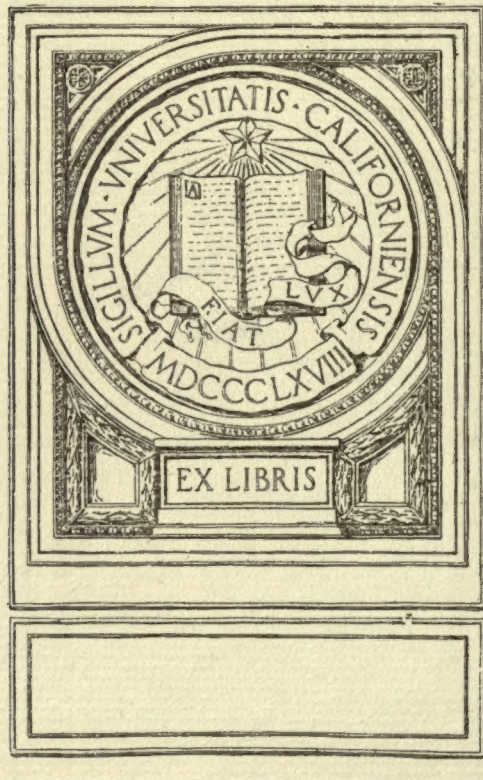


EXCHANGE



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THE DANISH INGOLF-EXPEDITION.

VOL. III, PART 3

CONTENTS:

H. J. HANSEN: CRUSTACEA MALACOSTRACA (II.)

PUBLISHED AT THE COST OF THE GOVERNMENT

BY

THE DIRECTION OF THE ZOOLOGICAL MUSEUM OF THE UNIVERSITY



COPENHAGEN.

H. HAGERUP.

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BY

H. J. HANSEN.

WITH 12 PLATES AND A LIST OF THE STATIONS.



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VOLUME III

3

GRISTACEA MALACOSTRACA II

H. J. HANSEN

EXCHANGE

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CONTENTS.

Crustacea Malacostraca. II.

IV. The Order Tanaidacea.

	Page		Page
Introduction.....	I	<i>Typhlotanais</i> G. O. Sars.....	35
On the Literature.....	1	21. — <i>irregularis</i> n. sp.....	36
Results and Questions.....	3	22. — <i>macrocephala</i> n. sp.....	38
A. The "Ingolf" Collection.....	3	23. — <i>pulcher</i> n. sp.....	39
B. Geographical and bathymetrical Distribution.....	4	24. — <i>gracilipes</i> n. sp.....	40
C. Sexual Differences in the Tanaidæ.....	5	25. — <i>mucronatus</i> n. sp.....	42
D. Some morphological Features in <i>Agathotanais</i> n. gen.....	8	26. — <i>eximius</i> n. sp.....	44
E. On the naming of Segments and Joints.....	8	27. — <i>penicillatus</i> n. sp.....	45
F. On generic and specific Characters.....	9	28. — <i>inermis</i> n. sp.....	46
Fam. I. <i>Apseudide</i>	10	29. — <i>variabilis</i> n. sp.....	48
<i>Apseudes</i> Leach.....	10	30. — <i>trispinosus</i> n. sp.....	49
1. <i>Apseudes spinosus</i> M. Sars.....	10	31. — <i>profundus</i> n. sp.....	51
2. — <i>vicinus</i> n. sp.....	11	32. — <i>spinicauda</i> n. sp.....	53
3. — <i>tenuis</i> n. sp.....	12	33. — <i>grandis</i> n. sp.....	54
4. — <i>gracilis</i> Norm. & Stebb.....	13	34. — <i>plebejus</i> n. sp.....	56
5. — <i>gracillimus</i> n. sp.....	15	35. — <i>inaequipes</i> n. sp.....	57
<i>Sphyrapus</i> Norm., G. O. Sars.....	16	36. — <i>finmarchicus</i> G. O. Sars.....	58
6. — <i>anomatus</i> G. O. Sars.....	16	37. — <i>mixtus</i> n. sp.....	59
7. — <i>serratus</i> G. O. Sars.....	17	38. — <i>cornutus</i> G. O. Sars.....	61
8. — <i>tudes</i> Norm. & Stebb.....	18	39. — <i>solidus</i> n. sp.....	62
Fam. II. <i>Tanaidæ</i>	18	<i>Agathotanais</i> n. gen.....	63
<i>Neotanais</i> Beddard.....	18	40. — <i>Ingolfs</i> n. sp.....	64
9. — <i>serratispinosus</i> Norm. & Stebb.....	18	<i>Leptognathia</i> G. O. Sars.....	65
10. — <i>hastiger</i> Norm. & Stbb.....	19	41. — <i>multiserrata</i> n. sp.....	66
11. — <i>giganteus</i> n. sp.....	20	42. — <i>Sarsii</i> H. J. H.....	68
<i>Heterotanais</i> G. O. Sars.....	21	43. — <i>gracilis</i> Krøyer.....	70
12. — <i>groenlandicus</i> n. sp.....	21	44. — <i>Hanseni</i> Vanhöffen.....	71
<i>Tanais</i> H. Milne-Edw.....	22	45. — <i>longiremis</i> Lilljeborg.....	74
13. — <i>Cavolinii</i> H. Milne-Edw.....	22	46. — <i>inermis</i> n. sp.....	76
<i>Pseudotanais</i> G. O. Sars.....	23	47. — <i>brachiata</i> n. sp.....	77
14. — <i>forcipatus</i> Lilljeborg.....	23	48. — <i>alba</i> n. sp.....	78
15. — <i>abyssi</i> n. sp.....	25	49. — <i>hastata</i> n. sp.....	79
16. — <i>Lilljeborgii</i> G. O. Sars.....	27	50. — <i>armata</i> n. sp.....	80
17. — <i>oculatus</i> n. sp.....	29	51. — <i>Andrupii</i> n. sp.....	81
18. — <i>affinis</i> H. J. H.....	30	52. — <i>tuberculata</i> n. sp.....	82
19. — <i>longipes</i> n. sp.....	33	53. — <i>uncinata</i> n. sp.....	83
<i>Paratanais</i> Dana.....	34	54. — <i>manca</i> n. sp.....	85
20. — <i>Batei</i> G. O. Sars.....	35	55. — <i>subæqualis</i> n. sp.....	87

	Page		Page
56. <i>Leptognathia tenella</i> n. sp.	88	69. <i>Cryptocope Veringii</i> G. O. Sars.	109
57. — <i>ventralis</i> n. sp.	89	70. — <i>arctophylax</i> Norm & Stebb.	110
58. — <i>acanthifera</i> n. sp.	91	<i>Tanaella</i> Norm. & Stebb.	113
59. — <i>breviremis</i> Lilljeborg	92	71. — <i>ochracea</i> n. sp.	113
60. — <i>crassa</i> n. sp.	95	72. — <i>unguicillata</i> Norm. & Stebb.	115
61. — <i>polita</i> n. sp.	96	<i>Strongylura</i> G. O. Sars	116
62. — <i>vicina</i> n. sp.	98	73. — <i>cylindrata</i> G. O. Sars.	116
63. — <i>profunda</i> n. sp.	99	74. — <i>minima</i> n. sp.	118
64. — <i>latiremis</i> n. sp.	101	<i>Strongylurella</i> n. gen.	120
65. — <i>glacialis</i> n. sp.	102	75. — <i>indivisa</i> n. sp.	120
<i>Haplocope</i> G. O. Sars	102	<i>Paranarthrura</i> n. gen.	121
66. — <i>linearis</i> n. sp.	103	76. — <i>insignis</i> n. sp.	122
<i>Leptognathiella</i> n. gen.	104	77. — <i>subtilis</i> n. sp.	124
67. — <i>abyssi</i> n. sp.	104	78. — <i>clavipes</i> n. sp.	125
<i>Cryptocope</i> G. O. Sars	106	Explanation of the Plates	127
68. — <i>arctica</i> H. J. H.	106		

Crustacea Malacostraca. II.

By

H. J. Hansen.

IV. The Order *Tanaidacea*.

Introduction.

Before entering on the subject of the present paper I may refer to the "Introductory Remarks" in "Crustacea Malacostraca I" published in 1908, because they contain various statements that need not to be repeated here. In that chapter I explained the limits of the area investigated by the "Ingolf" and other Danish expeditions to our northern dependencies; the principal sources (apart from the "Ingolf") for the material examined were enumerated and the principles followed as to "occurrence" and "distribution" were laid down. Zoologists wishing to get some information on these and allied topics may find them in the paper mentioned.

Our earlier knowledge of the Tanaidacea inhabiting the seas around Greenland, Iceland and the Færoes was poor. Only 9 species were known, 2 of which belong to the family Apseudidæ, 7 to the Tanaidæ. I am, however, inclined to think that no Carcinologist would have supposed that it might be possible to discover more than ten or fifteen new species within that area. But in the present paper I enumerate 78 species, all, excepting one, captured by Danish expeditions, and 52 of these species are new to science. The "Ingolf" has secured 71 of the species, but of these 13 have besides been taken by another Danish expedition or by two or more zoologists; 3 species have been gathered only by the "Thor" (Dr. Joh. Schmidt), 2 species exclusively by the second Amdrup-Expedition (Mag. sc. Søren Jensen) and a single species by other zoologists. In proportion to the number of species of Tanaidacea hitherto known from Norway, from Great Britain or from all seas together the "Ingolf" collection is so astonishing, that some special reason may be looked for; it may be of interest to attempt a discussion of the topic, and it may be possible to point out some results of more general significance. Finally a treatment of some other results and questions may be inserted before the purely systematic part.

On the Literature.

The earlier literature until the year 1881 comprises a good number of papers, but most among them dealing with only a single form or with some few species; the largest and most valuable of these contributions were written by H. Krøyer (1842) and W. Lilljeborg (1865). But in 1881 G. O. Sars published his paper: Revision af Gruppen: *Isopoda chelifera* (Arch. Math. og Naturv. Bd. 7), which is epoch-making in the history of our order. He divided it — he named it a group — into two well-

founded families, Apseudidæ and Tanaidæ, and pointed out their distinguishing characters; he established nine new genera (only five had been previously described); he enumerated nearly all species described from any ocean, and he added short descriptions of all species seen by him, redescribing a good number of species already made known and establishing twenty-three new species. He enumerated in all 3 genera and 14 species of the Apseudidæ, 11 genera with 46 species of the Tanaidæ, in all 14 genera with 60 species. But 4 species among the Apseudidæ were *nomina nuda* given by Norman, and Sars had overlooked a single species of *Apseudes* established by Willemoës-Suhm and two species of Tanaidæ established respectively by Nicolet and Bate. The result is that in 1884 59 species (not counting mere synonyms) of Tanaidacea had been established.

In 1886 G. O. Sars published his important paper: Middelhavets Saxisopoder (*Isopoda chelifera*), which contains elaborate descriptions with numerous excellent illustrations of seventeen species, all briefly described but not figured by him in 1880. And in his splendid work: An Account of the Crustacea of Norway, Vol. II, Isopoda (the parts on the Tanaidacea were edited in 1896—97) Sars published new descriptions and eighteen plates with figures of the Norwegian Tanaidacea, in all 28 species. By the three papers enumerated Sars has laid down a very broad foundation for future study and illustration of the animals, and he has done far more for the furtherance of our knowledge of the order than any other author.

Since 1881 about twenty-four zoologists have published descriptions of new species, sometimes besides of new genera, of Tanaidacea. Among these prominence must be given to the two English zoologists A. M. Norman and T. R. R. Stebbing, because in a valuable paper (On Crustacea Isopoda ... 1886) quoted several times in this report they gave good descriptions with numerous figures of 17 species (1 valid new genus), 13 of which were new and the majority even deep-sea forms; in other papers each of these two authors has described and figured some other forms. — In the Challenger Report Vol. XVII (1886) F. E. Beddard established 4 new genera and 10 new species, most of them interesting antarctic or deep-sea forms; unfortunately his figures are somewhat poor. — A. Dollfus has published preliminary descriptions, with some figures, of about 14 valid new species and 1 new and valid genus; in several papers published in later years Miss Harriet Richardson has established 2 new genera and several new species, mostly American.

In order to arrive at a fair idea of our knowledge of genera and species established before the middle of 1912 I have inspected the Zoological Records since 1877 and besides looked over the vast majority of the papers. I have attempted to count the genera and species hitherto established, excluding of course the synonyms, but it was impossible to arrive at absolute certainty as to the number of species, because in a few cases it cannot be made out whether a species is valid or ought to be cancelled as a synonym, and some few species have been so poorly described that they can scarcely be recognized with any certainty. But I am sure that the following numbers are nearly correct.

The family Apseudidæ comprises 8 genera: *Apseudes* Leach with 28 species, *Apseudopsis* Norm. with 2 species, *Parapseudes* Sars with 3 species, *Sphyrapus* Norman with 5 species, *Typhlapseudes* Bedd., *Leiopus* Bedd., *Kalliapseudes* Stebb. and *Pagurapseudes* Whitelegge, each with a single species. In all 42 species.

The family Tanaidæ comprises the following genera: *Neotanais* Bedd. (*Alaotanais* Norm. & Stebb.) with 5 species, *Tanais* H. M.-Edw. with 17 species, *Leptocheilia* Dana with 16 species, *Heterotanais* G. O. S. with 9 species, *Paratanais* Dana with 9 species, *Nototanais* Richardson with 3 species, *Typhlo-*

tanais G. O. S. with 16 species, *Leptognathia* G. O. S. with 14 species, *Pseudotanais* G. O. S. with 5 species, *Cryptocope* G. O. S. with 4 species, *Haplocope* G. O. S. with 2 species, *Strongylura* G. O. S., *Anarthrura* G. O. S., *Mesotanais* Dollf., *Pancolus* Richardson, *Tanaissus* Stebb., *Tanaella* Norm. & Stebb. and *Bathytanais* Beddard, each with a single species. In all 18 genera with 107 species.

Thus the order Tanaidacea comprises 26 genera with about 149 species.

Results and Questions.

A. The "Ingolf" Collection.

According to the literature only 9 species have hitherto been known from the coasts of Greenland and the adjacent deep-sea area; the number of deep-sea species secured North of Lat. 56° N. by the English expeditions was small, and the excellent collector of small Crustacea Prof. G. O. Sars captured only 8 species of Tanaidacea during the Norwegian North-Atlantic Expedition. Judging from these and other facts every zoologist would have thought it to be a good result if the "Ingolf" had raised the number of species known from the seas around our northern dependencies to twenty or possibly twenty-five. But as already stated, the "Ingolf" captured 71 species of Tanaidacea, some other expeditions or travellers added 6 species, and a single deep-sea species enumerated in the literature as taken by the "Valorous" within the area in question was not found again. — Besides it may be stated, that a good number of the new species were taken by the "Ingolf" at several stations and sometimes in considerable numbers.

Of the 78 species only 8 belong to the Apseudidæ, but 70 to the Tanaidæ. The animals belonging to the Apseudidæ are on the whole considerably or much larger than the Tanaidæ and consequently far less overlooked by collectors. But as only 8 species — 3 among them new — of Apseudidæ were secured by the "Ingolf" and the "Thor", while 42 species are described in the literature from all seas together, the number of species from our northern area is not even one-fifth of species hitherto established. As to the Tanaidæ the result is very different; 106 species were known from all seas, but the "Ingolf", etc. captured 70 species, thus almost two-thirds as many as hitherto known. And 49 species of the Tanaidæ are new to science.

These excellent results are mainly due to a method of collecting introduced by me during the first "Ingolf" cruise. A considerable quantity of the mud hauled up by dredge or trawl, or the whole bottom material when its quantity was less considerable, was sifted under water in smaller portions in a sieve clothed with silk gauze no. 7 used by millers; the well-sifted contents of the sieve were put in alcohol and later examined at home in small portions, in water or alcohol, on the lower part of a cheese-cover under a moderately magnifying lens. In this way hundreds of small animals, as Tanaidacea, Asellota, etc., were gathered. Other deep-sea expeditions could certainly have arrived at corresponding results if their methods of dealing with the bottom material had been more satisfactory; it may be considered quite certain that hundreds of species of small Crustacea etc. lived in the bottom materials hauled up by the "Challenger" and later great European and North American expeditions and were flushed into the sea again.

B. Geographical and bathymetrical Distribution.

The fact that the "Ingolf" alone raised the number of species of Tanaidacea inhabiting the area explored from 9 to 72, thus to almost half the number of species known from the entire world, proves with absolute certainty that our knowledge of this order is still in its infancy. But an examination of the list of localities for each species affords further interesting results.

The major part of the 149 species previously known were taken exclusively or generally in depths from 0 to 50 or 60 fathoms, several species generally in depths from 50 to 200 or at most 300 fathoms, and scarcely twenty species — secured mainly by the "Porcupine", the "Valorous", the "Challenger" and "Hirondelle" — had been found generally or exclusively in depths more than 300 fathoms, sometimes in more than 1000 fathoms, and the greatest depth recorded is 2050 fathoms. But among the 52 new species established in this report about 44 were taken either most frequently or — and in most cases — exclusively in depths exceeding 300 fathoms and often in depths between 700 and 1870 fathoms. Some species formerly taken in lesser depths were now found to be not uncommon in considerable depths. Thus, the "Ingolf" discovered more than twice as many deep-sea species as hitherto recorded from all seas together, and the great majority among them are small, less than 3.5 mm. and generally 1.6—3 mm. long.

Another point of great interest is that the richest harvest was yielded by some of the deepest stations in the warm area South and West of southern Greenland. At Stat. 78 (South-West of Iceland) an enormous quantity of bottom material was hauled up from 799 fathoms and 9 species of Tanaidacea were found; at Stat. 32 (Davis Strait) the quantity of bottom material from 318 fathoms was very large and rendered 8 species. But at St. 38 (entrance of the Davis Strait) the bottom material procured from 1870 fathoms filled in sifted condition scarcely more than a good tea-cup, and in that I found even 9 species. And two of the stations West of South Greenland were still richer; the sifted material from Stat. 36, 1435 fathoms, was about a liter and contained 11 species, while from Stat. 24, 1199 fathoms, I have 12 species of Tanaidacea. The last-named station thus rendered 4 species more than the whole Norwegian North-Atlantic Expedition, about half as many species as hitherto known from the Mediterranean; the harvest from the four deep-sea localities Stat. 22, 24, 36 and 38 is in all 30 species, while Sars in his standard work from 1896—97 has only 28 species from Norway.

From all these statements we may safely draw the conclusion, that the deep sea with 1100 to 1870 fathoms in the warm area in the North Atlantic has a much richer fauna of Tanaidacea than any large northern or tropical part of the Atlantic along the coasts and with depths from 0 to 100 fathoms. And as it seems very improbable that the deep sea near South Greenland is proportionately richer than the deep sea of the subtropical or tropical Atlantic, the Indian Ocean or the Pacific, we may infer that hundreds of unknown species of Tanaidacea inhabit the deep areas of the Oceans, and that the fauna from about 300 and down to at least 2000 fathoms is much richer than the fauna living in depths between 0 and 300 fathoms.

In the list of the "Ingolf" stations we find thirty places with the temperature at the bottom below zero; these stations belong to the cold deep-sea area and their depth ranges from about 300 to 1300 fathoms. Of our Tanaidacea 8 species are exclusively from these stations. The warm deep-sea

area is more difficult to define, but it may be proposed that the stations with a depth between 300 and 600 fathoms and the bottom temperature not below 3°, and all stations with depth from 600 to 1870 fathoms and the temperature above zero belong to that area. When we adopt this view it will be found that about 38 species enumerated in the following pages were taken exclusively in this warm deep-sea area, which consequently has a much richer fauna than the cold deep-sea area. A somewhat small number of species (*Sphyrapus anomalus* G. O. S., *Pseudotanais affinis* H. J. H., *Typhlotanais mixtus* n. sp., *Leptognathia longiremis* Lilljeborg, *L. ventralis* n. sp., *L. breviremis* Lilljebg., *Cryptocope arctica* H. J. H. and *Strongylura cylindrata* G. O. S.) have been taken both in the real cold deep-sea area and at rather deep or very deep stations in the warm area; but with a single exception (*Typhlotanais mixtus*) all these species have besides been taken in depths of less than 100 fathoms either by the "Ingolf" or at Norway, at East Greenland or in the Kara Sea. — The majority of the remaining species are forms living in depths less than 300 and frequently less than 100 fathoms. Some few species (as *Leptognathia inermis* n. sp., *L. Sarsii* H. J. H., *L. subæqualis* n. sp. and *L. latiremis* n. sp.) cannot be referred to any of the three categories just mentioned, but they seem to be essentially cold water forms sometimes found in temperatures a little above zero; *L. subæqualis* was once taken even in 318 fathoms in a temperature of 3.9°.

C. Sexual Differences in the Tanaidæ.

Adult males of species of the family Apsseudidæ are frequently taken together with the females, and I am unable to add anything to our knowledge of the sexual differences in this family. Sars has published excellent figures of both sexes of the two Norwegian species *Apsseudes spinosus* M. Sars and *Sphyrapus anomalus* G. O. S., of *Sphyrapus serratus* G. O. S. and of a few species of *Apsseudes* from the Mediterranean. In the males the abdomen is generally longer in proportion to the thoracic segments, the pleopods and their setæ are longer, the flagella of the antennulæ and antennæ and the endopod of the uropods are longer and divided into a larger number of joints than in the females; furthermore, the chelipeds of the males differ somewhat or very much from those of the females, and sometimes the second pair of thoracic legs show some difference.

As to the family Tanaidæ our knowledge of the males is still very imperfect and some interpretations are erroneous; it is necessary to distinguish sharply between adult and subadult or immature males. Sars has described the females of 26 species of Tanaidæ from Norway, but he was acquainted with really adult males of only 5 species, viz. *Tanais Cavolinii* M.-Edw. (*T. tomentosus* Kr., G. O. S.), *Heterotanais Oerstedii* Kr., *Typhlotanais finmarchicus* G. O. S., *Paratanais Batei* G. O. S. and *Leptognathia Sarsii* H. J. H. (*L. longiremis* G. O. S., not Lilljeborg); he described also what he believed to be the males of *Anarthrura simplex* G. O. S. and *Pseudotanais forcipatus* Lilljebg., but his animals were only subadult males, not adult specimens, and at least the adult male of the last-named species (already described, without figures, by Lilljeborg) is widely different from the subadult stage. Sars was aware that his males of *Strongylura cylindrata* G. O. S. were "probably" immature, which in reality was the case. In 1885 he figured the adult male of *Cryptocope Vöringii* G. O. S.; in his paper on the Mediterranean forms he figured the adult males of *Leptognathia brevimana* Lilljebg., *Heterotanais*

anomalus G. O. S. and of species of *Leptochelia*. — Adult males of some few other species have been described by Moore, Stebbing, etc.

A study of Sars' descriptions and figures of adult males as compared with the corresponding females is interesting. In *Tanais Cavolinii* M.-Edw. (*T. tomentosus* Kr., G. O. S.) female and male seem to differ only by the chelæ, which in the male are very broad, strongly forcipate and without tubercles on the fingers, while in the female they are rather slender, scarcely forcipate and with two tubercles on the fixed finger. The males of all other above-mentioned forms differ much more from their females. In *Heterotanais Ocrstedii* Kr. the male has the cephalothorax produced in a very long and thin "neck", the antennulæ and the antennæ are longer and thinner than in the female, the antennulæ five-jointed in the male, three-jointed in the female, and the chelipeds are quite anomalously shaped in the male, normal in the female. The males known belonging to *Paratanais*, *Typhlotanais*, *Leptognathia* and *Cryptocope* differ from their females in many particulars: the antennæ are six-jointed when three-jointed in the female, seven-jointed when four-jointed in the female, and have besides in all genera tufts of sensory hairs on three of the joints; the thoracic segments are conspicuously shorter in proportion to carapace and abdomen than in the females; the chelipeds or at least the chelæ differ somewhat or considerably in shape and equipment from those of the females: the thoracic legs are somewhat or considerably longer and more slender, the abdomen is larger, its pleopods longer with longer setæ and the uropods at least a little longer than in the females; finally in *Paratanais* the eyes of the males are much larger than in the females. The males of *Leptochelia* differ from their females especially in having much larger eyes, the chelipeds elongate with the chelæ very differently shaped and the antennulæ divided into a good number of joints. (It has been stated that in the males the mouth-parts are generally more or less reduced, but the majority of the males described have not been very closely investigated in that respect).

With a single exception (*Cryptocope Vöringii* G. O. S.) all species of which the adult males are known, inhabit comparatively low water, from the beach down to 30 or 50 fathoms. And according to the sexual differences just pointed out the adult males of most genera differ in general aspect and in several characters more from their own females than from males of other genera, and the differences between the two sexes of the same species are most frequently larger than the differences between the female of that species and females of several other genera. The result is that not unfrequently it is impossible with certainty to refer a male to its female, to determine specimens of the male sex.

While my material of females and immature specimens dealt with in this report is exceedingly large, comprising probably a good deal more than a thousand specimens, I have very few adult males. I establish a new species of *Neotanais* on a male about twice as long as any male or female hitherto known of this family from any sea. Furthermore, I have 5 males belonging to 3 species of *Pseudotanais*, 5 males belonging to 3 species of *Leptognathia* and a male *Cryptocope*, in all 11 specimens referred by me to 7 species; the reference of males to five of these species is absolutely certain, but two are referred with a little less certainty. Finally, I have still two males, one of which with a peculiarly armed chela, but being unable to refer them to genus I found it useless to describe them. But this enumeration of 14 adult males as compared with the enormous number of females and

immature specimens of both sexes proves that adult males must be either very rare or, and much more probably, that they swim about and are therefore rarely taken with the trawl or the dredge.

Immature or subadult males of many species were taken together with the females. In all species with the pleopods quite rudimentary or wanting in full-grown females with or without marsupium such subadult males are instantly recognized by having moderately developed or even somewhat large pleopods; this is the case in several species of *Leptognathia*, in *Pseudotanaïs forcipatus* and *P. Liljeborgii*, in *Agathotanaïs*, *Leptognathiella*, *Strongylura*, *Paranarthrura*. In all these forms the subadult males have the abdomen proportionately either a little or, as in *Paranarthrura insignis* n. sp., considerably longer than the female. In the genera with the antennulæ four-jointed these appendages, and especially their two proximal joints, are generally conspicuously thicker in the subadult males than in the females, and in some species of *Leptognathia* (f. instance *L. armata* n. sp.) the antennulæ of the subadult male are five-jointed, as the fourth joint has its basal part marked off by an articulation. In species of *Pseudotanaïs* or *Leptognathia* with the pleopods well developed in the female and in all species of *Typhlotanaïs* the antennulæ alone afford readily distinguishable differences between females without marsupium and subadult males. In *Typhlotanaïs* the main difference is the thickness of the two proximal joints and of a portion of the third joint; in *Pseudotanaïs* we find generally the basal part of the third antennular joint somewhat thickened and besides protruding below.

It is a common rule that when a good material of full-grown females of a species is to hand, the great majority are without marsupium, even when taken at the same station. But it is a curious fact that in several cases some of the largest specimens without marsupium are a little longer than the longest specimen with marsupium; this fact I cannot explain, but I am induced to think that some reduction in size may accompany the development of the marsupium and the eggs. In females with marsupium the ventral surface of the lamelligerous or of all thoracic segments is rather or quite flat, in specimens without marsupium most frequently considerably convex, but specimens without marsupium are sometimes found showing the ventral surface flat and on the whole showing an appearance as if the marsupial lamellæ had been lost, but whether this has been the case is impossible to decide.

In females without marsupium and subadult males of several species of *Typhlotanaïs* and of *Leptognathia ventralis* n. sp. the second thoracic segment is below, and generally at or not very far from the front ventral margin, produced in a generally acute and sometimes large process directed downwards and more or less forwards; in females with marsupium and in very few cases in female specimens without marsupium (perhaps lost) but with the lower side of the thoracic segments nearly or quite flat this process is either reduced in size and shape (*Leptognathia ventralis*) or lost (*Typhlotanaïs*). — In *Typhlotanaïs microcheles* G. O. Sars females without marsupium and with the ventral side of the thoracic segments convex, the ventral process is found on all thoracic segments excepting on the seventh (vid. "Remarks" on *T. gracilipes* n. sp.) — In *Paranarthrura insignis* n. gen., n. sp., the females without marsupium and subadult males have a conspicuous process on the ventral side of all thoracic segments, but in females with marsupium only the process on the seventh segment has been preserved.

D. Some morphological Features in *Agathotanaïs* n. gen.

Among all the new species described in the present paper only one, viz. *Agathotanaïs Ingolfi* n. gen., n. sp. shows hitherto unknown features of more general interest. Both females without marsupium and subadult males are at hand (Pl. VI, figs. 5a—5o). In the female the antennæ consist of a single minute joint (fig. 5c); in subadult males this joint is considerably larger (fig. 5n). In all specimens the seventh thoracic segment and all abdominal segments are immovably fused, but the limits between the segments are tolerably indicated by fine furrows (figs. 5b and 5o). The pleopods are wanting in the female (fig. 5b); in the subadult males they are rather long, unjointed, very slender conical and all coalesced, constituting a kind of pyramid with longitudinal furrows between the pairs, and each pleopod terminates in a few very short setæ (fig. 5o). The uropods are rudimentary, each being a small, subtriangular joint without any distinct division (figs. 5l and 5m).

Among these features the rudimentary state of antennæ and uropods are mere reductions, which yet are much stronger than in any other genus. The fusion of seventh thoracic segment and all abdominal segments is still more interesting. But completely without parallel among Crustacea is the fact, that in the subadult male all five pairs of pleopods are coalesced forming a single somewhat long protuberance, and this fact is of importance for comparison with features found in mouth-parts in a couple of groups of high rank of terrestrial Arthropoda.

E. On the naming of Segments and Joints.

Before entering on the systematic part it may be useful to say a little on the counting of the segments and joints and the terms used in the descriptions.

As the first thoracic segment is always fused with the head and hidden beneath the carapace, the apparently first segment is in reality the second, consequently it is here named the second and its legs the second pair, while the first pair of legs, the chelipeds, as belonging to the cephalothorax, are described separately.

The counting of the antennular joints presents no difficulty. But the antennæ are less easy. When the antennæ of females are fully developed they contain seven joints, as is seen in many species of *Leptognathia*. The first joint is very short, frequently nearly triangular, as the posterior margin is oblique and the upper margin very short or wanting; this joint is sometimes difficult to perceive and I never describe it, but it must of course be taken into consideration by counting. The two next joints are somewhat short and the third as a rule shorter than the second; in a couple of species of *Typhlotanaïs* these joints are strongly armed below. Fourth and fifth joints are somewhat long, but frequently, as in *Typhlotanaïs*, in some species of *Leptognathia*, in *Paranarthrura*, etc., fused, constituting a single long or very long joint sometimes with a vestige of division. Sixth joint is well developed, seventh always very small.

The thoracic legs have always the second joint long; the first joint is quite short but most frequently discoverable. The "claw" on the sixth joint is composed of the seventh joint and the real claw, and the limit or suture between these two parts is most frequently distinct. In the descriptions the joints are named according to their real number.

The chelipeds are somewhat difficult. In *Aapseudes* a cheliped seems to consist of only five joints instead of seven plus claw. But the presence of an exopod on the first joint proves that it is the second (according to the earlier morphology), and from a comparison with the second pair of legs it is evident that the long joint preceding the chela has been formed by the complete fusion of two joints; finally, the movable finger of the chela answers to the "claw" in the following legs, thus consisting of seventh joint and the real claw. In most genera of Tanaidæ the chelipeds consist of the same five joints as in *Aapseudes*, but in several forms, as in the male of *Neotanais giganteus*, in *Cryptocope Vöringii* and *C. arctophylax* and above all in *Anarthrura* (comp. Sars' figures) we find a conspicuous piece developed as a separate plate or (in *Anarthrura*) a large real joint between the usual "first" joint and the body; this plate or joint is certainly the real first joint which in most forms of the order is feebly or not marked off from the cephalothorax. As the chelipeds show such tangled morphology I have abstained from applying the counting method when the joints to be described must be indicated. Therefore I use some of the names applied by H. Milne-Edwards to the joints of the legs in Decapoda; whether most of the joints in the legs of Tanaidacea and Decapoda can be considered identical as to morphological value according to their number is another and very difficult question not to be discussed here. The apparently first and very conspicuous joint of the chelipeds in most forms is named the basal; the real first joint in *Anarthrura* and the plate marked off in the forms just enumerated is named the coxal joint. The joint beyond the basal is named the ischium, but in most forms it affords no character worth mentioning. The next joint is named the carpus, though morphologically it answers to meros and carpus; in the descriptions of the chela I speak of hand and fingers, the hand going to the insertion of the movable finger.

F. On generic and specific Characters.

In this report I establish only three genera, all belonging to the Tanaidæ. Two of these are well separated, but the third, founded on a single specimen, was established only because it fits badly in the genera known, though it does not seem to possess any single really good generic character. The big genus *Leptognathia* is divided into groups, and in the future it will certainly be divided into three or four genera, but I think it better to postpone this splitting up until a good number of unknown forms have been discovered, because the Carcinologist will then be more able to settle the value of several characters, whether they may be considered of generic or only of specific value. And here we fall in with a difficulty. It is with good reason that Sars laid stress on the mouth-parts in females (and immature males) as affording generic characters and especially on the development of the mandibles and the shape of their molar process, if that is present. But of numerous new species the material is very scanty or even consisting of only a single specimen, and in such cases an examination of the mouth-parts was postponed. Furthermore many species are so small, that several Carcinologists dealing with such animals are scarcely able to dissect the mouth-parts in such a way that a good representation of the mandibles can be given. And by the examination of the mouth-parts in various species of *Leptognathia* I found that two such species as *L. subæqualis* n. sp. and *L. ventralis* n. sp., which are rather allied in most characters and may be referred to the same group, show

in the shape and equipment of the molar processes such differences as those judged by Sars to be of generic value. The result is that the value of the shape of the molar processes as generic characters is lessened both from a scientific and a practical standpoint.

Though the descriptions of species published by G. O. Sars, Norman and Stebbing on the whole must be considered good, some of the characters in the family Tanaidæ used by these authors are scarcely sufficiently sharp, as a larger number of species have been discovered and it can be proved that hundreds of species are still undiscovered. While drawing the figures I found it necessary to use the ocular micrometer very much in order to figure as exactly as possible not only the relative length of the segments and of the joints of all appendages, but besides the exact proportion between length and breadth or depth of the joints of the chelipeds, the antennulæ and the peduncles of the uropods. Very frequently it is stated in the following pages that a joint is somewhat less than twice as long as deep or more than half as long again as another joint, etc., and in all such and several other cases the statements are founded upon measurements. As some slight individual variation exists and in some cases may be more pronounced, the proportions stated may sometimes be only approximate, but in spite of such variation I thought it better to give statements based on measurements than such founded on measuring by the eye.

Especially the relative length and breadth or depth of some of the joints of the chelipeds afford excellent specific characters, but care must be taken that the joints are seen exactly from the side, as an oblique position of a joint produces an erroneous impression as to the relative dimensions. The shape and length of all or of the three proximal joints of the antennulæ are also valuable. The processes on the ventral side of the abdominal segments in *Cryptocope Vöringii* G. O. S. and *C. arctophylax* Norm. & Stebb. were pointed out in the literature, but in many species of *Leptognathia* the presence or absence of ventral tubercles or of a peculiar process afford valuable characters. But it is scarcely necessary to say more on these topics, as the perusal of a few descriptions of species belonging to different genera may elucidate the methods applied.

Fam. I. Apseudidæ.

This family comprises eight genera, but only two are represented in the collection.

Apseudes Leach.

In the literature twenty-eight species have been established. The "Ingolf" captured three species, one of which is new; furthermore two species, both new, have been secured by the "Thor".

1. *Apseudes spinosus* M. Sars.

1859. *Rhoëa spinosa* M. Sars, Forh. Vid. Selsk. Christiania for 1858, p. 30.
 1886. *Apseudes spinosus* Norman & Stebbing, Transact. Zool. Soc. London, Vol. XII, Pt. IV, p. 85, Pl. XVII, fig. 1.
 1896. — — G. O. Sars, Account Crust. Norway, Vol. II, p. 7, Pls. I—II.

Remarks. As to this species I refer to Sars' description and good figures. It may only be mentioned that the largest of the females measures 13.8 mm. and was taken by the "Ingolf"; the largest male, 12 mm. long, is from Lat. 60° 5' N.

Occurrence. The "Ingolf" has taken this species at a single station:

West Iceland: St. 87: Lat. 65° 02.3' N., Long. 23° 56.2' W., 110 fm.; 7 spec.

The "Thor" has secured it at 3 stations:

South of Iceland: Lat. 63° 46' N., Long. 22° 56' W., 80 fm.; 1 spec.

— — — — — Lat. 63° 15' N., Long. 22° 23' W., 114—172 fm.; 5 spec.

South-West of the Færoes: Lat. 61° 15' N., Long. 9° 35' W., 400—500 fm.; numerous spec.

Distribution. The species occurs along the whole coast of Norway, from Vadsø to Christiania Fjord, in depths from 30 to 150 fm. (G. O. Sars), and even 180 fm. (Norman). It has been taken off Bohuslän (Lilljeborg), in the eastern part of Kattegat, 17 to 30 fm. and in Skagerak, 70 to 226 fm. (H. J. Hansen). Between the Shetland Islands and Norway it has been taken two times by Cand. mag. Ad. Jensen ("Michael Sars") in 1902: Lat. 61° 0' N., Long. 2° 35' E., 150 fm., temp. 7.9°, 1 spec., and Lat. 60° 5' N., Long. 3° 42' E., 190 fm., temp. 6.1°, 21 spec.; the "Thor" secured it near the Orkney Islands: Lat. 58° 32' N., Long. 4° 18' E., 150 fm. Tattersall has enumerated it from three places West of southern Ireland and in such depths as 293, 320 and 375 fm., and according to Norman & Stebbing it was taken off S. S. W. Ireland in 725 fm. — According to Norman *Apseudes Koehleri* Bonn., established on a specimen from the Bay of Biscay, is to be cancelled as a synonym to *A. spinosus*; but judging from Bonnier's drawings that reference is still somewhat doubtful.

2. *Apseudes vicinus* n. sp.

(Pl. I, figs. 1a—1c.)

Immature Female. Allied to *A. spinosus* M. Sars, but differing in a number of features. — The eye-lobes (fig. 1a) are more produced and more excavated in front than in *A. spinosus*, with the result, that the transverse portion is very short and the outer process long, acute; the lateral process behind the eye-lobe is more conspicuous than in the form mentioned, with the anterior margin somewhat arcuate and the outer angle acute and a little produced. The lateral margin behind last-named process is nearly straight excepting in front. The upper surface of the carapace with the transverse furrow very distinct, long.

The antennulæ in the main as in *A. spinosus*; the first joint with the proximal half of its inner margin serrate; the outer flagellum 8-jointed, the inner 4-jointed and somewhat more than half as long as the outer. Antennæ with the flagellum 7-jointed; the squama reaches the end of the penultimate joint of the flagellar peduncle.

Chelipeds (fig. 1b) nearly as in *A. spinosus*, but the lower margin of the carpus is somewhat longer than that of the ischium while in *A. spinosus* the lower margin of the carpus is shorter than that of the ischium and provided with two teeth not found in *A. vicinus*.

Thoracic segments somewhat longer in proportion to breadth than in *A. spinosus*, and the

lateral margins of the four posterior segments show considerable difference from *A. spinosus*, as in *A. vicinus* the anterior lateral process of each of these segments is much broader at the base, and this proximal part has a short, triangular protuberance both in front of and behind the main part of the process; furthermore the angle in front of the basal joint of each leg is produced into a small, acute protuberance. The ventral surface of the segments with acute processes as in *A. spinosus*. — Second pair of legs (fig. 1c) with a strong spine both from the anterior (upper) and the lower (posterior) angle of fourth joint, with a spine from the upper angle and two spines on the lower margin of fifth joint, while the sixth joint has two spines on the upper and five on the lower margin; fifth joint as long as the sixth and a little shorter than the fourth, while in *A. spinosus* the fifth joint is considerably shorter in proportion to the fourth.

Abdomen scarcely as long as the sum of the three posterior thoracic segments plus half of the fourth. The lateral processes of the five anterior segments somewhat long but distinctly shorter than in *A. spinosus*, the short terminal part of each process is suddenly slender. Sixth segment as long as the three preceding segments and half of the second segment combined, a little more than two and a half times as long as broad at the middle; the major anterior part of each lateral margin with six very feeble protuberances, each bearing a conspicuous seta. (Uropods lost excepting their basal joint.)

Length of the single immature female 6.3 mm.

Remarks. Among the characters enumerated in the description the shape of the eye-lobes, the processes on the lateral margins of the four posterior thoracic segments and the relative length of some of the joints in the chelipeds and second pair of legs are most easily observed.

Occurrence. Only taken by the "Thor" at the following locality.

South of Iceland: Lat. 62° 57' N., Long. 19° 58' W., 505 fm.; 1 spec.

3. *Aapseudes tenuis* n. sp.

(Pl. I, figs. 2a—2e).

Subadult Female. The eye-lobes are strongly produced and acute (fig. 2a), almost as much as in *A. vicinus*. The lateral process of the head shaped nearly as the eye-lobe; the lateral margin behind the last-named process considerably convex. The upper surface of the carapace with the transverse furrow very distinct, long.

The antennulæ more slender than in the preceding species; first peduncular joint more than four times as long as the second and with the proximal half of the inner margin distinctly serrate; the inner flagellum 10-jointed, more than two-thirds as long as the outer which is 13-jointed. — Antennæ (fig. 2a) with the flagellum 9-jointed and the squama not reaching the end of the penultimate joint of the flagellar peduncle.

Chelipeds (fig. 2c) considerably more slender than in *A. vicinus* but conspicuously stronger than in the two following species. Basal joint on the posterior margin with some minute spiniform setæ on the proximal part and somewhat before its end a very protruding angle bearing a strong spine, while the anterior margin is furnished with some setæ; the ischium has two spines near the end of the lower margin; the carpus slender with the lower margin unarmed and more than half as long

again as the lower margin of the ischium. The chela almost four times as long as broad, with the posterior margin slightly concave; the movable finger half as long again as the front margin of the hand.

Thoracic segments (figs. 2a and 2b) a little more slender than in *A. vicinus*; second segment as long as the third. Five posterior segments with their anterior lateral processes in the main shaped as in *A. vicinus*, excepting that their distal part is more slender and generally more produced; a lateral, sharp, triangular protuberance in front of the insertion of the legs on the four posterior segments. — Second pair of legs (fig. 2d) a little more slender than in *A. vicinus*; fifth joint slightly longer than the sixth and as long as the fourth; second joint with a strong spine on the distal lower angle; fourth joint with a long spine both on the upper and the lower distal angle; fifth joint with a terminal upper spine and two strong and distant spines on the lower margin; sixth joint twice as long as broad; with two spines above and six below; seventh joint with a minute tooth below at the middle. Seventh pair of legs (fig. 2e) with second joint nearly five times as long as broad; the following joints are rather slender; sixth joint twice as long as the seventh which is nearly as long as the claw.

Abdomen (fig. 2b) differs somewhat from that in *A. vicinus*. The lateral processes of the five anterior segments are long, distally more slender and directed more obliquely backwards than in that species. Sixth segment a little less than the combined length of second to fifth segment, scarcely less than three times as long as broad at the middle and with six pairs of lateral setæ originating from minute tubercles. — (Uropods lost).

Length of the largest specimen, a female with small marsupial lamellæ, 10 mm.

Remarks. This species is intermediate between the two preceding more robust forms, *A. spinosus* and *A. vicinus*, and the two following very slender species. It is more similar to the latter forms by the slender chelæ, but differs strongly from these and is rather allied to the two first-named species by the long and strong lateral processes on the abdomen, the serrate proximal half of the inner margin of first antennular joint, etc.

Occurrence. The "Ingolf" has taken this species at two deep-sea stations:

Davis Strait: St. 24: Lat. 63° 06' N., Long. 56° 00' W., 1199 fm., temp. 2.4°; 2¹/₂ spec.

Denmark Strait: St. 11: Lat. 64° 34' N., Long. 31° 12' W., 1300 fm., temp. 1.6°; 2 badly preserved spec.

4. *Apseudes gracilis* Norm. & Stebb.

(Pl. I, figs. 3a—3d.)

1886. *Apseudes gracilis* Norman & Stebbing, Transact. Zool. Soc. London, Vol. XII, Pt. IV, p. 95, Pl. XX.

Subadult Female. As it disagrees with the description and figures of the English authors in some particulars, the more essential features may be mentioned.

The eye-lobes (fig. 3a) have the outer distal angle produced in a thin, moderately short process directed nearly forwards. The lateral processes somewhat small, but otherwise shaped and directed about as the eye-lobes. The surface of the carapace has no transverse furrow.

Antennulæ (fig. 3a) somewhat short; the first joint somewhat short, about two and a half times as long as the second, without serration on the inner margin; the outer flagellum 13-jointed, a little shorter than the sum of the two proximal peduncular joints and four times as long as the short,

3-jointed inner flagellum. — Antennæ with the squama conspicuously shorter than the penultimate joint of the flagellar peduncle; the flagellum 8-jointed.

Chelipeds (fig. 3 b) agreeing with the figure of Norman & Stebbing, thus rather slender and without any spine or tooth on the posterior or lower margin of the joints. Basal joint not fully four times as long as broad; lower margin of the carpus half as long again as that of the ischium. Chela almost three and a half times as long as broad, with the posterior margin somewhat concave; movable finger conspicuously more than half as long again as the front margin of the hand and considerably overreaching the fixed finger, which has the major part of the distal half of its incisive margin finely serrate (fig. 3c) and a number of setæ inserted on the outer side along the serration.

Second thoracic segment, seen from above (fig. 3a), has the first joint of its legs triangular with the front margin even sloping a little backwards and the outer angle produced a little forwards; third segment with the outer angle acute and produced slightly forwards. The four posterior segments more slender than in *A. vicinus*; their lateral process proportionately somewhat small with the terminal part thin and no protruding proximal angle in front or behind; each segment furthermore with a small or rather small process on the ventral surface. — Second pair of legs (fig. 3d) somewhat slender; second joint without any spine at the posterior distal angle; fourth joint even slightly longer than the two following joints combined, without any spine above or below at the end, but with a number of setæ on the upper part of the outer side and along the distal half of the lower margin; fifth joint slightly shorter than the sixth and even slightly broader than long, with a terminal upper spine and two spines on the lower margin; sixth joint distinctly less broad than the fifth, not much longer than broad, with two distal spines above and eight spines along the lower margin; seventh joint with two denticulations below. — (Seventh pair of legs lost in the specimen).

Abdomen about as long as the four posterior thoracic segments combined, slender. Five anterior segments not fully as slender but otherwise shaped nearly as in the following species, thus with the processes from the postero-lateral angles thin and very short, but without processes below. Sixth segment about as long as the sum of the four preceding segments, not fully four times as long as broad, without minute lateral tubercles or setæ. — (Uropods lost).

Length of the specimen described, a female with the marsupial lamellæ very small, 13 mm.

Remarks. The subadult specimen agrees with the description of Norman & Stebbing in some important characters: the antennulæ without serration on the first joint and a very short, 3-jointed inner flagellum (according to the text of the English authors this flagellum is 4-jointed, but the figure has only 3 joints), the antennal squama short, the general shape of the chelipeds with setæ on the fixed finger and no spines on any joint, finally the shape and armature of the joints of second legs excepting that the lower margin of sixth joint has only 8 spines instead of 10. But it differs in several features: the processes of the cephalothorax and thoracic segments are much smaller than according to the English figures, the abdomen has no processes below and no tubercles on the last segment, the movable finger of the chelæ is longer than the fixed, finally some further particulars to be found by a comparison of my text with the description of Norman & Stebbing. I am, however, apt to think that my immature specimen is only a kind of variety of *A. gracilis*, not a separate species, and especially the shape and armature of the joints of second pair of legs bear strong witness for this view.

Together with the specimen described a very young specimen, measuring only 5.7 mm. and with seventh pair of thoracic legs not developed, was taken. It shows several peculiarities due to its very young age, and among these one may be pointed out, viz. that the lower margin of the sixth joint of second legs has only 5 spines; besides it has a spine at the lower distal angle of fourth joint of the same legs, but this feature may be interpreted as variation.

Occurrence: The "Ingolf" has captured this species at a single station.

Denmark Strait: St. 10: Lat. 64° 24' N., Long. 28° 50' W., 788 fm., temp. 3.5°; 1 subadult and 1 very young specimen.

Besides the "Valorous" took the species at the following place.

South of Davis Strait: Lat. 59° 10' N., Long. 50° 26' W., 1750 fm.

Distribution. According to the English authors quoted this species was taken by the "Valorous" at two stations situated considerably South of the Denmark Strait, viz.: Lat. 56° 11' N., Long. 37° 41' W., 1450 fm., and Lat. 55° 10' N., Long. 25° 58' W., 1785 fm.

5. *Aapseudes gracillimus* n. sp.

(Pl. I, figs. 4a—4e).

Subadult Female. Body and appendages still more slender than in *A. gracilis*. — Cephalothorax nearly as in that species, but the eye-lobes more produced. The carapace without transverse furrow.

The antennulæ (fig. 4a) as long as the carapace and the two anterior free segments combined; first joint slender, about three times as long as the second, without serration on the inner margin. Outer flagellum 17-jointed, about as long as the peduncle and more than two and a half times as long as the 4-jointed flagellum. — The antennæ almost as long as the antennular peduncles; flagellum 8-jointed; the squama reaches beyond the end of the penultimate joint of the flagellar peduncle.

The chelipeds very slender (fig. 4c) and their joints without spines or serration on the lower (posterior) margin. Second joint is considerably curved, long, only a little shorter than the carpus, five times as long as broad; carpus with the lower margin only somewhat less than twice as long as that of the ischium. Chela four times as long as broad, with the posterior margin very concave; the movable finger twice as long as the front margin of the hand and considerably longer than the fixed finger, which has about 4 setæ along the distal half of its incisive margin but no serration or setigerous area.

Second thoracic segment (fig. 4a) has the first joint of the legs triangular with the front margin nearly transverse and only the terminal angle produced slightly forwards as an acute denticle. The four posterior segments have the lateral processes considerably produced, distally slender, acute, and no produced angles from their proximal part; the processes on the lower surface of the segments conspicuous or even rather long. — Second pair of legs (fig. 4d) slender, second joint with a spine on the lower distal angle; fourth joint conspicuously longer than the sum of the two following joints and with a spine on the lower distal angle; fifth joint about half as long again as broad, slightly longer than the sixth, with a terminal spine above and two spines on the lower margin; sixth joint

in the largest specimen with 7, in somewhat smaller specimens with 6 spines on the lower margin and 2 on the upper; seventh joint with three denticulations below. — Seventh pair of legs (fig. 4e) very slender; second joint about five and a half times as long as broad; sixth joint has on the distal half of the inner margin a row of small spines; seventh joint even slightly longer than the sixth; the claw more than two-thirds as long as seventh joint.

Abdomen (fig. 4b) not quite as long as the sum of the four posterior thoracic segments, very slender. The five anterior segments with conspicuous, slender processes below, and the processes from the postero-lateral angles very short and slender. Sixth segment as long as the three preceding segments combined, even a little more than four times as long as broad at the middle, without tubercles and lateral setæ.

Length of the largest specimens, with the marsupial lamellæ very small, 14 mm.

Remarks. This species differs from *A. gracilis* Norm. & Stebb. in several features of more or less importance. But some characters, viz. the considerably longer inner flagellum of the antennulæ, the extreme slenderness of the chelipeds, no serration or setigerous area on the fixed finger of the chela, finally the oblong fifth joint of second pair of legs show, according to my judgment, that the form must be considered a separate species.

Occurrence. Only taken by the "Thor" at the following locality.

South of Iceland: Lat. 62° 57' N., Long. 19° 58' W., 505 fm.; 13 specimens, all mutilated or in fragments.

Sphyrapus Norman, M. S.; G. O. Sars.

Five species have been established, three of which are represented in our material.

6. **Sphyrapus anomalus** G. O. Sars.

1869. *Apseudes anomalus* G. O. Sars, Nyt Mag. for Naturv. B. XVI, p. 439.

1881. *Sphyrapus* — — — — —, Arch. for Math. og Naturv. B. 7, p. 19.

1886. — — — — — Norman & Stebbing, Trans. Zool. Soc. London, Vol. XII, Pt. IV, p. 101,
Pl. XXI, fig. II.

! 1896. — — — — — G. O. Sars, Account Crust. Norway, Vol. II, p. 9; Pls. III—IV.

This species, which has been excellently figured and described by G. O. Sars, is closely allied to the next form, *S. serratus* G. O. S. The most conspicuous and perhaps also the most valuable difference between them is the shape of the "epimera" of the five anterior abdominal segments; in *S. serratus* these epimera are, seen from above, very outstanding, obliquely triangular, acute but not acuminate, constituting a real saw; in *S. anomalus* they were described by Sars as "not at all produced" and drawn as scarcely or not visible from above, which agrees well with their shape in the males, but often not completely with their shape in the females. In the female from "Ingolf" St. 4 the epimera are visible from above, but much smaller than in *S. serratus*, with the freely outstanding part rather narrow, acuminate and acute, and in several other females the epimera, seen obliquely from above and somewhat from the side, are a little produced, acute, but directed mainly downwards. In all specimens of *S. anomalus* the fifth joint of second pair of legs has only two strong spines on

the distal part of its lower margin, while all adult females of *S. serratus* have three such spines (in a single specimen only two spines on one leg and three on the other); furthermore the basal joint of the antennulæ is a little broader and shorter in *S. anomalus* than in *S. serratus*.

Occurrence. The "Ingolf" has taken this species at eight stations.

Davis Strait: St. 32: Lat. 66° 35' N., Long. 56° 38' W., 318 fm., temp. 3.9°; 2 spec.
 — — St. 28: Lat. 65° 14' N., Long. 55° 42' W., 420 fm., temp. 3.5°; 2 spec.
 — — St. 25: Lat. 63° 30' N., Long. 54° 25' W., 582 fm., temp. 3.3°; large number of specimens.

West of Iceland: St. 8: Lat. 63° 56' N., Long. 24° 40' W., 136 fm., temp. 6.0°; 2 spec.

South-West of Iceland: St. 85: Lat. 63° 21' N., Long. 25° 21' W., 170 fm.; 3 spec.

East of Iceland: St. 4: Lat. 64° 07' N., Long. 11° 12' W., 237 fm., temp. 2.5°; 1 spec.

North of Iceland: St. 126: Lat. 67° 19' N., Long. 15° 52' W., 293 fm., temp. ÷ 0.5°; 10 spec.

— — — St. 124: Lat. 67° 40' N., Long. 15° 40' W., 495 fm., temp. ÷ 0.6°; 1 young.

Furthermore the species has been taken at East Greenland by two Danish expeditions.

Cape Dalton: Lat. 69° 24.6' N., ab. Long. 23° 30' W., 9—11 fm., II^d Amdrup Exp.; large number of specimens.

Lat. 69° 25' N., Long. 20° 1' W., 167 fm., large stones and clay, Ryder Exp.; 1 spec.

Hurry Inlet: Lat. 70° 50' N., Long. 22° 31' W., 10 fm., II^d Amdrup Exp.; 1 specimen.

Lat. 72° 40' N., Long. 20° 10' W., 100 fm., Ryder Exp.; 1 spec.

Distribution. *S. anomalus* has been captured by Cand. mag. Ad. Jensen ("Michael Sars") at two places North-East and East of the Shetlands Islands: Lat. 61° 40' N., Long. 3° 11' E., 220 fm.; 1 spec., and Lat. 60° 57' N., Long. 3° 42' E., 190 fm., temp. 6.1°; 1 spec. The "Thor" has captured it in the Skager Rak in depths from 280 to 350 fm. Sars has taken it "along the whole Norwegian coast from the Christiania Fjord to Vadsö", in depths "from 100 to 400 fathoms". Finally it is known from the Kara Sea, 50 fm. (Hansen) and from the places South of Novaia Zemlia, between Lat. 70° 20' and 70° 40' N., Long. 54° 08' and 56° 35' East, 61 and 90 meters (Stappers).

According to all these statements *S. anomalus* has been taken a single time in 50 fathoms in the very cold Kara Sea, three times in still lesser depths South of Novaia Zemlia and at numerous places in depths between 100 and 582 fathoms both in the cold area and especially at localities with the temperature somewhat or even considerably above the zero.

7. *Sphyrapus serratus* G. O. Sars.

1881. *Sphyrapus serratus* G. O. Sars, Arch. for Math. og Naturv. B. 7, p. 20.

! 1885. — — — Norske Nordhavs-Exp. Crust. I, p. 66, Pl. XXI.

The differences between this species and *S. anomalus* have been pointed out above.

Occurrence. The "Ingolf" has captured *S. serratus* at five stations, all in the cold deep-sea area.

North of Iceland: St. 124: Lat. 67° 40' N., Long. 15° 40' W., 495 fm., temp. ÷ 0.6°; 1 spec.

— — — St. 125: Lat. 68° 08' N., Long. 16° 02' W., 729 fm., temp. ÷ 0.8°; 1 spec.

South of Jan Mayen: St. 119: Lat. 67° 53' N., Long. 10° 19' W., 1010 fm., temp. ÷ 1.0°; 4 spec.

— - — St. 117: Lat. 69° 13' N., Long. 8° 23' W., 1003 fm., temp. ÷ 1.0°; 4 spec.

— - — St. 113: Lat. 69° 31' N., Long. 7° 06' W., 1309 fm., temp. ÷ 1.0°; 4 spec.

Besides this species has been taken by the Norwegian North-Atlantic Expedition at two stations between Norway and Iceland in 1163 fm. and 1215 fm. and the temperatures were ÷ 1.1° and ÷ 1.2°; besides it was taken West of Spitzbergen: Lat. 77° 58' N., Long. 5° 10' E., 1333 fm., temp. ÷ 1.4° (Sars).

S. serratus has thus been captured in all nine times, and always in temperatures somewhat or considerably below zero.

8. *Sphyrapus tudes* Norm. & Stebb.¹⁾

1886. *Sphyrapus tudes* Norman & Stebbing, Trans. Zool. Soc. London, Vol. XII, Pt. IV, p. 99; Pl. XXII, fig. 1.

This very characteristic species has been well described and figured by the English authors.

Occurrence. *S. tudes* has not been taken by the "Ingolf" but at two localities by the "Thor".

South-West of the Færoes: Lat. 61° 15' N., Long. 9° 35' W., 475 fm.; 26 spec.

— - - — Lat. 61° 7' N., Long. 9° 30' W., 440 fm.; 22 spec.

Distribution. This species was taken by the "Porcupine" South of Rockall: Lat. 56° 13' N., Long. 14° 18' W., 420 fm. (Norman & Stebbing).

Fam. II. Tanaidæ.

This family comprises eighteen genera hitherto established; twelve of these are represented in the "Ingolf" material, and three new genera are established.

Neotanais Beddard.

(*Alaotanais* Norm. & Stebb.).

This genus, which contains some of the largest forms of the family, comprises five species already established. The "Ingolf" collection contains two species, one of which is new, but a third species is enumerated below because it was taken by an English expedition near the entrance of the Davis Strait.

9. *Neotanais serratispinosus* Norm. & Stebb.

(Pl. I, figs. 6a—6b; Pl. II, figs. 1a—1c).

1886. *Alaotanais serratispinosus* Norman & Stebbing, Trans. Zool. Soc. London, Vol. XII, Pt. IV, p. 111; Pl. XXIII, fig. 1; Pl. XXIV, fig. 1.

¹⁾ The fourth species of this genus, *Sphyrapus malleolus* Norm. & Stebb., can scarcely be included in this report, as it has not been taken by any Danish expedition, and the most northern among the localities enumerated by the English authors is at Lat. 57° 11' N., Long. 37° 41' W., thus South-East of Cape Farewell, but about 12 geographical miles South of the area dealt with in the present paper.

Norman & Stebbing have published a good description and a number of figures of this characteristic species. The single adult specimen at hand, a female with the marsupium fully developed, measures 6.7^{mm} in length, and is somewhat smaller than the largest specimen seen by the English authors, as they stated it to be 8.5^{mm} long. My specimens agree well with their description, but I think it useful to give some analytical figures with some remarks.

The chelæ (fig. 6a) are somewhat longer than the carpus, a little more than twice as long as broad, with the posterior margin considerably sinuate, as almost its proximal half is conspicuously concave, the distal half rather convex. The movable finger is somewhat shorter than the front margin of the hand; its incisive margin is armed with six low to extremely low teeth (fig. 6b) increasing much in breadth from the proximal to the penultimate tooth and decreasing much in height from the first to the last tooth; each tooth has its distal end produced into a minute, oblong-triangular, acute tip. The fixed finger has its terminal part bent considerably and shaped as a thick, somewhat spiniform process with the margins glabrous, while the remaining long part of the incisive margin has almost its proximal half furnished with a close row of numerous very small teeth and the distal portion with five large, very broad and proportionately somewhat low, obtuse, brownish teeth.

Fig. 1a represents the terminal part of third left thoracic leg from behind; some nine long, glabrous and strong setæ originate in an oblique row from the margin of sixth joint, which above terminates in three very thick, serrate spines; seventh joint, seen in the intervals between the setæ, is distally slender and three times as long as the straight claw. — Fig. 1b represents the terminal part of sixth left leg from behind, and fig. 1c the corresponding part of seventh left leg from above; the last-named part has a transverse row of spines above the base of the long setæ at the end of sixth joint; in both legs the seventh joint is distally a little flattened and widened towards the rounded end which expands as a roof beyond the insertion of the claw; the distal part of seventh joint is closely serrate along the terminal margin and the most distal portion of the lateral margins, and from this serration to near the middle of the joint each lateral margin has a very close row of minute, very slender spines; the claw is half or more than half as long as seventh joint.

Occurrence. This fine species was taken by the "Ingolf" at a single station.

South of Greenland: St. 22: Lat. 58° 10' N., Long. 48° 25' W., 1845 fm., temp. 1.4°; 3 spec.

Distribution. Norman & Stebbing examined specimens from a station South of Greenland at Lat. 56° 11' N., Long. 37° 41' W., 1450 fm., and from two localities respectively North-West of Ireland and West of North Ireland, 1360 and 1380 fm.

10. *Neotanais hastiger* Norm. & Stebb.

1886. *Alaotanais hastiger* Norman & Stebbing, Trans. Zool. Soc. London, Vol. XII, Pt. IV, p. 1103; Pl. XXIII, fig. 2.

Occurrence. This species, which has not been gathered by any Danish expedition and has never been seen by me, is enumerated here because the single specimen hitherto known has been taken by the "Valorous" at a locality not far from the "Ingolf" St. 38 and between this station and Cape Farewell, viz. at Lat. 59° 10' N., Long. 50° 25' W., 1750 fm.

11. *Neotanais giganteus* n. sp.

(Pl. II, figs. 2a—2h.)

Adult Male. Carapace nearly as long as the three following segments combined, seen from above peculiarly shaped (fig. 2a), as scarcely its front half has the lateral margins feebly convex and is only a little longer than broad, while the major posterior part is laterally considerably expanded, but the postero-lateral area of this part is subquadrangular, well marked off by a suture and must be considered the coxal joint of the chelipeds. A portion of each lateral margin somewhat behind the front angle is furnished with a close row of outstanding, stiff setæ (fig. 2b).

The ocular plate is well marked off (fig. 2c), nearly ovate, with the end subacute and without any vestige of visual elements. — The antennulæ (fig. 2b) are somewhat longer than the carapace, 7-jointed; the first joint is very long, as long as the other joints combined, seen from above with the inner margin straight, the major proximal part of the outer margin distinctly concave, but the distal part of this margin somewhat convex and bearing a close longitudinal row of horizontal, stiff setæ. Second joint almost as thick, but somewhat less than half as long, as the first, with a shorter row of stiff, horizontal setæ on the outer margin. Third joint is short and rather thick; fourth joint is somewhat shorter than the second, tapers much towards the end and has on the outer side a long row of long sensory hairs; fifth and sixth joints, and especially the last-named, are short, and seventh joint is extremely short. — The antennæ (fig. 2c) 9-jointed; second, fourth and fifth joints long; third joint a little longer than deep; sixth joint a little shorter and considerably thinner than the fifth; seventh and especially eighth joint somewhat shorter and thinner than the sixth, and ninth joint short and very thin.

The chelipeds (fig. 2d) are robust. The coxal joint is mentioned above. The basal joint is moderately short but extremely thick, its whole lower side being produced downwards as a long, thick and rounded protuberance. The carpus is long, almost three times as long as deep, and the proximal third of its lower margin is deeply concave. The chela is a little longer than the carpus, two and a half times as long as broad; the movable finger, which is much curved near the middle and somewhat shorter than the strongly convex anterior margin of the hand, has almost the proximal half of its incisive margin serrate and a strong, triangular tooth considerably beyond the middle. The fixed finger has on the incisive margin near its middle a long, straight, subcylindrical, distally rounded process, and near the base a broad protuberance with two small incisions. The fingers cross each other greatly, while a large interval is left between their major proximal part.

The thoracic segments subsimilar in shape, length and breadth (fig. 2a), excepting the seventh segment which is somewhat shorter; the lateral margins of the segments are very convex. — The legs are moderately slender and somewhat long, all subsimilar, the only exception being that the real claw is extremely short on the anterior pairs (fig. 2f), a little longer on the posterior pairs (fig. 2g). Third joint is extremely short, fifth joint a little longer than the fourth, a little shorter than the sixth (fig. 2e), and the distal half of its lower side is furnished with a number of setæ; sixth joint has the distal half of the lower margin and the end set with a good number of setæ; seventh joint with claw much shorter than sixth joint.

The abdomen as long as the sum of the four preceding segments; its four anterior segments are broader than the thorax; the pleopods are strongly developed. Sixth segment not quite as long

as the two preceding segments combined, somewhat narrower than fifth segment, and posteriorly emarginate. — Uropods (figs. 2 a and 2 h) slightly shorter than the abdomen; peduncle about two and a half times as long as broad; endopod very long with thirteen joints, the first joint conspicuously thicker than the second and third and as long as these two combined; exopod very small, two-jointed, with the proximal joint shorter than the distal.

Length 20^{mm}.

Remarks. Though new species of this family as a rule ought not to be founded on adult males, I venture to establish a new species on the specimen described, because it is not only characteristic but very much larger than any specimen of Tanaidæ hitherto captured. The animal when hauled up from the sea was quite white.

Occurrence. The "Ingolf" has taken this species at a single station.

Davis Strait: St. 36: Lat. 61° 50' N., Long. 56° 21' W., 1435 fm., temp. 1.5°; 1 spec.

Heterotanaïs G. O. S.

Of this genus nine species have been established. The material at hand contains only a single probably new species.

12. *Heterotanaïs groenlandicus* n. sp.

(Pl. I, figs. 5 a—5 g.)

1887. *Heterotanaïs limicola* H. J. Hansen, Vidensk. Medd. Naturh. Forening i København for 1887, p. 178 (Probably not *H. (Paratanaïs) limicola* Harger).

Female. The body (fig. 5 a) about six times as long as broad. — Carapace only a little longer than the two anterior thoracic segments combined, a little longer than broad, anteriorly not fully half as broad as somewhat before the posterior margin (fig. 5 b).

The eye-lobes are considerably produced, distally not angular but rounded (fig. 5 c); the eyes are moderately large, black, but the black pigment renders it impossible to count the ocelli, a couple of which are seen at the hind margin of the black spot. — The antennulæ (figs. 5 a and 5 c) are a little shorter than the carapace, somewhat slender; first joint somewhat longer than the two others combined, almost four times as long as deep; third joint about twice as long as the second. — Antennæ somewhat slender; fourth joint (formed by fusion of fourth and fifth joints) only as long as the two preceding joints combined.

The chelipeds (fig. 5 c) are somewhat robust; the carpus is almost twice as long as deep. The chela is somewhat longer than the carpus and somewhat more than twice as long as broad; the movable finger is much shorter than the hand; the fixed finger (fig. 5 d) is somewhat expanded on the incisive side with about three low protuberances and near the end rather broad and distally rectangular, while the very short apical part of the finger is slender and marked off from the inner expansion.

Second pair of legs (fig. 5 c) with a very long seta from the upper distal angle of fifth joint; sixth joint about as long as fifth and fourth joints combined and a little shorter than seventh joint with claw; seventh joint a little shorter than the claw. Third pair of legs (fig. 5 e) have the seventh

joint and the claw about equal in length and together conspicuously more than half as long as the sixth joint. Seventh pair of legs (fig. 5f) with the second joint proportionately somewhat slender, four times as long as broad.

Abdomen scarcely or slightly broader than the thorax. — Uropods a little more than half as long as the abdomen; the endopod five-jointed (fig. 5g), but sometimes the first joint is divided again into two joints by a less conspicuous suture, and the relative length of the joints shows considerable variation; exopod as long as or longer than the first joint of the endopod, two-jointed.

Length of a female with marsupium 2.9^{mm}.

Remarks. In the above-named paper I had referred specimens of this species to *Heterotanais* (*Paratanais*) *limicola* Harger, though, as may be seen in the paper, I was well aware that Harger's description of the eyes did not agree with my specimens. Harger said that "the eyes are small and inconspicuous", while in the specimens seen by me the eyes are of considerable size, black and consequently very conspicuous, and having examined a large number of species of this family I am now inclined to think that the difference mentioned is a specific character. Harger's figures of his *H. limicola*, especially that of the cheliped, are too small for forming a judgement of some particulars. — *H. groenlandicus* differs in several important features from *H. Oerstedii* Kr., in which the eye-lobes are subacute, the third antennular joint not much longer than the second, the carpus and the chela of the chelipeds considerably thicker and the endopod of the uropods only four-jointed.

Occurrence. The "Ingolf" gathered this species at a single locality.

West coast of Greenland: Mouth of Ameralik Fjord, Godthaab (about at Lat. 64° 11' N.), 5—70 fm., shells; 25 spec.

The Copenhagen Museum possesses specimens from a few places in West Greenland, viz. Prøven (Lat. 72° 23' N., Long. 55° 23' W.), 1 spec.; Jakobshavn (Lat. 69° 13' N., Long. 51° 0' W.), 1 spec. (brought home by Mag. Traustedt); Godthaab, 10 spec. found between numerous specimens of the genus *Metopa* dredged in "deep water" (probably 40—60 fm.) where the bottom was clothed with *Sertularia*.

Distribution. Apart from West Greenland this species has not yet been recorded.

Tanais H. Milne-Edw.

Of this genus seventeen species have been established, but only a single form is known from our northern area.

13. *Tanais Cavolinii* H. Milne-Edw.

- | | | |
|---------|--------------------------|--|
| 1829. | <i>Tanais Cavolinii</i> | H. Milne-Edwards, in Audouin and Milne-Edwards: Précis d'Entomologie, I, Pl. XXIX, fig. 1 (Quoted from Miss Harr. Richardson). |
| ! 1842. | <i>Tanais tomentosus</i> | Krøyer, Nat. Tidsskr. B. IV, p. 183. |
| ? | — | Krøyer, Voy. en Scand. Crust., Pl 27, fig. 2 a—q. |
| 1847. | — | Krøyer, Nat. Tidsskr. Ny R., B. II, p. 412. |
| ! 1896. | — | G. O. Sars, Account Crust. Norway, Vol. II, p. 12, Pl. V. |

1899. *Tanais Cavolinii* A. M. Norman, Ann. Mag. Nat. Hist. Ser. 7, Vol. III, p. 332.
 1905. — — Harr. Richardson, Mon. Isop. North America, Bull. U. S. Nat. Mus. No. 54, p. 8.

The tangled synonymy of this well-known species is found in Norman's and Miss Richardson's papers.

Occurrence. The "Ingolf" secured this species at a single locality.

Færoes: Trangisvaag, between algæ at the shore. Many specimens.

In the paper on the Malacostraca from West Greenland I stated that a specimen with the label: "Greenland, Krøyer's effects", was preserved in the Copenhagen Museum; for this reason I mentioned the species, but did not number it, as I feared that the statement was not quite certain. Nevertheless Norman and other authors have on my authority included "Greenland" in the enumeration of the distribution of the species. But as *T. Cavolinii* has not been found at Iceland and has not in recent time been captured at Greenland I am now nearly sure that the species does not live at the last-named country.

Distribution. This species is known from Øresund (Krøyer), the western coast of Norway northwards to Lat. 63° 20' N. (G. O. Sars), Scotland northwards ab. to Lat. 56½° N. (Norman), England and Ireland (several authors), the Channel Islands (various authors), West France (Chevreux), many places in the western half of the Mediterranean (several authors), Azores (Barrois); finally Connecticut, Long Island Sound and Castle Harbour, Bermudas (H. Richardson). It lives always in quite shallow water, from the beach down to a few fathoms.

Pseudotanais G. O. S.

Of this genus five valid species have been established; four of these are boreal or arctic, while the fifth species is only known from the Mediterranean. The "Ingolf" captured six species, three of which are new.

This genus differs materially from all other genera by having fifth and sixth thoracic segments very long as compared with the fourth segment and especially with third and second segments. It is placed here because in some other features it is intermediate between *Tanais* and *Paratanais*—*Typhlotanais*. It agrees with *Tanais* and differs from the other genera in possessing only a single pair of marsupial lamellæ; as to antennulæ, antennæ, uropods and development of second pair of legs as compared with the following pair it agrees on the whole with *Paratanais*—*Typhlotanais*; as to the mouth-parts — mandibles and maxillipeds — it differs strongly from the genera named and is more related to *Leptognathia*, though showing peculiarities not found in the last-named genus.

14. *Pseudotanais forcipatus* Lilljeborg.

(Pl. II, figs. 3 a—3 e).

1864. *Tanais forcipatus* Lilljeborg, Bidrag till kännedomen om de inom Sverige och Norrige förekommande Tanaidernas familj., p. 16 (Female and Male).
 1897. *Pseudotanais forcipatus* G. O. Sars, Account Crust. Norw., Vol. II, p. 40; Pl. XVII, fig. 1 (Female and subadult Male).

! 1907. *Pseudotanaïs forcipatus* Vanhöffen, Zool. Jahrbücher, Abth. für Syst., Bd. XXV, p. 511; Taf. 20, fig. 10—12 (Adult Male).

Female. Sars has published a good description with numerous figures of this sex. To his description may be added that the front margin of the head, seen from above, is shaped as in *P. Lilljeborgii* (comp. fig. 5a), thus nearly transverse, feebly convex at the middle, not emarginate at the antennulæ, and the antero-lateral angles not produced.

The female is readily distinguished from the other northern species, excepting *P. abyssi* n. sp., by the strongly forcipate chelæ; from *P. abyssi* it is separated by having no pleopods, the uropods much shorter, the antennulæ and the walking legs shorter and thicker, etc.

Subadult Male. It has been figured and mentioned by Sars, who erroneously considered it the adult male. It agrees with the female in the shape of the chelæ, the antennulæ, the distal joints of the thoracic legs, etc., but it differs in three features: fourth and fifth thoracic segments shorter, but abdomen proportionately longer and thicker than in the female, and the pleopods well developed with long setæ. — In younger male specimens the thoracic and abdominal segments are more similar to those of the female, while the pleopods are smaller with the setæ short.

Adult Male. Almost fifty years ago Lilljeborg published a brief description in the Swedish language of this sex, but did not figure it, and some five years ago Vanhöffen (l. c.) pointed out the main differences between female and adult male, with three analytical figures of male appendages. A more full description may be given here.

The anterior end of the head about half as broad as the carapace (fig. 3a); the front margin is deeply emarginate at the base of each antennula (fig. 3c) and the antero-lateral angles considerably produced with the end blunt; in a lateral view (fig. 3b) the head is produced forwards covering the base of the outer side of the antennula as a rounded plate.

The antennulæ are seven-jointed (figs. 3b and 3c); the two proximal joints are very thick, subequal in length and together a little longer than the five others combined; third joint broad and a little longer than the two next joints combined; fourth joint very short, with a tuft of sensory hairs on the lower distal angle; the four distal joints increase considerably in length and decrease in thickness from the fourth to the seventh; fifth and sixth joints with some sensory hairs at the outer distal angle; seventh joint considerably longer than the sixth.

The chelæ (fig. 3b) are a little more than twice as long as broad and differ much from those of the female; the fixed finger at the base twice as broad as the movable, but the major distal part of its incisive margin is so concave, that a conspicuous interval is seen between the fingers when their terminal parts cross each other. The movable finger is evenly curved, somewhat longer than the front margin of the hand; the inner surface of the hand has above the insertion of the movable finger a transverse row of about nine peculiar setæ.

Fifth thoracic segment (fig. 3a) a little shorter than the two preceding segments combined and as long as sixth segment. The thoracic legs are conspicuously more slender than in the female. Second pair have the seventh joint with claw longer than sixth joint; third and fourth pairs with the spurs short and simple, while their seventh joint plus claw is only a little shorter than sixth joint; on the three posterior pairs (fig. 3d) seventh joint together with its claw is much longer

than in the female, about as long as the sixth joint, and the claw is conspicuously longer than seventh joint.

Abdomen much larger in proportion to the thorax than in the female, as long as the sum of the four posterior thoracic segments; sixth segment (fig. 3 e) produced considerably backwards, much longer than in the female and with the hind margin deeply emarginate, while the postero-lateral angles are scarcely rounded. — Pleopods about as in the female *P. abyssi*, with moderately narrow rami and the setæ very long. — Uropods (fig. 3 e) in the main as in the female, but a little more slender, and one of the terminal setæ of the endopod extremely long.

Length of two males 1.25 and 1.40 mm.

Occurrence. The "Ingolf" has taken this species at two localities.

West Greenland: Inner end of Ameralik Fjord, Godthaab, muddy bottom; 43 specimens, 2 of which are adult males.

North of Iceland: St. 128: Lat. 66° 50' N., Long. 20° 2' W., 194 fm., temp. 0.6°; 4 spec.

P. forcipatus has besides been captured by other collectors at the following five localities within our area.

West Greenland: Karajok Fjord, ab. Lat. 70° 20' N.; many spec. Vanhöffen.

East Iceland: Faskrud Fjord, 20—50 fm.; 1 spec. Mag. sc. R. Hørring.

East Greenland: Cape Dalton, Lat. 69° 24' N., 9—11 fm.; 5 spec. (♀ and ♂). II^d Amdrup Exp.

- — Turner Sound, Lat. 69° 44' N., 3 fm.; 8 spec. II^d Amdrup Exp.

- — Denmark Isl., Lat. 70° 27' N., Long. 26° 12' W., 10 fm., clay; 2 spec. Ryder Exp.

- — — several spec. Ryder Exp.

Distribution. This species has been established on specimens taken off Bohuslän in 50—60 and 120—130 fm. In the Danish seas it has been taken four times, viz. two times in the south-western Kattegat, 13 and 15 fm., and two times in Skagerak, in 70 and 125 fm. (H. J. Hansen). According to Sars it has been found along the whole Norwegian coast northwards about to Lat. 70° N. Furthermore it was captured in Klosterelv Fjord, East Finmark, close upon the frontiers of Russia (A. M. Norman), in the Barents Sea at Lat. 76° 26' N., Long. 60° 55' N., vertical pelagic haul from 30 to 0 meter (Stappers) and at Northbrook Island, Franz Joseph Land, 10 fm. (Th. Scott). Finally it is known from some localities in the northern Scotland, in 8—10 and 50—55 fm. (Th. Scott).

This species is thus boreal and arctic and lives in very moderate depths, from some few fathoms and down to nearly 200 fathoms.

15. *Pseudotanaïs abyssi* n. sp.

(Pl. II, figs. 4a—4i.)

Female. The body of the females with marsupium (fig. 4a) somewhat more than three times as long as broad; in the immature female it is conspicuously more slender. — Carapace, seen from above, with the lateral margins considerably convex excepting near the front end and two and a half times as broad as this front end; the anterior margin feebly concave behind the antennulæ, feebly produced at the middle and at the lateral angles. — Eyes wanting.

The antennulæ (figs. 4 a and 4 c) as long as the carapace, the second segment and half of the

third segment combined, rather slender. First joint, seen from the side, not fully five times as long as deep, decreasing conspicuously in depth from the base towards the middle and somewhat longer than the two other joints combined; third joint only a little longer than the second. — Antennæ (fig. 4 c) moderately slender; second and third joints without any spine at the distal upper angle; fourth joint (in reality formed by a fusion of fourth and fifth joints) two and a half times as long as the penultimate joint.

Chelipeds (fig. 4 d) somewhat slender. Carpus conspicuously longer than the basal joint, two and a half times as long as deep. Chela much longer than the carpus, nearly two and a half times as long as broad, with the posterior margin feebly concave; the fixed finger only slightly broader than the proximal part of the movable and keeping the same breadth from near the base to the middle; the movable finger is conspicuously longer than the front margin of the hand, moderately slender, with the major part of its incisive margin almost convex, at the base far from touching the fixed finger, so that the fingers, when their distal parts are crossed, are very forcipate, leaving a considerable triangular interval between their proximal halves.

Fifth thoracic segment (fig. 4 b) as long as the sum of the three preceding segments and scarcely or slightly longer than the sixth segment. — The thoracic legs are slender and somewhat long. Second pair (fig. 4 e) with sixth joint a little shorter than fourth and fifth joints combined (the articulation between these two joints forgotten on the figure) and almost half as long again as seventh joint with claw, and seventh joint itself is much shorter than the claw. Third pair (fig. 4 f) with the sixth joint not quite half as long again as the fifth and twice as long as seventh joint with claw; seventh joint and claw equal in length; spur on fifth joint moderately slender, not expanded; considerably less than half as long as sixth joint. Three posterior pairs of legs (fig. 4 g) with second joint long and slender, sixth joint a little longer than the fifth, seventh joint rather short, claw extremely short; the spur slender and only about as long as the diameter of the joint.

The abdomen somewhat longer than the sum of the two preceding segments (fig. 4 a). Pleopods well developed; their rami with very long setæ (fig. 4 h). — Uropods somewhat long (fig. 4 i); endopod with the proximal joint a little longer than the distal; exopod slender, reaching a little or somewhat beyond the end of the first joint of the endopod, and its two very distinct joints subequal in length.

Length of a female with the marsupium half developed 1.17^{mm}.

Remarks. This small species agrees with *P. forcipatus* in having no eyes and the chelæ strongly forcipate, but it differs from it in several features, especially in possessing well developed pleopods with long setæ, longer uropods, longer and more slender chelipeds and legs. *P. abyssi* bears some resemblance to *P. oculatus* n. sp., but the latter differs in having distinct ocelli, the chelæ conspicuously less forcipate, the exopod of the uropods longer and in several particulars in the legs. From the other northern species of the genus *P. abyssi* differs greatly, above all in having the chelæ strongly forcipate.

Occurrence. The "Ingolf" secured this species at a single station.

Davis Strait: St. 36: Lat. 61° 50' N., Long. 56° 21' W., 1435 fm., temp. 1.5°; 3 spec. (2 are females with the marsupium half developed).

16. *Pseudotanaïs Lilljeborgii* G. O. Sars.

(Pl. II, figs. 5 a—5 g.)

1881. *Pseudotanaïs Lilljeborgii* G. O. Sars, Arch. for Math. og Naturv. B. 7, p. 48.

! 1897. — Lilljeborgi — Account Crust. Norw., Vol. II, p. 40; Pl. XVII, fig. 2.

Female. Sars has described and figured the female, while he has not seen any immature or adult male. But his representation of the front end of the head with the eyes is not quite correct. My fig. 5 a represents the outline of the carapace with the right antennula; it is seen that the carapace is about two and a half times as broad as its front margin, which is transverse and a little convex at the middle. Sars mentioned the eyes and figured them as black spots, but while these spots frequently are distinct in specimens preserved during some years in spirit, I was unable to find them in specimens from several of the deeper "Ingolf" stations. Furthermore, internal visual elements of an ocellus or some two to three ocelli seem sometimes but not always to be distinguishable, but I have been unable to detect any cornea, so that the eyes must be considered quite rudimentary.

The female is well distinguished from the other species by a combination of characters, among which the most important may be enumerated. Third antennular joint is only slightly longer than the second; the chela is from two and a half to three times as long as broad, not forcipate; the legs are robust, the spurs of third to seventh pairs very broad and short or very short; the pleopods are wanting, and the uropods are short, with the two-jointed exopod not quite as long as the proximal joint of the rather stout endopod. — The length 1.55—2.05^{mm}.

Immature Male. Agrees with the female excepting as to the abdomen, which is stronger and proportionately somewhat or considerably longer than in that sex; furthermore the pleopods are less or more developed according to age. In a younger male the pleopods are rather short with their setæ quite short. In a subadult specimen the pleopods are very well developed, conspicuously longer than the uropods, with their rami very oblong and some of the setæ longer than the rami. In the last-named specimen the third antennular joint is a little thickened below; finally fig. 5 g represents the distal part of seventh leg, which agrees with that of the female in the following important particulars: the spur (on fifth joint) is very short and broad; the seventh joint, which is somewhat thick, is only one-third as long as sixth joint; the claw is thick and short.

Adult Male. Somewhat similar to the male of *P. forcipatus*, but differs in several particulars. In the relative length of the thoracic segments as compared with each other and in the strong development of abdomen it agrees with the male of *P. forcipatus* and differs consequently much from the female.

The front margin of the head (fig. 5 b) between the outer angles of the antennular peduncles is considerably convex; at the outer base of each antennula the lateral part of the head (fig. 5 c) is a somewhat high, flatly rounded lobe which, seen from above (fig. 5 b), is very conspicuous and marked off by an oblique suture forming the continuation of the median part of the front margin; this antero-lateral small part of the head is thus above, but not on the side, marked off as an eye-lobe, but a real eye could not be discovered. — The seven-jointed antennulæ (figs. 5 b and 5 c) are rather similar to those of the male *P. forcipatus*, but the two proximal joints are less robust and the seventh joint not longer than the sixth.

The chelæ (fig. 5 c) are somewhat less than three times as long as broad, with the posterior margin very moderately concave, shaped in the main as in the female, but the fingers are conspicuously shorter in proportion to the hand; the movable finger is thicker and the fixed finger near the base less thick than in the male *P. forcipatus*.

The thoracic legs as in the male *P. forcipatus* conspicuously more slender than in the female and as in that species showing other differences, but besides affording specific characters. Second pair (fig. 5 c) with seventh joint plus claw more than half as long again as sixth joint. Third and fourth pairs with the short spur rather slender, while seventh joint with claw is as long as sixth joint. Three posterior pairs of legs (figs. 5 e and 5 f) with the spur short and rather slender; seventh joint with claw only a little shorter than sixth joint, and the claw itself only half as long as seventh joint.

The five anterior abdominal segments, seen from above (fig. 5 d), with the lateral margins of each segment very convex, so that the entire lateral margin of this part of the abdomen has five deep incisions, while in the male *P. forcipatus* this margin shows no such incisions. Sixth segment posteriorly somewhat produced, but much less than in *P. forcipatus*, and has at the middle of the hind margin a somewhat small, angular emargination. — The highly developed pleopods with some of the setæ more than twice as long the rami. — The uropods in the main similar to those in the female, but the rami a little longer.

Length of the single male 1.8^{mm}.

Occurrence. The "Ingolf" has captured this species at seven localities.

West Iceland: St. 86: Lat. 65° 03' N., Long. 23° 47.6' W., 76 fm.; 1 spec.

East of Iceland: St. 4: Lat. 64° 07' N., Long. 11° 12' W., 237 fm., temp. 2.5°; 3 spec.

- - - St. 58: Lat. 64° 25' N., Long. 12° 09' W., 211 fm., temp. 0.8°; 14 spec.

East Iceland: Seydis Fjord, 20—50 fm.; 5 spec.

North of Iceland: St. 128: Lat. 66° 30' N., Long. 20° 02' W., 194 fm., temp. 0.6°; 4 spec.

- - - St. 126: Lat. 67° 19' N., Long. 15° 52' W., 293 fm., temp. ÷ 0.5°; 5 spec.

Jan Mayen: St. 115: Lat. 70° 50' N., Long. 8° 29' W., 86 fm., temp. 0.1°; 10 spec.

P. Lilljeborgii has besides been taken by other expeditions at six localities situated in very different parts of our area.

West Greenland: Karajok Fjord, ab. Lat. 70° 20' N.; several spec. Vanhöffen.

East Iceland: Nord Fjord, 40 fm.; 5 spec. Mag. sc. R. Hørring.

East Greenland: Angmasivik, at Lat. 65° 51' N.; 1 spec. Mag. sc. Kruuse.

- - Cape Dalton, Lat. 69° 24' N., 9—11 fm.; 2 spec. (♀ and adult ♂). II^d Amdrup Exp.

- - Denmark Isl., Lat. 70° 27' N., Long. 26° 12' W. 4—5 fm., muddy bottom; 1 spec.

Ryder Exp.

- - - - 1 spec. Ryder Exp.

Jan Mayen: 55 fm.; 1 spec. II^d Amdrup Exp.

Distribution. Outside our area hitherto known from Varanger Fjord at Vadsø (ab. Lat. 70° 10' N. in East Finmark), "in a depth of 100—120 fathoms" (G. O. Sars); recently it has been taken in the Barents Sea, Lat. 76° 26' N., Long. 60° 55' E., vertical pelagic haul from 30 to 0 meters (Stappers).

P. Lilljeborgii is thus more arctic than *P. forcipatus*; at the very cold places in the northern East Greenland it was found in quite low water, while in the open sea off Iceland it was most frequently found in depths from about 200 to near 300 fm.

17. *Pseudotanaïs oculatus* n. sp.

(Pl. II, figs. 6a—6d; Pl. III, figs. 1a—1d.)

Female (with the marsupium half developed, and younger specimens). Body four times as long as broad. — Carapace, seen from above (fig. 1a), with the lateral margins somewhat convex excepting near the front end, anteriorly half as broad as somewhat from the hind margin; the front margin is considerably bent, forming an angle at the middle, and the antero-lateral angle is produced, but seen from the side (fig. 1c) this produced part is not rounded but angular at the upper base of the antennæ. — The eyes are well developed, rather large, with about seven ocelli, and the cornea of each ocellus very conspicuous; in recently captured specimens the eyes are black and in a couple of specimens the dark colour has been preserved during many years.

Antennulæ about as long as the carapace plus second and half of the third thoracic segment, somewhat slender. First joint, seen from the side (fig. 1c), about four times as long as deep and with the proximal part much deeper than the middle part; this joint is somewhat longer than the two other joints combined, and third joint is somewhat longer than the second. — Antennæ somewhat robust; second and third joints proportionately long, without any real spine at the distal upper angle; third joint a little less than half as long as the fourth, which is a little less than twice as long as the penultimate joint.

Chelipeds (figs. 1b and 6a) moderately slender. Carpus somewhat less than twice as long as deep. Chela three times as long as broad (fig. 6a), with the posterior margin considerably concave; fixed finger somewhat narrow near the base, yet considerably thicker than the movable finger, slightly decreasing in breadth from near the base to somewhat beyond the middle and with most of the incisive margin straight; movable finger somewhat shorter than the anterior margin of the hand, rather narrow, towards the base not touching the other finger, and when the distal parts of the fingers are crossed, a conspicuous interval is left between their more proximal parts, but especially at the base this interval is a good deal narrower than in *P. abyssi* or *P. forcipatus*.

Fifth thoracic segment a little shorter than the three preceding segments combined and as long as the sixth. — The thoracic legs of moderate length and thickness (fig. 1b). Second pair (fig. 6b) with the sixth joint elongate, even slightly longer than fifth and fourth joints combined, much tapering towards the end and almost half as long again as seventh joint with claw. Third pair with the sixth joint about as long as the fifth plus half of the fourth and not fully twice as long as seventh joint with claw; the spur on fifth joint half as long as sixth joint, broad at the base but near the base somewhat abruptly much thinner and then tapering to the acute end. Fourth pair (fig. 6c) in the main as the third, but fifth to seventh joint somewhat shorter and the short basal part of the acute spur is very broad. Seventh pair (fig. 6d) with sixth joint slightly longer than the fifth and twice as long as seventh with claw; the spur somewhat slender.

The abdomen somewhat longer than the two posterior thoracic segments combined. Pleopods well developed, with long setæ. — Uropods (fig. 1d) with very long terminal setæ; endopod somewhat robust with the proximal joint slightly longer than the distal; exopod only a little shorter than the endopod but considerably thinner, with the proximal joint slightly shorter than the distal.

Length of a female with the marsupial lamellæ less than half developed 1.9^{mm}.

Remarks. *P. oculatus* differs from *P. forcipatus* and *P. Lilljeborgii* by possessing well developed pleopods, the exopod of the uropods much longer than the proximal joint of the endopod, etc.; it differs from *P. abyssi* in the chelæ, shorter and proportionately thicker legs, longer exopod of the uropods, etc., from *P. affinis* by features in nearly all appendages. It is on the whole more allied to *P. mediterraneus* G. O. S. than to any species described in the present paper, but differs from it in having the claw of second pair of legs shorter and in various minor features in the antennæ and thoracic legs. And above all it differs from *P. mediterraneus* and all species described from Norway or in the present paper in possessing real eyes with several well developed corneæ.

Occurrence. Taken by the "Ingolf" at a single station.

Davis Strait: St. 34: Lat. 65° 17' N., Long. 54° 17' W., 55 fm.; 1 spec.

Besides it has been captured at West and East Greenland by three other collectors.

West Greenland: Upernivik, Lat. 72° 48' N., July 21, 1887; 1 spec. Ryder.

Davis Strait: Lat. 65° 27' N., Long. 54° 45' W., 67 fm., temp. 1.1°; 1 spec. Wandel.

East Greenland: Angmagsalik, ab. Lat. 65° 30' N. Aug. 7, 1902; 1 spec. Mag. sc. Kruuse.

18. ***Pseudotanaïs affinis*** H. J. Hansen.

(Pl. III, figs. 2a—2o, and? figs. 3a—3b.)

1886. *Pseudotanaïs affinis* H. J. Hansen, *Dijmphna-Togtets zool.-bot. Udbytte*, p. 207; Tab. XXI,

Fig. 2 (Female).

— — — *crassicornis* H. J. Hansen, l. c. p. 208; Tab. XXI, Fig. 3, 3a (Subadult Male).

Female. The body about five times as long as broad. — Front margin of the head only about one-third as long as the breadth of the carapace (fig. 2a), somewhat sinuate, being conspicuously convex at the middle, a little emarginate behind each antennula and with the lateral angles distinctly produced. No eyes.

The antennulæ are moderately long, somewhat more than half as long again as the carapace (fig. 2a). First joint, seen from the side (figs. 2b and 2d), with the basal fourth considerably expanded below, four and a half to five times as long as deep, at the base broader than deep and seen from above (fig. 2a) abruptly narrowed slightly beyond the middle. Second joint about three times as long as deep; third joint slender, from a little longer to one-third as long again as the second. — Antennæ moderately slender; second and third joints (fig. 2d) on the distal upper angle with a spiniform, strong process; fourth joint nearly two and a half times as long as the penultimate.

Chelipeds rather slender. Chela (fig. 2e) more slender than in the preceding species, from a little more than three times to more than three and a half times as long as broad, with the posterior margin considerably concave at the middle; the fixed finger moderately slender and tapering from

the base; the movable finger nearly as long as the front margin of the hand, conspicuously more slender than the fixed finger; when the distal parts of the fingers are crossed there is a narrow or no interval between their proximal halves.

Fifth thoracic segment about three-fourths as long as the three preceding segments combined and scarcely longer than the sixth segment. — Thoracic legs moderately long and rather slender, but the posterior pairs vary a little in this respect. Second pair (fig. 2f) with sixth joint almost as long as fifth and fourth joints combined and a little shorter than seventh joint with claw. Third pair (fig. 2g) with the sixth joint only a little longer than the fifth and not fully twice as long as seventh joint with claw; the spur on fifth joint about, or more than, half as long as sixth joint, strongly narrowed a little beyond the very broad base (fig. 2i) and with the distal half conspicuously expanded, forming a very oblong plate with the end subacute or narrowly rounded. Seventh pair (fig. 2h) with fifth joint somewhat longer than the sixth, which is not fully twice as long as seventh joint with claw; the spur not half as long as sixth joint, moderately narrow or somewhat thin, not expanded at the middle.

Abdomen almost as long as the two preceding thoracic segments combined. — Pleopods well developed; the longest setæ about three times as long as their rami and on the posterior pairs even reaching the end of the uropods. — Uropods (fig. 2c) somewhat long and slender; the endopod with the proximal joint slightly longer than the distal; the exopod reaches about the middle of the distal joint of the endopod, and its proximal joint is always considerably shorter than the distal.

Length of the largest female with marsupium (from the Kara Sea) 2.2^{mm}, of large specimens without marsupium 2.1^{mm}.

Subadult Male. The most characteristic difference between subadult males and the other sex are the antennulæ (fig. 2l), which have the first joint much thicker, the second somewhat to much thicker, than in the other sex; the third joint is slender with a thickening below at the base. Fifth and sixth thoracic segments somewhat shorter as compared with the three anterior segments than in the females. The chelæ (fig. 2m) and the thoracic legs (fig. 2o) vary conspicuously as to thickness. Pleopods and uropods as in the females.

Variety. At Stat. 25 the "Ingolf" captured a number of specimens, all immature and of both sexes, which in some particulars differ from the other material. The largest female is only 1.4^{mm}, the largest subadult male 1.3^{mm}. In the females the antennulæ (fig. 2k) are distinctly less slender than usual, with first joint about four times as long as deep; the antennæ are conspicuously thicker (fig. 2k) with the fourth joint only twice as long as the penultimate, while second and third joints have a slender spine instead of a stronger process on their upper distal angle. The chelæ about three times as long as broad; the thoracic legs on the whole a little more robust and the spur on third pair scarcely as long as and somewhat more spiniform than in the typical form. The uropods normal. — In the subadult male the antennulæ (fig. 2n) have first and second joints much thickened, but the third joint is more than half as long again as the second, the thickening is not confined to the short proximal part but reaches to near the middle of the joint, and the proximal half of the joint is distinctly conical, the distal half cylindrical. The antennæ nearly as in the female, with the fourth joint slightly thicker.

The main differences between this variety and the normal form are thus the slender spines instead of processes on second and third joints of the antennæ, the shape of the proximal half of third antennular joint in the male, and the fact that the appendages of both head and thorax are on the whole more robust. But I think it improbable that these differences are of specific value; adult females with marsupium ought at least to be procured before the variety may possibly be separated as a new species.

Remarks. I established *P. affinis* on 3 females from the Kara Sea, while the insufficiency of the literature on the genus and my very scanty material induced me to establish *P. crassicornis* on a subadult male. I find it useful to insert here a more detailed description of female and subadult male together with a number of figures, as I now possess a rich material both of this species and of other forms.

P. affinis is closely allied to *P. macrocheles* G. O. Sars, but if the figures published by Sars (1897) are correct, the latter species differs especially in the outer ramus of the uropod, which is shorter and showing a proportion between its joints quite different from the features found in *P. affinis*; besides Sars has figured the antennulæ with a strong seta, while a process is found in the typical specimens of *P. affinis*. Sars' figures of the legs differ also in minor particulars from *P. affinis*.

Adult Male (Pl. III, figs. 3a—3b). A single adult male has been taken (at "Ingolf" St. 124) together with two females. But though this specimen considerably resembles the male of *P. forcipatus*, I am not quite sure that it belongs to *P. affinis*. The head, seen from the side (fig. 3a), has the antero-lateral lobe still longer than in *P. forcipatus*, broadly rounded. — The antennulæ have the fifth joint slightly shorter than the sixth, which is scarcely as long as the seventh. — The antennæ thicker than in the female; third joint proportionately long, as long as the penultimate joint, with a rather long spine on the distal upper angle. — The chelæ shaped as in the male *P. forcipatus*, somewhat more than twice as long as broad; the fixed finger at the base more than twice as broad as the movable, which is somewhat shorter than the front margin of the hand; a narrow interval is seen between the subdistal portions of the fingers.

Second pair of legs (fig. 3a) with the sixth joint a little shorter than the two preceding joints combined, but as long as seventh joint with claw. Fourth pair of legs uncommonly short, only two-thirds as long as the sixth pair; fifth pair, which are poorly preserved, seem also to be somewhat short. The three posterior pairs have the sixth joint a little shorter than seventh joint with claw.

The abdomen as to the shape of the lateral margins (fig. 3b) and other particulars nearly as in *P. forcipatus*, but sixth segment is proportionately longer and more produced backwards, reaching slightly beyond the end of first joint of the endopod of the uropods, while the posterior margin is somewhat broad and deeply emarginate as in *P. forcipatus*. — The uropods differ much from those of the female; the endopod has the proximal joint much longer than the distal, the exopod reaches slightly beyond the proximal joint of the endopod and its first joint is somewhat longer than the second.

Length of the single male 1.36^{mm}.

The shape of the chelæ and especially the relative length of the joints in the uropods as compared with the corresponding organs of the female *P. affinis* make the reference of the adult male to

this species somewhat uncertain, though, on the other hand, the antennulæ, the chelæ, the second pair of legs and the shape of the last abdominal segment show close relationship to the above-described males of the two other species of this genus, and no other species of the genus is known to which the male might possibly belong. For these reasons I have described and figured this male and referred it, with a query, to *P. affinis*.

Occurrence. The "Ingolf" has captured this species at twelve stations.

Davis Strait:	St. 32: Lat. 66° 35' N., Long. 56° 38' W., 318 fm., temp. 3.9°; 3 spec.
—	St. 25: Lat. 63° 30' N., Long. 54° 25' W., 582 fm., temp. 3.3°; 13 spec., described above as a variety.
—	St. 24: Lat. 63° 06' N., Long. 56° 00' W., 1199 fm., temp. 2.4°; 3 spec.
South-West of Iceland:	St. 78: Lat. 60° 37' N., Long. 27° 52' W., 799 fm., temp. 4.5°; 1 spec.
North-West of the Færoes:	St. 138: Lat. 63° 26' N., Long. 7° 56' W., 471 fm., temp. ÷ 0.6°; 4 spec.
—	St. 139: Lat. 63° 36' N., Long. 7° 30' W., 702 fm., temp. ÷ 0.6°; 1 spec.
East of Iceland:	St. 103: Lat. 66° 23' N., Long. 8° 52' W., 579 fm., temp. ÷ 0.6°; 3 spec.
—	St. 102: Lat. 66° 23' N., Long. 10° 26' W., 750 fm., temp. ÷ 0.9°; 1 spec.
—	St. 101: Lat. 66° 23' N., Long. 12° 05' W., 537 fm., temp. ÷ 0.7°; 3 spec.
North of Iceland:	St. 124: Lat. 67° 40' N., Long. 15° 40' W., 495 fm., temp. ÷ 0.6°; 3 spec.
North-East of Iceland:	St. 119: Lat. 67° 53' N., Long. 10° 19' W., 1010 fm., temp. ÷ 1.0°; 6 spec.
South of Jan Mayen:	St. 116: Lat. 70° 05' N., Long. 8° 26' W., 371 fm., temp. ÷ 0.4°; 1 spec.

Besides the species has been secured by the II^d Amdrup Exped. at a single locality.
East Greenland: Forsblad Fjord, at Lat. 72° 27' N., Long. 25° 28' W., 50—90 fm.; 1 spec.

Distribution. The type specimens were taken in the Kara Sea, 64—65 fm. (H. J. Hansen). — According to the list of localities the species has been taken four times in the warm area in depths from 318 to near 1200 fm., and the highest temperature is 4.5°, but besides it is widely distributed in the cold area in depths from 371 to 1010 fm. and the lowest temperature was ÷ 1.0°; finally it has been captured at cold localities in the northern East Greenland and the Kara Sea in much lesser depths, viz. between 50 and 90 fm.

19. *Pseudotanais longipes* n. sp.

(Pl. III, figs. 4a—4i.)

Female. The body scarcely four times as long as broad. — Carapace strongly tapering in breadth forwards (fig. 4b), with the lateral margins not much convex; the anterior margin, which is even a little less than one-third as long as the breadth of the carapace somewhat before its hind margin, is feebly concave at each antennula. — Eyes wanting.

Antennulæ very elongate, twice as long as the carapace (fig. 4a) and extremely slender (fig. 4c). First joint more than six times as long as deep though its proximal part is somewhat thickened below, slightly longer than the two other joints combined; second joint not half as long as the third; the setæ on all joints extremely long. — The antennæ (fig. 4c) are very slender; third joint shorter

than deep and much shorter than the second; fourth joint extremely long, almost four times as long as the penultimate joint, which is conspicuously longer than second and third joints combined.

Chelipeds somewhat long and slender (fig. 4a). Carpus twice as long as the basal joint and three times as long as deep. Chela a little less than half as long again as the carpus, four and a half times as long as broad (fig. 4d); the fixed finger at the base somewhat broader than the movable and keeping almost the same breadth to beyond the middle; the movable finger slender, tapering from near the base to the end, and the fingers without any interval between them when their terminal parts cross each other.

Fifth thoracic segment slightly longer than the three preceding segments combined, or than the sixth segment. — The legs extremely long and very slender; second pair with the sixth joint, though very long, scarcely as long as the sum of the two preceding joints but somewhat longer than seventh joint with claw, and the claw almost twice as long as seventh joint. Third pair (fig. 4f) with the sixth joint slightly shorter than the fifth and slightly longer than seventh joint with claw; the spur on fifth joint is a very long, slender spine. Fourth pair in the main as the third pair; the spur on fifth joint is a slender spine more than two-thirds as long as the sixth joint (fig. 4g) which is considerably longer than seventh joint with claw. — Seventh pair (fig. 4h) with the sixth joint slightly longer than the fifth and about two and a half times as long as seventh joint with claw.

Abdomen slightly longer than seventh, sixth and half of the fifth thoracic segment combined. Pleopods with slender rami and long setæ. — Uropods long and very slender (fig. 4i); the endopod with the proximal joint somewhat longer than the distal; the exopod reaches a little beyond the middle of the distal joint of the endopod, but its division into two joints could not be perceived with certainty; one of the terminal setæ of the exopod is nearly three times as long as the ramus itself and a little longer than the longest terminal seta of the endopod.

Length of the immature female drawn (the marsupial lamellæ are small) 1.60^{mm}; another female without marsupium measures 1.95^{mm}.

Remarks. *P. longipes* is easily distinguished from all other species of the genus by its extremely long and slender antennulæ, legs and uropods and the long and narrow chelæ.

It was taken at the station, where the trawl was filled with an enormous quantity of sponges, and it is of interest to note, that *Typhlotanais eximius* n. sp., which possesses chelæ more narrow and longer than any other species of the genus, and besides a most curious, extremely long-legged species of the sub-order Asellola have been taken at the same station. Judging from these facts I am inclined to suppose that such long-legged species have been developed under the influence of the environment, the sponges, and have been adapted to live on that peculiar ground.

Occurrence. This species has been taken by the "Ingolf" at a single station.

South-West of Iceland: St. 78: Lat. 60° 37' N., Long. 27° 52' W., 799 fm., temp. 45°; 3 spec.

Paratanais Dana.

This genus comprises at present nine species, but only a single form is known from the area investigated.

20. *Paratanais Batei* G. O. Sars.

1884. *Paratanais Batei* G. O. Sars, Arch. for Math. og Naturv. B. 7, p. 32.

1896. ———— Account Crust. Norw. Vol. II, p. 16, Pl. VII.

Occurrence. This well-known species has not been taken by the "Ingolf", but by two travelling Zoologists.

South of Iceland: Vestmannaeyjar, the littoral belt, Aug. 21, 1899; 1 spec. Mag. B. Sæmundsen.

The Færoes: Vestmanhavn, 10—30 fm., June 2, 1899; 1 spec. Dr. Th. Mortensen.

Distribution. *P. Batei* has been taken "in several places on the west coast of Norway, in comparatively shallow water among the roots of Laminariæ" (G. O. Sars). Furthermore it is known from some places on both sides of Scotland (T. Scott), from Falmouth and Plymouth (A. M. Norman), Galway Bay in Ireland, 5—15 fm. (Tattersall), the Channel Islands (various authors), Saint-Jan-de-Luz in S. W. France, 2½ fm. (Dollfus), finally from the Mediterranean at Spezia, 6—10 fm. (G. O. Sars) and the Gulf of Naples, 1—1½ fm. (G. Smith).

P. Batei is decidedly a shallow water species, and its occurrence near South Iceland is of interest, as some other Crustacea from the Lusitanian area also occur there and have their limit of distribution in north-western direction at that coast.

Typhlotanais G. O. Sars.

This genus hitherto comprised sixteen species, of which nine are known from Norway. The "Ingolf" material comprises nineteen species, but sixteen of these are new, while three are dealt with in the work of Sars. The sixteen new species were all taken in depths ranging from 293 to 1870 fathoms, and the majority exclusively in depths from 690 to 1870 fathoms, but even eleven of these species were captured only at a single station and seven among them I establish on a single specimen. Judging from these facts I am tolerably sure that several and probably numerous species of this genus living in the area explored by the "Ingolf" are still undiscovered, furthermore that the depths of the oceans, from about 400 to at least 2000 fathoms, must contain a very large number of species of this genus.

Sars has published a good description of the genus according to the species seen by him. But some of my new species differ conspicuously from that description in a few points. Thus, some species have the lateral margins of the thoracic segments very angular, while Sars said that the lateral contours of the body are almost straight; *T. macrocephala* has the cephalothorax extremely large, the antennulæ much thicker and the chelæ broader than allowable according to Sars' diagnosis. But I have found it impossible not only to separate a single form or some species as a new genus, but even to divide my nineteen species into moderately well separated groups, because the characters are intermingled in such a way and so gradually developed in various species, that no natural division of any value could be discovered.

The scantiness of my material of the majority of the new species rendered it impossible to examine their mouth-parts. But I have examined these parts of one of the species most aberrant from the forms studied by Sars, viz. *T. irregularis* n. sp., and found that they differed so little from

the figures published by Sars that the only feature worth mentioning is, that the movable lobe on the left mandible is very large, being a little longer and probably broader than the incisive lobe. Consequently, I suppose that Sars' description and figures in all points of any importance hold good for all species described in the following pages.

The genus *Typhlotanais* (females and immature males) may be characterized by the following diagnosis. Eyes wanting. Antennulæ three-jointed; first joint at least as long as and generally longer than the two other joints combined, second joint proportionately short. Antennæ with fourth and fifth joints completely fused, without any suture between them. Mandibles well developed with their molar process cylindrical or even a little thicker at the obliquely cut, dentate end. Chelæ slender, at least two and a half times as long as broad. Second pair of legs differ conspicuously from third or fourth pair by having seventh joint with claw considerably longer. Pleopods well developed in the female. Uropods with the rami slender, two-jointed or one-jointed. Incubatory pouch consists of four pairs of lamellæ. — (Adult males of all species unknown excepting of *T. finmarchicus* G. O. S., which has been described by Sars).

21. *Typhlotanais irregularis* n. sp.

(Pl. III, figs. 5a—5e.)

Female. Body moderately robust, somewhat more than five times as long as broad. — Carapace somewhat or considerably shorter than the two next segments combined, a little longer than broad, with the lateral margins somewhat convex, the front margin two-thirds as long as the posterior and the median process moderately long, acute.

Antennulæ (figs. 5a and 5b) considerably shorter than the carapace, rather stout. First joint considerably longer than the two other joints combined, not fully two and a half times as long as deep and tapering considerably and gradually from a little from the base to the end; second joint scarcely as deep as long and about half as long as the third; the longest terminal seta scarcely as long as third and second joints combined. — Antennæ moderately robust; third joint not thickened; fourth considerably less than twice as long as the penultimate joint; terminal setæ scarcely as long as those of the antennulæ.

Chelipeds (fig. 5b) moderately strong. Basal joint with the proximal protuberance somewhat short; the distance between its posterior end and the front lower angle of second thoracic segment about as long as the basal joint. Carpus distinctly longer than the basal joint and almost twice as long as deep. Chela (fig. 5c) distinctly longer than the carpus, about three times as long as broad; movable finger somewhat longer than the front margin of the hand; both fingers very acute; fixed finger near the base considerably broader than the movable and with an acute tooth somewhat from the end of the incisive margin.

Thoracic segments (fig. 5a) peculiarly shaped, decreasing in breadth from second to seventh, the latter being only slightly more than half as broad as the second; furthermore the segments increase a little in length from the second to the fourth and then decrease to the seventh. Second segment decreases very conspicuously in breadth from the antero-lateral, protruding angles to the pos-

terior margin; it is unusually large, slightly more than half as long as the carapace, somewhat or a little less than twice as broad as long, a little or somewhat shorter than third segment and without any process below. Third to seventh segments with their lateral margins strongly angular or, in the three posterior segments, very convex, but the angles or the broadest place of the segment is on the third segment situated not much behind the front margin, on the fourth a little more backwards, on the fifth at the middle, on the sixth somewhat behind the middle and on the seventh a little before the posterior margin. — The legs are rather long and slender; second pair have the sixth joint (fig. 5b) almost as long as fifth and fourth joints combined and only a little longer than seventh joint with claw; the few setæ of the legs short. Third pair rather similar to second, but sixth joint is a little shorter and seventh joint with claw only about two-thirds as long as sixth joint; setæ short. Fourth pair completely as the third. Seventh pair (fig. 5d) slender; second joint almost five times as long as broad; fourth and fifth joints not expanded, with a tooth-shaped spine at the distal posterior angle; sixth joint somewhat longer than the fifth; seventh joint with claw more than half as long as sixth joint.

Abdomen scarcely as long as the two preceding segments combined. — Uropods long and slender (figs. 5a and 5e); endopod two-jointed, with first joint somewhat or a little less than twice as long as the second; the exopod reaches the middle of the distal joint of the endopod and seems to be undivided.

Length of a female with marsupium 1.6^{mm}, of a large female without marsupium 1.85^{mm}.

Subadult Male. Differs from the female only in the antennulæ, which have the distal part of first joint and the whole second joint somewhat thicker than in the female, while the third joint has the basal part distinctly thickened on the lower side.

Remarks. *T. irregularis* is easily distinguished from all other forms of the genus excepting *T. macrocephala* n. sp. and *T. mucronatus* n. sp. by the shape and relative length and breadth of the thoracic segments; the rather short antennulæ, the legs and the uropods afford further characters. It bears some resemblance to *T. macrocephala*, but the latter species is easily distinguished by its extremely large carapace, the enormous process on the lower side of second thoracic segment, etc. From *T. mucronatus* it is easily separated by the widely different antennæ, short setæ on the legs, etc.

Occurrence. The "Ingolf" has taken this fine species at twelve stations, all in the cold area.

North of the Færoes: St. 141: Lat. 63° 22' N., Long. 6° 58' W., 679 fm., temp. ÷ 0.6°; 22 spec.

— — — — — St. 139: Lat. 63° 36' N., Long. 7° 30' W., 702 fm., temp. ÷ 0.6°; ab. 50 spec.

East of Iceland: St. 104: Lat. 66° 23' N., Long. 7° 25' W., 957 fm., temp. ÷ 1.1°; 1 spec.

— — — — — St. 103: Lat. 66° 23' N., Long. 8° 52' W., 579 fm., temp. ÷ 0.6°; 1 spec.

— — — — — St. 102: Lat. 66° 23' N., Long. 10° 26' W., 750 fm., temp. ÷ 0.9°; 21 spec.

North of Iceland: St. 126: Lat. 67° 19' N., Long. 15° 52' W., 293 fm., temp. ÷ 0.5°; 2 spec.

— — — — — St. 125: Lat. 68° 08' N., Long. 16° 02' W., 729 fm., temp. ÷ 0.8°; 12 spec.

North-East of Iceland: St. 120: Lat. 67° 29' N., Long. 11° 32' W., 885 fm., temp. ÷ 1.0°; 2 spec.

— — — — — St. 119: Lat. 67° 53' N., Long. 10° 19' W., 1010 fm., temp. ÷ 1.0°; 2 spec.

South of Jan Mayen: St. 118: Lat. 68° 27' N., Long. 8° 20' W., 1060 fm., temp. ÷ 1.0°; 6 spec.

— — — — — St. 117: Lat. 69° 13' N., Long. 8° 23' W., 1003 fm., temp. ÷ 1.0°; ab. 40 spec.

South of Jan Mayen: St. 113; Lat. $69^{\circ} 31' N.$, Long. $7^{\circ} 06' W.$, 1309 fm., temp. $\div 1.0^{\circ}$; 7 spec.

Distribution. A single ovigerous female has been found between some material from the Kara Sea brought home by the "Dijmphna" Expedition.

22. *Typhlotanais macrocephala* n. sp.

(Pl. III, figs. 6a—6e.)

Specimen without marsupium. Body almost five and a half times as long as broad. — Carapace (fig. 6a) exceedingly large, nearly longer than second, third and half of fourth segment combined, considerably longer than broad; the anterior margin only a little shorter than the posterior, with the frontal process constituting a broad, rather low triangle with the margins along the base of the antennulæ very feebly concave; the carapace is broadest at the end of the anterior two-thirds, and the major part of its lateral margins are somewhat convex and posteriorly with a few saw-teeth or fine indentations.

The antennulæ (fig. 6b) are short and thick, conical, only half as long as the carapace. First joint about half as long again as deep; the two distal joints combined about as long as the depth of the first joint; second joint much deeper than long; third joint proportionately thick at the base, conical, with the terminal setæ about as long as the first joint. — Antennæ short and moderately thick; third joint not thickened, fourth considerably less than twice as long as the penultimate joint; terminal setæ nearly as long as those of the antennulæ.

Chelipeds somewhat small (fig. 6b). Posterior protuberance on the basal joint short; the distance between its hind margin and the anterior lower angle and second thoracic segment considerably longer than the basal joint. Carpus considerably longer than the basal joint, about twice as long as deep. Chela a little longer than the carpus, only about two and a half times as long as broad; movable finger distinctly longer than the front margin of the hand; fixed finger thick at the base, with a tooth before the end.

Thoracic segments (fig. 6a) somewhat similar in general shape and relative dimensions to those of *T. irregularis*, but the major posterior part of the lateral margins of second to fourth segment with four or five distinct teeth (fig. 6c). Second segment slightly narrower than the carapace, not fully twice as broad as long, broadest at the angle a little behind the anterior margin and decreasing much in breadth posteriorly; seen from the side (fig. 6b) this segment is expanded downwards below and the expansion produced in an enormous process, the base of which is as long as the segment, while the posterior margin is regularly convex, the anterior margin deeply concave and the end of the process acute and directed somewhat forwards. Third segment scarcely longer and considerably narrower than the second but otherwise nearly of the same shape (fig. 6a); fourth segment about as long as the third but distinctly narrower and of similar shape. Fifth and sixth segments each scarcely as broad as the fourth and only a little more than half as broad as the carapace, while seventh segment is as broad as the fourth; the lateral margins of all three segments are considerably convex and more or less distinctly angular; fifth segment broadest a little behind the middle and the two other segments broadest somewhat behind the middle; the fifth segment has a few nearly rudimentary teeth

on the posterior part of the lateral margins. — Thoracic legs moderately long and rather slender; second pair (fig. 6b) with sixth joint only a little shorter than fifth and fourth joints combined and slightly longer than seventh joint with claw; setæ short. Third pair with sixth joint as long as the fifth plus half of the fourth; seventh joint with claw as long as fifth joint; setæ short. Seventh pair (fig. 6d) moderately long; second joint slender, nearly five times as long as broad; fourth and fifth joints moderately broad but scarcely expanded and without any armature; sixth joint proportionately somewhat stout, being not much thinner than the fifth and about as long as the fifth plus half of the fourth; seventh joint with claw quite short.

Abdomen as broad as the last thoracic segment, with the sides somewhat convex, a little shorter than the two preceding segments combined. — Uropods of moderate length (fig. 6e); endopod two-jointed with the proximal joint somewhat longer than the distal; exopod a little shorter than the endopod, two-jointed, with the proximal joint a little shorter than the distal.

Length of the single specimen (probably a female) 1.20 mm.

Remarks. This species differs from all other forms of the genus by its gigantic carapace, the very short and thick antennulæ, the huge process on the lower side of second thoracic segment and the serrate lateral margins of the three (four) anterior thoracic segments. In some other features and especially in the dorsal aspect of the thoracic segments it resembles considerably *T. irregularis* n. sp.

Occurrence. The single specimen has been captured by the "Ingolf".

South-West of Iceland: St. 78: Lat. 60° 37' N., Long. 27° 52' W., 799 fm., temp. 4.5°; 1 spec.

23. *Typhlotanais pulcher* n. sp.

(Pl. IV, figs. 1a—1g.)

Specimen without marsupium. Body very slender, more than eight times as long as broad. — Carapace considerably longer than broad but only slightly longer than the unusually long second thoracic segment (figs. 1a and 1b), lateral margins rounded posteriorly and from there converging gradually forwards to the anterior margin, which is somewhat longer than half of the breadth of the carapace, and the rostral process is somewhat long, subacute.

Antennulæ (figs. 1b and 1c) nearly as long as the carapace, moderately slender. First joint somewhat longer than the two other joints combined, about three and a half times as long as deep, and, seen from the side, not tapering, which renders it probable that the specimen may be an immature male; second joint about as long as deep, not half as long as the third joint, which has its proximal part slightly thickened on the lower side; terminal setæ as long as the two distal joints combined. — Antennæ moderately slender; third joint not thickened; fourth joint a little more than twice as long as the penultimate, and both these joints with long setæ at the end, while the setæ of the terminal joint are still longer, though a little shorter than the longest terminal antennular setæ.

Chelipeds (fig. 1c) moderately slender. Basal joint with the proximal protuberance scarcely free and of moderate length; its posterior end far removed from the front lower end of second thoracic segment. Carpus a little less than three times as long as deep. Chela a little longer than the carpus, three times as long as broad; movable finger rather slender and much longer than the front margin

or the hand; fixed finger towards the base much broader than the movable and with about three sharp teeth along the distal part of the incisive margin.

Thoracic segments extremely characteristic (fig. 1a). Second segment almost as long as the carapace or third segment and slightly longer than the fourth; each lateral margin is a straight line and the lateral margins converge considerably from the anterior to the posterior end; no ventral process is found. Third segment similar to the second excepting that it is broadest somewhat behind the anterior margin and the somewhat short anterior part of the lateral margin between its front end and the lateral angle is even concave. Fourth segment shaped nearly as the third. Fifth segment even slightly shorter and somewhat narrower than the fourth, with the major part of the lateral margins subparallel and the margins rounded and converging towards both ends. Sixth segment considerably shorter than the fifth and almost twice as long as the seventh, and both these segments increase somewhat in breadth from the anterior end to respectively somewhat from or near to the posterior margin. — Thoracic legs very different from each other. Second pair (fig. 1c) long and slender; fifth joint at the anterior distal angle with a seta as long as the joint; sixth joint considerably longer than the fifth and somewhat shorter than seventh joint with claw. Third pair (fig. 1d) considerably shorter than second, very slender; sixth joint conspicuously shorter than the fifth, nearly twice as long as seventh joint and with its anterior distal setæ somewhat long. Three posterior pairs (figs. 1e and 1f) moderately slender; second joint nearly four times as long as broad; fifth joint with the distal half somewhat expanded; sixth joint moderately long and somewhat slender, a little more than half as long again as seventh joint with claw.

Abdomen slightly longer than the two preceding segments combined (fig. 1a), somewhat oval, posteriorly nearly truncate with a low, rounded median protuberance. — Uropods (fig. 1g) short; endopod two-jointed with first joint somewhat longer than the second; exopod one-jointed, slightly longer than the proximal joint of the endopod.

Length of the specimen, which according to the antennulæ seems to be an immature male, 2.7 mm.

Remarks. This species, taken in very great depth, differs strongly from all other species of the genus by the shape and especially the relative length of the thoracic segments, the differences being in reality so great that one is tempted to regard them as being of generic value, but antennulæ, antennæ, chelipeds, thoracic legs, pleopods and uropods agree with structural features frequently found in *Typhlotanais*. The long seta at the end of fifth joint of second pair of legs is certainly a good specific character.

Occurrence. The single specimen has been taken by the "Ingolf".

South of the Davis Strait: St. 38: Lat. 59° 12' N., Long. 51° 05' W., 1870 fm., temp. 1.3°; 1 spec.

24. *Typhlotanais gracilipes* n. sp.

(Pl. IV, figs. 2a—2e.)

Female (without marsupium). Body very slender, almost eight times as long as broad. — Carapace (figs. 2a and 2b) long and narrow, as long as second, third and the half of fourth segment

combined, more than half as long again as broad; the lateral margins feebly convex posteriorly and then converging to the front angles; the anterior end slightly more than half as broad as the carapace a little from the hind margin; rostral process moderately long, somewhat narrow, acute.

Antennulæ (figs. 2a and 2b) considerably shorter than the carapace, somewhat robust. First joint a good deal longer than second and third joints combined, not fully three times as long as deep and tapering considerably to the end; second joint about as long as deep; third joint conspicuously more than twice as long as the second, thin, with the longest terminal seta scarcely longer than the joint. — Antennæ of usual size; third joint not thickened; fourth joint not twice as long as the penultimate and with long setæ from its distal lower angle; longest terminal setæ much longer than those of the antennulæ.

Chelipeds very slender (fig. 2b). Basal joint with the posterior process moderately long and its proximal margin rounded; the distance between this margin and the front lower end of second segment only a little shorter than the basal joint. Carpus almost twice as long as the basal joint and a little more than three times as long as deep. Chela small, somewhat shorter than the carpus, three and a half times as long as broad; movable finger slightly longer than the anterior margin of the hand; fixed finger near the base considerably broader than the movable.

Thoracic segments, as far as could be ascertained in the mutilated specimen, in the main as in *T. mucronatus* n. sp. (comp. description and figs. 3a of this species), but the difference between the anterior and the posterior breadth of each segment seems to be a little smaller and the lateral margins of the segments a little less convex (fig. 2a). Second segment (figs. 2a and 2b) only slightly more than half as long as the third and without ventral process. — Thoracic legs on the whole slender. Second pair (fig. 2b) slender and moderately long; fourth and fifth joints with the distal anterior setæ somewhat long; sixth joint long, only a little shorter than fifth and fourth joints combined and without any perceptible distal anterior seta; seventh joint with claw nearly as long as sixth joint. Third pair mutilated, but scarcely much different from fourth pair (fig. 2c) which is very slender, much shorter than second pair, with a rather long seta on the distal anterior angle of fifth joint, sixth joint considerably longer than the fifth but slightly longer than seventh joint with claw. Three posterior pairs of legs peculiarly built and unusually long (fig. 2d); second joint not fully four times as long as broad; fourth and fifth joints somewhat slender, though considerably and gradually widened on the anterior side towards the end, and there with a couple of somewhat long, slender spines, fifth joint besides with a couple of slender spines on the terminal inner margin; sixth joint not much longer than the fifth, moderately slender; seventh joint and the short, thin claw combined somewhat more than half as long as sixth joint.

Abdomen about as long as the two preceding segments combined. — Uropods mutilated, but one exopod (fig. 2e) has been preserved; it is long, very slender, perhaps undivided, but the seta generally found just before the articulation is long and originates even slightly beyond the middle.

Length of the single specimen 2.05 mm.

Remarks. *T. gracilipes* is easily distinguished from all species of *Typhlotanaïs* described in this paper by its slender, small chelipeds and the peculiar three posterior pairs of thoracic legs with the long and slender spines on fourth and fifth joints. It is closely allied to *T. microcheles* G. O. S.,

but according to Sars' figures and my examination of some of his co-types it differs in some particulars. In *T. microcheles* the chelipeds have the basal joint about three-fourths as long as the carpus, thus considerably longer than in *T. gracilipes*, and their carpus is deeper, scarcely two and a half times as long as deep; furthermore the thoracic legs are on the whole a little more robust than in *T. gracilipes*. In a specimen of *T. microcheles* with the ventral side of the anterior thoracic segments flat and without marsupium no ventral process on second segment is found, but in three other specimens presented by Sars the ventral surface of the anterior segments is convex, the second segment has a very large, long and broad, oblique-triangular, acute ventral process directed forwards and downwards, and each of the four following segments has a somewhat smaller but yet far from small, acute, somewhat curved ventral process.

Occurrence. The single specimen was taken by the "Ingolf".

South of Iceland: St. 54: Lat. 63° 08' N., Long. 15° 40' W., 691 fm., temp. 3.9°; 1 spec.

25. *Typhlotanais mucronatus* n. sp.

(Pl. IV, figs. 3a—3h.)

Female (without marsupium). Body slender, about six and a half times as long as broad. — Carapace (fig. 3b) somewhat small, slightly broader than long, a little longer or somewhat shorter than second segment plus half of the third; the lateral margins are somewhat convex, the anterior margin is even a little more than two-thirds as long as the breadth of the carapace and the frontal process very broad, proportionately rather low and broadly rounded.

Antennulæ (figs. 3b and 3c) extremely long and slender, a little longer than carapace and second thoracic segment combined. First joint a little longer than the two other joints together, very slender excepting its proximal fourth, which is considerably thickened below and its depth is here about one-fifth of the length of the joint; seen from above (fig. 3b) the joint is rather broad at the base, tapers considerably to beyond the middle, where it is abruptly narrowed a little and its distal part is subcylindrical. Second joint is thin, almost three times as long as deep; third joint very thin, more than twice as long as the second, with the longest terminal setæ extremely long, longer than the two distal joints and half of the proximal joint combined. — Antennæ slender but somewhat short as compared with the antennulæ (fig. 3c); third joint feebly thickened; fourth joint about twice as long as the penultimate; terminal setæ long, yet conspicuously less than half as long as those of the antennulæ.

Chelipeds slender (fig. 3c). Posterior process on the basal joint moderately short; the distance between its hind margin and the front lower end of second thoracic segment about half as long as the basal joint. Carpus considerably longer than the basal joint, almost three times as long as deep. Chela (fig. 3d) slightly longer than the carpus, almost four times as long as broad; movable finger nearly half as long again as the front margin of the hand; fixed finger much broader than the movable with a few low, obtuse teeth towards the end of the incisive margin.

Thoracic segments somewhat reminding of those of *T. irregularis*, increasing in length and decreasing in breadth from second to fifth, decreasing in length and increasing in breadth from fifth

to seventh segment (fig. 3a). Second segment about twice as broad as long, with the lateral margins distinctly convex and besides converging from somewhat behind the anterior to the posterior end; the segment is below and a little behind the front end produced in a very strong, oblique-triangular, acute process directed downwards and much forwards (fig. 3c). Third segment about half as long again as the second, broadest not much behind the anterior margin, but the lateral angles somewhat rounded, and from these angles the margins converge considerably to the hind margin; fourth segment nearly as the third, but the rounded lateral angles are nearer to the middle of the segment; fifth segment as long as broad, with the lateral margins nearly regularly convex. The two posterior segments increase almost gradually in breadth to somewhat behind the middle and the posterior part of their lateral margins is convex, thus converging near the hind margin, which is longer than the front margin of the same segment. — Thoracic legs slender. Second pair long (fig. 3c); fourth joint with a long seta from the anterior distal angle; fifth joint with two long setæ from the corresponding angle; sixth joint only somewhat longer than the fifth, with the setæ somewhat short; seventh joint with claw scarcely as long as fifth joint. Third pair somewhat shorter than the second; fifth joint with a long seta from the anterior distal angle; sixth joint as long as the fifth plus half of the fourth, with its distal anterior seta extremely long; seventh joint with claw less than half as long as sixth joint. Fourth pair in the main as the third. Three posterior pairs subsimilar, moderately long, slender (fig. 3e); second joint more than four times as long as broad; fourth joint not expanded, without spines, fifth joint (fig. 3f) with a small spine on the outer side of the end, while the joint is distally on the anterior side produced into a peculiar, short, broad, subtriangular, acute process directed forwards; sixth joint moderately strong, scarcely widened towards the end, a little longer than fifth joint and with a small spine on the anterior side a little before the end; seventh joint with claw distinctly less than half as long as sixth joint.

Abdomen a little longer than the two posterior thoracic segments combined and as broad as the second segment. — Uropods moderately short (fig. 3g); endopod two-jointed, with first joint conspicuously longer than the second; exopod scarcely reaching the middle of second joint of the endopod, without any perceptible division into two joints.

Length 2.45^{mm}.

Subadult Male. It differs from the female in having the antennulæ (fig. 3h) much thicker; first joint is not four times as long as deep and with nearly the same depth from base to end; the two other joints combined as long as first joint; second joint is proportionately thick, though somewhat longer than deep; third joint is conspicuously thicker than in the female and with the proximal third a little thickened below.

Remarks. *T. mucronatus* is especially distinguished by the long antennulæ with the third joint very long and in the female extremely thin, by the large ventral process on second thoracic segment, by the long setæ on some joints of the anterior pairs of thoracic legs, and by the peculiar process on fifth joint of the posterior pairs; furthermore the thoracic segments, seen from above, differ markedly from most other species.

Occurrence. It was taken by the "Ingolf" at three stations in the cold area and in very considerable depths.

North-East of Iceland: St. 120: Lat. $67^{\circ} 29' N.$, Long. $11^{\circ} 32' W.$, 885 fm., temp. $\div 1.0^{\circ}$; 10 spec.

— — — St. 119: Lat. $67^{\circ} 53' N.$, Long. $10^{\circ} 19' W.$, 1010 fm., temp. $\div 1.0^{\circ}$; 1 spec.

South of Jan Mayen: St. 117: Lat. $69^{\circ} 13' N.$, Long. $8^{\circ} 23' W.$, 1003 fm., temp. $\div 1.0$; 1 spec.

26. *Typhlotanais eximius* n. sp.

(Pl. IV, figs. 4a—4g.)

Female (without marsupium). The body of a somewhat contracted, not fullgrown specimen (fig. 4a) robust, somewhat less than four times as long as broad. — Carapace in the first-named specimen as long as the three following segments combined, in the second specimen (fig. 4b) somewhat longer than the two anterior segments combined; it is a little broader than long, the lateral margins posteriorly convex and then converging nearly evenly forwards to the anterior, somewhat produced angle; the front margin nearly half as long as the breadth of the carapace and the rostral process moderately large, acute.

Antennulæ long, as long as the carapace, second segment and half or almost the whole third segment combined. First joint (fig. 4b) considerably longer than the two other joints combined, about four and a half times as long as deep, and, seen from the side or from above, tapering considerably from somewhat from the base to the end. Second joint distinctly more than half as long as the third, not three times as long as deep; longest terminal seta almost as long as first and second joints combined. — Antennæ somewhat long; third joint somewhat thickened; fourth joint twice as long as the penultimate; terminal setæ very long, though somewhat shorter than those of the antennulæ.

Chelipeds (fig. 4b) long and very slender, excepting the basal joint which is somewhat thick, with the posterior protuberance thick, short, broadly rounded behind and reaching to near the front lower angle of second thoracic segment. Carpus more than half as long again as the basal joint, four times as long as deep and somewhat curved, with the lower margin conspicuously concave. Chela as long as the carpus and nearly more than six times as long as broad, with the hand very elongate, only somewhat less than twice as long as the movable finger, which is slightly thinner than the fixed finger.

Thoracic segments short in proportion to their breadth; the three anterior segments together as long as fifth and sixth segments combined; the second segment is about half as long as the third and the fourth is somewhat longer than the fifth, which is slightly longer than the sixth. The lateral margins of third and fourth segments feebly convex before the middle, of the three posterior segments a little convex or subangular rather near their posterior end. Second segment below with a moderately small, curved, acute process projecting near the front end, directed downwards and much forwards. — Thoracic legs slender. Second pair (fig. 4b) long; fifth joint with the distal anterior seta moderately short, sixth joint somewhat longer than the fifth and considerably longer than seventh with claw. Third pair not much shorter than second; fourth and fifth joints with the seta on the distal anterior angle somewhat long; sixth joint with the distal anterior seta somewhat long; seventh joint with

claw less than half as long as sixth joint. Sixth and seventh pairs (fig. 4c) much shorter than the anterior pairs; second joint about three and a half times as long as broad; fourth and fifth joints very moderately thickened towards their end, sixth joint somewhat long and slender, twice as long as seventh joint with claw.

Abdomen proportionately long, in the contracted specimen (fig. 4a) even slightly shorter than the three posterior thoracic segments combined. — Uropods (figs. 4a and 4d) long; endopod two-jointed, with first joint somewhat longer than second; exopod slightly shorter than the endopod, two-jointed, with the proximal joint about half as long as the distal.

Length of the largest specimen 1.50^{mm}, of the contracted specimen (fig. 4a) 1.19^{mm}.

Immature Male. A single specimen, only 1.0^{mm} long, is at hand, and its most important parts are rendered in figs. 4e—4g. Some of the differences between this specimen and the two above-described females are due to sex, other differences probably to age. The antennulæ are considerably thicker than in the female; first joint, which is as long as the two other joints combined, is only three times as long as deep and tapers slightly towards the end; second joint is conspicuously less than twice as long as deep, third joint more than twice as long as the second. — Antennæ with fourth joint distinctly less than twice as long as the penultimate joint. — The chela is slightly thicker than in the female with the hand conspicuously less elongate in proportion to the length of the movable finger. — The anterior pairs of legs are a little thicker in proportion to length than in the larger female. Uropods with the rami equal in length.

Remarks. *T. eximius* is easily distinguished from all other species by its very slender chelipeds with the very elongate chelæ and the hand very long in proportion to the fingers. In all other features it is allied to *T. penicillatus* G. O. S., differing only in various minor particulars, among which the most conspicuous is the fact, that in *T. penicillatus* the exopod of the uropods (fig. 5c) reaches scarcely or slightly beyond the middle of the second joint of the endopod.

Occurrence. Taken by the "Ingolf" at a single station.

South-West of Iceland: St. 78: Lat. 60° 37' N., Long. 27° 52' W., 799 fm., temp. 4.5°; 3 spec.

27. *Typhlotanais penicillatus* G. O. Sars.

(Pl. IV, figs. 5a—5d.)

1881. *Typhlotanais penicillatus* G. O. Sars, Arch. for Math. og Naturv. B. 7, p. 39.

! 1896. — — — Account Crust. Norway, Vol. II, p. 25, Pl. XI, fig. 3.

The "Ingolf" specimens agree well with Sars' description and figures of this species excepting that the setæ on the chelipeds are considerably longer, but that may be due to an accident or a slight error. Furthermore Sars stated that the exopod of the uropods is one-jointed, while it is two-jointed in my specimens, but the articulation between the two joints is not always really distinct.

T. penicillatus is closely allied to *T. eximius* n. sp., but differs especially in having the chelipeds shorter and much thicker and in having the exopod of the uropods (fig. 5c) conspicuously shorter than the endopod; furthermore the antennulæ, antennæ and anterior thoracic legs (fig. 5a) are in my largest specimens conspicuously shorter and thicker than in *T. eximius*; third pair of legs with

a small spine on the posterior side and near the end of sixth joint. It agrees above all with *T. eximius* in having the carapace considerably longer than the two anterior thoracic segments combined, in having the antennulæ and antennæ terminating in extremely long setæ and in possessing an acute process (on fig. 5a overlapped and therefore rendered by dotted lines) on the ventral side of second thoracic segment. — The chelipeds are characteristic; the carpus is considerably longer than the basal joint and about two and a half times as long as deep; the chela is a little or somewhat longer than the carpus, between three and a half and four times as long as broad, and the movable finger is only a little shorter than the anterior margin of the hand.

Marsupium is not found in any of my specimens. Somewhat young specimens are on the whole more clumsy, with the appendages shorter and more robust than in nearly fullgrown specimens. The largest specimen at hand is 1.56^{mm}. — In a specimen measuring 1.27^{mm} the antennulæ (fig. 5d) are considerably thicker, shaped nearly as in the young male of *T. eximius*, and therefore I consider this specimen to be an immature male.

Occurrence. *T. penicillatus* was brought home by the "Ingolf" from two stations.

Denmark Strait: St. 90: Lat. 64° 45' N., Long. 29° 06' W., 568 fm., temp. 4.4°; 1 spec.

South-West of Iceland: St. 78: Lat. 60° 37' N., Long. 27° 52' W., 799 fm., temp. 4.5°; 15 spec.

Distribution. Sars established this fine species on two specimens taken by him "at Sauesund, west coast of Norway, from depths of 50 to 100 fathoms".

28. *Typhlotanais inermis* n. sp.

(Pl. IV, figs. 6a–6g.)

Female (without marsupium). Moderately robust, about five and a half times as long as broad. — Carapace (figs. 6a and 6b) about as long as the two following segments combined, slightly longer than broad, with the lateral margins slightly converging from the base to beyond the middle and then more curved to the antero-lateral angles which are somewhat removed from the outer base of the antennulæ; the distance between these angles is more than two-thirds as long as the breadth of the carapace in front of its posterior margin, and from each angle the anterior margin is directed inwards and somewhat forwards to the acute median angle, each half of this front margin being slightly concave; the result is, that the carapace is pentagonal.

Antennulæ nearly as long as carapace and half of the next segment combined, very slender. First joint is, seen from the side, between four and five times as long as deep and tapers considerably from somewhat beyond the base to the end (fig. 6a); seen from above (fig. 6b) this joint has the basal fifth very broad, the outer margin angular at the end of that fifth, and from this angle the joint, which is distinctly less than three times as long as broad, tapers strongly to the distal end; it is somewhat longer than the two other joints combined. Second joint slender; third joint more than twice as long as the second, very slender, with the terminal setæ very long, the longest being somewhat longer than the two proximal joints combined. — Antennæ of moderate length, rather slender; second joint somewhat expanded above, third scarcely thickened, fourth somewhat less than twice as long as the penultimate joint; some of the terminal setæ about half as long as the long setæ of the antennulæ.

Chelipeds (fig. 6c) moderately robust. Basal joint with the posterior protuberance somewhat short, posteriorly rounded; its hind margin rather distant from the lower front angle of second thoracic segment. Carpus a little longer than the basal joint and a little more than twice as long as deep, with both margins feebly convex. Chela (fig. 6d) as long as the carpus, a little more than three times as long as broad; movable finger somewhat longer than the anterior margin of the hand; fixed finger much broader than the movable, with about three teeth along the distal part of the incisive margin and the last tooth rectangular and much larger than the two other teeth.

Thoracic segments (fig. 6a) differ slightly in breadth; all are subrectangular with the angles a little rounded; the major part of their lateral margins parallel or feebly convex. Second segment conspicuously less than half as long as the third, without any process below. The segments increase in length from the second to the fifth and decrease from the fifth to the seventh, but the fourth segment is slightly longer than the third and slightly shorter than the fifth. — The anterior legs moderately long and slender. Second pair (fig. 6c) with a very long seta both from the anterior and the posterior distal angle of fifth joint; sixth joint about as long as fifth joint plus half of the fourth, with the distal setæ short; seventh joint with claw slightly longer than sixth joint. Third pair somewhat shorter than second; fourth joint with a long seta from the distal posterior angle, fifth joint with a very long seta both from the anterior and the posterior distal angle; sixth joint somewhat longer than fifth, with short setæ; seventh joint with claw distinctly more than half as long as sixth joint. Sixth and seventh pairs (fig. 6e) with the second joint somewhat widened, two and a half times as long as broad; fourth joint feebly tapering and with a short spine at the distal anterior angle (fig. 6f); fifth joint moderately broad, slightly broader towards the end and with a small, low, glabrous protuberance just before the end of the anterior margin and a minute spine at the end; sixth joint only a little longer than the fifth, very moderately slender, with a spine near the distal anterior angle; seventh joint with claw about half as long as sixth joint.

Abdomen somewhat longer than and as broad as the two preceding segments combined. — Uropods somewhat short; endopod (fig. 6g) two-jointed, with first joint slightly longer than the second; exopod slightly or a little longer than the proximal joint of the endopod.

Length of females without marsupium 2.3^{mm}; females with marsupium unknown.

Immature Male. Differs from the female in the antennulæ, which are thickened as in the young male of *T. mucronatus*.

Remarks. This species is allied to *T. penicillatus*, but it is somewhat larger, a little more slender and differs in the shape of the carapace, in having seventh joint with claw of second and third pairs of legs much longer in proportion to the sixth joint, in possessing long or very long setæ on fifth joint of these legs, in having the exopod of the uropods considerably shorter and unjointed, and no ventral process on second thoracic segment. *T. penicillatus* is a warm water species, while *T. inermis* is known only from the cold area, with the temperature below zero.

Occurrence. This species has been taken by the "Ingolf" at four stations.

North of the Færoes: St. 141: Lat. 63° 22' N., Long. 6° 58' W., 679 fm., temp. ÷ 0.6°; 1 spec.

— - - - - St. 138: Lat. 63° 26' N., Long. 7° 56' W., 471 fm., temp. ÷ 0.6°; 1 spec.

North of the Færoes: St. 139: Lat. $63^{\circ} 36' N.$, Long. $7^{\circ} 30' W.$, 702 fm., temp. $\div 0.6^{\circ}$; 10 spec.

East of Iceland: St. 102: Lat. $66^{\circ} 23' N.$, Long. $15^{\circ} 52' W.$, 750 fm., temp. $\div 0.9^{\circ}$; 6 spec.

29. *Typhlotanais variabilis* n. sp.

(Pl. IV, figs. 7a—7d; Pl. V, figs. 2a—2c.)

Female. Moderately slender (fig. 7a), about six times as long as broad. — Carapace somewhat or considerably shorter than the two following segments combined, somewhat longer than broad, with the lateral margins convex posteriorly and their anterior two-thirds converging to the anterior angles; the anterior end slightly more than half as broad as the carapace somewhat before its posterior margin; the rostral process well developed, acute.

Antennulæ scarcely as long as the carapace and half of the next segment combined, rather slender (fig. 2a). First joint from a little more than four to five times as long as deep and, seen from the side or from above, tapering regularly from near the base to the end, considerably longer than the two other joints combined; second joint twice (fig. 2b) or conspicuously more than twice (fig. 2a) as long as deep and more than half as long as third joint; longest terminal seta slightly or somewhat longer than the two distal joints combined. — Antennæ of normal size; third joint scarcely thickened; fourth joint slightly or distinctly more than twice as long as the penultimate; terminal setæ conspicuously shorter than those of the antennulæ.

Chelipeds (fig. 2a) somewhat long, moderately slender. Basal joint with the posterior protuberance of moderate length; the distance between its hind margin and the front lower end of second thoracic segment about half as long as the joint. Carpus half as long again as the basal joint, three times or a little more than three times as long as deep, with the lower margin nearly straight. Chela somewhat longer than the carpus, not fully four times as long as broad; movable finger a little longer than the anterior margin of the hand; fixed finger much broader than the movable, with a feeble tooth near the end of the incisive margin.

Thoracic segments (fig. 7a) increase feebly in breadth from second to seventh. Second segment with the lateral margins feebly converging from the front to the posterior end. Third and fourth segments broadest somewhat before the middle, but the lateral angles at the broadest place of the segments are somewhat rounded and from thence the margins converge moderately to the hind margin. Fifth and sixth segments broadest somewhat from the posterior margin and their lateral margins are somewhat convex; seventh segment with the anterior half of the lateral margins convex, the posterior half straight. Second segment without any ventral process in the single female with marsupium and in a female of the same size with the ventral side of the anterior segments flat; in all other specimens the ventral side of the anterior segments is convex as in the subadult male (fig. 2c) and second segment has a conspicuous, acute ventral process projecting downwards and much forwards from the anterior part of the segment. — Thoracic legs of moderate length and rather slender. Second pair (fig. 2a) with the distal setæ on fourth and fifth joints somewhat short or moderately long; sixth joint as long as the fifth plus half of the fourth, with the distal setæ somewhat short; seventh joint with claw somewhat shorter than sixth joint. Third pair somewhat or rather considerably shorter

than second pair, because fourth, fifth and sixth joints are conspicuously shorter than in the last-named pair; the distal anterior setæ on fourth, fifth and sixth joints somewhat long, and in one specimen the distal posterior seta on fourth joint was very long; seventh joint with claw distinctly more than half as long as sixth joint. Three posterior pairs of legs (fig. 7b) with second joint about three times as long as broad; fourth joint (fig. 7c) with two distal short spines on the anterior side; fifth joint somewhat thick, with a rounded expansion on almost the distal half of the anterior margin and a few tiny spinules on that expansion; sixth joint about as long as the fifth plus half of the fourth, twice as long as seventh joint with claw.

Abdomen not fully as long as the two preceding segments combined, but a little broader than the last thoracic segment. — Uropods somewhat long and slender (fig. 7d); endopod with the proximal joint a little or slightly longer than the distal; exopod distinctly longer and more slender than the endopod, two-jointed, and the distal joint almost twice as long as the proximal.

Length of a female with marsupium and of the largest female without marsupium 2.4^{mm}.

Subadult Male. The antennulæ are thick (fig. 2c); first joint only a little more than three times as long as deep and tapers a little towards the end; second joint about as long as deep; third joint with the proximal half somewhat thickened below. Ventral process on second thoracic segment well developed (fig. 2c). Abdomen a little longer than the two preceding segments combined.

Remarks. *T. variabilis* is easily distinguished from all other species of *Typhlotanais* mentioned here or found at Norway by having the exopod of the uropods distinctly longer than the endopod. In various features it is allied to *T. penicillatus*.

As to the variation in presence or absence of a ventral process on second thoracic segment I refer to the statements on p. 7.

Occurrence. *T. variabilis* has been taken by the "Ingolf" at three stations, all in the cold deep-sea area.

North of the Færoes: St. 139: Lat. 63° 36' N., Long. 7° 30' W., 702 fm., temp. ÷ 0.6°; 3 spec.

East of Iceland: St. 105: Lat. 65° 34' N., Long. 7° 31' W., 762 fm., temp. ÷ 0.8°; 3 spec.

— . . . — St. 102: Lat. 66° 23' N., Long. 10° 26' W., 750 fm., temp. ÷ 0.9°; 2 spec.

(One of these specimens, represented in fig. 2a, has a minute parasitic Copepod (*♂*) fixed on the base of second left leg.)

30. *Typhlotanais trispinosus* n. sp.

(Pl. V, figs. 4a—4f.)

Female (without marsupium). Body slender, nearly seven and a half times as long as broad (fig. 4a). — Carapace about as long as the two following segments combined, somewhat longer than broad; its lateral margins converge slightly from near the base to somewhat from the front end where they are more curved; the front end is a little more than half as broad as the carapace near its base, and the rostral process is well developed, somewhat narrow, acute.

Antennulæ (fig. 4b) nearly or scarcely as long as the carapace, moderately slender. First joint about three and a half times as long as deep, somewhat tapering and somewhat longer than the two

other joints combined; second joint considerably longer than deep; third joint conspicuously more than twice as long as the second, with the longest terminal seta about as long as the joint. — Antennæ rather long; second and third joints (fig. 4c) very thick, third joint on the lower side with three strong, spiniform and nearly hook-shaped processes directed much backwards; second joint with a similar process a little behind the front lower angle and sometimes besides a minute, acute denticle behind the hook; fourth joint is distinctly more than twice as long as the penultimate joint, and the terminal setæ nearly as long as those of the antennulæ.

Chelipeds (fig. 4b) somewhat long and strong. Basal joint with the posterior protuberance somewhat long and rounded behind; the distance between its hind margin and the lower front end of second thoracic segment distinctly more than one-third of the length of the joint. Carpus much longer than the basal joint and nearly three times as long as deep. Chela as long as the carpus and little more than three times as long as broad; movable finger nearly as long as the front margin of the hand; fixed finger inconsiderably thicker than the movable, with low teeth towards the end of the incisive margin.

Thoracic segments (fig. 4a), taken together, with the lateral margins parallel excepting in front and behind, as the margins of second segment converge somewhat from near the front end to the hind margin, while those of seventh segment converge in the opposite direction. Second segment somewhat or considerably shorter than the third, below a little behind the front angle with a somewhat small, subacute process directed mainly forwards (fig. 4b). Third, fourth and sixth segments nearly equal in length, nearly as long as broad and only a little shorter than fifth segment. — Thoracic legs somewhat short. Second pair (figs. 4b and 4d) with fourth joint distinctly longer than the fifth and without setæ; seta on the anterior angle of fifth joint somewhat short; sixth joint a little shorter than fifth and fourth joints combined, and the seta on the anterior side stiff and only a little longer than the diameter of the joint; seventh joint with claw about as long as fourth joint; the third joint on the posterior side with an extremely long, strong seta reaching the end of fifth joint. Third pair with the seta on third joint proportionately still longer than that on second pair; fourth, fifth and sixth joints conspicuously shorter than in second pair, but preserving the same proportion as to length and similarity as to setæ; seventh joint with claw considerably less than half as long as sixth joint. Fourth pair with the same enormous seta on third joint. Seventh pair (fig. 4e) is rather robust; second joint expanded, only about twice as long as broad; third joint scarcely distinguishable; fourth and fifth joints much widened, with curved rows of very fine spines on the outer side and on the convex margin; sixth joint is not much longer than the fifth, with some five minute incisions along the longest margin and at the end with a long seta and two strong, moderately long spines pectinate along the concave margin; seventh joint very short and the claw minute. Sixth pair of legs are a little, and fifth pair somewhat, more slender than seventh pair, with seventh joint conspicuously longer and thinner, while fourth and fifth joints are adorned in the main as in seventh pair.

Abdomen somewhat shorter than the two preceding segments combined. — Uropods short, both rami one-jointed and the endopod somewhat longer than the exopod.

Length 2^{mm}.

Remarks. *C. trispinosus* is closely allied to *T. tenuicornis* G. O. S. Both these species agree

with each other and differ from all other species known by two very peculiar characters: the lower side of second and third joints of the antennæ is furnished with strong, hook-shaped processes, and the third joint of the three anterior pairs of thoracic legs bears an extremely long seta. But before mentioning the differences between *T. trispinosus* and *T. tenuicornis* I may write some remarks on Sars' description and figures of the last-named species. I have studied some co-types presented to our Museum by Sars, and have drawn three analytical figures (Pl. V, figs. 3a—3c) for comparison with my figures of *T. trispinosus*.

Sars described and figured the antennæ of *T. tenuicornis* as having two strong hooks on third joint and none on second joint, but in his co-types I find two strong hooks on each of these joints (fig. 3a). Sars' figure of the second leg is not quite correct; I have found (fig. 3b) the very long seta on the posterior angle of fourth joint, but no seta on the posterior angle of fifth joint; it does not seem probable that the last-named seta exists though it has been drawn by Sars, but we have both figured a moderately short and thin and a rather long, strong seta on the anterior angle of that joint; finally, the seta on the anterior margin of sixth joint is very strong, nearly spiniform, and, as also drawn by Sars, more than half as long as the joint, and seventh joint with claw is only as long as fifth joint, being too long in Sars' figure. Third pair of legs (fig. 3c) nearly as drawn by Sars, excepting that fifth joint has a minute denticle — as in *T. trispinosus* — and no seta at the posterior distal angle, furthermore fourth joint has only a moderately long seta on the posterior angle. The three posterior pairs of legs have their fourth and fifth joints adorned with rows of very fine spines in the main as in *T. trispinosus*.

T. trispinosus differs from *T. tenuicornis* especially in the armature of second and third antennal joints and in the feebler development of setæ on fourth to sixth joints of second pair of legs. The difference in the armature of the antennal joints is easily seen from my descriptions and figures of these parts of both species. A comparison of my fig. 3b with fig. 4c shows that the two long setæ found on the posterior angle of fourth joint and the anterior angle of fifth joint of second legs in *T. tenuicornis* are wanting in *T. trispinosus*, furthermore that the stiff seta on sixth joint is proportionately twice as long in the former as in the latter species. Finally it may be pointed out that antennulæ, antennæ, chelipeds and thoracic legs are thicker in proportion to length in *T. trispinosus* than in *T. tenuicornis*. The last-named species is known only from the west coast of Norway, from depths ranging between 60 and 120 fathoms, and from Skager Rak, N. N. E. of the lighthouse of the Skaw, 125 fm. (H. J. Hansen).

Occurrence. *T. trispinosus* has been taken by the "Ingolf" at a single station.

Davis Strait: St. 36: Lat. 61° 50' N., Long. 56° 21' W., 1435 fm., temp. 1.5°; 17 spec.

31. *Typhlotanais profundus* n. sp.

(Pl. V, figs. 5a—5e.)

Female (without marsupium). Body moderately robust, not fully six times as long as broad (fig. 5a). — Carapace a little longer than the two following segments combined and about as long as broad; the lateral margins conspicuously convex and the anterior end slightly more than half as broad as the carapace somewhat before the posterior margin; the frontal process moderately large.

Antennulæ slightly longer than the carapace. First joint is even more than half as long again as the two other joints combined, seen from the side (fig. 5c) almost four times as long as deep and tapering much from near the base to the end; seen from above (fig. 5b) this joint is somewhat less than three times as long as broad and the distal half is much narrower than the proximal, which has the outer margin a little angular somewhat from the base and the limit between the proximal and the distal part incised and furnished with an outstanding seta. Second joint is, seen from the side, more than twice as long as deep; third joint is somewhat less than twice as long as the second, and its longest terminal setæ about as long as the first joint. — Antennæ (fig. 5c) of normal length; third joint is distinctly thickened, fourth joint slightly more than twice as long as the penultimate; terminal setæ only a little shorter than those of the antennulæ.

Chelipeds (fig. 5e) moderately stout. Basal joint somewhat long, with the posterior protuberance of middle length, rounded behind and reaching to near the front margin of second segment; carpus considerably longer than the basal joint and somewhat less than three times as long as deep. Chela slightly longer than the carpus, about three and a half times as long as broad and with the posterior margin considerably concave; movable finger as long as the anterior margin of the hand and a little narrower than the fixed finger.

Thoracic segments (fig. 5a) show a little difference in breadth. Second segment somewhat more than half as long as the third, anteriorly as broad as, or a little narrower than, the carapace, with the lateral margins somewhat converging to the posterior margin and below a moderately small ventral process curved forwards and originating near the front end. Third, fourth and sixth segments with their lateral margins nearly parallel and the corners rectangular; fifth and sixth segments with the lateral margins diverging a little from the anterior to the posterior end; third segment slightly shorter than the fourth, which is as long as the sixth, a little shorter than the fifth and half as broad again as long. — Thoracic legs of moderate length and thickness. Second pair (fig. 5e) with somewhat short setæ; sixth joint long, even a little longer than fifth plus half of the fourth; seventh joint with claw slightly longer than fifth joint. Third pair with fourth to sixth joint conspicuously shorter than in second pair; sixth joint only a little shorter than fourth and fifth joints combined, twice or more than twice as long as seventh joint with claw; setæ somewhat short. Three posterior pairs nearly as in *T. inæquipes* (comp. fig. 9a); second joint about two and a half times as long as broad; fourth joint with a minute tooth; fifth joint a little expanded; sixth joint somewhat slender and almost as long as the two preceding joints combined; seventh joint with claw of middle length.

Abdomen not broader than the posterior part of the thorax but somewhat longer than its two posterior segments combined. — Uropods short (fig. 5d); endopod two-jointed, with the proximal joint a little longer than the distal; the exopod reaches beyond the middle of second joint of the endopod and seems to be one-jointed.

Length of the largest specimen 1.76^{mm}.

Subadult Male (fig. 5e). Antennulæ about as long as the carapace and half of the next segment combined, thick; first joint somewhat longer than the two other joints combined, seen from the side somewhat less than three times as long as deep and slightly tapering towards the end;

second joint about as deep as long; third joint twice as long as second, with the most proximal part feebly thickened below.

Remarks. This species is allied to *T. finmarchicus* G. O. S. and *T. mixtus* n. sp., but differs considerably in the antennulæ, which have much longer terminal setæ and the first joint in the female very differently shaped; furthermore the exopod of the uropods seems to be one-jointed in *T. profundus*, while it is distinctly two-jointed in the two other species.

Occurrence. *T. profundus* has been taken by the "Ingolf" at a single station.

South of the Davis Strait: St. 38: Lat. $59^{\circ}12' N.$, Long. $51^{\circ}05' W.$, 1870 fm., temp. 1.3° ; 4 spec.

32. *Typhlotanais spinicauda* n. sp.

(Pl. V, figs. 6a–6h.)

Female (without marsupium). Body somewhat slender, seven times as long as broad. — Carapace (fig. 6a) somewhat longer than the two following segments combined and considerably longer than broad, seen from above subcylindrical excepting its anterior third, which has the lateral margins converging forwards and distinctly convex; the anterior end almost two-thirds as broad as the base, with the frontal process of moderate size, acute.

Antennulæ (figs. 6a and 6c) conspicuously shorter than the carapace, somewhat robust. First joint more than half as long again as the two other joints combined, seen from the side little more than three times as long as deep and tapering very moderately; seen from above not quite two and a half times as long as broad and tapering regularly from base to end. Second joint short and slightly longer than deep; third joint nearly three times as long as the second, and its terminal setæ seem to be a good deal shorter than the joint. — Antennæ of normal length; third joint not thickened; fourth joint twice as long as the penultimate; terminal setæ considerably longer than those of the antennulæ.

Chelipeds (figs. 6b and 6d) of moderate length and thickness. Basal joint with the proximal protuberance scarcely as long as deep and its posterior margin not far from the front lower angle of second segment; carpus much longer than the basal joint, a little more than two and a half times as long as deep. Chela small, considerably shorter than the carpus, a little more than three times as long as broad; movable finger as long as the anterior margin of the hand; fixed finger near the base conspicuously broader than the movable.

Thoracic segments, seen from above, cylindrical with parallel margins. Second segment half as long as the third, with a conspicuous, oblong-triangular, acute, horizontal ventral process originating somewhat behind the front end of the segment (fig. 6b). Third and fourth segments with their front lateral angles produced in small, acute triangles only visible from the side (fig. 6b). — Thoracic legs short. Second pair (fig. 6e) somewhat slender with the setæ short; sixth joint as long as the fifth and half of the fourth combined; seventh joint with claw a little shorter than sixth joint. Third pair (fig. 6f) considerably shorter and distinctly thicker than the second, with short setæ; sixth joint a little shorter than the two preceding joints combined, seventh joint with claw conspicuously more than half as long as sixth joint. Sixth pair (fig. 6g) with the second joint somewhat expanded, slightly more than twice as long as broad; fourth and fifth joints rather broad and fourth joint with a distinct,

distal marginal tooth; seventh joint proportionately long, together with the short and thin claw slightly shorter than the sixth joint.

Abdomen at the middle of the hind margin with a short, protruding plate (fig. 6h), and each angle of the plate produced in a spiniform process; the distance between the end of each process and the hind margin is slightly longer than the breadth of the plate. — Uropods moderately long; endopod two-jointed (fig. 6h), with the proximal joint a little longer than the distal and with some minute spines along its inner margin; exopod a little shorter than the proximal joint of the endopod, two-jointed, with the joints equal in length.

Length of the single specimen 2.0^{mm}.

Remarks. *T. spinicauda* is easily distinguished from all other species by the plate with its two spines protruding from the end of abdomen; the uropods are also very characteristic. In several features it is allied to *T. finmarchicus* G. O. S.

Occurrence. Taken by the "Ingolf" at a single station.

Davis Strait: St. 28: Lat. 65° 14' N., Long. 55° 42' W., 420 fm., temp. 3.5°; 1 spec.

33. *Typhlotanais grandis* n. sp.

(Pl. V, figs. 7a–7e.)

Specimen without marsupium, probably an immature Male. Very large and somewhat slender, scarcely six and a half times as long as broad, but especially fifth thoracic segment is a good deal more narrow than carapace or abdomen (fig. 7a). — Carapace large, slightly longer than the two following segments combined and somewhat longer than broad; the lateral margins posteriorly convex but their anterior two-thirds converge nearly regularly to the front angles; the anterior end is a little more than half as broad as the carapace somewhat behind the middle; the rostral process is broad, somewhat short, acute.

Antennulæ (fig. 7b) a little shorter than the carapace. First joint slightly longer than the two other joints combined, slightly more than two and a half times as long as deep and, seen from the side, scarcely tapering, seen from above distinctly and regularly tapering from base to end. Second joint a little deeper than long; third joint long, about three times as long as the second and its proximal fourth distinctly thickened above; terminal setæ about as long as third joint. — Antennæ of normal length and thickness; third joint scarcely expanded; fourth joint a little more than twice as long as the penultimate joint; terminal setæ a little longer than those of the antennulæ.

Chelipeds (fig. 7b) moderately robust. Basal joint long with the posterior protuberance even a little longer than deep, rounded behind, but its hind margin is somewhat distant from the front lower angle of second thoracic segment; carpus as long as the basal joint, only twice as long as deep. Chela somewhat longer than carpus, three times as long as broad, with the posterior margin straight; movable finger as long as the front margin of the hand; fixed finger near the base conspicuously broader than the movable and with a small tooth a little from the end of the incisive margin.

Thoracic segments (fig. 7a) increase much in length and decrease considerably in breadth from second to fifth segment; sixth segment is slightly longer and a little broader than the fifth, much longer

and somewhat narrower than the seventh. Second segment is about half as long as the third and tapers much in breadth from the anterior to the posterior end; it has a small, oblique ventral process from the lower front end. Third segment with the lateral margins considerably converging from the anterior to the posterior angles. Fourth segment with the lateral margins strongly angular considerably before the middle and from these angles converging towards both ends. Fifth segment slightly longer than broad, and its lateral margins strongly angular somewhat behind the middle; sixth segment with the lateral margins strongly angular still nearer the posterior margin; seventh segment increases much in breadth from the anterior end to rather near the hind margin. — Thoracic legs moderately long. Second pair (fig. 7b) with the setæ short excepting the seta on the posterior margin of sixth joint; fourth joint somewhat longer than the fifth and as long as the sixth; seventh joint with claw only two-thirds as long as sixth joint. Third pair with fourth joint shorter than the fifth, which is somewhat shorter than the sixth; fourth joint with some minute spines on the posterior margin, setæ on fourth and fifth joints short, distal seta on the anterior side of sixth joint rather long; seventh joint with claw scarcely half as long as sixth joint. Three posterior pairs of legs moderately strong (fig. 7c); second joint about two and a half times as long as broad; fourth joint (fig. 7d) with a row of very short, tooth-shaped, small spines along the distal half of its anterior margin and two much larger spines before the end; fifth joint with a close row of small tooth-shaped spines along the major part of the convex front margin, a similar, curved row on the outer side, and a moderately long, very thick spine at the distal end; sixth joint only a little shorter than the two preceding joints combined, moderately stout, with a large number of quite minute denticles along the anterior part, two moderately long and very thick spines near the end and three much longer terminal spines, two of which with a few strong teeth on the concave margin and the third with a number of denticles along the major distal part of the corresponding margin; seventh joint with claw somewhat short, on seventh pair less than half as long as sixth joint, and both joint and claw with some few denticles on the concave margin.

Abdomen broader than seventh thoracic segment, but scarcely as broad as the second, slightly longer than seventh segment and half of the sixth combined; its hind margin transverse, feebly angular at the middle. — Uropods (fig. 7e) moderately long, somewhat slender; endopod with the first joint a little longer than the second; exopod reaches slightly beyond the middle of second joint of the endopod, two-jointed, with second joint about two and a half times as long as the first.

Length of the single specimen 4.18^{mm}.

Remarks. *T. grandis* is much larger than any other species of this genus found by Sars or the "Ingolf", but agrees in this respect with three species established by Dollfus (1897) on specimens taken by the Prince of Monaco. *T. grandis* is readily distinguished from the three last-named species by various characters (comp. Dollfus' figures) and from all forms seen by me by the peculiar armature of the posterior pairs of legs. In the shape of the thoracic segments *T. grandis* is somewhat similar to *T. irregularis*, but differs widely in several other features.

Occurrence. Taken by the "Ingolf" at a single station.

South of Iceland: St. 54: Lat. 63°08' N., Long. 15°40' W., 691 fm., temp. 3.9°; 1 spec.

34. *Typhlotanais plebejus* n. sp.

(Pl. V, figs. 8a—8g.)

Female (without marsupium). Body slender, almost eight times as long as broad, seen from above cylindrical (fig. 8a). — Carapace half as long again as broad and nearly longer than second, third and half of the fourth segment combined; the posterior halves of the lateral margins parallel, the anterior halves converging and distinctly convex; the front end somewhat more than half as broad as the carapace and the rostral process moderately developed, acute.

Antennulæ short, considerably shorter than the carapace. First joint (fig. 8b) somewhat longer than the two other joints combined, about three times as long as deep and moderately tapering from somewhat from the base to the end, seen from above nearly regularly tapering and about two and a half times as long as broad. Second joint slightly longer than deep; third joint about three times as long as the second, only moderately slender; terminal setæ a little shorter than third joint. — Antennæ somewhat long; third joint conspicuously thickened; fourth joint twice as long as the penultimate; terminal setæ somewhat shorter than those of the antennulæ.

Chelipeds (fig. 8c) rather robust. Basal joint very long, because the posterior protuberance is very elongate, more than half as long again as deep; carpus slightly longer than the basal joint, not fully two and a half times as long as deep. Chela somewhat small, somewhat shorter than the carpus and a little less than three times as long as broad, with the posterior margin conspicuously concave; movable finger somewhat shorter than the anterior margin of the hand; fixed finger at the base somewhat broader than the movable, with a low protuberance on the incisive margin a little from the end.

Thoracic segments all rectangular (fig. 8a), increasing in length from second to fifth and decreasing from fifth to seventh; second segment slightly shorter than the third, without ventral process; fifth segment considerably longer than the fourth and slightly longer than broad. — Thoracic legs on the whole somewhat short and robust. Second pair (fig. 8d) with fourth joint as long as the sixth joint; all setæ short. Third pair (fig. 8e) considerably shorter than second; fifth joint slightly longer than the fourth and not much shorter than the sixth, which is more than twice as long as seventh joint with claw; setæ short or moderately short. Fifth pair (fig. 8f) with second joint much expanded, scarcely twice as long as broad; fourth and fifth joints uncommonly broad and short; sixth joint slender and almost as long as fifth and fourth joints combined; seventh joint somewhat long and thin with a fine, curved claw. (Sixth and seventh pairs mutilated).

Abdomen almost as long as seventh, sixth and half of fourth thoracic segment combined. — Uropods somewhat short (fig. 8g); endopod distinctly two-jointed, with the first joint considerably longer than the second; exopod nearly as long as the proximal joint of the endopod, one-jointed.

Length of the single specimen 3.19^{mm}.

Remarks. *T. plebejus* is allied to *T. æquiremis* Lilljeborg and *T. assimilis* G. O. S., but it is instantly distinguished from both by shorter chelæ, by having the exopod of the uropods one-jointed and especially by the very long posterior protuberance on the basal joint of the chelipeds. By the last-named character it is distinguished from all other species of the genus.

Occurrence. Taken by the "Ingolf" at a single station.

South of the Davis Strait: St. 38: Lat. $59^{\circ} 12' N.$, Long. $51^{\circ} 05' W.$, 1870 fm., temp. 1.3° ; 1 spec.

35. *Typhlotanais inaequipes* n. sp.

(Pl. V, figs. 9a—9b; Pl. VI, figs. 1a—1c.)

Female (without marsupium). Body slender, a little more than seven times as long as broad, seen from above nearly cylindrical (fig. 1a). — Carapace as long as or a little shorter than the two following segments combined, not fully half as long again as broad; its lateral margins are nearly parallel from the base to near the beginning of their distal third, where they begin to converge more distinctly; the anterior end is scarcely more than half as broad as the base and the rostral process is middle-sized, acute.

Antennulæ considerably shorter than the carapace (fig. 1c), somewhat slender. First joint, seen from the side, about or not fully three times as long as deep and tapering somewhat irregularly from somewhat from the base to the end; seen from above the joint (fig. 1b) is nearly three times as long as broad and tapers nearly regularly; the joint is somewhat or considerably longer than the two other joints combined. Second joint from a little less to a little more than half as long as the third and at most about twice as long as deep; longest terminal setæ distinctly longer than third joint. — Antennæ of normal length (fig. 1c); third joint somewhat thickened; fourth joint at most half as long again as the penultimate; terminal setæ about as long as those of the antennulæ.

Chelipeds (fig. 1c) somewhat long but only moderately robust. The basal joint somewhat long, its posterior process large, a little longer than deep with its rounded hind margin considerably distant from the front margin of second thoracic segment; carpus considerably longer than the basal joint, three and a half times as long as deep. Chela a little shorter than the carpus, a little less than four times as long as broad; movable finger a little shorter than the front margin of the hand; fixed finger at the base somewhat thicker than the movable.

Thoracic segments with the lateral margins parallel excepting on second and seventh segments, on which the margins converge feebly respectively from the front angles backwards and from behind forwards. Second segment about two-thirds as long as the third, without ventral process; fifth segment a little longer than the fourth or the sixth and scarcely as long as broad. — Thoracic legs moderately strong. Second pair (fig. 1c) quite peculiar; fourth joint very elongate, about two and a half times as long as the fifth; sixth joint slightly more than half as long again as the fifth; seventh joint with claw as long as the fifth; setæ short. Third pair normal; fourth and fifth joints subequal in length; sixth joint about half as long again as the fifth and more than twice as long as the seventh with claw; the setæ moderately short excepting a somewhat long, distal seta from the side of sixth joint. Three posterior pairs not very characteristic; second joint (fig. 9a) about two and a half times as long as broad; fourth joint with a minute distal tooth; fifth joint slightly broader than the fourth, with one of the margins somewhat convex but without any distinct armature; sixth joint moderately or rather slender, almost as long as the two preceding joints combined, with a minute spine somewhat before the end; seventh joint with claw of middle length.

