

First record of Longosomatidae (Annelida: Polychaeta) from Iceland with a worldwide review of diagnostic characters of the family

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(Received 26 February 2013; accepted 22 October 2013; first published online 24 February 2014)

The family Longosomatidae Hartman, 1944 (Annelida: Polychaeta) is newly reported for Icelandic waters. The diversity, taxonomy and ecology of this poorly-known monogeneric family are reviewed based on material collected during the BIOICE project. Two species of the genus *Heterospio* are recorded and redescribed: *Heterospio longissima* Ehlers, 1874 *sensu* Hartman (1965) and *Heterospio reducta* Laubier, Picard and Ramos, 1972–73. Several body structures of high taxonomic relevance in the genus are reviewed and discussed.

Keywords: Polychaeta; Longosomatidae; *Heterospio*; Iceland; BIOICE; taxonomy

Introduction

Longosomatidae Hartman, 1944 (formerly Heterospionidae Hartman, 1963) is a poorly-known family of benthic polychaetes that is rather fragile and easily overlooked in benthic fauna surveys. The body is characterized by an anterior region composed of seven to nine segments with three to eight pairs of elongate branchial filaments usually called “thorax”, a “mid-body” region composed of elongate segments and a bulbous “posterior region” with terminal pygidium. The prostomium and peristomium are usually described as reduced and have a pair of nuchal organs and a pair of grooved palps, respectively. Chaetae occur in dense fascicles on the anterior segments and normally form complete rings on elongated segments; they include capillaries, thickened aristate and subuluncini-like capillaries and spines (Borowski 1994; Fauchald and Rouse 1997; Wilson 2000a; Rouse 2001; Hernández-Alcántara and Solís-Weiss 2009).

The family comprises a single genus, *Heterospio* Ehlers, 1874; Borowski (1994) recognized six species and, recently, Bochert and Zettler (2009) have described a new one. Species have been reported from widely scattered areas, mainly in deep shelf and slope sediments (Fauchald 1977; Rouse 2001). The phylogenetic position of Longosomatidae is still questioned; Rouse and Fauchald (1997) and Blake and Arnofsky (1999) placed it in the clade Spionida, but other authors like Wilson (2000a) consider it more similar to Cirratulidae, in the clade Terebellida.

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Three species have been described in North Atlantic waters (Figure 1): *Heterospio longissima* Ehlers, 1874 (type species of the genus) from west Ireland, *Heterospio mediterranea* Laubier, Picard and Ramos, 1972–73 and *Heterospio reducta* Laubier, Picard and Ramos, 1972–73 both from the Mediterranean Sea. Furthermore, Hartman (1965) and Uebelacker (1984) reported and described *H. longissima* and *H. cf. longissima*, respectively, from New England and the Gulf of Mexico, and Uebelacker (1984) reported *Heterospio* sp. A also from the Gulf of Mexico. All these reports probably represent new taxa.

The BIOICE (Benthic Invertebrates of Icelandic Waters) project was conceived with the aim of improving knowledge on benthic biodiversity in the waters around Iceland, by means of a number of oceanographic cruises. The sampling area covered a depth range from 20 to 3500 m on both sides of the Greenland–Iceland–Faroe Islands Ridge, above which the waters are generally less than 500 m deep. Examination of polychaete material collected during the BIOICE expeditions has led to several papers on polychaete taxonomy and ecology, including descriptions of a number of new taxa (Kirkegaard 2001; Sanfilippo 2001; Sigvaldadóttir 2002; Chambers and Woodham 2003; Parapar 2003; 2006; Parapar et al. 2011a; 2011b; Moreira and Parapar 2012). During the study of the samples collected by the BIOICE project, two species of longosomatids were also found. In this paper, both species are redescribed using scanning electron microscopy (SEM) and a preliminary review of key diagnostic characters in the genus is provided to improve our scarce knowledge about this family.

Material and methods

This study is based on material collected by several oceanographic cruises within the BIOICE Project. Specimens were fixed in a 4% formaldehyde–seawater solution, and preserved in 70% ethanol. Animals were sorted from samples by the staff at the Sandgerdi Marine Centre, and then examined by the authors. The studied material was deposited in the collections of the Icelandic Institute of Natural History, Reykjavik (IINH) and in the Museo Nacional de Ciencias Naturales de Madrid, Spain (MNCN). Data on the BIOICE samples with *Heterospio* specimens are presented in Table 1. For SEM, the specimens were dehydrated in a graded ethanol series, prepared by critical-point drying using CO₂, mounted on aluminium stubs, covered with gold in a BAL-TEC SCD 004 evaporator, and examined and photographed under a JEOL JSM-6400 scanning electron microscope at the Servicios de Apoyo á Investigación, University of A Coruña, Spain.

Systematics

Family **LONGOSOMATIDAE** Hartman, 1944

Genus *Heterospio* Ehlers, 1874

Heterospio longissima Ehlers, 1874 *sensu* Hartman (1965)

(Figures 1–4, 5B, 7A, 8)

Heterospio longissima. Hartman, 1965: 163–164, fig. 30 f–h.

Table 1. Coordinates, depth (m), bottom temperature (°C), salinity (‰) and sediment type, all referring to the start of the tow, of locations where specimens of *Heterospio longissima* Ehlers, 1874 *sensu* Hartman (1965) and *Heterospio reducta* Laubier, Picard and Ramos, 1972–73 were found during the BIOICE project.

