

Fishery Management Strategy

for the

Estuary General Fishery

February 2003





Fishery Management Strategy for the Estuary General Fishery

**Published in February 2003
by NSW Fisheries
Cronulla Fisheries Centre
202 Nicholson Parade
CRONULLA NSW 2230
(PO Box 21 CRONULLA NSW 2230)
ISBN 0 7310 9425 5**

Copyright © 2003 NSW Fisheries

Disclaimer

Any representation, statement, opinion or advice, expressed or implied in the publication is made in good faith and on the basis that the State of New South Wales, its agents and employees are not liable (whether by reason or negligence, lack of care or otherwise) to any person for any damage or loss whatsoever which has occurred or may occur in relation to that person taking or not taking (as the case may be) action in respect of any representation, statement or advice referred to above.

The Fishery Management Strategy for the Estuary General Fishery will be updated from time to time. Amendments will be made available on the NSW Fisheries website: www.fisheries.nsw.gov.au.

Cover image by J Matthews

TABLE OF CONTENTS

Introduction to the Estuary General Fishery FMS	1
1. Relevant Legislation	3
a) Objects of the Fisheries Management Act	3
i) Ecologically sustainable development	3
b) The NSW Environmental Planning and Assessment Act	4
c) The Commonwealth Environment Protection and Biodiversity Conservation Act ...	4
d) The NSW Marine Parks Act	5
e) Share management plans	5
i) The role of a share management plan	5
ii) Transition to share management	6
iii) Changes to Regulations	6
2. Vision and Goals for the Fishery	8
a) Fishery vision	8
b) Fishery goals	8
3. Fishery Description	9
a) An overview	9
b) Extent of the Fishery	11
i) Number of operators	11
ii) Activities endorsed in the fishery	11
iii) Overall catch levels and value	12
iv) Area	12
c) Species	13
i) Species taken in the fishery	13
ii) Bycatch species	17
iii) Size limits	18
iv) Protected fish	18
v) Interactions with threatened species and species of public concern	19
vi) Status of species within the fishery	19
vii) Overfished species	21
d) Gear used in the fishery	23
i) Traps	24
ii) Meshing nets	24
iii) Fish hauling nets	25
iv) Prawn nets	27
v) Other methods	27
vi) Boats used in the fishery	28
e) Interaction with other designated fishing activities	28
i) NSW commercial fisheries	28
ii) Recreational fishery	30
iii) Charter boat fishing	31
iv) Other designated fishing activities	31
4. Management Controls and Administration	32
a) Limited entry	32
b) Licensing Arrangements	32
i) Commercial fishing licences	32
ii) Fishing boat licensing	33

iii)	Renewal of licences	34
iv)	Appeal mechanisms	34
v)	Nomination policy.....	35
vi)	Training licences.....	35
c)	Net registration	35
d)	Controls on fishing gear and boats	35
e)	Transfer policies	36
i)	Transfer of licensed fishing boats.....	36
ii)	Transfer of fishing business entitlements.....	36
iii)	National licence splitting policy	36
f)	Time and area closures.....	37
g)	Zoning	37
h)	Recognised fishing grounds	39
i)	Permits.....	40
j)	Catch limits or quotas	41
k)	Seafood safety programs	41
l)	Cost recovery policy	42
5.	Compliance.....	43
a)	A penalty points system	43
6.	Research.....	45
a)	Proposed research areas	45
i)	Stock assessments of key species	45
ii)	Quantification and reduction of the bycatch and discarding of untargeted species	46
iii)	Effects of fishing methods on habitats	47
iv)	Importance of habitats to fish populations	48
v)	Importance of ecological processes to fish populations.....	48
vi)	Impacts of fishing on trophic interactions and ecosystems.....	49
vii)	Impacts of fishing on threatened species.....	49
b)	The Conservation Technology Unit.....	49
c)	Catch monitoring	50
7.	Consultation	52
a)	The Management Advisory Committee.....	52
b)	Ministerial Advisory Councils.....	53
c)	Fisheries Resources Conservation and Assessment Council	54
d)	Total Allowable Catch Setting and Review Committee	54
8.	Goals, Objectives and Management Responses	56
a)	A model framework	56
b)	Goals, objectives and management responses.....	58
9.	Performance Monitoring and Review	97
a)	Performance monitoring.....	97
i)	Performance indicators.....	97
ii)	Monitoring programs	97
iii)	Trigger points.....	97
b)	Predetermined review of performance indicators and trigger points.....	98
c)	Reporting on the performance of the management strategy	108
i)	Review report in response to trigger points.....	108
ii)	Annual performance report.....	109
d)	Contingency plans for unpredictable events	110
e)	Monitoring performance of stock assessment	110

f) Setting trigger points for monitoring changes in commercial landings..... 111

g) How trigger points based on landings will be applied..... 113

References..... 115

Appendix 1 The ten most prominent species in the Estuary General Fishery 119

Appendix 2 Estuary General Fishery – Fishing Gear Regulations 141

Appendix 3 Estuary General fishing gear/methods permitted in the estuaries open to
estuary general fishing..... 143

LIST OF TABLES

Table 1. Overview of the major marine commercial fisheries in NSW.	10
Table 2. Endorsements in the Estuary General Fishery.....	11
Table 3. Overall catch and value for the Estuary General Fishery.....	12
Table 4. Estuaries open to the Estuary General Fishery.....	13
Table 5. Species permitted to be taken in the Estuary General Fishery.....	14
Table 6. Other significant fisheries/sectors where primary and key secondary species are harvested.....	17
Table 7. Minimum legal sizes on estuary general species.....	18
Table 8. Fish species protected from fishing by all sectors.....	18
Table 9. Fish protected from commercial fishing only.....	19
Table 10. Definitions of exploitation status of fish stocks.....	20
Table 11. Exploitation status of primary and key secondary species.....	20
Table 12. Monthly provisions for the setting of mesh nets in estuaries where the use of a mesh net is permitted.....	25
Table 13. Endorsement numbers by region in the Estuary General Fishery (at June 2002)....	39
Table 14. Daily commercial fishing possession limits for tailor and Australian salmon.....	41
Table 15. Current membership on the Estuary General MAC.....	53
Table 16. Performance monitoring provisions.....	99
Table 17. Levels of trigger points for single year trigger.....	114

LIST OF FIGURES

Figure 1. Map of the NSW coast showing the seven regions being used for zoning (which are also the MAC electoral regions) and the three larger estuarine biological regions as defined by Pease (1999).....	38
Figure 2. A model of the framework for a fishery management strategy.	56
Figure 3. Example of how a single management response affects multiple goals and objectives.	57
Figure 4. Hypothetical examples where the trigger levels for the single year trigger (Table 17) are applied to existing catch data with an hypothetical starting point that shows the trigger levels relative to the most recent five years catch.....	113

ABBREVIATIONS

ACCF	Advisory Council on Commercial Fishing
ACFC	Advisory Council on Fisheries Conservation
ACoRF	Advisory Council on Recreational Fishing
ADT	Administrative Decisions Tribunal
AFMA	Australian Fisheries Management Authority
AQIS	Australian Quarantine and Inspection Service
BRD	Bycatch reduction device
CAMBA	Agreement between Australia and the People's Republic of China for Protection of Migratory Birds and their Environment
COE	Certificate of Exemption
CPUE	Catch per unit effort
DLWC	Department of Land and Water Conservation
DUAP	Department of Urban Affairs and Planning (now Planning NSW)
EG	Estuary General
EIA	Environmental Impact Assessment
EIS	Environmental Impact Statement
EMPMP	Emergency Marine Pest Management Plan
EP&A Act	Environmental Planning and Assessment Act 1979
EPA	Environmental Protection Authority
EPBC Act	Environment Protection and Biodiversity Conservation Act 1999
ESD	Ecologically Sustainable Development
FAD	Fish aggregation device
FM Act	Fisheries Management Act 1994
FMS	Fishery Management Strategy
FP Act	Food Production (Safety) Act 1998
FRCAC	Fisheries Resources Conservation and Assessment Council
FRDC	Fisheries Research and Development Corporation
IMCRA	Interim Marine and Coastal Regionalisation for Australia
IPA	Intertidal protected area
JAMBA	Japan-Australia Agreement for the Protection of Migratory Birds, Birds in Danger of Extinction and their Environment
MAC	Management Advisory Committee
MPA	Marine Parks Authority
NCC	Nature Conservation Council
NPWS	National Parks and Wildlife Service
NRSMPA	National Representative System of Marine Protected Areas
NSW	New South Wales
NSWF	NSW Fisheries
Regulation	Fisheries Management (General) Regulation 1995
RFA	Recreational fishing area
RFO	Recognised Fishing Operation
RFG	Recognised fishing ground
RFR	Registered Fish Receiver
RRFR	Restricted Registered Fish Receiver
TAC	Total allowable catch
TCM	Total catchment management
TSC Act	Threatened Species Conservation Act 1995

Introduction to the Estuary General Fishery FMS

Background

In December 2000, the NSW Government made changes to the way fisheries are managed in NSW. These changes place increased emphasis on ensuring that fishing activities are environmentally sustainable.

The changes require the development of a fishery management strategy for each major commercial fishery, the recreational fishery, the charter boat fishery, fish stocking and for the beach safety program. They also require an assessment of the environmental impacts of those fishing activities.

Estuaries of NSW

The Estuary General Fishery operates within the State's estuaries. Estuaries represent a 'mixing zone' between completely sheltered freshwaters and the open ocean. The forces driving this mixing include tides, wind, waves and river run-off, although the relative importance of each of these varies according to estuary type and location within the estuary.

There are at least 690 such waterbodies joining the Tasman Sea along the New South Wales seaboard (Williams *et al.*, 1998). The vast majority of these are very small and only intermittently open to the sea. Only 130 have a water area greater than 0.05 km².

Most estuaries have been directly affected by works that have modified or reduced freshwater inflows, and most are surrounded by urban, industrial or agricultural developments that also impact on their ecosystems.

A wide range of competing activities take place in estuarine waters, and the Estuary General Fishery is just one of these. Other activities undertaken in estuaries include other commercial fisheries such as the estuary prawn trawl fishery, the recreational and charter boat fisheries aquaculture and non-harvesting activities such as scuba diving and recreational boating.

The Estuary General Fishery

The Estuary General Fishery is one of nine major commercial fisheries in New South Wales. It is a large and diverse fishery harvesting a wide range of finfish and shellfish for sale from estuarine waters using a range of commercial fishing gear. The fishery also includes the taking of invertebrates (such as beachworms and pipis) by hand from ocean beaches.

Estuarine fishing has been undertaken in NSW since the mid-1800s. It comprises small fishing boats and although authorised to occur in approximately 100 estuaries, the majority of fishing activity occurs in 24 of the State's estuaries.

About half of the State's commercial fishing businesses are entitled to operate in the Estuary General Fishery. A diverse range of species are harvested in estuaries and from ocean beaches, using more than 17 different types of fishing gear. In 2000/01 the value of the 5,043 tonnes of fish harvested in the Estuary General fishery was approximately \$19 million at first point of sale¹.

¹ Based on Sydney Fish Market average monthly prices, and does not account for higher prices paid for exports or in other markets.

Around 80 species are taken in the Estuary General Fishery with the main species targeted being sea mullet, luderick, bream and school prawns. The most commonly used estuarine fishing methods are meshing and hauling nets. Other methods include trapping for crabs, eels and finfish, and a small amount of hand lining and handgathering. Gathering of pipis and beachworms by hand on ocean beaches is included in the Estuary General Fishery for administrative reasons and because handgathering also occurs in estuaries.

Estuarine fishing was first regulated in NSW under the *Fisheries Act 1865*. By the end of the 19th century there were controls in place over the type, size and use of fishing nets, as well as fishing closures, and requirements for the licensing of fishers and boats. These types of controls are still in existence today, but have now been augmented by many other management arrangements.

The Fishery Management Strategy

The fishery management strategy for the Estuary General Fishery contains the rules for the fishery. But it is much more than a collection of rules. The strategy contains the goals and objectives for the fishery, a detailed description of the way the fishery operates, and describes the management framework for the future. It also outlines a program for monitoring the biological, social and economic performance of the fishery, establishes trigger points for the review of the strategy, and requires annual reporting on performance in order to ensure the objectives set out in the strategy are met. Information about the impacts of harvesting by other fishing sectors (such as recreational fishing) is also provided, however the rules applying to such sectors are dealt with under separate management arrangements and are not the subject of this strategy.

The management advisory committee (MAC) for the Estuary General Fishery provided significant input into the drafting of the strategy. Input into the draft strategy was also sought from all fishers endorsed in the Estuary General Fishery, the Minister for Fisheries' advisory councils on fisheries conservation, recreational fishing and commercial fishing (which includes commercial fishers from other fisheries), and the Fisheries Resource Conservation and Assessment Council. Government agencies, such as Planning NSW and the Commonwealth's Environment Australia, have also been consulted throughout the drafting of the fishery management strategy.

An environmental impact statement was prepared for the Estuary General Fishery in 2001. The EIS contained the draft fishery management strategy and an environmental assessment on the management rules and risk mitigation measures contained in the strategy. The structure of the EIS was based on guidelines issued by Planning NSW including an assessment of the likely biophysical, social and economic impacts of implementing the draft management strategy.

The EIS was on public exhibition between 16 November 2001 and 18 January 2002. The EIS highlighted the importance of the Estuary General Fishery to the community in terms of employment, supply of seafood to the community and economic benefits. The EIS concluded that the management rules proposed by the fishery management strategy provide for an appropriate allocation of the resource, and incorporate measures needed to address the various principles of ecologically sustainable development.

The Minister for Fisheries made a formal determination under the *Environmental Planning and Assessment Act 1979* in July 2002 with respect to the Estuary General Fishery, which in effect, allows the fishery to continue in accordance with the fishery management strategy. This process relieves estuary general fishers of the requirement to undertake individual environmental assessments.

1. Relevant Legislation

a) Objects of the Fisheries Management Act

The *Fisheries Management Act 1994* (FM Act) seeks to achieve ecologically sustainable development for the fisheries of NSW through the achievement of its stated objectives, which are:

‘To conserve, develop and share the fishery resources of the State for the benefit of present and future generations. In particular the objects of the Act include:

- (a) to conserve fish stocks and key fish habitats, and*
- (b) to conserve threatened species, populations and ecological communities of fish and marine vegetation, and*
- (c) to promote ecological sustainable development, including the conservation of biological diversity,*

and, consistently with those objects:

- (d) to promote viable commercial fishing and aquaculture industries, and*
- (e) to promote quality recreational fishing opportunities, and*
- (f) to appropriately share fisheries resources between the users of those resources, and*
- (g) to provide social and economic benefits for the wider community of New South Wales.’*

i) Ecologically sustainable development

Ecologically sustainable development (ESD) has been defined under the National Strategy for ESD as “development that improves the total quality of life, both now and in the future, in a way that maintains the ecological processes on which life depends”. It can be achieved through the implementation of the following principles and programs²:

- precautionary principle – if there are threats of serious or irreversible environmental damage, lack of full scientific certainty should not be used as a reason for postponing measures to prevent environmental degradation
- intra-generational equity – the benefits and costs of pursuing ESD strategies should be distributed as evenly as practicable within each generation
- inter-generational equity – the present generation should ensure that the health, diversity and productivity of the environment are maintained or enhanced for the benefit of future generations
- conservation of biological diversity and ecological integrity – conservation of biological diversity and ecological integrity should be a fundamental consideration
- improved valuation, pricing and incentive mechanisms – such as user pays and the use of incentive structures to promote efficiency in achieving environmental goals.

² Adapted from section 6 (2) of the NSW Protection of the Environmental Administration Act 1991.

b) The NSW Environmental Planning and Assessment Act

The evolution of the new environmental assessment process for commercial fisheries in NSW stems largely from a decision handed down by the Land and Environment Court in January 2000. The Court decided that the issue of an individual commercial fishing licence had to meet the requirements of the *Environmental Planning and Assessment Act 1979* (the EP&A Act). This meant that the environmental impacts of any authorised activities had to be assessed at the time the licence was issued or renewed.

It is widely accepted that in most cases the best way of assessing the impact of fishing activity is by considering the total impact of fishing, instead of the potentially minor impacts of individual fishers. The Government was concerned that requiring assessment for each individual licence would be an unnecessarily expensive and time-consuming activity. Licensed fishers would have faced a high level of uncertainty and significant individual costs.

After thorough consultation with all stakeholders, the Government decided that the best approach would be to assess the environmental impact of fishing activities at the fishery level. This provides the best approach for both our aquatic environment and stakeholders. The legislation was subsequently amended to provide for the development of fishery management strategies and the environmental assessment of those strategies.

c) The Commonwealth Environment Protection and Biodiversity Conservation Act

The *Environment Protection and Biodiversity Conservation Act 1999* (the EPBC Act) makes it an offence for a person to undertake an action that has the potential to significantly impact on a matter of 'national environmental significance' without first obtaining a permit from the Commonwealth Minister for Environment and Heritage. Matters of national environmental significance include: declared World Heritage areas; declared Ramsar wetlands; listed threatened species and ecological communities; listed migratory species; listed marine species; nuclear actions; and the environment of Commonwealth marine areas.

The EPBC Act was amended in January 2002 to incorporate the provisions of the Wildlife Protection Act (which was repealed at the same time). The new Part 13A of the EPBC Act has the effect of removing the previous blanket exemption from export control for marine species. As a result, the export of all marine organisms will come under the controls of the Act and be subject to ecological sustainability assessments based on the guidelines established by the Commonwealth. To give time in which those assessments may be made, the exemption will continue until 1 December 2003. Until then, current arrangements regarding export of marine species will remain in effect, that is, most marine fish and the bulk of marine invertebrates will continue to be exempt from export controls under the Act.

If a fishery is not assessed as exempt, it will more than likely be able to continue to supply product for export through an approved wildlife trade operation (section 303FN) under the EPBC Act. These declarations will have conditions attached that will bring the management and operations of the fishery in line with the Commonwealth guidelines. Once declarations are made, exporters will need to apply for and obtain from Environment Australia a permit to export.

d) The NSW Marine Parks Act

The NSW Government is using a systematic approach to identify sites for marine protected areas and to prioritise new areas for marine biodiversity conservation in NSW waters. There are three types of marine protected areas in NSW - large multiple-use marine parks, small aquatic reserves and the marine and estuarine components of national parks and nature reserves.

Marine Parks aim to conserve biodiversity by protecting representative samples of the habitats in defined 'bioregions'. Zoning and operational plans are used to guide the protection of conservation values and manage activities that occur within the marine park. Four zones are used in marine parks - sanctuary zones, habitat protection zones, general use zones and special purpose zones.

Consultation occurs with the community prior to the declaration of marine parks. Up to date information on the creation and zoning of marine parks in NSW waters is available on the Marine Park Authority website: www.mpa.nsw.gov.au

The *Marine Parks Act 1997* was introduced to provide for the declaration of marine parks in NSW. The Act and associated regulations aim to protect biodiversity and provide for a variety of users (where consistent with the primary objective) by way of zoning and operational plans. These are required for all marine parks and the zones clearly identify the conservation and management priorities within marine parks (MPA, 2000). The objects of the Act are as follows:

- (a) to conserve marine biological diversity and marine habitats by declaring and providing for the management of a comprehensive system of marine parks
- (b) to maintain ecological processes in marine parks
- (c) where consistent with the preceding objects:
 - (i) to provide for ecologically sustainable use of fish (including commercial and recreational fishing) and marine vegetation in marine parks, and
 - (ii) to provide opportunities for public appreciation, understanding and enjoyment of marine parks.

This fishery management strategy has been prepared taking into account, and ensuring consistency with, the objects of the *Marine Parks Act 1997*.

e) Share management plans

i) The role of a share management plan

The *Fisheries Management Act 1994* requires that a share management plan be developed and implemented for all share management fisheries. A share management plan for the Estuary General Fishery will be prepared as part of the transition of the fishery to a full share management regime.

The primary role of a share management plan is to provide a legislative structure for the class or classes of shares and the rights of shareholders in a share management fishery. The share management plan also makes provision for a range of fishery specific controls to be formalised into a regulation. Examples of these include the fish that may be taken, the areas for taking fish, the times or periods during which the fishery may operate, the protection of fish habitats, as well as the use of boats, fishing gear and bait in the fishery.

The share management plan for the Estuary General Fishery may also bring into operation a number of controls in the fishery that are described in this management strategy. One example of this is the share forfeiture scheme referred to in the management strategy. Whilst the management strategy relies on the share forfeiture scheme as a compliance mechanism for creating an effective deterrent, the workings and provisions of the scheme will be included in the share management plan for the fishery.

A share management plan must include objectives and performance indicators which, for the Estuary General Fishery, will be consistent with the goals and objectives of this management strategy. The share management plan must also specify at what point a review of the plan is required when a performance indicator is not being met. The review process to be included in the share management plan will complement the review process outlined in this management strategy. This will ensure that there is a robust review and reporting framework for the fishery that is underpinned by the provisions of the share management plan.

In addition to a review that may occur if a trigger point is breached, a share management plan for a category 2 share management fishery must also be subject to scheduled periodic review. With regard to the Estuary General Fishery, shares are to be issued for an initial term of 15 years and a review of the management plan is to be conducted between years five and ten of that period.

ii) Transition to share management

The Estuary General Fishery is in the process of moving from being a restricted fishery (under section 111 of the FM Act) to a category 2 share management fishery. The progression to a share management regime is a staged implementation.

The fishery is first identified as a share management fishery by being included in Schedule 1 of the Act. Criteria for the allocation of shares are then determined and when the allocation formula has been decided, a public notice is published inviting applications for shares. Based on the criteria and applications received, provisional shares are issued.

After provisional shares are issued, a legal order is placed in the NSW Government Gazette commencing the “limited access stage” of share management. Once the limited access stage commences a person must hold at least one provisional share in the fishery to be eligible to hold an endorsement. Throughout this stage, the fishery continues to operate under the regulations that applied to the restricted fishery.

Applications for appeals against the allocation of shares are lodged before the fishery is formally commenced. The Management Advisory Committee for the fishery and any other relevant commercial or recreational industry groups will be consulted on the proposed management plan. The management plan for the fishery is then put into regulation, final shares are issued and the fishery then commences as a full share management fishery.

iii) Changes to Regulations

In the most part, the current regulations that apply to the Estuary General Fishery appear in the *Fisheries Management (General) Regulation 1995* (‘the Regulation’). The Regulation sets out the working arrangements that underpin the provisions of the *Fisheries Management Act 1994*, and are made pursuant to that Act. For example, an offence appears in the Act for possessing prohibited size

fish (section 16), however it is the Regulation that prescribes the fish species subject to size limits and what those size limits are (clause 7).

This management strategy includes a number of actions that will impact on the current regulations that apply to the fishery. Examples of these include a change to the dimensions of general purpose hauling nets (to limit the previous nets of 1000 metres and 725 metres to 500 metres), and potential alterations to the dimensions of flathead nets. Where it is necessary to introduce or change controls prior to the development and implementation of a share management plan for the fishery, changes to the Regulation will be made.

If a management plan for a fishery is inconsistent with any other regulation or fishing closure, the management plan prevails. Therefore, a share management plan is an appropriate tool that can be used to implement controls that are specific to the Estuary General Fishery. The only occasion where a management plan does not prevail over another regulation is if a regulation specifically expresses that it is to have effect despite a management plan. An example of when this may occur is where a short-term closure may be introduced in response to an emergency.

2. Vision and Goals for the Fishery

a) Fishery vision

The long term vision for the Estuary General Fishery is:

To have a more profitable Estuary General Fishery with a smaller number of operators which provides the community with fresh local seafood and bait, and uses fishing gear in an ecologically sustainable manner.

b) Fishery goals

The goals that are proposed for the fishery to assist in achieving this vision are:

1. To manage the Estuary General Fishery in a manner that promotes the conservation of biological diversity in the estuarine environment
2. To maintain fish populations harvested by the Estuary General Fishery at biologically sustainable levels
3. To promote the conservation of threatened species, populations and ecological communities associated with the operation of the Estuary General Fishery
4. To appropriately share the resource and carry out fishing in a manner that minimises social impacts
5. To promote a viable commercial fishery (consistent with ecological sustainability)
6. To ensure cost-effective and efficient Estuary General Fishery management and compliance programs
7. To improve knowledge of the Estuary General Fishery and the resources upon which the fishery relies.

3. Fishery Description

a) An overview

The Estuary General Fishery involves the taking of finfish and shellfish for sale from the estuarine waters of NSW using lawful commercial fishing gear, and the taking of selected species by hand from ocean beaches. The fishery does not include the taking of abalone and rock lobster or the Estuary Prawn Trawl method as these are subject to separate management regimes and require separate fishing entitlements. Additionally, the fishery does not operate in estuarine areas where fishing closures apply.

The Estuary General Fishery is the most diverse commercial fishery in NSW. Approximately 99% of the catch by total landed weight is comprised of 45 species (NSW Fisheries catch statistics database 1998/99), and these species are taken from approximately 100 estuaries along the NSW coast using more than 17 types of fishing gear. The gear ranges from large hauling nets to relatively small traps and gathering by hand.

The Estuary General Fishery has a large number of participants, with approximately 722 fishing businesses endorsed to operate in the fishery (in August 2002). There is also large variation in the levels of participation of fishers with some fishers operating on a full time professional basis, while others operate on a part time basis and maintain other non-fishing forms of employment. Of the full time fishers, around half operate solely in the Estuary General Fishery, and the remainder operate in a number of different commercial fisheries in NSW. Table 1 below shows a comparison between the Estuary General Fishery and other commercial fisheries in NSW based on statistics from 1999/2000.

Table 1. Overview of the major marine commercial fisheries in NSW.

(Source: Tanner & Liggins, 2001; Kennelly & McVea, 2001; NSW Fisheries Licensing database – August 2002)

	Estuary general	Ocean trap and line	Ocean prawn trawl	Ocean fish trawl	Ocean hauling	Lobster	Abalone	Estuary prawn trawl
Methods	Handline, Trap, Hauling net, Mesh/gill net, Hand collecting	Demersal trap, Handline, Setline, Dropline	Otter trawl net	Otter trawl net	Beach seine net, Purse seine net	Trap/pot	Diving (hookah)	Otter trawl net
Species	Yellowfin bream, Dusky flathead, Sand whiting, Longfinned eels, Sea mullet, Pipis	Snapper, Kingfish, Morwong, Spanner crabs, Silver trevally	King prawn, School prawn, Royal red prawn, Balmain bugs, Octopus	Silver trevally, Tiger flathead, Redfish	Sea mullet, Sea garfish, Luderick, Yellowtail, Pilchards	Rock lobster (eastern)	Black lip abalone	School prawn, King prawn
Total catch in 1999/00 (t)	5,239	1,931	2,473	470***	2,767	117	325	625
Est. value in 1999/00 (A\$m)	19,5	10.7	23.4	1.3	4.8	4.6	12.7	4.1
No. of authorised fishing businesses in August 2002	722	550	318	99	333	172	44	243
Standard boat length (m)	5	6-8	14	14	4	6-8	6	9
General no. of unlicensed crew	0*	0-1	2	2-3	0**	0-1	1	1

* Unlicensed crew permitted only when undertaking boat based prawn seining

** Unlicensed crew permitted in some forms of boat based hauling

*** Partial catches only, see Kennelly and McVea (2001) for explanation

b) Extent of the Fishery

i) Number of operators

In July 2001, NSW Fisheries licensing database showed that 944 fishing businesses held entitlements to operate in the Estuary General Fishery. During 2002, 30 recreational fishing havens were created in NSW estuaries. A voluntary buyout process associated with the introduction of the havens has reduced the number of businesses authorised to operate in the Estuary General Fishery to 722 (as at August 2002). The number of operators in the fishery, however, constantly varies due to a number of factors including the transfer and amalgamation of fishing businesses and late payments on renewal of fishing licences.

ii) Activities endorsed in the fishery

The Estuary General Fishery is categorised into nine endorsement types that determine the type of fishing that may take place. Table 2 lists the endorsement types available in the fishery and details the activity that is authorised by each endorsement. For example, only fishers with a crab trap endorsement on their fishing licence are permitted to use crab traps, and only fishers with category 1 hauling endorsement on their fishing licence are permitted to use general purpose hauling nets. A more detailed discussion of fishing licences and endorsements for the fishery appears in section 4(b) of this management strategy.

Table 2. Endorsements in the Estuary General Fishery.

Endorsement types	Endorsement description
Meshing	This endorsement authorises the commercial fisher to use a meshing net and a flathead net to take fish for sale from estuary waters
Prawning	This endorsement authorises the commercial fisher to use a prawn hauling net, prawn seine net, prawn set pocket net, prawn running net, hand-hauled prawn net, push or scissors net and a dip or scoop net to take prawns for sale from estuary waters
Category 1 hauling	This endorsement authorises the commercial fisher to take fish for sale from estuary waters using any of the following nets: general purpose hauling net, trumpeter whiting net, pilchard, anchovy and bait net, garfish hauling net, garfish bullringing net, bait net
Category 2 hauling	This endorsement authorises the commercial fisher to take fish for sale from estuary waters using any of the following nets: garfish hauling net, garfish bullringing net, bait net
Trapping	This endorsement authorises the commercial fisher to use a fish trap and a hoop or lift net to take fish (other than eels or mud crabs) for sale from estuary waters
Eel trapping	This endorsement authorises the commercial fisher to use an eel trap to take eels for sale from estuary waters
Mud crab trapping	This endorsement authorises the commercial fisher to use a crab trap to take mud crabs for sale from estuary waters
Hand gathering	This endorsement authorises the commercial fisher to take beachworms, pipis, cockles, yabbies, mussels and nippers for sale from estuaries and ocean beaches by hand picking
Handlining & hauling crew	This endorsement authorises the commercial fisher to take fish for sale from estuaries using a hand line or by assisting another commercial fisher with a category one or a category two hauling endorsement (using hauling methods only)

iii) Overall catch levels and value

The total commercial estuary catch³ has remained relatively stable over the past 50 years except for slightly higher catches during the late 1980s and early 1990s. Total landings have generally been stable between 1993/94 and 1999/00 (see Table 3). The total reported landed catch of 5,043 tonnes for the 2000/01 fiscal year was worth an estimated \$19 million, though the value figures do not take into account export, interstate or local markets, where higher prices may be obtained.

Table 3. Overall catch and value for the Estuary General Fishery.

Period	Catch (t)	Value (\$'000)
1993/94	5,774	21,390
1994/95	5,805	20,044
1995/96	5,664	19,941
1996/97	5,294	19,488
1997/98	5,668	19,366
1998/99	5,426	20,054
1999/00*	5,239	19,528
2000/01**	5,043	19,136

* Information for the 1999/00 period sourced from NSW Fisheries catch statistics database in September 2001.

** Information for the 2000/01 period sourced from NSW Fisheries catch statistics database in August 2002.

iv) Area

Estuarine waters are defined under the FM Act as waters other than ocean waters that are ordinarily subject to tidal influence. Where an estuary meets ocean waters, estuarine waters are those that are west of, or upstream of, a line drawn across the entrance between the eastern most high water mark of the two banks to a line identified as the tidal limit.

There are a number of flowing fresh water streams east of the Great Dividing Range which lead into catchments and rivers that form some of the estuaries along the NSW coast, however, these fresh water tributaries do not form part of the Estuary General Fishery.

The Estuary General Fishery may occur in 102 estuaries along the NSW coast, however parts of these estuaries are often closed to commercial fishing. As of September 2002, the estuaries listed in Table 4 were open to estuary general fishing. Areas available to the Estuary General Fishery are subject to change as areas are designated as recreational fishing havens, or as sanctuary, habitat protection or special purpose zones are established or modified within marine protected areas. Details of commercial fishing closures made under the FM Act can be found on the NSW Fisheries website at www.fisheries.nsw.gov.au or by contacting your local Fisheries Office.

The Estuary General Fishery also includes the gathering by hand of fish such as beachworms and pipis from ocean beaches, except where closures apply.

³ References to commercial catch in this fishery management strategy are references to commercial landings, except where the reference specifically relates to all catch (ie. landings plus bycatch).

Table 4. Estuaries open to the Estuary General Fishery (as at 2002)

Tweed River*	Camden Haven River*	Jervis Bay
Cudgen Lake	Manning River*	Swan Lake
Cudgera Creek	Khappinghat Creek	Berrara Creek
Mooball Creek	Wallis Lake	Nerrindilah Creek
Brunswick River	Smiths Lake	Termeil Lake
Belongil Creek	Myall Lakes	Willinga Lake
Tallow Creek	Myall River	Durras Lake
Broken Head Creek	Lake Booloombayt	Batemans Bay
Richmond River*	Port Stephens	Candlagan Creek
Evans River	Karuah River	Moruya River
Jerusalem Creek	Hunter River	Congo Creek
Clarence River*	Tuggerah Lakes	Meringo River
Sandon River	Wamberal Lagoon	Coila Lake
Wooli Wooli River	Terrigal Lake	Lake Brou
Station Creek	Avoca Lake	Kianga Lake
Corindi River	Cockrone Lake	Wagonga Inlet
Arrawarra Creek	Brisbane Water	Nangudga Lake
Darkum Creek	Hawkesbury River	Corunna Lake
Woolgoolga Lake	Pittwater	Tilba Tilba Lake
Hearns Lake	Narrabeen Lagoon	Wallaga Lake
Moonee Creek	Dee Why Lagoon	Barragoot Lake
Coffs Harbour Creek	Curl Curl (Harbord) Lagoon	Cuttagee Lake
Boambee Creek	Manly Lagoon	Murrah Lake
Bonville Creek	Sydney Harbour	Bunga Lagoon
Dalhousie Creek	Port Hacking	Wapengo Lake
Oyster Creek	Towradgie Creek	Middle Lake (Bega)
Nambucca River	Port Kembla Harbour	Wallagoot Lake
Macleay River	Lake Illawarra	Bournda Lagoon
South West Rocks Creek	Minnamurra River	Merimbula Lake
Saltwater Creek	Spring Creek	Pambula Lake*
Korogoro Creek	Werri Lagoon	Curalo Lake
Killick River	Crooked River	Merrica River
Lake Innes	Shoalhaven River	Nadgee River
Lake Cathie	Lake Wollumboola	Nadgee Lake

Note: Some of the above listed estuaries include tributaries which are also open to the Estuary General Fishery. Parts of these estuaries may be closed to some or all estuary general fishing methods at certain times through fishing closures under the FM Act, or other restrictions that may prevent fishing.

* Parts of these estuaries are recreational fishing havens.

c) Species

i) Species taken in the fishery

The Estuary General Fishery takes a wide and diverse range of species. Table 5 is a list of the species permitted to be taken in the fishery. A summary of the ten most prominent species in the Estuary General Fishery including information on life cycle, habitat, catch trends and average market values is presented in Appendix 1.

Table 5. Species permitted to be taken in the Estuary General Fishery

Common name	Scientific name	Taxonomic Family / Class name
Anchovy	<i>Engraulis australis</i>	ENGRAULIDAE
Arrow squid	<i>Nototodarus gouldi</i>	OMMASTREPHIDAE
Australian salmon	<i>Arripis trutta</i>	ARRIPIDAE
Beachworm spp.	various	Class: POLYCHAETA
Black sole	<i>Synaptura nigra</i>	SOLEIDAE
Blue mackerel	<i>Scomber australasicus</i>	SCOMBRIDAE
Blue mussel	<i>Mytilus edulis</i>	MYTILIDAE
Bonito	<i>Sarda australis</i>	SCOMBRIDAE
Bream		
> Black bream	<i>Acanthopagrus butcheri</i>	SPARIDAE
> Yellowfin bream	<i>Acanthopagrus australis</i>	SPARIDAE
Catfish spp.	various	ARIIDAE/PLOTOSIDAE
Cockle spp.	various	ARCIDAE/VENERIDAE
Crabs		
> Blue swimmer crab	<i>Portunus pelagicus</i>	PORTUNIDAE
> Mud crab	<i>Scylla serrata</i>	PORTUNIDAE
> Sand crab spp.	various	PORTUNIDAE
Cuttlefish spp.	various	SEPIIDAE
Eels		
> Southern conger eel	<i>Conger verreauxi</i>	CONGRIDAE
> Short-finned conger eel	<i>Conger wilsoni</i>	CONGRIDAE
> Longfin river eel	<i>Anguilla reinhardtii</i>	ANGUILLIDAE
> Shortfin river eel	<i>Anguilla australis</i>	ANGUILLIDAE
> Pike eel	<i>Muraenesox bagio</i>	MURAENESOCIDAE
Estuary catfish	<i>Cnidoglanis macrocephalus</i>	PLOTOSIDAE
Flathead		
> Dusky flathead	<i>Platycephalus fuscus</i>	PLATYCEPHALIDAE
> Sand flathead	<i>Platycephalus caeruleopunctatus</i>	PLATYCEPHALIDAE
Flounder spp.	various	PLEURONECTIDAE/BOTHIDAE
Garfish		
> Eastern sea garfish	<i>Hyporhamphus australis</i>	HEMIRAMPHIDAE
> River garfish	<i>Hyporhamphus regularis</i>	HEMIRAMPHIDAE
> Shortbill garfish	<i>Arrhamphus sclerolepis</i>	HEMIRAMPHIDAE
Gurnard spp.	various	TRIGLIDAE
Hairtail	<i>Trichiurus lepturus</i>	TRICHIURIDAE
Hardyhead spp.	various	ATHERINIDAE
John dory	<i>Zeus faber</i>	ZEIDAE
Leatherjacket spp.	various	MONACANTHIDAE
Longtom spp.	various	BELONIDAE
Luderick	<i>Girella tricuspidata</i>	GIRELLIDAE
Mackerel tuna	<i>Euthynnus affinis</i>	SCOMBRIDAE
Mangrove jack	<i>Lutjanus argentimaculatus</i>	LUTJANIDAE
Mantis shrimp	<i>Squilla spp.</i>	STOMATOPODA/SQUILLIDAE
Mullet		
> Flat tail mullet	<i>Liza argentea</i>	MUGILIDAE
> Pink-eye mullet	<i>Myxus petardi</i>	MUGILIDAE
> Red mullet	<i>Upeneichthys lineatus</i>	MULLIDAE
> Sand mullet	<i>Myxus elongatus</i>	MUGILIDAE
> Sea mullet	<i>Mugil cephalus</i>	MUGILIDAE

Table 5. continued

Common name	Scientific name	Taxonomic Family / Class name
Mulloway	<i>Argyrosomus japonicus</i>	SCIAENIDAE
Nipper spp.	<i>Callianassa spp.</i>	CALLIANASSIDAE
Octopus spp.	various	OCTOPODIDAE
Old maid	<i>Scatophagus multifasciatus</i>	SCATOPHAGIDAE
Pike spp.	<i>Sphyraena spp.</i>	SPHYRAENIDAE
Pilchard	<i>Sardinops sagax</i>	CLUPEIDAE
Pipi	<i>Donax deltoides</i>	DONACIDAE
Prawns		
> Eastern king prawn	<i>Penaeus plebejus</i>	PENAEIDAE
> Greasyback prawn	<i>Metapenaeus bennettiae</i>	PENAEIDAE
> School prawn	<i>Metapenaeus macleayi</i>	PENAEIDAE
> Tiger prawn	<i>Penaeus esculentus</i>	PENAEIDAE
Red gurnard	<i>Chelidonichthys kumu</i>	TRIGLIDAE
Red morwong	<i>Cheilodactylus fuscus</i>	CHEILODACTYLIDAE
Saucer scallop	<i>Amusium spp.</i>	PECTINIDAE
Scallop	<i>Pecten fumatus</i>	PECTINIDAE
Shell spp.	various	Class: GASTROPODA/PELECYPODA
Silver biddy	<i>Gerres subfasciatus</i>	GERREIDAE
Snapper	<i>Pagrus auratus</i>	SPARIDAE
Sole spp.	various	SOLEIDAE
Southern calamari	<i>Sepioteuthis australis</i>	LOLIGINIDAE
Squid spp.	various	Class: CEPHALOPODA
Stingray/stingaree spp.	various	DASYATIDAE/UROLOPHIDAE
Striped trumpeter	<i>Pelates sexlineatus</i>	TERAPONIDAE
Sweep	<i>Scorpius lineolatus</i>	SCORPIDIDAE
Sweetlip	<i>Lethrinus sp.</i>	LETHRINIDAE
Tailor	<i>Pomatomus saltatrix</i>	POMATOMIDAE
Tarwhine	<i>Rhabdosargus sarba</i>	SPARIDAE
Trevally		
> Black trevally	<i>Siganus nebulosus</i>	SIGANIDAE
> Golden trevally	<i>Gnathanodon speciosus</i>	CARANGIDAE
> Silver trevally	<i>Pseudocaranx dentex</i>	CARANGIDAE
Trumpeter	<i>Pelates quadrilineatus</i>	TERAPONIDAE
Whaler shark spp.	<i>Carcharhinus spp.</i>	CARCHARHINIDAE
Whitebait spp.	various	CLUPEIDAE/GALAXIIDAE
Whiting		
> Sand whiting	<i>Sillago ciliata</i>	SILLAGINIDAE
> School whiting	<i>Sillago bassensis</i>	SILLAGINIDAE
> Trumpeter whiting	<i>Sillago maculata</i>	SILLAGINIDAE
Yellowtail	<i>Trachurus novaezelandiae</i>	CARANGIDAE
Yellowtail kingfish	<i>Seriola lalandi</i>	CARANGIDAE

Many species taken in the Estuary General Fishery are also taken in other NSW commercial fisheries, by other sector groups and by fisheries managed under the jurisdiction of the Commonwealth or other States. The FM Act establishes a system of advisory councils who provide advice to the Minister for Fisheries on cross-fishery management issues. NSW Fisheries management and research staff will meet biannually with adjacent jurisdictions to consider consistent management regimes for shared species and to discuss initiatives such as stock assessment, complimentary size limits, monitoring programs and recovery programs for overfished species. Cross jurisdictional collaboration has occurred often on an as-needed basis in the past, however, a more formalised approach to joint management will now be undertaken.

This management strategy categorises retained species taken into “primary species”, “key secondary species” and “secondary species”. A description of those categorisations is provided below.

