

A REVISION OF THE AMPHIPOD GENUS *BATHYPOREIA* LINDSTRÖM

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(Text-figs. 1-6)

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HISTORY OF THE GENUS

The genus *Bathyporeia* was established by Lindström (1855, p. 59) on specimens collected in the Baltic at Wisby and Landskrona. His description is based, apart from a reference to the epimera as small and beset with hairs, on the form of the appendages. He assigned to the genus one species, *pilosa*, in which the segments of the body are described as smooth, the form generally rounded, the eyes black, small and somewhat reniform, and the length under three lines. He gives a detailed description and drawing of the appendages. From the description of the antennae and of the eyes it may be assumed that the specimens were females.

Spence Bate in 1856 (p. 59), and again in 1857*a* (p. 146), unaware of Lindström's paper, described a new genus, *Thersites*, as follows: "The upper antennae with the second joint of the peduncle produced from the inferior side of the first. Second gnathopod terminating in a bush. Telson double." He assigned to the genus two species, namely, *guilliamsoniana* with "the inferior antenna as long again as the superior" and *pelagica* with "the inferior antenna six times as long as the superior". Thus Bate was describing a female specimen in *guilliamsoniana* and a male in *pelagica*. Later (1857*b*, p. 271) he pointed out that his genus *Thersites* lapsed in favour of *Bathy-*

poreia, and that his species *guilliamsoniana* was probably the same as the *pilosa* of Lindström.

In 1862 (p. 174) Bate gave more extensive descriptions of the two species *pilosa* and *pelagica*, based on imperfect specimens, and added a third species, *robertsoni*, based on imperfect male specimens obtained in February at Cumbrae from low-water pools. The distinction between *pelagica* and *robertsoni* is based mainly on the length of the flagellum of the antenna which in the former is "longer than the animal", and in the latter about "half as long as the animal", and in the diagram shown as having twenty-four articulations bearing calceoli. Bate and Westwood in 1863 (pp. 304-10) gave further descriptions of these three forms.

Stebbing (1875, p. 74), on an examination of living specimens from the north Wales coast and from the English Channel coast, came to the conclusion that all three of Bate's species were referable to one species, the *pilosa* of Lindström, with *pilosa* as the adult female, *pelagica* as the adult male and *robertsoni* as the young male. He collected specimens indiscriminately over the whole intertidal area; evidence is now available to show that the various species are definitely zoned in relation to tide levels. Stebbing further commented on the scarcity of forms with long antennae, i.e. the adult males; this is a feature common to all the species in the genus.

Meinert (1877, p. 201) also expressed the opinion that the *pelagica* and *robertsoni* of Bate should be referred to the *pilosa* of Lindström. However, he described a new species, *tenuipes*, which Sars later (1891, p. 129) regarded as a synonym of *pelagica*.

Blanc (1884) agreed with Stebbing and Meinert, but Chevreux (1887) upheld *robertsoni* as a distinct species.

Sars (1891, pp. 127-34) gave detailed descriptions of five species of this genus, four of which occur in the fauna of Norway, namely *norvegica*, *pelagica*, *gracilis* and *robertsoni*. *B. norvegica* is described as a new species occurring in fine sand at a depth of 2-6 m. in south Norway, *pelagica* as occurring along the whole of the Norwegian coast within the littoral zone and associated with *norvegica*; *gracilis* as a new species of which he had one male and one female specimen occurring in deep water off the west coast; *robertsoni* from three male specimens obtained on the west coast of Finmark. He further described *pilosa* from specimens in the Stockholm museum, and this is referred to as a Baltic species with no known ex-Scandinavian distribution. Sars pointed out the taxonomic value of the coxal plates, of the third epimeral plate and of the armature of the fourth pleon segment on which later Stebbing established a key for the separation of the species.

Della Valle (1893, pp. 751-54) accepted *norvegica* as a distinct species but referred *pelagica*, *robertsoni* and *gracilis* to the *pilosa* of Lindström.

Scott (1893, p. 213) referred to *norvegica*, *pelagica* and *robertsoni* as occurring in the fauna of the Firth of Forth, thus accepting the species as described by Sars.

Walker (1895*a*) examined the specimens of this genus in the British

Museum collections which were presumably determined by Spence Bate. His remarks are as follows:

“*Bathyporeia pilosa* (Lindström).

“Two tubes so labelled, of these No. 50 contains two females of *B. norvegica* (Sars); the other No. 85 contains eleven specimens, all of which have dark eyes; some have dorsal spinules on the fourth pleon segment, others have not; one (a large female) has a rudimentary tooth slightly in front of the rounded hind margin of the third pleon segment.

“*Bathyporeia pelagica* (Bate). One adult male 5 millim. long.

“This agrees with the form described by Sars under the above name. It must be confessed that, of the five species of *Bathyporeia* given by Sars, only *B. norvegica* (Sars) seems to be distinct, owing to its having the hinder angle of the third pleon segment produced to a point, instead of being rounded, as in the other species.”

Walker later (1895*b*, p. 295) expressed the opinion that the species *pelagica*, *robertsoni* and *gracilis* should be referred to the *pilosa* of Lindström.

Norman (1900, p. 326) stated that he could not “regard some of the forms as entitled to specific, indeed they seem hardly worthy of varietal, separation”. He refers to the species *norvegica*, *pelagica*, *robertsoni* and *gracilis* but does not state which he regards as specific. In a later paper (1905, p. 82) he assigns *norvegica* as a synonym of *guilliamsoniana*.

Stebbing (1906, pp. 119–22) accepted the five species as described by Sars and added a sixth doubtful species, *lindströmi*, based on Della Valle’s description of the Mediterranean forms. He accepts *norvegica* as a synonym of *guilliamsoniana*, based on Walker’s statement that the finest specimens in the Spence Bate collection are similar to the *norvegica* of Sars.

Chevreaux & Fage (1925, pp. 91–5) described and referred to *guilliamsoniana*, *pelagica* and *robertsoni* as occurring on the coast of France.

Stephensen (1928, p. 130–32) described and referred to *guilliamsoniana*, *pelagica* and *robertsoni* as occurring in the fauna of Denmark, with *pilosa* as a Baltic species.

In the above survey of the history of the genus, reference is made only to those papers which have contributed to the morphology and nomenclature of the species. In the survey of the species which follows reference is also restricted to those papers which describe or figure specimens I have had the opportunity of examining. A reference is omitted if I have not examined the specimens or cannot satisfy myself as to the identity of the species referred to. The survey of the geographical distribution of the species is based almost entirely on the examination of specimens in various collections and on personal collection; it is not based on reference to the species in the literature.

This genus is abundant in the intertidal sands around all the shores of Britain and occurs generally distributed around the coasts of Europe extending into comparatively deep water. Raitt (1937, p. 249) has shown that it is abundant in the Petersen grab hauls taken in the north-western North Sea

and adjacent waters and in the stomachs of haddock, forming a considerable item in their diet.

The genus is easily identified by the geniculate character of the first antenna and the spatulate nature of the second gnathopod. Sars (1891, p. 127), Stebbing (1906, p. 119), Chevreux & Fage (1925, p. 91) give adequate descriptions of the genus. I hope to publish shortly a description of the feeding mechanism and burrowing habits of some of the species.

NOTES ON THE STRUCTURAL CHARACTERS OF THE GENUS

The species in the genus are remarkably similar in their structural characters, a fact which has led to their confusion one with another. The chief distinguishing characters are relatively minor ones, the form of the coxal and epimeral plates, the presence or absence of spines on the fourth pleon segment, the shape of certain joints of the appendages and their relative size in relation to succeeding joints, the form of the body, the colour of the eyes and of the eggs, and the extent of the body pigmentation. The sensory armature of the species follows very closely that described by Sexton (1925, pp. 358-60) for *Gammarus chevreuxi* and is remarkably constant in the various species. It affords little of specific value so that a generalized description will serve for all the species. Only the armatures of those parts of the body used in the identification of the species is given. The differences between the sexes, apart from the brood plates, are well marked in the adult stages, particularly in the characters of the antennules and antennae.

ANTENNULE. The large truncated basal joint shows a considerable degree of variation in the shape of its apex, which character may be used as specific. The dorsal surface of this joint carries a sensory groove in which lies a group of plumose hairs which Sexton (1925) regards as probably analogous to the auditory sac of *Anaspides* and many Decapoda. On the ventral surface is a group of feathered hairs varying in number from two to five in the various species, and two plumose hairs set at an angle of 90° to each other with a series of bristles immediately dorsal to them. On the ventral surface at the apex is a group of spines, each with a bifid tip and a small flagellum near the apex. No attempt is here made to distinguish between pointed spines, slender spines and spines. The second joint is characteristically elbowed in relation to the first joint and bears distally a group of spines dorsally and a group of spines or of bristles ventrally. The third joint is like the second. The number of joints in the flagellum is of some specific value and it shows distinct "secondary sexual characteristics".