Sample	Station	Date	Gear	Latitude	Longitude	Depth	Temperature	Salinity	Sediment type	<i>H. longissima</i>	<i>H. reducta</i>
2392	555	30 June 1993	Detritus sledge	63.250	-22.200	288–291	6.92	35.10	Sandy silt		7
2407	560	1 August 1993	Detritus sledge	62.976	-21.821	917–922	4.57	34.98	Fine silt		1
2414	563	2 July 1993	Detritus sledge	63.005	-21.012	784–808	5.36	35.02	Sandy silt	1	3
2474	587	5 July 1993	Detritus sledge	63.067	-21.588	791–834	5.54	35.03	Sandy silt	1	7
2719	735	7 September 1994	Detritus sledge	64.428	-26.403	300–305	5.56	35.04	Silt		1
2886	468	23 August 1996	Detritus sledge	65.120	-27.521	464–472	6.24	35.06	Sand with stones/boulders		1
2893	470	24 August 1996	RP sledge	65.353	-27.423	513–578	6.24	35.05	No data		1
3500	512	31 August 2002	Detritus sledge	62.998	-20.505	814–819	5.82	35.10	Silt	3	5
3613	408	12 September 2003	Detritus sledge	64.247	-26.052	345	6.95	35.14	Sandy silt		4
3617	209	12 September 2003	RP sledge	64.662	-26.465	270–272	6.99	35.14	No data		1

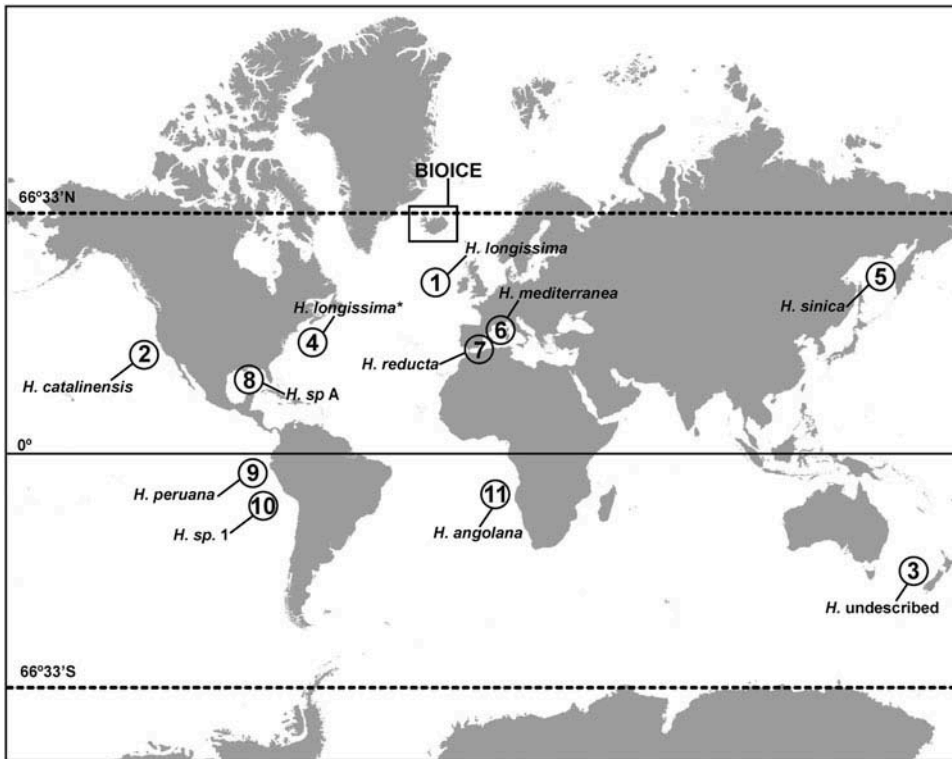


Figure 1. Type localities and collection localities of described and undescribed species of *Heterospio*, respectively, arranged in ascending order by date of description: (1) Ehlers (1874); (2) Hartman (1944); (3) Knox (1960); (4) Hartman (1965); (5) Wu and Chen (1966); (6) and (7) Laubier et al. (1972–73); (8) Uebelacker (1984); (9) and (10) Borowski (1994); (11) Bochert and Zettler (2009). The BIOICE sampling area is indicated. (*) probably represents a different species.

Material examined

Five incomplete specimens were collected in three BIOICE samples (Table 1). BIOICE sample 2414 (1 spec. in SEM stub, IINH27830); BIOICE sample 2474 (1 spec. in SEM stub, IINH27830); BIOICE sample 3500 (3 spec., IINH27831).

Description

Most complete specimen 9 mm long, 0.4 mm wide, with 14 chaetigers. Prostomium conical, anteriorly rounded, slightly flattened dorsoventrally (Figure 2A, B). Eyes absent. Nuchal organs as deep grooves posterolateral to prostomium. Peristomial palps and palp scars not observed. Pharynx sac-like, eversible and unarmed. Anterior body region slightly flattened dorsoventrally, with eight short chaetigers (CH) (Figures 2A, B, 5B). CH1–8 short, somewhat more than twice as wide as long. Chaetigers progressively longer from CH9 onwards. CH9 first elongated segment, longer than wide; length (as distance from chaetal bundle to chaetal cincture of CH10) about three times longer than CH8. Branchiae lacking in all specimens but eight pairs of branchial scars present from CH2 to CH9 (Figures 2A, B, 5B). CH1

