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Re-establishment of *Chone filicaudata* Southern, 1914 (Annelida: Sabellidae) and the first record of the Mediterranean species *Dialychone dunerificta* (Tovar-Hernández et al., 2007) (Annelida: Sabellidae) in British waters

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Abstract: An abundant sabellid taxon which fits well with the original description of *Chone filicaudata* Southern, 1914, was collected from waters of the Shetland Islands. However, due to a previous emendation of *C. filicaudata* and its placement within *Paradialychone* genus, for several years the Shetland taxon remained unnamed being different from *P. filicaudata*. Southern type material of *C. filicaudata* from the National Museum of Ireland and the British Museum of Natural History was therefore examined and compared. The comparison revealed that the newly collected material from Shetland belongs to the authentic *C. filicaudata*, that is now re-established as a valid species and lectotype and paralectotypes are here designated from Southern's original type material from the National Museum of Ireland. The specimen housed at the British Museum of Natural History and labelled as "syntype" is a *Paradialychone* species which was incorrectly identified and labelled as *C. filicaudata* which led to the previous erroneous emendation of the taxon. The first finding of the Mediterranean species *Dialychone dunerificta* (Tovar-Hernández et al. 2007) is also reported for the British fauna.

Résumé : *Rétablissement du taxon* Chone filicaudata *Southern, 1914 (Annelida : Sabellidae) et premier signalement de l'espèce méditerranéenne* Dialychone dunerificta *(Tovar-Hernández et al., 2007) (Annelida : Sabellidae) dans les eaux britanniques.* Un sabellidé abondant correspondant bien à la description originale de *Chone filicaudata* Southern, 1914, a été récolté dans les eaux des îles Shetland. Cependant, en raison d'une modification antérieure de *C. filicaudata* et de son placement au sein du genre *Paradialychone*, le taxon de Shetland est resté pendant plusieurs années différent de *P. filicaudata*. Le matériel type de Southern de *C. filicaudata* du Museum National d'Irlande et du Museum Britannique d'Histoire Naturelle ont donc été examinés et comparés. La comparaison a révélé que les individus nouvellement collectés des îles Shetland appartiennent à l'authentique *C. filicaudata*, qui est maintenant rétabli comme une espèce valide et le lectotype et les paralectotypes sont ici désignés à partir du matériel original de Southern du Museum National d'Irlande. Le spécimen hébergé au Museum Britannique d'Histoire Naturelle et étiqueté comme "syntype" est une espèce du genre

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Paradialychone qui a été incorrectement identifiée et étiquetée comme *C. filicaudata*, cequi a conduit à la précédente modification erronée du taxon. Le premier signalement de l'espèce méditerranéenne *Dialychone dunerificta* (Tovar-Hernández et al., 2007) est également rapporté pour la faune britannique.

Keywords: Polychaeta ● Sabellidae ● British waters

Introduction

The phylogenetic relationships within *Chone* (Krøyer, 1856) and related genera were assessed by Tovar-Hernández (2008), using morphological characters studied mostly from type material and revising some features such as: dentition of thoracic uncini, anterior and posterior abdominal uncini shape and the extent of a pre-pygidial depression among others. The analysis revealed the existence of three monophyletic genera previously assigned to *Chone*: *Dialychone*, *Paradialychone* and *Chone sensu stricto.*

However, while some species are assigned easily to *Dialychone* or *Paradialychone* (Nishi et al., 2009; Tovar-Hernández & Dean, 2010; Selim et al., 2012), for others it is difficult because they share several of the diagnostic features typically attributed to *Chone*, *Dialychone* and *Paradialychone* (Capa & Murray, 2015). Thus, the placement of some species into one of the above mentioned genera based on external morphology, may be ambivalent.

Up to now, it seems that *Chone* is not present in the Mediterranean area, whereas species of *Dialychone* are abundant there. By contrast, species of *Chone* are numerous along British coasts (Giangrande et al., 2015).

Shetland Oil Terminal Environmental Monitoring Group (SOTEAG) has carried out marine chemistry and macrobenthos surveys of Sullom Voe and Yell sound in Shetland since 1978. When the macrofaunal analysis was performed in 2012 by Marine Ecological Surveys Ltd. (MESL), some interesting taxa were found. One of them, newly recorded in the UK, was properly identified as *Dialychone dunerificta* (Tovar-Hernández et al., 2007), whilst another abundant taxon closely fitted the original description of *Chone filicaudata* by Southern (1914). However, following Tovar-Hernández et al. (2007), and Tovar-Hernández (2008), who assigned *C. filicaudata* to *Paradialychone* genus, this taxon should no longer be identified as *C. filicaudata,* even though features of the collected specimens did not correspond to that of the *Paradialychone* genus. Various attempts over the years at a sensible name for this taxon in M-Scan reports can be seen in the systematics section.

