

Short Communication

Description of *Bispira polyomma* n. sp. (Annelida: Sabellidae): a probable introduction to The Netherlands

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Abstract

Bispira polyomma sp. nov. is described. The taxon was recently found on the SW coast of The Netherlands (NE Atlantic), and could not be referred to as any previously described species of the genus *Bispira*. The area has been thoroughly investigated in the past, therefore we hypothesize the species is a new introduction to The Netherlands. The tubeworm is able to settle massively on all kinds of hard substrates, is eurythermal and able to withstand slight pollution, and therefore wider dispersal is a possibility to reckon with. For this reason we give a taxonomic species description even though the genus needs further revision. Presently the taxon has been observed only near Yerseke, a centre of shellfish culture and trade with a marina. The taxon was found in 2010. Subsequent surveys revealed a very dense population had developed in 2011, with the presence of small individuals in summer 2011 suggesting successful reproduction.

Key words: *Bispira polyomma* sp. nov.; description; introduction; The Netherlands

Introduction

Yerseke and Gorishoek are sites in the SW of The Netherlands (Figure 1) known for their frequent introductions of non-native species (e.g. Faasse and Ligthart 2009). Yerseke has a marina open to vessels from abroad. Pleasure craft visiting the SW Netherlands mostly originates from France, Belgium and the UK. Furthermore, Yerseke is a centre of shellfish trade with oyster storage basins. In the basins shellfish are kept alive until they are transported to customers. Fresh seawater is pumped to the basins and during low water, part of the seawater content of the basins is released to the nearby intertidal. Until 1977 Pacific seed oysters were imported from Japan and British Columbia to Yerseke and were later laid out on culture plots (Wolff 2005). Under the present legislation all shellfish from non-EU countries should be processed on land. In 2010 rapid visual surveys of both sites Yerseke and Gorishoek were conducted, aimed at the detection of non-native species. A survey

near the oyster storage basins at Yerseke revealed the presence on a hard substrate of a sabellid polychaete taxon, which has not been reported from the NE Atlantic before and cannot be assigned to any known species. The new taxon belongs to the genus *Bispira* as it has the abdominal neuropodia elevated, companion chaetae with a distal asymmetrical membrane, paired compound radiolar eyes along the radioles, and the ventral sacs directed outward from the crown.

At present the species seems to be an established taxon *sensu* Zenetos et al. (2010), because subsequent surveys in Yerseke revealed the presence in a marina of a very dense population including small specimens, suggesting successful reproduction. The area has been thoroughly investigated in the past (Faasse and Ligthart 2009; Van Moorsel 1998), therefore we hypothesize the species is a new introduction to The Netherlands.

As the species may disperse, a name is needed to refer to future occurrences of the same species.

Therefore, we provide a taxonomic description in the present paper, even though the genus *Bispira* needs further revision (Capa 2008). As the description of the new species was largely made by the second author the authorship of the species belongs to Giangrande & Faasse.

The genus *Bispira* is a heterogeneous group of species, which has been suggested as the sister group of *Sabella* (Fitzhugh 1989; Rouse and Fitzhugh 1994), or sister group of the clade with *Sabella*, *Sabellastarte*, *Pseudobranchiomma*, *Branchiomma* (Fitzhugh 2003), presented as an unresolved polytomy (Fitzhugh and Rouse 1999), or again paraphyletic without including *Branchiomma* and *Pseudobranchiomma* (Capa 2008). Up to now the genus counts 25 species mainly distributed in the northern warm boreal domain (Knight-Jones and Perkins 1998; Giangrande and Licciano 2004; Tovar-Hernández and Salazar-Vallejo 2006; Costa-Paiva and Paiva 2007; Capa 2008).