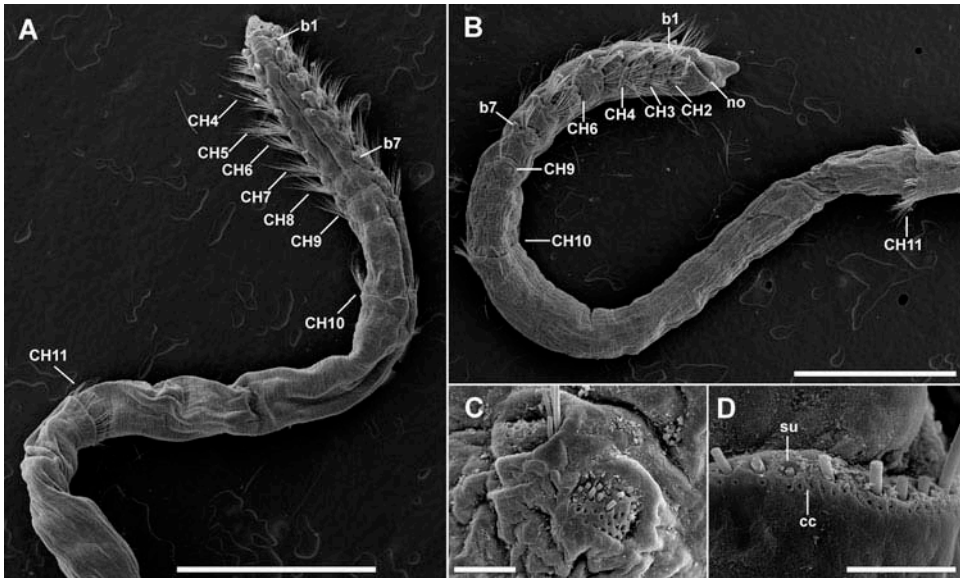


Figure 2. *Heterospio longissima* Ehlers, 1874 *sensu* Hartman (1965). Specimens from BIOICE samples 2414 and 2474. (A, B) Anterior end, dorsal and lateral views; (C) fan-like chaetal disposition in neuropodium of short anterior CH9; (D) flange-like chaetal disposition in neuropodium of elongated CH10. b1–7, branchial scars 1–7; CH2–11, chaetigers 2–11; no, nuchal organ; cc, capillary chaeta; su, subuluncini. Scale bars: A, B, 1mm; C, 45 μ m; D, 30 μ m.

abranchiate (no scars). The remaining chaetigers strongly elongated and cylindrical in cross-section; length increasing backwards; CH10 about four times longer than CH9, CH11 about 2.5 times longer than CH10. CH1–9 with biramous parapodia; with notopodial and neuropodial chaetal fascicles well separated. From CH10 onwards parapodia as elongated ridges forming a nearly closed flange-like cincture near anterior margin of segment (Figures 2A, B, 3, 5B). Chaetae of CH1–9 simple capillaries, in fan-shaped fascicles (Figure 2C). No neuropodial hooks in any anterior chaetiger. From CH10 onwards chaetae arranged in two rows (Figures 2D, 4A,B): anterior row of thick subuluncini (Figure 4D–H) and posterior row of simple fine capillaries (Figure 4C). Aristate or acicular spines not observed.

Occurrence

In Iceland *H. longissima sensu* Hartman (1965) is restricted to the slope bottoms of the southwestern coast, south Reykjanes Peninsula (Figure 7A). Depth range: 784–834 m; temperature range: 5.36–5.82°C (Table 1).

Distribution

Heterospio longissima was described by Ehlers (1874) based on an incomplete specimen from the northeast Atlantic. Hartman (1965) reported the species from the western Atlantic. However, Laubier et al. (1972–73) pointed out that Hartman's material was different from that of Ehlers, but further comparisons to test whether

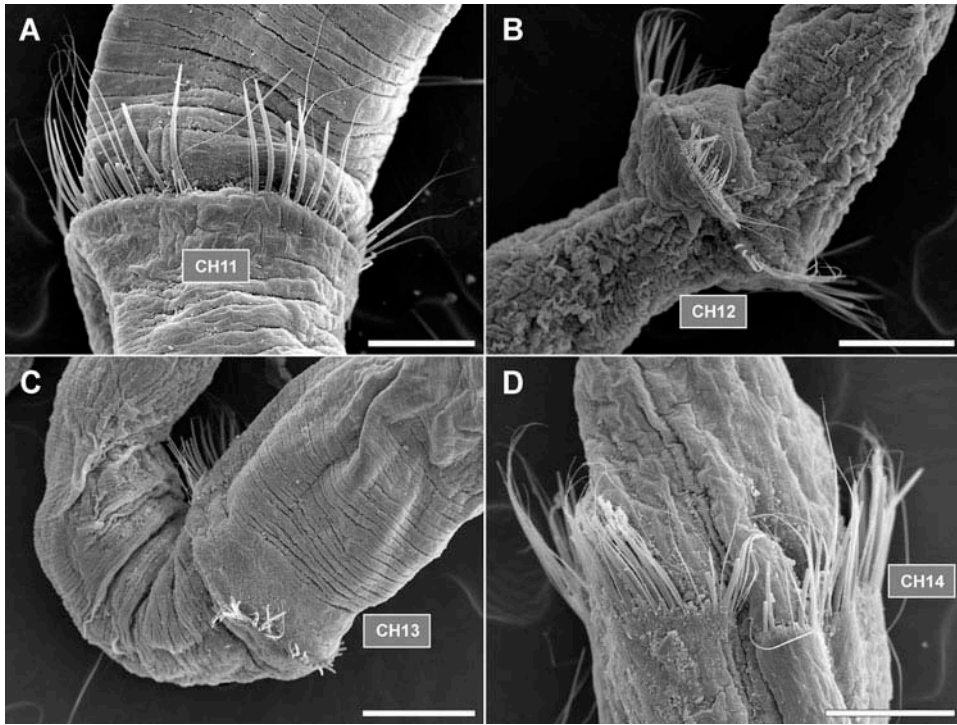


Figure 3. *Heterospio longissima* Ehlers, 1874 *sensu* Hartman (1965). Specimen from BIOICE sample 2414. (A–D) Chaetigers 11 to 14. Scale bars: A, 100 µm; B, 150 µm; C, 200 µm; D, 100 µm.

the latter corresponded to a different species were not possible because the holotype was apparently missing (Borowski 1994, p.130). Therefore, Laubier et al. (1972–73) cautiously considered the existence of two forms of this species: the nominal species and *H. longissima sensu* Hartman (1965). Since then, most subsequent reports of longosomatids were assigned to either form of *H. longissima* (e.g. Imajima 1974; Intès and Le Loeuff 1977; Kirkegaard 1980; Amoureux 1982; Rosenfeldt 1989; see Figure 8), but the character combinations of these specimens did not always match those of the two forms (cf. Hartman 1974; Uebelacker 1984). In view of the aforementioned worldwide reports attributed to the species, it is likely that several different species are still waiting to be described, particularly all those reported outside the North Atlantic Ocean (e.g., Hartman 1974; Imajima 1974; Intès and Le Loeuff 1977; Rosenfeldt 1989).

