Contributions du Département des Pêcheries,
Québec. — No 52

TANAIDACEA FROM CANADA AND ALASKA

by

KARL LANG

Swedish State Museum
of Natural History, Stockholm

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CORRIGENDA ET ADDENDA

During the two-year period when my paper was in the hands of the editor and the printer, a work by Holthuis (1956) appeared and mention of it could not be made in the text. The addenda given below are made necessary by Holthuis' statement that *Leptognathia crassimana* Dollfus is synonymous with *Tanaissus lilljeborgi* (Stebbing).

P. 3, add to the list of synonyms:

1898. *Leptognathia crassimana,* nova species. — Dollfus 1898, p. 46, fig. 8

1899. *Leptognathia crassimana* A. Dollfus. — Norman 1899, p. 340

1923. *Leptognathia crassimana* Dollfus. — Monod 1923, p. 48

1956. *Tanaissus lilljeborgi* (Stebbing). — Holthuis 1956, p. 257, figs. 88-89

P. 4, lines 2 and 3:

Instead of "Antennula (figs. A: 1-2)", read "Antennula (figs. A: 1-2) [1]"

The following sentence should be carried to the bottom of the page as a footnote: "1) All the drawings in this paper are reduced by half from my original illustrations."

P. 6, between lines 2 and 3, add:

France. Baie du Châtel, Bretagne (Dollfus 1898, Norman 1899, Monod 1923).

Holland. Between Helder and Wieringen, sand and mud (Holthuis 1956).

P. 31, between lines 20 and 21, add:

Dollfus, A. (1898). Isopoda. *In*: H. Gadeau de Kerville. Recherches sur les faunes marine et maritime de la Normandie, 2e voyage. Bull. Soc. Amis Sci. Nat. Rouen, 2e semestre, 1897.

P. 32, between lines 9 and 10, add:

Holthuis, L. B. (1956). Isopoda en Tanaidacea. Fauna van Nederland, 16.

Stockholm, June 9, 1958 K. Lang

CONTENTS

INTRODUCTION

In his paper entitled "The Isopoda from the Bay of Fundy", Wallace (1919) records the tanaids Typhlotanais aequiremis *(Lilljeborg)*, Typhlotanais mananensis *sp.n.*, Leptognathia *(?)* psammophila *sp.n.*, Leptochelia filum *(Stimpson) and* Leptochelia profunda *sp.n. Previously the only known species from this bay was* Leptochelia filum *(Stimpson 1853).*

Through the courtesy of Mr. Pierre Brunel, of the Station de Biologie marine, Grande-Rivière, Canada, I have been able to examine the material studied by Wallace. This material is deposited in the Royal Ontario Museum of Zoology, Toronto, Ontario. However, in the material sent to me, Typhlotanais aequiremis *was missing, and the single specimen of* Typhlotanais mananensis *had lost its chelipeds, peraeopods, pleopods and uropods.*

In addition, Mr. Brunel sent me an undetermined collection of tanaids from the Gulf of St. Lawrence. This collection, which contains the species Sphyrapus anomalus *(G.O. Sars) and* Leptognathia gracilis *(Kröyer) is deposited in the Station de Biologie marine, Grande-Rivière, Gaspé county, Québec, Canada.*

From Dr. Fenner A. Chace, Jr., United States National Museum, Washington, I received seven lots of tanaids collected at Point Barrow base, Alaska.

I have also been able to study other samples of tanaids, and the results of observations on these various collections are presented in this paper.

To all those who have loaned me material I wish to express my sincere gratitude. For correction of the English text I am much obliged to Dr. Fergus S. McCullough, Queen's University, Belfast.

THE SPECIES REPORTED BY WALLACE FROM THE BAY OF FUNDY

? Typhlotanais aequiremis (Lilljeborg)

It is uncertain that the specimen reported by Wallace (1919, p. 7, fig. 1), but not seen by me, belongs to *Typhlotanais aequiremis*. Judging from the description and figures of Wallace, the body is slender, the first peraeon segment is longer, the first antennular joint and the second joint of the exopodite of the uropod are shorter, and the last peraeopod is much more slender than in the European specimens. It may also be noted that *T. aequiremis* is known only with certainty from the Skagerak, Sweden, Norway, and western and eastern Iceland. This species in not reported by Hansen (1913) in his great work on the Tanaidacea from the Danish Ingolf-Expedition. However, the possibility that *T. aequiremis* may occur in the Bay of Fundy cannot be excluded, as *Leptognathia* (?) *psammophila*, which is a synonym of *Tanaissus lilljeborgi* (Stebbing), was also earlier known only from Great Britain, Germany, Denmark, the North Sea, Sweden and Norway.

Typhlotanais mananensis Wallace

Judging from the description given by Wallace (1919, pp. 8-10, fig. 2), this species seems to be valid. On the single specimen, however, all the legs are dissected off and the carapax is damaged. For this reason I cannot verify Wallace's description.

Distribution and occurrence

The specimen "was dredged outside Big Duck Island, Grand Manan, at a depth of 42 fathoms on a muddy bottom". (Wallace 1919, p. 8).

Tanaissus lilljeborgi (Stebbing)

1891. *Leptognathia Lilljeborgi sp.n.* — Stebbing 1891, p. 328, pl. XVI

Bibliography and synonymy

1877. *Paratanais brevicornis* Lillj. — Meinert 1877, pp. 87 and 240

1880. *Paratanais brevicornis* Lillj. — Meinert 1880, pp. 471, 509, 511
1890. *Typhlotanais brevicornis* Lillj. — Meinert 1890, p. 186 (partim)
1898. *Leptognathia lilljeborgi* Stebbing. — Th. Scott 1898, p. 219
1899. *Leptognathia Lilljeborgi* Stebbing. — Norman 1899, p. 335
1905. *Typhlotanais brevicornis.* — Tattersall 1905, p. 84 (partim)
1906. *Leptognathia Lilljeborgia* Stebbing. — Th. Scott 1906, p. 132
1906. *Tanaissus Lilljeborgii* (Stebbing). — Norman & Scott 1906, p. 34, pl. I, figs. 1-7
1907. *Tanaissus Lilljeborgi* Stebbing. — Norman 1907, p. 362
1909. *Leptochelia danica* n.sp. — Hansen 1909, p. 227, pl. V, figs. 2a-2f
1911. *Tanaissus Lilljeborgii* Stebbing. — Zirwas 1911, p. 105
1911. *Leptognathia Lilljeborgi* Stebbing. — Zirwas 1911, p. 105
1915. *Leptochelia danica* Hansen. —Björck 1915, p. 40
1919. *Leptognathia (?) psammophila* sp.n. — Wallace 1919, p. 10, fig. 3
1923. *Tanaissus Lilljeborgi* (Stebbing). — Monod 1923, p. 45
1929. *Tanaissus lilljeborgi* (Stebbing). — Stephensen 1929, pp. 19 and 22
1941. *Leptochelia danica* Hansen. — Dahl 1941, p. 3
1948. *Leptochelia danica* H. J. Hansen. — Stephensen 1948, p. 162, fig. 50
1949. *Tanaissus lilljeborgi* (Stebbing). — Lang 1949, p. 12
1955. *Tanaissus lilljeborgi.* — Remane 1955, pp. 63 and 71

As the description and figures of Wallace for this species are very inaccurate in some respects, a new description of his specimens and a comparison between them and the European specimens is given below. Specimens from the entire area of distribution of this species have been studied. All the specimens in Wallace's collection were females captured immediately before moulting. The old cuticle therefore is visible through the new one.

Description of the female

According to Wallace (1919, p. 10), the body is more than six times as long as broad. In fact, it is more than eight times as long as broad, as indeed is shown in Wallace's figure (1.c., fig. 3A).

Carapax as long as the following two segments combined, narrowing in front, with small eye-lobes but without eyes. Rostrum (fig. A:1) rounded. First peraeon segment the shortest, the following four subequal in length, last segment shorter than the preceding four but longer than the first. Pleon segments short, subequal in length. Telson rounded posteriorly, with a small denticle on each side of the anus.

Labrum and labium as in all other Paratanaidae.

Antennula (figs. A:1-2) 1) All the drawings in this paper are reduced by half from my original illustrations. Normally three-jointed, with a one-jointed flagellum. (In one specimen, the left antennula is four-jointed, as shown in fig. A:1). First joint much the longest, flagellum very minute, knob-like.

Antenna (fig. A:3) (Wallace's fig. 3C of this appendage is very misleading) inserted considerably behind the antennula, about as long as the first two antennular joints combined. *In situ,* however ,it reaches only the middle of the second antennular joint. Second joint about twice as long as the first; third joint a little longer than the first; fourth joint the longest, curved outwards; fifth joint narrower than the preceding joints, about as long as the third joint; flagellum one-jointed, very minute.

Mandibles (figs. A:4-5). *Pars incisiva* on either mandible finely serrate, on the left mandible with one large tooth (fig. A:4) and on the right mandible (fig. A:5) with two large teeth. Left mandible with a finely serrated *lacinia mobilis. Processus molaris* long, narrow, without denticles (fig. A:4).

Maxillula (figs. A:6-7) (Wallace's fig. 3E of this appendage is inaccurate.) with seven long spines at the distal margin; palp one-jointed with two long setae.

Maxilla rudimentary, forming a simple ovate lobe.

Maxilliped (fig. A:8) (Wallace's figure of this appendage is also incorrect). First three joints of the endopodite of equal width, fourth joint somewhat narrower. First joint without, last three joints with setae. Epignath falciform.

Cheliped (figs. A:9-11). Basis large, without setae. Merus triangular, with two setae. Carpus longer than broad, somewhat ovate in shape, with two setae on the upper (anterior) and two setae on the lower (posterior) margin. Upper margin of the propus very convex, distally with two prominent tubercles. Lower margin with an abrupt concavity near the base. Finger very broad, the lower margin with two setae, the tip with a large bifurcate tooth; outer surface with three setae (fig. A:10). Propus with a comb of four ciliated setae on the inner surface near the base of the dactylus (fig. A:11). Upper margin of the dactylus with three prominent tubercles.

The peraeopods (The first peraeopod is shown in fig. A:12), pleopods and uropods agree almost exactly with those of the European specimens (figs. B:5-10).

Variability

In Swedish as well as in other European specimens, the number of setae of the comb on the inner surface of the propus varies between three and six (fig B:2), and the dactylus is more or less tuberculate (cf. figs. B:1 and B:2). The fourth joint of the antenna is sometimes as curved as in Wallace's specimens but may be (fig. B:3) much less curved. The setae on the maxilliped of Swedish specimens may be either setiform or spiniform (fig. B:4). The exopodite of the uropod may have either one or two joints and in the latter case the division may be either quite obvious or obscure (fig. B:5). The interrelative length of the joints of the peraeopods (figs. B:6-9) shows variability. The endopodites of the pleopods have always one inner seta (fig. B:10), as is true also of the specimens from the Bay of Fundy, even though Wallace has not figured it.

Distribution and occurrence

Canada. Bay of Fundy, in sand "near West Quoddy at a depth of nine fathoms, and in Woodward's Cove, Grand Manan, from low tide mark to a depth of two fathoms" (Wallace 1919).

Great Britain. Firth of Forth at Largo Bay; Musselburgh; North Berwick and Aberdour (Th. Scott 1898, 1906). North Devon, in the sands at Lee and Woolacombe (Stebbing 1891). In shallow water at Exmouth, Dartmouth and at several localities (e.g. Jellycliff and Whitsand Bays), in the neighbourhood of Plymouth, and also at Ilfracombe (Norman & Scott

1906). In sand, low water, Belgrave Bay, Guernsey (Norman 1907, Monod 1923).

Germany. The species shows submergence : in the North Sea, it occurs in the eulittoral, but in the Bay of Kiel, it is found only at depths below six to eight metres. In the North Sea, *Pseudocuma longicornis* (Spence Bate) and *Tanaissus lilljeborgi* occur together in the rocky zone, this not being the case in the Belt Sea, however (Remane 1955).

Denmark. The Great Belt : Outside Hindsholm and at Nyborg (Meinert 1877); bight of Seirö; bight of Odense; Björns Knude, 4-5 fathoms, fine sand and algae (Meinert 1880). The Little Belt : Brandsö, 7-11 fathoms, sandy clay and mud (Meinert 1880). The Sound : (Meinert 1880), outside Hellebäck (Meinert 1890); west of Knähaken, 23-35 metres, shells, sand, some *Laminaria* and slag (Bjôrck 1915); east of Hellebaek, 10 metres sand (Dahl 1941). Southern part of the Kattegat (Meinert 1890).

Sweden. Locality Smedjan in the Gullmarfjord, Province of Bohus, sand (Lang 1949).

The species will most probably be found on the sandy bottom of the whole atlantic-boreal region and in some parts of the subarctic region, e.g. southwest Greenland.

Leptochelia filum (Stimpson)

1853. *Tanais filum* n.s. — Stimpson 1853, p. 43

Bibliography and synonymy

1864. *Tanais filum* W. Stimpson. — Lilljeborg 1864, p. 25
1865. *Tanais filum* W. Stimpson. — Lilljeborg 1865, p. 31
1867. *Tanais filum* Stimpson. — Packard 1867, p. 296
1879. *Leptochelia filum* (Stimpson). — Harger 1879, p. 164
1880. *Leptochelia filum* (Stimpson). — Harger 1880, pp. 426, 429, 435
1882. *Leptochelia* (?) *filum* (Stimpson). — G.O. Sars 1882a, p. 28
1883. *Tanais filum* Stimpson. — Smith 1883, p. 231
1886. *Leptochelia* (?) *filum* (Stimpson). — Norman & Stebbing 1886, p. 108
1894. *Leptochelia (?) filum* (Stimpson) Harger. — Moore 1894, p. 93
1896. *Leptochelia filum* (Stimpson). — Stebbing 1896, pp. 158, 159
1899. *Leptochelia filum* (Stimpson). — Norman 1899, p. 339
1900. *Leptochelia* (?) *filum* (Stimpson). — Richardson 1900, p. 212
1901. *Leptochelia* (?) *filum* (Stimpson). — Richardson 1901, p. 504
1905. *Leptochelia* (?) *filum* (Stimpson). — Richardson 1905, p. 31
1919. *Leptochelia filum* (Stimpson). — Wallace 1919, p. 12, fig. 4
1919. *Leptochelia profunda* sp. n. — Wallace 1919, p. 16, fig. 5
1943. *Leptognathia filum* (Stimpson). — Stephensen 1943, p. 73
1947. *Leptochelia filum* Stimpson. — Hatch 1947, pp. 161, 165, pl. 14, fig. 161

Nec :

1873. *Tanais filum* Stimpson. — Harger 1873, p. 573
1873. *Tanais filum*. — Verrill 1873, p. 381

I have compared Wallace's specimens of this species and of *L. profunda* Wallace with the type-material of *L. filum* and also with Fee's (1926) specimens.

Wallace's determination of *L. filum* is correct. On the other hand, his *L. profunda* represents simply an older stage of *L. filum*. The differences mentioned by Wallace (l.c., p. 18), namely the larger size, the more numerous articles in the antennular flagellum of the male and in the endopodite of the uropod, are due to this fact. After having studied more than three thousand specimens of *L. dubia* (Kröyer) *L. edwardsi* (Kröyer) and *L. mirabilis* Stebbing, I have observed that the number of joints of the appendages in question increase with the age of the animal. As distinguishing characters, Wallace also mentions that the males of *L. profunda* are more numerous than those of *L. filum* and that in *L. profunda* "the inner surface of the thumb of the propodus of the gnathopod is without teeth" (Wallace 1919, p. 19).

