

**The populations and community structures of fishes in
two large estuaries of south-western Australia**

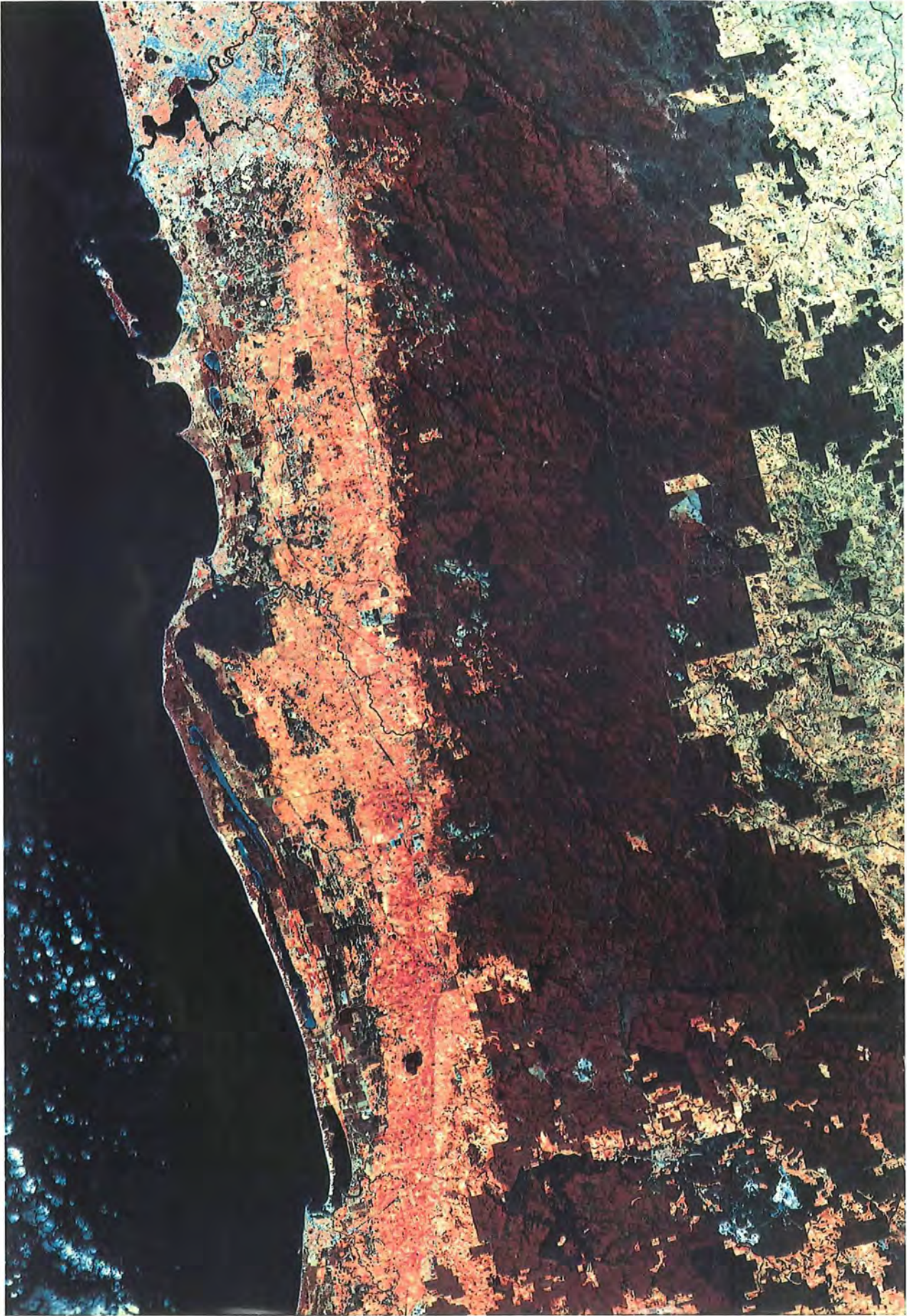
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I declare that this thesis is my own account of my research and contains as its main content work which has not previously been submitted for a degree at any University .