In the male each joint carries distally a calceolus with an associated group of setae dorsally and a group of aesthetascs ventrally, however, the last one or two joints do not bear calceoli. In the female the number of joints is less, and the number of aesthetascs per joint is less. The accessory flagellum has two joints, the basal of which bears up to four groups of two spines each on the

inner margin, with a single spine at the distal dorsal apex in both male and female; the male in addition has a tuft of setae on the middle of the outer margin. The size relation of the basal joint to the second joint is of specific value; the second joint is unarmed apart from a tuft of setae at the apex.

ANTENNA. The third joint is short and broad and carries two groups of bristles on its anterior margin. The fourth joint is twice as long as the third and bears groups of bristles on both anterior and posterior margins; the third and fourth joints may bear an occasional plumose hair. The fifth joint is less than the fourth and with bristles on the anterior and posterior margins. The flagellum shows secondary sexual characteristics in the male. The flagellum of the adult male is considerably elongated, its length in relation to the size of the body is of specific value. Each joint apart from the last one or two carries at the apex a calceolus and a tuft of setae. In the female the number of joints is few, and they are not modified in any way; the length of the flagellum in relation to the last two joints of the peduncle is of some specific value.

GNATHOPOD I. The shape of the propodus is of some specific value. Generally it is oval in outline with the posterior border carrying a long series of hairs and the anterior border some groups of bristles. The inner surface bears a row of spines diagonally placed, and the outer surface a few scattered bristles. The shape, size and armature of the propodus in male and female are alike. The dactylus is claw-like and larger in the male than the female; its anterior border carries a bristle which is modified in the fully adult form to a serrated bristle; the posterior border has an unmodified bristle.

PERAEOPOD III. The basis is much expanded with a row of bristles along the anterior and posterior margins and with five groups of spines on the outer surface near the anterior margin. The bristles of the anterior margin gradually change to feathered bristles near the ischium. The ischium is small and bears a group of bristles distally and feathered bristles on its anterior margin. The merus is characteristically expanded and its shape is of specific value. Its anterior margin is heavily clothed with a row of feathered bristles which become modified to serrated feathered bristles near the carpus. The number of feathered bristles is usually greater in the female than in the male. The outer surface near the anterior edge carries a row of spines. The carpus and propodus are reduced and the dactylus is absent. The carpus bears a number of spines along the anterior edge, the propodus a number of bristles along its anterior edge and one spine on the outer surface apically.

PERAEOPOD V. The size relation of the carpus and propodus is of some specific value. The dactylus is much reduced and is surrounded by a group of spines from the apex of the propodus. The carpus carries groups of bristles and spines on its anterior and posterior margins. The propodus carries groups of spines on the anterior margin and on the outer face.

UROPOD III. The basal joint carries groups of bristles along its outer margin and a row of spines at the apex. The inner ramus is much reduced,

with a few serrated spines at its apex. The outer ramus carries numerous feathered bristles along the inner margin and in some species an ordinary bristle associated with some of the groups of feathered bristles; the outer margin carries groups of spines. The terminal joint has the same armature as the basal joint. The shape of the first joint of the outer ramus and its size in relation to the second is of specific value.

TELSON. In all species the telson is cleft almost to the base. The armature is remarkably constant and gives little of specific value. Each half carries at the apex, from within outwards, a group of bristles which vary in number from two to six according to age and species, a group of usually two spines, a group of one or two serrated spines, and finally a group of one to three bristles. The dorsal surface carries one plumose hair apically, one a third of the distance from the apex and one nearer the base. The outer margin carries a further group of serrated spines and bristles, which increase in number with age. The variation in the number of bristles and spines with age in each species is such that this character, which has previously been given specific value, cannot be a determining one.

PLEON SEGMENT IV. This segment is grooved dorsally, the groove in the adult male is considerably deeper than in the adult female. The posterior edge of the groove carries a pair of forwardly directed bristles which are better developed in the male than in the female. In some species this segment also carries a pair of backwardly directed spines.

DESCRIPTION OF THE SPECIES

B. guilliamsoniana (Bate) (Fig. 1 *a-g*)

Thersites guilliamsonia Bate, 1856, p. 59.

T. guilliamsoniana Bate, 1857*a*, p. 146.

Bathyporeia guilliamsonia Bate, 1857*b*, p. 271.

B. pilosa Bate, 1862, p. 172, pl. 31, f. 4; Bate & Westwood, 1863, p. 304.

B. norvegica Sars, 1891, p. 128, pl. 43; Della Valle, 1893, p. 754; Scott, 1893, p. 213, pl. 5, f. 22; Walker, 1895*a*, p. 470; Walker, 1895*b*, p. 295.

B. guilliamsoniana Norman, 1905, p. 82; Stebbing, 1906, p. 120; Chevreux & Fage, 1925, p. 92, f. 84, 85; Stephensen, 1928, p. 130, f. 25.

It is now impossible to be certain if the two female specimens in tube no. 50 of the Spence Bate collection are the type specimens (see p. 213). Bate refers to the type specimens as having a length of $\frac{2}{10}$ inch, this is either an error or the above two female specimens are not the type specimens.

The description and drawings of this form as given by Sars are reasonably adequate, so that a brief description of certain appendages only is required.

MALE. First pair of coxal plates with a pointed tip and carrying a group of up to six bristles on the posterior margin; the origin of a smaller bristle is marked by a well-defined tooth. Second and third pair of coxal plates with a well-defined tooth at the posterior corners, marked by a distinct sulcus; the

ventral margin bears a row of about fifteen to twenty bristles. Fourth pair of coxal plates rounded as in the other species but carrying up to forty-eight bristles on the ventral margin. Last pair of epimeral plates (pleon segment III) with a distinct tooth at the posterior corner which projects beyond the posterior vertical margin of the plate; in fully adult males this tooth is considerably reduced and traces of it only remain; the outer margin bears four or five groups of spines which may be serrated in fully adult forms. Pleon segment IV deeply depressed with a pair of forwardly curving bristles and a pair of backwardly directed spines. The basal joint of the antennule is evenly rounded at the tip, its lower border with four or five feathered hairs; the flagellum is of ten to twelve joints of which the first eight to ten carry a calceolus and a dense tuft of aesthetascs; the basal joint of the accessory flagellum is long and narrow, as 100 : 14, with the second joint about a third the length of the first, with five groups of spines on the inner margin and a tuft of bristles on the outer margin. The antenna and first gnathopod are as described by Sars. Peraeopod III with the merus twice as long as broad, as 100 : 50, with the relation of the length of the merus to carpus plus propodus combined as 100 : 75. The propodus and carpus of peraeopod V are of equal length, robust and very spiny, dactylus short. Uropod III with the second joint of the outer ramus less than a third the length of the basal, as 30 : 100, with fifteen to seventeen feathered bristles on the inner margin of the basal joint and three to four on the second joint, with nine groups of spines on the outer margin. Telson with the typical arrangement of apical armature of which an average condition is, reading from within outwards, five or six bristles, two spines, one plumose hair (inset on dorsal surface), one or two serrated bristles, one to three bristles; laterally four serrated bristles and two bristles.

FEMALE. The female differs from the male in the following points: flagellum of antennule with seven or eight joints, the accessory flagellum without a tuft of setae on outer margin; flagellum of the antenna with eight or nine joints, considerably shorter than the fourth and fifth joints of the peduncle combined, as 71 : 100. The merus of peraeopod III may carry up to forty feathered bristles on its anterior border. Uropod III with a less number of feathered bristles, usually ten to twelve. Pleon segment IV less deeply depressed.

This species attains a length of 8 mm., and is the largest and most robust in the genus. It is translucent without any trace of pigment apart from the eyes which are a bright red. Eggs with a yellowish tinge.

