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Research article

urn.lsid:zoobank.org:pub:09359E10-277B-4018-BC69-7944D8DE6FD4

Re-description of *Dysponetus joeli* Olivier *et al.*, 2012 (Polychaeta, Chrysopetalidae), with a new key to species of the genus

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Abstract. *Dysponetus* is a genus of the family Chrysopetalidae with twelve currently described species. Specimens are fragile and easily damaged or broken during sampling making identification difficult. The most recently described species, *Dysponetus joeli* Olivier *et al.*, 2012, from the Bay of Biscay and the English Channel, was described from a few small, damaged and poorly preserved specimens. New specimens from the Isles of Scilly, in much better condition, resembled *D. joeli* except for the absence of ventral cirri on segment 3. Examination of the type material of *D. joeli* showed it to be identical to these new specimens and highlighted errors in the original description of the species. The present paper corrects the errors and a revised key to species is produced. The differences between *D. joeli* and the two most similar species, *D. bipapillatus* Dahlgren, 1996 and *D. macroculatus* Dahlgren, 1996 are also detailed.

Keywords. *Dysponetus*, tentacular cirri, ventral cirri, cirrophores.

Darbyshire T. 2012. Re-description of *Dysponetus joeli* Olivier *et al.*, 2012 (Polychaeta, Chrysopetalidae), with a new key to species of the genus. *European Journal of Taxonomy* 27: 1-9. <http://dx.doi.org/10.5852/ejt.2012.27>

Introduction

There are currently twelve described species of the genus *Dysponetus* Levinsen, 1879 from around the world. Most occur in shallow water and, with a few exceptions, are distributed in the Atlantic region. All are small and fragile and rarely recorded from surveys, most likely because they are easily overlooked or found in fragments not identifiable to species level. Several species are known only from their original description and, even where multiple records do exist, these number in single figures.

Five species have been described for the northeast Atlantic region: *D. caecus* (Langerhans, 1880), *D. gracilis* Hartman, 1965, *D. paleophorus* Hartmann-Schröder, 1974, *D. pygmaeus* Levinsen, 1879 and *D. joeli* Olivier *et al.*, 2012. All of these have potential to be found in UK waters although only two currently are. *Dysponetus gracilis* is, as yet, only recorded from deep water (>400 m) samples outside of the UK (Hartman 1965; Hartman & Fauchald 1971; Aguirrezabalaga *et al.* 1999), *D. paleophorus* has not been recorded since its first description off Norway and records for *D. pygmaeus* are restricted to the Arctic and Japanese Pacific (Levinsen 1879; Annenkova 1935; Imajima & Hartman 1964). *Dysponetus*

caecus, the most recorded *Dysponetus* species, has been identified from shallow littoral samples from the UK (Scotland: Dahlgren & Pleijel 1995) as well as from other European locations (Laubier 1964; O' Connor 1981; Kirkegaard 1992; Parapar & San Martín 1993; Dahlgren & Pleijel 1995; Brito *et al.* 1996). An anomalous addition to these records would appear to be the records of Böggemann (2009) from the abyssal southeast Atlantic. However, Böggemann addresses this anomaly in his paper by suggesting that the lack of previous records from this region and depth is related to its small size and fragility (probably the scarcity of previous samples too). Most recently, *D. joeli* was described from four shallow sites in the UK and France.

In 2009, a National Museum Wales subtidal survey of the Isles of Scilly, an island archipelago off the southwest tip of the UK, collected five specimens of *Dysponetus* in coarse sandy sediments. Initial examination of the specimens showed them to possess four eyes, a character possessed by half of the *Dysponetus* species, none of which, at that time, were described for the UK. Other characters, including the absence of ventral cirri on segment 3, were found that differentiated it from all but two other *Dysponetus* species, *D. bipapillatus* Dahlgren, 1996 from the Mediterranean and *D. macroculatus* Dahlgren, 1996 from Papua New Guinea. The description of *D. joeli* was published shortly before the description was finished and the two species showed such great similarity that the type specimens of the latter were obtained and examined in order to determine whether the differences were indeed real or might be due to the damaged nature of the specimens used. Examination of the holotype of *D. joeli* revealed that the ventral cirri of segment 3 were in fact entirely absent rather than merely detached and lost, and thus the specimens were indeed the same species. Consequently, this required distinguishing characters between *D. joeli*, *D. bipapillatus* and *D. macroculatus* to also be detailed. A full re-description is therefore made to clarify the species characters and differentiate it from the two most similar species.

