# *Haminaea callidegenita* Gibson and Chia, 1989 (Opisthobranchia: Cephalaspidea), a Pacific species introduced in European coasts

## *Haminaea callidegenita* Gibson y Chia, 1989 (Opisthobranchia: Cephalaspidea), una especie pacífica introducida en las costas de Europa

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ABSTRACT

The cephalaspidean *Haminaea callidegenita* Gibson and Chia, 1989, described from the Pacific ocean, is recorded for the first time in localities outside that ocean: Atlantic and Mediterranean European shores. The introduction of marine molluscs for comercial culture in these areas is the most likely reason explaining the presence of this species in the European coasts.

RESUMEN

El cefalaspídeo *Haminaea callidegenita* Gibson y Chia, 1989, originario del Pacífico, se cita por vez primera fuera de este océano. El hallazgo de esta especie en las costas europeas del Atlántico y Mediterráneo parece debido a la introducción en estas mismas zonas de moluscos marinos destinados al cultivo.

KEY WORDS: Cephalaspidea, *Haminaea*, introduced species.
PALABRAS CLAVE: Cephalaspidea, *Haminaea*, especie introducida.

## INTRODUCTION

The number of species belonging to the genus *Haminaea* in European shores has been increased in the last years with the description of four new species: *Haminaea orteai* Talavera, Murillo and Templado, 1987; *Haminaea templadoi* García, Pérez-Hurtado and García Gómez, 1991; *Haminaea exigua* Schaefer, 1992 and *Haminaea fusari* Alvarez, García and Villani, 1993. Three other species were previously known: *H. hydatis* (Linné, 1758), *H. navicula* (Da Costa, 1778) and *H. orbignyana* (Férussac, 1822).

Recently, and during the collection of *Haminaea* species for chemical studies, another species clearly different

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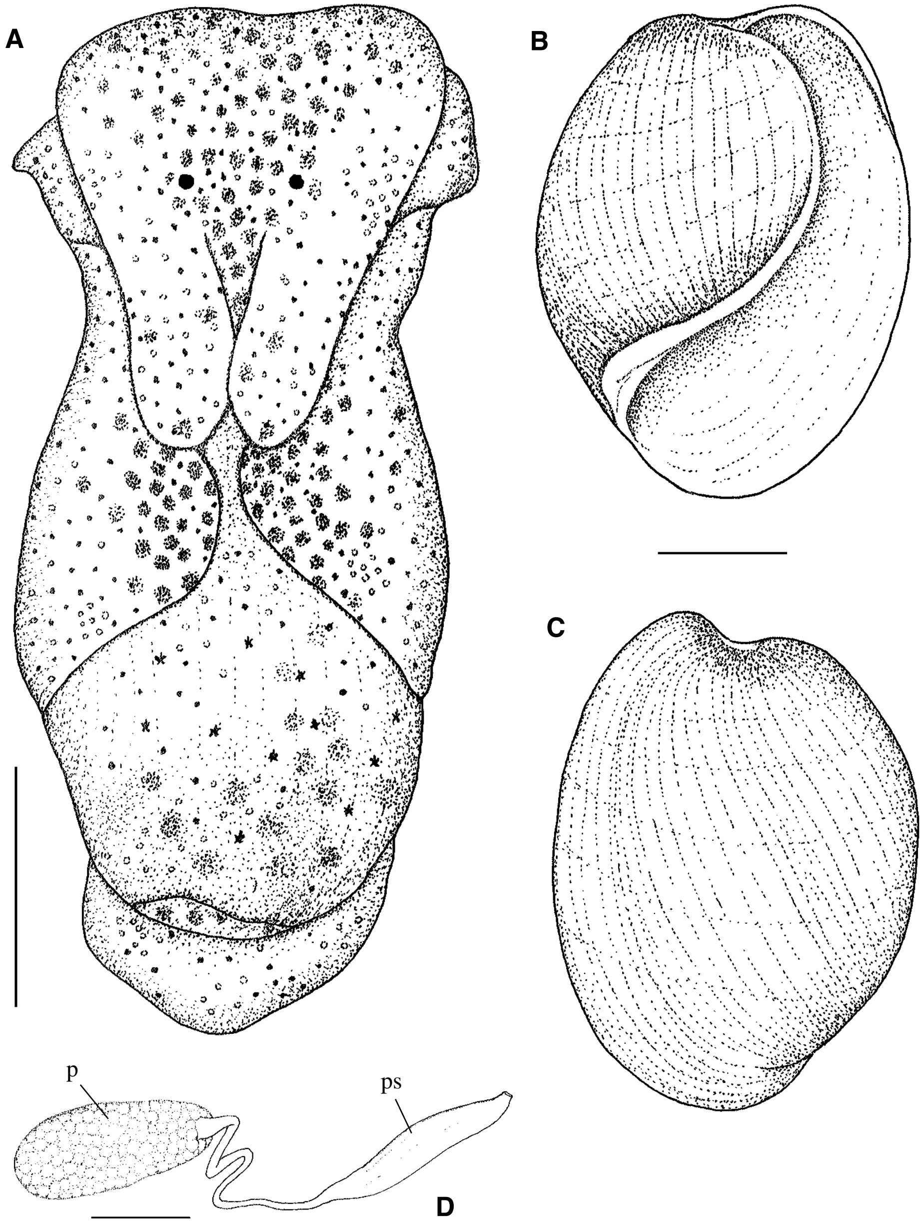



