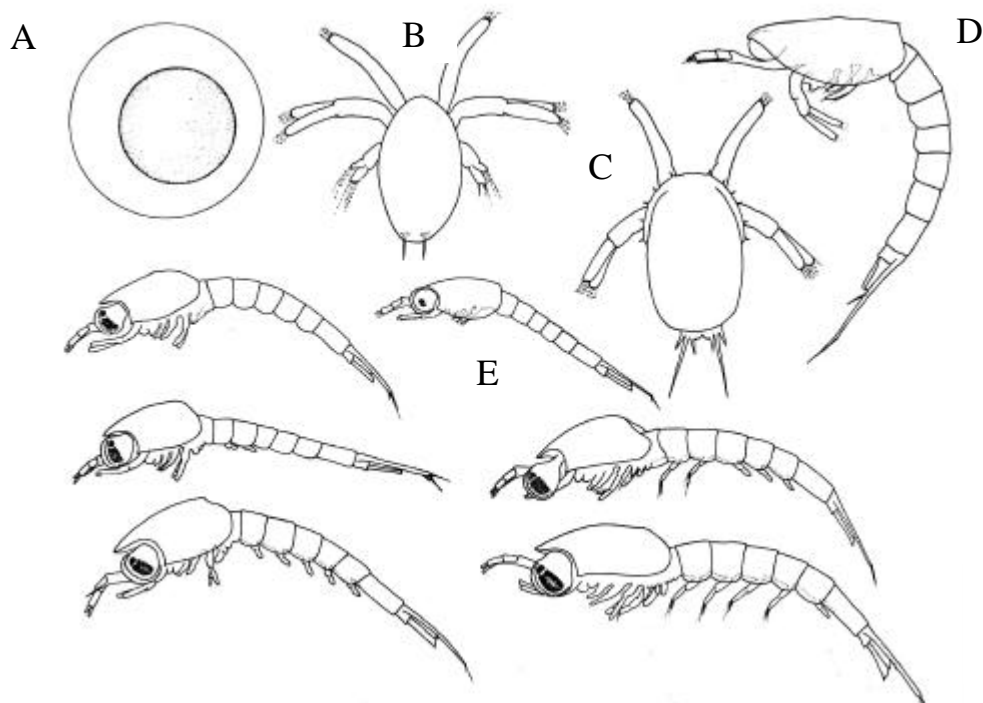
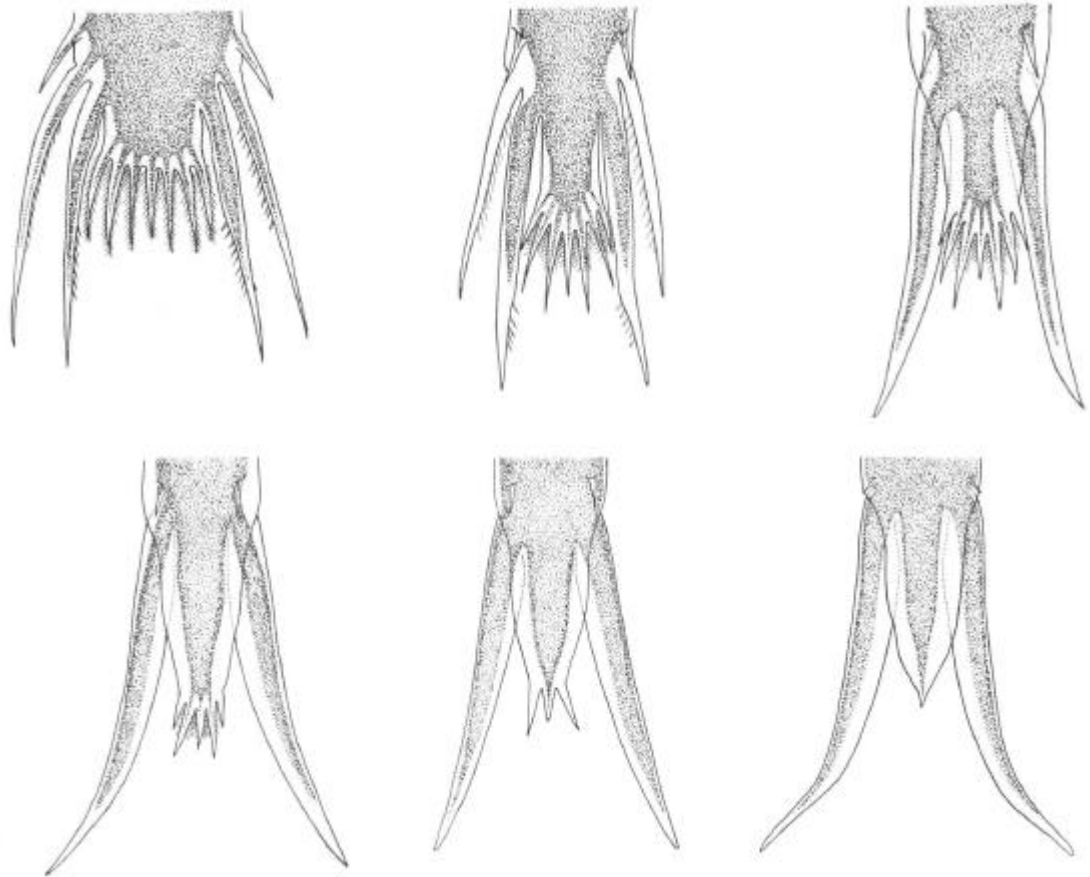


