

**Submission  
No 90**

## **INQUIRY INTO FLOODPLAIN HARVESTING**

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**Date Received:** 13 August 2021

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# **SUBMISSION to the NSW PARLIAMENTARY INQUIRY INTO FLOODPLAIN HARVESTING**

**by**

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**13 August 2021**

## **Personal background**

I am a retired Principal Research Scientist who worked for NSW Fisheries for 33 years studying the taxonomy, biology, conservation and aquaculture of Australian native freshwater fish of the inland Murray-Darling River System and the coastal Clarence River System. Key species were; Murray Cod (*Maccullochella peelii*), Eastern Freshwater Cod (*M. ikei*), Mary River Cod (*M. mariensis*), Trout Cod (*M. macquariensis*), Silver Perch (*Bidyanus bidyanus*) and Golden Perch (*Macquaria ambigua*). These species are unique and found only in Australia. I identified, described and named *M. ikei* and *M. mariensis*.

My research provided the biological basis for: hatchery production and stock enhancement of native fish; policies and regulations for the management of inland species and fisheries; conservation of threatened species; and farming techniques, including the control of infectious diseases.

## **Statement**

In 2020, I published an autobiography *The Codfather* about my life and career. The final chapter “Goodbye Darling” chronicles environmental degradation in the Darling River and describes the unprecedented ecological disaster in 2018 – 2020 and extinction of the aquatic ecosystem. Over-extraction of water for large-scale irrigation since 1990 was a major factor leading to the disaster.

This has been a national disgrace that parallels one of the World’s worst environmental disasters – the Aral Sea (between Kazakhstan and Uzbekistan). Commencing in 1960, water was diverted to irrigate cotton and by 1977 the Sea was just 10% of its original size; it is now basically a desert. A once thriving fishing industry was devastated and the soils severely degraded. The loss of the Aral Sea is an example that the cost of over-extraction and mismanagement of freshwater is the destruction of inland waters and their associated ecological and human communities and industries. We must learn from history!!

Floodplains, wetlands and floods are essential components our inland rivers. I suggest that we shouldn’t even be considering any level of “floodplain harvesting”; it is just another way to extract water for what history tells us will be an unsustainable textile industry.

Our priority should be to restore our inland rivers.

I make five recommendations for the management of water and rivers in the Murray-Darling River System (MDRS) (see page 8).

## **The Darling River and its catchment**

This submission concentrates on the Darling River and its catchment. This is the first example in Australia where gross mismanagement of rivers has led to ecological disaster and ecosystem extinction.

The Darling is an outback river that is part of Australia's history and heritage. It has played key roles in: (i) the evolution of fish and other aquatic organisms for millions of years; (ii) Aboriginal history and culture for 50,000 years; and (iii) the social and economic development of inland Australia since the 1830s.

The Darling is Australia's longest river (2,700 km) and its catchment and tributaries include rivers such as the Barwon, Gwydir, MacIntyre, Namoi, Gwydir, Condamine and Dumaresq in northern NSW and southern Queensland. These rivers have variable and unpredictable patterns of flow. Although in the outback, recent research has shown that The Darling River historically flowed for 92% of the time, including drought periods and that annual pulses were common.

The Darling is characterized by steep banks, floodplains, wetlands, flat topography, low rainfall, limited runoff and high evaporation and seepage rates. Floodplains and wetlands are vital components of inland rivers. Regular flow and periodic inundation of the floodplains (and return of the water to the rivers) provide the energy, nutrients and organisms that are essential for successful fish breeding, biological productivity, good water quality and river health. Floodplains are the "engine rooms" of the rivers. Water on floodplains and in wetlands is NOT wasted and must be allowed to return to the rivers. Only then can the ecosystem operate naturally.

These rivers are home to a unique and amazing fish fauna and other organisms that are superbly adapted to the harsh riverine conditions. The most famous fish and the icon of the MDRS is the Murray Cod a large, long-lived fish which grows to over 100 kg. It is the apex predator that plays a key role in the function of the ecosystem and biological diversity. In Aboriginal mythology, Murray Cod formed the Murray River and the other species of fish. It was THE FISH to indigenous people, and commencing in the early 1800s, was an important food item for explorers and early settlers in inland Australia. Even today Murray Cod has a mystique; it is the most sought-after fish and the basis of a large, valuable recreational fishery. The Darling was once the stronghold for Murray Cod and other native fish – it is no longer.

