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REDESCRIPTION OF *HIATELLA MERIDIONALIS* D'ORBIGNY, 1846 (MOLLUSCA, BIVALVIA, HIATELLIDAE) FROM ARGENTINA

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ABSTRACT

*The redescription of *Hiatella meridionalis* (d'Orbigny, 1846) is provided as first attempt to improve the systematics of the genus in the regions of Atlantic and western Pacific. This reanalysis is based on specimens collected in the vicinity of the type localities and is based on detailed morphology of samples that some researches consider a single, wide ranging species. From the morphological characters, the more interesting are: a high quantity of papillae at incurrent siphon; the retractor muscles of siphon divided in two bundles; the small size of the palps; the muscular ring in the stomach; and the zigzag fashion of the short intestinal loops. These characters distinguish the species from the other hiatellids so far examined. Type material of the species was examined, by first time illustrated, and the lectotype is designated.*

KEYWORDS: *Hiatella meridionalis*, morphology, anatomy, taxonomy, Argentina.

INTRODUCTION

There is considerable confusion in the taxonomy of the Mediterranean, Atlantic and western Pacific hiatellids. As their shells are highly irregular, it is difficult to find conchological characters for resolving the problem. As related below, a more conservative terminology has been applied by several authors, considering every sample as belonging to a single species. Considerably dissimilar specimens identified under the same epithet: *Hiatella solida* (Sowerby, 1834) or *H. arctica* (Linnaeus, 1767), are commonly found in collections, and even in the literature (e.g., Rios,

1994). The dissimilarity regards not only the shells, but also size, as some populations have specimens growing to more than 40 mm, while others the specimens barely reach 10 mm. It is also regards the bathymetry, there are samples collected intertidal, and others in deep waters. Besides, the geographic range of some species is also extraordinary, occurring from the Arctic to the Antarctic seas, through Mediterranean Sea, almost entire tropical areas, with records in the east and west coasts of the Atlantic, and east coast of the Pacific; normally in disjunct populations. With this data in mind, two conclusions are possible: (1) an astonishing environmental complacency of a small

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bivalve, possessing a fantastic power of dispersion, or (2) a misidentification of conchologically similar separated species.

This paper is the first attempt to resolve the systematics of the genus *Hiatella* Gray, 1824 (type species *Mya arctica* Linnaeus, 1767, OD), redescribing one of the species and extending the characters to the anatomy. The set of species that sometimes are considered all synonyms and sometimes with any degree of separation, includes from the European type localities: *Hiatella arctica* (Linnaeus, 1767); *H. rugosa* (Linnaeus, 1767); *H. minuta* (Linnaeus, 1767); and from type localities of the American Pacific coast: *H. bysifera* (Fabricius, 1780); *H. biaperta* (Bosc, 1801); *H. monoperta* Bosc, 1801; *H. striata* (Fleuriau, 1802); *H. bicarinata* (Schumacher, 1817); *H. gallicana* (Lamarck, 1818); *H. solida* (Sowerby, 1834); *H. unguana* (Grewinck, 1850); *H. bilirata* (Gabb, 1861); *H. flaccida* (Gould, 1861); *H. orientalis* (Yokoyama, 1920); *H. awana* (Yokoyama, 1924); *H. sakhalinensis* (Takeda, 1953) (Carcelles, 1944; Narchi, 1973; Rosenberg, 2005). Samples from Brazil to north Argentina are normally identified as *H. solida* or *H. arctica* (Narchi, 1973; Rios, 1994; Bremec *et al.*, 2000; Orensanz *et al.*, 2002).

Anatomical information on *Hiatella* is relatively weak, it can be found in Hunter (1949, on *H. gallicana* and *H. arctica*); Purchon (1958); Yonge (1971, on *Hiatella* sp.); Narchi (1973), and Domaneschi & Narchi (1998) (both on Brazilian sample of supposed *H. solida*). These reports are therefore used as a base for the present study.

MATERIAL AND METHODS

A complete list of examined material is presented after Description. The MZUSP specimens, containing individuals of every sizes, were all dissected. The studied material was collected during scallop fishing, as an epizoic on the shell of live scallop *Zygochlamys patagonica* (King and Broderip, 1832) in grounds 90-130 m depth. The specimens were fixed in 70% ethanol, unrelaxed. They were dissected by standard techniques, with the specimen immerse in fixative under a stereomicroscope. All drawings were made with the aid of a camera lucida. Serial sections of 5 µm of the middle portion of the whole animal were done also using standard histological procedures, stained with Mallory. Voucher material of a previous study (Narchi, 1973), deposited in Museu de Zoologia da USP, was also examined anatomically for basing the comparison and discussion of the presently studied

sample, at least with specimens from Brazilian coast. A complement of the morphological knowledge of the Brazilian and other samples will be published elsewhere; however, the current literature (mainly Narchi, 1973) brings sufficient data for the present discussion and comparison.