Geographically this species is probably distributed around all the shores of Europe apart from the Baltic. Chevreux & Fage (1925, p. 92) have recorded it from numerous localities in the English Channel and Mediterranean waters; Stephensen (1926, p. 53 and 1928, p. 130) from numerous localities around the Danish coasts; Elmhirst (1931, p. 170) from numerous localities around the Scottish coasts; Raitt (1937, p. 249) as present in many of the Petersen grab hauls from the north-western North Sea to a depth of 75 m. and in the stomachs of haddock to a depth of 35 m.; Crawford (1937a,

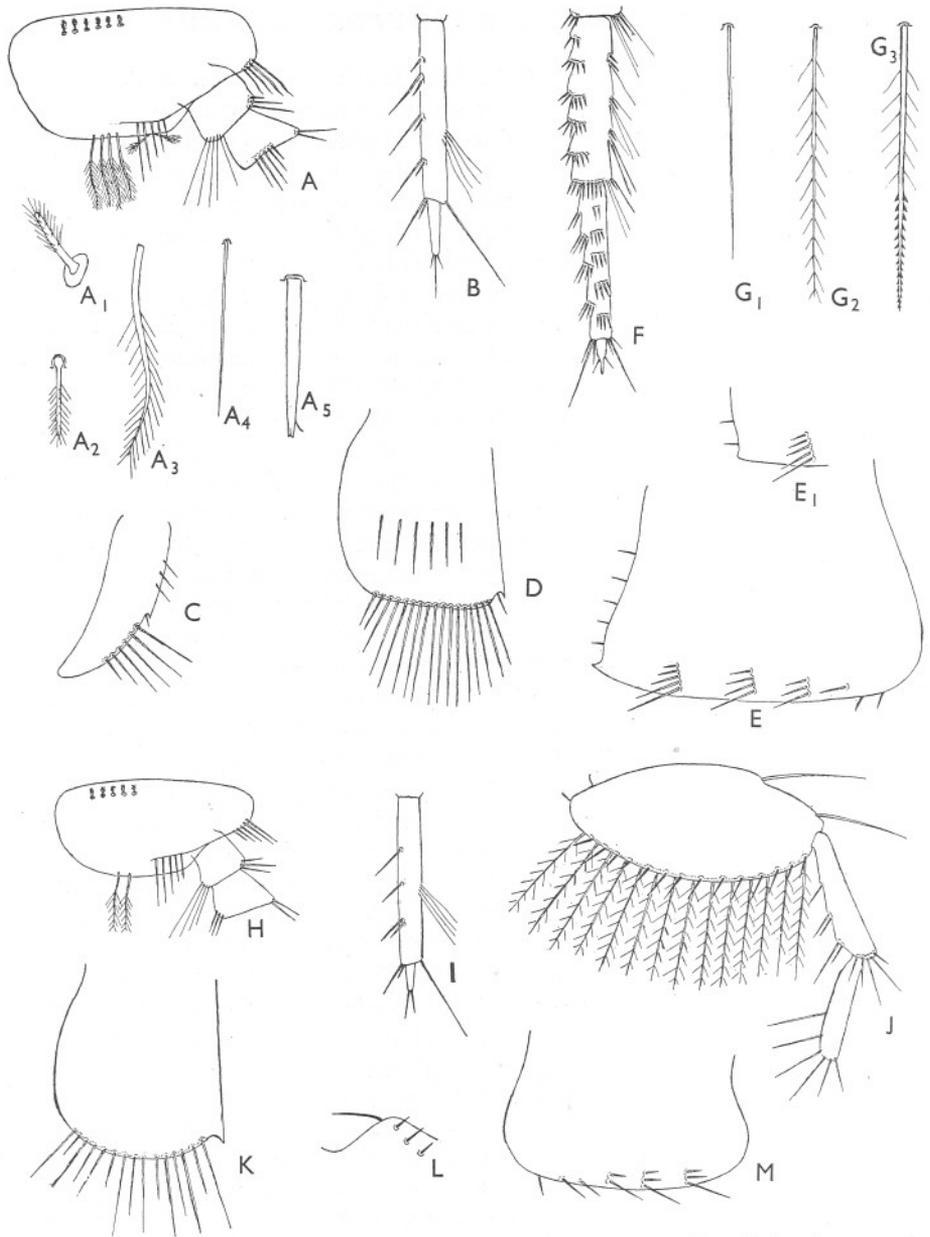


Fig. 1. a-g, *B. guilliamsoniana* ♂. h-m, *B. gracilis* ♂ type specimen. a, Basal joint of antennule; a₁, Plumose hair from dorsal groove; a₂, a₃ and a₄, Plumose hair, feathered hair and bristle from ventral margin; a₅, Spine from apex of joint. b, Accessory flagellum of antennule. c, First coxal plate. d, Second coxal plate. e, Third epimeral plate in adult ♀ and young ♂. e₁, Third epimeral plate in adult ♂. f, Carpus, propodus and dactylus of pereopod V. g₁, g₂, g₃, To show change from bristle to feathered bristle to feathered serrated bristle along anterior margin of basis, ischus and merus of pereopod III. h, basal joint of antennule. i, Accessory flagellum of antennule. j, Merus, carpus and propodus of pereopod III. k, Second coxal plate. l, Fourth pleon segment. m, third epimeral plate.

p. 637) from Plymouth waters; Moore (1937, p. 118) from Isle of Man waters. In the Norman collection in the British Museum there are specimens from the Moray Firth (register numbers 13762-781 and 13803), from Ilfracombe (13792) and from Guernsey (13782-791). As *B. norvegica* Sars (1891, p. 128) has recorded it from a single locality in the south of Norway; Della Valle (1893, p. 754) from the Bay of Naples; Scott (1893, p. 213) from the Firth of Forth; Walker (1895*b*, p. 295) from the north Wales and Isle of Man coasts. Spence Bate (1863, p. 306) gives the type locality as Weymouth "on a fine sandy bottom", and Tenby. This species may be collected at the low-water mark of spring tides and in shallow water at many localities around the British coasts.

B. pelagica (Bate) (Fig. 2)

Thersites pelagica Bate, 1856, p. 59; 1857*a*, p. 146.

Bathyporeia pelagica Bate, 1862, p. 174, pl. 31, f. 6; Bate & Westwood, 1863, p. 309.

Type specimen, a male, 5 mm. long, in the Spence Bate collection, British Museum, tube no. 86. Locality, Bate (1863, p. 309), Moray Firth.

MALE. This description is based partly on the type specimen (as far as possible without dissection) and partly on specimens collected at Aberystwyth and Kames Bay, Millport, and compared with specimens from other localities.

Body robust. First pair of coxal plates with a rounded tip and carrying a row of three to four bristles on the posterior margin; the origin of a more dorsally situated bristle is not marked by a tooth. Coxal plates II, III and IV as deep as the corresponding segments. Second pair of coxal plates rounded anteriorly without a tooth at the posterior corner; this corner is marked by a rounded projection not defined by a sulcus; the ventral margin carries a row of six to nine bristles. Third pair of coxal plates rectangular in outline, otherwise much as the second pair. Fourth pair of coxal plates rounded as in the other species with about 24 bristles on ventral margin. Last pair of epimeral plates (pleon segment III) unevenly rounded at the posterior corner in the adult male but with a small tooth marked by a well-defined sulcus some little distance from the apex in the young male; the ventral border carries about four groups of spines, the number of spines per row decreasing anteriorly. Pleon segment IV deeply depressed dorsally and carrying a pair of stout spines directed posteriorly and a pair of bristles directed anteriorly. Antennules with the basal joint produced to a point dorsally—the somewhat triangular apex is characteristic of this species and of *tenuipes*—lower border with three feathered hairs. The flagellum is of nine to eleven joints of which the first eight to ten carry calceoli and each a dense tuft of aesthetascs; accessory flagellum with the second joint about a quarter the length of the basal, as 27 : 100; the basal carries three or four groups of two spines each on the inner margin and a tuft of setae on the outer margin. The flagellum of the antenna is longer than the body; all the joints except the last one or two carry calceoli. The propodus of the first gnathopod is an oblong oval as in the other species,

