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# New species of Bryozoa from Madeira associated with rhodoliths

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## Abstract

Four new species of cheilostomate Bryozoa encrusting rhodoliths on Maërl beds are described from material collected at a single locality at Madeira Island. These are *Coronellina atlantica* **n. sp.**, *Hippothoa muripinnata* **n. sp.**, *Chorizopora rosaria* **n. sp.** and *Hippoporella maderensis* **n. sp.** A species of *Schizomavella* is left in open nomenclature. The genus *Coronellina* is transferred from the family Calescharidae and assigned to Microporidae. The close similarity of *C. atlantica* **n. sp.**, a non-opesiulate species with deep depressions, to *Coronellina fagei* with opesiules, implies that the generally accepted evolutionary sequence from non-opesiulate to opesiulate species might not be the rule.

**Key words:** NE Atlantic, Maërl beds, opesiules, Cheilostomata, Microporidae, *Chorizopora*, *Coronellina*, *Hippoporella*, *Hippothoa*, *Schizomavella*

## Introduction

Many oceanic islands are spots of high biodiversity, often possessing endemic flora and fauna, both aquatic and terrestrial. The Madeiran archipelago, part of the Macaronesian region together with the Azores, Cape Verde and the Canaries, is not an exception. In the specific case of Bryozoa, about 140 cheilostome species are presently known from this archipelago, making Madeira a hotspot of bryozoan diversity when compared with other well-known and larger areas (see Berning 2012 and references therein). However, an inventory of the marine fauna around the archipelago is far from complete.

One of the bottom types at Madeira is so-called Maërl beds, also known as rhodolith beds (Steller & Foster 1995). These habitats occur in tropical, temperate and polar environments (Bosence 1983; Freiwald & Henrich 1994) and are characterized by accumulations of living and dead unattached non-geniculate calcareous rhodophytes (Barbera *et al*. 2003). Maërl beds tend to be associated with elevated biodiversity, enhancing biological and functional diversity of coastal sediments (Jackson *et al*. 2004; Grall *et al*. 2006; Sciberras *et al*. 2009).

Maërl beds in general, and rhodoliths in particular, are characterized by slow growth rates and complex surface microtopography. The numerous crevices and microshelters contain an abundant and diverse epifauna (Blake & Maggs 2003; Bosence & Wilson 2003), and Bryozoa is one of the most important elements (Sciberras *et al*. 2009). For instance, in the course of taxonomic work on Iberian Bryozoa, nine new species have been described from Maërl beds around the Iberian Peninsula in recent years (Souto *et al*. 2010a,b) even though there was no targeted study on the Bryozoa of these habitats.

Madeiran rhodolith beds and associated bryozoans also occur in the Middle Miocene (Johnson *et al*. 2011), but no studies have been conducted on them as yet, so it is not possible to compare the Recent and fossil faunas.

In the present paper we describe five new Recent species of cheilostomate Bryozoa collected on a dozen rhodoliths from a single locality at Madeira Island. Additional to the descriptive work, we also propose the transfer of *Coronellina* from the family Calescharidae to the Microporidae.

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with *Lepraliella* (see Gordon 1984, 1993; Hayward & Ryland 1999). However, it is currently considered as a valid genus placed in the family Hippoporidridae (e.g. Winston & Hayward 2012; Bock & Hayward 2013b).


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## References


Álvarez, F., Emig, C.C., Roldán, C. & Viéitez, J.M. (2005) *Fauna Ibérica. Vol. 27. Lophophorata: Phoronida, Brachiopoda*. Museo Nacional de Ciencias Naturales, CSIC, Madrid, 276 pp.

Arístegui Ruiz, J. (1984) *Briozoos Quilostomados (Ectoprocta, Cheilostomata) de Canarias: Estudio sistemático, faunístico y biogeográfico*. Ph.D. thesis. Universidad de La Laguna, Spain, 524 pp.

Audouin, J.V. (1826) Explication sommaire des planches de polypes de l'Egypte et de la Syrie, publiées par Jules-César Savigny. *In*: Audouin, J.V. (Ed.), Description de l'Egypte, ou recueil des observations et des recherches qui ont était faites en Egypte pendant l'expédition de l'armée française. *Histoire Naturelle Tome 1*, 4ème partie. Imprimerie Impériale, Paris, pp. 225–244.

