Two new species of *Bulbamphiascus* Lang (Copepoda: Harpacticoida: Diosaccidae) from Scotland and the Isles of Scilly, with additional observations on *B. denticulatus* (Thompson)

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**Abstract**

*Bulbamphiascus incus* sp. nov. is described from muddy sediments, high in organics, from below fish cages in salmon farms in two Scottish Lochs. It is characterized by the ornamentation of the urosome, the presence of an anvil-shaped semi-hyaline structure on the basis of the male P2 and by the structure of the exopod of the male P5. A form, here given specific status under the name *B. scilloniensis* sp. nov., is described from St Martin’s Island in the Isles of Scilly and is identical to *B. incus* except for the ornamentation of the urosome in both sexes which is very similar to that found in *B. imus*. Newly described features of the male of *B. denticulatus* confirm that this species can only be distinguished from *B. imus* by the projection at the outer distal corner of the second segment of the antennule in both sexes.

**Keywords:** Bulbamphiascus, Harpacticoida, Scilly Isles, Scotland

**Introduction**

In a paper describing two new species of *Bulbamphiascus* Lang, 1944 from China, Mu and Gee (2000) pointed out that amalgamation of poorly described species by Lang (1948) and later authors (Wells and Rao 1987) had resulted in the type species, *Bulbamphiascus imus* (Brady, 1872), being regarded as a very variable species. Their material suggested that species of this genus may actually exhibit very little variability and therefore they found it necessary to re-examine the type species. Although the type material of *B. imus* has been lost, they examined material of this species from off the mouth of the River Tyne in NE England (very close to the original type locality) and from off the coast of Norfolk. They found virtually no variability in the characteristics of this species from these two localities and therefore established a neotype from the Tyne material.

Mu and Gee (2000) also discovered a new hyaline structure on the basis of the male P2 endopod of *B. imus* which was absent in their Chinese species. Consequently, they...
suggested that it might be characteristics of the male which would prove most important in defining the boundaries of the genus and distinguishing species within the genus. After briefly examining two specimens found in the Scilly Isles and identified by Wells (1961) as *B. imus*, they suggested that this might be a new species because the male P5 and the male P2 endopod basis did not agree with their description of the male of *B. imus*.

In a recent study of the environmental effects of various sealice treatments in Scottish fish farms, it was found that, very close to the fish cages, the population of harpacticoid copepods was abundant but consisted almost entirely of one species of *Bulbamphiascus*. Detailed examination of this material showed significant differences from the *B. imus* neotype material and justified the erection of a new species, *Bulbamphiascus incus* sp. nov. Similarly, further material identical to that described by Wells (1961) has been found in the Isles of Scilly along with numerous specimens of *B. denticulatus* (Thompson, 1893). Examination of this material has shown that the former is a new species very close to *B. incus* and that there are undescribed features of the latter.

**Materials and methods**

The material from the west coast of Scotland was obtained by diver hand-held cores from muddy sediments high in organic material at 30 m depth below salmon cages in Loch Kishorn and Loch Diabaig. Material from the Isles of Scilly was obtained from cores in clean coarse sand at LWST on St Martin’s Flats between the islands of St Martin and Tresco. All sediments were sieved through a 63 μm sieve and retained animals were fixed in 10%, and preserved in 4% formalin. Before dissection, measurements of body length were made from whole specimens temporarily mounted in lactophenol. Specimens were dissected in lactophenol, the parts individually mounted in lactophenol under coverslips subsequently sealed with clear nail varnish. All drawings were prepared using a camera lucida on a Nikon Optiphot 20 differential interference contrast microscope. The terminology of the body and appendage morphology follows that of Huys and Boxshall (1991). Abbreviations used in the text and figures are P1–P6 for thoracopods 1–6; exp(enp) 1(2, 3) to denote the proximal (middle, distal) segment of a ramus; and a for aesthetasc. Body length was measured from the base of the rostrum to the median posterior border of the anal somite. All material has been deposited in the Natural History Museum, London.

