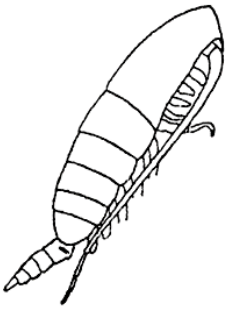
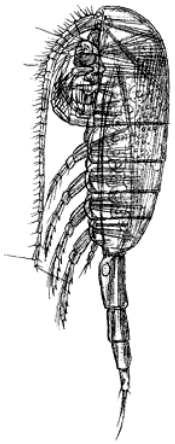
Guide to some common copepods in the Benguela Current LME

Zooplankton Workshop
Swakopmund, Namibia
January 2007





Compiled by:
Jenny Huggett (MCM, DEAT) &
Janet Bradford-Grieve (NIWA)

Foreword

Zooplankton occupy a key position in the pelagic foodweb, as they transfer organic energy produced by phytoplankton to higher trophic levels, including pelagic fish. In the coastal upwelling region of the Benguela Current Large Marine Ecosystem (BCLME) off southern Africa, data on zooplankton have been collected routinely, primarily in support of fisheries research, since the development of the pelagic fishing industry in southern Africa in the early 1950s. Zooplankton monitoring is ongoing in the region, and even if only the biomass distribution is usually investigated by applying bulk methods like volume or weight measurements, inspection of the species composition adds valuable information on the relative abundance, distribution and diversity of taxa. However, the BCLME region in general, and South Africa in particular, have over the past 2 decades suffered an enormous loss of expertise in zooplankton taxonomy at an exponential rate, to the extent that the very few experts remaining are on the list of 'Endangered Species'. Furthermore, such expertise has still to be developed in Namibia and Angola.

The dwindling of zooplankton taxonomic expertise over the years has restricted local scientists in their ability to study changes in zooplankton community structure in detail. Such knowledge is essential to understand and be able to predict the impact of environmental changes on fish stock fluctuations. In addition to the harvesting of marine living resources, the region is a hub of maritime activities, including oil and gas exploration and production, diamond mining, shipping, ports, and sovereignty and resource protection. The impacts of these activities on ecosystem health require judicious management at the ecosystem level, and the Benguela Current Commission (BCC) was recently established for that purpose. Detailed zooplankton taxonomic analyses will provide the BCC with practical applications to a range of policy issues such as climate change, biodiversity, the introduction of alien species, pollution and eutrophication in addition to fisheries.

To address this situation, a regional training course in zooplankton taxonomy and species identification was developed to upgrade institutional capacity in the BCLME region. Funds were sourced from the 2 regional capacity building programmes, BENEFIT and BCLME, as well as the Alfred P. Sloan Foundation (USA) through the Census of Marine Zooplankton, a project of the global Census of Marine Life. The course was facilitated by Dr Janet Bradford-Grieve, FRSNZ and world authority on copepod taxonomy from New Zealand. Five scientists and technicians from each of the 3 countries bordering the Benguela Current, viz. Angola, Namibia and South Africa, participated.

The course was held in Swakopmund, Namibia, during the period 8-19 January 2007. Practical sessions on taxonomy and microscope identification of different zooplankton groups were interspersed with lectures on the Benguela Current Ecosystem (Anja Kreiner, NatMIRC/MFMR), zooplankton ecology (Jenny Huggett, MCM/DEAT), sampling methodology and sample analysis (Hans Verheye, MCM/DEAT), copepod morphology, using keys, and copepod dissection and observation (Janet Bradford-Grieve). Material used for analysis included samples collected from the 3 respective countries.

This guide to common copepods was compiled during the workshop as an informal and useful take-home tool for the participants. It highlights some of the key features used to distinguish some of the more abundant copepod genera and species in the region, drawing on a number of more comprehensive references listed at the end of this guide. It is by no means comprehensive and is intended to serve as a basis for further laboratory-based learning in each BCLME country. It is also envisioned as the first in a series of identification guides to other taxa examined during the workshop, including euphausiids, amphipods and chaetognaths, and important taxa not covered during the workshop, such as gelatinous zooplankton (jellyfish, ctenophores, appendicularians, salps, doliolids).

Course Convenors: Hans M. Verheye (MCM/DEAT) and Anja Kreiner (NatMIRC/MFMR)

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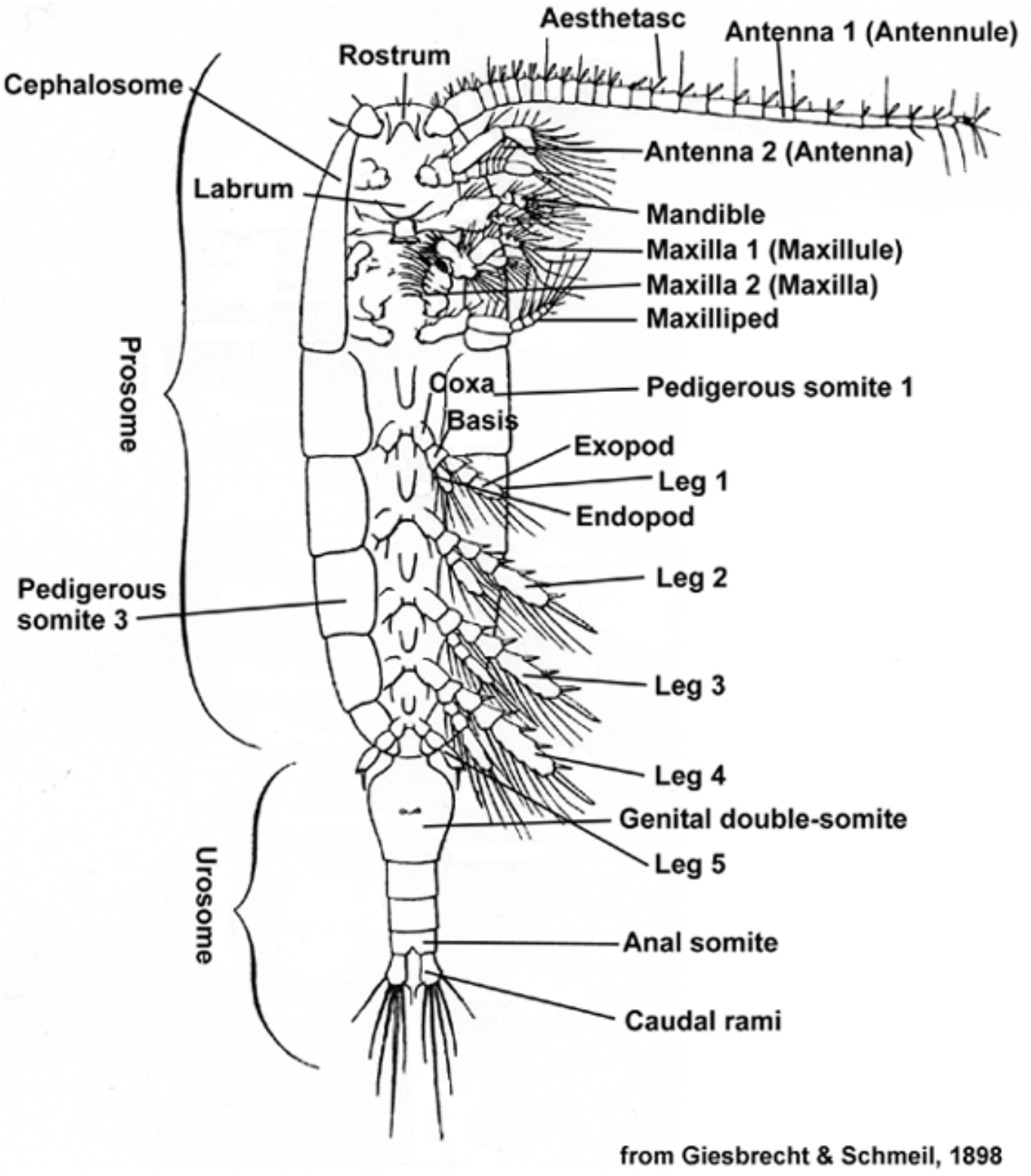
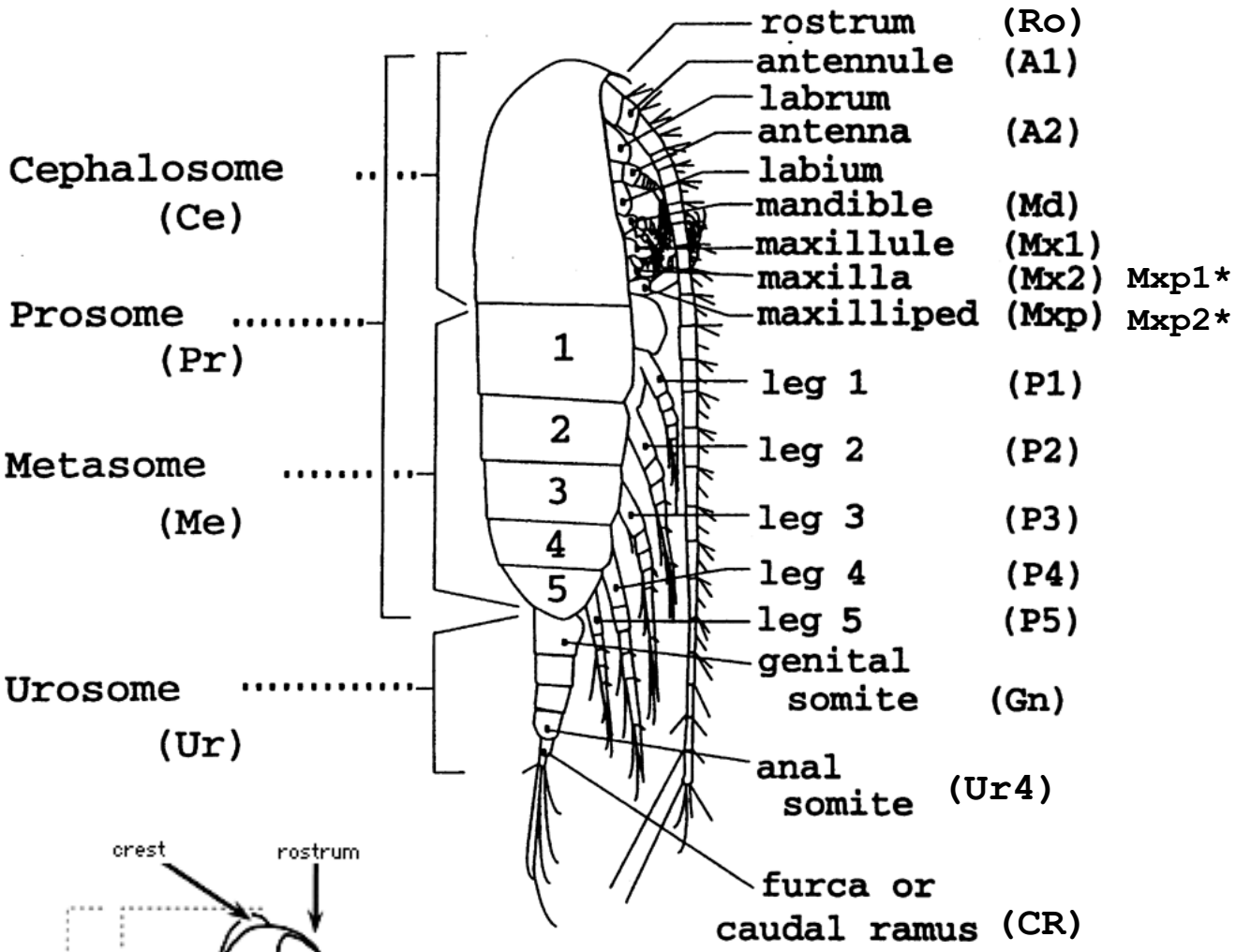
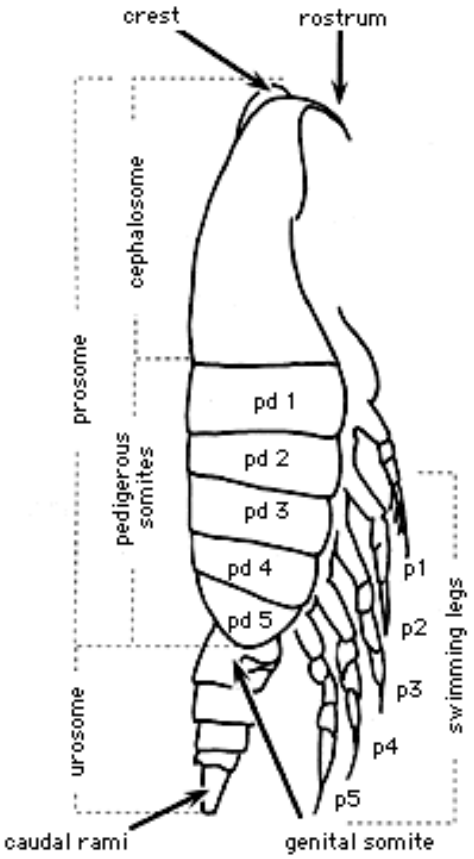
Copepod form – ventral view



Copepod form – lateral view

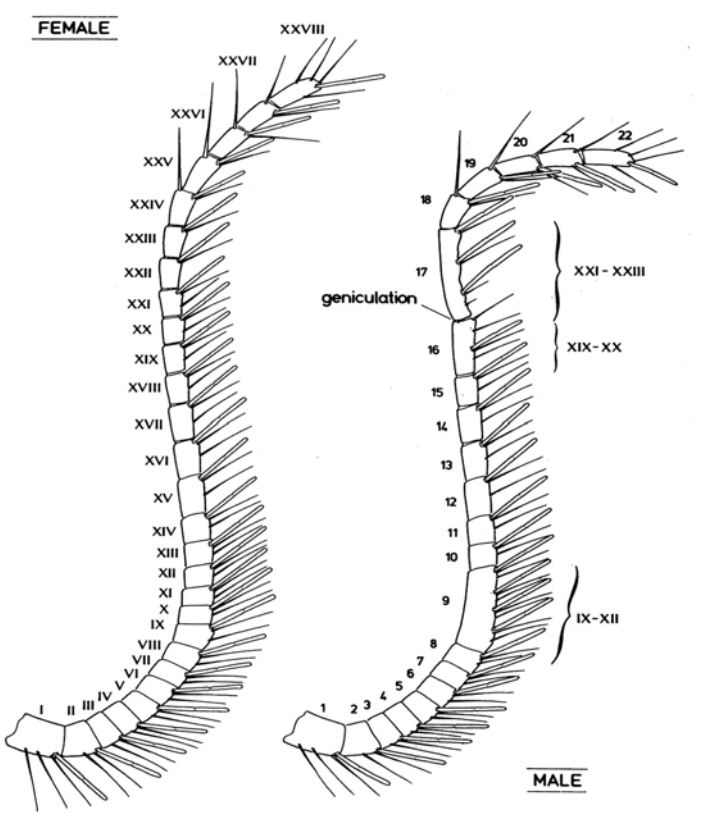




* used by some older works

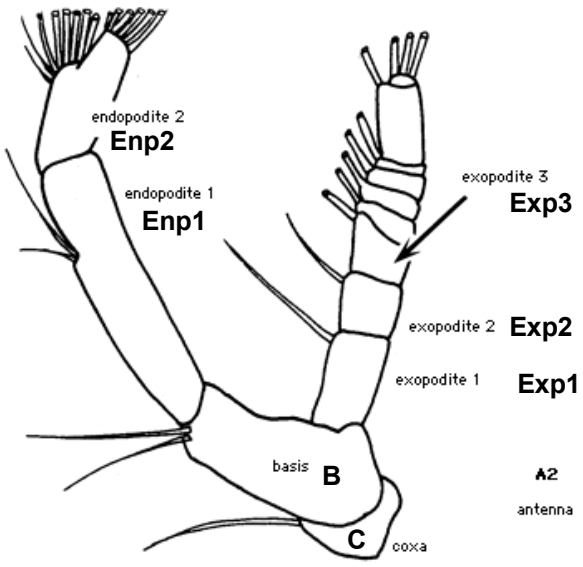
Calanoid mouthparts

Antennule (A1)

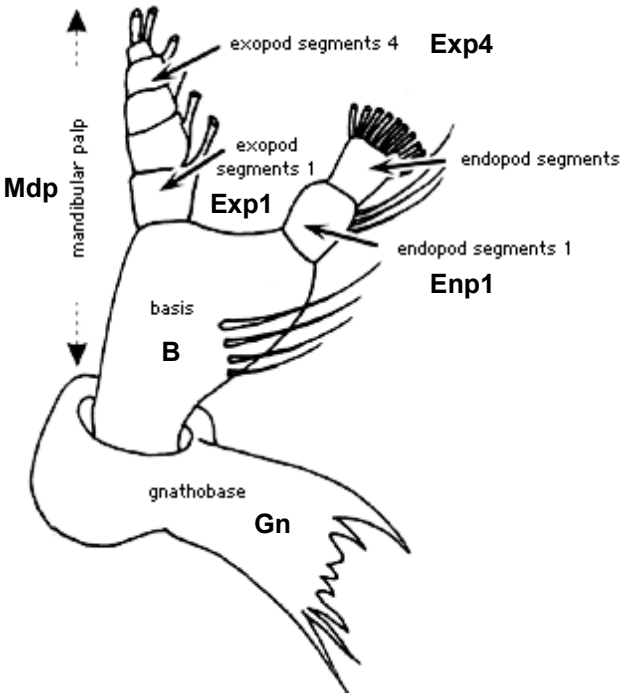


Maximum 28 segments in female A1

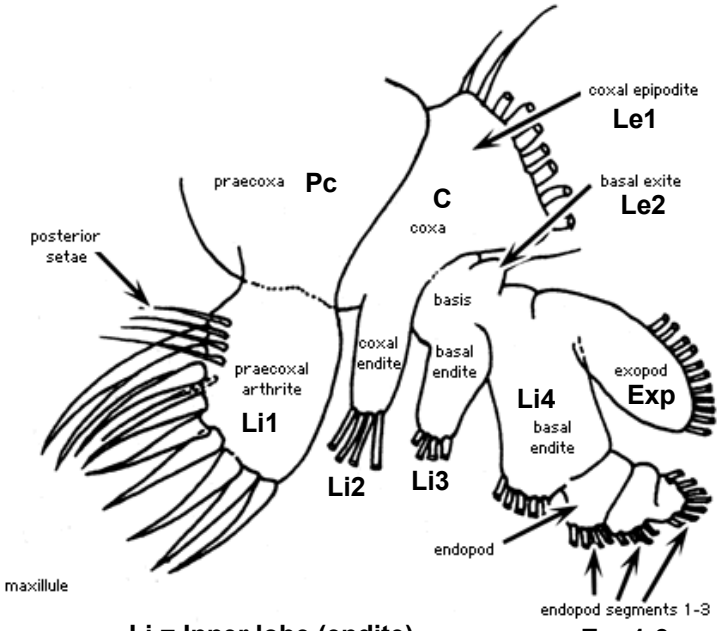
Antenna (A2)



Mandible (Md)



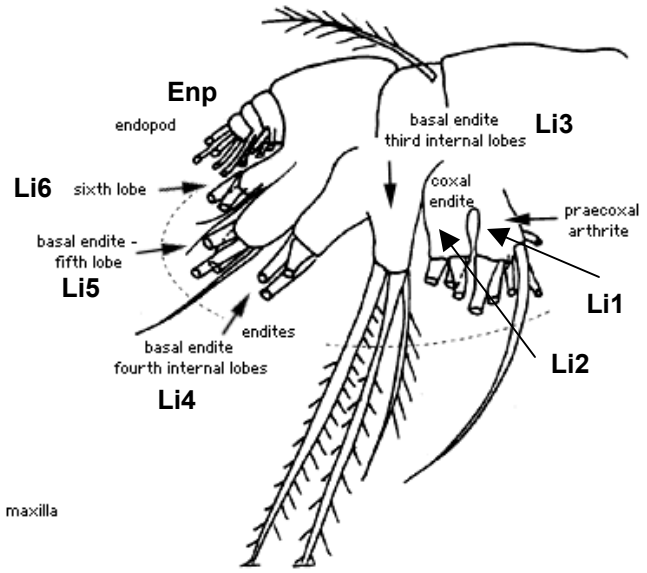
Maxillule (Mx1)



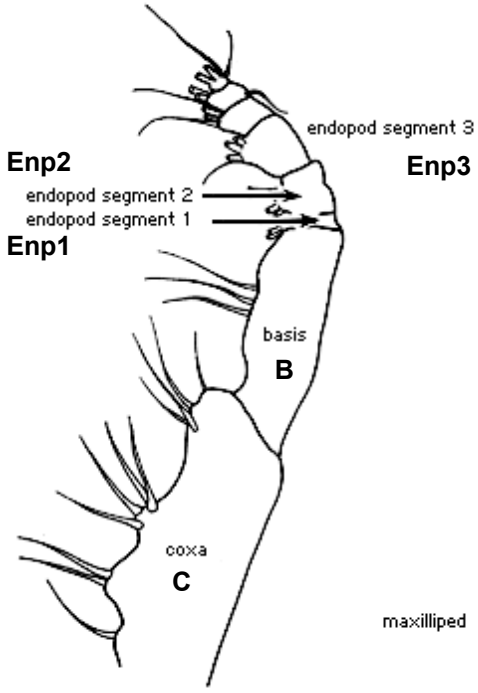
Li = Inner lobe (endite)
Le = Outer lobe (epipodite)

Calanoid mouthparts and swimming leg

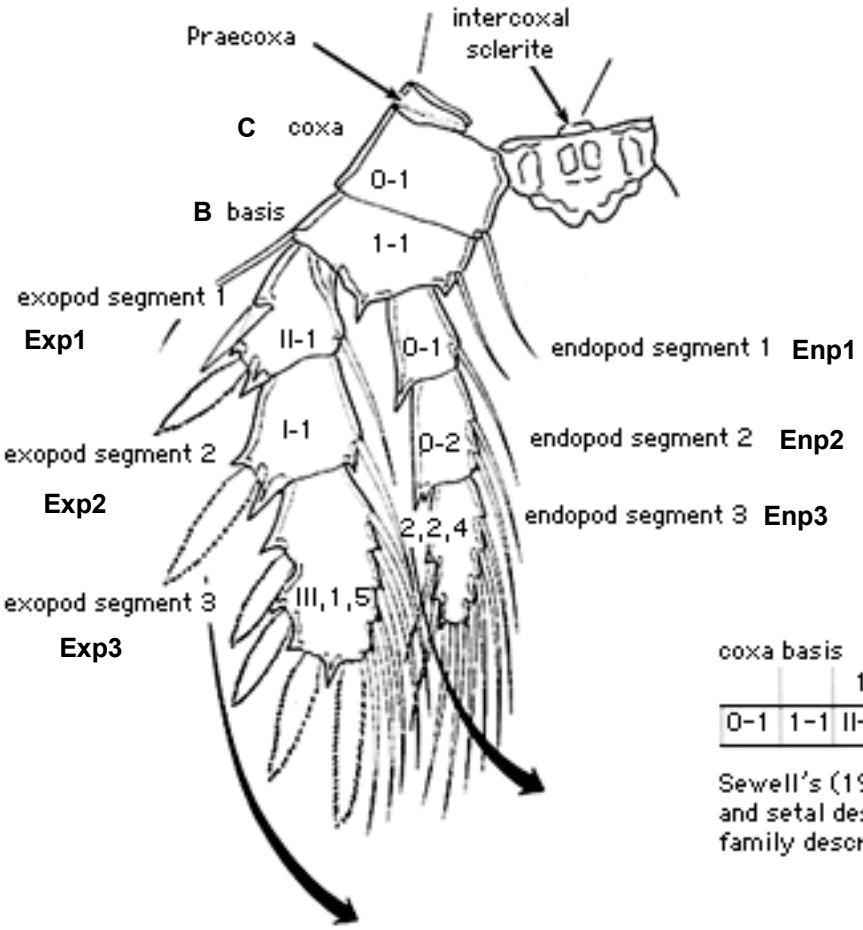
Maxilla (Mx2)



Maxilliped (Mxp)



Structure of calanoid swimming leg



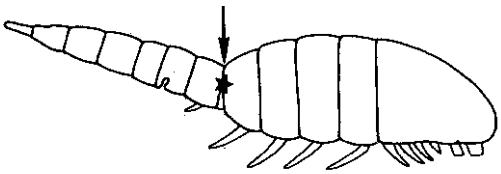
coxa	basis	exopod			endopod		
		1	2	3	1	2	3
0-1	1-1	II-1	I-1	III,1,5	0-1	0-2	2,2,4

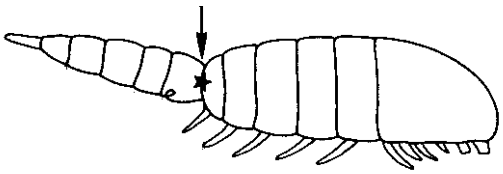
Sewell's (1949) system of spine and setal description, used in the family descriptions, is given in the box.

