

Fishery Management Strategy

for the

Ocean Trawl Fishery

January 2007



**NSW DEPARTMENT OF
PRIMARY INDUSTRIES**



NSW DEPARTMENT OF
PRIMARY INDUSTRIES

Fishery Management Strategy for the NSW Ocean Trawl Fishery

Published in March 2007

by the NSW Department of Primary Industries

202 Nicholson Parade

CRONULLA NSW 2230

(PO Box 21 CRONULLA NSW 2230)

ISBN 978 0 7347 1799 3

Copyright © 2007 NSW Department of Primary Industries

Apart from any fair dealing for the purposes of private study, research, criticism or review, as permitted under the Australian Copyright Act, no part of this publication may be reproduced by any process without written permission from Department of Primary Industries. Inquiries should be addressed to Department of Primary Industries.

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 of 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 above.

The Fishery Management Strategy for the Ocean Trawl Fishery will be updated from time to time. Amendments will be made available on the NSW DPI website:

<http://www.dpi.nsw.gov.au/fisheries>

Table of Contents

Table of Contents	iii
List of Tables	v
List of Figures.....	vi
Abbreviations	vii
1. Introduction	9
a) Background to the Fishery Management Strategy	9
b) The Ocean Trawl Fishery	10
c) Vision and Goals of the Ocean Trawl Fishery	10
i) Fishery Vision	10
ii) Fishery Goals.....	10
2. Relevant Legislation and Policy	12
a) Ecologically sustainable development	12
b) The Fisheries Management Act.....	12
c) Arrangements with the Commonwealth and other States	13
d) Fishery management framework	13
e) The NSW Environmental Planning and Assessment Act.....	14
f) The Commonwealth Environment Protection and Biodiversity Conservation Act .	14
g) The NSW Marine Parks Act.....	15
h) Changes to Regulations	15
i) Indigenous Fisheries Strategy.....	16
3. The Harvest Strategy	17
a) Extent of the Fishery	17
i) Number of fishers	17
ii) Area of operation.....	17
iii) Activities endorsed in the fishery	19
iv) Fishing gear used in the fishery	20
v) Boats used in the fishery.....	21
b) Species.....	22
i) Species allowed	22
ii) Bycatch species	23
iii) Size limits	24
iv) Protected species	25
v) Status of species within the fishery	25
vi) Overfished species.....	27
vii) Species in the fishery determined as being overfished.....	29
c) Management controls and administration.....	31
i) Limited entry	31
ii) Commercial fishing licences	31
iii) Fishing boat licensing.....	33
iv) Renewal of licences	34
v) Transfer policies	35
vi) Appeals mechanisms	36
vii) Code of practice.....	36
viii) Time and area closures	37
ix) Zoning.....	37
x) Permits.....	38
xi) Catch limits or quotas	38
xii) Seafood safety programs	38

xiii)	Cost recovery policy	38
d)	Compliance	39
e)	Research	40
i)	Proposed research areas	40
ii)	The Conservation Technology Unit.....	48
iii)	Catch monitoring.....	48
f)	Consultation	50
i)	Management Advisory Committees.....	50
ii)	Ministerial advisory councils	50
g)	Interactions with Other Fisheries	51
i)	Other NSW commercial fisheries	51
ii)	Commercial fisheries in adjacent jurisdictions	51
iii)	Recreational fishery	52
iv)	Indigenous fishery.....	52
4.	Goals, Objectives and Management Responses.....	53
a)	A model framework	53
b)	Goals, objectives and management responses	55
5.	Performance Monitoring and Review	84
a)	Performance monitoring	84
i)	Performance indicators	84
ii)	Trigger points.....	84
b)	Predetermined review of performance indicators and trigger points.....	85
c)	Reporting on the performance of the management strategy	85
i)	Performance assessment and report.....	85
ii)	Review report in response to trigger points	86
d)	Contingency plans for unpredictable events	95
e)	Monitoring performance of resource assessment.....	95
	References.....	97
	Appendices to the FMS.....	99
	Appendix 1. Copy of Minister's determination made under the EP&A Act.....	100
	Appendix 2. Implementation table.....	102
	Appendix 3. Supporting policy for ocean trawl bycatch reduction and prawn yields....	111
	Appendix 4. Specific management arrangements for trawling for whiting.....	116
	Appendix 5. Classes of resource assessment for species harvested in NSW	117

List of Tables

Table 1.	Snapshot of the major marine commercial fisheries in NSW	11
Table 2.	Numbers of fishing businesses by endorsement type in the OTF	20
Table 3.	Primary and key secondary species in the OTF.	23
Table 4.	The characteristics of the categories of exploitation status that are used to determine the status of key species, as part of the resource assessment system	26
Table 5.	Exploitation status of primary and key secondary species taken in the OTF.....	27
Table 6.	Summary of the attributes of the various classes of resource assessment.....	43
Table 7.	A summary of the proposed target resource assessment classes for primary and key secondary species of the fishery	44
Table 8.	Robustness Classifications	84
Table 9.	Performance indicators and trigger points for the fishery.	88
Appendix 2.	Implementation table for the OTF	103
Appendix 3.	Bycatch and prawn yield closure specifications.....	114

List of Figures

Figure 1.	Map of the area of the OTF including identification of major ports.....	18
Figure 2.	A model of the framework for a fishery management strategy.	53
Figure 3.	An example of how a single management response affects multiple goals and objectives.	54

Abbreviations

ARC	Australian Research Council
DEH	Department of the Environment and Heritage (Commonwealth)
EIS	Environmental Impact Statement
EP&A Act	<i>Environmental Planning and Assessment Act 1979</i>
EPBC Act	<i>Environment Protection and Biodiversity Conservation Act 1999</i>
ESD	Ecologically sustainable development
FM Act	<i>Fisheries Management Act 1994</i>
FMS	Fishery management strategy
FRDC	Fisheries Research and Development Corporation
IFS	Indigenous Fisheries Strategy
MAC	Management Advisory Committee
MLL	Minimum legal length
nm	Nautical miles
NSW	New South Wales
NSW DPI	NSW Department of Primary Industries
OCS	Offshore Constitutional Settlement
OTF	Ocean Trawl Fishery
OT MAC	Ocean Trawl Management Advisory Committee

1. Introduction

a) Background to the Fishery Management Strategy

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, fish stocking and for the beach safety program. They also require an assessment of the environmental impacts of those fishing activities.

The fishery management strategy (FMS) for the Ocean Trawl Fishery (OTF) is much more than a collection of rules for the fishery. The strategy contains the vision, goals and objectives for the fishery, a broad description of the way the fishery operates, and outlines the future management framework. It also outlines a program for monitoring the performance of the fishery against the management goals. Where necessary, information about the impacts of harvesting by other fishing sectors (such as recreational fishing) is also provided, however the rules contained in this FMS apply only to the OTF. The rules applying to other commercial and non-commercial fishing sectors are separate management arrangements and are not the subject of this strategy.

The Management Advisory Committee (MAC) for the OTF provided significant input into the drafting of this strategy. Input into the draft strategy was also sought from all fishers endorsed in the OTF, the Ministerial advisory councils on the seafood industry and recreational fishing, and the Fishery Management Strategy Working Group. Government agencies, such as the NSW Department of Planning and the Commonwealth Department of the Environment and Heritage, have also been consulted throughout the drafting of the FMS.

An Environmental Impact Statement (EIS) was prepared for the OTF and publicly exhibited in August/September 2005. The EIS contained the draft FMS and an assessment of the environmental risk mitigation measures contained therein. The structure of the EIS was based on guidelines issued by the NSW Department of Planning (formerly Planning NSW), including an assessment of the biophysical, social and economic impacts of implementing the draft management strategy.

The EIS highlighted the importance of the OTF to the community in terms of employment, supply of seafood to the community and economic benefits. The EIS concluded that, although there were several existing environmental risks, the management controls proposed by the draft FMS provided for an appropriate allocation of the resource and incorporated the measures needed to address the various principles of ecologically sustainable development.

After considering the EIS (among other things), the NSW Minister for Primary Industries made a formal determination under the *Environmental Planning and Assessment Act 1979* on 7 June 2006 with respect to the OTF (see Appendix 1). The determination permits the fishery to continue subject to the draft FMS being modified to take account of the preferred strategies developed after the EIS public exhibition phase. The FMS presented below incorporates those changes and has since been approved by the Minister under the provisions of the *Fisheries Management Act 1994*.

The requirement for the Government to assess the environmental impacts of each individual OTF authority upon its issue or renewal no longer applies.

b) The Ocean Trawl Fishery

The OTF is one of eight major marine and estuarine based commercial fisheries in New South Wales. Two types of trawling currently operate in ocean waters under NSW jurisdiction, prawn trawling and fish trawling. Both sectors use similar gear, the demersal trawl net, and many of the fishers endorsed for fish trawling are also endorsed to operate in the prawn trawl sector of the fishery.

Although the two forms of trawling target different species and are broadly different in operational aspects, they take many common species and have a significant level of geographic overlap. The non-selective nature of trawl nets, and the broad range of substrates over which trawling occurs, results in a large number of finfish and shellfish species being taken. The major species targeted by ocean prawn trawlers vary with the depth of fishing, and include eastern king, school and royal red prawns, and school whiting. Fish trawling mainly targets species such as silver trevally, tiger flathead, southern calamari, school whiting and a number of shark and ray species.

Ocean fish trawl and ocean prawn trawl activities are currently managed by input controls, which limit the fishing capacity of the vessels and gear used, indirectly controlling the amount of fish or prawns able to be caught. Input controls include restrictions on the number of licences, the size of boats and their engine power, the design and dimensions of trawl nets, and the locations that may be fished.

There are variations in the level of participation of fishers in the OTF. Many fishers operate in the fishery on a full time basis, while some work in a number of commercial fisheries and participate in the fishery on a part-time or seasonal basis. Table 1 shows a comparison of the OTF with other commercial fisheries in NSW.

c) Vision and Goals of the Ocean Trawl Fishery

i) Fishery Vision

The vision for the OTF is:

A profitable OTF which provides the community with fresh local seafood and carries out fishing in an ecologically sustainable manner.

ii) Fishery Goals

The goals of the OTF are:

1. Manage the OTF in a manner that promotes the conservation of biological diversity in the marine environment;
2. Maintain stocks of primary and key secondary species harvested by the OTF at sustainable levels;
3. Promote the conservation of threatened species, populations and ecological communities likely to be impacted by the operation of the OTF;
4. Appropriately share the resource and carry out fishing in a manner that minimises negative social impacts;
5. Promote a viable OTF, consistent with ecological sustainability;
6. Facilitate effective and efficient compliance, research and management of the OTF;
7. Improve knowledge about the OTF and the resources on which it relies.

Table 1. Snapshot of the major marine commercial fisheries in NSW (Source: NSW DPI licensing database extraction July 2006)

Fishery	Ocean trawl	Ocean trap and line	Estuary general	Ocean hauling	Lobster	Abalone	Estuary prawn trawl
Methods	Otter trawl net	Fish trap, Spanner crab net, Setline, Trotline, Driftline, Poling Handline, Jigging, Dropline, Trolling	Handline, Trap, Hauling net, Mesh net, Hand collecting	General purpose haul net, Garfish haul net, Purse seine net	Trap/pot	Diving (hookah)	Otter trawl net
Key species	King prawn, School prawn, Royal red prawn, Balmain bugs, Octopus, Silver trevally, Tiger flathead, Redfish, Calamari, School whiting	Snapper, Leatherjackets, Bonito, Kingfish, Morwong, Blue-eye, Spanner crabs, Silver trevally	Yellowfin bream, Luderick, Dusky flathead, Sand whiting, Longfinned eels, Sea mullet, Pipis	Sea mullet, Australian salmon, Blue mackerel, Sea garfish, Luderick, Yellowtail, Pilchards	Rock lobster (eastern)	Black lip abalone	School prawn, King prawn
Total catch in 2004/05 (t)	3970	1511	4049	5575	102 98	189	383
Est. value in 2004/05 (A\$m)	23.0	8.4	18.2	12.5	3.8	8.0	2.0
No. of fishing businesses (July 2006)	299 [#]	478	654	300	140	48	198
Standard boat length in metres (approx.)	14	6-8	5	4	6-8	6	9
General no. of unlicensed crew	2-3	0-1	0*	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

A further 44 fishing businesses are entitled to fish in the Southern Fish Trawl Restricted Fishery

2. Relevant Legislation and Policy

a) Ecologically sustainable development

Ecologically sustainable development (ESD) was 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 programs:

- 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.

b) The Fisheries Management Act

The Fisheries Management Act 1994 (FM Act) seeks to provide for 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 objectives 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 objectives:
- (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.*

c) Arrangements with the Commonwealth and other States

The extent and scope of the NSW OTF and any entitlements issued therein are subject to arrangements made from time to time between the State of NSW and the Commonwealth and other State governments over the management of particular fisheries. Section 135 of the FM Act enables the State of NSW to make arrangements with the Commonwealth under the powers of the Commonwealth *Fisheries Management Act 1991* and section 141A of the FM Act gives the power to enter into agreements with other States. Refer to Part 5 of the FM Act and sections 71-78 of the Commonwealth Act for further information on the power to make (and terminate) arrangements.