Barbera, C., Bordehore, C., Borg, J.A., Glémarec, M., Grall J., Hall-Spencer, J.M., De La Huz, C.H., Lanfranco, E., Lastra, M., Moore, P.G., Mora, J., Pita, M.E., Ramos-Espla, A.A., Rizzo, M., Sanchez-Mata, A., Seva, A., Schembri, P.J. & Valle, C. (2003) Conservation and management of northeast Atlantic and Mediterranean maerl beds. *Aquatic Conservation*, 13, S65–S76.
http://dx.doi.org/10.1002/aqc.569

Berning, B. (2012) Taxonomic notes on some Cheilostomata (Bryozoa) from Madeira. *Zootaxa*, 3236, 36–54.

Blake, C. & Maggs, C.A. (2003) Comparative growth rates and internal banding periodicity of maerl species (Corallinales, Rhodophyta) from northern Europe. *Phycologia*, 42, 606–612.
http://dx.doi.org/10.2216/i0031-8884-42-6-606.1

Bock, P. & Hayward, P.J. (2013a) *Calescharidae* Cook & Bock, 2001. WoRMS Editorial Board (2013) World List of Bryozoa. World Register of Marine Species. Available from: http://www.marinespecies.org/aphia.php?p=taxdetails&id=110732 (accessed 1 September 2013)

Bock, P. & Hayward, P.J. (2013b) *Hippoporella* Canu, 1917. *In*: WoRMS Editorial Board. (2013) World List of Bryozoa. Available from: World Register of Marine Species at http://www.marinespecies.org/aphia.php?p=taxdetails&id=110927 (accessed 8 September 2013)

Bosence, D.W.J. (1983) The occurrence and ecology of recent rhodoliths – a review. *In*: Peryt T.M. (Ed.), *Coated Grains*. Springer-Verlag, Berlin, pp. 225–242.

Bosence, D.W.J. & Wilson, J. (2003) Maerl growth, carbonate production rates and accumulation rates in the northeast Atlantic. *Aquatic Conservation*, 13, S21–S31.
http://dx.doi.org/10.1002/aqc.565

Busk, G. (1852) An account of the Polyzoa, and sertularian zoophytes, collected in the Voyage of the Rattlesnake, on the coasts of Australia and the Louisiade Archipelago. *In*: MacGillivray J. (Ed.), *Narrative of the Voyage of the H.M.S. Rattlesnake. Vol. 1.* T. & W. Boone, London, pp. 343–402.

Busk, G. (1859a) *A monograph of the fossil Polyzoa of the Crag*. London: The Palaeontographical Society, pp. 1–136.

Busk, G. (1859b) Zoophytology. On some Madeiran Polyzoa. Collected by J. Yates Johnson, Esq. *Quarterly Journal of Microscopical Science*, 7, 65–67.