Order Euphausiacea

Euphausiids, or krill, are relatively large shrimp-like organisms, of which there are 86 known species. There are only two families of euphausiids, Benth euphausiidae and Euphausiidae, of which only the latter have been sampled during the Darwin Programme. Euphausiids often swarm in large numbers and are generally found in greatest numbers away from the coast. Sexes are separate and eggs are either released directly into the water column (57 species) or held in an egg sacs or sacs, carried between the thoracic legs. Eggs are large, typically 0.3-0.9 mm in diameter, with, at least in free spawned eggs, a perivitelline space of varying diameter between the embryo and the outer membrane. The larva which emerges from free spawned eggs is the typical nauplius larva of crustaceans and has only 3 pairs of limbs. The nauplius develops through a second nauplius stage and then a metanauplius stage, which has only 2 pairs of limbs. Following the metanauplius are three calyptopis stages, the final of which moults into the first of several furcilia stages, the number varying with species and also determined by environmental conditions. Eyes emerge from below the carapace and start to pigment during the furcilia stages. Light organs (photophores), which are usually red, develop during this stage and are characteristic of all but 2 species of this order. Generally there are one at the base of each eye, a pair on the coxae of the second and seventh thoracic limbs and single ones on the mid line between each of the first to fourth pleopods. In the Genus *Stylocheiron* these numbers are reduced. There is a reduction in the number of spines on the telson as euphausiids approach adulthood, till there are only three spines. However, they cannot be considered adult until they are capable of reproduction, and till this time are called post-larval. In the later developmental stages their eyes are generally black or brown, sometimes red, and can be circular, sub-circular or elongated.



Developmental stages of euphausiids: A, egg; B, nauplius; C, metanauplius; D, calyptopis; E various successive furcilia stages. From Einarsson (1945).



Changes in the telson of the furcilia stage during development, showing the gradual reduction in the number of spines. From Einarsson (1945).

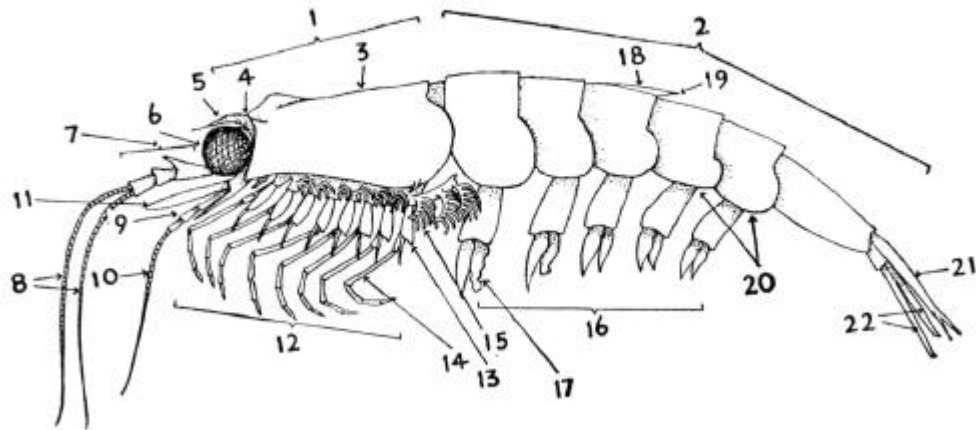
Euphausiid morphology

The body is divided into the cephalothorax and the abdomen. The cephalothorax includes the carapace, exposed gills, 5 paired mouthparts, 8 paired thoracic limbs, 2 pairs of antennae and a pair of eyes. There are 6 segments in the abdomen, which ventrally carry the paired pleopods, which are used in locomotion. The telson and uropods are found posteriorly.

