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A redescription of *Malvinasia* Cooper & Preston, 1910 (Bivalvia: Galeommatoidea), with the description of a new species

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ABSTRACT

After its original description, the bivalve genus *Malvinasia* Cooper & Preston, 1910 was regarded as a junior synonym of *Mysella* or *Rochefortia*. However, due to the recent changes proposed in the classification and the concept of 'mysellids', the current status and concept of this genus remains unclear. In the present study, the relationships of the genus *Malvinasia* with *Mysella*, *Rochefortia*, *Rochefortula* and *Altenaeum* are reanalysed, based on the study of *Malvinasia arthuri* Cooper & Preston, 1910, the type species of the genus. This species has a resilifer markedly introverted below the umbones and a right valve with a single, peg-like tooth, located anterior to the ligament. This peculiar hinge morphology is consistent throughout ontogeny in the genus, being present in at least four other South American morphospecies. Based on this evidence *Malvinasia* is considered a full genus, which is redescribed. In addition, *Malvinasia piccola*, a new species from the Atlantic coast of southern Patagonia is described and *Mysella* (*Rochefortia*) *molinae* Ramorino, 1968 is reallocated to *Malvinasia*. Information on the gross anatomy of this genus is provided by first time.

INTRODUCTION

In recent years, several contributions (e.g. Boyko & Mikkelsen, 2002; Dias Passos, Domaneschi & Sartori, 2005; Dias Passos & Domaneschi, 2006; Güller & Zelaya, 2012; Ituarte, Martin & Zelaya, 2012) have dealt with members of *Mysella* s.l. After studying the type species of *Mysella* Angas, 1877, *Rochefortia* Vélain, 1878, *Rochefortula* Finlay, 1927 and *Altenaeum* Spaink, 1972, Gofas & Salas (2008) produced one of the most significant changes in the classification of the group, concluding that '*Mysella*' *bidentata* (Montagu, 1803) and several other European species usually placed in *Mysella* are not conspecific with *M. anomala* Angas, 1877, the type species of the genus, and introducing the genus *Kurtiella* for these taxa. In addition, the authors treated *Mysella* and *Rochefortia* as synonyms, instead of two different (sub)genera as previously considered by some authors (e.g. Morrison, 1962; Chavan, 1969; Coan, Scott & Bernard, 2000). However, Gofas & Salas (2008) did not discuss the relationship of these genera with *Malvinasia*, a genus proposed by Cooper & Preston (1910) for *Malvinasia arthuri* Cooper & Preston, 1910 from the Malvinas (Falkland) Islands. The generic placement of this species is controversial in the literature. Thiele (1934) pointed out that *Malvinasia* is scarcely different from *Mysella* and Dall (1910: 48) considered that *Malvinasia* 'is based on a normal species of *Rochefortia*'. Carcelles (1950) listed *M. arthuri* under *Mysella*, a decision subsequently followed by Powell (1960) and Dell (1964, 1990), although none of these authors gave evidence to support the generic change. Soot-Ryen (1951: 33) pointed out that '*Malvinasia arthuri* . . . [has a] different construction of the hinge' compared with that of the material of *Mysella charcoti* (Lamy, 1906) that he had studied, and Chavan (1969) retained *Malvinasia* as a full genus. *Malvinasia arthuri* is the only species historically reported under this genus.

The aims of this contribution are to redescribe the genus *Malvinasia* and its type species, with a view to revise the current status of the genus and its affinities with the other 'mysellid' genera recognized by Gofas & Salas (2008). In addition, the placement of other South American '*Mysella*' species within the genus *Malvinasia* is discussed and a new species from southern Patagonia is described.

MATERIAL AND METHODS

Specimens for this study were collected during several field trips to Patagonia and additional information was obtained from material housed in museum collections. Specimens from Puerto Deseado, Santa Cruz Province, were collected in the lower intertidal zone, in sandy patches along the rocky littoral, by using a sieve (1 mm mesh). Specimens from Bahía Buen Suceso and Bahía Aguirre, Tierra del Fuego, were collected in the subtidal by using a 2 mm mesh-size net trawled from a ship, and sorted from the sediment under a stereoscopic microscope. Museum information comes from the following repositories: Los Angeles County Museum, Los

Angeles (LACM); Museo Argentino de Ciencias Naturales 'Bernardino Rivadavia', Buenos Aires (MACN); Museo de La Plata, La Plata (MLP); Museum Victoria, Melbourne (MV); Natural History Museum, London (NHMUK); Museum für Naturkunde, Berlin (ZMB). The new material collected is deposited in MACN and MLP. Throughout the text, the term 'mysellid(s)' is used in a broad sense to refer to those genera that morphologically resemble the genus *Mysella* (i.e. *Mysella*, *Kurtiella*, *Rochefortula*, *Altanaeum* and *Malvinasia*).

Shells were studied by scanning electron microscopy (SEM). Measurements refer to shell length (L; maximum antero-posterior distance), shell height (H; maximum dorso-ventral distance, perpendicular to L) and shell width (W; maximum inflation of united valves). The ratios W/H and H/L were calculated; mean values, standard deviations and numbers of specimens measured are indicated in each case. For anatomical studies, specimens were decalcified in a formalin-acetic acid solution and examined for anatomical details under stereomicroscope. Histological serial sections were obtained from specimens fixed and decalcified by a 12-h immersion in Bouin's fixative. After rinsing in tap water for 24 h, specimens were dehydrated in ethanol and embedded in epoxy resin (Historesin Leica®). Sections (3.5 mm thick) obtained with a Leica® RM 2255 rotary motorized microtome, were stained with haematoxylin-eosin.

SYSTEMATIC DESCRIPTIONS

Malvinasia Cooper & Preston, 1910

Type species: Malvinasia arthuri Cooper & Preston, 1910, by monotypy.

Original description: 'Shell small, inequilateral, subtrigonal; right valve bearing one small cardinal tooth and curved laterals on either side; left valve bearing a large, curved, club-shaped cardinal and a broad, shell-like (*sic*), posterior lateral tooth, the anterior lateral in this valve being obsolete; ligament weak, internal' (Cooper & Preston, 1910: 113).

Emended description: Shell small, subtrigonal to subovate, somewhat inequivalve, right valve slightly overlapping left valve at dorsal margin; markedly inequilateral. Umbones displaced backward. Anterior end projecting, posterior end shorter, truncated to variable degree. Hinge plate narrow; appearing as cleft beneath umbones. Resilifer ovate, deep, markedly introverted below beaks at point at which hinge plate appears cleft, but clearly visible from inner view in sagittal plane; bordered by low rounded ridge. Ligament large, internal, cylindrical, with small slightly calcified ventral portion, the lithodesma. Right valve with single, strong, peg-like tooth, located anterior to ligament and hanging below hinge line; anterior to this tooth and posterior to ligament, hinge plate margin forms low well-marked ridge delimiting (with anterior and posterior dorsal shell margins) two grooves to accommodate anterior and posterior dorsal margin thickenings, the latter strongly marked, of left valve. Adductor muscle scars subequal. Pallial line well-marked, entire.