This categorisation differs from the often used “target species versus byproduct species” categorisation because the fishery uses a range of relatively non-selective fishing gear to take many different species that are retained for sale. It follows that all saleable fish that are caught in the fishery would otherwise be considered “target” species. Primary and key secondary species are identified in Table 6. Table 6 also lists other significant fisheries and sectors where the primary and key secondary species are harvested.

Primary species

These are the species of major importance to the fishery, and consequently they receive a higher management and research priority within this management strategy. Primary species are listed in Table 6. Individual trigger points have been determined for these species to provide for a review of the fishery if catch rates fall outside predetermined reference points (see section 9 in this management strategy for further information).

Secondary species

Secondary species are categorised as those that are retained by the fishery but which do not fall under the primary species category described above.

A number of secondary species have been selected as “key secondary species” (see objective 2.1.4 in section 8) because they are subject to more rigorous performance monitoring requirements than the remaining secondary species. Key secondary species are listed in Table 6.

Table 6. Other significant fisheries/sectors where primary and key secondary species are harvested

Species	Primary or key secondary?	Other significant fisheries/sectors where species is harvested
Sea mullet	Primary	NSW (ocean hauling), Queensland, Victoria
Luderick	Primary	NSW (ocean hauling and recreational), Queensland, Victoria
Yellowfin bream	Primary	NSW (ocean hauling, ocean trap and line, fish trawl and recreational), Queensland
School prawns	Primary	NSW (ocean prawn trawl, estuary prawn trawl), Queensland
Dusky flathead	Primary	NSW (recreational), Queensland
Eastern king prawn	Primary	NSW (ocean prawn trawl, estuary prawn trawl), Queensland
Sand whiting	Primary	NSW (recreational, ocean hauling), Queensland
Mud crab	Primary	NSW (recreational), Queensland
River eels	Primary	Victoria
Pipis	Primary & bait	NSW (recreational)
Blue swimmer crab	Key secondary	NSW (recreational, estuary prawn trawl, ocean prawn trawl), Queensland
Greasyback prawns	Key secondary	NSW (estuary prawn trawl)
Mulloway	Key secondary	NSW (recreational, ocean trap and line)
Cockles	Key secondary & bait	NSW (recreational)
Beachworms	Key secondary & bait	NSW (recreational)
River garfish	Key secondary	NSW (recreational), Victoria
Silver biddy	Key secondary	NSW (estuary prawn trawl)
Flat tail mullet	Key secondary	–
Trumpeter whiting	Key secondary	NSW (estuary prawn trawl, ocean fish trawl)

Note: References in this table to ‘recreational’ includes charter boat.

ii) Bycatch species

Bycatch consists of those animals that are discarded from the catch or retained for scientific purposes, and that part of the “catch” that is not landed but is killed as a result of interaction with fishing gear. Fish that are landed are sometimes discarded because there is no market for that type (or size) of fish, or because the regulations prevent the fish from being retained (e.g. if it is smaller than the minimum legal length or is a species protected from commercial fishing).

Bycatch species in the Estuary General Fishery can generally be classified into fish that are juveniles of species that are of commercial or recreational importance, those that are of particular conservation significance and others which are neither a commercial or recreational species nor of specific conservation importance.

Juveniles of species that are considered to be of high commercial and recreational importance which are commonly caught in the estuary fishery include sand whiting, yellowfin bream, dusky flathead, tarwhine, snapper, leatherjackets, tailor and luderick.

iii) Size limits

Size limits apply to a number of species taken in the Estuary General Fishery. Table 7 lists the minimum legal lengths that apply to species permitted to be taken in the fishery.

Table 7. Minimum legal sizes on estuary general species.

SPECIES	SIZE LIMIT
Common name	Total length (cm)
<i>Primary</i>	
Sea mullet	30
Luderick	25
Bream	25
Dusky flathead	36*
Sand whiting	27
Eels	30
Mud crab	8.5 (carapace length)
<i>Key Secondary</i>	
Blue swimmer crab	6 (carapace length)
Mulloway	45
<i>Secondary</i>	
Tailor	30
Tarwhine	20
Snapper	30**
Red morwong	25
Yellowtail kingfish	60

* increased from 33 cm on 1 July 2001

** increased from 28 cm on 1 July 2001

iv) Protected fish

The *Fisheries Management (General) Regulation 1995* identifies a number of species that are protected, either from commercial fishing or fishing by all sectors.

Table 8. Fish species protected from fishing by all sectors

Protected fish include:	
Common name	Scientific name
Ballina angelfish	<i>Chaetodontoplus ballinae</i>
Eastern blue devil fish	<i>Paraplesiops bleekeri</i>
Elegant wrasse	<i>Anampses eleganus</i>
Estuary cod	<i>Epinephelus coioides</i>
Giant Queensland groper	<i>Epinephelus lanceolatus</i>
Grey nurse shark	<i>Carcharias taurus</i>
Great white shark	<i>Carcharodon carcharias</i>
Herbst nurse shark	<i>Odontaspis ferox</i>
Black rock cod	<i>Epinephelus daemeli</i>
Weedy sea dragon	<i>Phyllopteryx taeniolatus</i>
Australian grayling	<i>Prototroctes maraena</i>
Eastern freshwater cod	<i>Maccullochella ikei</i>
Trout cod	<i>Maccullochella macquariensis</i>
Macquarie perch	<i>Macquaria australasica</i>

Table 9. Fish protected from commercial fishing only

Fish protected from commercial fishing include:	
Common name	Scientific name
Black marlin	<i>Makaira indica</i>
Blue marlin	<i>Makaira nigricans</i>
Striped marlin	<i>Tetrapturus audax</i>
Blue groper	<i>Achoerodus viridis</i>
Atlantic salmon	<i>Salmo salar</i>
Australian bass	<i>Macquaria novemaculeata</i>
Eel-tailed catfish	<i>Tandanus tandanus</i>
Estuary perch	<i>Macquaria colonorum</i>
Silver perch	<i>Bidyanus bidyanus</i>
Brook trout	<i>Salvelinus fontinalis</i>
Brown trout	<i>Salmo trutta</i>
Rainbow trout	<i>Oncorhynchus mykiss</i>
Freshwater crayfish	<i>Euastacus</i> spp., <i>Cherax</i> spp. (except <i>Cherax destructor</i>)

Commercial fishers are not permitted to take protected fish or fish protected from commercial fishing. Fishers in the Estuary General Fishery are not likely to have any direct or indirect interaction with the majority of protected species because a large percentage of them are freshwater species. Any interactions between the fishery and protected fish are more likely to involve the incidental capture of Australian bass, estuary perch or estuary cod.

v) Interactions with threatened species and species of public concern

Although interactions with threatened species have not been commonly recorded in this fishery, this management strategy proposes two direct measures to obtain data on any such interactions. The first of these measures is the implementation of an observer-based surveys which will *inter alia* collect data on occurrences of threatened species in catches (see management response 1.1f in section 8 of this management strategy). Secondly, a modification to the monthly catch return forms will incorporate mandatory reporting of fishers' interactions with threatened species during fishing operations (see management response 3.1a).

A number of management responses also appear in section 8 of this management strategy aimed at minimising impacts on threatened species. These measures include using fishing closures (see management response 1.2a), modifying gear use and implementing the provisions of any threatened species recovery plans and threat abatement plans (management response 3.1b).

vi) Status of species within the fishery

NSW Fisheries uses a standardised method of reporting on the exploitation status of fish stocks across all commercial fisheries. This reporting method uses the terms defined in Table 10 to describe the stock status:

Table 10. Definitions of exploitation status of fish stocks.

Exploitation status	Definition
Under fished	The appraisal of a fish stock that suggests that the stock has the potential to sustain catches significantly higher than those currently being taken.
Moderately fished	The stock is assessed to be fished at levels which would probably allow only limited increases in catches.
Fully fished	The appraisal of a stock which suggests that current catches are sustainable and close to optimal levels (the definition of which may vary between fisheries; eg catches are close to maximum sustainable yield, or fishing effort is close to some reference point). In a fully fished fishery, significant increases in fishing effort above current levels may lead to overfishing.
Overfished	The appraisal suggests that current fishing levels may not be sustainable, and / or yields may be higher in the long term if the fishing level is reduced in the short term. This may be due to recruitment overfishing, growth overfishing and/or as a result of habitat degradation.
Uncertain	There is little or no information about the status of this stock (eg. no catch data or only very recent catch data).
Unknown	The only information about the status of the stock is long term fishery dependent catch data.

Where there are data, recreational harvest, including charter boat catch, and catch from other sectors is also taken into consideration when determining exploitation status. This allows a species based management approach where all known impacts on a species are considered

Table 11. Exploitation status of primary and key secondary species

Species	Primary or key secondary	Exploitation status
Sea mullet	Primary	Fully fished
Luderick	Primary	Moderately fished
Yellowfin bream	Primary	Fully fished
School prawns	Primary	Fully fished
Dusky flathead	Primary	Fully fished
Eastern king prawn	Primary	Fully fished
Sand whiting	Primary	Unknown
Mud crab	Primary	Unknown
River eels	Primary	Under fished to fully fished depending on catchment
Pipis	Primary	Unknown
Blue swimmer crab	Key secondary	Unknown
Greasyback prawns	Key secondary	Unknown
Mulloway	Key secondary	Unknown
Cockles	Key secondary	Unknown
Beachworms	Key secondary	Unknown
River garfish	Key secondary	Unknown
Silver biddy	Key secondary	Unknown
Flat tail mullet	Key secondary	Uncertain
Trumpeter whiting	Key secondary	Unknown

vii) Overfished species

If a species taken in this fishery is determined as ‘overfished’, this management strategy requires the implementation of, or assistance in developing, a recovery program for that species (see objective 2.5 and related management responses in section 8 of this management strategy). A recovery program must include a description of the actions proposed to return to acceptable levels those parameter(s) which have led to the determination of the species being overfished. The recovery program will also set out a timeframe for that process and may specify further appropriate action should recovery targets not be met.

Definitions of overfished status

There are two types of overfishing, both of which, when detected, require management action. It is important to note that the two types of overfishing are not mutually exclusive. “Growth overfishing” occurs when individual fish are typically harvested under the size that takes best advantage of the species growth in relation to expected natural mortality. “Recruitment overfishing” can be far more serious and occurs when fishing pressure has reduced the ability of a stock to replenish itself.

Designating a species as overfished

The information needed to clearly determine that a species has been growth overfished is more likely to be available than the information needed to detect recruitment overfishing. Most formal definitions of recruitment overfishing are determined on the basis of an understanding of relative rates of fishing mortality, population growth and population biomass as well as the relationship between spawners and recruitment (e.g. Hilborn and Walters, 1992). Even the most thoroughly studied species in NSW may not have relevant information on all those topics.

NSW Fisheries will consider advice from fisheries scientists as part of the annual assessment of the status of fish stocks in NSW, or as a result of a review arising from a trigger point breach (see section 9 of this management strategy). That advice could come as results of internal research become available, or from other agencies or institutions doing research relevant to the assessment of species harvested in NSW. If a species is the subject of a formal stock assessment process, the indication of overfishing is likely to come from having some performance indicator outside acceptable parameters. Other species’ status will be reviewed on the basis of the best available biological and catch information.

A stock that has had sufficient fishing mortality to cause a reduction in recruitment requires effective remediation. However, information that clearly demonstrates that a species’ recruitment has been impacted by fishing is difficult and expensive to collect, and likely to be rare. Management responses will need to be precautionary and are likely to draw inference from catch and catch composition, rather than from direct measurements of recruitment. For example, rapid declines in catch (especially when the species is targeted in a spawning aggregation), decreases in average size or missing years in age compositions are all indicative of potential problems with recruitment.

When new information that is likely to change the present status of a fish species is received by NSW Fisheries, NSW Fisheries scientists will review the status determination for that species against the criteria specified in Table 10 and report on the updated status in the annual report; “Status of Fisheries Resources”. If a species is designated as overfished, a recovery program involving all harvest sectors will be developed.

Appropriate management responses for different types of overfishing

Growth overfishing generally implies the productivity of a stock is being mismanaged by harvesting animals at too young an age. Fish stocks that are growth overfished are not necessarily in danger of imminent collapse and populations can be growth overfished and still be stable. However, growth overfishing may increase the risk to the population of subsequent recruitment failure arising from increased fishing pressure or external factors. The typical and most appropriate response to growth overfishing is to increase the average size at first harvest. This is commonly done by imposing a minimum size limit or increasing an existing one. The efficacy of such a response depends largely on the methods of capture and whether the selectivity of those methods can be appropriately altered to match the new size limit, otherwise wasteful discarding can occur. Careful thought must be given to changing size limits where there are problems in adjusting the selectivity of the primary fishing methods for that species.

Recovery programs for species suspected of having depressed recruitment due to overfishing must include strong precautionary action. Actions could include (but may not be limited to) temporary fishery closures or caps on either catch or fishing effort. Recovery programs for recruitment overfished species may also include changes to the monitoring program for that species and/or require targeted research to improve the assessment of risk to the species in critical areas.

Species in the Estuary General Fishery determined as being overfished

Silver trevally (*Pseudocaranx dentex*)

Silver trevally was determined as being overfished in the 1999/2000 NSW Fisheries Status of Fisheries Resources report. There has been a significant decline in commercial landings of silver trevally since the mid 1980s, from about 1000 t per annum to around 300 t per annum. The Estuary General Fishery catches approximately 16% of the total NSW commercial catch of silver trevally (based on average landings 1997/98 and 1998/99). Other significant catches of silver trevally are taken in the ocean fish trawl and ocean trap and line fisheries in NSW and the South East Trawl Fishery managed by the Commonwealth. There is also a significant recreational catch of the species.

Whereas the Estuary General Fishery lands approximately 16%, the NSW Ocean Fish Trawl Fishery lands approximately 55% of the landed weight of the NSW commercial catch of silver trevally. As the Ocean Fish Trawl Fishery is the primary fishery in NSW in which silver trevally are taken, a recovery program for the species will be developed under the ocean fish trawl management strategy. The Estuary General Fishery will contribute to the development of the recovery program, and will implement actions as needed under that program.

Sea garfish (*Hyporhamphus australis*)

A dramatic decline in the landings of sea garfish through the 1990's has prompted concern over the status of the stock. The concern is heightened by the lack of knowledge of the biology of the species. Catch levels are as low as 10% of the values from the early 1990's and the high value of the species makes it more likely that the decline in catch reflects a decline in abundance of the species.

Although no formal determination has been made of sea garfish being overfished, NSW Fisheries and the ocean hauling MAC are preparing a recovery program for the species. The preparation of the recovery program is a precautionary action in response to a severe decline in recorded landings of sea garfish in the ocean hauling fishery over recent years.

The Estuary General Fishery is a minor harvester of sea garfish landing approximately 10% of the total commercial catch in NSW during 1997 to 2000. Sea garfish comprises less than 0.1% of the total landings in the Estuary General Fishery (NSW Fisheries catch statistics database). The majority of the catch in the Estuary General Fishery is taken from Port Stephens, with the months March to June producing the highest landings.

School prawns and eastern king prawns

Montgomery (2000) used available information to show that school prawns and eastern king prawns were being captured at sizes smaller than that which optimised biological yield per recruit. The assessment fell short of categorising this as growth overfishing because of the preliminary nature of the analyses, low level of precision about some population parameters and insufficient information about the sizes of prawns caught by all harvesting sectors for prawns. However, the exploitation status of these species may change to growth overfished at the next review of the status of the fisheries resources by NSW Fisheries.

Specific actions in the strategy to address overfishing

Objective 2.5 in section 8 of this management strategy provides a mechanism for the fishery to participate in the recovery of overfished species. The objective has three major management responses as set out below, and the most appropriate management response for the fishery to adopt will be dependent upon the catch levels relative to other fisheries. The three management responses for objective 2.5 are:

- (a) where the fishery is a major harvester of an overfished species, develop and implement a recovery program for the species within a specified timeframe*
- (b) where the fishery is a minor harvester of an overfished species, contribute to the development of a recovery program for the species and adopt any measures required by that program*
- (c) during the period of development of a recovery program for a species that has been determined as being recruitment overfished, implement precautionary actions including, but not limited to, any of the following:*
 - total harvest controls*
 - reductions in effort associated with the harvest of the species*
 - the implementation of fishing closures*
 - bycatch management provisions*
 - mandatory gear changes.*

d) Gear used in the fishery

Fishing gear used in the fishery consists mostly of a range of hauling and meshing nets used to target finfish, as well as a number of nets designed to specifically target prawns. Traps are also used in the fishery to target finfish, crabs and eels, and the fishery also includes handgathering and hand lining. In all, there are 14 types of nets and three types of traps permitted in the fishery. Most of these fishing gear types are only able to be used by licensed commercial fishers, although recreational fishers are also able to use a number of the smaller nets including; the hand-hauled prawn net, the push scissor prawn net and the hoop or lift net.

The dimensions that apply to a number of the gear types differ between some of the estuaries. For example, the general purpose hauling nets able to be used in some of the larger coastal lakes have a longer overall length of net and longer hauling lines than the standard dimension hauling nets able to be used in most estuarine rivers and creeks. Appendix 2 provides information about changes to fishing gear and method controls in the *Fisheries Management (General) Regulation 1995* as a result of implementing the fishery management strategy.

The following sections describe the fishing gear able to be used in the Estuary General Fishery and provide details relating to the standard dimensions of that gear. Appendix 3 identifies the fishing gear types that may be used in each of the 102 estuaries in the fishery. The use of these gear types is subject to a range of time and area closures within each estuary. Up to date closure information can be obtained from the NSW Fisheries website: www.fisheries.nsw.gov.au or from the local Fisheries Office.

It is important to note that this fishery does not include the activity of prawn trawling. Prawn trawling currently occurs in four estuaries in NSW (the Clarence River, Hunter River, Hawkesbury River and Port Jackson) and is managed as a separate commercial fishery in accordance with a separate management strategy.

i) Traps

Fish trap

Fish traps are generally made from wire mesh supported by a timber frame. The standard dimensions for a fish trap are a maximum of 2 m in length, 1.5 m in width, 1 m in height and with mesh not less than 50 mm.

Crab trap

Crab traps are generally made from wire mesh supported by a solid frame similar to that used in fish traps. The standard dimensions for a crab trap are a maximum of 1.2 m in length, 1 m in width (or a diameter of no more than 1.6 m if round), 0.5 m in height and with mesh not be less than 50 mm.

Eel trap

The standard dimensions for an eel trap are either a maximum of 2 m in length, 0.5 m in width and 0.5 m in depth, or 1 m in length, 1 m in width and 0.5 m in depth. The mesh in the trap must be between 20 mm and 40 mm and the entrance funnel must not be more than 100 mm in diameter.

ii) Meshing nets

Meshing net

A meshing net consists of a length of mesh secured between a headline (or “cork line”) on the top, and a footline (or “lead line”) on the bottom. A standard length meshing net is a maximum length of 725 m with mesh size of not less than 80 mm.

A meshing net can be used in two ways, either by setting where the net is set in the water for a period (other than between sunrise and sunset), or by splashing where the net is placed in the water and the surrounding water splashed to encourage fish to swim into the net.

Whilst time and area closures generally control the use of meshing nets in particular estuaries, additional controls apply to the setting of mesh nets. Subject to those time and area closures, Table 12 shows when setting of mesh nets is allowed in applicable estuaries.

Table 12. Monthly provisions for the setting of mesh nets in estuaries where the use of a mesh net is permitted

Month	Region 3 and north	Region 4 and south
January	Splashing only	
February	3 hours maximum	3 hours maximum
March	3 hours maximum	3 hours maximum
April	3 hours maximum	3 hours maximum
May	3 hours maximum	Overnight
June	Overnight	Overnight
July	Overnight	Overnight
August	Overnight	Overnight
September	3 hours maximum	3 hours maximum
October	3 hours maximum	3 hours maximum
November	3 hours maximum	3 hours maximum
December	Splashing only	

The minimum mesh size for overnight set nets will increase in 2003 as outlined under Goal 1 in section 8 of this management strategy to decrease the proportion of juvenile fish captured.

Flathead net

The flathead net is a variation on a standard meshing net, and is specifically designed to target dusky flathead. As a result of the increased minimum legal length of dusky flathead from 33 cm to 36 cm in June 2001, the dimensions of flathead nets are being reviewed. Data from a mesh selectivity research program conducted during 2001 will be used to determine the most appropriate dimensions and controls for the re-designed flathead net. The previous mesh size restriction of between 70 and 80 mm will increase to minimise the capture of flathead less than the 36 cm minimum legal length.

Flathead nets may only be used by fishers with a meshing endorsement in Wallis Lake, Smiths Lake, Tuggerah Lakes and Lake Illawarra.

Hoop or lift net

A hoop or lift net, also known as a witches hat, is a relatively small net (less than 13 mm) and can take a number of forms. The net generally consists of one (and no more than two) hoops or rings to which loose netting is attached. The net is sometimes extended from the hoop by the use of a small float, however the net must not extend more than 1 m from the hoop or hoops and the hoop must not exceed 1.25 m in diameter (or at the greatest diagonal).

iii) Fish hauling nets

General purpose hauling net

The general purpose hauling net is the most common type of hauling net used in the Estuary General Fishery, and consists of relatively large mesh to catch a range of finfish. A standard dimension hauling net must not exceed 375 m in headline length. The following dimensions must also be complied with:

Part of net	Length restrictions	Mesh size restrictions
Wings of net	375 m less the length of the bunt	Not less than 80 mm
Bunt: in full	Not more than 90 m or one quarter of the total length of the net (whichever is lesser)	[see below]
Bunt: centre piece	Between 25 and 50 m	Between 30 and 50 mm
Bunt: remainder of	Not more than 50 m	50 mm

* Fishers may increase the mesh in the bunt (centre piece) of a general purpose haul net, by permit, from a maximum of 50 mm to a maximum of 57 mm to reduce the incidence of prohibited size sand whiting being caught in these nets. This is particularly an issue in some north coast rivers, as well as some of the larger coastal lagoons such as Wallis Lake. The effectiveness of the net operated under such a permit will be monitored by NSW Fisheries and consideration given to recommending a change to regulation.

Longer general purpose hauling nets of 1000 m, 750 m and 450 m were previously able to be used in selected estuaries, however, nets over 500 m in length will be prohibited by December 2002 and daily restrictions placed on the number of times the new 500 m net can be employed (see management response 1.1e in section 8 of this management strategy for details).

Pilchard, anchovy and bait net

This net is a type of hauling net designed to target smaller species and is only used in parts of Port Jackson, Pittwater and the Hawkesbury River. When used in estuarine waters this net must not have an overall length exceeding 250 m, and the following dimensions relating to the construction of the net must be complied with:

Part of net	Length restrictions	Mesh size restrictions
Wings of net	Each wing not more than 90 m	Not greater than 80 mm
Bunt	Not more than 60 m	Between 50 and 65 mm
Bag	Not more than 12 m	Not more than 30 mm
Cod-end	Not more than 6 m	Not more than 25 mm
Hauling lines	Each line not more than 125 m	-

Trumpeter whiting net

This net is a type of hauling net used in parts of Port Stephens to catch trumpeter whiting only. The standard dimensions of the net include an overall length of up to 275 m with the following restrictions applying:

Part of net	Length restrictions	Mesh size restrictions
Wings of net	Not more than 50 meshes deep	Between 50 and 65mm
Bunt of net	50 metres	Between 30 and 40mm
Overall length	Up to 275 metres	-
Hauling lines	Between 100 and 225 metres	-

Garfish hauling net

This net may only be used in parts of Port Jackson, Broken Bay, Port Stephens and Jervis Bay. The net has relatively small mesh of between 28 mm and 36 mm, although there is no overall maximum length applicable to this net.

Garfish bullringing net

Standard garfish bullringing nets consist of mesh between 28 mm and 36 mm with a standard maximum length of 275 m, and hauling lines of 25 m.

iv) Prawn nets

Prawn hauling net

The standard dimensions for a prawn hauling net is a maximum length of 40 m with mesh of between 30 mm and 36 mm and each hauling line must not exceed 130 m in length.

Prawn seine net

The standard dimensions for a prawn seine net is an overall length of 140m with the mesh throughout between 30 mm and 36 mm.

Prawn set pocket net

There is no standard length for this net and the total allowable headline length of the net may vary from 5 m to 63 m throughout different estuaries. The standard mesh restriction throughout is between 30 mm and 36 mm.

Prawn running net

The standard dimensions of a prawn running net include a mesh throughout of between 25 mm and 36 mm. The maximum total length of the net is either 75 m or 140 m, depending on the estuary in which the net is used.

Hand-hauled prawn net

A hand-hauled prawn net is a relatively short net with a maximum overall length of 6 m and mesh size between 30 mm and 36 mm. The net is operated by hand and is only used in relatively shallow water.

Push or scissor prawn net

This is a relatively small hand operated net that is not often used by commercial fishers. The net length of bottom line at the lower ends of the poles must not exceed 2.75 m and the mesh size must be between 30 mm and 36 mm.

v) Other methods

Handgathering

Handgathering includes the taking of fish by hand, or with the assistance of any of the following implements:

- a pump or similar device having a barrel or cylinder with a diameter of not more than 85 mm
- a tube or cylinder (whether or not fitted with a cap at one end) with a length of not more than 250 mm and a diameter of not more than 85 mm
- a single blade knife with a blade longer than it is wide
- a spade or fork (except in a seagrass bed, mangrove or saltmarsh area or for the taking of pipis)
- pliers

Hand lining

The term hand lining refers to the use of a spool of fishing line, or a reel of fishing line used in conjunction with a rod. Fishers in the Estuary General Fishery may also use up to ten set lines with a restriction of no more than six hooks on each line.

vi) Boats used in the fishery

The boats used in the fishery are generally small 'run-about' or 'punt' style vessels known as general purpose vessels. The same boats are often used in the ocean hauling fishery, and sometimes in the ocean trap and line fishery by fishers also authorised to operate in those fisheries.

General purpose vessels are normally between 3 m and 6 m in length. The most common construction material is aluminium. Boats in this fishery are occasionally equipped with two motors, one of which is generally of a small capacity to enable the boat to be navigated easily at low speed to assist in setting and tending fishing gear.

e) Interaction with other designated fishing activities

The fisheries of NSW are intrinsically complex due to the large diversity of species caught, the wide range of areas fished and the gear types used. Many species taken in the Estuary General Fishery are also taken in other NSW commercial fisheries, by other sector groups and by fisheries managed under the jurisdiction of the Commonwealth or other States. Table 6 lists other significant fisheries and sectors where primary and key secondary species are harvested other than the Estuary General Fishery.

Estuaries along the NSW coast also provide a nursery area for a number of species that become important species in other fisheries later in their lifecycle. Snapper is one example of this interaction, with large populations of snapper residing in estuaries as juveniles, being taken as adults in small numbers by estuary general fishers, and forming the basis of a significant commercial and recreational fishery around inshore and offshore rocky reefs in ocean waters.

The FM Act establishes a system of advisory councils who advise the Minister for Fisheries on issues that cross fishery management arrangements in NSW. Regular meetings between NSW Fisheries management and research staff with fisheries agencies from adjacent jurisdictions to consider consistency and innovation in research, management and monitoring programs for species shared with the estuary general fishery will also provide a more coordinated approach to managing these interactions.

i) NSW commercial fisheries

A number of the species taken in the Estuary General Fishery are of significant importance in other commercial fisheries in NSW. Species such as sea mullet and school prawns constitute a large percentage of the catch in other commercial fisheries. The 'ten most prominent species' descriptions in Appendix 1 detail the level of catch of these species in other commercial fisheries in NSW.

The Estuary General Fishery targets prawns, specifically school prawns, eastern king prawns and greasyback prawns, that are also targeted by the estuary prawn trawl and ocean prawn trawl fisheries, which operate in the same or adjacent waters. The fishery also harvests a number of 'bait' species such as anchovy and pilchard that may form part of the food source of species taken in other commercial fisheries.

There is no overlap of species taken in this fishery with the abalone and lobster share management fisheries. Abalone and lobsters are only permitted to be taken commercially by fishers endorsed in those fisheries. The lobster fishery does however, use a number of fish species as bait in inshore lobster traps. Mullet and luderick are the most commonly used baits in the lobster fishery and it is likely that most of these fish are supplied by the estuary general and ocean haul fisheries, with a small proportion being imported from other states.

Of 638 fishers who actively participated in the Estuary General Fishery during 2000/2001, 46% also participated in other NSW commercial fisheries. When they did so, the other fisheries involved were mainly the ocean hauling, ocean trap and line, and estuary prawn trawl fisheries. The number of estuary general fishers who participated in multiple fisheries is as follows:

- 54% participated in the Estuary General Fishery only
- 37% participated in two fisheries
- 8% participated in three fisheries
- 1% participated in four fisheries

Although there is some conflict between commercial fishing sectors in NSW, it is likely that the interaction of fishers participating in more than one fishery reduces the level of conflict that may be expected if each fisher participated in one fishery only. The diverse nature of commercial fishers in NSW means that most fishers have an understanding of the issues affecting each other and the industry as a whole.

Ocean Trap and Line Fishery

Approximately 18% of fishers operating in the Estuary General Fishery also fished in the Ocean Trap and Line Fishery during 2000/2001. Estuary general fishers who historically used fish traps in estuary waters often also set some traps in ocean waters around the headlands of estuaries. This resulted in some fishers who traditionally used fish traps being able to qualify for a fish trapping entitlements in both the estuary general and ocean trap and line fisheries when these fisheries were restricted in 1997.

Ocean Hauling Fishery

Approximately 19% of fishers operating in the Estuary General Fishery also fished in the Ocean Hauling Fishery during 2000/2001. This trend relates to the annual migration of species such as sea mullet out of estuarine waters during the autumn and winter period and along the ocean water beaches where the Ocean Hauling Fishery operates. The beach based sector of the Ocean Hauling Fishery uses similar gear and boats to the Estuary General Fishery. Indeed, 78% of fishing businesses with entitlements in the Ocean Hauling Fishery also hold entitlements in the Estuary General Fishery (NSW Fisheries licensing database, 2001).

The Estuary General Fishery also operates on a number of ocean beaches for the purpose of handgathering. As the name suggests, the method of handgathering involves limited hand operated gear to gather relatively small species such as pipis and beachworms. There is very little interaction between ocean hauling fishers and estuary general fishers over use of common beach areas for commercial fishing.

Estuary Prawn Trawl Fishery

The Estuary Prawn Trawl fishery currently operates in four estuaries that are also used in the Estuary General Fishery. These estuaries are the Clarence, Hunter and Hawkesbury Rivers and Port Jackson. The operation of the Estuary Prawn Trawl Fishery in these estuaries is limited through restrictions on areas and times that the boats (trawlers) may operate within.

Prawn trawlers operate in the same areas and often at the same times as the Estuary General Fishery. While there is potential for competition between these methods, estuary general fishers are generally aware of the main trawling grounds and tend not to compete over the areas during these times.

Approximately 14% of fishers operating in the Estuary General Fishery also fished in the Estuary Prawn Trawl Fishery during 2000/2001. Estuary prawn trawl operators who are also appropriately endorsed in the Estuary General Fishery can use estuary general methods, such as handlines and mesh nets from their trawling vessels.

ii) Recreational fishery

To obtain reliable estimates of non-commercial fishing patterns and levels of harvest, a National Recreational and Indigenous Fishing Survey was conducted in 2000 and 2001. Preliminary data provided from the survey shows a strong interaction between recreational fishing and the Estuary General Fishery and indicates that approximately 16% of the NSW population (approximately 1 million people) go recreational fishing at least once a year.

Recreational fishing in estuaries is safe and convenient for a large number of people and as such, the major proportion of recreational fishing effort is exerted in estuaries. Almost 40% of recreational fishing occurs in estuaries as opposed to 30% in ocean waters and 14% in freshwater rivers and streams. These preliminary figures appear to be consistent with the levels of catch (by numbers) with 42% of total recreational catch coming from estuaries, 37% from ocean waters and 8% from freshwater rivers and streams.

The preliminary figures from the survey also indicate that the main species of finfish taken by recreational fishers are bream, flathead, whiting, luderick and tailor. Prawns and blue swimmer crabs are also taken in substantial numbers by recreational fishers. All of these species with the exception of tailor, are listed as either primary or key secondary species in this management strategy.

A high level of competition over the years between the commercial sector and recreational sector has led to long standing discord between these groups. Many of the commercial fishing closures established in estuaries have been introduced to resolve such issues. During 2002, the NSW Government established 30 recreational fishing havens in the State's estuarine waters as a means of reallocating the fisheries resources between user groups.

Other interactions with recreational fishing in estuaries include captures of target recreational species in commercial fishing gear as bycatch. This is a concern especially in the case of Australian bass, a highly regarded recreational fishing species that migrates from freshwater into the upper reaches of estuaries during certain times of the year to spawn. Many fishing closures are in place in the Estuary General Fishery specifically to prevent captures of Australian bass in meshing nets.

iii) Charter boat fishing

The marine and estuarine charter fishing industry was restricted in 2000 when eligible vessels became licensed under the FM Act. Since licensing arrangements commenced, operators have been required to enter logbook returns, detailing the catch taken on board the vessel during charter activities, as part of a compulsory monitoring program. A separate logbook exists for estuarine charter fishing operations so the catch taken in estuarine waters by charter fishing operations can be identified. In August 2002, 195 charter boats were authorised to operate in estuarine waters.

Logbook returns entered to date indicate that one third of the fish taken during estuarine charter fishing activities are returned to the water. The retained catch from estuarine charter operations is dominated by dusky flathead, bream, tailor, sand whiting and luderick (charter boat monitoring program database, 2002). All of these species, except tailor, are primary species in the Estuary General Fishery.

iv) Other designated fishing activities

Beach safety (shark meshing) program

There is negligible interaction between the Estuary General Fishery and the beach safety program which occurs in ocean waters.

Fish stocking

There is minimal interaction between the Estuary General Fishery and fish stocking as stocking programs predominantly take place in freshwater areas including lakes and impoundments. Australian bass is generally the only stocked species that moves into the upper reaches of estuarine waters at certain times of the year. Australian bass are protected from commercial fishing.

4. Management Controls and Administration

There are two broad types of fishery management controls, known as input controls and output controls. Input controls limit the amount of effort commercial fishers put into their fishing activities, indirectly controlling the amount of fish caught. They need to be continually modified in response to fishing technology. Input controls can include restrictions on the number of licences, the size and engine capacity of boats, the length and mesh size of nets, and the areas and times which can be worked. Output controls, on the other hand, directly limit the amount of fish that can be taken from the water and are well suited for single species, high value fisheries using single gear types (Goulstone, 1996).

The Estuary General Fishery in NSW will be managed predominantly by input controls. The following sections set out in broad terms the controls that apply to activities in the fishery. The specific rules, such as the net length and mesh sizes applying in particular areas are detailed in section 3(d) of this management strategy and in the *Fisheries Management (General) Regulation 1995*.

a) Limited entry

The Estuary General Fishery was recently declared a category 2 share management fishery. Access to the fishery has been limited to eligible fishers since the restricted fishery regime commenced on 1 March 1997. Prior to that date, nearly every NSW fisher with a general commercial fishing licence could operate in the Estuary General Fishery.

Initial entry to the Estuary General Fishery under the restricted fishery regime for most methods was defined by having a minimum level of catch history showing that the methods sought in the application had been actively used over past years. An extensive statutory appeals process followed.

Following changes to the *Fisheries Management Act 1994* in December 2000, the Estuary General Fishery, along with the other major commercial fisheries, was selected to become a category 2 share management fishery. Section 6(a) outlines the process from moving from a restricted fishery regime to a share management regime.

It is possible that, in the future, the fishery may become a category 1 share management fishery. It is intended that this management strategy will apply to the fishery whether it has category 1 or category 2 share management status.

b) Licensing Arrangements

i) Commercial fishing licences

A commercial fishing licence is required by an individual before they can take fish for sale or be in possession of commercial fishing gear in or adjacent to waters. The licence only authorises activities that are covered by endorsements issued in respect of each part of a fishery and specified on the licence.

Commercial fishing licences are currently available to persons who held a licence immediately prior to the commencement of the *FM Act*, owners of a recognised fishing operation (RFO), or individuals who are the holder of shares in a share management fishery. This latter

provision will become the more relevant requirement as the Estuary General Fishery moves toward full implementation of category 2 share management.

This management strategy proposes to retain the RFO concept under share management, and the use of shares to allow for structural adjustment at the fishing business level to improve economic viability of fishers. Variations to the Licensing Policy will be made to allow for these changes as they are developed.

Fishing endorsements

It is important to understand the difference between endorsements and entitlements in the fishery and how they relate to commercial fishing licences.

Entitlements in the fishery are associated with fishing businesses, while endorsements appear on the commercial fishing licences of individuals and authorise the use of the specific gear or taking of specific species. Some fishing businesses can be owned and held in the names of more than one individual (including company or partnership names) and therefore an entitlement associated with a business may entitle more than one person's licence to be endorsed to operate in the fishery.

Nine classes of endorsement will exist in the fishery at the commencement of the management strategy. Table 2 lists the endorsement types and the gear able to be used by virtue of holding each endorsement type.

The eligibility to hold endorsements on a commercial fishing licence in a category 2 share management fishery is based on the shareholder holding the minimum number of shares specified in the share management plan for the fishery. Separate minimum shareholdings may apply to each endorsement or each region in the fishery, or to both.

Section 8 of this management strategy proposes a number of principles that will be adopted with respect to setting minimum shareholdings in the management plan. The principles relate to having a minimum shareholding at the fishing business level (taking into account shares in other fisheries) for new entrants to the fishery, and at the endorsement and regional level to ensure that the number of endorsements available for use at any one time does not exceed the historic and sustainable levels of activity in the fishery.

The introduction of minimum shareholdings will result in trading of shares within the Estuary General Fishery and will eventually result in each shareholder in the fishery falling into one of the following three categories:

- shareholders who have acquired shares and continue to fish
- shareholders who have chosen to transfer all or some of their shares and leave particular fisheries or endorsement types within fisheries
- shareholders who retain their original shareholdings, cannot fish, but can re-enter the fishery later if they acquire sufficient shares.

ii) Fishing boat licensing

In addition to each fisher requiring a commercial fishing licence, every fishing boat used in connection with estuary general fishing must also be licensed. There has been a cap on the total number of boat licences since 1984 (includes boats used in all fisheries) and this restriction will remain for the duration of the management strategy.

To prevent any increase in size and therefore efficiency of vessels in the fishery, a strict boat replacement policy exists and will continue under the management strategy. A previous restriction of 5.8 metres applied to boats used in the Estuary General Fishery. Following a recommendation by the Estuary General Fishery Management Advisory Committee and the Advisory Council on Commercial Fishing, boats 5.8 metres in length or less may be replaced with boats up to 6 metres. Boats that are greater than 6 metres in length may only be replaced with boats that are no more than 10% or 1 metre greater in length, whichever is lesser. The 10% tolerance continues to relate to the original boat length to avoid a progressive increase in boat length over time.

In addition, the Minister for Fisheries has approved a new provision allowing fishers to temporarily replace their fishing boats with smaller boats for up to two years. During this time, a permanent boat replacement must be made with respect to the original boat.

iii) Renewal of licences

Commercial fishing licences and fishing boat licences must currently be renewed annually. Fishers are sent renewal application forms approximately one month before the expiry date on the licence. If a commercial fishing licence is not renewed within 60 days of the expiry date on the licence, the renewal application is taken to be an application for a new licence. Additional fees apply to late renewal applications.

Abeyance period for fishing boat licences

Fishing boat licences can be held in abeyance for a period of up to two years from the date of expiry of the licence or when advised in writing by the owner. Fishing boat licence fees are not payable during the period of abeyance, but the full amount due is payable if the licence is reinstated within the two years specified.

iv) Appeal mechanisms

Fishers may lodge an appeal to the Administrative Decisions Tribunal (ADT) against a decision to refuse to issue or renew, suspend, cancel or place conditions on a commercial fishing licence (or an endorsement on that licence) or a fishing boat licence.

The main role of the ADT is to review administrative decisions of New South Wales government agencies. To lodge an appeal with the ADT, a request must first be made to NSW Fisheries for an internal review of the decision, then a written application should be lodged with the ADT no more than 28 days after the internal review was finalised.

The ADT can make various orders concerning an appeal application including:

- upholding the original decision
- reversing the decision completely or in part
- substituting a new decision for the original decision
- ordering the agency to reconsider the decision in light of the ruling.

For further information, refer to the *Administrative Decisions Tribunal Act 1997* or the following website: www.lawlink.nsw.gov.au/

v) **Nomination policy**

Owner-operator provisions will be introduced into the Estuary General Fishery (see management response 2.3a in section 8 of this management strategy). Existing nominations will continue until the arrangements between the parties expire, but no new nominations will be approved. These new arrangements will need to be reflected in the arrangements developed for the category 2 share management fishery.

vi) **Training licences**

Licences are available to eligible persons for the purposes of training a new entrant to the commercial fishing industry. There are two types of training licences available.

Trainer's licence: The seller may apply to continue to hold his/her fishing licence for up to one year from the next fishing renewal date, to work with the purchaser of the fishing business for training purposes (but the business must qualify as a RFO), subject to the entitlements of the fishing business, on the understanding that the licence is surrendered at the end of the one year period unless a further RFO is acquired which is not the original business.

Trainee licence: Within six months of acquiring a RFO a new entrant may request that the RFO be placed into abeyance whilst the owner works with an experienced fisher to gain the necessary skills. This arrangement may apply for a period of up to two years. Fishing methods which the new entrant can use are restricted to the entitlements held by his or her fishing business. Areas which can be worked by the new entrant are limited to areas included in the purchased RFO and areas of historic operation of the experienced fisher.

c) **Net registration**

Commercial fishing nets used in the Estuary General Fishery (with the exception of the hoop and lift net) are required to be registered. Net registration certificates are issued for individual nets and are valid for the life of the net. The certificates stipulate the length and mesh sizes of individual nets.

New (ie. additional) commercial fishing net registrations have not been issued since a freeze was placed on the registration of new nets in July 1989 and will not be issued under the management strategy.

