

# REVISION OF THE GENUS *BOREONYMPHON* G. O. SARS (PYCNOGONIDA)

## WITH A DESCRIPTION OF TWO NEW SPECIES, *B. OSSIANSARSI* KNABEN AND *B. COMPACTUM* JUST

By

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### ABSTRACT

Based on the late Dr. Nils Knaben's notes, including a key to species, the present paper presents a revision of the pycnogonid genus *Boreonymphon* G. O. Sars, 1888. Four species are recognised, viz. the original *B. robustum* (Bell, 1855), *B. abyssorum* (Norman, 1873) which is re-established as a valid species, *B. ossiansarsi* Knaben sp. nov., and *B. compactum* Just sp. nov. *Boreonymphon hians* (Heller, 1875) is considered a synonym of *B. robustum*. Descriptions, drawings, and maps of distribution of all four species are presented, together with a revision of drawings and photos in the literature. The genus is considered truly high arctic.

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### PREFACE

After returning from an expedition to Thule, NW-Greenland, with the Danish Atomic Energy Commission in the summer of 1968, I found in the material of Pycnogonida three specimens of an obviously new species of the genus *Boreonymphon*. When learning that the late Dr. N. Knaben (Zoological Museum, University of Oslo) had for many years worked on the north Atlantic and arctic pycnogonids, including a revision of the present genus, I had Dr. Knaben's notes sent to me through the kindness of Director T. Soot-Ryen, Oslo and Dr. J. H. Stock, Amsterdam; I was allowed to make the best possible use of the notes.

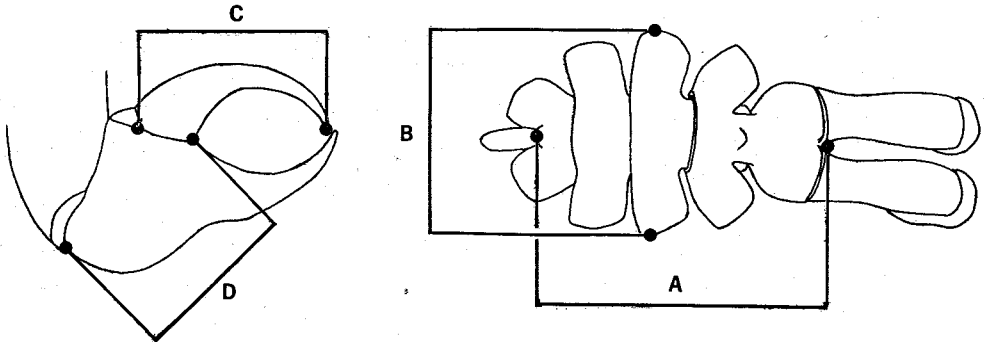


Fig. 1. The non-obvious measurements used in the text. A. (Body) length. B. (Body) width. C. Length of movable finger. D. Length of palm.

Concerning the genus in question, the notes consist of a full record of all samples seen and revised by Knaben and a diagnostic key, presented on p. 3, to the three species which he recognised, including the selection of a holotype and name for a new species. It should be regarded as Knaben's original description of *Boreonymphon ossiansarsi* KNABEN.

The major part of the basic work behind the present paper was done by Knaben, as can be seen from the lists of material.

The description and drawings of the four species, measurements (cf. Fig. 1), the various discussions, and revision of the literature are due to me. Details of the four species have been drawn to the same scale.

#### INTRODUCTION

The first investigator to record a member of the genus under revision was BELL (1855), when describing *Nymphon robustum* from arctic Canada (Northumberland Sound, 76°52'N, 97°W.) NORMAN (1873) described *Nymphon abyssorum* from deep water between the Faroes and the Shetland Islands. Finally, HELLER (1875) described *Nymphon hians* from the Barents Sea. HELLER obviously did not know the works of BELL and NORMAN mentioned above, as he finished his description by writing: „Unterscheidet sich durch die charakteristische Form der Mandibularscheeren von allen anderen Arten”.

SARS (1877) without comments lumped the three species under the name *Nymphon robustum* BELL. All later authors have followed that synonymy.

SARS (1888) gave a brief diagnosis in latin of *Boreonymphon* gen. nov., in which he placed *Nymphon robustum* BELL, and three years later (SARS 1891) he gave an extensive description of the genus and of the single species which he recognised.

MEINERT (1899) is the only investigator who has suspected *Boreonymphon robustum* (sensu SARS, 1888) to include more than one species; but his efforts to separate them, based on the shape and bristle-covering of the ovigers, were unsuccessful.

The removal of BELL's species from *Nymphon* to *Boreonymphon* has been doubted (though never discussed) by several authors; and more recently HEDGPETH (1963, p. 1326) recording the species as *N. robustum* from arctic Canada, merely writes: "There seems little reason to maintain *Boreonymphon* as a separate genus although the species differs from all other Nymphons in the arcuate shape of the dactyls of the chelae, which are smooth and resemble miniature ice tongs."

The present paper describes four closely related species differing in several respects from all known species of *Nymphon*. If that genus is to include the present four species the generic diagnosis should be revised in such a way as to bring it very close to the diagnosis of the family Nymphonidae. With minor modifications only the four species are neatly covered by SARS' (1888) description of *Boreonymphon* which must thus be considered a valid genus.

#### KNABEN'S KEY TO SPECIES

(Translated from the Norwegian)

##### Key to species of *Boreonymphon*

- A. Trunk covered like velvet by dense, small hairs. Scapus broader than the distance between scapi. Scapi directed forwards, 4th and 5th segments of oviger of about equal length and covered by short hairs or bristles, which are generally directed towards the base of the segment. Claw about as long as tarsus, auxiliary claw missing or rudimentary. Proboscis cylindrical. . . . . *B. robustum*
- B. Trunk smooth with scattered setae (bristles) of different length. Scapi more slender, thinner than the distance between them. Proboscis tapering at apex.
  - a. Scapi diverging, the distance between them at base equal to the diameter of scapus. Claw as long as tarsal segment, auxiliary claw distinct. Male with 5th segment of oviger slightly longer than 4th. Fourth and 5th segments covered by relatively long bristles or hairs chiefly directed towards the base of the segment. Eye tubercle distinctly set off. . . . . *B. abyssorum*
  - b. Scapi parallel. Distance between scapi in basal 1/3 approximately equal to the diameter of the scapus. Claw shorter than tarsal segment. Auxiliary claws small. Fourth segment of oviger distinctly shorter than 5th in both sexes. In the male 4th and 5th segments of oviger covered by short hairs or bristles chiefly directed towards the base of the segments. Eye tubercle not distinctly set off. Larger species. . . *B. ossiansarsi* n.sp.

A key to all species is presented on p. 15.

#### SYSTEMATIC PART

##### Diagnosis of *Boreonymphon* G. O. SARS, 1888

Large and robust Nymphonidae. Body with dorsal hind edge of segments 1-3 strongly elevated. Cephalic segment with a short, distinct "neck" bearing a rudimentary eye tubercle without visual elements; anterior half of segment greatly enlarged. Proboscis cylindrical or tapering towards apex. Chelifores stout, generally as long as proboscis. Chelae with short, inflated palm and strongly curved, smooth

fingers with opposing tips. Seventh to tenth joints of oviger with a row of simple teeth; dactylus smooth. Legs strong, of medium length; propodus longer than tarsus and without conspicuous spines along the hind edge. Dactylus as long as or shorter than propodus. Auxiliary claws rudimentary or absent.

Hairs and bristles present, but inconspicuous to the naked eye.

#### Description of the species

*Boreonymphon robustum* (BELL, 1855)

(Figs. 2, 7C)

Syn.: *Nymphon hians* HELLER, 1875.

**Neotype**: male of 11 mm with young of 4 to 5 mm. Bylot Sund, 76°28.65'N, 69°21.8'W, 11 August 1968, 97 m, clay, gravel, and stones. Thule Exped. 1968, Just et Vibe St. 29. Zoological Museum, University of Copenhagen.

**Body**: rather slender, width of body equalling length of first two body segments together; lateral processes not quite touching. Ocular segment as long as the two following segments together. Bristles present dorsally on front and hind edges of ocular segment, on hind edge and mid-dorsally on caudal half of segments 2 and 3. Fourth segment with a low bristle-bearing node immediately in front of the abdomen. Lateral processes with scattered bristles on the dorsal surface. The entire animal is covered by minute felt-like hairs.

**Abdomen**: straight; proximally and distally tapering and with almost parallel sides. Surface with many short bristles.

**Eye tubercle**: prominent, apex rounded.

**Proboscis**: almost completely cylindrical, as long as ocular segment and covered by tiny hairs about 30 microns long. Width at base subequal to that of scapus base.

**Chelifores**: with scapi parallel and as long as ocular segment. Straight in dorsal and curved in lateral view; slightly constricted in proximal third. Space between scapi at constriction level equalling half the width of scapus at the same level. Scapi evenly covered with small bristles and a felt of tiny hairs (Fig. 2D).

Chelae robust. Movable finger slightly longer than palm and evenly curved. Fixed finger as strong as movable, but less curved. Palm inflated and covered with fine bristles and a felt of tiny hairs.

**Palps**: when stretched out joint 3 reaches to the tip of the proboscis. Ratio between joints 2 and 3 approximately 1:1. Joints 4 and 5 of equal length; together they are slightly longer than 3rd joint. Joints 2-5 with a sparse cover of bristles and a felt of tiny hairs (Fig. 2E).

**Ovigers**: joints 4 and 5 of equal length. Joint 6 slightly less than half as long as 5. Joints 4-6 distally widening, with evenly scattered straight or curved bristles and a dense cover of clusters of tiny hairs (Fig. 2F).

