Aquatic Invasions (2007) Volume 2, Issue 4: 402-406
DOI: 10.3391/ai.2007.2.4.9

Special issue "*Alien species in European coastal waters*", Geoff Boxshall, Ferdinando Boero and Sergej Olenin (eds)

Research article

The American oyster drill, *Urosalpinx cinerea* (Say, 1822), introduced to The Netherlands – increased risks after ban on TBT?

Marco Faasse[1*] and Marianne Ligthart[2]
[1]*National Museum of Natural History Naturalis, P.O. Box 9517, 2300 RA Leiden, The Netherlands, E-mail: mafaasse@hetnet.nl*
[2]*Stichting Anemoon, P.O. Box 29, 2120 AA Bennebroek, The Netherlands, E-mail: mligthart01@freeler.nl*
[*]*Corresponding author*

Received 11 December 2007; accepted in revised form 12 December 2007

Abstract

A few specimens and egg capsules of the American oyster drill, *Urosalpinx cinerea*, have been found in the Oosterschelde, an area of shellfish culture in The Netherlands. Probably *U. cinerea* was introduced with imported shellfish from south-east England. It is expected that the oyster drill will establish itself firmly in The Netherlands. The ban on anti-fouling paints containing tributyltin has increased the risk of introduction of oyster drills to new areas in Europe.

Key words: *Urosalpinx cinerea*, introduction, shellfish imports, tributyltin

Introduction

The Oosterschelde is a sheltered water body situated in the south-west of The Netherlands, between two of the largest ports of Europe, Antwerp and Rotterdam. It is also the centre of shellfish culture and trade in The Netherlands. Furthermore, the south-west of The Netherlands is visited by a substantial quantity of pleasure craft from the United Kingdom, Belgium and France. Consequently, the Oosterschelde receives a large number of non-native marine and estuarine species, either as primary or secondary introductions.

During monitoring work on the distribution of non-native species in the Oosterschelde egg capsules of the European oyster drill *Ocenebra erinacea* (Linnaeus, 1758) were found. This oyster drill, although living on nearby coasts of Britain and France, did not hitherto occur in The Netherlands. Oyster drills are gastropod molluscs of the family Muricidae feeding on oysters, other bivalves and sometimes barnacles. In oyster culture these muricids are regarded as pests, as certain species are able to decimate oyster spat (Cole 1942). Introduction of oyster drills to regions where they do not occur naturally is a topic of major concern for the shellfish industry.

Non-native oyster drills, like other alien species, may thrive particularly well in their new habitat (Cole 1942), probably due to of the absence of specialized predators and parasites.

The observation of egg capsules of *O. erinacea* prompted us to start an investigation into the presence of native and non-native muricids in the Oosterschelde. The only muricid native to The Netherlands is the whelk tingle, *Nucella lapillus* (Linnaeus, 1758). The American oyster drill, *Urosalpinx cinerea*, hitherto had been recorded in Europe only from Essex and Kent in south-east Britain (Cole 1942, Hayward and Ryland 1990, Anonymous 2007a). The Japanese oyster drill, *Ocinebrellus inornatus* (Récluz, 1851) has been introduced to France but has not yet been reported from other European countries (Pigeot et al. 2000).

Two locations in the Oosterschelde susceptible to the settlement of non-native marine and estuarine species were surveyed several times.

Material and Methods

The two locations surveyed are Yerseke and Gorishoek, near the village of St. Maartensdijk (Figure 1). Yerseke is the centre of shellfish trade in The Netherlands. The littoral zone near shellfish storage basins at Yerseke was investigated on 5 dates, i.e. 10/02/07, 02/06/07, 18/06/07, 17/07/07 and 27/10/07. The other location is Gorishoek, an area of former oyster culture and present mussel culture, known for its high number of introduced algae. The littoral zone at Gorishoek was investigated on 3 dates from 20/10/07 to 03/11/07 (see Annex). Other locations will be surveyed in the future.

