



<http://researchspace.auckland.ac.nz>

### *ResearchSpace@Auckland*

#### **Copyright Statement**

The digital copy of this thesis is protected by the Copyright Act 1994 (New Zealand).

This thesis may be consulted by you, provided you comply with the provisions of the Act and the following conditions of use:

- Any use you make of these documents or images must be for research or private study purposes only, and you may not make them available to any other person.
- Authors control the copyright of their thesis. You will recognise the author's right to be identified as the author of this thesis, and due acknowledgement will be made to the author where appropriate.
- You will obtain the author's permission before publishing any material from their thesis.

To request permissions please use the Feedback form on our webpage.

<http://researchspace.auckland.ac.nz/feedback>

#### **General copyright and disclaimer**

In addition to the above conditions, authors give their consent for the digital copy of their work to be used subject to the conditions specified on the [Library Thesis Consent Form](#) and [Deposit Licence](#).

#### **Note : Masters Theses**

The digital copy of a masters thesis is as submitted for examination and contains no corrections. The print copy, usually available in the University Library, may contain alterations requested by the supervisor.

SYSTEMATICS AND ECOLOGY  
OF NORTHERN HAURAKI GULF BRYOZOA

Thesis presented in fulfilment  
of the requirements for the  
Degree of Doctor of Philosophy

RONALD F. WHITTEN

Geology Department  
University of Auckland

July 1979

## ABSTRACT

The bryozoan faunas of 104 sediment grab samples and 29 shore and shallow water collections from the northern Hauraki Gulf are described and illustrated. 175 species and subspecies are recognised, 23 of which are described as new and a further 8 recognised as new but not formally described owing to their poor state of preservation. One new genus, Maoricellepora, is proposed. The new species described are Conopeum zelandicum, Amphiblestrum remuliformis, Chaperiopsis uttleyi, C. browni, Beania huttoni, Caberea breviscuta, Celleporaria (Celleporaria) haurakiensis, Maoricellepora parva, Urceolipera hyalina, Conescharellina depressa, Sphaeropora granulata, Haswellina triavicularis, Smittoidea tawharanuiensis, Diastopora haurakiensis, D. kotahirau, D. maangainui, Tubulipora haurakiensis, Hastingsia maoriana, Crisia zelandica, Hornera aotearoa, H. gracilis, Crisina haurakiensis and Disporella bicuspis, and the new subspecies is Beania inermis zelandica. The Anascina is subdivided into superfamilies based largely on the 'Divisions' of previous authors.

The main environmental factors in the northern Hauraki Gulf are summarised and their effect on the bryozoan fauna discussed. The substrate preferences of some species are recognised.

The distribution and diversity patterns of the bryozoan fauna are examined, the greatest numbers and highest diversities being in the coarse sediments, the faunas of the fine sands and muds being sparse.

The eschariform and vinculariiform growth types are redefined and the assemblages analysed in terms of zoarial form.

Differences from some previous investigations of bryozoan growth form distributions are the absence of reteporiform species from shallow water, and the presence in shallow water of vinculariiform species in which the outer walls have been strengthened by secondary calcification or the branches are anastomosing.

A brief discussion is given on the use of Bryozoa in palaeoenvironmental analysis in the light of this and previous studies on bryozoan distribution.

## CONTENTS

	Page
ABSTRACT	iii
INTRODUCTION	1
Aim	1
Methods and Materials	1
Acknowledgements	2
Previous Investigations of New Zealand	
Bryozoan Faunas	4
PART I SYSTEMATICS	9
Introduction	9
General arrangement of supra-generic	
categories	9
Synonymies	9
Terminology	10
Measurements	12
Order Cheilostomatida	14
Order Cyclostomatida	360
PART II ECOLOGY	415
The Physical Environment of the Northern	
Hauraki Gulf	415
Bathymetry	415
Temperature and salinity	416
Currents and tides	417
Turbidity	418
Sediments	419
Rates of deposition	422
Effect of the Physical Environment on the	
Bryozoan Fauna	424
Temperature	424
Salinity	425
Light	425
Hydrodynamic factors	426
Rate of deposition	428
Desiccation	428
Substrate	429
Depth	448

	Page
Gross Quantitative Distribution of Species and Specimens	449
Species diversity	450
Detailed Quantitative Distribution of some Individual Species	455
Distribution of Zoarial Growth Forms	458
Introduction	458
Membraniporiform	460
Celleporiform	462
Scrupariiform	462
Flustridae	463
Catenicelliform	463
Cellariiform	464
Eschariform	466
Vinculariiform	467
Reteporiform	468
Lichenoporiform	469
Lunulitiform	471
Conescharelliniform	472
The Use of Bryozoa in Palaeoenvironmental Analysis	474
REFERENCES	478
APPENDIX: List of Stations	512

#### TABLES

1 Percentage distribution of Hauraki Bryozoa	opp. 456
2 Relationship between zoarial growth forms and environmental factors	476

#### TEXT-FIGURES

Fig. 1 Station distribution	3
2 Longitudinal section through a hypothetical ovicell to show the morphology of the wall layers	11

Fig.		Page
3	Sediment facies	420
4	Number of species of Bryozoa per sample	451
5	Number of specimens of Bryozoa per sample	451
6	Diversity (Shannon-Wiener information function)	451
7	Diversity (Simpson index)	451
8	Distribution of <u>Diastopora maangainui</u> and <u>Caberea breviscuta</u>	456
9	Distribution of <u>Emballotheca waipukurensis</u>	456
10	Percentage distribution of <u>Hornera gracilis</u>	456
11	Percentage distribution of <u>Cellaria tenuirostris</u>	461
12	Absolute frequency of <u>Cellaria tenuirostris</u>	461
13	Percentage distribution of Membraniporiform type	461
14	Percentage distribution of Celleporiform type	461
15	Distribution of Catenicelliform type	465
16	Percentage distribution of Cellariiform type	465
17	Distribution of Eschariform type	465
18	Percentage distribution of Vinculariiform type	465
19	Percentage distribution of Reteporiform type	470
20	Distribution of Lichenoporiform type	470
21	Distribution of Lunulitiform type	470
22	Distribution of Conescharelliniform type	470

CORRIGENDA

- i) "Genotype" on page 15 and subsequent pages should read "type-species".
- ii) "Opesium" and "opesia" on page 16 and subsequent pages should read "opesia" and "opesiae" respectively.