In many tanaids the males occur only during certain seasons. The occurrence of a greater or smaller number of males cannot be of any systematic value. If the collection is made in the middle of a breeding period, a great number of males will be found; if made, on the other hand, at the beginning or at the end of such a period, smaller numbers can be expected. Between two breeding periods the males seem to be absent. From the Zoological Museum of the University, Copenhagen, I have obtained a sample which contains more than a thousand females of *Leptochelia dubia* (Kröyer) but not a single male. Fee (1926, p. 8), among others, has made similar observations. Thus he writes about *L. filum* "that although over a hundred individuals were collected during the months of May, June and July for two successive summers, no males were found. The only possible explanations are that either the males only appear during a certain season, or else inhabit a different locality during the summer months". The last possibility, however, is out of question.

As shown in the figures, the fixed finger (= "the thumb") of "*L. profunda*" (fig. F:6) as well as that of *L. filum* (figs. F:4-5) is provided with teeth. The difference between the shape of the propus of the chelipeds of *L. filum* and "*L. profunda*" is due to the fact that the sample of "*L. profunda*" had dried and the specimens were shrivelled.

As *L. filum* has never been completely described, a redescription of it seems to be justified.

Description of the female

Length 2.4 mm (fig. C:1). Body elongate, about six times as long as broad. Carapax about as long as the following two segments combined, narrowing anteriorly. Eye-lobes separated; eye distinct (fig. D:1). First peraeon segment shortest, following four subequal in length, the last shorter than the preceding four segments, but longer than the first. Pleon segments short, subequal in length. Telson rounded posteriorly (fig. D:7).

Antennula (fig. D:1) three-jointed with a very small knob-like flagellum. First joint much longer than all the following joints combined; second joint less than half the length of the third; third joint slender. Flagellum with two setae and one aesthete.

Antenna (fig. D:2). Second joint about twice as long as the first, third joint about as long as the first. Second and third joints each with one large seta close to the upper distal corner, second joint also with a small seta at the lower distal corner. Last three joints more slender than the preceding joints. Fourth joint longer than the preceding two joints combined, fifth joint about as long as the second. Last joint very minute.

Labrum, mandibles, maxilla and labium as in the other species of the genus.

Maxillula distally with nine spines.

Maxilliped (fig. D:3). Basis with two to four long, ciliated setae on the medio-distal margin. Endite with three couples, two setae and one spine. First joint of the endopodite without, the following three joints with, setae.

Cheliped (figs. D:4-5). Basis short. Merus triangular with at least two setae. Carpus narrowed proximally, much longer than broad, with at least two setae on the lower (posterior) margin. Finger on the outer surface with two setae near the lower and three setae near the upper (anterior) margin, on the inner surface with one seta near the lower margin; upper margin irregularly toothed or eroded. One seta in the gap between the finger and the dactylus.

First peraeopod (fig. D:6). Coxa small, not prominent, with one seta. Basis somewhat curved, much longer than the following three joints combined. Ischium short. Merus and carpus about of the same size. Propus little longer than the preceding two joints combined. Dactylus, with its claw, longer than propus, claw shorter than dactylus. For the armature of the joints, see the figure.

Second and third peraeopods (figs. E:1-2) of about the same appearance. Dactylus and claw in the third peraeopod, however, much shorter than in the second. For the armature, see the figures.

Fourth and fifth peraeopods (figs. E:3-4) subequal. Dactylus and claw more powerful than in the preceding two peraeopods.

Sixth peraeopod (fig. E:5). Propus at the distal posterior corner with a tuft of comb-like setae. Dactylus much longer than the claw. For the armature, see the figure.

Pleopods (fig. E:6) (Wallace's (1919) figure is incorrect). Endopodite with one ciliated seta on the inner margin. Almost all the setae were broken off in the specimens sent to me.

Uropod (fig. D:7). Exopodite very short, two-jointed. Endopodite long, four-jointed. Fee (1926, p. 8) found a few individuals with a three-jointed exopodite on the uropod and with the pleon widest in the middle.

Description of the male

Length 1.5 mm. Body elongate (fig. C:2). Carapax about as long as the following three segments combined, of a shape quite different from that of the carapax of the female (see fig. F:1). Eyes much larger than those of the female. Telson projecting posteriorly, with four small setae (fig. F:2).

Antennula (fig. F:3) with two large peduncular joints and a six-jointed flagellum. All the joints of the flagellum with numerous aesthetes.

Antenna as in the female.

Cheliped (figs. F:4-6) more robust than that of the female. Propus with a comb of nine to ten spines on the inner surface. In one male, the left cheliped has nine and the right cheliped has ten spines.

Peraeopods as in the female.

Pleopods with longer setae than in the female.

Variability

The males which have been referred by Wallace to *L. profunda,* differ from the above description in the following respects: (1) Length 1.85 mm. (2) The flagellum of the antennula is seven-jointed. In his description of the male of *L. filum,* Wallace (1919, p. 15) says that there "is some indication of the separation of the first and fifth articles into two parts", but he states, nevertheless, that the antennular joints are more numerous in *L. profunda* than in *L. filum.* (3) The comb on the propus of the cheliped contains twelve spines.

Distribution and occurrence

Canada. Gulf of St.Lawrence, Belle Isle Strait, Caribou Island, in 8 fathoms, on a sandy bottom (Packard 1867). Bay of Fundy: Hake Bay, 20 fathoms, dredged among *Ascidiae callosae* (Stimpson 1853); off Biological Station, St. Croix River, 10 to 15 fathoms; off Eastport, Maine, 10 fathoms; off Cherry Island, Head Harbour Passage, 42 fathoms; off Spruce

Island, 36 fathoms; Head Harbour, 9 fathoms; off Head Harbour Island, 27 fathoms and 70 to 75 fathoms, from a bottom of sandy mud and stones; the Wolves, 16 to 30 fathoms; off Low Duck Island, Grand Manan, 34 fathoms; off Big Duck Island, 42 fathoms; off Three Islands, Grand Manan, 17 fathoms (Wallace 1919).

United States. Carkeek Park, Seattle, Washington, intertidal (Hatch 1947).

THE SPECIES FROM THE GULF OF ST.LAWRENCE AND ALASKA

Sphyrapus anomalus (G.O.Sars)

1869. *Apseudes anomalus* n.sp. — Sars 1869, p. 349

Bibliography and synonymy

1872. *Apseudes anomalus* G.O.Sars. — Sars 1872, pp. 79 and 90
1877. *Apseudes anomalus* G.O.Sars — Sars 1877, p. 346
1882. *Sphyrapus anomalus* (G.O.Sars). — Sars 1882a, p. 19
1882. *Sphyrapus anomalus* G.O. Sars. — Sars 1882b, p. 13
1886. *Sphyrapus anomalus* G.O.Sars. — Norman & Stebbing 1886, pp. 97 and 101, pl. XXI, fig. II
1887. ? *Sphyrapus anomalus* G.O.Sars. — Hansen 1887a, p. 206
1899. *Sphyrapus anomalus* G.O.Sars. — Norman 1899, p. 339
1899. *Sphyrapus anomalus* G.O.Sars. — Sars 1899, p. 9, pls. III-IV
1902. *Sphyrapus anomalus* G.O.Sars. — Norman 1902, p. 478
1909. *Sphyrapus anomalus* G.O.Sars. — Hansen 1909, p. 227
1911. *Sphyrapus anomalus* (G.O.Sars). — Stappers 1911, p. 83, pl. IV, fig: 13
1911. *Sphyrapus anomalus* G.O.Sars. — Zirwas 1911, pp. 77, 78, 79, 100, 104, 111, 112
1913. *Sphyrapus anomalus* G.O.Sars. — Hansen 1913, p. 16
1913. *Sphyrapus anomalus* G.O.Sars. — Stephensen 1913, p. 261
1929. *Sphyrapus anomalus* (G.O.Sars). — Stephensen 1929, p. 18
1932. *Sphyrapus anomalus* (G.O.Sars). — Stephensen 1932, p. 345
1933. *Sphyrapus anomalus* (G.O.Sars). — Préfontaine 1933, p. 254
1936. *Sphyrapus anomalus*. — Gurjanova 1936, p. 534
1937. *Sphyrapus anomalus* (G.O.Sars). — Stephensen 1937, pp. 14, 18, 22
1943. *Sphyrapus anomalus* G.O.Sars — Stephensen 1943, pp. 32, 69, 73
1948. *Sphyrapus anomalus* G.O.Sars. — Stephensen 1948, p. 156, fig. 48

Distribution and occurrence

Canada. Estuary of the St. Lawrence River, 200 metres, compact mud (Préfontaine 1933). Mécatina Bank, North Shore, Gulf of St. Lawrence, Quebec, two localities : station 55, about 50°16'N-50°58'W, 60 fathoms, mud, 1 female; approximate position between 50°38'W and 50°51'N and between 58°06'N and 58°38'W, 50-80 fathoms, mud, sand and gravel (Station de Biologie marine, Grande-Rivière).

Davis Strait. 66°35'N-56°38'W, 318 fathoms, temp. 3.9°C; 65°14'N-55°42'W, 420 fathoms, temp. 3.5°C; 63°30'N-54°25'W, 582 fathoms, temp. 3.3°C (Hansen 1913).

East Greenland. 72°40'N-20°10'W, 100 fathoms; Hurry Inlet, 70°50'N-22°31'W, 10 fathoms; 69°25'N-20°01'W, 167 fathoms, large stones and clay; Cape Dalton, 69°24.6'N-23°30'W, 9-11 fathoms (Hansen 1913).

Iceland. 67°40'N-15°40'W, 495 fathoms, temp. -0.6°C; 67°19'N-15°52'W, 293 fathoms, temp. -0.5°C; 64°07'N-11°12'W, 237 fathoms temp. 2.5°C; 63°56'N-24°40'W, 136 fathoms, temp. 6.0°C; 63°21'N-25°21'W, 170 fathoms (Hansen 1913).

Novaya Semlya. 70°20'N-56°35'E, 90 metres; 70°20'N-56°34'E, 90 metres; 70°40'N-54°08'E, 61 metres (Stappers 1911).

Kara Sea. 71°34'N-64°22'E, 50 fathoms, grayish-brown clay with small stones and ferriferous concrements (Hansen 1887a).

Northeast and east of the Shetland Islands. 61°40'N-3°11'E, 220 fathoms; 60°57'N-3°42'E, 190 fathoms, temp. 6.1°C (Hansen 1913).

Norway. Storeggan, 400 fathoms, soft clay with large stones; Dröbak and Vallö in the Oslo Fjord (Sars 1872); Vallö, 60-150 fathoms; Holmestrand, 40-50 fathoms (Sars 1869); 61°47.2'N-3°18.5'E, 220 fathoms, bottom temp. 5.8°C, clay; 63°22.5'N-5°29'E, 1215 fathoms, bottom temp. -1.6°C, biloculinifera (Sars 1877); Oslo Fjord to Vadsö, 100-400 fathoms (Sars 1882a).

Skagerak. 39-44 Kvml. NNW of Höjen and Hirtshals, 280-350 fathoms (Hansen 1909).

North Sea. 58°22'N-5°31'E, ooze (Zirwas 1911).

Leptognathia gracilis (Kröyer)

1842. *Tanais gracilis* Kr. — Kröyer 1842, p. 182

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1864. *Tanais gracilis* Kröyer. — Lilljeborg 1864, p. 18
1865. *Tanais gracilis* Kröyer. — Lilljeborg 1865, p. 21
1877. *Tanais islandicus*, n.sp. — Sars 1877, p. 346 (partim)
1882. *Leptognathia gracilis* (Kröyer). — Sars 1882a, p. 45
1882. *Leptognathia longiremis* (Lilljeb.). — Sars 1882a, p. 41
1882. *Leptognathia longiremis* Lilljeb. — Sars 1882b, p. 14
1885. *Leptognathia longiremis* (Lilljeborg). — Sars 1885, p. 79, pl. VII, figs. 17-28
1886. *Leptognathia longiremis* (Lillj.). — Forsstrand 1886, p. 47 (partim)
1886. *Leptognathia longiremis* (Lilljeborg). — Norman & Stebbing 1886, pp. 109-110 (partim)
1887. *Leptognathia gracilis* (Kr.). — Hansen 1887a, p. 207
1887. *Leptognathia longirèmis* (Lillj.). — Hansen 1887b, p. 179, pl. VI, figs. 9, 9a, 9b
1890. *Leptognathia longiremis* Lillj. — Meinert 1890, p. 186
1899. *Leptognathia longiremis* (Lilljeborg). — Norman 1899, p. 335 (partim)

1899. *Leptognathia gracilis* (Kröyer). — Norman 1899, p. 340
1899. *Leptognathia longiremis* (Lilljeborg). — Scott 1899, p. 66
1901. *Leptognathia longiremis* (Lilljeborg). — Ohlin 1901, p. 15
1901. *Leptognathia longiremis* Lillj. — Richardson 1901, p. 502 (partim)
1901. *Leptognathia* (?) *longiremis* (Lillj.) var. — Scott 1901, p. 269, pl. 18, figs. 30-38
1905. *Leptognathia longiremis* (Lilljeborg). Richardson 1905, p. 19, fig. 22 (partim)
1906. *Leptognathia longiremis* (Lilljeborg) var. — Scott 1906, p. 132
1907. *Leptognathia hanseni* Vanhöffen. — Vanhöffen 1907, p. 512, pl. 20, figs. 13-15
1909. *Leptognathia longiremis* (Lilljeb.). — Sars 1909, p. 8
1909. *Leptognathia Sarsii* n.sp. — Hansen 1909, p. 229
1909. *Leptognathia gracilis* Kröyer. — Hansen 1909, p. 230
1911. *Leptognathia longiremis* Lilljeb. — Zirwas 1911, pp. 79, 102, 105, 109, 110, 111
1913. *Leptognathia Sarsii* n.sp. — Hansen 1913, p. 68, pl. VI, figs. 7 a - 7 f
1913. *Leptognathia gracilis* Kröyer. — Hansen 1913, p. 70, pl. VII, figs. 1 a-1 d
1913. *Leptognathia graciloides* Lilljeborg. — Hansen 1913, p. 71
1913. *Leptognathia Hanseni* Vanhöffen. — Hansen 1913, p. 71, pl. VII, figs. 2 a - 2 l
1913. *Leptognathia gracilis* Kröyer. — Stephensen 1913, p. 271
1913. *Leptognathia Sarsii* H.J.Hansen. — Stephensen 1913, p. 271
1913. *Leptognathia Hanseni* Vanhöffen — Stephensen 1913, p. 272
1929. *Leptognathia sarsi* H.J.Hansen. — Stephensen 1929, pp. 10,13,18,21,22
1929. *Leptognathia gracilis* (Kr.). — Stephensen 1929, p. 18
1932. *Leptognathia gracilis* (Kröyer). — Stephensen 1932, p. 347
1932. *Leptognathia hanseni* Vanhöffen. — Stephensen 1932, p. 347
1932. *Leptognathia sarsi* H.J.Hansen — Stephensen 1932, p. 348
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1937. *Leptognathia gracilis* (Kröyer). — Stephensen 1937, pp. 16, 18, 23
1937. *Leptognathia sarsi* H.J.Hansen. — Stephensen 1937, pp. 16, 18, 23
1937. *Leptognathia hanseni* Vanhöffen — Stephensen 1937, p. 23
1943. *Leptognathia sarsi* Ohlin (and H.J.Hansen). — Stephensen 1943, pp. 35, 65, 69, 73
1943. *Leptognathia hanseni* Vanhöffen. — Stephensen 1943, pp. 35, 64, 69, 73, 78
1943. *Leptognathia gracilis* (Kröyer). — Stephensen 1943, p. 73
1947. *Leptognathia longiremis* Lilljeborg. — Hatch 1947, pp. 161, 167, 238, pl. 2, figs. 22-30
1948. *Leptognathia gracilis* (Kröyer). — Stephensen 1948, p. 171 (partim)

In January 1955 I received from Mr. Pierre Brunel three vials containing tanaids — provisionally referred by him to *Leptognathia longiremis* (Lilljeborg) — from three localities on Miscou Bank, entrance to Baie des Chaleurs, Gulf of St.