Arrangements made under the Act can effectively modify the waters and the fishing methods that fall under the jurisdiction and law of NSW. At the commencement of this management strategy, a series of significant arrangements known as the 'Offshore Constitutional Settlement' (initially made in 1990) are in place that cede jurisdiction of trawl fishing for certain species in certain waters beyond 3 nm to the State of NSW – refer to section 3(a)(ii) of this management strategy for a description of the effect of the existing arrangements on the OTF.

The FMS will apply to all waters under NSW jurisdiction following any changes to the arrangements made between NSW and the Commonwealth or other states.

d) Fishery management framework

The OTF is included in Schedule 1 of the FM Act and is a share management fishery, with the exception of the southern fish trawl sector which continues as restricted fishery pending the resolution of jurisdictional issues with the Commonwealth.

The FM Act requires that a share management plan be developed and implemented for all share management fisheries. At the time of approval of this FMS, the first share management plan for the OTF was in the process of being 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 the legislative framework for the fishery and the rights of shareholders in a share management fishery. The share management plan provides for a range of fishery specific controls to be formalised into a regulation. Examples of these include the species that may be taken, the areas for taking fish, the times or periods during which the fishery may operate, the protection of fish habitat and the use of boats and fishing gear in the fishery.

The share management plan for the OTF may also, over time, bring into operation a number of controls in the fishery that are described in this management strategy. One example of this is the penalty points scheme referred to in the management strategy. Whilst the management strategy relies on the penalty points scheme as a compliance mechanism for creating an effective deterrent, the workings and provisions of the scheme will be included in regulation or the relevant share management plan.

A share management plan must include objectives and performance indicators, which, for the OTF, will be complementary with the goals and objectives of this management strategy. The share management plan also needs to specify at what point a review of the plan is required when a performance indicator is not being met. The performance monitoring and 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 these 'performance-based' reviews, a share management plan is also subject to scheduled periodic review.

e) The NSW Environmental Planning and Assessment Act

Division 5 of Part 5 of the Environmental Planning and Assessment Act 1979 (EP&A Act) requires an environmental impact statement to be prepared for each designated fishing activity described in Schedule 1A of the FM Act, for the purposes of an environmental assessment.

Prior to the environmental impact statement being prepared, a draft fishery management strategy must be prepared under the FM Act. The environmental impact statement assesses the likely impact of implementing the draft FMS on the biophysical, economic and social environments.

Once a management strategy and environmental impact statement has been prepared and subject to a determination by the Minister for Primary Industries (under s.115O(4) of the EP&A Act), the requirement to undertake an environmental assessment for each individual fisher's licence issue or renewal does not apply.

f) The Commonwealth Environment Protection and Biodiversity Conservation Act

The Environment Protection and Biodiversity Conservation Act 1999 (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 the 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 concurrently repealed). The new Part 13A of the EPBC Act has the effect of removing the previous blanket exemption from export control that historically applied to marine species. As a result, the export of all marine organisms falls under the control of the EPBC Act and is subject to ecological sustainability assessments based on guidelines established by the Commonwealth. 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. The declarations generally have conditions attached that will bring the management and operations of the fishery in line with the Commonwealth guidelines. Once declarations are made, exporters may need to apply for and obtain a permit from the Department of the Environment and Heritage (DEH) to export.

The EIS prepared for the OTF was submitted to the Commonwealth Government for export approval. The Commonwealth has since issued a number of Wildlife Trade Operation (WTO) export approvals for the fishery (refer to www.deh.gov.au for further details).

g) 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 areas of high conservation value 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. It is also important that the Ocean Trawl MAC participates in the consultation about the selection of marine protected areas, as declaration of such areas can be beneficial to all sectors of the community, including the commercial sector. However, such declarations can also impact on the operations of ocean trawl fishers.

The *Marine Parks Act 1997* was introduced to provide for the declaration of marine parks in NSW. The objects of the Act are:

- (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*.

Up to date information on the creation and zoning of marine parks in NSW waters is available on the Marine Parks Authority website: www.mpa.nsw.gov.au

h) Changes to Regulations

Most of the regulations that currently apply to trawling in NSW ocean waters appear in the *Fisheries Management (General) Regulation 2002* (FM Regulation). The FM Regulation sets out the working arrangements that underpin the provisions of the FM Act, 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 FM Regulation that prescribes the fish species subject to size limits and what those size limits are (clause 9).

This management strategy includes a number of actions that will impact on the regulations that currently apply to the fishery. Where necessary, existing regulations will be amended or new regulations introduced to give effect to the actions and programs outlined in the FMS.

i) Indigenous Fisheries Strategy

Fishing has been an integral part of the cultural and economic life of Aboriginal communities since they have been in this land. Fishing has been an important source of food, a basis for trade and an important part of cultural and ceremonial life. Traditionally, Aboriginal fishers had responsibility for providing not just for themselves but for family and community. These cultural expectations continue in Aboriginal communities today, particularly in regard to improved access to fisheries resources.

Although Aboriginal participation in the OTF is limited, Aboriginal people have aspirations of becoming more involved in commercial fisheries. Such aspirations were identified as recently as June 2003 during an Indigenous Fisheries Strategy Working Group workshop. The workshop identified fishing closures, licence transfer rules, market value of entitlements and the gradual decline of Aboriginal commercial fishers in the industry as constraints for Indigenous involvement in commercial fisheries.

In December 2002, the NSW Indigenous Fisheries Strategy and Implementation Plan (IFS) was released (NSW Fisheries 2002). The IFS seeks to protect and enhance the traditional cultural fishing activities of Aboriginal communities, and ensure Aboriginal involvement in the stewardship of fisheries resources. There are some issues that will be addressed immediately by the IFS and others that will only be resolved after lengthy negotiation involving Aboriginal communities, the broader community, fishing groups and government agencies. The IFS puts in place a process which will ensure discussion and negotiation can continue, with progressive resolution of problems and challenges (see NSW Indigenous Fisheries Strategy and Implementation Plan, 2002).

While the relationship between Indigenous fishing and the OTF is probably not as direct as with the inland, estuarine or beach-based fisheries, there are possible linkages with many of the species caught by the OTF which spend part of their life cycle in estuaries or nearshore waters. To better understand the linkages between this and other fishing activities to Indigenous issues, a substantial research study has been proposed through the IFS which seeks, among other things, to identify the species, areas and harvesting techniques of cultural importance to Aboriginal people in NSW.

3. The Harvest Strategy

a) Extent of the Fishery

i) Number of fishers

As at July 2006, the NSW DPI licensing database showed that 299 fishing businesses held entitlements to operate in the OTF, with some businesses holding multiple endorsements within this fishery or in other fisheries. The number of fishers entitled to operate in the fishery fluctuates slightly over time, due to a number of factors including the transfer and amalgamation of fishing businesses and late payments on renewal of fishing licences. In 2004/05 the number of fishers who reported trawling in ocean waters was 52 for fish trawl, 157 for prawn trawl and 12 for royal red prawn trawl.

ii) Area of operation

The boundaries of the fishery extend from the NSW coastal baseline seaward to the 4,000 metre isobath (approx. 60 to 80 nm offshore) between Barrenjoey Point and the Queensland border. In ocean waters south from Barrenjoey Point to the Victorian border, trawling is currently managed by the State from the NSW coastal baseline seaward to 3 nautical miles offshore only (see Figure 1), and the Commonwealth retains jurisdiction for trawling outside 3 nautical miles to the edge of the Australian Fishing Zone. Note that the jurisdiction for trawling on some grounds inside 3 nautical miles south of Barrenjoey Point may transfer to the Commonwealth Government under this management strategy (see background information to management response 6.3b).

Trawling is carried out on suitable grounds in ocean waters off the entire length of the NSW coast. Trawling cannot be successfully conducted on areas of rocky reef, or where there are obstacles that could snag the net or attached gear (such as shipwrecks or undersea cables). Trawling is prohibited near shipwrecks with heritage values, the positions of which are listed by the NSW Heritage Office.

Ocean trawlers work out of most of the major ports along the length of the NSW coast. Most trawlers operate for the majority of the time from a single 'home' port, although a number of trawlers regularly operate from a number of ports, depending on the season, the availability of target species and the endorsements attached to the business. Apart from the area closures to commercial fishing such as those in marine protected areas including marine parks and aquatic reserves, there are currently a number of time and area closures in place which impact on the operation of trawlers (see section 3(c)(viii) for further information on time and area closures).

Trawling for eastern king prawns is concentrated mainly off the north coast of NSW, with the majority of fishing occurring north of Newcastle, in depths from 20 to 200 metres. Trawling for school prawns occurs mainly in shallow waters adjacent to the north coast estuaries, although some fishing also occurs seasonally on southern grounds. Trawling for royal red prawns and associated species occurs on a limited number of grounds in depths of 365 to 1100 metres, between 29°S and the boundary of the fishery east from Barrenjoey Point.

Trawling for fish species occurs on continental shelf and slope grounds between Smoky Cape (approx. 31°S) and the Victorian border. Depending on the season and the species mix being targeted, trawling for fish can occur in water depths from 10 metres to around 1000 metres. Trawling targeted at school whiting occurs year round on sandy bottoms in depths of 20 to 80 metres, mainly north of

Sydney. Targeted fishing for whiting occurs mainly in those areas located close to processing plants or the Sydney Fish Markets.

Fishermen's Co-operatives are located at many of the major ports and undertake low levels of fish processing for local markets. More significant processing facilities are located at Iluka, Tuncurry, Newcastle, Wollongong and Eden.

Currently, very little information is available on the boundaries of individual trawl grounds, and the intensity of trawling on each ground. This management strategy seeks the accurate mapping of trawl grounds, and for the frequency of trawling on each ground to be recorded as part of the normal catch and effort monitoring undertaken for the fishery.

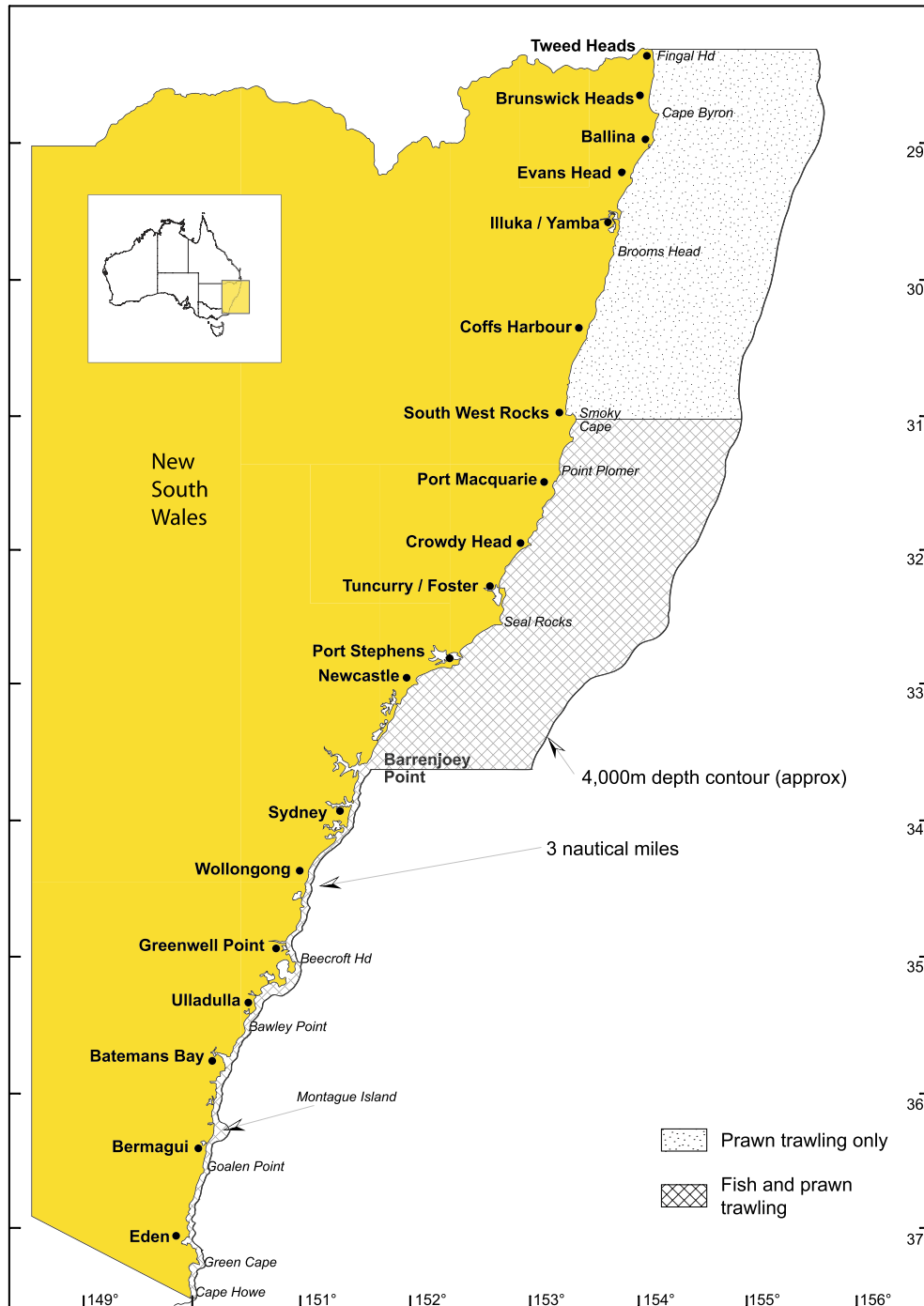


Figure 1. Map of the area of the OTF including identification of major ports, as at July 2006.

