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Rapid Communication

Further dispersal of the sea-spider *Ammothea hilgendorfi* (Böhm, 1879) in the North Sea to The Netherlands

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Abstract

The Pacific brown-banded sea-spider *Ammothea hilgendorfi* has been introduced to Venice (Mediterranean Sea: 1979–1981) and south England (NE-Atlantic: 1978). From the Channel Coast of south England it has spread to the southern North Sea Coast (Blackwater Estuary, Essex). The present paper reports further dispersal across the North Sea to the Atlantic coast of the European continent.

Key words: sea-spider; introduction; North Sea; brown-banded; recreational shipping; shell-fish importation

Introduction

Certain regions appear to be hotspots for marine species introductions as a relatively large proportion of new arrivals is recorded from the same geographic locations. Although the possible role of survey effort should not be ruled out as an explaining factor, regions that combine intercontinental shipping, recreational shipping, and shellfish trade and culture are prone to receive a high proportion of alien species introductions. This is especially the case if such regions include estuarine areas, because those regions can accommodate marine, brackish-water, and freshwater species. The southwestern part of The Netherlands, along the Southern Bight of the North Sea between the international ports of Antwerp and Rotterdam, is such a region because it includes a centre for shellfish trade and culture and various marinas for recreational shipping. The region receives marine alien species via intercontinental shipping and from neighboring countries via recreational shipping and shellfish transports (Wolff 2005). As it is prohibited in The Netherlands to release shellfish from other continents into the environment, the main vector for primary introductions would appear to be intercontinental shipping. Any of the vectors mentioned can be involved in secondary introductions.

In 2013, the persistence of the population of the introduced ostracod *Eusarsiella zostericola* (Cushman, 1906), first collected in the Oosterschelde inlet in 2012 (Faasse 2013), was monitored. The collection of a small amount of bottom material revealed the presence of yet another alien species, likely introduced from a neighboring country.

Materials and methods

A sample container of 200 ml was filled with shelly bottom material collected at 15 m below the high water mark during a SCUBA dive survey on 31 August 2013. As well, a similar sample container was filled with hydroids at the same location on 7 September 2013. The collection location was a former mussel plot near Zierikzee (51°37'46"N, 003°54'27"E) in the Oosterschelde, SW Netherlands. The shells and hydroid colonies collected were examined carefully under a dissecting microscope and all specimens of sea spiders removed. Sea-spiders were identified to species using Bamber (2010).

Figure 1. *Ammothea hilgendorfi*, Zierikzee, Oosterschelde, North Sea coast of The Netherlands, 31 August 2013, immediately after preservation.

Figure 2. *Ammothea hilgendorfi*, Zierikzee, Oosterschelde, North Sea coast of The Netherlands, 7 September 2013. Nine-articled palp (first article not on image) with five small distal articles.

Figure 3. *Ammothea hilgendorfi*, Zierikzee, Oosterschelde, North Sea coast of The Netherlands, 7 September 2013. Distal part of right hind leg with claw and auxilliary claws.

Figure 4. *Ammothea hilgendorfi*, Zierikzee, Oosterschelde, North Sea coast of The Netherlands, 7 September 2013. Knob-like chelifores are visible in front of the ocular lobe.

Results

Seventeen of the pycnogonid specimens separated from the two samples were identified as *Ammothea hilgendorfi* (Böhm, 1879) (Figure 1). The nine-segmented palps (Figure 2), the chelifores which are shorter than the proboscis, and the auxilliary claws (Figure 3) clearly identify the specimens as belonging to the family Ammotheidae. In accordance with the description in Bamber (1985), they were identified as *Ammothea hilgendorfi* due to having a complete trunk segmentation with well-separated lateral processes, dorsal posterior ridges on the three anterior trunk segments, and chelifores consisting merely of a rounded process with a distal spine (Figure 4) - characters distinguishing this species from other ammotheids in NE Atlantic waters. Three specimens of *A. hilgendorfi* were found in shelly bottom material on 31 August 2013. Two specimens possessed ovigers, one only oviger buds. Fourteen specimens of *A. hilgendorfi* were found on hydroids on 7 September 2013, among which was one male carrying egg bundles in its ovigers, and two females with clearly visible oocytes (unfertilised egg cells) in the femorae. The largest specimen had a body length of about 2 mm, with a leg span of about 20 mm with legs stretched. The specimens exhibited a brown-banded appearance (Figure 1), which faded after preservation in ethanol. In addition, the trunk showed a longitudinal diffuse band of minute red spots, with often similar, transverse bands on tibia 1 and proximally on the femur. Narrow transverse bands of black spots

sometimes were present on various leg segments and at about one third from the proximal end on proboscis and palps. The red and black spots disappeared when the specimens were placed in ethanol. Three of the specimens collected on 31 August 2013 were deposited in the collection of Naturalis Biodiversity Center, Leiden (RMNH.PYC.691).

Discussion

Ammothea hilgendorfi is a sea-spider originally recorded from the Mid- and North Pacific (Bamber 2012). In the years 1979–1981, it was found in the Lagoon of Venice in the Mediterranean Sea, probably introduced via intercontinental shipping (Krapp and Sconfetti 1983). In 1978, two immature specimens of *A. hilgendorfi* were found near Southampton in south England (Bamber 1985). In 1988, an adult specimen was found washed up after a hurricane at the same location (Bamber 1988). The species dispersed in Southampton Water and the west Solent and was recorded from Poole Harbour and Poole Bay as well (Bamber 2012). The first record from the North Sea dates from 2010, in the Blackwater Estuary, Essex (Bamber 2012). The present record from The Netherlands constitutes the first record from the Atlantic coast of continental Europe. Wolff (1976), who studied the sea spiders of the delta area in the SW Netherlands, did not find *A. hilgendorfi*. One or more individuals of *A. hilgendorfi* have probably been transported from England to The Netherlands, either with imported shellfish or with recreational vessels. The fact that the species was found on a former mussel plot in The Netherlands suggests that imported shellfish could have been a vector. However, in Poole Harbour it was able to spread from pontoons in a marina to the neighboring rocky shores and become locally 'superabundant' within 5 years (Bamber 2012). Without surveys in marinas in The Netherlands, recreational vessels cannot be ruled out as a vector. The Oosterschelde area where *A. hilgendorfi* was found does not receive commercial vessels from neighboring countries, which makes this a less likely, although not impossible, vector of introduction. In view of the recent spread of *A. hilgendorfi* to the English North Sea coast, it is unlikely that an independent introduction from the Pacific to The Netherlands has occurred.

The fact that two very small samples yielded a total of 17 individuals indicates existence of a very high density, unlikely to consist of only introduced individuals. One individual was carrying egg bundles in its ovigers and two others contained oocytes in advanced development. These facts suggest that a reproducing population has already been established.

Little is known of possible ecological consequences of the introduction of *A. hilgendorfi*. Bamber (2012) reports high densities of *A. hilgendorfi* locally in England. Other pycnogonid species did not seem to suffer a reduction in numbers (Bamber 2012). According to Eno et al. (1997) this species is of no ecological or commercial significance.

Sea-spiders with (traces of) brown banding in NE Atlantic benthos samples deserve identification to species, even if sea-spiders are not the main object of the sampling programme concerned. This is the only way to understand any further dispersal of *A. hilgendorfi* as sea-spiders usually are only collected as 'by-catch' of sampling programmes with other objectives.

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