Canu, F. (1917) Bryozoaires. *Revue critique de Paléozoologie*, 21, 29–37.
Canu, F. & Bassler, R.S. (1917) A synopsis of American early Tertiary Cheilostome Bryozoa. *United States National Museum Bulletin*, 96, 1–87.
Canu, F. & Bassler, R.S. (1925) Les Bryozoaires du Maroc et de Mauritanie. *Mémoires de la Société des Sciences Naturelles du Maroc*, 10, 1–79.
Cook, P.L. (1965) Notes on the Cupuladriidae (Polyzoa, Anasca). *Bulletin of the British Museum (Natural History), Zoology, London*, (5), 13, 151−187.
Cook, P.L. & Bock, P.E. (2001) Calescharidae, a new family for the Tertiary to Recent genera *Caleschara* MacGillivray and *Tretosina* Canu & Bassler (Bryozoa: Cheilostomata). *Invertebrate Taxonomy*, 15, 527–550.
Cook, P.L. & Chimonides, P.J. (1985) Recent and fossil Lunulitidae (Bryozoa: Cheilostomata) 3. 'Opesiulate' and other species of *Selenaria* sensu lato. *Journal of Natural History*, 19, 285−322.
http://dx.doi.org/10.1080/00222938500770231
Di Martino, E. & Taylor, P.D. (2012) Pyrisinellidae, a new family of anascan cheilostome bryozoans. *Zootaxa*, 3534, 1–20.
Freiwald, A. & Henrich, R. (1994) Reefal coralline algal build-ups within the Arctic Circle: morphology and sedimentary dynamics under extreme environmental seasonality. *Sedimentology*, 41, 963–984.
http://dx.doi.org/10.1111/j.1365-3091.1994.tb01435.x
Gautier, Y.-V. (1962) Recherches écologiques sur les Bryozoaires chilostomes en Mediterranée occidentale. *Recueil des Travaux de la Station marine d'Endoume,* 38 (24), 1–434.
Gordon, D.P. (1984) The marine fauna of New Zealand: Bryozoa: Gymnolaemata from the Kermadec Ridge. *New Zealand Oceanographic Institute Memoir*, 91, 1–198.
Gordon, D.P. (1989) The marine fauna of New Zealand: Bryozoa: Gymnolaemata (Cheilostomida Ascophorina) from the western south Island continental shelf and slope. *New Zealand Oceanographic Institute Memoir*, 97, 1–158.
Gordon, D.P. (1993) Bryozoan frontal shields: studies on umbonulomorphs and impacts on classification. *Zoologica Scripta*, 22, 203–221.
http://dx.doi.org/10.1111/j.1463-6409.1993.tb00352.x
Gordon, D.P. (2011) Genera and subgenera of Cheilostomata – Working list for *Treatise on Invertebrate Paleontology*. Version of September 2011. [Unpublished, available from author.]
Grall, J., Le Loc'h, F., Guyonnet, B. & Riera, P. (2006) Community structure and food web based on stable isotopes (δ15N and δ13C) analyses of a North Eastern Atlantic maërl bed. *Journal of Experimental Marine Biology and Ecology*, 338, 1–15.
http://dx.doi.org/10.1016/j.jembe.2006.06.013
Gray, J.E. (1848) *List of the specimens of British animals in the collection of the British Museum. Part 1. Centrionae or radiated animals*. London: Trustees of the British Museum (Natural History), pp. 1–173. [Polyzoa pp. 91–151.]
Harmelin, J.G., Ostrovsky, A.N., Cáceres-Chamizo, J.P. & Sanner, J. (2011) Bryodiversity in the tropics: taxonomy of *Microporella* species (Bryozoa Cheilostomata) with personate maternal zooids from Indian Ocean, Red Sea and southeast Mediterranean. *Zootaxa*, 2798, 1–30.
Harmelin, J.G., Vieira, L.M., Ostrovsky, A.N., Cáceres-Chamizo, J.P. & Sanner J.A. (2012) *Scorpiodinipora costulata* (Canu & Bassler, 1929) (Bryozoa, Cheilostomata), a taxonomic and biogeographic dilemma: complex of cryptic species or human-mediated cosmopolitan colonizer? *Zoosystema*, 34, 123–138.
http://dx.doi.org/10.5252/z2012n1a5
Hassall, A.H. (1842) Remarks on the genus *Lepralia* of Dr. Johnston with descriptions of six undescribed species. *Annals and Magazine of Natural History*, 1 (9), 407–414.
http://dx.doi.org/10.1080/03745484209445355
Hastings, A.B. (1979) The genus *Hippothoa* Lamouroux [Polyzoa (Bryozoa) Cheilostomata]. *Journal of Natural History*, 13, 535–560.
http://dx.doi.org/10.1080/00222937900770421
Hayward, P.J. & McKinney, F.K. (2002) Northern Adriatic Bryozoa from the vicinity of Rovinj, Croatia. *Bulletin of the American Museum of Natural History*, 270, 1–139.
http://dx.doi.org/10.1206/0003-0090(2002)270<0001:nabftv>2.0.co;2
Hayward, P.J. & Ryland, J.S. (1998) Cheilostomatous Bryozoa. Part 1. Aeteoidea – Cribrilinoidea. *Synopses of the British Fauna, n.s.* (2nd Edition), 10, 1–366.
Hayward, P.J. & Ryland, J.S. (1999) *Cheilostomatous Bryozoa. Part 2. Hippothoidea–Celleporoidea. Synopses of the British Fauna* n.s. (2nd Edition), 14, 1–416.
Hayward, P.J. & Thorpe, J.P. (1995) Some British species of *Schizomavella* (Bryozoa: Cheilostomatida). *Journal of Zoology, London*, 235, 661–676.
http://dx.doi.org/10.1111/j.1469-7998.1995.tb01776.x
Hincks, T. (1879) On the classification of the British Polyzoa. *Annals and Magazine of Natural History*, 5 (3), 153–164.
Hincks, T. (1880) Contributions towards a general history of the marine Polyzoa. Part I. Madeiran Polyzoa. *Annals and Magazine of Natural History*, (5), 6, 69–80.
Hondt, J.-L. d' (1985) Contribution à la systématique des Bryozoaires Eurystomes. Apports récents et nouvelles propositions. *Annales des Sciences naturelles, Zoologie & Biologie animale*, 7, 1–12.
Hondt, J.-L. d' (2006) Bryozoaires. Nouvelle explications des planches de Polypes de la Description de l'Egypte (dessinées

sous la direction de Jules-César Savigny, et commentées sommairement à l'origine par Victor Audouin). *Collection Nouvelle Description de l'Egypte*, 2, 1–86.

