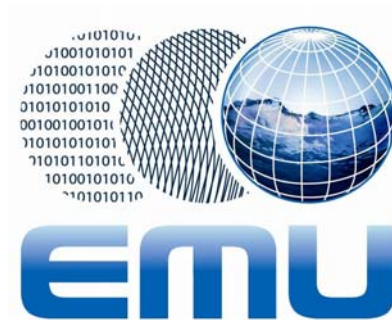


A Provisional Guide to the family Opheliidae (Polychaeta) from the shallow waters of the British Isles

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Introduction

Opheliidae occur worldwide in sandy or muddy substrates from the intertidal zone to depths of over 7000m (Rouse & Pleijel, 2001; Dauvin & Bellan, 1994). The family was originally grouped within the 'sedentary' polychaetes, presumably because of their relatively simple body shape. However, species of Opheliidae are active burrowers that never construct tubes (Rouse & Pleijel, 2001). The body may be one of three distinct shapes: short and grub-shaped; elongate and slender; or anteriorly inflated tapering to a narrower posterior. Most species have a deep ventral groove – either running along the entire length of the body or restricted to mid-body and posterior regions. The prostomium is conical and lacks appendages apart from a small palpode on the tip in some species. Most segments have biramous parapodia and chaetae, although in *Ophelia* and *Travisia* species the parapodia are very small and the chaetae appear to emerge straight from the body wall. All notochaetae and neurochaetae are capillary. Branchiae may be present along most of the body; may be restricted to mid-body or posterior segments; or may be completely absent. The pygidium is very variable within the family and its morphology is often used for the identification of species.

European Opheliidae

The following list of Opheliidae species recorded from European waters is derived from The Species Directory (Howson and Picton, 1997), The European Register of Marine Species (ERMS) (Bellan in Costello *et al.*, 2001), The North East Atlantic Taxa checklist (Hansson, 1998) and Bellan & Dauvin (1991):

Ammotrypanella arctica McIntosh, 1879
Armandia cirrhosa Filippi, 1861
Armandia polyophthalma Kükenthal, 1887
Euzonus flabelligerus (Ziegelmeier, 1955)
Ophelia amoureuxi Bellan & Costa, 1987
Ophelia barquii Fauvel, 1927
Ophelia bicornis Savigny in Lamarck, 1818
Ophelia borealis Quatrefages, 1866
Ophelia celtica Amoureux & Dauvin, 1981
Ophelia laubieri Bellan & Costa, 1987
Ophelia limacina (Rathke, 1843)
Ophelia neglecta Schneider, 1892
Ophelia radiata (Delle Chiaje, 1828)
Ophelia rathkei McIntosh, 1908
Ophelia roscoffensis Augener, 1910
Ophelia translucens (Katzmann, 1973)
Ophelina abbranchiata Støp-Bowitz, 1948
Ophelina acuminata Örsted, 1843
Ophelina aulogaster (Rathke, 1843) synonym of *O. acuminata* (Howson and Picton, 1997)
Ophelina breviata (Pettibone, 1954)
Ophelina cylindricaudata Jirkov, 2001
Ophelina helgolandica Augener, 1912
Ophelina minima Hartmann-Schröder, 1974
Ophelina modesta Støp-Bowitz, 1958
Ophelina norvegica Støp-Bowitz, 1945
Ophelina opisthobranchia Wirén, 1901
Polyophthalmus pictus (Dujardin, 1839)
Tachytrypane jeffreysii McIntosh, 1879
Travisia forbesii Johnston, 1840
Travisia gravieri (McIntosh, 1908) formerly *Kesun gravieri* (see Dauvin & Bellan, 1994)

Of these *Ammotrypanella arctica*, *Ophelina helgolandica*, *Tachytrypane jeffreysii* and *Travisia gravieri* are deepwater species and are not considered further here. Similarly, *Ophelia amoureuxi* and *Ophelia translucens* are Mediterranean species and have been excluded from the key. *Ophelina breviata* appears to be primarily an Antarctic species (e.g. Mackiolek & Blake, 2006) and it remains unclear why this species is included in the ERMS list. *Ophelina opisthobranchia* is also listed on the ERMS database but no morphological or distributional details of this species are known at present.

