

Short communication

Records of a new alien polychaete worm species, *Marphysa sanguinea* (Montagu, 1815) (Eunicidae) in the Eastern Scheldt, the Netherlands

Sander Wijnhoven* and Angela Dekker

Monitor Taskforce, Netherlands Institute of Ecology, Centre for Estuarine and Marine Ecology (NIOO-CEME), Korrिंगaweg 7, P.O. Box 140, NL-4401 NT, Yerseke, The Netherlands

E-mail: s.wijnhoven@nioo.knaw.nl (SW), a.dekker@nioo.knaw.nl (AD)

*Corresponding author

Received: 23 April 2010 / Accepted: 11 October 2010 / Published online: 20 October 2010

Abstract

Recently, four observations of *Marphysa sanguinea* (Montagu, 1815) were made in the Eastern Scheldt in the southwestern part of the Netherlands. This is remarkable as this alien species has been found only once in the Netherlands, in 1990 at the North Sea coast. It seems that this large polychaete species, that previously was noted to have a northern distribution limit in the southern North Sea (English southern coast and the French west coast), has established a population in a semi-enclosed Dutch tidal bay. The species may have reached the region via shellfish transport associated with the numerous aquaculture sites in the region. Consequences of the settlement of this large at least partially predatory polychaete species, for the macrozoobenthic communities in this region are unclear. Species of the genus *Marphysa* are found to be successful in a variety of environments all over the world. So far, no other species of the genus *Marphysa* has been recorded as present in the Netherlands.

Key words: *Marphysa sanguinea*, alien species, range extension, introduction, shellfish culture

During the annual autumn monitoring of the macrozoobenthic communities of the Dutch Delta in the southwestern part of the Netherlands, research assistants of the Monitor Taskforce encountered three specimens of *Marphysa sanguinea* (Montagu, 1815) in the last two years (2008 and 2009). All three observations were from the same region within the Eastern Scheldt, a semi-enclosed tidal bay, in the eastern part in the vicinity of Yerseke (locations indicated in Figure 1; exact coordinates given in Table 1). All three specimens, respectively collected on September the 10th 2008, September the 15th 2009 and October the 12th 2009, appeared to be incomplete, but could be identified as belonging to the genus *Marphysa* without certainty. The first specimen found was collected from a Reineck box-core sample taken from a depth of 4.1 meters in a peaty substratum. The specimen measured approximately 84 millimeters but was missing posterior segments. Approximately one year later another posteriorly incomplete specimen, was found in an intertidal sample from an area with rather high tidal dynamics, taken directly from the sediment with

a hand-corer. About one month later posterior segments of the species was sampled with a hand-corer at an intertidal low dynamic location with a fine sandy substrate containing shell fragments.

The observations were remarkable as the genus was only recorded once for the Netherlands, 18 years before the current observations. At that time a specimen was found in a piece of cork on the beach near Hoek van Holland and identified as *M. sanguinea* (the specimen is currently stored in the collection of the Natural History Museum of Rotterdam). To verify the observations, the specimens were sent to Unicmarine Laboratory in Letchworth, England, who kindly identified them as *M. sanguinea*. Later also Dr. P.A. Hutchings and Dr. C.J. Glasby confirmed the identification comparing the specimens with the neotype as described in Hutchings and Karageorgopoulos (2003). *M. sanguinea* is relatively easy to distinguish from the native polychaetes of the Netherlands, as no other species of the genus *Marphysa* is present, and *M. sanguinea* looks very different from the common larger polychaetes like

