

**Identification of the copepodite
developmental stages of twenty-six North
Atlantic copepods**

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**Marine Biological Association
Occasional Publications No. 21**

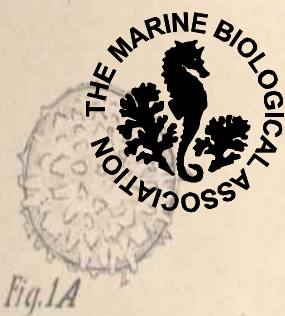


Fig. 1 B

Cover picture: Nauplii and copepod developmental stages of *Centropages hamatus* from Oberg, M. (1906). Die Metamorphose der Plankton-Copepoden der Kieler Bucht. Wiss. Meeresuntersuch. Kiel, 9: 37-103.

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Contents

Introduction	Page 4
Calanoida	6
<i>Calanus finmarchicus</i>	6
<i>Calanus helgolandicus</i>	7
<i>Neocalanus gracilis</i>	8
<i>Nannocalanus minor</i>	8
<i>Undinula vulgaris</i>	9
<i>Calanoides carinatus</i>	9
<i>Pseudocalanus elongatus</i>	10
<i>Microcalanus pygmaeus</i>	11
<i>Paracalanus parvus</i>	12
<i>Acartia clausi</i>	13
<i>Centropages hamatus</i>	14
<i>Centropages typicus</i>	15
<i>Candacia armata</i>	15
<i>Temora longicornis</i>	16
<i>Temora stylifera</i>	17
<i>Mertidia lucens</i>	18
<i>Pleuromamma abdominalis</i>	18
<i>Pleuromamma gracilis</i>	19
<i>Pareuchaeta norvegica</i>	19
<i>Euchaeta marina</i>	20
Cyclopoida	21
<i>Oithona nana</i>	21
<i>Oithona similis</i>	22
<i>Oncaea media</i>	22
<i>Oncaea subtilis</i>	23
Harpacticoida	24
<i>Microsetella norvegica</i>	24
<i>Euterpina acutifrons</i>	24
Regression equations of length and width for selected Calanoida	25
References	26

Introduction

In zooplankton studies there is often the requirement to identify copepod copepodite developmental stages e.g. for cohort studies, or perhaps detailed description of the gut contents of larval fish for comparison with their abundance in the plankton. Identification of the stages is based on the number of free, visible somites and number of pairs of swimming legs and if there is a restricted range of copepod species in your study area it is relatively simple to compile your own key to their developmental stages. Separation of copepodite stages is made easier because of the crustacean feature of moulting and rapid growth between stages, so there may be little or even no overlap in length between stages and it is usually possible to initially sort them on size alone. While knowledge of theoretical copepod segmentation is not necessary to identify the stages, it helps to understand the development process and the differences between species and families.

The major articulation of the body divides the copepod into an anterior prosome and a posterior urosome (Fig. 1). Theoretically, the adult copepod body consists of 16 somites. The anterior prosome is called the cephalosome and consists of 6 somites fused together, outwardly appearing as one somite. The first somite of the cephalosome bears a pair of limbs, the antennules. The next five somites each bear limb pairs which make up the feeding appendages: antennae, mandibles, maxillules, maxillae and maxillipedes. Because of a one somite difference between calanoid copepods and the other two main families (Cyclopoida and Harpacticoida) in the point where the body articulates, a generalised description of the remaining segmentation is difficult to make.

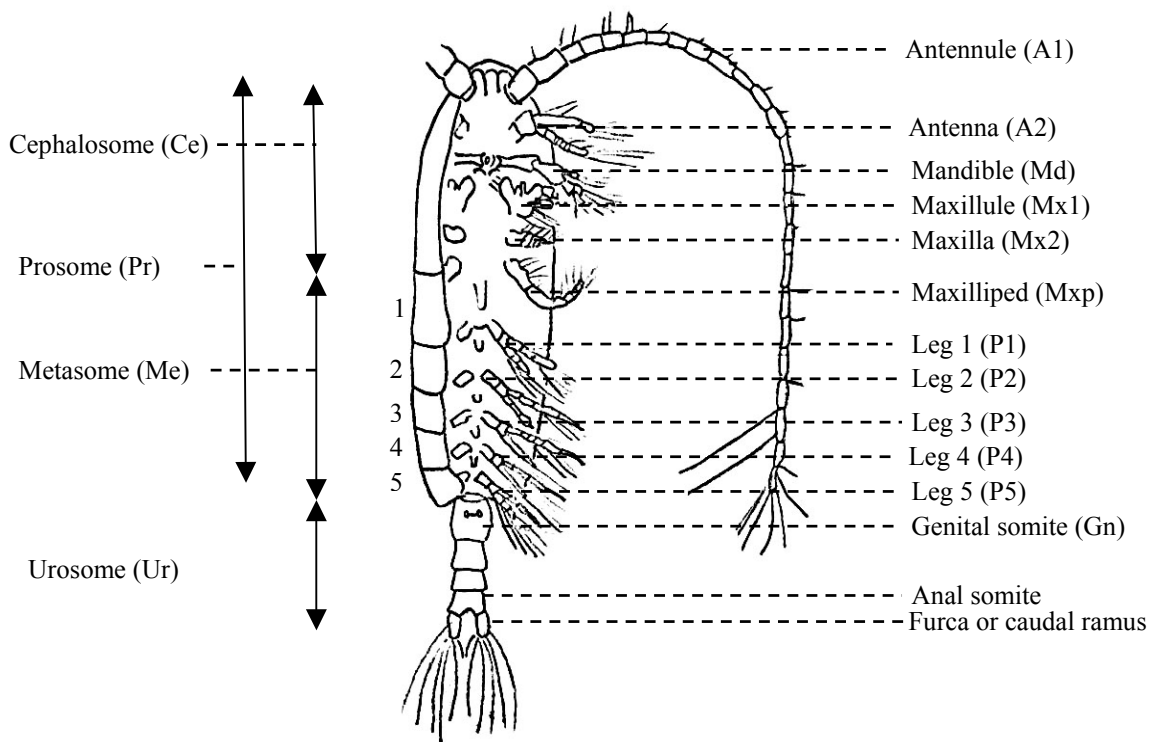


Fig. 1. Diagrammatic illustration of the external morphology and appendages of a CVI♀ calanoid copepod. Abbreviations for parts are shown and the pedigerous segments are numbered (Based on Mauchline, 1998).

The posterior prosome is called the metasome and in calanoids is composed of 5 somites, the first of which may be partially or completely fused to the cephalosome. In all copepods the metasome somites may be fused together in different ways, so there are interspecific differences in the number of free somites. They generally all bear paired swimming limbs (P1-P5; although some female calanoids only have four pairs) and are referred to as pedigerous somites. The next somite, the first somite of the urosome, in calanoids bears the genital openings in both sexes and is termed the genital somite. In cyclopoids and harpacticoids this somite bears the P5 and the genital somite is the following somite. In all female copepods the genital somite is usually fused with the following or more somites, giving the appearance of at least one less somite in the urosome than in males. The

last somite of the urosome has the anus located on the ventral side and is termed the anal somite. This ends in two furca or caudal rami which are not counted as a somite. The region posterior to the genital segment is the abdomen.

Total length can sometimes be difficult to measure if the copepod body is bent at the articulation between the prosome and the urosome, so prosome length is a more accurate and consistent measurement. Prosome width is a useful extra measurement if you are considering aspects such as net or feeding selection, as it is the minimum measurable copepod dimension an aperture must be for the copepod to pass through. The copepod may be wider dorso-ventrally, but it is problematical to accommodate the limbs in the measurement.

Descriptions and details of copepod developmental stages are not available for many species or are dispersed through the literature, so this report collates original and published information, on twenty-six of the commoner North Atlantic copepods. Terminology follows that of Huys and Boxshall (1991) and Mauchline (1998). Also included are regression equations for estimating body dimensions of seven calanoid species.

