

The habitat and relationships of *Plagyostila asturiana* (Gastropoda, Rissoidae)

by Serge GOFAS and Winston PONDER

Abstract. — *Plagyostila asturiana*, a species known only from shells for a long time, has been collected alive in St-Jean-de-Luz (Bay of Biscay) and Sagres (Portugal). It lives intertidally in St-Jean-de-Luz, together with *Tornus subcarinatus* on the underside of deeply (20-40 cm) buried rocks where oxygen is readily available. Morphology and anatomy confirm the systematic position in the family Rissoidae, and indicate relationship with *Cingula*.

Résumé. — *Plagyostila asturiana*, connue pendant longtemps par les seules coquilles, a été récoltée vivante à St-Jean-de-Luz (Golfe de Gascogne) et Sagres (Portugal). L'habitat observé à St-Jean-de-Luz se situe dans la zone des marées, avec *Tornus subcarinatus*, sous des pierres profondément enterrées (20-40 cm) mais toutefois oxygénées par la circulation d'eau dans le sédiment. La morphologie et l'anatomie confirment sa position systématique dans les Rissoidae, et indiquent une parenté avec *Cingula*.

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The monotypic genus *Plagyostila* Fischer, 1872 has been known for over a century from shells only. It was originally described as a rissoid, but its shell morphology is atypical to the point that one of us (PONDER, 1985) disputed its position within the Truncatelloidea (= Rissoacea).

Systematic collecting in the area of St-Jean-de-Luz (Bay of Biscay) in March 1988 yielded living specimens from an intertidal habitat. Examination of the living animal confirmed that it is a rissoid. Additional living material was obtained in Sagres (Algarve, Portugal) in May 1988 during a survey by the Muséum national d'Histoire naturelle of Paris, from a somewhat different habitat.

HABITAT

The collecting site of *Plagyostila* at St-Jean-de-Luz (43°24' N, 01°18' W), was a rocky intertidal platform, around the lower level of neap tides. The bedrock is a flysch with alternating decimetric layers of sandstone and shale, and differential erosion has created extensive depressions in which coarse sediment and rocks are trapped despite heavy surf. The surface of the deeply embedded stones was encrusted with ferric hydroxides, possibly resulting from bacterial activity and giving them a "rusty" appearance.

The under surface of cobbles and small boulders (10 to 50 cm in size) buried in the coarse sand is the habitat of a peculiar community including several Mollusca. There is a vertical stratification of species (fig. 1) :

- *Onoba semistriata* (Montagu, 1803) and *Striarca lactea* (Linnaeus, 1758) in the uppermost layer ;
- *Alvania lactea* (Michaud, 1830), *Leptochiton scabridus* (Jeffreys, 1880) and *Pseudopythina macandrewi* (Fischer, 1867) in a slightly deeper position (ca. 10 cm below the surface of the undisturbed sediment) ;
- *Plagyostila asturiana* (Fischer in de Folin & Périer, 1872), *Alvania carinata* (da Costa, 1778), *Tornus subcarinatus* (Montagu, 1803) and *Lepton* sp. in the lowest stratum, 20 to 40 cm under the surface of sediment.

