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# **South Australian Fisheries Management Series**

## **Ecological Assessment of the Lakes and Coorong Fishery**

### **Reassessment Report**

Prepared for the Department of Environment, Water,  
Heritage and the Arts

For the purposes of Part 13 of the Environment Protection and Biodiversity  
Conservation Act 1999

August, 2008

**Prepared by the Fisheries Division of Primary Industries and  
Resources South Australia**

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## 1. Purpose

This report has been prepared by the Fisheries Division of the Department of Primary Industries and Resources South Australia (PIRSA).

The purpose of this report is to provide a revised assessment of the management arrangements in place for the South Australian Lakes and Coorong Fishery, as set out in the Environment Protection and Biodiversity Conservation Act 1999 (EPBC Act). This report has been prepared in accordance with the *Guidelines for the Ecologically Sustainable Management of Fisheries*, 2<sup>nd</sup> Edition (2007) and particularly addresses the level of change that occurred in the fishery since the 2005 assessment. This report should be read in conjunction with that assessment.

## 2. Background

The Lakes and Coorong Fishery is a multi species, multi-method fishery, primarily managed using input controls. This report addresses key species taken in the fishery: black bream (*Acanthopargus butcheri*), golden perch (*Macquaria anmbigua*), greenback flounder (*Rhombosolea tapirina*), mulloway (*Argyrosomus japonicus*), pipi or Goolwa cockle (*Donax deltoides*), yellow-eye mullet (*Aldrichetta fosteri*) and other species such as bony bream (*Nematasola erebi*).

The *Fisheries Management Act 2007* provides a broad statutory framework to ensure the ecologically sustainable management of South Australia's marine, estuarine and freshwater fisheries resources. The regulations that govern the management of the Lakes and Coorong Fishery are the *Fisheries Management (Lakes and Coorong Fishery) Regulations 2006* and the *Fisheries Management (General) Regulations 2007*.

The Management Plan for the South Australian Lakes and Coorong Fishery (Sloan, 2005) provides a detailed outline of the strategic policy framework that has been established to provide for the ecologically sustainable management of the Lakes and Coorong Fishery. The Plan sets out a formal harvest strategy for the fishery and operates for five years (2005-10), subject to annual review and amendments as considered necessary by the Fisheries Council, the Director of Fisheries or the Minister for Agriculture, Food and Fisheries. The management plan includes a Strategic Research and Monitoring Plan, reviewed every two years. The management plan can be found at PIRSA's website: [www.pir.sa.gov.au](http://www.pir.sa.gov.au)

Management of the Lakes and Coorong Fishery is implemented in the context of a number of international legal instruments including the United Nations

Convention on the Law of the Sea (UNCLOS) and the Ramsar Convention. The Ramsar site is outlined in the 2005 Ecological Character Description (ECD) (Phillips & Muller, 2006), and the fishery operates within this site. Additionally, the fishery operates within the boundaries of the Coorong National Park, which is deemed as a 'Living Murray Icon Site' and is an area recognised primarily for its wetland habitats and its importance for a variety of migratory waterbirds and threatened fish communities (Sloan, 2005; Phillips and Muller, 2006).

The key policy drivers for the fishery are:

- The National Strategy for Ecologically Sustainable Development;
- The Australian Government Guidelines for the Ecologically Sustainable Management of Fisheries, which relate to the requirements of the *Environment Protection and Biodiversity Conservation Act 1999*;
- The Native Fish Strategy for the Murray –Darling Basin 2003-2013,
- The National Policy on Fisheries Bycatch;
- The Coorong, Lakes Alexandrina and Albert Ramsar Management Plan (2000), presently under revision; and
- The Coorong National Park Management Plan (1990).

The fishery management plan will be reviewed under the *Fisheries Management Act 2007* by the Fisheries Council of South Australia. This process will commence during 2008 and be completed during 2009. The general purpose of the plan is to describe the biological, economic and social characteristics of the fishery; identify impacts of the fishery on ecosystems; assess risks to the fishery and strategies to address them; set out methods for monitoring the performance of the fishery; and specify the share of aquatic resources to be allocated to each fishing sector.

### **3. Level of Assessment.**

The Lakes and Coorong Fishery was assessed as an approved Wildlife Trade Operation in 2005. Since the last assessment there have not been significant changes in most areas of interest as outlined in page 5 of the 'Guidelines for the Ecologically Sustainable Management of Fisheries' (see table 1).

Since the fishery was last assessed, there have been some changes to the fishery management arrangements, significant changes to environmental issues outside of the fishery management agency control, in terms of drought impacts. There have been no known changes in the nature, scale or intensity of impact and or changes to the management response for interactions with protected species, although changes to management of Murray cod (*Maccullochella peelii*) have been instigated for South Australian waters. There have been changes to stock status for some species.

**Table 1: Level of assessment required for the Lakes and Coorong Fishery**

Issue	Area of Interest	Yes	No
Fishery	Has there been any change to management arrangements, and/ or fishing practices?	X	
External Influences	Has there been any change to an environmental issue/influence outside of the fishery management agencies control?	X	
Interaction with protected species	Has there been any change in the nature, scale, intensity of impact, and/or management response?		X
Ecosystem impact	Has there been any change in nature, scale or intensity of impact and/or subsequent management response?		X
Target Stock Status	Has there been any change in the target stock status?	X	
By-product/bycatch status.	Has there been any change in the by-product and/or by-catch stock status?		X

Considering the above, the level of submission required for the Lakes and Coorong Fishery is standard plus ancillary information.

It is important to note that all management changes and progress against the DEWHA's recommendations have been communicated by PIRSA through annual reports and other communications to DEWHA.