Measurements of each species were often gathered from several sources, different areas and times of year and all have been included separately for comparison. All unpublished measurements were, whenever possible, based on at least ten specimens of each stage and were from specimens preserved in 4% formaldehyde (the raw measurement data is available to anyone who is interested). Developmental information for some other species can be found among the references in Ferrari (1988).

CALANOIDA

In adult calanoid copepods the major movable articulation (bending joint) of the body is located between the fifth pedigerous and genital somites (between the prosome and urosome), which in copepod segmentation terms is between the eleventh and twelfth body somites. On metamorphosis from the final nauplius stage (NVI) to the first copepodite stage (CoI); all species have two pairs of swimming legs. At each moult the copepodites acquire an additional pair of legs until the final compliment of 4 or 5 pairs, depending on species, is reached in CoIV. In the earliest stages, an additional pair of small rudimentary legs may sometimes be present, which are noted separately in the tables (e.g. 2+1). If present, these additional legs may be difficult to see and only become fully developed at the following moult.

Number of prosome somites on its own is not the most useful character in separating stages, as in some cases it hardly varies during development. Additionally, individual somites are often difficult to distinguish, especially in species where fusion of somites takes place during development (e.g. *Paracalanus parvus*).

Calanus finmarchicus (Gunnerus)

	Notes	CoI	CoII	CoIII	CoIV	CoV	CoVI
No. of free prosome somites	1	4	5	6	6	6	6
No. of free urosome somites	1	2	2	2	3	4	♀ 4 ♂ 5
No. pairs of swimming legs	1	2+1	3+1	4+1	5	5	5
Mean total length (mm)	2	0.77	1.06	1.37	1.81	2.44	♀ 2.70 ♂ 2.66
Range of total length (mm)	2	0.73-0.84	1.01-1.15	1.29-1.46	1.66-1.94	2.25-2.61	♀ 2.44-3.08 ♂ 2.50-2.85
Mean total length (mm)	3	0.88	1.23	1.66	2.16	2.89	♀ 3.41 ♂ 3.41
Range of total length (mm)	3	0.81-0.95	1.10-1.32	1.46-1.79	1.98-2.38	2.56-3.44	♀ 3.00-3.92 ♂ 3.22-3.59
Mean prosome length (mm)	2	0.60	0.83	1.09	1.44	1.90	♀ 2.11 ♂ 2.07
Range of prosome length (mm)	2	0.56-0.67	0.73-0.90	1.01-1.18	1.29-1.55	1.74-2.03	♀ 1.86-2.44 ♂ 1.97-2.15
Range of mean prosome length (mm)	4*	0.63-0.76	0.90-1.09	1.23-1.51	1.58-1.98	2.00-2.51	♀ 2.23-2.82 ♂ 2.34-2.67
Mean prosome width (mm)	2	0.21	0.25	0.31	0.41	0.54	♀ 0.64 ♂ 0.61
Range of greatest prosome width (mm)	2	0.20-0.23	0.23-0.28	0.28-0.34	0.37-0.45	0.46-0.58	♀ 0.58-0.76 ♂ 0.58-0.64

*Values are the range of mean sizes of groups of copepods sampled on different dates.

Notes:

- 1). From Marshall & Orr (1955).
- 2). From measurements of copepods sampled in the northern North Sea in April 1974.
- 3). From measurements of copepods sampled in the Irminger Sea in August 2002 (Samples from S.J. Hay, FRS Aberdeen).
- 4). From measurements of copepods sampled in the Clyde, January to October 1933 (Marshall *et al.*, 1934).

In the CoVI the prosome is oblong and approximately three times the length of the urosome. The antennules extend past the furca in all stages and their second last and third last segments bear long,

backwardly pointing, plumose setae. These setae are characteristic of the genus and are present in all stages.

Eriksson (1973), working on the west coast of Sweden, gives the female prosome length range as 2.00-3.12 mm.

Calanus finmarchicus is a free spawner and egg size given by Bainbridge (1968) is 135µm, by Corkett & McLaren (1970) as 145µm, by Marshall & Orr (1955) as 138-151µm and by Valentin (1972) as 180µm. For further information see Marshall & Orr (1955).

Calanus helgolandicus Claus

	Notes	CoI	CoII	CoIII	CoIV	CoV	CoVI
No. of free prosome somites	1	4	5	6	6	6	6
No. of free urosome somites	1	2	2	2	3	4	♀ 4 ♂ 5
No. pairs of swimming legs	1	2+1	3+1	4+1	5	5	5
Mean total length (mm)	1					2.69	♀ 2.91 ♂ 3.01
Range of total length (mm)	1					2.31-3.16	♀ 2.60-3.28 ♂ 2.79-3.27
Mean total length (mm)	2				1.9	2.4	♀ 2.9 ♂ 2.7
Range of total length (mm)	2				1.8-2.0	2.1-2.7	♀ 2.7-3.2 ♂ 2.7
Mean total length (mm)	3	0.93	1.23	1.64	2.34	2.98	♀ 3.53 ♂ 3.39
Range of total length (mm)	3	0.86-1.00	1.15-1.34	1.53-1.79	2.27-2.46	2.79-3.20	♀ 3.09-3.94 ♂ 3.01-3.72
Mean prosome length (mm)	3	0.74	0.97	1.30	1.75	2.38	♀ 2.79 ♂ 2.64
Range of prosome length (mm)	3	0.71-0.78	0.89-1.04	1.19-1.41	1.79-1.97	2.27-2.60	♀ 2.46-3.12 ♂ 2.34-2.90

Notes:

- 1). From copepods sampled in the Celtic Sea in January 1982.
- 2). From copepods sampled off north-western Iberia in July 2005.
- 3). From copepods sampled in the Celtic Sea in May 1980

The copepodites from north-western Iberia were measured from the same samples as the set of *Calanoides carinatus*, to see if size differences in the easily identifiable CoIV-VI stages could be tracked into the earlier stages. It was hoped this would enable differentiation between their very similar early copepodites through size difference. Unfortunately separation could not be done with any confidence.

From sampling throughout the year off northern Spain, Alvarez-Marques (1984) measured *C. helgolandicus* CoVI♀ as total length 2.26-3.57 mm (mean 2.81 mm) and CoVI♂ as 1.98-3.08 mm (mean 2.76 mm). Eriksson (1973), working on the west coast of Sweden, gives the female prosome length range as 1.88-3.08 mm.

Eggs are free spawned and from measurements of unpreserved eggs from the Celtic Sea in April 1983, had a diameter of 150-160µm. Preserved eggs collected off Plymouth were 175-191µm, mean 185µm. Marshall & Orr (1955) gave their diameter as up to 172µm.

***Neocalanus gracilis* (Dana)**

	Notes	CoI	CoII	CoIII	CoIV	CoV	CoVI
No. of free prosome somites	1	3	4	5	5	5	♀ 5* ♂ 6
No. of free urosome somites	1	2	2	2	3	4	♀ 4* ♂ 5
No. pairs of swimming legs	1	2	3	4	5	5	5*
Mean prosome length (mm)	1	0.78	1.01	1.30	1.55	2.10	

* From Rose (1933).

Notes:

1). From copepods sampled in the Gulf of Marseilles (Gaudy, 1962).

There is one less somite in the prosome in CoI-V than in *C. helgolandicus* and the A1 extends well beyond the furca. Gaudy (1962) did not provide measurements of the adult prosome, but the total lengths given by Rose (1933) are CoVI♀ 2.43-4.00 mm and CoVI♂ as 2.30-3.10 mm. From sampling throughout the year off northern Spain, Alvarez-Marques (1984) measured *N. gracilis* CoV♀ as total length 2.14-2.38 mm, but provided no measurements of males.