Structure of calanoid swimming leg. Basic copepod swimming leg, showing the maximum setation of a second leg.

from Huys and Boxshall (1991)

Major body articulation





ADULT

PODOPLEAN COPEPODS

Cyclopoida
Harpacticoida
Poecilostomatoida

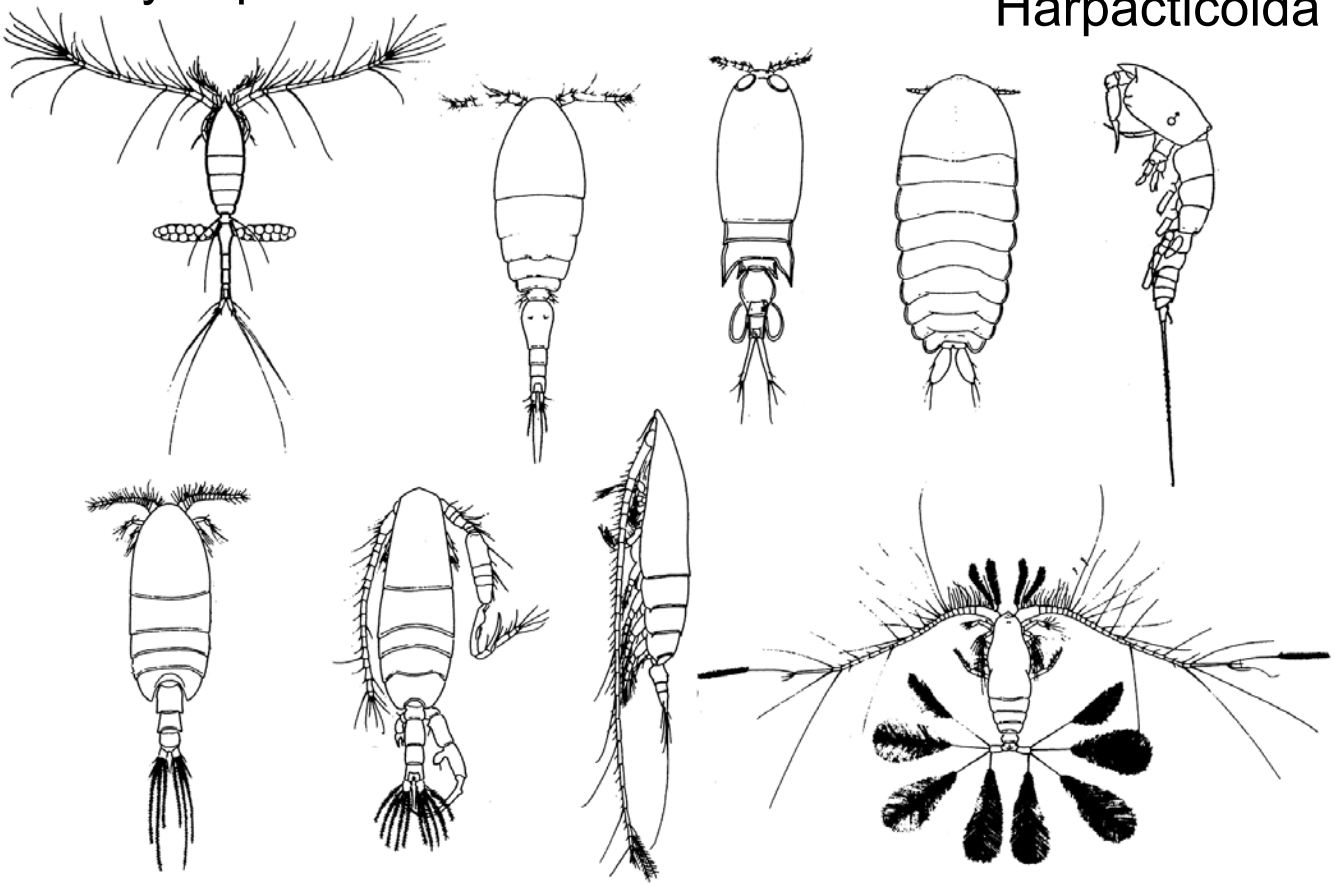
GYMNOPLEAN COPEPODS

Calanoida

Cyclopoida

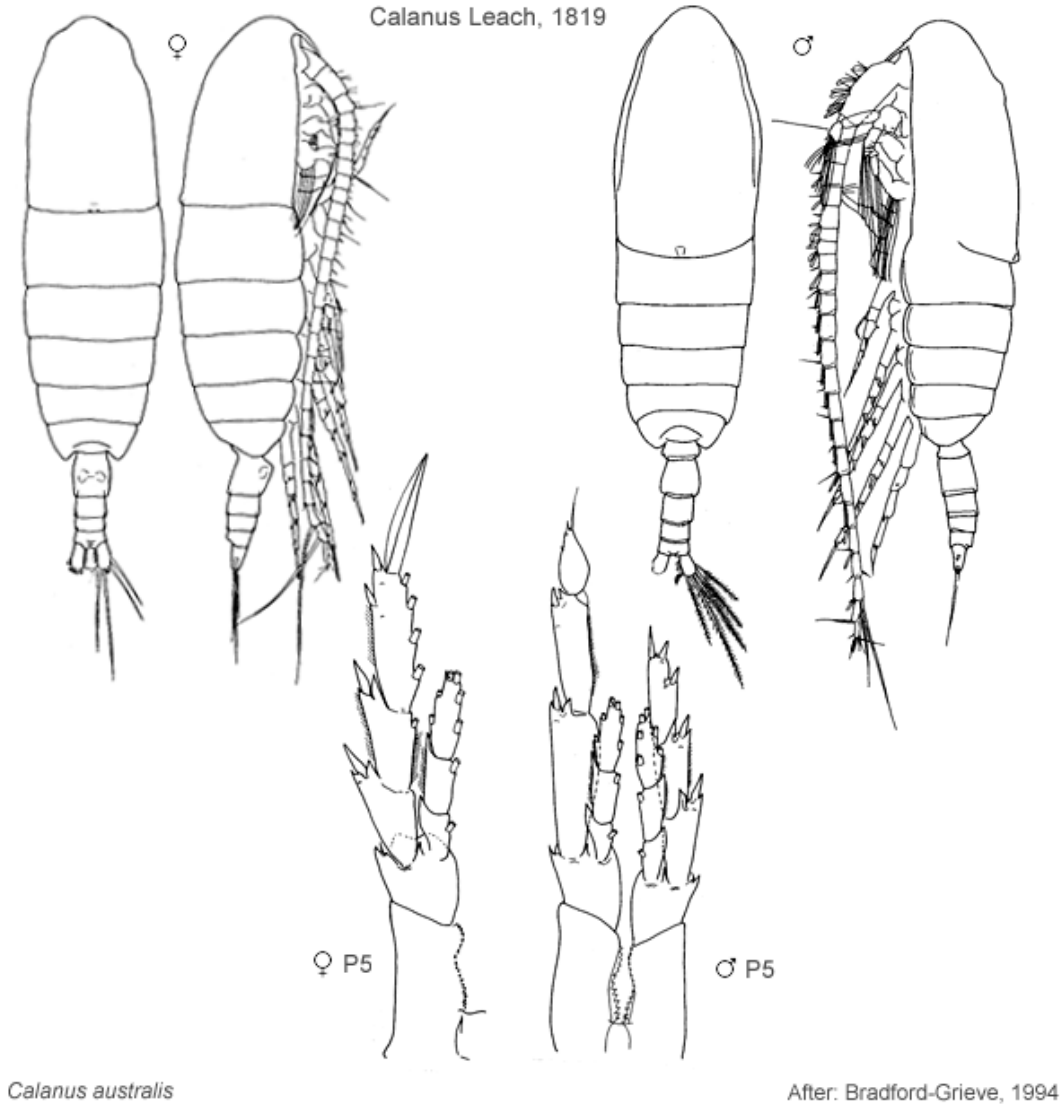
Poecilostomatoida

Harpacticoida



Calanoida

Calanoida: Family Calanidae



Family Calanidae
Genera: *Calanoides, Calanus, Canthocalanus, Cosmocalanus, Mesocalanus, Nannocalanus, Neocalanus, Undinula*

Females:
Ce and Pd 1 may be fused or separate. Pd4 and 5 always separate. Ur 4-segmented. P5 similar to P2-4. P5 Coxa with inner edge teeth in *Calanus*, *Nannocalanus* and *Cosmocalanus*.

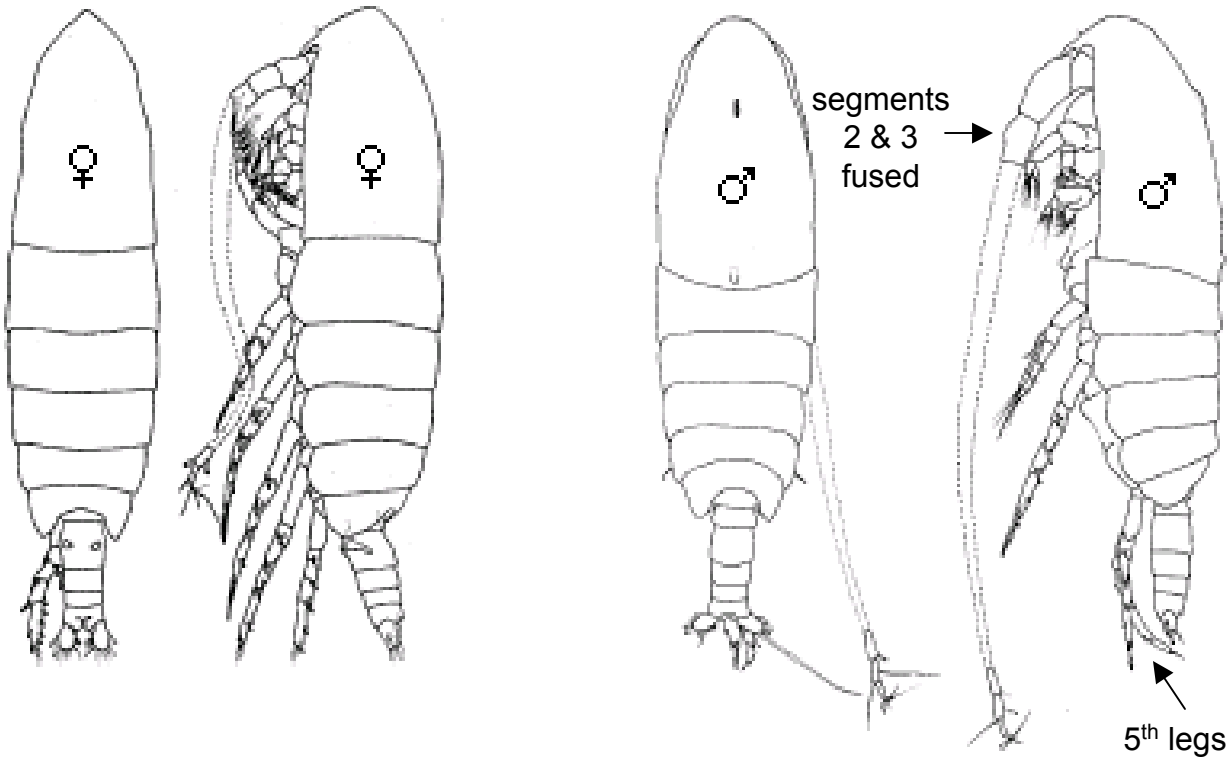
Males:
Ur 5-segmented. P1-4 as in female. P5 with both rami usually 3-segmented, right leg similar to other P, left leg variously modified. Enp sometimes reduced and devoid of setae on one or both sides.

Calanoides cf. carinatus

Females 2.25 - 2.85 mm; Males 2.35 – 2.70 mm

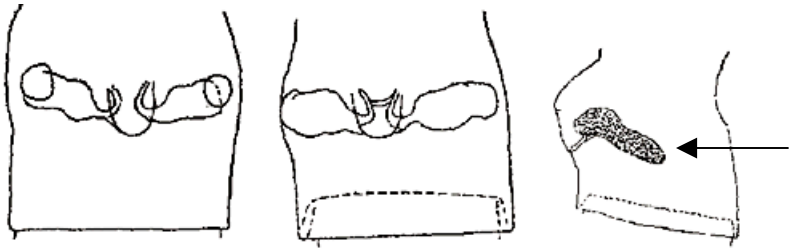
pointed head

rounded head



segments 2 & 3 fused

5th legs of similar length

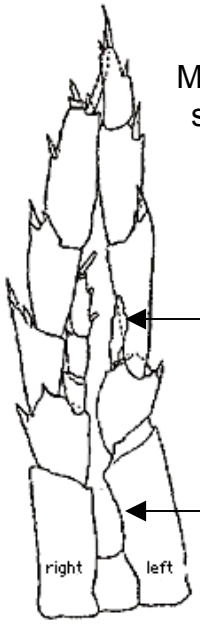


Spermatheca long in lateral view

from Giesbrecht (1892)

Male 5th legs of similar length

NO setae on outer border of Right Enp3



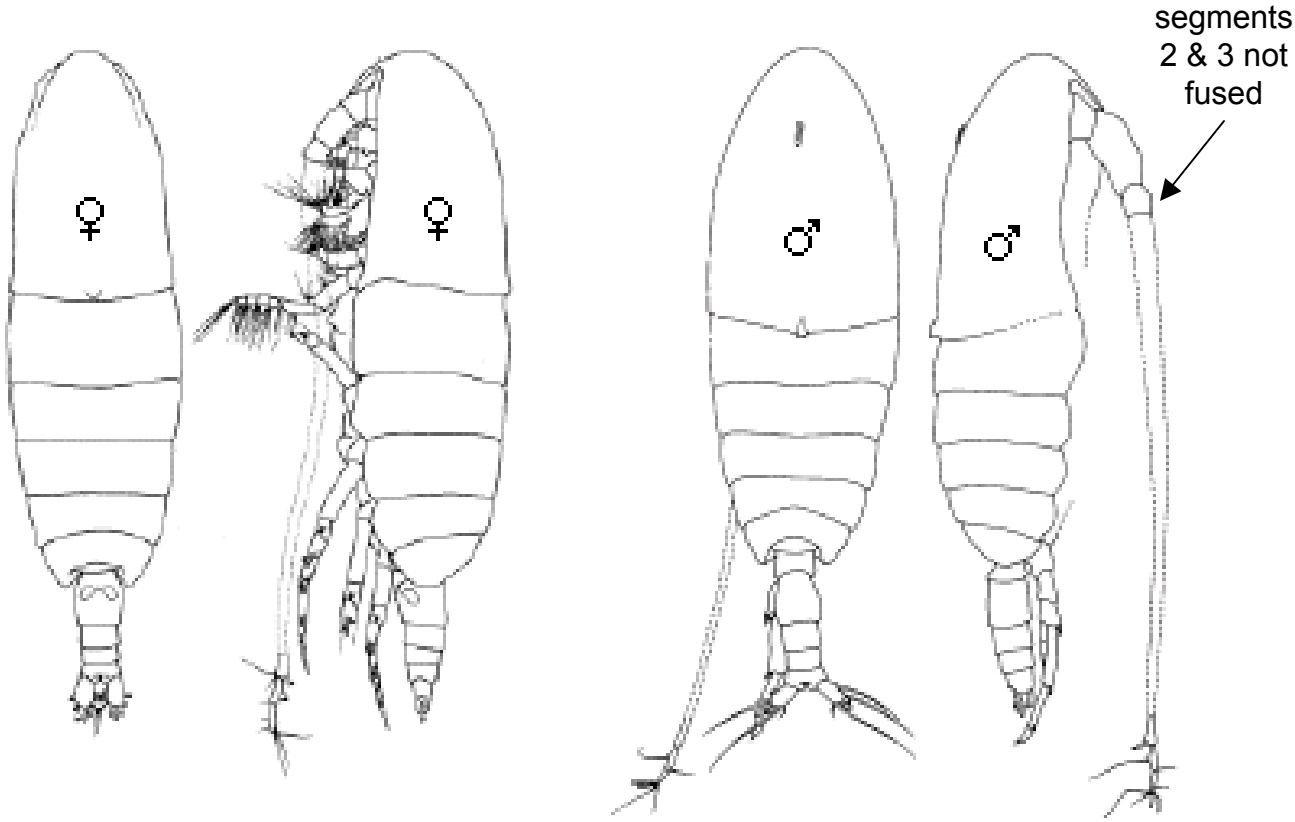
Left Endopod reduced/vestigial

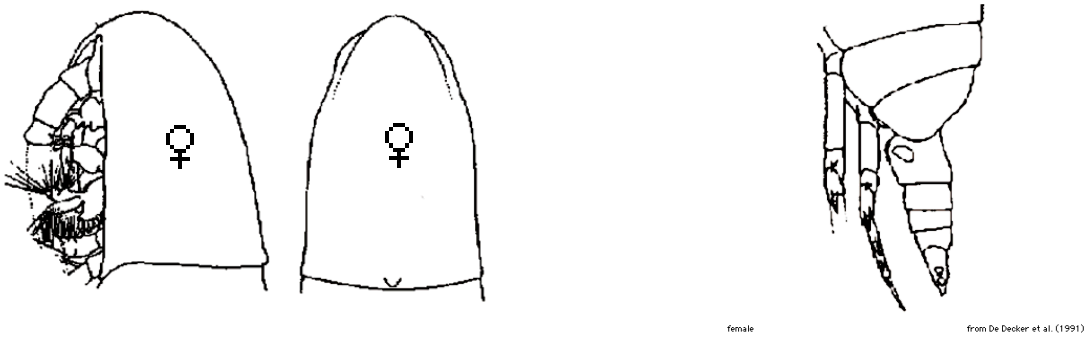
P5 inner coxa without teeth

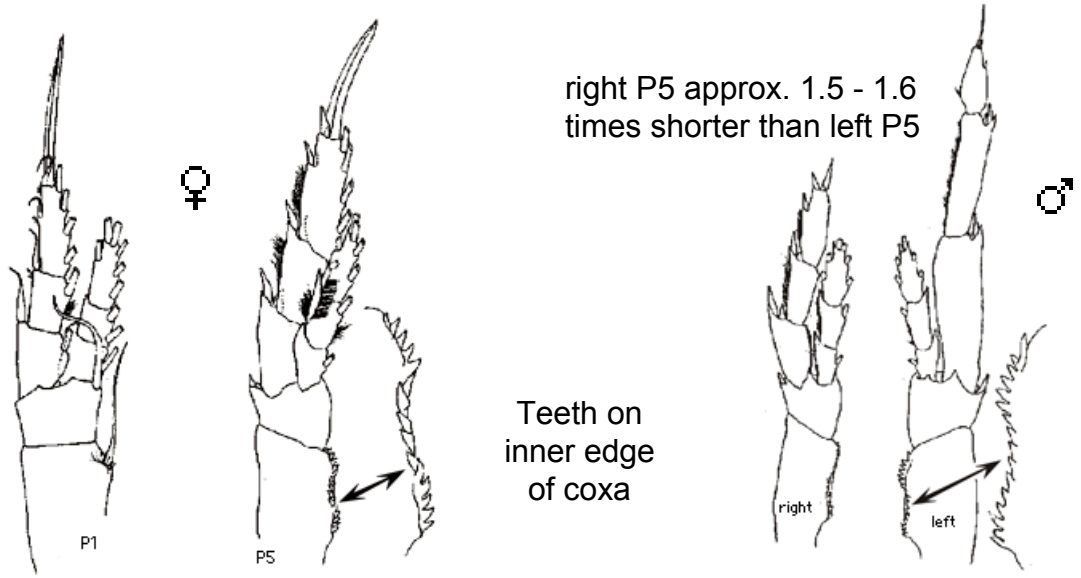
swimming leg 5 male from Giesbrecht (1892)