Remarks

Both *Heterospio longissima sensu* Hartman (1965) and the nominal species have in common that the first elongated segment is CH9, but the degree of elongation is different. In *H. longissima sensu* Hartman CH9 is about three times longer than previous chaetigers, whereas in *H. longissima sensu* Ehlers CH9 is about as long as all the anterior segments together (see Laubier et al. 1972–73, fig. 3; Borowski 1994,

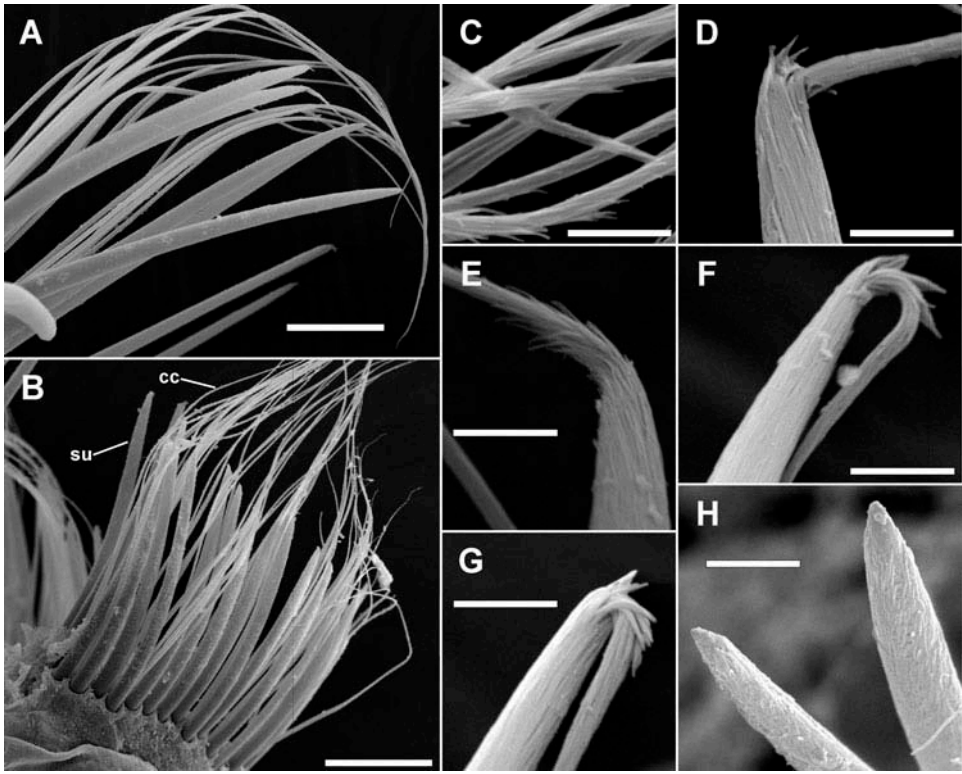


Figure 4. *Heterospio longissima* Ehlers, 1874 *sensu* Hartman (1965): Specimens from BIOICE samples 2414 and 2474. (A, B) capillary chaetae (cc) and subuluncini (su) of CH13 and CH14; (C) capillary chaetae of CH13; (D–G) detail of distal end of subuluncini of CH11 to CH14; (H) detail of tip of subuluncini without distal appendage from CH14. Scale bars: A, B, 20 μm ; C–G, 3 μm ; H, 5 μm .

notes 2 and 3 in table 2 on pp.140–143; Bochert and Zettler 2009, key on p.737). Additionally, *H. longissima sensu* Hartman has chaetae forming cinctures from CH10 onwards provided with thick subuluncini and fine capillaries, whereas in *H. longissima sensu* Ehlers all body chaetigers are provided with biramous parapodia with only simple capillaries (see Laubier *et al.* 1972–73, p. 250) (Figure 5A–B). *Heterospio longissima sensu* Hartman most closely resembles *Heterospio sinica* Wu and Chen, 1966 from the China Sea, *Heterospio catalinensis* (Hartman, 1944) from off California and *Heterospio peruana* Borowski, 1994 from off Peru, because all share having CH9 as the first elongated chaetiger, although clearly shorter than all previous segments as a whole (Figures 5B–D, 6C). *Heterospio catalinensis* differs from the others by having acicular chaetae in the neuropodium of CH1. *Heterospio sinica* and *H. peruana* are clearly distinguishable from Hartman's form of *H. longissima* by the presence of aristate chaetae on elongate segments. Moreover, while *H. sinica* also has eight pairs of branchiae in the thorax (Figure 5D), *H. peruana* has only four pairs (Figure 6C).

Although aristate chaetae as illustrated by Bochert and Zettler (2009) were not observed, the shaft of the subuluncini seems to be articulated with the blade