Material and methods

Rapid visual surveys were done in the intertidal area near the oyster storage basins in Yerseke on 18 September 2010 and in a marina in Yerseke (Prins Willem Alexanderhaven) and in the intertidal area at Gorishoek on 25 September 2010 (Figure 1). Subsequent follow-up surveys at Yerseke were done on 02 October 2010, 16 October 2010, 11 December 2010, 02 April 2011, 11 June 2011, 17 August 2011, 05 November 2011, 10 December 2011 and 03 March 2012. Subsequent surveys at Gorishoek were done on 12 February 2011, 5 March 2011 and 20 August 2011. On 05 November 2011 specimens were collected for taxonomic description, among which some were apparently sexually mature. Clusters of sabellid tubes were detached from the substrate. Sabellids were removed from their tubes before fixation. After initial relaxation with menthol crystals drops of formalin were added until tactile stimuli didn't elicit any reaction. Fixation in formalin 4% for two days was followed by washing in tapwater and transference to ethanol 70%.

Specimens were observed under a stereomicroscope. Photographs were taken with a Canon 500D digital camera attached to the stereomicroscope. Drawings were made with the aid of a camera lucida. Type material has been deposited in the Museum Nacional de Ciencias Naturales de Madrid, Spain (MNCN) and at the Laboratory of Zoology of Lecce, Italy (PCZL).

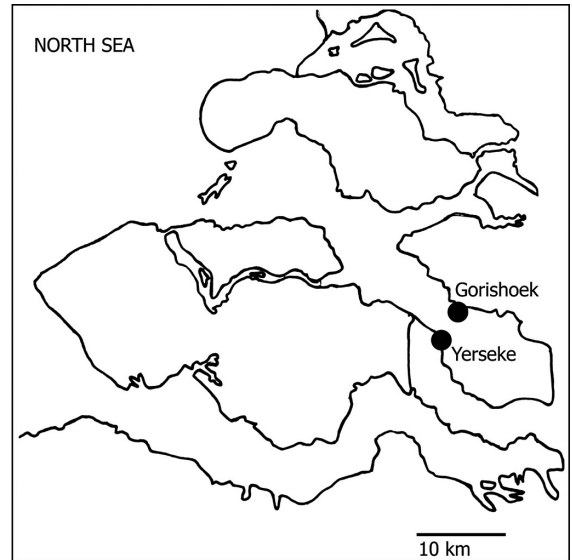


Figure 1. SW Netherlands with survey sites Yerseke and Gorishoek.

Taxonomic account

Sabellidae Latreille, 1825

Bispira Krøyer, 1856

Bispira Knight-Jones & Perkins, 1998: 405–406.

Type species: *Amphitrite voluticornis* Montagu, 1804.

Remarks: The genus *Bispira* is not characterized by any synapomorphy. According to Fitzhugh (1989), it differs from *Sabella* especially in the presence of compound eyes on radioles and in the presence of dorsal pinnular appendages. Both features, however, are absent in some species included in the genus *Bispira*. The remaining diagnostic characters are shared with other members of the clade *Bispira*, *Branchiomma*, *Pseudobranchiomma*, *Sabella*, *Sabellastarte* and *Stylomma* and, therefore, are not synapomorphies of *Bispira* (e.g. presence of paired radiolar eyes, shallow basal membrane, ventral sacs directed outward of the crown, collar margins separated by a wide gap, anterior margin of first ventral shield “W”-shaped, arrangement and shape of chaetae and uncini). Moreover, in the emendation of the genus by Knight-Jones and Perkins (1998) they described *Bispira* as having no basal flanges in the crown, but, as pointed out by Capa (2008), *B. voluticornis*, and *B. serrata* have been shown to have dorsal basal flanges. The latter species also shows some features such as serration of the radiolar flanges, and thoracic uncini with very short handle, which are not

present in any other species included in the genus *Bispira*, thus increasing the variability of the genus.

Bispira polyomma sp. nov.

Figures 2-3-4-5-6

Material examined: Holotype Yerseke, marina Prins Willem Alexanderhaven, 51°29'48"N-04°03'11"E, on a pontoon, depth 0.5m, 05-11-2011 MNCN 16.01/14313; Paratypes 3 specimens Yerseke, marina, 05-11-2011 PCZL; 25 specimens Yerseke, marina, 25-09-2010 coll. M.A. Faasse; 1 specimen Yerseke, marina, 03-04-2012 PCZL.