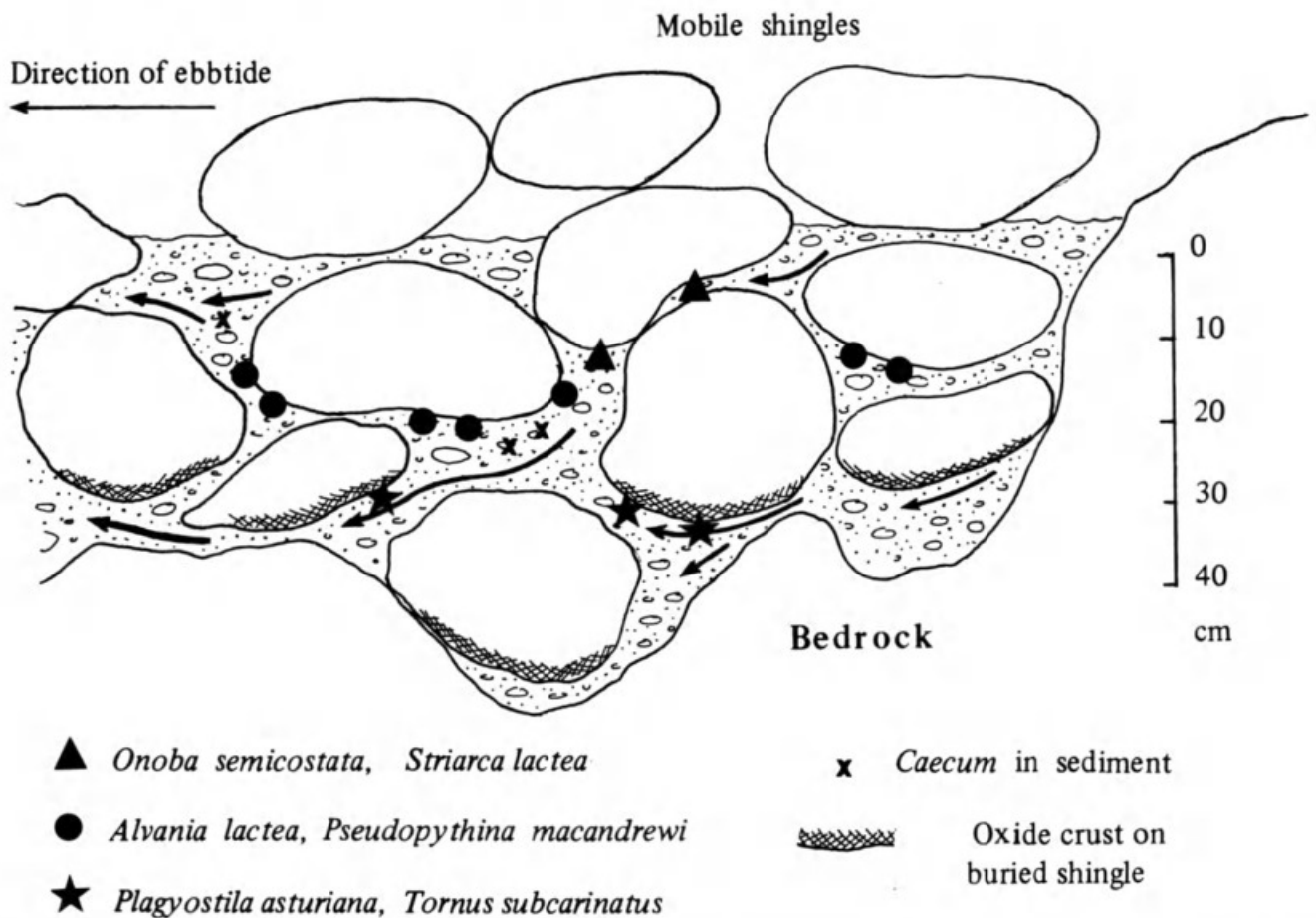


FIG.1. — Stratification of micromollusc populations among buried stones on the intertidal platform, St-Jean-de-Luz.

All these species remained attached to the surface of the stones despite the disturbance due to extracting them. Sieving of the interstitial sediment also yielded *Caecum glabrum* (Montagu, 1803).

Specimens in Sagres (37°01' N, 08°58' W), were collected subtidally, at a depth of 18-20 m where the foot of the cliff meets the flat, soft bottom. The coastline is exposed to heavy surf and the absence of silty/muddy deposits at the foot of the cliff is evidence of high wave energy.