Figure 1. *Haminaea callidegenita* Gibson and Chia, 1989. A: dorsal view of a living animal from the Eo estuary (Asturias, Spain); B: ventral view of the shell; C: dorsal view of the same; D: male copulatory apparatus; **p**: prostate; **ps**: penial sheath. Scale bars, A: 5 mm; B, C: 2 mm; D: 1 mm.
*Figura 1.* Haminaea callidegenita *Gibson y Chia, 1989. A: vista dorsal de un ejemplar de la ría del Eo (Asturias, España); B: vista ventral de la concha; C: vista dorsal de la misma; D: aparato copulador masculino;* ***p****: próstata;* ***ps****: vaina peneal. Escalas, A: 5 mm; B, C: 2 mm; D: 1 mm.*

from all of the above listed was found in distant localities in Atlantic and Adriatic coasts. This species has turned out to be *Haminaea callidegenita* Gibson and Chia, 1989, described from the Washington State coasts (USA). No later records that widen its distributional area are found in the literature.

This survey deals with the reasons of the unusual distribution of *H. callidegenita*. Also, new data on the biology of this species are presented.

## RESULTS

Family Haminoeidae Pilsbry, 1895
Genus *Haminaea* Leach, [1820]
*Haminaea callidegenita* Gibson and Chia, 1989

**Material**: Giudecca, Venice lagoon (NE Italy), May 1992; 195 specimens found in shallow muddy bottoms, togheter with *Haminaea navicula*, on *Ulva* sp. All the alive animals measured between 25-30 mm. O Grove inlet, Arosa estuary, Pontevedra (NW Spain), December 1992 and February 1993; about 250 specimens collected in the intertidal area on sandy-muddy bottoms, associated with *Ulva lactuca*, *Zostera noltii* and *Z. marina*. La Linera inlet, Eo estuary, Asturias (NW Spain). Several specimens between 17-22 mm, found over seed of Manila clam *Ruditapes philippinarum* Adams and Reeve, 1850, coming from Marennes-Oleron (West France) and that was being introduced in the estuary for its culture; some others on sandy bottoms used for clam culture.

**External anatomy**: Body elongated, reaching 30 mm in extension; parapodial lobes well developed, though they do not meet dorsally over the shell. One of the most outstanding character in this species is the cephalic shield, deeply bifurcate in its posterior end (Fig. 1A).

Hancock's organ tubular in shape, lacking the lamellar structure present in European species of this genus.

The shell is fragile, globular (Fig. 1B, C), orange coloured externally, with marked growth lines; some regularly placed spiral striae are visible.

The ground colour is lighter than that described by GIBSON AND CHIA (1989a). In animals from the Eo estuary the background colour is light brown, with many opaque white and dark brown dots and spots. Dark pigment is concentrated on the edges of the parapodial lobes and on the area between the eyes, the latter also with an orange shade. Spots of the same colour are also visible under the shell, their number increasing with animal size.