Net registrations are not transferable and are only issued for new nets that are replacing existing nets of the same specifications that are no longer serviceable. Where nets are acquired as part of the transfer of a fishing business (or share transfers), only the nets authorised for use by the new owner's entitlements will be registered.

d) **Controls on fishing gear and boats**

Detailed restrictions relating to the dimensions and type of fishing gear are set out in the *Fisheries Management (General) Regulation 1995*. The Regulation provides for the use of 'standard' gear in most estuaries, but variations to the standard gear are often applicable to particular estuaries or parts of estuaries. Appendix 3 outlines the gear permitted to be used in each NSW estuary in the fishery. The Regulation also stipulates in many cases how the gear must be operated. The current regulations relevant to the Estuary General Fishery will continue, subject to any changes necessary to implement the management strategy.

e) Transfer policies

i) Transfer of licensed fishing boats

The majority of licensed fishing boats used in the Estuary General Fishery are small vessels that have been classified as “general purpose” boats. Boats in this category do not carry validated catch history and can be transferred separate to the other entitlements of the fishing business. In general, boats have been categorised as general purpose vessels where the fisher, rather than the boat, was considered to be the predominant unit of fishing effort.

On the other hand, boats that are categorised as “boat history” vessels cannot be transferred separate to the fishing business. The Licensing Branch can advise a fishing boat owner whether a boat has been classed as a boat history or general purpose vessel. Any transfer of a fishing boat licence must first be approved by the Director, NSW Fisheries.

ii) Transfer of fishing business entitlements

Commercial fishing licences and endorsements to participate in a fishery are not freely transferable. Currently, commercial fishing licences and endorsements only become available to a new entrant if a fishing business with the required level of validated catch history is acquired. This may change as share management is introduced and shareholdings become important for access arrangements (see management responses 2.2b and 2.3b in section 8).

Prior to final shares being issued, fishing businesses must be sold as an entire package (ie. the catch history, endorsements or shares cannot be split). During this period, proposals regarded as licence splitting will not be approved.

Prior to the commencement of the share management plan for the fishery, the estuary general endorsements of a fishing business will only become available to the first new owner of the business. If the business is transferred for a second time, the offer to retain the endorsements lapses. This is known as the “interim transfer policy”.

The interim transfer policy will be superseded with the implementation of share management provisions and minimum shareholdings for the fishery upon the commencement of the share management plan.

iii) National licence splitting policy

The Commonwealth and the State governments have a long standing nationally agreed policy in place on licence splitting. The policy prevents entitlements held by one person or entity and issued by more than one jurisdiction, from being split and transferred separately. The transfer of a fishing business will not be approved unless all entitlements issued to the business by other jurisdictions are also transferred to the same buyer, or surrendered, or the approval of all agencies involved has been obtained.

Where fishing effort has been historically ‘shared’ across a number of entitlements held by a person, the policy prevents the increase in effort that would occur by creating two separate entitlements that could operate at full capacity.

This fundamental component of the Licensing Policy will be retained under the management strategy.

f) Time and area closures

The FM Act provides for the use of fishing closures in the Estuary General Fishery to, among other things:

- protect and conserve areas of key habitat
- manage the amount of fishing effort in an estuary
- to manage conflicts between stakeholders over the use of the resource and to ensure it is equitably shared
- minimise bycatch and the impacts of the fishery on threatened and protected species.

Fishing closures can be established on a seasonal, time, area, operator or gear specific basis. The existing fishing closures will remain until reviewed and new closures will be developed in accordance with the provisions in section 4.

Fishing closures will normally be published in the NSW Government Gazette, however, if the Minister for Fisheries considers that a fishing closure is required urgently, the Minister may introduce the closure and advise the public through media outlets and by displaying prominent signs in areas adjacent to the waters affected. In the case of an urgent closure, the Minister is to publish the closure in the Government Gazette as soon as practicable.

The *Fisheries Management Amendment Bill 2001* also proposed to allow closures to be made by regulation. References to closures in this management strategy include references to any such restrictions included in regulation.

Appendix 3 outlines the estuaries and gear types to which closures will apply at the beginning of the management strategy. Details on fishing closures that affect the Estuary General Fishery can be found on the NSW Fisheries website at: www.fisheries.nsw.gov.au.

g) Zoning

Estuary general fishers have historically had access to all estuaries not closed to commercial fishing. Although this arrangement has allowed commercial fishers greater flexibility, it has also had difficulties. The major problem caused by this arrangement was conflict resulting from fishers travelling out of their local estuaries to fish in other regions and disregarding local conduct rules. This problem was the major reason for zoning the Ocean Hauling Fishery in 1995.

In addition to promoting harmony within the fishery, zoning of the Estuary General Fishery focuses management and research on regional aspects of the biological, social and economic aspects of the fishery. Local management and research issues can then be addressed in a way that meets the requirements of local communities, within a statewide framework.

A zoning scheme for the fishery is being implemented in two stages. Stage one commenced in June 2001 and involves allocating each fisher to one of seven primary regions (see Figure 1) and, in some cases, issuing a permit to operate in individual estuaries or ocean zones that are beyond the fisher's primary region. Allocation of estuaries outside primary regions is based on fishers being able to demonstrate historical fishing participation in those estuaries. Stage two of the zoning process involves finalising and implementing the final zoning rules.

The zoning scheme introduces substantial changes to the way the fishery operates and will influence the way that the management strategy is implemented. Because the number of operators in each region is capped, programs for effort control will be developed regionally.

Based on the outcomes of stage one of the zoning scheme, Table 13 provides information on the number of endorsements in each endorsement class on a regional basis.

Figure 1. Map of the NSW coast showing the seven regions being used for zoning (which are also the MAC electoral regions) and the three larger estuarine biological regions as defined by Pease (1999).

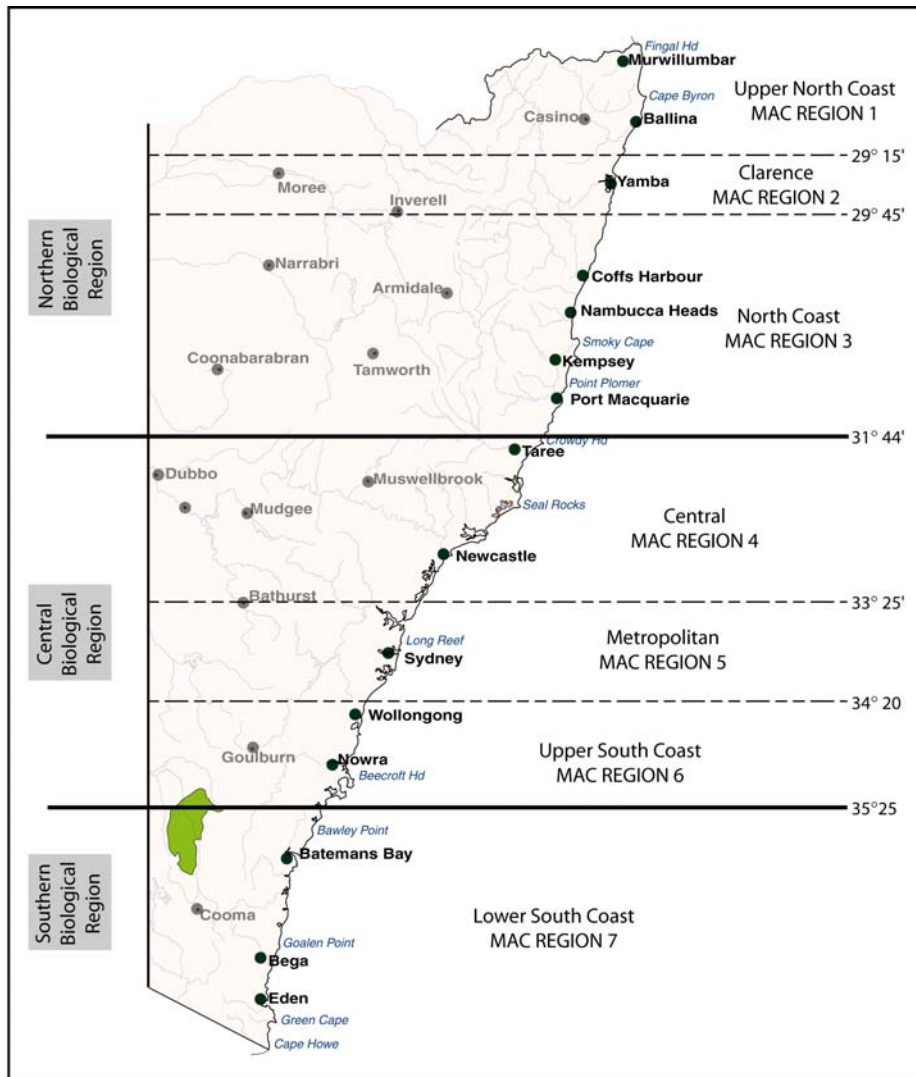


Table 13. Endorsement numbers by region in the Estuary General Fishery (at June 2002).

Class of endorsement	Regions							NSW Total
	1	2	3	4	5	6	7	
Crab Trap	21	56	45	95	15	3	3	238
Eel Trap	7	43	31	56	15	18	15	185
Fish Trap	5	23	29	102	33	7	7	206
Hand gathering	20	4	28	40	3	14	4	113
Handlining & hauling crew	53	138	74	226	81	68	44	684
Hauling Cat 1	10	26	9	63	23	17	9	157
Hauling Cat 2	9	29	21	53	13	21	12	158
Meshing	48	112	58	193	67	57	38	573
Prawning	29	102	39	178	15	50	37	450

Note: Fishers may hold more than one endorsement.

h) Recognised fishing grounds

Section 39 of the *Fisheries Management Act 1994* and clause 105 of the *Fisheries Management (General) Regulation 1995* provide for the declaration of waters used for net fishing by commercial fishers as recognised fishing grounds (RFGs). These areas may include areas of sea or estuaries that have been used historically for net fishing or are used regularly or intermittently for net fishing by commercial fishers.

Recognised fishing grounds aim to reduce conflict between user groups by clearly defining the specific areas that have traditionally been used by commercial fishers who take fish and prawns by specific methods, and giving priority to commercial fishers in those areas. Priority in areas that have not been declared an RFG will be based on whoever is present at the site first.

Recognised fishing grounds have two purposes:

1. Commercial fishers may request a person to remove anything that has been placed or left by the person, without lawful excuse, and which is obstructing the lawful use of the net fishing activities of the commercial fisher
2. Commercial fishers using nets have priority over recreational fishers in the waters defined as RFGs. Boats, surfcraft or similar equipment are not allowed to cause the dispersal of schooling fish or fish travelling in a school.

The implementation of RFGs does not mean commercial fishers will be excluded from areas that have not been declared an RFG nor does it provide an additional property right in the fishery. RFGs merely provide priority for access to particular areas. Additionally, just because an area has been declared an RFG, it does not prevent a lawful obstruction, such as a jetty or mooring being constructed. The declaration of an RFG however, will provide useful information for local Councils, and other State agencies when considering an application for construction and the impact of the obstruction on other user groups.

The process of declaring RFGs will involve broad stakeholder input. The initial step will be identification of possible sites by the Estuary General MAC, having regard to guidelines approved by the Minister for Fisheries. Once these sites have been identified, they will be presented to the other relevant advisory councils such as the Advisory Council on Recreational Fishing for consideration, prior to a period of public comment. The Estuary General MAC, prior to final recommendations being submitted to the Minister, will consider any comments made by the community.

There is currently only one declared recognised fishing ground in NSW, at Iluka in the Clarence River. However, the Estuary General MAC has already been consulted on the development of guidelines for the declaration of recognised fishing grounds for specific gear types in other areas. The draft guidelines are included below. This management strategy proposes that consultation take place with local stakeholder groups and the community in accordance with the draft guidelines.

Once the management strategy is finalised, it will up to the Estuary General MAC to decide on the extent and scope of any implementation program for RFGs in their fishery. The implementation program will need to be financed by an industry contribution determined on advice from the MAC.

Draft guidelines for defining RFGs in the estuary general fishery

1. As they are quite specific and defined areas, RFGs will be identified in waters used for fish and prawn hauling, prawn running and set pocket netting methods only
2. The area proposed for a RFG must be an area where there is historical evidence that the site has been fished using the relevant method at least 3 times a year and that there is a valid reason for its implementation (ie. there is a high level of ongoing user conflict)
3. The area proposed for a RFG must relate to areas that are not currently closed to commercial fishing
4. The grounds should be proposed initially by agreement between NSW Fisheries officers and local commercial fishers, considered by the Estuary General MAC and referred to the Advisory Council on Recreational Fishing and (when relevant) the Advisory Council on Aquaculture for consideration prior to the public consultation specified in guideline (6)
5. In the light of comments made by the advisory councils, the Minister for Fisheries or NSW Fisheries may either: proceed to release the proposals for public consultation with or without modifications; ask the Estuary General MAC to further consider the proposals prior to any public consultation; or decline to release the proposals for public consultation
6. Proposed RFGs must be displayed in the local NSW Fisheries office and NSW Fisheries Head Office for public comment for a period of at least 30 days, and an advertisement notifying of the exhibition placed in a newspaper circulating throughout the region
7. Any objections to the proposed RFGs will be considered by the Minister prior to the grounds being declared as an RFG
8. Following the Minister's approval of an RFG, copies of maps with the approved RFG will be deposited at the Head Office of NSW Fisheries and at the relevant district office of NSW Fisheries located in the region of the RFG.

i) Permits

Section 37 of the *Fisheries Management Act 1994* allows for permits to be issued for research and other authorised purposes. These permits provide a legal framework for activities that fall outside normal operating rules set out in the FM Act or its Regulation. Each permit sets out a number of conditions, which vary depending on the purpose of the permit. These conditions ensure that permits

are used only for the purpose intended by their issuing and are often used to limit the extent of the permitted activity.

Permits will be issued to authorise modified fishing practices to assist approved research programs or for purposes consistent with the vision and goals of the management strategy (see management response 6.4b in section 8).

Permits are valid for the period specified in the permit, and may be suspended or cancelled at any time by the Minister. Permits are not transferable and are valid only insofar as they do not conflict with approved determinations of native title made under the Commonwealth *Native Title Act 1993*.

j) Catch limits or quotas

Section 9 in this management strategy lists the trigger points and allowable commercial catch levels for primary and key secondary species in this fishery. The upper catch trigger level for the commercial catch of each of these species has been determined using the upper trigger point range and recorded annual landings.

A daily bycatch limit applies to Australian salmon north of Barrenjoey Headland and tailor in all NSW waters taken by commercial fishing nets as outlined in Table 14.

Table 14. Daily commercial fishing possession limits for tailor and Australian salmon

Commercial fishing activity	Daily possession limit per species
Hauling crew	100
Meshing crew (or individual)	50
Any other licensed commercial fishing vessel containing a commercial fishing net	50

This daily trip limit will continue to apply under the management strategy (see management response 4.1b in section 8 of this management strategy). Other species based catch controls, such as size limits and protected fish, are discussed in section 3(c) of this management strategy.

k) Seafood safety programs

Food safety programs relating to the Estuary General Fishery are administered by SafeFood Production NSW under the *Food Act 1989*. Food safety programs for all commercial fisheries are currently being prepared by SafeFood Production NSW and will continue under the management strategy (see management response 5.4a).

For the Estuary General Fishery the food safety program will encompass the already established biotoxin monitoring program for pipis. This program was established in 1998 in response to several food poisoning events traced to the consumption of pipis harvested from Ballina and Stockton beaches. Fishers operating under the biotoxin management plans are limited to operating on beaches that are regularly monitored for environmental conditions, algal concentrations and, when necessary, shellfish toxicity testing.

l) Cost recovery policy

NSW Fisheries recoups costs that are attributable to industry through a cost recovery policy. Cost recovery is a common principle among Australian commercial fisheries and an important component of ecologically sustainable development.

NSW Fisheries is in the process of implementing cost recovery in a progressive manner, so that all charges are not passed to industry immediately. The FM Act requires that in a share management fishery, the fees payable must be paid in proportion to the shareholdings in the fishery.

In November 2000, the Government announced a new cost recovery policy. As part of the second reading speech for the *Fisheries Management and Environmental Assessment Legislation Amendment Act 2000*, the Minister for Fisheries, the Hon. Eddie Obeid, gave the following commitment for the fisheries that were moving to category 2 share management fisheries:

“Over the next five years the Government will develop and implement a cost recovery framework for category 2 share management fisheries. This framework will be subject to extensive industry consultation.”

“During this period, the total amount of money collected for NSW Fisheries, for its existing management services, will not increase without the support of the relevant management advisory committee.”

“After five years, the costs that have been identified as attributable to the industry will be progressively introduced over a further three-year period.”

It is important to note that the new services required to be implemented under the management strategy or as a result of the environmental assessment process will need to be fully funded by the fishery participants.

A number of fees are payable in the Estuary General Fishery. The management strategy does not, in itself, set the charges, or limit or otherwise govern the way fees are changed.

5. Compliance

NSW Fisheries has approximately 90 fisheries officers responsible for coordinating and implementing compliance strategies in NSW. These strategies include:

- maximising voluntary compliance
- providing effective deterrence for offences
- providing effective support services.

Approximately 65 of these fisheries officers are located in areas along the NSW coast where the Estuary General Fishery occurs. Their general duties include conducting patrols, inspecting commercial fishers and fishing gear, and recording rates of compliance.

A compliance strategic plan is to be developed that will provide the direction for education, advisory and enforcement services provided by NSW Fisheries for the Estuary General Fishery (see management response 6.1a in section 8 of this management strategy).

To ensure that compliance service is delivered in a consistent manner, quality inspection guidelines will be developed as part of the operational plan for inspections within the Estuary General Fishery. These guidelines will set out a procedural approach to be adopted when undertaking inspections of fishers and fishing gear. The quality inspection guidelines will ensure that all issues requiring compliance by commercial fishers under this management strategy are subject to a compliance program.

a) A penalty points system

A penalty points scheme linked to endorsement suspension and share forfeiture provisions will be introduced under this management strategy and developed as part of a share management plan for the Estuary General Fishery (see management response 6.1b in section 8 of this management strategy).

The Estuary General Fishery generally has a high compliance rate, however, despite the relatively large number of potential offences and the maximum penalties specified in the FM Act and Regulation, there are still a small number of estuary general fishers who operate beyond the rules. This minority continue to breach the rules applying to the fishery and the courts sometimes appear unwilling to impose significant fines (which may be viewed as minor when compared to other criminal offences). The penalty points system is a way of providing a clear deterrent to fishers who are considering breaching the provisions of the strategy or associated rules, as well as providing the courts with a regulated management plan that reflects the serious nature of some fisheries offences.

Similar to the motor vehicle licence demerits points scheme (administered by the Roads and Traffic Authority), the proposed system would provide for a list of penalty points assigned to serious or repeated offences. If a fisher accrued a certain level of penalty points by breaching the rules applying to the fishery, the endorsement or fishing right would be subject to predetermined periods of suspension or cancellation through provisions in the share management plan for the fishery.

The offences deemed as “serious” and the definition of a “repeated offence” would need to be included in the share management plan, as would the points attributable to each offence.

It should be noted that the Estuary General MAC does not support the introduction of a share forfeiture scheme in the fishery. The MAC supports an endorsement or licence suspension scheme based on penalty points, but not the forfeiture of shares.

6. Research

a) Proposed research areas

The basic areas of research needed for the Estuary General Fishery can be categorised into seven broad areas: (i) stock assessments of primary species; (ii) quantification and reduction of the bycatch and discarding of untargeted species; (iii) effects of fishing methods on habitats; (iv) importance of habitats to fish populations; (v) importance of ecological processes to fish populations, (vi) impacts of fishing on trophic interactions and ecosystems; and (vii) impacts of fishing on threatened species.

Outlined below are those strategies by which research into these areas is proposed to proceed.

i) Stock assessments of key species

Fishery-dependent information

Previous assessments of fish stocks in estuaries have generally been inadequate and mostly reliant on fishery-dependent information. These assessments have made extensive use of reported catch and effort data supplied by commercial fishers and have included age-based assessments of commercial landings of key species (including sea mullet and bream since 1995 - Virgona *et al.*, 1998, Gray *et al.*, 2000, sand whiting and luderick between 1995-97 - Gray *et al.*, 2000 and dusky flathead between 1995-97 and 2000 - Gray *et al.*, submitted). Stocks of eels are also currently being assessed in a targeted Fisheries Research and Development Corporation (FRDC) funded project.

Fishery-dependent catch and effort information has been used in the past because: (i) it is easy to obtain; (ii) a large and long term data series exists; and (iii) it has been the best information available. These reasons do not, however, make up for the unreliable nature of such information – in terms of its accuracy, precision and consistency. Further, such information only concerns species (and sizes/ages of species) that are actually landed and therefore virtually no information is obtained on small, undersized individuals, bycatch species or other organisms involved in the affected ecosystems. Age-based sampling of commercial landings represents a significant advancement in stock assessments over that solely relying on catch and effort data, but its utility in assessing stocks, bycatch and ecosystem interactions remains minimal.

Nevertheless, because of the reasons listed above (fishery-dependent information is relatively easy to obtain, large, long-term and the best available), it is proposed to continue fishery-dependent age-based assessments of three key fish species in the Estuary General Fishery (sea mullet, bream and dusky flathead) until more robust methods for assessing stocks are developed and implemented (see below).

With the exception of some work on king prawns, few stock assessments of other invertebrates (like school prawns, blue swimmer crabs, mud crabs, pipis, beachworms, etc.) have been done (although a new four year project to assess school prawn stocks commences in 2002). Reported catch and effort data on such species have been (and will continue to be) monitored to assess any changes in relative abundance inferred by the data until better methods for stock assessments are established. Where known, other sources of mortality will be considered in the stock assessment process.

Fishery-independent information

Because of the problems inherent with fishery-dependent information, it is intended that future stock assessments of estuarine species will involve fishery-independent methods based on stratified randomised surveys of relative abundances and size and age structures of wild populations. Such data will provide more robust and rigorous assessments of natural populations than those based on fishery-dependent data.

The first step in implementing such a major change in focus is to do the necessary pilot studies that will develop appropriate fishing gears for the surveys, and to do cost-benefit analyses of pilot surveys to determine the most appropriate sampling regimes. This pilot work will then be followed by sampling to test the developed survey design and allow the preparation of a final design for subsequent surveys that will continue into the future. A program funded by the FRDC will cover the first three years of this work which includes all of the pilot and design work. It is intended that the pilot studies on alternative sampling tools and cost-benefit analyses will be done during 2002-2003 and a pilot sampling strategy will be implemented during 2003-2004. The proposed sampling regime will be implemented in the third year (2004/2005). After this period, it is intended that the program will be continued using funds provided by all users that benefit from these resources.

Such a fishery-independent survey will also have other benefits including the provision of fish samples for age determination, information on reproductive biology (which will allow some review of appropriate size limits), recruitment indices and some preliminary examinations of trophic interactions. Information from the fishery-independent surveys will therefore contribute to several other priority areas of research and management whilst allowing quite robust modelling of populations for stock assessment purposes.

ii) Quantification and reduction of the bycatch and discarding of untargeted species

It is widely accepted that the most reliable and accurate way one can assess bycatch and discarding is to use observer-based surveys. Observer surveys of bycatch and discarding have been carried out for most methods used in the Estuary General Fishery. Such studies examined by-catches from the prawning methods of set pocket netting (Andrew *et al.*, 1995), snigging (Gray, in press and unpublished), hauling (Gray *et al.*, in preparation) and running nets (Gray *et al.*, in preparation), general-purpose fish hauls (Gray *et al.*, 2001, in preparation) and mesh nets set overnight (Gray, in press). Discarding from all types of mesh nets is currently being assessed and is due to be complete in 2002. Bycatch from fish traps has also been examined in Botany Bay only (Stewart and Ferrell, in press).

Research into the development of discard-reducing gears has also been undertaken for some methods used in the Estuary General Fishery, including fish haul nets (Gray *et al.*, 2000; Kennelly and Gray, 2000), fish traps (Stewart and Ferrell, in press) and eel traps (Pease *et al.*, unpublished data). Further research is currently being done to reduce the capture of small prawns in estuarine prawning gears and to investigate the survival rates of discarded prawns. The survival rates of discards from general purpose haul nets have also been estimated (Kennelly and Gray, 2000; Gray *et al.*, in preparation).

Major gaps in our knowledge about bycatch and discarding in the Estuary General Fishery mainly exist for a few relatively minor fishing methods including crab and eel traps and specific

hauling gears like garfish haul and bullringing nets, trumpeter whiting haul nets and bait haul (e.g. lampara) nets.

It is proposed that future research concerning bycatch and discarding for the Estuary General Fishery will involve starting observer-based surveys on crab and eel trapping and specific haul nets in 2002/2003. It is then proposed to repeat observer surveys of all methods used in the fishery periodically in order to maintain a “watching brief” on bycatch levels in the fishery. Of course, if specific changes to operations occur, this ideally would be followed by directed observer surveys to assess effects of such changes on catches and bycatch. For example, the introduction of a new flathead net to the fishery in 2003 should be accompanied by an observer survey during the ensuing fishing season.

The scientific observer program will be important for:

- monitoring the impacts of the fishery on bycatch species
- providing data on relative selectivity among the fishing gears being observed
- broad level validation of catch returns
- recording any interactions with threatened species and occurrences of lost fishing gear.

Whilst the scope of the scientific observer program may not be sufficient to report on the level of impact of the fishery on threatened species, the program will provide information that could be used in the consideration of spatial overlaps of the fishery and threatened species.

The field component of the program will include observations of gear types used in a sample set of estuaries across the regions used in the fishery. Although the exact number of observer days is yet to be determined, the observer program will be stratified across factors of importance, for example regions or particular estuary types. The level of observer coverage will be sufficient within strata to detect differences among them. This will require pilot estimates of variation to be made early in the observer program.

Although the program will be conducted under the supervision of NSW Fisheries, the field observing component will be offered as a contract under a competitive tender process. This could result in a research institution (other than NSW Fisheries) undertaking the field observations and as such, it is not possible at this stage to estimate the number of observers that will be used to meet the requirements of the program.

It is proposed that when specific bycatch and discarding problems are identified, targeted research will be directed at ameliorating the identified problems. This could include the development and testing of alternative gears and fishing practices in addition to assessments of the utility of spatial and temporal fishing closures to reduce any identified problems.

iii) Effects of fishing methods on habitats

Whilst a study of the impacts of hauling over *Zostera* seagrass has been completed (Otway and Macbeth, 1999), the impacts on other habitats of other fishing gears have not been investigated and potential impacts have generally been inferred from studies undertaken elsewhere.

It is proposed to address the significant gaps in our knowledge about the physical impacts of various fishing methods on habitats via targeted projects involving manipulative field experiments on specific problems. Examples may include the effects of various mobile fishing methods like hauling on seagrass beds and sand flats. Specific issues will be prioritised and funding sought. As was the

case above for identified bycatch problems, if problems of physical damage on habitats are identified, it is proposed to undertake targeted projects on ways to reduce such effects through gear and/or operational modifications and/or spatial and temporal closures in sensitive areas.

There is a need for tools to monitor biodiversity in the ecosystem in which the fishery operates. The research needed to provide such tools is likely to be long-term and drawing on a variety of expertise and knowledge. This management strategy is proposing, however, reforms in research and monitoring that will significantly improve the working knowledge of the fishery in its environment. These reforms, such as improvements in the accuracy of catch returns and the knowledge of discards from the observer study, will form the basis for future studies to assist biodiversity monitoring.

iv) Importance of habitats to fish populations

Some research has been done on the associations between estuarine fish and the habitats on which they depend (e.g. Young, 1981; Middleton *et al.*, 1984; Bell and Pollard, 1989; Ferrell and Bell, 1991; Gray *et al.*, 1996). It is important that the role of different habitats in supporting fisheries resources continue to be studied and that the effects of the degradation of such habitats be fully understood. Current research includes a project investigating the impacts of acid sulphate soils on fisheries resources.

The extent and distribution of key estuarine habitats (e.g. seagrasses, mangroves, saltmarsh, etc.) have been recorded previously (West *et al.*, 1985) and this work is currently being repeated. It is planned to continue and, in fact expand, the monitoring and assessment of changes in the state's estuarine habitats.

Research on specific interactions between particular populations and certain habitats would involve targeted research projects directed at specific problems, which would include field-based manipulative experiments and mensurative studies. Specific issues will be prioritised and funding sought.

v) Importance of ecological processes to fish populations

The structure and functioning of ecosystems and the myriad of ecological processes that occur in them underpin the sustainability of most of those fish and crustaceans that are exploited from estuarine systems. It is therefore important for the fisheries that target species in these systems to understand the complex ecological processes in those systems, whether these processes directly involve target species or not.

The techniques and methodologies for examining such interactions involve quite complex field experimentation and there exists a substantial body of literature on the subject, though not often involving the estuaries of NSW that are exploited by the Estuary General Fishery.

Directed, detailed experimental and mensurative programs need to be undertaken so that management decisions about exploited fish and crustaceans can be made in the light of entire ecosystem processes. Such information will, of course, also provide vital information to other non-fisheries agencies that manage other aspects of such systems under the principles of ecological sustainable development.

vi) Impacts of fishing on trophic interactions and ecosystems

Little research has been done anywhere to assess the impacts that fishing has on the structure of estuarine ecosystems and none has been undertaken in relation to the Estuary General Fishery. In general, such work is very much in its infancy throughout the world and, where such work has been done, it is invariably characterised by being complex, expensive, of a long duration. However, such work has shown that fishing can significantly affect the structure and function of ecosystems (Hall, 1999; Kaiser and de Groot, 2000).

As with the proposals to study the effects of different fishing methods on habitats, it is proposed to examine the issue of impacts of fishing on trophic interactions and ecosystems through targeted projects on specific impacts using quite elaborate manipulative and mensurative experiments. An example of such work is currently being undertaken in the Clarence River where the impacts of trawling on benthic systems are being examined.

Before this ecosystem research commences however, it is proposed to undertake a risk assessment as proposed by the Sustainability Indicators Working Group of the Standing Committee on Fisheries and Aquaculture (see management response 1.3c in section 8). The Working Group is in the process of developing a national reporting framework for ESD for Australian fisheries and has completed some work on identifying the main ecosystem components that may be subject to impacts from fishing. Acknowledging that research resources are limited, the working group is recommending that Australian fisheries management agencies undertake a risk assessment for each fishery to determine the level of management (including research) necessary for each component of the ecosystem. The working group recommends that this be done through a workshop so that the outcome is a combined judgement of a group of people who have considerable expertise in the areas being examined.

vii) Impacts of fishing on threatened species

Little is known about the biology and ecology of many of those species listed as endangered or threatened, and the potential impacts of commercial fishing on these species are even less understood. It is proposed that research on such issues should involve specific projects targeted at particular species and the many factors that influence them, rather than studying particular fisheries for their impacts on certain species.

Such studies would involve examining the biology and ecology of certain species to assess potential impacts of a variety of “threats” (only one of which would be the Estuary General Fishery). Specific issues and species will be prioritised and funding sought.

b) The Conservation Technology Unit

In March 2001 NSW Fisheries established a Conservation Technology Unit to examine conservation-based gear technology in commercial and recreational fisheries. This focussed research initiative will help address gaps in knowledge including the selectivity of fishing gear used in the Estuary General Fishery. The research will also assist in identifying the most appropriate gear to be used in the fishery and ensure that future changes to gear regulations can be based on accurate scientific information. The development of new and innovative fishing techniques will help minimise unwanted catches, discarding and environmental change.

c) Catch monitoring

Fishers in the Estuary General Fishery required to submit records on a monthly basis detailing their catch and fishing effort. The information includes catch for each species, the effort expended (for each method) to take the catch, and the area/s fished. This information will be entered onto a database by NSW Fisheries will allow for analysis of fishing activity, catch levels and effort levels. The entry of catch return information onto the database is subject stringent quality control procedures including a three month timeframe for data entry following the receipt of a catch return by NSW Fisheries. A policy is being developed to manage the timely receipt and entry of commercial catch return data into the commercial catch records database.

The accuracy of the data provided on catch returns, particularly with respect to fishing effort data, is variable. There are a number of management responses proposed in this management strategy to improve the quality and reliability of the information provided on catch returns, including a review of the current monthly catch return and validation of catch and effort data under the proposed scientific monitoring program.

To maximise the accuracy of the data collected on monthly catch returns a range of quality-control procedures are currently in place or scheduled for implementation in the near future. A brief synopsis of these quality control procedures is provided here:

- Every return is scanned for errors when received by the “Commercial Catch Records” section in NSW Fisheries, and suspected omissions or errors are queried with fishers (by phone and/or written correspondence) and corrected if necessary
- Logical checks of data accuracy (range, consistency and validity checks) are performed automatically by computer during data-entry. Likely errors are queried with fishers (by phone and/or written correspondence) and corrected if necessary
- Following a review in May 2001, fishers who have not submitted catch returns during the period July 1997 to December 2000 are being notified and asked to submit omitted returns. Following completion of this process and update of the database, a regular process whereby omitted returns are identified and rectified will be implemented
- Data from the commercial catch statistics database “FINS” is regularly downloaded to a database “COMCATCH”, which can be accessed or queried by biologists and managers responsible for individual fisheries. Subsequently, any problems with data identified by the relevant biologists or managers are queried and may be corrected by the commercial catch records section after consulting fishers where necessary
- A recent pilot survey was undertaken to assess the accuracy of data entry with respect to the catch records. The results showed that data-entry errors by staff were of minimal significance. Errors were rare and generally concerned minor species. It is planned to repeat this survey annually to provide ongoing monitoring of the quality and accuracy of data entry
- Following implementation of routine reporting of the quantities of fish handled by registered fish receivers in NSW, it will be possible to compare the quantity of catch (by species) reported by fishers on catch returns with the quantity handled by fish receivers in NSW. This will provide a cross-validation of weights of individual species caught and handled in NSW

- The information collected on catch returns and options for improving the catch return forms (and increasing the reliability of data) is reviewed periodically by the management advisory councils and annually by the “Catch and Effort Working Group” which comprises industry representatives from each fishery. This working group was convened for the first time in April 2001.

All existing and proposed procedures attempt to maximise data quality. It is, however, inevitable that the accuracy of data supplied by fishers cannot be directly assessed and can sometimes be variable, particularly with respect to fishing effort data. Consequently, the commercial catch statistics supplied by fishers and maintained in the commercial catch records database is most accurately described as representing “reported landed catch”.

7. Consultation

There are a range of consultative bodies established in NSW to assist and advise the Minister and NSW Fisheries on fisheries issues. There are committees that are established to provide advice on specific issues as well as bodies to advise on matters which cut across different fisheries or sectors.

a) The Management Advisory Committee

Share management and major restricted fisheries in NSW each have a Management Advisory Committee (MAC) that provides advice to the Minister for Fisheries on:

- the preparation of any management plan, strategy or regulations for the fishery
- monitoring whether the objectives of the management plan, strategy or those regulations are being attained
- reviews in connection with any new management plan, strategy or regulation
- any other matter relating to the fishery.

Table 15 details the current membership on the Estuary General MAC. The industry members of the MAC comprise representatives that are elected by endorsement holders in the fishery (or shareholders in the share management fishery). There is an industry representative from each of the seven coastal regions in the fishery, although there are two representatives from region 4, to assist in addressing the diversity of issues that occur in that region. The members hold office for a term of three years, however the terms of office are staggered and the terms of half of the industry members expire every 18 months.

The non-industry members on the MAC are appointed by the Minister for Fisheries and also hold terms of office of up to three years. To ensure that all issues discussed by the committee are fairly represented the MAC is chaired by a person who is not engaged in the administration of the FM Act and is not engaged in commercial fishing.

Although the MAC receives advice from NSW Fisheries observers on research, compliance and administrative issues relating to the fishery, only members of the MAC have voting rights on the decisions of the MAC.

The actual composition and role of the MAC is set by the FM Act and its regulations and may be altered from time to time.

There are many references in this management strategy to consultation with the Estuary General MAC. Consultation involves seeking the advice of the MAC on its views. The MAC generally meets at least twice a year - but many issues may require resolution urgently, and it may not be practicable to defer consultation to a face-to-face meeting. For this reason, references to consultation with the Estuary General MAC in this management strategy may include the distribution of documents to MAC members with a request for comment from the individual members by a specific date. NSW Fisheries may then compile the comments received into a single document recording the views of MAC members. This document may then be used as a basis for further decision making by NSW Fisheries and/or the Minister for Fisheries.

Table 15. Current membership on the Estuary General MAC.

Position	boundary	Southern boundary
Independent chairperson	–	–
Region 1 (Upper north coast)	NSW-Queensland border	29°15'S Jerusalem Creek – south of Evans Head in the Bundjalung National Park
Region 2 (Clarence)	29°15'S	29°45'S Sandon River – south of Yamba in the Yuragir National Park
Region 3 (North coast)	29°45'S	31°44'S Diamond Head – south of Camden Haven in Crowdy Bay National Park
Region 4 (Central north)	31°44'S	32°30'S South of Big Gibber Headland in the Myall Lakes National Park
Region 4 (Central south)	32°30'S	33°25'S Wamberal Point – the entrance to Wamberal Lagoon north of Terrigal
Region 5 (Metropolitan)	33°25'S	34°20'S Bulli Point at Bulli
Region 6 (Upper south coast)	34°20'S	35°25'S Lagoon Head – Burrill Lake south of Ulladulla
Region 7 (Lower south coast)	35°25'S	NSW-Victorian border
Recreational fishing	All areas	–
Indigenous fishing	All areas	–
Conservation	All areas	–
NSW Fisheries	All areas	–
Others determined by the Minister from time to time	–	–

b) Ministerial Advisory Councils

Four Ministerial advisory councils are currently established under the *Fisheries Management Act 1994*. The Councils provide advice on matters referred to them by the Minister for Fisheries, or on any other matters the Councils consider relevant. They report directly to the Minister.

The Ministerial advisory councils currently established are

- Advisory Council on Commercial Fishing (ACCF)
- Advisory Council on Recreational Fishing (ACoRF)
- Advisory Council on Fisheries Conservation (ACFC)
- Advisory Council on Aquaculture (ACoA).

The Estuary General Fishery and each of the other share management and restricted fisheries have representatives on the ACCF. These representatives are nominated by each of the respective MACs and appointed by the Minister.

Representatives from the commercial fishing industry in NSW, or people who in the opinion of the Minister have expertise in commercial fishing are also represented on the ACFC.

The name and composition of Ministerial advisory councils is determined by regulations under the FM Act, and may be altered from time to time.

c) Fisheries Resources Conservation and Assessment Council

The Fisheries Resource Conservation and Assessment Council (FRCAC) has been established to play a key role in advising the Government on fisheries conservation and assessment throughout the State. The members on the council represent a wide range of interests and includes representatives from commercial fishing, recreational fishing, fish marketing, the fishing tackle industry, charter boat fishing, regional tourism, academic expertise, conservation, aquaculture and Indigenous peoples.

FRCAC advises the Minister for Fisheries on the preparation and revision of fishery management strategies for fishing activities, including the management strategy for the Estuary General Fishery.

The legislated role of the FRCAC includes providing advice on:

- the preparation or revision of a fishery management strategy,(and for that purpose to review the Environmental Impact Statement prepared in connection with a draft strategy)
- other matters as may be referred to it by the Minister.

In summary, the FRCAC's duties involve:

- fostering relationships between community groups, recreational fishing interests, commercial fishing interests and government agencies
- advising on the preparation and revision of fishery management strategies
- reviewing environmental impact statements prepared in connection with draft strategies
- providing an opportunity for key stakeholder groups to have input into issues papers prepared for recreational fishing areas selection processes
- reviewing community consultation reports that arise from the recreational fishing areas selection process.

Both the FRCAC and the ACCF are consultative bodies that facilitate cross-sectoral and cross-fishery consultation, respectively.

The composition and role of the FRCAC is set out by the FM Act and its regulations and decisions by the Minister for Fisheries. These arrangements may change from time to time.

d) Total Allowable Catch Setting and Review Committee

The final decision on total allowable pressure on prawn stocks would ultimately rest with the Total Allowable Catch Setting and Review Committee (TAC Committee). This committee would, as provided for in the share management plan, make determinations about the total level of fishing effort to apply in the capture of prawns. The TAC Committee consists of at least four members, including:

- a person appointed by the Minister as the Chairperson of the TAC Committee, being a person who is neither engaged in the administration of the FM Act nor engaged in commercial fishing

- a person appointed by the Minister who is a natural resource economist not employed by the Government
- a person appointed by the Minister who is a fisheries scientist not employed by the Government
- persons appointed by the Minister who have appropriate fisheries management qualifications.

The composition and role of the TAC committee is set by the FM Act and its regulations and decisions by the Minister. These arrangements may change from time to time.

This management strategy proposes a process for assessing the amount of fishing effort that can be exerted upon prawns and for allocating fishing effort across all fisheries. The proposal relies upon NSW Fisheries calling a meeting each year of a group of stakeholder representatives. The composition of the group would include: representatives of ocean and estuarine commercial prawn fishers, the Advisory Council on Recreational Fishing, Nature Conservation Council of NSW, the Advisory Council on Commercial Fishing and Government. Recommendations would be made to the Minister on the allocation of fishing effort on prawn stocks and other cross-fishery management measures. Stock assessments of the resources would be considered as part of a process.

The Minister may then require the TAC Committee to determine the total allowable fishing effort on prawn stocks in each of the relevant share management fisheries. The independent TAC Committee would consider all available information (including the stock assessments and submissions from the community and industry) about the allocation of fishing effort across the various fishing sectors and about the management measures being used to manage the resource.

The steps in the annual consultation process to determine and allocate fishing effort are:

- Step 1. The status of the stocks of target prawn species are assessed annually and presented as a stock assessment
- Step 2. The stock assessment will be reviewed by the relevant MACs and any stakeholder meeting convened by NSW Fisheries for that purpose and then recommendations on total prawn fishing effort, the allocation of prawn fishing effort between fisheries, and other cross-fishery issues (as required) will be made to the TAC Committee
- Step 3. The TAC Committee will review the stock assessment together with the advice arising from any stakeholder meeting convened by NSW Fisheries in step 2, other interested parties, and the community to determine the level of total fishing effort on prawn stocks to apply to each fishery.
- Step 4. Once the TAC Committee has made its determination, the Minister for Fisheries either may require the TAC Committee to reconsider the determination or publish the determination in the Government Gazette.

8. Goals, Objectives and Management Responses

This section sets out the goals, objectives and management responses for the Estuary General Fishery.

a) A model framework

Figure 2. A model of the framework for a fishery management strategy.

