pillar – A narrow, elongate anterior region on the paralarval or juvenile head of some families, between the eyes and the base of the brachial crown; especially well developed in young cranchiid squids.

Brain – Medial portion of the central nervous system that includes the suboesophageal and supraoesophageal masses but generally does not include the large optic lobes.

Branchial – Pertaining to the gills.

Branchial canal – A large opening at the base of each gill lamella and between the primary afferent and efferent blood vessels of the gill. A branchial canal is absent in nautiluses, cuttlefishes, bobtail squids, bottletail squids, pygmy squids, ram's horn squids, and cirrate octopods.

Branchial gland – Elongate or spheroidal gland adjacent and parallel to the gill attachment to the mantle wall.

Brooding – Incubation of eggs by the female. A characteristic feature of incirrate octopods, but also found in some squids (e.g. *Gonatidae*).

Buccal – Pertaining to the mouth.

Buccal connective – Thin muscular band that attaches the buccal support of the buccal membrane to the base of the adjacent arm. The position of attachment of the connective on the fourth arms was recognized in the early twentieth century as an important character for phylogenetic relationships among **decapodiformes** (Fig. 9).

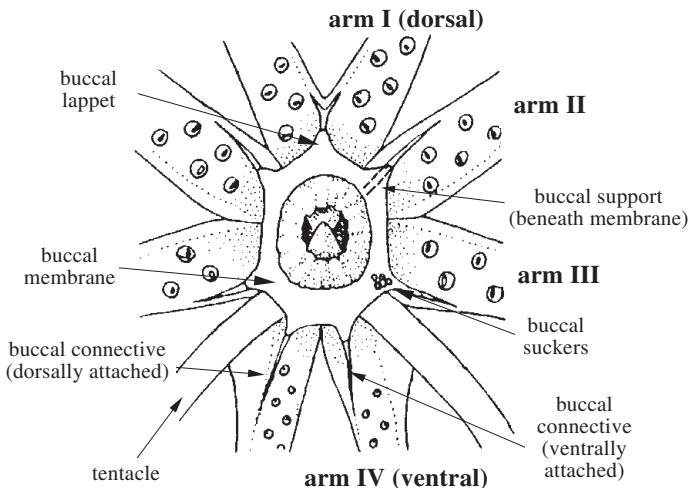


Fig. 9 Buccal anatomy of decapods

Buccal crown – Umbrella-like structure that surrounds the mouth and in turn is enveloped by the brachial crown. It consists of buccal supports and the buccal membrane. The buccal crown is present in most **decapodiformes** but absent from all **octopodiformes**.

Buccal lappet – A small, subtriangular flap at the tip of each buccal support of the buccal membrane; thought to be homologous with the inner ring of tentacles that surrounds the mouth of nautiluses. May bear suckers (Fig. 9).

Buccal mass – Muscular bulb at the anteriormost part of the digestive system that consists of the mouth, beaks, radula, muscles and pairs of salivary glands.

Buccal membrane – The muscular membrane that encircles the mouth like an umbrella (Fig. 9). It connects to the buccal supports to form the buccal crown. The pigmentation of the buccal membrane often differs from that of the adjacent oral surfaces of the arms.

Buccal membrane connectives – See buccal connective (Fig. 9).

Buccal suckers – Small suckers on the buccal lappets/membrane of some species (Fig. 9).

Buccal support – Muscular rod fused to buccal membrane as supporting rib (Fig. 9); 6 to 8 in number.

Buoyancy (neutral, positive, negative) – The tendency to float in seawater. A neutrally buoyant object does not rise or sink but maintains its position in the water; a positively buoyant object will rise and a negatively buoyant object will sink.

Bursa copulatrix – The wrinkled area present in most bobtail squids near the female genital opening for the attachment of the spermatophores; it is more differentiated in members of the subfamily **Sepiolinae** and forms a characteristic structure called 'bursa', which is used during copulation (Fig. 10). It differs conspicuously among species and can be used as a key character to identify *Sepiola* and *Sepietta* species females.

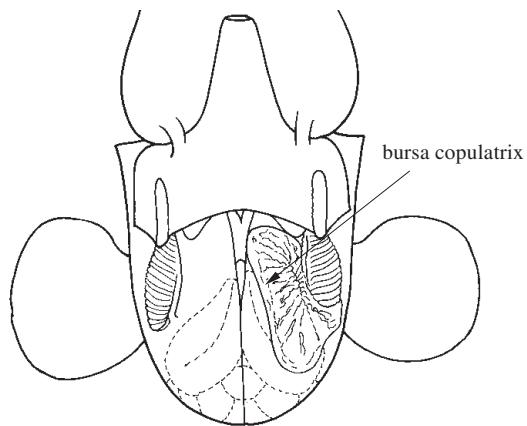


Fig. 10 Mantle cavity of female *Sepiola rondeletii* showing the bursa copulatrix

Caecal sac – The sac-like, thin-walled posterior portion of the caecum in the digestive tract that lacks the internal, ciliated leaflets characteristic of the anterior portion of the caecum.

Caecum – Region of the digestive tract of all cephalopods between the stomach and intestine. It is the primary site of food absorption.

Calcified – Chalky, calcareous material of calcium salts (calcium carbonate), formed by deposition.

Calamus – The conical papilla or projection at the base of the ligula on the hectocotylus of octopods, at the distal terminus of the sperm groove, distal to the last sucker (Fig. 11) (see **Ligula**).

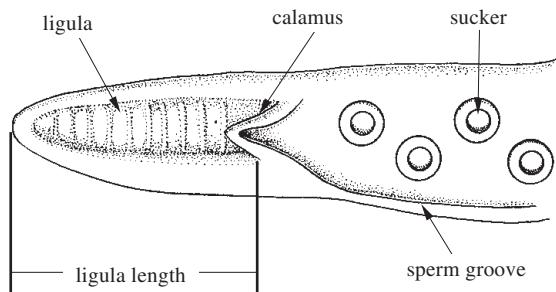


Fig. 11 Distal tip of hectocotylus of cirrate and incirrate octopods

Cambrian period – Oldest period of the modern geological timescale.

Carpal cluster (= Carpal pad) – An usually distinct group of suckers and knobs on the carpus of the tentacular club (Fig. 12).

Carpal knobs – Small, rounded, hemispherical, muscular protuberances on the carpus to which carpal suckers from the opposite club adhere during the locking of the clubs (Fig. 12).

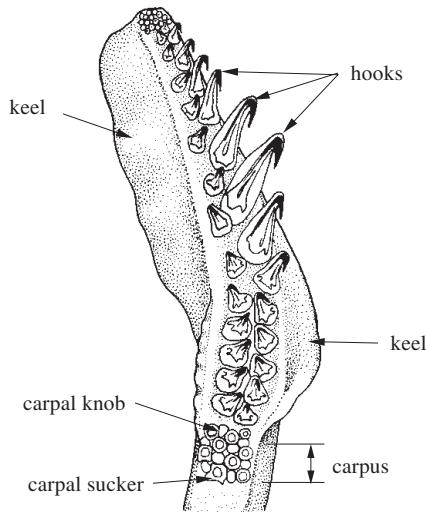


Fig. 12 Tentacular club of squid

Carpal suckers – Small suckers on the carpus of the club that adhere to the carpal knobs on the opposite carpus during the locking of the clubs (Fig. 12).

Carpus – The proximal zone of small suckers and knobs on the base of the tentacular club in some families (Fig. 12).

Cartilaginous structures or 'scales' – Cartilage-like structures in the skin of certain squids; may be overlapping and scale-like, or multifaceted platelets, knobs or papillae (Fig. 13).

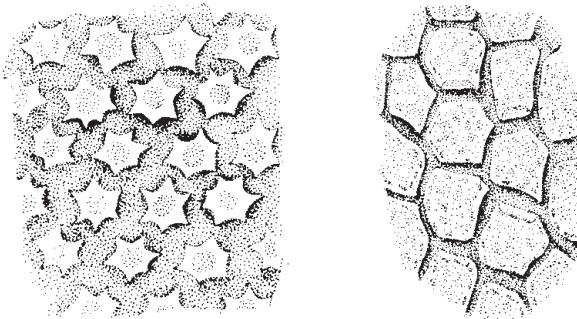


Fig. 13 Two types of cartilaginous structures or 'scales'

Cement body – Structure in the spermatophore that allows adhesion of the discharged spermatophore to a female (Fig. 38).

Cephalic cartilage – Cartilage-like tissue that envelops the posterior part of the brain of cephalopods and encompasses the statocysts. Anteriorly the cartilage thins and entwines with muscular tissue, which makes a well-defined limit difficult to distinguish. The cartilage has a large central foramen through which the oesophagus passes and minor foramina for nerves and blood vessels.

Cephalic vein – Large vein that drains blood from the head region; it lies along the ventral surface of the visceral sac, beside or dorsal to the intestine. The cephalic vein terminates by dividing into the two venae cavae, each of which passes through the 'kidney' (nephridium), the branchial heart and into the gill.

Cephalopoda – The class within the Mollusca characterized by bilateral symmetry, internal 'shell' or absence of shell (except nautiluses), anterior head appendages and funnel, posterior mantle, mantle cavity with organs, and shell and fins when present.

Character state – A particular condition of a taxonomic character. For example, the character 'sucker' may include the two states: sucker with a horny ring or sucker without a horny ring.

Chemotactile – Refers to chemical and touch sensitivity.

Chitin(ous) – A horny polysaccharide substance (fingernail-like) that forms the sucker rings, hooks and beaks.

Chorion – A tough secreted membrane that encapsulates the egg.

Chromatophores – Pigment-filled muscular sacs in the skin under individual nervous control that collectively provide the background colour, colour patterns and colour dynamics (play) of cephalopods.

Circumoral appendages – The eight arms of **decapodiformes** and **octopodiformes**, plus the two tentacles of **decapodiformes** and the very numerous arms of nautiluses. All arise from the head and encircle the mouth (Fig. 9).

Cirri (singular **cirrus**): 1) **Arm**: elongate, fleshy, finger-like papillae along the lateral edges of the oral surface of the arms, especially in cirrate octopods (Fig. 14).