Flow, connectivity and good water quality are critical for successful fish breeding. Flood conditions enhance recruitment in some species such as Murray Cod because inundation of the banks and floodplains provide habitat and food such as zooplankton and insects that are critical for the survival of larvae and juveniles.

## **Environmental degradation**

There has been environmental degradation of inland rivers since the mid-1800s. Changes associated with early rural development included removal of riparian vegetation, compaction of soils, altered run-off patterns, desnagging and felting of rivers and removal of rocks bars to facilitate passage of paddlesteamers. Despite changes associated with the expansion of the

wool industry, the Darling River and its tributaries remained relatively healthy for over 100 years. This was probably because the flow and flooding regimes of the rivers remained natural.

Further changes followed the population explosion of the introduced Common Carp (*Cyprinus carpio*) in the mid-1970s – aquatic plants were lost and turbidity of the water increased. It was estimated that Carp made up around 90% of the fish biomass in some rivers.

Since about 1990, the character of the Darling changed markedly and river health has declined. There were increasing periods of low and no flow and reduced connectivity between pools and lengths of river with serious consequences for water quality and the biology of fish and other organisms. In 1991, a huge bloom of algae, including blue-green algae, extended for approximately 1000 km along the Darling River. For the first time, the Australian public became aware of a major environmental problem in our inland rivers. Large algal blooms have detrimental effects on water quality often creating stressful and lethal levels of key variables such as oxygen, pH and ammonia. The poor water quality associated with algal blooms often results in fish kills.

Over the last three decades, the incidence of fish kills in the Lower Darling has been increasing. These kills sounded a clear, loud warning about the state of this inland river. Repeated fish kills in an area or river system can seriously deplete numbers, significantly reducing reproductive output and hindering or even preventing recovery. Repeated kills are a particularly serious threat to long-lived fish such as Murray Cod that rely on the breeding of numerous consecutive generations each season. The low numbers of adults and relatively low fecundity make recovery from low numbers biologically difficult for Murray Cod. A new infectious disease Epizootic Ulcerative Syndrome (EUS) was recorded for the first time in the Darling River between Bourke and Brewarrina in Murray Cod, Golden Perch, Silver Perch and Spangled Perch in 2010.

Some species have been lost (Trout Cod, Macquarie Perch, Darling River snail) while others have become rare (Silver Perch, Catfish, Mussels). In addition, significantly slower growth of key fish species such as Murray Cod and Silver Perch compared to the 1980s are biological signs of decreased productivity.

Lost species, rare species, declining numbers of fish, regular fish kills, disease outbreaks, a new disease and decreased productivity are all signs of a river in severe stress. A river crying out!!

### **Fisheries Scientific Committee**

The Fisheries Scientific Committee (FSC) was established under Part 7A of the *Fisheries Management Act 1994*. It is an independent body in NSW that makes recommendations and determinations to the State Government on threatened species, populations and communities.

In 2003, the FSC determined that the “Aquatic Ecological Community in the Natural Drainage System of the Lowland Catchment of the Darling River” was an ***Endangered Ecological Community (EEC)***. The area was defined by all natural creeks, rivers, streams and associated lagoons, billabongs, lakes, flow diversions to anabranches, the anabranches, and the

floodplains of the Darling River within the State of New South Wales, and including Menindee Lakes and the Barwon River. All waters below an elevation of 500 metres were included, as were all tributaries of the Darling and Barwon rivers in NSW.

The FSC identified the following threats to the survival of the EEC: instream structure such as dams and weirs and water extraction; clearing of riparian vegetation; access of stock to the riparian zone; removal of snags; introduced species; some types of agriculture through reduction of river flow by water extraction and pollution through pesticides.

The FSC warned “... *the Aquatic Ecological Community in the Natural Drainage of the Lowland Catchment of the Barwon-Darling River is likely to become extinct in nature, unless the circumstances and factors threatening its survival cease to operate.*”

Despite warnings from the FSC, as well as scientists, managers, Aborigines, environmentalists and river people, water extraction for large-scale irrigation continued unabated, principally through the expansion of the cotton industry.

