

THE GENUS ONCHOCALANUS G.O. SARS, 1905 (CRUSTACEA COPEPODA)

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The genus *Onchocalanus* was established by G. O. Sars in 1905 for two remarkable new Copepods, collected in deep water of the Atlantic Ocean, which were named *Onchocalanus trigoniceps* and *Onchocalanus hirtipes*. Of both forms the females only were found. Sars' generic diagnosis is very short; he only states that his new genus *Onchocalanus* is closely related to *Xanthocalanus* Giesbr., 1892, from which it differs by the shape of the rostrum, which in *Onchocalanus* is strongly chitinized and has a bifurcated apical portion, by the unusually strong, curved claw on the extremity of the 2nd maxilla, by the long and slender maxillipeds, and by the spinulation of the four pairs of swimming legs. In addition in the two genera there are minor differences in the shape of the 5th pair of legs. Undoubtedly the genera *Onchocalanus* and *Xanthocalanus* are closely related; the discovery of males of species of both genera has again underlined their relationship. Recently the number of species of these genera has considerably increased; it seems highly desirable, therefore, to re-establish the generic characteristics of *Onchocalanus* in its present, more extended form and to settle the identity and synonymy of its various species. This is the more desirable as some difference of opinion seems to exist about the limits of variation of certain species. Of the genus *Xanthocalanus* a much larger number of forms is known at present, in many instances described after mutilated, female specimens. A revision of this genus, although much needed, will undoubtedly meet with considerable difficulties. The present notes on species of *Onchocalanus* are based on specimens in the collections from the Siboga and Snellius Expeditions (eastern part of the Malay Archipelago), the Dana Expeditions (mainly on the Indo-pacific material) and on some Antarctic material collected by the Dutch Whaling factory ship "Willem Barendsz". I had the opportunity to study material of some interesting species from the collections of the British Museum (Natural History) and the U.S. National Museum. I am much indebted to Dr. J. P. Harding (British Museum,

Natural History) and Mr. Paul L. Illg (U.S. National Museum), who in various ways have assisted my investigations.

Onchocalanus trigoniceps G.O. Sars, 1905 (Sars, 1905, p. 20) must be considered as the genotype of *Onchocalanus*. In a later paper Sars (1907, p. 3) reported on the supposed identity of *O. trigoniceps* and *Xanthocalanus cristatus*, described by Wolfenden (1904, p. 119) from the Irish west coast. In this conclusion Sars was certainly mistaken; although Wolfenden's form is an *Onchocalanus* and should stand as *O. cristatus* (Wolfenden, 1904), it is not identical with *O. trigoniceps*. A. Scott (1909, p. 82) followed Sars' example and has listed *O. trigoniceps* amongst the synonyms of *Onchocalanus cristatus*. In his report on the Copepods of the Siboga Expedition he has unmistakably figured *Onchocalanus cristatus* (l.c., pl. 34 figs. 1-8); a female in the Siboga collection, labelled "*Onchocalanus cristatus*, Sta. 148 & 185" also clearly belongs to *Onchocalanus cristatus*. In 1920 and again in 1925 Sars withdrew his original opinion of the identity of *O. trigoniceps* and *O. cristatus*. A form closely related to *O. cristatus* was described by Wolfenden (1906, p. 31) as *Xanthocalanus subcristatus*; it should stand as *Onchocalanus subcristatus* (Wolfenden, 1906).

In 1906 Wolfenden (1906, p. 32) described *Xanthocalanus magnus*, a large Copepod from Antarctic waters, which clearly belongs to the genus *Onchocalanus*. Wolfenden, in his original description of *Xanthocalanus magnus*, mentions two specimens, an adult female of 8.8 mm length and an immature female of 8.65 mm length. In 1908, describing Copepods collected by the National Antarctic Expedition, Wolfenden again mentions *Xanthocalanus magnus*, but this time he describes specimens of 6.0 mm length. In 1911 Wolfenden described the Copepod material collected by the German South Polar (Gauss) Expedition. The large form described in 1906 is redescribed here as *Onchocalanus frigidus*. The smaller specimens, described in 1908, also appeared to be present in the Gauss material and are mentioned in his 1911 paper as *Onchocalanus magnus*. The large forms described in Wolfenden's publications have generally been considered as synonymous with *O. trigoniceps*. There are, however, besides rather considerable differences in length, small structural dissimilarities, which already drew the attention of With (1915), who enumerated the points of difference. Although Sars (1925, pp. 146, 147) believes the Atlantic and Antarctic material to be identical, a study of some Antarctic specimens in the "Willem Barendsz" collection has proved that both forms, although clearly much related, are specifically different; the Antarctic form should stand as *Onchocalanus magnus* (Wolfenden, 1906). It seems probable that A. Scott, who identified the Discovery Copepods reported upon by Hardy and Gunther

(1935), was already convinced that both forms were specifically different. The smaller form described by Wolfenden, which is also restricted to the Antarctic waters and occurs in the "Willem Barendsz" collection, has been named here *Onchocalanus wolfendeni* nov. spec. It shows affinities with *O. hirtipes* G. O. Sars and *O. affinis* With (vide infra).

With (1915, p. 233) attributed a new form to the genus *Onchocalanus* as *O. affinis*. Specimens from the eastern part of the Malay Archipelago, recorded by A. Scott (1909, p. 89) as *Onchocalanus hirtipes*, also belong to that form (cf. Sewell, 1947, p. 135). A new form from the Snellius collections will be described below as *Onchocalanus scotti* nov. spec. It shows affinities with both *O. hirtipes* and *O. affinis*.

Pesta (1920, p. 516) described Adriatic representatives of *Onchocalanus* as *O. steueri*; this form, however, is identical with *O. trigoniceps*.

Paulsen (1909, p. 37) mentions *Onchocalanus falcatus*; I have been unable to trace a description of a form of that name, but probably specimens of *O. trigoniceps* were studied, as *O. cristatus* is also mentioned in his paper. Sars (1912, p. 654) mentions *Onchocalanus rostratus*, probably a misprint for *O. cristatus*, as that form is also mentioned from the Michael Sars Expedition by Lysholm, Nordgaard & Wiborg (1945, p. 25).

Wolfenden (1908, p. 36), in a review of species of *Xanthocalanus*, mentions a new form as *Xanthocalanus antarcticus*. According to Wolfenden's notes (1911, p. 275) this species should find a place in the genus *Onchocalanus*; the structure of the 2nd maxilla and the 5th pair of legs differs so much from type usually met with in *Onchocalanus* that I have not followed Wolfenden's suggestions. For the time being it should be left in the genus *Xanthocalanus*.

Esterly (1911, p. 326) described a Copepod as *Onchocalanus latus*; he supplemented his description in 1913 (p. 183). The place of Esterly's form in the genus *Onchocalanus* must be taken with much reserve. The female, the only sex known at present, has no 5th pair of legs and the 2nd maxilla differs in shape and number of the sensory appendages of the endopod. If Esterly's notes are correct it may be necessary to establish a new genus for this curious Copepod. A definite judgment about its systematical position must be postponed until more material has become available.

Wilson (1942, p. 199) described a new *Onchocalanus* as *O. nudipes*; his description, unfortunately, in several essential points is not complete. A re-examination of the type material of this form, preserved in the collections of the U.S. National Museum, has shown its identity with *Phaenna spinifera* Claus, 1863 (Vervoort, 1950).

Summarizing the following species should be attributed to *Onchocalanus*:

- Onchocalanus cristatus* (Wolfenden, 1904)
Onchocalanus trigoniceps G.O. Sars, 1905 (genotype)
Onchocalanus hirtipes G.O. Sars, 1905
Onchocalanus magnus (Wolfenden, 1906)
Onchocalanus subcristatus (Wolfenden, 1906)
Onchocalanus affinis With, 1915
Onchocalanus wolfendeni nov. spec.
Onchocalanus scotti nov. spec.
Onchocalanus latus Esterly, 1911 (provisionally).

Generic diagnosis. Females. Copepods with elongated ovoid cephalothorax. Head and 1st thoracic segment as well as 4th and 5th thoracic segments imperfectly separated; line of fusion visible on the back or on the sides, always less distinctly visible than between other thoracic segments. Head crested in some forms, rounded in others. Rostrum strongly developed; it consists of a strongly chitinized basal portion, which is sometimes swollen, a bifurcated apical part, terminating into two acute points or two fine, filiform appendages. Postero-lateral thoracic margin triangularly produced, pointed or rounded.

Abdomen 4-segmented, the 4th segment usually telescoped into the 3rd. Genital swelling distinct, though not necessarily always large. Genital orifices, as far as could be observed, closed by a single, semicircular flap. Furcal joints about as long as wide, with four strong, plumose, marginal setae. The 2nd internal seta of both sides is lengthened and usually slightly thickened. In addition there are a small internal and external seta on both joints.

1st antennae as long as or longer than cephalothorax, 24-jointed, 8th-9th joints fused. 2nd antenna with endo- and exopods of nearly equal length. Basal joints each with a single seta; exopod with first two joints separated; number of setae on the 2nd endopodal joint 8 + 6. Mandibular palpus with squarish 2nd basal joint, carrying 3 internal setae. 1st endopodal joint not swollen, with 2 setae; 2nd endopodal joint with 9 terminal setae. Exopod with 6 setae in all. Manducatory plate with small cutting edge, carrying about 8 weakly chitinized, crenulated teeth. 1st maxilla with slender, elongated 1st inner lobe, carrying 7 strong and 3 or 4 smaller bristles. 2nd inner lobe with 2, 3rd with 4 setae. 1st outer lobe with 9, exopod with 10 setae. 2nd outer lobe absent. 2nd basal joint with 5 setae. Endopodal joints with 3, 2 or 3 and 4 setae. 2nd maxilla with 5 setae on the 1st, 3 on the 2nd to 4th, and 4 on the 5th lobe. Of the setae on the 5th lobe one has the appearance of a big, curved claw, minutely denticulated near the apex; the remaining 3 setae of that lobe are found at its base. Endopod with 7 brush shaped

sensory appendages and one long, filiform sensory organ. Maxilliped with unusually long and slender 2nd basal joint. The 1st basal joint has 3 setae on the proximal lobe, a sensory appendage and a seta at about half its length and 3 setae on the apical lobe. The 2nd basal joint has 3 setae at the middle of its length and 2 apical setae. The number of setae on the endopod is 4 on the 1st, 4 on the 2nd, 3 on the 3rd, 3 and 1 external on the 4th, and 3 and 1 external on the 5th joint. The 2nd endopodal joint is longer than the other joints; the apical joints are very small and in some species more or less coalescent.

The four pairs of swimming legs have the exopods all 3-jointed; the endopod of the 1st pair is 1-jointed, of the 2nd pair 2-jointed, and of the 3rd and 4th pairs 3-jointed. Caudal surfaces of the legs covered with small or strong spines. On the 1st legs there are rather big spines on the endo- and exopods, arranged in coronulae; on the other swimming legs large spines are found on the endopodal joints, and small spines, sometimes in great profusion, are found on the 2nd basal and exopod joints, to a smaller degree also on some endopodal joints. The three exopodal joints of 1st swimming legs have strong marginal spines. The 3rd exopodal joints of the 2nd to 4th swimming legs have 3 external marginal spines and 4 internal marginal setae. The terminal spine of these exopodal joints is big; the external margin carries an acutely serrated lamina, which is duplicated at the base of the spine. Legs of the 5th pair 3-jointed on both sides. The first joint is sometimes more or less coalescent with the chitinous ridge on the ventral surface of the cephalothorax. In the species known at present there are two apical spines, which may articulate with the last joint, and a small spine on external and internal margin. One of the marginal spines, which usually are articulating, may be absent. Caudal surface of the 5th legs covered with strong hairs, which may completely hide the spines on this appendage.

Males. Adult males are known of *Onchocalanus cristatus* (cf. With, 1915, p. 229), *O. hirtipes* (cf. With, l.c., p. 232), *O. affinis* (cf. With, l.c., p. 234) and *O. trigoniceps* (cf. Sars, 1925, p. 146). Unfortunately the males of *Onchocalanus* seem to be extremely rare; I only have at my disposal a very scarce and bad material of that sex. The following notes, therefore, are mainly taken from literature.