British Shallow Water Opheliidae

The species of Opheliidae that could occur in the shallow seas around the British Isles are divided among 6 genera: *Armandia* (2 species), *Euzonus* (1 species), *Ophelia* (10 species), *Ophelina* (6 species), *Polyopthalmus* (1 species) and *Travisia* (1 species). The following key to these species has been constructed using information in Amoureux & Dauvin (1981), Bellan & Costa (1987), Bellan & Dauvin (1991), Hartmann-Schröder (1996), Fauchald (1977), Fauvel (1927) and Tebble (1952).

Provisional key to British shallow water Opheliidae

1. - Ventral groove absent; body fusiform, indistinctly divided into 2 regions *Travisia forbesii*
- Ventral groove present along entire body or along posterior chaetigers 2
2. - Ventral groove absent from anterior part of body (at least from the first 6 or 7 chaetigers) 3
- Ventral groove present along whole body 4
3. - Body divided into 3 regions ('head', anterior and posterior); head region inflated; distinct prechaetal lobe or ridge on chaetiger 10; branchiae arborescent or pectinate *Euzonus flabelligerus*
- 2 relatively indistinct body regions; inflated anterior end but no distinct 'head' region; branchiae simple, cirriform *Ophelia*... 12
(see also Table 1)
4. - Lateral eyes present 5
- Lateral eyes absent *Ophelina*... 7
5. - Branchiae absent, characteristically pigmented *Polyopthalmus pictus*
- Branchiae present *Armandia*... 6
6. - 26-27 chaetigers *Armandia cirrhosa*
(rare, protected species)
- 33 chaetigers *Armandia polyopthalma*
7. - Branchiae absent; anal tube cylindrical, long and with a long medio-ventral cirrus *Ophelina abranchiata*
- Branchiae present 8
8. - Branchiae of middle chaetigers either missing or clearly reduced in size; anal tube cylindrical 9
- Branchiae present on most chaetigers (beware damaged specimens); anal tube cylindrical, spoon shaped or funnel shaped, with papillae but with or without cirri 10
9. - Anal tube with 4 short papillae; 24-27 chaetigers; posterior chaetigers (19-23) strongly shortened, clearly different to preceding chaetigers *Ophelina minima*
- Anal tube with small medio-ventral cirrus but no papillae; 28-34 chaetigers; posterior chaetigers not obviously shorter than preceding chaetigers *Ophelina cylindricaudata*

10. - Anal tube spoon shaped, opening ventrally, with papillae and cirri; 50 chaetigers..... *Ophelina acuminata*
 - Anal tube funnel shaped or cylindrical; more than 50 or less than 30 chaetigers..... 11
11. - Anal tube funnel shaped; 55-61 chaetigers..... *Ophelina norvegica*
 - Anal tube cylindrical; 22-24 chaetigers *Ophelina modesta*
12. - Branchiae present 13
 - Branchiae absent *Ophelia laubieri*
 (see note †)
13. - 1 large ventral anal papilla; 8-10 branchiate chaetigers..... *Ophelia rathkei*
 - 2 large ventral anal papillae; 13 or more branchiate chaetigers..... 14
14. - 16 or less branchiate chaetigers 15
 - 18 or more branchiate chaetigers 16
15. - 7 to 9 posterior abranchiate chaetigers; 13 to 15 branchiate chaetigers. 5 or 6 pairs of nephridiopores (starting on 2nd branchiate chaetiger). Intertidal..... *Ophelia bicornis* group
 (see note*)
 - 3 (occasionally 4) posterior abranchiate chaetigers; 16 (occasionally 15) branchiate chaetigers; 4 pairs of nephridiopores (on 2nd to 5th branchiate chaetigers). Offshore..... *Ophelia celtica*
16. - 18 branchiate chaetigers..... *Ophelia neglecta*
 - 20 or more branchiate chaetigers 17
17. - 1 posterior abranchiate chaetiger; 2 very large anal papillae and 12 much smaller *Ophelia roscoffensis*
 - 6 or 7 posterior abranchiate chaetigers 18
18. - 19 or 20 branchiate chaetigers (adults); small anal papillae are equal in length (or nearly so in smaller individuals) to the 2 stout ventral anal papillae; long chaetae in posterior segments *Ophelia borealis*
 - 22 branchiate chaetigers (adults); small anal papillae are short and blunt, never reaching the length of the 2 stout ventral papillae; short chaetae in posterior segments *Ophelia limacina*
 (arctic species probably not in UK – note in Species Directory; but see also Table 2)