Remarks: In the original description of *Malvinasia*, Cooper & Preston (1910) confused left and right valves and erroneously regarded the resilifer/ligament as a 'cardinal' tooth. In addition, they mistakenly described the ligament as weak and did not mention the presence of a lithodesma. Chavan (1969: p. 530) also confused left and right valves when describing the shell outline ('posterior side produced'), but not when referring to the hinge teeth. However, in this case, the author misinterpreted the enlargement of the anterior dorsal margin of the left valve as a 'hooklike' tooth. It should be noted that the specimen figured by Chavan (1969: fig. E31, 17 a, b) does not correspond to any of the type specimens currently housed in NHMUK.

Malvinasia arthuri Cooper & Preston, 1910
(Fig. 1)

Malvinasia arthuri Cooper & Preston, 1910: 113, figs 7, 8 [Malvinas (Falkland) Islands; 3 syntypes NHMUK 1912.9.19.14–16].

Material examined: photographs of 3 syntypes (NHMUK 1912.9.19.14–16; Fig. 1A–G); 3 specs (ZMB 62821; labelled 'types'); photograph of 1 syntype (MV F31272); 2 specs Mullet Creek, Malvinas (Falkland) Islands (MACN-In 10168; Fig. 1H).

Redescription: Shell not solid, medium-sized for genus (maximum observed $L = 3.3$ mm), trigonal-elongate, somewhat inequilateral. Umbones very low, posteriorly displaced, located at about 70% of shell length, opisthogyrate; beaks small, acuminate (Fig. 1A–G). Dorsal margin not long, anterior and posterior half of dorsal margin forming slightly obtuse angle; anterior margin uniformly curved; posterior margin subrect or slightly convex, oblique; ventral margin wide, with even curve continuous with anterior margin (Fig. 1A–G). Shell surface with low, irregularly spaced commarginal ribs; usually 5–7 growth lines well-visible (Fig. 1A–C, E, F). Periostracum thick, straw-yellowish. Hinge plate relatively weak, appearing as cleft below umbones, but always visible in area immediately adjacent to ligament when viewed from inner sagittal plane (Fig. 1D, H). Right valve with long peg-like tooth anterior to ligament, hanging below inner hinge line; dorsal margin anterior and posterior to ligament forming shallow, relatively narrow groove to receive left dorsal margin. Left valve with deep triangular socket to receive right tooth; inner anterior dorsal margin enlarged forming long, strong ridge, particularly developed in a blunt prominence towards umbo (Fig. 1D).

Anatomy: One specimen in NHMUK shows two, inner and outer demibranchs (Fig. 1G). No other anatomical details known.

Distribution: Only known with certainty from Malvinas (Falkland) Islands.

Remarks: As stated by Dell (1964: 98): 'Preston . . . has distributed his new species quite widely. There is no indication in the original publications of the existence of a type-specimen for any of these species, much less a location'. Specimens of *M. arthuri* labelled as types are present in the Manchester Museum (McGhie, 2008), NHMUK, ZMB and MV. In order to stabilize the species names, and based on the specimens in NHMUK, Dell (1964: 98) designated lectotypes for several of Preston's species, *M. arthuri* among them (Dell, 1964: 216). At present the NHMUK houses two articulated specimens and a single valve of *M. arthuri* labelled as 'syntypes', one of them with the additional annotation of 'figured syntype' (Fig. 1A, D). However none of these specimens match with the figure provided by Dell (1964: text fig. 3). Furthermore, none of these specimens is correctly labelled as a lectotype. The label reading 'figured syntype' is not original, but added to one of the specimens by a former curator (A. Salvador personal communication, May, 2014), not specifying to which Cooper & Preston (1910) or Dell (1964) figure it refers. Due to these uncertainties and, according to ICZN Art. 74.5, we consider such lectotype designation as not valid and, consequently, all specimens in NHMUK are regarded as syntypes.

