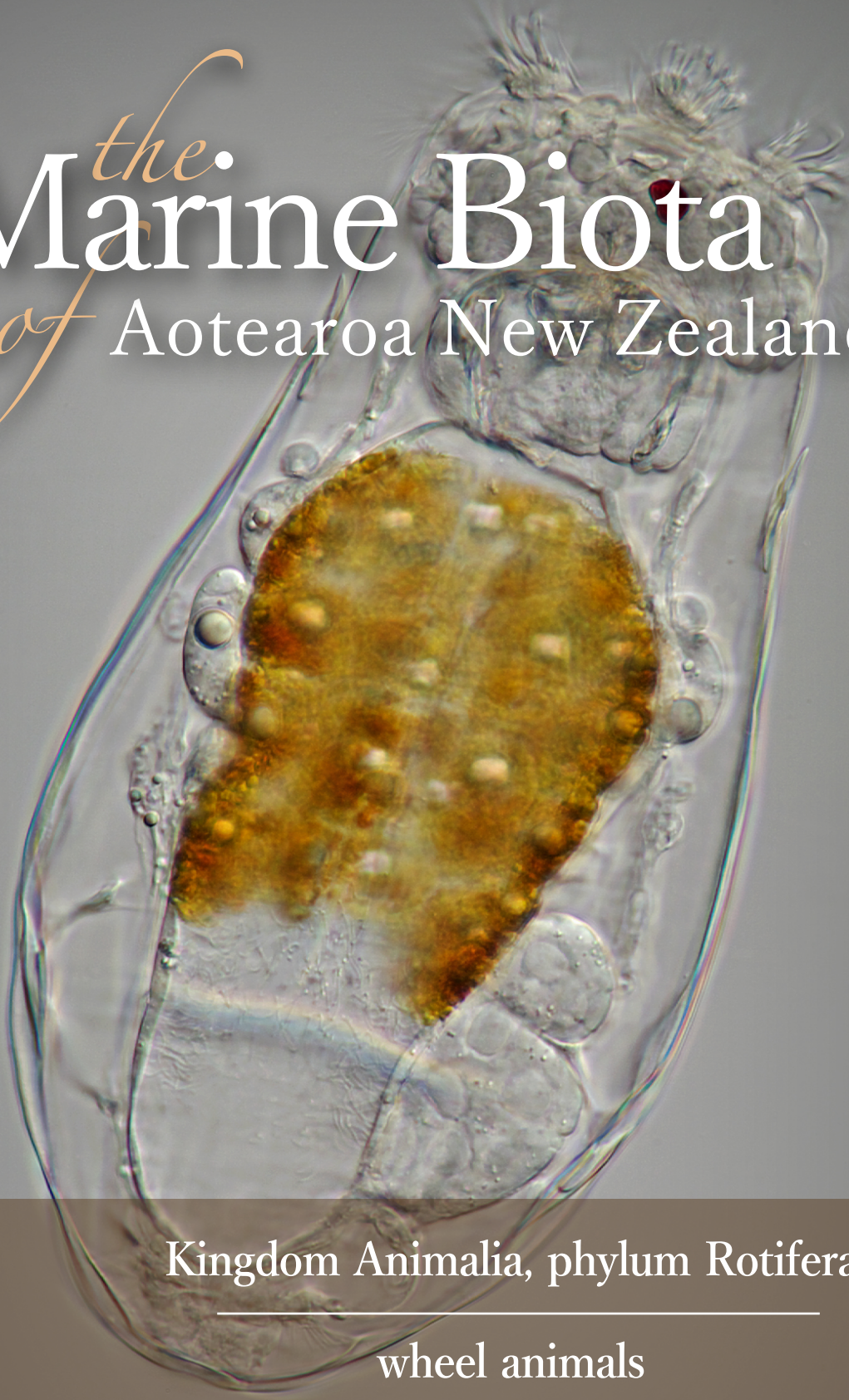
the Marine Biota of Aotearoa New Zealand



12

Kingdom Animalia, phylum Rotifera

wheel animals

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CHAPTER 12

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Kingdom Animalia, phylum Rotifera (wheel animals)

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Summary

Little is known of Aotearoa New Zealand's marine rotifer fauna, with only 17 taxa recorded thus far, three of which are new records since 2000, from Waituna Lagoon, Southland: *Notholca* cf. *marina*/*labis* Focke, 1961, *Notholca salina* Focke, 1961, and *Synchaeta vorax* Rousselet, 1902 (Duggan & White 2010) (Table 12.1; Fig. 12.1). A total of 480 rotifer taxa were recorded from New Zealand and its outlying islands by Shiel *et al.* (2009), but the majority of these were freshwater taxa (Shiel *et al.* 2009: tables on p. 138 and checklist on p. 153). Most of the 17 marine taxa recorded are widespread planktonic species, with only one endemic taxon recognised: *Notholca pacifica* (Russell, 1962). Benthic species, which are diverse and abundant elsewhere, are under-represented. Rotifer sampling from New Zealand marine environments has been spatially and temporally restricted, and mesh sizes used in marine zooplankton studies have been too coarse to collect most species. A checklist of extant New Zealand marine Rotifera is provided.