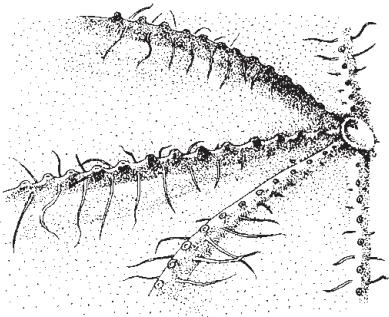


Fig. 14 Cirri on arms of cirrate octopods

2) **Body**: fleshy protuberances of the skin that can be erected as papillae, usually over the eyes (Fig. 15).

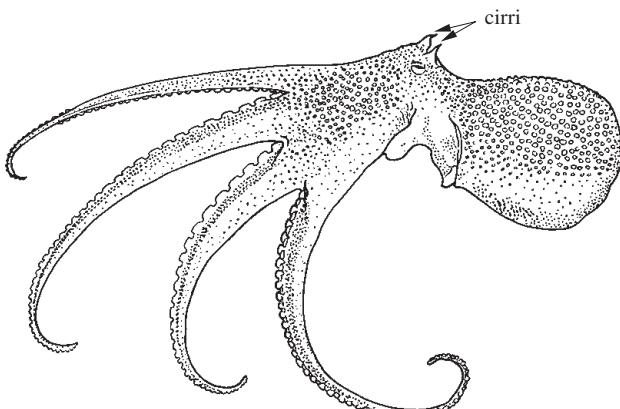


Fig. 15 Cirri dorsal to eyes of incirrate octopods

Club-fixing apparatus – Arrangement of suckers and matching knobs on the carpal region of the tentacular club that permits the two clubs to be locked together (Fig. 12).

Coelom – An internal body cavity of mesodermal origin that is lined by an epithelium. Cephalopods have two coeloms, the viscero-pericardial coelom and the nephridial coelom.

Collar – Muscular, flange-like structure that extends from the nuchal cartilage to the funnel; it forms a one-way valve that allows water to enter the mantle cavity but closes as the mantle contracts, thereby forcing exhalant water out through the funnel.

Cone, conus – The spoon-like, cup-like, spiked or simple conical posterior terminus of the gladius or cuttlebone; homologous to the phragmacone of fossil squids (Fig. 16).

Conus fields – The sides of the conus that continue anteriorly along the vanes of the gladius.

Cornea – Smooth, thin, turgid, transparent skin without muscles that covers the eyes to protect the eye lenses of incirrate octopods and some **decapods** (myopsids and sepioids) (Fig. 17).

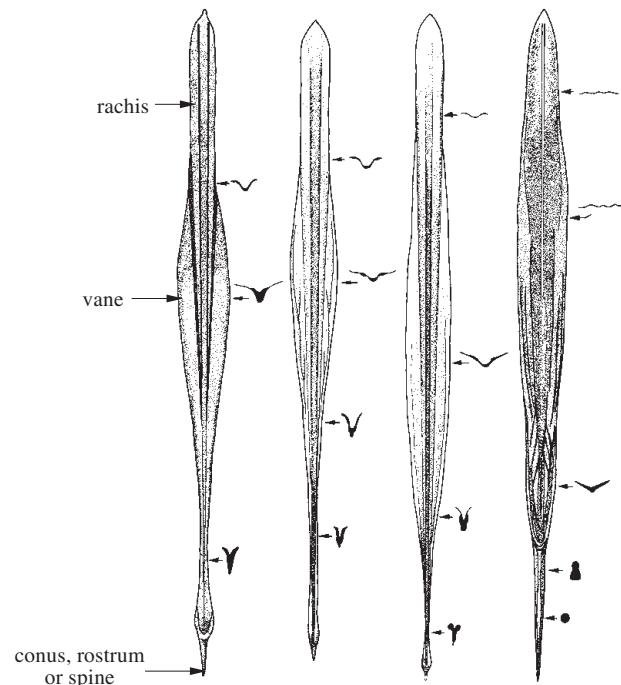


Fig. 16 Gladii of some squids

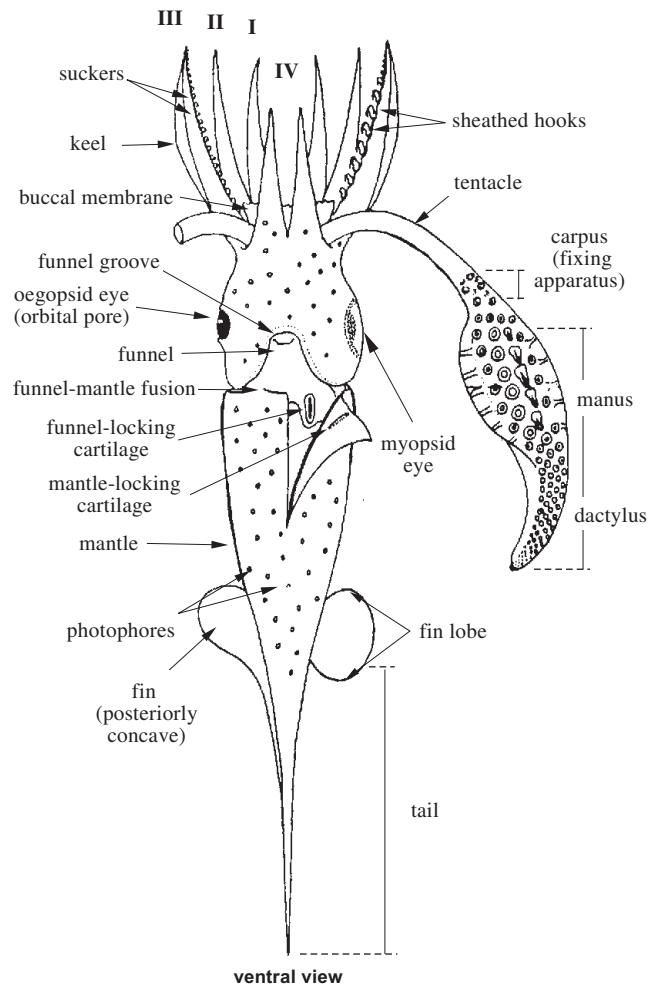


Fig. 17 A composite diagram illustrating basic squid features

Counter illumination – The production of bioluminescent light by an animal to conceal its silhouette against a lighted background. The process can allow an animal to become virtually invisible under dim directional light.

Cretaceous – The last period of the Mesozoic Era.

Crop – Expansion (i.e. a broadening or a side pocket) of the oesophagus for storing ingested food, prior to entering stomach. Present in **nautiluses** and most **octopods**.

Cusp – A point or projection on a tooth of the radula or on a cartilagenous tubercle in the skin.

Cuttlebone (= sepión) – The calcareous (chalky) oblong, supporting protective and buoyancy shield in the dorsal part of the mantle of cuttlefishes (Fig. 18).

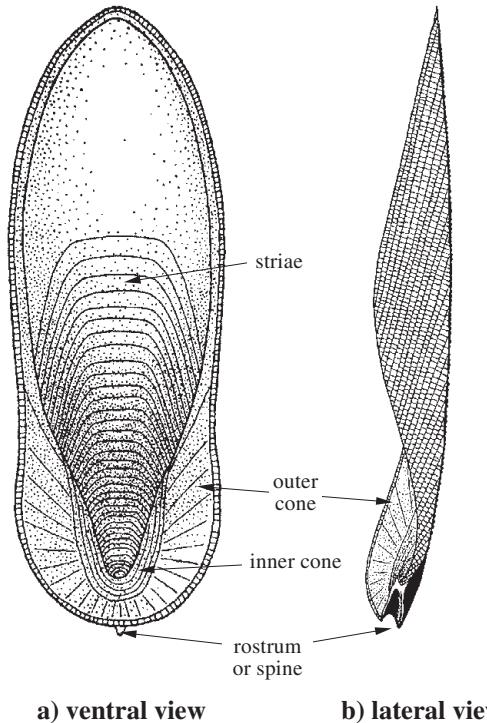


Fig. 18 Cuttlebone

Dactylus – The distal, terminal section of the tentacular club, often characterized by suckers of reduced size (Fig. 17).

Decapodiformes – Higher-level taxon that includes all 10-limbed cephalopods: cuttlefishes, bobtail squids, bottletail squids, pygmy squids, ram's horn squids, myopsid squids and oegopsid squids (Fig. 2 Living Cephalopods). Because of the long history of referring to these cephalopods by the common name '**decapods**', the latter is maintained as the common name for the **Decapodiformes**.

Decapods – Common name for the **Decapodiformes**.

Demersal – Organisms that live close to the ocean floor.

Diel vertical migration – Vertical animal migration during twilight periods. Many mesopelagic animals migrate to shallow depths at sunset, where they spend the night

feeding. Then they descend at sunrise from near-surface waters to spend the day hiding at greater, darker depths. Some animals migrate vertically over 1 000 m, others migrate less than 100 m.

Digestive gland – Primary organ in cephalopods that secretes digestive enzymes. It is also important in absorption and excretion (Fig. 19).

Digestive gland duct appendages – Outpockets of the ducts leading from the digestive gland that are covered with glandular epithelium (Fig. 19).