## 4. Fishery

The Lakes and Coorong Fishery has significant value to Aboriginal, commercial and recreational fishing sectors. Fresh water and salt water fishing have been fundamental to the cultural economy of the Ngarrindjeri people who continue to depend on these resources for cultural and economical well being. Many of the species are totems for the Ngarthii culture, and have cultural values (Ngarrindjeri Nation, 2007). The *Fisheries Act 2007* now recognises Aboriginal traditional fishing as a separate sector from commercial or recreational fishing.

The area of water encompassed by the Lakes and Coorong Fishery includes the waters of three separate, but closely linked, ecosystem components (see Figure 1) these are:

1. The lower River Murray lakes;
2. The Coorong lagoons; and

3. The coastal marine water adjacent to the Sir Richard and Youngusband Peninsulas, out to three nautical miles from the low water mark.

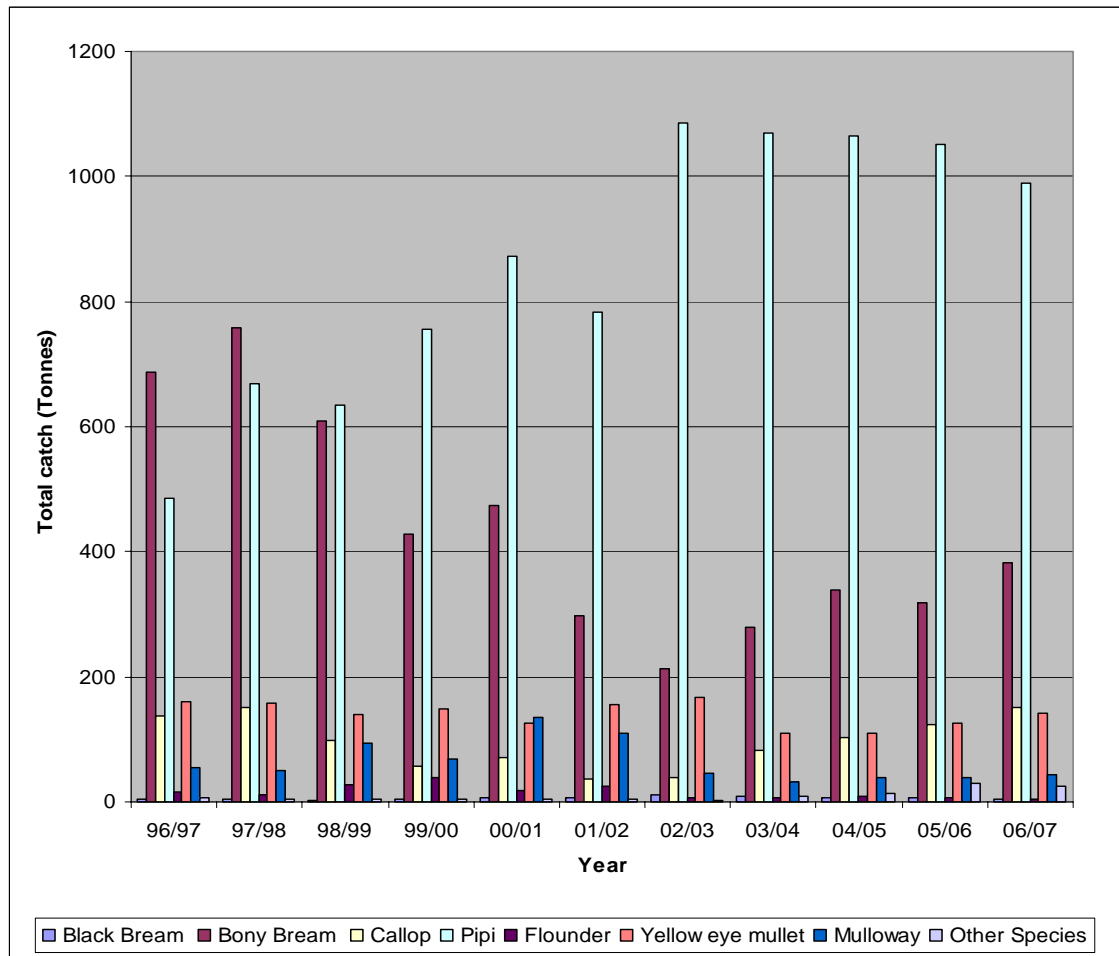
The fishery's boundaries are described in detail in the *Fisheries Management (Lakes and Coorong Fishery) Regulations 2006* and in Sloan (2005) on pages 32-34.

**Figure 1: Management areas for the Lakes and Coorong Fishery**



In 2006/07, a total catch of 2 443 tonnes was harvested from the Lakes and Coorong Fishery (see Figure 2). According to EconSearch (2008), GVP has increased steadily in recent years from approximately \$4.5 million in 2002/03 to \$7.1 million in 2006/07 (in nominal terms). This appears to be the result of (i) the increasing value of pipi, and (ii) a move to high value catch (golden perch).

**Figure 2: Reported catch for the Lakes and Coorong Fishery 1996/97-2006/07.**



Data source: EconSearch (2008)

### 3.1 Commercial Fishery

The commercial fishery is managed using a complex mix of input and output controls aimed at matching harvesting capacity with resource availability and controlling growth in aggregate harvesting capacity. Existing controls include limitations on the number of licences, a wide range of gear restrictions, spatial and temporal closures, restrictions on the number of commercial agents permitted to undertake fishing operations and, legal size limits for individual species.

Access to the fishery is limited to holders of one of 36 Lakes and Coorong Fishery licences, which have a variety of gear entitlements. These gear entitlements provide access to various sectors within the fishery. The main target species for each commercial fishing device are listed in Table 4 of the management plan. All licences are renewed on an annual basis and are fully

transferable. Detailed management arrangements for the commercial fishery are provided in Section 3 of the management plan.

Size limits for key species in the Lakes and Coorong Fishery remain the same. Management changes were introduced in 2007 for commercial and recreational Murray cod fishing (refer to section 6 – Interaction with Protected Species).