Description of holotype: Holotype short and thin, quite flattened in section; body 20 mm long and 6 mm wide, with eight thoracic and 50 abdominal segments. Branchial crown 12 mm long. Colour of body yellowish with some blackish spots. Branchial crown with 6-8 inner transversal pigmented bands, pigmentation on thoracic tori, interior part of ventral lappets in collar, and bases of dorsal lip and pinnular appendages (Figure 2, Figure 4A). Crown consisting of two semicircular lobes, both slightly involuted ventrally, radioles connected basally by a basal membrane of about 1/5 of length of crown (Figure 3A, B, C). Distal basal flanges absent. Each branchial lobe with 16 radioles. Radioles with very thin flanges (Figure 3F, H). Tips of radioles appearing smooth, similar in length or slightly shorter than pinnules (Figure 3G). Radioles with dark and light bands. Dorsal radioles each provided with about 6-8 pairs of compound eyes (Figure 3G, F), evenly spaced, but more developed at the base of the radioles. Ventral radioles without eyes and only with dark pigmentation. Axial skeleton composed of four main transverse rows of cells (Figure 3H). Collar covering the junction of crown and thorax, with margins separated dorsally by a wide gap (Figure 3A), ventrally forming paired fleshy lappets (Figure 3C). Dorsal lips tapered, about 1/5 of length of crown, with radiolar appendage skeleton (Figure 4A, B); dorsal pinnular appendages absent. Ventral lips and parallel lamellae well developed, with a pair of rounded and white ventral sacs, located exterior to branchial crown, exceeding the length of collar ventrally (Figure 3A). First segment about as long as the thoracic ones (Figure 3A). Ventral shield of first chaetiger as long as the second chaetiger (Figure 3A, B, C). Anterior border of first ventral shield 'W'-shaped. All ventral shields of about same width (Figure 3C).



Figure 2. *Bispira polyomma* sp. nov. ventro-lateral view of the thorax, detail of a live specimen (photo by M.A. Faasse).

Thoracic tori long and reaching the margins of the ventral shields (Figure 2, Figure 3B,C). Companion chaetae present, with broad, asymmetrical blades (Figure 5A,C). Abdominal chaetae in 'C'-shaped fascicles, but often in an incomplete spiral (Figure 3E). Small single interrampal eyespots present on both thoracic and abdominal chaetigers (Figure 3E). Collar chaetae arranged in two oblique rows, superior with elongate, narrowly hooded chaetae and inferior with broadly hooded chaetae. The other thoracic segments with chaetae arranged in superior chaetae long, elongate narrowly hooded (Figure 5D), and inferior rows with shorter chaetae, broadly hooded (Figure 5E). Uncini with 4 rows of teeth above the main fang, occupying half of its length, well-developed breast and short handle (Figure 5B). Abdominal chaetigers with neurochaetae arranged in two rows on elevated neuropodia, superior chaetae elongate narrowly hooded and inferior abdominal chaetae spinelike (Figure 5F). Abdominal uncini similar to the thoracic ones. Pygidium with median incision; pygidial eyes absent (Figure 3D).

Tube: soft and greyish, attached to hard substrates. Attached part sometimes transparent, remainder of tube consisting of a transparent secretion and sediment particles. Tube diameter up to about 5 mm.