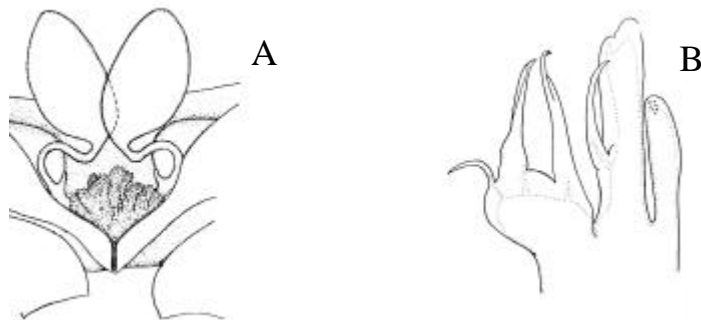
The paired first antennae, or antennules, each consists of a 3-segmented antennular peduncle and 2, multi-segmented, antennal flagellae. The anterior-dorsal edge of the first segment of the antennular peduncle is often extended, forming a plate called the antennular lappet, which varies in shape between species. The paired second antennae each consist of a basal segment, which has a 2-segmented antennal peduncle and an antennal scale. On the outer distal margin of the basal segment there is a spine, which varies in length. The antennal scale lies to the outside of the peduncle, which terminates in a single long flagellum.

Each of the abdominal pleopods carries a pair of setose plates, an inner endopodite and an outer exopodite. In Family Euphausiidae, the endopodites of the first and second pleopods are modified as sexual organs in males. The various hooks and processes, which develop on

the pleopods, are termed the petasma. The structure can be used in the identification of mature individuals. The external reproductive organ of the female is known as the thelycum and is found on the ventral surface of the sixth and seventh thoracic segments.



Generalised euphausiid, illustrating terminology. 1, Cephalothorax; 2, abdomen; 3, carapace; 4, frontal plate; 5, rostrum; 6, eye; 7, first antennal peduncle; 8, flagella of first antenna; 9, second antennal peduncle; 10, flagellum of second antennae; 11, antennal scale; 12, thoracic limbs; 13, exopodite of thoracic limb; 14, endopodite of thoracic limb; 15, gills; 16, pleopods; 17, male copulatory organ; 18, dorsal keel; 19, dorsal tooth; 20, pleuron; 21, telson; 22, uropods. From Boden (1954).



Typical euphausiid sex organs. A, female thelycum with two spermatophores attached; b, male petasma. From Einarsson (1945).

It should be noted that keys are based on adult feature and these same features may not be present in juveniles.

An excellent key and descriptions to the euphausiids of the world are given in Baker *et al.* (1990).

Family Euphausiidae

The eyes are well developed. The first and second pairs of pleopods in the male are transformed into copulatory organs. Photophores are present. The lower posterior margin of the carapace is not serrated but smooth, or carries one or two small denticles

Genus *Euphausia*

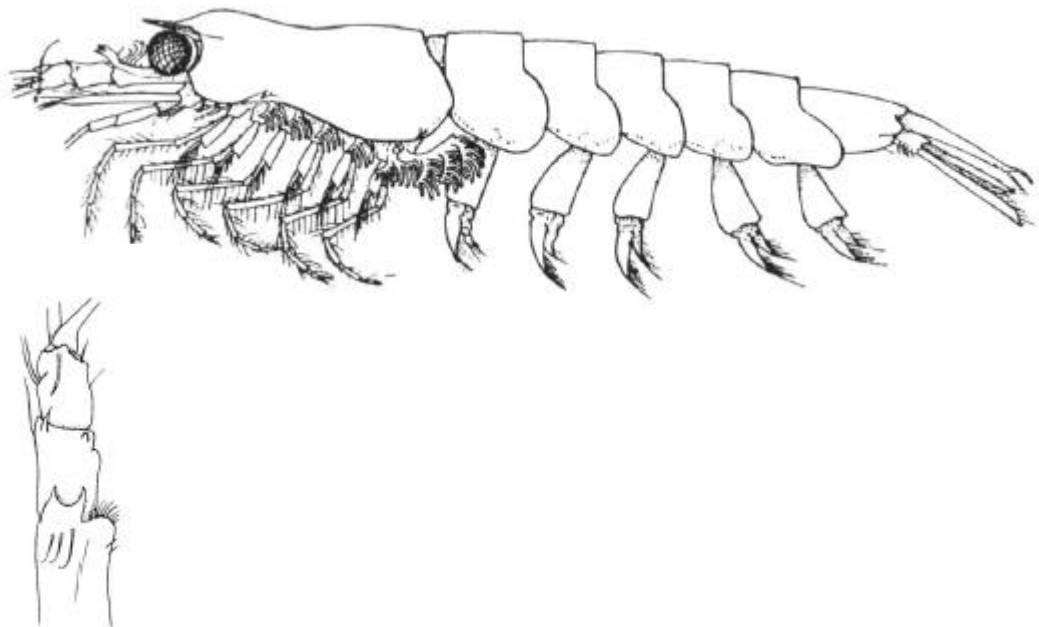
Denticle are generally present on the sides of the carapace, either one or two pairs. Eyes are always circular, or slightly sub-circular. Shape of the rostrum is variable, either pointed or gently rounded. The basal segment of the antennular peduncle often has a small lappet at the distal end. The seventh thoracic leg consists of a minute process with the exopodite missing, while the eighth thoracic leg is tiny.

