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ORIGINAL ARTICLE

Re-establishment of *Malletia sorror* (Soot-Ryen, 1957), an endemic bathyal bivalve off Chile (Mollusca: Bivalvia: Nuculanoidea)

Restablecimiento de *Malletia sorror* (Soot-Ryen, 1957), un bivalvo batial endémico de las costas de Chile (Mollusca: Bivalvia: Nuculanoidea)

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ABSTRACT

Fresh material of a nuculanoid bivalve of the genus *Malletia*, collected during an expedition of the R/V SONNE off Chile in 2023, allows the re-establishment of *Malletia sorror* (Soot-Ryen, 1957), a species previously considered a synonym of *M. peruviana* Dall, 1908. The morphology and anatomy of the new material is described and the characteristics that justify a separation from *M. peruviana* Dall, 1908 are worked out.

Keywords: Chile, *Malletia*, Malletiidae, Mollusca, SE Pacific Ocean.

RESUMEN

Material fresco de un bivalvo nuculanoide del género *Malletia*, recogido durante una expedición del R/V SONNE frente a las costas de Chile en 2023, permite restablecer *Malletia sorror* (Soot-Ryen, 1957), especie considerada anteriormente sinónima de *M. peruviana* Dall, 1908. Se describen la morfología y la anatomía del nuevo material y se elaboran las características que justifican la separación de *M. peruviana* Dall, 1908.

Palabras clave: Chile, *Malletia*, Malletiidae, Mollusca, Océano Pacífico SE.

INTRODUCTION

Members of the family Malletiidae occur throughout the Pacific, Indic and Atlantic Oceans with most records from deep-waters (Sanders & Allen 1985; Huber 2010, 2015; Coan & Valentich-Scott 2012, Valentich-Scott *et al.* 2020). Suárez-Mozo *et al.* (2018, table 3) summarise the shell characteristics of all the *Malletia* species recorded in the eastern Pacific Ocean. Only *Malletia chilensis* Des Moulins, 1832 and *M. sorror* (Soot-Ryen, 1957) are missing. Not knowing why *M. chilensis* was not mentioned, the absence of *M. sorror* was due to synonymisation with *M. peruviana* by one of the co-authors. Valentich-Scott *et al.* (2020) examined the type material of *M. sorror* and *M. peruviana* (at that time, only very few specimens of the type localities were available) and found that the differences between these two species are minor and synonymised the latter with *M. peruviana*. However, they also predict a future analysis of this synonymy when additional material is available. This finally leads to consideration in MolluscaBase (2024). To date, no new material has been found for either *M. sorror* or *M. peruviana*. Only publications are known of *M. peruviana* that always indicate the same locality (holotype) in Peru (Dall 1908; Hertlein & Strong 1940; Knudsen 1970; Alamo & Valdivieso 1997; Coan & Valentich-Scott 2012; Paredes *et al.* 2016; Valentich-Scott *et al.* 2020). The same is true for *M. sorror* in Chile (Soot-Ryen 1957, 1959; Scott *et al.* 1990; Villarroel & Stuardo 1998).

By participating in the R/V SONNE expedition in January/

February 2023 (SO296) off Chile, I had the opportunity to obtain sample material from a transect 50 to 1850 metres. At the deepest station several *Malletia* individuals were prominent, which were later determined as *M. sorror*, a species synonymised with *M. peruviana* to this time. The present study aims to rehabilitate *M. sorror* (Soot-Ryen, 1957) as a good species.

MATERIAL AND METHODS

The material used in this study was taken off Chile during a cruise with the research vessels SONNE (SO296). Sediment samples were taken using a dredge. The samples were sieved by washing retaining the fractions larger than 1 mm. The residues were fixed in ethanol and later sorted out and determined in the laboratory.

Selected shells and specimens were colour-photographed using a stereo Zeiss microscope Discovery.V8 in IOW. Digital microphotographs were made using an AxioCam 105 color (Carl Zeiss MicroImaging GmbH, Jena) and AxioVision software (Carl Zeiss Imaging Solutions GmbH, Jena). The resulting files were imported into Adobe Illustrator 2023 (Adobe Systems Incorporated) for further processing.

