

Lineage

Annual distribution of a bryozoan community

Bryozoans are abundant on the continental shelf around New Zealand, especially in areas of seafloor dominated by “bryomol” shell gravel, i.e. comprising a mixture of bryozoan skeletal remains and mollusc shells, especially bivalves. The bryozoan component varies between approximately 20% and 70% of the bryomol fraction, similar to that in the abundant Tertiary bryomol limestones found throughout New Zealand (Waipu, Waitomo, Te Kuiti, Punakaiki, Oamaru, Winton, etc.) (Nelson 1978). This layer describes the distribution of a community (biotope) of bryozoan species whose colonies are three-dimensional and large enough either to shape bottom habitat or to contribute to it structurally. Key habitat-forming species are *Cinctipora elegans*, *Celleporaria agglutinans*, *Celleporina grandis*, *Hippomenella vellicata*, *Galeopsis porcellanicus*, and *Diaperoecia purpurascens*, with their associated bryozoan epifauna. These species are all endemic, have wide spatial and depth distributions, and do not necessarily always co-occur together. Nevertheless, in the bryomol assemblages where they are found these species and their associates collectively form a bryozoan suspension-feeding guild. All of the key species are readily identifiable from gross colony morphology. The distribution of this biotope, based on the presence of one or more of these species, is portrayed.

The following species summaries were derived from the literature, museum holdings, and from discussion with bryozoan experts. Ministry for Primary Industries electronic databases were not checked because none was thought to contain any useful information on the distribution of bryozoa.

1. Literature.

- a. Using the keywords **Bryozoa* and New Zealand**, extracts were made from Aquatic Sciences and Fisheries Abstracts (all records at 27 July 2003). Using the keyword **Bryozoa***, extracts were made from and NIWAcat (all records at 27 July 2003). Relevant publications were obtained but none was useful in extending the distribution of the species beyond that described above.
- b. Using the keywords (anywhere or global) **Bryozoa and thesis** or **bryozoan and thesis** the library catalogues of The University of Auckland, Auckland University of Technology, The University of Waikato, Massey University, Victoria University of Wellington, University of Canterbury, University of Otago were checked between 7 July and 12 August 2003, and relevant theses obtained and examined. None was useful in extending the distribution of the

species beyond that described above, but some provided more detailed local distribution and abundance information.

2. Museum holdings.

Holdings of bryozoans in the following museums were examined. Other museum holdings were not investigated because it was considered that they would not add anything to the record. Data were used to help estimate presence/absence.

- a. NIWA Greta Point. The **AllSeaBio** database was examined for records on 23 July 2003. This collection includes samples from more than 9000 benthic stations, many hundreds containing bryozoans. Their positions have been plotted and were used to help estimate presence/absence.
- b. Museum of New Zealand Te Papa Tongarewa records of this species based on voucher specimens held in their collection have not yet been entered into the **Te Kahui** database. Much of the material has only been provisionally identified.

3. Summary.

Almost 1000 species of bryozoans inhabit the sea-bed around New Zealand, with some 960 species reported to date (Gordon 1999), of which about 320 are undescribed. This is very high species diversity by global standards, with a rate of endemism exceeding 60%. The following key species of the benthic, habitat-forming bryozoan suspension-feeding guild are all long-lived (years to decades) so seasonal distributions are the same as this annual one.

Cinctipora elegans Hutton, 1873, one of two living species in the endemic cyclostome family Cinctiporidae (Boardman et al. 1992), can be locally abundant. It has been recorded from Cape Runaway (about 37° S), greater Cook Strait, eastern South Island and the Chatham Rise through Foveaux Strait to all the subantarctic islands, south to about 53° S, at depths of 12–914 m (Taylor et al. in press). However, the deeper records almost certainly refer to transported dead specimens and it is estimated that the deepest that live individuals of this species are to be found is about 220 m. It is the dominant bryozoan among the mid-shelf bryozoan meadows at depths of 70–112 m on the Otago shelf (Probert et al. 1979, Carter et al. 1985). In eastern Foveaux Strait it is the principal frame-builder of extensive ‘reefs’ associated with the dredge oyster (Cranfield et al. 1999, 2003, submitted).