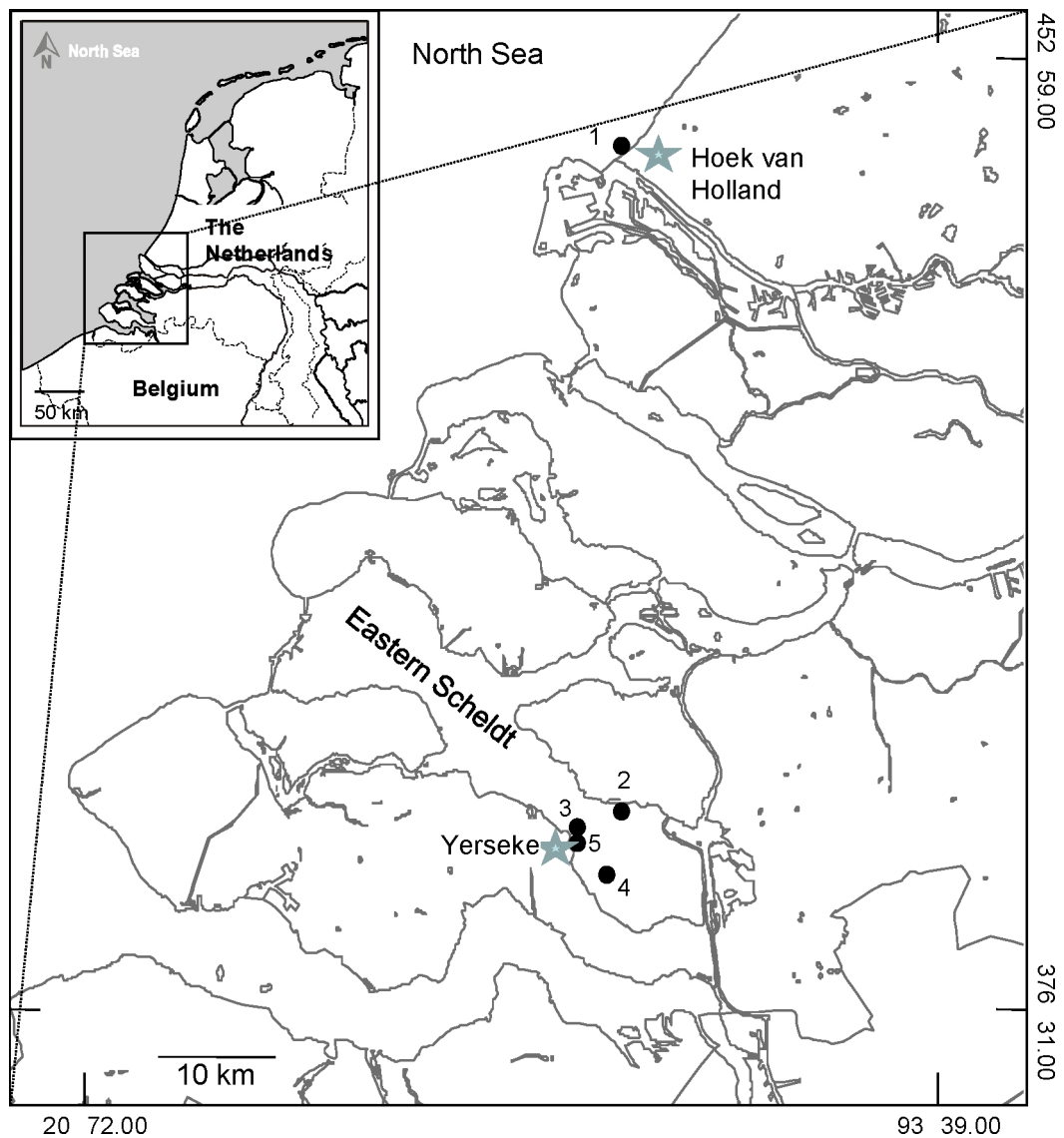


Figure 1. Map of the Rhine-Meuse-Scheldt delta in the southwestern part of the Netherlands and geographical locations of the records of *Marphysa sanguinea*.

Table 1. Positioning and characteristics of the sites where *Marphysa sanguinea* is observed.

No.	Date	Latitude, N	Longitude, E	Depth (m)	Tidal currents	Substrate	Observer
1	08-10-1990	51°59.3220	4°06.2760	0	-	Piece of cork	J.A.W.Lucas
2	10-09-2008	51°31.4025	4°06.9854	4.1	-	Peat	MT*
3	15-09-2009	51°30.0524	4°03.4419	Intertidal	High dynamics	Sand	MT*
4	12-10-2009	51°28.1610	4°05.2890	Intertidal	Low dynamics	Fine sand + shells	MT*
5	31-03-2010	51°29.1419	4°03.5083	Intertidal	Low dynamics	Muddy sand	E.Brummelhuis