Since some discrepancies were found between the original description of *C. filicaudata* by Southern (1914) and the description provided by Tovar-Hernández et al. (2007) of the "syntype", the taxonomic status of the collected taxon needed to be clarified.

In this study, material from surveys was re-examined and compared to the existing type material of *C. filicaudata*: that already considered in Tovar-Hernández (2008) and the original Southern material. Drawings and pictures of diagnostic features are provided, as well as photographs.

Materials and Methods

Specimens reviewed were sampled during the SOTEAG surveys from Shetland in 2012 and 2014 (SGS M-Scan Ltd., 2012 & 2014). In addition to this material, type material from the National Museum of Ireland Natural History (NMINH) and a "syntype" of *C. filicaudata* Southern from the British Museum of Natural History (BMNH) were examined. The thoracic glandular pattern was revealed by methyl green staining.

Systematics

SABELLIDA Latreille, 1825
SABELLIDAE Latreille, 1825
Chone Krøyer, 1856
Chone filicaudata Southern, 1914, reinstated
(Figs 1-3 - Shetland specimens - and 4 - lectotype and paralectotypes)

Chone filicaudata Southern, 1914: 141-143, pls 14-15, figs 32A-L.

Non *Chone filicaudata*.- Tovar-Hernández, Licciano & Giangrande, 2007: 331-332, Fig. 8.

Non *Paradialychone filicaudata*.- Tovar-Hernández, 2008: 2221.

Chone cf. infundibuliformis.- M-Scan Ltd., 2008: 34, 72, 79.

Chone filicaudata.- M-Scan Ltd., 2010: 68, 77, 81.

Chone 'filicaudata'.- SGS M-Scan Ltd., 2012: 44, 47, 365-366.

Dialychone cfr. longiseta.- SGS M-Scan Ltd., 2014: 101, 106.