Calanus agulhensis

Females 2.45 - 2.95 mm; Males 2.74 - 3.00 mm







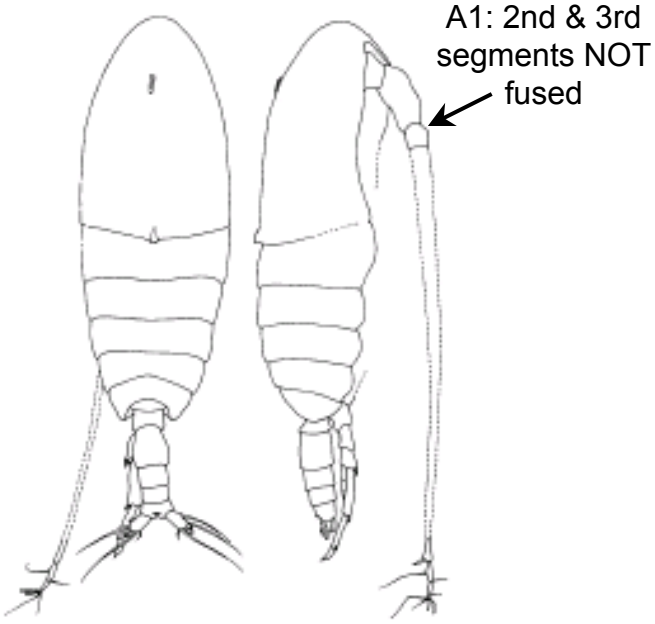
Calanus agulhensis males vs. *Calanoides cf carinatus* males

TL = 2.72 mm - West Coast of SA
TL = 2.55 mm – Agulhas Bank (SA)

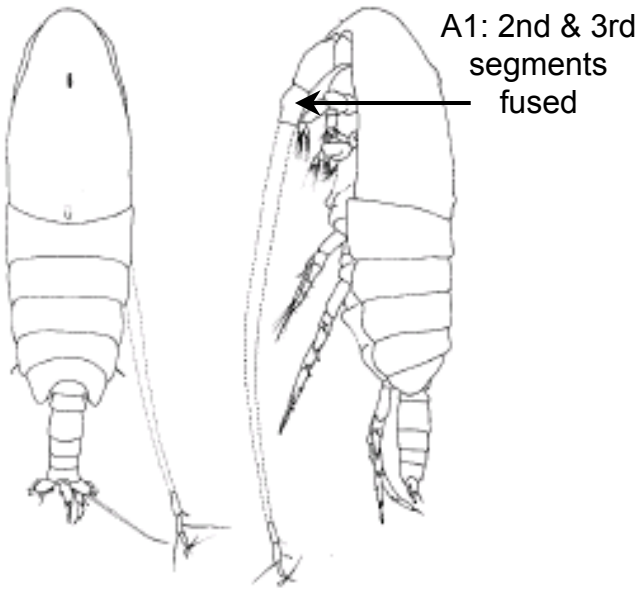
TL = 2.16 mm - Agulhas Bank (SA)
TL = 2.42 mm (2.08-2.60) – Ivory Coast
TL = 2.3 mm (2.2-2.5) – Conway *et al*. 2006

Calanus is usually bigger than *Calanoides*, but there is a size overlap, so length not definitive

rounded head

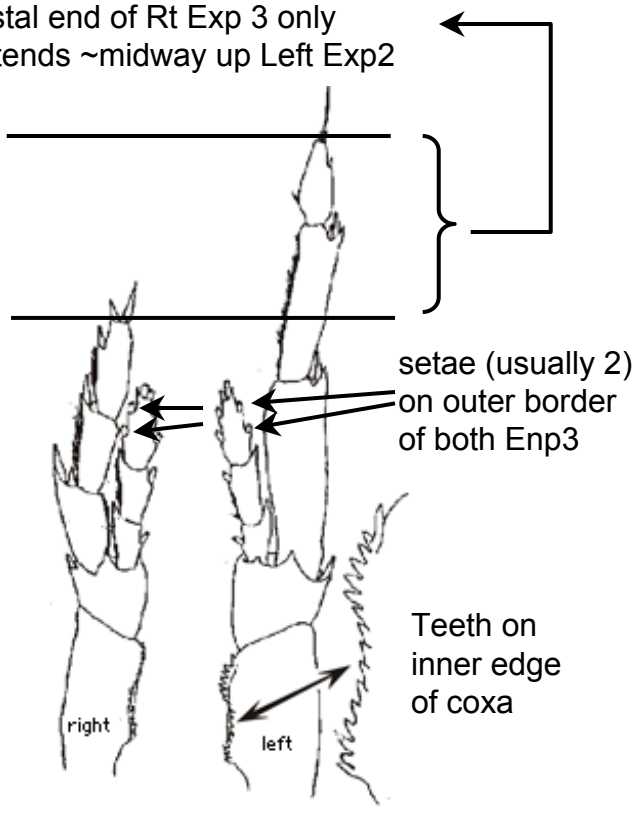


rounded head, not pointed as in female

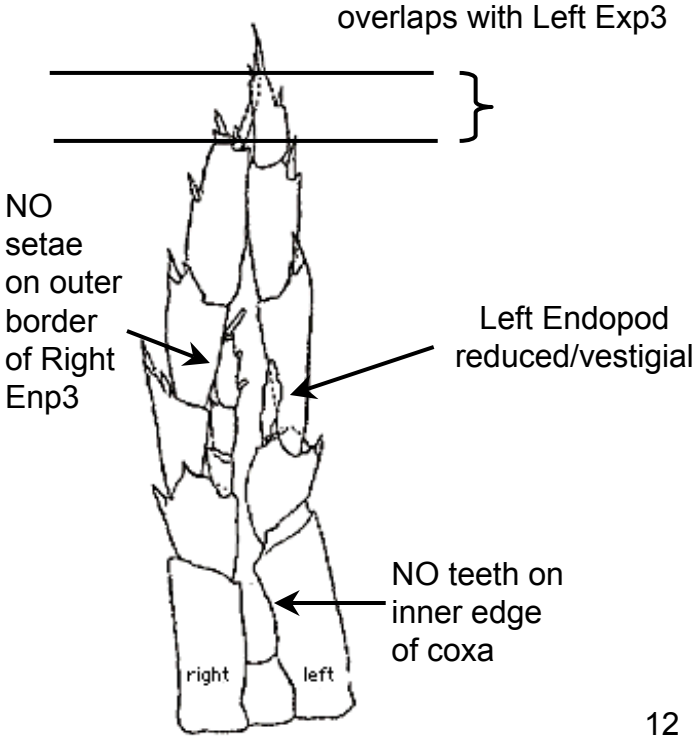


Male P5 (5th swimming leg)

Legs quite different lengths:
Distal end of Rt Exp 3 only extends ~midway up Left Exp2

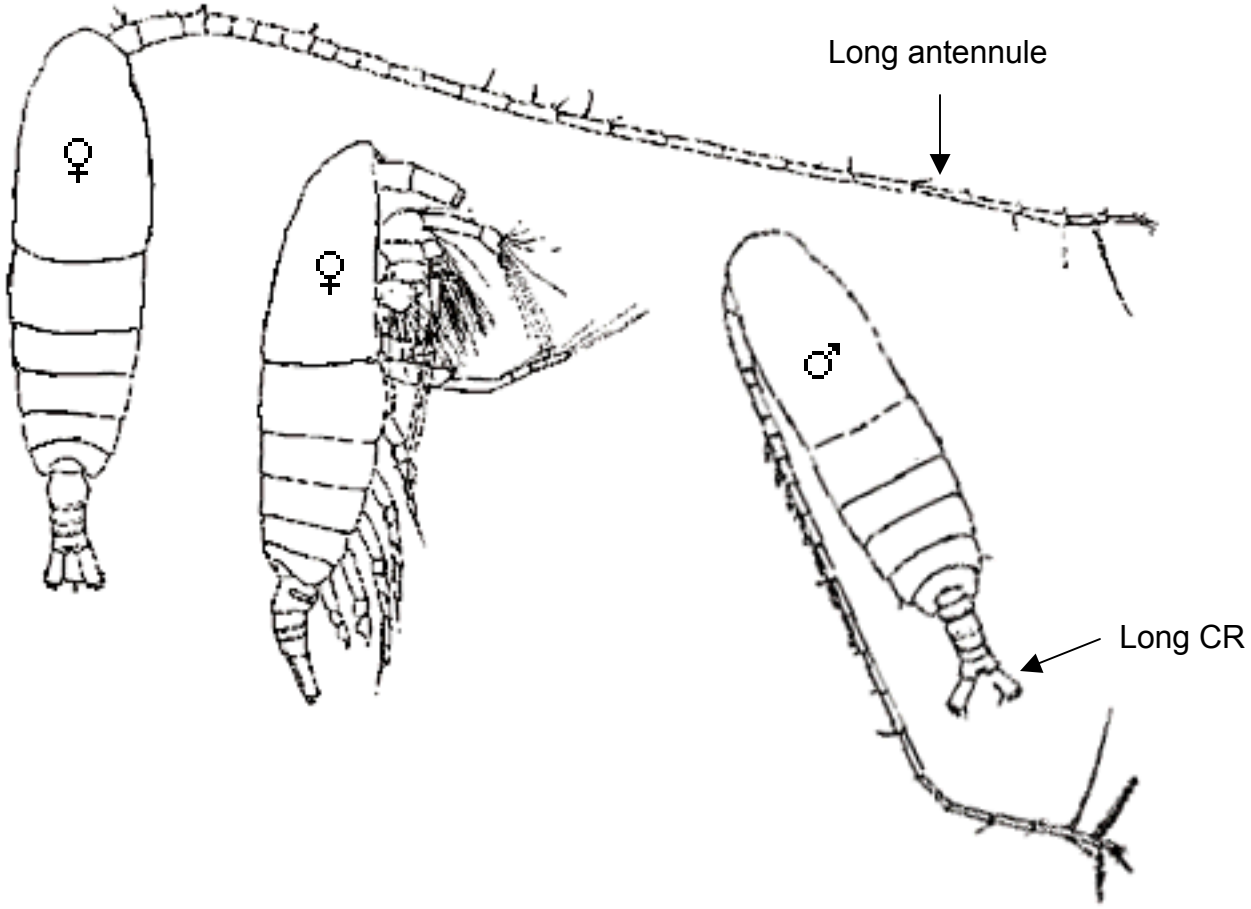


Legs similar in length:
Distal end of Rt Exp 3 overlaps with Left Exp3



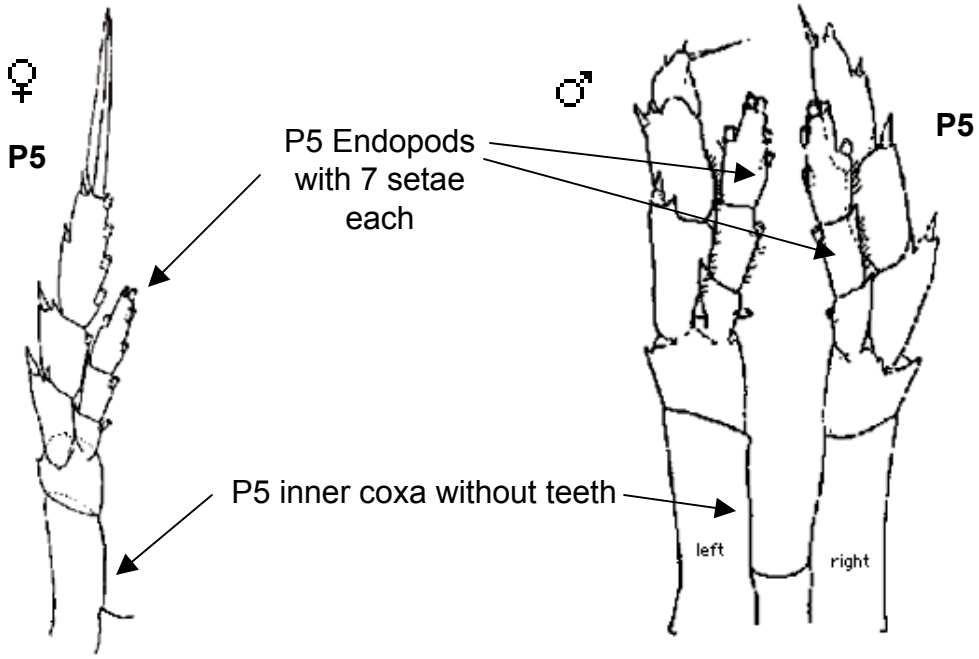
Mesocalanus tenuicornis

Females 1.80 - 2.40 mm; Males 1.70 – 2.20 mm



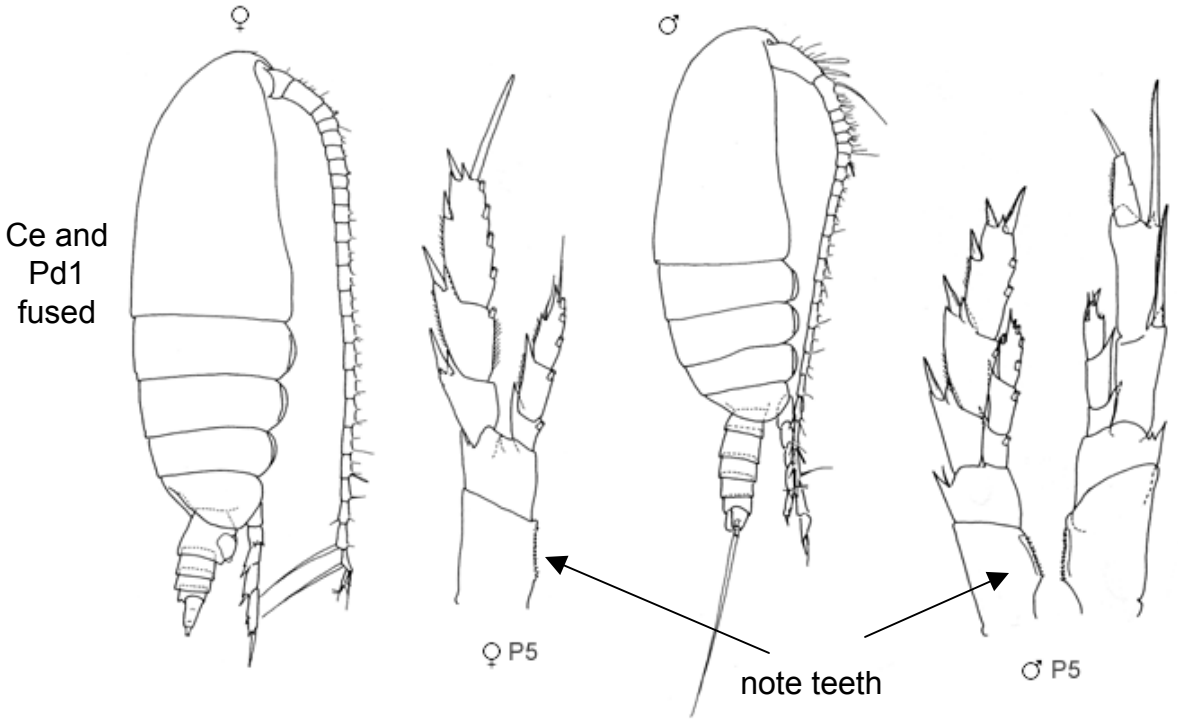
Female P5

Male P5



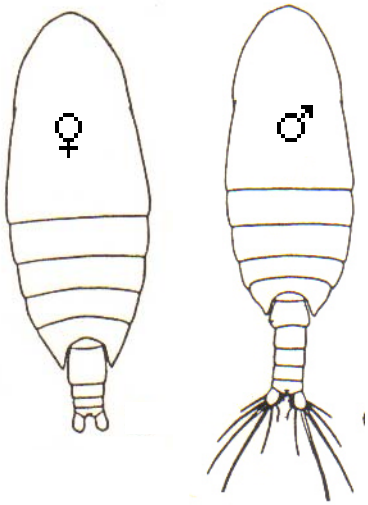
Nannocalanus minor

Females 1.80 - 2.25 mm; Males 1.20 – 1.80 mm



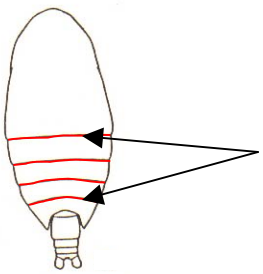
Nannocalanus minor After: Bradford-Grieve, 1994

In dorsal view, note that posterior margin of metasome extends into two points, giving it a “notched” look



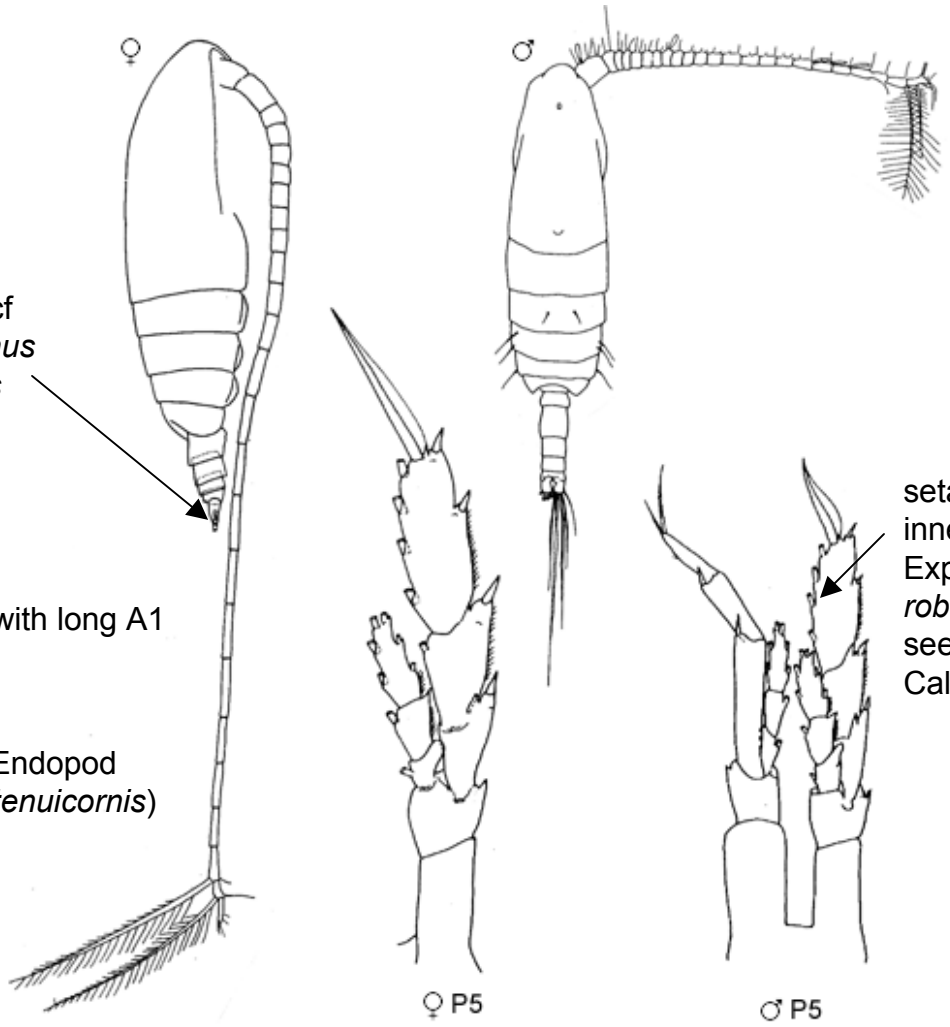
As with *Calanus*, the inner sides of the coxa on the 5th swimming legs (both male and female) are lined with small teeth.

Additional note: Margins of segments on prosome often have red colouration.