Abdomen slightly broader than the posterior thoracic segments and scarcely as long as the

two preceding segments combined. — Uropods somewhat short; endopod (fig. 9b) two-jointed, with the first joint somewhat longer than the second; exopod reaching about the middle of the distal joint of the endopod, divided by a suture at or slightly beyond the middle and with the proximal part of its long terminal seta quite unusually thick.

Length 2.15^{mm}.

Remarks. *T. inaequipes* is easily distinguished from all other species by the peculiarly elongate fourth joint of second thoracic legs. Antennæ, chelipeds and uropods afford various other characters, but the species is on the whole allied to *T. mixtus* n. sp.

Occurrence. Taken by the "Ingolf" at a single deep-sea station.

Davis Strait: St. 36: Lat. 61° 50' N., Long. 56° 21' W., 1435 fm., temp. 1.5°; 38 spec.

36. *Typhlotanais finmarchicus* G. O. Sars.

(Pl. VI, figs. 2a—2b.)

1881. *Typhlotanais finmarchicus* G. O. Sars, Arch. for Math. og Naturv. B. 7, p. 36.

1896. — — G. O. Sars, Account Crust. Norway, Vol. II, p. 20; Pl. IX (Female and adult Male).

In the last-named work Sars has published a description and numerous figures of this species, which differs from all other forms of the genus, excepting *T. mixtus* n. sp., by some characters.

The antennulæ (fig. 2a) are shorter than the carapace, their first joint between more than half as long again and a little less than twice as long as the two other joints combined, about three times as long as deep; second joint conspicuously longer than deep; third joint more than twice as long as the second, with the longest terminal seta not fully as long as the joint. Second pair of legs somewhat short; sixth joint only a little longer or even shorter than seventh joint with claw. Third pair of legs with fourth and fifth joints uncommonly short in proportion to thickness, each being only about half as long again as broad; seventh joint with claw considerably more than half as long as sixth joint or only a little shorter than this joint.

Sars' figure of the carpus of the chelipeds is not correct, as its greatest depth is not situated at the end of the preceding joint, but much nearer the distal end; the carpus is between two and a half and two times as long as deep; the movable finger of the chela is a little or slightly shorter than the anterior margin of the hand. Sars' figure of the uropod does not agree with the uropods in my numerous specimens, among which some co-types presented by that author; I have drawn a normal uropod (fig. 2b) and this figure shows that in the endopod the proximal joint is less than half as long again as the distal, while in Sars' figure the proximal joint is about twice as long as the other: furthermore Sars' figure shows the proximal joint of the exopod to be almost longer than the distal, while I always found (fig. 2b) the proximal joint conspicuously shorter than the distal. Finally, it may be mentioned that the ventral side of second thoracic segment has frequently a rather small or very small, acute process originating behind the front end of the segment and directed essentially forwards, but sometimes this process could not be found in specimens where it might be expected. — As to all other features I refer to Sars; the differences between *T. finmarchicus* and *T. mixtus* are pointed out below.

Occurrence. *T. finmarchicus* has been taken by the "Ingolf" at three localities.

West Greenland: Mouth of Ameralik Fjord, at Godthaab, 5—70 fm., shells; 16 spec.

— — Inner end — — — muddy bottom; 11 spec.

Jan Mayen: St. 115: Lat. 70° 05' N., Long. 8° 26' W., 86 fm., temp. 0.1°; large number of specimens.

Furthermore *T. finmarchicus* has been taken at Iceland by various Zoologists and at Jan Mayen and East Greenland by the second Amstrup Expedition. The localities are given here.

West Iceland: Önundar Fjord, 11—12 fm., ooze and stones with a few algæ; 2 spec. Mag. W. Lundbeck.

East Iceland: Faskrud Fjord, 20—50 fm., blue clay; 7 spec. Mag. R. Hörring.

— — Nord Fjord, 40 fm.; 1 spec. Mag. R. Hörring.

— — Bakke Fjord, 8—10 fm.; black sand; 1 spec. Dr. A. C. Johansen.

Jan Mayen: 50—60 fm. and 55 fm., 17 spec. II^d Amstrup Exp.

East Greenland: Cape Dalton: Lat. 69° 24.6' N., ab. Lat. 23¹/₂° W., 9—11 fm.; 11 spec.

II^d Amstrup Exp.

— — Turner Sound: Lat. 69° 44' N., Long. 23¹/₂° W., 3 fm.; 1 spec. — —

— — Sabine Island: Lat. 74° 30' N., Long. 19° 45' W., 3—5 fm.; 23 spec.

II^d Amstrup Exp.

Distribution. *T. finmarchicus* was previously known from Vadsö in Varanger Fjord (North-eastern Norway), where it occurred in 30 fathoms (G. O. Sars), and from Northbrook Island, Franz Joseph Land (Th. Scott). — The list given above shows that it has a wide distribution in the arctic and subarctic areas, while it is not known from the southern and south-western coasts of Iceland or from the Færoes.

It may be mentioned here that from the "Ingolf" Stat. 104: West of Iceland: Lat. 66° 23' N., Long. 7° 25' W., 957 fm., temp. ÷ 1.1°, I have 2 specimens (an immature female and an immature male), of which especially the characteristic female certainly belongs to *T. finmarchicus*, though judging from their occurrence at that deep-sea station it would have been expected that they belonged to the closely allied *T. mixtus* n. sp. It is very improbable that *T. finmarchicus*, which has been taken at many localities in depths from 3 to 60 fathoms and never in a depth exceeding 86 fathoms, may occur in a depth of nearly a thousand fathoms; therefore I do not venture to insert that single deep-sea station in the list of localities, fearing that some error has been committed in one way or another, but the statement inexplicable at present is mentioned here.

37. *Typhlotanais mixtus* n. sp.

(Pl. VI, figs. 3a—3f.)

Female. Body slender, about seven times as long as broad, seen from above nearly cylindrical (fig. 3a). — Carapace somewhat or considerably longer than the two following segments combined, nearly half as long again as broad; lateral margins parallel to near the beginning of their distal third, then converging and distinctly convex; the anterior end not quite two-thirds as broad as the carapace, with the rostral process somewhat long, acute.

Antennulæ (figs. 3 a and 3 b) somewhat shorter than the carapace. First joint only somewhat longer than the two other joints combined — thus proportionately a good deal shorter than in *T. finmarchicus* — seen from the side about three times as long as deep and tapering considerably, seen from above tapering nearly regularly from near the base to the end. Second joint somewhat longer than deep, less than half as long as the third; longest terminal setæ considerably shorter than third joint. — Antennæ with third joint slightly thickened (fig. 3 b); fourth joint not twice as long as the penultimate; terminal setæ almost longer than those of the antennulæ.

Chelipeds (fig. 3 b) moderately long. Basal joint moderately long; the posterior protuberance a little longer than deep, and the distance between its hind margin and the front lower angle of second thoracic segment is more than half as long as the joint; carpus rather slightly longer than the basal joint, about three times as long as deep — thus less robust than in *T. finmarchicus*. Chela as long as the carpus, a little more than three times as long as broad; movable finger somewhat or a little longer than the anterior margin of the hand; fixed finger distinctly broader than the movable, with a couple of triangular teeth towards the end of the incisive margin.

Thoracic segments (fig. 3 a) with their lateral margins subparallel excepting those of second segment which converge backwards. Second segment about half as long as the third, in females without marsupium generally with a moderately small or very small ventral process as in *T. finmarchicus*. Fifth segment slightly longer than the fourth or the sixth and slightly shorter than broad. — Thoracic legs somewhat short and robust. Second pair (fig. 3 b) with fifth joint a little longer than the fourth and not twice as long as deep; sixth joint much longer than the fifth, about as long as or a little longer than seventh joint with claw; setæ moderately short. Third pair with fourth and fifth joints short in proportion to thickness; seventh joint with claw considerably more than half as long as the sixth; distal anterior seta on sixth joint moderately long. Three posterior pairs nearly as in *T. finmarchicus*; second joint about two and a half times as long as broad; fourth and fifth joints somewhat broad, each with a distal small spine; sixth joint about as long as fifth and half of the fourth combined; seventh joint somewhat long, together with the fine claw nearly as long as the sixth joint.

Abdomen slightly broader than seventh thoracic segment and about as long as seventh and sixth segments combined. — Uropods (fig. 3 f) moderately short; endopod with the proximal joint somewhat longer than the distal; exopod scarcely reaching the middle of the distal joint of the endopod, with the distal joint a little longer than the proximal.

Length of a female with marsupium 1.94^{mm}.

Subadult Male. The antennulæ (fig. 3 c) considerably thicker than in the female; first joint about two and a half times as long as deep and tapering a little; second joint conspicuously deeper than long; third joint a little thickened below towards the base. — Length 1.9^{mm}.

Remarks. *T. mixtus* might perhaps be considered a variety of *T. finmarchicus*, but according to my judgment it is a separate species; I have learned by experience that even small characters are not infrequently of specific value. *T. mixtus* differs from *T. finmarchicus* in having the first joint of the antennulæ conspicuously shorter in proportion to the two other joints combined, in having the carpus of the chelipeds less deep in proportion to its length and the movable finger of the chela longer in proportion to the front margin of the hand. — I have been unable to find any difference between

the specimens from 1435 fathoms in the warm area and specimens from depths ranging between 495 and 1060 fathoms in the cold area, and must therefore refer them all to the same species.

Occurrence. *T. mixtus* has been taken by the "Ingolf" at ten deep-sea stations, with a single exception in the cold area.

Davis Strait:	St. 36: Lat. 61° 50' N., Long. 56° 21' W., 1435 fm., temp. 1.5°; 6 spec.
North of the Færoes:	St. 141: Lat. 63° 22' N., Long. 6° 58' W., 679 fm., temp. ÷ 0.6°; 8 spec.
— - - —	St. 139: Lat. 63° 36' N., Long. 7° 30' W., 702 fm., temp. ÷ 0.6°; 8 spec.
East of Iceland:	St. 102: Lat. 66° 23' N., Long. 10° 26' W., 750 fm., temp. ÷ 0.9°; 4 spec.
North of Iceland:	St. 124: Lat. 67° 40' N., Long. 15° 40' W., 495 fm., temp. ÷ 0.6°; 1 spec.
— - —	St. 125: Lat. 68° 08' N., Long. 16° 02' W., 729 fm., temp. ÷ 0.8°; 6 spec.
North-East of Iceland:	St. 120: Lat. 67° 29' N., Long. 11° 32' W., 885 fm., temp. ÷ 1.0°; 1 spec.
— - —	St. 119: Lat. 67° 53' N., Long. 10° 19' W., 1010 fm., temp. ÷ 1.0°; 17 spec.
South of Jan Mayen:	St. 118: Lat. 68° 27' N., Long. 8° 20' W., 1060 fm., temp. ÷ 1.0°; 4 spec.
— - - —	St. 117: Lat. 69° 13' N., Long. 8° 23' W., 1003 fm., temp. ÷ 1.0°; 13 spec.

38. *Typhlotanais cornutus* G. O. Sars.

1879. *Paratanais cornutus* G. O. Sars, Arch. for Math. og Naturv. B. 4, p. 431.

1885. *Typhlotanais* — G. O. Sars, Norske Nordhavs-Exp., Crust. I, p. 83, Pl. VII, figs. 29—38.

1896. — — G. O. Sars, Account Crust. Norway, Vol. II, p. 24, Pl. XI, fig. 2.

Sars' figures and description in his last-named work are on the whole good, but it may be useful to enumerate a number of features, by the combination of which this species is separated from any other form.

T. cornutus is thicker than most species, being about four and a half times as long as broad. The carapace is a little or somewhat shorter than the three following segments combined. Antennulæ moderately slender, scarcely as long as the carapace, with the longest terminal setæ decidedly longer than the two distal joints combined. Chelipeds with carpus and chela equal in length and somewhat short in proportion to breadth; the movable finger a good deal shorter than the front margin of the hand. — Second thoracic segment half or less than half as long as third segment, which is conspicuously shorter than the fourth. Second pair of thoracic legs somewhat slender; sixth joint conspicuously longer than the seventh with claw, with its distal posterior seta somewhat long. Second joint of the posterior pairs of legs moderately thick. — Uropods with both rami two-jointed and the exopod conspicuously shorter than the endopod.

Among the characters pointed out by Sars that drawn from the well-developed rostrum seems to me less valuable, and it may be stated here that I have some co-types of Sars presented by himself. — In specimens with the ventral side of second thoracic segment convex a moderately small or somewhat large process projects downwards and much forwards, originating somewhat behind the front end of the segment.

Occurrence. Taken by the "Ingolf" at a single station.

Davis Strait: St. 32: Lat. 66° 35' N., Long. 56° 38' W., 318 fm., temp. 3.9°; 42 spec.

Distribution. According to Sars this species has been taken at Kvalø in the most northern part of Norway (Lat. $70^{\circ}\frac{2}{3}'$ N.) "from depths of 60—100 fathoms", and at a locality "about midway between Beeren Eiland and Finmark", from 190 fathoms.

39. *Typhlotanais solidus* n. sp.

(Pl. VI, figs. 4 a—4 f).

Female (without marsupium). Body robust, only a little more than four times as long as broad (fig. 4 a). — Carapace even longer than the three following segments combined, slightly longer than broad (fig. 4 b); the postero-lateral angles broadly rounded, the major part of the lateral margins converging to near the front end, where they are rounded; the front end is scarcely half as broad as the carapace somewhat from its hind margin, and the rostral process is somewhat long, acute.

Antennulæ scarcely as long as the carapace (fig. 4 b), moderately robust. First joint half as long again as the two other joints combined, three and a half times as long as deep (fig. 4 c) and tapering regularly and somewhat feebly; seen from above (fig. 4 b) two and a half times as long as broad and tapering considerably. Second joint about twice as long as deep; third joint rather short, scarcely half as long again as the second, its longest terminal setæ distinctly longer than the two distal joints combined. — Antennæ (fig. 4 c) somewhat long; second and third joints considerably widened above; fourth joint not quite twice as long as the penultimate; longest terminal seta even slightly longer than that of the antennulæ.

Chelipeds (fig. 4 c) rather long but moderately robust. Basal joint with the proximal protuberance large, nearly as long as deep and reaching the front end of second thoracic segment; carpus long, considerably longer than the basal joint and three times as long as deep. Chela a little longer than carpus, three and a half times as long as broad; anterior margin of the hand almost half as long again as the movable finger; fixed finger at the base slightly broader than the movable, with a tooth near the end of the incisive margin.

Thoracic segments (fig. 4 a) increase in length and decrease a little in breadth from second to fifth, decrease in length and increase perceptibly in breadth from fifth to seventh; the lateral margins are very convex on second and third segments, moderately convex on the fourth segment, less convex but more or less distinctly angular towards or near the posterior margin on the three posterior segments. The three anterior segments combined scarcely longer than fifth and sixth segments together. — Anterior pairs of legs somewhat slender and moderately long. Second pair (fig. 4 d) with fifth joint a little longer than the fourth and somewhat shorter and thicker than the sixth, which is a little longer than seventh joint with claw; setæ short or wanting. Third pair only a little shorter than second; sixth joint a little longer than fifth and not fully twice as long as seventh with claw, with the upper distal setæ moderately long. Sixth and seventh pairs (fig. 4 e) considerably shorter than the anterior pairs, somewhat slender; second joint nearly three times as long as broad; fourth and fifth joints a little thickened, respectively with a single spine and two minute distal spines; sixth joint moderately slender and nearly as long as fourth and fifth joints combined; seventh joint very short with the claw minute, both together only about one-third as long as the sixth joint.

Abdomen slightly broader than seventh thoracic segment, as long as seventh, sixth and half of the fifth thoracic segment combined. — Uropods short (fig. 4 f); endopod rather robust, two-jointed, with the proximal joint distinctly longer than the distal; exopod nearly as long as the endopod, but more slender and without any perceptible articulation.

Length of the single specimen 1.85^{mm}.

Remarks. *T. solidus* is easily distinguished from the other species by its broad body and the shape of the thoracic segments; antennulæ, chelipeds and uropods afford further characters. The animal is yellow, and its exoskeleton seems to be more solid than in any other species of similar size. The specimen has the ventral side of the thoracic segments flat, consequently no ventral process on second segment, and seems to be full-grown.

Occurrence. Taken by the "Ingolf" at a single station.

South-West of Iceland: St. 78: Lat. 60° 37' N., Long. 27° 52' W., 799 fm., temp. 4.5°; 1 spec.

Agathotanis n. gen.

Body in the female and subadult male moderately slender, decreasing in breadth from the middle of the carapace to the base of abdomen, which is narrower than the last thoracic segment. Carapace about as long as the two following segments combined. No eyes. Antennulæ in the female three-jointed, with the first joint longer than the two others combined; in the subadult male the third joint has a transverse suture. Antennæ in the female (Pl. VI, fig. 5 c) quite rudimentary, consisting of a minute joint; in the subadult male (fig. 5 n) about as long as the proximal depth of the antennulæ.

Mandibles (fig. 5 d) small, with only the incisive part developed, while a movable lacinia and the molar process are completely wanting. Maxillulæ (fig. 5 f) consist of a single slender joint curved towards both ends; the terminal part has several thick spines and some fine hairs; the palp is only half as long as the joint, slender and very thin-skinned, with two terminal setæ. (Maxillæ not seen, rudimentary or wanting.) Maxillipeds (fig. 5 g) considerably reduced; the two proximal joints and the lobes are completely fused, constituting a circular, vaulted, strongly chitinized plate with a median fissure in its anterior part; the four-jointed palps with the terminal joint slender; the epipods — omitted in the figure — are subtriangular, small, thick plates.

Chelipeds slender. Thoracic legs very slender; second and third pairs completely similar; claw on the three posterior pairs very long (fig. 5 k). Seventh thoracic segment immovably fused with the abdomen and all abdominal segments immovably fused, but all seven segments are limited by moderately distinct, though feeble furrows (figs. 5 b and 5 o). Pleopods wanting in the female (fig. 5 b); in the subadult male (fig. 5 o) they are long, unjointed, slender and somewhat conical and all coalesced, constituting a kind of pyramid with longitudinal impressions between the pairs; each pleopod terminates in a few very short setæ. Uropods rudimentary, each being a small, subtriangular joint without any distinct division (figs. 5 l and 5 m).

The exoskeleton of the animals, excepting the walking legs, has a peculiar aspect and seems

to contain a large quantity of calcium, as it is firm but yet fragile. The walking legs are inserted in small holes in the firm wall of the segments.

Remarks. This genus, founded on some specimens of a single species, is the most aberrant type of the family hitherto discovered. The three most interesting features are: the rudimentary antennæ, the fusion of the last thoracic segment and all abdominal segments in a single portion with feeble furrows indicating the limits between the seven segments, finally the coalescence of all five pairs of long, unjointed pleopods in the subadult male.

In the number of joints in the antennulæ the genus shows affinity to the preceding genera *Paratanais* and *Typhlotanais*, while the similarity of second pair of legs with third pair resembles the features in *Leptognathia* and *Cryptocope*; the reduced mandibles are somewhat similar to those in *Tanaopsis*.

40. *Agathotanais Ingolfi* n. sp.

(Pl. VI, figs. 5a—5o.)

Female (without marsupium). Body about six and a half times as long as broad. — Carapace (fig. 5a) about as long as the two following segments combined, somewhat longer than broad, seen from above ovate, with the lateral margins considerably convex to near the front end which is a little less than half as broad as the base of the carapace and considerably less than half as broad as the carapace a little behind the middle; frontal process somewhat short and obtuse.

Antennulæ a little shorter than the carapace, moderately strong (fig. 5c). First joint considerably longer than the two other joints combined, about three and a half times as long as deep at the base, with the subdistal part as deep as the middle but a little narrowed between these places; seen from above it is distinctly thickened on the outer side both at the middle and near both ends. Second joint short, about half as long again as deep; third joint twice as long as the second, somewhat robust, with the terminal setæ shorter than the joint. — Antennæ consist of a minute conical joint terminating in a few setæ.

Chelipeds (figs. 5b and 5h) slender. Basal joint somewhat longer than deep, without any posterior protuberance, but attached to the cephalothorax by an oblique articulation, and the distance between this articulation and the front lower angle of second thoracic segment is about as long as the joint. Carpus about twice as long as the basal joint, between three and four times as long as deep, with the lower margin undulate. Chela about as long as the carpus, three times as long as broad; movable finger a little longer than the front margin of the hand; fixed finger near the base considerably broader than the movable, with three low, protruding angles on the distal part of the incisive margin.

Thoracic segments (fig. 5a) decrease in breadth from second to seventh. Third segment slightly longer than the second and slightly shorter than the fourth; fifth and sixth segments each somewhat longer than the others; seventh segment as long as second. Second segment not quite as broad as the carapace; broadest a little behind the anterior margin, tapering rapidly to the front angles and considerably to the posterior margin; third segment nearly as the second but its broadest part a little longer from the front end; fourth segment broadest not much before the middle and tapering to both

ends; on the three posterior segments their broadest part is behind the middle and in the seventh somewhat near the posterior margin. The broadest part of each segment has instead of lateral angles a pair of rounded protuberances on which the legs are inserted. — Thoracic legs moderately long and very slender. Second (fig. 5i) and third pairs completely similar (fig. 5b); fifth joint of very moderate length, with a somewhat long seta on the posterior angle; fifth joint very long, much longer than the fourth and slightly shorter than the sixth, with a very long seta from the anterior distal angle; seventh joint and claw equal in length and together somewhat shorter than sixth joint. Three posterior pairs of legs (fig. 5k) with second joint extremely long, about as long as the five following joints and the claw combined; sixth joint slightly longer than the fifth, and both these joints with some terminal spines, two of which are somewhat long; the claw much longer than seventh joint and sometimes even about as long as the sixth joint.

Abdomen somewhat shorter than the two posterior thoracic segments combined; the five segments somewhat narrower than seventh thoracic segment (fig. 5a); the last segment broadly cordiform, conspicuously broader than the preceding segment and as long as two segments combined. — Pleopods and uropods mentioned in the description of the genus.

Length of the largest specimen 3.8^{mm}.

Subadult Male. The antennulæ (fig. 5n) are much thicker than in the female; first joint about three times as long as deep, and nearly as deep at the end as at the base, but narrower at the middle, as the lower margin of the joint is somewhat concave; second joint considerably deeper than long; third joint divided by a transverse suture a little before the middle and the proximal part marked off in this way much thicker than the distal. Antennæ consist of a single joint about three times as long as in the female, about as long as the depth of first antennular joint at its base. — Abdomen somewhat longer in proportion to the posterior thoracic segments than in the female; the pleopods have been described in the diagnosis of the genus.

Length of a subadult male 3^{mm}.

Remarks. As to this extremely interesting species it may be sufficient to refer to the remarks on the genus. The animals are completely white.

Occurrence. Taken by the "Ingolf" at three stations in the warm area.

Davis Strait: St. 24: Lat. 63° 06' N., Long. 56° 00' W., 1199 fm., temp. 2.4°; 1 spec.

Denmark Strait: St. 10: Lat. 64° 24' N., Long. 28° 50' W., 788 fm., temp. 3.5°; 8 spec. (3 females, 3 males and 2 young spec.).

South of Iceland: St. 40: Lat. 62° 00' N., Long. 21° 36' W., 845 fm., temp. 3.3°; 1 spec.

Leptognathia G. O. Sars.

This genus comprises 14 species already established in the literature. In the following pages 25 species are described, 19 of which are considered new to science. The genus is thus very large, comprising 33 species. For reasons mentioned on p. 9, I do not divide it into three or four genera, though it comprises types not only very different in general aspect but also showing considerable

differences in the shape of the molar processes of the mandible, in chelipeds, thoracic legs, pleopods and uropods. But being unable to say anything about the mandibles in several interesting species, because my material is too small, and being in doubt whether some of the characters are only of specific value or ought to be considered of higher importance, I confine myself to dividing the species described or mentioned in this report into four groups and two of these groups into sub-groups. This arrangement may, I hope, not only facilitate the determination of species but besides afford a general view of the relationships of the various species. It may be stated that the divisions are founded exclusively on the females, because in several species the pleopods are rudimentary or wanting in this sex but well developed in the subadult males.

Group a. *Uropods long, with both rami two-jointed and the exopod considerably shorter than the proximal joint of the endopod. Pleopods in the females well developed, biramous, with long setæ. Animals moderately slender or somewhat robust.*

The animals of this division, which may be named the *Sarsii*- or *longiremis*-group, are somewhat uniform in general aspect and allied in several features. Sars' figures of the female of his *L. longiremis* (= *L. Sarsii* H. J. H., not *L. longiremis* Lilljbg.) convey a fair idea of the aspect of the forms of this group. The body is moderately slender. The antennæ are seven-jointed, as fourth and fifth joints are separated by a well developed articulation. The basal joint of the chelipeds have the posterior protuberance well developed, with its posterior margin free and rounded. The thoracic legs are moderately slender, with long or moderately long spines; the three posterior pairs with seventh joint moderately long, considerably or much longer than the claw and both combined as long as or longer than the sixth joint. This group may be divided into three subdivisions.

- a. The movable finger of the chelæ serrate along the anterior (upper) margin.
Fifth abdominal segment without any hastate process.
Species 41—43.
- β. The movable finger of the chelæ without serration along the anterior margin.
Fifth abdominal segment without any hastate process.
Species 44—48.
- γ. The movable finger of the chelæ without serration along the front margin.
Fifth abdominal segment with the ventral protuberance produced in a long acute process directed more or less backwards.
Species 49—51.

Group a, subdivision a (vid. above).

41. **Leptognathia multiserrata** n. sp.

(Pl. VI, figs. 6a—6e.)

Female (without marsupium). General aspect as in *L. Sarsii* H. J. H. — Antennulæ slightly more than two-thirds as long as the carapace. First joint nearly longer than the three others combined

(fig. 6a), not fully three times as long as deep, tapering much from somewhat from the base to the end; second joint slightly longer than the depth of the first and considerably produced above; upper margin of third joint only half as long as that of the second; fourth joint scarcely as long as the upper margin of the second. — Antennæ with fifth joint almost half as long again as the fourth, which is slightly longer than the sixth.

Chelipeds (fig. 6b) extremely robust. Carpus a little more than half as long again as deep, with the major distal part considerably expanded downwards and the corresponding part of the lower margin much longer than the proximal portion, considerably convex and with some low, rounded saw-teeth along its proximal part, viz. that situated beyond the usual seta. Chela as long as the carpus, less than twice as long as broad; the distal part of the hand somewhat expanded anteriorly and the corresponding part of the anterior margin very convex and furnished with about six rounded saw-teeth, but without any protruding angle above the insertion of the movable finger. Both fingers thick; the movable finger somewhat shorter than the anterior margin of the hand, with a row of conspicuous, rounded saw-teeth along the major part of the proximal half of the anterior margin; the fixed finger with an oblong, low, subtriangular thickening at the usual setæ on the outer side, and the posterior margin of this thickening has a row of four strong, rounded saw-teeth; the incisive margin of this finger with three very conspicuous, obtuse, moderately low teeth.

Second and third pairs of thoracic legs (fig. 6c) quite similar, rather slender; posterior distal spine of fourth joint even longer than fifth joint; sixth joint about one-third as long again as the fifth and a little longer than seventh with claw. Three posterior pairs of legs (fig. 6d) have the seventh joint somewhat shorter than the sixth and adorned with a close row of extremely small setiform denticles.

The five anterior abdominal segments (fig. 6e) with the median row of ventral protuberances rounded and somewhat low, seemingly not strongly chitinized. Pleopods with the marginal setæ more than twice as long as the rami. Terminal segment with the sides evenly rounded. — Uropods about as long as the sixth plus half of the fifth abdominal segment (fig. 6e); the peduncle more than twice as long as deep and more than half as long as the first joint of the endopod; first joint of the endopod slightly longer than the second; exopod half as long as the first joint of the endopod.

Length of the single full-grown or nearly full-grown female without marsupium 3.5^{mm}.

Remarks. This species is easily distinguished by having carpus and chela of the chelipeds proportionately broader than in any other species of this subdivision and besides by the peculiar shape of the chela with the rounded teeth at the posterior margin. — It may be added that the other specimen, which is so young, that seventh pair of thoracic legs are still wanting, has the carpus and the hand of the chelæ less expanded but showing all the characteristic crenulations.

Occurrence. Taken by the "Ingolf" at a single station.

East of Iceland: St. 4: Lat. 64° 07' N., Long. 11° 12' W., 237 fm., temp. 2.5°; 2 spec.

42. *Leptognathia Sarsii* H. J. Hansen.

(Pl. VI, figs. 7a—7f.)

1909. *Leptognathia Sarsii* H. J. Hansen, Vidensk. Medd. Naturh. Forening i Kjøbenhavn for 1909, p. 229¹).

1896. — *longiremis* G. O. Sars, Account Crust. Norway, Vol. II, p. 27, Pl. XII (Not *Tanais longiremis* Lilljeborg).

Female. — Antennulæ nearly three-fourths as long as the carapace. First joint about as long as the three others combined (fig. 7a), scarcely two and a half times as long as deep, tapering considerably from the base to the end; second joint slightly longer than the depth of the first and somewhat produced above; third joint about half as long as the second; fourth joint distinctly shorter than the upper margin of the second. — Antennæ with fifth joint a little more than half as long again as the fourth, which is slightly longer than the sixth.

Chelipeds (figs. 7a and 7b) very robust. Carpus only about half as long again as deep, its distal half somewhat expanded downwards, but the convex lower margin of that part without crenulation. Chela a little longer than the carpus, twice as long as broad, somewhat triangular in outline; the distal part of the anterior margin slightly convex and furnished with some four to seven sharp or rounded, small saw-teeth; the terminal corner above the insertion of the movable finger is somewhat protruding, about rectangular. The outer side of the chela has a row of eight or nine protruding teeth situated nearly parallel with and a little removed from the posterior margin, the row beginning with the strongest tooth somewhat near the distal setæ of the posterior margin and going upwards on the hand where the teeth are gradually smaller and finally disappear. Half or more than half of the anterior margin of the movable finger is crenulate, with a number of either sharp and triangular or rounded saw-teeth, the finger itself somewhat shorter than the anterior margin of the hand. The subdistal part of the incisive margin of the fixed finger with three sharp saw-teeth, the distal tooth subdivided into two teeth.

The thoracic legs somewhat slender. Second (fig. 7c) and third pairs subequal; posterior terminal spine on fourth joint conspicuously shorter than fifth joint; sixth joint almost or fully half as long again as the fifth, slightly or distinctly shorter than the seventh with claw. Three posterior pairs of legs have the seventh joint (fig. 7d) somewhat shorter than the sixth and furnished with an either distinct or nearly indistinct row of minute, setiform denticles.

Five anterior abdominal segments with the ventral tubercles high and strong (fig. 7e). Pleopods with the marginal setæ between half as long again and twice as long as the rami. Sixth abdominal segment (figs. 7e and 7f) with the lateral plate on each side produced downwards in a keel which generally projects in a very conspicuous, obliquely triangular, acute process directed downwards and backwards, but in some specimens (from four localities in Greenland) these processes are shorter and obtuse or very short and broadly rounded, but a protrusion is always distinct. — The uropods as long as the sixth and half of the fifth segment combined; the peduncle a little or somewhat less than twice as long as deep, but slightly more than half as long as the first joint of the endopod, which is

¹) In a foot-note in his Arctic Crustacea I (Bihang Kgl. Sv. Vet. Akad. Handlingar, B. 26, Afd. IV, No 12, 1901) Ohlin stated that I had proposed the name *L. Sarsii* for this species.

conspicuously longer than the second joint; the exopod more than half as long as the proximal joint of the endopod.

Length of the largest specimen, a female with marsupium from the Sabine Island, is 5^{mm} long, but the majority of the females are only 3.5–4^{mm}.

Subadult Male. Antennulæ considerably thicker than in the female, five-jointed, the proximal third of the fourth joint being set off by an articulation and somewhat thickened; first joint somewhat shorter than the other joints combined, thick to the end; second joint scarcely as thick as the first and third joint rather thick. Abdomen distinctly a little longer and thicker in proportion to thorax than in the female. — Length 2.6–2.7^{mm}.

Adult Male. Not seen by me, but I suppose that the adult male described and figured by Sars as belonging to his *L. longiremis* is the male of *L. Sarsii*. It has the two proximal joints of the antennulæ extremely broad and the chelæ uncommonly slender, while the thoracic legs have the sixth joint longer than seventh joint with claw.

Remarks. *L. Sarsii* is easily recognized from the other species by the rounded protruding keel or generally triangular process on the lower lateral surface of last abdominal segment and by the row of saw-teeth on the outer side of the chela a little from its posterior margin. In the shape of the hand and the crenulation of the movable finger it agrees with *L. gracilis* Krøyer and *L. graciloides* Lilljeborg. The form with the obtuse process or rounded lateral keel I name var. *obtusata*; it is certainly only a variety, as my material from the Sabine Island contains both specimens with the processes obtuse or much reduced. That *L. Sarsii* is identical with *L. longiremis* G. O. Sars as described and figured in his standard work is easily seen by the pair of processes on last abdominal segment. That the real *L. longiremis* Lilljeborg is another species is easily decided by two characters found in Lilljeborg's diagnosis of the female: "Manus... digito mobili lævi" and "Unguis pedum thor. 2:di paris brevis, et articulo unguifero multo brevior." This last-named species is described below.

Occurrence. The "Ingolf" has found this species at three stations.

North of Iceland: St. 128: Lat. 66° 50' N., Long. 20° 02' W., 194 fm., temp. 0.6°; 1 spec.
 — — — St. 126: Lat. 67° 19' N., Long. 15° 52' W., 293 fm., temp. ÷ 0.5°; 7 spec.
 — — — St. 124: Lat. 67° 40' N., Long. 15° 40' W., 495 fm., temp. ÷ 0.6°; 4 spec.

Besides *L. Sarsii* has been taken by various Zoologists and the II^d Amdrup-Expedition at a good number of localities.

West-Greenland, probably Egedesminde; 1 spec. (var. *obtusata*). Prof. D. Bergendal.

Færoes: Klaksvig, 10–15 fm.; about 70 spec. Dr. T. Mortensen.

East Iceland: Breidals Vig, 6 fm., mud and black sand; 28 spec. Dr. A. C. Johansen.

— — Seydis Fjord, 6 fm., black sand; 6 spec. Dr. A. C. Johansen.

— — Bakke Fjord, 8–10 fm., black sand; 9 spec. Dr. A. C. Johansen.

East Greenland: Angmagsalik, Lat. 65° 51' N.; 4 spec. (var. *obtusata*). Mag. Kruuse.

— — Cape Dalton, Lat. 69° 24.6' N., 9–11 fm.; 4 spec. II^d Amdrup Exped.

— — Turner Sound, Lat. 69° 44' N., 3 fm.; 1 spec. (var. *obtusata*). II^d Amdrup Exped.

— — North of Stewart Land (about at Lat. 70¹/₂° N.), 158 fm.; 2 spec. II^d Amdrup Exped.

East Greenland: Sabine Island, about at Lat. $74\frac{1}{3}^{\circ}$ N., 3—5 fm.; 15 spec. (the majority belonging to var. *obtusata*). II^d Amdrup Exped.

Finally two specimens mentioned by Ohlin (1901) probably belong to this species; they were taken at the two following localities.

East Greenland: Lat. $74^{\circ} 35' N.$, Long. $18^{\circ} 23' W.$, 18—21 m., sandy mud; 1 spec.

— — — — — Lat. $77^{\circ} 9' N.$, Long. $14^{\circ} 40' E.$, 90 m., soft grey clay; 1 spec.

Distribution. In the work quoted Sars has stated on his *L. longiremis*: "This species occurs along the whole Norwegian coast, from Christianiafjord to Vadsø in depths ranging from 30 to 100 fathoms". Sars has presented the Copenhagen Museum with 25 specimens which must be considered co-types of his *L. longiremis*, but only 13 of these specimens show the characteristic shape of sixth abdominal segment and belong consequently to *L. Sarsii* H. J. H., while 4 specimens belong to *L. gracilis* Kr. as interpreted below and 8 specimens must be referred to the real *L. longiremis* Lilljeborg. The result is that Sars' utterances on the occurrence of his *L. longiremis* along the whole Norwegian coast are valueless, but it remains certain that *L. Sarsii* has been taken at Norway, and I suppose only at the Finmark, because all above-named localities, where this species has been captured by Danish or Swedish explorers, have an arctic character.

43. *Leptognathia gracilis* Krøyer.

(Pl. VII, figs. 1a—1d).

1847. *Tanais gracilis* Krøyer, Naturh. Tidsskr. 2. R. B. II, p. 408.

? — — — — — Krøyer, Voy. en Scand. Crust. Pl. 31, fig. 4, a—i.

1877. — *islandicus* G. O. Sars, Arch. for Math. og Naturv. B. II, p. 346.

1885. *Leptognathia longiremis* G. O. Sars, Norske Nordhavs-Exped., Crust. I, p. 79, Pl. 7, figs. 17—27.

Female. This species is so closely allied to *L. Sarsii* that it may be sufficient to point out the differences and make mention of some features. — The antennulæ (fig. 1a) a little more slender than in *L. Sarsii*; first joint distinctly more than two and a half times as long as deep, somewhat tapering and as long as the three other joints combined; second joint conspicuously longer than the depth of the first, somewhat produced above; upper margin of third joint about half as long as that of the second; fourth joint nearly as long as the second. — Antennæ as in *L. Sarsii*.

Chelipeds (figs. 1a and 1b) scarcely as robust as in *L. Sarsii*; carpus only a little less than twice as long as deep. Chela slightly longer than carpus, nearly twice as long as broad, somewhat triangular in aspect; the hand is less or more protruding and angular above the insertion of the movable finger, and the crenulation on the distal part of the anterior margin is distinct or rudimentary; the outer side of the chela has no row of small tubercles as in *L. Sarsii*, while a longer or shorter part of the front margin of the movable finger is distinctly crenulate.

Second and third pairs of thoracic legs subequal; posterior terminal spine of fourth joint considerably shorter than fifth joint (fig. 1c); sixth joint not quite half as long again as the fifth; seventh joint with claw a little or conspicuously longer than the sixth joint.

Abdominal segments as in *L. Sarsii* excepting that the sixth segment has no trace of any pro-

truding lateral process or keel. — Uropods (fig. 1d) in the main as in *L. Sarsii*; peduncle about twice as long as deep, a little more than half as long as first joint of the endopod, and this joint is somewhat longer than the second; exopod scarcely more than half as long as the proximal joint of the endopod.

Length of a female without marsupium from Greenland 3.2^{mm}; an ovigerous female from Norway is 2.2^{mm} long.

Remarks. This species is, in my opinion, well separated from *L. Sarsii* by the absence of a row of teeth on the outer side of the chela and by having the last abdominal segment simple, without any acute or rounded lateral process.

In the revised list of the Danish species of most orders of Malacostraca (1909) I referred *L. graciloides* Lilljeborg to *L. gracilis* Kr. Having re-examined the Danish specimens I prefer now to refer them to *L. graciloides* which is re-established as a species closely allied to *L. Sarsii* and *L. gracilis*. *L. graciloides* agrees with *L. Sarsii* in having a row of tubercles on the outer side of the chela, but the anterior margin of the movable finger has only about five sharp saw-teeth, and the last abdominal segment has, as in *L. gracilis*, no trace of a lateral process; it differs from *L. gracilis* in possessing the row of tubercles on the outer side of the chela, and the carpus of the chelipeds has the distal half more expanded downwards, so that the lower margin of the carpus is at the middle considerably more incised as in *L. gracilis* and even more than in the figure of *L. Sarsii* (Pl. VI, fig. 7a); finally the uropods have the exopod considerably more than half as long as the first joint of the endopod. Length of the Danish specimens, among which a couple of ovigerous females, 2.2—2.5^{mm}.

As to Krøyer's specimen and description I refer to my remarks (p. 230—31) in the paper on the Danish fauna; it is clear that my application of the Krøyerian name is not quite certain, but I have used it, as I did not like to cancel it.

Occurrence. This species has been captured by the "Ingolf" at a single locality.

West-Greenland: Ameragdla (inner end of Ameralik Fjord, near Godthaab), muddy bottom,
11 spec. (some of them young).

According to Sars his specimens of *L. islandicus* or (in 1885) *L. longiremis*, which seem to belong to *L. gracilis*, were taken at Iceland, harbour of Reykjavik.

Distribution. As already mentioned, I found a few specimens of *L. gracilis* between co-types of *L. longiremis* given by G. O. Sars and taken at Norway. The Copenhagen Museum possesses 3 small specimens from the Kara Sea, 50 fathoms. Krøyer's specimen was from Spitzbergen. Specimens taken in the deep water off Aberdeen and in the Moray Firth were determined by Th. Scott as *L. (?) longiremis* Lilljeb., but according to his description and figures the specimens probably belong to *L. gracilis*.

Group a, subdivision β (vid. p. 66).

44. *Leptognathia Hanseni* Vanhöffen

(Pl. VII, figs. 2a—21).

1907. *Leptognathia hanseni* Vanhöffen, Zool. Jahrb., Abth. für System. Bd. XXV, p. 513, Taf. 20, Fig. 13—15.

Female. General aspect about as in *L. gracilis*. — Antennulæ (fig. 2a) on the whole a little

more robust. First joint a little longer than the three other joints combined, a little more than two and a half times as long as deep, moderately tapering; second joint about as long as the depth of first joint, moderately produced above and somewhat thick; upper margin of third joint half or more than half as long as the second; fourth joint decidedly shorter than the second, -- Antennæ with fourth joint scarcely half as long again as the fifth, as long as or shorter than the sixth.

Chelipeds (figs. 2a and 2e) somewhat robust; carpus a little or somewhat less than twice as long as deep, with the distal half distinctly expanded downwards and the corresponding part of the lower margin moderately convex. Chela slightly or a little longer than the carpus, somewhat more than twice as long as broad, thus conspicuously less broad than in the three preceding species; the hand is oblong but not subtriangular, its anterior margin without crenulation and about half as long again as the movable finger, the distal part above the insertion of the finger flatly rounded or obtuse. The margin of the movable finger and the outer side of the chela without crenulation. The fixed finger with three teeth along the distal portion of the incisive margin and the last tooth cleft.

The thoracic legs moderately slender. Second and third pairs subequal (fig. 2b); posterior terminal spine of fourth joint much shorter than fifth joint; sixth joint about half as long again as the fifth, but a little or very conspicuously shorter than seventh joint with claw. Posterior pairs (fig. 2c) with the sixth joint about half as long again as the seventh, which has a row of very fine and short, setiform denticles.

The five anterior abdominal segments (fig. 2d) with the median row of ventral tubercles high and strong; lateral plates of sixth segment without any expansion or process. The pleopods with the setæ about twice as long as the rami. — Uropods about as long as the two posterior segments combined; the peduncle nearly twice as long as deep, more than half as long as first joint of the endopod; second joint of the endopod conspicuously or even considerably shorter than the first; exopod a little more than half as long as the first joint of the endopod.

Length of a large female without marsupium 3.3^{mm}, of a female with marsupium 2.1^{mm}.

Subadult Male. Antennulæ much thicker than in the female, five-jointed, the proximal third of fourth joint being set off by an articulation and somewhat thickened; the first joint is thick to the end, second almost as thick as the first, and third joint rather thick. Abdomen a little longer and distinctly thicker than in the female.

Adult Male (figs. 2f—2l). This description is based on the single "Ingolf" specimen; Vanhöffen's specimen is mentioned in "Remarks". — Antennulæ with first and second joints very thick (fig. 2f); second joint is somewhat more than half as long as the first and slightly longer than the seventh, which is a little longer than the sixth; bundles of sensory setæ originate from the lower distal end of fourth, fifth and sixth joints.

Chelipeds (figs. 2f—2h) somewhat robust; carpus scarcely half as long again as deep. Chela not fully half as long again as the carpus, slightly more than twice as long as broad and nearly as broad as the depth of the carpus; anterior margin of the hand nearly half as long again as the movable finger, which has its incisive margin irregularly serrate from the base to the middle, while the corresponding margin of the fixed finger is somewhat convex and very finely serrate along nearly

three-fourths of its length; the inner side of the hand (fig. 2h) with a subdistal, transverse row of peculiar light but broad setæ.

Second pair of thoracic legs (fig. 2i) thinner than in the female, with the sixth joint scarcely half as long again as the fourth and as long as seventh with claw. Three posterior pairs of legs (fig. 2k) with sixth joint somewhat longer than the fifth and slightly shorter than the seventh, which is about two and a half times as long as the claw.

Sixth abdominal segment (fig. 2l) posteriorly produced into a small, rounded tip. — Endopod of the uropods somewhat longer than the exopod, two-jointed, with the first joint a little longer and considerably thicker than the second, before the middle on the upper half of the outer side with some fine hairs placed in a transverse row.

Length of the specimen 1.3^{mm}.

Remarks. *L. Hanseni* is sharply separated from the three preceding species by the more oblong chelæ without any serration on the anterior margin of hand or finger; from *L. longiremis* Lilljeborg and *L. inermis* n. sp. it is easily distinguished by the much longer "claw" (seventh joint plus claw) on second and third pairs of legs. As to the male described, which is easily seen to belong to *Leptognathia*, I am sure that it belongs to the female, because it has been taken together with a large number of females and immature males and cannot belong to any other species known from West Greenland excepting *L. Sarsii* and *L. gracilis*, but no female of any of these species has been taken at Ameralik, and the male described by Sars as belonging to his *L. longiremis* probably belongs to *L. Sarsii* and differs widely in some features.

Then the determination of the present species. In the paper on the marine Malacostraca of West Greenland (1887) I mentioned a specimen which did not agree with *L. longiremis* as interpreted and figured by Sars in the Norwegian North-Atlantic Expedition, because the chelæ had no serration; I named it "*?Leptognathia longiremis* Lilljeborg" and added figures of antenna, chela and uropod. According to these figures the specimen (which belongs to the Riks Museum in Stockholm) is certainly identical with the species described here as *L. Hanseni* Vanh. Later Vanhöffen captured several specimens of a species in Karajok Fjord (not very far from Kekertak); he found that his females agreed with my remarks and figures and finding no positive facts which made it necessary to refer the form to the real *L. longiremis* Lilljeborg, he named it *L. hanseni*, described and figured the male but unfortunately not the more important female. As his male differs from my above-described specimen in a couple of features to be discussed presently, I asked Dr. Vanhöffen to lend me a few specimens; I received the whole material, six females and an adult male, and I beg the Direction of the Berlin Museum and Dr. Vanhöffen to accept my sincere thanks. The females captured by Dr. Vanhöffen agree perfectly with my specimens from other localities, but the male must be mentioned separately.

Dr. Vanhöffen's specimen is 1.5^{mm}, thus distinctly a little larger than mine. He figured the endopod of the uropod as three-jointed, but it is in reality only two-jointed, as no articulation is found at the base of the transverse row of fine hairs. His figure of the chela does not agree completely with my specimen, but an examination of his specimen, which has both chelæ closed and the finer structure of the incisive margins somewhat indistinct, does not reveal any real difference worth men-

tioning. In his specimen the posterior legs have the seventh joint a little shorter and the claw longer (viz. half as long as seventh joint) than in my specimen. The only important difference between the two specimens is that in the antennulæ the seventh joint is considerably or rather much shorter than the sixth in Vanhöffen's specimen, a little longer than the sixth in my specimen. But in spite of this difference, I think that both males belong to the same species. In males of *Leptognathia breviremis* I have observed a conspicuous variation in the length of seventh antennular joint. The female of *L. longiremis* is allied to *L. Hanseni*, but the male of *L. longiremis* differs strongly from that of *L. Hanseni* in the armature of the chelæ and the extreme length of seventh joint with claw on the posterior pairs of thoracic legs (vid. Lilljeborg and my figures published in 1910). The male figured by Sars as belonging to his *L. longiremis* differs also widely from that of *L. Hanseni*. Consequently I am induced to think that the specific differences between males of different species of this group *a* are much larger than between Vanhöffen's specimen and my own, and that the differences observed between these two specimens are due only to variation.

Occurrence. Taken by the "Ingolf" at a single locality.

West Greenland: Mouth of Ameralik Fjord, near Godthaab, 5—70 fm., shells; more than a hundred females and immature males, and one adult male.

L. Hanseni has besides been taken at several other places in Greenland by various Zoologists.

West Greenland: Karajok Fjord, ab. Lat. 70° 20' N.; several spec. Dr. E. Vanhöffen.

— — Kekertak, Lat. 69° 58' N., 35—40 fm., clay; 1 spec. Nordenskjöld Exped. 1870.

East Greenland: Angmagsalik, ab. Lat. 65½°; 2 spec. Mag. Kruuse.

— — — 4—11 fm.; 2 spec. Ryder Exped.

— — Tasiusak, Lat. 65° 37' N., 20—30 fm., stones with algæ; 1 spec. Ist Amdrup Expedition.

— — Cape Dalton, Lat. 69° 24.6' N., 9—11 fm.; 2 spec. II^d Amdrup Exped.

— — Denmark Island, Lat. 70° 27' N.; 1 spec. Ryder Exped.

The species is hitherto only known from Greenland.

45. *Leptognathia longiremis* Lilljeborg.

(Pl. VII; figs. 3a—3e.)

1864. *Tanais longiremis* Lilljeborg, Bidrag till kännedomen om de inom Sverige och Norrige förekommande Crust. af ... Tanaidernas familj, p. 19 (Female and adult male).

1910. *Leptognathia longiremis* H. J. Hansen, Vidensk. Medd. Naturh. Forening i Kjøbenhavn for 1909, p. 229, Pl. V, figs. 3a—3b.

Female. General aspect as *L. Hanseni*. — Antennulæ (fig. 3a) moderately strong. First joint a little longer than the three other joints combined, somewhat less than three times as long as deep, moderately tapering; second joint slightly longer than the depth of first joint, considerably produced above and somewhat thick; upper margin of third joint less than half as long as that of the second; fourth joint a little shorter than the second. — Antennæ as in *L. Hanseni*.

Chelipeds (fig. 3a) nearly as in *L. Hanseni*; carpus a little less than twice as long as deep;

the distal half somewhat expanded downwards with its lower margin oblique or distally nearly angular. Chela a little longer than the carpus and somewhat more than twice as long as broad, without any serration excepting the four teeth on the distal half of the incisive margin of the movable finger; the anterior margin of the hand considerably longer than the movable finger and its distal part above the insertion of the finger rounded.

The thoracic legs are rather slender. Second and third pairs similar (fig. 3b); spine on the posterior angle of fourth joint somewhat shorter than fifth joint, which is at least more than twice as long as broad; sixth joint nearly half as long again as the fifth and somewhat or considerably longer than seventh joint with claw. Three posterior pairs with sixth joint as long as or slightly longer than seventh joint with claw (fig. 3c); the row of minute denticles on seventh joint scarcely distinct.

Five anterior abdominal segments (fig. 3d) with the ventral tubercles high and strong as in *L. Hanseni*; lateral plates of sixth segment without any expansion or process. Pleopods with their setæ very long, about three times as long as the rami. — Uropods (figs. 3d and 3e) somewhat shorter than the two preceding segments combined; peduncle not fully twice as long as deep, conspicuously more than half as long as the first joint of the endopod; the last-named joint from slightly longer to a little shorter than the second joint; exopod distinctly more than half as long as first joint of the endopod.

Length of a fine female without marsupium 2.9^{mm}, a female with marsupium is 2.8^{mm}. (Females with marsupium from Norway vary from 2.4^{mm} to 3.2^{mm} in length.)

Subadult Male. The differences between this animal and the female completely as in *L. Hanseni*.

Adult Male. This sex has been described by Lilljeborg, and in the above-named paper I published a couple of analytical figures. I have only seen the single Danish specimen.

Remarks. In the oblong chelæ without any serration *L. longiremis* agrees with *L. Hanseni* and differs sharply from the three other preceding species; by having seventh joint with claw of second and third pairs of thoracic legs conspicuously shorter than sixth joint it differs from *L. Hanseni*, while it is easily separated from *L. incermis* by the ventral row of well developed tubercles on the five anterior abdominal segments, by much larger difference between the length of the two proximal antennular joints, etc. That this species is the real *L. longiremis* has been pointed out by me in 1910; especially Lilljeborg's above-quoted description in his Latin diagnosis of second pair of legs together with his statement on the chela: "digito mobili lævi" proves the correctness of my interpretation.

Occurrence. It has been taken by the "Ingolf" at five stations.

Davis Strait: St. 25: Lat. 63° 30' N., Long. 54° 25' W., 582 fm., temp. 3.3°; 17 spec.

South-West of Iceland: St. 78: Lat. 60° 37' N., Long. 27° 52' W., 799 fm., temp. 4.5°; 8 spec.

East of Iceland: St. 4: Lat. 64° 07' N., Long. 11° 12' W., 237 fm., temp. 2.5°; 2 spec.

North-East of Iceland: St. 120: Lat. 67° 29' N., Long. 11° 32' W., 885 fm., temp. ÷ 1.0°; 4 spec.

— — — — — St. 119: Lat. 67° 53' N., Long. 10° 19' W., 1010 fm., temp. ÷ 1.0°; 6 spec.

Furthermore it has been taken by the II^d Amstrup Expedition at a single locality.

Jan Mayen, 55 fm.; 2 spec.

Distribution. Lilljeborg examined specimens taken off Bohuslän and at Molde (west coast of Norway at Lat. 62° 42' N.). Material from Norway determined by Sars contained, as already stated, several specimens of this species together with two other species. In 1910 I enumerated two localities in Skager Rak, 110 and 125 fm., and one locality in Kattegat, 20 fm. — All other localities for *L. longiremis* mentioned in the literature ought to be discarded as doubtful or erroneous, and the material in question re-examined by the aid of the present paper.

46. *Leptognathia inermis* n. sp.

(Pl. VII, figs. 4a–4g.)

Female. The antennulæ (fig. 4a) differ conspicuously from those in the preceding forms. First joint is robust, considerably shorter than the three other joints combined, only twice as long as deep and somewhat tapering; second joint is thick and long, with its upper margin somewhat longer than the depth of the first joint and it is somewhat produced above; third joint with its upper margin not fully half as long as the second; fourth joint somewhat shorter than the second. — Antennæ with fifth joint more than half as long again as the fourth, which is distinctly shorter than the sixth.

Chelipeds (figs. 4a and 4b) robust. Carpus extremely deep, only about half as long again as deep, with the distal half conspicuously or, generally, strongly expanded downwards and the corresponding part of the lower margin very convex, nearly semicircular. Chela as long as or a little longer than the carpus, from slightly more to distinctly less than twice as long as broad, thus rather broad, with the distal anterior corner of the hand at the insertion of the movable finger angular and frequently protruding, subrectangular or even with a subacute angle; movable finger uncommonly broad towards the base; with the anterior margin glabrous excepting in a single immature specimen (from East Greenland) which has nearly half of this margin sinuate, with three impressions (fig. 4g); fixed finger with three teeth on the distal part of the incisive margin, but these teeth are frequently obtuse and one or two among them poorly developed.

The thoracic legs are somewhat shorter and thicker than in the five preceding species. Second and third pairs subsimilar (figs. 4c and 4d); the spine from the distal posterior angle of fourth joint very long, from a little longer to somewhat shorter than fifth joint; the last-named joint varies considerably in breadth, being sometimes twice as long as broad, but most frequently broader, even only somewhat longer than broad, with the posterior margin straight or with a couple of low serrations; (perhaps the extreme breadth is due to compression originating from the influence of alcohol); sixth joint considerably longer than, sometimes even half or slightly more than half as long again as, the fifth and always considerably longer than seventh joint with claw. Posterior pairs of legs (fig. 4e) with sixth joint about as long as seventh plus the short claw; seventh joint with the row of minute setiform denticles more or less distinct.

Five anterior abdominal segments (fig. 4f) without any ventral median row of real tubercles, as the lower median margin of each segment is, seen from the side, rather flatly convex. Pleopods as in *L. longiremis*. Sixth abdominal segment, seen from the side (fig. 4f), generally, and in full-grown specimens probably always, more flatly convex than in all preceding species. — Uropods longer than

the two posterior abdominal segments combined; peduncle somewhat or considerably less than twice as long as deep, about half as long as the first joint of the endopod; second joint of the endopod slightly or a little shorter than the first; exopod distinctly more than half as long as first joint of the endopod.

Length of a large female without marsupium 2.8^{mm}, of a female with marsupium 2.15^{mm}.

Subadult Male. Antennulæ only four-jointed, but the two proximal joints are considerably, the third joint somewhat, thicker than in the female. The abdomen proportionately somewhat longer and thicker than in the female. — Length 2.1–2.3^{mm}.

Remarks. *L. inermis* differs from all preceding species of this genus by having the first antennular joint shorter in proportion to its depth and to the length of second joint; in this respect it agrees with some of the following species. From *L. longiremis*, with which it agrees in having seventh joint with claw of second and third pairs of legs conspicuously shorter than sixth joint, it differs in the antennulæ, in having no ventral abdominal tubercles, shorter and stouter legs, the chela broader, etc.

Occurrence. It has been taken by the "Ingolf" at five stations.

East of Iceland: St. 58: Lat. 64° 25' N., Long. 12° 09' W., 211 fm., temp. 0.8°; 1 spec.

— . . . — St. 101: Lat. 66° 23' N., Long. 12° 05' W., 537 fm., temp. ÷ 0.7°; 7 spec.

North of Iceland: St. 126: Lat. 67° 19' N., Long. 15° 52' W., 293 fm., temp. ÷ 0.5°; 1 spec.

— . . . — St. 124: Lat. 67° 40' N., Long. 15° 40' W., 495 fm., temp. ÷ 0.6°; 1 spec.

Jan Mayen: St. 115: Lat. 70° 50' N., Long. 8° 29' W., 86 fm., temp. 0.1; ab. 75 spec.

Besides it has been secured by the II^d Amdrup Exped. at a single locality.

East Greenland: Cape Dalton, Lat. 69° 24.6' N., 9–11 fm.; 1 spec. (The chelæ of this specimen has the anterior margin of the movable finger sinuate (fig. 4g)).

47. *Leptognathia brachiata* n. sp.

(Pl. VII, figs. 5a–5h.)

Female. Antennulæ two-thirds as long as the carapace (figs. 5a–5b). First joint (fig. 5c) robust, somewhat longer than the three other joints combined, a little more than twice as long as thick, moderately tapering; second joint stout, a little produced above, with the upper margin somewhat longer than the depth of first joint and a little more than half as long as that joint; third joint with the upper margin a little less than half as long as that of the second; fourth joint proportionately short, considerably shorter than the second. — Antennæ with fifth joint about half as long again as the fourth, which is a little shorter than the sixth.

Chelipeds (fig. 5d) moderately robust. Carpus somewhat less than twice as long as deep, with less than the distal half much expanded downwards, the corresponding lower margin being strongly convex and almost subangular. Chela a little shorter than the carpus, a little more than twice as long as broad, without any serration; anterior margin of the hand a little longer than the movable finger, with the lower angle above the insertion of the finger scarcely rounded; movable finger of moderate breadth; fixed finger with three acute saw-teeth on the distal part of the incisive margin.

Thoracic legs rather slender. Second and third pairs subsimilar (fig. 5e); posterior spine on fourth joint as long as fifth joint, which has two long distal spines; sixth joint about half as long again as the fifth and somewhat longer than seventh with claw. Three posterior pairs (fig. 5f) with seventh joint only a little shorter than the sixth and its row of minute setiform denticles rather distinct; claw somewhat long, longer than in the preceding forms.

Five anterior abdominal segments feebly developed or scarcely distinct, the lower margin of the segments being somewhat flatly convex (fig. 5h). Pleopods with long setæ. — Uropods distinctly longer than the two posterior segments combined and longer than in any other species of this genus (figs. 5g and 5h), as the peduncle is very long, almost four times as long as deep and about as long as the first joint of the endopod; second joint of the endopod slightly longer than the first joint; exopod from slightly less to slightly more than half as long as first joint of the endopod.

Length of a female with marsupium 3.3^{mm}.

Remarks. This fine species is easily distinguished from all other forms of the genus known to me by the very long peduncles of the uropods.

Occurrence. This species has been taken by the "Ingolf" at two stations.

Davis Strait: St. 25: Lat. 63° 30' N., Long. 54° 25' W., 582 fm., temp. 3.3°; 11 spec.

— — St. 24: Lat. 63° 06' N., Long. 56° 00' W., 1199 fm., temp. 2.4°; 6 spec.

The marsupium of one of the females from Stat. 25 contains two ovisacs of an unknown species of the family Choniostomatidæ. It is, I believe, the first time that the existence of a species of this family of parasitic Copepods has been observed in any form of the order Tanaidacea.

48. *Leptognathia alba* n. sp.

(Pl. VII, figs. 6a—6e.)

Specimen without marsupium. The single specimen is either a female without marsupium or, judging from the thick antennulæ, more probably a male so far from maturity, that the fourth antennular joint has not been divided into two joints. The body is conspicuously more robust than in the preceding forms.

Antennulæ (fig. 6a) slightly more than two-thirds as long as the carapace, very robust. First joint slightly longer than the three other joints combined, not fully two and a half times as long as deep and tapering feebly; second joint thick, as long as the depth of the first and somewhat produced above; upper margin of third joint only about one-third as long as that of the second; fourth joint somewhat shorter than the second. — Antennæ with fifth joint scarcely half as long again as the fourth, which is as long as the sixth.

Chelipeds (fig. 6b) moderately robust. Carpus somewhat more than twice as long as deep, with the proximal half of the upper margin somewhat concave; the distal half is feebly expanded downwards. Chela somewhat shorter than the carpus, somewhat more than twice as long as broad, oblong-triangular in aspect, without serration; the anterior distal corner of the hand not rounded; the movable finger somewhat broad and somewhat shorter than the anterior margin of the hand.

Thoracic legs somewhat slender. Second and third pairs subequal (fig. 6c); posterior spine on

fourth joint distinctly longer than fifth joint; distal spines on fifth joint uncommonly long; sixth joint not fully half as long again as the fifth; seventh joint with claw scarcely longer than fifth joint. Three posterior pairs (fig. d) with sixth joint almost as long as seventh with claw; setiform denticles on seventh joint nearly inconspicuous; claw proportionately long.

Five anterior abdominal segments with the median ventral tubercles peculiarly shaped (fig. 6 e), as each tubercle, seen from the side, is somewhat low, because its lower margin is concave instead of convex. Pleopods with their marginal setæ about three times as long as the rami. — Uropods a little longer than the two posterior segments combined; peduncle about half as long again as deep, only half as long as the first joint of the endopod; second joint of the endopod slightly longer than the first; exopod about half as long as the proximal joint of the endopod.

The specimen is 3.7^{mm} long; it is quite white.

Remarks. *L. alba* is easily distinguished from all above-described species by the shape of the ventral abdominal tubercles; the shape of the joints of the chelipeds also affords good characters. The species is uncommonly robust.

Occurrence. Taken by the "Ingolf" at a single station.

South-West of Cape Farewell: St. 22: Lat. 58° 10' N., Long. 48° 25' W., 1845 fm., temp. 1.4°; 1 spec.

Group a, subdivision γ (vid. p. 66).

49. *Leptognathia hastata* n. sp.

(Pl. VII, figs. 7 a—7 g.)

Female (without marsupium). Antennulæ somewhat or a little shorter than the carapace. First joint (fig. 7 a) a little shorter than the three other joints combined, somewhat more than twice as long as deep and considerably tapering; second joint thick and long, a little more than half as long as the first and somewhat produced above; upper margin of third joint a little less than half as long as that of the second; fourth joint somewhat shorter than the second. — Antennæ with fifth joint slightly more than half as long again as the fourth, which is as long as the sixth.

Chelipeds (fig. 7 b) rather robust. Carpus only about, or even less than, half as long again as deep, with the distal part strongly expanded downwards and the corresponding lower margin very convex. Chela a little longer than the carpus, about twice as long as broad, without serration; hand with the distal anterior corner subrectangular and protruding; movable finger somewhat broad, a little shorter than the anterior margin of the hand; fixed finger with the usual teeth on the incisive margin.

Thoracic legs moderately strong. Second and third pairs subequal (fig. 7 c); posterior distal spine on fourth joint a little longer than the fifth joint; sixth joint about half as long again as the fifth and its lower margin with a more or less distinct row of small denticles; seventh joint with claw slightly longer than fifth joint. Three posterior pairs (fig. 7 d) have seventh joint considerably shorter than the sixth and the row of setiform denticles is very conspicuous (fig. 7 e), the denticles being conspicuously longer than in the preceding forms; claw somewhat more than half as long as seventh joint.

The two anterior abdominal segments with the ventral tubercles wanting or rudimentary; third and fourth segments with the tubercles either rudimentary or rather low and triangular; fifth segment (fig. 7h) with the tubercle high and posteriorly produced into a very long, acute process projecting horizontally backwards and reaching the middle of sixth segment; in a single specimen (from Stat. 102) the tubercle of fifth segment is rudimentary with the process very short, being undeveloped from one reason or another. Pleopods with the setæ almost twice as long as the rami. — Uropods as in the majority of the preceding species, not fully as long as the two posterior segments combined; peduncle somewhat less than twice as long as deep; proximal joint of the endopod not quite as long as the peduncle and about as long as or a little longer than the distal joint (fig. 7g); exopod scarcely half as long as first joint of the endopod.

Length of the females without marsupium 2.5—2.8 mm.

Remarks. The differences between *L. hastata* and the two following species are pointed out in the "Remarks" on these species.

Occurrence. *L. hastata* has been taken by the "Ingolf" at two deep-sea stations in the cold area.

East of Iceland: St. 102: Lat. 66° 23' N., Long. 10° 26' W., 750 fm., temp. ÷ 0.9°; 2 spec.

North of Iceland: St. 125: Lat. 68° 08' N., Long. 16° 02' W., 729 fm., temp. ÷ 0.8°; 1 spec.

50. *Leptognathia armata* n. sp.

(Pl. VIII, figs. 1a—1f.)

Female (without marsupium) and subadult Male. This species is so closely allied to *L. hastata* that it is nearly sufficient to point out the differences. — The antennulæ of the female almost as in *L. hastata*. The antennulæ of the subadult male (fig. 1a) five-jointed, very thick; first joint a little shorter than the other joints combined, a little more than twice as long as deep, at the end somewhat less deep than somewhat beyond the base; second joint a little more than half as long as the first, somewhat more than half as long again as deep and considerably produced above; third joint short and thick; fourth and fifth joints combined somewhat shorter than the upper margin of the second, and fourth joint considerably deeper than long.

The chelipeds have the carpus two-thirds as long again as deep and its distal part is very moderately expanded downwards with the corresponding lower margin somewhat convex (fig. 1b) — thus the carpus is conspicuously longer in proportion to depth and less expanded downwards than in *L. hastata*. The chela is slightly shorter than the carpus and a little more than twice as long as broad, otherwise as in *L. hastata*.

Second and third pairs of legs (figs. 1c and 1d) nearly as in *L. hastata*, but the denticles on the posterior margin of sixth joint are very distinct, in the female specimen (fig. 1d) besides developed on fifth joint. Three posterior pairs (fig. 1c) with the setiform denticles on seventh joint scarcely as long as in *L. hastata*.

Four anterior abdominal segments (fig. 1f) with the ventral tubercles strongly chitinized, rather large and varying in shape, either subconical or a little obliquely and somewhat broadly truncate.

The process from fifth ventral tubercle is still broader at the base and longer than in *L. hastata* and besides not horizontal but directed backwards and somewhat downwards. Pleopods and uropods about as in *L. hastata*.

Length of the female without marsupium 3.8^{mm}, of the subadult male 3.3^{mm}.

Remarks. *L. armata* is so closely allied to *L. hastata* that I hesitated before establishing it as a separate species. But it seems to be a good deal larger than *L. hastata* and differs by having the carpus of the chelipeds less robust and conspicuously less expanded downwards, furthermore by the much more developed ventral abdominal tubercles and a different direction of the process from fifth segment. And judging from the species belonging to the subdivisions α and β of the same group a the shape of the carpus and the development of abdominal tubercles afford valuable specific characters. Finally *L. armata* was taken in very deep water with the temperatures above zero, while *L. hastata* was captured in considerable depths in the cold area. — The differences between both species and the next form, *L. Amdrupii*, are pointed out below.

Occurrence. *L. hastata* has been taken by the "Ingolf" at two stations.

Davis Strait: St. 36: Lat. 61°50' N., Long. 56°21' W., 1435 fm., temp. 1.5°; 1 spec. (♀).

South-West of Cape Farewell: St. 22: Lat. 58°10' N., Long. 48°25' W., 1845 fm., temp. 1.4°; 1 spec.

(subad. male).

51. *Leptognathia Amdrupii* n. sp.

(Pl. VIII, figs. 2a—2c.)

Female. So closely allied to *L. hastata* and *L. armata* that it may be sufficient to mention some features. — The antennulæ (fig. 2a) are distinctly more slender than in those species, and the first joint is slightly more than two and a half times as long as deep, but the relative length of their joints shows no essential difference. — The chelipeds (fig. 2b) are a little less robust; the carpus is about twice as long as the depth of its distal half which, in strong contradistinction to the other species, is distinctly less deep than the proximal half and with the lower margin nearly straight; chela a little longer than the carpus and more slender than in the two species mentioned, being considerably more than twice as long as broad; the movable finger almost longer than the front margin of the hand and as broad as the fixed finger. — Second pair of legs (fig. 2c) without spinules on the posterior margin of sixth joint.

Four anterior abdominal segments with the ventral tubercles rather low; the process from fifth segment about as long as in *L. hastata* but less horizontal, though scarcely directed as much downwards as in *L. armata*. Pleopods and uropods in the main as in *L. hastata*; exopod of right uropod two-jointed and distinctly more than half as long as first joint of the endopod, while the exopod of left uropod is much shorter and one-jointed, as second joint has not been developed.

Length of the female with marsupium 2.7^{mm}.

Remarks. By the shape of the carpus of the chelipeds *L. Amdrupii* is easily distinguished from the two preceding species. It differs on the whole a little more from *L. hastata* than from *L. armata*, but while the last-named species is only known from stations with positive temperatures at

the bottom and depths exceeding 1400 fathoms, *L. Amdrupii* was found in comparatively low water at the cold East Greenland.

The name is given in honour of G. C. Amdrup, Captain in the Danish Navy and the able leader of two Danish exploring expeditions to East Greenland.

Occurrence. Taken by the II^d Amdrup Expedition at a single locality.

East Greenland: Forsblad Fjord, Lat. 72° 27' N., 90—40 fm., 1 spec. (female with marsupium).

Group b. *Uropods long, with both rami two-jointed and the exopod conspicuously shorter than the first joint of the endopod. Pleopods in the female somewhat small with the marginal setæ at most as long as the rami or almost rudimentary. Animals slender or very slender.*

Species 52—53.

The animals of this group are on the whole allied to those of group a, but they are more slender with the pleopods considerably or much reduced and the articulation between fourth and fifth joint of the antennæ feebly developed.

52. **Leptognathia tuberculata** n. sp.

(Pl. VIII, figs. 3a—3f.)

Female. Body much more slender than in any of the preceding species, but the animal in other respects rather similar in general aspect. — Antennulæ (fig. 3a) slightly more than two-thirds as long as the carapace. First joint a little shorter than the three other joints combined, somewhat more than twice as long as deep, considerably tapering; second joint considerably produced above, distinctly more than twice as long as deep and with the upper margin conspicuously more than half as long as first joint; third joint short, fourth joint much shorter than the upper margin of the second. — Antennæ with the articulation between fourth and fifth joint feebly developed, less or more indistinct, and fifth joint about twice as long as the fourth, which is a little shorter than the sixth.

Chelipeds somewhat robust (fig. 3a). Carpus only half as long again as deep, with the distal half strongly expanded downwards and the corresponding part of the lower margin much curved and even subangular. Chela somewhat longer than the carpus and twice as long as broad, with the anterior lower corner of the hand angular; movable finger a little shorter than the anterior margin of the hand and with the subbasal part slightly narrower than the fixed finger, which has four teeth on the incisive margin.

Thoracic legs somewhat short (fig. 3a) and moderately slender. Second (fig. 3b) and third pairs with the spines on fourth and fifth joint very long; sixth joint nearly half as long again as the fifth, which is a little shorter than seventh with claw. Three posterior pairs (fig. 3c) with sixth joint as long as seventh with claw; seventh joint without any distinct row of minute setæ.

Four anterior abdominal segments (fig. 3d) with the median row of ventral tubercles low, while the tubercle on the fifth segment is more than twice as high, broadly conical, acute and even a little acuminate. Pleopods almost rudimentary, biramous, but the rami are shorter and much narrower than the small peduncle (fig. 3e), with a small terminal seta and a few minute marginal setæ. — Uropods

as in the species of group a, scarcely as long as the two posterior segments combined; peduncle twice as long as deep, distinctly more than half as long as the first joint of the endopod; the joints of the endopod subequal in length and the first joint conspicuously less than twice as long as the two-jointed exopod.

Length of a female with marsupium 3.3^{mm}, of a female without marsupium 3.1^{mm}.

Subadult Male. — The antennulæ five-jointed and as usually much thicker than in the female. In my single specimen the ventral tubercles on the four anterior abdominal segments are somewhat higher than in the females, while the tubercle of the fifth segment is obtuse, but probably damaged or misshaped. The pleopods are well developed (fig. 3f); as fig. e, representing a pleopod of the female, and fig. 3f, representing that of the male, were drawn with the same degree of enlargement, the comparison between these two figures will convey an idea of the enormous difference in size and development, and it may be added that the female is considerably larger than the subadult male in question. The endopod is nearly twice as long as the peduncle and has its distal rounded margin furnished with setæ as long as the ramus; the exopod is somewhat longer than the endopod, but the setæ along the terminal margin are only as long as those of the endopod. — Length of the specimen 2.4^{mm}.

Remarks. *L. tuberculata* is more slender than any among the above-described species; the female is easily recognized by the nearly rudimentary pleopods and the development of the ventral abdominal tubercles. The shape of the chelipeds and the relative length of the joints of the antennulæ afford additional characters.

Occurrence. The species has been taken by the "Ingolf" at two deep-sea stations in the warm area.

Davis Strait: St. 24: Lat. 63° 06' N., Long. 56° 00' W., 1199 fm., temp. 2.4°; 4 spec.

— — St. 36: Lat. 61° 50' N., Long. 56° 21' W., 1435 fm., temp. 1.5°; 1 spec.

53. *Leptognathia uncinata* n. sp.

(Pl. VIII, figs. 4a—4i.)

Female (without marsupium). This species is closely allied to *L. dentifera* G. O. Sars, of which a co-type presented by Sars himself has been examined. The two species agree with one another in the following more important particulars. The antennulæ are characteristic (fig. 4a); first joint is considerably shorter than the three others combined, very thick, conspicuously less than twice as long as deep; second joint is uncommonly long and thick, about two-thirds as long as the first, somewhat produced above, and its upper margin a little longer than the two distal joints combined and a little more than twice as long as the depth of the joint. — Antennæ with fourth joint about half as long as the fifth, and the articulation between them feebly developed. Chela (fig. 4b) as long as the carpus, twice as long as broad, with the two setæ on the posterior margin extremely thick; the anterior distal angle above the insertion of the movable finger is protruding and even produced as a short, obtuse process. — Second pair of legs (fig. 4c) with fifth joint a little shorter than the fourth and only half as long as the sixth, which is considerably longer than seventh joint with claw

and furnished with minute denticles along the lower margin; seventh joint strongly marked off from the claw, with a distinct spinule at the end. — Ventral tubercles on the five abdominal segments very low (fig. 4d). — Uropods as long as in the *Sarsii*-group; the peduncle (fig. 4e), measured to the insertion of the rami, slightly longer than the first joint of the endopod, thick and distally above produced in a large, oblong, subacute or acute process directed somewhat backwards and gradually curved much upwards; endopod with its two joints subequal in length; the two-jointed exopod somewhat (in *L. dentifera*) or considerably (in *L. uncinata*) shorter than first joint of the endopod.

But the two species are separated by two features. In *L. dentifera* G. O. S. the carpus of the cheliped is a little less than twice as long as deep, while in *L. uncinata* it is conspicuously deeper, being only half as long again as deep (fig. 4b), the distal third being considerably expanded downwards. In *L. dentifera* the pleopods are very small, slightly longer than in *L. tuberculata* (comp. fig. 3d), in my specimen from Norway even less developed than according to Sars' fig. 2 *plp*, and each ramus has a single seta less than half as long as the ramus and some tiny hairs; in *L. uncinata* the pleopods (fig. 4d), though reduced in size, are much larger than in *L. dentifera* with a number of very conspicuous setæ and some among them as long as the rami.

Length of the specimen 2.1^{mm}.

Adult Male. Antennulæ seven-jointed (fig. 4f); the two proximal joints robust, together considerably longer than the other joints combined, and second joint about two-thirds as long as the first; seventh joint half as long again as the sixth; fourth, fifth and sixth joints each with a bundle of sensory filaments from the lower end. — Antennæ with the articulation between fourth and fifth joint very distinct; fifth joint scarcely twice as long as the fourth, but only a little longer than the sixth.

Chelipeds somewhat robust (fig. 4f). Carpus about half as long again as deep, with the distal third distinctly expanded downwards. Chela considerably longer than the carpus, twice as long as broad, nearly triangular in aspect; distal anterior angle of the hand above the insertion of the finger protruding but a little rounded; movable finger a little shorter than the anterior margin of the hand, somewhat narrow, being scarcely half as broad as the fixed finger at the base, and its incisive margin without serration; fixed finger with half of its incisive margin finely serrate.

Second (fig. 4g) and third pairs of legs with the sixth joint only a little longer than the fifth and about as long as seventh joint with claw. Posterior pairs (fig. 4h) with seventh joint elongate, slightly longer than the sixth and about half as long again as the claw.

Sixth abdominal segment (fig. 4i) posteriorly rounded. — Uropods with the peduncle as long as second joint of the endopod, which is slightly shorter but much thinner than its first joint; the two-jointed endopod somewhat more than half as long as first joint of the endopod.

Length 1.5^{mm}.

Remarks. It was after considerable hesitation that I established *L. uncinata* as a new species, but the two differences pointed out between the females of *L. uncinata* and *L. dentifera* seem to be so important, that the deep-sea form ought to be established as a separate species.

I think that the reference of the adult male to this species is quite certain. This male is so small that it cannot belong to *L. armata* or *L. tuberculata* taken at the same station. Furthermore

the chelipeds of the male agree so well with those of the female in several particulars: length in proportion to depth or breadth of carpus and chela, protruding anterior angle of the hand, rather narrow movable finger and general shape of the fixed finger, and this agreement is larger than otherwise generally found in the chelipeds of the two sexes. The thickness and relative length of the two proximal joints of the antennulæ is also nearly the same in the two sexes, and perhaps the most important character is the long peduncle of the uropods in both sexes, as this joint in the male is nearly as long as, in the female slightly longer than, the first joint of the endopod, while in the females of all preceding species of the genus excepting the large *L. brachiata* the peduncle is much shorter than the first joint of the endopod.

Occurrence. Taken by the "Ingolf" at the following station.

Davis Strait: St. 36: Lat. 61° 50' N., Long. 56° 21' W., 1435 fm., temp. 1.5°; 2 spec. (♀ and ♂).

It may be mentioned that the "Ingolf" at Stat. 103: Lat. 66° 23' N., Long. 8° 52' W., 579 fm., temp. ÷ 0.6°, captured a considerably smaller, juvenile specimen, which is at least allied to *L. uncifera* and *L. dentata*, but the process from the peduncle of the uropods is very small and subhorizontal, probably not yet developed.

Group c. *Uropods with the endopod two-jointed, the exopod well marked off, one-jointed.*

These characters pointed out are very practical. But the group comprises in reality rather heterogenous elements, and its nine species mentioned on the following pages may be referred to three natural subdivisions.

- a. Pleopods wanting or extremely rudimentary in the females. The basal joint of the chelipeds normal, possessing a posterior process with the hind margin free and rounded. Slender species. Species 54—58.
- β. Pleopods very distinct with well developed setæ in the females. The basal joint of the chelipeds normal, as in subdivision a. Very stout species. Species 59—60.
- γ. Pleopods very distinct with well developed setæ in the females. The basal joint of the chelipeds aberrant, in a lateral view the long major part of its posterior margin is vertical and attached to the cephalothorax at or even before its middle, while the posterior process is short and situated more on the lower than on the lateral side of the cephalothorax. Species 61—62.

Group c, subdivision a (vid. above).

54. **Leptognathia manca** G. O. Sars.

(Pl. VIII, figs. 5a—5d.)

1881. *Leptognathia* (?) *manca* G. O. Sars, Arch. for Math. og Naturv., B. 7, p. 44.

1896. — — — Account Crust. Norway, Vol. II, p. 30, Pl. XIV, fig. 2.

Though Sars' description and figures are sufficient for the recognition of this species, I think it useful for comparison with the following forms of this subdivision to give a new description and a

couple of analytical figures of the female, together with corresponding figures of the hitherto unknown subadult male.

Female. The shape of the body from above is shown well by Sars' fig. 3; third to sixth thoracic segments have their lateral margins far from parallel, but conspicuously though not strongly angular, and the body tapers in breadth from the third segment.

Antennulæ (fig. 5a) considerably shorter than the carapace. First joint a good deal shorter than the other joints combined, about twice as long as deep, considerably tapering; second joint slightly more than half as long as the first and much produced above; upper margin of third joint distinctly less than half as long as that of the second; fourth joint about as long as the second and a little shorter than its terminal setæ. — Antennæ with fourth and fifth joint completely fused, without any vestige of an articulation between them.

Chelipeds (fig. 5a) somewhat slender. Basal joint not much longer than the distance between the rounded hind margin of its well developed posterior process and the front margin of second segment. Carpus almost twice as long as deep, with the lower margin feebly convex. Chela a little longer than the carpus, two and a half times, or even more, as long as broad; hand without any protruding anterior angle at the insertion of the finger, and this finger is about as long as the front margin of the hand; fixed finger slightly broader than the movable, with the teeth on the incisive margin distinct.

Second and third pairs of legs (fig. 5a) moderately strong or moderately slender; the spine on the posterior angle of fourth joint about as long as the fifth joint, which is somewhat shorter than the sixth joint, while the spines on its distal angles are long, though shorter than the joint; seventh joint with claw about as long as the sixth joint. — Three posterior pairs of legs essentially as in the *Sarsii*-group.

Abdomen (fig. 5b) with the lower margin of the five anterior segments conspicuously convex, but not shaped as tubercles. — Uropods moderately long, conspicuously longer than the sixth segment; peduncle a little longer than deep, conspicuously shorter than the first joint of the endopod, which is slightly shorter than second joint; the one-jointed exopod nearly as long as, or slightly longer than, the first joint of the endopod.

Length of a female with marsupium 2^{mm}, of a female without marsupium 2.2^{mm}.

Subadult Male. In the main as the female, but it differs by much thicker antennulæ and in the abdomen. The antennulæ (fig. 5c) are conspicuously longer as compared with the carapace than in the female, only four-jointed, and their three proximal joints together with the proximal part of fourth joint are much thicker than in the other sex. — The five anterior abdominal segments (fig. 5d) are longer than in the female, and the median ventral margin of each segment is shaped as a moderately high, subtriangular tubercle with the end rounded. The pleopods are somewhat long with the outer ramus much longer than the peduncle and longer than the inner ramus; the terminal setæ about as long as the rami. — Length 1.8^{mm}.

Remarks. *L. manca* differs from *L. ventralis* n. sp. by a different shape of second and third antennular joints, by having no ventral process on the second thoracic segments and by the posterior margin of the basal joint of the chelipeds being rather remote from the front end of the second

thoracic segment. From *L. subæqualis* it differs in the shape of the body, which in the latter species is extremely slender with the lateral margins nearly parallel; furthermore the exopod of the uropods is proportionately conspicuously longer in *L. subæqualis* than in *L. manca*. *L. manca* is rather remote from the other forms of group c.

Occurrence. The "Ingolf" has taken this species at two localities.

Davis Strait: St. 25: Lat. 63° 30' N., Long. 54° 25' W., 582 fm., temp. 3.3°; 23 spec.

South of East-Iceland: St. 90: Lat. 63° 43' N., Long. 14° 34' W., 90 fm., temp. 7.0°; 1 spec.

Distribution. Sars had this species from two widely separated places on the Norwegian coast, at depths of 100—150 fathoms. It has scarcely been mentioned by any other author.

55. *Leptognathia subæqualis* n. sp.

(Pl. VIII, figs. 6a—6f.)

Female. Body extremely slender (fig. 6a), nine or ten times as long as broad, seen from above nearly cylindrical, with fourth and fifth thoracic segments slightly broader than the carapace or the abdomen; the lateral margins of each thoracic segment nearly parallel, not angular but a little or conspicuously rounded at both ends of each segment. — Carapace, seen from above, about half as long again as broad, twice or more than twice as long as second thoracic segment but somewhat shorter than the two anterior segments combined; the front end of the carapace conspicuously more than half as broad as the carapace somewhat behind the middle; rostral process somewhat narrow.

Antennulæ almost as long as the carapace (fig. 6b), somewhat robust. First joint nearly as long as the three other joints combined, a little or somewhat more than twice as long as deep and with the proximal third considerably thickened downwards; second joint much produced above, with the upper margin distinctly more than half as long as first joint and twice as long as the depth of the joint itself; third joint with the upper margin very short; fourth joint conspicuously shorter than the second, much shorter than some of the terminal setæ. — Antennæ with fourth and fifth joints completely fused, without any vestige of an articulation.

Chelipeds (fig. 6b and 6c) moderately strong. Basal joint long, nearly as long as the carpus, with the rounded posterior process reaching near to the front lower angle of second thoracic segment. Carpus distinctly less than twice as long as deep, with its lower margin moderately arcuate. Chela slightly or a little longer than the carpus, somewhat more than twice as long as broad; anterior distal corner of the hand not protruding, obtuse; movable finger considerably shorter than the anterior margin of the hand and much narrower than the fixed finger, which has distinct, sharp teeth on the distal half of the inner margin.

Second (fig. 6b) and third pairs of thoracic legs moderately strong; posterior spine on fourth joint and both distal spines on fifth joint long; fifth joint only as long as the fourth; sixth joint more than half as long again as fifth joint, but a little shorter than seventh joint with claw. — Three posterior pairs of legs somewhat slender; sixth joint at least somewhat shorter than seventh joint with claw, and the claw as long as or shorter than seventh joint.

Abdomen cylindrical, as long as the sum of the two posterior thoracic segments. The lower

margin of the five anterior segments (figs. 6d and 6e) a little convex. The pleopods generally wanting; in a single specimen (from Stat. 4) which seems to be a female without marsupium, I found rudimentary pleopods (fig. 6e), each pleopod being a minute, a little oval plate. — The uropods moderately long, distinctly shorter than the two posterior segments combined; the peduncle a little longer than deep, considerably or much shorter than the first joint of the endopod; the two joints of the endopod equal in length or the first a little longer than the second; the one-jointed exopod reaches considerably beyond the end of the proximal joint of the endopod, but not fully to the middle of the distal joint.

Length of specimens with or without marsupium 1.7—1.9^{mm}.

Subadult Male. The four-jointed antennulæ (fig. 6f) considerably thicker than in the female, with first joint scarcely or distinctly less than twice as long as deep. Pleopods nearly as in *L. manca*; the outer remus is considerably or much longer than the oblong peduncle; the terminal setæ as long as or a little longer than the rami. — Length 1.4^{mm}.

Remarks. This small and extremely slender species is easily distinguished from allied forms of this group by the shape of the body and the length of the exopod of the uropods.

As in the Norwegian species of *Leptognathia* the mandibles of *L. subæqualis* have the molar process tapering to the acute end and besides distally curved.

Occurrence. This species has been taken by the "Ingolf" at six localities.

Davis Strait: St. 32: Lat. 66° 35' N., Long. 56° 38' W., 318 fm., temp. 3.9°; 6 spec.

West Greenland: Mouth of Ameralik Fjord, near Godthaab, at Lat. 64° 11' N., 5—70 fm., shells; 16 spec.

East of Iceland: St. 4: Lat. 64° 07' N., Long. 11° 12' W., 237 fm., temp. 2.5°; 7 spec.

— - — St. 58: Lat. 64° 25' N., Long. 12° 09' W., 211 fm., temp. 0.8°; 2 spec.

North of the Færoes: St. 139: Lat. 63° 36' N., Long. 7° 30' W., 702 fm., temp. ÷ 0.6°; 35 spec.

— - - — St. 141: Lat. 63° 22' N., Long. 6° 58' W., 679 fm., temp. ÷ 0.6°; 11 spec.

This distribution is interesting, as the species has been taken both in the cold area with a temperature of ÷ 0.6° and in temperatures above zero, even + 3.9°; furthermore it occurred near land at a locality where the greatest depth was only 70 fathoms and at another station it was hauled up from 702 fathoms.

56. *Leptognathia tenella* n. sp.

(Pl. IX, figs. 1a—1e.)

Female (without marsupium). Body slender, the largest specimen about eight times as long as broad (fig. 1a), seen from above nearly cylindrical, with the lateral margins of the thoracic segments slightly convex and the abdomen tapering a little from the base to the end. — Carapace much shorter than the two anterior segments combined, seen from above slightly more than half as broad at the front end as behind the middle, not much longer than broad, with the lateral margins somewhat convex and the frontal process somewhat feebly developed.

Antennulæ (fig. 1b) only a little shorter than the carapace, very characteristic. First joint as long as the three other joints combined, about two and a half times as long as deep, with the

proximal third considerably thickened downwards. Second joint much produced above, very long, having the upper margin distinctly more than half as long as that of the first joint, somewhat longer than the two distal joints combined and more than twice as long as the depth of the joint; third joint extremely short; fourth joint considerably shorter than the second which is about as long as the terminal setæ. Antennæ somewhat short; fourth and fifth joints completely fused, together conspicuously less than twice as long as sixth joint.

Chelipeds (fig. 1b) moderately robust. The basal joint is a little shorter than the carpus, its posterior process long, almost twice as long as deep with the end somewhat distant from the front lower end of second thoracic segment. Carpus a little less than twice as long as deep, with each of the two halves of the lower margin somewhat feebly convex. Chela a little longer than the carpus, a little more than twice as long as broad, presenting a somewhat peculiar aspect, because the posterior margin is conspicuously convex; no protruding angle above the insertion of the movable finger, and this finger is considerably shorter than the anterior margin of the hand and rather broad towards the base; the fixed finger has an acute tooth near the end of the incisive margin.

Second and third pairs of thoracic legs (fig. 1b) somewhat robust; fourth joint with the posterior spine rather long; fifth joint a little shorter than the fourth, with the distal anterior spine long and much longer than the posterior; sixth joint not fully twice as long as the fifth and distinctly longer than seventh joint with its claw. — Three posterior pairs of legs moderately robust (fig. 1c); the spines on fifth and sixth joints long; sixth joint somewhat shorter than seventh with its straight claw.

Abdomen as long as the two preceding segments combined; the sixth segment (figs. 1d and 1e) a little longer than the sum of the three preceding segments, thus a little longer than in the other species of this genus; this segment is somewhat produced behind, so that the uropods are inserted at, or even slightly before, the middle of its lateral margins, an arrangement producing a peculiar aspect. The lower margin of each of the five anterior segments either somewhat convex or even showing a somewhat low protuberance. — Uropods strong and considerably shorter than the sixth segment, reaching somewhat beyond the end of abdomen; peduncle much deeper than long; first joint of the endopod only half as long as the second, but yet a good deal longer than the small, one-jointed exopod.

Length of the largest specimen 1.7^{mm}.

Remarks. This species is easily recognized by the terminal part of the abdomen with its last segment produced posteriorly and the characteristic uropods originating at the middle of the lateral margins of the segments; the shape of the body, the antennulæ, the chelipeds afford further characters. — Mouth-parts unknown.

Occurrence. It has been taken by the "Ingolf" at a single station.

Davis Strait: St. 24: Lat. 63° 06' N., Long. 56° 00' W., 1199 fm., temp. 2.4°; 3 spec.

57. *Leptognathia ventralis* n. sp.

(Pl. VIII, figs. 7a—7k.)

Female. Body slender (fig. 7a), about seven times as long as broad, decreasing somewhat in breadth from the carapace to the end of abdomen. — Carapace as long as, or even slightly longer

than, the two following segments combined, considerably longer than broad, anteriorly a little more than half as broad as behind the middle, with the frontal process small and the posterior two-thirds of the lateral margins rather convex.

Antennulæ (fig. 7 b) considerably shorter than the carapace, moderately slender; first joint somewhat shorter than the three other joints combined, a little more than twice as long as deep, with the proximal third somewhat thickened downwards; second joint distinctly more than half as long as the first, not much produced above and about twice as long as deep; third joint as long above as below and slightly more than half as long as the second; fourth joint a little shorter than second, somewhat shorter than a couple of the terminal setæ. — Antennæ with fourth and fifth joints completely fused, together about three times as long as sixth joint.

Chelipeds (fig. 7 b) moderately strong. The basal joint considerably shorter than the carpus; its posterior process deeper than long, and its free hind margin reaches almost or fully to the anterior lower end of the second segment. Carpus somewhat long, about twice as long as deep, with the lower margin somewhat convex. Chela slightly or somewhat longer than the carpus, somewhat more than two and a half times as long as broad; no protruding angle above the movable finger, which is slightly shorter than the anterior margin of the hand and moderately broad; fixed finger with a tooth near the end.

Thoracic segments, seen from above (fig. 7 a) somewhat peculiar. Second segment short, very much shorter than the third and decreasing much in breadth backwards. Third to sixth segments each with the antero-lateral angles somewhat protruding and rounded, the lateral margins with the anterior half distinctly concave, at or behind the middle a little protruding and then converging much to the front margin of the next segment; seventh segment in the main of the same shape, but the convex part of the lateral margin is situated more backwards and is more protruding. Anterior ventral part of second segment produced in a conical, oblique process directed forwards and downwards, generally large and acute (as in the subadult male, fig. 7 i), but in a couple of females (one of which with marsupium) the process is smaller with the end obtuse (fig. 7 b). — Thoracic legs somewhat slender and long. Second and third pairs with rather long or long distal spines on fourth and fifth joint (figs. 7 b, 7 e and 7 h); sixth joint varies in length, being from a little shorter (fig. 7 h) to somewhat or considerably longer than fifth joint (figs. 7 b and 7 e), but it is always somewhat shorter than seventh joint with claw. Three posterior pairs (fig. 7 f) with the spines on fifth and sixth joint long and sixth joint shorter than seventh with claw.

Abdomen as long as the two preceding segments combined. Five anterior segments with their lower margin rather convex (fig. 7 g); pleopods entirely wanting. Sixth segment not quite as long as the three preceding segments combined, seen from above (fig. 7 a) with the portion between the uropods broadly triangular, acute. — Uropods slender and somewhat long, longer than the two posterior segments combined (fig. 7 g); peduncle much longer than deep, but considerably shorter than the proximal joint of the endopod; endopod with second joint distinctly longer than the first; the exopod thin and more than half as long as the first joint of the endopod but always somewhat shorter than that joint.

Length of females with or without marsupium 2—2.1 mm.

Subadult Male. The antennulæ (fig. 7 i) much thicker than in the female, nearly as long as the carapace; first joint twice as long as deep; fourth joint conspicuously longer than in the female and distinctly longer than second. Pleopods long, about as long as the last segment (fig. 7 k) and especially the exopod is long in proportion to the peduncle, but the terminal setæ are only about half as long as the exopod. — Length 1.5—1.7 mm.

Remarks. *L. ventralis* is somewhat allied to *L. manca* and *L. subæqualis* but easily separated by the shape of the thoracic segments, by the uropods and by the ventral process on second thoracic segment.

The mandibles of *L. ventralis* (fig. 7 c) differ materially in the shape of the molar processes from those in the species figured by Sars. The molar process of left mandible (*l*) is subcylindrical, its end cut off obliquely and furnished with about six triangular, obtuse teeth along the major part of the terminal margin and some four slender teeth at the posterior part of that margin; the molar process of the right mandible has in the main the same shape, but its oblique end has few and feeble teeth and besides a single spine.

Occurrence. It has been taken by the "Ingolf" at four stations.

South of the Davis Strait: St. 38: Lat. 59° 12' N., Long. 51° 05' W., 1870 fm., temp. 1.3°; 1 spec.

South of Iceland: St. 64: Lat. 62° 06' N., Long. 19° 00' W., 1041 fm., temp. 3.1°; 1 spec.

East of Iceland: St. 101: Lat. 66° 23' N., Long. 12° 05' W., 537 fm., temp. ÷ 0.7°; 1 spec.

Jan Mayen: St. 115: Lat. 70° 50' N., Long. 8° 29' W., 86 fm., temp. 0.1°; 22 spec.

This occurrence is somewhat astonishing. It is seen that the depths of the four stations vary from 86 to 1870 fathoms, the temperatures of the bottom from 3.1° to ÷ 0.7°. In vain I have attempted to find any valuable difference between the specimens from these stations. In the specimen from Stat. 38 (1870 fm.) the sixth joint of second and third pairs of legs is a little shorter as compared with fifth joint, the spines on fourth to sixth joint are longer and the uropods slightly longer than in the specimens from Stat. 115, but these differences seem to me to be insufficient as specific characters.

58. *Leptognathia acanthifera* n. sp.

(Pl. IX, figs. 2 a—d).

Female (without marsupium). Somewhat slender (fig. 2 a) a little less than seven times as long as broad, but decreasing considerably in breadth from second thoracic segment to the end of abdomen. — Carapace almost as long as the two following segments combined, anteriorly a little more than half as broad as behind the middle and with the posterior two-thirds of the lateral margins rather convex.

Antennulæ (fig. 2 b) somewhat short, considerably or much shorter than the carapace, somewhat robust. First joint almost as long as the three other joints combined, nearly half as deep as long; second joint scarcely half as long as the first, not much produced above; third joint distinctly longer than deep, with the upper margin a little more than half as long as that of second joint; fourth joint somewhat shorter than the second and somewhat shorter than its terminal setæ. — Antennæ without any vestige of an articulation between fourth and fifth joint.

Chelipeds (fig. 2b) moderately strong. The basal joint somewhat large, a little shorter than the carpus, with the posterior protuberance well developed and the free rounded hind margin a little in advance of the front lower end of second thoracic segment. Carpus a little more than twice as long as deep, with its lower margin rather feebly curved. Chela somewhat longer than the carpus, almost two and a half times as long as broad; movable finger somewhat robust, as long as the anterior margin of the hand.

Thoracic segments, seen from above (fig. 2a), with the lateral margins somewhat angular; on second to fourth segment the angles are situated before the middle and more or less rounded, on fifth and sixth segment the angles are respectively a little and somewhat behind the middle and moderately sharp, while on seventh segment no angle but a rounded protuberance is seen on each side near the posterior margin. Second segment somewhat or considerably shorter than the third, without any ventral process, but second, third and fourth segments have their lateral margins behind the insertion of each leg produced in a somewhat broad, oblong, acute process (fig. 2b) directed downwards and distally curved forwards; the processes on second segment are somewhat large and larger than those on the two other segments; the processes are not visible when the animal is seen from above. — Thoracic legs (figs. 2b and 2c) somewhat long and slender, with sixth joint distinctly shorter than seventh with claw. Second and third pairs (fig. 2b) subequal; posterior spine of fourth joint rather long; fifth joint about as long as the fourth, with its two distal spines of very moderate length.

Abdomen as long as seventh, sixth and half of fifth segment combined, decreasing distinctly in breadth backwards; sixth segment shorter than the three preceding segments combined but only a little shorter than broad, broadest at the middle, and with the proximal part of the lateral margins somewhat concave. Ventral margin of the five anterior segments somewhat convex (fig. 2d); no pleopods. — Uropods (fig. 2d) slender, about as long as the sum of the two posterior segments; peduncle a little longer than deep; endopod with second joint distinctly longer than the first; exopod slightly more than half as long as first joint of the endopod.

Length of the largest specimen 1.7 mm.

Remarks. *L. acanthifera* is easily separated from all other species by the lateral processes of second to fourth segment; furthermore the antennulæ are somewhat short and the uropods characteristic.

Occurrence. Taken by the "Ingolf" at a single deep-sea station.

Davis Strait: St. 36: Lat. 61° 59' N., Long. 50° 21' W., 1435 fm., temp. 1.5°; 3 spec.

Group c, subdivision β (vid. p. 85).

59. *Leptognathia breviremis* Lilljeborg.

Pl. IX, figs. 3 a—3 g).

1864. *Tanais breviremis* Lilljeborg, Bidrag til kännedomen om de inom Sverige och Norrige förekr. Crust. of Tanaidernas familj, p. 21 (Female).

! 1896. *Leptognathia breviremis* G. O. Sars, Account Crust. Norway, Vol. II, p. 28, Pl. XIII, fig. 1.

Female. Though Sars has published a good description with figures of this form, it may be useful to point out a number of features.

The antennulæ (fig. 3 a) are moderately stout and considerably shorter than the carapace. First joint nearly as long as the other joints combined, scarcely or distinctly more than twice as long as deep; second joint nearly half as long as the first and considerably produced above; third joint with its upper margin very short; fourth joint a little shorter than second, with its terminal setæ somewhat long. — Antennulæ with the articulation between fourth and fifth joint indistinct or moderately distinct.

Chelipeds somewhat long and moderately slender (fig. 3 a). Basal joint normal, somewhat long but yet somewhat shorter than the carpus, and the posterior margin of the protuberance reaches about the front angle of second thoracic segment. Carpus slightly or scarcely more than twice as long as deep, with its lower margin almost straight. Chela scarcely as long as the carpus, somewhat more than twice as long as broad; hand uncommonly long, with the anterior margin almost half as long again as the movable finger and with only a single seta at the hind margin at the base of the fixed finger, which has at least the distal tooth of the incisive margin triangular and well developed.

Thoracic legs moderately slender; sixth joint about as long as or, especially in the posterior pairs, a little longer than seventh with claw. Second (fig. 3 a) and third pairs have the fifth joint at least not longer than the fourth but much shorter than the sixth, and the setæ of moderate length.

Abdomen (figs. 3 b and 3 c) has the ventral margin serrate, as each of the five anterior segments has a well developed, oblique, triangular or distally obliquely cut, conspicuous process. Sixth segment not fully as long as the sum of the three preceding segments. Pleopods somewhat short and broad, with the setæ well developed and some of these longer than the rami. — Uropods short, in smaller specimens somewhat, in large specimens considerably or much, shorter than the last segment; endopod with first joint conspicuously shorter than, or about as long as, the second; exopod a little or somewhat shorter than the endopod.

Length of one of the largest specimens without marsupium (from the "Ingolf" Stat. 38) 1.8 mm, of an ovigerous female (from Stat. 117) 1.4 mm, of an ovigerous female from Norway 1.3 mm.

Subadult Male. Antennulæ as usually considerably thicker and the pleopods somewhat longer than in the female.

Adult Male (figs. 3 d—3 g). Antennulæ 7-jointed; the two proximal joints very thick and the upper margin of first joint about half as long again as that of the second; third and fifth joints quite short, fourth joint extremely short, these three joints taken together not quite as long as the second; fourth and fifth joints each adorned with very long sensory filaments; sixth joint either conspicuously longer than, or only as long as, the three preceding joints combined, at the lower distal angle with a bundle of shorter sensory setæ, and either a little longer or even a little shorter than seventh joint, which terminates in two strong setæ and a sensory hair. — Antennæ only as long as the upper margin of the two proximal antennular joints, terminating in an extremely long seta.

Chelipeds (fig. 3) long and moderately slender; carpus twice as long as deep. Chela considerably longer than the carpus, somewhat less than three times as long as broad; hand elongate, with the anterior margin half as long again as the movable finger, which is slender, while the fixed finger is broad at the base and its incisive margin extremely finely serrate, a feature visible only under high magnifying power.

Thoracic segments as usually short, together even less than twice as long as the carapace. Seventh segment with a large, obliquely triangular ventral process. — Thoracic legs long and slender; second (fig. 3d) and third pairs with the sixth joint almost half as long again as the fifth and scarcely longer than seventh with claw. Fifth pair with seventh joint plus claw considerably longer than sixth joint, while in the two posterior pairs (fig. 3e) the difference in length between the same parts is somewhat small.

Abdomen (fig. 3f) extremely long, about twice as long as the six thoracic segments combined; the five anterior segments each with an obliquely triangular ventral process, which is large on first segment, and the processes decrease gradually in size from first to fifth segment, so that that of the last-named segment is quite low. Pleopods long with extremely long setæ. Sixth segment about as long as the two preceding segments combined, posteriorly produced in a triangular, acute process. — Uropods inserted before the middle of their segment and reaching somewhat beyond its end; endopod three-jointed and last joint a little (fig. 3g) or somewhat (fig. 3f) shorter than the two others combined; exopod one-jointed, very slender, slightly longer than the first joint of the endopod.

Length 1—1.1 mm.

Remarks. The female and subadult male of *L. breviremis* are easily distinguished from all other species of the genus excepting *L. crassa* n. sp. by the thick body, the short uropods, etc. By the rather slender carpus and the slender chela with its proportionately long hand it can be separated from *L. crassa*. The adult male was hitherto unknown.

Occurrence. This species has been taken by the "Ingolf" at fifteen stations.

Davis Strait:	St. 24: Lat. 63° 06' N., Long. 56° 00' W., 1199 fm., temp. 2.4°; 2 spec.
— —	St. 36: Lat. 61° 50' N., Long. 56° 21' W., 1435 fm., temp. 1.5°; 20 spec., 2 of which are adult males.
South of Davis Strait:	St. 38: Lat. 59° 12' N., Long. 51° 05' W., 1870 fm., temp. 1.3°; 6 spec.
South of Iceland:	St. 64: Lat. 62° 06' N., Long. 19° 00' W., 1041 fm., temp. 3.1°; 1 spec.
North of the Færoes:	St. 141: Lat. 63° 22' N., Long. 6° 58' W., 679 fm., temp. ÷ 0.6°; large number of specimens.
— . . . —	St. 139: Lat. 63° 36' N., Long. 7° 30' W., 702 fm., temp. ÷ 0.6°; large number of specimens.
East of Iceland:	St. 105: Lat. 65° 34' N., Long. 7° 31' W., 762 fm., temp. ÷ 0.8°; 4 spec.
— - —	St. 103: Lat. 66° 23' N., Long. 8° 52' W., 579 fm., temp. ÷ 0.6°; 1 spec.
— - —	St. 102: Lat. 66° 23' N., Long. 10° 26' W., 750 fm., temp. ÷ 0.9°; ab. 30 spec.
— - —	St. 101: Lat. 66° 23' N., Long. 12° 05' W., 537 fm., temp. ÷ 0.7°; 8 spec., one of which is an adult male.
North of Iceland:	St. 125: Lat. 68° 08' N., Long. 16° 02' W., 729 fm., temp. ÷ 0.8°; 8 spec.
North-East of Iceland:	St. 120: Lat. 67° 29' N., Long. 11° 32' W., 885 fm., temp. ÷ 1.0°; 6 spec.
— - —	St. 119: Lat. 67° 53' N., Long. 10° 19' W., 1010 fm., temp. ÷ 1.0°; 33 spec.
South of Jan Mayen:	St. 118: Lat. 68° 27' N., Long. 8° 20' W., 1060 fm., temp. ÷ 1.0°; 1 spec.
— - —	St. 117: Lat. 69° 13' N., Long. 8° 23' W., 1003 fm., temp. ÷ 1.0°; large number of specimens.

Distribution. Lilljeborg established *L. breviremis* on specimens taken at Bohuslän, 50–60 fathoms, and at Molde (the western coast of Norway, at Lat. 62° 45' N.), 40–50 fathoms. Sars possessed it from Christiania Fjord, 20–60 fathoms, and from several places on the South and West coasts of Norway, northwards to Kvalø, at Lat. 70° 40' N. In 1910 I mentioned it from two places in the Kattegat, 15 and 17 fathoms and from a place in Skager Rak, 125 fathoms. Besides the species has been taken between Norway and the Orkneys, 150 fathoms (Internat. Investig.), at some places on both sides of Scotland, f. inst. near Aberdeen, 45 fathoms, and in Loch Fyne pelagically in a vertical haul (T. Scott), furthermore off Northumberland (G. S. Brady), at Plymouth (A. M. Norman) and off West Ireland, 320 fathoms (Tattersall).

The perusal of the preceding lines and of the "Ingolf" stations shows the bathymetrical occurrence to be extremely remarkable. In vain I have attempted to find any difference worth mentioning between females from 1870 fathoms in the warm area, from 1003 fathoms in the cold area and Norwegian specimens from 20–60 fathoms presented by Sars. To begin with I had believed that the specimens from the "Ingolf" belonged to a species different from the *L. breviremis* occurring at Denmark and Norway, but after a detailed examination I was forced to abandon that opinion, as I could not find any other difference than that the uropods seem to be a little longer and sixth abdominal segment a little less highly vaulted in the Norwegian specimens (fig. 3c) than in specimens from the deepest "Ingolf" stations.

60. *Leptognathia crassa* n. sp.

(Pl. IX, figs. 4a–4e.)

Female (without marsupium). Body uncommonly robust (fig. 4a), from four and a half to slightly more than five times as long as broad, seen from above subcylindrical, with the abdomen slightly narrower than the thorax and the lateral margins of the thoracic segments slightly convex. — Carapace a little shorter than the two following segments combined (fig. 4a), slightly broader than long and at the anterior end about half as broad as a little from the base; frontal process feebly developed, short, broad, acute.

Antennulæ (fig. 4b) only a little shorter than the carapace. First joint a little shorter than the other joints combined, robust, not fully twice as long as deep and somewhat produced above; second joint thick, distally much produced above, with the upper margin as long as the depth of the first joint; third joint with the upper margin very short; fourth joint slightly shorter than the upper margin of the second, slender and subcylindrical, with the terminal setæ somewhat long. — Antennæ with fourth and fifth joints completely fused, and this fourth joint only half as long again as the penultimate joint.

Chelipeds robust (fig. 4b). Basal joint thick, with the free hind margin of the posterior protuberance reaching to second thoracic segment. Carpus somewhat longer than the basal joint, ovate, somewhat or considerably less than twice as long as deep, with the free lower margin distinctly, the upper margin strongly convex. Chela slightly longer than the carpus, somewhat more than twice as long as broad; the hand with two strong setæ on the posterior margin at the base of the movable finger and its anterior margin only a little longer than the movable finger.

Thoracic segments subrectangular (fig. 4a) with their lateral margins slightly convex; third segment conspicuously less than half as long again as the second. — Legs of middle length (figs. 4b and 4c), and seventh joint with claw a little longer than sixth joint. Second and third pairs with sixth joint about as long as fifth plus half of the fourth and the setæ somewhat short; three posterior pairs (fig. 4c) with some of the setæ rather long.

Abdomen deep (fig. 4d) and as long as the sum of the three posterior thoracic segments; the ventral serration is low and feebly developed, but the margin of each segment shows a sharp angle. Pleopods small, but both rami with some well developed setæ about as long as the rami (fig. 4e). Sixth segment, seen from above (fig. 4a), as long as the sum of the three preceding segments and posteriorly broadly rounded. — Uropods (figs. 4d and 4e) only about half as long as their segment; peduncle deep; endopod with first joint almost as deep as long, thicker and much shorter than second joint and as long as, or slightly shorter than, the thin exopod.

Length of the largest specimen, a female without marsupium, 1.9^{mm}.

Remarks. *L. crassa* is similar to *L. breviremis*, but differs in several particulars. The antennulæ have the two proximal joints conspicuously thicker, but the fourth joint slender and cylindrical instead of conical. The chelipeds are much more robust with the carpus considerably deeper, the hand shorter in proportion to the movable finger than in *L. breviremis* and two strong setæ instead of one at the posterior base of the fixed finger. The abdomen has the ventral serration much less developed and the pleopods and uropods are distinctly smaller than in the other species.

Occurrence. Taken by the "Ingolf" at its deepest station.

South of Davis Strait: St. 38: Lat. 59° 12' N., Long. 51° 05' W., 1870 fm., temp. 1.3°; 6 spec.

It may be added that after I had discovered the six specimens of this species between the specimens of *L. breviremis* from the same station, I looked in vain for more specimens among the numerous specimens of the last-named species from the other fourteen "Ingolf" stations.

Group c, subdivision 7 (Vid. p. 85).

61. *Leptognathia polita* n. sp.

(Pl. IX, figs. 5a—5f.)

Female (without marsupium). Moderately robust (fig. 5a), about six and a half times as long as broad and seen from above subcylindrical, yet with the carapace and the middle of abdomen slightly broader than the thoracic segments, which have their lateral margins almost straight, being curved only at both ends of each segment. — Carapace slightly longer than the sum of the two next segments, seen from above (fig. 5a) nearly hexagonal and broadest considerably before the middle, where each lateral margin has a pronounced angle, and from these angles the margins converge slightly to the base and strongly to the front end, which is conspicuously less than half as broad as the carapace between the angles mentioned; frontal process low, rounded.

Antennulæ (fig. 5b) much shorter than the carapace and rather slender. First joint almost as long as the other joints combined, two and a half times as long as deep; second joint considerably produced above, half as long as the first and above a little more than twice as long as deep; third

joint with the upper margin half as long as that of second joint and conspicuously longer than the depth of the joint; fourth joint considerably shorter than the second and its longest terminal seta longer than the two distal joints combined. — Antennæ only a little shorter than the antennulæ, with fourth and fifth joints well separated.

Chelipeds (figs. 5b and 5c) strong and very curious. Basal joint nearly deeper than long; the posterior protuberance is, seen from the side, small, about as long as deep and with only the lower margin free, while even the posterior end is situated somewhat before the middle of the cephalothorax; the area between the hind margin of the basal joint and the thinner integument behind the cephalothorax is large, oblong, more than twice as long as deep and well separated by a thin-skinned, horizontal ridge from the carapace. The carpus, though a good deal longer than the basal joint with posterior protuberance, is short and deep, being less than half as long again as deep, with the upper margin very convex and the lower peculiarly hollowed. Chela somewhat longer than carpus and twice as long as broad; anterior margin of the hand distinctly shorter than the movable finger, which is very thick towards the base (fig. 5c) with its incisive margin very sinuate, having a broad, oblong-triangular protuberance before the middle; fixed finger with two tubercles on the incisive margin, the proximal being somewhat small though very distinct, the distal large, much broader than high, rounded; two setæ on the posterior margin of the hand, and the end of both fingers obtuse.

Second thoracic segment somewhat shorter than the third (fig. 5a); all segments transverse and all, excepting the seventh, subquadrangular with the angles rounded. — Thoracic legs uncommonly short. Second (fig. 5d) and third pairs moderately slender; distal spines on fourth and fifth joints moderately long; sixth joint somewhat longer than the fifth and a little longer than seventh with claw; the claw a little more than half as long as seventh joint.

Abdomen somewhat shorter than the three preceding segments combined (fig. 5a). Five anterior segments each with a rounded, moderately large ventral protuberance; pleopods moderately small and their rami with somewhat long setæ (fig. 5f). Sixth segment about as long as the three preceding segments combined. — Uropods a little shorter than their segment, somewhat robust; peduncle longer than deep; first joint of the endopod a little longer than the second and somewhat longer than the one-jointed exopod.

The body of the animal is polished, shining, yellowish, and the fingers of the chelæ are deep reddish yellow.

Length of the single probably full-grown specimen 3.2^{mm}.

Remarks. This species is moderately large and easily distinguished from all other forms of the genus excepting *L. vicina* n. sp. by its shape, colour, uropods, etc., but especially by the peculiar development of the chelipeds, which originate before the middle of the cephalothorax. The differences between *L. polita* and *L. vicina* are pointed out in the "Remarks" on the latter species.

Occurrence. This species has been taken by the "Ingolf" at a single station.

North of the Færoes: St. 141: Lat. 63° 22' N., Long. 6° 58' W., 679 fm., temp. ÷ 0.6°; 1 probably full-grown specimen and 1 juvenile specimen without seventh pair of legs.

62. *Leptognathia vicina* n. sp.

(Pl. IX, figs. 6a—6i.)

Female. Moderately robust (fig. 6a), from six to seven times as long as broad and seen from above subcylindrical, yet with the carapace and the middle of abdomen from slightly to distinctly broader than the thoracic segments. — Carapace nearly as long as, or slightly longer than, the two following segments combined (fig. 6a), seen from above less or more distinctly hexagonal and sub-similar to that of *L. polita*, but the broadest place is only a little before the middle; frontal process small, acute.

Antennulæ (fig. 6b) much shorter than the carapace and moderately slender. First joint somewhat shorter than the three other joints combined, a little more than twice as long as deep; second joint distally moderately produced above, with its upper margin half as long as the first joint but not quite twice as long as the depth; third joint above slightly more than half as long as the second; fourth joint a little shorter than the second and not much shorter than its terminal setæ. — Antennæ as long as the three proximal antennular joints combined, with fourth and fifth joints well separated and fifth joint half as long again as the fourth, which is slightly longer than the sixth.

Chelipeds (figs. 6b and 6f) somewhat similar to those in *L. polita*, but yet showing some differences. Basal joint about as long as deep, with the posterior protuberance, seen attached to the animal and from the side, not only somewhat short but low — when the cheliped has been removed and pressed a little under a glass-cover that protuberance shows itself to be a good deal broader (fig. 6f) because its lower part, which on the animal turns downward, then becomes visible. The area between the basal joint and the thin integument behind the cephalothorax is large, a little more than twice as long as deep, but the hind margin of the posterior protuberance is yet situated a little behind the middle of the cephalothorax. Carpus much longer than the basal joint, conspicuously less than half as long again as deep, and its lower margin has a conspicuous protuberance bearing two setæ. Chela as long as the upper margin of carpus plus the basal joint and a little more than twice as long as broad; anterior margin of the hand a little longer than the movable finger, which is very thick towards the base, but its incisive margin has its proximal half a little concave and without any protuberance before the middle; the fixed finger has on the incisive margin a feeble proximal and a more oblong and conspicuous though rather low distal protuberance.

Thoracic segments (fig. 6a) transverse with their lateral margins a little convex or rather sub-angular and as usually in such cases second to fourth segments are broadest before the middle, the other segments broadest gradually more and more behind the middle. Second thoracic segment somewhat or considerably shorter than the third. — Thoracic legs of moderate length; second (fig. 6b) and third pairs in the main as in *L. polita*, but seventh joint with claw as long as or a little longer than sixth joint. Three posterior pairs (fig. 6g) in the main as in *L. polita*, but sixth joint almost longer than the seventh joint with its somewhat short claw.

Abdomen somewhat shorter than the three preceding segments combined (fig. 6a). Ventral side of the five anterior segments (fig. 6h) with rounded moderate protuberances; the moderately small pleopods and their setæ also nearly as in *L. polita*. Sixth segment somewhat shorter than the sum

of the three preceding segments. — Uropods (fig. 6h) a little longer than sixth segment, somewhat robust; peduncle thick, only a little longer than deep; endopod with first joint a little longer than the second and considerably longer than the exopod.

The animals are whitish or light yellowish and less shining than in *L. polita*.

Length of females with marsupium 2.7—3 mm., of a very large female without marsupium 3.3 mm.

Subadult Male. The antennulæ (fig. 6i) are considerably thicker than in the female; first joint only slightly longer than second and third joints combined, about twice as long as deep; second joint only a little less deep than the proximal part of the first joint and conspicuously less than half as long again as deep. — Abdomen longer than in the female, slightly longer than the three preceding segments combined. Pleopods larger and especially the exopods conspicuously longer with longer setæ than in the females. — Length 2.4—3.0 mm.

Remarks. *L. vicina* is allied only to *L. polita*; the best distinguishing characters between them are afforded by the joints of the chelipeds and by the much feebler armature of the incisive margins of the fingers of the chelæ in *L. vicina*.

The mouth-parts have been examined. The mandibles (fig. 6c) are slender and their molar processes are very different from those in the species of *Leptognathia* figured by Sars. Each molar process has the proximal half somewhat thicker than the distal; the end is rounded with three triangular teeth in front (fig. 6d) and posteriorly with several slender processes forming a comb. The maxillulæ (fig. 6e) are very slender, but the major part of the palp is somewhat inflated.

Occurrence. *L. vicina* has been taken by the "Ingolf" at two stations.

Davis Strait: St. 32: Lat. 66° 35' N., Long. 56° 38' W., 318 fm., temp. 3.9°; 1 spec.

— — St. 28: Lat. 65° 14' N., Long. 55° 42' W., 420 fm., temp. 3.5°; 40 spec.

Besides it has been taken by Admiral C. Wandel in 1889 at the following place.

Davis Strait: Lat. 66° 49' N., Long. 56° 28' W., 235 fm., sand and ooze, temp. 4.4°; 1 spec.

Group d. *Uropods with the peduncle produced in a triangular protuberance probably answering to an exopod not marked off, endopod two-or one-jointed. Pleopods moderately well developed.*

Species 63—65.

This group is a very natural one, as its three species are allied to each other and differ in several features from all species of this genus described in the preceding pages. The chelipeds differ from those of all other species by the curiously shaped ischium and carpus; furthermore the basal joint has the whole oblique posterior margin attached to the cephalothorax. The three posterior pairs of legs are robust with seventh joint short and the claw very short.

63. *Leptognathia profunda* n. sp.

(Pl. X, figs. 1a—1h).

Female (without marsupium). Body slender, a little more than eight times as long as broad (fig. 1a) and with the abdomen almost broader than the thorax or the carapace. Carapace as long as the two following segments combined (fig. 1a), seen from above considerably longer than broad, feebly angular before the middle and in front more than half as broad as near the middle.

Antennulæ scarcely or a little shorter than the carapace (fig. 1b), moderately robust. First joint only a little longer than second and third joints combined, about twice as long as deep; second joint a little more than half as long as the first and a little produced above; third joint moderately long, with its lower margin as long as that of second joint; fourth joint almost as long as the second. — Antennæ with fourth and fifth joints completely fused.

Chelipeds (figs. 1b and 1c) moderately strong. Basal joint short, with its entire posterior margin very oblique and attached to the lower part of the side of cephalothorax nearly at its middle, thus very far from the lower front angle of second thoracic segment. Carpus half as long again as deep, somewhat triangular in aspect, with its postero-inferior margin long; the anterior margin uncommonly short. Chela not longer than the carpus, somewhat curved, almost two and a half times as long as broad with the posterior margin of the hand considerably concave; movable finger as long as the anterior margin of the hand, moderately broad; fixed finger with its posterior margin straight and with a single seta towards its base; this finger is somewhat broader than the movable and decreases gradually in breadth from the base to somewhat from the end, where a conspicuous, triangular tooth projects on the incisive margin, while the distal portion of the finger beyond that tooth is slender, straight and projects conspicuously when the fingers are closed; the movable finger has a long and strong sub-spiniform seta projecting from the inner side somewhat from the base; furthermore a long seta and two shorter setæ originate from the inner surface of the hand at the base of the fixed finger; when the fingers are closed no interval is found between their proximal halves.

Thoracic segments with their lateral margins considerably convex (fig. 1a); second segment somewhat shorter than the third. — Second to fourth pairs of thoracic legs (fig. 1b) moderately strong, subsimilar in shape but decreasing considerably in length from second to fourth pairs; second pair (fig. 1d) with fourth and fifth joints subequal in length and their terminal setæ short; sixth joint somewhat longer than the fifth and as long as seventh joint with claw. Three posterior pairs (fig. 1e) somewhat short and robust with their spines rather short; seventh joint short and the claw very short; both together much shorter than sixth joint.

Abdomen somewhat longer than the two preceding segments combined (fig. 1a). Ventral margin of each of the five anterior segments somewhat convex. Pleopods somewhat large (fig. 1g); both rami with a good number of plumose setæ (fig. 1f) and many of them long; the setæ are found on the exopod along the whole, on the endopod along the distal half, of the outer margin. Sixth segment as long as the two preceding segments combined. — Uropods somewhat shorter than sixth segment; peduncle broad but distinctly longer than deep, with its lower produced part almost as long as the upper margin of the peduncle and terminating in a long seta and two short setæ (fig. 1h); the endopod moderately robust, two-jointed, but the articulation is not very distinct; the second joint scarcely as long as the first and with a dorsal seta at the middle.

Length 2.2 mm.

Remarks. *L. profunda* differs from all preceding species of the genus by the characters enumerated for the group. Its differences from *L. latiremis* n. sp. are pointed out in the "Remarks" on this species.

Occurrence. It has been taken by the "Ingolf" at a single deep-sea station.

South-West of Cape Farewell: St. 22: Lat. 58° 10' N., Long. 48° 25' W., 1845 fm., temp. 1.4°; 3 spec.

64. *Leptognathia latiremis* n. sp.

(Pl. X, figs. 2a—2n).

Female (without marsupium) and subadult Male. Somewhat slender, about seven and a half times as long as broad, seen from above subcylindrical, but the lateral margins of the thoracic segments considerably convex. — Carapace somewhat shorter than the two following segments combined (fig. 2a), not much longer than broad, subquadrangular but with all angles broadly rounded.

Antennulæ in the female only a little shorter than the carapace, somewhat varying in thickness (figs. 2b and 2c). First joint somewhat longer than the two following joints combined, about two and a half times as long as deep; second joint about half as long as the first and a little produced above; third joint considerably shorter than the second, while fourth joint is conspicuously longer than the second; in a subadult male the three proximal joints (fig. 2d) are considerably thicker in proportion to length and the fourth joint is much longer than the second and only a little shorter than the first. — Antennæ with fourth and fifth joints completely fused, about twice as long as the penultimate joint.

Chelipeds robust (fig. 2g). The basal joint as in *L. profunda*; ischium extremely broad, embracing more than half of the lower margin of the carpus. Carpus extremely deep, less than half as long again as deep. Chela a little longer than the carpus, twice as long as broad; the proximal third of the posterior margin very concave and the major part distinctly convex, with two setæ; the fixed finger is peculiarly shaped, the incisive margin to a little from the end being very convex and a little more than the distal half of this portion serrate with some more or less obtuse teeth; the terminal small part of the finger is shaped as an oblong, almost straight tooth; the movable finger is robust, but yet very conspicuously narrower than the proximal half of the fixed finger and considerably shorter than the anterior margin of the hand; when the fingers are closed a conspicuous strip of the movable finger is covered by the fixed finger, while at the base there may be seen a minute hole between the fingers; the inner side of the hand bears a long, spiniform seta and a similar seta originates from the inner surface of the movable finger.

Thoracic segments nearly as in *L. profunda*. All thoracic legs (figs. 2h—2k) in the main as in *L. profunda*, but in the anterior pairs fourth and fifth joints are shorter in proportion to thickness, sixth joint much longer than the fifth but slightly shorter than the seventh with claw.

Abdomen somewhat longer than the two posterior thoracic segments combined (fig. 2a). Pleopods (fig. 2l) with the rami well developed though smaller than in *L. profunda*; each ramus with setæ only on the terminal margin and the setæ are shorter than the rami and not plumose; in young specimens with the last pair of thoracic legs still wanting the pleopods are also wanting (fig. 2n). Sixth segment short, shorter than the two preceding segments combined and posteriorly broadly rounded (fig. 2m). — Uropods as long as the sixth segment (figs. 2m and 2n); peduncle broad but distinctly longer than broad, produced in a triangular plate, which is as long as or longer than the upper margin of the peduncle and its obtuse end bears one long and one short seta; endopod moderately robust, without any vestige of a division into two joints.

Length of the largest specimen from Stat. 58 is 2.5^{mm}, of the specimen from Stat. 24 2.8^{mm}.

Remarks. This species is distinguished from *L. glacialis* especially by the shape of the fixed

finger of the chelæ; from *L. profunda* it is distinguished by several features, among which may be pointed out the quite different shape of the fixed finger of the chela and the short and not plumose setæ of the pleopods.

Fig. 2f represents the maxillipeds and fig. 2e the mandibles of this species. The last-named figure shows that the mandibles are somewhat thick and their molar processes decrease slightly in thickness to the end, which is cut off very obliquely and adorned with about three teeth. The molar processes differ therefore materially from those in the species figured by Sars and remind one more of those in *L. ventralis* as described on p. 91, though differing in the armature of their end.

Occurrence. *L. latiremis* has been taken by the "Ingolf" at three stations.

East of Iceland: St. 58: Lat. 64° 25' N., Long. 12° 09' W., 211 fm., temp. 0.8°; 12 spec., but the majority juvenile without pleopods.

North of Iceland: St. 126: Lat. 67° 19' N., Long. 15° 52' W., 293 fm., temp. ÷ 0.5°; 1 juv. spec.

— — — — — St. 124: Lat. 67° 40' N., Long. 15° 40' W., 495 fm., temp. ÷ 0.6°; 1 spec.

65. *Leptognathia glacialis* n. sp.

(Pl. X, figs. 3 a—3 b).

Female (without marsupium). This species, of which only a single specimen is at hand, is closely allied to *L. latiremis*, differing only in the shape of the chelæ and a little in the uropods. When the chela is seen vertically from the outer side (fig. 3a) it is observed, that the major part of its posterior margin is considerably convex with two setæ, the incisive margin a little sinuate and its proximal half slightly concave with about seven rounded saw-teeth; the movable finger is very much narrower than the proximal third of the fixed finger and has a minute tooth near the middle of its incisive margin; when the fingers have their apical parts crossed a long and moderately broad interval is found between their incisive edges. The uropods (fig. 3b) have the produced part of the peduncle considerably shorter and more rounded than in the two other species of group d.

Length of the specimen 2.8 mm.

Occurrence. This species has been taken by the II^d Amdrup Expedition at East Greenland at a single locality.

Fleming Inlet: Lat. 71° 51' N., Long. 22° 27' W., 118 fm., red^{cl} clay; 1 spec.

Haplocope G. O. Sars.

This genus, established on a single species, is so closely allied to *Leptognathia*, that it would perhaps be advisable either to cancel it or to divide *Leptognathia* into several genera. On p. 9 and 65—66 I have pointed out why I think it premature to subdivide the last-named genus, but as *Haplocope* has been established many years ago it might probably be nearly impossible to get it cancelled. *Haplocope angusta* G. O. Sars is a slender species with long uropods and the exopod of these appendages two-jointed; according to Sars it differs from *Leptognathia* in having the molar process of the mandibles

rather strong, cylindric and armed at the tip with dentiform tubercles, furthermore by having the pleopods uniramous without setæ. Dollfus has established a new species as *Haplocope* (?) *abyssorum*, but according to his figures I suppose that this species, which has no rami on the pleopods, does not belong to *Haplocope*, but either to *Leptognathia* or, and more probably, be the type for a new genus. — From the "Ingolf" I have a new species which is allied to *H. angusta* in the mandibles (fig. 4c) and in all other features of some importance excepting that the uniramous pleopods have very long setæ. I think that the best external character for *Haplocope* is that the pleopods are uniramous.

66. *Haplocope linearis* n. sp.

(Pl. X, figs. 4a—4f).

Female. Slender, between eight and eight and a half times as long as broad, tapering somewhat in breadth from the second thoracic segment to the end of abdomen (fig. 4a). — Carapace about as long as second segment plus half of the third, slightly narrower than second segment, not much longer than broad, about twice as broad behind the middle as at the front end and with the lateral margins very moderately convex.

Antennulæ (fig. 4b) much shorter than the carapace, somewhat robust. First joint somewhat shorter than the other joints combined, not fully twice as long as deep; second joint not quite half as long as the first and feebly produced above, only a little longer than the third and a little shorter than the fourth joint; longest terminal setæ about as long as the two distal joints combined. — Antennæ somewhat short, with fourth and fifth joints completely fused.

Chelipeds (fig. 4b) somewhat small. The basal joint with the posterior protuberance well developed, about as long as deep, with its rounded hind margin moderately distant from the lower front angle of second thoracic segment. Carpus considerably longer than the basal joint, twice as long as deep, with the lower margin considerably convex. Chela small, somewhat shorter than the carpus and somewhat more than twice as long as broad; movable finger as long as the anterior margin of the hand and towards the base much narrower than the fixed finger which has two long setæ on its straight posterior margin towards the hand.

The thoracic segments (fig. 4a) more or less distinctly angular, and on the second segment their lateral angles are situated far in front, on the following segments gradually more backwards, consequently on the seventh segment only a little from the posterior margin. Third segment is more than half as long again as the second, slightly longer than broad and slightly shorter than fifth segment. — Thoracic legs slender and subequal in length, moderately long. Second pair (fig. 4b) with fourth and fifth joints subequal in length and their terminal spines long; sixth joint not fully half as long again as the fifth and a little shorter than seventh joint with claw. Three posterior pairs (fig. 4d) with most of the spines moderately long and their sixth joint a little shorter than seventh with claw.

Abdomen slightly shorter than the two preceding segments combined and the first segment conspicuously narrower than the seventh thoracic segment. Five anterior segments with the ventral margins considerably or very moderately convex (fig. 4f). Pleopods (figs. 4e and 4f) long and narrow;

peduncle very oblong; the single ramus half as long again as the peduncle, about four times as long as broad, with the end cut off obliquely; on this terminal margin about seven fine, extremely long setæ are inserted, some of them about two and a half times as long as the ramus; no setæ are found on the lateral margins of the rami. Sixth segment as long as, or a little longer than, the two preceding segments together. — Uropods (fig. 4f) slender and long, from a little shorter to a little longer than the three posterior segments combined; peduncle long, about as long as the fifth segment and more than twice as long as deep; endopod with first joint a little or conspicuously longer than the second; exopod very slender, half as long as the endopod and with its two joints equal in length.

Length of a female with marsupium 2^{mm}.

Remarks. This small and slender species is easily distinguished from all North Atlantic or Arctic forms hitherto known by its long and uniramous pleopods with very long setæ.

The mandibles are shown in fig. 4c; a description is scarcely needed beyond that given in the remarks on the genus.

Occurrence. Taken by the "Ingolf" at a single station.

Davis Strait: St. 25: Lat. 63° 30' N., Long. 54° 25' W., 582 fm., temp. 3.3°; 12 spec.

Leptognathiella n. gen.

This genus is established on a new species which in a few features differs materially from *Leptognathia* and *Haplocope*.

The body is extremely slender. The four-jointed antennulæ differ from those of *Leptognathia* by having the second joint strongly produced above (Pl. X, figs. 5b and 5g) into a triangle overlapping a part of third joint; besides second joint, seen from the side (figs. 5d and 5g), increases in depth from the base to beyond the middle. (Mouth-parts unknown). Chelipeds normal, with the basal joint having the hind margin of the well developed posterior protuberance free and rounded. Thoracic legs built as in *Leptognathia*, short; three anterior pairs thick. Pleopods wanting in the female. Last abdominal segment with the posterior margin between the uropods feebly concave (fig. 5c); uropods extremely long, curved downwards, biramous (figs. 5f and 5i), with the endopod two-jointed, the short exopod one-jointed.

Remarks. Though the characters pointed out as generic are not very valuable, the aspect of the animal is so different from that of the forms of *Leptognathia* that the establishment of a new genus seemed to me to be necessary.

67. **Leptognathiella abyssi** n. sp.

(Pl. X, figs. 5a—5i).

Female (without marsupium). Body extremely slender, between ten and nine and a half times as long as broad (fig. 5a), broadest at the middle of the thorax which is a little broader than the carapace and somewhat broader than the abdomen. — Carapace about as long as the second plus

half of the third thoracic segment, considerably longer than broad (fig. 5b), at the front end somewhat more than half as broad as behind the middle; the lateral margins posteriorly somewhat convex, anteriorly a little concave.

Antennulæ (figs. 5b and 5d) nearly as long as the carapace, moderately strong. First joint slightly longer than the two next joints combined, somewhat more than twice as long as deep, somewhat produced above and before the middle considerably deeper than towards the end. Second joint extremely produced above, increasing in depth from the base to the end of the lower margin and its upper margin is nearly two-thirds as long as that of the first joint. Third joint considerably tapering, with the lower margin about twice as long as the upper; fourth joint slenderly conical, a little longer than the lower margin of third joint, considerably shorter than its terminal setæ. — Antennæ short, even a little shorter than the two proximal antennular joints combined; fourth and fifth joints completely fused.

Chelipeds (fig. 5g) somewhat robust. The basal joint even a little longer than the carpus, with the posterior protuberance large, as long as deep and its rounded hind margin reaching behind the anterior lower end of second thoracic segment. Carpus nearly ovate, slightly more than half as long again as deep. Chela a little longer than the carpus, about twice as long as broad, with the major part of its posterior margin straight and furnished with two long setæ; movable finger almost as long as the anterior margin of the hand and towards the base much narrower than the fixed finger.

Lateral margins of the thoracic segments (fig. 5a) not angular but evenly and moderately convex. Second segment somewhat shorter than the third which is slightly shorter than the fifth or the sixth. — Thoracic legs short. The two anterior pairs uncommonly thick (fig. 5g); third joint with a very long, spiniform seta from the posterior angle; fourth and fifth joints very thick; subequal in length and with the terminal spines long or rather long; sixth joint considerably longer than the fifth and slightly longer than seventh with claw. Three posterior pairs somewhat slender (fig. 5e) with their spines well developed; fifth joint even longer than the sixth and slightly longer than seventh without claw.

Abdomen a little shorter than the two preceding segments combined. Five anterior segments (fig. 5f) with the ventral margin moderately convex; pleopods wanting. Sixth segment (fig. 5c) scarcely as long as the two preceding segments combined, transverse, with the hind margin long and a little concave. — Uropods, inserted on the postero-lateral angles which are cut off obliquely, are only a little shorter than the five posterior segments combined and somewhat robust; the peduncle as long as the sixth segment, seen from the side (fig. 5f) curved a little downwards, with the lower margin concave; endopod curved downwards as the peduncle, almost thicker a little from the end than near the base, two-jointed, with the second joint more than twice as long as the first; exopod slender, as long as the first joint of the endopod, one-jointed.

Length of a female without marsupium 2^{mm}.

Subadult Male. Similar to the female in most features, but differing in some particulars. — The antennulæ (fig. 5g), especially their two proximal joints, somewhat thicker than in the female. — Three posterior pairs of legs (fig. 5h) have the seventh joint and the claw considerably longer than in the female, subequal in length and together twice as long as sixth joint. — Abdomen (fig. 5i)

a little longer than the two preceding segments combined; pleopods well developed, biramous, with the exopod much longer than the peduncle and its terminal setæ about as long as the pleopod. — Length 2.1^{mm}.

Remarks. This small and very slender species is easily distinguished from all other forms by its very long and peculiarly shaped uropods.

Occurrence. It has been taken by the "Ingolf" at the two deepest stations.

South-West of Cape Farewell: St. 38: Lat. 59° 12' N., Long. 51° 05' W., 1870 fm., temp. 1.3°; 3 spec.

— — — — — St. 22: Lat. 58° 10' N., Long. 48° 25' W., 1845 fm., temp. 1.4°; 1 spec.

Cryptocope G. O. Sars.

This genus was established in 1880 on two species, *C. abbreviata* G. O. Sars and *C. Vøringii* G. O. Sars. *C. abbreviata* must be considered the type, at it was described several years before the other species and by Sars placed before *C. Vøringii*, when he established the genus. Later I established *C. arctica* which is related to *C. abbreviata*. Norman & Stebbing established *Strongylura arctophylax*, which is nearly related to *C. Vøringii* and must be transferred to *Cryptocope*. This genus is closely related to *Leptognathia*, the only important difference between the two genera being the existence of four pairs of marsupial lamellæ in *Leptognathia* and only a single pair in *Cryptocope*. But females with marsupium are known only of *C. abbreviata* and *C. arctica*, while they are unknown not only of *C. arctophylax* but of *C. Vøringii*, as far as I may infer from Sars' detailed description of this species. But the genus may be divided into two groups, the first comprising *C. abbreviata* and *C. arctica*, which are small and very thick species and besides closely allied, the second group comprising *C. Vøringii* and *C. arctophylax*, both large, less robust and closely allied but differing much in the relative length of the thoracic segments and in general aspect from the two other species. As the marsupium is unknown in these two large species it may be somewhat uncertain whether they have only a single pair of marsupial lamellæ, and if in the future that should prove not to be the case, these two species must be removed from *Cryptocope* and a new genus be formed for them. But at least provisionally they may be referred to *Cryptocope*.

68. *Cryptocope arctica* H. J. Hansen.

(Pl. XI, figs. 1a—1h.)

- ! 1886. *Cryptocope arctica* H. J. Hansen, *Dijmphna-Togtets zool.-bot. Udbytte* p. 209, Tab. XXI, fig. 4.
 1887. — — — — — *Vidensk. Medd. naturhist. Forening i Kjøbenhavn for 1887*,
 p. 180, Tab. VII, Fig. 1—1c.

Female. Extremely thick (fig. 1a), from four to four and a half times as long as broad. — Carapace extremely large (fig. 1a), only a little shorter than the four following segments combined, somewhat longer than broad, at the front end scarcely half as broad as somewhat behind the middle, with the lateral margins somewhat convex.

Antennulæ somewhat long in proportion to the animal (fig. 1a), being somewhat more than half as long as the carapace and rather slender (fig. 1b). First joint somewhat shorter than the other joints combined, slightly more than twice as long as deep and a little more than twice as long as the second which is not produced above; third joint a little longer than deep, rectangular and considerably shorter than the second; fourth joint uncommonly long, as long as second and third joints combined, slender; longest terminal seta nearly as long as the three distal joints combined. — Antennæ with fourth and fifth joints completely fused without any vestige of an articulation, about twice as long as the penultimate joint.

Chelipeds (figs. 1b and 1c) somewhat large and moderately strong. Basal joint posteriorly produced into a considerable free portion bent much upwards and reaching distinctly behind the carapace. Carpus somewhat less than twice as long as deep, nearly oblong-ovate, with the lower margin considerably convex. Chela somewhat longer than the carpus, long and somewhat slender, being a little less than three times as long as broad, with two long setæ near the middle of the concave posterior margin and with the hand distinctly narrower at the base of the movable finger than near the middle; movable finger considerably or rather much shorter than the anterior margin of the hand, only a little narrower than the fixed finger (fig. 1c), the incisive margin of which is somewhat sinuate, showing two flatly vaulted and badly defined protuberances.

Thoracic segments (fig. 1a) with their lateral margins very convex, producing deep incisions between the segments; some of them are subangular. Second to fourth segment short, increasing in length backwards, together about as long as the sum of the fifth and the sixth; second segment decreases considerably in breadth from near the front to the posterior end; third segment is broadest somewhat before, and fourth a little before, the middle, while the three posterior segments are broadest behind their middle. Fifth segment is almost broader than the second and somewhat broader than the fourth or the seventh. — Thoracic legs (figs. 1b and 1d) long and slender; the anterior pair have the joints from the fourth to the sixth somewhat increasing in length, and the sixth joint, which is slender and long, is a little longer than seventh with claw. Posterior pairs (fig. 1d) have the spines of moderate length; sixth joint is very long and considerably or much longer than seventh with claw.

Abdomen somewhat longer than the two preceding segments combined (fig. 1a), seen from above tapering considerably backwards to the posterior margin which has a very obtuse angle; four posterior segments each with a pair of sublateral setæ (figs. 1a and 1e). Ventral side of the five anterior segments (figs. 1e and 1f) strongly serrate, as each segment bears a high, subtriangular or subquadrangular protuberance. Pleopods generally small and their rami terminating in some moderately long setæ (fig. 1e); in the largest specimens from the "Ingolf" Stat. 25 the pleopods are very small (fig. 1f) and their setæ nearly rudimentary. Sixth segment longer than the two preceding segments combined. — Uropods small; peduncle short and much deeper than long, thick; the endopod with its two joints equal in length; exopod more than half as long as the endopod, more or less distinctly two-jointed, with the joints subequal in length.

Length of females with marsupium 1.67—2^{mm}.

Subadult Male. Conspicuously more slender and distinctly smaller than adult females. — Antennulæ (fig. 1g) considerably thicker than in the female; first joint somewhat less than twice as

long as deep. — Five anterior abdominal segments (fig. 1 h) proportionately longer than in the females, with the pleopods somewhat long, well developed.

Remarks. *C. arctica* is allied and rather similar to *C. abbreviata* G. O. S., but according to Sars' text and figures and my examination of a Norwegian specimen given by him *C. abbreviata* is smaller than *C. arctica*, its pleopods have no setæ on the end of their rami, the exopod of the uropods is one-jointed and, what is of special importance, the chelipeds are rather different, having the carpus only one-third as long again as deep and the chela distinctly broader, two and a half times as long as broad, with a single setæ on the posterior margin.

In vain I have looked for differences of possibly specific value between the specimens from my very different localities; my type from the Kara Sea agrees completely with the specimens from East Greenland and from the "Ingolf" Stations. — Some among the specimens from the "Ingolf" Stat. 25 are larger than the others and, as already stated, have the pleopods less developed than all other specimens seen, but no other difference could be discovered.

Occurrence. It has been taken by the "Ingolf" at nine stations.

Davis Strait: St. 32: Lat. 66° 35' N., Long. 56° 38' W., 318 fm., temp. 3.9°; 11 spec.

— — St. 25: Lat. 63° 30' N., Long. 54° 25' W., 582 fm., temp. 3.3°; 29 spec.

— — St. 24: Lat. 63° 06' N., Long. 56° 00' W., 1199 fm., temp. 2.4°; 1 spec.

— — St. 36: Lat. 61° 50' N., Long. 56° 21' W., 1435 fm., temp. 1.5°; 7 spec.

Denmark Strait: St. 90: Lat. 64° 45' N., Long. 29° 06' W., 568 fm., temp. 4.4°; 4 spec.

South-West of Iceland: St. 81: Lat. 61° 44' N., Long. 27° 00' W., 485 fm., temp. 6.1°; 1 spec.

— — — St. 78: Lat. 60° 37' N., Long. 27° 52' W., 799 fm., temp. 4.5°; 27 spec.

East of North-Iceland: St. 101: Lat. 66° 23' N., Long. 12° 05' W., 537 fm., temp. ÷ 0.7°; 1 spec.

North of East-Iceland: St. 126: Lat. 67° 19' N., Long. 15° 52' W., 293 fm., temp. ÷ 0.5°; 4 spec.

Furthermore this species has been taken at a number of arctic localities on both sides of Greenland, especially East-Greenland, and off Jan Mayen by various Expeditions.

Baffin Bay: Lat. 72° 20' N., Long. 59° 39' W., 170 fm., clay with stones; 1 spec. "Ingegerd och Gladan" 1871. (H. J. Hansen).

East Greenland: Henry Land: Lat. 69° 34' N., Long. 23° 35' W., 20 fm.; 17 spec. II^d Amdrup Exp.

— — Hurry Inlet: Lat. 70° 36' N., Long. 22° 31' W., 50 fm.; 2 spec. — —

— — — — — 10 fm.; 1 spec. — —

— — Forsblad Fjord: Lat. 72° 27' N., Long. 25° 28' W., 90—40 fm.; 1 spec.

II^d Amdrup Exp.

— — Stormbugt, ca. Lat. 77° N., 15—20 fm.; 1 spec. Danmark Exped. (Steffensen).

Jan Mayen: 50—60 fm.; 1 spec. II^d Amdrup Exped.

Distribution. The type of *C. arctica* was taken in the Kara Sea, 64 fm. (H. J. H.). Later Stebbing has mentioned specimens from Novaia Zemlia or Spitzbergen, 100 fm. Recently it has been mentioned by Sars from the Gaase Fjord, Ellesmere Land (at ab. Lat. 78° N., on the western side of Smith Sound), 60 m. (2^d Fram Exped.).

The geographical and bathymetrical distribution of this species is very interesting. In the Kara Sea, at East Greenland, Jan Mayen and in Smith Sound it has been taken in depths between

10 and 90 fathoms; in the cold area it was taken by the "Ingolf" at two stations, 293 and 537 fm.; in the warm area by the "Ingolf" at seven stations at depths varying from 318 to 1435 fathoms.

69. *Cryptocope Vøringii* G. O. Sars.

(Pl. X, figs. 6a—6d.)

1877. *Tanais Vøringi* G. O. Sars, Arch. for Math. og Naturv. B. II, p. 347.

1881. *Cryptocope Vøringii* — Arch. for Math. og Naturv. B. VII, p. 50.

! 1885. — — — Den norske Nordhavs-Exp., Crust. I, p. 74, Pl. VII, figs. 5—16.

Female (without marsupium). G. O. Sars has published a very detailed description with several figures of this sex, but a number of observations may be added.

Body, carapace, thoracic segments and abdomen, seen from above, as to all particulars nearly as in *C. arctophylax* Norm. & Stebb. (comp. description and fig. 2a on Pl. XI of this species).

Antennulæ (fig. 6a) somewhat shorter than the carapace, moderately slender. First joint considerably shorter than the three other joints combined, about two and half times as long as deep and feebly tapering; second joint distinctly less than half as long as the first and considerably produced above; third joint somewhat shorter than the second, almost quadrangular; fourth joint long, nearly as long as third and second joints combined. — Antennæ somewhat long; fourth and fifth joints completely fused.

Chelipeds robust (fig. 6a). A coxal joint is well marked off, large, somewhat triangular and well chitinised on the outer side. Basal joint posteriorly produced into a moderately long, free, moderately thick protuberance directed backwards and upwards, and the hind margin of this protuberance is situated beneath the front margin of second thoracic segment. Carpus only somewhat longer than deep, being somewhat expanded downwards and showing a somewhat protruding triangle below at the front lower angle of the ischium. Chela almost half as long again as the carpus, robust, only a little more than twice as long as broad; movable finger somewhat shorter than the anterior margin of the hand, robust, with a conspicuous, subtriangular and moderately low tubercle at the middle of the incisive margin (fig. 6b); fixed finger somewhat thicker than the movable, with three setæ on its posterior margin, while its incisive margin has a large, broad and somewhat high, rounded tubercle beyond the middle and before the middle a low and badly defined protuberance; both fingers with their end obtuse.

Thoracic legs rather long and slender, with their spines short or moderately short. Anterior pairs (fig. 6c) with the joints increasing much in length from the fourth to the sixth; sixth joint very long and slightly longer than seventh with claw. Posterior pairs as in the next species (vid. infra).

Abdomen (fig. 6d) somewhat shorter than the three preceding segments combined. Five anterior segments with their ventral surface peculiarly armed; first segment with the ventral process somewhat short, obliquely and obtusely triangular; process of second segment long, longer than broad, obliquely triangular, somewhat curved and directed much backwards; the processes decrease much in length from second to fourth segment, while the process on fifth segment is only a moderately low, rounded tubercle. Pleopods very small, biramous, without setæ. (In juvenile specimens with the seventh pair

of thoracic legs not developed the pleopods and the ventral processes are not found). Sixth segment about as long as fifth, fourth and half of the third segment combined. — Uropods (fig. 6d) small and robust; both rami distinctly two-jointed (also in juvenile specimens) and the exopod somewhat shorter and much thinner than the endopod.

Length of the single larger specimen 4^{mm}; Sars stated that the female is 5.5^{mm} long.

Remarks. The differences between the females of *C. Voringii* and *C. arctophylax* are pointed out in the "Remarks" on the latter species. Sars stated that the uropods of the female have the exopod one-jointed, but this is decidedly incorrect; his figure of the chela is not good, and he has described and figured (figs. 5 and 6) the terminal part of the thoracic legs, viz. seventh joint with claw, quite erroneously.

Occurrence. Taken by the "Ingolf" at three stations in the cold area.

North-West of the Færoes: St. 138: Lat. 63° 26' N., Long. 7° 56' W., 471 fm., temp. ÷ 0.6°; 1 large spec.

South of Jan Mayen: St. 117: Lat. 69° 13' N., Long. 8° 23' W., 1003 fm., temp. ÷ 1.0°; 1 juven. spec.

— - — St. 116: Lat. 70° 05' N., Long. 8° 26' W., 371 fm., temp. ÷ 0.4°; 1 juven. spec.

Distribution: The specimens seen by Sars had been taken at three places in the cold area West of Norway, from Lat. 63° 10' to Lat. 67° 56' N., and in depths ranging from 350 to 778 fathoms; temperatures at the bottom from ÷ 1.0° to ÷ 1.4°.

70. *Cryptocope arctophylax* Norm. & Stebb.

(Pl. XI, figs. 2a—2k).

1886. *Strongylura arctophylax* Norman & Stebbing, Transact. Zool. Soc. London, Vol. VII, Pt. IV, p. 116, Pl. XXIV, fig. 3.

Young Female and subadult Male. Body of the subadult male (fig. 2a) robust, slightly more than five times as long as broad and the anterior half conspicuously broader than the posterior; the young female is about five and a half times as long as broad. — Carapace nearly as long as the two following segments combined, as long as or slightly longer than broad, anteriorly somewhat less than half as broad as behind the middle, where the lateral margins are very convex.

Antennulæ in the subadult male (fig. 2a) a little, in the young female somewhat, shorter than the carapace. In the female (fig. 2e) the antennulæ are somewhat slender; first joint considerably shorter than the three following joints combined, somewhat less than three times as long as deep and feebly tapering; second joint somewhat produced above, not fully half as long as the first, but much longer than the third which is a little shorter above than below; fourth joint almost as long as third and second joints combined and a little longer than the terminal setæ. In the subadult male the antennulæ (fig. 2b) are much thicker; first joint slightly more than half as long again as deep; second joint as deep as the length of its upper margin, which is half as long as the first joint; third joint more than half as deep again as the length of its upper margin; fourth joint uncommonly long, conspicuously longer than the two preceding joints combined, with the proximal portion somewhat thickened, and the terminal setæ are considerably shorter than the joint. Antennæ somewhat long, in the young female (fig. 2e) with, in the subadult male without, a vestige of an articulation between fourth and fifth joints.

Chelipeds robust and on the whole agreeing with those in *C. Voringii* excepting in the armature of the fixed finger (fig. 2c), which has the distal large tubercle furnished with two incisions dividing its margin into three rounded teeth, and the proximal protuberance is higher and better defined than in *C. Voringii*; in my specimens both fingers have their ends acute, while they are obtuse in my female of *C. Voringii*.

Thoracic segments (fig. 2a) decrease distinctly in breadth from second to sixth. Second segment is slightly shorter than the third which is as long as the fourth and only slightly shorter than the fifth. Second to fourth segments increase conspicuously in breadth from their posterior to the anterior, rather broadly rounded angle, while fifth and sixth segments are subrectangular with their angles rounded and the lateral margins feebly protuberant behind the middle; seventh segment broader behind than in front. — The thoracic legs as in *C. Voringii*; fig. 2d shows that in the posterior pairs sixth joint is considerably longer and thinner than the fifth and distinctly longer than seventh with claw; fig. 2f shows that the upper terminal spine on sixth joint is strong and adorned with some five pairs of lateral, oblique branches (a somewhat similar spine is found in *C. Voringii*).

Abdomen in the subadult male (fig. 2a) as long as the three preceding segments combined; its anterior half is as broad as seventh thoracic segment, but from the fourth segment the abdomen tapers conspicuously; in the young female the last thoracic segment has not arrived at full size and the abdomen is somewhat narrower than sixth segment, slightly longer than fifth and sixth segments combined and not tapering, as the sixth segment is fully as broad as the first. In the male (fig. 2d) the armature of the ventral side is strongly developed; the process from third segment is very long, acute, subtriangular, with the anterior margin a little convex and the posterior margin somewhat concave, directed mainly downwards; the process from second segment is much shorter than the third though still large, triangular and as long as broad; the first segment has only a somewhat low, triangular tubercle, fourth segment a somewhat higher tubercle, and on the fifth segment the protuberance is rudimentary. In the young female the processes (fig. 2g) or tubercles are conspicuously less developed, but show nearly the same relative proportions as to length. Pleopods completely wanting in the female, while in the subadult male they are well developed (fig. 2d), somewhat long, biramous, with moderately long setæ. — Uropods (figs. 2d and 2g) distinctly more slender and longer than in *C. Voringii*; peduncle at least as deep as long; endopod with the two joints subequal in length; exopod two-jointed, somewhat shorter and considerably thinner than the endopod.

Length of the subadult male 3.8 mm., of the young female 3.3 mm. (The female specimen described by Norman & Stebbing was 4 mm. long).

Adult Male (figs. 2h—2k). On the whole somewhat reminding of males of the genus *Leptognathia*. — Antennulæ (fig. 2h) as long as the carapace and second thoracic segment combined, seven-jointed. First joint twice as long as deep; second joint thick and slightly more than half as long as the first; third and fourth joints very short and fifth joint short, all three somewhat cup-shaped and fourth and fifth joints each with a close row of extremely long sensory hairs; sixth joint about as long as the four preceding joints combined, at the end with a row of very long sensory hairs; seventh joint long, nearly as long as the first and much thinner than the sixth, slightly longer than the terminal setæ.

Chelipeds (fig. 2h) moderately strong, somewhat long. The coxal joint is distinctly marked off; the basal joint is very thick, only a little shorter than the carpus, which is a little less than twice as long as deep. Chela considerably longer than the carpus, inconsiderably more than twice as long as broad (fig. 2i); movable finger almost as long as the anterior margin of the hand and distally much curved, and the major middle portion of its incisive margin is irregular with several moderately small or very small teeth and two minute spines; the fixed finger has nearly the proximal half of its incisive margin finely serrate, while the distal half has the two protuberances found in the immature male, but both are lower and the distal protuberance without marginal incisions and teeth excepting a single small, acute tooth at its end and just at the origin of the terminal, oblong-triangular, acute part of the finger.

Thoracic legs long and slender (fig. 2h), subsimilar in all particulars excepting that the spines on the anterior pairs are very short, on the posterior pairs somewhat more developed; sixth joint is very long and considerably longer than seventh with claw.

Abdomen (fig. 2k) somewhat longer and, as usually, conspicuously thicker than the thoracic segments. Five anterior segments with ventral tubercles; the tubercle on third segment triangular but almost twice as broad as high; from that segment the protuberances decrease in size both forwards and backwards and all are somewhat or fully rounded. Pleopods strong with very long setæ. — Sixth segment strongly produced backwards in a somewhat slender process with the upper margin distinctly concave; the result is that the uropods originate considerably before the middle of the segment and terminate before its end. — Uropods (fig. 2k) with the peduncle about as long as deep; endopod three-jointed, with first joint thicker and much shorter than the second, which is a little shorter than the third; exopod very slender and as long as the sum of two proximal joints of the endopod, two-jointed, the first joint very short, the second long.

Length 3.8 mm.

Remarks. *C. arctophylax* is allied to *C. Vøringii*, but the female and the subadult male of the two species differ sharply in the ventral abdominal processes, the third process being much longer than the others in *C. arctophylax*, while in *C. Vøringii* the second process is the longest; furthermore the female of *C. Vøringii* has small pleopods without setæ, while in the female *C. arctophylax* pleopods seem to be wanting; a third character is the difference in the above-described distal tubercle on the incisive margin of the fixed finger of the chelæ. — According to the figures of the male of *C. Vøringii* published by Sars this animal seems to differ sharply from the male of *C. arctophylax* by having the first joint of both endopod and exopod of the uropods much longer in proportion to the second joint than in the last-named species, and in *C. Vøringii* the terminal joint of the antennulæ is only somewhat longer than sixth joint, while in *C. arctophylax* the seventh joint is more than twice as long as the sixth.

C. arctophylax was established by Norman & Stebbing on a single female specimen; they referred, however, the species wrongly to the genus *Strongylura*, but it must be emphasized that their work was written before any figure of *Cryptocope Vøringii* G. O. S. or *Strongylura cylindrata* G. O. S. had been published. Stebbing's figures of the animal from above, of the cheliped, thoracic legs, etc., leave no doubt that the animal is either *C. Vøringii* or *C. arctophylax* as defined here; the locality for the specimen and the ventral abdominal process shown on his fig. III Pl. but not mentioned in the

text shows that the animal cannot be *C. Vøringii*. One small error may be noted, viz. that the English authors stated the exopod of the uropods to be unjointed, while it certainly is two-jointed.

Occurrence. *C. arctophylax* has been taken by the "Ingolf" at two deep-water stations in the warm area.

Davis Strait: St. 24: Lat. 63°06' N., Long. 56°00' W., 1199 fm., temp. 2.4°; 1 subadult male, 1 young female and 1 juvenile specimen.

— — St. 36: Lat. 61°50' N., Long. 56°21' W., 1435 fm., temp. 1.5°; 1 adult male and 1 mutilated juvenile specimen.

Distribution. The only specimen mentioned in the literature is the type, which has been dredged by the "Porcupine" at Lat. 56°24' N., Long. 11°49' W., "midway between Ireland and Rockall", 1380 fathoms. — *C. arctophylax* has only been found in the warm area, while *C. Vøringii* is confined to the cold area.

Tanaella Norm. & Stebb.

This genus was established on a single specimen of a new species, *T. unguicillata* Norm. & Stebb., and I possess a specimen of this species and a specimen of a hitherto unknown form; all three specimens hitherto known are females without marsupium. The genus is related to *Leptognathia* but differs in some particulars. A brief description of the genus may be given here.

Body somewhat robust. The antennulæ have the second joint longer than third and fourth joints combined, and the third joint is very short. Chelipeds unusually robust. Anterior pairs of thoracic legs have the rather long sixth joint longer than the seventh with claw; while on the posterior pairs sixth joint is considerably shorter than seventh with claw. Five anterior abdominal segments very short and peculiarly shaped so that they, seen from the side, are somewhat angularly bent at the median lateral line; sixth segment long, at least as long as the four preceding segments combined. Pleopods either small without setæ or wanting. Uropods robust, with a styliform, unjointed endopod and no exopod. (Mouth-parts, marsupium and male unknown).

Remarks. *Tanaella* is related to *Strongylura* in having the sixth abdominal segment very long in proportion to the five anterior segments, but the whole abdomen in *Tanaella* is shorter in proportion to the thorax than in *Strongylura*. In the diagnosis of *Tanaella* Norman & Stebbing stated that no pleopods are found, but this feature cannot be maintained as a generic character, because my new species *T. ochracea* is closely allied to *T. unguicillata* excepting in the single feature, that it possesses small pleopods. The structure of the uropods seems to be a good character; besides the antennulæ and the elongate terminal part of the posterior pairs of legs seem to afford generic characters.

71. *Tanaella ochracea* n. sp.

(Pl. XI, figs. 3a—3f.)

Female (without marsupium). Moderately robust (fig. 3a), a little more than six times as long as broad, subcylindrical, tapering slightly in breadth from the carapace to sixth abdominal segment, which is conspicuously broader than the preceding abdominal segments. — Carapace somewhat longer

than the two following segments combined, somewhat longer than broad, at the front end half as broad as a little behind the middle; the lateral margins considerably convex; the frontal process triangular, broad and of moderate length.

Antennulæ (fig. 3b) a little shorter than the carapace, somewhat robust. First joint slightly longer than the three other joints combined, more than two and a half times as long as deep and with the proximal third rather expanded below. Second joint moderately produced above, conspicuously more than half as long as the first and somewhat longer than third and fourth joints combined, increasing distinctly in depth from the base to the end; third joint very short and fourth joint uncommonly short and somewhat robust; terminal setæ somewhat or considerably longer than fourth joint. — Antennæ long; fourth and fifth joints completely fused and conspicuously more than twice as long as the penultimate joint.

Chelipeds robust (fig. 3b). Basal joint long, even distinctly longer than the carpus; the posterior protuberance is very deep and its free, rounded hind margin reaches the front lower angle of second thoracic segment. Carpus ovate, scarcely half as long again as deep, ovate. Chela considerably longer than the carpus, twice as long as broad; movable finger much shorter than the anterior margin of the hand, strong, with a broad, very low, very flatly triangular protuberance on the incisive margin somewhat from its base (fig. 3c) and a minute, sharp denticle at the distal end of that protuberance; fixed finger very broad, with two strong setæ on the posterior margin, while the incisive margin has at the base a somewhat deep and moderately narrow, not crenulated incision producing a small hole between the fingers when the chela is closed; beyond that incision the margin is somewhat undulate to rather near the end where it has a sharp tooth and beyond this a conspicuous incision; the terminal part of the finger is an oblong and somewhat curved triangle with the end acute.

Thoracic segments (fig. 3a) increase gradually in length from the second to the fifth; the lateral margins of each segment are nearly straight excepting at both ends, but the margins of seventh segment are somewhat convex. — Thoracic legs somewhat short. The two anterior pairs (fig. 3b) moderately slender, fourth joint with a rather long spine on the posterior angle; fifth joint a little longer than the fourth, with the anterior distal spine long and the posterior spine much shorter; sixth joint with fine denticles along the posterior margin and on the end (fig. 3d), considerably longer than the fifth and a little longer than seventh with the straight claw. Three posterior pairs moderately strong, with somewhat long spines on the fourth and especially on fifth and sixth joints (fig. 3e); sixth joint somewhat longer than the fifth but much shorter than the seventh with claw, the seventh joint being long but yet shorter than the very long claw, and both are finely ciliated below.

Abdomen somewhat shorter than the three preceding segments combined (fig. 3a). Five anterior segments short, scarcely as broad as the posterior thoracic segments, seen from the side (fig. 3f) a little angularly bent at the lateral margin; the ventral side with somewhat low, rounded protuberances. Pleopods very small, biramous, without setæ. Sixth segment even perceptibly longer than the sum of the four preceding segments, seen from above (fig. 3a) broader than these segments and with the posterior margin and the lateral margins together evenly curved like the greater part of a circle. — Uropods a little shorter than sixth segment (fig. 3f); peduncle somewhat longer than deep; endopod about twice as long as the peduncle, styliform.

The body is shining and its anterior half deeply reddish yellow.

Length of the single specimen 3.0^{mm}.

Occurrence. It has been taken at the deepest "Ingolf" station.

South-West of Cape Farewell: St. 38: Lat. 59° 12' N., Long. 51° 05' W., 1870 fm., temp. 1.3°; 1 spec.

Remarks. *T. ochracea* differs from *T. unguicillata* Norm. & Stebb. especially in the shape of the incisive margins of the chelæ, the shape of the five anterior abdominal segments when seen from the side, the shape of the last segment from above and by possessing small pleopods.

72. *Tanaella unguicillata* Norm. & Stebb.

(Pl. XI, figs. 4a—4d.)

1886. *Tanaella unguicillata* Norman & Stebbing, *Transact. Zool. Soc. London*, Vol. XII, Pt. IV, p. 118, Pl. XXIV, fig. IV.

Female (without marsupium). The single specimen is so strongly curved that it was impossible to straighten it without breaking. But it seems to differ slightly from *T. ochracea* as to the general shape of the body, outline and relative length of the carapace and thoracic segments (comp. fig. IV D in the English paper quoted.)

Antennulæ (fig. 4a) somewhat shorter than the carapace, but otherwise almost as in *T. ochracea*, the most important difference being, that the second joint is proportionately a little longer and cylindrical, considerably more than half as long as the first joint and a good deal longer than the two distal joints together. — Antennæ with a feeble articulation between fourth and fifth joints, which are more than three times as long as the penultimate joint.

Chelipeds very robust (figs. 4a and 4b). The basal joint not fully as long as the carpus, very deep, with the hind margin of the deep posterior protuberance very flatly convex. Carpus not quite half as long again as deep. Chela somewhat longer than the carpus, distinctly less than twice as long as broad; movable finger much shorter than the anterior margin of the hand, with a somewhat high, triangular protuberance on the incisive margin somewhat from its base and a minute, sharp denticle just beyond that protuberance (fig. 4b); fixed finger very broad, with two strong setæ on its posterior margin, while its incisive margin has at the base a somewhat deep and long incision crenulated with some five or six obtuse saw-teeth, producing a small hole between the fingers when adduced, and beyond that incision the margin is somewhat undulate to rather near the end, where a very obtuse angle and beyond this a triangular incision are seen; the ends of both fingers are obtuse.

Three anterior pairs of thoracic legs (fig. 4a) proportionately more slender than in *T. ochracea* and decreasing conspicuously in length from second to fourth pair; fourth and fifth joints subequal in length and with the length of their spines as in *T. ochracea*; sixth joint much longer than the fifth or the seventh with its straight claw. Three posterior pairs (fig. 4c) nearly as in *T. ochracea*; seventh joint with its long claw much longer than the sixth joint, finely ciliated and nearly straight or curved distinctly upwards.

Abdomen only a little shorter than the three preceding segments combined, seen from the side (fig. 4d) uncommonly thick and thickest a little before the middle. Five anterior segments short, seen

from the side with their vertical margins most curiously bent twice at the lateral margin. Pleopods wanting. Sixth segment even a little longer than the four preceding segments combined; its posterior margin is not broadly rounded as in *T. ochracea* but a little produced behind with a somewhat obtuse angle. — Uropods much shorter than the sixth segment, thus somewhat shorter than in *T. ochracea*, with the endopod not quite twice as long as the peduncle, but otherwise nearly as in the last-named species.

The animal is somewhat light greyish.

Length of the single specimen about 3.2^{mm}, thus a little larger than that of the English authors.

Remarks. The specimen described belongs unquestionably to *T. unguicillata*; especially the shape of the proximal parts of both fingers of the chelæ and the lateral view of the abdomen as compared with Stebbing's figures proves that beyond doubt. The main differences between *T. ochracea* and *T. unguicillata* have been pointed out in the "Remarks" on the first-named species.

Occurrence. It has been taken by the "Ingolf" at the following place.

South of West-Iceland: St. 69: Lat. 62° 40' N., Long. 22° 17' W., 589 fm., temp. 3.9°; 1 spec.

Distribution. The type of Norman & Stebbing was dredged by the "Porcupine" on the slope of the English Channel, Lat. 49° 7' N., Long. 10° 57' W., 96 fathoms. No other specimen has been recorded in the literature.

Strongylura G. O. Sars.

This genus was established on a single species, *S. cylindrata* G. O. S., of a peculiar aspect. This form is in most characters allied to species of *Leptognathia* with the pleopods rudimentary or wanting, but it differs by having the abdomen in the female and the subadult male extremely long, only somewhat shorter or even as long as the five posterior thoracic segments combined, while the sixth abdominal segment is extremely long, at least a little longer than the three preceding segments combined, and the biramous uropods are small and thick. Furthermore it differs from *Leptognathia* and reminds of *Cryptocope arctica* and *Tanaopsis* in having third and fourth thoracic segments each conspicuously shorter than the fifth or the sixth segment, the three anterior segments together being in reality scarcely as long as the sum of fourth and fifth segments.

The "Ingolf" material contains two species which I refer to *Strongylura*; one of them is less characteristic than *S. cylindrata*, while the other species is somewhat difficult, but after long hesitation I have referred it to *S. cylindrata*.

Cryptocope arctophylax, established by Norman & Stebbing as a species of *Strongylura*, differs widely from this genus but is, as already stated, allied to *Cryptocope Vøringii* G. O. S. No other species hitherto described has been referred to *Strongylura*.

73. *Strongylura cylindrata* G. O. Sars.

(Pl. XII, figs. 1a–11.)

1881. *Strongylura cylindrata* G. O. Sars, Archiv for Math. og Naturv., B. VII, p. 53.

! 1896. — — — Account Crust. Norway, Vol. II, p. 36, Pl. XVI, fig. 1.

In the last-named work Sars has given a good representation of this species, viz. figures of a female without marsupium from above and from the side, together with drawings of appendages. He presented the Copenhagen Museum with two of his co-types, but they differ in some points and especially in the antennulæ from his figures and description. A comparison between my fig. 1g, drawn from one of his co-types, with his figures on Pl. XVI shows, that the antennulæ are much more slender than figured by Sars and above all that the moderately slender terminal joint is slightly shorter than the two preceding joints combined, while according to Sars that joint is much shorter than the sum of the two preceding joints and very thick. Furthermore my figures of second and sixth legs (figs. 1h and 1i) as compared with Sars' figures of second and seventh legs show that the thoracic legs drawn by him have the joints conspicuously shorter in proportion to thickness than in my Norwegian specimens presented by him. As to the relative length of thorax and abdomen, Sars' figures agree well with my Norwegian specimens, but in these the uropods are more remote from the end of abdomen (fig. 1k) than according to his figures, in which the uropods reach beyond the end of abdomen which is not the case in his co-types mentioned, while it exists in all the "Ingolf" specimens. Sars stated that he had taken *S. cylindrata* at several places "in depths ranging from 50 to 200 fathoms".

Judging from these statements one might be tempted to suppose that Sars had mixed up two different species. But though the "Ingolf" material is small, it originates from three localities with the depth from about 1200 to near 1700 fathoms, two specimens from the cold and two from the warm area, and these specimens show various differences. Furthermore, the antennulæ show features intermediate between Sars' figures of *S. cylindrata* and his two co-types mentioned; the thoracic legs are in two "Ingolf" specimens about as drawn by Sars, in two other specimens still shorter and thicker. For such reasons I am apt to think that all specimens seen by Sars or me are in reality variations of the same species. But it may be of some significance to add some further notes on the "Ingolf" specimens from each locality.

The female from Stat. 113 (fig. 1a), which measures 3.7^{mm} in length, is more slender than any other of my specimens and than that figured by Sars, as it is even slightly more than nine times as long as broad. But its antennulæ (fig. 1b) have the fourth joint shorter and thicker than in the specimens from the other stations, though less thick than in Sars' drawing (fig. 1a¹), while the chelæ are more robust and the thoracic legs (figs. 1c and 1d) shorter and thicker than in the specimen figured by Sars or in my specimens from other places. The chelæ (fig. 1b) are slightly more than twice as long as broad; the abdomen is longer than in specimens from any other source, being as long as the five posterior thoracic segments plus more than half of second segment combined, while the sixth abdominal segment is only a little longer than the three preceding segments combined. In Sars' figures and in his two co-types the abdomen is scarcely as long as the five posterior thoracic segments combined, but its sixth segment is as long as the four preceding segments together. — The subadult male from the same place — Stat. 113 — agrees in all respects with the female and its antennulæ are but slightly thicker, but it has moderately developed pleopods, the rami of which are somewhat long in proportion to the peduncle and the setæ on their terminal margin short (as figured by Sars).