Habitat management

Healthy coastal and estuarine fish habitat is also critical to the ongoing sustainability of fish species caught by the OTF as many juveniles of these species recruit to these habitats before moving to oceanic waters. NSW DPI continues to be heavily engaged in aquatic habitat protection and conservation and there is significant potential for ocean trawl fishers and other industry advocates to become actively involved in key land use and natural resource management issues affecting estuarine and marine habitats, or via involvement in projects to rehabilitate habitats targeted towards benefiting industry. Examples include removing barriers to fish passage, rehabilitating damaged wetlands, and minimising acid sulphate soil run-off. The Catchment Management Authority process may create new funding opportunities for innovative projects aimed at improving the conservation of the State's riverine and estuarine areas.

Habitat management guidelines and plans have been and will continue to be prepared under the FM Act to prevent or minimise the impact of all types of activities on fish habitat. Habitat management plans can potentially close areas to commercial fishing and other activities. The Ocean Trawl MAC will provide advice and contribute to any reviews of NSW DPI habitat management policy and guidelines or habitat protection plans, where benefits may accrue to the resources harvested by trawlers.

Commercial fishers are often aware of the key habitat areas for fishery production. This knowledge can assist NSW DPI to identify and prioritise sites that may benefit from rehabilitation and potentially contribute to increased fishery production. Such information will be documented as part of the mapping of ocean trawl grounds and will be utilised in the identification of areas available to trawling (management responses 1.1a and 1.1b). This FMS also supports continued restrictions on the use of bobbin gear and the modification of trawl gear as required to minimise impacts on habitat.

iii) Activities endorsed in the fishery

The fishery is categorised into a number of endorsement types that determine the areas and types of fishing gear each fisher is allowed to use, and in some cases the species to be targeted. 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 an ocean prawn trawl (deepwater) endorsement on their fishing licence are permitted to use a prawn trawl net to take deepwater prawns from NSW waters. This FMS provides the tools to reduce the number of endorsements in each category over time in order to achieve a lesser number of more viable operators.

Table 2. Numbers of fishing businesses by endorsement type in the OTF, as at August 2006.

Endorsement type	Endorsement Description	Number of fishing businesses
Ocean Prawn Trawl - Inshore	This endorsement authorises the holder to use an otter trawl net (prawns) to take fish (other than deepwater prawns) for sale from inshore waters*	251
Ocean Prawn Trawl - Offshore	This endorsement authorises the holder to use an otter trawl net (prawns) to take fish (other than deepwater prawns) from offshore waters**, or from such offshore waters as may be specified in the endorsement by the Minister for Primary Industries	224
Ocean Prawn Trawl - Deepwater	This endorsement authorises the holder to use an otter trawl net (prawns) to take deepwater prawns from offshore waters**	63
Ocean Fish Trawl - Northern	This endorsement authorises the holder to use an otter trawl net (fish) to take fish (other than prawns) for sale from ocean waters that are north of a line due east from Barrenjoey Headland (other than waters in which use of an otter trawl net (fish) is prohibited under clause 39 of the FM Regulation)	64
Ocean Fish Trawl - Southern	This endorsement authorises the holder to use an otter trawl net (fish) to take fish (other than prawns) for sale from ocean waters that are not more than 3 nautical miles from the natural coast line and are south of a line drawn due east from Barrenjoey Headland	44

* Inshore waters means ocean waters that are not more than 3 nautical miles from the natural coastline.

** Offshore waters means ocean waters that are more than 3 nautical miles from the natural coast line and north of a line due east from Barrenjoey Point.

Note: Some Fishing Businesses may hold multiple endorsements in the fishery.

iv) Fishing gear used in the fishery

Currently, all trawling in ocean waters off NSW is carried out with demersal ‘otter’ trawl nets. These nets are fished by being towed along the sea floor, with the net being held open by the shearing action through the water of two ‘otter boards’ which are set at an angle to the direction of travel of the net over the bottom. ‘Sweep’ refers to a length of wire or wire rope that connects one end of the net to an otter board (one sweep on each side of the net).

The sweeps used on fish trawl nets are much longer than those used on prawn trawl nets, up to a maximum of about 274 metres or 150 fathoms. The otter boards are attached to the towing vessel by means of long wires, called ‘warps’, which are wound onto the drums of the trawl winch. Different designs of ‘trawl gallows’ are used to direct the warps from the water to the winch and to keep the warps and net clear of the boat’s propeller and superstructure when the gear is being set and retrieved. Various designs of net are used to target different fish and prawn species, however the general characteristics of each type of net are similar. Regulations prescribe a minimum mesh size for trawl nets (which is the internal diameter of individual meshes of the net, measured when stretched using an approved net measuring device), and in some cases the dimensions of the overall net and any attachments to the net are also regulated.

Following are the descriptions of each net type allowed to be used in the fishery at the commencement of the FMS (note that these descriptions may be subject to change as the strategy is progressively implemented, and although ‘Danish seine’ nets are specified, none are currently in use in the fishery):

- i) **Otter Trawl Net (Prawns)** – has a mesh size of not less than 40 mm and not more than 60 mm, except for the “cod-end” (the rear end of the net where the catch accumulates as the net is being trawled) which must have a mesh size of not less than 40 mm and not more than 50 mm. The total length of the headline of the net(s) is not to exceed 33 m, unless a different maximum length is specified in the boat licence of the vessel from which the net is being fished. The length of each sweep is not to exceed 5 m, or the distance from the trawl gallows to the stern of the boat (whichever is the greater).
- ii) **Otter Trawl Net (Fish)** – has a mesh size of not less than 90 mm throughout. The length of the headline of the net and the length of sweep is not specified. In waters south of a line drawn due east from Seals Rocks (approx. 32° 30' S latitude), ‘bobbin gear’ up to 100 mm in diameter may be used on the ground rope of fish trawl nets. In waters north of the Seal Rocks line, the use of bobbin gear is prohibited. ‘Bobbin gear’ describes the use of round or cylindrical rollers on the ground rope of a trawl net, which allows the net to ride up and over small variations in bottom topography, which might snag a conventional ground rope. This type of gear is used on harder bottoms comprising low relief rocky slabs or small protruding rocks. It will not allow the net to be successfully worked over rocky reefs with large protruding rocks or boulders, or in areas with high relief e.g. the sides of undersea canyons or pinnacles.
- iii) **Danish Seine Net (Fish)** – has a mesh size of not less than 83 mm throughout. The length of the headline of the net is not specified. Danish seine nets do not utilise otter boards or sweeps, but have a long length of rope attached to each end of the net by means of short bridles. The gear is set in a large triangular shape on the bottom, and the ropes are slowly retrieved, closing the gear and herding the fish into the path of the net.

This FMS aims to improve the selectivity characteristics of trawl nets by ensuring that fish trawl cod-ends are constructed with a “hanging ratio” to the body of the net of 1:1 (generally 100 meshes round). Square mesh cod-ends will be introduced for prawn trawl nets, based on the results of recent research that examined the selectivity of nets used by industry and novel net designs (see management response 2.1d). An additional trawl net type for targeting school whiting will also be considered, based on the results of trials being conducted to minimise the incidental catch in such a net (management response 5.1c).

v) ***Boats used in the fishery***

Boats used in the fishery range from 9 to 27 metres in length (subject to current management rules), with displacement hulls constructed from timber or steel. They are powered by single or twin diesel main engines of 60 to 400 kilowatts (80 to 540 horsepower). Smaller auxiliary diesel engines provide electric power and drive hydraulic pumps that operate the trawl winches. Modern electronic navigation and fish-finding equipment is now found universally on ocean trawl boats in NSW, and some vessels which operate under other jurisdictions also carry satellite-based vessel monitoring systems.

The number and size of boats that may be used in the offshore prawn trawl sector of the fishery are restricted, and replacement boats are limited in hull capacity and engine power (300 kilowatts or 400 horsepower) to prevent increases in fishing capacity. Currently, replacement boats in other sectors of the fishery must be within 1 metre or 10% of the length of the boat being replaced, whichever is the lesser, however the FMS provides for the introduction of consistent controls on the replacement of trawlers throughout all sectors of the fishery. These controls will be based on the rules

currently applying to endorsed offshore prawn trawlers and may include restrictions on hull capacity and engine power.

b) Species

i) Species allowed

The OTF is a multi-species fishery. A total of about 130 to 150 species of fish, crustaceans and molluscs are retained for sale, although many species are taken sporadically and in very small quantities. This FMS categorises retained species as “primary”, “key secondary” or “secondary”, depending on the quantity and relative value of that species taken by trawling. A description of these categories is provided below. A total of 28 species or 'species-groups' are listed as primary or key secondary species in this fishery (Table 3), and in 2004/05 these species comprised over 94% of the total landed catch of the trawl fishery.

Detailed information about each of the primary and key secondary species, including catch trends, CPUE trends, seasonality of catches and relative catches by fishery and method, can be found in the EIS prepared for the OTF (available at www.dpi.nsw.gov.au).

Primary species

Primary species are the target species of the trawl fishery, or those species that are landed in large quantities or are economically very significant to the fishery. The twelve 'primary' species comprised over 80% of reported landings by the ocean trawl fisheries in 2004/05 and are considered to be of major importance to trawl fishers. Consequently the primary species receive a higher management and research priority within this FMS. The strategy requires the development of a resource assessment for each of the primary species (management response 2.1b).

Key Secondary species

Sixteen species have been identified as "key secondary" species because, although not generally targeted, they are an expected catch of trawling and provide significant economic benefit to the fishery. The key secondary species comprised 14% of reported landings by the ocean trawl fisheries in 2004/05. These species are therefore subject to more rigorous monitoring requirements than the remaining secondary species. Resource assessments will also be undertaken on these species, though at a more rudimentary level than for the primary species where necessary.

Secondary species

Secondary species are categorised as those that are retained by the fishery but which do not fall under the primary or key secondary categories described above. These 'secondary' species are taken incidentally during trawling operations. In 2004/05 secondary species numbered 95 and contributed around 5% of the total weight of reported landings by ocean trawlers. This strategy contains measures to ensure the catch of secondary species by ocean trawlers remains low and within the range of historic levels.

Many species taken in the NSW ocean trawl fisheries 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 bodies who provide advice to the Minister for Primary Industries on cross-fishery management issues. NSW DPI management and research staff will also meet periodically with staff from adjacent jurisdictions to consider consistent management regimes for shared species and to discuss initiatives such as resource 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.

Table 3. Primary and key secondary species in the OTF.