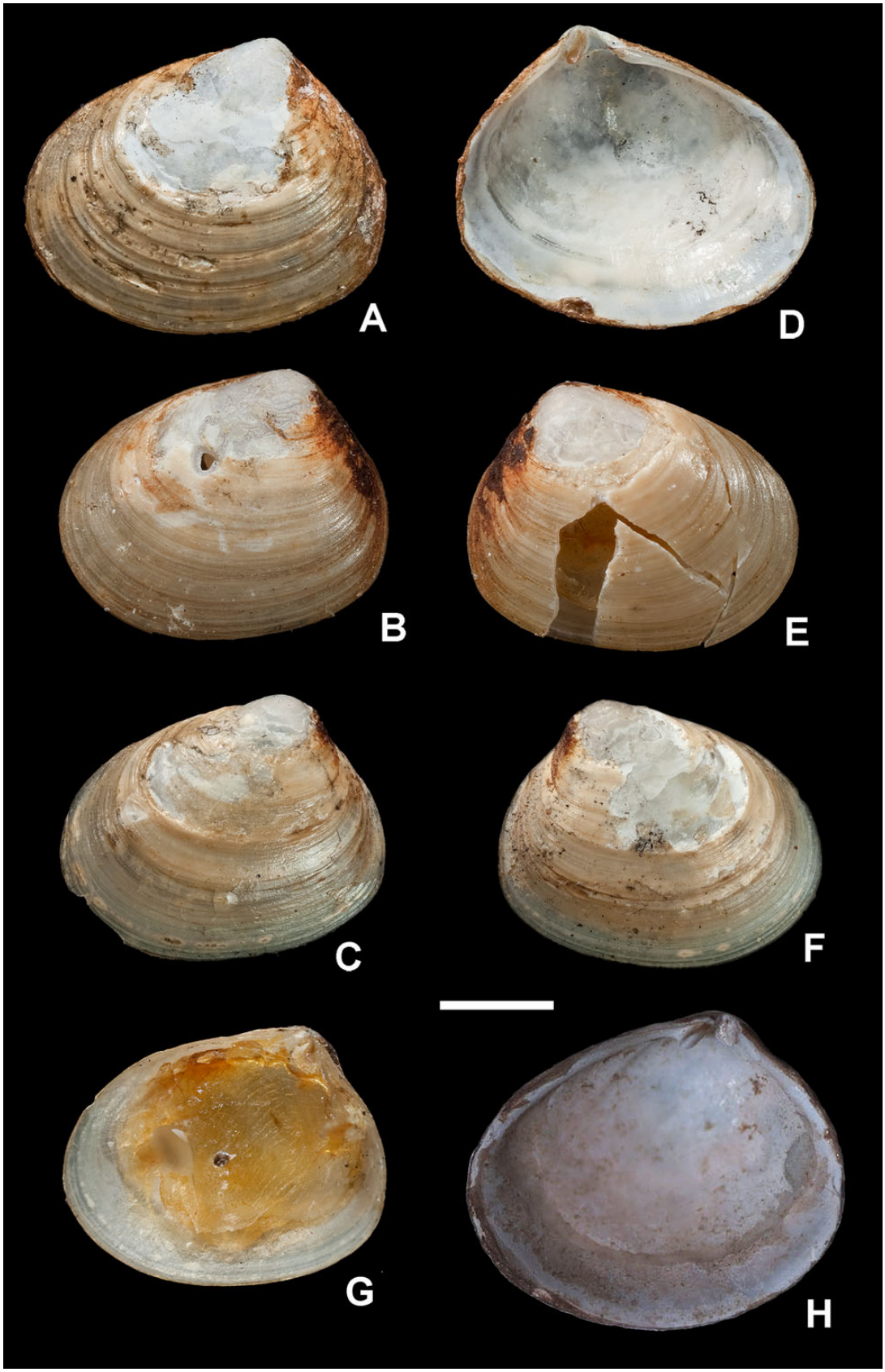

Figure 1. *Malvinasia arthuri*. **A–G.** Three syntypes in NHMUK. **A, D.** Left valve of one syntype (NHMUK 1912.9.19.14), outer and inner views; $L =$ 3.1 mm. **B, E.** Left (**B**) and right (**E**) valves of other syntype (NHMUK 1912.9.19.15); $L = 2.9$ mm. **C, F, G.** Outer and inner views of another syntype (NHMUK 1912.9.19.16): left valve (**C**) and right (**F, G**) valves; $L = 2.9$ mm. **H.** Inner view of specimen from Mullet Creek, Malvinas (Falkland) Islands (MACN-In 10168); $L = 3.4$ mm. Scale bar: 1.0 mm.

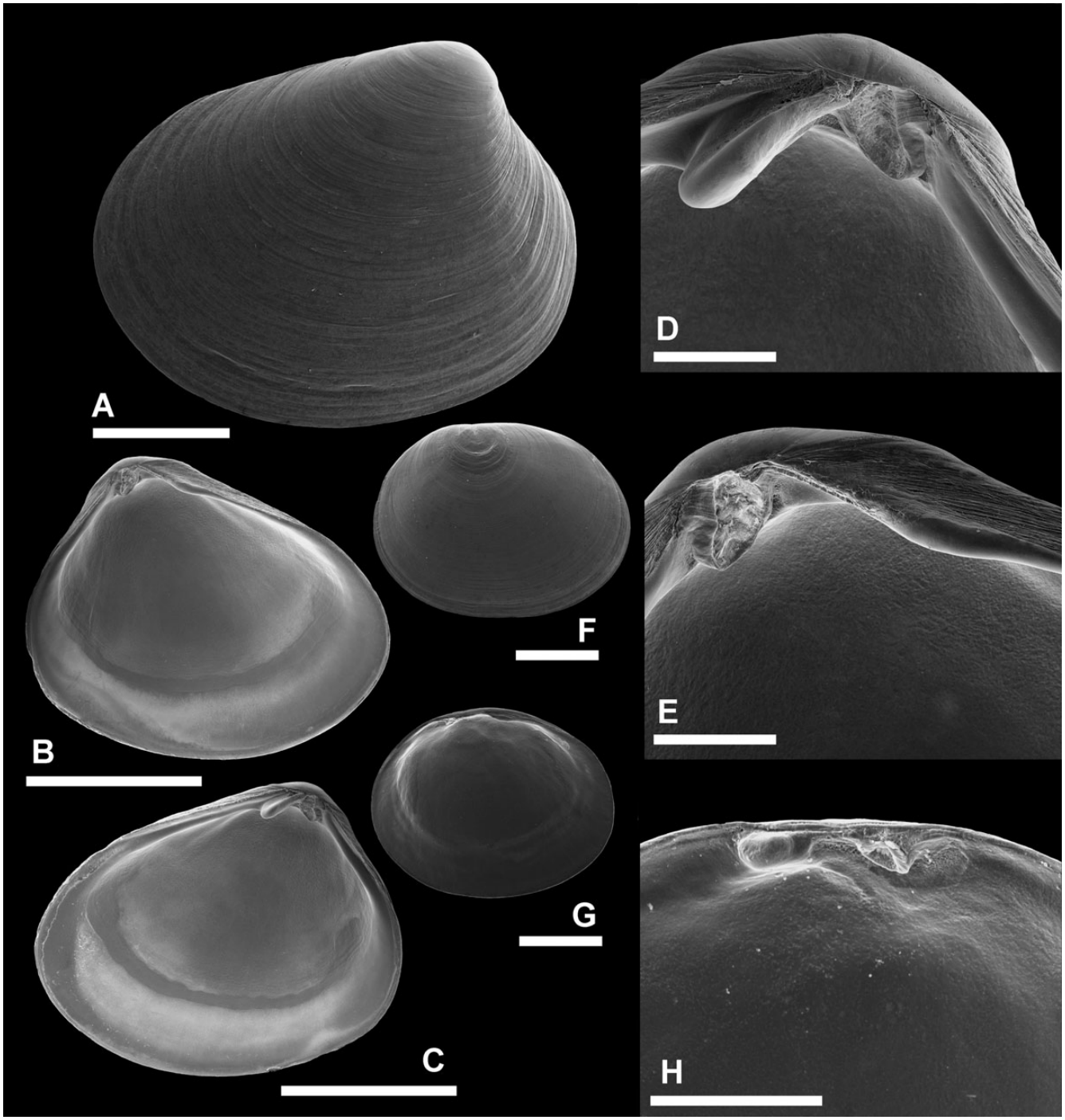

Figure 2. *Malvinasia cf. arthuri*, Bahía Buen Suceso (MACN-In 39886). **A.** Outer view of left valve; $L = 3.6$ mm. **B–E.** Inner views and details of hinge plate of another specimen, $L = 2.1$ mm: left (**B, E**) and right (**C, D**) valves. **F–H.** Brooding larvae: outer (**F**) and inner (**G**) views, and details of hinge plate of right valve (**H**). Scale bars: **A–C** = 1 mm; **D–G** = 200 μm; **H** = 100 μm.

Malvinasia cf. arthuri
(Fig. 2)

Remarks: Two lots from Bahía Buen Suceso (54°47.9′S, 65°14.7′W, 12 m) (MACN-In 39886) and Bahía Aguirre (54°54.9′S, 65°27.7′W, 11 m) (MACN-In 39885), southern Tierra del Fuego, resemble *M. arthuri* in general shell outline and hinge morphology (Fig. 2A–C). However, the specimens from Tierra del Fuego show the anterior end somewhat more projecting and pointed; the umbones are more prominent, located more posteriorly and with the beaks backwardly directed; the posterior end is shorter, with the posterodorsal margin slope slightly concave (Fig. 2A, B). Since it is difficult to determine the significance of these differences, these specimens are here tentatively identified as *M. cf. arthuri*.

One of the specimens ($L = 2.2$ mm) was found to have been brooding eight larvae within the inner demibranch, all of which were at the same developmental stage ($L = 600$ μm). The larval prodissoconchs showed a first portion (protoconch I?) with a

depression (the so called 'cicatrix') and a few strong commarginal folds, and a second portion (PII?) sculptured with numerous, regularly distributed, low commarginal ribs (Fig. 2C); the right valve (Fig. 2D–G) showed the initial stages of hinge development, with one strong anterior tooth, agreeing with that described for the larger specimens.