During low tide, the undersides and lateral sides of boulders and oyster clumps were inspected for gastropod molluscs and egg capsules. On each survey date at least two hours were spent searching for gastropods. For identification of *U. cinerea* the publications of Hayward and Ryland (1990) and Abbott (1954) were used. Pigeot et al. (2000) and Berrou et al. (2004) describe discriminating characters of *Ocenebra erinacea* and *Ocinebrellus inornatus*.

Results

Yerseke

Muricids found at Yerseke were half-grown specimens of the native whelk tingle, *Nucella lapillus*, and several adults, groups of egg capsules and one juvenile specimen of *Ocenebra erinacea*.

Gorishoek

At Gorishoek, *N. lapillus* was represented with adults, juveniles and groups of egg capsules. One empty shell, but no living specimens of *O. erinacea* were found at Gorishoek.

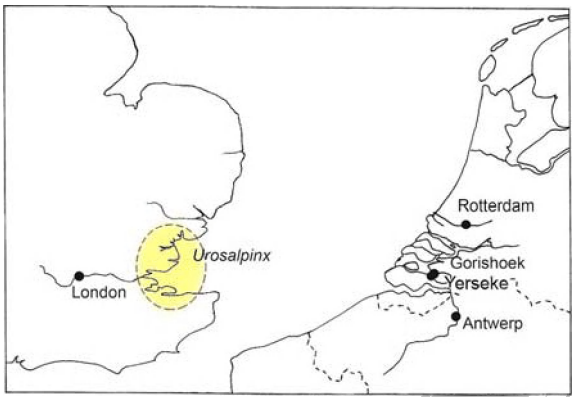

Figure 1. Southern Bight of the North Sea, with the locations Gorishoek and Yerseke and the known distribution of *Urosalpinx cinerea* in the United Kingdom.

Figure 2. Urosalpinx cinerea (Say, 1822) collected at Gorishoek (Oosterschelde, The Netherlands). Shell height 27 mm. Photo by M. Ligthart.

Urosalpinx cinerea (Figure 2) was observed at Gorishoek at the low water mark, on boulders overgrown with oysters. Numbers observed on the survey dates may be found in the Annex. Three specimens were collected on 20/10/2007. The shell of one specimen, much larger than all others observed, was 27 mm high. One group of

empty, worn egg capsules was found, within one meter of this specimen. The shells of both other specimens collected were 15 mm high. The shells of all other specimens observed had an estimated height of 1.0 –2.0 cm.

The Japanese oyster drill, *Ocinebrellus inornatus* was found at neither location

Discussion

It is not known how *U. cinerea* reached The Netherlands. Most likely the introduction vector is imported shellfish. However, without further research the donor area and the time of introduction remain unresolved. Although importations of shellfish have taken place regulary (Wolff 2005), *Urosalpinx cinerea* has never been recorded from The Netherlands before. Establishment of *U. cinerea* in the Oosterschelde area in the years from around 1970 to the mid 1990s was unlikely. In those years tributyltin (TBT), an agent used in anti-fouling paints, caused a decline and near extinction of the whelk tingle (*Nucella lapillus*) in The Netherlands. Since 1 January 1993 there has been a ban on TBT for ships shorter than 25 m in The Netherlands. From around 1997 onwards the population of the whelk tingle has been recovering (Gmelig Meyling et al. 2007). It is not clear to what extent this recovery has been favoured by the absence of cold winters in the south-west of The Netherlands after 1997. After a minimum water temperature of –1 ° C in 1997 at Vlissingen, the minimum water temperature varied between 2°C and 5°C from 1998 to 2006 (Anonymous 2007b). Nevertheless, there is little doubt that recovery would have been impossible without a ban on TBT. *Urosalpinx cinerea* is another muricid sensitive to TBT, its population in the United Kingdom being nearly wiped out in 1987 to 1990 (Gibbs et al. 1991, Anonymous 2007a). Therefore, successful establishment of *U. cinerea* in The Netherlands was unlikely while the use of TBT in anti-fouling paints for recreational boats remained legal, both because the British population was small and because reproduction in The Netherlands would at least be seriously impaired.