**Figure 1. The Darling River ecosystem under severe stress. Top: low flows, large algal blooms; dead Murray Cod in 2004. Bottom: Epizootic Ulcerative Syndrome a new infectious disease that was first recorded on Murray Cod and Golden Perch in 2010. Photos Ian Wooden and Dr Craig Boys.**



## Ecological disaster and extinction

In 2018 – 2020 there were massive fish kills near Menindee and an unprecedented ecological disaster. Millions of fish died, including Murray Cod and Bony Herring or *Nhaampa* the totem of the Barkindji people. The river bed was dry for much of its length from Bourke to Wentworth, as well as major wetlands such as Lake Menindee. Low flows, high water temperatures, algal blooms and poor water quality were the main factors contributing to the fish kills that occurred over a period of many months. The sequence of events is described in a number of reports, including my book *The Codfather*.

**Figure 2. Massive fish kills in the Darling River near Menindee in 2018 and 2019. Left: Dead Murray Cod and other species in the soupy, algae-laden water. Right: Dead Bony Herring or *Nhaampa* the totem of the Barkindji people. Photos courtesy of Rob McBride, Tolarno Station.**



**Figure 3. The Darling River in May 2019. Left: Culpaulin Station, 30 kilometres downstream of Wilcannia. Right: Tolarno Station, downstream of Menindee. Photos Stuart Rowland.**



This dramatic event, after decades of degradation, drove the ecosystem to extinction!! The species composition and the structure and function of the ecological community in the Darling River changed dramatically within a 50-year period. Characteristics of the ecosystem in 1970 and 2020 are described below.

1970: a lotic, riverine environment with flows 92% of the time, including annual pulses of water from various tributaries; clean water with visibilities often 1 metre or more other than periods of run-off from rain, freshes and floods; abundant, widespread aquatic plants,

particularly macrophytes such as Ribbonweed; fish fauna dominated by native species such as Murray Cod, Golden Perch, Silver Perch, Catfish, Herring – a stronghold for native fish and the basis for a popular inland fishery; abundant invertebrates such as mussels, snails and crustaceans. *The Darling River or Barka was the life-blood of the Barkindji for tens of thousands of years.*

2020: a lentic environment with long periods of low and no flow; large sections of dry river bed between Bourke and Wentworth; constantly turbid water; flora dominated by algae, often blue-green algae, with blooms common, but the large macrophytes now very rare; fish fauna dominated (> 90%) by the introduced Carp, with native species either missing (Trout Cod), declined (Murray Cod) or uncommon/rare (Silver Perch, Catfish); relatively few invertebrates such as mussels and snails with some species extinct or rare. *The Barkindji has lost its life-blood and most communities along the river were without the fundamentals of life – freshwater!*

The massive fish kills and ecological disaster in the period 2018 – 2020, including the predominantly dry river bed from Bourke to Wentworth signified extinction of the aquatic ecosystem.

The future of Murray Cod, Silver Perch and Catfish in the Darling remains uncertain. While some species of fish and other organisms will persist, the current ecosystem is completely different.

**Figure 4. Extinct Darling River aquatic ecosystem. Top: Kate McBride walking across the Darling River. Bottom: Lake Menindee in May 2019. Photos Rob McBride and Stuart Rowland.**



## Water management

For decades, there were serious concerns about the health of the Darling River and its tributaries. Even in the 1990s, some government representatives acknowledged that there had been an over-allocation of water to the irrigation industry. But governments continued to support the expansion of a large-scale industry. River regulation and over-extraction of water eventually had a cost – an ecological disaster and extinction of an ecosystem. Water extraction at low flows, particularly during spring and summer exacerbated the detrimental algal blooms leading to poor water quality. These conditions were critical in the fish kills and ecological disaster in 2018 - 2020.

The MDRS is a large, complex system and there is no doubt that its management has been and remains very difficult. The Murray-Darling Basin Authority developed a \$13 billion Plan in conjunction with the States and many stakeholders. It was an attempt to provide a basis for management, with a major objective of “returning water to the environment.” Clearly the Murray-Darling Basin Plan has been an abject failure, certainly in relation to the Darling River and its catchment.