Jackson, C.M., Kamenos, N.A., Moore, P.G. & Young, M. (2004) Meiofaunal bivalves in maerl and other substrata; their diversity and community structure. *Ophelia*, 58, 49–60.
http://dx.doi.org/10.1080/00785236.2004.10410212

Johnson, M.E., da Silva, C.M., Santos, A., Gudveig Baarli, B., Cachão, M., Mayoral, E.J., Rebelo, A.C. & Ledesma-Vázquez, J. (2011) Rhodolith transport and immobilization on a volcanically active rocky shore: Middle Miocene at Cabeço das Laranjas on Ilhéu de Cima (Madeira Archipelago, Portugal). *Palaeogeography, Palaeoclimatology, Palaeoecology*, 300, 113–127.
http://dx.doi.org/10.1016/j.palaeo.2010.12.014

Johnston, G. (1838) *A History of British Zoophytes*. W.H. Lizars, Edinburgh, London & Dublin, 341 pp.

Jullien, J. (1882) Dragages du « Travailleur », Bryozoaires. Espèces draguées dans l'Océan Atlantique en 1881. *Extrait du Bulletin de la Société zoologique de France*, 7, 1–33 + 5pls.

Lamouroux, J.V.F. (1821) *Exposition méthodique des genres de l'ordre des polypiers, avec leur description et celles des principales espèces figurées dans 84 planches; les 63 premiers appartenant a l'histoire naturelle des zoophytes d'Ellis et Solander*. V. Agasse, Paris, 115 pp. + 84 pls.

Levinsen, G.M.R. (1909) *Morphological and Systematic studies on the Cheilostomatous Bryozoa*. Nationale Forfatterers Forlag, Copenhagen, pp. 1–413.

López de la Cuadra, C.M. (1991) *Estudio sistemático de los Briozoos Queilostomados (Bryozoa: Cheilostomida) del Estrecho de Gibraltar y áreas próximas*. Ph.D. thesis. Universidad de Sevilla, Spain, 316 pp.

MacGillivray, P.H. (1895) A monograph of the Tertiary Polyzoa of Victoria. *Transactions of the Royal Society of Victoria*, 4, 1–166.

Manzoni, A. (1870) Bryozoi fossili Italiani. Quarta contribuzione. *Sitzungsberichte der Akademie der Wissenschaften in Wien (Abt. 1),* 61, 323–349.

Norman, A. (1909) The Polyzoa of Madeira and neighbouring islands. *Journal of the Linnean Society of London, Zoology*, 30, 275–314.
http://dx.doi.org/10.1111/j.1096-3642.1909.tb02407.x

Ostrovsky, A.N. (2013) *Evolution of Sexual Reproduction in Marine Invertebrates: example of Gymnolaemate Bryozoans*. Springer, Dordrecht, Heidelberg, New York, London, pp. 1–356.

Ostrovsky, A., Cáceres-Chamizo, J.P. & Vávra, N. (2013) Bryozoan collection from the Northern Bay of Safaga (Red Sea). Available from: http://palse2.pal.univie.ac.at/Bryozoa/Safaga_Bay/Safaga_Bay.html (accessed 1 September 2013)

Prenant, M. & Bobin, G. (1966) Bryozoaires, 2e partie. Chilostomes Anasca. *Faune de France*, 68, 1–647.

Reverter-Gil, O. & Fernández-Pulpeiro, E. (2001) Inventario y cartografía de los Briozoos marinos de Galicia (N.O. de España). *Monografías de Nova Acta Científica Compostelana, Serie Bioloxía*, 1, 1–243.

Reverter-Gil, O., Souto, J. & Fernández-Pulpeiro, E. (2012) A new genus of Lanceoporidae (Bryozoa, Cheilostomata). *Zootaxa*, 3339, 1–29.