Introduction

Rotifers, or wheel animals, are named for the metachronal beating of cilia on their corona, which can resemble rotating wheels (Fig. 12.1). The corona is used both for swimming and to draw food particles to the mouth and mastax (a muscular pharynx, containing jaw-like structures called trophi). Most common species are small (50–2000 μm in length). While commonly thought of as planktonic animals, rotifer diversity is dominated by creeping and semi-planktonic forms found in the littoral or benthic regions of standing freshwaters. While rotifers are often the most abundant metazoans in inland waters, both numerically and in terms of species richness (Wallace 2002), they are less commonly observed in marine environments.

Rotifera are currently considered to consist of two classes, the Eurotatoria and Pararotatoria. However, rotifers share a close, monophyletic relationship with the Acanthocephala (thorny-headed worms), though the relationships among these groups are not clear, with different published analyses providing inconsistent results regarding the respective relationships of each group to the others (Lasek-Nesselquist 2012; Fontaneto & De Smet 2015).

Over 2,000 species of rotifer are known worldwide (Segers 2002, 2008), including around 480 from New Zealand and outlying islands, primarily in freshwaters. Nevertheless, in view of the relatively low sampling effort to date, it is probable that these numbers represent less than half of the rotifers likely to be found in both regions (Shiel & Green 1996).

Approximately 400 rotifer taxa have been recorded from saline environments globally (Fontaneto *et al.* 2008). However, marine rotifers have not been well studied in New Zealand. Only seventeen species considered to be "strictly haline" or "euryhaline" by Fontaneto *et al.* (2006) have been recorded from New Zealand marine environments to date, almost all of which are widely distributed planktonic species (e.g., the eight *Synchaeta* species). Elsewhere, taxa inhabiting the psammon (i.e., those living between grains of sand on ocean shores) or benthos are more species-rich and abundant than those in the plankton in marine environments (Fontaneto *et al.* 2006), indicating a lack of sampling in this habitat in New Zealand. The apparent endemicity is low, with only one species considered endemic; *Notholca pacifica* was described by Russell (1962) from saline pools at Allans Beach, Otago. Nevertheless, *Brachionus plicatilis* Müller, 1786 (Fig. 12.1A) has been observed in several New Zealand localities; this taxon was long considered a single, global species, though genetic evidence suggests it is in fact a cryptic species complex, comprising at least 15 species (Suatoni *et al.* 2006; Mills *et al.* 2017). Further, Marshall (2022) recently observed individuals of a *Notholca* species in Auckland ponds experiencing

Table 12.1. Summary of marine Rotifera diversity in the Aotearoa New Zealand region expressed as total numbers and percentage change. Data for 2000 data are derived from Shiel *et al.* (2009) and WoRMS (https://www.marinespecies.org/). OTU = Operational Taxonomic Unit.

	Rotifera		% change
	2000	2023	
Total species diversity	>14	>17+	21
Described extant species, subspecies, or varieties	14	17	21
Undescribed extant species (OTU)	several	several	0
Described endemic extant genera	0	0	0
Described endemic extant species	1	1	0

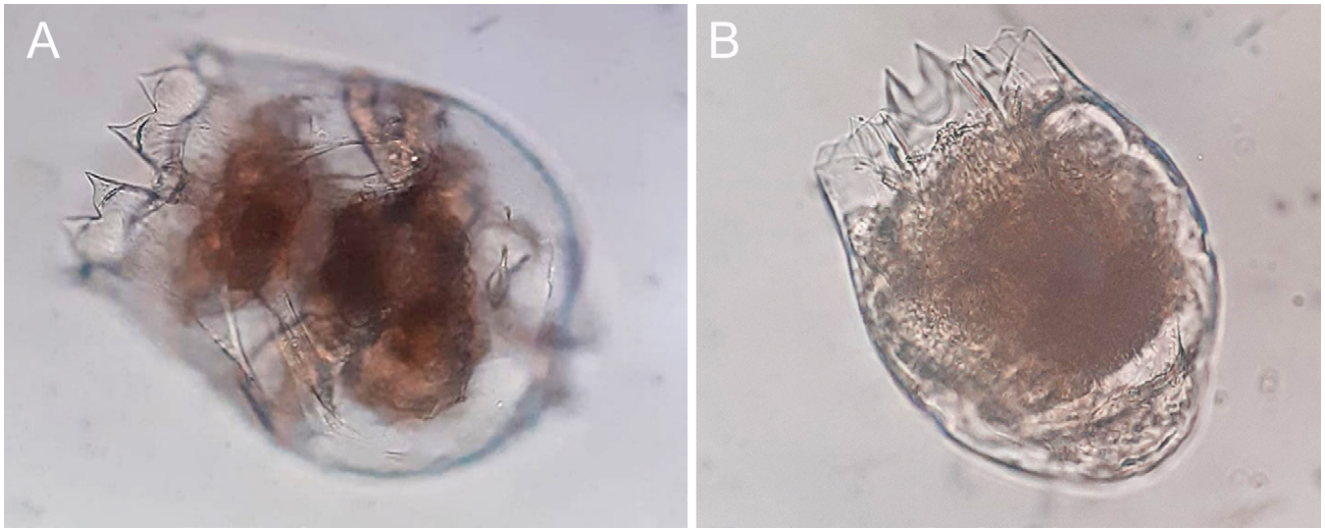

Figure 12.1. Rotifera from saline habitats in the North Island, New Zealand: **A.** *Brachionus plicatilis* Müller, 1786; **B.** *Notholca* cf. *salina* Focke, 1961. Photos by Ian Duggan.