The material is deposited at the Chilean National Museum of Natural History in Santiago de Chile.

SYSTEMATIC RESULTS

Class: Bivalvia Linnaeus, 1758
Superfamily: Nuculanoidea H. Adams & A. Adams, 1858 (1854)
Family: Malletiidae H. Adams & A. Adams, 1858 (1846)
Genus: *Malletia* Des Moulins[1], 1832
Type species *Malletia chilensis* Des Moulins, 1832 (type by monotypy).

Malletia sorror (Soot-Ryen, 1957)
(Figs 1A-J)

Malletiella sorror Soot-Ryen, 1957: 2; Soot-Ryen (1959): 18, pl. 1, figs. 4, 5; Villarroel & Stuardo (1998): 154, 182
Malletia sorror (Soot-Ryen, 1957): Scott *et al.* (1990): 9

[1] Charles des Moulins, full name Charles Robert Alexandre des Moulins (13 March 1798 – 23 December 1875) was a French naturalist, a botanist and malacologist. The spelling Desmoulins can also be found (e.g. in MolluscaBase 2024) (Further information at https://de.wikipedia.org/wiki/Charles_des_Moulins).

Material investigated: Chile, 75 km off Concepción • 5 live collected specimens and 2 empty double valves; sta. SO296/2-5; 36.3667°S, 73.8333°W; 1850 m; 22 Jan. 2023; dredge. The material is kept at the Chilean National Museum of Natural History (Spanish: Museo Nacional de Historia Natural or MNHN) under the collection numbers MNHNCL MOL 101636 and MNHNCL MOL 101637.

Compared photo material:
Malletiella sorror Soot-Ryen, 1957: Holotype (USNM 606947), South-west coast off Chile, "Albatross" station 2791; 38.1333°S, 75.8833°W; 1238 m; 14 Feb. 1888. (http://n2t.net/ark:/65665/m37c004327-7bba-452b-87a2-5bf1b630a10b)
Malletia peruviana Dall, 1908: Syntype (USNM 110574), Northern Peru, Aguja Point, "Albatross" station 4654; 5.7667°S, -81.5333°W; 1895 m; 12 Nov. 1904. (http://n2t.net/ark:/65665/m34beaf136-d4cf-4a7b-a090-fa96941c052b)

Description. See Figs. 1A-F. Shell equivalve, oblong oval, moderately inflated, a little gaping antero and postero ventrally, longer than high (length to height ratio 1:0.6) (see Table 1), inequilateral. Umbones broad and slightly protruding, located about one-third of shell length from anterior end. Anterior end rounded, posterior end truncated postero-ventrally. Inner ventral margin smooth. Interior of valves smooth and chalky-white. Pallial sinus very short but distinct (Fig. 1D, F). Adductor muscle scars subequal. Exterior sculpture smooth-glossy and with clear growth lines. Periostracum thin, glossy, pale yellow to light brown. Hinge with 10 anterior V-shaped teeth and 30 posterior teeth. Ligament long, external, narrow, dark brown, extending nearly ¾ the length of posterodorsal margin. Maximum length 19.5 mm, height 12 mm, width 8.5 mm.

Anatomy. See Fig. 1E. Foot massive, deeply cleft medially; digestive gland is prominent below the umbo; labial palp around the middle of the animal, palp proboscis large with distinct lamellae; lamellae of the gills relatively short, gills range little longer as the posterior hinge.

Habitat. Bathyal (1238 to 1850 m), soft bottom.

Distribution. The species is currently only known from two stations in the bathyal waters of central Chile (Fig. 3).