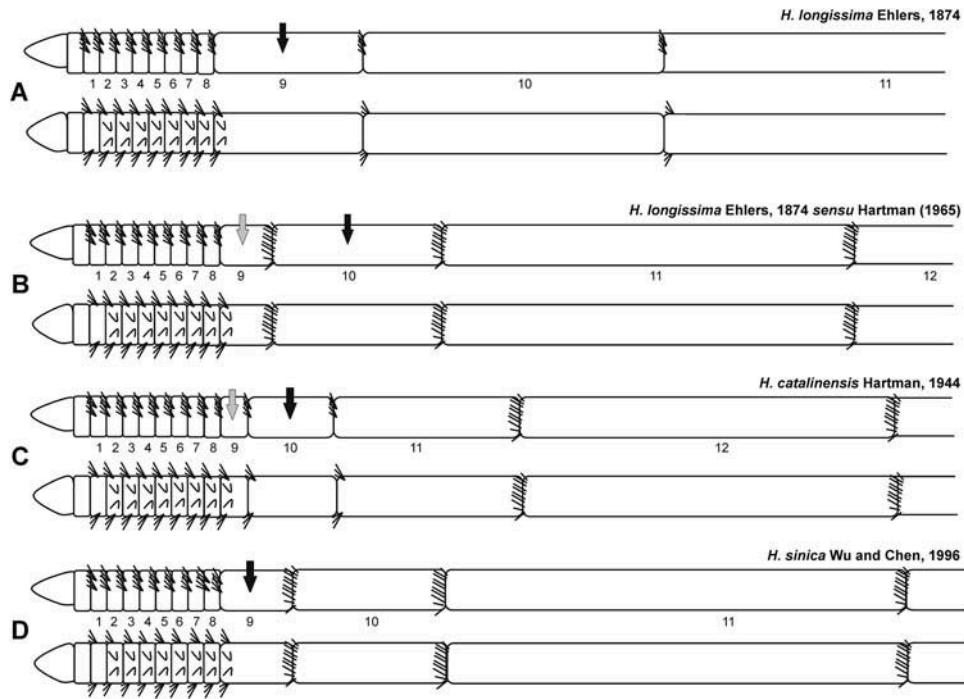


Figure 5. Schematic drawings (not to scale) following Laubier et al. (1972–73), showing lateral (above) and dorsal (below) views of four species of *Heterospio*: *Heterospio longissima* Ehlers, 1874, *Heterospio longissima* Ehlers, 1874 sensu Hartman (1965), *Heterospio catalinensis* Hartman, 1944 and *Heterospio sinica* Wu and Chen, 1966. Arrows mark position of first elongated chaetiger: black, after original description; grey, new interpretation (in case of being different to former; see text for explanations). Chaetigers numbered below lateral view of each species.

(Figure 4C–H) in a similar manner to that illustrated by Wu and Chen (1966); Borowski (1994) and Wilson (2000a) (see Discussion).

Heterospio reducta Laubier, Picard and Ramos, 1972–73
(Figures 6B, 7B, 9, 10)

Heterospio reducta Laubier, Picard and Ramos, 1972–73: 246, figs. 1B–C, 3.

Material examined

Thirty-one specimens were collected in 10 BIOICE samples (Table 1). BIOICE sample 2392 (5 spec., IINH27832 and 2 spec. in SEM stub IINH27833); BIOICE sample 2407 (1 spec., IINH27834); BIOICE sample 2414 (3 spec., MNCN 16.01/15211); BIOICE sample 2474 (7 spec., IINH27835); BIOICE sample 2719 (1 spec., IINH27836); BIOICE sample 2886 (1 spec., IINH27837); BIOICE sample 2893 (1 spec., IINH27838); BIOICE sample 3500 (5 spec., IINH27839); BIOICE sample 3613 (4 spec., IINH27840); BIOICE sample 3617 (1 spec., MNCN 16.01/15212).

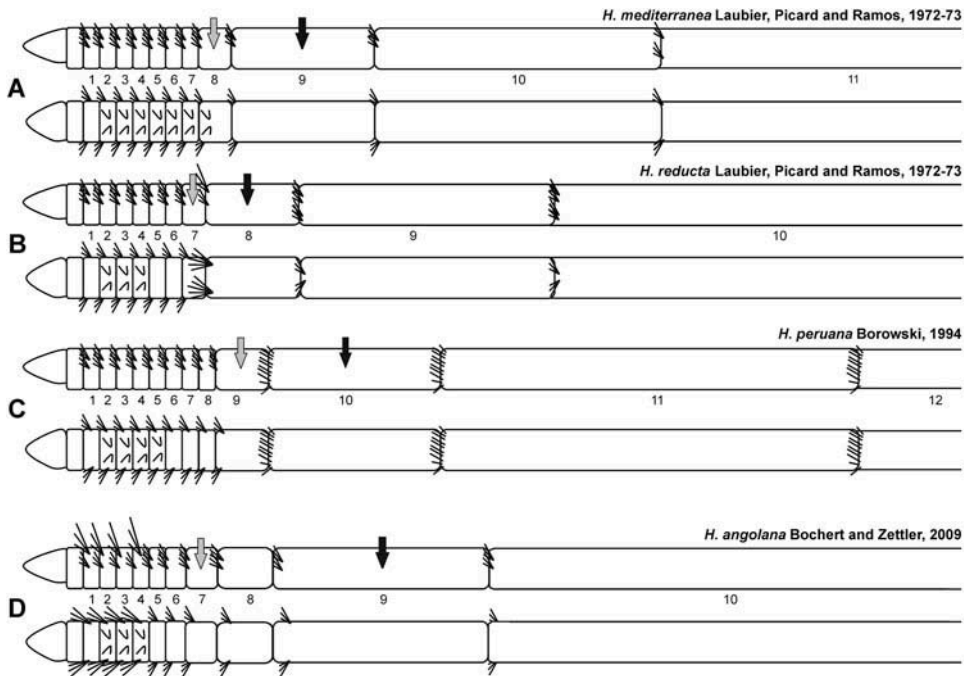


Figure 6. Schematic drawings (not to scale) following Laubier et al. (1972–73), showing lateral (above) and dorsal (below) views of four species of *Heterospio*. *Heterospio mediterranea* Laubier, Picard and Ramos, 1972–73, *Heterospio reducta* Laubier, Picard and Ramos, 1972–73, *Heterospio peruana* Borowski, 1994 and *Heterospio angolana* Bochert and Zettler, 2009. Arrows mark position of first elongated chaetiger: black, after original description; grey, new interpretation (see text for explanations). Chaetigers numbered below lateral view of each species.

Description

Most complete specimen 16 mm long, 0.3 mm wide, with 11 chaetigers. Prostomium conical, anteriorly rounded (Figure 9A–C); slightly flattened dorsoventrally. Eyes absent. Nuchal organs as deep grooves posterolateral to prostomium. Peristomial palps and palp scars not observed. Pharynx sac-like, eversible and unarmed (Figure 9C). Anterior body region slightly flattened dorsoventrally (Figure 9A). CH1–6 short, somewhat more than twice as wide as long. CH7 about 1.5 times longer than CH6 (Figure 6B). CH8 much longer than wide, about four times longer than CH7 (Figures 6B, 9A). Branchiae lacking in all specimens but three pairs of branchial scars present from CH2 to CH4 (Figures 6B, 9A–C). From CH9 chaetigers strongly elongated and cylindrical in cross-section, length increasing backwards. CH9 about three times longer than CH8. CH1–CH8 with biramous parapodia; notopodial and neuropodial chaetal fascicles well separated in all chaetigers. Chaetal cinctures near anterior margin of elongated segments not observed. Notochaetal fascicle of CH7 and particularly CH8 provided with longer chaetae and more dorsally located (Figures 6B, 9A, 10A). All chaetae fine simple capillaries. No neuropodial hooks in anterior chaetigers. Modified chaetae (subuluncini, aristate or acicular spines) not observed.