*The *Ophelia bicornis* group

The taxonomic status of *Ophelia bicornis sensu lato* Savigni 1818 has long been debated. It has a wide distribution on Mediterranean and European Atlantic coasts, occurring intertidally on high energy fine to medium sands.

Fauvel (1927) distinguished between *Ophelia bicornis*, *Ophelia radiata* and *Ophelia radiata* var. *barquii* using gill counts (15, 14 and 13 branchiate chaetigers respectively). In addition, he described both *O. bicornis* and *O. radiata* as having 6 nephridiopore pairs (i.e. on chaetigers 12 to 17). Since Fauvel various authors have re-grouped these 3 taxa within *Ophelia bicornis*. Gill counts have sometimes been deemed potentially unreliable in identifying the species of this group and the occurrence of occasional asymmetrical specimens (e.g. 15 branchiae on one side and 14 on the other) adds to the confusion.

However, consistency between the number of gill pairs and allozyme patterns led Britton-Davidian & Amoureux (1982) to recognise two distinct forms along French Atlantic coasts, which were assigned to *Ophelia bicornis* (15 branchiate chaetigers) and *Ophelia radiata* (14 branchiate chaetigers). Also, in a study of *Ophelia bicornis* in the Exe estuary, Harris (1991) found 99% of the study population had 15 branchiate chaetigers. Most recently the taxonomic distinction between *O. bicornis* and *O. barquii* was validated by Maltagliata *et al.* (2004) and Maltagliata *et al.* (2005) using genetic analysis and nephridiopore counts (*O. bicornis sensu strictu* 6 nephridiopore pairs and *O. barquii* 5 nephridiopore pairs).

The morphological features given in Table 1 below should help with the identification of individuals from this group. However, a good deal of caution is required when identifying any specimen occurring singly in one sample or survey area. A number of animals may be required to raise confidence levels beyond the '*O. bicornis* group' label. *O. barquii* has yet to be recorded from UK waters, but it is included here in case this omission is simply a result of the ongoing taxonomic uncertainties within the group.

†*Ophelia laubieri*

This species was described from the Sado estuary on the Atlantic coast of Portugal (Bellan & Costa, 1987). It would seem that since then there have been no further records around the UK. *Ophelia laubieri* is described as a very small species (<8mm) found in infralittoral fine sands covered by full salinity waters. As many Opheliid species have wide NE Atlantic distributions and some are recorded from UK waters down to Gibraltar and into the Mediterranean, *O. laubieri* has been included here. As a small abbranchiate species it has possibly been previously overlooked as a juvenile/damaged individual.