**Taxonomy**

**Family DIOSACCIDAE** Sars, 1906

*Bulbamphiascus* Lang, 1944

*Bulbamphiascus incus* sp. nov.

(Figures 1–6)

**Material examined**

Holotype: adult ♂ (dissected on to four slides) from Loch Kishorn, NHM Reg. No. 2004.4118. Paratypes: 20 adult ♀ (two dissected each on to three slides and 18 spirit preserved) and 19 adult ♂♂ (two dissected each on to three slides and 17 spirit preserved) from Loch Kishorn, NHM Reg. Nos 2004.4119–4157; seven adult ♀ and nine adult ♂♂, spirit preserved from Loch Diabaig, NHM Reg. Nos 2004.4158–4173.
Figure 1. *Bulbamphiascus incus* sp. nov. ♀: (A) urosome (excluding urosomite 1), dorsal; (B) urosome (excluding urosomite 1), lateral; (C) urosome (excluding urosomite 1), ventral; (D) rostrum and antennule; (E) labrum.
Figure 2. *Balhamphiascus incus* sp. nov. ♂: (A) antenna; (B) mandible; (C) maxillule; (D) maxilla (with setation of distal coxal endite inset); (E) maxilliped.
Figure 3. Bulbamphiascus incus sp. nov. ♀: (A) P1; (B) P3. ♂: (C) P3 exopod 3 anterior.
Figure 4. *Bulbamphiascus incus* sp. nov. ♀: (A) P2. ♂: (B) P2 (anvil-shaped hyaline structure on basis arrowed).
Figure 5. *Bulbamphiascus incus* sp. nov. ♂; (A) urosome (excluding urosomite 1), dorsal; (B) urosome (excluding urosomite 1), lateral; (C) urosome (excluding urosomite 1), ventral; (D) rostrum and antennule; (E) protopod of P1 (sexually dimorphic inner chitinous spine arrowed). ♀: (F) caudal ramus, ventral.
Description of female

Body. Length 0.900–1.097 mm (mean = 1.005 mm, n = 10); sub-cylindrical, widest at posterior margin of cephalothorax, tapering gradually posteriorly. Rostrum (Figure 1D) defined at base, elongate, triangular, extending beyond the second antennular segment, with a pair of small sensilla on lateral margins. Cephalothorax tapering anteriorly, as long as free prosomites. Genital double-somite (Figure 1A–C) divided dorsally and laterally by subcuticular rib. Genital field (Figure 1C) with separate genital apertures covered by vestigial P6, each bearing two pinnate and one smooth setae; copulatory pore situated medially, posterior to genital apertures, and obscured by large oval-shaped copulatory bulb; internal seminal receptacles kidney-shaped. Anal somite with small semicircular operculum near median dorsal anterior border and overlain by a minutely dentate pseudoperculum (Figure 1A). Caudal rami (Figures 1A–C, 5F) broader than long in dorsal view with a slender tube pore on ventral posterior margin; seta I (antero-lateral accessory seta) small

Figure 6. Bulhampiuscus incus sp. nov. ♀: (A) P5. ♂: (B) P5; (C, D) alternative conditions of P5 exopod.
and naked, seta II (antero-lateral seta) and seta III (postero-ventral seta) long and smooth; terminal setae IV and V well developed with few short spinules in central region; in most specimens seta V swollen in the fracture region; seta VI (terminal accessory seta) short and smooth; seta VII (dorsal seta) triarticulate.

*Somatic ornamentation (Figure 1A–C).* Body surface appears smooth under light microscope, all somites except preanal furnished with numerous sensilla and pores. Prosome without spinule rows; urosomite 4 with a median ventral row of fine spinules and a ventro-lateral patch of fine spinules, variable in extent; preanal somite with a continuous row of spinules ventrally and ventro-laterally; anal somite with a lateral and ventral row of strong spinules round the base of caudal rami. Hyaline frills of urosomites with minutely dentate margin.