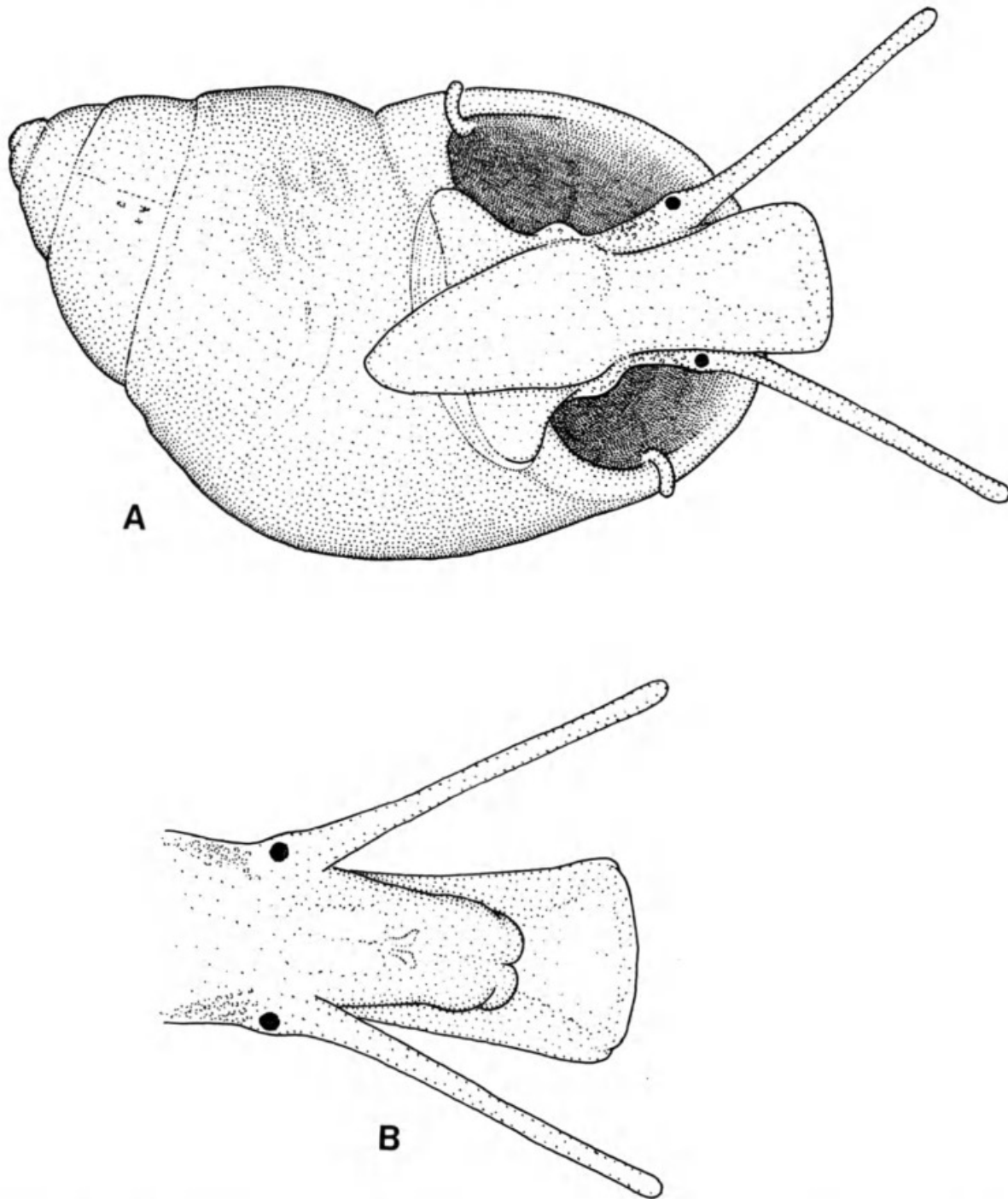


FIG. 2. — *Plagyostila asturiana* : external morphology of a specimen from St-Jean-de-Luz : A, crawling animal ; B, head and propodium. Actual length of shell : 2.65 mm.

The sample was obtained by using an air-lift pump, and consequently the microhabitat of living specimens was not observed. It is very likely to be also the lower side of boulders buried in sand.

REMARKS. — The intertidal platform of a rocky shore is a place where stones provide adequate shelter for many species. However, buried rocks cannot be a suitable habitat for

animals if the sediment is totally anoxic. Thus, it is essential that the place be exposed to enough wave energy so that the sediment will be coarse, permeable sand and not clay. A situation slightly above low water on average tides is probably an advantage, because underflow during ebbtide will provide repeated circulation down to the bedrock. The high wave energy surrounding the Sagres site has eliminated most of the fine-grained fraction in the sediment, thus presumably providing sufficient oxygenation to the underpart of rocks for molluscs, including *Plagyostila*, to live there.