***Nannocalanus minor* (Claus)**

	Notes	CoI	CoII	CoIII	CoIV	CoV	CoVI
No. of free prosome somites	1	3	4	5	5	5	5*
No. of free urosome somites	1	2	2	2	3 [§]	4	♀ 4* ♂ 5
No. pairs of swimming legs	1	2	3	4	5	5	5*
Mean prosome length (mm)	1	0.48	0.60	0.72	0.92	1.20	

*From Rose (1933).

[§]Gaudy (1962) recorded 4 somites in the urosome but drew 3.

Notes:

1). From copepods sampled in the Gulf of Marseilles (Gaudy, 1962).

Gaudy (1962) did not provide measurements of the adult prosome, but the total lengths given by Bradford-Grieve (1994) are CoVI♀ 1.70-2.30 mm and CoVI♂ as 1.20-2.01 mm. From sampling throughout the year off northern Spain, Alvarez-Marques (1984) measured *N. minor* CoVI♀ as total length 1.81-2.20 mm (mean 2.05 mm) and CoVI♂ as 1.78-1.95 mm (mean 1.86 mm).

***Undinula vulgaris* (Dana)**

	Notes	CoI	CoII	CoIII	CoIV	CoV	CoVI
No. of free prosome somites	1	2/3	4	5	5	5	5
No. of free urosome somites	1	2	2	3	3	4	♀4 ♂5
No. pairs of swimming legs	1	2	3	4	5	5	5
Total length range (mm)	1	0.65-0.70	0.81-1.19				
Mean total length (mm)	2		0.86	1.20	♀1.68 ♂1.56	2.24 2.14	2.89 2.51
Range of total length (mm)	2		0.84-0.86	1.12-1.30	♀1.56-1.86 ♂1.42-1.74	2.10-2.48 1.84-2.38	2.68-3.14 2.42-2.72
Mean total length (mm)	3			1.05	♀1.32 ♂1.27	1.63 1.65	2.07 1.96
Range of total length (mm)	3			1.04-1.10	♀1.25-1.42 ♂1.22-1.34	1.56-1.89 1.56-1.74	1.89-2.62 1.88-2.08

Notes:

- 1). From copepods sampled in the Caribbean off Curaçao (Björnberg, 1966).
- 2). From copepods sampled in the Indian Ocean at Station 555 (Sewell, 1929).
- 3). From copepods sampled in the Indian Ocean at Station 614 (Sewell, 1929).

Sewell (1929) states that from CoIV the P5 shows differences between sexes. In the CoIV♂ the exopod of the left P5 is longer and broader than the corresponding appendage on the right side, while the terminal spine is shorter; this is even more pronounced in CoV♂. The CoVI♀ has prominent spines on the posterior metasome somite, but these are absent in the CoV♀ where this somite is uniformly rounded as in the CoVI♂. This differs from other species which develop metasome spines, such as *Candacia* and *Centropages*; their spines are present from CoIV.

***Calanoides carinatus* (Kröyer)**

	Notes	CoI	CoII	CoIII	CoIV	CoV	CoVI
No. of free prosome somites	1				6	6	6
No. of free urosome somites	1				3	4	♀4 ♂5
No. pairs of swimming legs	1				5	5	5
Mean total length (mm)	1				1.7	2.2	♀2.5 ♂2.3
Range of total length (mm)	1				1.5-1.8	2.0-2.3	♀2.4-2.6 ♂2.2-2.5
Mean prosome length (mm)	1				1.4	1.8	♀2.0 ♂1.8
Range of prosome length (mm)	1				1.2-1.5	1.7-1.9	♀1.9-2.1 ♂1.7-1.9
Mean prosome width (mm)	1				0.4	0.5	♀0.6 ♂0.5
Range of greatest prosome width (mm)	1				0.3-0.4	0.5	♀0.5-0.6 ♂0.5-0.6

Notes:

- 1). From off north-western Iberia in July 2005 (Samples from D. Bonnet, PML, Plymouth).

CoIV-VI can easily be distinguished from other Calanidae which occur in the region (*Calanus helgolandicus*, *Neocalanus gracilis*, *Mesocalanus tenuicornis*, *Nannocalanus minor*) by the sharply pointed anterior cephalosome when viewed dorsally. The CoVI♂ does not show this feature, but the anterior cephalosome is certainly more pointed than in *C. helgolandicus* CoVI♂. CoV♂ probably has a pointed cephalosome, as all CoV examined showed this feature. The CoVI♂ can be distinguished from that of *C. helgolandicus* by examining the endopod of the left P5, which in *C. carinatus* is reduced to a simple segment without any setae. The inner margin of the basal segment of the P5 is smooth and rounded in CoV-VI♂♀, while in *C. helgolandicus* it is concave and bears a row of small teeth. While the CoIV-VI could be distinguished from *C. helgolandicus* in the same samples, based on morphology and size (although there was some overlap in size range), the CoI-III could not be separated with certainty.

From sampling throughout the year off northern Spain, Alvarez-Marques (1984) measured *C. carinatus* CoVI♀ as total length 2.00-3.09 mm (mean 2.36 mm) and CoVI♂ as 1.98-2.69 mm (mean 2.29 mm).

The egg has a perivittelline space variable in diameter and has dark pigmentation (Hirche, 1980). The outer membrane is transparent, its surface covered with branched wrinkles giving it a spiny appearance in optical section. Diameter of the egg is 190-225µm (mean 206µm). A description of the nauplii are also given in Hirche (1980).

Pseudocalanus elongatus Boeck

	Notes	CoI	CoII	CoIII	CoIV	CoV	CoVI
No. of free prosome somites	1	4	5	6	5	5	4
No. of free urosome somites	1	2	2	2	♀3 ♂3	♀4 ♂4	♀4 ♂5
No. pairs of swimming legs	1	2+1	3+1	4	♀4 ♂5	4 5	4 5
Mean total length (mm)	1			0.71	♀0.80 ♂0.86	1.05 1.00	1.54 1.12
Mean total length (mm)	2	0.49	0.64	0.82	♀0.96 ♂0.96	1.20 1.11	1.21 1.05
Range of total length (mm)	2	0.39-0.54	0.62-0.67	0.76-0.87	♀0.85-1.01 ♂0.87-1.07	♀1.10-1.32 ♂0.99-1.21	♀0.93-1.55 ♂0.98-1.13
Mean prosome length (mm)	2	0.39	0.50	0.65	♀0.73 ♂0.74	0.88 0.83	0.86 0.77
Range of prosome length (mm)	2	0.31-0.45	0.48-0.53	0.59-0.70	♀0.65-0.79 ♂0.67-0.84	0.79-0.93 0.73-0.90	0.65-1.15 0.73-0.84
Range of mean prosome length (mm)	3*	0.35-0.43	0.43-0.54	0.52-0.64	♀0.61-0.75 ♂0.60-0.73	0.68-0.91 0.68-0.85	0.75-1.06 0.65-0.84
Mean prosome width (mm)	2	0.16	0.20	0.25	♀0.28 ♂0.28	0.35 0.32	0.34 0.33
Range of greatest prosome width (mm)	2	0.14-0.18	0.17-0.23	0.23-0.28	♀0.25-0.31 ♂0.25-0.34	0.31-0.37 0.28-0.37	0.25-0.48 0.31-0.37

*Values are the range of mean sizes of groups of copepods sampled on different dates.

Notes:

- 1). From Kraefft (1910)
- 2). From measurements of copepods sampled in the Clyde in March 1974.
- 3). From copepods sampled off Plymouth throughout 1947 (Digby, 1950).

The prosome in *Pseudocalanus* is compact and rounded and approximately twice the length of the urosome. In all stages the antennules are shorter than the total length. The flexible setae on the

antennules and the stiffer setae on the furca are vulnerable to damage, either during sampling or preservation and are usually missing in all stages. In CoIV-V the last metasome somite is small and not easily distinguished.