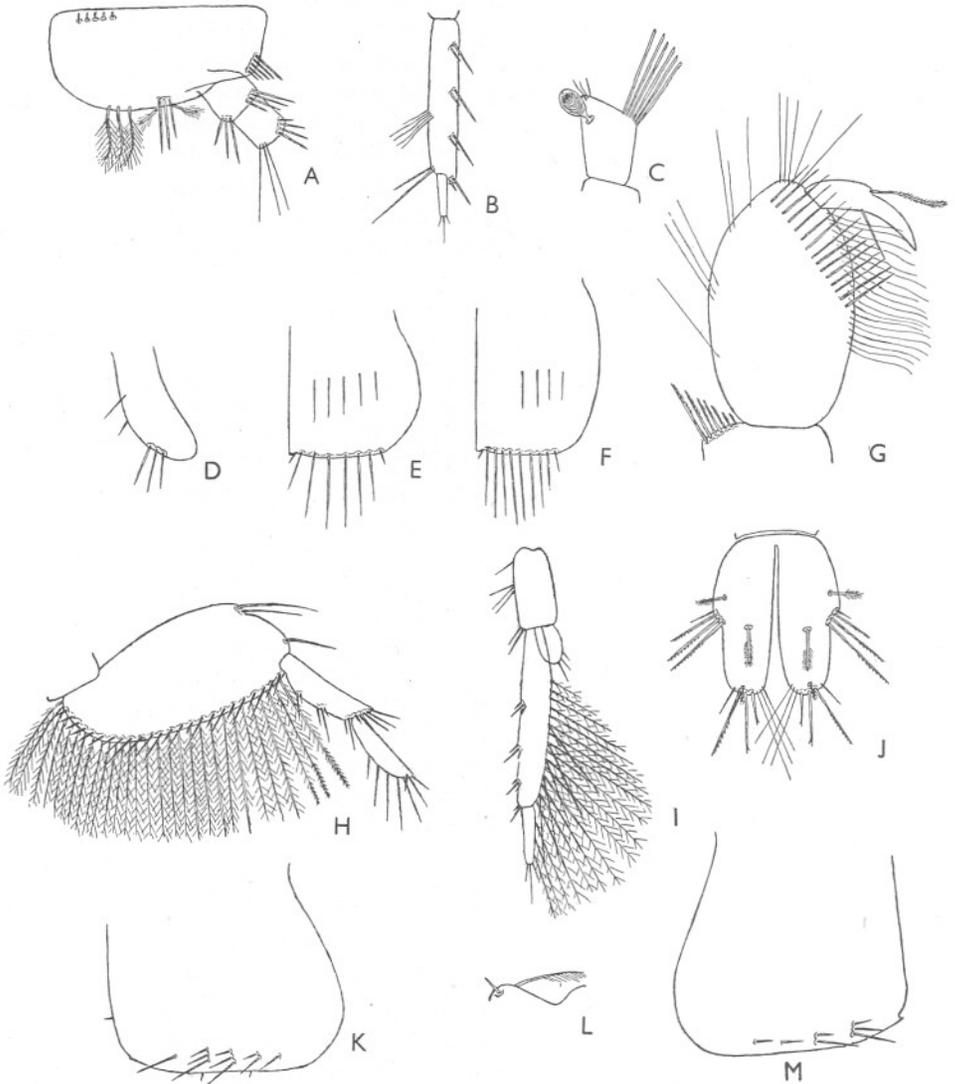


Fig. 2. *B. pelagica* ♂. *a*, Basal joint of antennule. *b*, Accessory flagellum of antennule. *c*, Typical joint from middle of flagellum of antennule. *d*, First coxal plate. *e*, Second coxal plate. *f*, Third coxal plate. *g*, Propodus and dactylus of first gnathopod. *h*, Merus, ischus and propodus of pereopod III. *i*, Third uropod. *j*, Telson. *k*, Third epimeral plate in adult ♂. *l*, Fourth pleon segment in adult ♂. *m*, Third epimeral plate in adult ♀ and young ♂.

except *elegans*; the dactylus is sharply pointed and carries a feathered bristle on its anterior margin in fully developed males but a simple seta in mature but not fully developed males. Peraeopod III with the merus more than twice as long as broad, as 100 : 44, the relation of the length of the merus to carpus and propodus combined being as 100 : 74; the anterior border of the merus carries up to thirty feathered bristles on its edge with up to twenty-four spines on the outer face. Peraeopods IV and V elongate, the relation of the length of the carpus to propodus in peraeopod V as 81 : 100. The outer ramus of uropod III with the second joint about a third the length of the basal, as 37 : 100, with fourteen to sixteen feathered bristles on inner margin of basal joint and two to four on the second joint; an ordinary bristle is associated with several of the feathered bristles, outer margin with four or five groups of spines. Telson with the typical arrangement of apical armature of which the usual condition is, reading from within outwards, three to five bristles, two spines, one plumose hair, one serrated bristle, one bristle; laterally with two or three serrated bristles and one or two bristles. Eyes reniform with dark red pigment.

FEMALE. The female differs from the male in the following points: the flagellum of the antennule with six or seven joints, the accessory flagellum without a tuft of setae on its outer margin. The flagellum of the antenna with eight to eleven joints and a little less in length than the fourth and fifth joints of the peduncle combines, as 92 : 100. The merus of peraeopod III may carry up to thirty-four feathered bristles on its anterior margin, although this number is exceedingly variable in egg-bearing females, the minimum count was twenty-one. The outer ramus of uropod III carries a less number of feathered bristles, usually seven to ten. Last pair of epimeral plates as in the young male and with a variable number of groups of spines and spines per group, an examination of ten individuals gave the following readings: 2.2.1, 2.2.2, 3.2, 3.2.1 (twice), 3.3.2, 3.2.2.1, 3.3.1.1, 3.3.2.1, 3.3.1. The number of bristles on the ventral margin of the coxal plates is greater than in the male. The fourth pleon segment is less deeply depressed. Eyes rounded with dark red pigment.

The body pigment is abundant, particularly in the pleon and its appendages, but this is variable in specimens from various localities. Eggs deep blue in colour.

The distribution of this species is, as far as my present records are concerned, restricted to the intertidal sandy shores of the coasts of Britain. It is found to occupy a definite tidal level below the high-water mark of neap tides. It has been found at numerous points on the west coast of Wales, at Redcar (Yorkshire) and the extensive collections of the Scottish Marine Biological Station show it to be common in many localities around the Scottish coast. It has not appeared in the collections of the Copenhagen, Stockholm and Oslo Museums.

*B. elegans**, nom.nov. (Fig. 3)

B. pelagica Sars, 1891, p. 129, pl. 44, f. 1.

Type specimens, numerous adult males and females, and young forms in the Zoological Museum, Oslo. Locality "in the Ognebugt off Jaederen", South Norway (Sars, 1891, p. 45).

The description given by Sars may be modified and amplified in the following particulars. Of the species in this genus this is the smallest and finest. The body is narrow and elongate; occasional specimens may reach a length of 6 mm., although 4-5 mm. is much more usual.

MALE. First pair of coxal plates with an obtusely pointed tip; the posterior margin carries a row of four to five bristles with a single bristle dorsal to the row, the origin of which is marked by a distinct but small tooth. The second, third and fourth pairs of coxal plates as deep as the corresponding segments. Second pair of coxal plates with a tooth on the posterior corner which is not as well developed as in *guilliamsoniana* and *tenuipes*; the tooth does not reach to the level of the base of the plate, but is variable in the degree of its development; the ventral margin carries a row of about twelve bristles. Third pair of coxal plates rectangular in outline, otherwise as the second pair. Fourth pair of coxal plates rounded as in the other species with about twenty-four bristles on the ventral margin. Last pair of epimeral plates (pleon segment III) rounded, without a tooth at the posterior corner; the outer edge carries about four groups of setae decreasing in number anteriorly. Pleon segment IV deeply depressed dorsally with one pair of bristles directed anteriorly and one pair of spines posteriorly. The basal joint of the antennule is evenly rounded at the tip, the lower border with two or three feathered hairs. Flagellum of nine to eleven joints of which the first seven to nine carry calceoli and a dense tuft of aesthetascs. Accessory flagellum with the second joint about a third the length of the basal, as 33 : 100; the basal carries up to four groups of spines on the inner margin and a tuft of setae on the middle of the outer margin. The flagellum of the antenna is longer than the body. The propodus of the first gnathopod is an oblong oval about twice as long as broad, longer than in the other species. The merus of pereopod III is more than twice as long as broad, as 100 : 46, the relation of the length of the merus to carpus and propodus combined being as 100 : 87; anterior border of the merus with about twenty-four feathered bristles and with about twenty-four spines on the outer face. Pereopod V with the carpus not so long as the propodus, as 90 : 100, dactylus pointed as a spine. The second joint of the outer ramus of uropod III is a little more than a third the length of the basal, as 100 : 38; the basal carries nine to eleven feathered bristles on its inner margin with an accessory seta associated with some of the bristles, the second joint

* Mr G. I. Crawford desires me to state that his reference to *B. elegans*, this *Journal*, Vol. XXI, p. 639, line 4, is an error and should read *B. gracilis*.