Variability: Size range of specimens studied is 22–32 mm, branchial crown included. Radiole number can reach 20 per branchial lobe in larger specimens. The crown is always involuted ventrally but never spiralled. The eyes are always disposed in regular bands on radioles, but

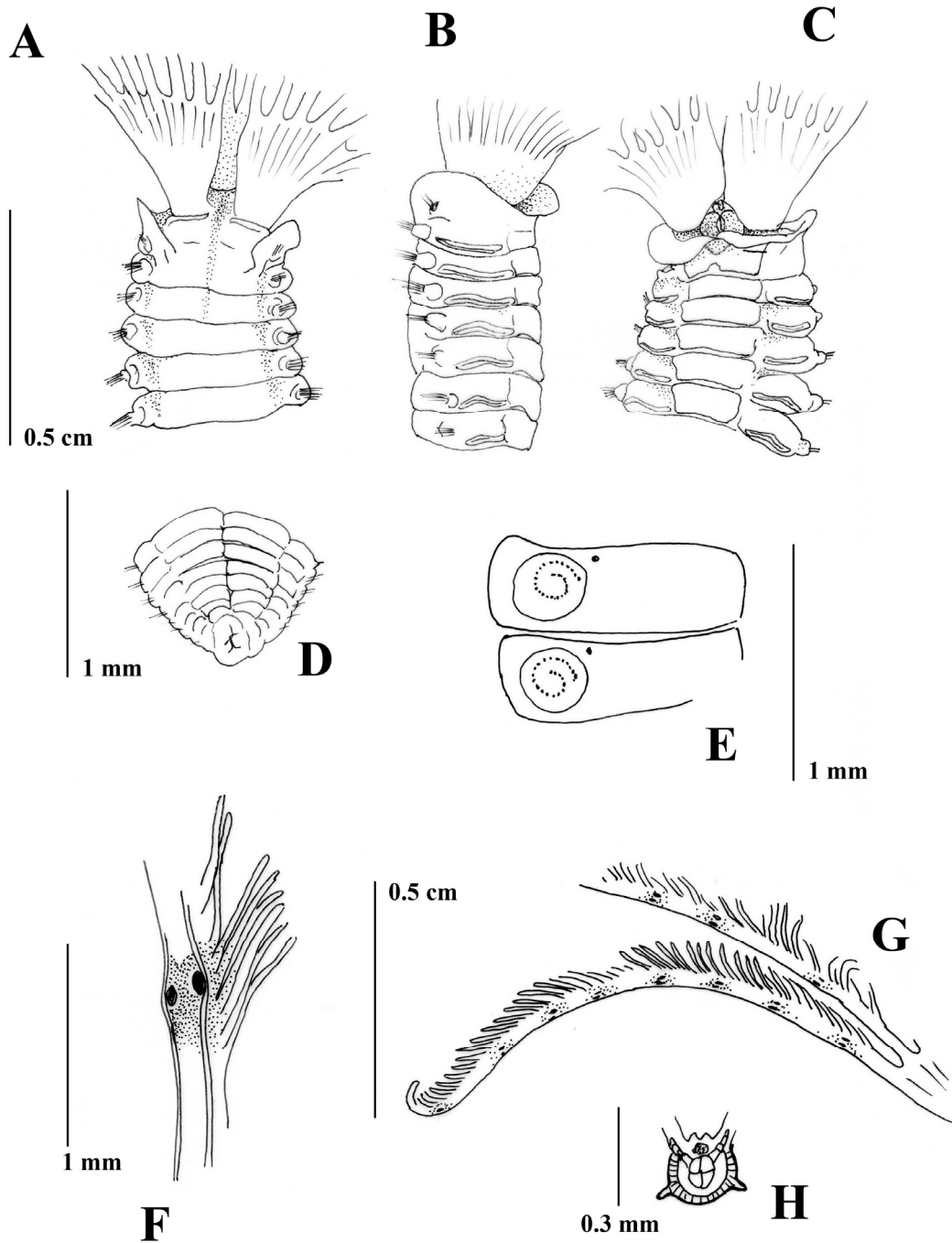


Figure 3. *Bispira polyomma* sp. nov. **A)** anterior part dorsal view, **B)** lateral view, **C)** ventral view, **D)** pygidium, **E)** lateral view of the abdomen, showing the chaetal arrangement and interramal eyespots, **F)** detail of a radiole showing the compound eyes and the flanges, **G)** dorsal radioles, **H)** section of a radiole (middle part) showing the skeletal cells and the flanges (drawing by A. Giangrande).