***Malvinasia piccola* new species**
(Figs 3–6)

Types: Holotype (MACN-In 39882), 47°45′S, 65°52′W, Puerto Deseado, Santa Cruz, Argentina; 15 ethanol preserved paratypes (8 paratypes MACN-In 39883, 7 paratypes MLP 13949) from type locality.

ZooBank registration: urn: lsid:zoobank.org:act:94FCBC30-5B99-4EFA-B1B2-C1E4C8DC0DBC

Etymology: The species name refers to the small size of the shells.

Other material examined: Two stubs with 8 shells and 4 specimens (MACN-In 39884) mounted and coated for SEM, all from type locality.

Diagnosis: Small, trigonal *Malvinasia*, with sharply truncated posterior end, acute anterior end and anterior part of dorsal margin sloping, nearly straight. Umbones somewhat globose, not projectiung from shell surface, posteriorly displaced.

Description: Shell solid, small for genus (maximum $L = 2.2$ mm), compressed (W/H ratio $= 0.55 \pm 0.03$, $n = 13$), strikingly inequilateral, anterior half longer than posterior one (Fig. 1A–D). Shell profile trigonal, typically 'nuculoid', relatively high (H/L ratio $= 0.79 \pm 0.1$, $n = 13$). Umbones wide, somewhat globose, not projecting from shell surface, slightly raised above dorsal margin,

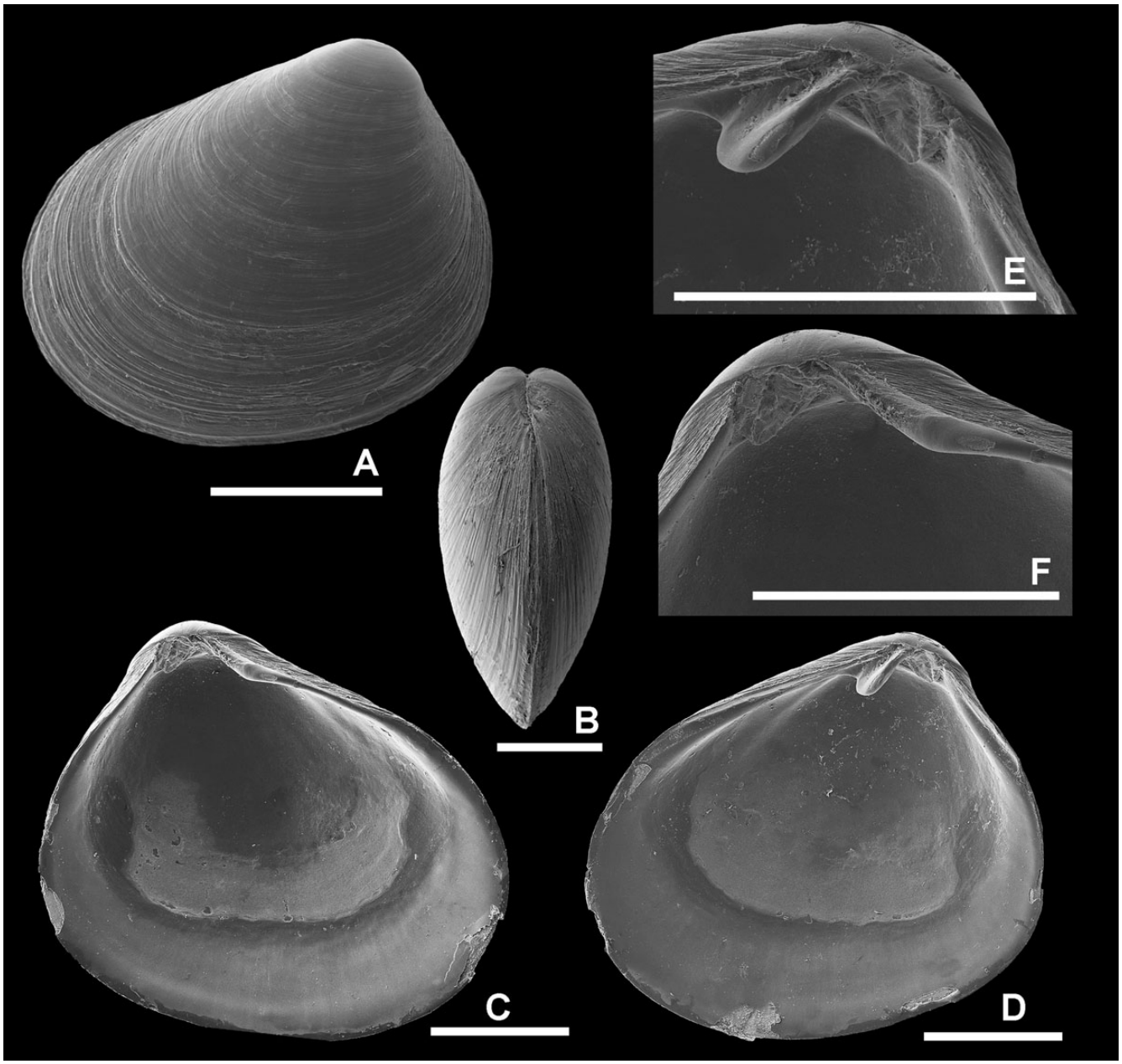

Figure 3. *Malvinasia piccola* n. sp., shell morphology. **A.** Holotype (MACN-In 39882); $L = 2.7$ mm. **B.** Posterior view of other specimen. **C–F.** Inner views and details of hinge plate of another specimen, 3.4 mm length: left (**C, F**) and right (**D, E**) valves. Scale bars = 500 μm.