marine intrusions that were morphologically similar to *N. salina* Focke, 1961, though with occipital (frontal) spines that were reduced in length compared to published depictions. These potentially represent either individuals with unique morphological variation within *N. salina*, or a unique taxon (Fig. 12.1B). Genetic assessment of the New Zealand populations may thus uncover currently hidden endemism. Around half of the marine rotifer species recorded in New Zealand are from the genus *Synchaeta*. Cassie (1960), for example, reported three species of *Synchaeta* in a blood-red water bloom southwest of Kapiti Island in 1959, the colour being imparted by the nerve ganglion and eyespot of the rotifers.

Russell (1953) reported *Keratella crassa* Ahlstrom, 1943, typically a freshwater species, in Lyttleton Harbour, noting it was the first time this species had been found in marine waters. In a review of rotifers in saltwater habitats, Fontaneto *et al*. (2006) identified no further records of this species in marine environments, globally. Interestingly, Fontaneto *et al*. (2006) did find records of freshwater species known from New Zealand recorded in the ocean elsewhere. For example, *Brachionus quadridentatus* Hermann, 1783, *Cephalodella catellina* (Müller, 1786), *Euchlanis dilatata* Ehrenberg, 1832 and *Filinia longiseta* (Ehrenberg, 1834), all common in New Zealand ponds and lakes, have each been recorded in oceans in a variety of geographical locations. Conversely, *Hexarthra fennica* (Levander, 1892), typically considered a marine species, was briefly recorded from the coastal freshwater Lake Pupuke, Auckland (Fowler & Duggan 2008) and at low salinities in Lake Waihola, South Island (0–3 ppt; Schallenberg *et al*. 2003); this species may thus be expected to be found in marine environments around New Zealand.

Three rotifer taxa have been added to the record since 2010 (cf. Shiel *et al*. 2009). These are a *Notholca* species with affinities to *N. marina* Focke, 1961 and *N. labis* Focke, 1961, which may constitute an undescribed species, as well as *Notholca salina* and *Synchaeta vorax* Rousselet, 1902. All of these species were recorded from Waituna Lagoon, a Southland coastal waterbody which experiences regular artificial breaching of its sandbar to the ocean (Duggan & White 2010). *Notholca marina*, *N. salina* and *S. vorax* are all considered "strictly haline" marine taxa by Fontaneto *et al*. (2006), while *N. labis* is euryhaline.

Knowledge gaps, research progress and future priorities

Sampling of rotifers from marine environments in New Zealand has been spatially and temporally restricted. Further, the mesh sizes typically utilised to sample zooplankton have been 100 µm or greater, too coarse to collect most species. For a greater understanding of the taxonomic composition and biogeographical associations of the New Zealand rotifer fauna, marine environments, and in particular marine littoral and benthic habitats, need greater attention.

Acknowledgements

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Checklist of extant marine Rotifera known from the New Zealand EEZ

The checklist is derived from Shiel *et al*. (2009) and Duggan & White (2010) and arranged according to the currently accepted systematics and classificatory scheme employed by the World Rotifera Database (Freshwater Animal Diversity Assessment Project, FADA), accessed through the World Register of Marine Species (WoRMS) (https://www.marinespecies.org/). Endemic taxa are indicated by 'E'. All other taxa are considered native by default, i.e., naturally occurring in New Zealand and elsewhere. M = marine; B = brackish; F = freshwater.

Phylum ROTIFERA
Class EUROTATORIA
Family BRACHIONIDAE
Brachionus plicatilis Müller, 1786 M, B
Keratella crassa Ahlstrom, 1943 M
Notholca cf. *marina/labis* Focke, 1961 M
Notholca pacifica (Russell, 1962) E, M
Notholca salina Focke, 1961 M, B
Family LEPADELLIDAE
Colurella adriatica Ehrenberg, 1831 M, B, F
Colurella salina Althaus, 1957 M, B, F
Family DICRANOPHORIDAE
Encentrum marinum (Dujardin, 1841) M, B, F
Family SYNCHAETIDAE
Synchaeta baltica Ehrenberg, 1834 M
Synchaeta cecilia Rousselet, 1902 M, B
Synchaeta cf. *curvata* Lie-Petersen, 1905 M
Synchaeta cf. *fennica* Rousselet, 1909 M
Synchaeta monopus Plate, 1889 M
Synchaeta neapolitana Rousselet, 1902 M
Synchaeta triophthalma Lauterborn, 1894 M, B
Synchaeta vorax Rousselet, 1902 M, B
Family TRICHOCERCIDAE
Trichocerca marina (Daday, 1890) M

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