Neil Randell Loneragan

Frontispiece : Landsat image of the Swan Estuary (top, north), Peel-Harvey Estuary (middle) and Leschenault Inlet (bottom, south) in south-western Australia. Image courtesy of Western Australian Department of Land Administration.

Abstract

The fish fauna of the large and adjacent Swan and Peel-Harvey estuaries in temperate south-western Australia, were sampled at regular intervals using beach seines, gill nets and otter trawls at a number of sites throughout these systems. A total of 673 037 individuals, representing 38 families and 76 species were caught in the Swan Estuary compared with 144 372 individuals, 29 families and 55 species in the Peel-Harvey Estuary. Although the Clupeidae, Terapontidae, Mugilidae, Apogonidae and Atherinidae were the most abundant families in each system, the important species within the families differed between the estuaries. Of the 15 most abundant species in the shallows of the Swan Estuary, seven were marine teleosts which entered the estuary regularly and in large numbers (marine estuarine-opportunists), seven completed their life cycle within the estuary (estuarine) and one (*Nematalosa vlaminghi*) was anadromous. The contribution of individuals of the marine estuarine-opportunist category to catches in the shallows declined from nearly 95% in the lower estuary, to approximately 17% in the middle estuary and 6% in the upper estuary. The estuarine and anadromous groups together comprised 83 and 94% of the catches in the middle and upper estuaries, respectively. By contrast, marine estuarine-opportunists were the most abundant group in all regions of the Peel-Harvey, including the saline reaches of tributary rivers.

The number of species and density of fish in the shallows of the Swan and Peel-Harvey systems declined with distance from estuary mouth and rose with increasing salinity and temperature. Classification and ordination of the data from the shallows of both estuarine systems distinguished the ichthyofauna of the saline reaches of the rivers from that of the lower reaches of the estuary. However, the faunal composition of the middle estuary of the Swan was also relatively distinct from those of the lower and upper estuary. The number of species and catch rates in the deeper waters of the Peel-Harvey were influenced to a greater extent by salinity, than those in the shallows. This implies that the larger fish which characterise the deeper waters may thus be less tolerant to low salinities than the smaller fish, typically found in the shallows.

Site within the Swan Estuary generally influenced the densities of individual species to a greater extent than either season or year, or the interactions between these factors. When seasonal effects were pronounced, they could be related to summer spawning migrations into the upper estuary (*N. vlaminghi*, *Amniataba caudavittatus*), spring immigrations into the lower estuary (*Mugil cephalus*) or winter movements into deeper and more saline waters (*Apogon rueppellii*). Marked annual variations in the density of *Torquigener pleurogramma* were related to large differences in the recruitment of the 0+ age class between years.

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Publications

The publications listed below form the basis for parts of this thesis :

1. Potter, I. C., Loneragan, N. R., Chrystal, P. J., Lenanton, R. C. J. and Grant, C. J. (1983). Abundance, distribution and age structure of fish populations in a Western Australian estuary. *J. Zool., Lond.* **200**: 21-50.
2. Loneragan, N. R., Potter, I. C., Lenanton, R. C. J. and Caputi, N. (1986). Spatial and seasonal differences in the fish fauna in the shallows of a large Australian estuary. *Mar. Biol.* **92**: 575-586.
3. Loneragan, N. R., Potter, I. C., Lenanton, R. C. J. and Caputi, N. (1987). Influence of environmental variables on the fish fauna of the deeper waters of a large Australian estuary. *Mar. Biol.* **94**: 631-641.
4. Loneragan, N. R., Potter, I. C. and Lenanton, R. C. J. (1989). The influence of site, season and year on the contributions made by marine, estuarine, diadromous and freshwater species to the fish fauna of a temperate Australian estuary. *Mar. Biol.* **103**: 461-479.
5. Loneragan, N. R. and Potter I. C. (in press). Factors influencing the community structure and distribution of different life-cycle categories of fishes within the shallow waters of a large Australian estuary. *Mar. Biol.*

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