**Antennule (Figure 1D).** Eight-segmented, segment 2 slightly swollen, with convex margins, segment 4 two times longer (on anterior margin) than broad; aesthetascs on fourth and distal segments. Setal formula as follows: 1-[1], 2-[11], 3-[8], 4-[3+(1+a)], 5-[2], 6-[4], 7-[4], 8-[4+(2+a)].

**Antenna (Figure 2A).** Coxa well developed with row of setules. Allobasis with partial suture and row of spinules dorsally at base of exopod; one seta on abexopodal margin. Exopod three-segmented, proximal segment with one pinnate seta; middle segment short, with a pinnate seta; distal segment with an oblique row of strong spinules; with one pinnate seta on lateral margin and two stout pinnate spines and one naked seta on distal margin. Free endopod segment with two rows of strong spinules on outer margin, row of smaller spinules on distal and inner margin and on ventral face; lateral armature of two large pinnate spines and two setae; distal margin armed with one pinnate spine, four geniculate setae (two pinnate medially), one naked and one plumose seta.

**Labrum (Figure 1E).** Posterior margin armed with lateral groups of four teeth, a median row of smaller teeth and two rows of setules.

**Mandible (Figure 2B).** Coxa stout, gnathobase armed with a number of stout bicuspid teeth and a row of finer unicuspid teeth; two setae (one pinnate) at inner distal corner. Basis broad, with two rows of spinules on anterior face and three pinnate setae on distal margin. Exopod indistinctly two-segmented, proximal segment with one lateral pinnate seta; distal segment with three setae, two fused at base. Endopod large, one-segmented; with eight setae (two setae proximally, three setae subdistally and, on distal margin, three setae fused at base).

**Maxillule (Figure 2C).** Arthrite of praecoxa with two setae on anterior face; distal margin with four pairs of recurved naked spines, and two pectinate spines. Coxa with two pinnate setae on distal margin. Basis with two rows of spinules on anterior face and distal margin; bearing seven elements (two naked setae and two pinnate spines distally and three naked setae subdistally). Exopod one-segmented with two plumose setae. Endopod one-segmented with four setae.

**Maxilla (Figure 2D).** Syncoxa with two rows of spinules and three endites, proximal and middle endite armed with two, distal endite with three, pinnate spines. Allobasal endite
with a large fused pectinate spine, a smaller articulating spine and three naked setae. Endopod one-segmented with five setae.

**Maxilliped (Figure 2E).** Syncoxa with three surface rows of spinules and four pinnate setae (two on distal margin and two subdistally on a small peduncle). Basis with two pinnate setae on palmar margin and a sub-marginal row of spinules. Endopod one-segmented, with a terminal, partially pinnate, claw and three accessory setae.

**P1 (Figure 3A).** Intercoxal sclerite (not shown in figure) small, ovoid, without ornamentation. Praecoxa with a row of minute spinules along distal margin. Coxa with four rows of small spinules and one row of long spinules on anterior face and three rows of spinules on posterior face. Basis with rows of spinules on inner and median distal margin and at base of inner and outer pectinate spines. Exopod three-segmented, each segment with row of strong spinules on outer margin, exp 2 with row of setules and a plumose seta on inner margin, exp 3 with two geniculate setae on distal, and three spines on outer, margin. Endopod three-segmented; enp 1 longer than enp 2 and 3 combined, reaching nearly to distal margin of exp 3, row of strong spinules on outer margin, row of setules and a strong seta on inner margin; enp 2 less than half length of exp 3, with row of spinules on outer margin and a pinnate seta on inner margin; enp 3 with row of spinules on outer margin and, on distal margin, a small pinnate seta, a large geniculate seta and a spine.