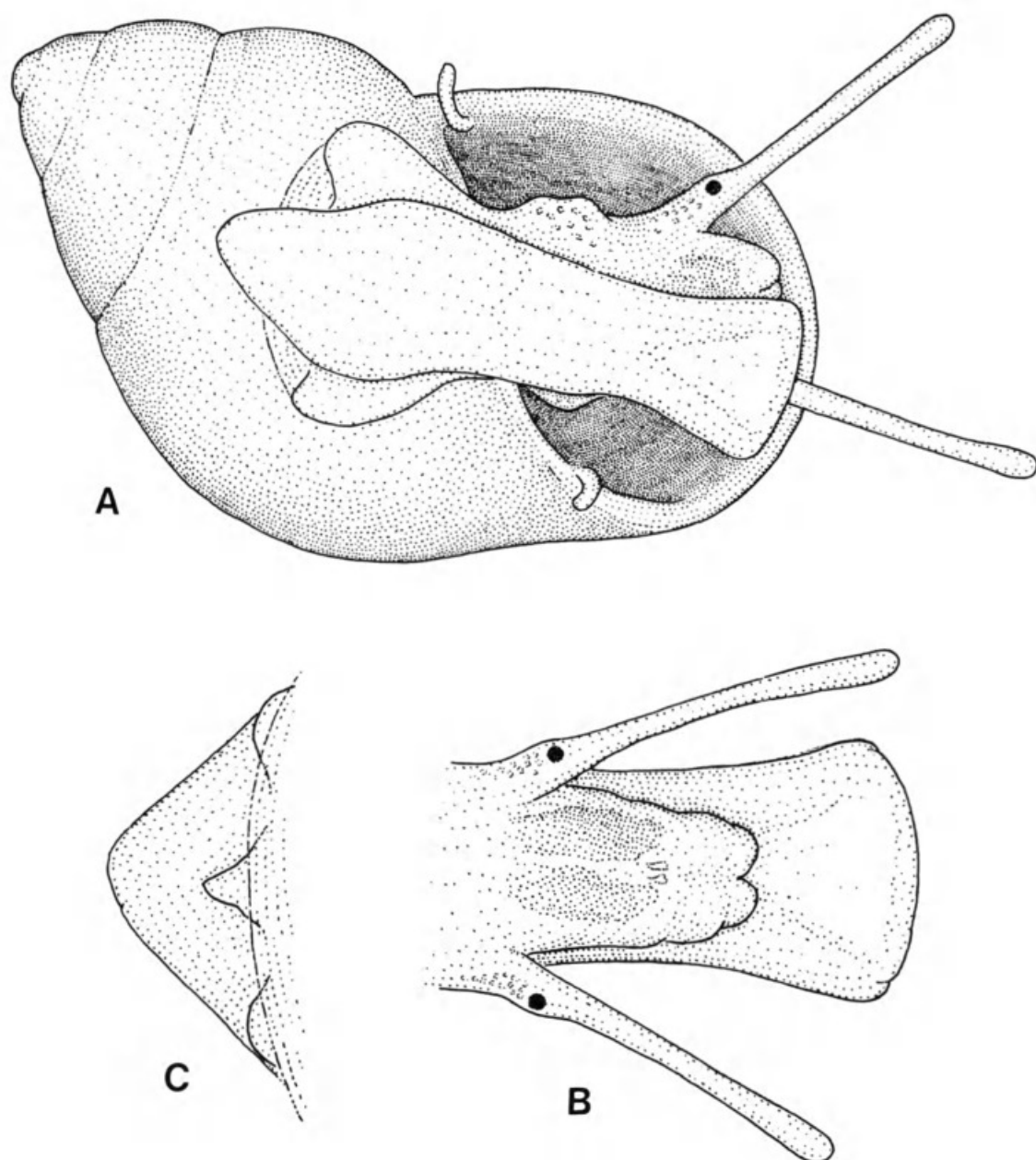


FIG. 3. — *Plagyostila asturiana* : external morphology of a specimen from Sagres : A, crawling animal ; B, head and propodium ; C, metapodium. Actual length of shell : 2.75 mm.

MORPHOLOGY OF *Plagyostila asturiana*

We provide below a short redescription of this species which can also serve as a diagnosis of the genus.