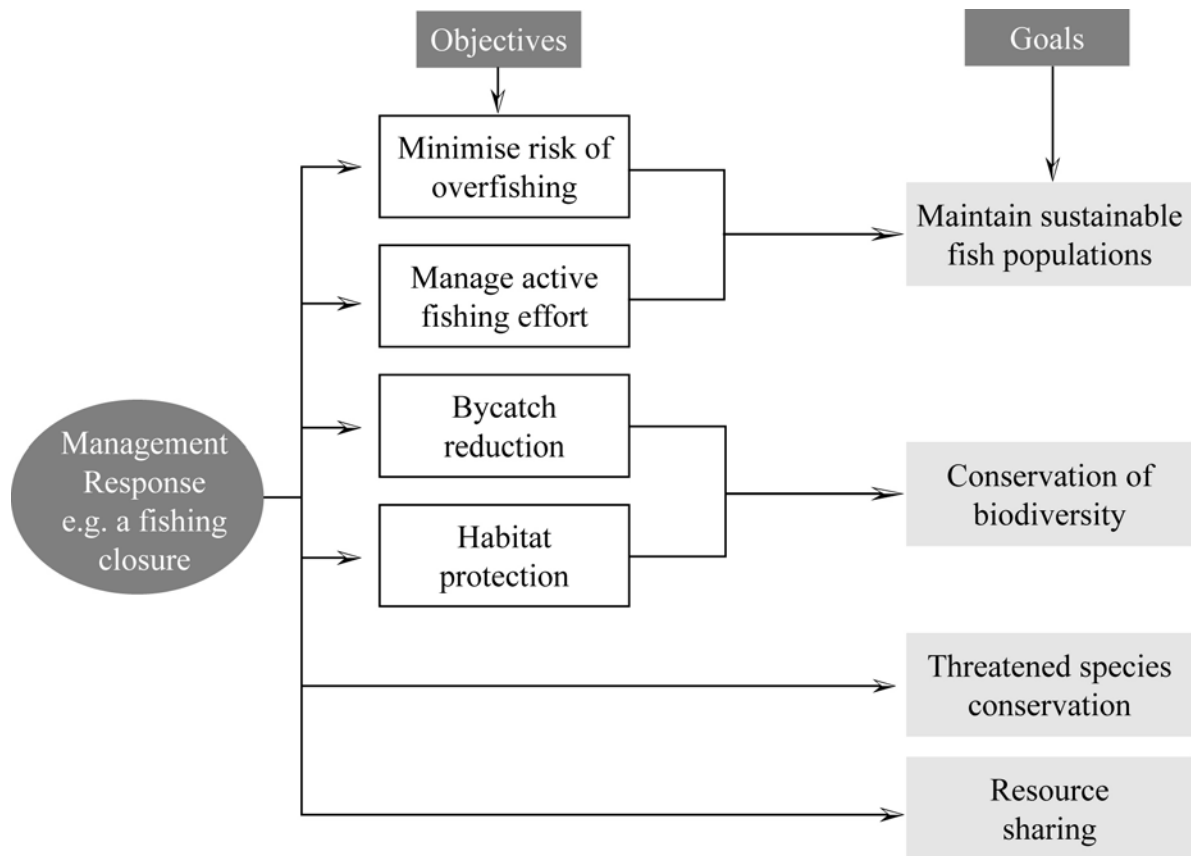


The link between the goals, objectives and management responses is not as simple as that portrayed in Figure 2. The reality is that most management responses assist in achieving more than one goal.

An estuarine fishing closure is one example of the complex relationships that exist in a multi-method multi-species fishery. Some closures were originally put in place to more fairly share access between recreational and commercial fishers. A closure to reduce conflict appears to fit into the “resource sharing” goal, however, it can have other benefits, and assist the fishery to meet other objectives.

For example, a closure can also reduce the level of fishing pressure in that area and provide greater protection to habitat and biodiversity. This outcome provides a range of benefits for the fishery over and above reducing conflict (see Figure 3).

Figure 3. Example of how a single management response affects multiple goals and objectives.



This complex structure has been dealt with in the following section by listing each of the management responses once only, under the objective that the response contributes most towards achieving. There are cross references between each response and the other goals and objectives that the response may also assist in achieving. When identifying the responses that are in place to achieve a particular objective, it is important to look at the cross referenced responses as well as any listed individually under the objective (ie. the “Other important responses” must be taken into account).

Information under each response is also provided detailing the timeframes in which the action will be undertaken, the agency or group responsible for implementation and the authority under which the action will be implemented.

b) Goals, objectives and management responses

GOAL 1. To manage the Estuary General Fishery in a manner that promotes the conservation of biological diversity in the estuarine environment

Healthy fish habitats are essential for the ongoing sustainability of fish populations and the conservation of biological diversity in the estuarine environment. There is a range of activities that take place in coastal catchments that have the ability to damage fish habitat and need to be appropriately managed, with estuary general fishing being only one. Many areas within estuaries act as nursery areas for juvenile fish. Mangrove, seagrass and saltmarsh areas are believed to provide very important habitats for fish and crustaceans.

Estuaries are extremely dynamic environments with a high diversity of species, and bycatch occurs as other species become inadvertently caught in the gear while it is being used to catch marketable fish. With the diverse nature of the Estuary General Fishery, there are still levels of uncertainty about bycatch associated with some of the fishing methods used, and about the impacts of bycatch on the broader ecosystem. To properly address the issue, fishing must be undertaken in a way to reduce bycatch as far as possible and further data are required to quantify the level of bycatch from fishing methods and its overall impact on the ecosystem.

Objective 1.1 To minimise the impact of fishing activities on bycatch: non-retained species (including prohibited size fish, unwanted fish and fish protected from commercial fishing)

Other important responses: 1.1f,g,h; 1.2a,b; 1.3c; 2.1g,h; 2.1.2c; 2.1.3b; 2.2b,c; 2.3a,b,c; 6.2a; 6.3c

- (a) Increase the minimum mesh size (and other dimensions if needed) of flathead nets from 70 mm following the 2001 research program into mesh net selectivity

Background: Following an increase in the minimum legal length of dusky flathead from 33 to 36 cm, NSW Fisheries and the Estuary General MAC agreed to phase out the use of 70mm mesh size flathead nets after the 2001 season. Recommendations on a replacement for the 70mm net in terms of mesh size, dimensions and other controls will be made with the benefit of data from the 2001 mesh selectivity research program.

Contributing to Goals	Timeframe	Responsibility	Authority
1,2,5	By November 2003	NSW Fisheries	Regulatory

- (b) Using the best available knowledge and appropriate technology, modify fishing practices (such as by adopting bycatch reduction devices) to reduce the impacts of the fishery on non-retained fish, invertebrates, reptiles, mammals and birds; and in particular implement the use of discard chutes by July 2003 to facilitate the return of fish removed from mesh nets

Background: The National Policy on Fisheries Bycatch provides a national framework for coordinating efforts to reduce bycatch. It provides options by which each jurisdiction can manage bycatch according to its situation in a nationally coherent and consistent manner. Any changes to fishing practice that transpire under this management response could be implemented through conditions on the relevant fishing endorsement, through a code of conduct or other regulatory control, depending on the nature of the change.

Contributing to Goals	Timeframe	Responsibility	Authority
1,2,4	Ongoing	NSW Fisheries EG fishers	Various

- (c) Use best-practice handling techniques, including the prohibition by December 2002 on the use of fish spikes, clubs or any other such implement that could unduly harm incidentally captured organisms

Background: Some techniques used to return unwanted animals to the water unduly injure animals. Such techniques are used to hasten the sorting process or to avoid handling dangerous animals. Fishers should adopt alternative techniques for returning animals to the water which avoid injuring those animals. In 1999, Oceanwatch (a non-profit company sponsored by the NSW seafood industry) produced a publication outlining bycatch solutions for non-trawl fisheries proposing better handling techniques. The prohibition of spikes and clubs by June 2002 is a specific action, however, the use of best handling techniques is an ongoing aim for the fishery.

Contributing to Goals	Timeframe	Responsibility	Authority
1,4	Ongoing	NSW Fisheries EG fishers	Regulatory

- (d) Phase out the setting of mesh nets with a mesh size less than 95 mm between sunset and sunrise over winter

Background: A research program conducted in 1999 found that overnight set mesh nets with a mesh size of 89 mm (3.5 inches) often catch a high proportion of juvenile fish. The survival rate was high for some species such as bream, but was low for some other species. NSW Fisheries and the Estuary General MAC support an increase in the minimum mesh size to 95 mm (3.75 inches) for which bycatch was significantly less.

Contributing to Goals	Timeframe	Responsibility	Authority
1,2	By November 2003	NSW Fisheries	Regulatory

- (e) Reduce the maximum allowable length of general purpose 'fish' hauling nets to 500 metres in estuaries where 725 metre and 1,000 metre nets are currently permitted, and restrict the number of times each day a fisher or crew may shoot a 500 metre net in those estuaries to one completed shot thereby ensuring an overall reduction in area swept by the net

Note: This response has been proposed by NSW Fisheries, and its implementation without a period of evaluation is not supported by the Estuary General MAC or the NSW Advisory Council on Commercial Fishing. The MAC does not consider the reduction in net length and

restriction on the number of shots per day as effective means of effort reduction and believes that there will be no environmental benefits.

Background: There are a number of the larger coastal rivers and lagoons in NSW where larger than standard length hauling nets (1,000 m, 725 m & 450 m) have historically been authorised. These nets are usually operated with hauling lines, each of which may be as long as the net itself. The area swept during the hauling of this type of net is significant.

This management response will act to reduce the swept area hauled to assist in reducing the impacts of fish hauling on bycatch, and any effects on habitat. It is not proposed to reduce the length of the hauling lines associated with these nets because fishers still need to be able to work the gear in the deeper water. This response may also assist in promoting harmony between commercial estuary fishers and other resource users. Due to its size, the current 1,000 metre hauling net requires a lengthy time to lay out and haul the net, which normally limits its use to one shot per day. Limiting the use of the 500 metre replacement net to one completed shot per hauling crew day prevents the hauling of the net multiple times per day and thereby negating the intention of this action.

The following estuaries are affected by the reduction in haul net length:

1000 m haul net previously permitted: - Wallis Lake and Tuggerah Lakes

725 m haul net previously permitted: - Clarence River, Lake Innes, Smiths Lake, Myall Lakes, Lake Booloombay, Lake Illawarra and Wallaga Lake

Although it was previously allowed, fishers in the Clarence River have not used 725 m haul nets as they are less practical as the shorter hauling nets in that estuary. Several other estuaries previously open to 1000 m and 725 m nets are now closed to hauling following the implementation of recreational fishing havens.

Contributing to Goals	Timeframe	Responsibility	Authority
1,2,4	By December 2002	NSW Fisheries	Regulatory

- (f) Introduce an industry-funded scientific observer program to collect information on the quantity and composition of bycatch (non-retained species) for methods where little or no information is known, and periodically repeat that program for all methods used in the fishery

Note: Bycatch monitoring is an important requirement under the Commonwealth environmental assessment guidelines. The observer program will be designed and costed in full consultation with the Estuary General MAC. The MAC may present alternative schemes and investigate competitive service delivery. The program will commence by collecting information on bycatch from gear types where little is currently known (e.g. trapping), and it would be periodically repeated for all methods. Further information on the scientific observer program is presented in section 6(a) of this management strategy.

Contributing to Goals	Timeframe	Responsibility	Authority
1,2,3,7	December 2003	NSW Fisheries EG fishers	-

- (g) Continue the restrictions on the use of fishing gear contained within the *Fisheries Management (General) Regulation 1995* including controls on the dimensions, construction materials and modes of operation unless otherwise described by this management strategy

Contributing to Goals	Timeframe	Responsibility	Authority
1,2,3,4,5	Current and ongoing	NSW Fisheries	Regulatory

- (h) Continue the prohibition on using firearms, explosives or electrical devices to take fish in the fishery

Contributing to Goals	Timeframe	Responsibility	Authority
1,2,4	Current and ongoing	NSW Fisheries	Regulatory

- (i) Ban the discarding of cooked prawns and investigate the sustainability of grading uncooked prawns

Background: Prawn fishers in some estuaries use a device known as a 'riddler' to grade the sizes of prawns in their catch and to sometimes separate debris and bycatch from the prawn catch. A riddler is a screen of wire or net mesh stretched over a frame. The mesh size of this screen varies but is usually between 35 mm and 50 mm. This grading device is used like a chute as it is positioned at an angle of about 60 degrees and the prawn catch is passed over the top of the screen. Smaller prawns pass through the screen and are collected in a container underneath, while larger prawns pass over the top and are collected in a container at the lower end of the riddler. Depending upon the level of grading necessary, the prawns from both containers may be passed over the screen a number of times. In the case of green prawns, the unwanted portion of the prawn catch is returned to the water after grading, whilst unwanted cooked prawns are disposed of. There is little information about the survival of 'riddled' green prawns once they are returned to the water.

A NSW Fisheries research program funded by the Fisheries Research and Development Corporation is investigating changes to fishing gears and practices that minimise the capture and mortality of small unwanted prawns. The research will be complete by April 2005.

Contributing to Goals	Timeframe	Responsibility	Authority
1,4,7	Ban for cooked prawns by December 2002; investigations complete by April 2005	NSW Fisheries, Estuary general fishers	Regulatory

Objective 1.2 To minimise the impact of activities in the fishery on marine and terrestrial habitat

Other important responses: 1.1e,g,h; 1.3c,d; 1.5a-f; 2.1a,g,h; 2.2b,c; 2.3b,c; 2.4c; 6.2a

(a) [Continue to] use fishing closures to control the area and time fished to:

- (i) protect key fish habitat, specifically prohibit the use of all hauling nets used in the Estuary General Fishery over beds of strapweed seagrass (*Posidonia australis*)
- (ii) protect key fish habitat and reduce bycatch by defining, in consultation with the Estuary General MAC and other key stakeholders identified by NSW Fisheries, designated landing sites for fish hauling nets in estuaries where seagrass (of any species) exists around shoreline areas
- (iii) reduce bycatch by identifying areas of seagrass (of any species) which should be closed to prawn hauling and prawn seining methods

Note: As an outcome of the Juvenile Prawn Summit held in June 2000, commercial fishers agreed to prohibit prawn hauling and prawn seining over areas of seagrass, and this concept has been generally supported by fishers. District Fisheries Officers and local fishers will identify these seagrass areas and the relevant closures will be declared as part of this management strategy.

- (iv) reduce bycatch in areas and at times of high abundances of jellyfish or juvenile fish

Note: Numerous fishing closures already exist in the Estuary General Fishery for a range of reasons. Each closure generally has benefits to numerous aspects of the resource and the fishery. Recommendations for short term area restrictions to protect fish could be made by informal local joint industry/NSW Fisheries working groups.

- (v) harvest fish at a size that maximises the economic return
- (vi) avoid direct interactions with marine and terrestrial threatened species, populations or ecological communities
- (vii) equitably share the resource between estuary general fishers and other stakeholders
- (viii) minimise impact on nesting and/or feeding areas of migratory shorebirds
- (ix) minimise impact on sensitive shoreline habitat.

Background: Fishing closures prohibit fishing over an area either absolutely or conditionally. In this management strategy all uses of the term "fishing closure" has a broad meaning encompassing any legally enforceable prohibition or restriction on fishing activity. This includes: fishing closures made under Division 1, Part 2 of the FM Act; aquatic reserve notifications made under Subdivision 3, Division 2, Part 7 of the FM Act; regulations under section 20 of the FM Act (as amended by the Fisheries Management Amendment Act 2001); regulations under section 220ZE of the FM Act; and regulations under section 205B of the FM Act.

Fishing closures can be gear specific, so that only the relevant gear type/s are affected by such a closure. Closures are periodically reviewed and modified to take account of changing fishing patterns and/or environmental conditions. Any intermittent closures should be implemented in accordance with appropriate guidelines developed by NSW Fisheries in consultation with the Estuary General MAC.

As a component of this management response, maps will be prepared in consultation with relevant stakeholders for each region to identify areas where commercial fishing can take place and areas totally closed to commercial fishing (e.g. recreational fishing havens and aquatic reserves) in accordance with a timeframe agreed between the Director-General of Planning NSW and the Minister for Fisheries.

Contributing to Goals	Timeframe	Responsibility	Authority
1,2,3,4,5,7	(i): Regulation under section 205B by December 2002 and section 8 fishing closures by July 2003, (ii)&(iv): By July 2003 and ongoing (iii): By December 2003 (v),(vi),(vii): Current and ongoing (viii)& (ix): By July 2003 and ongoing	NSW Fisheries EG MAC	Regulatory

- (b) Modify the use of fishing methods that have a detrimental impact on fish habitat, or threatened species, populations or ecological communities

Background: Where fishing methods are known or believed to be having detrimental impacts on fish habitat or threatened species, their use should be modified so as to avoid or minimise those impacts. These impacts may be identified through research programs proposed in this management strategy or through consultation with the Estuary General MAC or Ministerial advisory councils. This response allows the modification of gear use where new information about fishing methods, habitats, threatened species, populations or ecological communities has been obtained, for example through the outcomes of a research program. Other than the specific changes to fishing gear as set out in this management strategy, this management response does not propose any immediate actions.

Contributing to Goals	Timeframe	Responsibility	Authority
1,3,4	Ongoing	NSW Fisheries	Various

- (c) Develop a code of conduct for the fishery (with performance measures) with respect to:

- (i) guidelines for operating on or near river banks, seagrass, saltmarsh or mangrove habitat and in any other area of environmental sensitivity in a manner that minimises environmental impacts in those areas
- (ii) operating in the vicinity of listed Ramsar⁴ wetlands or known JAMBA & CAMBA migratory bird habitat in a manner that minimises disturbance
- (iii) operating in the vicinity of threatened species, populations and ecological communities
- (iv) the use of gear and behaviour of fishers, enforceable by conditions on licences and endorsements or by use of other regulatory controls
- (v) encouraging the use of effective icing and value-adding techniques to maximise the market price of product taken

⁴ Ramsar wetlands are wetlands of international importance identified through a treaty first signed by 18 countries in the small Iranian town of Ramsar in 1971.

Background: A code of conduct which has the support of surrounding communities can go a long way to improving the relations between the commercial fishing industry and other stakeholders. A code of conduct will be developed for the Estuary General Fishery similar to that used in the Ocean Hauling Fishery which sets standards for the manner in which fishers operate. The code of conduct for the Estuary General Fishery will be developed and periodically reviewed (and amended where necessary) by NSW Fisheries in consultation with the Estuary General MAC. Input from other natural resource agencies (e.g. National Parks and Wildlife Service) will be sought when developing relevant parts of the code. The code of conduct should provide for regional codes and will be enforceable through the share management plan for the Estuary General Fishery.

Contributing to Goals	Timeframe	Responsibility	Authority
1,3,4,5,6,7	By December 2003	NSW Fisheries EG MAC	Voluntary & Regulatory

(d) Continue the prohibition on wilfully damaging marine vegetation

Contributing to Goals	Timeframe	Responsibility	Authority
1,4	Current and ongoing	NSW Fisheries	FM Act

(e) Continue to prohibit the removal (by commercial fishers in this fishery) of large woody debris from estuaries

Background: The removal of large woody debris (snags) from rivers and streams in NSW was declared a key threatening process in November 2001 under the threatened species provisions of the FM Act. NSW Fisheries' policy on woody debris provides for removing snags from commercial fishing grounds. The 'Policy & Guidelines For Aquatic Habitat Management And Fish Conservation' provides for re-aligning snags and if this is not possible then relocating the snag 'out of the way' within close proximity to where the snag was taken.

Contributing to Goals	Timeframe	Responsibility	Authority
1,6	Current and ongoing	NSW Fisheries	Regulatory

Objective 1.3 To reduce the likelihood of this fishery changing species, populations and ecological communities in a manner which threatens ecosystem integrity (ie. composition and function)

Other important responses: 1.1a-h; 1.2a-d; 1.4b; 1.5a-f; 2.1a,c,e-g; 2.1.1b-d; 2.1.2b,c; 2.1.4a-c; 2.2a-c; 2.3a-c; 2.4c; 2.5a-c; 2.5.2a; 4.2b; 6.2a; 6.4a; 7.4a,b

(a) Collaborate with other institutions (such as universities and other research facilities) to improve our understanding of ecosystem functioning and how it is affected by fishing practices

Background: There is a general lack of knowledge about the way in which biodiversity in marine ecosystems is affected by fish harvesting or how to meaningfully measure these effects. This is especially true for diverse and complex systems like the environment in which the Estuary General Fishery operates. NSW Fisheries collaborates with universities and other

institutions in a range of ways such as; offering scholarships and in-kind contributions, collecting specimens and providing fish samples.

Contributing to Goals	Timeframe	Responsibility	Authority
1,6,7	Ongoing	NSW Fisheries	-

- (b) Contribute to relevant biodiversity monitoring programs to develop a performance measure of biodiversity impacts at the species, community and ecosystem levels

Background: There is no simple performance measure currently available to give an accurate representation of the impacts of the Estuary General Fishery on biodiversity. Careful thought must be given to deciding the most appropriate performance measure (and trigger points), so as to avoid expending resources unnecessarily on monitoring unrepresentative or inappropriate indicators. This may require some preliminary research to determine the best approach.

Research that contributes to our understanding of biodiversity is carried out by a number of institutions and a coordinated program is likely to be a key strategy within the aquatic biodiversity strategy currently being developed for NSW.

Contributing to Goals	Timeframe	Responsibility	Authority
1,3,6,7	Current and ongoing	NSW Fisheries	-

- (c) Through a workshop involving key stakeholders and experts, conduct a risk assessment of the impacts of the fishery on the ecosystem, and initiate appropriate management programs (e.g. monitoring) based on the outcomes of that process

Background: The Estuary General Fishery is a large and diverse fishery which is likely to have some level of impact on different components of the ecosystem. The Sustainability Indicators Working Group of the Standing Committee on Fisheries and Aquaculture is in the process of developing a national reporting framework for ESD in fisheries and has completed some work on identifying the main ecosystem components that may be subject to impacts from fishing. Acknowledging that resources are limited, the working group is recommending that Australian fisheries management agencies undertake a risk assessment for each fishery to determine the level of management or reporting necessary for each component of the ecosystem. The working group recommends that this be undertaken through a workshop in order that the outcome is a combined judgement of a group of people who have considerable expertise in the areas being examined.

Should the risk assessment determine that a particular species (other than primary or key secondary species) taken in the Estuary General Fishery requires more rigorous monitoring it will be subject to annual performance monitoring (see management response 2.1.4b).

Contributing to Goals	Timeframe	Responsibility	Authority
1,3,6,7	By December 2004	NSW Fisheries EG MAC	-

- (d) The Estuary General MAC will have the opportunity to comment on the selection and ongoing management of marine protected areas in estuarine waters

Background: A comprehensive system of representative marine protected areas (ie. marine parks and aquatic reserves) is being declared in NSW to protect and enhance marine and estuarine biodiversity. Large marine bioregions have been identified by the Interim Marine and Coastal Regionalisation for Australia (IMCRA) report.

Contributing to Goals	Timeframe	Responsibility	Authority
1,2,3,4,6,7	Current and Ongoing	EG MAC	-

- (e) Promote research on the impacts of estuary general fishing on the general environment, in particular, pursue the research priorities identified in section 6(a) of this management strategy.

Background: Like most fisheries around the world, direct effects of the Estuary General Fishery on the general environment are poorly understood and indirect effects are unknown. The direct impacts of the Estuary General Fishery on habitats and species of importance are not known. The Estuary General Fishery needs to promote and support long-term research that aids understanding of the impact of the fishery in an ecological setting.

Contributing to Goals	Timeframe	Responsibility	Authority
1	Ongoing	NSW Fisheries EG MAC	-

Objective 1.4 To prevent the introduction and translocation of marine pests and diseases

Other important responses: 2.2a; 2.4a,b; 6.4a

- (a) Implement, in consultation with the Estuary General MAC, measures required in accordance with any marine pest or disease management plans

*Background: The Minister for Fisheries or other authorities may alter management arrangements from time to time to minimise or mitigate the impact of marine pests and diseases. A recent example of an outbreak of disease was the mass mortality of pilchards across southern Australia, during which a system of closures and monitoring was implemented in NSW. Fishing closures were also introduced in 2000/2001 to prevent hauling in estuaries infested by the pest seaweed *Caulerpa taxifolia*.*

NSW Fisheries has a pest program team which has three key responsibilities:

- *identifying pest species at high risk of establishment in NSW and developing pest incursion plans for those species*
- *conducting biodiversity surveys and assessing the potential impact of any identified alien species. Potentially high risk species would be recommended for listing as noxious under the FM Act*
- *developing appropriate control measures for noxious species and other established pests.*

Contributing to Goals	Timeframe	Responsibility	Authority
1,2,6	Current and ongoing	NSW Fisheries EG MAC	To be determined

- (b) Continue the prohibition on taking or selling declared 'noxious fish'

Contributing to Goals	Timeframe	Responsibility	Authority
1	Current and ongoing	NSW Fisheries	FM Act

Objective 1.5 To facilitate the rehabilitation of priority areas of estuarine fish habitat to assist in the long term sustainable management of the fishery

Other important responses: 1.2a-d; 2.1h; 2.4a-c; 6.3c

- (a) The Estuary General MAC will provide advice to NSW Fisheries to assist in the mapping of key habitat areas for the fishery that require rehabilitation and will provide information concerning the historical significance of these habitats and the species which once used them

Background: Commercial fishers often know where the key habitat areas for fishery production occurred within an estuary prior to changes to land and water uses (e.g. wetlands, backswamps, creek systems). This knowledge can assist NSW Fisheries Office of Conservation to identify and prioritise sites that may benefit from rehabilitation and potentially contribute to increased fishery production. This knowledge may include identifying the location and original extent of the habitat area, the types of sizes of fish that occupied the area, and the vegetation/habitat values that attracted the fish to these areas. This information may be updated in consultation with the Office of Conservation on a five yearly basis.

Contributing to Goals	Timeframe	Responsibility	Authority
1,2,5,6,7	2002 and reviewed every 5 years	EG MAC	-

- (b) The Estuary General MAC will review NSW Fisheries' habitat rehabilitation and conservation research programs to provide advice on priority issues and habitat areas for the fishery

Background: The NSW Fisheries Office of Conservation has program plans which outline its priorities for habitat rehabilitation and conservation research in NSW. The plans aim to target funding bids and staff activities towards achieving the defined priorities. These plans should be reviewed annually by the Estuary General MAC to provide advice and input on the priority issues and habitat areas which should be addressed to benefit the fishery and associated fish habitat.

Contributing to Goals	Timeframe	Responsibility	Authority
1,2,5,6,7	Annually	EG MAC	-

- (c) The Estuary General MAC will review and provide advice on the development of estuarine habitat management and rehabilitation strategies developed by NSW Fisheries and other agencies; in particular through reviewing estuary management plans, floodplain management plans, floodgate management plans, wetland management plans, habitat protection plans, water and catchment management plans, aquatic reserve and marine protected area strategies

Background: The NSW Government has a range of natural resource management planning processes underway which affect the management of estuaries within NSW. While several of these forums have commercial fishery representation, there is limited direct consultation and input from the Estuary General Fishery on their development and implementation. A process will be developed in consultation with NSW Fisheries Office of Conservation and the Estuary General MAC to allow for input into these processes. This process can also be used to allow fishers to provide advice to NSW Fisheries Office of Conservation staff on development applications which may potentially impact on estuarine fish habitat or fishing activities.

Contributing to Goals	Timeframe	Responsibility	Authority
1,2,5,6,7	Ongoing	EG MAC	-

- (d) The Estuary General MAC will review habitat rehabilitation and research applications developed by NSW Fisheries to provide advice as to whether they provide benefit for the fishery and focus on priority issues and key habitat areas

Contributing to Goals	Timeframe	Responsibility	Authority
1,2,5,6	Annually	EG MAC	-

- (e) The Estuary General MAC will advise NSW Fisheries to assist in nominating priority habitat areas for the fishery for protection and management, including fishing closures, aquatic reserves and marine protected areas

Contributing to Goals	Timeframe	Responsibility	Authority
1,2,5,6	Ongoing	EG MAC	-

- (f) The Estuary General MAC will provide advice to NSW Fisheries to assist in reviewing the role, responsibilities and membership of the habitat monitor program to ensure the program includes a focus on habitat issues of importance to the fishery

Background: The habitat monitors program was established to provide an important communication link between NSW Fisheries and commercial fishers on habitat management issues. The program requires review to ensure that the role, responsibilities and membership reflect the current requirements of the fishery and NSW Fisheries in ensuring that habitat management issues are being communicated and addressed.

Contributing to Goals	Timeframe	Responsibility	Authority
1,2,5,6,7	Ongoing	EG MAC	-

GOAL 2. To maintain fish populations harvested by the Estuary General Fishery at biologically sustainable levels

It is important that the fishery operates at a level where the harvesting of fish is conducted in a manner that minimises the risk of overfishing the stocks. The Estuary General Fishery as a whole has maintained very stable catch rates over a long period. The biology of most of the principal species captured reflects a fishery based on fish that are generally fast growing, highly fecund and with variable growth rates. The stocks of the main species are therefore less vulnerable to recruitment overfishing than the target species in many other fisheries.

Because the fishery is managed by input controls, the key issue with respect to controlling the level of harvest is controlling the amount of fishing effort that is applied to the stock. Controlling fishing effort can include very specific measures such as regulating the size and dimensions of the fishing gear used, but at a broader level involves measures such as controls on the number of fishers who have access to (or are 'endorsed' to operate in) each part of the fishery.

Objective 2.1 To ensure that the quantity and composition (e.g. size, age, sex) of harvested fish of each species does not result in overfishing

Other important responses: 1.1a,b,d-h; 1.2a; 1.3d; 2.1a; 2.2a-c; 2.3a-c; 2.5a-c; 2.5.2a; 4.1a,b; 4.2a-c; 5.2a; 5.4b; 6.1a,b,e; 6.2a,b; 6.3c; 7.3c, 7.4a,b

- (a) Limit the estuaries and the gear types permitted to be used in each estuary to those listed in Appendix 3 (subject to other applicable controls)

Contributing to Goals	Timeframe	Responsibility	Authority
1,2,3,4,5	By December 2002	NSW Fisheries	Regulatory

- (b) Monitor total commercial landings in each estuary (by species) and evaluate, where available, landings by other sectors and in adjacent State or Commonwealth fisheries

Note: Where practical, monitoring should include verification against information sources that are independent of landings records originating from the fishery.

Contributing to Goals	Timeframe	Responsibility	Authority
2,4,7	Annually	NSW Fisheries	-

- (c) Promote research that contributes to more robust and reliable fish stock assessments and continue to involve the Estuary General MAC in prioritising research programs

Background: A clear expression of the relative priorities for stock assessment work is essential to ensure the most effective use of resources used for stock assessment. Making priorities for stock assessment and other research publicly available helps other institutions (e.g. universities) in determining directions for future research that may benefit the fishery.

Contributing to Goals	Timeframe	Responsibility	Authority
2,7	Current and ongoing	NSW Fisheries	-

- (d) Continue to use size limits on selected species to prevent the exploitation of juvenile, sub-adult and, where appropriate, mature fish

Background: Minimum legal lengths apply to many of the species in the Estuary General Fishery including all primary finfish species (see Table 7). To address a growth overfishing problem with respect to snapper, the minimum legal length for that species increased on 1 July 2001 from 28 cm to 30 cm.

Contributing to Goals	Timeframe	Responsibility	Authority
2,4,5	Current and ongoing	NSW Fisheries	Regulatory

- (e) Consider the need for minimum legal lengths for key secondary and secondary species

Background: Blue swimmer crab and mullocky are key secondary species already subject to legal length restrictions. A further five secondary species also have a minimum legal length in place (see Table 7). Several programs may result in minimum legal size limits being applied to secondary species that do not already have size limits. These include, but are not limited to, research, the development of management strategies for other NSW designated fishing activities and any recovery programs developed for overfished species.

Contributing to Goals	Timeframe	Responsibility	Authority
2,4	To be agreed by the Director-General of Planning NSW and the Minister for Fisheries	NSW Fisheries	Regulatory

- (f) Continue the prohibition on the taking of all female crabs carrying ova

Contributing to Goals	Timeframe	Responsibility	Authority
1,2	Current and ongoing	NSW Fisheries	Regulatory

- (g) Continue the prohibition on the use of unregistered fishing nets in the fishery (with the exception of hoop or lift nets and dip or scoop nets)

Contributing to Goals	Timeframe	Responsibility	Authority
1,2,4,6	Current and ongoing	NSW Fisheries	Regulatory

- (h) Subject to approval by the Minister for Fisheries, provide for the development of species based resource plans and/or area based resource plans in consultation with the Estuary General MAC, relevant stakeholders and the public as appropriate

Background: The NSW Government has established an Estuary Management program for many of the State's estuary systems. Estuary Management Committees are formed and funded

by Department of Land and Water Conservation and local council(s) with representation from State Government agencies (NSW Fisheries, National Parks and Wildlife Service, NSW Waterways, etc.) and local community interest groups. These committees operate within the provisions of the Estuary Management Policy and meetings take place approximately every three months.

Estuary Management Committees oversee the development and implementation of Estuary Management Plans. NSW Fisheries is normally represented by a local Fisheries Officer or a Conservation Manager. NSW Fisheries representatives are required to provide data, information and advice relating to commercial and recreational fishing, aquaculture and aquatic habitat protection. The committees can be a useful forum for initiating improved management practices in estuaries and rehabilitating fish habitats. It should also be noted that management response 6.3c provides for local joint industry/NSW Fisheries working groups to advise on local fishery management needs and arrangements.

If there are found to be benefits in producing plans of management for particular species or areas relevant to the Estuary General Fishery over and above the existing programs, the management strategy provides for their development subject to approval by the Minister for Fisheries.

Contributing to Goals	Timeframe	Responsibility	Authority
1,2,4	As required	NSW Fisheries	-

Objective 2.1.1 To maintain the stock of the primary species (yellowfin bream, sand whiting, dusky flathead, sea (bully) mullet, luderick, eels, mud crabs, school prawns, king prawns and pipis) at or above a level that minimises the risk of overfishing

- (a) Review and where appropriate implement minimum legal lengths for the primary finfish species to give a high probability that at least 50% of the fish of each particular species landed have reached reproductive maturity (unless alternative strategies apply to individual species)

Background: It is a generally accepted principle that the minimum legal length for finfish should be set such that at least 50% of the individuals of the species have spawned prior to capture. It is important however, to maintain the natural sex ratio in the population. As noted in the proposed response, there may be exceptions for some species.

Size limits are already in place for all primary finfish species. A periodic review of all size limits, involving community consultation, is conducted. If in the interim, additional information becomes available indicating that a size limit needs to be introduced or changed prior to the periodic review, the appropriate action is taken.

Contributing to Goals	Timeframe	Responsibility	Authority
2,4	In accordance with a timeframe agreed between the Director General of Planning NSW and the Minister for Fisheries	NSW Fisheries	Regulatory

- (b) Monitor the total commercial landings of each primary species annually for comparison against reference levels (see Table 17)

Background: Until biologically based performance indicators are implemented for primary species, the most recent year's available landings data will be used as the reference level around which to calculate single year trigger levels.

Contributing to Goals	Timeframe	Responsibility	Authority
1,2,4,7	Annually	NSW Fisheries	-

- (c) Develop a system for and conduct a formal stock assessment of the primary species within five years and review the assessment at least every three years thereafter

Background: The quantity of information available to assess fish stocks varies for each primary species, ranging from having completed major projects to having little information to include in an assessment beyond catch and effort information. Stock assessments for primary species will allow a change from landings-based monitoring to the use of biological reference points for monitoring stock status and fishery performance, and will provide for more accurate determination of sustainable levels of harvest for those species.

It is important to note that stock assessments are done on a species basis and are therefore reliant on harvest estimates from all sectors and adjacent jurisdictions. Future fishery-independent survey work will contribute more robust data towards stock assessments. See section 6(a) for a description of the fishery independent sampling program.

A stock assessment process will be proposed within 12 months of the management strategy commencing. An ongoing three year review of stock assessments is important for ensuring ongoing improvement of the assessments and the research programs providing information for them. An important part of the review of stock assessments will include reviewing the trigger points (biological reference points) for each species (see section 9(g)).

Contributing to Goals	Timeframe	Responsibility	Authority
1,2,4,5,7	From 2003	NSW Fisheries	-

- (d) The Minister for Fisheries will require the Total Allowable Catch Setting and Review Committee to make determinations relating to the maximum level of effort that may be applied to prawn stocks, after receiving advice from the Estuary General MAC and other stakeholders

Note: Under the Fisheries Management Act 1994, the TAC Committee can recommend total catch levels and/or total effort levels. Section 7(d) of this management strategy outlines the process by which the total allowable effort would be determined and allocated between fishing sectors.

Contributing to Goals	Timeframe	Responsibility	Authority
1,2,4	From 2003	NSW Fisheries EG MAC	Section 28(4) of the FM Act

Objective 2.1.2 To maintain local (catchment based) populations of glass eels and adult eels

(a) Monitor commercial landings of adult longfin and shortfin eels in each catchment

Contributing to Goals	Timeframe	Responsibility	Authority
2,7	Annually	NSW Fisheries	-

(b) Evaluate the quantity of eels taken for aquaculture purposes within stock assessment and monitoring processes

Background: Each year a limited quantity of eels are allocated to aquaculture permit holders and there are restrictions on the quantity that can be taken from each catchment area. It is important to take this harvest into account during the monitoring and assessment of eel stocks.

Contributing to Goals	Timeframe	Responsibility	Authority
1,2,4	Annually	NSW Fisheries	-

(c) Finalise the current review of eel harvesting and implement the outcomes

Background: A review is underway examining issues of trap design, bycatch reduction (specifically to exclude mammals and freshwater turtles), appropriateness of the current minimum legal size, eel fishing in farm dams, impoundments and aquaculture facilities, and glass eel harvesting.

Contributing to Goals	Timeframe	Responsibility	Authority
1,2,3,4	By December 2002	NSW Fisheries	To be determined

Objective 2.1.3 To contribute to the sustainability of the mud crab stock and to prevent localised depletion of mud crab populations in NSW waters

(a) Monitor commercial landings of mud crabs in each estuary

Background: Juvenile mud crabs recruit to particular estuaries and, other than migration to ocean waters for spawning, it is thought that they remain in that particular estuary for their entire life. For this reason, it is prudent to place increased emphasis on monitoring mud crab harvest on an estuary specific basis.

Contributing to Goals	Timeframe	Responsibility	Authority
2,4,7	Annually	NSW Fisheries	-

(b) Implement the approved recommendations of the review by NSW Fisheries and the Estuary General MAC in relation to fish and crab trapping

Background: A review was conducted in 1999/2000 relating to the use of excessive numbers of crab traps in estuaries and the appropriateness of the endorsement structure in the fishery. The review considered changes to the size and marking requirements of traps to improve compliance capabilities, and that a general 'trapping endorsement' allowing the use of both crab traps and fish traps would be a better alternative to the current separate 'fish trap' and

'mud crab trap' endorsement structure. The review recommended that fishers who hold either endorsement would be permitted to use ten traps, while fishers who hold both endorsements would be permitted to use 20 traps.

Contributing to Goals	Timeframe	Responsibility	Authority
1,2,6	By July 2003	NSW Fisheries EG MAC	Regulatory

(c) Consider the feasibility of implementing a tradeable crab trap regime based on shareholdings

Background: The Estuary General MAC has previously discussed the development of a tradeable trap management regime for the crab fishery (including mud crabs and blue swimmer crabs), and the share management fishery regime may provide an efficient way of administering such a scheme. The implementation of a tradeable trap regime would need to take into consideration any implications from the review of fish and crab trapping outlined in response 2.1.3(b).

Contributing to Goals	Timeframe	Responsibility	Authority
2,5,6	By December 2003	NSW Fisheries EG MAC	-

Objective 2.1.4 To detect fluctuations in commercial landings of the following key secondary species, and other secondary species, beyond reference points: mullet, silver biddy, flat tail mullet, river garfish, trumpeter whiting, blue swimmer crabs, greasyback prawn, cockles and beachworms

(a) Monitor the total commercial landings of each key secondary species and species subsequently identified as requiring additional monitoring as a result of implementing management response 1.3c annually for comparison against reference levels

Background: A number of secondary species have been selected as 'key secondary species' because they are subject to more rigorous performance monitoring requirements than other secondary species. The reference levels to apply to the key secondary species are discussed in section 9 and specified in Table 17).

Contributing to Goals	Timeframe	Responsibility	Authority
1,2,4,7	Annually	NSW Fisheries	-

(b) Monitor the commercial landings of all other secondary species taken in the fishery annually for comparison against an historical range for each of those species

Background: The catch of each other secondary species will be monitored to determine if it is outside the range of catches (ie. lowest and highest annual catches) within the period 1984/85 to 2000/01 (except those identified as requiring more rigorous performance monitoring under management response 1.3c).

Contributing to Goals	Timeframe	Responsibility	Authority
1,2,4,7	Annually	NSW Fisheries	-

- (c) Develop an objective system for defining and setting trigger points to detect concerning trends in landings of all species permitted to be taken in the Estuary General Fishery

Background: Unlike annual trigger points which are designed to detect dramatic changes over short periods, these trigger points are designed to detect patterns in landings that are of sufficient concern to require a review (e.g. a downward or upward trend over several years). The assistance of a statistical expert will be sought to develop the system for setting this type of trigger point. The system will be tested during the first nine months following the commencement of the management strategy and applied to all species taken in the fishery at the first annual review. (See section 9f for a more detailed discussion on setting trigger points for monitoring changes in commercial landings).

Contributing to Goals	Timeframe	Responsibility	Authority
1,2,4,7	Annually from 2003	NSW Fisheries	-

Objective 2.2 To conserve fish stocks by managing levels of active effort in the fishery

Other important responses: 1.1e,g,h; 1.2a; 1.3d; 2.1a,g; 2.1.1d; 2.1.2b; 2.1.3b; 2.5a-c; 2.5.2a; 4.1b; 5.2a; 6.1a,b,e; 6.2a,b

- (a) Implement a zoning scheme in the Estuary General Fishery

Background: A zoning scheme has been approved by the Minister for Fisheries and is currently being implemented (see section 4(g)).