**P2–P4 (Figures 3B, 4A).** Intercoxal sclerite strongly developed, almost square, sclerite of P2 with two rows of spinules. Protopod ornamented as for P1 except coxa with only three rows of spinules on anterior face and none on posterior face; basis without inner spine but with a distinct chitinous extension on inner distal margin. Rami three-segmented, equal in length in P2 and P3, endopod slightly shorter than exopod in P4; distal segment longest; all segments with row of strong spinules on outer margin; proximal two segments of both rami with spiniform extension of outer distal margin; inner distal seta on exp 3 weakly developed. Setal formula of swimming legs as follows:

|     | Exopod   | Endopod   |
|-----|-----------|-----------|
| P1  | 0 : 1 : 023 | 1 : 1 : 021 |
| P2  | 1 : 1 : 223 | 1 : 2 : 121 (1 : 312) |
| P3  | 1 : 1 : 223 | 1 : 1 : 221 |
| P4  | 1 : 1 : 323 | 1 : 1 : 121 |

Parentheses denote male condition.

**P5 (Figure 6A).** Elements of each side not fused medially. Baseoendopod and exopod separate. Inner expansion of baseoendopod reaching about half length of exopod; with a few spinules on outer margin; armed with five pectinate or pinnate setae (three on inner and two on distal margin). Exopod about twice as long as broad, with few spinules on inner and outer margin; with six setae, proximal inner seta pinnate, distal inner seta and terminal seta naked, borne on a short peduncle, proximal and medial outer setae short and normal, distal outer seta markedly swollen at base.
**Description of male**

Similar to female except for urosome, antennule, P1 basis, P2 basis and endopod, P3 exp 3 and P5.

**Body.** Length 0.59–0.80 mm (mean=0.66 mm, n=16), urosomites 2 and 3 not fused. Genital somite (Figure 5C) with vestigial P6 forming one fixed and one articulating plate each bearing three setae.

**Somatic ornamentation (Figure 5A–C).** As in female except that a ventral and ventro-lateral row of spinules present on urosomite 3 as well as urosomites 4 and 5.

**Antennule (Figure 5D).** Haplocer, 10-segmented with segment 4 a small segment overlaying the proximal portion of swollen segment 5; geniculation between segments 7 and 8 which both bear modified elements; aesthetascs on fifth and distal segments. Segment 5 with distinctly shaped seta (broad base and flagellate tip) near proximal margin (shown more clearly in Figure 7E). Setal formula as follows: 1-[1], 2-[11], 3-[8], 4-[2], 5-[7+(1+a)], 6-[2], 7-[37], 8-[27], 9-[4], 10-[5+(2+a)].

**P1 (Figure 5E).** Basis with a single, long chitinous projection at inner proximal corner.

**P2 (Figure 4B).** Praecoxa and coxa as in female. Basis without chitinous extension of inner margin as in female but with a smooth, anvil-shaped, hyaline structure near inner distal margin (arrowed in Figure 4B). Exopod as in female. Endopod modified, two-segmented; enp 1 as in female except inner seta slightly shorter; distal segment with three pinnate setae on inner margin, a seta (with a bluntly rounded tip and small pinnules) on distal margin and a large spine and a sinuous process (with a smooth rounded tip) articulating subdistally on outer margin.

**P3 (Figure 3C).** As in female except that hyaline tube pore present on anterior face of exp 3.

**P5 (Figure 6B–D).** Baseoendopods of each side fused medially. Endopodal lobe with two terminal pectinate spines and a few spinules on outer margin; outer peduncle elongate. Exopod about 1.5 times as long as broad with a short row of spinules at base of distal inner seta, a small tube pore on anterior surface and outer distal corner attenuated into a chitinous process; bearing four or five setae, of which inner two setae strongly developed and pinnate, distal and proximal outer setae naked, long and slender, distal outer seta either absent (Figure 6D) or vestigial and only visible under × 40 (Figure 6C) or × 100 (Figure 6B) oil immersion objectives.

**Etymology**

The specific name is the Latin for anvil, reflecting the shape of the hyaline structure on the male P2 endopod.