Shell small (2 to 3 mm in length), broadly ovate conic, white and glossy, completely lacking a periostracum, somewhat flattened dorsoventrally. Protoconch with 2 to 2 ¼ whorls (fig. 5), with faint spiral threads next to the suture, and crowded, sinuous growth lines preceding protoconch/teleoconch limit. Aperture pyriform with a simple outer lip ; columella thickened by a callus.

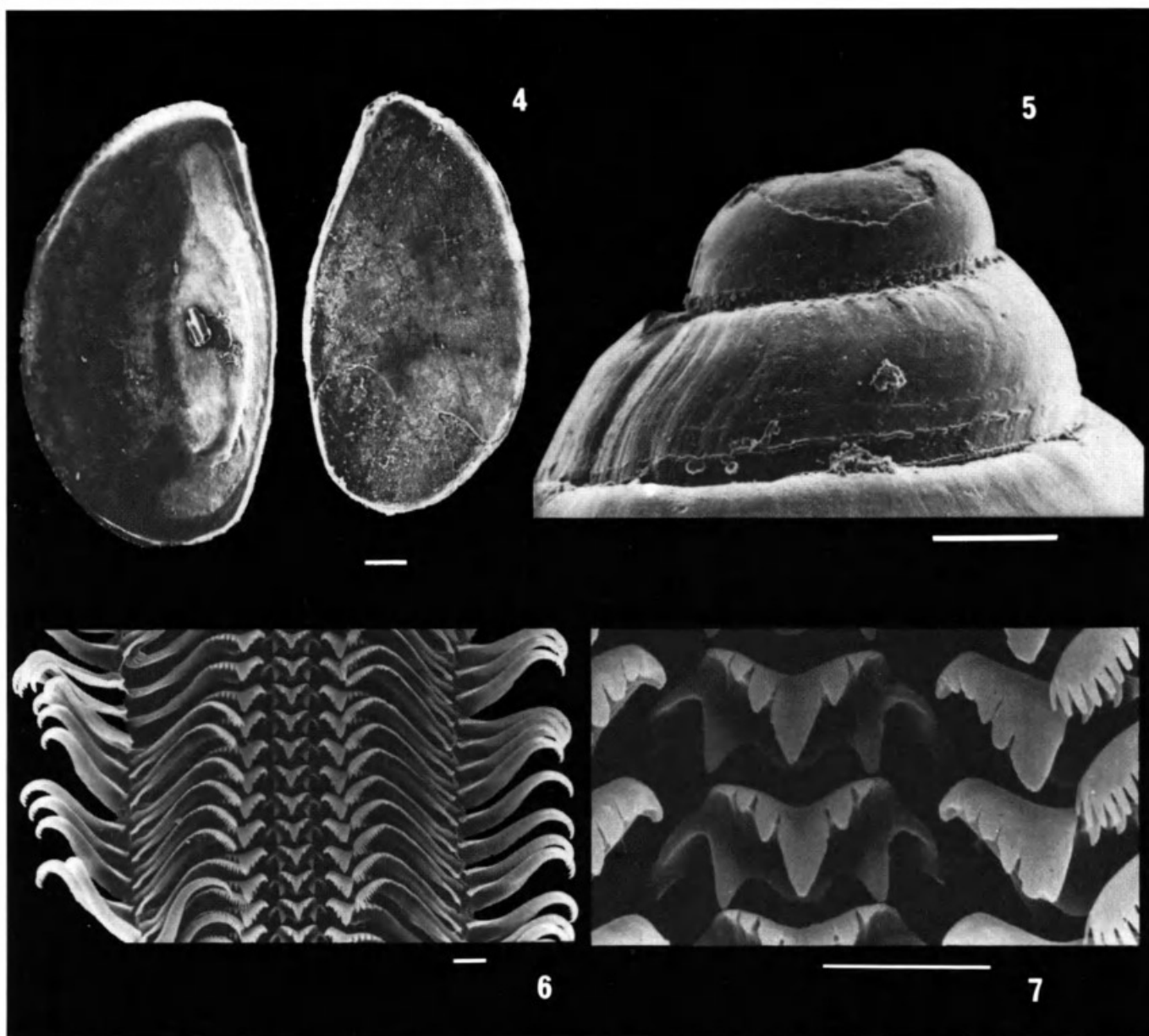


FIG. 4-7. — 4, Operculum of *Plagyostila asturiana* from Sagres, internal and external view respectively (scale bar 100 μ m) ; 5, protoconch of *Plagyostila asturiana* from Tangiers (scale bar 100 μ m) ; 6, 7, radula of *Plagyostila asturiana* from St-Jean-de-Luz : 6, partial view of the radula ; 7, detail of central and lateral teeth (scale bars 10 μ m).