Materials and Methods

Specimens of *Dysponetus joeli* were collected during a subtidal survey of the Isles of Scilly in June 2009. Samples were collected using a 0.1m² Van Veen grab from the R.V. *Sepia* of the Marine Biological Association UK. Sediment was elutriated gently with seawater and the resulting sample sorted live the same day. Animals were relaxed in a 7% magnesium chloride solution and fixed in 4% formaldehyde. Final preservation was in 80% alcohol with 2% propylene glycol added.

The type specimens of *D. joeli* were collected from shallow maerl beds by Day, Van Veen or Smith-McIntyre grab and sieved through a 0.5 or 1.0 mm mesh (Olivier *et al.* 2012).

All drawings and measurements were made using a camera lucida attachment on a Nikon Labophot-2 compound microscope or a Nikon Eclipse E400 binocular microscope. Microscope photographs were taken using AutoMontage™ software and SEM images were obtained using a Neoscope SEM.

Type specimens of *D. joeli* are held in the collections of the Muséum National d'Histoire Naturelle in Paris (MNHN) and the new specimens from the Isles of Scilly are in the National Museum Wales collections (NMW.Z). Specimens of *D. bipapillatus* and *D. macroculatus* were borrowed from the Swedish Museum of Natural History (SMNH) to enable a full comparison of characters.

Results

Phylum Annelida Lamarck, 1809
Class Polychaeta Grube, 1850
Family Chrysopetalidae Ehlers, 1864
Genus *Dysponetus* Levinsen, 1879

Dysponetus joeli Olivier *et al.*, 2012

Figs 1A–D, 2A–D

Dysponetus joeli Olivier *et al.*, 2012: 989–996, figs 1–3.**Material examined**

Chausey, France, Sta. SSMM01 (48° 55.570' N, 001° 48.270' W), maerl, 10.0 m, holotype (MNHN POLY TYPE 1533), paratype (MNHN POLY TYPE 1534), 18 Apr. 2006; off St Mary's, Isles of Scilly, Sta. 3b (49° 54.20' N, 006° 18.94' W), coarse sand/shell/gravel with some silt/clay, 25 m, 2 specimens (NMW.Z.2009.027.0001–0002), 25 Jun. 2009; west of St Martin's, Isles of Scilly, Sta. 14b (49° 57.86' N, 006° 15.21' W), shell gravel in muddy sand, 35.1 m, 2 specimens (NMW.Z.2009.027.0003–0004), 27 Jun. 2009; west of Isles of Scilly, Sta. 24b (49° 55.22' N, 006° 23.91' W), silty coarse sand/shell gravel, 47.1 m, 1 specimen used for SEM (NMW.Z.2009.027.0005), 29 Jun. 2009.