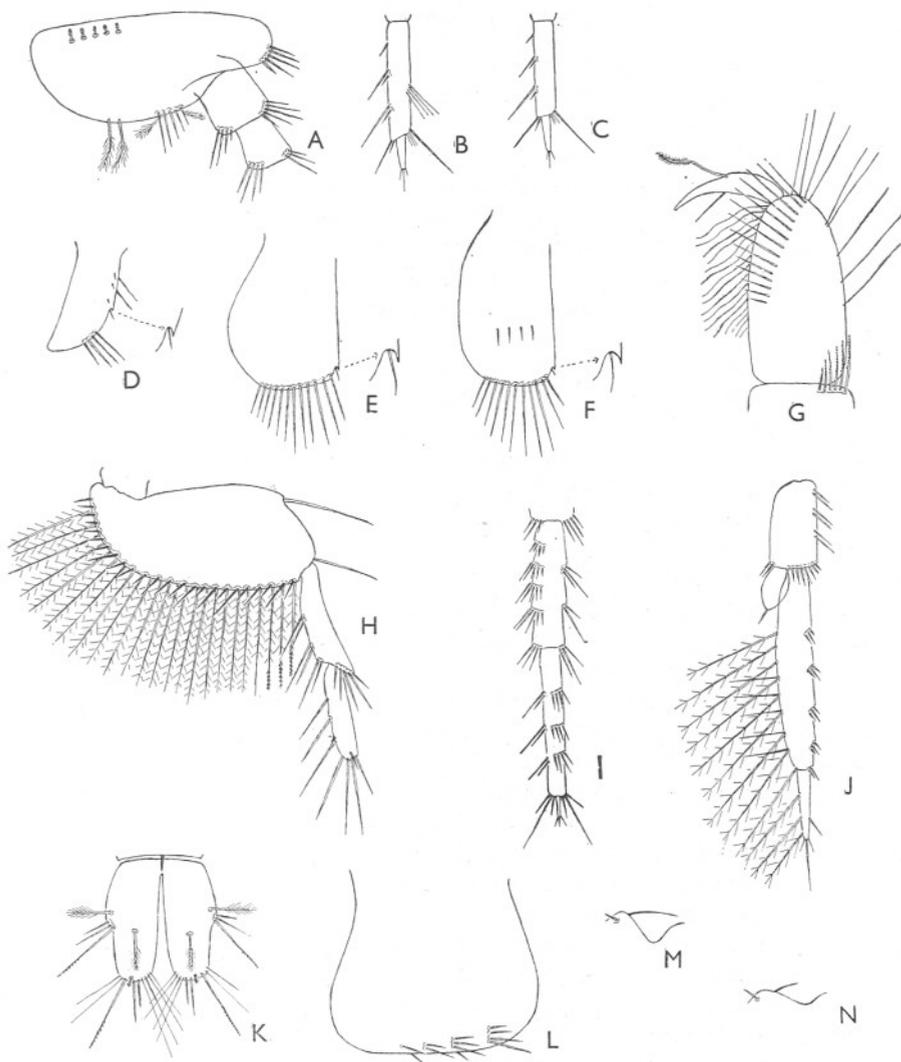


Fig. 3. *B. elegans* ♂. *a*, Basal joint of antennule. *b*, accessory flagellum of ♂. *c*, Accessory flagellum of ♀. *d*, First coxal plate. *e*, Second coxal plate. *f*, Third coxal plate. *g*, Propodus and dactylus of first gnathopod. *h*, Merus, carpus and propodus of pereopod III. *i*, Carpus, propodus and dactylus of pereopod V. *j*, Third uropod. *k*, Telson. *l*, Third epimeral plate. *m*, Fourth pleon segment in ♂. *n*, Fourth pleon segment in ♀.

with two or three feathered bristles; the outer margin bears four to six groups of spines. Telson with the typical arrangement of apical armature of which a usual condition is, reading from within outwards, two to four bristles, two spines, one plumose hair, one to three bristles, and laterally one or two serrated bristles and two or three bristles. Eyes large and reniform with bright red pigment.

FEMALE. The female differs from the male in the following points: the flagellum of the antennule with six joints, occasionally five, accessory flagellum with the basal joint shorter and broader, giving a relation with the second joint as 100:42 and without a tuft of setae on its outer margin. The flagellum of the antenna has eight or nine joints, occasionally ten, the relation of the length of the flagellum to the fourth and fifth joints of the peduncle being as 88:100.

The feathered bristles on the inner margin of uropod III are about equal in number to those in the male but are not so well developed. The merus of pereopod III has up to thirty feathered bristles on the ventral margin. The third epimeral plate gave the following readings for spine groups: 4.2.1 (twice), 4.2.2, 4.3.1 (twice), 4.3.2, 4.1.1.1, 5.3.2 (twice). The fourth pleon segment is less deeply depressed. Eyes rounded with bright red pigment.

The body in both male and female is translucent with practically no pigment. The colour of the eggs is yellowish.

Thus the main points in which *elegans* differs from *pelagica* are (i) the shape of the basal joint of the antennule, (ii) the presence of a small tooth on the coxal plates, (iii) the rounded posterior border of epimeral plate III, (iv) the general lack of pigmentation, (v) the colour of the eggs and of the ovary in the female, and (vi) the distribution in relation to tide level.

This species may be collected at low-water mark of spring tides in several localities around the coasts of Britain. It is in general a shallow-water form. The collections of the Oslo Museum show it to be present in several localities along the whole Norwegian coast, the Copenhagen Museum collections contain specimens from the Kattegat and from the North Sea coast of Denmark. In the Norman collection in the British Museum there are specimens from the Moray Firth (register numbers 13762-781 and 13826-827), from "25 miles off the Isle of May" (13813-816), from Whitsand Bay (13828-842), from Shetland (13843-845), and from Cumbrae (13846-855). Crawford (1937a, p. 637) records it as *B. pelagica* from Plymouth waters. The extensive collections of the Scottish Marine Biological Station show it to occur in several localities on the east and west coasts of Scotland and I have found it in one locality on the west coast of Wales. Stephensen (1928, p. 131) records *B. pelagica* as far south as Madeira, but this record needs confirmation in view of its possible confusion with *temuipes*. Thus it may be stated to have a general distribution around all the Atlantic coasts of Europe.

B. tenuipes Meinert (Fig. 4)*B. tenuipes* Meinert, 1877, p. 201.*B. gracilis* Norman, 1900, p. 326.*B. elegans* Crawford, 1937a, p. 639.

Type specimen, an adult male in the Zoological Museum, Copenhagen. Locality given on label in tube as Anholt, Kattegat. Meinert's description is as follows: "Antennae superiores subundae, flagello appendiculari bi-articulato. Antennae inferiores articulo tertio et quarto longis atque tenuibus. Angulus capitis acutus productus. Pedes omnes tenues, modice hirsuti; pedes saltatorii ultimi paris setis simplicibus instructi."

Through the kindness of Dr K. Stephensen of Copenhagen I have been able to examine the type specimen of *tenuipes* and find it sufficiently different from *B. pelagica* (Bate) and *B. elegans* to justify specific rank.

MALE. The type specimen may be redescribed as follows: Length 6 mm. Body elongate and narrow. First pair of coxal plates narrow with an obtusely pointed tip; the posterior margin possesses a row of about six setae with a single seta on the middle of the margin the origin of which is not marked by a tooth; dorsally there is a row of about eight setae on the outer face. Coxal plates II, III and IV deeper than the corresponding segments. Second pair of coxal plates triangular in outline with a pronounced tooth posteriorly defined by a deep sulcus, and carrying a row of about twenty-one bristles ventrally. Third pair of coxal plates rectangular in outline, otherwise as the second pair. Last pair of epimeral plates (pleon segment III) evenly rounded at the posterior corner without any trace of a tooth; the lower edge carries numerous groups of spines with one to three spines per group, reading 2.2.3.1.2.2.2.1.1.1, the posterior edge with three hairs. Pleon segment IV deeply depressed dorsally with a pair of anteriorly directed bristles and a pair of posteriorly directed spines; an additional pair of spines may be present in some specimens. The basal joint of the antennule is produced into a triangular point (N.B. "Angulus capitis acutus productus"), lower border with five feathered hairs. Flagellum of eleven joints of which the first nine carry calceoli and a dense tuft of aesthetascs. Accessory flagellum long and narrow with the second joint a little less than a third the length of the basal, as 31 : 100; the basal carries four groups of spines on the inner margin and a tuft of setae on the outer margin. The flagellum of the antenna is longer than the body. The propodus of the first gnathopod is an oblong oval as in the other species except *elegans*. Peraeopod III with the merus twice as long as broad, as 100 : 50, the relation of the length of the merus to carpus plus propodus combined as 100 : 84, the anterior border carries an edge row of about twenty-six feathered bristles with a row of about twenty-five spines on the outer face. Peraeopods IV and V elongate and narrow, peraeopod V with the carpus longer than the propodus, as 100 : 85, dactylus pointed as a spine. The outer ramus of uropod III is long and narrow with the second joint more than a