*The consideration of a floodplain harvesting strategy by the NSW Government demonstrates an ignorance of, or complete disregard for inland aquatic ecosystems, their fauna and flora, and associated indigenous people, river communities and agricultural industries. Floodplain harvesting is yet another way of taking water from an already totally degraded river system for the short-term gains of one particular irrigation industry.*

Any decision regarding water management in the MDRS must be made in light of the predicted implications of Climate Change – higher temperatures, more extreme weather events, drier conditions and less water. Scientists predict that there will be less water in the MDRS in the future. If we as a society value the inland rivers, surely there is no place for floodplain harvesting.

With the ecological community of the Darling River extinct and our other great inland rivers such as the Murray, Murrumbidgee, Lachlan and Goulburn facing similar threats, perhaps it is time to reflect on the following sayings.

Cree Nation of the American Red Indians *“Only when the last tree has died and the last river has been poisoned and the last fish been caught will we realise we cannot eat money.”*

Albert Schweitzer (Nobel Prize winner) *“Man has lost the capacity of foresee and forestall. He will end up destroying the earth.”*

Dr David Suzuki (famous environmental and conservation scientist) *“For heaven’s sake, you’re primarily a desert. Water is a great gift. Something like the Murray-Darling ... I mean that’s a national treasure, and from what I’ve heard since I’ve been to Australia this time, you’re really trashing that system.”*

Professor Peter Cullen (Cooperative Research Centre for Freshwater Ecology) *“Communities must demand that political leaders take control and responsibility for putting in place management regimes that benefit all of the communities not just a favoured few.”*



Bruce Shillingsworth (Aboriginal activist) *“The impact of the water mismanagement and the corruption and the corporate greed and capitalism in the country has killed our rivers.”*

Badger Bates (proud and respected Barkindji Elder) *“When I was a kid the Barka fed us. It was like a supermarket, we ate yabbies, shrimp, fish and turtles ... I never seen anything like what happened in Menindee in 2018 – 2020 ... If we don’t keep water in the river, it’ll all die ... How can you teach culture from an empty river? And it’s not just blackfellas’ culture, it’s whitefellas’ culture too, everyone got a culture on the Barka ... We must get together and help protect the Barka an tell the government what they are doing is wrong ... They go around with this water sharing plan, but it isn’t worth the piece of paper that it’s written on.”*

## **Recommendations**

1. introduce an immediate moratorium on the issuing of licences for water extraction and floodplain harvesting;
2. more stringent limits of water flow/water level as trigger points for up-stream pumping;
3. establishment of a water register;
4. implementation of a Royal Commission into the management of the Murray-Darling Basin;
5. commence a phase-out large-scale irrigation in the Darling River and its tributaries.

## **Key references**

Fisheries Scientific Committee (2003). *Aquatic Ecological Community in the Natural Drainage System of the Lowland Catchment of the Darling River*.

Harris JH and Gehrke PC (Editors). (1997). *Fish and Rivers in Stress the NSW River Survey*. NSW Fisheries Office of Conservation and the Cooperative Research Centre for Freshwater Ecology, Cronulla.

Mallen-Cooper M and Zampatti B (2020). Restoring the ecological integrity of a dryland river: why low flows in the Barwon-Darling River must flow. *Ecological Management and Restoration*. Doi:10.1111/emr.12428.

Rowland SJ (1985). *Aspects of the Biology and Artificial Breeding of Murray Cod, Maccullochella peelii peeli, and the Eastern Freshwater Cod, M. ikei sp. nov. (Pisces: Percichthyidae)*. PhD Thesis, Macquarie University.

Rowland, SJ (2005). Overview of the history, fishery, biology and aquaculture of Murray Cod (*Maccullochella peelii peelii*). Pages 38 – 61 in Lintermans M and Phillips B (Editors) *Management of Murray Cod in the Murray-Darling Basin Workshop: statement, recommendations and supporting papers. Proceedings of a workshop held in Canberra ACT, 3 – 4 June 2004*. Murray-Darling Basin Commission and Cooperative Research Centre for Freshwater Ecology, Canberra.

Rowland S (2020). Goodbye Darling. Pages 542 – 585, in *The Codfather*. Optima Press, Perth.

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