Since the last assessment, there have been a number of changes to management arrangements in the pipi sector of the fishery. Other management arrangements have not been modified significantly.

Key changes in the pipi fishery:

- In December 2007, a quota management system was introduced for the pipi (Goowla cockle) sector of the fishery. The Total Allowable Commercial Catch (TACC) was set at 1,150 tonnes for the 2006/07 season, based on historical catch and effort information.
- Licence holders were allocated individual transferable quota (ITQ) units that were endorsed on fishery licences. New compliance and quota monitoring arrangements were introduced at this time.
- In conjunction with the introduction of the quota system, the number of agents permitted to be used for pipi fishing activities was increased from two to four (two diggers, one grader and one bucket runner).
- A new pipi research program commenced in the 2007/08 season (see Appendix 2) to assess:
  - The suitability of using fishery-independent surveys for ongoing assessment of the status of pipi on the Youngusband Peninsula; and
  - The use of size/age data to provide information on year class strength, growth rates and mortality.

The regulations that established the quota management system and allowed for the allocation of quota units for the pipi fishery were disallowed in Parliament on 23 July 2008. This means that the quota management system no longer exists. PIRSA Fisheries is currently considering options for management arrangements prior to the fishery recommencing from 1 November 2008. A management priority will be to ensure the pipi resource is not over-fished and a cap on total catch will be implemented for the next season.

In 2008, the Lakes and Coorong Fishery achieved certification to the Marine Stewardship Council [1] standard for sustainable and well-managed fisheries. Four species were assessed and certified as meeting the MSC standard: golden perch, pipi, mulloway and yellow-eye mullet. Certification was awarded by independent certification body, Scientific Certification Systems,

following scrutiny of all aspects of the fishery's operation. Refer to [www.msc.org](http://www.msc.org) for further information.

### **3.2 Recreational Fishery.**

The regulations pertinent to the recreational sector of the Lakes and Coorong Fishery are detailed in the *South Australian Recreational Fishing Guide*, widely distributed free of charge to all fishers, and available at PIRSA's website: [www.pir.sa.gov.au](http://www.pir.sa.gov.au).

Mulloway and yellow-eye mullet are the most sought after species by recreational fishers in the lakes and Coorong region. Larger (sexually mature) mulloway are targeted by recreational fishers on the ocean beaches of the Sir Richard and Younghusband Peninsulas, particularly adjacent to the Murray Mouth where mulloway aggregate during the warmer months of spring and summer, particularly during periods of freshwater outflow. Smaller (immature) mulloway are targeted in the estuarine Coorong lagoons all year round. Yellow-eye mullet are targeted by recreational fishers all year round using rod and line and a limited number of small mesh nets. Pipi are harvested by recreational fishers on the ocean beaches of the Coorong, but predominantly along the Sir Richard Peninsula (Goolwa beach) (Sloan, 2005).

The recreational sector is permitted to use a wide variety of methods, provided in the *Fisheries Management (General) Regulations 2007*. Permitted methods include specified combinations of fishing rods, hand lines, hand nets, cockle rakes, shrimp and yabbie traps, and hoop and drop nets.

In addition to a rod and handline, a person can only use at any one time no more than;

- 1 mesh net (registered) and either
  - 1 hand net or one shrimp trap or
  - 1 hand net and 1 shrimp trap or,
  - 3 yabbie pots or,
  - 3 drop nets or,
  - 10 hoop nets or,
  - 3 hoop nets and 1 mesh net and either 1 hand net or 1 shrimp trap or,
  - 3 hoop nets and 1 hand net and 1 shrimp trap.

There are 989 recreational mesh nets permitted for use by existing licence holders in the waters of the Lakes and Coorong Fishery, which are subject to specific conditions. These recreational net registrations are non-transferable and no new registrations can be issued.

Bag and boat limits provide output controls that limit the total catch in the recreational sector to ensure catch levels remain within sustainable limits as follows:

**Table 2: Recreational daily bag and boat limits for key species in the Lakes and Coorong Fishery**

Species	Daily bag limit	Daily boat limit
Bream (all spp)	10	30
Golden perch	5	15
Flounder	20	60
Mulloway 46-75 cm (within Coorong only)	10	-
Mulloway 75 cm or larger (all state waters)	2	6
Pipi	600	-
Yellow-eye mullet	60	180

Size limits are in place for all species in the Lakes and Coorong Fishery other than recreationally caught greenback flounder, which is mainly targeted by hand spear. A review of bag, boat and size limits will be undertaken under the new *Fisheries Management Act 2007*.

### 3.3 Aboriginal Traditional Fishing

Many Aboriginal communities have a long history of fishing in what are now known as South Australian waters. Each community's fishing activities and cultural practices are distinct. Further information about these activities and practices will be described in each Aboriginal Traditional Fishing management plan that is developed. These plans are currently being developed through the process of negotiating Indigenous Land Use Agreements (ILUAs) with native title claimants and will be available as those agreements are concluded.

## 5. External Influences

The lower lakes, Coorong and Murray mouth region is one of Australia's most important wetlands, as recognised by its designation as one of the Living Murray "icon sites" and a Ramsar wetland of international significance. The region is one of the top six sites in Australia for migratory waterbirds and hosts up to 20% of the world population for some of these species (Phillips & Muller, 2006).

The natural ecosystems supporting fisheries resources throughout the River Murray and lower lakes and Coorong region have been dramatically modified since early European settlement in South Australia. Most of these modifications have been directed at water flow control and water extraction (Sloan, 2005).

An extensive barrage network was constructed near the Murray mouth in 1940, which has and continues to influence the ecosystem significantly, in particular the habitat available for a range of estuarine dependant fish species, native plants and waterbirds (Sloan, 2005). The Coorong lagoons now comprise the remnant estuary of the River Murray.

