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THE ECOLOGY OF TWO NEW ZEALAND
OPISTHOBRANCH MOLLUSCS

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A thesis submitted for
the degree of Doctor of
Philosophy in Zoology,
University of Auckland.
An intertidal population of the anaspidean *Aplysia* *dactylomela* Rang was followed for three consecutive years at the Leigh Marine Reserve, North Auckland, New Zealand. Field assessments were made of recruitment, growth (by recapture of tagged individuals), density, crawling rate, gonad index and mortality. These data allowed monthly estimates of the entire population within the entire study area (2.76 ha) to be made. Complementary laboratory studies investigated acceptable foods and an energy budget including data on energy of the food, growth rates, egestion, respiration and assimilation efficiency were also obtained in the laboratory. In conjunction with these studies, field work on the algal food of *A. dactylomela* (species of *Laurencia*) elucidated the entities present, their separate yearly changes in biomass and the causes. From this information, data on food requirements for *A. dactylomela* *ha*<sup>-1</sup> *month*<sup>-1</sup> are contrasted with standing crop estimates for *Laurencia* spp. in the same units to permit consideration of the theoretical grazing effects of *A. dactylomela*. Several lines of evidence show this environment to be sub-optimal for *A. dactylomela*. Storms account for the greatest mortality, but some losses are due to predation by the asteroid *Coscinasterias calamaria* (Gray). Few individuals reach reproductive maturity and the population is not self-recruiting.

An intertidal population of a second opisthobranch, the cephalaspidean *Haminoea* *zelandiae* (Gray in *Dieffenbach*) was followed for three consecutive years at Motukaraka Island, Hauraki Gulf, New Zealand. Field determinations of growth, annual abundance and reproductive cycles were made. The cryptogamic flora at Motukaraka Island has been characterised and annual patterns of cover and distribution presented for five major seasonal components. The relationship between *Haminoea zelandiae* and these algae is considered.

Additional studies on two less-common anaspideans were carried out. Field data on breeding, growth and density are given for *Aplysia* *parvula* Märch which exists in separate, spatially-isolated intertidal and subtidal populations at Goat Island Bay. For these two populations differences exist in diet, colouration, size distribution, growth and survivorship. The intertidal habitat is marginal whereas the subtidal is close to being optimal. *Bursatella leachi* Blainville shows variable annual recruitment to the cyanophyte *Lyngbya majuscula* intertidally at Motukaraka Island. Growth rates have been determined for field and laboratory populations. In the field a deliberate offshore migration takes place whilst *L. majuscula* is still abundant. Speculations on the possibilities and causes for migrations amongst opisthobranchs are discussed.

A taxonomic revision of the New Zealand Anaspidea follows as an appendix. There are eight sea hares authentically recorded for New Zealand: *Aplysia* (Pruvotaplysia) *parvula* Märch 1863; *A. (Varria) dactylomela* Rang 1828; *A. (V.) keraudreni* Rang 1828; *A. (V.) extraordinaria* (Allan 1932); *A. (Aplysia) juliana* (Quoy & Gaimard 1832); *Bursatella leachi* Blainville 1817; *Stylocheilus longicnuda* (Quoy & Gaimard 1825); *Dolabrifera dolabrifera* (Cuvier 1817). For each species a complete synonymy is given as well as full description, locality records and discussion.
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Frontispiece.

*Aplysia dactylomela* Rang. Length 120 mm.

Specimen photographed in situ, Echinoderm Reef, Goat Island Bay, Leigh.