	Common name	Scientific name	Taxonomic Family/Class name
Primary Species	Eastern King Prawn	<i>Penaeus plebejus</i>	PENAEIDAE
	School Prawn	<i>Metapenaeus macleayi</i>	PENAEIDAE
	Royal Red Prawn	<i>Haliporoides sibogae</i>	SOLENOCERIDAE
	Balmain Bug	<i>Ibacus spp</i>	SCYLLARIDAE
	Octopus	Octopus spp	OCTOPODIDAE
	Cuttlefish	<i>Sepia spp</i>	SEPIIDAE
	Southern Calamari	<i>Sepioteuthis australis</i>	LOLIGINIDAE
	School Whiting	<i>Sillago flindersi</i> and <i>Sillago robusta</i>	SILLAGINIDAE
	Tiger Flathead	<i>Neoplatycephalus richardsoni</i>	PLATYCEPHALIDAE
	Sand Flathead	<i>Platycephalus cearuleopunctatus</i>	PLATYCEPHALIDAE
	Silver trevally	<i>Pseudocaranx dentex</i>	CARANGIDAE
	Fiddler Shark	<i>Aptychotrema rostrata</i> and <i>Trygonorrhina</i> species A	RHINOBATIDAE
Key Secondary Species	Blue Swimmer Crab	<i>Portunus pelagicus</i>	PORTUNIDAE
	Squid	Various	LOLIGINIDAE & OMMASTREPHIDAE
	Gurnard / Latchet	<i>Chelidonichthys kumu</i> <i>Pterygotrigla polyomata</i> <i>Pterygotrigla andertoni</i>	TRIGLIDAE
	John Dory	<i>Zeus faber</i>	ZEIDAE
	Angel Shark	<i>Squatina australis</i> , <i>Squatina</i> species A	SQUATINIDAE
	Flounder (mixed species)	Various	PLEURONECTIDAE / PARALICHTHYIDAE
	Red Mullet	Various	MULLIDAE
	Redfish	<i>Centroberyx affinis</i>	BERYCIDAE
	Leatherjacket (mixed species)	Various	MONACANTHIDAE
	Ocean Perch	<i>Helicolenus barathri</i>	SCORPAENIDAE
	Mirror Dory	<i>Zenopsis nebulosus</i>	ZEIDAE
	Sole (mixed species)	Various	CYNOGLOSSIDAE / SOLEIDAE
	Morwong, Rubberlip (Grey)	<i>Nemadactylus douglasii</i>	CHEILODACTYLIDAE
	Moonfish	<i>Branchiostegus wardi</i>	MALACANTHIDAE
	Boarfish	<i>Paristiopterus labiosus</i>	PENTACEROTIDAE
"Sharks" (mixed species) *	Various	Various	

* "Sharks (mixed species)" includes catches reported as 'unspecified sharks', and also includes catches reported under other categories including whaler and dogfish groups, and saw, hammerhead, mako, carpet and ghost sharks (refer to the Ocean Trawl Fishery EIS for further detail).

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 injured or 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).

Demersal otter trawl nets of the types used in the ocean trawl fisheries are considered to be a relatively unselective fishing method, capturing most of the mobile species in the path of the net which are of a size that cannot escape through the meshes of the net. Trawl nets have been shown to have varying efficiencies for capturing the large range of species likely to be encountered, and the selectivity of a trawl net for an individual species also depends on the behaviour exhibited by that species in the path of the net.

The major part of the discarded fish catch (83% by weight) observed from fish trawls in the northern sector of the NSW fishery (Newcastle to Forster) in 1993–1995 comprised small non-commercial species. However, about 17% of discards (by weight) comprised small individuals of commercial species, chiefly redfish, tiger flathead and snapper (Liggins, 1996). Incidental catches that were discarded from ocean prawn trawl catches during 1990-92 comprised mostly small commercial and non-commercial species of finfish and invertebrates (Kennelly *et al.*, 1998). Following the introduction of Bycatch Reduction Devices (BRDs) for prawn trawl nets used in the fishery, in recent years the quantity of incidental catches taken by prawn trawlers has declined. However observer studies have not recently been repeated and quantitative data on recent bycatch levels are not available. There have also been significant changes in the design of fish trawl nets used in NSW ocean waters since the study of Liggins (1996). To ensure the effectiveness of changes to the selectivity of trawl nets, this FMS outlines a means to obtain data on current levels of discarding throughout the trawl fishery through a periodic onboard observer study.

Bycatch reduction devices

All prawn trawl nets must be fitted with a bycatch reduction device (BRD) that has been approved for use in the fishery. Bycatch reduction devices reduce the incidental capture of finfish in prawn trawl nets. There are eight BRDs approved for use in the fishery at the commencement of the FMS, including:

Nordmore grid	Diamond
Blubber chute	V-cut
Square mesh panel (modified)	Fish eye
Composite square mesh panel	Big eye

This list of approved BRDs is likely to reduce over time as the number of BRDs approved for use in the fishery is simplified. This is necessary to ensure that only the most efficient BRDs are used throughout the prawn sector of the fishery in the long term.

Turtle and seal exclusion devices are not mandatory in NSW ocean trawl nets. Based on previous observer studies and advice from industry, interactions with turtles and seals are believed to be low. Data on interactions between ocean trawling and turtles/seals will be obtained through changes to reporting forms and through periodic onboard observer studies. The FMS is designed to be responsive if the level of interaction is found to be, or becomes, unacceptably high at any stage.

iii) Size limits

Size limits apply to a number of species taken in the OTF. Clause 9 of the FM Regulation lists the minimum legal lengths that apply to species permitted to be taken in the fishery. The FMS includes an evaluation of the appropriateness of existing minimum size limits for ocean trawl species, and an assessment of whether minimum size limits should be specified for any other ocean trawl

species (see management response 2.1h). Information will be collected as part of the onboard observer program to assess the effectiveness of changes to trawl net selectivity, having regard to existing (and potential) minimum legal sizes for ocean trawl species.

In the case of prawns it is difficult to manage a legal minimum length because of the small size of the prawns and the quantities that are landed. A maximum count of prawns (number to the ½ kilogram) can be used as an alternative. Following recommendations by the Juvenile Prawn Summit Working Group in 2000, counts for king prawns and other prawn species will soon be adopted. These counts will apply to all sectors, including estuarine fishers, and will provide for some ongoing harvest of prawns that are smaller than those taken in the ocean prawn trawl fishery. This strategy adopts counts of 50 king prawns and 100 school prawns per half-kilogram to be used to guide the design of gear selectivity changes and when defining fishing closures in the fishery.

iv) Protected species

Commercial fishers are not permitted to take either protected fish or fish protected from commercial fishing. These species are listed in clause 6 and clause 7 of the FM Regulation.

A range of threatened species, other than fish, are protected by other legislation including 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*. Such species may be classified as threatened, endangered or vulnerable and cannot be retained by commercial fishers.

Interactions with threatened species and species of public concern

Although interactions with threatened species have not been commonly recorded in this fishery, this FMS includes two direct measures to obtain data on any such interactions. The first of these measures is a modification to the catch reporting system which incorporates mandatory reporting of fishers' interactions with threatened species during fishing operations (see management response 3.1a). Secondly, the implementation of a periodic observer survey will, *inter alia*, collect data on occurrences of threatened species in catches (see management response 1.2a).

A number of management responses appearing in section 4 of this FMS are also aimed at minimising impacts on threatened species. These measures include educating fishers in the identification/avoidance of threatened species, using fishing closures and modifying gear use to minimise known interactions with threatened species, and implementing the provisions of any threatened species recovery plans and threat abatement plans (management response 3.1b).

v) Status of species within the fishery

The determination of the status of the primary and key secondary species is central to the sustainable operation of the OTF, and is a key component of the strategy. NSW DPI uses a standardised method of reporting on the exploitation status of fish stocks across all commercial fisheries. Stock status is described using the terms defined in Table 4. Where available, data on the recreational harvest, including charter boat catch, and catch from other sectors are 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 4. The characteristics of the categories of exploitation status that are used to determine the status of key species, as part of the resource assessment system

Category	Characteristics
Recruitment overfished	<ul style="list-style-type: none"> Recruitment is being significantly or measurably suppressed as a result of a small spawning biomass Other characteristics of an 'overfished' stock (see below) are likely to be evident Unequivocal determination will require a well-calibrated population model or stock-recruitment relationship
Overfished	<ul style="list-style-type: none"> Fishing mortality rates are more than double natural mortality rates Estimates of biomass are less than 30% of the estimated unfished stock Catch rates are less than 30% of the initial catch rates Length and age distributions unstable (excessively affected by recruitment, too few age or size classes in the exploitable population given a species' life history) Trends in length/age compositions are evident which indicate increasing (and/or excessive) fishing mortality The 'Spawning Potential Ratio' is less than 20%
Growth overfished	<ul style="list-style-type: none"> Yield per recruit would increase if length at first capture was increased or fishing mortality decreased.
Fully fished	<ul style="list-style-type: none"> Fishing mortality is approximately the same as natural mortality Estimates of the biomass are greater than 30% of the estimated unfished biomass Catch rates have been steady for 5-10 years and/or catch rates are greater than 30% of initial catch rates. Length and age distributions are stable Species are fished throughout their entire geographic range
Moderately fished	<ul style="list-style-type: none"> Fishing mortality is less than half of natural mortality Estimates of the biomass are greater than 70% of the estimated unfished biomass Catch rates are greater than 70% of initial catch rates Species are fished in most of their geographic range but non-fishing areas are known to exist
Lightly fished	<ul style="list-style-type: none"> Fishing mortality less than 25% of natural mortality Estimates of the biomass are greater than 90% of the estimated unfished biomass Catch rates are greater than 90% of initial catch rates Only small proportions of the geographic range are fished Markets would likely limit catch and effort
Uncertain	<ul style="list-style-type: none"> A significant amount of evidence has been collected and considered, but there are inconsistent or contradictory signals in the data that preclude determination of exploitation status
Undefined	<ul style="list-style-type: none"> Catch data are available but no reasonable attempt has been made to determine exploitation status

Source: NSW Department of Primary Industries (2006).

Table 5 outlines the exploitation status of the primary and key secondary species for the OTF as at 2006. A number of species are classified as undefined and the strategy includes responses to measurably improve the quality of reported information and knowledge of stock status for these species. Section 3(e) and Appendix 5 provide details of the methods to be employed to help determine the status of the primary and key secondary species, as part of the resource assessment process.

Table 5. Exploitation status of primary and key secondary species taken in the OTF (as at 2006).

	Species	Exploitation status
Primary Species	Eastern King Prawn	Overfished (Growth)
	School Prawn	Overfished (Growth)
	Royal Red Prawn	Lightly Fished
	Balmain Bug	Fully Fished
	Octopus *	Uncertain
	Cuttlefish	Undefined
	Southern Calamari	Undefined
	School Whiting	Undefined
	Tiger Flathead	Fully Fished
	Sand Flathead	Fully Fished
	Silver trevally	Overfished (Growth)
	Fiddler Shark *	Uncertain
Key Secondary Species	Blue Swimmer Crab	Fully Fished
	Squid (mixed species)	Undefined
	Gurnard / Latchet	Undefined
	John Dory	Fully Fished
	Angel Shark (2 species)	Undefined
	Flounder (mixed species)	Undefined
	Red Mullet (2 species)	Undefined
	Redfish	Overfished (Growth) #
	Ocean leatherjackets	Moderately fished
	Ocean Perch	Fully Fished
	Mirror Dory	Fully Fished
	Sole (mixed species)	Undefined
	Morwong, Rubberlip (Grey)	Fully Fished
	Moonfish	Undefined
Boarfish	Undefined	
Sharks (mixed species) *	Undefined	

* = Species composition of the catch needs to be determined before any assessment of status can be made.

Redfish is considered to be growth overfished in the Commonwealth managed trawl sector of the SESSF. The implications for the NSW fishery are unclear, but the large decline in catch since the 1980s suggests a significant impact.

vi) Overfished species

If a species taken in this fishery is determined as overfished (either of the three types of overfishing), this FMS requires the implementation of, or assistance in developing, a recovery program for that species (see Objective 2.2 and related management responses in section 4 of this FMS). However, a recovery program is not required for species that are determined as 'growth overfished' if the Director-General, NSW DPI, considers that the combination of the existing harvest strategy and life history characteristics of the species provides sufficient protection for the stock from the effects of fishing.

The process of developing a recovery program for an overfished species initially involves NSW DPI preparing a summary of the known factors that have led to the determination being made.