General shape of the males as that of the females, but notably more slender and smaller. There are differences in the articulation of the abdomen, the jointing of the 1st antennae, the structure of the oral appendages and the shape of the 5th pair of legs. The abdomen is 5-segmented, the anal segment is very small and telescoped into the 4th abdominal somite. The

8th—13th joints of the 1st antennae are more or less coalescent. The mandible has a big 2nd basal joint. The 1st and 2nd maxillae and the maxilliped differ by the less chitinized condition and weaker setae and bristles; there seems to be no difference, however, in their number. The 5th pair of legs is represented by a single ramus on each side. The right leg is very short and consists of three, more or less distinctly separated joints; the left leg is elongated, about as long as the abdomen, and consists of two basal and 3 terminal segments.

Key for identification of females of the genus *Onchocalanus* ¹⁾.

- 1a. Head with a distinct crest, which is visible in dorsal as well as in lateral aspect. In dorsal aspect the head appears to be carinated, in lateral aspect there is a rounded or more or less helmet shaped, chitinous crest 2
- 1b. Head not carinated or crested; in dorsal aspect the head may be triangular, but it is never carinated 3
- 2a. Crest rounded in lateral aspect. 1st antenna reaches about as far as the furca. Rami of 2nd antenna of about equal length. 2nd basal of the 1st maxilla with 5 setae.
Onchocalanus cristatus.
- 2b. Crest more or less triangular. 1st antenna reaches as far as genital segment. Exopod of 2nd antenna longer than endopod. 2nd basal of the 1st maxilla with 4 setae.
Onchocalanus subcristatus.
- 3a. Terminal segment of 5th pair of legs about twice as long as 2nd (middle) segment. Some of the setae on the apical joints of the maxillipeds rather coarsely denticulated.
Onchocalanus trigoniceps.
- 3b. Terminal segment of 5th legs about as long as or 1½ times as long as 2nd (middle) segment. None of the setae on apical joints of maxillipeds denticulated, though some are plumose 4
- 4a. Genital segment at about middle of its length with two rather big, rounded, lateral swellings; the diameter of the genital somite suddenly increases towards the middle of segment and suddenly decreases again towards the end. *Onchocalanus hirtipes.*
- 4b. Genital segment either with slightly swollen sides, or increasing in diameter at the very beginning and of almost the same diameter throughout its length 5
- 5a. Genital segment with a broad, rounded swelling on both sides, which laterally covers the whole length of the somite. Flap at genital tubercle backwardly produced. Large, Antarctic species with produced, triangular, pointed postero-lateral thoracic margin. Rostrum small, not swollen at base, with two fine, filiform appendages
Onchocalanus magnus.
- 5b. Genital segment increasing in diameter at about 1/5 of its length and of about that diameter over its entire length. Flap at genital tubercle not backwardly produced. Postero-lateral margin rounded 6
- 6a. Rostrum exceedingly big; a shallow depression is present between the frontal part of the head and the much swollen, basal part of the rostrum. Genital swelling large, prominent, rostral wall steep and pubescent *Onchocalanus scotti.*
- 6b. Rostrum, although swollen at its base, not so very big. No shallow depression near the rostrum. Genital tubercle absent or slightly developed 7
- 7a. Maxillipeds (2nd basal and endopodal joints) very slender. Sensory appendage on 1st basal of maxilliped big, saucer shaped. Genital tubercle indistinct. Caudal surface of endopod of 1st leg with 3 spines, 2nd exopodal joint with 6, 3rd exopodal joint

1) *Onchocalanus latus* is not included! If Esterly's notes are correct the species at once distinguishes itself by the absence of the 5th legs.

- with 3, 5 and 6 spines *Onchocalanus affinis*.
 7b. Maxillipeds of usual length; sensory appendage on its 1st basal joint small. Genital tubercle prominent. Number of spines on caudal surface of 1st pair of legs increased.
Onchocalanus wolfendeni.

Onchocalanus cristatus (Wolfenden, 1904) (figs. 1, 2).

Xanthocalanus cristatus Wolfenden, 1904, pp. 111, 119, 145, pl. 9 figs. 18, 19; Pearson, 1906, p. 20; Van Breemen, 1908, p. 62, fig. 70; Conseil, etc., 1909, p. 100; Hardy & Gunther, 1935, p. 163.

Onchocalanus cristatus, Sars, 1907, p. 3; Farran, 1908, pp. 12, 49; Wolfenden, 1908, p. 34; Paulsen, 1909, p. 37; Scott, 1909, p. 82, pl. 34 figs. 1-8; Wolfenden, 1911, p. 277; With, 1915, p. 228, pl. 7 fig. 6, pl. 8 fig. 17; Sars, 1920, p. 7; Lysholm & Nordgaard, 1921, p. 18; Sars, 1925, p. 147, pl. 41 figs. 1-5; Rose, 1929, p. 26; 1933, p. 137, fig. 133; Jespersen, 1934, pp. 84, 131; Rose, 1935, p. 146; Jespersen, 1940, p. 34; Wilson, 1942, p. 199, fig. 90; Lysholm, Nordgaard & Wiborg, 1945, p. 25.

Xanthocalanus similis Esterly, 1906, p. 68, pl. 9 fig. 1, pl. 10 fig. 24, pl. 12 figs. 60, 61, pl. 13 figs. 71, 77.

? *Onchocalanus rostratus* Sars, 1912, p. 654.

Material

Siboga Expedition. One immature female, either from the Halmaheira Sea, 0° 17'.6 S, 129° 14'.5 E or the Manipa Strait, 3° 20'.0 S, 127° 22'.9 E (Siboga collection, labelled *Onchocalanus cristatus* by A. Scott).

Snellius Expedition. Immature and adult females and males from the Ombai Strait (Sta. 163, 8° 51'.5 S, 124° 24'.5 E) and the Flores Sea (Sta. 175, 7° 47'.0 S, 118° 21'.0 E and Sta. 197, 8° 00'.5 S, 121° 40'.0 E).

Dana Expeditions. Mature females from the Celebes Sea, Sta. 3683 (2), 4° 03' N, 123° 26' E.

Onchocalanus cristatus has been repeatedly found in deep water of the Atlantic and Indo-pacific; it has been described and figured by several authors. The length of adult females seems to vary between 5.0 and 8.15 mm. The specimens of 5 mm length have been described by Wolfenden from the Irish west coast; they are unusually small. No differences have been observed between Atlantic and Pacific specimens. The following notes have been taken from an adult female in the Dana collection (Sta. 3683).

Adult female, total length 6.90 mm. Proportions of cephalothorax and abdomen as 110 : 28. Body elongated, especially in the oral region. Line of separation between head and 1st thoracic segment, as well as between the 4th and 5th thoracic segments, only visible on the dorsal surface. Head carinated, in dorsal aspect sharply triangular, in lateral aspect with a low, rounded, chitinous crest (figs. 1a, 2a). Frontal part of body slightly dilated near place of attachment of 1st antennae and again in oral region. Rostrum conspicuous, consisting of a swollen basal portion and a bifurcated part, with the points widely separated (fig. 2b). The points are acute and point obliquely downwards and forwards. No filiform appendages. Frontal organ

scarcely visible, with two small hairs. Postero-lateral thoracic margin triangularly produced, covering beginning of genital segment. Apex with acute, downwardly pointing spine. Dorsal and ventral margins slightly curved (fig. 1b).

Proportions of the abdominal segments, with the furca:

segment	1 + 2	3	4	5	furca	
	41	27	17	4	11	= 100.

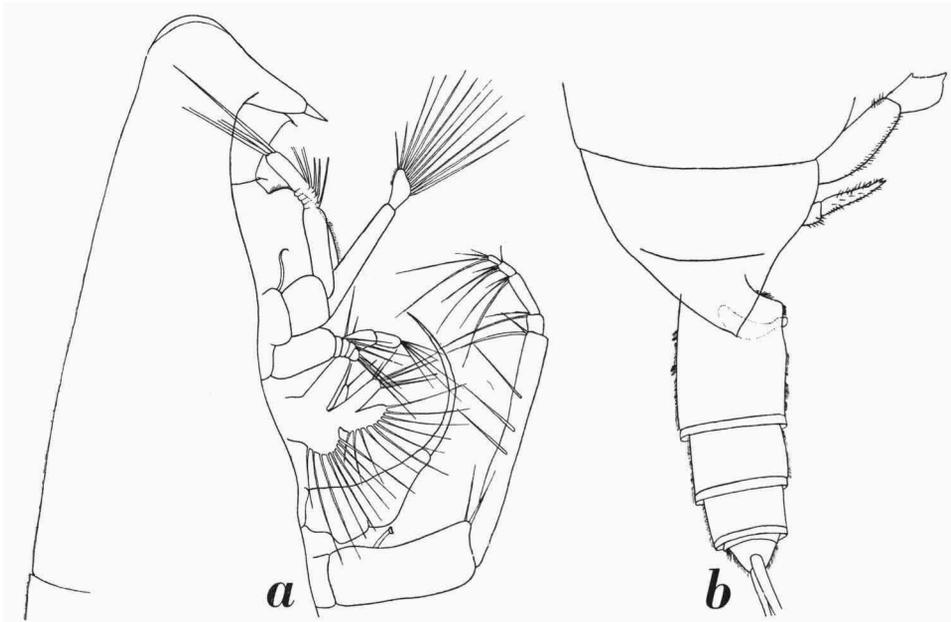


Fig. 1. *Onchocalanus cristatus* (Wolfenden, 1904), adult ♀, Dana Expedition, Sta. 3683 (2). a, cephalon in lateral aspect from the right side, 1st antennae removed to show the position of the oral parts; b, posterior part of cephalothorax and abdomen in lateral aspect from the right side. a, b, $\times 28$.

Genital somite in dorsal view symmetrical, at about $\frac{1}{4}$ of its length the diameter slightly increases (figs. 1b, 2c). Genital tubercle scarcely elevated, rostral wall steep. Genital operculum circular. Caudal margins of first three abdominal segments with a row of scale shaped teeth. Furcal joints about as long as wide, with the usual number of setae, which are broken in the present specimen. All abdominal segments and the furca with very short, prickly hairs; in addition there are some patches of longer hairs, closely packed together, especially on the rostral wall of the genital somite.

1st antennae broken in the present female, but in the other specimens they reach about as far as the 3rd abdominal somite. Endo- and exopod of the

2nd antennae are of the same length. 1st maxilla with 2 setae on the 2nd inner lobe and 4 setae on the 3rd inner lobe. 2nd basal of that appendage with 5 setae, endopodal joints with 3, 3 and 4 setae. Claw on apex of 2nd maxilla not exceedingly strong, shorter than setae on other lobes (fig. 2 d).