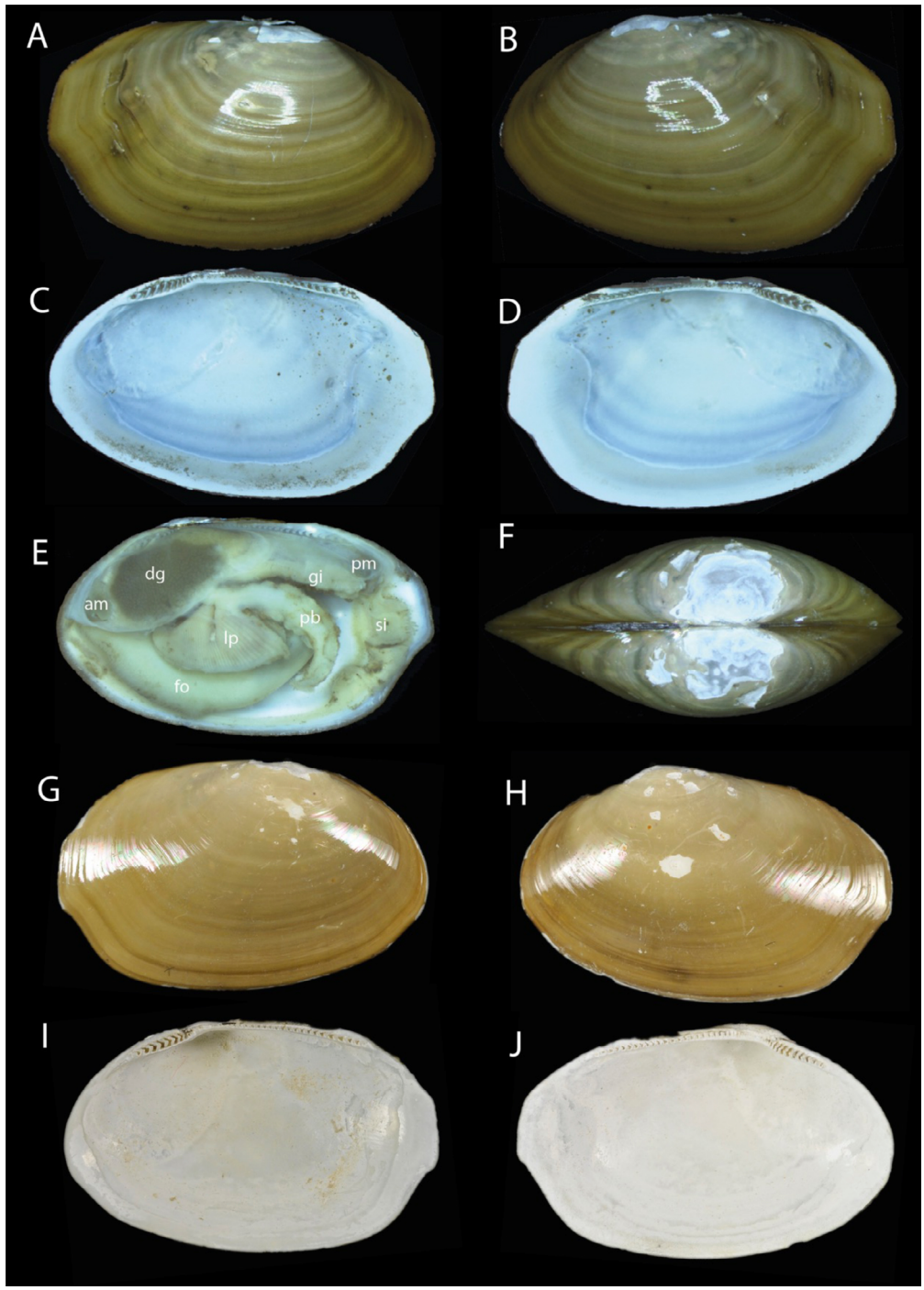

Figure 1. *Malletia sorror* (Soot-Ryen, 1957), A-F: IOW-Material, Chile, off Concepción, Sta. SO296/2-5. A-D: length 18.5 mm; E: length 17.2 mm, (aa: anterior adductor muscle; dg: digestive gland; fo: foot; gi: gill; lp: labial palp; pb: palp proboscis; pm: posterior adductor muscle; si: siphon) F: length 19.5 mm. G-J: Holotype (USNM 606947), Chile, off Lebu, Sta. Albatross 2791, length 18.3 mm. (The holotype images G-J with authorisation from the Department of Invertebrate Zoology, National Museum of Natural History, Smithsonian Institution, Washington DC. Photo Credit: Marilyn Gaizband). / *Malletia sorror* (Soot-Ryen, 1957), A-F: IOW-Material, Chile, frente a Concepción, Sta. SO296/2-5. A-D: longitud 18,5 mm; E: longitud 17,2 mm, (aa: músculo aductor anterior; dg: glándula digestiva; fo: pie; gi: branquia; lp: palpo labial; pb: probóscide palpebral; pm: músculo aductor posterior; si: sifón) F: longitud 19,5 mm. G-J: Holotipo (USNM 606947), Chile, frente a Lebu, Sta. Albatros 2791, longitud 18,3 mm. (Las imágenes del holotipo G-J con autorización del Department of Invertebrate Zoology, National Museum of Natural History, Smithsonian Institution, Washington DC. Crédito de la foto: Marilyn Gaizband).

Table 1. Measurements of specimens of *Malletia sorror* from Chile off Concepción (Sta. SO296/2-5). / Medidas de ejemplares de *Malletia sorror* de Chile frente a Concepción (Sta. SO296/2-5).

Specimens	length (mm)	height (mm)	width (mm)	length/ height	anterior teeth	posterior teeth
1	9.5	6.1	3.5	1.6	10	21
2	15.8	9.8	6.2	1.6	10	30
3	17	10.1	7	1.7	closed	closed
4	17.5	10.5	7.8	1.7	10	32
5	18	11	7.9	1.6	closed	closed
6	19	11.3	8.1	1.7	10	31
7	19.5	12	8.5	1.6	11	33