**Internal anatomy**: The radular formula was 33 x 21-1-R-1-21 in a 23 mm fixed animal from Venice (Italy), and 24 x 18-1-R-1-18 in a smaller specimen from Galicia (Spain).

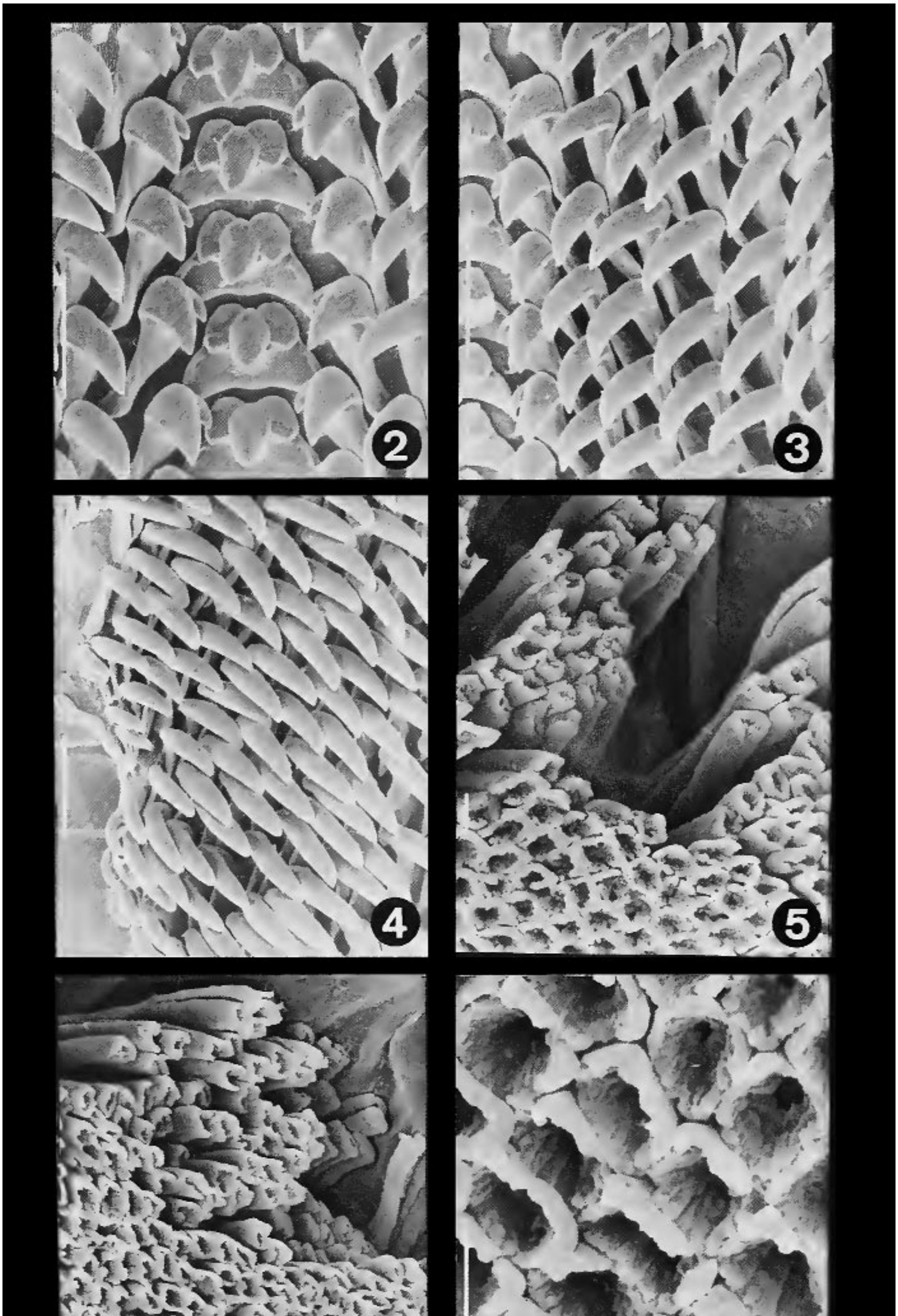
Rachidian tooth bearing three cusps, the central one more developed than the laterals. First lateral tooth smooth, hamate, bearing a well developed inner secondary cusp (described by Gibson and Chia as a notch). All other laterals are smooth, lacking the secondary cusp (Figs. 2-4).