Two possible scenarios of the introduction to The Netherlands merit further consideration. The first is a recent introduction with shellfish from Essex and/or Kent (Figure 1). Brown et al. (2006) report very recent export of seed mussels from Essex and Kent, where *U. cinerea* occurs, to The Netherlands: "In the Kent and Essex SFC District, a mussel seed fishery has developed over the past 3-4 years, with stock being sold to growers in N Wales and the Wash and more recently to Holland". From the dots on the map of Wijsman and Smaal (2006) it is clear they refer to the same exports when they mention the Thames: "Juvenile mussels are imported from the UK and Ireland to be re-laid on the culture plots in the Oosterschelde. From September 2005 until March 2007, a total amount of 9 471 ton (gross weight) of juvenile mussels were imported. 44% of these mussels (4 111 ton) were imported from the Wash and the Thames, at the east coast of England and Poole Harbour at the south coast". Wijsman and Smaal (2006) mention a figure of 3% of imports from the United Kingdom to the Oosterschelde originating from the Thames, which amounts to 280 ton. They calculate a proportion of tare of 23.7% from the data available, which results in our conservative estimate of 50 ton of tare originating from Kent and Essex having been discharged on culture plots in the Oosterschelde from September 2005 to March 2007. Tare may have contained specimens or egg capsules of *U. cinerea* or both. The ban on TBT for recreational boats may have opened up the way for introduction to and reproduction in The Netherlands. Wijsman and Smaal (2006) analysed the risks of substantial ecological impact as a result of importing exotic non-indigenous species by mussel imports to the Oosterschelde from the Irish and Celtic Seas, as these are main source areas, but they gave no assessment of risks associated with imports from Essex and Kent. We do not know whether imports from Essex and Kent are continuing.

However unlikely, a second scenario for the introduction cannot be completely ruled out. The present observations of *U. cinerea* may pertain to the recovery of a population introduced earlier unnoticed to Gorishoek or elsewhere in the Oosterschelde. The area near Gorishoek was in use for cultivation of oysters at least until 1904, i.e. not long before the presumed year of introduction of *U. cinerea* in the United Kingdom (Cole 1942). The present development of a young and reproducing population of *U. cinerea* at Gorishoek may have been facilitated by the ban on TBT.

We assume the distribution of *U. cinerea* is still very localized in The Netherlands, possibly comprising only Gorishoek. We were unable to find the species elsewhere during surveys in the

framework of the MOO project (Gmelig Meyling and de Bruyne 2003) for monitoring marine invertebrates in the Oosterschelde area, which is continuing until the present. Even at locations just a few kilometers away from the site where *U. cinerea* was observed not a single specimen or empty shell was found. Since there is no pelagic larval stage, *U. cinerea* can only disperse itself over a larger area by creeping animals. Cole (1942) mentions several figures for their speed, amounting to a maximum of some 50 m in 48 h.

It is likely that *U. cinerea* will thrive particularly well in the Oosterschelde area. Japanese oysters, *Crassostrea gigas* Thunberg, 1793, are extremely numerous. Furthermore, *U. cinerea* prefers muddy bottoms of estuarine areas over hard bottoms and hard sands of open sea coasts (Cole 1942). Water temperature during winter very rarely drops below 0° C (Anonymous 2007b), a temperature which *U. cinerea* stands much better than the native muricid *Nucella lapillus* (see Orton and Lewis 1931).

In recent years the Japanese oyster has caused serious problems in the south-west of The Netherlands. If *U. cinerea* invades the whole Oosterschelde area it may mitigate the negative effects of *C. gigas* on the ecology, recreation, fisheries and cultivation of mussels. A more extensive discussion of the possible consequences of this introduction falls outside the scope of the present paper.

Acknowledgements

We are grateful to Mr. F. van den Kieboom, keeper of the records of the municipality of Tholen, who provided us with information concerning oyster culture near Gorishoek in the past.