The subadult male from the "Ingolf" Stat. 24 (figs. 1e and 1f) agrees as to the relative length

of the thorax and abdominal segments, the length and thickness of the chelæ and the thoracic legs with Sars' figures. It may be mentioned that the chelæ in this "Ingolf" specimen (fig. 1e), in Sars' figure and in my Norwegian specimens are conspicuously more slender than in the above-described specimens from Stat. 113, the chela being somewhat more than twice as long as broad. But in this "Ingolf" specimen from Stat. 24 the antennulæ are intermediate between those from Stat. 113 and my Norwegian specimens (fig. 1g), especially their fourth joint is slightly shorter and distinctly thicker than in the last-named specimens. — The young male from the "Ingolf" Stat. 20 has the pleopods rudimentary; the sixth abdominal segment is as long as the five other abdominal segments combined, but as to the length and thickness of the thoracic legs, the length of abdomen in proportion to the thorax and the shape of the chelæ the specimen agrees with Sars' figures, while the antennulæ, and especially their short and thick fourth joint, are similar to those in the specimens from Stat. 113.

From this somewhat detailed investigation it may be seen that it is impossible to divide my somewhat scanty material from both the cold and the warm areas and from Norway into two or three species and besides to take the Norwegian specimens figured and described by Sars into account, because the characters are mingled apparently without reference to depth or temperature. Therefore I feel myself compelled to refer all specimens to the same species which shows considerable but gradual variation in several features.

Length of the largest specimen, the female from Stat. 113, 3.7^{mm}, of my largest specimen from Norway 3.0^{mm}.

Occurrence. It has been taken by the "Ingolf" at three stations.

Davis Strait: St. 24: Lat. 63° 06' N., Long. 56° 00' W., 1199 fm., temp. 2.4°;
1 subadult male.

South-East of Cape Farewell: St. 20: Lat. 58° 20' N., Long. 40° 48' W., 1695 fm., temp. 1.5°;
1 young male.

South of Jan Mayen: St. 113: Lat. 69° 31' N., Long. 7° 06' W., 1309 fm., temp. ÷ 1.0°;
1 female and 1 subadult male.

Distribution. *S. cylindrata* was hitherto known only from several places at the southern and western coasts of Norway, "in depths ranging from 50 to 200 fathoms. It extends northwards to Selsøvig, situated just within the polar circle."

74. *Strongylura minima* n. sp.

(Pl. XI, figs. 5a—5d.)

Subadult Male. This tiny species is, seen from above (fig. 5a), moderately slender, about seven and a half times as long as broad, subcylindrical, yet tapering slightly towards both ends. — Carapace not quite as long as the three following segments combined, narrower than the next segment, much longer than broad, anteriorly conspicuously more than half as broad as behind the middle.

Antennulæ moderately robust (fig. 5b), slightly longer than the carapace. First joint two and a half times as long as deep, somewhat shorter than the three other joints combined; second joint somewhat produced above and half as long as the first; third joint middle-sized, distinctly longer than

deep; fourth joint somewhat shorter than the two preceding joints combined and much shorter than the longest terminal seta. — Antennæ of middle length; second and third joints uncommonly long; fourth and fifth joints completely fused, about twice as long as the sixth joint.

Chelipeds (fig. 5b) moderately strong. Basal joint somewhat more than half as long as the carpus, with the posterior protuberance deep but short, its hind margin free and rounded and reaching somewhat behind the front lower angle of second thoracic segment. Carpus somewhat long, slightly more than twice as long as deep, with the lower margin distinctly convex. Chela as long as the carpus, slightly more than twice as long as broad, with the hind margin somewhat concave; movable finger somewhat short, very much shorter than the anterior margin of the hand, moderately strong; fixed finger with a single long seta on the posterior margin at its base, and with a more proximal, triangular protuberance and a more distal triangular tooth on the incisive margin.

Thoracic segments, seen from above (fig. 5a), as to relative length and the shape of the lateral margins in the main similar to those in *S. cylindrata*. The lateral margins of the second segment are rather convex; the three anterior segments together a little shorter than fifth and sixth segments combined. — Thoracic legs of moderate length and thickness. The two anterior pairs (fig. 5b) have fourth and fifth joints subequal in length and proportionately short, together as long as the sixth joint, which is somewhat longer than seventh with claw, and on these legs the spines are very short or partly wanting. Three posterior pairs somewhat similar to those of thick-legged specimens of *S. cylindrata*.

Abdomen only as long as seventh, sixth, fifth and half of the fourth thoracic segments combined; sixth segment as long as the three preceding segments together, its posterior margin is somewhat convex with an obtuse median angle (fig. 5a). Pleopods proportionately long (fig. 5c); the exopod much longer than the peduncle and somewhat longer than the endopod; the terminal setæ longer than the rami. — Uropods not much more than half as long as sixth segment, moderately robust (fig. 5c); peduncle short and thick, much deeper than long; endopod with the proximal joint twice as long as the distal; exopod about half as long as and much thinner than the proximal joint of the endopod.

Length of the single specimen 1.05^{mm}.

Female (without marsupium). As the single specimen is so curved that I did not venture to make an attempt to straighten it, the description of the species has been based on the subadult male, and some remarks on the female may be added.

The specimen is rather similar to the male in most respects, but differs in some minor particulars. As far as can be judged the specimen is somewhat more slender in proportion to length than the subadult male.

The carapace is considerably shorter than the three following segments combined. — The antennulæ (fig. 5d) are somewhat longer than the carapace, slender; the first joint is three times as long as deep; fourth joint is distinctly shorter than the second. — Chelipeds with the carpus about half as long again as the basal joint and nearly twice as long as deep; chela somewhat more than twice as long as broad, with the movable finger proportionately a little longer than in the male; the

two protuberances on the incisive margin of the fixed finger are well developed, and when the fingers are closed a row of three oblong holes are seen between them.

Abdomen proportionately as long as in the male, but the sixth segment is longer, being even slightly longer than the sum of fifth, fourth, third and half of the second abdominal segment.

Length 1.25^{mm}.

Occurrence. This species has been taken by the "Ingolf" at two deep stations in the warm area.

Davis Strait: St. 24: Lat. 63°06' N., Long. 56°00' W., 1199 fm., temp. 2.4°; 1 female.

South of Iceland: St. 64: Lat. 62°06' N., Long. 19°00' W., 1041 fm., temp. 3.1°; 1 subadult male.

Distribution. This tiny species is easily separated from *S. cylindrata*. It is the smallest species hitherto known from the North Atlantic and probably smaller than any species hitherto described.

Strongylurella n. gen.

Allied to *Strongylura*, but differing in the following characters.

The thoracic segments as to relative length as in *Leptognathia*, consequently differing from *Strongylura* in having the three anterior segments combined conspicuously longer than the fifth and sixth segments combined. The last abdominal segment shorter than in *Strongylura* and longer than in *Leptognathia*, being slightly longer than broad. The uropods have the endopod divided as in *Strongylura*, as its proximal joint is much longer than the distal, but the exopod is wanting.

Remarks. It was found necessary to establish this new genus on a single species which differs materially from *Leptognathia*, *Strongylura* and allied genera.

75. **Strongylurella indivisa** n. sp.

(Pl. XII, figs. 2a—2e.)

Female (without marsupium). Body very slender (fig. 2a), about eight and a half times as long as broad, broadest behind the middle of the carapace and thence tapering slightly to the base of the abdomen. — Carapace large (fig. 2a), even a little longer than the two following segments combined, considerably longer than broad, at the front end scarcely half as broad as behind the middle and with the lateral margins evenly and moderately convex.

Antennulæ (fig. 2b) somewhat shorter than the carapace, shaped nearly as in *Strongylura cylindrata*. First joint a little shorter than the three other joints combined, two and a half times as long as deep, but only a little deeper before the base than at the distal end. Second joint considerably produced above, a little less than half as long as the first and distally thicker than at the base; third joint moderately large and distinctly longer than deep; fourth joint conspicuously longer than the third and shorter than the second. — Antennæ moderately short; fourth and fifth joints completely fused, about two and a half times longer than the sixth joint.

Chelipeds moderately robust (fig. 2b). The basal joint is somewhat shorter than the carpus,

its posterior protuberance somewhat long, longer than deep, with the rounded hind margin situated considerably before the front lower angle of second thoracic segment. Carpus a little more than half as long again as deep, with the upper margin very convex, the free part of the lower margin feebly convex. Chela considerably longer than the carpus, a little more than twice as long as broad, with two strong setæ on the posterior margin, which is distinctly convex between the distal of these setæ and the base; movable finger considerably shorter than the anterior margin of the hand, somewhat robust; when the fingers are adduced a triangular, oblong hole is seen between their proximal parts, while the subdistal part of the incisive margin of the fixed finger is rather convex.

Thoracic segments (fig. 2a) taper slightly in breadth from second to seventh segment; their lateral margins are feebly convex or nearly straight and a little curved at both ends. Second segment a little shorter than the third which is somewhat shorter than the fifth. — Thoracic legs somewhat short. The two anterior pairs (fig. 2b) are moderately strong, with sixth joint long, somewhat shorter than fourth and fifth joints combined and considerably longer than seventh with claw; most of their spines short. The three posterior pairs rather slender (fig. 2c); their sixth joint about as long as the fifth but much shorter than seventh joint with claw; seventh joint and claw subequal in length.

Abdomen as long as seventh, sixth, fifth and half of the fourth thoracic segment combined (fig. 2a). Five anterior segments with the ventral line straight (fig. 2d). Pleopods wanting. Sixth segment distinctly shorter than the three preceding segments combined (figs. 2d and 2e); its lateral margins somewhat long and straight, while each half of the posterior margin is considerably concave, as the median half of the segment is produced posteriorly into a triangle about twice as broad as long and with the end acute (fig. 2d). — Uropods as long as the straight lateral margin of the last abdominal segment, moderately strong; peduncle, seen from the side (fig. 2e), oblong rectangular; endopod twice as long as the peduncle, with its proximal joint slightly less than twice as long as the distal joint; exopod completely wanting.

Length of the single specimen 1.7^{mm}.

Remarks. *S. indivisa* is easily distinguished from all other species mentioned in this paper by having a well developed and two-jointed endopod but no exopod on the uropods; furthermore the shape of the last abdominal segment is very characteristic.

Occurrence. Taken by the "Ingolf" at the following station.

South-West of Iceland: St. 78: Lat. 60° 37' N., Long. 27° 52' W., 799 fm., temp. 4.5°; 1 spec.

Paranarthrura n. gen.

Description. As to general aspect somewhat similar to *Leptognathia*. The body tapers considerably from the posterior part of the carapace or the front part of second segment to the abdomen. — Antennulæ four-jointed and shaped as in *Leptognathia*. Antennæ with fourth and fifth joints completely fused. — Mouth-parts (examined only in *P. insignis*) somewhat aberrant; the labrum (Pl. XII, fig. 3c) is produced in a somewhat long, distally obtuse triangle; the mandibles (figs. 3c and 3d) are somewhat long, without molar process, curved inwards far beyond the middle, and the

incisive margin of the right mandible has few and obtuse teeth, while that of the left mandible is somewhat incised and the movable lobe moderately developed. The maxillulæ are very slender (fig. 3e); the maxillipeds (fig. 3f) have their proximal unpaired part long, the lobes are well separated to their base and each has two short setæ at the terminal margin.

The thoracic segments have the lateral margins conspicuously angular and the anterior segments as to length developed as in *Leptognathia*. The thoracic legs shaped as in the last-named genus.

Abdomen in the female very short (figs. 3a and 4a); its five anterior segments combined at most as long as seventh thoracic segment, considerably narrower than this segment and somewhat narrower than sixth abdominal segment, which is broader than long and posteriorly somewhat produced. Pleopods wanting. Uropods short, with the exopod either unjointed or not marked off, the endopod one-jointed or two-jointed. — In the subadult male the five anterior abdominal segments are somewhat longer than in the female and their pleopods are moderately long, but terminal setæ are either somewhat short (fig. 3m) or quite wanting (fig. 5c). — (Adult males unknown).

Remarks. This genus differs from all preceding genera with four-jointed antennulæ in having the five anterior abdominal segments much reduced both in length and breadth; in the female of the genus *Anarthrura* G. O. S. the abdomen is also much reduced in length, but all segments are fused so that not even a vestige of a division into segments is visible. Furthermore, in *Anarthrura* the coxal joint of the chelipeds is, according to Sars' figure, developed as a free, outstanding joint different from the structure found in any species of *Paranarthrura*. Finally, the abdomen in the subadult male of *Anarthrura* is according to Sars much more developed than in *Paranarthrura* (I consider the male of *Anarthrura* figured by Sars to be not adult but in all probability only subadult, because its antennulæ contain only five joints as in subadult males of several species of *Leptognathia*, and because the thoracic segments and their legs do not differ materially from those in the female.)

Three new species secured by the "Ingolf" in the warm area are referred to this new genus. These species differ materially from each other in several particulars.

76. *Paranarthrura insignis* n. sp.

(Pl. XII, figs. 3a–3m.)

Female. Moderately slender (fig. 3a), almost seven times as long as the breadth of the carapace somewhat before its hind margin and tapering considerably backwards. — Carapace large, as long as the two following segments combined (fig. 3a), somewhat longer than broad, somewhat behind the middle more than two and a half times as broad as at the insertion of the antennulæ and thus nearly pear-shaped.

Antennulæ a little or somewhat shorter than the carapace, rather slender (fig. 3b). First joint uncommonly long, somewhat longer than the three other joints combined, nearly three and a half times as long as deep, but considerably deeper somewhat from the base than somewhat beyond the middle. Second joint distinctly produced above, as deep as the distal part of the first joint but slightly more than one-third as long as that joint; third joint distinctly longer than deep; fourth joint somewhat shorter than the second. — Antennæ slender and moderately short.

Chelipeds moderately strong (fig. 3 b). Basal joint short, somewhat deeper than long, without any posterior protuberance, as its whole posterior margin is oblique and inserted on a very large, well defined coxal area; the hind margin of the joint is very remote from the front lower end of second thoracic segment. Carpus twice or more than twice as long as deep, peculiarly shaped; the lower margin has a very low protuberance with two small setæ at the middle and behind and beyond this protuberance the margin is feebly concave; the upper proximal part of the joint is somewhat produced backwards. Chela somewhat longer than the carpus and a little more than twice as long as broad; the movable finger somewhat robust, as long as or slightly longer than the anterior margin of the hand, which is conspicuously but more or less irregularly arcuate; the posterior margin of the chela is sinuate, showing three concave or flatly incised places (figs. 3 b and 3 l — the last figure drawn from a subadult male); the incisive margin of the fixed finger has a sharp tooth somewhat from the end.

Thoracic segments, seen from above (fig. 3 a), peculiarly shaped and increasing somewhat in length from the second to the sixth. Second segment, which is slightly narrower than the carapace, is considerably broader anteriorly than behind, with the lateral margins converging considerably backwards. Third to seventh segment on each lateral margin with a rounded protuberance, which on the third segment is situated somewhat before the middle, on the following segments gradually more backwards; the front half of each lateral margin of the three posterior segments is conspicuously convex. In specimens without marsupium (fig. 3 b) each segment has on the ventral side a moderately long, slender, acute process; on second segment this process is situated near the front end, on the following segments gradually more backwards, on seventh segment (fig. 3 h) somewhat or a little before the middle; the anterior processes (fig. 3 b) are curved much forwards, while on the posterior segments they are directed more downwards (fig. 3 h); in females with marsupium the processes of second to sixth segments are lost, but the process on seventh segment is preserved. — Thoracic legs (figs. 3 b and 3 g) rather slender, decreasing in length from second pair, which are somewhat long, to seventh pair, which are somewhat short; most of the spines on the legs are somewhat long. Second pair with fourth and fifth joints rather long, sixth joint somewhat longer than the fifth and about as long as seventh joint with claw; the spine on the anterior angle of fifth joint long. Seventh pair (fig. 3 g) with sixth joint a little or slightly shorter than fifth joint and somewhat shorter than seventh joint together with the fine, curved claw.

Abdomen very short. Five anterior segments, when straightened (fig. 3 i), together a little or somewhat shorter and much narrower than seventh thoracic segment. Sixth segment, seen from above (fig. 3 i), a little longer than the three preceding segments combined, much broader than long and somewhat broader than the fifth segment, posteriorly at the middle distinctly triangularly produced; the lateral margins very convex. — Uropods about as long as, or a little longer than, sixth segment, robust; exopod not marked off and directed essentially downwards (fig. 3 h), being an oblong, triangular protuberance from the distal angle of the peduncle and longer than the peduncle itself, which is at least as long as deep; endopod two-jointed, with the first joint distinctly shorter than the second.

Length of a large female without marsupium 2.9^{mm}, of females with marsupium 2.6—2.8^{mm}.

Subadult Male. It differs from full-grown females without marsupium in three features

The antennulæ (fig. 3k) are considerably thicker; the first joint somewhat or rather considerably shorter than the three other joints combined and only a little more than two and a half times as long as deep; second joint considerably produced above; fourth joint nearly as long as the second and thickened, especially at the base. The five anterior abdominal segments (fig. 3m) are much longer than in the female, together about twice as long as seventh thoracic segment. The pleopods are somewhat large, with the rami much longer than the peduncle, but the terminal setæ are slightly more than half as long as the rami and somewhat thick.

Smaller than the females, measuring only 2.2—2.3^{mm}.

Remarks. *P. insignis* is a fine form which is abundantly distinguished from the two following species by possessing ventral thoracic processes, by the shape of the thoracic segments, the chelipeds and above all by the uropods.

Occurrence. It has been taken by the "Ingolf" at three stations.

Davis Strait: St. 32: Lat. 66° 35' N., Long. 56° 38' W., 318 fm., temp. 3.9°; 1 spec.

— — St. 25: Lat. 63° 30' N., Long. 54° 25' W., 582 fm., temp. 3.3°; more than a hundred specimens.

— — St. 24: Lat. 63° 06' N., Long. 56° 00' W., 1199 fm., temp. 2.4°; 6 spec.

77. *Paranarthrura subtilis* n. sp.

(Pl. XII, figs. 4a—4d.)

Female (without marsupium). Rather slender (fig. 4a), about seven and a half times as long as broad a little behind the front end of second thoracic segment and tapering considerably backwards. — Carapace as long as the second and half of the third segment combined — these segments are long —, somewhat longer than broad, not fully twice as broad at the middle as at the front end and with the lateral margins moderately convex.

Antennulæ much shorter than the carapace (fig. 4b), somewhat thick. First joint subcylindrical and somewhat more than twice as long as deep; second joint scarcely produced above and half as long as the first; third joint a little longer than deep; fourth joint scarcely as long as the second. — Antennæ short, a little more than half as long as the antennulæ.

Chelipeds (fig. 4b) somewhat slender. Basal joint short, about as long as deep, without posterior protuberance, but attached by the whole oblique hind margin, which is situated a little behind the middle of the cephalothorax. Carpus two and a half times as long as deep, with the upper proximal part produced backwards, the major part of the upper margin nearly straight and the lower margin a little sinuate. Chela scarcely as long as the carpus, somewhat slender, being two and a half times as long as broad; the movable finger as long as the front margin of the hand, moderately robust; the posterior margin is a little concave at the middle, where a single seta is inserted; the end of both fingers very acute.

Thoracic segments (fig. 4a) with the lateral margins very conspicuously angular; the angles, which on second segment are near the front end, are on the following segments placed gradually more backwards, on seventh segment somewhat from the posterior end; the margins between the acute

or somewhat rounded angles and both ends of each segment are straight. Third, fourth, fifth and sixth segments subequal in length, while second and seventh segments are somewhat shorter. No ventral processes are found. — Thoracic legs (figs. 4 b and 4 c) moderately short, and all subequal in length and moderately slender; the relative length of the joint almost as in *P. insignis*, but the spines on the anterior pairs are much shorter than in that species.

Abdomen very short (fig. 4 a). Five anterior segments combined scarcely as long as and considerably narrower than seventh thoracic segment (fig. 4 d). Sixth segment about as long as the four preceding segments combined and somewhat broader than the fifth segment; each half of its posterior margin is considerably concave, as the median third of the segment is produced backwards in a triangle with the end nearly acute. — Uropods robust and somewhat shorter than the sixth segment; the peduncle longer than deep (fig. 4 c), with the outer distal angle a little produced as a small rudiment of an exopod not marked off; the endopod unjointed, slightly longer than the peduncle.

Length of the largest specimen 1.9^{mm}.

Remarks. *P. subtilis* is easily distinguished from all other Tanaidæ with four-jointed antennulæ described in this paper by its uropods. The antennulæ are unusually thick and shaped as in subadult males of allied forms, but as no pleopods are found the specimens must be females.

Occurrence. Taken by the "Ingolf" at a single station.

Davis Strait: St. 32: Lat. 66° 35' N., Long. 56° 38' W., 318 fm., temp. 3.9°; 7 spec.

78. *Paranarthrura clavipes* n. sp.

(Pl. XII, figs. 5 a—5 c.)

Immature Male and juvenile Specimen. Body, seen from above (fig. 5 a), moderately slender, broadest across the carapace and tapering much backwards to the abdomen. — Carapace large (fig. 5 a), somewhat shorter than the two following segments combined — which are uncommonly long —, somewhat longer than broad and broadest a little before the middle, which is nearly more than twice as broad as the front end, and consequently the lateral margins are very convex.

Antennulæ (fig. 5 b) much shorter than the carapace. First joint a little longer than the three other joints combined and in the immature male two and a half times as long as deep; second joint somewhat produced above and not half as long as the first joint; third joint quite short; fourth joint considerably shorter than the second. — Antennæ of moderate length; the joint composed by the fusion of fourth and fifth joints is very long, while the penultimate joint is unusually short.

Chelipeds (fig. 5 b) moderately strong. The basal joint is considerably longer than deep, posteriorly produced in a protuberance which is narrowly rounded behind, and the distance between its end and the front lower angle of second thoracic segment is a little more than half as long as the joint itself. Carpus slightly more than half as long again as the basal joint, somewhat more than twice as long as deep, with the upper basal part somewhat produced backwards; most of the upper margin and nearly the whole free lower margin are straight and slightly converging. Chela slightly longer than the carpus, almost two and a half times as long as broad, regularly shaped with the fingers acute; the posterior margin almost straight with a single seta; the movable finger slightly shorter than the anterior margin of the hand.

Thoracic segments, seen from above (fig. 5a), in the main as in *P. subtilis*, but more tapering than in this species; the lateral margins are sharply angular; second segment is unusually long, only a little shorter than the third, which is as long as the fourth or the fifth. — Second and third pairs of thoracic legs (fig. 5b) somewhat long and slender, with the spines thin and moderately or very short; fifth joint conspicuously longer than the fourth; sixth joint only a little shorter than fourth and fifth joints combined and considerably longer than the seventh joint with claw. Three posterior pairs (fig. 5c) only a little shorter than second pair; second joint is clavate, being very thin towards the base while the distal part is thick; sixth joint is somewhat longer and considerably thinner than the robust fifth joint and somewhat longer than the seventh joint with claw.

Abdomen in general shape somewhat similar to that of *P. subtilis*. As the seventh thoracic segment is only half developed — having no legs — in the juvenile specimen shown in fig. 5a, the length of the abdomen must in this figure be compared not with seventh but with sixth thoracic segment. In the immature male (fig. 5c) the five anterior segments combined are nearly half as long again as seventh thoracic segment; the pleopods are of moderate size, with the exopod longer than the peduncle, but both rami completely without setæ. In the immature male the sixth abdominal segment is not quite as long as the three preceding segments combined; in the juvenile specimen it is even longer than the four preceding segments combined; it is a little less broad in proportion to length than in *P. subtilis*, and the produced part between the uropods is not triangular but rounded. — Uropods considerably shorter than the sixth segment; the peduncle is much shorter than deep (fig. 5c); the endopod two-jointed, with the second joint much longer than the first; the exopod is well marked off, one-jointed, a little more than half as long as, and much thinner than, the endopod.

Length of the immature male 2.15 mm, of the juvenile specimen 1.7 mm.

Remarks. In the structure of the uropods and the posterior protuberance on the basal joint of the chelipeds *P. clavipes* is sharply distinguished from the two preceding species. The clavate shape of the second joint of the three posterior pairs of thoracic legs is also very characteristic.

Occurrence. Taken by the "Ingolf" at the deepest of its stations.

South of the Davis Strait: St. 38: Lat. 59° 12' N., Long. 51° 05' W., 1870 fm., temp. 1.3°; 2 spec.
(1 immature male and 1 juvenile specimen).

EXPLANATION OF THE PLATES.

Plate I.

Fig. 1. *Apseudes vicinus* n. sp.

- Fig. 1a. Body of the single specimen, an immature female, from above; \times 21.
— 1b. Left cheliped, from the outer side; \times 32.
— 1c. Left second thoracic leg, from the outer side; \times 32.

Fig. 2. *Apseudes tenuis* n. sp.

- Fig. 2a. Cephalothorax and four thoracic segments of a subadult female from the "Ingolf" Stat. 24, from above; \times 13.
— 2b. Seventh thoracic segment and abdomen of the same specimen, from above; \times 13.
— 2c. Left cheliped of a subadult female, from the outer side; \times 24.
— 2d. Left second thoracic leg of the same specimen, from the outer side; \times 24.
— 2e. Left seventh thoracic leg of the same specimen, from the outer side; \times 24.

Fig. 3. *Apseudes gracilis* Norm. & Stebb.

- Fig. 3a. Cephalothorax and three thoracic segments of a subadult female, from above; \times 10.
— 3b. Left cheliped of the same specimen, from the outer side; \times 22.
— 3c. Distal half of the fixed finger of the chela of the cheliped shown in fig. 3b, from the outer side; \times 90.
— 3d. Left second thoracic leg of the same specimen, from the outer side; \times 22.

Fig. 4. *Apseudes gracillimus* n. sp.

- Fig. 4a. Cephalothorax and the major part of the thorax of a subadult female, from above; \times 10.
— 4b. Seventh thoracic segment and abdomen of the same specimen, from above; \times 10.
— 4c. Left cheliped of a subadult female, from the outer side; \times 23.
— 4d. Left second thoracic leg of the same specimen, from the outer side; \times 23.
— 4e. Left seventh thoracic leg of the same specimen, from the outer side; \times 23.

Fig. 5. *Heterotanais groenlandicus* n. sp.

- Fig. 5a. Female with marsupium, from above; \times 16.
— 5b. Carapace with antennulæ of the same specimen, from above; \times 35.
— 5c. Carapace and second thoracic segment with appendages of a female with marsupium, from the left side; \times 47.
— 5d. The fixed finger of the left chela of the same female, from the outer side; \times 94.
— 5e. Left third thoracic leg of the last-named female, from the outer side; \times 47.
— 5f. Left seventh thoracic leg of the last-named female, from the outer side; \times 47.
— 5g. End of abdomen with the left uropod of the same female, from the left side; \times 47.

Fig. 6. *Neotanaïs serratispinosus* Norm. & Stebb.

- Fig. 6a. Left cheliped of an adult female, from the outer side; $\times 23$.
 — 6b. Fingers of the cheliped shown in fig. 6a, from the outer side; $\times 67$.

Plate II.

Fig. 1. *Neotanaïs serratispinosus* Norm. & Stebb. (Continued).

- Fig. 1a. Terminal part of left third thoracic leg of an adult female, from the posterior side; $\times 74$.
 — 1b. Terminal part of left sixth thoracic leg of the same female, from the posterior side; $\times 74$.
 — 1c. Terminal part of left seventh thoracic leg of the same female, from above; $\times 74$.

Fig. 2. *Neotanaïs giganteus* n. sp.

- Fig. 2a. Adult male, from above; $\times 3$.
 — 2b. Anterior part of the carapace with the right antennula of the male, from above; $\times 8$.
 — 2c. Front end of the carapace with the ocular plate, the left antenna and the basal part of the left antennula, of the male, from the left side; $\times 8$.
 — 2d. Left cheliped of the male, from the outer side; $\times 8$.
 — 2e. Right second thoracic leg, from the posterior side; $\times 33/4$.
 — 2f. Terminal part of the leg shown in fig. 2e, from behind; $\times 24$.
 — 2g. Terminal part of right seventh leg, obliquely from above and in front; $\times 24$.
 — 2h. Last abdominal segment with the left uropod and the proximal part of the right uropod of the male, from above; scarcely $\times 7$.

Fig. 3. *Pseudotanaïs forcipatus* Lilljeborg.

- Fig. 3a. Body of an adult male, from above; $\times 36$.
 — 3b. Cephalothorax and the two anterior free thoracic segments with appendages of the adult male, from the left side; $\times 81$.
 — 3c. Front end of the carapace with the antennulæ of the adult male, from above; $\times 81$.
 — 3d. Left seventh thoracic leg of the adult male, from the outer side; $\times 81$.
 — 3e. Three posterior abdominal segments with the uropods of an adult male, from above; $\times 81$.

4. *Pseudotanaïs abyssis* n. sp.

- Fig. 4a. Female with the marsupium not half developed, from the left side; $\times 49$.
 — 4b. Body of a female with the marsupium fully developed, from above; $\times 36$.
 — 4c. Front end of the carapace with left antennula and antenna of the adult female, from the left side; $\times 98$.
 — 4d. Left cheliped of an immature female, from the outer side; $\times 98$.
 — 4e. Right second thoracic leg of an adult female, from the outer side; $\times 91$. The articulation between fourth and fifth joint erroneously omitted.
 — 4f. Left third thoracic leg of an immature female, from the outer side; $\times 98$.
 — 4g. Right fifth thoracic leg of an immature female, from the outer side; $\times 98$.

- Fig. 4h. Left first pleopod of an adult female, from behind; $\times 94$.
 — 4i. Right uropod of an adult female, from above; $\times 145$.

Fig. 5. *Pseudotanaïs Liljeborgii* G. O. Sars.

- Fig. 5a. Carapace with right antennula and half of left antennula of an ovigerous female, from above; $\times 45$.
 — 5b. Carapace with left antennula and half of the right antennula of an adult male, from above; $\times 45$.
 — 5c. Cephalothorax and the two anterior free thoracic segments with appendages of the adult male, from the left side; $\times 61$.
 — 5d. Four posterior abdominal segments and uropods of the adult male, from above; $\times 57$.
 — 5e. Left seventh thoracic leg of the adult male, from the outer side; $\times 61$.
 — 5f. Distal part of the leg shown in fig. 5e, from the outer side, $\times 146$.
 — 5g. Distal part of seventh thoracic leg of a subadult male, from the outer side; $\times 146$.

Fig. 6. *Pseudotanaïs oculatus* n. sp.

- Fig. 6a. Distal part of left cheliped of a not fully adult female, from the outer side; $\times 78$.
 — 6b. Left second and third thoracic legs of a not fully adult female, from the outer side; $\times 78$.
 — 6c. Left fourth thoracic leg of the same female, from the outer side; $\times 78$.
 — 6d. Left seventh thoracic leg of the same female, from the outer side; $\times 78$.

Plate III.

Fig. 1. *Pseudotanaïs oculatus* n. sp. (Continued).

- Fig. 1a. Body of a female with the marsupial lamella small, from above; $\times 24$.
 — 1b. Female with the marsupial lamella small, from the left; $\times 25$.
 — 1c. Front end of carapace with ocelli and left antennula and antenna of the female shown in fig. 1b, from the left side; $\times 78$.
 — 1d. Right uropod of the female shown in fig. 1a, from above; $\times 85$.

Fig. 2. *Pseudotanaïs affinis* H. J. Hansen.

- Fig. 2a. Carapace with left antennula of a female with marsupium from the Kara Sea, from above; $\times 33$.
 — 2b. Left antennula of the adult female from the Kara Sea, from the outer side; $\times 70$.
 — 2c. Right uropod of the adult female from the Kara Sea, from above; $\times 83$.
 — 2d. Left antennula and antenna of a female without marsupium from the "Ingolf" Stat. 103; from the outer side; $\times 56$.
 — 2e. Left chela of the same female from the "Ingolf" Stat. 103, from the outer side; $\times 56$.
 — 2f. Left second thoracic leg of the same female from the "Ingolf" St. 103, from the outer side; $\times 56$.
 — 2g. Left third thoracic leg of the same "Ingolf" specimen, from the outer side; $\times 56$.
 — 2h. Left seventh thoracic leg of the same "Ingolf" specimen, from the outer side; $\times 56$.

- Fig. 2i. Distal part of left third leg shown in fig. 2g, from the outer side; $\times 130$.
- 2k. Left antennula and antenna of a female without marsupium belonging to the variety from the "Ingolf" Stat. 25, from the outer side; $\times 82$.
- 2l. Left antennula and antenna of a subadult male from the "Ingolf" Stat. 119, from the outer side; $\times 52$.
- 2m. Left chela of an immature male from the "Ingolf" Stat. 119, from the outer side; $\times 52$.
- 2n. Left antennula and antenna of a subadult male of the variety from the "Ingolf" Stat. 25, from the outer side; $\times 82$.
- 2o. Left sixth thoracic leg of a subadult male from the "Ingolf" Stat. 119, from the inner side; $\times 52$.

Fig. 3. ?*Pseudotanaïs affinis* H. J. H.; adult Male.

- Fig. 3a. Cephalothorax and second thoracic segment with appendages of the male from the "Ingolf" Stat. 124, from the left side; $\times 80$.
- 3b. Four posterior abdominal segments and uropods of the same male, from above; $\times 80$.

Fig. 4. *Pseudotanaïs longipes* n. sp.

- Fig. 4a. Female with the marsupial lamellæ quite small, from the left; $\times 35$.
- 4b. Anterior part of the body of the not quite full-grown female, from above; $\times 35$.
- 4c. Left antennula and antenna of the female shown in fig. 4a, from the outer side; $\times 55$.
- 4d. Left chela of the same immature female, from the outer side; $\times 63$.
- 4e. Left second thoracic leg of the same immature female, from the outer side; $\times 63$.
- 4f. Left third thoracic leg of the same immature female, from the outer side; $\times 63$.
- 4g. Distal part of the left fourth thoracic leg of the same female, from the outer side; $\times 100$.
- 4h. Left seventh thoracic leg of the same immature female, from the outer side; $\times 61$.
- 4i. Right uropod of an immature female, from above; $\times 84$.

Fig. 5. *Typhlotanaïs irregularis* n. sp.

- Fig. 5a. Female, from above; $\times 31$.
- 5b. Cephalothorax and the two anterior free thoracic segments of a female without marsupium from the "Ingolf" Stat. 117, from the left side; $\times 73$.
- 5c. Left chela of the specimen shown in fig. 5b, from the outer side; $\times 128$.
- 5d. Left seventh thoracic leg of the same female, from the inner side; $\times 73$.
- 5e. Last abdominal segment with left uropod of the same female, from the left; $\times 73$.

Fig. 6. *Typhlotanaïs macrocephala* n. sp.

- Fig. 6a. The type-specimen, from above; $\times 43$.
- 6b. Cephalothorax and the two anterior free thoracic segments of the single specimen, from the left; $\times 85$.
- 6c. Second and third thoracic segments, from above; $\times 84$.
- 6d. Left seventh thoracic leg, from the outer side; $\times 85$.
- 6e. Last abdominal segment with left uropod, from the left; $\times 110$.

Plate IV.

Fig. 1. *Typhlotanais pulcher* n. sp.

- Fig. 1 a. The single specimen (without marsupium), from above; $\times 21$.
 — 1 b. Cephalothorax with antennulæ, from above; $\times 45$.
 — 1 c. Cephalothorax and second thoracic segment with appendages, from the left side; $\times 60$.
 — 1 d. Left third thoracic leg, from the outer side; $\times 60$.
 — 1 e. Left fifth thoracic leg, from the outer side; $\times 60$.
 — 1 f. Left seventh thoracic leg, from the outer side; $\times 60$.
 — 1 g. Left uropod, from above; $\times 88$.

Fig. 2. *Typhlotanais gracilipes* n. sp.

- Fig. 2 a. Anterior part of the body with antennulæ of the female without marsupium; $\times 44$.
 — 2 b. Carapace and anterior thoracic segments with appendages, from the left side; $\times 63$.
 — 2 c. Left fourth thoracic leg, from the outer side; $\times 63$.
 — 2 d. Right sixth thoracic leg, from the inner side; $\times 122$.
 — 2 e. End of abdomen with the mutilated left uropod — the endopod wanting — from above;
 $\times 132$.

Fig. 3. *Typhlotanais mucronatus* n. sp.

- Fig. 3 a. Body of a female without marsupium (from the "Ingolf" Stat. 120), from above; $\times 20$.
 — 3 b. Carapace with antennulæ of the specimen shown in fig. 3 a, from above; $\times 37$.
 — 3 c. Cephalothorax and two anterior free thoracic segments with appendages of a female without
 marsupium from the "Ingolf" Stat. 119, from the left side; $\times 48$.
 — 3 d. Left chela of the female shown in fig. 3 c, from the outer side; $\times 96$.
 — 3 e. Left sixth thoracic leg of the last-named female, from the outer side; $\times 48$.
 — 3 f. Distal half of the leg shown in fig. 3 e, from the outer side; $\times 90$.
 — 3 g. Last abdominal segment with left uropod of the last-named female, from the left side; $\times 57$.
 — 3 h. Left antennula and antenna of a subadult male from the "Ingolf" Stat. 120, from the left
 side; $\times 48$.

Fig. 4. *Typhlotanais eximius* n. sp.

- Fig. 4 a. Immature, somewhat contracted female, from above; $\times 35$.
 — 4 b. Cephalothorax and the two anterior free segments with appendages of the largest female
 without marsupium, from the left side; $\times 80$.
 — 4 c. Seventh right thoracic leg of the last-named female, from the outer side; $\times 80$.
 — 4 d. Right uropod of the specimen shown in fig. 4 a, from above; $\times 88$.
 — 4 e. Cephalothorax and two anterior free segments with appendages of the immature male, from
 the left side; $\times 77$.
 — 4 f. Left sixth thoracic leg of the immature male, from the outer side; $\times 77$.
 — 4 g. Last abdominal segment with left uropod of the immature male; $\times 77$.

Fig. 5. *Typhlotanais penicillatus* G. O. Sars.

- Fig. 5a. Cephalothorax and anterior free segments with appendages of a female without marsupium, from the left side; $\times 80$.
 — 5b. Left sixth thoracic leg of the same female, from the outer side; $\times 80$.
 — 5c. Last abdominal segment with left uropod of the same female, from the left side; $\times 80$.
 — 5d. Left antennula of an immature male, from the outer side; $\times 80$.

Fig. 6. *Typhlotanais inermis* n. sp.

- Fig. 6a. Body of a female without marsupium, from above; $\times 22$.
 — 6b. Carapace with antennulæ of the same female, from above; $\times 42$.
 — 6c. Cephalothorax and anterior thoracic segments with appendages of a female without marsupium from the "Ingolf" Stat. 139, from the left side; $\times 55$.
 — 6d. Left chela of the specimen shown in fig. 6c, from the outer side; $\times 100$.
 — 6e. Left sixth thoracic leg of the female shown in fig. 6c, from the outer side; $\times 55$.
 — 6f. Distal half of the leg shown in fig. 6e, from the outer side; $\times 138$.
 — 6g. Right uropod of the specimen shown in fig. 6a, from above; $\times 76$.

Fig. 7. *Typhlotanais variabilis* n. sp.

- Fig. 7a. Female without marsupium from the "Ingolf" Stat. 102, from above; $\times 22$. The legs omitted.
 — 7b. Left sixth thoracic leg of the adult female shown in fig. 2a on the next plate, from the outer side; $\times 50$.
 — 7c. Major distal part of left seventh leg of the last-named female, from the outer side; $\times 110$.
 — 7d. Left uropod of the last-named adult female, from the outer side; $\times 50$.

Plate V.

Fig. 1. *Typhlotanais mucronatus* n. sp.

- Fig. 1a. Left antennula and antenna of a subadult male, from the outer side; $\times 48$. (This figure, which is found as fig. 3h on Pl. IV, has by an error in the arrangement been reproduced here again.)

Fig. 2. *Typhlotanais variabilis* n. sp. (Continued.)

- 2a. Cephalothorax and anterior thoracic segments of an adult female from the "Ingolf" Stat. 102, from the left side; $\times 50$. *p.* parasitic Copepod, measuring 0.1 mm in length.
 — 2b. Left antennula and antenna of a female without marsupium from the "Ingolf" Stat. 105, from the outer side; $\times 50$.
 — 2c. Cephalothorax and anterior thoracic segments with appendages of a subadult male from the "Ingolf" Stat. 105, from the left side; $\times 55$.

Fig. 3. *Typhlotanais tenuicornis* G. O. Sars.

- Fig. 3a. Left antenna, setæ omitted, of a female from Norway (a co-type of G. O. Sars), from the outer side; $\times 140$.
 — 3b. Major distal part of left second thoracic leg of a female from Norway, from the outer side; $\times 140$.
 — 3c. Left third leg of the last-named female, from the outer side; $\times 140$.

Fig. 4. *Typhlotanais trispinosus* n. sp.

- Fig. 4a. Female without marsupium, from above; $\times 21$. The legs omitted.
 — 4b. Cephalothorax and anterior thoracic segments with appendages of a female without marsupium, from the left side; $\times 82$.
 — 4c. Left antenna of the last-named female, from the outer side; $\times 140$. The setæ omitted.
 — 4d. Major distal part of left second thoracic leg of the specimen shown in fig. 4b, from the outer side; $\times 140$.
 — 4e. Right seventh thoracic leg of a female without marsupium, from the outer side; $\times 205$.
 — 4f. Left uropod of the female shown in fig. 4b, from the outer side; $\times 82$.

Fig. 5. *Typhlotanais profundus* n. sp.

- Fig. 5a. Female without marsupium, from above; $\times 21$. The legs omitted.
 — 5b. Left antennula of the same specimen, from above; $\times 75$.
 — 5c. Left antennula and antenna of a female without marsupium, from the outer side; $\times 78$.
 — 5d. Left uropod of a female without marsupium, from the outer side; $\times 80$.
 — 5e. Cephalothorax and anterior thoracic segments with appendages of a subadult male, from the outer side; $\times 78$.

Fig. 6. *Typhlotanais spinicauda* n. sp.

- Fig. 6a. Cephalothorax and three anterior thoracic segments of the single specimen, a female without marsupium, from above; $\times 30$.
 — 6b. Cephalothorax and anterior thoracic segments with appendages of the female without marsupium, from the left side; $\times 45$.
 — 6c. Left antennula and antenna, from the outer side; $\times 83$.
 — 6d. Distal half of left cheliped, from the outer side; $\times 83$.
 — 6e. Left second thoracic leg, from the outer side; $\times 83$.
 — 6f. Left third thoracic leg, from the outer side; $\times 83$.
 — 6g. Right sixth thoracic leg, from the outer side; $\times 83$.
 — 6h. Last abdominal segment with the uropods, from above; $\times 60$.

Fig. 7. *Typhlotanais grandis* n. sp.

- Fig. 7a. Body of the single specimen, probably an immature male, from above; $\times 13$.
 — 7b. Cephalothorax and anterior thoracic segments with appendages of the specimen mentioned, from the side and somewhat obliquely from above; $\times 38$.
 — 7c. Left seventh thoracic leg, from the outer side; $\times 38$.
 — 7d. Major distal part of the leg shown in fig. 7c, from the outer side; $\times 135$.
 — 7e. Last abdominal segment with left uropod, from the outer side; $\times 54$.

Fig. 8. *Typhlotanais plebejus* n. sp.

- Fig. 8a. Body of a female without marsupium, from above; $\times 16$.
 — 8b. Left antennula and antenna of a female without marsupium, from the outer side; $\times 58$.
 — 8c. Left cheliped of a female without marsupium, from the outer side; $\times 58$.

- Fig. 8d. Left second thoracic leg of a female without marsupium, from the outer side; \times 58.
 — 8e. Left fourth thoracic leg of the same female, from the outer side; \times 58.
 — 8f. Left fifth thoracic leg of the same female, from the outer side; \times 58.
 — 8g. Last abdominal segment with left uropod of a female without marsupium, from the left side; \times 58.

Fig. 9. *Typhlotanais inaequipes* n. sp.

- Fig. 9a. Right seventh thoracic leg of a female without marsupium, from the outer side; \times 80.
 — 9b. Left uropod of a female without marsupium, from the outer side; \times 80.

Plate VI.

Fig. 1. *Typhlotanais inaequipes* (Continued.)

- Fig. 1a. Body of a female without marsupium, from above; \times 25.
 — 1b. Right antennula of the same female, from above; \times 80.
 — 1c. Cephalothorax and anterior thoracic segments with appendages of a female without marsupium, from the left side; \times 80.

Fig. 2. *Typhlotanais fnmarchicus* G. O. Sars.

- Fig. 2a. Left antennula and antenna of a female without marsupium from the Sabine Island, from the left side; \times 84.
 — 2b. Left uropod of the same female, from the outer side; \times 84.

Fig. 3. *Typhlotanais mixtus* n. sp.

- Fig. 3a. Body of a female without marsupium from the "Ingolf" Stat. 117, from above; \times 27.
 — 3b. Cephalothorax and anterior thoracic segments of a female with marsupium (the marsupium itself omitted) from the "Ingolf" Stat. 117, from the left side; \times 82.
 — 3c. Left antennula of a subadult male from the "Ingolf" Stat. 117, from the left side; \times 82.
 — 3d. Second thoracic segment (left leg omitted) of a female without marsupium from the same station, from the left side; \times 82.
 — 3e. Left sixth thoracic leg of the female shown in fig. 3b, from the outer side; \times 82.

Fig. 4. *Typhlotanais solidus* n. sp.

- Fig. 4a. The single specimen, a female without marsupium, from above; \times 21. Most of the appendages omitted.
 — 4b. Carapace with antennulae, from above; \times 32.
 — 4c. Cephalothorax with appendages, from the left side; \times 52.
 — 4d. Left second and third thoracic legs, from the outer side; \times 52.
 — 4e. Right seventh thoracic legs, from the outer side; \times 52.
 — 4f. Last abdominal segment with right uropod, from above; \times 52.

Fig. 5. *Agathotanaïs Ingolfi* n. gen., n. sp.

- Fig. 5a. Largest female without marsupium, from above; $\times 15$.
 — 5b. Largest female without marsupium, from the left side; $\times 16$.
 — 5c. Front end of the cephalothorax with left antennula and antenna of the last-named female, from the left side; $\times 53$.
 — 5d. Both mandibles of a female without marsupium, from below; $\times 93$. *l.* left mandible.
 — 5e. Paragnatha of the last-named female, from below; $\times 93$.
 — 5f. Left maxillula of the last-named female, from below; $\times 93$.
 — 5g. Maxillipeds, with the epipods omitted, of the last-named female, from below; $\times 93$.
 — 5h. Left chela of the female shown in fig. 5b, from the outer side; $\times 53$.
 — 5i. Left third thoracic leg of the female shown fig. 5b, from the outer side; $\times 53$.
 — 5k. Left seventh thoracic leg of the last-named female, from the outer side; $\times 53$.
 — 5l. Two posterior abdominal segments with left uropod of the last-named female, from the left side; $\times 68$.
 — 5m. Two posterior abdominal segments with uropods of another female without marsupium, from below; $\times 66$.
 — 5n. Front end of the head with left antennula and antenna of a subadult male, from the left side; $\times 61$.
 — 5o. Posterior part of the thorax, seventh left thoracic leg and abdomen with pleopods and left uropod of a subadult male, from the left side; $\times 36$.

Fig. 6. *Leptognathia multiserrata* n. sp.

- Fig. 6a. Right antennula and antenna of a female without marsupium, from the outer side; $\times 85$.
 — 6b. Carpus and chela of right cheliped of the same female, from the outer side; $\times 85$.
 — 6c. Second right thoracic leg of the same female, from the outer side; $\times 85$.
 — 6d. Sixth right thoracic leg of the same female, from the outer side; $\times 85$.
 — 6e. Five posterior abdominal segments with the right uropod and the pleopod of fifth segment of the same female, from the outer side; $\times 46$. Pleopods of second, third and fourth segments omitted.

Fig. 7. *Leptognathia Sarsii* H. J. Hansen.

- Fig. 7a. Anterior part of the cephalothorax of a female from Klaksvig (Færoe Islands), from the outer side; $\times 65$.
 — 7b. Left chela of an other female from the same locality, from the outer side; $\times 85$.
 — 7c. Left second thoracic leg of a third female from the same locality, from the outer side; $\times 58$.
 — 7d. Left seventh thoracic leg of the last-named female, from the outer side; $\times 58$.
 — 7e. Abdomen with left uropod and the pleopod of second segment of a female from the same locality, from the left side; $\times 39$. Four pleopods omitted in order to show the ventral protuberances.
 — 7f. End of abdomen with left uropod — setæ omitted — of another female from the same locality, from the left side; $\times 55$.

Plate VII.

Fig. 7. *Leptognathia gracilis* Kröyer.

- Fig. 1 a. Anterior part of the cephalothorax with appendages of a female, from the left side; $\times 65$.
 — 1 b. Left chela of a subadult male, from the outer side; $\times 84$.
 — 1 c. Distal part of left second thoracic leg of a female, from the outer side; $\times 80$.
 — 1 d. Left uropod of a female, from the outer side; $\times 80$.

Fig. 2. *Leptognathia Hanseni* Vanhöffen.

- Fig. 2 a. Anterior part of the cephalothorax with appendages of a female from the mouth of the Ameralik Fjord, from the left side; $\times 63$.
 — 2 b. Left second thoracic leg of the same female, from the outer side; $\times 76$.
 — 2 c. Left sixth thoracic leg of the same female, from the outer side; $\times 76$.
 — 2 d. Five posterior abdominal segments with left fourth pleopod and left uropod of a female from the same locality, from the left side; $\times 41$.
 — 2 e. Left cheliped of a subadult male from the same locality, from the outer side; $\times 76$.
 — 2 f. Anterior part of the cephalothorax with appendages of an adult male from the mouth of the Ameralik Fjord, from the left side; $\times 90$.
 — 2 g. Major part of the left chela of the same male, from the outer side; $\times 180$.
 — 2 h. Distal part of the hand with the base of the fingers of the same chela, from the inner side; $\times 170$.
 — 2 i. Left second thoracic leg of the same male, from the outer side; $\times 90$.
 — 2 k. Major distal part of left seventh thoracic leg of the same male, from the outer side; $\times 90$.
 — 2 l. Posterior end of abdomen with left uropod of the same female, from the outer side; $\times 90$.

Fig. 3. *Leptognathia longiremis* Lilljeborg.

- Fig. 3 a. Anterior part of the cephalothorax with appendages of a female without marsupium from the "Ingolf" Stat. 25, from the outer side; $\times 62$.
 — 3 b. Left second thoracic leg of the same female, from the outer side; $\times 62$.
 — 3 c. Distal part of left fifth thoracic leg of the same female, from the outer side; $\times 62$.
 — 3 d. Abdomen with left fourth pleopod and left uropod of the same female, from the left side; $\times 40$. The other pleopods omitted in order to show the ventral tubercles of the segments.
 — 3 e. End of abdomen with left uropod — setæ omitted — of the same specimen, from the outer side; $\times 92$.

Fig. 4. *Leptognathia inermis* n. sp.

- Fig. 4 a. Anterior part of the cephalothorax with appendages of an ovigerous female, from the "Ingolf" Stat. 115, from the left side; $\times 86$.
 — 4 b. Distal half of left cheliped of another female from the same station, from the outer side; $\times 86$.
 — 4 c. Left second thoracic leg of the specimen shown in fig. 4 a, from the outer side; $\times 86$.
 — 4 d. Major distal part of left second thoracic leg of another female, from the outer side; $\times 86$.

- Fig. 4e. Left sixth thoracic leg of the female possessing the chela shown in fig. 4b, from the inner side; \times 86.
- 4f. Abdomen with second and fifth left pleopods and left uropod of the female shown in fig. 4a, from the left side; \times 82.
- 4g. Left cheliped of a female from Cape Dalton, from the left side; \times 84. The movable finger differs from that in specimens from other localities (figs. 4a and 4b) in having three feeble indentations on the anterior margin.

Fig. 5. *Leptognathia brachiata* n. sp.

- Fig. 5a. Carapace with antennulae and second thoracic segment of a female without marsupium from the "Ingolf" Stat. 25, from above; \times 35.
- 5b. Cephalothorax and second thoracic segment with appendages of a female with marsupium from the "Ingolf" Stat. 25, from the left side; \times 47.
- 5c. Left antennula and antenna of the last-named specimen, from the outer side; \times 85.
- 5d. Left cheliped of the last-named specimen, from the outer side; \times 85.
- 5e. Left second thoracic leg of a female without marsupium from the same station, from the outer side; \times 85.
- 5f. Left sixth thoracic leg of the last-named female, from the outer side; \times 85.
- 5g. Three posterior abdominal segments of the specimen mentioned at fig. 5a, from above; \times 46.
- 5h. Abdomen with appendages of a female with marsupium from the "Ingolf" Stat. 25, from the left side; \times 46.

Fig. 6. *Leptognathia alba* n. sp.

- Fig. 6a. Left antennula and antenna of the single specimen, from the outer side; \times 55.
- 6b. Left cheliped, from the outer side; \times 85.
- 6c. Left second thoracic leg, from the outer side; \times 58.
- 6d. Left seventh thoracic leg, from the outer side; \times 58.
- 6e. Abdomen with left fifth pleopod and left uropod, from the outer side, \times 33. The other pleopods omitted in order to show the characteristic ventral tubercles.

Fig. 7. *Leptognathia hastata* n. sp.

- Fig. 7a. Left antennula and antenna of a female without marsupium from the "Ingolf" Stat. 102, from the outer side; \times 62.
- 7b. Left cheliped of the same specimen, from the outer side; \times 62.
- 7c. Left second thoracic leg of the same specimen, from the outer side; \times 88.
- 7d. Left fifth thoracic leg of the same specimen, from the outer side; \times 88.
- 7e. Distal part of left seventh thoracic leg of the same specimen, from the outer side; \times 172.
- 7f. Abdomen with left first and fifth pleopods and left uropod (with the setae omitted) of the same specimen, from the left side; \times 40.
- 7g. End of abdomen with left uropod of the same specimen, from the outer side; \times 65.
- 7h. Three posterior segments of the abdomen and left uropod — the setae omitted — of another female without marsupium from the "Ingolf" Stat. 102, from the left side; \times 40.

Plate VIII.

Fig. 1. *Leptognathia armata* n. sp.

- Fig. 1 a. Left antennula and antenna of a subadult male from the "Ingolf" Stat. 36, from the outer side; \times 59.
- 1 b. Left cheliped of the same subadult male, from the outer side; \times 59.
- 1 c. Left second thoracic leg of the same subadult male, from the outer side; \times 59.
- 1 d. Distal part of second thoracic leg of the female from the "Ingolf" Stat. 22, from the outer side; \times 100.
- 1 e. Left sixth thoracic leg of the subadult male, from the inner side; \times 59.
- 1 f. Abdomen with second left pleopod and left uropod of the female, from the left side; \times 32.
The other pleopods omitted.

Fig. 2. *Leptognathia Amdrupii* n. sp.

- Fig. 2 a. Left antennula of a female with marsupium, from the outer side; \times 60.
- 2 b. Left cheliped of the same female, from the outer side; \times 60.
- 2 c. Left second thoracic leg of the same female, from the outer side; \times 60.

Fig. 3. *Leptognathia tuberculata* n. sp.

- Fig. 3 a. Cephalothorax and second thoracic segment of a female without marsupium, from the left side; \times 56.
- 3 b. Left second thoracic leg of a female with marsupium, from the outer side; \times 83.
- 3 c. Left sixth thoracic leg of the last-named female, from the inner side; \times 83.
- 3 d. Abdomen with first, third and fifth left pleopod and left uropod of a female, from the left side; \times 48.
- 3 e. Left first pleopod of the female, from behind; \times 140.
- 3 f. Left first pleopod of a subadult male, from in front; \times 140.

Fig. 4. *Leptognathia uncinata* n. sp.

- Fig. 4 a. Left antennula of a female without marsupium, from the outer side; \times 93.
- 4 b. Left cheliped of the same specimen, from the outer side; \times 93.
- 4 c. Left second thoracic leg of the same specimen, from the outer side; \times 93.
- 4 d. Portion of abdomen with left fourth pleopod of the same female, from the outer side; \times 88.
- 4 e. End of abdomen with left uropod of the same female, from the left side; \times 93.
- 4 f. Major part of cephalothorax with appendages of an adult male, from the left side; \times 83.
- 4 g. Left second thoracic leg of the same male, from the outer side; \times 83.
- 4 h. Major part of left sixth thoracic leg of the same male; \times 83.
- 4 i. Two posterior abdominal segments with left uropod of the same male, from the outer side; \times 83.

Fig. 5. *Leptognathia manca* G. O. Sars.

- Fig. 5 a. Cephalothorax and second segment of a female without marsupium, from the left side; \times 86.
- 5 b. Abdomen of a female with marsupium, from the left side; \times 86.

- Fig. 5c. Cephalothorax of a subadult male, from the left side; \times 86.
 — 5d. Last thoracic segment (leg omitted) and abdomen with left uropod and fourth left pleopod — the other pleopods omitted — of the same subadult male, from the left side; \times 60.

Fig. 6. *Leptognathia subaequalis* n. sp.

- Fig. 6a. Female without marsupium from the "Ingolf" Stat. 139, from above; \times 34.
 — 6b. Cephalothorax and second segment with appendages of a female with marsupium from the same station, from the left side; \times 89.
 — 6c. Left cheliped of another female from the same station, from the outer side; \times 135.
 — 6d. Three posterior abdominal segments of the female shown in fig. 6b, from the left side; \times 89.
 — 6e. Four posterior abdominal segments with pleopods and left uropod of an immature male or more probably a female without marsupium from the "Ingolf" Stat. 4, from the left side; \times 89.
 — 6f. Left antennula and antenna of a subadult male from the "Ingolf" Stat. 139, from the left side; \times 89.

Fig. 7. *Leptognathia ventralis* n. sp.

- Fig. 7a. Female without marsupium from the "Ingolf" Stat. 115, from above; \times 27.
 — 7b. Cephalothorax and second segment — only the basal part of its left leg drawn — of a female with marsupium from the same station, from the left side; \times 86.
 — 7c. Mandibles of an immature male, from above; \times 142. *l.* left mandible.
 — 7d. Maxillipeds of the last-named specimen, from below; \times 142.
 — 7e. Left third thoracic leg of a female with marsupium from Stat. 115, from the outer side; \times 86.
 — 7f. Left seventh thoracic leg of the same female, from the outer side; \times 86.
 — 7g. Abdomen of a female from Stat. 115, from the left side; \times 59.
 — 7h. Left second thoracic leg of a female without marsupium from Stat. 38, from the outer side; \times 86.
 — 7i. Cephalothorax and second segment with appendages of a subadult male from Stat. 115, from the left side; \times 86.
 — 7k. Three posterior abdominal segments with left pleopods and uropod of a subadult male, from the outer side; \times 86.

Plate IX.

Fig. 1. *Leptognathia tenella* n. sp.

- Fig. 1a. Female without marsupium, from above; \times 33.
 — 1b. Cephalothorax and second thoracic segment of a female without marsupium, from the left side; \times 95.
 — 1c. Left seventh thoracic leg of the same female, from the outer side; \times 95.
 — 1d. Abdomen of the same female, from the left side; \times 95.
 — 1e. Three posterior abdominal segments of the female shown in fig. 1a, from above; \times 84. Setae of right uropod omitted.

Fig. 2. *Leptognathia acanthifera* n. sp.

- Fig. 2a. Female without marsupium, from above; \times 31.

- Fig. 2b. Cephalothorax and the two following segments of a female without marsupium, from the left side; $\times 84$.
- 2c. Left fifth thoracic leg, from the outer side; $\times 84$.
- 2d. Abdomen of the female shown in fig. 2b, from the left side; $\times 84$.

Fig. 3. *Leptognathia breviremis* Lilljeborg.

- Fig. 3a. Cephalothorax and second thoracic segment of a female without marsupium from the "Ingolf" Stat. 117, from the left side; $\times 83$. A minute parasitic Copepod is attached to the outer side of second joint of second thoracic leg.
- 3b. Four posterior abdominal segments with left fourth pleopod and left uropod of the above-named female, from the left side; $\times 83$.
- 3c. Abdomen of an ovigerous female from Norway, from the left side; $\times 83$. Pleopods excepting the third and the setæ of the uropod omitted.
- 3d. Anterior part with appendages of an adult male from the "Ingolf" Stat. 36, from the left side; $\times 84$.
- 3e. Left sixth thoracic leg of the same male, from the outer side; $\times 84$.
- 3f. Sixth and seventh thoracic and all abdominal segments of the same male, from the left side; $\times 84$. Thoracic legs and the pleopods of first, second and fourth abdominal segments omitted.
- 3g. Sixth abdominal segment with left uropod of an adult male from the "Ingolf" Stat. 101 from the left side; $\times 80$.

Fig. 4. *Leptognathia crassa* n. sp.

- Fig. 4a. Female without marsupium, from above; $\times 29$.
- 4b. Cephalothorax and second thoracic segment with appendages of a female, from the left side; $\times 60$.
- 4c. Left sixth thoracic leg of another female, from the outer side; $\times 79$.
- 4d. Abdomen of the female shown in fig. 4b from the left side; $\times 60$. Pleopods omitted excepting the third.
- 4e. Three posterior abdominal segments of the last-named female, from below; $\times 60$. The pleopods on the left side of the figure omitted.

Fig. 5. *Leptognathia polita* n. sp.

- Fig. 5a. Female without marsupium, from above; $\times 17$.
- 5b. Cephalothorax and second thoracic segment of the same female, from the left side; $\times 36$. Left second thoracic leg omitted excepting its most proximal part.
- 5c. Major part of left chela of the same specimen, from the outer side; $\times 80$.
- 5d. Right second thoracic leg of the same female, from the outer side; $\times 50$.
- 5e. Left sixth thoracic leg of the same female, from the outer side; $\times 50$.
- 5f. Five posterior abdominal segments with left fifth pleopod and left uropod of the same specimen, from the outer side; $\times 36$.

Fig. 6. *Leptognathia vicina* n. sp.

- Fig. 6a. Subadult male from the "Ingolf" Stat. 28, from above; $\times 25$.
 — 6b. Cephalothorax and second thoracic segment with appendages of a female without marsupium from the same station, from the left side; $\times 57$.
 — 6c. Mandibles of a female, from below; $\times 90$. / left mandible.
 — 6d. Molar processes of the same mandibles, from below; $\times 315$.
 — 6e. Left maxillula of the same female, from below; $\times 90$.
 — 6f. Left cheliped, removed from the animal and seen from the outer side; $\times 65$.
 — 6g. Right sixth thoracic leg of a female, from the outer side; $\times 57$.
 — 6h. Four posterior abdominal segments with fourth pleopod and left uropod of the female shown in fig. 4b, from the outer side; $\times 57$.
 — 6i. Left antennula of a subadult male from Lat. $66^{\circ}49' N.$, Long. $56^{\circ}28' W.$, from the left side; $\times 82$.

Plate X.

Fig. 1. *Leptognathia profunda* n. sp.

- Fig. 1a. Female without marsupium, from above; $\times 26$.
 — 1b. Anterior half of a female without marsupium, from the left side; $\times 56$.
 — 1c. Left cheliped of another female, from the outer side; $\times 97$.
 — 1d. Left second thoracic leg of a third female, from the outer side; $\times 97$.
 — 1e. Left sixth thoracic leg of the last-named specimen, from the outer side — distal half of the leg somewhat turned; $\times 97$.
 — 1f. Left first pleopod of a female, from in front; $\times 95$.
 — 1g. Four posterior abdominal segments with appendages of the female shown in fig. 1b, from the left side; $\times 56$.
 — 1h. Left uropod of another female, from the outer side; $\times 97$.

Fig. 2. *Leptognathia latiremis* n. sp.

- Fig. 2a. Female without marsupium from the "Ingolf" Stat. 58, from above; $\times 26$.
 — 2b. Left antennula and antenna of a female without marsupium from the same station, from the outer side; $\times 86$.
 — 2c. Left antennula of the female shown in fig. 2a, from above; $\times 48$.
 — 2d. Left antennula of an immature male from the same station, from above; $\times 48$.
 — 2e. Labrum and both mandibles of a female; from below; $\times 235$.
 — 2f. Maxillipeds of the last-named specimen, from below; $\times 235$.
 — 2g. Left cheliped of a female without marsupium, from the outer side; $\times 86$.
 — 2h. Distal part of left second thoracic leg of the last-named specimen, from the outer side; $\times 86$.
 — 2i. Left third thoracic leg of the last-named specimen, from the outer side; $\times 86$.
 — 2k. Left seventh thoracic leg of the same specimen, from the outer side; $\times 86$. The distal half of the leg somewhat turned.

- Fig. 2l. First left pleopod of a female, from in front; \times 86.
 — 2m. Posterior part of abdomen with right uropod of a female, from above; \times 52.
 — 2n. Posterior part of abdomen of a young specimen with the seventh pair of thoracic legs and the pleopods still wanting, from the left side; \times 86.

Fig. 3. *Leptognathia glacialis* n. sp.

- Fig. 3a. Distal half of left cheliped, from the outer side; \times 86.
 — 3b. Three posterior abdominal segments, from the left side; \times 86.

Fig. 4. *Haplocope linearis* n. sp.

- Fig. 4a. A full-grown female, from above; \times 32. The right uropod in this specimen was abnormally short.
 — 4b. Cephalothorax and second thoracic segment with appendages of a female without marsupium, from the left side; \times 90.
 — 4c. Mandibles of a female, from below; \times 200. *l.* left mandible.
 — 4d. Right sixth thoracic leg of the female shown in fig. 4b, from the outer side; \times 90.
 — 4e. Third left pleopod of a female with marsupium, from in front; \times 108.
 — 4f. Major part of abdomen with fourth and fifth left pleopod — the other pleopods omitted — and left uropod of a female with marsupium, from the left side; \times 75.

Fig. 5. *Leptognathiella abyssii* n. gen., n. sp.

- Fig. 5a. Female without marsupium, from above; \times 26.
 — 5b. Anterior part of the same female, from above; \times 56.
 — 5c. Abdomen and posterior part of the thorax of the same female, from above; \times 44.
 — 5d. Left antennula and antenna of a female, from the outer side; \times 82.
 — 5e. Left sixth thoracic leg of a female, from the outer side; \times 82.
 — 5f. Abdomen and major part of last thoracic segment of a female, from the left side; \times 56.
 — 5g. Cephalothorax and two anterior thoracic segments with appendages of a subadult male, from the left side; \times 82.
 — 5h. Left fifth thoracic leg of the subadult male, from the outer side; \times 82.
 — 5i. Abdomen with fourth and fifth left pleopod and uropod of the subadult male; \times 56. Anterior pairs of pleopods omitted.

Fig. 6. *Cryptocope Vøringii* G. O. Sars.

- Fig. 6a. Cephalothorax of a female without marsupium from the "Ingolf" Stat. 138, from the left side; \times 31.
 — 6b. Distal part of the chela of the same female, from the outer side; \times 53.
 — 6c. Left third thoracic leg of the same female, from the outer side; \times 31.
 — 6d. Abdomen of the same female without marsupium, from the left side; \times 31.

Plate XI.

Fig. 1. *Cryptocope arctica* H. J. Hansen.

- Fig. 1 a. Female without marsupium from the "Ingolf" Stat. 25, from above; $\times 26$.
- 1 b. Cephalothorax and second thoracic segment with appendages of an ovigerous female from Henry Land, from the left side; $\times 47$.
- 1 c. Left chela of a female without marsupium from the "Ingolf" Stat. 25, from the outer side; $\times 77$.
- 1 d. Left sixth thoracic leg of the last-named specimen, from the outer side; $\times 50$.
- 1 e. Abdomen and last thoracic segment of the female shown in fig. 1 b, from the left side; $\times 47$.
The thoracic leg excepting its basal part and second, third and fourth left pleopod omitted.
- 1 f. Abdomen with small pleopods — second, third and fourth pleopod omitted — of a large female without marsupium from the "Ingolf" Stat. 25, from the left side; $\times 52$.
- 1 g. Left antennula of a subadult male from Henry Land, from the left side; $\times 47$.
- 1 h. Abdomen — left second, third and fifth pleopod omitted — and posterior part of the thorax of a subadult male from Henry Land, from the left side; $\times 47$.

Fig. 2. *Cryptocope arctophylax* Norm. & Stebb.

- Fig. 2 a. Subadult male from Stat. 24, from above; $\times 16$.
- 2 b. Left antennula of the same subadult male, from the outer side; $\times 57$.
- 2 c. Major part of left chela of the same subadult male, from the outer side; $\times 56$.
- 2 d. Abdomen — first, second and fourth pleopod omitted — and seventh thoracic segment of the same subadult male, from the left side; $\times 32$.
- 2 e. Left antennula and antenna of an immature female from Stat. 24, from the left side; $\times 57$.
- 2 f. Distal part of left sixth thoracic leg of the same immature female, from the outer side; $\times 80$.
- 2 g. Abdomen and end of thorax of the same immature female, from the left side; $\times 36$.
- 2 h. Cephalothorax and anterior part of thorax of an adult male from Stat. 36, from the left side; $\times 35$.
- 2 i. Left chela of the adult male, from the outer side; $\times 61$.
- 2 k. Major part of abdomen — the three anterior pleopods omitted — of the same adult male, from the left side; $\times 33$.

Fig. 3. *Tanaella ochracea* n. sp.

- Fig. 3 a. Female without marsupium, from above; $\times 21$.
- 3 b. Cephalothorax and the two anterior thoracic segments with appendages of the same female, from the left side; $\times 46$.
- 3 c. Major part of left chela of the same specimen, from the outer side; $\times 85$.
- 3 d. Distal part of left third thoracic leg of the same female, from the outer side; $\times 80$.
- 3 e. Left seventh thoracic leg of the same female, from behind; $\times 80$.
- 3 f. Abdomen — first, third and fourth pleopod omitted — and seventh thoracic segment of the same female; $\times 32$.

Fig. 4. *Tanaella unguicillata* Norm. & Stebb.

- Fig. 4a. Cephalothorax and two anterior thoracic segments with appendages of a female without marsupium, from the left side; $\times 40$.
 — 4b. Major part of left chela of the same female, from the outer side; $\times 85$.
 — 4c. Left sixth thoracic leg of the same female, from in front; $\times 80$.
 — 4d. Last thoracic segment and abdomen of the same female, from the left side; $\times 31$.

Fig. 5. *Strongylura minima* n. sp.

- Fig. 5a. Subadult male, from above; $\times 55$.
 — 5b. Cephalothorax and two anterior thoracic segments with appendages of the subadult male, from the left side; $\times 95$.
 — 5c. Four posterior abdominal segments — third and fourth left pleopod omitted — from the side; $\times 95$.
 — 5d. Cephalothorax of a female without marsupium, from the left side; $\times 91$.

Plate XII.

Fig. 1. *Strongylura cylindrata* G. O. Sars.

- Fig. 1a. Female without marsupium from the "Ingolf" Stat. 113, from above; $\times 14$.
 — 1b. Cephalothorax of a female without marsupium from the "Ingolf" Stat. 113, from the left side; $\times 52$.
 — 1c. Left third thoracic leg of the female from Stat. 113, from the outer side; $\times 81$.
 — 1d. Left seventh thoracic leg of the female from Stat. 113, from the outer side; $\times 81$.
 — 1e. Cephalothorax and second thoracic segment of the subadult male from the "Ingolf" Stat. 24, from the left side; $\times 60$.
 — 1f. Posterior part of abdomen of the subadult male from Stat. 24, from the left side; $\times 60$.
 — 1g. Left antennula and antenna of a female without marsupium from Norway, from the left side; $\times 60$.
 — 1h. Left second thoracic thoracic leg of the same female from Norway, from the outer side; $\times 81$.
 — 1i. Left sixth thoracic leg of the same female from Norway, from behind; $\times 81$.
 — 1k. Last abdominal segment of the same female from Norway, from the left side; $\times 58$.
 — 1l. Left pleopod of the abdomen shown in fig. 1k, from the outer side; $\times 175$.

Fig. 2. *Strongylurella indivisa* n. gen., n. sp.

- Fig. 2a. Female without marsupium, from above; $\times 36$.
 — 2b. Cephalothorax and second thoracic segment of the same specimen, from the left side; $\times 91$.
 — 2c. Left sixth thoracic leg of the same specimen, from the outer side; $\times 91$.
 — 2d. Five abdominal segments of the same female, from the left side; $\times 80$.
 — 2e. Four posterior abdominal segments of the same female, from above; $\times 54$.

Fig. 3. *Paranarthrura insignis* n. gen., n. sp.

- Fig. 3a. Female without marsupium from the "Ingolf" Stat. 25, from above; $\times 21$.

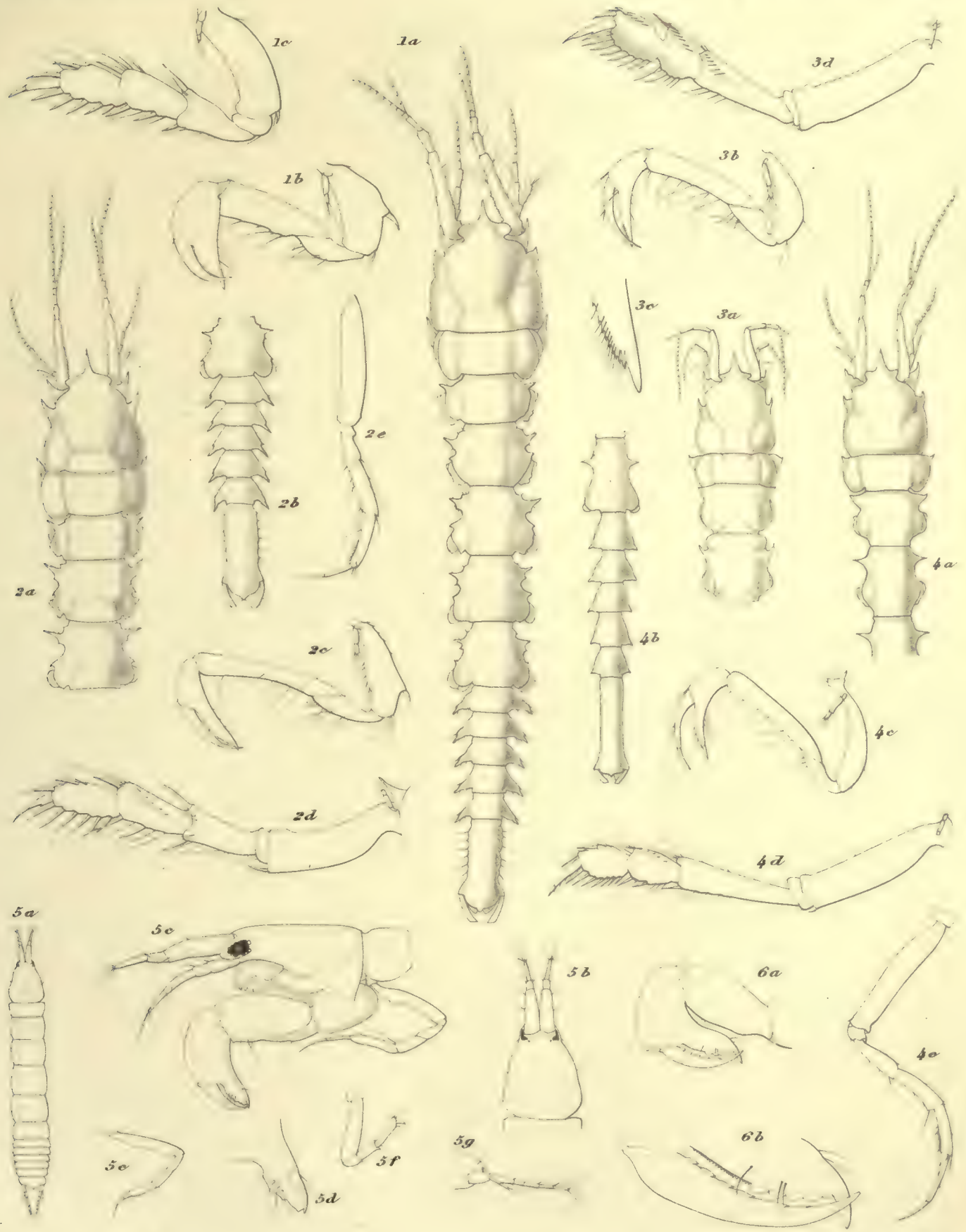
- Fig. 3b. Cephalothorax and anterior thoracic segments of a female without marsupium from the same station, from the left side; \times 56.
- 3c. Labrum and mandibles of a female, from below; \times 130.
- 3d. Both mandibles in another position, from below; \times 200.
- 3e. Left maxillula of the last-named female, from below; 130.
- 3f. Maxillipeds — epipods omitted — of the same female, from below; \times 130.
- 3g. Left seventh thoracic leg of an ovigerous female, from behind; \times 56.
- 3h. Seventh thoracic segment — the leg omitted — and abdomen of a female, from the left side; \times 47.
- 3i. Seventh thoracic segment and abdomen of a female, from above; \times 42.
- 3k. Left antennula and antenna of a subadult male from Stat. 25, from the left side; \times 56.
- 3l. Left cheliped of a subadult male, from the left side; \times 81.
- 3m. Seventh thoracic segment and abdomen of a subadult male from Stat. 25, from the left side; \times 47. Left thoracic leg and third and fourth pleopods omitted.

Fig. 4. *Paranarthrura subtilis* n. sp.

- Fig. 4a. Female without marsupium, from above \times 34.
- 4b. Cephalothorax and second thoracic segment with appendages of a female without marsupium, from the left side; \times 89.
- 4c. Seventh thoracic segment and abdomen of the same female without marsupium, from the left side; \times 89.
- 4d. Seventh thoracic segment and abdomen of another female without marsupium, from above; \times 89.

Fig. 5. *Paranarthrura clavipes* n. sp.

- Fig. 5a. Young specimen with the seventh thoracic segment only half developed, from above; \times 35.
- 5b. Cephalothorax and second left leg of an immature male, from the left side; \times 82.
- 5c. Abdomen and posterior part of the thorax of the same immature male, from the left side; \times 82. Major part of sixth leg and first, second and fourth pleopod omitted.

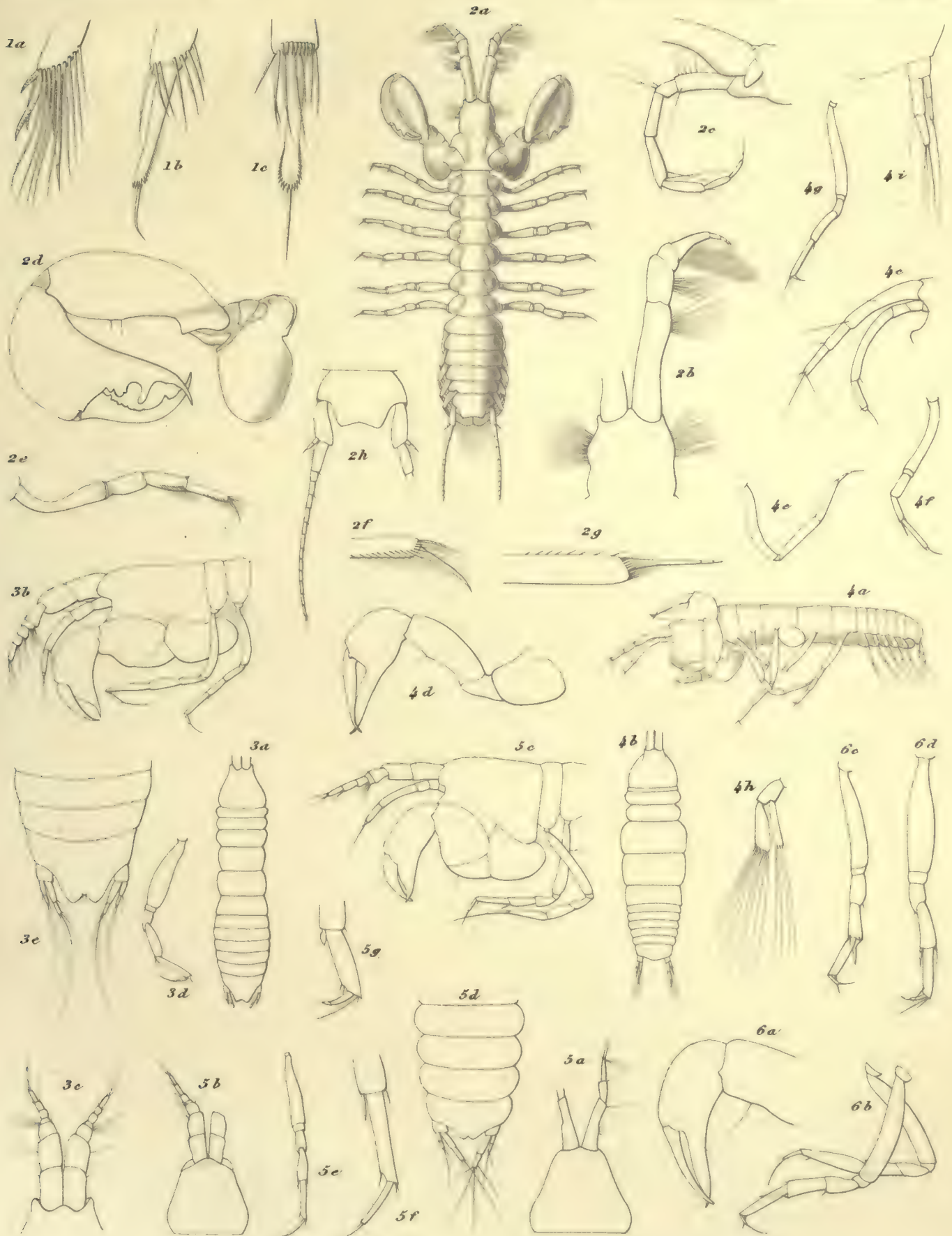


1. *Apseudes vicinus* n.sp. 2. *A. tenuis* n.sp. 3. *A. gracilis* Norm. & Stebb. 4. *A. gracillimus* n.sp.

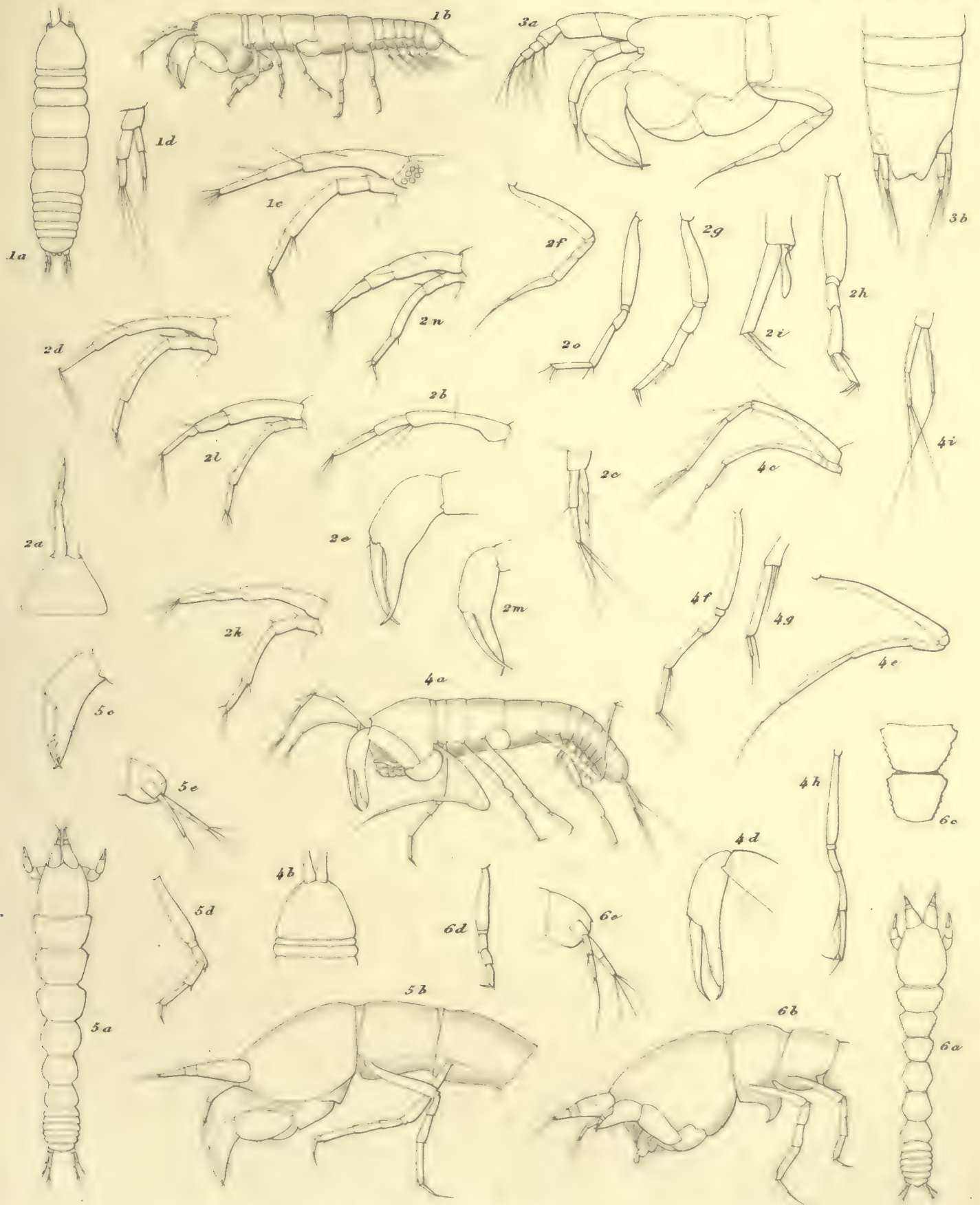
5. *Heterotanais groenlandicus* n.sp. 6. *Neotanais serratispinosus* Norm. & Stebb.

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1. *Neotanais serratispinosus* Norm. & Stebb. 2. *N. giganteus* n.sp. 3. *Pseudotanais forcipatus* Lilljeb.
 4. *P. abyssii* n.sp. 5. *P. lilljeborgii* G.O.S. 6. *P. oculatus* n.sp.



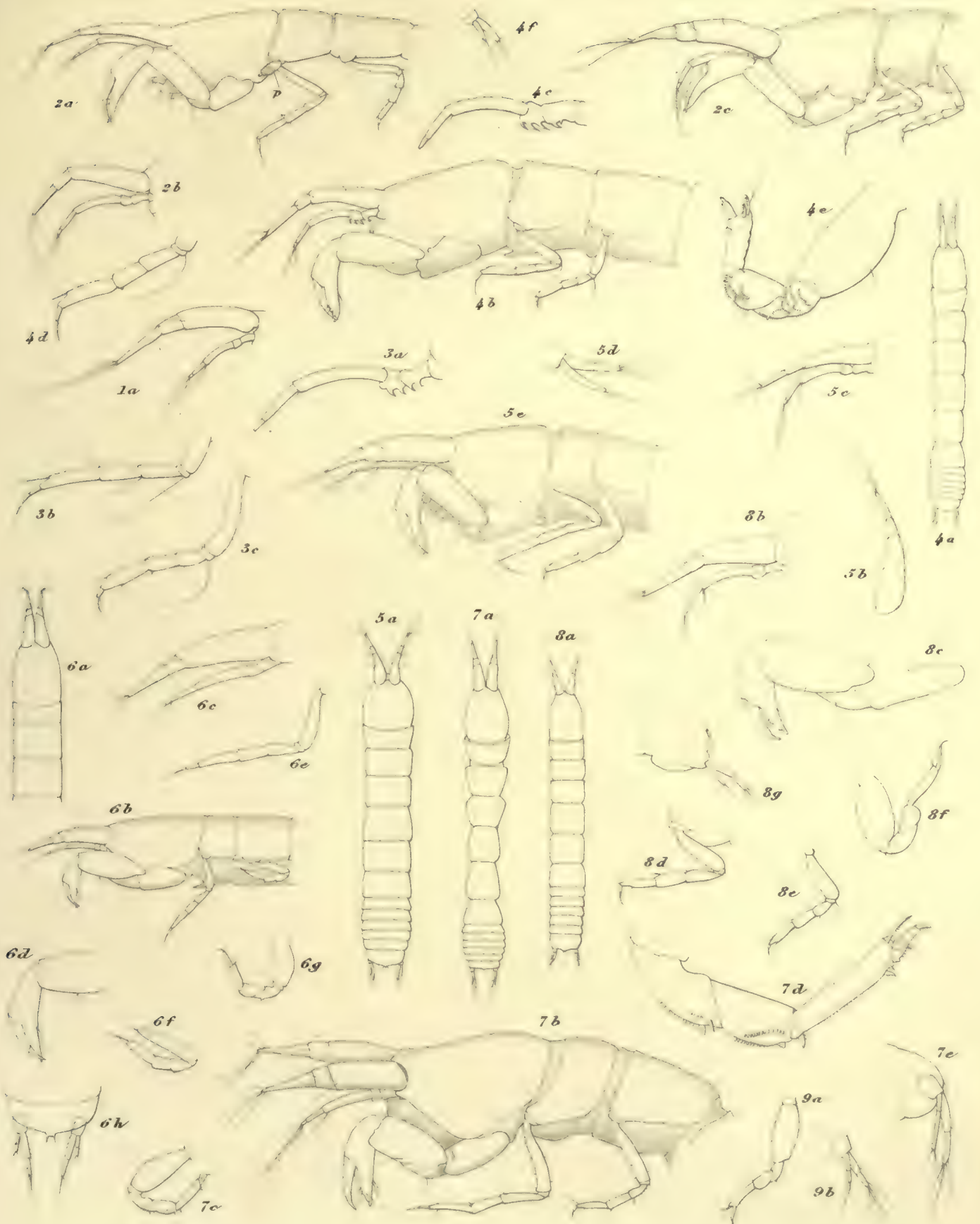
1. *Pseudotanaïs oculatus* n. sp. 2. *P. affinis* H.J.H. 3. *P. affinis* H.J.H. ♂ ad.
 4. *P. longipes* n. sp. 5. *Typhlotanaïs irregularis* n. sp. 6. *T. macrocephala* n. sp.

H.J. Hansen del.

T.N. Møller sc.



1. *Typhlotanais pulcher* n. sp. 2. *T. gracilipes* n. sp. 3. *T. mucronatus* n. sp. 4. *T. eximius* n. sp.
 5. *T. penicillatus* G.O.S. 6. *T. inermis* n. sp. 7. *T. variabilis* n. sp.



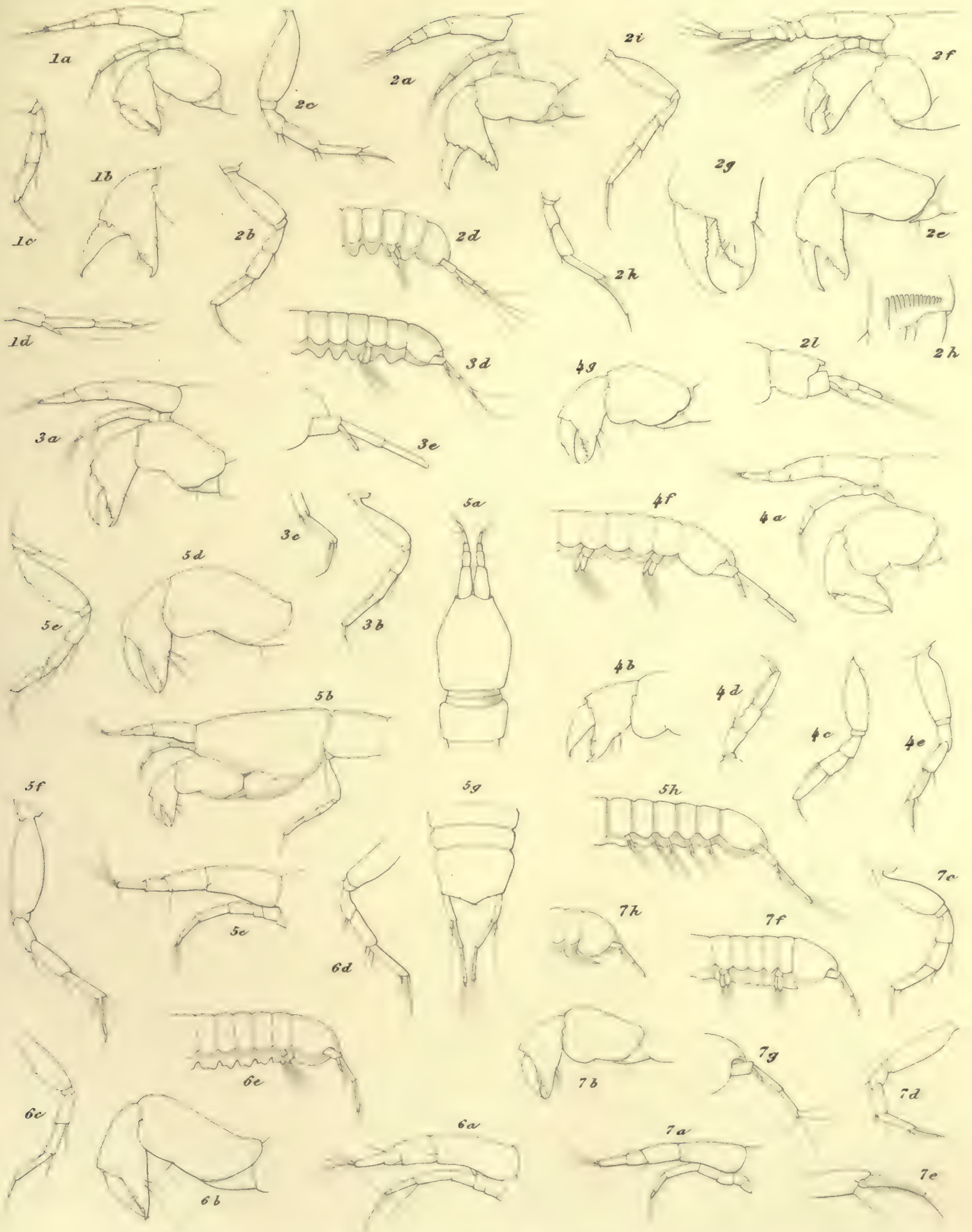
1. *Typhlotanais mucronatus* n. sp. 2. *T. variabilis* n. sp. 3. *T. tenuicornis* G.O.S. 4. *T. trispinosus* n. sp.
 5. *T. profundus* n. sp. 6. *T. spinicauda* n. sp. 7. *T. grandis* n. sp. 8. *T. plebejus* n. sp. 9. *T. inaequipes* n. sp.

H.J. Hansen del.

T.N. Möller sc.

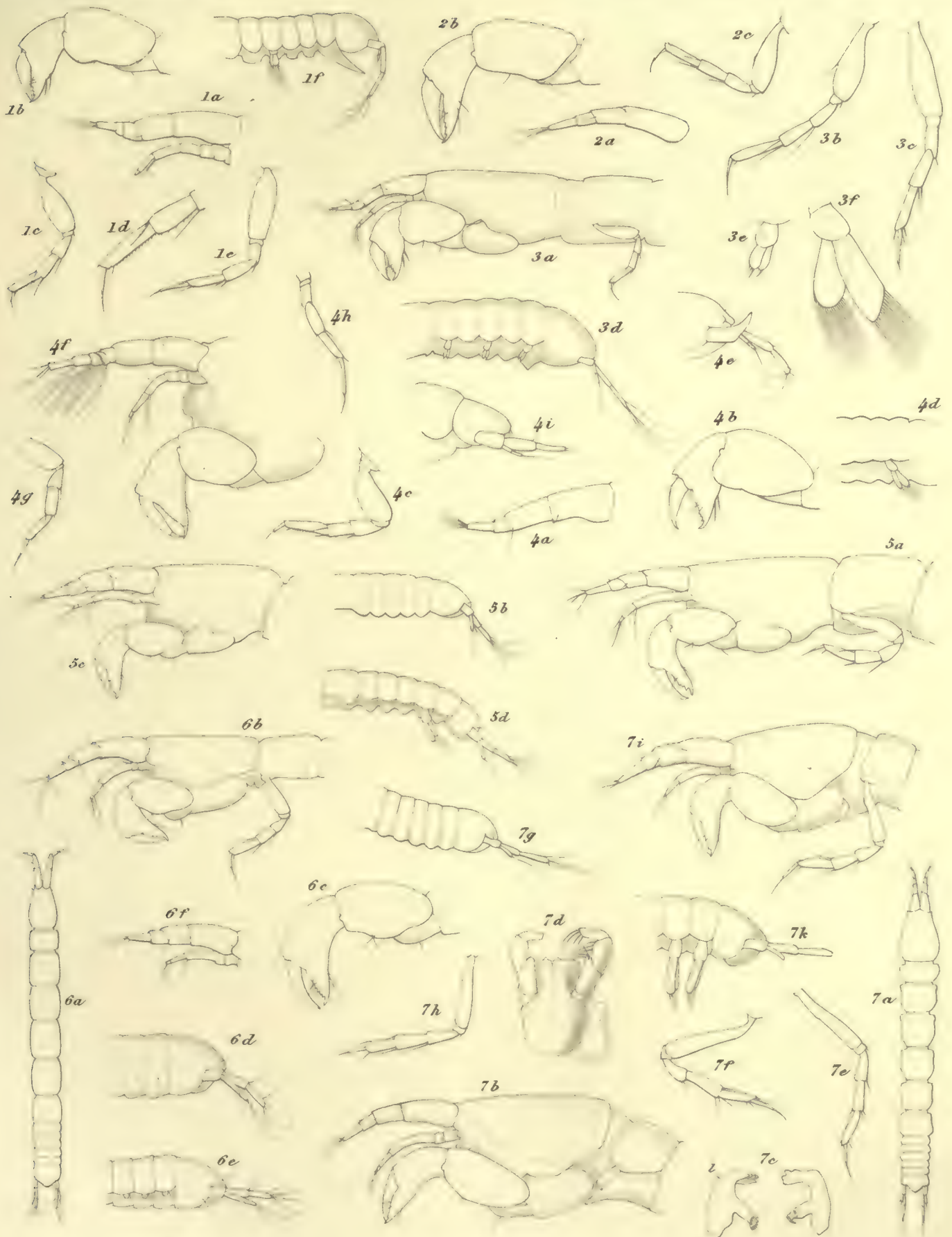


1. *Typhlotanais inaequipes* n. sp. 2. *T. finmarchicus* GOS. 3. *T. mixtus* n. sp. 4. *T. solidus* n. sp.
 5. *Agathotanais Ingolfsi* n. gen. n. sp. 6. *Leptognathia multiserrata* n. sp. 7. *L. Sarsii* H.J.H.



1. *Leptognathia gracilis* Kr. 2. *L. Hanseni* Vanhoffen. 3. *L. longiremis* Lilljeb. 4. *L. inermis* n.sp.

5. *L. brachiata* n.sp. 6. *L. alba* n.sp. 7. *L. hastata* n.sp.

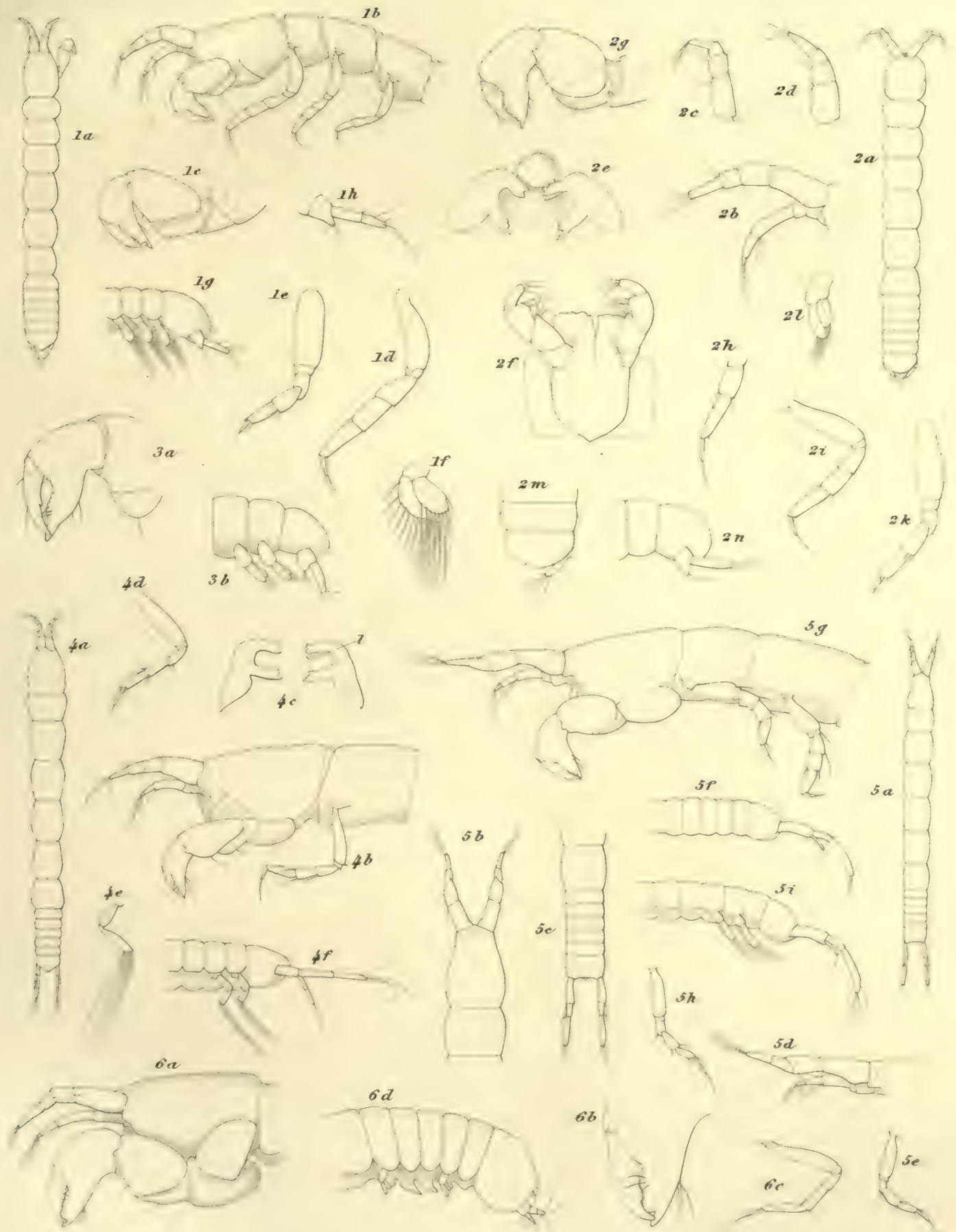


1. *Leptognathia armata* n. sp. 2. *L. Andrupii* n. sp. 3. *L. tuberculata* n. sp. 4. *L. uncinata* n. sp.
 5. *L. manca* a. o. s. 6. *L. subaequalis* n. sp. 7. *L. ventralis* n. sp.

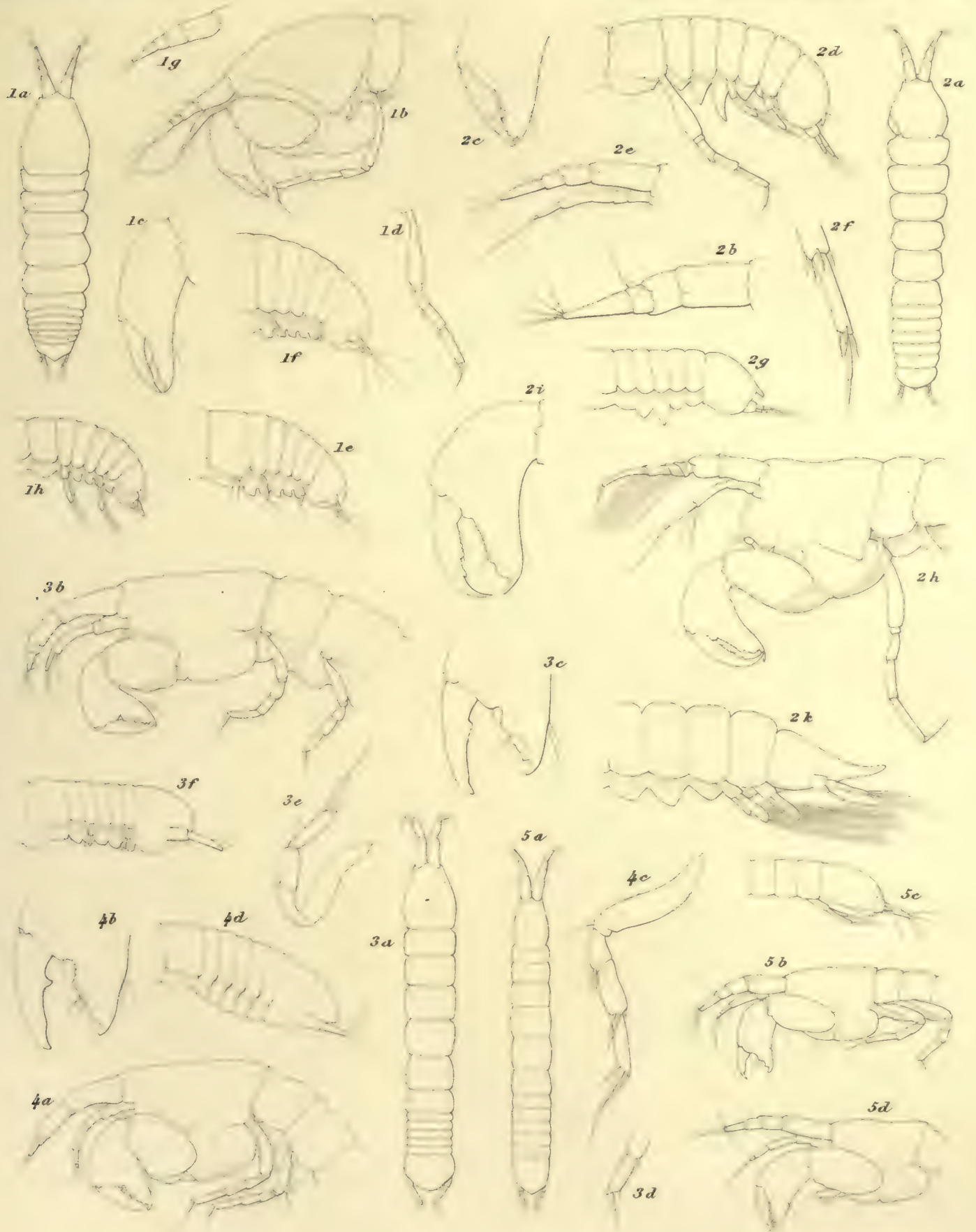


1. *Leptognathia tenella* n. sp. 2. *L. acanthifera* n. sp. 3. *L. breviremis* Lilljeb. 4. *L. crassa* n. sp.

5. *L. polita* n. sp. 6. *L. vicina* n. sp.

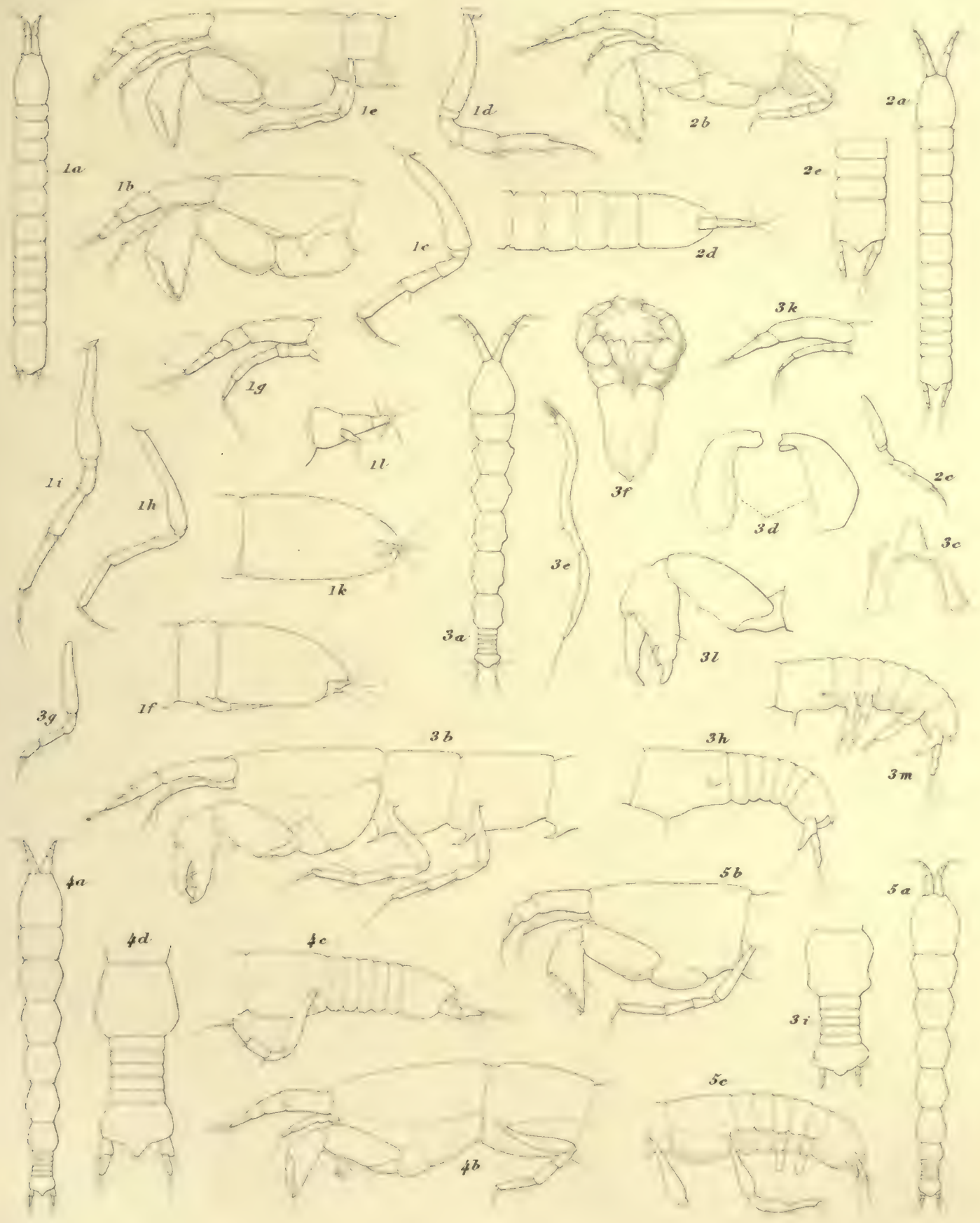


1. *Leptognathia profunda* n. sp. 2. *L. latiremis* n. sp. 3. *L. glacialis* n. sp. 4. *Haplocope linearis* n. sp.
 5. *Leptognathiella abyssii* n. gen. n. sp. 6. *Cryptocope Vöringii* a.O.S.



1. *Cryptocope arctica* HJH. 2. *C. aretophylax* Norm. & Stebb. 3. *Tanaella ochracea* n. sp.

4. *T. unguicillata* Norm. & Stebb. 5. *Strongylura minima* n. sp.



1. *Strongylura cylindrata* a.o.s. 2. *Strongylurella indivisa* n.gen., n.sp. 3. *Paranarthrura insignis* n.gen., n.sp.

4. *P. subtilis* n.sp. 5. *P. clavipes* n.sp.

H.J.Hansen del.

T.N. Møller sc.

THE INGOLF-EXPEDITION

1895—1896.

THE LOCALITIES, DEPTHS, AND BOTTOMTEMPERATURES OF THE STATIONS.

Station Nr.	Lat. N.	Long. W.	Depth in Danish fathoms	Bottom-temp.	Station Nr.	Lat. N.	Long. W.	Depth in Danish fathoms	Bottom-temp.	Station Nr.	Lat. N.	Long. W.	Depth in Danish fathoms	Bottom-temp.
1	62° 30'	8° 21'	132	7°2	24	63° 06'	56° 00'	1199	2°4	45	61° 32'	9° 43'	643	4°17
2	63° 04'	9° 22'	262	5°3	25	63° 30'	54° 25'	582	3°3	46	61° 32'	11° 36'	720	2°40
3	63° 35'	10° 24'	272	0°5		63° 51'	53° 03'	136		47	61° 32'	13° 40'	950	3°23
4	64° 07'	11° 12'	237	2°5	26	63° 57'	52° 41'	34	0°6	48	61° 32'	15° 11'	1150	3°17
5	64° 40'	12° 09'	155			64° 37'	54° 24'	109		49	62° 07'	15° 07'	1120	2°91
6	63° 43'	14° 34'	90	7°0	27	64° 54'	55° 10'	393	3°8	50	62° 43'	15° 07'	1020	3°13
7	63° 13'	15° 41'	600	4°5	28	65° 14'	55° 42'	420	3°5	51	64° 15'	14° 22'	68	7°32
8	63° 56'	24° 40'	136	6°0	29	65° 34'	54° 31'	68	0°2	52	63° 57'	13° 32'	420	7°87
9	64° 18'	27° 00'	295	5°8	30	66° 50'	54° 28'	22	1°05	53	63° 15'	15° 07'	795	3°08
10	64° 24'	28° 50'	788	3°5	31	66° 35'	55° 54'	88	1°6	54	63° 08'	15° 40'	691	3°9
11	64° 34'	31° 12'	1300	1°6	32	66° 35'	56° 38'	318	3°9	55	63° 33'	15° 02'	316	5°9
12	64° 38'	32° 37'	1040	0°3	33	67° 57'	55° 30'	35	0°8	56	64° 00'	15° 09'	68	7°57
13	64° 47'	34° 33'	622	3°0	34	65° 17'	54° 17'	55		57	63° 37'	13° 02'	350	3°4
14	64° 45'	35° 05'	176	4°4	35	65° 16'	55° 05'	362	3°6	58	64° 25'	12° 09'	211	0°8
15	66° 18'	25° 59'	330	-0°75	36	61° 50'	56° 21'	1435	1°5	59	65° 00'	11° 16'	310	-0°1
16	65° 43'	26° 58'	250	6°1	37	60° 17'	54° 05'	1715	1°4	60	65° 09'	12° 27'	124	0°9
17	62° 49'	26° 55'	745	3°4	38	59° 12'	51° 05'	1870	1°3	61	65° 03'	13° 06'	55	0°4
18	61° 44'	30° 29'	1135	3°0	39	62° 00'	22° 38'	865	2°9	62	63° 18'	19° 12'	72	7°92
19	60° 29'	34° 14'	1566	2°4	40	62° 00'	21° 36'	845	3°3	63	62° 40'	19° 05'	800	4°0
20	58° 20'	40° 48'	1695	1°5	41	61° 39'	17° 10'	1245	2°0	64	62° 06'	19° 00'	1041	3°1
21	58° 01'	44° 45'	1330	2°4	42	61° 41'	10° 17'	625	0°4	65	61° 33'	19° 00'	1089	3°0
22	58° 10'	48° 25'	1845	1°4	43	61° 42'	10° 11'	645	0°05	66	61° 33'	20° 43'	1128	3°3
23	60° 43'	56° 00'			44	61° 42'	9° 36'	545	4°8	67	61° 30'	22° 30'	975	3°0

Only the Plankton-Net used

Station Nr.	Lat. N.	Long. W.	Depth in Danish fathoms	Bottom-temp.	Station Nr.	Lat. N.	Long. W.	Depth in Danish fathoms	Bottom-temp.	Station Nr.	Lat. N.	Long. W.	Depth in Danish fathoms	Bottom-temp.
68	62° 06'	22° 30'	843	3°4	92	64° 44'	32° 52'	976	1°4	118	68° 27'	8° 20'	1060	-1°0
69	62° 40'	22° 17'	589	3°9	93	64° 24'	35° 14'	767	1°46	119	67° 53'	10° 19'	1010	-1°0
70	63° 09'	22° 05'	134	7°0	94	64° 56'	36° 19'	204	4°1	120	67° 29'	11° 32'	885	-1°0
71	63° 46'	22° 03'	46			65° 31'	30° 45'	213		121	66° 59'	13° 11'	529	-0°7
72	63° 12'	23° 04'	197	6°7	95	65° 14'	30° 39'	752	2°1	122	66° 42'	14° 44'	115	1°8
73	62° 58'	23° 28'	486	5°5	96	65° 24'	29° 00'	735	1°2	123	66° 52'	15° 40'	145	2°0
74	62° 17'	24° 36'	695	4°2	97	65° 28'	27° 39'	450	5°5	124	67° 40'	15° 40'	495	-0°6
	61° 57'	25° 35'	761		98	65° 38'	26° 27'	138	5°9	125	68° 08'	16° 02'	729	-0°8
	61° 28'	25° 06'	829		99	66° 13'	25° 53'	187	6°1	126	67° 19'	15° 52'	293	-0°5
75	61° 28'	26° 25'	780	4°3	100	66° 23'	14° 02'	59	0°4	127	66° 33'	20° 05'	44	5°6
76	60° 50'	26° 50'	806	4°1	101	66° 23'	12° 05'	537	-0°7	128	66° 50'	20° 02'	194	0°6
77	60° 10'	26° 59'	951	3°6	102	66° 23'	10° 26'	750	-0°9	129	66° 35'	23° 47'	117	6°5
78	60° 37'	27° 52'	799	4°5	103	66° 23'	8° 52'	579	-0°6	130	63° 00'	20° 40'	338	6°55
79	60° 52'	28° 58'	653	4°4	104	66° 23'	7° 25'	957	-1°1	131	63° 00'	19° 09'	698	4°7
80	61° 02'	29° 32'	935	4°0	105	65° 34'	7° 31'	762	-0°8	132	63° 00'	17° 04'	747	4°6
81	61° 44'	27° 00'	485	6°1	106	65° 34'	8° 54'	447	-0°6	133	63° 14'	11° 24'	230	2°2
82	61° 55'	27° 28'	824	4°1		65° 29'	8° 40'	466		134	62° 34'	10° 26'	299	4°1
83	62° 25'	28° 30'	912	3°5	107	65° 33'	10° 28'	492	-0°3	135	62° 48'	9° 48'	270	0°4
	62° 36'	26° 01'	472		108	65° 30'	12° 00'	97	1°1	136	63° 01'	9° 11'	256	4°8
	62° 36'	25° 30'	401		109	65° 29'	13° 25'	38	1°5	137	63° 14'	8° 31'	297	-0°6
84	62° 58'	25° 24'	633	4°8	110	66° 44'	11° 33'	781	-0°8	138	63° 26'	7° 56'	471	-0°6
85	63° 21'	25° 21'	170		111	67° 14'	8° 48'	860	-0°9	139	63° 36'	7° 30'	702	-0°6
86	65° 03' ₆	23° 47' ₆	76		112	67° 57'	6° 44'	1267	-1°1	140	63° 29'	6° 57'	780	-0°9
87	65° 02' ₃	23° 56' ₂	110		113	69° 31'	7° 06'	1309	-1°0	141	63° 22'	6° 58'	679	-0°6
88	64° 58'	24° 25'	76	6°9	114	70° 36'	7° 29'	773	-1°d	142	63° 07'	7° 05'	587	-0°6
89	64° 45'	27° 20'	310	8°4	115	70° 50'	8° 29'	86	0°1	143	62° 58'	7° 09'	388	-0°4
90	64° 45'	29° 06'	568	4°4	116	70° 05'	8° 26'	371	-0°4	144	62° 49'	7° 12'	276	1°6
91	64° 44'	31° 00'	1236	3°1	117	69° 13'	8° 23'	1003	-1°0					



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VOL. III, PART 4

CONTENTS:

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PUBLISHED AT THE COST OF THE GOVERNMENT

BY

THE DIRECTION OF THE ZOOLOGICAL MUSEUM OF THE UNIVERSITY.

COPENHAGEN.

H. HAGERUP.

PRINTED BY BIANCO LUNO.

1915.



THE DANISH INGOLF-EXPEDITION.

VOLUME III.

4.

COPEPODA I. CALANOIDA AMPHASCANDRIA.

BY

CARL WITH.

WITH 8 PLATES, 422 TEXTFIGURES, 1 CHART AND A LIST OF THE STATIONS.



COPENHAGEN.

PRINTED BY BIANCO LUNO.

1915.

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CONTENTS

Copepoda I. Calanoida Amphiscandria.

	Page		Page
Introduction.....	I	23. <i>Gaidius tenuispinus</i> G. O. Sars.....	89
On the material.....	I	24. — <i>brevispinus</i> G. O. Sars.....	94
On the literature.....	3	25. <i>Gaetanus Kruppi</i> Giesbr.....	97
On systematic characters.....	4	26. — <i>minor</i> Farr.....	103
On postlarval development.....	7	27. — <i>pileatus</i> Farr.....	104
On nomenclature and abbreviations.....	7	28. — <i>miles</i> Giesbr.....	107
On the description of species.....	8	29. — <i>latifrons</i> G. O. Sars.....	108
On variation and parasites.....	9	30. — <i>ferox</i> n. sp.....	111
Calanidae.....	10	31. <i>Euchirella rostrata</i> Claus.....	113
<i>Calanus carinatus</i> Kr.....	11	32. — <i>curticauda</i> Giesbr.....	118
— <i>cristatus</i> Kr.....	11	33. — <i>messinensis</i> Claus.....	122
1. <i>Calanus finmarchicus</i> Gun.....	10	34. — <i>intermedia</i> n. sp.....	124
2. — <i>hyperboreus</i> Kr.....	30	35. — <i>maxima</i> Wolf.....	127
<i>Macrocalanus</i> G. O. Sars.....	36	36. — <i>bitumida</i> n. sp.....	131
3. <i>Macrocalanus princeps</i> Brady.....	37	37. <i>Undeuchæte minor</i> Giesbr.....	132
<i>Megacalanus</i> Wolf.....	40	38. — <i>major</i> Giesbr.....	136
4. <i>Megacalanus princeps</i> Wolf.....	41	39. — <i>superba</i> n. sp.....	137
Eucalanidae.....	44	40. <i>Chirudina Streetsi</i> Giesbr.....	141
5. <i>Rhincalanus nasutus</i> Giesbr.....	44	41. — <i>pustulifera</i> G. O. Sars.....	145
6. <i>Eucalanus elongatus</i> Dana.....	48	42. — <i>abyssalis</i> n. sp.....	147
7. — <i>attenuatus</i> Dana.....	52	43. — <i>notacantha</i> G. O. Sars.....	148
8. — <i>crassus</i> Giesbr.....	53	44. — <i>parvispina</i> Farran.....	151
Paracalanidae.....	54	<i>Valdiviella Steuer</i>	154
9. <i>Paracalanus parvus</i> Claus.....	54	45. <i>Valdiviella insignis</i> Farran.....	154
Pseudocalanidae.....	57	Euchætidae.....	157
10. <i>Pseudocalanus minutus</i> Kr.....	57	<i>Euchæte Philippi</i>	157
11. <i>Microcalanus pygmæus</i> G. O. Sars.....	66	46. <i>Euchæte norvegica</i> Boeck.....	158
12. <i>Clausocalanus arcuiformis</i> Dana.....	68	47. — <i>tonsa</i> Giesbr.....	166
13. <i>Spinocalanus abyssalis</i> Giesbr.....	69	48. — <i>glacialis</i> Hansen.....	169
14. — <i>magnus</i> Wolf.....	72	49. — <i>Farrani</i> n. sp.....	172
Aetidiidae.....	72	50. — <i>barbata</i> Brady.....	174
15. <i>Aetidius armatus</i> Boeck.....	75	51. — <i>Sarsi</i> Farran.....	177
16. <i>Chiridius armatus</i> Boeck.....	77	52. — <i>Scotti</i> Farran.....	179
17. — <i>nasutus</i> n. sp.....	81	53. — <i>Hansenii</i> n. sp.....	181
18. — <i>modestus</i> n. sp.....	82	54. — <i>Bradyi</i> n. sp.....	182
19. — <i>obtusifrons</i> G. O. Sars.....	83	55. — <i>bisinuata</i> G. O. Sars.....	183
20. — <i>gracilis</i> Farr.....	85	56. — <i>gracilis</i> G. O. Sars.....	185
21. <i>Aetidiopsis rostrata</i> G. O. Sars.....	86	57. — <i>acuta</i> Giesbr.....	187
22. <i>Udinopsis armatus</i> Vanh.....	88	58. — <i>hebes</i> Giesbr.....	188

	Page		Page
Scolecithricidae	189	Phaënnidae	222
59. Scaphocalanus magnus Th. Scott	189	71. Cornucalanus chelifer Thomps.	222
60. — brevicornis G. O. Sars	192	72. Onchocalanus magnus Wolf.	225
61. — obtusifrons G. O. Sars	194	73. — cristatus Wolf.	228
62. — validus Farran	198	74. — hirtipes G. O. Sars	231
63. — globiceps Farran	199	75. — affinis n. sp.	233
64. — robustus Th. Scott	202	76. Xanthocalanus Greeni Farran	235
65. Scolecithricella minor Brady	204	77. — pinguis Farran	236
66. — Ingolfii n. sp.	207	78. — claviger Th. Scott	239
67. — ovata Farran	208	79. — hirtipes Vanh.	241
68. Lophothrix frontalis Giesbr.	211	80. Phaëna spinifera Claus.	241
69. Scottocalanus Thorii n. sp.	215	List of Literature	245
70. — securifrons Th. Scott	220	Explanation of the plates	249

Introduction.

My studies on the Plancton-Copepods, brought home by the Danish Ingolf Expedition, which were commenced about 1904, have been delayed for several reasons, of which the three principal ones are: in the first place that I for several years was occupied with other topics, in the second place that the rich collections of The Thor Expedition from the waters around Iceland as well as those of the Danish Expedition to East Greenland 1900 have greatly added to the work to be done; the third reason is, that it was my intention to give so full an account of each species as possible, not only of the adult males and females but also of the different stages of Copepodites.

On the Material.

The principal source of material was that of the "Ingolf" 1894 and 1895; the investigation of this expedition "extended over the eastern part of the seas along the west coast of Greenland from a point a little north of the polar circle to about 58° L. N., two degrees south of Cape Farewell, from there in a north-easterly direction towards Iceland, the waters round this island and between Iceland and the Færoes, lastly eastwards to a line drawn almost due north from the Færoes to Jan Mayen". The above quotation is from Hansen's Crustacea Malacostraca I of the Ingolf-Expedition vol. III 2 1908, to the introductory remarks of which paper I partly refer. The southern limitation in the Atlantic was about 60° L. N.

Comparatively few specimens were taken with the trawl; a good many of the samples were gathered with ordinary vertical nets (P and V) in a depth lying between 50—300 fathoms and the surface and a few ones with a closing net in considerable depth; numerous samples were taken at the surface with net marked Pl, Apst and Cyl during the voyage. The Ingolf collections give a very good picture of the plankton copepods, the big as well as the small species, but only down to a depth of 300 fathoms; the deeper layers of these regions are, as shown by the Thor, populated by numerous species, which were not taken by the Ingolf, at least as far as the Atlantic South and west of Iceland is concerned. It is a pity that no deep hauls were made on the West Coast of Greenland; an Atlantic fauna, identical with that mentioned, should certainly be found here. It is rather interesting that in one of the few samples, taken with a closing net at a considerable depth near Jan Mayen St. 118 a new species *Euchæte Bradyi* was found and in another a single specimen of so scarce a species as *Scaphocalanus brevicornis* G. O. Sars was secured.

The Ingolf's material from the Atlantic, rich in specimens, of the bigger as well as the smaller species, which inhabit the intermediate as well as the upper layers, is in a useful way supplemented

by the material gathered by the investigation-Steamer »Thor«, the leader of which was Dr. J. Schmidt, in the year 1903—1905. The region investigated by the Thor is the eastern part of Denmark Strait, the Atlantic South of Iceland, the Iceland-Færoe Channel, a few Stations North-east of Iceland and outside the Ingolf area, the Atlantic, South West of the Færoes. The hauls of the Thor were made with the young-fish trawl from the surface down to a depth of nearly a thousand meters (length of the wire out about 1800 meters.)

As the meshes of the young-fish trawl were rather wide, and as I have only examined few of the surface samples, the Thor material gives a rather onesided picture of the fauna of pelagic Copepods from these tracts. Several of the Copepods from the Thor were by Dr. Ove Paulsen sent to Professor G. O. Sars for determination; to the former of these gentlemen I am indebted because he kindly lent me these specimens, to the latter, one of the first authorities on the Copepods, for much useful information.

The third Danish Expedition to East Greenland under the leadership of the captain in the navy Amdrup and with the late mag. sc. Søren Jensen as zoologist in the year 1900 has gathered numerous samples during the journey. Surface samples were gathered each hour, day and night, from $19/6$ — $25/6$ in the western part of the Norwegian Sea from 60° L. N. 3° L. E. to near Jan Mayen; from $27/6$ — $10/7$ during the Journey from Jan Mayen to near the East Coast of Greenland (at about 72° L. N. 21° L. W.) in water, which often contained Scattered Ice. During the journey home from $30/8$ to $30/9$ samples were taken generally each second hour of the day in the ocean North-West of Iceland, in Denmark Strait and in the Atlantic South of Iceland as far South and East as 59° L. N. 0.52 L. W.

These surface samples (marked A, B, C, but generally F) as a rule only contain comparatively few specimens and species, but they give nevertheless a very good impression of the diurnal variations in the occurrence of the most common species *Cal. finmarchicus* at least at the surface. The mentioned Expedition has at Jan Mayen as well as near the Coast of East-Greenland taken some vertical hauls with the closing net at moderate depth.

In addition to these I have examined a few samples from East Greenland collected by cand. E. Bay and Dr. H. Deichmann.

Our museum contains a good many samples containing Plancton-Copepods, from the west Coast of Greenland, collected by Bergendal and W. Lundbeck, as well as from the waters around Iceland, brought home by mag. sc. R. Hørring, A. Ditlevsen, W. Lundbeck and Lieutenant in the navy E. Jensen.

To discuss the number of species, which has been found in each of the explored regions by the different Expeditions as well as other questions concerning the distribution of the species, will more naturally fall within the next volume of this paper, which will deal with the *Calanoida heterarthrandria*; in the next volume I hope to be able to publish a list, showing the number of species and the proportionate number of the specimens of each successive stage occurring at each Station.

At present I am only going to say a few words about the number of species brought home by each Expedition. I have altogether examined 79 species, which probably belong to the region;

among these 13 were new to science. The Ingolf has only collected 21 species of which 3 were new, the Thor has collected 69 different species (8 however outside the area explored by the Ingolf), of which 11 were new, and the Danish East Greenland Expedition 1900 has only taken 13 different species, of which only one has not been recorded previously. Of the *Calanidae* and related families the Ingolf has taken 7 species, the Thor 9 and the Ø.Exp. 1900 5, of the *Aetidiidae* the three expeditions have taken 6, 29 and 3 species respectively, of the *Euchaetidae* the Ingolf has taken 4, the Thor 12 and the Ø.Exp. 3 species and of the *Scolecithricidae* the three expeditions have taken 4, 19 and 2 species respectively. Of species, which by previous authors were recorded from the examined region, only a single one *Udinopsis armata* Vanh. was not taken by any of the expeditions.¹⁾

On the Literature.

Without underestimating the fine papers by E. Canu and Th. Scott, it must be admitted, that Giesbrecht and G. O. Sars are the two modern zoologists, who have contributed most to the knowledge of the Plancton-Copepods. The work of the former indicates a new epoch in the studies of these animals; unfortunately the arrangement of the topics in his main paper is so unpractical, that it is often very difficult to derive full advantage from the vast amount of information, which is found in it. Giesbrecht has sometimes been blamed for giving unnecessarily many details for the definition and understanding of the species. I do not share this opinion, as it sometimes occurred to me, that details necessary for the limitation of two nearly related species were wanting in his description. G. O. Sars has in many ways contributed greatly to the study of the Copepods as well as to that of the other Crustacea; his descriptions are lucid and supported by numerous practically arranged figures, but might sometimes be a little more exhaustive.

In the last ten years numerous Plancton-Copepods have been described from the deeper layers of the North-East Atlantic as well as from other ocean tracts; the three principal authors, who have described these species are Farran, Wolfenden and A. Scott. The papers of the first of these naturalists have a direct bearing upon the Ingolf-Investigations; he has given good descriptions of numerous new species and most useful information about the Copepod-fauna of the Atlantic Slope of Ireland. Wolfenden's papers often include a number of useful characters and details, supported by beautiful drawings, but he does not always seem to have accepted the classic rules of nomenclature. A. Scott's main-paper on the Copepods of the Siboga Expedition, which only partly falls within my sphere, contains most useful lists of synonymy, descriptions of numerous new species and several new characters; his descriptions are according to my opinion often a little too meagre for the definition of nearly related species.

When speaking of the studies on the Plankton-Copepods of later years, I think a few words may be added about a most useful paper by Koefoed & Damas on the collections brought home by the duc d'Orléans. It may perhaps be allowed to set forth a few words of criticism. It is a pity that the authors have not wished under each species to give a full account of the biological facts,

¹⁾ Wolfenden (1904 p. 112) has from the cold area of the Færoe Channel mentioned four species viz: *Bradyidius armatus* Gbt., *Udinopsis bradyi* G. O. Sars, *Bryaxis brevicornis* Farr., *Ctenocalanus vanus* Gbt. and *Scolectrix similis* Gbt., but as they are all found south of the 60° L. N. I have not included them in this paper. The same is the case with *Oothrix bidentata* Farr. which according to the duc d'Orléans was secured at 75° L. N. 14° L. W., somewhat north of the area, included in this paper.

In front of the labrum a sometimes hairy protuberance is found; this was by Sars in *Euchæte* designated the *epistoma*; I have in this paper followed him, where the organ belonged to the somite of the antennae. The *labrum* proper, which is placed in the mandibular somite is often subdivided and has in the *Euchætidae* and *Scolecithricidae* its free or anterior surface more or less hairy, in a way that often is of systematic importance (cf. pl. VI fig. 2 b, 7 a, 14 a and pl. VII fig. 5 e, 9 b and 7 c); along the hinder margin of the labrum, separating the anterior and the oral surface, marginal bristles are always observed (pl. II fig. 3 b; pl. IV fig. 5 e). The *oral surface* is adorned with a more or less developed chitinous framework, to which longitudinal muscles are fastened; this system is by comparison with fig. 7 f. pl. II and fig. 2 a and 5 e pl. IV seen to be differently developed in the different forms. Along the median line three central circular spots, in the middle with two parallel lines, as well as a fourth more posterior one, with a lateral one on each side are found; laterally a few spots, which may perhaps be regarded as muscular spots, are observed (cf. pl. IV fig. 5 e). About the nature of these four central circular striated spots I do not know anything; they are certainly not muscular spots, perhaps sensory ones. Around or behind the fourth spot a bigger or smaller transverse row or area of spines or bristles is observed; the systematic importance may be realised by comparing fig. 2 a and 5 e pl. IV. The oral surface of the labrum is on each side near the middle adorned with a lateral longitudinal series of bristles or spines, which is again dissolved into five groups, the more detailed variations of which show interesting differences between species and genera, as seen in numerous figures (pl. I—VII).

The *labium* is gradually fused with the posterior wall of the pharynx; it is generally adorned with curious structures. In the middle a compactness in the chitinous skeleton the »*lamina labialis*« is found; in front it is not well separated from the wall of the pharynx, but its hinder margin seems to be partly free, and shows many variations, as seen by comparing the figures (pl. II fig. 7 f, 2 a and 3 c; pl. III fig. 5 e; pl. V fig. 26; pl. VI fig. 3 b, 11 b and 13 b); in the *Scolecithricidae* this organ seems to be wanting or poorly developed (pl. VII fig. 4 e and 7 d).

Laterally to the *lamina labialis* on each side a longitudinal row of 6 generally well articulated spines is found. I have designated it the *serrula sexdentata*, and as it was found in all the examined genera except *Candacia* and *Heterorhabdus* within the Calanoida, but not in any of the few genera of other groups, which were examined, it is certainly of some systematic importance. In front of the *lamina labialis* and the *serrula*, curved longitudinal rows of bristles or granules are found, which as seen in the figures show specific as well as generic differences (pl. I fig. 1 c; pl. II fig. 2 a; pl. III fig. 5 e; pl. IV fig. 1 c, 2 c and 3 d; pl. V fig. 2 b and 4 c; pl. VI fig. 1 b, 2 d, 3 b, 5 a and 10 b and pl. VII fig. 2 c, 4 e and 12 c). Behind the *lamina labialis*, more or less well developed areas, covered with granules or spines are found (pl. II fig. 7 f.). The *labial lobes* as well as the area between and behind are covered with series of delicate hairs; the arrangement of these series is different in the various genera, but these differences are probably modifications only of a general system (cf. pl. II fig. 7 f; pl. IV fig. 1 d, 4 c and 5 g; pl. V fig. 1 c and 5 f; pl. VI fig. 5 b). Behind the area *labialis* in the maxillular and maxillar somites an intricated system of hairy areas is sometimes found, f. inst. in *Calanus hyperboreus* (pl. I fig. 1 d).

In the literature I have found a good description of these organs in *Laophonte* and *Hersiliodes*

(Canu 1892), but their structure is quite different from the one described; lately I have examined the labrum and labium in two genera of the *Harpactoida*, in *Oncaea* and in *Oithona*, but only in the latter genus found a structure not quite dissimilar to the one described.

In the nauplius of *Calanus* I have not yet succeeded in elucidating the structure of these organs; in the first postlarval stage of *C. finmarchicus* the structure is in its main feature like that of the adult one.

The structure of the mouth organs in the males is, in species in which the oral appendages are not reduced, scarcely different from that of the female, but in other forms, it is more or less reduced (cf. pl. IV fig. 1 e; pl. VI fig. 3 e).

From the above it seems to me to be evident that the study of these organs in different forms is of no mean importance.

On postlarval development.

Most modern authors, who have studied the Plancton-Copepods from the systematic point of view have only paid attention to the adult males and females, even when younger specimens were present; in later years Oberg has given a description of the larval stages in several species and Kraeefl has paid much attention to the postlarval development in a very interesting paper; Damas, Paulsen and Stephensen have for single species contributed to our knowledge of the development. It is generally understood that Grobben is the first who has described the nauplius in *Calanus finmarchicus* and that Gran was the first to give an account of the postnaupliial development; both statements are wrong, as Krøyer, as early as the year 1847, followed the development of *Calanus finmarchicus* from the nauplius to the adult (or more correctly the penultimate stage). In this paper I have not dealt with the larval forms, but I have tried and generally succeeded in determining the postlarval stages; I have named the first postlarval form stage I, and the adult male and female stage VI. About the differences between the different stages in each species, and the reductions in the limbs I refer to the systematic part; the most complete account is found in the description of *Cal. finmarchicus*. The mouth-organs are generally not reduced in the Stages IV—V; the number of setae in the exopodite of the maxillulae forms an exception to this rule. In the adult female the number is 11, in stage V it is 10, in stage IV it is 9, in stage III it is 8, in stage II it is 7 and in stage I probably 6. The main differences between the stages is found in the number of natatory legs and number of somites of the urosome.

Nomenclature.

In the naming of the different appendages I have followed Hansen as well as Giesbrecht, who somewhat later arrived at the same result. Hansen has shown that the *antennae*, *mandibulae* and *maxillipeds* really have threesegmented basipodites. The structure of the *maxillulae* in *Valdiviella insignis* shows clearly, that the basipodite of these limbs are threesegmented; the first basal segment is adorned with the *Li* I; the second bears the *Le* and a single *Li* (II ∞ III); the third basal segment which is distinctly articulated to the preceding one, supports the two rami. The natatory legs ap-

parently have only two basal segments; but according to Hansen the first basal segment of the natatory legs is probably fused with the complicated chitinous system of the ventral surface; if this is right, the first basal segment of the authors is really the second, and the second the third. In the description I have followed this nomenclature; the last basal segment is accordingly designated the third one (corresponding to the second one of most authors in the antennae, mandibulae, maxillulae, maxillipeds and natatory legs); the second basal segment in my description corresponds to the first one of most authors in the maxillipeds and natatory legs; the second basal segment of the mandibulae and the first one of the antennae are as show by Hansen poorly developed.

About the different abbreviations used in this paper I refer to the following list.

Plancton nets used by the Ingolf.	species are those used by Giesbrecht and following authors.
V signifies the big vertical plancton net.	Basp. I—III = The first, second and third basepodite.
V ¹ — the smaller one.	Ri = Ramus internus.
V ² — net with different width of the meshes.	Re = Ramus externus.
P ¹ — Apstein's vertical net (Nr. 20).	Ri I—III and Re I—III signifies the number of the segment of the endopodite or exopodite.
Apst. = A. The same net used in the surface.	∞ signifies that two segments are fused e. g. Re II ∞ III and segment 8 ∞ 9 of the antennulae.
Pl. — Surface plancton net.	Si = an interior seta.
Cyl. — Cylindric net.	Se = an exterior seta.
Closing net is the net of von Petersen-Chun, modified by Hensen.	Sp = a posterior seta.
Yt is the abbreviation of the youngfish trawl used by the Thor.	Sa = an anterior seta.
Ø. Exp. 1900 is the abbreviation of The Danish Expedition to East Greenland in the year 1900.	Spr = a proximal seta (antennulae).
A. B. C. D. E. and F. are the different kinds of surface nets used by this expedition.	Sd = a distal seta (antennulae).
f♀ = adult female.	St = a terminal seta (Re III pes I—V).
f♂ = fullgrown male.	L or Lob = lobe.
Y = a young specimen.	Le or Li = Lobus externus or internus.
St. = the stage.	Sp = Spermatophores. Sp. within a bracket indicates that specimens, bearing these structures, were secured.
St. I—VI signifies the postlarval development; St. I is the youngest first postlarval stage and St. VI is the adult male or female.	Sin. and dext. means sinister and dexter.
The abbreviations used in the description of the	

On the description of species.

As I have personally examined all the samples from the three expeditions myself and have picked out a fairly big number of specimens, generally more than a hundred, if so many were present, adult as well as young ones, I think that we get a fairly good impression of the proportion between the different stages; Paulsen has as far as *Calanus finmarchicus* is concerned picked out a hundred specimens to get an impression of the proportional distribution of the stages. In the systematic part I have given an almost complete description of the species, which were only imperfectly described; in cases, in which good descriptions have been given by previous authors, I have only added features, overlooked, or differing from existing description. Not only the males and females of the last stages

have been described, but also the younger stages, as far as they showed features of any interest. The descriptions are as a rule rather long, partly on account of the new characters, which are taken into account, partly because it often struck me, that existing descriptions were often too wanting in details for a sure definition of nearly related species.

Under each species is found a list of synonymy, which I have tried to make as complete as possibly for the years after the publication of Giesbrecht's classical paper; for each species I have given the measurements of each examined stage.

After the description is added a few words of the variations and parasites, if any have been observed. Under occurrence I have only given my personal observations, but under distribution I have dealt with the facts, previously published, relating to the occurrence of each species within as well as outside the explored area. Under remarks the whole systematic position of the species is discussed.

On variation and parasites.

In a good many species viz: *Rhincalanus nasutus*, *Eucalanus elongatus*, *Paracalanus parvus*, *Pseudocalanus minutus*, *Chiridius armatus*, *Gaetanus Kruppi*, *G. pileatus* and *G. latifrons*, *Euchirella rostrata* and *curticauda*, *Euchæte tonsa* and *barbata* and *Scaphocalanus magnus* variations of different kinds were observed; most common is variation in a rudimentary fifth pair of legs and in the structure of the setae of the furcal branches; several of the variations are probably due to traumata and regeneration, others certainly represent a kind of atavism. To study the whole question of variation within the Copepods or to collect all the published facts (cf. Wolfenden and Steuer) does not lie within the frame of this paper. But as such facts are rather scarce, and as they may be important for a future student of these topics, it seems to me to be the duty of each observer to make his personal observations known, even if they are fragmentary. Negative statements are seldom of much value; but nevertheless I think it rather curious, that abnormal segmentation, which is fairly common in the Arachnids, Insects and Annelids, was never met with in any of the examined, I think several thousand, Copepods; to my knowledge no case of abnormal segmentation has been observed in any of the Crustacea.

In several species parasites of different kinds have been observed; I refer to the description of *Rhincalanus nasutus*, *Chiridius armatus*, *Gaidius tenuispinus* and *brevispinus*, *Gaetanus Kruppi*, *pileatus* and *latifrons*, *Undeuchæte superba* and *Chirudina notacantha*.

Fam. 1. Calanidae.

1. *Calanus finmarchicus* Gunnerus. (Textfigs 1—5).

1765.	<i>Monoculus finmarchicus</i> n. sp. Gunnerus, pp. 175, fig. 20—23.	1903.	<i>Calanus finmarchicus</i> Gunn. I. C. Thompson, p. 15.
1842—1845.	<i>Calanus spitsbergensis</i> n. sp. Krøyer, pl. 41, figs. 1 a—n.	1903.	<i>Calanus helgolandicus</i> Claus. G. O. Sars, pp. 11—12, pl. IV.
	<i>Calanus affinus</i> n. sp. Krøyer, pl. 41, fig. 5.	1903.	— — — Thompson & Scott, p. 241.
	<i>Calanus quinqueannulatus</i> n. sp. Krøyer, pl. 41, fig. 3.	1904.	<i>Calanus finmarchicus</i> Gunn. Wolfenden, pp. 126—127.
1849.	<i>Calanus spitsbergensis</i> Kr. Krøyer, pp. 531—542, p. 552.	1905.	— — — G. O. Sars, p. 1.
	<i>Calanus affinis</i> Kr. Krøyer, pp. 544—545, p. 553.	1905.	— <i>helgolandicus</i> Claus. G. O. Sars, p. 1.
	<i>Calanus quinqueannulatus</i> Kr. Krøyer, pp. 545—546, p. 553.	1905.	— — — Th. Scott, pp. 221.
1863.	<i>Cetochilus helgolandicus</i> n. sp. Claus, p. 171, pl. XXVI, figs. 2—9.	1905.	<i>Calanus finmarchicus</i> Gunn. Farran, p. 30.
1886.	<i>Calanus finmarchicus</i> Gunn. H. J. Hansen, pp. 255—256.	1905.	— — — Damas, pp. 1—23.
1892.	<i>Calanus finmarchicus</i> Gunn. Canu, p. 170, pl. I; figs. 13—19.	1905.	— — — Esterly, pp. 125—126; fig. 1.
1892.	<i>Calanus finmarchicus</i> Gunn. Giesbrecht, p. 89, taf. 6—8.	1906.	<i>Calanus septentrionalis</i> Goodsir. Norman & Scott, p. 126.
1897.	— — — Vanhöffen, p. 278, pl. I fig. 7.	1906.	— <i>helgolandicus</i> Claus. Pearson, pp. 4—5.
1898.	— — — Aurivillius, pp. 67—69.	1906.	— <i>finmarchicus</i> Gunn. Paulsen, pp. 1—21.
1898.	— — — Giesbrecht - Schmeil, pp. 14—15.	1906.	— — — Williams, pp. 639—640.
1899.?	— — — Brady, p. 32.	1907.	— — — Damas & Koefoed, pp. 382—93; 405.
1899.	— — — T. Scott, p. 90.	1908.	— — — v. Bremen, pp. 7—8; fig. 1.
1900.	— — — Wheeler, pp. 164—165, fig. 1.	1908.	— <i>helgolandicus</i> Claus. v. Bremen, pp. 8—9; fig. 2.
1900.	— — — G. O. Sars, p. 2.	1908.	— <i>finmarchicus</i> Gunn. Farran, p. 20.
1901.	— — — T. Scott, p. 338.	1910.	— — — Steuer, p. 21.
1902.	— — — Gran, pp. 56—65.	1910.	— — — Sharpe, pp. 409—410.
1902.	— — — Mrázek, pp. 503—519, figs. 1—4.	1911.	— — — Farran, pp. 83—89.
1903.	— — — Jensen, Johansen & Levensen, p. 303, tab. I.	1911.	— — — Esterly, pp. 140—151.
1903.	— — — G. O. Sars, pp. 9—11, pl. I—III.	1912.	— — — Esterly, pp. 282—295.
		1913.	— — — Stephensen, pp. 308—310.
		1913.	— — — Stephensen, p. 71.

Giesbrecht refers this species to *Monoculus finmarchicus* Gunnerus, (p. 32—33). Krøyer (1848 p. 528) has already shown that Gunnerus species was a *Calanus*, but he thinks that the description is too incomplete for a sure identification. In contrast to Giesbrecht I think that it is quite impossible to tell if the species belongs to *Cal. finmarchicus* or to young specimens of *Calanus hyperboreus*. The one figure in natural size shows a small animal (c. 2 mm. long) even less robust than most specimens of *C. finmarchicus*; this figure and the author's remarks about »quite small animals« certainly speaks against its identification with *Cal. hyperboreus*, but the remark about, the very pellucid, shining colour without indication of the reddish tint which is most often found in *Cal. finmarchicus*, especially the antennulae, does not bear out the same opinion. The biological conditions under which the two species are found in the polar region, are almost identical, and do not allow any conclusion. But as the name *Cal. finmarchicus* has been once recognized, and as it cannot with better, probably with smaller, right be applied to *Cal. hyperboreus*, I think it right to follow Giesbrecht. In other respects as far as the synonymy is concerned I refer to Giesbrecht; as I have however

As I have had the opportunity of examining Krøyer's original specimens of *Cal. carinatus* and *cristatus*, I think that a few words of their systematic position would not be superfluous, even if these species belong to another geographical region.

Calanus carinatus Krøyer.

1849. *Calanus carinatus* n. sp. Krøyer, p. 554.
 1856. — *brevicornis* n. sp. Lubbock p. 11.
 1860. — — — Lbk. Lubbock, p. 117.
 1892. — — — Lbk. Giesbrecht, p. 90; taf. 6, 7, 8.

Of this species Krøyer has examined a single not very well preserved adult female from the coast of Brazil. In spite of the differences enumerated below I think it is identical with the midatlantic species, which Giesbrecht has referred to *C. brevicornis* Lubk. The total length was $2.0 + 0.6 = 2.6$ mm. The marginal frontal keel is more prominent than figured by Giesbrecht (t. 6, fig. 7) and the rostral spines are more stiff, but the lateral outline of the labrum shows the same characteristic structure as figured by Giesbrecht. The fourth abdominal somite is dorsally 1.2 as long as the fifth one as shown in Giesbrecht's fig. 18, but in contrast to his text, in which he writes that the fifth somite is a little longer than the fourth.

The antennulae extend a little beyond the tip of the fourth abdominal somite; the segment VIII—IX are less well separated than the rest. The distal setae of segm. VIII and XII are not spinelike. The measurements are at least different from Giesbrecht's figure of the male (taf. 8 fig. 5); the segment 24 is a little shorter than the 23, which is scarcely as long as the 22. The 25 segment is rather mutilated, but seems scarcely to be half as long as the preceding one.

No marginal setae were found along the inner margin of the second basipodite of the pes II, IV and V, and no teeth. The first Se of the Re III divides the outer margin in equal parts in the second pair of legs but in the fourth pair the portion, proximal to Se I is 1.7 (not 1.4 as in *brevicornis*) as long as that distal to it.

Calanus cristatus Krøyer.

1845. *Calanus cristatus* n. sp. Krøyer, pl. 41, figs. 6 a—k.
 1849. — *cristatus* Kr. Krøyer, pp. 546—550, p. 553.
 1884. — — — Kr. Poppe, pp. 282—286; taf. XX, fig. 1—6.
 1892. — — — Kr. Giesbrecht, p. 91, t. 6, figs. 14—15.

Of this species I have examined 14 young specimens (Krøyer's original ones), of which 12 belonged to perultimate stage and a single to stage IV. They were all rather mutilated, but nevertheless it is scarcely doubtful that Poppe's and Giesbrecht's rather imperfect descriptions refer to this species. Total length is 8.6 ($7.0 + 1.6$). Shape of the head is alike Giesbrecht (fig. 14—15); the lateral corners are rounded and not produced. The antennulae extend with the 25 segment beyond the end of the abdomen. The segment 8 ∞ 9 are only indistinctly separated and together just as long as the segment 21, which is 1.15 as long as the segment 22. The latter is 1.1 as long as the 23 and 25 segment, which is 1.3 as long as the 24. The mouth-appendages scarcely provide features of interest. The Ri of pes I—IV possess no Si. The Re III pes II is by the Se I divided into a proximal shorter and a distal almost 1.2 as long; the exopodites of the three last pair of legs are wanting. The inner margin of the first basipodite of the fifth pair of legs is smooth.

had the opportunity of examining Krøyer's original specimens of this species, I do not find it out of place to add a few remarks.

Krøyer's description and figure of *Cal. Spitsbergensis* apply without doubt to the mature females; his description is clear and remarkably exhaustive; he has seen and described the receptacula seminis; his original specimen is a *Cal. finmarchicus*. Krøyer's description and figure of *Cal. affinis* applies to young specimens (St. V), but of his 3 original specimens the two belong to the fourth stage. The description and figure of *Cal. quinqueannulatus* refer without doubt to the male of *Cal. finmarchicus*; Krøyer's original specimens were not preserved, but a number of specimens, determined by Krøyer as *C. quinqueannulatus*, were males of *Cal. finmarchicus*.

As Krøyer had unfortunately not examined mature specimens of *Cal. hyperboreus*, but only young animals, he was obliged to establish his species on specimens of stage V; accordingly he did not realise that the number of abdominal somites is not a systematic character, and was not able to understand the full cyclus of development from nauplius to fullgrown animal of *Calanus finmarchicus* ∞ *hyperboreus*. He realised that it was too difficult for him to distinguish the earlier stages of these two nearly related species. Starting from the stage V of *Cal. hyperboreus* he regarded the stage IV as the oldest larve; he has given fairly good figures and clear descriptions of stage I—IV; he has recognised the nauplius and metanauplius as forming part of this cyclus. I think that Krøyer was the first to set forth the almost complete development of one of the Calanoid; so full a description of several features does not seem to have been published for this species in spite of its importance (cf. Damas p. 8, who thinks that Gran is the first to recognise the larval stages).

As I have been obliged to examine a big number of specimens of this species from the wide area investigated by the Ingolf, the Thor and the East-Greenland Expedition, I have felt it necessary to try to solve the question whether Sars is right or wrong in establishing the two species *Calanus finmarchicus* and *C. helgolandicus*¹). According to Sars:

The female of the more southern form *C. helgolandicus* is about 3 mm. long, the male 2.8 mm., while *C. finmarchicus* is 4 and 3.6 mm. respectively; the former species is more narrow in form with more angularly produced head. The urosome is in *Cal. finmarchicus* about half the length of the metasome, and the caudal rami are somewhat longer than the anal somite, while *Cal. helgolandicus* has the urosome exceeding half the length of the metasome and the caudal rami scarcely longer than the anal segment. In *Cal. helgolandicus* the antennulae extend only 2 segments beyond the caudal rami but 3 in *Cal. finmarchicus*. The most important difference is found in the fifth pair of legs of the male, which are more asymmetrical in *Cal. helgolandicus* with the Ri sin. extending a little beyond the Re I (not beyond the middle of Re II) and with the Re III scarcely exceeding half the length of the Re II (not nearly so long).

The difference in size does not, as suggested by Sars, always correspond to a more northern or southern distribution as pointed out by several authors. Mrázek (p. 502) has in the same samples from Spitzbergen found mature females varying in size from 3.4 to 5.2 mm., Damas and Koefoed have from the same locality seen specimens varying from 3.2 to 5.4 mm. (cf. p. 382). Giesbrecht's spec-

¹) A name, which Norman & Scott with good reason propose to replace with *Cal. septentrionalis* Goodsir.

imens varied from 2.7 to 4.5 mm. I have found the same to be the case in several samples from the west coast of Greenland.

In a sample from Jakobshavn I found 100 specimens (f♀) varying in size from 3.3, 3.5, 3.8 to 4.1 and 4 specimens 4.6 to 5.3 mm. long; a young female from the same sample measured 3.9 mm., 19 young ones measured about 3 mm. From Ingolf St. 28 f♀ of size from 3.5 to 5.1 and young specimens from 3.5 to 4.8 were taken.

By comparing the length of the urosome and anterior portion in specimens from different localities and of different size etc. it was quite impossible for me to find any character of value. In specimens of f♀ from the west coast of Jutland (Thyborøn, Thor 17/3 04) the head was certainly more produced than in specimens taken 73° L. N. 8° L. E. by Johannes Petersen, but in the former the caudal rami were scarcely as long as wide, and a little longer than the anal somite, and in the latter distinctly 2.1 as long as wide. In 3 of the mentioned specimens from Denmark the antennulae reached three segments beyond the tip of the urosome, but in 2 other specimens two only; in specimens from Spitzbergen (c. 3.4 mm) they extended three segments beyond the end of the urosome, but in a big specimen from Greenland (5.3 mm) with the head even less produced than the specimens from Spitzbergen the antennulae extended only two segments beyond the urosome.

As far as the shape of the head is concerned the differences between the different types are better marked in the males than in the females; as far as the characters found in the fifth pair of legs are concerned I first tried like Mrázek to find a character in the variations of the spinulation of the inner margin of the second basipodite, but like him without success.

In Sars' figures of *C. finmarchicus* the pes V does not extend to the end of the abdomen; in none of my specimens the pes V is so short as figured by Sars; in all my specimens they extend to or almost to the end of the abdomen. In all the examined males (from Denmark, Greenland or Spitzbergen) except in a single one from Denmark, the Ri III sin. reached beyond the middle or almost to the end of Re II. In a single specimen from Denmark the Re II sin. was 1.7 as long as the Re III, but in most other specimens the Re II was 1.4 or 1.5 as long as Re III; the last segment differs from Sars' figures by a more or less marked rounded protuberance basally and inwards.

Scott (1905), followed by Pearson (p. 5), has accepted Sars' two species, but most authors agree in regarding the proposed characters as insufficient f. inst. Wolfenden (1904 pp. 126—127), Farran (1905 p. 30) and Gough (1905). Mrázek has (1902 pp. 502—506) without knowledge of Sars' point of view tried to solve the question. Without result he tried to find characters in the dentation of the inner margin of the first basipodite of the fifth pair of legs. He writes p. 504: »Etwas konstanter erwiesen sich die Längenverhältnisse der vorderen Antenne. Die Länge derselben ist der Länge des Körpers umgekehrt proportionell.« He also found differences of some value in the armature of the legs, and the relation between the length of the different parts of the body; but he rightly thought, that a detailed study of a larger material, consisting of specimens, originating from a different region of the ocean with statistical methods of studying the limit of variation, would scarcely solve the question, without at the same time studying material from well defined geographic regions. The question ought soon to be properly investigated, for if *Cal. finmarchicus* and *helgolandicus* should really be proved to belong to two different species, a good deal of the vast amount of knowledge

about the biology and distribution, collected in the last years, is in danger of losing considerably in value. All questions regarding development, propagation and distribution should in most regions be extremely difficult to investigate, if we instead of a single well defined species had two very badly limited.

Description ♂—♀. Size: ♀. 2.8—5.5 mm. ♂. 3—4.4 mm. (Smallest specimens Færoe Iceland Channel; largest Davis Strait).

The number of secretory pores scarcely differed in the males and females, or in specimens from different localities. In the first pair of legs no secretory pores were found; on the anterior surface of Ri I, at the base of Se, sometimes a minute pore (?) was seen. In pes II—V a minute pore was found on the anterior surface at the base of a minute Se of third basipodite; in the Re I—II a more or less distinct pore was found at the base of Se in the four last pair of legs, and a distinct one was found at the base of the Se 2—3 Re III, but in addition to these in the pes III—IV a pore was found corresponding to the missing Se I Re III, in pes II this pore was most often wanting. The shape of the labrum etc. (cf. textfig. 6) is somewhat different from Sars' fig. (pl. I). Between the insertion of the antennulae a small elevation is found, which by a transverse groove, less prominent than shown in the figure, is divided into a shorter anterior portion (a) and a longer posterior one (b). Separated from this by a narrow groove and between the insertion of the antennae a low elevation (c), slightly convex from before backwards and from side to side is seen. In front limited by a transverse groove, behind by the free posterior margin and laterally gradually continued into the transverse chitinous bar, situated between the articular cavity of the antennae and mandibulae respectively, the labrum proper is found. The mentioned chitinous bar is medially to the articular cavity of the mandibulae connected with the area labialis, thus forming the chitinous bed, in which the manducatory portion is situated (cf. Sars' fig. pl. II). The *labrum* proper has in front, in the middle, a prominent tumulus, beset with a number of long bristles directed backwards. On each side of the process an oblique series, directed outwards and backwards, sometimes fused with the lateral marginal row, is found; it consists of short spinelike hairs. In front of hinder margin on each side a group of fairly long setae, beginning in the middle and directed backwards and outwards, is observed and laterally a marginal row of rather short spinelike hairs is found.

The *oral surface of the labrum* shows an arrangement alike that of *Cal. hyperboreus* (pl. I fig. 1 b), but the enlarged group in front is less developed (differing on the two sides in the two examined specimens), the first group is converging anteriorly, the second group is medioconvex, well separated from the first group, but only indistinctly from the third one; the third to the fourth groups are partly fused and consist of several rows of hairs. Transversely between the last series only a few teeth are found.

The *lamina labialis* (textfig. 1), which seems to form a part of a transverse chitinous system, has posteriorly a median tooth, and on each side two or three teeth (often asymmetrical). In front of the lamina labialis a delicate granulation is found in the middle between a median series of shorter and a lateral of longer hairs. Behind the lamina and between the serrulae 6dentatae an outer group of fairly delicate hairs and a median one of thick granules, fused with a group between the labial lobes

are found. The arrangement of hairs on the labial lobes and the somites behind seems, as far as made out, to be like that of *Cal. hyperboreus*. In several specimens it was seen that the transverse line, which limits the maxillar somite posteriorly, is continued just in front of the articular cavity of the maxillipes and laterally into the membrane, dorsally and posteriorly limiting the head. Accordingly the first, thoracic somite bear two pair of limbs viz. maxillipeds and pes I, and thus corresponds to two somites (cf. Hansen 1893).

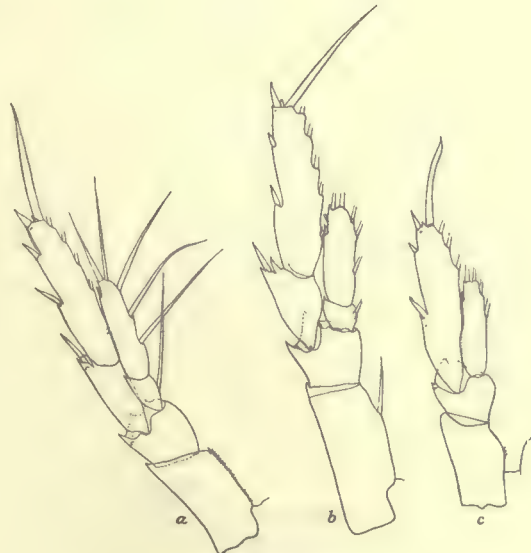
By examining females from Denmark I did not find any difference from those described except in the arrangement of the hairs of the ventral surface of the maxillar and maxillular somite, which is less complex than those figured.

The only difference between males and females seems to be the more prominent median process of the labrum in the former sex.



Textfigure 1.

Calanus finmarchicus G. ♀. Labial lobe seen from in front with lamina labialis and serrula 6dentata etc. \times c. 170.



Textfigure 2.

C. finmarchicus G. ♀. (Stage IV—V).
 a. Pes V sin. (stage V) in anterior view \times 85.
 b. Pes IV sin. (stage IV) in anterior view \times 85.
 c. Pes V sin. (stage IV) in anterior view \times 85.

Y. (St. V). Size: Varying from 2.2 (Egedesminde, Davis Strait), 2.5 (73' L. N. 8' L. E.) — 4.8 mm. (Davis Strait). Gran's specimens (\div urosome) varied from 2.1—2.6 and the specimens from duc d'Orléans 3—4.5 mm.

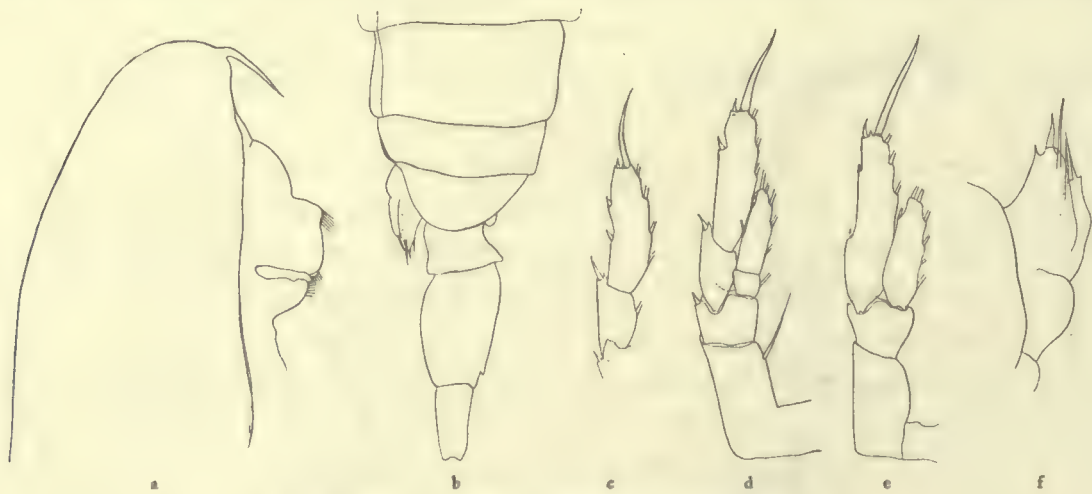
This stage, in which I have not been able to distinguish males and females, is easily distinguished by 4 abdominal somites of which the second is the longest, 2.7 as long as the first and 1.4 as long as the anal somite. The mouth-appendages are scarcely different except the maxillulae, which have only 10 instead of 11 setae in the exopodite. The four pair of natatory legs are scarcely different from those of the mature female, but pes V differs by fused Ri II—III without indication of Se II but with the number of Si 7 as usual, and by the fused Re II—III with 5 Si and well developed Se Re II (textfig. 2 a). Number of secretory pores seem to be alike ♀ in pes II—III, but

in pes IV no secretory pore corresponding to Se 1 Re III was seen and in Re II ∞ III pes V only a single pore is found at the base of Se 3.

The labrum shows in lateral view complete similarity to Sars' figure pl. I but has the anterior process less prominent than in most f-♀ examined by me.

Y. (St. IV). Size: Varying from 2 (63° 43 L. N. 0.26 L. E.), (1.8 + 0.6) = 2.4 (South West of Iceland), 2.6 (Davis Strait), 2.8 mm. (64° 56 L. N. 36° 19 L. W.) to 2.9 mm. (Jan Mayen). Gran's specimens (\div urosome) varied from 1.4—1.83 and specimens from duc d' Orléans from 2—3.5 mm.

This stage is easily distinguished by 3 abdominal somites, of which the third one is the longest, being 1.3 as long as the second one, and 2.6 as long as the first one. The number of setae in the furca is scarcely different. The antennulae (with 25 segments) and mouth-appendages (including



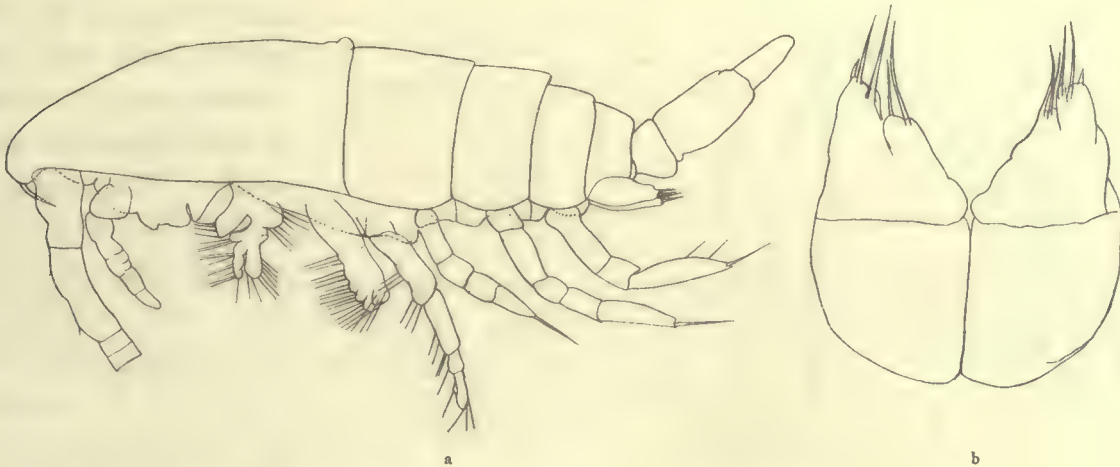
Textfigure 3. *Cal. finmarchicus* G. ♀. (Stage III).
 a. Head from the right. $\times 85$. b. Abdomen from the left. $\times 85$.
 c. Pes II dext. Re in post. view. $\times 110$. d. Pes III sin. in anterior view. $\times 110$.
 e. Pes IV sin. in anterior view. $\times 110$. f. Pes V sin. in lateral view. $\times 150$.

the labrum, exteriorly as well as in oral view) except the L_e of the maxillulae, which only possess 9 setae, are scarcely different from f♀. Pes I has the Ri II—III fused and an indistinct articular membrane between Ri I and II; the Re II—III are also fused but in other respects this appendage is scarcely different. Pes II—III have the same segments fused, the Se Ri II is missing, but Ri has 10 setae as usual; the Re II ∞ III have only 5 Si. The pes IV differs from the preceding pair by 8 setae only of Ri (textfig. 2 b). The pes V is more clumsy than in stage V with undivided Ri with 6 setae and undivided Re with 4 Si and 3 Se. The inner margin of basipodite II has 3 teeth (textfig. 2 c). Secretory pores are in pes II—IV wanting in Re III, corresponding to Se 1-2, but found at Se Re II and at Se 3 Re III; in pes V secretory pores are found at base of Se Re I and Se 3.

Y. (St. III). Size: Varying from 1.4 (Davis Strait), 1.7 (1.3 + 0.4) (63° L. N. 15° L. W.) — 2.4 mm. (Davis Strait). Gran's specimens (\div urosome) of his stage IV varied from 1.05—1.44 and specimens from duc d' Orléans 2—2.2 mm.

The body appears more slender than in the preceding stage; the urosome consists of 2 somites; the Se of furcal rami is missing (textfig. 3 a—b). The antennulae, which consist of 23 segments, extend 3 segments beyond the tip of the abdomen. The antennae and other mouthlimbs except the maxillulae, in which the Le has 8 setae and the Re 8, are scarcely different. The lateral outline of the labrum is as shown in textfig. 3 a like stage V, but the frontal protuberance is less prominent. The oral surfaces of the labrum and the labium are in their main structures alike f♀.

Pes I = St. IV. Pes II in main features alike St. IV, but Ri with 8 setae and Re II ∞ III, which is less slender, with 4 Si only (textfig. 3 c). Pes III is comparatively shorter than II, and the Re II ∞ III has only 2 Se (fig. 3 d). The pes IV (fig. 3 e) has no seta in basipodite II, 7 setae in unsegmented Ri and 3 Si + 3 rather short Se in Re. The pes V (fig. 3 f) is represented by a wide indistinctly divided basal part, which is distally attenuated, and here subdivided into longer outer branch with at least 3 setae decreasing outwards and a shorter inner branch with 2 fairly long setae. Secretory pores were with certainty only observed at the base of Se 3 Re II ∞ III in pes II—III.



Textfigure 4. *Cal. finmarchicus* G. ♀. (Stage II).
a. In lateral view × 85. b. Pes IV × 225.

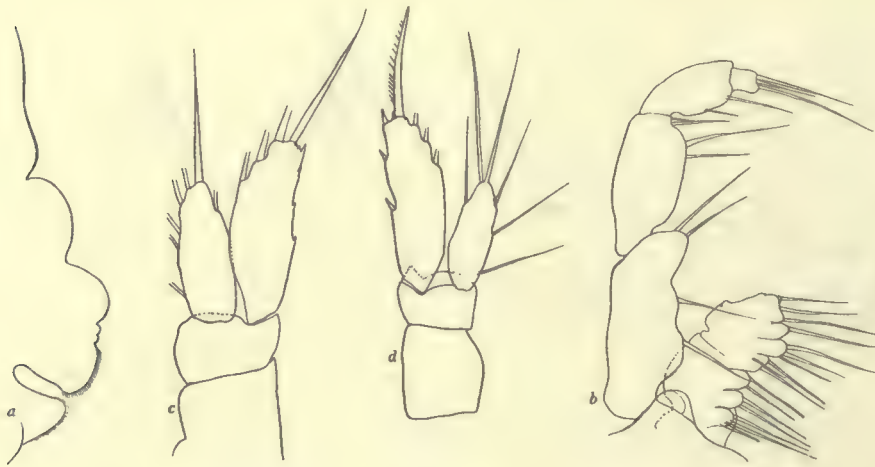
Y. (St. II). Size: Varying from 0.9 (S. W. Iceland), 1.1 (Davis Strait), 1.3 (1 + 0.3) (Jan Mayen) — 1.6 mm. (Jan Mayen). Gran's specimens (∴ urosome) of his stage V varied from 0.78—1.01 and specimens from duc d'Orléans from 1.4—1.8 mm.