Contributing to Goals	Timeframe	Responsibility	Authority
1,2,4,	By December 2002	NSW Fisheries	Various

- (b) Identify the level of active effort (as opposed to latent effort) in each endorsement type and region, and implement minimum shareholdings over set time periods to ensure that the level of active effort does not exceed historical levels (provided that those levels are biologically sustainable)

Background: Minimum shareholdings can be used to control the overall number of fishers in a fishery, or the number of fishers able to access particular components (e.g. methods) within a fishery. The use of minimum shareholdings provides a dynamic framework to allow for the ongoing adjustment of share packages within the fishery. This adjustment is funded by industry through the selling and buying of shares.

The fishery management strategy addresses the potential for existing operators to increase their activity in endorsement types they have had little involvement in. 'Active effort' and 'historical levels' will be determined using data on historic participation levels and current endorsement numbers. NSW Fisheries' status reports and stock assessments (when available) will be used to determine biologically sustainable effort levels.

Contributing to Goals	Timeframe	Responsibility	Authority
1,2,4,5	By December 2003 and ongoing	NSW Fisheries	Regulatory

- (c) Continue the licensing arrangements described in the proposed harvesting strategy (see section 4(b) of this management strategy)

Contributing to Goals	Timeframe	Responsibility	Authority
1,2,4,5,6,7	Current and ongoing	NSW Fisheries	Various

Objective 2.3 To prevent the activation of latent (unused) fishing effort by new entrants

Other important responses: 2.1.1d; 2.2b,c

- (a) Implement an owner-operator rule for estuary general fishing businesses (ie. no new nominations and sunset existing nominations), except in cases of short term illness

Background: There have been notable instances where fishers who have worked their entitlements very little in recent years have used the existing nomination provisions to 'pass' their entitlements to new entrants who work at significantly greater levels than the owner had been, thus substantially increasing the level of effort in the fishery.

Contributing to Goals	Timeframe	Responsibility	Authority
1,2,4,5,6	By December 2003	NSW Fisheries	Regulatory

- (b) Establish minimum entry requirements for new entrants at the fishing business level (ie. taking into account entitlements held in other fisheries) to prevent increases in effort by small businesses

Background: Similar to how the current Recognised Fishing Operation policy works, safeguards are needed to ensure that new entrants to the fishery replace active fishing businesses before they can operate. This response also provides a mechanism for structural adjustment in the fishery to improve the economic viability of fishing.

The best available information suggests that about 50% of the endorsement holders take only 10% of the fishery revenue. Operators need to be in a position, by 2008, to afford to pay for the attributable costs of management from their fishing revenue. Viable fishing businesses also have a greater incentive to support long term management decisions that are needed now and into the future.

The Estuary General Fishery has for many years involved some component of lifestyle. A number of fishing businesses operate on a 'part time' basis, with fishers only working during times of peak catches or often when commitments in other fields of employment allow. NSW has a large residential coastal population and a significant recreational fishery. The community has made it clear in the past that commercial style netting in estuaries, particularly for reasons of lifestyle or recreation, is not favoured. It is the Government's intention to encourage a full time professional fishing industry, and this response will assist in achieving that.

Contributing to Goals	Timeframe	Responsibility	Authority
1,2,4,5	By December 2003	NSW Fisheries	Regulatory

- (c) Continue the prohibition on unlicensed crew from operating in the fishery (with the current exception that applies to prawn seining to a boat)

Contributing to Goals	Timeframe	Responsibility	Authority
1,2,4,5	Current and ongoing	NSW Fisheries	FM Act

Objective 2.4 To minimise the impact of activities external to the Estuary General Fishery on the resources harvested by the fishery and on fishery related habitats

Other important responses: 1.3d 1.4a; 1.5a-f; 2.1.1a,d; 2.5a,b; 4.2c; 6.3c

- (a) NSW Fisheries will continue to review, provide relevant advice and where appropriate under the *Fisheries Management Act 1994*, impose conditions in order to avoid or minimise impacts on fishery resources from coastal developments

Background: Development applications submitted under the Environmental Planning and Assessment Act 1979 that have the potential to adversely impact on fish or fish habitat are often referred to NSW Fisheries for review and comment. Using legislative powers under the FM Act, NSW Fisheries has the ability to recommend the refusal of a development (if inconsistent with the Act or Policy and Guidelines for Aquatic Habitat Management and Fish Conservation 1999), recommend the approval of a development without changes, or in some circumstances, recommend the approval of a development with conditions to be attached which limit the potential impacts of the activity. Where issues do not fall within the legislative jurisdiction of NSW Fisheries, the Department may still provide advice to the relevant determining authority to ensure that these issues are considered and appropriately addressed.

Contributing to Goals	Timeframe	Responsibility	Authority
1,2,7	Current and ongoing	NSW Fisheries	EP&A Act FM Act

- (b) The Estuary General MAC will consider the impacts on the resource of activities external to the fishery and bring any detrimental impacts to the attention of NSW Fisheries and/or the relevant managing agency

Contributing to Goals	Timeframe	Responsibility	Authority
1,2,5,6,7	Current and ongoing	EG MAC	-

- (c) NSW Fisheries and commercial fishers will contribute to the development of policies or legislation established by the NSW Government to ensure that fish stock and habitat issues (including beach habitat) are properly considered in other environmental planning regimes

Background: NSW Fisheries and fisheries stakeholders are already represented on many natural resource management committees that operate across the State (e.g. Catchment Management Boards, Healthy Rivers Commission, Coastal Council of NSW, etc.)

Contributing to Goals	Timeframe	Responsibility	Authority
1,2,6,7	Current and ongoing	NSW Fisheries EG fishers	-

Objective 2.5 To promote the recovery of overfished species

Other important responses: 1.1g; 1.5a-f; 2.1a,c,d; 2.1.1a; 2.1.4b; 2.2a-c; 2.3a-c; 4.2c

- (a) Where the fishery is a major harvester of an overfished species, develop and implement a recovery program for the species within a specified timeframe

Contributing to Goals	Timeframe	Responsibility	Authority
1,2,4,5,6	Recovery program drafted for consultation within 6 months	NSW Fisheries EG MAC	To be determined

- (b) Where the fishery is a minor harvester of an overfished species, contribute to the development of a recovery program for the species and adopt any measures required by that program

Contributing to Goals	Timeframe	Responsibility	Authority
1,2,4,5,6	As required	NSW Fisheries EG MAC	To be determined

- (c) During the period of development of a recovery program for a species that has been determined as being recruitment overfished, implement precautionary actions including, but not limited to, any of the following:

- total harvest controls
- reductions in effort associated with the harvest of the species
- the implementation of fishing closures
- bycatch management provisions
- mandatory gear changes.

Background: In the event that a species is determined to be recruitment overfished urgent action is needed to prevent the risk of a stock collapse. Growth overfishing on the other hand relates to maximising the yield from the stock and does not necessarily require immediate measures prior to the introduction of a recovery program.

Contributing to Goals	Timeframe	Responsibility	Authority
1,2,6	As required	NSW Fisheries	Various

Objective 2.5.1 To assist in the development of a recovery program for silver trevally

- (a) Participate in any consultation with other harvest sectors of silver trevally over the development of a recovery program for that species, in particular consider the introduction of an appropriate size limit to address the growth overfishing problem

Background: Data available for both commercial and recreational catches since the late 1980s strongly suggest a significant reduction in the mean size of silver trevally. Yield modelling indicates silver trevally are being caught well below the optimum size, and the analyses suggest that the silver trevally stock is growth overfished. Significant increases in yield (per recruit) would be expected to result from increasing the size at first capture, at current exploitation rates.

Contributing to Goals	Timeframe	Responsibility	Authority
2,6	Current and ongoing	NSW Fisheries EG MAC	-

Objective 2.5.2 To assist in the development of a recovery program for sea garfish

- (a) Prevent the taking of sea garfish in the fishery whilst a recovery program for the species is being developed through the ocean hauling fishery

Background: Sea garfish are found in ocean waters throughout NSW and are also found in the lower reaches of estuaries. The life history is poorly understood. Juveniles are known to occur in estuaries and spawning most likely occurs in coastal waters. Sea garfish are predominantly taken in the Ocean Hauling Fishery, and comprise less than 0.1% of the estuary general commercial catch. The draft fishery management strategy for the Ocean Hauling Fishery has identified sea garfish as most likely to have been recruitment overfished and that the species is being caught at levels generally lowest on record. There is an urgent need to improve biological knowledge of and the assessment for this species to ensure appropriate management settings. The development of a recovery program for sea garfish commenced with the preparation of a draft FMS for the Ocean Hauling Fishery. Note that river garfish, which are taken in much greater quantities in estuaries, should not be confused with sea garfish.

Contributing to Goals	Timeframe	Responsibility	Authority
1,2,6	By December 2002	NSW Fisheries	Regulatory

GOAL 3. To promote the conservation of threatened species, populations and ecological communities associated with the operation of the Estuary General Fishery

Activities that impact on species, populations or ecological communities that are listed as being threatened must, under several pieces of state and federal legislation, be modified or phased out so as to mitigate those impacts. Protected animals must also receive a higher conservation status. This includes threatened mammals, birds, and reptiles, as well as fish species and could include habitats that are critical to the survival of such animals.

While there are no firm data, it is thought that the impact of the Estuary General Fishery on threatened species, populations and ecological communities is small. Nevertheless, it is important to quantify and monitor any threatened species interactions, and have a management framework that is adaptive to change in the event that impacts are identified and found to be unacceptable.

Objective 3.1 To identify, eliminate and/or minimise any impact of fishing activities in the fishery on threatened species, populations and ecological communities (including mammals, birds, reptiles, amphibians, fish, invertebrates and vegetation), and where possible promote their recovery

Other important responses: 1.1f,g; 1.2a-c; 1.3b-d; 2.1a; 2.1.2c; 6.4a

- (a) Modify the reporting system, in consultation with the Estuary General MAC, so as to collect information on sightings and captures of threatened or protected species using catch returns

Background: The guidelines for a “ecologically sustainable” fishery approved by the Commonwealth under the Environment Protection and Biodiversity Conservation Act 1999 include a requirement to collect information on interactions with endangered, threatened or protected species and threatened ecological communities. These species, populations and communities are listed in the FM Act, Threatened Species Conservation Act 1995 and the EPBC Act.

Contributing to Goals	Timeframe	Responsibility	Authority
3,6,7	By December 2002	NSW Fisheries EG fishers	-

- (b) Implement, in consultation with the Estuary General MAC, the provisions of any relevant threatened species recovery plans or threat abatement plans

Note: The recovery plans referred to in this response could include those being developed under the Fisheries Management Act 1994, the Threatened Species Conservation Act 1995 or other State or Commonwealth legislation. This response recognises that the statutory provisions of a threatened species recovery plan must be implemented and given precedence over the provisions of this management strategy.

Contributing to Goals	Timeframe	Responsibility	Authority
3,6,7	As required	NSW Fisheries EG MAC	Various

- (c) Continue the prohibition on taking protected fish and on fish protected from commercial fishing as set out in the *Fisheries Management (General) Regulation 1995*

Background: 'Protected fish' refers to species of fish that are protected from all forms of fishing. 'Fish protected from commercial fishing' as the name suggests, refers to species of fish that are protected from commercial fishing only. Protected fish includes species identified as threatened, endangered or vulnerable under the Fisheries Management Act 1994.

At the time of drafting this management strategy, the marine and estuarine species of protected fish included Ballina angelfish, black rock cod, eastern blue devil fish, elegant wrasse, estuary cod, giant Queensland groper, grey nurse shark, Herbsts nurse shark, great white shark, and weedy sea dragon. Fish protected from commercial fishing included marlin (black, blue and striped), groper (blue, brown and red), Australian bass and estuary perch.

Contributing to Goals	Timeframe	Responsibility	Authority
3,4	Current and ongoing	NSW Fisheries	FM Act

- (d) Continue the prohibition of taking any species in commercial fishing operations protected under other jurisdictions' arrangements (this may include invertebrates, fish, reptiles, birds, mammals, plants etc.)

Background: Protected species are identified under the NSW Threatened Species Conservation Act 1995, the NSW National Parks and Wildlife Act 1974, and the Commonwealth Environment Protection and Biodiversity Conservation Act 1999.

Contributing to Goals	Timeframe	Responsibility	Authority
3,4,6	As required	NSW Fisheries	Various

GOAL 4. To appropriately share the resource and carry out fishing in a manner that minimises social impacts

The Estuary General Fishery operates in close proximity to many residential areas, popular tourism destinations and other general users of the State's waterways. It also harvests species of fish that are actively targeted in other commercial fisheries, the charter boat fishery and the recreational fishery, or that may have significant conservation value. The interaction among commercial fishers and between estuary general fishers and other stakeholders is a significant issue in this fishery that requires careful management.

Objective 4.1 To monitor and provide an appropriate allocation of the fisheries resource between fishing sector groups, acknowledging the need of seafood consumers to access fresh quality fish

Other important responses: 1.1e,g; 1.2a; 2.1a,b,d,e,g,h; 2.1.1a-d; 2.1.2b; 2.1.4a,b,c; 2.2a-c; 2.3a-c; 2.5a,b; 4.2a; 4.5a; 6.2a,b; 6.3c; 7.4b

- (a) Estimate, as far as practicable, the size of the non-commercial catch for use in stock assessment models, and the relative impact of such harvesting on the resource, taking into account the results of the National Recreational and Indigenous Fishing Survey and information obtained from charter fishing boat logbooks

Note: The Recreational and Indigenous Fishing Survey research report was not published at the time of writing the management strategy.

In November 2000, a licensing scheme was introduced for all marine and estuarine charter boat operators. These operators are required to record catches taken on board licensed charter vessels as part of a mandatory logbook program. Estimates of harvest rates from all sectors will be used in stock assessments.

The non-commercial catch includes any 'black market' catch sold by both licensed and unlicensed fishers.

Contributing to Goals	Timeframe	Responsibility	Authority
2,4,7	By June 2003	NSW Fisheries	-

- (b) Continue the requirement that species landed in this fishery are not landed in contravention of any maximum daily catch or 'trip' limit that may apply to particular species

Background: At the time of drafting this management strategy, a daily catch limit applied to two species taken in the Estuary General Fishery. A limit of 100 kg per hauling crew, 50 kg per meshing crew (or individual) and 50 kg for any other licensed commercial fishing vessel containing a commercial fishing net applies for Australian salmon north of Barrenjoey Headland and tailor taken in all NSW waters.

Contributing to Goals	Timeframe	Responsibility	Authority
2,4	Current and ongoing	NSW Fisheries	Various

Objective 4.2 To monitor and manage a fair and equitable sharing of the fisheries resource among commercial fisheries

Other important responses: 1.1e,g; 1.2a; 2.1a,b,d,e,g,h; 2.1.1a-d; 2.1.4b,c; 2.2b,c; 2.3a,c; 2.5a,b; 4.1b; 4.2a; 6.2a,b; 6.3c; 7.4b

- (a) Monitor the catch of the primary estuary general species that are also taken in other commercial fisheries (ie. ocean trap and line, estuary prawn trawl, etc)

Contributing to Goals	Timeframe	Responsibility	Authority
2,4,7	Annually	NSW Fisheries	-

- (b) Through cross fishery stakeholder consultation, determine an appropriate size at first capture for king prawn and school prawn species.

Background: Cross fishery consultation will allow issues relating to commonly shared prawn stocks to be addressed. Other fisheries proposed to be represented include the Estuary Prawn Trawl Fishery, the Ocean Prawn Trawl Fishery and the Recreational Fishery.

Controlling the size at first capture is similar to a legal length restriction. As well as sharing the resource, it can assist in conserving stocks and promote recruitment to the spawning population. In the case of prawns it is difficult to administer a minimum legal length because of the quantities of individuals landed. Therefore a maximum count of prawns (ie. number to the half kilogram) can be used instead. Trial shots can be used to determine when an area should be open and closed to prawning and counts can be periodically reviewed as more precise information becomes available on the growth and mortality of prawns.

Information on the growth and mortality of eastern king prawns will be reviewed by July 2004 and a research project investigating the growth and mortality of school prawns is due to be completed by 2006. These studies will assist future decisions made about maximum prawn counts. Once an appropriate size has been determined, the use of prawn gear in the Estuary General Fishery (such as times of operation) should be modified appropriately.

Contributing to Goals	Timeframe	Responsibility	Authority
1,2,4,5	As required from 2003	NSW Fisheries	Various

- (c) Review, in consultation with the Estuary General MAC and Ocean Hauling MAC, the use of the garfish hauling and garfish bullringing nets in the Estuary General Fishery and the Ocean Hauling Fishery with the aim of:

- removing the garfish hauling method from the Estuary General Fishery, and
- removing the garfish bullringing method from the Ocean Hauling Fishery.

Background: The Ocean Hauling MAC has made clear it's view that the garfish bullringing net operates as a meshing net and should not be used in the Ocean Hauling Fishery. Similarly the Estuary General MAC has expressed concern about the garfish hauling net, traditionally an ocean based method, being used in the Estuary General Fishery.

This management response may assist the sea garfish recovery program proposed in the draft Ocean Hauling Fishery Management Strategy.

Contributing to Goals	Timeframe	Responsibility	Authority
2,4,6	By July 2003	NSW Fisheries EG MAC	-

Objective 4.3 To monitor and manage a fair and equitable sharing of the fisheries resource within the Estuary General Fishery

Other important responses: 1.1e,g; 1.2a; 2.1a,d,e,g,h; 2.1.1a,c,d; 2.1.2c; 2.1.3a,c; 2.1.4c; 2.2a-c; 2.3a,c; 2.5a,b; 5.2a; 6.1d; 6.2a,b; 6.3c; 7.4b; 7.5a,b

- (a) Monitor the relative catch of the primary and key secondary species taken by meshing, hauling, trapping, and hand lining methods

Contributing to Goals	Timeframe	Responsibility	Authority
4,7	Annually	NSW Fisheries	-

- (b) Prohibit shareholders in the fishery from owning more than 5% of the total number of each class of share issued in the fishery

Contributing to Goals	Timeframe	Responsibility	Authority
4,5	By December 2003	NSW Fisheries	Regulatory

Objective 4.4 To minimise any negative impacts of the Estuary General Fishery on Aboriginal or other cultural heritage

Other important response: 4.1a; 6.4a

- (a) Participate in the development of and subsequent reviews of any Indigenous fisheries strategies

Contributing to Goals	Timeframe	Responsibility	Authority
4,6	As required	NSW Fisheries	-

- (b) Consult the Aboriginal Sites Register administered by the National Parks and Wildlife Service and coastal Aboriginal Land Councils when identifying designated landing sites (see management response 1.2a(ii)), and wherever practicable avoid hauling over known Aboriginal sites

Contributing to Goals	Timeframe	Responsibility	Authority
4,6	Current and ongoing	EG MAC	To be determined

Objective 4.5 To promote harmony between the commercial fishery and other resource users, including recreational fishers, Indigenous fishers and local communities, through fair and equitable sharing of the fisheries resource

Other important responses: 1.1b,c,e,g,h; 1.2a-d; 1.3d; 2.1a,d,e,h; 2.1.1a,d; 2.1.2c; 2.2a-d; 2.3a-c; 3.1c; 4.1a,b; 4.2b; 4.3b; 4.4a,b; 6.1b; 6.3b,c; 6.4a; 7.1a-c; 7.2a; 7.4a

- (a) Consult with the community on proposals for recognised fishing grounds made, subject to and in accordance with the guidelines approved by the Minister, over historical fish hauling, prawn hauling, prawn running and prawn set pocket net sites.

Background: Recognised fishing grounds determine the rights of priority for certain methods between commercial fishers and other waterway users in specified areas. They do not prevent local Councils from approving applications for development in or over those areas, but they can be useful in highlighting areas of importance for commercial fishing. Draft guidelines for declaring recognised fishing grounds in the Estuary General Fishery are provided in section 4(h) of this management strategy.

Contributing to Goals	Timeframe	Responsibility	Authority
4,5,6	Ongoing	NSW Fisheries EG MAC	FM Act & Regulatory

- (b) Continue to administer the code of conduct in the Clarence River relating to the modification of prawn set pocket net operations to reduce the impact of noise on the surrounding community

Background: Fishers from the Clarence River operate under a local code of conduct which limits the level of noise made by prawn set pocket net boats during their operation, specifically noise emanating from boats using their engines and propellers to stimulate water flow through the nets, from marine radios and from gas fired prawn cookers.

Contributing to Goals	Timeframe	Responsibility	Authority
4,6,7	Current and ongoing	EG fishers	Voluntary

GOAL 5. To promote a viable commercial fishery (consistent with ecological sustainability)

In terms of gross value of production, the Estuary General Fishery is worth approximately \$20 million annually (not including revenue received from the export market which generally yields higher prices). An economic survey of the Estuary General Fishery carried out in 2001 showed that only a small proportion of the respondents (20%) are making an economic surplus. With the progressive phase in of full cost recovery of attributable costs between year 2005 and 2008, estuary general fishers need to be in a position to fund a greater proportion of the management costs. Viable fishing businesses have a greater incentive to support long term management decisions that are needed for sustainability now and into the future.

Objective 5.1 To optimise the biological yield of fish taken within the fishery where appropriate to maximise economic return

Other important responses: 1.1a,g; 1.2a; 2.1a,d,e; 2.1.1a-c; 2.5a,b,c; 4.1a; 4.2b; 6.3c; 7.5a

Objective 5.2 To promote the long term economic viability of estuary general fishing

Other important responses: 1.1a; 1.2a,c; 1.5a-f; 2.1.3c; 2.2b,c,d; 2.3a-c; 2.5a,b; 4.1a; 4.2b; 4.3b; 5.3a; 6.1d; 7.5a,b

- (a) Use minimum shareholding provisions, either as a trigger point response or in accordance with the share management plan, to adjust the number of estuary general fishing businesses to a level which improves the economic viability of the fishery and its participants (within the limits of ecological sustainability)

Background: As stated earlier in this section, it is the Government's intention to create a full time professional fishing industry.

Operators need to be in a position after a five year period to afford to pay for the attributable costs of management from their fishing revenue. Viable fishing businesses also have a greater incentive to support long term management decisions that are needed for ecological sustainability now and into the future.

This management response provides a mechanism within the management strategy to reduce the number of estuary general fishing businesses in order to improve the fishery-wide average economic return expand the potential for greater individual profitability.

Contributing to Goals	Timeframe	Responsibility	Authority
2,4,5	By December 2003	NSW Fisheries	Regulatory

- (b) NSW Fisheries will develop, in consultation with the Estuary General MAC, a performance measure for economic viability at the individual fishing business level

Background: A performance indicator is already proposed under goal 5 in section 9 of this management strategy to measure economic viability on a fishery-wide basis. This management

response would provide a measure of the economic viability of individual fishers to monitor the relationship with the overall economic viability of the fishery.

Contributing to Goals	Timeframe	Responsibility	Authority
4,5,7	By December 2005	NSW Fisheries EG MAC	-

(c) NSW Fisheries will develop, in consultation with the Advisory Council on Commercial Fishing, a cost recovery framework

Background: On 2 November 2000, the Government announced that over the succeeding five years NSW Fisheries would develop and implement a fair and transparent cost recovery framework for category 2 share management fisheries. During this period, the total amount of money collected for NSW Fisheries for its existing management services, will not increase without the support of the relevant MAC. Each estuary general fisher currently pays the same commercial fishing licence fees for the Estuary General Fishery, irrespective of their level of access. From 2005, recovery of the costs that have been identified as attributable to industry will be progressively introduced over a further three year period.

Contributing to Goals	Timeframe	Responsibility	Authority
5,6	By November 2005	NSW Fisheries ACCF	Ministerial determination

Objective 5.3 To provide secure fishing entitlements for estuary general fishers

Other important responses: 2.1.1c; 2.2c; 2.3b,c; 4.5a; 6.1d, 7.5a,b

(a) Implement the share management provisions of the *Fisheries Management Act 1994*

Background: The category 2 share management provisions allow for the allocation of shares with a 15 year term to eligible persons, and with a statutory right to compensation if the Government cancels the shares during their term. A share management plan must be prepared and that plan must be reviewed within 10 years after commencement. A category 2 share management fishery may be converted to a category 1 share management fishery in accordance with the FM Act.

Contributing to Goals	Timeframe	Responsibility	Authority
5,6	Commence the share management plan by December 2003	NSW Fisheries	FM Act

Objective 5.4 To appropriately manage food safety risks in the harvesting of fish in the fishery

Other important responses: 1.2c; 2.2c; 2.4b; 6.1f; 6.4a

- (a) Co-operate with SafeFood Production NSW in the development and implementation of food safety programs relevant to the fishery, including the pipi biotoxin management scheme

Background: SafeFood Production NSW is currently in the process of developing food safety plans for harvest and post-harvest seafood industry, and the plans may impose statutory requirements on fishers to comply with the approved standards. Supporting food safety programs is a responsible way of promoting consumer confidence in fish product harvested by the fishery and protecting viability of the industry.

Contributing to Goals	Timeframe	Responsibility	Authority
5,6	Current and ongoing	EG fishers	FP Act

- (b) Continue the prohibition on the processing or mutilation of fish taken in this fishery on or adjacent to water

Contributing to Goals	Timeframe	Responsibility	Authority
2,5,6	Current and ongoing	NSW Fisheries	Regulatory

GOAL 6. To ensure cost-effective and efficient estuary general management and compliance programs

Effective management and compliance programs are important to the successful implementation of the fishery management strategy. As full cost recovery is phased in to the Estuary General Fishery in the coming years, it is important that programs are conducted in an efficient and cost-effective manner. This goal can be achieved through the cooperation of estuary general fishers, ongoing communication and consultation between NSW Fisheries and industry through the Estuary General MAC, and promoting complementary management programs in other States and the Commonwealth.

Objective 6.1 To maximise compliance with the Estuary General Fishery Management Strategy

Other important responses: 1.2c; 2.1g; 2.1.3b; 2.2c; 2.3a; 4.5a; 5.3a; 6.2a-c; 6.3a,c; 7.1a-c; 7.4a,b

- (a) Develop, in consultation with the Estuary General MAC, a compliance strategic plan to provide the direction for education, advisory and enforcement services provided by NSW Fisheries for the Estuary General Fishery

Background: To assist in delivering regionally focussed compliance and advisory services, there are currently 19 Fisheries Offices along the NSW coast. Each of these offices provides services for a range of programs, one of which is the Estuary General Fishery. The level and focus of services targeted towards the Estuary General Fishery varies in each district, and is determined by the nature of the activities in that area. Fisheries officers in each office operate under a district compliance plan to ensure appropriate compliance coverage across all programs. District compliance plans are subject to fortnightly review to consider any changed circumstances and are also subject to an annual review.

Each district compliance plan is developed to be consistent with the compliance strategic plan for NSW Fisheries. This plan is an overarching framework that identifies priorities and objectives for compliance throughout the State. The Estuary General MAC will be consulted over priorities relevant to the fishery prior to each review of the compliance strategic plan. The compliance strategic plan is subject to a review every three years.

Contributing to Goals	Timeframe	Responsibility	Authority
2,6	By December 2002	NSW Fisheries EG MAC	Policy

- (b) Implement an endorsement suspension scheme and share forfeiture scheme based on a demerit point scale for serious offences and habitual offenders

Note: "Serious offences" will be defined in the share management plan and could include offences such as interfering with fishing gear, offences carrying serious consequences, etc. It should be noted that the Estuary General MAC supports a penalty points scheme with suspension or cancellation provisions for endorsements, but does not support a forfeiture scheme for shares issued in the fishery.

Contributing to Goals	Timeframe	Responsibility	Authority
2,4,6	By December 2003	NSW Fisheries	Regulatory and Policy

- (c) Publish, where appropriate, successful prosecution results for nominated offences in relevant publications and media to discourage illegal activity

Contributing to Goals	Timeframe	Responsibility	Authority
6,7	Ongoing from 2003	NSW Fisheries	-

- (d) Continue the prohibition on fishers using or interfering with fishing gear set by other fishers

Contributing to Goals	Timeframe	Responsibility	Authority
4,5,6	Current and ongoing	NSW Fisheries	Regulatory

- (e) Continue the requirement that all fishing gear in the fishery be marked in accordance with the requirements set out in the Regulation

Contributing to Goals	Timeframe	Responsibility	Authority
2,6	Current and ongoing	NSW Fisheries	FM Act

- (f) Continue the requirement that fish taken in this fishery are marketed through a registered fish receiver (RFR) or a restricted registered fish receiver (RRFR)

Contributing to Goals	Timeframe	Responsibility	Authority
5,6,7	Current and ongoing	NSW Fisheries	Regulatory

Objective 6.2 To encourage cooperation between fishers and compliance officers in detecting offences and to promote stewardship of the resource

Other important responses: 1.2c; 2.1.3c; 2.2c; 2.3a; 4.5b; 5.3a; 6.1a,d; 6.3a,c; 7.1a-c

- (a) Continue the use of regulatory controls, including conditions on fishing licences, endorsements and permits to ensure that the authority conferred by the authorisation is consistent with the goals and objectives of this management strategy

Contributing to Goals	Timeframe	Responsibility	Authority
1,2,4,6	Current and ongoing	NSW Fisheries	Various

- (b) Continue the requirement for fishers to adhere to determinations made by local fisheries officers with respect to the use of prawn nets

Contributing to Goals	Timeframe	Responsibility	Authority
2,4,6	Current and ongoing	NSW Fisheries	Regulatory

- (c) Continue the requirement that fishers comply with directives given by Fisheries Officers, including to allow officers to board fishing boats to inspect catch, and to produce “authorities to fish” when requested

Contributing to Goals	Timeframe	Responsibility	Authority
6	Current and ongoing	NSW Fisheries	FM Act

Objective 6.3 To provide effective and efficient communication and consultation mechanisms in relation to the Estuary General Fishery

Other important responses: 1.3a,c,d; 1.5a-f; 2.2c; 2.4b,c; 2.5.1a; 4.2b,c; 4.4a,b; 5.2c; 5.4a; 2.5a,b; 6.1a,c; 6.3c; 7.1a-c; 7.2a; 7.3a; 7.4a,b

- (a) Continue to recognise the Estuary General MAC as the primary consultative body for issues affecting the fishery.

Contributing to Goals	Timeframe	Responsibility	Authority
6	Current and ongoing	NSW Fisheries	Policy

- (b) Continue to utilise the services of a chairperson in the Estuary General MAC who is not engaged in the administration of the *Fisheries Management Act 1994* nor engaged in commercial fishing

Contributing to Goals	Timeframe	Responsibility	Authority
4,6	Current and ongoing	NSW Fisheries	FM Act

- (c) Establish informal local joint industry/NSW Fisheries working groups as needed to provide advice to NSW Fisheries on local management needs and arrangements

Background: Local joint industry/NSW Fisheries working groups will be able to provide direct feedback to NSW Fisheries on local fishery management needs and arrangements. The working groups may also provide a framework for more focussed input into the Estuary Management Committee process already in place for many of the State's estuary systems. See the background to management response 2.1h for more information on the representation and role of Estuary Management Committees.

Contributing to Goals	Timeframe	Responsibility	Authority
1,2,4,5,6	From September 2002 as required	NSW Fisheries EG fishers	-

Objective 6.4 To implement the Fisheries Management Strategy in a manner consistent with related Commonwealth and State endorsed programs aimed at protecting aquatic environments, and achieving the objects of the Act and the principles of ecologically sustainable development

Other important responses: 1.3b-d; 1.4a; 2.2c; 2.5c; 2.5.2a; 3.1a,b; 4.4a,b

- (a) Manage the Estuary General Fishery consistently with other jurisdictional or natural resource management requirements, such as the marine parks program, aquatic biodiversity strategy, threatened species program and others

Background: The management strategy will be operating alongside other programs relating to the management of marine resources, and must be consistent with those programs. The management strategy must be adaptive if inconsistencies between the programs become apparent. This response enables a whole-of-government approach to management of the estuarine ecosystem.

Contributing to Goals	Timeframe	Responsibility	Authority
1,3,4,5,6	Current and ongoing	NSW Fisheries	Policy

- (b) Provide for the issue of permits under section 37 of the *Fisheries Management Act 1994* authorising modified fishing practices to assist research programs or for purposes consistent with the vision and goals of this management strategy

Background: Permits are required to use gear in a manner that varies to that specified in the Regulations. Approval to trial new approaches to fishing gear design is commonly given to industry members participating in research. This provides a formal mechanism to operate gear in a manner other than as set out in the FM Act or Regulation.

Contributing to Goals	Timeframe	Responsibility	Authority
6,7	Current and ongoing	NSW Fisheries	FM Act

GOAL 7. To improve knowledge of the Estuary General Fishery and the resources upon which the fishery relies

By their very nature, fish stocks and marine ecosystems are very complex and costly to study. There is a general lack of information and knowledge about many of the species taken in the Estuary General Fishery and about the impacts of fishing on the general environment. This situation is not unique to NSW. Management decisions need to be made using the best available information at the time and need to be precautionary where there are uncertainties in the information and threats of serious or irreversible environmental damage from the activity.

Objective 7.1 To improve the community's understanding and public perception of commercial estuary general fishing

Other important responses: 1.1f; 1.2a,c; 1.3d; 1.4a; 2.1.1b,c; 2.1.2a; 2.1.3a; 2.1.4a-c; 2.4a-c; 4.5b; 5.2b; 6.1c; 7.2a; 7.3a; 7.4b; 7.5a

- (a) Develop a strategic approach for disseminating information on the Estuary General Fishery, including making the Fishery Management Strategy, Environmental Impact Statement and other relevant documentation widely available to the public by:

- placing them on the NSW Fisheries website
- providing copies at Fisheries Offices throughout the State
- targeted mail outs to key stakeholders

Background: The Estuary General MAC believes that these actions are the most appropriate and cost effective means for communicating with and educating the public about the fishery at this stage. The MAC will, however, develop a strategic approach for disseminating information on the Estuary General Fishery to the general public, which will incorporate identifying the most appropriate and cost effective communication and education methods.

Contributing to Goals	Timeframe	Responsibility	Authority
4,6,7	Ongoing	NSW Fisheries	-

- (b) Produce or contribute to the production of brochures, newsletters, and signs and undertake targeted advisory and educational programs as considered appropriate by NSW Fisheries

Contributing to Goals	Timeframe	Responsibility	Authority
4,6,7	Current and ongoing	NSW Fisheries	-

- (c) Respond to inquiries by industry or the public with respect to this management strategy or the fishery generally

Contributing to Goals	Timeframe	Responsibility	Authority
4,6,7	Current and ongoing	NSW Fisheries	-

Objective 7.2 To promote community awareness as to the importance of fish habitat to fish stocks

Other important responses: 1.5f; 2.1.1b; 2.4a-c

- (a) Publish educational information concerning the protection of fish habitat (including the benefits of aquatic reserves) on the NSW Fisheries website and in other publications and media that NSW Fisheries consider relevant

Contributing to Goals	Timeframe	Responsibility	Authority
4,6,7	Current and ongoing	NSW Fisheries	-

Objective 7.3 To promote appropriate scientific research and monitoring to gain knowledge of target species, bycatch species and the impacts of fishing on the general environment

Other important responses: 1.1f; 1.3a-c; 1.5b; 2.1b,c; 2.1.1b,c; 2.1.4a-c; 3.1a; 4.1a; 4.2a; 4.3a; 6.4b; 7.4a,b

- (a) Determine, in consultation with stakeholder groups identified by NSW Fisheries, the priorities for research for the fishery, taking into account the research needs identified in the management strategy, or arising from new research results

Background: NSW Fisheries has commenced consultation with a broad range of stakeholder groups over the development of research priorities relating to the State's fisheries resources, including those harvested in the Estuary General Fishery.

Contributing to Goals	Timeframe	Responsibility	Authority
4,6,7	Current and ongoing	NSW Fisheries	-

- (b) Allocate research resources and where appropriate make grant applications to support research relevant to the fishery in accordance with the priorities identified from the process described in management response 7.3a

Background: Research into the Estuary General Fishery is currently funded through a combination of NSW Fisheries core expenditure and external grants from State and Commonwealth research and development programs. Shareholders will contribute to the costs of research programs in accordance with the cost recovery policy outlined in management response 5.2c.

Contributing to Goals	Timeframe	Responsibility	Authority
7	Ongoing from June 2002	NSW Fisheries	-

- (c) Develop and implement fishery-independent surveys for use in future stock assessments of species that inhabit estuarine waters

Background: Future stock assessments for estuarine species will consider information collected during fishery-independent surveys. These surveys will use stratified randomised

surveys to provide information that can be used to estimate relative abundances and size and age structures of wild populations. The FRDC is funding a project which will include all of the pilot and design work for this program over a three year period. Pilot studies on alternative sampling tools and cost-benefit analyses will be done during 2002-2003 and a pilot sampling strategy will be implemented during 2003-2004. The proposed sampling regime will be implemented in the third year (2004/2005). See section 6(a) for further discussion on the development of fishery independent sampling.

Contributing to Goals	Timeframe	Responsibility	Authority
7	By July 2005	NSW Fisheries	-

Objective 7.4 To improve the quality of the catch and effort information collected from endorsement holders

Other important responses: 1.1f; 1.3b; 2.1.1c; 2.2c; 3.1a; 6.1f

(a) Periodically review, in consultation with the Estuary General MAC, the mandatory catch and effort return forms submitted by estuary general fishers and implement changes if:

- the data collected is perceived to be of poor quality or insufficient for monitoring and assessment purposes
- the forms are found to be exceedingly complex for fishers to complete, ensuring an emphasis on the quality rather than quantity of information collected.

Background: A working group of commercial fishers and NSW Fisheries staff is reviewing catch and effort returns used by fishers. The working group will help to change the current returns to improve the quality of data collected. One initiative will be to allow catches of each individual species to be recorded on catch returns and move away from grouping similar species to ensure that all species permitted to be taken in the fishery can be monitored appropriately. Any proposed changes to catch return forms would be discussed with the Estuary General MAC.

Contributing to Goals	Timeframe	Responsibility	Authority
1,2,4,6,7	Current and ongoing	NSW Fisheries EG MAC	-

(b) Determine accuracy of current recording of species identification in catch records and provide advice to industry to make needed changes (may need to wait for results from observer study)

Background: Correct species identification is critical to many areas of performance of the management strategy. Most species in the fishery are clearly and easily identified and accurately reported, however, there are some species for which correct identification or reporting can be difficult (e.g. the different species of leatherjackets and bream). The proposed observer study will be of significant value in implementing this management response. Observers will provide first-hand information on alternate names used to identify species, and any patterns in the use of those names. This information will be used to ensure that industry advice and education is appropriately targeted.

Contributing to Goals	Timeframe	Responsibility	Authority
1,2,4,6,7	By December 2004 and ongoing	NSW Fisheries EG MAC	-

Objective 7.5 To improve knowledge of social and economic aspects of the fishery

Other important responses: 5.2a-c; 5.3a; 7.1a

- (a) Consult with the Estuary General MAC on a strategy for improving the understanding of economic and social information relating to the Estuary General Fishery, taking into account the information gaps outlined in the economic and social assessment in the Environmental Impact Statement for the fishery

Background: An economic and social survey conducted as part of the environmental assessment process has provided some limited information on economic and social issues in the Estuary General Fishery. The Environmental Impact Statement identified a number of information gaps and provided recommendations for further investigation of economic and social issues.

Contributing to Goals	Timeframe	Responsibility	Authority
4,5,7	By July 2005	NSW Fisheries	-

- (b) Assess, in consultation with the Estuary General MAC, the feasibility of gathering additional information on social and/or economic aspects of the Estuary General Fishery including:

- modifying the existing catch returns or fishing licence renewal application forms
- undertaking targeted social and economic surveys
- any other methods of gathering the desired information

Background: The gathering of social and economic information will aid in understanding the implications of changes to fishing rules over time. Some information gathering methods may be relatively simple and inexpensive to implement whilst others, like targeted surveys, are likely to be more resource intensive. Consideration will need to be given to the quality of information likely to be received through different information gathering techniques.

Contributing to Goals	Timeframe	Responsibility	Authority
4,5,7	By July 2005	NSW Fisheries EG MAC	-

9. Performance Monitoring and Review

a) Performance monitoring

The complex nature of the Estuary General Fishery means that many of the management responses assist in achieving multiple goals. Therefore, rather than examining the performance of each individual response or objective, it is more efficient and appropriate to measure the performance of the management strategy against the seven goals (ie. the major objectives). An annual performance report for the fishery will, however, be prepared (as outlined later in this section) detailing the progress made in implementing management responses.

In addition to the performance monitoring process outlined below, a share management plan will be prepared for the fishery and include goals and performance indicators consistent with those specified in this management strategy. The *Fisheries Management Act 1994* provides that the share management plan must specify at what point a review of the management plan is required when a performance indicator is not being satisfied. Accordingly, when the share management plan for the fishery is prepared the plan will need to provide for a review process that is complementary to the review process described in this management strategy. Additional information on share management plans can be found in section 1(e) of this fishery management strategy.

i) Performance indicators

The performance indicators provide the most appropriate indication of whether the management goals are being attained. With the implementation of the new research proposals for the fishery outlined in section 6(a) of this management strategy, a broader information base relating to the fishery and its impacts may allow for more precise performance indicators to be developed.

ii) Monitoring programs

Monitoring programs collect the information used to measure the performance indicators. Monitoring programs may be specific to the fishery, or encompass cross fishery interactions such as the catch of a species by several commercial fisheries or harvest sectors. Table 16 identifies the information sources and monitoring programs used as part of the performance monitoring and review process for the Estuary General Fishery.

iii) Trigger points

Trigger points have been set for most performance indicators to specify when a performance indicator has reached a level that suggests there may be a problem with the fishery and a review is required.

Some performance indicators vary naturally from time to time. Trigger point levels have been selected to be well within the expected natural range of variation. This means that triggers will be exceeded more frequently because of natural variation in the performance indicator than because of a problem in the fishery. If the natural variation of a performance indicator is known, the trigger point for that indicator will be set so that it is outside the range where 80% of the most common observations fall.

Table 16 includes the performance indicators, monitoring programs and trigger points that will be used to measure whether each of the management goals described in section 8 of this management strategy are being attained.

b) Predetermined review of performance indicators and trigger points

It is likely that changes to the activities authorised under the management strategy will evolve over time. It is also likely that better performance indicators will become apparent and it would then be an inefficient use of resources to continue monitoring the performance indicators that appear in this management strategy. If new information becomes available as a result of research programs, more appropriate performance indicators and trigger points can be developed and the management strategy may be amended by the Minister for Fisheries accordingly.

