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Rangia cuneata (Bivalvia, Mactridae) expanding its range in The Netherlands

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The invasive bivalve species *Rangia cuneata* is reported from brackish water at a fifth locality in The Netherlands (Fig. 1). The records for Europe are summarized. It remains unclear how the various occurrences that were reported within less than ten years, might be interconnected. Its transport by ballast water was already hypothesized on the basis of previous records and is supported by the present record in the port of Rotterdam.

Keywords: Bivalvia, Mactridae, *Rangia*, invasive species, ballast water, Europe, The Netherlands.

De brakwaterstrandschelp *Rangia cuneata* wordt van een vijfde plaats in Nederland gemeld (Fig. 1). De diverse vindplaatsen bevinden zich wijd uiteen, in verschillende provincies. Alle meldingen uit Europa, d.w.z. België, Nederland en Polen, stammen uit een periode van minder dan 10 jaar, zodat aan enige samenhang kan worden gedacht. Het is echter ook mogelijk dat de soort aanvankelijk over het hoofd werd gezien. Voorgaande waarnemingen gaven reeds de indicatie dat de distributie van deze soort in Europa vooral via het ballast water van schepen zou hebben plaats gevonden. De hier gemelde vondst in de haven van Rotterdam ondersteunt die hypothese.

Recently, Warzocha & Drgas (2013) reported the occurrence of the invasive, bivalve species *Rangia cuneata* (Sowerby I, 1832) (Mactridae) in the SE. Baltic and summarized the data in the literature on its migratory history. The first record in the Baltic dates from 2010 in the Russian part of the Vistula lagoon (Rudinskaya & Gusev, 2012). In the Polish part of the same lagoon *R. cuneata* was first recorded in 2011. The shell sizes that were found in Russia and Poland suggest that the species settled there in 2007-2008 (Warzocha & Drgas, 2013).

The species is autochthonous in the Gulf of Mexico and maybe along the Atlantic coast of North America. The first record for Europe is from the port of Antwerp, where the species was found in August 2005 (Verween et al., 2006). However, according to Kerckhoff et al. (2007: 247) the species lived there already from approximately 2000 on, because in May 2007 specimens that were “at least six years old” were found.

In The Netherlands the species has now been reported from four locations that are widely separate in different provinces [first record between brackets]: (1) the channel Noordzeekanaal [2007], and the river IJ near Amsterdam [2008, living since 2005?], province of Noord Holland (Bruyne, 2008; Melchers & Moolenbeek, 2008; Moolenbeek, 2009; Bruyne et al., 2013: 105; Neckheim, 2013), (2) Sluiskil, Gent-Terneuzen Channel [2008], province of Zeeland (Neckheim, 2013), (3) Termunterzijldiep, from Termunterzijl to Nieuwolda (9.0 km inland), province of Groningen (Luijten, L., 2014), and (4) river Waal, a single valve, washed ashore between km 870 and 871, west of Millingen [2011], province of Gelderland (Neckheim, 2013). Locality (4), near Millingen, is doubtful since live specimens were not observed whereas the river Waal is not brackish. Here we can add another Dutch record, separate in a fifth province, viz. the port of Rotterdam, province of Zuid Holland.

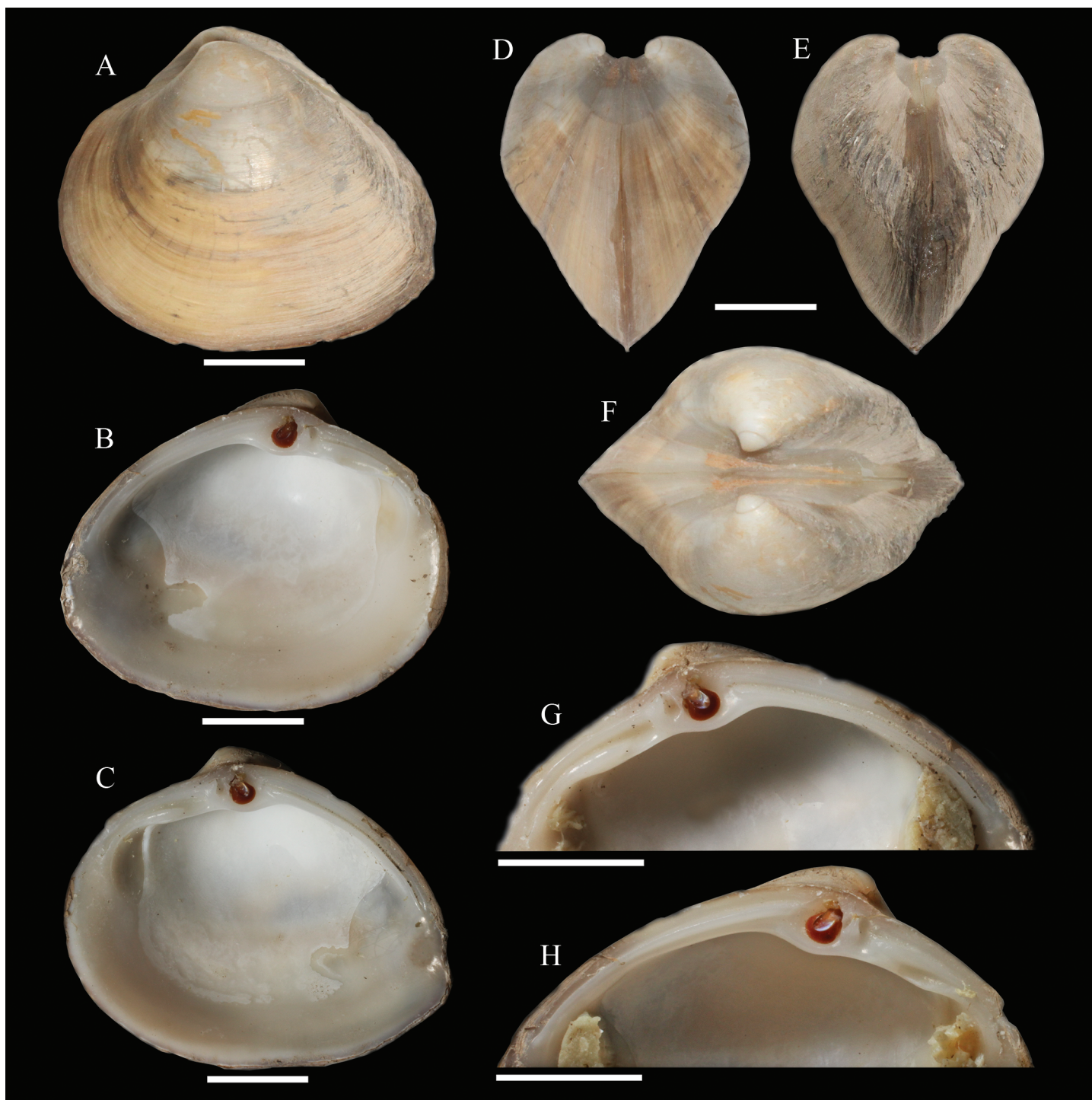
In the port of Rotterdam two specimens were collected 28.viii.2014 with a hand dredge that was pulled over the bottom over a distance of 10 meters from a floating dock in one of the more inland harbours, i.e. the 1st Eemhaven (51° 53.337'N 4° 25.113'E; Fig. 1). The specimens were collected at a depth of 4-5 m on a bottom partly covered by algal vegetation consisting of the species *Polysiphonia stricta* (Dillwyn) Greville and *Spirogyra* spec. The bottom sediment consisted