Ristedt, H. (1991) Ancestrula and early astogeny of some anascan Bryozoa: their taxonomic importance and possible phylogenetic implications. *Bulletin de la Société des Sciences Naturelles de l'Ouest de la France Mémoire HS*, 1, 371−382.

Ryland, J.S. & Gordon, D.P. (1977) Some New Zealand and British species of *Hippothoa* (Bryozoa: Cheilostomata). *Journal of the Royal Society of New Zealand*, 7, 17–49.
http://dx.doi.org/10.1080/03036758.1977.10419334

Savigny, J.C. (1817) *Description de l'Égypte, ou recueil des observations et des recherches qui ont été faites en Égypte pendant l'Expédition de 'Armée française ... Histoire naturelle*. *Vol. 2.* Imprimerie Royale, Paris, 125 pls.

Sciberras, M., Rizzo, M., Mifsud, J.R., Camilleri, K., Borg, J.A., Lafranco, E. & Schembri, P.J. (2009) Habitat structure and biological characteristics of a maerl bed off the northeastern coast of the Maltese Islands (central Mediterranean). *Marine Biodiversity*, 39, 251–264.
http://dx.doi.org/10.1007/s12526-009-0017-4

Smitt, F.A. (1868) Kritisk förteckning öfver Skandinaviens Hafs-Bryozoer, IV. *Öfversigt af K. Vetenskaps-Akademiens Förhandlingar*, 25, 3–230, pls 24–28.

Souto, J., Reverter-Gil, O. & Fernández-Pulpeiro, E. (2010a) Bryozoa from detritic bottoms in the Menorca Channel (Balearic Islands, western Mediterranean), with notes on the genus *Cribellopora*. *Zootaxa*, 2536, 36–52.

Souto, J., Reverter-Gil, O. & Fernández-Pulpeiro, E. (2010b) Gymnolaemate Bryozoans from the Algarve (S. Portugal). New species and biogeographical considerations. *Journal of the Marine Biological Association of the United Kingdom*, 90, 1417–1439.
http://dx.doi.org/10.1017/s0025315409991640

Souto, J., Reverter-Gil, O. & Fernández-Pulpeiro, E. (2013) *Schizomavella grandiporosa* and *Schizomavella sarniensis*: Two cryptic species. *In*: Ernst, A., Schäfer, P. & Scholz, J. (Eds.), *Bryozoan Studies 2010, Lecture Notes in Earth System Sciences* 143. Springer-Verlag, Berlin Heidelberg, pp. 357–365.

Steller, D.L. & Foster, M.S. (1995) Environmental factors influencing distribution and morphology of rhodoliths in Bahía Concepcion, B.C.S., México. *Journal of Experimental Marine Biology and Ecology*, 194, 201–212.
http://dx.doi.org/10.1016/0022-0981(95)00086-0

Tilbrook, K.J. (2006) Cheilostomatous Bryozoa from the Solomon Islands. *Santa Barbara Museum of Natural History Monographs,* 4 (Studies in Biodiversity 3), 1–386.

Tilbrook, K.J., Hayward, P.J. & Gordon, D.P. (2001) Cheilostomatous Bryozoa from Vanuatu. *Zoological Journal of the Linnean Society*, 131, 35–109.
http://dx.doi.org/10.1111/j.1096-3642.2001.tb01309.x

Vieira, L.M., Gordon, D.P., Facelucia, B.C. & Haddad, M.A. (2010) New and little-known cheilostomatous Bryozoa from the south and southeastern Brazilian continental shelf and slope. *Zootaxa*, 2722, 1–53.

Vigneaux, M. (1949) Révision des Bryozoaires néogènes du Bassin d'Aquitaine et essai de classification. *Mémoires de la Sociét Géologique de France, n.s.,* 28, 1–153.

Winston, J.E. & Hayward, P.J. (2012) The Marine Bryozoans of the Northeast Coast of the United States: Maine to Virginia. *Virginia Museum of Natural History Memoir*, 11, 1–180.

Zabala, M. (1986) *Fauna dels Briozous dels Països Catalans*. Institut d'Estudis Catalans. Arxius de la Secció de Ciències, 84, 1–836.

Zabala, M. & Maluquer, P. (1988) Illustrated keys for the classification of Mediterranean Bryozoa. *Treballs del Museu de Zoologia de Barcelona*, 4, 1–294.