The body is more slender than in the preceding stage (textfig. 4 a). The head is sometimes indistinctly separated from the first thoracic tergite, in addition to which 3 somites are found, of which the last one only bears a rudimentary pair of legs. The antennulae, which reach about one segment beyond the tip of the furca, consist of 18 segments only, as the segments proximal to the 11 are more or less fused. The antennae and mandibulae are practically alike those of the f♀. The number of setae of the maxillulae is comparatively small; Le has only 6 setae, Li I has only 10 spines, basipodite III has 3, Ri I 1, Ri II 2, Ri III 5 and Re 7 setae. The maxillae are in the main features alike the f♀. The maxillipeds are in shape alike the preceding stages, but the Basp. III has in the middle only 2 Si, as the basal one is wanting, Ri I has a single seta, Ri II (probably Ri II ∞ III) is rather elongate

with a median and a distal Si and the following segments are fused with 4 setae. The labrum is scarcely different from the preceding stage. Pes I is in the main structured as in the two preceding stages, but the Si of basp. II is very delicate, the Ri has a fairly well developed articular membrane between the Ri I and Ri II \approx III. The pes II is practically alike the pes III of the stage III, and the pes III alike pes IV (cf. fig. 3 e). The pes IV is alike the pes V of stage III and the pes III of stage I (textfig. 4 b).

Y. (St. I). Size: Varying from 0.8, 0.9 (0.7 + 0.2) — 1.1 mm. Specimens from duc d'Orléans were 1 mm.

The head is more produced than in the following stage without distinct filaments; behind the head 3 fairly distinct somites are seen in addition to the two somites of the urosome. The antennulae, which scarcely reach the end of the urosome, consist of 11 segments only; proximally 3 indistinct segments are found, the segments 11—18 are probably fused and the segments 19—25 are free. The



Textfigure 5. *Cal. finmarchicus* G. ♀. (Stage I).

a. Lateral view of the labrum $\times 225$; b. maxilla and maxillipes $\times 225$; c. pes I (perhaps somewhat flattened by the pressure of the glasscover) $\times 225$; d. pes II sin. in anterior view. $\times 175$.

antennae and mandibulae are practically as in f♀. The maxillulae are alike those of preceding stage but the number of setae seems to be somewhat smaller. The maxillae are in main as shown in textfig. 5 b alike f♀. The maxillipeds are even more reduced than in the preceding stage, as easily recognised by studying fig. 5 b. The Ri, which is only $\frac{2}{3}$ as long as the basipodite III, consists of the long basal segment with two 2 Si and shorter terminal segment with 4 setae.

The lateral outline of the labrum and labium are, as seen by comparing textfig. 5 a with 3 a, somewhat different from stage III, the longitudinal series of hairs on the oral surface are in the main arranged as in the preceding stages, but the hairs are very short. The lamina labialis, the longitudinal series of delicate hairs in front of it and the serrula sexdentata are scarcely different from preceding stages. The pes I fig. 5 c has 2 wide basal segments without Si. The undivided Ri has 7 setae and the Re has 3 Si and 3 Se. The pes II (fig. 5 d) is less slender but in other respects alike pes IV stage III. The pes III is alike pes V stage III. No secretory pores were observed.

Occurrence etc. *Calanus finmarchicus* Gunn. was, as there was good reason to expect, found all over the area explored by the different expeditions. As I have examined a great number of this species from several hundred of samples, I thought it worth while to examine the proportion of the different stages in each sample. As the number of specimens, which were originally picked out from

the samples, were not selected from this point of view, and as the instruments, by which the different hauls are made, are widely different, the results arrived at are only to be compared with caution, and are not expected to give more than an impression. For getting an exact knowledge of the vertical and seasonal distribution of a species like *Calanus finmarchicus*, we are obliged to have at our disposal numerous samples taken with a closing net at the different hours of the day, and in the succeeding months of the year at the same localities, scattered over a wide area. Most of the samples at my disposal are surface ones; the vertical hauls are not procured with a closing net. Like most expeditions in these regions the Ingolf Exp. etc. has only taken plankton samples in the months of the summer (May to September) and seldom in different months in the same region.

West coast of Greenland. The Ingolf Expedition has in the months of June and July 1895 taken several samples with *C. finmarchicus*.

Number of samples in which each stage occurred in 17 samples June and in 15 samples July.	St. VI ♂	June	0	July	4
	St. VI ♀		11		13
	V		7		12
	IV		9		13
	III		8		12
	II		6		8
	I		4		7

Table showing the proportion, in which the different stages were found.

Date 1895.	L. N.	L. W.	Station of Ingolf.	Depth in fathoms.	Temp. Surface.	Percentage of different stages.						Number of specimens examined.	
						St. VI		V	IV	III	II		I
						♂	♀						
18/6 4 p. m.	60°29	34°14	St. 19	V ¹ 300—0	9° C.	..	31	64	5	..	..	..	100
26/6 2 p. m.	63°30	54°25	St. 25	V ¹ 200—0	2·9° C.	..	17	24	19	15	13	12	200
26/6 3 p. m.	63°56 5	52°41	St. 26	V ¹ 20—0	2·9° C.	..	1	1	2	14	52	30	130
1/7 8 p. m.	65°17	55°42	St. 28	V ¹ 100—0	1·15° C.	..	1	21	57	20	1	..	65
5/7 3·30 p. m.	65°34	54°31	St. 29	V ¹ 50—0	3·5° C.	0·3	3	32	22·3	23·4	18	1	340
11/7 8·40 p. m.	66°35	55°54	St. 31	V ¹ 50—0	2·6° C.	..	0·3	0·3	18	36	45	0·4	230
6/7 11 p. m.		Holstensborg.	..	Pl. 31	1·5° C.	0·5	2	91·5	2	4	..	..	100
18/7 3 p. m.	65°17	54°17	St. 34	V ¹ 100—0	5·1° C.	..	4	15	20	30	29	2	50
28/7 7 p. m.	61°50	56°21	St. 19	V ¹ 100—0	8·5° C.	..	3	47	47	2	1	..	200

The following table shows the number of the mentioned 9 samples, in which a certain percentage of the different stages were found.

Stage.	VI	V	IV	III	II	I
Percentage.						
0%	0	0	0	1	2	4
0—5	7	2	3	2	2	3
5—10	0	0	0	0	0	0
10—20	1	1	3	3	2	1
20—50	1	4	2	3	2	0
50—75	0	0	1	0	1	1
75—100	0	1	0	0	0	0

From the above it is impossible to draw any conclusions except that all stages occur fairly frequently in the months of July and June. As mature males have been found in four samples (in addition to the 2 mentioned: 1/7. St. 27. 64°54 L. N. 55°10 L. W. V¹ 200—0 and 26/6. St. 26. Pl. 25. 63°57 L. N. 52° L. W.), in the month of July it is safe to conclude that propagating takes place at that date. From the North of Greenland Lundbeck and Bergendal have 1889 and 1890 (6/5—6/6) taken 7 samples, which all contained mature females. The other stages were less frequent. In the samples from August and September the mature were found in comparatively few samples; in the two examined samples, with numerous specimens, the stage IV formed the majority.

	Lundbeck 6/5—6/6 1889—90 7 Samples.	Bergendal 6—26/8 1890 8 Samples.	Bergendal Lundbeck. 6/9 14/9.		Percentage of each stage.						Number of specimens examined.
					VI	V	IV	III	II	I	
VI	7	3	....	Lundbeck 6/6 90. 65°27 L. N. 53°48 L. W.	20	0	19	27	27	25	> 100
V	2	5	2	Lundbeck 14/9 1890 Diskobay.	..	35	60	5	..	..	> 100
IV	4	7	2	Bergendal 6/9 1890 Diskobay.	..	14	81	5	..	..	> 100
III	2	7	2		..	..	..	..	..	..	....
II	2	5	....		..	..	..	..	..	..	....
I	2	1	....		..	..	..	..	..	..	....

Mature males were taken by Lundbeck 19/5 89 (57°08 L. N. 49° L. W.); females with spermatophores 23/5 89 (59°12 L. N. 52°05 L. W.). In addition to these localities, males were taken by Søren Hansen 18/7 85 (59° L. N. 51°18 L. W.), and males are mentioned under the name of *C. quinqueannulatus* by Krøyer from Greenland.

Denmark Strait. The Ingolf Expedition has 22/5—18/6 1895 and 25/6—28/6 1896 taken 28 samples containing *C. finmarchicus*. The different stages were distributed in the following way.

Stage.	Number of samples.	Date.	Ingolf.	Lat. N.	Long W.	Depth in fathoms.	Temperat. at surface.	Percentage of each stage.						Number of specimens.	Percentage of specimens in 5 samples.	Number of Samples.							
								VI		V	IV	III	II			I	VI		V	IV	III	II	I
								♂	♀								♂	♀					
VI	♂ 2 ♀ 24	6 1/2 p. m. 20/5 1895	St. 9	64°18	27°10	V ¹ 100—0	7.9° C.	2	28	7	13	23	23	4	c. 200	0	3	..	..	..	..	2	3
V	18	21/5 1895	St. 11	64°34	31°12	V ¹ 200—0	7.0° C.	1	70	16	6	4	1	2	175	0—5 6—10	2	3	2	1	2	2	2
IV	19	8.30 a. m. 5/6 1895	St. 16	65°28	27°05	Pl ¹ II	8° C.	..	1	27	48	20	4	..	70	11—20	..	..	1	1	2	..	..
III	18	4—6 p. m. 15/6 1895	..	63°43	24°20	Cyl. 10	..	..	3	6	74	17	..	..	86	20—50	..	1	2	1	1	1	..
II	9	3 a. m. 28/6 1896	St. 96	65°24	29°00	P. 100—0	7.9° C.	..	1.5	39	58	1.5	..	..	64	50—75	..	1	..	2	..	..	..
I	5	...	..	..	..	..	..	..	..	..	..	..	..	..	..	75—100	..	..	..	..	..	..	..

The S/S Thor has from 18—20/6 1904 taken 14 samples containing *Cal. finmarchicus* with the young-fish trawl from deep water, in addition to several from the surface, which have been examined by Paulsen (cf. 1906 p. 10).

The East-Greenland Expedition 1900 has in the Denmark Strait from $8/9$ — $22/9$ between 65° Lat. North and $62^\circ 45'$ Lat. North, and between 35 and 26° Long. W. taken 50 samples (F. 312—366), of which 30 contained *C. f.*; the hauls were made each second hour day and night at the surface.

Stage.	Number of samples.	1904.	S/S. Thor.	L. N.	L. W.	Depth in metres.	Percentage of each stage.						Number of specimens.	Percentage of specimens in 4 samples.	Number of Samples.							
							VI		V	IV	III	II			I	VI	V	IV	III	II	I	
							♂	♀														♂
♂ VI	9	19/6	St. 152	65°00'	28°10'	Yt. 200 M. Wire	6.5	57	36	0.5	..	..	..	130	0	I	..	..	4	..	..	..
♀ VI	14	20/6	St. 153	65°20'	27°12'	Yt. 800 M. Wire	11	60	27	2	..	..	..	100	0—5	3	..	I	2	..	..	..
V	10	20/6	St. 154	65°27'	27°10'	Yt. 15 M. Wire	..	97	3	..	..	..	..	130	6—10	I	..	I	..	..	..	..
IV	4	..	..	..	..	Yt. 75	1	92	7	..	..	..	..	100	11—20	I	..	I	..	..	..	..
	..	..	..	..	..	Yt. 80	4	78	18	..	..	..	..	175	20—50	..	..	3	..	..	..	..
	..	..	..	..	..	Yt. 800	2	52	46	..	..	..	..	100	51—75	..	3	..	..	..	..	..
	..	18/6	St. 149	65°52'	26°12'	Yt. 250	2	58	40	..	..	..	..	80	76—100	..	3	..	..	..	..	..

From the following list it seems to be fairly safe to conclude that the *C. f.* in the month of September is more common at night than in the day time at the surface, and that the stage IV—V is the most common. In no sample I have examined more than 30—40 specimens; in the few ones containing that number the percentage of the stage IV—V was greatest. Only a single fullgrown female was found in a day sample.

Stage.	Number of samples in which specimens of each stage were found.	The time at which samples were taken by the Danish East-Greenland Expedition 1900 from $8/9$ — $22/9$.	Number of samples without <i>C. f.</i>	Number of samples containing <i>C. f.</i>
VI	8	Taken between 4·05 morning and 7·55 evening	18	8
V	25			
IV	23	Taken between 8 evening and 4 morning	3	21
III	13			
II	7			
I	7			

For drawing any conclusion from the material from the Ingolf and the Thor Exp. at the present time the material is too scanty. But it can not be denied that the percentage of mature specimens is bigger in the August-June samples, and that propagating takes place about the month of June, as fullgrown males or females with spermatophores were found $16/6$ 1892 (Lundbeck Dyrefjord), c. $20/5$ 1895 and $20/6$ 1904; no males were found September 1900.

South of Iceland. In the Atlantic south of Iceland from about 28° Long. W. to the Færoe-Channel, and as far South as 60° Lat. North, the Ingolf Exp. has $12/5$ — $16/6$ 1895—96 taken about 55 samples containing *C. f.*, and in August 1895—1896 about 10 samples.

Date.	Ingolf.	L. N.	L. W.	Depth in fathoms and net.	Temp. at Surface.	Percentage of each stage.						Number of specimens.	Stages.	Number of samples in which each stage was found.							
						VI		V	IV	III	II			I	12/5-16/6	August					
						♂	♀														
4-8 a. m. 14/6 96	..	61°30'	27°25'	Cyl. 25	8.8° C.	..	4	..	30	60	6	..	109	♂ } VI	5	..					
7 p. m. 14/6 96	St. 83	62°25'	28°30'	P. 100-0	9.2° C.	..	..	10	13	5	22	50	60	♀ } VI	25	6			
11:50 p. m. 8/6 96	St. 73	62°58'	23°28'	V. 100-0	7.3° C.	..	0.5	6	11	63	19	0.5	135	V	39	10					
8 p. m. 8/6 96	..	..	..	Pl. 11	8.3° C.	..	..	2	38	48	12	..	217	IV	46	8
9/6 96	St. 74	62°17'	24°36'	Pl. 12	8.3° C.	..	..	4	7	81	4	4	100	III	38	5			
3:30 a. m. 3/6 96	St. 69	62°40'	22°17'	V. 100-0	?	..	..	15	29	51	5	..	100	II	30	6			
3 a. m. 3/6 96	St. 67	61°32'	22°29'	Pl.	8.6° C.	..	..	..	1	49	43	7	71	I	12	4		
10 p. m. 3/5 96	St. 62	63°18'	19°12'	Pl. 10	7.7° C.	..	..	20	39	40	1	..	136						
7:30 p. m. 1/6 96	St. 63	62°40'	19°05'	V. 100	8.3° C.	..	2	31	33	34	..	..	100						
3 p. m. 1/6 96	St. 64	62°06'	19°00'	A. 16	8.6° C.	9	49	34	8	..	178	Percentage of specimens in 19 samples.	Number of samples.						
3 p. m. 18/5 96	St. 54	63°08'	15°40'	Pl. 5	9° C.	..	2	2	32	9	33	22	233		VI	V	IV	III	II	I	
19/5 96	St. 55	63°33'	15°02'	V. 100-0	8.4° C.	1	..	28	21	27	21	2	100	♂	♀						
1 p. m. 16/5 95	St. 6	63°43'	14°34'	V. 50-0	?	..	76	4	5	13	2	..	168	0	15	9	3	..	1	3	9
3 p. m. 16/5 96	St. 53	63°15'	15°07'	V. 100-0	8.8° C.	8	10	61	21	70	0-5	2	5	6	2	1	4	3
8:30 a. m. 13/5 96	St. 49	62°07'	15°08'	V. 100-0	9.3° C.	..	29	2	7	16	25	21	77	6-10	..	1	4	7	2	2	3
? 15/5 96	St. 52	63°57'	13°32'	V. 200	8.3° C.	1	8	7	10	13	53	8	100	11-20	1	1	2	2	4	3	..
7 a. m. 20/5 96	St. 57	63°37'	13°02'	V. 100	8.2° C.	26	26	2	6	19	14	7	50	21-50	1	2	3	8	7	5	4
8 a. m. 20/5 96	St. 57	A. 11	8.5° C.	13	15	32	8	32	50	51-75	3	2	..
1:30 p. m. 9/8 96	St. 133	63°13'	11°24'	P. 100-0	10.8° C.	..	5	88	7	403	76-100	..	1	1	..	1

The Thor Expedition has in 1904, south of Iceland, taken 1 sample in May, 5 in July and 2 in September.

Stage.	Number of samples.			1904.	S/S. Thor.	L. N.	L. W.	Depth in metres.	Percentage of each stage.						Number of specimens.	
	24/5	2-11/7.	1-2/9.						VI		V	IV	III	II		I
									♂	♀						
♂	..	3	2	2/7	St. 171	63°46'	22°56'	?	11	52	37	..	..	..	..	70
♀	1	5	1	11/7	183	61°30'	17°08'	Yt. 1800M.W.	1	90	9	..	..	..	..	500
V	..	5	1	1/9	285	62°49'	18°46'	Yt. 100M.W.	2	89	9	..	..	..	..	100
IV
III	..	1	..	..	..	..	..	..	..	..	..	..	..	..	..	..
II	..	1	..	..	..	..	..	..	..	..	..	..	..	..	..	..
I

The East Greenland Expedition 1900 has south of Iceland (62°-60° Lat. N., 21°-8° Long. W.) from 23-28/9 (F 367-430) taken 63 samples of which 22, contained *C. f.*, but only a few specimens, seldom 20 and only once 46.

In addition to the localities mentioned, specimens in propagating have been found by Lundbeck $18/5$ 1890 $55^{\circ}25$ Lat. N. $29^{\circ}05$ Long. W. (5 ♂; 25 ♀; 5 (V); 15 (IV); 5 (III); 1 (II)), $11/7$ 1893 between Talkna and Arnarfjord (1 f♂; 8 ♀; 2 (III)).

Stage.	Number of samples containing the different stages.		The hours at which the samples were taken by the Danish East-Greenland Exp. 1900 $23-28/9$	Number of samples without <i>C. f.</i>	Number of samples containing <i>C. f.</i>
	4 ⁰⁵ a. m. —7 ⁵⁹ p. m.	8 p. m. —4 a. m.			
VI	7	7	Taken between 4 ⁰⁵ morning and 7 ⁵⁹ evening.	29	12
V	7	7			
IV	4	5	Taken between 8 evening and 4 morning.	12	10
III	4	..			
II	..	..	..	..	..
I	..	..	..	..	..

By S/S Thor several males and (St. 183) once females with spermatophores were found in July, and even $1/9$. By the Ingolf Expedition it has been found propagating in several samples from May 1896 and $6/6$ 1896 (Cyl. 12 $62^{\circ}17$ Lat. N. $28^{\circ}03$ L. W.).

When the material collected in May—June is compared with that collected August and September, one is struck by the fairly equal representation of the different stages in the spring, and by the preponderance of the stage V—VI in the August—September samples. When the difference between day and night-samples is compared with that from Denmark Strait, it is seen to be less marked; in the number of specimens of the different stages no marked difference was found day and night.

Iceland-Færoe-Channel. The Ingolf Exp. has South-East of Iceland in May 1895—96 taken 9 samples containing *Cal. f.* and in August 1896 7 samples.

Stage.	Number of samples.		Date.	Ingolf.	L. N.	L. W.	Depth in fathoms.	Temp. at surf.	Percentage of each stage.						Number of specimens.	
	May 1895—96	Aug. 1896							VI		V	IV	III	II		I
									♂	♀						
♂ } VI	4	1	$13/5$ 95 2 ¹ / ₂ p. m.	St. 4	$64^{\circ}07$	$11^{\circ}12$	V. 100—0	..	2	95	1	..	1	1	..	100
	11	5	$12/5$ 95 5 p. m.	St. 2	$63^{\circ}04$	$9^{\circ}22$	V. 30—0	$9^{\circ}5$ C.	0 ⁵	79 ⁵	4	4	2	5	5	100
♀ } V	8	7	$11/5$ 95 8 p. m.	St. 1	$62^{\circ}30$	$8^{\circ}21$	V. 50—0	10° C.	1	25	18	20	24	12	0	100
IV	5	7	$20/5$ 96 9 a. m.	St. 59	$65^{\circ}00$	$11^{\circ}26$	A. 12	$1^{\circ}5$ C.	..	98	2	..	..	..	..	100
III	5	4	$10/8$ 96 7 p. m.	St. 139	$63^{\circ}36$	$7^{\circ}30$	A. 80	9° C.	..	2	20	49	14	13	2	100
II	5	3	$10/8$ 96 10 p. m.	..	$63^{\circ}45$	$7^{\circ}25$	A. 81	$8^{\circ}5$ C.	..	4 ⁵	47	19	15	10	4 ⁵	100
I	3	3	$10/8$ 96 2 ³⁰ — 4 ³⁰ p. m.	..	$63^{\circ}30$	$7^{\circ}40$	Cyl. 40	$10^{\circ}5$ C.	1	5	13	..	..	..	..	..

From the Thor expedition 1904 I have only examined specimens from 4 samples, 3 containing males or eggs.

$5/5$ 04. St. 63. $64^{\circ}05$ Lat. N. $0^{\circ}38$ Long. W. Yt. 300 M. Wire 7 f♀ (2 with spermatoph.); 3 f♂; 2 V.

$9/5$ 04. St. 70. $63^{\circ}35$ Lat. N. $6^{\circ}20$ Long. W. Yt. 100 M. Wire 17% f♂; 80% f♀ (1 f♀ with sperm.); 3% V.

$22/5$ 04. St. 99. $61^{\circ}15$ Lat. N. $9^{\circ}35$ Long. W. Yt. 100 M. Wire 90% f♀ 10% V.

My material from Ingolf and the few samples from Thor confirm Paulsen's result that the propagating in this region takes place in the beginning of May. It is rather curious that a single male was found in September. Compared to the May samples those from September show a preponderance of Stage IV—V.

South-West of the Færoes. In the Atlantic, South-West of the Færoes, about 8 samples with *C. f.* were taken $30/5$ — $26/6$ 1905 by the Thor.

Stage.	Number of samples.	1905.	Thor.	L. N.	L. W.	Depth in metres.	Stage.			Number of specimens.
							VI		V	
							♂	♀		
♂	3	..	..	..	..	..	..	..	..
♀	7	$8/6$ 05	St. 72	$57^{\circ}52$	$9^{\circ}53$	Yt. 600 M. W.	8	92	..	50
V	6	$21/6$ 05	St. 90	$47^{\circ}47$	$8^{\circ}00$	Yt. 300 M. W.	15	60	25	75
IV	1	..	..	..	..	..	..	..	..	..

In addition to the two mentioned localities a male was found ($24/6$ 49° L. N. 12° L. W.), and females with spermatophores ($30/5$ $59^{\circ}49$ L. N. 8° L. W.). Propagation accordingly takes place as far South as 47° Lat. North $21/6$. In this connection ought to be mentioned that the S/S Thor (St. 223 B. $17/3$ 1904) at Thyborøn, Denmark, has taken 50 f♀, 5 f♂, 10 (V), 1 (IV); and that Rink $18/3$ 1858 has taken 1 f♂, 12 f♀, 16 (V), 5 (IV), 1 (III) at the Orkney Islands.

South-East of the Færoes. The Ingolf Expedition has South-East of the Færoes, as far South and East as $57^{\circ}53$ L. N. $7^{\circ}39$ L. E. from $5-7/5$ 1895 and $4-6/5$ 1896, taken 10 samples containing *C. f.*, and from $10-15/8$ 1895 and $19/8$ 1896 9 samples; they were almost all taken with *Cyl.* and contained generally 10—30 specimens (cf. tabula).

Stage.	Number of samples from Ingolf.		Number of samples containing each stage taken by Ø. Exp. 1900.		The hours, at which samples were taken by East-Greenland Exp. 1900 $29-30/9$.	Samples without <i>C. f.</i>	Samples with <i>C. f.</i>
	May.	Aug.	Night 8 p. m.—4 a. m.	Day 4 a. m.—8 p. m.			
VI	6	1	..	2	Taken between 4 ⁰⁵ morning and 7 ⁵⁹ evening.	11	4
V	6	8	0	4			
IV	7	6	..	2	Taken between 8 evening and 4 morning.	8	0
III	8	2	..	..	
II	5	5	..	..	
I	..	1	..	..	..	..	..

In the May samples from the Ingolf the different stages seem to be equally well represented in contrast to those from August, in which the stages IV—V are best represented. In this region the Thor has in 1905 collected some fullgrown males viz: 1 f♂, 2 (V) ($21/7$ 1905 St. 120 $59^{\circ}54$ Lat. N. $1^{\circ}19$ Long. E.), 1 f♂, 2 (V) ($17/7$ 1905 St. 119 $59^{\circ}54$ Lat. N. $4^{\circ}00$ Long. E. Yt. 500 M. W.), 1 f♂, 15 f♀, 12 (V) ($6/9$ 1905 $57^{\circ}33$ Lat. N. $4^{\circ}26$ Long. E.).

The East Greenland Expedition 1900 has $29/9$ — $30/9$ ($59^{\circ}33$ L. N. to 59° L. N.; $3^{\circ}24$ L. W. to $0^{\circ}05$ L. W.) (F: 431—453) collected 23 samples, of which only 4 day-samples contained a few specimens of *C. f.* (cf. tab.).

Norwegian Sea. The East Greenland Expedition has from $19/6-24/6$ 1900 crossed the Norwegian Sea from $60^{\circ}26$ Lat. North, $3^{\circ}10$ Long. East to $69^{\circ}06$ Lat. N. $6^{\circ}12$ Long. West. In the samples taken with the net F. (F. 1-89) 79 were found containing *C. f.* but only 5 without any specimens. In addition to these, 5 samples, taken with a closing net and 6 samples with net A and B were taken. The proportion between the different stages in 39 samples from the whole region which were examined in this respect was as follows.

VI	17	} The number of samples (altogether 33) in which each stage occurred.
V	26	
IV	26	
III	22	
II	14	
I	7	

No males were found at the surface in the explored region. As I have unfortunately not examined the proportion between the stages in all the 79 samples, and have not with security classified the larval stages, the following remarks are set forth with due reservation. In the more southern part of the region (to 64° N. F. 38) the stage IV-V were found in 14 samples of 16, the f♀ only in 4 (1-2 specimens) [F. 27: 10 (V), 6 (IV); F. 29: 8 (V), 16 (IV)]. In a few samples (between 64° N.- 65° N.) the younger stages were well represented f. inst. [F. 51: 4 (V), 20 (IV), 20 (III), 18 (II), 11 (I); F. 52: 2 (V), 10 (IV), 14 (III), 10 (II), 20 (I)].

In 10 samples taken between 67° L. N. and 69° L. N. (F. 62-81) f♀ were found, in fairly big numbers (5-10), but only in a single one of these (F. 64 6 f♀; 2 (V) 1 (IV)) stage IV-V were found and in another stage I-II (F. 66 2 f♀ 5 (II), 15 (I)); in the latter sample as well as in most of the ten mentioned above and in several others often large numbers of eggs and larval stages of *Calanus*, certainly of *Cal. finmarchicus*, as no *Cal. hyperboreus* was found in this region, were observed. It seems to be probable that propagation took place in this region c. $24/6$ 1900, in a similar way, as Damas has found out with a more southern and eastern region. Whether the propagation between $62-67^{\circ}$ Lat. N. has taken place at an earlier date, or if the juniores there found are born in the region explored by Damas, it is at present impossible to tell.

Near Jan Mayen. In the ocean tract passed by the Danish East Greenland Expedition from $28/6$ 11 p. m. 1900 to $9/7$ 9 a. m. from near Jan Mayen to $74^{\circ}15$ Lat. North $12^{\circ}21$ Long. West (F. 91-F. 243) about 145 samples were found, of which only 4 contained a few specimens of *C. f.* viz. F. 92 $28/6$ 11 p. m., F. 96 $30/6$ 4 a. m. and F. 91 $28/6$ 11 p. m. with 5 f♀, 2 (V), 1 (III) near Jan Mayen, and F. 143 $2/7$ 8 a. m. $72^{\circ}30$ L. N. $0^{\circ}41$ L. W. 1 f♀. In the samples F. 153-243, which were taken between scattered ice or along the ice-edge no specimens of *C. f.* were observed, but 17 samples with a few specimens of *C. hyperboreus*. A few vertical hauls in the region near Jan Mayen show that the fauna of *C. f.* in deeper waters was probably richer.

		♂	♀	V	IV	III	II
$25/6$	1900 Jan Mayen 50-60 f.	..	21	56	14	2	..
$25/6$	12 a. m. at the surface	..	10	8	..	..	..
	12 p. m.	..	5	2	..	..	..
$28/6$		..	12	11	..	..	..
$1/7$	1 p. m. Closing net 100-50 f.	..	1	3	..	..	..
	50-25 f.	1	1	3	1	1	1
$4/7$	300-0 f.	..	1	3	..	..	..

It is worth noticing that a f♂ was found between 50—25 fathoms. In this connection it may perhaps be of some interest that Johannes Petersen ^{11/7} 1901 73 Lat. N. 8° Long. E. caught a big sample consisting almost exclusively of *C.f.*: the proportion between the stages was the following: f♀ 52 0/0; V 42.5 0/0, IV 3 0/0, III 1 0/0, II 0.5 0/0, I 1 0/0.

Jan Mayen to East Greenland. From ^{9/7} 10 a. m. to ^{17/7} 5 a. m. taken in the sea north-west and west of Jan Mayen between 74°28 Lat. N. 15°03 Long. W. and the coast of East Greenland at 70°29 Lat. N. 21°21 Long. W. I have examined 13 samples (F. 244—262), of which only 5 contained *C.f.* viz. St. VI in 3 samples, IV in 1, II, in 1, I in 1.

East Greenland. The East Greenland Exp. has, near the coast of Greenland, taken some samples containing *C.f.* in vertical hauls. viz.

				VI	V	IV	III
^{10/7} 6 a. m. 1900	72°28 Lat. N.	15°30 Long. W.	Closing net 6—0 f.	3	9	2	..
6 a. m.			120—0 f.	1	12	..	..
			Closing net 110—40 f.	10	6	1	..
^{16/7} 1900			— 35—10 f.	8	18	..	..
^{29/7} 1900	Stewards country			6	..	..	9
^{28/8} 1900	Forblas Fjord			1	1	..	..
^{28/7} 1891	E. Bay.	72°26 Lat. N.	19°56 Long. W.	70	30	..	..

On the voyage home between Forblas Fjord, Antarctic harbour, and 70° L. N. 18° L. W. from ^{30/8} 9 p. m. to ^{2/9} 9 a. m. 1900 the East Greenland Expedition collected 20 samples (F. 265—278), of which 12 night samples contained *C.f.* in different stages, while 4 day samples only contained a few specimens (St. I—II), and the remaining 4 nauplii only.

Stage.	8 p. m. 4 a. m.	3 a. m. 7 p. m.	Date.	Ø. Exp. 1900.		Percentage of each stage.						Number of spec- imens.	Naupl.	eggs.
						VI	V	IV	III	II	I			
VI	2	..	^{30/8} 10 p. m.	F. 266	Forblasfjord	1.5	9.5	3	10	32	44	75	c	c
V	2	..	11 p. m.	F. 267	..	3	6	11	49	16	15	85	c	c
IV	4	..	^{31/8} 8 p. m.	F. 277	..	..	..	..	49	25	26	50	c	..
III	9	..												
II	8	3												
I	8	3												
Nauplius	12	8			Taken between 3 a. m.—7 p. m.			4						
Eggs	5	0			Taken between 8 p. m. and 4 a. m.			0				12		

The vertical hauls show that stages IV—V of *C.f.* are fairly frequent in the month of July. As no *Cal. hyperboreus* were found in any of the samples, and as the younger stages of Copepodites of *C.f.* were common, there is every reason to regard the nauplii and eggs found in large numbers all over the surface as belonging to the same species. Accordingly there is no reason to doubt that an important locality for the propagation of *C.f.* is sometimes found in this region. The few samples and the small number in which the f♀ were found suggest that the f♀—♂ are either extinguished or living in deeper strata.

North of Iceland. The East Greenland Expedition has in the region crossed from $2/9$ 10 a. m. to $4/9$ 10 p. m. between ca. 70° L. N. and 67° L. N. and between 17° L. W. and 23° L. W. taken 27 samples (F. 284—310), of which only 8 (taken in the night) contained *C. f.*

Number of samples at which each stage was found.	Ø. Exp. 1900.	Number of samples with <i>C. f.</i>		Date.	Net.		VI	V	IV	III	II	
		-	+									
VI	2	Taken between 3 a. m.—7 p. m.	17	0	$3/9$ 10 p. m.	F. 299	c. 68° L. N. 17° L. W.	..	4	2	..	1
V	5											
IV	4											
III	2	Taken between 8 p. m.—4 a. m.	2	8	$4/9$ 2 a. m.	F. 301	...	1	21	21
II	3											
I	2											

The contrast to the previous group is well marked by the preponderance of stage IV—V, and by the fact that no nauplii were found (cf. p. 21 about their occurrence in Denmark Strait).

The Ingolf Exp. has from $18/7$ — $3/8$ 1896 collected 9 samples with *C. f.* north and east of Iceland (as far south as c. 65° north) and 17 from 10 — $25/7$ between Jan Mayen and north-east of Iceland (including St. 101, 121 and 107).

Stage.	In 9 samples $18/7$ — $3/8$.	In 17 samples 10 — $25/7$.	1896.	Ingolf.	L. N.	L. W.	Depth at fathoms.	Temp. at surface.	Percentage of each stage.						Number of specimens.	
									VI		V	IV	III	II		I
									♂	♀						
♂ } VI	0	1	$2/8$ 96 10 p. m.	..	$66^\circ 40'$	$22^\circ 15'$	A. 73	7° C.	..	..	30	45	20	3	2	75
♀ } VI	4	12	$10/7$ 4'30 p. m.	St. 101	$66^\circ 23'$	$12^\circ 05'$	V ² . 100—0.	5.5° C.	2	20	9	20	35	14	..	150
V	7	8	$10/7$ 5 a. m.	St. 102	$66^\circ 23'$	$10^\circ 26'$	V ² . 100—0.	4.3° C.	..	84	16	..	..	..	..	50
IV	7	14	$11/7$ 4'20 a. m.	St. 104	$66^\circ 23'$	$7^\circ 25'$	P. 100—0.	6.3° C.	..	1	1	6	16	55	21	75
III	7	12	$25/7$ 11 a. m.	St. 120	$67^\circ 29'$	$11^\circ 32'$	V ² . 100—0.	5.1° C.	..	0.5	0.5	20	49	28	2	133
II	6	12	$24/7$ 3'30 p. m.	St. 117	$69^\circ 13'$	$8^\circ 23'$	V ² . 100—0.	4.1° C.	..	20	75	2	..	2	1	150
I	6	9														

The S/S Thor has in 1904 taken two samples with *C. f.* viz. $22/7$ St. 214 $67^\circ 19'$ L. N. $17^\circ 55'$ L. W. Yt. 800 M. Wire 4 f♀, 14 (V), and $23/7$ 1904 St. 216 $66^\circ 15'$ L. N. $12^\circ 13'$ L. W. Yt. 600 M. Wire 1 (V). As a f♂ was taken $10/7$ 1896 and by the East Greenland Expedition near Jan Mayen $1/7$ 1900, and as Copepodites of stage I—II and nauplii of *C. f.*? were taken at several stations, there is reason to think that propagating takes place in this region in the month of July.

Distribution etc. About the distribution of *Cal. finmarchicus* I refer to the able account of Farran (1911). It has "been recorded from the South Atlantic off Cape Colony, the west coast of North and South America, the Mediterranean, the Adriatic, the Red Sea and the Polar Ocean." In the Pacific it has been found abundantly by Esterly in the Bay of California. "In the North Atlantic it is distributed over the whole of the area north of about 55° N." It is sometimes found in great numbers along the east-coast of North America and is, to the east, distributed as far as the western part of the Baltic.

To deal with the vast topic of its seasonal occurrence in the area investigated by the International Commission does not fall within the scope of this paper, and has fortunately been as well done by Farran as the in several respects incomplete material allowed. As, however, the important contributions to the biology of *Calanus finmarchicus* by Damas, Damas & Koefoed and especially by Paulsen are based upon material from the regions investigated by the Ingolf Exped., and as all the conclusions, to which these authors have arrived, do not quite stand criticism in details, I feel obliged to deal rather exhaustively with these papers.

About the vertical distribution of the different stages it seems to be a general rule, that the younger the stage of development the nearer the surface do the specimens live, as pointed out by Damas, Paulsen and Farran; the fullgrown females and males are generally spawning on the surface in every case in the northern seas, as set forth by Damas & Koefoed, who write (1907 p. 393) "La ponte de *Calanus finmarchicus* s'opère visiblement à une profondeur d'autant plus grande que la région considérée est plus méridionale. Par la même, la distance de la côte où it se reproduit augmente progressivement; autrement dit, cette espèce prend un caractère océanique de plus en plus accentué." About the vertical distribution of the *C. f.* within the day I have only found observations by Esterly, who writes (1911 pp. 140—151) as his conclusion:

- 1) *C. f.* is most abundant at the surface about 7—8 p. m. during June and July.
- 2) It has begun to leave the surface by midnight and is most abundant at a depth of 5—10 fathoms about midnight.
- 3) The plurimum during the day (6 a. m.—6 p. m.) is probably 200 feet.

He thinks that the effect of light upon the "geotropisme of animals is probably the main factor involved". On a much bigger material (1912, pp. 282—95) he arrives at almost the same result.

Unfortunately he has not examined the part which the different stages play in these diurnal migrations.

My material was not well adapted for solving this question, but the difference in the number of specimens taken by the Danish East Greenland Expedition in Denmark Strait (^{23-28/9}) cf. tab. p. 21, from North-East Iceland (^{2-4/9}), but especially from East Greenland (cf. tab. p. 26), indicate that all stages inhabit the surface-layers in the night in some regions and at some seasons, in which only the youngest Copepodites or the larves are frequent in the day.

It must accordingly be admitted that there is a source of error in comparing the relative proportion of the different stages contained in surface samples, as Paulsen has possibly done, as he does not state whether the hauls are made in the day or in the night.

It may perhaps be allowed to set forth one more general remark against Paulsens conclusions, that they are often based upon a too scanty material; even if, f. inst., five samples from a certain region show almost the same proportion between the stages, it is not at all improbable, that the next 5 will show quite another result.

Paulsen thus summarises (1906 p. 7) his results based on the Thors material from April 1904. "In April, there are many adult *Calanus finmarchicus* and *Nauplii* at the surface of the sea to the south of Iceland, many *Nauplii* (Sample 10) west of Iceland likewise on the surface. North of Iceland there are but few adults and probably no *juniores*. Along the east coast of Iceland *C. f.* seems for

the most part to be absent." On p. 6 "I thus venture to conclude that stage III [my IV] has been predominant along the west coast of Iceland in April". Only 2 samples (7 and 9) bear out this opinion; sample 1 but especially 10—12 (taken same date and locality with different nets), when rightly interpreted, shows the species in propagation. The conclusion, as far as the North is concerned, is based on several hauls with negative result and 2 samples taken with young-fish trawl and with c. 95 % f♀; to bear out this conclusion much more material is needed.

His conclusion for May reads. "Whereas the Atlantic and the waters between the Færoes and Iceland are rich in *C. f.* the waters on the east and north coast of Iceland are poor, of the west coast we know almost nothing." The Ingolf material from May and June 1895—96 (cf. tab. pp. 20—22) confirms this view, and shows the species in full propagation especially in the latter half of May. The same is the case in the middle of Denmark Strait. Paulsen's conclusion from north Iceland is placed on far too scanty material.

Paulsen's conclusion for June reads. "To the south and west of Iceland there are great quantities, mainly *juniores*, — west of Iceland considerable quantities of adult both ♂ and ♀ . . . On the western part of the north coast of Iceland, where the water is warmer, many *juniores* were also found, on the eastern part, where the water is colder, few or none" (1906 p. 12). The Ingolf material (cf. p. 22) from the south of Iceland confirms the conclusion that the *juniores* predominate; the great number of St. I—III probably indicates the new generation. My own samples from the Thor and in a less degree from the Ingolf (cf. p. 20) tell the same story as far as the west coast is concerned. Paulsen thinks that the adult males and females probably belong to the new generation, "as they occur along with a number of *juniores*, most of which are in the larger stages". This proportion between the stages, which *f. inst.* is not found in a sample (Ingolf St. 9 ²⁰/₅), seems just as much to speak for referring them to the old as the new generation. The hauls from the north coast are so few, that it must be admitted that our knowledge about the occurrence of *C. f.* in the month of June is too incomplete for any conclusion as far as this region is concerned.

The author writes (1906, p. 13). "Summarising the conditions in July we find that *Calanus finmarchicus* has increased more in the south than in the north, and that individuals on the easterly north coast are larger than those of the westerly north coast on the one side, and than those on the east coast on the other." The greatest number of specimens of the south coast belong to the stage V—VI; Paulsen's suggestion that deep hauls with the young-fish trawl would show a considerable amount of males is shown to be right by tab. pag. 22; whether these specimens belong to the elder or the new generation is impossible to tell. The two samples (Nr. 3—4) from the north western coast do not allow any conclusion, but the preponderance of St. IV (50—90 %) in 9 of 10 samples, scarcely without any adult, is very remarkable, but does not give any information about the origin of the specimens; 4 samples from the east coast show not much similarity to each other or to 2 samples, from the Ingolf (St. 101—102) with a considerable number of adult specimens. Paulsen concludes (p. 14). "As there are practically no *Calani* on the greater part of the North coast at the end of May and beginning of June, and as Nielsen has shown with certainty, that the water here is renewed from the west, we are entitled to conclude that the large quantity of *Calani* on the north coast, as also the young of the cod, have come with the Irminger current from the west." Before accepting this

theory, a much larger number of samples from May and June must be examined. Personally I think that surface plankton like the *Nauplius* of *C. f.* are carried by the current from the south to the north, increasing in size during the carriage, but also that not the smallest amount originates where it lives, and begins to prosper when the Atlantic current makes its influence felt. Paulsen's conclusion that from August stage V is predominant south of Iceland is proved by a big and varied material; a few samples taken by the Ingolf south-east of the Færoes and of Iceland tells the same story.

Paulsen has from the month of September examined a few samples from the north coast with St. V in the majority. Samples taken by the East Greenland Expedition north-west of Iceland, in Denmark Strait and south of Iceland tell the same story.

Damas has in his interesting paper shown that the propagating of *C. f.* took place $21-30/6$ 1904, south of 67° L. N. where the Atlantic and the North Polar current meet. The material brought home by the Amdrup Expedition tells exactly the same story for $19-24/6$ 1900, but as far north as 69° L. N. Damas suggested that the majority of the specimens of *C. f.*, which inhabit the Northern Ocean took their origin from this region, and, by the Gulf-Stream, were scattered all over the ocean. He writes (1905 p. 19) "Il est donc extrêmement probable que nous avons par là reconnu le chemin suivi par le renouvellement printanier des Calanides et l'origine des masses considérables de Calanus qui peuplent en été le Nord de l'Océan et y jouent un rôle si important." Gran had, however, in his well known paper (1902 p. 64), found the *C. f.* in full propagation on the north-west coast of Norway in April—May, Paulsen has from Lofoten examined specimens in propagating from $24/1-16/3$ 1899 and Damas and Koefoed (1907 p. 390—391) have found it spawning not only along the coast of Norway but also in the fjords of Spitzbergen ($26-28/6$ 1905). The Duc d'Orléans has taken *C. f.* ♂—♀ near Cap Bismarck ($76^{\circ}49$ L. N. $18^{\circ}13$ L. W.) $27/7$ 1905 in a depth of 100 meter, $31/7$ at St. 42 ($78^{\circ}06$ L. N. $15^{\circ}06$ L. W.) 44—280 m. *C. f.* was found cc (♂—♀) and at St. 47 ($76^{\circ}47$ L. N. $15^{\circ}21$ L. W.) $8/8$ 60—170 meter *C. f.* was found cc (♂—♀). Even if no eggs or larvæ were found together with the adults at these localities, their presence confirms my view that propagation of *C. f.* sometimes takes place on a large scale on the east coast of Greenland.

Paulsen suggests in his concluding remarks "that the spring is perhaps not the only reproductive period of *Calanus finmarchicus*, for the reason that we also find the adults of both sexes at other times of the year almost everywhere, where fishing has been carried out in deep waters".

In this he is probably right. He agrees with the different authors "that this species has its principal reproductive period at any rate in the spring" (1906 p. 19). He is only right, if the spring is defined as the period at which the waters reach a certain temperature and salinity, and which varies according to the latitude from March (February?) to August (East Greenland).

2. *Calanus hyperboreus* Krøyer. (Plate I figs. 1 a—d; textfigs. 6 a—b).

1838. <i>Calanus hyperboreus</i> n. sp. Krøyer, pp. 84, tab. IV, fig. 23.	1898. <i>Calanus hyperboreus</i> Kr. Giesbrecht & Schmeil,
1842-45. — — Kr. — pl. 41, figs. 2 a—g.	p. 15.
1849. — — Kr. — pp. 542—543, 559.	1899. — — — Th. Scott, pp. 90—91.
1892. — — Kr. Giesbrecht, p. 91, taf. 6—8.	1897. — — — Vanhöffen, p. 278.
1898. — — — Aurivillius, pp. 88—89.	

1900.	<i>Calanus hyperboreus</i> Krøyer, G. O. Sars, p. 2.	1905.	<i>Calanus hyperboreus</i> Krøyer, Th. Scott, p. 221.
1901.	— — — — Th. and A. Scott, pp. 338—339.	1905.	— — — — G. O. Sars, p. 1.
1902.	— — — — Th. Scott, p. 450.	1907.	— — — — Damas & Koefoed, pp. 352—358, 405.
1902.	— — — — Mrázek, pp. 506—507.	1908.	— — — — Farran, p. 20.
1903.	— — — — Jensen, Johansen, Levensen, p. 303.	1908.	— — — — v. Bremen, pp. 8—9, fig. 3.
1903.	— — — — G. O. Sars, pp. 12—13, pl. V.	1911.	— — — — Farran, pp. 89—90.
1903.	— — — — Norman, p. 135.	1913.	— — — — Stephensen, p. 71.
1904.	— — — — Wolfenden, pp. 112.	1913.	— — — — Stephensen, pp. 307—308.

Description. ♀. Size varies from 7.5—9 mm.

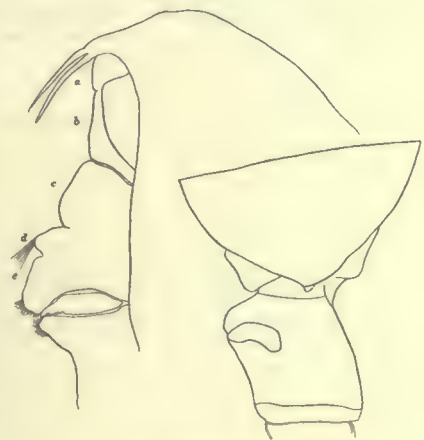
The number of secretory pores differs from that of *Calanus finmarchicus* by the presence of a "secretory pore", (not in all specimens, as far as I was able to find out) laterally a little removed from the base in Re III pes II in stead of corresponding to the wanting Se I; in pes III—IV the pore was found at the same place as in *Cal. finmarchicus*, but was more distinct.

In the serration of the second basipodite of pes V it is, as shown by Giesbrecht (taf. 8 fig. 21, 23), distinctly different from that of *Cal. finmarchicus*, in which species a serrated lamina is found; in *Cal. hyperboreus* the number of teeth are smaller (about 25—35) and they are not fused basally.

As far as the shape of the *labrum* etc. is concerned I refer partly to the description of the preceding species; only a few minor differences are dealt with here. The anterior process of the labrum is more produced (text-fig. 6 a (d)). In the longitudinal series on the oral surface (figs. 1 a—b) the two first groups are seen to be fused and are diverging towards the free margin. In front of the lamina labialis no granulation was observed.

Behind the lamina labialis (fig. 1 c) and between the serrula bidentata a dense group of hairs, medially more like short spines is found; the arrangement is, as seen in the figure, somewhat different from that of *Cal. finmarchicus* G. Behind, the group is separated into two, of which the inner is continued between the lobi labiales, while the outer is continued on the anterior surface of the lobe and thus fused with the inner series of the lobes. The labial lobes (fig. 1 d), bear 4—5 longitudinal series, of which the inner is the longest and has the longest hairs; behind they are more or less fused with the group between the lobes. Behind the transverse list, between the

mandibular and the maxillular somites, laterally on each side are found two groups of hairs, forming together a semicircular figure. Between these groups, in the middle, a group, which is in front triangularly pointed and behind the transverse line, which probably indicates the limitation between the maxillar and maxillular somites, is widened out and divided into two portions, between which a triangular median group of dense hairs is found. More posteriorly a square group of densely placed short setae is found in addition to one of fewer hairs just in front of the hinder limitation of the maxillar somite. Laterally as seen in fig. 1 d a few groups are found.



Textfig. 6 a—b.

Calanus hyperboreus Kr.

6 a. Head in lateral view. × 85.

e. First abdominal somite. × 85.

Y. (St. V). Size. 6 — 6.8 mm. (4.5 + 1.3).

This stage shows the same differences from the mature females as in *Cal. finmarchicus* G., it differs from that species, as in the adult females, by a pointed lateral corner, fewer teeth in the basipod. II pes V marginally, by larger size and greater transparency.

Y. (St. IV—I). Size. of St. IV 3.7 mm. (2.9 + 0.8) — 4.5. Difference from *Cal. finmarchicus* as in preceding stage, but number of spines at inner margin of basipodite II pes V 2—3. The stage III, which varies in size from 2.6—3 (2.4—0.6) mm., the stage II, which varies from 1.8—1.9 mm. and the stage I, of which I have not examined any specimen, seem only to be distinguished from the corresponding stages of *Cal. finmarchicus* by larger size, as the character found in the pointed lateral corner is wanting.

Occurrence. Specimens of *Calanus hyperboreus* have been taken all over the area investigated by the different expeditions as far south as 51°00 L. N. 11°43 L. W., the S/S Thor has 15/6 05 taken a single f♀. (St. 82. Jt. 1200 M. W.)

West Coast of Greenland. On the west coast of Greenland it has been found by the Ingolf Expedition from 22/6—18/7 95 in 10 samples in the depth of 200—0 fathoms. The stage IV has been found in the greatest number of samples, but the stage V in the largest numbers; of the adult females and stage III only single specimens were found; the youngest Copepodites seem to be wanting:

Stages.	Number of samples in which each stage is found.	Number of specimens examined in 10 samples.	Date 1895.	Ingolf.	L. N.	L. W.	Depth in fathoms.	Temp. at surface.	Percentage of stages.			Number of specimens examined.
									VI	V	IV	
VI	4	6	25/6 95	St. 24	63°06	56°00	V.1 200—0	4.2° C.	1	96	3	105
V	8	200	22/6 95	St. 22	58°10	48°25	V.1 200—0	5.4° C.	5	88	7	65
IV	9	30	..	..	..	..	..	..	..	..	..	..
III	3	10	..	..	..	..	..	..	..	..	..	..

Bergendal has at Jakobshavn 21/8 1890 taken a single f♀.

Lundbeck has from 19/5 1889. 58°21 L. N. 48°43 L. W. 1 f♀.

from 23/5 1889. 59°12 L. N. 52°05 L. W. 3 f♀, 3 V.

26/5 1890. 57°08 L. N. 49°04 L. W. 10 f♀, 10 V.

Søren Hansen 18/7 1885. 59°14 L. N. 51°18 L. W. 4 V, 10 IV.

Eberlein 12/7 1882. Umanakfjord. 1 f♀, 4 (V), 1 IV.

Denmark Strait. The Ingolf Expedition has south-west of Denmark Strait (between 62° L. N. and 58° L. N. and between 40° L. W. and 26 L. W.) 12/6 1895 and from 16/6—20/6 1896 taken 4 samples of which 3 contained together 6 f♀, 3 respectively 12 V and 9 IV, and only 2 samples containing 3 specimens of stage III. The same expedition has in the Denmark Strait 26/6 1896 taken 5 f♀ and 25 V, 4/5 1895 1 f♀ and 21/5 1895 3 V + 3 IV.

The Thor has from 18—21/6 1904 in Denmark Strait in 6 of 7 samples collected 180 f♀ and 104 V, but in 4 of 7 samples only 10 IV. At St. 154 21/6 67°27 L. N. 27°10 L. W. the percentage of 196 specimens examined was f♀ 67%, V 30% and IV 3%.

South of Iceland. The Ingolf Expedition has south of Iceland $13/6$ 1896 St. 68 taken 2 V and $18/5$ 1896 St. 54 3 f♀ + 3 V. The Thor has $24/5$ 1904 (St. 104, $62^{\circ}47$ L. N. $15^{\circ}03$ L. W. Yt. 1500 M. Wire) taken 25 f♀ and $11/7$ 1904 (St. 183 $61^{\circ}30$ L. N. $17^{\circ}08$ L. W. Yt. 1800 M. W.) taken 20 f♀, 10 V and 1 IV. As the Danish East Greenland Exp. from $8-28/9$, 1900 has taken 50 samples (F. 312—366) at the surface from Denmark Strait and 63 (F. 367—430) in the Atlantic Ocean south of Iceland without any specimens, it is certainly right to conclude, that *C. hyperboreus* is only seldom found in these regions at the surface.

Iceland-Færoe Channel. In the Iceland-Færoe Channel the Ingolf Exp. has from $11-16/5$ 1895 taken 3 samples of which 2 together contained 8 f♀ and 2 V, one contained a single IV and one 3 III; 19 f♀ and 29 (V), contained in 4 samples, taken from $15-21/5$ 1896, were examined, but only 4 IV (found in 2 samples) and a single (III). The Thor has $5/5$ 1904 (St. 63, $64^{\circ}05$ L. N. $9^{\circ}38$ L. W. Yt. 300 M. Wire) taken 10 f♀, 10 (V), 1 (IV), $22/5$ 1904 (St. 99, $61^{\circ}15$ L. N. $9^{\circ}35$ L. W. Yt. 1000 M. Wire) 16 f♀ + 7 (V) and $9/5$ (St. 70, $63^{\circ}35$ L. N. $6^{\circ}20$ L. W. Yt. 100 M. Wire) 175 f♀. From $4/8$ 1904 (St. 230, $63^{\circ}10$ L. N. $7^{\circ}31$ L. W. Yt. 1200 M. Wire) 1 f♀, 1 V and 1 IV were found. As far south as $57^{\circ}52$ L. N. $9^{\circ}53$ L. W. Yt. 1500 M. Wire the S/S Thor has $8/6$ 1905 taken 16 f♀ + 20 (V).

North Coast of Iceland. The Ingolf Exp. has on the north-west coast of Iceland collected a large number of *Cal. hyperboreus* $27/7$ 1896 St. 125 with the stage V in majority; north-east of Iceland as far north as Jan Mayen 11 samples with *C. h.* were taken from $10-24/7$ 1904; 7 of these contained f♀, 7 (V), 4 (IV), 3 (III) and 2 stage II; in all samples but one the stage IV—V formed the greatest percentage.

Date.	Ingolf.	L. N.	L. W.	Depth in fathoms.	Temp. at surface.	VI	V	IV	III	II	Number of specimens.
$29/7$ 1896 4 p. m.	St. 125	$68^{\circ}08$	$16^{\circ}02$	Apst. 68	2.1° C.	25 %	74 %	1 %	..	..	224
$10/7$ 1896 4.30 p. m.	St. 101	$66^{\circ}23$	$12^{\circ}05$	V ¹ 100—0	5.5° C.	14	16	1	7	5	..
$20/5$ 1896 12.15 a. m.	St. 59	$65^{\circ}00$	$11^{\circ}16$	P. 100—0	1.6° C.	87 %	12 %	1 %	..	..	91
11.15 p. m.	..	..	..	Apst. 12	1.5° C.	24	21	..	..	..	..
$24/7$ 1896 3.30 p. m.	St. 117	$68^{\circ}13$	$8^{\circ}03$	V ² 100—0	4.1° C.	14 %	13.5 %	36 %	35 %	1.5 %	150
Thor $22/7$ 1904	St. 214	$67^{\circ}19$	$17^{\circ}55$	Yt. 800 M. W.	...	20 %	27 %	53 %	..	..	75

Norwegian Sea etc. In the western part of the Norwegian Sea between 60° L. N. 3° L. E. and 69° L. N. 6° L. W. the Danish East Greenland Expedition has not in any of the 84 surface samples (F 1—89), which were collected from $19-24/6$ and contained plenty of *C. finmarchicus*, found *C. hyperboreus*. With E. 14 a single f♀ was taken $21/6$ c. 64° L. N. 0.51 L. W. The same expedition has near Jan Mayen with a closing net made several vertical hauls, and a few horizontal ones with a big net, which makes it evident that the species was rather common in this region.

Of 5 samples from Jan Mayen ($^{25}/_6$ 1 a. m.—5 a. m.) 4 contained f♀ (21 specimens), 5 (V) (34 specimens) and 3 stage (IV) (6 specimens only); of 8 day samples 5 (taken 6 a. m. to 11 p. m.) did not contain any specimens, but 3 (12 a. m.—3 p. m.) contained together 9 f♀.

Date.		Ø. Exp. 1900 at Jan Mayen.	VI	V	IV	III	II	I	Number of specimens examined.
$^{25}/_6$ 12:30 night	Horizontal net.	At the Surface	87 %	13 %	..	..	..	..	100
$^{25}/_6$	Closing net.	50—60 fathoms	10	17	1	..	..	..	...
$^{28}/_6$	?	...	20	2	3	4	8	..	...
$^{1}/_7$ 1 p. m.	Closing net.	25—10	10 %	40 %	21 %	29 %	..	..	60
...	...	50—25	1	3	..	..	..	..	...
...	...	100—50	1	4	..	..	..	..	...

From the $^{28}/_6$ 10 p. m.— $^{1}/_7$ 1900 the East Greenland Exp. has near Jan Mayen collected c. 40 samples (F. 90—135); 27 day samples (6 a. m.—7 p. m.) were taken, of which only F. 125 ($^{1}/_7$ 1912 mid-day $71^{\circ}31$ N. $7^{\circ}43$ L. W.) contained a single f♀; of 13 night samples the 4 following contained *C. h.*, and the f♀ most abundantly.

		Ø. Exp. 1900.	VI	V	IV	Number of specimens examined.
$^{28}/_6$ 10 p. m.	Jan Mayen	F. 90	85 %	15 %	..	106
11 p. m.	..	- 91	5	4	1	...
12 p. m.	..	- 92	40	4	..	...
$^{29}/_6$ 1 a. m.	..	- 93	3	15	6	...

In the ocean tract crossed by the East Greenland Expedition from $^{2}/_7$ 1 a. m. to $^{9}/_7$ 12 p. m. between 73° L. N. 4° L. W. and 74° L. N. 11° L. W. 109 samples (F. 136—244) were taken, partly along the ice-edge or among scattered ice. As is easily seen in the following table the adult females are the most frequent; the species is rather scarce at the surface and there is not seen to be any marked difference in its occurrence in different times of the day.

Ø. Exp. 1900 $^{2-9}/_7$.	Number of samples without <i>C. h.</i>	Number of samples containing <i>C. h.</i>	Number of f♀.	Number of stage V.	
Number of samples and specimens taken	f 5 a. m.—7 p. m.	43	16	54	6
	l 8 p. m.—4 a. m.	40	10	12	6
Summa	83	26	66	12	

That the species was well represented in the greater depth even at localities in which it was scarce at the surface is shown by a few vertical hauls (cf. table p. 35).

By Deichmann 3 f♀ + 5 (V) were taken as far north as 75°37 L. N. and 6°40 L. W. As the Danish East Greenland Expedition from the coastal waters only took the species in the few above mentioned samples, and as not one was found in 13 surface samples (F. 244—262) taken from 9/7—17/7 in the

Date.	L. N.	L. W.	Ø. Exp. 1900.	VI	V	IV	Number of spec- imens.
4/7 3 p. m.	73°32	3°30	300—0 m.	83%	16%	1%	114
8/7 2 p. m.	74°09	11°31	400—0 m.	23	1	3	..
10/7 6 a. m.	74°28	15°36	110—0 m.	7	15	1	..
16/7	72°02	21°20	35—10	2	1	..	..

sea north-west and west of Jan Mayen, and as not one was collected in 47 samples (F. 265—310) taken on the voyage home from 30/8—4/9 between Forblasfjord and 67° L. N. 23° L. W., there is reason to suggest that the species was not very common in the mentioned period.

Distribution. This species has its main area of distribution in the North-Polar Basin, (but has at the present only been found as far east as 136 L. E.), where its propagation probably takes place; it is found at the surface as well as in the lower layers. In the waters, which connect the polar seas, it is equally found viz. the Bering Strait (von Bremen), the Barents Sea, the Davis Strait (Ingolf Expedition, Vanhöffen and Stephensen in Karajakfjord), but especially in the ocean between Spitsbergen and the east coast of Greenland. It was here found from the surface or 5—10 met. below it, when there was floating ice, down to about 1000 meters. Probably carried by the north polar current it was found in the North Sea, but generally in small numbers and in the lower layers. The area around Iceland in which it occurs in abundance "coincides almost exactly with the path of the east polar current and takes the form of a broad tongue passing in a south-easterly direction between Iceland and Jan Mayen and reaching almost as far as the Færoes" (Farran p. 89). By the south-going bottom current it is probably carried over the Wyville Thomson's and the Iceland-Færoe ridges, and is accordingly found scantily in the deeper layers of the North Atlantic as far south as 54° L. N. on the west coast of Ireland. By the assistance of the Labrador- and the Kuro-Sivo currents the species is probably in a similar way distributed over the West-Atlantic and the Pacific. In the Skager Rak and the deep fjords at the west coast of Norway it is sometimes found abundantly, according to Sars, as a relict fauna. If he is right, it should be possible to find it in propagation here. It should be interesting to know, if the species in the deep Atlantic is sometimes propagating, or if the stock must be renewed. The temperature under which this species is found abundantly, lies between $\div 1.9$ and $+ 6.0$, the salinity between 33.15‰ and 35.18‰. About the details in the biology and distribution of this species I refer to the papers of Farran and Damas-Koefoed.

Remarks. This species is in the three last stages easily distinguished from *Cal. finmarchicus*. But the distinction in the earlier stages, in which the difference is only found in the size etc., may, as pointed out by Damas & Koefoed, be very difficult if not impossible, especially in the polar sea, where *Cal. finmarchicus* attains a size of 5 mm. or more.

Macrocalanus G. O. Sars.

1883. <i>Calanus pars</i> Brady.	1907. <i>Megacalanus</i> G. O. Sars.
1905. <i>Macrocalanus</i> G. O. Sars.	1908. <i>Megacalanus</i> Farran.
1906. <i>Megacalanus</i> Pearson.	1909. <i>Bradycalanus</i> Scott p. 14.
1906. <i>Heterocalanus</i> Wolfenden.	1911. <i>Heterocalanus</i> Wolfenden p. 201.

Since Wolfenden, as the first, established a new genus, *Magacalanus*, for a big Calanoid from the deep Atlantic, four other genera viz. *Macrocalanus* G. O. Sars, *Heterocalanus* Wolfenden, *Bathycalanus* G. O. Sars, and *Bradycalanus* Scott, more or less related to the original one, have been established. A good deal of confusion about the right definition of these genera has risen. Scott and Wolfenden have both tried, but only with partial success, to find the right names for the most natural groups of species.

About the genus *Bathycalanus* G. O. Sars not much discussion is necessary. By Sars it was characterized by the ribbon-shaped and densely-ciliated bristles on the lobes of the maxillae and maxillipeds, and by the two-segmented Re of pes I; the described species (*B. Richardi*) has 2 distinct spines covering the rostral filaments and "assez grêles" rostral processes. As Wolfenden has examined a specimen of *B. Richardi* G. O. Sars with indication of segmentation between Re II and III pes I, and as his other species *B. maximus* Wolf. has a three segmented Re pes I (without Se as in the other species) and with long and stiff rostral processes, he regards the structure of the maxillae + maxillipeds and the frontal teeth as the most important character (p. 198). Scott (1909 p. 11) is certainly wrong in not accepting *Bathycalanus maximus* Wolf. as belonging to Sars' genus on account of the differences in the segmentation of Re pes I.

Wolfenden writes (1911 p. 201) "Ob die Charaktere dieser drei Gattungen genügen, um ihre Abtrennung von einander zu rechtfertigen, kan Ansichtssache sein; wenn aber die generische Unterscheidung von *Bathycalanus* und *Megacalanus* anerkannt wird, so erscheint auch die Abtrennung von *Heterocalanus* als eigene Gattung berechtigt, denn *Heterocalanus* unterscheidet sich von jeder der beiden andern Gattungen deutlich durch die Bewaffung der Maxillipeden, die Form des Kopfes und den Bau des 5 Fusspaares". From this point of view Wolfenden as well as Scott (1903 p. 11) are right, and Sars wrong in referring his *Macrocal. princeps* and *longicornis* to the same genus, but his *Bathycalanus Richardi* to a new genus. The genus *Megacalanus* Wolf. with *M. princeps* Wolf. as the type is characterized by the hook on the anterior surface of the Basp. III pes I and the slender bristles of the maxillae. Wolfenden, who rightly recognised that Brady's *Calanus princeps* is nearly related if not identical with his *Heterocalanus medius*, ought in every case in his later publications to have accepted Sars name *Macrocalanus*, which according to the general rules of nomenclatures had priority, especially as *Mac. princeps* Brady is naturally regarded as the type of the genus and as the name *Heterocalanus* has been previously used for another genus of Calanoids. In the Report from the Siboga Expedition, Scott (p. 44) established a new genus *Bradycalanus* with a single species *B. typicus*, which differs from *Heterocalanus* by the head without crest, by the pointed lateral corners of the last thoracic somite, and by the well developed Se of Re I—II pes I and 2 Se Re III of pes I. He writes: "I think that it is probable that Brady's *Calanus princeps* belongs to this genus rather than to *Bathycalanus* or *Heterocalanus*"; accordingly, instead of establishing a new generic name, he ought to have accepted *Macrocalanus* G. O. Sars.

Scott suggest that *Heterocalanus medius* Wolf. is identical with Kröyeyers *Calanus cristatus*; this species, of which I have examined the type specimens, is however a true *Calanus* (cf. p. 11).

On account of the existing confusion I think the following synoptic key will be useful.

- | | | | |
|----|--|---|----|
| 1. | Strong hook on anterior surface of basp. III pes. 1; pes I—IV with 3 segmented Re and Ri. The maxillae without densely plumous setae | <i>Megacalanus</i> | 2. |
| 1. | Strong hook on anterior surface of basp. III pes I wanting | | 3. |
| 2. | 3 Se of Re III of pes II—IV | <i>Megacalanus princeps</i> Wolf. | |
| 2. | 2 Se of Re III of pes II—IV | <i>Calanus gracilis</i> Dana. | |
| | | <i>Calanus robustior</i> Giesb. | |
| 3. | Maxillae without densely plumous setae. 2 Se of Re III of pes II—IV | <i>Calanus</i> | |
| 3. | Maxillae with densely plumous setae. 3 Se of Re III of pes II—IV | | 4. |
| 4. | Maxillipeds with slender setae | <i>Macrocalanus</i> . | 5. |
| 4. | Maxillipeds with densely plumous setae. Re pes I without Se. Front with 2 conical processes | <i>Bathycalanus</i> G. O. Sars. | 6. |
| 5. | Frontal crest. Rounded lateral corner. Pes I has no Se in Re I—II, one Se in Re III | <i>Macrocalanus (Heterocalanus) princeps</i> Brady. | |
| 5. | Frontal crest wanting. Pointed lateral cornes. Pes I has 1 Se in Re I—II, 2 Se in Re III | <i>Macrocalanus (Bradycalanus) typicus</i> Scott. | |
| 6. | Re pes I two segmented. Rostral processes rather slender | <i>Bathycalanus Richardi</i> G. O. Sars. | |
| 6. | Re pes I with 3 segments. Rostral processes long stiff rounded | <i>Bathycalanus maximus</i> Wolf. | |

3. *Macrocalanus princeps* Brady.

(Pl. I figs. 2a—b; textfigs. 7a—b).

1883.	<i>Calanus princeps</i> n. sp. Brady, pp. 36—37, pl. IV figs. 3—7.	1906?	<i>Heterocalanus medius</i> n. sp. Wolfenden pp. 27—28. pl. VIII figs. 1—5.
1904 nec.	<i>Megacalanus princeps</i> n. sp. Wolfenden pp. 112—113.	1908.	<i>Megacalanus princeps</i> Brady. Farran p. 21.
1905.	<i>Macrocalanus princeps</i> Brady. G. O. Sars p. 7.	1911 nec.	<i>Megacalanus princeps</i> Wolf. Wolfenden pp. 196—198.
1905 nec.	<i>Megacalanus princeps</i> Brady. Wolfenden pp. 3—5 pl. I figs. 7—9.	1911?	<i>Heterocalanus medius</i> Wolf. Wolfenden pp. 201—202 taf. XL figs. 1—5.
1906.	<i>Megacalanus princeps</i> Brady. Pearson p. 6.		

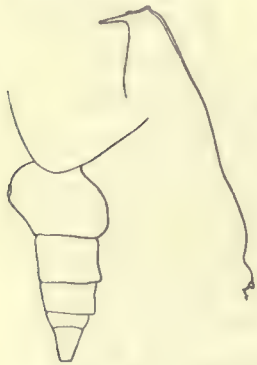
Description f♀. Size. Anterior division 5.5 + 5 mm; posterior 3 mm; total length 13.5 mm. The body is slender, as the anterior division is about 2.5 as long as wide. The first as well as the fifth somite, the lateral corner of which is regularly rounded (fig. 7b), are well distinguished. The head has a low crest terminated by a small frontal process. The rostrum consists of two powerful rounded spines, parallel and directed downwards. At the base slender rostral filaments protected above by low processes. The hinder margin of the head has dorsally a small elevation bearing a conical process. The urosome consists of four somites, of which the first — the genital one —, ventrally produced in front, dorsally behind, is distinctly wider and deeper than long, and distinctly twice as long as the following somites. The furcal rami are a little shorter than the third somite and 1.2 as long as wide.

The antennulae project at least 6 segments beyond the tip of the furca; they consist of 25 segments, of which, however, the 8 and 9 are less well separated. The segments increase in length

from the 8 to the 17 segments, but decrease from the 20 to the 24, which is scarcely half as long as the 23, which is of almost equal length to the 25. In the basal segment only 2 terminal setae are observed; the second segment bears three tritheks, and the following 17 segments bear a single one, consisting of rather delicate setae; the 20–23 segments have only 2 terminal setae (Sd + “Æsthes-tasken”), the 24 segment has a single long and slender seta and the 25 segment has 6. Segment 22 has a delicate posterior seta (Sp.) and the two last segments each bear a powerful, ringed plumous one, at least twice as long as the two segments combined.

Antennae are in the main alike *Calanus*, but the Si of the Basipodite II is very short and the Re I and II have no Si, but the latter segment has two processes medially.

Mandibulae: The manducatory part is rather short with the first to the fifth serrations well developed without accessory teeth; the sixth to the eighth serrations are only poorly developed. The four partly plumous setae, of about equal length, are shorter than the width of the segment. The Ri I has only 2 setae and the Ri II has 8 setae anteriorly and a single one posteriorly.



Textfig. 7.
Macrocalanus princeps
Brady. a. Head of adult
male. $\times 8.5$. b. Abdomen.
 $\times 8.5$.

Maxillulae: The Le I has the 2 first setae extremely short, almost rudimentary, and the following 7 long and plumous; the Le II is only indistinct without any seta. The Li II, which does not bear any seta, is comparatively shorter than Li III, which is fairly slender with 2 setae only. The Basp. II has 2 moderately slender setae (Sp.?) ; the Ri I–II which are indistinctly separated from each other as well as from the basipodite, have a single seta each, while the well distinguished Ri III bears 4 long and one single rather short seta. Re, which has the usual eleven plumous setae, extends a little beyond the end of the endopodite.

Maxillae are in most respects alike *Calanus*, but the Lob. V bears anteriorly 2 long slender ribbon-shaped setae, and the Ri, which has the articular membranes rather indistinct bears six setae of the described structure.

Maxillipes: The proportions of Basp. I \approx II, Basp. III and Ri = 55:50:30; they are in the main alike *Calanus*, but Ri II–IV have only a single seta each, and Ri V has 2 Si + 1 Se.

Legs are comparatively short and broad and have three segments in exopodites as well as in endopodites. In the first pair the Re I–II has no Se and the Re III has only a single one, placed a little nearer to base than tip. The Re I–III has 1 + 1 + 5 Si (cf. Wolfenden t. XI fig. 5, in which, however, the Se Re III is placed distinctly nearer tip than base). The second pair of legs has the Ri extending just beyond the end of Re II; the Re I–II is 1.1 shorter than Re III, but 1.6 as long as the distinctly serrated St.; the Re I–II have each a Se and the Re III has 3. The third and fourth pair of legs are in the main features alike the second pair. The fifth pair of legs is smaller than the others and differs in several respects. The inner margin of the basipodite II and III are almost straight, thus differing distinctly from pes. II, and in a less degree from pes. III–IV. The Ri extends beyond the base of Re III to the insertion of Se 2. The Re I–II have each one Se and the Re III has 2; the number of Si is 4 in Re III and 1 in Re II, but the Si is wanting in Re I.

Secretory pores are in pes II found on the the anterior surface at the base of Se Re II

and the Se I—III of Re III, and, surrounded by a number of fine hairs, somewhat removed from tip, on the anterior surface of Ri III; in addition to these the pes III—V have a pore at the base of Se Re I, and so has pes V, in which, however, only 2 pores are observed in Re III.

The number as well as the arrangement of the "maculae cribrosae", of which none was observed in the mouth-appendages, is less regular than in *Megacalanus*. On the anterior surface of Re I, at base of Se, the organ was observed in pes II—III, but not in pes IV. On the posterior surface the maculae were sometimes found near the base of Se Re I pes II, and regularly in pes II as well as pes III near the base of Se Re II and Se I—II Re III; in pes IV only a single group was observed in Re II.

On the anterior surface of pes II—III, medially to insertion of the Re, a group of delicate filaments, projecting through minute pores (?) and perhaps corresponding to a macula cribrosa, was found.

The lateral outline shows, somewhat in front of the labrum, a low rather elongated elevation. In the middle, as well as on each side, well removed from the hinder margin, a group of fairly long and slender, delicate hairs are observed. The posterior margin has a median incision, and well removed from the middle on each side a transverse marginal row consisting of about 15 short lancet-shaped spines (fig. 2a). On the oral surface the usual longitudinal series is dissolved into 5 more or less transversely placed groups, as shown in fig. 2 a pl. I; the bristles of the more posterior groups are more slender and longer than those of the anterior ones; between the group (Nr. 4) on each side and behind the fourth central spot a transverse row of granules is found.

The lamina labialis has 1 median and on each side 2 lateral teeth; in front of this we have an exterior and mostly anteriorly slightly convex series of rather long bristles and an interior short one of shorter bristles (pl. I fig. 2b). The serrula 6-dentata has the 4 posterior spines club-shaped; between these and the labial lobes scarcely any setae were observed. The area labialis has behind the labial lobe a median somewhat convex group, and a lateral oblique group of numerous hairs on each side; the labial lobes bear about 8 groups of shorter and longer hairs, which seem to be arranged in 3 series.

Y (St. V). Size: $8.4 + 2.2 = 10.6$ mm. The shape of body is scarcely different from that of the f♀ except for the urosome, which has four somites, hardly produced beneath, of which the second is almost twice as long as the first, which is the shortest. The antennulae extend only 4 segments beyond the end of the furca; the measurements differ in minor points only; the maxillulae have in one specimen only a single seta in the basp. III in another 2 as in f♀. The Re has only 10 setae. In other respects no difference was observed.

Y (St. III). Size 6.1—6.3 mm. ($1.10 + 0.53$).

Of this stage I have examined 2 specimens; in spite of the different shape of the head and the short antennulae I do not doubt that the animals are rightly referred to this species, as they agree with it in several important features e. g. the curious structure of the maxillulae.

The body is much more slender, and the head shows no trace of a frontal keel; the first as well as the fifth thoracic tergite is well marked. The urosome consists of 2 somites, of which the second is almost twice as long as the rostrum as well as the furcal branch. The antennulae, which just reach beyond the end of the abdomen with the tip of the last segment, consist of 23 segments; the

25 is 2.1 as long as the 24 and 1.1 as long as the 23. The Le as well as the Re of the maxillulae have only 11 setae. The distal setae of the maxillae show indication of the curious structure found in the full-grown. The pes I—III have the Ri II \sim III and the Re II \sim III fused; the Re II \sim III pes II has 3 Se and 5 Si; the Re II \sim III pes III has only 2 Se; and its Ri has 8 setae. The pes IV has Ri I \sim III fused with 7 setae and the Re I \sim III has 3 Se and 3 Si. The fifth pair of legs is, as shown in *Cal. finmarchicus*, quite rudimentary. In contrast to the full-grown female a distinct pore was found at the base of Se basp. III of the pes II—III; in addition to this a pore was found at the base of Se Re I and Se 3 Re III.

Occurrence. This species has not been captured by the Ingolf Expedition, but the Thor Expedition has taken it from the following stations 1904 and 1905.

- Thor ¹⁹/₆ 1904 St. 152 65°00 Lat. N. 28°01 Long. W. Yt. 1000 M. Wire 2 f♀.
¹⁰/₇ 1905 St. 180 61°34 Lat. N. 19°05 Long. W. Yt. 1800 M. Wire 3 f♀.
¹¹/₇ 1904 St. 183 61°30 Lat. N. 17°08 Long. W. Yt. 1800 M. Wire 4 f♀; 2 y (V); 2 (III).
²⁵/₅ 1904 St. 104 62°47 Lat. N. 15°03 Long. W. Yt. 1500 M. Wire 1 f♀.
²²/₅ 1904 St. 99 61°15 Lat. N. 9°35 Long. W. Yt. 1700 M. Wire 1 f♀.
⁷/₆ 1905 St. 71 57°47 Lat. N. 11°33 Long. W. Yt. 1500 M. Wire 2 f♀.
⁸/₆ 1905 St. 72 57°52 Lat. N. 9°53 Long. W. Yt. 1500 M. Wire 2 f♀.
¹¹/₉ 1905 St. 167 57°46 Lat. N. 9°55 Long. W. Yt. 1500 M. Wire 3 f♀.

Distribution. This species has previously only been recorded from the great depths in the Atlantic Ocean viz. from the west coast of Ireland as far north as 55° Lat. North, from the North Atlantic (c. 40° Lat. N. 70° Long. W.) and the Mid Atlantic (c. 10° Lat. N. and 20° Long. W.). As it has not been taken by the Siboga Exp., it is rather doubtful if it is found in the Indian Ocean.

Remarks. It seems to me scarcely doubtful, that the described species is identical with Brady's *Calanus princeps*; this author writes: The abdomen is short, stout and three-jointed. The latter character is certainly due to a mistake. His fig. 5 of the maxillula shows, probably wrongly, only 6 setae in Le I and 10 in Re. As I have examined specimens, identified by Sars, it is scarcely doubtful that the species is identical with Sars and Farran's *Megacalanus princeps* Brady. Farran has suggested, that Wolfenden's *Heterocalanus medius* is identical with *Cal. princeps* Brady, and I think he is right. My specimens differ from Wolfenden's fairly exhaustive description (1906 p. 27) in the following features: 1) Le I maxillulae has 9 instead of 7 bristles and the 2 setae of basp. II are not "very short and delicate". 2) the Se Re III pes I is placed nearer the base than the tip.

Megacalanus Wolfenden.

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|---|--|
| 1904. <i>Megacalanus</i> , Wolfenden. | 1908. <i>Megacalanus</i> pars, Farran, p. 21. |
| 1905. <i>Macrocalanus</i> pars, G. O. Sars. | 1909. <i>Megacalanus</i> , Scott, pp. 10—12. |
| 1905. <i>Megacalanus</i> pars, Wolfenden. | 1911. <i>Megacalanus</i> , Wolfenden, pp. 195—196. |
| 1906. <i>Megacalanus</i> pars, Pearson, p. 6. | |

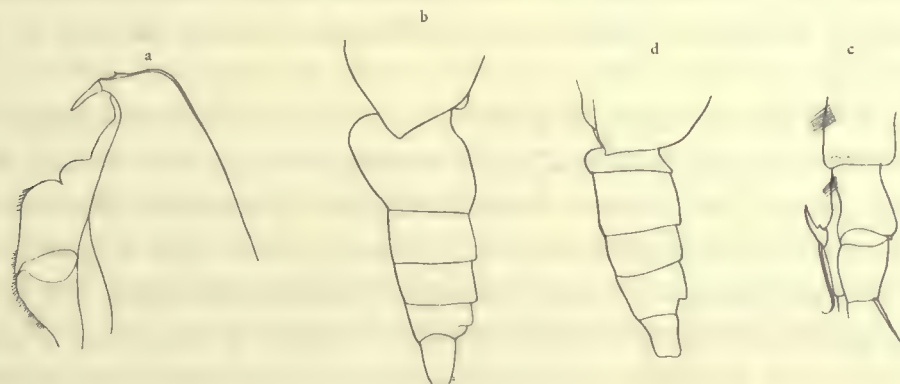
The type of this genus, which is probably more related to *Calanus* than *Macrocalanus* and *Bathycalanus*, is *M. princeps*; it is well characterized by its size and the curious hook on the anterior

surface of the third basipodite of the first pair of legs. Scott has proposed to refer *Calanus gracilis* Dana and *Calanus robustior* Giesbrecht to the same genus, in spite of smaller size, on account of a similar hook. Possibly he is right; but as I have not had the opportunity of examining any specimens of the two said species, I do not feel competent to judge in the case.

3. *Megacalanus princeps* Wolfenden.

(Pl. I figs. 3 a-i; textfigs. 8 a-d).

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|---|---|
| 1904. <i>Megacalanus princeps</i> n. sp. Wolfenden, pp. 112--113. | 1906. <i>Megacalanus longicornis</i> G. O. Sars. Pearson, p. 6. |
| 1905. <i>Macrocalanus longicornis</i> n. sp. G. O. Sars, p. 7. | 1908. <i>Megacalanus longicornis</i> G. O. Sars. Farran, p. 21. |
| 1905. <i>Megacalanus bradyi</i> n. nom. Wolfenden, pp. 1-3, pl. I, figs. 1-6. | 1909. <i>Megacalanus princeps</i> Wolfenden. Scott, pp. 13-14, pl. I, figs. 12-18. |
| 1905. Nec. <i>Megacalanus princeps</i> Brady. Wolfenden, pp. 3-4, pl. I, figs. 7-9. | 1911. <i>Megacalanus princeps</i> Wolfenden. Wolfenden, pp. 196-198, taf. XXII, figs. 1-11. |



Text-figure 8.

Megacalanus princeps Wolfenden.

- a. Head of adult female $\times 16$. b. Abdomen of adult female $\times 16$. c. Pes I in situ $\times 67$.
d. Abdomen of young female (stage V) $\times 16$.

Description ♀. Size: 10.5 mm. (anterior division 8.5; urosome 2). The head is slightly produced between the base of the antennulae and is without any crest. The rostral filaments are short and placed on a low elevation just above the rostrum, composed of a short basal part and two slightly convergent rather obtuse, fairly long spines, directed backwards and downwards. The five thoracic somites are well distinguished; the fifth is laterally triangularly produced. Projecting from the hinder margin of the head a small process, similar to that of *Macrocalanus*, though less prominent, is observed.

The abdomen is only one fourth of the anterior division in length. The genital somite is as long as deep and wide, and in front ventrally produced.

The *antennulae*, which are at least 8 segments longer than the body, have all 25 segments well separated, except the VIII and IX, with the articular membranes wanting posteriorly. The segments increase in length from the 8 to the 17; beyond the 19 they are much shorter; the 23 is 1.4 as long as the 25, which is only 1.1 as long as the penultimate one. The 13 and 14 have in the distal part, ventrally and exteriorly, a row of delicate teeth (according to Wolfenden they are found in segment 12 and 13). The bristles of the antennulae are rather delicate; the posterior setae of segment 23-24 are rather weak, and scarcely 1.5 as long as two distal segments (in Scott's figure they are

distinctly twice as long). The arrangement and number of setae are alike that of *Macrocalanus*, and agree with *Calanus* by the presence of a single seta instead of two in segment 21.

Antennae are in the main alike those of *Calanus* (cf. Wolfenden), but the Re II is by an incomplete articular line divided into a proximal division, bearing two setae, and a shorter terminal one with a single bristle.

Mandibulae (figs. 3 a and c) cf. Wolfenden (taf. XXII fig. 5) have a well developed manducatory portion with five distinct teeth and a few more or less fused.

Maxillulae are alike *Calanus finmarchicus* in most features, but differ by comparatively long Re, and by the presence of 3 setae instead of 4 in Ri I (as seen in Wolfenden's fig. 2).

The Maxillae (fig. 3 d) and Maxillipeds are as described by Wolfenden (taf. XXII figs. 4 and 6) in the main features alike those of *Calanus*, but the former organ has the fifth lobe comparatively long with a thin hook, and the latter has the hairs, which cover the anterior surface of the Basp. III proximally and medially bifurcate or divided into three branches, and the Se of Ri 4—5 are comparatively short and unarmed.

The five pair of natatory legs have three segments in exopodites and endopodites; in basipod III pes I a characteristic structure is found in the upwards directed hook, which dorsally in the concavity has a rather irregular process, and ventrally bears the slightly plumous Si; this hook is indicated in most species of *Calanus* and in *Macrocalanus* as a small process on which the Si is placed (cf. Giesbrecht p. 110). Pes II has the inner margin of second basipodite almost straight (cf. fig. 3 e). The pes III—IV is in main features alike pes II, but Ri II with distinct Se. The pes V (fig. 3 h) is in general structure like the preceding pairs, but is distinctly shorter; the inner margin of basp. has no hairs and no Si.

Glandular pores, surrounded by prominent rings are observed in the pes II—IV, as shown in fig. 3 e at the base of Se basp. III and Re I—III, and are observed surrounded by fine hairs distally on the anterior surface of Ri III; the last mentioned pore and the pore corresponding to the wanting Se 1 Re III are absent in pes V.

Maculae cribrosae: In the legs and in a less degree in the other appendages small spots, consisting of a more or less circular ring of minute pores, continued into a delicate threadlike glandular duct? (fig. 3 f—g), are observed.

As the arrangement of these, "maculae cribrosae" seems to be fairly regular, and as I have only observed them in *Megacalanus* and *Macrocalanus*, I think they are of some systematic importance and hope that the following account of their number is fairly exhaustive; they are often rather difficult to observe. The antennulae possess on the upper surface of the second segment a group of 9 pores; on the anterior surface of the Ri I of the antennae, at the base of the distal third, a group of about 15 pores is observed. The manducatory part of the mandibulae bears at the base of the serrations at least a single group, and the basp. III at least 2 rings of 7 pores anteriorly. The maxillulae bear on the anterior surface a group of 14 pores at the base of Le I and basally near the lateral margin of Re. In the maxillae a single group of 12 pores is observed on the anterior surface of the first basipodite and near the outer margin.

On the posterior surface of the first pair of legs no pores are found; anteriorly a group of 10 pores is observed in basip. III medially to the articular cavity of Re I, and another one is seen in the

middle of Ri II. In the second pair of legs, on the anterior surface, pores are found near the lateral margin of basip. II (on the left side a single group of 10 pores and on the right side two groups of 6 pores), in the basip. III medially to the insertion of Re I and in Re I near base of the process bearing Se; on the posterior surface of basip. II, and at base of Se Re II and Se 1—2 Re III, a rather indistinct group of pores is found. In the third and fourth pair of legs, groups of pores are also found posteriorly at base of Se basp. II and Re I; in the fifth pair of legs only a single group was found in Re III posteriorly (at base of Se I).

As the number and arrangement of the maculae cribrosae in the mature male are scarcely different from those in the female, and as only the groups in the maxillulae, but not those in the natatory legs, were observed in the Copepodites (stage IV—V) it seems to be possible, that the main purpose of the maculae cribrosae is connected with the sexual life (e. g. light organs).

In front of the labrum and well distinguished from it, a fairly prominent elevation is found. The *labrum* itself is rather elongated (Pl. I, figs. 3a—b and text-fig. 8a). Anteriorly a transverse row of delicate hairs is found, and posteriorly on each side of the median incision a transverse marginal row of about 25 rather short lancet-shaped spines in addition to two somewhat convex rows, and a small group of delicate hairs. The oral surface of the labrum has in front two well separated oblique groups. The three following groups are placed more longitudinally as seen in fig. 3b. Only corresponding to the fourth central spot a few hairs are seen in a transverse row. The *lamina labialis* is, as seen in fig. 3c, fairly distinct without serrations; in front of this an outer convex series consisting of fairly long hairs, in continuation of the serrula 6-dentata, and three inner series of very delicate hairs are observed. Behind the lamina labialis, between and upon the labial lobes and behind these a number of series and rows of delicate hairs are found; about their arrangement I refer to fig. 3a.

f♂. Size: 10.6 mm. (anterior division 8.5; urosome 2.1). The body is more slender and the process of the posterior margin of the head is better developed. The abdomen consists of 5 somites, of which the second is 2.5 as long as the first and 1.2 as long as the third.

The *antennulae* (Pl. I fig. 3i) have the articular membranes between the 7—9 segments less well developed than between the preceding and following ones. The number of the bristles shows a similar difference from that of the female as in *Calanus*. The “Æstetasken” are powerfully developed and the Sd of segment 9 is represented by a clavate structure (fig. 3i). The other appendages do not show any difference from those of the females except the fifth pair of legs. In these the basp. and Ri are scarcely different, but the Re have no Si except the Re II of the pes V sin, which has the Si(?) represented by a stumpy articulated process, prolonged into a somewhat twisted feathery spine, at the base of which long and stiff hairs are seen; marginally a dense seam of hairs, as figured by Wolfenden (fig. 9), is seen.

Y. (V). Size: 8.2 mm. (anterior division 6.5, urosome 1.7). The shape of body is in main as in f♀, but the lateral corner is more pointed and the urosome consists as seen in fig. 8d of four somites, of which the first one is prominent ventrally. The mouth appendages seem in the main features alike those of mature females; the Re of the maxillulae possess as usually 10 for 11 setae. The second pair of legs differs by comparatively short Ri, which does not extend to the end of Re II, and by the wanting glandular pore at the base of Se I Re III; the same pore is wanting in the fourth pair

of legs and the corresponding Se is distinctly smaller than the following. The fifth pair of legs has the Ri II—III fused with the usual number of setae, as well as the Re II—III, bearing 3 Se (pore at base of Se I missing) and 5 Si.

Y. (IV). Size: 6.8 mm. (anterior portion 5.5; posterior 1.3). The body differs distinctly by a three-segmented abdomen; the first somite, which is slightly produced beneath, is the shortest, and 1.6 shorter than the third one. The *antennulae*, especially the distal segments, are comparatively longer; the number of setae differ in several details. The *maxillulae* differ by a smaller number of bristles in Ri (Ri I has f. inst. only 2 setae) and by 9 setae of Re. The first pair of legs have the Ri II—III fused with 8 setae, and the Re II—III with 3 rather slender Se, but only 4 Si. The second pair of legs has the Ri II—III fused with 9 setae, and the Re II—III fused with 3 Se and 5 Si; glandular pores as in preceding stage. The fourth pair of legs has 7 setae in Ri II \approx III, and 5 Si and 3 Se, of which first one without glandular pore, in Re II \approx III. The fifth pair of legs has the Ri I \approx III with 6 setae and the Re I \approx III with 3 Si, 3 Se and a St.; only a single pore at base of Se III is found.

Occurrence. This species has not been captured by the Ingolf Expedition, but has been taken at the following stations in deep hauls by the Thor 1904—1905 south and west of Iceland.

Thor 19/6 1904 St. 152 65°00 Lat. N. 28°00 Long. W.	1 y (IV).
13/7 1903 St. 164 62°10 Lat. N. 19°36 Long. W.	1 f♀.
10/7 1904 St. 180 61°34 Lat. N. 19°05 Long. W. Yt. 1800 M. W.	2 f♀; 3 f♂; 1 y (V).
11/7 1904 St. 183 61°30 Lat. N. 17°08 Long. W. Yt. 1800 M. W.	4 f♀; 4 f♂; 5 y (V); 1 y (IV).
24/5 1904 St. 104 62°47 Lat. N. 15°03 Long. W. Yt. 1500 M. W.	1 y♀ (V).
12/5 1904 St. 78 61°08 Lat. N. 9°28 Long. W.	1 f♀.
29/8 1905 St. 167 60°00 Lat. N. 10°35 Long. W. Yt. 1000 M. W.	1 f♀.
31/8 1905 St. 167 57°46 Lat. N. 9°55 Long. W. Yt. 1500 M. W.	1 f♀; 1 y (V); 1 y (IV).
8/6 1905 St. 72 57°52 Lat. N. 9°53 Long. W. Yt. 1500 M. W.	1 f♀; 1 y (IV).
23/7 1905 St. 124 61°04 Lat. N. 4°33 Long. W. Yt. 1000 M. W.	1 f♀.

Distribution. This species seems to be fairly common in the Færoe-Shetland Channel, and on the west coast of Ireland between 600 and 1000 fathoms. It has been taken in the Atlantic by the Gauss Expedition as well as at a single station in the south polar region (c. 65° Lat. S. c. 85° Long. E). By the Siboga Expedition it has been taken at three stations at about 4° Lat. S. 129 Long. E.

Eucalanidae.

5. *Rhincalanus nasutus* Giesbr.

(Pl. I figs. 4 a—e).

1877. <i>Rhincalanus gigas</i> Brady. Möbius.	1898. <i>Rhincalanus nasutus</i> Giesbr. Giesbrecht & Schmeil pp. 22—23.
1888. — <i>nasutus</i> n. sp. Giesbrecht, p. 334.	
1888. — <i>gigas</i> Brady. J. C. Thompson, p. 148.	1901. — <i>gigas</i> Brady Th. Scott, p. 237; pl. XXVII figs. 1—4.
1892. — <i>nasutus</i> Giesbr. Giesbrecht, pp. 152—158, taf. 3, 12 and 35.	

1902.	Rhincalanus gigas	Brady.	Th. Scott, p. 450.	1905.	Rhincalanus nasutus	Giesbr.	G. O. Sars, p. 2.
1902.	—	nasutus	Giesbr. G. O. Sars, pp. 15—16 pls. VI—VII.	1905.	—	—	Th. Scott, p. 222.
1903.	—	—	J. C. Thompson, p. 16.	1905.	—	—	Esterly, p. 137, fig. 10.
1903.	—	—	Thompson & Scott, p. 242.	1905.	—	—	Wolfenden, p. 996.
1903.	—	—	Norman p. 135.	1906.	—	—	Pearson, p. 8.
1903.	—	—	Cleve, p. 368.	1908.	—	—	Farran, p. 22.
1904.	—	—	Wolfenden, p. 128.	1908.	—	—	v. Bremen, p. 18 fig. 14.
1904.	—	—	Cleve, p. 196.	1909.	—	gigas	Brady. Scott, pp. 24—25.
1905.	—	—	Farran, p. 30.	1910.	—	nasutus	Giesbr. Farran pp. 18—19.

Description ♀. The females examined varied in size from 4.5 to 5 mm. When this characteristic species is examined in lateral view, a marked difference is observed between the different specimens in the outline of the head; in some animals a distinct pointed eminence is seen just in front of the insertion of the antennulae, in others the outline is more even as figured by Sars; the size of this eminence is probably dependent upon the preservation of the animal and the position of the antennulae in the moment of death. The structure of the limbs is scarcely different from Giesbrecht's description. In the exterior margin in the middle between Se I and II of the Re II \sim III in the first pair of legs a small incision with a circular pore(?), through which a minute conical eminence projects, is seen (glandular pore?). In the three last pair of legs I have not been able to find secretory pores with certainty.

As seen in Sars' figure the *labrum*, which is widely removed from the insertion of the antennulae, is saddle-shaped and by a median line divided into an anterior and a posterior division (fig. 4a). On the oral surface of the labrum, on each side almost attaining the middle, a row of fairly long stiff hairs are found in addition to six short stout setae, more alike granules, in the middle partly fused with transverse groups, and two posterior groups of partly sickleshaped spines, between which large group of stout teeth are found (cf. Pl. I fig. 4e). The lamina labialis consists of a median and two lateral divisions (fig. 4c). In front of this we have laterally an inwards convex series of fairly long bristles; the inner longitudinal row is posteriorly represented by row of rather short spines or granules and anteriorly with irregular group of similar spines. Behind the lamina labialis and between the serrula 6-dentata the setae are arranged as figured. The lobus labialis possesses 4 longitudinal series or groups of hairs, which posteriorly and inwards are fused into a big irregular group of hairs, extending between the two lobi.

♂. Size: 3.8 to 4.5 mm. The head is less produced in front of the rostral filaments. The abdomen, which is one fourth of the length of the anterior division consists of five somites; the first one is dorsally and posteriorly produced into a distinct spine, corresponding to that found in the genital somite of the female. The two first segments of the antennulae are well separated. The antennae (cf. Pl. I fig. 4f) are more clumsy than those of the female, and so are the mandibulae, which have a well developed manducatory lobe. The maxillulae, maxillae and maxillipeds, especially the latter, which have the second basal segment scarcely twice instead of three times as long as wide, are more clumsy than in the females, but scarcely less adapted for manducatory purposes. The mouth and its surroundings are scarcely different from those of the female; the single specimen which I examined had the spinulation of the labrum less coarse than in the female. The natatory legs are scarcely different from those of the female. The internal sexual organs are found on the left side.

Of this species Giesbrecht has only examined a single mutilated male from the Pacific Ocean. The figure, which is represented on his pl. 9 fig. 14 is not quite like the structure found in several males which I have examined, the main-differences being that the endopodite of the right leg in none of my specimens is terminated with a short clumsy hair; it is rather doubtful if this difference has any specific value, as the legs of the animals examined show marked variations in other respects. The left leg consists of 2 basal segments and a fairly elongate exopodite (fig. 4g) produced into a more or less curved terminal spine and a minute Se; only in a single one of my specimens, which had no Se, the St was so strongly curved as figured by Giesbrecht (fig. 4h). In the four specimens examined the exopodite of the right leg had a long St and a short slender Se; but the endopodite varied in a curious way. In a specimen (fig. 4g) with the Ri about 5 times as long as wide, the articular line between the last two segments was almost obsolete, and the posterior surface was more hairy than in the specimen with the segment about 3.6 as long as wide (fig. 4h). In a single specimen (fig. 4j) the Ri was represented by short segment, but this is probably due to a mutilation.

Y. ♀—♂ (St. V). Size: 3.5—4.1 mm. The "head" is about twice as long as the thorax, and the anterior division is 5.5 as long as the abdomen, which consists of four somites; the last one is partly fused with the furca; the first (genital) somite is produced beneath in the female, not in the male. The appendages are in most respects alike those of the mature females; the only difference of any interest is, that the exopodite of the maxillulae possesses 8 instead of 9 bristles. While the fifth pair of legs in the female is like that of the mature, this organ is in the male less developed than in the full-grown animal. The left leg (fig. 4k) is most similar to that of the female, but less slender; the Ri is represented by a conical protuberance, and a minute Se is found in Re. The right leg possesses an exopodite very similar to that of the left leg, and a fairly long and slender endopodite with a slender terminal bristle. Brady gives (Pl. VIII, fig. 10) in his description of *Rh. gigas*, without having understood its real nature, a figure of the fifth pair of legs in the young male; the Ri dext. has two bristles in stead of a single one, and the Se of Re is missing; in the former feature a valuable character between the y♂ of the two species is probably found; the latter character is probably due to a mistake (or an abnormality) as an exterior seta is present even in the mature female of Brady's species (Pl. VIII fig. 9) as well as in *Rh. grandis* Giesbr. in contrast to the female of *Rh. nasutus*.

Y. ♀—♂ (St. IV). Size: 3.9 mm. This stage is characterized by the three somites of the urosome. The pes V is better developed in the male; the right and the left legs are as shown in fig. 4l nearly symmetric. The Ri sin. is longer than in the preceding stage, but shorter than the Ri dext, which is however shorter than the Re dext.

Variation. A mature female (Thor St. 72; fig. 4b) had the lateral thoracic spine on right side of fourth thoracic somite distinctly bifurcate (in the same specimen a nematode was dwelling as parasite); a corresponding variation was found in a specimen from Thor St. 183, but in addition the right dorsal spine of the first abdominal somite was bifurcate. In a mature female from Thor St. 82 the latter abnormality was found on both sides and in a young female on the left side only. In a single specimen (Thor St. 88) the Re of the right fifth foot has a lateral pointed projection (fig. 4d); about the variations in the fifth pair of legs in the males I refer to the description of the male.

- ⁸/₆ 1905 St. 72 57°52 L. N. 9°53 L. W. Yt. 1500 M. Wire 50 f♀; 5 f♂; 20 y♀ (V); 20 y♂ (V); 1 y♂ (IV).
²⁰/₆ 1905 St. 88 48°09 L. N. 8°30 L. W. Yt. 300 M. Wire 75 f♀; 60 f♂; 15 y♀ (V); 5 y♂ (V).
²¹/₆ 1905 St. 90 47°47 L. N. 8°00 L. W. Yt. 300 M. Wire 10 f♀; 10 f♂; 1 y♀ (V); 2 y♂ (V).
¹⁷/₇ 1904 St. 11 959°54 L. N. 4°00 L. W. Yt. 500 M. Wire 1 y♀ (V).

From the material available it has been impossible to form any conclusive opinion about the season at which *Rhincalanus nasutus* attains its full development. By counting the specimens, collected by the Thor Expedition with the young fish trawl from May, June and July 1904 and 1905, I have attained the following figures. Even if we admit that the animals have been taken in two succeeding years in a limited and occasional quantity, I think that the following figures give some impression of the relation between the males and females etc. About 100 f♀, 20 y♀ and a few young males were taken in the month of May 1904 between 62°47 L. N. 15°05 L. W. and 61°15 L. N. 9°35 L. W. In June 1905 about 150 f♀, about 80 f♂, about 105 y♀ and 50 y♂ were taken between 57°52 L. N. and 47°47 L. N., 9°53 L. W. and 8°06 L. W. In July 1904 (61°30 L. N. 17°08 L. W.) a single sample containing 150 f♀, 1 f♂, 2 y♀ and 2 y♂ was taken. ¹/₉ 1904 (62°49 L. N. 18°46 L. W. Yt. 500 M. W.) 5 females were captured. As the greatest number of males (60) against 75 females, of which three carried spermatophores attached to the genital somite, were taken ²⁰/₆ 1905 St. 88 48°09 L. N. 8°30 L. W. Yt. 300—0, propagation probably took place in this locality.

Distribution. This species has been recorded from the Pacific between the Straits of Magellan and the Gulf of California, from the western part of the Mediterranean and from the Indian Ocean (one specimen only). Our knowledge about its distribution in the greater part of the Atlantic is very scarce: "As far as concerns its distribution in the N. E. Atlantic, it may be regarded as an inhabitant of the Atlantic current; its distribution to the north and east depending on the varying strength of that stream" (Farran p. 65). I think, that its occurrence on the west coast of Ireland, the Faeroe channel, the Faeroe-Iceland channel, the North Sea south and south-east of Shetland, the Norwegian Sea east of the Faeroes and east of Iceland (Sars), as well as at my own localities the south and west of Iceland is easily explained in this way.

The vertical range of the species seems to be uniform from the surface down to more than 1800 meters (Farran p. 66).

Esterly (1912 pp. 317—318) has on a somewhat scanty material drawn the conclusion that there is indication "of a movement of the greater proportion of the individuals from the neighbourhood of 200 fathoms upwards to above 100 fathoms at night".

6. *Eucalanus elongatus* Dana.

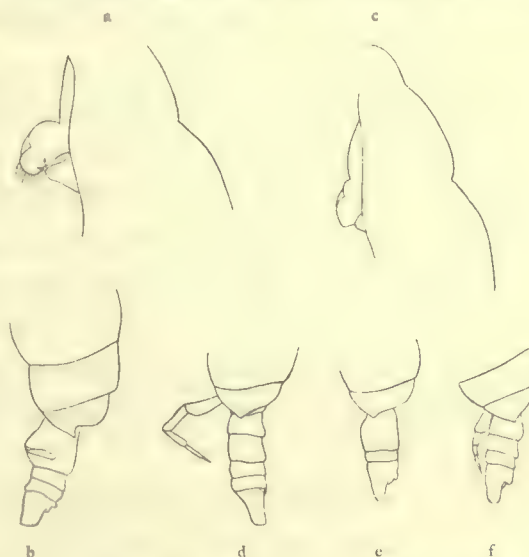
(Pl. I figs. 5 a—d; text-figs. 9 a—f).

- | | |
|--|--|
| 1852. <i>Calanus elongatus</i> n. sp., Dana. | 1898. <i>Eucalanus elongatus</i> Dana. Aurivillius, p. 29. |
| 1877. <i>Eucalanus elongatus</i> Dana. Streets, p. 139. | 1901. — — — Cleve, p. 6. |
| 1892. — — — Giesbrecht, pp. 131, 149. | 1903. — — — J. C. Thompson, p. 15. |
| 1894. — <i>spinifer</i> n. sp. Scott, p. 29, pl. I, figs. 15—23. | 1904. — — — Wolfenden, p. 127. |
| 1895. — <i>elongatus</i> Dana. Giesbrecht, p. 248. | 1904. — <i>Atlanticus</i> n. sp. Wolfenden, pp. 113—114, |
| 1898. — — — Giesbrecht & Schmeil, p. 20. | pl. IX, figs. 3—4. |

1905.	<i>Eucalanus elongatus</i> Dana.	Esterly, p. 131—132, figs. 6 a—d.	1908.	<i>Eucalanus elongatus</i> Dana.	v. Bremen, p. 15, fig. 10.
1905.	—	—	1908.	—	Farran, p. 21.
1905.	—	Th. Scott, p. 222.	1908.	—	Wolfenden, p. 29.
1905.	—	Farran, p. 30.	1910.	—	Farran, pp. 93—94, pl. XIV.
1906.	—	Pearson, pp. 6—7.	1911.	—	Wolfenden, p. 204.
1906.	—	G. O. Sars, p. 2.			

Description. ♀. Size: 6.5 mm. The females scarcely differ from Giesbrecht's description. No glandular pores were observed in the natatory limbs.

The *labrum* proper, which is suddenly raised from the region lying in front of it, is by a transverse groove divided into an anterior and a more raised posterior portion; the latter is divided into three hairy lobes, a median and two lateral ones (text-fig. 9 a). The oral surface (fig. 5 a) shows a structure similar to that found in *Rhincalanus*, but the two first groups of the longitudinal series consist of fairly long and slender bristles. In front of as well as behind the transverse bar the skin is beset with a dense group of strong granules. In front of the trebly divided *lamina labialis* (fig. 5 b) a median longitudinal row of long and a lateral one of very delicate setae are observed; in the middle a row of very short hairs is found on each side, single behind and double in front. Between the serrulae 6-dentatae a longitudinal lateral series, a median group and more posteriorly a transverse group of short setae are found; behind the serrula an oblique group was seen. The area labialis possesses a central group of hairs between the labial lobes, partly continued on the latter, which bear four fairly regular rows of hairs.



Text-fig. 9. *Eucalanus elongatus* Dana.
 a. (to the left above) ♀. Labrum etc. × 18.
 b. ♀. Abdomen × 18.
 c. (to the right) ♂. Labrum etc. × 18.
 d. ♂. Abdomen × 18.
 e. ♀ (St. V). Abdomen × 18.
 f. (to the right beneath). ♂ (St. V) × 18.

♂. Size: 4.5—5 mm. The fifth thoracic somite is better marked out, and the lateral corner is less produced than in the female. The head is in front of the transverse groove more strongly convex (text-fig. 9 c) and the labrum is lower; its oral surface is smooth; the labial appendages are lower. The intestine is well developed with the usual convexity and coecal sacs.

The oral appendages are, as shown by Giesbrecht, greatly reduced. The legs of the fifth pair (fig. 5 c) are more slender than figured by Giesbrecht; the left leg was, except in two specimens, the longer. In a single male the terminal segments of the fifth pair possessed a small median hair in addition to the terminal one. The fifth pair of the young male has the left leg a little longer than the right; the Re is divided into two distinct segments, of which the latter bears two long bristles (fig. 5 f, cf. Wolfenden Pl. IX, fig. 3); in a single young? male the number of setae in the terminal segment was 3 instead of 2 (fig. 5 d) and in another young (?) male the structure was, as seen in fig. 5 e, more like that of the mature male.

J♀ (V). Size: 4.5 mm. The lateral corner of the last thoracic somite is like that of the ♂. The urosome consists of three somites, as the two basal ones (text-fig. 9 e) are fused in most specimens

and slightly produced below. The anal somite is fused with the furcal rami, of which sometimes the left and sometimes the right is the longer. The structure of the legs and of the labrum is scarcely different from that of the female.

J♂ (V). The male of this stage is scarcely different from the female except for the four abdominal somites (text-fig. 9 f) and well developed fifth pair of legs, as previously described. Wolfenden (1904 p. 113) has, with some doubt established the young male of this species as a new one *Euc. atlanticus*, because "the larger furcal segment and longest tail seta are on the left side, instead of the right side", and on account of the not retrograded oral organs.

As, however, the former assumption is wrong, because not only males and females but also young specimens have the longest furcal branch now on the right and now on the left side, and as the latter is a general phenomenon in the young males, the species must vanish.

J♀ (IV). Size: 3.8 mm. In general structure this stage is like the preceding one, but the urosome consists of 3 somites, of which the two first are of almost equal length and distinctly shorter than the third one, which is fused with the furcal rami, on the left side being the longer in both specimens examined. The ovaries were well developed though less so than in the preceding stage.

Occurrence. The Ingolf has taken this species only at a single station in Denmark Strait.

²⁷/₆ 1896 St. 95 65°14 Lat. N. 30°39 Long. W. V. 200—0 fm. Temp. at surface 7.8° C. 10 f♀.

By the Thor it has been taken at the following stations.

Thor ¹⁹/₆ 1904. St. 152. 65°00 Lat. N. 28°10 Long. W. Yt. 1000 M. Wire 35 f♀; 1 y♂ (V).

Yt. ? 90 f♀.

²⁰/₆ 1904. St. 153. 65°20 Lat. N. 27°12.5 Long. W. Yt. 800 M. Wire 1 f♀.

²¹/₆ 1904. St. 154. 65°27 Lat. N. 27°10 Long. W. Yt. 800 M. Wire 30 f♀.

Yt. 75 M. Wire 10 f♀.

¹⁸/₆ 1904. St. 150. 65°50 Lat. N. 26°53 Long. W. Yt. 400 M. Wire 3 f♀.

The Ingolf, in the Atlantic south of Iceland, has caught the species at 6 stations, and the Thor at 7 stations.

Ingolf ¹⁷/₆ 1895. St. 18. 61°44 L. N. 30°29 L. W. V¹ 200—0 fm. Temp. at surface. 10° C. 15 f♀.

¹⁶/₆ 1895. St. 17. 62°49 L. N. 26°55 L. W. V¹ 200—0 fm. — - — 9.1° C. 1 f♀.

³/₆ 1896. St. 68. 62°06 L. N. 22°30 L. W. V¹ 100—0 fm. — - — 8.7° C. 1 f♀.

¹⁸/₅ 1896. St. 54. 63°08 L. N. 15°40 L. W. V. 100—0 fm. — - — 9.0° C. 10 f♀.

¹³/₅ 1896. St. 49. 62°07 L. N. 15°07 L. W. V. 100—0 fm. — - — 9.3° C. 40 f♀.

¹²/₅ 1896. St. 47. 61°32 L. N. 13°40 L. W. V. 100—0 fm. — - — 10.6° C. 35 f♀.

Thor ⁹/₇ 1904. St. 178. 63°08 L. N. 21°30 L. W. Yt. 700 M. Wire 85 f♀.

¹⁴/₇ 1903. St. 167. 63°05 L. N. 20°07 L. W. — — — 1 f♀.

¹⁰/₇ 1904. St. 180. 61°34 L. N. 19°05 L. W. Yt. 1800 M. Wire 8 f♀.

¹/₉ 1904. St. 285. 62°49 L. N. 18°46 L. W. Yt. 500 M. Wire 8 f♀.

¹¹/₇ 1904. St. 183. 61°30 L. N. 17°08 L. W. Yt. 1800 M. Wire about 350 f♀.

²/₉ 1904. St. 286. 61°49 L. N. 14°11 L. W. Yt. 1800 M. Wire 10 f♀.

Yt. 15 M. Wire 1 f♀.

In the Iceland-Færoe channel, the Ingolf has taken it at 3 stations and the Thor at 6 stations, one from the month of July with a single female, and 5 from May.

Ingolf	¹⁵ / ₅	1896.	St. 52.	63°57 L. N.	13°32 L. W.	V. ¹	200—0 fm.	8.3° C.	2 f♀.
	²⁰ / ₅	1896.	St. 57.	63°37 L. N.	13°02 L. W.	V. ¹	100—0 fm.	8.2° C.	9 f♀.
	¹¹ / ₅	1896.	St. 45.	61°32 L. N.	9°43 L. W.	V. ¹	100—0 fm.	9.1° C.	15 f♀.
Thor	²³ / ₅	1904.	St. 102.	61°41 L. N.	13°31 L. W.	Yt.	15 M. Wire		100 f♀.
	²² / ₅	1904.	St. 100.	61°21 L. N.	10°39 L. W.	Yt.	180 M. Wire		15 f♀.
						Yt.	15 M. Wire		20 f♀.
	²² / ₅	1904.	St. 99.	61°15 L. N.	9°35 L. W.	Yt.	1000 M. Wire		75 f♀; 1 y♀.

In the Atlantic outside the Ingolf area a big number of specimens, males as well as females, were found.

Thor	¹⁵ / ₆	1905.	St. 82.	51°00 L. N.	11°43 L. W.	Yt.	1200 M. Wire		500 f♀; 28 y♀ (V); 100 y♂ (V); 2 y♀ (IV).
						Yt.	800 M. Wire		50 f♀; 10 y♀ (V); 10 y♂ (V); 2 y♀ (IV).
	¹ / ₉	1905.	St. 167.	57°36 L. N.	9°55 L. W.	Yt.	1500 M. Wire		25 f♀; 1 y♂ (V).
	⁸ / ₆	1905.	St. 72.	57°52 L. N.	9°53 L. W.	Yt.	1500 M. Wire		2 f♀; 12 f♂; 15 y♀ (V); 16 y♂ (V); 1 y♀ (IV).
	²⁰ / ₆	1905.	St. 88.	48°00 L. N.	8°30 L. W.	Yt.	300 M. Wire		35 f♀; 3 f♂; 1 y♀ (V); 1 y♂ (V); 2 y♂ (IV).
	²¹ / ₆	1905.	St. 90?	47°47 L. N.	8°00 L. W.	Yt.	300 M. Wire		45 f♀; 17 f♂; 9 y♀ (V); 5 y♂ (V).

It is rather curious that a large number of adult females, but only three young animals, from three stations, were taken in the numerous samples brought home by the Ingolf and Thor from ³¹/₇—⁸/₉ north of 61° Lat. North. At four southern stations (⁸/₆—²¹/₆ 1905) the Thor gathered mature males and young animals in addition to numerous adult females.

Distribution. This species has been recorded from the Mediterranean, the Indian Ocean, the Pacific between 61° Lat. N. and 33° Lat. S., and the North and South Atlantic (as far south as 47° Lat. S. 40° Long W.).

In the North Atlantic (cf. Farran Pl. XIV) it has been found on the south and west coast of Ireland, in the Færoe channel, north and east of Shetland and occasionally in the North Sea as far east as the coast of Norway. "In point of number it is generally scarce. Vertically it is recorded from the surface down to 4000 meters." Esterly (1912 pp. 295—300) has on an extensive material made it probable "that the species is more abundant and more frequent above 50 fathoms by night than by day."

7. *Eucalanus Attenuatus?* Dana.

(Pl. I figs. 6 a—c; text-figs. 10 a—e).

1849.	<i>Calanus attenuatus</i> n. sp.	Dana.		1903.	<i>Eucalanus attenuatus</i> Dana.	J. C. Thompson,	p. 15.
	<i>Eucalanus attenuatus</i>	Dana.	Dana.	1905.	—	—	Wolfenden, p. 996.
1892.	—	—	Giesbrecht,	pp. 131.	1905.	—	G. O. Sars, p. 2.
1894.	—	—	Th. Scott,	pp. 28—29.	1905.	—	Esterly, p. 133, figs. 7 a—c.
1895.	—	—	Giesbrecht,	p. 248.	1906.	—	Pearson, p. 7.
1898.	—	—	Giesbrecht & Schmeil,	pp. 20—21.	1908.	—	Farran, p. 22.
1901.	—	—	Cleve,	p. 6.	1908.	—	v. Bremen, p. 16, fig. 12.
1903.	—	—	Norman,	p. 135.	1909.	—	O. Pesta, p. 21.
1903.	—	—	Cleve,	p. 362.	1911.	—	O. Pesta, p. 20.
1900.	—	—	Wheeler,	p. 167.	1910.	—	Steuer, p. 21.
1903.	—	—	J. C. Thompson & A. Scott,	pp. 242.	1912.	—	Sewell, p. 357.

Description ♀. (Stage V). Length: anterior division $3.34 - 1.26 = 4.6$; urosome 0.58; total length 5.18 mm. The head (text-figs. 10 a—b) is like that of *Rhincalanus nasutus* triangularly produced in lateral as well as in dorsal view. The fifth thoracic somite (text-fig. 10 c—d) is fairly well marked out, especially dorsally, and its lateral corners are slightly produced and rounded. The rostral filaments (text-fig. 10 e) are long and slender, and placed on a long bifurcate basal portion. The urosome, which is scarcely one sixth as long as the anterior portion, consists of three somites. The first (I \approx II), which does not show any trace of receptacula seminis, is longer than the two following combined; the fourth somite is completely fused with the furca, which has the longer branch on the left side. The St. 2 sin. is distinctly longer and more powerful than the other setae.



Text-fig. 10.

Eucalanus attenuatus Dana. Y♀ (stage V).a. Head in lateral view $\times 18$.b. Head in dorsal view $\times 18$.c.—d. Abdomen in lateral and dorsal view $\times 18$.e. Rostral filaments $\times 27$.

lateral as well as in dorsal view. The fifth thoracic somite (text-fig. 10 c—d) is fairly well marked out, especially dorsally, and its lateral corners are slightly produced and rounded. The rostral filaments (text-fig. 10 e) are long and slender, and placed on a long bifurcate basal portion. The urosome, which is scarcely one sixth as long as the anterior portion, consists of three somites. The first (I \approx II), which does not show any trace of receptacula seminis, is longer than the two following combined; the fourth somite is completely fused with the furca, which has the longer branch on the left side. The St. 2 sin. is distinctly longer and more powerful than the other setae.

The structure of the mouth appendages and natatory legs scarcely shows differences of any importance from Giesbrecht's description; the Ri 2 of the maxillipeds has only 3 instead of 4 Si. No glandular pores were observed in the four pair of legs.

The *labrum* is in lateral view like that of *Euc. elongatus* though less produced. The oral surface differs from that of the other species 1) by anterior group of minute spines laterally near free margin, and 2) by the different number and arrangement of three first groups of spines in longitudinal series, as seen by comparing figures 5 a and 6 a; the structure of the three posterior groups and of the transverse rows are scarcely different from that of *Euc. elongatus*. About the small differences existing in the structure of the labium etc. I refer to fig. 6 b.

Y♂ (Stage V). Length: 5 mm. The lateral corner of the fifth thoracic somite is less produced. The urosome consists of four somites, of which the first one is 1.2 as long as the second, which is again 1.3 as long as the third and fourth. In this species the fifth pair of legs (fig. 6 c) shows, as a whole, more similarity to that of the adult male of *E. attenuatus* than in *E. elongatus*. The right leg is the shorter, and the segments are more attenuated than in the mature male.

Remarks. Most probably the specimens examined ought to be referred to *Euc. attenuatus* Dana in spite of a more produced forehead than in original specimens, and of greater size (Giesbrecht f♀: 4.2—4.85 mm.). The Thor Expedition has taken the species at the following two stations

¹¹/₇ 1904 St. 183 61°30 L. N. 17°08 L. W. Yt. 1800 M. Wire 1 y♀; 1 y♂.
⁸/₆ 1905 St. 72 57°52 L. N. 9°53 L. W. Yt. 1500 M. Wire 1 y♂.

Eucalanus attenuatus has been recorded from the Pacific, the Mediterranean, the Indian Ocean and the Atlantic. In the North Atlantic on the west coast of Ireland it has been found as far north as 54°57 Lat. N. 10°51 L. W. at about 700 fathoms.

8. *Eucalanus crassus* Giesbrecht.

(Pl. I fig. 7; textfig. 11).

1888. <i>Eucalanus crassus</i> n. sp. Giesbrecht, p. 333.	1905. <i>Eucalanns crassus</i> Giesbr. Th. Scott, p. 222.
1892. — — — Giesbr. Giesbrecht, p. 132, pls 4, 11, 35.	1905. — — — G. O. Sars, p. 2.
1898. — — — Giesbrecht & Schmeil, p. 22.	1905. — — — Esterly, p. 134, fig. 8.
1901. — — — Cleve, p. 6.	1905. — — — Farran, p. 30.
1902. — — — Wolfenden, p. 361.	1906. — — — Pearson, p. 7.
1903. — — — J. C. Thompson and A. Scott, p. 242.	1908. — — — v. Bremen, pp. 16—17; fig. 13.
1903. — — — Cleve, p. 362.	1908. — — — Farran, p. 22.
1904. — — — Wolfenden, pp. 127—128.	1909. — — — A. Scott, p. 19—20.
1905. — — — Wolfenden, p. 996.	1912. — — — Sewell, p. 357.

Description. f♀. Length: 3.7—4.0 mm. The basal fused portion of the rostral filaments is comparatively longer than figured by Giesbrecht (t. 35, fig. 26). The last thoracic somite, which is well marked out, is somewhat rounded (text-fig. 11). The *abdomen* consists of 3 somites only; the receptaculum seminis is large. The coecal sacs on each side are divided into smaller parts (fig. 7). In the structure of the appendages a feature of interest was observed in the structure of the external process of the basal segment of Ri, pes I, which is produced into a distinct point not seen in Giesbrechts fig. 29 taf. 11. No glandular pore was observed.

The *labrum* is, in appearance, like that of *Eucal. elongatus*, but the distance to the insertion of the antennulae is comparatively shorter, and by a transverse groove divided into an anterior and a posterior better raised part. The oral surface of the labrum is most like that of *Euc. attenuatus*, but differs somewhat by sharp distinction between median and lateral groups of marginal bristles. The two first groups of the longitudinal series are partly fused and convex towards the middle. Around the first muscular spot a transverse group of granules is seen. The structures of the labium are in the main similar to those of the species mentioned.

Occurrence. The Ingolf Expedition has not taken this species, but it probably belongs to the area, as the Thor Expedition has taken it at

²⁰/₈ 1905 48°05 Lat. North 8°29 Long. West Yt. 300 M. Wire 1 f♀.
³¹/₈ 1905 St. 167 57°46 Lat. North 9°55 Long. West Yt. 1500 M. Wire 3 f♀.



Text-fig. 11.
Eucalanus crassus
 Giesbr. f♀. Ab-
 domen in lateral
 view X 30.

Distribution. This species has been recorded from the Mediterranean, the Indian Ocean, the Pacific and the Atlantic. It has been found several times in the Færoe channel and on the west coast of Ireland as far north as 56°11 L. N. 9°50 L. W.

Paracalanidae.

9. *Paracalanus parvus* Claus.

(Text-figures 12 a—f).

1863. <i>Calanus parvus</i> n. sp. Claus, p. 173.	1903. <i>Paracalanus parvus</i> Claus. J.C.Thompson & A. Scott, p. 243.
1864. <i>Paracalanus parvus</i> Claus. Boeck, p. 233.	1903. — — — Cleve, p. 367.
1892. — — — Canu, p. 169, pl. I, figs. 1—12.	1904. — — — Cleve, p. 194.
1892. — — — Giesbrecht, pp. 164—171, taf. 1, 6 and 9.	1904. — — — Wolfenden, pp. 129—130.
1894? — — — Th. Scott, pp. 26—27, pl. I figs. 9—14.	1905. — — — var. <i>borealis</i> n. var. Wolfenden, pp. 997—998, pl. 96 figs 7—11 and 16.
1898. — — — Aurivillius, pp. 29—30.	1905. — — — parvus Claus. G. O. Sars, p. 2.
1898. — — — Giesbrecht & Schmeil, p. 24.	— — — Farran, p. 30.
1899. — — — Th. Scott, p. 248.	— — — Esterly, pp. 140—41, figs 12a—e.
1899. — — — Brady, p. 32.	1906. — — — var. <i>perplexus</i> n. var. Norman & A. Scott, p. 127 pl. XII figs. 1—2.
1900. — — — Th. Scott, p. 383.	1906. — — — parvus Claus. Pearson, p. 8.
1900. — — — Wheeler, p. 168, figs 6a—c.	1906. — — — T. Scott, p. 298.
1901. — — — Th. Scott, p. 350.	1908. — — — v. Bremen, p. 20 fig. 17.
1901. — — — Cleve, p. 8.	1908. — — — Farran, p. 22.
1901. — — — Brady, p. 32.	1909. — — — A. Scott, pp. 27—28.
1902. — — — A. Scott, p. 402.	1910. — — — Farran, pp. 61—63.
1902. — — — Wolfenden, p. 361.	1910. — — — Kraeef, p. 77, taf. 1 figs. 1—13.
1902. — — — G. O. Sars, pp. 17—18 pls VIII—IX.	1910. — — — Steuer, p. 22.
1903. — — — Jensen, Johansen and Levinson, p. 303, tabel I.	1912. — — — Sewell, p. 358.

Description. ♀. Size: 0.84—1.0 mm.

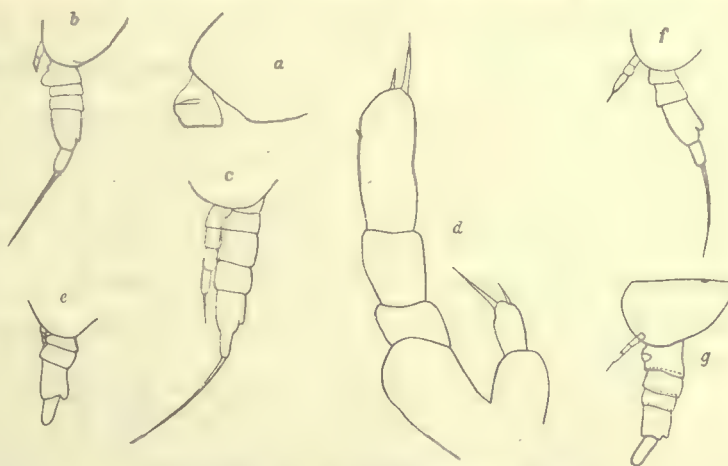
In contrast to Giesbrecht the head and the first thoracic somite are completely fused. The mouthlimbs are scarcely different from Giesbrecht's description. In the structure of the natatory legs, however, fairly well marked differences are found, especially in the armatures of the basipodites and endopodites; in these respects they fairly well agree with Sars' description, but especially with that given by Wolfenden for his *P. parvus* variet. *borealis*. In Sars figure, Pl. IX, the first segment of the exopodite of the first pair of legs has a minute spine; in all my specimens this spine is substituted for by a bundle of fine hairs as seen in Giesbrecht's Taf. 9 fig. 31. Glandular pores are observed at the base of the exterior spines of the exopodites (at least in the second pair of legs).

Between the mouth and the rostral filaments the usual elevations are found; I was not able to see any setae along the hinder margin of the labrum. The arrangement of hairs on the oral surface of the labrum is similar to that of *Pseudocalanus*. The first group, which is convex outwards, and oblique, consists of about 10 short hairs in a single row; this group is followed by an almost straight row of about 25 very short hairs; most orally, and fairly well separated from this group, 20 hairs are placed in a S-shaped group. Laterally to the first group two partly transverse groups of

fairly long setae, slightly convex inwards and posteriorly, are found. The median circular spots and transverse series of hairs were not observed. The *lamina labialis* shows three serrations, of which the median is the smallest. The *serrula 6-dentata* is found as usually; the arrangement of the setae was not examined in detail.

f♂. About the description of the mature males I refer to Sars and Giesbrecht. Size: 0.7—1.02 mm.

Y♀—♂ (St. V). Size: ♂ 0.80 mm. (Ø. Exp. 1900); ♀ (0.61 + 0.18) = 0.79 mm. (Ingolf 96 Cyl. 45). The shape of the body is in the main like that of the mature female, but the head and the first thoracic somite are fairly well separated, and there is an indication of limitation between fourth and fifth thoracic somite. The first abdominal somite is, at least in most specimens, distinctly produced below (text-fig. 12 b). The oral appendages are scarcely different from those of the mature females; the natatory legs, however, show a few differences; a very short Se Re II is present in the first pair of legs. The exterior margin of the last segment of exopodite is smooth in the fourth pair of legs, but, as usual, dentated in the third pair. The fifth pair of legs appears more clumsy with shorter terminal spine.



Text-fig. 12. *Paracalanus parvus* Claus.

- a. f♀. Genital somite in lateral view $\times 90$.
 b. y♀ (Stage V). Abdomen $\times 90$.
 c. y♂ (Stage V). Abdomen $\times 90$.
 d. y♂ pes V in anterior view $\times c. 400$.
 e-f. y♀-♂ (Stage IV). Abdomen $\times 90$.
 g. f♀. Abnormal specimen with well developed pes V $\times 90$.

The male differs from the female by the less prominent first abdominal somite, and by the better developed asymmetrical fourth pair of legs (cf. Canu) (textfigs. 12c—d).

Y♀—♂ (St. IV). Size: (0.48 + 0.14) = 0.62 mm. This stage is easily distinguished from the preceding one by the number of abdominal somites (3 only). As in the other stage, differences are found in the less prominent fifth pair of legs in the males (cf. text-figs. 12e—f).

Of the copepodites (stages I—III) I am not sure of having observed any; according to Oberg these as well as the larval forms are rather difficult to distinguish from those of *Pseudocalanus elongatus*; they are, however, smaller and more clumsy, and have the exopodite and the endopodites of the antennae of almost equal length. From Ingolf St. 62 (Apst. 14) I have examined a young specimen (St. II) 0.6 mm. long and one (St. I) 0.48 mm. long, which on account of the long endopodite of the antenna perhaps ought to be referred to this species.

Variation. In a single mature female? (F. 389 Ø. Exp. 1900), the size of which was (0.68 + 0.2) = 0.88 mm. the left leg of the fifth pair consisted of four segments as in the immature male, while the right consisted of two segments only. A somewhat smaller female from the same locality had both pair of usual structure. Bay has taken 3 specimens with the left leg somewhat longer than the right,

though consisting of the same number of segments. Normann & Scott have with reservation described a female with the right fifth foot three-segmented, and longer than the left as *P. p.* var. *perplexus*.

Remarks. The specimens, which have been examined all belong to the northern variety (var. *borealis* Wolfenden p. 997), and are fairly well distinguished from the Mediterranean form described by Giesbrecht. A. Scott (1909 pp. 27—28) thinks that the differences are rather unimportant, in that he is scarcely right. Detailed examination of a good many specimens from different localities especially from the Mid-Atlantic is necessary to decide the question whether the observed differences are specific or due other reasons.

Occurrence. The Ingolf Expedition has taken this species from 7 stations to the south and south-east of Iceland as well as in the Færoe channel. It has been taken as far west as at St. 84 Long. W. $25^{\circ}24$, Lat. N. $62^{\circ}58$; the only station farther north where it has been taken by the Ingolf Exp. is St. 101 (Apst. 47 $\frac{9}{7}$ 1896 4 p. m. $66^{\circ}23$ Lat. N. $12^{\circ}05$ L. W. 2 f♀) north-east of Iceland. From the East Greenland Exp. 1900 it was once taken in Denmark's Strait as far north as $65^{\circ}36$ L. N. $31^{\circ}32$ L. W. $\frac{9}{9}$ 2 a. m. F. 318. The comparatively few other localities, in which it has been taken by this Expedition lies between $62^{\circ}06$ Lat. N. and $59^{\circ}20$ L. N., and $21^{\circ}11$ L. W. and $0^{\circ}52$ L. W. At the following stations more than single specimens of this species were captured.

Ingolf $\frac{17}{6}$ 96	St. 84	$62^{\circ}58$ L. N.	$25^{\circ}24$ L. W.	Cyl.	9 f♀; 3 y♀ (V); 2 y♂ (IV).
$\frac{19}{8}$ 95		$61^{\circ}02$ L. N.	$0^{\circ}40$ L. W.	Pl.	11 f♀; 2 y♂ (V).
$\frac{17}{8}$ 96		$60^{\circ}28$ L. N.	$0^{\circ}20$ L. E.	Cyl.	9 f♀; 1 f♂; 3 y♀ (V); 1 y♂ (V); 1 y♀ (IV); 1 y♂ (V).
Ø. Exp. 1900 $\frac{24}{9}$ 6	p. m.	$61^{\circ}06$ L. N.	$16^{\circ}26$ L. W.	F. 389	2 f♀; 2 f♂; 6 y♀ (V); 2 y♂ (V).
$\frac{25}{9}$ 2	p. m.	$60^{\circ}29$ L. N.	$12^{\circ}10$ L. W.	F. 399	7 f♀; 3 y♂ (V).
8	a. m.	—	—	F. 396	3 f♀; 2 y♀ (V); 2 y♂ (V).

It is an interesting fact that almost all the collections of this species are from the month of September (Ø. Exp. 1900 $\frac{9}{9}$ — $\frac{30}{9}$ 16 Stations) or from the month of August (Ingolf Exp. 1895—96 $\frac{9}{8}$ — $\frac{17}{8}$ 8 Stations). In the month of May a single young male ($\frac{4}{5}$ 96 Cyl. 2 $57^{\circ}54$ Lat. N. $6^{\circ}27$ L. E.) was taken, and in the month of July (Cyl. St. 84 $\frac{17}{6}$ 1896 $62^{\circ}58$ Lat. N. $25^{\circ}24$ Long. W.) 9 mature females, 3 young females (stage V) and 2 young males (stage IV) were taken. Young animals (St. IV—V) were also captured as late as $\frac{27}{8}$ 1896 and $\frac{25}{9}$ 1900. The fact that this species was rarely taken in several collections in the months of May and June 1895, 1896 and 1900 in the same regions in which it was found in August and September indicates a certain periodicity in its occurrence, as shown by Farran, in several of the localities explored by the International Investigations (1910 pp. 61—62). The average salinity for this species, which generally is swarming at the surface is rather low in the Kattegat ($19\frac{33}{100}$, Temp. $10\frac{33}{100}$ ° C.), but a good deal higher in the English Channel ($35\frac{26}{100}$, Temp. $13\frac{28}{100}$ ° C.). According to Cleve (1901) the salinity in the Arabian Gulf lies between $35\frac{77}{100}$ and $36\frac{20}{100}$ (Temp. $26\frac{7}{100}$ ° C.) and in 1904 between $35\frac{40}{100}$ and $40\frac{70}{100}$; the maximum temperature at which it was found in the Indian Ocean is $29\frac{35}{100}$ ° C. (Cleve 1901 p. 8).

Distribution. Assuming the specific identity of the northern and tropical forms we find records of its occurrence from the Mediterranean, the Black Sea, the Red Sea, the Arabian Sea, the Indian Ocean as far South as New Zealand (Brady 1911 p. 32), the Malay Archipelagos (A. Scott 1909) the

Pacific between 61° N. and 52° N., between 10° S. and 55° S. west of South-America, and 108° L. W. Equator (Giesbrecht 1892) and off California (Esterly 1905). In the North Atlantic it has been recorded on the west side off Woods Hole (Wheeler 1900) and on the east from the Faeroes to Gibraltar. According to Scott (1894) it is fairly common in the Gulf of Guinea as far south as the Congo; Wolfenden shares, probably rightly, the opinion that the species which the mentioned author describes as *P. parvus* really is *Paracalanus aculeatus* Giesbr., which represents this species in the South Atlantic (1911, p. 203). In addition to all these localities this species is found in the southern part of the Baltic, the Kattegat and the North Sea.

Pseudocalanidae.

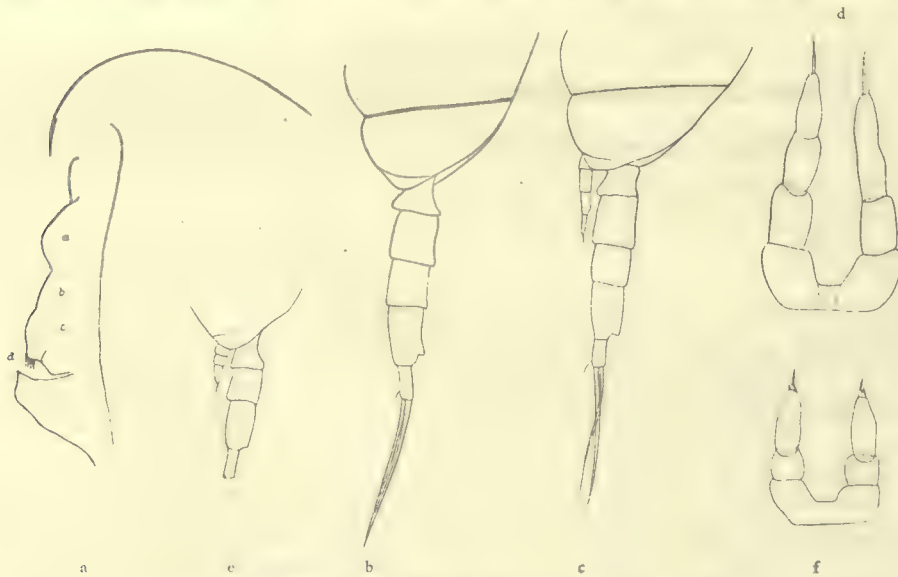
10. *Pseudocalanus minutus* Krøyer.

(Plate I fig. 8; text-figs. 13 a—f and 14 a—c).

1845—47. <i>Calanus minutus</i> n. sp. Krøyer, T. 41 fig. 4.	1903. <i>Pseudocalanus elongatus</i> Boeck. Jensen, Johansen, Levin- vinsen, p. 304, tabel II.
1849. <i>Calanus minutus</i> Kr. Krøyer, pp. 543—44, 552.	1903. — — — J. C. Thompson & A. Scott, p. 244.
1864. <i>Clausia elongata</i> n. sp. Boeck, p. 234.	1904. — — — Wolfenden, p. 111.
1872. <i>Pseudocalanus elongatus</i> Boeck. Boeck, p. 37.	1905. — — — G. O. Sars, p. 3.
1892. — — — Boeck. Giesbrecht, pp. 197—200, taf. 10.	1905. — — — Farran, p. 30.
1892. <i>Clausia elongata</i> Boeck. Canu, pp. 170—171; pl. II, figs. 1—13.	1906. — — — Pearson, p. 10.
1897. <i>Pseudocalanus elongatus</i> Boeck. Vanhöffen, p. 278, pl. I, fig. 6.	1906. — — — Williams, p. 640.
1898. — — — Giesbrecht & Schmeil, p. 28.	1907. — — — major G. O. Sars. Koefoed & Damas, p. 407.
1898. — — — Aurivillius, pp. 69—70.	1907. — — — <i>gracilis</i> G. O. Sars. Koefoed & Damas, p. 406.
1900. — — — G. O. Sars, p. 69.	1908. — — — major G. O. Sars. v. Bremen, p. 25, fig. 22.
1900. — — — major n. sp. G. O. Sars, pp. 69—72, pl. XX.	1908. — — — <i>elongatus</i> Boeck. v. Bremen, p. 25, fig. 23.
1901. — — — <i>elongatus</i> Boeck. Th. & A. Scott, p. 339.	— — — Farran, p. 28.
1902. — — — Mrázek, pp. 507—508, figs. 5—6.	1910. — — — Oberg, pp. 48—49, 56—57 taf. I and VI fig. 3.
1902. — — — Th. Scott, p. 450.	— — — Kraeef, pp. 67, 77, 79, taf. I figs. 13—21.
1902. — — — Wolfenden, p. 361.	1910. — — — Steuer, p. 22.
1903. — — — Norman, p. 135.	1911. — — — Farran pp. 63—65.
1903. — — — I. C. Thompson, p. 16.	1913. — — — Stephensen, pp. 71—72, pls 4—5.
1903. — — — G. O. Sars, pp. 20—21, pls X—XI.	1913. — — — Stephensen pp. 312—13.
1903. — — — <i>gracilis</i> n. sp. G. O. Sars, pp. 154—155, pl. I (Suppl.).	

Synonymy. As Krøyer has described and figured a young male of his species, it is perhaps not so curious that the different authors have not realized that it is identical with *Pseudocalanus elongatus* Boeck. Krøyer's description and figure are however so good, that scarcely any other species from the Arctic Sea has a penultimate stage to be confounded with it. As I have had the opportunity of examining Krøyer's original specimens, it is quite evident to me, that the two species are identical; the three examined specimens belonged all to the penultimate stage (1♂ + 2♀); they were in the shape of the head most alike *Ps. gracilis*, and were of middle size. According to the general rules of nomenclature the name *Ps. elongatus* ought to be changed to *Ps. minutus* Kr., if the three forms are referred to a single species.

Introductory Remarks. The material which I have examined of this species has been very big, as it is one of the most abundant and widely distributed plancton-copepods of the northern seas; it was therefore quite necessary for me to try to solve the question, whether different or only a single species alike to *Pseudocalanus minutus* exist; unfortunately the result of my investigations is not quite satisfactory. Sars has been the first, who has pointed out that different types exist, and taking the scanty material into consideration he was quite right in establishing the three species *Ps. elongatus* Boeck, *Ps. major* G. O. S. and *Pseudocalanus gracilis* G. O. S. No naturalist has later on tried to solve the question, scarcely touched it¹; most of them have examined specimens from southern regions and



Text-fig. 13. *Pseudocalanus minutus* Kr.

a. ♀. Head from the left $\times 110$. b-c. YQ-♂ (stage V) Abdomen $\times 59$.
 d. Y♂ (stage V) Pes V $\times 150$. e. Y♂ (stage IV) Abdomen $\times 59$.
 f. Y♂ (stage IV) Pes V $\times 150$.

have scarcely been wrong in referring them to the *Ps. elongatus* Boeck (sensu strictu). According to Sars the 3 species are characterized in the following manner.

1) *Ps. major* G. O. S. Average length of ♀ 2.4 mm. The head is only slightly produced anteriorly; the abdomen is half as long as the cephalothorax. The antennulae extend almost to the middle of the abdomen.

2) *Ps. elongatus* Boeck (sens. strict.). The average length is 1.4 mm. The head is only

slightly produced anteriorly; the urosome somewhat exceeding half the length of the anterior division. The antennulae scarcely reach beyond the second caudal somite.

3) *Ps. gracilis* G. O. S. Average length 1.65 mm. The body is more slender and the head anteriorly distinctly produced; the urosome scarcely exceeds half the length of the anterior division; the caudal rami are comparatively narrower and more divergent. The antennulae reach to the end of the third caudal somite. Legs considerably more slender than in the typical species, with both rami very narrow.

It will be noticed that in most characters, except in size, the *Ps. gracilis* differs almost equally from the two other forms. The character found in the size and the length of the urosome is at least of very relative value, as even from the same station (Ing. Nr. 31)² the following was observed: Spec. Nr. 1 2.3 mm. with ant. division 2.5 \times urosome, Nr. 2 1.8 mm. ant. div. 2.5 \times uros. (head of *gracilis* type); Nr. 3 1.8 mm. ant. div. 2 \times uros. (head elong. type); Nr. 4 1.7 mm. ant. divis. 2.5 \times uros., Nr. 5 1.5 mm. ant. divis. 2.4 \times urosome; Nr. 6 1.4 mm. ant. divis. 2.1 \times urosome; Nr. 7 1.2 mm. ant. divis. 2.3 \times urosome. The relation between the length of the urosome and anterior portion has

¹ With the exception of Damas and Koefoed, who have often been in difficulty about the identification of the specimens and p. 406 write "Ces deux espèces, distinguées par Sars, ne sont peut-être que des variations d'une seule forme".

² N. B. from this station was found copepodite (St. V) 1.7 mm. and cop. (St. IV) 1.4 mm. long.

also been examined at several other stations (f. inst. Gunolfsvig Iceland), where I often found that the small specimens had the urosome comparatively longer (f. inst. ant. div. $1.9 \times$ uros.), but with several exceptions. According to Sars the anterior division of *Ps. gracilis* is comparatively more slender; I found, certainly, that a specimen of typus *major* had the anterior division 2.3 as long as wide, one of typus *gracilis* 2.7 as long as wide, and one of typus *elongatus* 2.4 as long as wide, but as several exceptions were found, I was not able to use this character. I first got the impression that the characters found in the comparatively long antennulae and natatory legs in several specimens of the typus *gracilis* were useful, but a study of greater material made it evident to me that they were too variable to be of any value. The feature which marks out some specimens as *gracilis* is the curiously prominent forehead, which is in any case very seldom found in the biggest as well as in the smaller specimens. But as all transitions were found between the different shape of head, even in specimens which in other respects were most like *gracilis*, it was impossible for me to accept more than a single species.

Description. ♀. I was not able with certainty to find any secretory pores in the natatory legs.

The *labrum* proper, which is the most posterior of a row of more or less prominent elevations found behind the insertion of the rostral filaments (text-fig. 13a), has along its hinder margin, on each side, a group of fairly long hairs, and in the middle, somewhat in front, a hairy protuberance. The oral surface of the labrum possesses four groups of short hairs, as seen in fig. 8 (Pl. I). The *lamina labialis* has along its posterior margin three indistinct rounded eminences; orally the two usual longitudinal series of fairly short hairs are observed, of which the more lateral is longer and with longer hairs. Behind the lamina a transverse row of short hairs or teeth is observed and a similar but longitudinal one is found inside the serrula 6-dentata. Between the labial lobes, which are covered with hairs, the arrangement of which were not made out, about four groups of hairs are found, of which the hindmost, which has longer hairs, stands more laterally. Between this and the lateral margin behind the labial lobes 2 oblique groups of hairs are present.

Behind the *area labialis* proper is found on each side a large group of fairly long hairs in addition to a few hairs more laterally, and in the middle a triangular group, placed more posteriorly and with its hindmost, wider part fused with a rather irregular group of setae placed between the insertion of the maxillae.

♂. As far as the full-grown males, of which comparatively few were examined, were concerned, I could not find other differences between the different specimens than that of size, varying from 1.1 to 1.4 mm. Canu and Sars have given descriptions and figures of the rudimentary mouth limbs. In most specimens an indication between the head and first thoracic somites was seen as figured by Canu as well for the male as for the immature specimens.

Y. (Stage IV). Size: 1.2 — 1.9 mm. The last thoracic somite is generally more produced than that of the mature females, and dorsally a more or less marked limitation between the two last somites is found (text-figs. 12b—c). The urosome is comparatively short and sometimes only one third of the anterior division; according to Kraefft (figs. 15—18) the two first somites are better separated in the males than in the females; generally no such differences were observed, but in some young females, especially of the smaller "variety", the two first somites were somewhat produced below,

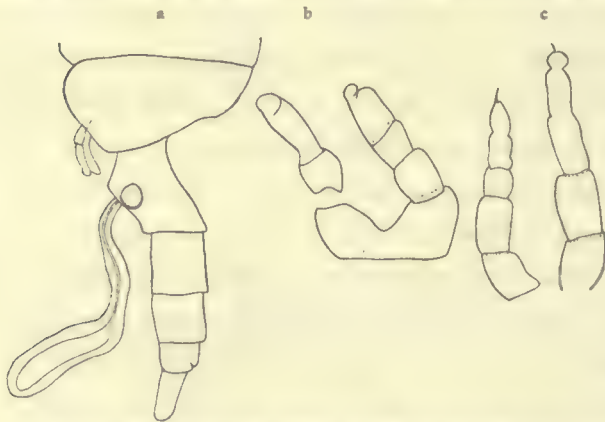
probably an indication of the final ecdysis. The mouth limbs are scarcely different from those of mature females. The males are always easily distinguished from the females by the presence of the well developed pes V (text-fig. 13 d) which consists of two basal segments and two terminal ones (Re), which especially on the right side, are not always so well distinguished as figured by Canu (Pl. II fig. 6). In this stage varieties similar to those of mature females but less marked were found.

Y. (Stage IV). Size: 0.9—1.4 mm. But for the presence of only 3 somites in the abdomen this stage is like the preceding one, and shows similar differences between the two sexes (text-figs. 13 e—f).

Y. (Stage III). Size: 0.7—1.0 mm. This stage, of which Stephensen has given figures of all the limbs, shows no sexual differences, and is characterized by four natatory legs and two abdominal somites.

Y. (Stage II). Size. 0.5—0.8 mm. This stage has three natatory legs and two abdominal somites. The last copepodite stage as well as the larval forms was not with security found out; I refer to Oberg's description.

Variation. From Iceland I have examined a female (taken ^{25/6} 1902 by Ditlevsen in Hestereyri-fjorde) with a spermatophor attached to the genital somite, in which a fairly well developed



Text-fig. 14. *Pseud. minutus* Kr., abnormal female.

- a. Abdomen (female with spermatophor from Hestereyri-fjord Iceland) $\times 67$.
 b. Pes V of same specimen $\times 160$.
 c. (to the right) Pes V of specimen from Ing. St. 49.

fifth pair of legs was observed (cf. text-fig. 14 a—b). The Ingolf Exp. (at St. 49 V. 100—0 fm.) has taken a full-grown female? alike the preceding but with much longer pes V, of which the left is longer than the right (text-fig. 14 c). The Ø. Exp. 1900 (F. 451) has taken a female with a right and left pes V of almost equal length; the Re III of left pair is rounded and short, without terminal seta; the corresponding segment of the right side is more elongate. From Ingolf (St. 29 V. 50—0 fm.) I have examined a young animal (♀?) with a rudimentary pair of legs, consisting of two short basal segments, and a rounded small terminal segment. Boeck is the first who

has mentioned females with a fifth pair of legs (1864 p. 234), and Mrázek has published an interesting study on this topic. He has found a small rudiment now and then, and sometimes a fairly well developed pair of legs; his figures of two specimens are somewhat different from each other, but in structure mainly like my specimen from Ø. Exp. Kraefft has examined a female with a rudimentary fifth pair of legs. It is interesting, though in no way surprising, that the organ in none of the 6 specimens in which its structure has been described was alike another.

Occurrence. This species has been taken almost all over the area explored by the Ingolf Expedition, as far north as Jan Mayen and the Diskoisland; in the Atlantic it has not been taken farther south than at the latitude of 63° North. By the East-Greenland Expedition it was only taken at comparatively few stations, south east of the Færoes 61°06 Lat. N. 10°26 Long. W., in the Norwegian Sea as far east as 1°04 Long. East (lat. 62°16 North) and at 6°12 Long. West (at 69°06 Lat.

North), in the Polar Sea as far north as $72^{\circ}30'$ Lat. North ($6^{\circ}41'$ Long. West), along the east coast of Greenland as far north as c. 70° Lat. N. In Denmark Strait, in the Atlantic (west of the Færoes) and in the fjords of Iceland as well as on the west coast of Greenland it has been taken by several collectors.

In the following I am going to give an account of the number of stations at which the different stages and partly the types of the species were taken at the different seasons.

West Greenland. In Davis Strait, on the west coast of Greenland, the Ingolf Expedition 1895, has taken mature females of *Ps. major*, at four stations from $1/7$ — $11/7$ 1895, *Ps. gracilis* at five stations from $25/6$ — $28/7$, and *Ps. elongatus* from a single stat. $11/7$. Of the copepodites (St. V) specimens of *Ps. major* have been taken at 2 stat. ($26/6$ — $1/7$), of *Ps. gracilis* at 3 st. ($1/7$ — $28/7$) and of *Ps. elongatus* at 2 stat. ($1/7$ — $11/7$); of the copepodites (St. IV) *Ps. major* was taken at 3 stat. ($26/6$ — $1/7$), of *Ps. gracilis* at 2 stat. ($6/7$ — $28/7$) and *Ps. elongatus* at 2 stat. ($1/7$ — $11/7$). At a single station ($1/7$ St. 29, $65^{\circ}17'$ Lat. North $55^{\circ}42'$ Long. West) a single mature male was found, but at no station copepod. of younger stages than the fourth were taken. In contrast to the Ingolf Expedition, by which most specimens were taken in the open sea in vertical hauls in a depth of from 200--0 fathoms, Bergendal and Lundbeck have in 1890 taken a good many specimens at the surface and near the coast. On that account, perhaps, almost all the specimens are most naturally referred to the *Ps. elongatus* type. From "Jakobshavn" 2 mature males [from the same sample 50 f♀; 5 y♀ (V); 4 y♂ (V); 3 y♂ (IV); 1 y (III)] were taken $28/8$, mature females were taken at 3 stations ($21/8$ — $28/8$), young specimens (V) at same 3 stations and Ccp. (III—IV) at a single stat. ($28/8$) only. From Egedesminde 2 mature males were taken $23/7$ [from same stat. 6 f♀; 2 y♀ (V); 2 y♂ (V)], $4/8$ 2 f♂ [9 f♀; 60 y♀ (V); 35 y♂ (V) from same station] and 3 f♂ $10/8$ [from the same stat. 12 f♀; 9 y♀ (V); 2 y♀ (V); 5 y♂ (V); 1 y♂ (IV); 1 y (III); 1 y (II)]; from the same locality mature females were found eight times between $21/7$ and $10/8$ and a single time $9/10$ night [at this catch were taken 6 f♀; 12 y♀ (V); 4 y♂ (V); 6 y♀ (IV); 4 y♂ (IV); 4 y (III); 1 y (II)], young animals (V) seven times between $3/7$ and $10/8$ and $9/10$, young animals (IV) $3/7$, $10/8$ and $9/10$ and Copep. (II—III) only $9/10$.

At Disco Bay Lundbeck has $6/9$ taken 160 mature females, 3 mature males, 3 young females (V) and 5 males (V), 3 young females IV and 13 copepodites (III) and Bergendal at the same date 100 ♀ (VI), 1 ♂ (VI) and 3 y♀ (V).

West of Iceland. In Denmark Strait and on the west coast of Iceland no specimens, which were naturally referred to *Ps. major*, were observed; mature females of *Ps. gracilis* were only taken at 3 stations (V.¹ 19 — $20/5$ 1895) in the open sea and young ones (III—V) only $19/5$, while specimens in different stages, including mature males, of the *Ps. elongatus* s. s. were only found in "Dyrefjord" [$30/5$ 1895. 6 f♀ (partly with egg-balls attached to genital somite), 9 y♀ (V), 2 y♀ (IV), 1 f♂, 7 y♂ (V), 1 y♂ (IV), 2 y (III) and $3/6$ 1896 1 f♀]. The sample from $19/5$ 1895 V.¹ 100—0. St. 8, $63^{\circ}56'$ Lat. N. $24^{\circ}40'$ L. W. contained 100 f♀, 2 y♀ (IV), 7 f♂, 2 y♂ (V), 1 y♀ (IV) and 2 y (IV), and that from $20/5$ 1895 V.¹ 100—0 fm. St. 9 17 f♀ and 15 f♂.

North of Iceland. In the fjords north-west and north of Iceland A. Ditlevsen has $25/8$ 1902, at Hjalteneýri Øfjord gathered specimens of the *elongatus* type [1 f♀, 2 y♀ (V), 1 y♀ (IV); 2 y♂ (IV); 1 y (III)]

and $28/8$ at Svavadilvig [2 f♀, 1 y♀ (V); 1 y♂ (IV), 3 y♂ (V)]. Lundbeck has $25/5$ 1892 taken 14 f♀ (two with egg-ball and one with spermatophor), 3 y♀ (V), 2 y♂ (V) at Skutulsfjord and $23/8$? in Gunolfsvig (N. East Iceland) 50 f♀, 5 y♀ (V), 10 y♂ (V) and 1 y♂ (IV).

South-West of Iceland. To the south-west of Iceland 10 mature females, 5 y♀ (V), 3 mature males and 5 young males (V) were found $13/6$ 1896, St. 80, P. 100—0 fm. $61^{\circ}02$ Lat. N. $29^{\circ}32$ Long. W.

South of Iceland. To the south of Iceland a single male was taken by the Ingolf Exp. ($7/8$ 1896, Cyl. 32, $63^{\circ}45$ Lat. N. $22^{\circ}37$ Long. W. 2 ♀; 2 ♂); $8/8$ 1896 a mature female of *Ps. gracilis*, and from $13/5$ — $19/5$ 1896 at three stations females of *Ps. elongatus* were taken; of the latter young animals (V) were taken at 3 stations ($6/5$ — $31/5$), y♀ (IV) at a single station ($31/5$ 1896) and young animals (III) $30/5$ 1895 and $31/5$ 1896. The East Greenland Exp. 1900 has taken a few mature and young females south of Iceland $25/9$.

In the Icelandic fjords adult males have been taken several times by different collectors. On the north coast it was only taken once [Ingolf $1/8$ 1896 Selvik in Skagafjord $65^{\circ}58$ L. N. $19^{\circ}50$ L. W. Pl. 4 y♀ (V), 1 f♂, 5 y♂ (V), 7 y♂ (IV), 10 y (III) and 2 y (II)]. On the east to west coast males were taken 3 times ($13/5$ — $26/5$ 1902), and females as well as juniores (stage II—V) were in several samples found common from $13/5$ — $26/5$.

South-East of Iceland. In the Iceland-Færoe channel south east of Iceland *Ps. gracilis* (f♀) were taken in four samples between $11/5$ — $16/5$ 1895 and $20/5$ 1896, and *Ps. elongatus* (f♀—♂) in four samples ($11/5$ — $16/5$ 1895 and $20/5$ 1896); young animals (IV—V) were taken three times ($11/5$ — $13/5$ 1895 and $20/5$ 1896). Several males were found in a single sample from $11/5$ St. 1, V. 50—0 fm. $62^{\circ}30$ Lat. N. $8^{\circ}21$ L. W., including 140 f♀, 23 y♀ (V), 8 y♀ (IV), 30 f♂, 20 y♂ (V) and 5 y♂ (IV). From St. 3, $12/5$, V. 100—0 fm. 11 f♀ and 1 f♂ were found and from St. 4, $13/5$ 1895, V. 100—0 fm. $64^{\circ}07$ L. N. $11^{\circ}12$ L. W. 37 f♀, 3 y♀ (V), 1 y♀ (IV), 2 f♂ and 4 y♂ (V). From St. 57, $20/5$ 1896, V. 100—0 fm. $63^{\circ}37$ Lat. North $13^{\circ}02$ Long. West, 1 f♀, 1 y♀ (V) and 2 f♂ were secured.

North-East of Iceland. To the east and north-east of Iceland as far north as Jan Mayen specimens (f♀) of *Ps. gracilis* were found in four samples, taken between $10/7$ and $25/7$ 1896, and *Ps. elongatus* in six samples ($10/7$ — $25/7$); young animals (IV—V) of the former type from 3 Stat. ($10/7$ — $25/7$) and of the latter from 9 Stat. ($10/7$ — $25/7$ 1895); the following stage (III) was taken at 6 Stat. ($1/7$ — $28/8$).

The East Greenland Expedition 1900 has from $21/6$ to $2/7$ in the Norwegian Sea between $63^{\circ}16$ Lat. North $1^{\circ}14$ Long. East and $72^{\circ}30$ Lat. N. $6^{\circ}41$ Long. W. collected a few samples containing this species (type: *gracilis* or *elongatus*) all taken at the surface (F. or G.).

The mature female was only taken once ($21/6$ 12 p. m. F. 33, $64^{\circ}17$ Lat. North $0^{\circ}51$ Long. West); young animals (V) were taken in 7 samples, including that from the most northern station, young animals (III—IV) were found in four samples. As the species was only taken in few specimens, in altogether 7 samples, though one sample was taken each hour day and night from $21/6$ to $10/7$ as far north as $74^{\circ}28$ Lat. North ($15^{\circ}36$ Long. West), there is good reason to regard it as extremely scarce at the surface at the season and in the region mentioned.

The expedition has taken the *Ps. elongatus* a few times in Nansen's closing net.

Viz: $^{21/6}$ 1 p. m. $64^{\circ}17$ L. N. $0^{\circ}51$ L. E. 75—50 fm. 1 f♀; 3 y♀ (V); 1 y♀ (IV); 1 f♂; 3 y♂ (V); 3 y♂ (IV); 1 y (III); 1 y (II).
40—10 fm. 1 f♀; 6 y♀ (V); 5 y♀ (IV); 9 y♂ (V); 9 y♂ (IV); 7 y (III).
$^{25/6}$ Jan Mayen 50—60 fm. 5 f♀.
$^{1/7}$ 100—50 fm. 1 f♀.

Johannes Petersen has $^{11/7}$ 1901 at 73° Lat. North and 8° Long. East taken 60 f♀, 99 y♀ (V), 9 y♀ (IV), 72 y♂ (V) and 5 y♂ (IV) of *Ps. gracilis*.

East and South-East of the Færoes. To the east and south-east of the Færoes mature females of *Ps. gracilis* were only taken $^{7/5}$ 1895 and $^{6/5}$ 1896, while those of *Ps. elongatus* were taken in 3 samples ($^{5/5}$ and $^{19/8}$ 1895) and in 9 samples by Ingolf 1896 ($^{4/5}$ — $^{6/5}$ and $^{16/8}$). Mature males were taken $^{6/5}$ 1895 Cyl. 2 [$59^{\circ}17$ Lat. N. $3^{\circ}26$ Long. E. 3 f♀; 1 f♂], $^{4/5}$ 1896 Cyl. 4 [$58^{\circ}29$ Lat. N. $5^{\circ}0$ Long. E. 16 f♀, 3 y♀ (V), 2 y♀ (IV), 2 f♂, 6 y♂ (V), 2 y♂ (IV), 1 y (III)], $^{5/5}$ 1896 Cyl. 6 [$59^{\circ}18$ Lat. N. $3^{\circ}08$ Long. E. 5 f♀, 1 y♀ (IV), 1 f♂, 1 y (III)], $^{5/5}$ 1896 Cyl. 8 [$61^{\circ}00$ Lat. N. $0^{\circ}10$ L. E. 9° C. 33 f♀, of which one with spermatophor, 1 y♀ (V), 1 y♀ (IV); 8 f♂, 6 y♂ (V)], $^{10/8}$ 1896 Apstein 81 [$63^{\circ}45$ Lat. N. $7^{\circ}10$ Long. W. 1 f♂; 1 y♂ (IV); 1 y (III)], $^{13/8}$ 1896 Klakvig Ankerplads the Færoes 1 f♂, $^{17/8}$ 96 Cyl. 44 [$60^{\circ}50$ Lat. N. $0^{\circ}25$ L. W. 6 f♀, 8 y♀ (V), 10 y♀ (IV); 1 f♂, 14 y♂ (V), 8 y♂ (IV); 4 y (III); 1 y (II)] and $^{17/8}$ 1896 Cyl. 47 [$59^{\circ}40$ Lat. N. $2^{\circ}12$ Long. E. 11 f♀, 1 y♀ (IV); 1 f♂; 1 y (III)]. Young animals (V) were taken $^{5/5}$ 1895 and in 9 samples 1896 ($^{4/5}$ — $^{6/5}$; $^{16/8}$ — $^{17/8}$), young animals (IV) only in 5 samples ($^{4/5}$ — $^{6/5}$ and $^{17/8}$ 1896), jun. (III) in 3 samples ($^{4/5}$, $^{6/5}$, $^{17/8}$ 1896) and juniores (II) $^{4/5}$ and $^{12/8}$ 1896.

E. Bay has $^{11/6}$ 1891 $58^{\circ}03$ Lat. N. $2^{\circ}08$ L. W. taken 50 f♀, 31 y♀ (V), 16 y♀ (IV), 3 f♂, 16 y♂ (V), 19 y♂ (IV), 9 y (III) and 2 y (II). Mortensen has $^{3/6}$ 1899 at Kalbarsfjord, the Færoes, 40—10 fm. taken 3 females with spermatophores and Rink has $^{18/3}$ 1848 at the Ørkney Islands taken 6 f♀, 4 y♀, 3 f♂ and 3 y♂.

If any conclusions with regard to the occurrence of the three mentioned types can be drawn from the above, it must be that *Ps. major* is only found in the open sea in Davis Strait, probably not at the surface, that *Ps. elongatus* is often found at the very surface, most common in samples taken comparatively near the coast, though in no wise scarce in those from the open sea, and that *Ps. gracilis* seems to be a more northern and more oceanic form.

Propagation. As it is generally recognised that the mature males of the pelagic copepodes, especially in species in which the manducatory limbs are rudimentary, only live a comparatively short time, we are right in concluding that the seasons in which we find mature males are those of the propagation of the species; specimens with spermatophores attached to the genital somite and with egg-balls indicate the same.

Mature males have been found south-east of the Færoes $^{6/5}$ 1895 and in 4 samples $^{4/5}$ — $^{6/5}$ 1896, in the Iceland-Færoe Channel at 3 stations $^{11/5}$ — $^{13/5}$ 1895 and $^{20/5}$ 1896, south-west of Iceland $^{13/6}$ and $^{7/8}$ 1896, in Denmark Strait at 2 stations $^{19/5}$ — $^{20/5}$ 1895, in various Icelandish fjords, in 5 samples $^{3/5}$ — $^{30/5}$ 1895—1902, at the Ørkney Islands $^{18/3}$ 1848; $^{3/6}$ 1899 a female with spermatophor was taken at the Færoe Islands; $^{11/6}$ 1891 mature males were taken south-east of the Færoes; north-east of Iceland (as far north as 66° Lat. North) mature males were taken $^{25/7}$ 1895 (+ females with spermatophores)

and $21/6$ 1900. In Davis Strait mature males were taken $1/7$ 1895 and at Egedesminde etc. in 6 samples from $23/7-6/9$ 1890.

From the north of Iceland males were taken $1/8$ 1896; from the Færoes and the Norwegian Sea, south-east of these Islands, they were taken in 5 samples from $7/8-17/8$.

As only very few samples were taken from the explored regions at other seasons (from Norwegian Seas none June—July 1895—96), we do not know if propagating took place at other seasons.

Mature females were taken in Denmark Strait $19/5-30/5$ 1895, in Davis Strait $25/6-28/7$ 1895 and $23/7-6/9$ 1892, south-west of Iceland $13/6$ 1896, south of Iceland $13/5-19/5$ 1896, $7/8$ 1896 and $25/9$ 1900, south-east of Iceland $11/5-16/5$ 1895, $20/5$ 1896, north-east of Iceland $10/7-25/7$ 1896, $21/6-25/6$ 1900 and $11/7$ 1901, south-east of the Færoes $4/5$ and $19/8$ 1895, $4/5-6/5$ and $16/8$ 1896. The copepodites (V—IV) were practically found in samples from the same dates, the only interesting exception being their occurrence at Disco Bay $9/10$ 1892; the copepodites (III, II) were only found at very few stations, probably on account of their small size.

Distribution. The *Pseudocalanus minutus* Kr. has its main distribution over the northern part of the Atlantic Ocean, on the west side as far south as the Gulf of St. Laurence, and on the east as far south as 35° Lat. North; it has been mentioned from the Black Sea, the Gulf of Suez and the Mediterranean. In the Arctic Ocean it is known from Baffins Bay to the New Siberian Islands, and has once been recorded from the west coast of North America (Puget Sound).

Farran, mainly on material collected by the International Investigations, has given a fairly exhaustive account of its distribution and the points of its biology. It is most often abundant in the Baltic, except in the Gulf of Bothnia, in the Belts, Kattegat, Skagerak, along the coast of Norway, in the English Channel, the Irish Sea and in coastal waters on the south and west coasts of Ireland. "In the North Sea south of 55° it is always present but usually scarce, sometimes abundant". In the north-west of Scotland, there is an indication of periodicity in its occurrence as well as of curious variation from year to year; it was common in August 1903, moderate in August 1904 and 1906, scarce in August 1907, and absent or almost absent in August 1905. In the Færoe and the Færoe-Iceland channel the recorded distribution is somewhat irregular; during several years it has been found fairly common in May and August (in 1906 almost absent). "On the south and west coast of Iceland it is generally distributed in the open sea ten miles or more from shore, but it is usually rare, and often absent from the tow-nettings. In the coastal waters it may be found frequently, and often forms large shoals". On the north coast of Iceland it has been recorded by Paulsen.

In the Norwegian Sea and southern Arctic Ocean between Jan Mayen and Iceland on the west and Norway on the east it is in any case sometimes common or abundant.

On the west coast of Greenland it has been recorded by Vanhöffen from Umanak Fjord (1897) and rather abundantly from the surface down to 240 m. adults as well as copepodites by Stephensen from Northern Strömfjord about $67^\circ 40'$ Lat. North (range of temperature 0° to 3.2° C.).

From the east coast of Greenland it has been recorded by Cleve $74^\circ 15'$ Lat. N. $18^\circ 15'$ Long. W. and by Koefoed, who has found specimens (1.42 to 1.7 mm. long) at 4 Stations between $78^\circ 09'$ and $77^\circ 35'$ Lat. North, and $14^\circ 01'$ and $18^\circ 02'$ Long. West from the surface down to 65 met. (Temperat. $\div 10 - \div 17^\circ$ C.), which he thinks ought to be referred to *Ps. elongatus* rather than to *Ps. gracilis*.

As the Duc d'Orléans is the expedition which has made the most systematic plancton-investigations from different depths with measurements of salinity and temperature, and as Koefoed and Damas are the only ones, who have separated the three types, I think a more detailed survey of their material, should pay.

Ps. major, which was first recorded by G. O. Sars north of the New Siberean Islands, was only taken a single time 78°05 Lat. N. 5°21 Long. W. ¹⁶/₇ 1905 between 800 and 1350 met. (salinity 34.95 ‰; temp. 0.08° — ÷ 0.37° Cels.).

Ps. elongatus was only taken near the coast of Spitzbergen (c. 80° Lat. North 14°33 Long. East) at 4 stations near the surface (Temp. 0.50—2.50° C.) and at the mentioned stations near East Greenland.

Ps. gracilis, which has previously been recorded by Sars at the coast of Finmarken and between Finmarken and Bären Island "a été capturé entre 600 mètres et la surface; il est particulièrement abondant au-dessus de 200 mètres; d'après les estimations faites par Koefoed, il paraît moins fréquent le long de la côte grönlandaise qu' au large, mais il est très fréquent tant dans le Gulfstream que dans le courant polaire". The species is generally missing in hauls from 0—20 meters, but it has been found common here at a few station (c) independent of the time of the day and of the temperature (lying between ÷ 1.70 and + 1.50). It has been found common at a depth between 480 and 600 metres, juniores between 800—1000 metres (p. 270), and abundant at temperatures from ÷ 1.70 to + 3° C. The salinity, at which it is found common, varies from 30.60 ‰ to 34.90 ‰.

As set forth by Farran the conditions at which this species can flourish are very varied. The salinity varies from 7.25 ‰ to 35.30 ‰, the temperature from ÷ 1.70° C. to 12.47° C., it is found from the surface near the coast, where it is often left in tidal pools, as deep as 600 metres in the open ocean. About the details of its biology I refer to Farran, several interesting studies of Herdmann from the Irish Channel but especially to Kraeef, who in the Baltic and the North Sea has studied the growths and the occurrence at different depths of the various stages (juniores). He writes (1910 p. 79) "es zeigt sich deutlich dasz das III Stadium von Schicht zu Schicht, von Boden nach der Oberfläche gerechnet in immer gröszer werdenden Menge vorhanden ist"; he found that mature females (April 1906 in the Baltic) were present in 59.1 ‰ between 75 and 30 metres, but only in 3.1 ‰ between 5 and 0 metres.

About the time of propagating I have in the literature only found that the Duc d'Orléans has collected mature females and males (⁸/₇ 1905 80°13 Lat. N. 7°42 Long. East 400—500 metres, 0.23—0.80° C., and ¹⁵/₈ 1905 71°22 Lat. N. 18°58 Long. East, 200—400 metres, 0.67—1.53° C.).

