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Tonicia atrata and *Chiton cumingsii* (Polyplacophora: Chitonidae): First records in European waters

ANDRÉS ARIAS[1,2] & NURIA ANADÓN[1]

[1]*Departamento de Biología de Organismos y Sistemas (Zoología), Universidad de Oviedo, Oviedo 33071, Spain*
[2]*Corresponding author. E-mail: ariasandres.uo@uniovi.es*

At present, over 300 species of marine alien Mollusca are reported from the European waters (Streftaris *et al*. 2005; Zenetos *et al*. 2010). However, only three alien polyplacophoran have been recorded: *Chaetopleura angulata* (Spengler, 1797), *Acanthopleura gemmata* (Blainville, 1825) and *Chiton hululensis* (E. A. Smith, 1903); the latter is considered as "questionable" (Zenetos *et al*. 2010). These polyplacophoran constituting about 1% of the alien marine mollusc reported from Europe. Here we present the first record of *Tonicia atrata* (Sowerby, 1840) and *Chiton cumingsii* Frembly, 1827 in European waters, constituting the first evidence of their presence outside their native range. Furthermore, we give brief notes on the taxonomy and distribution of *T. atrata* and *C. cumingsii*, and discuss the potential pathways for introduction to Europe.

In Europe, *T. atrata* occurs together with the well-known alien *Ch. angulata;* and probably both species have historically been misidentified in collections because both reach large size (> 60 mm) and in many cases the larger size was commonly used to differentiate the presumed alien (*Ch. angulata*) from the native polyplacophoran of smaller size. Recently in the Bay of Biscay, both species coexist with the Mediterranean *Chiton olivaceus* Spengler, 1797, which has become a new alien for this region (authors' pers. obs.).

Preserved specimens in the collections of the Department of Biology of Organisms and Systems (Zoology), University of Oviedo, Spain (BOS), previously identified as *Ch. angulata* from Atlantic coastal waters of the Iberian Peninsula and Canary Islands collected throughout the last decades, were re-examined.

Genus *Tonicia* Gray, 1847

Type species: *Chiton elegans* Frembly, 1827; by subsequent designation (Gray, 1847) = *Tonicia chilensis* (Frembly, 1827).

***Tonicia atrata* (Sowerby, 1840)**
Fig. 1A, B, C

Material examined: *Eo estuary*, 43º28'N, 7º03'W (Jan. 1978)*:* BOS-CHI10, BOS-CHI11; *Sado estuary*, 43º28'N, 7º03'W (Jul. 1985): BOS-CHI12, BOS-CHI13, BOS-CHI14; *Avilés Port* 43°33'N, 5.55'W, (May 2010): BOS-CHI15.

Habitat and distribution: Intertidal rocks, boulders and *Macrocystis* holdfasts (Dell 1971). In southern Chile this species was recorded under stones, in pools; from mid to low eulittoral (Schwabe *et al.* 2006). It is also recorded from the Magellan Strait and the Falkland Islands (Sirenko 2006).

Diagnosis and description: Long straight oval shape. Head plate semicircular in outline, with posterior margin straight, showing radially arranged striations; insertion plate with 9–10 slits. Intermediate plates rectangular in outline; posterior margin slightly concave on both sides of protruding apex; lateral areas slightly elevated, with ocelli restricted to anterior half of lateral areas; jugal area not elevated with a fine dentated jugal sinus between the apophyses; solid articulamentum with one slit in insertion plates; apophyses short, trapezoidal. Tail plate semicircular in outline with mucro situated in anterior half; postmucronal area showing concentric growth marks.

Remarks: The variability in colour of this species extends from dark brownish to greenish or greyish, with or without radial lines in blue or white colour (Fig. 1A–C). The largest specimen measures 71 mm long, 30 mm broad.