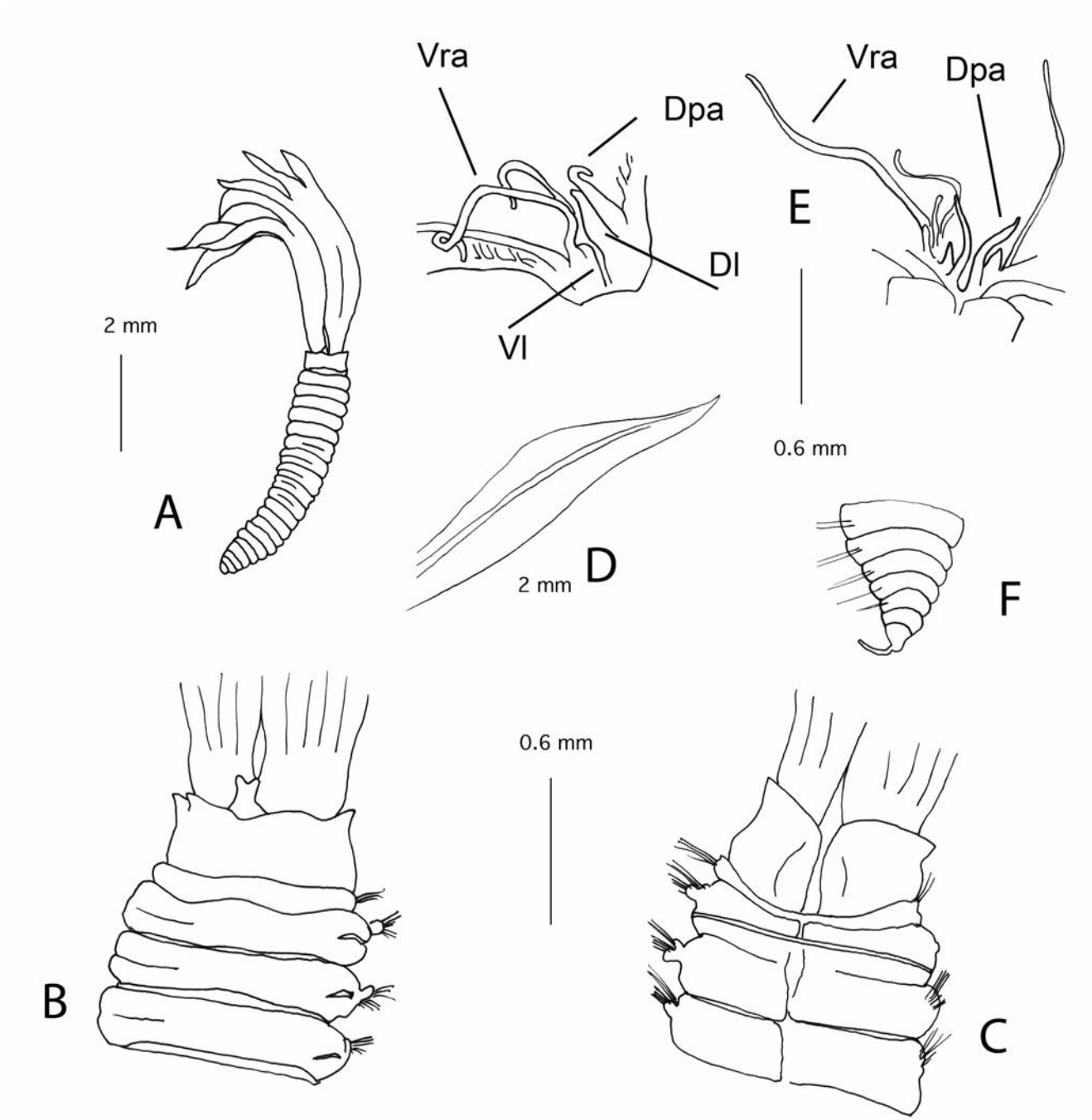

Figure 1. *Chone filicaudata* Southern, 1914. Drawing from an intermediate sized specimen from Shetland, Calbeck Ness. **A.** Entire specimen. **B.** Collar, ventral view. **C.** Collar, dorsal view. **D.** Flanges and radiolar tip. **E.** Internal appendages of the crown. **F.** Pygidium.

Material examined

Shetland, Calbeck Ness, 38 m depth, June 2012, 60°29.569'N-1°15.171'W, MES-Ref 30865, MSCSUL0612, St. 36, 17 specimens (held at Salento University, PCZL S C 3.1); Shetland, Outer Voe, 14 m depth, June 2014, 60°27.898'N-1°19.510'W, MES-Ref 37972, MSCSUL0614, St. 9, 3 specimens (held at Salento University, PCZL S C 3.2).

Comparative material examined

BMNH 1914.12.12.25, "syntype", collected Dingle Bay, West Ireland, 32.18 m, gravel (it is not *C. filicaudata*, it belongs to *Paradialychone* sp.). NMINH 1914.331.1,

