Lineage – Scientific methodology

Annual distribution of a Spirits Bay invertebrate complex lineage

The benthic invertebrate assemblages of Spirits Bay, Northland, are the richest in New Zealand in terms of numbers of species and taxon diversity (Cryer et al. 2000). The area, dominated by colonial suspension feeders (85% of all species), has been rated as New Zealand's marine-biodiversity "hotspot" (e.g. Taylor & Gordon 2003). For example, more than 200 species of sponges and 300 species of bryozoans have been recorded in Spirits Bay. The significance of the latter can be appreciated when compared to the total bryofauna of New Zealand (951 marine species, hence 32% of species are in Spirits Bay), and Britain (302 species). Similarly, 739 species of sponges are known for New Zealand, of which the Spirits Bay diversity is 27%. The area also boasts many other invertebrate taxa and high rates of local/global endemism.

The sponges and other colonial suspension feeders in Spirits Bay are important in pelagic-benthic energy transfer and provide three-dimensional structure for other components of the system. In Cryer et al.'s (2000) study, there was a strong correlation between bryozoan and crustacean species richness, supporting the idea that colonial suspension feeders provide a diverse habitat suitable for a diverse epifauna/ macrofauna.

Sponge richness seems to be the most affected by scallop dredging. For this reason, and because of its unique fauna, an area seaward of Spirits Bay and extending to North Cape, in the 50–70 m depth zone, was closed to trawling, Danish seining, and commercial scallop dredging on 11 November 1999 (Taylor & Gordon 2003).

Although there are many endemic species in the Spirits Bay area, two bryozoan and two sponge species (the bryozoans *Spiritopora perplexa* and *Steginoporella perplexa*, and the sponges *Lamellomorpha strongylata* and *Crambe* sp.) are selected here as being potentially endangered. The distribution of this biotope, based on the presence of these species, is portrayed; although known best from Spirits Bay, this biotope appears also to exist as far south as Ahipara on the west coast.

The following species summaries were derived from the literature, museum holdings, and from discussion with bryozoan and sponge experts. Ministry of Fisheries electronic databases were not checked

because none was thought to contain any useful information on the distribution of these taxa.

1. Literature

All published work on this invertebrate community is known and listed below. Searches were therefore not initiated on any reference databases.

2. Museum holdings

Holdings of bryozoans and sponges 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.

a. NIWA Greta Point. The **New Zealand Bryozoan Biodiversity Database** was consulted on 26 August 2005 and the distributions of the two species determined. The two sponge species do not appear in the NIWA's **AllSeaBio**, checked on 26 August 2005.
b. Museum of New Zealand Te Papa Tongarewa. A search of their database on 22 August 2005 yielded no records of the four species.
c. Auckland Museum records confirmed (22 August 2005) one record of *Steginoporella perplexa*, off Cape Maria van Diemen.

Examination of the NIWA Invertebrate Collection database **Specify** and discussions with the relevant experts (Michelle Kelly and Dennis Gordon, both of NIWA) in May 2009 did not reveal any recent additional records of any of these species. The most recent record of *Lamellomorpha strongylata* (not taken into account in the previous reviews) was taken on a Spirits Bay habitat mapping survey in May 2006 (M. Kelly, NIWA, Unpublished data).

3. Summary

Spiritopora perplexa Taylor & Gordon, 2003 (Cyclostomata: Diaperoeciidae). The monotypical genus *Spiritopora* is entirely endemic to Spirits Bay, where it can be so locally common as to be a noteworthy bycatch. Part of the reason for this is that mature colonies, up to 50 mm diameter, are bryoliths (like rhodoliths); as colonies grow they can become independent of their encrusting substratum by enveloping it. The bryoliths can then be tumbled and accumulate in depressions or sediment ripple troughs. Biologically, *S. perplexa* morphologically straddles two cyclostome bryozoan suborders, accounting for the species name and its interest to bryozoologists. The species is found at depths from 35–76 m. Of the ten NIWA stations from which the species was obtained, only one was in the protected area in Spirits Bay . The type locality is outside the protected area.