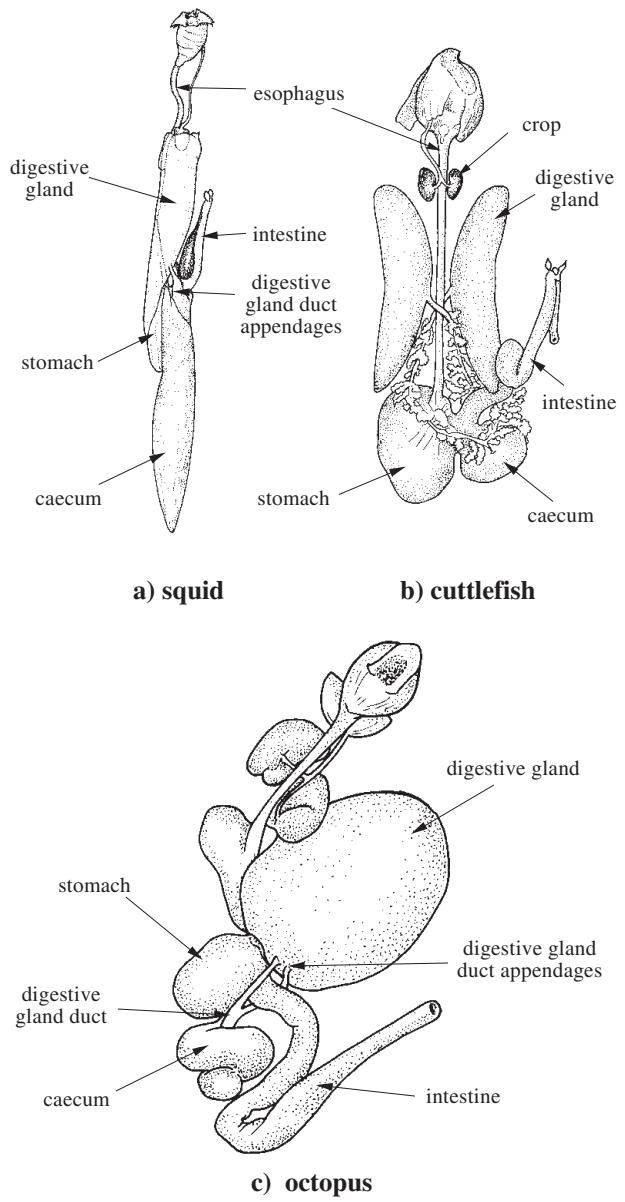


Fig. 19 Digestive system
(after Bidder, 1966)

Distal – Away from the central region of the body or point of origin; toward the peripheral parts (opposite of proximal).

Doratopsis – The peculiar paralarval stage that is characteristic of all members of the oegopsid squid family **Chiroteuthidae**.

Dorsal – The uppermost or back surface of a cephalopod, opposite the ventral surface where the funnel is located (Fig. 20).

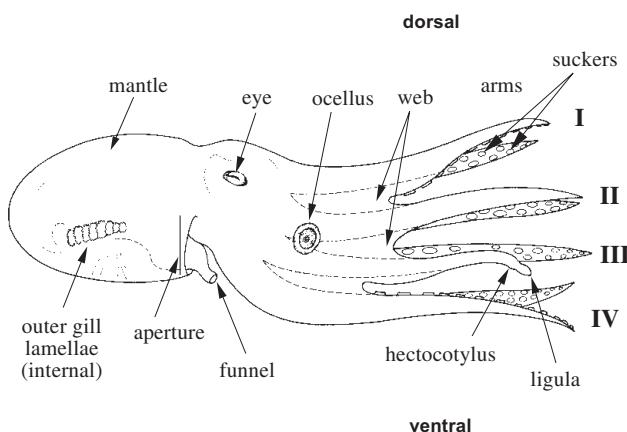


Fig. 20 Schematic lateral view of octopus features

Efferent vein – Vein that carries blood away from the heart or an organ.

Efferent nerve – Nerve carrying impulses away from the brain or specific ganglia.

Egg mass – A large number of eggs encapsulated in a gelatinous matrix or a large number of such structures that are attached together. The pelagic egg mass of an oceanic squid can be a large, fragile, gelatinous ball that carries many thousands of eggs. In contrast, the egg mass of a neritic squid (loliginid) can be composed of hundreds of very tough, encapsulated eggs in strings, attached together at their bases and to the substrate.

Ejaculatory apparatus – Portion of the spermatophore involved in the vigorous extrusion of the sperm mass (Fig. 38).

Epipelagic zone – The uppermost pelagic zone of the ocean.

Epithelial pigmentation – The pigmentation contained in epithelial cells that are unable to change their shape in the absence of muscles and nerves. Colour in most cephalopods, however, is created by pigment granules that are contained in specialized organs, the chromatophores, that can change shape rapidly by muscular action under nervous control (see **Chromatophores**).

Exploitation rate (E) – When fishing mortality (F) and natural mortality (M) operate concurrently, the exploitation rate represents the fraction of dead animals due to the fishery (i.e. caught by the fishery), which is, F/Z where Z denotes the total (i.e. $M+F$) mortality rate.

Eye (position and size) – Eyes are the primary sensory organs of cephalopods; they usually are large and located one on each side of the head. However, some species have small eyes, eyes on stalks or telescopic eyes.

Eyelid sinus (= optic sinus = orbital sinus) – Indentation, often complex, of the anterior margin of the eyelid (Fig. 28).

Family – The taxon above the genus level, comprised of the most closely related genera.

Fin(s) – The pair of muscular flaps that arise along the dorsolateral surface of the mantle of **decapodiformes**, **vampires** and **cirrate octopods**; used for locomotion, steering and stabilization (Fig. 17).

Fin angle – The angle between the longitudinal axis of the mantle and the posterior border of one fin (Fig. 21).

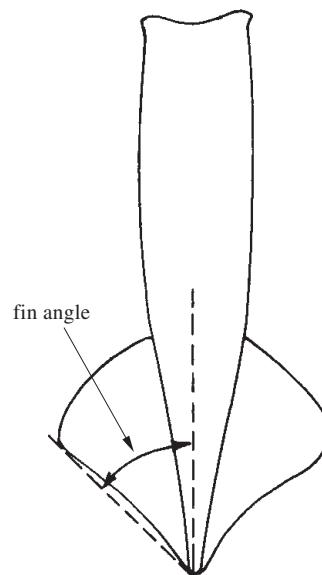


Fig. 21 Fin angle on squid

Fin attachment – A fin attaches to the shell, the mantle, the opposite fin or some combination of these.

Fin cartilage – Cartilage associated with the fins of all fin-bearing cephalopods.

Fin length – Length from anterior lobe, or anteriormost attachment of lobe, to posteriormost attachment of fin to mantle or tail. Extremely long, spike-like tails usually do not include fin tissue.

Fin lobe – The portion of a fin that extends anteriorly from the fin's anterior point of attachment, or posteriorly from the fin's posterior point of attachment of the fin, to the mantle (Fig. 17). This often is called the 'free' lobe.

Fin position – Fins are located anterior to the termination of the muscular mantle (subterminal position) or mostly posterior to it (terminal position) or in an area of overlap between the two.

Fin shape – Fins are classified, somewhat arbitrarily, by their shape as sagittate, rhomboid, circular/elliptical, lanceolate, ear-shaped, ribbed, lobate or skirt-like.

Fixing apparatus – The mechanism of suckers and knobs on the carpal region of the tentacular club that permits the two clubs to be locked together during capture of prey (Figs 12 and 17) (see **Carpus**).

Foot – See **Molluscan foot**.

Foveola – Transverse, membranous fold of skin that forms a pocket in the anterior end of the funnel groove of some oegopsid squids (Fig. 22) (see **Side pockets**).

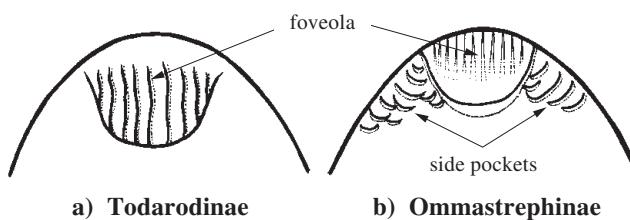


Fig. 22 Funnel groove

Funnel – The ventral, subconical tube through which water is expelled from the mantle cavity during locomotion and respiration (reproductive and waste products and the ink also pass through the funnel) (Figs 17 and 20). Archaic term: **siphon**.

Funnel-adductor muscles – Muscles that support the lateral attachment of the funnel to the head.

Funnel groove – The depression in the posteroventral surface of the head in which lies the anterior portion of the funnel (Fig. 17).

Funnel-locking cartilage – The cartilaginous groove, pit, pocket or depression on each ventrolateral side of the posterior part of the funnel that joins with the mantle component to lock the funnel and mantle together during locomotion and respiration, so that water is expelled only through the funnel and not around the mantle opening (Figs 17 and 23) (see **Mantle-locking cartilage**).

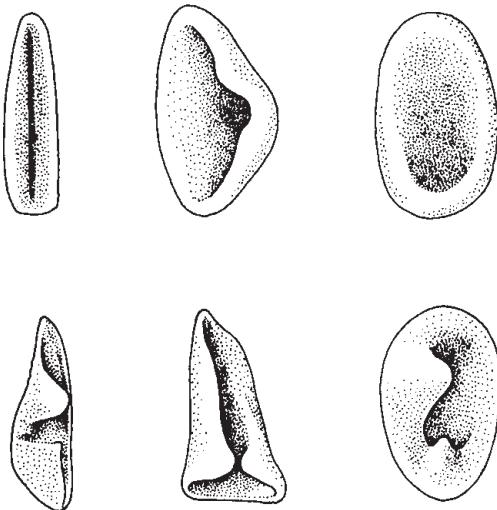


Fig. 23 Funnel-locking cartilage; examples of shapes and structures

Funnel organ – The glandular structure fused to the internal surface of the funnel, generally a single W-shaped form in **octopodiformes** and a dorsal inverted V-shaped component with opposed ventral oblong components in **decapodiformes** (Fig. 24).

Funnel-retractor muscles – Large muscles that attach to the corners of the funnel and run posteriorly to attach to the sides of the shell sac (generally near the base of the gills) or, in some species, insert on the interior mantle wall.

Funnel valve – The semi lunar muscular flap in the dorsal inner surface near the distal opening of the funnel in some species (Fig. 24).

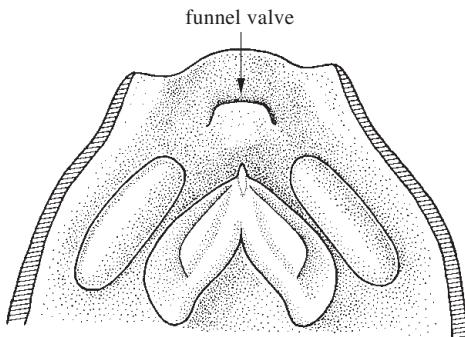


Fig. 24 Funnel organ and funnel valve components on inner surface of funnel of squids

Genus – The taxon below the family level and above the species level.

Gill – Primary organ for the exchange of respiratory gases with seawater (Fig. 30).

Gill lamellae – The leaf-like convoluted individual components of the gill through which gas exchange occurs (Figs 25 and 30).

