Impacts of River Flow Beyond the Murray Mouth
BY: GARRY HERA-SINGH

Without a healthy Coorong and adjacent marine zone, the fishery and the RAMSAR listed site will not exist.

The most obvious benefits from maintaining significant flows thru the Lower Lakes barrages are:

1. keeping the Murray Mouth open,
2. maintaining lower salinities to enhance the ecology of the estuary,
3. allowing very large quantities of salt to be discharged from the Murray Darling Basin creeks and rivers into the Southern Ocean, preventing salinisation and eutrophication of these valuable freshwater resources, and
4. providing nutrients and fresh water to nearshore marine zones in Encounter Bay, adding food for a wide range of marine species, and fuelling the nearshore marine ecosystem for hundreds of square kilometres.

These values are a no-brainer for most people except for those with a distinct conflict of interest, including a suite of upstream lobby groups who believe freshwater through the barrages and out through the Murray Mouth is a futile exercise that serves only to 'irrigate the Southern Ocean'.

River water flowing out of the Murray Mouth keeps sand ingress at bay and allows migration of fish both ways – in and out - mostly for euryhaline species but, more importantly, for diadromous and catadromous fish species. The most notable species in the Lower Lakes and Coorong is the congolli because of their past very high abundance. Males are diadromous, spending part of their life cycle in fresh water and most of the remaining part in the ocean, while the females are catadromous, living most of their life in freshwater but migrating to the sea to spawn before returning to the lakes.

Keeping the Murray Mouth open allows the tidal flats to receive the benefit of cooler, carbonate-rich, oxygenated seawater daily, particularly during the warmer months which helps to promote the growth of key food sources for a wide range of migratory waders, shorebirds and juvenile fish.

There are four main types of aquatic ecosystems, with varying degrees of natural productivity. They are marine, estuarine, freshwater, and hypersaline. Estuarine systems occur where salinities vary below seawater and above freshwater (often described as brackish at the interface where freshwater meets the saltwater) and produce the highest levels of natural primary production. This is mostly in the form of microscopic plants (phytoplankton) promoting increased aquatic bug (zooplankton) production that, along with other nutrients, provide the basis and foundation of massive amounts of food for a very wide range of aquatic plants and animals.

The benefits of significant flows out the Murray Mouth are diverse and widespread. In fact, positive outcomes from prolonged high flow periods can be felt 500kilometres away in the marine zone.

Large flows, generally in the order of approximately 100 gigalitres per day (for example in the 1931, 1956, 1974-1976, 1989-90, 1992-1994, and 2010-11, 2022-24 floods), produced positive outcomes for many species more than 500 km from the Murray Mouth region. Such large flows provide a 'berley trail" many kilometres out to sea for all kinds of predatorial birds and fish. This benefitted species such as dolphins, seals, sharks, mulloway, salmon, rays, and many commercial and recreationally important species - too many to name here.

The largest bronze whaler pupping ground in South Australia is an area roughly 800 square kilometres adjacent to the Murray Mouth. Prior to barrages and flow diversions, this species evolved to breed within this 20 by 40 kilometre zone because of the constant food source to feed their young. Historically, there have been many instances where sharks have been caught near Kangaroo Island with bony bream (a freshwater fish from the River Murray) in their gut, or examples of rock lobster dying in the wells of boats moored at Granite Island near Victor Harbor because of the freshwater drift along the coast by south-easterly winds.

The small, moderate and large freshwater flow events provide an important opportunity for many fish species to remove many of the marine parasites accumulated internally and externally whilst roaming the Southern Ocean. Mulloway, by using the fresh flows as a medicinal wash to remove these infestations of parasites, are a great example of this. At the same time, freshwater flows provide enormous volumes of food, enabling rapid growth rates and storage of subcutaneous fats for the gestation period and eventual spawning.

These fish-related benefits are well understood by the fishing industry, but the value of freshwater flows out the Murray Mouth are poorly understood by many inland and urban stakeholders.

A further important aspect is the delivery of freshwater particulates, nutrients, phytoplankton, zooplankton and large tonnages of land-based salts entering the marine zone underpin a very complex trophic food web. A sophisticated mix of these elements in turn benefits the pelagic (water column), benthic (bottom) and littoral (near shore) food chains.

The South Australian pipi (*Donax deltoides*) population is spread along the ocean beach from Goolwa to seventy kilometres south, and is the largest known Donax population in Australia. Although a marine shellfish, they are dependent on the production of diatoms (single cell, silica-shelled algae) for food, in particular Asterionella species that are fed by river flow nutrients. Spawning of pipi's is linked to ocean upwellings which keeps them reproducing at low levels during dry years, but in years of high river flow, multiple spawning events may occur. Abundant populations of Donax species provide multiple benefits to mollusc-eating birds, fish and humans, with approximately 400 tonnes per annum sold for human consumption.

Freshwater flows out the mouth provide many other benefits to a wide range of animals and aquatic plants. Polychaetes (marine worms) are a food for many different birds and fish species whose survival relies on nutrients and varying salinities driven by barrage releases. Diatoms are an important food source for many types of bivalves that live inside and outside of the estuary. The abundance and production of this single-cell algae is assured from high river flows to the ocean.

The high turbidity associated with high flow events provides food for microscopic size larvae and juvenile fish, and refuge from potential predation. Strong year-classes of many species of fish are associated with high flow events because of the protection provided to these animals in their infancy.

The really sad part is this.
Pre-colonial settlement flows out of the Murray Mouth used to be around 14,000 gigalitres per year. Lots of food and nutrients. By comparison, the flows through the barrages between 2000 and 2020 have averaged just 1,966 gigalitres per year. This is just 14% of natural flows, only fractionally more than during the devastating Federation Drought of 1895-1903.
Natural productivity levels of Coorong birds, fish, aquatic vegetation, phytoplankton, zooplankton and so on have also reduced to just 7-14% of historical levels. This is either in direct proportion to

the reduction in flows, or at a greater rate than flow reduction, due to the ongoing capture of all small to moderate flow events.
Such low levels of natural primary production do not allow for much resilience in the aquatic ecosystem to bounce back, particularly against long dry periods and the pending impacts of climate change. So, over-extraction and over-allocation issues within the Murray Darling Basin continually place this special ecosystem on the edge of ecological collapse.

Hmmm…