Due to increased regulation, the Murray mouth approaches closure more frequently than would have occurred naturally. Additionally, flow management can result in abrupt changes to salinity levels and overall water quality in the River Murray estuary, which disrupts the natural reproductive cycles and movement patterns of many fish species. The net result of these factors and other external impacts on the fishery is that there are varied and acute pressures placed on fish stocks and the ecosystem that supports them (Ferguson, 2008). Mulloway (*A. japonicus*) provide an example of an environmentally limited fish population associated with the River Murray estuary (Ferguson et al 2008a). Mulloway, through their river discharge spawning relationship and requirement for protected juvenile habitat in the estuary, may provide an environmental indicator for the system.

## **5.1 The current situation in the Murray-Darling Basin**

This year, the Murray-Darling Basin has experienced its fourth driest autumn on record. As a result, Murray system inflows in autumn approached the record low levels experienced in 2006/07. The dry weather has continued in the southern half of the Basin and the monthly inflows for June 2008 set a new record low of only 95 GL, compared with 220 GL in June 2007 and a long term average of 680 GL (MDBC, 2008).

The condition of the Coorong and lower lakes in South Australia remains very serious. Large areas of mudflats have been exposed in Lake Albert and there is a significant risk of acidification. Pumping of water from Lake Alexandrina commenced in early May 2008 to maintain Lake Albert at its current level and prevent further exposure of sulfidic sediments. The cooler winter weather has reduced evaporative losses and led to a temporary stabilization of water levels (MDBC 2008).

If the weather remains dry and Murray inflows remain low, the water level in Lakes Alexandrina and Albert is expected to continue falling during spring

and summer. Further water management options for the lower lakes are being carefully considered for 2008/09 and beyond, which will respond to actual lake levels and system inflows. These drought conditions and broader water management decisions will be taken into account during the development of future fisheries management arrangements in the Lakes and Coorong Fishery, using a precautionary approach.

## **6. Interactions with Protected Species.**

The nature and extent of interactions with threatened, endangered or protected species (TEPS) within the Lakes and Coorong fishery are presently uncertain. The ongoing Fisheries Research and Development Corporation (FRDC) funded bycatch project is still ongoing and will provide baseline data of discards and a risk assessment for bycatch in the fishery. Additionally, all South Australian commercial fishery licence holders are required to record all wildlife interactions using the TEPS logbook, developed by PIRSA in conjunction with the South Australian Research and Development Institute (SARDI) Aquatic Sciences and the fishing industry.

Catch and effort information shows that some fishers have a low level of interaction with Murray cod, which is listed nationally as a species vulnerable to extinction in 2003 under the *Environment Protection and Biodiversity Conservation Act 1999*. Murray cod is a permitted species in the fishery. Confidentially provisions in the *Fisheries Management Act 2007* prevent reporting specific catches but the total is considered to be less than 300 kg over the past five years.

In response to the recent re-structure of the South Australian River Fishery from a native fishery to a principally non-native fishery, a fishery-independent monitoring program (Native Fish Monitoring Program (NFM)) was introduced for the River Murray. Data from the previous native commercial River Fishery, the NFM program and other ancillary projects were used to inform the stock status report for Murray cod, which was published in 2007. Historical fishery data suggest a strong correlation between flow and Murray cod recruitment (Ye and Zampatti 2007). The status report states that aside from some low level recruitment in 2000 (associated with flows in the River Murray of around 20,000 - 60,000 ML/day), there is little indication of strong recruitment of Murray cod since 1994. Further to this and given protracted years without significant high flows, particularly the critical drought conditions in the last six years in the Murray-Darling Basin, there is a high risk that the stock may decline further unless strong year classes can be added.

In response to the status of the stock and ongoing drought conditions, a closed season designed to protect Murray cod during its breeding season has

been extended by one month. It now starts on 1 August (previously 1 September) and continues until 31 December each year. Further measures to protect Murray cod include a reduction to the daily bag limit from two to one and a reduction to the boat limit (where three or more people are fishing from the boat) from six to three. The minimum legal size limit has been increased from 50 cm to 60 cm. The maximum legal size limit has been maintained at 100 cm.

## **7. Target Stock Status**

Information about the Lakes and Coorong Fishery's performance against performance indicators (PIs) and reference points (RPs) is provided in the annual South Australian Lakes and Coorong Fishery Stock Status reports. The most recent report was published in January 2008 (Ferguson, 2008) and provides 2006/07 catch and effort information. Data pertaining to the 2007/08 fishing season will be available by early 2009.

SARDI Aquatic Sciences collects, collates and validates catch and effort data from the Lakes and Coorong Fishery for stock assessment and stock status reporting. In the past five years, stock assessments have been produced for both freshwater and estuarine species – mulloway (2003), golden perch (2004), yellow-eye mullet (2005), pipi (2003 and 2006), greenback flounder (2007) and Murray cod (2007). Stock assessments for black bream and golden perch will be available in October and November 2008, respectively.

Species to which a high priority has been assigned will have a full stock assessment report produced at least every two to three years. Lower priority species will have a full stock assessment report produced every three to five years.

All stock assessment reports provide a full literature review and comprehensively evaluate the status of fish stocks, as measured by performance against established management objectives and reference values outlined in the management plan. Stock status reports are produced each year for all key species in the fishery. These status reports provide a brief assessment of the performance of the fishery for each key species, as measured by biological performance indicators for established management objectives and RPs outlined in the management plan.

The 2006/07 status report indicated that there were three PIs above the upper RPs and one below the lower RP. In the 2006/07 season, CPUE for black bream was 3% above the upper RP, CPUE for mulloway was 9% above the upper RP, and the CPUE for yellow eye mullet was 26% above the upper RP (Ferguson, 2008). CPUE estimates for mulloway, black bream and golden perch were historically high. CPUE for mulloway (small mesh nets) was the

highest ever recorded at a time when catches were historically low. According to Ferguson (2008) this may indicate hyper-stability of CPUE due to aggregation of individuals of these species in response to environmental conditions caused by the drought.