*MT = Monitor Taskforce of the NIOO-CEME

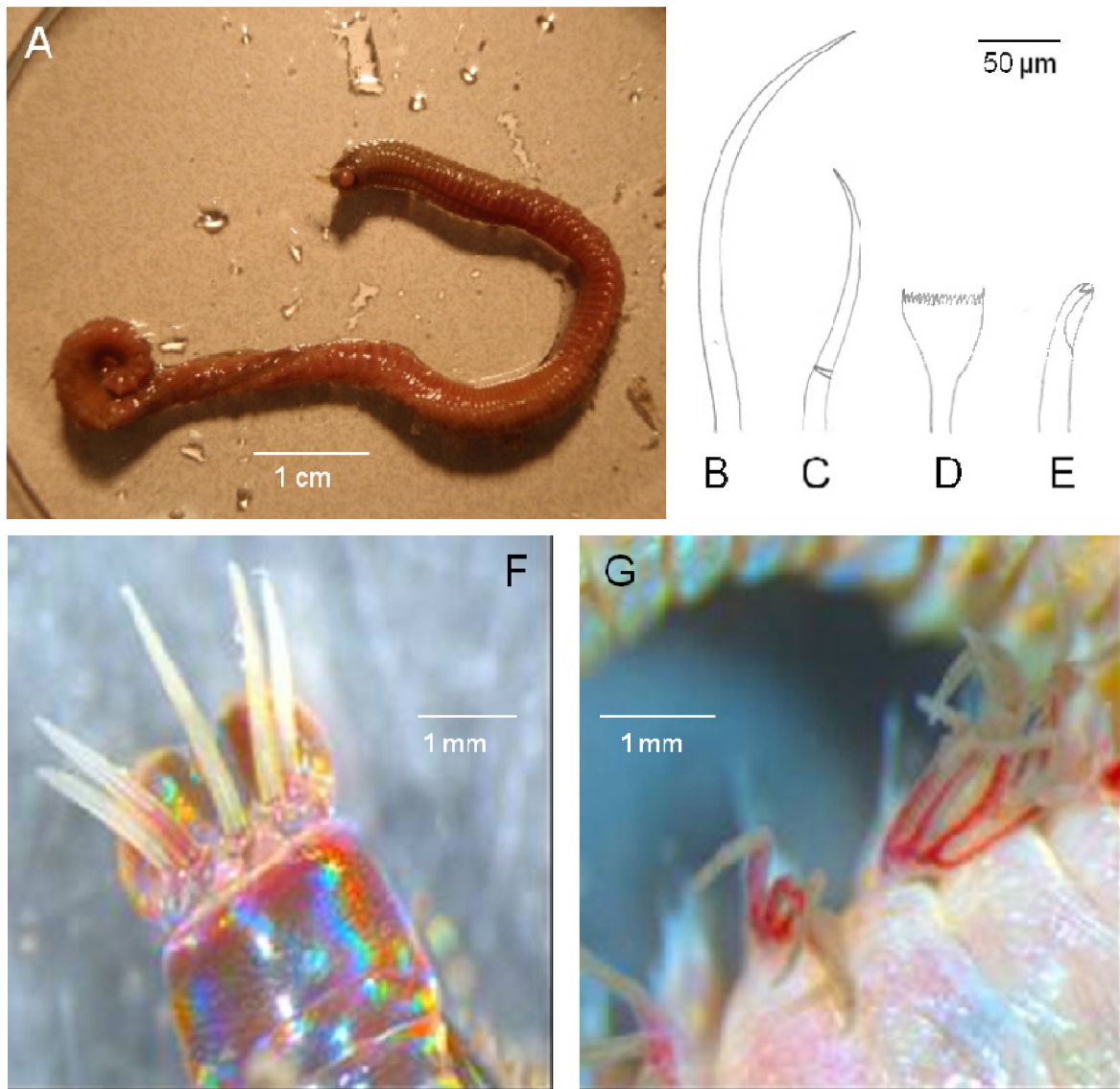


Figure 2. *Marphysa sanguinea* with close-ups and identification characteristics. A, a specimen in total. B, simple capillary chaeta from chaetiger 8. C, shorter bladed compound spinigerous chaeta from chaetiger 8. D, simple capillary chaeta from chaetiger 47. E, hooded acicular chaeta from chaetiger 47. F, dorsal view anterior end, showing the five antennae and the bilobed upper lips. G, parapodia with branchiae from the middle region of the body.