**Variability**

The ornamentation of the urosome was consistent in the presence of fine spinule rows on urosomites 4 and 5 in the female and urosomites 3–5 in the male but the extent of the spinule patches ventro-laterally varied from a few spinules to many spinules.
There was no discernible variation in the structure and setation of the oral and swimming appendages except for the presence and size of the distal outer vestigial seta on the male P5.

Remarks

This material from the two Scottish lochs has been assigned to a new species primarily on the basis of the structure on the basal segment of the male P2 endopod, on the form of the male P5 exopod and on the ornamentation of the urosome in both sexes.

Mu and Gee (2000) first noted and figured (their Figures 13A, 14D) the presence of a peculiar flexible, semi-hyaline, papillate, spine-like structure on the basis of the P2 of the male in their specimens of *B. imus* which was not present in any of their Chinese material. They concluded that this structure was homologous to the chitinous apophysis present on the basis of the female but otherwise absent in the male of *B. imus*. The same structures are found on the basis of the P2 in female and male specimens from Scotland but here the semi-hyaline structure in the male is completely different in shape, being smooth-walled and T-shaped, very much like a blacksmith’s anvil.

Mu and Gee (2000), in their Figure 13B, showed that the exopod of the male P5 of *B. imus* was only slightly longer than broad and bore six setae, two strongly developed, plumose inner setae, one distal naked seta and three outer setae, the proximal one well developed and pinnate and the two distal setae well developed and distinctly swollen at the base. In the Scottish material the exopod is about 1.5 times longer than broad with the same inner and distal armature but a very different armature of the outer margin. At the outer distal corner is a large chitinous apophysis which has almost certainly been formed by the enlargement and fusion with the segment of the distal outer swollen seta of *B. imus*. In some specimens there is still an indication of a suture line at the base of the apophysis on the posterior face. Conversely, the middle outer seta has become vestigial (very often its presence can only be discerned under ×100 oil immersion objectives) or has been lost entirely. Drastic modification of the two distal outer setae of the male P5 exopod has also been reported for *B. chappuisi* by Rouch (1962), who describes and figures an exopod more than twice as long as broad with both the distal outer setae fused to the segment and forming chitinous projections. In this species Rouch (1962) also indicates in his Figure 34 (but does not mention in the text) that the swollen distal outer seta of the female P5 exopod is also fused to the segment.

Whilst these features clearly distinguish the male of *B. incus* from the male of *B. imus*, the only distinguishing characteristic in the female is in the abdominal ornamentation. Mu and Gee (2000) showed that in female *B. imus* there is a group of two strong spinules on the postero-lateral border of urosomite 3 and a median ventral row of strong spinules on the posterior border of urosomite 4 and never any spinules on the posterior border of urosomite 5. In the Scottish material of *B. incus* there is always a complete row of very fine spinules on the posterior border of urosomite 5; always a ventral row and a small to large ventro-lateral patch of fine spinules on the posterior border and lateral face of urosomite 4 and occasionally a few fine spinules on the posterior border of urosomite 3. Mu and Gee (2000) showed that the urosome ornamentation of *B. imus* was very consistent, even between two different populations in the North Sea, and it was the difference in somatic ornamentation which first alerted the present author to the possibility that the Scottish material was a different species.

As a result of this discovery it is advisable to treat many of the records of *B. imus* with caution, particularly those from areas of high organic pollution on the west coast of
Scotland, e.g. Moore and Pearson (1986). In this connection, it is interesting to note that although the description and figures of *Stenhelia reflexa* by T. Scott (1895) is only of the female, this species has definite characteristics of *B. incus* rather than *B. imus*, with which species it was synonymized by Lang (1948). In Scott's drawings he clearly shows a female with a row of spinules on the preanal somite (urosomite 5) which is never found in *B. imus*. Further, he illustrates seta V of the caudal ramus with a swelling in the fracture zone (not found in specimens of *B. imus* I have studied), and he illustrates the exopod of the mandible with only one lateral seta on the proximal segment (as in *B. incus* but *B. imus* has two).