Diaperoecia purpurascens (Hutton, 1873), like *C. elegans*, is erect and branching but belongs to a different cyclostome family (Diaperoeciidae). It can be locally abundant and is widely distributed from about 33° to 54°S, from the Three Kings Islands to the Macquarie Ridge at depths of 0–1156 m (Whitten 1979, Taylor et al. in press). Again, the deeper records are

probably transported dead specimens and it is estimated that the deepest that live individuals of this species is to be found is about 220 m.

Celleporaria agglutinans (Hutton, 1873) is a cheilostome bryozoan in the family Lepraliellidae. It is commonly known as Tasman Bay coral or hard coral and occurs live from the Three Kings Islands to Foveaux Strait at about 3–220 m depth (Gordon 1989). It is a common shelf species, particularly well represented off Abel Tasman National Park, the western Marlborough Sounds, and Otago shelf (Bradstock & Gordon 1983, Cryer et al. 2000, Batson 2000, Grange et al. 2003). Colonies start out as mounded encrusters that produce erect foliaceous, platey, and tubular growths to 30 cm high. Areas of muddy-sandy bottom off Separation Point historically supported many thousands of large biohermal mounds of hard coral intermixed with other bryozoans, creating a nursery habitat for juveniles of commercial fish, particularly snapper, tarakihi, and John dory (Bradstock & Gordon 1983). The *C. agglutinans* biotope has existed in the northern South Island region since the Early Miocene (Gordon et al. 1994).

Galeopsis porcellanicus (Hutton, 1873) (Cheilostomata, Celleporidae) has a similar colony morphology to *C. elegans* and *D. purpurascens*. Found live from the Three Kings Islands to Foveaux Strait, it co-occurs with most of the other species at depths of 0–235 m (Gordon 1989).

Hippomenella vellicata (Hutton, 1873) (Cheilostomata, Schizoporellidae) starts life as a two-dimensional encruster. It can reproduce in this phase but commonly produces erect, brittle lamellar-foliaceous growths up to almost 30 cm across. In this form it is referred to as cornflakes coral by fishers. It is widely distributed around the New Zealand shelf from the Kermadec Ridge through the Three Kings Shelf and outer Hauraki Gulf to Foveaux Strait, living at depths of 10–350 m and is particularly common off Tasman Bay and the Otago shelf (Bradstock & Gordon 1983, Gordon 1989, Batson 2000, Oh 2001). It co-occurs with *C. agglutinans* in the Tasman Bay coral biotope (Gordon et al. 1994). Off Otago Shelf it is the host of the only known New Zealand species (presently undescribed) of the parasitic phylum Orthonectida (formerly part of the Mesozoa), which occasionally infects the ovicells in which larvae are incubated (Junge 1998).

Celleporina grandis Gordon, 1989 (Cheilostomata, Celleporidae) is not as common as the other species but has nevertheless been recorded live from the Three Kings Islands, Tasman Bay, Westland, Fiordland coast, Puysegur Bank, Foveaux Strait, and Otago shelf at depths of 17–220 m (Gordon 1989, Batson 2000). Colonies are somewhat finger-shaped and generally branching. The most robust colonies, up to 5 cm high, occur on the Otago shelf.

Most of the information on the distribution and abundance of these and other bryozoans is general in nature, but there are clearly hotspots in

distribution. New Zealand bryozoan-dominated continental-shelf (including rock-wall) habitats include the Three Kings Shelf and Spirits Bay area, the Poor Knights Islands, outer Hauraki Gulf, Ritchie Banks, Cook Strait (e.g. Separation Point, Stephens Hole), Otago Shelf, Fiordland, Puysegur Bank/Foveaux Strait region, and Snares Plateau (Probert et al. 1979, Grange et al. 1981, Willan 1981, Bradstock & Gordon 1983, Junge 1998, Cranfield et al. 1999, 2003, Batson & Probert 2000, Cryer et al. 2000, Grange et al. 2003). In all these places bryozoans play an important role in structuring the benthic communities.