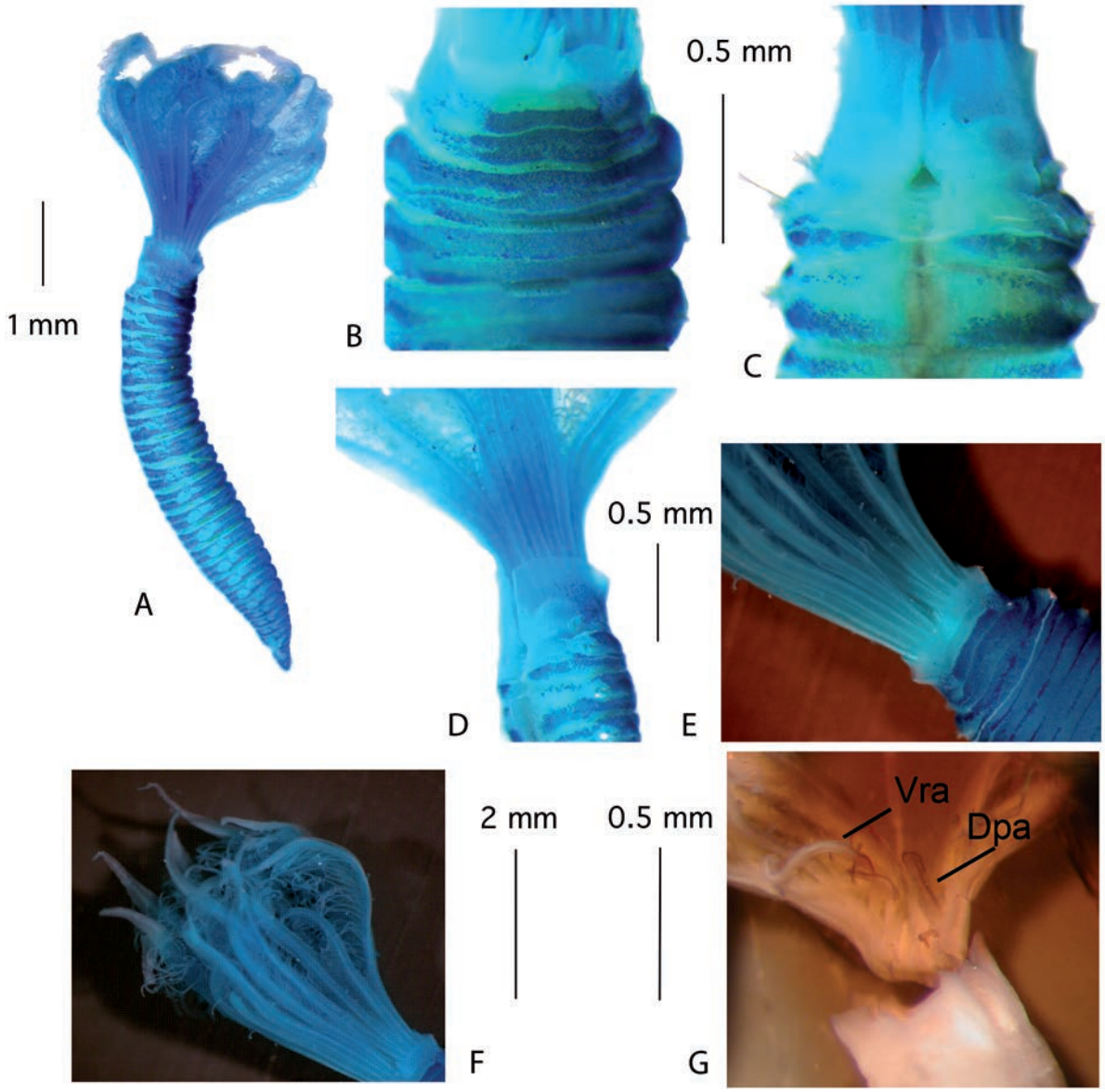

Figure 2. *Chone filicaudata* Southern, 1914. Photographs from a large sized specimen from Shetland, Calbeck Ness. Methyl green staining patterns. **A.** Entire specimen. **B & E.** Collar, ventral view. **C.** Collar, dorsal view. **D.** Collar, lateral view. **F.** Branchial crown. **G.** Internal appendages of the branchial crown.

Ballynakill Harbour, M. L. Llla, 22.vii.01, Dredge, 2 fms, lectotype of *C. filicaudata* by present designation. NMINH 1914.313.19, Kingstown-Dalkey, Dublin city, 1 paralectotype of *C. filicaudata* by present designation. NMINH 1909.151.9, Inishlyre Harbour, Clew Bay, St. W, 78 fms, 5 dredge, May, 1909, 3 paralectotypes of *C. filicaudata* by present designation. NMINH 1908.77.30, Dingle Bay, St. W, 260 fms, 19-20 dredge, in gravel, 7 paralectotypes of *C. filicaudata* by present designation.

Description of Shetland specimens

Average body length without crown 6.2 mm, width 1.2 mm; a relatively long branchial crown averaging about 3.8 mm in length and 0.6 mm in width; maximum total length 12 mm; minimum total length 4 mm; maximum width 1.3 mm (Figs 1A & 2A), Thorax consistantly with 8 chaetigers, 9 to 22 abdominal chaetigers. Branchial lobes each with 10 fully developed radioles in the largest specimens (8-9 in smaller specimens), with palmate membrane for at least three quarters of the radiolar length (Fig. 1A). Broad lateral flanges continuing up to the tip of radioles (Figs 1D & 2F). Dorsal pinnular appendages highly developed (Figs 1E & 2G). Dorsal lips triangular, without radiolar appendages (Figs 1E & 2G). Ventral lips rounded; 2 to 3 long ventral