**Legs**: all legs have femur and both tibiae of subequal length. Femur cylin-

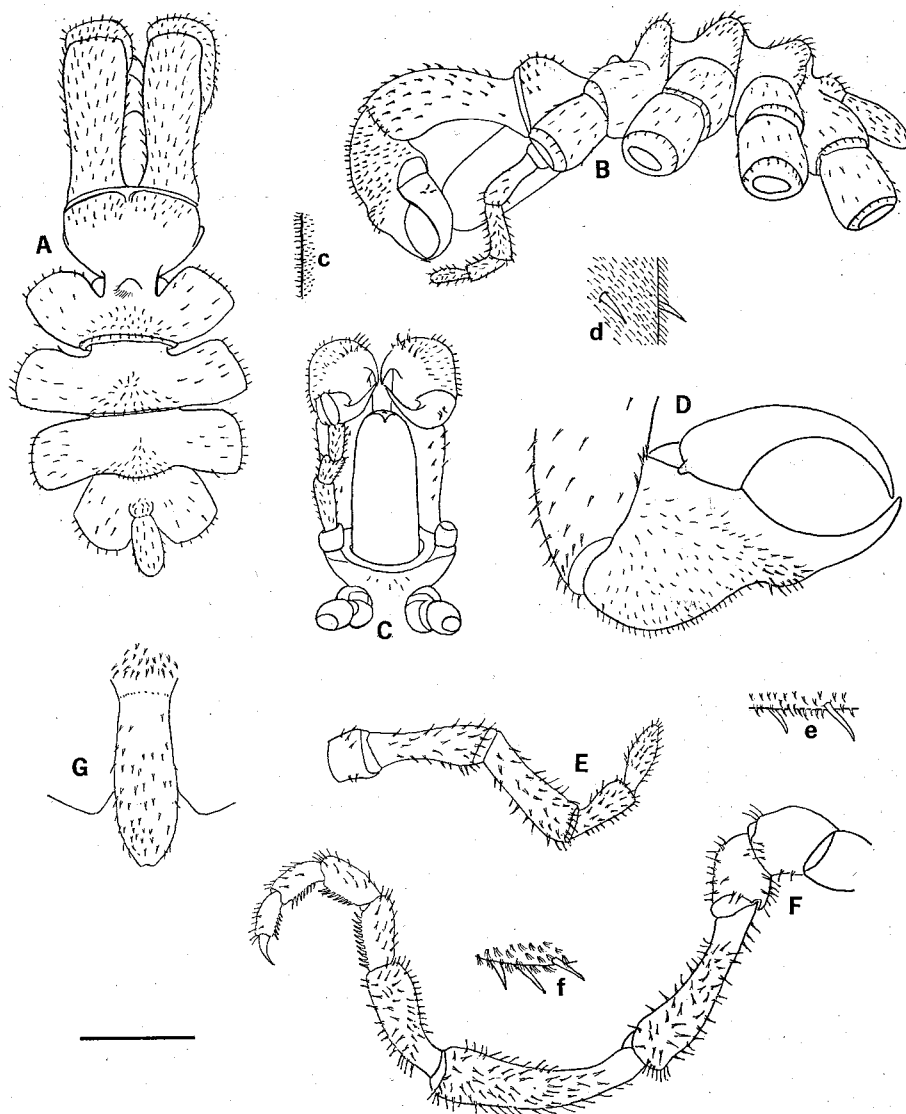


Fig. 2. *Boreonymphon robustum* (BELL), neotype. A. Dorsal view. B. Lateral view. C. ventral view (c surface of proboscis). D. Chela (d surface of scapus). E. Palp (e surface of palp). F. Oviger (f surface of oviger). G. Abdomen. Scale, A, B, and C: 4 mm; D, E, F, and G: 2 mm; c, d, e, and f: 0.5 mm.

drical and as long as the corresponding three coxae together. Second tibia hardly twice as long as tarsus and propodus together. Ratio between tarsus and propodus is 3:4 (Fig. 7C). Claws a little less than half as long as propodus. Auxiliary claws absent. Legs covered with small bristles, the density of which increases distally; underneath the bristles are tiny felt-like hairs.

### Variations

**Hairs and bristles:** the cover of tiny hairs on the body may be very nearly absent. In several specimens the naked sides of tarsus and propodus of the legs appear as extremely narrow bands only.

**Shape:** minor variations can be found in the shape of the eye tubercle, which may appear pointed in lateral view, and in the abdomen, which is sometimes of a more or less irregular shape.

**Proportions:** joint 5 of the oviger of the adult male may exceed the length of joint 4 slightly. The ratio between the various joints of the legs is due to minor variations. In adult specimens the femur is often slightly longer than the three coxae together.

**Others:** in a few specimens auxiliary claws have been found on one or more legs.

**Females:** generally as males, and with the same variations; but joints 4 and 5 of the oviger are weaker and armed with scattered straight bristles.

### Remarks

During his work with the present genus KNABEN visited museums and collections in England and Scotland in order to locate type material. BELL's material of *Nymphon robustum* could not be found, so I have considered it useful to select the neotype recorded above.

Since SARS (1877), HELLER's *Nymphon hians* has been considered a synonym of *Boreonymphon robustum* (BELL). KNABEN investigated HELLER's type material and verified the correctness of SARS' view (KNABEN, MS.) The material has not been seen by me.

### *Boreonymphon abyssorum* (NORMAN, 1873) (Figs. 3, 7D)

**Holotype:** male with eggs. Porcupine St. 56, 1869, 60°02'N, 6°04'W, 480 fm. (878 m), -0.7°C. British Museum (Nat. Hist.), London.

Present description and drawings based on a male of 9 mm with young of 1.5 to 3 mm. Michael Sars, 26 June 1902, 62°52'N, 4°14'E, 880 m, Ad. S. Jensen leg. Zoological Museum, University of Copenhagen.

**Body:** slender, width of body equalling length of first two body segments together; lateral processes not touching each other. Ocular segment as long as three last segments together. Bristles present dorsally on front and hind edges of ocular segment, and on hind edge of segments 2 and 3. Segment 4 without node or conspicuous bristles in front of the abdomen. Lateral processes with one row of bristles on dorsal surface. The entire animal is covered very sparsely with tiny hairs.

**Abdomen:** straight, narrowly ovoid, maximum breadth in the middle. Sparsely but evenly covered with small bristles.

**Eye tubercle:** prominent; narrowly pointed in lateral view.

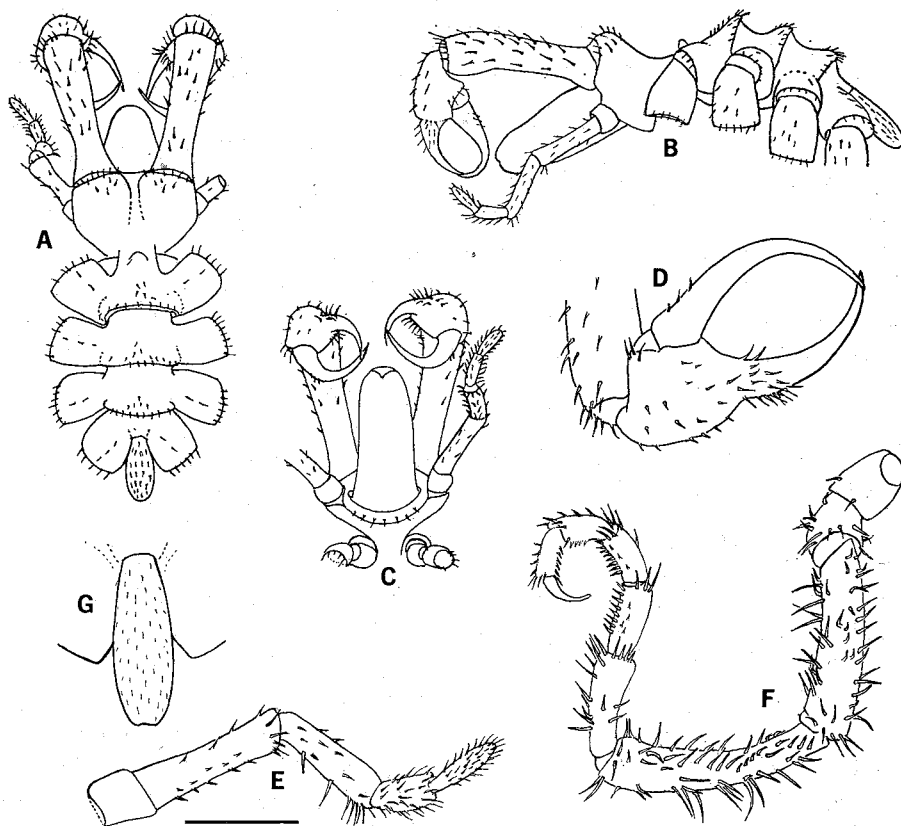


Fig. 3. *Boreonymphon abyssorum* (NORMAN), Michael Sars 1902. A. Dorsal view. B. Lateral view. C. Ventral view. D. Chela. E. Palp. F. Oviger. G. Abdomen. Scale, A, B, and C: 4 mm; D, E, F, and G: 2 mm.

**Proboscis**: slightly tapering distally. As long as ocular segment. Sparsely covered with minute hairs. Width at base about twice that of scapus base.

**Chelifores**: scapi diverging, slender, as long as ocular segment, with scattered and rather coarse bristles. Base and apex of equal width but scapi narrowing somewhat in proximal third, especially in dorsal view.

**Chelae** slender. Movable finger evenly curved, almost twice as long as palm. Fixed finger of same strength and curvature as movable, and longer than palm. Movable finger bears a few bristles ventrally in proximal third. Palm not much inflated, with scattered coarse bristles, which are especially long at the base of the fixed finger.

**Palps**: when stretched out the third joint of the palp reaches well beyond the tip of the proboscis. Ratio between joints 2 and 3 is 4:3. Joint 4 two thirds the length of 5, and together they are slightly longer than joint 3. Joints 2 and 3

bear scattered bristles of varying length, the bristles being longer and more numerous in distal half of the joints. Joints 4 and 5 more evenly covered with bristles.

**Ovigers** : joints 4 and 5 very nearly of equal length, both beset with a mixture of backward curving bristles and more or less straight ones pointing in various directions. Joint 4 with parallel sides, 5 somewhat widening distally. Joint 6 half as long as 5, with straight bristles, especially ventro-distally.

**Legs** : first leg has femur and both tibiae of equal length. Last three legs have 2nd tibia distinctly longer than the two preceding joints, which are of equal length. Ratio between femur and the three coxae together is 3:2. Femur strongly widening distally. Second tibia  $2\frac{2}{3}$  the length of tarsus and propodus together. Ratio between tarsus and propodus is 3:5 (Fig. 7D). Claws slender, about half as long as propodus. Auxiliary claws present in pairs but minute.

Legs (except tarsus and propodus) with scattered, distally pointing bristles of varying length, increasing in number from coxae to 2nd tibia. Tarsus and propodus have naked sides. Tarsus has an even cover of bristles on dorsal and ventral surfaces, while on propodus the dorsal bristles run in two parallel rows.

#### *Variations*

**Hairs and bristles** : bristles on dorsal surface of lateral processes may be scattered rather than in one row. The parallel rows of bristles on the dorsal surface of propodus may be confluent in the first pair of legs.

**Shape** : a few specimens have the proboscis subcylindrical or slightly bulging in the middle.

**Proportions** : scapi normally equalling the length of the ocular segment, but small variations in both directions can be found.

**Others** : the scapi normally are strongly diverging, but specimens with almost parallel scapi (fixation artefact?) are present in the material. In a few specimens the auxiliary claws are absent in one or more legs.

**Females** : generally as males, but joints 4 and 5 of oviger somewhat shorter and less densely covered with bristles.

#### *Boreonymphon ossiansarsi* KNABEN sp. nov.

(Figs. 4, 5, 7A)

**Holotype** (selected by KNABEN) : male of 17 mm with young of 3 to 6 mm. *Michael Sars* St. 13, 1900, 66°42'N, 16°40'W, 590 m, 0.11°C. Zoological Museum, University of Bergen (Cat. No. 26 630).

**Body** : slender, width of body equalling length of first two body segments together; lateral processes not touching each other. Ocular segment as long as the last three segments together. All bristles on the body very short; bristles present along dorsal hind edges and dorso-medially on all segments and along the front edge of ocular segment. Segment 4 with a weak node bearing a few bristles in front of the abdomen. Lateral processes with small bristles on the dorsal surface, especially in distal third.