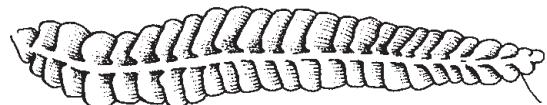


Fig. 25 Gill lamella, a single element from a complex structure

Gladius (= pen) – The feather or rod-shaped chitinous supporting structure in the dorsal midline of **squids**; the homologue of the shell of ancestral forms (Fig. 16).

Gladius length (GL) – Sometimes used as a measurement of the body (= mantle) length when direct measurement of the mantle is unreliable (usually due to deformation).

Gonoduct(s) – Tubular structure(s) of the reproductive system which serves to transport reproductive products from the gonad(s) to the exterior (see **Oviducts**).

Hatchling – Young cephalopod newly hatched from the egg.

Head length (HL) – A standard measurement within species growth stages and for species comparisons; measured from posterior limit to V-notch at base of Arms I (Fig. 6).

Head-mantle fusion – Zone of fusion of head and mantle; it varies among groups/families; of systematic and biological significance.

Hectocotylus – One (or more) modified arm in male cephalopods used to transfer spermatophores to the female; modifications may involve suckers, sucker stalks, protective membranes, trabeculae (Figs 11 and 26) (see **Calamus**, **Ligula**).

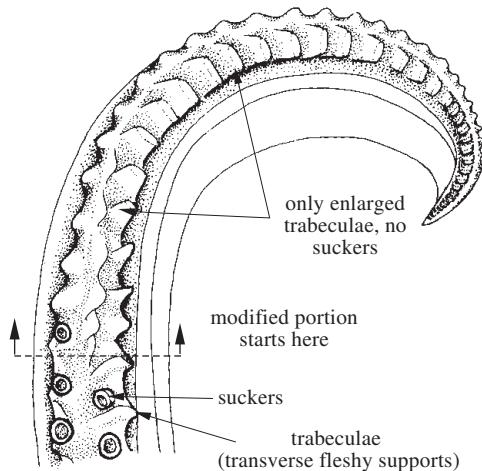


Fig. 26 Hectocotylized arm (*Illex oxygonius*)

Hood – Leathery cap or trapdoor of nautiluses that can be retracted to protect the animal within the shell.

Holotype – The single specimen designated by the original author to represent the new species name. It is an international standard of reference that provides objectivity and stability for the species name.

Hooks – Chitinous, claw-like structures ontogenetically derived from the suckers on the arms and/or clubs of some oegopsid squids (Fig. 12).

Horizontal arm septa – Septa extending the length of the arms (i.e. parallel to the arm axis), that roughly divide the arms into oral and aboral regions. This feature is a characteristic of the arms of cirrate octopods and the incirrate octopods of the family **Bolitaenidae**. The functional significance is unknown.

Horny rings of suckers – Suckers of decapods have two types of hard, horny rings. One, the inner ring, lies around the inner walls of the *acetabulum* (cup) and often bears teeth. The other, the outer ring, is composed of numerous minute platelets and lies on the surface of the *infundibulum* (outer rim) (Fig. 40).

Inferior frontal lobe system – A system of lobes in octopod brains: the paired posterior buccal, lateral inferior frontal and subfrontal lobes, and the single median inferior frontal lobe. They form a functional unit concerned with the chemotactile information from the arms and its use.

Ink sac – The structure that manufactures and stores the ink of cephalopods; it lies parallel with the intestine and empties via a duct into the rectum (Figs 7 and 30).

Intestine – Distal region of the alimentary canal between the stomach/caecum complex and the anus (Fig. 19).

Juvenile – Life history stage between the hatchling and the nearly-mature subadult stages.

Keel – (1) A flattened, muscular extension along the aboral surface of some arms to render them more hydrodynamic (Fig. 17); (2) 1 or 2 expanded muscular membranes along the tentacular club of some groups (Fig. 12); (3) the lateral ridge of skin around the lateral margin in incirrate octopods (Fig. 27).

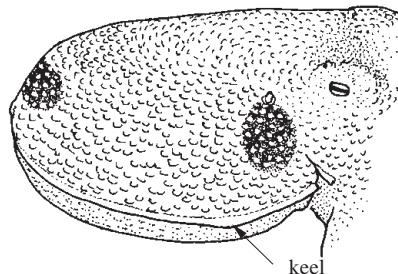


Fig. 27 Incirrate octopod

Lateral – Pertaining to the side(s) of an organism or structure, away from the centre or midline.

Lateral funnel-adductor muscles – See **Funnel-adductor muscles**.

Lateral membranes of arms IV – See **Tentacular sheath**.

Lateral-line analogue – Sensory structure analogous to the lateral line of fishes. The lateral-line analogue, which senses vibrations transmitted by seawater, is located along a series of lines on the dorsal surface of the head, with some sensory cells extending onto the bases of the arms.

Lateral ridge – A narrow, horizontal, muscular structure along the lateral side of the mantle of incirrate octopods. Also referred to as a keel (Fig. 27).

Length at 50% maturity – Mantle length at which 50% of specimens examined in a representative sample is sexually mature, according to the maturity scale and the statistical model used.

Lens (in photophores) – Structure in a photophore that can focus or disperse bioluminescent light.

Light guides – Structures in photophores that specifically direct light via internal reflection.

Light organ (= photophore) – A simple or complex structure that produces bioluminescence (cool light) by intrinsic (self generated) or extrinsic (bacterial) means (Figs 17 and 28).

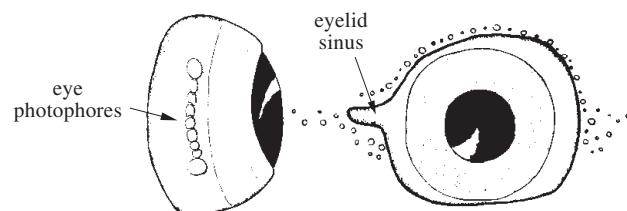


Fig. 28 Light organs (photophores) on ventral surface of squid eyeball; eyelid or orbital sinus

Ligula – The spatulate to spoon-shaped, terminal structure of the hectocotylus of many incirrate octopods, that contains the **calamus** basally (proximally) and usually a series of transverse ridges and grooves on the oral surface (Fig. 11) (see **Calamus**, **Hectocotylus**). Spermatophores

transferred along the sperm groove of the hectocotylized arm are presumably gripped by the ligula. Details of the function of the ligula are unknown.

Lips – Two concentric, muscular, glandular rings of skin that surround the mouth and beaks.

Living chamber – Largest and most recently formed chamber of **nautilus** shell in which the animal resides (also refers to numerous shells of fossil cephalopods).

Macrotritopus – A complex of paralarval forms in the incirrate octopod family **Octopodidae**, characterized by the third pair of arms being extremely elongate.

Mantle – The fleshy (muscular) tubular or sac-like body of cephalopods; provides propulsion through jet-like expulsion of water; contains the viscera (Figs 17 and 20).

Mantle cavity – Space enclosed by the mantle. In cephalopods the mantle cavity contains the visceral sac, gills, anus, openings of the gonoducts, nephridial pores and various muscles and septa (Fig. 30).

Mantle length (ML) – The standard measure of length in coleoid cephalopods. In **decapods** ML is measured along the dorsal midline from the mantle margin to the posterior tip of the body (Fig. 6). In **octopods** ML is measured from a line joining the mid-point of the eyes (rather than the anterior mantle margin, since the latter is obscured by the head/mantle fusion) to the posteriormost area of the mantle (Fig. 6).

Mantle-locking cartilage – The cartilaginous ridge, knob or swelling on each side of the ventrolateral, internal surface of mantle that locks into the funnel component of the locking apparatus during locomotion (Figs 17 and 23) (see **Funnel-locking cartilage**).

Manus – Central or ‘hand’ portion of club between the dactylus distally and the carpus proximally (Fig. 17).

Mature – In cephalopods this term refers to sexual maturity which is determined for females by the presence of ova (mature eggs) free in the coelom or oviducts (Fig. 30), and for males by the presence of spermatophores in Needham’s sac (Fig. 29) (see **Adult**).

Medial(n) – Pertaining to a structure located toward, on, or along the dorsal or ventral midline.

Mesopelagic zone – The middle-depth zone of the pelagic realm of the ocean.

Mollusca – One of the major invertebrate phyla. Some of the common molluscs are snails and clams. The **Cephalopoda** is a class within the Mollusca.

Molluscan foot – A major structure in molluscan morphology. In gastropods the foot is the muscular sole that the animal crawls with. In cephalopods the funnel, and possibly the arms and tentacles are derived from the molluscan foot. The evolutionary origin of the latter is still uncertain. They may represent outgrowths of the head (favoured by anatomical evidence of the nerve connections) or modifications of the molluscan foot that

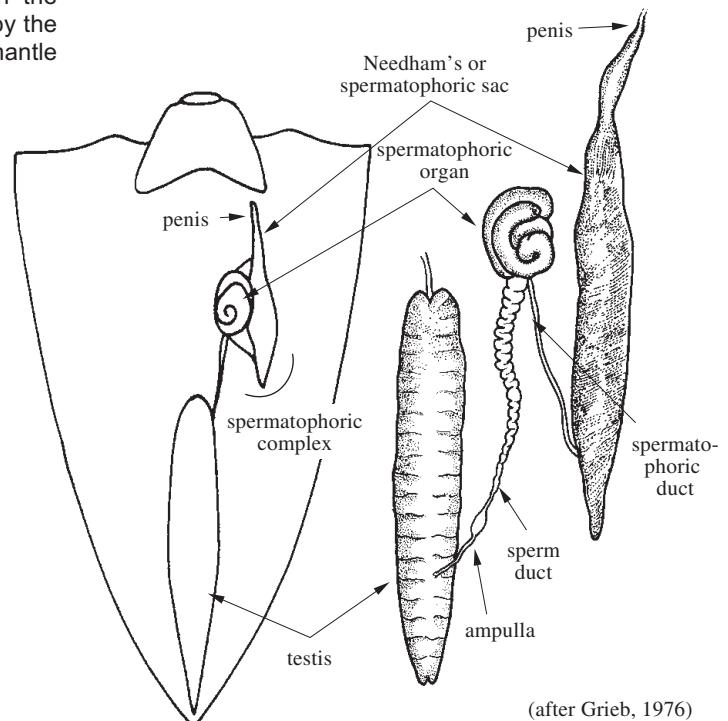
have migrated around the mouth (favoured by embryological evidence, the migration of arm primordia).