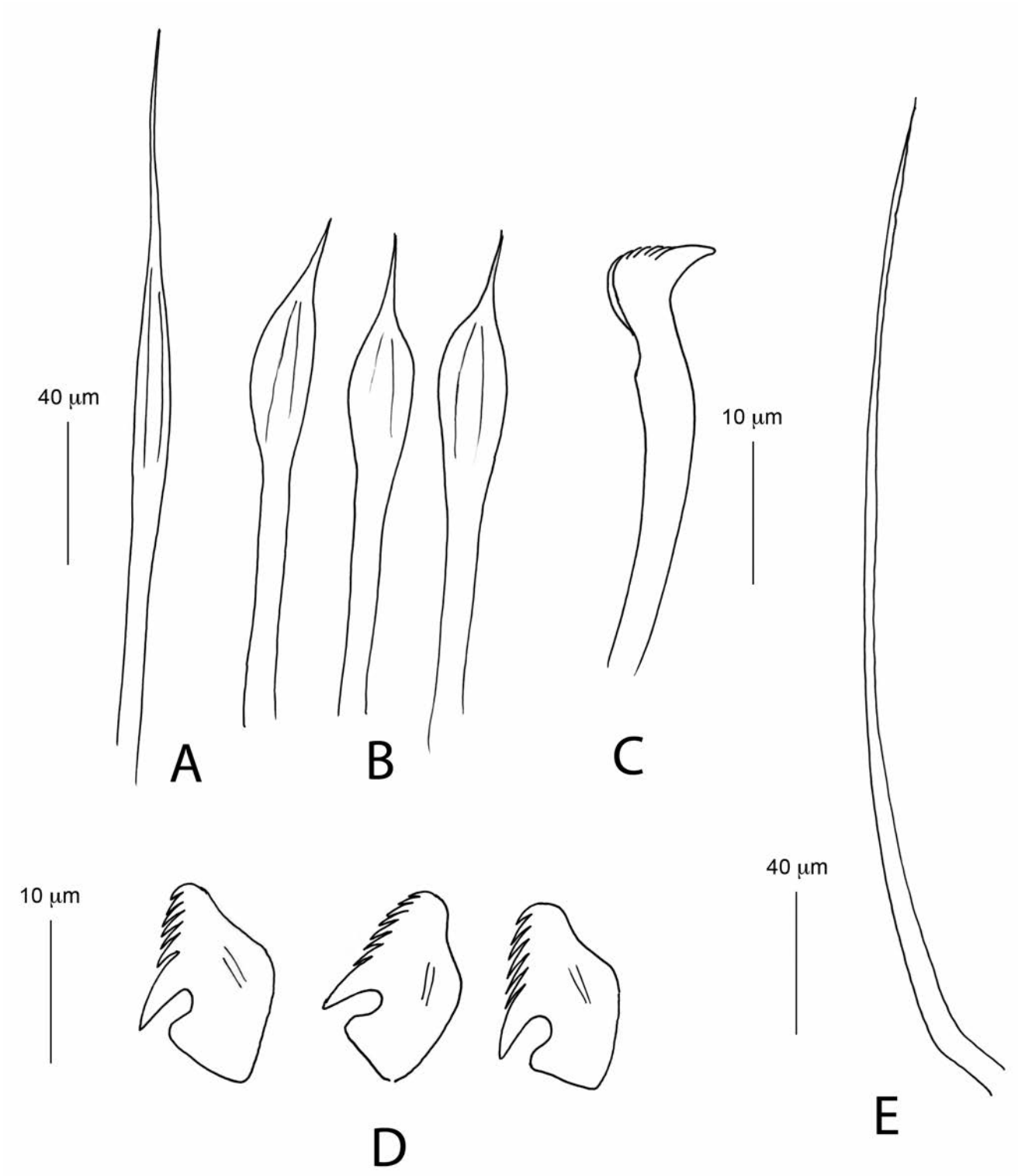

Figure 3. *Chone filicaudata* Southern, 1914. Drawing from the intermediate sized specimen from Shetland, Calbeck Ness of Figure 1. **A.** Superior thoracic notochaeta. **B.** Inferior thoracic notochaetae. **C.** Thoracic uncinus. **D.** Uncini from anterior abdominal segment on the left and from more posterior segments in the middle and on the right. **E.** Abdominal neurochaeta.