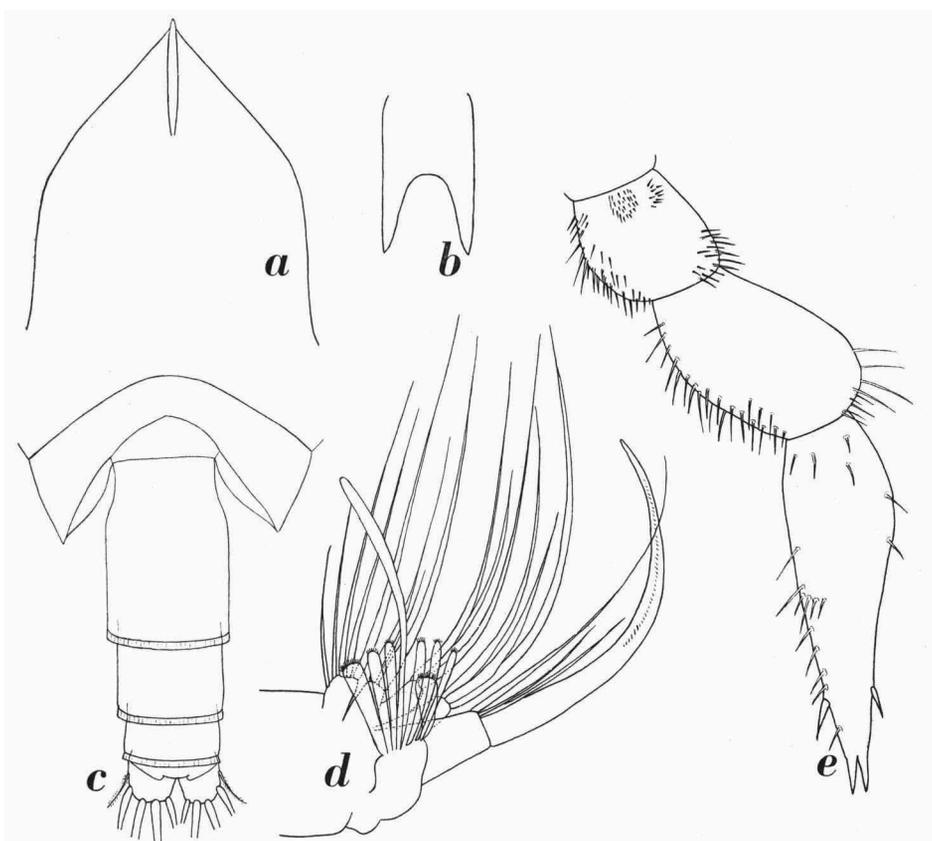


Fig. 2. *Onchocalanus cristatus* (Wolfenden, 1904), adult ♀, Dana Expedition, Sta. 3683 (2). a, outline of the head in dorsal aspect; b, rostrum, ventral view; c, posterior part of cephalothorax and abdomen, dorsal aspect; d, right 2nd maxilla; e, right 5th leg, posterior aspect. a, d, $\times 60$; b, $\times 90$; c, $\times 40$; e, $\times 170$.

Two of the 7 brush shaped appendages on the endopod are notably stronger. The joints of the maxillipeds have the following proportions:

segment	basal 1	basal 2	1	2	3	4 + 5	
	33	44	6	12	3	2	= 100.

Sensory appendage on the 1st basal joint rather big; external margin of apical lobe of that joint with fine teeth. Basal portion of 2nd basal also denticulated at internal margin.

Caudal surface of 1st swimming legs with big teeth. Endopod with 3 big teeth; 1st exopodal joint with 5 small teeth near external spine, 2nd with 3 teeth near internal margin, 3rd with 2, 4 and 5 teeth on that surface. 2nd leg with 3 big teeth on caudal surface of 1st endopodal joint; two coronulae of 4 each are found on the 2nd joint, in addition to 5 much smaller spines. 3rd legs with the caudal surface of the 1st endopodal joint with 3, 2nd with 2 and 3rd with 4 big teeth. 2nd and 3rd endopodal joints of the 4th legs with densely packed, long, hair like spinules. In addition to the above mentioned teeth there are smaller spinules distributed over the caudal surface of the swimming legs. Proportions of the three joints of 5th pair of legs 9 : 11 : 19. Terminal joint elongated, tapering towards the apex and there with 2 non-articulating spines (fig. 2e). External and internal margin each with a strong, articulating spine, placed almost opposite. Caudal surface of 5th legs sparingly haired with long, spiniform hairs.

Onchocalanus subcristatus (Wolfenden, 1906)

Xanthocalanus subcristatus Wolfenden, 1906, p. 31, pl. 10 figs. 4-6; 1908, p. 34.
Onchocalanus subcristatus, Wolfenden, 1911, p. 278, pl. 31 figs. 6-8.

Unfortunately I have no material of this form at my disposal. It is closely allied to *O. cristatus*, from which, however, it distinguishes itself at once by the curious, helmet shaped, triangular crest. Some additional differences have been listed by Wolfenden (1906, p. 32). The 1st antennae in *O. subcristatus* reach the genital segment; the exopod of the 2nd antenna is larger than the endopod. The endopod of the mandibular palpus is stronger developed than the exopod. The 2nd basal joint of the maxillipeds is more than twice as long as the 1st; the endopod is also rather long, and carries weak bristles. The spinulation of the swimming feet is reduced. In addition differences in the number of setae on the 1st maxilla are indicated, but I feel justified to conclude that Wolfenden did not correctly observe the number of setae of that appendage in *O. cristatus*. In *O. cristatus* there are 5 setae on the 2nd basal (not 2 as indicated by Wolfenden), whilst 4 are said to be present there in *O. subcristatus*. The endopod carries 10 setae in all in *O. cristatus*; the same number is found in *O. subcristatus*. The length of female specimens seems to vary between 6 and 7 mm. The form has so far only been met with in deep water of the Antarctic or Subantarctic.

Onchocalanus trigoniceps G. O. Sars, 1905 (figs. 3, 4)

Onchocalanus trigoniceps Sars, 1905, pp. 5, 20; 1925, p. 144, pl. 40; Rose, 1929, p. 26; Sewell, 1929, p. 176; Rose, 1933, p. 137, fig. 132; Jespersen, 1934, pp. 83, 131; 1940, p.

33; Wilson, 1942, p. 200, fig. 96; Sewell, 1947, p. 139, textfig. 34.

Onchocalanus magnus With, 1915, p. 225, pl. 7 fig. 5, pl. 8 fig. 16; Lysholm & Nordgaard, 1921, p. 19.

Onchocalanus steueri Pesta, 1920, p. 516, pl. 8 figs. 1-11; Rose, 1933, p. 136, fig. 131; 1937, p. 17.

Material

Snellius Expedition. Immature and adult females and males from the Sulu Sea (Sta. 66, 6° 35'.5 N, 120° 02'.0 E), Moluccan Sea (Sta. 80, 1° 06'.5 S, 126° 46'.5 E), Banda Sea (Sta. 212, 8° 33'.0 S, 124° 32'.5 E), Arafoera Sea (Sta. 115, 8° 51'.5 S, 129° 01'.5 E), Ombai Strait (Sta. 163, 8° 51'.5 S, 124° 24'.5 E) and Flores Sea (Sta. 192, 5° 58'.0 S, 121° 32'.0 S).

Onchocalanus trigoniceps has been recorded many times from deep waters of the Atlantic Ocean; it has also been found in the Arabian Sea, the Indian Ocean and the eastern part of the Malay Archipelago, where it is also strictly bathypelagic in its occurrence. No structural differences have been found between Atlantic and Pacific specimens. The length of adult females varies between 6 and 8.3 mm. The small forms have been recorded from the Adriatic by Pesta (1920) as *Onchocalanus steueri*. This form, according to Pesta, also differs by the absence of a line of separation between the 4th and 5th thoracic segments and the structure of the setae on the furca. *Onchocalanus steueri* is certainly not a crested form, as Rose (1933) tries to uphold. Ramification of the furcal setae is a common form of malformation due to damage of these setae and is commonly met with in pelagic Copepods. *O. steueri* certainly should be considered as synonymous with *O. trigoniceps*.

The adult male of *O. trigoniceps* has been figured and described by Sars. There is, unfortunately, no record of its length. One tolerably well preserved male in the Snellius collection measures 4.85 mm. The following notes have been taken from an adult female in the Snellius collection (Sta. 212).

Adult female, total length 7.45 mm. Proportions of cephalothorax and abdomen as 115 : 35. General appearance of the body slender (fig. 3a); cephalothorax in dorsal aspect with triangular head with rounded apex, no carina, slightly dilated in the oral region (fig. 4c). Head in lateral aspect broadly rounded, frontal portion considerably rounded and provided with very prominent rostrum (fig. 4a). The rostrum consists of a swollen basal portion and bifid, acutely pointed rami, which point almost straightly downwards and slightly backwards. No filiform appendages. Head and 1st thoracic segment separated, line of demarcation not so distinct as between other thoracic segments. 4th and 5th thoracic segments fused; line of fusion visible on the dorsal surface. Postero-lateral thoracic margin produced into broad, triangular flaps, covering about half the length of the genital somite.

Extreme tip sharply pointed, ventral border slightly rounded, dorsal border cut off straightly.

Proportions of the abdominal segments, with the furca :

segment	1 + 2	3	4	5	furca	
	39	27	19	4	11	= 100.

Genital segment about $1\frac{1}{2}$ times as long as wide, in dorsal aspect sym-

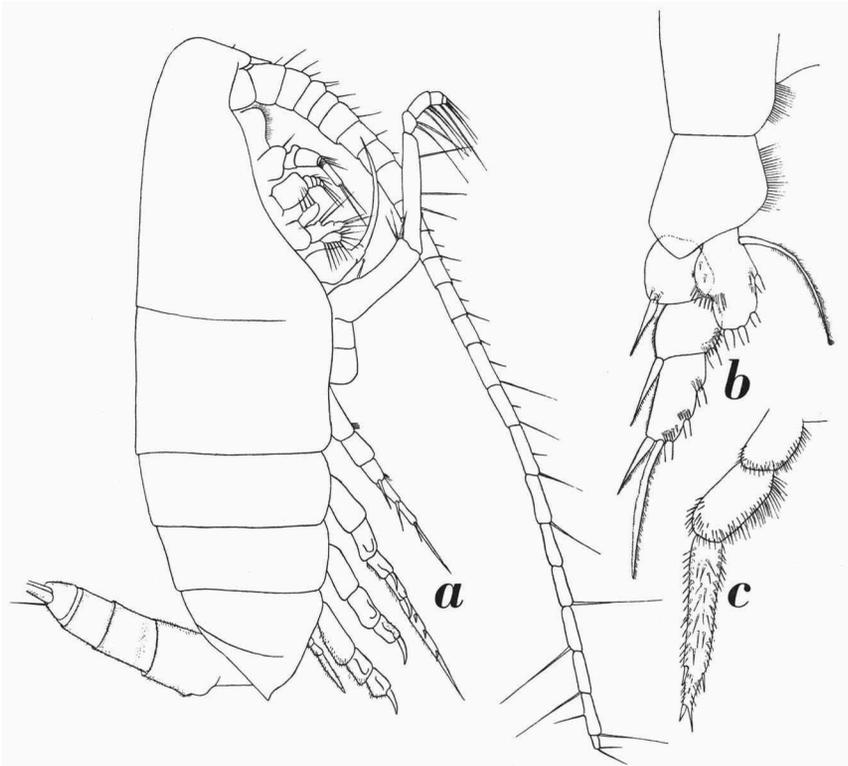


Fig. 3. *Onchocalanus trigoniceps* G. O. Sars, 1905, adult ♀, Snellius Expedition, Sta. 212. a, whole animal, lateral view from the right side; b, left 1st leg, posterior aspect; c, left 5th leg, posterior aspect. a, $\times 15$; b, c, $\times 65$.

metrical, slightly increasing in diameter towards the middle of the segment. Genital tubercle slight (fig. 4b), receptacula small, genital operculum semi-circular, small. Genital somite densely haired, near the place of attachment of the genital flap there is a small area covered with densely packed, short hairs. 2nd and 3rd abdominal somites also covered with hairs, though these are not so densely packed. Posterior margins of first three abdominal somites with uniform, plate like teeth. 4th abdominal segment telescoped into 3rd. Furcal joints symmetrical, as long as wide, external margin haired, internal