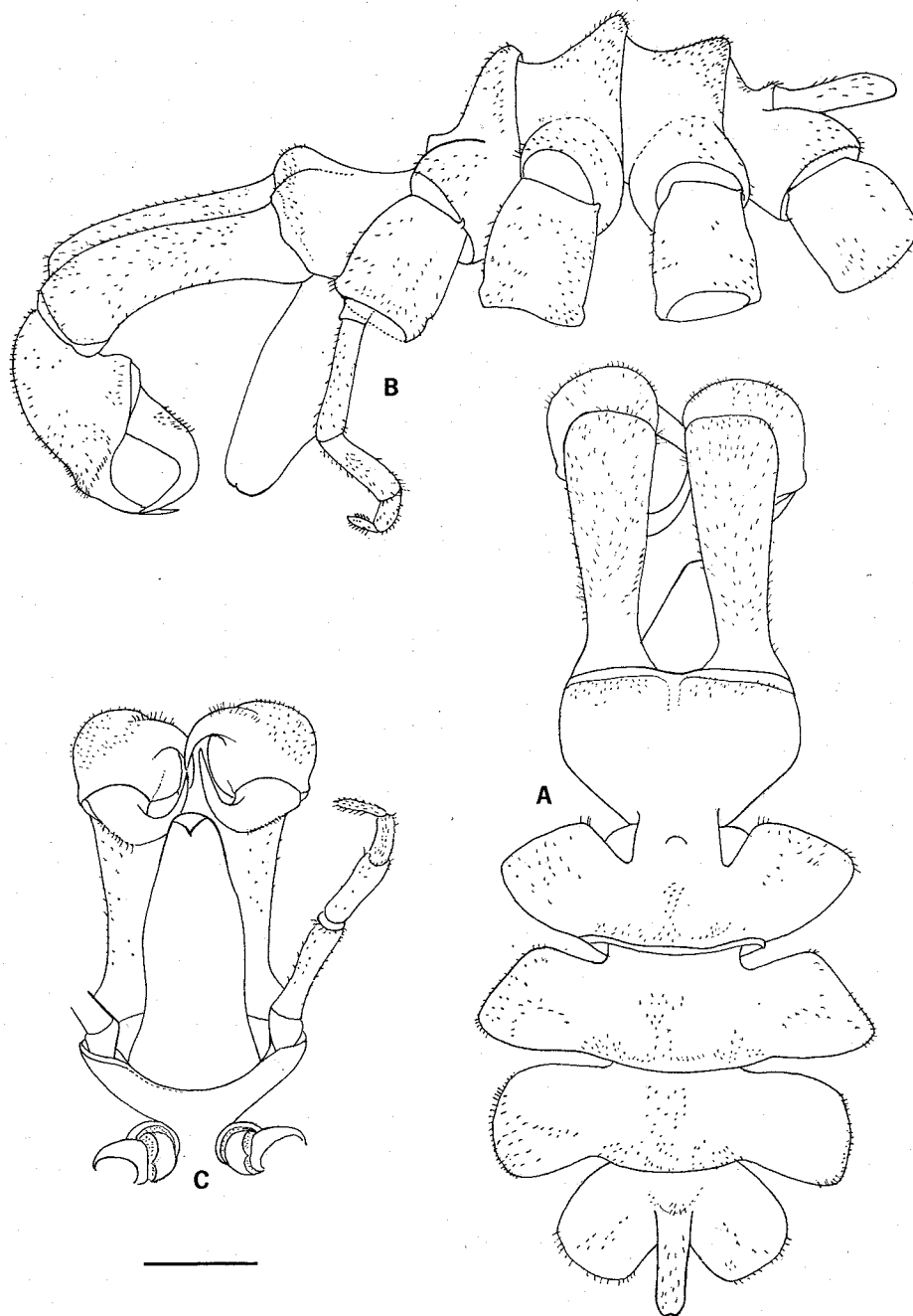


Fig. 4. *Boreonymphon ossiansarsi* KNABEN sp. nov., Holotype. A. Dorsal view. B. Lateral view. C. Ventral view. Scale: 4 mm.

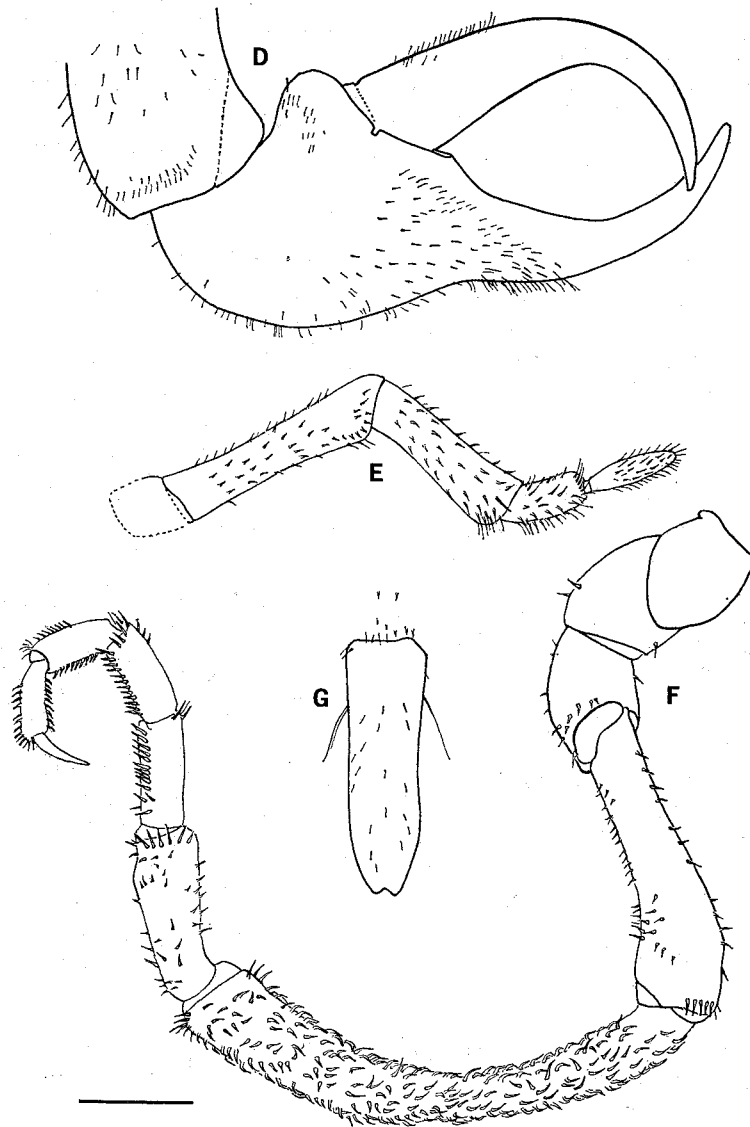


Fig. 5. *Boreonymphon ossiansarsi* KNABEN sp. nov., Holotype. D. Chela. E. Palp. F. Oviger. G. Abdomen. Scale: 2 mm.

**Abdomen:** straight, with parallel sides in dorsal view. In lateral view ventral side straight, dorsal side bulging in distal third before tapering towards apex.

**Eye tubercle:** very low.

**Proboscis:** generally strongly conical, but bulging in the middle. As long as ocular segment. Naked. Width at base  $1\frac{1}{2}$  times the width of scapus base.

**Chelifores:** scapi parallel; club-shaped in dorsal view, with a broad base followed immediately by a strong constriction. Distal 4/5 widening evenly towards the apex. Space between scapi at constriction level as broad as scapus base. Scapi evenly but not densely covered with small bristles.

**Chelae** strong and coarse. Movable finger as long as palm, abruptly and strongly curving in the middle. Fixed finger of same strength as movable, but far less curved. Tip of movable finger hits fixed finger proximal to the tip of the latter. Movable finger bears a long cluster of small bristles ventrally on proximal half. Palm much inflated, unevenly covered with small bristles.

**Palps:** when stretched out the third joint of the palp does not quite reach apex of proboscis. Ratio between joints 2 and 3 is 3:2. Joints 4 and 5 of equal length, and together as long as joint 3. Joints 2-4 unevenly covered with small bristles. Fifth joint more evenly covered, but proximal third naked.

**Ovigers:** ratio between joints 4 and 5 is 3:5. Joint 4 strongly club-shaped and with scattered bristles. Joint 5 curved, very slender, and densely covered with bent, generally backward-pointing bristles. Joint 6  $1\frac{1}{3}$  the length of 5, with scattered bristles as in joint 4.

**Legs:** all legs have femur and 1st tibia of equal length and 2nd tibia about 1/6 longer. Femur distally widening. Ratio between femur and the three coxae together is 5:3. Second tibia three times as long as tarsus and propodus together (slightly less in first leg). Ratio between tarsus and propodus is 5:6 (Fig. 7A). Claws  $1\frac{1}{4}$ - $1\frac{1}{2}$  the length of propodus. Auxiliary claws present but minute.

Legs covered by small bristles, the density of which increases distally. Tarsus and propodus have naked sides, but the naked band is very narrow in the tarsus, especially of the first leg.

#### *Variations*

**Shape:** the eye tubercle may be almost indistinguishable.

**Others:** in some specimens the auxiliary claws are absent in one or more legs.

**Females:** generally as males, but joint 5 of the oviger is subequal to or slightly longer than joint 4 and armed with short, straight bristles only.

#### *Boreonymphon compactum* JUST sp. nov.

(Figs. 6, 7B)

**Holotype:** male of 15 mm with eggs. Bylot Sund, 76°26.8'N, 69°42.3'W, 15 August 1968, 260 m, clay and large stones. Thule Exped. 1968, Just et Vibe St. 35. Zoological Museum, University of Copenhagen.