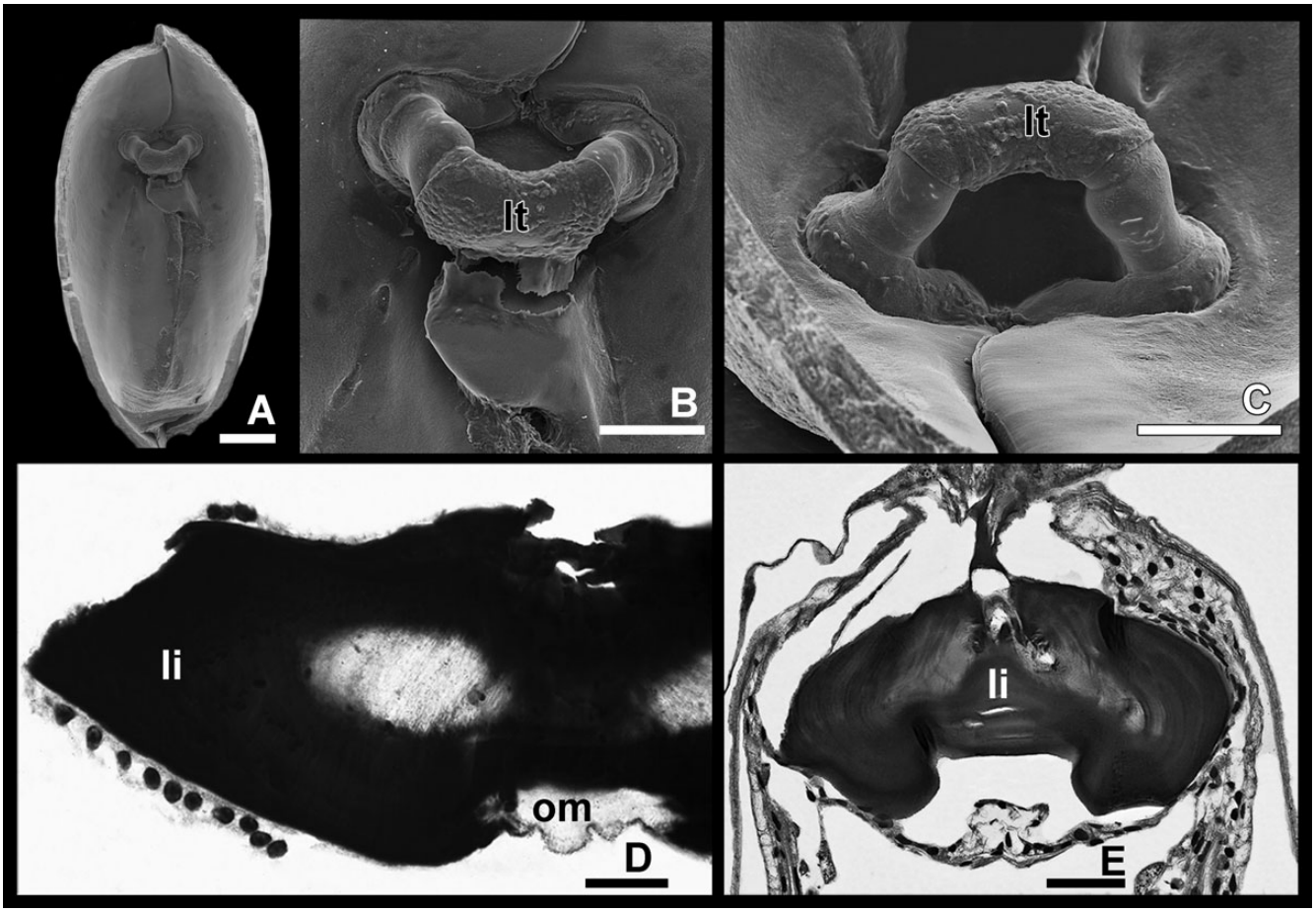

Figure 4. *Malvinasia piccola* n. sp., ligament. **A–C.** SEM photographs of the ligament *in situ* (valves broken). **A, B.** Ventral views of ligament, **C.** Anterolateral view of ligament. **D, E.** Transverse histological sections of ligament. Abbreviations: li, ligament; lt, lithodesma; om, organic matrix of lithodesma. Scale bars: **A** = 200 μm; **B, C** = 100 μm; **D** = 20 μm; **E** = 50 μm.

posteriorly displaced, located at 75–77% of shell length, opisthogyrate (Fig. 1A–D). Dorsal margin moderately short, anterior portion longer than posterior one, both forming nearly straight angle; anterior half of dorsal margin nearly straight, posterior half very slightly curved and sloping down. Anterior margin widely curved; posterior margin short, subrect (Fig. 1A, C, D). Ventral margin wide, evenly curved (Fig. 1A, C, D). Shell surface straw-yellow or greyish, sculptured with low, irregularly spaced commarginal ribs and slight growth lines (Fig. 1A). Prodissoconch oval ($L = 500$ μm), smooth. Hinge plate not solid, cleft just beneath umbones, leaving passage for internal ligament (resilium) (Fig. 3C–F). Right valve with only one, relatively strong, peg-like tooth anterior to ligament, hanging below hinge plate (Fig. 3D, E). Anteriorly to anterior tooth and posteriorly to ligament, hinge plate margin forms low, well-marked ridge delimiting (with anterior and posterior dorsal shell margins) two grooves (Fig. 3D, E) to accommodate anterior and posterior dorsal margins of left valve (Fig. 3F). Left valve edentulous, dorsal margin moderately thickened on each side of resilium, forming short lamellae that interlock with grooves in right valve (Fig. 3E). Resilifer deeply recessed, limited by low marginal rounded ridge (Fig. 3E, F). Ligament strong, cylindrical (Fig. 4A–E), with wide, extremely thin, delicate calcified area forming a ventral shield, the lithodesma, partially covering anteroventral portion of ligament (Fig. 4B–D).

Anatomy: Mantle border thin, smooth, ornamented only with delicate frills at anterior third (Fig. 5A); widely open in long inhalant-pedal aperture extending for 2/3 length of mantle margin, separated from moderately small posterior exhalant aperture by short presiphonal suture. Ctenidial axis slightly tilted with respect to dorsoventral axis (Fig. 5A). Ctenidia nonplicate, inner and outer demibranchs present, the outer one reflected, represented by only one lamella (Fig. 5A, B). Outer demibranch small, slightly longer than half length of inner one, with about 10 filaments approximately parallel to posterodorsal shell margin (Fig. 5A). Inner demibranch with about 20 obliquely-directed filaments in larger specimens; ascending lamella less than half length of descending lamella. Interlamellar junctions absent. Tips of filaments of ascending lamellae attached to visceral mass tegument by tissue junctions. Left and right inner demibranchs fused at posterior end at level of presiphonal suture and slightly anterior to visceral ganglion (Figs 5C, 6D, E). Hypobranchial gland well developed in posterior portion of pallial cavity immediately behind point where suprabranchial chambers of left and right inner demibranchs join to form single chamber (Fig. 6B–D). Two types of gland cells present (Fig. 6B, C): acidophilic cylindrical cells with basal nucleus, interspersed with ciliated cells (Fig. 6G), and deeply basophilic cells, extending posterior to level of visceral ganglia (Fig. 6B, C, H), lining inner surface of funnel, ending in exhalant opening (Fig. 6A, D). Basophilic cells also present at adfrontal portion of gill filaments of posterior half of both inner demibranchs (Fig. 6E, F, I). Labial palps with 10 sorting ridges. Anterior part of foot heavily ciliated (Fig. 5B). Transverse section of anterior and posterior adductor muscles