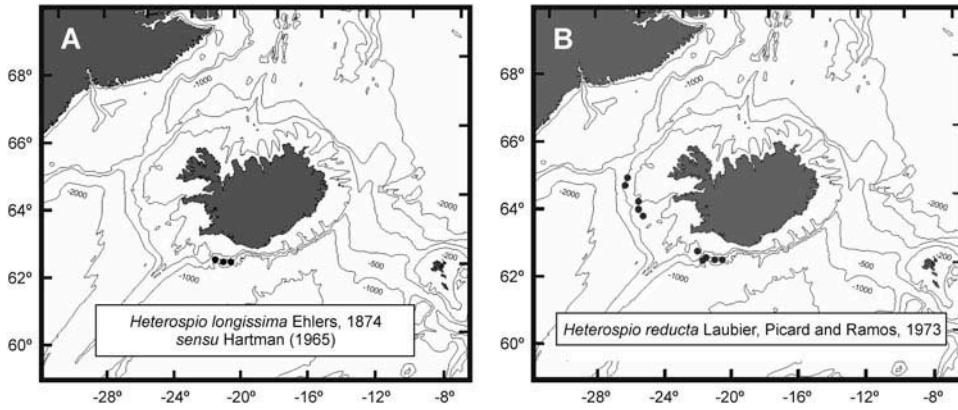


Figure 7. Map of the area sampled during the BIOICE project showing collecting sites where species of *Heterospio* were found.

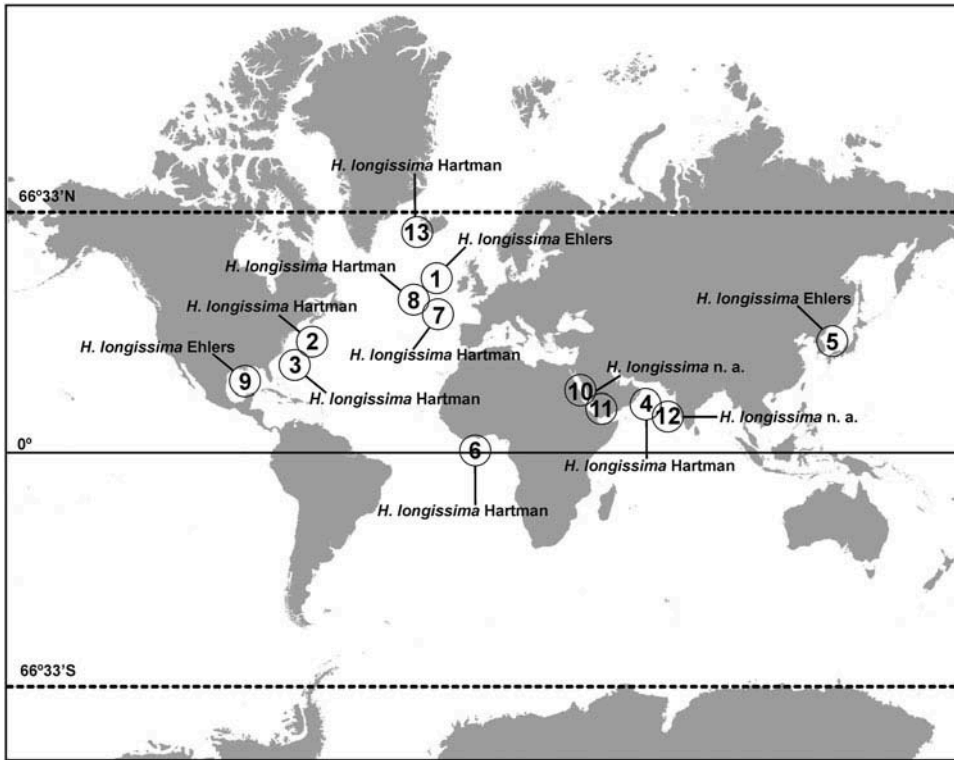


Figure 8. Worldwide reports of *Heterospio longissima* arranged in ascending order by date. For each report, the original designation is indicated. (1) Ehlers (1874); (2) Hartman (1965); (3) Hartman and Fauchald (1971); (4) Hartman (1974); (5) Imajima (1974); (6) Intes and Le Loeuff (1977); (7) Kirkegaard (1980); (8) Amoureux (1982); (9) Uebelacker (1984); (10) Rosenfeldt (1989); (11) Türkay (1996); (12) Wehe and Fiege (2002); (13) this work. n.a. = no assignment.