radiolar appendages (Figs 1E & 2G). Posterior peristomial ring collar high, with similar length all around and forming dorsally two deep and thick pockets covering the junction between the branchial crown and the thorax (Figs 1B-C & 2B-D). Anterior peristomial lobe distally bilobate and ventrally visible (Figs 1B & 2B). Glandular ridge on chaetiger 2 narrow all around (Figs 1C, 2C & E). Notopodial fascicle of chaetiger 1 with 8 elongate narrowly hooded chaetae. Chaetigers 2-8 with superior fascicle of 8 elongate narrowly hooded chaetae (Fig. 3A) and inferior fascicle with 8 subspatulate chaetae posteriorly (*sensu* Capa & Murray, 2015) (Fig. 3B), and 8 bayonet type chaetae anteriorly. Up to 20 neuropodial acicular uncini for each torus in chaetigers 2-8. Uncini with hoods, long handles and a series of small teeth over main fang (Fig. 3C), numbering about 19 per torus. Abdominal neuropodial fascicles with elongate chaetae (Fig. 3E). Up to 20 notopodial squared uncini in each torus. Uncini with main fang surmounted by 6-7 rows of small teeth. Uncini with similar shape along the abdomen (Fig. 3D). Intratorus variation absent. Pre-pygidial depression absent. Several specimens with a long filamentous appendix in the pygidium (Fig. 1F).

Methyl green staining pattern marked on ventral shields both in the thorax and abdomen, extending laterally (Fig. 2A). Collar not stained except ventrally where the basal part of the collar shield shows strong staining revealing its low wide shape (Fig. 2B-E).

Ecology and distribution

The SOTEAG surveys for which we have access to the raw data are from the 2012 and 2014 surveys (SGS M-Scan Ltd., 2012 & SGS M-Scan Ltd., 2014). These data show that *C. filicaudata* is most abundantly found at stations SV36 and SV37 which are in the more exposed outer part of the Voe. The sediment data in the reports show that these sites are described as sandy gravel. The rest of the survey area is much more muddy. The most abundant species at these two stations also show that there is a lot of exposed clean surface area to colonise. By far the most abundant taxa are *Spirobranchus triqueter* (Linnaeus, 1758), followed by *Leptochiton asellus* (Gmelin, 1791)

