

Scientific Classification

Kingdom: Animalia
Subkingdom: Eumetazoa
Superphylum: Deuterostomia
Phylum: Echinodermata



Sand dollars, cucumbers, urchins
Family: Holothuroidea and Echinoidea

Ecological Roles

Many members of the Asteroid Class are **keystone species**. Habitat overgrazing by urchins, called an urchin barren, can occur if not controlled by predators like sea otters. Many species also have **commensal relationships** with other species.



Feather stars
Family: Crinoidea

Echinodermata

“spiny skin”

Characteristics

- o **Skeleton composed of calcium carbonate and protein.** Calcium is deposited as sponge-like microstructures called **ossicles**. These ossicles, although technically an endoskeleton, act more like an exoskeleton just under the epidermis and enclosing most other tissues. **Collagen** connects the ossicles of echinoderms, allowing specialized movement without muscular effort.
- o **Water vascular system.** The **madreporite** is the opening to the system which serves in functioning capacities for locomotion, respiration, feeding and sensory functions. This systems consists of a network of radial canals extending to each limb that are connected to the tube feet, **podia**, which are armed with a sucker at the end for grasping things and moving.
- o **Pentamerous radial symmetry.** Radial symmetry of skeleton and most organ systems in most groups; although there are some echinoids and holothuroids (sea cucumbers) that have bilateral symmetry.

Nutrition and Feeding

- o **Predators** – Asteroids (sea stars) evert their stomach to externally digest their prey.
 - o **Detritivores or suspension feeders** – Holothurians (sand dollars and cucumbers) sweep their branched tentacles over the bottom or hold them out in the water to trap particulate material. Crinoids are solely suspension feeders.
 - o **Herbivores** – urchins (scrape algae from rocks).
- **Note:** Ophiuroids (brittle stars) are carnivores, deposit feeders, scavengers and filter feeders. They also have an incomplete digestive system (lack an intestine and anus).



Sea stars

Family: Asteroidea

Reproduction

- o **Separate sexes (Gonochoric).** Generally, **external fertilization** occurs with the following life cycle consisting of a free-living larval stage followed by benthic settlement. Upon settling, metamorphosis into adult form occurs. There are some exceptions to this in that some polar and boreal species of Echinoderms are **brooders**, meaning they hold on to their eggs rather than releasing them into the water column.



Basket and brittle stars
Family: Ophiuroidea

Scientific Classification

Kingdom: Animalia

Phylum: Annelida

Class: Polychaeta

Polychaeta

“many bristles”

Characteristics

- o **Segmented body (metamerism)**. Generally, they are perfectly segmented and have identical cylindrical body segments that support fleshy, paddle-like appendages (**parapodia**).
- o **Presence of chaetae (=setae)**. Chaetae are bristles found in upper and lower bundles on each body segment. These help in locomotion and defense or in anchoring burrow- or tube-dwelling species.
- o **Informally divided into 2 lifestyle groups:**

- 1.) **Errant** (free-moving) species that generally move around by swimming, crawling or burrowing. Some of these species are strictly pelagic while others are benthic. The parapodia in such species are adapted as paddles or legs.
- 2.) **Sedentary** (tube-dwelling) species that live and feed from a permanent tube or burrow. The parapodia in these species are adapted to circulate water in the tube and their bodies are softer and less muscular.



Posterior segments of a Bamboo worm; arrow indicates area of regeneration.

Genus: Clymenella



Larval sandworm with eversible jaws tucked inside its pharynx.

Family: Nereididae

Reproduction

- o **Separate sexes (Gonochoric)**. Most polychaetes reproduce only sexually. Some species may reproduce asexually through **budding** or division of the body. Release of gametes in some species occurs through a reproductive phenomenon called **epitoky**. This process is the formation of a specially adapted pelagic reproductive individual, or epitoke, from a sedentary species which burst to release eggs and sperm into the water. Fertilized eggs then hatch into a swimming planktonic larvae, called a **trochophore**.

Ecological Role

Polychaetes play a significant ecological role in the reworking of soil and sediments as a result of burrowing and the ingestion and secretion of large amounts of sediment. This sediment reworking plays a significant role in benthic communities. In addition, some tube-dwelling species secrete an ecasing tube that, when found in large numbers, may play a significant role in reef formation.