Table 1 *Ophelia* species – Summary of Morphological Features

Species	Branchiate chaetigers	Stout ventral anal papillae	Small anal papillae	Typical Formula
<i>barquii</i>	13	2	10-15	10a + 13b (2b-6b) + 9a
<i>bicornis</i>	15	2	10-15	10a + 15b (2b-7b) + 7a
<i>borealis</i>	20 (19)	2	12 (10-16) often as long as but thinner than stout ventral papillae	10a + 20b (2b-7b) + 6a
<i>celtica</i>	16	2	12; much smaller than 2 stout ventral papillae	10a + 16b (2b-5b) + 3a + n
<i>laubieri</i>	0	2	10	24a + 0b + 0n
<i>limacina</i>	22 (21-23)	2 ovoid	10 (6-12) shorter than stout ventral papillae	10a + 22b (2b-7b) + 7a
<i>neglecta</i>	18	2 ovoid	11-18	9a + 18b (3b-8b) + 5a
<i>radiata</i>	14	2	12-14	10a + 14b (2b-7b) + 8a
<i>rathkei</i>	9 (8-10)	1	~9, shorter than stout ones	11a + 9b (2b-4b) + 4a
<i>roscoffensis</i>	23	2	12, very small	8a + 23b (4b-9b) + 1a

Information derived from Amoureux & Dauvin (1981); Bellan & Costa (1987); Fauvel (1927); Hartmann-Schröder (1996); Harris (1991); Maltagliata *et al.* (2005); Tebble (1952).

Notes:

Explanation of Typical Formula (following Tebble, 1952) e.g. *O. borealis*:

10a + 20b (2b-7b) + 6a = 10 anterior abranchiolate chaetigers followed by 20 branchiate chaetigers then 6 abranchiolate chaetigers; six pairs of nephridiopores (from branchiate chaetiger 2 to 7).

Formulae are generally applicable for larger individuals (>10mm) but variations can occur in younger stages – typically fewer branchiate chaetigers and more posterior abranchiolate chaetigers (e.g. *O. borealis* 10a + 18b (2b-7b) + 8a; *O. celtica* 10a + 15b (2b-5b) + 4a). The adult body formula would thus be achieved during development by the growth of gills on posterior chaetigers (Tebble, 1952).

The 1st abranchiolate chaetiger is often difficult to see (chaetae are often shorter than in subsequent chaetigers).

Small anal papillae can be fewer in juveniles e.g. 6 in young *O. borealis* (Tebble, 1952).

Nephridiopores are usually quite obvious (positioned immediately in front of ventral chaetae) but can be hard to detect. Staining with Methyl Green may help (see Fig 1).

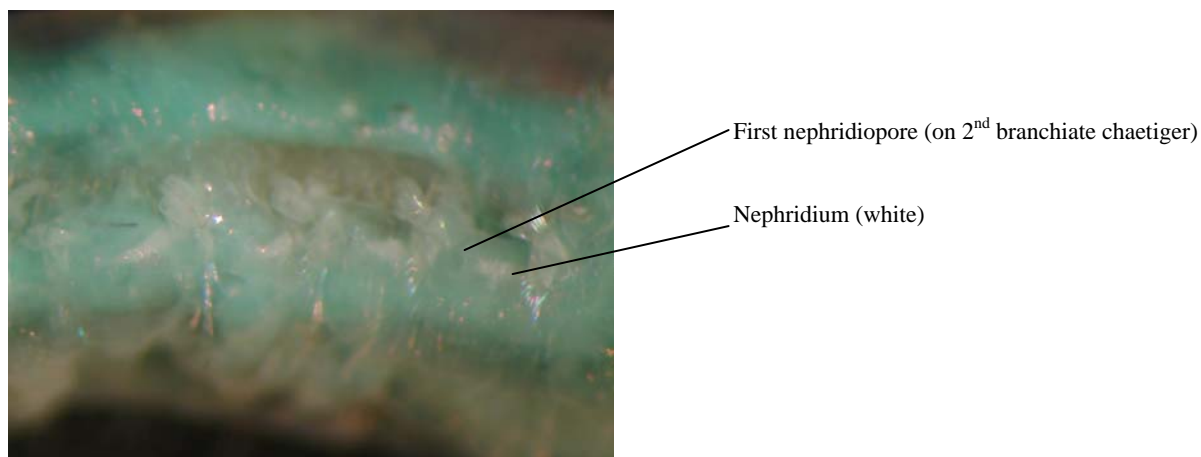


Fig 1 *Ophelia celtica* (lightly stained with Methyl Green) showing the first 5 branchiate chaetigers (running from right to left) and the 4 nephridia leading to nephridiopores on branchiate chaetigers 2-5.