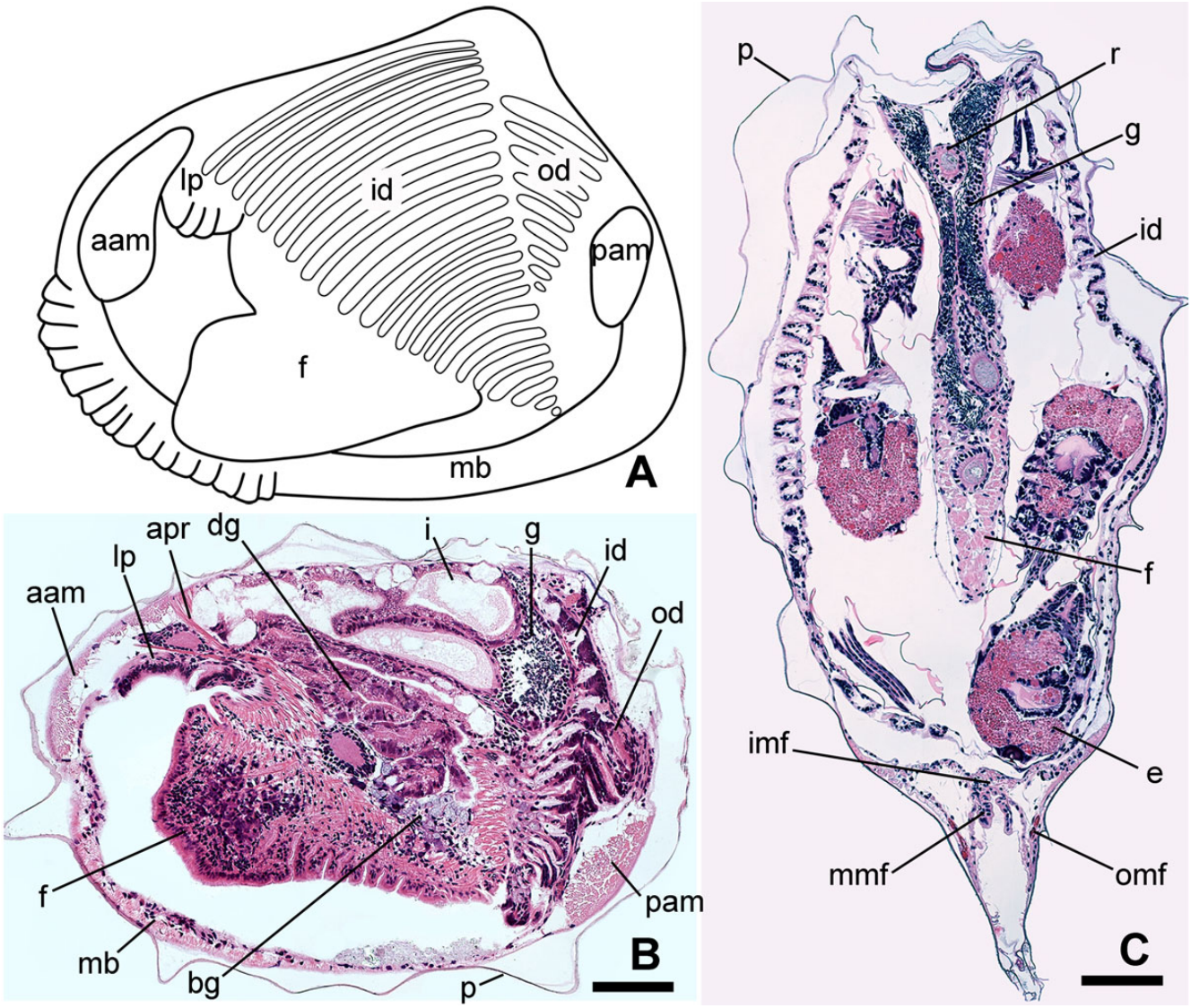

Figure 5. *Malvinasia piccola* n. sp., gross anatomy. **A.** Schematic drawing of gross anatomy viewed from left side. **B, C.** Histological sections. **B.** Sagittal plane. **C.** Transverse section. Abbreviations: aam, anterior adductor muscle; apr, anterior pedal retractor; bg, byssus gland; dg, digestive gland; e, brooding embryo; i, intestine; id, inner demibranch; imf, inner mantle fold; f, foot; g, gonad; lp, labial palp; mb, mantle border; mmf, medium mantle fold; od, outer demibranch; omf, outer mantle fold; p, periostracum; pam, posterior adductor muscle; r, rectum. Scale bars = 150 μm.

ovate, the anterior larger than posterior one (Fig. 5A, B). Anterior pedal retractor strong (Fig. 5B). Large byssus gland opening into ciliated groove (Fig. 5B).

Biological observations: Gonad hermaphrodite, male and female gametes coexisting in same specimen (Fig. 6F); seminal receptacle absent. Gill brooding was observed in three specimens, about 2 mm length, collected in April, May and September (austral autumn and spring), containing four to five embryos per demibranch, developing free in the branchial space.

Habitat: *M. piccola* lives in the mid and lower intertidal zone of sandy-muddy beaches. The population studied at Puerto Deseado, Santa Cruz, is part the infaunal assemblage dominated by the irregular sea urchin *Abatus cavernosus*.

Distribution: Thus far known only from type locality.

Remarks: *M. piccola* differs from *M. arthuri* in having a consistently smaller shell with more posteriorly displaced umbones, which are also more globose and not acuminate. The posterior end in *M. piccola* is sharply truncated and the anterior end more acute than in *M. arthuri*. The hinge plate in *M. piccola* is more solid, the right valve shows a shorter tooth and the left valve a stronger and more prominent posterodorsal margin than in *M. arthuri*.

Malvinasia molinae (Ramorino, 1968) new combination

(Fig. 7A, B)

Mysella (*Rochefortia*) *molinae* Ramorino, 1968: 209–210, pl. 2, figs 5, 6, pl. 7, figs 1, 4 (32° 58′03″S 71°33′05′W, Bahía de Valparaíso, Chile).

Diagnosis: Shell large for genus (maximum $L = 6.9$ mm), ovate, relatively high (H/L ratio $= 0.78 \pm 0.2$, $n = 6$), solid, anterior end larger than posterior one. Anterodorsal margin long, slope widely convex; posterodorsal margin short, slope nearly straight. Umbones low, located at 64% of shell length, beaks pointed, posteriorly directed. Shell surface sculptured with fine, densely-packed