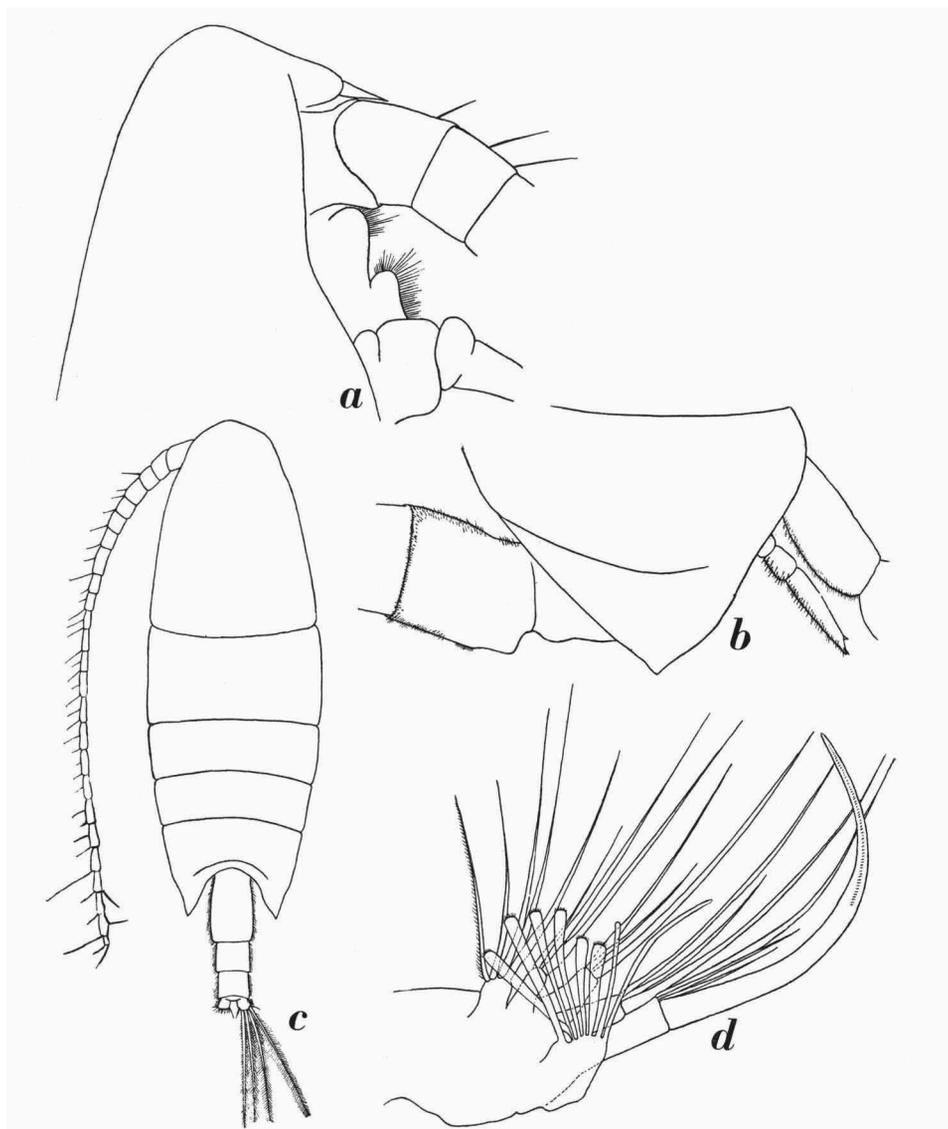


Fig. 4. *Onchocalanus trigoniceps* G. O. Sars, 1905, adult ♀, Snellius Expedition, Sta. 212. a, cephalon, lateral view from the right side; b, posterior part of cephalothorax and genital somite, lateral view from the right side; c, whole animal, dorsal view, right 1st antenna and left furcal setae omitted; d, right 2nd maxilla. a, b, $\times 33$; c, $\times 10$; d, $\times 56$.

margin with some scattered hairs. The 2nd internal seta of each joint is twice as long as the abdomen.

The antennae reach about as far as the posterior margin of the genital

somite, 24-jointed, 8th and 9th joints fused. Proportional lengths of the various joints:

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25
39	43	28	25	33	31	27	41	25	29	32	43	49	61	61	57	56	49	55	45	44	52	58	17	= 1000.

Endo- and exopods of the 2nd antenna of about the same length. 2nd inner lobe of 1st maxilla with 2, 3rd with 4 setae. 1st outer lobe of that appendage with 9 strong, plumose setae; exopod with 10 setae. 2nd basal joint with 5 setae, endopod with 3, 3 and 3 setae. Claw on 2nd maxilla slightly shorter than other setae, finely serrated near the apex (fig. 4d). Sensory appendages on the endopod of nearly the same length and size, with the exception of the long filiform appendage on that limb. The joints of the maxillipeds have the following proportional lengths:

segment	basal 1	basal 2	1	2	3-5
	29	46	8	14	3
	= 100.				

Sensory appendage on 1st basal joint small, head globular. Some setae on the endopodal joints very strong and with rather big teeth along the internal border, approaching the condition met with in some species of *Cornucalanus* Wolfenden, 1905.

Caudal surface of the 1st pair of swimming legs with big teeth (fig. 3b). 5 of these teeth are found on the endopod near the external border. 1st exopodal joint of that pair with 3 small teeth near the base of the external spine; 2nd exopodal joint with 7 spines near internal border and 3rd exopodal joint with 3, 5 and 6 teeth in coronulae near the internal border and almost at the base of the marginal setae. 2nd legs with 6 teeth on the caudal surface of 1st endopodal joint; two groups of 3 and 8 are found on the 2nd endopodal joint. 2nd exopodal joint of 2nd pair of legs with short row of 12 rather strong spines near base of external marginal spine. 3rd pair of legs with 6 strong spines on the caudal surface of the 1st endopodal joint, 6 on the 2nd and 4 and 3 on the 3rd endopodal joint. The 2nd and 3rd endopodal joints of the 4th pair of legs have the caudal surfaces covered by long, hair like spines, which occur in great profusion. Small, scattered teeth are observed on the caudal surfaces of the exopodal joints and the 2nd basal joints of the 2nd—4th pairs of legs. On the 4th pair of legs these teeth are markedly longer, and here they also occur on the 1st basal joint. Proportions of the three joints of the 5th pair 9 : 12 : 22. 3rd joint narrowed near the apex and carrying a strong spine, coalescent with the joint (fig. 3c). In addition there is a small, articulating apical spine. Along the internal and external margins a smaller spine is found; these spines articulate and are almost opposite. Caudal surface of these legs densely covered by long hairs; rostral surface almost nude.

Onchocalanus magnus (Wolfenden, 1906) (figs. 5-8).

Xanthocalanus magnus Wolfenden, 1906, p. 32, pl. 10 figs. 7-9.

? *Onchocalanus magnus* Hardy & Gunther, 1935, p. 163.

Onchocalanus frigidus Wolfenden, 1911, p. 276.

Material

Willem Barendsz Expedition 1946/47. Adult female specimens from the Atlantic sector of the Antarctic, Sta. A 032 and Sta. A 033, 66° 58' S, 16° 03'.5 W.

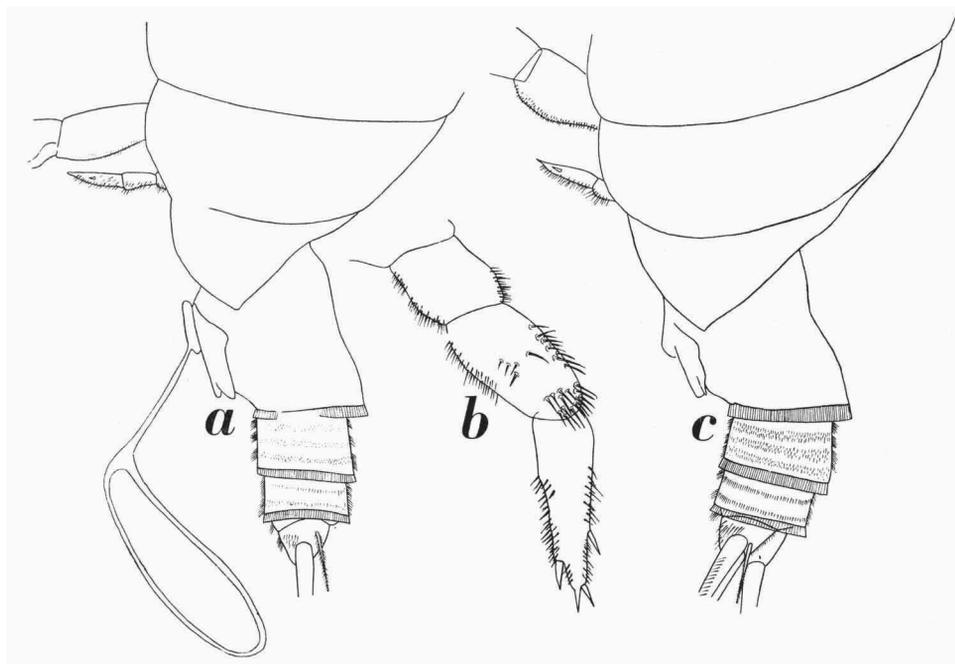


Fig. 5. *Onchocalanus magnus* (Wolfenden, 1906), Willem Barendsz Expedition, Sta. A 032. a, adult ♀ no. 1, posterior part of cephalothorax and abdomen, lateral view from the left side, spermatophore attached to genital operculum; b, adult ♀ no. 2, right 5th leg, posterior aspect; c, adult ♀ no. 2, posterior part of cephalothorax and abdomen, lateral view from the right side. a, c, $\times 24$; b $\times 70$.

The comparison of Antarctic Onchocalanids with *O. trigoniceps* from Atlantic and Pacific waters has convinced me that *O. magnus*, described by Wolfenden from Antarctic waters and generally considered identical with *O. trigoniceps*, is specifically different from that form. It should stand as *Onchocalanus magnus* (Wolfenden, 1906). Dr. J. P. Harding supplied me with photographs of a female *Onchocalanus* in the collection of the British Museum (Natural History), labelled *Xanthocalanus magnus* Wolfenden, Antarctic, 1909-V-14-49. The specimen measures just over 8 mm and represents the large form mentioned in Wolfenden's publications. Although

the specimen is in a rather bad condition, the shape of the posterior portion of the cephalothorax and of the abdomen in lateral aspect clearly shows its identity with the specimens from the Willem Barendsz Expedition. These three specimens vary in length between 8.60 and 8.80 mm. The description is taken from an adult female from Sta. A 032, length 8.80 mm.

Adult female, total length 8.80 mm. Proportions of cephalothorax and

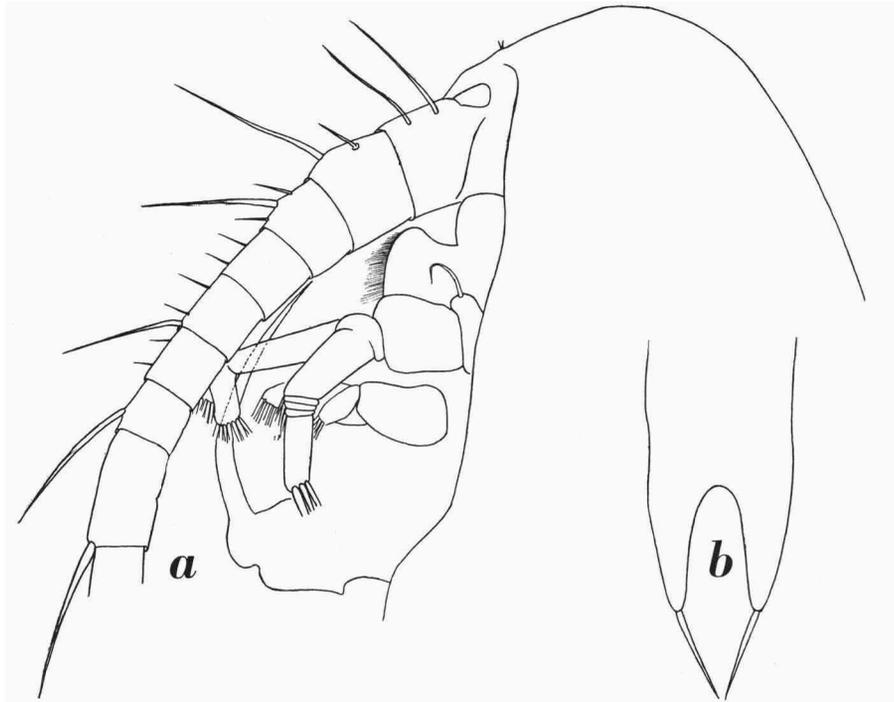


Fig. 6. *Onchocalanus magnus* (Wolfenden, 1906), adult ♀ no. 2, Willem Barendsz Expedition, Sta. A 032. a, cephalon in lateral aspect from the left side, oral parts more or less schematic, 1st maxilla omitted; b, rostrum, ventral view. a, $\times 30$; b, $\times 90$.