Mud worm

Family: Spionidae

Nutrition and Feeding

o **Predatory** - Prey consist of small invertebrates, sometimes other polychaetes, usually caught using a proboscis with jaws.

o **Herbivores/Omnivores/**

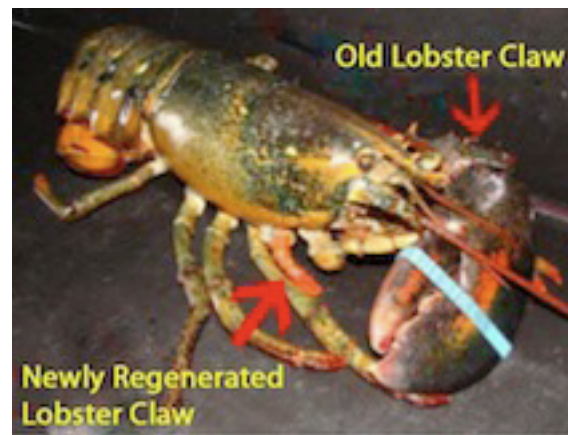
Scavengers - Jaws may be used to tear algae rather than flesh.

o **Deposit feeders** - Direct consumption of mud or sand to remove organic material. Mostly burrowers and tube dwellers.

o **Filter feeders** - Many sedentary burrowers and tube dwellers are equipped with specialized feeding apparatus that filter plankton and detritus from the water column.

Scientific Classification

Kingdom: Animalia
Phylum: Arthropoda
Class: Malacostraca
Order: Decapoda



Crabs, lobsters, and crayfish
Suborder: Pleocyemata

Nutrition and Feeding

o **Predators** – Large invertebrates are common prey for decapods.

o **Herbivores/Detritivores** - characteristic of most hermit crabs and many shrimp who scrape algae from rocks or feed on plant detritus.

o **Detritivores/Filter-feeders** - Some crabs, like the fiddler crab, scoop up mud and sand and then strain out the organic material while many burrowing shrimp filter feed from a water current.

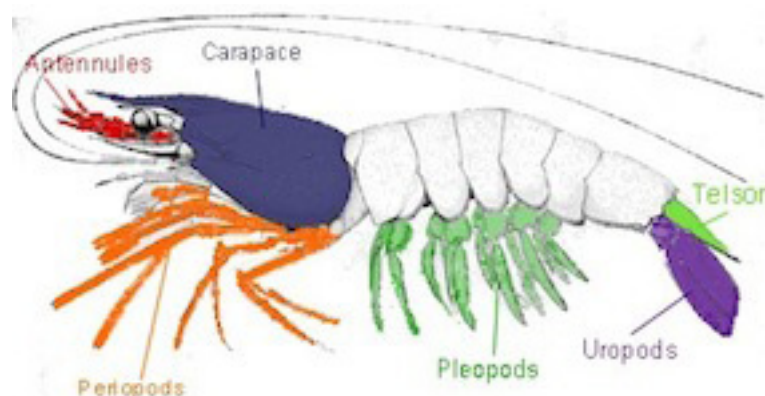
** Note, many decapods use combinations of the above feeding habits as well as use chemosensory abilities to track down prey.

Decapoda

“ten legs”

Characteristics

- o **Segmented body.** Divided into 2 main divisions:
 - 1.) Cephalothorax
 - Head: consists of antennules, antennae, mandibles, maxillae and stalked, compound eyes.
 - Thorax: Consists of the maxillipeds, modified appendages that function as mouth parts, and the pereopods, the primary walking legs, aid in gathering food and bear the sexual organs and gills.
 - 2.) Abdomen
 - Consists of the pleopods/swimmerets, uropod and telson.
- o **All have 10 legs.** These consist of the last 5 pairs of the 8 thoracic appendages (pleopods, below).
- o **Hard exoskeleton.** Covers the entire body and is made up of **chitin**. This hard, external skeleton is molted, or discarded, as the organism grows.



www.tolweb.org/treehouses/?treehouse



Shrimp and prawns
(Suborder: Dendrobranchiata)