Euphausia diomedea Ortmann 1894

Length: 10-18 mm.

The anterior extension of the carapace is short, sometimes extended over the eyestalks and terminates in a slender rostrum. Two denticles are present on the carapace, anteriorly and posteriorly, towards the lower edge. The basal segment of the first antennal peduncle bears a bifurcated lobe, the ends of which point forwards and outwards. The second segment has 2 processes distally, the outer one blunt and the other sharp. There is a short low ridge on the third segment.

Recorded: Zuza, Madagascar.



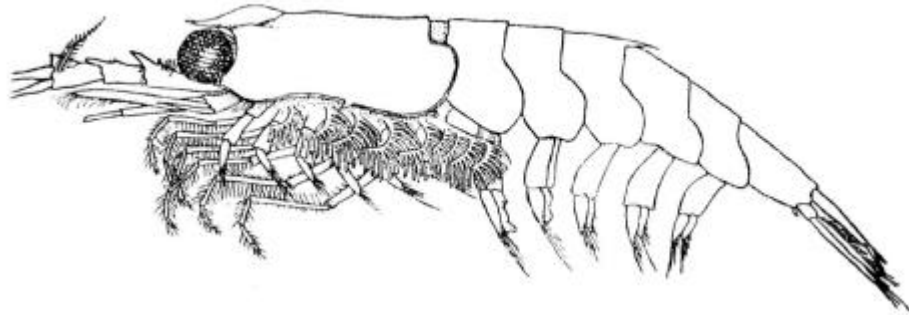
Euphausia diomedea: Adult male from left side and right first antennal peduncle from above. From Boden(1954).

Euphausia gibboides Ortmann 1893

Length: 22-27 mm.

Body quite robust. The anterior projection of the carapace is short, with a broad based but terminally sharp rostrum. There is a single spine on the carapace, on the lower margin, around half way along. There is a pronounced keel on the dorsal carapace. The eyes are large and circular. The basal segment of the first antennular peduncle is extended distally into a long lobe, which points forwards and upwards for the first half of its length and then tapers abruptly and bends sharply outwards. The upper distal end of the second segment is concave but projects as a lobe over the proximal end of the third segment. The third segment has a high dorsal keel with an acute tooth at its dorsal, distal edge. The scale of the second antennal segment reaches to around the middle of the third segment of the first antennal peduncle. The spiny process on the outer edge of the scale is just under half as long as the scale. There is a short tooth on the dorsal surface of the third abdominal segment.

Recorded: Madagascar.



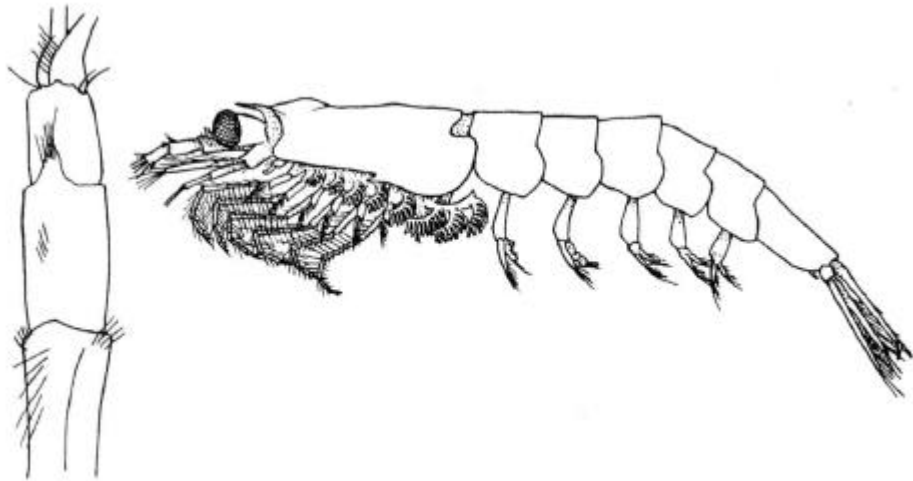
Euphausia gibboides: Adult male from left side. From Boden (1954).