abdomen as 135 : 41. Cephalothorax very robust, greatest diameter at about half its length. Head and 1st thoracic somite, as well as the 4th and 5th thoracic somites, separated; line of separation distinct, but not so well marked as between other thoracic segments. Head in dorsal aspect broadly triangular, extremity rounded (fig. 7b). Frontal portion of cephalothorax slightly dilated in the oral region. Head in lateral aspect smoothly but broadly rounded (fig. 6a); both in lateral and dorsal aspect without any trace of a crest or carina. The rostrum consists of a distinctly swollen, highly chitinized basal plate and a chitinized, bifurcated portion, terminating into slender, moderately long, filiform appendages (fig. 6b). The rostrum points

obliquely downwards, the extremity is hidden between the basal parts of the 1st antennae. Frontal organ distinctly visible, slightly prominent, carrying a pair of fine hairs. Postero-lateral margin of last thoracic somite triangularly produced, covering about $\frac{1}{3}$ of the genital segment (figs. 5a, c). In dorsal view the extreme tip of the thorax appears to be pointed, although the points are not acute. In lateral aspect the extreme tip is bluntly pointed

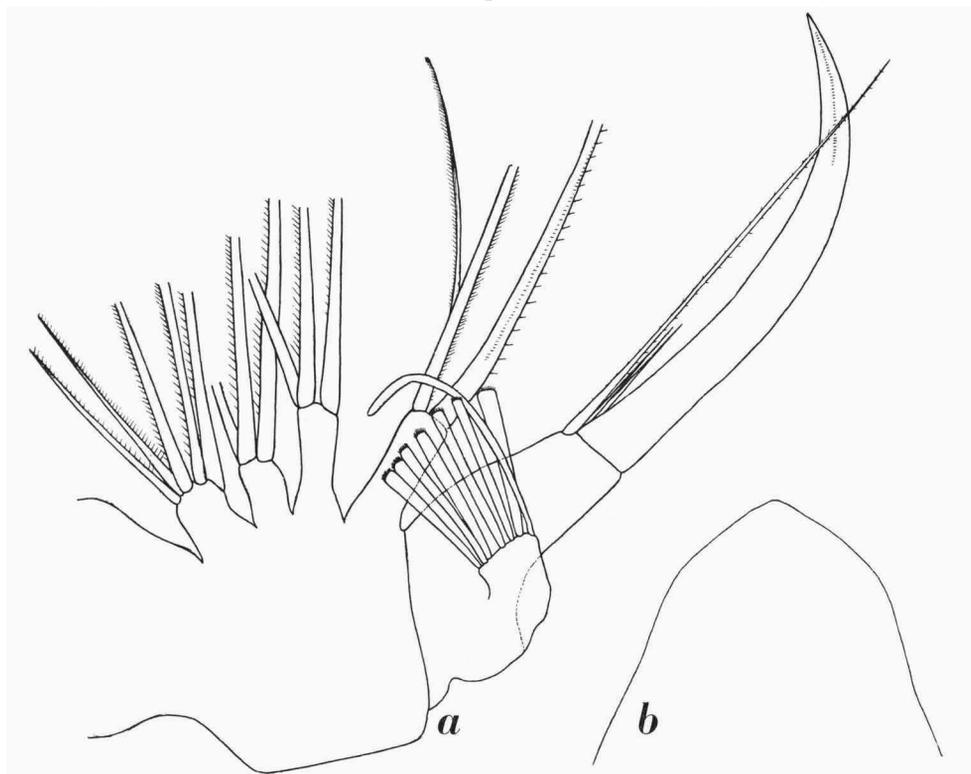


Fig. 7. *Onchocalanus magnus* (Wolfenden, 1906), adult ♀ no. 2, Willem Barendsz Expedition, Sta. A 032. a, right 2nd maxilla; b, outline of the head in dorsal aspect. a, $\times 125$; b, $\times 30$.

(fig. 5c; in another specimen the apex is slightly thickened and knob shaped, fig. 5a); the ventral margin of the 5th thoracic somite is broadly rounded, the dorsal margin is cut off straightly.

Proportions of the abdominal segments, with the furca :

$$\text{segment} \quad \frac{1+2}{49} \quad \frac{3}{22} \quad \frac{4}{15} \quad \frac{5}{4} \quad \frac{\text{furca}}{10} = 100.$$

Genital segment symmetrical; the lateral surfaces are produced and very broadly rounded (fig. 8). In lateral aspects the genital segment appears to

have a large genital swelling; the orifices of the receptacula are closed by a flap with produced caudal border, projecting slightly beyond the genital swelling. Dorsal line of the segment with a distinct incurvation opposite the genital swelling. Caudal border armed with a row of leaf like spinules; segment nude. 2nd and 3rd abdominal somites covered with short hairs, arranged in transverse rows; caudal borders with a fringe of leaf like

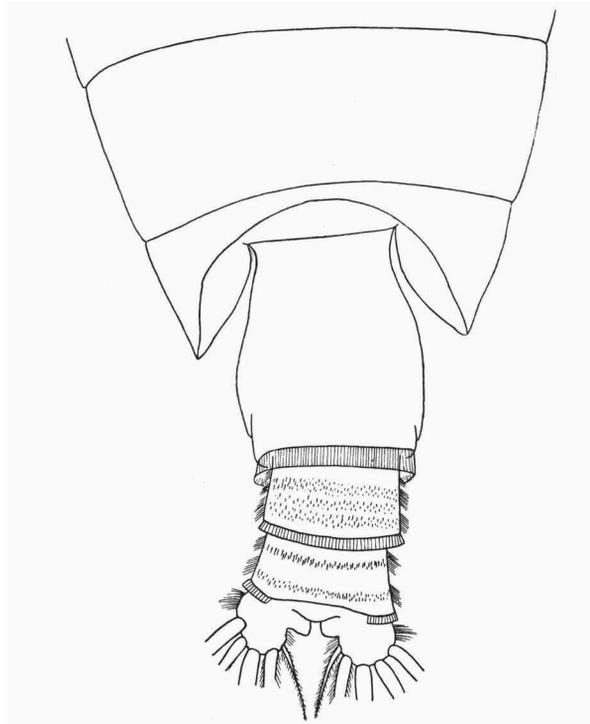


Fig. 8. *Onchocalanus magnus* (Wolfenden, 1906), adult ♀ no. 2, Willem Barendsz Expedition, Sta. A 032, posterior part of cephalothorax and abdomen, dorsal aspect. $\times 30$.

spinules. 4th abdominal segment very short and in the present specimen completely telescoped into the 3rd. Furcal joints symmetrical, as long as wide, with a dense tuft of long hairs at the external margin, into which the small external seta is completely hidden. 2nd internal marginal seta on both sides greatly lengthened, about $2\frac{1}{2}$ times as long as abdomen, slightly thicker than other setae. Remaining marginal setae about $1\frac{1}{2}$ times as long as abdomen. One of the other females carries a spermatophore, which is 1.35 mm long and has a diameter of 0.23 mm (fig. 5a).

In normal position the 1st antenna reaches as far as the thoracic border;

its length, however, is slightly longer than that of the cephalothorax. The 8th and 9th joints are fused; the various segments have the following proportional lengths:

$$\frac{1 \ 2 \ 3 \ 4 \ 5 \ 6 \ 7 \ 8 + 9 \ 10 \ 11 \ 12 \ 13 \ 14 \ 15 \ 16 \ 17 \ 18 \ 19 \ 20 \ 21 \ 22 \ 23 \ 24 \ 25}{60 \ 37 \ 28 \ 28 \ 35 \ 32 \ 27 \ 47 \ 28 \ 34 \ 35 \ 46 \ 48 \ 53 \ 53 \ 52 \ 50 \ 50 \ 53 \ 43 \ 46 \ 51 \ 53 \ 11} = 1000.$$

Exopod of the 2nd antenna longer than the endopod. 1st inner lobe of the 1st maxilla with 7 strong and 4 weak bristles; 2nd inner lobe with 2, 3rd with 4 setae. 1st outer lobe with 9, exopod with 10 setae. 2nd basal joint with 5 setae, one of which is markedly strong. Jointing between the endopodal joints indistinct, endopod with totally 9 setae. Claw of the 2nd maxilla very strong, as long as the remaining setae, with very fine teeth near the apex (fig. 7a). The endopodal joints of the maxilliped are distinctly separated and have, with the basal joints, the following proportions:

$$\begin{array}{cccccccc} \text{segment} & \text{basal 1} & \text{basal 2} & 1 & 2 & 3 & 4 & 5 \\ \hline & 31 & 43 & 9 & 9 & 4 & 3 & 1 = 100. \end{array}$$

Sensory appendage on the 1st basal joint not very big, short, with globular head.

Caudal surface of the swimming legs covered with big teeth and spinules. On the 1st leg 6 teeth are found along the internal border of the endopod; the exopod carries 6 teeth near the insertion of the external spine on the 1st joint, 5 near the internal seta on the 2nd joint, and three coronulae of 5, 5 and 10 teeth along the internal border. The 2nd pair of legs has 10 rather big teeth on the 2nd basal joint near the insertion of the exopod. The 1st endopodal joint has 4 teeth, the 2nd endopodal joint 6 and 5 teeth. The 1st exopodal joint of that pair has 5 and 7 teeth. The 3rd pair of legs has 15 teeth near the insertion of the exopod on the 2nd basal joint. The 1st endopodal joint carries 5 teeth, the 2nd 7 and the 3rd 7 teeth. On the 1st exopodal joint there are 4 and 10 teeth. The endopodal joints of the 4th pair of legs are densely covered by long, hair like teeth. In addition to the above mentioned teeth small spinules are to be observed on the exopodal and 2nd basal joints of the 2nd—4th pairs of legs; to a smaller degree these teeth are also found on some endopodal joints. There are also fine spinules on the 1st and 2nd basal joints of the 4th pair of legs. Terminal spines on the 3rd exopodal joints with very acutely serrated external margins. The 3 joints of the 5th legs have proportions of 12 : 17 : 20. The terminal joint is more or less rounded near the apex, and there it carries 2 small spines, one of which articulates with the joint (fig. 5b). There is a marginal spine along the internal and one along the external border, which are not strictly opposite. The caudal surface of the 5th legs is densely covered with long hairs.

Onchocalanus wolfendeni nov. spec. (figs. 9-11).

Xanthocalanus magnus Wolfenden, 1908, pp. 34, 37, pl. 7 figs. 1-9.

Onchocalanus magnus, Wolfenden, 1911, p. 275, pl. 31 figs. 3-5; Cépède, 1914, p. 152.

Material

Willem Barendsz Expedition 1946/47. One adult female from Sta. A 027, $\pm 66^{\circ} 5$ S, 11° W.

The name *Onchocalanus wolfendi* is proposed here for an Onchocalanid which, although closely related to *O. magnus* and *O. trigoniceps*, differs in length and structural features. Wolfenden originally considered it identical with *O. magnus*, but later on he separated both forms and used the name of *O. magnus* for the small form (vide supra), which is illegitimate, as *O. magnus* is the specific name of a different species and was published previous to the description of the form here indicated as *O. wolfendeni*. The following description is taken from the single female in the Willem Barendsz collection (lectotype).

Adult female, total length 6.75 mm. Proportions of cephalothorax and abdomen 105 : 30. In general appearance the body resembles that of *O. magnus* strikingly much. The cephalothorax is robust, especially in lateral aspect; the head and 1st thoracic segment, as well as the 4th and 5th thoracic segments, are fused; a weak line of separation is visible in the mid-dorsal portion of the back (figs. 9a, b). Head in dorsal aspect broadly rounded, dilation in oral region only very slight. Head in lateral aspect with smoothly rounded back; frontal portion flattened and provided with a powerful rostrum (fig. 10b). Basal portion of rostrum distinctly swollen, resembling the condition found in *O. affinis*; apical portion deeply cleft and each point provided with a filiform appendage of almost the same length. Terminal portion of rostrum hidden between the basal part of the 1st antennae. Frontal organ slightly elevated, carrying two small hairs. Postero-lateral thoracic margin triangularly produced, covering about half the length of the genital somite. Extreme tip broadly rounded and in this respect totally different from *O. magnus*. Ventral and dorsal borders of 5th thoracic segment straight.