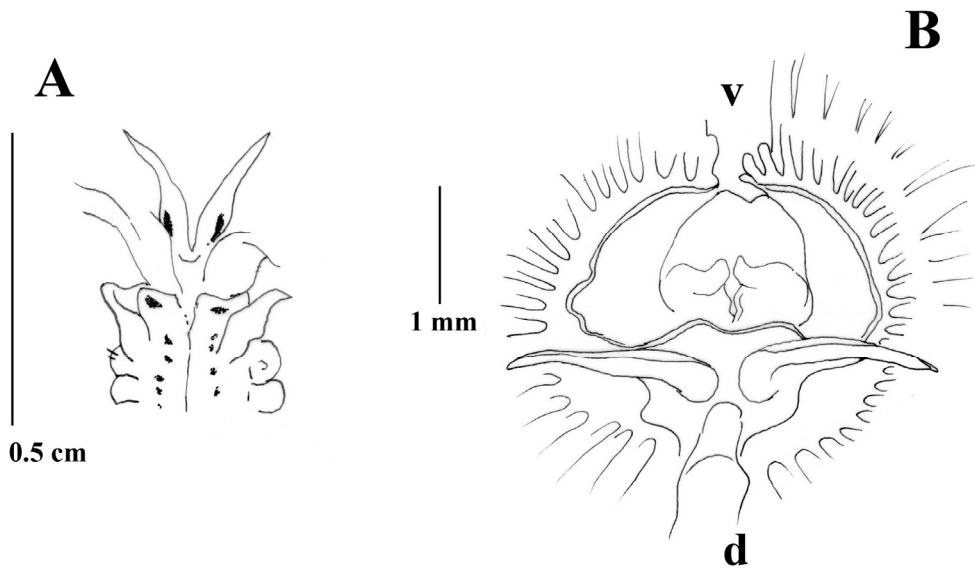


Figure 4. *Bispira polyomma* sp. nov. **A)** anterior part dorsal view showing the pigmentation and the dorsal lips, **B)** Internal view of the branchial crown structures: v=ventral side; d=dorsal side (drawing by A. Giangrande).