**Body:** short and broad; width of body equalling length of first three body segments together. Lateral processes in contact with each other. Ocular segment hardly as long as the two following segments together. Entire body covered dor-

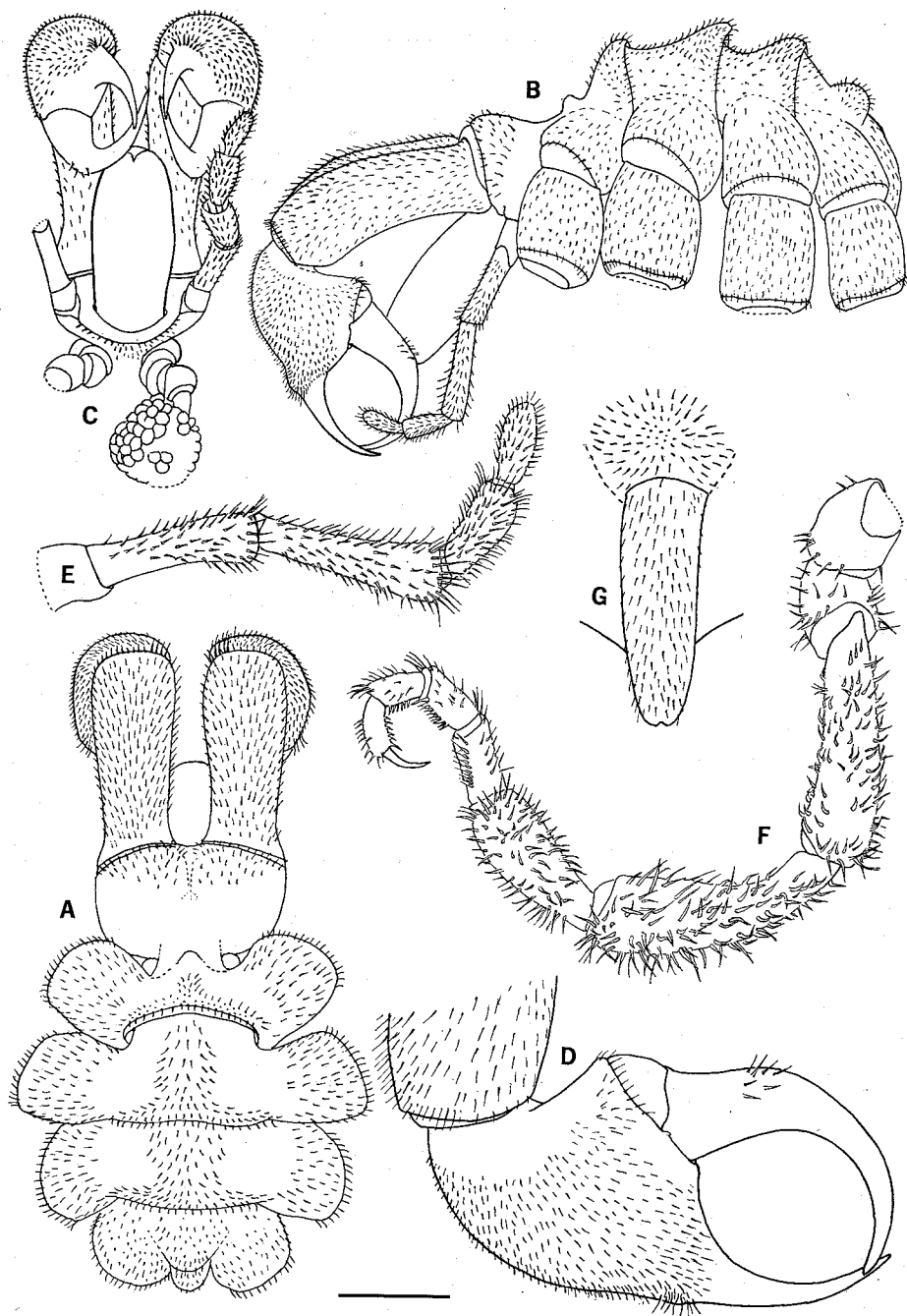


Fig. 6. *Boreonymphon compactum* sp. nov., Holotype. A. Dorsal view. B. Lateral view. C. Ventral view. D. Chela. E. Palp. F. Oviger. G. Abdomen. Scale, A, B, and C: 4 mm; D, E, F, and G: 2 mm.

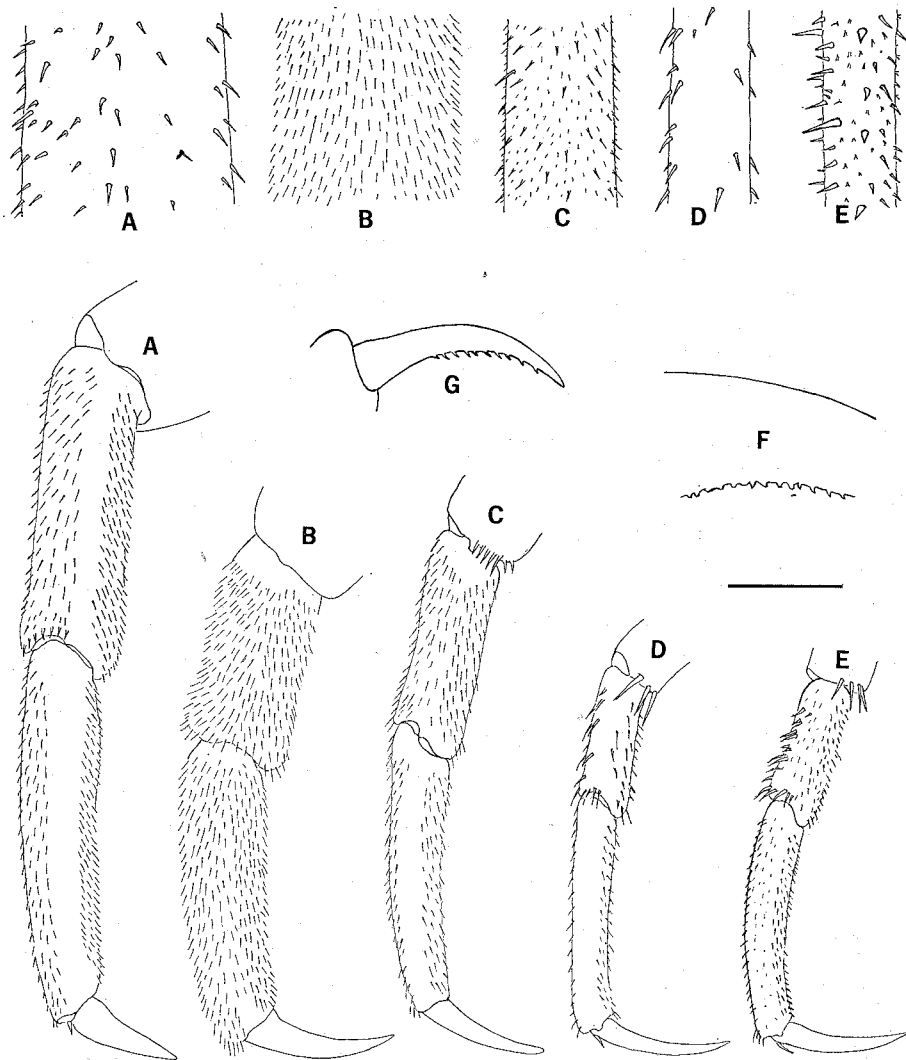


Fig. 7. Tarsus, propodus, dactylus, and section of 1st tibia of A. *B. ossiansarsi*. B. *B. compactum*. C. *B. robustum*. D. *B. abyssorum*. E. Aberrant specimen of *B. abyssorum* (see text). F. Section of movable finger. G. Dactylus of oviger of E. Scale, A-E: 2 mm; F-G: 0,5 mm.

sally by small bristles except in the middle of the ocular segment and at the base of the lateral processes. A sparse felt of tiny hairs is present. Segment 4 with a very conspicuous bristle-covered node in front of the abdomen.

**A b d o m e n** : long, cylindrical, and bent strongly downwards; barely extending beyond lateral processes of segment 4 in dorsal and lateral views. Bristle covering as on body.

**E y e t u b e r c l e** : low, apically rounded.

**Proboscis**: slightly bulging in the middle and gently tapering towards base and apex. Distinctly longer than ocular segment. Surface covered by tufts of tiny hairs about 50 microns long. Width at base equalling that of scapus base.

**Chelifores**: scapi parallel, almost completely cylindrical in dorsal view, as long as ocular and first half of 2nd segments together. Densely covered by small bristles.

**Chelae** strong. Movable finger as long as palm, forming an even curve. Fixed finger distinctly weaker than movable and far less curved. Movable finger bears a cluster of bristles ventrally in the middle of proximal half. Palm much inflated, densely covered with small bristles, and with a cluster of longer bristles at the dorsal root of the fixed finger.

**Palps**: when stretched out the third joint of the palp reaches to the tip of the proboscis. Ratio between joints 2 and 3 is 7:8. Joint 4 slightly longer than 5; joints 4 and 5 together as long as 3. Surface of the palp covered by clusters of tiny hairs; the four terminal joints with an even cover of rather long straight bristles.

**Ovigers**: joints 4 and 5 of equal length, both densely covered with a mixture of backward-bent and straight bristles, the bent ones being more numerous on joint 4. Ratio between joints 5 and 6 is 5:3. Joint 6 densely covered with straight bristles. Joints 4-6 all distally widening.

**Legs**: all legs have femur and both tibiae broad and of equal length. Femur cylindrical. Ratio between femur and the three coxae together is 1(+):1. Second tibia twice as long as tarsus and propodus together. Ratio between tarsus and propodus is 3:4 (Fig. 7B). Claws slender, about half as long as propodus. Auxiliary claws absent.

All joints of legs densely covered by small bristles.

### *Variations*

The two adult specimens from Thule (one male and one female) do not show any variations, except that the ovigers of the female are weaker and less densely covered with bristles.

The single specimen (an egg-bearing male) from Kap Tobin differs from the Thule specimens by having the body slightly longer in proportion to the width.

### Notes on an aberrant specimen

The material of *Boreonymphon* in the Swedish State Museum of Natural History, Stockholm includes a specimen (No. 523) labelled "*Nymphon robustum* Bell var.?, Baffin Bay, 1871, Ingegerd and Gladan's Exped. St. 186".

The general appearance and proportions of the body, chelae, and legs are in good agreement with *B. abyssorum*, but in several details the specimen differs markedly from that species. Thus the scapi, although slightly diverging, are somewhat shorter and broader than in *B. abyssorum*. The

inner edges of both fingers are minutely serrated (Fig. 7F). The abdomen is straight, but club-shaped rather than oviform, broadest in the distal third. The bristle-covering of body, chelifores, and abdomen is generally as in *B. abyssorum*, but a fine felt of tiny hairs, as in *B. robustum* and *B. compactum*, is present. The proboscis is *abyssorum*-shaped but with tiny hairs as in *B. robustum* and *B. compactum*. Ovigera with a "hairy" surface as in *B. robustum*; dactyli with a row of minute spines along the inner edge (Fig. 7G). The legs bear relatively coarse bristles as in *B. abyssorum*. They are, however, standing almost perpendicular to the surface of the leg (distally pointing in normal *B. abyssorum*); a felt of fine hairs is present, but not as dense as in *B. robustum*.

The specimen has a body length of 8 mm, and there are no traces of genital pores. It may be a sterile hybrid between *B. abyssorum* and one of the felt-covered species (*B. robustum* and *B. compactum*), or otherwise genetically aberrant.

#### Key to the species

- |  |                       |
|--|-----------------------|
| 1. Width of body equalling length of first three body segments together..... | <i>B. compactum</i>   |
| Width of body equalling length of first two body segments together .....     | 2                     |
| 2. Length of movable finger of chela almost twice that of palm .....         | <i>B. abyssorum</i>   |
| Length of movable finger of chela subequal to that of palm.....              | 3                     |
| 3. Proboscis cylindrical .....   | <i>B. robustum</i>    |
| Proboscis conical .....  | <i>B. ossiansarsi</i> |

#### Juvenile specimens

The characters used in the key presented just above are intraspecifically constant in all specimens longer than 5 mm.

*Boreonymphon* males are known to carry their progeny around for a considerable length of time as judged from the known size of attached young, which may often equal almost half the body length of the parent. Thus juvenile specimens with a body length of less than 5 mm are very rarely found separately. Where two or more species of *Boreonymphon* are found in the same sample, detached juveniles down to about 2 mm could be referred to species in the following way: specimens of *B. ossiansarsi* differ from those of *B. abyssorum* and *B. robustum* by having a very long, conical proboscis, which reaches conspicuously beyond the tips of the fingers of the chelae; no juvenile less than 5 mm is known for *B. compactum*. Specimens of *B. robustum* and *B. abyssorum* both have the proboscis subcylindrical and reaching to about the tips of the fingers of the chelae. However, *B. robustum* has a dense felt of fine hairs (especially easily seen on legs and scapi), whereas *B. abyssorum* has a naked surface.