Steginoporella perplexa Livingstone, 1929 (Cheilostomata: Steginoporellidae). This striking species forms large hand-sized planar fronds up to 150 mm high. No other living *Steginoporella* species has such a morphology. Colonies are basally rooted into soft or gravelly substrata by rootlets issuing from the base of the colony. Being calcified and quite stiff, the planar colonies are baffle-like, but their precise role in their habitat is not known. Originally described from "Three Kings Island … 65 fathoms" on the basis of material collected by the Thomas Mortensen Pacific Expedition, 1914–1916 (Livingstone 1929), the only reported location of this locally endemic species beyond the vicinity of the Three Kings Shelf and Spirits Bay is at NIWA Station E268 (44 m deep) southwest of Ahipara. The depth range within the bounds of the Three Kings Shelf region at all stations where the species has been recorded is 30–99 m.

Lamellomorpha strongylata Bergquist, 1968 (Astrophorida: Incertae sedis). *Lamellomorpha* is an endemic genus of uncertain family attribution. When first described, it was monotypic. The holotype specimen (NIWA holotype H-33) was from the Three Kings vicinity, with additional material from the Campbell Plateau. A massive bright green sponge, it is sometimes folded and incurved, becoming lamellate, supported by a stout stalk. This species and a congener (*Lamellomorpha* sp.) were recorded from Spirits Bay by M. Kelly and M. Wilkinson in Cryer *et al*. (2000). Known depth range in the Three Kings area is 55–110 m; on the Campbell Plateau it is 84–188 m. The Campbell Plateau record was not incorporated into the present distribution map because *L. strongylata* was not present there in association with the other three species.

Crambe sp. (Poecilosclerida: Crambidae): A recent collection in Spirits Bay, Northland (Kelly & Wilkinson *in* Cryer *et al*. 2000) yielded the first record of the genus *Crambe* and the family Crambidae in the Southwest Pacific. In life, this sponge is encrusting and red.

The above information on the distribution of this invertebrate biotope, derived mostly from accounts in the literature and museum collections, was largely written by Dr Dennis Gordon (NIWA Wellington), with help from Michelle Kelly (NIWA Auckland), and reviewed by Dr Abigail Smith, Department of Marine Science, University of Otago, and then integrated by hand onto a large-scale map of New Zealand. The rounded lines were digitised and imported into a GIS software package as layers. Not enough is known of the distribution of this invertebrate complex to allow hotspots of occurrence to be assigned. The area of the 100% distribution class was calculated and the layer linked to attribute and metadata files.

No additional records of these species outside of the known range were identified in reviews carried out in November 2007 and May 2009.

4. References

The following publications were the key references and/or the ones most useful in describing the recent/current annual distribution of this invertebrate complex.

Bergquist, P.R. (1968). The marine fauna of New Zealand: Porifera, Demospongiae, part 1 (Tetractinomorpha and Lithistida). *New Zealand Oceanographic Institute Memoir 37*: 1–98.

Cryer, M.; O'Shea, S.; Gordon, D.; Kelly, M.; Drury, J.; Morrison, M.; Hill, A.; Saunders, H.; Shankar, U.; Wilkinson, M.; Foster, G. (2000). Distribution and structure of benthic invertebrate communities between North Cape and Cape Reinga. Final Research Report for Ministry of Fisheries Research Project ENV9805 Objectives 1–4: 1–154.

Livingstone, A.A. (1929). Papers from Dr. Th. Mortensen's Pacific Expedition 1914–16. XLIX. Bryozoa Cheilostomata from New Zealand. *Videnskabelige Meddelelser fra Dansk naturhistorisk Forening i Kjøbenhavn 87*: 45–104, 2 pls.

Taylor, P.D.; Gordon, D.P. (2003). Endemic new cyclostome bryozoans from Spirits Bay, a New Zealand marine-biodiversity "hotspot". *New Zealand Journal of Marine and Freshwater Research 37*: 653–669.