In the figures, the following abbreviations are used: **aa**, anterior aorta; **am**, anterior adductor muscle; **an**, anus; **ap**, posterior aorta; **au**, auricle; **bf**, byssal furrow of foot; **bg**, byssal gland; **by**, byssus; **cv**, ctenidial (efferent) vessel; **dd**, ducts to digestive diverticula; **dg**, digestive diverticula; **di**, inner demibranch; **do**, outer demibranch; **es**, esophagus; **fm**, posterior foot retractor muscle; **fr**, anterior foot retractor muscle; **ft**, foot; **gd**, gastric dorsal fold; **gf**, ventral gastric fold; **go**, gonad; **gs**, gastric shield; **gt**, gastric transversal typhlosole; **in**, intestine; **ip**, inner hemipalp; **mb**, mantle border; **ml**, mantle lobe; **mo**, mouth; **mp**, mantle papillae; **op**, outer hemipalp; **pa**, posterior adductor muscle; **pc**, pericardium; **pe**, periostracum cover of siphons; **pl**, pallial line; **po**, pedal orifice in mantle; **pp**, palp; **se**, excurrent siphon; **rm**, transversal rim; **rt**, rectum; **sa**, gastric sorting area; **sc**, subbranchial chamber; **sh**, shell; **si**, incurrent siphon; **sm**, siphonal retractor muscle; **sp**, gastric sphincter; **st**, stomach; **ty**, typhlosole; **ub**, shell umbo; **um**, fusion between left and right mantle lobes; **ve**, ventricle; **vg**, visceral ganglia; **vm**, visceral mass.

Institutional abbreviations: **BMNH**, The Natural History Museum, London, England; **MACN**, Museo Argentino de Ciencias Naturales "Bernardino Rivadavia", Buenos Aires, Argentina; **MZUSP**, Museu de Zoologia da Universidade de São Paulo, Brazil.

Systematics

Hiatella meridionalis (d'Orbigny, 1846)

(Figs. 1-24)

Saxicava meridionalis d'Orbigny, 1846:521 (pl. 81, figs. 21-22; published in 1847).

Hiatella solida: Bastida *et al.* 1992:696, Ciocco *et al.* 2005:1272 (*non* Sowerby, 1834).

Hiatella arctica: Pouliot, Bourget & Fréchette 1995:280 (*non* Linnaeus, 1767).

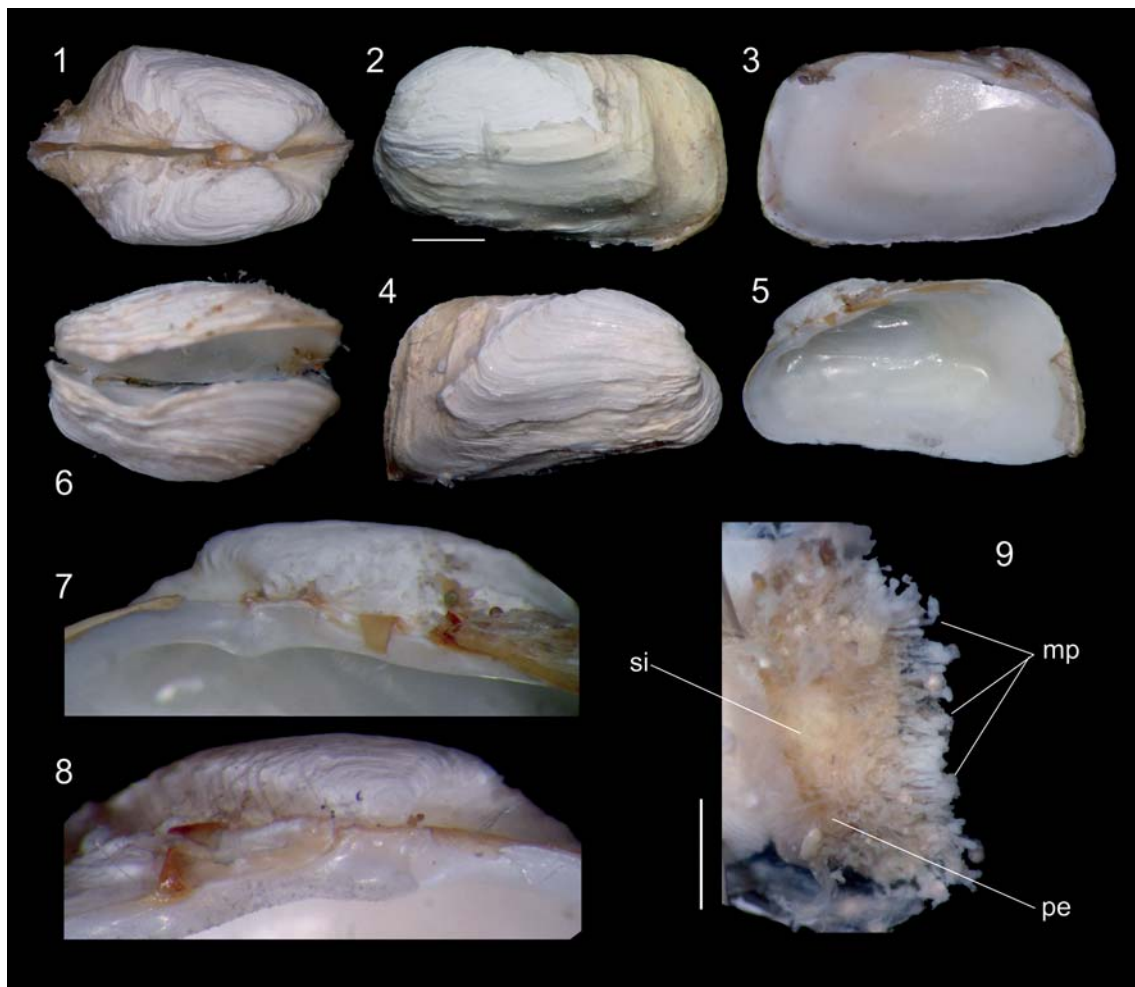
Types: BMNH 1854.12.4.672, 6 valves (examined, Fig. 18). Specimen Figs. 18A-B here designed as lectotype, the remaining specimens are the paralectotypes.

Type locality: "Malvinas (Falkland) Is. and Patagonia, Argentina".