Neocalanus gracilis

Females 2.43 – 4.00 mm; Males 2.30 – 3.10 mm

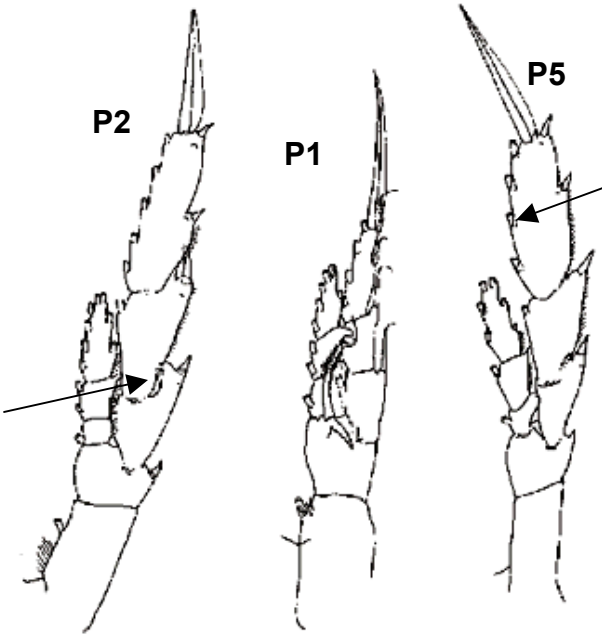


Short CR cf *Mesocalanus tenuicornis*

Female with long A1

8 setae on Endopod (cf 7 on *M. tenuicornis*)

setae present on inner border of Exp 3 (also in *N. robustior*) – not seen in other Male Calanidae



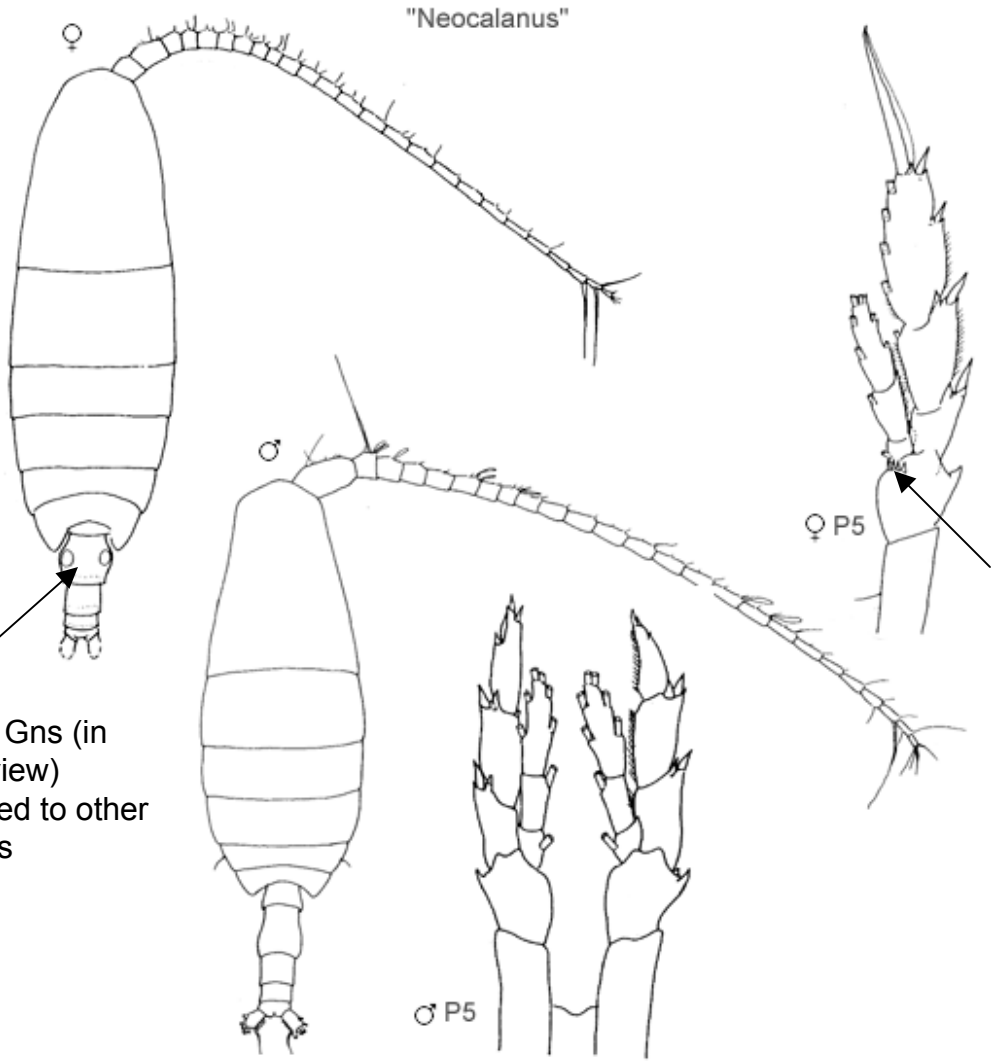
♀

***Neocalanus* feature**: P2 Exp 1 with recurved spine (hook) adjacent to outer spine

setae on inner border of Exp 3 – found in all Female Calanidae

Neocalanus tonsus

Females 3.40 – 4.10 mm; Males 3.30 – 4.40 mm



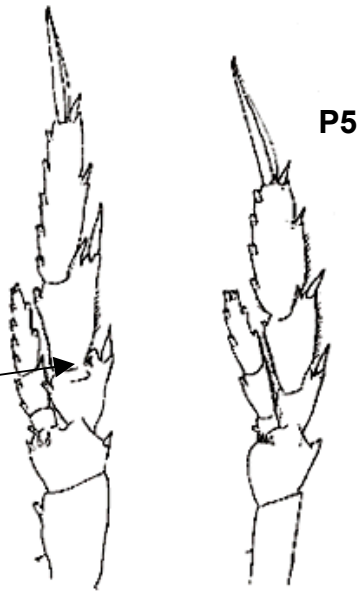
swollen Gns (in dorsal view) compared to other Calanids

Only *Neocalanus tonsus* has postero-distal inner spines on Basis of P2-4

Neocalanus tonsus

After: Bradford-Grieve, 1994

♀ **P2** **P5**

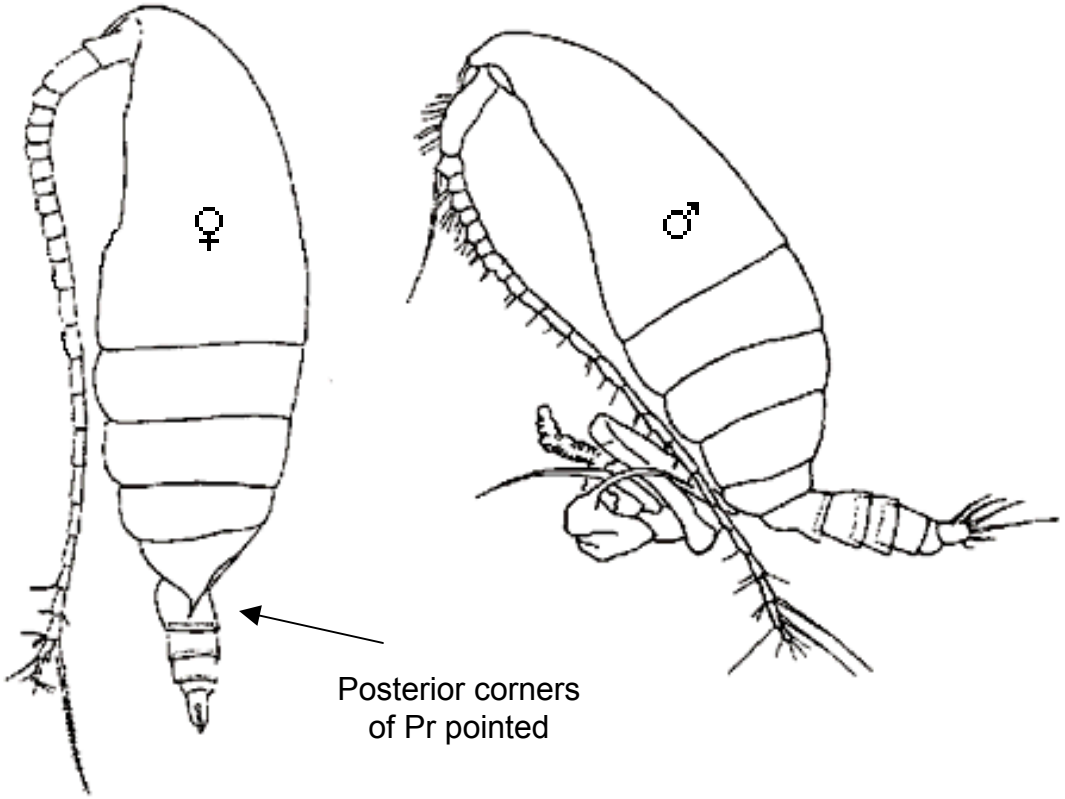


***Neocalanus* feature**: P2 Exp 1 with recurved spine (hook) adjacent to outer spine

Undinula vulgaris

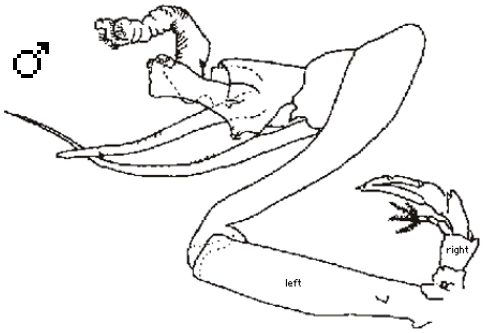
Females 2.25 – 3.25 mm; Males 2.04 – 2.50 mm

Ce and Pd1 fused

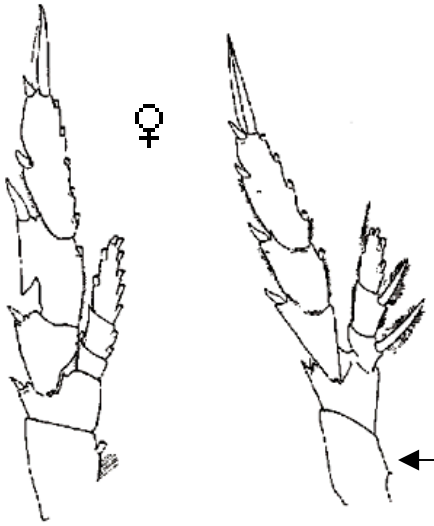


Posterior corners of Pr pointed

Male P5 highly modified

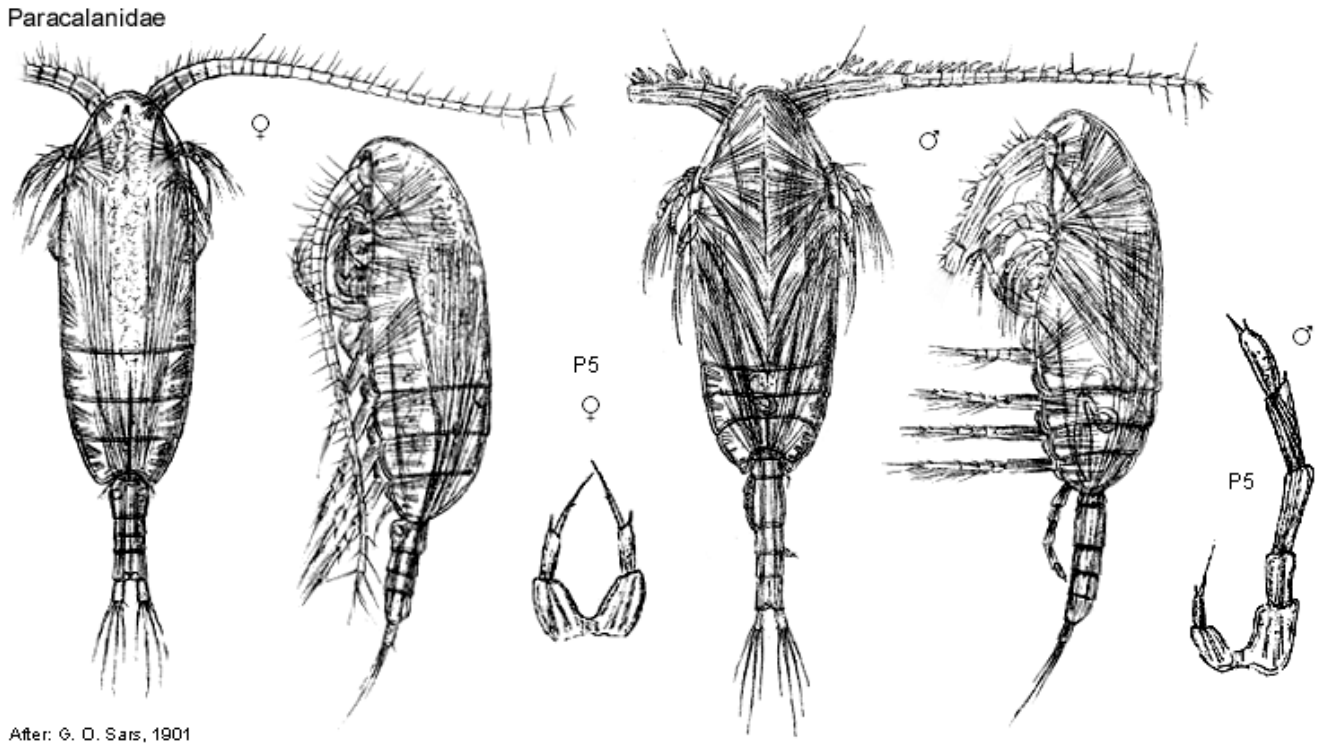


Female (and Male) P2 Exp 2 with outer proximal edge invaginate



P5 inner coxa without teeth

Calanoida: Family Paracalanidae



Family Paracalanidae
Genera: *Acrocalanus*, *Bestiolina* (not recorded in the South Atlantic), *Calocalanus, Delius, Paracalanus, Parvocalanus*

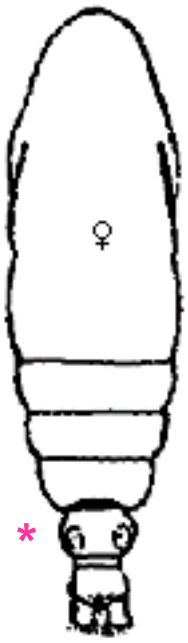
Females:
Ce and Pd 1 usually fused. Pd4 and 5 fused or separate. Ur 2-4-segmented. Anal somite usually longer than any somite between it and Gns. R of 2 filaments (*Acrocalanus, Calocalanus, Paracalanus*); 2-pointed, solid (*Delius*); or massive (*Parvocalanus*). P5 uniramous, absent or vestigial (*Acrocalanus*), present on left only (*Delius*). If both P5 present then symmetrical, 2-segmented (or 3-segmented) (*Paracalanus*, *Parvocalanus*) or 3-4-segmented (*Calocalanus*).

Males:
A2 terminal Exp(7) very short and without 3 terminal setae (as seen in females). Ur 5-segmented. Cephalic hump present (*Acrocalanus*, *Paracalanus*) or absent. Right P5 may be absent (*Acrocalanus, Delius*), or present as 2-3-segmented (*Paracalanus, Parvocalanus*), or 3-4-segmented (*Calocalanus*).

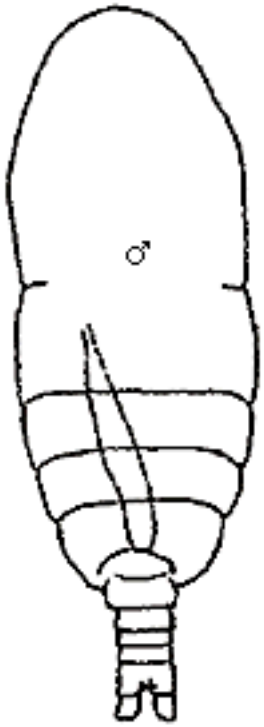
Calocalanus
Female P5 3-4-segmented
Male Right P5 4-segmented

Calocalanus namibiensis

Females 0.66 – 0.70 mm; Males 0.50 – 0.52 mm



Ur with 3 somites

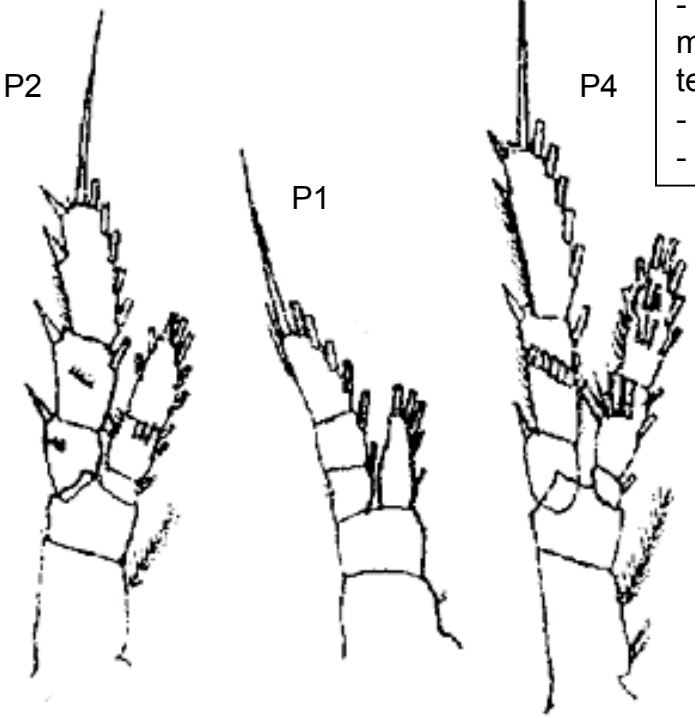


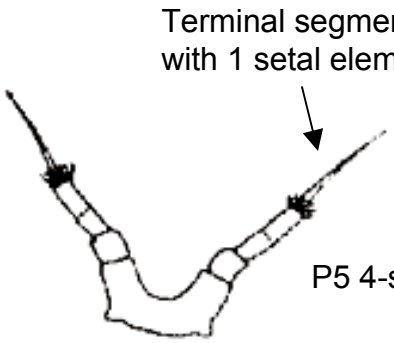
Ur with 5 somites
(in all Paracalanid males)

* Short Ur with fat, onion-shaped Gns is characteristic of *Calocalanus* females

Male P5 – extends slightly beyond CR (not shown here)

Characters used to identify *Calocalanus* females to species:
- Ur somites (2, 3 or 4 – one somite may be difficult to see due to telescoping within previous segment)
- P5 terminal setae/spines
- CR symmetry



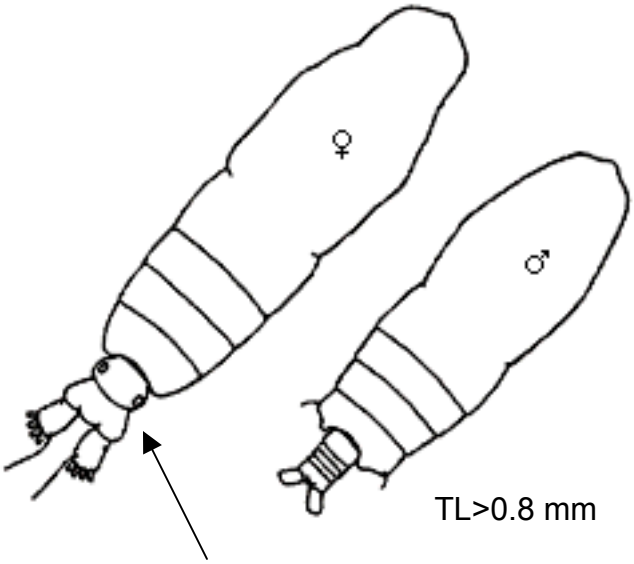


Terminal segment with 1 setal element

P5 4-segmented.

Calocalanus pavo

Females 0.88 – 1.20 mm; Males 0.91 – 1.04 mm

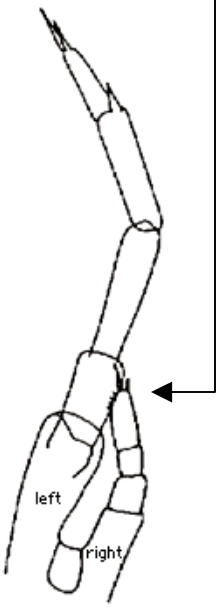


TL>0.8 mm

Female Ur with 2 somites

Right P5 leg does not extend as far as distal border of segment 2 of left leg

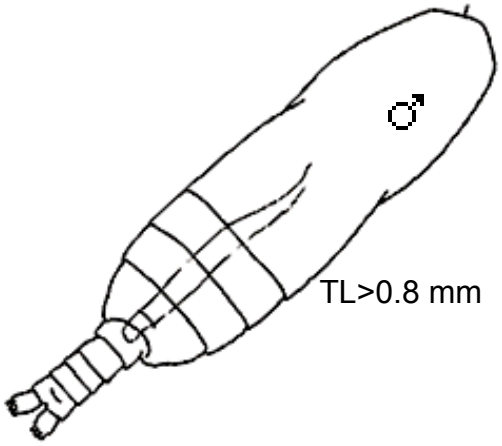
Female P5



Male P5

Calocalanus plumulosus

Females 0.93 – 1.20 mm; Males 0.83 – 0.90 mm

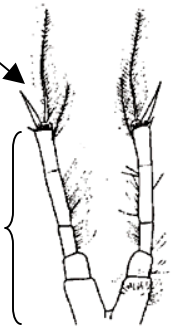


TL>0.8 mm

Right P5 leg extends beyond segment 2 of left leg

Male P5

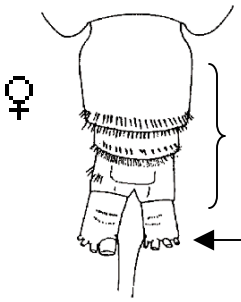
3 setal elements



4 segments

Female P5

Female P4



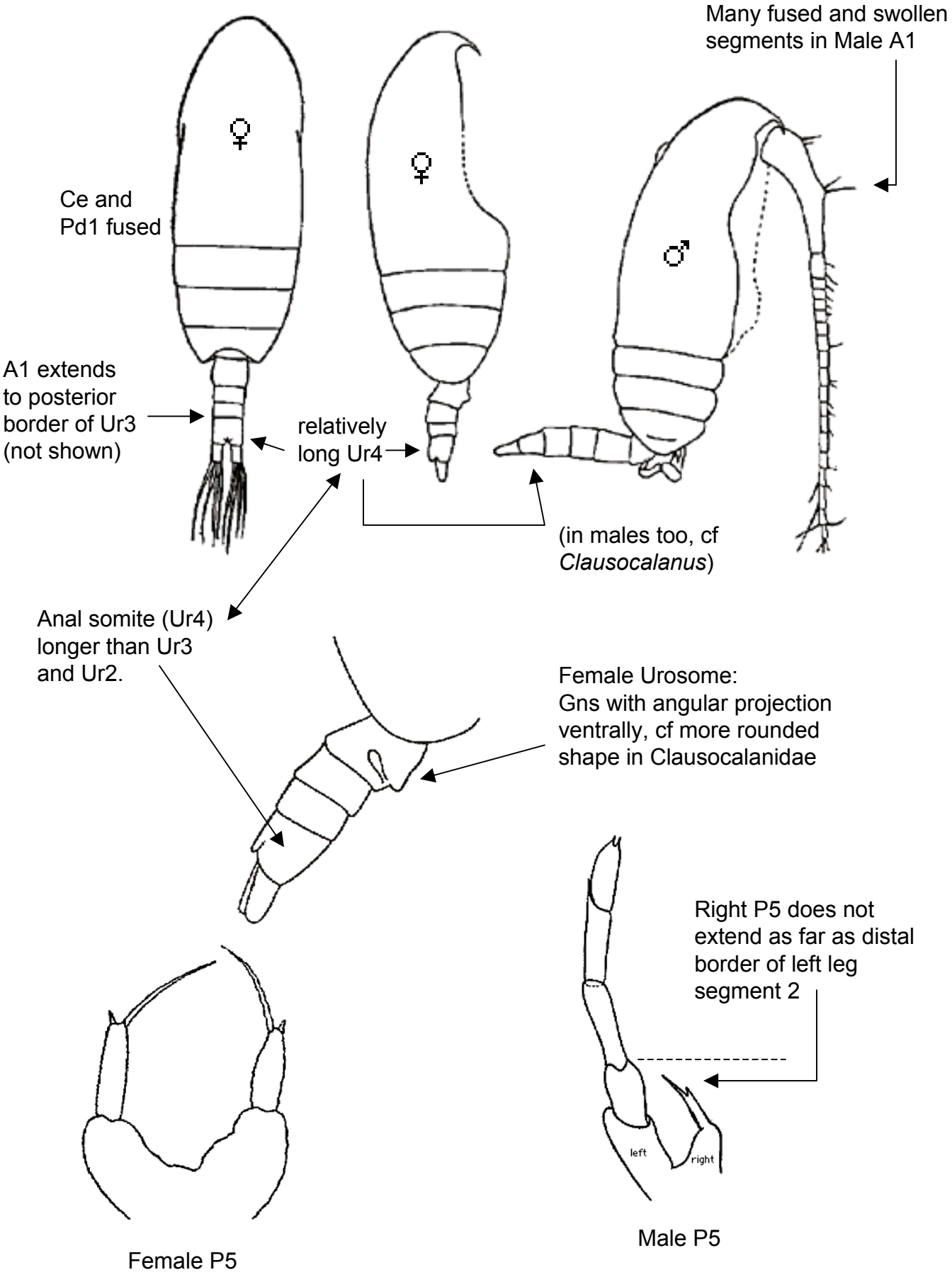
Female Urosome

3 somites

CR asymmetrical

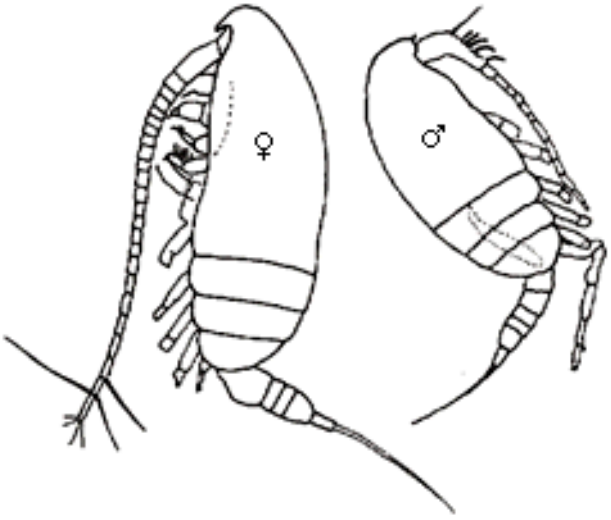
Paracalanus parvus

Females 0.70 – 1.30 mm; Males 0.74 – 1.40 mm



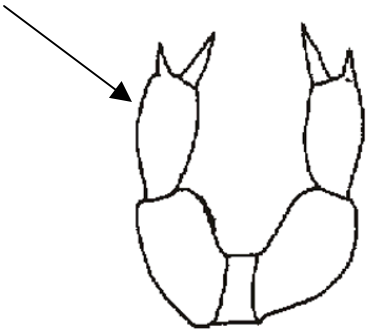
Parvocalanus crassirostris

Females 0.47 – 0.55 mm; Males 0.35 – 0.39 mm

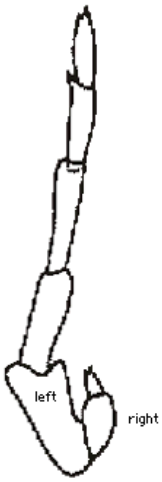


Female P1 – with 2-segmented Enp (not shown)