A variable proportion of CoVI♀ stages, which should only 4 pairs of legs in the females, can often have a rudimentary pair which can make them appear like a *Clausocalanus* female. However, closer examination will show that the legs are obviously rudimentary. Marshall (1949) found that <1% of CoVI♀ in Loch Striven showed this abnormality. However, at the Plymouth L4 station the percentage can sometimes be higher. Because the female does not normally develop a P5, the sexes can be distinguished in CoIV and CoV stages. In the CoVI♂ the limbs of the P5 are of unequal length, but not as unequal as in *Paracalanus*. In the Pseudocalanidae the terminal spine on the exopod of all swimming legs, except the P1, is serrated, while in the Paracalanidae this character is not found.

Eriksson (1973), working on the west coast of Sweden, gives the female prosome length range as 0.62-1.30 mm.

Eggs appear to be carried as an egg mass without an enclosing membrane (Marshall, 1949) and can be easily detached. From measurements of preserved eggs from the Celtic Sea in April 1983 they have a diameter of 130-140µm. Corkett and McLaren (1969) measured the eggs as being 100-130µm. Conway *et al.* (1994) measured fresh eggs from off Plymouth as being 102-122µm with a mean of 116µm ± 7.04. Frost (1989) gives preserved eggs from off Plymouth as 120-133µm, with a mean of 125µm ± 0.65. For further information see Corkett (1968), Frost (1989).

Microcalanus pygmaeus G.O. Sars

	Notes	CoI	CoII	CoIII	CoIV	CoV	CoVI
No. of free prosome somites	1						4
No. of free urosome somites	1	2	2	2	3	4	♀ 4 ♂ 5
No. pairs of swimming legs	1	2	3	4	♀ 4 ♂ 5	4 5	4 5
Mean total length (mm)	1	0.25	0.35	0.41	♀ 0.48 ♂ 0.53	0.57 0.62	0.66 0.70
Range of total length (mm)	1	0.25	0.31-0.42	0.39-0.42	♀ 0.45-0.51 ♂ 0.48-0.65	0.51-0.59 0.56-0.68	0.62-0.70 0.67-0.73
Mean prosome length (mm)	1	0.20	0.28	0.33	♀ 0.38 ♂ 0.40	0.47 0.48	0.52 0.49
Range of prosome length (mm)	1	0.20	0.23-0.34	0.31-0.34	♀ 0.37-0.39 ♂ 0.34-0.51	0.42-0.51 0.45-0.51	0.48-0.56 0.48-0.51
Range of mean prosome length (mm)	2*	0.23 [§]	0.29 [§]	0.35-0.38	♀ 0.38-0.44 ♂ 0.41-0.46	0.45-0.51 0.43-0.55	0.51-0.58 0.53-0.57
Mean prosome width (mm)	1	0.08	0.12	0.14	♀ 0.17 ♂ 0.21	0.21 0.22	0.23 0.22
Range of greatest prosome width (mm)	1	0.08	0.11-0.14	0.14	♀ 0.14-0.20 ♂ 0.17-0.23	0.20-0.23 0.20-0.25	0.23-0.25 0.20-0.23

*Values are the range of mean sizes of groups of copepods sampled on different dates.

[§]Mean for July 1933 only.

Notes:

- 1). From copepods sampled in the Clyde in March 1974.
- 2). From copepods sampled in the Clyde between January and October 1933 (Marshall, 1949).

Although Marshall (1949) recorded *M. pygmaeus* from the Clyde, the Clyde copepods from March 1974 were originally identified as being *Microcalanus pusillus*, as their characteristics most closely

agreed with Sars's 1903 description of this species. However, they now appear to be considered variations of the same species (Razouls, 1995) and the name *M. pygmaeus* Sars 1900, takes precedence (Mauchline (1998) still listed the species separately).

It is one of the smallest calanoid copepods and tends to be distributed vertically towards the sea bottom. The prosome is deep and stocky, and this characteristic shape is found even in the earliest stages. The prosome is approximately three times the length of the urosome in the female and twice its length in the male. As in *Pseudocalanus*, the terminal spine on the exopod of all the swimming legs except the P1 is serrated.

Paracalanus parvus Claus

	Notes	CoI	CoII	CoIII	CoIV	CoV	CoVI
No. of free prosome somites	1	2	3/4	4/5	6	6/5	4
No. of free urosome somites	1	2	2	2	3	4	♀ 4 ♂ 5
No. pairs of swimming legs	1	2+1	3+1	4+1	5	5	5
Mean total length (mm)	2	0.35	0.46	0.55	0.72	♀0.87 ♂0.96	0.87 0.96
Range of total length (mm)	2	0.32-0.37	0.42-0.48	0.49-0.59	0.65-0.76	♀0.87 ♂0.96	0.82-0.99 0.96
Mean prosome length (mm)	2	0.28	0.36	0.43	0.56	♀0.70 ♂0.73	0.69 0.73
Range of prosome length (mm)	2	0.25-0.30	0.34-0.37	0.39-0.45	0.51-0.59	♀0.70 ♂0.73	0.65-0.76 0.73
Range of mean prosome length (mm)	3*			0.46-0.47	♀0.46-0.54 ♂0.57-0.60	0.59-0.65 0.70-0.74	0.66-0.73 0.73-0.79
Range of mean prosome length (mm)	4*	0.24-0.30	0.30-0.38	0.39-0.49	♀0.46-0.56 ♂0.52-0.59	0.55-0.63 0.65-0.73	0.62-0.85 0.68-0.79
Mean prosome width (mm)	2	0.10	0.13	0.15	0.20	♀0.25 ♂0.28	0.25 0.28
Range of greatest prosome width (mm)	2	0.10-0.11	0.11-0.14	0.13-0.17	0.17-0.23	♀0.25 ♂0.28	0.23-0.31 0.28

*Values are the range of mean sizes of groups of copepods sampled on different dates.

Notes:

- 1). From Kraefft (1910) and copepods from the Northern North Sea in April 1974.
- 2). CoI-V from the Northern North Sea in April 1974 and CoVI from the Clyde in March 1974.
- 3). From copepods collected in the Clyde from July to October 1933 (Marshall, 1949).
- 4). From copepods collected off Plymouth throughout the year in 1947 (Digby, 1950).

Paracalanus, although much smaller than *Calanus*, is almost a miniature in body dimensions. The prosome is approximately three times the length of the urosome. Paracalanidae can be distinguished from the Pseudocalanidae by the lack of serration on the terminal spine of P2-4. In CoIV-VI, males are generally longer than females. In CoV♂ the P5 is the same length as the P4 and body dimensions are obviously *Paracalanus*. In CoVI♂ the P5 are very unequal in length, the body is narrower than in *Pseudocalanus* and the P5 are much shorter and less robust. The P5♀ are tiny and slender with a long terminal spine, quite different from *Clausocalanus* which has a robust P5 with short terminal spines.

Eriksson (1973), working on the west coast of Sweden, gives the female prosome length range as 0.50-0.92 mm.

Eggs are free spawned and have a diameter of 70µm (Valentin, 1972).