There has been a long downward trend in CPUE for pipi and the CPUE value for 2006/07 was 32% below the lower RP. The South Australian Goolwa Cockle (*Donax deltooides*) Fishery Assessment Report prepared in 2006 suggested that the fishery was at its weakest position for several years. The conclusion was reached taking into account that:

1. Catches in recent years have stabilised whilst effort has continued to increase;
2. CPUE has declined significantly over 12 years since 1996-97, and in 2004-05 was at its lowest level since 1999-00, and the second lowest since 1991-92;
3. Since 1994-95, CPUE has declined with increasing effort; and
4. CPUE in 2004-05 was 12% below the lower reference point.

These concerns are currently being addressed by the collection of supplementary information on distribution and relative abundance during the 2007/08 season (Ferguson, 2008). However, there is evidence to suggest a decrease in fishable biomass which can be explained by:

1. High levels of exploitation,
2. Changing environmental conditions or a
3. Combination of these (Ferguson & Mayfield, 2006).

Detailed management responses to these four RP breaches and proposed management actions are presently being developed in consultation with key stakeholder groups, as provided by the process outlined in the management plan on pages 45 and 46.

**Table 3: Current status and trends for key species in the Lakes and Coorong Fishery (trends over last five years (2002/03 to 2006/07)).**

Species	Stock status	Assessment reliability	Trend in annual catch	Trend in annual effort
Mulloway	Environmentally limited Recruitment overfished Growth overfished	Reliable	Large mesh gill net: historically low, stable  Swinger net: No clear trend	Large mesh gill net: Decreasing  Swinger net: No clear trend
Pipi	Overexploited	Reliable	Decreasing	Increasing
Black bream	Environmentally limited	Indicative	Historically low, stable	No clear trend
Golden perch	Fully fished	Reliable	Increasing	Increasing
Greenback flounder	Environmentally limited	Indicative	Historically low (Decreasing over 10 years)	No clear trend
Yellow-eye mullet	Fully fished	Reliable	No clear trend	Decreasing
Bony bream	Under fished	Reliable	Increasing	Decreasing

Production levels in the Lakes and Coorong Fishery are affected by variation in natural environmental conditions, in particular the frequency of flooding and the extent of drought periods. As such, the biological productivity of most major fish species and the economic productivity of the fishery will continue to fluctuate in line with variations in natural environmental conditions (Sloan, 2005).

For many of the key species in the fishery, it appears that there has been no recruitment in recent years due to drought conditions. Many of the fish are slow growing, long lived species and although biological information on reproduction, growth, mortality and population structures for some target species is limited (Sloan, 2005) it is essential to address trends for these species (Ferguson, 2008).

Stock assessments and stock status reports for the Lakes and Coorong Fishery rely heavily on fishery-dependent data. However, SARDI Aquatic Sciences has a significant focus on freshwater ecology and the Inland Waters Program conducts a number of research projects within the River Murray system. In

addition to stock assessments reports, there is ongoing research into fish passage, ecology and larval recruitment of key species as part of the MDBC's and CSIRO's icon site activities. Additionally, these studies may provide baseline information on the population structure (age/size structure) of key species. Future research will potentially focus on the role of habitat and environmental factors in the life history of key species.

## **8. By-product and bycatch stock status**

There have been no known changes in the status of by-product or bycatch species in the fishery.

An FRDC project titled 'Gear interactions with non-target species in the Lakes and Coorong Fishery' aimed at the characterisation of by-catch in the fishery is in place, its main outputs will be:

1. Net selectivities for key species and gear;
2. Code of practice developed with industry for minimising discards from the net fishery;
3. Rates of mortality for key discard species<sup>1</sup>; and
4. Biological performance indicator for discards.

It is expected that this project will be completed in 2008/09 and seek implementation of the industry's code of conduct and a modified logbook to require fishery-wide recording of bycatch species.

## **9. Additional Information:**

There are numerous monitoring and survey activities being conducted in the lakes, Coorong and Murray mouth region. The majority of projects have been undertaken by DEH (fresh water soaks, bird and pest monitoring). Other projects undertaken by various institutions include: water quality, rehabilitation works, grazing trials, and fish monitoring (Marsland & Nicol, 2006).

The following projects are relevant to this assessment:

- Successful spawning and recruitment of black bream and greenback flounder (Coorong and lakes), FRDC & SARDI Aquatic Sciences.
- Improved connectivity between the lakes and Coorong to facilitate required fish passage between freshwater and estuarine habitats that provides for the improved spawning and recruitment success of

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<sup>1</sup> Drought conditions will prevent this output from being achieved.

diadromous fish species such as congolli (*Pseudaphritis urvilli*) and common galaxias (*Galaxias maculatus*), FRDC & SARDI Aquatic Sciences.

- Improve connectivity between Coorong and the sea. This facilitates fish passage between habitats for juvenile and adult life-history stages of diadromous fish species such as lampreys and eels or estuarine dependent species such as mulloway, MDBC and SA Government.
- Management of flows to the Southern Ocean to provide diatoms for off-shore cockle communities.
- The Goolwa cockle PhD program is continuing. Aims of the program are to:
  - a) Describe the spatial and temporal distribution of *D. delooides* on Younghusband Peninsula;
  - b) Investigate potential for using demographic data to describe recruitment patterns;
  - c) Describe patterns in reproductive development;
  - d) Describe growth patterns; and
  - e) Investigate ageing techniques.