Lawrence. Examination of the samples showed that, although the specimens seemed to belong to the same species, they were somewhat different in each of the different localities. Because of this variation, doubt is cast on the existence of many of the *Leptognathia* species which Hansen (1913, p. 66) includes in his "*Sarsii*- or *longiremis*-group". Hansen divides this group, which is characterized by having both rami of the uropods two-jointed and well developed, and biramous pleopods in the female, into three subgroups. At present only the first two are of interest.

The conclusions reached in the present study are reflected in the list of synonyms above and are based on an examinaton of 1,048 females and 18 males. The material comes from the following sources: (1) Station de Biologie marine, Grande-Rivière, Gaspé-sud, Québec, Canada (specimens from the Miscou Bank, Baie des Chaleurs, Gulf of St. Lawrence); (2) Smithsonian Institution, U.S. National Museum, Washington (specimens from Point Barrow base, Alaska); (3) Zoological Museum of Oslo, Norway (specimens from Iceland and Norway); (4) Zoological Museum of the University, Copenhagen, Denmark (specimens collected by the Danish Ingolf-Expedition and in the Skagerak); (5) British Museum of Natural History, London (specimens from Scotland); (6) Swedish State Museum of Natural History, Stockholm, Sweden (specimens from the Swedish west coast and the Sound, and Lilljeborg's type specimens of *L. longiremis*); (7) collections made by myself in the Gullmarfjord, Province of Bohus, and in the Sound, Sweden.

In table I is given in summarized form Hansen's (1913, pp. 66-71) view of the most prominent characters of the species belonging to the first subgroup and also of *L. hanseni*, which belongs to the second subgroup of his "*Sarsii*- or *longiremis*-group". In the first of these subgroups the dactylus of the cheliped is serrate, in the second subgroup it is smooth along the anterior (upper) margin.

As shown in table I, the main characters which distinguish *L. sarsi* from the other species are (1) that the telson is provided laterally with an acute or obtuse process, (2) that the propus of the cheliped has a row of eight or nine teeth, and (3) that "half or more than half of the anterior margin" of the dactylus of the same leg "is crenulate". (Hansen 1913, p. 68).

However, an examination of specimens from the Gulf of St. Lawrence showed that these characters are not always interrelated. The specimens were caught at nine close stations on the Miscou Bank (series HEC), at the entrance of Baie des Chaleurs, and at one station inside the bay (station PB1). The full data pertaining to these stations are given in table II.

A complete description of a female specimen from station HEC 42 (cf. table II), Miscou Bank, is given below. The specimen agrees with the three characters of *L. sarsi* mentioned above.

Description of female (figs. G:1 and H-I)

Length about 4.4 mm. Body slender and elongated, about 7.5 times as long as broad (fig. G:1). Carapax about as long as the first two peraeon segments combined, distal part abruptly attenuated, anterior margin obtusely angled. First peraeon segment shorter than the following segment. Second, third and fourth peraeon segment subequal, fifth segment somewhat shorter than the fourth, last peraeon segment about as long as the first. Pleon segments subequal, ventral tubercles high (fig. I:11). Telson on each side armed with a minute deflected tooth (figs. G:2 and I:11).

Antennula (fig. H:1). First joint somewhat longer than the other joints combined, second joint longer than the third which is the shortest, fourth joint more slender than the preceding joints and of about the same length as the second joint. All the joints are provided with one or more distally ciliated movable sensory setae ("auditory setae" *fide* G.O. Sars) and ordinary setae.

Antenna (fig. H:2) six-jointed, the fourth joint, however, indistinctly subdivided. First joint very minute, second joint broadest, about 1.5 times as long as the third. Fourth joint arched, upper margin convex and lower margin concave, subdivided into a shorter proximal and a somewhat longer distal part. Fifth joint slightly shorter than the distal part of the fourth joint. Last joint minute. First joint without setae, second and third joints each with one ordinary seta at the upper distal corner; fourth joint with two distally ciliated movable sensory setae, one at the proximal and the other at the distal part, and with a tuft of three ordinary setae on the lower distal corner. Fifth joint with one ordinary seta on the lower distal corner, last joint with a tuft of ordinary setae at the tip.

Labrum (fig. H:9) as in the other members of the genus.

Mandibles (figs. H:3-4). *Pars incisiva* of the left mandible with two small and two large teeth (fig. H:3), that of the right mandible with one small and two large teeth (fig. H:4). *Lacinia mobilis* of the left mandible with one large, one small and one very minute tooth. *Pars molaris* at the tip with long and short denticles (see the figures).

Maxillula (fig. H:5) with 9 spines on the distal margin. Palp one-jointed with 2 setae at the tip.

Maxilla (fig. H:6) a simple lobe.

Maxilliped (fig. H:7). Basis with one very minute and one long seta near the distal margin. Endite with one small and one long seta (see the figure) near the undulating distal margin. First joint of the endopodite without, the other three joints with setae. Epignath (fig. H:8) falciform, with a long seta at the tip.

Cheliped (figs. H:10-12). Basis somewhat shorter than carpus, with one seta on the upper (anterior) margin. Merus triangular, with one seta on the lower (posterior) margin. Carpus about 1.5 times as long as broad, with one seta near the upper distal corner and one seta near the middle of the lower margin. Upper margin in the proximal half exceedingly finely crenate, lower margin in its distal half more obviously crenate. Propus in the distal part of the upper margin with six small tubercles (figs. H:10-12), on the outer side with a row of nine tubercles, originating from one chitinous ridge, nearly parallel with, and at some distance from the lower margin. Inner surface with a comb of one long seta and four shorter setae, and with rows of very fine hairs. Finger with two setae on the lower and three setae near the upper margin. Upper margin distally with four teeth. Dactylus on the upper margin with nine tubercles. The gap between dactylus and finger is provided with one seta.

First peraeopod (figs. I:1-3). Coxa moderately large with one seta on the anterior margin. Basis much longer than the following three joints combined and with one seta on the anterior margin. Ischium short with one seta at the distal posterior corner. Merus shorter than carpus, at the posterior terminal corner with one small seta and one spine as long as (fig. E:1) or shorter than (fig. E:3) the carpus. Carpus shorter than propus, posterior and anterior terminal spines about the same length (fig. I:1). Propus with one seta near the distal posterior corner. Carpus and propus with several rows of very minute hairs on the inner surface (fig. I:2). Dactylus with its claw about as long as propus.

Second and third peraeopods (figs. I:4-5) subequal. Coxa little different from that of second peraeopod. Basis much longer than the following three joints combined, with two distally ciliated movable setae ("auditory setae" *fide* G.O. Sars) on the anterior margin. Posterior terminal spine of merus about as long as carpus. Carpus with one short and one long spine at the distal posterior corner, and one long spine at the anterior corner. Propus longer than carpus, with one seta near the distal posterior corner and one hair-like seta near the distal anterior corner. Dactylus with its claw about as long as propus.

Fourth to sixth peraeopods (figs. I:6-8) subequal. Basis large, broader than in the preceding peraeopods, with two distally ciliated movable setae on the anterior margin (Morphologically, this margin corresponds to the posterior margin of the three anterior pairs of peraeopods.). Ischium with two setae at the anterior distal corner. Merus shorter than carpus, propus about as long as carpus. Merus with two, carpus with three, and propus with two spines at the anterior distal corner. Propus of fourth and fifth peraeopods with one spine, propus of sixth peraeopod with three spines at the posterior distal corner. Dactylus much longer than its claw. On the surface, the last four joints are provided with some rows of minute hairs (see the figures).

Pleopods (fig. I:9). Basis without setae. Exopodite with long, ciliated setae along its outer margin. Endopodite with one shorter ciliated seta near the inner distal corner, and with longer ciliated setae on the distal margin and on the distal part of the outer margin.

Uropod (figs. I:10-11). Peduncle short, somewhat longer than broad. Exopodite much shorter than the first joint of the endopodite, two-jointed, second joint somewhat shorter than the first, first joint with one short, second joint with one short and one long, terminal setae. Endopodite two-jointed, first joint much longer than the second. First joint with one distally ciliated movable seta at the outer distal and one long ordinary seta at the inner distal corner. Second joint in its distal part with four long and two small ordinary setae.

Variability of the females from Baie des Chaleurs

If we compare the above given description of *Leptognathia sarsi* with that of Hansen (1913, pp. 68-69, pl. VI, figs. 7 a — 7 f), it will be seen that they almost exactly agree. There are, however, some differences, the most important of which are the following.

According to Hansen, the posterior distal spine on the merus of the second and third peraeopods "is conspicuously shorter" than the carpus. In the specimen described above, this spine is as long or slightly shorter than that joint. In this respect it agrees more with *L. multiserrata* Hansen (l.c., p. 67). In having the distal lower margin of the carpus of the cheliped crenate, it also agrees with *L. multiserrata* and differs from *L. sarsi.* The propus of the cheliped agrees, however, with the description given by Hansen of *L. sarsi* but differs from his description of this joint for *L. multiserrata.*

The fine crenulation in the proximal part of the upper margin of the carpus of the cheliped is not mentioned by Hansen in any of his described species. In this respect, the specimen described above also differs from the other five specimens in the same sample. In all these specimens, the carpus agrees with Hansen's description of the same joint of *L. sarsi,* and the propus and the dactylus of the cheliped agree almost exactly with the corresponding joints of the specimen here described. There are six to nine tubercles in the row of tubercles on the propus, and there are eight to ten on the dactylus. In one specimen, the posterior terminal spine of the merus of the first peraepod is distinctly shorter than the carpus and the anterior terminal spine of the carpus of the same leg is distinctly shorter than the posterior spine (fig. I:3).

It is obvious that it would be impractical to give full descriptions of all the specimens which have been studied in the present investigation. Only those characters which Hansen (1913) considers to be of specific value will therefore be considered, namely the telson, the ventral tubercles on the pleon segments, the cheliped, the length of the spine on the merus of the first peraeopod and the length of the dactylus, with its claw, of the same peraeopod.

Station HEC 81, 3 females (cf. table II). The telson has laterally a deflected tooth and the ventral tubercles of the pleon segments are more or less high. The cheliped has no serrations on the carpus ,the propus has three to four low tubercles on the distal part of the upper margin (fig. J:1) and near the lower margin a row of three to five low tubercles, the hindmost of which continues into a chitinous ridge; further down there is another shorter ridge (fig. J:2). On the inner surface there is a comb of one long and four shorter setae and some rows of very fine hairs (fig. J:1). The carpus has eight to nine low tubercles (fig. J:1) on the upper margin. The length of the spine on the merus of the first peraeopod varies considerably (fig. J:3-6) and furthermore, it may be different on the left and right leg of the same specimen (figs. J:3-4). The length of the spines on the carpus of this leg also varies (figs. J:3-6). The dactylus with its claw is as long as the propus.

As will be seen, the specimens from this locality differ from Hansen's description of *L. sarsi* mainly by having a smaller number of tubercles as well as by the presence of a second ridge on the propus of the cheliped. In these respects also, they differ from all the species hitherto described in the genus.

Station HEC 1, 7 females (cf. table II). The telson is laterally rounded, without any trace of a protrusion or tooth, and the ventral tubercles of the pleon segments are moderately high (fig. J:7). The cheliped has no serrations on the carpus, the propus has three to five small tubercles on the distal part of the upper margin; near the lower margin there are two ridges but no tubercles (fig. J:8). The dactylus has seven to nine low saw-teeth on the upper margin. On the inner surface there is, in one of the females 2.9 mm. long, a comb of one long and four shorter setae, in the other females, a comb of one long and three shorter setae (fig. J:9) and some rows of very fine hairs. The length of the spine on the merus of the first peraeopod varies only a little (The extremes are seen in figs. J:10-11). The dactylus, with its claw, of the first peraeopod is almost as long as the propus.

These specimens neither agree with any of the species described by Hansen nor with any other known species.

Station HEC 17, one of the females (cf. table II). The telson is laterally provided with an acute process as in *L.*

sarsi. In the other characters, also, it agrees almost exactly with this species.

Stations HEC 2, 3, 15, 17, 28, 93 and PB1 (cf. table II). All the other females from these stations have the telson rounded laterally, without any trace of a protrusion or process. In all the females the ventral tubercles of the pleon segments are more or less high; the carpus of the cheliped has no tubercles and the first peraeopod agrees almost exactly with Hansen's description of the same leg in *L. sarsi.* The propus of the cheliped has a shape somewhat different from that of the specimens from stations HEC 1, 42 and 81 discussed above (cf. figs. J:12-17). Near the lower margin, this joint has a row of six to twelve high tubercles originating from two chitinous ridges. Sometimes the number of tubercles is different in the chelipeds of the same specimens (figs. J:12-15). The dactylus is crenulate in its greater part. With the exception of the female from station HEC 17 mentioned above, all the specimens differ from *L. sarsi* only in the telson and in the shape of the propus of the cheliped; some of them also differ from that species in the number of tubercles near the lower margin of the propus of the cheliped. From *L. graciloides* they differ in the crenulation of the dactylus of the cheliped, from *L. gracilis* by the row of tubercles on the propus of the same leg, from *L. multiserrata,* among other characters, in the non-serrate lower margin of the carpus of the cheliped. In the shape of the ventral tubercles of the pleon segments, three of the specimens, however, agree more with *L. multiserrata* than with *L. sarsi* or *L. gracilis.*

Variability of the females from Point Barrow

The specimens from off Point Barrow base, Alaska, differ from those taken on the Miscou Bank, Gulf of St. Lawrence. All the females from Point Barrow, with the exception of the female No. 1 mentioned below, have no trace of any lateral process on the telson. The ventral tubercles of the pleon segments are moderately high, *i.e.* they are neither as high nor as low as stated by Hansen for *L. sarsi* and *L. multiserrata* respectively. The carpus of the cheliped is non-crenate and the propus of the same leg has a comb of one long and two short setae on the inner side. The dactylus, with its claw, of the first peraeopod is as long as, or slightly longer than the propus. In other respects, there are some differences.

The specimens were caught at seven different stations, which are here numbered for reference purposes. The females whose characters are discussed are also numbered for the same purposes.