Juvenile specimens of *B. compactum* could possibly be confused only with *B. robustum*, due to an expected presence of felt-like hairs in the former, but *B. compactum* is likely to differ markedly from juveniles of the other three species with regard to the breadth/length ratio of the body.

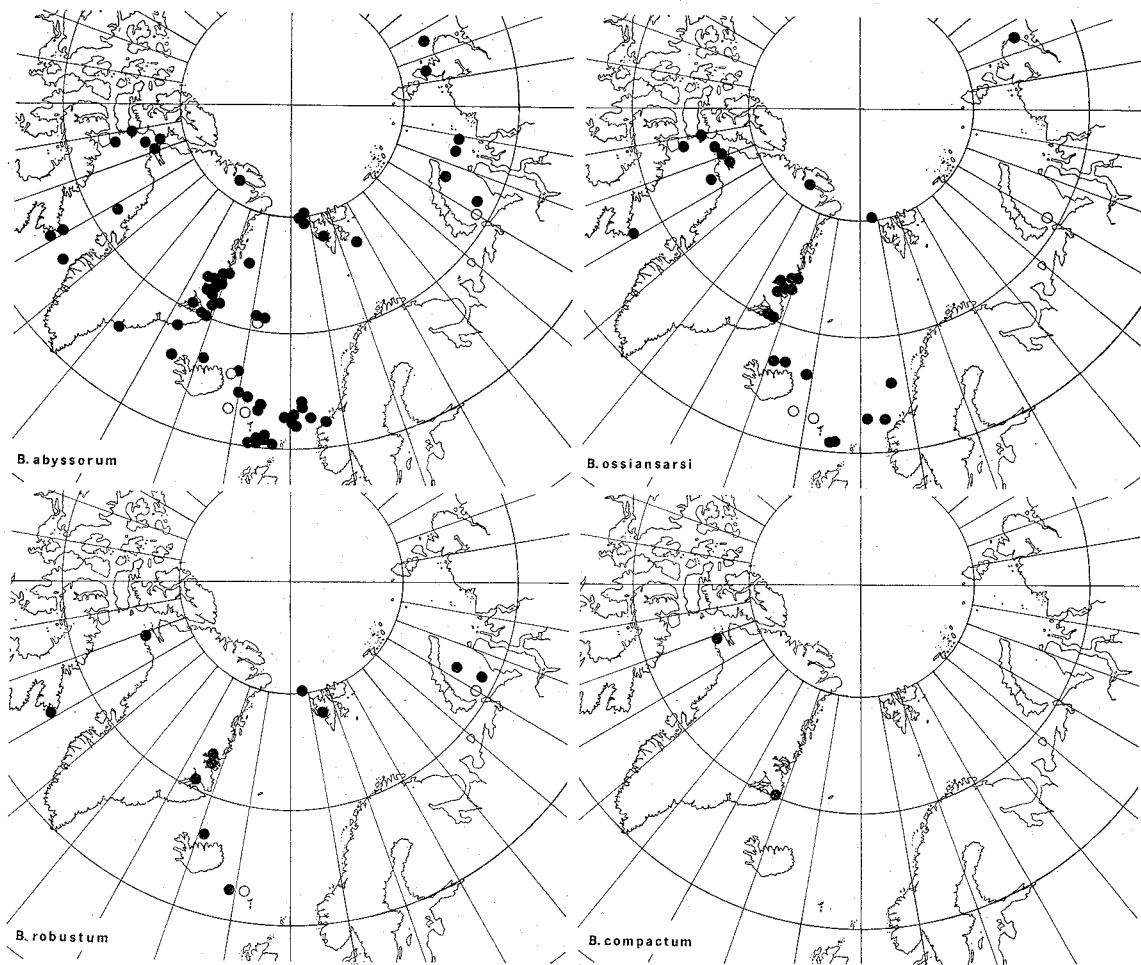


Fig. 8. Distribution of the species of *Boreonymphon*, based on the present lists of material (open circles = uncertain positions).

It should be noted that juvenile specimens of 5 mm of *B. compactum* have a straight abdomen. This indicates that the curved abdomen (Fig. 6B and G) is an adult character.

#### DISTRIBUTION

Based on the samples recorded in the lists of material, Fig. 8 shows the distribution of the four species of *Boreonymphon*. According to the literature the genus as a whole has a somewhat wider distribution. This is shown in Fig. 9, which includes additional records by SCHIMKEWITSCH (1930), DERJUGIN (1935), STEPHENSEN (1933, 1935), GORBUNOV (1946), STOCK (1956), and HEDGPETH (1963).



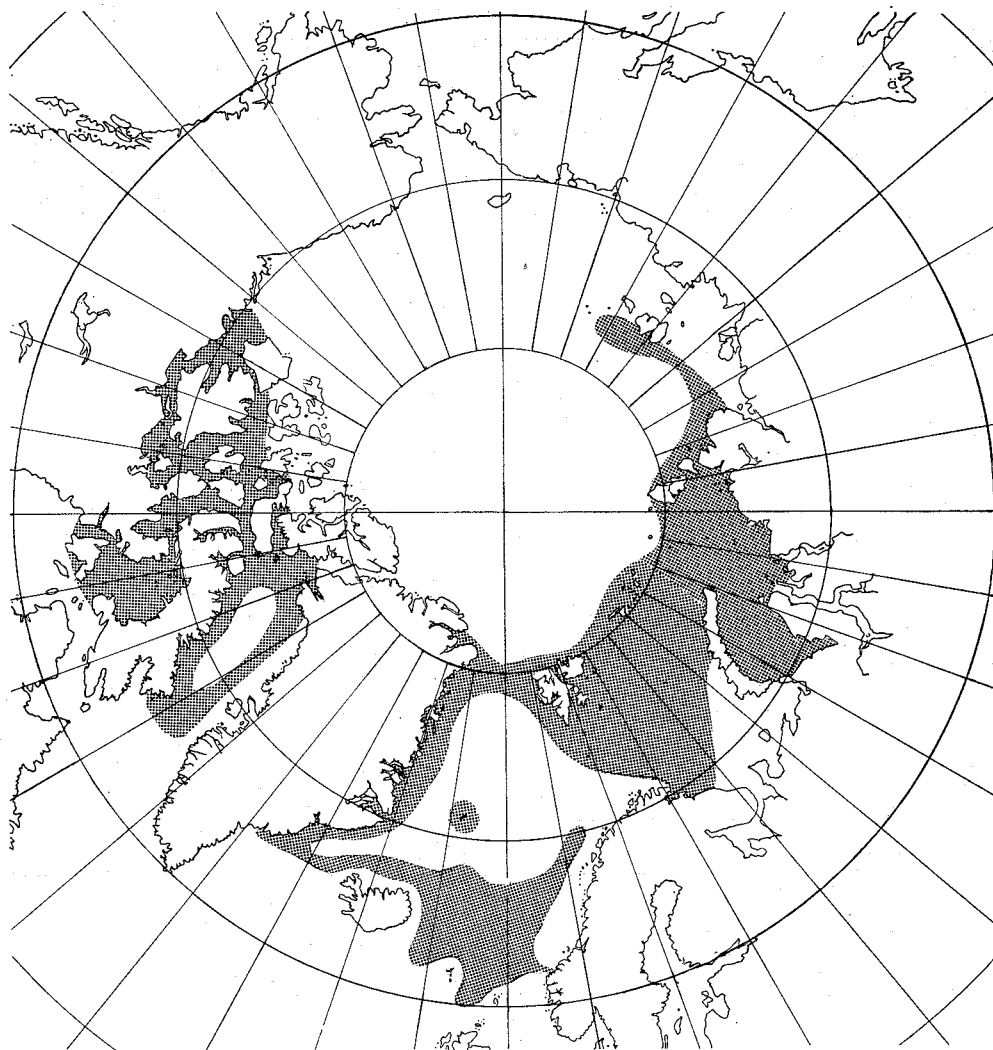


Fig. 9. The known distribution of the genus *Boreonymphon*.

Except for the obviously very rare *B. compactum*, there is a striking similarity in the distribution of the species. The almost identical patterns are, however, not associated with a high frequency of samples containing more than one species. It is found to be the case in 18 samples (16%) out of 110; 14 of these cases are due to the simultaneous catches of *B. abyssorum* and *B. ossiansarsi*. In only three cases were *B. abyssorum*, *B. ossiansarsi*, and *B. robustum* taken together. The low frequencies of simultaneous catches are indicative of some marked differences in the biology of the species.

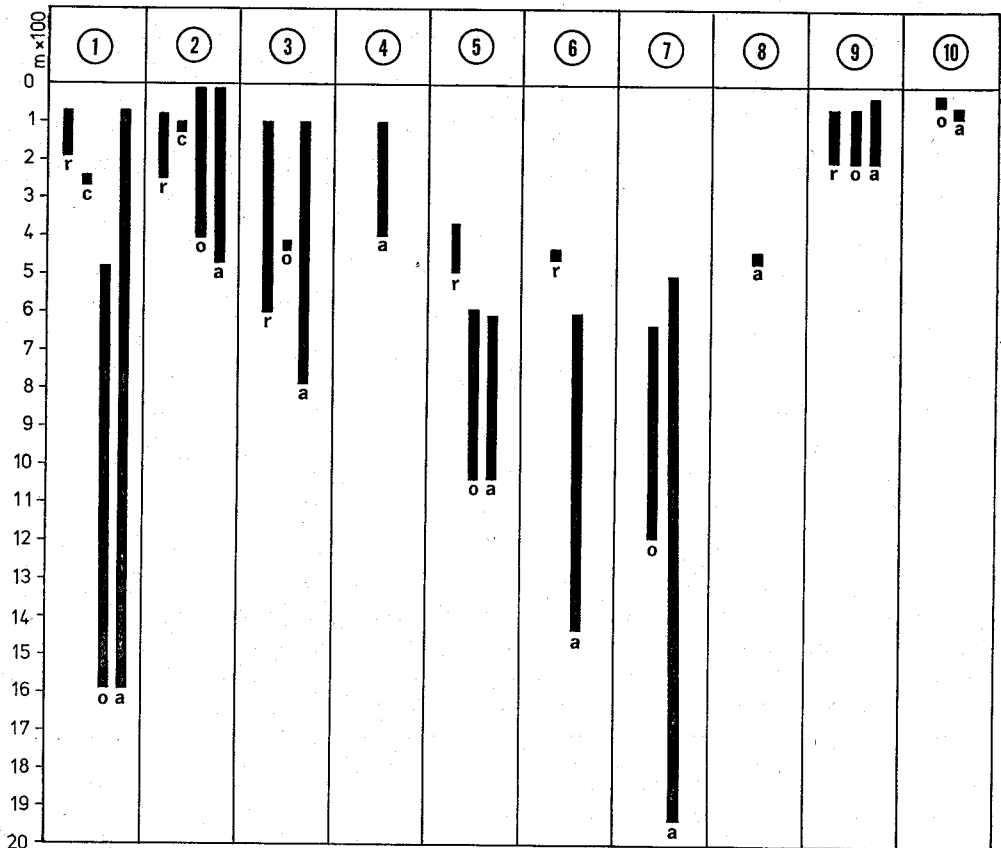


Fig. 10. Depth distribution of a *B. abyssorum*, c *B. compactum*, o *B. ossiansarsi*, r *B. robustum*. — Geographical areas, 1 W of Greenland. 2 East Greenland. 3 Spitzbergen. 4 Jan Mayen. 5 N and NE of Iceland. 6 W and NW of the Faroes (*B. ossiansarsi* is present in the area, but no depth records have been available). 7 Faroe-Shetland Channel and the Norwegian Sea. 8 Western Norway. 9 Barents Sea and Kara Sea. 10 E of Kara Sea.

