HESIONIDAE (GRUBE, 1850) - A PROVISIONAL GUIDE TO THE IDENTIFICATION OF THE BRITISH SPECIES

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Introduction

Hesionidae is a family of errant polychaete worms often encountered in small numbers in fully marine samples taken throughout British waters. The first hesionid (*Nereis punctata,* now called *Nereimyra punctata*) was described in 1776 by O. F. Müller in a treatment of the Danish and Norwegian fauna, but the family Hesionidae was not erected until 1850 (Grube). The name was adopted from Greek mythology where Hesione was the daughter of Laomedon, king of Troy.

Worldwide there are about 24 genera containing roughly 130 species but only 11 genera (15 species) are listed for the British Isles and surrounding region in the MCS directory (Howson and Picton, 1997). These are:

Dalhousiella McIntosh, 1901

Gyptis Marion & Bobretzky, 1875

Hesiospina Imajima & Hartman, 1964

Kefersteinia Quatrefages, 1865

Leocrates Kinberg, 1866

Nereimyra de Blainville, 1828

Ophiodromus Sars, 1861

Periboea Ehlers, 1864

Podarke Ehlers, 1864

Podarkeopsis Laubier, 1961

Syllidia Quatrefages, 1866.

Podarke is now considered a junior synonym of *Ophiodromus* and *Periboea* is probably synonymous with *Hesiospina* (see Pleijel, 1998) so these two genera are no longer considered valid. In addition to the above list, however, there is the possibility that the genus *Hesione* will occur in British waters as a result of climate change. This means that there are potentially ten valid genera in the region. Further species are likely to be recorded especially in deeper waters. Currently confirmed and prospective species are dealt with in the following key which also gives references to descriptions in the literature.

Until recently the genera *Hesionides* and *Microphthalmus* were treated in a sub-family of the Hesionidae (Microphthalminae) but their taxonomic position is now regarded as uncertain and they have been removed from the family (see Pleijel and Dahlgren, 1998; Rouse and Pleijel, 2001 p. 106). They are not treated here. Aids to their identification can be found in Hartmann-Schröder (1996 p. 140) and Clausen (1986).

Pilargidae bears some resemblance to Hesionidae and pilargid species were included within the Hesionidae by Fauvel (1923). However, pilargids do not have compound

chaetae whereas hesionids always have some compound neurochaetae. Hesionids may also be confused with syllids but the latter have uniramous parapodia which never occur in Hesionidae.

Information in this paper is based heavily on the summaries of Hesionidae found in Wilson (2000) and Rouse and Pleijel (2001).

Morphology

The British species have the following features (see Figure A):

The **prostomium** is more or less rectangular or oval with a rounded anterior margin and sometimes with a posterior incision (the shape can depend on whether the proboscis is everted or not – see p. 231 in Fauvel, 1923). It carries a dorsal pair of **antennae** and a pair of ventrally inserted biarticulated **palps** (except in *Hesione* which lacks palps). A median antenna may also be present and this is inserted either on the anterior margin of the prostomium (frontal) as in *Ophiodromus* and *Podarkeopsis,* or on the dorsal surface (e.g. *Gyptis*). All the species treated here have two pairs of eyes. Nuchal organs can sometimes be seen as raised ridges or slits on the posterior part of the prostomium but are often difficult to see.

The **pharynx** (or **proboscis**) is an eversible, muscular tube which usually ends in a ring of papillae. These are sometimes reduced or absent. In *Syllidia* and *Nereimyra* there is a pair of lateral **jaws**.

The anterior three or four segments (depending on genus) lack chaetae and bear a pair of long cirri on each side (one dorsal and one ventral). These are termed "**tentacular cirri**" They may be articulated, wrinkled or smooth. The first segment (and often also the second) is only visible ventrally and laterally and so appears to be covered dorsally by the rear of the prostomium. The remaining segments have chaetae and dorsal cirri which are usually shorter than the tentacular cirri (although anterior cirri may approach the tentacular cirri in length). They also have ventral cirri which are much shorter, scarcely extending beyond the parapodium. Cirri originate from cirrophores (which remain visible when cirri are missing).