*Bulbamphiascus scilloniensis* sp. nov.  
(Figure 7)

*Bulbamphiascus imus* (Brady) Wells (1961, 1970).

**Material examined**

Holotype: adult ♂ (dissected on to four slides) from intertidal sandflat on St Martin's, Isles of Scilly, NHM Reg. No. 2004.4174. Paratypes: two adult ♀ (one dissected on to four slides) and three adult ♂♀ from the same locality, spirit preserved, NHM Reg. Nos 2004.4175–4179; one ♂ and one ♂ spirit preserved, collected by the University of London Sub-Aqua Club (USLAC) from sandy substrate, 20–30 m depth from Deep Point, Peninnis Head and Darrity's Hole, St Mary's, Isles of Scilly, NHM Reg. No. 1967.10.31.48.361.6.

**Description of female**

As in *B. incus* except as follows: body length 0.625–0.785 mm (mean = 0.648 mm, n = 3). Urosome ornamentation (Figure 7A, B) consisting of a short row of strong spinules on ventral posterior margin of urosomite 4. Caudal ramus seta V without swelling at base.

**Description of male**

As in *B. incus* except as follows: body length 0.48–0.67 mm (mean = 0.562 mm, n = 5). Urosome ornamentation (Figure 7C, D) consisting of short row of strong spinules on ventral posterior border of urosomites 3 and 4.

**Etymology**

The species name refers to the Isles of Scilly.

**Remarks**

In the above material, all the males have the principal characteristics of *B. incus*, namely the anvil-shaped semi-hyaline structure on the basis of P2 (arrowed in Figure 7G) and the outer chitinous apophysis and vestigial (or absent) distal outer seta of the male P5 exopod (Figure 7F). Although Wells (1961) described this seta as absent and the chitinous apophysis as a seta, an examination under ×100 oil immersion objective of his ULSAC material (Wells 1970) indicated a P5 exopod exactly as drawn in Figure 7F.

The singular difference between the Scottish and Scilly Isles material is in the ornamentation of the urosome. No specimens from the Scilly Isles have any spinules on
Figure 7. *Bulbamphiascus scilloniensis* sp. nov. 9: (A) uroosome (excluding urosomite 1), lateral; (B) uroosome (excluding urosomite 1), ventral; (C) uroosome (excluding urosomite 1), lateral; (D) uroosome (excluding urosomite 1), ventral; (E) antennule segments 5 and 6; (F) P5; (G) P2 protopod (anvil-shaped hyaline structure arrowed).
urosomite 5 and the spinules on the other somites are much coarser than in all the Scottish material. Indeed the body ornamentation of the Scilly Isles specimens is much more akin to that of *B. imus* as shown in Mu and Gee (2000, Figure 11B, C) than it is to the Scottish *B. incus*. In fact there is no difference between the two species in body ornamentation in the male and the only difference in the female is that the small ventro-lateral group of two to three spinules on urosomite 3 in most *B. imus* is absent in the Scilly Isles material, a very minor difference making a distinction between the Scilly Isles females and those of *B. imus* very uncertain.

The other difference between the Scottish and Scilly Isles material is in their habitats. The former was found in soft muddy sediments, high in organic material and probably with high levels of bacteria, judging by the number of filamentous bacteria attached to the specimens. The latter was recovered from clean, coarse sand, in an area completely free of organic or chemical pollutants.

That the Scilly Isles material is more closely related to *B. incus* as described above than to *B. imus* is clear from the structure of the male P2 endopod and P5 exopod. However, whether the differences in abdominal ornamentation are sufficient to accord the Scilly Isles material specific status, or are merely an expression of sub-specific population variation is more difficult to ascertain until more populations of *Bulbamphiascus* from a variety of habitats have been critically examined. However, I have decided to accord the Scilly Isles material specific status based on: (1) the fact that Mu and Gee (2000) found no difference in the abdominal ornamentation of two populations of *B. imus* down the east coast of England, or in populations of two closely related species of *Bulbamphiascus* they described from all over the Bohai Sea in China; (2) whilst, in my experience, it can be quite common for different species of a genus to have the same or very similar ornamentation patterns, I have not come across another case of the same species having significantly different ornamentation patterns on the urosome.