the Nereididae and the Nephtyidae. The largest and most intact specimen of *M. sanguinea* (Figure 2) had 128 chaetigers, measured 84 mm with a maximum approximate width of 6 mm. All the specimens collected were adults. Table 2 gives an overview of the characteristics of the collected specimens, which were as far as they could be observed using light microscopy, all in line with the descriptions given by Hutchings and Karageorgopoulos (2003) and Glasby and Hutchings (2010). A 4th specimen (also

posteriorly incomplete) was found by a colleague on March the 31st 2010 (Table 1). This specimen was preserved on 70% ethanol after identification. The three specimens collected by the Monitor Taskforce were first preserved with 4% formaldehyde solution and stained with Rose Bengal, a standard procedure to distinguish biological material from the residues. After that they were also stored on 70% ethanol in the macrozoobenthos collection of the Monitor Taskforce.

Table 2. Overview of the characteristics of the recently collected specimens of *Marphysa sanguinea* in the Netherlands.

Parameter or structure	Characteristics	
Length (mm)*	84	
Width (mm)*	6	
Total number of chaetigers*	128	
Eyes (number, color)	2, black	
Prostomium shape	Notched anteriorly	
Mandible	Calcified, oar-shaped tips, dark brown	
Maxillae	With large teeth	
Antennae	5 smooth antennae with tapering tips extended just past the frontal margin	
Median antenna	Longest antenna, reaching till the anterior margin of the 1st chaetiger	
Number of filaments per branchiae	From chaetiger 22-24*	1
	From chaetiger 24-34*	2
	From chaetiger 35-46*	3
	From chaetiger 47*	4
Chaetae	Near the posterior end	1
	Capillary chaeta	Long and ending in a simple point (see Figure 2b)
	Compound chaeta	With long and short blades, distally pointed (see Figure 2c)
	Pectinate / comb chaetae	No different types could be distinguished (see Figure 2d)
	Hooded acicular chaeta	From chaetiger 47*, bifid and distally hooded (see Figure 2e)
Aciculae	Embedded in the parapodium, not visible	
Pygidium	With 2 anal cirri	
Color specimen	Uniformly iridescent with pale flesh to dark rose pigmentation and bright red branchiae	

*Recorded from the largest collected specimen

M. sanguinea is recorded to grow up to a length of at least 330 mm and a width of 9 mm and can have at least up to 275 segments at such size (Hutchings and Karageorgopoulos 2003).

Several authors have recorded on the characteristics and ecology of *M. sanguinea* (e.g. Pettibone 1963; George and Hartmann-Schröder 1985; Hayward and Ryland 1995). However, since the studies by Hutchings and Karageorgopoulos (2003), Lewis and Karageorgopoulos (2008) and Glasby and Hutchings (2010) it is known that these descriptions are unlikely to represent *M. sanguinea*, but probably represent a suite of *Marphysa* species. The once recorded cosmopolitan species consists of a series of cryptic species (Lewis and Karageorgopoulos 2008). All literature referring to *M. sanguinea* from before 2003 should therefore be referred to

with caution, as so far *M. sanguinea* has only been observed with certainty in southern England.

Various other recordings from all over the world like Australia (Hutchings and Karageorgopoulos 2003), South Africa (Lewis and Karageorgopoulos 2008) and the Indo-west Pacific up to the Red Sea (Glasby and Hutchings 2010), Japan and Portugal (Lewis and Karageorgopoulos 2008) appeared to be other species when compared with the neotype from England. Above findings suggest that the populations from America's east coast (e.g. Pettibone 1963) and the Mediterranean (e.g. Prevedelli and Simonini 2003; Prevedelli et al. 2007) might also be other species. This leaves an assured distribution range for *M. sanguinea* limited to southern England and the new recording from the Eastern Scheldt