The non-cephalized segments have an internal **acicula** in each ramus of the parapodium (cf. Syllidae) and fully developed neuropodia. However, notopodial development varies among the genera (see Figure B). Sometimes this ramus is fully developed with many emergent chaetae (e.g. *Ophiodromus*) and the parapodium is therefore **biramous**. However, **sub-biramous** parapodia also occur where the notopodium is reduced and has just a few emergent chaetae (e.g. *Nereimyra punctata*) or lacks emergent chaetae altogether. This last condition, where the acicula is retained within the cirrophore and there are no emergent chaetae is called "**sesquiramous**" by Hilbig (1997) and Parapar et al. (2004) and is found in *Syllidia armata* and *Psamathe fusca.* All notochaetae are simple (capillaries, hooks or forked chaetae). Neurochaetae are compound and both falcigers and spinigers may be evident in varying combinations, together sometimes with simple chaetae. The **pygidium** bears a pair of cirri.

The total number of chaetigers in adults is fixed in some genera (e.g. *Leocrates* and *Dalhousiella* have only sixteen) but is variable in most hesionids up to a maximum of about 60. Length ranges up to about 75 mm (*Psamathe fusca* – Hartmann-Schröder, 1996).

Identification

Hesionids are fragile animals and whole specimens are seldom encountered in samples. The worms fragment easily at intersegmental boundaries and both cirri and antennae are readily shed. The genera are superficially alike and the identifier is normally confronted by an anterior portion devoid of appendages. However, careful examination of the features described above allows for identification at least to genus level. A traditional dichotomous key is presented here together with a table of salient features which may be used as an alternative aid. In using these the worker should bear the following points in mind:

- Antennae are often missing but may leave a scar or small stub.
- There are either three or four pairs of tentacular cirri. Although a dorsal and ventral tentacular cirrus is associated with each of the anterior three or four segments their disposition is not always obviously dorsal and ventral (i.e. one above the other). If the cirri are missing this arrangement can be confusing initially. Staining (10 minutes in methyl blue or methyl green) will pick out the cirrophores in smaller specimens and facilitate counting. Rotating the specimen in oblique incident lighting will allow confirmation of the number.
- The proboscis may not be everted or the terminal ring bearing the papillae may not be fully extended. In the former case dissection may be necessary, in the latter probing with a sharp needle will reveal the papillae just within the opening of the proboscis. When dissecting, a medioventral incision through the body wall and proboscis should suffice to establish whether papillae are present.
- The jaws of *Nereimyra* are not easy to see being small, transparent and embedded laterally in the proboscis wall. Dissecting as described above will reveal them if the proboscis is not everted, but sometimes downward pressure with a needle on the posterior part of the everted proboscis or prostomium will cause the opening to be directed upwards so that it is possible to see into the mouth. The jaws can then be seen inside the pharynx (embedded in the lateral walls). The darkened jaws of *Syllidia* often show through the body wall and are much easier to detect, even without manipulation.
- *Hesiospina* is very similar to *Psamathe* and may have been misidentified. The sigmoid spines or curved hooks in the notopodia in median segments are near the base of and anterior to the cirrophore.
- Hesionid ontogeny may cause problems identifying early settlement stages:
  - all juveniles have a median antenna. In some taxa this migrates forward during development to the anterior insertion position, in others it is lost.
  - hesionids start post-larval development with 10 proboscis papillae which are then lost in some species and multiplied in others.
  - earliest stages have one pair of tentacular cirri and add pairs sequentially during development until the adult complement is attained (Hilbig, 1997).

  Adult configurations are attained at 25 segment stage in *G. rosea* (Haaland & Schram, 1982) and *Nereimyra punctata* (Schram & Haaland, 1984) and at the 20 segment stage for *Ophiodromus flexuosus* (Haaland & Schram, 1983)

Key to British genera of Hesionidae Grube 1850

(see Salazar-Vallejo & Orensanz (2006) for a key to worldwide genera)

1 Sixteen chaetigers 2

Adult with more than sixteen chaetigers..... 4

2 Palps absent, no median antenna. .....***Hesione***[1]

Palps present. 3

3 Median and posterior parapodia with notochaetae. Median antenna present ....***Leocrates***[2]

All parapodia with neurochaetae only. No median antenna .....***Dalhousiella***[3]