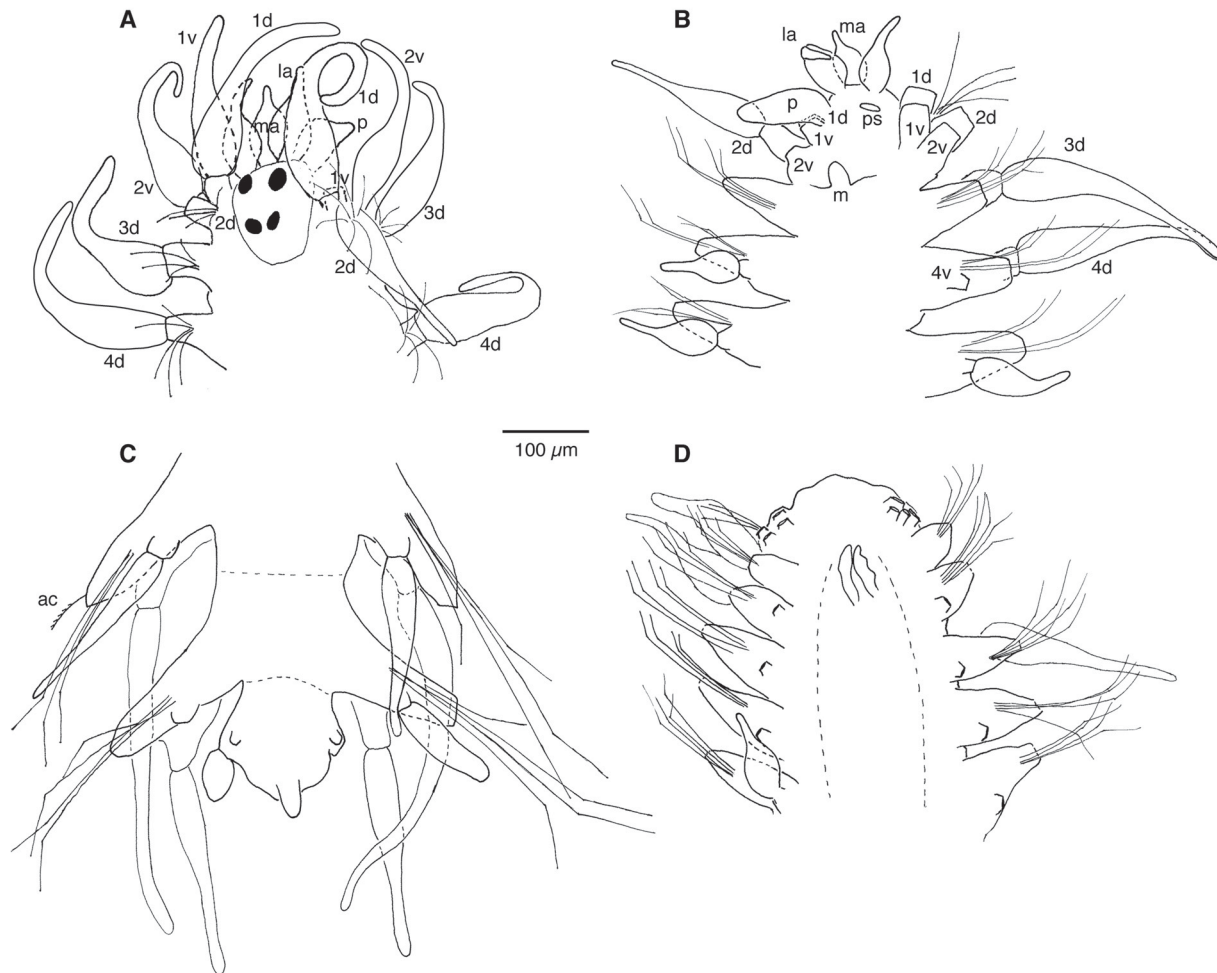


Fig. 1. *Dysponetus joeli* Olivier *et al.*, 2012. **A.** NMW.Z.2009.027.0003, anterior end, dorsal view. **B.** NMW.Z.2009.027.0004, anterior end, ventral view. **C.** NMW.Z.2009.027.0003, posterior end, ventral view. **D.** Holotype (MNHN POLY TYPE 1533), anterior end, ventral view. Only a few chaetae drawn in each case for clarity. – ac = accessory chaeta, d = dorsal (cirrus/cirrophore), la = lateral antenna, ma = median antenna, m = mouth appendage, p = palp, ps = palp scar, v = ventral (cirrus/cirrophore); numbers indicate the segment.

Description

Holotype in 4 pieces, posteriorly incomplete, 3.1 mm long for 19 chaetigers. Paratype in 3 pieces, anterior dissected fragment of 5 chaetigers with 2 further detached chaetigers. 3 non-type specimens up to 6 mm long, 0.35 mm wide (between segments, not including parapodia or chaetae) with 25–33 chaetigers. Two other incomplete non-type specimens examined. The following description is based on entire specimens from the Isles of Scilly, except where specified as pertaining to the type material.

Body shape cylindrical, ventrally flattened, tapered slightly at posterior. Body pale cream in colour (fixed, unstained), eyes dark reddish brown (Fig. 2A) but pigment may degrade in alcohol. Eyes of type specimens already barely discernable.

Prostomium oblong, wider anteriorly (Fig. 1A). Four large, rounded eyes visible in fixed specimens, anterior pair larger and more widely separated than posterior. Median antenna small, bottle-shaped, arising anterodorsally from prostomium. Lateral antennae bottle-shaped, slightly smaller than median, arising immediately dorsal to palps. Antennae without distinct ceratophores. Palps directed posteriorly, stout, oval, more than twice as long as wide. No antennae or palps remaining on type specimens examined. Nuchal organs not observed.

Distinct single mouth appendage on lower lip, anteriorly directed, digitiform with blunt tip (Fig. 1B, 2B). Single pair of stylet-shaped jaws, visible through body wall with methyl green staining. Proboscis not observed.