Additional information specific to the Lakes and Coorong Fishery can be found in the following publications:

- Lakes and Coorong Yellow-eye Mullet (*Aldrichetta forsteri*) Fishery (2005)
- Monitoring of recreational catch and effort during /after the 2005 Tauwitchere fishway trial (2006).
- Mulloway (*Argyrosomus japonicus*) Fishery (2003)
- The South Australian Goolwa Cockle (*Donax deltooides*) Fishery (2006)
- The South Australian Greenback Flounder (*Rhombosolea tapirina*) Fishery (2007)
- Fisheries biology of the greenback flounder *Rhombosolea tapirina* (Günther 1862) (Teleostei: Pleuronectidae) in South Australia (2006)
- Economic indicators for the South Australian Lakes and Coorong fishery 2006/07
- Do recent age structures and historical catches of mulloway, *Argyrosomus japonicus* (Sciaenidae), reflect freshwater inflows in the remnant estuary of the Murray River, South Australia?
- [Marine Stewardship Council - Final Assessment Report of the Lakes and Coorong Fishery \(2008\)](#)

General information about the fishery can also be found in these documents:

- South Australian Fisheries Resources Current Status and Recent Trends 2006.
- South Australian Wild Fisheries Information and Statistics Report, 2006.

Publications are available from PIRSA and SARDI websites: [www.pir.sa.gov.au](http://www.pir.sa.gov.au), and [www.sardi.sa.gov.au](http://www.sardi.sa.gov.au).

## 10. Recommendations by DEWHA

1. PIRSA to advise the Department of the Environment and Heritage (DEH) of any material change to the LCF's management arrangements that could affect the criteria on which *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) decisions are based, within 3 months of that change being made.

PIRSA has maintained communication with DEWHA through annual reports and has communicated management changes to DEWHA as they have arisen.

2. PIRSA, within 2 years, to complete the review of catch and effort logbooks, and implement methods to enable catch and effort to be monitored over finer temporal and spatial scales.

SARDI has refined the commercial catch and effort database for all catch and effort data in the LCF.

The logbook for the net sector has been simplified by the development and implementation of a separate logbook for pipi. This separate commercial pipi logbook requires finer temporal and spatial scale reporting and was finalised and implemented in December 2006.

Development of a bycatch indicator and incorporation into the net sector logbook has been discussed with the Lakes and Coorong Consultative Committee and in-principle agreement has been obtained. An implementation plan to roll out the logbook also needs to be developed in conjunction with industry. SeaNet was an important component (as a facilitator) for the implementation of the logbook, and additional extension of basic logbook skills for fishers. The closure of Oceanwatch/SeaNet has delayed the project.

3. PIRSA, within 12 months, to review available options to validate catch and effort data on target and by-product species in the LCF. Appropriate validation mechanisms for target and by-product catch and effort data to be progressively developed and applied in the fishery within 18 months.

Commercial fishing logbook returns are validated by SARDI. Those in error are corrected in association with the individual licence holder on an ongoing basis.

The limitations of fishery-dependent stock assessments are well understood, particularly with respect to the uncertainty associated with setting reference

points and performance indicators as estimates of sustainability. However, the costs of fishery-independent monitoring are likely to exceed the benefits in a small-scale fishery such as the Lakes and Coorong Fishery. The fishery is restricted (by its size and economic resources) in its ability to implement a data validation mechanism. As such, no validation mechanisms have been developed for the fishery. However, development of cost-effective methods to ensure that robust and reliable stock assessments are available is a priority for the fishery.

4. PIRSA, within 2 years, to further refine stock assessments in a process to develop more robust sustainable yield estimates for key species. As a first step, PIRSA to implement ongoing programs, within 12 months, to obtain necessary biological and environmental data to inform stock assessment and performance criteria of key species.

Stock assessments have been completed for: mulloway (2003), golden perch (2004), yellow-eye mullet (2005), pipi (2003 and 2006), greenback flounder (2007) and Murray cod (2007). Stock assessments for black bream and golden perch will be available in October and November 2008, respectively. The assessments provide an evaluation against the established performance indicators and reference points.

Annual fishery stock status reports have been completed for 2004/05, 2005/06 and 2006/07. The fishery status report provides an assessment against the performance indicators and reference points for the six key species of the Lakes and Coorong fishery.

A range of programs is in place to obtain biological and environmental data, which will inform management of the fishery. Various research projects are underway as a component of the Living Murray and Ramsar Management plans including; water quality monitoring, diadromous fish passage and recruitment studies, endangered fish surveys and under CLAMMEcology, a range of habitat mapping and modelling projects are underway to better understand environmental linkages to water management 'levers'.

A Stakeholder and Traditional Owner Committee has been established to oversee the research project 'Flow Related Fish and Fisheries Ecology in the Coorong, South Australia. The project aims to address flow-related ecology of key fish species of commercial, recreational, conservation and/or ecological significance (black bream, greenback flounder, yellow-eye mullet, congolli and a goby spp) in the Coorong, lower lakes and Murray mouth (CLLAMM) region, with a focus on reproductive biology and recruitment processes. The research will complement other current CLLAMMEcology research into fish movement and migration. The CLLAMMEcology research cluster is developing tools to predict how changes in management practices, such as environmental

flow releases and the operation of the lower lakes barrages, are likely to impact on ecosystem function and biodiversity.

Significant progress has been made on the Goolwa cockle PhD project. It will be completed during 2008/09 and the results will be incorporated into stock assessment.

A new and ongoing Goolwa cockle research program commenced in the 2007/08 season to assess:

- a) The suitability of using fishery-independent surveys for ongoing assessment of the status of Goolwa cockles on the Youngusband Peninsula; and
- b) The use of size/age data to provide information on year class strength, growth rates and mortality.

Results of this program will be used to inform stock assessment and management decision-making in future years.

A key priority for the fishery is the preparation of quantitative stock assessment reports for all key species, in accordance with the staged approach in the strategic research and monitoring plan. The primary source of data used to underpin all stock assessment work is fishery-dependent. At this stage, this approach is considered appropriate, given the scale of the fishery and its stage of development. Continued refinement of quantitative stock assessment approaches for all key species and incorporating recreational catch and effort data are listed as priorities in the strategic research and monitoring plan.