4. 6 pairs of tentacular cirri 5

8 pairs of tentacular cirri 7

5. Antenna frontal (but often lost). No proboscis papillae..... ***Ophiodromus***[4]

No antenna. Proboscis with 10 papillae..... 6

6. A few notochaetae present - emerging from just below dorsal cirri.....***Nereimyra***[5]

Parapodia sesquiramous. Notochaetae absent .....***Syllidia***[6]

7. Parapodia sub-biramous with no notochaetae or with sigmoid or falcate spines; no median antenna 8

Parapodia biramous; notochaetae present; median antenna present (but often lost) 9

8. Mid-body notopodia each with 1-2 falcate spines (hooks) (may be difficult to see) .....***Hesiospina***[7]

Notopodial spines absent .....***Psamathe***[8]

9. Forked chaetae present in notopodia; median antenna inserted anteriorly. Ten proboscis papillae .....***Podarkeopsis***[9]

No forked chaetae in notopodia; median antenna inserted dorsally. Many proboscis papillae ..... ***Gyptis***[10]

Notes:

1. *Hesione* is not in the MCS Directory but *H. splendida* Lamarck, 1818 was found off the Basque coast. This Mediterranean species is considered possible in British waters as a result of climate change. Description in Fauvel (1923) p. 233 as *H. pantherina* (Risso, 1826) and Parapar et al. (2004) p. 216.

2. *L. atlanticus* (McIntosh, 1885) is the only species recorded so far from this region (Ouessant Island near Brest) - See Fauvel (1923) p. 235 or Parapar et al. (2004) p. 219 for a description.

3. *D. carpenteri* McIntosh, 1901 reported from the Atlantic end of the English Channel and described in Fauvel (1923), p. 234. Also described in Parapar et al. (2004) p. 224.

4. *Ophiodromus*: two species in British area: *O. flexuosus* (Chiaje, 1827) - see p. 136 in Hartmann-Schröder (1996) and p. 248 in Parapar et al. (2004). This has transverse light bands on chaetigers 6, 10, 15, 23, 27 … etc (visible on preserved specimens). *O. pallidus* (Claparède, 1864) is described in Fauvel (1923) p. 244 under the old name of *Podarke pallida*. See also Parapar et al. (2004) p. 250 for a fuller description.

5. *Nereimyra*: For *N. punctata* (Müller, 1788) - see p. 134 in Hartmann-Schröder (1996) or Parapar et al. (2004) p. 230. The anterior dorsum has transverse dark black to green bands. A further, deep water species which lacks this pigmentation has been reported in the north. This is *N. woodsholea* (Hartman, 1965). There appear to be no other morphological differences between the two species (Nygren, Pleijel and Sundberg, 2005).

6. *Syllidia*: One species reported in British waters, *S. armata* (Quatrefages, 1866). Jaws are usually obvious. Fig. 57 Hartmann-Schröder (1996) p. 139; Parapar et al. (2004) p. 235.

7. *Hesiospina*: One species listed in British waters: *H. similis* (Hessle, 1925). This may often have been misidentified as *Psamathe fusca* (= *Kefersteinia cirrata*). The hooks only appear in mid-body notopodia and may need dissection and slide preparation to see. *Periboea longocirrata* Ehlers, 1864 is in the MCS directory but was originally described with 7 pairs of tentacular cirri. This is not likely in hesionids and Pleijel (1998) considers this an error. The taxon is probably a synonym of *Hesiospina* (species unclear). *H. similis* is figured by O'Connor and Shin (1983) and described in Parapar et al. (2004) p. 227.

8. *Psamathe fusca* Johnston, 1836 = *Kefersteinia cirrata* (Keferstein, 1862) (see Pleijel, 1998). Fig. 53 Hartmann-Schröder (1996) p. 133: Parapar et al. (2004) p. 233.

9. *Podarkeopsis*: There may be more than one species in the area. Call all finds *P. "capensis"* pending further revision. Fig. 56. Hartmann-Schröder (1996) p. 137; Parapar et al. (2004) p. 255.