In addition to the summary, a range of management options will be identified and outlined. Consultation will then formally commence with the relevant MACs and advisory bodies. The recovery program will be developed under the management strategy for the fishery that is the key harvester of the species concerned, and must include a description of the actions proposed to return to acceptable levels those parameter(s) that have led to the determination of the species being overfished. The recovery program will also set out a timeframe for that process (including annual reviews) and may specify further appropriate action should recovery targets not be met.

Definitions of overfished status

The NSW DPI Resource Assessment System (Table 4) uses a continuum of three categories of overfishing which, when detected, in most cases require management action. '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' is the most serious form of overfishing and occurs when fishing pressure has reduced the ability of a stock to replenish itself, *i.e.* the size of the spawning biomass is so reduced as to compromise recruitment. Between these two categories, the general term 'overfishing' is used to capture situations that represent excessive fishing mortality being placed on a stock with the result that it is likely to have a small relative spawning biomass and suppression of recruitment. However, significant measurable evidence that would confirm the stock's status as 'recruitment overfished' is lacking.

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 (in the absence of an obvious stock collapse). 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 for the most studied species taken by the OTF information may not be available on all these topics.

NSW DPI will consider advice from fisheries scientists as part of the annual assessment of the status of fish stocks in NSW. That advice could result from the findings of monitoring and research conducted by scientists employed by NSW DPI, or from other agencies or institutions doing research that is relevant to the assessment of species harvested in NSW. If the species is the subject of a formal resource assessment process, the indication of overfishing is likely to come from having a 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), increases in average size or missing year-classes 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 DPI, NSW DPI scientists will review the status determination for that species against the criteria specified in Table 4 and report on the updated status in the resource assessment report. If a

species is designated as overfished, a recovery program involving all harvest sectors will be developed as provided for above.

Appropriate management responses for different types of overfishing

'Growth overfishing' generally implies the productivity of a stock is sub-optimal due to the harvesting of fish 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, to prevent the wasteful discarding of large numbers of undersized individuals. 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. Nevertheless, the primary objective of a recovery program for growth overfished species should be to improve the management of a stock to ensure sustainability and optimise economic yield at a fully fished status.

Recovery programs for species suspected of having depressed recruitment due to overfishing (ie. species determined as 'overfished' or 'recruitment overfished'), 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.

vii) *Species in the fishery determined as being overfished*

Eastern king prawn (*Penaeus plebejus*) – growth overfished

Although total NSW commercial catches of eastern king prawns have been relatively stable around 800 to 1100 t per annum for the past two decades, size composition data suggest a significant proportion of the catch (by all fisheries) is comprised of prawns smaller than the optimum size at first capture (Montgomery, 2000). More recent information shows that the commercial catch of this species declined to below 600 t in 2004/05, however this was paralleled by a decrease in effort thereby maintaining relatively stable CPUE. Improvements in trawl net selectivity for eastern king prawns and the adoption of a 'prawn count' principle (50 per half-kilo), the expansion of the closures protecting juvenile king prawns, the collection of representative size composition data throughout the fishery, the development of a more detailed population model and the application of total effort levels in accordance with the process in the Estuary General and Estuary Prawn Trawl fishery management strategies, will all assist in addressing the 'growth overfished' status of the stock as far as the ocean trawl fishery is concerned.

School prawn (*Metapenaeus macleayi*) – growth overfished

Commercial catches of school prawns are variable, and depend significantly on environmental factors, especially rainfall and resulting river discharge levels. In the past decade the majority of school prawns have been taken from estuaries by the Estuary Prawn Trawl and Estuary General fisheries, while catches from ocean waters have comprised about 12% of the total for NSW (between 1997/98 and 2004/05). Size composition data suggest that catches of school prawns from some estuaries contain a significant proportion of prawns that are less than the biological optimum size

(Montgomery, 2000). A research program aimed at a more detailed assessment of the status of school prawn resources is underway, with results expected by 2007. Changes being pursued by this FMS to introduce closures to trawling during times of high river discharge, improve cod-end selectivity and utilising a 'prawn count' of 100 per half-kilo to guide gear selectivity changes and closures and should assist in addressing any growth overfishing in the OTF in the interim.

Silver trevally (*Pseudocaranx dentex*) – growth overfished

There has been a significant decline in commercial landings of silver trevally since the 1980s, and the study by Rowling and Raines (2000) concluded that the stock was growth overfished. Significant quantities of silver trevally are landed by the Ocean Trap and Line Fishery, the Estuary General Fishery (prior to Botany Bay becoming a recreational fishing haven) and the Recreational Fishery, however more than 50% of commercial landings are taken by ocean fish trawlers. Significant quantities are also taken in the Commonwealth trawl sector of the Southern and Eastern Scalefish and Shark Fishery (SESSF).

A recovery program for silver trevally will therefore be developed under this FMS. The recovery program will include the imposition of a minimum legal length of 30 cm (total length) for silver trevally in NSW, and changes to the selectivity of fish trawl cod-ends to allow trevally smaller than the minimum legal length to escape from the net.

Redfish (*Centroberyx affinis*) – growth overfished

The majority of the redfish catch (about 1500 t per annum) is taken by fish trawlers operating in the Commonwealth trawl sector of the SESSF, south of Sydney. About 50 t of redfish are caught annually by commercial fisheries under NSW jurisdiction, the majority being taken in the OTF. Redfish in the Commonwealth trawl sector have been shown to be growth overfished (Rowling, 2001; BRS, 2003). While only a relatively small proportion of the redfish catch is taken by trawlers operating under NSW jurisdiction, it is important that action is taken to identify and ameliorate any growth overfishing in the NSW fishery. The selectivity changes proposed for cod-ends of fish trawl nets should significantly address any growth overfishing of redfish by NSW trawlers. Onboard observer data will, over time, be used to assess the effectiveness of the selectivity changes.

Gemfish (*Rexea solandri*) – recruitment overfished

The eastern stock of gemfish underwent a collapse in recruitment in the late 1980s, and the stock has failed to show any significant recovery since the mid 1990s (Rowling and Makin, 2001). Eastern gemfish has been nominated for listing as an endangered species under the FM Act and EPBC Act, and at the time of approval of the FMS decisions regarding these nominations are pending. All NSW commercial fishers are currently subject to a 50 kg trip limit for eastern gemfish, to discourage targeted fishing for the species. Current regulations will be reviewed as part of the development of a recovery program for eastern gemfish, which will occur under the Ocean Trap and Line Fishery Management Strategy. NSW ocean trawl fishers will be required to comply with any amended restrictions that might result from the recovery program. If eastern gemfish is listed as a threatened species under the FM Act or the EPBC Act, consideration will need to be given to more conservative management measures, such as precautionary closures to trawling in areas and at times where pre-spawning aggregations of gemfish are likely to be found. NSW will also need to collaborate with the Commonwealth with a view to implementing compatible arrangements with respect to any temporal or spatial closures.

c) 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 continually be 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 that can be worked. Output controls, on the other hand, directly limit the amount of fish that can be landed and are well suited for single species, high value fisheries using single gear types.

The OTF in NSW is managed predominantly by input controls. The following section describes in broad terms the diverse range of controls that apply to activities in the fishery. The general rules applying to commercial fishing and the specific rules for this fishery, such as gear specifications, are detailed in the FM Regulation 2002. It should be noted that the preceding and following text represents the position at the commencement of the FMS, however, some of these provisions will change as the strategy is progressively implemented.

i) *Limited entry*

The OTF is a category 1 share management fishery. Access to the fishery is limited to shareholders (or their nominated fisher) who hold shares above any minimum shareholding level established in the share management plan. Access to the offshore prawn trawl sector of the fishery was first limited in the mid-1980s and access to other sectors of the fishery were first limited (under a 'restricted fishery' management regime) in 1997.

ii) *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 the endorsements, issued in respect of each part of the fishery and specified on the licence. Conditions may be placed on licences and endorsements in order to restrict fishers' commercial activities where required.

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) which includes a business that holds an offshore prawn trawl endorsement or contains a minimum level of validated catch history
- in the case of an offshore prawn trawler, the skipper of the vessel or the nominated fisher of an RFO, or
- individuals who are the holder of shares in a share management fishery.

This last provision will become the more relevant requirement as share management is implemented in the OTF.

Fishing endorsements

It is important to identify 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 commercial fishing licences of individuals and authorise the use of specific gear or taking of certain

species. Some fishing businesses can be owned and held in the names of more than one individual (including company or partnership names). Currently in the OTF, only one person can be nominated to hold the primary endorsement in respect of a fishing business. Other licensed fishers may currently, subject to the criteria outlined in the Regulation, hold separate endorsements to operate in the fishery in the form of a 'skipper's endorsement'. These arrangements will change upon the issue of final shares and as the endorsements that arise from the shares held by a fishing business will appear on a Fishing Business Card instead of on commercial fishing licences.

In the case of the offshore prawn trawl endorsement, in addition to the operator of the vessel holding a commercial fishing licence and an offshore prawn trawl endorsement, the boat also needs to be appropriately unitised.

Five classes of endorsement will exist in the fishery at the commencement of the FMS. 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 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.

Nomination policy and special arrangements for skippers

Part of the introduction of the restricted fishery regime was the creation of rules to allow the endorsements of a fishing business to be nominated to a person. This was necessary due to fishing businesses being held in company or partnership names, and because fishing licences can only be issued to natural persons. The system also had to enable skippers to continue operating in the industry and consequently three different skipper arrangements were developed – general skippers, employee skippers, and conditional skippers – each with their own eligibility criteria. For further information about the past skipper arrangements, refer to the relevant commercial fisheries licensing policies or the Ocean Trawl EIS.

This FMS supports the adoption of a new approach to the issuing of endorsements that will be carried out as part of the implementation of category 1 share management fisheries and will reduce administration (with associated costs) and make it easier for business owners to obtain skippers at short notice. It involves issuing a 'Fishing Business Card' in respect of each business that details the endorsements that may be activated by the licensed commercial fisher in possession of the card. This program will replace the current endorsement nomination and skipper policies. The fishing business owner will simply need to notify the Department (in the approved form and manner) of a change in the nomination before handing the Fishing Business Card to a different licensed fisher amongst the owner's pre-registered list of eligible nominated fishers. The share management plans will contain specific requirements for nominations and may specify minimum time periods for nominations in order to prevent fishing businesses from operating 'around the clock'.

Provisions for unlicensed crew

The holder of a commercial fishing licence or fishing boat licence endorsed in the OTF may use unlicensed crew up to the limit (if any) specified in the share management plan.

A licensed fisher employing crew must maintain records about her/his crew. Information relating to crew must be recorded on the mandatory catch and effort return submitted in respect of the fishing business.

iii) Fishing boat licensing

In addition to each fisher having to be licensed, every fishing boat used in connection with the OTF must also be licensed. There has been a cap on the total number of general boat licences since 1984 (includes boats used in all fisheries) and this restriction will remain with respect to the OTF.

Boats that may be used in the offshore sector of the prawn trawl fishery have been restricted since 1985. These boats have historically been recognised by an OP1 endorsement that appears on the boat licence and strict boat replacement rules currently apply (i.e. the unitisation scheme). These boats are currently subject to one of four different boat licence conditions (P1, P2, P3 and P4) that establish the waters the boat may work, whether access to the offshore sector of the prawn trawl fishery is transferable with the licence and if the boat may be upgraded:

P1 - the boat may be upgraded and the offshore prawn trawl entitlement is 'transferable'

P2 - the boat cannot be upgraded, but the offshore prawn trawl entitlement is 'transferable'

P3 - the boat cannot be upgraded, and the offshore prawn trawl entitlement is not 'transferable'

P4 - the boat is restricted to operating in offshore waters north of Cape Byron, cannot be upgraded and the offshore prawn trawl entitlement is 'transferable' subject to the parallel transfer of the Queensland fishing entitlement allocated to the boat.

These classifications will cease to apply when the share management plan commences. From that point on, whether a boat will be authorised to be fish in the certain waters will depend on whether it is unitised, with the maximum units of the vessel appearing on the fishing boat licence. All boat licences will be transferable and able to be upgraded, but only up to the maximum specifications permitted by the length and unit allocations attached to the licence.

The process of restricting hull capacity, engine power and net length in the offshore prawn trawl fishery is known as 'unitisation' because the allowable hull capacity, engine power and net length for each boat is expressed in terms of 'units'. Engine units and net units can be increased (i.e. upgraded) by amalgamating two or more boat licences. This is one of the programs used to restructure the number of boats operating in the fishery.

All other ocean trawlers (i.e. those not endorsed for offshore prawn trawling) are currently subject to boat length restrictions. Engine power has not historically been restricted in these sectors of the industry. These boats have, however, been 'unitised' and will become subject to the same vessel capacity restrictions as the boats endorsed for offshore prawn trawling (see management response 5.2a). The current boat capacity and net length restrictions are further explained below.