P5 terminal segment just under 0.5 times as wide as long with 2 subequal strong terminal spines



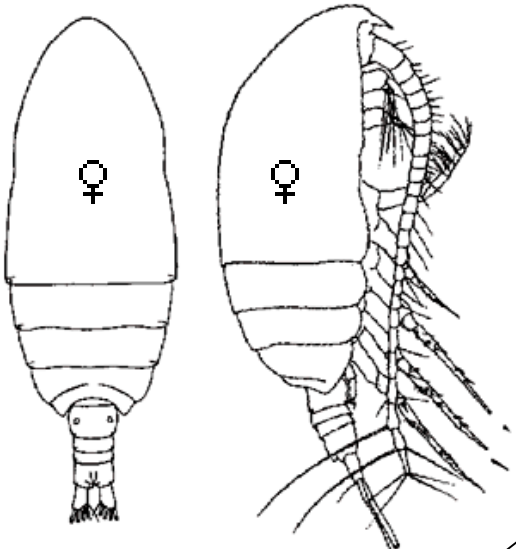
Female P5



Male P5

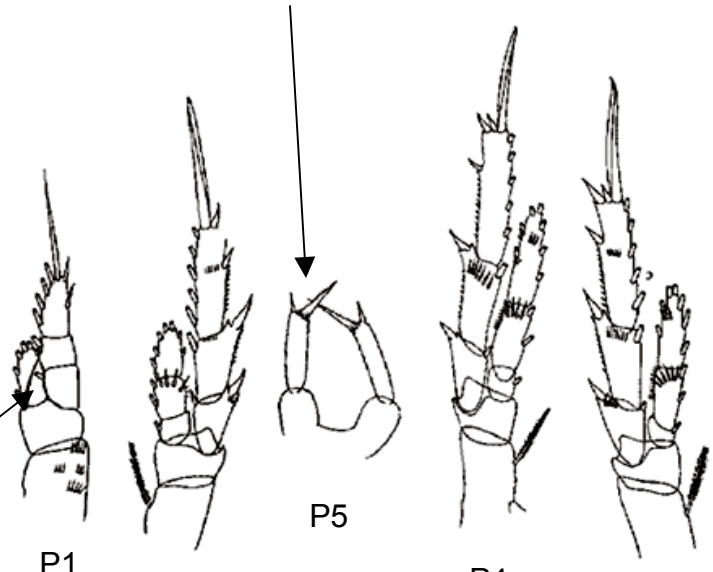
Parvocalanus scotti

Females 0.64 – 0.67 mm; Males unknown



P1: 1-segmented Enp

P5 terminal segment about 0.3 times as wide as long with inner terminal spine longest.

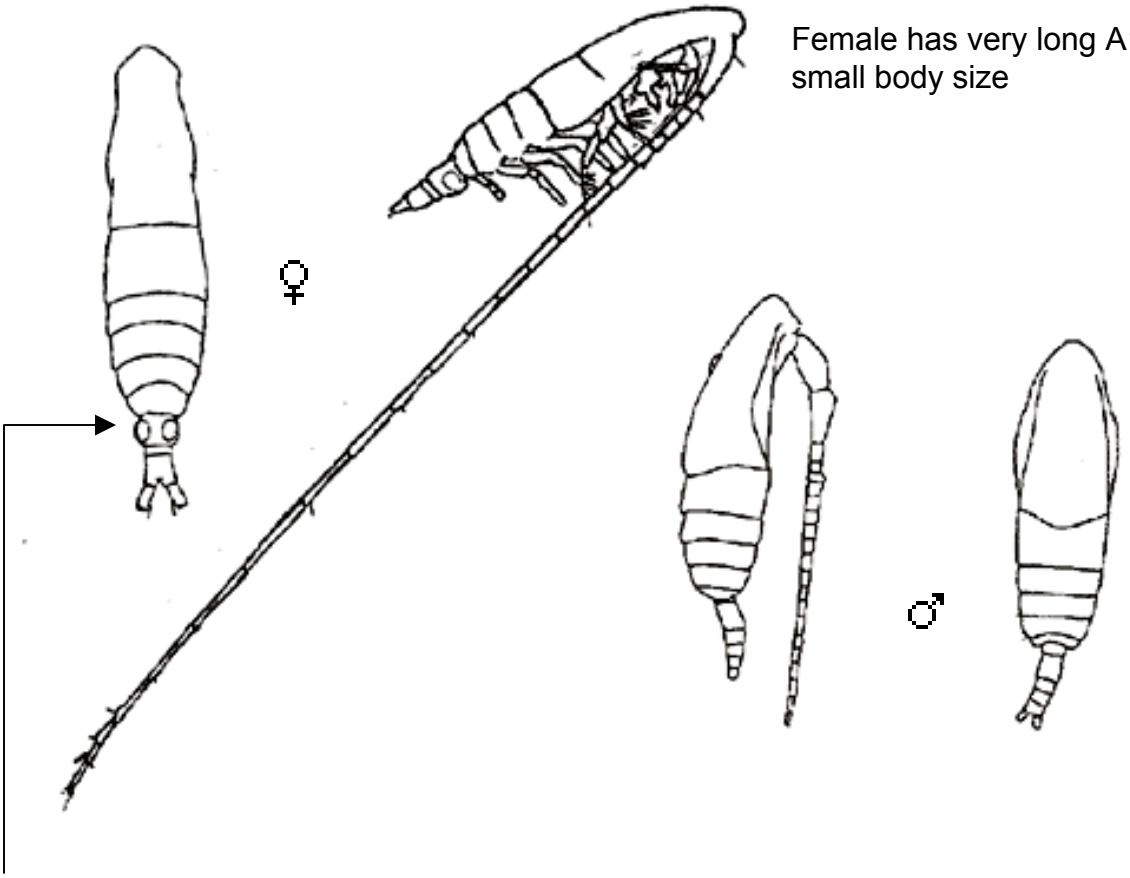


Female legs:

Calanoida: Family Mecynoceridae

Mecynocera clausi

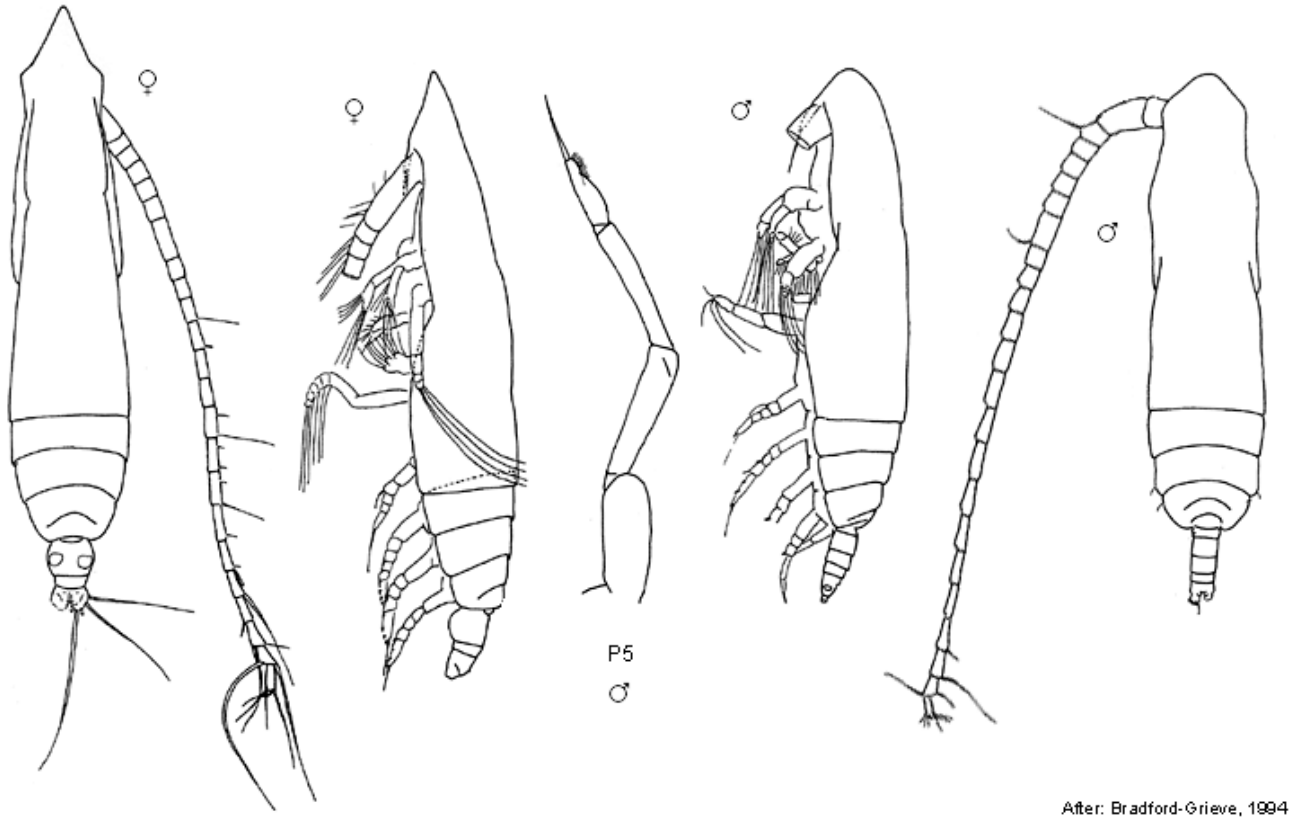
Females 0.92 – 1.21 mm; Males 0.94 – 1.12 mm



Female has very long A1 but small body size

Female has globular Gns with obvious spermathecae

Calanoida: Family Eucalanidae



After: Bradford-Grieve, 1994

Family Eucalanidae
Large copepods with elongated and transparent bodies. In dorsal view, most have a typical triangular anterior cephalosome.
Genera: *Eucalanus, Pareucalanus, Subeucalanus, Rhincalanus*

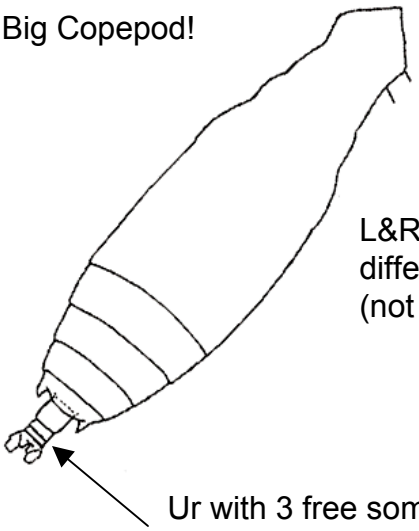
Females:
Ce & Pd1 fused; Pd4 & 5 partially fused. Urosome very short, 3- or 4-segmented. Genital segment usually broad. CR usually fused to anal somite. P5 absent in *Eucalanus*, *Pareucalanus* & *Subeucalanus*. P5 with 3 segments in *Rhincalanus*

Males:
Ur 5-segmented. CR usually fused to anal somite. P5 uniramous both sides (*Eucalanus*, *Pareucalanus*), biramous on left (*Rhincalanus*) or absent on right (*Subeucalanus*).

Eucalanus hyalinus s.l.

Females 5.10 – 7.10 mm; Males 4.70 – 6.25 mm

Very Big Copepod!



L&R A1 of different lengths (not shown)

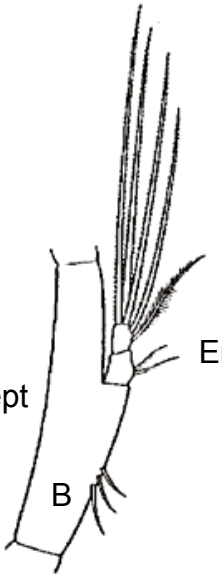
Female rostrum

Ur with 3 free somites (Ur4 fused with CR) = characteristic of *Eucalanus*

To identify *E. hyalinus* vs. *E. spinifer*:

1. Measure total length
2. If prosome < 6.2 mm, then…
3. Measure lengths of antennule ancestral seg 22 (actual seg 18) on both sides. Calculate ratio of long/short segments: *E. hyalinus* = 1.35-1.59; *E. spinifer* = 1.18-1.33 (see Goetze & Bradford-Grieve 2005)

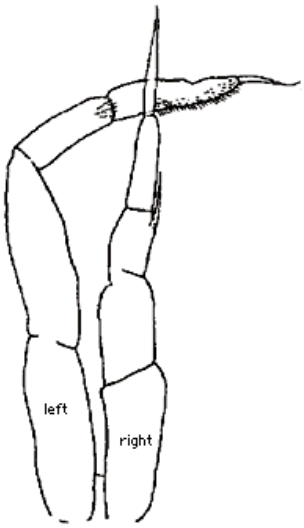
Enp reduced; B and Exp elongate (feature of all Eucalanidae except *Rhincalanus*)



Female Mandibular palp

P1

Female P1 with seta on Basis (feature of Eucalanidae)



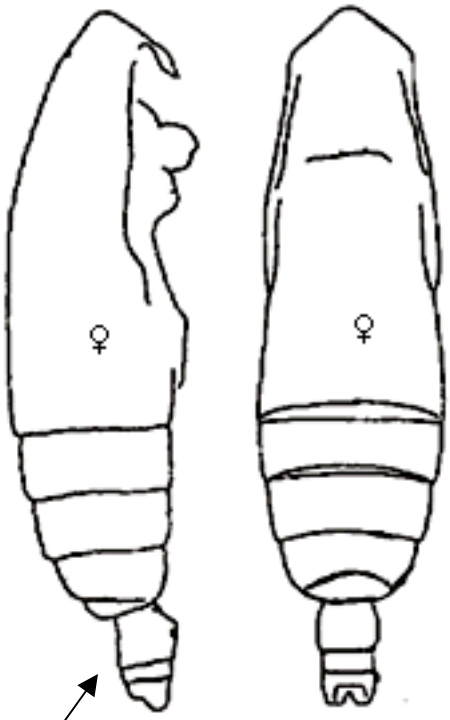
Male P5

Uniramous on both sides (*Eucalanus* & *Pareucalanus*)

Female Urosome 3 free somites

Subeucalanus pileatus

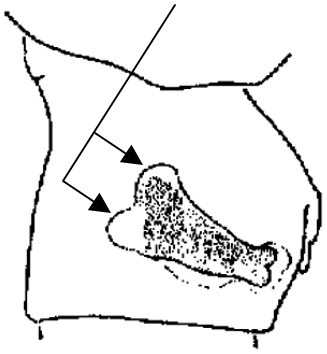
Females 1.95 – 2.50 mm; Males 1.80 – 2.25 mm



Ur with 2 free somites (Ur3 fused with CR) = characteristic of *Subeucalanus* and *Pareucalanus*

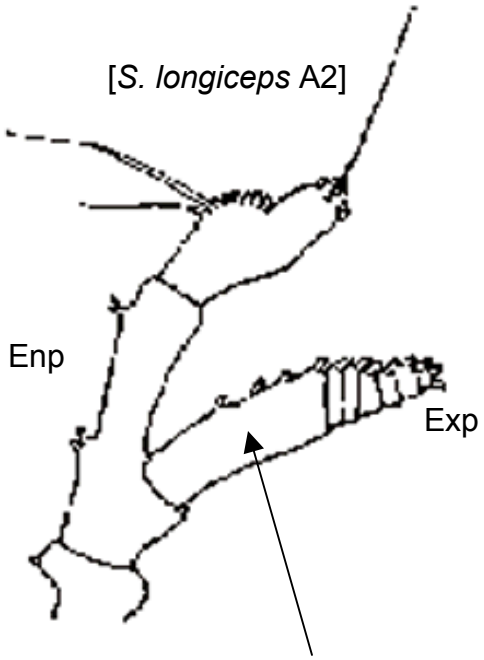
Male Ce

In lateral view, distal part of seminal receptacles bilobed – specific to *S. pileatus*



Female **Gns**

[*S. longiceps* A2]



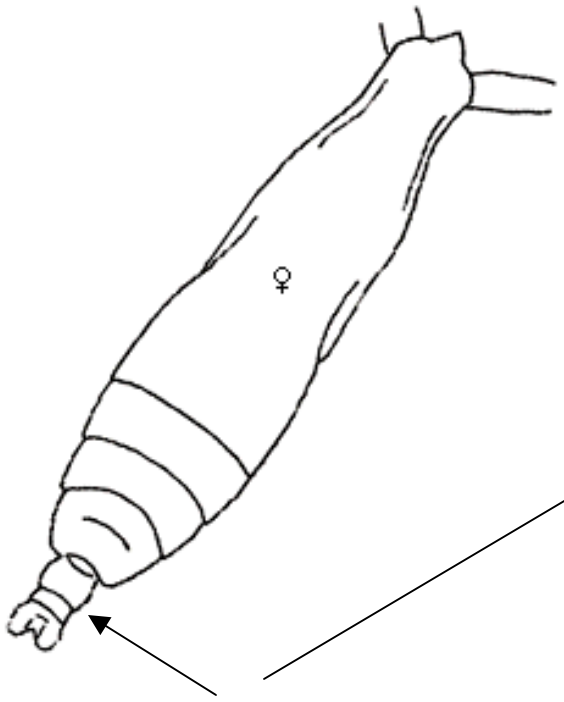
A2 Exp segments 1-4 fused. (Fusion of Exp1 & 2 = characteristic of *Subeucalanus*)

Right P5 absent = characteristic of *Subeucalanus*

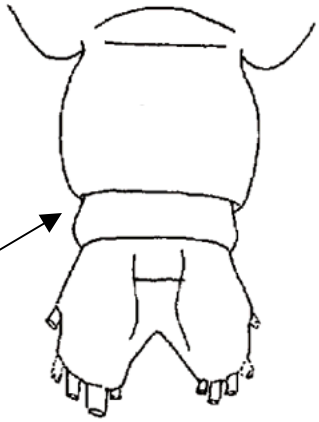
Male **P5**

Pareucalanus sewelli

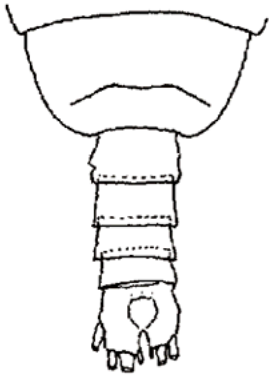
Females 3.86 – 6.10 mm; Males 2.89 – 4.58 mm



Ur with 2 free somites (Ur3 fused with CR) = characteristic of *Subeucalanus* and *Pareucalanus*



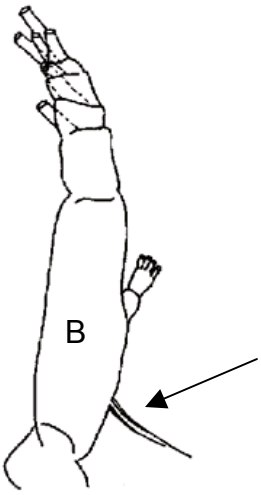
Female urosome



Male urosome

A2 Exp segments 2-4 fused. Enp1 & 2 not fused (not shown) – cf *Subeucalanus*

Male P5 = uniramous on both sides (also in *Eucalanus*). Right P5 is 3-segmented.