Redescription

Shell (Figs. 1-8, 10, 12, 18-24): Outline somewhat rectangular (Figs. 2-5). Outer surface irregular, whitish, with strong growth lines and concentric undulations. Periostracum yellowish, transparent, thick, usually eroded close to umbos, extending beyond calcified shell, along siphons. Umbos weakly protruded, flat, located between middle and anterior thirds; young specimens with umbos slightly more protruded and pointed (Figs. 18E-M). Young specimens sometimes possessing one or two pairs of posterior radial cords, normally interrupted somewhat uniformly, forming successive spines, pointing posteriorly (Figs. 19, 20), or pustules (Figs. 18G, 21, 23), or a mixture of both (Fig. 22); this posterior sculpture disappearing

in larger specimens (Figs. 1-4, 18A-D). Ligament external, located posterior to umbos along about 1/7 of shell length (Figs. 1, 7, 8, 24). Hinge with single short cardinal tooth in each valve, just below umbos, each one with a fold-like platform base (Figs. 6-8, 18B, D, 24); anterior tooth in right valve (Figs. 5, 7). Gap narrow between both valves in posterior (siphonal) region (Fig. 6). Inner surface whitish, glossy (Figs. 3, 5, 24). Scar of anterior adductor muscle elliptical; located close to ventral-anterior corner of valve, at some distance from shell edge; scar area about 1/20 of valve surface. Posterior scars of posterior adductor muscle and anterior retractor muscle also elliptical, located close to dorsal edge of valves, between middle and posterior thirds of dorsal edge; area about double of anterior scar. Pallial line with shallow sinus (Fig. 24).

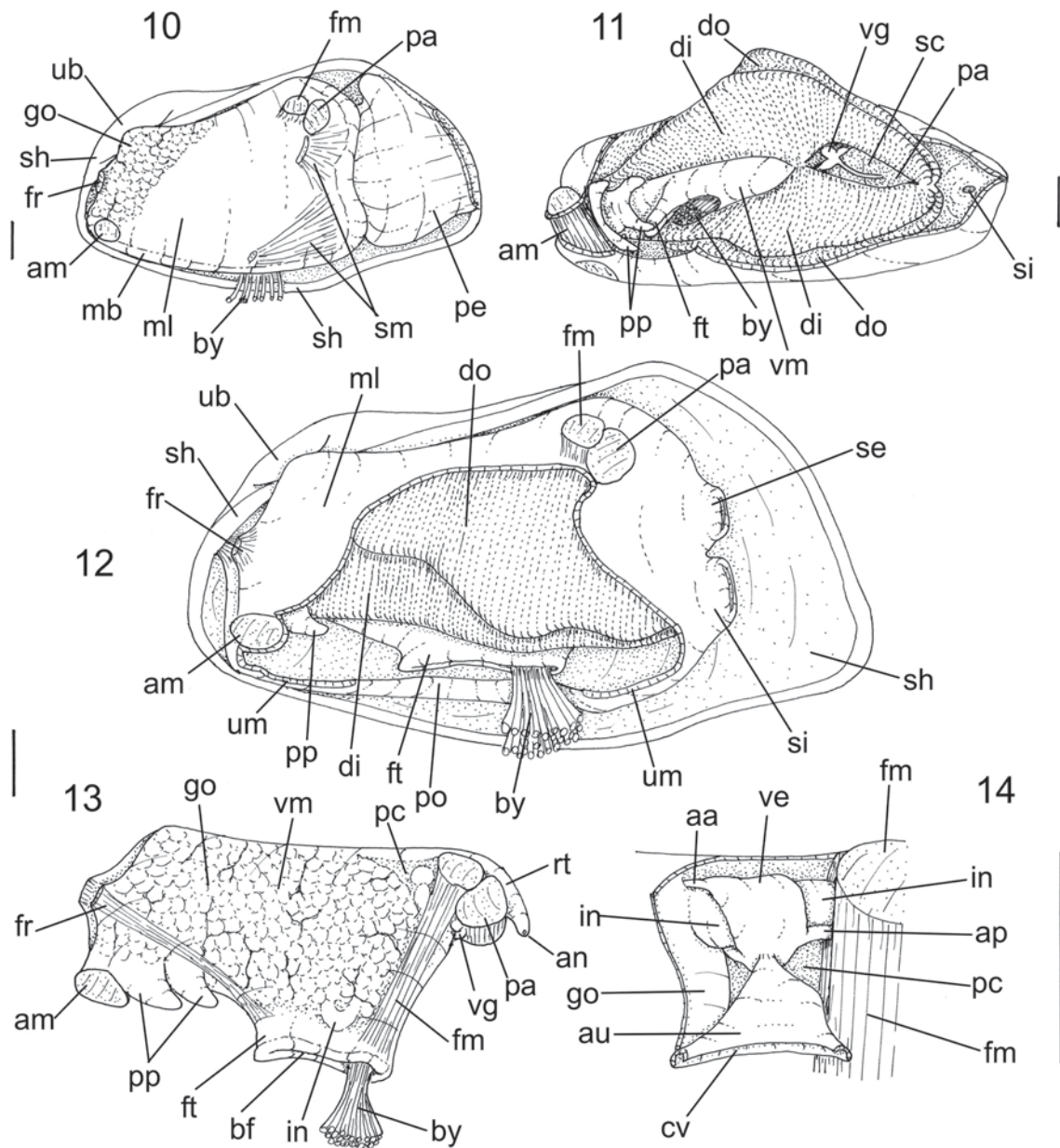


FIGURES 1-9: *Hiatella meridionalis*: 1-5) a specimen MZUSP 61525; 1) dorsal view; 2) left valve, outer view; 3) same, inner view; 4) right valve, outer view; 5) same, inner view; 6) another specimen of same lot, ventral view, main concern to inner view of hinge; scale = 2 mm; 7) detail of hinge, right valve, same specimen of figs 1-5; 8) same, left valve; 9) detail of siphonal area showing siphonal papillae (mp), some papillae and periostracum (pe) are lost and damage because of dissection. Scales = 1 mm.

