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The life of a flatfish, the yellowbelly flounder, *Rhombosolea leporina* Günther, 1873, in Auckland’s sheltered waters

David Baraza Mutoro

A thesis submitted for the degree of Doctor of Philosophy in Biological Sciences, University of Auckland, September 1999, resubmitted November 2001
“Give Them Fish and They will ask for More
Show Them to Fish and They Will Feed Themselves”
ABSTRACT

*Rhombosolea leporina* Günther, 1873 is a right-eyed flatfish endemic to New Zealand coastal waters. This study examines this flounder species as an indicator of the importance to fish of the fringe habitats, and its early life stages in those habitats as an indicator of human disturbance. The study was carried out in disturbed areas of the Manukau and Waitemata Harbours, and Tamaki Estuary, which have an urban catchment from the Auckland metropolitan city area, and less disturbed areas in the Kaipara Harbour and Waiwera Estuary with rural catchments.

Juvenile fish on mud/sand flats were caught by scoopnet and in channels by a dragnet. The adult fish were taken by a setnet. Aging was estimated by use of the otolith. Analysis of the otolith and length relationship shows that *R. leporina* has a short life span of about four years. This species spends most of its life in shallow water and starts tidal migration during the 1+ age.

At low tide *R. leporina* < 5cm total length remain on the mud / sand flats, but at localities where there is no standing water this size group occurs along the edge of the retreating tide. Fishes >20cm migrate with the ebb tide to the deeper parts of the channels which in turn lead to the main, deepest channels of the harbour.

Length and weight data were used in the analysis of growth of fish from different localities. The Condition Factor index (CF) calculated from length and weight data of juvenile *R. leporina* reveals that the Manukau Harbour fish are in poorer condition than those of the Waitemata and Kaipara Harbours. Growth estimates by Von Bertalanffy (1938) curves show fast growth in the 1+ and 2+ age groups. The Von Bertalanffy parameters and Walford plots reveal that the female *R. leporina* may grow larger than the male fish.

Sexual maturity is attained at age 2+, females at a length >25cm and males at 22cm. Spawning of this species takes place offshore. Ovary development can be divided into five stages; immature / resting, ripening, ripe, running, and spent. Gonadosomatic index (GSI), founded on ovary development, shows a peak spawning season from winter to spring. GSI is estimated from ovary and fish weight. The juvenile stages of 0+ and 1+ age groups feed on assorted invertebrates. Adults from >20cm length size, the 2+ age group, start to specialise in their diet, mainly feeding on three species of crabs, *Halicarculmus cooki*, *Helice crassa* and *Macrophthalmus hirtipes*.

The early life stages of the 0+ and 1+ age groups are protected by the minimum legal size of fish
that can be taken commercially not being reached until 2+. This enables the fish to reach adulthood and spawn at least once before being taken. The species grows fast and has high fecundity. The fish collected from the Manukau Harbour are more affected by pollution related diseases than those from the Waitemata and Kaipara Harbours. The sediment and water samples were analysed for heavy metals, organo-chemicals, faecal coliforms and Enterococci coli. Those fish analyzed for heavy metals and organo chemicals had their liver loaded with these toxins more than any other organ or tissue. The Manukau, Waitemata Harbours and Tamaki Estuary are more impacted than the Kaipara Harbour.

The other flatfish species caught were Rhombosolea plebeia (Richardson, 1842) and Peltorhamphus latus (James, 1972). The Auckland inshore areas are dominated by the juvenile and adult yellow eye mullet Aldrichetta forsteri which occurs throughout the year. The other fish species caught were only present seasonally, particularly from spring to summer. Nineteen other fish species were recorded at the study sites.
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Table 6.4: The percentage of developmental stages of ovary in the Manukau and Waitemata Harbours between September 1996 to November 1997.

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Manukau and Waitemata Harbours.

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CHAPTER SEVEN

Feeding

Table 7.1: The gut contents of juvenile *R. leporina* from the Manukau, Waitamata and Kaipara Harbours, and Tamaki Estuary.

Table 7.2: The gut contents of sub-adult *R. leporina* from the Manukau, Waitamata and Kaipara Harbours.

Table 7.3: The gut contents of adult *R. leporina* from the Manukau, Waitamata and Kaipara Harbour.

Table 7.4: The juvenile *R. leporina* gut index, means of (fish length, weight and gut weight) for fish from the Manukau and Kaipara Harbours.

Table 7.5: The adult *R. leporina* gut index, means of (fish length, weight and gut weight) for fish from the Manukau and Kaipara Harbours.

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CHAPTER EIGHT

Human Impact on Coastal Habitats of Auckland Region

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Table 8.2: The amount (mg/kg) of metals detected in *R. leporina*, *A. forsteri* and *C. gigas* from the Manukau, Waitamata and Kaipara Harbours, and Tamaki Estuary.

Table 8.3: The amount (mg/kg) of four metals detected in sediments from the Manukau, Waitamata and Kaipara Harbours.

Table 8.4: The amount (mg/kg) of PCBs detected in *R. leporina*, *A. forsteri* and *C. gigas* from the Manukau, Waitamata and Kaipara Harbours, and Tamaki Estuary.
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**Other fishes of the Auckland Region**

**Table A1.1:** The juvenile fish of other species in Auckland coastal habitats, for the Manukau, Waitemata and Kaipara Harbours.

**Table A1.2:** The *R. plebeia* mean of total length (cm) and weight (gm), for the Manukau, Waitemata and Kaipara Harbours.

**Table A1.3:** The *Aldrichetta forsteri* mean of total length (cm) and weight (gm), for the Manukau, Waitemata and Kaipara Harbours.

**Table A1.4:** The *R. plebeia* condition factor index “CF” for the Manukau, Waitemata and Kaipara Harbours.

**Table A1.5:** The *Aldrichetta forsteri* condition factor index “CF” for the Manukau, Waitemata and Kaipara Harbours.

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**Data of collected and analysed sample**

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Table A4.1

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