First two segments slightly elevated dorsally with four pairs tentacular cirri, longer than but with same shape as dorsal cirri of third and following segments, anteriorly directed. First segment achaetous, second segment with notochaetae only, situated slightly anterior to dorsal tentacular cirrus. Third segment biramous; dorsal cirri present, ventral cirri absent (Figs 1A, B, D, 2B). Holotype lacking all cirri on anterior three segments, but presence indicated by cirrophores (Fig. 1D). Following segments all biramous with both dorsal and ventral cirri. Single noto- and neuroacicula present in each parapodium.

Notopodial lobes reduced. Dorsal cirri long, slender, longer than chaetae (210–430 μm , longest on median chaetigers), cirrophores present. Styles slightly proximally swollen, distally tapering, tips blunt. Notoacicula difficult to detect. Notochaetae inserted dorsal to cirrus, densely packed, directed posteriorly leaving middle part of dorsum exposed. Chaetae D-shaped in cross-section (Fig. 2C) with denticles sharply pointed, in two parallel rows, 15–20 on each side. Notochaetal count, mid-body segments, up to 26.

Neuropodia well-developed, conical mounds. Compound neurochaetae, with heterogomph shafts and fine bidentate falcigerous blades (Fig. 2D). Neurochaetal count, mid-body segments, at least 20–26 (chaetae densely packed and difficult to accurately count). Up to two accessory simple chaetae, similar to but smaller than notochaetae, inserted distally and anteriorly on neuropodial lobe (Fig. 1C). Ventral cirri fusiform, shorter than dorsal cirri (length 110–270 μm , longest on median chaetigers), arising posteroventrally on neuropodial lobe (Fig. 1C).

Final segment lacking noto- and neurochaetae, cirrophores of dorsal and ventral cirri observed although only a single, rounded dorsal cirrus observed on 1 specimen (NMW.Z.2009.027.0003). Pygidium conical with single projection (length 40 μm), cylindrical, slightly distally tapering, inserted posteroventrally (Fig. 1C), anus terminal.

Eggs visible within one specimen (NMW.Z.2009.027.0001), flattened oval in shape, maximum width approx. 50 μm , possibly immature.

Habitat

The species was originally described from maerl beds in the Bay of Biscay and the English Channel. The new specimens are all from coarse sand and shell sediments collected around the Isles of Scilly.

Remarks

The original description of *D. joeli* was based on small, damaged specimens and this may explain why the absence of the ventral cirri on chaetiger 3 was attributed to loss of the cirri rather than actual absence. Although cirri are easily lost from specimens, the cirrophores can still be seen under light microscopy at x400 magnification or greater. Application of methyl green staining can help distinguish these features. Under SEM conditions the absence of cirrophores on chaetiger 3 is obvious (Fig. 2B).

An additional complication in determining the described characters of *D. joeli* arises from the character matrix scores in the original paper (Olivier *et al.* 2012). In their species description, the authors stated that there were 2 pairs of tentacular cirri on the first 2 segments but made no mention whether segment 3 possessed or lacked ventral cirri. They then later scored ventral cirri as absent for the first 2 segments (no separate score for tentacular cirri) and present for the third in the character matrix. However, in the