Euphausia tenera Hansen 1905

Length: 7-9 mm.

The rostrum is quite short but pointed and there is a slight keel on the dorsal carapace. There is a single denticle on the edge of the carapace, just behind its mid point. The eyes are small and slightly oval. The basal segment of the first antennular peduncle of the male has several strong setae, but no processes. The second segment has a distal, which extends over the third segment. There are no strong setae on the basal segment of the first antennular peduncle of the female, but the upper terminal margin has a small flat process, pointing upward and visible from the side. The second segment has a much smaller lobe than in the male, which terminates in an angle. There are no processes on the third segment of the peduncle in either sex.

Recorded: Madagascar



Euphausia tenera: Adult male from left side and right male first antennal peduncle from above. From Boden (1954).

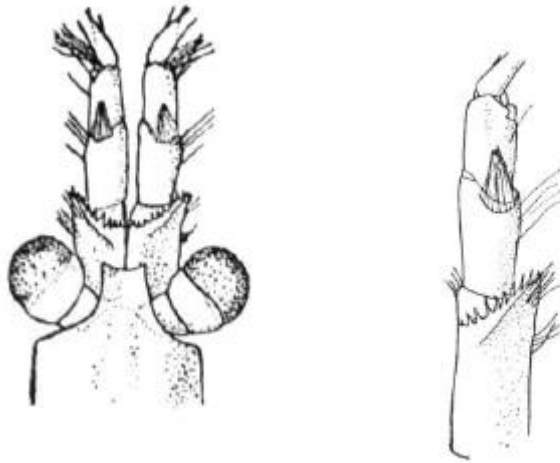
Genus *Pseudeuphausia*

Pseudeuphausia latifrons G.O. Sars, 1883

Length: 7-16 mm.

This is the only species of the genera recorded in the region. Closely related to *Euphausia*. The carapace is produced into a frontal plate, which is transversely cut off so there is no rostrum. The plate is concave anteriorly and longitudinally. There is a prominent median keel on the carapace. A small lateral denticle is present on the lower posterior border of the carapace. The first segment of the antennular peduncle has a dorsal keel bearing 9-10 spines and cuts across at an angle to the outer corner, with a conspicuous spine on the outer edge. Before the distal edge of the second segment there is a group of stiff curved setae, which converge at their tip near the middle of segment 3.

Recorded: Zuza, Madagascar



Pseudeuphausia latifrons: Front part of carapace and first antennal peduncle from above, and right first antennal peduncle from above. From Boden (1954).