All stock assessment reports for individual species address the key performance indicators outlined in the management plan. Performance indicator values are estimated using conventional stock assessment methods and more empirically based practical methods, which are outlined in the plan. These methods will be refined during the life of the management plan as advances in knowledge are made. Additional indicators of fishery performance may be developed over time as advances in knowledge are made, stock assessment methods are refined and knowledge of the interaction between environmental variables and fishing operations is better understood.

5. PIRSA to develop precautionary harvest reference points for bony bream in order to identify any substantial alterations in fishing effort or by-product catch rates which may indicate changes in stock status.

Commercial catch and effort data for bony bream has now been included in the annual fishery stock status reports.

Bony bream are widely distributed in all Australian mainland warm water catchments and have benefited from the creation of larger areas of freshwater

habitat in the lower lakes. They were the most and second-most abundant native fish species in the Pilot Sustainable Rivers Audit and the NSW Rivers survey, respectively. Fishers generally do not target bony bream as it is a low value species, which has been predominantly replaced by carp as bait for the Rock Lobster Fishery. PIRSA does not have sustainability concerns for bony bream and does not consider that it is necessary to develop specific biological reference points for this species.

6. Within 18 months, PIRSA to develop a process to improve estimates of all removals of LCF species, including recreational and Indigenous harvests as well as an estimate of illegal take and factor these into the stock assessments and management controls to ensure overall catch levels are sustainable.

PIRSA has developed an assessment of the recreational catch and effort information for the South Australian regional component of the 2000/01 National Recreational and Indigenous Fishing Survey. In August 2007 PIRSA commenced a statewide recreational fishing survey. This is a 12-month survey designed to be compatible with the national survey of 2000/01. Results from the survey will be available at the end of 2008, and incorporated in the decision making process.

Annual compliance risk assessments consider illegal fishing activities in the Lakes and Coorong Fishery and guide compliance activities and management decision-making. Developing and implementing methods to quantify illegal catch levels, and its biological and economic impact, has been identified as a strategy in the management plan and strategic research plan. These methods will be continuously improved, noting that the degree to which PIRSA is able to carry out these programs is dependent on funding.

PIRSA is in the process of negotiating Indigenous Land Use Agreements (ILUAs) with Native Title claim groups in South Australia and preparing Aboriginal Traditional Fishing management plans. This process also includes the development of methodologies for measuring Aboriginal traditional fishing activities in South Australia. Funding arrangements are currently being investigated to undertake a monitoring program for this component of the fishery. Data collected on catch and effort by the Aboriginal traditional fishing sector will be incorporated into stock assessment models for the key species.

SARDI has factored all estimated removals into annual stock assessments<sup>2</sup>. In the absence of other survey data, the data provided by the National Recreational and Indigenous Fishing Survey (Henry and Lyle, 2003) (NRIFS)

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<sup>2</sup> SARDI has provided estimates of catch from the recreational sector where available. Other potential catches are addressed as 'uncertainty' surrounding estimates.

has been used as the main source of information on catch and effort levels in the recreational sector.

7. PIRSA, within 2 years, to develop and implement management arrangements to control the extent of harvests of all target and key by-product species at ecologically sustainable levels. Particular consideration should be directed at addressing the presently uncontrolled increases in catch of Goolwa cockles and risk of overexploitation of cockle stocks.

A review of the management arrangements and the stock assessment report has been completed for the pipi sector. Also, a quota management system, and supporting quota monitoring framework, was implemented for the pipi sector of the fishery in December 2007. The TACC for the 2007/08 season was set at 1,150 tonnes. However, the regulations that established the quota management system and the allocation of quota units for the pipi fishery were disallowed in Parliament on 23 July 2008. Future management options are currently being considered by PIRSA.

Input controls, including limited entry, gear restrictions and spatial and temporal closures are the primary methods for controlling the commercial harvest in the other sectors of the fishery. Bag, boat and size limits are used as output controls for the recreational fishery. PIRSA considers that they are currently the most appropriate and cost-effective methods for controlling the harvest due to the multi-species, multi-method nature of the fishery and the relatively low value of the fishery.

PIRSA has commenced a review of Lakes and Coorong Fishery licence conditions and gear regulations.

8. PIRSA, within 18 months, to review known biology of harvested species and existing size limits to ensure size limits are sufficiently precautionary and take into account all removals from the fishery.

In August 2007 PIRSA commenced a statewide recreational fishing survey. This is a 12-month survey designed to be compatible with the national survey of 2000/01. Results from the survey will be available at the end of 2008. PIRSA will undertake a review of size, bag and boat limits under the new *Fisheries Management Act 2007*.

Stock assessments, which elaborate on the biology of the different species, have been completed for: mulloway (2003), golden perch (2004), yellow-eye mullet (2005), pipi (2003 and 2006), greenback flounder (2007) and Murray cod (2007). Stock assessments for black bream and golden perch will be available in October and November 2008, respectively.

Size of maturity information for black bream and flounder is still needed for South Australia. Size of maturity information for golden perch is expected to come from a recently completed study (Adelaide University).

In response to the status of the South Australian Murray cod stock and ongoing drought conditions, PIRSA made a number of management changes affecting the take of this species by the commercial and recreational fishery. The minimum legal size limit was increased from 50 cm to 60 cm and the maximum legal size limit was maintained at 100 cm. In addition, the closed season was extended (from 1 September to 31 December) to include the month of August; the recreational daily bag limit was reduced from two to one; and the boat limit (where three or more people are fishing from the boat) was reduced from six to three.

9. PIRSA, within 2 years, to develop and implement an ongoing program to collect information on the composition and abundance of by-catch across the commercial sectors of the fishery.

PIRSA-funded by-catch project was completed in 2005, which enabled the current project funded by FRDC. This project will seek the implementation of the code of conduct and modified logbook to allow fishery wide recording of by-catch species and it is expected to be finalised by December 2008.