I. Off Point Barrow base, 3.2 miles out; 162 feet; mud, gravel, stones, rocks (few small); 18 February 1950. 3 females (figs. K:1-8).

Female 1 (figs. K:1-2). Propus of cheliped: a small ridge and four small tubercles near the upper margin; upper distal corner with two big tubercles; a row of nine high but narrow tubercles and a long ridge near the lower margin. Dactylus of cheliped strongly and in its proximal part irregularly tuberculate. First peraeopod as in the next female (see fig. K:5). Telson with an obtuse lateral process as in Hansen's *L. sarsi* var. *obtusata*.

Female 2 (figs. K:3-5). Propus of cheliped: upper distal corner with three low tubercles; a row of eight high but narrow tubercles and an arched ridge near the lower margin. Dactylus of cheliped: strongly tuberculate. First peraeopod: merus with a long spine (fig. K:5).

Female 3 (figs. K:6-8). Propus of cheliped: upper distal corner scantily tuberculate or crenate; a row of five very small, narrow tubercles and an irregularly running ridge near the lower margin. Dactylus of cheliped: less strongly tuberculate than in the two preceding females. First peraeopod: merus with a very short, minute ciliated spine (fig. K:8).

II. Off Point Barrow base, 3.2 miles out from Beacon light; 162 feet; mud, gravel, stones, small rocks; 18 February 1950. 6 females (figs. K:9-11).

Female 4. Propus of cheliped: a row of four tubercles near the upper margin; upper distal corner with one tubercle; a row of six moderately high and narrow tubercles limited on either side by a fine ridge. Dactylus of cheliped: strongly and irregularly tuberculate. First peraeopod: spine of merus more than half as long as carpus (fig. K:11).

The other females from this station agree closely with one or other of the four females discussed above.

III. Off Point Barrow base, 5 miles out; 295 feet; rocks, stones, gravel; 11 October 1949. 2 identical females (figs. L:1-3).

Female 5. Propus of cheliped: upper distal corner very scantily crenate; two small ridges but no tubercles near the lower margin. Dactylus of cheliped: slightly crenate in its proximal part. First peraeopod: spine of merus much shorter than carpus (fig. L:3).

IV. Off Point Barrow base, 6 miles out; 341 feet; stones, gravel, rocks (few); 11 October 1949. 4 females which show only slight variations (figs. L:4-6).

Female 6. Propus of cheliped: upper margin smooth; two small ridges near the lower margin. Dactylus of cheliped: slightly crenate in its proximal part and undulated in its distal part. First peraeopod: spine of merus much shorter than carpus (fig. L:6).

V. Off Point Barrow base, 7 miles out; 420 feet; stones, gravel; 9 August 1949. 1 female (figs. L:7-8).

Female 7. Propus of cheliped: upper margin smooth; a small ridge near the lower margin; four very small and indistinct tubercles or ridges nearly perpendicular to the lower margin. Dactylus of cheliped: slightly crenate in its proximal part. First peraeopod: spine of merus much shorter than carpus.

VI. Off Point Barrow base, 8 miles out; 453 feet; rocks, stones, gravel (small amount); 11 October 1949. 10 females (figs. L:9-10), 6 males (one pair in copulation), and 7 manca stages. (The males will be dealt with below).

Female 8. Propus of cheliped: upper margin smooth; a small and very indistinct ridge near the lower margin. Dactylus of cheliped: almost smooth. First peraeopod: spine of merus about one third of the length of the carpus.

The chelipeds of the other females agree with that of the specimen figured. The spine on the merus, however, varies in length, but it never exceeds half the length of the carpus.

I have made a direct comparison between the females of *L. hanseni* — which are deposited in the Zoological Museum of the University, Copenhagen — and the females from the above mentioned stations III-VI. The last mentioned females differ from *L. hanseni* only in the more or less distinct crenation of the dactylus and — in some of the females — also of the upper margin of the propus of the cheliped.

VII. Off Point Barrow base, 4.3 miles out; 216 feet; rocks, stones; 6 October 1949. 4 females.

The females from this station agree with one or other of the females from the two first mentioned stations.

Discussion

Sars' collection of "*Leptognathia longiremis* (Lilljeborg)" contains two quite different types. In one, the upper margin of the dactylus of the cheliped is tuberculate, the propus of the same leg has either a row of six (figs. M:1-2) to nine tubercles or two ridges near the lower margin (the shape of the tubercles and ridges varies greatly.), the upper distal margin of the same joint has from one to five tubercles (fig. M:1) or it is quite smooth (fig. M:2). The spine on the merus of the first peraeopod is sometimes as long as, sometimes much shorter than the carpus. The dactylus of this leg, with its claw, has always about the same length as the propus (fig. M:3). The telson is laterally rounded or provided with a dentiform projection. The specimens of this type belong to *L. gracilis*.

Before dealing with the second type in Sars' collection, it is pertinent to mention some of the specimens in the collection of the Zoological Museum of the University, Copenhagen, and also specimens from the province of Bohus, Sweden.

As pointed out in an earlier paper (Lang 1949, pp. 10-11), Hansen (1909, pp. 230-231) considered *Tanais graciloides* Lilljeborg as identical with *Leptognathia gracilis* (Kröyer). Later, he (Hansen 1913, p. 71) was of the opinion that they represented two different species. However, as pointed out by me (Lang l.c., p. 10), Lilljeborg's species is the same as that which Sars (1882a, p. 43) later described as *Leptognathia laticaudata*, and which he subsequently referred (Sars 1896, p. 31) to his new genus *Tanaopsis*.

In a tube of specimens marked "*Leptognathia gracilis* Kr." from the Copenhagen Museum, there was also a label marked "*Leptognathia graciloides* Lilljeborg, Hauch St. 370". The tube contained eight specimens. In these specimens the telson is without any trace of a lateral protruding keel or dentiform projection; the upper margin of the propus of the cheliped is either indistinctly crenate (figs. M:4-5) or smooth (figs. M:6-8); near the lower margin there is either a row of two to three small tubercles which extend backwards into two ridges (figs. M:4 and 8) or two small ridges only (figs. M:6-7). In this respect the chelipeds of any one specimen may be different (figs. M:6-8). The comb on the propus of the cheliped consists of one long and three shorter spines or setae (fig. M:5). The upper margin of the dactylus of the same leg has four to five small saw-teeth. The spine on the merus of the first peraeopod is distinctly shorter than the carpus; the dactylus with its claw is about as long as the propus (fig. M:9).

In the collection of the Swedish State Museum of Natural History, there is one specimen from Bohus-Malmön, province of Bohus, Sweden, of almost the same shape as the last-mentioned specimens (figs. M:10-12). In this specimen, the upper distal margin of the propus of the cheliped has three saw-teeth and near the lower margin of the same joint there is a row of three triangular tubercles which continues backwards into two ridges (figs. M:10-11). In the first peraeopod (fig. M:12), the spine on the merus is as long as the carpus, and the dactylus with its claw as long as the propus. The ventral tubercles on the pleon segments are moderately high, the telson laterally rounded. A similar form is mentioned by Zirwas (1911, p. 79). All these forms belong to *L. gracilis*.

The extreme forms of the females described in this paper differ considerably from one another. They are, however, related with each other by transitional forms, so that there can be no doubt that they belong to the same species, *Leptognathia gracilis*. It is quite clear that the form of the telson, the size of the ventral tubercles on the pleon segments, the shape of the cheliped, the tuberculation or crenulation of the upper distal margin of the propus and of the dactylus of the cheliped, the presence or absence of a row of tubercles near the lower margin of the propus of the same leg, and also the length of the spine on the merus of the first peraeopod, are of no specific value. All the forms, however, have two characters in common by which they markedly differ from *L. longiremis* (Lilljeborg). The ratio between the length of the propus and the dactylus (with its claw) of the first peraeopod is 0.95 ± 0.02 with a standard deviation of 0.05, and the propus of the same leg is never provided with spines along its posterior margin.

Many of the specimens referred to *L. longiremis* by different authors undoubtedly belong to *L. gracilis*, and it is therefore not possible to decide at present whether subspecies of the latter species exist.

The second type in Sars' collection may now be considered. This is the true *Leptognathia longiremis* (Lilljeborg).

In this species the telson is always laterally rounded; the upper margin of the dactylus of the cheliped is smooth; the propus of the same leg has no tubercles but one to two ridges 1) near the lower margin (figs. N:1-4) and its upper distal margin is smooth; the comb on the inner side consists of one long and three to four shorter spines

1) That these ridges have not been seen by others is probably due to the fact that the cheliped has been studied under too low magnification.

or setae.The first peraeopod (figs. N:5-10) has, in all the specimens studied by me (469 females from all parts of its geographical range), some spines on the propus (Their number seems to be quite variable, and it is generally very difficult to detect them.) ; the propus is always distinctly shorter than the dactylus with its claw (The ratio between these joints is 1.44 $\pm$ 0.07, standard deviation of 0.10) ; the spine on the merus is always about as long as the carpus.

The males

Sars' (1896, p. 27, pl. XII, fig. p 1 ♂) description and figure of the cheliped of the male of "*Leptognathia longiremis*" is incorrect. He has figured it, no doubt, in a somewhat oblique position, this being the reason for the narrowness of the propus.

I cannot, however, decide whether I have seen the male of *L. gracilis* or that of *L. longiremis* in Sars' collection. In one sample labelled "Norw. merid.", there was one male (figs. O-P) as well as many females of both *L. gracilis* and *L. longiremis*. From the same sample, Sars had separated seven males in a tube. In all these males the propus of the cheliped is much broader (figs. O:1-4) than is shown by Sars, although its shape agrees very well with his figure if the appendage is placed in an oblique position.

The cheliped has no serrations, the upper margin of the finger and the lower margin of the dactylus is finely saw-teethed. The propus has a comb of eleven to fifteen spines or setae on the inner side (figs. O:2 and 4). The antennulae (figs. O:5-6) of the same male may differ. The antennae are seven-jointed and of the same form as shown in fig. Q:5. In the first three pairs of peraeopods (figs. P:1-3), the propus is as long as, or somewhat longer, in the last three pairs (figs. P:4-6) much shorter, than the dactylus with its claw. The setae on the pleopods (fig. P:7) are longer than those of the females. The uropods (fig. P:8) have a two-jointed exopodite; the endopodites are sometimes two- (this seems to be the rule.), sometimes three-jointed (sometimes different numbers on the right and left uropod). The telson is posteriorly narrowly produced.

The subadult male from station HEC 2 (cf. table II), Miscou Bank, differs from the females only in having the antennula five-jointed.

The sample from station VI, off Point Barrow base, contains six males, among them one in the copulatory position. These males differ from all males of *Leptognathia* hitherto described by having the dactylus of the cheliped either more or less distinctly crenate. In one of them (fig. Q:1-2), the lower margin of the propus of the cheliped is irregularly crenate. The comb consists of twelve to fifteen spines or setae (fig. Q:3). The terminal joint of the antennula (fig. Q:4) is much shorter than in the males from Norway. The antenna is seven-jointed (fig. Q:5). The interrelative length of the propus and the dactylus of the peraeopods, with its claw, (figs. Q:6-11) is the same as in the males from Norway. The endopodites of the uropods are in some specimens two-, in others more or less distinctly three-jointed, and in the same specimen they may be different (fig. Q:12).

Distribution and occurrence

Alaska. Off Point Barrow base: 3.2 miles out, 162 feet, mud, gravel, stones, few small rocks; 3.2 miles out from Beacon light, 162 feet, mud, gravel, stones, small rocks: 4.3 miles out, 216 feet, rocks, stones; 5 miles out, 295 feet, rocks, stones, gravel; 6 miles out, 341 feet, stones, gravel, few rocks; 7 miles out, 420 feet, stones, gravel; 8 miles out, 453 feet, rocks, stones, gravel (United States National Museum, Washington).

Canada. Gulf of St.Lawrence, Miscou Bank, entrance to Baie des Chaleurs, at nine close stations, and in Baie des Chaleurs, between Port-Daniel, Québec, and Shippigan Island, New Brunswick (For complete data pertaining to the collection made at these ten localities, cf. table II.) (Station de Biologie marine, Grande-Rivière).

West Greenland. Karajak Fjord, about 70°24'N (Vanhöffen 1907); probably Egedesminde; Ameragdla, muddy bottom; mouth of Ameralik Fjord, near Godthaab, 5-70 fathoms, shells; Kekertak, 69°58'N, 35-40 fathoms, clay (Hansen 1913).

East Greenland. 77°9'N-14°40'E, 90 metres, soft gray clay; 74°35'N-18°23'W, south of Little Pendulum Island, 18-21 metres, sandy mud, algae

(Ohlin 1901); 74 1/3°N, 3-5 fathoms; north of Stewart Land, about 70½°N, 158 fathoms; Denmark Island, 70°27'N; Turner Sound, 69°44'N, 3 fathoms; Cape Dalton, 69°24.6'N, 9-11 fathoms; Angmagsalik, 65°51'N; Tasiusak, 65°37'N, 20-30 fathoms, stones with algae (Hansen 1913).

Iceland. 64°07'N-11°12'W, 237 fathoms, temp. 2.5°C; 67°40'N-15°40'W, 495 fathoms, temp. -0.6°C; 67°19'N-15°52'W, 293 fathoms, temp. -0.5°C; 66°50'N-20°02'W, 194 fathoms, temp. 0.6°C; Breidals Vig, 6 fathoms, mud and black sand; Seydis Fjord, 6 fathoms, black sand; Bakke Fjord, 8-10 fathoms, black sand (Hansen 1913); Reykjavik Harbour (Sars 1877, 1885).

Spitsbergen. Belsund, among algae (Kröyer 1842, 1847).

Franz Josef Land. Vicinity of Cape Flora (Scott 1899).

Novaya Zemlya. Goose Fjord (Sars 1909).

Kara Sea. 71°34'N-64°22'E, 50 fathoms, grayish-brown clay with small stones and ferriferous concrements (Hansen 1913).

Norway. From Oslo Fjord to Vadsö (Sars 1896).

Sweden. Bohus-Malmön, 50 metres, and Gullmar Fjord, 30-90 metres (coll. Bock and Lang, respectively); Province of Bohus (Swedish State Museum of Natural History).

Faroes. Klagsvig, 10-15 fathoms (Hansen 1913).

Scotland. "From various parts of the Scottish coast" (Scott 1899); in deep water off Aberdeen and in the Moray Firth (Scott 1901); North Berwick; Musselburgh; in the neighbourhood of Bass Rock (Scott 1906).

Skagerak. Skagen's lightship, 110-125 fathoms, ooze (Meinert 1890).

North Sea. 54°49'N-5°30'E, 42 metres, sandy ooze (Zirwas 1911).

NOTES ON SPECIES FROM THE PACIFIC COAST

Dr. T.H. Butler, Pacific Biological Station, Nanaimo, British Columbia, has kindly lent me specimens of the following species mentioned by Fee (1926): *Leptochelia dubia* (Kröyer), *Leptochelia filum* (Stimpson), *Tanais normani* Richardson, *Paratanais nanaimoensis* Fee, and *Heterotanais melacephala* Fee.

Fee's determination of the first three of these species is correct. *Tanais normani* belongs, however, to the genus *Anatanais* Nordenstam.

