

**Inter-period comparisons of the
ichthyofaunas of two nearby, modified
estuaries and the biology of *Pelates
octolineatus* (Terapontidae)**

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Declaration

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 tertiary education institution.

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The good old days: Landscape shots of the Leschenault Estuary and ‘the team’ hard at work (photo taken by South West Catchment Council).

Abstract

The nearby Leschenault and Peel-Harvey estuaries, on the lower west coast of Australia, have undergone radical “engineering” changes. This applies particularly to the Peel-Harvey Estuary, in which a second artificial entrance channel was constructed in 1994 to increase tidal exchange and thereby reduce the massive eutrophication that afflicted the system. The number of species, densities and species compositions of the ichthyofaunas of these two systems between winter 2008 and autumn 2010 were determined using data derived from seasonal seine netting. The results were compared with those obtained in 1994 in the Leschenault Estuary and in 1996-97 and 1980-81 in the Peel-Harvey Estuary.

Sampling throughout Leschenault Estuary in 2008-10 using a 21.5 m seine net yielded 27,044 fish, representing 43 species, with 75 % of the catch comprising the atherinids *Atherinosoma elongata*, *Craterocephalus mugiloides* and *Leptatherina presbyteroides*, the clupeid *Hyperlophus vittatus* and the mugilid *Aldrichetta forsteri*. Species richness was greatest in the lower and middle regions, due to a high abundance of marine species, whereas *C. mugiloides* and *A. elongata* were the only two species consistently abundant in the upper and apex regions, which are influenced far less by tidal exchange and undergo more pronounced changes in salinity and temperature. The contrast between the large numbers of *C. mugiloides* and *Atherinomorus vaigiensis* caught in 2008-10 and their absence in the earlier period represents a southwards extension of these tropical species, presumably in response to increasing water temperatures in recent years.

Sampling of the Peel-Harvey Estuary in 2008-10 yielded 58,980 fish, representing 46 species, when using the 21.5 m seine net, and 107,670 fish, representing 56 species, when employing a 102.5 m seine net. While *A. elongata*, *H. vittatus*, *L. presbyteroides*, *C. mugiloides* and *Ostorhinchus rueppellii* were abundant in the

catches of both nets, the 102.5 m net samples contained far greater numbers of *Torquigener pleurogramma*, *Favonigobius lateralis*, *T. pleurogramma* and *L. presbyteroides*, which are generally found in the lower reaches of south-western Australian estuaries, were consistently abundant throughout the system, reflecting the maintenance of high salinities for much of the year. Following the introduction of the Dawesville Channel in 1994 and subsequent massive increases in tidal exchange, the ichthyofaunal composition of the Peel-Harvey Estuary changed from being related mainly to region to becoming influenced more by season (Young & Potter, 2003a, b). Since the late 1990s, there has been an increase in both the number of species, and particularly of marine teleosts, and in the abundance of fish and especially of “plant” associated species. This is attributable to increases in seagrass and macroalgal biomass in certain regions and reduced freshwater flows and is reflected in the ichthyofaunal composition becoming similarly related to both season and region.

While the geomorphology of the Leschenault and Peel-Harvey estuaries differ, the ichthyofaunal compositions of these two systems underwent similar pronounced seasonal cycling in the late 2000s. However, the fish faunas of the Leschenault Estuary changed sequentially with increasing distance from the entrance channel and thus along a gradient of increasing salinity, whereas those of the basin regions of the Peel-Harvey Estuary, in which salinities varied far less, were similar. The greater influence of tidal water movement between the Peel-Harvey Estuary and the ocean provides a far more effective mechanism for transporting marine species into and out of this system.

A concomitant study compared the biology of *Pelates octolineatus* in the Peel-Harvey Estuary and nearby coastal embayments. This terapontid settles in shallow seagrass beds in coastal bays, where they remain for about a year, before moving to deeper waters where they can live for up to 10 years. This species reaches maturity at the end of its second year of life and spawns between late spring and late summer.

Growth is highly seasonal, occurring mainly in the warmer months. The Peel-Harvey Estuary also acts as an important nursery area for *P. octolineatus*, with young juveniles recruiting in summer and emigrating in autumn when temperatures and salinities decline, a trend repeated by some 1+ and 2+ fish. Instantaneous growth rates were greater in the Peel-Harvey Estuary than in marine embayments, presumably reflecting the greater productivity of the estuary.

This thesis demonstrates that the ichthyofaunas of the Peel-Harvey and Leschenault estuaries are influenced markedly by environmental, anthropogenic and climatic effects. It provides a valuable insight into the biological and ecological characteristics of a marine estuarine-opportunist species that can complete its life cycle in marine embayments but also use estuaries during the earlier years of its life cycle.

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