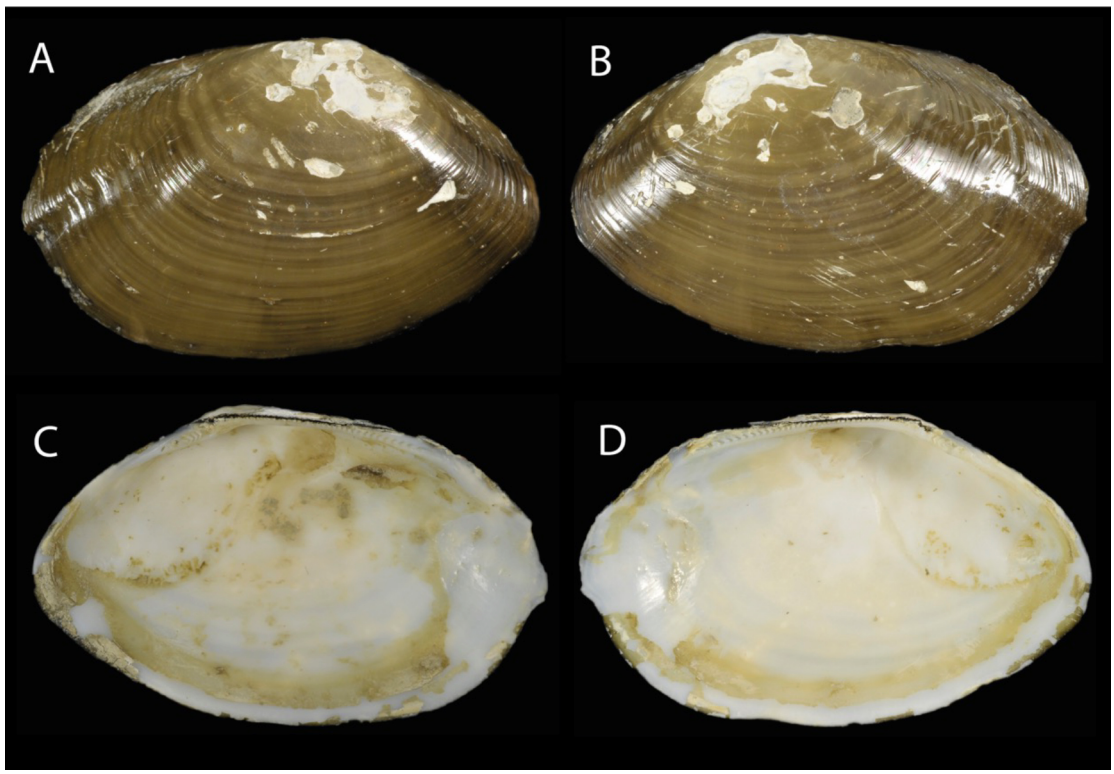

Figure 2. *Malletia peruviana* Dall, 1908, A-D: Syntype (USNM 110574), Peru, Aguja Point, Sta. Albatross 4654, length 28 mm. (With authorisation from the Department of Invertebrate Zoology, National Museum of Natural History, Smithsonian Institution, Washington DC. Photo Credit: Marilyn Gaizband). / *Malletia peruviana* Dall, 1908, A-D: Sintipo (USNM 110574), Perú, Punta Aguja, Sta. Albatros 4654, longitud 28 mm. (Con autorización del Department of Invertebrate Zoology, National Museum of Natural History, Smithsonian Institution, Washington DC. Crédito de la foto: Marilyn Gaizband).

Figure 3. Records of *M. sorror* (triangle) and *M. peruviana* (star) in waters off Chile and Peru (type = type locality; ps = present study). / Registros de *M. sorror* (triángulo) y *M. peruviana* (estrella) en aguas de Chile y Perú (type = localidad tipo; ps = presente estudio).

DISCUSSION

If we compare *M. sorror* with other *Malletia* species from the Pacific using Table 3 of Suárez-Mozo *et al.* (2018) and the monographic books by Coan & Valentich-Scott (2012) and Valentich-Scott *et al.* (2020), the only similar species is *M. peruviana* (see Table 2). All *Malletia*-species of SE Pacific (off Peru and Chile), especially *M. peruviana*, have a very shallow pallial sinus, whereas the sinus is more distinct in *M. sorror*. As already stated by Soot-Ryen (1957, 1959) the most distinctly feature of *M. sorror* is its broadly rounded anterior margin. In contrast, Dall (1908) emphasised that the anterior margin of *M. peruviana* is almost pointed, which can be clearly seen when comparing Figures 1 and 2. Furthermore, the clear difference in size between *M. sorror* (maximum 19.5 mm) and *M. peruviana* (28 mm) is striking. Based on the series of five individuals collected alive and two double valves, I assume