Acartia clausi Giesbrecht

	Notes	CoI	CoII	CoIII	CoIV	CoV	CoVI
No. of free prosome somites	1	4	5	6	5	5	5
No. of free urosome somites	1	2	2	2	♀2* ♂3	3 4	3 5
No. pairs of swimming legs	1	2+1	3+1	4	5	5	5
Mean total length (mm)	1			0.73	♀0.96 ♂0.94	1.13 1.08	1.43 1.28
Mean total length (mm)	2	0.48	0.58	0.70	♀0.88 ♂0.93	1.06 1.04	1.13 1.16
Range of total length (mm)	2	0.34-0.53	0.53-0.62	0.65-0.84	♀0.84-0.93 ♂0.90-0.99	1.01-1.10 0.98-1.27	1.04-1.18 1.04-1.32
Mean prosome length (mm)	2	0.38	0.47	0.56	♀0.69 ♂0.72	0.83 0.82	0.87 0.87
Range of prosome length (mm)	2	0.25-0.42	0.42-0.51	0.51-0.65	♀0.65-0.76 ♂0.70-0.76	0.79-0.84 0.79-0.93	0.79-0.93 0.79-0.99
Range of mean prosome length (mm)	3 [§]	0.38 [‡]	0.48 [‡]	0.54-0.66	♀0.64-0.79 ♂0.64-0.75	0.75-0.96 0.74-0.89	0.85-1.17 0.82-1.00
Range of mean prosome length (mm)	4 [§]	0.33-0.43	0.43-0.52	0.50-0.60	♀0.59-0.76 ♂0.60-0.73	0.67-0.86 0.70-0.85	0.83-1.12 0.80-0.97
Mean prosome width (mm)	2	0.14	0.16	0.19	♀0.23 ♂0.24	0.28 0.26	0.28 0.28
Range of greatest prosome width (mm)	2	0.08-0.17	0.14-0.17	0.17-0.23	♀0.20-0.23 ♂0.23-0.25	0.25-0.31 0.23-0.33	0.25-0.31 0.25-0.31

*Gaudy (1962) gives the number of urosome somites in CoIV as 3.

[§]Values are the range of mean sizes of groups of copepods sampled on different dates.

[‡]Mean for July 1933 only.

Notes:

- 1). From Kraefft (1910) and Klein Breteler (1982).
- 2). From copepods sampled in the Clyde in March 1974.
- 3). From copepods sampled in the Clyde from January to October in 1933 (Marshall, 1949)
- 4). From copepods sampled off Plymouth from January 1947 to January 1948 (Digby, 1950).

Adult *Acartia* are characterised by their slim, almost “coffin” shaped prosomes. The antennules bear many long, flexible setae and there is an array of very fine, rigid setae on the furca. The setae in this species seem to withstand sampling and preservation better than most other species of copepod, and they are practically always present and very obvious, even in the earliest stages (They may be more flexible). An eyespot is often visible, but can be bleached out by preservative. The body shape in early stages is reminiscent of the adult, but the anterior cephalosome is more rounded and the metasome somites taper in more towards the urosome. In CoV♀ the genital somite has started to swell, making it appear like a CoVI. However, the segmentation is not as well defined as in the adult, the genital somite appears empty and the P5 are short. In CoV♂ the P5 are much longer than in the female, the urosome somites are not well defined and there is one more somite than in the CoV♀.

Eriksson (1973), working on the west coast of Sweden, gives the female prosome length range as 0.56-1.16 mm.

Eggs are free spawned and have a diameter of 84µm (Valentin, 1972), 79µm (Corkett & McLaren, 1970).

***Centropages hamatus* (Lilljeborg)**

	Notes	CoI	CoII	CoIII	CoIV	CoV	CoVI
No. of free prosome somites	1	4	5	6	6	6	6
No. of free urosome somites	1	2	2	2	3	♀3 ♂4	3 4
No. pairs of swimming legs	1	2+1	3+1	4+1	5	5	5
Mean total length (mm)	2	0.42	0.54	0.71	♀0.88 ♂0.84	1.23 1.14	1.45 1.38
Range of total length (mm)	2	0.39-0.45	0.51-0.56	0.66-0.78	♀0.79-0.96 ♂0.81-0.87	1.17-1.29 1.01-1.32	1.27-1.62 1.27-1.47
Mean prosome length (mm)*	2	0.31	0.41	0.56	♀0.67 ♂0.65	0.92 0.86	1.13 1.00
Range of prosome length (mm)*	2	0.28-0.34	0.39-0.42	0.48-0.63	♀0.60-0.72 ♂0.63-0.66	0.84-1.01 0.78-0.96	0.96-1.27 0.90-1.08
Range of mean prosome length (mm)*	3 [§]	0.35 [‡]	0.43 [‡]	0.48-0.64	0.58-0.79	♀0.71-1.09 ♂0.68-0.98	0.86-1.37 0.79-1.16
Mean prosome width (mm)	2	0.15	0.17	0.23	♀0.28 ♂0.27	0.37 0.34	0.45 0.38
Range of greatest prosome width (mm)	2	0.14-0.17	0.17	0.21-0.24	♀0.25-0.33 ♂0.27	0.33-0.42 0.30-0.39	0.36-0.53 0.34-0.39

*Measured to end of points on posterior metasome somite.

§Values are the range of mean sizes of groups of copepods sampled on different dates.

‡Mean for July 1933 only.

Notes:

- 1). From Klein Breteler (1982) and copepods sampled in the Clyde in March 1974.
- 2). From copepods sampled in the Clyde in March 1974.
- 3). From copepods sampled in the Clyde from March to September in 1933 (Marshall, 1949).

Centropages hamatus are easily distinguishable from most other copepod from CoIV, as the last metasome somite is produced into two backwardly directed spines. Prior to the development of these spines, confusion could arise with early stages of *Pseudocalanus* and *Paracalanus*, although in *Centropages* the metasome somites are less streamlined in profile, bulging outwards, and with experience species can easily be separated. Males can be distinguished from females from CoIV by the already swollen geniculate right antennule and asymmetric P5. Even in the early stages, the setae on the furca seem able to withstand sampling and preservation and are usually present, although often snapped off for part of their length. CoI-III of *C. typicus* and *C. hamatus* (illustrated by Oberg, 1906), are not easily separable.

Eriksson (1973), working on the west coast of Sweden, gives the female prosome length range as 0.70-1.58 mm.

***Centropages typicus* Kröyer**

	Notes	CoI	CoII	CoIII	CoIV	CoV	CoVI
No. of free prosome somites	1	4	5	6	6	6	6
No. of free urosome somites	1	2	2	2	3	♀3 ♂4	3 4
No. pairs of swimming legs	1	2+1	3+1	4+1	5	5	5
Mean prosome length (mm)*	1	0.29	0.38	0.50	0.65	♀0.88 ♂0.82	1.20 1.05

*Measured to end of points on posterior metasome somite.

Notes:

1). From Lawson and Grice (1970).

Centropages typicus are easily distinguishable from most other copepods, as from CoIV the last metasome somite is produced into two backwardly directed spines, more pronounced than in *C. hamatus*. Prior to the development of these spines, confusion could arise with early stages of *Pseudocalanus* and *Paracalanus*, although in *Centropages* the metasome somites are less streamlined in profile, bulging outwards, and with experience species can easily be separated. Males can be distinguished from females in CoIV, as they have a swollen geniculate right antennule and asymmetric P5. They also have a small spine developed on segment 19 of the right antennule which becomes a robust spine by CoVI. Even in the early stages the setae on the furca seem able to withstand sampling and preservation and are usually present, although often snapped off for part of their length. CoI-III of *C. typicus* and *C. hamatus* (illustrated by Oberg, 1906) are not readily separable.

Eriksson (1973), working on the west coast of Sweden, gives the female prosome length range as 1.10-1.64 mm.

Spiny eggs are free spawned, a mass at a time stuck, together in a ribbon.

***Candacia armata* (Boeck)**

	Notes	CoI	CoII	CoIII	CoIV	CoV	CoVI
No. of free prosome somites	1	4	5	6	6	6	5
No. of free urosome somites	1	2	2	2	3	♀3 ♂4	2 5
No. pairs of swimming legs	1	2	3	4	5	5	5
Mean total length (mm)	1	0.6	0.7	0.9	1.2	♀ 1.8 ♂1.7	2.5 2.4
Range of total length (mm)	1		0.6-0.7	0.8-1.0	1.1-1.3	♀ 1.6-1.9 ♂1.6-1.9	2.3-2.7 2.1-2.6
Mean prosome length (mm)*	1	0.4	0.5	0.7	1.0	♀ 1.4 ♂1.4	2 1.9
Range of prosome length (mm)*	1		0.5-0.6	0.7-0.8	0.9-1.0	♀ 1.3-1.5 ♂1.3-1.5	1.9-2.2 1.8-2.2
Mean prosome width (mm)	1	0.2	0.3	0.3	0.4	♀ 0.6 ♂0.6	0.8 0.8
Range of greatest prosome width (mm)	1		0.2-0.3	0.3-0.4	0.4-0.5	♀ 0.5-0.6 ♂0.5-0.7	0.7-0.8 0.7-0.8

*Measured to end of points on posterior metasome somite.