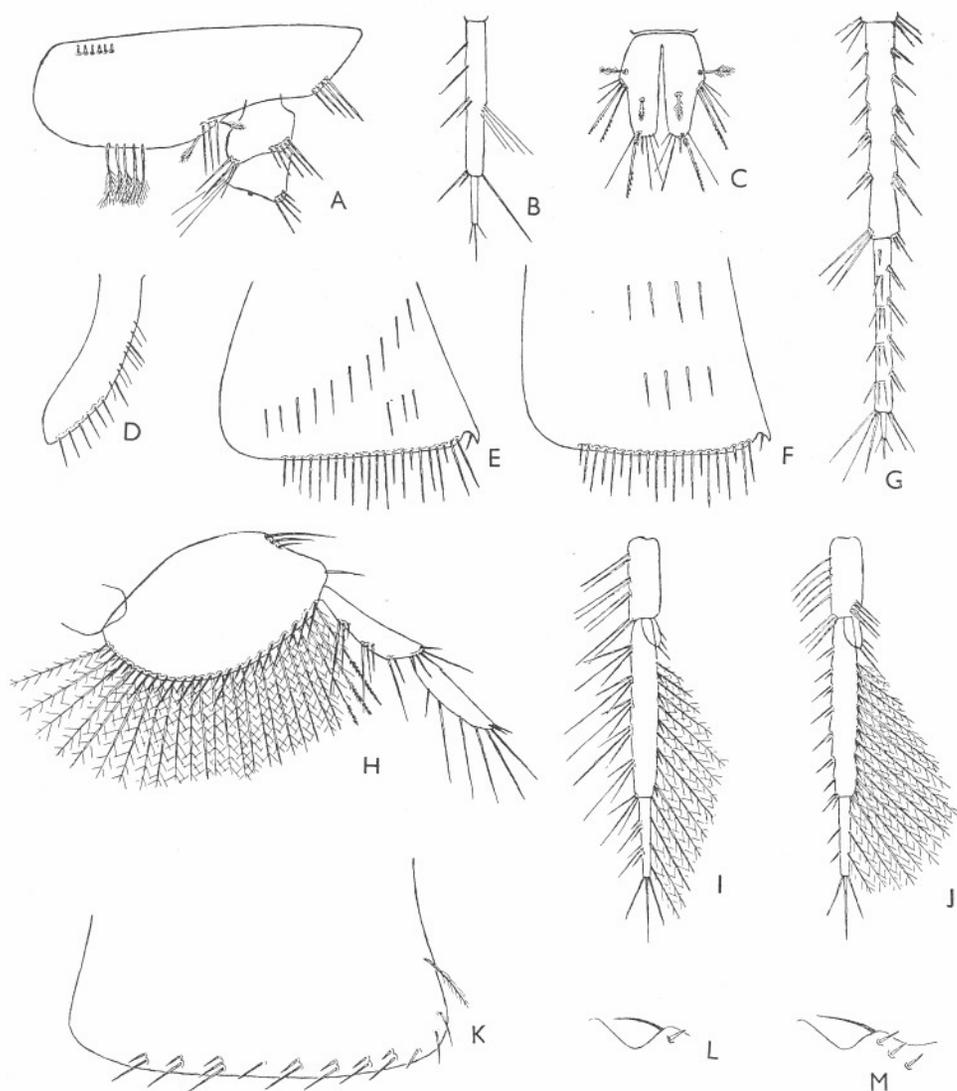


Fig. 4. *B. tenuipes* ♂. *a*, Basal joint of antennule. *b*, Accessory flagellum of antennule. *c*, Telson. *d*, First coxal plate. *e*, Second coxal plate. *f*, Third coxal plate. *g*, Carpus, propodus and dactylus of pereopod V. *h*, Merus, carpus and propodus of pereopod III. *i*, Third uropod of ♀. *j*, Third uropod of ♂. *k*, Third epimeral plate. *l*, Fourth pleon segment of type specimen. *m*, Fourth pleon segment of male from unrecorded locality in Kattegat.

third the length of the basal, as 45 : 100; the basal joint carries thirteen and the second joint three feathered bristles on the inner margin, each with an associated short seta; the outer margin with eight groups of spines. Telson with an apical armature of two or three bristles, one spine, one plumose hair, two or three bristles one of which may be modified to a serrated bristle, two bristles, laterally with two serrated bristles, two bristles. Eyes large and reniform. Colour unknown. A comparison of other adult males with the type shows but little variation.

FEMALE. The female differs from the male in the following points: the flagellum of the antennule with six or seven joints, accessory flagellum without a tuft of setae on the outer margin, the second joint from a quarter to more than a third the length of the basal. The flagellum of the antenna with eight to ten joints, the relation of the length of the flagellum to fourth and fifth joints of the peduncle combined as 84 : 100, but somewhat variable. The outer ramus of uropod III with about seven feathered bristles on the inner margin with the accessory bristles well developed, the outer margin with ten groups of well-developed spines, the spines almost as long as the feathered bristles. The anterior border of the merus of pereopod III carries a greater number of feathered bristles. The ventral margin of the second and third coxal plates a greater number of bristles. The fourth pleon segment is less deeply depressed.

Thus the main points in which *tenuipes* differs from *elegans* are (i) the triangular end to the basal joint of the antennule with four or five feathered hairs on the lower margin, (ii) the well-developed tooth at the posterior corner of coxal plates II and III, (iii) the numerous rows of spines on the third epimeral plates, and (iv) the length of the second joint of the outer ramus of uropod III which is more than a third the length of the basal.

Geographically this species has a wide distribution, but due to its previous confusion with *elegans* the number of records are few. The author has examined the collections of *B. pelagica* of the Copenhagen Museum, which show *tenuipes* as occurring at five stations in the Kattegat; the Stockholm Museum collections contain one tube of this species labelled as from the Kristinberg Biological Station without exact locality. In the Norman collection in the British Museum there are specimens from Guernsey (register numbers 13782-791 and 13808-812), from Start Bay, Devon (13817-821), from the Kattegat (13859), from the Scilly Isles (13875) and from two stations of the *Porcupine* Expedition, 1869, namely St. 6, west of the Shannon, Ireland, 90 fathoms (13871-874), and St. 18, west of Clew Bay, Ireland, 183 fathoms (13856-858). Crawford (1937a, p. 639) records it as *B. elegans* (see footnote, p. 222) from Cawsand Bay, Plymouth.

B. gracilis Sars (Fig. 1, *h-m*)

This is a somewhat doubtful species described by Sars (1891, p. 132, pl. 45, f. 1) from an adult male and female collected from comparatively deep water off the Norwegian coast. The male specimen only is extant.

An examination of the male specimen shows that it agrees in certain features with *tenuipes*, to which it seems most nearly related. It agrees with *tenuipes* in possessing (i) a well-developed tooth at the posterior corner of coxal plates II and III; the shape of the first coxal plate was not ascertained, but Sars describes it as obtusely pointed. (ii) Peraeopods IV and V are long and narrow, (iii) the third epimeral plate is evenly rounded at the posterior corners and carries numerous groups of spines, (iv) the pleon segment IV carries more than one pair of backwardly directed spines. (v) The third uropod is missing in the specimen, but Sars' drawing of this appendage in the female shows its agreement with *tenuipes*. It differs from *tenuipes* in (i) the rounded end to the basal joint of the antennule with two feathered hairs on the lower margin; (ii) the second joint of the accessory flagellum is short and about a fifth the length of the basal; (iii) the merus of peraeopod III is not expanded, it is more than twice as long as broad. It is unlike any other species in the character of the flagellum of the antenna in the male, which is short and composed of thirteen joints of which the first five carry calceoli. It seems advisable to retain this species until further specimens are available.

B. pilosa Lindström (Fig. 5)

B. pilosa Lindström, 1855, p. 59, pl. 2, f. 1-11; Sars, 1891, p. 133, pl. 45, f. 2; Stebbing, 1906, p. 121; Stephensen, 1928, p. 132, f. 25.

B. robertsoni Bate, 1862, p. 173, pl. 31, f. 5; Bate & Westwood, 1863, p. 307.

Type specimen, a female, not extant. Locality, off the island of Gottland, Baltic. A brief description of specimens collected at Kames Bay, Millport, which have been compared with specimens from the Baltic kindly loaned by Dr Sixten Bock of the Zoological Museum, Stockholm, follows:

MALE. Length not exceeding 6 mm. Body robust. First pair of coxal plates with a pointed tip and with a group of three or four bristles on the posterior margin; the origin of a single bristle dorsal to this group is not marked by a tooth. Coxal plates II, III and IV are not as deep as the corresponding segments and thus are smaller than in the other species. Second pair of coxal plates rounded but narrowing towards the base; the ventral margin carries a row of about five to six bristles and the posterior corner is not marked by a tooth. Third pair of coxal plates rectangular, but narrowing towards the base, otherwise as the second pair. Last pair of epimeral plates (pleon segment III) evenly rounded at the posterior corner without any trace of a tooth; the number of groups of spines is less than in the other species, a typical arrangement is 2.1 or 3.1. Pleon segment IV deeply depressed dorsally with a pair of anteriorly directed bristles. The basal joint of the antennule is evenly rounded at the tip which is narrower than in the other species; lower margin with two feathered hairs; the number of joints in the flagellum varies from ten to fourteen of which the first eight to twelve carry calceoli and a small group of three to four aesthetascs, the flagellum is longer than in the other

