NEW RECORDS OF WARM-WATER FORAMINIFERA FROM NORTH-EASTERN NEW ZEALAND.

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SUMMARY

Six species of warm-water benthic foraminifera (*Spiroloculina angulata*, *Wiesnerella auriculata*, *Amphistegina papillosa*, *Carterina spiculotesta*, *Loxostomum limbatum costulatum* and *Sigmavirgulina tortuosa*) found in surface sediments around the Cavalli Islands, east Northland, are recorded from New Zealand for the first time. These are also the first records in the New Zealand Recent fauna of the genera *Wiesnerella*, *Amphistegina*, *Carterina* and *Sigmavirgulina*.

These taxa, together with a number of other warm-water foraminifera previously recorded from north-eastern New Zealand, are believed to have arrived here since the Last Glaciation, being carried south in warm currents.

INTRODUCTION

Recent studies on the benthic foraminifera around the Cavalli Islands have produced a number of records of taxa not previously known from New Zealand. The Cavalli Islands (latitude 35° 00' S, longitude 173° 57' E) lie 2—4 km off the east coast of Northland midway between the Bay of Islands and Whangaroa Harbour (Harward 1979a). The foraminifera studied are from 55 dredge samples of surface sediments taken at 0 to 41 m during the Offshore Islands Research Group trip at New Year 1978-1979 (Hayward 1979b, Grace & Hayward 1980). “Live” individuals were distinguished using the protoplasm stain, Rose Bengal.

Many of the new records are of taxa whose distribution is not well known. In this note only taxa of undoubted warm-water distribution are dealt with. I have endeavoured to compliment the Cavalli Island records of these species by listing other samples held by the New Zealand Geological Survey in which they occur.

Sample numbers (e.g. F201 720) quoted are those of the New Zealand Geological Survey, Micropaleontology Section, Lower Hutt.

NEW RECORDS

*Spiroloculina angulata* Cushman Fig. 2

*Spiroloculina grata* var. *angulata* Cushman 1917, *U.S. National*
**Museum Bulletin 71 : 36, pl. 7, fig. 5.**

**New Zealand Localities:** Cavalli Islands - 6 m, 40 m, 41 m (F201 719, 720, 729); Hen and Chicken Islands - 60 m, 85 m (F201 048, 050); Goat Island Bay - beach (F201 352); Whangateau Harbour entrance - beach (F201 353). No live individuals observed.

**Distribution:** Widely distributed in the tropical and sub-tropical Indo-Pacific and Mediterranean. The nearest records to New Zealand are from New South Wales, Fiji, Tonga (Cushman and Todd 1944) and Norfolk Island (F201 573).

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**Wiesnerella auriculata** (Egger) Fig. 1.


**New Zealand Localities:** Cavalli Islands - 10 m, 36 m, 40 m (F201 718, 719, 752). No live individuals seen.

**Distribution:** This relatively rare species is widely distributed throughout the warmer seas of the world.

**New Zealand Fossil Record:** This species is known from the lower Miocene, Altonian stage and the genus is also known from the Eocene, Runangan stage (Hornibrook 1961).

**Amphistegina papillosa** Said Fig. 4.

*Amphistegina radiata* var. *papillosa* Said, 1949, Cushman Laboratory for Foraminiferal Research, Special Publication 26: 39, pl. 4, fig. 12.

**New Zealand Locality:** Cavalli Islands - 1.5 m (F201 756).

**Distribution:** *Amphistegina* is a tropical to warm subtropical genus, with its range apparently limited by the 14°C winter isotherm (Larsen 1976). I consider this value to be rather liberal and 16°C to be more accurate. *Amphistegina*’s extreme latitudinal limits are 34°N, off south-east Japan and 37°S, off eastern Australia (Todd 1978).

**New Zealand Fossil Record:** *A. papillosa* has not been recorded in New Zealand, but the genus is extremely abundant in Eocene to mid Miocene rocks. There are also scattered records of *Amphistegina* from the late Miocene and Pliocene, but it is not known from our Pleistocene (Hornibrook 1968).
Figs 1 - 7. Scanning electron photographs of Recent foraminifera from the Cavalli Islands. (Numbers prefixed by FP are NZ Geological Survey catalogue numbers). 1. Wiesnerella auriculata, length 0.47 mm, FP 2981; 2. Spiroculina angulata, length 0.48 mm, FP 2982; 3. Loxostomum limbatum costulatum, length 0.45 mm, FP 2983; 4. Amphistegina papillosa, diameter 1.2 mm, FP 2984; 5. Sigmavirgulina tortuosa, length 0.40 mm, FP 2985; 6. Carterina spiculotesta, juvenile, greatest diameter 0.8 mm, FP 2986; 7. Carterina spiculotesta, average length of spicules 0.05 mm, FP 2986.
Discussion: The Cavalli Islands’ record is of a single, somewhat worn, adult specimen (Fig. 4) which was dead at the time of collection. *Amphistegina* are large, robust foraminifera, prone to reworking from older sedimentary rocks and therefore the possibility that this specimen is derived from older rocks must be considered. The abraded character of the specimen might be taken as indicative of reworking, but many of the foraminifera in the coarse bioclastic sediments around the Cavallis are abraded and obviously not reworked. There are no older marine sedimentary rocks exposed on land within tens of kilometres of the Cavallis from which *Amphistegina* could be derived, although the possible presence of a submarine outcrop of Pleistocene rocks cannot be discounted. Further support for my contended Recent age for this *Amphistegina* comes from the lack of any obviously reworked foraminifera around the Cavallis, the absence of this species in our fossil record, its abundance in Recent sediments around Norfolk Island and the presence of other warm-water taxa in Cavalli Island’s sediments.