The jaws are two symmetrical plates, provided with numerous elongated, hollow rodlets (Figs. 5-7).

The gizzard has three plates, each one bearing 12 (number variable among specimens) transverse ridges. Numerous little papillae are found over these ridges, but never reach the intervening troughs (Figs. 8-11).

The prostatic gland is unilobular and the prostatic duct is about once the length of the latter; the penis is unarmed.

**Remarks**: Several features clearly distinguish *H. callidegenita* from all European species. As far as the radula is concerned, its first lateral tooth has an inner and well developed secondary cusp, whereas in the European species it is either smooth or externally serrated. The shape of the rachidian tooth is also distinctive. A non-lamellar Hancock's organ and the unilobular prostate are also characteristic of *H. callidegenita*.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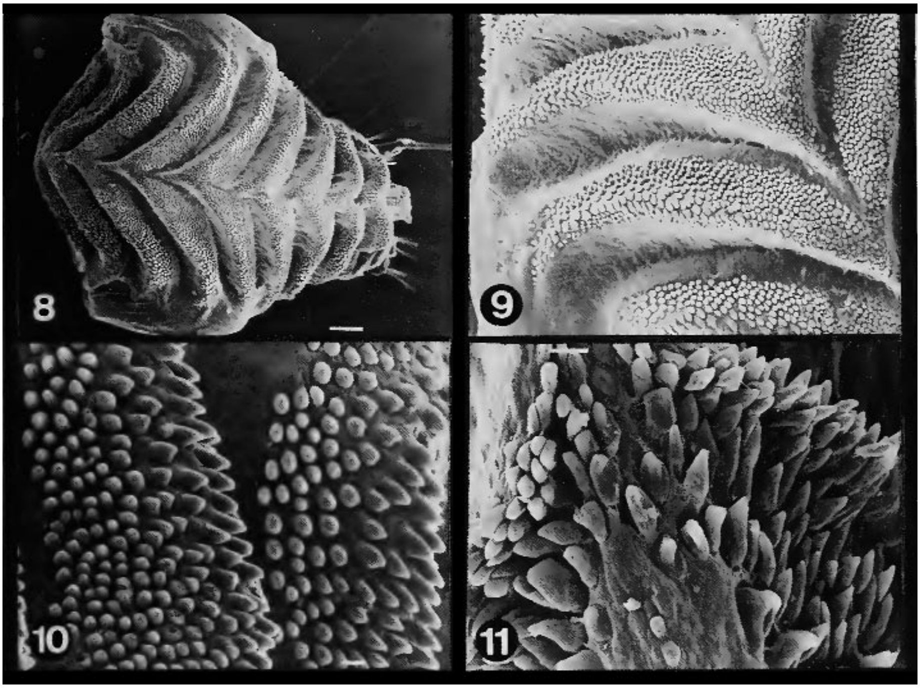


Figures 8-10. *Haminaea callidegenita* from Galicia (NW Spain). 8: general view of a gizzard plate; 9, 10: details of the transverse ridges. Figure 11. *H. callidegenita* from Asturias (NW Spain). Detail of the ridges of a gizzard plate. Scale bars, 8, 9: 100 µm; 10, 11: 10 µm.
*Figuras 8-10.* Haminaea callidegenita *de Galicia (NO de España). 8: vista general de una placa gástrica; 9, 10: detalles de las costillas transversales. Figura 11.* H. callidegenita *de Asturias (NO de España). Detalle de las costillas de una placa gástrica. Escalas, 8, 9: 100 µm; 10, 11: 10 µm.*

In American shores *H. callidegenita* lives in shallow and sheltered areas, associated with sandy and muddy bottoms; the same applies to its European habitats. The odd development of this species (both juveniles and veligers hatch from the egg mass) has been described in detail by GIBSON AND CHIA (1989b).