Remarks. It has previously been mentioned that no characters are found by which all specimens could be referred to one of the three types of *Pseudocalanus minutus*; in the same sample intermediary links are found not only between the extremities of the mature females but also between the copepodites of stage IV—V, in which however the difference between the types is less marked. The question how to explain marked differences in size and other characters found in the same sample under the same biological conditions, if they all belong to the same species, is too vexed to be answered now. Specificness of the different types may perhaps be excluded by the examination of several hundreds of specimens at least, from samples with marked variation between the specimens, after Galton's statistical methods.

Some of the differences are certainly congenital, but others are probably due to the fact that specimens, which later on are found under identical biological conditions, are born at different localities and have got a different start in life, before being carried by currents or other agencies to their present abode.

II. *Microcalanus pygmæus* G. O. Sars.

1900. <i>Pseudocalanus pygmæus</i> n. sp. (♀) G. O. Sars, pp. 73—75 pl. XXI.	1907. <i>Pseudocalanus pygmæus</i> G. O. Sars. Damas and Koefoed, pp. 396 and 407.
Spinocalanus longicornis n. sp. (♂) G. O. Sars, pp. 77 —78, pl. XXII figs. 13—14.	1908? <i>Microcalanus</i> sp. Farran, p. 28.
1901. <i>Pseudocalanus pygmæus</i> G. O. Sars. Th. & A. Scott, p. 339.	1908. — <i>pygmæus</i> G. O. Sars. v. Bremen, p. 26 fig. 24.
1902. — — — Mrázek, pp. 508— 509, taf. V figs 3—11.	— <i>pusillus</i> G. O. Sars. v. Bremen, p. 27 fig. 25.
1902? — — G. O. Sars. Giesbrecht, p. 20, taf. 2.	1908? — — — Wolfenden, pp. 41—42, pl. II fig. 5.
1903. <i>Microcalanus pygmæus</i> G. O. Sars. G. O. Sars, p. 157.	1908? — — — Hj. Brock.
? <i>Microcalanus pusillus</i> n. sp. G. O. Sars p. 156—157; sup- plement pl. II, pl. III fig. 1.	1910? — — — Kraeef, pp. 98—99.
	1911? — — — Farran, pp. 98—99.
	1911? — — — Wolfenden, p. 286.
	1913. — <i>pygmæus</i> G. O. Sars. Stephensen, pp. 311 —312.

Description. f♀. Most of the examined full-grown females agreed fairly well with Sars' description of *M. pygmæus*. The size of the specimens varied from 0.65 to 0.9 mm. In a single specimen (St. 8) the antennulae scarcely reached the end of the first abdominal somite, and the terminal spine of the second pair of legs of this, as well as of other specimens, had indication of the serration which according to Sars forms the chief characteristic between *M. pygmæus* and *pusillus*; as the natatory limbs were broken in most of my specimens, I was unfortunately unable to examine this character in most specimens (cf. pag. 68). According to Sars the rostrum is represented by two "extremely small tentacular filaments"; in my specimens, as in those examined by Mrázek and Kraeef, these organs are rather thick and more like teeth.

f♂. Size: 1.1 mm. The structure of the fifth pair of legs is very much like that figured by Sars (Pl. I pes V ♂), but in my specimen the division of the left leg into 3 basal segments is more indistinct.

Y (St. V). The juniores (♂—♀ Copep. V) are practically like the preceding stage, but for the number of abdominal somites. The male differs from the females by less prominent first abdominal somite and a fairly well developed fifth pair of legs (cf. Mrázek fig. 13).

Y (St. IV): Size: (♀) 0.65—0.75; (♂) 0.65—0.9 mm. In this stage with only 3 abdominal somites are the same differences between males and females observed.

Occurrence. Considering its minuteness one can not wonder that this species has only been taken from the following few stations by the Ingolf Exp.

Davis Strait: St. 29. 65°34' L. N. 54°31' L. W. 5/7 3.30 p. m. 1895. V¹. 50—0 fm. Temp. at surface 3.5°
C. 1 ♀, 1 ♂, 4 y♀ (V), 8 y♂ (V).

West of Iceland: St. 95. 65°14' L. N. 30°29' L. W. 27/6 5.25 p. m. 1896. P. 100—0 fm. Temp. at surface 7.8°
C. 16 ♀, 5 y♀ (V), 26 y♂ (V).

St. 8. 63°56' L. N. 24°40' L. W. 19/5 5 p. m. 1895. V. 100—0 fm. Temp. at surface 8.6°
C. 1 ♀.

- South-east of Iceland: St. 133. 63°14 L. N. 11°24 L. W. $\frac{9}{8}$ 96 1:30 p. m. P. 100—0 fm. Temp. at surface 10.8° C. 2 ♀, 2 y♂ (V).
 St. 58. 64°25 L. N. 12°09 L. W. $\frac{20}{5}$ 96 3 p. m. P. 100—0 fm. Temp. at surface 1.2° C. 7 ♀, 2 y♀ (V), 2 y♀ (IV), 2 y♂ (V), 2 y♂ (IV), 1 y (III).
- North-east of Iceland: St. 105. 65°34 L. N. 7°20 L. W. $\frac{11}{7}$ 6:30 p. m. 96. Closing net. 700 fm. 11 ♀, 2 y♂ (V).
 St. 104. 66°23 L. N. 7°25 L. W. $\frac{11}{7}$ 5:30 a. m. Closing net. 850 fm. 1 ♀.
- East of the Færoes: 60°05 L. N. 1°18 L. E. $\frac{17}{8}$ 11:45—3:45 p. m. 96. Cyl. 46. 1 y♂.
- West of the Færoes: 60°28 L. N. 12°10 L. W. the East-Greenland Exp. has $\frac{25}{9}$ 1900 F. 397 taken 1 y♂ (V).

The mentioned expedition has besides taken the species from the polar seas east of Greenland.
 74°28 L. N. 15°30 L. W. $\frac{10}{7}$ 1900 Closing net 110—40 fm. 2 y♀ (V), 2 y♀ (IV), 2 y♂ (V), 2 y♂ (IV).
 72°02 L. N. 21°20 L. W. $\frac{16}{7}$ 1900 6 a. m. Closing net 35—10 fm. 1 ♀, 1 y♀ (V), 1 y♀ (IV), 2 y♂ (V), 2 y♂ (IV).

Distribution. The *M. pygmaeus* G. O. S. was originally captured by Nansen (78° N. 13.6° E.) in considerable numbers north of the New Siberian Islands in October 1893; by Bruce it was taken at Novaya Zemlya $\frac{12}{6}$ 1900 and by Schaudin at Spitsbergen 81°32 L. N. The most important contribution to its distribution in the polar seas and to its biology has been published by Damas and Koefoed in the "Duc d'Orléans". It has been taken at almost all the stations in the polar seas between Spitsbergen and Greenland as far east as 10°42 Long. East and as far west as 18°22 Long. West, as far north as 80°17 Lat. North and as far south as 75°35 Lat. North between $\frac{26}{6}$ and $\frac{16}{8}$ 1905. The authors write (p. 396) "*Microcalanus pygmaeus* possède une grande amplitude verticale: il s'observe encore en abondance entre 1800 et 1200 mètres (St. 17) et ne manque dans aucun des échantillons profondes. Il remonte fréquemment à la surface. Nos pêches prouvent que son niveau habituel est au dessous de 100 mètres". As all the information about each species, which is found under the gatherings for each station, has not been collected for each species, I have tried to do it for *Microcalanus pygmaeus*. Near the surface it has only been found: at St. 13 (0—20 metres, T. 0.30° C., Salin. 33.30‰ $\frac{8}{7}$ 4:45 p. m.), at St. 30 (0—5 metres, T. 1.20° C., Sal. 31.32‰ $\frac{22}{7}$ 8 p. m.) and at St. 43 (0—20 met. T. 0.98° — ÷ 1.64° C. Sal. 32‰ $\frac{1}{8}$ 3 p. m.). As the salinity at which this species has been found lies between 31.10‰ and 35‰ the said authors may be right (p. 406) in referring it to the intermediary group of species, which in the Norwegian Sea exceptionally are observed "à la surface surtout pendant la nuit et dans les endroits, où la salinité est élevée"; but their final statement, indicating a difference in the vertical distribution in the different seas, about *M. pygmaeus* (p. 407) "a) Dans la Bassin polaire: constaté à de faibles profondeurs. b) Dans la Mer du Grönland: principalement vers 100 mètres; existe depuis la surface jusque à 1850 mètres. c) Dans la Mer de Norvège: surtout abondant entre 200 et 600 mètres", is neither born out by their own material (tab. II) nor by the information available in the literature. The species has not yet been recorded from the Norwegian Sea. The temperature, at which this species has been found even in great numbers (cc) at different depths, varies from ÷ 1.75 to + 2.15° C.; it has been found fairly common (+) at 3.81° C., but its optimum temperature seems to be a little below and a little above Zero. Adult males have been found at 11 stations in the Greenland Sea between $\frac{15}{7}$ and $\frac{15}{8}$, in vertical hauls from 60 to 20 and from 1000 to 800 metres and at

a temperature between $+0.49^{\circ}\text{C}$. and -1.75°C . In the literature I was unable to find any further information about this species, but about *M. pusillus* G. O. Sars, which possibly is identical with it, a good deal of information is found. According to Farran (1910 pp. 98—99) it has been recorded from several of the Norwegian fjords at considerable depths, and from the sea between Jan Mayen and Finnmarken. According to Paulsen a species, which Sars has determined as *M. pusillus*, but which really is *M. pygmaeus* (cf. later on), occurred plentifully in a depth between 230 and 350 metres on the north coast of Iceland ($14/8$ 1904 $66^{\circ}20$ L. N. $12^{\circ}10$ L. W.). In addition it has been recorded from the Irish Sea, the west coast of Ireland, the whole Norwegian Sea, the Skager Rak, the Kattegat and in the extreme S. W. Baltic off Bornholm.

At Spitsbergen ($80^{\circ}02$ L. N. $17^{\circ}02$ L. E.) it was found by the "Duc d'Orléans" in a depth of from 60—30 m. (Temp. $0.40-0.27^{\circ}\text{C}$.) and by Hofsten and Bock (150—40 m. D.).

The Belgian Antarctic as well as the National Antarctic Expedition has in the Antarctic Seas collected a good number of a minute species by nets let down through holes in the ice to a depth of 200—500 met.; they have been mentioned by Giesbrecht and Wolfenden respectively as *M. pygmaeus* and *pusillus*. The latter has pointed out that Giesbrecht's description refers to *M. pusillus* (viz. comparatively short antennulae). Giesbrecht's localities lie between $71^{\circ}18$ and $69^{\circ}48$ Lat. South and $92^{\circ}22$ and $81^{\circ}19$ Long. W. If this identification is right, the species should certainly be found in the deep sea all over the world.

Remarks. I am fairly convinced, that the characters, which Sars has set forth to distinguish *Microcalanus pygmaeus* and *pusillus* viz: shape of St. pes IV and length of the antennulae are not sufficient. In this point of view I have been even more convinced by examining some specimens from the North of Iceland, placed at my disposal by the kindness of Dr. Paulsen and determined by Professor Sars as *M. pusillus*. Most of the specimens were young males with the antennulae reaching about to the middle of the abdomen; the spinulation of the St. of the natatory legs was not very coarse. In a single specimen (length 0.84 mm.) the St. pes III has 16 dentations in proximal half in contrast to Sars figure of *M. pusillus* with 10 teeth, and to an adult female from Ingolf St. 8 with about 20. It seems evident to me that Paulsen's specimens ought to be referred to *M. pygmaeus*, and the fact that even such an authority as Sars has difficulty in distinguishing the two species from each other, makes reservation necessary with regard to several identifications found in literature, and bears out my doubts with regard to the validity of the two species.

The partial value of the two main characters have been mentioned. According to Sars the size of the adult specimens of *M. pusillus* scarcely exceeds 0.7 mm.; several of my specimens are smaller. Mrázek, who has examined ♂ and ♀, varying in size from 0.60 to 0.75 suggests the possibility of referring them to two species, and Kraeefl points out minor differences between his specimens of *M. pusillus* and Sars' description. It may be admitted that a careful re-examination of a good material from the different localities is necessary before settling the question of the identification of the species.

12. *Clausocalanus arcuiformis* Dana.

(Pl. I figs. 9a—d).

- | | |
|---|---|
| 1849. <i>Clausocalanus arcuiformis</i> n. sp. Dana. | 1894. <i>Clausocalanus arcuiformis</i> Dana. Th. Scott, p. 73, pl. 8. |
| 1892. — — — Dana. Giesbrecht, pp. 185—190,
taf. 1, 2, 10 and 36. | 1895. — — — — — Giesbrecht p. 248. |

1898.	<i>Clausocalanus arcuiformis</i>	Dana	Giesbrecht & Schmeil,	1905.	<i>Clausocalanus arcuiformis</i>	Dana	G. O. Sars, p. 3.
			p. 27.	1906.	—	—	— Pearson, p. 9.
1899.	—	—	Brady, p. 32.	1908.	—	—	v. Bremen, p. 23, fig. 20.
1900.	—	—	Wheeler, p. 171, fig. 9.	1908.	—	—	Farran, p. 28.
1901.	—	—	Cleve, p. 5.	1909.	—	—	Pesta, p. 22.
1903.	—	—	J. C. Thompson & A.	1909.	—	—	A. Scott, p. 32.
			Scott, p. 243.	1910.	—	—	Steuer, p. 22.
1903.	—	—	Cleve, p. 359.	1910.	—	—	Farran, pp. 91—92.
1904.	—	—	Cleve, p. 188.	1911.	—	—	Wolfenden, p. 203.
1905.	—	—	Wolfenden, p. 999.	1912.	—	—	Pesta, pp. 20—21.
1905.	—	—	Esterly, p. 142, fig. 13.	1912.	—	—	Sewell, p. 360.

Description. Between the specimens described by Giesbrecht and my specimens scarcely any differences were found. As far as the oral surroundings are concerned they scarcely show features of greater interest. Just behind the rostrum a low epistoma bearing a few rather short and strong bristles (fig. 9a) is found. In the middle of the *labrum* proper a rather prominent, narrow and hairy process is found, on each side of which a group of rather short setae is seen. Posteriorly the labrum is on each side produced into a hairy wing-like rounded expansion. The oral surface of the labrum (Pl. I fig. 9c) possesses on each side 3—4 longitudinal rows of short setae, and between these 3 transverse groups, of which the posterior is the most developed.

The *lamina labialis* has three subdivisions. Orally and anteriorly two interiorly convex series of hairs are observed on each side. The arrangement of the hairs behind the lamina labialis did not show features of greater interest (Pl. I, fig. 9d).

Occurrence. This species seems to be extremely rare within the area explored by the Ingolf Expedition; I have only examined 11 full-grown females and a single young one, which were taken 24/4 1889 59° Lat. North and 17° Long. West.

Distribution. The species has previously been found on the west coast of Ireland¹. In the Mediterranean it has been recorded by several authors. In the northern as well as in the southern parts of the Atlantic Seas it has been captured by the Monaco and the German Antarctic Expeditions. On the west coast of South America it has been found as far south as 53° S. By Wolfenden it is recorded from the Maladive Islands and from the Antarctic Seas as far south as Lat. 84°01', and by Brady from New Zealand (at the surface). In the Pacific Ocean it has been found between 20° Lat. North and 26° Lat. South. Vertical range from the surface to 4000 met. Cleve has found the species in the Arabian Sea (Temperat. between 24·8° and 26·7° C. and salinity between 36·20 and 35·77 ‰), the Indian Ocean (7—4° Lat. North T. 27·7°—29·35° C., Sal. 30·84—34·38 ‰) and in the Malay Archipelago (T. 25·3°—28·30° C. Sal. 32·22—33·80 ‰). According to Scott (1909 p. 32) it is moderately common over the whole area investigated by the Siboga Expedition.

13. *Spinocalanus abyssalis* Giesbrecht.

(Plate I figs. 10a—b; textfigs. 15a—e).

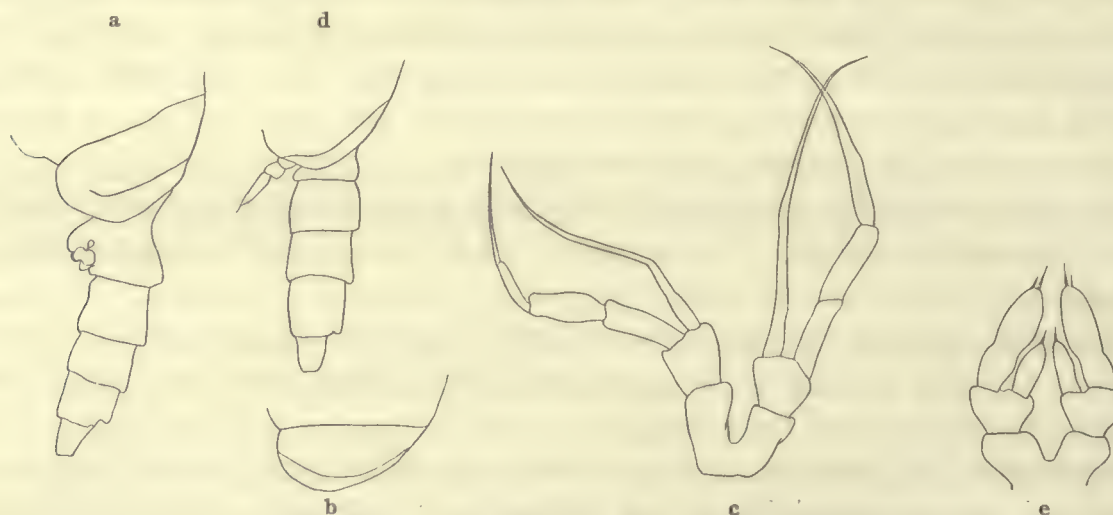
1888.	<i>Spinocalanus abyssalis</i>	n. sp.	Giesbrecht.	1900.	<i>Spinocalanus longicornis</i>	n. sp. (♀)	G. O. Sars, pp. 75—78,
1892.	—	—	Giesbr. Giesbrecht, 1892 pp. 209				pl. XXII.
			—213, taf. 13 and 36.				

¹ According to Farran (1910 p. 92) "it is occasionally carried by currents into the mouths of the English Channel and the British Channel, but has not yet been recorded from the west or north coast of Scotland". (Salinity 35·4 ‰).

1902? <i>Spinocalanus</i> Schaudinni n. sp. Mrázek, pp. 509—512, taf. IV, taf. V fig. 1.	1903. <i>Spinocalanus abyssalis</i> Giesbr. G. O. Sars, pp. 157—158; supplement pl. III fig. 2.
1903. — <i>longicornis</i> G. O. Sars. G. O. Sars, pp. 22—23, pl. XII.	1908. — — — v. Bremen, pp. 28—29, fig. 27.
	1908. — — — Farran, p. 27.

Description. f♀. Size: varied from 1.73 to 1.86 mm. Sars' specimens measured 1.1—1.6 and Giesbrecht's 1.1—1.25 mm.

The specimens which I have examined are certainly to be referred to Gbt's species in spite of minor differences, in which I most often agree with Sars' description. The head and the first thoracic segment are completely fused except in a single specimen, in which there was indication of a subdivision. The fifth thoracic somite is, as seen in text-fig. 15a, only indistinctly marked out in front. The ventral protuberance of the genital somite is less prominent than figured by Giesbrecht, and more prominent than drawn by Sars, and the shape is somewhat different.



Text-fig. 15. *Spinocalanus abyssalis* Giesbr.
 a. f♀. Abdomen $\times 170$. d. y♂ (stage V). Abdomen $\times 170$.
 b. f♂. Lateral thoracic corner $\times 170$. e. y♂ (stage V). Pes V $\times c. 225$.
 c. f♂. Pes V in anterior view $\times 225$.

The oral appendages are scarcely different from Giesbrecht's description. In the structure of the natatory legs a few differences are observed. The number of bristles which are present on the anterior surface of the second basipodite are fewer in number than figured by Giesbrecht. The exterior seta of the first outer segment of the first pair of legs is distinctly more slender than that of the following segments. The number and the arrangement of the spines or setae which adorn the surface of the exopodites and endopodites in the last three pair of legs show variations from specimen to specimen, and are not quite like Giesbrecht's description; in most specimens f. inst. short spines are observed, as figured by Sars (Pl. XII), not only on the posterior, but also on the anterior surface of the two last segments of the endopodites. In the second pair of legs the usual glandular pores were observed at the base of the exterior seta in the two last segments; none was observed in the basal segment.

The *labrum* proper is less prominent than figured by Sars (Pl. III 2c). In front of the hinder margin in the middle a transverse row of long bristles is observed, but here none along the margin

proper; laterally a series of short setae is observed (Pl. I fig. 10a), and in front of these, partly on the oral surface, a group of short spines or granules is observed. Orally we find on each side an inner and an outer series of delicate bristles, arranged in a short posterior and a long anterior division. As far as the structure of the labium etc. is concerned I refer to the fig. 10b.

f♂. Size of male 1.63 mm.

The thoracic somite IV and V are as seen in the text-fig. 15b well separated. The *antennulae* have the articular-membranes between the segments 8-9 and 10, 10 and 11, 11 and 12 rather indistinct; the antennulae become rather suddenly narrower beyond segment 14, which is wider than 15. The first to ninth segments possess two bristles in addition to one or two "Aesthetasken"; in the following segments, except in the 12th, no distinct proximal seta (Spr.) is observed, but small incisions, corresponding to their insertions; "Aesthetasken" are observed in several of the segments. The oral appendages are as shown and partly figured by Sars rather rudimentary. The *maxillulae* show the following features. The *Le* possesses 7 short bristles; the *Li* I has only a few rudimentary setae, and the rather prominent *Li* II-III have 3 short delicate bristles each. The *Basp.* has 5 and the *Ri* I-III 4 + 4 + 6 bristles, of which those of *Ri* III are fairly long and slender. The *Re* bears 11 partly powerful hairs. The *mandibles* are figured by Sars; the *antennae*, the *maxillae* and the *maxillipeds* are less powerful, but in the main features alike those of the female. The *labrum* and labial appendages show exteriorly a structure scarcely different from that of the female.

The *Se* of *Re* I *pes* I is even less developed than in the female. The structure of the fifth pair of legs (cf. text-fig. 15c) is in some points different from Sars' description; between the *Re* I and II on the right side an indistinct limitation is seen.

Y (St. V). Size: 1.45 mm.; anterior division 1.00 and the abdomen 0.45 mm.

The shape of the body is scarcely different from that of the female; there is indication of articulation between the head and first thoracic somite; the two last thoracic somites are, as seen in text-fig. 15d, well developed. The oral and natatory appendages are scarcely different from those of the females. The structure of *pes* V is shown in text-fig. 14e.

Occurrence. The Ingolf Expedition has taken 2 mature females, a single mature male and two young ones (St. V) ²⁶/₆ 1895 2 p. m. V¹. 200-0 fathoms St. 25 63°30' Lat. N. 54°25' Long. W.

Distribution. This species has been taken at 2 different stations in the polar seas in about the 80th degree of latitude and the 134th degree of longitude east as well as at 81°32' L. N. by Rømer and Schaudinn, on the coast of Norway (Osterfjord Norway in the depth from 400-600 metres), and in moderate numbers on the west coast of Ireland "at all depths from 200 to 1000 fathoms". According to Giesbrecht it is found "99°-132° W. 3° S.-14° N. In 1000-4000 Meter Tiefe".

Remarks. The female described by Mrázek as *Spinocalanus Schaudinni* is certainly identical with the mentioned Species. His male, however, seems in rather important features to differ; in his specimen the segments VIII to XIV of the antennulae are completely fused (Taf. V fig. 1), and the *pes* V differs distinctly, especially by the *Ri*, the terminal seta of which just reaches beyond the end of *Re* I.

14. *Spinocalanus magnus* Wolf.

1904. <i>Spinocalanus magnus</i> n. sp. Wolfenden, p. 118.	1908. <i>Spinocalanus magnus</i> Wolf. Farran, p. 27.
1905. — — — Wolf. Farran, pp. 30—31, pl. IV figs. 1—12.	1908. — — — v. Bremen, p. 29, fig. 29.
1906. — — — Pearson, pp. 10—11.	1911? — — — Wolfenden, pp. 216—217, text-f. 8, pl. XXV figs. 3—5.
1907. — — — Damas & Koefoed, p. 409.	

Description. f♀. Size of female from Thor St. 82 2·8 mm.; anterior division measured 2·2; urosome 0·6 mm. Wolfenden's specimens measured 2·75 and Farran's 2·9 mm.

As far as could be made out by the examination of the two very mutilated specimens, they do not seem to differ in any feature of interest from Farran's description.

In the second pair of legs no glandular pores were observed in the first outer segment, but a distinct one in the second segment, and three near the base of Se in the third outer segment.

In front of the labrum proper, which is very prominent, a smoothly rounded elevation was found; the structure of the labrum etc. was not examined in detail.

Occurrence. Of this species I have only examined two mutilated females, gathered by the Thor ¹⁴/₆ 1905 St. 82 51°00 L. N. 11°43 L. W. Yt. 1200 M. Wire.

Distribution. This species is according to Farran of frequent occurrence on the west coast of Ireland "from the surface to 1000 fathoms, though never very plentiful". According to Koefoed & Damas it is found "dans la mer du Grönland: de 800 à au moins 1800 mètres". According to the tables prepared by Koefoed, it has been found at four stations, but according to the records from each single station it has only been found at St. 22 79° L. N. 1°52 L. E. 800—1350 metres and at St. 48 71° L. N. 18°58 L. W. 800—1000 metres. The species is by Wolfenden recorded from the Antarctic, but he is probably not right in referring the Antarctic animals to the northern species, as his figure shows the genital somite less distinctly produced.

Aetideidae G. O. Sars.

Little by little a good many genera of the *Aetideidae* have been established; these genera are not at all of equal value, and in their definition not the same principles have been followed. My material has not been sufficiently exhaustive for a final solution of the question, but nevertheless a few remarks upon the value and the position of the genera, which I have examined, may be useful.

As a whole I think that undue stress has been placed on the presence or absence of the lamelli-formed setae or spines along the inner margin of second basipodite in the fourth pair of legs. *Chiridius* and *Actidiopsis* are the only genera in which marginal setae of usual structure without spines are found; in *Actidius* (Pl. II fig. 1c) terminally and posteriorly a few teeth were found in addition to the usual slender setae. In most species of *Gaidius*, *Gaetanus* and *Euchirella* the setae are transformed into more or less well developed spines. In *Underchæte minor* and nearly related species the margin is either completely smooth or possesses a few terminal teeth (cf. text-figure) and in *Chirudina*, the margin is either completely smooth as in *Ch. Streetsi*, or possesses well developed spines

(*Ch. abyssalis* and *pustulifera*). Corresponding to the difference between the mature females and males a difference is sometimes found between the two sexes in the penultimate stage; in *Gaidius tenuispinus* and *Euchirella rostrata* f. inst. the young female has along the inner margin of the second basipodite in the fourth pair of legs a few lamellous setae, while the young male has a few of usual structure; in most species of *Euchirella* and *Chirudina* the margin is smooth in both sexes in the penultimate stage.

The *Aetidius* is a well characterized genus which, as far as can be concluded from the wanting glandular pore in Re I pes II and the well developed marginal setae in the fourth pair of legs, is a rather primitive form. The *Chiridius*, to which genus I refer not only *Ch. obtusifrons* without distinct rostrum, but also *Ch. armatus* in similarity to Sars and in contrast to Vanhöffen and Wolfenden, is among other features characterized by the wanting plate-shaped process of the second basipodite of the maxillipeds, the well developed exopodite of the first pair of legs with 3 setae, and the slender marginal setae of the fourth pair of legs; as Giesbrecht had originally established the genus for a species without rostrum, Wolfenden and Vanhöffen have accepted the name *Pseudoaetidius* for *Ch. armatus*; Sars has judged this single character as being of minor importance, and he is certainly right, especially when it is taken into consideration that a rudimentary slightly bifurcate rostrum is really found. On account of the great number of glandular pores in the three last pair of legs (Pl. II figs. 3—5a) I once thought that Wolfenden was right; but as *Ch. modestus* n. sp., which in other respects was like *Ch. armatus*, has 3 glandular pores (including one in Re I), I definitively accepted Sars' definition. Sars has established a new genus *Aetidopsis* synonymous with Wolfendens *Faeroella*, especially characterized by well developed fifth thoracic tergite; as a fairly well marked fifth somite is found in most specimens of *Ch. armatus*, I do not think this genus is a good one. A. Scott's new genus *Gaidiopsis* (1909 p. 52), characterized by a very robust rostrum, is probably nearly related to *Chiridius*.

The genera *Bradyetes* Farr. and *Undinopsis* G. O. Sars (synonymous with *Bradyidius* Giesbr.) are nearly related; *Pseudoeuchæte* Sars is according to Farran related to these genera as well as to *Bryaxis* Boeck, the position of which seems to be a little doubtful on account of the poorly developed outer ramus of the antennae. The position of Sars' genus *Chiridiella* is very doubtful. I have not had the opportunity of examining any specimens of the last mentioned five genera.

According to Giesbrecht (1892 p. 249) the genus *Gaidius* has "rostrum kurz einspitzig" and "Aussenast des ersten Fusses zwei ... und Innenast des 1. und 2. Fusses eingliedrig" and the only difference from *Gaetanus* is found in the frontal spine and the two-segmented endopodite of the second pair of legs of the latter genus. The character found in the segmentation of the endopodite of the second pair of legs is not of much value, as this articulation is well developed in most species of *Gaetanus* as well as in *Gardius brevispinus*, slightly developed in *Gaetanus miles* and *Gardius tenuispinus*, and completely wanting in *Gaetanus minor*. The presence or absence of the frontal spine seems to me to furnish a good specific, but scarcely a generic, character; Sars seems to share this opinion, as he has established a *Gaetanus inermis* without any spine. Wolfenden has established a new genus *Mesogaidius* (1911 p. 223) for his *M. intermedius*, perhaps identical with *G. brevispinus*, and his *M. maximus*, because they combine the wanting frontal spine with "das Vorhandensein eines Zipfel

am Aussenaste der hinteren Antennen und einer eigentümlichen Chitinlamelle am Rande der hinteren Maxillipeden". The former character is found in *G. tenuispinus* as well (Pl. III fig. 2 b), and the latter is scarcely sufficient; the exopodite of the first pair of legs of *M. maximus* has 3 distinct segments, each with a well developed outer seta, a character not found in any *Gaidius* or *Gaetanus* known to me. If we regard the following species of *Gaidius* and *Gaetanus* as forming one group, the natural division will probably be the following: 1) the *Gaidius tenuispinus* which has no frontal spine and no lamina in the second basipodite of the maxillipeds; the second segment of the exopodite of the antennae possesses a distinct process for the second seta, the first segment of the exopodite in the second pair of legs has no glandular pore, and the inner margin of the second basipodite in the fourth pair of legs in the young females has a few stiff setae, while in the young males it has a few of usual structure, 2) the *Gaidius brevispinus* which has a well developed lamina in the maxillipeds of the female, and the male of which has not a minute outer seta in the second segment of the exopodite in the second pair of legs, 3) the *Gaetanus Kruppi* and *latifrons*, which differ from the two preceding species by the frontal spine, and the presence of ten instead of eleven setae in the exopodite of the maxillulae, but in other respects, except the lamina of the maxillipeds, agree with *G. tenuispinus* 4) *Gaetanus minor* which, except for the wanting glandular pore in the first outer segment in the second foot, completely agrees with the preceding group; and 5) *Gaetanus pileatus* and *miles*, which in addition to the wanting glandular pore of the second foot do not possess any process in the second outer segment of the antennae, and have the inner margin of the second basipodite in the fourth foot smooth in both sexes in the penultimate stage. For settling definitively the question of the relative position of the species, the structure of the fifth foot in the male of *G. miles* must be known. At present I am inclined to regard *Gaidius tenuispinus* and *Gaetanus Kruppi* as being more nearly related to each other than the latter species is to *Gaetanus miles*. In addition to the mentioned characters all the enumerated species have the lamina labialis rather simple, without the division in three portions as in *Euchirella*, in contrast to *Chiridius* and *Aetidius*. The position of *Chirudina*, to which not only *Ch. Streetsi* but also *pustulifera*, *abyssalis*, *notacantha*, *parvispina* and *spectabilis* are referred, is a little doubtful. These species are in several respects rather different, but show their affinity by the structure of the oral surface of the labrum, and the structure of the fifth pair of legs in the male; the second outer segment of the antennae have distinct setigerous processes, the outer surface of the maxillae (Pl. V figs. 5 c) is not very produced, the maxillipeds have a rather characteristic structure, the exopodite of the first foot is more or less distinctly three-divided, with three outer setae, and the glandular pore of the first outer segment is wanting in the second foot; the inner margin of the second basipodite in the fourth pair of legs is either more or less smooth, or has a distinct corona of spines in the mature female, but is completely smooth in both legs in the penultimate stages. Some of these characters suggest affinity to *Chiridius*, others to *Gaidius*; if Wolfenden's *Mesogaidius maximus* with a lamina in the maxillipeds, and the outer edged spines in the second pair of legs, really belongs to this genus, a connecting link with *Gaidius* is found. The three last species ought perhaps, on account of the structure of the fifth pair of legs, to form an independent genus, and others, f. inst. *Ch. pustulifera*, ought perhaps, as suggested by Sars, to be referred to *Undenchæte*, the most nearly related genus. As, however, the three or five species which I have referred to this genus form a well defined group,

I have preferred to exclude other species of somewhat doubtful position, as well as to let Wolfenden's genus *Mesundeuchata* go out. Though the different species of *Euchirella* differ from each other in several important features, I think the genus is a quite natural one, as it is not only characterized by the structure of the antennae and maxillulae, but also by the presence of a glandular pore at the base of Se I Re II pes II—IV (cf. *Chiridius*), which is wanting in the penultimate stage. In *Euch. rostrata*, *messinensis*, *maxima* and *betumida* a glandular pore is wanting in the first outer segment in the second pair of legs, but in *E. curticauda* and *intermedia* it is wanting in the third and fourth pairs of legs as well. In addition to the generally accepted specific characters, good ones are found in the structure of the oral surface of the labrum, in the number of bristles of the exopodite of the maxillulae in the males, and in the marginal hairs of the second basipodite of the fourth pair of legs.

15. *Aetidius armatus* Boeck.

(Pl. II fig. 1 a—d; text-fig. 16).

1872.	<i>Pseudocalanus armatus</i> n. sp. Boeck, p. 38.	1904.	<i>Aetidius tenuirostris</i> n. sp. Wolfenden, pp. 116—117.
1883?	<i>Aetidius armatus</i> n. sp. Brady, p. 75.	1905.	— <i>armatus</i> Boeck. Farran, p. 31.
1892. nec.	— — Brady. Giesbrecht, p. 213, taf. 2, 14 and 36.	1905.	— — — Esterly, p. 145, figs. 14 a—b.
1893. pars.	— — — Th. Scott, p. 70.	1905.	— — — Th. Scott, p. 222.
1898. pars.	— — — Giesbrecht & Schmeil, p. 31.	1906.	— — — Pearson, p. 11.
1901.	— — Boeck. Th. Scott, p. 238.	1908.	— — — v. Bremen, p. 30 fig. 30.
1902.	— — — Th. Scott, p. 451.	1908.	— — — Farran, p. 28.
1902.	— — — G. O. Sars, pp. 25—26, pls XIII—XIV.	1909?	— — — Pesta, p. 23.
1903.	— — — Norman, p. 136.	1909.	— — — A. Scott, pp. 37—38, pl. IV, figs 14—25.
1903.	— — — Jensen, Johansen, Levensen, p. 304.	1910.	— — — Steuer, pp. 23—24.
1903?	— — Brady. J. C. Thompson, p. 16.	1910.	— — — Wolfenden, p. 209, text-fig. 4.
		1911.	— — — Farran, pp. 81—82.

Description. ♀. Size of specimen from Ingolf St. 47, 193 mm.: anterior division (head + som. thor. I 0920; somite II—V 0575) 1495; urosome 0437 mm.

The head is as figured by Sars etc. vaulted in a characteristic way without frontal keel, and the rostrum has two pointed branches without basal tubercle. The genital somite, which is both wider and deeper than long, has a receptaculum seminis (text-fig. 16) which is distinctly different from that of *A. Giesbrechtii* Cleve 1904 (synonymous with *A. mediterraneus* Steuer 1910), as seen by comparing figs 1 a—b with Giesbrecht's fig. 9 Taf. 36; the vulva (fig. 1 b) is also somewhat different from Giesbrecht's fig. 8.

The measurements of the antennulae are distinctly different from those given by Giesbrecht, as the segment 23 is shorter than 22, and as segment 24 \approx 25 is respectively 14 and 15 as long as segment 8 \approx 9 and 2 (not 2 and 2.5). The antennae differ from Sars' as well as from Giesbrecht's figures by the small process on which the proximal seta of Re II is placed. The other mouth appendages show some differences from Sars' figures, but not in any feature worth to be mentioned from Giesbrecht's description.

The pes I differs from Giesbrecht's description (fig. 10) by the second basipodite, which has no setae exteriorly and distally, and by the third one, which has no spinous area laterally and anteriorly.



Text-fig. 16.
Aetidius armatus
Boeck.
Abdomen in left
view $\times 57$.

The pes II has the articular membrane between Re I and II distinct anteriorly, but missing posteriorly; the basp. II pes IV has, in addition to marginal row of setae, posteriorly and just proximally to the Si a transverse row of 4 short spines (Pl. II fig. 1 c), which corresponds to the two spines mentioned by Giesbrecht but not by Sars and Scott. Glandular pores were found at the base of Se Re II and Se 3 Re III in the three posterior pair of legs, and in addition to these a pore was found at the base of Se Re I in pes III—IV.

The *labrum* is in lateral view like Sars' figure, with a short anterior elevation, which by a low incision is separated from the labrum proper; this is, anteriorly, evenly convex and, posteriorly towards the free margin, slightly concave. In front of the marginal row of setae along the free posterior margin no setae were found. The oral surface of the labrum is most like that of *Gaidius*; the longitudinal group 1 consists of a single series of fairly long hairs; the groups 2—5 are only indistinctly separated, and only the groups 4—5 are 2—3 setae deep. The lamina labialis and the setae in front of it have a structure as shown in figure 1 d.

Y♀ (V). Size of specimen from St. 45 1.58 mm., anterior division 1.23 mm.; urosome 0.35 mm.

This stage differs distinctly from that of the adult female by the structure of the abdomen. The head is well separated from the first thoracic tergite, and the fifth from the fourth; the appendages do not show any difference of importance, except the even less developed articulation between Ri I—II pes II, and the wanting spines in besipodite II pes IV, which has however the usual marginal setae.

Occurrence. The Ingolf Expedition has gathered this species at the following stations viz:

1/7	1895	St. 27	64°54 L. N.	55°10 L. W.	V ¹ . 200—0 fm.	Temp. at surface 3.9° C.	1 f♀.
26/6	1895	St. 25	63°30 L. N.	54°25 L. W.	V ¹ . 200—0 fm.	2.9° C.	1 f♀.
30/7	1895	St. 38	59°12 L. N.	51°06 L. W.	V ¹ . 100—0 fm.	10° C.	1 f♀.
18/6	1895	St. 19	60°29 L. N.	34°14 L. W.	V ¹ . 300—0 fm.	9° C.	6 f♀.
20/5	1895	St. 11	64°34 L. N.	31°12 L. W.	V ¹ . 200—0 fm.	8.2° C.	1 f♀.
12/5	1896	St. 47	61°32 L. N.	13°40 L. W.	V ¹ . 100—0 fm.	10° C.	15 f♀.
15/5	1896	St. 52	63°57 L. N.	13°32 L. W.	V ¹ . 200—0 fm.	8.3° C.	1 f♀.
20/5	1896	St. 57	63°37 L. N.	13°03 L. W.	V ¹ . 100—0 fm.	8.2° C.	11 f♀.
20/5	1896	St. 59	65° L. N.	11°16 L. W.	Apst. 12	1.5° C.	1 f♀.
11/5	1896	St. 45	61°32 L. N.	9°43 L. W.	V ¹ . 100—0 fm.	9.1° C.	2 f♀, 1 y♀ (V).

In addition to these Captain Wandel has 1891 at 67°07 L. N. 11°41 L. W. taken 1 f♀, and the Danish East Greenland Expedit. 1900 10 p. m. F. 403 has gathered a single female 60°29 L. N. 12°10 L. W.

Distribution. This species is according to Farran "a characteristic inhabitant of the lower layers of the North-East Atlantic off the coast of Ireland and Scotland": It has been found in the cold as well as in the warm area of the Faeroe channel, the northern part of the North Sea, and several of the Norwegian fjords. It has been taken off the Finmark coast N. W. of Nordkyn and north of Iceland. The records of the Ingolf. Exp. show that it is also found in deep waters, probably as a member of the Atlantic fauna, in the Iceland-Faeroe channel, Denmark and Davis Straits. This species seems to have a very wide distribution; according to Scott and Wolfenden the spec-

imens which they have referred to *A. armatus* are not to be distinguished from specimens from the northern seas. The gulf of Guinea, the South Atlantic, the Indian and Malayan Seas ought accordingly to be regarded as lying within the range of this species. Even if Sars is right, that some of Brady's specimens are identical with Boeck's species, we are not right in concluding that the species has the distribution stated by Brady (cf. A. Scott's remark p. 37).

16. *Chiridius armatus* Boeck.

(Pl. II figs. 3a-e; text-figs. 17 a-d).

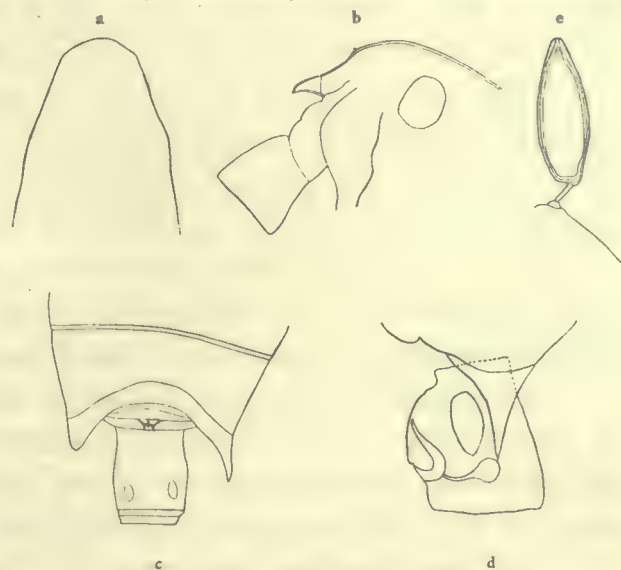
1872.	<i>Euchæte armata</i> n. sp. Boeck, p. 39.	1905.	<i>Chiridius armatus</i> Boeck. Farran, p. 34.
1897.	nec. <i>Pseudocalanus armatus</i> Boeck. Vanhöffen, p. 279, fig. 16.	1905.	— — — G. O. Sars, p. 2.
1900.	nec. <i>Chiridius armatus</i> Boeck. G. O. Sars, pp. 29-30.	1905.	— — — Th. Scott, p. 222.
1903.	— — — G. O. Sars, pp. 27-29, pls. XV-XVI.	1906.	<i>Pseudoaetidius armatus</i> Boeck. Pearson, p. 11.
1903.	— — — Jensen, Johansen & Levisen, p. 304.	1907.	<i>Chiridius armatus</i> Boeck. Koefoed & Damas, p. 408.
1904.	<i>Pseudoaetidius armatus</i> Boeck. Wolfenden, pp. 115 and 131, pl. IV figs. 29-31.	1908.	— — — Farran, p. 30.
		1908.	<i>Pseudoaetidius armatus</i> Boeck. v. Bremen, p. 33, fig. 34.
		1911.	<i>Chiridius armatus</i> Boeck. Farran, pp. 90-91.
		1913.	nec — — — Stephensen, p. 316.

Description. ♀. Size of specimens from Thor St. 172 measured 4.43 mm., anterior division 3.3 mm., urosome 1.10 mm. The smallest specimen (Thor St. 72) measured 3.6 mm.

The body differed in the following features from Sars' description; laterally and beneath, the limitation between the head and first thoracic tergite is indicated; the fifth thoracic tergite, which is produced into well developed triangular points, is short, but well distinguished (text-fig. 17 c). The genital somite is only slightly produced beneath, and the receptaculum has, as seen in fig. 17 d, a characteristic structure. The furcal rami, which are a little longer than the anal somite, are scarcely 1.3 as long as wide.

The *antennulae*, which have the segment 25 well marked out with rather indistinct articular membrane, have the segment 2 a little longer than 8-9, which is as long as the segment 20; the segment 21 is a little longer than 18, and the segment 23 is distinctly 1.1 as long as 24. The arrangement of the appendages is scarcely different from that of *Ch. obtusifrons*; the posterior seta of the segment 23 just reaches the tip of the segment 25. The exopodite of the *antennae* is scarcely 1.4 as long as the endopodite. The Le 1 of the *maxillulae* has as usual

9 setae and the Li 2 possess 5 spinelike setae, the Li 3, which terminally on the anterior surface has a curved row of short spines, has 4 setae, and the basipodite III has a similar row of short spines and



Text-fig. 17. *Chiridius armatus* Boeck.

- a. Head in dorsal view $\times 16$. b. Head in lateral view $\times 60$.
c. First abdominal somite in dorsal view $\times 50$.
d. Lateral corner etc. $\times 60$. e. Parasite attached to the right maxilla $\times 74$.

5 setae. The Ri has 13 setae as the Ri I has 3 Sa + 1 Sp, and the Re has only 10 setae. The posterior seta of the first lobe of the *maxilla* is at least 3 times as long as the lobe itself. In the maxillipeds the third basipodite is about 1.3 as long as the second, and three times as long as the endopodite. The fourth lobe possesses in addition to the usual 3 hairs a short hairy sensory process. In contrast to Sars' figure the distance between the Si 2 and Si 3 is 2.5 as long as the distance between the Si 1 and 2.

The *first pair* of legs has the Se Re I just extending beyond the tip of Re II. On the anterior surface of Re II, near the lateral margin, 1–2 minute pores are often observed, and at the outer margin of Re III, somewhat posteriorly, just in the middle, a pore, placed on a minute process surrounded by delicate hairs, is found. The pes II has a fairly distinct articular surface between Re I–II anteriorly, but posteriorly it is partly wanting in contrast to pes III–IV, in which it is well developed. The *terminal spine* has 40–50 well separated teeth (fig. 3 a). On the anterior surface of the Ri III the usual glandular pore surrounded by delicate hairs is found in the last three pair of legs; the usual *glandular pores* at the base of Se Re I–III in the three last pair of legs are not seen, but they are certainly represented by a number of pores which, as shown in fig. 3 a, in the arrangement provides an important character for this species; the "pore" is formed by a chitinous ring, in the middle of which a generally longitudinal split is seen. In the Re I a single pore and in Re III three are found in pes II–IV, but in Re II a single is found in pes IV, but 2 in pes II–III.

The lateral outline of the *labrum* is like Sars' figure Pl. XV, and scarcely different from *Actidius*. The anterior surface of the labrum has, in addition to the usual marginal row of setae which are fairly slender in the middle and more like granules laterally, in the middle a transverse row of laterally shorter setae, and in front on each side a group of short setae.

The oral surface of the *labrum* is rather characteristic (fig. 3 b). In front of the chitinous transverse bar behind the median central spot Nr. 3, a transverse row of short setae is found; around and behind the median spot 4 (S⁴) short setae are placed in transverse rows. The skin is everywhere, especially posteriorly, minutely granular. The lateral longitudinal series consists as usual of 5 groups; the two first groups are placed somewhat longitudinally, are distinctly longer than wide, and consist of short spinules, most like granules; the groups 3–5 are, in contrast to the two first, less well separated, and consist of an inner row of longer and an irregular, outer group of scattered shorter hairs.

The lamina labialis (fig. 3 c) is in the shape of the dentations somewhat different from that of *Ch. obtusifrons* (fig. 2 a), and it is almost smooth. The arrangement of the groups of hairs in front of and behind the lamina labialis I refer to *Ch. obtusifrons*. About the arrangement of the series of bristles on the labial lobes, the fig. 3 d will give an impression.

♂. Size: Specimen from Thor St. 99 1904 measured 3.66 mm., anterior division 2.65 mm. urosome 1.01 mm.

The body seems to be more slender than figured by Sars; the anterior division is 2.6 as long as the urosome; the fifth thoracic tergite is well distinguished. The first abdominal somite is somewhat assymmetric, and the genital pore is found on the left side; the second somite is three times as long as the first; the furcal branches, which are almost twice as long as the anal somite, are 1.6 as long as wide.

The *Antennulae* are in the main like Sars' figure; the segments $24 \sim 25$ are almost completely fused; the segments $8 \sim 9$ and 10 as well as the $20-21$ are almost completely fused on the right side, but fairly well distinguished on the left side. The segments $8 \sim 9$ are a little longer than 2, which is about 1.2 as long as segment 20; the posterior seta of segment 23 is very short. The *antennae* are scarcely different from those of the female, in contrast to the *mandibulae* which, except for the presence of 2 instead of a single seta in Ri, are completely like Sars' figure without distinct manducatory plate. The manducatory part of the *maxillulae* is scarcely developed, and the rudimentary Li I bears a few short sensory appendages instead of spines; the Li 2 is not developed; the Li 3 bears 2 feathery bristles, the basipodite 3, and the endopodite 9 setae; the exopodite possesses 9 strong plumous setae. The *maxillae* are comparatively more slender than figured by Sars, with a number of very short spinules and three proximal knobs. The *maxillipeds* differ from those of the females by the comparatively long Basp. III, which is 1.7 as long as the second. The first four pair of legs is scarcely different from those of the females. Pes V is scarcely different from Sars' description; the Ri sin (fig. 3 e) is rather elongate; about the structure of the right and the left exopodite I refer to figs 3 g—f.

Y (Stage V). Size: Specimen from Thor St. 72 measured 3.05; anterior division 2.4 mm., urosome 0.65 mm. Another specimen was 3.65 mm.

The abdomen consists as usual of four somites, of which the second is the longest; the antennulae are comparatively longer than in the females, and reach to about the end of the second abdominal somite; the articular membrane between the Ri I—II pes II is only indicated by a faint line. The pes V of the male is, as shown in Pl. II fig. 3 h, like that of *Gaidius*.

Y♂ (Stage IV). Size: Specimen from Thor St. 82 measured 2.16 mm.; anterior division 1.7 mm.; urosome 0.46.

The shape of the body is like that of the adult specimens, but the abdomen has only three somites; the number of segments is somewhat reduced in pes IV, as Re II \sim III and Ri II \sim III are more or less completely fused. Two glandular pores were observed in Re III and one in Re I. The pes V is rather rudimentary, as seen in fig. 3 i.

Variation. In a few specimens from Thor St. 172 $\frac{6}{9}$, 1905, which, except for the less prominent sexual area, were in all other respects like the adult females, a fifth pair of legs, as shown in fig. 3 j, with the right leg the longer, was found. In a specimen from St. 72 (Thor 1905) the left leg was longer and more slender (fig. 3 l), and in one from St. 173 (Thor $\frac{7}{9}$, 1905) fig. 3 k the right leg was again the longer. In two specimens from St. 104 (Thor $\frac{24}{5}$, 1904), and in one from St. 99 (Thor $\frac{22}{5}$, 1904), the pes V was like fig. 3 e; the last mentioned specimens as well as one from St. 153 ($\frac{7}{9}$, 1905) with pes V dext. $>$ sin. and well developed eggs had the genital somite of female type, but without distinct receptaculum seminis.

As most of the mentioned specimens were in all respects but the presence of pes V like the typical ones, and as the mentioned structure was variable to a degree, it must be regarded as a kind of abnormality (cf. similar structures in *Pseudocalanus*).

Parasites. In a single adult female from Thor $\frac{1}{9}$ St. 285 a stalked parasite was found, attached to the first basipodite laterally on the anterior surface of the right maxilla; the body consisted of

a chitinous wall and a granular content, and was as a whole not quite unlike a spermatophor. (text-fig. 17 e).

Occurrence. Of this species the Ingolf Expedition has taken a single adult female ²⁶/₆ 1896 St. 92 64°44 L. N. 32°52 L. W.

The Thor Expedition has gathered the species, fairly common, at several stations, most often in deep hauls.

Thor	¹¹ / ₇	1904.	St. 153.	65°20 L. N.	27°12'5 L. W.	Yt. 800 M. Wire	1 f♀; 1 f♂; 1 y♂ (V).
	⁹ / ₇	1904.	St. 178.	63°08 L. N.	21°30 L. W.	Yt. 750 M. Wire	1 f♀.
	¹ / ₉	1904.	St. 285.	62°49 L. N.	18°46 L. W.	Yt. 500 M. Wire	17 f♀.
	¹¹ / ₇	1904.	St. 183.	61°30 L. N.	17°08 L. W.	Yt. 1800 M. Wire	15 f♀; 2 f♂; 2 y♂ (V).
	²⁴ / ₅	1904.	St. 104.	62°47 L. N.	15°03 L. W.	Yt. 1500 M. Wire	8 f♀; 1 y♂ (V).
	²⁹ / ₈	1905.	St. 164.	61°20 L. N.	11°00 L. W.	Yt. 300 M. Wire	2 f♀.
	²² / ₅	1904.	St. 99.	61°15 L. N.	9°35 L. W.	Yt. 1700 M. Wire	2 f♀; 2 f♂.
						Yt. 900 M. Wire	3 f♀.
	¹² / ₅	1904.	St. 78.	61°08 L. N.	9°28 L. W.		5 f♀.
	²³ / ₇	1905.	St. 124.	61°04 L. N.	4°33 L. W.	Yt. 100 M. Wire	1 f♀.

Outside the Ingolf area the S/S. Thor has gathered the species at the following stations.

Thor	¹⁵ / ₆	1905.	St. 82.	51°00 L. N.	11°43 L. W.	Yt. 1200 M. Wire	1 f♀; 1 y♀ (V).
						800 M. Wire	2 f♀; 1 y♂ (V); 1 y♂ (IV).
	²⁰ / ₆	1905.	St. 88.	48°00 L. N.	8°30 L. W.	Yt. 300 M. Wire	4 f♀; 1 y♀ (V); 2 y♂ (V).
	⁸ / ₆	1905.	St. 72.	57°52 L. N.	9°53 L. W.	Yt. 1500 M. Wire	75 f♀ (one with spermatophor)
							1 f♂; 4 y♂ (V); 1 y♀ (V).
	⁹ / ₉	1904.	St. 294.	57°54 L. N.	7°38 L. W.		9 f♀.
	¹ / ₉	1905.	St. 167.	58°42 L. N.	6°13 L. W.	Yt. 1500 M. Wire	17 f♀; 1 y♂ (V); 2 y♀ (V).
	⁶ / ₉	1905.	St. 172.	57°33 L. N.	4°26 L. E.	Yt. 300 M. Wire	121 f♀; 4 f♂; 5 y♂ (V).
	⁷ / ₉	1905.	St. 173.	57°52 L. N.	8°01 L. E.	Yt. 600 M. Wire	3 f♀.
						Yt. 300 M. Wire	4 f♂.

Distribution. The above mentioned localities affirm the conclusion arrived at by Farran at the base of the records in the literature "that *Chiridius armatus* is a permanent inhabitant of the North-East Atlantic, the Norwegian Sea south of 65° N., the Norwegian Channel and the Skagerak, at depths of from 300 to 2000 metres, and is also indigenous to all the deeper Norwegian fjords." It has been taken by the Monaco Expedition; the records of this species from the west coast of Greenland and from the North Polar Basin refer, as shown by Sars, really to *Ch. obtusifrons*.

According to Damas and Koefoed it has been taken at the following two stations by the Duc d'Orléans. Viz: St. 14 ⁹/₇ 1905 80°17 L. N. 5°40 L. E. between 340 and 600 meters (f♀ with ovisacs) and St. 23, ¹⁷/₇ 77°25 L. N. 4°03 L. W. between 480—640 meters; as, however, nearly related species exist, which have probably been confounded with *Ch. armatus* now and then, these localities ought to be accepted with due reservation.

Remarks. In spite of the small differences enumerated in the description, I do not doubt that this species is identical with that described by Sars from Norway, and with that which Wolfenden has described under the name of *Pseudaetidius* from the Færoe channel. According to my investigations the size of the specimens varied from 3.6 to 4.4 mm., the biggest being those from northern regions; Farran's (1905) specimens measured 3.3–3.5 mm., and even 2.65; these small specimens possibly belong to another species.

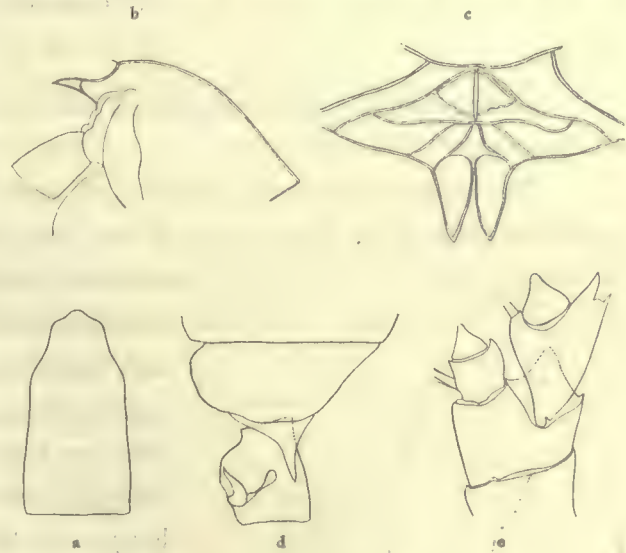
17. *Chiridius nasutus* n. sp.

(Pl. II fig. 4 a; text-figs 18 a–e).

1905. pars? *Chiridius armatus* Boeck. Farran.

Description. f♀. Size: Specimen from St. 167 2.88 mm.; anterior division 2.19 mm.; urosome 0.69.

The shape of the body is in the main like that of the preceding species, but somewhat more slender (text-fig. 18 a). The insertion of the antennulae is apparently better removed from the tip and the rostral spines, which are somewhat longer and basally swollen, and directed more forwards (text-figs 18 b–c). The anterior division is just three times as long as the abdomen. The genital somite (text-fig. 18 d), which has a receptaculum seminis like that of *Ch. armatus*, is about 1.5 as long as the third and 1.7 as long as the fourth somite; the furcal rami are 1.7 as long as wide and 1.7 as long as the anal somite; the last segment is about half as long as the third one. The antennulae, which extend somewhat beyond the end of cephalothorax, but scarcely to the end of the abdominal somite, have the segments 24 and 25 well defined; the measurements differ only in minor details, as the segment 20 is a little longer than 8∞9, as the segment 18 is a little longer than 21, and as the segment 23 is scarcely 1.1 as long as 24. The appendages are like those of *Chiridius*



Text-fig. 18. *Ch. nasutus* n. sp.

a. Head in dorsal view $\times 16$. b. Rostrum from below $\times 150$.
c. Head in lateral view $\times 60$. d. Genital somite etc. $\times 60$.
e. Pes IV dext. in anterior view with abnormal rami $\times 150$.

armatus, but the Sp. of the segment 23 extends somewhat beyond the end of the segment 25. The antennae are like those of the preceding species, but the exopodite is 1.5 as long as the endopodite. The mandibulae and maxillae are scarcely different, and the maxillulae only by the smooth anterior surface of the third basipodite. In the maxillipeds the third basipodite is 1.5 as long as the second, and 2.2 as long as the endopodite. The legs are only in minor points different from those of *Ch. armatus*; the Se of Re I in the first pair of legs extends a little beyond the end of the second segment, the articulation between the Re I and II of the second pair of legs is well developed anteriorly as well as posteriorly, and its terminal spine has 30–40 spinules (fig. 4 a). A curious difference is found between this species and *Chiridius modestus* as well as *armatus* in the arrangement of the glandular pores; in the number of the pores it is, as shown in fig. 4 a, like *Ch. modestus*, as a single pore

was found in the three segments of the exopodites in the three last pair of legs, but in the position of the pores, especially in Re I—II, it is most like *Ch. armatus*, as these are placed on the anterior surface, well removed from the lateral margin.

Occurrence. This species was taken by the S/S Thor at the following 3 stations viz:

¹¹/₇ 1904. St. 183. 61°30 L. N. 17°08 L. W. Yt. 1800 M. Wire 1 f♀.

⁸/₆ 1905. St. 72. 57°52 L. N. 9°53 L. W. Yt. 1500 M. Wire 2 f♀.

¹/₉ 1905. St. 167. 57°46 L. N. 9°55 L. W. Yt. 1500 M. Wire 2 f♀.

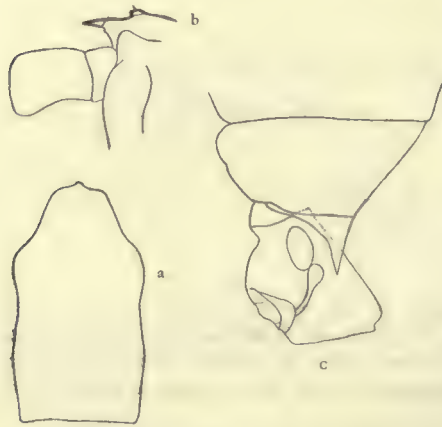
Remarks. This species, which on account of its small size, the prominent rostrum, and the curious arrangement of the secretory pores is well distinguished from *Ch. armatus*, is certainly new to science, as in the literature I have only found a single reference to a species of the *Ch. armatus* type of a size of 2.65 mm. (viz. Farran 1905 p. 34).

18. *Chiridius modestus* n. sp.

(Pl. II fig. 5; text-figs 19 a—c).

Description. f♀. Size: Specimen from St. 183 measured 3.69 mm.; anterior division 2.70 mm., urosome 0.99.

The rostral spines are longer and more prominent than in *Ch. armatus*, but less so than in *nasutus* (text-fig. 19 b). The outline of the head is anteriorly not fairly rounded as in *Ch. armatus*, but distinctly produced (text-fig. 19 a). The frontal organ is prominent, and the distance between it and the base of the rostrum is short and straight, not slightly concave as in the two other species. The cephalothorax, which is 2.5 times as long as wide, is scarcely 3 times as long as the urosome. The genital somite, which has a receptaculum seminis of the usual structure, is about 1.3 times as long as the third somite, and 1.7 as long as the fourth (text-fig. 19 c); the furcal rami are 1.6 as long as wide, and 1.4 as long as the anal somite, which is a little longer than the furca; the latter somite is scarcely half as long as the third one.



Text-fig. 19. *Chiridius modestus* n. sp.

a. Head in dorsal view $\times 16$.

b. Head in lateral view $\times 60$.

c. Genital somite etc. $\times 60$.

The *antennulae*, which extend somewhat beyond the end of the thorax, have the 24—25 segments almost fused. The appendages and the measurements are scarcely different from those of *Ch. nasutus*. The *antennae* have the exopodite 1.4 as long as the endopodite; the Re I has, inwards, a conical process, but no seta, and the Re II has a medial and a terminal seta placed on a small protuberance, in addition to a basal protuberance without seta. The *mandibulae* and *maxillae* do not show any features of interest, and the *maxillulae* only differ from those of *Ch. nasutus* by slightly developed spinulation of the anterior surface of the Li 3. The third basipodite of the *maxillipeds* is 1.4 as long as the second, and 2.4 as long as the endopodite; its 2 proximal setae are placed near to each other with the articular membranes confluent. The Se Re I in the first pair of legs extends distinctly beyond the end of the segment. In the second pair of legs

(fig. 5 a) the terminal spine has about 80 densely placed, partly fused, spinules; in other respects, except the arrangement of pores, which, except for the more medial position is like that of *Ch. obtusifrons* etc., the legs are like those of preceding species.

Occurrence. The S/S. Thor has gathered a few specimens of this species at the following two stations.

²¹/₆ 1904. St. 154. 65°27' L. N. 27°10' L. W. Yt. ? Wire 3 f♀.

¹¹/₇ 1904. St. 183. 61°30' L. N. 17°08' L. W. Yt. 1800 M. Wire 2 f♀.

Remarks. This species, which seems to stand between the species of *Chiridius* without rostrum and *Ch. nasutus*, is well characterized by the shape of the rostrum and the position of the glandular pores.

19. *Chiridius obtusifrons* G. O. Sars.

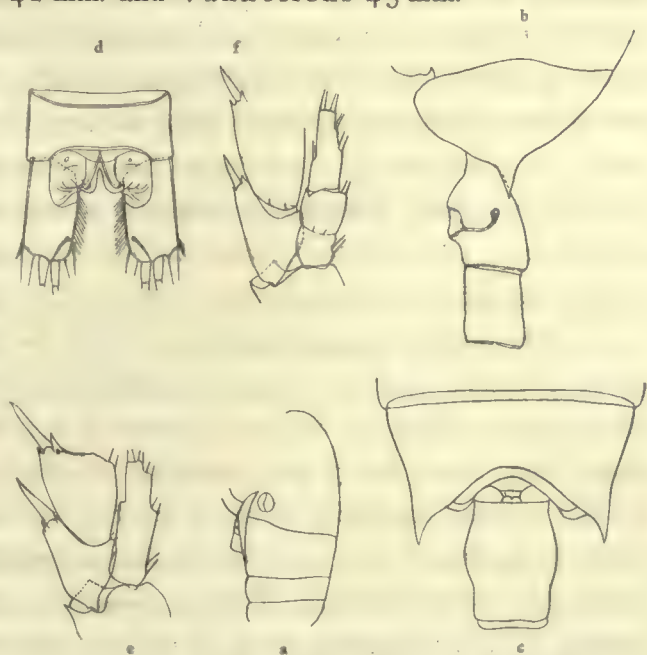
(Plate II figs. 2 a—b; text-figs 20 a—e).

- | | |
|--|---|
| 1897. <i>Pseudocalanus armatus</i> Boeck. Vanhöffen, p. 279, fig. 6. | 1907. <i>Chiridius armatus</i> Boeck. Vanhöffen, pp. 519—521. |
| 1900. <i>Chiridius armatus</i> Boeck. G. O. Sars, pp. 29—30, pl. XVII. | 1908. — <i>obtusifrons</i> G. O. Sars. v. Bremen, pp. 34—35, fig. 37. |
| 1902. — — — Mrázek, pp. 521—22. | |
| 1903. <i>Chiridius obtusifrons</i> n. sp. G. O. Sars, pp. 29—30, pl. 17. | 1909. nec. <i>Chiridius?</i> <i>obtusifrons</i> G. O. Sars. A. Scott, p. 43, pl. XLIV figs 1—3. |
| 1904. — — — G. O. Sars. Wolfenden, p. 131. | |
| 1904? — Vanhöffeni n. sp. Wolfenden, p. 117, pl. IV fig. 23. | 1913. pars. — <i>armatus</i> Boeck. Stephensen, pp. 316—317. |
| 1907. — <i>obtusifrons</i> G. O. Sars. Koefoed & Damas, p. 408. | |

Description. f♀. Size: Specimen from Thor St. 214 measured 4.39 mm.; anterior division 3.12 mm., urosome 1.27 mm. Sars' specimens measured 4.2 mm. and Vanhöffens 4.5 mm.

The shape of the body is as figured by Sars (cf. text-fig. 20 a). The articular membrane between the head and first thoracic tergite and between the fourth and fifth thoracic tergite (except in the middle) is often wanting; in the articular membrane between the last thoracic and the first abdominal somite chitinous lists of a rather curious structure are found (text-fig. 20 c). According to most authors no rostrum is observed; in several specimens, however, the rostrum was represented by a very short spine, sometimes showing trace of bifurcation as a median line, when observed from beneath. The anterior division is 2.4 as long as wide, and 2.4 as long as the abdomen. The genital somite, which has a receptaculum seminis of a similar structure as in *Ch. armatus*, but more slender, is 1.2 as long as the fourth somite; the furcal rami are almost twice as long as wide (text-fig. 20 d).

The *antennulae*, which almost extend to the



Text-fig. 20. *Chiridius obtusifrons* G. O. Sars.

a. Cephalosome $\times 9$. b. Genital somite in lateral view $\times 31$. c. Genital somite in dorsal view $\times 33$. d. Anal somite etc. in dorsal view $\times 60$. e. (Downwards to the left) pes II in anterior view $\times 60$. f. (In the middle above) pes III in anterior view $\times 60$.

posterior end of the genital somite, have the 24 and 25 segments fairly well separated; the segments 2 and 8 \approx 9 are of equal length, and a little longer than the segment 20; the segment 18 is distinctly 1.1 as long as 21, and the segment 24 is a little longer than 23. The posterior seta of the segment 23 scarcely extends to the tip of the segment 24. The *antennae* have the exopodite almost twice as long as the endopodite, and the third basipodite of the *mandibulae* has the Si 1 shorter than figured by Giesbrecht (Taf. 14 fig. 17). The *maxillulae*, *maxillae* and the *maxillipeds* are scarcely different from those described by Giesbrecht; a small pointed process, placed behind the articular cavity of the maxillipeds, is better developed than in preceding species (text-fig. 20 a). The first pair of legs is like Sars' fig., but the Se Re I extends a little beyond the end of the Re II. In the second pair of legs (text-fig. 20 e) no trace of articulation was found between Ri I—II, neither anteriorly nor posteriorly; the articular membrane between Re I—II is anteriorly indicated by a faint line. Glandular pores are found at the base of the respective Se of Re I—III in the last three pair of legs; the articular membranes between the Re I—II in pes III—IV are scarcely better developed than in the second pair of legs, but the articulation between Ri I—II is marked not only by a lateral incision as drawn by Sars, but also by a faint line anteriorly (text-fig. 20 f).

The structure of the *labrum* is in most respects like that of *Ch. armatus*; the most interesting differences are found at the oral surface viz: the wanting transverse row of spinules behind the median circular spot Nr. 3, and the lateral group of spinules anteriorly which is divided into a smaller anterior and a bigger posterior portion. The *lamina labialis* (fig. 2 a) consists posteriorly of a chitinous apparatus which is subdivided into a median and two lateral clumsy teeth, the posterior margin of which is somewhat striated; the lamina is gradually sloping anteriorly, and overlapped by the slightly concave posterior margin of an almost semicircular chitinous plate. In front of the lamina labialis we observe on the posterior wall of the pharyngeal cavity in the middle a smooth longitudinal area, and on each side of this a minutely granular area, as seen in fig. 2 a. Laterally a series of fairly slender setae, which are situated on a chitinous lists, apparently a continuation of that supporting the serrula 6-dentata, is found. Behind and medially, a longitudinal series of about 20 more slender setae; this series reaches only a little beyond the anterior limitation of the lamina labialis. The number of the serrulae behind the lamina is three, arranged as seen in fig. 2 a.

The number of series of hairs behind the labial lobes etc. is in the main like that of *Gaidius* (cf. fig. 7 f). The series lateral 1 seems to be wanting, series lat. 2 consists of about 30 short delicate hairs which are anteriorly placed in a single longitudinal row, and posteriorly in an irregular group; the series lat. 3 has posteriorly an oblique row of short hairs, on the medial side of which we find an area consisting of about 20 short bristles, and anteriorly one or two short rows, one of which is continued as a long row to the end of the labial lobe. The series lat. 4 is medially placed transversely with backwards directed convexity, as seen in fig. 2 a; laterally to this, and probably belonging to it, a triangular group of densely placed hairs is found. The series lat. 5 is represented by a group of densely placed short hairs, which are placed in a triangular area, pointed in front. The connection between the two last series and the hairs on the lateral lobes was not made out.

Y (Stage V). Size: Female from St. 154 measured 3.08 mm.; anterior division 2.3 mm.; urosome 0.78 mm.

The shape of the body is in the main like that of the adult, but the articulation between the head and the first thoracic tergite was complete at least in a single specimen; a well marked fifth somite bearing the lateral spines was found. The abdominal somites are as usual four. The male differs from the females by the presence of a fifth pair of legs without any endopodite, corresponding to the structure in the adult males (Pl. II fig. 2 b).

Occurrence. The Ingolf Expedition has curiously enough not gathered any specimen of this species, but the Thor has taken it at the following stations.

- 21/6 04 St. 154 65°27 L. N. 27°10 L. W. Yt. 800 M. Wire 85 f♀, 1 y♀ (V).
 22/7 04 St. 214 67°19 L. N. 17°55 L. W. Yt. 800 M. Wire 67 f♀ (one with spermatophor), 1 y♀.
 23/7 04 St. 216 66°15 L. N. 12°13 L. W. Yt. 600 M. Wire 1 f♀.
 9/5 04 St. 70 63°35 L. N. 6°20 L. W. Yt. 100 M. Wire 12 f♀.
 23/7 05 St. 124 61°04 L. N. 4°33 L. W. Yt. 100 M. Wire 1 f♀.

The Danish East Greenland Expedition 1900 has gathered the species three times.

- 4/7 1900 3 p. m. 79°09 L. N. 4°36 L. W. Vertical net 300—0 1 f♀.
 8/7 2 p. m. 74°09 L. N. 11°31 L. W. — 400—0 2 f♀.
 24/9 12 p. m. 61°06 L. N. 16°26 L. W. F. 392 2 f♀.

Distribution. Nansen's North Polar Expedition found this species rather abundantly from the surface down to a depth of 300 meters. By the S/S Michael Sars it has been taken twice in the open sea about midway between Iceland and Norway. According to Wolfenden this species occurs sparingly in the cold underwater of the Færoe channel. By the Duc d'Orléans this species was found at eleven stations, most often between 300 and 600 meters, as far north as 78° N., as far east as 5° L. E. and as far west as 16° L. W. In Lille Karajakfjord it was taken by Vanhöffen on the west coast of Greenland.

Taking into consideration the new localities enumerated above, it seems right to regard the species as characteristic of the deeper layers of the Arctic seas.

Remarks. The male which Wolfenden has described as *Ch. Vanhöffeni* is certainly identical with that described by G. O. Sars as *Ch. obtusifrons*. The species, which A. Scott with doubt refers to this species, does certainly not belong to it, on account of its smaller size and more robust body, not taking into consideration the distribution.

20. *Chiridius gracilis* Farran.

(Text-figs 21 a—d).

1905. *Chiridius Poppei* Giesbrecht. Farran, p. 35.

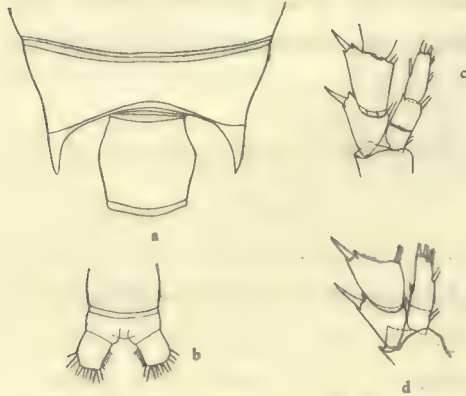
1908. — *gracilis* n. sp. Farran, pp. 30—31, pl. II figs 1—3.

1909? *Chiridius? gracilis* Farran. A. Scott, p. 42, pl. XI figs 1—3.

1911? — *polaris* n. sp. Wolfenden, pp. 211—212, taf. XXIV figs 9—12, text-f. 6a—b.

Description. Size: 2.69 mm.; anterior division 2.00; abdomen 0.69 mm. Farran's specimens measured 2.4—2.8 mm.

The shape of the body is like Farran's description; the anterior division is 2.9 as long as the abdomen; the furcal rami are 1.4 as long as wide (text-figs 21 a—b). The *antennulae* differ from



Text-fig. 21. *Chiridius gracilis* Farran.
a. Genital somite in dorsal view $\times 60$.
b. Furca $\times 60$.
c. Pes II sin in anterior view $\times 60$.
d. Pes III sin in anterior view $\times 60$.

those of *Ch. obtusifrons* by the 20 segment, which is a little longer than the second, which is again longer than segments 8-9. The Si 1 of the third basipodite of the *mandibulae* is longer and thicker than that of *Ch. obtusifrons*, but shorter than that of *Ch. Poppei*. In the other mouth appendages scarcely any difference was observed. In the first pair of legs the Se Re I does not extend to the end of the segment. The segmentation of the legs is better developed than in *Ch. obtusifrons*, as shown by Farran (text-figs 21 c—d).

Occurrence. Though the Thor has only taken 3 f♀ (of which one with spermatophor) $\frac{8}{6}$ 1905 St. 72 57°57' L. N. 9°53' L. W. Yt. 1500 M. Wire, I think that this species belongs to the fauna of the region explored by the Ingolf Expedition.

Remarks. This species is according to Farran fairly common on the west coast of Ireland; its range was from 280 to 1000 fathoms. I think it is extremely doubtful whether the species which A. Scott refers to this species, from the Malayan Sea, really is identical with the Irish species. I think that Farran is right in regarding it as a species which forms a connecting link between the much smaller *Ch. Poppei* and the much bigger *Ch. obtusifrons*, of which the former is a distinct Arctic and the latter a Mediterranean form.

As the females belonging to the *Chiridius*, as Giesbrecht defined it are very much alike, a thorough investigation of the differences between the existing species viz. those from the Siboga expedition, the three mentioned above and *Ch. polaris* Wolf. (p. 212), which is very nearly related to if not identical with *Ch. gracilis*, is needed.

21. *Aetidiopsis rostrata* G. O. Sars.

(Pl. II figs 6 a—b; text-figs 22 a—d).

1903. <i>Aetidiopsis rostrata</i> n. sp. G. O. Sars, p. 160, supplement pls. IV—V.	1907. <i>Aetidiopsis rostrata</i> G. O. Sars. Koefoed & Damas, p. 409.
1904? <i>Faeroella multiserrata</i> n. sp. Wolfenden, p. 117, pl. IX figs 26—28.	1908? <i>Faeroella multiserrata</i> Wolf. Farran, p. 29.
1906? — — — — — Wolf. Pearson, p. 13.	1908. <i>Aetidiopsis rostrata</i> G. O. Sars. v. Bremen, p. 33, fig. 35.
	1909. Nec. — — — — — A. Scott, pp. 40—41, pl. V figs 13—24.

Description. f♀. Size: Specimens from Thor St. 214 measured 3.8 mm.; anterior division 2.76 mm.; urosome 1.04. Other specimens measured 3.4 and 3.9. Sars' specimens measured 4.4 and Wolfenden's 3.54 mm.

The shape of the body is like Sars' figure. The rostral spines (text-fig. 22a) are comparatively shorter, and in shape somewhat different from Sars' figure; the frontal organ is very prominent. The articular membrane is distinct not only dorsally, but also laterally between the head and the first thoracic somite. The lateral spines of the thorax (text-figs 22 b) scarcely reach the middle of the genital somite. The abdomen is in most specimens at least one third of the length of the cephalo-

thorax, but in others it is scarcely one third. The comparative length of the abdominal somites and the furcal rami are 32 — 24 — 18 — 11 — 16; the furcal rami are 1.6 as long as wide. The receptacula seminis are in most specimens well developed, and of similar shape as in *Ch. obtusifrons* (text-figs 22b—c).

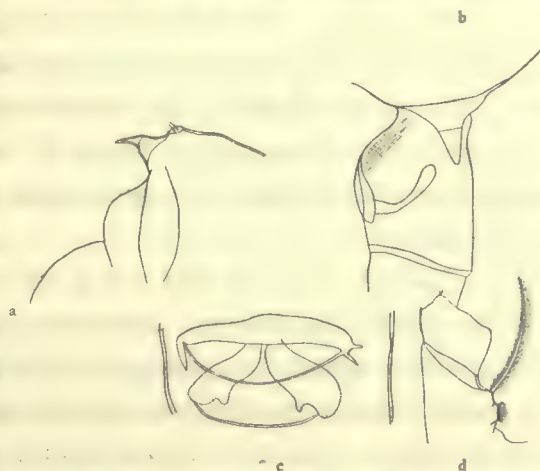
The *antennulae*, which have the segment 24 and 25 well separated, reach about to the end of the third abdominal somite; the segment 2 is 1.2 as long as 8∞9, which is a little shorter than the segment 20; the segment 21 is about as long as 18, and the segment 23 is 1.1 as long as the 24. The appendages are like those of *Ch. obtusifrons*, but a distinct "Aestetask" is found in segment 7; the posterior seta of segment 23 reaches distinctly beyond the end of segment 25. The *antennae* are like Sars' figure, with the Re 1.4 as long as the Ri; the setae of Re I—II are arranged as described in *Ch. modestus*. The *mandibulae* are like Sars' figure. The *maxillulae* are in main features, especially in the number of setae, like *Ch. armatus*; the *maxillae* are scarcely different from Sars' figure, but differ from those of mentioned species by a small depression in the middle of the exterior margin of the first basipodite, which seems to be connected with a wide chitinous sac. The third basipodite of the *maxillipeds*, is 1.5 as long as the first and second segments and almost twice as long as the endopodite.

In the first pair of legs the Se Re I extends distinctly beyond the end of Re II. The second pair of legs has the first basipodite greatly enlarged inwards; the articulation between Ri I—II is wanting anteriorly; glandular pores are present at the base of the Se in Re I—III; the St has 58 spinules (in Sar's figure 35 only). The fourth pair of legs differs from that of the three first pairs by wanting marginal row exteriorly of the second basipodite; its structure is in most features like Sars' figure, and the St has about 60 spinules (text-fig. 22 d).

The anterior surface of the *labrum* was like that of *Ch. armatus*, but differed by the wanting lateral irregular group of hairs in front of the transverse series. The oral surface has the hairs in the three first groups, especially the third, somewhat differently arranged, as seen in fig. 6 a; the groups 4—5 are more irregular than in this species. The *lamina labialis* is, as seen in fig. 6 b, in most respects similar to that of *Ch. armatus*; the inner longitudinal series in front of the lamina was not observed. The longitudinal series of hairs upon and behind the labial lobes are in most features, especially in series lateral IV—V, like those fully described in *Ch. obtusifrons*.

Occurrence. The Ingolf Expedition 11/7 96 6.30 p. m. St. 105 65°34' L. N. 7°31' L. W. closing net 700 fathoms has taken a single adult female, and the S/S Thor has gathered it at the following three stations.

20/6 04 St. 153 65°20' L. N. 27°12.5' L. W. Yt. 800 M. Wire 1 f♀.
 21/6 04 St. 154 65°27' L. N. 27°10' L. W. Yt. 800 M. Wire 3 f♀.
 22/7 04 St. 214 67°19' L. N. 17°55' L. W. Yt. 800 M. Wire 6 f♀.



Text-fig. 22. *Aetidiopsis rostrata* G. O. Sars.
 a. Head in lateral view $\times 60$. b. Genital somite in lateral view $\times 60$. c. Genital area from below $\times 115$. d. Pes IV dest. in post. view $\times 60$.

Distribution. This species was taken twice by S/S Michael Sars between Jan Mayen and Finmarken at a depth of from 500 to 1000 metres. According to Koefoed and Damas the species is found "a) dans la mer du Grönland: de 60 jusqu' à 1800 mètres au moins, b) dans la mer de Norvège: jamais observé à moins de 400 mètres" (p. 409). By the Duc d'Orléans it was gathered at 10 stations as far east as 2°40' L. E. at 79° L. N., and as far west as 15° L. W. at 78° L. N. near the east coast of Greenland. The expedition has at the most northern station ¹²/₇ 1905 taken adult males as well as females and young ones. According to Wolfenden his *Faeroella multiserrata* "is not uncommon in the deep water of the Færoe channel, and has been traced by the writer as far south as Valentia in Ireland" (p. 117). This species is, according to Farran, "occurring not uncommonly from 400 to 1000 fathoms" off the west coast of Ireland.

Remarks. I do not doubt that the specimens which I have examined ought to be referred to Sars' species, in spite of the smaller size, the shorter rostral spines, the lateral spines which scarcely reach the middle of the genital somite, and the comparatively longer abdomen; from Wolfenden's very imperfect description it differs by the well marked segmentation between the head and first thoracic tergite, by imperfect segmentation of Ri pes II, and by more coarsely spinulated terminal spines of the legs.

Though Sars (cf. Farran p. 20) has accepted Wolfendens species as distinct from his own, and in spite of the different distribution, I am fairly convinced that they belong to the same species; the southern variety has sometimes comparatively few dentations in the St pes II (Farran has found 32 only). Further examination and comparison of the different forms are needed before the question can be solved. It is to be regretted that neither Wolfenden nor Damas & Koefoed, who have examined the males as well, have given any description of them.

If Scott's figure of the antennulae of his *A. rostrata* Sars is correct, the Sp. of the segment 23 does not reach the end of the segment 24, and a new species ought to be established.

Wolfenden has later on established 2 new species *Faeroella minor* and *antarctica* (1911 p. 214); it is remarkable that this author does not accept Sars' name, which without doubt has the priority. That the species are cogenetic does not seem to be doubtful; whether the genus is quite natural is very doubtful. To solve this rather vexed question I have not sufficient material of the different genera.

22. *Udinopsis armatus* Vanhöffen.

- | | |
|---|--|
| 1895. <i>Bradyanus armatus</i> n. sp. Vanhöffen, p. 322. | 1907. <i>Udinopsis armatus</i> Vanh. Vanhöffen, pp. 517—519, taf. 21 |
| 1897. — — Vanh. Vanhöffen, p. 280, fig. 17. | fig. 24 |
| 1902. pars. <i>Bradyidius armatus</i> Vanh. Mrázek, p. 521. | 1908. <i>Bradyidius similis</i> G. O. Sars. v. Bremen, p. 32, fig. 32. |
| 1903. <i>Udinopsis similis</i> n. sp. G. O. Sars, p. 34, pl. XXI. | 1913. <i>Udinopsis armatus</i> Vanh. Stephensen, p. 317. |

This species, which has not been secured by any of the expeditions, has been mentioned from "Lille Karajak Fjord" on the west coast of Greenland, and Sars has found it in the inner part of the Stavanger Fjord, where "it only occurred close to the ground", "the depth ranging from 50 to 100 fathoms".

This species is not identical with *Bradyidius armatus* Giesbr. of Scott, Giesbrecht-Schmeil and Wolfenden. Stephensen has wrongly given *Bradyidius armatus* v. Bremen as partly synonymous with it.

23. *Gaidius tenuispinus* G. O. Sars.

(Pl. II fig. 8 a; pl. III figs 2 a—n; text-figs 23 a—j).

1900. <i>Chiridius tenuispinus</i> n. sp. G. O. Sars, p. 67, pl. XVIII.	1907. <i>Gaidius tenuispinus</i> G. O. Sars. Vanhöffen, pp. 521—522,
1902. <i>Gaidius tenuispinus</i> G. O. Sars. Mrázek, p. 512.	taf. 21 fig. 27, taf. 22 fig. 33.
1902. — <i>borealis</i> n. sp. Wolfenden, p. 365.	1907. — — G. O. Sars. Koefoed & Damas, p. 408.
1903. — <i>tenuispinus</i> G. O. Sars. Norman, p. 136.	1908. — — — Farran, p. 32.
1903. <i>Chiridius tenuispinus</i> G. O. Sars. G. O. Sars, pp. 30—31,	1908. — — — v. Bremen, p. 36, fig. 39.
pl. XVIII.	1909. Nec. — <i>similis</i> Th. Scott. A. Scott, pp. 51—52, pl. VII
1903. <i>Gaidius tenuispinus</i> G. O. Sars. G. O. Sars, p. 162, pl. VI,	figs 1—11.
suppl.	1911. — <i>tenuispinus</i> G. O. Sars, Farran, p. 97.
1904. ? <i>Gaidius pungens</i> Giesbr. Wolfenden, p. 131, pl. IX fig. 43.	1911? — — — Wolfenden, p. 223, figs
1905. <i>Chiridius tenuispinus</i> G. O. Sars. Th. Scott, p. 223.	11 a—b.
1905. <i>Gaidius tenuispinus</i> G. O. Sars. Farran, p. 33.	1913. — — — Stephensen, pp. 315
1906. — — — Pearson, p. 13.	—316.

Description. ♀. Size: Specimen from Thor St. 70 measured 3.84 mm.; anterior division 2.94 mm.; urosome 0.90 mm. Two specimens from Thor St. 285 measured $2.6 + 0.62 = 3.22$ mm. and $2.9 + 0.8 = 3.7$ mm.; specimens from Thor St. 183 measured $2.7 + 0.7 = 3.4$ mm. Sars' specimens measured 3.8 and Wolfenden's 3.8 (1904) and 3.25 (1911) mm. Vanhöffen's specimens 3.9 and Farran's (1905) 3.2 mm.

The shape of the body is scarcely different from Sars' figure, and no trace of segmentation between the fourth and fifth thoracic somite was observed; the lateral spines of the thorax are distinctly set off, and extend almost to the end of the genital somite (text-fig. 23 a). The rostrum is not, as set forth by most authors, undivided, but shows as seen in fig. 2 a (Pl. III) trace of bifurcation.

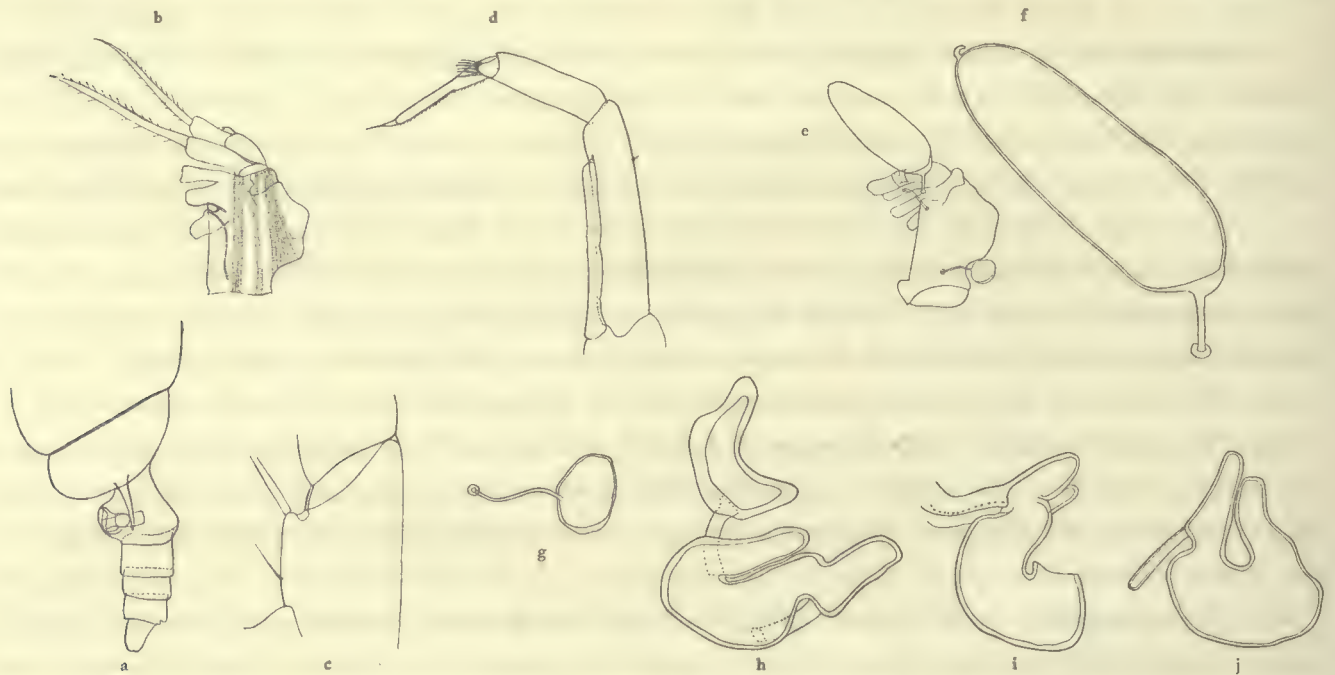
The length of the abdomen, compared to that of the anterior division, varies from about $\frac{1}{3}$ to $\frac{1}{4}$. The genital somite, which as seen in fig. has a short and well marked receptaculum seminis, well distinguished from the stalked one in *Chiridius*, is somewhat deeper and wider than long, and 1.6 as long as the third somite. The furcal rami are 1.6 as long as wide and a little wider than the anal somite is long.

The *antennulae* reach to about the end of the third abdominal somite and have the measurements distinctly different from those of *G. brevispinus* on account of the shorter distal segments; the segment 2 is 1.2 as long as 8 or 9, which is almost 1.3 as long as segment 13 and only a little shorter than segment 20; the segments 19 and 22 are almost of equal length, and almost 1.1 shorter than segment 2. The appendages are like those described by Giesbrecht in *Gaetanus armiger* with "Aesthetasken" in segments 3, 4 and 6 and Spr. in segment 13; the posterior seta of the segment 23 is ringed, and about three times as long as the segments 24 and 25, which are well separated.

The *antennae* have the Re 1.3 as long as Ri; the Ri I is distinctly twice as long as Re II; this is about twice as long as Re I, and about twice as long as Re III—VI, and about $\frac{2}{3}$ as long as Re VII. The Re II has the short Se 2 placed on a rather prominent process, (Pl. III fig. 2 e), like that found in Giesbrecht's fig. 19 Taf. 14 of *Gaetanus armiger*, and the Se 3 is somewhat longer. The *mandibulac* differ from Sars' figure by two slender Si of the third basipodite, and are in main features like those in Giesbrecht's *G. armiger*. The *maxillulae* are rather elongated, like Giesbrecht's figure of *Gaetanns miles* (Taf. 14 fig. 21); the Li I possesses on the anterior surface about 10 fairly strong teeth, and on the posterior surface near the base of S 11 about 10 similar ones; the Li II has 4 setae, and the Li III 5 + a sensory lobe and anteriorly a fairly strong spinulation, the Basp. III

has 4 Sp and 1 Sa but no spinulation anteriorly; the Ri I has 3 Sa + 1 Sp, the Ri II has 3 Sa + 1 Sp and the Ri III 5 S. The exopodite has 11 setae, and the Le has 7 long + 2 shorter ones. The *maxillae* are very characteristic by the strongly and suddenly convex outer margin of the basipodite, with a short concavity in the middle (text-fig. 22 b); the lobe I possesses a quite rudimentary spinelike Sp. 1 and a Sp. 2, which is about twice as long as the lobe itself; the strong spine of lobe IV is somewhat longer but scarcely stronger than that of lobe V. The third basipodite of the *maxillipeds* is 1.2 as long as Basp. I—II and three times as long as Ri; the exterior margin of the second basipodite has no trace of lamina, and its fourth lobe bears 3 hairs and a sensory process (fig. 2 c Pl. III).

The *first pair* of legs has the articulation between Re I and II indicated by a faint line anteriorly, and sometimes a small incision laterally; the Se Re I is wanting; the St has the usual



Text-fig. 23. *Gaidius tenuispinus* G. O. Sars.

a. ♀. Abdomen in lateral view $\times 33$. b. Maxilla sin. in posterior view. c. Pes IV sin. in posterior view $\times 82$. d. ♂. Pes V sin. $\times 140$. e. Maxilla dext. in anterior view to show position of parasites $\times 60$. f and g: the same parasites $\times 150$. h—j. Contorted bodies attached to the body-wall $\times 400$.

characteristic structure (Pl. III fig. 2 d). The articulation between Re I and II in pes II and Ri I and II is as shown in Sars' figure well developed; the St has 25 teeth. The *fourth pair* of legs has the Re III three times as long as wide and the St. has 25 teeth, partly armed with accessory ones; the first basipodite has the usual marginal hairs substituted for by 30—40 stiff thin lamellous bristles, which are placed in about 5 rows along the inner margin, and in 2—3 parallel ones on posterior surface, the more posteriorly the more distally placed. The arrangement and number of the glandular pores in pes I—IV are as in *Ch. obtusifrons*.

The lateral view of the *labrum* is like that of *Chiridius*, but the different parts are less prominent. The oral surface of the labrum (Pl. III fig. 2 e) is, as seen by comparing figures, distinctly different from *Gaidius brevispinus*; the five groups, as well as the sixth more transversely

placed one (not seen in fig.), are well separated; the setae around the median circular spot Nr. 4 are well developed.

The *lamina labialis* is almost smooth, but in other respects scarcely different from fig. 7 f (Pl. II), and the area in front of it is most like fig. 5 e Pl. III. The longitudinal lateral series of hairs placed behind the lamina labialis are in details somewhat different from those of *G. brevispinus*; the 3 posterior groups of the third series are better separated, and without direct connection with the anterior part; the proximal and distal groups of the series V seem to be fused.

♂. Size of specimen from Thor St. 183 was 3.01 mm.; anterior division 2.3 mm., urosome 0.71.

The shape of the body is scarcely different from Sars' fig. Pl. VI (supplement). The rostrum is fairly long and shows, terminally, trace of bifurcation (Pl. III figs. 2 f—g).

The *antennulae* have the segments 8–9 partly fused with 10, and the segments 12 and 13 with 14; the segments 20 and 21 and 24 and 25 are completely fused; the appendages are scarcely different from those of *Aetidius armatus* (cf. Giesbrecht Taf. 14 fig. 15). The measurements differ from those of the female by the segment 22, which is 1.1 as long as segment 17 and 1.2 as long as segment 2. The structure of the *antennae* is in most respects like that of the female, but the Si 2 of Re II is not placed on a small process. The manducatory portion of the *mandibulae* (cf. fig. 1 d) is even more thin-skinned than in *G. brevispinus*, but has rudimentary teeth; the third basipodite has no setae, and those of the exopodites and endopodites are better developed. The *maxillulae* differ from those of *G. brevispinus* (fig. 1 e) by a fairly long Li 2 with a number of rounded sensory organs. The *maxillae* (Pl. III fig. 2 h) are small, thin-skinned organs, which in the main preserve their original shape; the exterior margin of the basipodite has no convexity; the inner surface possesses an indistinct number of short partly fused lobes, the setae of which are more or less transformed into thin-skinned more or less setiform appendages with a swollen base; the Ri has a few setae of usual form. The two first segments of the maxillipeds possess only the fourth lobe.

The *first pair of legs* has, as shown in fig. 1 g, the Se Re II represented by a minute seta, and the St. is as usual in the male almost straight (Pl. III fig. 2 i); the second to the fourth pairs of legs are scarcely different from those of the females, except by the smooth inner margin of the second basipodite of the fourth pair of legs. The *fifth pair of legs* is on the right side in the main like Sars' figure; the Ri (Pl. III fig. 2 l) is distally swollen and contains clear alveolar structures; the Re I (I–II?) has in most specimens a lateral protuberance, and shows trace of segmentation (fig. 2 m); the Re II has inwards a lamelli-form process which surrounds a shallow cup facing backwards and outwards (fig. 2 n, cf. fig. 1 j); the Re III is elongate and curved with a terminal hooked hairy process. The left leg (text-fig. 22 d) appears more slender than in Sars' figure; the Ri which shows a trace of segmentation is long and slender, distally somewhat enlarged and bearing a short hair; the Re 2 has inwards a hairy protuberance (fig. 2 j), and the Re 3 is very elongate with a distal fairly long Se and a St. (fig. 2 k).

Y (St. V). Size of female from St. 70 3.15 mm.; anterior division 2.51 mm., urosome 0.64.

The shape of the body, except for the usual segmentation of the abdomen, is as in the female, the *antennulae* extend almost to the end of the abdomen. The mouth appendages are scarcely in any features of interest different from those of the female. The articulation between Ri I and II of pes II is less developed than in the female; the glandular pores were scarcely different. Along the

inner margin of the second basipodite of pes IV a few lamellous setae like those of the adult females were found in the young females, but in the males a few marginal hairs of usual structure were found. The fifth pair of legs in the males is as seen in fig. 8 a (Pl. II) rather slender.

Y♀ (St. IV). Size: A single female from Thor St. 165 1905 measured 2.06 mm.; anterior division 1.67; urosome 0.39 mm. The antennulae reached to base of furca; the shape of the body is in the main like that of the adult females, but the abdomen has as usual only three somites. The structure of the appendages was not examined in details.

Parasites. In several adult females of this species curiously twisted bodies (text-figs 22 h—j) to the number of one or two were found, now on the right and now on the left side; they are by a delicate stalk fastened to the skin of the body wall between the insertion of the maxillae and maxillulae; their content is finely granular. About their nature I do not at present wish to express any opinion. They were found in the following number of adult females from 5 stations viz. 1 from Ingolf St. 20, 25 from Thor St. 152 ¹⁹/₆ 1904, 20 from Thor ²¹/₆ St. 153 and 4 from ¹⁰/₇ 1904 St. 78. At St. 152 and 153 they were generally found together with the "parasites" to be described.

In a great number of adult females of this as well as of the following species elongate obovate bodies (text-figs 22 e—f) were observed; they are by a stalk and a terminal disc fastened to the chitin of the maxillulae (in a specimen from Ingolf St. 19 f. inst. to a seta of Le), but especially of the maxillae. These structures are of somewhat different shape in the various animals, with the tip more or less pointed; they consist of a transversely striated wall, which, in contrast to the stalk, is dissolved into a solution of potash and a content with vacuoles but without distinct nuclei in glycerin preparations. The stalk is hollow and widened out towards the sac, which is here more or less pointed.

These structures were sometimes found on the left sometimes on the right side to the number of one to four; they were found in the following number of specimens in one sample from Ingolf, and in 11 from Thor: viz: Ingolf St. 19 2 specimens; Thor St. 152 (¹⁹/₆ 1904) 25 specimens, St. 153 (²⁰/₆ 1904) 20, St. 154 (²¹/₆ 1904) 3, St. 78 (¹⁰/₇ 1904) 8, St. 285 (¹/₉ 1904) 5, St. 214 (²²/₇ 1904) 1, St. 183 (¹¹/₇ 1904) 6, St. 104 (²⁴/₅ 1904) 10, St. 164 (²⁹/₈ 1905) 1 and St. 72 (⁸/₆ 1905) 3 specimens. It is rather curious to notice that the distribution of these "parasites", which in some features are not unlike spermatophors, is very irregular within the area; they were most common in Denmark Strait, and very scarce at the southern stations. At the station (Thor ⁹/₅ 1904 St. 70) at which the greatest number of specimens of *G. tenuispinus* viz 890 f♀ were collected, these structures were not observed.

Occurrence. The Ingolf Exp. has gathered this species at the following stations in Davis Strait.

²⁵/₆ 1895. St. 24. 63°06 L. N. 56°00 L. W. V. 200—0 fathoms. Temp. at surface 4.2° C. 1 f♀.

²⁶/₆ 1895. St. 25. 63°30 L. N. 54°25 L. W. V. 200—0 fathoms. — 2.9° C. 1 f♀.

¹/₇ 1895. St. 27. 64°54 L. N. 55°10 L. W. V. 200—0 fathoms. — 3.9° C. 1 f♀.

In the Atlantic south-east of Greenland it has been taken at 2 stations.

²⁰/₆ 1895. St. 20. 58°20 L. N. 40°48 L. W. V. 200—0 fathoms. Temp. at surface 6.1° C. 2 f♀.

¹⁸/₆ 1895. St. 19. 60°29 L. N. 34°14 L. W. V. 300—0 fathoms. — 9° C. 5 f♀,
1 y♀ (V); 1 y♂ (V).

In Denmark Strait it has been taken.

²¹/₅ 1895. St. 11. 64°34 L. N. 31°12 L. W. V. 200—0 fathoms. Temp. at surface 8.2° C. 1 f♀.

The S/S. Thor has in Denmark Strait at four stations from 1904 taken numerous specimens, of which numerous were infected with "parasites" of both kinds.

¹⁹/₆ 1904. St. 152. 65°00 L. N. 28°10 L. W. Yt. 800 M. Wire about 100 f♀; 1 y♀ (V); 1 y♂ (V).

²⁰/₆ 1904. St. 153. 65°20 L. N. 27°12.5 L. W. Yt. 800 M. Wire 80 f♀; 3 y♀ (V); 2 y♂ (V).

²¹/₆ 1904. St. 154. 65°27 L. N. 27°10 L. W. Yt. 800 M. Wire 85 f♀; 1 y♀ (V); 1 y♂ (V).

¹⁸/₆ 1904. St. 150. 65°50 L. N. 26°53 L. W. Yt. 400 M. Wire 1 f♀.

In the Atlantic south of Iceland the S/S. Thor has taken numerous specimens from deeper layers; comparatively few specimens were infected with the said parasites.

Thor ¹⁰/₇ 1904. St. 78. 63°08 L. N. 21°30 L. W. Yt. 750 M. Wire 50 f♀.

¹⁰/₇ 1904. St. 180. 61°34 L. N. 19°03 L. W. Yt. 400 M. Wire 26 f♀.

¹/₉ 1904. St. 285. 62°49 L. N. 18°40 L. W. Yt. 500 M. Wire 125 f♀; 3 y♂ (V).

¹¹/₇ 1904. St. 183. 61°30 L. N. 17°08 L. W. Yt. 1800 M. Wire about 100 f♀; 14 f♂; 4 y♀ (V);
7 y♂ (V).

²⁴/₅ 1904. St. 104. 62°47 L. N. 15°03 L. W. Yt. 1500 M. Wire 35 f♀; 2 y♂ (V).

In the Iceland-Færoe channel the S/S. Thor has taken the species at four stations a single time in big numbers, only few specimens bore "parasites".

Thor ²⁹/₈ 1905. St. 164. 61°20 L. N. 11°00 L. W. Yt. 300 M. Wire 1 f♀.

²²/₅ 1904. St. 99. 61°15 L. N. 9°35 L. W. Yt. 1700 M. Wire 2 f♀.

⁹/₅ 1904. St. 70. 63°35 L. N. 6°20 L. W. Yt. 100 M. Wire 890 f♀; 4 y♀ (V); 7 y♂ (V).

²⁷/₇ 1904. St. 124. 61°04 L. N. 4°33 L. W. Yt. 100 M. Wire 28 f♀.

Outside the Ingolf area the S/S. Thor has taken the species at the following stations.

Thor ¹⁵/₆ 1905. St. 82. 51°00 L. N. 11°43 L. W. Yt. 1200 M. Wire 2 f♀.

⁸/₆ 1905. St. 72. 57°52 L. N. 9°53 L. W. Yt. 1500 M. Wire 23 f♀; 1 y♀ (V); 1 y♂ (V).

³¹/₈ 1905. St. 167. 57°46 L. N. 9°55 L. W. Yt. 1500 M. Wire 8 f♀; 1 y♀ (V); 3 y♂ (V);
1 y♀ (IV).

North of Iceland the species was taken by S/S. Thor at a single station.

²²/₇ 1904. St. 214. 67°19 L. N. 17°55 L. W. Yt. 800 M. Wire 60 f♀; 2 f♂; 1 y♀ (V); 3 y♂ (V).

Distribution. The species has previously been recorded fairly common in the eastern part of the north polar basin crossed by Nansen; specimens were found as far north as 85 Lat. N., and here near the surface; at the other stations they were found at considerable depth. From Spitsbergen it has been recorded by Mrázek. In the ocean lying between Spitzbergen and Greenland it was found fairly common from altogether 18 stations, scattered all over the area crossed by the Duc d'Orléans as far north as 80° L. N. 2°47 L. E.; its range was between 100 and 700 meters in depth. In the Norwegian Sea it was found a few times between Finmarken and Jan Mayen between 500 and 1000

meters. From the west coast of Greenland it has been recorded from "Lille Karajakfjord" by Vanhöffen. It is, as seen from the above, fairly common in the Iceland-Færoe channel between 100—0 meters, and so it is in the Færoe-Shetland channel; its shallowest record here is according to Farran (1911 p. 97) "from a haul of 100—0 meter in 143 meters of water from a station lying to the east of Shetland". It has as far south as 55° L. N. "several times been met with in small numbers in the deep water of the Atlantic slope off the south west coast of Ireland at depths of from 500 to 600 fathoms". The species has not been taken by the Monaco; the records from the Gauss and the Siboga Expeditions seem to be very doubtful, and shall presently be discussed.

The Ingolf and the Thor's records of this species from Baffin Bay, Danmark Strait, the sea north of Iceland and the Atlantic south of Iceland as far south as 60 to 51° L. N. complete the picture of this species as a North Atlantic and arctic species from the intermedial layers.

Remarks. That the described species is identical with Sars' *G. tenuispinus* does not seem doubtful, in spite of the slightly bifurcate rostrum and the stiff broad bristles on the inner margin of the second basal segment of the fourth pair of legs, which were not mentioned by the author; the latter character was well described by Wolfenden for his species *G. borealis*; Wolfenden has later on identified his species with *G. tenuispinus*, but has in the list of species, probably by a slip of the pen, given it the name *G. pungens* Giesbr.

Wolfenden has identified specimens from Cap and the Antarctic ocean with the northern form; he has examined specimens from the northern as well as the southern regions without being able to find great differences; he may be right; but as the differences between the species are often so small, and as too few characters are generally used by the authors, I prefer to look forward to further investigations, not the least on account of the different localities. It is on that account that I have given so full a description of this species.

A Scott is certainly right in regarding his father's species *Euchæte Hessii* var. *similis* (1894 pp. 58—59 Pl. VI figs 24—25) as being related to *Gaidius*; but as its size is only 2.2 mm., as the terminal segment of the left pes V is somewhat swollen at the base and as it "wants the prominent rostrum of *Euc. Hessei*" (his figure does not show any rostrum), I do not think his identification ought to be accepted. A. Scott identifies his *G. similis* Th. Scott with *G. pungens* Gbt.; in this he may possibly be right. He writes (p. 52). "I regard the form described by Sars as *Gaidius tenuispinus* ... to be identical with this species". His figures of the pes V and of the rostrum of the male, which are somewhat insufficient, do not support his view.

24. *Gaidius brevispinus*? G. O. Sars.

(Pl. II figs. 7 a—h; pl. III figs. 1 a—j; textfigs 24 a—i).

1900?	<i>Chiridius brevispinus</i> n. sp.	G. O. Sars, p. 68, pl. XIX.	1905?	<i>Gaidius brevispinus</i>	G. O. Sars. G. O. Sars, p. 3.
1902?	<i>Gaidius</i>	— G. O. Sars. Mrázek, p. 521.	1905?	— <i>affinis</i> n. sp.	G. O. Sars, p. 9.
1903?	—	— G. O. Sars, pp. 162—163; suppl. pl. VI.	1905.	— <i>brevispinus</i>	G. O. Sars. Farran, p. 33.
1903?	—	— Norman, p. 136.	1906.	—	— Pearson, p. 13.
1904.	— <i>major</i> n. sp.	Wolfenden, pp. 114—115; pl. IX figs 7—8.	1908.	—	— v. Bremen, p. 35.
			1908.	— <i>affinis</i>	— Farran, p. 32.

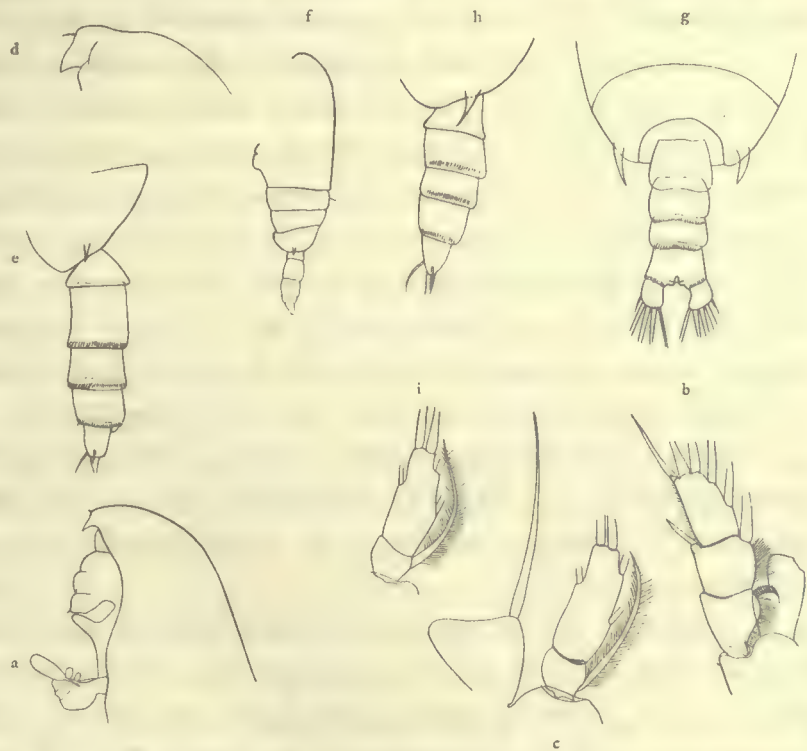
Description. f♀. Size of specimen from Thor St. 183 4.05 mm.; anterior division 3.13 mm., urosome 0.92 mm. Sars' specimens measured 4.8 mm., Wolfenden's specimens 4.65 mm. and Farran's specimens measured 3.9—4.5.

The shape of the body is practically as figured by Sars, except for the distinctly longer lateral spines of the thorax, which are directed downwards and backwards. The rostrum is not undivided as stated by Sars, but is, as shown in fig. 7 a (Pl. II), distinctly bifurcate terminally. On each side of the vulva a somewhat triangular plate was found, and a short receptaculum seminis was observed (fig. 7 b); the structure of the genital apparatus was rather complicated, but was not examined in the details; figs 7 b—c will give an impression of its structure. The furcal rami are 1.4 as long as wide, and a little shorter than the anal somite.

The *antennulae* do not reach to the end of the anal somite, but only somewhat beyond the end of the genital somite. The segment 2 is 1.1 as long as 8~9, which is scarcely 1.1 as long as segment 13, and 1.2 shorter than segment 20; segment 19 is a little longer than 20 and 22 which are of almost equal length, and longer than segment 2. The appendages differ from those of *G. tenuispinus* by the presence of a Sp. in segment 13.

The *antennae* have the Re about 1.5 as long as Ri, but are scarcely different in other respects. The *maxillulae* differ from those of *G. tenuispinus* by Li 3, which only bears 4 setae in addition to the sensory lobe, and by the Re III, which possesses 6 Sa + 1 Sp. The *maxillae* (fig. 7 d) have the exterior margin less strongly convex than the preceding species; the Sp. 2 of the first lobe is three times as long as the lobe itself, and the Sp. of lobe IV is stronger as well as longer than the corresponding Sp of lobe V. The *maxillipes* differs from those of the preceding species by a rounded lamelli-form protuberance on the exterior surface of the second basipodite (fig. 1 a). The articulation between the Re I—II of the *first pair of legs* is better developed than in *G. tenuispinus* (text-fig. 24 b), and so is the articulation between Ri I—II of the second pair of legs (text-fig. 24 c), the St. of pes II has only 19 teeth; along the inner margin of the second basipodite of the fourth pair of legs distally and posteriorly one to two rows of broad stiff bristles were observed (fig. 1 c).

The oral surface of the *labrum* has a well developed longitudinal series of hairs, which are, however, only indistinctly divided into the usual 5 groups as seen in fig. 7 f; group III is



Text-fig. 24. *Gaidius brevispinus* G. O. Sars.

a. f♀. Head from the left with parasite attached to maxilla × 18. b. f♀. Pes I sin. in ant. view × 80. c. Pes II sin. Ri in ant. view × 80. d. f♂. Rostrum × 57. e. f♂. Abdomen × 33. f. f♂. × 9. g. Y♀. (Stage V) × 33. h. Y♀. Abdomen lateral view × 33. i. y♀. Pes II Ri in ant. view × 80.

fairly well marked, and group IV has in addition to the inner series a lateral one with 10 short hairs. The transverse series around the fourth pair of central spots is less prominent than in the preceding species. The lateral group of hairs is assymmetrical in one of the examined specimens. The granular *lamina labialis* with the area in front of it is shown in fig. 7 f. Behind the lamina labialis four partly fused groups of short spines are placed near the middle line. On the area labialis and the lobi labiales altogether 5 longitudinal series of hairs (Pl. II fig. 7 f S¹—S⁵) arranged as shown in figure were found.

♂. Size of specimen from St. 183 Thor 1904 was 3.34 mm.; anterior division 2.53 mm.; urosome 0.81 mm. Wolfenden's specimen measured 3.1 mm.

The shape of the body is practically like that of preceding species, but for the shorter lateral spines (text-figs 24 d—f). The *antennulae* extend almost to the end of the abdomen; the segment 22 is 1.4 as long as the segment 17, but in other respects they are scarcely different from those of preceding species. The *antennae* are comparatively more clumsy, with comparatively shorter Re; the manducatory part of the mandibulae is comparatively more thin-skinned (Pl. III fig. 1 d), but in other respects the mandibulae are scarcely different. The *maxillulae* (fig. 1 e) are fairly well developed; the Le I has as usual 9 setae; the Li I does not possess any setae, but a number of short rounded sensory organs; the Li II which is quite rudimentary, and the Li III which has at least one real setae, possess similar organs. The third basipodite has at least 2 setae and the Ri I—III 3 + 3 + 6 setae. The Re has as usual 11 setae. The *maxillae* are scarcely different from those of preceding species (cf. fig. 2 h). The *maxillipeds* (fig. 1 f) have the third basipodite 1.3 as long as the basipodites I—II and 2.5 as long as Ri; the basipodites I—II have a rudimentary Li I and a fairly well developed Li IV.

The first pair of legs has the articulation of Re I well developed (fig. 1 g), but not only Se Re I but also Se Re II are completely wanting. The St. Re III of pes II has 37 teeth, and the inner margin of the second basipodite in the fourth pair of legs is smooth and has, as seen by comparing figs 7 g and 7 e another shape than in the female. The *fifth pair* of legs (Pl. III fig. 1 h) is very similar to that of *G. tenuispinus*, but the basal segments are comparatively shorter, especially the third one of the right side. The left endopodite shows no trace of segmentation, and has no small terminal seta; the left Re III has, as shown in fig. 1 i, a rather characteristic structure.

Y (Stage V). Size of female from St. 183 Thor 3.22 mm.; anterior division 2.53 mm.; urosome 0.69 mm.

The shape of the body, except for the structure of the abdomen, is scarcely different from that of the adult female. The *antennulae* extend distinctly to the end of the last abdominal somite; the Sp. of segment 23 is only 1.5 as long as the segments 24—25. The *maxillulae* have only 10 setae in Re, the exterior margin of the basipodite of the *maxillae* is less distinctly convex, and the laminous process of the exterior surface of the second basipodite of the maxillipeds is less prominent, with a distal tooth. The *pes II* has the articulation between the Ri I—II slightly developed (text-fig. 24 i), and the marginal hairs of the second basipodite of the fourth pair of legs are in the male only fewer (about 10) than in the pes III, but not different; in the female, however, not only the number is smaller (17 against

32), but the hairs are stiffer, and the row is distally turning around margin posteriorly. The fifth pair of the legs (fig. 7 h) is in several respects different from that of *G. tenuispinus* (fig. 8 a).

Parasites? "Sacshaped" structures, like those of preceding species in a similar position were found in a single female from Thor St. 152 and in 29 females from Thor St. 183.

Occurrence. The Ingolf Expedition has not taken this species, but the S/S. Thor gathered it at a few stations in Denmark Strait and south of Iceland viz:

¹⁹/₆ 1904. St. 152. 65°00 L. N. 28°10 L. W. Yt. 800 M. Wire 11 f♀.

²⁰/₆ 1904. St. 153. 65°20 L. N. 27°12.5 L. W. Yt. 800 M. Wire 1 f♀.

¹/₉ 1904. St. 285. 62°49 L. N. 18°40 L. W. Yt. 500 M. Wire 1 f♂.

¹¹/₇ 1904. St. 183. 61°30 L. N. 17°08 L. W. Yt. 1800 M. Wire 160 f♀; 3 f♂; 10 y♀ (V); 42 y♂ (V).

²⁴/₅ 1904. St. 104. 62°47 L. N. 15°03 L. W. Yt. 1500 M. Wire 2 f♀.

Distribution etc. As the circumscription of this species is not quite sure, I feel obliged before discussing its distribution, to write a few words about the synonymy.

The described species differs from Sars' *G. brevispinus* by the somewhat smaller size, by the divided rostrum and by the much longer lateral spines; as Sars does not seem to have realised the importance of the characters found in the laminous process of maxillipeds and in the curious setae of the second basipodite of pes IV, the fact that he does not mention these characters is scarcely of importance. Wolfenden's description of the female as well as of the male is very incomplete; the females are bigger than my specimens, and the lateral corners seem to be like those of my specimens. Farran has (1908 p. 32) examined specimens from the west coast of Ireland, which, as far as his few remarks go, show exactly the same differences from Sars' description as my specimens do; really I do not doubt that they belong to the same species. Farran has, however, referred his specimens to Sars' *G. affinis*, and Sars has himself confirmed this identification, though his original specimens of *G. affinis* only measured 3.6 mm. Sars' description is too incomplete to be of much value. Though Sars regards *G. brevispinus* as well as *affinis* from the Monaco Expedition as different species, it is most probable that the animals which are recorded from the Færoe channel and the north-east Atlantic under the name of *G. major*, *affinis* and *brevispinus* ought to be referred to the same species, varying in size from 3.6 to 4.65 mm. If this species is not identical with *G. brevispinus* its name ought to be *G. major* Wolf. This species or variety is distributed as far north as Denmark Strait and the Færoe-Iceland channel, and is found as far south at least as 50° L. N.; *G. brevispinus* proper which, as seen above, differs from the southern form by the larger size and shorter lateral spines, has been taken in the western part of the polar basin crossed by Nansen (at 84° L. N. rather plentifully), once in the sea between Finmarken and Jan Mayen, but rather curiously not in any of the numerous samples brought home by the Duc d'Orléans.

From *G. intermedius* Wolf. it differs by the less pointed lamina of the basipodite of the maxillipeds.

25. *Gaetanus Kruppi?* Giesbr.

(Pl. III figs 3 a—h; text-figs 25 a—o).

April 1903? *Gaetanus Kruppi* n. sp. Giesbrecht, p. 202, pl. | 1903? *Gaetanus armiger* Giesbr. J. C. Thompson, p. 17.
VII fig. 8, pl. VIII fig. 29. | June 1903? — major n. sp. Wolfenden, p. 125.

1903?	<i>Gaetanus armiger</i>	Giesbr. Norman, p. 137.	1908?	<i>Gaetanus Kruppi</i>	Giesbr. v. Bremen, p. 41, fig. 47.
1904?	—	major Wolf. Wolfenden, p. 114, pl. IX figs 7-8.	1908?	—	major Wolf. Wolfenden, p. 31.
1905.	—	—	1908?	—	Kruppi, Giesbr. Wolfenden, p. 32.
1905.	—	Farran, p. 33.	1909 ♀?	—	—
1905.	—	Kruppi, Giesbr. G. O. Sars, p. 4.			A. Scott, pp. 48-49, pl. IX figs 9-15.
1906.	—	major Wolf. Pearson, p. 14.			♂ nec. — — — A. Scott, pl. X figs 1-9.
1908.	—	—	1911?	—	major Wolf. Wolfenden, p. 231.
1908.	—	Farran, pp. 36-37.			
1908?	—	—			
1908?	—	v. Bremen, p. 40, fig. 45.			



Text-fig. 25. *Gaetanus Kruppi* Giesbr.

a. f♀. Head $\times 33$. b. f♀. Abdomen $\times 33$. c. f♂. Head $\times 33$. d. Y♂ (st. II). Head $\times 33$. e. Y (st. III). Abdomen $\times 33$. f. Abnormal spec. Head $\times 33$. g. f♂. Antennula sin. segments 8-9-17 $\times 33$. h. Intestinal tract $\times 9$. i. Maxilla dext. in post. view $\times 57$. j. Maxillipes sin. in post. view $\times 57$. k. Maxillipes dext. in anterior view $\times 57$. l. Y♂ (st. IV). Maxillipes sin. in anterior view $\times 57$. m. Y♂ (st. III). Maxillipes $\times 57$. n-o. Y♂ (st. V-IV). Pes V anterior view.

Description. f♀. Size: Specimen from Thor St. 104 measured 5.4 mm.; anterior division 4.2 mm., urosome 1.2 mm. Wolfenden's specimens measured 5 mm.

The body, which appears moderately slender, is 2.7 as long as wide, and has a well developed frontal spine (text-fig. 25 a), which is directed forwards and slightly downwards, and smoothly continued into the dorsal outline of the body. The rostrum is short, and is terminally slightly bifurcate. The

lateral spines of the fifth thoracic tergite (text-fig. 25 b) are suddenly set off, slightly divergent and reach the middle of the genital somite. The anterior division is 3.5 as long as the urosome, which has the 4 somites and the furca of the following relative length viz. 46, 23, 19, 15 and 21; the furcal rami are about 1.2 as long as wide. The genital area is similar to that of *Gaidius* (text-fig. 25 b).

The *antennulae*, which extend somewhat beyond the end of the abdomen, have the segments 24—25 almost completely fused and the appendages like those of *Gaidius tenuispinus* and *Gaetanus armiger*; the Sp. segm. 23 is at least twice as long as segments 24—25. The segments 2, 8 & 9 and 20 are of about equal length and about 1.1 shorter than segment 19. The *antennae* differ from those of *Gaetanus armiger* (cf. Giesbrecht p. 221) by the Re II, which is distinctly twice as long as Re I, and has not only the second but also the third Se placed on a conical protuberance. The *mandibulae* differ from *G. armiger* by the fairly long plumous Si 1 of the third basipodite and the short Se 2 with a few branches. The *maxillulae* and *maxillae* are scarcely different from those of *G. armiger* (text-fig. 25 i). The third basipodite of the *maxillipes* is 1.3 as long as the two first segments and 3 times as long as the endopodite; the second basipodite has almost in the middle anteriorly on the exterior surface a laminous process with a concavity turning forwards; its tip is somewhat produced and rounded, and proximally to it a more or less distinct tooth is found (text-figs 25 k and j). The fourth Li of the basp. II has in addition to the usual sensory lobe and two hairs a small conical process representing the third hair.

The pes I has the articular line between Re I and II distinct anteriorly, except near the inner margin; posteriorly only a faint line was observed; the pes II has the St., which has 25 well separated teeth, distinctly longer than the Re III, in length almost equal to Re I—II. The basp. II of the fourth pair of legs (fig. 3 a) has about 25—30 stiff triangularly pointed marginal bristles, in the main placed on the posterior surface. The number of secretory pores is completely like that of *Gaidius*, with a pore at the base of Se Re I in pes II.

The oral surface of the *labrum* is in most respects like that of *G. latifrons* (cf. fig. 5 d); the bristles in group 3—5 are more like spines; the transverse rows of hairs between the circular spots of group IV, as seen in fig. 3 b, are more like *Gaidius tenuispinus*. The lateral outline of the labrum is very much like that of *G. brevispinus*, with three small elevations; no setae were observed on the anterior surface in front of marginal row. The *lamina labialis* (fig. 3 c) is smooth and of another shape than in *G. latifrons*, but in other respects, except for a somewhat different arrangement of the serrulae behind the lamina, the labial appendages etc. are similar to those of *G. latifrons*.

As most specimens are very pellucid the intestinal tract, especially the black hindmost portion is generally quite distinct. It shows a characteristic structure with a large somewhat pointed coecal sac directed towards the frontal spine, a small dorsal one opposite the wide oesophagus, and behind the latter a gentle concavity, in which the oviducts with big eggs are placed (text-fig. 25 h).

♂. Size of specimen from Thor St. 183(?) was 5.04 mm.; anterior division 4 mm., urosome 1.04. Wolfenden's specimen measured 4.65 mm.

The shape of the body is more slender; the anterior division is 3 times as long as wide and almost 4 times as long as the urosome. The bifurcate *rostrum* is shorter and more clumsy

than in the female; dorsally to the frontal organ the outline is first bulked; above this a concavity, and beneath the frontal spine another proeminence adorned with about 10 transversely placed chitinous lines, laterally somewhat convergent, are found. The comparative length of the first four abdominal somites and the furca is 15, 34, 23, 23 and 14; the anal somite is, seen from above, almost completely covered, and the furcal ramus is only a little longer than wide.

The *antennulae* (text-fig. 25 g) extend about to the end of the second abdominal somite, but not as in the female beyond the end of the abdomen. The segmentation from segm. 8—14 is difficult to make out, partly because the articular membranes are rather indistinct and partly because a number of faint transverse lines were seen between the real membranes; it seems, however, that only the segm. 12 and 13 are really fused; the segments 20 and 21 are completely, and 24—25 only partly fused. The number of "Æstetasken" is like Giesbrecht's description of *Actidius* (Taf. 14 fig. 13), but the segments 8~9 possess 4. The segments 11—13 bear two setae each, of which the proximal is the longer, and is inserted in a small protuberance; the Sd of segments 14, 15, 16 and 17 are placed on small protuberances. The posterior seta of segm. 23 extends somewhat beyond the middle of segment 24. In the Re II of the *antennae* no setae were observed. The *mandibulae* possess a large but soft manducatory part without distinct teeth but with a short Sdi; the Basp. 2 has an ovoid minutely granular area, and the third one as well as Ri I has no setae; the setae of the Ri and Re are better developed than in the female. The *maxillulae* are in main features like those of *G. brevispinus* (fig. 1 e) but the Basp. III seems only to have a single delicate seta, and the Re only 10 setae. The *maxillae* and *maxillipeds* are scarcely different from those of *Gaidius*.

The pes I is more slender than in the female; the articular line between Re I—II is wanting posteriorly; the Se Re II is represented by a very short delicate bristle; the glandular pore in the outer margin of Re III, which is only indicated in the female, is well developed. The inner margin of the second basipodite was found smooth not only in the fourth, but also in the third pair of legs. The fifth pair of legs (Pl. III figs 3 d—f) is in main features like that of *Gaidius*, but is as a whole distinctly more slender. The right endopodite, which is half as long as Re I and distally and posteriorly has a short tooth, is distally inflated and spoon-shaped; the Re II has the anterior process which encloses the bowel-shaped cavity shorter and more prominent (fig. 3 f). The endopodite of the left legs is almost $\frac{2}{3}$ of the length of the Re I; it is indistinctly divided into 3 segments, of which the second is the shortest, and has no terminal seta. Inwards, at the base of Re III, a small process bearing 4 short hairs is found.

Y (Stage V). Size: female from Thor St. 183 (?) 4.0 mm.; anterior division 3.2; urosome 0.8 mm. Farran's young male measured 4.3 mm.

The relative length of the four abdominal somites and the furca is: 19, 21, 18, 19 and 17; the furcal rami are 1.3 as long as wide. The *antennulae* are distinctly longer than in the adult, and the measurements are slightly different. The *maxillulae* have, in contrast to the female, only 10 setae in the Re, and the lob. IV of the second basipodite of the maxillipeds bears 3 setae as in the male, in addition to the sensory lobe. The articulation between Re I and II in the first pair of legs is only indicated anteriorly as a faint line; the St. of the Re III in the second pair of legs has only 20 teeth, the setae along the inner margin of the basipodite of the fourth pair of legs are rather stiff. The

male differs from the female by the presence of a fifth pair of legs which as shown in text-fig. 25 n, is like that of *Gaidius*.

Y (St. IV). Size of male from Thor St. 165 was 3.29 mm.; anterior division 2.6; urosome 0.69 mm.

The body is comparatively slender, a distinct limitation between the head and the first thoracic tergite is observed, the somites IV and V are as in other stages fused with well marked lateral spines. The relative length of the abdominal somites and the furca is 11, 17, 19 and 13; the furcal rami are 1.4 as long as wide. The *antennulae* extend about 3 segments beyond the end of the abdomen. The *maxillulae* differ as usual by the 9 setae of Re, but the Basp. III has only 3 Sa + 1 Sp, and the Ri I—II each 2 Sa + 1 Sp; the laminous process of the maxillipeds has a slightly different shape without terminal tooth (text-fig. 25 l). The pes I has Re II—III fused, but Se Re II is present; the fourth pair of legs (fig. 3 g) has like the two preceding pairs, the Re II ∞ III fused, with 3 Se and 16 teeth in the terminal seta; the secretory pore corresponding to the Se Re II is missing. The only difference between the 2 sexes is found in the presence of a fifth pair of legs of the usual rudimentary type in the male (text-fig. 25 o).

Y (St. III). Size of specimen Thor St. 167 2.48 mm.; anterior division 2.07 mm.; urosome 0.41.

The shape of the body is distinctly more slender, and so is the frontal spine; the *rostrum* is blunt; the head is as in preceding stage well separated from the first thoracic somite, but also the fourth from the fifth one, which has no lateral spines. The relative length between the two abdominal somites and the furca, which is 1.4 as long as wide, is 12, 20 and 11. The *antennulae* extend 4 segments beyond the tip of the abdomen; the segments 2—3 and 4—5 seem to be fused, and the measurements are in several respect rather different; it is curious that the segment 25, which is well separated from the preceding one, is not only relatively but also absolutely longer than in any of the preceding stages (it is shortest in the f♀). The *maxillulae* are like those of preceding stage, but differ by 8 setae in the Re and by the Li I, in which one of the posterior setae is wanting (only 3 present), and one of the anterior ones (S 5) is represented by a short spine. The other mouth appendages, except the *maxillipeds* which have the laminous process rounded, are in main features like those of preceding stages (text-fig. m).

The pes II, which like pes III—IV have the Ri unsegmented, has a fairly distinct limitation between Re I and Re II—III, and is in main features like fig. 3 g; the pes III differs from II by less distinct limitation between Re I and Re II ∞ III, but the latter segment has only 2 Se; the pes IV is again more reduced, as seen in fig. 3 h, as all the segments are completely fused, and as only a single secretory pore was found.

Variation etc. A single specimen from Thor St. 152 showed a rather curious shape of the dorsal outline behind the frontal spine; as the species was in all other respects like the rest, the structure ought perhaps to be regarded as a kind of deformity (text-fig. 25 f).

“Sacshaped structures” like those described in *G. tenuispinus* are found in several specimens, mostly adult females, but also in young ones of the penultimate stage; the following number of “parasites” were found in samples from the following 6 stations of Thor viz. $\frac{19}{6}$ 1904 St. 152 7 parasites in

f♀ and 1 in y♂, ¹¹/₇ 1904 St. 183 2 par. in f♀ and y♂, ¹/₉ 1905 St. 167 13 in f♀ and 2 in y♂, ⁹/₅ 1905 St. 72 15 in f♀, and 14 in y♂, ²⁹/₈ 1905 St. 165 1 in f♀ and ²²/₅ 1904 St. 99 1 parasite in f♀.

Occurrence. The Ingolf Exp. has not taken any specimens of this species, but it was gathered in several hauls by the Thor.

In Denmark Strait:

¹⁹/₆ 1904 St. 152 65°00 L. N. 28°10 L. W. Yt. 1000 M. Wire 6 f♀, 1 y♀ (V), 2 y♂ (V).

800 M. Wire 7 f♀.

? 15 f♀, 3 y♀ (V), 12 y♂ (V).

? 18 f♀, 2 f♀ (V), 10 y♂ (V), 2 y♀ (IV).

²⁰/₆ 1904 St. 153 65°20 L. N. 27°12.5 L. W. Yt. 800 M. Wire 1 f♀, 4 y♂ (V).

²¹/₆ 1904 St. 154 65°20 L. N. 27°10 L. W. 2 f♀, 2 y♀ (V), 2 y♂ (V).

In the Atlantic south of Iceland it was gathered at the following stations.

¹⁰/₇ 1904 St. 180 61°34 L. N. 19°05 L. W. Yt. 1800 M. Wire 1 f♀, 1 y♂ (V).

¹¹/₇ 1904 St. 183 61°30 L. N. 17°08 L. W. Yt. 1800 M. Wire 39 f♀, 23 f♂. 10 y♀ (V), 31 y♂ (V), 4 y♀ (IV),
4 y♂ (IV).

²⁵/₅ 1904 St. 104 62°47 L. N. 15°03 L. W. Yt. 1500 M. Wire 10 f♀, 4 f♂, 15 y♀ (V), 9 y♂ (V), 1 y♀ (IV),
1 y♂ (IV).

East and south-east of Iceland it was gathered at 2 stations:

²²/₅ 1904 St. 99 65°15 L. N. 9°53 L. W. Yt. 1700 M. Wire 3 f♀, 1 y♀ (V), 1 y♀ (IV).

¹²/₇ 1903 St. 164 62°10 L. N. 4°36 L. W. 1 f♀.

South-west of the Færoes outside the Ingolf area the species was taken at the following stations:

¹⁵/₆ 1905 St. 82 51°00 L. N. 11°43 L. W. Yt. 1200 M. Wire 2 y♂ (V); 2 y♀ (IV), 1 y (III).

800 M. Wire 1 y♀ (V).

⁸/₆ 1905 St. 72 57°52 L. N. 9°53 L. W. Yt. 1500 M. Wire 80 f♀, 5 f♂, 36 y♀ (V), 83 y♂ (V), 7 y♀ (IV),
16 y♂ (IV), 2 y (III).

²⁹/₈ 1905 St. 195 60°00 L. N. 10°35 L. W. Yt. 1500 M. Wire 5 f♀, 1 y♀ (V).

¹/₉ 1905 St. 167 57°46 L. N. 9°55 L. W. Yt. 1500 M. Wire 46 f♀, 12 y♀ (V), 13 y♂ (V), 5 y♂ (IV), 4 y (III).

Distribution and Remarks. I have examined specimens of this species which were determined *G. Kruppi* Giesbr. by Professor Sars. *G. Kruppi* Giesbr. differs from my specimens by the much smaller size (♀: 3.6–4 mm.; ♂: 3.7 mm.), and on that account I am not quite sure that they are identical. I have on that account at a earlier date preferred the name *G. major* Wolf, and this name is printed on Plate III. But as the description of *G. Kruppi* was published a few months previous to that of *G. major* (as stated by A. Scott), and as Wolfenden not only in his original description (1903 p. 114) says "the lamellar appendage of the posterior foot-jaw is absent", but reiterates the same statement as late as 1911 (p. 231), well aware of the importance of this character, I feel obliged to accept the name *G. Kruppi* at present. As Wolfenden has identified drawings of specimens from the west coast of Ireland which were submitted to him by Farran as belonging to *G. major*, and as Farran (1908), about the species which he names *G. major* Wolf, writes "*G. Kruppi* appears to be at

most a rather smaller Mediterranean variety of this species", it seems probable that Farran's specimens belong to the species described above. The female of which A. Scott in the Siboga Expedition has given figures and has identified with *G. Kruppi*, is possibly identical with this species (Size 5.7 mm.; lobe IV maxillipeds with 3 setae and frontal spine rather short), but the male is scarcely so on account of the different shape of Re dextr. pes V. Scott regards Esterly's *G. brevicornis* (1906 p. 56—57) as identical with *G. Kruppi*, though the lamella of the maxillipeds has quite another shape, and his *G. clarus* (pp. 57—58) as the male of this species; in the latter supposition he is possibly right, but it is in any case different from the male from the Atlantic.

If *G. Kruppi* and *major* of the different authors are identical, its distribution is wide (Indian Ocean, South and North Atlantic and the Mediterranean); if only the localities which certainly belong to the species described here are taken into consideration its range encompasses the North East Atlantic as far south as 50° L. N. and as far north as 65° L. N.; it is distributed as far west as Denmark Strait (L. W. 28°), and as far east as the Færoe-Iceland channel (L. W. 4°). All records show that it is a deep sea species.

26. *Gaetanus minor* Farran.

(Pl. III fig. 4 a).

1905. <i>Gaetanus minor</i> n. sp. Farran, p. 34, pl. V figs 1—11.	1909. <i>Gaetanus minor</i> Farran. A. Scott, pp. 47—48, pl. IX
1906. — — Farran. Pearson, p. 14.	figs 1—8.
1908. — — — Farran, p. 37.	1911. — — — (minimus? n. sp.) Wolfenden,
1908. — — — v. Bremen, p. 41, fig. 46.	pp. 233—234, text-figs 20 a—e.
1908. — — — Wolfenden, p. 32.	

Description. f♀. Size: 2.3 mm., anterior division 1.89; urosome 0.44 mm. Farran's specimens measured 2.4 mm.

The short rostrum is undivided. The anterior division is 4.3 as long as the urosome. The lateral spines reach the end of the genital somite (fig. 4 a). The genital somite is rather swollen below, with a distinct receptaculum seminis. The caudal rami are almost as long as wide. The relative length of the abdominal somites and the furca is 20, 9, 8, 8 and 7.

The *antennulae* reach just beyond the end of the genital somite; the measurements are practically as given by Farran, and the appendages are as in preceding species. The Re of the *antennae* is scarcely 1.4 as long as Ri; the Ri I is twice as long as Re II, which is again 2.6 as long as Re I, and 1.6 shorter than Re III. The Re II has the short Se 2 placed on a conical protuberance, but has none for the more slender Se 3. The *maxillulae* differ from those of *G. Kruppi* by the 2 spinelike Sp. of the Li 2. The third basipodite of the *maxillipeds* is 1.1 as long as the 2 first, and 2.7 as long as the Ri; the second basipodite has, as stated by Wolfenden, a rounded lamellous process, and the lobe IV has as usual 3 setae + a sensory lobe; the third basipodite has in a similar way as in *G. miles* Giesbr. (cf. Taf. 14 fig. 24) the inner margin produced into a rounded process which slopes most gradually towards the base, and here bears the usual row of teeth. This process is distinct but much lower in *G. Kruppi*, and is only indicated in *Gaidius*.

The terminal seta in the exopodite of pes II, which has 14 well separated teeth, is 1.1 as long as the Re I—II. The second basipodite in the fourth pair of legs has 12 stiff pointed bristles

of the usual structure. The secretory pore at the base of Se Re I is wanting in pes II, present in III—IV.

Occurrence. The Thor has gathered a single adult female ²⁰/₆ 1904 St. 88 48°09 L. N. 8°30 L. W. Yt. 300 M. Wire. This species has been recorded from the west coast of Ireland from a depth of about 400 fathoms, from the middle of the South Atlantic between 5° L. N. and 30° L. S. and from the Malay Archipelagos.

Though Farran does not mention the process of the Re II of the antennae nor the lamellous process of the maxillipeds, I do not doubt that the described species is identical with his *G. minor*; the mentioned features are found in Wolfenden's species, which he somewhat prematurely proposed to name *G. minimus*, if it should turn out to be another species than *G. minor*; the only difference between Wolfendens specimens and mine is the somewhat shorter antennulae, which do not extend beyond the end of the genital somite, and the smaller size (1.75—2 mm.). Between my specimen and Scott's description of specimens from the Siboga Expedition no difference except the shorter antennules of the females from the Siboga Expedition was found.

27. *Gaetanus pileatus* Farran.

(Pl. III fig. 6 a; text-figs 26 a—e).

1903. <i>Gaetanus pileatus</i> n. sp. Farran, p. 16, pl. XVII figs 1—11.	1908. <i>Gaetanus caudani</i> Canu. v. Bremen, p. 42, fig. 48.
1904. — <i>caudani</i> Canu. Wolfenden, p. 114, pl. IX, figs 20—22.	1908. — <i>pileatus</i> Farr. Farran, pp. 35—36.
1905. — <i>pileatus</i> Farr, Farran, p. 33.	1909. — <i>caudani</i> Canu. A. Scott, pp. 46—47, pl. VIII figs 9—15.
1905. — <i>caudani</i> Canu. G. O. Sars, p. 4.	1911. — <i>pileatus</i> Farr. Wolfenden, pp. 229—231, taf. 27 figs. 1—2, textf. 17 a—c.
1906. — — — Pearson, p. 13.	
1908? — — — Wolfenden, p. 31.	

Description. f♀. Size: Specimen from St. 82 measured 5.74 mm.; anterior division (including frontal spine 0.4 mm.) 4.7; urosome 1.04 mm.

The frontal spine has, as seen in (text-fig. 26 a) and as described by the authors, a very characteristic shape; the frontal organ is rather indistinct; the rostrum, which is very short, is in some specimens undivided, in others terminally slightly bifurcate. The fourth and fifth thoracic somites show dorsally trace of segmentation. The lateral spines are rather suddenly produced, slightly divergent, and almost reach the end of the genital somite. The anterior division is distinctly 4 times as long as the urosome, the genital somite is distinctly produced below, and the structure of the receptaculum etc. is in lateral view like that of *G. latifrons* (cf. fig. 5 b).

The relative length of the abdominal somites and the caudal rami, which are almost as long as wide, is 42, 23, 19, 19 and 20.

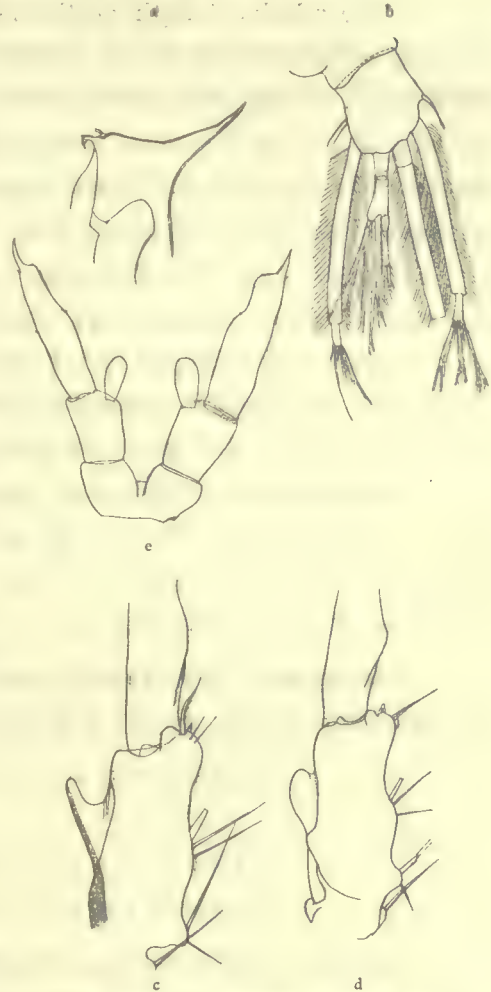
The *antennulae* extend 6—7 segments beyond the end of the abdomen. The measurements provide some similarity to *Gaetanus miles*, but differ especially by the more slender distal segments; the segment 19, which is the longest segment, is twice as long as segment 2, 1.7 as long as segments 8—9 and 1.2 as long as segment 22; the segment 19 is 2.3 as long as segment 24. In the *antennae* the Re is only 1.1 as long as Ri, and the Ri I is 2.5 as long as Re II, which only possesses a terminal seta, and is only a trifle shorter than the Re VII. The *maxillulae* possess no spinules on the posterior

surface of Li I, but has about 14 fairly strong spinules on the anterior surface of Li III. The third basipodite of the maxillipeds is 1.1 as long as the two first ones and 2.8 as long as the Ri; the exterior margin of the second basipodite bears a fairly slender rounded lamella (text-fig. 26 d) and the fourth lobe is divided most distinctly by a deep cleft into a posterior smooth division and an anterior one, which possesses 3 setae in addition to the sensory lobe.

The Re I—II of the first pair of legs are completely fused with the exception of a small lateral incision. The terminal seta of the second pair of legs has 19 teeth, and is distinctly longer than the Re III. The second basipodite of the fourth pair of legs has 20 lamellous bristles. The secretory pore of Re I is wanting in pes II, present in III—IV.

The *labrum* is anteriorly scarcely different from that of the preceding species; orally it is as seen in fig. 6 a in main features like *G. Kruppi* (Pl. III fig. 2 e); the longitudinal series has in most groups two or more rows of hairs. The transverse groups of short hairs around the median circular spot Nr. 4 are on each side dissolved into a somewhat triangular group as seen in fig. 6 a, and somewhat behind it a transverse area of short spines or granules is found.

The *lamina labialis* is like that of fig. 5 e but is almost smooth; in front of this we have the usual two lateral series of slender spines, of which the more lateral is almost semi-circular, while the median one is very short. In front, by a smooth area separated from the lamina, a wide area covered with flat granules and almost fused with the corresponding part of the other side is found. The 4 transverse groups of densely placed short spines behind the lamina are like those of *G. Kruppi* (fig. 3 c). The lateral longitudinal series shows the following structure: Ser. Nr. 1 consists of 10 short hairs in a transverse group and of 30 in a longitudinal group, continued upon the lobus labialis and partly confluent with the series Nr. 2, which has 20 slender hairs placed longitudinally. The series Nr. 3 has two groups behind, of which the more lateral is more posterior (in contrast to fig. 7 f Pl. II), and a longitudinal row which on the posterior surface of the lobus labialis is continued to near the tip. The series Nr. 4 is posteriorly placed almost transversely, forming a convexity, turning backwards and almost reaching corresponding part of opposite side, and is anteriorly continued to tip of the lobus labialis. The series Nr. 5 consists of a median transverse group of about 30 longer and shorter setae placed near the middle, and a more lateral partly longitudinal group; this group is not continued directly into any series on the labial lobe, but probably corresponds to the most medial one which is dissolved into independent groups. Possibly the series 5 corresponds also to the longitu-



Text-fig. 26. *Gaetanus pileatus* Farr.

- f♀. Head $\times 18$.
- f♀. Right caudal ramus in abnormal specimen $\times 57$.
- f♀. Maxillipes sin in anterior view $\times 57$.
- y♂ (Stage V) m. s. in ant. view $\times 57$.
- y♂ (Stage V) pes V in anterior view $\times 57$.

dinal group medially to the serrula 6-dentata and the inner series in front of the lamina (cf. Pl. II fig. 7 f s 6); if this interpretation is right, the serrula 6-dentata (fig. 7 f s 7) perhaps corresponds to Ser. 4.

Y_♀[♂] (Stage V). Size of female from Thor St. 82 was 5.74, anterior division 4.2 mm., urosome 0.87.

The relative length of the abdominal somites and the furcal rami, which are about 1.2 as long as wide, is 20, 23, 18, 20 and 17. The appendages show similar differences from those in the adult as *G. Kruppi*; the lamina of the second basipodite of the maxillipeds is shorter and more rounded (text-fig. 26 d); but the inner margin of basip. II pes IV is smooth; the fifth pair of legs is in main features like those of *G. Kruppi* (text-fig. 26 e). In contrast to Canu's description of a young male of *G. caudani* the Re I—II of pes I are completely fused without Se Re I.

Y_♀[♂] (St. IV). Size of a male from Thor St. 82 was 3.72 mm., anterior division 3.01 mm., urosome 0.71 mm.; a female measured 3.5 mm.

The relative length of the abdominal somites and furca was 19, 18, 24 and 13. The antennulae extend at least 8 segments beyond the end of the abdomen; the differences in the other appendages are scarcely different from those described in *Gaetanus Kruppi*.

Parasites and Abnormity. Sac-shaped parasites like those described in *G. tenuispinus* were found in one specimen from Thor St. 78 and 99, in 5 from Thor St. 183, in 28 adult females from Thor St. 82 (Yt. 1200 M. W.) and in 60 from St. 72. In a single adult female the setae of the right caudal ramus was branched (text-fig. 26 b).

Occurrence. The Ingolf Expedition has not gathered this species, but it has been captured at the following stations by the S/S Thor in Denmark Strait.

19/6	1904	St. 152	65°00	L. N.	28°10	L. W.	Yt. 1000	M. W.	1 y♀ (V).
									8 f♀.
20/6	1904	St. 153	65°20	L. N.	27°12.5	L. W.			5 f♀, 1 y♂ (V).
21/6	1904	St. 154	65°27	L. N.	27°10	L. W.			1 f♀, 1 y♂ (V).

In the Atlantic south of Iceland.

12/7	1903	St. 164	62°10	L. N.	19°36	L. W.			1 y♂ (IV).
11/7	1904	St. 183	61°30	L. N.	17°08	L. W.	Yt. 1800	M. Wire	19 f♀, 1 y♂ (V).
24/5	1904	St. 104	62°47	L. N.	15°03	L. W.	Yt. 1500	M. Wire	34 f♀, 1 y♂ (V).
2/9	1904	St. 286	61°49	L. N.	14°11	L. W.	Yt. 800	M. Wire	3 f♀, 1 y♀ (V).

In the Iceland-Færoe channel.

12/5	1904	St. 78	61°7	L. N.	9°30	L. W.			3 f♀.
22/5	1904	St. 99	61°15	L. N.	9°35	L. W.			7 f♀.

In the Atlantic, south-west of the Færoes.

15/6	1905	St. 82	51°00	L. N.	11°43	L. W.	Yt. 1200	M. Wire	270 f♀, 38 y♀ (V), 15 y♂ (V), 3 y♀ (IV), 1 y♂ (IV).
							Yt. 800	M. Wire	40 f♀, 4 y♀ (V), 3 y♂ (V).
8/6	1905	St. 72	57°52	L. N.	9°53	L. W.	Yt. 1500	M. Wire	180 f♀, 23 y♀ (V), 1 y♂ (V), 1 y♂ (IV).
21/8	1905	St. 165	60°00	L. N.	10°35	L. W.	Yt. 1500	M. Wire	1 f♀, 1 y♂ (V).
20/6	1905	St. 88	48°09	L. N.	8°30	L. W.	Yt. 300	M. Wire	2 f♀.

Distribution. About this species Farran writes (1908 p. 36) "this species is a very noticeable feature in the deep-water fauna off the west coast of Ireland, occurring often in considerable numbers, in almost every tow-net from 200 to 1150 fathoms".

The gatherings of the Thor seem to show that it is much more abundant south of 60° L. N. even if it is found in Denmark Strait as far north as 65° L. N. By Wolfenden it has been recorded from the South Atlantic, and it was found by the Monaco Expedition, as well as at 5 stations from the deep water of the Malay Archipelago (5 females only).

Remarks. Though I have not seen Farran's original description, I am quite sure that my species is identical with his *G. pileatus* and different from Canu's *G. caudani* (if this author has not examined an abnormal specimen). As I have examined specimens determined by Sars as *G. caudani*, no doubts exist about its identification with the Monaco's species; and the same is the case with Wolfenden's species, from the South Atlantic. As the lamina of the maxillipeds (Pl. VIII fig. 13) was differently shaped in the Siboga specimens (length 5.7 mm.), I am not quite convinced of Scott's identification. Scott regards Esterly's *G. unicornis* as identical with his *G. caudani*, which he regards as the synonym of *G. pileatus*, but he is scarcely right, as the lamina of the maxillipeds has quite another shape in Esterly's species (1906 Pl. XII fig. 54).

28. *Gaetanus miles* Giesbrecht.

(Pl. III figs 7 a—b).

1888. <i>Gaetanus miles</i> n. sp. Giesbrecht, p. 335.	1905. <i>Gaetanus miles</i> Giesbr. G. O. Sars, p. 3.
1893. — — — Giesbr. Giesbrecht, p. 219, taf. 14 & 36.	1906. — — — Pearson, p. 14.
1895. — — — Giesbrecht, p. 248.	1908. — — — Farran, p. 36.
1898. — — — Giesbrecht & Schmeil, p. 32.	1908. — — — v. Bremen, p. 39, fig. 42.
1903. — — — Norman, p. 136.	1909. — — — A. Scott, pp. 44—45, pl. VIII figs
1903. — — — J. C. Thomsen, p. 17.	1—8.
1904. — — — Cleve, p. 191.	1913. — — — Wolfenden, p. 231.

Description. ♀. Size of specimen from Thor St. 82 was 4.21 mm.; anterior division 3.4, urosome 0.81 mm. Giesbrecht's specimen measured 3.5, Scott's 4.3 and Wolfenden's 3 mm.

The shape of the body is scarcely different from Giesbrecht's figure; the anterior division is 4.2 as long as the urosome, which has the relative length of the somites and furcal rami as follows: 34, 13, 11, 11, 15; the furcal rami are 1.3 as long as wide. The *antennulae* differ from those of Giesbrecht's specimen by the proportional length of the segments; the segment 19 is a little longer than 22, which is the longest according to Giesbrecht, and this again is a little longer than 20; the segments 8~9, 13 and 24~25 are in *G. miles* of almost equal length, but in my specimens segment 13 is 1.1 as long as 8~9 and 1.2 as long as 24~25. The mouth-appendages, with the exception of the *maxillipeds*, are scarcely different from those of *G. miles*; in this pair of appendages the third basipodite is 3 times as long as the endopodite, and 1.3 as long as the Basp. I—II; the plate-shaped process of the exterior surface of the second basipodite is rounded and almost semicircular (fig. 7 a), and distinctly different from Giesbrecht's fig. 24. Taf. 14. In the first pair of legs the articular line between Re I—II was scarcely indicated; the Ri of the second pair of legs has the articulation between Ri I—II fairly distinct anteriorly, and scarcely indicated posteriorly; the second basi-

podite of the fourth pair of legs possesses 15 strong knife-shaped spines (Pl. III fig. 7 b). The glandular pore at the base of Se Re I is wanting in the second pair of legs but found in pes III—IV.

The oral surface of the *labrum* is in the main like that of *G. pileatus* (cf. fig. 6 a Pl. III); the first group in the longitudinal series consists of numerous short setae (2—3 setae deep), and the second of somewhat longer ones; in the third group only a single row of fairly long spines were observed, and in the third one a few very short ones were observed laterally in addition to the inner row of long knife-shaped spines (cf. fig. 5 d). The *lamina labialis* is smooth as in *G. Kruppi*, but the area in front of and behind it is like that of *G. latifrons*.

Y♀ (St. V). Size of female from St. 88 3.34 mm.; anterior division 2.76 mm., urosome 0.58.

The relative length of abdominal somites and furcal ramus, which is 1.1 as long as wide, is 15, 13, 9, 12 and 11. The measurements of the antennulae are more like those of the *G. miles*, as segment 22 is a little longer than 19, and as segments 8 ∼ 9, 13 and 24 ∼ 25 are of almost equal length. In other respects of any importance the appendages are scarcely different from those of the adults, except by the structure of the second basipodite in the fourth pair of legs, which is smooth and has the inner margin almost straight, not suddenly produced as seen in fig. 7 b.

Occurrence. The Ingolf Expedition has not taken this species, but the Thor has gathered a few specimens at four stations viz.

- 11/7 1904. St. 183. 61°30' L. N. 17°08' L. W. Yt. 1800 M. Wire 1 ♀.
 10/7 1904. St. 180. 61°34' L. N. 19°05' L. W. Yt. 400 M. Wire 1 ♀.
 15/6 1905. St. 82. 51°00' L. N. 11°43' L. W. Yt. 1200 M. Wire 1 ♀.
 20/6 1905. St. 88. 48°09' L. N. 8°30' L. W. Yt. 300 M. Wire 1 ♀.

Distribution. This species has previously been recorded from the west coast of Ireland, from the area explored by the Monaco Expedition, from the South Atlantic between 20 and 40 L. S., from the Malay Archipelagos and from the Pacific (3° L. S.—5° L. N. 99°—115° L. W.).

Remarks. I am not quite sure that the specimens which I have examined really are identical with Giesbrecht's *G. miles*, which is smaller, has the relative measurements of the antennulae somewhat different, the lamina of the second basipodite of the maxillipeds quite differently shaped and only 5 instead of 15 spines marginally in the second basipodite of the fourth pair of legs. Scott's specimens agree with mine in the number of the mentioned spines, in the size and partly in the shape of the lamina of the maxillipeds, but differ in the measurements of the antennulae. As Scott's specimens form a connecting link between Giesbrecht's and the Atlantic specimens, I do not think the establishment of a new species is warranted.

29. *Gaetanus latifrons* G. O. Sars.

(Pl. III figs 5 a—g; text-figs 27 a—e).

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|--|--|
| 1905. <i>Gaetanus latifrons</i> n. sp. G. O. Sars, p. 11. | 1908. <i>Gaetanus latifrons</i> G. O. Sars. v. Bremen, p. 39, fig. 43. |
| 1905. — <i>holti</i> n. sp. Farran. pp. 33—34, pl. VI figs 1—12. | 1908. — <i>holti</i> Farran. Wolfenden, p. 31. |
| 1905. — <i>longispinus</i> n. sp. Wolfenden, pp. 7—8, pl. III. | 1909. — — — — A. Scott, pp. 49—50, pl. X figs 10—17. |
| 1906. — <i>latifrons</i> G. O. Sars. Pearson, p. 14. | 1911. — — — — Wolfenden, pp. 232—233, fig. 19. |
| 1908. — — — — Farran, p. 36. | |

Description. f♀. Size of specimen from Thor St. 183 was 5.1 mm.; anterior division 4 mm.; urosome 1.1 mm. Sars' specimens measured 4.85 mm., Farran's specimens 5.1, Scott's 5.4 and Wolfenden's 3.7—4 mm.

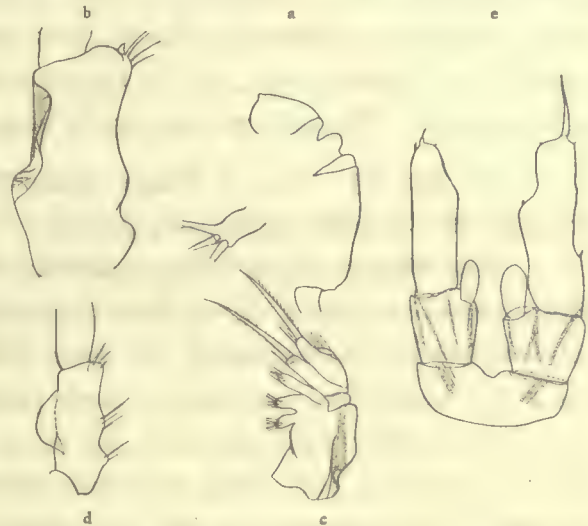
The frontal spine, which has a triangular base, has as seen in fig. 5 a the tip directed forwards and upwards. The distance between the base of the frontal spine and the frontal organs, which are placed on a small process, is almost straight with a low crest. The rostrum is terminally bifurcate. The shape of the body is scarcely different from Farran's figure; the anterior division is 2.5 as long as wide and 3.6 as long as the urosome. The genital somite (fig. 5 b), which is distinctly 1.4 as wide as long and 1.1 as deep as long, has a fairly prominent receptaculum seminis. The relative length of the abdominal somites and the furcal rami is the following: 42, 23, 19, 18 and 21; the furcal rami are 1.1 as long as wide.

The *antennae*, which have the Re about 1.3 as long as the Ri, have the Ri I almost twice as long as Re II, which is 1.7 as long as Re I, and a little shorter than Re VII. The Re I has a single terminal seta on a conical protuberance, and the Re II has 3 setae, of which the basal is the longest and like the median one is placed on small protuberances. The *maxillulae* possess 5 setae on Li II; the Li I has no spinules posteriorly and the Li III has none anteriorly. The third basipodite of the *maxillipeds* is 3 times as long as the endopodite and 1.3 as long as the first and second basipodites combined; the lamina of the second basipodite (text-fig. 26 b), which is folded in a characteristic way, is in the whole length fastened to the anterior surface of the segment; the inner margin of the third basipodite is basally not straight as shown in Farran's figure, but slightly convex as figured by Scott.

The *first pair* of legs has a well developed articulation between Re I and II, and the Se of Re II almost reaches the end of Re II. The *second pair* of legs has a well developed articulation between Re I and II, and a glandular pore at the base of Se Re I; the terminal seta, which has 23 teeth, is a little longer than the Re III, and of equal length to Re I—II.

The second basipodite in the fourth pair of legs has about 25 knife-shaped spines as shown in fig. 5 c.

The oral surface of the *labrum* is fairly characteristic, as shown in fig. 5 d, especially the transverse rows of granules around the median circular spot Nr. 4; the *lamina labialis* has a characteristic granulation as seen in fig. 5 e, which also illustrates the area in front of it. The arrangement of setae in the lateral series behind the lamina labialis is not unlike that of *G. pileatus*: Ser. set 1 consists of about 70 short setae placed in a longitudinal group: The series 2 seems to be represented by 3



Text-fig. 27. *Gaetanus latifrons* G. O. Sars.

a. f♀. Maxilla sin in post. view $\times 57$. b. f♀. Maxillipes sin. in ant. view $\times 57$. c. Y (stage III). Maxilla dext. in ant. view $\times 57$. d. Y (stage III). Maxillipes sin. in anterior view $\times 57$. e. Y♂ (stage V). Pes V in anterior view $\times 57$.

groups with from 10—25 slender setae, of which the first is placed behind near the middle, while the third, which is more longitudinal, is placed laterally more in front. The series Nr. 5, to which the two most medial groups mentioned ought perhaps to be referred, falls in this species naturally into three divisions, forming together an outwards convex figure (like that in fig. 7 f Pl. II) consisting of 2 hairs most medially, well separated from the group of 14 hairs, which is almost fused with the dense longitudinal row almost reaching the end of the labial lobes; the series Nr. 3—4 are scarcely different from those of *G. brevispinus* (Pl. II fig. 7 f).

Y_♀ (St. V). Size of female from Thor St. 183 was 4.16 mm.; anterior division 3.29 mm.; urosome 0.87.

There is indication of an articular line between head and first thoracic tergite, and between the fourth and fifth ones. The relative length of the abdominal somites and the furcal rami, which are 1.2 as long as wide, is the following: 19, 19, 17, 19 and 17. The first abdominal somite is somewhat produced below, more so than in the male. The inner margin of the second basipodite is in both sexes almost straight, and distinctly different from that described in the adult female; in the female we find about 20 stiff pointed setae, and in the male about 9 setae of usual structure (in pes II a close row of 20 is observed). The fifth pair of legs is very similar to that of *G. Kruppi* (text-fig. 27 e).

Y_♀ (St. IV). Size of female from Thor St. 183 was 3.13 mm.; anterior division 2.53 mm.; urosome 0.60. A male measured 3.45 mm.

The relative length of the abdominal somites and the furca is as follows 15, 18, 19 and 13. The *antennulae* extend by at least 2 segments beyond the end of the abdomen. The *maxillulae* show differences corresponding to those described in *G. Kruppi*. The lamina of the *maxillipeds* has a less complicated structure, is more prominent and of obtusely triangular shape. The *pes I* has the Re I—II fairly well separated, and has 3 Se pes I; the second basipodite of the fourth pair of legs has only 3—4 setae along the inner margin. The only difference between the male and female is found in the presence of a fifth pair of legs (cf. text-fig. 27 o).

Y (St. III). Size of specimen from St. 82 was 2.48; anterior division 2.04; urosome 0.44 mm.

The head and the first thoracic somite as well as the fourth and fifth ones are well separated. The frontal spine is scarcely different from that of the adult females, but the lateral corners of the thorax are rounded without trace of spines. The relative length of the abdominal somites and the furca is 15, 18 and 9. The *antennulae*, which extend 3 segments beyond the end of the abdomen, show similar differences from those of the adult ones as in *G. Kruppi*. The *maxillulae* have only 8 setae in Le, but in other respects show similar differences as in preceding; the Li II possesses 5 setae as in the adult females. The exterior margin of the *maxillae* (text-fig. 27 c) is almost straight, in contrast to the structure in the adult females, the structures in the two preceding stages forming intermediary steps. The lamina of the *maxillipeds* is more regularly rounded and apparently more prominent (text-fig. 27 d).

In the first pair of legs the segmentation of the exopodite is only indicated laterally; 3 Se are present, but the two proximal ones are very short; the 3 last pair of legs are scarcely different from those of *G. Kruppi*.

Variations etc. In a single young female of stage V the third seta of the left caudal rami was dichotomous.

Sac-shaped "parasits" like those described in *G. tenuispinus* were found in four adult females and in a young male from St. 183.

Occurrence. The Ingolf Exp. has not taken this species, the S/S Thor has gathered it at the following stations.

- ¹⁹/₆ 1904 St. 152 65°00 L. N. 28°10 L. W. 1 y♀ (V).
¹¹/₇ 1904 St. 183 61°30 L. N. 17°08 L. W. Yt. 1800 M. Wire 8 f♀, 2 y♀ (V), 5 y♂ (V).
²²/₅ 1904 St. 99 61°15 L. N. 9°36 L. W. 1 f♀.
¹⁵/₆ 1905 St. 82 51°00 L. N. 11°43 L. W. Yt. 1200 M. Wire 1 y (III).
⁸/₆ 1905 St. 72 57°52 L. N. 9°53 L. W. Yt. 1500 M. Wire 1 f♀, 5 y♀ (V), 4 y♂ (V), 1 y♀ (IV), 1 y♂ (IV).
³¹/₈ 1905 St. 167 57°46 L. N. 9°55 L. W. Yt. 1500 M. Wire 1 y♂ (V), 1 y♀ (IV).

Distribution. The species has been taken at several stations by the Monaco Expedition, and is fairly common on the west coast of Ireland "at depths of from 330 to 1150 fathoms". According to Wolfenden it is "anschinen im Atlantischen Ocean sehr häufig, erscheint von dort auch in den Fängen des "Gauss" und erstreckt sich nach Norden bis zur Westküste Grönlands". A single specimen has by been collected the Siboga Exp. in the Malay Archipelago.

Remarks. Between this species and Sars' description of *G. latifrons* scarcely any difference was found; in spite of some small differences, enumerated above, it is certainly identical with Farran's *G. holti*; Wolfenden's specimens were as a whole somewhat smaller, but in other respects scarcely different. This species seems to differ from Scott's description by the shorter antennulae and the different shape of the lamina of the maxillipeds.

30. *Gaetanus ferox* n. sp.

(Text-figs 28 a—b).

Description. f♂. Size: 3.4 mm., anterior division 2.6 mm.; urosome 0.78 mm.

The shape of the body is most like that of *Gaidius tenuispinus*, but the head dorsally terminates in a prominent, obtusely rounded keel (partly broken in the examined specimen). Below the frontal spine the outline is almost straight, and is then convex towards the base of the clumsy rostrum, which possesses two terminal points (text-fig. 28 a). The head and the first somite as well as the two last thoracic ones are completely fused; the lateral corners are regularly rounded, but somewhat in front of the margin are seen rather short slender spines, which probably only extend slightly beyond margin (broken in examined specimen). The anterior division is 3.3 as long as the abdomen, which as usual consists of 5 somites; the second somite is 1.5 as long as the third, which is a little longer than the first and fourth; the fifth somite is just visible from above. The genital pore is found on the left side. The furcal rami are almost as long as wide; the St. 2 is somewhat longer than the abdomen (text-fig. 24 b).

The antennulae extend distinctly beyond the end of the abdomen; the segments 20—21 are completely fused, and the segment 22 has, at least on the left side, a characteristic structure, as it is widened out from the narrower middle portion towards the base as well as towards the tip.

The measurements and appendages differ scarcely from those of *G. Kruppi*. The *antennae* are like those of *G. Kruppi*, but the two branches are almost of same length. The *mandibulae*, *maxillulae* and *maxillae* are scarcely different from those of *G. Kruppi*. The third segment of the *maxillipeds* is 1.2 as long as the first and second combined, and 2.7 as long as the endopodite, but in other respects this pair of appendages is scarcely different from those of *G. Kruppi*.

The *first pair* of legs is like that of *Gaidius brevispinus* (Pl. III fig. 1 g), but the articular line between Re I—II is indicated anteriorly, though wanting posteriorly; the Se of Re I and II are wanting. The Se of Ri I of the pes II is wanting; the St, which has about 30 teeth, is a little longer than Re III, which is again a little longer than the Re I—II; no glandular pore is found at the base of Se Re I. The pes III—IV have a secretory pore at the base of Se Re I; the basipodite of the third pair has a marginal row of setae, but that of the fourth pair is completely smooth. The *fifth pair* of legs (text-fig. 28 b) is in most features like that of *Gaet. Kruppi* (Pl. III fig. 3 d); the right leg is less slender, especially the third basipodite, which is, however, less clumsy than in *G. brevispinus* (Pl. III fig. 1 h); the first segment of the right exopodite has exteriorly a slight concavity almost in the middle and, proximally to it, a slender seta (Se Re I), thus indicating that this segment really corresponds to Re I ∞ II; the Re III differs from that of *G. Kruppi* by the structure of the terminal portion (that distal to inner process) which is only two thirds as long as the basal part and not in the least as long as, and, proximally to a hair-shaped terminal part, has an inner lamina in the distal half. The right endopodite when observed from behind, is almost completely



Text-fig. 28. *Gaetanus ferox* n. sp.
a. Head from the left \times c. 40.
b. Abdomen \times c. 40.

like that of *G. Kruppi* (fig. 3 d), but viewed anteriorly it is seen to have a very characteristic form on account of a wide deep "cavity" and a terminal tooth not unlike a Prussian helmet, but with a prolongation towards the base, as if to give protection to the back of the neck. The *pes V sin* has the Ri of a similar shape as in *G. Kruppi*, but it is comparatively shorter, reaching only slightly beyond the middle of Re I, and has the segmentation more indistinct; the first segment of the exopodite has the outer margin somewhat convex, and is terminally somewhat produced inwards; the Re III, which is scarcely 1.1 as long as Re II, has a fairly long terminal spine, near the base of which a delicate seta is observed, as well as some hairy spots.

Remarks etc. Of this species I have only examined a single male, brought home by the S/S Thor, and taken $\frac{8}{6}$ 1905 57°52 L. N. 9°53 L. W. Yt. 1500 M. Wire.