Head-foot with slender cephalic tentacles and a large, bilobed snout. The reddish buccal mass may be seen through the translucent snout, and anteriorly to it a pair of small, bright jaws. Eyes small, black. Dense superficial white flecks behind the eyes, and over the flanks and the neck lobes. Foot with conspicuous, triangular anterior pedal gland ; posterior pedal gland not seen. Large opercular lobes ; operculum (fig. 4) paucispiral. Metapodial tentacle a small flap, with a distal tapering appendage. Mantle with a single, well-developed pallial tentacle on left and right sides.

Pallial cavity : Ctenidium well developed, filaments about twice as high as wide. Osphradium nearly as long as ctenidium, reaching posterior end of ctenidium but terminating a little behind its anterior end. Hypobranchial gland moderately well developed. Renal opening small, in posterior end of pallial wall.

Alimentary canal : Stomach short (stomach/style sac ratio 2.2-2.6 ; stomach length/stomach height 1.21-1.32). Loop of intestine just behind posterior pallial wall ; lies dorsally over the glandular oviduct between upper and lower oviduct glands in the female ; in male just behind prostate gland. Rectum straight within pallial cavity, lying alongside pallial oviduct in female. Anus just in front of anterior end of pallial oviduct in female. Pallial roof glandular anterior to anus.

Radula (descriptive standards of PONDER, 1985 : 11) : Typical of family ; central teeth (2-3) + 1 + (2-3)/1 1, with single pair of large basal denticles ; cutting edge with pointed cusps, primary cusp a little more than twice as long as adjacent cusps ; lateral margins at about 40°, thickened in upper half ; U-shaped ventral extension moderately developed ; dorsal margin strongly concave. Lateral teeth (4-5) + 1 + (5-6) ; inner row of cusps larger than outer row ; primary cusp broad, rather irregular, slightly longer than adjacent inner cusp, considerably longer than adjacent outer cusp. Marginal teeth with numerous, small, sharp cusps distally ; cusps on inner and outer marginal teeth subequal in size, present on the outer third of inner marginal teeth and on the outer quarter of outer marginal teeth.

Reproductive system

Male : Prostate gland oval, on the right side of posterior pallial roof ; closed with pallial vas deferens emerging from anterior end. Internally prostate gland with simple, slit-like lumen. Penis long (reaches to about posterior end of pallial cavity), straight when at rest and parallel sided to slightly tapering with blunt end. Penial duct straight.

Female : Pallial oviduct short, thick ; unusual in having long, ventral, slit-like opening. Upper oviduct gland abuts pallial oviduct (capsule gland) ; it is an ovoid, translucent mass consisting of coiled, tubular gland, with coiling pattern only slightly visible. Ventrally, on outer (right) side of oviduct two sperm sacs branch off from very short non-glandular part of oviduct between the upper and lower oviduct glands ; anterior sac (assumed to be bursa copulatrix) small, narrow ; abuts against intestinal coil (which occupies most of dorsal space between upper and lower oviduct glands). Long, narrow tubule lies immediately behind bursal duct on right latero-ventral surface of upper oviduct gland. Distal end of tubule swollen in some specimens, blind and recurved to point anteriorly for a short distance. This distal end is presumably the seminal receptacle. Remainder of tubule assumed to be homologue of thin-walled duct to upper oviduct gland in *Cingula* (PONDER, 1985, fig. 31-32) but homology not confirmed by histological examination.