Table 2 Distributional Data obtained to date

Species	Emu records	NEAT (Hansson, 1998)	Other
<i>Armandia cirrhosa</i>	Portland	Mediterranean	UK South coast saline lagoons, Portland Harbour (B&E) Portland (UM)
<i>Armandia polyophthalma</i>	Western Bristol Channel; Irish Sea	Ireland, Engl. Channel, Mediterranean	Adriatic, Madeira (F) Bristol Channel, Cardigan Bay, N Donegal, Scilly Isles (UM)
<i>Euzonus flabelligerus</i>	Irish Sea, Yarmouth, Dogger	S & central North Sea, White Sea	North Sea (H-S) Bristol Channel, Moray Firth, Wash, Wight (UM)
<i>Ophelia barquii</i>		French Mediterranean	Mediterranean (B&D)
<i>Ophelia bicornis</i>	?Wight (old unchecked record)	Engl. Channel, Bay of Biscay, Mediterranean	Exe estuary (H) NE Atlantic from English Channel to Gibraltar (B&D)
<i>Ophelia borealis</i>	English Channel; Irish Sea South West North Sea	Isefjord, Öresund - Kattegatt, all Norway, North Sea, Greenland, Irish Sea, Engl. Channel	Biscay (B&D) Belfast, Bristol Channel, Cardigan Bay, Clyde, Dogger, Dublin, East Channel, Firth of Forth, Liverpool, Moray, Portland, Solway, Thames, Wash (UM)
<i>Ophelia celtica</i>	Eastern English Channel	Irish Sea, Celtic Sea, Bay of Morlaix	Western English Channel (B&D) Eastern English Channel, Plymouth, Bristol Channel, Wight, Wash (UM)
<i>Ophelia laubieri</i>		Portugal (Sado estuary)	
<i>Ophelia limacina</i>	all old unchecked records	W Baltic-Skagerrak, Spitsbergen, Siberia, North Sea, Iceland, Greenland, Engl. Channel	Arctic, NE Pacific, N Atlantic, sub-Arctic, temperate (B&D) NW Atlantic circumboreal, Hudson Bay, Grand Manan (R)
<i>Ophelia neglecta</i>		Bretagne, Biscay, W Mediterranean	NE Atlantic Brittany (B&D)
<i>Ophelia radiata</i>		W Engl. Channel-Gibraltar, Mediterranean	NE Atlantic W Engl. Channel-Gibraltar, Mediterranean (B&D)
<i>Ophelia rathkei</i>	Tay Estuary	W Baltic, Isefjord, Lofoten, S North Sea, Engl. Channel, Britain, Ireland	Belfast, Orkney Thames (UM) North Atlantic - Scotland, Ireland (H-S)
<i>Ophelia roscoffensis</i>	South West (SEA8)	Roscoff, Plymouth, Biscay, Gibraltar, Mediterranean, Ivory Coast	West Channel (T) Plymouth (UM)
<i>Ophelina abranchiata</i>		Skagerrak (off Arendal) - Lofoten	Arctic, N Atlantic, Adriatic (H-S)
<i>Ophelina acuminata</i>	Firth of Forth, North West Roughs Torbay, English Channel, Tees, Irish Sea, Castletownbere, North Sea	N Öresund - Bohuslän - Skagerrak - all Norway, Spitsbergen, North Sea, Siberia, Iceland, Greenland, Ireland, Engl. Channel	Belfast, Bristol Channel, Cardigan Bay, Dogger, Dublin, E Channel, Firth of Forth, Liverpool Bay, Moray, Northumberland, Thames, Wash, Viking (W), Orkney (UM)
<i>Ophelina cylindricaudata</i>	N North Sea	Kattegatt - Skagerrak, Drøbak - W Finnmark, Spitsbergen, Kara Sea, Greenland, Irish Sea	Moray Firth, Belfast, Scilly Isles (UM) Bipolar and worldwide (H-S)
<i>Ophelina minima</i>		Skagerrak	
<i>Ophelina modesta</i>	?Wight (old unchecked records)	Gullmarfjord, Koster Channel, Skagerrak, Østfold - S Troms, Irish Sea	Belfast, Northumberland, Orkney, Yorkshire, Moray Firth, W Viking (UM)
<i>Ophelina norvegica</i>		Bohuslän in 50-200m, Skagerrak, all Norway	N North Sea(SCJ)
<i>Polyophthalmus pictus</i>	Falmouth	North Sea, Engl. Channel, Ireland	English Channel, Atlantic, Mediterranean, Red Sea, Pacific (F)
<i>Travisia forbesii</i>	English Channel; Humber; Thames; Irish Sea; North Sea; Western Bristol Channel; Dogger Bank	W Baltic - Bohuslän - all Norway, Spitsbergen, Jan Mayen, Greenland, North Sea, Iceland, Britain, Engl. Channel	NE & NE Atlantic, S America, S Africa (D&B)