(the Netherlands). It is likely that populations from north-western France and the observations of specimens south-east and west of the UK (GBIF 2010; OBIS 2010; WoRMS 2010) are of the same species, as is the recent recording from the Belgian North Sea (Zintzen and Massin 2010). This would result in a distribution range for *M. sanguinea* centered around the English Channel. Observations of specimens in the central part of the North Sea from 1977 and before (GBIF 2010; OBIS 2010), the Scottish waters in 1996 (OBIS 2010), and the Swedish west coast in the late 80s (Winsnes 1989) might have been occasional observations of *M. sanguinea*, but could also belong to other *Marphysa* species. They might have drifted to the places attached to materials, as happened with the specimen found at the Dutch coast near Hoek van Holland in 1990, which was found in a piece of cork (Table 1). But it is also possible that they arrived with boats or were imported as bait for angling, in which case they can as easily also belong to another *Marphysa* species. It is not very likely that populations are established there. The current four observations within a short period within the same area in the Eastern Scheldt suggest however that in this region the species has, at least temporarily, survived and might establish.

Little is known about the ecology of *M. sanguinea* as characteristics of several species have been mixed up through time. From assured recordings it is known that *M. sanguinea* is mostly found in fine sand, mud and mixtures of both. They are also found under rocks and stones and in crevices of rocks (Hutchings and Karageorgopoulos 2003). Eunicidae are generally carnivorous, but also some species have been found to be herbivorous or omnivorous (Pettibone 1963; Pardo and Amaral 2006). It is believed that *M. sanguinea* is either carnivorous or omnivorous.

In common with other alien species, there are various ways by which the species might have been introduced to the region. Species can be introduced via boats, introduced as bait for angling, or via introductions of other species in cultures. Transport via boats is possible, but the question is then why this species is found exactly in this region of the Eastern Scheldt, where numbers of internationally travelling boats are not higher than in other Dutch regions, taking into account that the annual monitoring of the Monitor Taskforce covers the whole Dutch Delta? *M. sanguinea* or other *Marphysa* species

are often used as bait by fisherman in regions where they are common (Pettibone 1963; Valero et al. 1989; Hutchings and Karageorgopoulos 2003), and is therefore even commercially harvested in certain regions (Skilleter et al. 2006). But, as it is a non-native species, the species is not cultured in the Netherlands yet. There is a chance that the species is imported from abroad as fishing bait, but this chance is not very large. The region, however, is famous for its shellfish culture, particularly mussels (*Mytilus edulis* Linnaeus, 1758) and oysters (*Crassostrea gigas* Thunberg, 1793 and *Ostrea edulis* Linnaeus, 1758), with Yerseke as its centre. For culture purposes, it is known that mussels are regularly introduced from other regions like the Irish Sea, and oysters are regularly introduced from French waters. Both waters contain flourishing populations of *Marphysa* sp., probably *M. sanguinea*, making accidental introductions in the Eastern Scheldt likely. The current spread of the species in Western Europe suggests that the distribution of the species into the North Sea region is temperature related. The current survival of *M. sanguinea* in the Eastern Scheldt for at least three years, and no observations of the species before, might have to do with a gradually increasing year average and winter temperature in the Dutch coastal waters (Wijnhoven et al. unpublished data). Occasional introduced specimens might therefore now survive in the Eastern Scheldt.

Ecological implications of the arrival of this alien species in the Eastern Scheldt are unclear, but one might expect an impact of such a large, partially predatory, species on the macrozoobenthic communities once the species becomes abundant. Competition with, for instance, Nereididae and Nephtyidae can be expected. Implications for man cannot yet be foreseen. Dermato-respiratory allergic reactions to allergens of *Marphysa* sp. due to exposure from worm handling have been described. However, it is a phenomenon more often occurring when in frequent contact with worms and arthropods (Valero et al. 1989).