10. *Gyptis*: Four species in the MCS Directory of which *G. brevipalpa* (Hartmann-Schröder, 1959) can probably be discounted. The original description is from El Salvador. *G. arenicola* (La Greca, 1946) is mentioned as present in British waters (Gibbs and Probert, 1973). *G. propinqua* Marion and Bobretzky, 1875 and *G. rosea* (Malm, 1874) are re-described in Pleijel (1993) and have descriptions in Hartmann-Schröder (1996) pp. 131 & 132. An additional new species, *G. mackiei* Pleijel, 1993 from Scandinavia may occur in North Sea samples. It is also described in Hartmann-Schröder (1996) on p. 130. Her key to species is translated below with adaptations, but this does not include *G. Arenicola*

Key to British species of *Gyptis* Marion & Bobretzky, 1875
Adapted from Pleijel (1993) and Hartmann-Schröder (1996)

1 Prostomium wider than long, ventral cirri inserted distally ..... ***G. rosea* (Malm, 1874)**[1]

Prostomium as wide as long, ventral cirri inserted subdistally 2

2 Prostomium with deep posterior median incision; median antenna widest subdistally, adults (> about 20 segments) with neurochaetae from segment five; dorsal cirri much longer than chaetae ..... ***G. propinqua* Marion & Babretzky, 1875**[2]

Prostomium without deep posterior median incision; median antenna widest medially, adults with neurochaetae from segment four, dorsal cirri much shorter than chaetae ..... ***G. mackiei* Pleijel, 1993**[3]

Notes:

1. Description in Pleijel (1993) p. 172, Hartmann-Schröder (1996) p. 132 and Parapar et al. (2004) p. 242.
2. Description in Pleijel (1993) p. 161, Hartmann-Schröder (1996) p. 131 and Parapar et al. (2004) p. 239.
3. Description in Pleijel (1993) p. 165 and Hartmann-Schröder (1996) p. 130.

The following table can be used as an alternative to the dichotomous key to distinguish the commonly encountered hesionids. The genera with a fixed number of chaetigers are excluded.

	Pairs of tentacular cirri	Insertion of median antenna		Emergent notochaetae	Proboscis papillae
		dorsal	frontal		
Ophiodromus	6	×	✓	many[1,2]	none
Syllidia	6	×	×	none	10
Nereimyra	6	×	×	few	10
Podarkeopsis	8	×	✓	few[2]	10
Gyptis	8	✓	×	many	many
Hesiospina	8	×	×	few[3]	many
Psamathe	8	×	×	none	many

Notes:

1. *O. pallidus* has few emergent notochaetae – see Parapar et al. (2004) p. 250.
2. forked chaetae present.

3. one or two emergent falcate spines in mid-body region.

Natural history, reproduction and development

Hesionids can be found on hard bottoms or in soft sediments subtidally ranging down to deep sea habitats. They are seldom found in large numbers. A favoured habitat appears to be the interstices of algal holdfasts, oyster beds, encrusting fauna and mixed sediments but they can also be found moving over finer sediments (e.g. *N. punctata* – Hartmann-Schröder, 1996). The family also has representatives in more unusual habitats (outside the area covered by this key) such as hydrothermal vents and frozen methane hydrates in cold seeps. Most species appear to be active or ambush carnivores (Wilson, 2000) and detect moving prey using touch and chemoreceptors (Shaffer, 1979) but they will also ingest non-living material. *Ophiodromus flexuosus* is reported as commensal with echinoderms and other polychaetes (Martin and Britayev, 1998). Some species are active swimmers and may spawn in the water column.

In the species studied so far sexes are separate (*Hesione splendida* is a protandrous hermaphrodite – Schroeder and Hermans, 1975). The larger species become sexually mature at about two years of age and can spawn more than once. Larvae are planktotrophic or lecithotrophic and can remain in the plankton for up to two months.

Distribution of the British species

Ophiodromus flexuosus, Nereimyra punctata, Psamathe fusca, Podarkeopsis spp. and *Gyptis rosea* have a wide distribution in offshore and nearshore waters. *G. rosea* however, appears to be more sparsely recorded in the south west. *Syllidia armata* is restricted to coastal waters throughout the region. *Leocrates* and *Dalhousiella* have only been recorded in deeper Atlantic waters in the north Biscay area. Habitat/substratum preferences for the species are poorly documented. There is some indication that *Ophiodromus flexuosus* is tolerant of anoxia (Haaland & Schram, 1982).