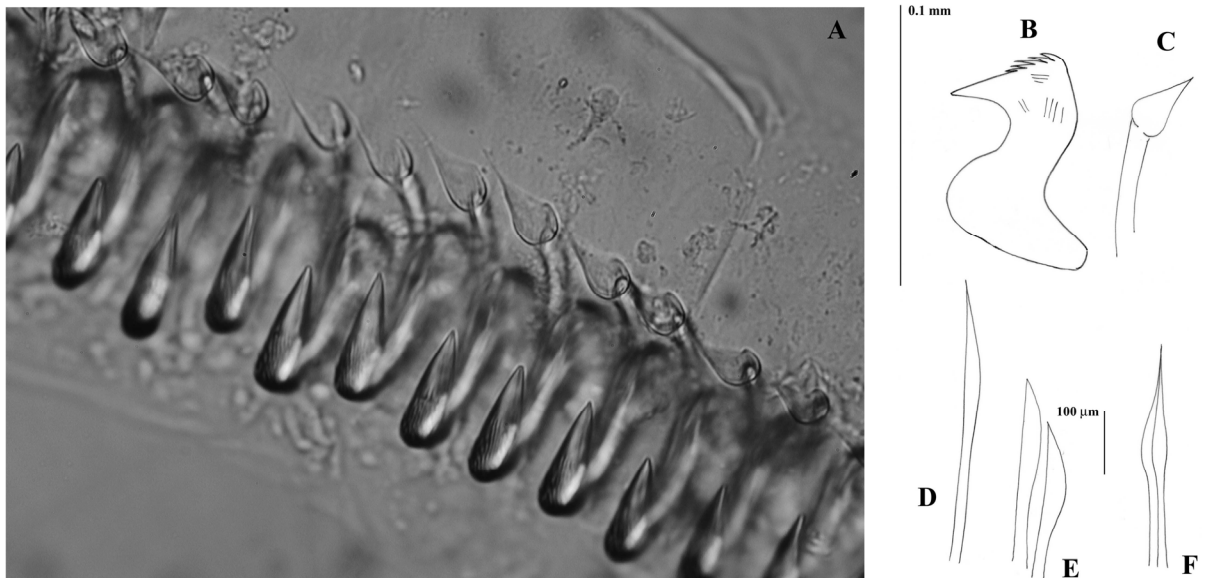


Figure 5. *Bispira polyomma* sp. nov. **A)** part of thoracic torus with uncini and companion chaetae, **B)** thoracic uncinus, **C)** companion chaeta, **D)** superior thoracic chaeta, **E)** inferior thoracic chaetae, **F)** abdominal chaeta (drawing by A. Giangrande and photo by M.A. Faasse).

the number of radioles containing eyes is variable. In some specimens only the ventral radioles have eyes, in others, as in the holotype, eyes are present only on the dorsal radioles, other specimens have eyes on all radioles.

Radiolar flanges reaching the tip of the radioles (Figure 6) are more evident in live specimens, whilst in some specimens they seem to be absent after fixation. Pygidial eyes are present in some specimens.

Remarks: The new taxon belongs to the group of species with long thoracic tori, numerous eyes on the radioles with a regular disposition, and a wide dorsal gap in the collar. Among them the most similar species, *B. volutacornis* and *Bispira spirobranchia*, are both bigger and with more radioles (60 per branchial lobe, whereas *Bispira polyomma* sp. nov. has a maximum of 20). In the former two species there is an evident spiralization of the branchial crown that is not present in the new taxon. Moreover, *B. spirobranchia* has a different shape of the ventral shields and radioles without flanges. *Bispira polyomma* sp. nov. furthermore differs from both species by having 6-8 regular coloured bands on the radioles. These are the main features distinguishing the new taxon from all the described species in the genus. Radiolar flanges are present in *B. serrata*, *B. elegans*, *B. guinensis*, *B. manicata*, *B. mariae*, *B. melanostigma*, *B. monroi*, *B. pacifica*, *B. crassicornis* and *B. volutacornis*, which also share with *B. polyomma* sp. nov. paired compound eyes along the radioles, however, in *B. polyomma* sp. nov. flanges are thinner and do not seem to be supported by skeleton. Moreover, among these species only *B. volutacornis* and *B. mariae* have long thoracic thori and *B. mariae* also has a different disposition of eyes in the crown.

Etymology: The name of this species refers to the numerous compound eyes present on the radioles.

Distribution and Ecology: This species was first found in the outlet of an oyster storage basin near Yerseke on 18 September 2010. The population observed consisted of more than hundred individuals on an area of less than 1 m². They occurred at the water line in running water, with some individuals just above the waterline. No other individuals were found in the intertidal area where all oyster storage basins of Yerseke discharge their used water. On 25 September 2010 and 02 October 2010 a large population of hundreds of individuals was found in the marina of Yerseke. Most of them were attached to floating pontoons at depths between 30 and 70 cm. At Gorishoek the species has not been found. During winter 2010/2011 the population persisted, although individuals seemed to be in suboptimal condition, with less expanded branchial crowns. On 2 April 2011 the population observed had fully recovered with respect to condition and numbers of individuals visible to the naked eye. On 11 June 2011 numerous



Figure 6. *Bispira polyomma* sp. nov. Tip of the radiole showing the flanges (photo by A. Giangrande).



Figure 7. *Bispira polyomma* sp. nov. Photo by M.A. Faasse from natural environment showing density of the species.

small individuals were observed, with a tube diameter of up to 1 mm.