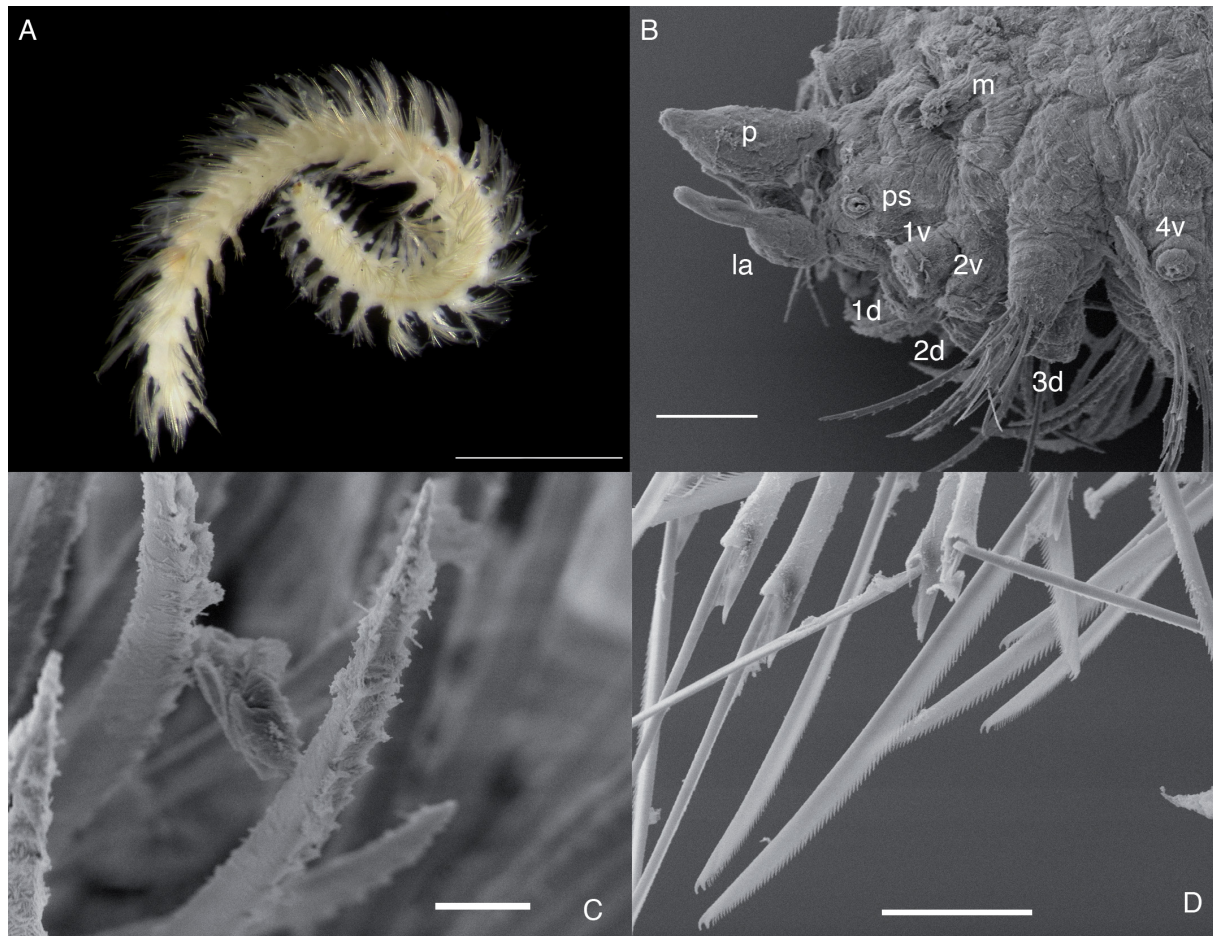


Fig. 2. *Dysponetus joeli* Olivier *et al.*, 2012. **A.** NMW.Z.2009.027.0003, whole specimen, dorsal view (scale bar 1 mm). **B.** NMW.Z.2009.027.0005, anterior end, ventrolateral view (scale bar 50 μ m). **C.** Notochaetae (scale bar 10 μ m). **D.** Neurochaetae (scale bar 20 μ m). – d = dorsal (cirrophore), la = lateral antenna, m = mouth appendage, p = palp, ps = palp scar, v = ventral (cirrophore); numbers indicate the segment.

species key itself, *D. joeli* is keyed out with ventral cirri being present on the 3rd segment (i.e. chaetiger 2). It is apparent from the character states scored for the other species in the matrix that the authors have used the term ‘ventral cirrus’ interchangeably with ‘tentacular cirrus’. Earlier authorities have also been variable in their use of the terms ‘tentacular cirrus’ versus ‘cirrus’ with regards to the appendages of the first 3 segments in species of *Dysponetus*. In this paper, only the cirri of the first 2 segments, which lack parapodia and have cirrophores directly attached to the body wall, are regarded as being tentacular. A later paper will discuss the different characters of *Dysponetus* species in more detail.

The lack of ventral cirri on segment 3 distinguishes *D. joeli* from most other *Dysponetus* species. The only other species with this characteristic are *D. bidentatus* Day, 1954, *D. bipapillatus* and *D. macroculatus*, although *D. bidentatus* lacks ventral cirri on segment 2 also (Day 1954). The presence or absence of ventral cirri on segment 3 is unknown for *D. hebes* (Webster & Benedict, 1887); however, this species differs considerably by having a double mouth appendage as opposed to single, and sphaerical not elongated palps. With the revised character for segment 3, the species key in Olivier *et al.* would place *D. joeli* with both *D. bipapillatus* and *D. macroculatus*. The latter two species are distinguished in the key according to the relative size of the eyes; however, this is not a good character as the eye pigments degrade in alcohol and disappear over time – as is already evident in the type specimens. A new revised key to the 12 species of the genus is provided below.