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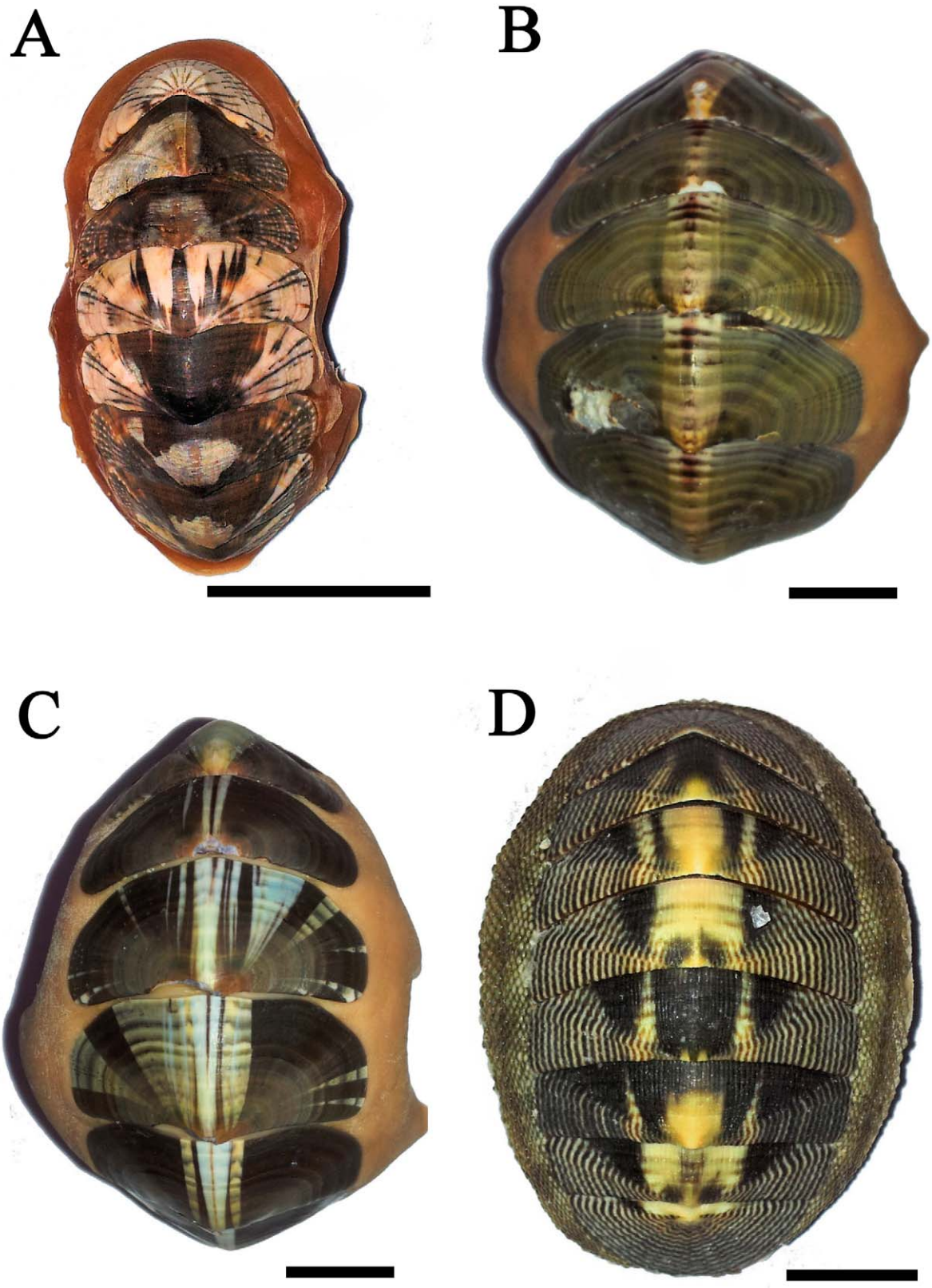

FIGURE 1. European alien Polyplacophora. Colour polymorphisms in *Tonicia atrata* specimens A—BOS-CHI15; B—BOS-CHI10; C—BOS-CHI12; D—*Chiton cumingsii* BOS-CHI16. All scale bars 1 cm.

Genus *Chiton* Linnaeus, 1758

Type species: *Chiton tuberculatus* Linnaeus, 1758

***Chiton cumingsii* Frembly, 1827**
Fig. 1 D

Material examined: *Las Palmas Port -Canary Islands*, 28º06'N, 15º25'W (Aug. 2012): BOS-CHI16, BOS-CHI17, BOS-CHI18.

Habitat and distribution: On undersides of rocks, lower intertidal areas from Peru to Chile (Leloup 1956).

Diagnosis and description: Animal with oval shape. Intermediate plates not separated by spaces of exposed mantle, slightly superimposed over one another, growth lines on intermediate plates evident to naked eye. Only jugal area with uniform pale colour, remainder with greyish striped. Girdle with imbricating rhombus-shaped, never whitish scales well ordered one beside another. Tail plates elliptical to round in outline, with subcentral mucro; postmucronal area with concentric growth marks.

Remarks: The biggest specimen was 42 mm long, 25 mm broad.

Conclusions: Many alien species arrived on the Iberian Peninsula as a result of secondary spread from other nearby European countries where their introductions were attributed to ship transport from distant locations such as Asia or South America (Kaas & van Belle 1987; Streftaris at al. 2005). The South American *Ch. angulata* was recorded on the Iberian Peninsula in the early 20th century (Hidalgo 1916) and has subsequent expanded along the Bay of Biscay and south of Portugal to the Straits of Gibraltar (Anadón 1979; Rolán 1983; Carmona & García 2000). This study revealed the presence of not only *Ch. angulata*, but also *T. atrata* in the Atlantic Iberian Peninsula estuaries, demonstrating that *T. atrata* is not a species that has emerged in recent years, but had been present in the seventies.

Generally one explains the arrival of marine exotic species in European waters by the unintentional co-transport of their larvae and/or juveniles into commercial bivalve cultures, mainly clams and oysters from the American continent (Rolán 1983; Zenetos *et al*. 2010; Arias & Anadón 2012; Rolán & Horro 2005; Arias *et al.* 2012). This may also apply to the introduction of *T. atrata* to the Iberian Peninsula because the two estuaries with this species are locations of intensive mariculture with high traffic of exotic aquaculture species (Arias & Anadón 2012; Arias *et al*. 2012). On the other hand, for *C. cumingsii* in the Canary Islands, the "shipping" would be the most plausible way of introduction for this species. Since due to its proximity to a port area, *C. cumingsii* may be introduced either by "biofouling" on the ship's hulls.

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