= Mysida =

Mysida is an order of small , shrimp @-@ like crustaceans in the malacostracan superorder Peracarida . Their common name opossum shrimps stems from the presence of a brood pouch or " marsupium " in females . The fact that the larvae are reared in this pouch and are not free @-@ swimming characterises the order . The mysid 's head bears a pair of stalked eyes and two pairs of antennae . The thorax consists of eight segments each bearing branching limbs , the whole concealed beneath a protective carapace and the abdomen has six segments and usually further small limbs .

Mysids are found throughout the world in both shallow and deep marine waters where they can be benthic or pelagic , but they are also important in some fresh water and brackish ecosystems . Many benthic species make daily vertical migrations into higher parts of the water column . Mysids are filter feeders , omnivores that feed on algae , detritus and zooplankton . Some mysids are cultured in the laboratory for experimental purposes and are used as a food source for other cultured marine organisms . They are sensitive to water pollution , so are sometimes used as bioindicators to monitor water quality .

= = Description = =

The head of a mysid bears two pairs of antennae and a pair of large , stalked eyes . The head and first segment (or sometimes the first three segments) of the thorax are fused to form the cephalothorax . The eight thoracic segments are covered by the carapace which is attached only to the first three . The first two thoracic segments bear maxillipeds which are used to filter plankton and organic particulate from the water . The other six pairs of thoracic appendages are biramous (branching) limbs known as pereopods , and are used for swimming , as well as for wafting water towards the maxillipeds for feeding . Unlike true shrimps (Caridea) , females have a marsupium beneath the thorax . This brood pouch is enclosed by the large , flexible oostegites , bristly flaps which extend from the basal segments of the pereopods and which form the floor of a chamber roofed by the animal 's sternum . This chamber is where the eggs are brooded , development being direct in most cases .

The abdomen has six segments , the first five of which bear pleopods , although these may be absent or vestigial in females . The fourth pleopod is longer than the others in males and has a specialized reproductory function .

The majority of species are 5 ? 25 mm (0 @.@ 2 ? 1 @.@ 0 in) long , and vary in colour from pale and transparent , through to bright orange or brown . They differ from other species within the superorder Peracarida by featuring statocysts on their uropods (located on the last abdominal segment) . These help the animal orient itself in the water and are clearly seen as circular vesicles : together with the pouch the statocysts are often used as features that distinguish mysids from other shrimp @-@ like organisms .

= = Distribution = =

Mysids have a cosmopolitan distribution and are found in both marine and freshwater environments , the deep sea , estuaries , shallow coastal waters , lakes , rivers and underground waters . They are primarily marine and fewer than ten percent are found in freshwater . There are about 72 freshwater species in total , being predominantly found in the palearctic and neoptropical zones . These non @-@ marine mysids occur in four distinct types of habitats ; some are estuarine species ; some were isolated in the Ponto @-@ Caspian Basin where Paramysis has since radiated enormously (23 species) ; some are glacial relicts and some are subterranean Tethyan relicts .

= = Behaviour = =

Some species are benthic (living on the seabed) and others pelagic (living in mid @-@ water) ,

but most are found close to , crawling on or burrowing into the mud or sand . Most marine species are benthic by day but leave the seabed at night to become planktonic . Locomotion is mostly by swimming , the pleopods being used for this purpose . Some mysids live among algae and seagrasses , some are solitary while many form dense swarms . Mysids form an important part of the diet of such fish as shad and flounder . In general , they are free @-@ living , but a few species , mostly in the subfamily Heteromysinae , are commensal and are associated with sea anemones and hermit crabs . Several taxa have also been described from different freshwater habitats and caves . Mysis relicta and its close relatives inhabit cold , deep lakes and have a diurnal cycle of vertical migrations .

The majority of Mysida are omnivores , feeding on algae , detritus , and zooplankton . Scavenging and cannibalism are also common , with the adults sometimes preying on their young once they emerge from the marsupium . The pelagic and most other species are filter feeders , creating a feeding current with the exopods of their pereopods . This wafts food particles into a ventral food groove along which they are passed before being filtered by setae (bristles) on the second maxillae . Larger planktonic prey can be caught in a trap composed of the endopods of the thoracic appendages . Some benthic species , especially members of the subfamily Erythropinae , have been observed feeding on small particles which they collected by grooming the surfaces of their bodies and legs .

Individual mysids are either male or female , and fertilisation is external . The gonads are in the thorax and are tubular in shape . Males have two gonopores in the eighth thoracic segment and a pair of long penises . The female gonopores are in the sixth thoracic segment and the oostegites are attached to the first to seventh pereopods to form a brood pouch . Mating usually takes place at night and lasts only a few minutes . During the process , the male inserts his penises into the marsupium and releases sperm . This stimulates the female and the eggs are usually released into the marsupium within an hour . Here they are fertilised and retained , development of the embryos in the brood pouch being direct with the young hatching from the eggs as miniature adults . The size of a mysid brood generally correlates with body length and environmental factors such as density and food availability . The age at which mysids reach sexual maturity depends on water temperature and food availability . For the species Mysidopsis bahia , this is normally at 12 to 20 days . The young are released soon afterwards , and although their numbers are usually low , the short reproductive cycle of mysid adults means a new brood can be produced every four to seven days .

= = Culturing mysids = =

Some species of mysids are easy to culture on a large scale in the laboratory as they are highly adaptive , and can tolerate a wide range of conditions . Despite low fecundity , these species have a short reproductive cycle which means they can quickly reproduce in vast numbers . They can be cultured in static or flow @-@ through systems , the latter having been shown to be able to maintain a higher stocking density than a static system . In flow @-@ through systems , juvenile mysids are continuously separated from the adult brood stock in order to reduce mortality due to cannibalism . Artemia (brine shrimp) juveniles (incubated for 24 hours) are the most common food in mysid cultures , sometimes enriched with highly unsaturated fatty acids to increase their nutritional value .

Cultured mysids are thought to provide an ideal food source for many marine organisms . They are often fed to cephalopods , fish larvae , and commercial farmed shrimp due to their small size and low cost . Their high protein and fat content also makes them a good alternative to live enriched Artemia when feeding juveniles (especially those that are difficult to maintain such as young seahorses) and other small fauna .

Their sensitivity to water quality also makes them suitable for bioassays . Americamysis bahia and Americamysis almyra are frequently used to test for pesticides and other toxic substances , with A. bahia found to be more sensitive during the periods when it is moulting .

= = Systematics = =

The Mysida belong to the superorder Peracarida , which means ? near to shrimps ? . Although in many respects mysids appear similar to some shrimps , the main characteristic separating them from the superorder Eucarida is their lack of free @-@ swimming larvae . The order Mysida is extensive and currently includes approximately 160 genera , containing more than 1000 species .

Traditionally , Mysida were united with another , externally similar group of pelagic crustaceans , the Lophogastrida , into a broader order Mysidacea , but that classification is generally abandoned at present . While the previous grouping had good morphological support , molecular studies do not corroborate the monophyly of this group . Previously Mysida included two other families , Lepidomysidae and Stygiomysidae , but these have now been placed in a separate order , Stygiomysida .

= = Classification = =