

Short Communication

The North American ostracod *Eusarsiella zostericola* (Cushman, 1906) arrives in mainland Europe

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Abstract

In sediment samples collected in the Oosterschelde, a marine embayment in the southwest of The Netherlands (southern North Sea), nine specimens of a non-native myodocopid ostracod were found. The ostracods were identified as the North American species *Eusarsiella zostericola* (Cushman, 1906), previously introduced to southeastern England, probably with imported American oysters.

Key words: introduction; shellfish; Myodocopida; The Netherlands

Introduction

At least three species introduced to southeast England with oysters from North America have subsequently been recorded from The Netherlands. The American slipper limpet *Crepidula fornicata* (L., 1758) and the American piddock *Petricolaria pholadiformis* (Lamarck, 1818) arrived in The Netherlands, possibly with shellfish imports from England (Wolff 2005), and the American oyster drill *Urosalpinx cinerea* (Say, 1822) almost certainly did so (Faasse and Lighthart 2009). In view of the proximity of southeast England to the southwest of The Netherlands, other American species introduced to southeast England with oysters were likely to follow.

In the course of a survey of the marine ostracod fauna of the southwest of The Netherlands, samples of different kinds of substrates are taken. Several samples of algae, hydroids, sand bottom, and shell bottom have been studied in recent years. The first samples of a muddy-sand sediment mixed with shells and shell grit, taken in 2012, yielded the first

ostracods of the order Myodocopida from The Netherlands. They do not belong to any of the native species known from the North Sea area. Their similarity to a species introduced to England with oysters from North America was immediately evident and this was checked with the pertinent literature.

Material and methods

Samples were taken in the southwest delta area of The Netherlands, on the eastern shore of the Southern Bight of the North Sea. The samples described in this article were taken from the upper 1.5 cm of sediment during SCUBA dives in the Oosterschelde near Zierikzee. On 7 September 2012, a sample was taken approximately 1 km west of the “Zeelandbrug” (51°37'46"N, 03°54'27"E) at a depth of 12 m below the low water mark and consisted of muddy-sand mixed with shell grit. On 22 September 2012, a sample was taken at the “Zeelandbrug” (51°37'44"N, 03°54'44"E) at a depth of 15 m below the low water mark and consisted of sandy-mud mixed with shells. At the latter location, additional samples were taken on

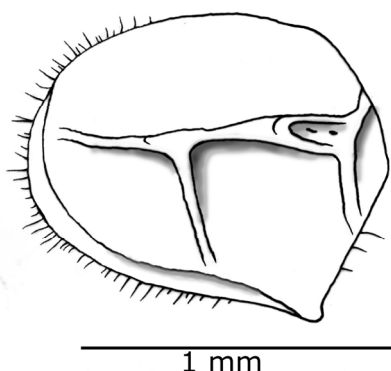


Figure 1. *Eusarsiella zostericola* from Oosterschelde, The Netherlands, 18/10/2012.

6 and 13 October and 10 November. An additional sample was collected from mud at a depth of 6.5 m on 18 October (see Appendix 1). For identification of podocopid ostracods, Athersuch et al. (1989) was used. For the myodocopid species, Angel (1993), Cushman (1906), Kornicker (1986, 1991), Hall (1987) and Bamber (1987b) were consulted. Only living specimens were recorded.

Results

Podocopid ostracods in the samples were identified as *Heterocythereis albomaculata* (Baird, 1838), *Hirschmannia viridis* (Müller, 1785), *Semicytherura nigrescens* (Baird, 1838), *Leptocythere pellucida* (Baird, 1850), *Paradoxostoma angliorum* Horne and Whittaker, 1985 and *P. normani* Brady, 1868. A total of 9 specimens of a non-native myodocopid ostracod species were found.

The myodocopid ostracods belonged to the family Sarsiellidae, subfamily Sarsiellinae (for details of samples see Appendix 1). The only sarsielline ostracod native to the North Sea area is *Sarsiella capsula* Norman, 1869, described from a locality near Shetland (Angel 1993). The species found in the samples was *Eusarsiella zostericola* (Cushman, 1906) (Figure 1). This species (females) differs from congeners by a combination of the following characters: 3 lateral ridges join in the centre of the convex valves and extend almost to the margin, valve margin without processes, and valve surface not covered with numerous rounded processes

bearing abundant hairs (Cushman 1906; Kornicker 1986; Bamber 1987b). Two specimens collected on 7 September 2012 were deposited in the collection of Naturalis Biodiversity Center (RMNH.Crus.B.2152).

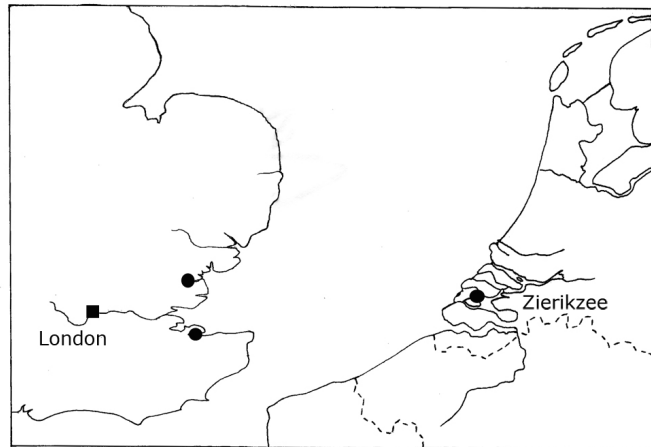
The total length of the specimens collected ranged between 0.58 and slightly longer than 1 mm.