Hull size

In the offshore prawn trawl sector the hull capacity of a replacement boat must not exceed the hull capacity of the replaced boat. Hull capacity is defined in terms of 'hull units', which are calculated using the following formula;

$$\text{Hull units} = \text{length} \times \text{depth} \times \text{beam} \times 0.6 / 2.83.$$

A maximum length of 20 metres also applies. For consistency, the dimensions of a boat must be specified in a survey and are determined using the Uniform Shipping Laws Code method for measuring boats. Hull units cannot currently be amalgamated for the purpose of increasing hull capacity.

Engine controls

In the offshore prawn trawl sector a fisher must request approval from the Director-General, NSW DPI before replacing the engine in a trawler. The power rating of a replacement engine, or the engine in a replacement boat, must not exceed the engine units allocated to the licence. A 10% tolerance applies in some instances. For consistency, the continuous brake kilowatt power rating published by the manufacturer and endorsed by NSW DPI is used when assessing applications for engine replacement (for a given engine, the number of engine units is equal to the manufacturer's published power rating in Kw). All boats used in the OTF will become subject to the same controls on replacement as part of the implementation of the FMS.

Nets

Trawl nets do not need to be registered and a detailed description of the net types is provided in section 3(a)(iv). To limit fishing effort on prawn stocks the headrope length of prawn trawl nets is restricted to 33 metres, unless otherwise specified on the boat's licence. Limiting the headrope length restricts the size of the net that can be used, indirectly limiting the area of sea floor that can be covered during each trawl shot. Boats endorsed for the offshore prawn trawl sector have the allowable headrope length recorded on the boat's licence. Headrope lengths in this sector of the fishery range from 33 metres to a maximum of 60 metres. Following the transfer or amalgamation of a boat licence, or upon replacing a boat or its engine, the maximum allowable headrope length for the boat is reduced to 55 metres.

Net units (i.e. net length) in the offshore prawn trawl sector are based on the 'Total Units' of the boat, using the following method:

Total Units = Engine Units + Hull Units

For each 'total unit' up to 100, 0.275 net units are allocated,
then 0.183 net units are added for each total unit between 101 and 200,
and 0.092 net units are added for each total unit over 200.

1 net unit equates to 1 metre of headrope length allowed for the trawl net.

In other sectors of the prawn trawl fishery the maximum headrope length is 33 metres, but this will change for each boat as the process of unitisation is implemented in these sectors of the fishery. The headrope length of fish trawl nets is currently not restricted, however this FMS proposes the introduction of a maximum headrope length of 60 metres in respect of fish trawl nets.

Sweeps are used to herd fish into the path of a trawl net. Sweeps on prawn trawl nets are restricted to a maximum of 5 metres, or the distance between the trawl gallows and the stern of the boat, whichever is the greater. The length of sweeps on fish trawl and Danish seine nets is not regulated, however the size of the trawl gear able to be towed effectively by a trawler is dependent on the size and horsepower of the vessel, factors which will be regulated for all trawlers under the FMS.

iv) 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 currently 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.

It is proposed under the share management system that no time limit will apply on attaching a physical boat to a licence (ie. a fishing boat licence can be maintained without an associated boat), but the licence fees will continue to have to be paid each year.

v) *Transfer policies**Transfer of licensed fishing boats*

Boats used in the ocean trawl fisheries have historically been classed as “boat history” vessels, and have not been permitted to be transferred separately to the fishing business.

Under the share management plan, it is proposed that all fishing boat licences will be able to be transferred to other fishing business owners independently of the other components of the fishing business. However, no additional boat licences will be issued and controls on access to particular fisheries will be managed through the shareholdings and eligibility for endorsements. Any transfer of a fishing boat licence must first be approved by the Director-General, NSW DPI.

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 they acquire a fishing business with the required level of validated catch history or particular fishing entitlements.

In the past, offshore prawn trawl endorsements have been transferable if the boat licence associated with the business has a P1, P2 or P4 entitlement. Offshore prawn trawl endorsements associated with P3 prawn trawlers were not non-transferable. Other ocean trawl endorsements (inshore prawn trawl, deepwater prawn trawl, northern fish trawl and southern fish trawl) have only been available to a new owner of the fishing business if the business has at least \$30,000 worth of validated catch history in any two years between 1986 and 1990 and in one year between 1991 and 1993. A restrictive transfer policy has been necessary to prevent endorsements that were granted under a low entry criteria from being issued to new owners of fishing businesses and utilised at much higher levels of fishing effort.

Under the current Licensing Policy, fishing businesses must be sold as an entire package (i.e. the catch history, boat history vessels and/or endorsements associated with boats cannot be split). Proposals regarded as licence splitting, or contrary to the intention of the Licensing Policy are not approved.

Under the FMS, transfer arrangements will be specified by the provisions of the general regulation or the share management plan. Shares will become the key tradeable right and while shares are likely to be more freely tradeable than in the past, the fundamental principle of avoiding increases in fishing effort through transfer arrangements will be applied.

National licence splitting policy

The Commonwealth and State Governments have had a long-standing nationally agreed policy in place on "licence splitting". The policy seeks to prevent entitlements held by one person or entity,

and issued by more than one jurisdiction, from being split and transferred separately. In NSW the transfer of a fishing business is not currently approved unless all entitlements issued to the business by other jurisdictions are also transferred to the same person or surrendered, unless the separate transfers have been approved by all agencies involved.

Where fishing effort has been historically 'shared' across a number of entitlements held by a person, the National licence splitting policy seeks to prevent any increase in effort in each of the respective fisheries that might occur following the splitting of the entitlements.

Specific guidelines have been developed that provide for the transfer of Queensland fishing entitlements (including 'nights') separate to NSW fishing entitlements in some situations. These guidelines allow for the transfer of up to 20% of the nights originally allocated to the Queensland licence, or the transfer of all nights and entitlements if the boats original allocation was less than 30 nights.

New regulations, introduced in mid-2006, provide the powers to cancel, refuse to renew, refuse to transfer, or to restrict the NSW fishing entitlements of any dual licensed operator who splits any external fishing authorities (ie. Commonwealth or other State/Territory authorities) associated with their fishing business.

vi) Appeals 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 DPI 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 is 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: <http://www.lawlink.nsw.gov.au>.

vii) Code of practice

Fish trawl operators who are also endorsed in the Commonwealth trawl sector of the SESSF abide by an "Industry Code of Conduct for Responsible Fishing in the South East Trawl Fishery". Copies of this code of conduct are available from the South East Trawl Fishing Industry Association (email: trawline@tassie.net.au). This FMS promotes the development of a code of practice for all trawl operators, to encourage responsible fishing practices (see management response 1.2d).

viii) Time and area closures

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

- protect and conserve areas of key habitat
- manage the amount of fishing effort in an area/region
- 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. Fishing closures are required to be published in the NSW Government Gazette, however, if the Minister for Primary Industries 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.

Closures impacting on the fish trawl sector currently include the closure to fish trawling of all waters north of Smoky Cape (approx. 31°S latitude) and a closure to trawling in waters between Red Pt and Windang Island, off Lake Illawarra. All forms of trawling are excluded from areas declared as 'sanctuary' and 'habitat protection' zones in marine parks and grey nurse shark critical habitat areas. This FMS promotes the identification and mapping of habitat types in NSW ocean waters, with the intention of restricting trawling to soft sediment habitats, and implementing trawl closures in areas with hard bottom where more biologically diverse faunas are generally found.

Details on up-to-date fishing closures that apply to the OTF can be found on the NSW DPI website at: www.dpi.nsw.gov.au or in the relevant share management plans once finalised.

ix) Zoning

The five endorsements relevant to trawling in NSW ocean waters establish not only the methods that may be used, but also the area in which fishing may be conducted under that endorsement. The following summarises the fishing 'zones' for each endorsement type:

1. Ocean Prawn Trawl (Inshore) – waters between the coastal baseline and 3 nautical miles to sea, from the Queensland border in the north to the Victorian border in the south.

2. Ocean Prawn Trawl (Offshore) – waters between 3 nautical miles and the 4000 metre depth contour (approximately 80 nautical miles to sea), from the Queensland border in the north to a line drawn due east from Barrenjoey Point (Sydney) in the south. However, this FMS (management response 4.3a) aims to separate the offshore and deepwater sectors of the fishery and this may be done through area limitations. Offshore prawn trawlers with a P4 boat licence condition have historically been restricted to waters north of a line drawn due east of Cape Byron, Byron Bay.

3. Ocean Prawn Trawl (Deepwater) - waters between 3 nautical miles and the 4000 metre depth contour (approximately 80 nautical miles to sea) from the Queensland border in the north to a line drawn due east from Barrenjoey Point (Sydney) in the south (for particular species only). However, this FMS (management response 4.3a) aims to separate the offshore and deepwater sectors of the fishery and this may be done through area limitations.

4. Ocean Fish Trawl (North) – waters between the coastal baseline and the 4000 metre depth contour (approximately 80 nautical miles to sea), from a line drawn due east of Smoky Cape (South West Rocks) in the north to a line drawn due east of Barrenjoey Point (Sydney) in the south.

5. Ocean Fish Trawl (South) – waters between the coastal baseline and 3 nautical miles to sea, from a line drawn due east of Barrenjoey Point (Sydney) in the north to the Victorian border in the south.

x) *Permits*

Section 37 of the *Fisheries Management Act 1994* allows for permits to be issued for research or other authorised purposes. These permits provide a legal framework for activities that fall outside the normal operating rules set out in the 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, and are often used to limit the extent of the permitted activity.

Permits issued under section 37 of the *Fisheries Management Act 1994* are only valid insofar as they do not conflict with approved determinations of native title made under the Commonwealth Native Title Act 1993. Permits are valid for the period specified on the permit, and may be suspended or cancelled at any time by the Minister for Primary Industries. Permits are not transferable.

xi) *Catch limits or quotas*

A commercial daily catch limit (or “trip limit”) applies to a range of species taken from NSW waters as part of the OTF. These daily catch limits are intended to complement the quota system administered by the Commonwealth Government that directly limits the harvest levels of these species by Commonwealth endorsed boats. Details of up-to-date trip limits applying to the OTF can be found on the NSW DPI website at: www.dpi.nsw.gov.au or in the share management plan and supporting plan.

xii) *Seafood safety programs*

Food safety programs which relate to the ocean trawl fisheries are administered by the NSW Food Authority under the *Food Act 1989*. Food safety programs for all commercial fisheries are currently being prepared by the NSW Food Authority and will be supported under the FMS (see management response 5.5a).

xiii) *Cost recovery policy*

NSW DPI currently recoups some of the 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 DPI is in the process of implementing cost recovery in a progressive manner, so that all charges are passed on to industry in a planned and orderly way. In November 2000, the Government announced a policy to develop and implement a cost recovery framework for the new category 1 share management fisheries. This framework will be subject to extensive industry consultation. During this period, the total amount of money collected for NSW DPI, for its existing management services, will not increase without the support of the relevant management advisory body. At the time of commencement of the FMS, the cost recovery policy was under review.

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

participants. A range of regulatory and administrative fees are payable by fishing business owners in the OTF. The management strategy does not, in itself, set the charges, or limit or otherwise govern the way fees are charged.

d) Compliance

NSW DPI has approximately 100 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 75 of these fisheries officers are located in areas along the NSW coast where trawlers fish in ocean waters. 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 DPI for the OTF (see management strategy response 6.1a in section 4 of this FMS). To ensure that compliance service is delivered in a consistent manner, quality inspection guidelines will be developed. These guidelines will set out a procedural approach to be adopted when undertaking inspections of fishers and fishing gear in the OTF. 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 penalty points system

A penalty points scheme linked to endorsement suspension and share forfeiture provisions will be introduced under the management strategy and developed through the share management plan for the OTF (see management response 6.1c).

The OTF 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 may still be a small number of fishers who regularly operate beyond the rules. The penalty points system will provide a clear deterrent to fishers who are considering breaching the provisions of the management strategy or associated rules, as well as guiding the courts with a regulated management plan that reflects the serious nature of some fisheries offences.