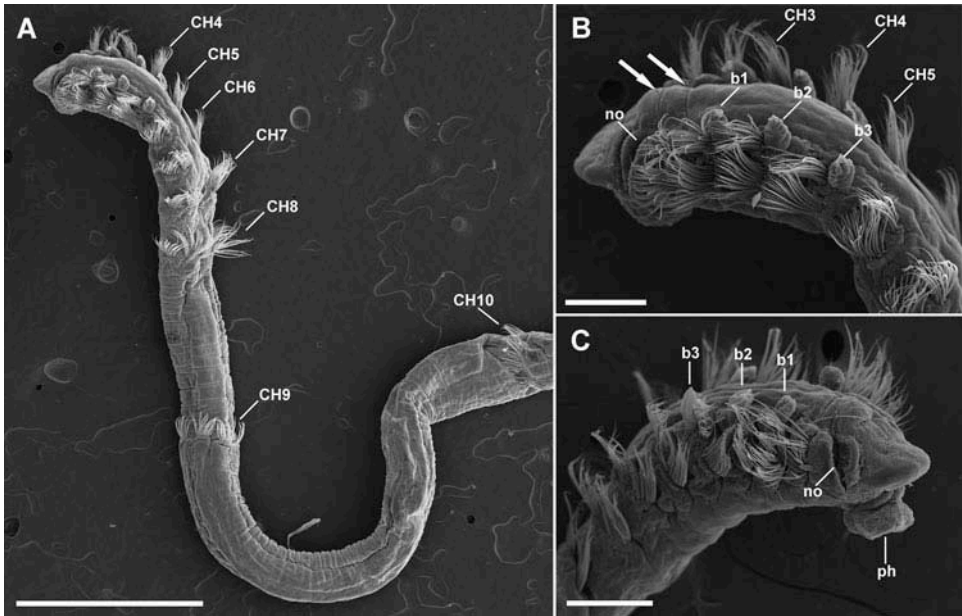


Figure 9. *Heterospio reducta* Laubier, Picard and Ramos, 1972–73: Specimens from BIOICE sample 2392. (A) Anterior end in dorsolateral view; (B, C) detail of prostomium and short anterior chaetigers. b1–3, branchial scar 1–3; CH3–10, chaetigers 3–10; no, nuchal organ; ph, pharynx. Arrows marking posterior margin of segments 1 and 2. Scale bars: A, 1 mm; B, C, 200 μ m.

Occurrence

Heterospio reducta was found at slope bottoms of the west (Snaefellsnes Peninsula and western Fjords) and southwestern (south Reykjanes Peninsula) coast (Figure 7B). Depth range: 270–922 m; temperature range: 4.57–6.99°C (Table 1).

Distribution

Originally described from off Algiers by Laubier et al. (1972–73), the species was later reported by Amoureux (1982) from the continental slope (500–1400 m) off west Ireland.

Remarks

Heterospio reducta is distinguished from most longosomatids by the smaller number of short anterior chaetigers (CH1–CH6), with CH7 being the first elongated chaetiger, while in other species the latter is either CH8, CH9 or CH10. Laubier et al. (1972–73), while describing and illustrating CH7 slightly longer than CH6, consider CH8 as the first posterior chaetiger; this is followed by Bochert and Zettler (2009) in their key of worldwide species of *Heterospio*. As no chaetal cinctures are present in this species, Laubier et al. (1972–73) used the segment size as evidence of the beginning of the mid-body region, instead of the shape of the chaetal bundles.

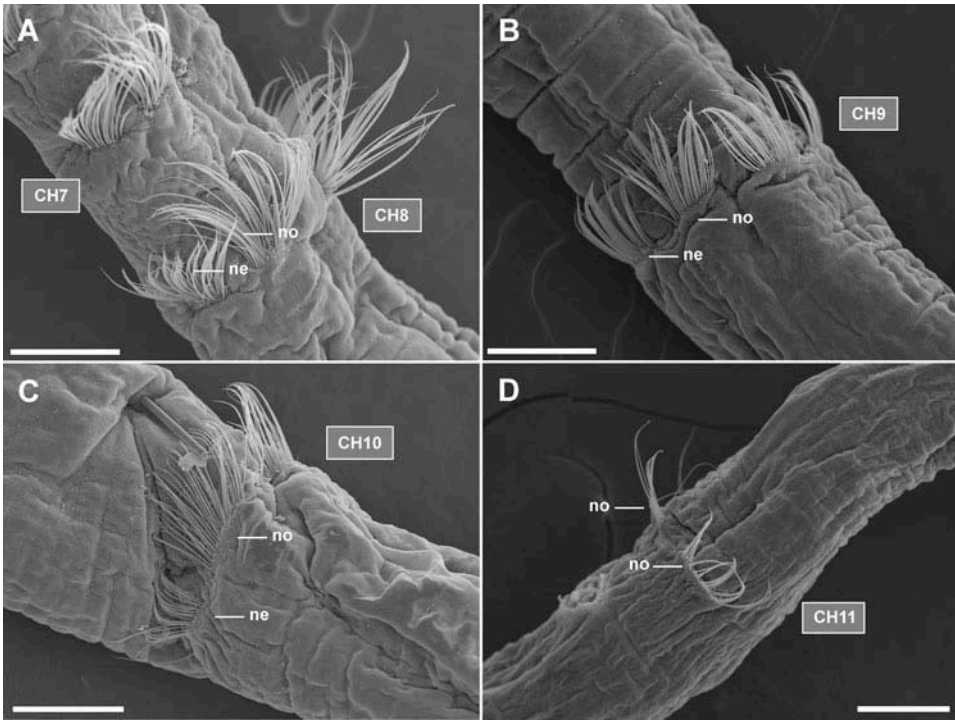


Figure 10. *Heterospio reducta* Laubier, Picard and Ramos, 1972–73: Specimens from BIOICE sample 2392. (A–D) Chaetigers 7 to 11. ne, neuropodium; no, notopodium. Scale bars: A–D, 150 μm .

Hence, in *H. reducta* the first mid-body chaetiger would actually be CH7 rather than CH8 (see above description and Figure 6B). The only substantial difference between Icelandic specimens of *H. reducta* and those from the type locality is the presence of very long chaetae in the notopodia of CH8, which are located more dorsally (Figures 9A, 10A).

Heterospio reducta differs from specimens of *H. longissima sensu* Hartman, 1965 also found in Icelandic waters in the number of short anterior chaetigers (six in *H. reducta* and eight in *H. longissima sensu* Hartman) and by having only one type of chaeta; furthermore, in the latter species the chaetae form almost complete circles on elongated chaetigers, which are not observed in *H. reducta*.

Heterospio reducta differs from *H. mediterranea* from the Mediterranean Sea and *Heterospio* sp. A as described by Uebelacker (1984) from the Gulf of Mexico in the number of short anterior chaetigers (seven in these species and six in *H. reducta*) and in the number of branchiae and chaetal composition, respectively. Hence, *H. mediterranea* has seven pairs of branchiae while *H. reducta* has only three; *Heterospio* sp. A has acicular hooks in the neuropodia of CH1, whereas in *H. reducta* there are simple capillaries in both the notopodia and neuropodia.