Discussion

According to Kornicker (1975), *E. zostericola* arrived in southeast England with imports of Atlantic oysters *Crassostrea virginica* (Gmelin, 1791) from North America. Additional unpublished records suggest that *E. zostericola* persists in the Thames Estuary and has spread as far as the Isle of Wight on the southern coast of England (D.J. Horne, personal communication, November 2012). The most likely introduction vector of *Eusarsiella zostericola* to The Netherlands is the importation of shellfish from abroad. Because the ostracod is associated with soft sediments, transportation on ships' hulls is unlikely. Transport in the sediment of ballast water tanks cannot be ruled out, although the location where *E. zostericola* was found in The Netherlands suggests otherwise. The Oosterschelde is only visited by inland freight carriers and recreational vessels, whereas shellfish culture and trade are an important characteristic of the area. Several non-native organisms have been detected along with imported mussels in recent years (Wijsman and Smaal 2006).

The occurrence of ostracods on oysters from the Oosterschelde was documented decades ago (e.g., Korringa 1951), and includes: *Loxocochoa rhomboidea* (Fischer, 1855) (as *L. impressa*), *Leptocythere castanea* (Sars, 1866), *Heterocythereis albomaculata* (Baird, 1838), *Hirschmannia viridis*, *Semicytherura nigrescens* (Baird, 1838) (as *Cytherura nigrescens*), *Cytherois fischeri* (Sars, 1866), and *Hemicythere villosa* (Sars, 1866). Kornicker (1975) suggests that *E. zostericola* has also been introduced with transports of Atlantic oysters *Crassostrea virginica* to the Pacific coast of North America between 1870 and 1910, together with the American slipper limpet *Crepidula fornicata* and the American oyster drill *Urosalpinx cinerea*. *Eusarsiella zostericola* was described from the Pacific coast of North America erroneously as *Eusarsiella tricostata* (see Jones 1958a, 1958b; Kornicker 1975).

Figure 2. European locations where *Eusarsiella zostericola* has been found, southeast England (after Kornicker 1975 and Bamber 1987a) and southwest Netherlands (Zierikzee).



The arrival of *Eusarsiella zostericola* in the Oosterschelde is not unexpected. At least five species of North American origin are known to have been introduced to southeastern England along with American oysters: the polychaete worm *Clymenella torquata* (Leidy, 1855), the ostracod *E. zostericola*, the American slipper limpet *Crepidula fornicata*, the American oyster drill *Urosalpinx cinerea* (see Kornicker 1975), and the American piddock *Petricolaria pholadiformis* (see Wolff 2005). The latter three species already have been introduced to The Netherlands (Wolff 2005; Faasse and Ligthart 2009). *Eusarsiella zostericola* is small and thus can hide in crevices of oyster shells or between byssus threads of mussels and will also be harder to detect during inspection of imported shellfish. Southeastern England is very close to the southwest of The Netherlands (Figure 2), which ensures short transportation times for imported shellfish.

It is hard to estimate the year of introduction of *Eusarsiella zostericola* to The Netherlands. Korrynga (1951) was the last person to study the ostracods of the region, and he only studied a small number of samples of the epifauna of oysters. In standard benthos sampling, it is easy to miss a species that is slightly more than a millimeter long, only present as adults part of the year, and that occurs in low densities.

Eusarsiella zostericola has wide physiological tolerances. On the Atlantic coast of North America, it occurs from Maine to Texas (Kornicker 1986) and is exposed to temperature ranges and fluctuations comparable to those in

coastal waters of The Netherlands. Kornicker (1967) mentions temperatures in Texas up to 25°C. The same author mentions occurrence in salinities from 22-36, and that the species occupies substrates comprised of black mud, grey mud, sand, and shells as well as occurrences on sea grasses and hydrozoans. Bamber (1987a) found *E. zostericola* in southeast England in salinities down to 26 on bottoms with an average silt content of 77%.

According to Bamber (1987a) *E. zostericola* can occur in high densities. In view of its predatory lifestyle (Kornicker 1967), a significant influence of high densities of this species on ecological processes cannot be ruled out.

Once a species has established a founder population on a different continent or in a different ocean, in this case after introduction with imported shellfish, further spread is likely to result as shellfish are transported to additional continents or oceans. Three additional species known to have been introduced with Pacific oysters *Crassostrea gigas* (Thunberg, 1793) to the Pacific coast of North America (Kornicker 1975), have also been introduced to the Oosterschelde: *Ocenebra inornata* (Récluz, 1851) (as *Tritonalia japonica*), *Tapes philippinarum* (Adams and Reeve, 1850) (as *Paphia philippinarum*) and *Mytilicola orientalis* Mori, 1935. Therefore, in risk assessments, e.g. of shellfish transports, species known as transoceanic or transcontinental invaders should receive special attention. *Eusarsiella zostericola* is one of those species.

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Appendix 1. Numbers of the American myodocopid ostracod, *Eusarsiella zostericola*, collected at Zierikzee (The Netherlands). Depth given is depth below the low water mark.

Location	Coordinates	Date	Sample size	Depth	number
Zierikzee	51°37'46"N 003°54'27"E	07/09/2012	250 ml	12 m	2
Zierikzee	51°37'44"N 003°54'44"E	22/09/2012	500 ml	15 m	1
Zierikzee	51°37'44"N 003°54'44"E	06/10/2012	250 ml	15 m	2
Zierikzee	51°37'44"N 003°54'44"E	13/10/2012	250 ml	15 m	1
Zierikzee	51°37'44"N 003°54'44"E	18/10/2012	250 ml	6.5 m	1
Zierikzee	51°37'44"N 003°54'44"E	10/11/2012	250 ml	15 m	2