Monophyletic group – A natural group (taxon) that shares a common ancestor.

Myopsida – A high-level taxon (order) within the **Decapodiformes**. In recent classification, the **Myopsida** (including the family **Loliginidae**) have been considered the sister group of the **Oegopsida** and the two groups together compose the **Teuthoidea** (squids). In contrast, at the beginning of the twentieth century, the **Myopsida** included the **Loliginidae** and the **Sepioidea** (cuttlefish and relatives) and the presence of a cornea covering the eye lens defined the group. At present the phylogenetic relationships within the **Decapods** are unresolved.

Neck – The region that separates the posterior end of the cephalic cartilage and head musculature. Only those cephalopods with elongate heads (e.g. the oegopsid squid family **Chiroteuthidae**) have distinct necks.

Needham’s sac (= spermatophore/spermatophoric sac) – The elongate, membranous organ of males where completed, functional spermatophores are stored. It opens into the mantle cavity or directly into the water through the penis (Fig. 29).



(after Grieb, 1976)

Fig. 29 Male squid reproductive apparatus

Nephridial coelom – The cavity of the renal (kidney) sac. It connects with the exterior via the renal pore and with the visceroperitoneal coelom via a pair of slender ducts from the latter.

Nephridial papillae – Small raised openings to the renal cavities.

Neritic – The region of the ocean that overlies the continental shelf.

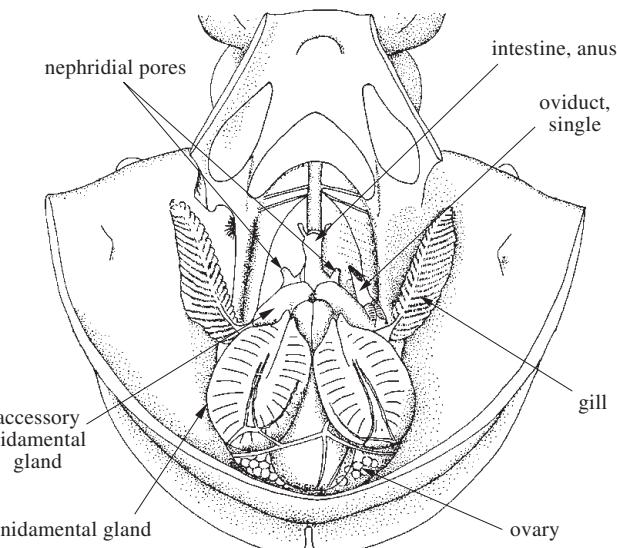
Nidamental glands – Large glandular structures in females of most **decapods** and **nautiluses** that lie in and open directly into the mantle cavity. The glands are composed of numerous lamellae that are involved in secretion of egg cases or the jelly of egg masses (Fig. 30).

Nominal species – A species that has been formally described and is based on a morphological type. It is an available name but not necessarily a valid species.

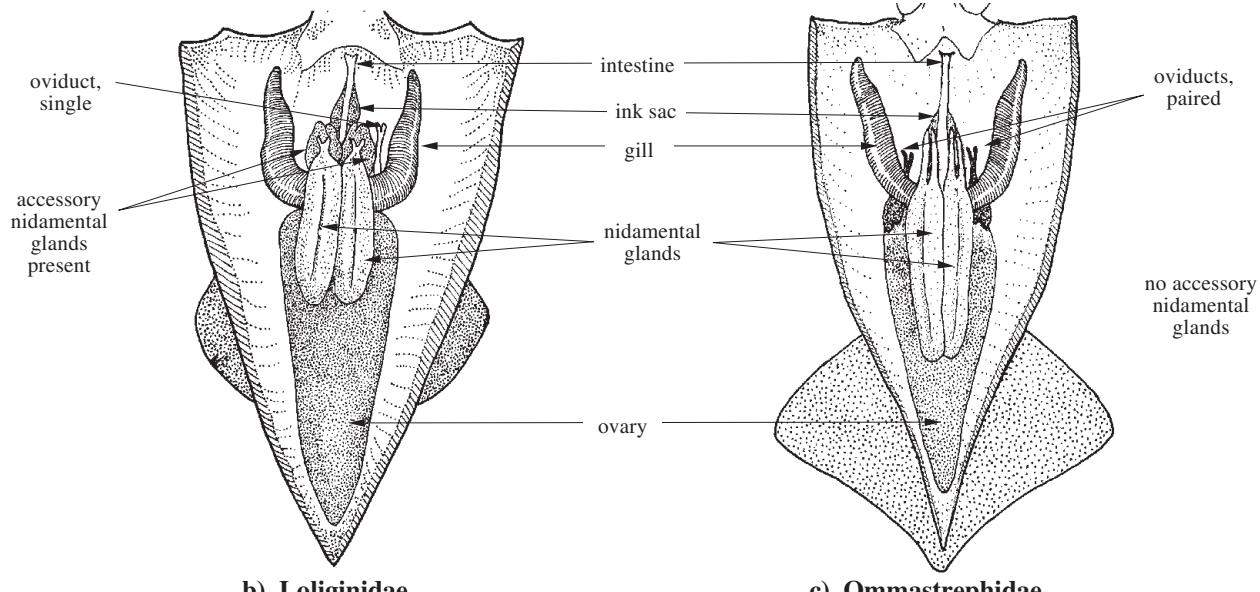
Nuchal cartilage – See **Nuchal-locking apparatus**.

Nuchal crest – Prominent transverse ridge in most **decapods** that extends across the dorsal head and down the lateral head surfaces at its posterior end (Fig. 31).

Nuchal folds – Fixed folds or pleats of the head integument that adjoin the nuchal crest posteriorly and are perpendicular to it. The function of the folds is uncertain (Fig. 31).

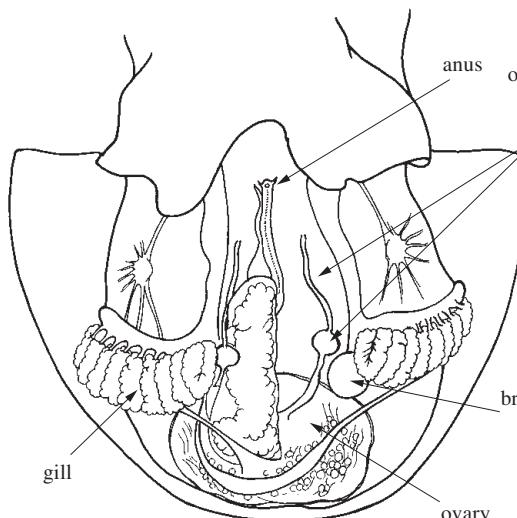


a) Sepiidae

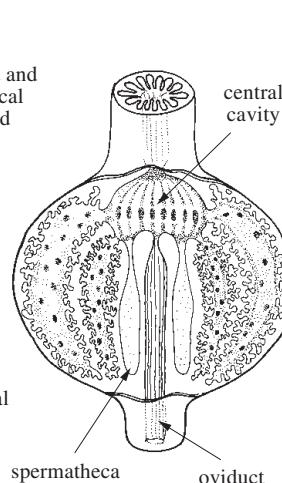


b) Loliginidae

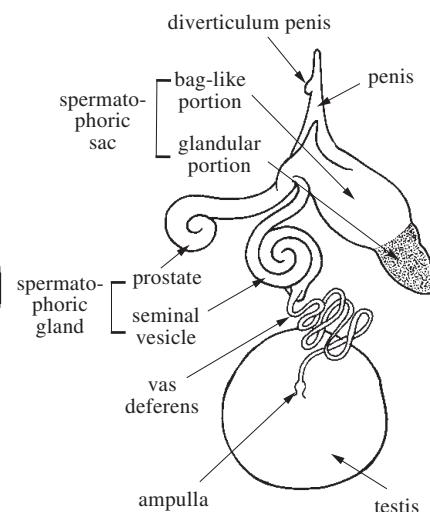
c) Ommastrephidae



d) female Octopus



e) oviducal gland
(after Froesch and Marthy, 1975)



f) male reproductive tract
(after Mann, 1984)

Fig. 30 Internal organs
[a, b and c - Decapodiformes; d, e and f - Octopodiformes]

Nuchal-locking apparatus – An oblong, cartilaginous locking structure in **decapods** located mid-dorsally just posterior to the head. It is composed of the nuchal cartilage, which also forms an attachment site for collar and head retractor muscles, and an interlocking, complementary cartilage on the mantle that underlies the gladius. The apparatus keeps the head and mantle aligned dorsally during mantle contractions (Fig. 31).

Nuchal membrane (= occipital membrane) – A thin membrane that connects the main nuchal folds at their posterior ends (Fig. 31).

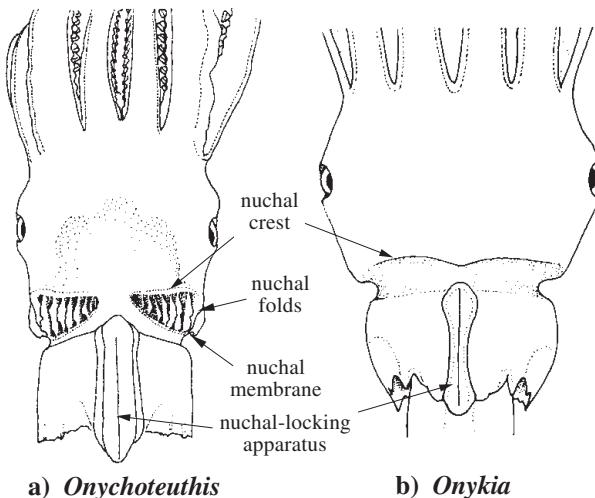


Fig. 31 Nuchal folds and nuchal crest

Nuchal organ – Small sensory organ with photoreceptor-like sensory cells that is located in the nuchal region of apparently all **coleoid** cephalopods.