Mantle: Thin, whitish, of uniform thickness (Figs. 10, 12). Edges of mantle lobes mostly fused, a single pedal open (further than of siphonal aperture), situated in middle-anterior region of ventral edge (Fig. 12: po), corresponding to about 1/4 of shell length. Siphon muscular root divided into 2 bands (Fig. 10: sm): 1) ventral band narrower, bordering ventral edge of

mantle along about half of its length and 1/3 of valve height; 2) dorsal band about half shorter than ventral band, with equivalent width of ventral band, attached to shell just ventral to posterior adductor muscle.

Siphons: Incurrent siphon about half fused along its length to excurrent siphon in basal region (Fig. 12).



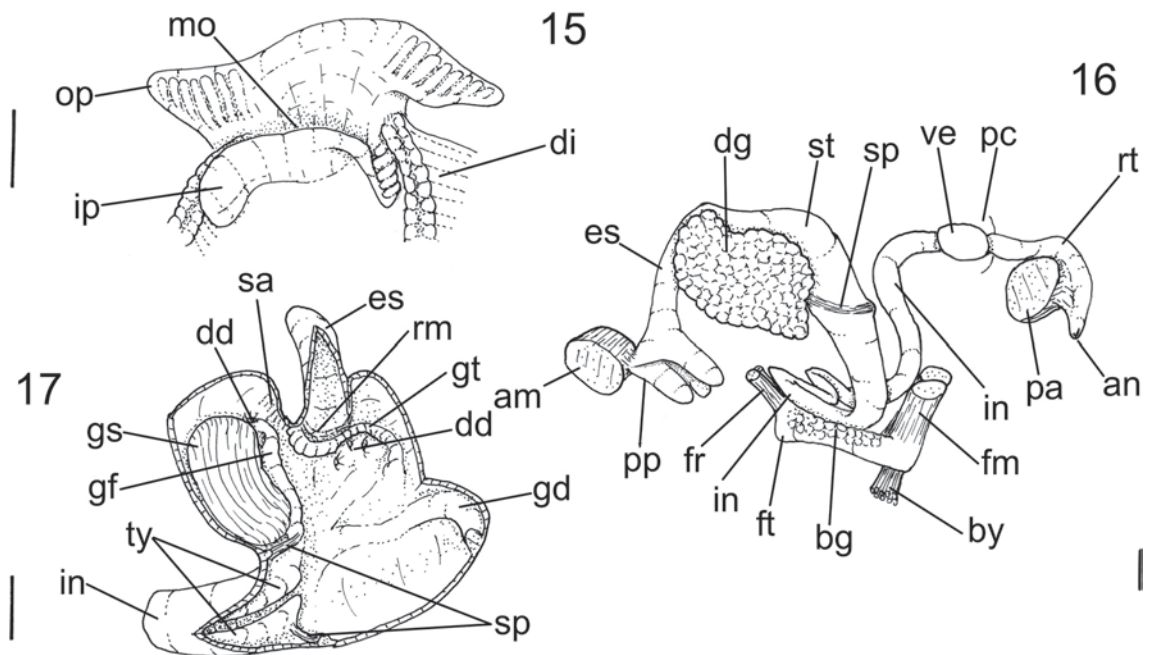
FIGURES 10-14: *Hiatella meridionalis* anatomy: 10) left view of an animal with left valve just removed; 11) whole specimen, ventral view, left mantle lobe partially removed, gills deflected and partially separated from each other in posterior region, showing a portion of suprabranchial chamber, siphons and posterior adductor muscle seen by their ventral base; 12) whole specimen, left view, left valve, periostracum and part of left mantle lobe removed; 13) isolated visceral mass, left view, most structures seen by transparency; 14) detail of pericardium region, left view, left pericardial wall removed. Scales = 1 mm.

Outer surface almost entirely covered by periostracum (Figs. 9, 10: pe). Incurrent siphon slightly broader than excurrent siphon; tip bearing several series of small papillae (Fig. 9: mp), each papilla with slender, long, filiform base, and weakly expanded, balloon-like tip. Excurrent siphon tip somewhat similar to incurrent one, except for bearing less numerous papillae, restricted to a single series. Both siphons totally separated from each other by a muscular internal septum, started in posterior end of gills (Fig. 11), attached to gills by cilia.

Main muscles and foot: Adductor muscles relatively small. Anterior adductor muscle situated close to ventral-anterior edge of shell (Figs. 10, 12, 13, 24: am), with about 1/25 of valve area. Posterior adductor muscle situated at some distance from postero-dorsal shell edge (Figs. 10, 12, 13, 24: pa); about 1.5 times larger than anterior. Foot relatively small (about 1/6 of visceral volume), byssal furrow running longitudinally along ventral surface, on median line, along about 1/4 of ventral edge of visceral mass (Figs. 12, 13). Byssal gland running in dorsal and lateral regions of this furrow (Fig. 16: bg). Foot anterior region weakly projected; posterior region broader due to byssal gland (Figs. 12, 13). Pair of anterior retractor muscle of foot narrow, slender

(Fig. 13: fr); originating dorsal, at some distance from anterior adductor muscle (Figs. 10, 12, 13), origin with about 1/3 of anterior adductor muscle, and separated from that by a distance about 1/3 of shell height; inserting in anterior region of foot. Pair of posterior retractor foot muscles broad and thick, runs straight towards dorsal (Fig. 13: fm); origin just anterior and dorsal to posterior adductor muscle (Figs. 10, 12, 13) with area approximately 80% of that of posterior adductor muscle; insertion in posterior end of byssal furrow, as continuation from byssus (Fig. 13).