*Carterina spiculotesta* (Carter) Figs. 6, 7.


**New Zealand Localities:** Cavalli Islands - 2.5 m, 3 m, 8 m, 33 m (F201 750, 755, 758, 766), all “alive”; Mokohinau Islands - 24 m (F. Brook collection).

**Discussion:** This monotypic genus is unique in that it produces its own calcareous fusiform spicules (Fig. 7) to build its test.

*Loxostomum limbatum costulatum* (Cushman) Fig. 3.

*Bolivina limbata* var. *costulata* Cushman 1922, *Carnegie Institute Publication* 311: 26, pl. 3, fig. 8.

**New Zealand Localities:** Cavalli Islands - 3 m, 5.5 m, 9 m (F201 746, 757, 758); Goat Island Bay - beach (F201 352); Kawau Island - 10 m (F201 817). No live individuals seen.

**Distribution:** Widely distributed in the shallow tropical to sub-tropical waters of the world, with many records from the Indo-Pacific and Caribbean. The nearest records to New Zealand are from the Great Barrier Reef and Samoa (Cushman 1937).

*Sigmavirgulina tortuosa* (Brady)


**New Zealand Localities:** Cavalli Islands - beach, 2.5 m, 3 m, 10 m, 34 m (F201 721, 725, 732, 736, 755, 760); Goat Island Bay - beach (F201 746, 757, 766).
352); Kawau Island -10 m (F201 817); Whangateau Harbour entrance
beach (F201 353). Some live individuals.

**Distribution:** A common species in warm, shallow water of Indo-Pacific and Caribbean. The nearest records to New Zealand are from New South Wales, Fiji, Tonga and Lord Howe Island (Cushman 1937).

**New Zealand Fossil Record:** This species occurs commonly in Oligocene and lower Miocene rocks (Whaingaroan to Altonian stages).

**DISCUSSION**

In New Zealand these six species are only known from shallow locations off the east coast of Northland. This distribution is similar to that of a number of other warm-water foraminifera previously recorded from New Zealand (e.g. *Buliminoides williamsoniana*, *Cornuspirella diffusa*, *Cornuspiroides foliaceus* — Eade 1967), and to that of several other previously unrecorded species that are possibly warm-water restricted (e.g. *Neoconorbina pacifica*, *Rugidia simplex*, *Suratkina australiensis*).

This distribution pattern parallels that of a number of higher animal groups (e.g. mollusca, echinoderms, fish), and appears to be related to the warm East Auckland Current (Brodie 1960). All are probably derived from warmer waters, either from the north-west (Lord Howe and Norfolk Islands) via the East Australian Current or from the north-east (Kermadec Islands) via the Trade Wind Drift, and then carried southwards offshore along the coast of Northland. This warm East Auckland Current comes close inshore in only a few places and the Cavalli Islands are one of these, although lying on the fringe of the current.

*Amphistegina* and *Carterina* are the two most tropical taxa of these six new records. It is significant that only one specimen (Fig. 4) of *Amphistegina* was found at the Cavalli Islands and it seems unlikely that this taxon is breeding here. It may however have a breeding population in a suitable habitat further out in the current, such as at Cape Karikari or Poor Knights Islands. The distribution of *Amphistegina* appears to be limited by the 16°C winter isotherm and this is very close to the winter temperature of 15°C of the East Auckland Current (R.V. Grace pers. comm.).

Only juvenile specimens of *Carterina* were found at the Cavalli Islands but an adult was found at the Mokohinau Islands, further out in the warm current. This taxon could easily have a breeding population somewhere off eastern Northland.

*Spiroloculina angulata*, *Sigmavirgulina tortuosa* and *Loxostomum limbatum costulatum* are more common around the Cavalli Islands than *Amphistegina*, *Carterina* and *Wiesnerella*. All are undoubtedly breeding in New Zealand waters and all are also found in the Cape
Rodney area, 150 km south of the Cavallis, which is sometimes affected by the East Auckland Current.

It is interesting to note that *Amphistegina, Sigmavirgulina* and *Wiesnerella* were all present in the New Zealand region in the middle Tertiary when surface water temperatures were warmer than they are today. All disappear from the fossil record in the late Tertiary, as temperatures dropped. Although it is not possible to determine whether they disappeared completely from New Zealand due to the lack of late Tertiary marine rocks in Northland, it is unlikely that they survived the Pleistocene glacial periods. It seems most probable that the present records are a result of reinvasion of New Zealand since the Last Glaciation by taxa carried down from the north.

ACKNOWLEDGEMENTS

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REFERENCES


Cushman, J.A. & Todd, R. 1944: The genus *Spiroloculina* and its species. *Cushman Laboratory for Foraminiferal Research, Special Publication* No. 11. 82 p.