Proportions of the abdominal segments, with the furca:

$$\begin{array}{cccccc} \text{segment} & 1+2 & 3 & 4 & 5 & \text{furca} \\ & 45 & 23 & 16 & 4 & 12 = 100. \end{array}$$

Genital segment symmetrical, in dorsal view suddenly widened at about 1/3 of its length, the diameter decreases slowly towards the end of the segment (fig. 10a). Genital swelling in lateral aspect large, its outline can best be described by referring to the figure (fig. 11a). Genital somite covered with long hairs, which are arranged in patches. 4th thoracic segment almost completely telescoped into the 3rd; 2nd — 4th abdominal somites nude. Posterior

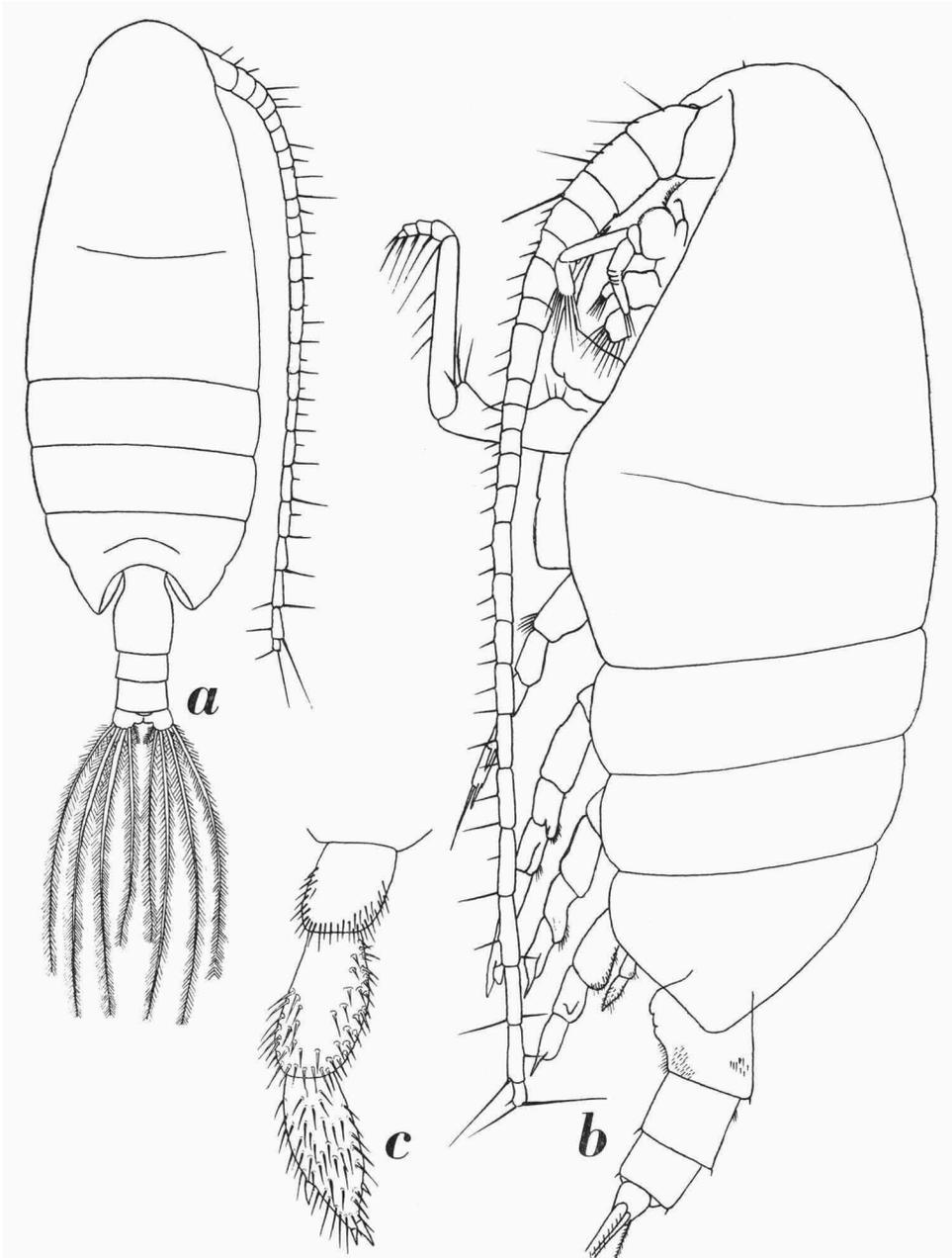


Fig. 9. *Onchocalanus wolfendeni* nov. spec., adult ♀, Willem Barendsz Expedition, Sta. A 027. a, whole animal, dorsal view, left 1st antenna omitted; b, whole animal, lateral aspect from the left side; c, left 5th leg, posterior aspect. a, $\times 15$; b, $\times 24$; c, $\times 95$.

margins of all abdominal segments with thin lamella of leaf like spines. Anal flap just visible behind margin of 3rd segment. Furcal joints as long as wide, with the usual 4 long, marginal setae. External margin with a patch of long hairs, internal margin nude.

The 1st antenna reaches slightly beyond the posterior margin of the

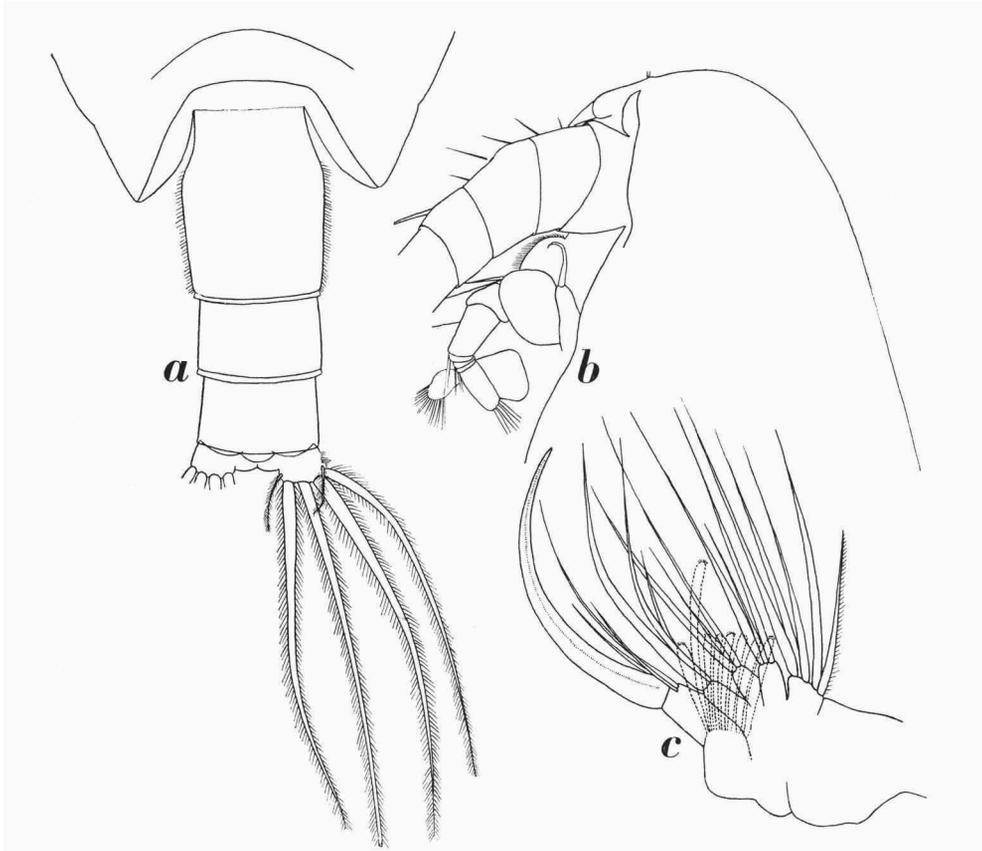


Fig. 10. *Onchocalanus wolfendeni* nov. spec., adult ♀, Willem Barendsz Expedition, Sta. A 027. a, posterior part cephalothorax and abdomen, dorsal aspect, left furcal setae omitted; b, cephalon in lateral view from the left side; c, right 2nd maxilla. a, b, $\times 35$; c, $\times 60$.

genital segment; 24-jointed, 8th and 9th joints fused. The various joints have the following proportional lengths:

1	2	3	4	5	6	7	8 + 9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25
33	46	25	26	32	30	27	51	22	27	32	47	49	57	57	52	51	54	47	50	54	54	20	= 1000.

Exopod of the 2nd antenna slightly longer than the endopod. Claw on the 5th lobe of the 2nd maxilla large, with small teeth along its entire length

(fig. 10c). The endopod carries the usual 7 brush shaped sensory appendages, one of which is much larger. In addition there is a long, filiform sensory appendage. The proportional lengths of the basal joints and endopod of the maxiliped are:

$$\frac{\text{basal 1}}{33} \quad \frac{\text{basal 2}}{47} \quad \frac{\text{endopod}}{20} = 100.$$

The sensory appendage on the 1st basal joint is small.

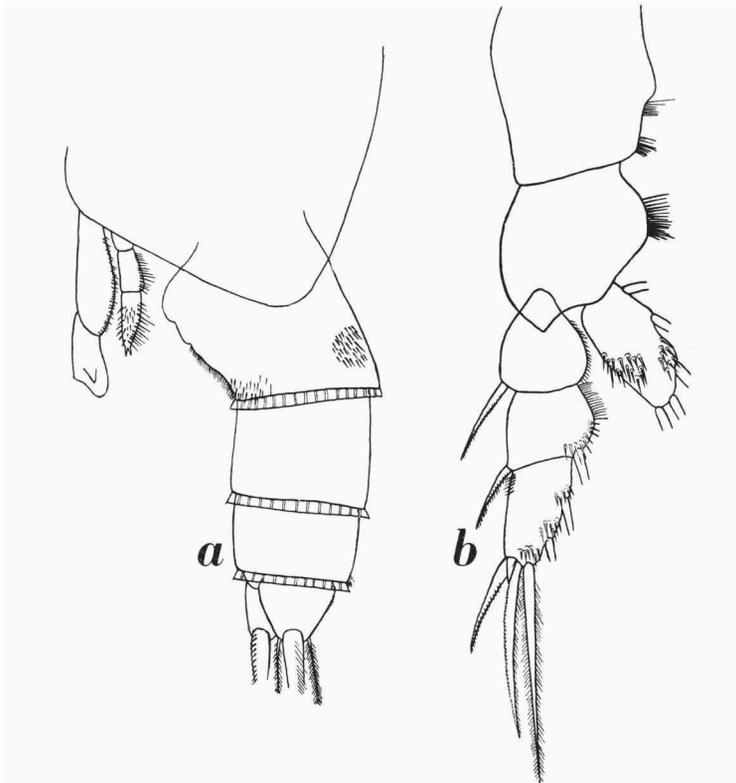


Fig. 11. *Onchocalanus wolfendeni* nov. spec., adult ♀, Willem Barendsz Expedition, Sta. A 027. a, posterior part cephalothorax and abdomen, lateral view from the left side; b, left 1st leg, posterior aspect. a, $\times 40$; b, $\times 65$.

Endopod of the 1st leg with 9 spines along the internal margin on the caudal surface (fig. 11b). On the exopodal joints there are some scattered small spines on the caudal surface of the 1st, found near the base of the external marginal spine; 9 teeth on the 2nd joint, and three coronulae of 5, 5 and 10 on the 3rd joint. The joints of the 5th pair of legs have proportions of 9 : 13 : 15. The 1st joint is only indistinctly separated from the

basal ridge. The apex of the 3rd joint carries two spines of unequal length (fig. 9c). The internal one is big and coalescent with the joint; the external tooth is smaller and articulates with the joint. In addition a small tooth is to be observed along the internal and one along the external margin. All joints are densely covered with long hairs, which almost completely hide the various spines.