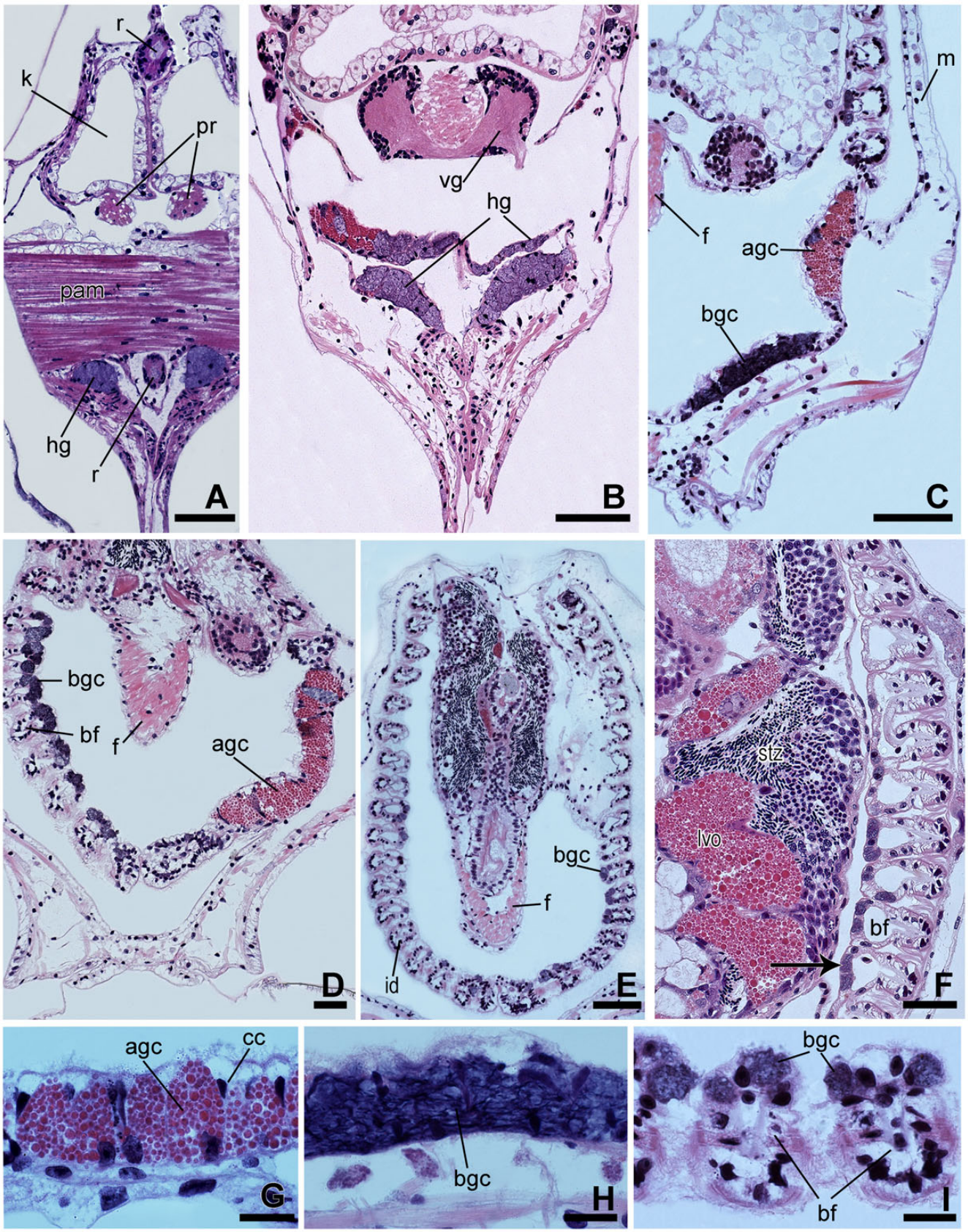

Figure 6. *Malvinasia piccola* n. sp., anatomical details. **A.** Transverse section at level of posterior adductor muscle. **B.** Transverse section at level of visceral ganglion and main portion of hypobranchial gland. **C.** Transverse section with detail of the two glandular components of hypobranchial gland. **D.** Transverse section at level of mantle fusion (anterior to **C**). **E.** Transverse section at level of posterior fusion of inner demibranchs.

growth lines. Periostracum pale brownish. Right valve with single, strong tooth anterior to ligament; left valve edentulous.

Remarks: Except for confusing left and right valves, the original description of *M. molinae* is considered adequate for recognizing the species and consequently a redescription is unnecessary. According to the original description, the holotype was deposited in the mollusc collection at the Estación de Biología Marina 'Montemar', Universidad de Chile, under the registration number 2700. However, according to B. Campos (personal communication, July 2014) at present a formal mollusc collection does not exist at this station, and there is no trace of the type material among Ramorino's studied samples still housed at Montemar (now part of the Universidad de Valparaíso). One specimen of *M. molinae* labelled 'holotype' was found at the Museo Nacional de Historia Natural, Santiago (MNHN 1095), without mention of any connection with the type material reported in the original description. The measurements of this specimen as well as shell morphological details are identical to those described and figured by Ramorino (1968) for the holotype of *Mysella* (*Rochefortia*) *molinae*. Consequently, despite the facts given above, there are no reasons for questioning the type status of this specimen, which is here figured for comparative purposes (Fig. 7A, B). The species has a single tooth in the right valve, and a large and recessed resilifer, surrounded by a ridge, two characters here recognized as diagnostic of *Malvinasia*, the genus to which the species is consequently transferred. *Malvinasia molinae* differs strikingly from *M. arthuri* and *M. piccola* n. sp. by having a larger shell with the anterior part of the dorsal margin widely curve (instead of straight) and having lower umbones and very small, acute beaks.

***Malvinasia* sp. 1**
(Fig. 7C–F)

Remarks: Two articulated valves from 14°15.1′S, 76°12′W, Bahía de la Independencia, Peru, 22 m (LACM 35–10), agree in hinge morphology with that of members of *Malvinasia* considered here. The shell of this specimen ($L = 5.6$ mm) resembles that of *M. molinae*, from which it differs in being lower and by having the posterior end more markedly projecting, resulting in a more ovate and elongated shell outline. In addition, this specimen has the anterior part of the dorsal margin not convex (as it is the case in *M. molinae*) and the tooth in the right valve is strikingly lamellate. We believe that this specimen corresponds to a new species, although the limited material currently available precludes us from describing it as such.

***Malvinasia* sp. 2**
(Fig. 7G, H)

Remarks: A single, strongly eroded right valve from 54°43.7′S, 64°14.2′W, Isla de los Estados, 18 m (LACM 71–264), clearly shows the hinge morphology here recognized as diagnostic for *Malvinasia*. This valve has a markedly triangular, high shell outline which clearly differs from all other species considered above. This single valve is inadequate for the description as a new taxon.

DISCUSSION

Malvinasia comprises a group of relatively homogeneous species, defined by the morphology of the hinge, in particular the presence of a single tooth in the right valve and the absence of differentiated teeth in the left valve (leaving aside the anterior and posterior enlargement of the dorsal margin of the valve either side of the ligament). This character clearly differs from the condition present in *Mysella*, *Kurtiella*, *Rochefortula* and *Altanaeum*, where the right valve has two teeth, anterior and posterior to the ligament. In addition, the left valve of *Altanaeum* has a well-differentiated tooth anterior to the ligament, and *Rochefortula* has two well-differentiated teeth (one anterior and one posterior to the ligament). Furthermore, *Rochefortula* has a weak external ligament, which is absent in *Malvinasia* as well as in the other 'mysellid' genera considered.

In *Mysella anomala* (type species of *Mysella*), as well as in *Altanaeum* and *Rochefortula*, the hinge plate forms a continuous platform beneath the umbones holding the ligament; in members of *Kurtiella* the hinge plate is interrupted beneath the beaks, while in *Malvinasia* there is an intermediate condition with respect to the condition in *Mysella*/*Altanaeum*/*Rochefortula* and *Kurtiella*, with a partially cleft hinge plate, although the hinge plate is still visible when viewing the valves internally in sagittal plane; the resilifer is here deeply recessed.

The study of specimens from a wide range of sizes of *M.* cf. *arthuri* (from shelled larvae to a specimen of $L = 4.3$ mm) allowed us to confirm that the hinge configuration (number of hinge teeth and the morphology and position of the resilifer) remains unchanged throughout ontogeny. Consequently the lack of teeth posterior to the ligament in the right valve is here regarded as diagnostic for the genus.