The above information on the distribution of this bryozoan biotope, derived mostly from general accounts in the literature and museum collections, was largely written and fully reviewed by Dr Dennis Gordon, NIWA Wellington, and then integrated by hand onto a large-scale map of New Zealand. The rounded lines were then digitised and imported into a GIS software package as layers. The areas of each distribution class were calculated and the layers were linked to attribute and metadata files. The map, because of its scale, cannot be taken to accurately define the local distribution of this species.

4. References.

The following publications were the key references and/or the ones most useful in describing the recent/current annual distribution of the bryozoan species. The list is not intended to be an exhaustive bibliography of publications about these species.

- Batson, P.B. (2000). The Otago shelf bryozoan thickets: aspects of their distribution, ecology and sedimentology. Unpublished M.Sc. thesis, University of Otago, Dunedin. 166 p.
- Batson, P.B.; Probert, P.K. (2000). Bryozoan thickets off Otago Peninsula. *New Zealand Fisheries Assessment Report 2000/46*: 1–31.
- Boardman, R.S.; McKinney, F.K.; Taylor, P.D. (1992). Morphology, anatomy, and systematics of the Cinctiporidae, new family (Bryozoa: Stenolaemata). *Smithsonian Contributions to Paleobiology* 70: 1–81.
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- associated sediments in Foveaux Strait, southern New Zealand. *Continental Shelf Research* 23: 1337–1357.
- Cranfield, H.J.; Rowden, A.A.; Smith, D.J.; Gordon, D.P.; Michael, K.P. (submitted). Macrofaunal assemblages of benthic habitat of different complexity: the relative importance of fishing disturbance and source of propagules to habitat regeneration in Foveaux Strait, New Zealand. *Journal of Sea Research*.
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- Gordon, D.P. (1999). Bryozoan diversity in New Zealand and Australia. In: The other 99%. The conservation and biodiversity of invertebrates. Ponder, W.; Lunney, D. (eds), pp 32–37. Royal Zoological Society of New South Wales, Mosman. vii + 454 p.
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- Grange, K.R.; Tovey, A.; Hill, A.F. (2003). The spatial extent and nature of the bryozoan communities at Separation Point, Tasman Bay. *Marine Biodiversity Biosecurity Report* 4: 1–22 p.
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- Taylor, P.D.; Gordon, D.P.; Batson, P.B. (in press). Paleodepth estimation and the bathymetric distributions of modern populations of some common Cenozoic Bryozoa from New Zealand. *New Zealand Journal of Geology and Geophysics*.

- Whitten, R.F. (1979). Systematics and ecology of northern Hauraki Gulf Bryozoa. Unpublished Ph.D. thesis, University of Auckland. viii + 515 p., 1 tab., 24 pls.
- Willan, R.C. (1981). Soft-bottom assemblages of Paterson Inlet, Stewart Island. *New Zealand Journal of Marine and Freshwater Research* 8: 229–248.

2005 Update.

Discussions with bryozoan specialist Dr Dennis Gordon, NIWA indicated that there were no new NIWA museum holdings, or recent identifications of old material, that would alter the NABIS 2003 distribution map. The NORFANZ (2003) voyage to the northwest of Cape Reinga did not record these species. Further, there has been just one paper published since 2003 on bryozoan distribution around New Zealand (Rowden et al. 2004); the only change to the NABIS 2003 distribution map that this paper prompted was the inclusion of the Auckland Islands Shelf in the range of distribution of this community. There have been no further, formally identified shelvings of material in the Te Papa collections that extended or altered these distributions (Rick Webber, Collection Manager Marine Invertebrates, Museum of New Zealand Te Papa Tongarewa, pers. comm.).