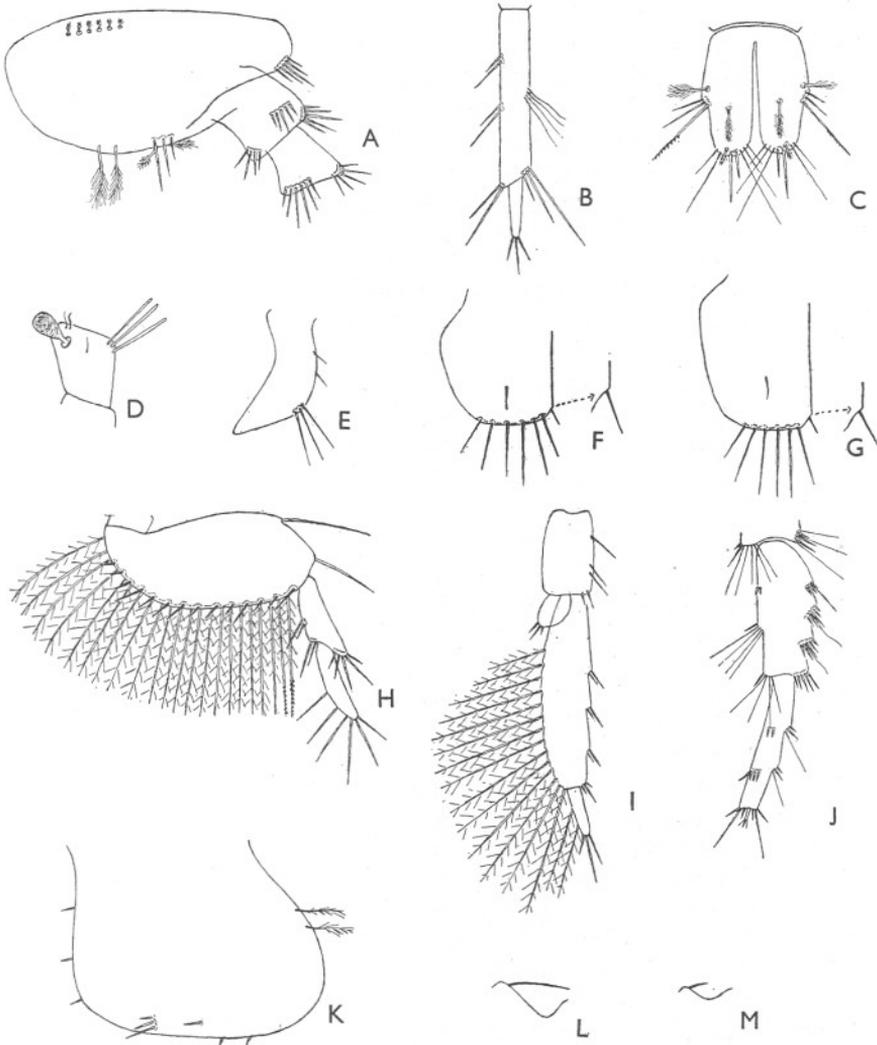


Fig. 5. *B. pilosa* ♂. *a*, Basal joint of antennule. *b*, Accessory flagellum of antennule. *c*, Telson. *d*, Typical joint from middle of flagellum of antennule. *e*, First coxal plate. *f*, Second coxal plate. *g*, Third coxal plate. *h*, Merus, carpus and propodus of pereopod III. *i*, Third uropod. *j*, Carpus, propodus and dactylus of pereopod V. *k*, Third epimeral plate. *l*, Fourth pleon segment in ♂. *m*, Fourth pleon segment in ♀.

species and the number of aesthetascs fewer. Accessory flagellum with the second joint less than a third the length of the basal, as 29 : 100, with three groups of spines on the inner margin and a tuft of setae on the outer margin. The flagellum of the antenna is about one-half to two-thirds the length of the body, the number of joints varying from seventeen to over thirty, all of which apart from the last one or two carry calceoli. The propodus of the first gnathopod as in the other species except *elegans*. The merus of pereopod III is more than twice as long as broad, as 100 : 46; its anterior margin carries a row of from eighteen to twenty-four feathered bristles, and is much longer than the carpus plus propodus combined, as 100 : 71. The carpus and propodus of pereopod V are of equal length, the carpus is broad and more robust than in the other species. The basal joint of the outer ramus of the third uropod is expended along the middle of its length, with from twelve to eighteen feathered bristles on the inner margin and three to four groups of spines on the outer margin; the second joint is less than a third the length of the basal as 26 : 100, with one to three feathered bristles on its inner margin. A typical arrangement of the armature at the apex of the telson is, reading from within outwards, two or three bristles, two spines, one plumose hair which may be absent, two to four bristles, the inner one of which may be modified to a serrated bristle, laterally one serrated bristle and two bristles. Eyes reniform with dark red pigment.

FEMALE. The female differs from the male in the following points: the flagellum of the antennule with six or seven joints, accessory flagellum without a tuft of setae on the outer margin and with the second joint on an average more than a third the length of the basal, as 37 : 100. The flagellum of the antenna with eight or nine joints and in length less than the fourth and fifth joints of the peduncle combined, as 83 : 100. The number of feathered bristles on the anterior border of pereopod III varies from twenty-three to thirty, on the inner margin of the third uropod from five to ten. The number of groups of spines and spines per group on the third epimeral plate of ten specimens gave the following readings: 1 (twice), 1.1 (twice), 1.1.1, 2.1 (four), 2.1.1. Eyes round with dark red pigment. Eggs blue.

Colour of body variable; in the reddish sands of Kames Bay the amount of red pigment in the pleon is considerable, in the lighter coloured sands of the Welsh coast pigment it is much less.

Geographically this species occurs in numerous localities in the Baltic from the Danish coast to the island of Gottland (Oldevig, 1933), in the Kattegat and on the North Sea coast of Denmark (specimens in the Zoological Museum, Copenhagen), in the Oslo fjord (specimens in the Zoological Museum, Oslo). My only records of it from the east coast of England and Scotland are Leigh-on-Sea (Essex) collected by Crawford (specimens in the British Museum) and from Amble (Northumberland), specimens supplied by Professor A. D. Hobson, Newcastle, who also collected it in the Hebrides in 1937. Further collecting in the estuaries on the east coast will probably add many records.

I have no records from the English Channel. On the west coast of Britain it is abundant in several localities. I have collected it in the estuaries and sandy beaches of the west coast of Wales, at Kames Bay, Millport, and on the Ayrshire coast; in these localities it occurs above the high-water mark of neap tides, occasionally in water of somewhat reduced salinity. Crawford (1937*b*, p. 652) records it as *Bathyporeia* sp. from the River Taw, North Devon.

B. sarsi, nom.nov. (Fig. 6)

B. robertsoni Sars, 1891, p. 131, pl. 44, f. 2; Scott, 1893, p. 213, pl. 5, f. 26-9; Stebbing, 1906, p. 121; Chevreux & Fage, 1925, p. 94, Stephensen, 1928, p. 132, f. 25.
B. pilosa Elmhirst, 1931, p. 170.

Type specimens, three adult males, two of which are extant, in the Zoological Museum, Oslo. Locality (Sars, 1891, p. 132) Sorvaer, west coast of Finmark, northern Norway.

The specimens described by Bate as *B. robertsoni* were collected by Robertson on "Cumbrae...in sand pools, near low water mark, numerous darting hither and thither". Bate gave two somewhat meagre descriptions and two contradictory drawings of these specimens, the first (1862, p. 173, pl. 31, f. 5) shows fourteen joints in the flagellum of the antennule and twenty-four joints with calceoli in the flagellum of the antenna; the second (1863, p. 307, with figure) shows ten joints in the flagellum of the antennule and eighteen joints in the flagellum of the antenna. Sars in his description of the Norwegian specimens states "inferior antennae...composed of seventeen articulations each except the last two bearing calceoli". Thus Sars seems to have based his identification of the Norwegian specimens on the second of Bate's drawings. An examination of the type locality of *B. robertsoni* Bate during April 1936, 1937 (Watkin, 1937) and 1938 failed to show a single specimen of this species as described by Sars, but *B. pilosa* Lindström was abundant and an occasional specimen was found with as few as seventeen calceoli-bearing joints in the flagellum of the antenna.

I am myself confident that the *robertsoni* of Bate was *pilosa*, and it thus follows that Sars was dealing with a new species which is here named "*sarsi*" in compliment to him. The following description is based partly on the two type specimens and partly on specimens from other localities.