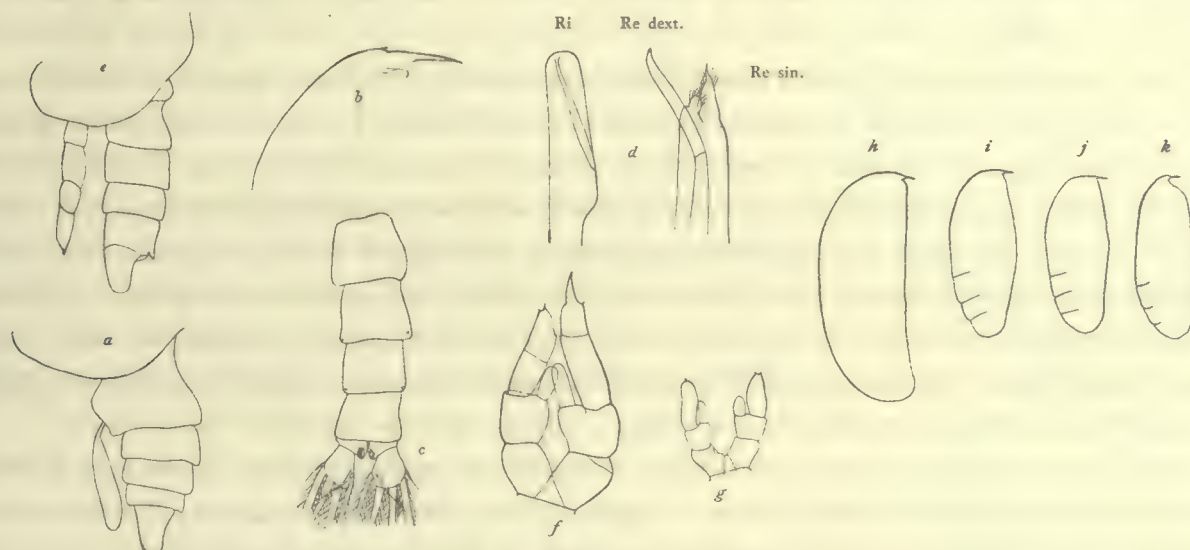
As except in the shape of the forehead it is in almost all characters like the male of *G. Kruppi*, I think it is rightly referred to *Gaetanus*. It is certainly not the male of any of the species of *Gaetanus* which has been mentioned in this paper; nothing indicates that it is the male of any of the described species of *Gaidius* or *Gaetanus*.

31. *Euchirella rostrata* Claus.

(Pl. IV figs 1 a—h; text-figs 29 a—k)!

1866. <i>Undina rostrata</i> n. sp. Claus, p. 11, taf. I fig. 2.	1905. <i>Euchirella rostrata</i> Claus. G. O. Sars, p. 4.
1883. ? <i>Euchæte hessii</i> n. sp. Brady, p. 63, pl. XX figs 1—13.	1905. — — — Th. Scott, p. 223.
1892. <i>Euchirella rostrata</i> Claus. Giesbrecht, p. 232, taf. 15.	1905. — — — Esterly, pp. 152—153.
1898. — — — Giesbrecht & Schmeil, p. 36.	1905. Nec. — — — var. <i>magna</i> Wolfenden, p. 18.
1900. ? — — — Cleve, p. 4, pl. 2 figs 1—12.	1905. — — — Farran, p. 36.
1902. ? — — — Wolfenden, p. 367.	1906. — — — Pearson, p. 15.
1903. Nec. — — — Thompson & Scott, p. 244.	1908. — — — Farran, p. 38.
1903. — — — Norman, p. 137.	1908. — — — v. Bremen, p. 47, fig. 52.
1903. — — — J. C. Thompson, p. 18.	1911. — — — Wolfenden, p. 235.
1904. — — — Wolfenden, p. 129.	1912. — — — Esterly, p. 311.

Description. ♀. Size: Specimen from Ingolf St. 19 measured 4.07 mm.; anterior division 3.26; urosome 0.81 mm. The size of specimens from other stations varied from 3.25—4.2 mm. Giesbrecht's specimens measured 2.95—3.1 mm., Farrans 3.3—4.2 and Wolfendens from 2—3 mm.

Text-fig. 29. *Euchirella rostrata* Claus.

a. f♀. Abdomen $\times 45$. b. f♂. Rostrum $\times 45$. c. f♂. Abdomen $\times 45$. d. f♂. Tips of pes V from the right $\times 150$.
e. y♂ (St. V). Abdomen $\times 45$. f. y♂ (St. V) Pes V $\times 60$. g. y♂ (St. IV) Pes V $\times 60$. h. f♀. Body $\times 33$.
i—j. y♀—♂ (St. V) $\times 33$. k. f♂ $\times 33$.

The long and pointed rostrum is more vertical and the head is much more suddenly raised than seen in Giesbrecht's fig. 23 (Taf. 36) (text-fig. 29 h). The genital somite has the ventral protuberance more regularly raised, especially behind, than shown in Giesbrecht's fig. 17 (text-fig. 29 a).

The *antennulae* differ from Giesbrecht's description by the comparatively longer segment 2, which is almost as long as segments 8 and 9. The *maxillulae* differ from Giesbrecht's description (fig. 28) by one instead of 2 delicate Sa in Li 2, and by the presence of a posterior process bearing two rudimentary setae(?) on the Li 3 in addition to the two well developed Sa. The sensory conical process of Lob. IV of the second basipodite of the maxillipeds is rather small.

The *pes I* is completely like Giesbrecht's fig. 11 (Taf. 15); the Re III has a minute pore in the outer margin, somewhat posteriorly, and nearer the base than the tip. The *pes II*, which has 22 teeth in the terminal setae, has the systems of glands of the Re well developed, in a similar way as figured

by Giesbrecht (fig. 27); the pores are placed on small rounded elevations somewhat removed from the margin; the Re I has no pore, the Re II has one near the base of Se and the Re III has 2, placed at the base of Se I and Se III; the Ri III possesses a minute pore near tip on the anterior surface.

The *pes III—IV* have, in addition to the mentioned pore, one near the base of Se Re I; the *pes IV* is like Giesbrecht's fig. 27, except for the somewhat different shape of the glands and the different number and arrangement of the spines on the inner margin of the second basipodite. In one specimen (Pl. 4 fig. 1a) 7 triangular lamellae were observed, decreasing in size distally and posteriorly; the seventh is placed on the hinder surface; in addition to these, 3 quite rudimentary teeth were found; in no specimen was the number of spines greater, in several it was smaller, and sometimes almost completely like Giesbrecht's fig.; the arrangement is not always symmetrical.

The area behind the rostrum is almost straight; separated from this by a transverse groove the *labrum* proper, which consists of a convex anterior portion by a shallow groove, separated from the projecting free hinder margin adorned with two series of bristles; no bristles were observed in front of the free margin.

The oral surface (Pl. IV fig. 1b) shows a very characteristic structure. In front of the first central circular spot is a transverse row of minute granules; behind the spot I a transversely placed group of spinules is found, probably formed by the fused *first* groups of the longitudinal series. The *second group* is, as shown in figure, asymmetrical, and seems partly to be fused with the lateral group; it consists of a number of acicules and bristles. The *third group* consists of about ten fairly long setae, and is fairly well separated from the following group, the *fourth* one, with 15 comparatively short setae. This group is almost completely fused with the *fifth* one; laterally to these two groups a longitudinal series of about 20 setae is found. Behind the central spot Nr. 3 a rather irregular transverse group of spinules is observed, and behind the spot Nr. 4 a transverse row of more delicate spinules is found.

The *lamina labialis* is granular, and has a concave posterior margin (fig. 1c); the area in front as well as that behind the lamina has as seen in figure a fairly interesting structure. The lateral series of setae behind and upon the labial lobes show as seen in fig. 1d an arrangement which is distinctly different from that of *Gaidius*, as the two first series and partly the third are represented by four areas of spinules.

♂. Size of specimen from Ingolf St. 47 was 2.99 mm.; anterior division 2.18 mm.; urosome 0.81 mm. Cleve's specimen measured 2.58 mm.

The body is comparatively longer and more slender than in the female; no frontal keel is found, and the rostrum is fairly long and slender (text-fig. 29b); no trace of limitation between head and first thoracic somite was found. The anterior division is 2.6 as long as the abdomen. The first abdominal somite, which has the genital opening as a vertical split on the left side, is about as long as the second one; this is a little longer than the third, which is again a little longer than the fourth; the striated seam along the hinder margin of somites II—IV is only indicated dorsally (text-fig. 29c). The *antennulae* extend about to the middle of the abdomen; the segment 10 is separated by a rather indistinct line from 8—9; the limitation between segments 12—13 is indistinct posteriorly. The segments 20—21 are well separated on both sides. The measurements are very similar to those of the female, but the segments beyond 18 are comparatively shorter. The differences in the appendages are as in *E. messinensis*. The

antennae have the endopodite at least as long as the exopodite, and it extends beyond the Re VI; the setae are better developed; the Re II has in the middle inwards a rudimentary tooth (for a Si). The *mandibulae* have as seen in fig. 1e a fairly well developed but soft-skinned manducatory part with a few rudimentary teeth. The *maxillulae* (fig. 1h) have 7 plumous setae, of which the 2 proximal are somewhat shorter in Le 1; the Li 1, which is fairly well developed but soft-skinned, possesses a number of soft setae, of which some, though more or less swollen at the base, have not yet lost their original shape, while others are represented by short eminences; the Li 2 seems to be represented by a short, somewhat ringed eminence without setae; the Li 3 (?) has a single setae; the basipod 3 + the Ri possess 4 plumous setae. The Re has 11 setae. The *maxillae* form a ringed, elongate, soft-skinned organ, which bears slender setae along its inner concave margin. The *maxillipes* is longer and more slender than in the female; the second basipodite has setae only on the Lobe IV, namely a strong plumous one and a shorter one in addition to a sensory lobe. The *pes I* differs from that of the female by the almost straight margin (fig. 1f); the St. of Re III of *pes II* has 37 teeth. The inner margin of the second basipodite in the *fourth pair of legs* is only slightly convex, without setae or teeth.

The *pes V* (text-fig. 29d) provides great similarity to that of *Gaetanus*, but is nevertheless distinctly different (Pl. IV fig. 1g). The Ri dext. is long and somewhat enlarged towards the end, where, inside, it bears two short delicate setae. The Re I \sim II (?) of the right leg is fairly long and slender. The Re III (?) is somewhat enlarged inwards, and then rather suddenly attenuated; exteriorly, at the base of the terminal part, which distally has an inner membrane and has the pointed tip curved outwards, a slender Se is placed; the distal part is at least 1.5 as long as the proximal. The Ri sin. is fairly long and slender; the Re III of left leg, at the base of which a tuft of hair is found, is short, almost fused with preceding segment and produced into a hairy spine-shaped protuberance.

The structure of the oral surroundings is in the main like that of the female (cf. fig. 1e); the *labrum* proper, which partly overlaps the chitinous bed in which the manducatory part of the mandibulae is placed, is well developed, but appears, but for a terminal tooth, to be smooth outside as well as inside. The *labial lobes*, which consist of soft ringed chitin, are just indicated, and do not possess any hairs. The *lamina labialis* etc. are completely wanting. This structure corresponds well with the rudimentary state of the masticatory part of the maxillulae, not being adopted for predatory purposes, nor even for taking any nourishment at all.

Y σ° (St. V). Size of female from Ingolf St. 47: 3.06 mm.; anterior division 2.44; urosome 0.62 mm. A young male measured 2.14.

The limitation between the head and first thoracic somite is generally better marked than in the adult female (text-figs 29i-j). The first one of the four abdominal somites is ventrally produced in the female, barely so in the male (text-fig. 29e). The appendages show the usual differences from those of the adult females; the St. of Re III *pes II* has 14 teeth; an interesting difference is found in the wanting glandular pore at the base of Se I Re III; the second basipodite of the fourth pair of legs is smooth, while 7 short hairs are found in the females, corresponding to the spines of the adult females. The *fifth pair of legs* is as seen in text-fig. 29f rather clumsy and quite unlike Cleve's fig. 3 Pl. II; the Re dext., which is longer than the Ri dext., and which has a strong terminal spine, is distinctly longer than the Re sin.

$Y_{\text{♀}}^{\text{♂}}$ (St. IV). Size of female from Ingolf St. 47 is 2.24 mm.; anterior division 1.85; urosome 0.39 mm. A male from the same station measured 2.1 mm.

The appendages show similar differences as in *G. Kruppi*, f. inst. glandular pores are only found at the base of Se Re II and Se 3 Re III; the St. of pes II has only 13 teeth; the inner margin of the basipodite of the fourth pair of legs appears smooth. The only difference between the male and female is found in the presence of a fifth pair of legs in the former (text-fig. 29g).

Y (St. III). Size of specimen from Ingolf St. 47 was 1.65 mm.; anterior division 1.3 mm.; urosome 0.35 mm.

The thoracic somites IV—V are well separated; the antennulae extend scarcely to the end of the abdomen. The appendages show differences corresponding to those in *G. Kruppi*.

Abnormality. In a single adult female the right furcal branch had the third and the second terminal setae dichotomously branched. There is a well marked difference between pellucid and less transparent specimens with more prominent eggs. In most specimens the intestinal tract consists of a wide stomach which, in front of the insertion of the narrow oesophagus, is continued into a wide coecal sac and behind is turned upwards to meet the following portion, and the intestine proper. In a single specimen the connection between the stomach and the intestine was twisted, and not lying on the same level.

Occurrence. The Ingolf Exp. has on the west coast of Greenland collected a young male (stage IV) $^{26/6}$ 95 St. 25 $63^{\circ}30$ L. N., $54^{\circ}25$ L. W. V 200—0 fm. Temp. 2.9° C. The Ingolf Expedition has not collected this species in Denmark Strait, but the Thor has taken it at the following stations:

Thor $^{19/6}$ 1904 St. 152 $65^{\circ}00$ L. N. $28^{\circ}10$ L. W. Yt. 1000 M. Wire 1 f♀, 1 y♀ (V), Yt. 100 M. Wire 1 f♀,
Yt. ? 3 f♀, 3 y♀ (V), 3 y♂ (V).
 $^{20/6}$ 1904 St. 153 $65^{\circ}20$ L. N. $27^{\circ}12.05$ L. W. Yt. 800 M. Wire 1 y♀ (V).
 $^{20/6}$ 1904 St. 154 $65^{\circ}27$ L. N. $27^{\circ}10$ L. W. Yt. 80 M. Wire 1 f♀, 2 y♀ (V).
 $^{18/6}$ 1904 St. 150 $65^{\circ}50$ L. N. $26^{\circ}53$ L. W. Yt. 400 M. Wire 1 y♀.

In the Atlantic south-west and south of Iceland the Ingolf Expedition has gathered the species at the following stations:

$^{18/6}$ 1895 St. 19 $60^{\circ}29$ L. N. $34^{\circ}14$ L. W. V¹ 300—0 fm. Temp. 9° C. 48 f♀, 8 y♀ (V), 4 y♂ (V).
 $^{17/6}$ 1895 St. 18 $61^{\circ}44$ L. N. $30^{\circ}29$ L. W. V¹ 200—0 fm. — 10° C. 13 f♀.
 $^{16/6}$ 1895 St. 17 $62^{\circ}54$ L. N. $26^{\circ}34$ L. W. V¹ 200—0 fm. — 9.1° C. 2 f♀, 1 y♀ (IV).
 $^{3/6}$ 1896 St. 68 $62^{\circ}06$ L. N. $22^{\circ}30$ L. W. V¹ 100—0 fm. — 8.8° C. 1 f♀.
 $^{9/8}$ 1895 St. 40 $62^{\circ}03$ L. N. $21^{\circ}36$ L. W. V¹ 100—0 fm. — 13.5° C. 9 f♀.
 $^{1/6}$ 1896 St. 63 $62^{\circ}40$ L. N. $19^{\circ}05$ L. W. V¹ 100—0 fm. — 8.3° C. 6 f♀, 2 y♀ (V).
 $^{19/5}$ 1896 St. 55 $63^{\circ}33$ L. N. $15^{\circ}02$ L. W. V¹ 100—0 fm. — 8.4° C. 1 y♂ (V).
 $^{12/5}$ 1896 St. 47 $61^{\circ}32$ L. N. $13^{\circ}40$ L. W. V¹ 100—0 fm. — 10.6° C. 2 f♀, 17 y♀ (V), 4 f♂, 10 y♂ (V),
1 y♀ (IV), 1 y♂ (IV), 1 y (III).

S/S Thor has south of Iceland gathered the species at 14 stations, but at 9 of these only a few adult females were found.

- Thor ¹/₉ 1904 St. 285 62°49 L. N. 18°46 L. W. Yt. 100 M. Wire 148 f♀, 1 y♀ (V), 1 y♂ (V).
²/₉ 1904 St. 285 62°49 L. N. 18°46 L. W. Yt. 800 M. Wire 31 f♀.
¹¹/₇ 1904 St. 183 61°30 L. N. 17°08 L. W. Yt. 1800 M. Wire 750 f♀, 3 y♂ (V).
²⁵/₅ 1904 St. 104 62°47 L. N. 15°03 L. W. Yt. 1500 M. Wire 2 y♂ (V).

In the Iceland—Færoe channel the Ingolf Expedition has taken the species at 3 stations, and the S/S Thor at 5 stations.

- ²⁰/₅ 1896 St. 57 63°37 L. N. 13°02 L. W. V^r 100—0 fm. Temp. 8.2° C. 1 y♂ (V).
²⁰/₅ 1896 St. 59 65°00 L. N. 11°16 L. W. Apstein 12 11.45 p. m. — 1.5° C. 1 y♀ (IV).
¹¹/₅ 1896 St. 45 61°31.5 L. N. 9°43 L. W. V^r 100—0 fm. — 9.1° C. 1 y♂ (V).

- Thor ²⁸/₈ 1905 St. 163 62°36 L. N. 12°05 L. W. Yt. 300 M. Wire 3 f♀.
²²/₅ 1904 St. 100 61°21 L. N. 10°39 L. W. Yt. 180 M. Wire 1 f♀, 3 y♂ (V).
²⁹/₈ 1905 St. 164 61°20 L. N. 11°00 L. W. Yt. 300 M. Wire 35 f♀.
²⁹/₈ 1905 St. 165 60°00 L. N. 10°35 L. W. Yt. 100 M. Wire 1 f♀.
²³/₇ 1905 St. 124 61°04 L. N. 4°35 L. W. Yt. 1000 M. Wire 1 f♀.

The Danish East-Greenland Expedition has, ¹⁸/₉ 1900 10 p. m. F. 346 at the surface near Kap Dan (Tarsuak Fjord), taken a single adult female.

Lundbeck has ¹⁸/₅ 1890 55°25 L. N. 29°5 L. W. gathered 1 f♀, 1 y♀ (IV).

The S/S Thor has, outside the Ingolf area south west of the Færoes, taken the species at four stations, but at the two only a few adult females.

- Thor ⁸/₆ 1905 St. 72 57°52 L. N. 9°55 L. W. Yt. 1500 M. Wire 125 f♀ (one with spermatophor).
²¹/₆ 1905 St. 90 47°47 L. N. 8°00 L. W. Yt. 300 M. Wire 139 f♀ (one with spermatophor).

Distribution. This species has been recorded from the Mediterranean, and from the Atlantic as far north as 55° L. N. 10° L. W.; it has been taken by the Monaco and by the Gauss Expeditions in the Mid and South Atlantic; by the Gauss it has been taken at 45 L. S. 35 L. E. south of the Cape. It was not taken by the Siboga, but Esterly records it from the Californian Bay, and based on somewhat too small material he draws the following conclusion (1912 p. 311) "evidently, the species moves upwards at night if the numbers taken then as compared with those during the day can be taken as representative of the whole population".

I think we are right in regarding this species as in the main an Atlantic one, which frequents the intermedial strata, but occasionally is found from the surface down to a depth of about 1000 meters.

Remarks. The described species is certainly identical with that described by Giesbrecht, in spite of the larger size, the wanting seta of Le 2 of maxillulae and the structure of the spines in the Basp. II pes IV. The male, which Cleve refers to this species, is possibly identical with mine; his description is too incomplete to settle the question at present. I think that Giesbrecht is right in referring the small Atlantic specimens of *E. Hessii* Brady to this species, the bigger ones may perhaps be identical with *E. rostromagna* Wolf.

32. *Euchirella curticauda* Giesbrecht.

(Pl. IV figs 3a—m; Pl. VIII, figs 2a—c; text-figs 29a—e.)

1888.	<i>Euchirella curticauda</i> n. sp.	Giesbrecht, p. 336.	1905.	<i>Euchirella curticauda</i> Giesbr.	Farran, p. 35.
1892.	—	— Giesbr. Giesbrecht, p. 233, taf. 15, 36.	1906.	—	— Esterly, p. 59, pes 9, 10, 12—13.
1898.	—	— Giesbrecht & Schmeil, p. 36.	1906.	—	— Pearson, p. 15.
1902.	—	— J. C. Thompson, p. 18.	1908.	—	— v. Bremen, p. 48, fig. 54.
1904?	—	— var. <i>atlantica</i> n. var. Wolfenden, p. 116.	1908.	—	— Farran, p. 38.
1905?	—	<i>atlantica</i> n. sp. Wolfenden, p. 20.	1909.	—	— A. Scott, p. 55.
1905.	—	<i>curticauda</i> Giesbr. G. O. Sars, p. 4.	1911.	—	— Wolfenden, p. 236.

Description. ♀. Size: Specimen from Thor St. 88 4.26 mm.; anterior division measured 3.61 mm.; urosome 0.65 mm. Giesbrecht's specimen measured 3.5, Farran's 4.3—4.8.

The head has a prominent rounded frontal keel (Pl. IV fig. 3a); the frontal organ is fairly prominent at the base of a low prolongation downwards from the keel; the rostrum, which is only visible from beneath, is short and undivided, but sometimes asymmetrical with an accessory tooth on the right side. The articular membrane between the head and the first thoracic tergite is indicated in some specimens, but is completely wanting in others. The posterior margin of the first to fourth tergites is strongly chitinized, and falls on each side naturally into a lateral and two median divisions; behind the hinder margin of the fourth tergite and partly covered by it, the fifth thoracic tergite, hollowed like a gutter, is found. The cephalosome is about 6.5 as long as the abdomen. The genital somite is distinctly produced below, and has, on each side of the vulva, a lateral projection, generally visible from the side; along the hinder margin of this somite is a marginal seam. The *antennulae* almost reach to the end of the genital somite, the appendages are as in *E. messinensis*, but the measurements are distinctly different, as the distal segments are comparatively shorter; the 8 ∞ 9 segments, f. inst., are about as long as segment 15, not much shorter. The *antenna* is in its main features like Giesbrecht's fig. 3 Taf. 15, but a distinct articulation is found between Re I and Re II. The *maxillulae* stand as pointed out by Giesbrecht, between *E. rostrata* and *messinensis*; the Le 1 has 9 setae, but the Li 1 has, as in *messinensis*, only 3 posterior setae, and the Li 2 4 strong setae; the Li 3 and basipodite 3 are also like this species, but the Ri has 3 setae only. The *maxillipes* has, exteriorly, near the tip of the anterior surface of the second basipodite, as mentioned by Giesbrecht, a characteristic knob-formed process.

The margin between Se 1—2 of Re I ∞ II in the *first pair* of legs is only slightly concave, with a minute pore. The *pes II* (text-fig. 29a), which has 26 teeth in the St., has a well developed first Se in Ri, and the same number of secretory pores as in the preceding species. The *pes III* has a distinct accessory tooth at the base of Se Ri I; the glandular pore in Re I seems to be wanting (text-fig. 29b). The number of spines interiorly on the posterior surface of basipodite II in *pes IV* varies from 7 to 13, and is most often different on the two sides; the accessory tooth of Se Ri I is smaller; the secretory pore in the Re I is sometimes indicated.

The anterior surface of the *labrum* is like that of *E. rostrata*. The chitinous system which supports the oral surface of the labrum attains a characteristic development, as seen in fig. 3c, as the anterior bars are directed towards the middle, almost touching each other, and almost encircling the median circular spot Nr. 3. The groups of setae in the longitudinal series show a characteristic arrangement: the *first group* consists of an area covered with about 30 short strong spines; the

second group is represented by a longitudinal row of about 20 minute spines; the *third group* (cf. Pl. IV fig. 3 c) consists of 5 fairly long and slender setae placed more forwards, and lateral, and of 2—3 placed more inwards and backwards; the *fourth group*, which consists of 20—25 fairly strong setae, has a characteristic shape, as it is convex, and has its right and left parts converging towards the middle, and almost touching each other in front; the *fifth group* is a continuation backwards of the fourth, and consists of about 30 more delicate setae. Behind this group an oblique, almost transverse row of short "spines" is observed. Behind the central spot Nr. 3 no transverse row of setae is observed, but behind Nr. 4, which is single, two transverse rows of rather delicate setae are observed. The *lamina labialis* (fig. 3 d), which is distinctly granular, is indistinctly divided into three parts. In front of it, in the middle, is a longitudinal row of short spines on each side, followed by the two areas of acicules, forming a curvature corresponding to the outer row of setae (cf. fig. 1 c); the latter is single behind, double in front, as a lateral row of shorter setae is found. The arrangement of the spinous areas behind the lamina as well as of the series of hairs on the labial lobes is seen in figs 3 d—e.

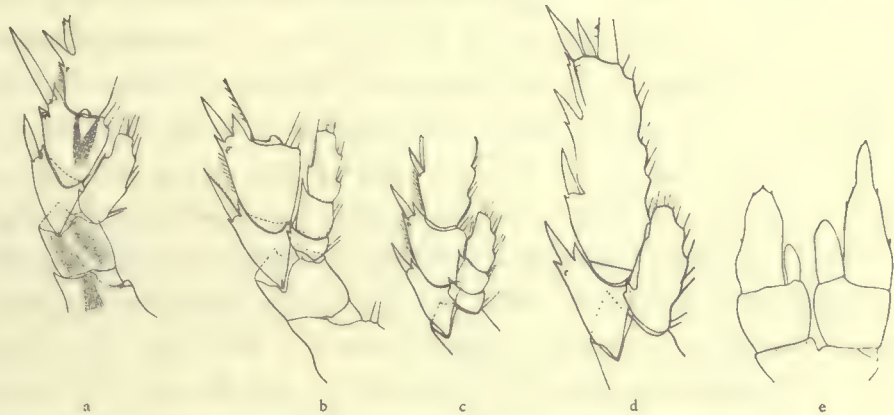
The intestinal tract is almost straight, with a short restriction between the anterior and posterior divisions, and with a slender coecal sac in front.

f♂. Size of male from Thor St. 88 3.73 mm.; anterior division 2.92 mm.; urosome 0.81 mm.

The head has a distinct frontal keel (fig. 3 f), somewhat longer and lower than in the

female; the body is rather elongate, and attenuated in front as well as behind. The head and the first thoracic tergite are completely fused; the articular membranes between the thoracic tergites are like those of the females. The anterior division is 3.5 as long as the urosome; the genital pore is found on the left side of the first abdominal somite; the furcal rami are short, rounded, and about as long as wide; their St. 2 is a little longer than the abdomen, and almost twice as long as the Si.

The *antennulae* extend a little beyond the end of the cephalothorax; the segments 2 and 3, 4 to 7, 8~9 and 10 as well as 11 to 14 are more or less fused; the segments 20—21 are completely fused on the right side, well separated on the left side. The appendages are scarcely different from those of *E. messinensis*; they are as a whole more soft-skinned than in the female, and the Sp. of segment 23 is much shorter than that of segment 24. The segment 2 is almost 1.1 as long as segment 17, which in length is equal to 15, 16 and 19, and about 1.1 as long as segments 8~9. Segment 20 is on the left side about as long as 8~9, but 20~21 on the right side combined is the longest segment, and almost 1.4 as long as segment 2. The *antennae* have the Re 1.5 as long as Ri, and have well developed distal setae; the Re I and II are well separated, but the medial tooth of Re I is wanting. The Le of the *maxillulae*



Text-fig. 30. *Euchirella curticauda* Giesbr.

a. f♀. Pes II sin. in ant. view $\times 40$. b. f♀. Pes III $\times c. 40$. c. y♀ (stage V). Pes III $\times c. 40$. d. y♂ (stage IV, a single specimen from Thor ²⁰/₁₆ 1905 St. 88 not mentioned in the text). Pes III sin. $\times c. 50$. e. y♀ (St. V). Pes V $\times 60$.

possesses 9 setae, of which the 2 proximal ones are extremely short, the third one is distinctly shorter than the strong powerful S 4—9, of which again S 6—7 are the longest. The Li I is well developed but has only a few short soft appendages; the Li I—II were not observed; the Basp. III (?) is quite rudimentary, with at least a single almost rudimentary seta, and the Ri I—III (Basp. III?) bears 4 stiff fairly long plumous setae. The Re has 10 well developed plumous setae in addition to an inner quite rudimentary one. The *maxillae*, have as seen in fig. 3 h, in the main preserved the shape in the female and so has the maxillipes, which is however much more slender, and it has preserved the knob-shaped process of the second basipodite, though it is less prominent than in the female.

The *first pair* of legs (Pl. VIII, fig. 2 a) is distinctly different from that of the female; the anterior surface of the Ri has the process, which is situated laterally at the end of the chitinous list, forming the margin of the rounded lobe, more prominent and perforated by about 3 canals for delicate ducts; between the Re I and II a distinct articulation is found; the Se Re I is short, delicate and swollen at the base; the outer margin of Re II is almost straight, with a distinct pore placed somewhat beyond the middle; the pore in the outer margin of Re III, which is scarcely indicated in the female, is well developed, and placed somewhat beyond the middle. The *pes II* differs by well developed articulation between Ri I and II \approx III, and by the comparatively short Se Re I and the *pes IV* with the smooth inner margin of the second basipodite. The *fifth pair* of legs shows similarity not only to that of *E. messinensis* but also to that of *E. rostrata*; the two legs are almost of equal length (figs 3 g—i). The *pes dext.* has a rather short second basipodite, partly fused with the corresponding one of the left side, and a long strongly enlarged third basipodite, which has an inwards process, which bears the rather slender Ri (Pl. VIII fig. 2 c) extending somewhat beyond the end of Re I \approx II; it is most narrow in the middle, extending, as well, towards the base, but especially towards the tip, and the anterior surface is slightly concave, with the lateral margin somewhat turned over inwards; the lateral margin has two distal processes, of which the one is placed near the tip. The Re I—II is long and slender, without distinct processes. The Re III is as seen in fig. 3 j irregularly curved, and has near the base a plate-shaped process; in the distal half the inner margin possesses a few big teeth, and a more distally dense serration. The *left leg* has the basal segments long and slender, as seen in fig. 3 i; the obtuse and slender Ri extends somewhat beyond the proximal third of the Re I. The Re I is moderately long and slender; it bears a delicate Se at the base of Re II; the Re II is rather short, and apparently excavated outwards and backwards (fig. 3 m); interiorly it is produced into a somewhat hairy process; at the base of this process is the slightly curved, attenuated but blunt Re III (fig. 3 l seen from in front and from the inside), which inwards has two hairy processes basally, and terminally a marginal seam of short hairs.

$Y_{\text{♀}}^{\text{♂}}$ (St. V). Size of female from Thor St. 88 was 3.63 mm.; anterior division 3.06 mm.; uro-some 0.57 mm.

The body is more slender, and the abdomen consists of 4 somites without any difference between the first somite in the male and the female. The *antennae* of the female are scarcely different from those of the adult, except by the Ri, which is one fourth as long as Re, but they are distinctly different from those of the male, in which the Ri is almost half as long as Re, well developed and possessing 5 well developed setae in Le and 3 long + 2 rudimentary ones in Li, a number which is smaller than that of the adult male (6 + 7), and bigger than that of the female (3 + 2). The legs are in minor

features different from those of the adults; the Re III has no secretory pore at the base of Se I; the outer tooth of Ri I pes II is blunt, and the corresponding accessory tooth of pes III is just indicated (text-fig. 30 c). The inner margin of the second basipodite is smooth in the male, but has in the female about 10 short delicate but rather stiff bristles. The *pes V* is similar to that of *E. rostrata*, but there is no indication of subdivision of Re; the terminal spine of Re dext. is longer and less sharply set off, and that of left Re is much shorter (text-fig. 30 e).

Variation. In a single male the exopodite of the second foot was curiously transformed, as seen in fig. 2 b (Pl. VIII).

Occurrence. The Ingolf Expedition has not taken any specimen of this species, but the Thor has gathered it at the following stations.

In Denmark Strait:

19/6	1904	St. 152	65°00	L. N.	28°10	L. W.	Yt. 1000 M. Wire	1 f♂.
20/6	1904	St. 153	65°20	L. N.	27°12.5	L. W.		3 f♀.
21/6	1904	St. 154	65°27	L. N.	27°10	L. W.		1 f♀.

In the Atlantic south of Iceland:

9/7	1904	St. 178	63°08	L. N.	21°30	L. W.	Yt. 750 M. Wire	1 f♂.
10/7	1904	St. 180	61°34	L. N.	19°05	L. W.	Yt. 1800 M. Wire	1 f♀.
11/7	1904	St. 183	61°30	L. N.	17°05	L. W.	Yt. 1800 M. Wire	14 f♀ (3 with spermatophors).
25/5	1904	St. 104	62°47	L. N.	15°03	L. W.	Yt. 1500 M. Wire	10 f♀.
1/9	1904	St. 285	62°49	L. N.	18°44	L. W.		13 f♀.
29/8	1905	St. 164	61°20	L. N.	11°00	L. W.	Yt. 300 M. Wire	16 f♀ (5 with spermatophors).
22/5	1904	St. 99	61°15	L. N.	9°35	L. W.	Yt. 1400 M. Wire	1 y♂ (V).
12/5	1904	St. 78	61°07	L. N.	9°30	L. W.		2 f♀.

Outside the Ingolf area south-west of the Færoes a fairly large number of specimens has been captured.

15/6	1905	St. 82	51°00	L. N.	11°43	L. W.	Yt. 1200 M. Wire	1 f♀, 3 f♂, 1 y♀ (V).
							Yt. 800 M. Wire	11 f♀ (3 with spermatophors).
11/9	1905	St. 167	57°46	L. N.	9°55	L. W.	Yt. 1500 M. Wire	16 f♀ (5 with spermatophors).
8/6	1905	St. 72	57°52	L. N.	9°53	L. W.	Yt. 300 M. Wire	51 f♀, 1 f♂, 1 y♂ (V).
20/6	1905	St. 88	48°09	L. N.	8°30	L. W.	Yt. 300 M. Wire	200 f♀ (30 with spermatophors), 7 f♂, 2 y♀ (V), 2 y♂ (V).
21/6	1905	St. 90	47°47	L. N.	8°00	L. W.	Yt. 300 M. Wire	5 f♀, 1 f♂.

Distribution. "This species" is according to Farran "of frequent occurrence, and often moderately common" on the west coast of Ireland "at depths of from 200 to 1000 fathoms". It has been taken by the Monaco Exp. and by the Gauss' Exp. as far south as c. 10° Lat. S. It has been recorded from the Bay of California and from the Malay Archipelago.

Remarks. This species is certainly identical with that described by Giesbrecht and Esterly, though it is somewhat bigger, and in spite of some features, e. g. shape of fifth thoracic tergite, which

are not mentioned in Giesbrecht's rather short description. The species is probably identical with *Wolfendens var. atlantica*, as the differences set forth viz: "head separated from first thoracic segment", basipodite II of pes IV, which has "only six rather broad-based and long spines", and the smaller size (3.8 mm.) are not of much importance. It is more doubtful, if it is identical with *E. atlantica* Wolf, in which the abdomen is only $\frac{1}{8}$ of the anterior division in length. Most probably the described male belongs to this species, especially on account of the characteristic articular membranes of the thoracic tergites, the frontal keel, the almost obsolete rostrum and the knob-like process of the second basipodite of the maxillipeds. The arrangement of secretory pores and the structure of Se of Ri I in the legs are like those of the females. Some of the differences are certainly due to sex, f. inst. longer abdomen, longer endopodite of antennae with greater number of setae; a few of the other differences are not quite the same as those found in related species, but it must be remembered that sexual differences are apt to vary from the one species to the other.

33. *Euchirella messinensis* Claus.

(Pl. IV figs 2 a—c; Pl. VIII fig. 1; text-figs 31 a—f.)

1863.	<i>Undina messinensis</i> n. sp.	Claus, p. 187, pl. XXXI.	1904.	<i>Euchirella messinensis</i> Claus.	Cleve, p. 190.
1892.	<i>Euchirella messinensis</i> Claus.	Giesbrecht, p. 232, taf. 15 & 36.	1905.	—	Esterly, p. 151, fig. 18.
1894.	Nec. —	— Th. Scott, pp. 45—46.	1905.	—	G. O. Sars, p. 4.
1896.	—	— Canu, p. 424.	1908.	—	Farran, p. 37.
1898.	—	— Giesbrecht & Schmeil, p. 31.	1909.	—	Pesta, p. 23.
1903.	—	— Giesbrecht, p. 201.	1909.	—	A. Scott, p. 56.
1903.	—	— Thompson & Scott, p. 244.	1912.	—	Pesta, p. 13.
			1911.	—	Wolfenden, p. 237.

Description. ♀. Size of specimens from Thor St. 183 5.7 mm.; anterior division 4.5 mm.; urosome 1.2 mm. Giesbrecht's specimens measured 4.75 mm.

The sac-shaped protuberance of the genital somite, which is rather variable in the specimens examined, differs somewhat in shape from Giesbrecht's fig. 18 (Taf. 36); it is distinctly widened out towards the end, does not reach much behind the end of the third somite and beyond a distinct concavity at the right side the tip is directed towards the right; the protuberance is dorsally excavated. The Ri of the antennae possesses 5 setae in Le and 3 (not 4) in Li. The *first pair of legs* has the outer margin between the Se of Re I—II almost straight with a distinct pore, continued into a conical process at least in one specimen. The glandular pore in the outer margin of Re III pes I is placed $\frac{1}{3}$ of the length of Re III measured from the base. The number of glandular pores is as in *E. rostrata*; in the Re I exteriorly distinctly removed from the tip a transverse split (secretory pore) was observed not only is pes II but also in pes III—IV, in which the real pore is found; a similar one was observed in Basp. III medially to the insertion of Se I, and in Re III near to the insertion of Si 4.

Somewhat behind the insertion of the antennulae a well marked elevation is found, which is well separated from the labrum proper by an anteriorly convex chitinous line; in connection with the mentioned elevation as well as with a transverse chitinous bar behind the mouth a strong chitinous system forming a covering for the manducatory part of the mandibulae is found. The anterior surface of the *labrum* does not possess any setae in front of the marginal row; this consists, on

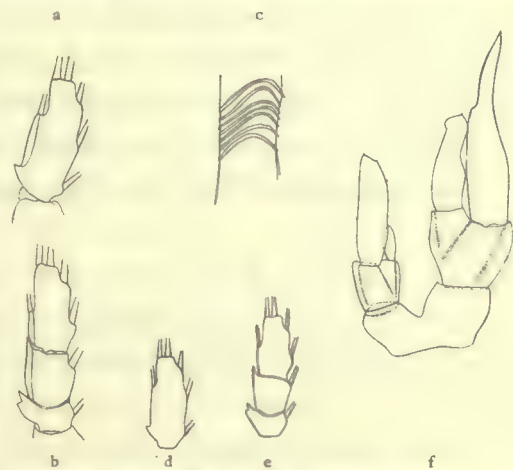
each side of the median concavity, of a medial transverse row of about 25 more spine-shaped setae. The chitinous system of the oral surface of the labrum (fig. 2 a) shows as seen in figures (cf. 3 c) some similarity to that of *E. curticauda*, but the arrangement of the groups of hairs in the longitudinal series is distinctly different, and is indeed very characteristic. The *first group* consists of about 30–40 setae, placed in a single inwards convex row; the *second group*, which is perhaps fused with the lateral group, is represented by a big group of minute acicules; the *third group* consists of about 20 fairly long setae, and is converging towards the front; the *fourth group*, consisting of about 25 fairly strong setae, has the anterior portion placed almost transversely, and is almost fused with corresponding part of the other side; the *fifth group*, which consists of about 40 rather slender setae, is partly fused with the fourth; the sixth group is transverse, and consists of short delicate hairs. No transverse series of spinules is observed behind the median circular spot Nr. 3, and the two series behind the fourth median spot are fused to a square area, beset with spinules.

The *lamina labialis*, as seen in fig. 2 b, is smooth and very insignificant; the arrangement of setae in front of lamina is, as seen in fig. 2 c, somewhat different from that of *E. curticauda*. Behind the lamina 3–4 spinous areas are observed on each side. The series of hairs behind and upon the labial lobes show a rather regular arrangement, as seen in fig. 2 c, the medial posterior groups of a few hairs could not naturally be referred to any of the series. The *first series* consists of a number of short hairs, placed in a rounded area; the *second series* consists of two rather independent almost transverse rows; the *third series* seems only to be represented on the labial lobes, and the *fourth one* has in addition to the regular row on the lobe a more medial and posterior portion; the *fifth group*, which consists of somewhat stronger setae, falls naturally into a median portion which is fused with the corresponding part of the other side, and a lateral one which is continued to the end of the labial lobe.

♂. Size of specimen from Thor St. 183 5.46 mm.; anterior division 4.37 mm.; urosome 1.09 mm. Giesbrecht's specimen measured 3.95 mm.

The frontal keel is distinctly higher than figured by Giesbrecht (Taf. 36 fig. 25). The oral appendages are practically like Giesbrecht's description, but the mandibulae possess as in *Euch. rostrata* a well developed manducatory portion; the labrum and labium show a similar development as in this species.

According to Giesbrecht (p. 240) the only difference between the natatory legs in males and females is found in the completely smooth inner margin of the fourth pair of legs in the males; in my specimens, however, the difference is even better marked than in *E. rostrata* and *curticauda* (Pl. VIII fig. 1). The articulation between Re I and II pes I is indicated, but the Se Re I is wanting; the Se Re II is quite rudimentary; the pore in the outer margin of Re II is well developed, but that of Re III seems to be wanting: The St. of the Re III pes II has about 50 instead of c. 25 teeth.



Text-fig. 31. *Euchirella messinensis* Claus.
a–b (to the left). ♀. Ri pes II–III $\times 57$. c. Pes V dext; ridges of Re III $\times 175$. d–e (in the middle below) ♂ (St. V) Ri pes II–III $\times 57$.
f. ♂. Pes V ant. view $\times 57$.

The *fifth pair* of legs is scarcely different from Giesbrecht's fig. 21 (Taf. 15); the teeth along the inner margin of Re III pes V dext. correspond really to transverse keels, as seen in text-fig. 31 c.

Y_♀ (Stage V). Size of male from Thor St. 88 4.19 mm.; anterior division 3.29 mm.; uro-some 0.90.

The shape of the body is in the main as in adult female, without frontal keel. The appendages are in the main like those of the adult female, except the *antennae*; these organs show similar differences as in *E. curticauda*; the antennae of the female is in the main like those of the adult, with rudimentary Ri, which, however, has the setae of Ri 2 better developed (in Li 4 setae); the antennae of the male are like those of the adult by the more powerful Ri, which, however, only reaches the middle of Re 2, and has a similar number of setae as in the female. The *nataory legs* differ somewhat from those of the adult by the less developed Se of Ri I, as seen in text-figs 31 d—e, as well as by the wanting glandular pore at the base of Se 1 Re III. The inner margin of the second basipodite in the fourth pair of legs is smooth in the male, but has in the female about 6 short delicate bristles. The *fifth pair* of legs has, as seen in text-fig. 31 f, a characteristic structure resembling that of the adult male.

Occurrence. The S/S Thor has gathered a few specimens of this species at the following stations:

¹¹/₇ 1904 St. 183 61°30 L. N. 17°08 L. W. Yt. 1800 M. Wire 5 f♀.

²⁴/₆ 1905 St. 93 49°25 L. N. 12°20 L. W. Yt. 200 M. Wire 1 f♀.

¹⁵/₆ 1905 St. 82 51°00 L. N. 11°43 L. W. Yt. 1200 M. Wire 2 f♀, 1 y♂ (V).

800 M. Wire 2 f♀, 2 f♂.

²⁰/₆ 1905 St. 88 48°09 L. N. 8°30 L. W. Yt. 300 M. Wire 2 f♀, 1 f♂, 1 y♀ (V), 1 y♂ (V).

Distribution. The species, according to Farran, is fairly common on the west coast of Ireland "at depths of from 350 to 700 fathoms". It has been recorded from the North-east Atlantic, the South Atlantic, the Mediterranean, the Malay Archipelago and the Pacific (Bay of California).

Remarks. In spite of the mentioned small difference the female must be regarded as identical with *E. messinensis*; if the difference in the first pair of legs between my male and Giesbrecht's is really a constant one, the identification of the males seems to be rather doubtful.

34. *Euchirella intermedia* n. sp.

(Pl. IV figs 4 a—c; Pl. VIII fig. 3; text-figs 32 a—f.)

1902? *Euchirella carinata* n. sp. Wolfenden, pp. 366—367.

1911? *Euchirella gracilis* n. sp. Wolfenden, pp. 237, text-fig. 22, tafel XXVII figs 8—10.

Description. f♀. Size of specimen from Thor St. 82 5.66 mm.; anterior division 4.66 mm.; uro-some 1 mm.

No frontal keel is found; the short strong rostrum is directed forwards and downwards (cf. text-fig. 32 e). The articular membrane between head and first thoracic tergite is present laterally; the articular membranes between the thoracic tergites show similarity to those of *Euch. curticauda*; the fifth somite is laterally indicated as a mere marginal seam, and the lateral corner is rounded as seen in fig. 4 a.

The abdomen, which is $\frac{1}{4.6}$ as long as the anterior division, has the furcal rami about as long as the fourth somite, and about as long as wide. The genital somite, which is as deep as wide, is somewhat wider than long; in dorsal view it is distinctly asymmetrical and more convex on the left than on the right side; on the left side, near the hinder margin, we observe a lamellous process with broad base, and directed backwards and somewhat outwards; behind this, as seen in fig. 4 a, another less prominent elevation was observed. The genital area is well produced in front, and the median prominent crista, which is prominent in Giesbrecht's fig. 21 (Taf. 36) of *E. venusta*, was not seen. The triangular teeth along the hinder margin of abdominal somites 1-2, 3 and 4 are only poorly developed.

The antennulae reach the end of the body, their appendages are scarcely different from those of *E. messinensis*, and the measurements are very much alike. The endopodite of the *antennae* is about half as long as the exopodite, and its second segment has 9 setae in Li and 9 in Le. The Re I, which has a well developed conical process without any seta, is fairly well separated from Re 2 (Pl. VIII fig. 3). The *maxillulae* differ from those of *Euc. messinensis* by the presence of a less powerful Sa in Ri I. The *maxillae* have the outer margin rather suddenly produced as in *E. rostrata*, but are in other respects scarcely different from *E. messinensis*; the *maxillipeds* differ from those of the latter species by the almost straight exterior margin of the third basipodite. The glandular pore in the outer margin of Re III of pes I is more removed from base, in other respects the first pair of legs is like *E. messinensis*. The Se of Ri I of pes II is more prominent than in *E. messinensis* (cf. text-fig. 31 a); the accessory tooth of the Se Ri I is indistinct in pes III, and completely wanting in pes IV. As in *E. curticauda* no glandular pore was found in Re I of pes III-IV. The second basipodite of the fourth pair of legs has only a single strong spine, extending to end of segment (text-fig. 32 a).

The *labrum* is in lateral view like that of *Euc. messinensis*; its oral surface (fig. 4 b) is in structure lying between that of *E. messinensis* and *curticauda* (fig. 2 a and 3 c). The *first group* consist of an area with densely placed, fairly strong spines; the *second group* is represented by 2-3 longitudinal rows of short teeth, laterally to which a similar longitudinal row is seen; the *third group* consists of about 5 fairly long spines, placed medially to and partly in front of the posterior part of second group. Behind the median spot Nr. 4 a square area of small spinules and a posterior transverse row are found. The *lamina labialis* (cf. fig. 5 f) is like that of *E. maxima* Wolf, but is more distinctly granular posteriorly. The area in front of lamina labialis is like that of *E. messinensis*, and so is the area behind, which, however, in the posterior groups shows some not quite unimportant differences.

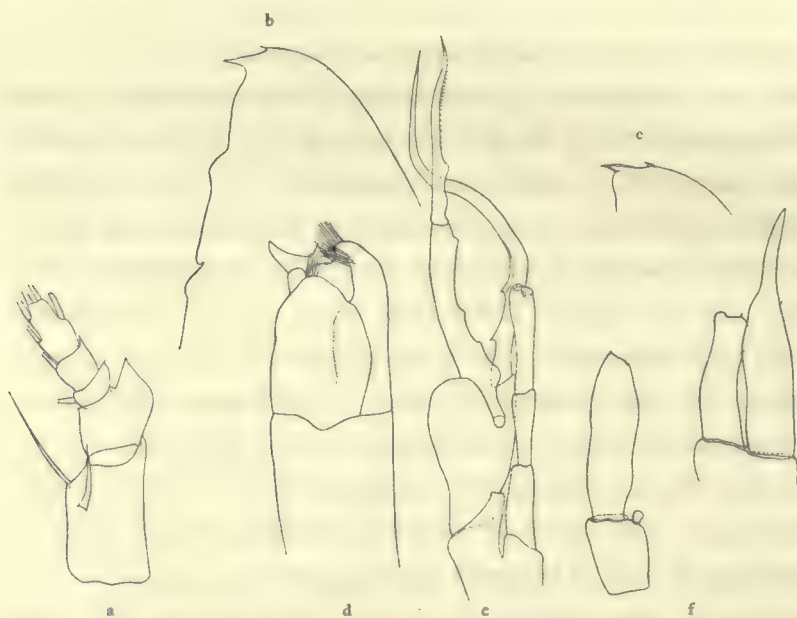
f♂. Size of male from Thor St. 88 5.3 mm.; anterior division 4.2 mm.; urosome 1.1 mm.

The body is distinctly more slender than in the female. No frontal keel is found, but the rostrum is longer and directed more downwards (text-fig. 32 b); the lateral corners are rounded, and the fourth and fifth thoracic tergites are completely fused. The *abdomen* is distinctly one fourth as long as the anterior division. The furcal rami are a little wider than long; the serrated seam along the hinder margin of somites II-IV is fairly well developed.

The *antennulae* extend to the end of the abdomen; the appendages are scarcely different from those of *E. messinensis*; segments 8-9 are completely fused with segment 10; segments 12 and 13, 14 and 15 are more or less fused. The exopodite of the *antennae* is 1.4 as long as the endopodite, the

Le of which has 5 setae, while its Li has 7 setae. The *maxillulae* are scarcely different from those described in *E. curticauda*; the *maxillae* agree in general shape (cf. fig. 3 h Pl. IV), but the setae of the four proximal lobes are poorly developed, while the fifth lobe has a long, soft, somewhat contorted sensory seta in addition to one fairly slender and one very short of usual structure; the *maxillipeds* are as usual more slender than in the female.

The *first pair* of legs is as usual well distinguished from that of the female; the first and the second outer segments are marked off from each other by a small incision, proximally to which the short, at base swollen, Se is found; the Se of Re II is short and moderately slender; the position of



Text-fig. 32. *Euchirella intermedia* n. sp.

a. f♀. Pes IV sin. in post. view $\times 33$. b. f♂. Head $\times 135$. c. f♂. Pes V in post. view $\times 145$. d. f♂. Pes V sin. $\times 275$. e. y♀ (St. V) head $\times 33$. f. y♂ (St. V) pes V in anterior view $\times 57$.

of the glandular pores in the outer margin of Re II and III is as in the female. The *third pair* of legs differs by the better developed accessory tooth of the Se Ri I, and the *fourth pair* by the smooth inner margin of the second basipodite.

The *fifth pair* of legs is much longer than the abdomen, and extends almost to the end of the furcal setae; both legs are very similar to those of *E. messinensis* (text-figs 32 c—d); the processes on the margins of the rami of the right leg are slightly different from those of the mentioned species. The right endopodite seems to be wanting; the right exopodite is terminated by three somewhat hirsute processes (cf. text-fig. 32 d), of which the first is hook-shaped with

three teeth, the second is flat and rounded, while the third one is slightly hook-shaped without serrations.

$Y_{\text{♀}}^{\text{♂}}$ (St. V). Size of female from Thor St. 88 4.78 mm.; anterior division 3.91 mm.; urosome 0.87 mm.

The shape of the body is practically like that of the adult female with the usual differences in the shape of the abdomen; triangular teeth are found along the hinder margin of somites II—III. The only difference of importance which was observed in the mouth appendages was found in the antennae, which in the female as well as in the male is like that of the adult female, but in Le Ri only 6 setae are found and in Li 7. The Se of Ri I is blunt, and only slightly prominent in the second pair of legs, and its accessory tooth is almost obsolete. The inner margin of the second basipodite in the fourth pair of legs is smooth in the male as well as in the female. The *fifth pair* of legs of the male shows (text-fig. 32 f) on the one side a distinct similarity to that of *E. messinensis*, but is on the other side distinctly different, f. inst. by the short rounded left endopodite.

Occurrence. The S/S Thor has gathered this species at two stations viz:

$^{15}/_6$ 1905 St. 82 51°00 L. N. 11°43 L. W. Yt. 800 M. Wire 2 f♀, 19 y♀ (V), 2 y♂ (V).

$^{20}/_6$ 1905 St. 88 48°09 L. N. 8°30 L. W. Yf. 300 M. Wire 1 f♂, 2 y♀ (V), 1 y♂ (V).

Remarks. The male of this species is very similar to *E. pulchra* Giesbr., while the female seems to be nearly related to *E. venusta* Giesbr., but is distinctly different by the shape of the genital somite, the larger size, the much longer endopodite of the antennae with greater number of setae and the single spine in the second basipodite of the fourth pair of legs. It is possibly identical with Wolfenden's *E. gracilis* (p. 237 1911) from the South Atlantic, which agrees with it in several of these characters, as far as can be seen from the short description, but as the genital somite in dorsal view has a different outline and laterally is "ohne Auswüchse", and as the endopodite of the antennae has 8 + 7 terminal setae, I feel justified in regarding my species as a new one. Between Wolfenden's description of a young male of *E. carinata* and this species there is some similarity.

In spite of the somewhat curious difference found in the number of setae in the endopodite of the antennae I do not doubt that the young specimens belong to the same species. In all features of importance, even the wanting glandular pore in Re I of pes III—IV, they agree with the females.

In several respects this species bears similarity to *E. curticauda* Giesbr.

35. *Euchirella maxima* Wolf.

(Pl. IV figs 5 a—h; Text-figs 33 a—i.)

1905. <i>Euchirella maxima</i> n. sp. Wolfenden, p. 18, pl. VI figs 9—11.	1909. <i>Euchirella maxima</i> Wolf. A. Scott, pp. 57—58, pl. XII figs 12—20.
1908. — — — Wolf. Farran, p. 38.	1911. — — — Wolfenden, pp. 238—239, taf. 28 figs 3—5; text-figs 24 a—b.

♀. Size of specimen from Thor St. 88 was 7.8 mm; anterior division 6.5 mm.; urosome 1.3 mm. A specimen from Thor St. 167 measured 8.5 mm. Wolfenden's specimen measured 7.5—8.7 mm.

The head is mounted with a well marked frontal keel. The rostrum is short, undivided and in lateral view almost triangular. The first thoracic tergite is fused with the head. The fifth thoracic tergite is, as stated by Scott, well separated from the fourth; it is narrow above, but below it is widened out, and on the left side produced into an irregular, rounded lamina (fig. 5 b), but on the right produced into a somewhat shorter pointed process (fig. 5 c); this interesting structure, which is rather variable within the different specimens, has not been described by previous authors. The articular membranes of the thoracic tergites are developed in a similar way as in *E. curticauda*. The abdomen is only one fifth of the anterior division; the somites are short and dorsally along the hinder margin have short bristles. The lower surface of the genital somite (fig. 5 d) is produced, and has, somewhat in front of middle, on the left side, a prominent pointed process, which is curved forwards and inwards. On the left side and behind, a small protuberance, scarcely visible from above, is seen, and on the right a small anterior process and a fairly prominent bigger one, which is placed more posteriorly and is partly visible in dorsal view. The furcal rami are about as long as wide.

The *antennulae* reach about to the end of the genital somite; the segment 17 is about as long as segment 2 and 16 as long as segments 8—9 and segments 24—25. The endopodite of the *antennae* is only $\frac{1}{3}$ of the exopodite; its Le of the second segment has only 3 moderately long almost naked setae, and the Li has 5 somewhat shorter ones (the number of setae is according to Wolfenden as well as to Scott 5 + 5); the Re I—II is distinctly longer than Re III—VII; the Re I, which has a pro-

minent conical process without hair, is well separated from the Re II, which possesses a basal, a median and distal short conical protuberance without any hairs (the 2 first are shown in Scott's fig. 17). The Le of the *maxillulae* possesses 8 setae, of which the 3 basal are rather short and delicate, and the fifth moderately long, but much shorter than the fourth as well as the following one, which are long and powerful; the number of setae is else as in the *E. curticauda*. The *maxillae* differ from those of *E. messinensis* by somewhat stronger spines and more pronounced spinulation on the posterior surface of the lobes. The *maxillipeds* are most like those of *E. curticauda*; the third basipodite is 2.5 as long as the Ri, which has 4 setae in the Ri 2.

The *first pair* of legs is scarcely different from that of *E. curticauda*; the *second pair* of legs has a well marked tooth in Ri I, and the Se Re II extends as shown by Wolfenden at least to the tip of Se I Re III; the *third pair* of legs has the accessory tooth, corresponding to Se Ri I pointed and well developed; the second basipodite of the *fourth pair* of legs, which is strong, broad and of triangular shape, extends barely to the end of the somite, and seems, as figured by Scott fig. 20 Pl. XII, to be formed by the fusing of about 4 spines. The pores are like those of *E. messinensis*.

The *labrum* (fig. 5 e), as seen in figure, has the inner marginal row well developed, but the outer one seems to be represented by a few minute granules. The oral surface is in all main features like that of *E. curticauda*, but differs as seen in figures, as f. inst. by the third group, which is not converging but diverging posteriorly. The *lamina labialis* (fig. 5 f) is striated but not distinctly granular; the area in front of the lamina is rather similar to that of *E. curticauda* (cf. fig. 3 d), but the lateral series, which forms the continuation of the serrula 6-dentata, has only a single row of fairly strong spines, and the inner series has about 25 short spines in a single row in addition to the usual area covered with acicules, which starts behind the end of the inner series. The arrangement of setae behind the lamina labialis and at the labial lobes (fig. 5 g) is, as far as series III—V are concerned, practically like that of the preceding species, but as far as the first series is concerned is rather different.

♀. Size of specimen from Thor St. 167 was 6.7 mm.; anterior division 5.1 mm.; urosome 1.6 mm.

The body (text-figs 33 a—b) is moderately slender; the head and first thoracic somite are completely fused; the lateral corners are rounded, and the fourth and fifth somites are completely fused. The head is surmounted by a fairly big, prominent, rounded, keel and has a short, strong, compressed and undivided rostrum. The abdomen is about one third as long as the anterior division; the first and second somites, which are of equal length are somewhat longer than the third, and about as long as the fourth; the serration along the hinder margin of somites II—IV is short and delicate. The furcal rami are about as long as wide; the St. II, which is distinctly longer than the abdomen and twice as long as Si, is longer than St. I—III, and again longer than St. IV.

The *antennulae* extend to the end of the second abdominal somite; they are in most respects like those of *E. curticauda*. The exopodite of the *antennae*, which has an indication of a protuberance in Re I, is 1.4 as long as the endopodite, which possesses 5 setae in Le and 7 setae in Li.

The *maxillulae* possess 8 setae in Le, completely like those of the female; the Li I and II are fairly well developed, and possess a few soft contorted appendages, and the Si of the Re is fairly long, but in other respects the appendages are scarcely different from those of *E. curticauda*; the *maxillae* and *maxillipeds* are practically like those of the preceding species.

The *first pair* (text-fig. 33 c) of legs is in most respects like that of *E. curticauda*; the process on the anterior surface of Ri with 3 teeth, perforated by delicate canals, is almost obsolete; the Se of Re I is fairly long and slightly swollen at the base; the pore in the outer margin of Re III is placed distinctly nearer the base than the middle. The *pes II* shows a similar difference as that of *E. curticauda*, with fairly well developed articulation between Ri I and II and comparatively short Se Re II. The *pes III—IV* are like those of the females, but the inner margin of the second basipodite in the fourth pair of legs is completely smooth.

The *fifth pair* of legs (text-figs 33 b and e—g) shows most similarity to that of *E. curticauda*; the right and the left legs are of almost equal length; the Ri dext., which extends almost to the end of Re I \approx II, is terminally inflated, and outwards has two rounded processes in the middle; the Re III is



Text-fig. 33. *Euchirella maxima* Wolf.

a. f♂. Head $\times 34$. b. f♀. Abdomen $\times 20$. c. f♂. Pes I $\times 66$. d. f♂. Pes IV sin. Ri $\times 66$. e. f♂. Pes V dext. Re II—III $\times 66$. f. f♂. Pes V sin. Re III (from below) $\times 107$. g. f♂. Pes V sin. Re III (in exterior view) $\times 66$. h. y♂. (stage V) Pes V in ant. view $\times 33$. i. y♂. (stage IV) Pes V in ant. view $\times 60$.

slender, gradually attenuated towards the tip and is in distal half, in a similar way as in *E. messinensis*, regularly serrated along the margin (text-fig. 33 e). The left leg has a long and slender Ri, which extends to the end of Re I and terminally is rounded and slightly convex in its whole length; the Re I is fairly long and slender, somewhat concave inside and here possessing a few protuberances; the Re II is somewhat shorter, with a basal rounded process and 2 distal ones, of which the one is short and conical, while the other is about one third as long as the segment, and gradually attenuated, the Re III, which is distinctly half as long as the Re II and placed at the base of the last mentioned process, is triangularly pointed beyond a distal conical process and hairy along inner margin proximal to it (text-fig. 33 f).

Y♂ (St. V). Size of female from Thor St. 88 is 6.04 mm.; anterior division 4.96 mm.; urosome 1.08.

The shape of the body is like that of the adult, but the frontal keel is somewhat lower; the lateral corners are rounded (fig. 5 h), not produced, and the fifth somite is dorsally as well as laterally represented by a mere seam. The abdomen is about one fourth as long as the anterior division. The

antennae of the female are scarcely different from those of the adult female, but for the presence of 5 setae instead of 3 in *Le*; the antennae of the male are more similar to those of the adult male, as the *Ri* is half as long as *Re* and has 7 setae in *Li* and 5 in *Le*. In the *maxillulae* of the female the *S* 14 of *Li* I is distinctly shorter than *S* 13; this structure is probably due to individual variation, as *S* 13 and 14 in the male are of equal length. The legs differ from those of the adult female by the less prominent *Se* of *Ri* I and by the completely smooth inner margin of the second basipodite in the fourth pair of legs in male as well as in female. The *fifth pair* of legs (text-fig. 33 g) is distinctly different from that of preceding species, as both *Re* as well as *Ri* are of almost equal length, and as the left leg is distinctly pointed.

Y_♀[♂] (St. IV). Size of female from Thor St. 88 4.69 mm.; anterior division 4.0 mm.; urosome 0.69.

The fifth thoracic somite was not marked out; the *antennulae* extend a little beyond the end of the abdomen. The *antennae* are practically like those of the female of the preceding stage, but the *Li* of *Ri* has 6 setae; the *Ri* in the male, which has 6 setae in *Le*, is not distinctly longer than in the female. The *Re* of the *maxillulae* possess as usual in this stage 9 setae only. The *first pair* of legs has as usual *Re* I—III completely fused; the *Se* *Re* I is much longer than *Se* *Re* II; the secretory pore in the outer margin of *Re* II is wanting; while that in the outer margin of *Re* III is well developed; the *pes* II—IV show the usual differences; the inner margin of the second basipodite of the fourth pair of legs is smooth in both sexes; glandular pores are in *pes* III—IV found at the base of *Se* *Re* I and at the base of *Se* 3 *Re* III. The *fifth pair* of legs is very similar to that of *E. rostrata*, but the endopodites are comparatively longer, and the *Re* dext. is more elongated with fairly long *St.* (text-fig. 33 i).

Occurrence. The S/S Thor has gathered this species in six samples viz:

- 11/7 1904 St. 183 61°30 L. N. 17°08 L. W. Yt. 1800 M. Wire 1 y♀ (V).
 15/6 1905 St. 82 51°00 L. N. 11°43 L. W. Yt. 1200 M. Wire 6 y♀ (V), 6 y♂ (V).
 Yt. 800 M. Wire 1 y♂ (V).
 11/9 1905 St. 167 57°46 L. N. 9°55 L. W. Yt. 1500 M. Wire 1 f♀, 1 y♀ (V), 1 y♂ (V).
 31/8 — — — — — Yt. 300 M. Wire 2 f♂.
 8/6 1905 St. 72 57°52 L. N. 9°53 L. W. Yt. 1500 M. Wire 2 f♀.
 20/6 1905 St. 88 48°09 L. N. 8°30 L. W. Yt. 300 M. Wire 4 f♀, 1 y♀ (V), 6 y♂ (V), 5 y♂ (IV), 4 y♀ (IV).

Distribution. This species is recorded from five stations on the west coast of Ireland at depths of from 350 to 1000 fathoms; it has been taken at a great depth by the Gauss Expedition in the South-Atlantic as far south as c. 35° L. S. (5° L. E.), and in the Malay Archipelago by the Siboga Expedition.

Remarks. In spite of small differences, partly enumerated above, this species is certainly identical with that described by Wolfenden. I think that the described male is most naturally referred to this species in spite of the comparatively small size, fairly long rostrum and rounded lateral corners of the thorax, and especially on account of the shape of the frontal crest and the well developed accessory teeth in *Se* *Ri* I of *pes* III—IV.

36. *Euchirella bitumida* n. sp.

(Pl. V figs 9 a—g; Pl. VIII figs 4 a—e; text-fig. 34.)

Description. ♀. Size of specimen from Thor St. 82 6.6 mm.; anterior division 5.4; urosome 1.2. Another specimen measured about 7 mm.

The head is produced into a prominent rounded helmet-shaped crista (Pl. VIII fig. 4 a), like that of *E. galeata*, which is well marked off behind, and not continued into a dorsal keel; below the crest the margin falls steeply towards the prominent but rather short rostrum. The body is rather slender, with the head and the first thoracic tergites coalesced; the fifth tergite is not distinctly marked out, and the lateral corners are rounded (figs 9 a—b). The anterior division is 4.5 as long as the abdomen. The *genital somite* has in dorsal view a better marked convexity on the right than on the left side, and possesses, slightly in front of middle on each side, a rounded protuberance, bigger on the right side and with a shallow impression between the two; the genital somite is in lateral view rather characteristic, partly on account of the ventral outline which is suddenly produced in front and falls rather smoothly behind; in ventral view it appears rather simple (fig. 9 c). The caudal rami are about as long as wide; the terminal setae, which are somewhat longer than the interior one, are of almost equal length and a little shorter than the abdomen.

The *antennulae*, which almost extend to the end of the abdomen, have the appendages completely like those of *E. messinensis*, and the measurements almost alike, except segment 17, which is the longest segment, a little longer than segment 19. The *antennae* (Pl. VIII fig. 4 a) have the endopodite one third as long as the exopodite; the endopodite has 6 setae of equal length in the Le and 6 in the Li, of which the two inner are rather short. The *maxillulae* differ from those of *E. messinensis* by the relative length of the setae in Le; the two first and the fifth one are distinctly shorter than the others. The *maxillae* are, as seen in fig. 9 d, in main features like those of *E. messinensis*. The *maxillipeds* have the exterior margin of the third basipodite, which is 1.3 as long as Basip. I ∞ II and about twice as long as Ri, somewhat sinuated; the Ri II has only 3 setae.

The *first pair* of legs (fig. 4 b) has a small pore in the almost straight margin of Re II, and a very indistinct one placed near the base on the outer margin of Re III. The Se of Ri I (fig. 4 c) of the undivided endopodite in the second pair of legs is poorly developed, as seen in fig. 4 c, and the Se of Re II extends slightly beyond base of Se I Re III. The accessory tooth of Se Ri I is only indicated in the third pair of legs (fig. 4 d). The *fourth pair* of legs has on the posterior surface of the second basipodite in the type specimen on the left side a single straight, fairly strong spine, which almost extends to the base of the third basipodite, and on the right side is substituted for by 3 more slender spines (fig. 4 e); in another specimen the spine was wanting on the right side; in a third specimen a single spine was observed on the left side, while none was observed on the right side (perhaps broken?); in two specimens a single spine was observed on both sides, and in a single one a spine on the left and one on the right side.

The number of glandular pores is like that of *E. messinensis* with a pore in Re I of pes III—IV.



Text-fig. 34.
Euch. bitumida n. sp.
Y♂. Pes V in anterior view $\times 57$.

The main difference between *E. messinensis* and this species, found in the structure of the labrum, is observed in the 2 first groups of the oral surface (fig. 9 e), which are fused to a single group consisting of numerous short spinules. The *lamina labialis* (fig. 9 f) is distinctly granular; the arrangement of setae in front of the lamina as well as of the spinulous areas behind it is in the main like that of *E. messinensis*. The development of the series of setae behind and upon the labial lobes is, as seen by comparing figs 9 g and 5 g (Pl. IV), most like that of *E. maxima*.

$Y_{\text{♀}}^{\text{♂}}$ (St. V). Size of female from Thor St. 88 was 4.66 mm.; anterior division 3.85 mm.; urosome 0.81. A male from the same sample measured 4.99 mm.

The shape of the body is as in the adult female; the antennulae extend slightly beyond the end of the abdomen. The antennae are in the young female, scarcely different from those of the adult female but in the young male the exopodite is twice as long as the endopodite, which is much more powerful and has 7 setae in Li.

The second basipodite of the fourth pair of legs has in the middle on the inner-margin 3 rather short and stiff hairs, while the margin is smooth in the male. The *fifth pair* of legs in the male is very much like that of *E. messinensis* (cf. text-fig. 34), but the Re dext. is more regularly rounded, and does not possess any terminal hair.

Occurrence. The Thor has gathered the species in four samples; the first locality is not quite certain, owing to a mistake.

$^{2/9}$ 1904 St. 285 62°49' L. N. 18°46' L. W. Yt. ? Wire 1 f♀.

$^{15/6}$ 1905 St. 82 51°00' L. N. 11°43' L. W. Yt. 1200 M. Wire 6 f♀ (1 with spermatophor), 1 y♀ (V).
800 M. Wire 1 f♀.

$^{20/6}$ 1905 St. 88 48°09' L. N. 8°30' L. W. Yt. 300 M. Wire 2 f♀, 2 y♀ (V), 1 y♂ (V).

Remarks. This species, of which I was not able to find any description in the literature, is nearly related to *E. messinensis*; in the shape of the head it provides some similarity to Giesbrecht's rather imperfect description of *E. galeata*, but his fig. 22 (Taf. 36) of the genital somite is very different.

37. *Undeuchæte minor* Giesbr.

(Pl. V figs 3 a—g; text-figs 35 a—g.)

1856? <i>Undina plumosa</i> n. sp. Lubbock, p. 18, pl. IX figs 3—5.	1904. <i>Undeuchæte minor</i> Giesbr. Cleve p. 198.
1883♀. <i>Euchæte pulchra</i> Lubb. Brady, pp. 63—64, pl. XIV figs 6—9.	1905. — — — Esterly, p. 149, fig. 17.
♂? — <i>australis</i> n. sp. Brady, p. 65, pl. XXI figs. 8—9	— — — Farran, p. 35.
1889. <i>Undeuchæte minor</i> n. sp. Giesbrecht, p. 335.	— — <i>australis</i> Brady. G. O. Sars, p. 4.
1892. — — Giesbr. — p. 228, pl. 14 and 37.	1906. — — <i>minor</i> Giesbr. Pearson, p. 15.
1893? <i>Euchæte australis</i> Brady Th. Scott, p. 58, pl. VI fig. 23.	1907. — — — G. O. Sars, p. 3.
1895. <i>Undeuchæte minor</i> Giesbr. Giesbrecht, p. 251.	1908. — — — Farran, p. 37.
1896. — — — Canu, p. 424.	1908. — — — v. Bremen, p. 44, fig. 50.
1898. — — — Giesbrecht & Schmeil, p. 34.	1909. — — <i>plumosa</i> Lubb. A. Scott, pp. 62—63, pl. XXII figs 1—8.
1903. — — — Thompson & Scott, p. 244.	1911. — — <i>minor</i> Giesbr. Wolfenden, p. 244.
1904. — — — Wolfenden, p. 111.	

Description. f♀. Size of specimen from St. 88 was 4.65 mm.; anterior division 3.68 mm.; urosome 0.97 mm. Giesbrecht's specimens measured 3.2, Farran's 4.2, and A. Scott's 3.5—4.5 mm.

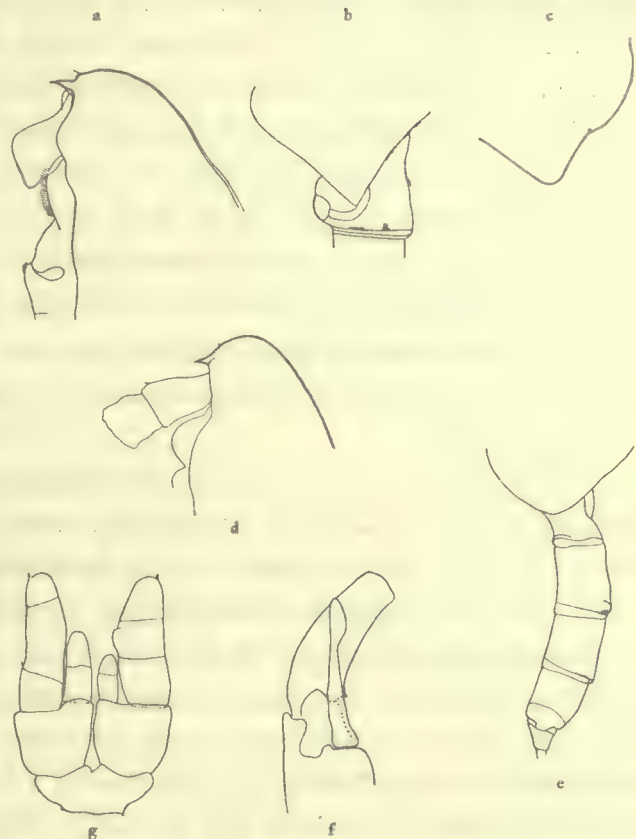
The strong and short rostrum (text-fig. 35 a) is directed forwards and downwards. The lateral corner of the thorax is triangularly pointed on the left side and rounded on the right (text-figs 35 b—c). The first abdominal somite is as described by Giesbrecht asymmetric, and possesses on the right side, dorsally, a strong curved spine; on the left side at the posterior margin we find in most specimens two vertical rows of from 4—10 teeth, placed the one above the other; on the right side a more regular row of teeth is observed. The structure of the vulva seems to be rather simple (fig. 3 a). Only in a single specimen was there found on the left side of the third abdominal somite near the hinder margin a structure somewhat like the hairy cumulus, which was figured (Taf. 37 fig. 55) by Giesbrecht. In a single specimen a moderately long slender seta was observed in Re I of the *antennae*. In the lobe IV of the second basipodite in the *maxillipeds* no sensory process was observed. The *first pair* of legs has no Se Re I, but Se Re II extends almost to the base of Se Re III; the articulation between Re I and II is fairly well marked except anteriorly and medially. The lateral margin of Re II has a glandular pore near the base of Se Re II, and that of Re III has one placed near base. The Se Ri I has a well developed accessory tooth in pes II, and a somewhat smaller one in pes IV; the inner margin of the second basipodite is smooth in the fourth pair of legs. Glandular pores were found in Re II and in Re III at the base of Se 3, and in pes III—IV as well in Re I.

The lateral outline (text-fig. 35 a) of the *labrum* is somewhat similar to that of *Euchæte*. Behind the transverse chitinous list, which is placed somewhat behind the insertion of the antennulae, a low hairy elevation is found; this is separated by a depression from the well raised labrum proper.

On the said elevation a median group of long setae and on each side lateral ones of short setae are observed. Along the posterior margin of the labrum long setae are placed in the middle, and shorter spine-shaped ones laterally. The oral surface of the labrum is very similar to that of *U. major* (cf. fig. 2 a), but the number of setae in the first group is somewhat larger. The *lamina labialis* and the two series of setae in front of it are in the main like fig. 2 b, but the number of setae is larger; the arrangement of hairs on the labial lobes and behind is similar to fig. 1 c.

f♂. Size of specimen from Thor St. 90 was 3.93 mm.; anterior division 2.89; urosome 1.04 mm. A. Scott's specimens measured 3.2—3.6 mm.

The rostrum is straight and directed directly downwards; the head is raised but has no frontal



Text-fig. 35. *Undeuchate minor* Giesbr.

a. f♀. Head × 33. b—c. f♀. Left and right lateral corner × 33. d. f♂. Head × 39. e. f♂. Abdomen × 39. f. f♂. Pes V. Ri sin × 59. g. y♂ (St. V) Pes V in ant. view × 59.

keel. The body is rather slender and in dorsal view somewhat attenuated towards the front; the lateral corners are rounded (text-figs 35 d—e). The *abdomen*, which is at least one third as long as the anterior division, is long and slender. The genital opening is placed on the left side; the fifth somite is scarcely visible from above; the caudal rami are short (only half as long as the fourth somite, rounded and about as long as wide). The terminal setae are distinctly longer than the abdomen, and the Si is one fourth as long as St. 2.

The *antennulae* extend about to the end of the third abdominal somite; the segments 8 ∞ 9 are partly fused with 10, and 12 with 13, but the segments 20 and 21 are well separated on both sides. The measurements are very like those of the female; the appendages are practically like those of *Aetidius*. The *antennae* are scarcely different from those of the female; the manducatory part of the *mandibulae* is well developed and rounded, but soft-skinned, without any teeth, while the terminal setae of the palps are more powerful than in the female. The *maxillulae* have no setae in Li 1—2, but 3 in Li 3; the number of setae in the third basipodite and the Ri is as in the females, but they are more slender. The Re has 10 powerful setae, which were all of equal length. The *maxillae* form an angle-shaped soft-skinned organ, in which distally soft-skinned, irregular twisted appendages are found. In the second basipodite of the *maxillipeds* two setae are found in the fourth lobe; the third basipodite is enlarged basally, and attenuated towards the end; the setae of the endopodite are fewer in number and less powerful.

The *first pair* of legs has a well developed articulation between Re I—II, and the Se Re II is short and strong, and far from reaching the middle of following segment; in other respects the natatory legs are scarcely different from those in the female.

The *right leg* of the *fifth pair* (fig. 3 b) has a short second basal segment, which is fused with the corresponding one of the left side, and is strongly produced outwards, and a much longer and wider third basal segment. The right endopodite (fig. 3 e), which extends to the end of Re I ∞ II, is rather elongated, distally slightly curved and, as shown in fig., somewhat hollowed; its anterior surface is distinctly striated, and marginally we observe a basal tooth, followed by a distinct striated keel, which is most elevated in the middle (figs 3 c and e). The Re I ∞ II of right leg, which are almost completely fused (figs 3 c—d), have in the proximal part the inner surface striated, and the outer one mounted with a few rounded rudimentary teeth, followed by an elongated lamina, and lastly a distinct tooth; the distal portion (Re II) is somewhat attenuated, and has medially a somewhat contorted, irregular lamella; the R III, which is comparatively short, has its inner surface somewhat excavated, and has the posterior inner margin lamellous. The *left leg* (fig. 3 b) has a short second basal segment, but a long and wide third one; the left endopodite (text-fig. 35 f) is long and slender, reaches distinctly beyond the middle of Re (not seen in fig. 3 b), is widest at the base and is distally enlarged to a rounded lamella (text-fig. 35 f). The left exopodite has a fairly short, somewhat curved Re I, a rather short Re II which terminally possesses a strong spine bearing a basal accessory tooth (fig. 3 f), and a moderately long Re III, which possesses a long terminal seta and a group of fairly long setae anteriorly and interiorly; the last segment is laterally connected with the Re II by a real articulation, but medially by a wide, soft membrane of a somewhat complicated structure.

Y♂ (St. V). Size of specimen from Thor St. 88 was 3.16 mm.; anterior division 2.51 mm.; urosome 0.65 mm.

In the shape of the body etc. it is scarcely different from the adult female, but the lateral corner of the thorax is more pointed, showing, however, a similar difference between a more pointed left and a more rounded right corner. In one of five females a strong spine, similar to that of the adult, directed upwards and slightly backwards was found dorsally near the posterior margin of the first abdominal somite on the right side; in two other specimens the spine was represented by a single tooth, or a few only; along the posterior margin of the second abdominal somite no short teeth were found. The appendages are in the main like those of the adult females; the Re of the maxillulae possess as usual only 10 setae, of which the median are the shortest; the Se of Re II pes I is shorter than in the adult female, but longer than in the adult male, reaching somewhat beyond the middle of the following segment. The male is always easily distinguished from the female by the presence of a rather short and clumsy *fifth pair of legs*, of which the left is the longer (text-fig. 35 g).

Occurrence. The Ingolf Expedition has taken 2 females, of which one with spermatophore.

¹²/₅ 1896 St. 47 61°32 L. N. 13°40 L. W. V¹ 100—0 fathoms. Temp. at surf. 10.6° C.

The Thor has gathered it at the following stations:

- ¹¹/₇ 1904 St. 183 61°34 L. N. 18°43 L. W. Yt. 1800 M. Wire 7 f♀.
¹⁵/₆ 1905 St. 82 51°00 L. N. 11°43 L. W. Yt. 1200 M. Wire 3 f♀, 1 f♂.
²⁹/₈ 1905 St. 164 61°20 L. N. 11°00 L. W. Yt. 300 M. Wire 1 f♀.
⁸/₆ 1905 St. 72 57°52 L. N. 9°53 L. W. Yt. 1500 M. Wire 11 f♀ (one with 4 sp.).
²⁰/₆ 1905 St. 88 48°09 L. N. 8°30 L. W. Yt. 300 M. Wire 90 f♀ (35 with sp.), 2 f♂, 4 y♀ (V), 6 y♂ (V).
¹/₆ 1905 St. 90 47°47 L. N. 8°00 L. W. Yt. 300 M. Wire 125 f♀ (85 with sp.), 36 f♂, 3 y♀, 5 y♂.

Distribution. This species seems to have a world-wide distribution. It has been recorded from the warm area of the Færoe-Shetland channel, from the west coast of Ireland as far north as 54° L. N. "at depths of from 400 to 1100 fathoms". It has been taken by the Monaco Expedition and by the Gauss Expedition in the Mid- and South Atlantic as far south as 35° L. S. By the Siboga Expedition it was found rather common in the Malay Archipelago; it was recorded by Giesbrecht from the Pacific (6°20 L. N. 166—173 L. E.) and by Esterly from the Bay of California.

Remarks. In spite of a few minor differences I am fairly convinced that this species is identical with that described by Giesbrecht. Though Scott's fig. 8 Pl. XXII is wanting in details I think his male is identical with that described here. Scott is possibly right in identifying Lubbock's *Undina plumosa* with this male, in spite of minor differences, especially in the structure of the right fifth foot, which may, however, be due to a mistake; as Lubbock's description is rather incomplete, I do not at present accept the name *U. plumosa*.

I think Scott is right in referring the female of Brady's *Euchæte pulchra* Lubb. to *U. minor*. As far as I understand Scott, he refers Brady's *Euchæte pulchra* ♀ and his *E. australis* ♀ to the same species, but when we compare Brady's fig. 5 Pl. 21 and fig. 6 Pl. 14, it is easily realised that the two animals are probably not identical, especially on account of the different shape of the genital somite. I

think the similarity with the other species of this genus, as pointed out by Giesbrecht as far as *U. major* is concerned, is better marked, but it may just as well be a species not yet rediscovered. A. Scott also regards the male of Brady's *E. australis* as identical with this species, and so does Sars; Brady's figs 8–9 Pl. XXI show that it belongs to an *Undeuchæte*, but is far too incomplete for the drawing of further conclusions.

38. *Undeuchæte major* Giesbr.

(Pl. V figs 2 a–d; text-fig. 36).

1883? ♀. <i>Euchaeta australis</i> n. sp. Brady, p. 65, pl. XXI figs 5–11.	1905. <i>Scolecithrix cristata</i> Giesbr. Farran, p. 35.
1888. <i>Undeuchæte major</i> n. sp. Giesbrecht, p. 335.	1903. ♀. — — — Esterly, pp. 147–148 fig. 16.
1892. — — — Giesbr. Giesbrecht, p. 227, pl. 37.	1905. <i>Chirudina angulata</i> n. sp. G. O. Sars, p. 13.
1895. — — — — — p. 251.	1906. <i>Undeuchæte major</i> Giesbr. Pearson, p. 15.
1898. — — — — — Giesbrecht & Schmeil, p. 34.	1907. — — — — — G. O. Sars, p. 3.
1900. — — — — — J. C. Thompson, p. 278.	1908. — — — — — Farran, p. 37.
1903 ♂. <i>Scolecithrix cristata</i> Giesbr. J. C. Thompson, p. 21, pl. III figs 1–5.	1908. ♀. — — — — — v. Breemen, p. 43, fig. 49.
1904. — — — — — Wolfenden, p. 111.	1909. — — — — — A. Scott, pp. 61–62.
1904. — — — — — Cleve, p. 198.	1911. — — — — — Wolfenden, p. 243.

Description. ♀. Size of female from Thor St. 90: 4.92 mm.; anterior division 3.91; urosome 1.04 mm. Giesbrecht's specimens measured 4.5 mm. and Scott's 4.8–6.4 mm.

The lateral corners of the thorax are asymmetrical in a similar way as in *Und. minor*; on the left side it is triangularly pointed, more so than shown in Giesbrecht's fig. 5a (Taf. 37); on the right side it is more rounded, and bears a small conical process just in front of the end. The oblique hinder margin has two groups of short spines.

The *antennulae* are like Giesbrecht's description, but the measurements are somewhat different; the segment 17, f. inst., is scarcely, not distinctly, twice as long as the segment 12. The mouth-appendages are scarcely different from Giesbrecht's description. The *natory legs* differ in a few minor points from those of *U. minor*; the Se Re II in the first pair of legs extends somewhat beyond the middle of Re III, but does not reach the end of it; the accessory tooth of Se Ri I of pes II, which was just indicated in the preceding species, is fairly distinct. The inner margin of the second basipodite of the *fourth pair* of legs is not quite smooth, but finely undulated, and the posterior surface possesses near margin just above the insertion of Si from one to four closely placed short spines.

The *labrum* is in lateral view like that of the preceding species. The oral surface of the labrum (fig. 2a) shows a structure similar to that of *Chiridina Streetsi* (fig. 4 b), though less complicated; the *first group* consists of about 25 short hairs, placed in an oblique row; the *second* to the *fifth groups* possess a regular median row and a more or less irregular lateral portion. The transverse rows of setae are very regular. The chitinous framework is well developed. The *lamina labialis*, as seen in fig. 2 b, is distinctly divided into three divisions, and is distinctly striated; in front of the lamina a median slightly curved series of about 20 setae is found, and a lateral one of numerous setae, of which the posterior ones are rather delicate. Behind the lamina 4 spinous areas are found on each side, of which the first one is almost obsolete. The arrangement of the setae upon and behind the labial lobes differs from that of following species by the comparatively few and long setae in the second series.

f♂. Size of specimen from Thor St. 90 4.92 mm.; anterior division 3.59 mm.; urosome 1.33.

The head is, as in the female, mounted with a distinct frontal keel; the body is more slender than that of the female and even more so than that of the preceding species. The lateral corners are regularly rounded. The St. 2 of the caudal ramus is longer than the urosome. The *antennulae* extend about to the middle of the abdomen. The mouth-limbs are like those of the preceding species, but soft-skinned, short rounded appendages were observed in the Li I—II of the maxillulae, and the appendages of the maxillae are better developed. The *pes I* shows the same difference as in *U. minor*, and the second basipodite of the fourth pair of legs is smooth.

The *fifth pair* of legs differs from that of *U. minor* by a few features only; the inner margin of the Ri dext. (fig. 2 c) has basally a distinct tooth, followed by a lamina with a distinct process in the middle, in shape different from that of the preceding species; the outer margin of Re I dext. has a rather low keel, but no distinct teeth. The Re III sin. (fig. 2 d) differs by shorter terminal seta and by the different arrangement of the setae. The left endopodite is more slender (text-fig. 36).



Text-fig. 36.
Undeuchæte
major Giesbr.
f♂. Pes V sin.
× 59.

Y♀ (St. V). Size of female from Thor St. 82 4.95 mm.; anterior division 3.91 mm.; urosome 1.04 mm.

The shape of body with the frontal keel is scarcely different from that of the adult female.

The Se Re II in the first pair of legs is not shorter than in the female; the inner margin of the second basipodite in the fourth pair of legs is completely smooth.

Occurrence. The S/S Thor has gathered this species at three stations only:

¹⁵/₆ 1905 St. 82 51°00 L. N. 11°43 L. W. Yt. 1200 M. Wire 1 f♀ (with sperm.), 2 y♀ (V).

²⁰/₆ 1905 St. 88 48°09 L. N. 8°30 L. W. Yt. 300 M. Wire 55 f♀ (13 with sp.).

²¹/₆ 1905 St. 90 47°47 L. N. 8°00 L. W. Yt. 300 M. Wire 25 f♀ (5 with sp.), 5 f♂.

Distribution. This species was recorded by Farran "on every station of from 350 to 1000 fathoms and in 16 out of 34 gatherings, generally in moderate numbers" on the west coast of Ireland as far north as 54° L. N. It has been met with during the Prince of Monaco's cruises in the East Atlantic and was recorded as rather numerous at several stations in the South Atlantic even south of Africa at about 40° L. S. 35° L. E. by the Gauss Expedition.

It has been recorded by Esterly from the Gulf of California, by Giesbrecht from the Pacific (L. N. 20 L. E. 173) and by Scott from the Malay Archipelago.

Remarks. In spite of the few differences enumerated above, I do not doubt that my Atlantic specimens are identical with Giesbrecht's from the Pacific.

A. Scott is certainly right in determining the male referred by Esterly to this species as a species of *Euchæte*, as well as in regarding the male of Thompson's *Scolecithrix cristata* as belonging to this species.

39. *Undeuchæte superba* n. sp.

(Pl. IV figs 6 a—b; Pl. V figs 1 a—c; text-figs 37 a—f.)

Description. f♀. Size of specimen from Thor St. 183 was 6.42 mm.; anterior division 5.11 mm.; urosome 1.31 mm.

A rounded, rather low, but fairly prominent frontal keel is found; the undivided rostrum is short, but strong (text-fig. 37 a). The head and the first tergite are fairly well separated; the fourth and fifth

thoracic tergites are completely fused. The right lateral corner of the thorax (Pl. V fig. 1 a) is fairly regularly rounded and somewhat shorter than the left one, which is triangularly produced and sometimes shows trace of bifurcation (fig. 1 b).

The abdomen is about one fourth of the anterior division; the genital somite is a little deeper than wide and long; on the right side it has a strong, fairly long spine, directed upwards and backwards (fig. 1 a; text-fig. 37 b); in the middle it is strongly produced, and has on the right side of the vulva a strong spine directed backwards. Along the hinder margin of the third somite ventrally short triangular teeth are found; they seem to be wanting in the other somites. The caudal rami are distinctly wider than long; the terminal setae are at least as long as the abdomen, and the Si is one third as long as St. 2.

The *antennulae* extend almost to the end of the fourth abdominal somite. The Re of the *antennae* is 1.7 as long as the Ri. The *maxillulae* have in Le the S 1—3 of moderate length, the S 4 somewhat longer and the S 5—9 much longer, but of almost equal length; the Re has, as in the two preceding species, the median setae distinctly shorter than the others, but not in so marked a degree. The *maxillipeds*, in which the comparative length between Basp. 1 \approx 2, Basp. 3 and Ri is as 30—52—13, have the setae of Ri even better developed than in the preceding species, so far resembling the corresponding limbs of *Euchæte*. The *mandibulae* and *maxillae* are scarcely different from those of *U. major*.

The *first pair* of legs has the articulation between Re I and II almost obsolete; the Se Re II extends distinctly beyond the middle of Re III, but scarcely to the end of it. The *second pair* of legs has a fairly well developed accessory tooth in Se Ri I (text-fig. 37 c), and the St. has 45—50 serrations. The Se of Ri I in the *fourth pair* of legs has a distinct pointed accessory tooth, even better developed than the more rounded one in pes III; the inner margin of Basp. II is somewhat undulated, and has on the posterior surface, in a similar position as in the preceding species, five short spines (text-fig. 37 d). The glandular pores are as in the other species.

The anterior coecal sac seems to be wanting. The lateral outline of the *labrum* is not quite like that of the two preceding species; the anterior elevation, which on each side possesses about two groups of long slender hairs, forms an obtuse angle with the labrum proper; this is on each side in front beset with a small number (about 50) of short hairs.

The oral surface of the *labrum* is like that of *U. major* (fig. 2 b Pl. V), but shows similarity to that of *Ch. Streetsii* by a larger number of setae; the lateral group of setae, f. inst., consists of 30—40 short spines, and the first group of the longitudinal series has two instead of a single row. The *lamina labialis* and the area in front of it are scarcely different from those of the preceding species. The series of hairs behind and upon the labial lobes is rather characteristic as shown in fig. 1 c (Pl. V). The series I consists of a single oblique row laterally placed; the series II is represented by a large median and posterior group of short hairs; the series III seems to be represented by a fairly big group in the middle, almost fused with the corresponding portion of the opposite side, by a more lateral group partly fused with the fourth group and by two oblique rows on the labial lobe; the series IV consists of a median group fused with the third and fifth series, and of a rather short row on the labial lobe; the fifth series consists of a median group and a lateral row.

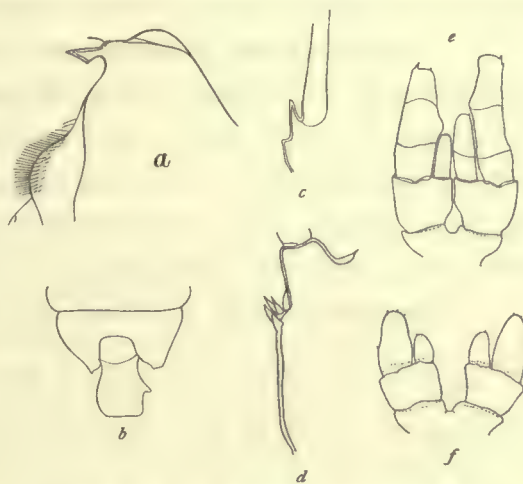
f♂. Size of specimen from Thor St. 183 was 5.35 mm.; anterior 4.08 mm.; urosome 1.27.

The rostrum and the frontal keel are scarcely different from those of the adult female. The body is more slender, and the lateral corners are rounded and symmetrical. The abdomen is scarcely different from that of the two preceding species. The *antennulae* extend about to the end of the third abdominal somite, and are also in other respects similar to those of the preceding species. The *antennae* are practically like those of the female, but in the Re I a small conical process was observed medially, apparently bearing a delicate seta. The manducatory portion of the *mandibulae* possesses posteriorly one or two rudimentary teeth. The *maxillulae* have short soft appendages in Li 1—2; the Le has 2 short and 6 long setae, and the 10 setae of the Re are as usual in the male not shortest in the middle; the Li 3 has 3 setae, and the Basp. as well as Ri have a similar number of setae as in the female, but they are softer. The *maxillae* and *maxillipeds* are scarcely different from those of the preceding species. The *first pair* of legs has as usual a well developed articulation between Re I—II, and the Se Re II is comparatively short; the pes II—IV are scarcely different from those of the females.

The *right leg* of the *fifth pair* has the basal segments like those of the preceding species (cf. fig. 3 b Pl. V). The right endopodite is in general shape very much like that of *U. minor* (figs 9 a—b Pl. IV, cf. fig. 3 e Pl. V); it is terminally somewhat curved and has here lamellar margins, turned over to establish a gutter-shaped excavation facing forwards and outwards. Outwards and backwards a well developed conical tooth is found near the base, and beyond this, removed one third of the length of the segment from the base, another striated tooth or elevation is found, which really forms the middle of the marginal, here scarcely indicated, keel present in the two other species; the anterior

surface of the endopodite is distinctly striated. The first segment of the right exopodite (figs 6 a—b) is basally and in front produced into a wing-like expansion bearing three serrations, which are followed by a low keel and, somewhat more distally, a well developed tooth, where in the typical specimen a soft-skinned parasite, divided into three globules as seen in figs, is fastened; the second segment, which is almost completely fused with the first, has distinct marginal lamelli-form expansions; the third segment is elongated, somewhat attenuated and includes a gutter-shaped excavation facing inwards.

The basal segments of the *left leg* are in main features like those of the preceding species; the left endopodite, which extends distinctly beyond the middle of Re I, is elongate and attenuated with undulated margin; the first segment of the exopodite is less robust and somewhat shorter than the third basipodite, and somewhat convex; the second segment is short, about 1.5 as long as the strong curved tooth, which has a distinct accessory tooth; the third segment is similar to that of the preceding species, but the terminal spine is distinctly articulated.



Text-fig. 37. *Undeuchate superba* n. sp.
 a. f♀. Head \times c. 30. b. f♀. Abdomen \times 9.
 c. f♀. Pes II Ri I sin in ant. view \times 150. d. f♀.
 Pes IV basipod. II in post. view \times 150. e. y♂
 (St. V). Pes V ant. view \times 33. Y♂ (St. IV). Pes V
 ant. view \times 59.

The elevation in front of the labrum is well developed but smooth. The *labrum* is rudimentary without distinct setae, and so is the area labialis; both are soft-skinned with ringed chitin. Laterally we observe one to two groups of very short hairs.

Y_♀[♂] (St. V). Size of female from St. 167 Thor 1905 was 4.77 mm.; anterior division 3.80 mm.; urosome 0.97 mm. A male from the same station measured 4.88 mm.

Shape of body, but for four abdominal somites and more triangularly pointed lateral corners of the thorax, is like that of the adult female. The Re I of the antennae apparently bears a setigerous process like that of the adult male; the other appendages do not show features of interest.

The only difference between the males and females is found in the presence of the fifth pair of legs, which, as shown in text-fig. 37 e, has a rather characteristic structure.

Y_♀[♂] (St. IV). Size of male from St. 183 was 3.28 mm.; anterior division 2.70 mm.; urosome 0.58 mm. Size of female from the same station 3.1 mm.

The frontal keel is lower, and the lateral corners of the thorax are less pointed. The mouth-appendages do not show features of great interest. The Re II ∞ III of the second pair of legs are fused, have only 3 Se but the usual number of Si; a glandular pore is only found in Re III at the base of Se 3; the fourth pair of legs has also a glandular pore in Re I, and has the inner margin of the second basipodite smooth. The only difference between the male and female is found in the presence of a fifth pair of legs with undivided Re and Ri as shown in text-fig. 37 f.

Occurrence. The S/S Thor has taken a few specimens of this species at several stations.

19/6 1904	St. 152	65°00 L. N.	28°10 L. W.		1 f♀ (with sperm.), 1 f♂, 1 y♂ (V).
21/6 1904	St. 154	65°27 L. N.	27°10 L. W.		1 f♀ (with sperm.).
10/7 1904	St. 180	61°34 L. N.	19°03 L. W.	Yt. 400 M. Wire	2 f♀ (with sperm.).
1/9 1904	St. 285	62°49 L. N.	18°46 L. W.		1 f♂.
11/7 1904	St. 183	61°30 L. N.	17°08 L. W.	Yt. 1800 M. Wire	11 f♀, 2 f♂, 1 y♀ (V), 6 y♂ (V), 1 y♀ (IV), 1 y♂ (IV).
25/5 1904	St. 104	62°47 L. N.	15°03 L. W.		1 f♀.
2/9 1904	St. 286	61°49 L. N.	14°11 L. W.		2 f♀, 1 y♂.
29/8 1905	St. 165	60°00 L. N.	10°35 L. W.		1 f♀.
22/5 1904	St. 99	61°15 L. N.	9°35 L. W.		1 f♀.

Outside the Ingolf area the species has been taken

15/6 1905	St. 82	51°00 L. N.	11°43 L. W.	Yt. 1200 M. Wire	1 f♀.
31/8 1905	St. 167	57°46 L. N.	9°55 L. W.	Yt. 1500 M. Wire	1 f♀, 3 f♂, 1 y♀ (V), 1 y♂ (V).
8/6 1905	St. 72	57°52 L. N.	9°53 L. W.	Yt. 1500 M. Wire	6 f♀, 1 f♂, 2 y♂.

Remarks. As this species was found not only in the Atlantic south of Iceland, but also in Denmark Strait and in the Iceland-Færoe channel, while it was wanting in some of the more southern stations in which the two other species were found, it is possibly a more northern form.

It belongs naturally to the same group as *U. minor* and *major*, though it is well distinguished from both by combining the right lateral spine of the genital somite and the ventral spine on the

right side of the vulva, as well as by the frontal keel and by the teeth on the second basipodite of the fourth pair of legs.

This species is even more related to two newly established species, but if the descriptions are correct, it is scarcely identical with them.

From *U. intermedia*, which was described by A. Scott (1909 p. 63—64; Pl. 23 figs 1—8), it differs by a distinctly raised forehead between the rostrum and the keel, by the different shape and direction of the two characteristic spines of the genital somite, as well as by a few other characters. From Wolfenden's *Mesundeuchaete assymetrica* (1911 pp. 244—245; Taf. 29 figs 4—7; text-fig. 28) from the South Atlantic, which it is very much like in dorsal view, it differs by the structure of the vulva, as the right spine is wanting in Wolfenden's species. To encompass these species he established a new genus on account of the teeth of the posterior surface of the second basipodite of pes IV; as the presence of such spines (cf. *Aetidius* Pl. II fig. 1 c), even if they are often wanting, is a rather characteristic feature in the *Aetidiidae*, and as such spines are found in *U. major* as well, the foundation is rather too weak. When all the structural features of males as well as of females are taken into consideration, it is quite evident that the five species go naturally together.

40. *Chirudina Streetsii* Giesbr.

(Pl. V figs 4 a—f; Pl. VIII figs. 5 a—b; text-figs 38 a—k.)

1895. <i>Chirudina Streetsii</i> n. sp. Giesbrecht, pp. 249—250; taf. I figs 5—10.	1906. <i>Chirudina Streetsii</i> Giesbr. Pearson, p. 16.
1898. — — Giesbr. Giesbrecht & Schmeil, p. 34.	1906. — — — Esterly, p. 59, pls 9, 10, 12, 14.
1902 nec. <i>Euchirella carinata</i> n. sp. Wolfenden, pp. 366—367.	1908. — — — Farran, p. 37.
1904? — — — Wolf. Wolfenden, pp. 115—116.	1908. — — — v. Bremen, p. 46.
1904. <i>Chirudina Streetsii</i> Giesbr. Cleve, p. 187.	1909. — — — A. Scott, p. 43, pl. XII figs 1—11.
1905. — — — G. O. Sars, p. 4.	1913. — — — Wolfenden, p. 241.

Description. f♀. Size of specimen from Thor St. 72 was 5.22 mm.; anterior division 4.18; urosome 1.04 mm. Giesbrecht's specimens measured 5.3 mm. Scott's specimens measured 4.8—5.3 mm.

The frontal keel and rostrum are well developed, as seen in text-fig. 38 a; dorsally there is trace of articulation between the head and the first thoracic somite; the fourth and the fifth thoracic tergites are completely fused, except dorsally, where trace of segmentation may be found. The lateral corners vary very much in the different specimens; they are more or less rounded, but mounted with a pointed process, which is sometimes almost wanting, especially on the right side (text-figs 38 b—e), but is sometimes well developed. The genital somite is in dorsal view slightly asymmetrical, as the right outline is more regularly rounded than the left; the genital area (fig. 4 a), looked at from beneath, is very similar to that of *C. pustulifera*, but observed from the side, a fairly prominent anterior protuberance and a short, sometimes completely covered, posterior one are seen.

The *antennulae* extend about to the base of the furcal branches; the segment 19, which is the longest segment, is about 1.1 as long as 20, which is again longer than 17, the latter being about 1.1 as long as 16; the segment 16 is 1.1 as long as 24 ~ 25. The exopodite of the *antennae* is 1.5 as long as the endopodite; the second segment of the endopodite has 7 + 7 setae; the first segment of the exopodite, which is well defined and about one third as long as the second, has a well devel-

oped setigerous process inwards, and the second segment has a similar one at the base in addition to ones sitting in the middle as well as terminally (text-fig. 38 f). The *mandibulae* and *maxillulae* do not show any features which were not mentioned in Giesbrecht's description. The *maxillae* are very much like fig. 5 c of *Ch. abyssalis*. The third basipodite of the *maxillipeds*, which is almost twice as long as the Basp. 1 \approx 2 and distinctly three times as long as the Ri, has along the exterior margin almost

from base to tip on the posterior surface a low transparent lamella with a distinct concavity in the middle; the fourth lobe of the second basipodite is placed posteriorly, and has a fairly long sensory lobe surrounded by slender hairs, in addition to three setae (text-fig. 38 g); anteriorly, and somewhat removed from the tip, a rounded protuberance is found in the second basipodite, probably corresponding to that of *E. curticauda*. The first pair of legs has the inner margin of the last basipodite slightly convex, as seen in text-fig. 38 h; the Se of Ri I has no accessory tooth in the second pair of legs, and no trace of it in the third and fourth pairs (text-fig. 38 i); the inner margin of the second basipodite in



Text-fig. 38. *Chirudina Streetsii* Giesbr. f♀.

a. f♀. Head \times 30. b. f♀. Abdomen \times 18. c. f♀. Lateral corner from the right side \times 18. d-e. f♀. Left lateral corner \times 18. f. f♀. Antenna sin. Re \times 57. g. f♀. Maxillipes dext. in post. view \times 57. h. f♀. Pes I sin. \times 57. i. f♀. Pes IV sin. \times c. 20. j. y♀ (St. V). Left lateral corner \times 18. k. y♂ (St. V). Pes V in anterior view.

the fourth pair of legs is in most specimens completely smooth, but in some has one or two short stiff hairs corresponding to Giesbrecht's "spärlichen kurzen Spitzen". The glandular pores are like those of *Undeuchæte*. The elevation in front of the *labrum* is smooth and fairly well raised; along the posterior margin the *labrum* proper has as usual a median row of long and slender hairs divided into a right and a left part, and a lateral shorter one, of more spine-shaped setae. The oral surface of the *labrum* (fig. 4 b) is like that of *Undeuchæte*. The first group of the longitudinal series is placed obliquely, and consists of about ten fairly strong setae; the second group consists of two rather inde-

pendent parallel rows; the *third group* as well as the *fourth* and *fifth* has the inner rows of setae in each group fairly well separated, but has the more laterally placed hairs of each group rather irregularly placed. Behind and laterally to the fifth group on each side a large number of very delicate hairs are found. The lateral group in front consists of numerous delicate short hairs. The transverse series around and behind the median circular spot Nr. 4 is shown in fig. 4 b.

The *lamina labialis* is minutely granular and, as seen in fig. 4 c, laterally prolonged backwards; the lateral series in front consists, except posteriorly, of a single row; the medial series, in front of which a minutely granular area is found, is fairly long.

The arrangement of the series of hairs behind and upon the labial lobes is the following (fig. 4 d): the *first series* is almost longitudinal and consists of 10 hairs; the *second series* consists of a group of about 10 hairs; the *third series* consists of two well separated transverse rows, well removed from the longitudinal row upon the labial lobe; in front of the two mentioned transverse rows 2 others are observed, which probably belong to the *fourth series*; this is well developed upon the lobe and has proximally a large group of numerous hairs, partly belonging to the *fifth series*, which medially has a transverse row. In at least one of the specimens several of the hairs are slightly clavate. Behind the transverse line which separates the mandibular and maxillular somites, groups of hairs, as shown in fig. 4 d, are found.

A short but distinct frontal coecal sac is found.

f♂. Size of specimen from Thor St. 88 was 3.80 mm.; anterior division 2.83 mm.; urosome 0.97. Scott's specimen measured 4.1 mm.

The frontal keel and the rostrum are (as seen in Pl. VIII fig. 5 a), somewhat different from those of the female. The body is rather slender and attenuated towards the front, but less so towards the end; the lateral corners are rounded. The anterior division is 3.8 as long as the abdomen, which has the genital opening on the left side and short triangular teeth along the hinder margin of the second to fourth somites. The *antennulae* extend scarcely to the middle of the abdomen; the segments 8 & 9 are almost completely fused with 10 and 12 with 13, but the segments 20 and 21 are well separated on both sides. The exopodite of the *antennae*, which is 1.4 as long as the endopodite, has in the first segment a single process without setae, and in the second 2 basal processes and a single terminal one. The soft-skinned manducatory part of the *mandibulae* has a single well developed tooth and a few rudimentary ones, and the Ri 2 has 9 Sa, but not, as in female, a Sp.

The *maxillulae* possess at least 6 soft sensory (?) appendages in Li 1; the Li 2 was wanting, but in Li 3 at least 3, in Basp. 3 at least 3, and in Ri at least 11 setae were found. The Re has 10 well developed plumous setae in addition to a delicate interior one, and Le has 2 short, delicate, basal setae in addition to 5 distal, long ones. The *maxillae* (Pl. VIII fig. 5 b) have 5 well developed lobes, of which the fifth one bears a big twisted seta with enlarged base; the endopodite has at least 5 setae. The *maxillipes* is more clumsy than that of the female, in shape resembling that of the males of *Undeuchate*; the third basipodite is 1.3 as long as the two first ones and 2.5 as long as Ri; the lob. IV of the second basipodite has a long, slender seta and a rather short, curved, spine-like one in addition to the usual conical one.

The *first pair of legs* differs from that of the female by the very short Se of Re I; the Se of

Ri I in the *third pair* of legs has a fairly distinct accessory tooth, but in other respects scarcely any difference was observed between the natatory legs of the male and female.

The *fifth pair* of legs is in general structure most like that of *Undeuchæte minor* (Pl. V fig. 4 e), to the description of which I partly refer. The right endopodite is about as long as the first segment of the exopodite, enlarged distally and here gutter-shaped; on the posterior surface near the base a short tooth was observed, and along the outer margin a short and low lamina. The first and second segments of the right exopodite are completely fused, and have in the middle an obtuse angle open outwards; the outer margin has proximally two large teeth and a smaller one, and the posterior surface has, near the end, one or two raised keels; the third segment of the exopodite is gutter-shaped, like that of *Undeuchæte* s. s., but has a terminal, well articulated seta, two thirds as long as the segment.

The third basipodite of the *left leg* has inwards near base a blunt tooth; the *endopodite* is slender, projects beyond the end of the first segment of the exopodite, and it distally somewhat hollowed; the second segment of the exopodite is rather short, has the inner surface distinctly hollowed, and has inwards near the end a strong, rather short spine with a blunt accessory tooth as well as a rounded process; the third segment of the left leg (fig. 4 f) is similar to that of *Undeuchæte*, but is less slender, and possesses a short bristle in addition to the terminal setae, which are distinctly half as long as the segment.

$Y_{\text{♀}}^{\text{♂}}$ (St. V). Size of female from Thor St. 88 was 4.0 mm.; anterior division 3.15 mm.; urosome 0.85 mm. A male measured 4.02 mm.

The shape of the body is in the main like that of the adult male, but the frontal crest is somewhat lower, and the lateral corners are triangularly pointed, and scarcely different on the two sides; the limitation, between the head and the first tergite as well as between the fourth and fifth ones, is fairly distinct (text-fig. 38 j). The first abdominal somite is better produced in the male than in the female. The appendages show the usual differences from those of the adult female; the inner margin of the second basipodite is smooth in both sexes. The *fifth pair* of legs is, as seen in text-fig. 38 k, fairly well developed.

Occurrence. The S/S Thor has in the Atlantic south of Iceland gathered this species at four stations viz:

- 1/9 1904 St. 285 62°49 L. N. 18°46 L. W. 2 f♀, 1 y♂ (V).
 11/7 1904 St. 183 61°30 L. N. 17°08 L. W. Yt. 1800 M. Wire 1 f♀.
 24/5 1904 St. 180 62°47 L. N. 15°03 L. W. Yt. 500 M. Wire 1 f♀, 1 y♀ (V).
 28/8 1905 St. 163 63°36 L. N. 12°05 L. W. Yt. 300 M. Wire 1 f♀.

Farther south the species was in one of five samples taken in big numbers.

- 15/6 1905 St. 82 51°00 L. N. 11°43 L. W. Yt. 1200 M. Wire 1 f♂.
 31/8 1905 St. 167 57°46 L. N. 9°55 L. W. Yt. 1500 M. Wire 5 f♀.
 8/6 1905 St. 72 57°52 L. N. 9°53 L. W. Yt. 1500 M. Wire 5 f♀.
 21/6 1905 St. 90 47°47 L. N. 8°00 L. W. Yt. 300 M. Wire 5 f♀.
 20/6 1905 St. 88 48°09 L. N. 8°30 L. W. Yt. 300 M. Wire 137 f♀, 7 f♂, 27 y♀ (V), 62 y♂ (V).

Distribution. According to Farran "this species is of frequent occurrence in the N. E. Atlantic, having been taken on every station at depths of from 300 to 1000 fathoms". It has been recorded from the Færoe channel, from the Mid Atlantic and from the South Atlantic as far south as 35° L. S. It has been recorded from the Gulf of California, from the Pacific 35° L. N. 125° L. W. as well as from the Malay Archipelago.

Remarks. In spite of the small differences enumerated between my specimens and Giesbrecht's description I think the Atlantic and the Pacific forms belong to the same species. Different authors, f. inst. Pearson and A. Scott, have identified Wolfenden's *Euch. carinata* with this species; they are certainly wrong as far as the young male described in 1902 is concerned; on account of the frontal crest like that of *E. galeata*, the rounded lateral corners of the thorax and the left endopodite of the fifth pair of legs "like small stump" there is some reason to identify it with, f. inst., *Euchirella intermedia* (cf. p. 127). The position of the adult female is somewhat uncertain; Wolfenden regards it (p. 236) as a true *Euchirella* in spite of the missing spines of the second basipodite of the fourth pair of legs. It is with some reluctance that I have referred the described male to this species; at present it is impossible to tell its certain position. The descriptions of Esterly and Scott are too short for a certain identification.

41. *Chirudina pustulifera* G. O. Sars.

(Pl. V figs 6 a—d; text-fig. 39.)

1905. *Undeuchæte pustulifera* n. sp. G. O. Sars, p. 14.

1908. *Euchirella Wolfendenii* n. sp. Farran, pp. 38—39; pl. II figs 18—19; pl. IV fig. 3.

1908. *Undeuchæte pustulifera* G. O. Sars. v. Bremen, p. 44.

Description. Size of female from Thor St. 183 was 6.9 mm.; anterior division 5.7 mm.; urosome 1.2 mm. Sars' specimens measured 6.9 and Farran's 7.2 mm.

The head has no frontal crest, but a strong, slightly curved rostrum (text-fig. 39). The fifth somite is well limited in front, and the lateral corners are rounded (figs 6 a—b). The genital somite has a very characteristic shape (figs. 6 a—b); on the left a low protuberance is found, and on the right side a very prominent one, consisting of a basal larger portion and a terminal regularly rounded part. The genital somite, seen from the side, has a strong, rounded, rather prominent protuberance in front, and a lower one in the middle as well as behind; observed from below the genital area (fig. 6 c) is like that of *Ch. Streetsii*. The abdomen is almost everywhere hairy, but the setae are longest and best developed dorsally along the hinder margin of somites II—IV. Dorsally in the genital somite as well as ventrally in the third and fourth ones tufts of shorter and longer hairs are observed. The caudal rami are about as long as wide, and the Si is scarcely half as long as the St., which is about as long as the abdomen.



Text-fig. 39. *Chirudina pustulifera* G. O. Sars. f♀. Head × c. 18.

The *antennulae* extend to the end of the abdomen. The *antennae* are scarcely different from Farran's fig. 18 Pl. XI, except by the presence of a fairly long terminal seta in Re 2; the Re is about 1.7 as long as Ri. The *mandibulae* are scarcely different from those of *C. abyssalis* n. sp. (cf. fig. 5 b); the third basipodite is not smooth as indicated by Farran, but has 3 setae. The *maxillulae* have 5 powerful setae in Li 2, have 4 + a conical process in Li 3, and 5 in the Basp. 3; the Ri I—III pos-

sess 4 + 5 + 7 setae as in *Ch. Streetsii*. The exopodite has 11 setae, of which the median ones are comparatively short, but not in so marked a degree as in *Undeuchæte*. The Le has 9 setae (according to Farran 8 only), of which the third and the ninth are somewhat shorter than the Set. 4—8, and the first and second are much shorter. The *maxillae* are very much like those of *Ch. abyssalis*, cf. fig. 5c, and have the hairs on the posterior surface of the four lobes arranged in a similar way. The *maxillipeds* are very similar to those of *Ch. Streetsii*, but have no lamina along the outer margin of the second basipodite, nor the anterior process of the second basipodite; the third basipodite is 1.5 as long as the first and second, and 3.8 as long as the endopodite.

The *first pair* of legs has the articulation between Re I and II represented by a fairly distinct chitinous line, which is almost wanting posteriorly; the Se Re I extends beyond the end of Re II, and the Se Re II extends just to the end of Re III. The *second pair* of legs has indication of articular membrane between the Ri I—II, but has no accessory tooth at the base of the blunt Se Ri I; the terminal spine has 70 serrations. The Se of Ri I is pointed, but is without accessory teeth in the two last pair of legs; the second basipodite of the *fourth foot* bears on the hinder surface of a process projecting from the inner margin a transverse row of 8—11 strong, fairly long spines, of which the inner are somewhat more slender.

The lateral outline of the *labrum* is like that of *Ch. Streetsii*, with well raised, smooth, anterior elevation, and so is the oral surface of the *labrum* (fig. 6d); the only difference of importance is found in the much longer first group, the almost wanting lateral row in the second group, and the much better developed transverse row of short hairs in front of the transverse chitinous bar. The *lamina labialis* and the area in front of it are scarcely different from those of *Ch. Streetsii*, while the arrangement of hairs upon and behind the labial lobes is like that of *Ch. abyssalis* (fig. 5f); a tuft of about 20 long slender setae is found on the lateral surface of the labial lobe, just as in *Ch. notacantha*.

Occurrence. The S/S Thor has gathered this species at two stations.

¹¹/₇ 1904 St. 183 61°30 L. N. 17°08 L. W. Yt. 1800 M. Wire 17 f♀ (5 with sp.).

¹⁰/₇ 1904 St. 180 61°34 L. N. 19°03 L. W. Yt. 400 M. Wire 1 f♀ (with sp.).

Distribution. This species has been recorded from two stations between 700 and 1000 fathoms off the west coast of Ireland; the Monaco Expedition has gathered it at three stations.

Remarks. The only difference found between my specimens and Sars' description, which is rather insufficient, is found in the comparatively shorter "antennes antérieures dépassant la longueur de la division antérieure du corps". The Basp. II of pes IV has 6 for 11 spines. The unimportant differences from Farran's description are enumerated in the description. Farran has referred the species to *Euchirella*, probably on account of the well developed spines in the second basipodite of the fourth pair of legs, but it differs in a number of more important characters, viz: the structure of the oral surface of the labrum, the wanting glandular pore of the base of Se 1 Re III pes II—IV, the comparatively long Ri of the antennae, the position of the spines on posterior surface of lobes I—IV of maxillae, and the arrangement of the setae of the maxillulae. In all these characters it agrees with *Chirudina* as well as, though in a less degree, with *Undeuchæte*. It agrees with *Undeuchæte* in the comparatively short median setae of the Re of the maxillulae, but with *Chirudina* in the number of setae in Li 2 and

Ri of the maxillulae and the presence of a Se Re I pes I. The two genera are very nearly related, but as the five species of *Undeuchæte* form a very natural group I prefer to refer this species to *Chirudina*.

42. *Chirudina abyssalis* n. sp.

(Pl. V figs 5 a—f; text-figs 40 a—c).

Description. f♀. Size of specimen from Thor St. 183 was 5.4 mm.; anterior division 4.3 mm.; urosome 1.1 mm.

The head is gradually rounded in front, without any crest; the rostrum is rather short, but strong, directed downwards and slightly backwards (text-fig. 40 a). The cephalothorax, which is moderately slender and slightly attenuated towards the front part as well as towards the end, is about 2.5 as long as wide; the first thoracic tergite is, at least dorsally, well separated from the head; the fifth somite, which is well separated in front, is laterally not produced, and has evenly rounded corners (fig. 5 a). The anterior division is about four times as long as the abdomen.

The genital somite, which is a little wider than deep and as deep as long, is in dorsal outline almost symmetrical; the ventral surface is anteriorly rather suddenly produced and posteriorly gradually sloping; the genital area is in ventral view seen to be somewhat different from that of the preceding species. The genital

somite possesses, dorsally, along hinder margin, short hairs, and ventrally tufts of longer hairs; the following somites are more and less hairy, the hairs being longest dorsally and ventrally. The caudal rami are about as long as wide; the terminal setae are distinctly shorter than the abdomen and about three times as long as the Si.

The *antennulae* extend to the end of the caudal rami; the measurements are very like those of the preceding species. The exopodite of the *antennae* is 1.6 as long as the endopodite; the second segment of the endopodite has 8 setae in Li and 7 in Le; the first segment of the exopodite, which is one third as long as the second, has inside a short protuberance with a short hair; the second segment has only a terminal seta. The *mandibulae* have, as shown in fig. 5 b, a rather characteristic shape, and the *maxillulae* are completely like those of *Ch. pustulifera*. The *maxillae* (fig. 5 c) are only slightly produced basally, and have the spinous areas on the hinder surface of the four proximal lobes distinctly different from those of most species of *Euchirella* (cf. fig. 9 d); in the first lobe a smooth area is found surrounded by spines. The *maxillipeds* are scarcely different from those of the preceding species; beyond the Si 3 in the third basipodite a longitudinal row of longer and shorter teeth is found (text-fig. 40 c); similar teeth were found in *Ch. pustulifera*, but not in *Ch. Streetsii*.



Text-fig. 40. *Chirudina abyssalis* n. sp.

a. f♀. Head $\times 18$. b. Pes I $\times 33$. c. Maxillipes sin. Basp. III in post. view $\times 87$.

The *first pair of legs* (text-fig. 40 b) has the articulation between Re I and II better developed than in the preceding species, but is in other respects scarcely different; the terminal spine of the *second pair* of legs has 90 teeth, and the second basipodite of the *fourth pair* of legs has 11 knife-shaped spines (fig. 5 d).

The outline of the *labrum* is, as seen in text-fig. 40a, somewhat different from that of *Ch. Streetsii*; the oral surface of the labrum differs in the same way as that of *Ch. pustulifera* from that of *Ch. Streetsii*. The *lamina labialis* is smooth, and the area in front of it is, as shown in fig. 5 e, somewhat different from that of *Ch. Streetsii*, and so is the arrangement of hairs upon and behind the labial lobes (fig. 5 f), the main difference being that a large group of delicate hairs is found where the series III and IV start at the base of labial lobes, not where series IV and V start. In front of the oesophagus a long coecal sac is found.

Occurrence. Of this species the S/S Thor has only taken 4 adult females ¹¹/₇ 1904 St. 183 61°30 L. N. 17°08 L. W. Yt. 1800 M. Wire.

Remarks. This species is very nearly related to *Ch. pustulifera*, and ought, accordingly, to be referred to the same genus. It shows some similarity to *U. obtusa* G. O. Sars (1905 p. 13; Farran 1908 p. 40), which has the antennules "dépassant à peine, en longueur, la division antérieure du corps", as well as to *U. lobata* G. O. Sars (1907, pp. 11—12), from which it seems to differ by lateral corners "assez saillants en arrière et étroitement arrondis au bout", by longer abdomen and antennulae.

43. *Chirudina notacantha* G. O. Sars.

(Pl. V figs 7 a—b; Pl. VI figs 1 a—b; text-figs 41 a—k).

1905. *Gaidius notacanthus* n. sp. G. O. Sars, pp. 9—10.

1908. — — G. O. Sars, Farran, pp. 33—34, pl. III fig. 7.

1909. Nec. *Gaidius notacanthus* G. O. Sars. A. Scott, p. 52, pl. XXI figs 24—32.

Description. Y_♂ (St. V). Size of a young male 5.72 mm.; anterior division 4.7 mm.; urosome 1.02 mm. Young females measured from 4.31—5.54 mm. Sars' specimen measured c. 5 mm.

The lateral outline of the head is gradually sloping towards the strong undivided rostrum, which is directed downwards and slightly backwards (text-fig. 41 g). The cephalosome, which in the middle is scarcely half as broad as it is long, is attenuated towards the front as well as towards the end. The head is well separated from the first thoracic tergite, and the fifth one is well marked out in front (text-fig. 41 i); the latter somite is, near dorsal margin, produced into a strong triangularly pointed spine, which scarcely attains the end of the first abdominal somite. The abdomen, which is scarcely one fourth as long as the anterior division, has four somites, the comparative length of which was 22, 29, 21, 17 and 15 (furcal branch); the furcal branch is distinctly wider than long. Along the hinder margins densely placed hairs are found; the terminal setae are distinctly shorter than the abdomen (text-fig. 41 j).

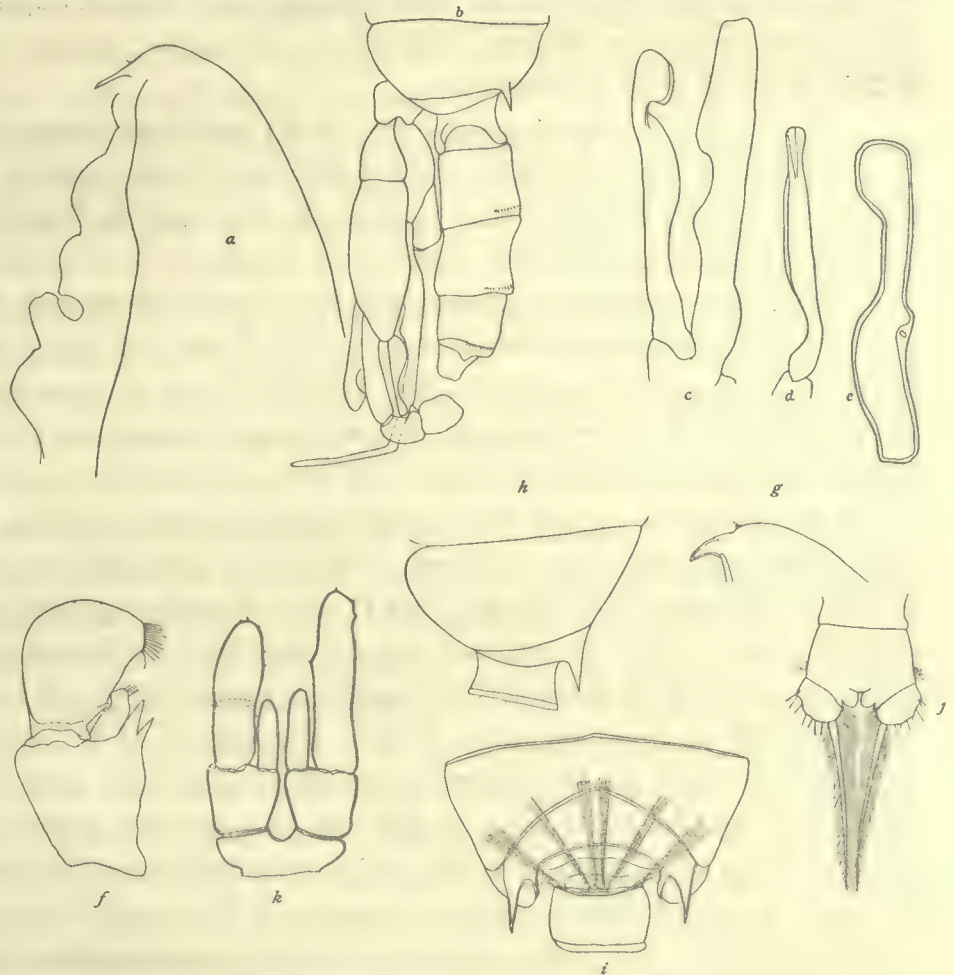
The *antennulae* extend almost to the middle of the abdomen; in measurement they are very much like those of *Ch. Streetsii*. The exopodite of the *antennae* is almost 1.8 as long as the endopodite, which has 7 setae in L_i and 6 in L_e; the first segment of the exopodite has a short process inside, bearing a delicate seta, only as long as the process itself, and the second has a terminal seta

inside (cf. *Ch. abyssalis*). The *maxillulae* have in addition to the 4 Sp. on the posterior surface of Li 1 a short S 15; the Le 2 has 5 setae, the Li 3 has 4 setae and the Basp. III has 5 setae; the endopodite has 3 setae in Ri I, 5 setae in Ri II and 7 setae in Ri III. The exopodite has 10 setae of about equal length, and the Le has 2 short proximal setae and 7 long distal ones. The *maxillae* are scarcely different from those of *Ch. abyssalis* cf. Pl. V fig. 5 c, and the *maxillipeds* have the third basipodite 3'3 as long as the endopodite and r6 as long as the two basal segments.

The *first pair* of legs is very much like that of *Ch. abyssalis*; the articular membrane between Re I—II is completely wanting posteriorly and only slightly developed anteriorly; the Se of Re I distinctly extends beyond the end of preceding segment, and so does Se of Re II. The articulation between Ri I—II in the *second pair* of legs is wanting posteriorly, but is marked by an indistinct line anteriorly, and the Se of Ri I is slightly marked as seen in text-fig.; the articulation between Re I and II is almost wanting posteriorly; the St. has 50—60 short teeth.

The Se of Ri I is well developed but without an accessory tooth in the *fourth pair* of legs, and the inner margin

of the second basipodite is completely smooth. The only difference between the male and female is found in the *fifth pair* of legs in the male (text-fig. 41 k); this is distinctly different from the preceding species by the segmentation of the left exopodite and by the wanting terminal setae. The *labrum* etc. is scarcely different from that of *Ch. Streetsii* (cf. text-fig. 38 a); along the transverse ridge which limits the labrum in front about 10 rather delicate setae are found. The *oral surface* of the labrum (Pl. VI fig. 1 a) is rather characteristic, though showing most similarity to that of *Ch. Streetsii*; the supporting chitinous framework is less developed. The *first group* of the longitudinal series consists of numerous short spinules; the *second group* consists of a single longitudinal row of fairly long setae; the *third*



Text-fig. 41. *Chirudina notacantha* G. O. Sars.

a. f♂. Head $\times 30$. b. abdomen etc. $\times 30$. c—d. Pes V dext. Ri + Re I ∞ II from the right and partly from behind $\times c. 50$. e. Pes V Ri sin. $\times 66$. f. Pes V sin. Re II—III $\times 75$. g. y♂ (St. V) rostrum. h—i. (St. V) fifth thoracic tergite from the left and from above. j. (St. V) furca $\times 29$. k. (St. V) Pes V in ant. view $\times 29$.

to *fifth groups* consist of an inner more or less longitudinal row of fairly long setae inwards and of more irregularly placed setae laterally; a *sixth group* of very short delicate setae is found; the transverse rows are, as seen in figs, like those of *Chirudina Streetsii*. The *lamina labialis* (Pl. VI fig. 1 b) is not quite like that of any of the examined species, as it consists, as shown in figure, of two rather independent portions. The arrangement of the setae in front of the row is like that of *Chirudina Streetsii*, but no granular area was observed. The arrangement of the series upon and behind the labial lobes is in its main feature like that of *C. abyssalis* (Pl. VI fig. 1 b; cf. Pl. V fig. 5 f). Laterally a similar tuft of hairs is found as in *Ch. pustulifera*.

♂ (St. VI). Size of specimen from Thor St. 183 was 6.7 mm.; anterior division 5.2 mm.; urosome 1.5 mm.

The head is rounded, with fairly slender rostral spine (text-fig. 41 a). The body is more slender than in the female; the articulation between the head and the first thoracic tergite is only indistinct; the lateral spine of the thorax is placed more dorsally, is more slender and apparently starts from the fifth somite. The comparatively slender abdomen is about one third of the anterior division, and has, as seen in text-fig. 41 b, the genital opening on the left side, and has a seam of short, delicate teeth along the posterior margins of somites II—IV. The furcal rami are somewhat wider than long; the St. 2 is somewhat longer than the abdomen. The *antennulae* extend about to the end of the second abdominal somite; the segment 10 is partly fused with 8 ~ 9, the segment 12 with 13, but the segments 21 and 22 are well separated on both sides; "Æsthetasken" are only wanting in segments 20, 23 and 24; the measurements are very similar to those of the young ones. The exopodite of the *antennae* is only 1.3 as long as the endopodite; the Re I and II are indistinctly separated, and both possess a rudimentary setigerous process, but the antennae are in other respects like the female. The *mandibula* scarcely differs from that of *Ch. Streetsii*. The *maxillulae* possess in Li I at least 10 soft-skinned ringed appendages as well as two short setae of usual structure, in Li II, which is fairly long, 3 soft appendages, and in Li III 5 setae of usual structure are found; the basipodite III has 5 setae, the Ri I—II have 7 setae, and the Ri III has 7 as well; the exopodite has 10 long setae and a short delicate inner one, and the Le has 2 short basal ones and 5 long distal ones. The *maxillae* are soft-skinned, but they are better developed than in most other species of this family; the Lob. I—IV are well developed, and possess 2 to 3 setae, and so does Lob. V, but its Sp. is strong and not twisted; the Re has 6 setae. The *maxillipeds* are in main feature like those of *Ch. Streetsii*; their third basipodite is 2.5 as long as Ri and 1.5 as long as the two basal segments.

The *first pair* of legs has the articulation between Re I—II better developed, and the Se Re I is quite rudimentary; the three last natatory legs are scarcely different from those of the young specimens.

The *right fifth foot* has a rather short third basipodite; the right endopodite has some similarity to that of *Ch. Streetsii*, is terminally gutter-shaped on the anterior surface, but has somewhat proximally to its end laterally a rounded incision (text-fig. 41 c); the outline of the endopodite is rather irregular, but no marginal laminae or teeth were observed in proximal half. The right exopodite has the two first segments fused, and is, observed from in front, distinctly convex towards the middle; the third segment is obtusely rounded, is rather elongate and possesses marginally a distinct lamina (text-figs 41 c—d). The third basipodite of the *left foot* is long, almost attaining the middle of Re I ~ II; the left endopodite (text-fig. 41 e) is unsegmented, and is, as shown in fig., distinctly narrow somewhat beyond the middle.

The first segment of the left exopodite is fairly long and slender, while the second, as shown in text-fig. 41 f, is broad and widened out terminally, where a bifurcate spine is seen; the third segment (Pl. V fig. 7 a) is distinctly widened out towards the end and produced inwards, where the usual tuft of marginal setae is observed; on the posterior surface groups of delicate hairs are found. Inwards at the base of Re III, a partly independent, lobe is observed with groups of fairly long hairs posteriorly.

The outline of the *labrum* is, as seen in fig., very similar to that of the female, but the whole apparatus is soft-skinned without any setae, but adorned with an intricate system of chitinous ridges; two labial lobes are present with a longitudinal furrow between.

Parasites. In one specimen twisted structures like those described in *Gaidius tenuispinus* (p. 92) were attached behind both maxillae; in another specimen a similar organ was found behind the one maxilla only, but in that specimen a "sac-shaped parasite?" was found attached to the Li I of the left maxillula.

Occurrence. The Thor Expedition has ¹¹/₇ 1904 St. 183 61°30' L. N. 17°08' L. W. Yt. 1800 M. Wire gathered 3 young females, 11 adult males and 9 young males.

The Monaco Expedition has taken immature females at two stations, and Farran has recorded adult males as well as immature ones from the west coast of Ireland "on four stations from depths of 600 to 1150 fathoms".

Remarks. I am pretty well convinced that the described species is identical with Sars' *Gaidius notacanthus*, in spite of a few differences from the somewhat meagre description, viz: in the antennulae, which are not "presque aussi longues que le corps". The male is probably identical with that described by Farran. The male, which Scott has referred to this species, is 5.9 mm. long and has rounded lateral corners; accordingly it is not the male of *Ch. notacantha*, and it may more naturally be regarded as the male of *Ch. pustulifera*. Sars and Farran as well as the other authors have provisionally referred this species to *Gaidius*, as the adult females are not yet known. Several structural features have, however, convinced me that this species like *Ch. parvispina*, and probably also *Gaidius validus* Farran (1908, p. 32), *G. cryptospinus* G. O. Sars (1905, p. 10), *divaricatus* G. O. Sars (p. 10) and *G. maximus* Wolf. (1906, p. 2), is nearly related to *Undeuchæte spectabilis* G. O. Sars (1900) p. 59 as well as to *Chirudina Streetsii*, *pustulifera* and *abyssalis*. It differs from *Gaidius tenuispinus* etc. by the three-segmented exopodite of the first pair of legs with well developed Se Re I, by the wanting setae along the inner margin of the second basipodite in the fourth pair of legs in the young specimens of the fifth stage, as well as by the structure of the oral surface of the labrum and the lamina labialis.

All the described males referred to this genus show a marked similarity to *Undeuchæte* in the structure of the fifth pair of legs, and are accordingly different from those of *Gaidius* and *Gaetanus*.

44. *Chirudina parvispina* Farran.

(Pl. V figs 8 a; text-figs 42 a-g and 43 a-h.)

1900? *Undeuchæte spectabilis* n. sp. G. O. Sars, pp. 59-63, pls XV-XVI.

1908. *Gaidius parvispinus* n. sp. Farran, pp. 34-35, pl. II figs 4-8.

Description. Y[♂] (St. V). Size of young male from Thor St. 183 was 5.1 mm.; anterior division 4.14 mm.; urosome 0.96 mm. Young female measured 4.42 mm. Farran's specimens measured 4.9 mm.

The rostrum is strong and directed downwards. The head is, in contrast to Farran's fig. 4, well separated from the first thoracic tergite. The fifth somite is well developed and bears a short, downwards directed hooked spine (text-fig. 42). The abdomen differs from that of the preceding species by being less hairy. The *antennulae* extend to the end of the cephalosome; the mouth appendages are scarcely different from those of *Ch. notacantha*. In the structure of the natatory legs scarcely any difference was observed between this and the preceding species. The *third foot* is shown in text-fig. 42 e. The only difference between male and female is found in the presence of a *fifth pair* of legs in the former sex; this pair of legs (text-fig. 42 g) is in most respects like that of the preceding species, but differs by the equal length of the two exopodites as well as in a few minor points.

In the structure of the *labrum* and its surroundings no difference of great interest was observed

between this species and the preceding ones (cf. Pl. VI figs 1 a—b).

Y_{σ}^{σ} (St. IV). Size of male from Thor St. 183 was 3.46 mm.; anterior division 2.81 mm.; urosome 0.65 mm.

The body is more slender, and so is the rostrum; the lateral corners are somewhat more robust (text-fig. 43 f). The abdomen consists of three segments as shown in text-fig. 43 f. The mouth appendages show the usual differences. The exopodite of the *first pair* of

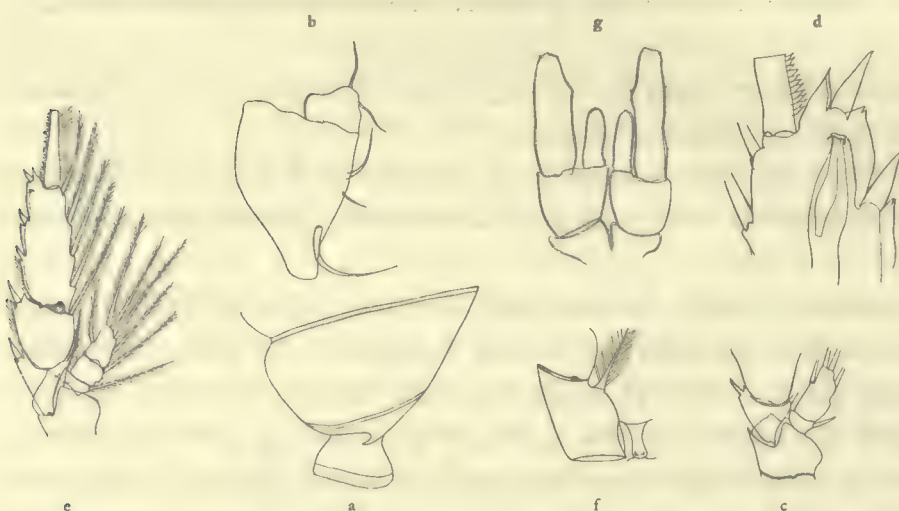


Fig. 42. *Ch. parvispina* Farr. Y_{σ}^{σ} (St. V).

a. Left lateral corner $\times 29$. b. Third basipodite of mandibula $\times 50$. c. Pes II $\times 33$. d. Pes II Re III; glandular pore $\times 57$. e. Pes III sin. $\times 29$. f. Second basipodite of pes IV. g. Pes V in ant. view $\times 33$.

legs shows no trace of segmentation, but has three well developed Se. The endopodite of the *second pair* of legs is unsegmented, and the two last segments of the exopodite are fused, bearing 3 Se and a single glandular pore at the base of Se 3. The inner margin of the second basipodite of the *fourth pair* of legs is smooth. The only difference between the male and female is found in the *fifth pair* of legs, which, as shown in text-fig. 43 h, is less developed than in the preceding stage.

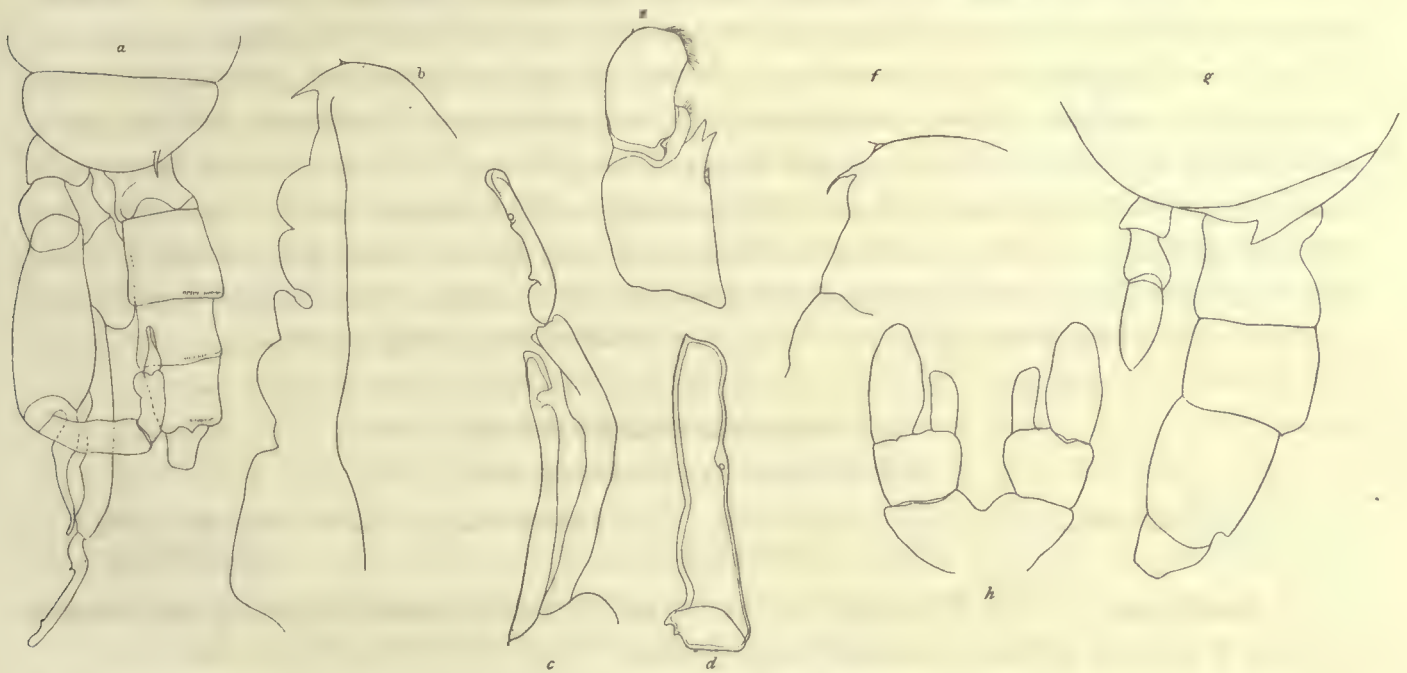
f_{σ} . Size of male from Thor St. 183 was 5.28 mm.; anterior division 4.15 mm.; urosome 1.3 mm.

The rostrum (text-fig. 43 a) is somewhat shorter, and the lateral spines of the end of the thorax, which are placed less dorsally, are more slender and extend a little beyond the hinder margin; the fifth thoracic tergite is not distinctly marked out. The abdomen (text-fig. 43 b) is scarcely different from that of *Ch. notacantha*.

The *antennulae* extend beyond the end of first abdominal somite. The two basal segments of the exopodites are well separated in the *antennae*, and the *maxillae* have the setae of the first lobes somewhat contorted, and the Sp. of the lob. V more swollen at the base, but in other respects the mouth-limbs were like those of the male of *Ch. notacantha*.

The *first pair* of legs has the inner margin of the third basipodite less produced than in the preceding species; the Se of Re I is rather short, but strong, and the Se of Re II, which is fairly strong, extends only a little beyond the middle of Re III; the other natatory legs are scarcely different.

The *fifth pair* of legs is in main features like that of *Ch. notacantha*, but differs in several details. The right endopodite (text-fig. 43 c) has a more regular shape, and has a somewhat different shape terminally; the third segment of the right exopodite (text-fig. 43 c) has, inwards, characteristic incisions and processes. The left endopodite has a more regular shape, and is terminally produced into a short tooth (text-fig. 43 d). The second segment of the exopodite is of more equal breadth throughout, and the third segment is distinctly more slender (text-fig. 43 e); the arrangement of the series of hairs on the posterior surface of Re III shows characteristic features of specific value (fig. 8 a Pl. V).



Text-fig. 43. *Chirudina parvispina* Farr.

a. f♂. Abdomen × 22. b. Head × 22. c. Pes V dext. Ri + Re × c. 50. d. Pes V Ri sin. × 66. e. Pes V sin. Re II—III × 75. f. y♂ (Stage IV). Head × 66. g. Abdomen × 66. h. Pes V × c. 80.

Occurrence. The S/S Thor has gathered this species at two stations viz:

11/7 1904 St. 183 61°30 L. N. 17°08 L. W. Yt. 1800 M. Wire 1 f♂, 2 y♂ (V), 2 y♀ (V), 1 y♀ (IV), 1 y♂ (IV).
10/7 1904 St. 180 61°34 L. N. 19°03 L. W. Yt. 1800 M. Wire 1 y♂ (V).

This species has only been recorded by Farran from the west coast of Ireland between 580 and 680 fathoms at 54°53 L. N. 10°42 L. W. in the month of November 1904, and at 54°57 L. N. 10°51 L. W. in the month of February 1905.

Remarks. The specimen (young male) described by Farran is scarcely different from my specimens. The female is perhaps identical with *Und. spectabilis* G. O. Sars (1900, p. 59), which is, however, much bigger (f♀ 8 mm.), but in other respects, except by the shorter Se of Re I pes I, is scarcely different in any features of importance. If, however, Sars' male (6 mm. long) and female really belong

to the same species (they were gathered in the same sample at 84° L. N., "the tow-net having been lowered to 130 metres"), *Ch. parvispina* and *spectabilis* are scarcely identical, as Sars' male possessed a rounded lateral corner and a distinctly more elongate third segment in the exopodite of the fifth foot.

Valdiviella Steuer.

1883? <i>Euchæte</i> pars Brady.	1908. <i>Valdiviella</i> Steuer. Farran.
1904. <i>Valdiviella</i> n. gen. Steuer.	1909. — — A. Scott.
1905. — Steuer. G. O. Sars.	1911. — — Wolfenden.

According to G. O. Sars and Wolfenden this genus is nearly related to *Euchæte*; the structure of the maxillulæ and the maxillæ bear out this opinion. With some right Steuer suggests that it ought to be referred to the *Aetideidae*; the structure of the legs, of the labrum, the labium and the antennulæ support this view. On account of the two egg-balls and the distinctly three-segmented basipodite of the maxillulæ, I think that the form is a rather primitive one. *V. oligarthra* Steuer, *insignis* Farran and *brevicornis* G. O. Sars, as well as the curious *V. minor* Wolf. are certainly good species. A. Scott has referred a young male, probably belonging to this genus, to Brady's *Euc. gigas*; he is certainly wrong; his specimens are from the Malayan Seas and Brady's from the west coast of South-America; the length of the former was 8 mm. and of the latter 5.25 mm. The lateral corner of Brady's specimens had a long lateral spine, that of Scott's species a short triangular one.

45. *Valdiviella insignis* Farran.

(Pl. VI figs 2a—e; text-figs 44 a—d).

1908. <i>Valdiviella insignis</i> n. sp. Farran, pp. 45—46, pl. III figs 1—6, pl. IV fig. 5.	1911. <i>Valdiviella insignis</i> Farran. Wolfenden, pp. 247—248, Taf. XXXX figs 6—7.
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Description. f♀. Size of specimen from St. 183 was 11.75 mm.; anterior division 8.5 mm.; urosome 3.25 mm. Farran's specimens measured 11.5—12.0 mm.

The anterior division, which has distinctly rounded lateral corners without tuft of hairs, is rather clumsy; the rostrum consists of two short, well separated spines; the first thoracic somite is completely fused with the head, and the fourth with the fifth. The anterior division is 2.5 as long as the abdomen, which has the proportional length as 45, 35, 25, 11, 11. The genital somite is almost symmetrical and only slightly produced below; the vulva is seen laterally as an incision between an anterior and posterior process. The somites III—IV have ventrally a tuft of long hairs; the posterior margins, not only of the III—IV tergites but also of the I ∞ II, are denticulated. The furcal rami and the setae are scarcely different from Farran's description; the appendicular seta seems to be longer than figured by Wolfenden.

The *antennulæ*, which extend a little beyond the end of the thorax, have not the obtuse angle between the proximal and distal portion, which is found in *Euchæte*; the segments 8 ∞ 9 and 24 ∞ 25 are almost completely fused. The ringed terminal setae are less powerful than those found in *Euchæte*; no proximal setae were found in segments 10, 11 and 20—23; rather short triangularly pointed "Æsthes-tasken" were observed in segments 5, 9, 12, 14 and 19. The measurements are even in minor details

like Farran's description and very characteristic; the segments 8~9 are 1.3 as long as segment 7, and again 1.2 as long as 13; the segment 17, which is three times as long as the segment 14, is a little longer than the segment 19, and 1.4 as long as 24~25. The basipodite III of the *antennae* has a single well developed seta; the Ri I has 2 fairly long setae, and the Li of Ri II has at least 7 longer and shorter setae. The exopodite is a little longer than the endopodite; its first segment is well developed without any seta, and the second has a short terminal seta. The *mandibulae* have the teeth developed in a curious way, as shown in Farran's fig. 3; the basipodite III possesses proximally a fairly long somewhat curved seta and, medially, a short one; the Ri I has at least one seta, and the Ri II 8 powerful long setae, and more medially, a fairly long slender one. The *maxillulae* have in general shape some similarity to *Euchæte*; in the Le were found only 6 well developed setae, of which the third is the longest in several specimens, and not 7 as figured by Farran (fig. 5), as the proximal was probably wanting; the Li I has only 11 setae, as S 12-14 on the posterior surface are missing; corresponding to Li II-III only a single lobe with 4 setae was found. The Basp. III has 1 seta, the Ri I 2 and the Ri II~III 3 strong setae. Three basal segments are easily recognized in this species; the Basp. I is adorned with Li I, the Basp. II with Li II and Le I, and the Basp. III, which is well articulated, has the two branches. The *maxillae* are like Farran's fig. 4 Pl. III; the first basipodite has the exterior margin distinctly concave in the middle; the Lob. I-IV have posteriorly a distinct spinous area. The proportional length of the segments in the *maxillipeds* is 60, 90, 26; they are scarcely different from those of *V. oligarthra*.

The *pes I* has the Ri I-II completely fused, and the Re I is only indicated by a medial incision and a powerful Se; as shown in fig. 2 a, a glandular canal and pore was present in the exterior margin of the second and third division; the pore in the former was covered by a spine-shaped mass, and both pores were surrounded by numerous hairs. The *pes II* has the distinction between Re I-II indicated by a medial incision and a well developed lateral spine; the articular membrane is anteriorly represented by a faint line, which is not seen posteriorly. The unsegmented Ri has near the tip on the anterior surface a minute pore (text-fig. 44 b). Near the base of Se Re II and Se 3 Re III but not in Re I, wide glandular pores are found, in connection with big sacs with glandular cells, which are placed proximally to the articular membranes between the Re I-II and Re II-III respectively. The *pes III* differs from *pes II* by the distinct articular line between Ri II-III; a distinct glandular pore is found at the base of Se Re I; the *pes IV* is in main features like *pes III*, but the Basp. II has comparatively few hairs along the inner margin.

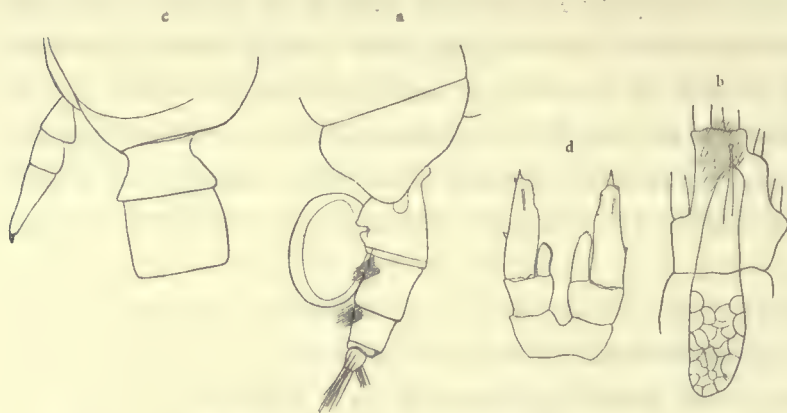
The epistoma is represented by a short protuberance, which is placed somewhat behind the insertion of the antennulae; it is steep in front, and smoothly sloping behind, and appears quite smooth. The *labrum* is rather prominent; on the anterior surface, somewhat in front of the free margin, a transverse row of fairly long stiff hairs (fig. 2 b) is observed; and more laterally, partly covered by this, an oblique row; and along the hinder margin the usual row of numerous somewhat curled hairs (fig. 2 e).

The oral surface of the *labrum* (fig. 2 c) has the group 1 placed laterally, and consisting of numerous short setae or granules; the group 2, which is well separated from this, and consists of comparatively few longer setae, is closely followed by groups 3-4; the group 5 consists of more numerous and comparatively longer setae.

The *lamina labialis* does not show any features of interest (fig. 2 d); the area in front of it is most like that of *Chiridius*; it consists of a lateral, somewhat convex, row of fairly long setae and two median, well separated, groups, as shown in fig. Behind the lamina and between the labial lobes, which were not studied in detail, no setae were observed.

Y♂ (St. V). Size of specimen from St. 183 was 9 mm.; anterior division 6.5 mm.; urosome 2.5 mm.

The shape of the body is in main respects like that of the females, but the lateral corner of the thorax has a small tooth; of the four abdominal somites the second is longer than the third, which is as long as the first. The measurements of the antennulae are somewhat different; the segments 17 and 19, which are of equal length, are 1.24 as long as 24 ~ 25, and 2.5 as long as segment 14. The other appendages do not seem to show differences of any importance; the Re of the maxillulae possess, as usual in this stage, only 10 setae. The *pes V* of the male is somewhat like that of *Euchæte*; the Ri, which is almost twice as long on the right side as on the left side, is distally rounded without



Text-fig. 44. *Valdiviella insignis* Farr.

a. f♀. Abdomen × 8. b. f♀. Pes III Ri III in anterior view with gland × 59.
c. Y♂ (St. V). Left lateral corner × 16. d. Y♂ (St. V). Pes V in ant. view × 18.

any spines; the Re, which are of almost equal length, are continued into a rather strong spine (St), and have on each side one or two Se, as well as 2 or 3 Si. The structure of the *pes V* is distinctly different from Scott's fig. 26 of the corresponding pair of legs in *V. gigas*, as well as from Brady's fig. 5 of *Euchæte gigas*.

Y (St. III). Specimen from Thor St. 183: 5.58 mm.; anterior division 4.5; urosome 1.08.

The rostrum and the frontal parts are like those of the adult females; the lateral corners are neither produced nor pointed; the first as well as the fifth thoracic tergites are well marked out. The abdomen consists of two somites, of which the terminal one is almost twice as long as the basal one.

The *antennulae* extend almost to the end of the abdomen; the "Æsthetasken" are as in the adults, but the Spr. was only observed in segment 19. The measurements are distinctly different, as the distal segments are comparatively longer; the segment 19 is 1.3 as long as 17, and scarcely 1.1 as long as 24 ~ 25, which is 1.2 as long as 17. The mouth appendages, except the *maxillulae*, are practically like those of the adult; the Le had in the single specimen examined a single proximal long seta and 3 very delicate hairs distally; the Li I has only 10 setae, and the Re as usually 8.

The *pes I* differs distinctly from that of the adult by the more slender form especially of Ri; both branches are undivided; the 3 Se are well developed, and a glandular pore is found in the third division. The *pes II* has both branches unsegmented; the Re I—III has 6 Si and 4 Se; only at the base of Se 3 Re III is a glandular pore found. The *pes IV* is comparatively more slender than *pes II*; the Re I ~ III have 3 Si and 3 Se, and a single glandular pore; the Ri I ~ III have 6 setae altogether. In lateral view the labrum and labial appendages are scarcely different from those of the adult.

Occurrence etc. The S/S Thor has twice gathered a few specimens of this interesting species, viz:
11/7 1904 St. 183 61°30 L. N. 17°08 L. W. Yt. 1800 M. Wire 3 f♀ (one with 2, the others with single egg-sac), 2 y♂ (V), 1 y (III).
10/7 1904 St. 180 61°34 L. N. 19°05 L. W. Yt. 1800 M. Wire 4 f♀ (one with 2 egg-sacs), 1 y♂ (V).

On the west coast of Ireland "three specimens of this species were taken at depths of 700, 730 and 1150 fathoms. By Wolfenden it has been recorded at about 20° L. S. and 20° L. W. On account of the longer antennulae and well developed Se Re I pes II I think with Farran, in contrast to Wolfenden, that this species is well distinguished from *V. oligarthra* Steuer from the South Atlantic.

Euchætidae.

Euchæte Philippi 1843.

A. Scott has established a new genus (1911 p. 64) *Pareuchæte* with *E. norvegica* as a type in contrast to the true *Euchæte* with *E. marina* as type species; the latter is characterized by the fifth pair of the legs in the male, which has the Re III of the left foot elongated and pointed, and in the females "two of the six apical spines on the first maxilliped, in addition to being furnished with rows of very short spinules have also a number of moderately long and conspicuous spinules". The latter characteristic is very interesting, but probably not important enough for the establishment of a new genus, especially as a single apical seta of the mentioned structure was found in *E. hebes*, in which pes V of the male is of the *E. norvegica* type; in *E. acuta* only a single seta of this structure was found.

In spite of specific variations the structure of the epistoma, and the anterior and posterior surface of the labrum show, as seen by comparing the figures on Pl. VI and the descriptions, common features; the arrangement of the hairs in front of the lamina labialis is fairly characteristic.

The arrangement of the glandular pores in the legs does not show specific difference of great value. In the outer margin of Re III pes I, somewhat beyond the middle, a glandular pore was found, alike, but less distinctly developed than the corresponding pore in *Valdiviella insignis* Farr. (Pl. VI fig. 2 a). In the second pair of legs a pore is found at the base of Se Re II and Se 3 Re III as well as one minute one near the tip of Ri III; in the third and fourth pair, in addition to these, a pore is found at the base of Se Re I.

In this genus the adult females show the most characteristic systematic features, especially in the structure of the genital somite; it must be remembered, however, that the usual inspection of the genital area from the side and from below is not quite satisfactory for a full estimation of the characters. A full dissection is often necessary to understand the complicated structures of the vulva; unfortunately, I have not had the opportunity of doing so at the present. The characters found in the number of setae in the maxillulae, as well as in the relative length of the spines in the exopodite of the second pair of legs are of value, but often show some variations. To refer the copepodites as well as the adult males to the right species is often impossible.

As a good deal of confusion exists as regards the determination of several species, I think the following synoptic key of the adult females may be useful.

1. One of the apical setae of the maxillae with numerous short spinules and a few long ones. Lateral corner rounded.
2. The genital somite on the left side with a conical process. 4 mm. *E. acuta*.
2. The genital somite on the left side dorsally a hairy process. On the right side of the vulva a laminous process. 3.5 mm. *E. hebes*.
1. All the apical setae of the maxillae of the usual structure.
3. Si of the furca distinctly shorter and thinner than St. 2. Lateral corner rounded. The posterior process of the vulva longer than the anterior. 10 mm. *E. glacialis*.
3. Si of the furca distinctly longer than St. 2.
4. Lateral corner pointed.
5. Lateral corner triangularly pointed without tuft of hairs 6.6 mm. *E. tonsa*.
5. Lateral corner with a well defined pointed process; distinct tuft of hairs. On each side of vulva a median process. 8.8 mm. *E. norvegica*.
4. Lateral corner rounded.
6. 3 distinct processes on each side of the rather low genital protuberance. 5.6 mm. *E. bisinuata*.
6. Without 3 distinct processes on the same level.
7. Genital protuberance very deep, almost squarely truncate with a small median process on each side of the vulva. 6.7 mm. *E. gracilis*.
7. Genital protuberance not very deep. On each side of the vulva in front of the posterior edge a laminous process.
8. Dorsally and behind on the protuberance small process. Le maxillulae with 9 setae. Se Re I pes I long and slender. 8.9 mm. *E. Hanseni*.
8. No such process observed.
9. On the left side of the genital somite a conical process found
10. The Se 2 Re III pes II does not extend to end of segment 11 mm. *E. Farrani*.
10. The Se 2 Re III pes II extends beyond end of segment 8 mm. *E. barbata*.
9. On the left side of the genital somite no conical process found. Se Re I pes I small or wanting.
11. The genital protuberance is prominent with short anterior frange. 8.2 mm. *E. Brady*.
11. The genital protuberance not very prominent
12. Shape of body clumsy. 6 mm. *E. Scotti*.
12. Shape of body rather slender. 9.5 mm. *E. Sarsi*.

46. *Euchæte norvegica* Boeck.

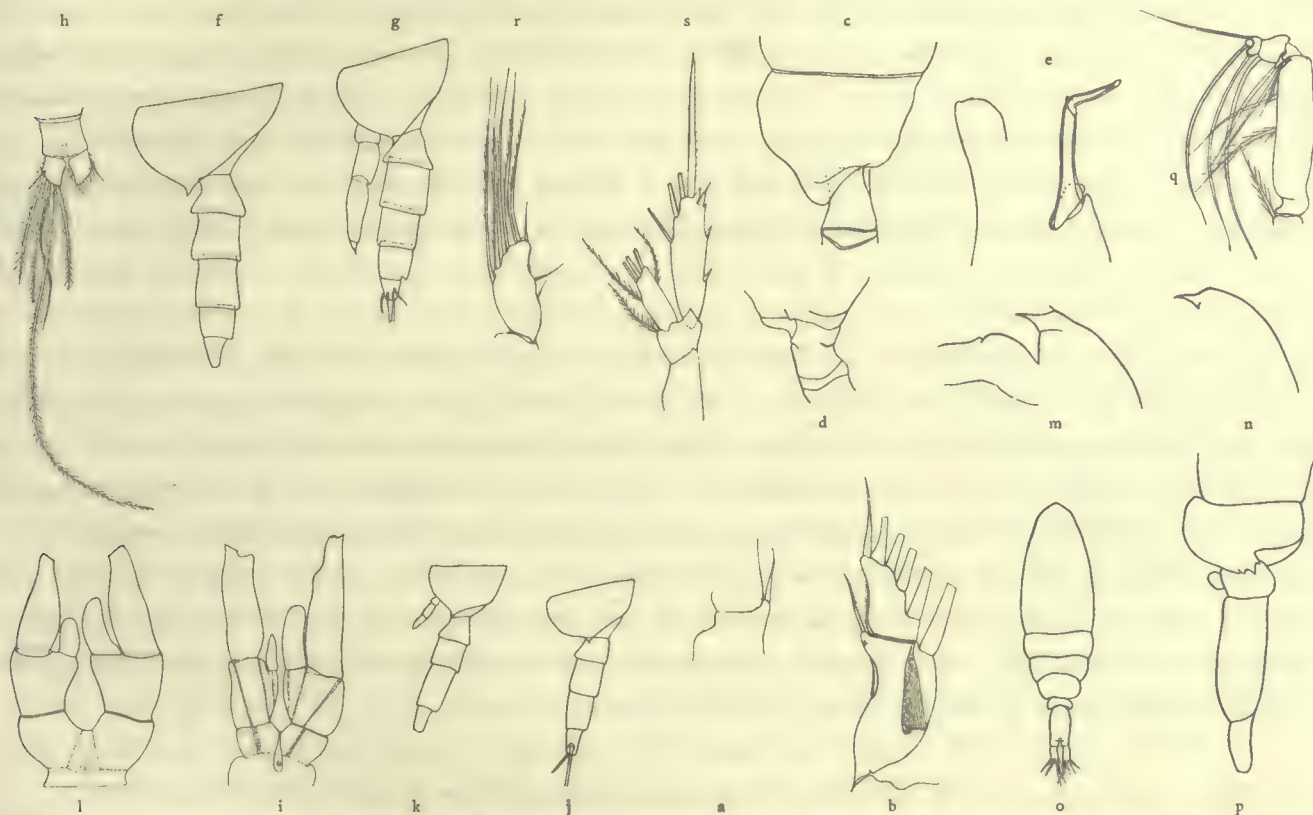
(Pl. VI figs 3 a—f; text-figs 45 a—s.)

1864? *Euchæte pestandreae* Philippi. Boeck, p. 12.
 1872. — *norvegica* n. sp. Boeck, p. 40.
 1873. — *carinata* n. sp. Möbius, p. 271, tab. VII.

1885 pars. *Euchæte norvegica* Boeck. G. O. Sars, p. 234, t. 19.
 1892. — — — — — Giesbrecht, p. 246, taf.
 15, 16 and 37.

1898 pars. <i>Euchaete norvegica</i> Boeck. Giesbrecht & Schmeil, p. 40.	1904. <i>Euchaete norvegica</i> Boeck. Wolfenden, p. 133.
1898. — — — Aurivillius, pp. 89—90.	1905. — — — G. O. Sars, p. 5.
1899. — — — Th Scott, pp. 248—249.	1905. — — — Farran, p. 35.
1900 pars. — — — G. O. Sars, p. 58. pl. XIV.	1907. — — — Damas & Koefoed, p. 396, 407.
1902? — — — Mrázek, p. 515.	1906 pars. — — — Pearson, p. 16.
1903. — — — G. O. Sars, pp. 38—39, pl. XIV—XVI.	1908. — — — v. Bremen, p. 52—53 fig. 59.
1903. — — — Norman, p. 137.	1908. — — — Farran, p. 40.
1903. — — — Jensen, Johansen, Levin- sen, p. 86, tabel II.	1911. — — — Farran, pp. 95—96.
	1913. — — — Stephensen, p. 320.

Description. f♀. Size: One of the largest specimens (Thor St. 183) anterior division (2.76 + 3.68); posterior division 2.42; total length 8.86 mm. Sars' females measured 8 mm. and Giesbrecht's 8.5.



Text-fig. 45. *Euchaete norvegica* Boeck.

a. f♀. Pes I in anterior view $\times 57$. b. In posterior view $\times 57$. c. f♂. Lateral corner of the thorax from the left $\times 18$. d. From the right $\times 18$. e. Pes V Ri sin. in internal view. f—g. Y♀ and y♂ (Stage V). Abdomen $\times 12$. h. Y♂ (St. V). Furca $\times 18$. i. Pes V $\times 28$. j—k. Y♀—♂ (St. IV). Abdomen $\times 16$. l. Y♂ (St. IV). Pes V $\times 65$. m. Y (St. III). Rostrum $\times 59$. n. Y (St. II). Rostrum $\times 59$. o. Y (St. II). Animal in dorsal view $\times 18$. p. Y (St. II). Abdomen in lateral view $\times 59$. q. Y (St. II). Maxillipes sin. in posterior view $\times 59$. r. Y (St. II). Pes I sin. in post. view $\times 57$. s. Y (St. II). Pes III sin. in post. view $\times 57$.

The last thoracic somite has laterally a minute tooth as figured by Sars; in one specimen it was wanting on the right side. The genital somite has in front of the prominent ventral protuberance, which possesses a small tooth on each side of the vulva, a characteristic small tubercle.

The first pair of legs (text-figs 45 a—b) has the articular line between Re I and II rather complete posteriorly; anteriorly it is wanting, except inwards, where a chitinous line is observed, to which a muscle is attached. The glandular pores are rather indistinct; in the *pes II* they were only observed at the base of Se Re II and Se 3 Re III and terminally in the middle of Ri; in the two following pairs pores, even if indistinct, were observed besides at base of Se Re I.

Between the insertion of the antennae, (Pl. VI figs 3 a—c.) an *epistoma*, directed forwards and terminally covered with long, stiff bristles is found; between this and the well developed labrum, which is gradually sloping anteriorly, a rather shallow portion is found; anteriorly the *labrum* is marked off by a chitinous transverse convex list, where the longitudinal muscles are fastened, which move the marginal fringe of setae. The labrum bears in the middle two rather irregular rows of more or less slender bristles. The marginal fringe consists in the middle on the well developed lobes of a right and left group of fairly long hairs; more laterally a group of shorter hairs is found; orally an indistinct transverse row is found (cf. Pl. VI fig. 3 a). The chitinous framework which supports the oral surface of the labrum is in the main like, but less developed than, that of *Euchirella messinensis* (cf. Pl. IV fig. 2 a). In addition to the usual four central spots, 6 spots are present on each side. Just behind the spots Nr. 4 a transverse group of short spines is found. The first lateral group of the longitudinal series of delicate hairs is placed transversely, and fairly well separated from the more longitudinally placed group 2; this again is well separated from the more or less fused groups 3—5, as seen in fig. 3 a.

The *lamina labialis* (fig. 3 b) is divided into a median and, on each side, two lateral serrations, which are connected with a chitinous skeleton. The area in front has, as shown in fig. 3 b, a rather complicated structure; on each side, in the middle, a granular area converging in front, is found, and more laterally several slightly convex longitudinal series of delicate hairs as well as a square spinous area just in front of the serrula 6-dentata; the latter is, as seen in fig. 3 b, placed on a well developed chitinous system. Behind and between the branches of the lamina labialis about 5 oblique rows of delicate hairs are found on each side. Möbius has given a fairly good description of the oral surface of the labrum and the lamina labialis. The *labial lobes* (fig. 3 c), which are well developed and rather prominent, possess about 5 somewhat irregular longitudinal series of comparatively short hairs, which, posteriorly, are fused into fairly big median groups. The region behind the area labialis proper does not possess any group of delicate hairs, but somewhat medially to the articular cavities of the maxillae is found a group of 15—20 long, stiff setae, directed inwards and almost attaining the middle; in the middle, more posteriorly, a group of 10 shorter setae, directed forwards, is found.

f♂. Size: In one of the largest specimens (Thor St. 183) the total length was 6.34; anterior division (2.53 + 1.95) 4.48; urosome 1.86 mm. Sars' males measured 7 mm. and Giesbrecht's 5.45.

The lateral corner of the fifth thoracic somite (text-figs 45 c—d) is distinctly more produced on the left side than on the right; dorsally, a small marginal tooth is found, more developed on the left side. The first abdominal somite has the genital pore on the left side, and is somewhat produced on the right side; on the same side laterally and dorsally near the base of the somite a triangular tooth is found. The segments 12—13 of the *antennulae* are well separated on the left side, but have on the right side the articular membrane indistinct, posteriorly. The measurements are practically like those in the adult females. The Ri of the *antennae* has on the interior lobe 5 plumous setae, even longer than in the female, in addition to two short ones. The *mandibulae* possess, in contrast to Sars' and Giesbrecht's description, a well developed, but soft-skinned, manducatory part with 4 short marginal teeth (Pl. VI fig. 3 e). The *maxillulae* are better developed than described by Sars and Giesbrecht, though they are probably without value for mastication. The Le has 5 strong setae; the Li 1 possesses at least three delicate bristles, the Li 2 a single short one and the Li 3 a single

somewhat longer; the Basp. 2 has 4, and the Ri at least 5 setae. The Re has $10 + 1$ setae. The *maxillae* are quite rudimentary soft-skinned, somewhat twisted organs possessing the usual number of lobes, which bear soft appendages, on the distal lobes most like setae. The *maxillipeds* are less powerful than those of the female, the Li I of the basipodite $1 \sim 2$ has one hair, Li 2 one short hair, Li 3 two hairs and Li 4 a single hair in addition to a hooked organ surrounded by fine hairs like that of *E. bisinuata* Farran (Pl. VI fig. 11 e).

The *second pair* of legs differs distinctly from that of the female by the short Se Re II, which only reaches the end of the segment, far removed from the base of Se I Re III.

The Re II—III sin. of the *fifth pair* of legs (Pl. VI fig. 3 d) are in the main like Giesbrecht's fig. 24 (Taf. 16), differing from Sars' by two not one, rows of serrations, between which the segment is distinctly more hollowed than in the two following species. The left endopodite consists of two segments (text-fig. 45 e).

The epistoma and labrum are in lateral outline seen to be distinctly lower than those of the females; by further examination (Pl. VI fig. 3 e) it was found to be poorly developed, without labial lamina and distinct labial lobes; the complicated system of hairs found in the females seems to be completely wanting.