A comprehensive review of the appropriateness of all performance indicators and trigger points will be carried out not more than two and a half years from the commencement of the management strategy, in consultation with the Estuary General MAC. This will occur in addition to the preparation of the annual performance report that reports on whether performance indicators have breached corresponding trigger points. If the performance report identifies an inappropriate performance indicator prior to the two and half year review it can be addressed accordingly at this stage.

As new or improved guidelines for fishery reporting become available, such as those being considered in the *'National ESD Reporting Framework for Australian Fisheries – the how to guide for wild capture fisheries report'*, they will be taken into account to promote continuous improvement in the management of the fishery.

Table 16. Performance monitoring provisions

GOAL 1. To manage the Estuary General Fishery in a manner that promotes the conservation of biological diversity in the estuarine environment					
No.	Performance indicator	Monitoring program	Time frame	Trigger point	Comments
1	[A performance indicator will be developed to monitor biodiversity impacts at the species, community and ecosystem levels — see management response 1.3b]	A monitoring program for this indicator cannot be identified until an indicator has been developed	-	[No trigger point set at this stage]	There are no available performance indicators to measure the impact of this fishery on biodiversity. As such, surrogate indicators will be used (below) until a suitable indicator is developed. This is likely to include the monitoring of species composition and abundance
2	Number of estuaries totally closed to estuary general fishing (through regulatory controls, marine parks and/or aquatic reserves)	Review number of estuaries totally closed to estuary general fishing every two years	Commence in 2003 and ongoing subject to review every two years	The number of estuaries open to estuary general fishing increases after the commencement of the management strategy or any estuary that was previously closed to commercial fishing is opened	Significant closed areas prevent any impacts of the fishery on biodiversity in those areas, thus minimising the total impact on biodiversity at the regional or state-wide scale
3	Estimate of total quantity of bycatch by method	Observer-based program that provides a predetermined cover of all fishing methods in a predetermined number of key estuaries stratified throughout the regions	Begin 2003 and ongoing subject to annual review	Total bycatch increases by a percentage to be determined by NSW Fisheries for each method in consultation with the Estuary General MAC between repeated observer surveys	This has been estimated for some methods through previous research programs, but will not be possible for all methods until the observer program commences. Baseline information relating to seasonal changes will be obtained through the observer program. The frequency of observer surveys will vary for each method and will take into account the priorities for the scientific observer program as determined by NSW Fisheries in consultation with the Estuary General MAC

Table 16. Performance monitoring provisions (continued)

GOAL 1. (Continued) To manage the Estuary General Fishery in a manner that promotes the conservation of biological diversity in the estuarine environment					
No.	Performance indicator	Monitoring program	Time frame	Trigger point	Comments
4	Ratio of bycatch compared with total landings by method	Observer-based program that provides a predetermined cover of all fishing methods in a predetermined number of key estuaries stratified throughout the regions	Begin 2003 and ongoing subject to annual review	No trigger point set at this stage. To be set for each method progressively after the commencement of the scientific observer program, unless suitable information is available from another source	The scientific observer program will provide benchmarks for the ongoing monitoring of bycatch. Data for each method will become available in line with the priorities established during the design phase for the observer program. Information obtained through monitoring bycatch ratios may assist in detecting broad changes in ecological relationships
5	Response of the fishery to marine pest and disease incursions	Reports on the monitoring of marine pests and diseases will be provided to the Estuary General MAC through the marine pest management program	Ongoing	The Director, NSW Fisheries, determines that the fishery has not responded appropriately to marine pest and disease management programs that recommend that estuary general fishing be modified	The marine pest and disease management program is responsible for monitoring marine pests and diseases (e.g. noxious fish), and developing contingency plans in the event of new incursions. Section 210 of the FM Act provides an offence for selling fish that are or have been declared noxious. This performance measure ensures that the fishery is responsive to existing or threatening marine pest or disease incursions

Table 16. Performance monitoring provisions (continued)

GOAL 2. To maintain fish populations harvested by the Estuary General Fishery at biologically sustainable levels					
No.	Performance indicator	Monitoring program	Time frame	Trigger point	Comments
1	Total annual commercial landings or other available indications of stock size of each primary species	NSW commercial catch return data and other relevant data from adjacent jurisdictions where available to be obtained in March/April of each year. Annual analysis by NSW Fisheries, in consultation with the Estuary General MAC in May each year	Begin 2003 and ongoing subject to annual review	See table 17*	This includes commercial landings of those species from adjacent jurisdictions where that data is available. The selection of species trigger points is discussed later in this section
2	Total annual commercial landings or other available estimates of stock size of each key secondary species	NSW commercial catch return data and other relevant data from adjacent jurisdictions where available to be obtained in March/April of each year. Annual analysis by NSW Fisheries, in consultation with the Estuary General MAC in May each year	Begin 2003 and ongoing subject to annual review	See table 17*	This includes commercial landings of those species from adjacent jurisdictions where that data is available. The selection of species trigger points is discussed later in this section
3	Commercial landings of each eel species in each catchment contributing greater than 10% of total eel landings	Commercial catch return data obtained in March/April of each year. Annual analysis by NSW Fisheries, in consultation with the Estuary General MAC in May each year	Begin 2003 and ongoing subject to annual review	Landings in any one of these catchments change by at least 45% from the reference year 1998/99*	
4	Commercial landings of sea mullet in estuary and ocean waters	Commercial catch return data obtained in March/April of each year. Annual analysis by NSW Fisheries, in consultation with the Estuary General MAC in May each year	Begin 2003 and ongoing subject to annual review	Landings in estuary or ocean waters change in the same direction by at least 10% per year in each of two consecutive years*	

Table 16. Performance monitoring provisions (continued)

GOAL 2. (Continued) To maintain fish populations harvested by the Estuary General Fishery at biologically sustainable levels					
No.	Performance indicator	Monitoring program	Time frame	Trigger point	Comments
5	Total commercial landings from each estuary fished	Commercial catch return data obtained in March/April of each year. Annual analysis by NSW Fisheries, in consultation with the Estuary General MAC in May each year	Begin 2003 and ongoing subject to annual review	Total landings in any one estuary changes by at least 50% between any two consecutive years*	There is a broad range in the trigger point because there is normally significant variation in commercial landings between consecutive years in estuaries
6	Total days fished by estuary general method in each estuary fished	Commercial catch return data obtained in March/April of each year. Annual analysis by NSW Fisheries, in consultation with the Estuary General MAC in May each year	Begin 2003 and ongoing subject to annual review	Total days fished for any estuary general method in any estuary increases by 20% or more between any two consecutive years	This indicator monitors spatial changes in fishing effort between estuaries, which can occur if fishers adjust their fishing activities. Programs which may influence estuary general fishing activities include the implementation of zoning, share management and recreational fishing havens
7	Ratio of prohibited size fish of primary and key secondary species	Observer-based program that provides a predetermined cover of all fishing methods in a predetermined number of key estuaries stratified throughout the regions	Begin 2003 and ongoing subject to annual review	Ratio of prohibited size fish of primary and key secondary species increases between consecutive observer surveys	This information will come from the scientific observer program
8	Total Estuary General Fishery annual landings of each secondary species (other than key secondary species)	Commercial catch return data obtained in March/April of each year. Annual analysis by NSW Fisheries, in consultation with the Estuary General MAC in May each year	Begin 2003 and ongoing subject to annual review	Landings are outside the range of catch for two consecutive years, with the range calculated from the period 1984/85 to 2000/01 (see comments)*	Catches for some secondary species have been reported as zero in previous years. Despite this, a zero catch recorded in any future year will be considered as outside the acceptable range specified in this strategy
9	Number of each endorsement type in each region	Annual review by NSW Fisheries, in consultation with the Estuary General MAC of relevant data from NSW Fisheries licensing database	Begin 2003 and ongoing subject to annual review	Number of available endorsements exceed historically active levels after four years	This indicator measures potential fishing effort at the broad scale. If the target number of endorsements is not achieved by the timeframe stipulated, the minimum shareholding must immediately increase to ensure that historical levels are maintained

* Benchmarks should not include catches taken in estuaries or by gear types that are not available to commercial fishers as a result of other programs that impact on the operation of the fishery (e.g. the declaration of recreational fishing havens or aquatic reserves).

Table 16. Performance monitoring provisions (continued)

GOAL 3. To promote the conservation of threatened species, populations and ecological communities associated with the operation of the Estuary General Fishery					
No.	Performance indicator	Monitoring program	Time frame	Trigger point	Comments
1	Number of incidental captures relating to threatened species, populations or ecological communities	Commercial catch return data obtained in March/April of each year. Annual analysis by NSW Fisheries, in consultation with the Estuary General MAC in May each year. Analysis of the results of any targeted research on threatened species, populations or ecological communities	Begin 2003 and ongoing subject to annual review	[No trigger point set at this stage]	Data will be gathered through catch returns and any information resulting from targeted research on threatened species.
2	Response of the fishery to threatened species declarations	Reports will be provided to the Estuary General MAC containing recommendations from the Director, NSW Fisheries and/or the Director-General of the National Parks and Wildlife Service where appropriate actions may be needed to conserve threatened species, populations and ecological communities	Ongoing	Threatened species recovery plan or threat abatement plan requires a modification to estuary general fishing which the Director, NSW Fisheries considers is not adequately provided for in this management strategy	The NSW Fisheries Office of Conservation and the NSW National Parks and Wildlife Service monitor sightings of threatened species and develop threatened species recovery plans as required

Table 16. Performance monitoring provisions (continued)

GOAL 4. To appropriately share the resource and carry out fishing in a manner that minimises social impacts					
No.	Performance indicator	Monitoring program	Time frame	Trigger point	Comments
1	Estimates by NSW Fisheries of the catch of primary and key secondary species for all non-commercial sectors (including recreational, charter boat, aquaculture and Indigenous)	Stratified recreational creel surveys, analysis of charter boat logbooks, aquaculture records, discussions with Indigenous stakeholders and compliance reports	Begin 2005 and ongoing subject to annual review	Estimates not available within three years from the commencement of the fishery management strategy	This information is also needed for stock assessments for primary species as outlined in Goal 2
2	Percentage of total catch from the commercial, recreational (including charter boat) and Indigenous sectors (including estimates if data is not available)	Annual analysis by NSW Fisheries of commercial catch returns and available data on catches by other sectors. Data obtained in March/April of each year. Annual analysis by NSW Fisheries, in consultation with the Estuary General MAC in May each year	Begin 2005 and ongoing subject to review every five years	After estimates become available, relative catch between sectors shifts by 25% or more over each five year period	This relates primarily to the objective of monitoring and managing equitable allocations between fishing sector groups, and will exclude catches attributable to recreational fishing havens
3	Landings of species taken in the Estuary General Fishery relative to other commercial fisheries	Commercial catch return data obtained in March/April of each year. Annual analysis by NSW Fisheries, in consultation with the Estuary General MAC in May each year	Begin 2003 and ongoing subject to annual review	Relative landings between commercial fisheries shifts by 25% or more within any five year period	This relates primarily to the objective of monitoring and managing equitable allocations between commercial fisheries
4	Catch of primary and key secondary species by Estuary General Fishery endorsement type	Commercial catch return data obtained in March/April of each year. Annual analysis by NSW Fisheries, in consultation with the Estuary General MAC in May each year	Begin 2003 and ongoing subject to annual review	Relative landings between commercial fisheries shifts by 25% or more within any five year period	This relates primarily to the objective of monitoring and managing equitable allocations within the fishery
5	Total annual commercial landings taken in each region	Commercial catch return data obtained in March/April of each year. Annual analysis by NSW Fisheries, in consultation with the Estuary General MAC in May each year	Begin 2003 and ongoing subject to annual review	Landings between any two regions shifts by 25% or more within any five year period	This relates primarily to the objective of monitoring and managing equitable allocations within the fishery

Table 16. Performance monitoring provisions (continued)

GOAL 5. To promote a viable commercial fishery (consistent with ecological sustainability)					
No.	Performance indicator	Monitoring program	Time frame	Trigger point	Comments
1	Median fishery-wide gross return of estuary general fishers derived from commercial fishing in NSW	Part of the annual review will involve calculating the median gross return of fishers endorsed in the Estuary General Fishery, by multiplying their monthly catches with the respective average Sydney Fish Market price	Ongoing	Median fishery-wide gross return has not increased by at least 20% four years after the commencement of the share management plan	This relates to the fishery-wide median and will indicate if there is a greater number of economically viable fishing businesses involved in the Estuary General Fishery over time. This should not be interpreted as the gross return of individuals increasing by that amount
2	Average market value of estuary general shares	The market value of shares will be collected and recorded by the Share Registrar upon each share transfer. The average market value will be calculated each year as part of the annual review	Ongoing	No trigger point set at this stage	It is not possible to predict how the value of shares will change during the first few years of share trading. However, once the trading period with increased minimum shareholdings has stabilised, average share value may be a good indicator of economic health of the fishery

Table 16. Performance monitoring provisions (continued)

GOAL 6. To ensure cost-effective estuary general management and compliance programs					
No.	Performance indicator	Monitoring program	Time frame	Trigger point	Comments
1	Rate of compliance relating to the Estuary General Fishery as indicated by quality inspections conducted by NSW Fisheries	The compliance rate will be calculated as part of the annual review using information from the quality inspections reflected on the program activity reports (PARs) that are completed by NSW fisheries officers	Begin 2003 and ongoing subject to annual review	Overall annual rate of compliance with quality inspections is less than 80% or compliance rate with respect to any offences that may be defined as 'share forfeiture offences' by the share management plan is less than 90%	"Quality inspections" will be used as a compliance tool to provide a more comprehensive evaluation of compliance levels in the fishery. It is likely that previously reported levels of compliance will decrease as a result of introducing quality inspections.
2	Number of Estuary General MAC meetings held each year	The number of Estuary General MAC meetings held will be determined as part of the annual review based on the records held by NSW Fisheries	Ongoing	Less than two meetings held in a calendar year, unless otherwise agreed by the MAC	Holding two Estuary General MAC meetings per year is currently a requirement of the Regulation
3	Occasions when the Director, NSW Fisheries, determines that this management strategy is in direct conflict with other approved Commonwealth or State programs	Any major concurrent Government programs will be considered during the annual review, however other programs considered by the Director, NSW Fisheries to be in conflict with this management strategy will be reported to the Estuary General MAC on a case by case basis	Ongoing	Any occasion when the Director, NSW Fisheries determines that this management strategy is inconsistent with other approved Commonwealth and State programs	This includes programs such as the aquatic biodiversity strategy, marine parks and aquatic reserves program

Table 16. Performance monitoring provisions (continued)

GOAL 7. To improve knowledge of the Estuary General Fishery and the resources upon which the fishery relies					
No.	Performance indicator	Monitoring program	Time frame	Trigger point	Comments
1	Scientific observer program is established and providing quality data	Implement a sampling strategy to adequately cover, via an observer survey, all estuarine commercial fishing methods across all regions (though the different methods may be staggered between years)	Begin 2003 and ongoing subject to review every two years	The scientific observer program has not commenced by December 2003	Funding for this new program will be sourced from the fishery participants
2	Total level of funding committed to research projects that the Director, NSW Fisheries determines provide a flow of benefits to the Estuary General Fishery	Annual review by the Director, NSW Fisheries of total research funding from consolidated and external funds that are being spent on the Estuary General Fishery	Begin 2003	To be determined by NSW Fisheries in consultation with the Estuary General MAC	Part of the annual reporting on the fishery management strategy (as described in section 9(c)) will include expenditure on research for the fishery
3	Number of research grant applications submitted to external funding agencies annually relating to the Estuary General Fishery	Via the Estuary General MAC submit at least two grant applications that relate to the fishery to external funding agencies annually	Begin 2003	There are less than two such applications submitted annually	The outcome of such grant applications can not be guaranteed
4	Rate of successful external research funding applications relating to the Estuary General Fishery, measured as a percentage	No monitoring program will be identified until a performance monitor has been developed	-	To be determined	
5	Accuracy of catch return data measured every two years	An analytical comparison of commercial catch returns with Registered Fish Receiver data and observer-based surveys	Begin 2003 and review every two years	The Director, NSW Fisheries, determines that accuracy of data has not improved (assessment of data accuracy is integral to the stock assessment program)	Accuracy will be measured by undertaking comparisons with market records using a sample of endorsement holders and by comparison of data from the observer program

c) Reporting on the performance of the management strategy

There are two types of reports to be prepared under this management strategy. One of these is a review report, which is to be prepared if a performance indicator for the fishery is breached. The other type of report is an annual performance report which reports generally on the performance of the fishery with respect to the management strategy. Both types of reports are discussed in further detail below.

i) Review report in response to trigger points

If the trigger point for a performance indicator is breached, a review is to be undertaken of the likely causes for the breach. Any such review is to include consultation with the Estuary General MAC. In some circumstances, the breach may be related to a performance indicator that measures broader cross fishery issues and will require consultation with other management advisory committees or the Ministerial advisory councils. Cross fishery issues are most likely to involve catch levels of a species that is harvested in more than one fishery.

The majority of information needed to measure performance indicators for the fishery, including catch data and other statistics, will become available around March/April of each year. It would therefore be practical to collect and analyse other information relevant to the performance of the fishery, such as compliance rates and economic data, at the same time. This does not, however, prevent a review from being conducted at any other time should it become apparent that a performance indicator has breached a trigger point.

Once the relevant information is obtained an initial analysis against the trigger points will be undertaken by NSW Fisheries. Where the data or information indicate that a trigger point has been breached, details will be provided to the relevant fishery MACs and the relevant Ministerial advisory councils.

A meeting of the Estuary General MAC should be scheduled around May of each year to review the performance of the fishery against the management strategy. At this meeting, the MAC will be able to review performance indicators that have been breached and provide advice on the suspected reasons for any trigger point breaches. At the same time, the MAC will also be able to provide advice on the preparation of any review reports that are required.

A review report is to be provided to the Minister for Fisheries within three months of the trigger point being breached, and must include the likely reasons for the breach (where known), and any recommendations for remedial actions.

Reviews arising from landings data exceeding trigger points should consider, but not be limited to, the following factors:

- changes in the relative catch levels among harvest sectors (including those beyond NSW jurisdiction)
- new biological or stock information (from any source) available since the most recent review of the species
- changes in the activities or effectiveness of fishing businesses targeting the species
- changes in principal markets or prices for the species
- environmental factors.

A review report should include whether the suspected reasons for the trigger point being breached are the result of a fishery effect or an influence external to the fishery, or both.

If a review concludes that the reasons for the trigger point being breached are due to the operation of the fishery, or if the relevant fishery objectives are compromised if the fishery continued to operate unchanged, management action must be taken with the aim to return the performance indicator to an acceptable range within a specified time period. The nature of any remedial action proposed may vary depending on the circumstances that have been identified as responsible for the trigger point being breached.

A review relating to catch levels of a species may recommend modifications to any fishery management strategy that allows harvesting of that species. This approach to the review process will avoid triggering multiple reviews for a species which is caught in multiple fisheries.

There may be circumstances where no change to management arrangements or the management strategy is deemed necessary following the review. For example, a review could be triggered because the landed catch of a species declines. However, there would be little cause for concern over the performance of the management strategy if the decline in landed catch of a species was clearly caused by a drop in market prices. Any price fluctuations can result in fishers adjusting their activities.

If a review considers that the management objectives or the performance monitoring provisions are inappropriate and need to be modified, the management strategy itself may be amended by the Minister for Fisheries. If the reasons are considered to be due to impacts on the resource from factors external to the fishery, these factors should be identified in the review and referred to the relevant managing agency for action.

All review reports will be publicly available.

ii) Annual performance report

An annual performance report assessing the performance of the fishery will be submitted to the Minister for Fisheries each year following the review of trigger points by the MAC. The annual performance report is the formal mechanism for reporting on performance indicators and trigger points, and will be made publicly available. This report will also include a review of progress made in implementing each of the management responses.

The vast majority of management responses in the management strategy are linked to specified implementation timeframes. Some of these management actions are subject to specific trigger points that ensure reviews and appropriate remedial actions if the target timeframes are not met.

If the performance report identifies that any specified target timeframe has not been met, a review will be undertaken and any necessary remedial measures recommended to the Minister for Fisheries⁵.

The fishery will continue to be regarded as being managed within the terms of the management strategy whilst any remedial measures associated with breaches in timeframes or

⁵ In some circumstances a required action may be completed outside the scheduled timeframe, but prior to the commencement of the review (e.g. an action was due for completion by September 2003, but it is actually completed in October 2003). When this occurs, it is not necessary to proceed with a review.

triggering of performance indicators are being considered through the review process and/or by the Minister for Fisheries.

d) Contingency plans for unpredictable events

In addition to the circumstances outlined above, the Minister for Fisheries may order a review and/or make a modification to the management strategy in circumstances declared by the Minister as requiring contingency action, or upon the recommendation of the Estuary General MAC. In the case of the former, the Minister must consult the Estuary General MAC on the proposed modification or review.

These circumstances may include (but are not limited to) food safety events, environmental events, results of research programs or unpredictable changes in fishing activity over time. The Minister may also amend this fishery management strategy if matters identified during the finalisation of any other fishery management strategy indicate that a modification is necessary.

Notwithstanding the above, however, the Minister for Fisheries may make amendments to the management strategy that the Minister considers to be minor in nature at any time.

e) Monitoring performance of stock assessment

Stock assessment involves the use of various statistical and mathematical calculations to make quantitative predictions about the reactions of fish populations to alternative management choices (Hilborn and Walters, 1992). These calculations can vary from simple graphical presentations of commercial landings to sophisticated computer models that predict the biomass of the stock under various harvest regimes. The data and the scientific expertise required to apply these methods vary enormously. Stock assessment processes for the Estuary General Fishery need to be defined to suit the resources available. To achieve this outcome, short-term and long-term approaches will be applied.

The short-term approach will be to use landings of target species to monitor the performance of this fishery. A catch and effort working group convened by NSW Fisheries undertakes an annual workshop with stakeholders (including members of management advisory committees, the Seafood Industry Council and the Nature Conservation Council) during which catch data from the previous year are reviewed to detect concerning trends and identify areas where future research should be focussed.

Within 12 months of the commencement of the management strategy a stock assessment process for primary species will be proposed. The process needs to be appropriate for the data available and the value of this fishery. This will be the long-term approach that will be used to assess the primary species of this fishery. Two principles will apply to the long-term proposal for stock assessments:

- assessment methods will be consistent with the data (ie. the assessment program design will not rely on data sources that are not funded)
- assessment methods will be at least equivalent to approaches for fisheries of similar value in other Australian jurisdictions.

The exact methods that will be proposed may require the development of novel approaches. Trigger points will be an integral component of the stock assessment proposal for each species. Peer review of the assessment methods will be completed within three years of the proposal being developed, with the following terms of reference, to:

- report upon the technical soundness of the assessment methods proposed
- report upon the cost-effectiveness of the assessment methods proposed
- indicate if the assessment process will be likely provide timely information for the management of the fishery
- report upon the conditions where the assessment process is likely to be unsatisfactory
- recommend revisions to the proposed approach including additional data collection strategies that should be considered.

The schedule for providing stock assessments can not and should not be the same for all primary species. Priorities for each species should be determined in consultation with the assessment scientists and the appropriate MACs. The Estuary General MAC will be briefed on information used in the stock assessment process and other research outcomes relevant to the fishery. This information will be used in the preparation of NSW Fisheries' status reports.

f) Setting trigger points for monitoring changes in commercial landings

A system to detect undesirable changes in landings will be used while stock assessments are being developed for primary species. This primary monitoring tool is also likely to be in place for an extended period for the many species of low value (and/or catch) that do not have better estimates of stock status. As biological reference points become available from stock assessments, monitoring based solely on landings will be phased out.

Systems for monitoring based on landings only are rarely formalised, as proposed in this management strategy, and published examples of such systems could not be found. However, the large number of species caught in most NSW fisheries means that some species must remain a relatively low priority for stock assessment. For these species, monitoring landings is the only practical choice.

A more sophisticated treatment of catch data often used in stock assessments is catch per unit effort (or CPUE) analysis. However, caution must be taken in analysing CPUE information for the reasons described in the box on the following page.

The aim of trigger points based on changes in catch is to force a review of a species' circumstance when landings go beyond a reasonable expected range. Trigger points must be set at a level where they are sensitive enough to be likely to register a real problem but not so sensitive that they constantly trigger when there is no need for a review.

Trigger points will be set in a precautionary manner relative to known levels of variation in annual catch levels. That is, trigger levels will be set to be within the known range of past landings variation, leading to the expectation of "false alarms". This is desirable insurance that ensures reviews will be done when management action is needed.

Note on the use of catch per unit effort as an indicator of relative abundance

It is tempting to consider that there is a simple relationship between fish stock abundance and catch which has been scaled by units of fishing effort (known as catch per unit of effort or CPUE). Most stock assessment models assume that CPUE is directly proportional to stock abundance. This can only be the case if fishing effort is randomly distributed, and we know that this is seldom the case. Some fisheries target aggregations of fish, which can mean that CPUE stays high, even as total abundance drops because the remaining fish continue to aggregate.

The correct use of fishing effort data requires a good knowledge of the biology of each species that it is applied to, so that its spatial distribution can be adequately considered. Information about fishers' behaviour and gear is also important so that effort units can be standardised and changes over time can be accounted for.

An index of relative abundance based on CPUE is likely to be biased when applied to a range of species, even when caught by the same gear (Richards and Schnute, 1986). This means the application of CPUE information from commercial catch records would need to be adjusted for each species.

Finally, CPUE series need to take account of changes in reporting (see Pease and Grinberg, 1995) or other changes that may have changed catchability. The difficulties as they relate to the NSW Estuary General Fishery are discussed in Scandol and Forrest (2001). For these reasons, CPUE has not been used in the development of initial performance indicators and trigger points in this management strategy.

There are a number of factors that must be considered when selecting a trigger level based on performance of fishery or species landings:

- level of variation in recorded historic landings
- management changes over time that may affect landings levels
- changes in the catch recording system that limit interpretation of landings data
- relevant environmental events
- changes in activities by important harvesters of that species.

All these factors have and will continue to influence how changes in catch can be interpreted.

The landings-based trigger points are designed to measure different types of changes in catch of the primary and key secondary species.

The first type of trigger point is designed to cause a review when landings change dramatically from one year to next – the “single year trigger”. The change that triggers a review is not an unprecedented change but rather a change that was well within the normal range of variation, but expected infrequently (perhaps once every five to ten years). The single year triggers are based on the variation in year-to-year changes in the historical catch data. The trigger points are set at a level of change that occurs less than 20% of the time. In other words, changes that are at least as large as the largest 20% of historical changes will trigger a review. This level of change is chosen to ensure that there will be a review if there is a dramatic change in the circumstances of the fishery over a short period. Setting the trigger points this way means accepting the inevitable “false alarms” when the performance indicator is at the edge of its natural range. The review will determine which trigger breaches are “false alarms”. The reference level for this short term trigger will be the landings level from the previous year as presented in Table 17.

The second type of trigger point is designed to detect patterns in landings that are of sufficient concern to require a review (e.g. a downward or upward trend over several years). Time series of landings for any commercial species are likely to be correlated from one year to the next (ie. the level

of landings one year is related to the level of landings in one or more previous years.) This type of data structure will complicate the analysis of trends in landings. It is not a trivial exercise to devise an objective system to force a review when catch data exhibit certain patterns. For example, downward trends in landings should cause concern but the monitoring system must consider the importance of the rate of decline and the time period over which the decline occurs. The analysis must address the likelihood of relationships between data points and any relevant biological considerations (e.g. does the species come from a group that is known to be relatively long- or short-lived?).

The assistance of a statistical expert will be sought to develop an objective system for defining trigger points that detect concerning trends in landings. The system will be developed and tested during the first nine months and applied to all species taken in the fishery when the first performance report is prepared. The system may involve several different measures, including the steepness of the trend and the period over which the trend occurs.

g) How trigger points based on landings will be applied

The single year trigger is explained in the examples shown in Figure 4. These examples below explain how the single year trigger points will work with a hypothetical starting point (five years ago), trigger levels and existing catch data.

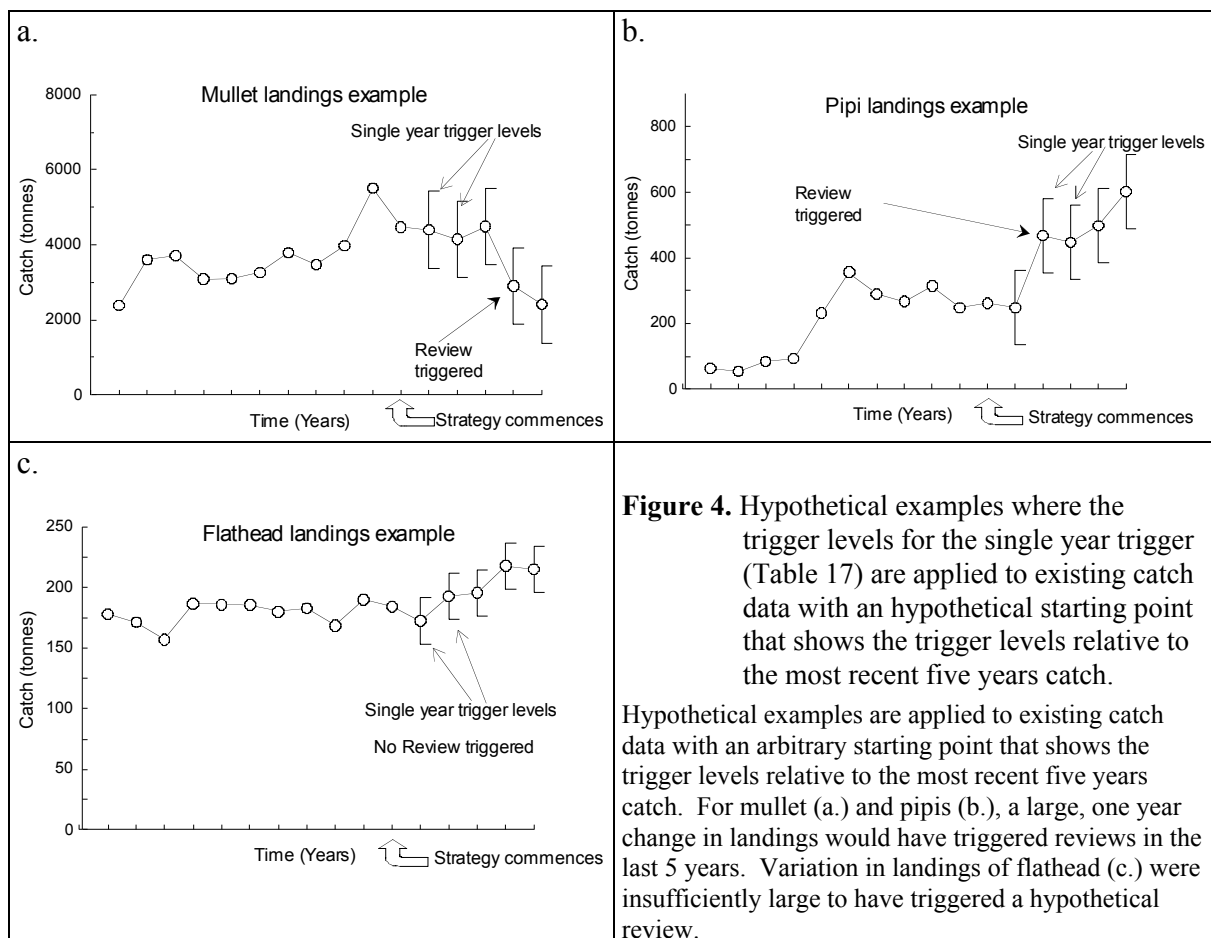


Table 17. Levels of trigger points for single year trigger.

Note: These levels will apply for the first year of the management strategy only. At each annual review the trigger levels for the next year will be calculated, using the most recent year of catch data as the new reference level. The average annual change was calculated over the 16 years commencing in 1984/85 except for river eels, where records commenced in 1990/91. All values are in tonnes. (CI = confidence interval)

	Reference level (2000/01 catch)	Average annual change (+ 80% CI)	First year upper trigger point	First year lower trigger point
<i>Primary species</i>				
Sea mullet	3230.2	1022	4252.2	2208.2
Luderick	509.0	102.9	611.9	406.1
Yellowfin bream	296.6	101.7	398.3	194.9
School prawns	1141.1	373.5	1514.6	767.6
Dusky flathead	174.6	18.7	193.3	155.9
Eastern king prawn	1066.5	179.4	1245.9	887.1
Sand whiting	149.3	38.7	188.0	110.6
Mud crab	128.1	40.2	168.3	87.9
River eels	185.3	64.7	250.0	120.6
Pipis	621.5	113.3	734.8	508.2
<i>Key secondary species</i>				
Blue swimmer crab	130.2	68.5	198.7	61.7
Greasyback prawns	21.5	28.9	50.4	0.0
Mulloway	65.4	30	95.4	35.4
Cockles	51.1	27.3	78.4	23.8
Beachworms	19.4	14.7	34.1	4.7
River garfish	36.4	12.7	49.1	23.7
Silver biddy	131.6	43.8	175.4	87.8
Flat tail mullet	94.7	29.6	124.3	65.1
Trumpeter whiting	62.8	16.1	78.9	46.7

Reference level figures extracted in June 2002.

References

- Andrew, N.L., Jones, T., Terry, C. and Pratt, R. (1995). Bycatch of an Australian stow net fishery for school prawns (*Metapenaeus macleayi*). *Fisheries Research* **22**, 119-136.
- Bell, J.D. and Pollard, D.A. (1989). Ecology of fish assemblages and fisheries associated with seagrasses. In: *Biology of Seagrasses* (eds. Larkum, A.W.D., McComb, A.J. and Shepherd, S.A.) pp. 565-609. Elsevier, Amsterdam.
- Beumer, J. P. 1996 'Freshwater Eels' In *Freshwater Fishes of South-Eastern Australia* Ed. R. M. McDowall, Reed Books, Sydney
- Ferrell, D.J. and Bell, J.D. (1991). Differences among assemblages of fish associated with *Zostera capricorni* and bare sand over a large spatial scale. *Marine Ecology Progress Series* **72**, 15-24.
- Fletcher, W. and McVea, T. (eds) (2000). NSW Fisheries 1998/99 Status of Fisheries Resources. NSW Fisheries Research Institute. 219 pp.
- Gibbs, P. (1997). A review of information on NSW South Coast estuarine fisheries. NSW Fisheries Research Institute. Cronulla. 74 pp.
- Goulstone, A. (1996). Fisheries Management Techniques. Fishnote DF 61. NSW Fisheries, March 1996.
- Gray, C.A. (2001). Catch composition and relative selectivity of commercial gill nets set overnight in New South Wales estuaries. *Fisheries Research*. In press.
- Gray, C.A., McElligott, D.J. and Chick, R.C. (1996). Intra- and inter-estuary difference in assemblages of fishes associated with shallow seagrass and bare sand. *Journal of Marine and Freshwater Research* **47**, 723-735.
- Gray, C.A., Gale, V.J., Stringfellow, S.L., and Raines, L.P. (in review a). Variations in sex, length and age compositions of commercial catches of *Platycephalus fuscus* (Pisces: Platycephalidae). Submitted to *Fisheries Research*.
- Gray, C.A., Pease, B.C., Stringfellow, S.L., Raines, L.P., Rankin, B.K. and Walford, T.R. (2000). Sampling estuarine fish species for stock assessment. FRDC Project No. 94/042. NSW Fisheries Final Report Series No. 18. 194 pp.
- Hall, S.J. (1999). *The Effects of Fishing on Marine Ecosystems and Communities*. Fish Biology and Aquatic Resources Series 1. Blackwell Science. 274 pp.
- Hannan, J.C. and Williams, R.J. (1998). Recruitment of juvenile marine fishes to seagrass habitat in a temperate Australian estuary. *Estuaries* **21(1)**, 29-51.
- Harden Jones, F.R. (1994). Fisheries Ecological Sustainable Development: Terms and Concepts, IASOS, University of Tasmania.
- Hilborn, R. and Walters, C.J. (1992). *Quantitative Fisheries Stock Assessment: Choice, Dynamics and Uncertainty*. Chapman and Hall, New York. 563 pp.
- Hutchins, B. and Swainston, R. (1986). *Sea fishes of southern Australia*. Swainston Publishing, Perth, W.A. 180 pp.
- Kailola, P.J., Williams, M.J., Stewart, P.C., Reichelt, R.E., McNee, A. and Grieve, C. (1993). *Australian Fisheries Resources*. Bureau of Resource Sciences and the Fisheries Research and Development Corporation. Commonwealth of Australia. 422 pp.

- Kaiser, M.J. and de Groot S.J. (2000). *The Effects of Fishing on Non-target Species and Habitats: Biological, Conservation and Socio-economic Issues*. The European Commission Fisheries, Agriculture and Agroindustrial Research Program (FAIR), 399 pp.
- Kennelly, S.J. and Gray, C.A. (2000). *Reducing the mortality of discarded undersize sand whiting *Sillago ciliata* in an estuarine seine fishery*. Marine and Freshwater Research, **51**, 749-753
- Kennelly, S.J. and McVea, T. (eds) (2001). NSW Fisheries 2000/2001 Status of Fisheries Resources. Cronulla Fisheries Centre, Sydney. 313 pp.
- Middleton, M.J., Bell, J.D., Burchmore, J.J., Pollard, D.A. and Pease, B.C. (1984). Structural differences in the fish communities of *Zostera capricorni* and *Posidonia australis* seagrass meadows in Botany Bay, New South Wales. *Aquatic Botany* **18**, 89-109.
- Montgomery, S.S. (2000). Status of eastern king and school prawn stocks. In: Proceedings of Juvenile Prawn Summit June 26-27. NSW Fisheries Publication. Sydney. pp. 28-47.
- Otway, N.M. and Macbeth, W.G. (1999). Physical effects of hauling on seagrass beds. FRDC Project Nos. 95/149 & 96/286. NSW Fisheries Final Report Series No. 15. Cronulla Fisheries Centre, Sydney. 86 pp.
- Pease, B.C. (2000). NSW commercial eel fishery. In: Strategies and techniques for sampling adult anguillid eels (eds. Walford, T. and Pease, B.C.). Proceedings of a workshop held at FRI, Cronulla, August 1999. Fisheries Research Report Series 5. NSW Fisheries. Cronulla.
- Pease, B.C. (1999). A spatially oriented analysis of estuaries and their associated commercial fisheries in New South Wales, Australia. *Fisheries Research* **42(1)**, 67-86.
- Pease, B.C. and Grinberg, A. (1995). New South Wales commercial fisheries statistics 1940 to 1992. Fisheries Research Institute, Cronulla NSW. 351 pp.
- Pollard, D.A. and Grown, I.O. (1993). The fish and fisheries of the Hawkesbury-Nepean River System, with particular reference to the environmental effects of the Water Board's activities on this system. Interim report to the Water Board – April 1993. NSW Fisheries, Fisheries Research Institute, Cronulla. 291 pp. plus appendices.
- Richards, L.J. and Schnute, J.T. (1986). An experimental and statistical approach to the question: is CPUE an index of abundance? *Canadian Journal of Fisheries and Aquatic Science* **55**: 1545-1552.
- Robinson, K. and Gibbs, P. (1982). *A field guide to the common shelled molluscs of New South Wales estuaries*. Coast and Wetlands Society, Sydney. 56 pp.
- Sainsbury, K. J., Campbell, R. A., Lindholm, R. and Whitelaw, A. W. (1997). Experimental management of an Australian multi-species fishery: Examining the possibility of trawl induced habitat modification. **In**: *Global Trends: Fisheries management*. John Wiley and Son, pp 107-112.
- Scandol, J.P. and Forrest, R.E. (2001). Modelling services for the NSW Estuary General Fishery. Draft Report for NSW Fisheries. July 2001. Centre for Research on Ecological Impacts of Coastal Cities, University of Sydney, NSW. 114 pp.
- State Pollution Control Commission (SPCC) (1981a). The ecology of fish in Botany Bay - community structure. Environmental Control Study of Botany Bay. Sydney, Australia. Report No. BBS 23A. 127 pp.

- State Pollution Control Commission (SPCC) (1981b). The ecology of fish in Botany Bay - biology of commercially and recreationally valuable species. Environmental Control Study of Botany Bay. Sydney, Australia. Report No. BBS 23B. 287 pp.
- Stewart, J., Ferrell, D.J. and Andrew, N.L. (1998). Ageing yellowtail (*Trachurus novaezelandiae*) and blue mackerel (*Scomber australiasicus*) in NSW. NSW Fisheries Final Report Series No. 3. FRDC Project No. 95/151.
- Stewart, J. and Ferrell, D. J. (In press) Mesh selectivity in the New South Wales demersal trap fishery. *Fisheries Research*.
- Tanner, M. and Liggins, G.W. (2000). New South Wales Commercial Fisheries Statistics 1998/99. NSW Fisheries, Cronulla Fisheries Centre. 21 pp.
- Virgona, J., Deguara, K., Sullings, D., Halliday, I. and Kelly, K. (1998). Assessment of the stocks of sea mullet in New South Wales and Queensland waters. FRDC Project No. 94/024. New South Wales Fisheries, Cronulla. 104 pp.
- Ward, T., Alder, J., Margules, C., Sainsbury, K., Tarte, D. and Zann, L. (1997). Australia's Oceans Policy: Biodiversity Conservation. Oceans Policy Issues Paper 7. Environment Australia, Canberra.
- West, R.J., Thorogood, C., Walford, T. and Williams, R.J. (1985). An estuarine inventory for New South Wales, Australia. Fisheries Bulletin 2. Department of Agriculture New South Wales, Division of Fisheries, Sydney. 140 pp.
- West, R.J. (1993). Northern Rivers Report Part A – Estuarine Fisheries Resources Internal Report, NSW Fisheries, Sydney. 173 pp. plus appendices.
- Williams, R.J., Watford, F.A., Taylor, M.A. and Button, M.L. (1998). New South Wales Coastal Aquatic Estate. *Wetlands (Australia)* **18**, 25-48.
- Yearsley, G.K., Last, P.R. and Ward, R.D. (1999). Australian Seafood Handbook. CSIRO Marine Research, Hobart. 461pp.
- Young, P.C. (1981). Temporal changes in the vagile epibenthic fauna of two seagrass meadows (*Zostera capricorni* and *Posidonia australis*). *Marine Ecology Progress Series* **5**, 91-102.