Pallial cavity: Occupying about 75% of shell inner volume, covering about 85% of lateral surface of visceral mass. Gills length about 90% of that of shell; gills height about 80% of that of shell. Outer demibranch somewhat triangular, anterior end narrow, increasing gradually, becoming broader in its middle region towards posterior, of same width of inner demibranch (Figs. 11, 12). Inner demibranch somewhat rectangular, width uniform along its length (Figs. 11, 12). Anterior half of inner demibranch connected to visceral mass by cilia, posterior half connected to with inner lamella of other inner demibranch forming an anatomical separation between infra- and supra-bran- chial chambers (Fig. 11) by ciliary connection. Ante-



FIGURES 15-17: *Hiatella meridionalis* anatomy: 15) detail of palps region, ventral view, palps partially deflected; 16) whole digestive system, left view, seen as in situ, some adjacent structures also shown; 17) stomach, dorsal view, dorsal gastric wall partially removed and deflected to right, esophagus and intestine partially opened longitudinally. Scales = 0.5 mm.

rior region of inner demibranch not covered by outer demibranch, introduced between both hemipalps (Fig. 15). Food groove running in outer edge of inner demibranch (Fig. 15).

Circulatory system: Heart relatively small (Fig. 13: pc) (about 1/15 of visceral mass), positioned between gonad and pair of posterior retractor muscles of foot. Auricles triangular, each connected to ctenidial (efferent) vessel (Fig. 14) and directly to gill at about 1/4 of gill length, in their middle region. These ctenidial veins narrow in both sides anterior and posterior. Ventricle surrounding intestine, anterior aorta dorsal and posterior aorta ventral (Fig. 14).

Digestive system: Palps relatively small (about 1/15 of demibranch area), triangular (Figs. 11-13, 15). Outer hemipalps slightly larger than inner hemipalps (Fig. 15). Inner surface with 8-10 broad, transversal folds; each fold with rounded ventral end, at short distance from palp ventral edge; folds successively smaller towards distal and posterior. Folds

faint in dorsal end at some distance from palp dorsal edge (Fig. 15), forming a smooth inner margin both dorsal and ventral in both hemipalps. Mouth broad and ample, both lips with thick edge; situated somewhat posteriorly to anterior adductor muscle (Figs. 11, 15). Esophagus broad, with about 1/4 of shell length (Fig. 16), inner surface smooth (Fig. 17). Stomach occupying about 1/3 of visceral volume, covered in both sides by pale green digestive diverticles (Fig. 16). Esophageal aperture into stomach protected in ventral side by a narrow rim (Fig. 17: rm), and in dorsal side by tall, long, sigmoid fold, transversally furrowed (Fig. 17: gt). This fold extending in both sides, surrounding anterior sides of aperture to digestive diverticles. Gastric shield with about 1/4 of inner gastric area, located in its left-posterior region. Tall fold surrounding gastric shield ventral edge, extending along gastric dorsal wall in level of intestine origin (Fig. 17). Aperture to digestive diverticles multiple, situated around 2 shallow cavities by side of esophageal aperture; these cavities separated from esophageal aperture by gastric transversal typhlosole, and from each other by space equivalent to