Y_{σ}^{σ} (St. V). Size of specimen from Thor St. 183; the total length 5.57 mm.; anterior division ($2.46 + 1.79$) 4.25; urosome 1.42.

The shape of the anterior portion differs from that of the f_{σ} by triangularly pointed lateral corners (text-figs 45 f—g). The abdominal somites show the usual differences; in contrast to the f_{σ} , the Si of the furca is distinctly shorter than the St. 2 (text-fig. 45 h). The *antennulae* are comparatively shorter, but the arrangement of the appendages is completely like that of the f_{σ} ; the measurements are, however, slightly different; the segments $24 \sim 25$ are at least as long as the segment 19, not 1.2 shorter, as the segment 23 is 1.1 as long as, not 1.1 as short as, the segment 16. The Re of the *maxillulae* possess only 10 setae. The Re I—II of the first pair of legs are completely fused without trace of segmentation.

The male of this stage is easily distinguished from the female by the presence of a fairly well developed two-branched fifth pair of legs (text-figs 45 g and i).

Y_{σ}^{σ} (St. IV). Size of a big specimen from St. 183 was 3.6 mm.; anterior division ($1.7 + 1.0$) = 2.7; urosome 0.90 mm.

This stage differs from the preceding one by the urosome, which consists of three somites only (text-figs 45 j—k), of which the last is the longest, the first the shortest; the subapical seta is, as in the preceding stage, shorter than St. 2. The *antennulae* have the appendages like the adult females, and the measurements show corresponding differences; the segments $24 \sim 25$, f. inst., are distinctly 1.2 as long as the segment 19. The Re of the *maxillulae* possess only 9 setae, as usual in this stage. The exopodite of the first pair of legs is alone unsegmented, as not only Re I—II are fused but also Re II—III. The Re II—III of pes II—III are fused with 3 Se, of which Se I Re II \sim III pes II is comparatively long, probably corresponding to Se Re II. The Ri II—III are fused in pes III—IV.

The male of this stage differs from the female by the fairly well developed fifth pair of legs (text-fig. 45 l).

St. III. Size of specimen from Ingolf St. 19 was 2.65 mm. long; anterior division ($1.26 + 0.63$) = 1.89; urosome 0.76 mm.

The rostrum is less prominent (text-fig. 45 m), and the lateral corners are regularly rounded; the abdomen consists of two somites only; the subapical seta is, as in f♀, much longer than St. 2. The *antennulae* extend almost to the end of the furca; the usual long setae, which are more powerful in the segment 7, are found, but the number of the short setae is much smaller, as the fused segments ($4 \sim 5$) ($2 \sim 3$) have only a single seta, as the segment 6—10 do not possess any, and as Spr. is only found in segment 19. No "Æsthetasken" were found in segment 12, but, as usual, in segments 5, 9, 14 and 18. The measurements are distinctly different as the segments 19—24 are comparatively longer than in the preceding stages; the segments $24 \sim 25$ are 1.3 as long as segment 19. The mouth appendages are in the main like those of the adult females, but the number of the setae is as a whole a little smaller, f. inst., the Re of the maxillulae has only 8 setae. The two first pairs of legs are scarcely different from stage IV; the pes III has in Re II \sim III only 2 Se and 4 Si, and the Ri is undivided; the pes IV has Re I—III fused with a basal Se well separated from two distal ones.

St. II. Size of specimen from Ingolf St. 19 was 1.79 mm. long; anterior division ($0.92 + 0.41$) = 1.33; urosome 0.46.

The lateral corner of the anterior division is not regularly rounded, and the rudimentary fourth pair of legs is found as a wing-like expansion (text-figs 45 n—p). The subapical seta (Si) is thicker and longer than the St. The *antennulae*, which almost extend to the end of the urosome, have several of the proximal segments (1—18) more or less fused. A long distal seta is found in segments $3 \sim 4$, $6 \sim 7$, 14 and 18. No "Æsthetasken" were found. Beyond the segment 18 the segments become suddenly longer; the 19 is almost twice as long as the 18; the segments 19—23 are of almost equal length; the segments $24 \sim 25$ are 1.3 as long as 19. The mouth appendages show similar differences as in the preceding stages; the *maxillulae* have only 7 setae in Re; the *maxillae* are less powerfully developed, as seen in fig. 3 f. The *maxillipeds* have only 2 setae in the middle of basipodite 3, as the median one is wanting. The Ri possesses only 5 setae.

The *pes I* is comparatively more clumsy; 3 Se are present, as in the preceding stages. The *pes II* has the Re I indicated with well developed Se; in addition, 2 Se and 4 Si were found. The *pes III* is like the *pes IV* of the preceding stage, with 3 Se and 3 Si (text-figs 45 r—s).

Occurrence. Davis Strait. The Danish Ingolf Expedition has in the southern part of the Davis Strait as far north as 65° L. N. from $25/6$ — $28/7$ 1895 taken 9 samples containing *Euch. norvegica*; in the following 5 a fairly big number was found. In the table (p. 163) a few stations south and south east of Greenland are dealt with.

As the species was found neither in any surface sample nor more north than 65° , there is reason to suppose that the form does not belong to the fauna of the surface, but belongs to the northern prolongation of the Atlantic fauna. Propagation has been found to take place at the mentioned season in this region.

1895,	Ingolf	L. N.	L. W.	Depth in fathoms and net.	Temp. at surface.	VI		V		IV		III	II	I	Number of specimens examined.
						♂	♀	♂	♀	♂	♀				
1/7	St. 28	65°17	55°42	V. 100—0	17.5° C.	..	10 ¹	10	16	1	..	..	..	..	..
—	St. 27	64°54	55°10	V. 1 200—0	3.9° C.	..	4 ¹	4	7	2	3	1	..	..	..
25/6	St. 25	63°30	54°25	V. 1 200—0	2.9° C.	2%	24%	5%	7%	14%	15%	30%	3%	..	115
25/6	St. 24	63°06	56°00	V. 1 200—0	4.2° C.	7%	34% ¹	20%	30%	5%	3%	1%	..	..	163
25/7	St. 36	61°50	56°21	Trawl	..	..	1 ¹	..	..	..	..	..	..	..	..
—	—	..	..	V. 1 100—0	8.5° C.	..	..	34%	31%	15%	15%	5%	..	..	120
30/7	St. 38	59°12	51°05	V. 1 100—0	10° C.	..	..	11	8	5	2	6	..	..	..
22/6	St. 22	58°10	48°25	V. 1 200—0	5.35° C.	..	..	4	3	3	1	1	..	..	..
20/6	St. 20	58°20	40°48	V. 1 200—0	6.1° C.	..	6	10	18	6	6	19	1	..	..
18/6	St. 19	60°29	34°14	V. 1 300—0	9° C.	..	8%	20%	33%	20%	9%	9%	1%	..	151
17/6	St. 18	61°44	30°29	V. 1 200—0	10° C.	5%	24%	22%	26%	9%	9%	5%	..	..	163

¹ Means that spermatophores were found attached to the genital somite of the females or to pes V of the males.

² — — — — — egg-sacs

Denmark Strait. The Ingolf Expedition has in Denmark Strait (20-28/6 96) taken 5 samples containing *E. norv.*, but only few specimens (stage V most numerous; a single f♂ was found); in 1895 a single sample (St. 11) with a fairly big number of specimens was found. The S/S Thor has at four stations from 18-20/6 1904 taken numerous specimens with the young-fish trawl, among which were several adult males with spermatophores attached to the fifth pair of legs, as well as females with eggs and spermatophores. The table shows the relation between the different stages.

		L. N.	L. W.	Depth and net.	Temp. at surface.	VI		V		IV		III	II	I	Number of specimens examined.
						♂	♀	♂	♀	♂	♀				
Ingolf	21/5 95	St. 11	64°34	31°12	V. 1 200—0 fm.	8.2° C.	..	33 ¹	1	27	5	6	..	..	..
Thor	18/6 04	St. 150	65°50	26°53	Yt. 400 M. Wire	..	..	12	5	15	11	3	..	..	..
	18/6 04	St. 152	65°00	28°10	Yt. 800 M. Wire	..	20%	16% ^{1,2}	7.5%	7%	22.5%	27%	..	..	365
	19/6 04	—	..	..	Yt. 1000 M. Wire	..	15 ¹	22 ^{1,2}	1	..	2	5	..	..	..
	20/6 04	St. 153	65°27	27°12	Yt. 800 M. Wire	..	24 ¹	21 ^{1,2}	..	..	25	25	..	..	..
	21/6 04	St. 154	65°27	27°10	Yt. 800 M. Wire	..	..	27% ^{1,2}	4%	5%	36%	27%	1%	..	110

South of Iceland. South-west of Iceland the Ingolf has taken a few, mostly young, specimens in 5 samples; a single sample from the deep sea contained an adult female with spermatophore, in the others from surface-hauls copepodites of stages V—IV, were found, but no adult.

In the Atlantic, south of Iceland, the Ingolf Expedition has (3-6/6 96 and 9/8 95) taken 4 surface samples with a few young specimens of stages IV—V; and in addition to these 7 samples from lower layers, of which 5 contained adult specimens. The S/S Thor has in this region taken 11 samples (24/5 1904, 2/7-14/7 1903-04 and 1/9 1904), which all contained adult specimens.

		L. N.	L. W.	net.	Temp. at surface.	VI		V		IV		III	II	I	Number of specimens examined.	
						♂	♀	♂	♀	♂	♀					
Ingolf	3/6 96	St. 68	62°06	22°30	V. 1 100—0 fm.	8.8° C.	1	9 ¹	15	36	2	1	1	..	..
	3/6 96	St. 69	62°40	22°17	V. 1 100—0 fm.	7.3° C.	..	5% ¹	12% ¹	75% ¹	5% ¹	3% ¹	..	..	..	100
	1/6 96	St. 63	62°40	19°05	V. 1 100—0 fm.	8.3° C.	1% ¹	4% ¹	22% ¹	63% ¹	6% ¹	4% ¹	..	..	..	174
	9/8 95	St. 40	62°00	21°36	V. 1 100—0 fm.	13.5° C.	..	25 ¹	5	4	..	..	..	..	..
	13/5 96	St. 49	62°07	15°08	V. 1 100—0 fm.	9.3° C.	..	..	1	20	2	1	1	..	..
	12/5 96	St. 47	61°42	13°14	V. 1 100—0 fm.	10.6° C.	4	21 ¹	2	8	1	..	..	..	..
Thor	9/7 04	St. 178	63°11	21°30	Yt. 780 M. Wire	..	6%	33%	20%	23%	12%	6%	..	..	..	163
	10/7 04	St. 180	61°34	19°03	Yt. 400 M. Wire	..	1	20 ¹	22	10	16	12	..	..	..	..
	—	—	..	..	Yt. 1800 M. Wire	..	..	1	1	..	..	..	..	..	..	..
	1/9 04	St. 285	62°49	18°46	Yt. 500 M. Wire	..	1%	35% ¹	21%	11%	17%	15%	..	..	..	170
	11/7 04	St. 183	61°30	17°08	Yt. 1800 M. Wire	..	10% ¹	19% ^{1,2}	32%	24%	8%	7%	..	..	..	1235
	21/5 04	St. 104	62°47	15°03	Yt. 1500 M. Wire	..	51% ¹	39% ^{1,2}	1.5% ¹	1.5% ¹	2%	5%	..	..	..	217

The presence of adult males and the presence of females with spermatophores and egg-sacs certainly indicate that propagation takes place or has taken place; at St. 183, where among 230 f♀ 60 had spermatophores and had 3 egg-balls, but especially at St. 104, where 30 of 110 f♂ had spermatophores attached to the fifth pair of legs, and 50 of 85 f♀ wore spermatophores and 15 wore egg-balls, a great number of specimens certainly are active in propagating the species.

Iceland-Færoe Channel. The Ingolf Expedition has not found any adult specimens in two samples taken near the surface from the Iceland-Færoe channel, but in those (four) from the deeper

		L. N.	L. W.	Depth and net.	Temp. at surface.	VI		V		IV		III	II	I	Number of specimens examined.	
						♂	♀	♂	♀	♂	♀					
Ingolf	15/5 96	St. 52	63°57	13°32	V. 1 200—0 fm.	8.3° C.	..	4 ¹	1	7	3	11	..	..	..	..
	20/5 96	St. 57	63°37	13°02	V. 100—0 fm.	8.2° C.	..	4	1	35	3	14	4	2	..	..
	11/5 96	—	61°32	10°47	Cyl. 14	..	..	..	1	11	7	6	..	..	..	..
	11/5 96	St. 45	61°31	9°43	V. 2 100—0 fm.	9.1° C.	9% ¹	12% ¹	5% ¹	46% ¹	8% ¹	6% ¹	11% ¹	3% ¹	..	100
Thor	23/5 04	St. 102	61°41	13°31	Yt. 15 M. Wire	..	..	2 ¹	3	17	3	6	..	..	..	..
	28/8 05	St. 163	62°36	12°05	Yt. 300 M. Wire	..	1	24	19	6	4	2	..	..	..	..
	22/5 04	St. 99	61°15	9°35	Trawl. 900 M.	..	28	22	1	..	..	..	..	..	..	..
	—	—	..	..	Yt. 1000 M. Wire	..	12% ¹	55% ¹	2% ¹	11% ¹	5% ¹	12% ¹	3% ¹	..	..	100
	—	—	..	..	Yt. 1700 M. Wire	..	9	37 ^{1,2}	1	7	1	8	..	..	..	..
	5/5 04	St. 63	64°05	9°38	—	..	5	36 ¹	6	..	1	1	..	..	..	..
	12/5 04	St. 78	61°08	9°20	—	..	15	13 ¹	..	..	..	..	..	..	..	..
	9/5 04	St. 70	63°33	6°20	Yt. 100 M. Wire	..	..	96% ^{1,2}	1.5% ¹	2°5% ¹	..	..	..	..	..	156
	33/7 05	St. 124	61°04	4°33	Yt. 1000 M. Wire	..	1	11 ²	..	2	..	..	..	..	..	..

layers had always found adult females. The S/S Thor has taken samples at 15 stations; adult specimens were found at all except two. Adult males have been found from the month of May till August.

North of Iceland. North and north-east of Iceland the Ingolf Expedition has at 4 stations taken a few young specimens, and at one adult females. The S/S Thor has at a single station taken a fairly large number of adult specimens.

Ingolf	2/8 96	St. 128	66°50 L. N.	20°02 L. W.	Trawl.	1 ♂ (V), 1 ♀ (V).
	10/7 96	St. 102	66°23 L. N.	10°26 L. W.	V. ² 100—0 fm. Temp. at surface 0.3° C.	2 f♀, 1 (III).
	23/7 96	St. 117	69°13 L. N.	8°13 L. W.	V. ² 100—0 fm.	— 4.1° C. 1 (III), 2 (II).
	24/7 96	12.30 a. m.	St. 118	68°27 L. N.	8°20 L. W.	Closing net 1030 fm. — 1 ♀ (V), 1 ♀ (IV).
Thor	22/7 04	St. 214	67°19 L. N.	17°55 L. W.	Yt. 800 M. Wire	11 f♂, 35 ♀ (eggs sperm.), 2 ♀ (V), 2 ♂ (IV).

South of the Færoes. The S/S Thor has in the Atlantic, south-west of the Færoes, at six stations taken adult males and females; in the samples enumerated below the number of specimens was fairly big; at 5 of 6 stations south-east of the Færoes adult females were found.

1905	Thor.	L. N.	L. W.	Depth and net.	VI		V		IV		III	II	I	Number of specimens examined.
					♂	♀	♂	♀	♂	♀				
3/8	St. 167	57°46	9°55 W.	Yt. 300 M. Wire	1	10	3	3	..	2	..	..	..	..
—	—	..	..	Yt. 1500 M. Wire	12	46 ¹⁻²	14	7	5	5	..	..	..	..
8/6	St. 72	57°52	9°53 W.	Yt. 1500 M. Wire	43% ¹	32% ¹⁻²	8%	11%	2.5%	2.5%	1%	..	..	311
20/6	St. 88	48°09	8°30 W.	Yt. 300 M. Wire	38 ¹	36 ¹	20	9	..	..	..	..	..	..
21/6	St. 90	47°33	7°40 W.	Yt. 300 M. Wire	10	18 ¹	5	4	..	1	..	..	..	..
—	—	—	—	Yt. 500 M. Wire	..	1 ¹	..	..	1	..	..	..	..	..
6/9	St. 172	57°33	4°26 E.	Yt. 300 M. Wire	35	30 ¹⁻²	5	7	5	5	4	..	..	..
6/9	St. 173	57°52	8°01 E.	Yt. 800 and 300 M. Wire	3 ¹	7	1	8	1	..	..	..	..	..

East-Greenland Expedit. That scarcely any specimens were taken in the numerous surface hauls during the crossing of the Danish East-Greenland Expedition 1900 (June—September), in the Norwegian Sea, in the ocean east of Greenland, in Denmark Strait and the Atlantic south of Iceland, seems to indicate that the species is extremely scarce at the surface.

In vertical samples from near the coast of Greenland a few specimens were found. As so few specimens have been taken, I think a full account of the stations may be useful.

25/6	1900	Jan Mayen.	Closing net 60—50 fathoms	1 y (III).
4/7	3 p. m.	73°32 N. 3°30 W.	Vertical. 300—0 m.	1 f♀.
8/7	2 p. m.	74°28 N. 15°36 W.	— 400—0 m.	1 f♂, 5 f♀, 1 ♂ (V), 1 ♀ (V).
10/7	6 a. m.	74°28 N. 15°36 W.	— 100—0 m.	1 ♂ (V), 1 ♀ (V).
—	—	—	Closing net 110—40 fath.	1 ♂ (IV).

- 3/9 12 p. m. 68°22 N. 17°15 W. F. 300 1 ♀ (V).
 18/9 12 p. m. Kap Dan F. 347 1 ♂ (V).
 24/9 10 p. m. 61°06 N. 16°26 W. F. 391 1 ♂ (V); 1 ♂ (IV).
 12 p. m. F. 392 1 ♀ (IV).

Distribution. *Euchæte norvegica* is recorded from the Atlantic at least as far south as 51° L. N. from the west coast of Greenland at little Karajak-Fjord (Vanhöffen), and north of Iceland (Paulsen). It has been found abundantly in the Færoe channels, and in the Norwegian Sea, but only in the northern part of the North Sea. It is, according to Sars, frequent in deeper layers along the whole coast of Norway, and so it is in the Skager Rak. It is recorded as common in the Barents Sea. The most common species of *Euchæte* found in the Polar basin crossed by Nansen was *E. glacialis*, not *norvegica* as originally proposed by Sars, but the latter species was nevertheless (Sars 1903 p. 39) found occasionally in two different places. As Mrázek says that his specimens attain a length of about 10 mm., he has probably confounded the two species.

Euchæte norvegica has been taken by the Duc d'Orléans (from 7/7—1/8 1905) at most stations between c. 10° Long. East and the east coast of Greenland as far north as 80° Lat. North, but was never common. The species was never common between c. 300—100 meters, where adult females with ovi-sacs or spermatophores and males (sometimes with spermatophores attached to pes V) were often found; between 0—100 met. mature specimens were never found, but now and then a few young ones (1907 p. 407). Wolfenden has found the same to be the case in the Atlantic and writes (p. 133) "Young and undeveloped specimens are not uncommon near the surface, but the adult animal appears to prefer the deep water down to 500—600 fathoms". My material, as far as it goes, tells the same story.

Though the species has a wide distribution in the northern seas, and though it is occasionally found propagating here, I think we are right in regarding it as a species which belongs to the North Atlantic, and by the Atlantic currents are carried to the polar regions; it seems in any case to be distinctly more common in the Færoe channels and the west of Iceland than in the ocean between Norway, Greenland and Spitsbergen.

47. *Euchæte tonsa* Giesbrecht.

(Pl. VI figs 4 a—b; text-figs 46 a—g).

1895.	<i>Euchæte tonsa</i> n. sp.	Giesbrecht, p. 251, pl. IV figs 9—10.	1906.	<i>Euchæte tonsa</i> Giesbr.	Esterly, p. 64, pls 9—10.
1898.	—	Giesbr. Giesbrecht & Schmeil, p. 40.	1908.	—	v. Bremen, p. 55, fig. 62.
1904.	—	Cleve, p. 190.	1908.	—	Farran, p. 40.
1905.	—	G. O. Sars, p. 5.	1909.	—	A. Scott, p. 72, pl. XIV figs 8—15.
1905.	—	Farran, p. 35.	1911.	—	Wolfenden, p. 298, text-figs 50 a—d.
1906.	—	Pearson, p. 17.			

Description. ♀. Size of specimen from St. 72 Thor 1905 was 6.4 mm.; head + first thoracic tergite 2.8, four posterior thoracic somites 1.8; urosome 1.8 mm.

The lateral corner is like Wolfenden's figure, and more pointed than figured by Scott and Esterly for Pacific species; the point is, as shown in text-figs 46 a—b, more prominent on the left than on the right side; no lateral tuft of hairs is found.

The genital somite is, as seen in fig. 46 a, distinctly produced below, but the outline is not quite like any of the published drawings. The structure of the vulva seems to be a good deal more complicated than figured by Wolfenden. The subapical seta is more slender, but longer than St. 2.

The *antennulae* are like Scott's fig. 11; the segments 24 ~ 25 are distinctly shorter than segment 19, and 23 than 16. The mouth-appendages are scarcely different from those of *E. norvegica*.

The *pes I* is in main features like *E. n.*, but distinctly different from Scott's fig. 13; the articular membrane between Re I—II is fairly developed anteriorly, but posteriorly is wanting, except medially; the Se Re I is fairly developed. The *pes II* is like Wolfenden's fig. 50 c, but in details is different from Scott's figure; the Se Re II scarcely reaches the base of Se 1 Re III, and Se 2 almost reaches the base of short Se 3. On the posterior surface of the second basipodite in the fourth pair of legs a number of delicate hairs are found in the middle.

The epistoma and outer surface of the labrum are in the main like those of *Euch. glacialis* (cf. p. 169) and slightly different from *E. norv.* The oral surface of the *labrum* is like *E. norv.*, except the two first groups of hairs, which are placed as shown in fig. 4 a. The area in front of the lamina labialis is like that of *E. norv.*, but inwards delicate spines are found instead of granules; the most lateral group of hairs is almost as wide as long. The *lobus labialis* possesses in similarity with *Euch. glacialis* a posterior lateral group of hairs.

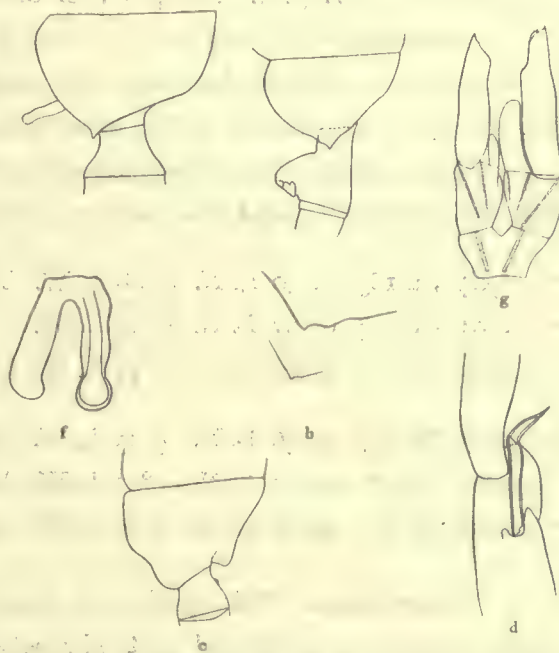
♂. Size: 5.89 mm.; anterior division (2.56 + 1.6); urosome 1.73.

Shape of the body is scarcely different from *E. norv.* The rostrum is a little more obtuse and somewhat shorter. The lateral corners are rounded and somewhat less produced, but more produced on the left than on the right side; the difference is, however, less marked than in *E. norv.* (text-fig. 46 c).

The *antennulae* reach somewhat beyond the end of the thorax and are scarcely different from those of *E. norv.*

The *pes I* has a well developed articular membrane between Re I—II, and the Se Re I is very short, scarcely three times as long as wide. The *pes II* differs from ♀ by the slightly different shape of the Se Re II—III, and by the Se 2, which does not reach the base of Se 3; the base of the process, possessing the Se 2 Re III, is, in *E. norv.*, placed almost as near the end as the base, but is here placed distinctly nearer the base than the tip.

The *fifth pair* of legs differs from that of *Euch. norv.* by the different shape and serration of the process of Re II sin, which is distinctly longer, not shorter, than the ringed appendage (fig. 4 b), and by the slightly different shape of the left endopodite (text-fig. 46 d).



Text-fig. 46. *Euchete tonsa* Giesbr.
 a. f♀. Genital somite × 16. b. f♀. Lateral corner from the right × 16 and × 52. c. f♂. Lateral corner from the right × 18. d. Pes V Ri sin. from the right (in situ) × 59. e. Y♂(?) (St. V) with abnormal pes V × 16. f. Y♂(?) (St. V). Abnormal pes V × 39. g. y♂ (St. V). Pes V in anterior view × 33.

$Y_{\text{♀}}^{\text{♂}}$ (St. V). Size of specimen from Thor St. 82 1904 was 4.42 mm.; anterior division ($2.07 + 1.23$) = 3.3; urosome 1.12 mm.

The body is somewhat more slender; the first abdominal somite is in some specimens rather prominent ventrally; the lower surfaces of two last abdominal somites possess tufts of the fairly long hairs sometimes represented in *E. norv.* The lateral corner of the thorax is less acutely pointed than in *E. norv.* (text-fig. 46 e). The pes I has no articular membrane between Re I—II, and the Se I is extremely short; the pes II is scarcely different from the adult females. The male only differs from the female by the presence of a well developed fifth pair of legs; the Re sin. is rather obtusely truncate (text-fig. 46 g).

$Y_{\text{♀}}^{\text{♂}}$ (St. IV). Size of ♂—♀ from St. 88 Thor 1905 was 3.34 mm.; anterior division ($1.56 + 0.90$) = 2.46; urosome 0.88 mm.; male from St. 82 3.28 mm. and female 3.54 mm.

The body is more slender than in corresponding stage in *E. norvegica*, and the lateral corners are less distinctly pointed. The Se 2 of Re II \approx III in the pes II almost reaches the base of Se 3 in contrast to *E. norvegica*. The pes V of the male is scarcely different from that of the other species.

Variation. A young male (St. 82) (text-figs 46 e—f) had, as shown in fig., the fifth pair of legs developed in a rather curious way; in another specimen the left lateral corner was evenly rounded, but the right one pointed in the usual way.

Occurrence. The Thor Expedition has taken the species from the following stations in the Atlantic south of Iceland (one west of Iceland), all in fairly deep layers.

11/7	1904	St. 183	61°30 L. N.	17°08 L. W.	Yt. 1800 M. Wire	1 f♂, 4 f♀ (egg-balls + sperm.).
21/6	1904	St. 154	67°27 L. N.	27°10 L. W.		1 f♀.
15/6	1905	St. 82	51°00 L. N.	11°43 L. W.	Yt. 1200 M. Wire	11 f♀ (2 with sperm.), 2 ♀ (V), 6 ♂ (V), 2 ♀ (IV), 4 ♂ (IV).
31/8	1905	St. 167	57°46 L. N.	9°55 L. W.	Yt. 1500 M. Wire	1 f♀ (sperm.), 1 ♂ (IV).
8/6	1905	St. 72	57°52 L. N.	9°53 L. W.	Yt. 1500 M. Wire	4 f♀.
20/6	1905	St. 88	48°09 L. N.	8°30 L. W.	Yt. 300 M. Wire	2 f♀, 1 ♀ (V), 1 ♂ (V), 1 ♀ (IV), 1 ♂ (IV).

Distribution. This species, or a nearly related, somewhat larger one, was recorded from the Pacific by Giesbrecht and Esterly between 150 and 300 fathoms (1912, p. 321); it was gathered at several stations in Malay waters by the Siboga Expedition. The Gauss Expedition has gathered the species at two stations in the South Atlantic (c. 35° L. S. c. 10° L. W.), and at two stations in the Mid Atlantic. On the west coast of Ireland it is, according to Farran, "a rather characteristic species in deep water tow-nettings ranging from 400—1000 fathoms".

Remarks. That the described female is identical with that mentioned by Farran and Wolfenden is scarcely doubtful. Farran's specimens measured 4.95—5.25 mm., Wolfenden's specimens measured 5—5.3 mm. The specimens from the Pacific are a good deal larger (Giesbrecht's 6.1, Esterly's 6.1 and Scott's 7 mm.), but as my adult females from the North-Atlantic measured up to 6.4 mm., the character found in size is scarcely of great importance. The only character in which my specimens seem to differ from Scott's etc. is the more pointed lateral corners and the structure of pes I—II, especially the long Se 2 of Re III pes II. At present I do not deem these characters important enough to establish two species.

That the copepodites of the stages V—IV belong to the same species as the adult females is especially borne out by the curious structure of the Re III pes II. That the described male, which as realised from the above remarks is rather difficult to distinguish from *E. norvegica*, is really the hitherto undescribed male, is not quite certain; but, as *E. tonsa* also in other respects (e. g. structure of the labrum, of the young specimens) shows greater similarity to *E. norvegica* than to any other species, I prefer for the present to refer the males and females to the same species.

48. *Euchæte glacialis* H. J. Hansen.

(Pl. VI figs 5 a—d; text-figs 47 a—n.)

1886. <i>Euchæte glacialis</i> n sp. H. J. Hansen, p. 74, pl. XXIII figs 5—5 k, pl. XXIV figs 1—1 d.	1904. <i>Euchæte glacialis</i> Hansen. Wolfenden, pp. 134—135, figs 1, 2, 7.
1900 pars. — <i>norvegica</i> Boeck. G. O. Sars, p. 58, pl. XIV.	1905. — — — Th. Scott, pp. 222—223.
1902 pars. — — — Mrázek, p. 515.	1907. — — — Damas & Koefoed, p. 408.
1903. — <i>glacialis</i> Hansen. G. O. Sars, pp. 40—41, pl. XXVII.	1908. — — — v. Bremen, p. 54 fig. 60.
	1913. — — — Stephensen pp. 319—320.

Description. Size of specimen from Thor St. 154 1904 was 10.4 mm.; anterior division (4 + 3.5) = 7.5; urosome 2.9 mm. Sars' specimens measured 10 mm.

The lateral corner of the thorax is somewhat triangular, and possesses in most specimens a minute rounded process, which is not figured by Wolfenden and Sars (text-figs 47 a—c). The genital protuberance is very prominent, and has on each side of the vulva, the ventral surface of which has been figured by Wolfenden (p. 134), two distally rounded, lamelliform processes, of which the hindmost is the longer. The subapical seta is distinctly shorter than the St. 2. The *antennulae* and *mouth-limbs* do not differ from those of *Euch. norvegica* in any features of importance.

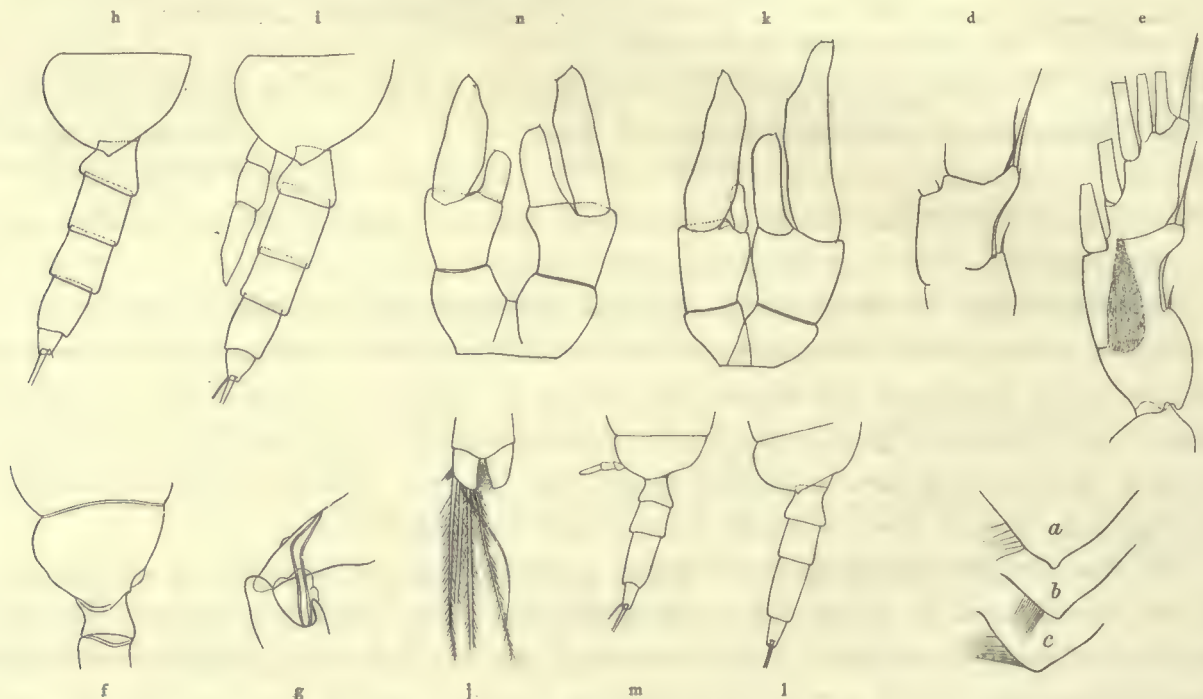
The articular line between Re I and II pes I (text-figs 47 d—e) is anteriorly wanting in the middle, and that between Re II and III is only slightly developed, especially anteriorly. The Se I is scarcely shorter than in *E. norvegica* (cf. Wolfenden p. 134); the Se Re II is perhaps somewhat longer than the corresponding Se in *E. n.*; but the difference is not so marked that any character can be found in this feature.

The structure of the *labrum* is in the main like that of *E. norvegica*; the arrangement of the hairs on the oral surface differs in minor details; the lateral anterior group is placed transversely, and consists of about 20 rather stiff, short hairs; a sixth group, fairly well separated from the fifth, is found. The *lamina labialis* and the serrula 6-dentata are scarcely different, but the hairs in front of the lamina are distinctly different, as seen in fig. 5 a Pl. VI, especially the lateral group, which consists of 3—4 longitudinal rows. The arrangement of the hairs on the labial lobes is somewhat different, as seen by comparing figs 5 b and 3 c; especially the lateral basal group is better developed.

f♂. Size of specimen from Thor St. 214 was 6.21 mm.; anterior division (2.65 + 1.95) = 4.6; urosome 1.61 mm. Hansen's specimens measured 7.7 and Sars' 8 mm.

The lateral corners (text-fig. 47 f) are, in contrast to those of *E. norvegica*, almost symmetrical and only slightly produced, as on the right side in the species mentioned; the dorsal marginal tooth is only indicated, or is very short. The first abdominal somite does not on the right side possess any dorsal lateral process.

The *antennulae* extend about to the middle of the abdomen; the segments 12—13 are posteriorly fused, not only on the right but also on the left side. "Æsthetasken" are found in all segments except 23, even in the segment 20, in which they are wanting in *E. norvegica*. The measurements are only in minor details different from those of the female. The interior lobe of the Ri of the *antennae* has medially, in addition to the 5 + 2 setae, an extremely delicate one. The *mandibulae* and *maxillae* scarcely differ from those of *E. norvegica*. The *maxillulae* are, as seen in fig. 5 c Pl. VI, better developed than in other species; the Li I has, f. inst., 9 fairly long setae, and so has the Ri. The *maxillipeds* are like those of *E. norvegica*, but the usual hooked process of lob. IV Basp. II seems to be represented by a rather slender, straight, conical process.



Text-fig. 47. *Euchete glacialis* H. J. Hansen.

a—c. f♀. Left lateral corner in three specimens; most setae missing $\times 18$. d—e. f♀. Pes I dext. in anterior and posterior view $\times 57$. f. f♂. Left lateral corner $\times 18$. g. f♂. Pes V Ri sin. in internal view. h—i. Y♂—♀ (stage V). Abdomen $\times 16$. j. Y♂ (st. V). Furca $\times 18$. k. Y♂ (st. V). Pes V $\times 33$. l—m. Y♂—♀ (st. IV). Abdomen $\times 16$. n. Y♂ (st. V). Pes V $\times 89$.

Pes I has the articulation between the Re I—II better developed than in the female, but the Se of Re I is wanting; the *pes II* shows a similar sexual difference.

Pes V dext. has, about in the middle, an almost complete articular line between Re I and II; proximally to this a short tooth is found exteriorly, which is indicated in *E. norvegica*; the Re III is terminally somewhat hollowed, and less widened. The Re II—III *pes V* sin. are distinctly shorter; the ringed appendage is comparatively short, and the serrated process is moderately hollowed between the two rows of teeth; the left endopodite has only one single segment (text-fig. 47 g).

Y♂ (St. V). Size of specimen from Thor 1904 St. 154 was 7.71 mm.; anterior division (3.51 + 2.3) = 5.81; urosome 1.9 mm. Hansen's specimen measured 7 mm.

This stage is easily distinguished from the corresponding stage of *E. norvegica* by the more obtusely pointed lateral corner of the fifth thoracic somite (text-figs 47 h—j). The differences in the

measurements of the terminal segments of the antennulae are like those of *E. norvegica* though less marked; the articular membrane between Re I—II of pes I is not completely lost.

The fifth pair of legs in the male shows minute differences, as realised by comparing figures (text-fig. 47 k).

Y_♀[♂] (St. IV). Size of specimen from Thor St. 154 was 5.02 mm.; anterior division (2.3 + 1.43) = 3.73; urosomn 1.29 mm.

This stage differs from the corresponding stage of *E. norvegica* by the more rounded lateral corner of the thorax. The appendages show differences similar to those of *E. norvegica* (text-figs 47 l—n).

Occurrence. The Ingolf Expedition has taken the species at three stations only, viz:

- 26/6 1896 St. 94 64°56 L. N. 36°19 L. W. P. 100—0 Temp. at surface 2.5° C. 4♀ (V), 1 y♂ (V), 1 y♂ (IV).
 25/7 1896 St. 121 66°59 L. N. 13°11 L. W. V.¹ 100—0 — 4.8° C. 1 f♀, 4 y♀ (V), 2 y♂ (V) 1 y (III).
 27/7 1896 St. 117 69°13 L. N. 8°23 L. W. V.² 100—0 — 4.1° C. 1 y (V).

The Danish East Greenland Expedition 1900 has taken it at three stations.

- 4/7 3 p. m. 73°32 L. N. 3°30 L. W. 300—0 meters 1 f♀ (with sperm.), 1 y♀ (V), 1 y♀ (IV).
 8/7 2 p. m. 74°09 L. N. 11°31 L. W. 400—0 — 1 f♀, 3 y♀ (V), 1 y♂ (V).
 10/7 6 p. m. 74°28 L. N. 15°36 L. W. 400—0 — 1 f♂, 2 y♀ (V), 3 y♂ (V), 1 y♀ (IV), 1 y♂ (IV).

The S/S Thor has taken the species at 8 stations.

- 20/6 04 St. 153 65°20 L. N. 27°12.5 L. W. Yt. 800 M. Wire 1 y♀ (V), 6 y♂ (V).
 21/6 04 St. 154 65°27 L. N. 27°10 L. W. Yt. ? 16 f♀ (2 with sperm.), 2 y♀ (V), 2 y♂ (V), 2 y♀ (IV), 4 y♂ (IV).
 Yt. 800 M. Wire 12 f♀, 2 f♂, 4 y♀ (V), 4 y♂ (V).
 22/7 04 St. 210 66°43 L. N. 18°10 L. W. Yt. 400 M. Wire 1 f♀, 3 y♀ (V), 1 y♀ (IV).
 22/7 04 St. 214 67°19 L. N. 17°55 L. W. Yt. 800 M. Wire 19 f♀ (3 with egg-balls), 3 f♂, 1 y♂ (V), 1 y♂ (IV).
 5/5 04 St. 63 64°05 L. N. 9°38 L. W. Yt. 300 M. Wire 8 f♀, 6 y♀ (V), 6 y♂ (V).
 4/8 04 St. 230 63°10 L. N. 7°31 L. W. 2 f♀.
 9/5 04 St. 70 63°33 L. N. 6°20 L. W. Yt. 100 M. Wire 27 f♀ (2 with sperm.), 5 f♂, 5 y♀ (V), 3 y♂ (V), 3 y♀ (IV), 1 y♂ (IV).
 23/7 05 St. 124 61°04 L. N. 4°33 L. W. Yt. 1000 M. Wire 1 f♀.

Distribution. The species is very common in the Polar basin crossed by Nansen, "from 300 metres to the very surface of the sea". By the Duc d'Orléans it was taken at 15 stations in the sea between Spitzbergen and Greenland between 79°56 L. N. 1°29 L. E. and 71°22 L. N. 18°58 L. W. (11/7—15/8 1905). Adult males and females partly with eggs and spermatophores were found at 5 stations between 200 and 500 metres; the young specimens were sometimes found in higher layers, but scarcely at the surface; in the lower layers between 500—1000 metres young ones only have been found. In the Norwegian Sea it has, according to Sars, been taken a few times between 200—1000 metres. Damas & Koefoed write (p. 408) without mentioning the source: "Dans la mer de Norvège: jamais à la surface; principalement au delà de 600 mètres". According to Wolfenden (1904, p. 133) "it is of rare occurrence in

the Færoe channel, and only once it occurred in the warm Atlantic area", and according to Damas & Koefoed "entre les Færøer et l'Islande: pas au dessus de 400 mètres" (p. 408).

My own records show that the species was fairly common in the ocean north of Iceland, and in Denmark Strait; it has been found a few times in the Iceland—Færoe channel and a single time south-east of the Færoes. It is rather odd that it has not been taken in Davis Strait, but as comparatively few deep sea samples have been examined from this region it is too early to exclude the species from the fauna of this region. As it never occurred in any of the numerous samples brought home by Thor and the Ingolf Exp. from the Atlantic south of Iceland, we are probably right in excluding it from the ordinary fauna of this region.

49. *Euchæte Farrani* n. sp.

(Pl. VI fig. 6 a; text-figs 48 a—d.)

1883. nec.	<i>Euchæte barbata</i> n. sp.	Brady, p. 66, pl. 22 figs 6—12.	1906. nec.	<i>Euchæte barbata</i>	Brady. Pearson, p. 17.
1892. nec.	—	—	1907.	—	—
1894. nec.	—	—	1907. nec.	—	—
1898. nec.	—	—	1908. pars.	—	—
1900. pars.	—	—	1909. nec.	<i>Pareuchæte barbata</i>	Brady. A. Scott, p. 70, pl. XVIII figs 1—8.
1903.	—	—	1909. nec.	—	—
1904. pars.	—	—			

Description. f♀. Size of specimen from Thor St. 230 was 10.75 mm.; anterior division 8 mm.; urosome 2.75 mm. Sars' specimens measured 12 mm.

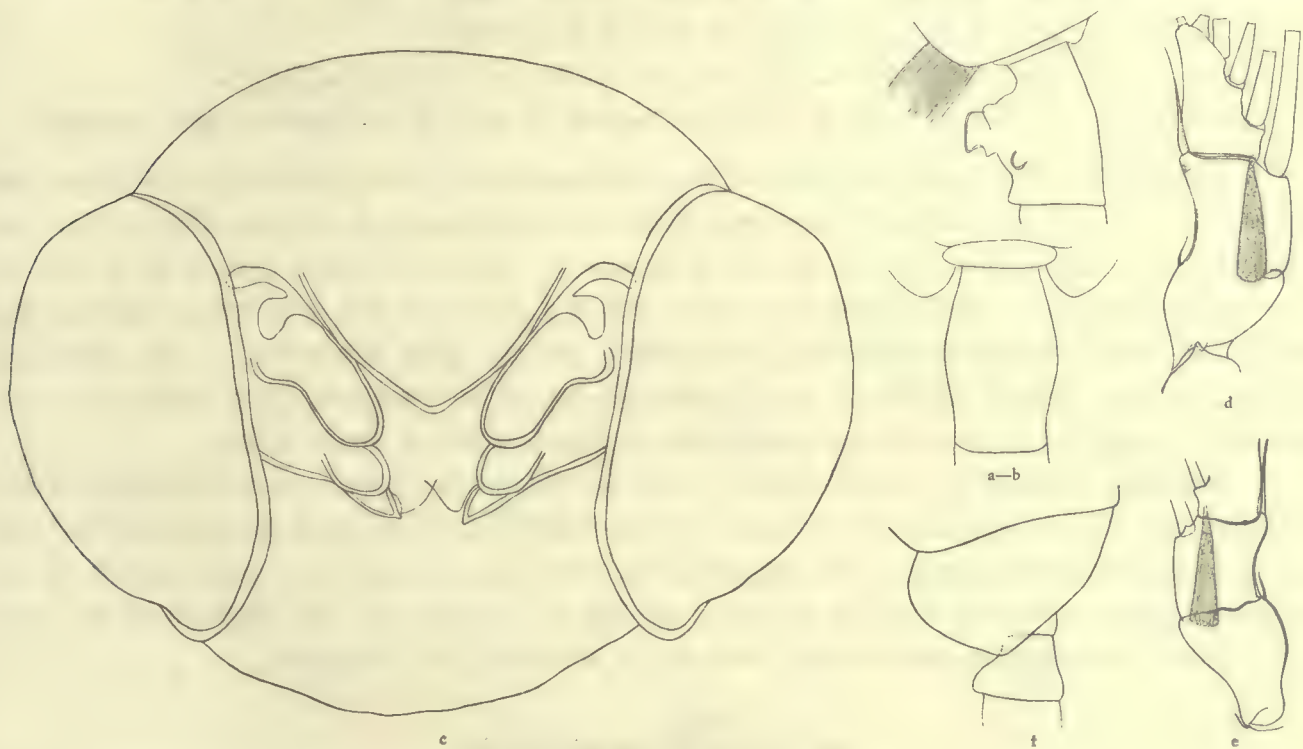
The shape of the body is scarcely different from Sars' figure; the anterior division, which has a rounded lateral corner with a tuft of long hairs, is 2.5 as long as the urosome. On the ventral surface of the third to fifth abdominal somites tufts of powerful hairs are found. The comparative length between the 3 first somites is as 50, 30, 25.

The *genital somite* (text-figs 48 a—c), which is 1.2 as long as wide and 1.1 as long as deep, is almost as long as the following two combined; the ventral surface has a big protuberance for the vulva, placed almost in the middle of the somite. In lateral view the ventral outline is anteriorly rounded, in the middle almost straight, and posteriorly produced into a somewhat triangular process, which by an incision is well separated from a "posterior process", which really is the posterior limitation of the vulva; this posterior process is basally marked by an incision. Somewhat more posteriorly and dorsally than the base of the genital protuberance on the left side a small rounded process is found; this process has been found in all the examined specimens, and is best seen when the somite is examined in not quite lateral view. In ventral view the vulva is seen to be limited by a slightly prominent edge behind; laterally it is partly covered by a wing-like expansion, which is rounded in front, and produced behind. In the middle of the vulva a chitinous "plate" is found, which in the posterior margin has a median incision, laterally is partly fused and covered by a somewhat trilobated process, and in front is in the middle covered by a posteriorly triangularly pointed plate. The St. 2 of the furca is almost twice as long as the St. 1—4, but much shorter than the distinctly geniculate Si.

The *antennulae*, antennae, mandibulae, maxillae and maxillipeds do not show any feature of

interest. The Le of the *maxillulae* show, however, some variation. In one specimen a single very short hairy seta, a longer one and 5 very long ones were present on each side; in another specimen 1 fairly long + 5 very long were found on the left side, but 2 short + 5 long on the right side; in 3 specimens 2 short + 5 long setae were found on each side, and in one, on the left side, in addition to the 5 long ones, one fairly long and one very short seta. The basipodite has 5 setae, the Ri I 3, Ri II 4 (one very delicate), and the Ri III 3 setae.

The *pes I* has the articular membrane between Re I—II fairly well developed anteriorly (text-figs 48 b—c), and the Se Re I is fairly well developed. The Se Re II scarcely extends to the end of the short Se 1 Re III, and the Se 2 Re III extends somewhat beyond the middle of the third division (cf. Wolfenden's fig. 9, p. 134). The epistoma, anterior surface of the labrum, and the labial lobes



Text-fig. 48. *Euchate Farrani* n. sp.

a—b. f♀. Abdomen in dorsal and lateral view $\times 18$. c. f♀. Vulva from below $\times 18$. d. f♀. Pes I dext. in post. view $\times 57$. e. Pes I dext. in ant. view $\times 50$. f. Y♀. Lateral corner $\times 18$.

seem in main features to be like *E. norvegica*; the oral surface of the labrum is somewhat different from *E. norvegica*, as seen by comparing figs 6 a and 3 a; the lateral anterior group has about 60 rather strong short spines, the groups 1—6 are more regularly placed. The area in front of the lamina labialis differs by the less square, more rounded, lateral group of short hairs.

Y♀ (St. V). Size 8.3 mm.; anterior division 6 mm.; urosome 2.3 mm.

The lateral corners of the thorax are regularly rounded; in other respects, except the usual ones, this stage is scarcely different from the adult females (text-fig. 48 f).

Occurrence. This species was gathered at the following stations by the Ingolf Expedition.

$1/7$ 1896 St. 104 $66^{\circ}23$ L. N. $7^{\circ}25$ L. W. P. 100—0 fathoms Temp. at surf. 6.3° C. 5 f♀.
 $11/7$ 1896 St. 105 $65^{\circ}34$ L. N. $7^{\circ}31$ L. W. 5.8° C. 1 f♀.

- 24/7 1896 St. 117 69°13 L. N. 8°23 L. W. V² 100—0 fathoms Temp. at surf. 4.1° C. 1 f♀.
 25/7 1896 St. 118 68°27 L. N. 8°20 L. W. — 4.9° C. 2 f♀ (eggs + sperm.),
 1 y♀ (V).
 25/7 1896 St. 120 67°29 L. N. 11°32 L. W. — 5.1° C. 1 f♀.
 10/8 1896 St. 138 63°26 L. N. 7°56 L. W. — 1 f♀ (eggs).

Deichmann has taken 2 f♀ (with egg-balls) 70°32 L. N. 8°10 L. W. Depth 470 fathoms.

The S/S Thor has taken a single specimen south of Iceland at a typical Atlantic station as well as from a few stations in the Iceland--Færoe channel.

- 11/7 04 St. 183 61°30 L. N. 17°08 L. W. Yt. 1800 M. Wire 1 f♀.
 13/7 03 St. 164 62°10 L. N. 19°36 L. W. Trawl. 1 f♀.
 23/7 05 St. 124 61°04 L. N. 4°33 L. W. Yt. 1000 M. Wire 1 f♀.
 9/5 04 St. 71 63°06 L. N. 6°20 L. W. Yt. 1500 M. Wire 7 f♀ (1 egg-ball), 1 y♀.
 4/8 04 St. 230 63°10 L. N. 7°31 L. W. Trawl. 1090 M. D. 27 f♀ (2 with sperm., 4 with egg-balls).

Distribution. This species, according to Sars, has been taken several times in the Norwegian Sea "by the aid of trawl" "and always in great depth down to 2000 fathoms". By the Duc d'Orléans it was taken 12/7 1200—1800 metres 79°34 L. N. 2°40 L. E., and 16/7 800—1350 metres 78°05 L. N. 5°21 L. W. The species seems most often to have been taken with the trawl; the few observations indicate that the species belongs to the northern deep sea plankton, with its main distribution in the seas lying between Iceland, Norway, Greenland and Spitsbergen, but it is sometimes found south of Iceland. Curiously enough it has not yet been found either in Denmark nor in Davis Strait.

Remarks. Though the lateral tubercle of the left side of the genital somite is distinctly shown neither in Sars' nor in Wolfenden's figures, I do not doubt that the described species is identical with that described by the two authors. On account of the structure of the pes II, Farran regards Wolfenden's species as identical with his *E. Sarsi*; the size 10—11 mm. and the structure of the vulva (fig. 5) make it necessary to refer at least some of the specimens to *E. Farrani*.

50. *Euchæte barbata* Brady.

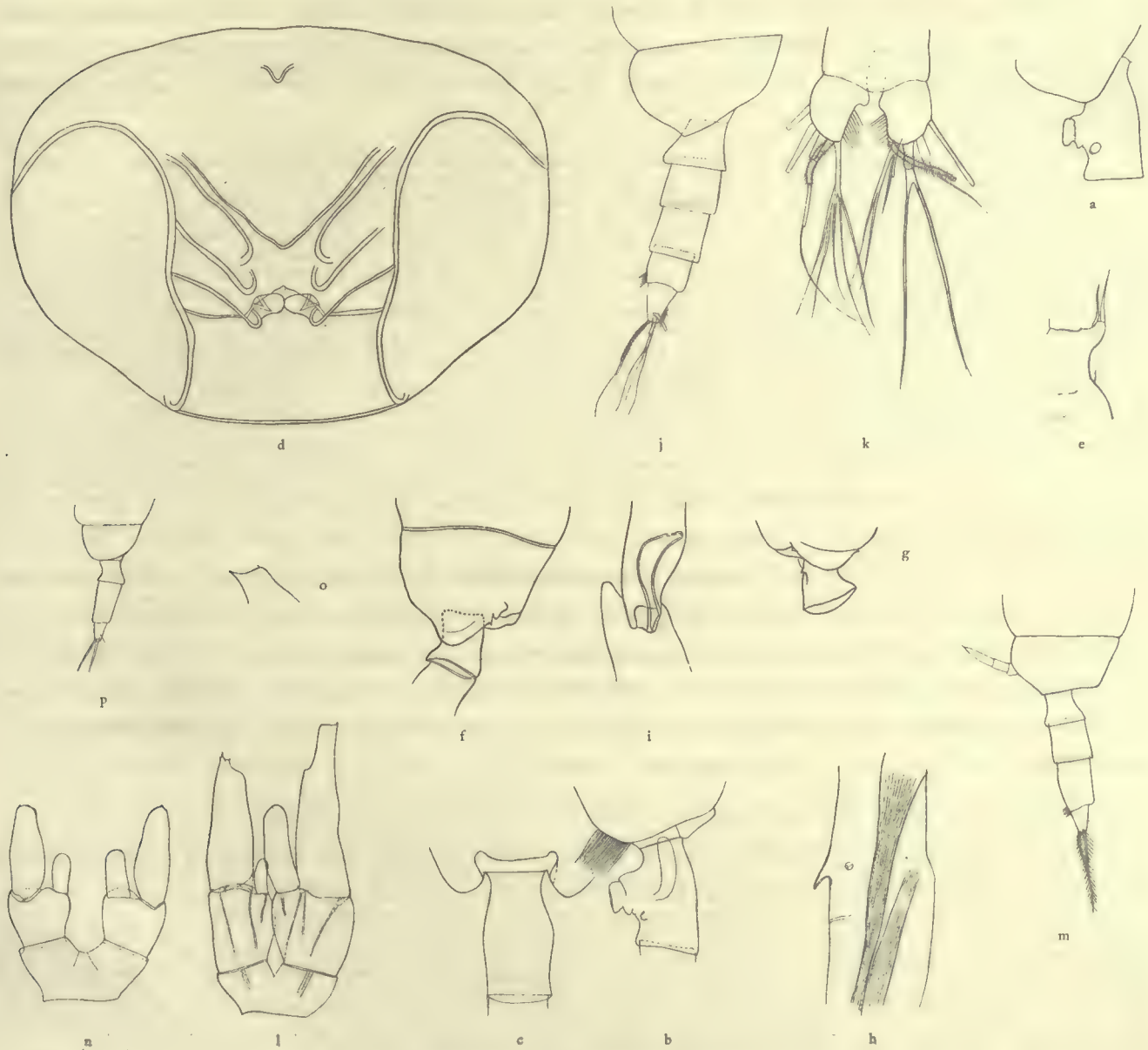
(Pl. VI figs 8 a—b; text-figs 49 a—p.)

1883.? <i>Euchæte barbata</i> n. sp. Brady, p. 66, pl. XXII figs 6—12.	1906. <i>Euchæte barbata</i> Brady. Pearson, p. 17.
1892. — — Brady. Giesbrecht, p. 246.	1907. nec. — — — Damas & Koefoed, p. 409.
1894. nec. — — — Th. Scott, p. 58.	1907.? — — — G. O. Sars, p. 3.
1898. — — — Giesbrecht & Schmeil, p. 40.	1908. pars. — — — v. Bremen, pp. 54—55 fig. 61.
1903.? — — — Thompson & A. Scott, p. 244.	1908. — — — Farran, pp. 40—41, pl. III figs 13—14.
1903. nec. — — — G. O. Sars, p. 41, pl. XXVIII.	1909.? <i>Pareuchæte barbata</i> Brady. A. Scott, p. 70, pl. XVIII figs 1—8.
1904.? — — — Wolfenden, p. 135.	
1905.? — <i>porrecta</i> n. sp. G. O. Sars, p. 16.	

Description. f♀. Size of specimen from St. 183 was 7.87 mm.; anterior division 5.75 mm.; urosome 2.12 mm. Another specimen measured 8.3 mm. Farran's specimens measured 8.1—8.8 mm.

The shape of the body is practically like that of the preceding species; the ventral surface of the abdominal somites are less heavily hirsute. The comparative length between the 3 first abdominal somites is as 42, 24, 24; the *genital somite* is 1.3 as long as wide and scarcely 1.3 as long as deep;

the ventral protuberance is in lateral view scarcely different from *E. Farrani*; the anterior process is comparatively shorter, but the posterior margin and the dorsal lateral process are scarcely different. In the transverse chitinous plate no median incision was found posteriorly; covered by this plate a chitinous system was found with a median incision (text-figs 49a-d).



Text-fig. 49. *Eucheate barbata* Brady.

a-b. f♀. Genital somite of two specimens in lateral view $\times 16$. c. f♀. Genital somite $\times 16$. d. Vulva $\times 180$. e. f♀. Pes I dext. ant. view $\times 53$. f-g. f♂. Lateral corner from the left and right $\times 18$. h. f♂. Pes V dext. Re $\times 57$. i. Pes V Ri sin. from inner side $\times 59$. j. Y♀ (St. V). Abdomen $\times 18$. k. Furca of same specimen $\times 33$. l. Y♂ (St. V). Pes V $\times 33$. m. Y♂ (St. IV). Abdomen $\times 16$. n. Y♂ (St. IV). Pes V $\times 57$. o-p. Y (St. III). Rostrum and abdomen $\times 16$.

The measurements of the *antennulae* show in the examined specimens a slight difference from *E. Farrani*; the segments 24 \sim 25 are slightly longer than, (not =) segment 19 and the segment 21 is almost 1:1 as long as 17 (not as long as). The Le of the *maxillulae* possesses in the examined specimens, in addition to the usual 5 long setae, 2 shorter ones, showing from fairly long to very short variations.

The *pes I* (text-fig. 49 e) is scarcely different. The *pes II* differs distinctly by the Se Re II, which almost extends to the end of the fairly long Se 1 Re III, and by the long Se 2, which extends to the tip of the segment and to the base of the Se 3.

The anterior surface of the *labrum* shows an arrangement of the hairs most like that of *E. Sarsi* (fig. 7 a). The oral surface is like that of *E. Farrani*; the lateral group consists of about 40 hairs, placed inwards in two rows, and outwards in one; about the difference in the arrangement of the other groups I refer to fig. 8 a. In the arrangement of the hairs on labial lobes etc. no features of great interest were found.

♂. Size of specimen from St. 183 was 7.37 mm.; anterior division 5.3 mm.; urosome 2.07 mm.

The shape of the body is practically like that of *E. norvegica*; the rounded lateral corner is more produced on the left side than on the right; the dorsal lateral process is more distinct on the right side than on the left. The first abdominal somite has the dorsal process near the anterior border prominent on the right side, and just indicated on the left (text-figs 49 f—g). The *antennulae* reach just beyond the end of the cephalothorax; the segments 12—13 being without any articular membrane posteriorly on the left side, but with a fairly distinct articular membrane on the right side in some specimens. No "Æsthetasken" were found in segment 20. The segments 24 ∼ 25 are 1.1 as long as segment 15. The *antennae*, mandibulae and maxillae scarcely show features of interest; the *maxillulae* have 8 setae in Ri, but do not differ from *E. norv.* in other respects. The *maxillipeds* do not possess any hooked process in the lob. IV of basipodite II, but 2 setae, of which the one is thicker. The Se of Re I *pes I* is extremely short and delicate. The *pes II* differs by the short Se Re II, which does not reach the middle of the third division. The *pes V* dext. is scarcely different from *E. norv.*; it has a well developed Se Re I, and trace of articular membrane between Re I and II. The *pes V* sin. has the Re II—III comparatively shorter than *E. norv.*, and has the serrated process fairly pointed, rather shallow, and with a few distal teeth, comparatively strong, as shown in figure 8 b. The left endopodite is rather clumsy and has only a single segment (text-fig. 49 i).

Y♂ (St. V). Size: 6.14 mm.; anterior division 4.6 mm.; urosome 1.54 mm.

The lateral corner of the fifth thoracic somite, which is fairly well marked, is produced into a rather blunt point. The first of the 4 abdominal somites is distinctly produced below in the females, not in the single male. The appendages do not show features of great interest; the *pes II* is scarcely different from that of the adult female. The *pes V* (text-fig. 49 l) is like that figured in *E. tonsa*, but the St. are more developed. In a single female several of the furcal setae were more or less bifurcate (text-figs 49 j—k). The two last abdominal somites bear ventrally groups of rather short hairs.

Y♀ (St. IV). Size: 4.49 mm.; anterior division 3.39 mm.; urosome 1.10 mm.

The lateral corners are slightly more pointed than in the preceding stage (text-fig. 49 m); the first of the 3 abdominal somites is barely produced below; only a single tuft of hairs is observed near the hinder border of the last abdominal somite ventrally. The appendages show differences similar to those described in *E. norv.*, f. inst., the segments 24 ∼ 24 of the *antennulae* are 1.3 as long as the segment 19 (text-fig. 49 n).

Y (St. III). Size: 3.06 mm.; anterior division 2.37 mm.; urosome 0.69 mm.

Apart from the bigger size and more straight rostrum, the stage is scarcely different from that of *E. norvegica* (text-figs 49 o—p).

Occurrence. The S/S Thor has $11/7$ 04 St. 183 61°30 L. N. 17°08 L. W. Yt. 1800 M. Wire taken 9 f♀, 2 f♂, 4 y♀ (V), 1 y♂ (V), 2 y♀ (IV), 1 y♂ (IV), 1 y (III) and $10/7$ 09 St. 180 61°34 L. N. 19°03 L. W. Yt. 1800 M. Wire 1 f♀.

Distribution. Remarks. About the distribution of this species only very little is known, as will be understood from the following remarks. By Farran it has been recorded as occurring "in small numbers on five stations of from 700 to 1000 fathoms" off the west coast of Ireland. As neither Sars nor Scott says anything about the characteristic tubercle on the left side of the genital somite, and as their descriptions are not very perfect, I do not think that we should be right in including the Mid Atlantic and the Indian Ocean within the range of this species. Farran, with some reluctance, refers his species to Brady's old species from 36° L. S. 46° L. W., on account of the corresponding size and similar structure of pes II; Brady's figure of the genital protuberance and the smooth ventral surface of the abdominal somites III—IV seems to me to speak against the correctness of this view. The same opinion is shared by Wolfenden, who regards *E. barbata* as more related to *E. Wofendenii* than to any other (cf. 1911, p. 300); as, however, the name is now applied to a well defined species, and as there is no reason to hope for a sure identification, I prefer to follow Farran in this respect.

51. *Euchæte Sarsi* Farran.

(Pl. VI figs 7 a—b; text-figs 50 a—f.)

1908. *Euchæte Sarsi* n. sp. Farran, p. 41, pl. III figs 15—16.

1909? — — Farr: A. Scott pp. 75—76, pl. XXI figs 9—15.

Description. ♀. Size of specimen from St. 183 was 10 mm.; anterior division 7.3 mm.; urosome 2.7 mm. Farran's specimens measured 9.8—10.2 mm.

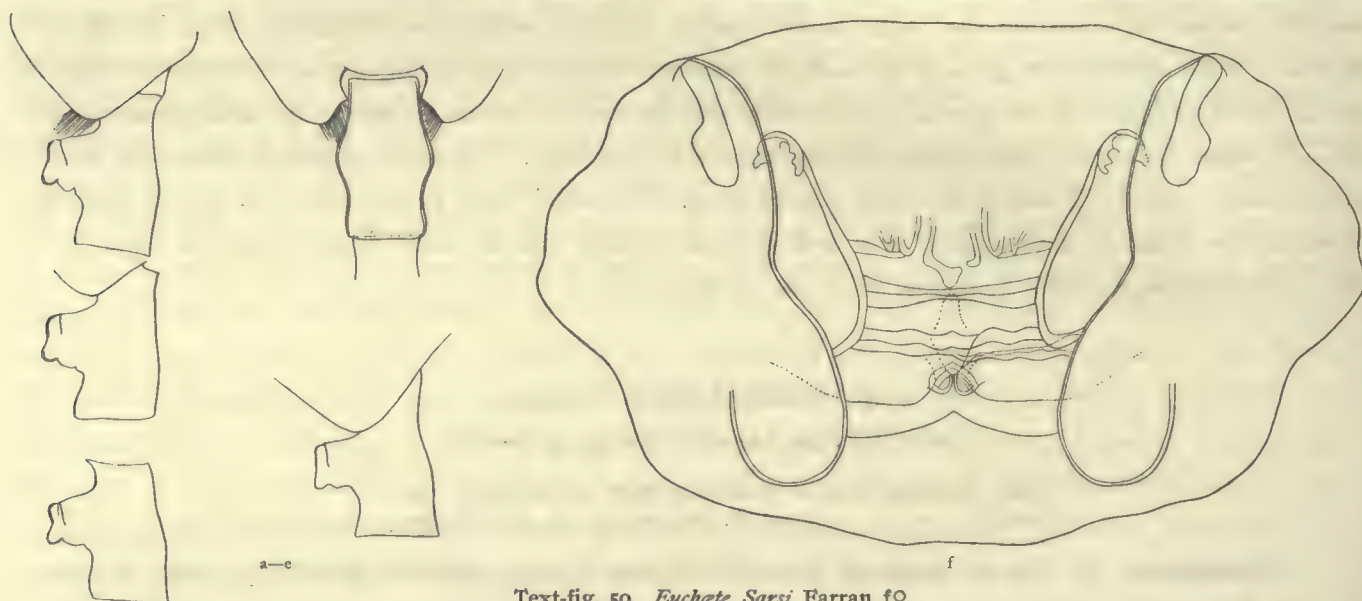
The shape of the body etc. scarcely show features of interest. The anterior division is 2.7 as long as the urosome; the proportional length of the abdominal segments is 45, 27, 27. The genital somite has not on the left side the characteristic tubercle found in *E. Farrani*, and the ventral protuberance has the anterior process slightly concave in the middle, and the posterior process less prominent than in the other species (text-figs 50 a—e). The vulva is in the ventral surface quite different from that of *E. Farrani* and *barbata*. The median chitinous plate has posteriorly a median incision, but the area in front is irregularly wrinkled, and the triangular plate is only indicated; the trilobate process is very indistinct (text-fig. 50 f). The segment 19 of the antennulae is 1.1 as long as 24 ~ 25. The Le of the *maxillulae* possess 2 extremely short and one longer seta proximally, and in addition to these the usual long ones distally. The *pes* I has a very short Se Re I. The Se of Re II extends to the end of Se 1 Re III, and the Se 2 Re III extends somewhat beyond the middle of the third division.

The anterior surface of the *labrum* is distinctly different from that of *E. norv.* and *Farrani*, as realised by comparing fig. 7 a and the description of *E. norv.* The oral surface of the labrum is very much like that of *E. norv.* The lateral group consists of 30—40 short spines; the groups 1—2 are placed near to each other; the 3—5 are fairly well separated. The arrangement of hairs in front of *lamina*

labialis is most similar to that of *E. Scotti* (fig. 10 b); the large lateral group is almost completely fused with the median, which, however, has longer hairs.

♂. Size: 8.3 mm.; anterior division 5.5 mm.; urosome 2.8 mm.

The rostrum is directed more forwards than in *E. barbata* Brady; the lateral dorsal teeth of the last thoracic tergite are only slightly developed. The *antennulae* extend distinctly beyond the end of the cephalo-thorax; the segment 20 has a well developed "Æsthetask"; in other respects these organs are scarcely different from those of *E. barbata*. The *maxillipeds* have in the lobe IV of Basp. II a well developed, rather slender, hairy conical process, which terminally is produced into a delicate lash. The *Se* of *Re I pes I* is wanting. The *pes II* is practically like that of *E. barbata*. The *pes V dext.* is scarcely different from that of *E. barbata*; the *pes V sin.* is in most respects like that of the other species;



Text-fig. 50. *Eucheate Sarsi* Farran f♀.

a-e. Abdomen of different specimens $\times 16$. f. Vulva in ventral view $\times 180$.

the differences are best realised by comparing figs 7 b and 8 b; the best character is found in the serrated process which is more slender, and has a less regular serration.

Occurrence. The S/S Thor has taken this species at the following deep sea stations.

11/7 1904 St. 183 61°30' L. N. 17°08' L. W. Yt. 1800 M. Wire 3 f♀.

10/7 1904 St. 180 61°34' L. N. 19°03' L. W. Yt. 1800 M. Wire 1 f♀.

31/8 1905 St. 167 57°46' L. N. 9°55' L. W. Yt. 1500 M. Wire 1 f♂.

Farran has recorded this species from three deep sea stations off the west coast of Ireland.

Remarks. That the described females are identical with *E. Sarsi* Farran, I regard as quite evident; in contrast to Farran I do not regard it as identical with Wolfenden's *E. barbata* (cf. p. 174). The described male is certainly different from that which has been referred to *E. barbata*, and belongs certainly to *E. Sarsi* or another species of similar size nearly related to it. I do not think that the male, which A. Scott refers to *E. Sarsi* is identical with the described one, on account of the well developed lateral dorsal teeth of the fifth thoracic tergite and the different shape of the serrated process.

52. *Euchæte Scotti* Farran.

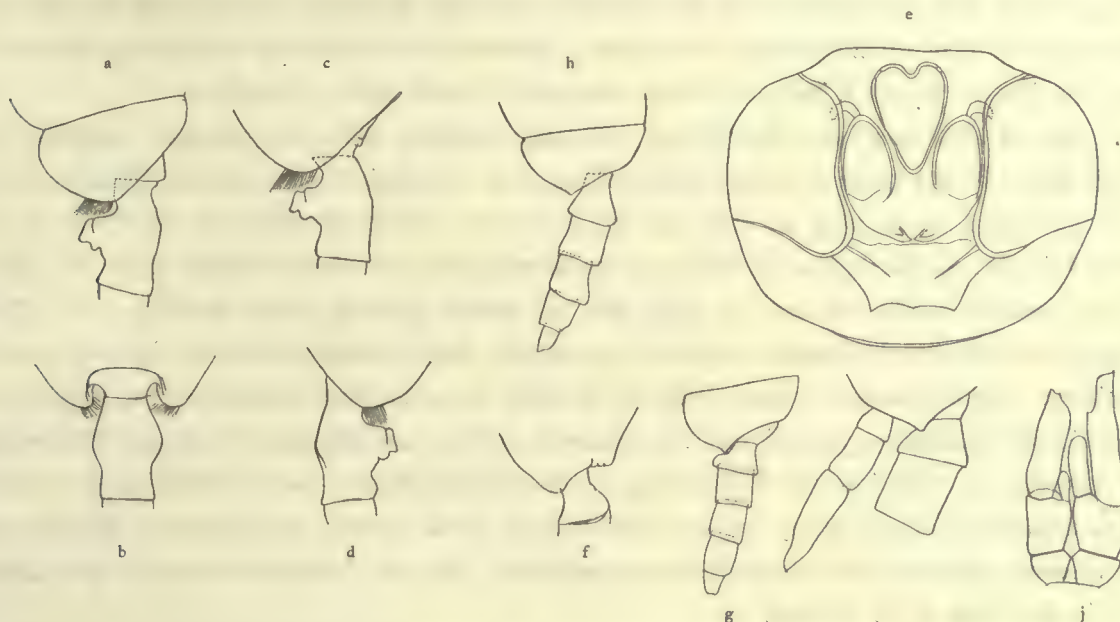
(Pl. VI figs 10 a—c; text-figs 51 a—j.)

1908. *Euchæte Scotti* n. sp. Farran, p. 42, pl. III figs 11—13.

1911. ? — — — Farr. Wolfenden, pp. 301—302, pl. XXXV fig. 2, text-figs 53 a—c.

Description. f♀. Size of specimen from St. 183 was 5.99 mm.; anterior division 4.26 mm.; urosome 1.73 mm. Farran's specimens measured 5.7—6.3 mm., Wolfenden's specimens measured 4.2—4.85 mm.

The shape of the body is more robust than in the preceding species, as the anterior part is only c. 2.3 as long as wide, and as wide as the urosome is long. The lateral corner of the cephalothorax is not quite regularly rounded, but somewhat triangularly produced; the anterior division is 2.5 as long as the urosome, which shows the following proportion between the three first somites (15, 8.5,

Text-fig. 51. *Euchæte Scotti* Farran.

a—d. f♀. Genital somite $\times 18$. e. f♀. Vulva from below $\times 180$. f. f♂. Left corner $\times 18$. g—h. Y♀—♂ (St. V). Abdomen from the left $\times 24$. i. Y♂ (St. V). Lateral corner $\times 15$. j. Y♂ (St. V). Pes V $\times 15$.

8.5). The *genital somite*, which is 1.3 as long as wide and 1.2 as long as deep, is in dorsal view slightly asymmetrical, and has the lateral margins strongly convex, somewhat in front of the middle. The *genital protuberance* has in lateral view a wing-like anterior process, sometimes slightly concave in the middle, and a more dorsal and posterior process, separated from the former by a distinct incision (text-figs 51 a—e). In ventral view the vulva shows some similarity to Wolfenden's figure 53 a, which is, however, too incomplete for a detailed comparison, and is distinctly different from the mentioned species of this group. The posterior incision in the median plate is not observed; the anterior triangular point, of which an oval plate is found, is just indicated.

The *antennulae* extend just beyond the end of the third thoracic tergite, but not to the end of the cephalo-thorax; the segments 24 \sim 25 are as long as the segment 19; the appendages scarcely show differences from those of *E. norvegica*. The mouth-limbs are scarcely different from those of *E. barbata*;

the Le of the *maxillulae* possess 5 long + 2 shorter setae. This is in contrast to Wolfenden, who has only found 5 setae in his specimens. The articular membrane between Re I—II of *pes I* is barely indicated, and the Se is, as pointed out by Wolfenden and Farran, extremely minute. The *pes II* is like Farran's description; the Se Re II almost extends to the end of Se 1 Re III, and the Se 2 Re III extends a little beyond the middle of the third division; in most of Wolfenden's specimens the Se 2 reaches the end of the segment.

The anterior surface of the *labrum* is in the arrangement of the setae scarcely different from *E. Sarsi* (fig. 7 a); the oral surface is most like that of *E. norvegica* (fig. 10 a); the lateral group consists of about 10 fairly long, densely placed, setae. The first group of the longitudinal series, which is somewhat convex in front, is connected with group 2, which possesses fairly long setae, by delicate hairs scattered inwards and outwards; groups 3—6 are fairly well separated, without difference between outer and inner portion. The arrangement of the hairs on the area in front of the *lamina labialis* (fig. 10 b) is in the main like that of *E. norvegica*, but shows, however, as realised by comparing figures, distinct difference; the lateral group, f. inst., is almost completely fused with the median.

♂. Size of specimen from St. 183 was 5.56 mm.; anterior division 3.93 mm.; urosome 1.63 mm.

The shape of the body is more clumsy than in *E. norvegica*; the anterior division is only 2.5 as long as wide, and 2.4 as long as the abdomen, the first somite of which is about 1.1 as long as broad. The left side of the thorax is distinctly produced, and the dorsal lateral spine is represented by a minute rounded eminence; on the right side no lateral spine is found (text-fig. 51 f). The dorsal lateral process of the first abdominal somite is, as usually, best developed on the right side, but is not very prominent. The *antennulae* extend distinctly beyond the end of the cephalo-thorax; segments 12—13 have no articular membrane posteriorly; the segment 19 is 1.9 as long as 2.4—2.5; no "Æsthetask" was found in segment 20. The lob. IV of the Basp. II of the maxillipeds has in addition to a fairly long slender seta a moderately long hairy process and a rather small conical protuberance; the other mouthlimbs are scarcely different from those of the type-species. The *pes I* has an extremely short Se in Re I; the *pes II* is like that of *E. barbata*.

The *pes V* is shorter and more clumsy than in the mentioned species; the Re I—II *pes V* sin. are most like the corresponding segments in *E. barbata* (fig. 10 c); the serrated process is narrow with regular marginal serration.

Y♂ (St. V). Size of ♀ from St. 183 was 4.83 mm.; anterior division 3.63; urosome 1.2 mm. ♂ (St. 183) measured 4.54 mm.

The shape of the body is, as in the adult specimens, more clumsy than the corresponding stages of the related species. The lateral corner is, as shown in figure, triangularly, but obtusely, pointed. The Se of the Re I *pes I* is comparatively long and slender. The females examined are distinctly different from the male by the produced lower margin of the first somite; the *pes V* does not show characters of great interest (text-figs 51 g—j).

Y♀ (St. IV). Size of specimen from St. 183 was 3.34 mm.; anterior division 2.48 mm.; urosome 0.86 mm.

This stage differs from corresponding stage in related species by an obtusely pointed lateral corner.

Occurrence. The Thor Expedition has gathered this species at two stations only viz:

11/7 1904 St. 183 61°30 L. N. 17°08 L. W. Yt. 1800 M. Wire 37 f♀ (3 with egg-balls, 2 with sperm.), 8 f♂,
 8 y♀ (V), 4 y♂ (V), 1 y♀ (IV).
 24/5 1904 St. 104 62°47 L. N. 15°03 L. W. Yt. 1500 M. Wire 4 f♀.

This species has previously been gathered off the west coast of Ireland "at depths of from 700 to 1000 fathoms" at five stations "but very few specimens were found on each occasion". Wolfenden's specimens, which on account of the different shape of the genital somite (Pl. XXXV fig. 3) cannot with security be referred to the same species, were gathered under the equator ca. 20° L. W. (depth 3000 m.)

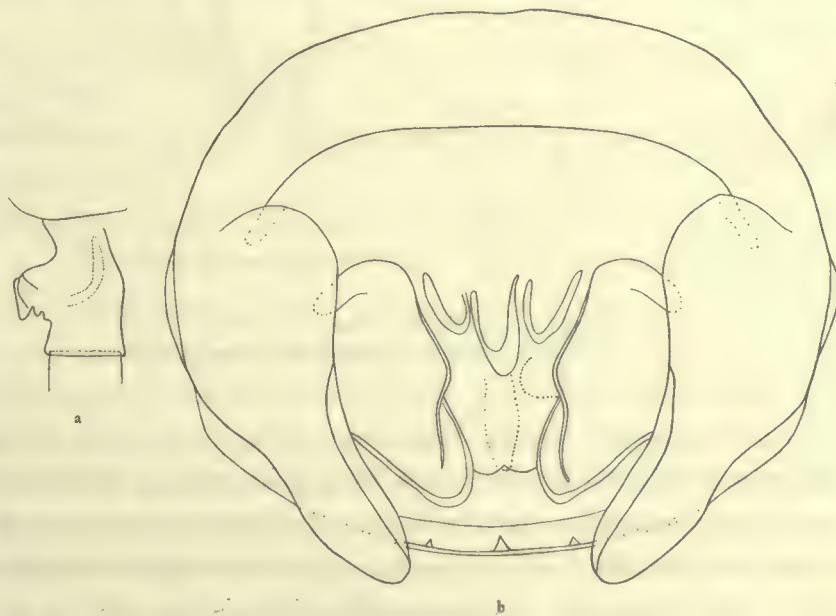
53. *Euchæte Hansenii* n. sp.

(Text-figs 52 a—b.)

Description. Size: 8.9 mm.; anterior division 6.5 mm.; urosome 2.4 mm.

The shape of the body is like that of *E. norvegica*. The anterior division is 2.7 as long as the urosome, which is only a little longer than the width of the thorax. The proportional length of the abdominal somites is 45, 26, 25. The *genital somite* is, laterally, more suddenly convex than in *E. Sarsi*, and, as in this, the greatest width lies in the proximal part; the genital somite is 1.3 as long as wide, but only 1.1 as long as deep.

The lateral conical process which characterises *E. barbata* and *Farrani*, is wanting. In lateral view the genital protuberance differs distinctly from that of *E. Sarsi* by the straight, not concave, anterior process, and by a fairly distinct process behind and above the second one, sometimes indicated in *E. Sarsi*, which, as usually, represents the posterior border of the vulva. The ventral surface is quite different; the triangular plate in front is divided into three processes; the transverse plate has posteriorly a median incision, on each side of which are two lobes (text-figs



Text-fig. 52. *Euchæte Hansenii* n. sp.

a. f♀. Abdomen $\times 16$. b. Vulva in ventral view $\times 180$.

52 a—b). — The *antennulae* scarcely extend to the end of the cephalo-thorax; the appendages are scarcely different from those of *E. norvegica*; the segment 19 is 1.1 as long as the segments 24 \sim 25. The *maxillulae* possess in Le 1 two basal, fairly long and slender, setae, followed by 6 powerful seta and one terminal somewhat shorter one; the Basip. has 5, the Ri I 3, Ri II 4 and the Ri III 3 setae. The articular membrane between Re I—II is barely indicated, and the Se is long and slender. The Se of Re I is fairly long, and extends almost to the base of Se 1 Re III, and the Se 2 Re III extends to the base of Se 3.

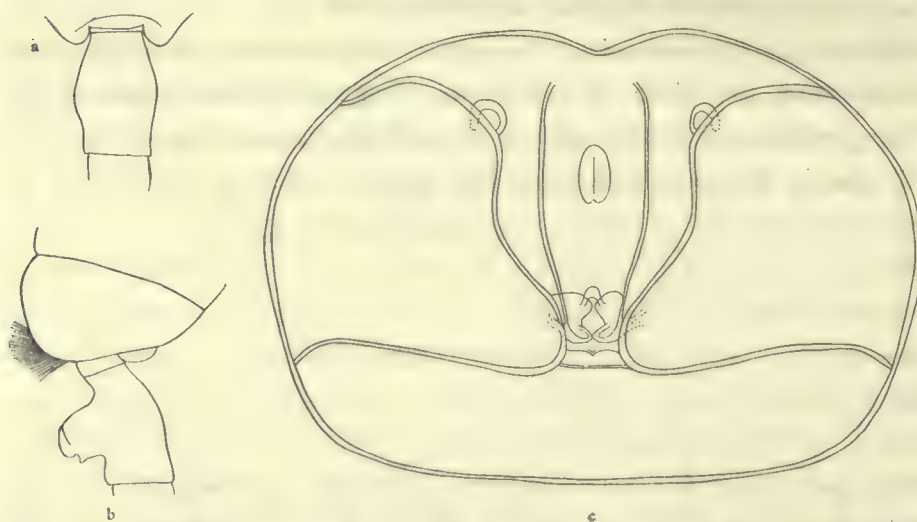
Remarks etc. Of this species the S/S Thor has $29/8$ 1905 St. 165 60°00 L. N. 10°35 L. W. taken a single mutilated female. This species is nearly related to *E. Sarsi*, but it easily distinguished by the smaller size, by the structure of the genital somite, by the 9 setae in the Le of the maxillulae, and by the well developed Se Re I pes I.

54. *Euchæte Bradyi* n. sp.

(Pl. VI fig. 9 a; text-figs 53 a—b).

Description. Size: 80 mm.; anterior division 5.5 mm.; urosome 2.5 mm.

The anterior division is about 2.2 as long as the urosome, which is about as long as the abdomen is wide. The lateral corner is rounded, with a heavy tuft of hairs. The proportional length



Text-fig. 53. *Euchæte Bradyi* n. sp. f♀.
a—b. Abdomen $\times 16$. c. Vulva from below $\times 180$.

between the abdominal somites is 40, 25, 25. The ventral surface of the three last abdominal somites possesses a number of short delicate hairs. The *genital somite* is 1.6 as long as wide, but, on account of the high ventral protuberance, only 1.1 as long as deep; no posterior process is found on the left side. The subapical seta is broken, but is probably longer than St. 2. The anterior flange on the side of the vulva is rather short, with

a somewhat convex outline, when observed in lateral view; the posterior margin is rather prominent. The vulva is covered by the lateral flanges, in any case in front, to a greater extent than in the other species; the triangular plate in front is indistinctly developed; posteriorly a median incision is found, on each side of which a complicated chitinous framework is found (text-figs 53 a—c).

The *antennulae* extend somewhat beyond the end of the abdomen; the appendages are like those of *E. norvegica*; the segments 24 \sim 25 are 1.1 as long as segment 19. The Le of the maxillulae possess two short and 5 long setae; the basipodite has 5, and the Ri 3 + 4 + 3 setae. The other mouth-limbs do not show features of any interest.

The articular line between Re I—II *pes I* is indistinctly marked; the Se Re I is wanting, and the concavity distal to its usual insertion is only moderate. The exterior outline of the Re III, which in most species is more or less straight, is moderately convex towards the middle, and the usual glandular pore is not seen. The Se Re II of the *pes II* extends almost to the tip of the Se 1 Re III, and the Se 2 of this segment extends somewhat beyond the middle of the third division, but not to the end of the segment.

The anterior surface of the *labrum* has on each side, posteriorly, an area covered with fairly long hairs; this group is almost fused with a transverse row of rather short hairs, which, without interruption, is continued from right to left. The oral surface has in the lateral group 40–50 short spine-like hairs placed in a curved row; in the middle two distinct transverse rows, as seen in fig. 9 a. The groups I–II, in the longitudinal series, meet as in *Euc. norv.* under an angle; the groups III–IV have a smooth area in the middle, while the groups V–VI are compact. The groups of hairs in front of the lamina labialis are in most respects like fig. 3 b, but the lateral posterior group is more elongate, and consists of fewer hairs.

Remarks etc. Of this species I have only examined a single female, taken ^{24/7} 1896 St. 118 68°27' L. N. 8°20' L. W. Closing net 1030 fathoms by the Ingolf Expedition; it is probably nearly related to *E. barbata*, but differs distinctly from it by the deep genital protuberance.

55. *Euchæte bisinuata* G. O. Sars.

(Pl. VI figs 11a–e; text-figs 54 a–j).

1907. *Euchæte bisinuata* n. sp. G. O. Sars, p. 12.

1908. ——— G. O. Sars. Farran, p. 45, pl. III figs

17–19, pl. IV fig. 4.

1909. *Euchæte bisinuata* G. O. Sars. A. Scott, pp. 70–71, pl. XVI figs 10–17.

Description. f♀. Size: 5.62 mm.; anterior division (2.58 + 1.59) = 4.17; urosome 1.45 mm. Sars' specimens measured 5.2 mm.; Scott's 5 mm.

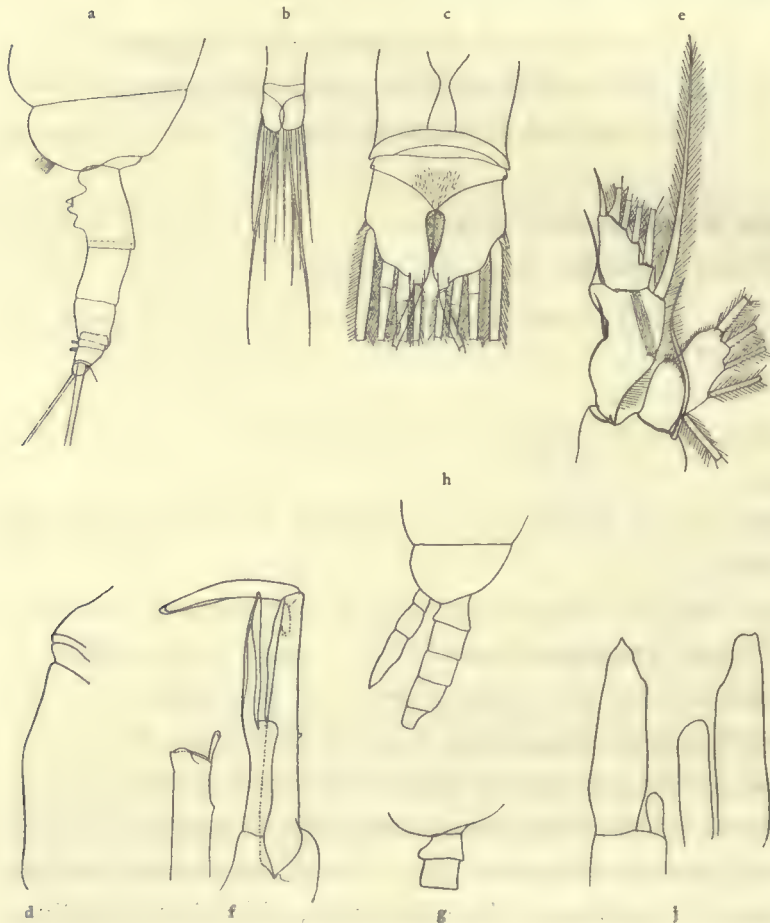
The anterior division, which is distinctly twice as long as the urosome, is rather short and clumsy with the lateral corners regularly rounded.

The genital somite is, seen from above, slightly asymmetrical with a well marked convexity in front, somewhat behind the base of the somite (text-figs 53 a–c). The ventral outline shows 3 characteristic lobes, as figured by Farran and Scott. The posterior border of the vulva is formed by a transverse, somewhat hollowed, ridge, which is gradually sloping forwards. In front of this, and on each side are a median and an anterior laminous process, of which the latter is the longer and thinner; the processes on the left side are comparatively shorter, and are placed more posteriorly; in ventral view they are seen to be turned towards the middle, thus partly covering the vulva. The third and fourth somites are almost smooth, and without any hairs below, in contrast to the fifth somite, which has ventrally a tuft of hairs; it is dorsally almost completely covered by the preceding tergite. The subapical seta is thinner but not very much longer than the St. 2, and it is not geniculated.

The *antennulae* extend almost to the tip of the anterior part; they are in the main like *E. norv.*, but the segments 24 ∼ 25 are just as long as segment 20, and 23 is a little longer than 16, which is as long as 17. The antennae and mandibulae do not show any features of interest. The Le 1 of the *maxillulae* bears 6 bristles of almost equal width basally, but the distal bristle is much shorter than the others, which are much longer than the breadth of the maxillulae. The Li 1 has the usual 10 hairs anteriorly, but only two posteriorly; the Li II as well as Li III is well developed, and each bears a long seta. The basipodite III has 3 setae with short hairs, of which the distal is the longest. The Ri I has 2 rather slender and a single powerful seta, while the Ri II ∼ III have 4 powerful ones. The convexity of the exterior margin in the basal segment of the *maxillae* is just indicated (text-fig. 54 d). The *pes I* has

only the limitation between Re I—II indicated, where the muscle is fastened inwards; the articulation between the Re II and III is well marked anteriorly, but only indistinctly so posteriorly (text-fig. 54 e). The exterior border has a well marked concavity (as shown in Farran's fig. 18 in contrast to Scott's fig. 15) and a long and slender Se 1, almost reaching the base of Se 2. The *pes II* is like the figures of the two authors; the Se Re II scarcely reaches the end of the Se 1 Re III, and Se 2 Re III scarcely reaches the end of Se 3.

The epistoma and the anterior surface of the *labrum* are scarcely different from those of *E. norv.*



Text-fig. 54. *Euchaete bisinuata* G. O. Sars.

a. f♀. Abdomen × 18. b—c. f♀. Furca × 18 and 57. d. f♀. Maxilla dext. from behind × 57. e. f♀. Pes I × 57. f. f♂. Pes V in anterior view × 75. g—h. y♀—♂ (St. V). Abdomen × 16. j. y♂ (St. V). Pes V × 57.

The oral surface of the *labrum* (fig. 11 a) shows a distinct difference from that of *E. norv.*, as is realised by comparing figures; the most characteristic feature is the lateral position of the first group, in front of which, behind the marginal fringe, a granular area is found. The usual spinous area behind the median spot Nr. 4 is wanting. The *lamina labialis* is, as seen in fig. 11 b, somewhat different from *E. norv.*, but more interesting is the large lateral group of hairs almost completely fused with the median group, situated in front of the lamina. The lobus labialis has the posterior lateral group well developed.

♂. Size: 4.8 mm.; anterior division (2.2 + 1.4) = 3.6 mm.; urosome 1.2 mm.

The body is rather clumsy, and about 3 times as long as the urosome; no difference was found between the lateral corners on the right and left side, and no tooth was observed. The genital somite is distinctly asymmetrical, as it is produced behind on the right side. The subapical seta is as usual in the male short and thin.

The *maxillulae* are as a whole less developed than in the male of *E. norv.*, and differ in minor points. The Le I has, in addition to the 5 long setae, a delicate basal one, and the Basp. has only a single seta. The Basp. II of the *maxillipeds* has in the lob IV only a single hair in addition to a hooked clumsy organ surrounded by delicate hairs (fig. 11 c).

The *pes I* has no Se in the first segment, which is well separated from the second by a complete articular membrane; the Se 2, which is short and strong, is placed on the somewhat produced exterior corner of Re II. The *pes II* has, in contrast to the female, the Se Re II very short

and the Se 2 Re III does not reach the end of the segment. The pes V (fig. 54 f) resembles in most respects that of *E. norv.* The Ri dext. is long and slender, consisting of a single segment, but divided into two, about equal, divisions (of which the posterior is the more slender) by an exterior rounded eminence, which is indicated in *E. glacialis*. The Re I∞II of the right leg, which is 1.5 as long as the Re III, shows by an indistinct incision indication of subdivision into a basal and a terminal segment; a small Se Re I is found. The Ri sin., which is short and club-shaped, shows trace of segmentation only towards the tip, and has terminally a very minute spine. The tip of the left exopodite is, as seen by comparing the figures (Pl. VI figs 11 d—e), like that of *E. norv.*, but differs distinctly by the short and clumsy form of the serrated interior lobe with two distal rows of larger and smaller teeth converging towards the end, and by the comparatively long hairy appendage (text-fig. 54 f).

Y♂ (St. V). Size: ♀ 4.11 mm.; anterior division (2.09 + 1.01) = 3.1; urosome 1.01 mm.

In two female specimens the first abdominal somite is distinctly produced below, in a single male scarcely so (text-figs 54 g—h). The measurements of the *antennulae* and the structure of pes I—II are scarcely different from those of adult females. The pes V ♂ does not provide features of great interest (text-fig. 54 j).

Y♀ (St. IV). Size: 3.36 mm.; anterior division 2.5 mm.; posterior 0.86 mm. A single female, which ought perhaps to be referred to this species, was examined.

Occurrence. The S/S Thor has taken 11/7 1904 St. 183 61°30 L. N. 17°08 L. W. Yt. 1800 M. Wire 9 f♀, 4 f♂, 2 y♀ (V), 1 y♂ (V), 1 y♀ (IV).

It has previously been recorded by Sars from several stations, from the Monaco Expedition, by Farran "in small numbers at three stations" off the west coast of Ireland as far north as 55° N. (10°45 W.) "at depths between 700 and 1150 fathoms", and by Scott, taken by the Siboga Exp., from 5 stations (1—2 specimens) in considerable depths.

Remarks. As the described males and females were found together, as they corresponded fairly well to each other in size, and as I did not find any species to which the males are more naturally referred, I have referred them to the same species, in spite of a rather curious difference found in the structure of pes I. The young specimens, on account of rounded lateral corners, size and similar structure of pes I—II, were referred to the same species.

In spite of minor differences from Sars' and Scott's descriptions, scarcely any doubt can exist, that the specimens examined by the different authors belong to the same species.

56. *Euchaete gracilis* G. O. Sars.

(Text-fig. 55.)

- | | |
|--|---|
| 1894. <i>Euchaete barbata</i> Brady. Th. Scott, p. 58, pl. VI fig. 17. | 1911. <i>Euchaete quadrata</i> Farran. Wolfenden, pp. 297—298, fig. 39, Taf. XXXV fig. 1. |
| 1905. — <i>gracilis</i> n. sp. G. O. Sars, p. 16. | |
| 1908. — <i>quadrata</i> n. sp. Farran, p. 43, pl. III figs 20—21. | |

Description. f♀. Size of specimen from St. 88 was 6.74 mm.; anterior division (2.76 + 1.96) = 4.72 mm.; urosome 2.02 mm. Sars' specimens measured 6.6, Farran's 6.9, Wolfenden's 5.85—6 mm.

The shape of the body is practically like that of *E. norvegica*. The lateral corners are not regularly rounded as stated by the authors, but somewhat squarely truncate (text-fig. 55). The genital

somite, which is distinctly shorter than the following two, but 1.5 as long as the second, has a very prominent and characteristic genital protuberance. The vulva is surrounded by a chitinous system distinctly more complicated than figured by Wolfenden; more exteriorly, along the lower margin, is found on each side a chitinous plate pointing forwards, which, somewhat in front of the middle, possesses a short, rounded process (cf. Wolfenden). As stated by Wolfenden, in contrast to Sars and Farran, hairs were found on the ventral surface in the third and fourth abdominal somites in most specimens.

The *antennulae* extend scarcely to the end of the thorax; the appendages are scarcely different from those of *E. norv.*, and the measurements are not very characteristic; the segment 20 is as long as the segment 24 \approx 25, and the 23 as long as the 16. The antennae and mandibulae are scarcely different from those of *E. norv.*, while the *maxillulae*, as pointed out by Farran, possess, in the Le 9 bristles, of which the 2 proximal are moderately short; the Basp. III has four setae and the three segments of Ri have three setae each. The maxillae and maxillipeds are like those of *E. norv.*, but the latter differ by the more slender spines of Ri.

The articulation between the Re I and II of *pes I* is anteriorly indicated outwards, and posteriorly inwards; the Se Re I is represented by a small protuberance. The Se Re II *pes II* extends almost to the tip of Se Re III, and the Se 2 extends just to the base of Se 3.



Text-fig. 55. *Euchaete gracilis* G. O. Sars.
Abdomen \times 16.

The shape of the epistoma is scarcely different from that of *E. norv.* The anterior surface of the *labrum* has the hairs somewhat differently placed; anteriorly, in the middle, a transverse row of short hairs is found, in addition to a more lateral group of rather long setae; laterally and more posteriorly an area covered with densely placed short spines is observed. The oral surface of the *labrum* and the labial lobes are scarcely different from *E. norv.*, and the area in front of the *lamina labialis* only differs by less regular lateral groups of hairs.

Occurrence. The Ingolf Expedition has not taken this species, but it has been gathered by the Thor at the following stations.

11/7	1904	St. 183	61°30	L. N.	17°08	L. W.	Yt. 1800	M. Wire	1 f♀.
15/6	1905	St. 82	51°00	L. N.	11°43	L. W.	Yt. 1200	M. Wire	3 f♀.
8/6	1905	St. 72	57°52	L. N.	9°53	L. W.	Yt. 1500	M. Wire	1 f♀.
20/6	1905	St. 88	48°09	L. N.	8°30	L. W.	Yt. 300	M. Wire	5 f♀ (2 with sperm).
21/6	1905	St. 90	47°47	L. N.	8°00	L. W.	Yt. 300	M. Wire	2 f♀.

This species "was taken in small numbers on five stations at from 350 to 700 fathoms" off the west coast of Ireland. It has also been gathered by the Prince of Monaco and the Gauss at several stations in the Mid-Atlantic.

Remarks. This species is probably identical with Sars' *E. gracilis*, as no difference was found between my specimens and Sars' rather incomplete description. From A. Scott's description it differs by the shorter antennulae and the hairy ventral surface of the abdominal somites III—IV. From Wolfenden's description of most of his specimens it differs by 9 instead of 7 setae in Le of the maxillulae, and by the comparatively shorter Se 2 Re III *pes II*; as, however, one of Wolfenden's specimens had compara-

tively long antennulae and comparatively short Se 2 there is reason to suggest that the value of these characters ought not to be exaggerated.

57. *Euchæte acuta* Giesbrecht.

(Pl. VI figs 12 a—c; text-figs 56 a—b.)

1892. <i>Euchæte acuta</i> n. sp. Giesbrecht, p. 246, Taf. 16 and 37.	1905. <i>Euchæte acuta</i> Giesbr. Esterly, p. 157 fig. 23.
1898. — — Giesbr. Giesbrecht & Schmeil, p. 38.	1906. — — — Pearson, p. 17.
1903. — — — J. C. Thompson, p. 18.	1908. — — — Farran, p. 40.
1903. — — — J. C. Thompson & A. Scott, p. 244.	1908. — — — v. Bremen, p. 51, fig. 56.
1904. — — — Wolfenden, p. 111.	1909. — — — A. Scott, p. 65, pl. XX figs 1—9.
1904. — — — Cleve, p. 190.	1909. — — — Pesta, p. 23.
1905. — — — G. O. Sars, p. 4.	1911. — — — Wolfenden, p. 299.
1905. — — — Farran, p. 35.	1912. — — — Pesta, p. 22.

Description. f♀. Size: 4.02 mm.; anterior division (1.7 + 0.97) = 2.67 mm.; urosome 1.35 mm. Giesbrecht's specimen measured 4.1 mm., Farran's 4.4 mm. and Scott's 4.2 mm.

The genital area has on each side of the vulva a lamina-shaped process, somewhat larger on the right side; the outline is, as shown in fig. 12 a, somewhat different from Giesbrecht's fig. 47 (Taf. 37). Scott's fig. 4 of the abdomen in dorsal view differs distinctly by the presence of a right lateral process (may possibly be the process on the right side of the vulva, which is visible when the animal is not examined in complete dorsal view). The subapical seta is much longer than the St. 2.

The *antennulae*, mouth-limbs and natatory limbs are scarcely different from Giesbrecht's description.

The epistoma and the anterior surface of the *labrum* do not show any features of interest. The hairs on the oral surface of the labrum show a rather simple arrangement. The group 1 is, as usual, placed somewhat laterally, but is not distinctly separated from the group 2; the groups 3—4 are small and well marked out; the group 5 is fairly big. The transverse row behind the median spot Nr. 3 is short and narrow. No lateral group was observed (cf. fig. 12 b). The lateral group in front of the *lamina labialis* (fig. 12 c) consists of small granules, and is well separated from the median groups; these consist, as shown in fig., of fairly long hairs; the inner group of granules anteriorly was not observed.

Y♂ (St. V). Size: 3.72 mm.; anterior division 2.68 mm.; urosome 1.04 mm.

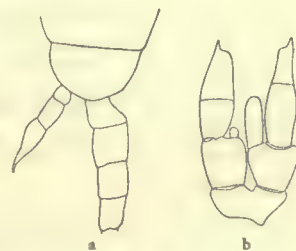
The lateral corners are rounded. The subapical setae are, as in the adult females, stronger as well as much longer than the St. 2. The *antennulae* extend scarcely to the end of the anterior division. The appendages are scarcely different. The structure of the *fifth foot* is seen in text-figs 56 a—b.

Occurrence. The species was not gathered by the Ingolf Exp.; but, as it was found by the Thor at the following 3 stations, I have included it here.

¹⁵/₆ 1905 St. 82 51°32 L. N. 11°43 L. W. Yt. 1200 M. Wire 1 f♀.

²⁰/₆ 1905 St. 88 48°09 L. N. 8°30 L. W. Yt. 300 M. Wire 15 f♀ + 1 y♂.

²¹/₆ 1905 St. 90 47°47 L. N. 8°00 L. W. Yt. 300 M. Wire 1 f♀.



Text-fig. 56. *Euchæte acuta* Giesbr. Y♂ (St. V).

a. Abdomen × 18. b. Pes V in anterior view × 33.

Distribution. This species has been taken off the west coast of Ireland, in the Mediterranean, in the South Atlantic as far south as 25° L. S., in the Indian ocean, and in the Pacific.

58. *Euchaete hebes* Giesbrecht.

(Pl. VI figs 13 a—b; text-fig. 57.)

1888.	<i>Euchaete hebes</i> n. sp.	Giesbrecht, p. 337.	1905.	<i>Euchaete hebes</i>	Giesbr. G. O. Sars, p. 4.
1892.	—	—	1906.	—	—
		Giesbr. Giesbrecht, p. 246, Taf. 15 and 37			Norman & Scott, p. 128.
		figs 15—16.	1908.	—	—
1894.?	—	—			v. Bremen, pp. 51—52 fig. 57.
		Th. Scott, p. 59, pl. VI figs 18—19.	1909.	—	—
1898.	—	—			Pesta, p. 24.
		Giesbrecht & Schmeil, p. 39.	1910.	—	—
1903.	—	—			Steuer, p. 24.
		Lo Bianco.	1911.	—	—
1905.	—	—			Farran, pp. 94—95.
		Gough, p. 336, figs 4—7.	1912.	—	—
					Pesta, p. 22.

Description. f♀. Size: 3.54 mm.; anterior division (1.56 + 0.99) = 2.55 mm.; urosome 0.99 mm. Giesbrecht's specimens measured 2.85—2.95 mm.

Near the lateral margin of the last thoracic somite is found, dorsally, a membranous fringe bearing short hairs; it is not equally prominent in all specimens, but generally more so than shown in fig. 13 a. The



Text-fig. 57.
Euchaete hebes Gbt.
Y♂ (St. V). Pes V
× 39.

abdominal somite I ∞ II has, dorsally, a characteristic process, and, on each side of the vulva lamelli-form processes more developed, on the right side. One of the 6 apical setae of the maxillae shows the structure characteristic of *Pareuchaete* with several short teeth and a few larger branches. The number of glandular pores in the legs scarcely differs from those of *E. norv.*, except by the absence of any pore at the base of Se 1 Re III.

The epistoma and the outer surface of the *labrum* are in main features like those of *E. norv.* The oral surface has the two first groups placed rather longitudinally, and the three following ones fairly well separated. The area in front of the *lamina labialis* is, as shown in fig. 13 b, rather characteristic, especially by the lateral group of hairs, which is a longitudinal series in continuation of the serrula 6-dentata.

♂. Size: 3.03 mm.; anterior division (1.35 + 0.78) = 2.13 mm.; urosome 0.9 mm. Giesbrecht's specimens measured 2.75 mm.

Lateral corners are rounded and somewhat more produced on the right than on the left side; on both sides is, dorsally, the usual fairly well developed tooth. The first abdominal somite has on each side, dorsally, a similar tooth as in *E. norv.* The *antennulae* reach distinctly beyond the end of the cephalo-thorax; the segments 12—13 are, posteriorly, indistinctly separated, and more so on the left side.

The Re I of *pes V* has a fairly well developed Se.

♂ (St. V). Size: 2.68 mm.; anterior division (1.19 + 0.75) = 1.94; urosome 0.74 mm.

The lateral corners of the thorax are regularly rounded without the mentioned hairy fringe. The subapical seta of the furca is only a little longer than the St. 2. Pes V differs from *E. norv.* by a more rounded Ri sin.; the outlines of the exopodites are, as realised by comparing text-figs 47 i and 57, somewhat different.

Occurrence. Within the area explored by the Ingolf Exp. this species has not been taken; but, as it has been gathered by the S/S Thor 21/6 05 St. 90 47°47' L. N. 8°00' L. W. (viz: 23 f♀ (2 with egg-sacs), 2 f♂, 1 y♂ (V)), I have included it here. As the species has only been found in the Mediterranean

and the East Atlantic, especially with moderate frequency off the mouth of the English Channel, and as it has not been recorded by Farran from the west coast of Ireland, Farran is probably right in regarding it as a member of the Mediterranean fauna in its wider sense (cf. p. 95).

Scolecithricidae.

59. *Scaphocalanus magnus* Th. Scott.

(Pl. VII figs 8 a—d; Pl. VIII figs 6 a—g; text-figs 58 a—k.)

- | | |
|--|---|
| 1893. <i>Amalophora magna</i> n. sp. Th. Scott, p. 55, pl. VI figs 5—9. | 1905. <i>Amalophora magna</i> Scott. G. O. Sars, p. 5. |
| 1894. <i>Scolecithrix cristata</i> n. sp. Giesbrecht, pp. 252, Taf. II—III. | 1905. <i>Scolecithrix cristata</i> Giesbr. Farran, p. 36. |
| 1898. — — Giesbr., Giesbrecht & Schmeil, p. 48. | 1906. — — <i>magna</i> Scott. Esterly, p. 66, pls 9, 11—13. |
| 1900. <i>Scaphocalanus acrocephalus</i> n. sp., G. O. Sars, p. 36, pls VII—IX. | 1906. <i>Amalophora</i> — — Pearson, p. 17. |
| 1903. <i>Amalophora magna</i> Scott. G. O. Sars, pp. 51—53, pls XXXIV—XXXV. | 1907. — — — Koefoed & Damas, p. 410. |
| 1903. ♀ nec. ♂ <i>Scolecithrix cristata</i> Giesbr., J. C. Thompson, p. 21. | 1908. <i>Scolecithrix</i> — — Farran, pp. 51—52. |
| 1904. <i>Amalophora magna</i> Scott. Wolfenden, p. 111. | 1908. — — — v. Bremen, p. 76 fig. 89. |
| | 1909. <i>Scaphocalanus magnus</i> Th. Scott. A. Scott, p. 97. |
| | 1911. <i>Amalophora magna</i> Scott. Wolfenden, p. 262. |
| | 1913. — — — Stephensen, pp. 313—314. |

Description. f♀. Size of specimen from Thor St. 183 was 5.23 mm.; anterior division 4.08 mm.; urosome 1.15 mm. Sars' specimens measured 5 mm., Giesbrecht's and Scott's 4.5 and Wolfenden's 3.7 to 4.25 mm.

The lateral corners of the thorax are triangularly produced and more or less rounded; but the shape is, however, as seen in text-figs 58 a—i, rather variable, and in some specimens rather suddenly produced. The third basipodite of the *mandibulae* is less elongate than figured by Sars, and has two, not one, setae interiorly; the first inner segment has two terminal setae, and the second has nine. The *maxillulae* are scarcely different from Sars' figure; the third basipodite has five setae as shown in Giesbrecht's fig. 1 Pl. III, not 4 as mentioned in the text. The *Li 1* bears 10 setae anteriorly and 3 posteriorly. The *maxillae* and *maxillipeds* scarcely differ from Sars' figures.

The *second pair* of legs shows a few features not mentioned in Sars' description. On the anterior surface of the three outer as well as of the three inner segments groups of short teeth are observed; the first inner segment has, as seen in fig. 8 b, a small outer tooth, which was, however, wanting in another specimen. The first outer segment shows also a few spines on the posterior surface. The anterior surface of the third as well as the fourth foot is, as mentioned by Giesbrecht, covered all over with small teeth. The marginal setae of the second basipodite in the fourth pair of legs are poorly developed or wanting. Glandular pores were not observed, except one in the outer margin of the third outer segment of the first pair of legs. The *fifth pair* of legs is in most specimens like that figured by Sars, but it is often rather asymmetrical, and the outer seta extends sometimes beyond the end of the segment, and is sometimes much shorter.

The elevation in front of the labrum, corresponding to the antennal segment, is slightly raised (Pl. VII fig. 8 a); the labrum proper, which is produced in front as a rounded protuberance; is by an

anteriorly convex line divided into an anterior and a posterior smaller part; the labrum proper is beset with a number of shorter and longer bristles, the somewhat complicated arrangement of which is most easily understood by studying fig. 8 c.

The oral surface of the *labrum* (Pl. VII fig. 8 d) shows a rather characteristic structure; the longitudinal series on each side consists anteriorly of an oblique group of fairly long and strong spines; behind this two or three groups of comparatively long and slender setae are found, followed by a more medially placed, almost square, area of short spines; behind the last mentioned group, which is only separated from the corresponding one of the other side by a narrow smooth area, an oblique one covered with delicate hairs is found. The *lamina labialis* seems to be represented by a very short transverse

plate; in front of it and the serrula 6-dentata a medial short row of fairly long setae and a longer curved lateral one of shorter setae are found. Behind the *lamina labialis* and between the serrulae is found on each side a short group of strong spines, almost fused with the corresponding one of the other side, as well as a more posterior and lateral group. The arrangement of the delicate hairs behind, as well as upon, the labial lobes consists, as in *S. ovatus* (fig. 14 b) of a median and, on each side, a lateral group, in addition to more laterally placed scattered setae.

f♂. Size of specimen from Thor St. 214 was 4.74 mm.; anterior division 3.14 mm.; urosome 1.6 mm. Sars' specimens measured 4.5 mm.

The fifth thoracic somite is well marked out, and its lateral corner is rounded. The comparative length of the abdominal somites and the furcal rami is 15, 83, 47, 52, 10 and 20.

The *antennulae* extend somewhat beyond the end of the thorax, and are distinctly attenuated towards the end; they are proximally to segment 14 slightly curved, and the proximal portion forms an obtuse angle with the more attenuated distal portion. The segments 8-9 are completely fused with segments 10-12; the segment 13 is well separated, and the segments 21-22 generally so. "Æsthetasken" are beyond segments 8-9 only observed in segments 12, 14, 15, 16 and 25. The *antennae* have comparatively long setae, and the second outer segment is distinctly restricted in the middle. The manducatory part of the *mandibulae* is more soft-skinned than in the female, and has less powerful teeth; the third basipodite is much wider than in the female, almost as wide as long, and has the inner setae short and delicate. The *maxillulae* are more elongated, and their setae are less powerful than in the female; the Li II has only a single seta, the Basp. III has only 4, and the Ri I has 2 for 3. The *maxillae* are in general shape like those of the females, but their appendages are less developed. The *maxillipeds* are as figured by Sars, but are more slender and delicate.

Text-fig. 58.

Scaphocalanus magnus T. Scott.
a-i. Left lateral corner in 8
different adult females × 59.
j-k. Same of two young males
(St. V) × 59.

The natatory legs are scarcely different from those of the female.

The *fifth pair* of legs is scarcely different from Sars' figure; the terminal attenuated part of the right endopodite is articulated, and corresponds to the third segment.

Y_{σ}° (St. V). Size of male from Thor St. 183 was 3.94 mm.; anterior division 3.04 mm.; urosome 0.90 mm. Another specimen measured 4.12 mm.

The shape of the body is in the main like that of the adult females, but the articular line between the head and the first thoracic tergite is fairly distinct; the fifth thoracic somite is well marked in front with produced pointed lateral corners directed somewhat downwards (text-figs 58 j—k; Pl. VIII fig. 6 f).

The *antennulae* almost reach the end of the body; the other appendages are scarcely different from those of the adult female; the spinulation of the anterior surface of the natatory legs is well developed.

The only difference between the sexes is found in the fifth pair of legs, which in the male has 2 fairly elongated basal segments and a two-segmented exopodite in addition to a somewhat shorter endopodite (Pl. VIII fig. 6 g).

Variation. In an adult female from Thor St. 183, which had the lateral corner of the thorax produced as in text-fig. 58 g, but in no other respects differed from the described specimens, the fifth pair of legs was distinctly asymmetrical with a rudimentary endopodite (Pl. VIII fig. 6 c); in another female (Nr. 2) with the same shape of the lateral corner, the pes V was symmetrical and like the right leg in Nr. 1, but with strong inner seta and rudimentary outer one; in a third specimen, like the others from St. 183 (Nr. 3), a fairly well developed endopodite was found, and two Se were present in the exopodite; in a fourth specimen from Thor St. 152 (Nr. 4) with the lateral corner like text-fig. 58 b, the third outer segment has two terminal setae, but no endopodite was found. The pes IV in an abnormal specimen is seen in fig. 6 b (Pl. VII).

Occurrence. The Ingolf Expedition has not gathered any specimen of this species, probably because it prefers the deeper strata, at least in the northern regions; by the Thor it has been gathered at a good many localities. It is rather curious, that the young males of the penultimate stage are much more common than the young females; of the examined 34 young specimens only 5 were females.

In Denmark Strait:

$19/6$	1904	St. 152	$65^{\circ}00'$	L. N.	$28^{\circ}10'$	L. W.	Yt. M. Wire	18 f♀, 3 y♂ (V).
							Yt.?	2 y♂ (V).
$21/6$	1904	St. 154	$65^{\circ}27'$	L. N.	$27^{\circ}10'$	L. W.	Yt.?	1 f♂.
$20/6$	1904	St. 150	$65^{\circ}50'$	L. N.	$20^{\circ}53'$	L. W.	Yt.?	12 f♀ (1 sp.), 1 y♂.

South of Iceland the species was taken at 3 stations viz:

$1/9$	1904	St. 285	$62^{\circ}49'$	L. N.	$18^{\circ}46'$	L. W.	Yt. 500 M. Wire	6 f♀, 2 y♀, 6 y♂.
$11/7$	1904	St. 183	$61^{\circ}30'$	L. N.	$17^{\circ}08'$	L. W.	Yt. 1800 M. Wire	28 f♀ with rounded lateral corner, 15 f♀ with lateral corner more or less produced and 3 f♀ with Ri pes V, 1 f♂, 2 y♀ (V), 11 y♂ (V).
$24/5$	1904	St. 104	$62^{\circ}47'$	L. N.	$15^{\circ}03'$	L. W.	Yt. 1500 M. Wire	25 f♀, 1 y♂.

In the Iceland—Færoe channel it was taken at 4 stations viz:

$29/8$	1905	St. 165	$60^{\circ}00'$	L. N.	$10^{\circ}35'$	L. W.	Yt. 1000 M. Wire	1 f♀.
$1/9$	1905	St. 167	$57^{\circ}47'$	L. N.	$11^{\circ}33'$	L. W.	Yt. 1500 M. Wire	27 f♀, 1 y♀, 2 y♂.
$9/5$	1904	St. 70	$63^{\circ}32'$	L. N.	$6^{\circ}20'$	L. W.	Yt. 100 M. Wire	1 f♀.
$23/7$	1905	St. 124	$61^{\circ}04'$	L. N.	$4^{\circ}33'$	L. W.	Yt. 1000 M. Wire	2 f♀.

North-east of Iceland:

²²/₇ 1904 St. 214 67°19 L. N. 17°55 L. W. Yt. 800 M. Wire 19 f♀, 1 f♂, 1 y♂ (V).

Outside the Ingolf area the species was captured:

¹⁵/₆ 1905 St. 82 51°00 L. N. 11°43 L. W. Yt. 800 M. Wire 1 f♀, 1 y♂ (V).

Yt. 1200 M. Wire 4 f♀, 4 y♂ (V).

³/₆ 1905 St. 72 57°47 L. N. 11°33 L. W. Yt. 1500 M. Wire 35 f♀, 1 f♂, 2 y♀, 10 y♂.

²⁰/₆ 1905 St. 88 48°09 L. N. 8°30 L. W. Yt. 300 M. Wire 1 f♀.

Distribution. This species seems to have a world-wide distribution; it has been found, though rather scarce, generally in considerable depths in the Antarctic seas (65° S. 85° E.), in the Atlantic, south as well as north, even at the Equator (c. 30° L. W.), in the Arctic seas, in the Malay Archipelago, in the Gulf of California between 50 and 300 fathoms (Esterly 1912, p. 321) and in the Pacific (35° L. N. 125° L. W. 0—300 m.). According to Farran (p. 52) it is "a very common and noticeable species in deep water" off the west coast of Ireland, "it occurred on every station and in almost every tow-netting between 280 and 1150 fathoms". The species was sometimes found in the Norwegian Sea between 200 and 1000 metres as well as in the deep Norwegian fjords. By the Duc d'Orléans it was taken at eleven stations (in about 15 samples) in the ocean east of Greenland between about 200 and 1800 metres; it is rather curious that it was never found farther east than 9°00 L. W. at 75°55 L. N.; it was found near the coast of Greenland and as far north as 78°13 L. N. It was found as far south as 71°22 L. N. (18°58 L. W.); only in a single sample St. 43 ¹/₈ 1905 78°13 L. N. 16°31 between 310—475 meters was it found fairly common, males as well as females. By the Nansen's Expedition it was found fairly abundant, sometimes up to the very surface of the sea as far north as 84° L. N. between 134 and 76 Long. E. These different facts indicate, as pointed out by Sars, that this form has its main area of distribution in the Polar basin, though it is found in small numbers in the deeper layers of the different seas.

Remarks. As the variations in the lateral corners, as well as in the fifth pair of legs in the females, are rather common, I did not find any reason to establish a new species for the three mentioned specimens with a well developed endopodite. The features which distinguish my specimens from Giesbrecht's *Sc. cristata* are enumerated above, and are too unimportant for establishing two species. Wolfenden's specimens from the Atlantic measured 3.7, and those from the Antarctic seas 4.25 mm., but he could not find any other characters, except in the comparative length of the spines of the fifth pair of legs, which, as shown above, are very variable.

60. *Scaphocalanus brevicornis* G. O. Sars.

(Pl. VII figs 7 a—b; textfigs 59 a—b).

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|--|---|
| 1900. <i>Scolecithrix brevicornis</i> n. sp. G. O. Sars, pp. 46—47, pl. X. | 1907. <i>Amalophora brevicornis</i> G. O. Sars. Damas & Koefoed, |
| 1902? — — G. O. Sars. Th. Scott, p. 452, pl. | p. 410. |
| XXV figs 1—2. | 1908. <i>Scolecithrix gracilipes</i> n. sp. Farran, pp. 52—53, pl. VI |
| 1903. <i>Amalophora brevicornis</i> G. O. Sars. G. O. Sars, pp. 53—54, | figs 1—4. |
| pl. XXXVI. | 1908. — <i>brevicornis</i> G. O. Sars. v. Bremen, p. 78, fig. 90. |
| 1904? — — — Wolfenden, p. 137. | 1913. <i>Amalophora brevicornis</i> G. O. Sars. Stephensen, p. 314. |

Description. f♀. Size of specimens from Ingolf St. 105 was 2.23 mm; anterior division 1.66 mm.; urosome 0.57 mm. Sars' specimen measured scarcely 2 mm.; Farran's 2.3—2.5 mm.

The shape of the body is scarcely different from Sars' figures; the appendages, as far as they were examined in the single mutilated specimen, were scarcely different; posteriorly, near the end of the second outer segment of the first pair of legs, a transverse row of short spines was found. The *fifth* pair of legs has on the left side the Se standing opposite the Si, as in Sars' figure, but on the right side it stands somewhat more distally.

f♂. Size of specimen from St. 82 Thor was 2.5 mm.; anterior division 1.65 mm.; urosome 0.85 mm. A male from St. 183 measured 3.3 mm.

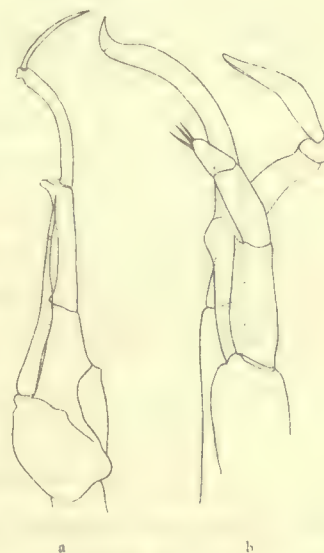
The shape of the body is rather slender, very much like that of *S. magnus*. The distinction between the head and first tergite is indicated dorsally, and the fifth thoracic tergite, which is rounded, is well marked out. The *rostrum* consists of a basal bifurcate part, which is prolonged into a thin rather stiff filament on each side; the outline is, above the rostrum, at least in the single, somewhat mutilated specimen, somewhat concave. The abdomen (fig. 7 a) is distinctly half as long as the anterior division, and the comparative length of the somites is 7, 43, 27, 30, 4, and 10 for the furca, which is about 1.3 as long as wide.

The *antennulae*, which were broken, have the proximal segments like those of *S. magnus*. The *antennae* are scarcely different from those of the female. The manducatory part of the *mandibulae* is rather slender; the third basipodite is very short and robust; it possesses, somewhat beyond the middle, a single short hair and, more terminally, at least one quite rudimentary one. The *maxillulae* are well developed and in most respects like those of the female. The long well developed Li I has 10 short setae at least, the Li II has one, the Li III has 3 at least, and the third basipodite has 5; the Ri I has 2, and the Ri III \sim II have 5 setae; the exopodite has 7 well developed setae. The *maxillae* and *maxillipeds* are in most respects like those of the preceding species.

The *nataory* legs were scarcely different from those of the female; on the posterior surface of the third outer segment in the first pair of legs no spines were observed. The fifth pair of legs (fig. 7 b and text-fig. 59 b) is in the main like those of the preceding species, but differs, however, in a few respects. The inner terminal process of the first outer segment of the right foot is somewhat pointed, not rounded; the right endopodite has the two first segments somewhat convex with a small inner terminal process, which was not observed in the bigger specimen; the terminal segment is better articulated. The left right leg is scarcely different from that of the preceding species except in minor details, as seen when comparing figures (text-fig. 59 b); the left Re III has 3 fairly long setae.

Occurrence. The Ingolf Expedition has gathered a single mutilated female with closing net 700 fathoms $11\frac{1}{7}$ 1896 St. 105 65°34' L. N. 7°31' L. W.

The S/S Thor has gathered a single male:



Text-fig. 59. *Scaphocalanus brevicornis* G. O. Sars. f♂.

a. Pes V dext \times c. 150. b. Pes V in situ from the left; terminal segments \times c. 250.

¹¹/₇ 1904 St. 183 61°30' L. N. 17°08' L. W. Yt. 1800 M. Wire.

¹⁵/₆ 1905 St. 82 51°00' L. N. 11°43' L. W. Yt. 1200 M. Wire.

Distribution. This species has been found at a single station in the Polar basin at about 84° L. N. and 90° L. E. In the sea between Spitzbergen and Greenland the Duc d'Orléans has between ¹²/₇ and ⁵/₈ gathered it at 4 stations, and sometimes in considerable numbers, males as well as young ones, f. inst. at St. 43 78°13' L. N. 16°31' L. W. 310—475 meters depth; the three other localities were at 79°39' L. N. 2°40' L. E. 1200—1800 Meters depth, at 78°05' L. N. 5°21' L. W. 500—1350 M. depth, and 71°22' L. N. 18°58' L. W. It has once been recorded from the Norwegian Sea in a depth of about 400 M., and from the west coast of Ireland at a depth lying between 280 and 680 fathoms, and always rather scarce.

Remarks. Though the males and the female were found at widely separated localities, I am fairly convinced that they belong to the same species, and without doubt to *S. brevicornis*. As the male described by Scott is only 1.5 mm., and as the fifth pair of legs seems to differ in several respects, I am not convinced that it ought to be referred to this species.

I am fairly convinced that Farran's species *S. gracilipes*, which was established with due reservation especially on account of "the more distal position occupied by the outer-edge tooth of the second joint of the fifth foot," is identical with this. Farran has (p. 53) found a rudimentary endopodite, like that observed in specimens of *S. magnus* (cf. p. 191) in a specimen of his *Scolecithrix gracilipes* as well as of his *S. valida*, which he regards as an anomaly. In this, as well as in his opinion of Giesbrecht's genus *Racovitzanus*, I agree with him (cf. Wolfenden 1911 p. 259).

61. *Scaphocalanus obtusifrons* G. O. Sars.

(Pl. VII figs 9a—d; Pl. VIII figs 8a—e; text-figs 60a—c and 61a—d).

1905. *Amalophora obtusifrons* n. sp. G. O. Sars, p. 22.

1905. *Scolecithrix emarginata* n. sp. Farran, pp. 36—37, pl. VII figs 6—17.

1906. *Amalophora obtusifrons* G. O. Sars. Pearson, p. 17.

1906? *Scolecithrix inornata* n. sp. Esterly, p. 67, pls 9, 11 and 13.

1908. *Scolecithrix obtusifrons* G. O. Sars. Farran, p. 54.

1908. *Scolecithrix obtusifrons* G. O. Sars. v. Bremen, p. 25, fig. 87.

1909. *Scolecithricella obtusifrons* G. O. Sars. A. Scott, p. 92, pl. XXXI figs 1—9.

1911? *Scolecithrix æqualis* n. sp. Wolfenden, pp. 255—256, text-fig. 33.

Description. f♀. Size of specimen from Thor St. 72 was 4.4 mm.; anterior division 3.55; urosome 0.85 mm. Sars' specimens measured 5.6 mm., Farran's 4.3 mm. and Scott's 4.5 mm.

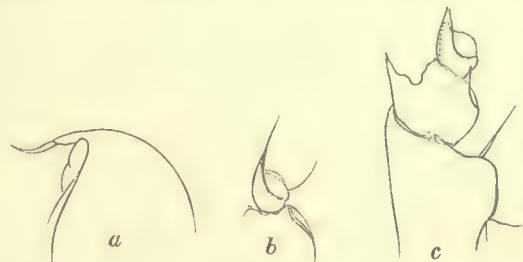
The shape of the body etc. is scarcely different from Farran's description; each filament of the rostrum is as stated by Sars and Scott terminally bifurcate (text-fig. 59a). The genital somite is slightly produced below, and has a well developed curved receptaculum (Pl. VIII fig. 8a).

The *antennules*, which extend a little beyond the end of the furca, are in measurement almost exactly like Farran's figures; the segments 24 and 25 are fairly well separated, the proximal seta is wanting in segm. 10 as well as in 17, and the Sp. of segment 24, which is placed near the tip, extends only slightly beyond the end of segment 25. The exopodite is distinctly longer than the endopodite of the *antennae*, and this has 7 setae in the Li of the second segment and 5 setae in the Le. The *mandibulae* are scarcely different from those of *S. magnus*. The *maxillulae* are like Farran's figure, with 8 setae in the exopodite and 7 long setae and a shorter more delicate one in Le. The *maxillae* have the

exterior margin distinctly produced, and have, in addition to powerful vermiform sensory appendages, at least 5 amalliform or brush-shaped ones. The *maxillipeds* are like those of *S. magnus*, and have, in contrast to Farran's, a sensory seta in the middle of the second basipodite.

The *first pair of legs* has, as stated by Farran (fig. 14 Pl. VII), a well developed Se in Re I, attaining the middle of Re II. The *second pair of legs* is in main features like Farran's fig. 15 (cf. text-fig. 60 b), but the outer marginal tooth of the second basipodite is well developed, and the inner margin is near the tip produced into a short curved tooth; the arrangement of the spines on the posterior surface differs only in minor details, f. inst. by the presence of spines in Re I, but in addition to the spines areas of short teeth were found on the posterior surface of the exopodite; the anterior surface seems to be smooth; the first inner segment has a well developed Se; the St of the third outer segment has about 70 partly fused teeth (fig. 9 a) without the characteristic basal fenestra. Glandular pores seem to be present in Re II and III. The *third pair of legs* has the inner margin of the second basipodite, a little proximally to the Si, produced into a longer or shorter, generally broken, styliform process, corresponding to that of the second pair of legs; this process is beset inwards as well as terminally by the most distally placed marginal bristles, and in this way forms a prolongation of the inner margin proper; the third basipodite is anteriorly and terminally produced into a distinct slender spine medial to the insertion of the endopodite (text-fig. 60 c), like that of *Scottocalanus*. On the anterior surface of the third feet, except in the third outer segments, a delicate spinulation is found; the spinulation of the posterior surface is like Farran's description, but a basal group is found in the third outer segment. The *fourth pair of legs* (text-fig. 60 c) has the second basipodite very clumsy without marginal bristles, and is suddenly restricted near the tip; on the posterior surface transversely placed short spines were observed in Ri II, and in a less degree in Ri III, but the anterior surface is covered all over with areas of more or less delicate teeth; the serrations of the terminal setae are more or less fused in the middle; a glandular pore is observed not only in Re II and III, but in Re I as well. The *fifth pair of legs* has the exopodite divided into a short basal and a longer, somewhat enlarged outer segment, possessing a shorter terminal and a longer more proximal seta.

The anterior portion of the *labrum* proper is distinctly more produced in front than seen in fig. 8 a of *S. magnus*; the arrangement of the setae is, as seen in fig. 9 b, rather characteristic; the anterior curved group of long delicate setae is posteriorly on each side divided into an outer and inner portion; in the middle an anteriorly convex row is found; for further details I refer to the figure. The *oral surface* of the labrum (Pl. VII fig. 9 e) shows a rather characteristic structure, bearing most resemblance to that of *Scottocalanus*; the first oblique group of the longitudinal series is smaller than in *S. magnus*, and it is followed by two or three more or less fused groups of fairly long setae, between which the transverse median rows are placed, behind the mentioned groups an oblique one of more slender hairs, corresponding to the square one of *S. magnus* is found. Laterally, in front, two groups of delicate hairs are found. No distinct *lamina labialis* was observed; in front of the serrula 6-dentata an



Text-fig. 60. *Scaphocalanus obtusifrons* G. O. Sars ♀.
a. Head $\times 33$. b. Pes II sin in ant. view $\times 58$.
c. Pes IV sin in ant. view $\times 58$.

inner and an outer longitudinal series were found (Pl. VII fig. 9 d); the arrangement of hairs between and behind the serrulae was not studied in details. In the middle, between the labial lobes, a large median group of setae was found, which on each lobe is continued into two lateral series placed closely to each other; more laterally, well separated from this system, a lateral row of shorter setae, starting from a basal group, was observed.

The intestinal tract is anteriorly produced into a rather slender rostral coecal sac; posteriorly the wide stomach is attenuated, and is, somewhat in front of the abdomen, continued through a slight curvature into the straight intestine proper.

f♂. Size of specimen from Thor St. 180 was 3.84 mm.; anterior division 2.65; urosome 1.19 mm.

The body is somewhat more slender than in the female, with rounded lateral corners of the well marked short fifth somite; the rostral filaments are scarcely different. The urosome is almost half

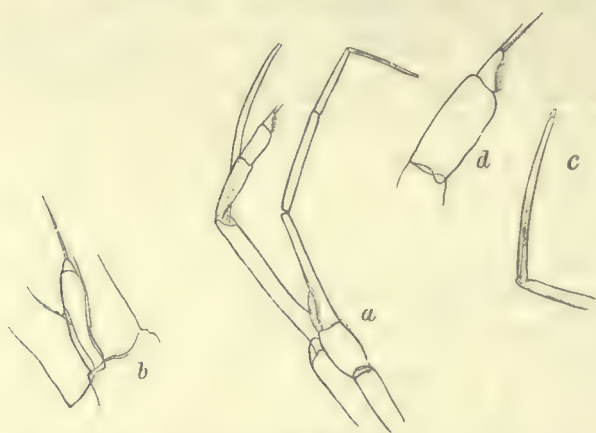
as long as the anterior division, and the comparative length of its somites is 23, 40, 34, 44 and 4 (Pl. VIII fig. 8 c).

The antennulae scarcely extend to the end of the furca; the number of free segments is scarcely different from that found in *S. magnus*, but the segments 13 and 15 are partly fused with the preceding ones, as the articular line is wanting behind; the measurements and the appendages are very much like those of *S. globiceps*. The antennae and mandibulae are scarcely different from those of *S. magnus*. The maxillulae are fairly well developed; the Le possesses 9 setae; the Li I has at least 8 rather

delicate setae, the Li II has 2 setae and the Li III has 4 setae; the third basipodite has 4 setae; and the Ri 2 + 5 setae; the exopodite has as in the female 8 setae. The maxillae are fairly developed, with 4 setae in each of the four proximal lobes; the lobe V has one spine somewhat stronger than the corresponding one of the lobe IV; the endopodite has 6 soft sensory setae, but not amalliform ones, the maxillipeds are like those of the male of *S. magnus*, but no setae were observed in the middle of the second basipodite.

The natatory legs show in all features of interest complete similarity to those of the female.

The fifth pair of legs is very characteristic, as seen in text-fig. 61 a; on the right side (Pl. VIII fig. 8 c) we have a long and slender first basal segment, followed by a well enlarged second segment. The right endopodite (text-fig. 61 b) is rather short, somewhat clavate, and has a slender, delicate seta almost half as long as the segment; the right exopodite consists of three long slender ones, of which the first is much the longer and thicker, while the third, somewhat plate-shaped one, is the shortest and most slender (text-fig. 61 c). The two basal segments on the left side are, like those of *S. magnus*, long and slender; the left exopodite has 3 segments (text-fig. 61 d), of which the third one, which is much the shortest, is distinctly attenuated, with a terminal seta; the left endopodite is long and slender and extends distinctly beyond the end of the exopodite.



Text-fig. 61. *Scaphocalanus obtusifrons* G. O. Sars f♂.
a. Pes V × 58. b. Pes V dext. Ri × 150. c. Pes V
dext. Re III × 150. d. Pes V sin. Ri × 150.

Y_{σ}^{δ} (St. V). Size of specimen (male as well as female) from Thor St. 152 was 3.65 mm.; anterior division 2.96 mm.; urosome 0.69 mm.

The abdomen has four somites, but in other respects scarcely any difference was observed from the adult females, except by the better developed articulation of the exopodite of the fifth pair of legs in the females (fig. 8e). The fifth pair of legs of the males is clumsy, and most similar to that of *Scottocalanus*, but has the setae better developed (fig. 8 d Pl. VIII).

Occurrence. The Ingolf Expedition has not gathered this species, but the S/S Thor has brought it home from several localities.

In Denmark Strait it was found:

$^{21/6}$ 1904 St. 154 65°27 L. N. 27°10 L. W. 3 f♀.
 $^{19/6}$ 1904 St. 152 65°00 L. N. 28°10 L. W. Yt. 1000 M. Wire 12 f♀, 1 y♀ (V), 3 y♂ (V).

In the Atlantic, south of Iceland:

$^{1/9}$ 1904 St. 285 62°49 L. N. 18°46 L. W. Yt. 500 M. Wire 1 y♀ (V).
 $^{10/7}$ 1904 St. 180 61°34 L. N. 19°05 L. W. Yt. 1800 M. Wire 1 f♀, 1 f♂.
 $^{11/7}$ 1904 St. 183 61°30 L. N. 17°08 L. W. Yt. 1800 M. Wire 7 f♀, 1 f♂, 2 y♀ (V), 2 y♂ (V).
 $^{24/5}$ 1904 St. 104 62°47 L. N. 15°03 L. W. Yt. 1500 M. Wire 10 f♀, 1 y♂ (V).

In the Iceland-Færoe channel:

$^{29/8}$ 1904 St. 165 60°00 L. N. 10°35 L. W. Yt. 1000 M. Wire 1 f♀.
 $^{22/5}$ 1904 St. 99 61°05 L. N. 9°35 L. W. Yt. 1700 M. Wire 2 f♀, 6 f♂.
 $^{1/9}$ 1905 St. 167 57°46 L. N. 9°55 L. W. Yt. 1500 M. Wire 15 f♀, 1 y♀ (V), 1 y♂ (V).
 $^{8/6}$ 1905 St. 72 57°47 L. N. 11°33 L. W. Yt. 1500 M. Wire 14 f♀, 5 y♂ (V).

Distribution. "This species is a noticeable feature of the deep water plankton off the west coast of Ireland" "at depths of from 330 to 1150 fathoms" (Farran); it has been taken by the Monaco Expedition as well as in the Malay Archipelago.

Remarks. That this species is identical with Farran's *Sc. emarginata* is scarcely doubtful; Farran's specimens were identified by Sars with his *A. obtusifrons*, which is, however, distinctly bigger and has the fifth feet somewhat different "muni en dedans d'une épine assez forte et allongée, et en outre de 2 petits denticules, l'un apical, l'autre sortant du bord extérieur". It differs from Scott's description by the wanting delicate spinulation of the posterior surface of the fourth exopodite.

This species is nearly related to, if not identical with, Wolfenden's *S. aequalis* from the South Atlantic (1911, p. 255), as well as with *S. inornata* Esterly (1906, p. 67), but the descriptions are too insufficient for solving the question.

The species is characterised by the robust shape of the body and the antennulae, which are longer than the body, without Spr. in segment 17, and without setae in segment 10. The Se Re I pes I is comparatively short, and only attains the middle of the following segment, while the Se Ri I pes II is long and pointed. The St. Re III pes II has about 70 partly fused teeth. The inner terminal seta of the anterior surface of Basp. III—IV is well developed, long and slender. The second basipodite of the third pair of legs has a distinct lateral tooth, but no spinous lamina.

62. *Scaphocalanus validus* Farran.

(Pl. VII figs 11 a—b; text-figs 62 a—f.)

1908. *Scolecithrix valida* n. sp. Farran, pp. 55—57, pl. V figs 14—15, pl. VI fig. 7.

Description. f♀. Size of specimen from Thor St. 183 was 3.95 mm.; anterior division 3.1 mm.; urosome 0.85 mm. Farran's specimens measured 3.8—3.95 mm.

The body is more slender, and the head less suddenly raised in lateral view than in *S. obtusifrons*, but more distinctly so than in *S. globiceps* (text-figs 62 a—b). The rostrum is most like that of the former species, with the basal part less enlarged and with fairly long, apparently undivided, filaments. The lateral corners are slightly produced and rounded (text-fig. 62 c). The genital somite is better produced below, and its receptaculum seminis appears more slender than in the preceding species; the comparative

length between the abdominal somites and the furcal rami is 45, 28, 25, 9 and 17; the furcal rami are 1.5 as long as wide; along the hinder border of somites II—IV a marginal seam with delicate serrations is observed.

The *antennulae* do not reach the end of the furca; the segments 24—25 are fairly well separated; "Æsthetasken" are found in segments 8~9, 12, 14 and 19; the segment 10 has a distinct seta, and a proximal seta is found in segments 12—14, 18, and sometimes in segment 15, but never in segment 17; the Sp. of segment 24 is somewhat longer than segment 25. The segment 19 is distinctly 1.2 as long as segments 8~9 and 15, which are of almost equal length; segment 16 is 1.2 as long as 15. The third basipodite of the *mandibulae* seems to have only 2 setae medially; in other respects the *mandibulae* as well as the antennae are like those of the preceding

Text-fig. 62. *Scaphocalanus validus* Farr. f♀.

a. Head $\times 33$. b. Rostrum from the right $\times 59$. c. Genital somite $\times 33$. d. Pes II sin. in anterior view $\times 59$. e. Pes III sin. $\times 59$. f. St. pes II sin. $\times 150$.

species. The *maxillulae* have 7 + 2 setae in the Le, 10 + 2 in the Li I, 2 in Li II, 4 in Li III and 5 in the third basipodite; the Ri I has 3 setae, the Ri II~III 5 and the Re has 9 setae. The *maxillae* and *maxillipeds* are scarcely different from Farran's description.

The *first pair* of legs has the Se Re I extending to the base of Se Re II; in the outer edge of the Re III, proximally to the middle, a distinct glandular pore is found, better developed than in other species. The *second pair* of legs (text-fig. 62 d) is like Farran's fig. 16 Pl. V; the Se of Ri I is rather short and clumsy, and the St. of Re III has about 35 serrations, some of which are fused at their base (text-fig. 62 f); the anterior surface of the appendage is minutely granular, and the posterior one has, in addition to the usual spines, areas of smaller teeth. No glandular pores were observed. The *third pair* of legs (text-fig. 62 e) has no distinct styliform process at the inner margin of the second basipodite, and the slender terminal tooth of the anterior surface of the third basipodite medial to the insertion of the endopodite is very short and clumsy; the posterior surface of the third basipodite has a number of short spines in contrast to that of the second foot, which is smooth; in other respects this pair is like that of the preceding species. The *fourth pair* of legs has a long and slender second

basipodite without marginal setae. The *fifth pair* of legs is like Farran's figure, with a long and strong inner seta, a rather short terminal seta, and a very delicate outer one; all segments are fused, but the two basal ones are indicated.

The anterior portion of the *labrum* is, in lateral view, less prominent than in preceding species; in front of the labrum proper behind the transverse line, which limits the antennal somite, a tuft of long setae is found. The arrangement of setae on the anterior surface of the *labrum* (Pl. VII fig. 11 a) is, as seen by comparing figures (cf. 9 b), like that of *S. obtusifrons*, but the lateral posterior group is better developed, and the central group has only a few setae. The *oral* surface of the labrum is most like that of *S. globiceps* (Pl. VII fig. 10 a), but the granular area in front has much smaller granules, and it is much smaller. The structure of the *lamina labialis* etc. is completely like that of *S. globiceps*.

Y♂ (St. V). Size of young male from Thor St. 183 was 3.25 mm.; anterior division 2.51 mm.; urosome 0.74 mm.

The only difference, except the usual one in the shape of the abdomen, is found in the more obtuse inner tooth of the third basipodite of the fourth foot. The segment 10 of the *antennulae* has a seta, but the segment 17 has no proximal seta. The fifth pair of legs is more slender than in *S. obtusifrons*, but is alike in other respects.

Occurrence etc. The S/S Thor has gathered the species at a single station viz: 11/7 1904 St. 183 61°30' L. N. 17°08' L. W. Yt. 1800 M. Wire 5 ♀, 2 ♂ (V). It has only been recorded once by Farran, who has examined six specimens, taken at a depth of 700 fathoms off the west coast of Ireland. As to the differences from the related species I refer to *S. globiceps*. The species is characterized by antennulae about as long as the body, with a seta in segment 17. The Se of Re I pes I is fairly long and slender, and the Se Ri I pes II is rather short and obtuse. The St. of Re III pes II has 35 partly fused teeth. The inner terminal seta of the anterior surface of Basp. III pes III—IV is only poorly developed. The second basipodite of the third pair of legs has no spinous lamina.

63. *Scaphocalanus globiceps* Farran.

(Pl. VII figs 10 a—b; fig. 11 b; Pl. VIII figs 9 a—c; text-figs 63 a—b.)

1905. ? *Scolecithricella gracilis* n. sp. G. O. Sars, p. 2.

1908. *Scolecithrix globiceps* n. sp. Farran, pp. 54—55, pl. V figs 8—13, pl. VI fig. 8.

Description. ♀. Size of specimen from Thor St. 183 was 4.48 mm.; anterior division 3.38 mm.; urosome 1.10 mm. Farran's specimens measured 4.3—4.5 mm.

The body is more slender, and the abdomen comparatively longer than in the preceding species; the fifth thoracic tergite is somewhat produced, but rounded. The rostral branches, arising from a short basal part, are almost straight, stiff and fairly long, apparently longer than the pointed slender filaments (text-fig. 63 a). The genital somite is only slightly produced below, and has an elongate, distally not enlarged, receptaculum seminis (text-fig. 63 b). The comparative length between the abdominal somites is 53, 35, 30 and 10. The serration along the posterior margin of the somites is distinct, at least dorsally. The *antennulae* extend to the end of the furca; the appendages differ from those of

S. validus by the presence of a proximal seta in segment 17; the measurement is like that of the preceding species, but for the segments 8~9 and 19 which are of equal length. The manducatory part has 3 setae in the third basipodite, but in other respects the *mandibulae* as well as the *antennae* and *maxillulae* are scarcely different from those of the preceding species. The *maxillae* and *maxillipeds* show, as pointed out by Farran, a few rather unimportant differences.

The *first pair* of legs is scarcely different from Farran's description, and the *second pair* is very similar as well; the Se of the first outer segment is short and robust; the anterior surface of the third basipodite as well as of the two branches is covered all over with areas of small spinules; on the posterior surface the number of teeth is like Farran's fig., but a patch of distinct teeth is found near the apex of the third basipodite. The terminal seta is adorned with about 20, well separated, coarse serrations. A glandular pore was observed at the base of Se 3 Re III. The *third pair* of legs has, along the exterior border of the second basipodite, a low lamina, which, in the middle, has a row of 15-20

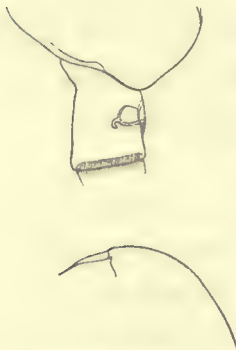
fairly long spines not observed in the other species, and most distinct when observed in situ; the spinulation, especially of the anterior surface, is better marked than in the second pair; on the posterior surface of the third basipodite it is scarcely better developed. The inner tooth of the anterior surface of the third basipodite is short and rounded. The second basipodite of the *fourth pair* of legs is comparatively less slender than in the preceding species; the inner tooth of the third basipodite is just indicated; the spinulation of the anterior surface of the basipodites as well as of the first outer and inner segments is well developed; the distal segments of the exopodites as well as the endopodites are wanting. The *fifth pair* of legs is scarcely different from Farran's description.

The *anterior surface* of the *labrum* seems, in most respects, to be like that of *S. obtusifrons* (Pl. VII fig. 9 b), but the *oral surface* differs distinctly from that species (Pl. VII fig. 10 a, cf. fig. 9 c); the most characteristic feature is found

in the distinct spinulation behind the marginal setae around the two first median circular spots and as far lateral as the first well developed group of short spines; as to the other features I refer to the figure. The *lamina labialis* is scarcely indicated; in front of it, the usual inner and outer row is seen (fig. 10 b); posteriorly, between the serrula 6-dentata, a median group of short spines is found, as well as a paired one more behind. In the middle, behind the labial lobe, two more or less separated groups of shorter and longer hairs are found, laterally continued into a wide oblique row along the inner margin of the lobe. More laterally the lobe possesses an angle-shaped series of densely placed hairs as well as a basal group without direct connection.

♂. Size of specimen from Thor St. 180 was 4.44 mm.; anterior division 2.99; urosome 1.45 mm.

The body is somewhat more slender than in the female, and the abdomen is about half as long as the anterior division; the comparative length of the abdominal somites is 15, 45, 40, 45, 4 and 14; the furcal rami are about 1.3 as long as wide. The *antennulae* reach somewhat beyond the end of the third abdominal somite; the segment 13 is fairly well separated from 12, and segment 14 from 15, but segments 20 and 21 are completely fused on the right side, but well separated on the left; beyond segments 8~9 2 setae were found only in segments 12 and 14. Segment 22 is 1.4 shorter than seg-



Text-fig. 63.
Scaphocalanus globiceps
Farran, f♀.

a. Head × 33. b. Ge-
nital somite × 33.

ment 19. The mouth-appendages are comparatively slightly transformed; the third basipodite of the *mandibulae* has, in addition to a fairly long Se 1 and a quite rudimentary Si 2, a small rounded process. The *maxillulae* and the *maxillae* are scarcely less developed than in the female; the *maxillipeds* are comparatively less slender, but the amalliform seta of the second basipodite is well developed as in the female. The *natatory legs* are practically like those of the female, but the spinulation, especially, of the anterior surface is less developed, and the medial terminal tooth of the anterior surface of the fourth pair of legs is better developed; the terminal seta of Re III pes II has about 60 serrations. Along the outer margin of the second basipodite of the third pair of legs, a lamina with a row of short spines is found.

The *fifth pair* of legs, which in natural position is seen to extend a little beyond the end of the abdomen is very much like that of *S. obtusifrons*. The right endopodite (Pl. VIII fig. 9 b) is rather short, distally somewhat triangularly produced, and rather suddenly attenuated to a fairly long spine. The right basipodite (fig. 9 a) is, outwards, produced into a long process which is fused with the first outer segment; a terminal process of somewhat triangular shape, as in *S. magnus*, as well as a median one is observed; the second outer segment is rather short and somewhat curved, and the third one is short, flat, slightly curved and somewhat attenuated (fig. 9 a). The basipodites of the left foot are long and slender; the comparatively short and slender endopodite is slightly curved, and indistinctly divided into two proximal segments of about equal length as well as a short third segment with a fairly slender terminal seta beyond a rounded process. The left exopodite is comparatively long and clumsy; its first segment is the longer, and has two triangular processes, while the third one is the shortest, and hairy (Pl. VII fig. 11 b).

$Y_{\text{♀}}^{\text{♂}}$ (St. V). Size of female from Thor St. 183 was 3.49 mm.; anterior division 2.71; urosome 0.78 mm.

The shape of the body shows the usual difference from that of the adult female; the distal segments of the antennulae are comparatively longer; the segment 19 is 1.1 as long as segments 8-9; the fifth pair of legs is somewhat smaller, but in other respects scarcely different.

Occurrence. The S/S Thor has taken this species at three stations in deep water viz:

1/9 1904 St. 285 62°49' L. N. 18°46' L. W. Yt. 500? M. Wire 1 f♀.

10/7 1904 St. 180 61°34' L. N. 19°05' L. W. Yt. 1800 M. Wire 2 f♀ + 1 f♂.

11/7 1904 St. 183 61°30' L. N. 17°08' L. W. Yt. 1800 M. Wire 2 f♀, 3 f♂, 2 y♀ (V).

Distribution. The species has only been recorded twice by Farran off the west coast of Ireland at 1000 and at 700 fathoms.

Remarks. This species is certainly identical with Farran's species, as they do not differ in any features of interest. Though, as far as the description goes, it agrees completely with Sars' *Scolecithricella gracilis*, especially in the structure of the fourth pair of legs, I prefer to refer it to Farran's species, as it is well distinguished from *Scolecithricella* according to Sars' own definition.

The described male, which is well distinguished from that of *S. obtusifrons* by its long and more slender fifth foot, I have, on full consideration, referred to this species rather than to *S. validus* with

which it agrees in a few features, on account of its size and the spinous lamina along the outer margin of the second basipodite of the third foot.

Scaphocalanus globiceps, *obtusifrons*, *validus* and *robustus* seem to be nearly related, and are, without detailed investigation rather difficult to distinguish from each other. In contrast to Scott, who refers them to *Scolecithricella*, I follow Sars, and regard them as more nearly related to *Scaphocalanus magnus*, with which they agree by the number of segments in the antennulae, by the appendages of the maxillae, and by the structure of the fifth foot in the male. About the differences between *S. robustus* and *globiceps* I refer to the former species. The female of *S. globiceps* is characterised by slender shape comparatively short antennulae, which have a single setae in segment 10 and a Spr. in segment 17. Se Re I pes I is long and slender, and Se Ri I pes II is short and clumsy. St. Re III pes II has about 20 well separated teeth. The inner terminal seta of the anterior surface of Basp. III pes III—IV is only poorly developed. The second basipodite of the third pair of legs has, laterally, a spinous lamina.

64. *Scaphocalanus robustus* Th. Scott.

(Pl. VII figs 12 a—c; text-figs 64 a—c).

1894. *Amalophora robusta* n. sp. Th. Scott, pp. 56—57, pl IV 1896. *Scolecithrix robusta* Th. Scott. Giesbrecht & Schmeil, p. 47.
figs 24—26. 1908. — — — Farran, p. 57, pl. VI fig. 3.

Description. f♀. Size of specimen from Thor St. 167 was 2.78 mm.; anterior division 2.12 mm.; urosome 0.66 mm. Scott's specimen measured 3 mm. and Farran's 2.65—3.1 mm.

The rostrum has rather short filaments (text-fig. 64 a). The head is distinctly raised, and the body is rather robust; the first thoracic somite is fused with the head, and the fourth and fifth thoracic somites with each other; the lateral corners are slightly produced and rounded. The genital somite is only slightly produced below; the receptaculum seminis is elongated and slender, but rather short (text-fig. 64 b). The comparative length of the abdominal somites and the furcal branches is 33, 20, 18, 10 and 14; the genital somite is almost as wide and deep as long, and the furcal rami are a little longer than wide. The serration along the hinder margin of somites 2—4 is well developed.

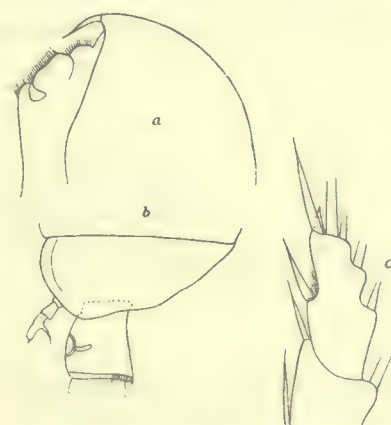
The *antennulae* extend to the end of the genital somite; the limitation between segments 24 and 25 is rather indistinct; the appendages are like those of *S. globiceps*, with a single seta in segment 10, and 2 in segment 17. The measurements are similar to those of the preceding species; the segments 19 and 16 are almost of equal length, and 1.3 as long as segments 8~9, which are, again, a little shorter than segment 15. The *antennae*, *mandibulae*, *maxillulae* and *maxillipeds* are like those found in *S. globiceps*. The *maxillae* possess 4 amalliform and 4 vermiform sensory appendages.

When the *natatory legs* sitting on the animal are examined from the side, a curious difference is found between the 3 first pairs and the fourth pair of legs in the basipodites as in related species; the posterior surface of the three first pairs is seen to be excavated, while that of the fourth pair appears cylindrical, and in lateral view is almost twice as deep as that of the third foot. The *first foot* is very much like that of *S. globiceps*, but the Se Re I scarcely extends to the end of Re II (text-fig. 64 c). The *second foot* has the outer-edge spine of the first outer segment long and sickle-shaped, and the outer-edge spine of the first inner segment short and rounded; the St has 30 short, well separated

teeth; the armature of the anterior and posterior surface is scarcely different from that of *S. globiceps*. The *third pair* of legs is like those of the preceding species, but the outer-edge spinous lamina of the second basipodite is wanting, and the posterior surface of the third basipodite has a patch of strong spines, wanting in the second pair. The *fourth pair* of legs is distinctly granular on the anterior surface, but has fairly long spines in a longitudinal area on the two inner segments in addition to the granulation; on the posterior surface of the two distal outer segments as well as on the distal inner one a few short spines are observed; on the posterior surface of the second inner segment a transverse row of 8 long spines is found. The *fifth foot* agrees fairly well with Scott's and Farran's description, but the articulation is very indistinct.

The *labrum* is comparatively slightly produced in front (Pl. VII fig. 12 a). The arrangement of setae on the *anterior surface* is rather characteristic; in front a median group of fairly long bristles, 3—4 deep continued into a lateral group of a number of shorter hairs, extending laterally to in front of a posterior lateral group of densely placed hairs. In the middle, laterally partly fused with mentioned anterior group, a transverse series of comparatively few short setae. Add to this a marginal group of numerous bristles.

The oral surface of the *labrum* (Pl. VII fig. 12 b) shows some similarity to *S. validus*, and in a less degree to *S. globiceps*; the granular area around the first median circular spot is only small; the lateral marginal and the first lateral group form a fairly long oblique group, medially consisting of granules, and converging towards the second median circular spot; the following lateral groups are in the main like the structures in the preceding species. The arrangement of setae around the "*lamina labialis*", and upon the labial lobes, is very much like that of *S. globiceps*.



Text-fig. 64.

Scaphocalanus robustus Th. Scott f♀.
a. Head × 18. b. genitalsomite × 18.
c. Pes I sin. × 135.

Variation. In the first right foot in one of the specimens a median outer-edge seta was observed in the third outer segment.

Occurrence. The S/S Thor has collected three females of this species at the following stations:

¹⁹/₆ 1904 St. 152 65°00 L. N. 28°10 L. W. Yt. 1000 M. Wire.

¹¹/₇ 1904 St. 183 61°30 L. N. 17°08 L. W. Yt. 1800 M. Wire.

¹/₉ 1905 St. 167 57°47 L. N. 11°33 L. W. Yt. 1500 M. Wire.

Distribution. This species has only been recorded twice, namely from the Gulf of Guinea in a gathering from 85 fathoms (⁵/₂ 4°26 L. S. 10° L. E.), and from the west coast of Ireland "on four stations at depths of from 400 to 680 fathoms".

Remarks. Though this species differs from that described by Scott by less robust shape, by 4 for 5 amalliform setae of the maxillae, and by the slightly different shape of the fifth foot, it seems natural to regard the two as identical. It seems to be nearly related to *S. obtusifrons*, but differs by a more robust shape, by the structure of the third pair of legs, and by the longer antennulae.

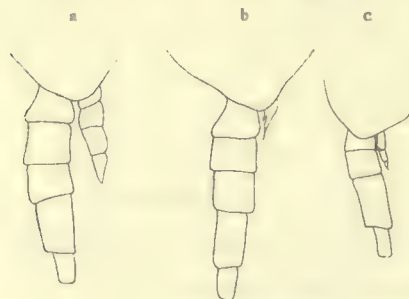
65. *Scolecithricella minor* Brady.

(Pl. VII fig. 13; Pl. VIII figs 10 a—c; text-figs 65 a—c.)

1883.?	<i>Scolecithrix minor</i> n. sp. Brady, pp. 58—59, pl. XVI figs 15—16, pl. XVIII figs 1—5.	1904. <i>Scolecithrix minor</i> Brady. Wolfenden, p. 111.
1892.?	— — Brady. Giesbrecht, p. 266.	1905. — — — Th. Scott, p. 223.
1894.?	— — — Th. Scott, p. 50.	1905. — — — Farran, p. 35.
1898.?	— — — Giesbrecht & Schmeil, p. 46.	1906. <i>Scolecithricella minor</i> Brady. Pearson, p. 18.
1902.?	— Römeri n. sp. Mrázek, pp. 513—515, Taf. 6, text-figs 11—13.	1907. — — — Koefoed & Damas, p. 397.
1903. <i>Scolecithricella minor</i> Brady. G. O. Sars, pp. 55—56, pls XXXVII—XXXVIII.		1908. — — — Farran, p. 51.
		1908. <i>Scolecithrix minor</i> Brady. v. Bremen, pp. 73—74, text-f. 85.
		1913. <i>Scolecithricella minor</i> Brady. Stephensen, pp. 314—315.

Description. f♀. Size of specimen from Ingolf St. 40 was 1.52 mm.; anterior division 1.22 mm.; urosome 0.3 mm. Sars's specimens measured 1.40 mm.

The *antennulae* extend slightly beyond the end of the thorax; the segments 1 and 2 are indistinctly separated, and so are segments 24 and 25; the segments 8~9 are almost completely fused with 10. The Sp of segment 24 is placed terminally, and extends distinctly beyond the end of segment



Text-fig. 65. *Scolecithricella minor* Brady.
a—b. Y♂—♀ (St. V). Abdomen × 87.
c. Y♂ (St. IV). Abdomen × 57.

25. The *mouth-limbs* are completely like Sars' figures, and so are the natatory legs; the second basipodite of the fourth pair of legs has 3—4 rather stiff, marginal setae. In lateral view the third as well as the fourth foot has in the second basipodite an outer-edge lamina, which terminally is produced into a small tooth, much bigger in the fourth foot; this lamina has in the third pair, almost in the middle, about 5 rather short and delicate teeth.

The *labrum* and area in front of it is in lateral view very much like Sars' figure Pl. XXXVII; the labrum proper and its anterior portion, which is only slightly prominent, have only a slightly pronounced concavity between them. The *anterior surface* of the labrum is like that of *S. ovata* (cf. Pl. VII fig. 14 b); most anteriorly a transverse row of long slender bristles is found, continued laterally and posteriorly into a row of shorter setae; behind this, almost in the middle, a transverse row of shorter setae is found.

The *oral surface* of the labrum shows a great similarity to that of *S. ovata* (cf. fig. 14 c), but the anterior lateral group is not well separated from the marginal setae, and the following group is not convex outwards, and is directed towards the second median circular spot. The rudimentary *lamina labialis* (Pl. VII fig. 13 a) scarcely shows features of great interest. The arrangement of hairs upon and behind the labial lobes shows great similarity to Pl. VII fig. 14 b, but the median and the lateral groups of hairs are fused.

f♂. Size of specimen from Ingolf St. 40 was 1.34 mm.; anterior division 0.99 mm.; urosome 0.35 mm. Sars' specimens measured 1.40 mm.

The *antennulae* are like Sars' figure, but segments 20~21 bear only a single seta not two. The mouth-appendages are very much like those of the female, except the *mandibulae* which have the third basipodite distinctly longer than wide, the *maxillae* which have the sensory setae better developed, and the *maxillipeds* which are shorter and more clumsy. The *natatory legs* are scarcely different from those of the female. The *fifth foot* is like Sars' description; the left endopodite

which is placed on a small protuberance, is short and clumsy, and indistinctly divided into two segments.

$Y_{\text{♀}}^{\text{♂}}$ (St. V). Size of female from Ingolf St. 70 was 1.15 mm.; anterior division 0.90 mm.; urosome 0.25 mm. A young male from same station measured 1.17 mm.

The shape of the body is practically like that of the adult females; the first as well as the fifth thoracic somites are fairly well marked in front. The antennulae extend somewhat beyond the end of the body, but the measurements are scarcely different. The third and fourth feet are like those of the adult female, and so is the fifth foot, except for the very indistinct lateral seta. The only difference between male and female is found in the structure of the fifth foot, which is seen in Pl. VIII figs 10 a—b (textfigs 65 a—b).

$Y_{\text{♀}}^{\text{♂}}$ (St. IV). Size of female as well as of male from Ingolf St. 19 was 0.95 mm.; anterior division 0.74 mm.; urosome 0.21 mm.

The shape of the body is in main like adult female. The distal segments of the antennulae are comparatively longer. The only difference between the sexes is found in the fifth pair of legs, the structure of which is seen in figures (text-fig. 65 c and Pl. VIII fig. 10 c).

Occurrence. Of this species the Ingolf Expedition has taken a big number of specimens while the S/S Thor has not taken any specimens in the samples taken with the young-fish trawl.

In Davis Strait and in the Atlantic west of Greenland, the Ingolf Exp. has gathered it at 6 stations.

5/7 95	St. 29	63°34	L. N.	54°31	L. W.	V ¹ .	50—0	fathoms.	Temp. surf.	3.5° C.	1 f♀.
1/7 95	St. 27	64°54	L. N.	55°10	L. W.	V ¹ .	200—0	—	—	3.9° C.	31 f♀ (1 with sperm.), 10 f♂, 2 y♀ (V).
25/6 95	St. 24	63°06	L. N.	56°00	L. W.	V ¹ .	100—0	—	—	4.2° C.	25 f♀ (2 with sp.), 13 f♂, 14 y♀ (V), 3 y♂ (V), 1 y♂ (IV).
26/6 95	St. 25	63°30	L. N.	54°24	L. W.	V ¹ .	200—0	—	—	2.9° C.	82 f♀, 12 f♂, 17 y♀, 15 y♂.
28/7 95	St. 36	61°50	L. N.	56°21	L. W.	V ¹ .	100—0	—	—	8.5° C.	3 f♀, 11 y♀, 6 y♂, 3 y♀ (IV), 3 y♂ (IV).
30/7 95	St. 38	59°12	L. N.	51°05	L. W.	V ¹ .	100—0	—	—	10° C.	95 f♀ (10 with sp.), 15 f♂, 5 y♀ (V), 10 y♂ (V).

In the Atlantic south-west of Iceland and east of Greenland the species was taken at 5 stations.

20/6 95	St. 20	58°20	L. N.	40°48	L. W.	V ¹ .	200—0	fathoms.	Temp. surf.	6.1° C.	40 f♀ (1 with sp.), 16 f♂, 13 y♀ (V), 10 y♂ (V).
18/6 95	St. 19	60°29	L. N.	34°14	L. W.	V ¹ .	300—0	—	—	9° C.	100 f♀ (10 with sp.), 30 f♂ (3 with sp.), 15 y♀ (V), 5 y♂ (V), 1 y♀ (IV).
17/6 95	St. 18	61°44	L. N.	30°29	L. W.	V ¹ .	200—0	fathoms.	Temp. surf.	10° C.	55 f♀ (5 with sp.), 25 f♂, 1 y♀ (V), 1 y♂ (V).
13/6 96	St. 80	61°02	L. N.	29°32	L. W.	P.	100—0	—	—	8.5° C.	1 y♂ (V).
10/6 94	St. 17	62°54	L. N.	26°34	L. W.	V ¹ .	200—0	—	—	9.1° C.	4 f♀, 2 f♂, 1 y♀, 1 y♂.

In Denmark Strait it was taken at 5 stations.

27/6	96	St. 95	65°14 L. N.	30°29 L. W.	Closing net.	700 fathoms			2 f♀.
20/5	95	St. 11	64°34 L. N.	31°12 L. W.	V ¹ .	200—0 fathoms.	Temp. surf.	8.2° C.	10 f♀, 1 f♂, 5 y♀, 5 y♂.
20/5	95	St. 10	64°19 L. N.	28°52 L. W.	V ¹ .	200—0	—	7.9° C.	1 f♀, 2 f♂.
20/5	95	St. 9	64°18 L. N.	27°10 L. W.	V ¹ .	100—0	—	7.9° C.	1 f♀, 3 f♂.
19/5	95	St. 8	63°56 L. N.	24°40 L. W.	V ¹ .	100—0	—	8.5° C.	65 f♀ (2 with sp.), 37 f♂, 1 y♀ (V).

In the Atlantic south of Iceland it was taken at 6 stations.

9/8	95	St. 40	62°00 L. N.	21°36 L. W.	V ¹ .	100—0 fathoms.	Temp. surf.	13.5° C.	60 f♀, 15 f♂, 24 y♀ (V), 15 y♂ (V), 2 y♂ (IV).
3/6	96	St. 68	62°06 L. N.	22°30 L. W.	V ¹ .	100—0	—	8.8° C.	4 f♀.
1/6	96	St. 63	62°40 L. N.	19°05 L. W.	V ¹ .	100—0	—	8.3° C.	26 f♀, 6 f♂, 5 y♀ (V).
18/5	96	St. 54	63°08 L. N.	15°40 L. W.	V ¹ .	100—0	—	9° C.	10 f♀, 6 f♂, 3 y♀, 2 y♂.
13/5	96	St. 49	62°07 L. N.	15°07 L. W.	V ¹ .	100—0	—	9.3° C.	15 f♀, 5 f♂, 6 y♀, 4 y♂.
12/5	96	St. 47	61°32 L. N.	13°40 L. W.	V ¹ .	100—0	—	10.6° C.	58 f♀ (10 with sp.), 22 f♂, 3 y♀ (V), 2 y♂ (V).

The Danish East Greenland Exp. 1900 has in surface hauls taken a few specimens, viz:

24/9	F. 390	8 p. m.	61°06 L. N.	15°26 L. W.				4 f♀.
	F. 392	12 p. m.	—	—				1 f♀, 1 f♂.
25/9	F. 393	2 a. m.	60°29 L. N.	12°10 L. W.				15 f♀, 6 f♂
	F. 402	8 a. m.	—	—				1 f♀.
	F. 403		—	—				3 f♀, 1 y♂ (V).
26/9	F. 412	8 p. m.	60°13 L. N.	9°42 L. W.				1 f♀.

In the Iceland-Færoe channel the Ingolf-Exp. has taken it in 5 samples.

14/5	96	9:30 a. m.	64°13 L. N.	15°00 L. W.	Apst. 6		Temp. at surf.	7.8° C.	1 f♀, 1 y♂ (V).
15/5	96	St. 52	63°57 L. N.	13°32 L. W.	V ¹ .	200—0 fathoms.	—	8.3° C.	8 f♀, 2 f♂, 2 y♀, 1 y♂.
20/5	96	St. 57	63°37 L. N.	13°02 L. W.	V ¹ .	100—0	—	8.2° C.	1 f♀, 3 f♂, 1 y♀, 1 y♂.
11/5	96	St. 45	61°31 L. N.	9°45 L. W.	V ¹ .	200—0	—	9.1° C.	16 f♀ (4 with sp.), 8 f♂, 9 y♀ (V), 4 y♂ (V).
11/5	95	St. 1	62°30 L. N.	8°21 L. W.	V ¹ .	50—0	—	10° C.	3 f♀.

North-east of Iceland the Ingolf Exp. has taken it at two stations.

25/7	96	St. 119	67°53 L. N.	10°19 L. W.	P.	100—0 fathoms.	Temp. at surf.	5° C.	1 f♀.
26/7	96	St. 117	69°13 L. N.	8°23 L. W.	V ¹ .	100—0	—	4.1° C.	1 y♀ (V).

Outside the Ingolf area, specimens were examined from two localities, viz:

Dan. East Gr. Exp. 1900	21/6	1 p. m.	63°33 L. N.	0°04 L. W.	Closing net.	75—50 fathoms.			1 f♀.
Joh. Petersen			73° L. N.	8° L. E.					3 f♀, 2 y♀ (V).

Distribution. Brady's specimens were taken in the Indian Ocean 47° L. S. 45° L. E. at the surface. By Th. Scott it was recorded from the Gulf of Guinea, and, according to Farran, it is fairly common off the west coast of Ireland at depths of from 100 to 1000 fathoms; occasionally it has been found at or near the surface. According to Sars it is a true pelagic form (often occurring close to the surface of the sea), which is found along the greater part of the Norwegian coast as far north as Lofoten Islands, as well as sometimes in the open sea. In the sea between Spitzbergen and Greenland as far north as $80^{\circ}17'$ L. N. the Duc d'Orléans has gathered this species in 32 samples from about 80, between $7\frac{1}{7}$ and $15\frac{1}{8}$ 1905, as well in cold as in temperate water. It was neither found at the very surface nor below 500 meters, but in 12 out of 14 samples taken at a depth of from 100 to 200 meters, generally scarce never abundant; in 8 samples adult males as well as females were found at a depth of from 20 to 400 meters.

Remarks. I have followed Sars in referring the northern form to Brady's species from the Indian Ocean, though his description is too incomplete for a certain identification. In spite of minor differences, f. inst. in the shape of pes V of the adult female, I am fairly convinced that Mrázek's *S. Römeri* is identical with this species. As the species has not been found, as far as I know, in any of the extensive collections from the South- and Mid-Atlantic or Indian Oceans, I think we are entitled to regard this species as one which has its chief centre of distribution in the North-Atlantic and in a less degree in the Arctic seas communicating with it. It seems not to have been found in the North Sea proper or adjacent waters; may be on account of lower salinity.

