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# One-step beyond: northernmost record of *Berghia verrucicornis* (Costa, 1867)

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## Abstract

The nudibranch *Berghia verrucicornis* (Costa, 1867) was sampled during a citizen science survey along the Brittany coast as part of a macrofaunal species monitoring in the intertidal area. This note reports for the first time the occurrence of *B. verrucicornis* in Brittany. In addition, it is also the northernmost record for this species. Its distributional range is thereby increased by 200 km to the north.

**Keywords:** *Berghia verrucicornis*; Brittany; citizen science; new record; nudibranch

## Un pas en avant : signalement septentrional de l'espèce *Berghia verrucicornis* (Costa, 1867)

### Résumé

Le nudibranche *Berghia verrucicornis* (Costa, 1867) a été échantillonné lors d'une sortie de science participative le long des côtes bretonnes, dans le cadre d'un suivi de la macrofaune des estrans. Cette note rapporte pour la première fois l'occurrence de *B. verrucicornis* en Bretagne. De plus, il s'agit du signalement le plus septentrional pour cette espèce. Son aire de distribution s'agrandit de 200 km vers le nord.

**Mots-clés :** *Berghia verrucicornis* ; Bretagne ; nouveau signalement ; nudibranche ; science participative

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## Introduction

The “Observatoire du Changement sur les Estrans” (OBCE, literal translation: “Observatory of the intertidal modifications”) citizen science program was created in 2018 by Bretagne Vivante - SEPNEB, an association aiming to protect the nature in Brittany. OBCE monitors several marine species whose distributional ranges reach their northern or southern limit on the coasts of Brittany. Gathering all marine enthusiasts naturalists and some scientists experts of Brittany, the project also aims to record any taxa which might newly occur either naturally or as introduced by humans activities within the area (Hily, 2018).

Recently, several sea slugs species have been reported either for the first time in Brittany, such as for the small species *Trinchesia genovae* (O'Donoghue, 1926), either as a northernmost record for *Spurilla neapolitana* (Delle Chiaje, 1841) or for both reasons like *Babakina anadoni* (Ortea, 1979) and *Felimida krohni* (Vérany, 1846) (Deleamarre *et al.*, 2016; Droual, 2018; Grall *et al.*, 2015). Unfortunately, the naturalist knowledge is currently decreasing in research laboratories as well as funding allocated for biodiversity assessment. In such context, citizen science might appears as a useful tool to help the scientists to cope with the lack of time and knowledge. Combined with the technology (e.g. passionate groups on social media), citizen marine naturalists might then act as early detectors of non-indigenous species or new distributional records (Giovos *et al.*, 2019; Kleitou *et al.*, 2019). In this study, we present such an example: *Berghia verrucicornis* is recorded in Brittany for the first time, a record which correspond to its northernmost record, during an OBCE field survey.

## Methods

Macrofaunal biodiversity assessment were made without strict protocol. The specimen was sampled under a rock boulder close to the kelps level at the mean low water level the 20th February 2019 at ‘La Pointe du Diable’, Plouzané, France (48°21'17"N 4°33'29,5"W) (Figure 1). The alive specimen was examined under a Zeiss Stemi 2000-C stereomicroscope and photographed with a Canon EOS 600D mounted on stereomicroscope. After identification, the specimen was fixed in 96 % alcohol, freshened up three times and kept at ambient temperature.

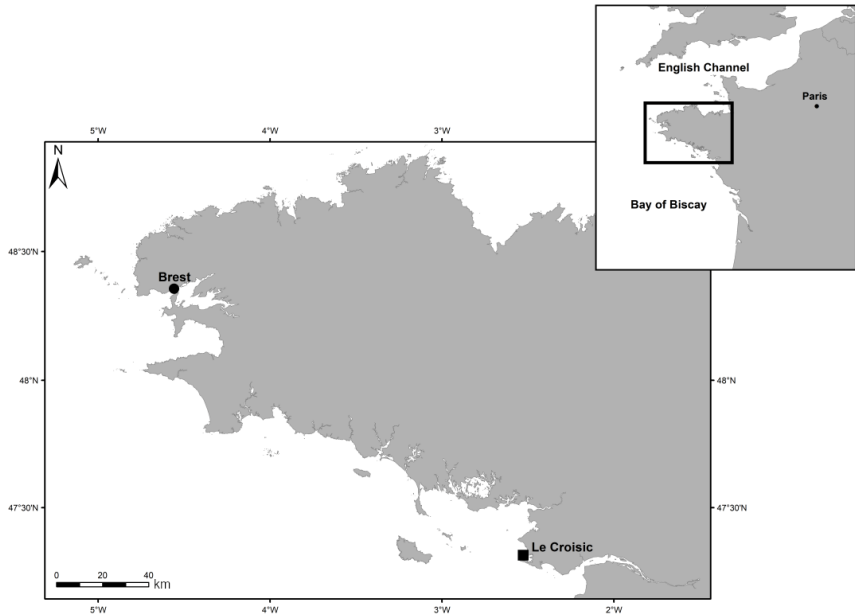
The specimen is available at the Paris National Museum of Natural History under the collection number MNHN-IM-2013-86089.