Appendix 1 The ten most prominent species in the Estuary General Fishery

This section provides an overview of the selected primary and secondary species, which constitute in excess of 80% of the total landed weight taken in the Estuary General Fishery. The description of each species includes four graphs showing catch trends, seasonal trends, catch between other commercial fisheries and the main gear types used in harvesting each of these species. For a full description of the species and historic catch and effort trends, refer to the current NSW Fisheries' *Status of Fisheries Resources* report, which are made available on the NSW Fisheries website: www.fisheries.nsw.gov.au. Information relating to prices for the species was obtained from Sydney Fish Market records, and other marketing information was obtained from fish wholesalers or exporters in NSW.

Sea mullet (*Mugil cephalus*)

The following overview is based on information provided in SPCC (1981b), Kailola *et al.*, (1993), Pollard and Growns (1993), Pease and Grinberg (1995), Virgona (1995) Gibbs (1997), Yearsley *et al.*, (1999), Fletcher and McVea (2000), and the NSW Fisheries catch statistics database.

The sea, bully or striped mullet (*Mugil cephalus*) occurs around much of the Australian coastline, as well as in many temperate and subtropical areas worldwide. In NSW waters, sea mullet are found primarily within estuaries and inshore waters, although they also occur within the freshwater reaches of coastal rivers. Within estuaries, sea mullet are found in association with shallow weed beds and bare substrates. They mostly eat microscopic plants (e.g. blue-green algae, filamentous green algae and diatoms), macroalgae (e.g. the green sea lettuce *Ulva* spp.) and detritus, and often ingest large amounts of substrate in the process.

Spawning occurs at sea, from autumn to early winter. The larvae enter estuaries and the small juveniles subsequently live in sheltered shallow water habitats. Many sea mullet travel into freshwaters, where they may reside for long periods, particularly if denied passage back to the estuary. Sea mullet grow quite quickly, taking about 4 years to reach 440 mm in length. Maximum length is approximately 750 mm. Between late summer and early winter, adult sea mullet (two or more years of age) leave estuaries in large schools that then travel northward along the open coastline on their way to spawning grounds. This behaviour appears to be triggered by strong westerly winds and falling water temperatures. Shorter migrations by so-called 'hard-gut' (sub-adult) also occur periodically, possibly in response to heavy flooding.

Sea mullet comprise the largest catch by weight of all species taken in commercial fisheries in NSW. Mesh nets are the principal gear type used to catch sea mullet in this fishery.

Annual landings progressively increased after 1984/85 and peaked at 5560 tonnes in 1993/94. Landings remained relatively high, between 4500 and 5000 tonnes until 1997/98. These trends reflected an increase in ocean landings, which occurred in response to the development of an export market for roe. Throughout this period, estuary landings were relatively stable. After 1997/98, landings declined significantly. This decline has been most dramatic in the ocean fishery, but estuary landings have also declined slightly. The recent decline in landings almost certainly reflects a decrease in abundance of stock, although the cause is unclear. The decline in abundance may be an effect of over-harvesting by the ocean hauling fishery, but could also be a natural fluctuation due to recruitment variability.

The majority of the sea mullet harvest from NSW estuaries is sold as whole fish and a significant quantity of the female roe (eggs) is exported. When sold as whole fish through the Sydney Fish Market, sea mullet attracted an average wholesale price of \$1.78/kg for the period 1995/96 to 1999/2000. A much higher return however, is achieved by exporting the roe to markets in South-East Asia and the Middle East.

Sea mullet (*Mugil cephalus*)

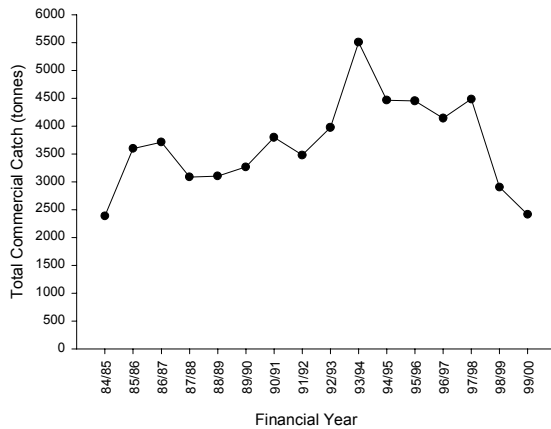


Figure A1. The total reported commercial catch of sea mullet in NSW for the period 1984/85 to 1999/2000

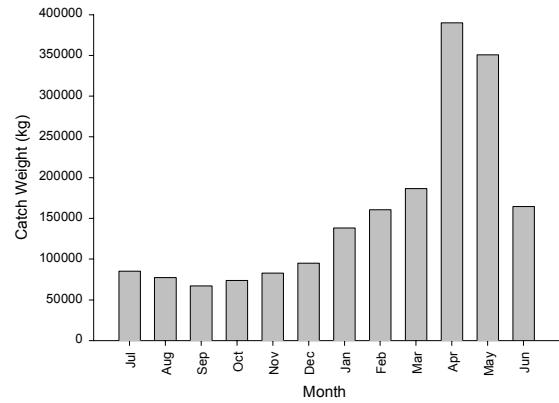


Figure A2. The average reported catch per month of sea mullet in the estuary general fishery for the period 1997/98 and 1998/99.

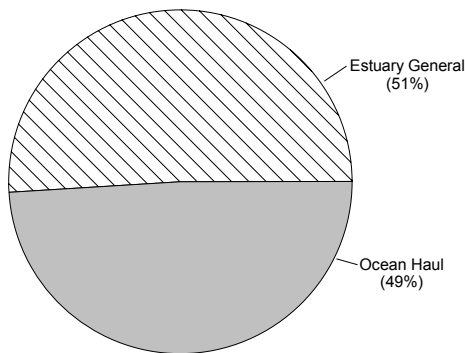


Figure A3. The average percentage of reported catch of sea mullet between commercial fisheries for the period 1997/98 and 1998/99

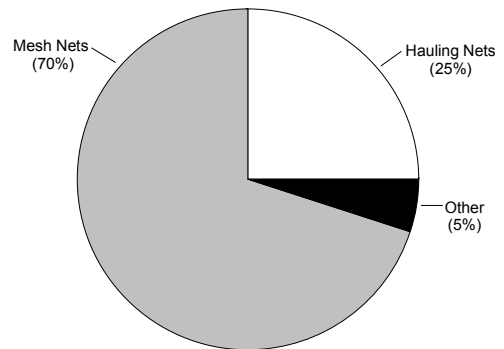


Figure A4. The average percentage of reported catch of sea mullet by gear types in the estuary general fishery for the period 1997/98 and 1998/99.

Luderick (*Girella tricuspidata*)

The following overview is based on information provided in Pease *et al.*, (1981c), Kailola *et al.*, (1993), Pollard and Growns (1993), Pease and Grinberg (1995), Gibbs (1997), Yearsley *et al.*, (1999), Fletcher and McVea (2000), and the NSW Fisheries catch statistics database.

The luderick (*Girella tricuspidata*) occurs from Noosa in Queensland to Tasmania and South Australia and is also found in New Zealand. In NSW Waters, luderick are found primarily within estuaries and around nearshore rocky reefs. Within estuaries, luderick are mainly found in association with 'weedy' habitats such as seagrass beds and rocky reefs. They are primarily herbivorous, preferring certain species of green macroalgae; although other foods (particularly small invertebrates) also form part of their diet.

Spawning occurs in surf zones near estuary entrances, typically during winter. The larvae enter estuaries and the small juveniles subsequently live in sheltered shallow water habitats (particularly seagrass beds and mangrove channels). Larger juveniles occur in slightly deeper waters, and are particularly common around estuarine reefs. Luderick grow fairly slowly, taking approximately 5 years to reach 270 mm (fork length). They mature at around 250 mm and undertake a northerly migration along the NSW coast prior to spawning. Maximum length is approximately 700 mm (total length). Adults usually return to estuarine waters after spawning.

Luderick in the estuary general fishery are primarily caught in mesh nets and hauling nets during autumn and winter.

When sold as whole fish through the Sydney Fish Market, luderick attracted an average wholesale price of \$1.42/kg for the period 1995/96 to 1999/2000. A higher price is generally obtained in the Melbourne Fish Market, so many fishers on the south coast send luderick to markets in Melbourne rather than to Sydney. A proportion of luderick is salted and used for bait in the commercial rock lobster fishery, although estimates of this amount are not recorded.

Luderick (*Girella tricuspidata*)

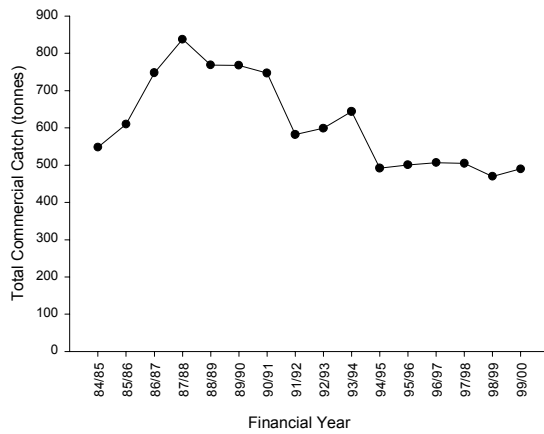


Figure A5. The total reported commercial catch of luderick in NSW for the period 1984/85 to 1999/2000.

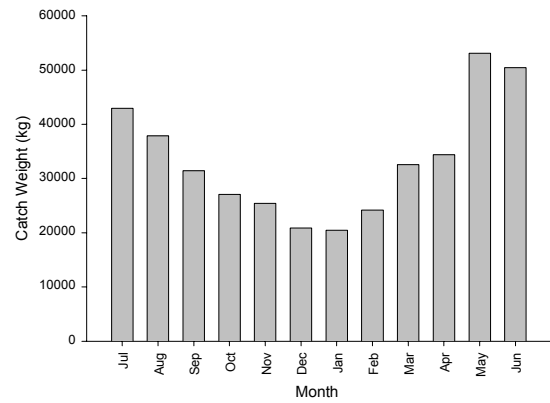


Figure A6. The average reported catch per month of luderick in the estuary general fishery for the period 1997/98 and 1998/99.

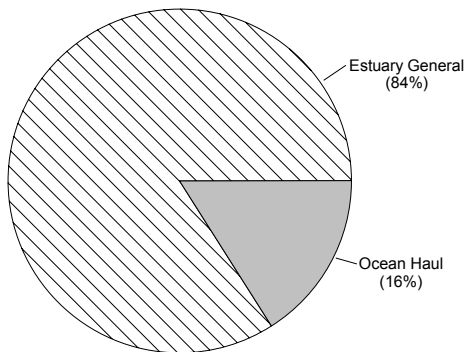


Figure A7. The average percentage of reported catch of luderick between commercial fisheries for the period 1997/98 and 1998/99.

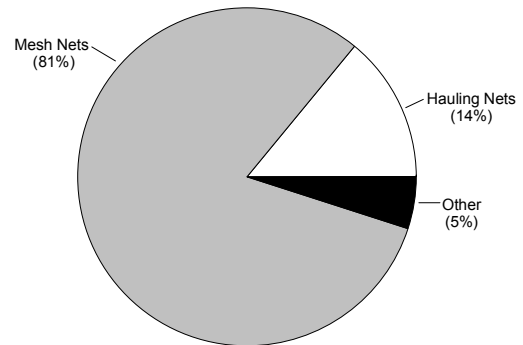


Figure A8. The average percentage of reported catch of luderick by gear types in the estuary general fishery for the period 1997/98 and 1998/99.

Yellowfin bream (*Acanthopagrus australis*)

The following overview is based on information provided in SPCC (1981b), Kailola *et al.*, (1993), Pollard and Grouns (1993), West (1993) Pease and Grinberg (1995), Gibbs (1997), Yearsley *et al.*, (1999), Fletcher and McVea (2000), Gray *et al.*, (2000) and the NSW Fisheries catch statistics database.

The yellowfin bream (*Acanthopagrus australis*) is endemic to Australia and occurs from Townsville in Queensland to the Gippsland lakes in Victoria. In NSW Waters, yellowfin bream are found primarily within estuaries and along nearshore beaches and rocky reefs, although they also occur within the lower freshwater reaches of coastal rivers. Within estuaries, yellowfin bream are found in association with all types of habitat, including seagrass beds, mangroves, bare substrates and rocky reefs. They eat a wide variety of foods, including small fish, molluscs, crustaceans and worms.

Spawning occurs in surf zones near estuary entrances, typically during winter. The larvae enter estuaries and the small juveniles subsequently live in sheltered shallow water habitats (particularly seagrass beds and mangrove channels). Larger juveniles occur in slightly deeper waters, and are particularly common around estuarine reefs. Yellowfin bream grow slowly, taking about 5 years to reach 230 mm (fork length). They mature at around 220 mm and appear to undertake extensive pre-spawning migrations. Maximum length is about 660 mm (total length). Adults usually return to estuarine waters after spawning.

The majority of bream taken in the estuary general fishery are caught in meshing and hauling nets with a smaller number taken in fish traps. The highest commercial catches of bream occur in winter and autumn. Yellowfin bream are also taken in large quantities by recreational fishers.

Reported landings of bream have declined over the past seven years. Reductions in past three years may be partly attributed to phasing out the use of pound (figure 6) nets in Port Stephens and adjoining coastal waters, but could also be attributable to general declines in reported estuarine fishing effort. Declines in landings could also be attributed to environmental conditions and the availability of fish in the ocean hauling fishery. Despite the recent reductions in reported landings, the age compositions of catches have remained relatively stable, indicating no declines in older fish. The absence of a reliable index of stock abundance casts much uncertainty over the status of the bream stock.

Bream are a popular table fish with the majority sold fresh on the domestic market. When sold as whole fish through the Sydney Fish Market, bream attracted an average wholesale price of \$8.68/kg for the period 1995/96 to 1999/2000. Yellowfin bream should not be confused with blue morwong, which are often sold under the marketing name of ‘bream’ or ‘sea bream’. Luderick are also often sold as ‘sea bream’.

Black bream are a similar species to yellowfin bream and are found in estuarine waters on the NSW coast south of Myall Lakes. They are almost exclusively found in estuarine waters, and generally only enter ocean waters after periods of flood. Black bream are often reported as yellowfin bream during catch reporting, as distinguishing the difference between the species by visual examination can be very difficult. The differentiation between the species is made more difficult through a percentage of hybrids that exist as a result of the two species interbreeding. Black bream only constitute a small component (less than 5%) of overall estuarine bream catches.

Yellowfin bream (*Acanthopagrus australis*)

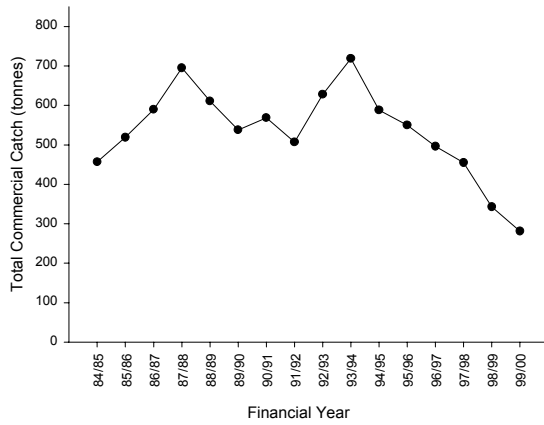


Figure A9. The total reported commercial catch of bream (yellowfin & black) in NSW for the period 1984/85 to 1999/2000.

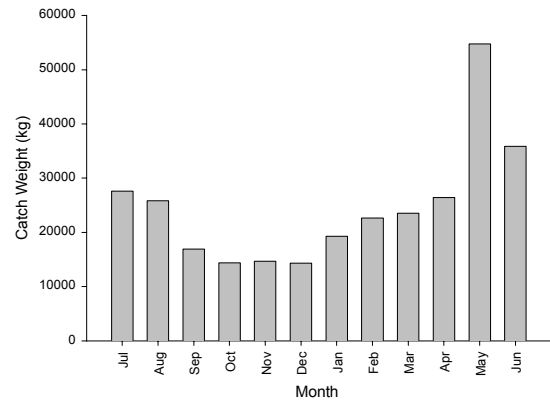


Figure A10. The average reported catch per month of bream (yellowfin & black) in the estuary general fishery for the period 1997/98 and 1998/99.

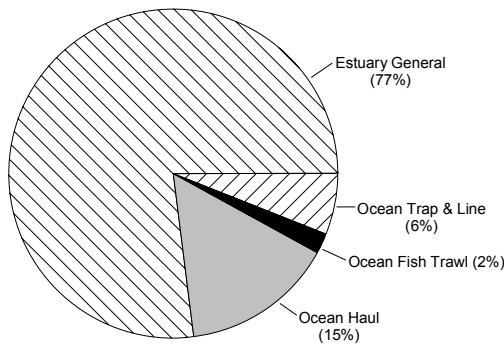


Figure A11. The average percentage of reported catch of bream (yellowfin & black) between commercial fisheries for the period 1997/98 and 1998/99

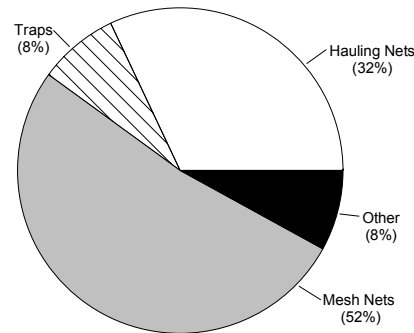


Figure A12. The average percentage of reported catch of bream (yellowfin & black) by gear types in the estuary general fishery for the period 1997/98 and 1998/99.

School prawns (*Metapenaeus macleayi*)

The following overview is based on information provided in Grey *et al.*, (1983), Kailola *et al.*, (1993), Pollard and Grouns (1993), Pease and Grinberg (1995), Yearsley *et al.*, (1999), Fletcher and McVea (2000), and the NSW Fisheries catch statistics database.

The school prawn (*Metapenaeus macleayi*) occurs along the east coast of Australia, between southern Queensland and eastern Victoria. Throughout this range, school prawns inhabit both estuaries (mostly as juveniles and sub-adults) and inshore ocean waters (as adults). Within estuaries, they prefer soft muddy substrates and areas of seagrass, and can be found well upstream into brackish to fresh waters. School prawns eat a variety of small invertebrates and detritus.

School prawns spawn in the ocean off NSW between February and May. After a larval stage of about 2 to 3 weeks, the postlarval prawns enter estuaries and move upstream. By the following spring, the now adolescent prawns return downstream in preparation for the next spawning. School prawns grow to 130 mm (males) and 160 mm (females) and generally live for 12 to 18 months, spawning only once. Rainfall and the associated river discharge are thought to be important cues in the life cycle of school prawns, in that it appears to facilitate downstream migration, gonad maturation, spawning success and larval return. School prawns may undertake oceanic migrations of up to approximately 100 km.

School prawns are taken in hauling nets, running nets, set pockets nets and seine nets in this fishery. They are also heavily targeted by the estuary prawn trawl fishery, and by the ocean prawn trawl fleet after periods of high rainfall or flooding.

There is a large domestic market for larger school prawns for human consumption, and substantial quantities, especially from the Clarence and Hawkesbury Rivers, are sold elsewhere for recreational fishing bait. When sold for consumption through the Sydney Fish Market, school prawns attracted an average wholesale price of \$6.87/kg for the period 1995/96 to 1999/2000.

School prawns (*Metapenaeus macleayi*)

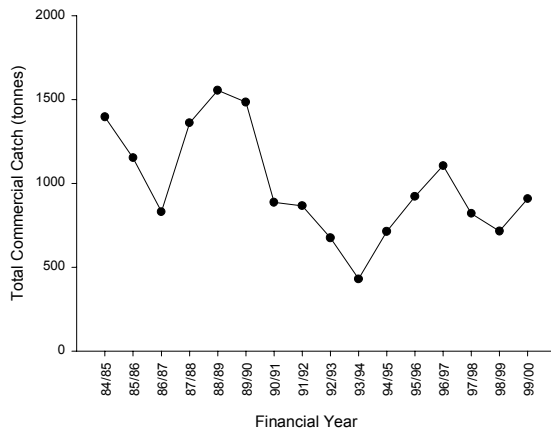


Figure A13. The total reported commercial catch of school prawn in NSW for the period 1984/85 to 1999/2000.

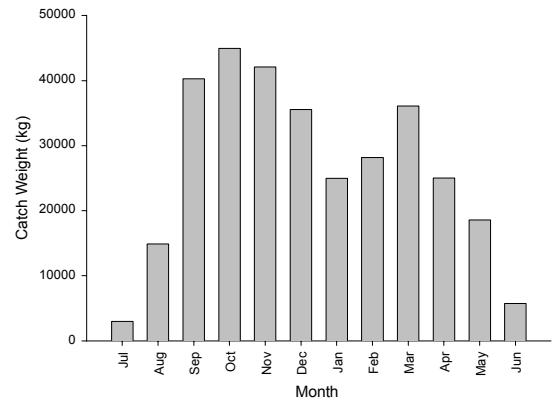


Figure A14. The average reported catch per month of school prawn in the estuary general fishery for the period 1997/98 and 1998/99.

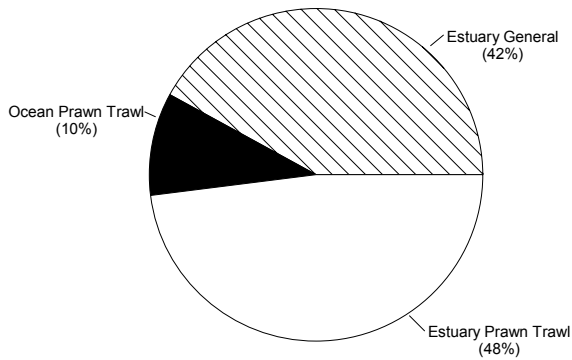


Figure A15. The average percentage of reported catch of school prawn between commercial fisheries for the period 1997/98 and 1998/99.

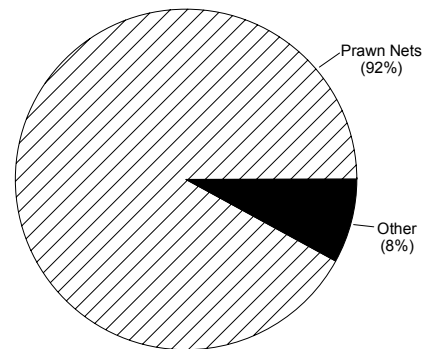


Figure A16. The average percentage of reported catch of school prawn by gear types in the estuary general fishery for the period 1997/98 and 1998/99.

Dusky flathead (*Platycephalus fuscus*)

The following overview is based on information provided in SPCC (1981b), Kailola *et al.*, (1993), Pollard and Grown (1993), West (1993), Pease and Grinberg (1995), Gibbs (1997), Yearsley *et al.*, (1999), Fletcher and McVea (2000), and the NSW Fisheries catch statistics database.

The dusky flathead (*Platycephalus fuscus*) is endemic to Australia and occurs from Cairns in Queensland to South Australia. In NSW Waters, dusky flathead are found primarily within estuaries, but also occur in inshore ocean waters. They are a bottom dwelling fish and are normally found on soft substrates, including mud, sand and seagrass. Dusky flathead eat small fish and a variety of invertebrates including prawns, crabs and squid. They are essentially ambush predators that lie and wait (often partly buried) for passing prey.

Spawning appears to occur both in the lower reaches of estuaries and in the sea, typically during summer. The larvae enter estuaries and the small juveniles subsequently live in the same habitats as the adults. Dusky flathead grow quickly, reaching 400 mm (Fork Length) after 3 years. They mature at around 320 mm (males) to 360 mm (females). They are reported to reach 1.5 metres in length.

Commercial catch of dusky flathead is almost exclusively limited to the estuary general fishery with large numbers also taken by recreational fishers. The highest levels of commercial catches occur during the winter months. In July 2001, the minimum legal length for this species increased from 33 to 36 cm.

Dusky flathead are sold mostly as fillets or whole fish. When sold as whole fish through the Sydney Fish Market, dusky flathead attracted an average wholesale price of \$4.08/kg for the period 1995/96 to 1999/2000.

Dusky flathead (*Platycephalus fuscus*)

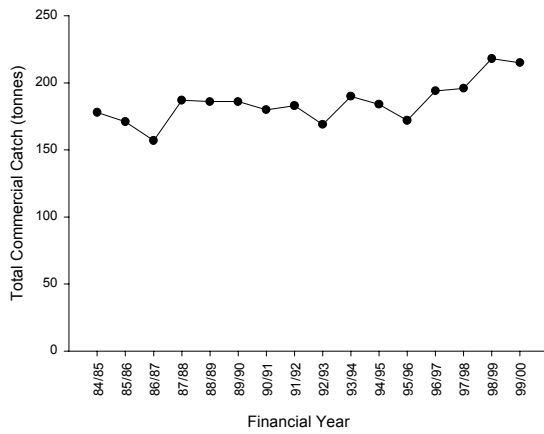


Figure A17. The total reported commercial catch of dusky flathead in NSW for the period 1984/85 to 1999/2000

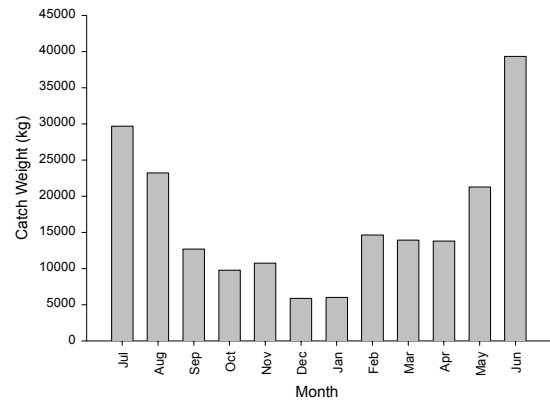


Figure A18. The average reported catch per month of dusky flathead in the estuary general fishery for the period 1997/98 and 1998/99.

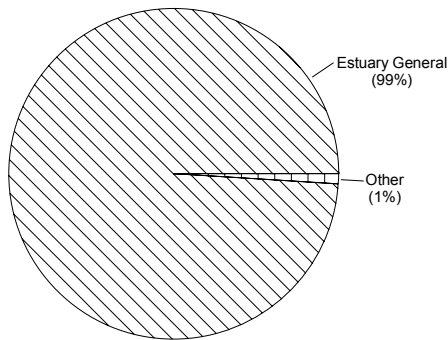


Figure A19. The average percentage of reported catch of dusky flathead between commercial fisheries for the period 1997/98 and 1998/99.

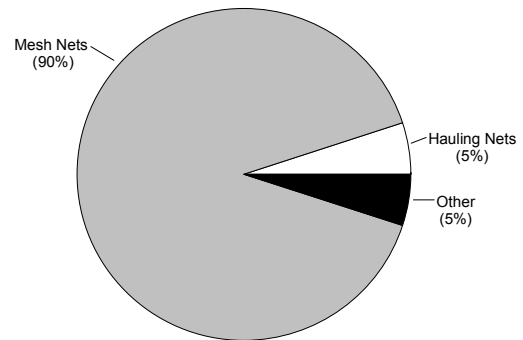


Figure A20. The average percentage of reported catch of dusky flathead by gear types in the estuary general fishery for the period 1997/98 and 1998/99.

Blue swimmer crab (*Portunus pelagicus*)

The following overview is based on information provided in Kailola *et al.*, (1993), Pollard and Grouns (1993), Pease and Grinberg (1995), Yearsley *et al.*, (1999), Fletcher and McVea (2000), and the NSW Fisheries catch statistics database.

The blue swimmer crab (*Portunus pelagicus*) inhabits coastal waters in all Australian states except Tasmania and Victoria, and is also widely distributed throughout the Indo-Pacific region. In NSW Waters, blue swimmer crabs are found primarily within lower estuaries and inshore coastal waters. Within estuaries, they are found in association with mud, sand and seagrass, and are often buried in the sediment. Blue swimmer crabs mostly prey on slow-moving invertebrates such as bivalve molluscs, crustaceans and worms, but also scavenge on material including dead fish and squid.

Based on reports from South Australia and Western Australia, blue swimmer crabs in NSW are likely to spawn in both lower estuarine and ocean waters, with peak spawning expected in spring or summer. The larvae may drift well out to sea before settling in shallow estuarine or inshore waters, in areas similar to those inhabited by adults. Blue swimmer crabs grow in excess of 200 mm (carapace width) and live for up to 3 years. Size at maturity is variable, but based on studies from other states, is likely to be around 90 mm in NSW (ie. at about 1 year of age).

Reported landings of blue swimmer crab increased dramatically from <50 to >200 tonnes between 1990 and 1992, after which it stabilised to around 200 tonnes per-annum. This increase in landings is possibly related to expansions in the market for blue swimmer crab and the associated value of the product.

Blue swimmer crabs are caught in fish traps, hoop nets and mesh nets in the estuary general fishery, and are also caught as an incidental catch in the estuary prawn trawl fishery.

There is a small export market for blue swimmer crabs, but the majority of crabs are sold whole cooked or uncooked in local markets. When sold as whole fish through the Sydney Fish Market, blue swimmer crabs attracted an average wholesale price of \$6.46 per kilogram for the period 1995/96 to 1999/2000.

Blue swimmer crab (*Portunus pelagicus*)

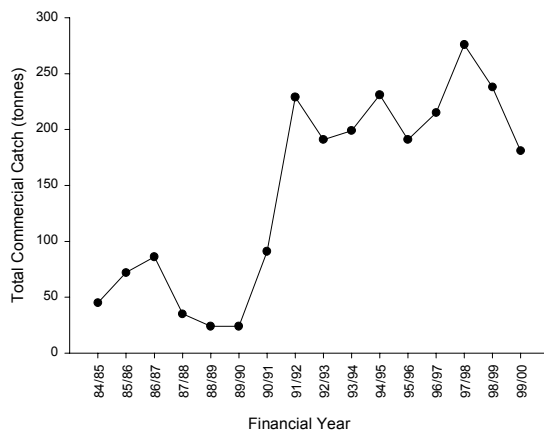


Figure A21. The total reported commercial catch of blue swimmer crab in NSW for the period 1984/85 to 1999/2000.

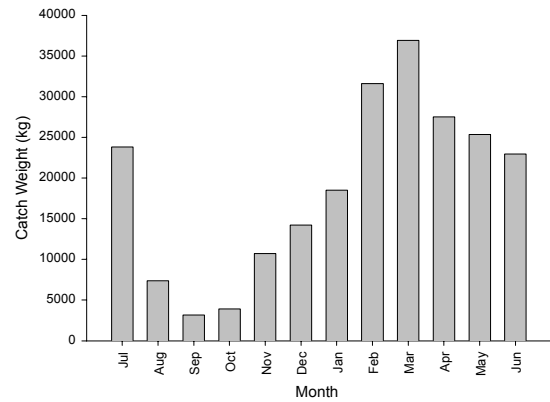


Figure A22. The average reported catch per month of blue swimmer crab in the estuary general fishery for the period 1997/98 and 1998/99.

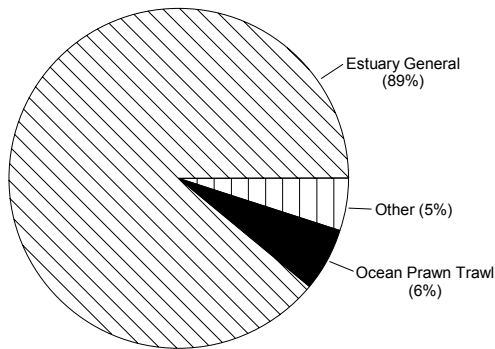


Figure A23. The average percentage of reported catch of blue swimmer crab between commercial fisheries for the period 1997/98 and 1998/99.

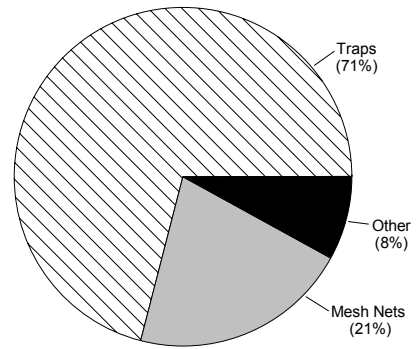


Figure A24. The average percentage of reported catch of blue swimmer crab by gear types in the estuary general fishery for the period 1997/98 and 1998/99.

Sand whiting (*Sillago ciliata*)

The following overview is based on information provided in SPCC (1981a), Hutchins and Swainston (1986), Kailola *et al.*, (1993), Pollard and Growns (1993), West (1993) Pease and Grinberg (1995), Gibbs (1997), Yearsley *et al.*, (1999), Fletcher and McVea (2000), and the NSW Fisheries catch statistics database.

The sand whiting (*Sillago ciliata*) occurs along the entire eastern coastline of Australia, from Cape York (Queensland) down to eastern Tasmania. It is also found in New Caledonia and Papua New Guinea. In NSW waters, sand whiting are found within estuaries and in coastal waters off ocean beaches. Within estuaries, the favoured habitat is bare sandy substrate. Sand whiting eat bottom-dwelling invertebrates, particularly polychaete worms, crustaceans and molluscs taken by fossicking through the sand.

Spawning occurs near river mouths, typically during summer. Many of the larvae enter estuaries, with the small juveniles preferring shallow water (particularly along sandy shores, but also in and around seagrasses and mangroves). Sand whiting grow fairly slowly, taking about 5 years to reach 290 mm (fork length). They mature at around 240 mm (males) to 260 mm (females). Maximum length is about 500 mm (total length). After spawning, adults may either enter estuarine waters or remain along ocean beaches.

The majority of sand whiting taken in the estuary general fishery are caught in hauling nets and the catch is reasonably well spread throughout the year.

They are generally sold as whole fish or fillets and when sold whole fish through the Sydney Fish Market, sand whiting attracted an average wholesale price of \$9.27/kg for the period 1995/96 to 1999/2000.

Sand whiting (*Sillago ciliata*)

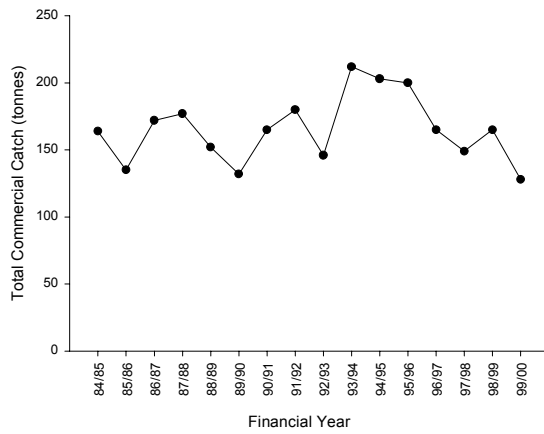


Figure A25. The total reported commercial catch of sand whiting in NSW for the period 1984/85 to 1999/2000.

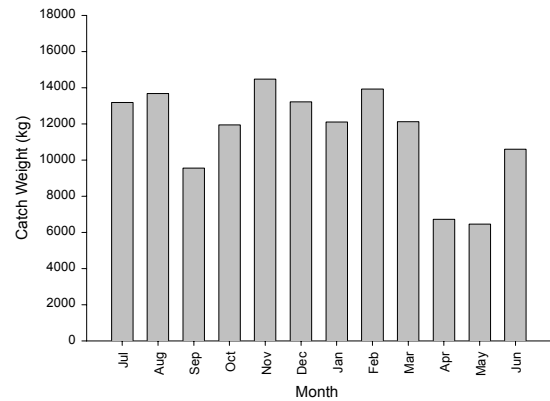


Figure A26. The average reported catch per month of sand whiting in the estuary general fishery for the period 1997/98 and 1998/99.

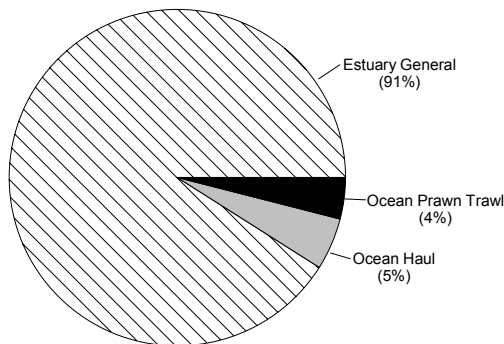


Figure A27. The average percentage of reported catch of sand whiting between commercial fisheries for the period 1997/98 and 1998/99

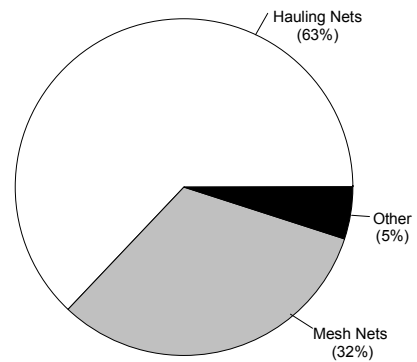


Figure A28. The average percentage of reported catch of sand whiting by gear types in the estuary general fishery for the period 1997/98 and 1998/99.

Silver biddy (*Gerres subfasciatus*)

The following overview is based on information provided in SPCC (1981a), Kailola *et al.*, (1993), Pollard and Grown (1993), Pease and Grinberg (1995), Gibbs (1997), Hannan and Williams (1998), Yearsley *et al.*, (1999), Fletcher and McVea (2000), and the NSW Fisheries catch statistics database.

The silver biddy (*Gerres subfasciatus*) is widely distributed, occurring on both the east and west coasts of Australia. In NSW Waters, silver biddies are found in both estuaries and inshore waters. Within estuaries, they are generally found over sand and mud bottoms. Their diet consists of small invertebrates, particularly polychaetes.

Spawning appears to occur within both inshore waters and marine-dominated estuaries, primarily during summer and early autumn. The larvae enter estuaries and the small juveniles subsequently live in sheltered shallow water habitats (particularly where cover such as seagrass or algae are available). Larger juveniles appear to be less dependent on such cover, and are found over open bare substrate. Silver biddies are thought to mature at around 200 mm in length. Maximum length is only about 230 mm (total length). Little is known about growth rates or migration patterns.

Silver biddies are one of the smallest finfish commercially harvested in NSW. Silver biddies are similar in appearance to small bream, and this often causes mistaken concern amongst people viewing commercial fishing operations or browsing at fish in retail outlets. Prior to the 1980s silver biddies were landed in small quantities and sold as an incidental catch in hauling operations as their relative value was low.

As prices began to rise for silver biddies, quantities of this previously discarded species started to be more readily retained and sold, leading to a significant expansion in recorded catch. For instance, the average annual recorded catch of silver biddies from 1970/71 to 1980/81 was 51.4 tonnes compared with recent annual catches of more than 130 tonnes. This species is taken mainly by hauling nets year round.

When sold as whole fish through the Sydney Fish Market, silver biddies attracted an average wholesale price of \$2.18/kg for the period 1995/96 to 1999/2000.

Silver biddy (*Gerres subfasciatus*)

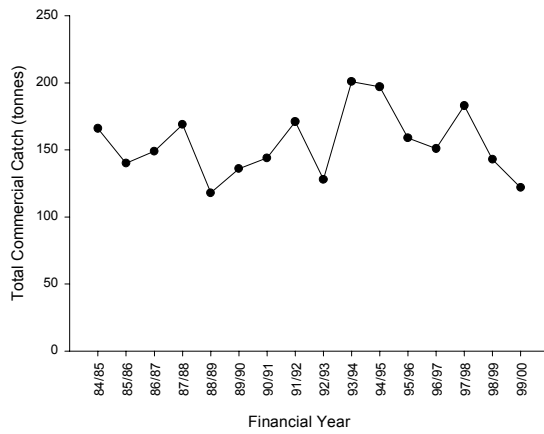


Figure A29. The total reported commercial catch of silver biddy in NSW for the period 1984/85 to 1999/2000.

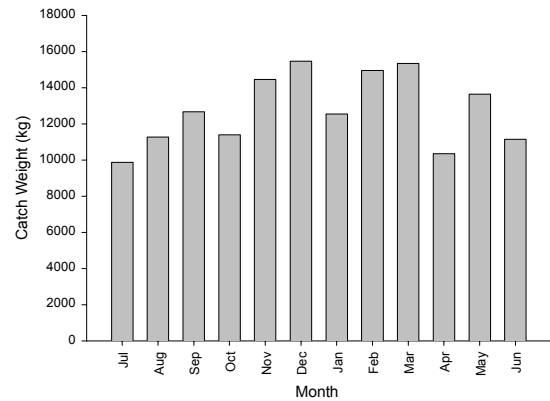


Figure A30. The average reported catch per month of silver biddy in the estuary general fishery for the period 1997/98 and 1998/99.

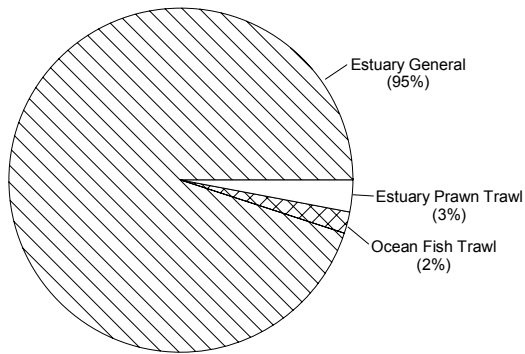


Figure A31. The average percentage of reported catch of silver biddy between commercial fisheries for the period 1997/98 and 1998/99.

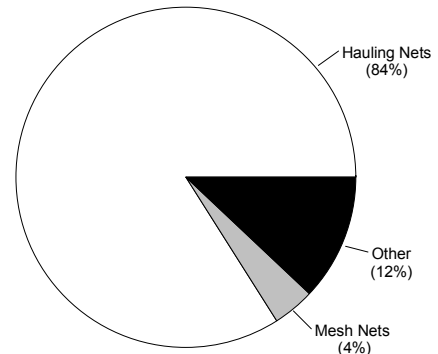


Figure A32. The average percentage of reported catch of silver biddy by gear types in the estuary general fishery for the period 1997/98 and 1998/99.