Notes:

1). From copepods sampled off north-western Iberia in July 2005. The coarse mesh neuston sampler used, retained almost no CoI.

Candacia armata is a large predatory species and the maxilla is massively developed for grasping prey, obvious from CoI. The antenna and mandible are also very large with very long setae, also obvious from CoI. The maxilliped is greatly reduced. The anterior cephalosome, between the antennules, is very square from CoI, compared to a slight point in *Centropages* spp., with which it could possibly be confused. The points on the posterior metasome somite appear from CoIV where they are quite small and arranged close to the urosome. The sexes can easily be separated from CoIV when the P5 appears. The P5 are very rudimentary in CoIV-V, with a pair of symmetrical single rami in the ♀, while the P5♂ is asymmetric, the right limb bearing an endopod. In Co5♀ the first somite of the urosome is long and slightly swollen, while in Co5♂ it is short and narrower. Typical of the genus, black pigmentation may be present along the edges of the prosome segments and on the distal portion of P1-5. Bernard (1965) gave the total length of CoI as 0.50 mm.

Eggs are 170µm in diameter, opaque and reddish brown with a thick external membrane (Bernard, 1965). Prominent external spines progressively develop after the egg is laid.

Temora longicornis O.F. Müller

	Notes	CoI	CoII	CoIII	CoIV	CoV	CoVI
No. of free prosome somites	1	4	5	6	6/5	5	5
No. of free urosome somites	1	2	2	2	3	♀3 ♂4	3 5
No. pairs of swimming legs	1	2+1	3+1	4+1	5	5	5
Mean total length (mm)	2	0.44	0.52	0.65	♀0.88 ♂0.97	1.22 0.96	1.54 1.28
Range of total length (mm)	2	0.42-0.45	0.50-0.53	0.56-0.74	♀0.73-1.04 ♂0.84-1.07	1.10-1.29 0.87-1.04	1.43-1.66 1.13-1.46
Mean total length (mm)	1			0.75	♀0.98 ♂0.92	1.25 1.31	1.54 1.56
Mean prosome length (mm)	2	0.33	0.40	0.47	♀0.61 ♂0.64	0.81 0.66	1.04 0.83
Range of prosome length (mm)	2	0.31-0.34	0.37-0.42	0.42-0.51	♀0.53-0.70 ♂0.59-0.70	0.76-0.87 0.62-0.70	0.93-1.10 0.70-0.93
Range of mean prosome length (mm)	3*	0.34 [§]	0.40 [§]	0.41-0.58	♀0.46-0.53 ♂0.45-0.52	0.51-0.92 0.50-0.81	0.60-1.07 0.59-0.94
Range of mean prosome length (mm)	4*	0.29-0.34	0.37-0.42	0.45-0.56	♀0.53-0.62 ♂0.55-0.57	0.65-0.77 0.67-0.74	0.80-1.17 0.76-1.07
Mean prosome width (mm)	2	0.19	0.22	0.27	♀0.34 ♂0.37	0.46 0.34	0.56 0.38
Range of greatest prosome width (mm)	2	0.17-0.20	0.20-0.23	0.23-0.31	♀0.28-0.42 ♂0.31-0.45	0.42-0.51 0.31-0.37	0.48-0.59 0.31-0.42

*Values are the range of mean sizes of groups of copepods sampled on different dates.

[§]Mean for July 1933 only.

Notes:

- 1). From Kraeffft (1910), Klein Breteler (1982), Corkett, (1967).
- 2). From copepods sampled in the Clyde in March 1974.
- 3). From copepods sampled in the Clyde from April to September 1933 (Marshall, 1949).
- 4). From copepods sampled off Plymouth all year round in 1947 (Digby, 1950).

Adult *Temora* have a very characteristic diamond-shaped prosome when viewed dorsally and a pronounced high, rounded back when viewed laterally. The caudal furca are very long. From the earliest stages the copepodites show these characteristics, making them one of the easiest species to identify. The CoV♂ right antennule is clearly thickened, but already shows some geniculate characters from CoIV. Corkett (1967) found a proportion of CoIV of both sexes with 5 or 6 prosome somites, suggesting incomplete fusion in some cases. CoIV♀ can be similar in segmentation to CoV♀, but in CoV♀ the first urosome somite bulges. The P5 in both the CoV♀ and CoVI♀ are similar. The sexes can be distinguished from CoIV by the asymmetric P5 in the male.

Eriksson (1973), working on the west coast of Sweden, gives the female prosome length range as 0.52-1.40 mm.

Temora has been observed with an egg sac containing 4-8 eggs (Otten, 1913) but no signs of any egg sacs were ever seen on *Temora* from Loch Striven (Marshall, 1949) or from inshore sampling off Plymouth. Eggs are thus probably free spawned and have a diameter of 76µm (Corkett & McLaren, 1970).

Temora stylifera Dana

	Notes	CoI	CoII	CoIII	CoIV	CoV	CoVI
No. of free prosome somites	1	4*	5*	5	5	5	5 [§]
No. of free urosome somites	1	2	2	2	3	♀3 ♂4	♀3 [§] ♂5
No. pairs of swimming legs	1	2+1	3+1	4+1	5	5	5 [§]
Mean prosome length (mm)	1	0.35	0.40	0.52	0.67	0.85	

* Gaudy 1962 gave one less somite, for some reason not counting the shield-shaped cephalosome.

§From Rose (1933)

Notes:

1). From copepods sampled in the Gulf of Marseilles (Gaudy, 1962).

From CoI the adult characteristics are obvious; the points on the last prosome somite are present, as is the extended shield-shaped cephalosome and the long furca. From CoIV♂ the P5 is obviously asymmetric. Gaudy (1962) did not give information on adults, but Rose (1933) gives the adult female total length range as 1.4-1.9 mm and for males 1.4-1.5 mm. *T. stylifera* lays eggs of 80 µm directly into the sea (Valentin, 1972).

***Metridia lucens* Boeck**

	Notes	CoI	CoII	CoIII	CoIV	CoV	CoVI
No. of free prosome somites	1					5	5
No. of free urosome somites	1	2	2	2	3	4	♀3 ♂5
No. pairs of swimming legs	1	2+1	3+1	4+1	5	5	5
Mean total length (mm)	2	0.58	0.66	1.00	♀1.32 ♂1.22	1.92 1.68	2.53 1.80
Range of total length (mm)	2	0.56-0.59	0.70-0.82	0.93-1.04	♀1.27-1.38 ♂1.15-1.29	1.86-2.03 1.60-1.77	2.25-2.73 1.80
Mean prosome length (mm)	2	0.42	0.50	0.73	♀0.93 ♂0.87	1.31 1.14	1.69 1.13
Range of prosome length (mm)	2	0.42	0.51-0.59	0.67-0.79	♀0.87-0.96 ♂0.82-0.93	1.29-1.35 1.07-1.21	1.49-1.80 1.13
Mean prosome width (mm)	2	0.18	0.18	0.26	♀0.33 ♂0.30	0.47 0.42	0.62 0.45
Range of greatest prosome width (mm)	2	0.17-0.20	0.20-0.23	0.23-0.28	♀0.31-0.34 ♂0.28-0.34	0.45-0.51 0.39-0.45	0.51-0.67 0.45

Notes:

- 1). Personal communication from J.A. Adams
- 2). From copepods sampled in the Northern North Sea in April 1974.