Genus *Stylocheiron*

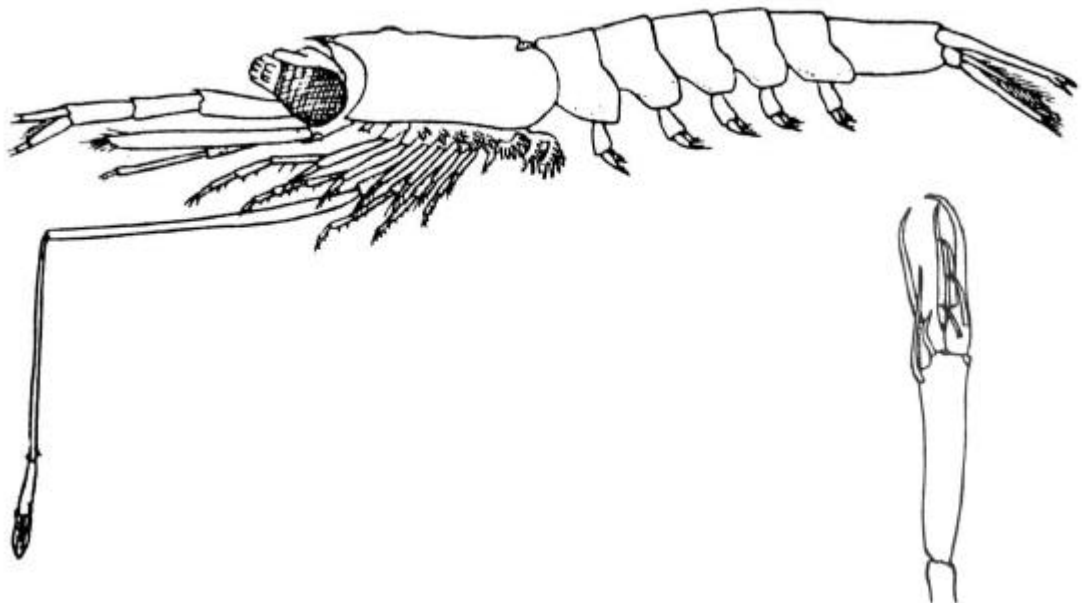
Mostly small slender species, tending to have elongated eyes with large crystal cones at the top. They never have denticles on the carapace. The second and third segments of the antennular peduncle in the female are long and slender while in the male they are short and thick. The upper flagellum is shorter than the lower in the male and the segments are flattened and broad, while in the female they are slender and cylindrical. The peduncle of the second antennal endopodite is extremely elongated, reaching beyond the end of the scale. The first 2 thoracic limbs are short, while the third is extremely elongated, terminating in a claw-like segment called a false chelae. However, this limb is fragile and is often broken off during sampling. The remaining thoracic limbs gradually reduce in size and the last is rudimentary. The number of photophores is reduced in this genera. They are found at the base of the eyes, on the coxae of the seventh thoracic limbs and in the ventral mid-line of the first abdominal segment.

Stylocheiron affine Hansen, 1910

Rostrum long and slender in the female, reaching to, or beyond the anterior eye, shorter in the male. The carapace is keeled dorsally. The eyes are less than twice as high as broad, with the lower end less than twice as wide as the upper end. At the upper narrow end are 4-7 crystalline cones in a transverse row. The first antennal peduncle in both sexes is about as long as the carapace, relatively shorter in the male. In the female the upper flagellum is cylindrical and slender and around as long as the peduncle while in the male the distal parts of both flagella are flattened and wider. The elongated third thoracic limb terminates in the typical chelae of the genera. The second last segment has a long, strong curved spine and 2 shorter spines.

Length: 5.4-8.5 mm.

Recorded: Madagascar



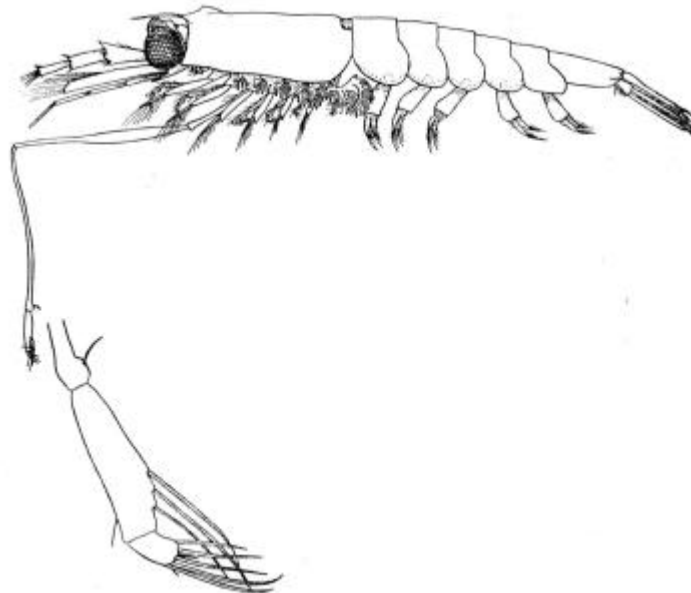
Stylocheiron affine: Adult female from left side and terminal segment of third thoracic limb. From Boden (1954).

Stylocheiron carinatum G.O. Sars, 1883

Length: 6-12 mm.

The anterior carapace is short, with a sharp rostrum. The eyes are sub-circular, quite broad at the base, upper lobe short and narrow with 6-8 slightly enlarged crystalline cones at the top, in a transverse row. There is a high dorsal keel on the carapace behind the rostrum. The basal segment of the first antennular peduncle is similar in both sexes and has no lobes or processes. The flagellae are shorter than the peduncle, the lower slightly shorter than the upper, and in the male thick at the base. The female flagellae are much thinner than in the male. At the distal end of the third last segment of the elongated third thoracic limb, there is a raised portion armed with a spine. The second last segment has three strong setae on its lower edge.