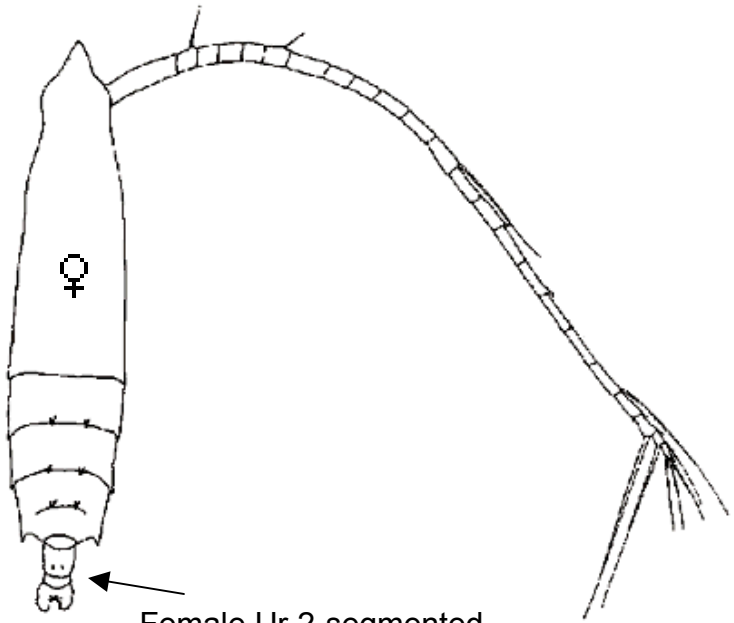


Mdp Basis with 2 setae (specific to *P. sewelli*)

Female Mandibular Palp (Mdp)

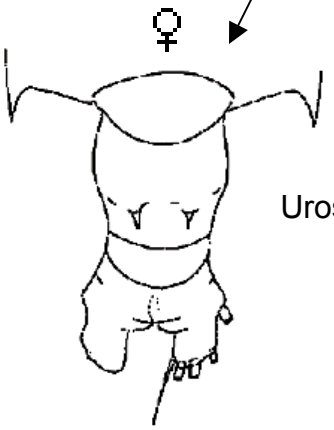
Rhincalanus nasutus

Females 3.90 – 5.30 mm; Males 2.70 – 4.30 mm

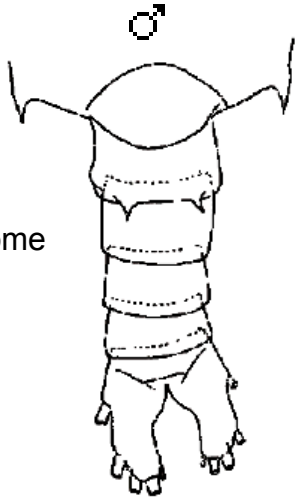


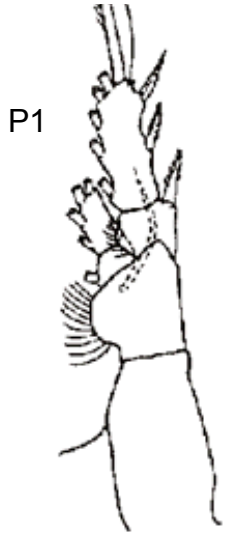
Female Ur 2-segmented

Female Mandibular Palp (Mdp)



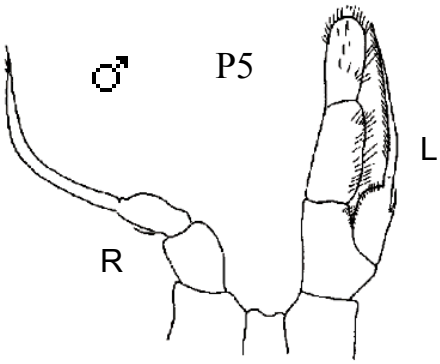
Urosome





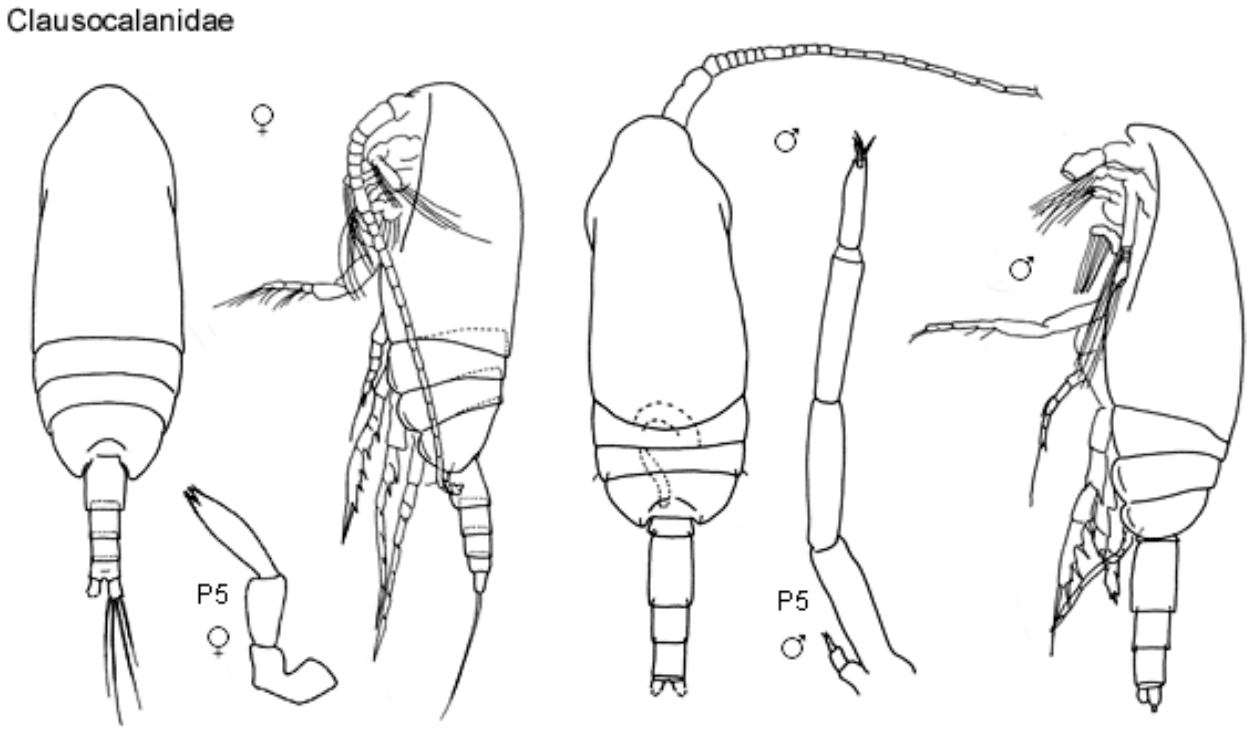
♀

P5 present in female, and is 3-segmented



Male P5 biramous on left

Calanoida: Family Clausocalanidae



After: Bradford-Grieve, 1994

Family Clausocalanidae

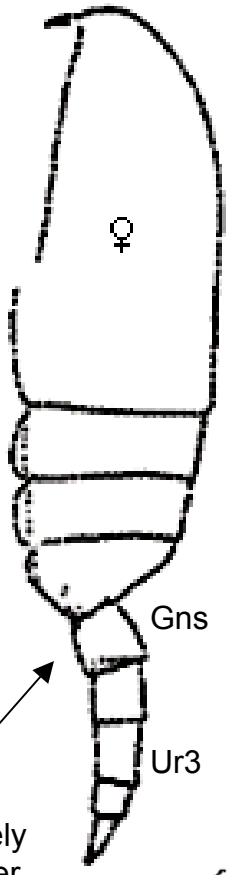
Anal segment usually short relative to Gns, sometimes telescoped inside previous segment in the males. At least 6 genera,with *Clausocalanus, Ctenocalanus, Drepanopus* and *Farrania* found in the South Atlantic. *Microcalanus*, *Pseudocalanus* and *Spicipes* not yet recorded in S. Atlantic. The genus *Clausocalanus* was revised by Frost & Fleminger (1968).

Clausocalanus:
Females: P5 uniramous on both sides, symmetrical, 3-segmented terminally produced into short bifid pointed processes. Males: P5 present on both sides, but unequal in length, uniramous. Longer leg nearly always on left, 5-segmented; shorter leg 3-segmented, less than half length of Coxa of other leg.

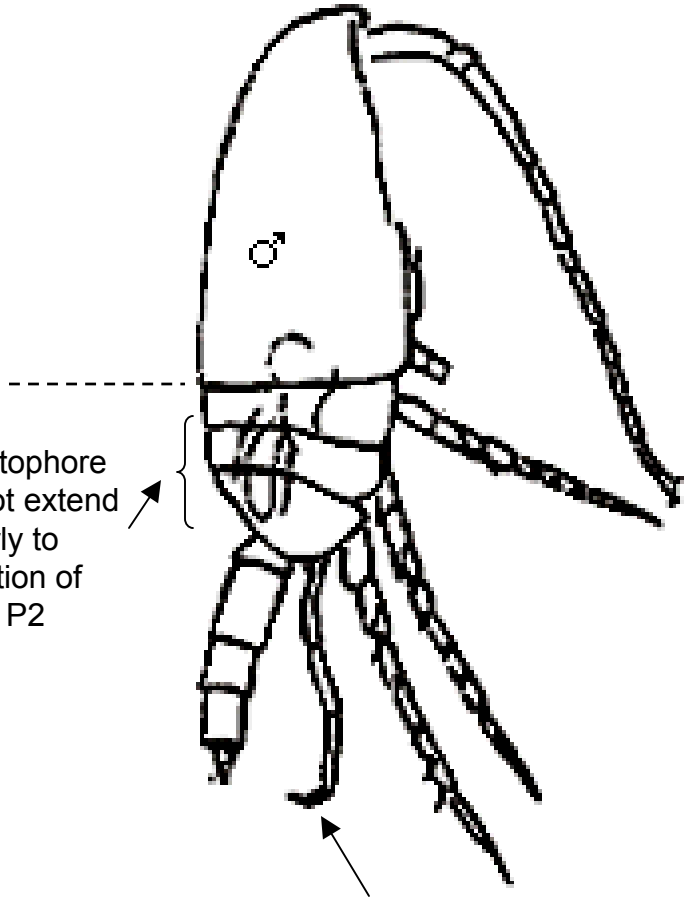
Ctenocalanus:
Females: P5 consisting of very small appendage, developed only on the left and of 2-4 segments. Males: P5 as in *Clausocalanus*.

Clausocalanus furcatus

Females 0.94 – 1.31 mm; Males 0.70 – 0.92 mm



Gns relatively short cf other *Clausocalanus* spp, being similar in length to Ur3

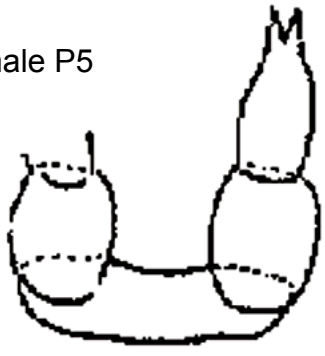


spermatophore does not extend anteriorly to articulation of P1 with P2

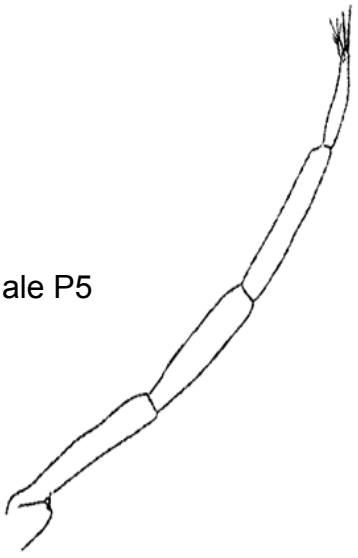
Longest P5 (usually right leg) longer than Urosome

Female Gs

Female P5



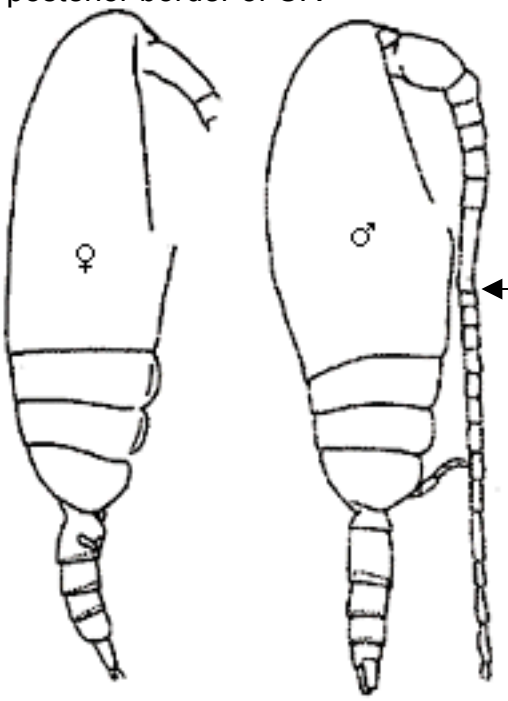
Male P5



Ctenocalanus vanus

Females 0.92 – 1.16 mm; Males 1.20 – 1.26 mm

A1 reaches posterior border of CR

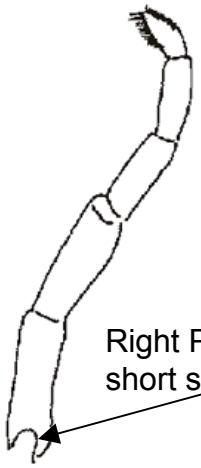


curved section of antennule

A1 bends slightly after long fused section

Male P5

Male P3 basis



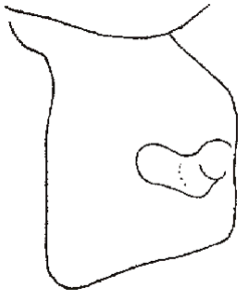
Right P5 short stump

Female P4

P4 Exp2-3 (part)

Female P5

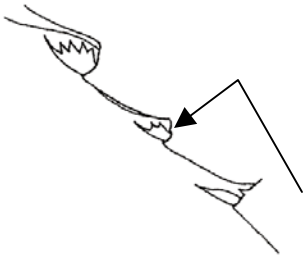
Female Gns



Female P4 Exp3 outer spines robust, expanded at the base

Ctenocalanus citer

Females 0.80 – 1.41 mm; Males 0.99 – 1.45 mm



A1 exceeds CR by several segments

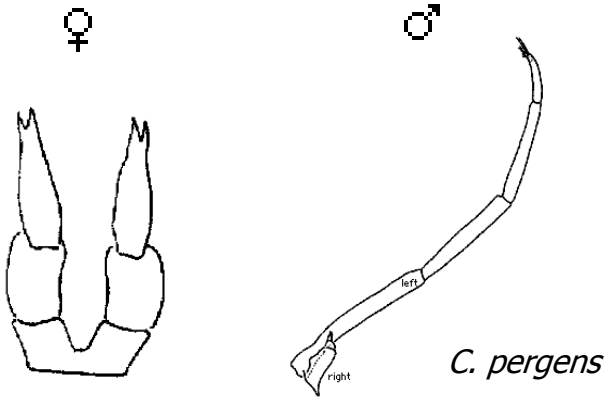
Male P5

Female P4 Exp3 outer spines not expanded at the base

Small copepods – P5 comparison

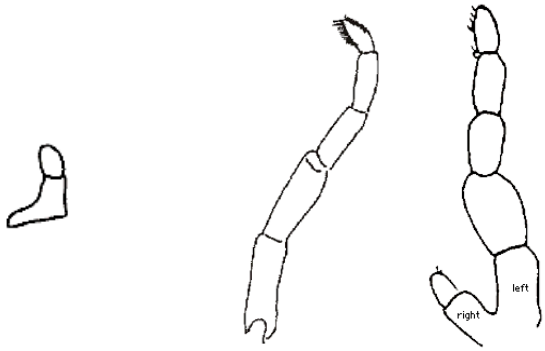
Clausocalanidae

Clausocalanus spp.
Female Ur4 usually relatively **short**.
Female: P5 uniramous on both sides, symmetrical, 3-segmented terminally produced into short bifid pointed processes.
Male: Both P5 present, uniramous. Left leg 5-segmented, much longer than 1-3-segmented right leg. Right P5 with terminal spinules on distal segment.



C. pergens

Ctenocalanus vanus
Female Ur4 similar in length to Ur3.
Female: P5 consisting of very small appendage, developed only on the left and of 2-4 segments.
Male: P5 present on both sides, uniramous. Long leg 5-segmented, right leg short stump lacking spines and spinules.



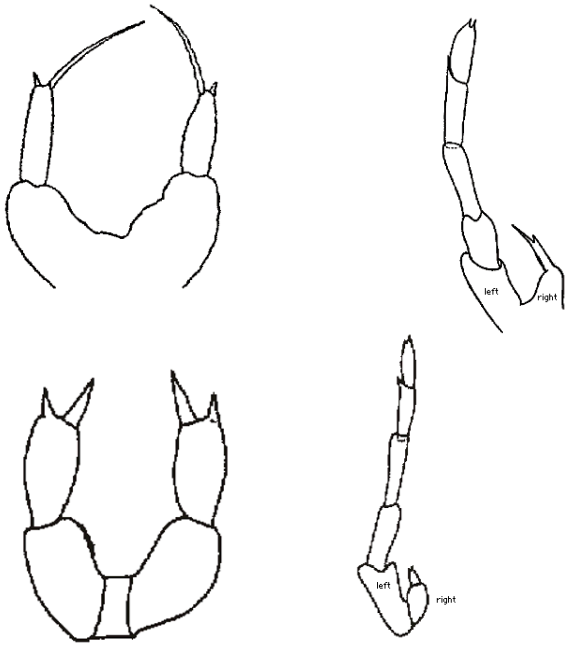
C. vanus *C. citer*

Paracalanidae
Female Ur4 usually relatively **long**

Paracalanus parvus
Female: Both P5 developed, symmetrical 2-segmented.
Male: Long 5-segmented left leg. Right P5 2-segmented, does not reach distal border of left leg segment 2

Parvocalanus crassirostris
Female: P5 2-segmented
Male: Long 5-segmented left leg. Right P5 2-segmented, does not reach distal border of left leg segment 1

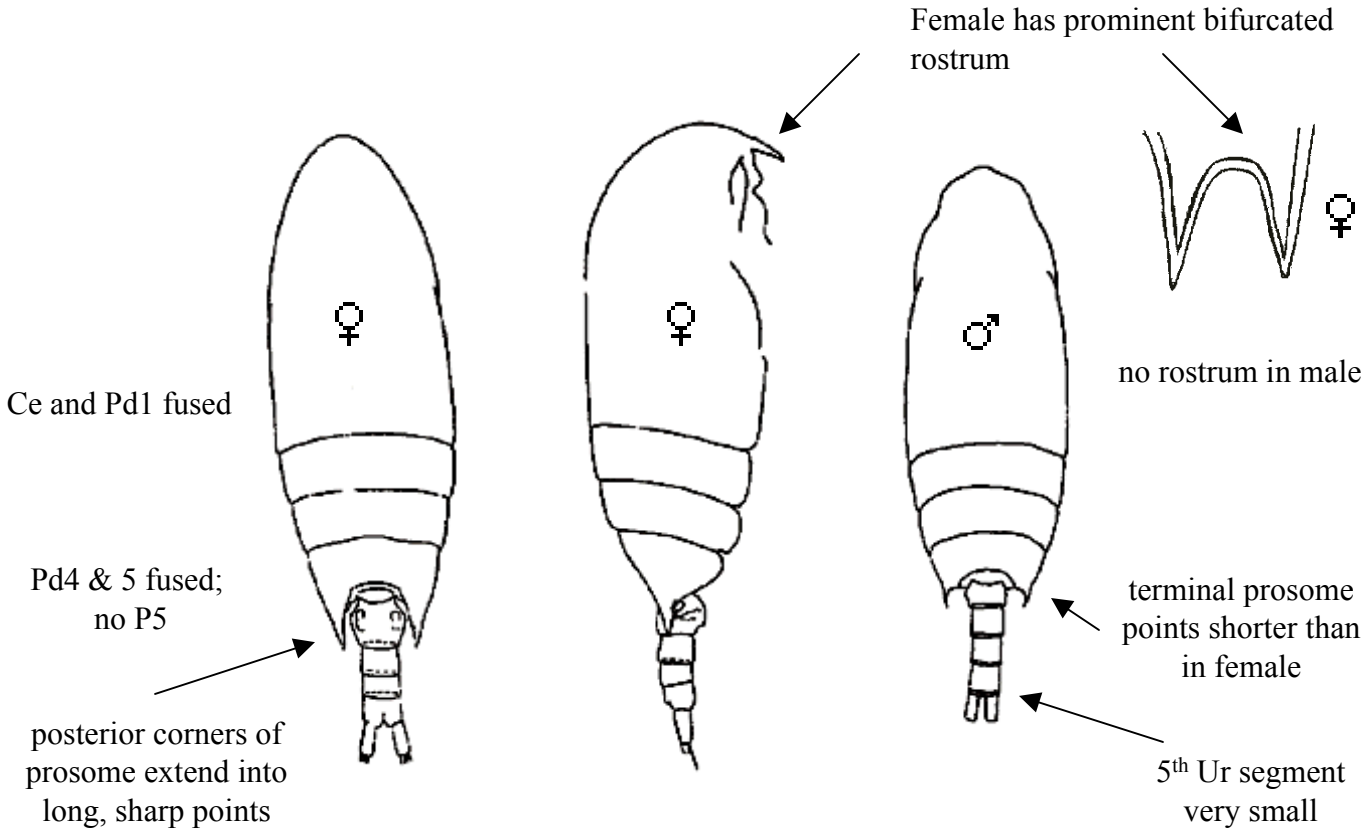
Acrocalanus spp. (not shown)
Female: P5 absent or vestigial
Male: Right P5 absent, or 1-segmented