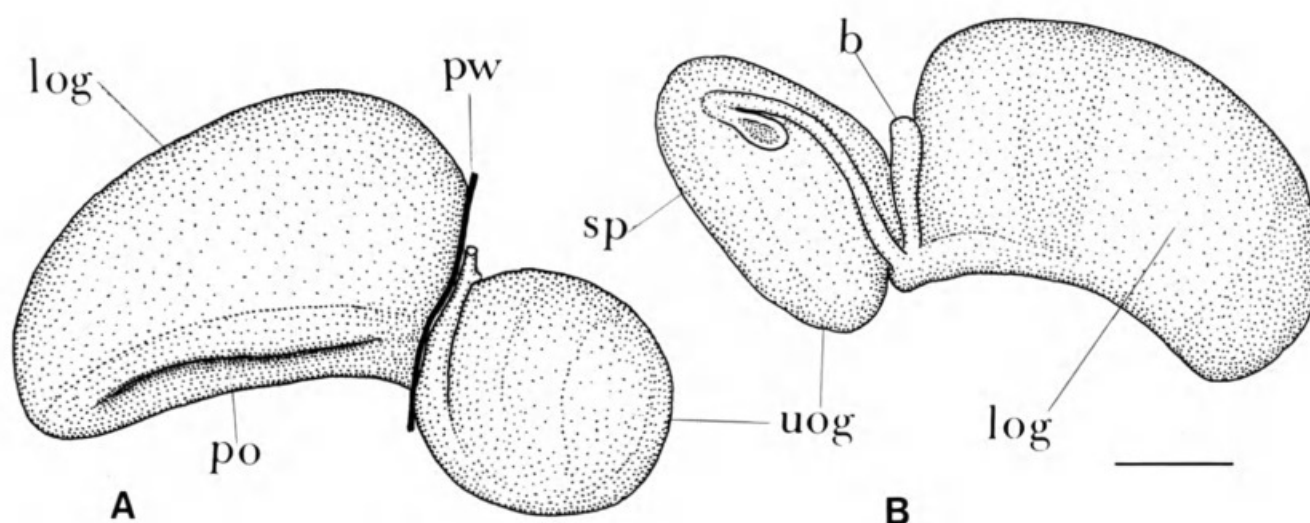


FIG. 8. — Female genital ducts of *Plagyostila asturiana* from Sagres : A, view from left side ; B, view from right side.

b : bursa copulatrix ; po : opening of pallial oviduct ; pw : posterior wall of pallial cavity ; log : lower oviduct gland ; sp : sperm pouch ; uog : upper oviduct gland. (Scale bar 100 μ m).

REMARKS. — The anatomy of the female reproductive system generally resembles that of *Cingula* except for the long, slit-like pallial opening. Such an opening is known only in *Merelina*, *Lucidestea* and *Obtusella* in the Rissoidae (PONDER, 1985). Species of *Alvania* also have a duct passing across the upper oviduct gland but tend to have multiple seminal receptacles and a large bursa copulatrix. The relationships of *Plagyostila* appear to lie with *Cingula*.

RANGE AND NOMENCLATURE

Plagyostila asturiana is reported on the southern shore of Bay of Biscay (type locality : off Gijón, 18 fathoms). Other reports are from southern Spain (CARROZA, 1977 ; VAN AARTSEN, MENKHORST and GITTENBERGER, 1984 and original material), northern Morocco (PALLARY, 1920) and La Macta, Algeria (PALLARY, 1900, 1920). A considerable range extension for the genus is the discovery of a single shell from Cape Verde Islands (BURNAY, 1989). This specimen shows no apparent conchological differences from mainland specimens but further material is needed to ascertain this occurrence.

The genus first appears as a *nomen nudum* with the spelling *Plagiostyla* and locality of collecting as Vigo Bay (P. FISCHER in DE FOLIN and PERIER, 1872a : 315). The genus and species were described by P. FISCHER in DE FOLIN and PERIER (1872b : 50, pl. 2, fig. 5) under the spelling *Plagyostila* and with type locality off Gijón. NORDSIECK (1972 : 160, 1980 : 79) introduced the incorrect subsequent spelling *Plagiostila*. *P. asturiana* is the type species of *Plagyostila* by monotypy.

The assignment of the genus has been controversial. COAN (1964) included it tentatively in the "Rissoinidae, subfamily Barleeinae". PONDER (1985) has disputed its position in the

Truncatelloidea and tentatively placed it among the Eulimidae on the basis of its unusual shell. *Plagyostila* is here reassigned to the Rissoidae as it was in the original description.

