

First records of the introduced marine bivalve *Theora lubrica* A. Gould, 1861 from Asturias, NW Spain (Semelidae)

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Summary

The first records of the introduced marine bivalve *Theora lubrica* A. Gould, 1861 from Gijón and Avilés in Asturias are presented; the first Spanish records outside the Basque Country. It is quite likely that it is currently widespread in harbours and marinas in NW Spain, but has been overlooked or misidentified as an *Abra* species.

Resumen

Se registran las primeras citas del bivalvo marino introducido *Theora lubrica* A. Gould, 1861 de Gijón y Avilés, en Asturias; las primeras citas españolas fuera de la región Vasca. Es bastante probable que la especie esté bien distribuida en puertos y marinas en el NO de España, pero que haya pasado desapercibida o identificado erróneamente por una especie del género *Abra*.

Key words: Bivalvia, *Theora lubrica*, invasive species, Asturias, Cantabrian Sea

INTRODUCTION

Theora lubrica A. Gould, 1861 (Fig. 1) is a marine bivalve of the family Semelidae, with an oval, thin and translucent shell, up to 16 mm long, with fine growth striations. It presents a characteristic oblique internal ridge at the anterior end of the shell, which is also visible from the outside, allowing easy differentiation from similar species like *Abra nitida* (O. F. Müller, 1776) (Fig. 2) and *Abra prismatica* (Montagu, 1808). It also has a bifid cardinal tooth in the left valve.

Nemesis (online) states this species is native to the Northwest Pacific, from northern Japan and the Vladivostok area (Russia), south to the Hong Kong region. It has been introduced to other parts of the world, with ballast water being the primary vector of transport, reaching Australia in 1958 (Boyd, 1999), California in 1968-1969 (Seapy, 1974) and New Zealand in 1971 (Cranfield et al., 1998). Regarding Europe, records are few and scattered, compared to other alien species. For the Mediterranean, it has been reported from Italy (Livorno) in 2001 (Balena et al., 2002) and Israel (Haifa) in 2006 (Bogi & Galil, 2007). Records on the European Atlantic coast are from Spain (Bilbao and Pasajes, Basque Country) in 2010 (Adarraga & Martínez, 2011), southeastern England in 2018 (Ashelby et al., 2018), the Netherlands in 2003 (Faasse et al., 2019) and Scotland in 2020 (Notton, 2020).

Though the first confirmed record for the eastern Atlantic was sampled in 2003, it is likely that this species has been present in the Netherlands as early as in 1985, but remained undetected for many years as it was identified as *Abra nitida* (Faasse et al., 2019).

Here, we present the finding of numerous specimens in mud at about 4 m depth in the marinas of Gijón and Avilés, both in Asturias (Fig. 3):

Gijón Marina (43°33'N, 5°41'W). Living and dead specimens, leg. A. Alonso & J.G.M. Raven (AA 0896-A, R 02385) (Fig. 3).

Avilés Marina (43°34'N, 5°55'W). Living and dead specimens, leg. A. Alonso & J.G.M. Raven (AA 0896-B; R 02628).

MATERIAL AND METHODS

Sampling was carried out with a small handmade dredge of approximately 1 litre volume (Fig. 4), an inexpensive device made mostly from recycled materials, that turned out to be quite productive despite its simplicity. Though a boat was employed for sampling the bottom at some other



Fig. 1. One of the *Theora lubrica* specimens collected at the Gijón marina, Asturias, Spain. L 8.7 mm.



Fig. 2. *Abra nitida* specimens collected at the Gijón marina, Asturias, Spain. Above L 9.6 mm, below L 10.3 mm.



Fig. 3. Map showing localities mentioned in the text (Base: Google Earth).

points inside the Gijón marina, the most productive dredging was carried out from a single point on the Gijón jetty. At Avilés sampling was performed at two points along the long pontoon.

RESULTS

At Gijón marina the dredging started in August 2022 and was repeated at least every half year. It delivered a rich mollusc fauna (>100 species), in which numerous species are represented by an abundance of specimens. This included a large number (>100/m²) of living and dead specimens of *T. lubrica*, indicating a thriving population that has been in place at least for several years. The marina forms a sheltered environment within a large embayment, allowing the settlement of fine mud, thus providing an excellent habitat for many species that normally are found at greater depths.

At Avilés the marina is situated inside an estuary, an environment in which sediment-laden freshwater mixes with seawater, resulting in the settlement of the clay particles, forming mud. Here a single sampling campaign was held in August 2023. Compared to Gijón, the fauna is less rich (about 30 mollusc species), but comprises some taxa not recorded at Gijón.

In September 2023 we applied the same technique from a pontoon in the fishing harbour of Laredo, Cantabria. Sampling was more limited. The harbour is a small sheltered area within a large embayment, the seabed formed by sticky mud and numerous leaves. Here the fauna was quite restricted (19 mollusc species were noted) and no specimens of *T. lubrica* were found, despite the proximity of the embayment to Bilbao and Pasajes from where the species was first recorded in Europe by Ardarraga & Martínez (2011).



Fig. 4. The dredge employed for the sampling, operated by the second author.

DISCUSSION

Repeated sampling in the Gijón marina to monitor invasive species (Fernández-Rodríguez et al. 2022) did not detect the population of *T. lubrica*, which is due to the sampling method: collecting mussel lumps from the pontoons. The presence of *T. lubrica* would not have been noted without sampling the bottom mud. During sampling of the mud in 2024, Omar Sanchez (pers. comm.) also found the species at the marinas of Gijón and Avilés. Despite decades of intense monitoring of the Poniente beach next to the marina, not a single beached specimen of this species had been found. The species apparently prefers the soft, organic-rich mud in the marina and the estuary to the sandy sediment in the open embayment, which is in agreement with observations elsewhere (e.g., Seapy, 1974; Nemesis, online; Faasse et al., 2019).

Theora lubrica populations are well established at numerous localities around the world, mostly in or near harbours. Most sources therefore accept the release of larvae with bal-

last water as explanation for the introduction of this species (e.g., Nemesis; Bogi & Galil, 2007; Faasse et al., 2019). We found the species in a marina, but located within a large embayment, the largest part of which forms a large fishing and commercial harbour.

Fernández-Rodríguez et al. (2022) mention the role of ports and marinas as gateways for the introduction of exotic species through worldwide shipping, in which they focus on various organisms introduced into the Gijón marina through epibionts growing on ships. Like *T. lubrica*, other species probably arrived in Gijón through ballast water, such as *Ensis leei* (Huber, 2015), which occurs in large numbers in the Musel harbour of Gijón, adjoining the marina (Arias & Anadon, 2012), but only rarely is found on Gijón's beaches (Raven, 2015, 2017). This shows that beach observations may underestimate the presence and abundance of invasive species.

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