The above was confirmed by Dr Gordon on 27 September 2005. The NABIS website distribution map and associated data for this community were checked on 21 September 2005 and no other necessary changes were detected. The existence of this community on the Pukaki, Campbell, and Bounty Rises to the south of New Zealand remains unknown through insufficient sampling, but the Auckland Islands Shelf is now part of the area of distribution of this community. Changes are necessary to both the map layers and the lineage document.

Because of its scale, the distribution map cannot be taken to accurately define the local distribution of this species. Note that the distribution of New Zealand bryozoans held by NIWA can be accessed through its Bryozoan Biodiversity Database.

NORFANZ (2003). Biodiversity survey of seamounts and slopes of the Norfolk Ridge and Lord Howe Rise. Progress Report 1 to Australia's National Oceans Office.

Rowden, A.A.; Warwick, R.M.; Gordon, D.P. (2004). Bryozoan biodiversity in the New Zealand region and implications for marine conservation. *Biodiversity and Conservation* 13: 2695–2721.

2007 Update.

Discussions with bryozoan specialist Dr Dennis Gordon, NIWA on 20 September 2007 revealed that recent identifications of old material have led to changes to the distribution map. The existence of this community on the

Pukaki, Campbell, and Bounty Rises to the south of New Zealand is now confirmed (Taylor et al. 2004, 2007); changes are therefore necessary to the map layers. (Note, however, that as before, because of its scale, the distribution map cannot be taken to accurately define the local distribution of this species.)

Taylor, P.D.; Gordon, D.P.; Batson, P.B. (2004). Bathymetric distributions of modern populations of some common Cenozoic Bryozoa from New Zealand, and paleodepth estimation. *New Zealand Journal of Geology and Geophysics* 47: 57–69.

Taylor, P.D.; Kuklinski, P.; Gordon, D.P. (2007). Branch diameter and depositional depth in cyclostome bryozoans: testing a potential paleobathymetric tool. *Palaios* 22: 220–224.

2010 Update.

Discussions with bryozoan specialist Dr Dennis Gordon, NIWA on 26 October 2010 revealed that there was no recent information to extend or alter the current distribution map. Note, however, that as before, because of its scale, the distribution map cannot be taken to accurately define the local distribution of this species. As with many species, it is possible that the current known distribution of this species may be influenced by the spatial distribution of sampling effort.

Taylor, P.D.; Gordon, D.P.; Batson, P.B. (2004). Bathymetric distributions of modern populations of some common Cenozoic Bryozoa from New Zealand, and paleodepth estimation. *New Zealand Journal of Geology and Geophysics* 47: 57–69.

Taylor, P.D.; Kuklinski, P.; Gordon, D.P. (2007). Branch diameter and depositional depth in cyclostome bryozoans: testing a potential paleobathymetric tool. *Palaios* 22: 220–224.

2012 Update.

A Google search (***bryozoan community***) on 9 August 2012 did not yield any information that extended or altered the above distributions.

Discussions with bryozoan specialist Dr Dennis Gordon, NIWA on 15 August 2012 revealed that there was no recent information to extend or alter the current distribution map. Note, however, that as before, because of its scale, the distribution map cannot be taken to accurately define the local distribution of this species. As with many species, it is possible that the current known distribution of this species may be influenced by the spatial distribution of sampling effort.

Taylor, P.D.; Gordon, D.P.; Batson, P.B. (2004). Bathymetric distributions of modern populations of some common Cenozoic Bryozoa from

New Zealand, and paleodepth estimation. *New Zealand Journal of Geology and Geophysics* 47: 57–69.

Taylor, P.D.; Kuklinski, P.; Gordon, D.P. (2007). Branch diameter and depositional depth in cyclostome bryozoans: testing a potential paleobathymetric tool. *Palaios* 22: 220–224.