Similar to the motor vehicle licence demerit points scheme administered by the Roads and Traffic Authority, the system will provide for a list of penalty points assigned to the more serious offences. If a fisher accrues a certain level of penalty points by breaching the rules applying to the fishery, the endorsement or fishing right will be subject to predetermined periods of suspension or cancellation. Details of how the scheme will operate, such as the points attributable to each offence and the sanction threshold levels, will be developed in consultation with Management Advisory Committees.

e) Research

NSW DPI has developed a strategic research plan covering priorities across all fisheries which is responsive and takes account of the research requirements identified under each fishery management strategy.

i) Proposed research areas

Research necessary for the OTF can be categorised into six broad topics:

- resource assessment of primary and key secondary species
- quantification and reduction of 'bycatch'
- the impact of trawling on key secondary species, especially elasmobranchs
- the economic viability of trawl fishing and flow-on effects to the community
- effects of trawling on ocean ecosystems (including habitat and trophic interactions) and the effectiveness of management measures in addressing these impacts, and
- interactions of trawling with threatened species.

The first three topics above are considered to be the highest priority for research relevant to the ecological sustainability of the OTF, while research on the economics of the fishery is important to provide better information on fishing business viability that can be taken into consideration in future management of the fishery. The impact of trawling on ocean ecosystems represents a very broad area for research, which will require significant resources and a long-term approach. The available data and anecdotal evidence suggests that trawling in ocean waters off NSW has a low level of impact on threatened species, with the priority at present being to obtain more accurate information about the level of interaction, rather than undertake research projects on the impacts (it is likely that threatened species recovery plans will specify any research to be undertaken in this area).

Outlined below are those strategies by which research into these priority areas should proceed.

Resource assessment of important species

The twelve species (or species groups) that have been identified as 'primary' species for the OTF include some species for which considerable information is available regarding the status of the stock, a number of species for which there is some information regarding stock status, and some 'species groups' where there is a requirement to determine the species composition of trawl catches with more accuracy before any assessment of stock status can be developed. Monitoring of reported commercial landings each year has been done for many of the more important species, but its use in assessing the status of the stocks is limited. Size and age based monitoring is a significant improvement upon the monitoring of catch and effort alone.

A number of the primary fish species taken in the OTF are also landed by trawlers working in the Commonwealth trawl sector of the SESSF, which has a dedicated fishery assessment group process (see Smith and Wayte, 2002). Assessments with varying degrees of detail have been undertaken as part of this process for tiger flathead, school whiting, silver trevally and royal red prawns (however, with the exception of silver trevally, none of these species had a full stock assessment available in 2003). Significant work has been done in both NSW and Queensland towards developing assessment models for eastern king prawns (Gordon et al., 1995; Courtney, 1997) however there is considerable work still to be done to combine these assessments to cover the full range of the stock.

Other primary species for which there is some information that could be used in an assessment of the status of the stocks in NSW include Balmain bugs, southern calamari, school prawns, sand flathead and school whiting. For these species there is a need to collect and analyse appropriate information from NSW fisheries, to review available information on the species from other jurisdictions, and to develop resource assessments that will specify what further research or monitoring is required to improve the quality of future assessments.

Resource assessment processes should be established for all high risk species as a priority, although the level of assessment is likely to differ due to species identification problems. For fiddler shark, octopus and cuttlefish the species composition of trawl catches needs to be determined, and relevant biological data collected, before any assessment of the status of the stocks can be attempted. This can be achieved through a combination of onboard observer work and market sampling, and is a necessary first step in defining those species which will require the development of more detailed resource assessments under this FMS, and what biological data and fishery monitoring is required to support those assessments. Until identifications are consistent and reliable, it will not be possible to achieve Class 1 or 2 assessments (see Table 6 below).

Priority ranking for assessment of primary species in the Ocean Trawl Fishery.

1. **Eastern king prawn.** By far the most economically important species to the OTF. The high price per kg will encourage targeting even at low abundance levels. Very significant landings of mature prawns are made by trawlers off southern Queensland, and there are significant commercial and recreational landings of immature prawns from many NSW estuaries. Existing population models need to be updated and extended across jurisdictions and to all sectors which exploit the species.
2. **School prawn.** Stock probably comprises a number of discrete populations, but very limited biological information is available. Very significant commercial landings of small prawns are made in some estuaries. Catches of larger prawns from ocean waters have declined markedly since 1980s. Currently the subject of a four year FRDC-funded research program.
3. **School whiting.** The most valuable finfish species in the OTF, with recent catches exceeding 1000 t per annum in some years. Includes both red spot and stout whiting (2 similar species), with limited biological data available. Specific arrangements will be developed under this FMS for targeting school whiting. Close monitoring and assessment of stock status is needed to evaluate the effects of gear change.
4. **Fiddler shark.** The bulk of the catch is shovelnose ray, but banjo shark are also included. A large elasmobranch with limited fecundity, the relatively high landings and a lack of relevant monitoring and biological data increase the priority to assess the status of the shovelnose ray resource.
5. **Sand flathead.** Very important inshore flathead species caught almost entirely off NSW, with a significant recreational catch. A poorly studied species with limited information about the species' biology and some sporadic monitoring data - therefore a moderate priority for assessment.
6. **Balmain bug.** Economically important, relatively long-lived crustaceans. Two significant species (not distinguished by fishers) caught almost entirely by trawling. Limited information is available about the species' biology, and there is minimal monitoring data

available. Recent decline in catch preceded the imposition of a minimum legal size of 100 mm carapace width.

7. **Royal red prawn.** A significant deepwater prawn species sometimes taken in large catches. Targeting can be influenced by market demand. Also taken in the Commonwealth SESSF where catches are generally well below the TAC. Research suggests that grounds north of Sydney may contain a large proportion of the mature population. A relatively long-lived (3+ yrs) prawn species.
8. **Tiger flathead.** A relatively deepwater flathead, and a major species in the Commonwealth south-east trawl fishery, south of Sydney. Limited biological and monitoring data are available from NSW catches. The stock has been overfished before and therefore it is important to assess the current level of utilisation by NSW trawlers.
9. **Octopus.** At least ten species of octopus are taken in trawl nets off NSW, although data from research vessel catches suggest landings may be dominated by a smaller number of species. No monitoring data are available for this group, except total catch of 'octopus', which is relatively stable at around 500 t per annum. The biology of most species is poorly known. A better description of catch-by-species is required before any assessment can be contemplated.
10. **Cuttlefish.** Again a number of species are known to occur in trawl catches off NSW, but a quantitative estimate of the species composition of the commercial catch is not available. Cuttlefish are thought to be short-lived (1-2 years maximum). Reported landings in NSW have declined from a high in 1994/95 to remain between 200-300 t for the past 10 years.
11. **Southern calamari.** A widely dispersed and quick growing species (maximum age less than 18 months), which occurs in very shallow inshore waters as well as on deeper trawl grounds. Calamari is an important species in the Newcastle/Port Stephens area, where it is a significant component of trawl catches. The species has been much studied off southern Australia, however few monitoring or biological data are available for NSW.
12. **Silver trevally.** An assessment of the status of the silver trevally stock has previously been completed (Rowling and Raines, 2000), and responses in this FMS will address the 'growth overfished' status of the stock. The effectiveness of the recovery program needs to be closely monitored, but the results will take some time to become apparent in the population structure and there is no immediate need to update the resource assessment for silver trevally.

Classes of resource assessment for species harvested in NSW

Table 6 summarises the characteristics of each class of resource assessment that has been developed for species harvested in NSW. A detailed description of the assessment classes is provided in Appendix 5 (Scandol 2004). Table 7 (adapted from Scandol 2004) contains the target assessment classes that are proposed for the primary and key secondary species of the fishery. The content of Table 7 will require ongoing revision.

Table 6. Summary of the attributes of the various classes of resource assessment

Attribute	Class of Resource Assessment				
	One	Two	Three	Four	Five
Biomass estimate	•				
Estimate of fishing mortality	•				
Quantitative risk analysis of future harvesting	•				
Standard fisheries biological reference points	•				
Credible indicator of abundance	•	•			
Representative time-series of commercial catch	•	•	•	•	
Age-structured data (where possible)	•	•			
Local information for growth, mortality, selectivity and maturity	•	•	•		
Length-structured data	•	•	•		
Non-local information for growth, mortality, selectivity and maturity			•	•	•
Externally reviewed or publishable	•	•	•	•	•

(Source: Scandol 2004)

Table 7. A summary of the proposed target resource assessment classes for primary and key secondary species of the fishery. Age information will be collected for those species granted a Class 2 assessment where no local information on growth is available.

Species	Species Type	Resource Assessment Class	EIS Risk Rating	Indicators	Comments
Eastern King Prawn	P	1	Moderately-High	Catch; CPUE; Length	Ongoing monitoring program
School Prawn	P	2	Moderately-High	Catch; CPUE; Length	FRDC study in progress
Royal Red Prawn	P	3	Intermediate	Catch; CPUE	Some existing length data (Commonwealth)
Balmain Bug	P	2	Intermediate	Catch; CPUE; Length	Ongoing monitoring program - some existing length data, species identification issues
Octopus	P	2	Low	Catch; CPUE	Current program - species identification issues
Cuttlefish	P	3	Intermediate	Catch; CPUE	Current program - species identification issues
Southern Calamari	P	2	Low	Catch; CPUE;	Current program - species identification issues
School Whiting	P	2	Intermediate	Catch; CPUE; Age; Length	Current project - some existing length data
Tiger Flathead	P	2	Low	Catch; CPUE; Age; Length	Mostly Commonwealth fishery - existing age and length data (Commonwealth)
Sand Flathead	P	2	Intermediate	Catch; CPUE; Age; Length	Ongoing monitoring program
Silver trevally	P	2	Moderately-High	Catch; CPUE; Age; Length	Ongoing monitoring program - existing age and length data
Eastern shovelnose ray	P	2	High	Catch; CPUE; Length	Observer program - some existing historical length data; species identification issues
Blue Swimmer Crab	K2	2	Low	Catch; CPUE; Length	Current project - no existing length data
Squid (mixed species)	K2	3	Intermediate	Catch; CPUE	Observer program - no existing age or length data; species identification issues
Gurnard / Latchet	K2	3	Moderately-High	Catch; CPUE; Length	Mostly Commonwealth fishery - some existing length data (Commonwealth)
John Dory	K2	3	Moderately-High	Catch; CPUE; Length	Mostly Commonwealth fishery - existing length data (Commonwealth)
Angel Shark (two species)	K2	3	High	Catch; CPUE; Length	Observer program - some existing length data
Flounder (mixed species)	K2	3	Low	Catch; CPUE; Length	Observer program - some existing historical length data; Species identification issues

Species	Species Type	Resource Assessment Class	EIS Risk Rating	Indicators	Comments
Red Mullet (two species)	K2	3	Low	Catch; CPUE; Length	Ongoing monitoring program - some existing historical length data
Redfish	K2	2	Moderately-High	Catch; CPUE; Length	Mostly Commonwealth fishery - existing age and length data (Commonwealth)
Ocean leatherjackets	K2	3	Moderately-High	Catch; CPUE; Age; Length	Current project - species complex, most landings would be ocean leatherjacket
Ocean Perch	K2	3	Moderately-High	Catch; CPUE; Length	Ongoing monitoring program - some existing historical age data; Mostly Commonwealth fishery
Mirror Dory	K2	3	Low	Catch; CPUE; Length	Mostly Commonwealth fishery - existing length data (Commonwealth)
Sole (mixed species)	K2	3	Low	Catch; CPUE; Length	Observer program - no existing age or length data, species identification issues
Morwong, Rubberlip (Grey)	K2	2	Moderately-High	Catch; CPUE; Age; Length	Ongoing monitoring program - existing age and length data
Moonfish (Pink Tilefish)	K2	3	Moderately-High	Catch; CPUE; Age; Length	Proposed new program - no existing age data, minimal historical length data
Boarfish	K2	3	Intermediate	Catch; CPUE; Length	No existing age data, some historical length data
Sharks (mixed species)	K2	2	Moderately Low to High	Catch; CPUE; Length	Observer program – no existing age or length data; species identification issues

Quantification and reduction of bycatch

One of the major concerns about the operation of demersal trawl nets is the fact that the net may catch a large number of non-target organisms, which are then returned to the water with unknown survival rates. Significant research has been undertaken to develop methods to minimise the quantities of bycatch taken by nets used in this fishery and, based on the results of this research, this strategy promotes additional modification of trawl nets to further reduce bycatch. It is important that the results of bycatch reducing modifications be monitored, and this can only be effectively done by onboard observers. Research is continuing into more effective bycatch reduction using trawl net modifications (e.g. square-meshed cod-ends for prawn trawl nets), and as more effective means are developed, they will be introduced to the fishery. It is also important that the spatial and temporal distribution and abundance of bycatch be documented by onboard observers, to assist in identifying strategies for minimising bycatch of fish trawling, where the use of bycatch reducing gear modifications is more problematic. There will therefore be an ongoing need for onboard observer presence in this fishery, to gauge the effectiveness of bycatch reduction modifications and strategies in commercial operations.