Calanoida: Family Aetideidae

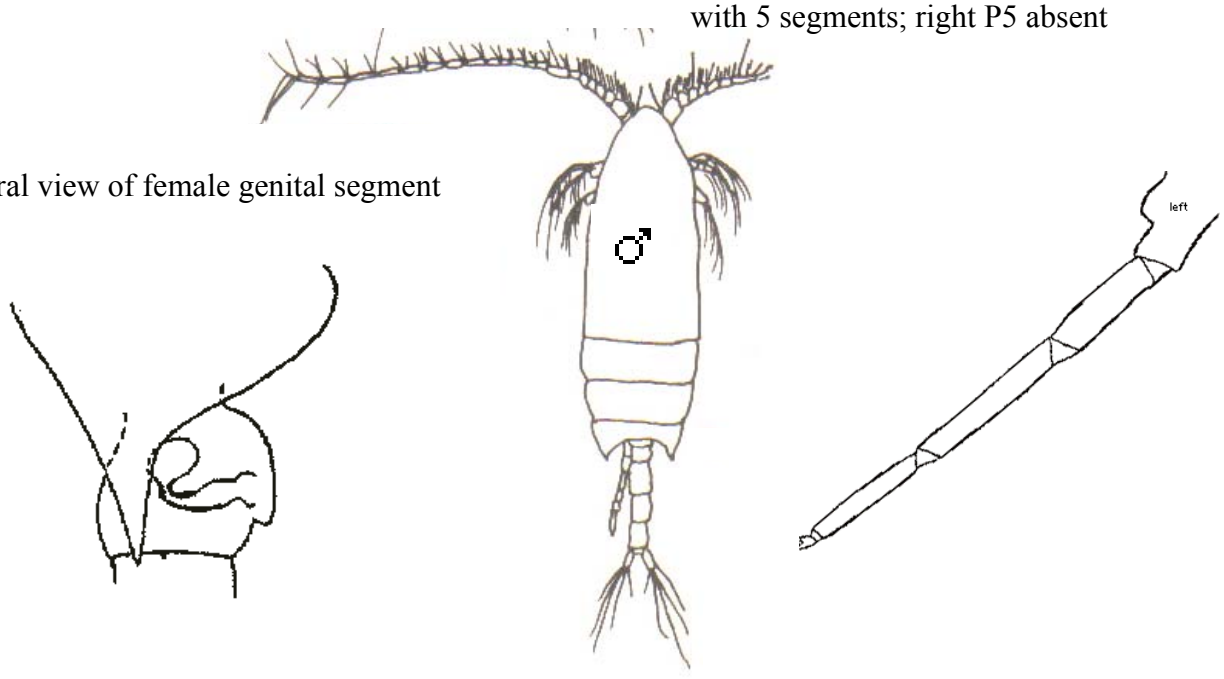
Aetideus armatus

Females 1.60 – 2.00 mm; Males 1.30 – 1.53 mm



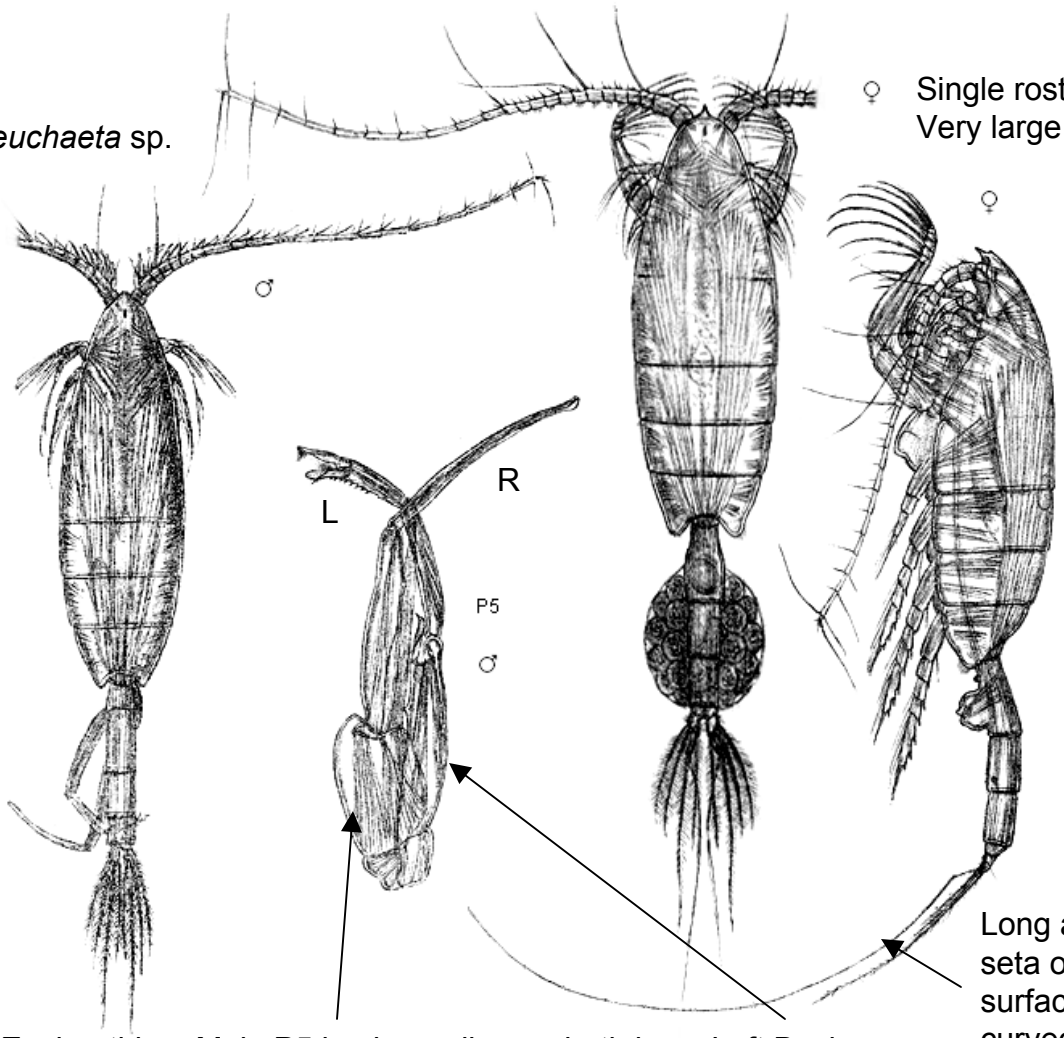
Male left P5 uniramous, elongated, simple, with 5 segments; right P5 absent

Lateral view of female genital segment



Calanoida: Family Euchaetidae

Pareuchaeta sp.



♀ Single rostral point
Very large Maxillipeds

Long appendicular seta on ventral surface, sometimes curved

In all Euchaetidae: Male P5 basis swollen on both legs; Left Basis larger than Right Basis. Right Exp with 2 elongated segments, Left Exp with one segment

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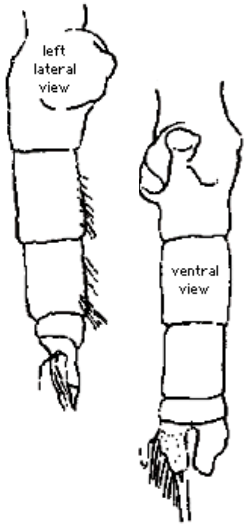
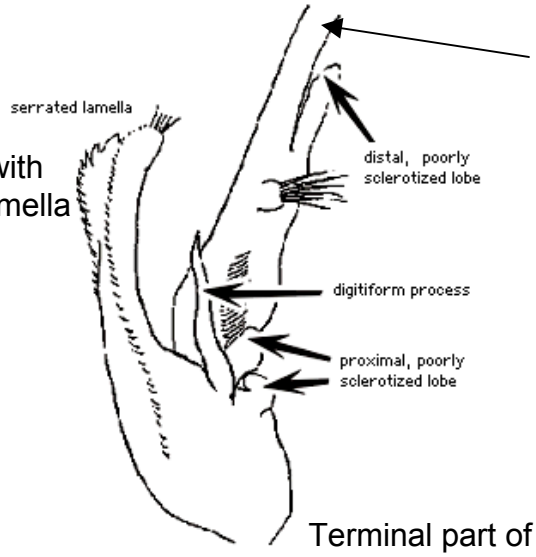
Euchaeta marina

Females 3.40 – 3.64 mm: Males 2.88 – 3.20 mm



Female Gns distinctive shape, asymmetrical with rounded protrusion, triangular in dorsal view

left Exp 2 with serrated lamella



Terminal part of Male Left P5

<u>Characteristic feature of Male *Euchaeta*</u>: Distal Exp segment on both right and left P5 tapering into long spine

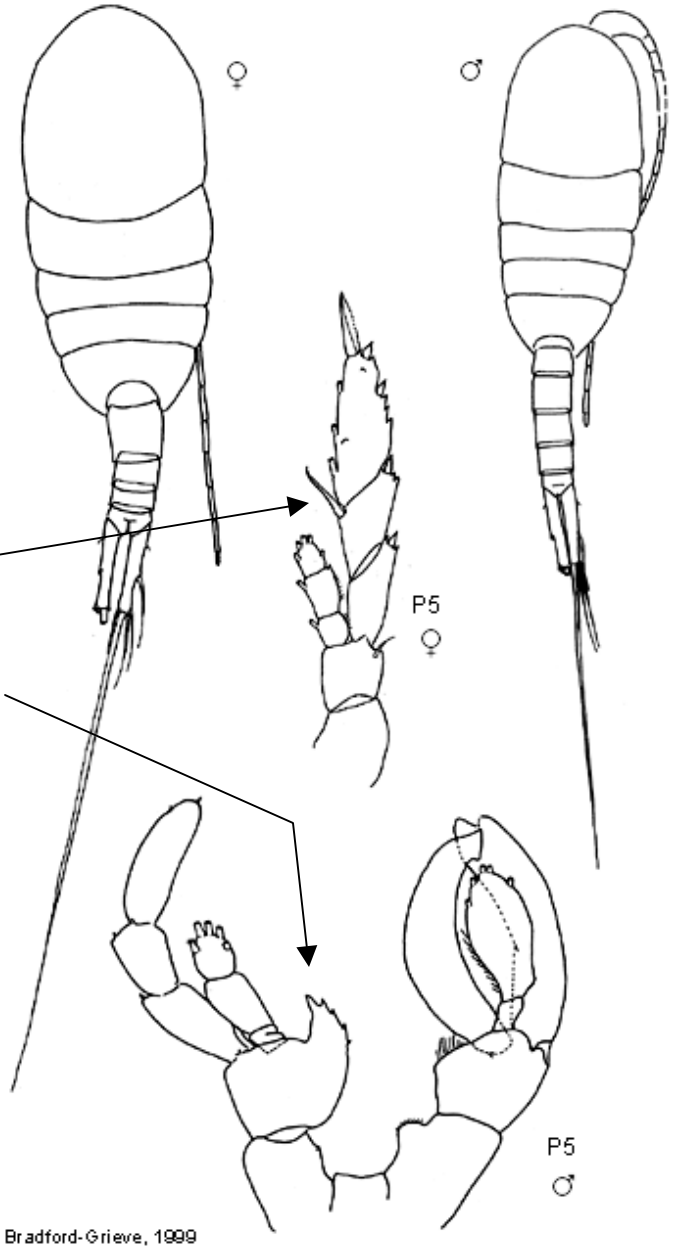
Calanoida: Family Lucicutiidae

General form of
Lucicutia

Female: Elongated Urosome.
CR symmetrical, relatively long,
with 7 setae

Female P5 Exp2 with inner seta
thickened into a strong spine.

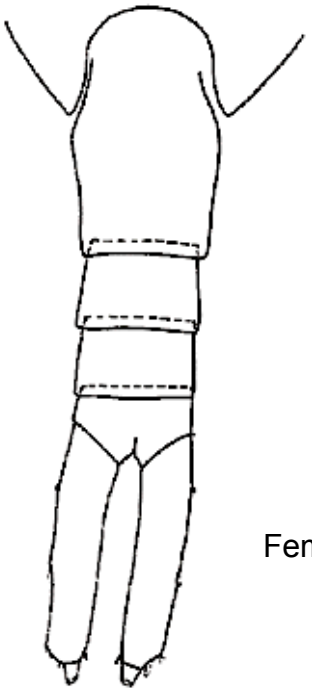
Male P5 basis with inner extensions



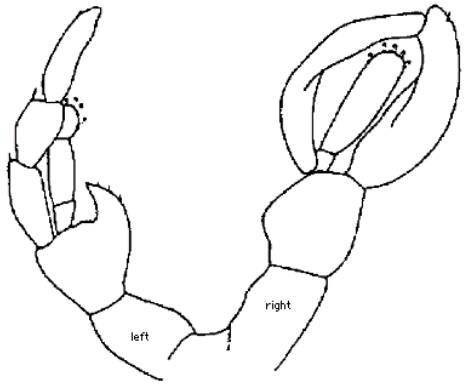
After: Bradford-Grieve, 1999

Lucicutia flavicornis

Females 1.30 – 2.00 mm
Males 1.30 – 1.70 mm



Female Urosome

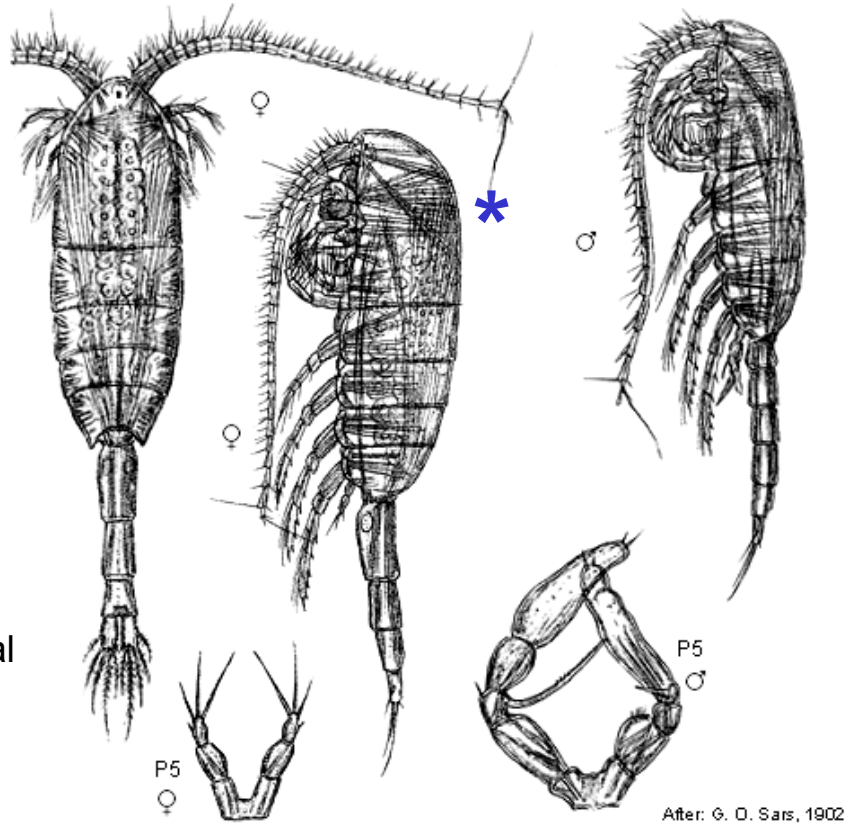


Male P5

Calanoida: Family Metridinidae

Females:
Ce & Pd1 separate. Ur of 3 somites. Pd1 with dark pigmented spot on one side in *Pleuromamma*. Enp segment 1 of P2 typically incised and ornamented with 1 or more hook-like spinous processes.

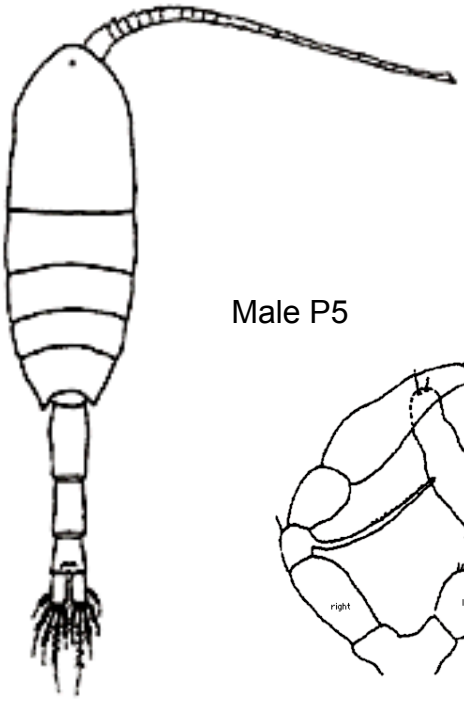
Males:
Ur of 5 somites. A1 prehensile on one side only (usually left). P5 asymmetrical. Left P5 Exp 1 with curved inner process, distal segment swollen, often curved or claw-like.



Metridia lucens

Females 2.39 – 2.93 mm; Males 1.62 – 2.30 mm

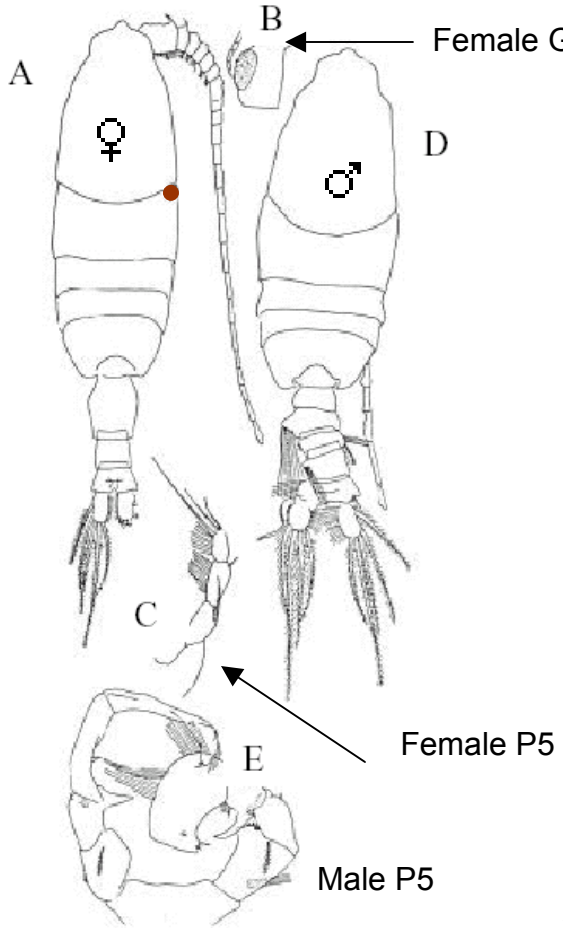
* Has distinctive sloping head of *Metridia* in lateral view. Also distinctive long, narrow Urosome.



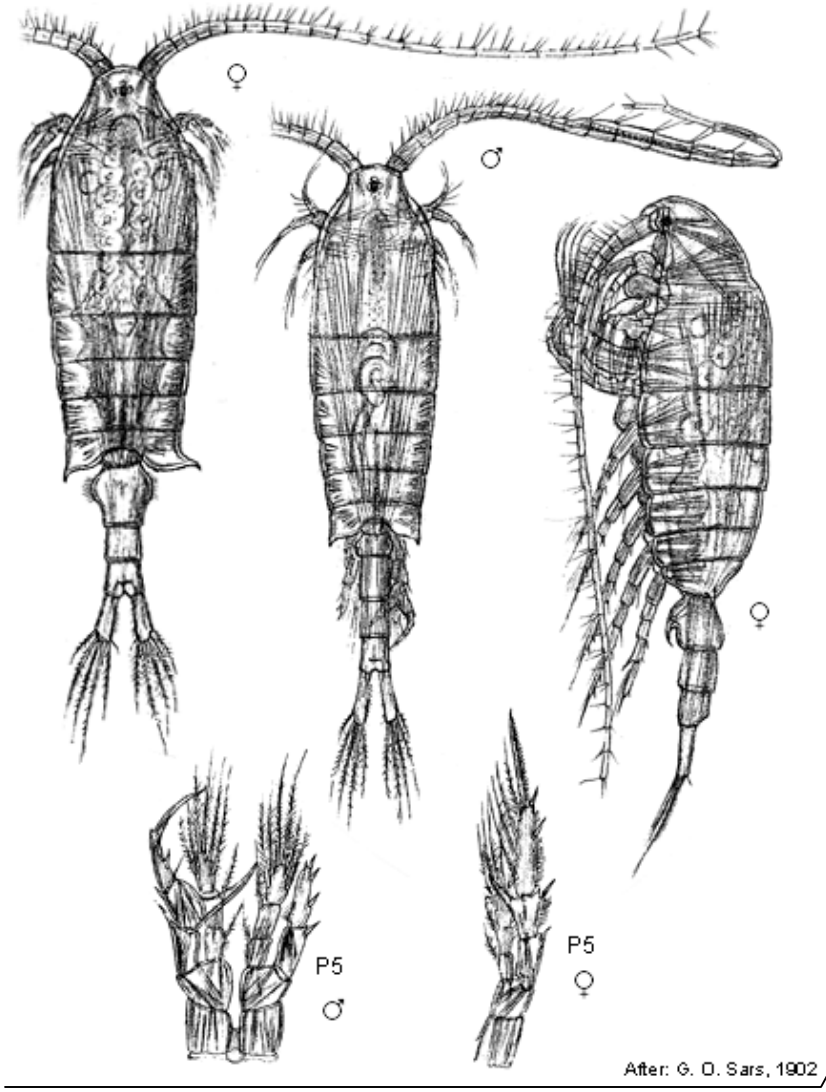
Male P5

Pleuromamma abdominalis

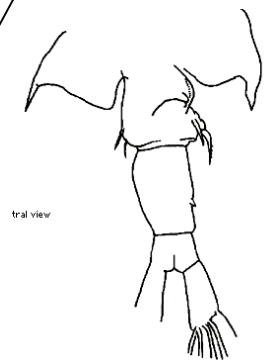
Females 2.40 – 3.70 mm; Males 2.75 – 3.50 mm



Calanoida: Family Centropagidae



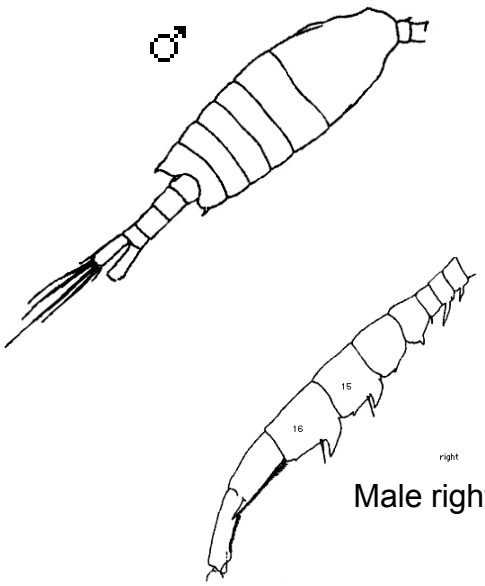
General form of
Centropages



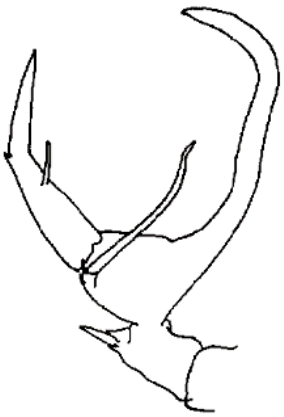
Female Ur, ventral view

Centropages brachiatus

Females 1.73 – 2.30 mm; Males 1.58 – 1.90 mm



Male right A1



Male P5

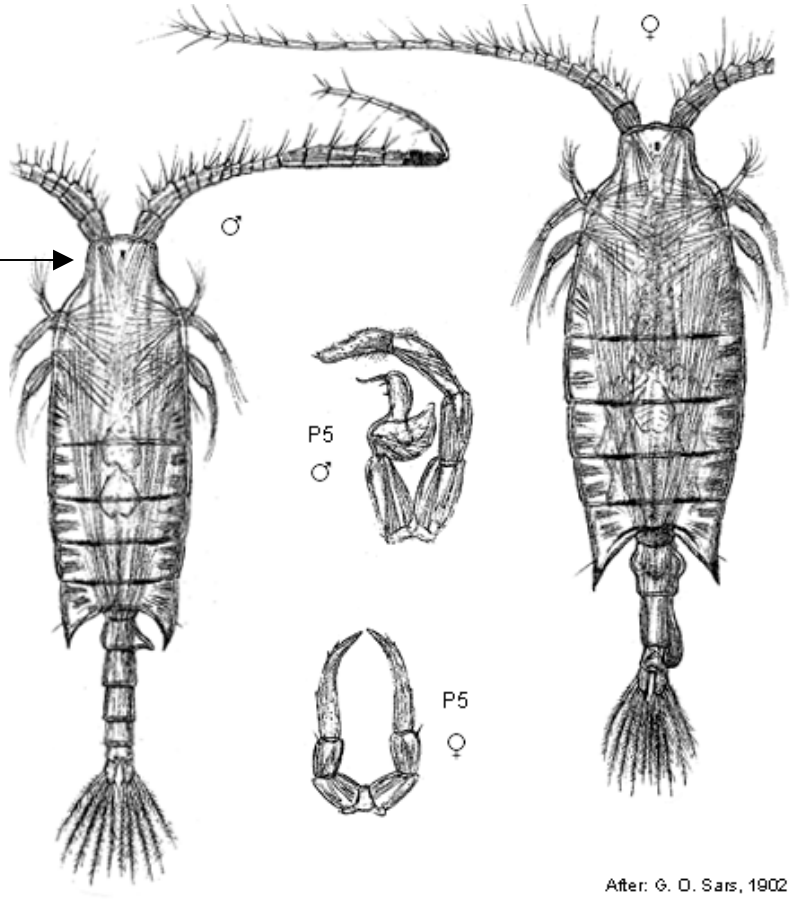
Female P5

Calanoida: Family Candaciidae

General form of *Candacia*

square head

Body relatively robust, anterior Ce rectangular in dorsal view, with conspicuous lateral constriction anteriorly (square head). Many spp have dark pigment in some parts of body. Prosome ends in pointed processes, often asymmetrical.