Dysponetus joeli is a much larger species than both *D. bipapillatus* and *D. macroculatus*. Even the type specimens, described as ‘small’ (ranging from 3.5–4 mm in length, incomplete) and smaller than those from the Isles of Scilly, were 2–3 times the size of each of the latter species, respectively.

Dysponetus joeli is most similar to *D. bipapillatus* from the Mediterranean, sharing all of the obvious characteristics. The paired papillae on segment 8 described for *D. bipapillatus* were not observed on any of the *D. joeli* specimens; however, these appendages were only seen on a few specimens of *D. bipapillatus* and are thus not a good character for comparison. In his paper, Dahlgren (1996) stated that the specimens, though small, were considered mature adults due to the presence of the paired papillae, interpreted as genital organs, and the development of the anterior segments. A comparison of the individual characters shows *D. joeli* to possess twice as many neurochaetae as *D. bipapillatus* across all segments (20–26 compared to 9–13), more numerous denticles on the notochaetae (15–20 as opposed to 10–15) and a shorter pygidial projection (40 µm versus 50 µm), the last character particularly noticeable in relation to the larger body size of *D. joeli*. Similarly, the number of neurochaetae in *D. joeli* is greater than the 19–22 found on *D. macroculatus*, and, in general, the former species is a much larger animal than the latter, being 2–3 times as long at maturity (as evidenced by the presence of eggs in specimens of both).

Key to *Dysponetus* species

- 1 Ventral tentacular cirri absent on segment 12
- Ventral tentacular cirri present on segment 16

- 2 Elongate palps; 4 eyes*D. bulbosus** Hartmann-Schröder, 1982
- Sphaerical palps; 2 eyes or eyes absent3

- 3 Anterior median antenna; double mouth appendage on lower lip; 2 eyes
-*D. hebes* (Webster & Benedict, 1887)
- Dorsal median antenna; eyes absent4

- 4 Ventral tentacular cirri present on segment 2*D. gracilis* Hartman, 1965
- Ventral tentacular cirri absent on segment 25

- 5 Mouth appendage absent; paleae present among notochaetae*D. paleophorus* Hartmann-Schröder, 1974
 – Double mouth appendage on lower lip; paleae absent*D. pygmaeus* Levinsen, 1879
- 6 Mouth appendage absent7
 – Single mouth appendage on lower lip8
- 7 Elongate palps, ventral tentacular cirri present on segment 2*D. hesionides* Böggemann, 2009
 – Sphaerical palps, ventral tentacular cirri absent on segment 2*D. profundus* Böggemann, 2009
- 8 Eyes absent, ventral cirri present on segment 3*D. caecus* (Langerhans, 1880)
 – Eyes present, ventral cirri absent on segment 39
- 9 16 or less notochaetae in mid-body segments*D. bulbosus** Hartmann-Schröder, 1982
 – 20 or more notochaetae in mid-body segments10
- 10 Ventral tentacular cirri absent on segment 2*D. bidentatus* Day, 1954
 – Ventral tentacular cirri present on segment 211
- 11 Few neurochaetae, only 9–13 in mid-body segments*D. bipapillatus* Dahlgren, 1996
 – Numerous neurochaetae in mid-body segments, 19 or more12
- 12 Small body size, 2–3 mm; 19–22 neurochaetae*D. macroculatus* Dahlgren, 1996
 – Large body size, >3 mm; 20–26 neurochaetae*D. joeli* Olivier *et al.*, 2012

* Descriptions of *D. bulbosus* (Hartmann-Schröder 1982, 1986) contradict each other over the presence or absence of ventral cirri on each of the first few segments. For this reason, *D. bulbosus* is included twice in the key to account for the discrepancy in descriptions. *Dysponetus bulbosus* will be reviewed in a forthcoming paper.

Acknowledgements

The work in the Isles of Scilly was part of the *Assessment of Marine Biodiversity Linked to Ecosystems* project funded by the Department for Environment, Food & Rural Affairs (DEFRA). Thanks must go to Dr Richard Warwick and Dr Paul Somerfield who jointly led the project, the Captain and crew of the Marine Biological Association's Research Vessel *Sepia* and everyone else involved with the sampling. Elin Sigvaldodóttir and Tarik Meziane are also thanked for the loan of specimens from the Swedish Museum of Natural History, Stockholm and Muséum National d'Histoire Naturelle in Paris that enabled this paper to be written. Dr Andrew Mackie is thanked for his comments and improvements on the paper.

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Manuscript received: 17 August 2012

Manuscript accepted: 19 October 2012

Published on: 8 November 2012

Topic editor: Rudy Jocqué

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