It is evident that Fee did not study Hansen's (1913) work on the tanaids from the Danish Ingolf-Expedition. Otherwise he would have found that *Paratanais nanaimoensis* is identical with *Pseudotanais oculatus* Hansen, and *Heterotanais melacephala*, identical with *Heterotanais groenlandicus* Hansen. By a comparison with Hansen's type specimens, I have been able to confirm the identity of these species.

Fee (l.c., p. 11) collected *Leptognathia longiremis* (Lilljeborg) "from sandy mud in Departure Bay, 15 to 20 fathoms; from gray mud in Pylades channel, 30 fathoms; and from sponge beds off Snake Island, 25 fathoms". In fact, these specimens most probably belong to *L. gracilis* (Kröyer).

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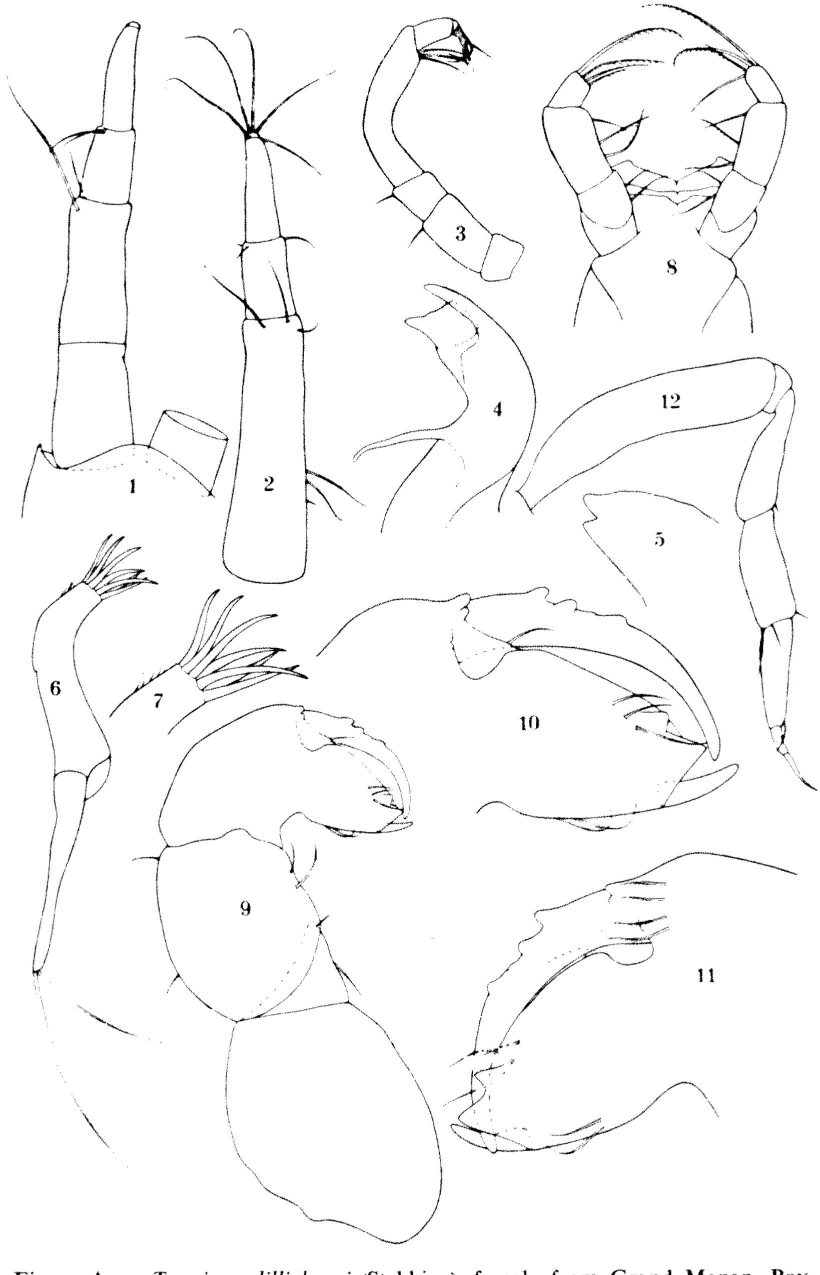

Figure A — *Tanaissus lilljeborgi* (Stebbing), female from Grand Manan, Bay of Fundy. 1. Rostrum and antennula, 175X. 2. Antennula, 175X. 3. Antenna, 175X. 4. Left mandible, 300X. 5. Pars incisiva of the right mandible, 300X. 6. Maxillula, 300X. 7. Distal part of the maxillula, 500X. 8. Maxilliped, 245X. 9. Cheliped, 140X. 10. Distal part of the cheliped, outer side, 300X. 11. Distal part of the cheliped, inner side, 300X. 12. First peraeopod, 175X.

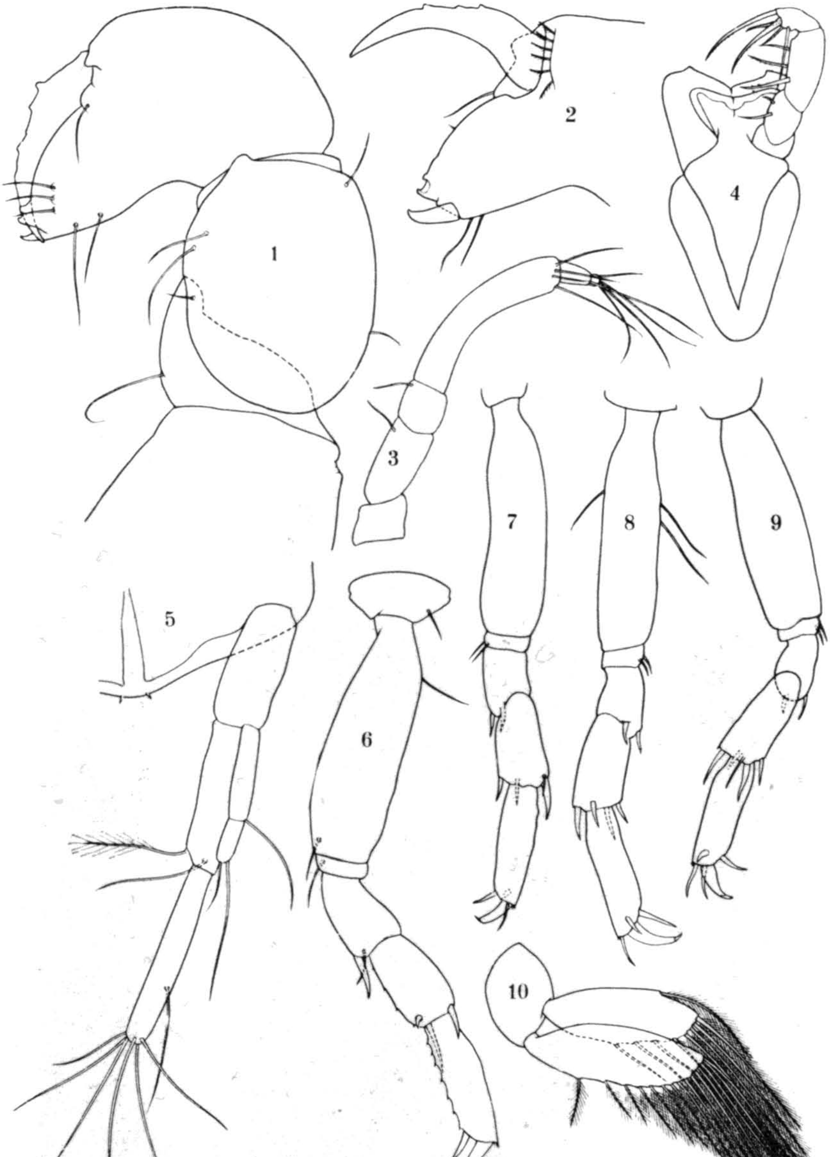

Figure B — *Tanaissus lilljeborgi* (Stebbing), female from the Gullmarfjord, Province of Bohus, Sweden. 1. Cheliped. 2. Distal part of the cheliped, inner side. 3. Antenna. 4. Maxilliped. 5. Posterior part of the telson, with uropod. 6-9. Third to sixth peraeopods. 10. Pleopod. All figures: 172X

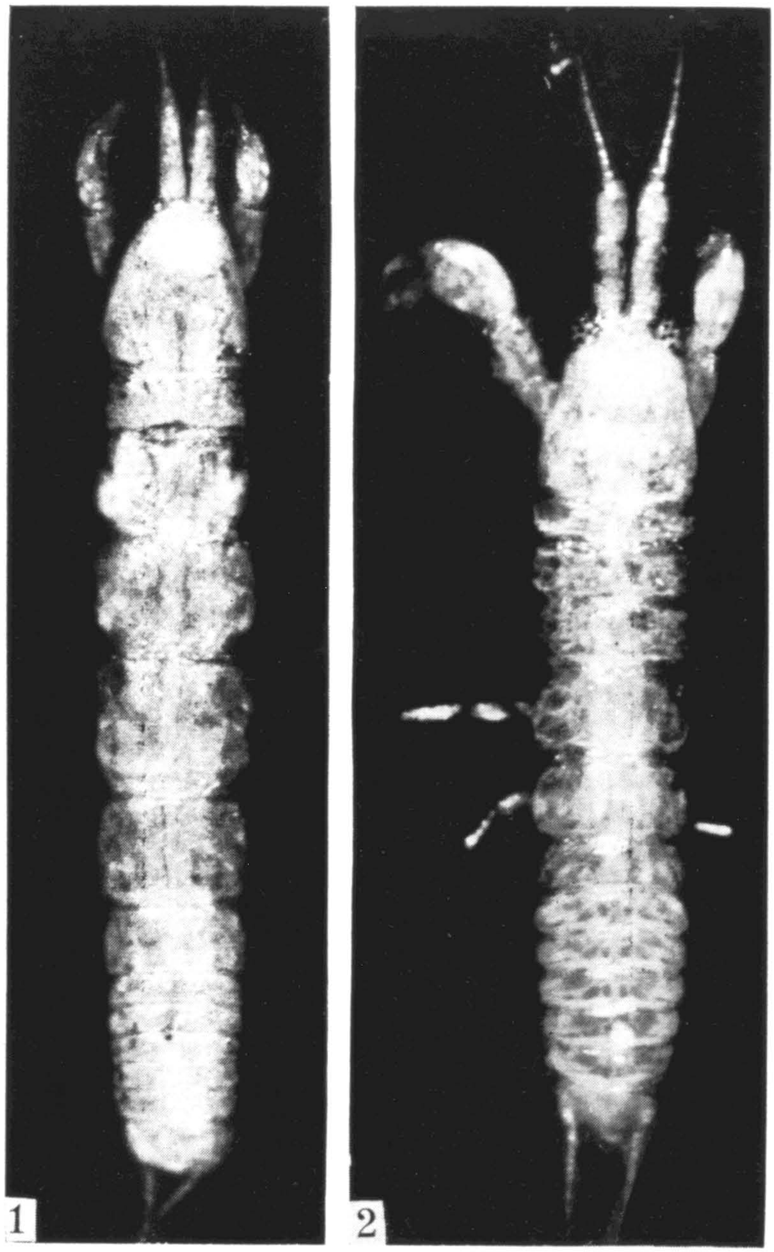

Figure C — *Leptochelia filum* (Stimpson). 1. Female, 38X. 2. Male, 52X.

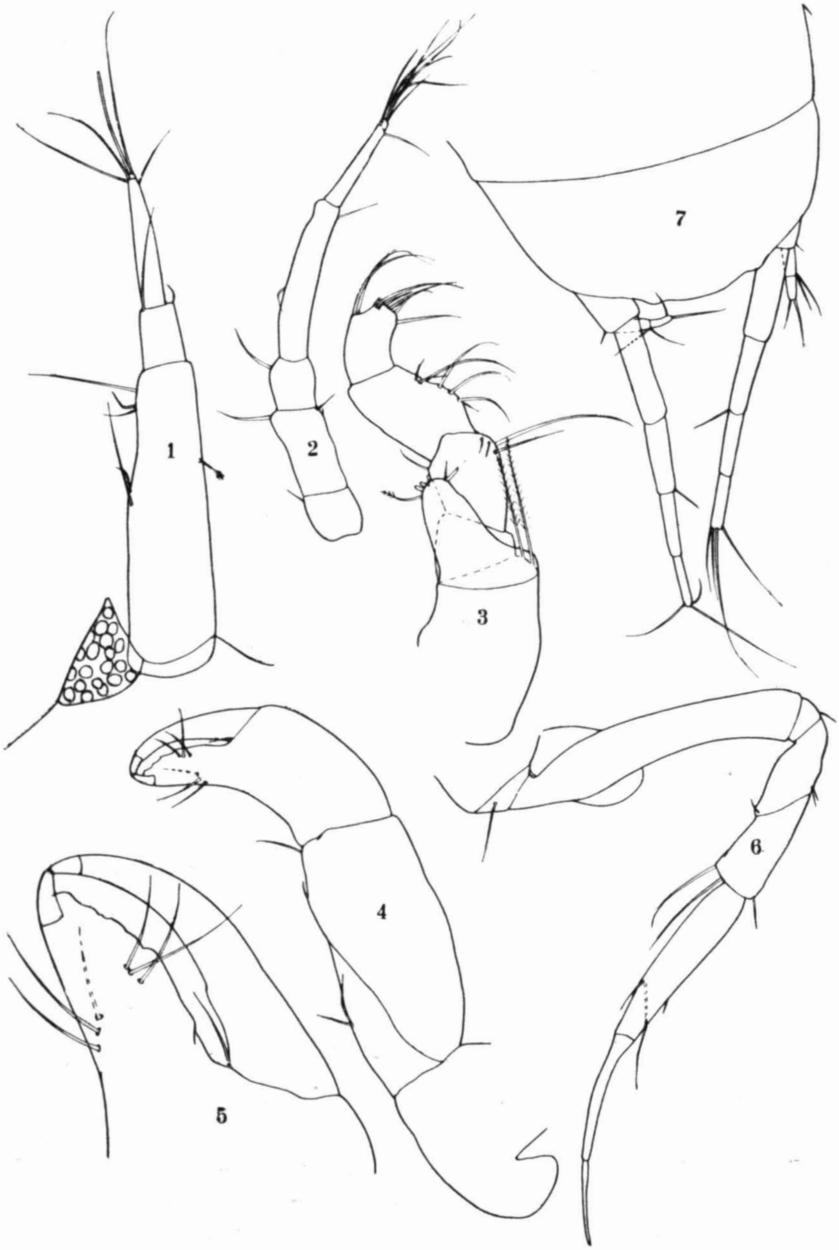

Figure D — *Leptochelia filum* (Stimpson), female from the Wolves Islands, Bay of Fundy. 1. Eye and antennula, 175X. 2. Antenna, 175X. 3. Maxilliped, 245X. 4. Cheliped, 120X. 5. Distal part of the cheliped, 300X. 6. First peraeopod, 175X. 7. Telson and uropod, 175X.