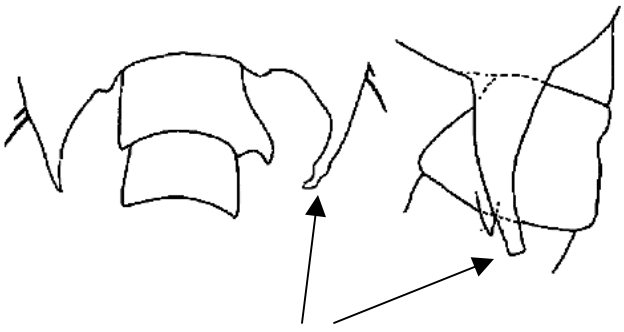


After: G. O. Sars, 1902

Candacia bipinnata

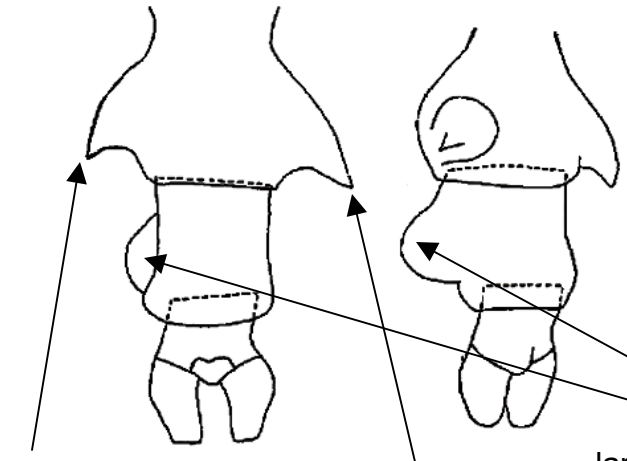
Females 2.35 – 2.65 mm; Males 2.15 – 2.50 mm

Male Genital segment



right process with blunt end, extends below Gns)

Female Urosome



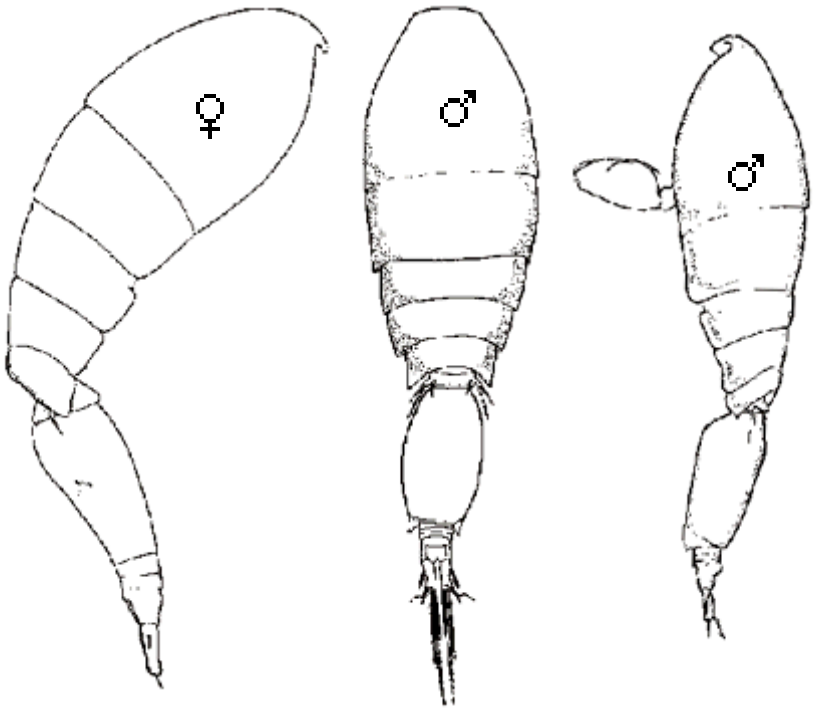
triangular, pointed lateral margins

lamella on ventral surface of Ur2

Poeicilostomatoida: Family Oncaeidae

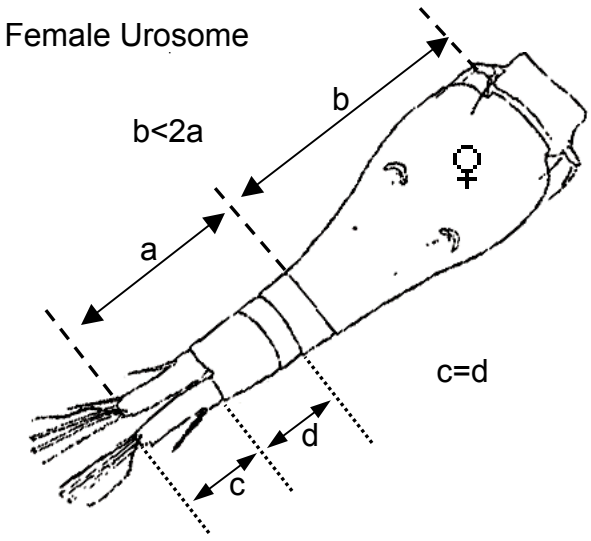
Oncaea mediterranea

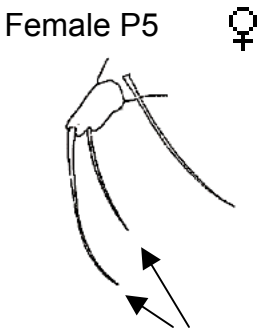
Females 1.14 – 1.26 mm; Males 0.74 – 0.97 mm



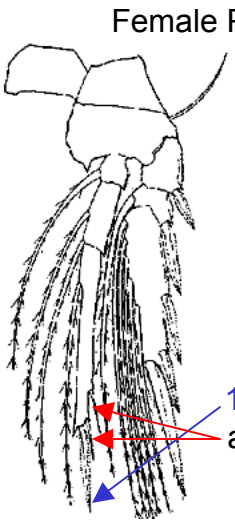
Female Maxilliped

Male Maxilliped





P5 terminal setae unequal in length

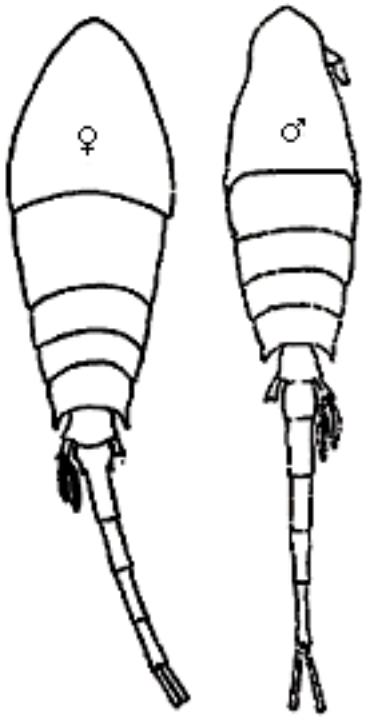


Enp 3 has 1 inner seta and 2 outer spines

Some other Poeicilostomatoida

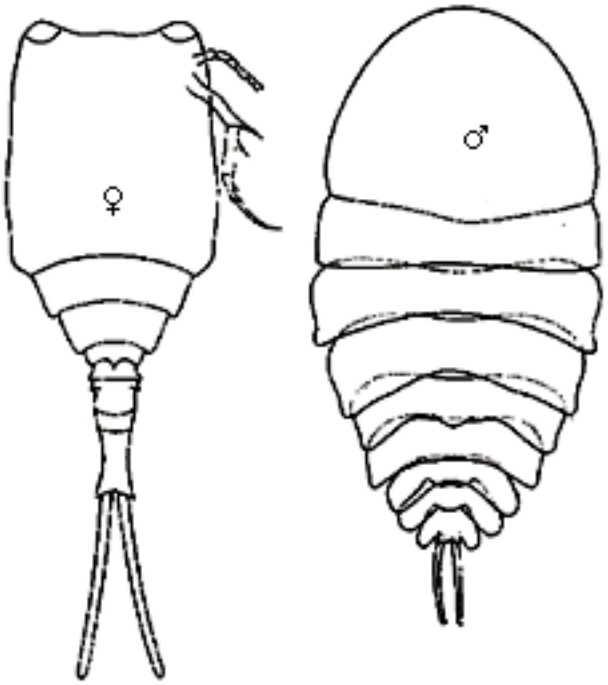
Lubbockia aculeata

Females 2.21 – 2.30 mm; Males 2.35 mm



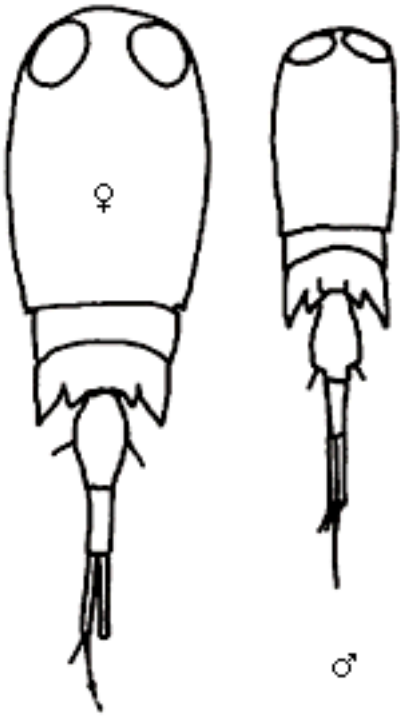
Copilia hendorffi

Females 3.90 – 5.10 mm; Males 5.50 – 8.30 mm



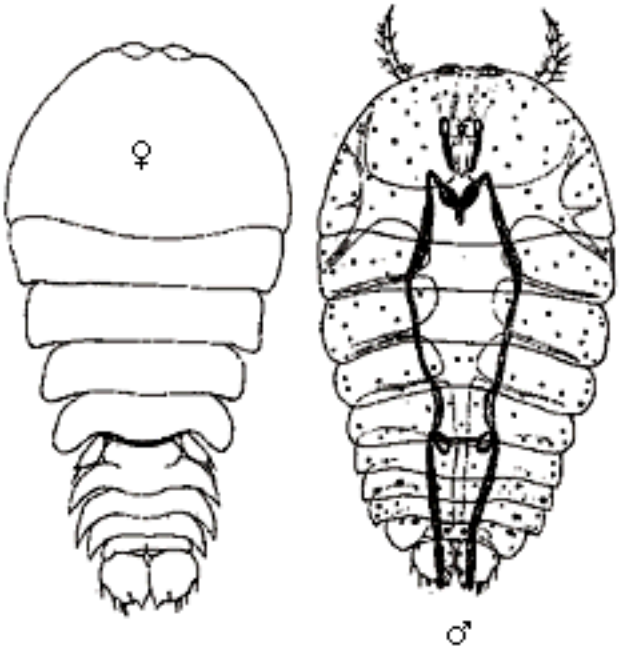
Corycaeus agilis

Females 0.92 – 0.98 mm; Males 0.70 – 0.77 mm



Sapphirina opalina-darwinii

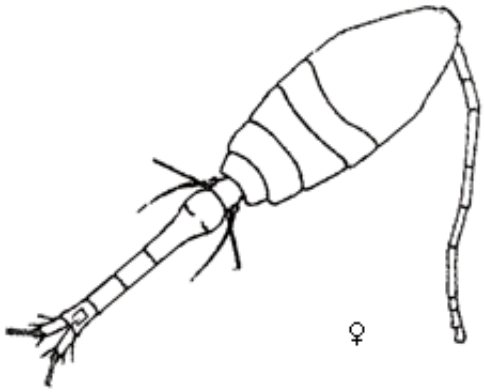
Females 2.13 – 4.17 mm; Males 2.42 – 4.36 mm



Cyclopoida: Family Oithonidae

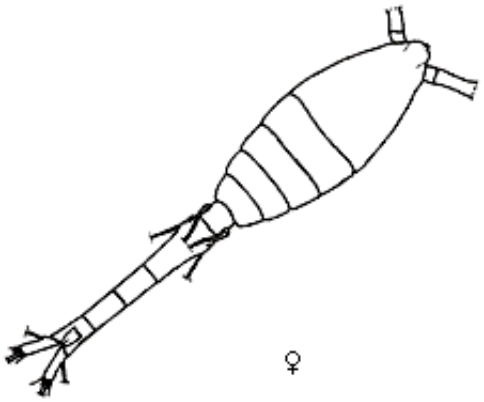
Oithona similis

Females 0.68 – 0.96 mm; Males 0.67 – 0.70 mm



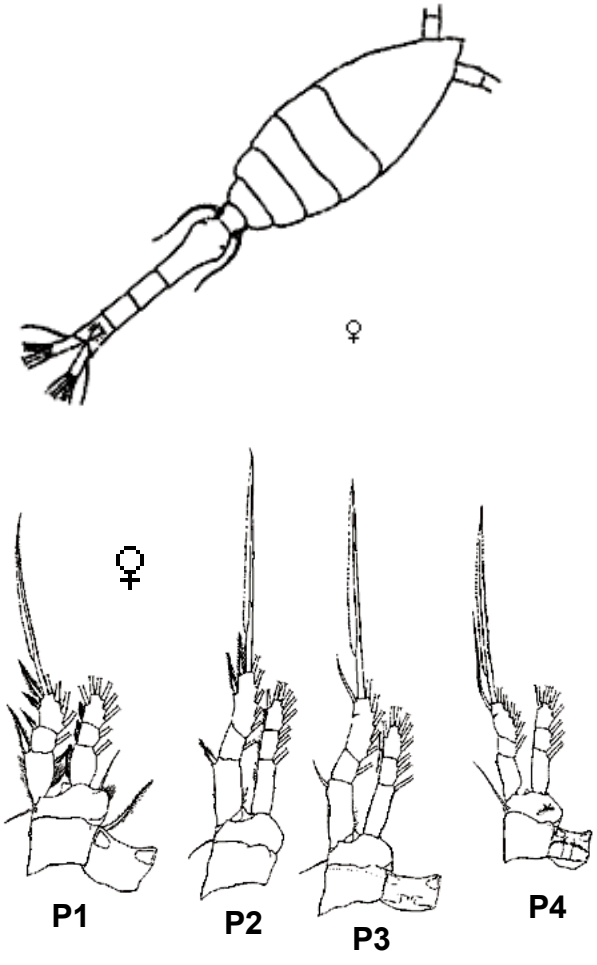
Oithona plumifera

Females 1.06 – 1.51 mm; Males 0.59 – 0.68 mm



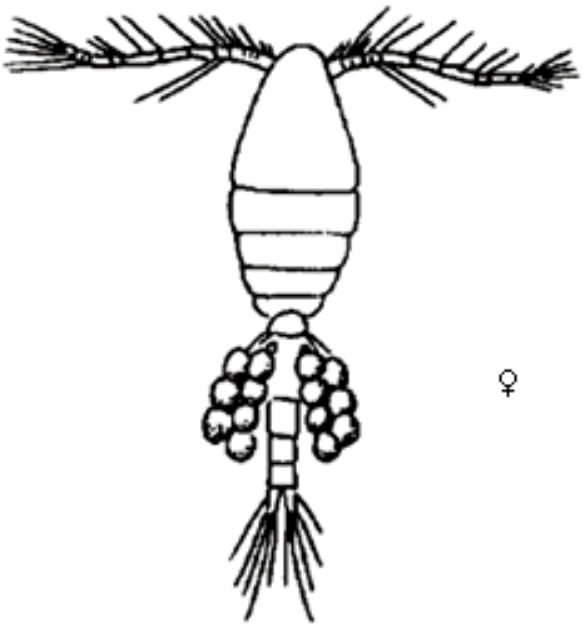
Oithona atlantica

Females 1.00 – 1.43 mm; Males 0.82 mm



Oithona minuta

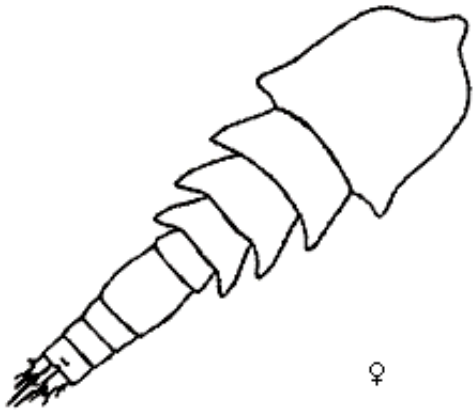
Females 0.45 – 0.65 mm; Males 0.42 – 0.50 mm



Harpacticoida

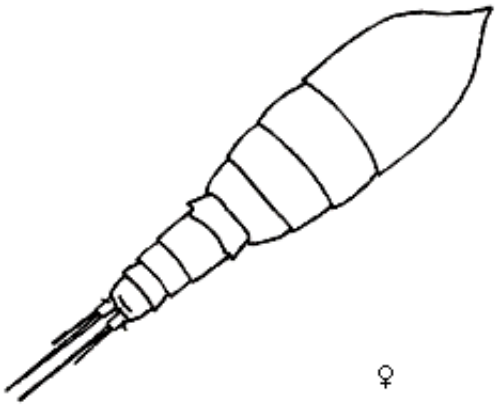
Clytemnestra scutellata

Females 1.00 – 1.24 mm; Males 1.05 – 1.30 mm



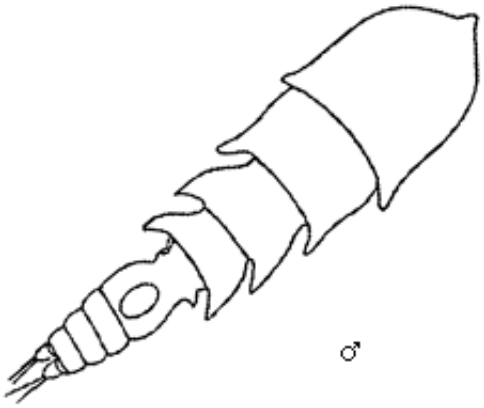
Euterpina acutifrons

Females 0.50 – 0.75 mm; Males 0.50 – 0.56 mm



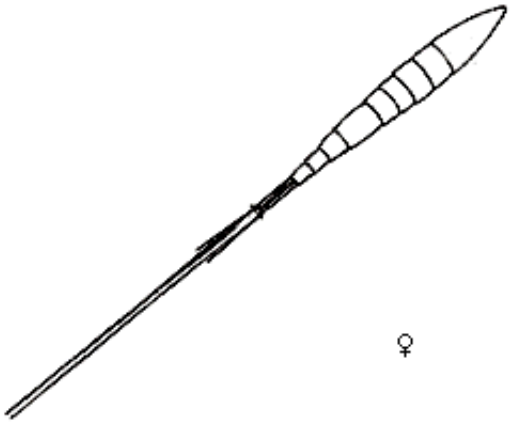
Clytemnestra rostrata

Females 0.60 – 1.00 mm; Males 0.80 – 0.90 mm



Macrosetella gracilis

Females 1.40 – 1.50 mm; Males 1.13 – 1.16 mm

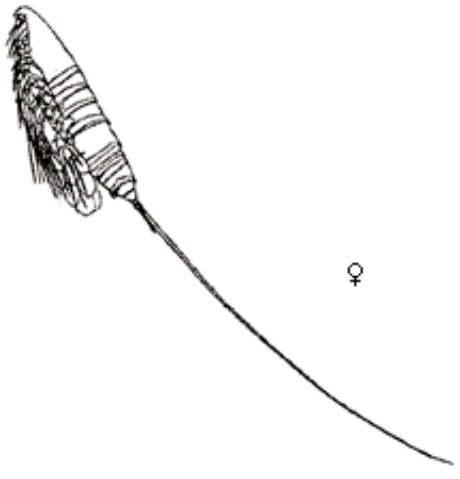


Microsetella norvegica

Females 0.35 – 0.53 mm; Males 0.33 – 0.42 mm

Microsetella rosea

Females 0.64 – 0.85 mm; Males unknown?



Glossary

Technical word	English	Portuguese
pedigerous	with legs	com patas
somite	body segment	corpo segmentado
seta(e)	articulated spine or hair-like structure	espinha (pelo) articulado que sai do segmento
truncate	chopped off	truncado
dorsal	top side (back)	dorsal
ventral	underside (tummy)	ventral
anterior	towards/in front	anterior
posterior	towards rear	posterior
ramus (i)	branch	ramificar
biramous	two branches	ramificado em duas partes
distal	away from point of origin	distante
proximal	close to point of origin	proximo
endo-	inside	interior
exo-	outside	exterior
blade	blade (flattened)	lamina
symmetrical	same both sides	simétrico
asymmetrical	not same both sides	assimétrico
vestigial	not well-developed	vestigio
protrusions	things sticking out	saliência do corpo
bifid	divided by a deep cleft into 2 parts	dividido em duas partes com uma fenda no meio
denticle	small tooth-like projection	pequena espinha (pelo)
pectinate	toothed like a comb	saliências tipo serra

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