The species is new to the North Sea area, and for the moment is not known from elsewhere. Its real distribution is unknown to us. The development of small individuals in summer 2011 in the marina of Yerseke suggests successful reproduction. The species survived a low water temperature of about 0°C. during winter 2010/2011 and a high water temperature of 19°C in summer 2011. As the seawater temperature seldom gets beyond these limits in The Netherlands the taxon is likely to establish a permanent population. Until now Yerseke is the only locality in The Netherlands where it has been found. The species has reached a very high density, only on hard substrates, i.e. pontoons in

the marina and brick walls of the outlet of an oyster storage basin, where it forms dense clusters of individuals (Figure 7). Both sites are extremely sheltered with respect to prevailing (south)westerly winds. In the marina almost no water movement exists and there is some pollution with oil, probably originating from recreational boats. In contrast, near the oyster storage basins the worms regularly experience strong water currents.

Discussion

In their taxonomic review of the genus *Bispira*, Knight-Jones and Perkins (1998) included 19 species and two undescribed ones from California. Since then one more species has been described (Tovar-Hernández and Salazar-Vallejo 2006) from the Mexican Caribbean, one from Brazil (Costa-Paiva and Paiva 2007) and two others from Australian waters (Capa 2008).

In the cladistic analysis by Capa (2008), *Bispira* is paraphyletic without including *Branchiomma* and *Pseudobranchiomma*. However, the author pointed out that the results must be considered as preliminary; therefore she proposed no synonymies or nomenclature changes, until further studies will clarify the situation. For the moment we include this new taxon in the genus *Bispira*, with which it shares diagnostic features. Further analyses, also from a molecular point of view, are needed to clarify the systematics of the genus *Bispira*. Molecular analyses of specimens belonging to this new taxon are still in progress and results will become available in the future.

A few other species of the genus *Bispira* have been reported from the surrounding area. *Bispira volutacornis* occurs in the English Channel (Knight-Jones and Perkins 1998), but is not known from eastern coasts of the Southern Bight of the North Sea. *Bispira crassicornis* and *B. fabricii* occur farther north; the former has been reported from the Finmark area in northern Norway and the latter from Iceland and Svalbard (Knight-Jones and Perkins 1998). Even though we cannot rule out the possibility that the new taxon became detectable only after colonizing new habitats and/or increasing its abundance, in view of extensive investigations near Yerseke (Faasse and Ligthart 2009) and in coastal waters of The Netherlands (e.g. van Moorsel 1998), we assume that the species described herein is an introduction. In poorly studied groups it is not

unusual that an undescribed species attracts attention after introduction to a new region where the marine fauna is well known and investigated regularly. An example is the description of some cnidarian species after their introduction to the eastern Mediterranean (Galil et al. 1990; Galil et al. 2010). Therefore we hypothesize that in its original area of distribution *Bispira polyomma* sp. nov. may have been unnoticed or recorded as *Bispira* sp. The possibility can't be ruled out that the taxon has been described and incorrectly assigned to a different genus, however, in view of the two recent revisions of the genus (Knight-Jones and Perkins 1998; Capa 2008) this possibility is remote.

Ecological effects of the introduction of the new *Bispira* taxon are difficult to predict at this stage. As it was an undescribed species it is unknown whether it is a strong competitor for space and food. Further dispersal in northwest Europe certainly cannot be ruled out. Seawater temperatures in most NW European regions are less extreme than in The Netherlands. The species apparently is able to disperse from a littoral hard substrate to a nearby marina or vice versa. If *Bispira polyomma* sp. nov. is able to settle on pleasure craft from abroad, dispersal to nearby countries is highly probable.