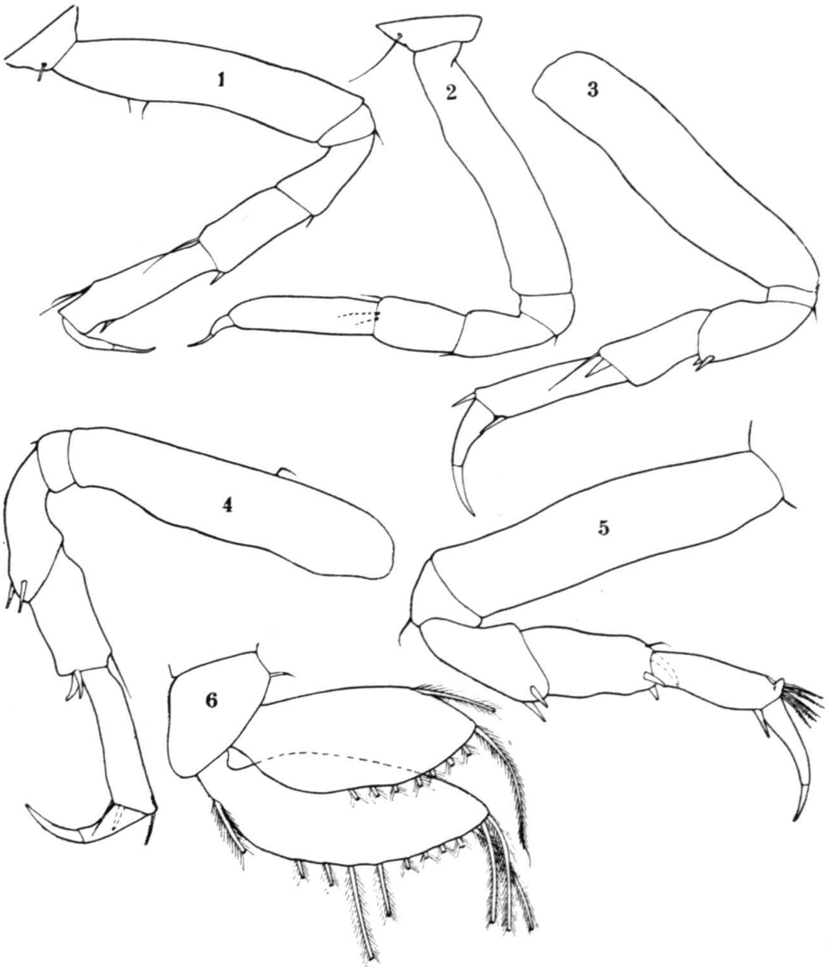

Figure E — *Leptochelia filum* (Stimpson), female from the Wolves Islands, Bay of Fundy. 1. Second peraeopod, 245X. 2. Third peraeopod, 245X. 3. Fourth peraeopod, 245X. 4. Fifth peraeopod, 245X. 5. Sixth peraeopod, 245X. 6. Pleopod, 300X.

Figure F — *Leptochelia filum* (Stimpson), male. 1. Carapax, 175X. 2. Telson and uropod, 175X. 3. Antennula, 175X. 4. Cheliped, outer side, 140X. 5. Propus and dactylus of the cheliped, inner side, 140X. 6. Dactylus and finger of the cheliped of a male referred by Wallace (1919) to *L. profunda,* 245X.

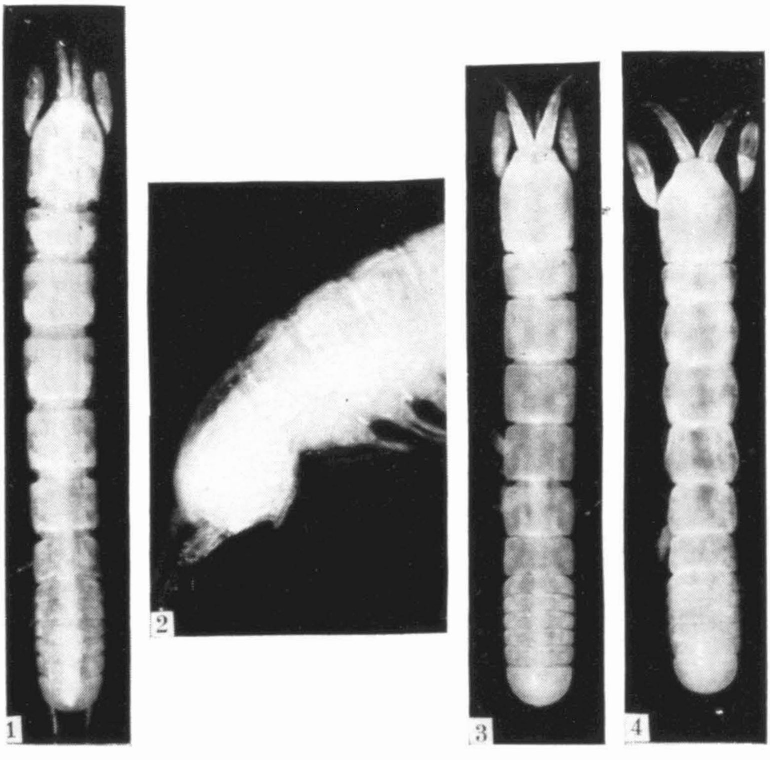

Figure G — *Leptognathia gracilis* (Kröyer). 1. Female from the Miscou Bank, Baie des Chaleurs (station HEC 42), 20X. 2. Telson of the same from the right side, 87X. 3. Female from the collection of Sars (telson with an acute lateral process as in fig. G:2), 28X. 4. Female from the same collection (telson as in fig. G:2), 28X. The sample is labelled "Norw. merid.". Observe the different shape of the carapax and of the peraeon segments.

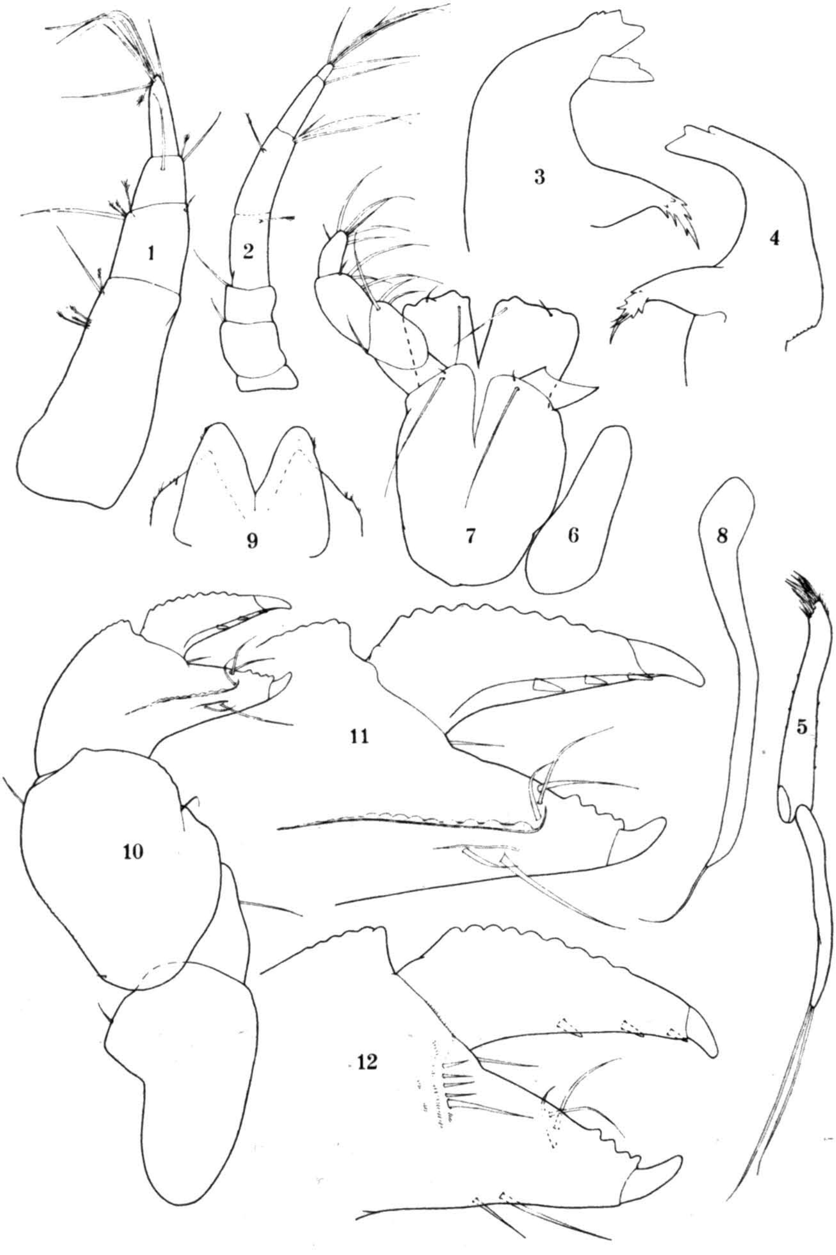

Figure H — *Leptognathia gracilis* (Kröyer), female from the Miscou Bank, Baie des Chaleurs (The same specimen as in fig. G:1). 1. Antennula, 110X. 2. Antenna, 110X. 3. Left mandible, 245X. 4. Right mandible, 245X. 5. Maxillula, 140X. 6. Maxila, 140X. 7. Maxilliped, 140X. 8. Epignath, 140X. 9. Labrum, 140X. 10. Cheliped, 110X. 11. Distal part of the cheliped ,outer side, 245X. 12. Distal part of the cheliped, inner side, 245X.

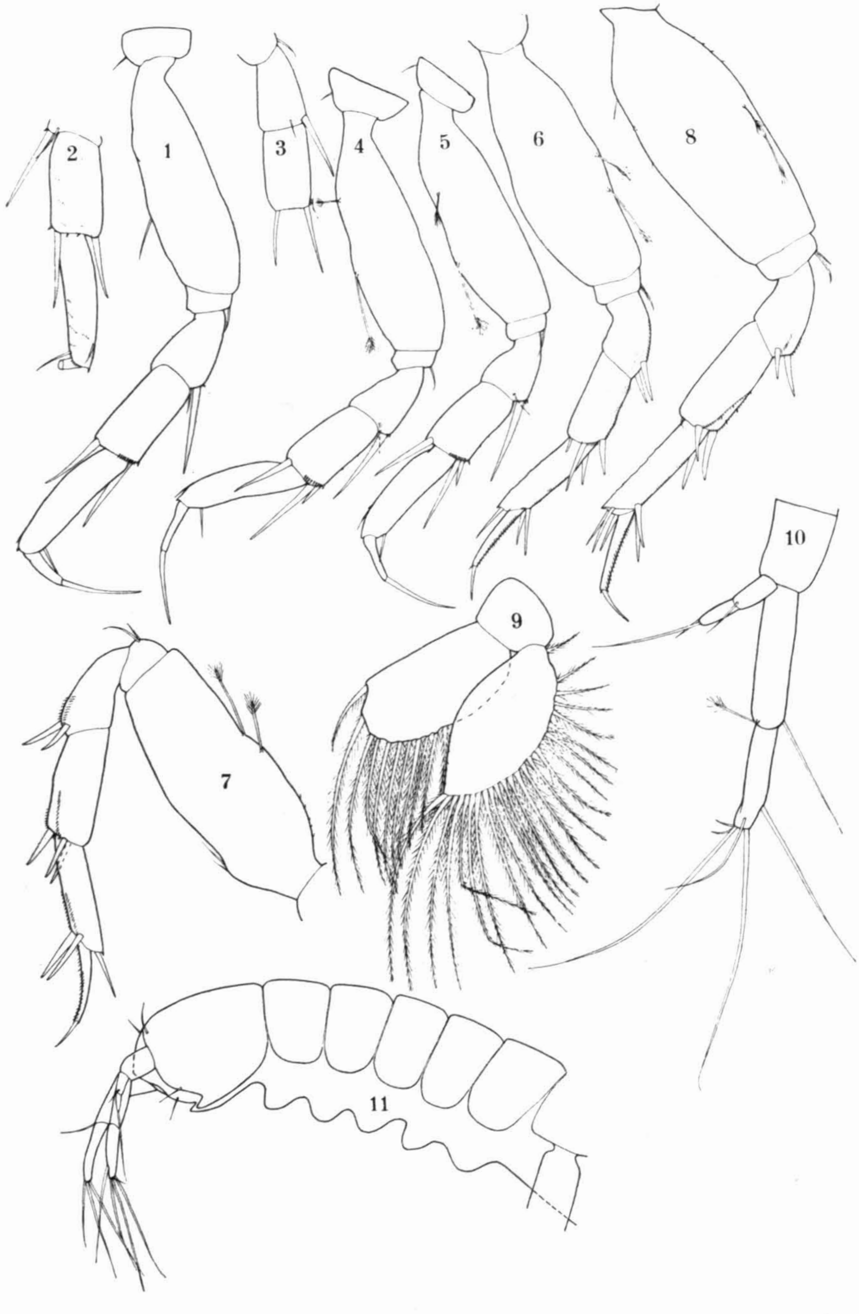

Figure I — *Leptognathia gracilis* (Kröyer), the same female as in fig. H. 1. Right first peraeopod, outer side, 140X. 2. Carpus and propus of the same, inner side, 140X. 3. Merus and carpus of the left first peraeopod, 140X. 4-8. Second to sixth peraeopods, 140X. 9. First pleopod, 140X. 10. Uropod, 140X. 11. Pleon segments, telson and uropods, lateral view, 70X.

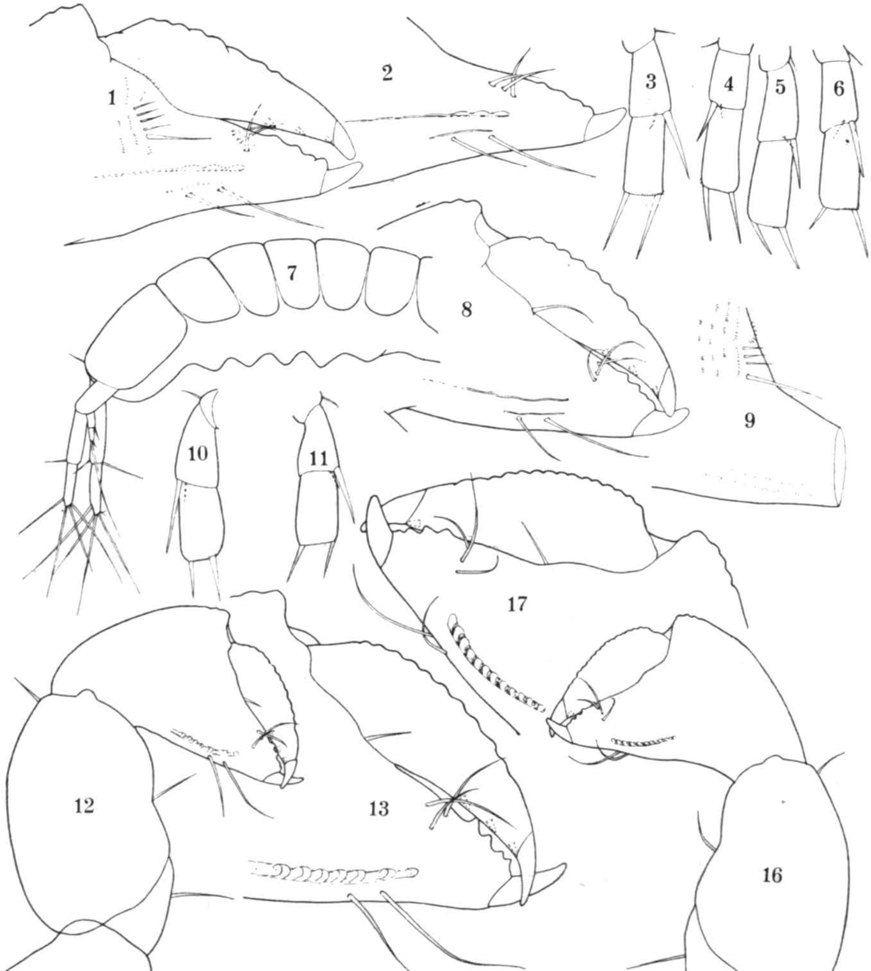

Figure J — *Leptognathia gracilis* (Krőyer), females from the Miscou Bank, Baie des Chaleurs. 1. Propus and dactylus of the cheliped, inner side (station HEC 81), 245X. 2. Finger of the cheliped, outer side (station HEC 81), 245X. 3-4. Merus and carpus of the left and right first peraeopod of the same specimen, 140X. 5-6. Merus and carpus of the first peraeopod of the other two specimens from station HEC 81, 140X. 7. Pleon segments, telson and uropods, lateral view (station HEC 1), 70X. 8. Propus and dactylus of the cheliped ,outer side (station HEC 1), 245X. 9. Comb of the cheliped (station HEC 1), 245X. 10-11. Merus and carpus of the first peraeopod from two specimens (station HEC 1), 140X. 12-15. Right and left chelipeds of one specimen (station PB 1); figs. 12 and 14: 110X, 13 and 15: 245X. 16. Cheliped (station HEC 15), 90X. 17. Distal part of the same, 175X.