Acknowledgements

The authors would like to thank the research assistants of the Monitor Taskforce (NIOO-CEME) for identifying the macrozoobenthic samples and being receptive to the possible presence of new species. Special thanks to Loran Kleine Schaars and Daniël Blok who found three specimens and Anke Engelberts and Olaf van Hoessel for helping to identify the species. Thanks to Emiel Brummelhuis of Wageningen

IMARES who kindly brought in a specimen. Thanks to David Hall of Unicomarine Laboratory in Letchworth (England), Dr. P.A. Hutchings and Dr. C.J. Glasby for verifying the identification, and to C.W. Moeliker of the Natural History Museum of Rotterdam, who kindly provided us with information about the observation from 1990. Thanks to Dr. P.A. Hutchings and an anonymous reviewer for their comments on an earlier version. This is publication 4897 of the Netherlands Institute of Ecology (NIOO-KNAW) and Monitor Taskforce Publication Series 2010-11.

References

- GBIF (2010) Global Biodiversity Information Facility (GBIF). <http://data.gbif.org> (Accessed 13 April 2010)
- George JD, Hartmann-Schröder G (1985) Polychaetes: British Amphinomida, Spintherida and Eunicida, Synopses of the British Fauna no. 32. The Linnean Society of London and the Estuarine and Brackish Water Association, EJ Brill/Dr W Backhuys, London, 221 pp
- Glasby CJ, Hutchings PA (2010) A new species of *Marphysa* Quatrefages, 1865 (Polychaeta: Eunicida: Eunicidae) from northern Australia and a review of similar taxa from the Indo-west Pacific, including the genus *Nauphanta* Kinberg, 1865. *Zootaxa* 2352: 29–45
- Hayward PJ, Ryland JS (1995) Handbook of the Marine Fauna of North-West Europe. University Press, Oxford, 800 pp
- Hutchings PA, Karageorgopoulos P (2003) Designation of a neotype of *Marphysa sanguinea* (Montagu, 1813) and a description of a new species of *Marphysa* from eastern Australia. *Hydrobiologia* 496: 87–94, doi:10.1023/A:1026124310552
- Lewis C, Karageorgopoulos P (2008) A new species of *Marphysa* (Eunicidae) from the western Cape of South Africa. *Journal of the Marine Biological Association of the United Kingdom* 88: 277–287, doi:10.1017/S002531540800009X
- OBIS (2010) Ocean Biogeographic Information System (OBIS). <http://www.iobis.org> (Accessed 13 April 2010)
- Pardo EV, Amaral ACZ (2006) Foraging and mobility in three species of aciculate (Annelida: Polychaeta). *Brazilian Journal of Biology* 66: 1065–1072, doi:10.1590/S1519-69842006000600014
- Pettibone MH (1963) Marine polychaete worms of the New England region. I. Aphroditidae through Trochochaetidae, U.S. *National Museum Bulletin* 227: 234–238
- Prevedelli D, Simonini R (2003) Life cycles in brackish habitats: adaptive strategies of some polychaetes from the Venice Lagoon. *Oceanologica Acta* 26: 77–84, doi:10.1016/S0399-1784(02)01232-X
- Prevedelli D, Massamba N'Siala G, Ansaloni I, Simonini R (2007) Life cycle of *Marphysa sanguinea* (Polychaeta: Eunicidae) in the Venice Lagoon (Italy). *Marine Ecology* 28: 384–393, doi:10.1111/j.1439-0485.2007.00160.x
- Skilleter GA, Cameron B, Zharikov Y, Boland D, McPhee DP (2006) Effects of physical disturbance on infaunal and epifaunal assemblages in subtropical, intertidal seagrass beds. *Marine Ecology Progress Series* 308: 61–78, doi:10.3354/meps308061
- Valero A, Huguet J, Sanosa J, Malet A, García-Calderón PA (1989) Dermato-respiratory allergy induced by a marine worm (*Marphysa sanguinea*) used as fishing bait. *Annals of Allergy* 62: 514–517
- Winsnes IM (1989) Eunicid polychaetes (Annelida) from Scandinavian and adjacent waters. Family Eunicidae. *Zoologica Scripta* 18: 483–500, doi:10.1111/j.1463-6409.1989.tb00142.x
- WoRMS (2010) World Register of Marine Species (WoRMS). <http://www.marinespecies.eu> (Accessed 13 April 2010)
- Zintzen V, Massin C (2010) Artificial hard substrata from the Belgian part of the North Sea and their influence on the distributional range of species. *Belgian Journal of Zoology* 140: 20–29