*B. abyssorum* is by far the most common species of the genus, being present in no less than 77% of the 110 samples available. *B. ossiansarsi* occurs in 27%, *B. robustum* in 13%, and *B. compactum* in less than 2% of the samples. In addition, *B. abyssorum* is often found in greater numbers per sample (15–30) than the other three species (1–3, occasionally 5).

*B. abyssorum* seems to be the dominating species along East Greenland, in deep water in the Faroe-Shetland Channel, in the southern part of the Norwegian Sea, and in the Barents Sea and the Kara Sea. West of Greenland, north of Iceland, and around Spitzbergen *B. abyssorum* and *B. ossiansarsi* occur with almost the same frequency. *B. abyssorum* is the only species so far recorded from Jan Mayen and western Norway.

*B. robustum* is found scattered throughout the area shown in Fig. 9, while *B. compactum* is probably a very rare western arctic species. It is likely to be present in the Canadian archipelago.

As stated many times in the literature, the genus is most characteristic of the Arctic. The overwhelming majority of the present samples originates from water with negative temperatures, while only a few samples were collected at slightly positive temperatures (0–2°C). The two records of *B. abyssorum* from water of 4 and 8°C (c. 1 000 m, Faroe-Shetland Channel, *Silver Belle*) must be regarded as highly exceptional.

The genus is truly high arctic (sensu LEMCHE 1941) and, to judge from the known distribution, it represents the high arctic element of HEDGPETH's (1963) arctic North Atlantic pycnogonid province.

The northernmost records of the genus are north of Franz Joseph Land (SCHIMKEWITSCH 1930) and Jörgen Brönlund Fjord, Peary Land (JUST 1970).

The depth range of the species can be seen from Fig. 10.

#### REVISION OF DRAWINGS AND PHOTOS

BELL 1855, Pl. 31, fig. 4: the original drawing of *Boreonymphon robustum* (as *Nymphon robustum*).

NORMAN 1873, fig. 22: the original drawing of *B. abyssorum* (as *N. abyssorum*).

HELLER 1875, Tab. 5, figs. 3–5: the original drawing of *N. hians* (= *B. robustum*), but figs. 3 and 4, and probably also 5, are *B. abyssorum*.

HOEK 1881, Pl. 2, figs. 35–40: most probably correctly referred to *B. robustum* (as *N. robustum*).

HANSEN 1887, Tab. 18, fig. 1: without doubt *B. abyssorum* (recorded as *B. robustum*).

SARS 1891, Pl. 12, fig. 3: referred to *B. robustum* but is *B. abyssorum*.

MEINERT 1899, Tab. 3, figs. 23–24: probably *B. abyssorum*.

APPELLÖF 1912, fig. 364: reproduction of NORMAN's original drawing of *B. abyssorum*, but given as *N. robustum*.

BOUVIER 1923, fig. 26: reproduction of SARS (1891); is *B. abyssorum*.

SCHIMKEWITSCH 1930, Tab. 5, figs 1–2: referred to *B. robustum*, but is *B. abyssorum*.

HELPER & SCHLOTTKE 1935, fig. 170: reproduction of SARS (1891); is *B. abyssorum*.

BRONSTEJN 1948, fig. 35: reproduction of SCHIMKEWITSCH (1930); is *B. abyssorum*.

HEDGPETH 1963, fig. 2: dorsal view, reproduction of NORMAN's original drawing of *B. abyssorum*.

Lateral view, reproduction of SARS (1891); is *B. abyssorum*.

#### LISTS OF MATERIAL

Note: samples marked with an asterisk are not shown on Fig. 8.  
Abbreviations:

BMNH	British Museum (Natural History), England.
SMNH	Swedish State Museum of Natural History, Stockholm, Sweden.
ZMBN	Zoological Museum, University of Bergen, Norway.
ZMES	Zoological Museum, Edinburgh, Scotland.
ZMLS	Zoological Museum, University of Lund, Sweden.
ZMON	Zoological Museum, University of Oslo, Norway.
ZMUC	Zoological Museum, University of Copenhagen, Denmark.

## Part 1. Samples revised by KNABEN and seen by JUST

*Boreonymphon robustum*

- ZMUC Kara Sea, *Dijmphna* Exped. 1882-83, 44-100 fath.  
 " Færökanalen, *Ingolf* Exped. 1895-96, st. 2, 3, 4, 138, 140, 143.  
 " Totness Road, Exter Sound, 66°19'N, 17 Oct. 1928, 75-200 m, -1.6°C, *Godthaab* Exped., st.166b.  
 " Dusen Fjord, W end of Bredningen, 11 Aug. 1932, 240 m, hard clay, Dan. 3-year Exped. 1931-34, *Godthaab* st.84.  
 " Nordfjord, 3 naut. miles off the Danish house, 4 Jul. 1932, 205 m, clay, Dan. 3-year Exped. 1931-34, *Godthaab* st.29.  
 " 66°32'N, 18°50'W, 1 Aug. 1933, 492 m, *Dana* st.4 616.  
 ZMON F2262 80°3'N, 8°28'E, 14 Aug. 1878, 640 m, -0.9°C, coarse clay, Norweg. North-Atlantic Exped. st.363.  
 " F3724 Dusen Fjord, 20 Aug. 1931, 185-75 m, clay, -1.2°C (at 60 m), Hoel's Greenland Exped. st.55.  
 RMSS 282 71°21'N, 64°53'E, 2 Aug. 1878, 60 fath., mud, -0.2°C, *Vega* Exped. st.14.  
 " 366 Kara Sea, 70°10'N, 64°40'E, 9 Aug. 1876, 28 fath., clay, Nordenskiöld's Exped. st.13.  
 " 533 \*Kola Peninsula, Ora Fjord, 1877, Sandberg's Exped. st.341.  
 " 692 Icefiord, Kilaas Billen Bay, 14 Aug. 1908, 150-140 m, clay with stones, -1.7°C, Swedish Spitzbergen Exped. st.101.

*Boreonymphon abyssorum*

- ZMUC 79°59'N, 5°40'E, 14 Aug. 1878, 839 m, clay, -1.0 °C, Norweg. North-Atlantic Exped. st.362.  
 " Kara Sea, *Dijmphna* Exped. 1882-83, 44-100 fath.  
 " \*Faroe-Shetland Channel and Davis Strait, 1890 and 1891, Wandel.  
 " Scoresby Sund, 3 Aug. 1891, 3-25 fath., Deichmann.  
 " 72°53'N, 20°36'W, 24 Jul. 1891, 96 fath., large stones, Deichmann.  
 " 72°26'N, 19°35'W, 28 Sept. 1891, 105 fath., Deichmann.  
 " \*Norwegian Sea and Greenland Sea, 1895-96, *Ingolf* Exped. st.101, 105, 115, 116.  
 " Færökanalen, 1895-96, *Ingolf* Exped. st.2, 3, 4, 138, 140, 143.  
 " 66°18'N, 25°58'W, 611 m, -1.5 °C, *Ingolf* Exped. st.15.  
 " Hurry Inlet, 7 Aug. 1900, 0-14 m, East Greenland Exped. 1900, S. Jensen.  
 " Kap Borlase Warren, 10 Aug. 1900, East Greenland Exped. 1900, S. Jensen st.1.  
 " Hurry Inlet, the mouth, 11 Aug. 1900, 100 m, clay with stones, East Greenland Exped. 1900, S. Jensen.  
 " Kap Hope, 21 Aug. 1900, 225 m, clay with stones, East Greenland Exped., S. Jensen.  
 " Flemming Inlet, 24 Aug. 1900, 225 m, red clay, East Greenland Exped. 1900, S. Jensen.  
 " Forsblad Fjord, 28 Aug. 1900, 100 m, East Greenland Exped. 1900, S. Jensen.  
 " Forsblad Fjord, 30 Aug. 1900, 175-100 m, clay with stones and gravel, East Greenland Exped. 1900, S. Jensen.  
 " NE of Iceland, 66°2'N, 11°5'W, 5 May 1903, 1040-900 m, *Thor* st.51.