## DISCUSSION

The introduction of some molluscs species for aquaculturing seems to be the way in which *H. callidegenita* reached European shores. The culture of not autochthonous species is an usual practice in modern aquaculture. A good example is the introduction in all European shores of both Japanese oyster *Crassostrea gigas* (Thunberg, 1793) and Manila clam *Ruditapes philippinarum* (Adams and Reeve, 1850), coming both from North America and Japan. In the thirties the USA

(Left page). Figures 2-7. *Haminaea callidegenita* from Galicia (NW Spain). 2: Rachidian and first lateral teeth; 3: a view of the lateral teeth; 4: marginal teeth; 5, 6: elements of the jaws; 7: detail of the same. Scale bars, 2-4: 100 µm; 5-7: 10 µm.
*(Página izquierda). Figuras 2-7.* Haminaea callidegenita *de Galicia (NO de España). 2: diente raquídeo y primer lateral; 3: aspecto de los dientes laterales; 4: dientes marginales; 5, 6: uncinos de la armadura labial; 7: detalle de los mismos. Escalas, 2-4: 100 µm; 5-7: 10 µm.*

and Canada imported a great amount of spat (juvenile Japanese oyster) for culture in the Pacific shores; at the same time the Manila clam was accidentally introduced; this latter species quickly settled all the coast from Vancouver to California (see FLASSCH AND LEBORGNE, 1992).

Between 1971 and 1977 France made a big importation of both Japanese oyster and clam. The Manila clam came from Puget Sound (Canada), both as juvenile (seed) and adults; the latter were used as reproductives in the French hatcheries. In the case of oysters adult specimens came from the British Columbia (Canada), and the spat from Japan. Together with these two species, some other "not wished" ones were introduced. Despite the treatment with fresh water that any imported consignment must undergo, GRUET, HÉRAL AND ROBERT (1976) identified several algae, invertebrates and sea-squirts species that had been introduced in Bourgneuf Bay (France) together with spat and seed from Japan. These species had survived to the fresh water and appeared in the bay a year after the treatment.

The peculiar features in French coasts allowed a natural breed of the bivalves destinated to culture. Juvenile specimens (spat and seed) are sent out to other European countries: in this way importation from Pacific shores became innecesary.

Thus, it can be assure that this is the way *Haminaea callidegenita* reached European coasts from its original distributional area (Washington State, Pacific USA coast). First, this species settled in the Atlantic French coasts, and from this area was later introduced in Spain. This idea is supported by the fact that specimens from the Eo estuary were directly found over the seed of Manila clam just imported from the "claires" of Marennes-Oleron (France). The same applies for O Grove (Galicia), where molluscs are also cultured in its inlet. Likewise, Giudecca (Venice lagoon) is a molluscs culturing area. In fact, *R. philippinarum* was first established in Italy in the lagoon of Venice (Breber, 1985; Cesari and Pelizzato, 1985; Sacchi, Occhipinti and Sconfietti, 1989 in ZIBROWIUS, 1991). The settlement of some Mediterranean prosobranchs by means of this activity has already been pointed out (ROLÁN, TRIGO, OTERO-SCHMITT AND ROLÁN-ÁLVAREZ, 1985), whereas an exhaustive revision of species introduction in the Mediterranean Sea is given by ZIBROWIUS (1991). Although most of the species listed in this paper are considered as lessepsian, some of them were introduced as a result of shellfish movements.

All introduced opisthobranchs species have limited ranges where they become stablished. These are usually harbours, since all the introduced opisthobranchs species so far listed in literature have reached new areas by means of shipping, associated to their prey on ships' hulls (see CERVERA, GARCÍA GÓMEZ, TOSCANO AND GARCÍA, 1988 and GOSLINER, 1987, among others). This is the first time that the introduction of one species in a manner different to that above mentioned is recorded. Lessepsian migrants usually have wider new habitats, and some opisthobranchs species had already entered the Mediterranean through the Suez Canal (ZIBROWIUS, 1991).

As far as the status of European populations of *H. callidegenita* is concerned, the species have succesfully settled in sheltered areas such as O Grove inlet, where makes up regular spawning populations. On the contrary, in Giudecca, Venice, *H. callidegenita* was very abundant in May 1992, whereas no specimen was found a year later; in the Eo inlet few specimens have been collected in the real substratum. Additional regular samplings in these areas would give an accurate idea on the actual status of the population of this species.

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