Recorded: Zuza, Madagascar



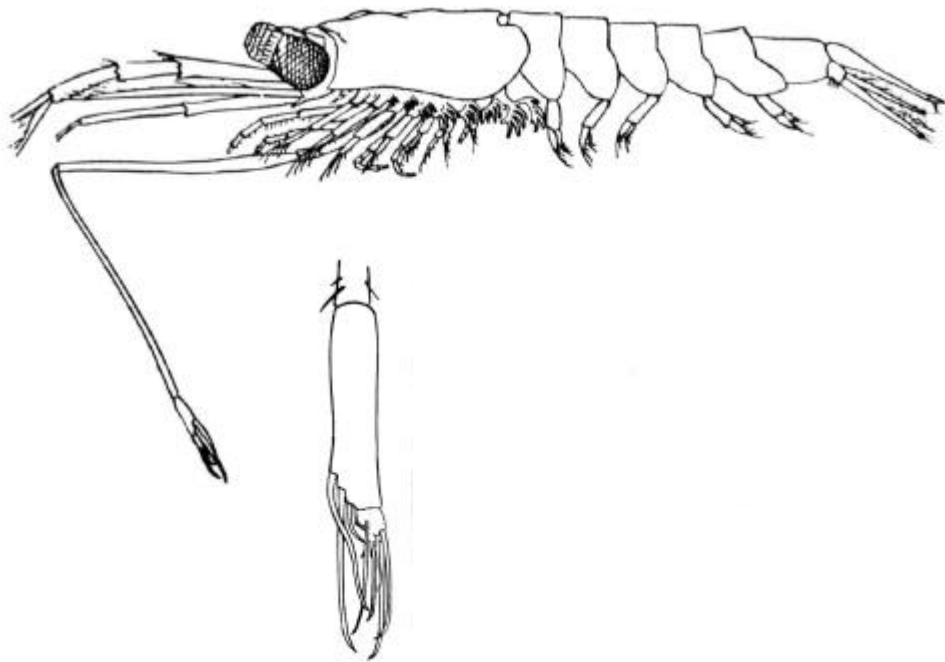
Stylocheiron carinatum: Adult female from left side and terminal segments of third thoracic limb. From Boden (1954).

Stylocheiron longicorne G.O. Sars, 1883

Length: 6.2-11.3 mm.

The rostrum is short but pointed. There is a low dorsal keel without a prominent crest. The eyes are twice as high as the width across the base, the upper part almost as wide as the lower part. The upper eye has 7-19 enlarged crystalline cones in a transverse row. The false chelae bear a number of strong bristles on the last 2 segments. The sixth abdominal segment is slightly longer than the fifth segment.

Recorded: Madagascar



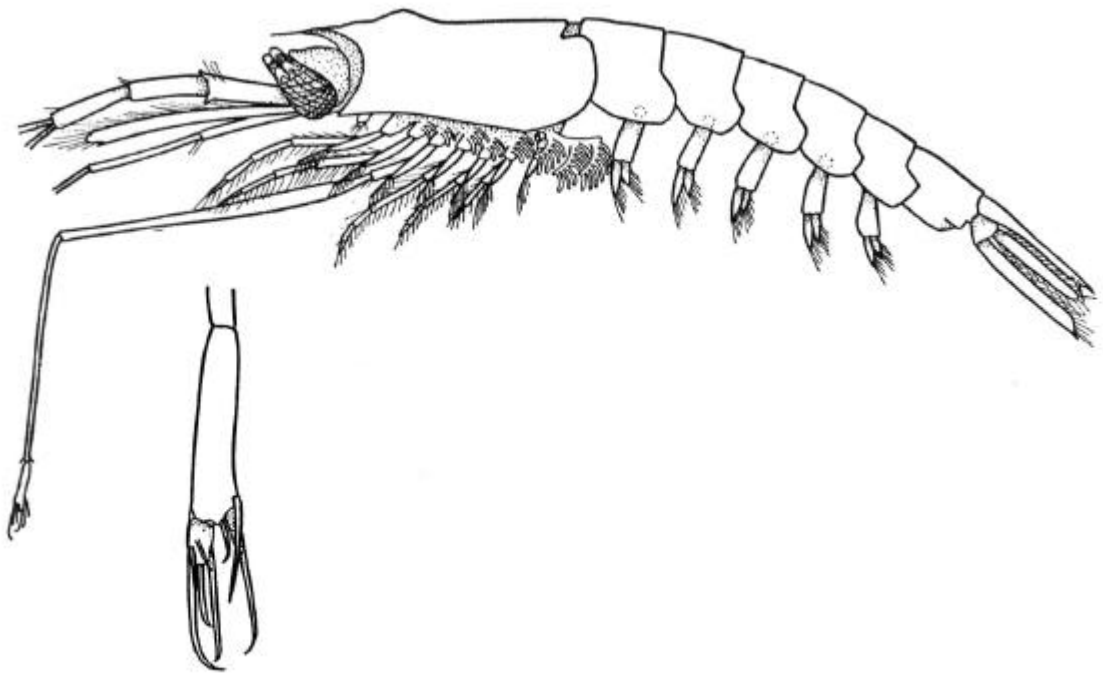
Stylocheiron longicorne: Adult male from left side and false chelae of the third thoracic limb. From Boden (1954).