- ZMUC Hopen Island, Spitzbergen, Jul.-Aug. 1904, 100 fath., H. Larsen.
- " \*Spitzbergen, H. Larsen.
- " Sulenfjord, the mouth, (W Norway), 25 Jun. 1902, 220 fath., mud, *Michael Sars* st.32.
- " Sulenfjord, the mouth, (W Norway), 25 Jun. 1902, 220 fath., *Michael Sars* st.32.
- " 62°52'N, 4°14'E, 26 Jun. 1902, 450 fath., *Michael Sars*.
- " 62°30'N, 1°56'E, 29 Jun. 1902, 275-300 fath., -0.17 °C, *Michael Sars*.
- " 62°40'N, 1°56'W, 19 Jul. 1904, 365 fath., -0.3 °C, *Michael Sars*.
- " Stationsfjord, Angmagssalik, 15 Mar. 1921, c. 36 m, Kolonibestyrrer Hedegaard.
- " 77°05.5'N, 71°13'W, 4 Aug. 1928, 790 m, -0.4 °C, *Godthaab* Exped. st.87.
- " 78°14'N, 74°10'W, 8 Aug. 1928, 672 m, -0.5 °C, *Godthaab* Exped. st.99.
- " 76°34.4'N, 74°18'W, 16 Aug. 1928, 580 m, -0.5 °C, *Godthaab* Exped. st.112.
- " 75°54'N, 81°01'W, Jones Sound, 17 Aug. 1928, 610 m, -0.6 °C, *Godthaab* Exped. st.119.
- " 74°12'N, 77°00'W, 22 Aug. 1928, 680 m, -0.4 °C, *Godthaab* Exped. st.131.
- " 67°48.5'N, 60°48'W, 13 Sep. 1928, 1 600 m, -0.4 °C, *Godthaab* Exped. st.162.
- " Totness Road, Exter Sound, 66°19'W, 17 Sept. 1928, 75-200 m, -1.6 °C, *Godthaab* Exped. st.166b.
- " Ravnsfjord, East Greenland, 30 Jul. 1932, M. Degerbøl.
- " Franz Joseph Fjord, E of Zoologdalen, 8 Aug. 1932, 180 m, hard clay with stones, Dan. 3-year Exped. 1931-34, *Godthaab* st.72.
- " Dusen Fjord, W end of Bredningen, 11 Aug. 1932, 240 m, hard clay, Dan. 3-year Exped. 1931-34, *Godthaab* st.84.
- " Dusen Fjord, W of Kap Graah, 12 Aug. 1932, 150 m, hard brown clay, Dan. 3-year Exped. 1931-34, *Godthaab* st.86.
- " Between Kap Weber and Ymer Ö, 13 Aug. 1932, 400 m, clay with very large stones, Dan. 3-year Exped. 1931-34, *Godthaab* st.94.
- " Antarctic Sund, inside the W end, 14 Aug. 1932, 230 m, clay and large stones, Dan. 3-year Exped. 1931-34, *Godthaab* st.99.
- " 5 naut. miles S of Bontekoe Ö, 2 Aug. 1932, 245 m, hard clay and few stones, Dan. 3-year Exped. 1931-34, *Godthaab* st.114.
- " Solitärebugt, Ella Ö, 24 Aug. 1932, 320 m, medium hard grey-brown clay, Dan. 3-year Exped. 1931-34, *Godthaab* st.124B.
- " Between Maria Ö and Ella Ö, 25 Aug. 1932, 250 m, clay with gravel and large stones, Dan. 3-year Exped. 1931-34, *Godthaab* st.130.
- " Hurry Inlet, E side, ½ naut. mile inside the mouth, 20 Jul. 1933, 60-75 m, algae, stones, some clay, Dan. 3-year Exped. 1931-34, *Godthaab* st.172.
- " Solvigen at Nordvestfjord, 24 Jul. 1933, 30-37 m, very loose light-grey clay, Dan. 3-year Exped. 1931-34, *Godthaab* st. 247.
- " Kap Hooker, Jamesons Land, 27 Jul. 1933, 150 m, Dan. 3-year Exped. 1931-34, *Godthaab* st.341.
- " Kap Hooker, Jamesons Land, 27 Jul. 1933, 150 m, Dan. 3-year Exped. 1931-34, *Godthaab* st.341.
- " Solitärebugt, Ella Ö, 26 Sept. 1931, 53-56 m, clay and stones, Dan. 3-year Exped. 1931-34, G. Thorson st.229.
- " Solitärebugt, Ella Ö, 28 Sept. 1931, 68-74 m, stones and coarse gravel, Dan. 3-year Exped. 1931-34, G. Thorson st.243.
- " Solitärebugt, Ella Ö, 10 Okt. 1931, 14-22 m, clay, Dan, 3-year Exped. 1931-34, G. Thorson st.276.

- ZMUC Solitærebugt, Ella Ö, 25 Jul. 1932, 85–95 m, stones and clay, Dan. 3-year Exped. 1931–34, G. Thorson st. 296.
- ” Kap Hedelund, Kempes Fjord, 10 Jul. 1932, 42–48 m, clay, Dan. 3-year Exped. 1931–34, G. Thorson st.311.
- ” Kap Hedelund, Kempes Fjord, 13 Jul. 1932, 48–49 m, clay and *Fucus*, Dan. 3-year Exped. 1931–34, G. Thorson st.348.
- ” Kap Hedelund, Kempes Fjord, 14 Jul. 1932, 70–85 m, clay and small stones, Dan. 3-year Exped. 1931–34, G. Thorson st.356.
- ZMON F2264\*Norweg. North-Atlantic Exped. st.18, 48, 192, 362,  $-0.3$  to  $-1.0$  °C.
- ” F3730\*Hoel's Greenland Exped. 1930, st.1092.
- ” F3735 Vega Sund, 17 Aug. 1930, 250–190 m, clay, Hoel's Greenland Exped. st.1119.
- ” F3739 W of Bontekoe Ö, 3 Aug. 1931, 275 m,  $-0.06$  °C, clay, Hoel's Greenland Exped. st.18.
- ” F3740 S of Kap Mary, 13 Aug. 1931, 250–230 m,  $-1.16$  °C, clay, Hoel's Greenland Exped. st.36.
- SMNH 184 Baffin Bay,  $72^{\circ}24'N$ ,  $59^{\circ}50'W$ , 19 Jul. 1871, 227 fath., hard grey clay, *Ingegerd* and *Gladan's* Exped. st.19.
- ” 283 Arctic Sea of Siberia,  $77^{\circ}40'N$ ,  $105^{\circ}10'E$ , 20 Aug. 1878, 70 fath., clay, *Vega* Exped.
- ” 367 Kara Sea,  $75^{\circ}25'N$ ,  $65^{\circ}15'E$ , 24 Aug. 1875, 40–50 fath., clay, Novaja Semlja Exped. st.181.
- ” 368 Kara Sea,  $71^{\circ}54'N$ ,  $67^{\circ}37'E$ , 7 Aug. 1875, 32 fath., clay, Novaja Semlja Exped.
- ” 369 Kara Sea,  $74^{\circ}52'N$ ,  $75^{\circ}35'E$ , 11 Aug. 1875, 22 fath., clay, Novaja Semlja Exped. st.169.
- ” 370 Kara Sea,  $75^{\circ}34'N$ ,  $79^{\circ}45'E$ , 12 Aug. 1875, 26 fath., sandy clay, Novaja Semlja Exped. st.171.
- ” 371 Kara Sea,  $74^{\circ}52'N$ ,  $75^{\circ}32'E$ , 11 Aug. 1875, 20 fath., clay, Novaja Semlja Exped.
- ” 372 Kara Sea,  $70^{\circ}10'N$ ,  $64^{\circ}40'E$ , 9 Aug. 1876, 28 fath., clay, Nordenskiöld's Exped. st.18.
- ” 517 Franz Joseph Fjord, inner end of Moskusoxefjord, 17 Aug. 1900, 100 m, clay, Zool. Polarexped. st.26.
- ” 518 Off Franz Joseph Fjord, between Bontekoe Ö and Mackenzie Bugt, 8 Aug. 1900, 250 m, mud, Zool. Polarexped. st.21.
- ” 521  $76^{\circ}52'N$ ,  $116^{\circ}E$ , 22 Aug. 1878, 36 fath., fine grey mud,  $-1.4^{\circ}C$ , *Vega* Exped. st.284.
- ” 522 \*Baffin Bay, *Ingegerd* and *Gladan's* Exped. 1871, st.185.
- ” 523 \*Baffin Bay, *Ingegerd* and *Gladan's* Exped. 1871, st.186.
- ” 691 Icefjord, off Tundra Bay, 21 Aug. 1908, 147–141 m, loose clay with stones,  $-0.68$  °C, Swedish Spitzbergen Exped. st.94.

*Boreonymphon ossiansarsi*

- ZMUC Kara Sea, *Dijmphna* Exped. 1882–83, 44–100 fath.
- ” Færökanalen, *Ingolf* Exped. 1895–96, st.2, 3, 4, 138, 140, 143.
- ” \*Norwegian Sea and Greenland Sea, *Ingolf* Exped. st.101, 105, 115, 116, 126.
- ” Hurry Inlet, 7 Aug. 1900, 0–14 m, East Greenland Exped. 1900, S. Jensen.
- ”  $62^{\circ}53'N$ ,  $4^{\circ}14'E$ , 26 Jun. 1902, 450 fath., *Michael Sars*.
- ”  $62^{\circ}58'N$ ,  $1^{\circ}56'E$ , 27 Jun. 1902, 600 fath., clay, *Michael Sars* st.35.
- ”  $66^{\circ}2'N$ ,  $11^{\circ}5'W$ , 25 May 1903, 1040–900 m, *Thor* st.51.

- ZMUC 75°35'N, 66°41'W, 1 Aug. 1928, 490 m, 0.7 °C, *Godthaab* Exped. st.81.  
 " 77°05.5'N, 71°13'W, 4 Aug. 1928, 790 m, -0.4 °C, *Godthaab* Exped. st.87.  
 " 77°28.5'N, 68°46'W, 6 Aug. 1928, 875 m, -0.4 °C, *Godthaab* Exped. st.94.  
 " 76°37'N, 74°18'W, 16 Aug. 1928, 580 m, -0.5 °C, *Godthaab* Exped. st.112.  
 " 75°54'N, 81°01'W, 17 Aug. 1928, 610 m, -0.6 °C, *Godthaab* Exped. st.119.  
 " 74°12'N, 77°00'W, 22 Aug. 1928, 680 m, -0.4 °C, *Godthaab* Exped. st.162.  
 " Dusen Fjord, W end of Bredningen, 11 Aug. 1932, 240 m, Dan. 3-year Exped. 1931-34, *Godthaab* st.84.  
 " Kap Hooker, Jameson Land, 27 Aug. 1932, 150 m, Dan. 3-year Exped. 1931-34, *Godthaab* st.341.
- ZMON F2259 66°41'N, 6°59'E, 19 Jun. 1877, 640 m, coarse clay, -0.9 °C, Norweg. North-Atlantic Exped. 1876-78 st.124.  
 " F3719 80°3'N, 8°28'E, 14 Aug. 1878, 475 m, clay, -1.1 °C, Norweg. North-Atlantic Exped. 1876-78 st.363.  
 " F3720 Tyrolerfjord, near the head, 15 Aug. 1932, 125 m, clay and sand, -1.4 °C, Hoel's Greenland Exped. st.623.  
 " F3721 Clavering Fjord, by Kap Stosch, 11 Aug. 1931, 400-338 m, clay -1.19 °C, Hoel's Greenland Exped. st.31.  
 " F3722 Tyrolerfjord, near Young Sound, 15 Aug. 1932, 320 m, clay mixed with sand, -1.73 °C, Hoel's Greenland Exped. st.627.  
 " F3723 Kong Oscars Fjord, near Kap Pettersen, 9 Aug. 1930, 230 m, white viscous clay with stones, Hoel's Greenland Exped. st.1086.  
 " F3725 Vega Sund, 17 Aug. 1930, 250-190 m, clay, Hoel's Greenland Exped. st.1119.  
 " F3726 Grantaffjord, 7 Aug. 1932, 82 m, grey clay, -1.56 °C, Hoel's Greenland Exped. st.554.  
 " F3727 Holmbugt, Kong Oscars Fjord, 31 Jul. 1932, 100 m, reddish brown clay, -1.15 °C, Hoel's Greenland Exped. st.527.  
 " F4296 80°3'N, 8°28'E, 14 Aug. 1878, 475 m, clay, 1.1 °C, Norweg. North-Atlantic Exped. 1876-78 st.363.  
 " F4297 Dusen Fjord, 20 Aug. 1931, 185-75 m, clay, -1.2 °C (at 60 m), Hoel's Greenland Exped. st.55.
- ZMBN 16889 66°42'N, 16°40'W, 590 m, 0.11 °C, *Michael Sars* 1900, st.13.  
 " 26630 66°42'N, 16°40'W, 590 m, 0.11 °C, *Michael Sars* 1900, st.13.— *Holotype*.  
 " 26634 62°58'N, 1°56'E, 26 Jun. 1902, 1130 m, *Michael Sars* st.35.  
 " 30405 60°57'N, 4°38'W, 10 Aug. 1910, 1098 m, dark sand and clay, *Michael Sars* st.102.
- SMNH 291 Chatanga, off the mouth, 75°N, 113°30'E, 24 Aug. 1878, *Vega* Exped. st.41.