## Results

Material examined: one specimen, maximal length around 20 mm (specimen stretched out), Pointe du Diable, Plouzané, Brittany, France, the 20th February 2019.

## Identification

The species level have been reached thanks to all recent diagnosis available through the literature (Ballesteros *et al.*, 2012; Calado & Silva, 2012; Carmona *et al.*, 2014; García-Gómez *et al.*, 2011).



**Figure 1:** Map showing the northern historical sighting site (black square) of *Berghia verrucicornis* (Costa, 1867) at Le Croisic made by Labbé (1931) and the current northern record (black circle) at La Pointe du Diable close to Brest city.

## Diagnostic criteria (Figure 2)

Papillate rhinophores short and orange with white tips; two obvious orange bands from the rhinophores to the oral tentacles; two eyes clearly visible. Behind eyes, fade orange triangle linked to the pericardic region. Orange spot on pericardic area; orange line continuing to the cerata group 4. Cerata with white tip; subapical bright orange ring.

## Discussion

*Berghia verrucicornis* distribution, before the record here reported, ranges from the Mediterranean Sea to the Atlantic. In the Eastern Atlantic, it lives from Le Croisic (Labbé, 1931) in France to the African coasts (Edmunds, 1968; Muniain & Ortea, 1999). The northern limit of *B. verrucicornis* now reaches the Iroise Sea at the entrance of the Bay of Brest. Such localization expands the former northernmost locality by some 200 km to the north (Figure 1).

Among the numerous abiotic parameters impacted by climate changes, seawater temperatures experience strong increase over the last decades, especially in the European seas (Belkin, 2009). Modification of the seawater isotherms is usually considered as the main driver causing shifts of distributional ranges and rescheduling phenology at large spatio-temporal scales (Burrows *et al.*, 2014). Species are expected to adjust their geographical distribution to face these forthcoming environmental changes (Burrows *et al.*, 2014; Stuart-Smith *et al.*, 2017).



**Figure 2:** *Berghia verrucicornis* (Costa, 1867), alive specimen from ‘La pointe du Diable’, Plouzané near Brest, 20th February 2019, MNHN-IM-2013-86089. Scale bar: 5 mm.

Some studies demonstrate that marine species will track the isotherms velocities mainly poleward even if some species might go further south or show no responses, depending on their physiology, dispersal abilities, population size, but also from physical barriers, habitat or food suitability (Burrows *et al.*, 2014; Pinsky *et al.*, 2013). According to a meta-analysis, benthic Mollusca (post-larval stages for gastropods, bivalves, chitons) leading edge is increasing by almost 20 km per decade (Poloczanska *et al.*, 2013). The extension of *Berghia verrucicornis* is here reported 200 km from its last northern historical record almost 10 decades ago (Labbé, 1931) which seems coherent with the results of Poloczanska *et al.* (2013). However, because the temperature started to increase noticeably later than the last report of *B. verrucicornis*, the species might have expand recently its distributional range at a rate higher than 20 km per decade (Belkin, 2009; Cheng *et al.*, 2019). The expansion of the geographical distribution of *Berghia verrucicornis* probably results from the effect of climate change on seawater isotherms distribution rather than from a local introduction.

It also has to be noticed that new records of small nudibranch species along Brittany coast are not surprising, as this taxon has received poor attention during the last decades in this area. Indeed, the last large focused scientific study on nudibranchs in Brittany was

published more than 40 years ago (Bouchet & Moreteau, 1975) and has never been updated since. During most of benthic monitoring projects, the identification of nudibranchs usually does not reach the species level since the organisms lose their colours and cerata and are often in bad condition when stored in formalin (Droual, 2018). Additionally, as discussed above, climate change induce locally new distributional ranges for some taxa and lead to the establishment of new allochthone nudibranch species. This group should thus receive specific attention during campaigns or biodiversity assessment fieldworks, especially on live material, to acquire more data and to update species checklists (work in progress). Range shifts induced by climate change are usually easier to observe on the intertidal zone compared to the deeper waters, thereby programs like the OBCE project may be essential tools to improve biodiversity monitoring at large scales and in areas under-monitored by scientists (Garcia-Soto *et al.*, 2017; Wethy & Woodin, 2008).

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