Gofas & Salas (2008) described the presence of only a single demibranch (the inner) in *Kurtiella*, while in *Malvinasia* both inner and outer demibranchs are present. Different degrees of reductions of the gill have been reported for other species of *Mysella s. l.* For example: Ponder (1967) and Franz (1973) described for *Mysella unidentata* (Odhner, 1924) and *Mysella planulata* (Stimpson, 1851), respectively, the presence of a single lamella in the outer demibranch; Dias Passos et al. (2005) described an outer demibranch as lacking in *Mysella charcoti* (Lamy, 1906), as did Boyko & Mikkelsen (2002) for *Mysella pedroana* Boyko & Mikkelsen, 2002; Güller & Zelaya (2012) described a single, reduced demibranch on each side in *Mysella cahuelmensis* (Zelaya & Güller, 2012). However, it should be noted that the actual generic placement for all these '*Mysella*' species remains uncertain.

The genus *Malvinasia* at present is represented by three species—*M. arthuri*, *M. molinae* and *M. piccola* n. sp., and two putative species from the southern part of South America, from Peru to Tierra del Fuego, in the Pacific Ocean, and extending northwards up to Santa Cruz Province (Argentina) in the Atlantic Ocean, including the Malvinas (Falkland) Islands. None of the 'mysellid' species thus far known from Antarctic waters, namely *Mysella charcoti*, *Mysella minuscula* (Pfeffer in Pfeffer, 1886), *Mysella antarctica* (Smith, 1907), *Mysella gibbosa* (Thiele, 1912) (all of them figured by Dell, 1964, 1990) and *Mysella narchii* Passos & Domaneschi, 2006 show the hinge morphology here regarded as diagnostic for *Malvinasia*. However, it should also be noted that not all 'mysellid' species from southern South America belong to *Malvinasia*. In fact, *Mysella mabillei* (Dall, 1908), *Mysella rochebrunei* (Dall, 1908), *Mysella sculpta* Soot-Ryen, 1957, *Mysella deanneae* Ramorino, 1968, *Mysella cahuelmensis* Güller & Zelaya, 2012 and *Mysella patagona* Ituarte *et al.*, 2012, some of them sympatric with the *Malvinasia* species studied herein, correspond to a different

F. Transverse section of middle visceral mass at level of hermaphrodite gonad showing adfrontal basophilic gland cells of inner demibranch (arrow). **G.** Detail of acidophilic and ciliated cells of hypobranchial gland. **H.** Detail of basophilic gland cells of hypobranchial gland. **I.** Transverse section of gill filaments. Abbreviations: agc, acidophilic gland cell; bf, branchial filament; bgc, basophilic gland cell; cc, ciliated cell; f, foot; hg, hypobranchial gland; id, inner demibranch; k, kidney organ; lvo, late vitellogenic oocyte; m, mantle; pam, posterior adductor muscle; pr, pedal retractor muscles; r, rectum; stz, spermatozoids; vg, visceral ganglion. Scale bars: **A–E** = 100 μm; **F** = 50 μm; **G–I** = 20 μm.

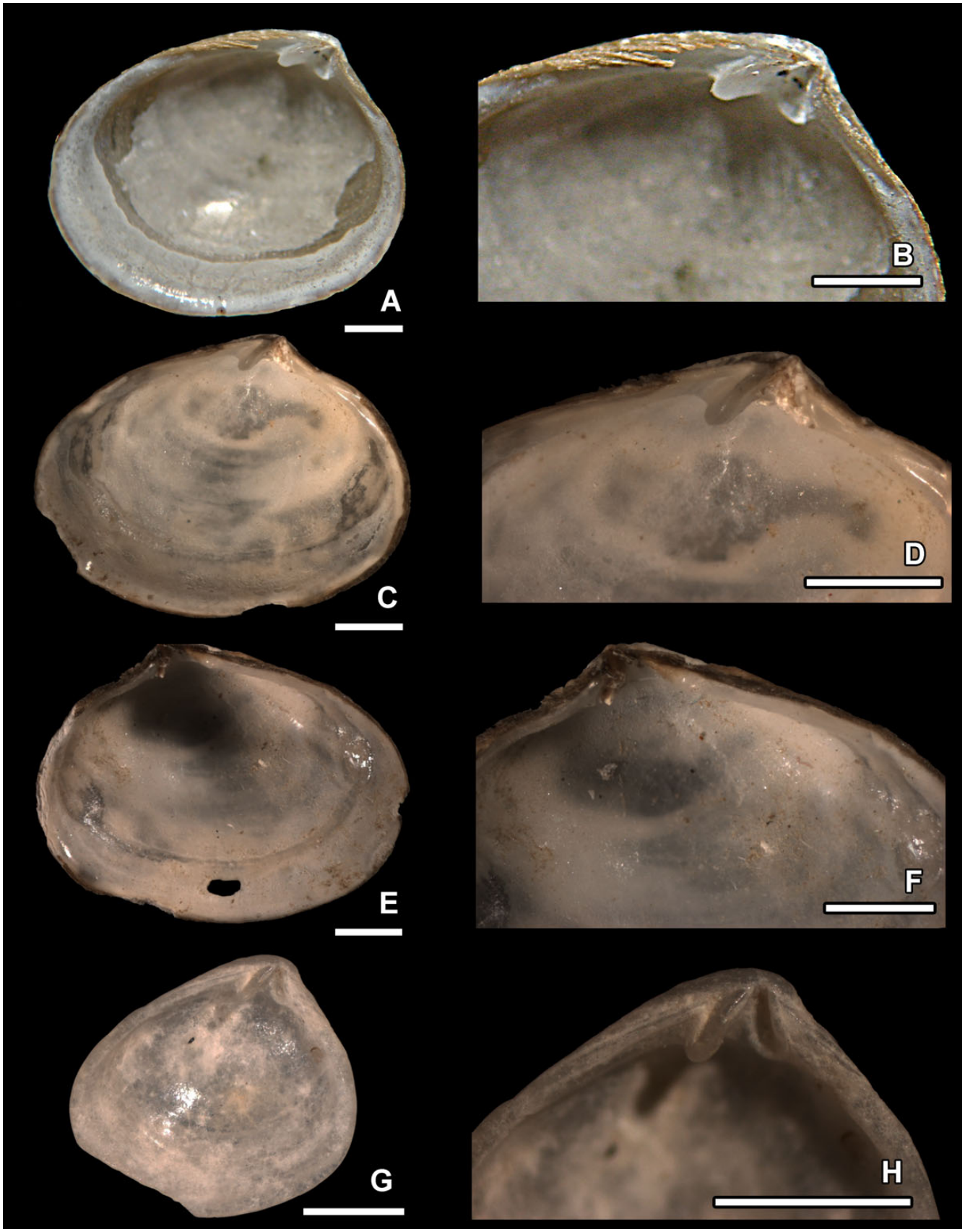

Figure 7. Other *Malvinasia* species. **A, B.** *Malvinasia molinae* (Ramorino, 1968). **C–F.** *Malvinasia* sp. 1. **G, H.** *Malvinasia* sp. 2. **A–D, G, H.** Right valves. **B, D, H.** Details of hinge plates. **E, F.** Left valves. **F.** Detail of hinge plate. Scale bars = 1.0 mm.

group of species, characterized by having two subequal teeth in the right valve, a partial cleft of the hinge plate beneath the umbos, and each gill comprising two demibranchs (the only exception is *Mysella cahuelmensis*, which has a single demibranch on each side). The generic allocation of these species requires further study.

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