

# Estuarine fish in the mixing zone

*Estuaries are an essential part of Western Australia's coastal environment. The sheltered waters, abundance of food and lack of large predatory fish provide a key habitat for many fish species, for either some or all of their lifecycle. However, changing environmental factors and increasing threats from human use are having their effect on estuarine-dependant species.*

## Biological indicators

Because of the large range of fish species that are found in different estuaries, it is difficult to monitor in detail what is happening to each and every one. Therefore, the longer-lived and more vulnerable fish species are selected to act as an indicator of what is happening amongst similar species, or even as an indication of overall ecosystem health.

Perth herring is one example. The species was once common in the Swan-Canning Estuary but numbers have declined dramatically over the last decade or two. To find out why, researchers conducted larval sampling in parts of the upper estuary used as spawning grounds by Perth herring. Their observations suggest that the combined effects of declining rainfall and poor water quality could have led to the decline of this species.

In particular, it is thought that the larvae may be dying once they settle to the bottom of the river, due to little or no oxygen on the riverbed at this time of year. For this reason, Perth herring may serve as a good indicator for the health of the river, in particular to the presence of hypoxic conditions (little or no oxygen).



## Rainfall and fish diversity

Estuaries that are open permanently or that are seasonally open for long periods by heavy winter rains tend to have a higher diversity of fish. This is because there are many opportunities for a large variety of marine fish, such as Australian herring, pink snapper, sea mullet, King George whiting and flathead, to swim into the estuary.

The Swan-Canning estuary owes its rich biodiversity to its permanent connection to the sea. Over 137 fish species in the estuary have been recorded, of which 55% are visitors from the ocean. It is a major nursery area for many marine fish species, and crustaceans such as blue swimmer crabs and king prawns. Examples of other permanently open estuaries include the Peel-Harvey and Walpole-Normalup estuaries, and Oyster Harbour.

In lower rainfall areas, some estuaries may be closed to the ocean for months or even years. There are limited opportunities for fish to enter these estuaries and once inside fish may encounter harsh conditions. The low rainfall and high evaporation rates over summer means that the water can become hypersaline (extremely salty). In Wellstead estuary near Bremer Bay, the salinity can vary from nearly fresh following winter rains to more than twice seawater salinity when closed for a long period over summer. Only the hardiest of fish, such as black bream and mullet, are able to tolerate such extreme conditions.

When an estuary becomes extremely hypersaline, most fish retreat upstream to the lower salinity waters of the rivers that feed into it. At this time, dams, weirs and other barriers to fish passage become deadly because they prevent fish from escaping the high salinity.



## Black bream

Black bream is one of the most important recreational and commercial fish species in south-western Australia. Unlike many other fish found in estuaries, black bream do not migrate to the ocean to spawn, completing their whole life cycle within the confines of the ever-changing estuary environment. They are considered a 'true estuarine' species.

Black bream are well adapted to life in a 'euhaline' environment, coping well with salinity changes that range from freshwater to 'hypersaline' (extreme salinity).

Black bream almost never leave the estuary unless flushed out to the ocean under conditions of extreme flooding. This has led to genetically distinct populations within each estuarine system, as stocks are not replenished by eggs or larvae from the ocean.

Since black bream cannot migrate to other estuaries, they are reliant on a healthy habitat, a productive food chain and good water conditions to maintain healthy populations within a particular estuary.



## Managing estuarine fisheries

A mixture of fish with vastly different life cycles is just one factor that makes the management of commercial and recreational fisheries in our estuaries quite a challenge. This is because the abundance of fish stocks is highly variable and follows different trends in each estuary. This variability is often driven by factors that are independent of any fishing pressure, such as environmental changes.

Environmental impacts can place significant pressure on estuarine fish. Factors including loss of vegetation, increased salinity arising from catchment clearing, acid sulphate soils, and increased pesticide, herbicide and fertiliser run-off, all have major effects on estuary health and fish abundance. To ensure we have healthy fish communities, it is vitally important to maintain a healthy catchment and estuary ecosystem.

Resource sharing issues are also a consideration and different management controls are used. Some estuaries are permanently closed to commercial fishing. Area (spatial) closures occur in parts of some estuaries (for example, around the estuary mouth of Wilson Inlet), and restricted netting arrangements also limit the interaction between recreational and commercial fishers.



## A melting pot of fish

The types of fish found in an estuary will depend on the fresh and saltwater influence, the connection between the estuary and the sea, the fish's ability to tolerate fluctuating conditions, and species present in nearby marine areas.

Some fish are migrant species that pass through an estuary on the way to the river or the sea. Others enter for a short period to feed when conditions are favourable. Some species live permanently in the estuary system and are able to tolerate the changing salinities that occur. Fish can be grouped according to their dominant habitat or the area where they breed:

- 1 Semi-anadromous** – fish that live mainly in the ocean but spawn in the upper estuary, such as Perth herring.
- 2 Estuarine** – fish that breed and complete their life cycle within estuaries, such as black bream.
- 3 Estuarine/marine** – fish that can complete their life cycles either in the estuary or in sheltered marine waters outside the estuary, for example estuary cobbler and bluespotted flathead.
- 4 Marine-estuarine opportunist** – fish that spawn in the ocean and use the sheltered and productive estuary as a nursery area, for example yellow eye mullet, sea mullet, King George whiting and pink snapper.
- 5 Marine straggler** – fish that enter the estuary infrequently and usually in low numbers, like sharks and leatherjackets.