that I have recorded the size spectrum of *M. sorror* (see Table 1). The holotype of *M. sorror* fits very well with a length of 18.3 mm. Although only an indication for the separation, the distance between the type locality of *M. sorror* and our station is about 280 km, whereas it is about 3700 km compared to the type locality of *M. peruviana* (Fig. 3). The maximum ratio of anterior to posterior teeth is 11/33 in *M. sorror* and 11 to 36 in *M. peruviana*. Although Soot-Ryen (1957, 1959) gives 10-11 anterior and 30-40 posterior teeth for the holotype of *M. sorror*, it is not clear where this information comes from. At that time only three specimens (two paratypes, one holotype) were available (see Scott *et al.* 1990), and for the description Soot-Ryen (1957) used the largest specimen, which has only 10 anterior to 30 posterior teeth.

Table 2. Summary of shell characters of *Malletia peruviana* and *M. sorror* from the Pacific Ocean. / Resumen de los caracteres de las conchas de *Malletia peruviana* y *M. sorror* del Océano Pacífico.

Species	Shape	Type locality	Reported depth range (m)	Maximum length (mm)	Anterior end	Pallial sinus	Hinge
Malletia peruviana Dall, 1908		Off Punta Aguja, Piura, northern Peru	1900	28	pointed	shallow	10–11 anterior teeth; 33–36 posterior teeth
Malletia sorror (Soot-Ryen, 1957)		South-west coast off Chile, "Albatross" station 2791	1230 - 1850	19.5	broadly rounded	distinct	10–11 anterior teeth; 30-33 posterior teeth

CONCLUSION

In the end, the only conclusion that can be drawn is that *Malletia sorror* (Soot-Ryen, 1957) is a separate species that needs to be re-established. The material collected in the present study certainly allows barcoding, but there is currently no material available from *M. peruviana* that allows a genetic comparison.

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