NORDSIECK (1980 : 79 and pl. 30, fig. 29a) has introduced an additional species, *Plagiostila* [sic] *pauperata*, from Helgoland, North Sea. The type material is possibly in the Rentner collection, Hamburg (R. JANSSEN, pers. comm.) and is not available for study. NORDSIECK's figure may be represent juvenile *Hydrobia* s.l. and certainly not a species related to *Plagyostila asturiana*.

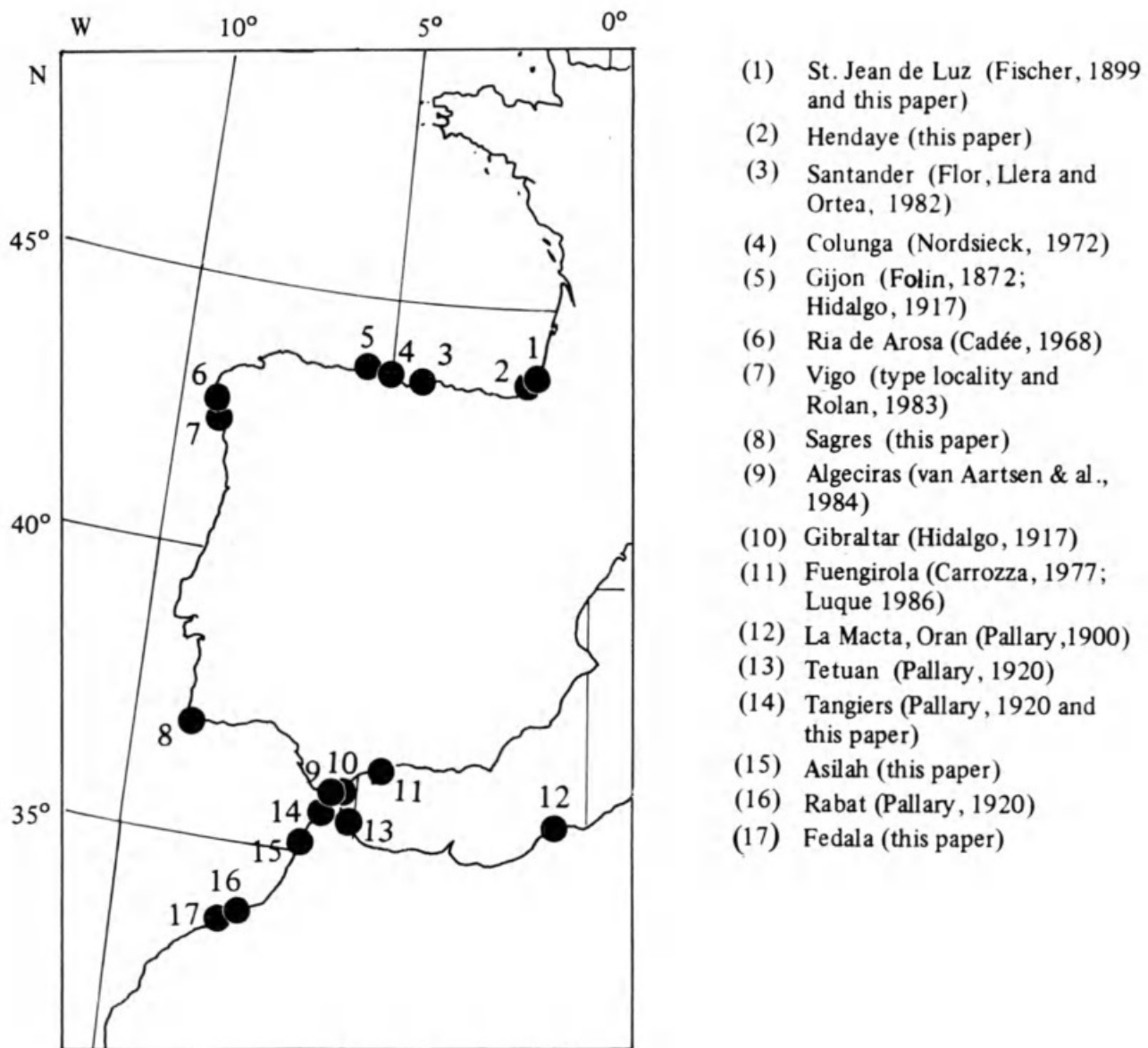


FIG. 9. — Range of *Plagyostila asturiana*.

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