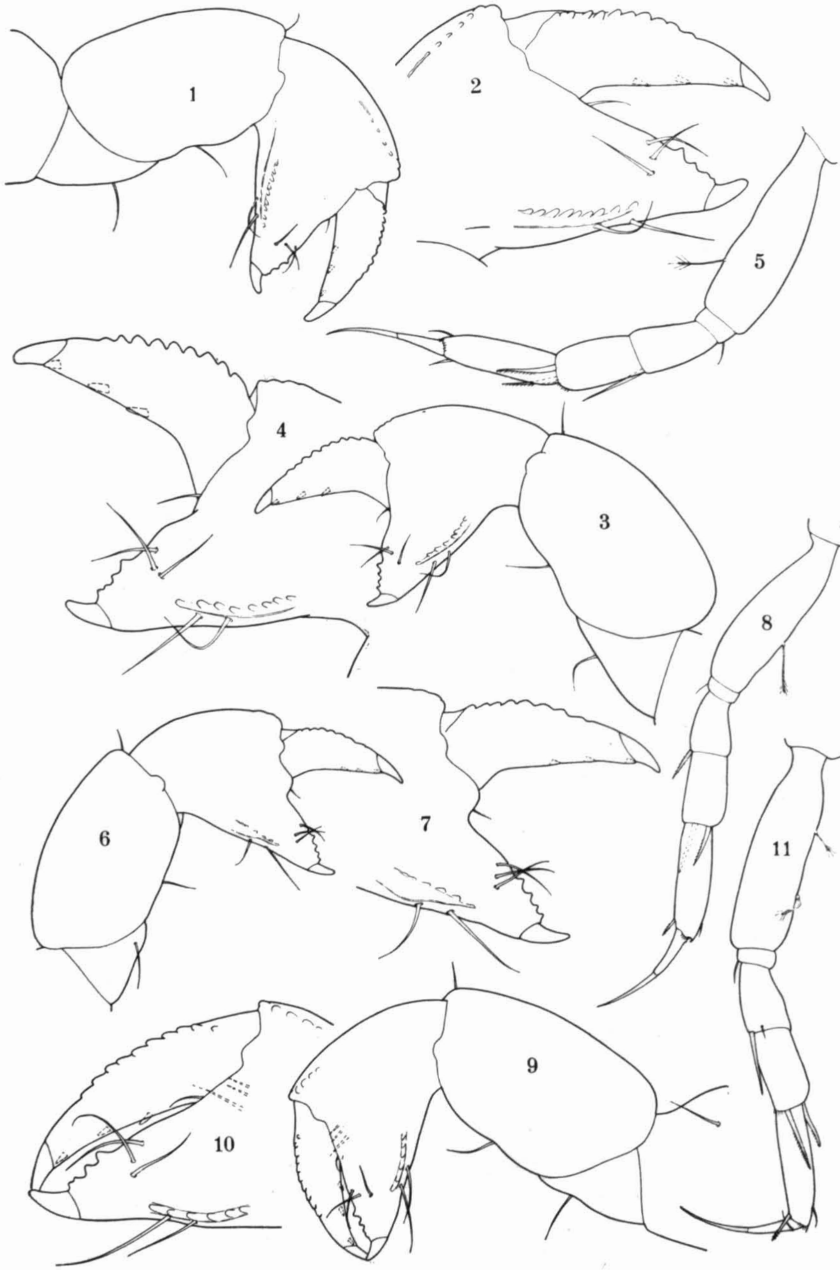

Figure K — *Leptognathia gracilis* (Krôyer). Females from off Point Barrow base, Alaska. 1. Cheliped (female 1, station I). 140X. 2. Propus and dactylus of the same. 245X. 3. Cheliped (female 2, station I). 140X. 4. Propus and dactylus of the same. 245X. 5. First peraeopod of the same. 175X. 6. Cheliped (female 3, station I). 140X. 7. Propus and dactylus of the same. 245X. 8. First peraeopod of the same. 175X. 9. Cheliped (female 4, station II). 140X. 10. Propus and dactylus of the same. 245X. 11. First peraeopod of the same. 175X.

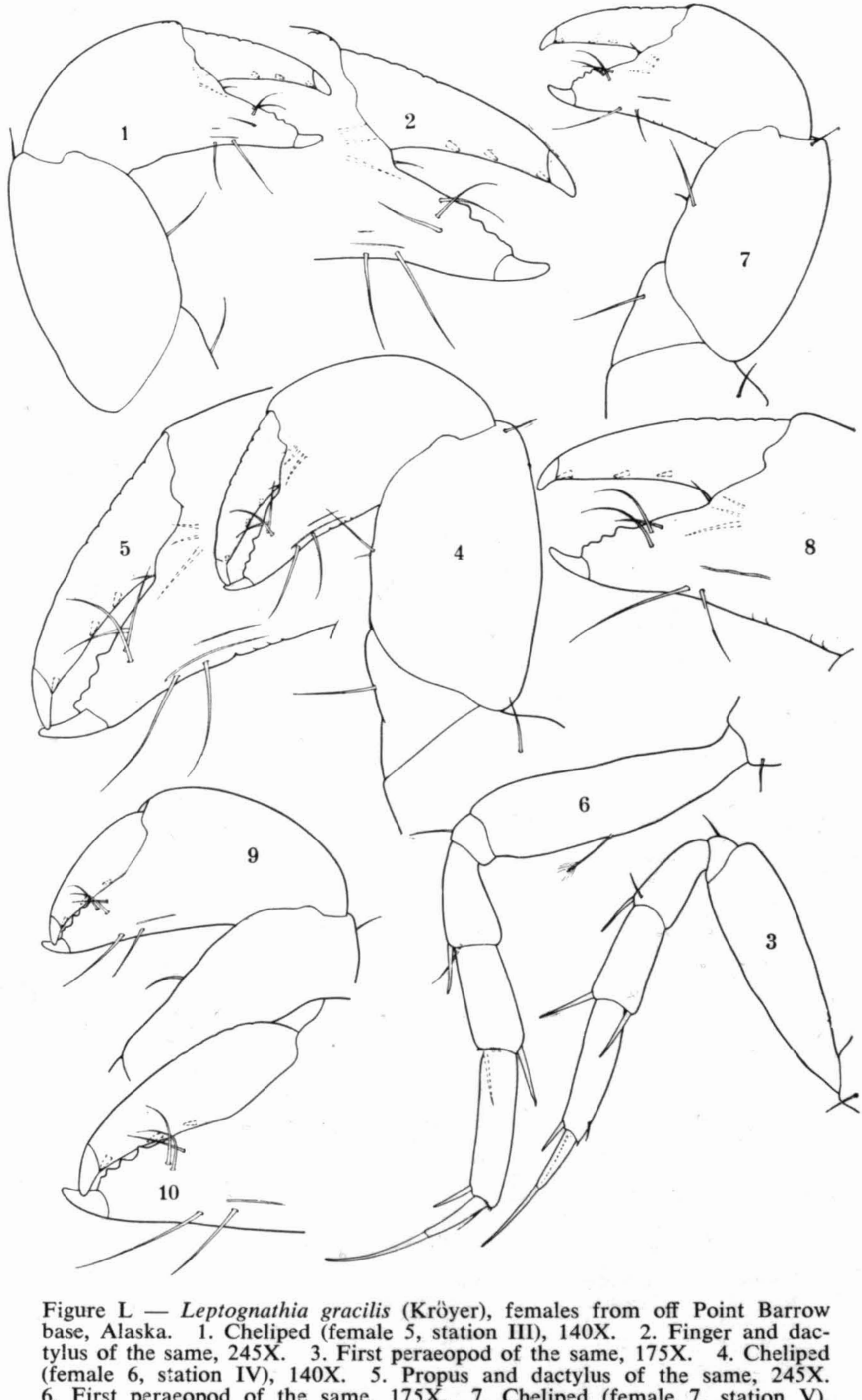

Figure L — *Leptognathia gracilis* (Kröyer), females from off Point Barrow base, Alaska. 1. Cheliped (female 5, station III), 140X. 2. Finger and dactylus of the same, 245X. 3. First peraeopod of the same, 175X. 4. Cheliped (female 6, station IV), 140X. 5. Propus and dactylus of the same, 245X. 6. First peraeopod of the same, 175X. 7. Cheliped (female 7, station V), 140X. 8. Propus and dactylus of the same, 245X. 9. Cheliped (female 8, station VI), 140X. 10. Propus and dactylus of the same, 245X.

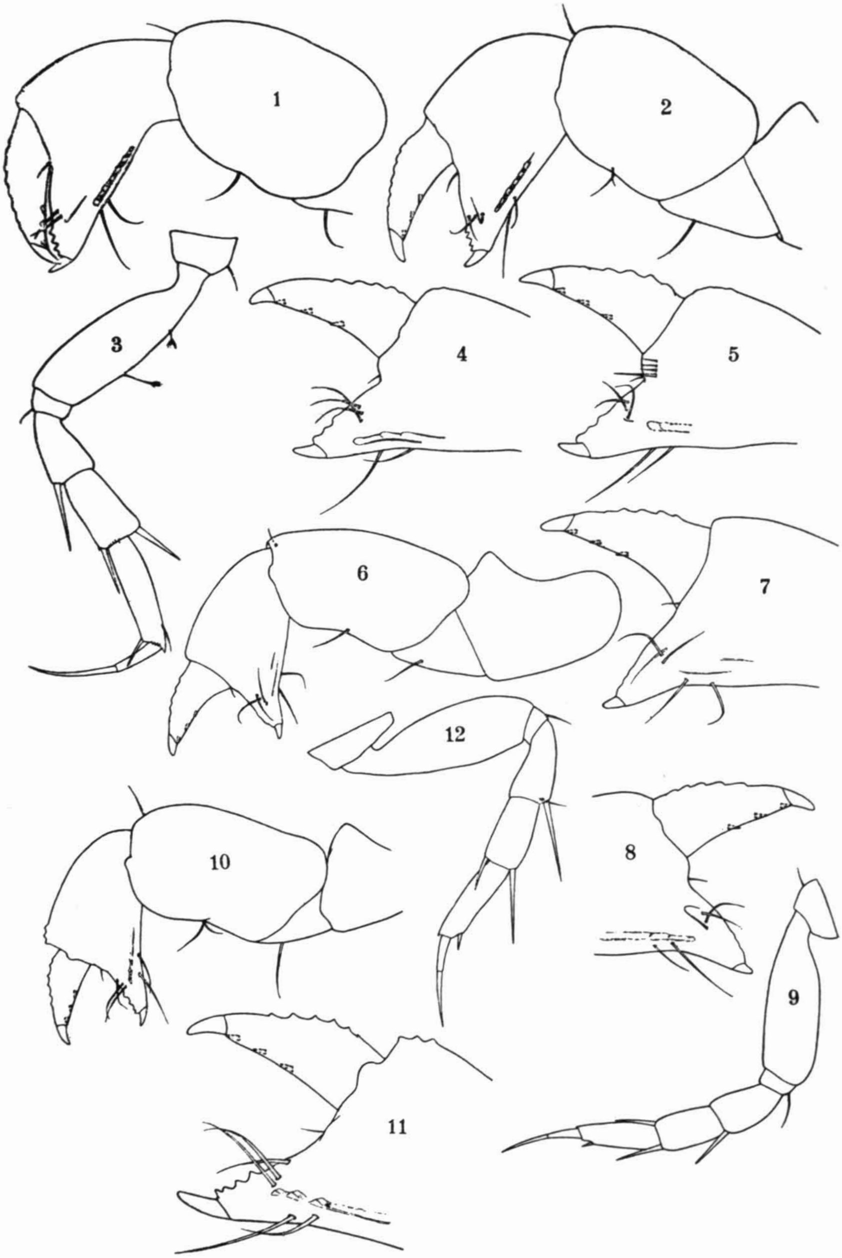

Figure M — *Leptognathia gracilis* (Kröyer). 1-3. Females from Reykjavik, Iceland. 1. Cheliped, 130X. 2. Cheliped, 110X. 3. First peraeopod, 140X. 4-9. Females, "Hauchs" Togter, station 370. 4. Propus and dactylus of the cheliped, outer side, 245X. 5. The same, inner side, 245X. 6. Left cheliped of another female, outer side, 140X. 7. Propus and dactylus of the same, 245X. 8. Propus and dactylus of the right cheliped of the same female as in figs. M:6 and M:7, outer side, 245X. 9. First peraeopod of the same, 175X. 10. Cheliped of a female from Bohus-Malmön, Sweden, 140X. 11. Propus and dactylus of the same, 300X. 12. First peraeopod of the same, 175X.