Nuchal region – The dorsolateral area around posterior part of the head and the area immediately posterior to it, normally covered by the anterior mantle wall.

Occipital crest – See **Nuchal crest**.

Occipital folds – See **Nuchal folds**.

Occipital membrane – See **Nuchal membrane**.

Ocellus – A pigmented spot or patch that usually consists of a central locus of concentrated chromatophores with one or more outer concentric rings of chromatophores. Ocelli occur on some octopuses, and their normally vivid iridescence and pigmentation cause them to stand out against the background coloration of the skin. Also called 'false eyespot' (Fig. 20).

Octopodiformes – Higher-level taxon that includes all 8-limbed cephalopods: vampires, cirrate octopods, incirrate octopods. (Fig. 2 Living Cephalopods). Because of the long history of referring to these cephalopods by the common name 'octopods', the latter is used as the common name for the **Octopodiformes**.

Octopods – Common name for **Octopodiformes**.

Ocular photophore – Photophore(s) that lie(s) on the eyeball (Fig. 28).

Oegopsida – A high-level taxon within the **Decapodiformes**. In recent classification, the **Oegopsida** (oceanic squids) has been considered the sister group of the **Myopsida** and the two groups together compose the **Teuthoidea** (squids). At present the composition and affinities of the **Oegopsida** are unresolved.

Oesophagus – The portion of the digestive tract between the buccal mass and the stomach (Fig. 19). Often a portion of the oesophagus is expanded to form a crop for food storage (see **Crop**).

Olfactory papilla – A pit, or bump-like to finger-like protuberance on the posterolateral surface of each side of the head; of olfactory function.

Olfactory organ – A chemosensory organ present in all coleoid cephalopods thought to be the homologue of the **rhinophore** of *Nautilus*.

Ontogenetic descent – The progressive descent into a deeper-water habitat as a mesopelagic cephalopod grows older and larger. This distribution pattern is particularly common in many pelagic chiroteuthid and cranchiid squids.

Opening/closing trawl – A trawl whose mouth is open during fishing at a selected depth but is closed during descent and retrieval.

Optic lobes of brain – Large lobes of the brain associated with the eyes. In octopods and some squids the optic lobes may be separated from the rest of the brain by an optic stalk of varying length.

Optic sinus – See **Eyelid sinus**.

Oral – Toward or pertaining to the mouth.

Orbital pore – Minute pore in the anterior part of the transparent tissue (cornea) that covers the eyes of decapods except for the oegopsid squids; remnant of the primary eyelids (Fig. 17).

Orbital sinus – See **Eyelid sinus**.

Order – The taxonomic category above the family level.

Outer cone – Rim that surrounds the phragmocone in cuttlebones.

Oviduct(s) – Female gonoduct(s). The oviduct conducts eggs from the visceropericardial coelom, that encompasses the ovary, to the mantle cavity and often is used to store eggs. In some argonautid octopods eggs are fertilized and undergo either partial (*Argonauta*) or complete (*Ocythoe*) embryonic development within the oviduct (Fig. 30).

Oviducal gland – Glandular structure that surrounds the anterior end of the primary oviduct and secrets some of the external coatings around spawned eggs.

Paralarva – The term that indicates the first free-living life history stage (typically planktonic) for those cephalopods that differ in morphology and ecology from older juveniles.

Pedicel (= **sucker stalk**) – A short, muscular stalk that supports a sucker in sepioids and teuthoids (Fig. 32).

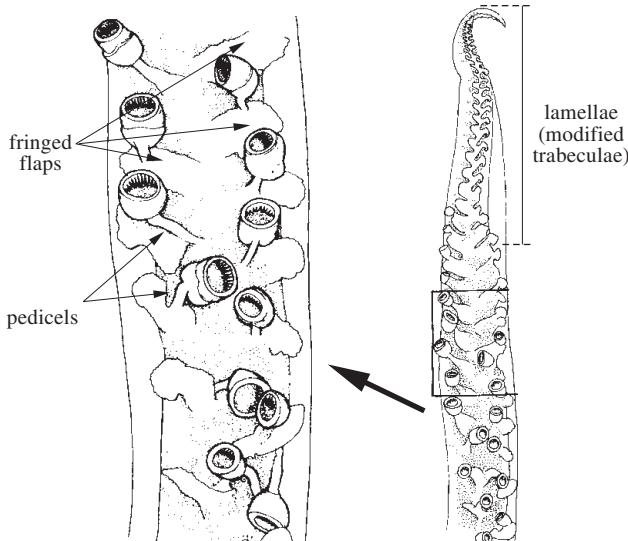


Fig. 32 Hectocotylized arm of males

Pelagic – (1) Free swimming in open ocean; (2) the region of the ocean away from the ocean floor.

Pen – See **Gladius**.

Penis – The long, muscular terminal section of the male gonoduct that serves to transfer spermatophores to the female (Fig. 29). Apparently, in species with a hectocotylus, the penis transfers spermatophores to the hectocotylus which in turn transfers them to the female. In species without a hectocotylus, the penis often is greatly elongate, capable of extending beyond the mantle opening and apparently can transfer spermatophores directly to the female.

Photocytes – Cells that produce bioluminescence in photophores.

Photophore – An organ that produces and distributes bioluminescence or 'living light', either intrinsically through biochemical reaction or extrinsically through luminescent bacteria (Figs 17 and 28) (see **Light organ**).

Phylum – The major, formative, principal taxonomic level; above 'Class'.

Phragmocone – System of plates that comprise the cuttlebone.

Pocket, tentacular – An open depression in the anteroventral surface of the head between the bases of arms III and IV of **decapods**, except myopsid and oegopsid squids, into which the ejectable feeding tentacles are retracted when not in use (Fig. 33).

Polarity (Evolutionary) – The direction of evolution. That is, one state is 'primitive' (plesiomorphic) and another is 'derived' (apomorphic).

Polarize (Evolutionary) – To determine the direction of evolution. That is, to determine which state is 'primitive' (plesiomorphic) and which is 'derived' (apomorphic).

Posterior – Toward the closed, tail-end of the mantle, away from the head and arms.

Primary conus – A solid conus on the gladius that is not formed by the in-folding of the lateral vanes.

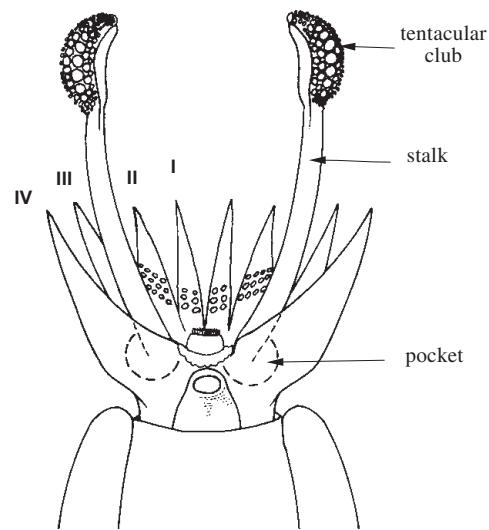


Fig. 33 Diagrammatic sketch of arms and tentacles of decapods other than myopsid and oegopsid squids

Protective membrane – Thin web-like integument along the lateral angles of the oral surface of the arms and clubs lateral to the suckers, supported by muscular rods called trabeculae (Fig. 34) (see **Trabeculae**).

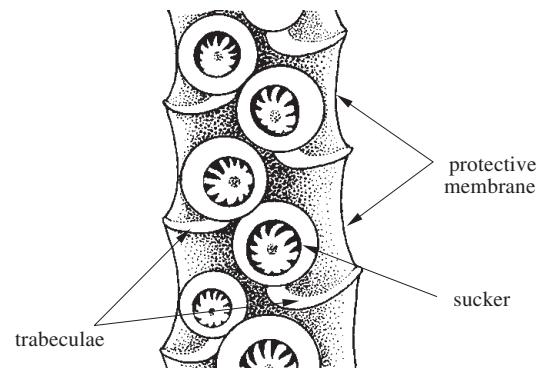


Fig. 34 Trabeculae, protective membranes and suckers on arm of squid

Proximal – Situated nearest or next to the centre of the body or nearest the point of origin or attachment of a muscle, appendage, etc. (opposite of distal).

Pseudomorph – An ejected mass of ink and mucous that approximates the size and shape of the cephalopod that released it; i.e. a false body that fixes the attention of a predator while the cephalopod escapes.

Rachis – The thickened central axis that usually extends the entire length of the gladius. Free rachis is the portion that does not support vanes (Fig. 16) (see **Gladius, Vane**).

Radula – The chitinous, ribbon-like band in the mouth of cephalopods that contains up to seven transverse rows of teeth that aid in transport of food into the oesophagus (Fig. 35). Has a significant higher taxonomic value.

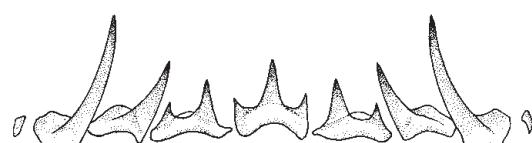


Fig. 35 Radula

Recent – Geological term referring to an organism or species that is living or has lived within the past 10 000 years, or to an object formed or events that have occurred within the past 10 000 years.

Renal appendages – Structures that form the nephridium (= kidney). The renal appendages are out-pockets of the veins within the renal sac (primarily the venae cavae) that are covered with renal epithelium. The renal sac empties into the mantle cavity via the nephridial (or renal) pore.

Renal pore – The opening(s) of the renal cavities into the mantle cavity, through which urine is discharged.

Rhinophore – A short sensory tentacle in **nautiluses**. Four in total, one on both sides of each eye.

Rhynchoteuthion – Paralarval stage of the Ommastrephidae characterized by the fusion of the tentacles into a trunk-like proboscis.

Rostrum (= **spine**) – A spike-like posterior projection of the gladius or cuttlebone, exterior to the conus (Figs 16 and 18).

Secondary conus – A conical region at the posterior end of the gladius that is formed by an in-rolling and fusion of the vanes. The ventral line of fusion usually is apparent. The secondary conus may be rather short or exceed half the gladius length (Fig. 36).

Secondary eyelid – An eyelid fold that covers the ventral part of the cornea in cuttlefishes.