River (longfinned) eels (*Anguilla reinhardtii*)

The following overview is based on information provided in Kailola *et al.*, (1993), Pollard and Grown (1993), Pease and Grinberg (1995), Beumer (1996), Yearsley *et al.*, (1999), Fletcher and McVea (2000), Pease (pers. comm.) and the NSW Fisheries catch statistics database.

There are two species of ‘river eels’: the long-finned river eel (*Anguilla reinhardtii*) and the short-finned river eel (*A. australis*). Both species occur along the entire NSW coast, but longfinned eels are the primary target of the commercial fishery. Within Australia, the short-finned river eel has a more southerly distribution (approximately between Brisbane and Tasmania) than the long-finned river eel (between Cape York and Tasmania). Both species are also found at Lord Howe Island and Norfolk Island as well as in New Caledonia and New Zealand. Longfinned eels are also found in New Guinea and the Solomon Islands. In NSW waters, both species occur within estuaries and in most freshwaters east of the Great Dividing Range, with the long-finned river eel preferring riverine and estuarine habitats while the short-finned river eel is more likely to be found in still or slow flowing fresh waters. River eels are the top carnivores in upper catchment waters, feeding on crustaceans, molluscs, terrestrial and aquatic insects, and in the case of larger individuals, fish (including other eels) and small waterfowl.

Spawning occurs in deep ocean waters (believed to be the Coral Sea), typically during winter. River eels pass through two distinct larval stages: the leaf-like ‘leptocephali’ larva and the unpigmented, eel-shaped postlarvae known as ‘glass eel’ or ‘elver’. After a long larval period (almost one year) the elvers enter estuaries and freshwaters. In the process, they quickly develop into fully pigmented sub-adults or ‘yellow eels’, which are the focus of the commercial fishery. River eels are less affected by instream barriers than are most finfish, and are able to ascend most dams and weirs provided suitably damp conditions are available. River eels appear to grow slowly, taking about 10 to 50 years to reach sexual maturity. In general, females grow to a much larger size than males. Mature eels migrate downstream (with the assistance of floodwaters) before swimming up to 3000 km to reach the spawning area. Maximum length is about 1650 mm for long-finned river eels and about 1100 mm for short-finned river eels. Adults are presumed to die after spawning.

River eel landings were first recorded separately in 1969. Recorded landings remained low (less than 100 tonnes per year) until 1991. During this period most of the landings were recorded from the Clarence River. The primary market was for locally smoked eel meat or frozen fillets exported to Europe. Prices for both markets were relatively low. In the early 1990s, a high value market developed for live eels for export to China. Fishing effort in the estuaries increased substantially and permits were issued for harvesting from farm dams and impoundments in 1991. Landings quickly increased to a peak of over 400 tonnes in the fiscal year 1992/93. Fishing effort levelled off and landings declined to around 300 tonnes in the mid-1990s. Since 1997, annual landings have stabilised to around 200 tonnes.

Peaks in eel fishing activity vary between catchments. In the Clarence River eel trapping is generally a winter activity. Commercial eel fishing in the Hawkesbury River, however, peaks earlier in the year, and is possibly market driven to supply the high export demand for the Chinese New Year.

Eels are taken almost exclusively in eel traps. Most of the catch is exported live to China and a very small proportion of the catch is sold as whole fish through the Sydney Fish Market where they attracted an average wholesale price of \$2.83 kg for the period 1995/96 to 1999/2000. The export value to fishers was as high as \$12 kg during this period.

River (longfinned) eels (*Anguilla reinhardtii*)

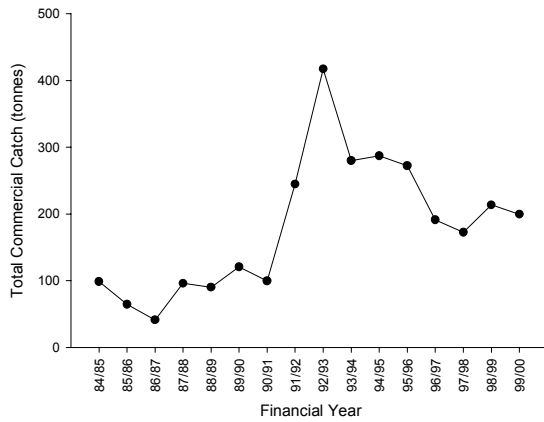


Figure A33. The total reported commercial catch of longfinned river eel in NSW for the period 1984/85 to 1999/2000.

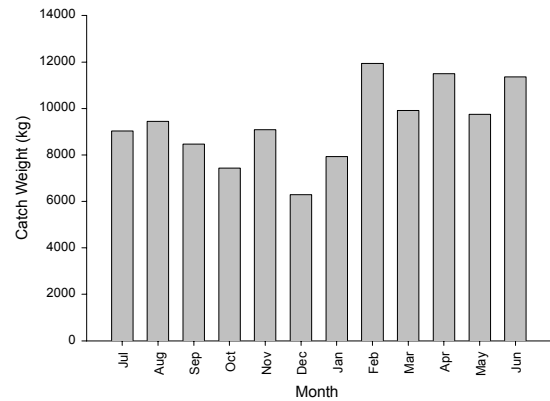


Figure A34. The average reported catch per month of longfinned river eel in the estuary general fishery for the period 1997/98 and 1998/99.

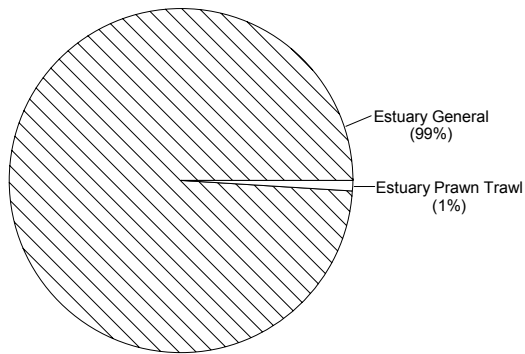


Figure A35. The average percentage of reported catch of longfinned river eel between commercial fisheries for the period 1997/98 and 1998/99

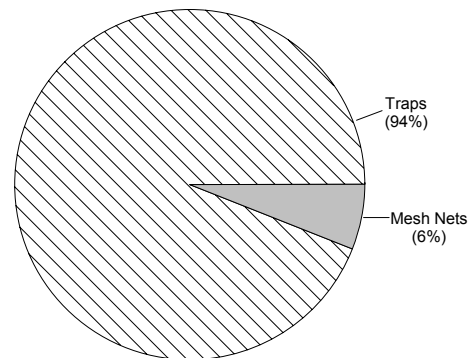


Figure A36. The average percentage of reported catch of longfinned river eel by gear types in the estuary general fishery for the period 1997/98 and 1998/99

Pipis (*Plebidonax deltoides*)

The following overview is based on information provided in Robinson and Gibbs (1982) and Kailola *et al.*, (1993), Pease and Grinberg (1995), Yearsley *et al.*, (1999), Fletcher and McVea (2000), the NSW Fisheries catch statistics database and on Philip Gibbs (pers. comm.).

The pipi (*Plebidonax deltoides*) occurs on surf beaches from southern Queensland to Eyre Peninsula in South Australia. They are found within the surf zone, (ie. within intertidal and shallow subtidal waters) along high energy coastlines. Whilst pipis are harvested under the estuary general fishery, they are not normally found within estuaries proper. Like most bivalve molluscs, pipis filter feed by extracting microscopic matter (particularly phytoplankton) from the water.

Based on studies in South Australia, pipis probably spawn in spring, with the juveniles recruiting to the same habitat as that occupied by adults. Maturity is likely to be reached at around 36 mm shell length and 13 months of age. Pipis grow to more than 60 mm shell length and are believed to live for up to 4 or 5 years.

There was a considerable peak in landings of pipis in 1996/97 before several events of human sickness following consumption of pipis caused this part of the fishery to be closed periodically during 1997 and 1998. The pipis were contaminated by algal blooms occurring off some beaches in summer. Access to this part of the fishery has subsequently been limited to fishers who operate in accordance with an approved biotoxin management program. Under the program, fishers test the water regularly for the presence of algae and cease harvesting if concentrations are above established levels.

Reported landings of pipis have increased from around 50 tonnes per annum in 1984/85 to over 600 tonnes per annum in 1999/00. Increased landing throughout this period probably arose due to increased market and product value. It is envisaged that the value of pipis will continue to rise.

Pipis are collected exclusively by hand gathering endorsement holders in the estuary general fishery, by the method of hand picking. Apart from human consumption in soups and chowders, pipis are often used sold as recreational fishing bait. When sold through the Sydney Fish Market, pipis attracted an average wholesale price of \$2.50 kg for the period 1995/96 to 1999/2000, although this average is probably affected by public confidence during the food poisoning events. The average price appears now to be rising and it is likely to continue to do so over the coming years.

Pipis (*Plebidonax deltoides*)

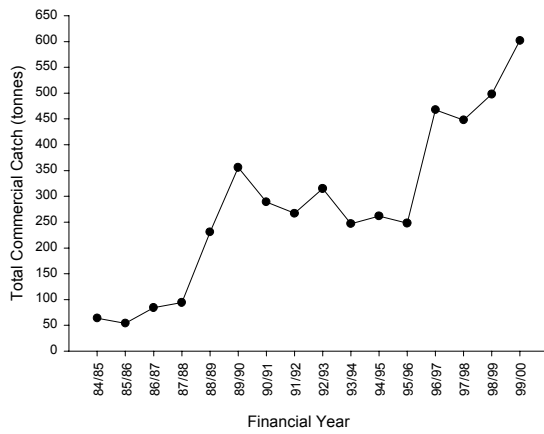


Figure A37. The total reported commercial catch of pipis in NSW for the period 1984/85 to 1999/2000.

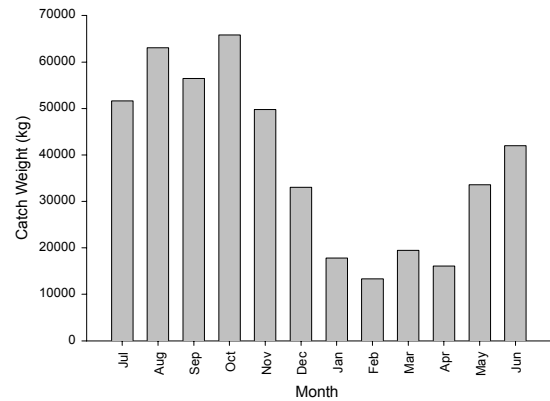


Figure A38. The average reported catch per month of pipis in the estuary general fishery for the period 1997/98 and 1998/99.

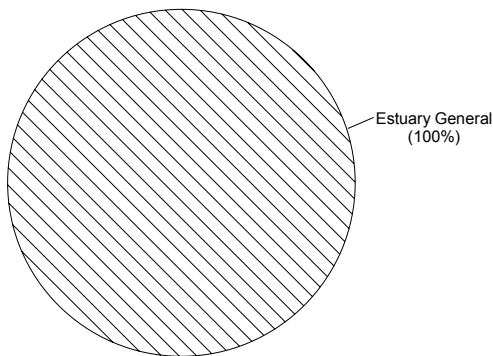


Figure A39. The average percentage of reported catch of pipis between commercial fisheries for the period 1997/98 and 1998/99.

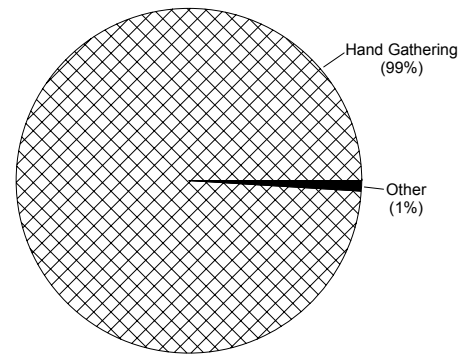


Figure A40. The average percentage of reported catch of pipis by gear types in the estuary general fishery for the period 1997/98 and 1998/99.

Appendix 2 Estuary General Fishery – Fishing Gear Regulations

The *Fisheries Management (General) Regulation 1995* includes descriptions (including standard and non-standard dimensions) for the fishing gear used in the Estuary General Fishery, as well as identifying the waters in which the gear may be used.

A comprehensive review of the Regulation was undertaken during 2002 and new Regulations will be gazetted to in late 2002 to implement some of the components of this management strategy. Up-to-date regulations can be viewed on NSW Fisheries website (www.fisheries.nsw.gov.au). The regulations relating to permitted gear types will change as a result of implementing various management responses in the strategy and will be incorporated into the share management plan prepared for the fishery in 2003. At the commencement of the strategy the following changes will be provided for in the Regulation. Information in this appendix should be read in conjunction with the *Fisheries Management (General) Regulation 1995* which is available on the NSW Fisheries website.

Changes required to fishing gear/method regulations	
Gear/method	Change to regulation
Fish trap	*
Eel trap	*
Crab trap	*
Hoop or lift net	*
Meshing net	*
Flathead net	* Also, dimensions to be determined in accordance with management response 1.1a
Hauling net (general purpose)	* Also, nets previously with a maximum length of 1000 m and 725 m will be restricted to a maximum of 500 m. The use of these nets will also be limited to one completed shot per day
Prawn net (hauling)	*
Pilchard anchovy and bait net	Nil
Trumpeter whiting net (hauling)	Nil
Bait net	Nil
Garfish net (hauling)	Nil
Garfish net (bullringing)	*
Seine net (prawns)	Nil
Prawn net (set pocket)	Nil
Prawn running net	Nil
Push or scissors net (prawns)	*
Hand-hauled prawn net	*
Hand gathering	Limited to the estuaries in Appendix 3 (as well as ocean beaches)
Handlining	Limited to the estuaries in Appendix 3
Dip or scoop net (prawns)	*
Lampara net	This gear type will be removed

* The *Fisheries Management (General) Regulation 1995* has historically permitted (subject to any closures) these gear types to be used in 'all other waters' or 'any waters'. Under the management strategy, the use of these gear types and methods will (subject to any closures) be limited to certain estuaries as specified in Appendix 3. Estuaries not listed in Appendix 3 do not form part of the fishery.

Appendix 2 Estuary General Fishery – Fishing Gear Regulations

The *Fisheries Management (General) Regulation 1995* includes descriptions (including standard and non-standard dimensions) for the fishing gear used in the Estuary General Fishery, as well as identifying the waters in which the gear may be used.

A comprehensive review of the Regulation was undertaken during 2002 and new Regulations will be gazetted to in late 2002 to implement some of the components of this management strategy. Up-to-date regulations can be viewed on NSW Fisheries website (www.fisheries.nsw.gov.au). The regulations relating to permitted gear types will change as a result of implementing various management responses in the strategy and will be incorporated into the share management plan prepared for the fishery in 2003. At the commencement of the strategy the following changes will be provided for in the Regulation. Information in this appendix should be read in conjunction with the *Fisheries Management (General) Regulation 1995* which is available on the NSW Fisheries website.

Changes required to fishing gear/method regulations	
Gear/method	Change to regulation
Fish trap	*
Eel trap	*
Crab trap	*
Hoop or lift net	*
Meshing net	*
Flathead net	* Also, dimensions to be determined in accordance with management response 1.1a
Hauling net (general purpose)	* Also, nets previously with a maximum length of 1000 m and 725 m will be restricted to a maximum of 500 m. The use of these nets will also be limited to one completed shot per day
Prawn net (hauling)	*
Pilchard anchovy and bait net	Nil
Trumpeter whiting net (hauling)	Nil
Bait net	Nil
Garfish net (hauling)	Nil
Garfish net (bullringing)	*
Seine net (prawns)	Nil
Prawn net (set pocket)	Nil
Prawn running net	Nil
Push or scissors net (prawns)	*
Hand-hauled prawn net	*
Hand gathering	Limited to the estuaries in Appendix 3 (as well as ocean beaches)
Handlining	Limited to the estuaries in Appendix 3
Dip or scoop net (prawns)	*
Lampara net	This gear type will be removed

* The *Fisheries Management (General) Regulation 1995* has historically permitted (subject to any closures) these gear types to be used in 'all other waters' or 'any waters'. Under the management strategy, the use of these gear types and methods will (subject to any closures) be limited to certain estuaries as specified in Appendix 3. Estuaries not listed in Appendix 3 do not form part of the fishery.

Appendix 3 Estuary general fishing gear/methods permitted in the estuaries open to estuary general fishing

The listed gear and methods specified in this appendix are permitted to be used in the corresponding estuary. Any methods not listed alongside an estuary are not permitted to be used in that estuary. Some important points to note regarding the information in this appendix are:

- Many of the estuaries listed below include tributaries that are open to the Estuary General Fishery, although not specifically identified in the list.
- Parts of these estuaries may be closed to all commercial fishing or certain methods at some or all times (e.g. seasonal, weekend and area based fishing closures). Parts of estuaries affected by closures are detailed in individual fishing closure notices provided for under the *Fisheries Management Act 1994*. Details of up-to-date fishing closures made under the Act can be found on the NSW Fisheries website at www.fisheries.nsw.gov.au or by contacting your local Fisheries Office.
- The *Fisheries Management (General) Regulation 1995* also controls the size and dimensions of different gear types used in the various estuary waters available to the fishery. See section 3(d) for a description of the standard fishing gear authorised in the Estuary General Fishery.
- Areas available to the Estuary General Fishery are subject to change. For example, if areas are designated as recreational fishing havens or sanctuary, habitat protection or special purpose zones are established within marine protected areas. Fishing regulations are subject to marine park and aquatic reserve restrictions.
- Other authorities (e.g. local government councils) may prohibit fishing in estuaries due to poor water quality or other reasons. Examples of estuaries currently subject to such restrictions include Manly Lagoon, Curl Curl Lagoon and Dee Why Lagoon. It is advised to check with the appropriate authority for details.
- In addition to the estuaries, gear types and methods that follow, the Estuary General Fishery includes the gathering by hand of fish such as beachworms and pipis from ocean beaches (except where closures apply).

COMMERCIAL FISHING GEAR/METHODS PERMITTED IN THE NSW ESTUARY GENERAL FISHERY		
Name of Estuary	Gear permitted	
Tweed River	Hauling net (general purpose)	Prawn net (hauling)
	Garfish net (bullringing)	Meshing net
	Bait net	Hoop or lift net
	Hand hauled prawn net	Push or scissor net
	Dip or scoop net	Fish trap
	Crab trap	Eel trap
	Hand lining	Handgathering
Cudgen Lake	Hand hauled prawn net	Push or scissor net
	Dip or scoop net	Hoop or lift net
	Fish trap	Crab trap
	Eel trap	Hand lining
	Handgathering	
Cudgera Creek	Hand hauled prawn net	Push or scissor net
	Dip or scoop net	Hoop or lift net
	Fish trap	Crab trap
	Eel trap	Hand lining
	Handgathering	
Mooball Creek	Hand hauled prawn net	Dip or scoop net
	Push or scissor net	Hoop or lift net
	Fish trap	Crab trap
	Eel trap	Hand lining
	Handgathering	
Brunswick River	Hand hauled prawn net	Dip or scoop net
	Push or scissor net	Hoop or lift net
	Fish trap	Crab trap
	Eel trap	Hand lining
	Handgathering	
Belongil Creek	Hand hauled prawn net	Dip or scoop net
	Hoop or lift net	Fish trap
	Push or scissor net	Eel trap
	Crab trap	Handgathering
	Hand lining	
Tallow Creek	Hand hauled prawn net	Push or scissor net
	Hoop or lift net	Dip or scoop net
	Fish trap	Crab trap
	Eel trap	Hand lining
	Handgathering	
Broken Head Creek	Hoop or lift net	Hand hauled prawn net
	Push or scissor net	Dip or scoop net
	Fish trap	Crab trap
	Eel trap	Hand lining
	Handgathering	
Richmond River	Bait net	Hauling net (general purpose)
	Garfish net (bullringing)	Prawn net (hauling)
	Meshing net	Hoop or lift net
	Hand hauled prawn net	Push or scissor net
	Dip or scoop net	Fish trap
	Crab trap	Eel trap
	Hand lining	Handgathering

COMMERCIAL FISHING GEAR/METHODS PERMITTED IN THE NSW ESTUARY GENERAL FISHERY		
Name of Estuary	Gear permitted	
Evans River	Hoop or lift net	Hand hauled prawn net
	Push or scissor net	Dip or scoop net
	Crab trap	Hand lining
	Handgathering	
Jerusalem Creek	Hand hauled prawn net	Dip or scoop net
	Push or scissor net	Hoop or lift net
	Fish trap	Crab trap
	Eel trap	Hand lining
	Handgathering	
Clarence River <i>(including Lake Wooloweyah)</i>	Hauling net (general purpose)	Garfish net (bullringing)
	Prawn net (set pocket)	Meshing net
	Hoop or lift net	Hand hauled prawn net
	Push or scissor net	Dip or scoop net
	Fish trap	Crab trap
	Eel trap	Hand lining
	Handgathering	
Sandon River	Eel trap	Fish trap
	Crab trap	Hand lining
	Handgathering	
Wooli Wooli River	Hauling net (general purpose)	Garfish net (bullringing)
	Prawn net (hauling)	Meshing net
	Hoop or lift net	Hand hauled prawn net
	Push or scissor net	Dip or scoop net
	Fish trap	Crab trap
	Eel trap	Hand lining
	Handgathering	
Station Creek	Hand hauled prawn net	Hoop or lift net
	Push or scissor net	Dip or scoop net
	Fish trap	Crab trap
	Eel trap	Hand lining
	Handgathering	
Corindi River	Dip or scoop net	Fish trap
	Crab trap	Eel trap
	Hand lining	Handgathering
Arrawarra Creek	Dip or scoop net	Hoop or lift net
	Hand hauled prawn net	Hand lining
	Handgathering	
Darkum Creek	Dip or scoop net	Hand hauled prawn net
	Push or scissor net	Hoop or lift net
	Fish trap	Crab trap
	Eel trap	Hand lining
	Handgathering	
Woolgoolga Lake	Hoop or lift net	Hand hauled prawn net
	Push or scissor net	Dip or scoop net
	Fish trap	Crab trap
	Eel trap	Hand lining
	Handgathering	

COMMERCIAL FISHING GEAR/METHODS PERMITTED IN THE NSW ESTUARY GENERAL FISHERY		
Name of Estuary	Gear permitted	
Hearns Lake	Hoop or lift net	Hand hauled prawn net
	Push or scissor net	Dip or scoop net
	Fish trap	Crab trap
	Eel trap	Hand lining
	Handgathering	
Moonee Creek	Hoop or lift net	Hand hauled prawn net
	Push or scissor net	Dip or scoop net
	Fish trap	Crab trap
	Eel trap	Hand lining
	Handgathering	
Coffs Harbour Creek	Hand hauled prawn net	Push or scissor net
	Dip or scoop net	Fish trap
	Crab trap	Eel trap
	Hand lining	Handgathering
Boambee Creek	Dip or scoop net	Fish trap
	Crab trap	Eel trap
	Hand lining	Handgathering
Bonville Creek (including Pine Creek)	Dip or scoop net	Fish trap
	Crab trap	Eel trap
	Hand lining	Handgathering
Dalhousie Creek	Garfish net (bullringing)	Prawn net (hauling)
	Meshing net	Hoop or lift net
	Hand hauled prawn net	Push or scissor net
	Dip or scoop net	Fish trap
	Crab trap	Eel trap
	Hand lining	Handgathering
Oyster Creek	Garfish net (bullringing)	Prawn net (hauling)
	Meshing net	Hoop or lift net
	Hand hauled prawn net	Push or scissor net
	Dip or scoop net	Fish trap
	Crab trap	Eel trap
	Hand lining	Handgathering
Nambucca River	Hauling net (general purpose)	Garfish net (bullringing)
	Prawn net (hauling)	Meshing net
	Hoop or lift net	Hand hauled prawn net
	Push or scissor net	Dip or scoop net
	Fish trap	Crab trap
	Eel trap	Hand lining
	Handgathering	
Macleay River	Seine net (prawns)	Hauling net (general purpose)
	Garfish net (bullringing)	Prawn net (hauling)
	Meshing net	Hoop or lift net
	Hand hauled prawn net	Push or scissor net
	Dip or scoop net	Fish trap
	Crab trap	Eel trap
	Hand lining	Handgathering

COMMERCIAL FISHING GEAR/METHODS PERMITTED IN THE NSW ESTUARY GENERAL FISHERY		
Name of Estuary	Gear permitted	
South West Rocks Creek	Dip or scoop net	Fish trap
	Crab trap	Eel trap
	Hand lining	Handgathering
Saltwater Creek	Prawn net (hauling)	Meshing net
	Hoop or lift net	Hand hauled prawn net
	Push or scissor net	Dip or scoop net
	Fish trap	Crab trap
	Eel trap	Hand lining
	Handgathering	
Korogoro Creek	Fish trap	Crab trap
	Eel trap	Hand lining
	Handgathering	
Killick River	Hand hauled prawn net	Dip or scoop net
	Fish trap	Crab trap
	Eel trap	Hand lining
	Handgathering	
Lake Innes	Hauling net (general purpose)	Garfish net (bullringing)
	Prawn net (hauling)	Meshing net
	Hoop or lift net	Hand hauled prawn net
	Push or scissor net	Dip or scoop net
	Fish trap	Crab trap
	Eel trap	Hand lining
Lake Cathie	Prawn net (set pocket)	Dip or scoop net
	Hand hauled prawn net	Hoop or lift net
	Push or scissor net	Fish trap
	Crab trap	Eel trap
	Hand lining	Handgathering
Camden Haven River	Prawn net (set pocket)	Seine net (prawns)
	Garfish net (bullringing)	Prawn net (hauling)
	Meshing net	Hoop or lift net
	Hand hauled prawn net	Push or scissor net
	Dip or scoop net	Fish trap
	Crab trap	Eel trap
	Hand lining	Handgathering
Manning River	Prawn net (hauling)	Hauling net (general purpose)
	Garfish net (bullringing)	Meshing net
	Hoop or lift net	Hand hauled prawn net
	Push or scissor net	Dip or scoop net
	Fish trap	Crab trap
	Eel trap	Hand lining
	Handgathering	
Khappinghat Creek	Fish trap	Crab trap
	Eel trap	Hand lining
	Handgathering	

COMMERCIAL FISHING GEAR/METHODS PERMITTED IN THE NSW ESTUARY GENERAL FISHERY		
Name of Estuary	Gear permitted	
Wallis Lake	Prawn net (hauling)	Prawn net (set pocket)
	Seine net (prawns)	Hauling net (general purpose)
	Garfish net (bullringing)	Meshing net
	Flathead net	Hoop or lift net
	Hand hauled prawn net	Push or scissor net
	Dip or scoop net	Fish trap
	Crab trap	Eel trap
	Hand lining	Handgathering
Smiths Lake	Prawn net (hauling)	Prawn net (set pocket)
	Hauling net (general purpose)	Seine net (prawns)
	Garfish net (bullringing)	Meshing net
	Flathead net	Hoop or lift net
	Hand hauled prawn net	Push or scissor net
	Dip or scoop net	Fish trap
	Crab trap	Eel trap
	Hand lining	Handgathering
Myall Lakes	Hauling net (general purpose)	Prawn net (hauling)
	Garfish net (bullringing)	Meshing net
	Hoop or lift net	Hand hauled prawn net
	Push or scissor net	Dip or scoop net
	Fish trap	Crab trap
	Eel trap	Hand lining
	Handgathering	
Myall River	Prawn net (set pocket)	Trumpeter whiting net
	Garfish net (bullringing)	Hauling net (general purpose)
	Prawn net (hauling)	Meshing net
	Hoop or lift net	Hand hauled prawn net
	Push or scissor net	Dip or scoop net
	Fish trap	Crab trap
	Eel trap	Hand lining
	Handgathering	
Lake Booloombay	Hauling net (general purpose)	Garfish net (bullringing)
	Prawn net (hauling)	Meshing net
	Hoop or lift net	Hand hauled prawn net
	Push or scissor net	Dip or scoop net
	Fish trap	Crab trap
	Eel trap	Hand lining
	Handgathering	
Port Stephens	Hauling net (general purpose)	Trumpeter whiting net
	Garfish net (hauling)	Garfish net (bullringing)
	Prawn net (hauling)	Meshing net
	Hoop or lift net	Hand hauled prawn net
	Push or scissor net	Dip or scoop net
	Fish trap	Crab trap
	Eel trap	Hand lining
	Handgathering	

COMMERCIAL FISHING GEAR/METHODS PERMITTED IN THE NSW ESTUARY GENERAL FISHERY		
Name of Estuary	Gear permitted	
Karuah River	Hauling net (general purpose)	Garfish net (bullringing)
	Meshing net	Hoop or lift net
	Fish trap	Crab trap
	Eel trap	Hand lining
	Handgathering	
Hunter River	Hauling net (general purpose)	Garfish net (bullringing)
	Prawn net (hauling)	Meshing net
	Hoop or lift net	Hand hauled prawn net
	Push or scissor net	Dip or scoop net
	Fish trap	Crab trap
	Eel trap	Hand lining
	Handgathering	
Tuggerah Lakes	Hauling net (general purpose)	Garfish net (bullringing)
	Prawn net (hauling)	Prawn net (set pocket)
	Prawn running net	Seine net (prawns)
	Meshing net	Flathead net
	Hoop or lift net	Hand hauled prawn net
	Push or scissor net	Dip or scoop net
	Fish trap	Crab trap
	Eel trap	Hand lining
	Handgathering	
Wamberal Lagoon	Hand lining	Handgathering
Terrigal Lake	Hand lining	Handgathering
Avoca Lake	Hand lining	Handgathering
Cockrone Lake	Hand lining	Handgathering
Brisbane Water	Hand lining	Handgathering
Hawkesbury River	Garfish net (hauling)	Hauling net (general purpose)
	Garfish net (bullringing)	Prawn net (hauling)
	Meshing net	Hoop or lift net
	Whitebait species net (by permit only)	Hand hauled prawn net
	Push or scissor net	Dip or scoop net
	Fish trap	Crab trap
	Eel trap	Hand lining
Handgathering		
Pittwater	Hauling net (general purpose)	Garfish net (bullringing)
	Garfish net (hauling)	Prawn net (hauling)
	Meshing net	Hoop or lift net
	Whitebait species net (by permit only)	Hand hauled prawn net
	Push or scissor net	Dip or scoop net
	Fish trap	Crab trap
	Eel trap	Hand lining
Handgathering		
Narrabeen Lagoon	Hand lining	Handgathering
Dee Why Lagoon	Hand lining	Handgathering

COMMERCIAL FISHING GEAR/METHODS PERMITTED IN THE NSW ESTUARY GENERAL FISHERY		
Name of Estuary	Gear permitted	
Curl Curl Lagoon <i>(Harbord Lagoon)</i>	Hand lining	Handgathering
Manly Lagoon	Hand lining	Handgathering
Sydney Harbour	Garfish net (hauling)	Prawn net (hauling)
	Pilchard, anchovy and bait net (hauling)	Hauling net (general purpose)
	Garfish net (bullringing)	Meshing net
	Whitebait species net (by permit only)	Hoop or lift net
	Hand hauled prawn net	Push or scissor net
	Dip or scoop net	Fish trap
	Crab trap	Eel trap
	Hand lining	Handgathering
Port Hacking	Hand lining	Handgathering
Towradgie Creek	Prawn net (hauling)	Hoop or lift net
	Hand hauled prawn net	Push or scissor net
	Dip or scoop net	Fish trap
	Crab trap	Eel trap
	Hand lining	Handgathering
Port Kembla	Fish trap	Crab trap
	Eel trap	Hand lining
	Handgathering	
Lake Illawarra	Hauling net (general purpose)	Prawn net (hauling)
	Prawn running net	Seine net (prawns)
	Prawn net (set pocket)	Garfish net (bullringing)
	Meshing net	Flathead net
	Hoop or lift net	Hand hauled prawn net
	Push or scissor net	Dip or scoop net
	Fish trap	Crab trap
	Eel trap	Hand lining
	Handgathering	
Minnamurra River	Dip or scoop net	Fish trap
	Crab trap	Eel trap
	Hand lining	Handgathering
Spring Creek	Prawn net (hauling)	Hoop or lift net
	Hand hauled prawn net	Push or scissor net
	Dip or scoop net	Fish trap
	Crab trap	Eel trap
	Hand lining	Handgathering
Werri Lagoon	Hand hauled prawn net	Dip or scoop net
	Fish trap	Crab trap
	Eel trap	Hand lining
	Handgathering	
Crooked River	Dip or scoop net	Hand hauled prawn net
	Push or scissor net	Fish trap
	Crab trap	Eel trap
	Hand lining	Handgathering

COMMERCIAL FISHING GEAR/METHODS PERMITTED IN THE NSW ESTUARY GENERAL FISHERY		
Name of Estuary	Gear permitted	
Shoalhaven River <i>(including Crookhaven River)</i>	Prawn net (hauling)	Hauling net (general purpose)
	Garfish net (bullringing)	Meshing net
	Hoop or lift net	Hand hauled prawn net
	Push or scissor net	Dip or scoop net
	Fish trap	Crab trap
	Eel trap	Hand lining
	Handgathering	
Lake Wollumboola	Prawn running net	Hauling net (general purpose)
	Garfish net (bullringing)	Prawn net (hauling)
	Meshing net	Hoop or lift net
	Hand hauled prawn net	Push or scissor net
	Dip or scoop net	Fish trap
	Crab trap	Eel trap
	Hand lining	Handgathering
Jervis Bay <i>(including Currumbene Creek)</i>	Meshing net	Hauling net (general purpose)
	Garfish net (bullringing)	Garfish net (hauling)
	Prawn net (hauling)	Hand hauled prawn net
	Whitebait species net (by permit only)	Push or scissor net
	Hoop or lift net	Fish trap
	Crab trap	Eel trap
	Hand lining	Handgathering
Swan Lake	Prawn running net	Hauling net (general purpose)
	Garfish net (bullringing)	Prawn net (hauling)
	Meshing net	Hoop or lift net
	Hand hauled prawn net	Push or scissor net
	Dip or scoop net	Fish trap
	Crab trap	Eel trap
	Hand lining	Handgathering
Berrara Creek	Hand hauled prawn net	Push or scissor net
	Dip or scoop net	Hand lining
	Handgathering	
Nerrindilah Creek	Prawn net (hauling)	Hoop or lift net
	Hand hauled prawn net	Push or scissor net
	Dip or scoop net	Fish trap
	Crab trap	Eel trap
	Hand lining	Handgathering
Termeil Lake	Hauling net (general purpose)	Garfish net (bullringing)
	Prawn net (hauling)	Meshing net
	Hoop or lift net	Hand hauled prawn net
	Push or scissor net	Dip or scoop net
	Fish trap	Crab trap
	Eel trap	Hand lining
	Handgathering	
Willinga Lake	Dip or scoop net	Fish trap
	Crab trap	Eel trap
	Hand lining	Handgathering

COMMERCIAL FISHING GEAR/METHODS PERMITTED IN THE NSW ESTUARY GENERAL FISHERY		
Name of Estuary	Gear permitted	
Durras Lake	Prawn running net	Meshing net
	Garfish net (bullringing)	Prawn net (hauling)
	Hoop or lift net	Hand hauled prawn net
	Push or scissor net	Dip or scoop net
	Fish trap	Crab trap
	Eel trap	Hand lining
	Handgathering	
Batemans Bay <i>(including Clyde River and Cullendulla Creek)</i>	Hauling net (general purpose)	Garfish net (bullringing)
	Prawn net (hauling)	Meshing net
	Hoop or lift net	Hand hauled prawn net
	Push or scissor net	Dip or scoop net
	Fish trap	Crab trap
	Eel trap	Hand lining
	Handgathering	
Candlagan Creek	Hand lining	Handgathering
Moruya River	Hauling net (general purpose)	Garfish net (bullringing)
	Prawn net (hauling)	Meshing net
	Hoop or lift net	Hand hauled prawn net
	Push or scissor net	Dip or scoop net
	Fish trap	Crab trap
	Eel trap	Hand lining
	Handgathering	
Congo Creek	Prawn net (hauling)	Meshing net
	Hoop or lift net	Hand hauled prawn net
	Push or scissor net	Dip or scoop net
	Fish trap	Crab trap
	Eel trap	Hand lining
	Handgathering	
Meringo River	Prawn net (hauling)	Meshing net
	Hoop or lift net	Hand hauled prawn net
	Push or scissor net	Dip or scoop net
	Fish trap	Crab trap
	Eel trap	Hand lining
	Handgathering	
Coila Lake	Hauling net (general purpose)	Prawn net (hauling)
	Prawn running net	Garfish net (bullringing)
	Meshing net	Hoop or lift net
	Hand hauled prawn net	Push or scissor net
	Dip or scoop net	Fish trap
	Crab trap	Eel trap
	Hand lining	Handgathering
Lake Brou	Prawn running net	Hauling net (general purpose)
	Garfish net (bullringing)	Prawn net (hauling)
	Meshing net	Hoop or lift net
	Hand hauled prawn net	Push or scissor net
	Dip or scoop net	Fish trap
	Crab trap	Eel trap
	Hand lining	Handgathering

COMMERCIAL FISHING GEAR/METHODS PERMITTED IN THE NSW ESTUARY GENERAL FISHERY		
Name of Estuary	Gear permitted	
Kianga Lake	Hauling net (general purpose)	Garfish net (bullringing)
	Prawn net (hauling)	Meshing net
	Hoop or lift net	Hand hauled prawn net
	Push or scissor net	Dip or scoop net
	Fish trap	Crab trap
	Eel trap	Hand lining
	Handgathering	
Wagonga Inlet	Hand lining	Handgathering
Nangudga Lake	Hauling net (general purpose)	Garfish net (bullringing)
	Prawn net (hauling)	Meshing net
	Hoop or lift net	Hand hauled prawn net
	Push or scissor net	Dip or scoop net
	Fish trap	Crab trap
	Eel trap	Hand lining
	Handgathering	
Corunna Lake	Prawn running net	Hauling net (general purpose)
	Garfish net (bullringing)	Prawn net (hauling)
	Meshing net	Hoop or lift net
	Hand hauled prawn net	Push or scissor net
	Dip or scoop net	Fish trap
	Crab trap	Eel trap
	Hand lining	Handgathering
Tilba Tilba Lake	Prawn running net	Hauling net (general purpose)
	Garfish net (bullringing)	Prawn net (hauling)
	Meshing net	Hoop or lift net
	Hand hauled prawn net	Push or scissor net
	Dip or scoop net	Fish trap
	Crab trap	Eel trap
	Hand lining	Handgathering
Wallaga Lake	Hauling net (general purpose)	Prawn net (hauling)
	Prawn running net	Meshing net
	Garfish net (bullringing)	Hoop or lift net
	Hand hauled prawn net	Push or scissor net
	Dip or scoop net	Fish trap
	Crab trap	Eel trap
	Hand lining	Handgathering
Barragoot Lake	Hauling net (general purpose)	Garfish net (bullringing)
	Prawn net (hauling)	Meshing net
	Hoop or lift net	Hand hauled prawn net
	Push or scissor net	Dip or scoop net
	Fish trap	Crab trap
	Eel trap	Hand lining
	Handgathering	
Cuttagee Lake	Hauling net (general purpose)	Prawn running net
	Garfish net (bullringing)	Prawn net (hauling)
	Meshing net	Hoop or lift net
	Hand hauled prawn net	Push or scissor net
	Dip or scoop net	Fish trap
	Crab trap	Eel trap
	Hand lining	Handgathering

COMMERCIAL FISHING GEAR/METHODS PERMITTED IN THE NSW ESTUARY GENERAL FISHERY		
Name of Estuary	Gear permitted	
Murrah Lake	Hauling net (general purpose)	Garfish net (bullringing)
	Prawn net (hauling)	Meshing net
	Hoop or lift net	Hand hauled prawn net
	Push or scissor net	Dip or scoop net
	Fish trap	Crab trap
	Eel trap	Hand lining
	Handgathering	
Bunga Lagoon	Hauling net (general purpose)	Garfish net (bullringing)
	Prawn net (hauling)	Meshing net
	Hoop or lift net	Hand hauled prawn net
	Push or scissor net	Dip or scoop net
	Fish trap	Crab trap
	Eel trap	Hand lining
	Handgathering	
Wapengo Lake	Hauling net (general purpose)	Garfish net (bullringing)
	Prawn net (hauling)	Meshing net
	Hoop or lift net	Hand hauled prawn net
	Push or scissor net	Dip or scoop net
	Fish trap	Crab trap
	Eel trap	Hand lining
	Handgathering	
Middle Lake (Bega)	Prawn running net	Hauling net (general purpose)
	Garfish net (bullringing)	Prawn net (hauling)
	Meshing net	Hoop or lift net
	Hand hauled prawn net	Push or scissor net
	Dip or scoop net	Fish trap
	Crab trap	Eel trap
	Hand lining	Handgathering
Wallagoot Lake	Garfish net (bullringing)	Meshing net
	Hoop or lift net	Hand hauled prawn net
	Push or scissor net	Dip or scoop net
	Fish trap	Crab trap
	Eel trap	Hand lining
	Handgathering	
Bournda Lagoon	Dip or scoop net	Fish trap
	Crab trap	Eel trap
	Hand lining	Handgathering
Merimbula Lake	Hand hauled prawn net	Push or scissor net
	Dip or scoop net	Fish trap
	Crab trap	Eel trap
	Hand lining	Handgathering
Pambula Lake	Hauling net (general purpose)	Garfish net (bullringing)
	Prawn net (hauling)	Meshing net
	Hoop or lift net	Hand hauled prawn net
	Push or scissor net	Dip or scoop net
	Fish trap	Crab trap
	Eel trap	Hand lining
	Handgathering	

COMMERCIAL FISHING GEAR/METHODS PERMITTED IN THE NSW ESTUARY GENERAL FISHERY		
Name of Estuary	Gear permitted	
Curalo Lake	Hauling net (general purpose)	Garfish net (bullringing)
	Prawn net (hauling)	Meshing net
	Hoop or lift net	Hand hauled prawn net
	Push or scissor net	Dip or scoop net
	Fish trap	Crab trap
	Eel trap	Hand lining
	Handgathering	
Merrica River	Fish trap	Crab trap
	Eel trap	Hand lining
	Handgathering	
Nadgee River	Fish trap	Crab trap
	Eel trap	Hand lining
	Handgathering	
Nadgee Lake	Fish trap	Crab trap
	Eel trap	Hand lining
	Handgathering	