Reproduction

- o **Gonochoric (separate sexes).** Generally, there are separate sexes, but some species go through sex changes as some point in their life. Generally, all lay eggs.
 - **Spawners** (shrimp and prawns): eggs are released into the water where they hatch into nauplius.
 - **Brooders** (crabs, lobsters and crayfish): eggs are hatched into the abdomen, remaining with the female, until they hatch into a more developed stage than the nauplius

Economic Significance

Decapods are becoming increasingly popular as aquarium pets. Many of these are kept as an aid in maintaining aquaria health because they eat algae or detritus that might accumulate in such an environment. Additionally, decapods are a large part of the seafood industry around the country and world. Commonly, decapods that we consume are referred to as shellfish. There are substantial industries for lobsters, crab and shrimp in North America.

Glossary

Ecological Roles and Economic Significance

- ✓ *Keystone species*: A species that has a disproportionately large effect on its environment relative to its abundance and play critical roles in maintaining the structure of ecological communities.
- ✓ *Commensal relationship*: A commensal relationship is a type of symbiotic relationship in which one member of the relationship benefits and the other is neither significantly helped nor harmed.

Characteristics

- ✓ *Ossicles*: Small calcareous plates that form the internal skeleton of echinoderms.
- ✓ *Collagen*: Common animal fibrous protein that forms extracellular (outside the cell) skeletal materials.
- ✓ *Madreporite*: The calcareous plate used to draw water into the water vascular system. Generally, the madreporite on a sea star is visible as a small, smooth spot on the upper side (aboral) of the body.
- ✓ *Podia*: The tube feet of an echinoderm. Water is forced into podia, causing them to expand and allowing echinoderms to move.
- ✓ *Parapodia*: Paired, unjointed, fleshy lateral outgrowths from the bodies of Polychaetes. They are used in movement as well as in respiration of the animal.
- ✓ *Pelagic*: Open-ocean areas (as compared to waters adjacent to land).
- ✓ *Chitin*: A tough, semitransparent substance that is the main component of arthropod exoskeletons and is also found in cell walls of algae and fungi.

Nutrition and Feeding

- ✓ *Detritus*: Decomposing plant and animal parts and/or fecal matter
- ✓ *Predator*: Organisms that consume other organisms.
- ✓ *Herbivore*: Animals that rely primarily or solely on plants for their food.
- ✓ *Omnivore*: Animals that eat other animals OR plants as primary food sources.
- ✓ *Scavenger*: Animals that feed on dead and decaying animal or plant matter.
- ✓ *Detritivore*: Organisms that consume detritus. Very important in decomposition and nutrient cycles.

- ✓ *Suspension feeding*: Animal obtain food by capturing or filtering suspended particles (plankton or detritus) from the water column.
 - *Filter feeding*: A type of suspension feeding in which particles are removed from a current by a filter.
- ✓ *Deposit feeding*: Animals obtain food by sifting through soil to consume detritus that has been deposited there.
- ✓ *Proboscis*: Any tubular part of the head or anterior part of the gut which is usually used in feeding and is often able to be extended.

Reproduction

- ✓ *Gonochoric*: Separation of the sexes in different individuals for reproduction.
- ✓ *External fertilization*: When sperm and egg are united externally to the bodies of the reproducing individuals.
- ✓ *Brooding*: In comparison to spawning, the act of external fertilization, brooding reproduces retain the eggs and care for them during at least the early part of development. Eggs can be either inside or outside of the body.
- ✓ *Spawning*: Involves the release of eggs and sperm into the water where external fertilization occurs. Many aquatic and marine animals reproduce through the process of spawning.
- ✓ *Budding*: A form of asexual reproduction where a new individual, genetically identical to the parent, develops from an outgrowth (bud) of the parent individual. The new bud continues to grow on the parent individual until it reaches maturity, at which time it separates.

Characteristics

- ✓ *Metamerism*: Linear arrangement of body segments that are fundamentally similar in structure. This body structure plays a critical role in locomotion.
- ✓ *Chaetae*: Bristles made up of chiton found on the segments of the body that aid in locomotion.