Through the kindness of Dr. J. P. Harding, British Museum (Natural History), I had the opportunity to study some of Wolfenden's microscopic slides of "*Xanthocalanus magnus*". The three slides contain antennae, oral appendages and legs of specimens collected by the National Antarctic ("Discovery") Expedition and are labelled "*Xanthocalanus magnus*, Discovery, Antarctic, 1909-V-12-106, 1909-V-12-107 & 1909-V-12-108". Some of the drawings represented in Wolfenden's report (1908, pl. 7 figs. 1-9) certainly are made from appendages preserved on these slides. The structure and shape of the 2nd maxilla and 5th pair of legs leave no doubt about the identity of the form described by Wolfenden in 1908 as *Xanthocalanus magnus* and the present specimen collected by the "Willem Barendsz". Some additional information, taken from Wolfenden's slides, is given below.

The endo- and exopod of the 2nd antenna, in contradiction to Wolfenden's statement, have almost the same length and have the usual number of setae. On the 1st maxilla 7 strong and 4 smaller spines are found on the 1st inner lobe, 2 on the 2nd, and 4 on the 3rd inner lobe. The 2nd basal joint carries 5 setae, the endopod 3, 3 and 4 setae. The joints of the maxillipeds have the following proportional lengths:

$$\begin{array}{cccccccc} \text{segment} & \text{basal 1} & \text{basal 2} & 1 & 2 & 3 & 4 + 5 \\ \hline & 38 & 40 & 7 & 10 & 3 & 2 & = 100. \end{array}$$

The 1st basal joint has a strong and serrated apical lobe, carrying 2 setae and a short, strong spine. Sensory appendage small, with globular head. 2nd basal joint with basal portion of internal margin haired; 3 setae at the middle of its length and 2 setae on the apical lobe. 1st endopodal joint with 3, 2nd with 4, 3rd with 2, 4th with 3 + 1, and 5th with 3 + 1 setae.

1st endopodal joint of the 2nd pair of legs with 7 spines along the external margin; 2nd endopodal joint with 3 coronulae of about 10 spines each. 1st exopodal joint with 2 coronulae of about 8 spinules each; 2nd and 3rd exopodal joints densely set with small teeth. 3rd and 4th pairs of legs as in the other species of the present genus.

Onchocalanus affinis With, 1915 (figs. 12-14).

Onchocalanus hirtipes Scott, 1909, p. 83, pl. 34 figs. 9-17.

Onchocalanus affinis With, 1915, p. 233, textfigs. 75, 76; Sars, 1920, p. 7; 1925, p. 150, pl. 41 figs. 12-18; Rose, 1933, p. 138, fig. 134; Jespersen, 1940, p. 34; Sewell, 1947, p. 135, textfigs. 32, 33.

Material

Snellius Expedition. One adult male from the Ombai Strait (Sta. 163, 8° 51'.5 S, 124° 24'.5 E) and two adult females from the Flores Sea (Sta. 175, 7° 47'.0 S, 118° 12'.0 E).

Onchocalanus affinis is a deep water form which has been captured in the North Atlantic and the Arabian Sea. Additional specimens from the Manipa Strait, 3° 20' S, 127° 22'.9 E, were mentioned by A. Scott (1909) as *O. hirtipes*. Unfortunately these specimens are no longer present in the Siboga collection, but Scott's drawing can easily be recognized. Males of *O. affinis* have been described by With (1915, p. 234). The present male specimen, 4.10 mm long, carries 3 short, curved and stiff hairs at about half the length of the 2nd joint of the left 5th leg, which are not mentioned in With's description. The 1st antennae extend to the furca; the left 5th leg is slightly longer than the furca (fig. 14). Some additional information about the female is given below. It has been taken from one of the females from Sta. 175.

Adult female, total length 4.85 mm. Proportions of cephalothorax and abdomen as 3 : 1. Cephalothorax slender; head and 1st thoracic segment imperfectly separated; line of fusion only visible on the dorsal surface (fig. 12a). 4th and 5th thoracic segments more or less separated, but the line of separation is not distinct. Head in lateral aspect broadly rounded (fig. 13d), in dorsal view also rounded, without traces of a crest or a carina (fig. 12c). Rostrum strong, consisting of a basal portion, which is swollen, and a bifurcated portion, each point terminating into a fine, filiform appendage, $\frac{1}{5}$ the length of the free rostral points. The rostrum points downwards and a little backwards; apical portion hidden between basal parts of 1st antennae. Postero-lateral margins of last thoracic segment triangularly produced, covering the beginning only of the long genital somite. Extreme tip narrowly rounded; ventral border rounded, dorsal border cut off straightly.

Proportions of the abdominal segments and the furca:

$$\text{segment} \quad \frac{1+2}{42} \quad \frac{3}{26} \quad \frac{4}{16} \quad \frac{5}{4} \quad \frac{\text{furca}}{12} = 100.$$

Genital segment comparatively long, in dorsal aspect slightly increasing in diameter, symmetrical (fig. 13a). In lateral view there appears to be a distinct genital swelling, rostral surface cut off almost rectangularly (fig. 13d). Ventral portion of genital segment densely haired. The following

two abdominal segments have hairs on the ventral surface and some hairs on the lateral surface. The posterior margins of the first three abdominal segments have a row of small, plate like teeth. 4th abdominal segment completely telescoped into the 3rd. Furcal joints about as long as wide; internal and external margins with dispersed, short hairs. The 2nd internal seta on both sides is lengthened, and is about twice as long as the abdomen; it

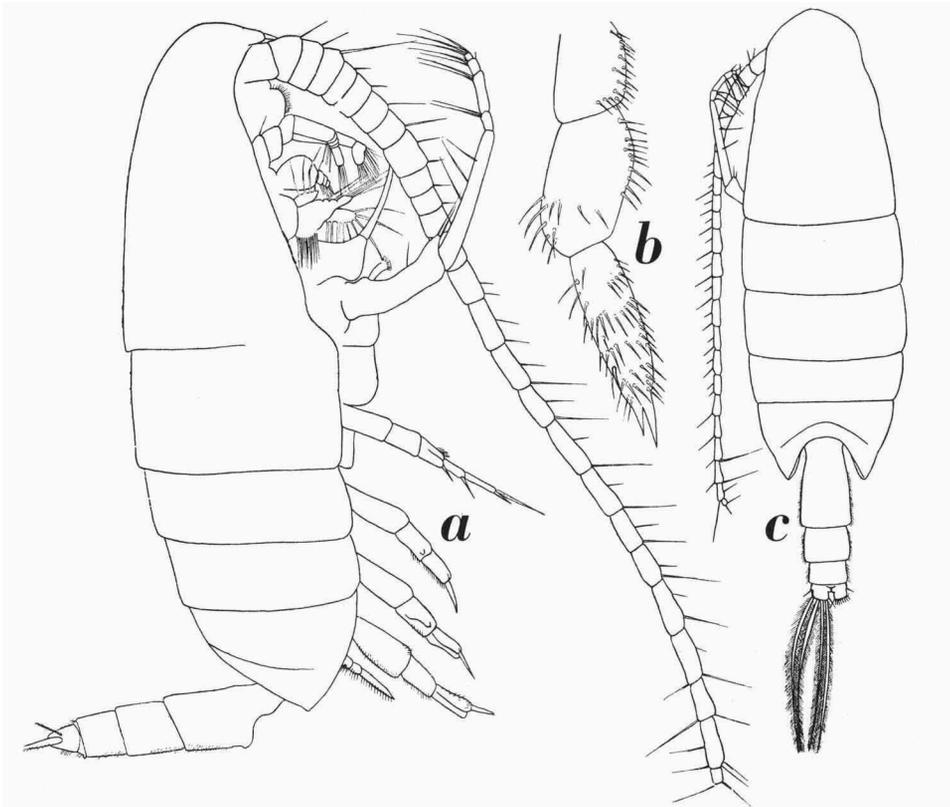


Fig. 12. *Onchocalanus affinis* With, 1915, adult ♀, Snellius Expedition, Sta. 175. a, whole animal, lateral view from the right side; b, left 5th leg, posterior aspect; c, whole animal, dorsal view, right 1st antenna and right furcal setae omitted. a, $\times 25$; b, $\times 130$; c, $\times 16$.

is thickened at its base. External small seta turned upwards, gradually tapering into a fine hair.

The 1st antennae reach beyond the lateral thoracic margin by the last 2 or 3 joints. The various joints have the following proportional lengths:

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	
32	44	28	25	28	30	35	47	23	25	32	40	47	60	60	57	54	54	53	46	43	54	63	20	=	1000.

8th and 9th segments fused.

Endo- and exopod of 2nd antenna of about the same length. 1st inner lobe of the 1st maxilla with 7 strong and 4 much thinner bristles. 2nd inner lobe with 2, 3rd with 4 setae. 2nd basal joint with 5 setae; endopod with 3, 2 and 5 setae. Claw on the 2nd maxilla strong, serrated at about half

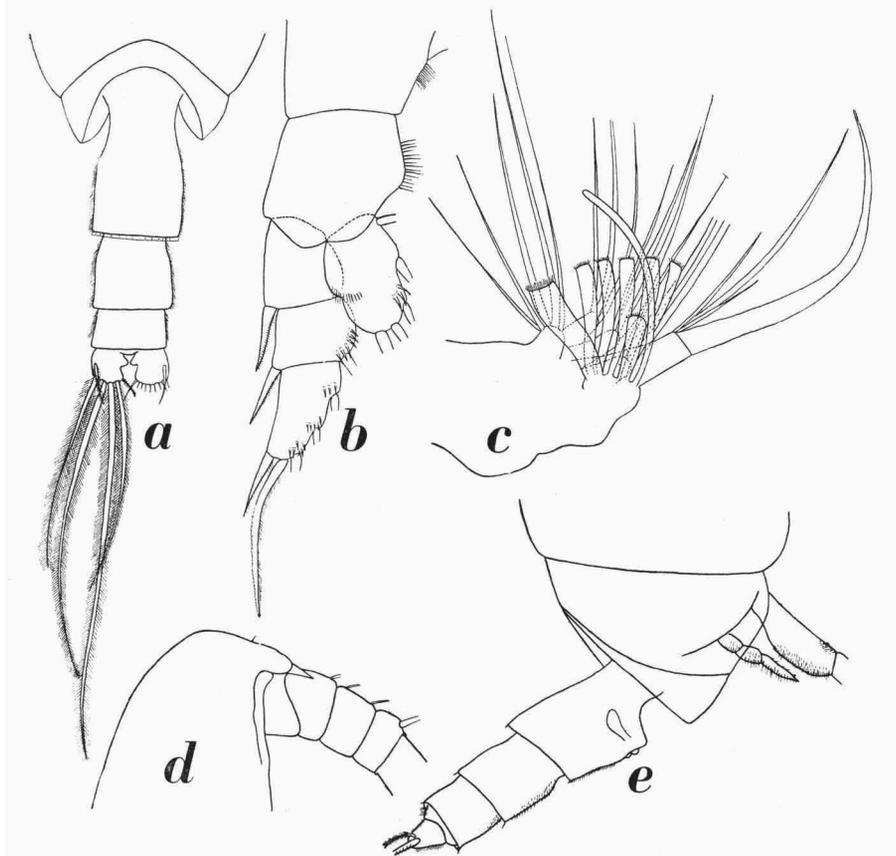


Fig. 13. *Onchocalanus affinis* With, 1915, adult ♀, Snellius Expedition, Sta. 175. a, posterior part of cephalothorax and abdomen, dorsal view, right furcal setae omitted; b, left 1st leg, posterior aspect; c, right 2nd maxilla; d, head in lateral aspect from the right side, right 1st antenna removed; e, posterior part of cephalothorax and abdomen, lateral aspect from the right side. a, d, e, × 30; b, c, × 70.

its length (fig. 13 c). The endopod carries 7 brush shaped and 1 filiform appendage; two of the brush shaped appendages are thicker but shorter than the others. The joints of the maxilliped have the following proportional lengths:

segment	basal 1	basal 2	1	2	3	4 + 5
	34	44	8	9	3	2 = 100.

Sensory appendage on the 1st basal joint big, dumb-bell shaped; apical lobe

very big, carrying 2 setae and a spine. In addition there is a rudimentary spine on that lobe.