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References

- Capa M (2008) The genera *Bispira* Krøyer, 1856 and *Stylomma* Knight-Jones, 1997 (Polychaeta: Sabellidae): systematic revision, relationships with close related taxa and new species from Australia. *Hydrobiologia* 596: 301–327, <http://dx.doi.org/10.1007/s10750-007-9105-2>
- Costa-Paiva EM, Paiva PC (2007) Sabellidae Latreille, 1825 (Annelida, Polychaeta) from Rocas Atoll, Brazil, with the description of a new species. *Arquivos do Museu Nacional, Rio de Janeiro* 65(3): 363–368
- Faasse MA, Ligthart AHM (2009) American (*Urosalpinx cinerea*) and Japanese oyster drill (*Ocenebrellus inornatus*) (Gastropoda: Muricidae) flourish near shellfish culture plots in The Netherlands. *Aquatic Invasions* 4:321–326, <http://dx.doi.org/10.3391/ai.2009.4.2.3>
- Fitzhugh K (1989) A systematic revision of the Sabellidae-Caobangiidae-Sabellongidae complex (Annelida: Polychaeta). *Bulletin of the American Museum of Natural History* 192: 1–104
- Fitzhugh K (2003) A new species of *Megalomma* Johansson, 1927 (Polychaeta: Sabellidae: Sabellinae) from Taiwan, with comments on sabellid dorsal lip classification. *Zoological Studies* 42(1): 106–134

- Fitzhugh K, Rouse GW (1999) A remarkable new genus and species of fan worm (Polychaeta: Sabellidae: Sabellinae) associated with marine gastropods. *Invertebrate Biology* 118: 357–390, <http://dx.doi.org/10.2307/3227007>
- Galil BS, Spanier E, Ferguson WW (1990) The Scyphomedusae of the Mediterranean coast of Israel, including two lessepsian migrants new to the Mediterranean. *Zoologische Mededelingen, Leiden* 64: 95–105
- Galil BS, Gershwin L, Douek J, Rinkevici B (2010) *Marivagia stellata* gen. et sp. nov. (Scyphozoa: Rhizostomeae: Cepheidae), another alien jellyfish from the Mediterranean coast of Israel. *Aquatic Invasions* 5: 331–340, <http://dx.doi.org/10.3391/ai.2010.5.4.01>
- Giangrande A, Licciano M (2004) Extrinsic factors influencing latitudinal pattern of biodiversity: an example with Sabellidae. *Biodiversity and Conservation* 13: 1633–1646, <http://dx.doi.org/10.1023/B:BIOC.0000029327.63397.6b>
- Knight-Jones P, Perkins TH (1998) A revision of *Sabella*, *Bispira* and *Stylomma* (Polychaeta: Sabellidae). *Zoological Journal of the Linnean Society* 123: 385–467, <http://dx.doi.org/10.1111/j.1096-3642.1998.tb01370.x>
- Rouse GW, Fitzhugh K (1994) Broadcasting fables: Is external fertilization really primitive? Sex, size, and larvae in sabellid polychaetes. *Zoologica Scripta* 23(4): 271–312, <http://dx.doi.org/10.1111/j.1463-6409.1994.tb00390.x>
- Tovar-Hernández MA, Salazar-Vallejo SI (2006) Sabellids (Polychaeta: Sabellidae) from the Grand Caribbean. *Zoological Studies* 45(1): 24–66
- Van Moorsel GWNM (1998) Biomonitoring van levensgemeenschappen op sublitorale harde substraten in Grevelingenmeer, Oosterschelde, Veerse Meer en Westerschelde. [Biomonitoring of communities on sublittoral hard substrates in Grevelingenmeer, Oosterschelde, Veerse Meer and Westerschelde]. Bureau Waardenburg, Culemborg, rapport nr. 98.009, 86 pp
- Wolff WJ (2005) Non-indigenous marine and estuarine species in The Netherlands. *Zoologische Mededelingen* 79(1): 1–116
- Zenetos A, Gofas S, Verlaque M, Çinar ME, García Raso JE., Azzurro E, Bilecenoglu M, Froggia C, Siokou I, Bianchi CN, Morri C, Sfriso A, San Martin G, Giangrande A, Katağan T, Ballesteros E, Ramos Espla A, Mastrototaro F, Ocana O, Zingone A, Cantone G, Gambi MC, Streftaris N (2010) Alien species in the Mediterranean Sea by 2010. A contribution to the application of European Union's Marine Strategy Framework Directive (MSFD). Part I. Spatial distribution. *Mediterranean Marine Science* 11 (2): 381–493