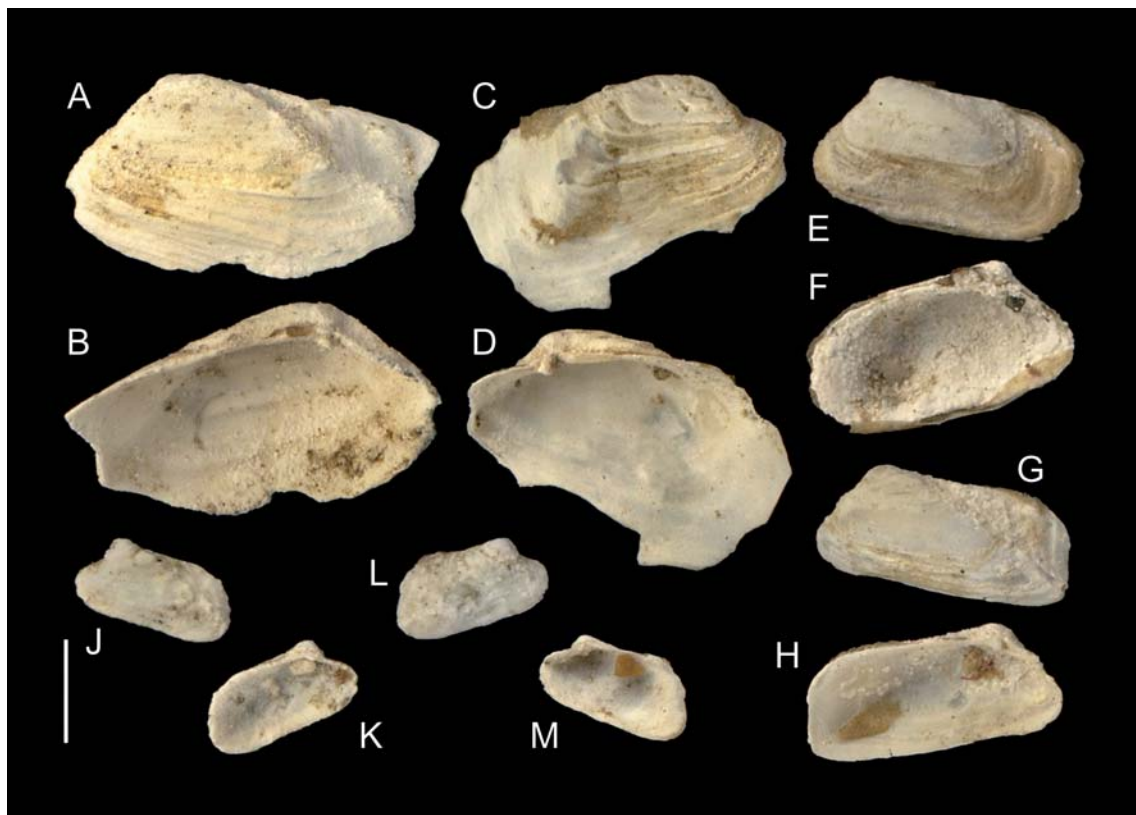
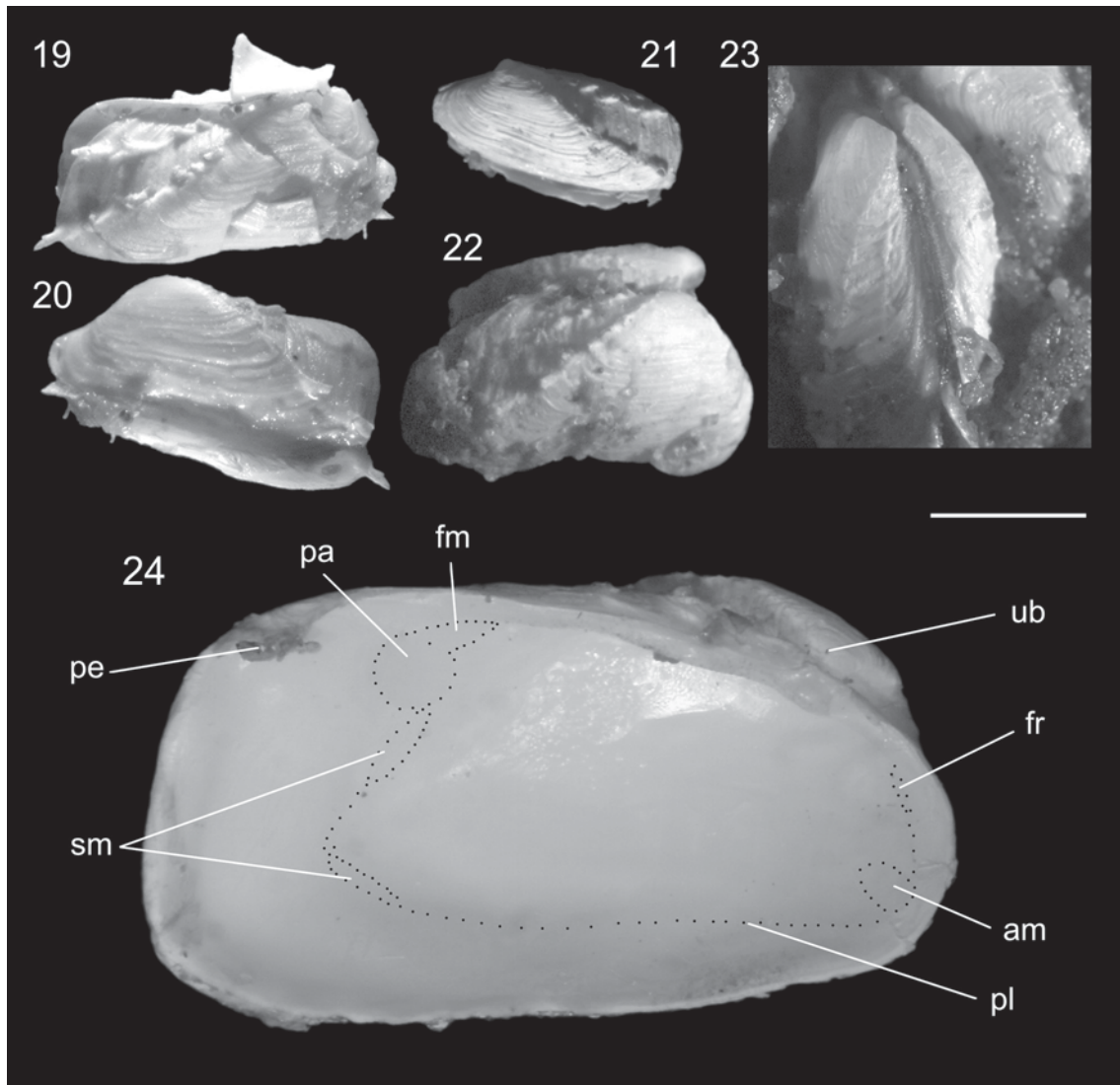


FIGURE 18: *Hiattella meridionalis* type material, 6 valves successively shown in external and internal views; specimen A-B here designated as lectotype; the remaining specimens are the paralectotypes. Courtesy of the Natural History Museum, London. Scale = 1 mm.

about 1/4 of gastric width. Between gastric chamber and intestine a sphincter, marked by a narrow layer of circular muscle immerse in gastric walls (Figs. 16, 17: sp). Intestine and style sac anatomically combined; both separated internally by a pair of tall longitudinal folds; right fold originating in gastric fold surrounding gastric shield; left fold originating abruptly (Fig. 17: ty). Intestine narrowing gradually towards posterior-ventral region of visceral mass; suddenly towards anterior, bordering byssal gland; zigzagging in anterior region of foot, crossing to right side of its first loop, running towards dorsal close to stomach; in this region bearing a curve, running towards pos-

terior, crossing through pericardium, and surrounding dorsal and posterior surface of posterior adductor muscle (Fig. 16). Anus simple, somewhat projected (Figs. 13, 16: an).