Stylocheiron microphthalmum Hansen, 1910

Length: 6.1-6.9 mm.

Frontal plate triangular in the male but produced to a slender rostrum in female. Antennal scale long and narrow, about 12 to 20 times longer than wide at its widest point. Eye small, upper lobe with 2 enlarged crystalline cones in a transverse row. The false chelae of the third thoracic leg have a long distally curved spine and 2 shorter spines on the second last segment. The terminal segment has several strong spiniform bristles. The eyes of this species are small compared to *S. affine* and *S. suhmii*.

Recorded: Madagascar



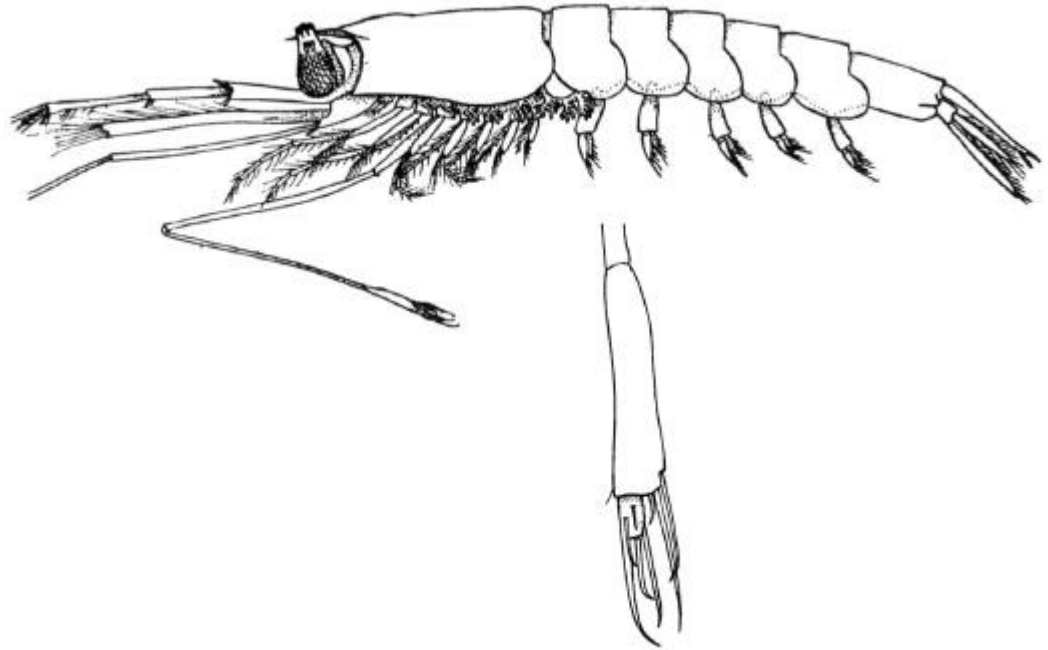
Stylocheiron microphthalmum: Adult female and false chelae of third thoracic leg. From Boden *et al.* (1955)

Stylocheiron suhmii G.O. Sars, 1883

Length: 5.5-7.8 mm.

The rostrum is short and pointed. Antennal scale long and narrow, about 12 to 20 times longer than wide at its widest point. No dorsal crest on carapace. Eyes narrower than in *S. affine* and with only 3 well developed crystal cones in a transverse row across the top.

Recorded: Madagascar



Stylocheiron suhmii: Adult female from left side and false chelae of third thoracic limb. From Boden (1954).