It is almost certain that all the records of *B. imus* from the Scilly Isles can be referred to this species (Brady 1880; Wells 1961, 1970) and other records of *B. imus*, particularly from coarse clean sand and shell gravels, should be viewed with caution, e.g. Roe (1958) from Dublin Bay, Wells (1963) from Strangford Lough, and Geddes (1972) from Anglesey.

**Bulbamphiascus denticulatus** (Thompson, 1893)
(Figures 8, 9)

*Material examined*
Thirteen ♂♀ (one dissected on to three slides), 35♂♂ (one dissected on to four slides) and seven copepodids from coarse intertidal sand on St Martin’s, Isles of Scilly, NHM Reg. Nos 2004.4180–4191.

*Description of female*
As described by Thompson (1893) and Sars (1911) except with the following additions.

Body length 0.665–0.85 mm (mean=0.73 mm, *n*=8). Urosome ornamentation (Figure 8A, B) a single median ventral row of coarse spinules on posterior margin of urosomite 4 and on anal somite at base of caudal rami.
Figure 8. *Bulbamphiascus denticulatus* (Thompson, 1893). ♀: (A) urosome (excluding urosomite 1), lateral; (B) urosome (excluding urosomite 1), ventral. ♂: (C) urosome (excluding urosomite 1), lateral; (D) urosome (excluding urosomite 1), ventral; (E) P1 protopod; (F) P5.
Figure 9. *Bulbamphiascus denticulatus* (Thompson, 1893). ♂: (A) P2 (hyaline structure arrowed); (B) rostrum and antennule. ♀: (C) segmentation of antennule.
Antennule (Figure 9C) with pronounced apophysis at outer distal corner of segment 2; this and segment 4 slightly longer than in *B. imus* but armature of all segments as for that species. Mouthparts as in *B. imus*.

**Description of male**

As described by Sars (1911) except with the following additions.

- Body length 0.55–0.695 mm (mean =0.59 mm, *n* =10). Urosome ornamentation (Figure 8C, D) as in female except with additional row of spinules on ventral posterior border of urosomite 3.

- Antennule (Figure 9B) 11-segmented as result of segment 9 in *B. imus* being divided into two segments, total armature as in *B. imus*.

- P1 basis (Figure 8E) with single chitinous projection at inner distal corner.

- P2 basis with large tapering, tubiculate, semi-hyaline projection at inner distal corner (arrowed in Figure 9A), identical to that found in *B. imus*.

- P5 (Figure 8F) exopod with six well-developed armature elements of somewhat different lengths to those shown in Sars (1911, suppl. Plate 18) and with both distal outer elements distinctly swollen as base.

**Remarks**

These observation show that the hyaline structure on the basis of the male P2 endopod in *B. denticulatus* is exactly the same shape as that found in *B. imus* by Mu and Gee (2000) and that the ornamentation of the urosome and the structure of the P5 in both sexes is also as described for *B. imus*. With the possible exception of the segmentation of the male antennule, this confirms the observation of Sars (1911) that the only feature by which *B. denticulatus* can be distinguished from *B. normani* (a synonym of *B. imus*) is in the attenuation into a thorn-like process of the outer distal corner of segment 2 of the antennule in both sexes.

This appears to be the first genuine record of *B. denticulatus* in the Scilly Isles. It was not entered in the faunal list of Wells (1970) and although Lang (1948) records that Brady (1905) found it in the Scilly Isles on St Mary’s Island, the island to which Brady refers is St Mary’s off the coast of Northumberland. The preferred habitat of this species is coarse sand or shell gravel and virtually the only record from muddy sediments (inside Port Erin harbour) is that of Thompson (1893).

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