The species most similar to *H. reducta* is *Heterospio angolana* Bochert and Zettler, 2009 from the southeast Atlantic Ocean (Angola). This species has the same number of pairs of branchiae (three) and short anterior chaetigers (six)—although Bochert and

Zettler (2009) consider CH9 as first elongated chaetiger– but they differ in length of CH8, being more elongated in *H. reducta* than in *H. angolana* (Figure 6B,D) and in the very long chaetae of *H. reducta* on CH8.

Discussion

Because the number of anterior segments (“thoracic region”) and the relative length of the following elongated segments (“mid-body region”) are two of the key characters in longosomatid taxonomy, and since segmental furrows are normally not evident in this family, we believe that it is necessary to establish the position of segmental limits to avoid confusion in their designation. According to our observations, parapodia are located at the anterior border of segments and therefore the length of a segment can be considered as the distance between these parapodia and the parapodia of the next chaetiger.

The transition between the thoracic and mid-body regions has not been clearly established in the literature; both the elongation of the segments (e.g. Laubier et al. 1972–73) and the shape of the parapodia (Wu and Chen 1966; Borowski 1994) have been used to indicate the onset of the mid-body region. However, the transition between the two presumed parts of the body is not conspicuous enough in all species. Hence, in most species apart from *H. longissima* Ehlers, the first elongated segment is just slightly longer than the previous ones, and therefore it is difficult to discern whether it belongs to the thorax or to the mid-body. Similarly, the change in shape and arrangement (biramous vs cincture) of the chaetae on these transition chaetigers is sometimes not clearly defined but shows an intermediate aspect (e.g. *H. reducta*). Therefore, we recommend not using the terms “thorax” and “mid-body” in longosomatids to avoid further confusions when characterizing species.

Aristate chaetae have been reported in many polychaete families, such as Acoetidae Kinberg, 1856 (e.g. Pettibone 1989), Trochochaetidae Örsted, 1843 (e.g. Wilson 2000b), Cirratulidae Ryckholdt, 1851 (e.g. Glasby 2000), Lumbrineridae Schmarda, 1861 (e.g. Aguirrezabalaga and Carrera-Parra 2006), Spionidae Grube, 1850 (e.g. Hourdez et al. 2006), Pilargidae Saint-Joseph, 1899 (e.g. Darbyshire and Mackie 2003) and Flabelligeridae Saint-Joseph, 1894 (e.g. Salazar-Vallejo 2012). This term actually encompasses different types of chaetae (both in shape and origin), which only match a general shape of a “simple chaeta with smooth shaft and a tuft of hairs or a single spine” (Rouse and Pleijel 2001). This type of chaeta was first described in longosomatids by Wu and Chen (1966, p.166, text and table; “they resemble aristate setae”) when describing those of *H. sinica*; this was also followed by Borowski (1994, p.135, pl. 2C) for *H. peruana* and Wilson (2000a, p.194, pl. 1.105) for one still undescribed *Heterospio* species. The observation under the SEM of the chaetae of Icelandic *H. longissima sensu* Hartman revealed that the ones here named “subuluncini” closely resemble those that Wu and Chen (1966) and Wilson (2000a) named “aristate chaetae” or the ones illustrated by Borowski (1994) as “transitional subuluncini capillary-like”. We also noticed that the distal ends of these chaetae are deciduous, resulting in chaetae very similar to the “pointed distally” chaetae of Bochart and Zettler (2009). However, the chaeta illustrated by Borowski (1994) as “aristate” seems to be different from any other chaetae described so far in *Heterospio*. Therefore, we think that confusion regarding the nomenclature of chaetae in *Heterospio* exists, making necessary a

redefinition of terms like “subuluncini”, “spine” and “aristate”, because it is possible that all of them are simply stages of transition of the same type of chaetae, in the sense already discussed by Borowski (1994).

The presence of palps in the genus *Heterospio* has previously been questioned. For instance, Hartman (1965, p.163) recognized that even though no palps were observed attached to individuals of *H. longissima* “several palpi are present in the sample, which are believed to belong to this species; their bases fit well in the scars of attachment at the posterior margin of the prostomium” and she had also illustrated them as such (Hartman 1965, fig. 30f). Laubier et al. (1972–73, p. 245) presented an ambiguous description: “En vue latérale, des organes nucaux sont visibles à la limite postérieure. Les palpes son toujours absents,” which is not clarified in either the drawings or in the discussion. Later, Uebelacker (1984, pp. 10.1) provided a different opinion, interpreting the deep grooves behind prostomium as nuchal organs: “Neither palps nor scars of their attachment were observed on Gulf of Mexico specimens, although distinct, usually everted nuchal organs were readily apparent”. In contrast, Wu and Chen (1966) actually described and illustrated the palps attached to the animal (Wu and Chen 1966, p. 166, pl IA,B). Borowski (1994) reviewed the family, in confirming the presence of these structures: “Nuchal organs sac-like, in deep grooves between prostomium and peristomium ... Peristomium asetigerous, with deep transverse grooves; tentacles in all specimens lost.” However, Uebelacker’s (1984) view was recently revived by Bochert and Zettler (2009, p.736), who also denied their presence: “Nuchal grooves posterio-lateral to prostomium. Tentacles or tentacle scars in all specimens absent.” The study of our specimens showed that the only structure observed under the SEM is a deep groove between prostomium and peristomium (never everted in our specimens), which does not look like a tentacle scar as much as a nuchal organ.

Acknowledgements

The authors are grateful to Solrun Bragadóttir and all the women of the Sandgerdi Marine Centre involved in sorting of specimens from the BIOICE samples, Gudmundur V. Helgason for his assistance during the stays of JP at the Sandgerdi Marine Centre, Gudmundur Gudmundsson (Icelandic Institute of Natural History) for making available to us the material described in this paper, Ada Castro and Catalina Sueiro (Servizos de Apoio á Investigación, University of A Coruña) for assisting in the preparation of specimens and use of the SEM, Noela Sánchez (University of A Coruña) for preparing the maps and Julia García-Carracedo for correcting the English version of the manuscript. Thanks are also due to Danny Eiby-Jacobsen, one anonymous referee and Louise Allcock, *Journal of Natural History* co-editor, for their helpful comments that greatly improved quality of the manuscript.

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