MALE. Length not exceeding 6 mm. Body robust. First pair of coxal plates with a rounded tip, the posterior margin with a row of three to four bristles; the origin of a single bristle dorsal to this row is not marked by a tooth. Coxal plates II, III and IV as deep as the corresponding segments. Second pair of coxal plates square in outline with about four to five bristles on the ventral margin; the posterior corner is not marked by a tooth but a definite ridge may occur in some specimens. Third pair of coxal plates rectangular in outline, otherwise much as the second pair. Last pair of epimeral plates (pleon segment III) with the posterior corner rounded, the lower edge

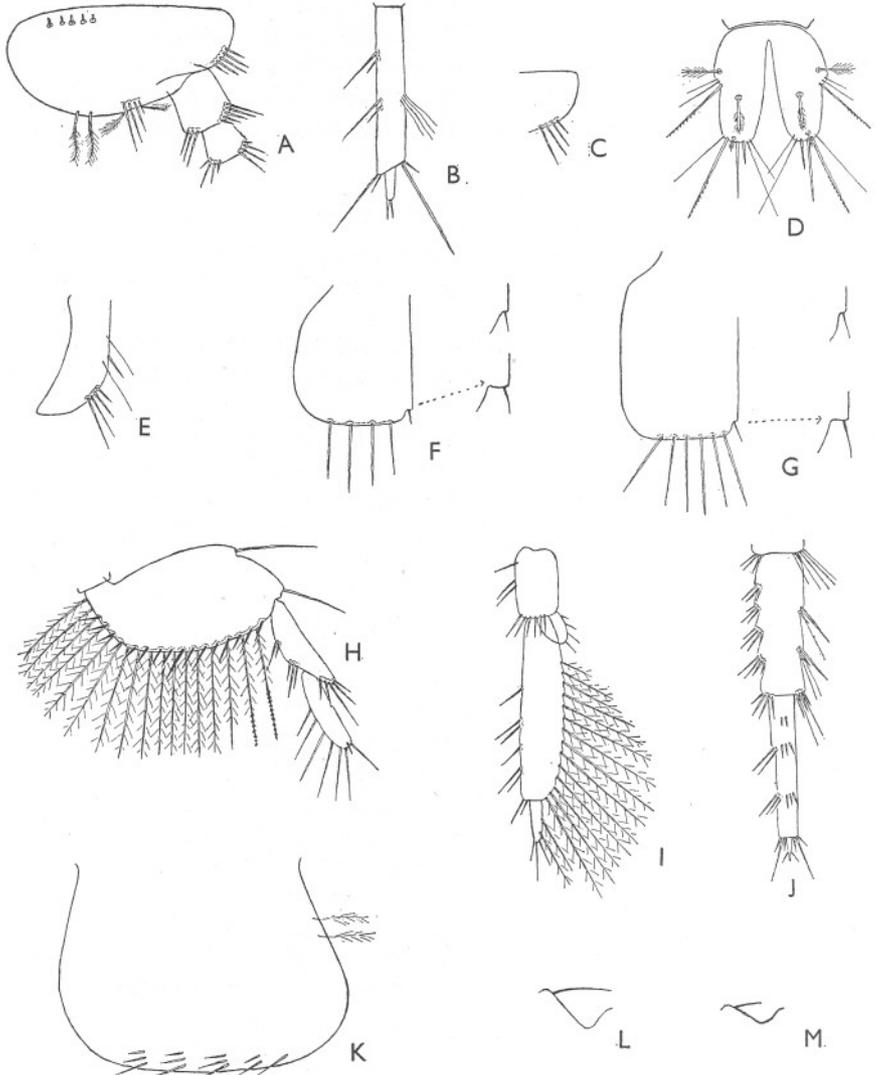


Fig. 6. *B. sarsi* ♂. *a*, Basal joint of antennule. *b*, accessory flagellum of antennule. *c*, Apex of basal joint of antennule in ♀. *d*, Telson. *e*, First coxal plate. *f*, Second coxal plate. *g*, Third coxal plate. *h*, Merus, carpus and propodus of pereopod III. *i*, third uropod. *j*, Carpus, propodus and dactylus of pereopod V. *k*, Third epimeral plate. *l*, Fourth pleon segment in ♂. *m*, Fourth pleon segment in ♀.

carried four to five groups of spines, typical arrangements are 3.3.3.2.1, or 3.3.2.1. Pleon segment IV deeply depressed dorsally with a pair of anteriorly curved bristles only. The basal joint of the antennule with an evenly rounded tip, with two or three plumose hairs ventrally; the flagellum is of ten or eleven joints of which the first eight or nine carry calceoli and a dense tuft of aesthetascs. The accessory flagellum with the second joint less than a fifth the length of the first, as 19 : 100, with three or four groups of spines on the inner border and a tuft of setae on the outer border. The flagellum of the antenna is shorter than in any other species, not exceeding one-half the length of the body, and is composed of fifteen to twenty-two joints each of which carries a calceolus with one or two joints without a calceolus. Eyes reniform. Colour unknown.

The propodus of the first gnathopod a rounded oval as in the other species except *elegans*. The merus of peraeopod III is about twice as long as broad, as 100 : 51, the anterior border with seventeen to twenty-two feathered bristles. Peraeopod V with the propodus longer than the carpus, as 100 : 90, dactylus pointed as a spine. The second joint of the outer ramus of the third uropod is about a quarter the length of the basal, as 24 : 100, the basal joint is expanded along the middle of its length with twelve to sixteen feathered bristles on the inner margin and four groups of spines on the outer margin, second joint with two to three feathered bristles. A typical arrangement of the armature at the apex of the telson is as follows, reading from within outwards: two or three bristles, two spines, one plumose hair, one or two bristles the inner of which may be modified as a serrated bristle; laterally one serrated bristle, one or two bristles.

FEMALE. The female differs from the male in the following points: Length 7-8 mm. The basal joint of the antennule has a more square tip; the number of joints in the flagellum is seven or eight; accessory flagellum without a tuft of setae on the outer margin of the basal joint. The number of joints in the flagellum of the antenna is eight to ten, the relation of its length to the fourth and fifth joints of the peduncle being as 78 : 100. The second and third coxal plates carry numerous bristles on their ventral margins, the number increasing with age up to about twenty-four. The anterior margin of the merus of peraeopod III carries many more feathered bristles: counts of up to forty were recorded. The number of groups of spines on the third epimeral plate is greater, a typical arrangement is 3.3.2.2.1.1. The number of feathered bristles on the inner margin of the outer ramus of the third uropod is less, varying from ten to fourteen. Pleon segment IV is less deeply depressed.

Geographically this species occurs along the whole of the Norwegian and Danish coasts, on the French and English sides of the English Channel, and in several localities along the east coast of Scotland and England. Its absence from the west coast of Britain is peculiar, but extensive collecting failed to record its occurrence. It is usually an intertidal or shallow water form.

B. *lindströmi* Stebbing

B. lindströmi Stebbing, 1906, p. 122.

B. pilosa (part), Della Valle, 1893, p. 752, pl. 5, f. 1; pl. 36, f. 19-32.

Della Valle referred *pelagica*, *robertsoni* and *gracilis* to the synonymy of *pilosa*, and described and figured specimens collected from sand in the Bay of Naples at a depth of 10-20 m. as *pilosa*. Stebbing formed the doubtful species *lindströmi* on the description and figures of *pilosa* as given by Della Valle. This form is obviously different from *pilosa* and *sarsi* in that the coxal plates are toothed and the fourth pleon segment carries a pair of backwardly directed spines. The third epimeral plate is rounded at the posterior corner, and thus it may agree with *elegans*, *tenuipes* or *gracilis*, but the description and figures are insufficient for correct determination. The absence of the dactylus in peraeopod V and the lack of armature at the apex of the telson are probably incorrect. The original specimens described by Della Valle are lost and no further specimens are at the moment available. The Norman collection in the British Museum contains two tubes labelled as from Naples, but the specimens are somewhat damaged and brittle and unreliable for detailed description. This species must remain a doubtful one until further specimens are available. It is omitted from the key given below.

KEY TO THE IDENTIFICATION OF THE SPECIES

- | | | | | | | | | |
|----|--|-----|-----|-----|-----|-----|-----|------------------------|
| 1. | Fourth segment of pleon with spines directed posteriorly and bristles anteriorly | ... | ... | ... | ... | ... | ... | 2 |
| | Fourth segment of pleon with anteriorly directed bristles only | ... | | | | | | 5 |
| 2. | Third epimeral plate, in adult females and young males, with tooth at or near the posterior corner. In adult males the tooth is reduced, its reduction being indicated by an uneven border... | ... | ... | ... | ... | ... | ... | 3 |
| | Third epimeral plate evenly rounded at posterior corner | ... | ... | ... | ... | ... | ... | 4 |
| 3. | Third epimeral plate with well-developed tooth at posterior corner which extends beyond the vertical margin of the posterior border (reduced in adult males). Second and third coxal plates with tooth at posterior corner | ... | ... | ... | ... | ... | ... | <i>guilliamsoniana</i> |
| | Third epimeral plate with small tooth almost at the posterior corner, not extending beyond the vertical margin of posterior border (reduced in adult males). Second and third coxal plates without tooth at posterior corner | ... | ... | ... | ... | ... | ... | <i>pelagica</i> |
| 4. | Basal joint of the antennule rounded at tip; coxal plates II and III with small tooth on posterior corner... | ... | ... | ... | ... | ... | ... | <i>elegans</i> |
| | Basal joint of the antennule produced to a point; coxal plates II and III with well-developed tooth at posterior corner | ... | | | | | | <i>tenuipes</i> |
| | Basal joint of the antennule rounded at the tip; coxal plates II and III with well-developed tooth at posterior corner | ... | ... | ... | ... | ... | ... | <i>gracilis</i> |

5. Third epimeral plate with not more than three groups of spines;
basal joint of antennule with a rounded but narrow tip *pilosa*
Third epimeral plate with from four to six groups of spines; basal
joint of antennule with a rounded but broad tip *sarsi*

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