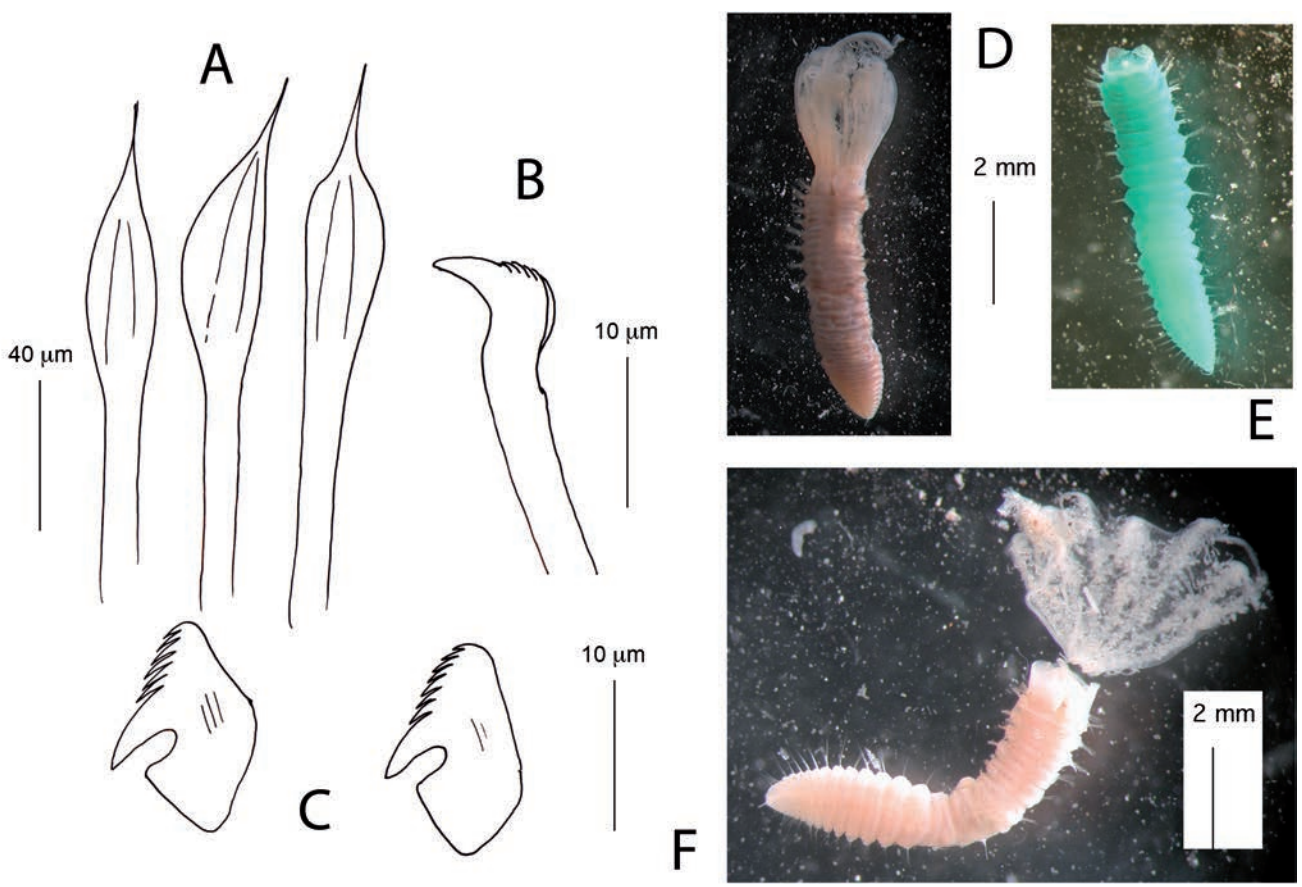

Figure 4. *Chone filicaudata* Southern, 1914. Drawing of paralectotype from Clew Bay, NMINH 1909.151.9. **A.** Inferior notochaetae. **B.** Thoracic uncinus. **C.** Uncini from anterior abdominal segment on the left and from more posterior segment on the right. **D.** Photographs of lectotype from Ballynakill Harbour, NMINH 1914.331.1. **E-F.** Paralectotype from Dingle Bay, NMINH 1908.77.30.

Anomiidae, and dozens of species of encrusting Bryozoa. These along with less abundant species such as *Hydroides norvegica* Gunnerus, 1768, and *Verruca stroemia* (O.F. Müller, 1776) in general all live attached to clean stones. Other more free living species that were common were many Annelida including *Eulalia bilineata* (Johnston, 1840), *Sphaerosyllis* spp. Claparède, 1863, *Syllis* spp. Savigny in Lamarck, 1818, *Glycera lapidum* Quatrefages, 1866, *Grania* sp. Southern, 1913 and also Crustacea such as *Tryphosa nana* (Krøyer, 1846), *Parametaphoxus fultoni* (Scott, 1890) and *Galathea intermedia* Lilljeborg, 1851.

The species is distributed all round the Ireland coast (Southern, 1914), in the UK it is known for the moment in Shetland.

Remarks

Features of the Shetland material such as absence of dorsal radiolar appendage, absence of abdominal uncinial variation and uncinal dentition, and absence of simple pre-pygidial depression, led to the taxon being considered to belong to the genus *Chone*. Moreover, the taxon fits well with the features of Southern's type material. Chaetae and uncini are the same as the re-examined Southern material both in shape and number (Fig. 4A-C), though his description of the number of rows of teeth above the main fang of the abdominal uncini is contradictory as he describes 7-8 rows of teeth in surface view and 10-12 rows in side view. His figures show a more rounded base to these uncini too. Our re-examination of the uncini from one of the paralectotypes and the newer Shetland material shows a consistant 6-7 rows of teeth from a side view and square bases. The exact orientation of the incini under the slide probably accounts for this difference. SEM imagery would clarify this though we are currently content with our interpretation. Thoracic chaetae are peculiar in having very long handles consistant with Southern material. Southern in his original description reported specimens from West Ireland as "short and stout". Indeed the size and shape of Southern material is similar to our material, even if they appear a little more wide (maximum wide 1.5 mm) (Fig. 4D-E). Our largest specimens also have the same number of radioles (10 pairs) as the largest type material specimen. Smaller specimens have 8-9 in Southern and Shetland material (though Southern only mentioned specimens with 8-9 even though his largest specimen re-examined by us had 10 pairs). There is a slightly higher palmate membrane in the Shetland material compared to the larger Southern specimen, about three quarters as high as the filaments against two-thirds reported by Southern (1914). Branchial crown in type material is so damaged that measurements were difficult (Fig. 4F).