B&E=Bamber & Evans 2003; B&D=Bellan & Dauvin (1991); D&B=Dauvin & Bellan (1994); F=Fauvel (1927); H=Harris (1991) H-S=Hartman-Schröder (1996); R=Riser (1987); T=Tebble (1952)
UM=Unicomarine; SCJ=Steve Jarvis (MIES)

Request For Information and Specimens

This guide is a work in progress and I have yet to see specimens of several of the species in the key.

I would welcome feedback on the information provided and on the key itself.

I would also be very grateful for the loan of any specimens, particularly of *Ophelina abramchiata*, *Ophelina minima*, *Ophelia neglecta*, *Ophelia radiata*, and any possible *Ophelia laubieri*;

As Table 2 shows, specific information on the distributions of many Opheliid species in British waters is fairly sparse at present and any data you can provide would be gratefully received.

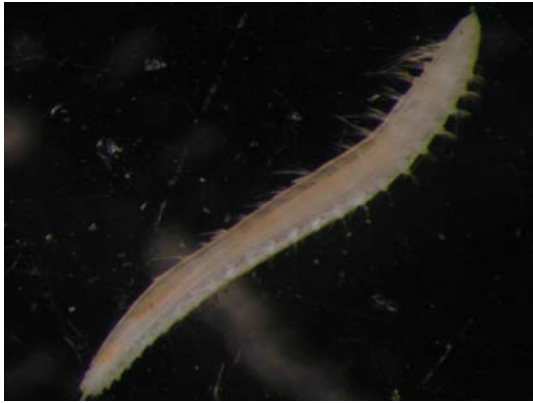
Thank you

Acknowledgements

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Armandia cirrhosa 5mm



Armandia polyophtalma 12mm



Euzonus flabelligerus 4mm



Polyophtalmus pictus 9mm (Rose Bengal stained)



Travisia forbesii 7mm (Rose Bengal stained)



Ophelia borealis 9mm



Ophelia borealis 9mm posterior



Ophelia borealis 14mm posterior



Ophelia celtica 12mm



Ophelia celtica 12mm posterior



Ophelia rathkei 6mm



Ophelia rathkei 6mm posterior



Ophelia roscoffensis 7mm



Ophelia roscoffensis 15mm posterior



Ophelina cylindricaudata 6mm



Ophelina cylindricaudata 6mm posterior



Ophelina acuminata 15mm posterior



Ophelina norvegica posterior



Ophelina modesta 4mm



Ophelina modesta 4mm posterior