The records of the "Ingolf," which are all from the months May to July, and almost all with the vertical net down to about 100 fathoms, tell the same story as the above mentioned records of the Duc d'Orléans; that the species in these regions and at this season is only exceptionally found at the surface; if it were not so, it must have been found in several of the numerous surface samples from the Ingolf or the Danish East-Greenland Exp. It is worth recording that the species was found in several surface samples gathered from the mentioned expedition in the month of September, southwest of the Færoes. The Ingolf material does not allow any final conclusion about the time of propagation, but as adult males were found in 19 out of 24 samples (in a percentage varying from about 10 to 50) taken from May to July, and as spermatophores were often attached to the genital somite of the female as well as sometimes to that of the male, it is almost certain that the species is propagating then. The Duc d'Orléans found only males in 8 out of 32 samples. Adult males were gathered southwest of the Færoes in the month of September. Young animals of the penultimate stage were found in most samples, except in those from the month of September.

66. *Scolecithricella Ingolfii* n. sp.

(Pl. VIII figs 11 a—c).

Description. f♀. The shape of the body is practically like that of *S. minor*; the head is perhaps a little more raised. The lateral corner is, like that of preceding species, somewhat triangularly produced. The *antennulae* and oral appendages are completely like those of *S. minor*.

The *first pair* of legs is scarcely different; the first inner segment of the *second* foot has a

fairly distinct pointed outer spine; the outer-edge lamina of the third pair of legs has no spines. Along the inner margin of the second basipodite only two setae are observed; the inner terminal tooth of the third basipodite is longer and more slender. The *fifth pair* of legs is fairly well developed, with three indistinct segments (fig. 11 b); on the left side two indistinct terminal setae are found; on the right side the endopodite is indicated by a small process, and the exopodite has, inwards, a distinct spine. A similar asymmetric structure was also observed in a specimen from Ing. St. 19. In a specimen from Ing. St. 9, the left leg had a somewhat better developed endopodite, and the exopodite had a terminal and an inner seta, fairly long and placed nearer the tip than the base. In the specimen from Ø. Exp. 1900, the legs were symmetrical, and showed, as seen in Pl. VIII fig. 11 c, a somewhat different structure.

Occurrence. The Ingolf Expedition has gathered this species at three stations viz:

$1/7$	1895	St. 27	64°54	L. N.	55°10	L. W.	V ¹ .	200—0	fathoms	Temp. at the surface	3.9°	C.	2 f♀.	
$18/6$	1895	St. 19	60°29	L. N.	34°14	L. W.	V ¹ .	300—0	—	—	—	6°	C.	1 f♀.
$20/5$	1895	St. 9	64°18	L. N.	27°10	L. W.	V ¹ .	100—0	—	—	—	7°	C.	2 f♀.

The Danish East-Greenland Expedition has $25/9$ 2 p. m. 1900 60°19 L. N. 22°10 L. W. F. 399 gathered a single adult female.

As far as I was able to ascertain, this species has not been described hitherto. It is very much related to *S. minor*, and it is not without doubt that I have established it as a new species, as, at almost all the localities it was found in company with that species; but as the character found in the much longer fifth foot was found to be fairly constant in spite of small variations, I thought it right to do so.

67. *Scolecithricella ovata* Farran.

(Pl. VII figs 14 a—d; Pl. VIII figs 12 a—f).

1905. <i>Scolecithrix ovata</i> n. sp. Farran, p. 37, pl. VI figs 13—18, | 1908. <i>Scolecithrix ovata</i> Farr. Farran, p. 51.
pl. VIII figs 1—5. | 1908. — — — v. Bremen, p. 72, fig. 83.
1906. <i>Scolecithricella ovata</i> Farr. Pearson, p. 18.

Description. Size of specimen from Ing. St. 19 was 2.32 mm.; anterior division 1.84 mm.; urosome 0.48. Another specimen measured 2.5 mm. Farran's specimens measured 2.3 mm.

The shape of the body is in main features like Farran's description; the head is fairly well raised, and the rounded lateral-corners are slightly produced. The first and the fifth thoracic somites are not marked out in front. The rostrum consists of two short, obtuse, slightly divergent teeth, arising from a short lamelliform undivided process, to which are attached fairly slender and apparently obtuse rostral filaments, several times longer than the rostrum proper and, in direction downwards and backwards, reaching beyond the insertion of the antennulae; these filaments are wanting in most specimens.

The abdomen has the genital somite only slightly produced below; the receptaculum seminis is elongated-pear-shaped, and generally very prominent. The comparative length between the abdominal somites and the furcal rami, which are almost twice as long as wide is 22, 12, 14, 3 and 12.

The *antennulae* have 23 segments of which the segments 24 and 25 are completely fused; they reach

about to the end of the third abdominal somite. The *antennulae* appear rather clumsy, and their measurements are scarcely different from Farran's figures. A proximal seta, in addition to the distal one, was found in segments 12, 14 and 18; in contrast to Farran's fig. 14 no seta whatever was observed in segment 10; the posterior seta of segment 24 is short, and scarcely extends beyond the end of segment 25. The *antennae* are like those of *S. minor*, but the inner lobe of the endopodite has only 7 setae. The *mandibulae* have on the inner side of the long and slender third basipodite two long setae placed close to each other, of which the basal is the longer and stronger; the last segment of the exopodite has 9 long setae. The *maxillulae* have 7 + 2 setae in the outer lobe. Li I has 2, Li II 3 setae, Basp. III has 4 setae and Ri I—III 3 + 3 setae. The exopodite has 5 setae. The *maxillae* are like Farran's figure, and possess numerous vermiform, but no analliform, setae (Pl. VII fig. 14 a); the *maxillipeds* are like Farran's figure, but the second lobe of the second basipodite bears a fairly long, terminally hooked, and soft sensory seta.

The *first foot* has a well developed Se in the first outer segment, almost reaching the middle of the following segment. The *second foot* has the second basipodite rather broad; medially proximally to the insertion of Si a small tooth is observed, and laterally the margin is proximally produced into a strong tooth; the Se of the first outer segment is long and slender, and the St of Re III has about 55 basally fused teeth. The spinulation of the posterior surface is better developed than indicated by Farran. A glandular pore was observed at the base of Se 3 Re III. The *third pair* of legs has a well developed outer tooth in the second basipodite, and a short inner one, resembling that in the second foot of *S. obtusifrons*. The *fourth pair* of legs has no inner marginal bristles in the second basipodite, and no outer tooth. The St has a rather curious structure, as the marginal serrations are not completely coalesced basally, leaving an elongated fenestra. Spinulation, consisting of about 15 rather small teeth, is found on the posterior surface of the second inner segment.

The *fifth pair* of legs is in the main features like Farran's figure, with the first basal segment well distinguished, and with the second more or less well separated from the broad lamellar third segment. The legs are generally asymmetrical, partly because the articulation is better developed on the left than on the right side, and partly because the number of setae is rather variable. On the left side we generally find a shorter terminal and a longer distal seta as figured by Farran, on the right sometimes the terminal and sometimes the medial seta is absent, but often both are present.

The anterior portion of the *labrum* is distinctly prominent in front; the *anterior* surface shows a rather simple arrangement of the bristles (fig. 14 b) most similar to that of *S. obtusifrons*, though less complicated; in addition to the marginal rows of bristles an anterior transverse distinctly convex row, composed of several units, and a posterior shorter one are observed. The *oral* surface of the labrum has the anterior lateral group fairly well separated from the marginal rows (fig. 14 c); the posterior groups of the longitudinal series are, as seen in figure, more or less fused. As seen in fig., the transverse median groups are rather poorly developed. The structure of the "*lamina labialis*" etc. is in the main like that of the preceding species. The arrangement of the hairs upon and behind the labial lobes shows, as seen in fig. 14 b, a very marked difference between a central and two lateral groups.

The intestine is not straight, but distinctly twisted, at least vertically, though in a less degree than in *Lophothrix frontalis*.

$Y \text{ } \sigma^{\circ}$ (St. V). Size of young female from Ing. St. 19 was 1.86 mm.; anterior division 1.47; urosome 0.39. Another female from Thor St. 82 measured 1.6 mm.

The shape of the body is like that of the adult female; the comparative length of the abdominal somites and the furcal rami is 7, 9, 9, 11 and 9. The *antennulae* reach the base of the furca; the distal segments are comparatively longer. The inner lobe of the last segment of the endopodite of the *antennae* has 8 setae, in other respects the mouth appendages were scarcely different; no difference of interest was found in the structure of the natatory legs. The *fifth pair* of legs in the female is scarcely different from that of adult, but showed in the male, as seen in fig. 12 f Pl. VIII, a rather characteristic structure, as the left leg is much longer than the right one.

$Y \text{ } \sigma^{\circ}$ (St. IV). Size of male from Ingolf St. 27 was 1.38 mm.; anterior division 1.1 mm.; urosome 0.28.

The difference between this and the preceding stage is found in the abdomen, consisting of three somites, the comparative length of which was 6, 9, 12 and 7. The *antennulae* reach only to the middle of the last abdominal somite.

The *first* foot differs from that of preceding stage by the fused Re II—III; the *second* foot showed the same feature, and its second basipodite has no outer tooth, while the spinulation was scarcely different. The left *fifth* foot is somewhat longer than the right, and each foot consists of three segments; no setae were observed.

Occurrence. The Ingolf has gathered this species at 4 stations in Davis Strait:

$1/7$	95	St. 27	64°54	L. N.	55°10	L. W.	V ¹ .	200—0	fathoms	Temp. at surf.	3.9° C.	3 f♀, 1 y♂ (IV).
$26/6$	95	St. 25	63°30	L. N.	54°25	L. W.	V.	200—0	—	—	2.9° C.	9 f♀, 5 y♀ (V).
$30/7$	95	St. 38	59°12	L. N.	51°05	L. W.	V ¹ .	100—0	—	—	1.0° C.	6 f♀.
$25/6$	95	St. 24	63°06	L. N.	56°00	L. W.	V ¹ .	100—0	—	—	4.2° C.	1 f♀.

In the Atlantic south-west of Iceland it was taken:

$20/6$	95	St. 20	58°20	L. N.	40°48	L. W.	V ¹ .	200—0	fathoms	Temp. at surf.	6.1° C.	2 y♀ (V).
$18/6$	95	St. 19	60°29	L. N.	34°14	L. W.	V ¹ .	300—0	—	—	9° C.	25 f♀, 3 y♂ (V), 3 y♀ (V).
$17/6$	95	St. 18	61°44	L. N.	30°29	L. W.	V.	200—0	—	—	10° C.	1 f♀.
$16/6$	95	St. 17	62°54	L. N.	26°34	L. W.	V ¹ .	200—0	—	—	9.1° C.	5 f♀.

In Denmark Strait the Ingolf took it:

$20/5$	95	St. 11	64°34	L. N.	31°12	L. W.	V ¹ .	200—0	fathoms	Temp. at surf.	8.2° C.	1 f♀, 2 y♀ (V).
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In the Atlantic south of Iceland:

$12/5$	96	St. 47	61°32	L. N.	13°40	L. W.	V ¹ .	100—0	fathoms	Temp. at surf.	10.6° C.	5 f♀.
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The "Thor" has gathered the species at a single station:

$8/6$	1905	St. 72	57°47	L. N.	11°33	L. W.	Yt.	1500	M. Wire	2 f♀.
$15/6$	1905	St. 82	51°32	L. N.	12°03	L. W.	Yt.	1200	M. Wire	1 y♀.

Distribution etc. This species has previously been recorded only from the west coast of Ireland, where it seems to be of frequent occurrence over deep water from the surface to 1000 fathoms,

but only in small numbers. In spite of small differences I do not doubt that my specimens ought to be referred to Farran's *S. ovata*. As the maxillae do not possess any amalliform setae, I have referred the species to *Scolecithricella*, though in several respects it shows great similarity to *Scaphocalanus obtusifrons*, and perhaps is more related to this species than to *Sc. minor*.

68. *Lophothrix frontalis* Giesbr.

(Pl. VII figs 7 a—d; text-figs 66 a—f and 67 a—d).

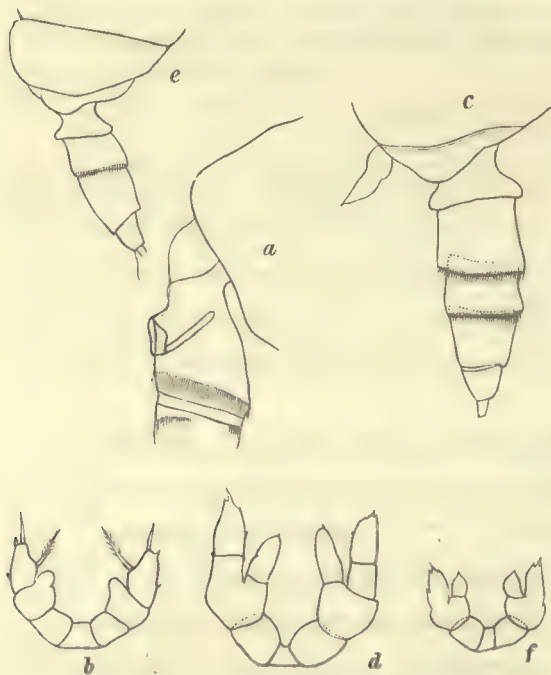
1895. <i>Lophothrix frontalis</i> n. sp. Giesbrecht, p. 254, pl. II.	1906. <i>Scolecithrix frontalis</i> Giesbr. Esterly, p. 65 pls 9 & 13.
1898. <i>Scolecithrix frontalis</i> Giesbr. Giesbrecht & Schmeil, p. 49.	1908. <i>Lophothrix frontalis</i> Giesbr. Farran, p. 58.
1903. — — — J. C. Thompson, p. 21.	1908. <i>Scolecithrix frontalis</i> Giesbr. v. Bremen, pp. 79—80, fig. 93.
1904. <i>Lophothrix frontalis</i> Giesbr. Wolfenden, p. 120 pl. IX figs 41—42.	1909. <i>Lophothrix frontalis</i> Giesbr. A. Scott, p. 99, pl. XXVI figs 11—20, pl. XXIX figs 1—10.
1905. — — — G. O. Sars, p. 6.	1911. — — — Wolfenden, p. 268.
1906. — — — Pearson, p. 19.	

Description. ♀. Size of female from Thor St. 72 was 6.45 mm.; anterior division 5.18 mm.; urosome 1.27 mm. Giesbrecht's specimen measured 6.6 mm., Scott's 7.4, and Wolfenden's 5.5—6.0 mm.

The genital somite is slightly produced below and has an elongate receptaculum seminis, which is directed upwards and forwards (text-fig. 66 a). Along the hinder margin of somites 2—4 a well developed serration is found; the third and the fourth somites possess dorsally and anteriorly transverse groups of short spines.

The *antennulae*, which extend beyond the end of the third abdominal somite, consist of 24 segments, as segments 24 and 25 are fairly well separated. "Æsthetasken" are, in contrast to Scott's figure, beyond segments 8~9 only found in segments 12, 14, 19 and 25. The segment 10 possesses a well developed seta, and a proximal seta is beyond segment 8~9 only found in segments 12, 14 and 18. The Sp of segment 24 extends distinctly beyond the end of segment 25. Segments 8~9 are only a little shorter than segment 18, which is a little longer than segment 17 as well as 19, which is 1.2 as long as segment 20. The *antennae* are like Giesbrecht's figure, with the exopodite a little longer than the endopodite, which has 8 setae in the Li and 6 in the Le. The third basipodite of the *mandibulae* has three long convex setae; the first inner segment has 2 setae, and the second has 9. The *maxillulae* are like those of *S. magnus*, with 7 + 2 setae in Le, 14 setae in Li I, 2 in Li II, 5 in Li III and 4 or 5 in basipod. III. The Ri I has 3 setae, the Ri II~III 5 setae, and the Re has 9 setae. The shape of the *maxillae* is like that of fig. 14 a; amalliform as well as vermiform setae are found. The *maxillipeds* are like Giesbrecht's description. The second, third and fourth pairs of legs do not show the marked difference in the second basipodite when observed in lateral view in situ; in the second and third feet an outer-edge lamina is found, but neither spines nor distal tooth. The first outer segment of the *first foot* has no outer seta. The *second foot* has a well developed long outer spine in the first inner segment, as figured by Giesbrecht; the anterior surface is smooth, but the posterior surface has a number of short spines, as seen in fig. 7 a Pl. VII. The *fourth pair* of legs has the inner margin of the second basipodite smooth; the third basipodite has, like the third pair, a small inner tooth on the anterior surface near the end; a few teeth were found only on the posterior surface of the two inner segments. The *fifth pair* of legs is scarcely different from Giesbrecht's description.

The *labrum* is, as seen in Wolfenden's fig. 41, more elongated than that of *S. magnus* (Pl. VII fig. 8 a), and strongly produced in front; the hinder portion of the labrum is, as in most other species, marked by an anteriorly convex line. I am fairly convinced that the anterior as well as the posterior portion of the labrum belongs to the mandibular and not to the antennal somite; the anterior portion, accordingly, does not correspond to the epistoma of *Euchæte*. The arrangement of bristles on the anterior surface is very characteristic (Pl. VII fig. 7 b). In the middle, most anteriorly, is a forward convex row of about 30 long bristles. A little more posteriorly we have on each side a long row extending laterally from the middle in front towards near the hinder margin; the setae of this row are decreasing in length posteriorly; the right and the left parts establish an acute angle open posteriorly, and thus include a more posterior row, forming a more obtuse angle, of shorter setae.



Text-fig. 66. *Lophothrix frontalis* Giesbr.

a. ♀♀. Genital somite $\times 33$. b. ♀♀ (St. V) Pes V $\times 59$. c. ♂♂ (St. V). Abdomen $\times 33$. d. ♂♂ (St. V). Pes V $\times 59$. e. ♂♂ (St. IV). Abdomen $\times 33$. f. ♂♂ (St. IV). Pes V $\times 59$.

In addition to the marginal setae, posteriorly irregular groups of short setae are found on each side. The *oral* surface of the labrum is rather characteristic, the first group is poorly developed, consisting of small granules and is well separated from the groups 2—4, which are more or less fused and consist of fairly strong, densely placed setae; behind, a group of small granules is observed (fig. 7 c, which is turned upside down). A *lamina labialis* (fig. 7 d Pl. VII), consisting of a median and two lateral parts, is found. In front of the serrula 6-dentata are two rather irregular rows of delicate setae, as seen in figure. Between the serrulae at least two groups of short spines and a longitudinal row are seen on each side. The *lobus labialis* possesses a wide inner row of numerous hairs, and an outer one of few hairs; both rows start posteriorly from a median group consisting of an inner portion with numerous densely placed hairs, and an outer portion with scattered hairs. More posteriorly and laterally, two groups

of a few hairs as well as irregularly placed hairs are found. The intestinal tract is curiously twisted. In front of the oesophagus a short coecal sac is observed; behind, the stomach is gradually attenuated, and forms a slight ventral convexity. At the insertion of the third pair of legs the intestine is suddenly, in a sharp bend, turned upwards and directed forwards, being thus placed dorsally to the mentioned part; somewhat in front of the maxillipeds it is continued through a second curvature into the intestine proper.

f♂. Size of male from Thor St. 183 was 5.66 mm.; anterior division 4.19 mm.; urosome 1.47 mm. Scott's specimens measured 5.75 mm.

The body is slender and attenuated in front as well as behind; in dorsal view, scarcely in lateral, a trace of rostrum, is observed. The rostrum is on each side continued into two fairly long

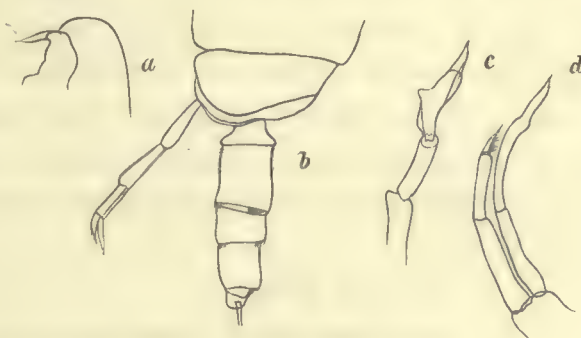
and slender spines (text-fig. 67 a). The fifth thoracic somite is well distinguished in front, and the regularly rounded lateral corners are scarcely produced.

The *abdomen* is one third as long as the anterior division; the comparative length of the abdominal somites and the furca is 18, 67, 53, 48, 10 and 18.

The *antennulae* extend at least to the end of the third abdominal somite; the shape is similar to that of *S. magnus*, but the proximal part is straighter, the restrictions at the base of the basal segments are less pronounced, and the angle between segments 14 and 15 is less marked. Segments 8~9 are almost completely fused with 10-12, segments 20 and 21 and 24-25 are completely fused. The appendages are scarcely different from those of *S. magnus*; the segment 20 does not possess any setae. The segments 8~12 are 1.1 as long as segments 23-25, not, as in *S. magnus* and related species, much (1.5) shorter, and segment 22 is 1.2 shorter than segment 19. The *antenna* are scarcely different from those of adult females, and the *mandibulae* are very much like, but the manducatory parts are less powerful, and the third basipodite is comparatively wider, with two short setae inwards, and a more distally placed knob representing a third one. The Li I of the *maxillulae* is fairly well developed, and has at least 12 rather short and soft setae; in Li III only 4 setae were observed, but in other respects scarcely any difference was observed. The *maxillae* have the sensory appendages, especially the amalliform ones, slightly developed; the maxillipeds are like those of *S. magnus*.

The *natatory legs* are scarcely different from those of the female. The *fifth* pair of legs extends almost to the end of the abdomen, and shows great similarity to that of *S. magnus*. The right endopodite, which extends somewhat beyond the end of the first outer segment, is styliform, with the terminal part fairly well articulated. The right exopodite (text-fig. 67 c) has the first segment articulated upon a long outer process of the third basipodite as long as the segment itself; the two pieces form a natural joint, elongated and outwards convex; the second outer segment is much shorter than the first; the third somewhat lamelliform segment is again somewhat longer, convex inwards, with a distinct angular process in the middle directed forwards, and produced into a pointed eminence, at the base of which a small conical process is found. The basal segments of the left leg are long and slender, and of almost equal length; the left endopodite (text-fig. 67 d) is like that of *S. magnus*, with the two first segments long and slender, and the third rather short and pointed; the left exopodite is somewhat shorter than the endopodite, and its third segment is triangularly attenuated, with fairly long setae inwards and terminally and short ones outwards.

The *anterior surface* of the *labrum* is very much like that of the female; anteriorly three irregular series of apparently very short setae are found; the series along the hinder margin is wanting. The *oral surface* has anteriorly a small conical process on each side, behind which at least two striated median spots are found; on each side an irregularly striated protuberance was found; no hairs were



Text-fig. 67. *Lophothrix frontalis* f♂.
a. Head $\times 18$. b. Abdomen $\times 18$. c. Pes V dext.
Re II-III $\times 59$. d. Pes V sin. $\times 59$.

observed. The *lamina labialis* seems to be represented by a transverse crest; in front of it on each side a longitudinal area of very minute hairs is found, and behind, a serrula 6-dentata consisting of rather short setae is observed. The *labial lobes* are well developed, but no setae are observed upon them.

Y_♀[♂] (St. V). Size of female from Thor St. 72 was 4.88 mm.; anterior division 3.80 mm.; urosome 1.08 mm. Male from the same station measured 5.37 mm.

The young animals are in most respects like those of the adult females; the fifth thoracic tergite is distinctly marked out (text-fig. 66c). The only difference is found in the structure of the fifth foot, which in one female was scarcely different from that of the adult, while in another, probably a variation, the distal outer seta is comparatively short, but in addition to it another proximal one is observed, and the endopodite is indicated by a short rounded process (text-fig. 66b). In the male the setae are short, and a long endopodite is found (text-figs 66b-d).

Y_♀[♂] (St. IV). Size of male from Thor St. 167 was 3.48 mm.; anterior division 2.90 mm.; urosome 0.58 mm.

The shape of the body shows the usual differences; the lateral corners are slightly more produced (text-fig. 66e). The mouth-limbs are scarcely different, but the 3 last natatory legs have the number of segments reduced; the second foot, f. inst., has the 2 last outer segments fused with 3 outer spines only; the number of teeth on the posterior surface is smaller. The *fifth foot* of the female has 3 segments, a strong terminal spine, and a short outer spine, but no inner one. The fifth foot of the male is, as seen in text-fig. 66f, distinctly smaller than in preceding stage.

Occurrence. The Ingolf has not taken this species, but it was gathered at several stations by the "Thor".

In Denmark Strait:

19/6 1904 St. 152 65°00 L. N. 28°10 L. W. Yt. 1000 M. Wire	10 f♀, 1 y♀ (V), 4 y♂ (V).
20/6 1904 St. 153 65°27 L. N. 27°12.5 L. W.	6 f♀, 1 y♂ (V).
21/6 1904 St. 154 65°27 L. N. 27°10 L. W.	3 f♀, 1 f♂, 2 y♀ (V).

In the Atlantic South of Iceland:

12/5 1904 St. 78 61°08 L. N. 28° L. W.	1 y♀ (V).
1/9 1904 St. 285 62°49 L. N. 18°46 L. W.	14 f♀, 1 y♀ (V), 1 y♂ (V).
11/7 1904 St. 183 61°30 L. N. 17°08 L. W. Yt. 1800 M. Wire	15 f♀, 8 f♂.
25/5 1904 St. 104 62°47 L. N. 15°03 L. W.	7 f♀; 1 f♂, 1 y♀ (V), 2 y♂ (V).

In the Færoe-Iceland channel:

22/5 1904 St. 99 61°15 L. N. 9°35 L. W. Yt. 1700 M. Wire	1 f♀.
Yt. 900 M. Wire	3 f♀.
4/8 1904 St. 230 63°10 L. N. 7°31 L. W. Yt. 1200 M. Wire	1 f♀.
12/5 1904 St. 78 61°07 L. N. 9°30 L. W.	2 f♀.
29/8 1905 St. 165 60°00 L. N. 10°35 L. W. Yt. 1000 M. Wire	1 f♀, 1 y♂ (V).

Outside the Ingolf area:

15/6 1905 St. 82 51°32 L. N. 12°03 L. W. Yt. 1200 M. Wire	5 f♀, 1 y♀ (V), 1 y♂ (V).
Yt. 800 M. Wire	1 f♀, 1 y♂ (V).

- $1/9$ 1905 St. 167 57°46 L. N. 9°55 L. W. Yt. 1500 M. Wire 81 f♀, 1 y♀ (V), 1 y♀ (IV).
 $8/6$ 1905 St. 72 57°52 L. N. 9°53 L. W. Yt. 1500 M. Wire 58 f♀, 3 y♀ (V), 25 y♂ (V), 1 y♂ (IV).
 $20/6$ 1905 St. 88 48°09 L. N. 8°30 L. W. Yt. 300 M. Wire 18 f♀, 2 y♀ (V), 5 y♂ (V).

Distribution. This species is probably distributed all over the Atlantic as far north as Denmark Strait and as far south as 35° L. S. It has been recorded from the Pacific (35° L. N. 125° L. W.), from the Gulf of California where, according to Esterly (1912 p. 321), it is found between 50 and 300 fathoms, and from the Malay Archipelago. According to Farran it is a not uncommon species in the N. E. Atlantic. "It was taken on every station at all depths from 330 to 1150 fathoms, and in fifteen out of thirty-four gatherings".

Remarks. In spite of a few minor differences, partly enumerated above, I regard this species as identical with Giesbrecht's, Scott's and Wolfenden's species.

69. *Scottocalanus Thorii* n. sp.

(Pl. VI figs 14 a—c, Pl. VIII figs 14 a—b, text-figs 68 a—i, 69 a—d and 70 a—d).

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|---|--|
| 1893. ♂ nec. ♀ <i>Scolecithrix securifrons</i> n. sp. Th. Scott, pp. 47—48, pl. IV. | 1905. nec. <i>Scolecithrix persecans</i> Giesbr. Esterly, pp. 168—167, fig. 28. |
| 1895. nec. — <i>persecans</i> n. sp. Giesbrecht, pp. 253—254, Taf. 3 figs 6—12. | 1906. ? pars. <i>Scottocalanus securifrons</i> Scott. Pearson, p. 19. |
| 1898. nec. — — Giesbr. Giesbrecht & Schmeil, p. 58. | 1908. — <i>persecans</i> Giesbr. Farran, p. 58. |
| 1903? — — — J. C. Thompson, p. 20. | 1908. nec. <i>Scolecithrix persecans</i> Giesbr. v. Bremen, pp. 80—81. |
| 1904? — — — Cleve, p. 197. | 1909. nec. <i>Scottocalanus persecans</i> Giesbr. A. Scott, pp. 105—106, pl. XXVII figs 10—18. |
| 1905. <i>Scottocalanus securifrons</i> Soott. G. O. Sars, p. 7. | 1911. pars. <i>Lophothrix securifrons</i> Scott. Wolfenden, p. 268. |

Description. f♀. Size of female from Thor St. 82 was 4.69 mm.; anterior division 3.91 mm.; urosome 0.78 mm. Esterly's specimens measured 4.6 mm.

The rostrum is very strong, and only terminally subdivided into two rather short divergent branches without terminal appendages (text-figs 68 a—b). The eyes are well developed. The forehead is surmounted by a short, rather prominent crest. The shape of body is, as seen in text-figs 68 c—d, somewhat robust, and the anterior division is almost five times as long as the abdomen. The first as well as the fifth somites are fused with the preceding ones; the lateral corners are somewhat triangularly produced, but are obtusely rounded, with a small notch.

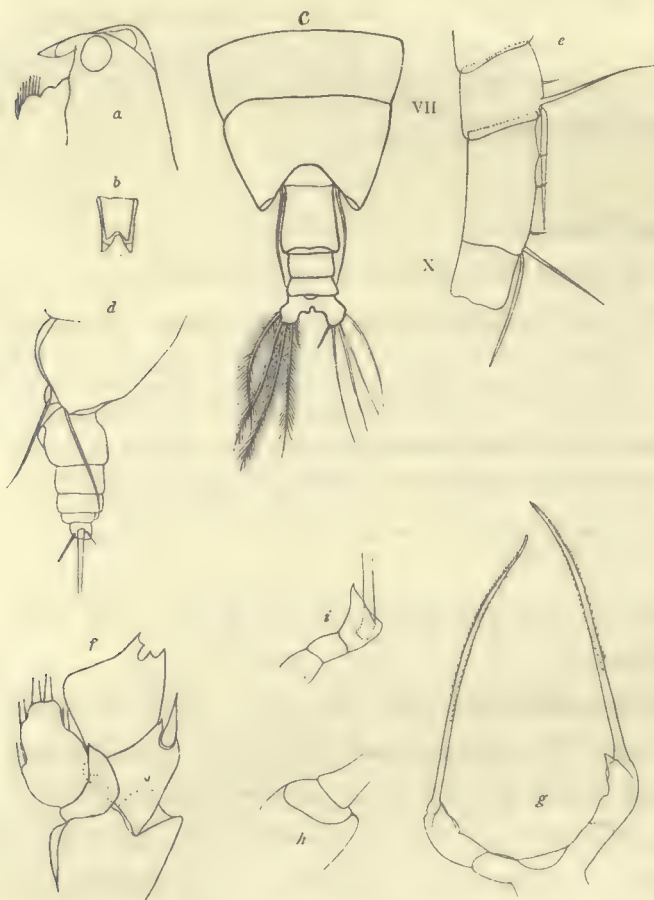
The *genital somite*, which is about as long as the following three somites, is moderately produced below, but the hinder and ventral corner does not project beyond the following somite. No serration was observed along the hinder margin of the abdominal somites.

The *antennulae* extend at least to the end of the third abdominal somite; segments 8—9 are well separated from 10, and segments 24 and 25 are fairly well separated. The appendages differ from those of *L. frontalis* by wanting a seta in segment 10, and by the delicate Sp. of segment 24, which just extends beyond the end of segment 25; the segments 8—9 have two soft setae (text-fig. 68 e). The measurements are very much like those of *L. frontalis*. The exopodite of the *antennae* is almost 1.5 as long as the endopodite, which has 8 setae in the outer and 6 in the inner lobe of the second segment. The *mandibulae* are in the main like those of *L. frontalis*, but the third basipodite has only two setae;

the *maxillulae* differ from those of the mentioned species by 3 setae in the second inner lobe and 8 setae in the exopodite. The posterior margin of the *maxillae* is only slightly convex, and only a few slightly developed amalliform sensory setae in addition to the vermiform one were observed. The *maxillipeds* are like those of the preceding species, but the amalliform seta of the second basipodite is rather slender, and the endopodite is comparatively elongate.

In lateral view the second basipodite of the second and third foot has an outer-edge lamina with a prominent distal tooth.

The *first foot* has 3 outer segments; the outer spine of the first segment extends somewhat



Text-fig. 68. *Scottocalanus Thorii* n. sp. f♀.

a. Head $\times 18$. b. Rostrum $\times 33$. c. Abdomen in dorsal view $\times 15$. d. Abdomen in lateral view $\times 15$. e. Segments VII—X of the antennulae. f. Pes II dext. in anterior view. g. Pes V in anterior view $\times 59$. h. Base of spine in posterior view $\times 150$. i. Base of spine in partly anterior view $\times 59$.

beyond the middle of the second segment; in the outer margin of the third segment a distinct glandular pore is found near the base. The *second pair* of legs (text-fig. 68 f) has a large somewhat rounded outer tooth in the first outer segment. The terminal seta has about 30 well separated serrations. The posterior surface of Ri II \sim III has 6 strong spines, and the anterior one a few shorter ones. The posterior surface has a single row of teeth in the second outer segment and two rows in the third. Indistinct glandular pores are found at the base of Se Re II and Se 3 Re III. The *third pair* of legs has a well developed inner tooth terminally on the anterior surface of the third basipodite; the third to fifth serration of the terminal spine is shorter than the more proximal and distal ones; the arrangement of the spinules is less developed than in the second pair of legs. The *fourth foot* has a short clumsy second basipodite without marginal setae outwards; the endopodite has no teeth posteriorly, but has a few on the anterior surface of Ri II and III, as in the preceding pairs; the exopodite is almost smooth. Well developed glandular pores are found in Re I as well as in Re II—III. The *fifth pair* of legs has three rather indistinct segments; inwards a small conical process bearing a short spine and, with a rudimentary hair at the base of the strong outer spine, almost

extending to the end of the third abdominal somite; in the distal half the spine is interiorly serrated, and terminally, a few hairs are found outwards (text-figs 68 g—i).

The lateral view of the *labrum* is like that of *S. magnus*, but the anterior part of the labrum is less produced, and in front of it a smooth, rounded elevation is found. The anterior surface of the *labrum* (Pl. VI fig. 14 a) shows some similarity to that of *L. frontalis* (Pl. VII fig. 7 b). Most anteriorly

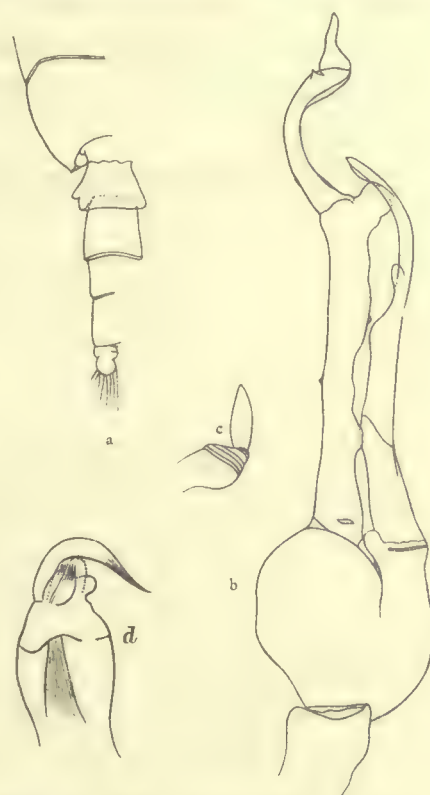
a curved row of fairly long setae, in the middle connected with the opposite side, is found; somewhat more posteriorly, and extending from the middle anteriorly to the hinder margin posteriorly, an elongated semicircular row is found (in fig. 14 a, this row is wrongly represented as being separated from that of the opposite side); this row is several setae high, and the length of its setae decreases backwards. More posteriorly another convex row of shorter setae is found, and between the end of this row and the mentioned outer row a short oblique series is found. Posteriorly and laterally scattered hairs are found, and more medially an almost transverse row. The posterior marginal setae are well developed. The *oral surface* of the labrum (Pl. VI fig. 14 b) shows greatest similarity to that of *S. obtusifrons* (Pl. VII fig. 9 c). Laterally, in front, a big area with short setae is observed, belonging to the marginal system. The first lateral group consists of a few granules, and is well separated from the three following more or less fused groups of fairly strong setae; posteriorly one or two groups of more delicate setae. The arrangement of the transverse rows is seen in figure. The *lamina labialis* (fig. 14 c) seems to be represented by two rounded structures meeting in the middle; in front of it the two usual rows of setae are found. The arrangement of the hairs behind and between the serrula 6-dentata is seen in figure. In the middle between the labial lobes a large group of densely placed hairs is found, which laterally is continued into an inner marginal row of longer and a more lateral row of shorter hairs. Independent of these, and more laterally, two rows of short setae are found.

f♂. Size of male from Thor St. 82 was 5.24 mm.; anterior division 3.93 mm.; urosome 1.31 mm. Th. Scott's specimens measured c. 4 mm., Giesbrecht's 4.5, Esterly's 5.3 and A. Scott's 4.4 mm.

The shape of the body is somewhat more slender than in the female. The *rostrum* is more slender than that of the female, and its branches have sometimes a delicate terminal filament. The fifth thoracic tergite is fairly well marked in front, and is distinctly rounded (text-fig. 69 a).

The *abdomen*, which is about one third of the anterior division, has on the left side of the first somite a backwards directed, rather prominent process, in which the genital opening is found; a fairly distinct serrated seam was found along the hinder margin of the second to the fourth somites.

The *antennulae* extend to the end of the fourth abdominal somite, and are almost straight. Segments 8~9 to 13 are more or less fused, but the articular membranes between segments 8~9 and 10, and between 12 and 13, are fairly well developed anteriorly; the segments 21 and 22 are fused on the right side, while segments 24 and 25 are well separated on both sides. The articulation between segments 14 and 15 is only poorly developed. Most of the bristles are soft-skinned, and very much like sensory setae. One or two "Æsthetasken" were found in all segments from 1—19; a proximal seta



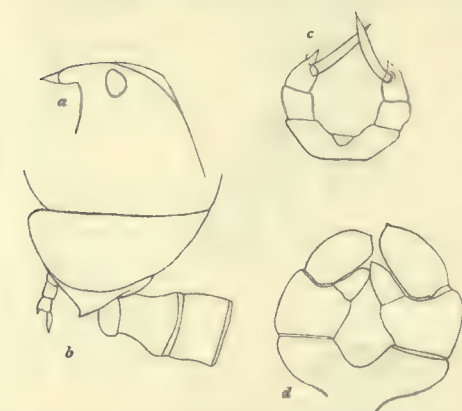
Text-fig. 69. *Scottocalanus Thorii* n. sp. f♂.
a. Abdomen $\times 15$. b. Pes V dext. from the left and partly from below $\times 59$.
c. Re III dext. from below. d. Pes V sin. Re III from the right side.

was found in segments 12 and 14, but not in segment 18. The Sp. of segment 24 does not extend to the end of segment 25. The segments 8—12 are 1.4 as long as segments 23—25, and segment 19 is 1.1 as long as 23. The antennae, mandibulae and maxillulae are practically like those of the adult females. The sensory organs of the *maxillae* are better developed, and the *maxillipeds* show the usual differences. The *natatory legs* are scarcely different from those of the females.

The *fifth pair* of legs is distinctly longer than the abdomen. The *right leg* (text-fig. 69 b) has the third basipodite rounded in the usual way; inwards a short process is found, where the endopodite is articulated; this extends distinctly beyond the end of the first outer segment, is gradually attenuated, distally curved and here slightly hollowed. The first outer segment has several projections medially, and is distinctly produced inwards terminally, where is the outwards convex second segment, with a shallow excavation facing forwards and inwards; the third segment is short and somewhat attenuated (text-fig. 69 c).

The basipodites of the *left leg* are, as usual, long and slender; the endopodite, which extends somewhat beyond the first outer segment, is a thin, elongated structure with indication of segmentation in the middle, somewhat enlarged terminally, and with a small terminal seta. The left exopodite consists of two segments of almost equal length; the second is somewhat enlarged, and is terminated with 2—3 leaf-like structures in addition to a slender hook-shaped organ dissolved into "setae" terminally, and a plate with at least 7 long serrations (text-fig. 69 d and Pl. VIII figs 14 a—b).

The labrum etc. are in all features of interest like those of the female; a curious feature was, however, found in the arrangement of the hairs on the anterior surface, as the oblique row of hairs between the two convex rows was wanting.



Text-fig. 70. *Scottocalanus Thorii* n. sp.
a. Y♀ (St. V). Head $\times 33$. b. Abdomen $\times 33$.
c. Pes V in post. view $\times 59$. d. Y♂ (St. V).
Pes V $\times 59$.

Y♂ (St. V). Size of female from Thor St. 88 was 3.84 mm.;

anterior division 3.06 mm; urosome 0.78 mm. Male from St. 82 measured 3.63 mm.

The shape of the body (text-figs 70 a—b) is in the main like that of the adult female, but the frontal keel is just indicated; the fifth thoracic somite is well marked in front, and its lateral corner is produced into a short but distinct tooth. The abdomen consists of four somites, of which the second is longer than the first and third, which are of equal length and longer than the fourth. The first abdominal somite has a small process on the left side; the serrated membrane of the somites II—IV is only indicated. The appendages are, with the exception of the fifth pair of legs, like those of the adult females as well as alike in the two sexes. In the female (text-fig. 70 c) the fifth foot consists of three distinct, almost square segments in addition to a short terminal one, produced into a short spine, at the base of which an exterior delicate hair is found; at the base of the last segment a strong spine is found, at least as long as the 3 distal segments. The fifth pair of the male consists of two short basal segments in addition to the undivided branches, somewhat asymmetrical (text-fig. 70 d).

Occurrence. The Ingolf Expedition has not gathered this species, but it was taken at the following stations by the Thor.

In Denmark Strait

¹⁹ / ₆	1904	St. 152	65°00	L. N.	28°10	L. W.	Yt. 1000	M. Wire	1 f♀.
²⁰ / ₆	1904	St. 153	65°27	L. N.	27°12	L. W.	Yt. ?		1 f♀.

In the Atlantic, south of Iceland

¹ / ₉	1904	St. 285	62°49	L. N.	18°46	L. W.			3 f♂, 1 f♀.
¹⁰ / ₇	1904	St. 180	61°34	L. N.	19°05	L. W.	Yt. 1800	M. Wire	1 f♀.
¹¹ / ₇	1904	St. 183	61°30	L. N.	17°08	L. W.	Yt. 1800	M. Wire	2 f♀.
²⁵ / ₅	1904	St. 104	62°47	L. N.	15°03	L. W.			2 f♀, 1 f♂.

In the Iceland-Færoe channel

²⁹ / ₈	1905	St. 164	61°20	L. N.	11°00	L. W.	Yt. 300	M. Wire	1 f♂.
²⁹ / ₈	1905	St. 165	60°00	L. N.	10°35	L. W.	Yt. ?		1 f♀, 1 f♂.
²² / ₅	1904	St. 99	61°15	L. N.	9°35	L. W.	Yt. 1700	M. Wire	1 f♂.
¹² / ₅	1904	St. 78	61°07	L. N.	9°30	L. W.			1 f♀.

Outside the Ingolf area

¹⁵ / ₆	1905	St. 82	51°32	L. N.	12°03	L. W.	Yt. 800	M. Wire	1 f♀, 1 y♀ (V).
							Yt. 1200	M. Wire	10 f♀, 1 f♂, 2 y♂ (V).
¹ / ₉	1905	St. 167	57°46	L. N.	9°55	L. W.	Yt. 1500	M. Wire	6 f♀, 1 y♂ (V).
⁸ / ₆	1905	St. 72	57°52	L. N.	9°53	L. W.	Yt. 1500	M. Wire	5 f♀, 9 f♂.
²⁰ / ₆	1905	St. 88	48°09	L. N.	8°30	L. W.	Yt. 300	M. Wire	1 f♂, 3 y♀ (V).

Distribution. This species is by Farran recorded as fairly common on the west coast of Ireland "at depths of from 330 to 1150 fathoms"; it has been recorded by the Monaco Expedition, and from the gulf of Guinea. The records from the South Atlantic, the Pacific and the Indian Ocean cannot be accepted.

Remarks. That the species is identical with the male of *Sc. securifrons* Scott and with Farran's *S. persekans* seems not to be doubtful. I think, that Farran, in contrast to Sars, is right in applying the name *Sc. securifrons* to the species with the pointed lateral corner, as Canu, who was the first to rediscover the species, has done so. Farran has identified the Atlantic species with Giesbrecht's *S. persekans*, and, as will be seen in the nomenclature of Plate VI, I once thought he was right. But on full consideration I feel obliged to follow A. Scott, and admit that *S. persekans* is another species, and I have accordingly given the Atlantic species the name *S. Thorii* in appreciation of the good work of this expedition. The female of *S. persekans* has been only imperfectly described by Esterly, but the fifth foot seems to be somewhat different. The male of *S. persekans* is characterized "by the moderately long spines on the rami of the rostrum", and by several structures in the structure of the fifth foot.

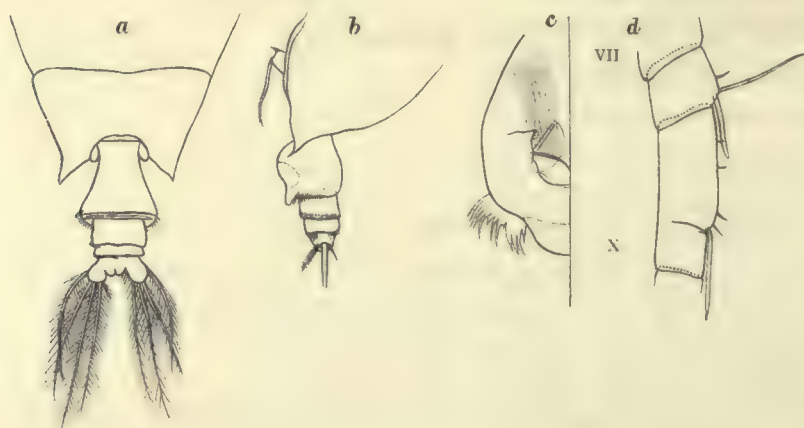
70. *Scottocalanus securifrons* Th. Scott.

(Pl. VIII figs 13 a—b; text-figs 71 a—d, 72 a—e and 73 a—d.)

1893. ♀ nec. ♂. <i>Scolecithrix securifrons</i> n. sp. Th. Scott, pp. 47—48, pl. IV—V.	1905. <i>Scottocalanus acutus</i> n. sp. G. O. Sars, p. 7.
1896. <i>Scolecithrix securifrons</i> Scott. Canu, p. 425.	1906. ? pars. — <i>securifrons</i> Scott. Pearson, p. 19.
1898. — — — Giesbr. & Schmeil, p. 49.	1908. — — — Farran, p. 57.
1903. pars. — — — Norman, p. 137.	1908. ♀ nec. ♂ <i>Scolecithrix securifrons</i> Scott. v. Bremen, p. 76 fig. 88.
1903. — — — J. C. Thompson, pp. 20—21.	1909. <i>Scottocalanus securifrons</i> Scott. A. Scott, pp. 104—105 pl. XXV figs 1—9, pl. XXVIII figs 1—9.
1904. ? — — — Cleve, p. 197.	1911. pars. <i>Lophothrix securifrons</i> Scott. Wolfenden, p. 268.
1904. <i>Lophothrix</i> — n. sp. Wolfenden, p. 120, pl. IX figs 12—15.	

Description. f♀. Size of female from Thor St. 82 was 4.49 mm.; anterior division (to the end of the lateral corners) 3.77 mm.; urosome 0.72 mm. Th. Scott's specimens measured 4 mm. and A. Scott's 4.3 mm.

The crista is scarcely different from that of the preceding species, but the lateral corners are



Text-fig. 71. *Scottocalanus securifrons* Th. Scott f♀.
a—b. Abdomen $\times 15$. c. Genital somite from below $\times 46$.
d. Segments VII—X of the antennulae.

triangularly produced into spine-like processes, which in dorsal view are seen to be directed somewhat outwards (text-figs 71 a—b). The rostrum has the basal portion elongate, with parallel margins; the divergent rami are short, without distinct tooth. The genital somite is strongly swollen below, and it is distally produced into a strong process which overlaps the proximal half of the following somite. Along the hinder margin of somites II—IV a generally well developed serrated seam is observed (text-figs 71 a—b).

The *antennulae* are like those of the preceding species, but the articular membrane between segments 8~9 and 10 are wanting posteriorly, and segments 8~9 have only one sensory seta (text-fig. 71 d). The oral appendages are scarcely different from those of the preceding species.

The *natatory legs* are very similar to those of the preceding species, but the outer spines of the second basipodite, as well as the inner of the third one, are comparatively longer in the second and third pairs of legs. The second basipodite of the *first pair* of legs has anteriorly and outwards near the end a rounded broad process; the Se of Re I is comparatively longer. The Se of Re I in the second foot is distinctly pointed. The *fifth pair* of legs is shorter; the inner process is longer, and its spine is longer and stronger; the outer spine is much shorter, as it does not reach the end of the genital somite, and the inner serration consists of fewer teeth.

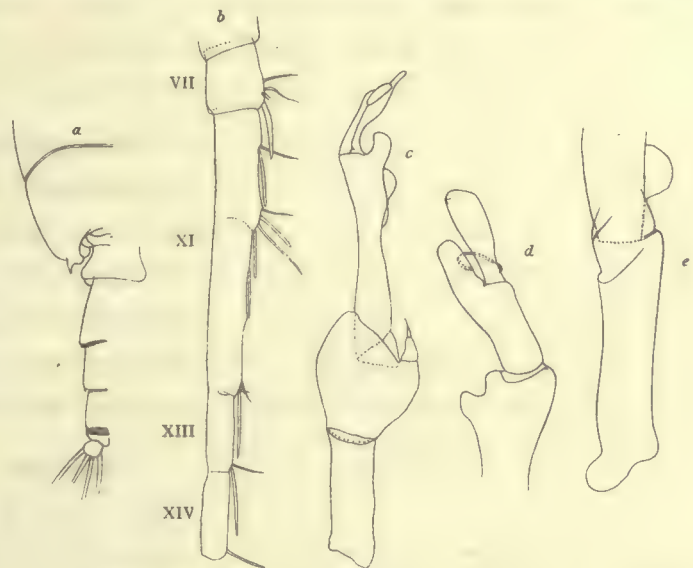
The structure of the *labrum* etc. is scarcely different from that of the preceding species.

f♂. Size of male from Thor St. 82 was 4.98 mm.; anterior division 3.81 mm.; urosome 1.17 mm.; Scott's specimens measured 4.75 mm.

The *rostrum* has the basal portion long and rather slender, and is divided into two rather short branches, which each possesses a very short tooth; the whole structure is completely like Scott's fig. 4, Pl. XXVII. The crista is scarcely different from that of the female. The fifth thoracic tergite has near the dorsal margin a distinct slender tooth, almost reaching the middle of the first genital somite. The abdomen (text-fig. 72 a) is like that of the preceding species, but the lateral process of the first genital somite is less prominent. The *antennulae* as well as the oral appendages are scarcely different from those of *S. Thorii* (text-fig. 72 b); the *nataory* legs do not differ from those of the females. The right endopodite of pes V (text-fig. 72 c) is very short, and consists of three segments, which are indistinctly separated; the second segment is the longest, and the third one is a short conical process bearing a slender seta. The first outer segment is long, and distinctly widened out terminally, where it medially possesses 3 expansions anteriorly and a single more prominent outer one posteriorly; the second outer segment is comparatively short, and, outwards, convex with a terminal expansion, and the third one is short, rounded, with a single spine. The described terminal parts of the right exopodite form a clasping organ (text-fig. 72 c—d). The two cylindric basal segments of the *left leg* (text-fig. 72 e) have each a basal rounded process as seen in figure; the third basipodite has an inner terminal one as well. The left endopodite consists of two segments, of which the one is rather short and rounded with distal process, while the other has two diverging processes, of which the one is axeshaped. The *left exopodite* consists of a short basal segment and a longer distal one, inwards excavated and enlarged towards end; the inner margin of this is terminally and posteriorly densely spinous, and anteriorly a laminous process divided into two spines is found. The third segments consists of a rounded basal portion with a few teeth, and a much longer pointed spinelike portion (Pl. VIII figs 13 a—b).

$Y_{\text{♀}}^{\text{♂}}$ (St. V). Size of female from Thor St. 82 was 3.45 mm.; anterior division 2.80; urosome 0.65 mm. Size of female from St. 90 was 3.54 mm.

The frontal keel is less prominent than in the adult, though distinct. The lateral corner is produced into a distinct tooth (text-figs 73 a—e). The *fifth foot* of the female is much shorter than in the preceding species; the limitation between the segments is more indistinct, the third outer segment is only represented by a short spine, and the inner spine is not as long as the three terminal segments (text-figs 73 c—d). The *fifth foot* of the male is characterized by a short, distinct spine in the left exopodite as well as by the pointed endopodite; the branches of the right side, especially the endopodite, are distinctly more rounded.



Text-fig. 72. *Scottocalanus securifrons* Th. Scott f.♂.
a. Abdomen $\times 15$. b. Segments VII—XIV of the left antennula $\times 51$. c. Pes V dext. $\times 33$. d. Pes V dext. Re II—III in right view. e. Pes V sin. two first segments in dorsal view.

Occurrence. In the Atlantic, south of Iceland, the Thor has gathered this species.

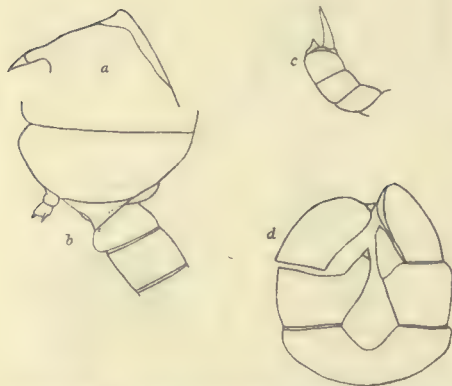
- 9/7 1904 St. 178 63°08 L. N. 21°30 L. W. Yt. 750 M. Wire 1 f♀.
 11/7 1904 St. 183 61°30 L. N. 19°05 L. W. Yt. 750 M. Wire 1 f♀.
 25/5 1904 St. 104 62°47 L. N. 15°03 L. W. Yt. 1800 M. Wire 1 f♀.

In the Iceland-Færoe Channel:

- 29/8 1905 St. 164 61°20 L. N. 11°00 L. W. Yt. 300 M. Wire 2 f♀.

Outside the Ingolf area:

- 15/6 1905 St. 82 51°32 L. N. 12°03 L. W. Yt. 800 M. Wire 1 f♂.
 Yt. 1200 M. Wire 18 f♀, 5 f♂, 3 y♀ (V).
 8/6 1905 St. 72 57°52 L. N. 9°53 L. W. Yt. 1500 M. Wire 1 f♀.
 20/6 1905 St. 88 48°09 L. N. 8°30 L. W. Yt. 300 M. Wire 3 f♀, 8 f♂, 1 y♀ (V).
 21/6 1905 St. 90 47°47 L. N. 8°00 L. W. Yt. 300 M. Wire 4 f♀, 7 f♂, 1 y♀ (V), 1 y♂ (V).



Text-fig. 73. *Scottocalanus securifrons* Th. Scott.
 a—b. Y♀ (St. V). Head and first abdominal
 somites $\times 33$. c. Y♀ (St. V). Pes V dext.
 in posterior view $\times 59$. d. Y♂ (St. V). Pes
 V $\times 59$.

Distribution. This species is, according to Farran, very characteristic of deep-water tow-nettings off the west coast of Ireland, most plentifully at about 700 fathoms, but it was taken at 100 fathoms. It has been recorded from the Bay of Biscay by the Monaco Expedition, from the Gulf of Guinea, and by Wolfenden in the Atlantic as far south as 35° L. S. By A. Scott it has been recorded from the Malay Archipelago.

Remarks. As this species (males, females, adult as well as young ones) is distinguished from the preceding species by a number of important characters, viz. pointed lateral corners and the structure of the fifth foot, Wolfenden is certainly wrong in regarding *Scott. acutus* G. O. Sars and *Sc. securifrons* Th. Scott (Sars) as the same species. The species, which A. Scott has

described from the Malayan Seas and referred to this species, seems in all essentials to be like the Atlantic form.

Phaënnidae.

71. *Cornucalanus chelifer* Thomps.

(Pl. VII figs 4 a—h, Pl. VIII figs 15 a—g).

- | | |
|--|--|
| 1903? <i>Scolecithrix chelifer</i> n. sp. J. C. Thompson, pp. 21—22, pl. V figs 1—9. | 1907. <i>Cornucalanus chelifer</i> Thomps. G. O. Sars, p. 27. |
| 1905. — — — Farran, p. 36, pl. VII figs 18—19. | 1908. — — — Farran, pp. 49—50. |
| 1905. <i>Cornucalanus magnus</i> n. sp. Wolfenden, pp. 21—22, pl. VII. | 1908. <i>Onchocalanus chelifer</i> Thomps. v. Bremen, pp. 65—66, fig. 76. |
| 1906. <i>Onchocalanus chelifer</i> Thomps. Pearson, p. 19. | 1911. <i>Cornucalanus magnus</i> Wolf. Wolfenden, pp. 281—83, pl. XXXII figs 1—10, text-fig. 45. |

Description. f♀. Size of female from Thor St. 183 was 8.7 mm; anterior division 6.7 mm.; urosome 2 mm. Wolfenden's specimens measured 8 mm.

The head has a low terminal crista with a dorsal spine directed forwards and downwards (Pl. VIII fig. 15 a). The rostrum is bifurcate with the spines directed downwards and backwards, each bearing terminally a slender backwards curved filament. The shape of the body is like Wolfenden's figure; the articulation between the head and first thoracic tergite, as well as between the fourth and fifth tergites is well developed; the lateral corners are somewhat triangularly produced, are rounded and possess a small tooth (Pl. VII fig. 4 a).

The *abdomen*, which is about one third as long as the anterior division, has a serrated seam along the hinder margin of somites II—IV; the somites, especially the genital one, are all over covered with short hairs or spines. The genital somite, which is a little longer than deep, is distinctly produced below; the receptaculum seminis is, as seen in fig. 4 a, well developed. The fifth abdominal somite is scarcely visible from above, the comparative length between the three first somites and the furcal branches, which are wider than long, is 35, 22, 17 and 10. The St 2, at the base of which a dorsal tooth is seen, is almost half as long as the body and twice as long as the other setae.

The *antennulae*, which scarcely extend to the end of the cephalo-thorax, consist of 24 segments. "Æsthetasken" are found in segments 2, 3, 5, 7, 9, 12, 14, 19 and 25, as well as in segments 18 and 21, but here representing the distal seta. A proximal seta was found in segment 12 as well as in segments 14—18. The Sp. of segment 23 is well removed from the tip of segment ($\frac{1}{4}$ — $\frac{1}{5}$ of its length), and extends scarcely to the end of segment 25. The segment 21 is 1.3 as long as segment 22.

The endopodite of the *antennae* is two thirds as long as the exopodite; its second segment has 8 setae in the inner lobe and 6 in the outer lobe. The manducatory part of the *mandibulae* is long and slender, with fairly well developed teeth; the third basipodite, which is about as long as wide, has three setae inwards; the second segment of the endopodite has 9 Sp.

The Lob I of the *maxillulae* is long and slender; the Li 2 has two long plumous setae, the Li 3 has 4 setae, and the third basipodite has 4 Sa and 1 Sp. The Ri I has 3 setae, the Ri II has 3, of which one is very delicate, and the Ri III has 4 setae. The exopodite has 10 setae and two groups of short spines on the anterior surface; the Le has 7 + 2 setae.

The *maxillae* and *maxillipeds* have a very characteristic structure, but are scarcely different from Wolfenden's figure.

The *first pair* of legs is like Wolfenden's figure; the segments are broad, and the exopodite has 3 segments with powerful outer setae; the endopodite has 3 fairly long spines on the posterior surface; the exopodite has on the posterior surface of Re II at the base of Si five slender spines, and at the base of Si I Re III two spines. A glandular pore is found beyond the middle in the outer margin of Re III. The *second pair* of legs is like Wolfenden's figure, but the segments are comparatively longer; the first inner segment is produced into a fairly long, somewhat rounded, spine; the armature of the posterior surface is scarcely different from Wolfenden's description. The St has the serrations almost completely fused in the distal three fourths, but only fused in the middle in the proximal fourth, leaving a basal fenestra free. Small glandular pores were found at the base of Se Re I and II, and at the base of Se 1 and 3 of Re III. The *third pair* of legs is in main features like the *fourth pair*;

the number of glandular pores is like that of the second foot. The *fourth* foot is like Wolfenden's figure, but the armature of the posterior surface of the third outer segment differs in minor details (Pl. VII fig. 4 b); the structure of the St. is like that of the second foot (Pl. VIII fig. 15 b). The *fifth* pair of legs (fig. 4 c) consists of three segments, bearing a few hairs posteriorly; the terminal segment is rather slender, attenuated, and produced into a rather short terminal spine.

The lateral outline of the *labrum* etc. is rather characteristic, as seen in fig. 15 a; a well developed *epistoma* densely covered with about 40 long setae on each side was found; the *labrum proper* is densely covered with setae, the arrangement of which is similar to that seen in fig. 5 e, though differing in details; anteriorly a group of rather short setae (about 3 deep) is found; this group is on each side continued into a large group of long setae, placed laterally and posteriorly, extending towards the hinder margin, where groups of shorter setae are found. In the area in front of the mentioned groups a median group of fairly long setae is observed.

The *oral surface* of the labrum (fig. 4 d) is rather characteristic. Laterally, in front, an almost transverse row of rather short setae is found; behind this a longitudinal row of setae is observed. In the middle, on each side, 3–4 almost completely fused groups of densely placed, fairly long, setae are found. In the middle, around the median circular spots, areas of short spines or granules are found. The *lamina labialis* seems to be wanting, but the serrula 6-dentata is well developed (Pl. VII fig. 4 e); in front, a median wide and elongated group of fairly long setae is found, as well as a lateral rounded one. Between the serrulae and behind, 2 groups of setae are found. The arrangement of the densely placed hairs on the labial lobes and on the area behind was not studied in details, but shows great similarity to that of *O. magnus* (fig. 5 e).

♂. Size of male was 6.17 mm.; anterior division 4.95 mm.; urosome 1.22 mm.

The head is rounded, without any frontal crista or spine (fig. 15 d). The rostrum is strong, with short terminal filaments. The lateral corners are rounded, without any spine (Pl. VII fig. 4 f).

The *abdomen* is only one fourth as long as the anterior division; along the hinder margin of somites II–IV a marginal serrated seam is found; the fifth abdominal somite is almost rudimentary; the comparative length of the first four abdominal somites and the furcal branches is 8, 20, 15, 10 and 5.

The *antennulae* extend to the end of the cephalo-thorax; the two first segments are inflated and much more powerful than those following; they contain 24 segments, but the articulation between 8–9 and 10 and between 12 and 13 is wanting posteriorly. "Æsthetasken" are found in the following numbers, 1 in segment 1, 4 in segment 2, 2 in segments 3–8–9, and a single one in segments 10–19, 22 and 25. The measurements are scarcely different from those of the females. The *antennae* are like those of the female, while the *mandibulae* differ from those of the female by the much wider third basipodite with three short setae medially.

The *maxillulae* differ from those of the female by the rudimentary setae of the Li I and the two short setae of Li II. The *maxillae* are very similar to those of *O. cristatus* (Pl. VII fig. 6 c), but the spine of lob. IV is comparatively stronger, being longer, though less powerful, than that of lob. V; the number of the setae is scarcely different from that of the female; the sensory setae of the endopodite have a rather curious structure, with a more or less prominent, rather short, terminal filament surrounded by short delicate dentations. The *maxillipeds* are widely different from those of the females,

especially on account of the wanting strong spines of the endopodite; the dentation of the third basipodite is not better developed than in related species; the fourth lobe of the second basipodite has two short setae in addition to the spine.

The *natatory* legs are scarcely different from those of the female. The *fifth pair* of legs is not unlike Wolfenden's description, but his right foot corresponds to the left one in my specimens (Pl. VII figs 4 f—g). The right foot (fig. 15 e) consists only of three segments and a short terminal tooth. The left leg consists of 5 long proximal segments, in addition to a fairly short, attenuated and hairy third outer segment, which has a short terminal seta (fig. 4 g).

Y $\frac{\sigma}{\phi}$ (St. V). Size of female from Thor St. 183 was 6.3 mm.; anterior division 5.1 mm.; urosome 1.2 mm. Size of male 6.4 mm.

The shape of the body is like that of the adult female, but the lateral corner is more pointed (fig. 15 f); the abdomen consists of four somites, the comparative length of which was 10, 19, 14, 8 and 5. The appendages, except the fifth feet, are in the young female like those of the adult females (Pl. VII fig. 4 h), this pair is even less developed than that of the adult, as seen in the drawing; in the male each leg consists of four segments, and the left leg is considerably longer than the right one; about the arrangement of hairs and setae I refer to fig. 15 g.

Occurrence. The Thor has in Denmark Strait once gathered this species viz:

19/6 1904 St. 152 65°00 L. N. 28°10 L. W. Yt. 200 M. Wire 1 f♀.

In the Atlantic, south of Iceland:

10/7 1904 St. 180 61°34 L. N. 19°05 L. W. Yt. 1800 M. Wire 1 f♀, 1 f♂.

11/7 1904 St. 183 61°30 L. N. 17°08 L. W. Yt. 1800 M. Wire 31 f♀, 6 f♂, 3 y♀ (V), 4 y♂ (V).

In the Iceland-Færoe Channel:

12/5 1904 St. 78 61°07 L. N. 9°30 L. W. 3 f♀.

In the Atlantic, south west of the Færoes:

8/6 1905 St. 72 57°52 L. N. 9°53 L. W. Yt. 1500 M. Wire 4 f♀.

Distribution. According to Farran "this species is of frequent occurrence in deep-water tow-nettings off the west coast of Ireland", at depths of from 330 to 1150 fathoms. By the Gauss it was taken 9/10 near the Cape Verde Islands, and 12/11 it was taken about 35° L. S. 0°5° L. E.

Remarks. In spite of minor differences I do not doubt that this species is identical with *Cornucalanus magnus* Wolf.; Wolfenden refers Thompson's *Sc. chelifera* to a different species on account of a wanting frontal spine; as Thompson's description of a young male is so very imperfect, I prefer to follow Farran and Pearson.

72. *Onchocalanus magnus* Wolfenden.

(Pl. VII figs 5 a—g; Pl. VIII figs 16 a—d).

1906?	<i>Xanthocalanus magnus</i> n. sp.	Wolfenden, pp. 32—33, pl. X.	1911?	<i>Onchocalanus frigidus</i> n. sp.	Wolfenden, pp. 276 —277.
1908?	—	— Wolf. Wolfenden, p. 37, pl. VII figs 1—9.	—	nec. —	<i>magnus</i> Wolf. Wolfenden, pp. 275 —276, pl. XXX.

Description. Size of female from Thor St. 183 was 8.3 mm.; anterior division 6.5 mm.; urosome 1.8 mm. Wolfenden's specimens measured 8.8 mm.

The body is rather elongated; the head (fig. 5 a) is well raised, with distinct eyes, but without trace of frontal keel or spine. The rostrum (Pl. VIII fig. 16 a) is bifurcate, with fairly long, slightly divergent spines, one of which, at least, possesses a slender filament. The lateral corner is triangularly produced, and has a well marked pointed tooth, which in some specimens, however, is only indicated, but is generally most distinct on the right side.

The *abdomen* (Pl. VII fig. 5 b) is scarcely one third as long as the anterior division; the genital somite is rather suddenly produced below; the genital opening is more broad than long, and is placed in the middle of a densely hirsute area; the lateral margins are somewhat overlapping and pointed in front; an elongated receptaculum seminis is found. The anal somite is scarcely visible from above; the comparative length of the three first abdominal somites and the furcal branches is 32, 22, 16 and 11. The marginal serrated seam along the hinder margin of segments 2—4 is only poorly developed.

The somites are more or less hirsute, especially ventrally; the first somite has the hairs more distinct, especially dorsally in front, where a pad of densely placed hairs is found.

The *antennulae* reach almost to the end of the body and consist of 24 segments the appendages are scarcely different from those of *C. chelifera*; the Sp. of segment 24 is one third removed from the end of the segment, and is far from reaching the tip of the segment 25. The segments 21 and 22 are of almost equal length. The exopodite and the endopodite of the *antennae* are of almost equal length; the *mandibulae* and *maxillulae* are in main features like those of *C. chelifera*. The basipodite of the *maxillae* is first strongly excavated and then distinctly produced; the lobe 1 has 5 setae, the lobes 2—4 have 3 setae; the posterior seta of the fourth lobe is stronger than the preceding setae, but much weaker than the strong curved spine of the fifth lobe, at the base of which 3 fairly long and slender setae are found. The endopodite has 6 brush-shaped sensory organs in addition to a long slender one. The *maxillipeds* show great similarity to those of *C. chelifera*; the comparative length between the main divisions is 18, 29 and 15. The first and second basipodites are like those of *C. chelifera*; the third basipodite is about 6 times as long as wide, with the three proximal setae well separated from each other; and inwards and basally with an area of densely placed delicate spines. The second segment of the endopodite has one short serrated curved spine and two long ones; the third segment has two similar spines.

The *first pair* of legs is like that of the preceding species, but the segments are much more slender. The *second pair* of legs is like those of the preceding species, but is distinctly more slender; the third outer segment is about twice as long as wide, and as long as the terminal spine. The outer spine of the first inner segment is fairly long and somewhat obtuse; on the anterior surface of the second inner segment a small pore surrounded by slender hairs is found; indistinct glandular pores were only found in Re II and at the base of Se 3 Re III. On the posterior surface of the two inner segments coronas of spines were found, while larger and smaller prickles were found in numbers in the outer segments. The *third pair* of legs differs from the following pair by the comparatively longer and thicker teeth, especially in the endopodite. The *fourth pair* of legs has marginal setae in the second basipodite; a glandular pore is observed in the second outer segment; the posterior surface is covered with groups of short prickles or fairly long setae, with all intermediary steps between; the setae are

comparatively shorter in the two outer segments. Anteriorly, hairs are only found in the second basipodite, where, f. inst., laterally a large group of long setae is found.

The *fifth* pair of legs (fig. 5 d) consists of three segments; the exopodite has a terminal and two outer spines; the anterior surface is almost smooth, while the posterior surface as well as the sides are covered with long setae.

In front of the rather prominent labrum proper a prominent *epistoma* (Pl. VII fig. 5 a), which is densely covered with long bristles (fig. 5 e), is found; the bristles of the labrum are neatly arranged into two anterior groups of long bristles, about three lateral groups of shorter hairs and a single marginal row. The *oral* surface of the labrum (fig. 5 f) is anteriorly densely covered with a number of short minute prickles; scarcely distinguished from these, two lateral groups of hairs are found, probably corresponding to two groups in *C. chelifera*. Almost in the middle, on each side, about three almost completely fused groups of short bristles as seen in figure are found, and more behind, an oblique group of delicate hairs is found. In the middle densely placed granules are found in transverse areas. No distinct lamina labialis is found; in front of the serrula 6-dentata (fig. 5 g) a large inner group of short granules is found, and an outer longitudinal row of fairly long hairs. Behind, a horse-shoe shaped group of granules is found on each side and, well separated from this, as seen in fig. 5 e, irregularly placed short hairs. Along the inner margin of the labial lobes inwards short spines, and more outwards long bristles, are found.

Y♀ (St. V). Size of female from Thor St. 183 was 6.25 mm.; anterior division 5 mm.; urosome 1.25 mm.

The shape of the body is scarcely different from that of the adult, but for the regularly pointed lateral corner. The comparative length of the four abdominal somites and the furcal branches is 10, 15, 13, 8 and 6. The abdominal somites are almost completely smooth. But for the comparatively shorter fifth foot, the appendages are scarcely different from those of the adult females.

Occurrence. The Thor has taken this species at two stations.

¹¹/₇ 1904 St. 183 61°30' L. N. 17°08' L. W. Yt. 1800 M. Wire 2 f♀, 2 y♀ (V).

⁸/₆ 1905 St. 72 57°52' L. N. 9°35' L. W. Yt. 1500 M. Wire 1 y♀ (V).

Distribution. This species has previously been found in the Antarctic Seas.

Wolfenden has originally given the name *X. magnus* to a species about 8.8 mm. long with pointed lateral corners. Later on he has subdivided his original species into a smaller one with rounded lateral corners to which he applies the name *O. magnus*, and a larger one which he names *O. frigidus*. I think the name *magnus* must necessarily be used for the bigger species.

I am very doubtful, if my North Atlantic species is really identical with the Antarctic one; Wolfenden's description, however, is in several important points too incomplete to settle the question.

The differences are the following. In my specimens the first as well as the fifth thoracic somites are well marked in front; the genital somite is not as long as the following three somites, the vulva has no "lateral flap" on each side, and the genital somite can scarcely be called "very swollen ventrally". The antennulae are longer, as they reach distinctly beyond the middle of the genital

somite. The Li 2 of the maxillulae has 2 not 3 setae. The Ri 2 of the fourth foot has no "corona of spines", but a number of fairly long bristles, and the fifth feet seem to be somewhat different.

73. *Onchocalanus cristatus* Wolf.

(Pl. VII figs 6 a—e; Pl. VIII figs 17 a—f).

- | | |
|---|--|
| 1904. <i>Xanthocalanus cristatus</i> n. sp. Wolfenden, p. 119, pl. IX figs 18—19. | 1908. <i>Onchocalanus cristatus</i> Wolf. Farran, p. 49. |
| 1905. <i>Onchocalanus trigoniceps</i> n. sp. G. O. Sars, p. 20. | 1908. <i>Xanthocalanus cristatus</i> Wolf. Wolfenden, p. 34. |
| 1906. <i>Xanthocalanus cristatus</i> Wolf. Pearson, p. 20. | 1908. — — — v. Bremen, p. 62 fig. 70. |
| 1906? — — — <i>similis</i> n. sp. Esterly, pp. 68—69, pls 9—13. | 1909? <i>Onchocalanus cristatus</i> Wolf. A. Scott, pp. 82—83, pl. XXXIV figs 1—8. |
| 1907. <i>Onchocalanus cristatus</i> Wolf. G. O. Sars, p. 3. | 1911. — — — Wolfenden, pp. 277—278. |

Description. ♀. Size of female from Thor St. 183 was 8.15 mm.; anterior division 6.45 mm.; urosome 1.70. Another specimen measured 7.5 mm. Wolfenden's specimen measured 5.5 mm., Sars's 7 mm. and Scott's 6.6 mm.

The shape of the body is like that of *O. magnus*, but it is more slender; the first as well as the fifth thoracic somite is well marked out in front. The head (Pl. VIII fig. 17 a) is well raised, and surmounted with a dorsal low crest, visible in dorsal as well as in lateral view. The rostrum consists of a basal portion and two fairly long somewhat divergent spines without distinct terminal filament. The lateral corners are triangularly produced and terminated with a distinct tooth.

The *abdomen* is a little more than one fourth as long as the anterior division; the genital somite is like that of *O. magnus*, but is less produced below. The comparative length of the abdominal somites and the furcal branches is 28, 18, 13 and 6; the somites are hairy in a similar way as in the other species.

The *antennulae* are like those of *O. magnus*, and extend about to the end of the furca; the only difference is found in the slightly different measurements of the segment 13, which is 1.24 (not 1.4) as long as segment 12, and of segment 24 which is 1.1 as long as segment 23 (not a little shorter). The *antennae*, *mandibulae* and *maxillulae* are scarcely different from those of *O. magnus*. The *maxillae* are like those of the preceding species; the endopodite possesses in addition to a short seta of usual structure a long slender sensory seta and 5 fairly long ones, the slightly enlarged part of which is more or less "brush-shaped". The *maxillipeds* are like those of the preceding species, but the third outer segment has 4 instead of 3 strong curved spines. The *first* pair of legs differs only by rather unimportant details in the armature of the posterior surface. The Se of the first inner segment is long, slender, and distinctly pointed in the *second* pair of legs. The *third* as well as the *fourth* pair of legs differs from *O. magnus* in the details of the arrangement of the hairs, and by the curiously contorted terminal spine. The *fifth* pair of legs consists of three segments, of which the third, attenuated one, is longer than the second, but shorter than the two basal ones combined; it has, as seen in fig. 6 a Pl. VII, a terminal and two outer spines. The anterior surface is smooth, while the sides as well as the posterior surface are all over covered with fairly strong setae or spines.

The *labrum* (Pl. VIII fig. 17 a) etc. are not in any features of great interest different from the corresponding organs of the preceding species.

f♂. Size of male was 6.5 mm.; anterior division 5.07 mm.; urosome 1.43 mm.

The body is more slender than in the female; the head shows trace of a crista, especially in dorsal view. The lateral corners are rounded and possess a small, well marked tooth.

The *abdomen* is fairly slender (Pl. VII fig. 6 b) and is, as seen in figure, beset with hairy spots. The comparative length of the first four abdominal somites and the furcal branches is 25, 55, 45, 28 and 15.

The *antennulae* extend about to the end of the body; the proximal 7 segments are more powerful than in the female. The segments 8-9 to 13 are posteriorly indistinctly separated, as the articular membrane is sometimes missing; the segments 20 and 21 are, on the right side, partly fused; the appendages are scarcely different from the male of *C. chelifera*. The *antennae* scarcely differ from those of the female, but the *mandibulae* differ by the wide third basipodite with three rather short inner setae; the *maxillulae* are more soft-skinned than in the female; the Li 1 has 8 short setae, but the number of setae is in other respects like that of the female. The *maxillae* (fig. 6 c) is a soft-skinned organ of somewhat similar shape to that of the female; the number of setae in the lobes is seen in figure; the endopodite has 7 sensory setae, differing from rather clumsy ones basally to more slender ones distally.

The *maxillipeds* are distinctly more robust than in the females; the comparative length between the main divisions is 34, 34 and 15, the setae of the second basipodite, especially the sensory one in the middle, are less developed; the strong curved setae of the endopodite are represented by rather weak setae.

The *natatory* legs are scarcely different from those of the female. The *fifth* pair of legs extends almost to the end of the abdomen. The *right leg* is much shorter than the two first segments in the left leg (cf. Pl. VII fig. 6 b), and it forms an outward convexity; the outer margin of the second segment is slightly convex, and somewhat spinous; the third segment is indistinctly divided into two parts, and has at least a terminal and an outer rather weak spine as well as a number of stiff hairs terminally on the posterior surface. The *left leg* has two long cylindrical basal segments, of which the distal one is much the longer; the second segment is convex outwards, and here possesses terminally about 7 stiff hairs. The exopodite consists of three segments, decreasing in length as well as in thickness from the first towards the third; the third segment (Pl. VIII fig. 17 e) is somewhat attenuated and hairy, and is in possession of a short terminal spine.

The *epistoma* (Pl. VIII fig. 17 c) is well developed, with two rows of long setae; the *labrum* proper has, anteriorly, a well developed projection, but is posteriorly rather soft-skinned, with undulated lines in the chitin; anteriorly 2-4 rows of long bristles are found; posteriorly, rows of short bristles were observed; the marginal row of hairs was apparently wanting. The *oral* surface of the labrum is not unlike that of the female, but the granulation in front is wanting; three well separated lateral groups of hairs were found on each side. In the middle, just behind the third median circular spot, a single transverse group of short bristles was found. In front of a well developed *serrula 6-dentata* with short teeth, a median elongated group with two longitudinal rows and, laterally, a single convex row were found. The labial lobes are well developed, with short marginal bristles; between the lobes a small pointed process is found on each side.

Y♀ (St. V). Size of female from Thor St. 183 was 6.15 mm.; anterior division 4.9 mm.; urosome 1.25 mm.

The shape of the body is more slender than in the adult female. Short, but distinct rostral, filaments were found in the examined specimen. The comparative length of the abdominal somites and the furcal branches is 30, 50, 40, 20 and 17; the somites are distinctly hirsute. The appendages do not show any difference of importance, except the fifth pair of legs; this was in one specimen (St. 167) shorter than that of the adult female, and especially the last segment was less slender; in another, however (St. 183) (fig. 17 f Pl. VIII), the last segment was, as seen in figure, divided into two; as the right and the left foot were almost quite alike, I am most disposed to regard this feature as an abnormality and not as one characteristic of the male.

Y♀ (St. IV). Size of female from Thor St. 183 was 4.36 mm.; anterior division 3.44 mm.; urosome 0.92.

The comparative length of the abdominal somites and the furcal branches is 28, 40, 40 and 17. The *maxillulae* have only 9 setae in the exopodite. The natatory legs show the usual differences, as the Ri II—III and Re II—III are fused; the second to fourth pairs of legs have only 3 Se in the Re II ∼ III. The *fifth* pair of legs (Pl. VII 6 e) is rather short and clumsy, with the first outer seta of Re III rather indistinct.

Occurrence. The Thor has taken this species in Denmark Strait:

¹⁹/₆ 1904 St. 152 65°00 L. N. 28°10 L. W. 1 f♀.

In the Atlantic, south of Iceland:

¹⁰/₇ 1904 St. 180 61°34 L. N. 19°05 L. W. Yt. 1800 M. Wire 1 y♀ (V).

¹¹/₇ 1904 St. 183 61°30 L. N. 17°08 L. W. Yt. 1800 M. Wire 3 f♀, 5 f♂, 2 y♀ (V), 1 y♀ (IV).

²¹/₅ 1904 St. 99 61°15 L. N. 9°35 L. W. Yt. 1500 M. Wire 1 f♀.

In the Iceland-Færoe channel:

²⁹/₈ 1904 St. 165 60°00 L. N. 10°35 L. W. Yt. 1000 M. Wire 1 y♀.

²²/₅ 1904 St. 99 61°15 L. N. 9°35 L. W. Yt. 1700 M. Wire 1 f♀; 1 y♀ (V).

⁴/₈ 1904 St. 230 63°10 L. N. 7°31 L. W. Yt. 1200 M. Wire 1 f♀.

In the Atlantic, south west of the Færoes:

⁹/₆ 1905 St. 72 57°52 L. N. 9°55 L. W. Yt. 1500 M. Wire 2 f♀, 3 y♀ (V), 2 y♀ (IV).

Distribution. This species has previously been recorded from the North-East Atlantic and is, according to Farran, not uncommon off the west coast of Ireland "at depths of from 330 to 1150 fathoms"; the other records are rather doubtful.

Remarks. On full consideration I do not doubt that the females and males are rightly referred to the same species.

My specimens differ from Wolfenden's original description by its much larger size, and by the maxillae, which do not possess "seven short thick brush processes", and, from a note (1906 p. 32) by the number of setae in the third basipodite and the endopodite of the maxillulae. It differs from Sars' *O. trigoniceps* by its size and the anteriorly well marked first thoracic tergite.

It differs from Scott's species from the Malay Archipelago by the less slender fifth foot without inner spine, and by the endopodite of the maxillae, which does not possess 6 strongly brush-shaped setae.

This species is nearly related to Esterly's *X. similis*; it differs, according to him, especially by the four segments of the fifth pair of legs (Pl. XIII fig. 77). As the only examined female (from the Gulf of California), which is 6.5 mm. long, is a young one of the penultimate stage, I think, although the fifth pair of legs is completely like the four-segmented one which I have examined of the same stage (Pl. VIII fig. 17 f), that a more detailed description is needed of specimens from this region before settling the question.

74. *Onchocalanus hirtipes* G. O. Sars.

(Text-figs 74 a—i).

1905. *Onchocalanus hirtipes* n. sp. G. O. Sars, p. 20.
1908. — — G. O. Sars. Farran, p. 49.

1909. *Onchocalanus hirtipes* G. O. Sars. A. Scott, p. 83, pl.
XXXIV figs 9—17.

Description. f♀. Size of female from Thor St. 183 was 5.3 mm.; anterior division 4.0 mm.; urosome 1.3 mm. Sars' specimens measured 4.7 mm., Farran's 5.7 and Scott's 5 mm.

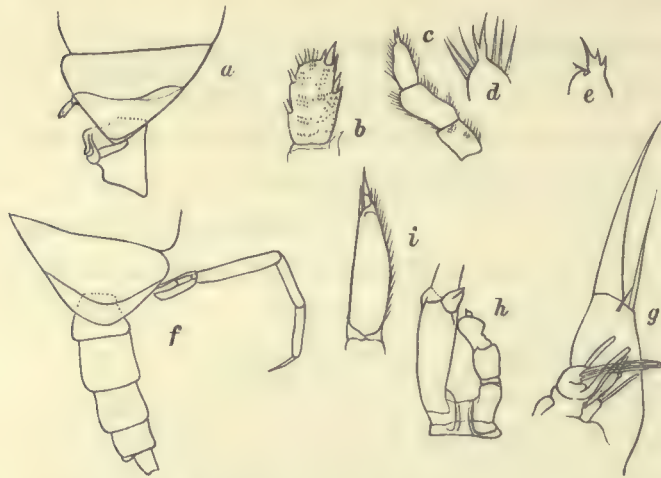
The body is moderately slender. The head is suddenly, but not very much, raised, and does not possess any crista. The fairly long *rostrum* has two only slightly divergent spines, each possessing a long, slender terminal filament. The first as well as the fifth thoracic tergites are well marked in front; the lateral corners are somewhat triangularly produced, but rounded (text-fig. 74 a).

The *abdomen* is one third as long as the anterior division; the genital somite is strongly produced below, and has a short receptaculum; in dorsal view it is seen to be much broader somewhat in front of the middle; in front and in a less degree behind it becomes suddenly narrow. The serrated seam along the hinder margin from the second to fourth somite is well developed. Short, stiff, scattered hairs are found on each side of the genital somite, and tufts of fairly long hairs on the ventral surface of the fifth somite.

The *antennulae* reach about to the end of the genital somite; the appendages are scarcely different from those of *C. chelifera*, except the Sp. of the segment 24, which is one third removed from the tip of the segment, and extends to the end of segment 25. The segment 13 is 1.6 as long as segment 12, and the segment 24 is a little longer than 23.

The exopodite and the endopodite of the *antennae* are of almost equal length; the Si of the first basipodite is as in the preceding species short. The *mandibulae* and *maxillulae* are like those of *C. chelifera*, but for the presence of 11 setae in the endopodite (5 in the Ri III) of the maxillulae. The structure of the *maxillae* is like that of the two preceding species; the endopodite has, in addition to a single vermiform seta, 7 rather curiously developed "brush-shaped" setae, similar to those figured in Scott's fig. 14 (Pl. XXXIV). The *maxillipeds* are similar to those of the preceding species; the comparative length of its main divisions is 65, 80 and 47; the sensory setae of the second basipodite is distinctly brush-shaped, and scarcely twice as long as wide on the left side, but on the right side it is like that of other species; the number of curved setae in the endopodite is as in the preceding species, but they are comparatively weaker.

The *first pair* of legs is like that of the preceding species; the Se of the Re I extends somewhat beyond the end of the Re II. The endopodite has on its posterior surface 3 + 2 spines; the exopodite has 5 spines at the base of Se Re I, 6 spines at the base of Si Re II, and near the inner margin of Re III three groups consisting of 4, 3 and 3 spines. The endopodite of the *second pair* of legs has a long pointed Se in the Re I; on the posterior surface of Ri I a group of 5 fairly strong spines is found, and in Ri II two outer rows of 6 spines and an inner one of 8 weaker spines. The terminal seta, which is like that of the preceding species, is as long as the third outer segment; on the posterior surface of the third basipodite and the exopodite groups of rather short spines are found; the number of glandular pores is like that of *O. magnus*. The armature of the posterior surface of the *third pair* of legs is like that of the preceding species; the endopodite has 5 long spines in Ri I, a curved row of 7 long spines and an inner group of about 20 setae in Ri II, and in Ri III groups of 5 strong and 12 short spines;



Text-fig. 74. *Onchocalanus hirtipes* G. O. Sars.

a. f♀. Genital somite × 33. b. f♀. Pes III Re III × 59. c. f♀. Pes V sin. d-e. f♀. Pes V Re III sin. et dext. × 150. f. f♂. Abdomen × 33. g. Maxilla sin. in ant. view × 150. h. f♂. Pes V in ant. view × 59. i. f♂. Pes V sin. Re III.

the exopodite has a number of short spines and bristles. The third outer segment is, as shown in text-fig. 73 b, curiously short, probably due to accident; a similar abnormal structure has been described by Wolfenden in the fourth pair of legs of the male of *C. chelifera* (1911 p. 283). The *fourth pair* of legs has the armature somewhat less developed, but the third outer segment was transformed in a similar way. The terminal segments of the third and fourth pairs of legs were only examined on the left side, as they were wanting on the right side.

The *fifth pair* of legs (text-figs 74 c-e) consists of three segments, which are almost completely smooth on the anterior surface, but posteriorly at least in distal half of the segments, they are covered with fairly long stiff hairs; the left leg has terminally a bifurcate process (fig. 74 d), and in the right a three-divided one (fig. 74 e) is found.

The lateral view of the *labrum* etc. is like that of the preceding species; the organs were not examined in detail in the single specimen at my disposal.

f♂. Size of male from Thor St. 183 was 4.04 mm.; anterior division 3.05 mm.; urosome 0.99 mm.

The shape of the cephalosome is scarcely different from that of the female (text-fig. 74 f). The *abdomen* has, as usual, five somites, but the fifth one is scarcely visible from above; the comparative length of the four somites and the furcal branches, which are as long as wide is 25, 40, 33, 20 and 12. The distal segments of the *antennulae* were wanting; the proximal segments are like those of the preceding species. The *antennae*, *mandibulae* and *maxillulae* show the same differences from those of the female as in *O. cristatus*.

The *maxillae* are in general shape like those of the preceding species (cf. Pl. VII fig. 6 c); the structure and arrangement of the 8 sensory setae in the endopodite are seen in text-fig. 74 g. The

maxillipeds are like those of the female; the comparative length of the main divisions is 55, 65 and 32; the endopodite is somewhat shorter, and its setae are less strong. The sensory seta of the second basipodite is three to four times as long as wide, curved, and somewhat attenuated; it is thus well distinguished from the short one of the female, as well as from the comparatively long and straight one of the male in *O. cristatus*.

The *first* pair of legs differs from that of the female by the want of spines on the posterior surface of the Re I, and by three spines only in Ri. The *second* pair of legs is scarcely different from that of the female. The *third* pair of legs is in main features like that of the female; the third outer segment is of usual structure, and the armature of the posterior surface is like that of *O. magnus*. The *fourth* pair of legs was very defective.

The *fifth* pair of legs, like that of *O. cristatus*, consists of a short right leg extending scarcely to the end of the first segment of the left side, and of a long and slender left leg, which extends distinctly beyond the end of the abdomen (text-fig. 74 f); the right leg has, as seen in text-fig. 74 h, three fairly long and broad proximal segments in addition to a rudimentary terminal one, continued into a short spine. The left leg consists, as seen in figure, of five elongated segments like those of *O. cristatus*; the third outer segment is, however, as seen in text-fig. 74 i, less slender, and has in addition to the terminal seta a distal outer one.

Occurrence. The Thor has taken a male and a female of this species $11/7$ 1904 St. 183 $61^{\circ}30'$ L. N. $17^{\circ}08'$ L. W. Yt. 1800 M. Wire.

Distribution. Previously a single specimen (♀) has been gathered by the Monaco St. 1849, $36^{\circ}17'$ L. N. $28^{\circ}28'$ L. W. 0—3000 M., on the west coast of Ireland (55° L. N. 10° L. W. at 1150 fathoms) and by the Siboga at 3° L. S. 127° L. E.

Remarks. My specimens do not differ from Sars' short description, and agree with Farran's specimens in the shape of the genital somite, but differ by the shape of the fifth pair of legs, which is not "five-jointed" on the one side. From Scott's figures they differ by minor points in the structure of the antennulae, but especially by the third segment of the fifth foot, which has a distal Se in addition to an undivided St; as, however, the fifth foot seems to vary from the one specimen to the other, there is not at present sufficient justification for separating the two species from each other.

75. *Onchocalanus affinis* n. sp.

(Text-figs 75 a—e and 76 a—d).

Description. f♀. Size of female from Thor St. 183 was 6.3 mm.; anterior division 5.09 mm.; urosome 1.4 mm.

The body is somewhat more slender than in the preceding species. The head is more suddenly raised; the basal portion, which is more powerful than in the preceding species, is directed more downwards (text-fig. 75 a). The first and the fifth tergites are only indistinctly marked in front; the lateral corners are triangularly produced and obtusely rounded.

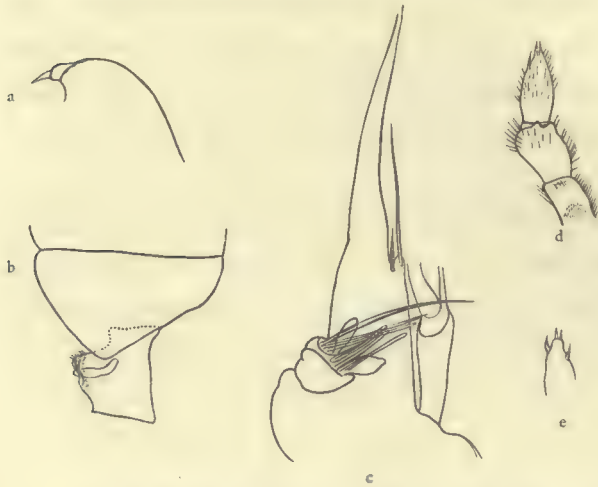
The *abdomen* (text-fig. 75 b) differs from that of the preceding species by the shape of the genital somite; dorsally the somite, somewhat in front of the middle, is rather suddenly wider than

more anteriorly, but posteriorly it is of almost equal width. The comparative length of the three first abdominal somites and the furca is 75, 50, 30 and 22.

The *antennulae* reach at least to the end of the third abdominal somite; the Sp of segment 24 is one third removed from the tip of the segment, and is far from extending to the end of segment 25; in other respects the antennulae are like those of the preceding species. The oral appendages are

scarcely different from those of *O. hirtipes*; the comparative length of the main divisions in the maxillipeds is 85, 100 and 57; the sensory seta of the second basipodite is fairly long like that of *O. cristatus*.

The *first pair* of legs differs from that of *O. hirtipes* by the number of spines; the endopodite has 4 spines; the exopodite has no spines in Re I, 7 spines at the base of Si Re II, and in Re III 3, 6 and 6 spines near the inner margin. The number of spines on the posterior surface in the *second pair* of legs is somewhat greater than in *O. hirtipes*; the endopodite has in Ri II 8 + 6 + 12 spines. In the structure of the *third and fourth* legs no difference from the preceding species was observed. The *fifth pair* of legs (text-figs 75 d—e) differs



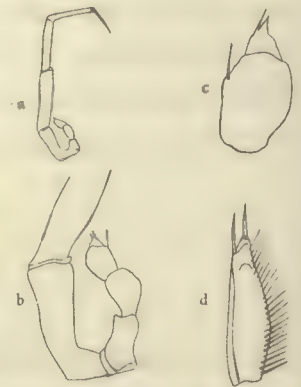
Text-fig. 75. *Onchocalanus affinis* n. sp. f♀.
a. Rostrum × 18. b. Abdomen × 18. c. Maxilla sin. in anterior view × 150. d—e. Pes V sin. et dext. × 59.

from that of the preceding species by the structure of the terminal spines of Re III; in the left leg two terminal spines in addition to a Se were found; on the right side the Se is poorly developed, but a fairly strong Si was found. The anterior surface is, as in *O. hirtipes*, almost completely smooth.

f♂. Size of male from Thor St. 180 was 5.19 mm.; anterior division 4.1 mm.; urosome 1.09 mm.

The shape of the body is like that of the preceding species; the lateral corners are more rounded and less produced than in the female. The comparative length between the abdominal somites and the furcal branches is 30, 45, 36, 24, 2 and 15. The *antennulae* almost reach to the end of furca; they show the usual differences from those of the female. The *antennae*, *mandibulae* and *maxillulae* are scarcely different from those of the adult female. The *maxillae* differ by the structure of some of the sensory setae of the endopodite (text-figs 75 c). The *maxillipeds* are like those of the preceding species, but the sensory seta is shorter than in the preceding species; the comparative length of the main divisions is 75, 80 and 42. The *natatory legs* are scarcely different from those of the female.

The *fifth pair* of legs (text-figs 76 a—b) is only in minor points different from that of *O. hirtipes*; the right leg extends somewhat beyond the first segment of the other side. The terminal segment of the *right* leg is somewhat bigger than in the preceding species (text-fig. 76 c); the third outer segment has on the left side, as seen in text-fig. 76 d, a somewhat different shape from that of *O. hirtipes*.



Text-fig. 76.
Onchocalanus affinis n. sp. f♂.
a. Pes V × 18. b. Basal segments of pes V × 59. c. Pes V Re III dext. in posterior view × 150. d. Re III sin. × 150.

Occurrence. The Thor has gathered 2 specimens:

¹¹/₇ 1904 St. 183 61°30 L. N. 17°08 L. W. Yt. 1800 M. Wire 1 f♀.

¹⁰/₇ 1904 St. 180 61°34 L. N. 16°05 L. W. Yt. 1800 M. Wire 1 f♂.

Remarks. It is not without some doubt that I have established a new species for the described male and female. In spite of the variations in the fifth pair of legs, which is not uncommon to several species, I think that the different shape of the fifth pair of legs, the larger size, and the different armament of the first pair of legs warrant the establishment of a new species for the female. I think that the males of the two species are distinctly distinguishable especially by the right leg of the fifth pair of legs.

76. *Xanthocalanus Greenii* Farran.

(Pl. VII figs 3 a—g; Pl. VIII figs 18 a—d).

1905. <i>Xanthocalanus Greenii</i> n. sp. Farran, p. 39, pl. VIII figs 1—13.	1908. <i>Xanthocalanus Greeni</i> Farr. Farran, p. 48.
1906. — — Farr. Pearson, 20.	1908. — — — v. Bremen, p. 60, fig. 67.
1906? — <i>calaminus</i> n. sp. Wolfenden, p. 34, pl. XI figs 3—5.	1908. — <i>calaminus</i> Wolf. Wolfenden, p. 34.
1907. — <i>Greeni</i> Farr. G. O. Sars, p. 13.	1911? <i>Talacalanus calaminus</i> Wolf. Wolfenden, pp. 279—281, Taf. XXXI, figs 9—12, text-figs 44 a—b.

Description. Y♂ (St. V). Size of young male was 8.12 mm.; anterior division 6.69 mm.; urosome 1.43 mm. Farran's specimen measured 6.0 mm. and Wolfenden's 5.5 mm.

The anterior division is short and robust, about 4.5 as long as the abdomen. The rostrum consists of a proximal portion, continued into 2 thin, but stiff, rather long and somewhat divergent branches (Pl. VIII fig. 18 a). The head is rounded without any trace of crest. The first thoracic tergite is well marked in front by an articular line, which, beneath, is seen to be continued between the insertion of the maxillae and maxillipeds, as is the fifth thoracic tergite, as seen in fig. 18 b. The lateral corners are produced and terminated with a small tooth.

The comparative length of the abdominal somites and the furcal branches is 10, 17, 13, 7 and 15; the furcal branches are 1.4 as long as wide; serrated seam along the hinder margin of somite II—III is well developed.

The *antennulae* extend almost to the end of body; the appendages of the 24 segments are like those of the preceding species; the Sp. of segment 24, which was broken, was placed in the middle of the segment; the measurements are in the main like Farran's description. The *antennae* are like Farran's description, with two rami of about equal length. The *mandibulae* have a long and slender manducatory part with rather weak teeth; the third basipodite has three long slender spines, of which the most distal is almost twice as long as the proximal ones. The *maxillulae* have 7 long powerful + shorter bristles in the exterior lobe; the Li I (Pl. VII fig. 3 a) has 4 rather delicate Sa and 10 Sp., of which at least 8 are widened out to lancet-shaped laminae with delicate serration, as seen in fig. 3 b; the Li 2 has 4 setae, and so has Li 3, and while the third basipodite has 4 Sa + 1 Sp the endopodite has 11 setae and the exopodite 10. The *maxillae* are only slightly produced posteriorly; Lob. I has 5 setae, lobe II—III has 3 setae, and lobe IV (Pl. VII fig. 3 c) has a strong slightly curved

serrated spine in addition to the usual pinnate setae with laminae-formed serrated membrane; the lobe V has two rather delicate bristles posteriorly, of which one is short, and in addition 2 very long serrated membraniferous setae (figs 3 c-d). The endopodite (cf. Wolfenden's Pl. XXXI fig. 11) has 7 longer or shorter brush-shaped sensory setae as well as a long slender vermiform one. The *maxillipeds* (Pl. VII fig. 3 e) are in main features like those described by Farran and Wolfenden; the comparative length of the main divisions is 47, 41 and 43; the first basipodite has in the middle no brush-shaped seta, but a fairly long pointed seta; the second basipodite is distinctly twice as long as wide. The two last setae of the segments of the endopodite are curiously developed, as shown in fig. 3 f (Pl. VII); the last segment has in addition to these two setae two simple setae and a plumous one (not drawn by Wolfenden).

The *first pair* of legs is like Sars' figure of *X. borealis*, but the Se of Re I and II are short, as seen in Farran's fig. 9; both surfaces are smooth. The *second pair* of legs has a short blunt Se in the first inner segment (fig. 18c); the second inner segments possess on the posterior surface two groups of 12 strong spines; the posterior surface of the exopodite is completely smooth; the terminal seta is short and broad (Pl. VII fig. 3 g), and its teeth are only free in their terminal portion; well developed glandular pores are found in Re I, II and III at the base of Se 3. The *third pair* of legs is like that of the preceding pair, but the second inner segment has 9, and the third inner segment has 7 spines. The *fourth pair* of legs has on the posterior surface of the second inner segment 19 comparatively short and slender spines; on the posterior surface of the third inner segment a number of short bristles is found.

The *fifth pair* of legs of the examined specimen, which is probably a young male, is distinctly different from Farran's description of a young male, and is asymmetrical; the left smaller leg consists as seen in fig. 18 d, of three segments; the exopodite has two outer and a terminal spine; a rudimentary styliform endopodite is present. The right leg is somewhat longer than that of the left side, and the endopodite as well as the exopodite has two segments.

The lateral outline of the *labrum* etc. is, as seen in fig. 18 a (Pl. VIII), rather characteristic.

Occurrence. The Thor has in 1904 or 1905 in the Atlantic south of Iceland without locality taken a young male of this interesting species.

This species has previously been recorded from the west coast of Ireland "at depths of from 680 to 1150 fathoms", from the Bay of Biscay and by the Monaco Expedition.

Remarks. On full consideration I think that this species is identical with Farran's *X. Grenii* in spite of the larger size and the distinct tooth of the lateral corner. It is probably also identical with Wolfenden's *X. calaminus*, though differing in the features mentioned as well as in a few others.

77. *Xanthocalanus pinguis* Farran.

(Pl. VII figs 2 a-d, text-figs 77 a-b).

1897?	<i>Xanthocalanus hirtipes</i> n. sp.	Vanhöffen, p. 282, fig. 18.	1908.	<i>Xanthocalanus pinguis</i> Farr.	Farran, p. 48, pl. IV fig. 18.
1905.	—	<i>pinguis</i> n. sp. Farran, pp. 39-40, pl. VIII	1908.	—	— v. Bremen, pp. 60-61, fig. 68.
		—IX.	1908?	—	— Wolfenden, p. 35.
1906.	—	Farr. Pearson, p. 20.			

Description. f♀. Size of female from Thor St. 99 was 5.19 mm.; anterior division 4.15 mm.; urosome 1.04. Farran's specimens measured 4.5–5.1 mm.

The shape of the body is in the main like that of *X. borealis*. The first and fifth somites, but especially the fifth, are well marked in front (text-fig. 77 a); the lateral corners are produced into a small tooth.

The *abdomen*, which is one fourth as long as the anterior division, has a slightly produced genital somite, and a distinct receptaculum seminis; along the hinder margin of somites II–IV a striated seam is found; the comparative length of the first three abdominal somites and the furcal rami is 18, 12, 9 and 8.

The *antennulae* extend to the end of the fourth thoracic tergite, and consist of 23 segments; the number of "Æsthetasken" is like that of *C. chelifer*; a proximal seta was found in segments 12, 14, 16 and 18, but not in segments 15 and 17; the posterior seta of segment 24 is placed in the middle of the segment, and extends just to the end of segment 25. Segment 24 is 1.2 as long as 23, and 1.5 as long as 24, which is as long as segment 22.

The exopodite of the *antennae* is distinctly longer than the endopodite. The *mandibulae* are scarcely different from those of *X. borealis*, while the *maxillulae*, especially the distal portions, are more long and slender than in *X. Greeni* as well as *borealis*; the number, but not the shape, of setae in the *maxillulae* is as in *X. Greeni*, but the endopodite has only 9 setae. The *maxillae* are like Sars' and Farran's figures; the lobe V has in addition to 3 setae, of which the two are short and delicate, a serrated and distinctly curved spine, which is longer and stronger than that of the fourth lobe; the endopodite has 7 brush-shaped sensory setae in addition to a vermiform one. The *maxillipeds* are somewhat less slender than in *X. borealis*; the sensory seta of the second basipodite is fairly long and brush-shaped; the comparative length between the main divisions is 65, 73 and 48.

The *first* pair of legs is like that of *X. borealis*, but the Se of Re I extends almost to the end of Re II. The *second* pair of legs differs from that of *X. borealis* by finer serration of St; the glandular pores are like those of the preceding species. The Si of the second basipodite shows an abnormal structure probably due to traumatism, as it is suddenly narrower and then gradually enlarged, where it is divided into three again subdivided branches. The *third* and *fourth* pair of legs, the distal segments of which were wanting, are scarcely different from those of *X. borealis*. The *fifth* pair of legs (Pl. VII fig. 2 a) is in main features like Farran's earlier description, and is scarcely different from the figure which Farran has given of a larger specimen (his Pl. IV fig. 18); the anterior surface is smooth, but the posterior surface has, as shown in figure, groups of short spines.

The lateral outline of the epistoma and labrum is like that of *X. Greeni*, as seen in figure, and they are not distinctly defined from each other. The epistoma has in front a group of long slender bristles; somewhat in front of the transverse row of bristles along the posterior margin a regular transverse series of fairly long setae is found, and just in front of this a group of irregularly placed bristles is found; laterally two or three groups of short hairs are found.

On the oral surface of the *labrum* (Pl. VII fig. 2 b), in front and laterally, two oblique almost parallel wide rows of bristles were observed; in the middle, on each side, 4 more or less fused wide



Text-fig. 77. *Xanthocalanus pinguis* Farr. a. f♀. Genital somite $\times 18$. b. y♂ (St. V). Abdomen $\times 18$.

areas of numerous short hairs or granules were observed. The chitinous framework is on each side in front of the third median circular spot produced into a beak-like structure; somewhat behind, a transverse chitinous bar was found in the middle. Behind the fourth median circular spot a number of short granules was found.

In front of the indistinct *lamina labialis* a large group of short hairs is observed, consisting of an inner and outer part; the hairs decrease in size outwards. Between the *serrula 6-serrata* a group of granules is observed, and behind, outer and inner groups of longer and shorter hairs, as seen in figure 2 c (Pl. VII). Along the labial lobes inwards, marginal rows of long slender setae are found anteriorly and short spines posteriorly; behind the lobes in the middle, areas of minute granules are found, and the lobes possess laterally groups of irregularly placed fairly long and slender bristles, limited inwards by an oblique row of somewhat shorter hairs.

Y_{σ}^{δ} (St. V). Size of young male was 4.43 mm.; anterior division 3.51 mm.; urosome 0.92. Another young male as well as a female measured 3.7 mm.

The shape of the body differs from that of the adult by the comparatively better marked fifth thoracic somite (text-fig. 77 b), and by the abdomen, which has four somites, the comparative length of which is 5, 13, 9, 6 and 5; the furcal rami are a little longer than wide. The *fifth* pair of legs in the female is scarcely different from that of the adult; in the male (Pl. VII fig. 2 d) it is distinctly different; on the right side it differs by the two-segmented exopodite, the first segment of which has a distinct Se, and the terminal segment of which has 2 terminal spines; the left leg shows a similar segmentation, but is less hirsute and shows trace of segmentation in Re II.

Occurrence. The Thor has gathered this species once in the Iceland-Færoe channel and once in the Atlantic south of Iceland.

$^{22/5}$ 04 St. 99 61°05 L. N. 9°35 L. W. Yt. 1700 M. Wire 2 f♀, 2 y♀ (V), 3 y♂ (V).

$^{12/5}$ 04 St. 78 61°08 L. N. 28° L. W. 1 y♂ (V).

Distribution. This species has been recorded from the west coast of Ireland "at a depth of 630 fathoms". If it is identical with *X. hirtipes* Vanh. and *borealis* G. O. Sars, it has a wide distribution viz. the west coast of Ireland, the Iceland-Færoe channel, the west coast of Norway, Kara Sea and the Arctic Ocean near the New Siberia Islands.

Remarks. That this species is identical with the species which Farran 1908 has mentioned as *X. pinguis?* seems not to be doubtful on account of its size 5.1 mm. and the almost identical shape of the fifth pair of legs. From the typical specimens of Farran's species (1905) it differs by the more pointed lateral corners of the fifth thoracic tergite, and by a somewhat different measurement of the antennulae [the segment 22 is as long as instead of 1.3 (in fig. 20 Pl. VIII the two segments are of almost equal length) as long as segment 25], but especially by the more distinct spinulation of the fifth pair of legs. When the variability of the fifth pair of legs is taken into consideration, I do not doubt that the two different forms belong to the same species.

It is nearly related to *X. profundus* Sars (1907 p. 14), which differs from it by larger size, 6.2 mm., and by the somewhat different shape of the fifth pair of legs.

From *X. hirtipes* and *borealis*, to which it is very nearly related, it seems to differ by greater size, by comparatively shorter antennulae, which do not reach to the end of the genital somite, and by 10 instead of 9 setae in the exopodite of the antennae.

78. *Xanthocalanus claviger* Th. Scott.

(Text-figs 78 a—d).

1909. *Amalophora claviger* n. sp. Th. Scott. pp. 124—125, pl. III figs 1—11, pl. IV figs 13—17.

Description. f♂. Size of male from Thor St. 183 was 4.55 mm.; anterior division 3.22; urosome 1.33 mm.

The shape of the body is like that of *X. borealis*; the head has no crest; the rostrum is broken but seems to be fairly long, and is directed somewhat backwards. The lateral corners of



Text-fig. 78. *Xanthocalanus claviger* Th. Scott. f♂.

a. Abdomen $\times 23$. b. Pes V sin. Re II—III in situ from the left side $\times 122$. c. Pes V sin. Re II—III in ant. view $\times 240$. d. Pes V dext. in exterior view $\times 122$.

the thorax are regularly rounded. The head and the fourth somites are almost completely fused with the following ones. The anterior division is 2.4 as long as the urosome; the comparative length of the abdominal somites are seen in the fig. 78 a. The serrated seam along the hinder margins is poorly developed.

The *antennulae* extend distinctly beyond the end of the thorax to the end of the second abdominal somite. Segments 8–9 are only in front indistinctly separated from segments 10–12, which are completely fused; these segments are fairly well separated from segment 13, which is well separated from segment 14; the following segments are well separated from each other. A complete "trithek" is found in segments 3–9; "Æsthetasken" are found in segments 10–19, but are wanting in segments 20–24. Small proximal setae are seen in segments 12, 14, 16 and 18.

The exopodite of the *antennae* is 1.5 as long as the endopodite, which has 6 setae in the outer and 8 in the inner lobe of the second segment. The manducatory part of the *mandibulae* is soft-skinned and very long and slender, with delicate but distinct teeth; the third basipodite is widened

out and possesses 2 long Si. The *maxillulae* are fairly well developed, and different from those of the male of *X. borealis*; the Le has 7 long powerful as well as 2 short bristles. The Li 1 is only a little longer than wide, and has at least 9 bristles, which are long, broad, somewhat lamellous and distinctly plumous; the Li 2 has 4 short setae, the Li 3 has 4 fairly long, partly plumous setae, and the third basipodite has 5 setae. The endopodite seems only to possess 10 setae, and so does the exopodite. The *maxillae* are rather soft-skinned; the Lob. I has 4 rather slender setae, the lob. 2-3 have 3 each; the fourth lobe has 2 slender plumous bristles and a long, broad, strongly plumous seta, and the fifth lobe has a single shorter one of similar structure in addition to 2 fairly strong plumous setae and a very delicate one. The endopodite has 2 vermiform setae, 5 rather slender brush-shaped ones, and a curious globular appendage scarcely twice as long as wide, with terminal almost circular opening and striated wall. The *maxillipeds* are scarcely different from those of *X. borealis*.

The *first* and *second* pairs of legs are scarcely different from those of *X. borealis*; the distal segments of the *third* and *fourth* legs are wanting, while the proximal ones are like those of mentioned species. The *fifth* pair of legs extends distinctly beyond the end of the abdomen; the *right* leg is comparatively short and somewhat convex outwards, but extends distinctly beyond the end of the first basal segment (text-fig. 77 a, d); it consists, as seen in figure, of 4 segments, of which the last one shows trace of further segmentation, and is terminated with a short tooth. The *left* leg consists of three elongated proximal segments, the comparative length of which is seen in figure; the first segment has inwards on the anterior surface a short keel (text-fig. 77 a-c). The fourth segment (Re II?) is much shorter than the preceding ones, and is somewhat enlarged towards the middle, where a process with two groups of about 10 bristles is found; beyond this process the segment is hollowed with a concavity facing inwards, and has about 6 setae along the outer margin, as well as a tuft of 5 more slender ones and one stronger seta terminally (text-fig. 78 b-c); apparently articulated to this segment a short "segment" with a tuft of hairs was found. The terminal segment (Re III?) has along the one margin in the middle 5 fairly strong spines, and terminally a hooked spine; at base of which four moderately slender setae are observed.

Occurrence. The Thor has collected a single male.

¹¹/₇ 1904 St. 183 61°30' L. N. 17°08' L. W. Yt. 1800 M. Wire 1 f ♂.

Distribution. A few males have once been taken ¹⁷/₈ 1908 59°36' L. N. 7° L. W. Depth 1140 Meters.

Remarks. As far as I am able to see the male of this species, which is especially characterized by the curious development of the left foot, is identical with Scott's *Amalophora claviger*. The somewhat laminous setae which are observed in the maxillulae and maxillae suggest some affinity to *X. Grenii*; its much smaller size excludes this species.

About 20 species of *Xanthocalanus* have been described; to refer the described male to most of these may be excluded, especially on account of its much greater size (4.5 mm. against 2-3 mm. for the female). Only *X. pinguis* Farr. (4.5-5.1 mm.), *X. muticus* G. O. Sars (5.3 mm.) and *X. profundus* G. O. Sars (6.2 mm.) could possibly be the females of this species. From *X. pinguis* it seems to be distinguished by rounded lateral corners and longer antennulae. From *X. profundus* it seems to differ in quite similar features, and from *X. muticus* it seems to differ by longer rostrum, by lateral corners

rounded not "obtusément triangulaire", by longer urosome, by shorter antennulae not "aussi longues que le corps". I think it is quite impossible at present to tell whether the described male ought to be regarded as identical with any of these three species, or whether it is the male of a not yet described female.

79. *Xanthocalanus hirtipes* Vanhöffen.

1897.	<i>Xanthocalanus hirtipes</i> n. sp.	Vanhöffen, p. 282, fig. 18.	1905.	<i>Xanthocalanus borealis</i>	G. O. Sars. Farran, pp. 38—39, pl. VIII figs 14—17.
1900.	—	<i>borealis</i> n. sp. G. O. Sars, pp. 49—51, pl. XI.	1906.	—	— Pearson, p. 20.
1902.	—	G. O. Sars. Th. Scott, pp. 452 —453, pl. XXII figs 8—9.	1907.	—	Vanh. Vanhöffen, pp. 514— 517, Taf. 21, fig. 16—22.
1902.	—	<i>hirtipes</i> Vanh. Mrázek, p. 523.	1908.	—	G. O. Sars. v. Bremen, pp. 58— 59, fig. 66.
1903.	—	<i>borealis</i> G. O. Sars. G. O. Sars, p. 46, pl. XXXI—XXXII.	—	pars.	<i>subagilis</i> Wolf. v. Bremen, pp. 62—63, fig. 71.
1904. ? ♀ nec ♂	—	<i>subagilis</i> n. sp. Wolfenden, p. 118, pl. IX figs 17—32.	1908?	—	<i>borealis</i> G. O. Sars. Wolfenden, p. 33.
1905.	—	<i>borealis</i> G. O. Sars. G. O. Sars, p. 5.	1913.	—	<i>hirtipes</i> Vanh. Stephensen, p. 318.

Of this species I have only examined a single, very mutilated, adult female found in the contents of the stomach of a *Liparis barbata* from Kara Sea. I have included it in this paper partly because it certainly belongs to the fauna of this region, and partly because a full synonymy and a discussion of its position seem to be useful.

The lateral corners of the thorax are distinctly pointed, as in Sars' figure Pl. XXXI. The exopodite of the maxillulae has only 9 setae, as stated by Sars.

The *fifth* pair of legs is most similar to that described by Vanhöffen (Taf. 21 fig. 22), with three terminal spines only, but the last segment is fairly well distinguished, and the hairs, especially those of the posterior surface of the third segment as well as those of the inner surface of the first segment, are distinctly longer. The *labrum* etc. are in all main features like that of the preceding species.

To decide whether *X. hirtipes* and *borealis* really belong to the same species is somewhat difficult without specimens of both forms at disposal. The character found in the size is not of much value, when remembering that Farran's specimens varied from 2.5 to 3.5, that Sars' measured 3.5, and Vanhöffen's 4 mm.; the characters found in the structure of the fifth pair of legs are not sufficient, when taking into consideration the great variations which, according to Farran, exist in the structure of this pair of legs. Vanhöffen thought that characters could be found in the spinulation of the posterior surface of the endopodites of the natatory legs; the differences pointed out by him are certainly due to individual variability. To define the limitations of the species within this group is probably a task just as difficult as that which has previously been discussed with *Calanus* and *Pseudocalanus*.

80. *Phaëna spinifera* Claus.

(Pl. VII figs 1 a—c; text-fig. 79).

1863.	<i>Phaëna spinifera</i> n. sp.	Claus. p. 189, Taf. XXXI figs 1—7.	1903.	<i>Phaëna spinifera</i>	Claus. Thompson & Scott, p. 246.
1892.	—	— Claus. Giesbrecht, p. 293, Taf. 5, 12, 37.	1903.	—	— Cleve, p. 367.
1893.	—	— Th. Scott, p. 81, pl. VI—VII.	1904.	—	— Wolfenden, p. 111.
1898.	—	— Giesbrecht & Schmeil, p. 50.	1904.	—	— Cleve, p. 194.
1903.	—	— J. C. Thompson, p. 23.	1905.	—	— Wolfenden, p. 1009.

1905.	Phaëna spinifera	Claus.	G. O. Sars,	p. 5.	1909.	Phaëna spinifera	Claus.	Pesta,	p. 22.
1905.	—	—	Farran,	p. 47.	1909.	—	—	A. Scott,	p. 80.
1906.	—	—	Pearson,	p. 21.	1911.	—	—	Wolfenden,	pp. 285—286.
1908.	—	—	Farran,	p. 47.	1912.	—	—	Pesta,	p. 24.
1998.	—	—	v. Bremen,	p. 56 fig. 63.					

Description. f♀. Size of specimen from Thor St. 82 was 2.9 mm.; anterior division 2.42; urosome 0.48 mm. Giesbrecht's specimens measured 1.8—2.1 mm.

In some of the examined specimens the head possesses dorsally, as seen in text-fig. 79, a conical protuberance.

The interior lobes of the *maxillae* are placed very near to each other, the Lob. 1 has 5 setae, the Lob. 2 has 3, and the Lob. 3, which is very short, has probably 3 setae as well; the fourth lobe has at least 2 setae, of which the one is comparatively strong, and distinctly curved, and the fifth lobe has in addition to fairly strong claw-shaped setae two short slender ones; the endopodite has seven comparatively short and thick brush-shaped setae, distally apparently fused, in addition to a long and slender pointed one.

The legs are scarcely different from Giesbrecht's description. The outer margin of the third outer segment of the *first foot* has proximally to the middle a small incision and a glandular pore. On the anterior surface of the third inner segment of the second and third pairs of legs a minute glandular pore was found, but in the fourth pair none was seen. At the base of the outer spine in the Re II, and at the base of Se I and III Re III, glandular pores were found in the second pair of legs, and in the third and fourth pairs at the base of Se Re I as well. The Ri II ~ III, which are fused in the second pair of legs, possess on the posterior surface two coronas of 8 and 6 long spines respectively, the Ri II and III of the third pair of legs have 8 and 6 spines respectively, and the Ri II of the fourth pair of legs has 6 long rather weak spines.

The very short *labrum* and the elevation in front of it are only indistinctly separated, and the latter is placed just behind the insertion of the antennulae; the epistoma is covered by a number of longer and shorter setae; on the labrum proper a transverse group of fairly short setae is found; the marginal setae are only poorly developed (Pl. VII fig. 1 a). The oral surface (fig. 1 b) has in front 4 longer and shorter oblique groups of shorter hairs converging towards the middle, and more posteriorly, probably composed of the three hinder, a longitudinally placed elongated group of short hairs is found. In the middle at least three groups of very short hairs or granules are found. The lamina labialis is only poorly developed (Pl. VII fig. 1 c); in front of it a regular granular area is found; the area behind the lamina and on the labial lobes was not studied in details (cf. fig. 1 c).

f♂. Size of specimen from St. 82 was 2.26 mm.; anterior division 1.89 mm.; urosome 0.37 mm. Giesbrecht's specimen measured 1.8 mm.

The anterior division did not possess a lamelliform projection, as figured and described by Giesbrecht. No dorsal protuberance was found.

Y♀ (St. V). Size of specimen from Thor St. 82 was 2.3 mm.

The only difference was found in the different structure of the abdomen.



Text-fig. 79.
Phaëna spinifera Claus.
f♀. Lateral outline of body
× 18.

Occurrence. The S/S Thor has gathered a few specimens of this interesting form, viz.:

¹⁴/₆ 1905 St. 82 51°00 L. N. 11°43 L. W. Yt. 800 M. Wire 8 f♀, 1 f♂, 2 y♀ (V).

Yt. 1200 M. Wire 1 f♀.

²⁰/₆ 1905 St. 88 48°09 L. N. 8°30 L. W. Yt. 300 M. Wire 3 f♀.

This species has been recorded from the west coast of Ireland, from the mid and south Atlantic, from the Mediterranean, the Red Sea, the Indian Ocean, the Malay Archipelago and the Pacific Ocean.

Remarks. In spite of the greater size I regard this species as identical with that described by Giesbrecht.

I am much indebted to Mr. Norman H. Beale, who has kindly undertaken the revision of the language of this paper, as well as to Messrs. Hendriksen, who have taken great trouble in the reproduction of the text-figures.

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An asterisc indicates that the book in question was not at my disposal.

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EXPLANATION OF THE PLATES.

Plate I.

Fig. 1. *Calanus hyperboreus* Kröyer.

- Fig. 1 a. f♀. Marginal setae of the labrum; × 77.
— 1 b. f♀. Oral surface of the labrum; × 200.
— 1 c. f♀. Lamina labialis etc. l = lamina labialis, s = serrula 6-dentata; × 200.
— 1 d. f♀. Lobi labiales and area behind. a—c = articular cavities of the maxillulae, maxillae and maxillipeds; × 44.

Fig. 2. *Macrocalanus princeps* Brady.

- Fig. 2 a. f♀. Oral surface of the labrum; × 57.
— 2 b. f♀. Lamina labialis and anterior surface of the lobus labialis; × 57.

Fig. 3. *Megacalanus princeps* Wolfenden.

- Fig. 3 a. f♀. Labrum, lobi labiales and area behind from below; × 24.
— 3 b. f♀. Oral surface of the labrum; × 77.
— 3 c. f♀. The lamina labialis, the lobi labiales and the right mandibula in ventral and partly anterior view. s = serrula 6-dentata; l = lamina labialis; × 57.
— 3 d. f♀. The left maxilla; × 24.
— 3 e. f♀. The left second foot in anterior view. gl = glandular pores; × 24.
— 3 f. f♀. Se Re I pes II sin. in anterior view; l = lamina cribrosa; gl = glandular pore; × 44.
— 3 g. f♀. The lamina cribrosa; × 280.
— 3 h. f♀. The left fifth foot in anterior view; × 24.
— 3 i. f♂. The segment 6 (VI) to segment 11 (XI) of left antennula; × 24.

Fig. 4. *Rhincalanus nasutus* Giesbrecht.

- Fig. 4 a. Y♀ (V). The anterior part of the body in left view; × 24.
— 4 b. f♀. The right side of the abdomen in abnormal specimen; × 44.
— 4 c. f♀. The lamina labialis etc.; × 200.
— 4 d. f♀. The fifth foot in abnormal specimen from Thor 1905 St. 88; × 90.
— 4 e. f♂. The oral surface of the labrum; × 280.
— 4 f. f♂. The left antenna in posterior view; × 38.
— 4 g. f♂. The fifth foot in posterior view of specimen from Thor 1905 St. 88; × 90.
— 4 h. f♂. The fifth foot in posterior view of specimen (Nr. 2) from Thor 1905 St. 88; × 90.
— 4 i. f♂. The fifth foot in posterior view of specimen (Nr. 3); × 90.
— 4 j. f♂. The fifth foot of an abnormal specimen from Thor St. 88; × 90.
— 4 k. Y♂ (V). The fifth foot in posterior view; × 90.
— 4 l. Y♂ (IV). The fifth pair of legs in posterior view of specimen from Thor 1905 St. 72; × 90.

Fig. 5. *Eucalanus elongatus* Dana.

- Fig. 5 a. f♀. The oral surface of the labrum; $\times 200$.
 — 5 b. f♀. The lamina labialis etc.; $\times 200$.
 — 5 c. f♂. The fifth pair of legs in anterior view; $\times 65$.
 — 5 d. Y♂ (V). The fifth pair of legs of an abnormal male; $\times 65$.
 — 5 e. Y♂ (V). The fifth foot in ant. view; $\times 65$.
 — 5 f. Y♂ (V). The fifth foot in ant. view; $\times 65$.

Fig. 6. *Eucalanus attenuatus* Dana.

- Fig. 6 a. Y♀ (V). The oral surface of the labrum; $\times 200$.
 — 6 b. Y♀ (V). Lamina labialis; $\times 200$.
 — 6 c. Y♂ (V). The fifth foot in post. view; $\times 77$.

Fig. 7. *Eucalanus crassus* Giesbrecht.

- Fig. 7 a. f♀. The coecal sac; $\times 44$.

Fig. 8. *Pseudocalanus minutus* Kröyer.

- Fig. 8 a. f♀. The oral surface of the labrum; $\times 280$.

Fig. 9. *Clausocalanus arcuiformis* Dana.

- Fig. 9 a. f♀. The head etc. from the left; $\times 77$.
 — 9 b. f♀. The genital somite from the left; $\times 77$.
 — 9 c. f♀. The oral surface of the labrum; $\times 260$.
 — 9 d. f♀. The lamina labialis etc.; $\times 260$.

Fig. 10. *Spinocalanus abyssalis* Giesbrecht.

- Fig. 10 a. f♀. The oral surface of the labrum; $\times 260$.
 — 10 b. f♀. The lamina labialis etc.; $\times 260$.

Plate II.

Fig. 1. *Aetidius armatus* Boeck.

- Fig. 1 a. f♀. First abdominal somite from the left; $\times 152$.
 — 1 b. f♀. First abdominal somite from below; $\times 152$.
 — 1 c. f♀. Basipodite of pes IV sin. in posterior view; $\times 152$.
 — 1 d. f♀. Lamina labialis etc.; $\times 280$.

Fig. 2. *Chiridius obtusifrons* G. O. Sars.

- Fig. 2 a. f♀. The labial structures; $\times 280$.
 — 2 b. Y♂ (V). Pes V; $\times 77$.

Fig. 3. *Chiridius armatus* Boeck.

- Fig. 3 a. f♀. Pes II sin. anterior view; $\times 77$.
 — 3 b. f♀. Labrum—oral view. g^2-g^4 the second and fourth groups of the lateral longitudinal series. S^4 the fourth central circular spot; $\times 200$.
 — 3 c. f♀. Lamina labialis and serrulae 6-dentatae; $\times 280$.
 — 3 d. f♀. Area labialis et postlabialis; $\times 147$.
 — 3 e. f♂. Pes V sin; the endopodite; $\times 280$.

- Fig. 3 f. f♂. Pes V sin; the last segment of the exopodite; $\times 280$.
 — 3 g. f♂. Pes V dext; the exopodite; $\times 47$.
 — 3 h. Y♂ (V). Pes V; $\times 77$.
 — 3 i. Y♂ (IV). Pes V; $\times 117$.
 — 3 j. f♀. Pes V in anterior view from abnormal specimen (Thor $\frac{6}{9}$ 05 St. 172); $\times 77$.
 — 3 k. f♀. Pes V in anterior view from abnormal specimen (Thor $\frac{7}{9}$ 05 St. 173); $\times 77$.
 — 3 l. f♀. Pes V in anterior view from abnormal specimen (Thor $\frac{22}{5}$ 04 St. 72); $\times 77$.

Fig. 4. *Chiridius nasutus* n. sp.

Fig. 4 a. f♀. Pes II sin; $\times 77$.

Fig. 5. *Chiridius modestus* n. sp.

Fig. 5 a. f♀. Pes II sin; $\times 77$.

Fig. 6. *Aetidiopsis rostrata* G. O. Sars.

- Fig. 6 a. f♀. Anterior portion of oral surface of labrum; $\times 280$.
 — 6 b. f♀. Lamina labialis etc. partly in anterior view; $\times 280$.

Fig. 7. *Gaidius brevispinus* G. O. Sars.

- Fig. 7 a. f♀. Rostrum, observed from below; $\times 200$.
 — 7 b. f♀. Abdomen with spermatophore in lateral view; $\times 44$.
 — 7 c. f♀. Genital area; $\times 117$.
 — 7 d. f♀. Exterior margin of maxilla sin. in post. view; $\times 77$.
 — 7 e. f♀. Inner margin of basp. of left pes IV in posterior view; $\times 117$.
 — 7 f. f♀. Labrum et labium; $\times 200$. g^2 and g^4 the second and fourth group of the lateral longitudinal series; S^1 — S^7 the seven lateral series of hairs upon, between and behind the labial lobes.
 — 7 g. f♂. Inner margin of basp. of left pes IV in post. view; $\times 117$.
 — 7 h. y♂. Pes V ant. view; $\times 77$.

Fig. 8. *Gaidius tenuispinus* G. O. Sars.

Fig. 8 a. y♂. Pes V ant. view; $\times 77$.

Plate III.

Fig. 1. *Gaidius brevispinus* G. O. Sars.

- Fig. 1 a. f♀. Maxillipes sin. in post. view; $\times 77$.
 — 1 b. f♀. Maxillipes sin.; basipodite III; $\times 77$.
 — 1 c. f♀. Pes IV sin. The basipodite in posterior view; $\times 152$.
 — 1 d. f♂. Manducatory portion of the mandibula; $\times 152$.
 — 1 e. f♂. The left maxillula in posterior view; $\times 117$.
 — 1 f. f♂. Maxillipes sin. in posterior view; $\times 77$.
 — 1 g. f♂. Pes I sin. in nearly anterior view; $\times 117$.
 — 1 h. f♂. Pes V in posterior view; $\times 77$.
 — 1 i. f♂. The terminal segment of the left pes V; $\times 200$.
 — 1 j. f♂. The terminal segment of the right pes V; $\times 200$.

Fig. 2. *Gaidius tenuispinus* G. O. Sars.

- Fig. 2 a. f♀. The rostrum in dorsal view; $\times 200$.
 — 2 b. f♀. The basal segments of the left antenna; $\times 77$.

- Fig. 2 c. f♀. Maxillipes sin. Lobus IV of basipod. II in anterior view; $\times 152$.
 — 2 d. f♀. Pes I. The terminal seta of the last segment of the exopodite; $\times 117$.
 — 2 e. f♀. The oral surface of the labrum; $\times 280$.
 — 2 f. f♂. Rostral spine; $\times 77$.
 — 2 g. f♂. Rostrum seen from below; $\times 200$.
 — 2 h. f♂. Maxilla; $\times 280$.
 — 2 i. f♂. Pes I. The terminal seta of the last segment of the exopodite; $\times 117$.
 — 2 j. f♂. Re II of left pes V in exterior view sitting on the animal; $\times 200$.
 — 2 k. f♂. Tip of Re III of left pes V; $\times 280$.
 — 2 l. f♂. Ri of right pes V in situation, seen from the left side; $\times 200$.
 — 2 m. f♂. Re I \approx II of left pes V; $\times 77$.
 — 2 n. f♂. Pes V dext. The third segment of exopodite from inner side; $\times 280$.

Fig. 3. *Gaetanus major* Wolfenden.

- Fig. 3 a. f♀. Setae of inner margin of basipodite II of pes IV in posterior view; $\times 117$.
 — 3 b. f♀. Portion of the labrum (oral view); $\times 280$.
 — 3 c. f♀. Lamina labialis etc. observed partly from in front; $\times 200$.
 — 3 d. f♂. Pes V in posterior view; $\times 37$.
 — 3 e. f♂. Pes V dext.; the endopodite in anterior view; $\times 200$.
 — 3 f. f♂. Portion of pes V in anterior view; $\times 200$.
 — 3 g. Pes IV sin. of stage IV in anterior view; $\times 77$.
 — 3 h. Pes IV sin. of stage III in anterior view; $\times 77$.

Fig. 4. *Gaetanus minor* Farran.

- Fig. 4 a. f♀. The abdomen seen from the left side; $\times 44$.

Fig. 5. *Gaetanus latifrons* G. O. Sars.

- Fig. 5 a. f♀. Rostrum and frontal spine; $\times 24$.
 — 5 b. f♀. Abdomen with spermatophore seen from the left side; $\times 24$.
 — 5 c. f♀. Setae on inner margin of basp. II of pes IV sin. in posterior view; $\times 117$.
 — 5 d. f♀. Oral surface of the labrum; $\times 280$.
 — 5 e. f♀. Lamina labialis etc.; $\times 280$.
 — 5 f. Y♀ (V). Setae on inner margin of basp. II pes IV sin. in posterior view; $\times 117$.
 — 5 g. Y♂ (V). Same of Y♂ (pes IV dext.); $\times 117$.

Fig. 6. *Gaetanus pileatus* Farran.

- Fig. 6 a. Labrum in oral view; $\times 280$.

Fig. 7. *Gaetanus miles* Giesbrecht.

- Fig. 7 a. The left maxillipes in anterior view; $\times 77$.
 — 7 b. Setae on inner margin of basp. II of left pes IV in posterior view; $\times 117$.

Plate IV.

Fig. 1. *Euchirella rostrata* Claus.

- Fig. 1 a. f♀. Teeth along inner margin of basp. II pes IV dext. in posterior view; $\times 200$.
 — 1 b. f♀. Labrum in oral view; $\times 200$.

- Fig. 1 c. f♀. Lamina labialis etc.; $\times 200$.
 — 1 d. f♀. Lobus labialis sin.; $\times 117$.
 — 1 e. f♂. Labrum, labium and manducatory portions of the mandibulae seen from beneath; $\times 117$.
 — 1 f. f♂. The left pes I in ant. view; $\times 77$.
 — 1 g. f♂. Pes V in ant. view; $\times 44$.
 — 1 h. f♂. The distal segments of the left maxillula; $\times 117$.

Fig. 2. *Euchirella messinensis* Claus.

- Fig. 2 a. f♀. The labrum in oral view; $\times 200$.
 — 2 b. f♀. Lamina labialis; $\times 117$.
 — 2 c. f♀. Area labialis and lobi labiales; $\times 77$.

Fig. 3. *Euchirella curticauda* Giesbrecht.

- Fig. 3 a. f♀. Head; $\times 24$.
 — 3 b. f♀. Last thoracic and first abdominal somites; $\times 24$.
 — 3 c. f♀. Labrum in oral view; $\times 200$.
 — 3 d. f♀. Lamina labialis etc.; $\times 200$.
 — 3 e. f♀. Lobus labialis sin.; $\times 77$.
 — 3 f. f♂. The frontal portion of the head; $\times 44$.
 — 3 g. f♂. Abdomen in left view; $\times 24$.
 — 3 h. f♂. Left maxilla in post. view; $\times 117$.
 — 3 i. f♂. Pes V in post. view; $\times 24$.
 — 3 j. f♂. Pes V dextr. Re III; $\times 117$.
 — 3 l. f♂. The last segment of the exopodite of the left pes V; $\times 200$.
 — 3 m. f♂. (signature not found on the plate, where the figure is placed to the right of 6 b). The last segments of the exopodite of the left pes V; $\times 117$.

Fig. 4. *Euchirella intermedia* n. sp.

- Fig. 4 a. f♀. Abdomen in lateral view; $\times 22$.
 — 4 b. f♀. Labrum in oral view; $\times 117$.
 — 4 c. f♀. Lobus labialis sin.; $\times 77$.

Fig. 5. *Euchirella maxima* Wolf.

- Fig. 5 a. f♀. The frontal part of the head in lateral view; $\times 24$.
 — 5 b. f♀. Abdomen in lateral view; $\times 24$.
 — 5 c. f♀. The right lateral corner of the last thoracic somite; $\times 24$.
 — 5 d. f♀. The genital somite of the abdomen seen from below; $\times 24$.
 — 5 e. f♀. Labrum in oral view; $\times 77$.
 — 5 f. f♀. Lamina labialis; $\times 77$.
 — 5 g. f♀. The left lobus labialis; $\times 77$.
 — 5 h. Y♂. The left lateral corner of the last thoracic somite; $\times 24$.

Fig. 6. *Undeuchæte superba* n. sp.

- Fig. 6 a. f♂. Pes V; $\times 77$.
 — 6 b. f♂. Pes V dextr.; $\times 44$.

Plate V.

Fig. 1. *Undeuchæte superba* n. sp.

- Fig. 1 a. The abdomen in right view; $\times 135$.
 — 1 b. The left lateral corner of last thoracic somite; $\times 44$.
 — 1 c. Area labialis in ventral view; $\times 77$.

Fig. 2. *Undeuchæte major* Giesbrecht.

- Fig. 2 a. The labrum in oral view; $\times 200$.
 — 2 b. The lamina labialis; $\times 200$.
 — 2 c. f♂. The endopodite of the right pes V in anterior and interior view; $\times 77$.
 — 2 d. f♂. The Re III of left pes V; $\times 77$.

Fig. 3. *Undeuchæte minor* Giesbrecht.

- Fig. 3 a. f♀. The genital area from beneath; $\times 77$.
 — 3 b. f♂. The pes V in anterior view; $\times 33$.
 — 3 c. f♂. The endopodite and the exopodite of the right pes V in anterior and interior view; $\times 77$.
 — 3 d. f♂. The exopodite of the right pes V; $\times 24$.
 — 3 e. f♂. The endopodite of the right pes V; $\times 24$.
 — 3 f. f♂. The Re II—III of the left pes V; $\times 117$.
 — 3 g. f♂. The Re II of the left pes V; $\times 117$.

Fig. 4. *Chirudina streetsi* Giesbrecht.

- Fig. 4 a. f♀. The genital area from beneath; $\times 77$.
 — 4 b. f♀. The labrum in oral view; $\times 200$.
 — 4 c. f♀. The lamina labialis etc.; $\times 200$.
 — 4 d. f♀. The area labialis; $\times 77$.
 — 4 e. t♂. The pes V in posterior view; $\times 32$.
 — 4 f. f♂. The 2 last segments of the left pes V in anterior and interior view; $\times 98$.

Fig. 5. *Chirudina abyssalis* n. sp.

- Fig. 5 a. f♀. The abdomen seen from the left; $\times 24$.
 — 5 b. f♀. The left mandibula in ant. view; $\times 44$.
 — 5 c. f♀. The left maxilla in post. view; $\times 44$.
 — 5 d. f♀. The marginal teeth of the second basipodite of left pes IV in posterior view; $\times 117$.
 — 5 e. f♀. The lamina labialis etc.; $\times 77$.
 — 5 f. f♀. The area labialis; $\times 77$.

Fig. 6. *Chirudina pustulifera* G. O. Sars.

- Fig. 6 a. f♀. The abdomen in dorsal view; $\times 24$.
 — 6 b. f♀. The first abdominal somite in lateral view; $\times 24$.
 — 6 c. f♀. The genital area seen from beneath; $\times 77$.
 — 6 d. f♀. The labrum in oral view (anterior portion); $\times 200$.

Fig. 7. *Chirudina notacantha* G. O. Sars.

- Fig. 7 a. f♂. The 2 last segments of the exopodite of the left pes V; $\times 77$.
 — 7 b. f♂. The last segment of the exopodite of the left pes V from another specimen in a somewhat different position; $\times 77$.

Fig. 8. *Chirudina parvispina* Farran.Fig. 8 a. f♂. The 2 last segments of the exopodite of the left pes V; $\times 77$.Fig. 9. *Euchirella bitumida* n. sp.Fig. 9 a. f♀. The abdomen etc. in dorsal view; $\times 24$.— 9 b. f♀. The abdomen seen from the left side; $\times 24$.— 9 c. f♀. The genital somite seen from beneath; $\times 24$.— 9 d. f♀. The right maxilla in post. view; $\times 117$.— 9 e. f♀. The labrum in oral view (anterior portion); $\times 200$.— 9 f. f♀. The lamina labialis; $\times 117$.

— 9 g. f♀. The area labialis; 77.

Plate VI.

Fig. 1. *Chirudina notacantha* G. O. Sars.Fig. 1 a. f♀. Labrum; $\times 147$.— 1 b. f♀. Labium; $\times 147$.Fig. 2. *Valdiviella insignis* Farran.Fig. 2 a. f♀. Pes I sin.; outer margin of second and third outer segment in anterior view; $\times 77$.— 2 b. f♀. Anterior surface of the labrum; $\times 77$.— 2 c. f♀. Oral surface of the labrum; $\times 77$.— 2 d. f♀. Lamina labialis and serrula 6-dentata; $\times 77$.— 2 e. f♀. Labial lobes etc.; $\times 77$.Fig. 3. *Euchæte norvegica* Boeck.Fig. 3 a. f♀. Oral surface of the labrum; $\times 147$.— 3 b. f♀. Lamina labialis; $\times 147$.— 3 c. f♀. Labial lobe; $\times 147$.— 3 d. f♂. Pes V sin.; second and third outer segment; $\times 77$.— 3 e. f♂. The oral surrounding in ventral view; $\times 147$.— 3 f. Y (Stage II). Maxilla sin.; $\times 77$.Fig. 4. *Euchæte tonsa* Giesbrecht.Fig. 4 a. f♀. Labrum in oral view; $\times 147$.— 4 b. f♂. Pes V sin.; second and third outer segment; $\times 77$.Fig. 5. *Euchæte glacialis* H. J. Hansen.Fig. 5 a. f♀. Lamina labialis and serrula 6-dentata; $\times 147$.— 5 b. f♀. Labial lobe in ventral view; $\times 77$.— 5 c. f♂. Maxillula sin.; $\times 77$.— 5 d. f♂. Pes V sin.; second and third outer segment; $\times 77$.Fig. 6. *Euchæte Farrani* n. sp.Fig. 6 a. f♀. Oral surface of the labrum; $\times 147$.Fig. 7. *Euchæte Sarsi* Farran.Fig. 7 a. f♀. Labrum in anterior surface; $\times 57$.— 7 b. f♂. Pes V sin.; second and third outer segment; $\times 77$.

Fig. 8. *Euchæte barbata* Brady.Fig. 8 a. f♀. Labrum in oral view; $\times 77$.— 8 b. f♂. Pes V sin.; second and third outer segment; $\times 77$.Fig. 9. *Euchæte Bradyi* n. sp.Fig. 9 a. ♀. Labrum in oral view; $\times 77$.Fig. 10. *Euchæte Scotti* Farran.Fig. 10 a. f♀. Labrum in oral view; $\times 77$.— 10 b. f♀. Lamina labialis and serrula 6-dentata; $\times 77$.— 10 c. f♂. Pes V sin.; second and third outer segment; $\times 77$.Fig. 11. *Euchæte bisinuata* Farran.Fig. 11 a. f♀. Labrum in oral view; $\times 147$.

— 11 b. f♀. Lamina labialis etc.; 147.

— 11 c. f♂. Maxillipeds; hook-shaped seta of the second basipodite (lobe IV); $\times 200$.— 11 d—e. f♂. Pes V sin.; third and second outer segment; $\times 117$.Fig. 12. *Euchæte acuta* Giesbrecht.Fig. 12 a. f♀. Abdomen in lateral view; $\times 44$.— 12 b. f♀. Labrum in oral view; $\times 200$.— 12 c. f♀. Lamina labialis and serrula 6-dentata; $\times 200$.Fig. 13. *Euchæte hebes* Giesbrecht.Fig. 13 a. f♀. Abdomen in lateral view; $\times 44$.— 13 b. f♀. Lamina labialis and serrula 6-dentata; $\times 200$.Fig. 14. *Scottocalanus Thorii* n. sp. (in the plate marked *persecans* Gbt.)Fig. 14 a. f♀. Labrum in anterior view; $\times 77$.— 14 b. f♀. Labrum in oral view; $\times 117$.— 14 c. f♀. Lamina labialis and serrula 6-dentata; $\times 117$.

Plate VII.

Fig. 1. *Phaëna spinifera* Claus.Fig. 1 a. f♀. Rostrum and labrum in anterior view; $\times 77$.— 1 b. f♀. Labrum in oral view; $\times 220$.— 1 c. f♀. Lamina labialis and serrula 6-dentata; $\times 280$.Fig. 2. *Xanthocalanus pinguis* Farran.Fig. 2 a. f♀. Pes V sin. in posterior view; $\times 77$.— 2 b. f♀. Labrum in oral view; $\times 200$.— 2 c. f♀. Lamina labialis and serrula 6-dentata; $\times 200$.— 2 d. Y♂ (Stags V). Pes V in posterior view; $\times 77$.Fig. 3. *Xanthocalanus Greeni* Farran.Fig. 3 a. Y♂ (V). First inner lobe of the maxillulae in posterior view; $\times 44$.— 3 b. Y♂ (V). Fourth seta in anterior view; $\times 77$.— 3 c. Y♂ (V). Maxilla; setae of fifth lobe in posterior view; $\times 44$.

- Fig. 3 d. f♀. End of broken seta in fifth lobe of the maxillae; $\times 44$.
 — 3 e. f♀. Maxillipes sin.; $\times 13.5$.
 — 3 f. f♀. Last segment of left maxillipes; $\times 44$.
 — 3 g. f♀. Pes II sin.; terminal seta; $\times 44$.

Fig. 4. *Cornucalanus chelifer* J. C. Thompson.

- Fig. 4 a. ♀. Abdomen in lateral view; $\times 13.5$.
 — 4 b. ♀. Pes IV sin. in posterior view; $\times 44$.
 — 4 c. ♀. Pes V dext. in posterior view; $\times 57$.
 — 4 d. ♀. Labrum in oral view; $\times 280$.
 — 4 e. ♀. Serrula 6-dentata etc.; $\times 200$.
 — 4 f. ♂. Abdomen in lateral view; $\times 13.5$.
 — 4 g. ♂. Pes V sin.; third outer segment; $\times 117$.
 — 4 h. ♀ (Stage V). Pes V sin. in anterior view; $\times 57$.

Fig. 5. *Onchocalanus magnus* Wolfenden.

- Fig. 5 a. ♀. Head in lateral view; $\times 13.5$.
 — 5 b. ♀. Abdomen in lateral view; $\times 13.5$.
 — 5 c. ♀. Pes IV sin. in posterior view; $\times 44$.
 — 5 d. ♀. Pes V sin. in anterior view; $\times 57$.
 — 5 e. ♀. Labrum in anterior view and labial lobes; $\times 33$.
 — 5 f. ♀. Labrum in oral view; $\times 77$.
 — 5 g. ♀. Serrula 6-dentata and lobus labialis in anterior view; $\times 77$.

Fig. 6. *Onchocalanus cristatus* Wolfenden.

- Fig. 6 a. ♀. Pes V sin.; third outer segment; $\times 57$.
 — 6 b. ♂. Abdomen in lateral view; $\times 13.5$.
 — 6 c. ♂. Maxilla sin.; $\times 44$.
 — 6 d. ♂. Serrula 6-dentata; $\times 200$.
 — 6 e. ♀ (Stage V). Pes V sin.; $\times 37$.

Fig. 7. *Lophothrix frontalis* Giesbrecht.

- Fig. 7 a. ♀. Pes III sin.; $\times 24$.
 — 7 b. ♀. Labrum in anterior view; $\times 117$.
 — 7 c. ♀. Labrum; oral surface; $\times 117$.
 — 7 d. ♀. Lamina labialis and serrula 6-dentata; $\times 117$.

Fig. 8. *Scaphocalanus magnus* Th. Scott.

- Fig. 8 a. ♀. Labrum etc. in lateral view; $\times 24$.
 — 8 b. ♀. Pes II; endopodite; $\times 57$.
 — 8 c. ♀. Labrum in anterior view; $\times 77$.
 — 8 d. ♀. Labrum in oral view; $\times 200$.

Fig. 9. *Scaphocalanus obtusifrons* G. O. Sars.

- Fig. 9 a. ♀. Pes IV dext.; terminal seta; $\times 77$.
 — 9 b. ♀. Labrum in anterior view; $\times 77$.
 — 9 c. ♀. Labrum in oral view; $\times 200$.
 — 9 d. ♀. Serrula 6-dentata; $\times 200$.

Fig. 10. *Scaphocalanus globiceps* Farran.

- Fig. 10 a. f♀. Labrum; oral surface; $\times 200$.
 — 10 b. f♀. Serrula 6-dentata; $\times 200$.
 — 10 c. ♂. Pes V; $\times 77$. = 11 b.

Fig. 11. *Scaphocalanus validus* Farran.

- Fig. 11 a. f♀. Labrum in anterior view; $\times 77$.
 — 11 b. f♂. Pes V of *S. globiceps* Farran.

Fig. 12. *Scaphocalanus robustus* G. O. Sars.

- Fig. 12 a. f♀. Labrum in anterior view; $\times 200$.
 — 12 b. f♀. Labrum in oral view; $\times 200$.
 — 12 c. f♀. Serrula 6-dentata etc.; $\times 200$.

Fig. 13. *Scolecithricella minor* Brady.

- Fig. 13 a. f♀. Serrula 6-dentata etc.; $\times 280$.

Fig. 14. *Scolecithricella ovata* Farran.

- Fig. 14 a. f♀. Maxilla sin. in anterior view; $\times 117$.
 — 14 b. f♀. Labrum in anterior view and lobi labiales; $\times 77$.
 — 14 c. f♀. Labrum in oral view; $\times 280$.
 — 14 d. f♀. Serrula 6-dentata etc.; $\times 280$.

PL. VIII.

Fig. 1. *Euchirella messinensis* Claus.

- Fig. 1. f♂. Pes I dext. in anterior view; $\times 77$.

Fig. 2. *Euchirella curticauda* Giesbrecht.

- Fig. 2 a. ♂. Pes I sin. in anterior view; $\times 77$.
 — 2 b. Pes II dext. in anterior view in an abnormal specimen; $\times 77$.
 — 2 c. Pes V; right endopodite; $\times 117$.

Fig. 3. *Euchirella intermedia* n. sp.

- Fig. 3. f♀. Antenna dextra in anterior view; $\times 44$.

Fig. 4. *Euchirella bitumida* n. sp.

- Fig. 4 a. f♀. Head from the left; $\times 24$.
 — 4 b. f♀. Pes I sin. in anterior view; $\times 77$.
 — 4 c. f♀. Pes II dext.; endopodite; $\times 77$.
 — 4 d. f♀. Pes III dext.; endopodite; $\times 77$.
 — 4 e. f♀. The first basipodite with spines of the right and left side in posterior view; $\times 117$.

Fig. 5. *Chirudina Streetsi* Giesbrecht.

- Fig. 5 a. f♂. Head from the left; $\times 24$.
 — 5 b. f♂. Maxilla sin. in anterior view; $\times 117$.

Fig. 6. *Scaphocalanus magnus* Th. Scott.

- Fig. 6 a. f♀. Abdomen from the left; $\times 24$.
 — 6 b. f♀. Pes IV sin. in an abnormal specimen; $\times 44$.

- Fig. 6 c. f♀. Pes V in posterior view in an abnormal specimen; $\times 77$.
 — 6 d. f♂. Pes V sin.; $\times 77$.
 — 6 e. f♂. Pes V dext.; $\times 77$.
 — 6 f. Y♂ (V). Abdomen; $\times 24$.
 — 6 g. Y♂ (V). Pes V; $\times 57$.

Fig. 7. *Scaphocalanus brevicornis* G. O. Sars.

- Fig. 7 a. f♂. Abdomen from the left; $\times 24$.
 — 7 b. f♂. Pes V; tip of the right endopodite; $\times 77$.

Fig. 8. *Scaphocalanus obtusifrons* G. O. Sars.

- Fig. 8 a. f♀. Abdomen from the left; $\times 44$.
 — 8 b. Pes V. Median portion of the terminal seta; $\times 200$.
 — 8 c. f♂. Abdomen from the left; $\times 44$.
 — 8 d. Y♂ (V). Pes V; $\times 77$.
 — 8 e. Y♀ (V). Pes V; $\times 77$.

Fig. 9. *Scaphocalanus globiceps* Farran.

- Fig. 9 a. f♂. Pes V dext. in anterior view; $\times 77$.
 — 9 b—c. f♂. Pes V dext.; endopodite in anterior and lateral view; $\times 200$.

Fig. 10. *Scolecithricella minor* Brady.

- Fig. 10 a. Y♀ (V). Pes V; $\times 200$.
 — 10 b. Y♂ (V). Pes V; $\times 200$.
 — 10 c. Y♂ (Stage V). Pes V; $\times 200$.

Fig. 11. *Scolecithricella Ingolfii* n. sp.

- Fig. 11 a. ♀. Pes IV; third basipodite in anterior view; $\times 200$.
 — 11 b—c. Pes V of two females in anterior view; $\times 200$.

Fig. 12. *Scolecithricella ovata* Farran.

- Fig. 12 a. f♀. Head from below; $\times 77$.
 — 12 b. f♀. Head from the side; $\times 77$.
 — 12 c. f♀. Genital somite; $\times 77$.
 — 12 d. f♀. Pes V dext.; $\times 117$.
 — 12 e. Y♀ (Stage V). Pes V in anterior view; $\times 117$.
 — 12 f. Y♂ (Stage V). Pes V in anterior view; $\times 117$.

Fig. 13. *Scottocalanus securifrons* Th. Scott.

- Fig. 13 a. f♂. Abdomen from the left; $\times 20$.
 — 13 b—c. f♂. Pes V sin. in superior and inferior view; $\times 77$.

Fig. 14. *Scottocalanus Thorii* n. sp.

- Fig. 14 a. f♂. Abdomen from the left; $\times 20$.
 — 14 b. f♂. Pes V sin.; $\times 77$.

Fig. 15. *Cornucalanus chelifera* J. C. Thompson.

- Fig. 15 a. f♀. Head in lateral view; $\times 24$.
 — 15 b. f♀. Terminal setae of pes IV sin.; $\times 117$.
 — 15 c. f♀. Pes V sin.; the exopodite; $\times 200$.

- Fig. 15 d. f♂. Head; $\times 24$.
— 15 e. f♂. Pes V in anterior view; $\times 77$.
— 15 f. Y♀ (V). Abdomen from the left; $\times 14$.
— 15 g. Y♂ (V). Pes V in anterior view; $\times 57$.

Fig. 16. *Onchocalanus magnus* Wolfenden.

- Fig. 16 a. f♀. Rostrum in anterior view; $\times 77$.
— 16 b. f♀. Maxillula sin.; $\times 44$.
— 16 c. f♀. Maxilla sin.; $\times 24$.
— 16 d. f♀. Pes II; left endopodite; $\times 57$.

Fig. 17. *Onchocalanus cristatus* Wolfenden.

- Fig. 17 a. f♀. Head from the left; $\times 14$.
— 17 b. f♀. Pes II; left endopodite; $\times 57$.
— 17 c. f♂. Head from the left; $\times 44$.
— 17 d. f♂. Pes V dext. in anterior view; $\times 77$.
— 17 e. f♂. Pes V sin.; last segment of the exopodite; $\times 200$.
— 17 f. f♀. Pes V sin.; $\times 57$.

Fig. 18. *Xanthocalanus Greeni* Farran.

- Fig. 18 a. Y♀ (V). Head from the left; $\times 14$.
— 18 b. Y♀ (V). Abdomen from the left; $\times 14$.
— 18 c. Y♀ (V). Pes II; left endopodite; $\times 44$.
— 18 d. Y♀ (V). Pes V in anterior view; $\times 44$.



1. *Calanus hyperboreus* Kr. 2. *Macrocalanus princeps* Brady. 3. *Megacalanus princeps* Wolf. 4. *Rhincalanus nasutus* Gbt.
 5. *Eucalanus elongatus* Dana. 6. *E. attenuatus* Dana. 7. *E. crassus* Gbt. 8. *Pseudocalanus minutus* Br.
 9. *Clausocalanus arcuiformis* Dana. 10. *Spinocalanus abyssalis* Gbt.

With del.

T.N. Møller sc.



1. *Aetidius armatus* Boeck. 2. *Chiridius obtusifrons* G.O.S. 3. *Ch. armatus* Boeck. 4. *Ch. nasutus* n. sp.
 5. *Ch. modestus* n. sp. 6. *Aetideopsis rostrata* G.O.S. 7. *Gaidius brevispinus* G.O.S. 8. *G. tenuispinus* G.O.S.
 With det. T. Müller ex.



1. *Gaidius brevispinus* G.O.S. 2. *G. tenuispinus* G.O.S. 3. *Gaetanus major* Wolf. 4. *G. minor* Farr.

5. *G. latifrons* G.O.S. 6. *G. pileatus* Farr. 7. *G. miles* Gbt.

With del.

T.N. Møller sc.



1. *Euchirella rostrata* Cls. 2. *E. messinensis* Cls. 3. *E. curticauda* Gsd. 4. *E. intermedia* n.sp.

5. *E. maxima* n.sp. 6. *Undeuchate superba* n.sp.

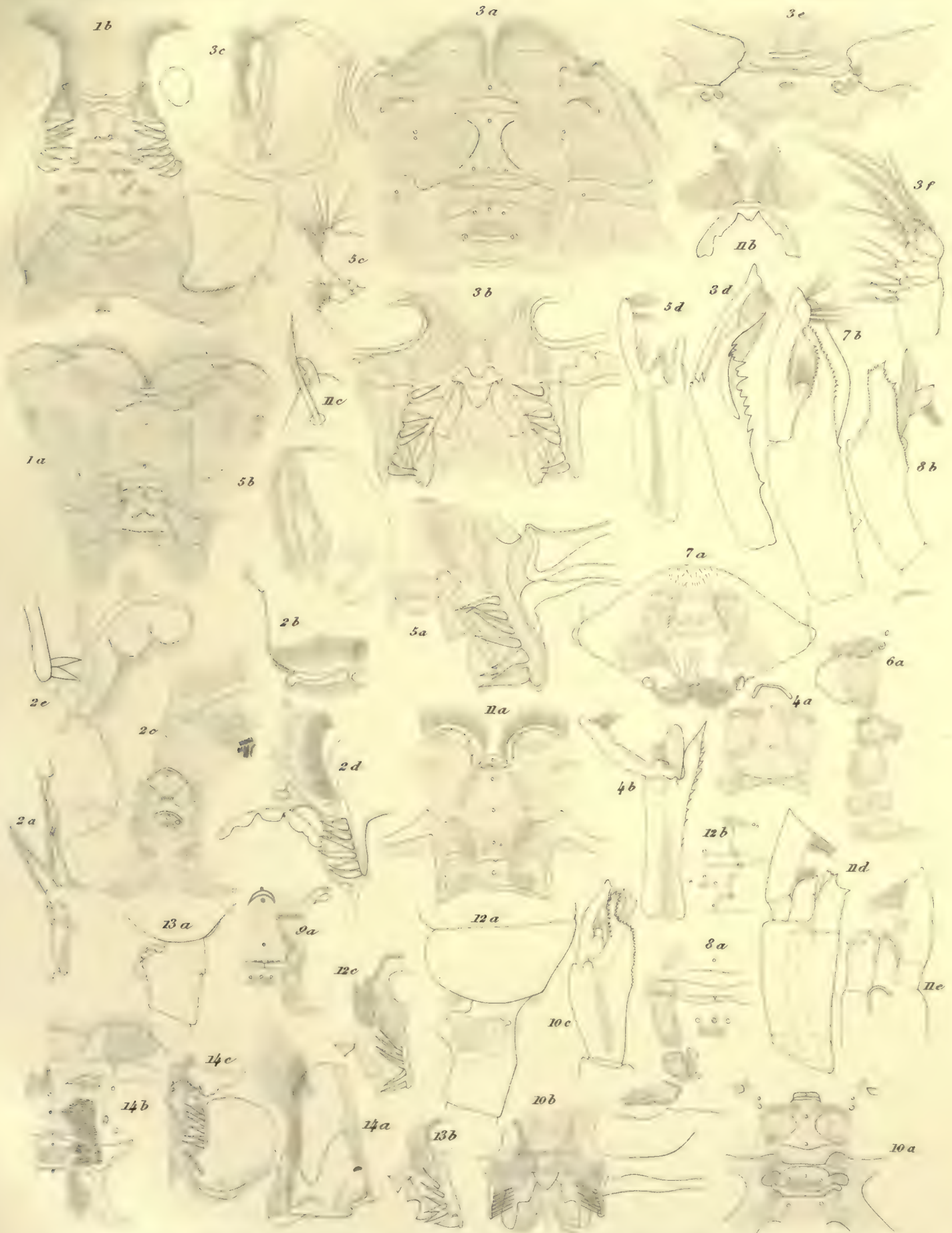
With del.

T. Miller sc.





1. *Undeuchate superba* n. sp. 2. *U. major* G6t. 3. *U. minor* G6t. 4. *Chirudina streetsi* G6t. 5. *C. abyssalis* n. sp.
 With del. 6. *C. pustulifera* G6S. 7. *C. notacantha* G6S. 8. *C. parvispina* Farr. 9. *Euchirella bitumida* n. sp. ENM6ller sc.



1 *Chirudina notacantha* G.O.S. 2 *Valdiviella insignis* Farr. 3 *Euchaete norvegica* Boeck 4 *E. tonsa* Gbt.
 5 *E. glacialis* Hans. 6 *E. Farrani* n.sp. 7 *E. Sarzi* Farr. 8 *E. barbata* Brad. 9 *E. Bradyi* n.sp. 10 *E. Scotti* Farr.
 11 *E. bisinuata* Farr. 12 *E. acuta* Gbt. 13 *E. hebes* Gbt. 14 *Scottocalanus persecans* Gbt.

With del.

J.N. Müller sc.



1. *Phaenna spinifera* Cl. 2. *Xanthocalanus pinguis* Farr. 3. *X. Greeni* Farr. 4. *Cornicalanus cheltfer* Thoms.

5. *Onchocalanus magnus* Wolf. 6. *O. cristatus* Wolf. 7. *Lophothrix frontalis* Gdt. 8. *Scaphocalanus magnus* Scott.

9. *S. obtusifrons* G.O.S. 10. *S. globiceps* Farr. 11. *S. Validus* Farr. 12. *S. robustus* G.O.S.

13. *Scolecithricella minor* Brad. 14. *S. ovata* Farr.

With del.

J.N. Miller sc.



1. *Euchirella messinensis* Cls. 2 *E. curticauda* Gbt. 3. *E. intermedia* n.sp. 4. *E. bitumida* n.sp. 5. *Chirudina Streetsi* Gbt.
 6. *Scaphocalanus magnus* Scott. 7. *S. brevicornis* G.O.S. 8. *S. obtusifrons* G.O.S. 9. *S. globiceps* Farr. 10. *Scolecithricella minor* Brady.
 11. *S. Jngolfi* n.sp. 12. *S. ovata* Farr. 13. *Scottocalanus securifrons* Scott. 14. *S. Thorii* n.sp. 15. *Cornucalanus chelifer* Thomp.
 W&h del. 16. *Onchocalanus magnus* Wolf. 17. *O. cristatus* Wolf. 18. *Xanthocalanus Greeni* Farr. T.N. Müller sc.

THE INGOLF-EXPEDITION

1895—1896.

THE LOCALITIES, DEPTHS, AND BOTTOMTEMPERATURES OF THE STATIONS

Station Nr.	Lat. N.	Long. W.	Depth in Danish fathoms	Bottom-temp.	Station Nr.	Lat. N.	Long. W.	Depth in Danish fathoms	Bottom-temp.	Station Nr.	Lat. N.	Long. W.	Depth in Danish fathoms	Bottom-temp.
1	62° 30'	8° 21'	132	7°2	24	63° 06'	56° 00'	1199	2°4	45	61° 32'	9° 43'	643	4°17
2	63° 04'	9° 22'	262	5°3	25	63° 30'	54° 25'	582	3°3	46	61° 32'	11° 36'	720	2°40
3	63° 35'	10° 24'	272	0°5		63° 51'	53° 03'	136		47	61° 32'	13° 40'	950	3°23
4	64° 07'	11° 12'	237	2°5	26	63° 57'	52° 41'	34	0°6	48	61° 32'	15° 11'	1150	3°17
5	64° 40'	12° 09'	155			64° 37'	54° 24'	109		49	62° 07'	15° 07'	1120	2°91
6	63° 43'	14° 34'	90	7°0	27	64° 54'	55° 10'	393	3°8	50	62° 43'	15° 07'	1020	3°13
7	63° 13'	15° 41'	600	4°5	28	65° 14'	55° 42'	420	3°5	51	64° 15'	14° 22'	68	7°32
8	63° 56'	24° 40'	136	6°0	29	65° 34'	54° 31'	68	0°2	52	63° 57'	13° 32'	420	7°87
9	64° 18'	27° 00'	295	5°8	30	66° 50'	54° 28'	22	1°05	53	63° 15'	15° 07'	795	3°08
10	64° 24'	28° 50'	788	3°5	31	66° 35'	55° 54'	88	1°6	54	63° 08'	15° 40'	691	3°9
11	64° 34'	31° 12'	1300	1°6	32	66° 35'	56° 38'	318	3°9	55	63° 33'	15° 02'	316	5°9
12	64° 38'	32° 37'	1040	0°3	33	67° 57'	55° 30'	35	0°8	56	64° 00'	15° 09'	68	7°57
13	64° 47'	34° 33'	622	3°0	34	65° 17'	54° 17'	55		57	63° 37'	13° 02'	350	3°4
14	64° 45'	35° 05'	176	4°4	35	65° 16'	55° 05'	362	3°6	58	64° 25'	12° 09'	211	0°8
15	66° 18'	25° 59'	330	-0°75	36	61° 50'	56° 21'	1435	1°5	59	65° 00'	11° 16'	310	-0°1
16	65° 43'	26° 58'	250	6°1	37	60° 17'	54° 05'	1715	1°4	60	65° 09'	12° 27'	124	0°9
17	62° 49'	26° 55'	745	3°4	38	59° 12'	51° 05'	1870	1°3	61	65° 03'	13° 06'	55	0°4
18	61° 44'	30° 29'	1135	3°0	39	62° 00'	22° 38'	865	2°9	62	63° 18'	19° 12'	72	7°92
19	60° 29'	34° 14'	1566	2°4	40	62° 00'	21° 36'	845	3°3	63	62° 40'	19° 05'	800	4°0
20	58° 20'	40° 48'	1695	1°5	41	61° 39'	17° 10'	1245	2°0	64	62° 06'	19° 00'	1041	3°1
21	58° 01'	44° 45'	1330	2°4	42	61° 41'	10° 17'	625	0°4	65	61° 33'	19° 00'	1089	3°0
22	58° 10'	48° 25'	1845	1°4	43	61° 42'	10° 11'	645	0°05	66	61° 33'	20° 43'	1128	3°3
23	60° 43'	56° 00'	Only the Plankton-Net used		44	61° 42'	9° 36'	545	4°8	67	61° 30'	22° 30'	975	3°0

Station Nr.	Lat. N.	Long. W.	Depth in Danish fathoms	Bottom-temp.	Station Nr.	Lat. N.	Long. W.	Depth in Danish fathoms	Bottom-temp.	Station Nr.	Lat. N.	Long. W.	Depth in Danish fathoms	Bottom-temp.
68	62° 06'	22° 30'	843	3°4	92	64° 44'	32° 52'	976	1°4	118	68° 27'	8° 20'	1060	1°0
69	62° 40'	22° 17'	589	3°9	93	64° 24'	35° 14'	767	1°46	119	67° 53'	10° 19'	1010	1°0
70	63° 09'	22° 05'	134	7°0	94	64° 56'	36° 19'	204	4°1	120	67° 29'	11° 32'	885	1°0
71	63° 46'	22° 03'	46			65° 31'	30° 45'	213		121	66° 59'	13° 11'	529	-0°7
72	63° 12'	23° 04'	197	6°7	95	65° 14'	30° 39'	752	2°1	122	66° 42'	14° 44'	115	1°8
73	62° 58'	23° 28'	486	5°5	96	65° 24'	29° 00'	735	1°2	123	66° 52'	15° 40'	145	2°0
74	62° 17'	24° 36'	695	4°2	97	65° 28'	27° 39'	450	5°5	124	67° 40'	15° 40'	495	-0°6
	61° 57'	25° 35'	761		98	65° 38'	26° 27'	138	5°9	125	68° 08'	16° 02'	729	-0°8
	61° 28'	25° 06'	829		99	66° 13'	25° 53'	187	6°1	126	67° 19'	15° 52'	293	-0°5
75	61° 28'	26° 25'	780	4°3	100	66° 23'	14° 02'	59	0°4	127	66° 33'	20° 05'	44	5°6
76	60° 50'	26° 50'	806	4°1	101	66° 23'	12° 05'	537	-0°7	128	66° 50'	20° 02'	194	0°6
77	60° 10'	26° 59'	951	3°6	102	66° 23'	10° 26'	750	-0°9	129	66° 35'	23° 47'	117	6°5
78	60° 37'	27° 52'	799	4°5	103	66° 23'	8° 52'	579	-0°6	130	63° 00'	20° 40'	338	6°55
79	60° 52'	28° 58'	653	4°4	104	66° 23'	7° 25'	957	-1°1	131	63° 00'	19° 09'	698	4°7
80	61° 02'	29° 32'	935	4°0	105	65° 34'	7° 31'	762	-0°8	132	63° 00'	17° 04'	747	4°6
81	61° 44'	27° 00'	485	6°1	106	65° 34'	8° 54'	447	-0°6	133	63° 14'	11° 24'	230	2°2
82	61° 55'	27° 28'	824	4°1		65° 29'	8° 40'	466		134	62° 34'	10° 26'	299	4°1
83	62° 25'	28° 30'	912	3°5	107	65° 33'	10° 28'	492	-0°3	135	62° 48'	9° 48'	270	0°4
	62° 36'	26° 01'	472		108	65° 30'	12° 00'	97	1°1	136	63° 01'	9° 11'	256	4°8
	62° 36'	25° 30'	401		109	65° 29'	13° 25'	38	1°5	137	63° 14'	8° 31'	297	-0°6
84	62° 58'	25° 24'	633	4°8	110	66° 44'	11° 33'	781	-0°8	138	63° 26'	7° 56'	471	-0°6
85	63° 21'	25° 21'	170		111	67° 14'	8° 48'	860	-0°9	139	63° 36'	7° 30'	702	-0°6
86	65° 03'6	23° 47'6	76		112	67° 57'	6° 44'	1267	-1°1	140	63° 29'	6° 57'	780	-0°9
87	65° 02'3	23° 56'2	110		113	69° 31'	7° 06'	1309	-1°0	141	63° 22'	6° 58'	679	-0°6
88	64° 58'	24° 25'	76	6°9	114	70° 36'	7° 29'	773	-1°0	142	63° 07'	7° 05'	587	-0°6
89	64° 45'	27° 20'	310	8°4	115	70° 50'	8° 29'	86	0°1	143	62° 58'	7° 09'	388	-0°4
90	64° 45'	29° 06'	568	4°4	116	70° 05'	8° 26'	371	-0°4	144	62° 49'	7° 12'	276	1°6
91	64° 44'	31° 00'	1236	3°1	117	69° 13'	8° 23'	1003	-1°0					



THE DANISH INGOLF-EXPEDITION.

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