Secondary fin – A non-muscular fin-shaped structure found in some oegopsid squids, located posterior to the true or primary fin (Fig. 37). The secondary fin may act as a buoyancy organ. **Vampire** juveniles also have secondary fins, which, however, are lost with growth.

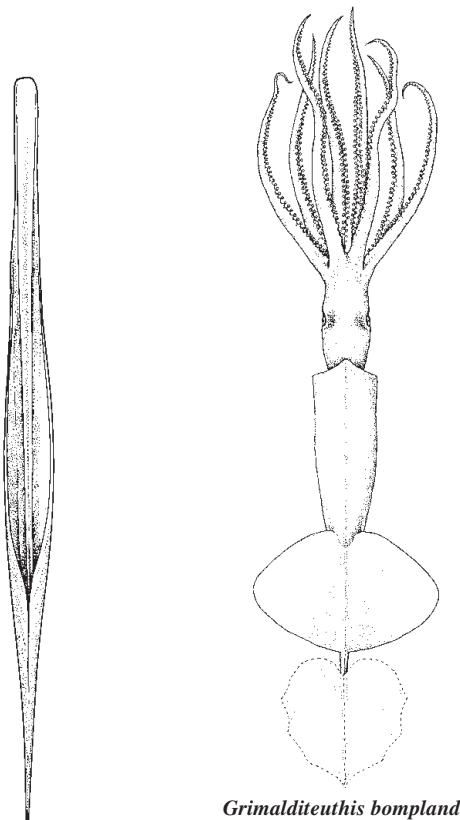


Fig. 36 Secondary conus

Fig. 37 Secondary fin

Secondary web – The narrow membrane that connects the primary web to the arms in some cirrate octopods; e.g. **Cirroteuthidae**.

Sepion (= **cuttlebone**) – The calcareous, laminate, dorsal supportive buoyancy structure in the mantle of cuttlefishes (Fig. 18).

Semelparous – A reproductive strategy in which females spawn once then die. Sometimes called terminal or 'big-bang' spawners. Many cephalopods are semelparous but in some species reproduction is prolonged (up to 50% of the ontogenesis). **Nautiluses** are iteroparous and spawn repeatedly over a period of years.

Sepioid gills – Gills of some cirrate octopods that look superficially like gills of sepioids.

Sepioidea – A high-level taxon within the **Decapodiformes**. Typically, this taxon includes the **Sepiidae**, **Idiosepiidae**, **Sepiolidae**, **Sepiadariidae** and **Spirulidae**, but the monophyletic nature of the group has been questioned. At present the phylogenetic relationships and classification within the **Decapodiformes** are unresolved.

Shell sac – The sac that secretes the shell in the **Coleoidea**, composed of ectodermal epithelium that invaginates during embryonic development to form an internal sac.

Side pockets – Small membranous folds of the integument that form small, shallow pockets lateral to the foveola in the funnel groove (Fig. 22) (see **Foveola**).

Siphuncle – The tube-like posterior extension of the body wall, coelom and covering sheath that penetrates into the phragmocone chambers in cephalopods with a chambered shell (**Spirula**, **nautiluses** and **cuttlefishes**). It regulates gas exchange into the phragmocone chambers.

Spadex – Male reproductive structure used to transfer spermatophores to the female in **nautiluses**. It is formed by the fusion of 4 circumoral tentacles.

Species – Populations of animals that interbreed or are potentially capable of interbreeding in nature. Considerable debate exists over the general definition of a species and how the theoretical definition should be applied in practice. With regard to the latter problem, cephalopod species generally are defined by distinct morphological traits not exhibited by any other species. This practice is valid if interbreeding does not occur. However, the amount of interbreeding (i.e. hybridization) that actually occurs in nature and contributes to or diminishes speciation is virtually unknown in cephalopods.

Sperm cord – The coiled rope of sperm that lies within the spermatophore (Fig. 38).

Sperm duct (= **seminal duct**) – The duct of males which joins the testis with the spermatophoric organ (Fig. 29).

Sperm groove – Sulcus along the ventral side of the hectocotylus used to transfer the spermatophores (Fig. 11).

Sperm mass – The mass of sperm held within the spermatangia of everted spermatophores.

Sperm receptacle – A bulbous structure in the buccal region or at the openings of the oviducts in females of certain cephalopods for deposition of spermatangia.

Spermatangium (pl. spermatangia) – Extruded, exploded, evaginated spermatophore/s, often in the form of a round bulb.

Spermathecae – Specialized sperm-storage structures found in the skin of some female **decapodiformes** or as pockets of the oviducal gland in **octopods**.

Spermatophore – A tubular structure manufactured by male cephalopods for packaging sperm; capable of holding millions of sperm, it is transferred and attached to the female until fertilization begins (Fig. 38). It forms a spermatangium after the spermatophoric reaction occurs and the spermatophore has everted.

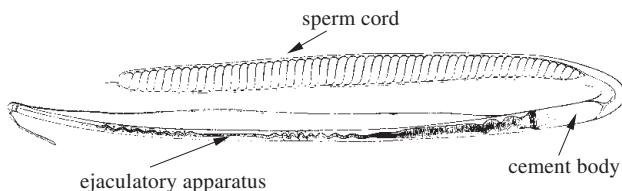


Fig. 38 Spermatophore

Spermatophore pad – A fleshy patch of tissue, usually in the mantle cavity of some female cephalopods (e.g. loliginids), to which spermatangia adhere after mating and remain until fertilization occurs.

Spermatophoric complex – The unit formed by the sperm duct, the spermatophoric organ, the spermatophoric sac, the spermatophoric duct and the penis (Fig. 29).

Spermatophoric duct – The duct of males through which the spermatophores, once formed, pass from the spermatophoric organ to the spermatophoric sac (Fig. 29).

Spermatophoric organ – Male organ where the spermatophores are formed (Fig. 29).

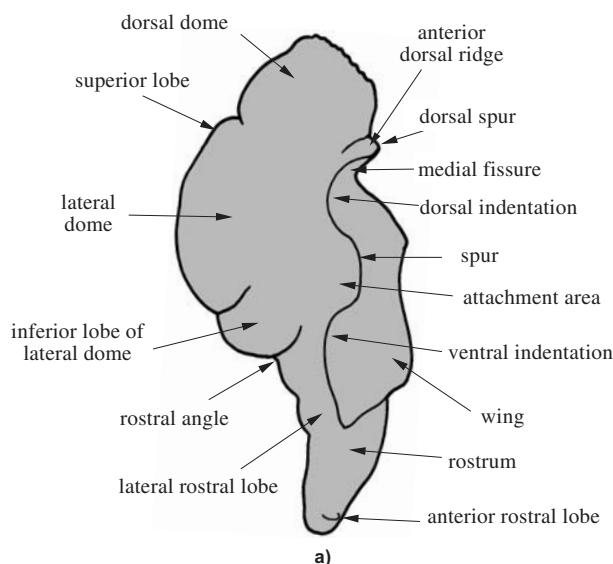


Fig. 39 Diagrams of a generalized teuthoid statolith (anterior view) with a) basic terms and b) basic dimensions labelled
(after Clarke, 1978)

Spermatophoric reaction – The evagination of a spermatophore with the extrusion of the sperm mass, caused by the penetration of water inside the spermatophoric cavity, where the osmotic pressure is higher.

Spermatophoric sac – See **Needham's sac** (Fig. 29).

Spine – See **Rostrum** (Fig. 18).

Squid – Common name given to members of the **Teuthoidea** and some members of the **Sepiolidae**.

Squid, general terminology – Diagrammatic drawing with external features labelled, ventral view (Fig. 17).

Stalk of tentacle – See **Tentacle stalk**.

Stalked eyes – See **Eye** (position and size).

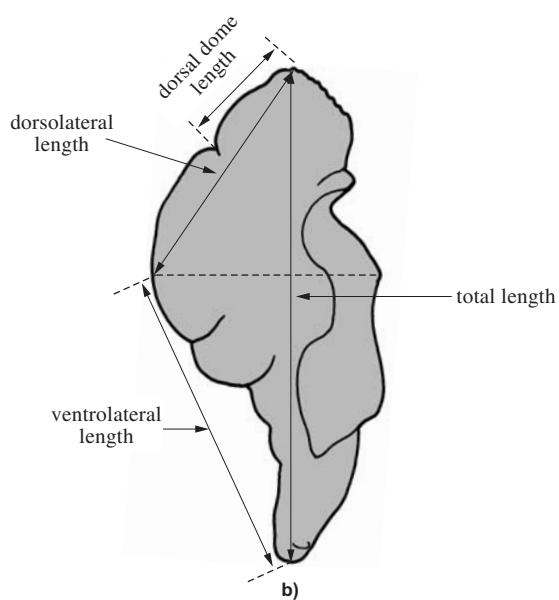
Statocyst – A sense-organ that detects gravity, angular accelerations and low-frequency sound. The statocyst is embedded within the cephalic cartilage and contains the statoliths.

Statolith – A calcareous stone in the statocyst that detects linear acceleration, angular acceleration and orientation (Fig. 39). Statoliths of many species can be used to estimate age.

Stellate ganglion – Major ganglion of the peripheral nervous system of necoleoid cephalopods that controls nerves to the mantle muscles.

Stomach – The muscular organ of the digestive system where primary digestion occurs (Fig. 19). The stomach generally is lined with cuticular ridges to aid in grinding food, and is supplied with digestive enzymes from the digestive gland. The stomach may be greatly expandable in size and serve as a storage area until food can be fully processed.

Striae – Numerous thin septa visible in the ventroposterior end of cuttlebone, making the cuttlebone appear as if transversely striated (Fig. 18).



Stylets – A pair of rod-like structures considered remnants of the molluscan shell in incirrate octopods. Generally in the form of a slender, cartilage-like, pointed rod tightly surrounded by the shell sac and buried in the mantle muscle at a dorsolateral position.

Subadult – Stage at which all of the characters that typically define the species are present, but the reproductive system is not mature and functional. It follows the juvenile stage and precedes the adult stage. A subadult stage is defined in cephalopods since the adult phase frequently is abbreviated.