In contrast, the general aspect does not fit with the "syntype" (BMNH 1914.12.12.25) of *C. filicaudata* in that our specimens are not as elongate as the "syntype" is (Fig. 5A-C). In addition, material from Shetland shows a different collar shape and methyl green staining pattern compared to the alleged "syntype" (Fig. 5A-C). In the "syntype" which the collar is higher ventrally compared to our specimens and to the Southern material, in which the length of the collar is similar all around. The "syntype" stains uniformly in thorax and abdomen, dorsal, ventral and laterally, by contrast in our specimens ventral shields of collar remain unstained, as also occurs in Southern type material. We suggest that "syntype" BMNH 1914.12.12.25

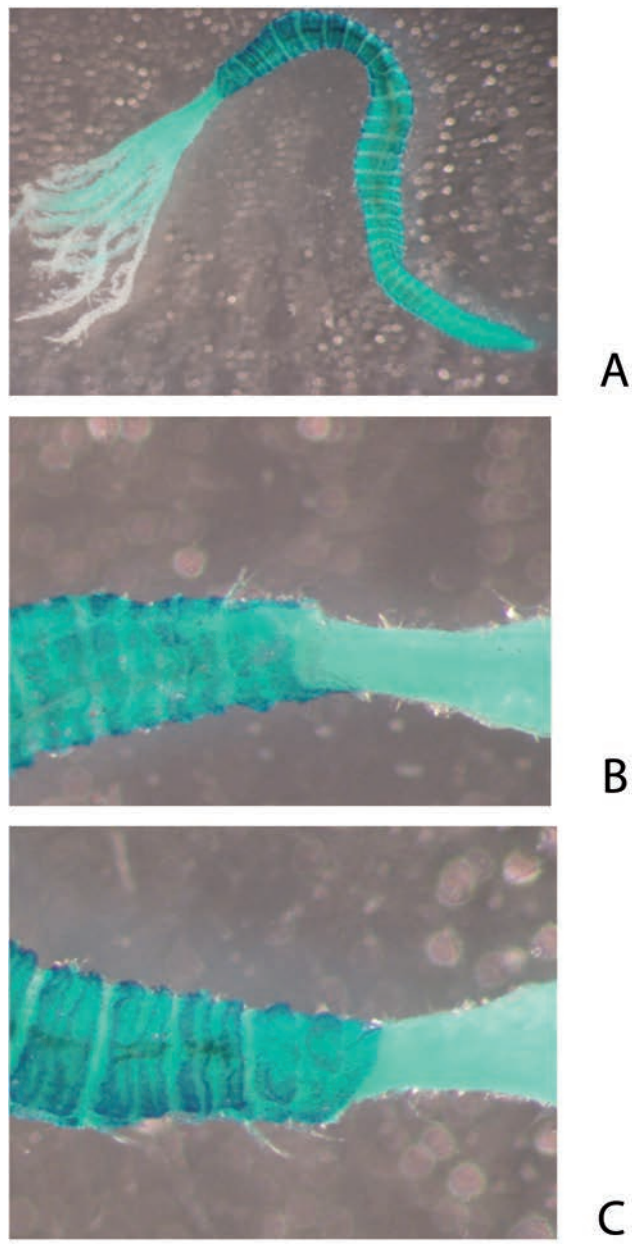

Figure 5. Erroneous "syntype" of *Chone filicaudata* (BMNH 1914.12.12.25), now *Paradialychone* sp. Not scaled.

is a species of *Paradialychone* that was erroneously classified as *C. filicaudata* in the British Museum of Natural History, London, database.

According to the article 73.2.1 of the International Code of Zoological Nomenclature (ICZN, 1999), syntypes may include specimens labelled "cotype" or "type". Southern labelled specimen NMINH 1914.331.1 from Ballynakill Harbour as "Type specimen". This specimen is here designated as lectotype (Article 74.1) and the others from Kingstown-Dalkey (NMINH 1914.313.19), Inishlyre Harbour (NMINH 1909.151.9) and Dingle Bay (NMINH 1908.77.30) as paralectotypes according to the Article 74.1.3 (ICZN, 1999).

As far as the ecology of the taxon Shetland material was collected between 14 and 17 m depth in sandy gravel, whilst in Clew Bay and it was collected in Harbour from 2 to 5 m depth, and in Dublin Bay and Dingle Bay between 8 and 20 m depth in gravel.

Final remarks

Discovered in the SOTEAG surveys was another species, *Dialychone dunerificta* (Tovar-Hernández et al., 2007). This taxon was only known only from the Mediterranean. Its dicovery and inclusion in a workshop key (Giangrande et al., 2015) led to the workshop participants acknowledging it to be widespread in British waters and previously considered to be *Chone duneri* Malmgren, 1867.

Acknowledgments

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