Part 2. Samples revised by KNABEN (in notes); not seen by JUST

The few records of *B. robustum* have been omitted as KNABEN's notes do not state if the samples were revised

*Boreonymphon abyssorum*

- ZMON F2260 74°54'N, 14°53'E, 22 Jul. 1878, clay, -1.2 °C, Norweg. North-Atlantic Exped. 1876-78 st.312.  
 " F2261 76°34'N, 12°51'E, 7 Aug. 1878, 1359 m, -1.2 °C, Norweg. North-Atlantic Exped. 1876-78 st.343.  
 " F2262 80°3'N, 8°28'E, 14 Aug. 1878, 475 m, clay, 1.1 °C, Norweg. North-Atlantic Exped. 1876-78 st.363.

- ZMON F2263\*Norweg. North-Atlantic Exped. 1876-78 st.?  
 " F2265\*Norweg. North-Atlantic Exped. 1876-78 st.?  
 " F2270\*Norweg. North-Atlantic Exped. 1876-78 st.?  
 " F3718\*Norweg. North-Atlantic Exped. 1876-78 st.?  
 " F3728 Franz Joseph Fjord, off Kempe Fjord, 12 Aug. 1930, 100-55 m, clay with stones  
 Hoel's Greenland Exped. st. 1101.  
 " F3729 Moskusoxe Fjord, 5 Aug. 1930, 235 m, clay, Hoel's Greenland Exped. st.1072.  
 F3730\*Hoel's Greenland Exped. 1930 st.1092.  
 " F3731 Sofiasund, 18 Aug. 1930, 200 m, clay, Hoel's Greenland Exped. st.1124.  
 " F3732 Herschelhus, 19 Jul. 1930, 80-78 m, clay with some red algae, Hoel's Green-  
 land Exped. st.1017.  
 " F3733 Sofiasund, between Ymer Ö and Robertson Ö, 19 Aug. 1930, 250 m, clay,  
 Hoel's Greenland Exped. st.1130.  
 " F3734\*Hoel's Greenland Exped. 1930, st.1043.  
 " F3736 Franz Joseph Fjord, NE of Kap Pettersen, 17 Aug. 1931, 462-400 m, clay with  
 stones, -0.03 °C, Hoel's Greenland Exped. st.47.  
 " F3737 S of Hold with Hope, 14 Aug. 1931, 310-260 m, clay with stones,  
 0.21°C, Hoel's Greenland Exped. st.37.  
 " F3738 Clavering Fjord, opposite Kap Stosch, 9 Aug. 1931, 410-370 m, clay, 1.19 °C,  
 Hoel's Greenland Exped. st.29.  
 " F3743 Nathorst Fjord, near the mouth, 4 Aug.1932, 137 m, red-brown clay, -1.76 °C,  
 Hoel's Greenland Exped. st.548.  
 " F3747 Franz Joseph Fjord, W of Kap Franklin, 12 Aug. 1932, 170 m, blue clay with  
 stones, -1.16 °C, Hoel's Greenland Exped. st.615.  
 " F3749 Tyroler Fjord, near Young Sound, 15 Aug. 1932, 320 m, clay mixed with sand,  
 -1.73 °C, Hoel's Greenland Exped. st.627.
- ZMBN 3348 79°59'N, 5°40'E, 14 Aug. 1878, 839 m, clay, -1.0 °C, Norweg. North-Atlantic  
 Exped. 1876-78 st.362.  
 " 6894 64°58'N, 11°12'W, 25 Aug. 1902, 300 fath., -0.32 °C, *Michael Sars* st.96.  
 " 8503 63°10'N, 1°35'W, 28 Jun. 1902, 1190-1318 m, clay, *Michael Sars* st.36.  
 " 11529 62°30'N, 1°56'E, 30 Jun. 1902, 500 m, -0.07 °C, *Michael Sars* st.38a.  
 " 14849 60°57'N, 4°38'W, 9 Aug. 1910, 1098 m, *Michael Sars* st.102.  
 " 15888\**Armauer Hansen*, c. 800 m, 12 May 1914, st.4.  
 " 16777 62°40'N, 1°56'E, 19 Jul. 1902, 670 m, -0.21 °C, *Michael Sars* st.55.  
 " 17561 60°57'N, 4°38'W, 9 Aug. 1910, 1098 m, *Michael Sars* st.102.  
 " 18361 63°6'N, 2°46'E, 23 Jul. 1900, 915 m, -1.07 °C, *Michael Sars* st.7.  
 " 18362 64°58'N, 11°12'W, 25 Aug. 1902, 300 fath., -0.32 °C, *Michael Sars* st.96.  
 " 23919 62°43'N, 1°26'E, 29 Jun. 1902, 775 m, clay, *Michael Sars* st.37.  
 " 23960\**Vöringen* st.362.  
 " 23967 60°57'N, 4°38'W, 9 Aug. 1910, 1098 m, *Michael Sars* st.102.  
 " 26627 63°6'N, 2°46'E, 23 Jul. 1900, 915 m, -1.07 °C, *Michael Sars* st.7.  
 " 26628 64°53'N, 10°00'W, 28 Jul. 1900, 630 m, -0.69 °C (at 600 m), *Michael Sars*  
 st.10.  
 " 26629 63°55'N, 6°22'W, 26 Jul. 1900, 1960 m, -1.0 °C, *Michael Sars* st.9.  
 " 26631 Jan Mayen, 1900, 140-160 m, -0.4 °C, *Michael Sars* st. 25.  
 " 26632 Jan Mayen, 8 Aug. 1900, 100-150 m, *Michael Sars* st.26.  
 " 26633 Jan Mayen, 9 Aug. 1900, 400 m, -0.1 to -0.2 °C, *Michael Sars* st.29.  
 " 26634 62°58'N, 1°56'E, 27 Jun. 1902, 600 fath., *Michael Sars* st.35.  
 " 26635 62°53'N, 4°14'E, 26 Jun. 1902, 450 fath., *Michael Sars* st.34.  
 " 26636 62°43'N, 1°26'E, 29 Jun. 1902, 400 fath., *Michael Sars* st.37.



- ZMBN 26637 62°30'N, 1°56'E, 29 Jun. 1902, 500 m, coarse brown sand and clay, *Michael Sars* st.38a.
- " 26638 62°40'N, 1°56'E, 19 Jul. 1902, 670 m, mud, -0.21 °C, *Michael Sars* st.55.
- " 26639 60°10'N, 6°35'W, 11 Aug. 1902, 650 fath., -0.41 °C, *Michael Sars* st.75.
- " 26641 63°13'N, 6°32'W, 29 Aug. 1902, 1783 m, -0.51 °C, *Michael Sars* st.102.
- " 26717 60°19'N, 5°22'W, 10 Aug. 1902, 1130 m, brown sand and small black stones, -0.15 °C, *Michael Sars* st.74.
- " 30497\* *Michael Sars*, 24 May 1911, 1500 m, st.18c.
- " 34085 75°59.4'N, 14°21.3'W, 24 Jul. 1905, *Belgica* st.32.
- ZMLS Franz Joseph Fjord, the mouth, 14 Aug. 1900, 200-300 m, mud, Zool. Polar-exped. st.25.
- BMNH 60°3'N, 6°24'W, 496 fath., 1°C, *Silver Belle*.
- " 60°46'N, 3°36'W, 507 fath., 4°C, *Silver Belle*.
- " 60°4'N, 5°47'W, 495 fath., 8°C, *Silver Belle* st.9.
- " Faroe Channel, 60°12'N, 6°04'W, 1869, 480 fath., -0.7°C, *Porcupine* st.56. — *Holotype*.
- " \*Faroe Channel, *Porcupine* 1869, st.52, 55, 57, 59, 62, 64, 65.
- " \**Knight Errant* coll. no. 98.7.8.1-50.
- " 60°5'N, 6°21'W, 608 fath., *Triton* 1882, Norman Coll. 1911-11-8, 49, 181-183.
- " \*Faroe Channel, 608 fath., *Triton* 1882, Norman Collection 98.7.7.21-40.
- " \*W Norway to Spitzbergen, st.18, 48, 192, 362, coll. no. 90.12.1.23-36.
- " \*Norman Collection 98.7.7.21.40.
- " \*Norman Collection 98.7.7.75.85.
- ZMES \**Knight Errant* Exped., 17 Aug. 1880, 540 (fath.)?, st.8, 11.2.
- " \*13 Jul. 1898, 100 fath., coll. by W. S. Bruce, 1921, 145.270.
- " \*13 Jul. 1898, 100 fath., coll. by W. S. Bruce, 1921, 145.270.
- " \*13 Jul. 1898, 100 fath., coll. by W. S. Bruce, 1921, 145.270.

*Boreonymphon ossiansarsi*

- ZMBN 14849 60°57'N, 4°38'W, 9 Aug. 1910, 1098 m, *Michael Sars* st.102.

## Part 3. New records and material revised by JUST

*Boreonymphon robustum*

- ZMUC 66°18.7'N, 18°36'W, 19 Jul. 1938, 360 m, *Dana* st.5982.
- " 63°06'N, 10°40'W, 24 Jul. 1938, 437 m, *Dana* st.6004.
- " Bylot Sund, 76°28.65'N, 69°21.8'W, 11 Aug. 1968, 97 m, clay, gravel, and stones, Thule Exped. 1968, Just et Vibe st.29. — *Neotype*.

*Boreonymphon abyssorum*

- ZMUC Jan Mayen, 25 Jun. 1900, 50-60 fath., mud, East Greenland Exped. 1900, S. Jensen.
- " 62°43'N, 1°26'E, 29 Jun. 1902, 425 fath., clay, *Michael Sars* st.37.
- " 64°26'N, 8°37'W, 6 Jun. 1904, 1430 m, *Thor* st.64.
- " Jørgen Brønlund Fjord, off Vendenæs, 3 Aug. 1966, 40-45 m, fine red-brown clay, 4th Peary Land Exped. 1966, Just et Andersen st.29.

*Boreonymphon ossiansarsi*

- ZMUC Hurry Inlet, 18 Aug. 1934, 80 m, *Pourquoi-Pas?*  
 " Jørgen Brönlund Fjord, at Kap Knud Rasmussen, 31 Jul. 1966, 20 m, clay with some stones, 4th Peary Land Exped. 1966, Just et Andersen st.60.

*Boreonymphon compactum*

- ZMUC Kap Tobin, 21 Aug. 1900, 110 m, stones, East Greenland Exped. 1900, S. Jensen.  
 " Bylot Sund, 76°26.8'N, 69°42.3'W, 15 Aug. 1968, 260 m, clay and large stones, Thule Exped. 1968, Just et Vibe st.35. — *Holotype*.  
 " Bylot Sund, 76°26.8'N, 69°42.3'W, 15 Aug. 1968, 260 m, clay and large stones, Thule Exped. 1968, Just et Vibe st.35.  
 " Bylot Sund, 76°26.8'N, 69°42.3'W, 15 Aug. 1968, 260 m, clay and large stones, Thule Exped. 1968, Just et Vibe st.35.

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