Subequal – Nearly equal. Generally refers to the length of the arms when these appear to be approximately the same length. Arm lengths cannot be measured very accurately due to variation in their states of contraction.

Sucker/s – Muscular, suction-cup structure/s on the arms and tentacles (occasionally on the buccal membrane) of cephalopods. It consists of a cup-shaped portion, the **acetabulum**, and a flat, distal ring, the **infundibulum**, that contacts the substrate. Some are stalked, placed on muscular rods that contract (squids and cuttlefishes); some are sessile, embedded without stalks on the oral surface of the arms (octopuses) (Fig. 40a). They usually are counted either in longitudinal rows or in transverse (oblique) series (Fig. 40b).

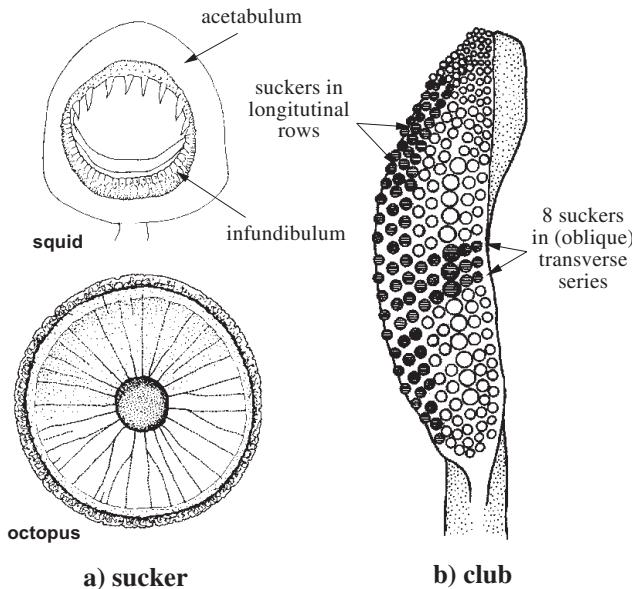


Fig. 40 Squid and octopus sucker and squid sucker orientation

Sucker ring – Chitinous, often serrated or toothed, ring that encircles the opening of suckers of squids and cuttlefishes (Fig. 41).

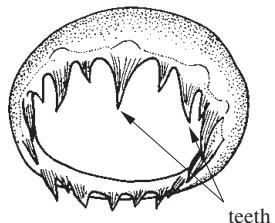


Fig. 41 Sucker ring

Sucker series – The longitudinal rows of suckers on the arms or tentacles of **decapods**. Series (= transverse rows) contrasts with **rows** (= longitudinal rows) in describing

sucker arrangement. In octopods, sucker 'series' generally is synonymous with 'rows', the 'longitudinal' component of the term is implied.

Sucker stalk – The muscular support and connective structure between the sucker and the arm. In **octopods** it is a cylindrical structure about the same diameter as the sucker and in **decapods** it is constricted into a conical pillar.

Sucker teeth – Sharp, blunt, or rounded teeth on the inner horny sucker rings of some **decapods**.

Sulcus – A median longitudinal groove, sometimes flanked by two low ridges on the ventral side of the cuttlebone.

Superior buccal lobes – Lobes of the central nervous system that sit dorsal to the oesophagus where the latter enters the buccal mass.

Swimbladder – Gas-filled structure found in the dorsal region of the pelagic octopod, *Ocythoe*.

Swimming membrane (= **keel**) – An elongate, flat, muscular vane along the aboral surface of arms and clubs of **decapods** that functions to streamline and supports the appendages during swimming (Figs 12 and 17).

Synonym – One of two or more names applied to the same taxon/species.

Systematics – The classification of organisms into hierachal groups based on phylogenetic relationships.

Tail – Posterior narrow extension of the body posterior to the fins. The end of the fins and the beginning of the tail often overlap. An operational definition for point of demarcation for the purposes of measurement is: the point where a hypothetical line, continuous with the broad posterior edge of the fin, crosses the midline of the body (Fig. 17).

Taxa, taxon – A taxonomic group of any rank. A taxonomic unit.

Tentacles – Modified fourth pair of appendages in **decapods**, used for prey capture and capable of considerable extension and contraction. Distal ends contain clubs with suckers and/or hooks; stalks are frequently devoid of suckers. Tentacles can retract into pockets, or merely contract (Figs 17 and 33). Although the tentacles are derived evolutionarily from the fourth pair of arms, the term 'arms IV' is reserved for the subsequent arm pair, the ventral arms, which are evolutionarily the fifth pair of arms.

Tentacle absence – Tentacles can be absent because the species lacks tentacles, they are accidentally lost during capture, or they are naturally lost at a particular stage of development.

Tentacle pads – Poorly understood and complex pad-like photophores that are found on the tentacular stalks of some squids of the family **Chiroteuthidae**.

Tentacle stalk – Region of the tentacle proximal to the club.

Tentacle terminology – See Figs 17 and 33.

Tentacular club – The distal, terminal, usually expanded, part of the tentacle that bears suckers and/or hooks. Used for capturing prey (Figs 12, 17 and 33).

Tentacular retractor muscles – Muscles that serve to coil the tentacle when retracted, in contrast with those muscles that serve to shorten (contract) the tentacle.

Tentacular sheath – (1) The keels of arms IV are off-set laterally and often enlarged to fully or partially conceal, protect or encase the adjacent tentacles. The latter function is most fully developed in the chiroteuthids and mastigoteuthids; (2) tubular muscular sheaths of nautiluses into which the tentacles can be retracted.

Terminal fins – Fins with more than 50% of their length posterior to the muscular mantle. These fins, therefore, are at the 'terminal' or posterior end of the body and generally are supported by an elongate secondary conus of the gladius.

Terminal organ – Alternative name for penis, as true definition of a penis is 'organ of insertion'. In most cephalopods, the hectocotylized arm is used for spermatophore insertion, or placement, in the females.

Terminal pad (of tentacular club) – A small, distinct pad or circlet of small terminally suckers at the distal tip of the club.

Teuthoidea – The higher taxon that includes all squid-like decapods; now archaic. The monophyly of this taxon is questionable.

Total length (TL) – Length measured from the posterior tip of the mantle to the anterior tip of the outstretched tentacles (squids and cuttlefishes) or arms (octopuses) (Fig. 6).

Trabeculae – Muscular rods that support the protective membranes on the arms and clubs of cephalopods (Fig. 34). Occasionally membranes are reduced and/or trabeculae are elongated, so they extend beyond the edge of the membrane, papilla-like.

Tragus – Particular inward projecting knob in the funnel-locking apparatus of some squids. It is the knob found on the medial surface of the central depression (Fig. 8).

Truncate teeth – Teeth on the inner chitinous rings of decapod suckers that do not terminate in a point but rather in a broad, flat tip.

Umbilicus – The central core of the chambered nautilus shell, representing the juvenile shell with its initial coils; often a depression (Fig. 42). It can be open, so as to show the inner most coils, or closed, often covered by a thickened layer, the callus.

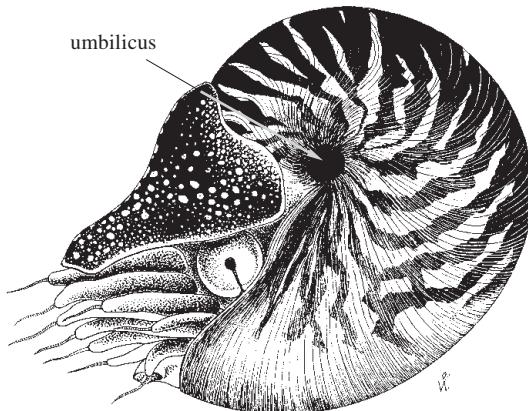


Fig. 42 *Nautilus* (lateral view)

Vane – Thin, lateral expansion of the gladius that arises from the rachis (Fig. 16) (see **Rachis**).

Ventral – The lowermost or belly surface of a cephalopod, the surface on which the funnel is located. Opposite the dorsal surface (Figs 17 and 20).

Visceral sac – The body region posterior to the head surrounded by the mantle. The body wall in this region that encases the viscera usually is rather thin-walled, hence the name 'visceral sac'. The visceral sac is also called the 'visceral dome'.

Visceropericardial coelom – The largest coelom in all cephalopods, except in the incirrate and cirrate octopods, where it is greatly reduced. Generally it encloses the gonad, and partially encapsulates the stomach, caecum and ventricle, among other structures. The visceropericardial coelom also communicates with the other cephalopodan coelom, the nephridial coelom, and the mantle cavity via a pair of ducts that open at the bases of the nephridial papillae.

Water pores – (1) Large cephalic orifices at base arms of some pelagic octopods, e.g. *Tremoctopus* (Fig. 43); (2) 8 small openings to the water pouches located at the base of the arms on the ventral web of the benthic octopus *Cistopus*.

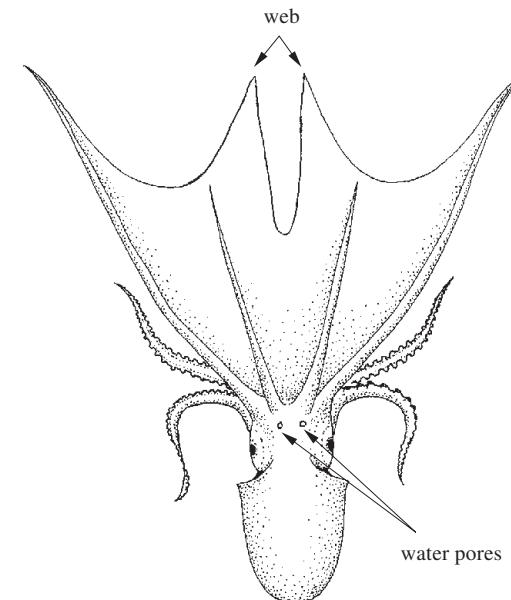


Fig. 43 *Tremoctopus* (dorsal view)

Water pouches – Glandular pouches with muscular pore openings situated in the oral webs between the base of each arm in the incirrate octopus genus *Cistopus*.

Web – A membranous sheet of greater or lesser extent that extends between the arms of many octopods, giving an umbrella-like appearance when the arms are spread out, e.g. on cirroteuthids (Figs 20 and 43). It is reduced or absent in most decapods.