Genital system: Gonad pale cream in color, located surrounding visceral structures, including digestive diverticula; filling almost entire visceral sac, except ventral region, at some distance from foot (Figs. 10, 13). No gonoducts detectable. Pair of genital orifice located anterior and close to nephropores, separated from them by a distance equivalent to 1/20 of shell length.



FIGURES 19-24: *Hiatella meridionalis* young specimens MACN 36596 showing two pairs of posterior radial cords with spines; 19-20) specimen #1, (broken) right and left valves respectively; 21) specimen #2, left valve; 22) specimen #3, right valve and a portion of left valve; 23) specimen #3 in situ on scallops; 24) left valve, inner view, muscular scars artificially dotted, MZUSP 61525. Scale = 2 mm.

Main ganglia of nervous system: Not seen in details. Pair of visceral ganglia large, close one another, located in ventral surface of posterior adductor muscle, close to adjacent region of posterior foot retractor (Figs. 11, 13: vg).

Habitat: Epizoic on the shell of live bivalve *Zygochlamys patagonica*, between 83 and 189 m depth (Bastida *et al.*, 1992).

Measurements (length, height and width in mm): MZUSP 61525, #1 (Figs. 1-5): 9.5 by 5.3 by 5.4; #2: 7.9 by 4.5 by 4.2 mm.

Geographic range: Argentina coast.

Material examined: Lectotype and paralectotypes (see above). ARGENTINA; Buenos Aires; Off Mar del Plata, 39°04'S 55°44'W to 39°29'S 56°04'W, MZUSP 61525, 5 specimens (31/viii/1998), MZUSP 61526, 33 specimens, MACN 36596, 326 specimens (05/ix/2001).

DISCUSSION

In the original description of *Hiatella meridionalis*, d'Orbigny (1846) figured a specimen with a pair of radial, posterior cords, forming somewhat uniform dots. This pattern is not shown in grown specimen, neither in the type specimens (Fig. 18). Nevertheless, the grown specimens tend to have a slightly uniform carina (Figs. 1, 18A – the here designed lectotype), forming a slope between the posterior and middle thirds of the valves. However, the pattern of two pairs of dotted cords is exhibited by some young specimens (Figs. 19-23). The flat shape of specimen figured by d'Orbigny (1846) and its size (4 mm *sic.*) show that the specimen he examined was young. This is corroborated by the exam of the type material (Fig. 18), in such the larger specimens have about 4 mm (Figs. 18A-D). The finding of young specimens with similar conchological features of d'Orbigny (1846, pl. 81, fig. 21) specimen, allows that they can be considered the same species (Figs. 19-23). The type material figured in this paper (Fig. 18) and the young specimens (Figs. 19-23) show the tendency of the shell to be flatter, with the umbos weakly more protruded and pointed (Figs. 18E-M, 20, 21), features that are gradually modified to an inlaid umbos and a more obese fashion in larger specimens (Figs. 1-5, 18A-D, 22). The two pairs of radial dotted cords can even bear projected spines in some young, 3-4 mm specimens

(Figs. 19-21). These conchological patterns have not been found in specimens collected from other localities so far examined.

The anatomical characters of *Hiatella meridionalis* are similar to those of congener species where the anatomy is known (Hunter, 1949; Yonge, 1971; Narchi, 1973). It, however, differs from Brazilian sample of *H. solida* (*sensu* Narchi, 1973; personal observation), here therefore designed as *H. cf solida*, in having smaller sized palps, a stomach with a less developed dorsal hood, middle region of intestine not coiled (only performing a zigzag), and mainly by the greater quantity of papillae in the incurrent siphon (Fig. 9). It is important to emphasize that all examined specimens of *H. meridionalis* and the Brazilian samples of the *H. cf solida* have an equivalent number of siphonal papillae inside each sample, which demonstrates that such character is not highly variable and a suppose important character for species distinction. As only preserved specimens were available, the study on the inner surface of the stomach is somewhat precluded. Although some differences are detectable among the inner surface of examined specimens with some known hiatellids (Purchon, 1958; Narchi, 1973), e.g., absence of clear sorting areas, a deeper analysis of the differences is not performed here.

Hiatella meridionalis occurs much deeper, around 110 m depth, than the Brazilian *H. cf solida*, which is intertidal. *H. meridionalis* differs from *Hiatella* sp. (Yonge, 1971) in having more developed anterior and posterior retractor muscles of the foot, by smaller adductor muscles, by larger pedal aperture in mantle, and by different fashion of siphonal papillae. One interesting character of *H. meridionalis* is the pair of retractor muscles of siphons divided into 2 bundles (Fig. 10). This feature is not usually shown in the siphon-bearing bivalves, but its significance in taxonomy is so far speculative, as it needs to be proved to occur in other hiatellids.

Hiatella meridionalis still differs anatomically from species of the genus *Saxicavella* Fischer, 1878 (Scott, 1994) in having longer siphons, in lacking papillae surrounding the siphonal base, foot lacking heel, less developed pallial musculature and longer outer demibranch. A deeper additional analysis on the morphological differences among the hiatellid genera is provided by Yonge (1971).

