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# *Umbraculum umbraculum* (Gastropoda: Heterobranchia) spreading northwards: additional evidence to the "tropicalization" of the Bay of Biscay

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**Abstract:** The occurrence of the subtropical and meridional heterobranch gastropod *Umbraculum umbraculum* is reported for the first time in the Bay of Biscay, from northern Spain, constituting its northernmost distribution in the eastern Atlantic to date. We present a detailed diagnosis and illustrations of the species in order to facilitate its identification. Furthermore, the potential implications of this finding are discussed.

**Résumé:** *Sur la propagation au nord d'*Umbraculum umbraculum *(Gastropoda: Heterobranchia): une preuve supplémentaire de la «tropicalisation» du Golfe de Gascogne*. Le gastéropode subtropical et méridional *U. umbraculum* est découvert pour la première fois dans le Golfe de Gascogne. Ce signalement représente actuellement sa limite nord de distribution dans l'Atlantique Est. Dans cette étude, nous donnons des caractères distinctifs et des illustrations de cette espèce afin de faciliter son identification. Enfin, nous présentons une brève discussion sur les possibles implications de ce signalement.

*Keywords*: Umbrella slug ● Climate change ● Cantabrian Sea ● Iberian Peninsula ● France

The arrival of new marine species outside their usual range of distribution is becoming an increasing global phenomenon. Changes in climate and oceanographic conditions have been detected in recent years, and have affected the dynamics and composition of species communities (IPCC, 2014). The increase of subtropical-tropical species within a specific biogeographic area is commonly defined as "tropicalization". The Cantabrian Sea (southern Bay of Biscay, eastern Atlantic Ocean) is an interesting area to study this phenomenon, being a transitional zone between two different ecoregions (one with predominantly boreal biota and one with subtropical Atlantic biota: Fisher-Piette, 1957), and due to the increase in average seawater temperature during the last 30 years (between 0.3 to 0.8°C per decade: IPCC, 2014). During a series of surveys carried out between 2011-2014 along the coast of Asturias (northern Spain, central Cantabrian Sea) by the first author, two live specimens of the umbrella slug *Umbraculum umbraculum* (Lightfoot, 1786) were found intertidally, one in El Rinconín rocky cove of Gijón (43º32'N-05º38'W), on

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12 July 2011, and the other one in Rodiles rocky cove of Villaviciosa (43º32'N-05º21'W), on 24 May 2013. Furthermore, two empty shells were located on the tide line of La Griega sandy beach of Colunga (43º30'N-05º15'W), on 4 August 2014. These findings constitute the first record of the species in the Bay of Biscay.

Family Umbraculidae Dall, 1889 (1827)
***Umbraculum umbraculum*** (Lightfoot, 1786)

Large species (max. diameter of ~20 cm) with a calcified external shell partially covering dorsum (Fig 1A). Shell with an eccentric backwardly curved protoconch, usually covered by encrusting biota (Fig 1A). Circular body bright orange to brownish in color, with large pustules (Fig 1A). Head with a pair of large orange colored rhinophores with a longitudinal slit beneath shell (Fig 1A). Below rhinophores, body split by a mid-anterior cleft, in which mouth opens (Fig 1A). Large bipinnate gills located in right side of body (Fig 1B), foot large and sole smooth and flat (Fig 1C).

*Umbraculum umbraculum* is the only species within the genus *Umbraculum* Schumacher, 1817. It is considered widespread in tropical to warm temperate waters of the Indo-West Pacific and Atlantic Oceans, as well as in the Red Sea and the Mediterranean (Caballer et al., 2015). However, for the time being no molecular studies aiming to evaluate the conspecificity of the known populations have been carried out. Thus, the possibility of dealing with a complex of several species cannot be ruled out. The record hereby reported constitutes the northernmost distribution for this species to date. This taxon produces a large number of eggs, 80-90 µm in diameter, united in a coiled ribbon, and its larvae are planktotrophic (Thompson, 1970). Therefore, it seems likely that its arrival to stated new area may have occurred through larval transportation by water currents from the southern Iberian Atlantic and the subtropical adjacent region, and that its only recent settlement in the area has been indeed favored by the increase in seawater temperature. So far, due to the presence of few specimens, no ecological adverse conditions have been reported. However, *U. umbraculum* is a sponge feeder, and has been recorded on a number of different Demospongia, including *Tethya* spp. (Willan, 1984). European species of the *Tethya auratium* complex are threatened taxa (included in the Annex II of the Berne Convention). Therefore, in case of establishment of thriving *U. umbraculum* populations, it may have negative impact on local sponge biota.

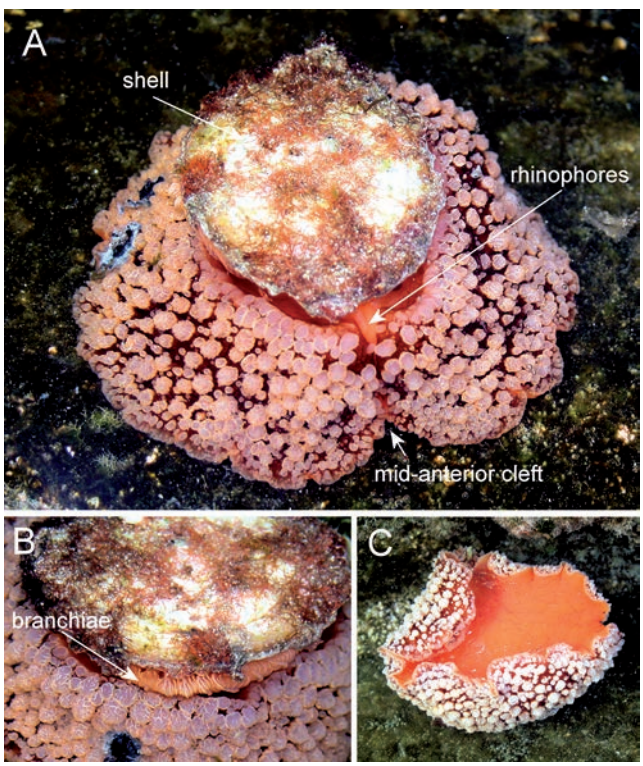


**Figure 1.** *Umbraculum umbraculum* live specimen from the Bay of Biscay (about 15 cm diameter). **A.** Overall view. **B.** detailed view of the branchiae. **C.** Ventral view.

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