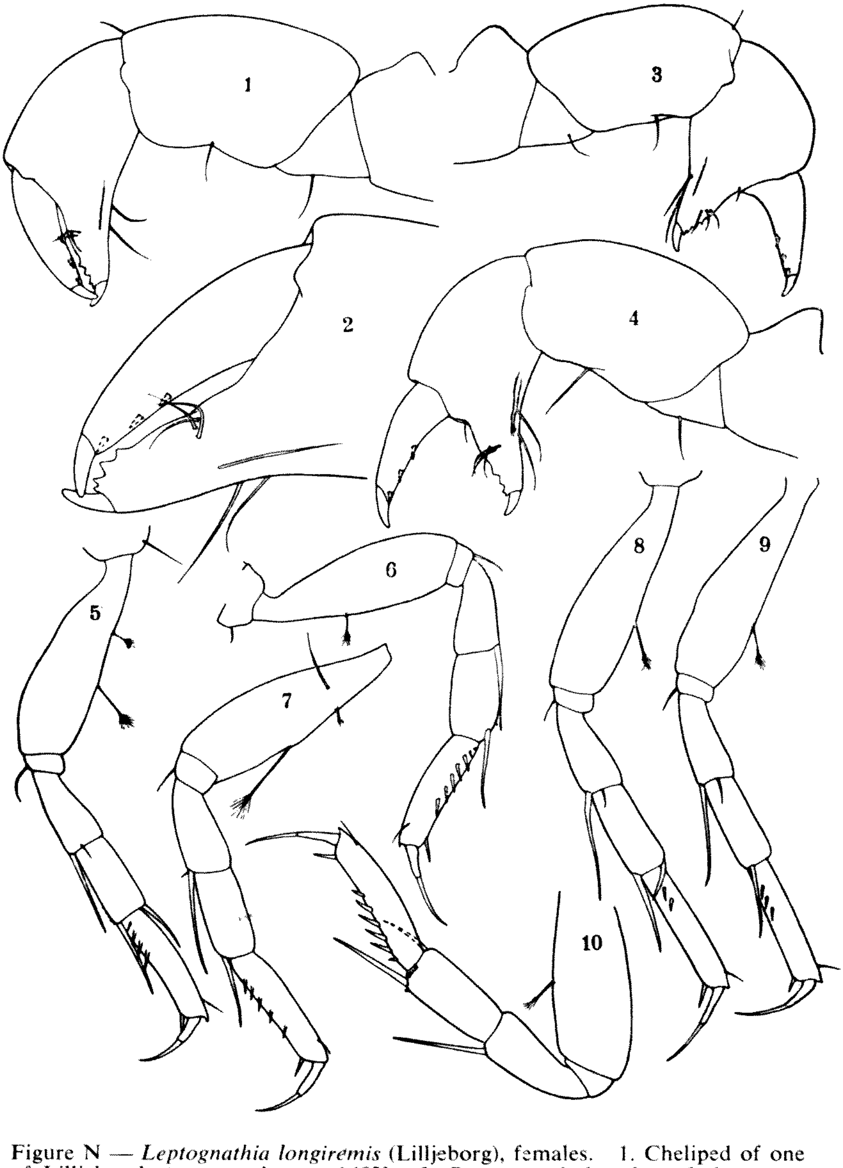

Figure N — *Leptognathia longiremis* (Lilljeborg), females. 1. Cheliped of one of Lilljeborg's type specimens, 140X. 2. Propus and dactylus of the same, 300X. 3-4. Chelipeds of two specimens from Reykjavik, Iceland, 140X. 5. First peraeopod of the same specimen as in fig. N:1, 175X. 6. First peraeopod of the same specimen as in fig. N:4, 175X. 7-10. First peraeopod of four specimens from the Gullmarfjord, Sweden, 175X.

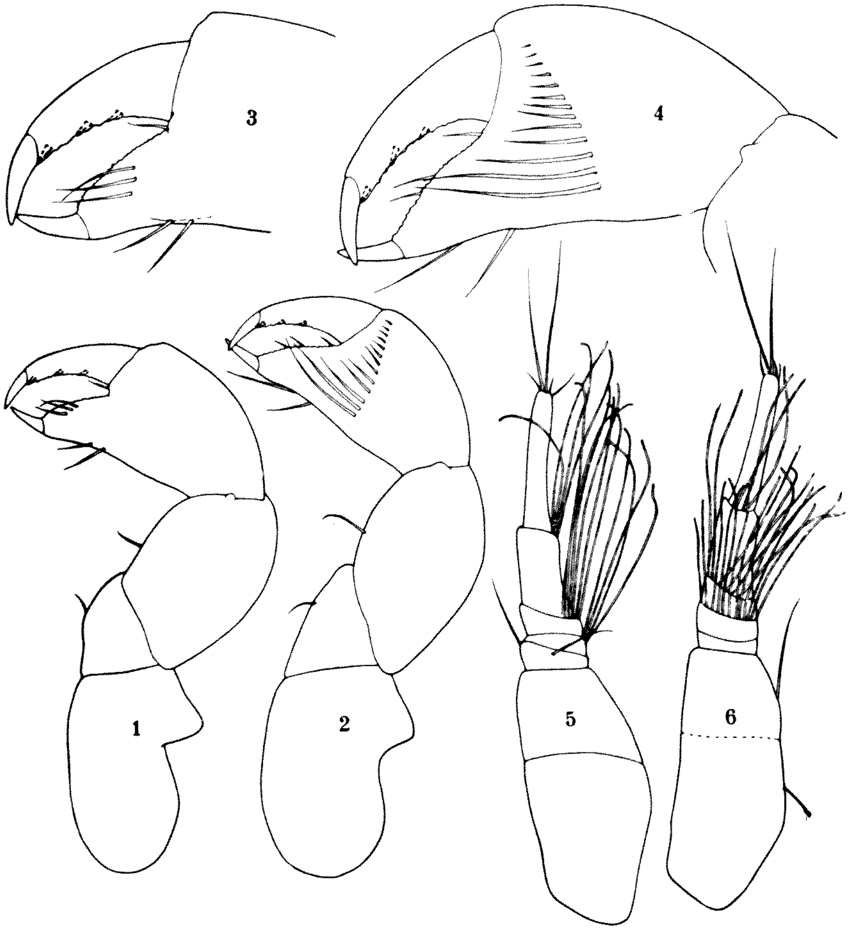

Figure O — *Leptognathia gracilis* (Kröyer) or *L. Longiremis* (Lilljeborg), male from Sars' collection, labelled "Norw. merid.". 1. Cheliped, outer side, 140X. 2. The same, inner side, 140X. 3. Propus and dactylus of the same, outer side, 245X. 4. The same, inner side, 245X. 5-6. Antennulae of the same male, 140X.

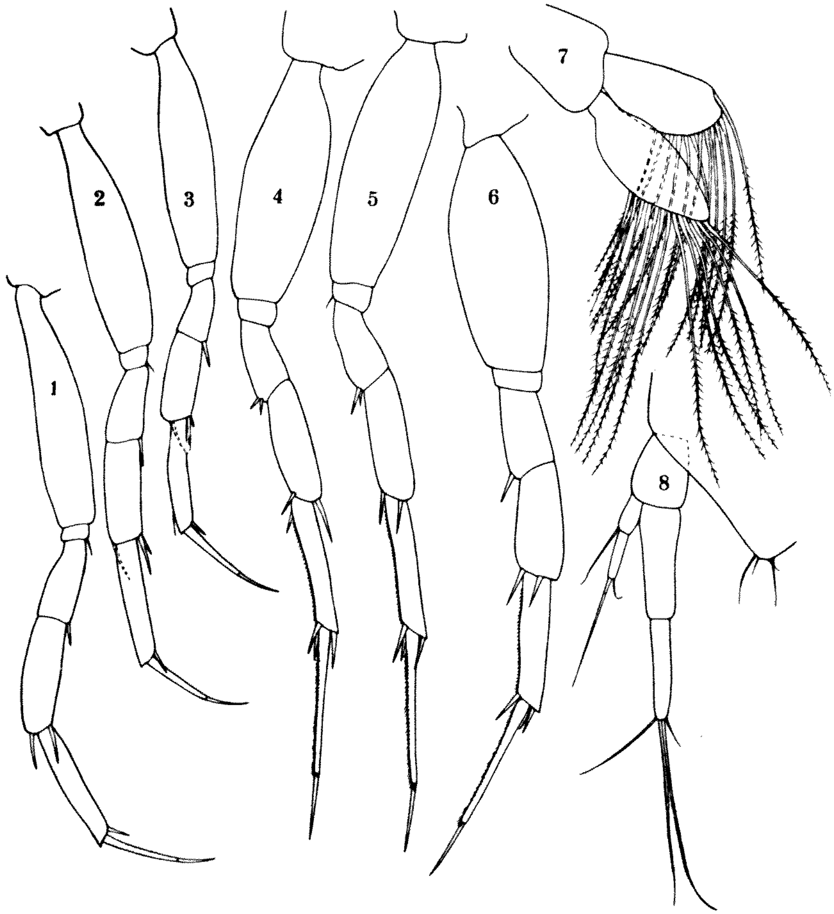

Figure P — *Leptognathia gracilis* (Kröyer), the same male as in fig. O. 1. First peraeopod, 140X. 2. Second peraeopod, 140X. 3. Third peraeopod, 140X. 4. Fourth peraeopod, 140X. 5. Fifth peraeopod, 140X. 6. Sixth peraeopod, 140X. 7. Pleopod, 175X. 8. Uropod, 175X.

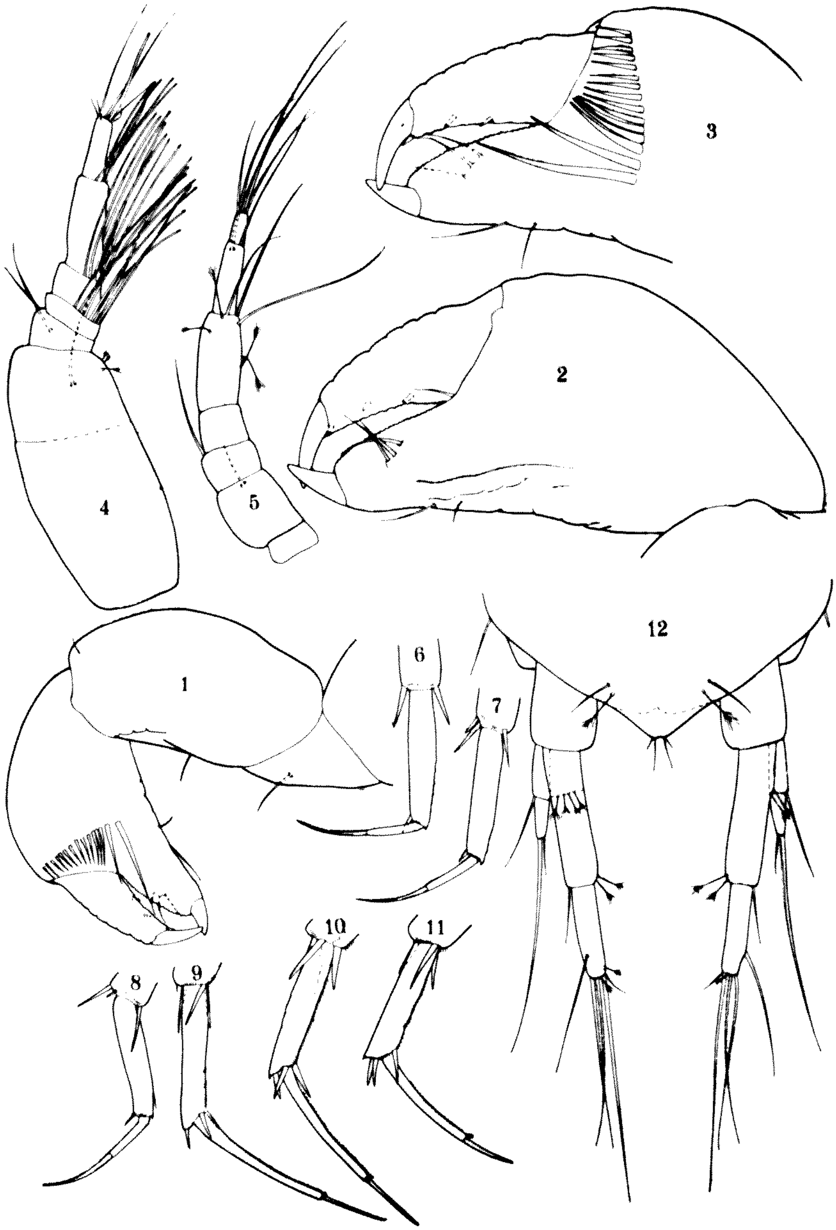

Figure Q — *Leptognathia gracilis* (Kröyer), male from Point Barrow base, Alaska, station VI. 1. Cheliped, inner side, 140X. 2. Propus and dactylus of the same, outer side, 245X. 3. The same, inner side, 245X. 4. Antennula, 140X. 5. Antenna, 175X. 6-11. Propus and dactylus of the first to the sixth peraeopods 140X. 12. Telson and uropods, 175X.

TABLE I

COMPARISON OF CHARACTERS OF THE SPECIES OF **Leptognathia** BELONGING TO THE FIRST SUBGROUP OF HANSEN'S (1913) "**Sarsii**- OR **longiremis**-GROUP" AND OF **L. hanseni** VANHÖFFEN

		L. multiserrata Hansen	**L. sarsi** Hansen	**L. gracilis** Kröyer	**L. graciloides** Hansen	**L. hanseni** Vanhöffen
Lateral process of telson		absent	Present, either acute, or short and obtuse, or very short and rounded (var. **obtusata**)	absent	absent	absent
Ventral protuberances of the pleon segments		Rounded and somewhat low	High and strong	High and strong	Moderately strong (Personnal observation)	High and strong
Carpus of cheliped, saw-teeth along proximal part of posterior margin		Present: low and rounded	absent	absent	absent	absent
Propus of cheliped	Crenulation of upper margin	6 rounded saw-teeth	4-7 sharp or rounded, small saw-teeth	Distinct or rudimentary	Present or absent (Personnal observation)	absent
	Row of saw-teeth or tubercles near lower margin	absent	8-9 protruding teeth	absent	tubercles	absent
Dactylus of cheliped, anterior margin		Row of conspicuous rounded saw-teeth along major part of proximal half	Half or more than half is crenulate	A longer or shorter part is distinctly crenulate	With only about 5 sharp saw-teeth	smooth
First peraeopod	Posterior distal spine on merus	Longer than carpus	Conspicuously shorter than carpus	Considerably shorter than carpus	About as long as carpus	Much shorter than carpus
	Claw of dactylus	A little shorter than propus	Slightly or distinctly longer than propus	A little or conspicuously longer than propus	As long as propus (Personnal observation)	A little or very conspicuously longer than propus

TABLE II

DATA FOR THE COLLECTING STATIONS OF THE STATION DE BIOLOGIE MARINE WHERE **Leptognathia gracilis** (KRÖYER) WAS TAKEN, IN BAIE DES CHALEURS (PB) AND ON MISCOU BANK (HEC)

Collecting apparatus : Holme bottom sampler

Sta. no.	Position	Depth (fathoms)	Nature of bottom	Bottom temperature	Date	Material
HEC 1	64°20'15''W-48°12'15''N	32	Mud		30 August 1954	5 females 3.2 mm. long 2 females 2.9 mm. long
HEC 2	64°20'15''W-48°11'15''N	29	Sand and mud	2.3°C	12 August 1953	1 female 1 subadult male
HEC 3	64°20'15''W-48°10'15''N	24	Sand and mud	0.95°C	13 August 1953	1 female
HEC 15	64°18'50''W-48°11'45''N	30	Sand and mud		12 August 1953	7 females
HEC 17	64°18'45''W-48°9'15''N	18	Sand and pebbles	1.4°C	28 August 1953	3 females
HEC 28	64°17'15''W-48°11'15''N	26	Sand	2.8°C	25 August 1953	3 females
HEC 42	64°15'45''W-48°10'15''N	20	Fine sand and mud		27 August 1953	6 females
HEC 81	64°11'15''W-48°10'15''N	26	Sandy		10 August 1954	3 females 3.2 mm. long
HEC 93	64°09'45''W-48°11'15''N	27	Sandy		13 August 1954	1 female
PB 1	64°46'W-47°59'N	26	Sandy mud and pebbles		19 July 1954	1 female