A revision of the genus *Hiatella* is still in progress, and several morphological differences have been found among geographically distant samples of the genus, indicating that there are actually several species. This paper brings the base for this revision, with a more complete description of one of the species, in

such further studied species will be, gradually, added. Although even the artificial transportation have been advocated for explaining the wide range of this bivalve (e.g., Orensanz *et al.*, 2002), in a single-species scenario, the preliminary results have shown that samples from different regions constitute isolated species. as explained above, in this paper *Hiatella meridionalis* is, then, taxonomically defined. The remaining species will be defined in complementary papers.

RESUMO

A redescricao de *Hiatella meridionalis* (d'Orbigny, 1846) é realizada como primeiro passo na melhoria da sistemática do gênero das regiões atlântica e pacífica oeste. Esta re-análise é baseada em espécimes coletados nas vizinhanças da localidade tipo e em morfologia detalhada de amostras que alguns pesquisadores consideram pertencer a uma única espécie de ampla distribuição. Dos caracteres anatômicos, os mais interessantes são: uma grande quantidade de papilas no sifão inalante; o músculo retrator dos sifões dividido em duas porções; o tamanho pequeno dos palpos; um anel muscular transversal no estomago; e um padrão em zigzag no curto intestino. Estes caracteres distinguem a espécie dos demais hiatélideos até então examinados. Os sintipos da espécie foram também examinados e pela primeira vez ilustrados; o lectótipo é designado.

PALAVRAS-CHAVE: *Hiatella meridionalis*, morfologia, anatomia, taxonomia, Argentina.

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REFERENCES

- BASTIDA, R.; ROUX, D. & MARTINEZ, D.E. 1992. Benthic communities of the Argentine continental Shelf. *Oceanologia Acta*, 15(6):687-698.
- BREMEC, C.; BREY, T.; LASTA, M.; VALERO, J. & LUCIFORA, L. 2000. *Zygochlamys patagonica* beds on the Argentinean shelf. Part I: Energy flow through the scallop bed community. *Archive of Fishery and Marine Research*, 48(3):295-303.
- CARCELLES, A. 1944. Catalogo de los moluscos marinos de Puerto Quequén. *Revista del Museo de La Plata, Zoología*, 3:233-309.
- CIOCCO, N.F.; LASTA, M.L.; NARVARTE, M.; BREMEC, C.; BOGAZZI, E.; VALERO, J. & ORENSANZ, J.M. 2005. Scallops: fisheries in Argentina. In: Shumway, S. & Parsons, G. (Eds), *Developments in Aquaculture and fisheries sciences*. Elsevier, p.1251-1292.
- D'ORBIGNY, A.D. 1835-1847. Mollusques. In: *Voyage dans l'Amérique Meridionale (le Bresil...)* execute pendant les annees 1829-1833. P. Bertrand, Paris, v. 5, pt. 3, 758p + 85 pls.
- DOMANESCHI, O. & NARCHI, W. 1998. Adaptive convergences in two nestling bivalves (Myoida: Myoida, Hiatellidae) of the Brazilian littoral. *Iheringia, Serie Zoologia*, 85:89-96.
- HUNTER, W.R. 1949. The structure and behavior of *Hiatella gallicana* (Lamarck) and *H. actica* (L.), with special reference to the boring habit. *Proceedings of the Royal Society of Edinburg*, 63:271-289.
- MIKKELSEN, P. 2006. *Western Atlantic Bivalves*. Available at: <<http://peet.amnh.org>>. Access in: 12/ May/2006.
- NARCHI, W. 1973. On the functional morphology of *Hiatella solida* (Hiatellidae: Bivalvia). *Marine Biology*, 19:332-337.
- ORENSANZ, L.J.M.; SCHWINDT, E.; PASTORINO, G.; BORTOLUS, A.; CASAS, G.; DARRIGRAN, G.; ELÍAS, R.; LÓPEZ GAPPA, J.J.; OBENAT, S.; PASCUAL, M.; PENCHASZADEH, P.; PIRIZ, M.L.; SCARABINO, F.; SPIVAK, E.D. & VALLARINO, E.A. 2002. No longer the pristine confines of the world ocean: a survey of exotic marine species in the southwestern Atlantic. *Biological Invasions*, 4:115-143.
- POULIOT, F.; BOURGET, E. & FRÉCHETTE, M. 1995. Optimizing the design of giant scallop (*Placopecten magellanicus*) spat collectors: field experiments. *Marine Biology*, 123(2):277-284.
- PURCHON, R.D. 1958. The stomach in the Eulamellibranchia; stomach type IV. *Proceedings of the Zoological Society of London*, 131:487-525.
- RIOS, E.C. 1975. *Brazilian marine mollusks iconography*. Fundação Cidade do Rio Grande, Rio Grande, 331p. + 91 pls.
- RIOS, E.C. 1994. *Seashells of Brazil*. 2nd edition. Fundação Universidade do Rio Grande, Rio Grande, 368p. + 113 pls.
- ROSENBERG, G. 2005. *Malacolog 4.0.1: Western Atlantic Mollusk Database*. Available at: <<http://data.acnatsci.org/wasp/search.php>>. Access in: 10/Apr./06.
- SCOTT, P.H. 1994. A new species of *Saxicavella* (Bivalvia: Hiatellidae) from California with unique brood protection. *Veliger*, 37(1):62-68.
- YONGE, C.M. 1971. On the functional morphology and adaptive radiation in the bivalve superfamily Saxicavacea (*Hiatella* (= *Saxicava*), *Saxicavella*, *Panomya*, *Panope*, *Cyrtodaria*). *Malacologia*, 11(1):1-44.

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