Fig. 1. Distribution records of *Rangia cuneata* throughout Belgium and The Netherlands (see the text). The year in which the species was first recorded is indicated, together with the probable year of settlement (between brackets).

(next page)

Fig. 2. Various views of *Rangia cuneata* (length 37 mm) from the 1st Eemhaven, port of Rotterdam (Colln GiMaRIS, Leiden). Scale bar = 1 cm. Photo A. G.



of 1.1% fine gravel (>1.80 mm), 14.3% coarse sand (1.80-0.50 mm), 42.4% medium sand (0.50-0.25 mm), 33.0% fine sand (0.25-0.06 mm), and 9.2% silt (<0.06 mm)(n=3). The water parameters turbidity, temperature, pH and salinity at the site were measured in spring and summer 2014 in four water samples taken at 30 cm, 1 m, 4 m and 4.5 m (bottom) depth with a Hanna Instruments 93414 turbidity meter and a Hanna Instruments I9829 Multiparameter. The average turbidity, water temperature and salinity measurements of the water during the spring monitoring were 7.5 ntu, 18.6°C and pH 8.3, respectively. In summer on average 26.5 ntu, 20.5°C and pH 8.07 were measured. As is shown with the turbidity measurements the water was relatively murky. This is confirmed by the water transparencies of respectively 0.8 m and 0.7 m, that were measured with a Secchi disk (diameter 30 cm) in spring and summer. *Rangia cuneata* was found twice in a hand dredge haul over 10 m of the bottom but in none of the three petit ponar bottom grab samples (surface cover of 0.023 m²) and in none of the six hand corer samples (surface cover of 0.025 m²) that were taken at exactly the same site. In the 1st Eemhaven *R. cuneata* is therefore considered to be relatively rare. In its native area in America for example, up to 1000 specimens / m² are found (Bruyne et al., 2013).

Although the density of *R. cuneata* in the 1st Eemhaven was relatively low, the habitat appears to have the most favourable combination of environmental conditions for *Rangia cuneata*, viz. a combination of low water salinity, high turbidity, and a soft substrate composed of sand, silt and vegetation at a depth of less than 6 m. The maximum abundance and number of size classes of *R. cuneata* are found at salinities of 0-2 ‰ (Hoese, 1973; Rudinskaya & Gusev, 2012; Tarver, 1972). As the species can be found in a much broader range of environments and brackish waters varying between oligo- and mesohaline (Bruyne et al., 2013; Warzocha & Drgas, 2013; Luijten, 2014), it has probably settled in various harbours in the port of Rotterdam and not only in the 1st Eemhaven.

As the largest of the two specimens found in Rotterdam measured 37 mm, the species has settled in the port at least 3 to 4 years ago, i.e. in 2010-2011 assuming that the growth rate is similar to that recorded at other European sites (Rudinskaya & Gusev, 2012). It has been most generally ac-

cepted that the species has reached Europe by ship in ballast water. This is supported by the present record in Rotterdam. It is unclear whether the Belgian, the five Dutch, and the Polish occurrences are in any other way connected. How else the species could have reached these areas, which are not interconnected by brackish waters, is unclear, but the fact that all the records fall into a period of less than ten years sets one thinking.

Verween et al. (2006: 200 [Open Access article]) provide a description of the shells, accompanied by an identification key for European Mactridae. Shells of *R. cuneata* (Fig. 2) are somewhat similar at first sight to *Spisula subtruncata* (da Costa, 1778). For additional illustrations we refer to Verween et al. (2006: 200, figs 2, 3), Bruyne et al. (2013: 105, 3 figs), Warzocha & Drgas (2013: 292, figs 1, 2), and Luijten (2014: 121, fig. 1).

There has been some confusion in the literature about the year in which the name for this species was introduced. Several authors indicated 1831. However, the original description by G.B. Sowerby I dates from 1832 (see Petit, 2006: 86).

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