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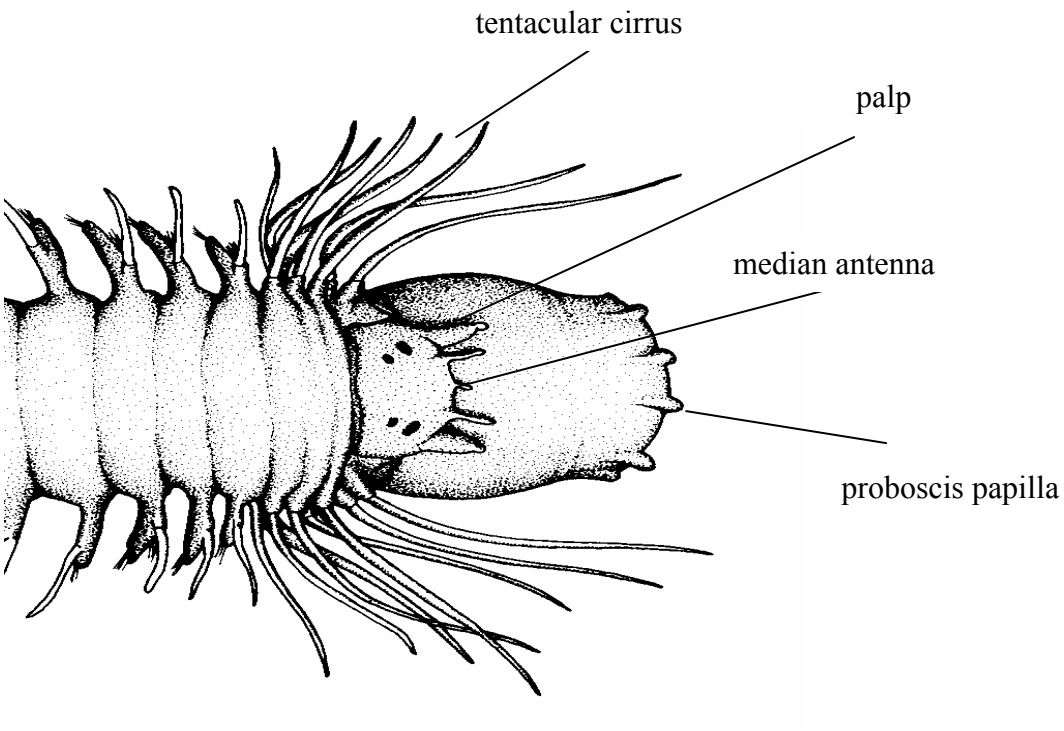

Figure A *Podarkeopsis capensis* to show general features of a hesionid. Adapted from Parapar et al. (2004)

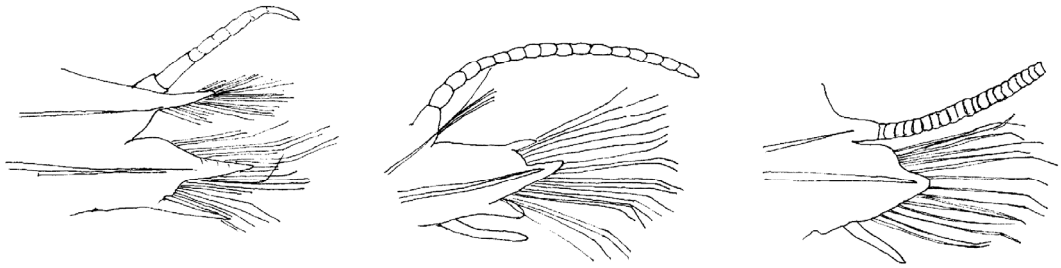

Figure B Examples of hesionid parapodia. left – biramous with many emergent notochaetae (*Ophiodromus flexuosus*); centre – sub-biramous with few emergent notochaetae (*Nereimyra punctata*); right – sesquiramous with acicula in cirrophore and no emergent chaetae (*Psamathe fusca*). Redrawn from Parapar et al (2004)

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Good general sources of information and images are available from websites. Annelid resources (http://biocollections.org/pub/worms/annelid.html) and the Tree of Life web project (http://www.tolweb.org/tree) are good places to start.

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