Caudal surface of swimming legs spinulose. There are 3 teeth on the endopod of the 1st pair. 6 spines are found on the 2nd exopodal joint of that pair and 3 coronulae of each 3, 5 and 6 spines on the 3rd exopodal joint (fig. 13b). On the caudal surface of the endopod of the 2nd pair of legs there are 5 teeth on the 1st joint, and 6 and 4 teeth on the 2nd. In addition small,

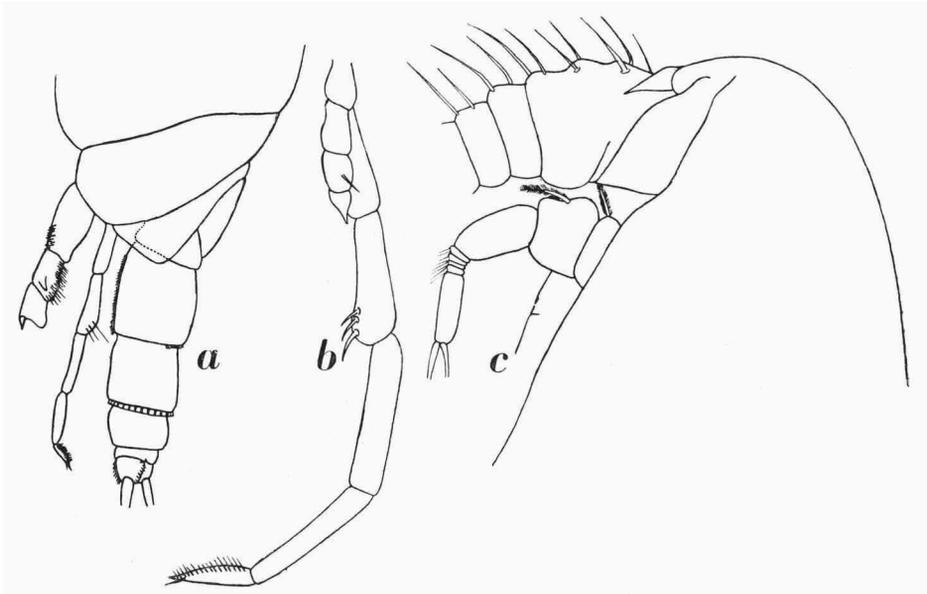


Fig. 14. *Onchocalanus affinis* With, 1915, adult ♂, Snellius Expedition, Sta. 163. a, posterior part cephalothorax and abdomen, lateral aspect from the left side, b, 5th pair of legs, left 5th leg figured on right side; c, cephalon, lateral aspect from the left side, left 1st antenna removed. a, $\times 33$; b, $\times 70$; c, $\times 50$.

scattered teeth are found on both endo- and exopodal joints. In the 3rd legs there are 5 teeth on the caudal surface of the 1st endopodal joint, 6 on the 2nd, and 4 and 5 on the 3rd. In addition small teeth are to be observed on the 2nd basal joint and on the exo- and endopodal joints. The 2nd and 3rd endopodal joints of the 4th pair have long, densely packed hair like teeth on the caudal surface. The three joints of the 5th pair of legs have proportions of 22 : 36 : 50. The 3rd joint is narrowed towards the end, and carries one big coalescent spine and one smaller articulating spine (fig. 12b). The various joints are densely covered by long hairs, so that it is almost impossible to observe lateral spines, but one seems to be present on the left 3rd joint along the external margin.

Onchocalanus scotti nov. spec. (fig. 15).

Material

Snellius Expedition. Two rather mutilated females from the Celebes Sea (Sta. 74, 4° 21'.5 N, 120° 01'.0 E) and the Moluccan Sea (Sta. 79, 1° 52'.0 N, 125° 41'.0 E).

Two female Onchocalanids occur in the Snellius collection, which appear to belong to a new form. Both specimens differ in length, the female from Sta. 74 measures 4.25 mm, the female from Sta. 78 measures 5.15 mm, but otherwise they are identical. The new name has been chosen in honour of the late Mr. Andrew Scott, a specialist of free and parasitic Copepods, whose study on the pelagic Copepods of the Siboga Expedition is of fundamental value. The following description has been taken from the female from Sta. 79 (type specimen).

Adult female, total length 5.15 mm. Proportions of cephalothorax and abdomen as 45 : 14. In general appearance the outline of the body strikingly resembles that of *O. affinis*; differences are to be observed, however, in the shape, in lateral aspect, of the head, and in the genital somite of the abdomen. Head and 1st thoracic segments imperfectly separated, 4th and 5th thoracic segments imperfectly fused; line of demarcation visible on the sides. Head in dorsal aspect broadly rounded, in lateral aspect also rounded, but with a large flattened portion in front of the rostrum (fig. 15 f). No trace of a crest or carina is visible. Between the rounded portion of the head and the base of the rostrum there is a distinct shallow depression, clearly visible in lateral view, in which the frontal organ, carrying two small hairs, is situated. Rostrum large, basal portion strongly chitinized; bifurcated portion deeply cleft, pointing downwards and slightly backwards (fig. 15 b). The apical portion, which carries two slender, fili-form appendages, is hidden between the basal portion of the 1st antennae. Dorsal profile with slight depression in the back opposite the oral opening. Postero-lateral portion of body triangularly produced, covering about ¼ of the genital somite (fig. 15 a). Extreme tip rounded, ventral surface slightly curved.

Proportions of the 4 abdominal segments and the furca:

$$\begin{array}{cccccc} \text{segment} & 1+2 & 3 & 4 & 5 & \text{furca} \\ & 47 & 16 & 19 & 4 & 14 \end{array} = 100.$$

Genital segment with a large genital tubercle, resembling the condition described in *O. hirtipes*. Genital somite in dorsal aspect slightly asymmetrical; at about 1/3 of the length the sides of the genital segment are swollen; swelling on the right side slightly bigger than on the left (fig. 15 e). Before and behind these swellings the diameter of the genital segment gradually decreases. Genital tubercle in lateral aspect different from that observed in

O. affinis, rostral wall steep, pubescent (fig. 15 a). Genital orifice closed by a single, circular flap. Ventral surface of genital segment nude, with some minor swellings. Caudal slope of genital tubercle haired. Caudal margins of the first three abdominal somites with a row of leaf like spinules, ventral surface of 2nd abdominal segment with some scattered hairs. Anal

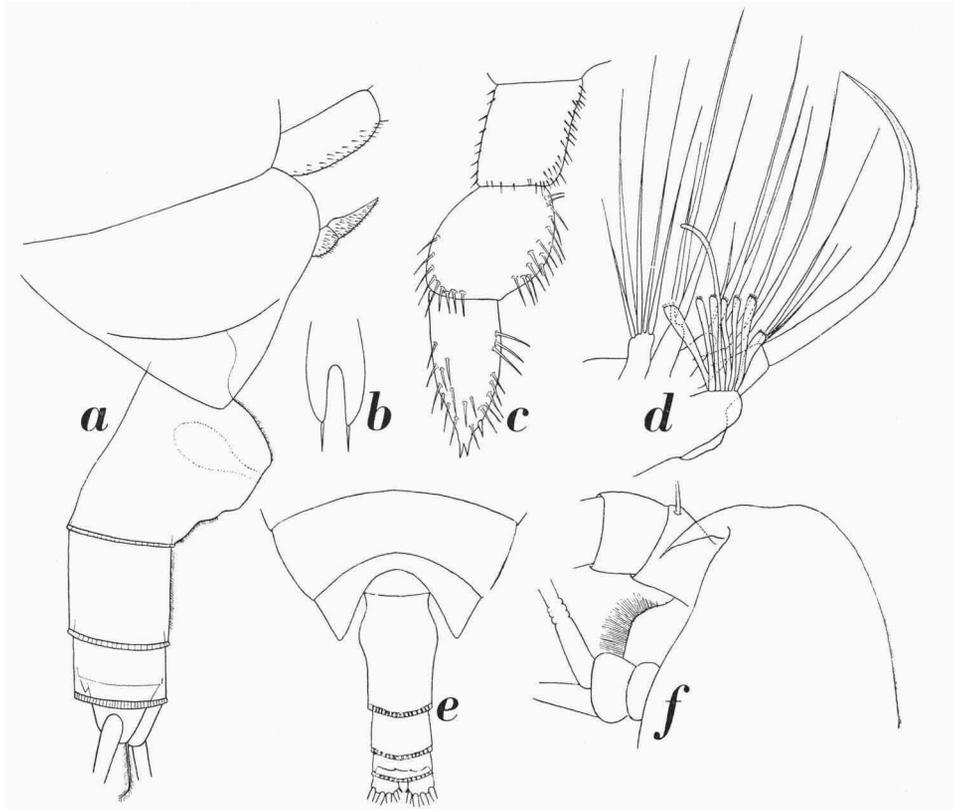


Fig. 15. *Onchocalamus scotti* nov. spec., adult ♀, Snellius Expedition, Sta. 79. a, posterior part of cephalothorax and abdomen, lateral aspect from the right side; b, rostrum, ventral aspect; c, left 5th leg, posterior aspect; d, right 2nd maxilla; e, posterior part of cephalothorax and abdomen, dorsal view; f, cephalon, lateral view from the left side, left 1st antenna removed. a, f, $\times 45$; b, $\times 85$; c, $\times 125$; d, $\times 65$; e, $\times 30$.

segment completely telescoped into 3rd. Furcal joints as long as wide, external margin slightly haired. All furcal setae damaged in present specimen; internal and external margins of furca nude.

The 1st antenna reaches as far as the caudal border of the 2nd abdominal segment. There are 24 free joints, the 8th and 9th are fused. The various joints have the following proportions:

1 2 3 4 5 6 7 8 + 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25
 59 36 26 26 29 29 32 42 20 23 29 44 46 55 55 54 54 54 55 44 49 55 64 20 = 1000.

Exopod of the 2nd antenna slightly longer than endopod. The 1st maxilla has the usual elongated 1st inner lobe, carrying 8 + 4 bristles. The 2nd inner lobe has 2, the 3rd 4 setae. The 2nd basal joint carries 5 setae; the endopod 3, 3 and 4 setae. The claw on the 5th lobe of the maxilliped is not so strong as in the other members of the present genus; the apical portion has fine denticules (fig. 15 d). The joints of the maxilliped have proportions of:

segment	basal 1	basal 2	1	2	3	4 + 5	
	30	40	7	10	11	2	= 100.

The sensory appendage on the 1st basal joint small, dumb-bell shaped. Apical lobe of 1st basal joint finely serrated along external margin, with 3 setae, 2 of which are normal, 1 is spiniform. There is no reduced spine on that lobe.

Big and small spinules are profusely found on the caudal surface of endo- and exopods of the swimming legs. The 1st pair has 4 on the endopod, 6 on the 2nd exopodal joint, and 3, 5 and 8 on the 3rd exopodal joint. On the 2nd pair there are 4 teeth on the 1st endopodal joint and 8 on the 2nd. In the 3rd pair there are 6 big teeth on the 1st endopodal joint, 12 on the 2nd, and 7 on the 3rd. The 2nd and 3rd endopodal joints of the 4th pair have densely packed hair like spinules. Proportions of the 3 joints of the 5th pair of legs 7 : 8 : 9. 3rd joint notably short, suddenly narrowed at the apex and there with 2 non-articulating spines of the same size (fig. 15 c). In addition a small spine is found along the internal and one along the external margin of the left joint; there is only one small external spine on the right leg. All joints sparingly set with long hairs, found on the caudal surface only.

Onchocalanus hirtipes G. O. Sars, 1905.

Onchocalanus hirtipes Sars, 1905, pp. 5, 20; Farran, 1908, pp. 12, 49; With, 1915, p. 231, textfig. 74; Sars, 1925, p. 148, pl. 41 figs. 6-11; Rose, 1933, p. 138, fig. 134.

Unfortunately I have no material of this species at my disposal, but it was accurately described and figured by With and Sars. It resembles both *O. affinis* and *O. scotti*, from which it distinguishes itself by the shape of the rostrum and the appearance of the genital segment. It has so far only been recorded from Atlantic waters; the specimens recorded by A. Scott as *O. hirtipes* belong to *O. affinis*.

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