In *Metridia*, apart from the earliest stages, the urosome is approximately two thirds the length of the prosome. From CoI there are rudiments of hooks at the base of the first segment of the endopod of the P2, becoming more clearly defined with each moult. In CoIV-V the female can be distinguished from the male by its larger size and shorter P5. In CoV♀ there is a reduction by fusion from 4 to 3 urosome somites between CoV-VI. A CoI *M. lucens* of total length 0.67mm was sampled in the Celtic Sea in April 1983.

Eggs are free spawned, with a diameter of 170-200µm (unknown source).

***Pleuromamma abdominalis* Lubbock**

	Notes	CoI	CoII	CoIII	CoIV	CoV	CoVI
No. of free prosome somites	1	3	4	4	4	4	5*
No. of free urosome somites	1	2	2	2	3	4	♀3* ♂5
No. pairs of swimming legs	1	2	3	4	5	5	5*
Mean prosome length (mm)	1	0.50	0.67	0.99	1.30	1.50	

*From Bradford-Grieve (1999)

Notes:

- 1). From copepods sampled in the Gulf of Marseilles (Gaudy, 1962). Spines on the proximal segment of the A1 become obvious from CoII. The brown button, typical of the genera, appears in CoIV on the right of the prosome. Gaudy (1962) did not give details of segmentation or prosome lengths for CoVI♀♂. Bradford-Grieve (1999) gives the CoVI♀ total length range as 2.40-4.36 mm and the CoVI♂ range as 2.68-4.30 mm.

***Pleuromamma gracilis* Claus**

	Notes	CoI	CoII	CoIII	CoIV	CoV	CoVI
No. of free prosome somites	1	3	4	4	4	4	5*
No. of free urosome somites	1	2	2	2	3	4	♀3* ♂5
No. pairs of swimming legs	1	2	3	4	5	5	5*
Mean prosome length (mm)	1	0.44	0.53	0.65	0.77	0.96	

*From Bradford-Grieve (1999)

Notes:

1). From copepods sampled in the Gulf of Marseilles (Gaudy, 1962).

The brown button, typical of the genera, appears in CoIV on the right. There are no spines on the proximal part of the A1.

Gaudy (1962) did not give details of segmentation or prosome lengths for CoVI♀♂. Bradford-Grieve (1999) gives the CoVI♀ total length range as 1.20-2.55 mm and the CoVI♂ range as 1.51-2.25 mm.

***Pareuchaeta norvegica* (Boeck)**

	Notes	CoI	CoII	CoIII	CoIV	CoV	CoVI
No. of free prosome somites	1	3	4	4	4	4	♀4/5* ♂4
No. of free urosome somites	1	2	2	2	3	4	♀4 § ♂5
No. pairs of swimming legs	1	2+1	3+1	4+1	♀4 ♂5	4 5	4 5
Mean total length (mm)	1	1.2	1.7	2.3	♀3.9 ♂3.7	5.6 5.4	8.1 6.0
Mean prosome length (mm)	1	0.9	1.3	1.8	♀2.9 ♂2.8	4.3 4.2	6.1 4.4

*Some authors draw an additional partially fused somite in the female prosome.

§Nicholls (1934) gave 5 somites in the female urosome, but there are only 4 (Park, 1994).

Notes:

1). From Nicholls (1934).

E. norvegica is a large copepod and the various developmental stages are correspondingly large. *Euchaeta* females do not have a P5. The maxilliped in the later copepodite stages is massive and reaches its greatest development in the CoVI♀, being less developed in the CoVI♂. The size of this limb is associated with their mainly carnivorous diet. From CoI the antennules bear characteristic long, widely spaced flexible setae. A single plumose seta is present on the penultimate segment of the antennules in all stages, but does not always survive sampling and preservation. From CoIV♂ the P5 is asymmetric, so the sexes can be easily separated. In all stages the anterior cephalosome comes to a point. Park (1974) gives the female prosome length range as 5.5-6.0 mm, total length range as 7.7-8.5 mm; male prosome length range as 3.8-4.3 mm, total length range as 5.3-5.9 mm.

***Euchaeta marina* (Prestandreae)**

	Notes	CoI	CoII	CoIII	CoIV	CoV	CoVI
No. of free prosome somites	1	3	4	4	4	4	♀4/5* ♂4
No. of free urosome somites	1	2	2	3 [§]	3	4	♀4* ♂5
No. pairs of swimming legs	1	2	3	4	5	5	4* 5
Mean prosome length (mm)	1	0.67	0.85	1.20	1.45	1.93	

* From Rose (1933). Original descriptions show 5 somites in the female prosome, but Bradford (1974) only draws 4, so there may be an additional partially fused somite.

§Gaudy (1962) recorded 2 somites in the urosome of CoIII, but drew 3 in his figure.

Notes:

1). From copepods sampled in the Gulf of Marseilles (Gaudy, 1962).

Features described for *P. norvegica* also apply to this species. From CoIV♂ the P5 is asymmetric, so the sexes can be easily separated. In all stages the anterior cephalosome comes to a point. Gaudy (1962) did not give details of segmentation or prosome lengths for CoVI♀♂. Park (1994) gives the CoVI♀ prosome length range as 2.50-2.68 mm, total length range as 3.40-3.64 mm; CoVI♂ prosome length range as 2.26-2.36 mm, total length range as 2.88-3.20 mm.

CYCLOPOIDA

Poecilostomatoid copepods are now included with the cyclopoids and all have the same general body segmentation. The adult cyclopoid body comprises a prosome with a cephalosome and 4 pedigerous somite, and a urosome with 6 somites which are all free in the male but only 5 are free in the female. The major articulation of the body occurs between the fourth and fifth pedigerous somites (the tenth and eleventh body somites). Thus, the first somite of the urosome bears the fifth pair of limbs (usually much reduced). The fifth pedigerous somite does not appear until CoIII.

It has been the convention when making prosome measurements of CoIII-VI cyclopoids, to measure from the anterior of the cephalosome to the posterior of the first urosome somite. While this includes all the pedigerous somites, as in the calanoid measurement, it is rather confusing to call them urosome somites and then include them in the prosome measurement.

Oithona nana Giesbrecht

	Notes	CoI	CoII	CoIII	CoIV	CoV	CoVI
No. of free prosome somites*	1	4	5	5	5	5	5
No. of free urosome somites*	1	2(1)	2	3(4)	4(5)	5(6)	♀5 ♂6
No. pairs of swimming legs	1						5
Mean total length (mm)	1	♀0.20 ♂0.19	0.32 0.26	0.38 0.34	0.48 0.40	0.52 0.45	0.55 0.48
Range of prosome length (mm) [§]	2	0.15	0.19-0.20	0.23-0.24	0.25-0.27	0.28-0.31	♀0.31-0.34 ♂ -

* Segmentation for *O. brevicornis* from Uchima (1979). Figures in brackets interpreted from key and illustrations for *O. nana* in Murphy (1923).

[§]Values are the range of mean sizes of groups of copepods sampled on different dates. From CoIII measurements include the first somite of the urosome.

Notes:

- 1). From Murphy (1923), Uchima (1979).
- 2). From copepods sampled off Plymouth from September to December in 1947 by Digby (1950).

It was difficult to interpret body segmentation of *O. nana* from the key and crude illustrations in Murphy (1923) and they did not always appear to follow a logical sequence. Because of this, segmentation for *O. brevicornis* from Uchima (1979), which is assumed to be the same, has been substituted. The key in Murphy (1923) says that there are 6 urosome somites in CoV♀, while CoVI♀ has 5 somites in the urosome following partial fusion of somites 2 and 3, a constriction between them remaining clearly visible. However, this does not appear to correspond with other illustrations which have been made of *Oithona nana* and other *Oithona* spp., which indicate complete fusion.