PIRSA Fisheries implemented a generic data recording logbook for all TEPS in 2007 across all South Australian commercial fisheries. Wildlife interactions addressed across all fisheries (section 4.1.2, recommendation C).

Trials of a new logbook have been run in the fishery, and will be completed by 2009. The new logbook will include the capacity to record bycatch information.

10. Within 2 years, PIRSA to conduct an ecological risk assessment of the impacts of the LCF, including any impacts on the listed ecological character and values of the Coorong, and Lakes Alexandrina and Albert Wetland Ramsar site (Site No. 25). PIRSA to develop and implement any mitigation measures considered necessary.

Component trees for ecological interactions have been identified and included in the fishery management plan.

An ecological risk assessment for the Lakes and Coorong Fishery is required to be developed as part of the review of the fishery management plan, which will commence during 2008.

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## Appendix 1: Total catch by species in the lakes and Coorong fishery 1996/97 - 2006/07

Table 4: Total catch for the Lakes and Coorong Fishery, 1996/97 to 2006-07 (tonnes) - EconSearch, (2007)

Species	96/97	97/98	98/99	99/00	00/01	01/02	02/03	03/04	04/05	05/06	06/07
Black Bream	4	4	3	4	7	8	12	10	6	7	4
Bony Bream	688	757	609	429	474	298	212	279	340	318	382
Callop	137	151	98	57	71	36	38	82	103	123	152
Pipi	485	669	635	756	873	783	1,086	1,070	1,066	1,052	989
Flounder	15	11	28	40	19	26	6	6	9	7	5
Yellow eye mullet	161	158	139	150	127	155	167	111	110	126	141
Mulloway	56	50	95	69	136	109	45	31	39	38	44
Other Species	8	4	4	5	5	4	2	10	14	29	25
<b>Total</b>	<b>1554</b>	<b>1804</b>	<b>1611</b>	<b>1510</b>	<b>1712</b>	<b>1419</b>	<b>1568</b>	<b>1599</b>	<b>1687</b>	<b>1700</b>	<b>1742</b>

Table 5: Total value for the Lakes and Coorong Fishery, 1996/97 to 2006-07 (\$000) - EconSearch, (2007)

Species	96/97	97/98	98/99	99/00	00/01	01/02	02/03	03/04	04/05	05/06	06/07
Black Bream	34	42	30	37	58	70	110	100	55	69	51
Bony Bream	553	661	542	479	512	564	227	234	286	318	382
Callop	1638	1691	1190	851	892	271	583	1176	1464	1094	2297
Pipi	647	712	1098	1096	1710	1315	2013	2305	2092	2757	2662
Flounder	74	62	132	219	113	183	53	49	78	62	51
Yellow eye mullet	612	544	581	773	704	195	392	257	245	310	401
Mulloway	310	303	570	482	824	736	306	192	256	231	286
Other Species	13	9	13	18	14	24	7	35	54	127	123
<b>Total</b>	<b>3881</b>	<b>4024</b>	<b>4156</b>	<b>3955</b>	<b>4827</b>	<b>3358</b>	<b>3691</b>	<b>4348</b>	<b>4530</b>	<b>4968</b>	<b>6253</b>

## Appendix 2: Pipi research program

**Title**            **LAKES & COORONG FISHERY (Goolwa cockles)**

### **Timeframe**

Commencement Date:        1 July 2007

Completion Date:            30 June 2008

### **Summary**

This scope of work is for a project on Goolwa cockles (*Donax deltoides*). The key objectives are (i) to assess the suitability of using fishery-independent surveys for ongoing assessment of the status of Goolwa cockles on the Younghusband Peninsula and (ii) the use of size/age data to provide information on year class strength, growth rates and mortality.

### **BACKGROUND**

This project provides information to support the ecologically sustainable management of the fishery for Goolwa cockles (*Donax deltoides*) and addresses a key finding of a recent industry workshop that recommended that future assessments of the fishery should not rely solely on commercial CPUE.

The project builds on previous research, which includes; 1) stock assessment reports on Goolwa cockles in 2002-03 and 2005-06 by SARDI Aquatic Sciences, and 2) a PhD project jointly funded by PIRSA Fisheries, SARDI Aquatic Sciences and Adelaide University that began in 2005.

The project aims to develop methodologies to underpin future stock assessments of the fishery for Goolwa cockles on the Younghusband Peninsula. The strategy is to develop a collaborative relationship between fishers, researchers and managers (like those that currently exist in other South Australian fisheries, such as the Blue Crab Fishery and Spencer Gulf Prawn Fishery) and to conduct cost-effective fishery-dependent surveys that involve coordinated scientific sampling and structured commercial fishing.

### **Objectives**

- Collect data during the 2007-08 season for Goolwa cockles to;
  - Examine the potential for using fishery-independent surveys to assess the status of Goolwa cockles on Younghusband Peninsula and to inform future management,
  - Assess the potential for using length/age frequency information to characterise the demographic structure of Goolwa cockles.

## **METHODS**

- Conduct fishery-independent surveys of Goolwa cockles on the Younghusband Peninsula;
  - Sampling done by commercial fisher crews using commercial cockle rakes (possibly modified with smaller mesh),
  - Sampling done over approximately one week during the 2007-08 Goolwa cockle fishing season,
  - Catch sold and proceeds shared to offset costs of survey,
  - Each commercial crew accompanied by one scientific observer (uses modified cockle rake to collect length frequency data with wider range),
  - Collect, collate and analyse data,
  - Assess potential for using fishery independent surveys as assessment tool for Goolwa cockles on Younghusband Peninsula.

## **Outcomes**

- Report on the survey of Goolwa cockles on Younghusband Peninsula in the 2007-08 South Australian Goolwa cockle season including,
  - Examination of the potential for establishing a performance indicator based on survey results, and
  - Assess use of length/age frequency data for characterising the demography.