References

Abbott, R Tucker (1954) American seashells. D. van Nostrand, Toronto - New York – London

Anonymous (2007a). *Urosalpinx cinerea*. Joint Nature Conservation Comittee. Non-native species - Fauna. http://www.jncc.gov.uk/page-1712(accessed 26/11/2007)

Anonymous (2007b). WaterStat. Ministerie van Verkeer en Waterstaat http://ds122.xs4all.nl/waterstat/applicatie/wsInetApp.asp (accessed 28/11/2007)

Berrou V, Merle D, Dommergues J-L, Crônier C, and Néraudeau D (2004) Comparative morphology of Pliocene, Quaternary and Recent shells of *Ocenebra erinaceus* (Linnaeus, 1758) and *O. brevirobusta* Houart, 2000 (Mollusca, Muricidae, Ocenebrinae): reflections on the intra- and interspecific variations. Geodiversitas 26 (2): 263-295

Brown JH, McLeod DA and Scott DCB (2006) Development of best practice in relation to movement of bivalve shellfish stock. Report of Project No FC1017/CSA7049 commissioned by DEFRA, 68 pp http://www.aquaculture.stir.ac.uk/Systems/documents/DEFRAProjectsFC1017CSA7049shellfishmovement.pdf (accessed 01/12/2007)

Cole HA (1942) The American whelk tingle, *Urosalpinx cinerea* (Say), on British oyster beds. Journal of the Marine Biological Association of the United Kingdom 25: 477-508

Gibbs PE, Spencer BE and Pascoe PL (1991) The American oyster drill, *Urosalpinx cinerea* (Gastropoda): Evidence of decline in an imposex-affected population (R. Blackwater, Essex). Journal of the Marine Biological Association of the United Kingdom 71: 827-838

Gmelig Meyling AW and de Bruyne RH (2003) Het Duiken Gebruiken 2. Gegevensanalyse van het Monitoring-project Onderwater Oever, Fauna-onderzoek met sportduikers in de Oosterschelde en het Grevelingen-meer. Periode 1978 t/m 2002. Stichting ANEMOON, Heemstede (in Dutch) http://www.anemoon.org/anemoon/downloads/rapporten/DuikenGebruiken2.pdf (accessed 10/12/2007)

Gmelig Meyling AW, Willemsen J and de Bruyne RH (2007) Verspreiding en trends in Nederland van de Purperslak *Nucella lapillus*. Stichting Anemoon rap.nr. 2006-14 (in Dutch) http://www.anemoon.org/anemoon/downloads/rapporten/PIMP_2006_10_20.pdf (accessed 19/11/2007)

Hayward PJ and Ryland JS (eds) (1990) The marine fauna of the British Isles and north-west Europe. 2 vols. Clarendon Press, Oxford

Orton JH and HM Lewis (1931) On the effect of the severe winter of 1928-1929 on the oyster drills of the Blackwater estuary. Journal of the Marine Biological Association of the United Kingdom 17: 301-313

Pigeot J, Miramand P, Garcia-Meunier P, Guyot T and Séguignes M (2000) Présence d' un nouveau prédateur de l'huître creuse, *Ocinebrellus inornatus* (Récluz, 1851), dans le bassin conchylicole de Marennes-Oléron. Comptes Rendus de l'Académie des Sciences de Paris (Ser. 3) Sciences de la Vie/Life Sciences 323: 697-703

Wijsman JWM and Smaal AC (2006) Risk analysis of mussels transfer. Wageningen Imares. Report number C044/06 http://library.wur.nl/wasp/bestanden/LUWPUBRD_00346549_A502_001.pdf (accessed 01/12/2007)

Wolff WJ (2005) Non-indigenous marine and estuarine species in The Netherlands. Zoölogische Mededelingen 79(1): 1-116

Annex

Numbers of the American oyster drill, *Urosalpinx cinerea*, and number of groups of egg capsules, observed at Gorishoek.

Location	Geographic coordinates		Survey date	Oyster drills	Groups of egg capsules	Observer/Collector
	Latitude, N	Longitude, E				
Gorishoek	51°31'27"	04°04'35"	16.10.2007	5	0	M Ligthart
Gorishoek	51°31'27"	04°04'35"	20.10.2007	6	1	M Ligthart and M Faasse
Gorishoek	51°31'27"	04°04'35"	03.11.2007	9	0	M Ligthart and M Faasse
East of Gorishoek	51°31'33"	04°04'49"	03.11.2007	3	0	M Ligthart and M Faasse