In CoV♀ the antennules reach to the anterior margin of the third metasome somite, while in CoVI♀ they reach the posterior margin. The P5 are reduced to two bristles, which are identical in both sexes. The square-cut front of the head of the male as opposed to the bluntly rounded head of the female is recognisable from CoIII.

***Oithona similis* Claus**

	Notes	CoI	CoII	CoIII	CoIV	CoV	CoVI
No. of free prosome somites*		4	5	5	5	5	5
No. of free urosome somites*		2	2	3	4	5	♀5 ♂6
No. pairs of swimming legs							5
Range of mean prosome length (mm)	1 [§]	0.29 [‡]	0.35 [‡]	0.37-0.42	0.42-0.48	0.47-0.55	♀0.52-0.59 ♂0.49-0.56
Range of mean prosome length (mm)	2 [§]	0.20-0.24	0.25-0.31	0.31-0.38	0.35-0.44	0.41-0.50	♀0.43-0.53 ♂0.43-0.49

*Segmentation for *O. brevicornis* (Uchima, 1979).

[§]Values are the range of mean sizes of groups of copepods sampled on different dates. From CoIII measurements include the first somite of the urosome.

[‡]Mean for July 1933 only.

Notes:

- 1). From copepods sampled in the Clyde from January to October in 1933 (Marshall, 1949).
- 2). From copepods sampled off Plymouth all year round in 1947 (Digby, 1950).

The number of prosome and urosome somites in *O. similis* are assumed to be the same as in *O. brevicornis* (Uchima, 1979).

Eriksson (1973), working on the west coast of Sweden, gives the female prosome length range as 0.28-0.60 mm.

Eggs are carried in paired egg sacs and from measurements off Plymouth have a diameter of 56µm.

***Oncaea media* Giesbrecht**

	Notes	CoI	CoII	CoIII	CoIV	CoV	CoVI
No. of free prosome somites	1	5	5	5	5	5	5
No. of free urosome somites	1	1	2	3	4	♀4 ♂5	5 6
No. pairs of swimming legs	1	2	3	4	5	5	5
Total length range (mm)	1	0.22	0.25-0.32	0.36-0.42	0.33-0.49	♀0.50-0.59 ♂0.55	0.49-0.76 0.37-0.58

Notes:

From copepods collected in the English Channel in September 1979, August to October 1980 and from laboratory reared specimens (Malt, 1982).

In CoV♀ the P5 emerges from the first urosome somite and consists of a tiny cylindrical segment bearing 2 terminal setae and a seta on the dorsal surface of the somite. The CoV♂ P5 is similar but the cylindrical segment is replaced by a swollen protuberance. The genital setules in the CoV♀ are situated laterally on the second urosome segment anterior to the mid-point. The P5 arrangement in both adults is similar to the CoV. In the CoVI♀ the genital apparatus is situated anterior to the midpoint on the dorsal surface of the genital somite, each aperture armed with a setule. In the CoV♂ there are genital lappets protruding on the dorsal margin of the genital somite.

***Oncaea subtilis* Giesbrecht**

	Notes	CoI	CoII	CoIII	CoIV	CoV	CoVI
No. of free prosome somites	1	5*	5	5	5	5	5
No. of free urosome somites	1	1*	2	3	4	♀4 ♂5	5 6
No. pairs of swimming legs	1	2*	3	4	5	5	5
Total length range (mm)	1		0.28	0.28-0.34	0.32-0.36	♀0.36-0.48 ♂0.34-0.40	0.46-0.69 0.38-0.44

*Assumed to be the same as *O. media*.

Notes:

From copepods collected in the English Channel in September 1979, August to October 1980 and from laboratory reared specimens (Malt, 1982).

In CoV♀ the P5 emerges from the first urosome somite and consists of a tiny cylindrical segment bearing 2 terminal setae and a seta on the dorsal surface of the somite. The CoV♂ P5 is similar but the cylindrical segment is instead a swollen protuberance. The genital setules in the CoV♀ are situated laterally on the second urosome segment anterior to the mid-point. The P5 arrangement in both adults is similar to the CoV. In the CoVI♀ the genital apparatus is situated anterior to the midpoint on the dorsal surface of the genital somite, each aperture armed with a setule. In the CoV♂ there are genital lappets protruding on the dorsal margin of the genital somite.

Few CoIV were caught by Malt (1982), possibly because this is a short duration stage and therefore infrequently caught in the plankton.

HARPACTICOIDA

The adult harpacticoid body comprises a prosome with 4 free somites and a urosome with 6 somites, which are all free in the male but indistinctly free in the female due to fusion of the genital and first abdominal somite. The major articulation of the body occurs between the fourth and fifth pedigerous somites (the tenth and eleventh body somites), thus as in cyclopoids the first somite of the urosome bears a pair of limbs. In many harpacticoid species the separation between the prosome and the urosome is not as obvious as in calanoid and cyclopoid species.

Microsetella norvegica (Boeck)

	Notes	CoI	CoII	CoIII	CoIV	CoV	CoVI
No. of free prosome somites*	1	3	4	4	4	4	♀4 ♂4
No. of free urosome somites*	1	2	2	3	4	4	♀5 ♂6
No. pairs of swimming legs	1	2+1	3+1	4+1	4+1	5	5
Mean total length (mm). Spring	1	0.30	0.35	0.38	0.41	0.41	♀0.49 ♂0.43
Mean total length (mm). Summer	1	0.31	0.36	0.39	0.42	0.43	♀0.57 ♂0.46

*Segmentation numbering altered from Diaz & Evans (1983) table, to numbers in prosome and urosome rather than numbers in cephalothorax and abdomen.

Notes:

1). From Diaz & Evans (1983).

In CoI-IV the last pair of legs are rudimentary. Diaz & Evans (1983) considered that sex differences could not be distinguished before the adult stage.

Eggs are carried in a single egg sac and from measurements off Plymouth have a diameter of 40µm.

Euterpina acutifrons (Dana)

	Notes	CoI	CoII	CoIII	CoIV	CoV	CoVI
No. of free prosome somites*	1	3	4	4	4	4	♀4 ♂4
No. of free urosome somites*	1	2	2	3	4	4	♀5 ♂6
No. pairs of swimming legs	1	2+1	3+1	4+1	4+1	5	5
Mean total length (mm). §	1	0.325	0.371	0.423	♀0.492 ♂0.459/0.490	0.552 0.488/0.569	0.674 0.526/0.678
Mean prosome length (mm). §	1	0.157	0.167	0.174	♀0.198 ♂0.180/0.199	0.219 0.187/0.219	0.266 0.190/0.244

* Segmentation deducted from the text of Haq (1965b) and from drawings of the adult.

§Males from stage CoIV were measured separately for a small and a large sub-set of specimens.

Notes:

1). From specimens reared in the laboratory (Haq, 1965b).

Regression equations of total length and prosome width on prosome length for selected calanoid species.

The following regression equations can be used for estimating total length (TL) from prosome length (PL) and prosome width (PW) from PL.

Species	Equation
<i>Calanus finmarchicus</i>	TL = - 0.0140 + 1.2859 CL CW = 0.0134 + 0.2860 CL
<i>Pseudocalanus elongatus</i>	TL = - 0.0754 + 1.4335 CL CW = 0.0115 + 0.3760 CL
<i>Microcalanus pygmaeus</i>	TL = - 0.0221 + 1.3441 CL CW = - 0.0095 + 0.4701 CL
<i>Temora longicornis</i>	TL = - 0.0920 + 1.6064 CL CW = 0.0305 + 0.4958 CL
<i>Acartia clausi</i>	TL = - 0.0305 + 1.3227 CL CW = 0.0247 + 0.2944 CL
<i>Centropages hamatus</i>	TL = - 0.0187 + 1.3508 CL CW = 0.0294 + 0.3630 CL
<i>Metridia lucens</i>	TL = - 0.1251 + 1.5677 CL CW = - 0.0061 + 0.3689 CL

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