The impact of trawling on key secondary species

Of the 'key secondary' fish species taken in the OTF, redfish, john dory, mirror dory, ocean perch and some shark species are managed by a system of Total Allowable Catches in the Commonwealth SESSF, and have at least rudimentary stock assessments carried out on an annual basis (Smith and Wayte, 2002). However, with the exception of redfish and gummy and school sharks, none of these species could be said to have an adequate assessment available in 2003. Many of the remaining key secondary fish species are also taken in varying quantities by trawlers fishing in the Commonwealth trawl sector of the SESSF, however as they are not managed by Total Allowable Catches, little in the way of monitoring or resource assessment has been undertaken for these species. For a number of these species (e.g. Angel sharks, red mullet and moonfish/pink tilefish), trawling is the only fishing method that takes significant quantities, so it is important to effectively monitor the impact of the trawl fishery on these resources as part of this FMS. The catches of some other key secondary species groups (e.g. squid and "sharks") comprise a number of species, some of which are taken by other fisheries, so initially it is important to identify and quantify the species mix taken by trawling, before the impact of trawling can be assessed on the individual species. Specific attention will be paid to the "sharks" to accurately describe the species taken by trawling, and collect important biological data on the sex ratio, size at maturity and fecundity of the important species.

The correct identification and reporting by fishers of all the key secondary species will be a high priority, as will the collection of representative size composition data of the catch of each species, by both onboard observers and shore-based monitoring programs.

Economic research

To address the economic objectives of the FMS, research will be needed to assess the economic viability of businesses endorsed in the OTF, and to quantify the flow-on effects from trawling activities to the economies of coastal communities.

Previous studies of the economic viability of trawl operators relied on the results of a survey of a sample of businesses for the 1999/2000 financial year (Roy Morgan, 2001). As the financial situation of fishers is likely to have changed, a further survey is required to provide updated information, or alternative methodologies may need to be applied. Additional information should also

be collected on variations in prices according to the type of 'fish receiver' or market chosen by fishers through which to sell their product.

Currently, there are only limited data available on the flow-on (or multiplier) effects from the trawl fishery, which includes not only the direct employment, income and expenditure generated by participants in the fishery, but also those benefits indirectly generated as a result of inputs and other ancillary services provided to the trawl fishing fleet. Study of flow-on effects should be undertaken at the regional level and would ideally be linked with regional economic assessments.

Impacts of trawling on ocean ecosystems (including habitat and trophic interactions) and the effectiveness of management measures in addressing these impacts

The structure and functioning of ocean ecosystems and the myriad of ecological processes that occur in them, underpin the sustainability of the fisheries that depend on the fish, crustacean and mollusc resources of NSW ocean waters. Research on Australian and overseas trawl fisheries has shown that demersal trawling has the potential to significantly modify some ocean habitats (Sainsbury et al., 1993; Kaiser and de Groot, 2000). However, similar research has not been done off the NSW coast, and accurate descriptions of the distribution of various habitat types are not currently available for much of NSW ocean waters. Initially, this FMS aims to accurately map trawl grounds and to gather information on habitat types on and near these grounds. Information on the frequency of trawling on grounds will also be collected (recorded on a daily basis on a re-designed fisher catch and effort return form). A number of research projects studying the effects of trawling on ocean habitats are currently underway in Australia (FRDC Projects 2002/102 and 2003/023). The results of these and previous research will be discussed with the OT MAC with a view to implementing trawl gear designs that minimise impacts on ocean habitats, and/or closing areas with sensitive habitats to trawling.

Little directed research has been done anywhere to assess the impacts that fishing has on the structure of oceanic ecosystems, although a number of recent reviews which assembled data from many diverse studies suggest that the impacts of fishing may be severe (Jennings and Kaiser, 1998; Hall, 1999; Myers and Worm, 2003; Christensen et al., 2003). There is a need to develop biodiversity indicators for the ecological system in which the OTF operates. Research to provide such indicators will likely be long-term, and will need to draw on a variety of expertise and knowledge. This FMS promotes initiatives in research and monitoring that will significantly improve the working knowledge of the fishery in its environment. These initiatives, such as the mapping of trawl grounds and associated habitats, improvements in the accuracy of catch returns, the quantification of discards by observers and potentially doing fishery-independent surveys, could provide a basis for future studies aimed at developing appropriate indicators for monitoring biodiversity. NSW DPI is also undertaking research, in collaboration with the University of British Columbia, that uses trophodynamic ecosystem modelling to describe ecosystem interactions in NSW marine waters.

This FMS aims to establish a series of closures to trawling to protect a representative range of ocean habitats and their associated biota, in addition to those that are already protected within the boundaries of Marine Parks or permanent trawl closures. Included in this approach will be the closure of areas with 'hard' bottom habitats, which are at risk of being permanently modified by the effects of trawling. In the longer term, closures to trawling may be implemented to provide 'refuge' areas for species targeted by trawling as scientific information becomes available - these areas could include specific closures to protect habitats considered to be critical to the survival of any life-history stage of species taken by trawling. Research projects could be conducted to evaluate the effectiveness of these

closures with respect to the aims of conserving biodiversity, reducing the impact of trawling on ocean ecosystems and providing refuge areas for species taken by trawling. Specific research funding would be required over an extended period to undertake such studies.

Impact of fishing on threatened species

Little is known about the biology and ecology of many of the species listed as threatened, and the potential impacts of commercial trawling on these species are also poorly understood. This strategy seeks to improve the accuracy of information available on interactions between the OTF and threatened species. The recovery plans or priority action statements for relevant threatened species should drive research on such issues, and determine specific projects to be targeted at the species of concern. Such studies would involve examining the biology and ecology of threatened species to assess the potential impact of a variety of threats, including trawling. A project assessing the broad-scale interactions between fishing and marine mammals, reptiles and avifauna in NSW marine waters was recently completed (Ganassin and Gibbs, 2005). This project identifies specific issues and provides some recommendations for improvement to current management which are provided for within this FMS.

ii) *The Conservation Technology Unit*

In March 2001 NSW Fisheries (now NSW DPI) established a Conservation Technology Unit to examine gear technology for use in commercial and recreational fisheries in support of the management objectives developed to achieve conservation management goals. This focussed research initiative will help address gaps in knowledge including the selectivity of trawl gear used in the OTF. 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 impacts on the environment.

iii) *Catch monitoring*

Fishers in the OTF will continue to be required to submit records on a monthly basis detailing their catch and fishing effort, however it is intended that recording of fishing activities and catches be done on a daily basis. The information required will include the general location or fishing ground worked, the catch for each species, and the effort expended (i.e. hours trawled) for each gear type to take the catch. This information will continue to be entered onto a database by NSW DPI, to allow for analysis of fishing activity, catch and effort levels. The entry of catch return information onto the database will be subject to stringent control procedures including deadlines for data entry following the receipt of a catch return by NSW DPI. A policy will be developed to manage the timely receipt and entry of commercial catch return data into the commercial catch records database, and the provision of these data for analysis as part of the fishery review process. A number of initiatives are contained in this FMS to improve the quality and reliability of the information provided by ocean trawl fishers on catch and effort returns.

To maximise the accuracy of the data collected on monthly catch and effort returns a range of quality-control procedures are currently in place or scheduled for implementation in the near future, namely:

- Every return is scanned for errors when received by the “Commercial Catch Records” section in NSW DPI, 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
- Data from the commercial catch statistic database are regularly downloaded to a database which can be accessed or queried by scientific staff and managers responsible for individual fisheries. Subsequently, any problems with data identified by these officers are queried and may be corrected by the commercial catch records section after consulting fishers where necessary
- A previous 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 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) will be reviewed periodically by the management advisory councils and annually by the “Catch and Effort Working Group” which comprises industry representatives from each fishery.

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 verified and has sometimes been variable, particularly with respect to fishing effort data. Consequently, the commercial catch statistics supplied by fishers and maintained in the commercial catch records database are most accurately described as representing “reported landed catch”.

f) Consultation

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

i) Management Advisory Committees

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

- the preparation of any management plan 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, including advice about responding to negative impacts on the fishery due to the effects of any activities external to the fishery.

Each MAC comprises industry members and members representing the recreational fishing sector, indigenous and conservation interests and NSW DPI. The MACs provide advice to NSW DPI and the Minister on the development of a management plan for their respective fishery, and on changes to Regulations and policy affecting the fishery.

The industry members of the MACs comprise representatives that are elected by endorsement holders in the respective fishery sectors. 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 MACs representing recreational fishers, conservation groups and NSW DPI, are appointed by the Minister for Primary Industries and also hold terms of office of up to three years. The number of non-elected members in the MAC must be less than the number of elected members.

At least two meetings are to be held each year, unless otherwise determined by the MAC. Although the MAC receives advice from NSW DPI observers on research, compliance and administration 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.

ii) Ministerial advisory councils

Two Ministerial advisory councils are currently established under the FM Act. The Councils provide advice on matters referred to them by the Minister for Primary Industries, or on any other matters the Councils consider relevant. They report directly to the Minister for Primary Industries.

The wild harvest fishery related Ministerial advisory councils in place at August 2006 are the:

- Seafood Industry Advisory Council (SIAC)
- Advisory Council on Recreational Fishing (ACoRF)

The OTF and each of the other major share management fisheries have representatives on the SIAC. These representatives are nominated by each of the respective management advisory committees and appointed by the Minister for Primary Industries.

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

g) Interactions with Other Fisheries

The fisheries of NSW are intrinsically complex due to the large diversity of species caught, the wide range of areas fished and gear types used. Ocean waters off NSW contain a large number of fish and invertebrate species, due to the overlap of sub-tropical and temperate ecosystems, and the relatively narrow continental shelf. As demersal trawl nets are not a highly selective method of fishing, they catch a large number of species, many of which are significant in other commercial or recreational fisheries. Of the primary and key secondary species taken by trawling in NSW ocean waters, most are also significant in the catch taken by one or more commercial or recreational fisheries, either in NSW or in adjoining jurisdictions.

i) Other NSW commercial fisheries

As well as interactions in the form of the same species being caught, trawling in ocean waters overlaps with the other ocean fisheries with respect to the area fished. There have been numerous interactions between trawling and fish traps and lobster traps, with the two types of fishing gear sometimes being fished on the same grounds.

A significant number of fishing businesses are endorsed to operate in both the ocean trawl and ocean trap and line fisheries, although the nominated fishing vessel can only operate in one fishery at any given time. Many businesses endorsed for trawling in ocean waters also hold endorsements in other NSW commercial fisheries, such as the Estuary General, Estuary Prawn Trawl or Ocean Hauling fisheries.

ii) Commercial fisheries in adjacent jurisdictions

Significant interactions occur between the OTF and the Queensland East Coast Trawl Fishery in the case of prawn trawl fishers, and between the OTF and the Commonwealth SESSF in the case of fish trawl and deepwater prawn trawl fishers. Many fishing businesses are endorsed to operate in these adjoining jurisdictions and considerable focus is needed to promote complementary (and not necessarily consistent) management arrangements for the adjoining fisheries. Management of the Commonwealth SESSF is based on setting an annual Total Allowable Catch for each important species, which is allocated to each operator as an Individual Transferable Quota. Management of prawn trawling in the Queensland fishery relies on controls on the dimensions of trawl nets and allocation of the number of nights allowed to be fished each year.

Offshore Constitutional Settlement

Offshore Constitutional Settlements (OCS) involve an exchange in power between the States and the Commonwealth over marine and seabed resources. These settlements aim to provide a framework for more ecologically rational management of fish populations and simplification of administration and licensing for fishers. An OCS was reached between NSW and the Commonwealth in 1990 that defines jurisdiction over specific fisheries by area, species and gear type.

Resolution of the OCS meant that many fishers who previously held both NSW and Commonwealth licences needed only to renew their State licence each year, resulting in large licence fee savings and reduced paperwork and administration. Under OCS agreements, fishing boats that were previously licensed to fish outside 3 nautical miles under Commonwealth jurisdiction were

automatically issued an authority on their State boat licence (called an 'OG1' for general offshore fishing and an 'OP1' for prawn trawling) to continue to work in offshore waters.

Since the signing of the initial OCS agreement, negotiations have continued between the Commonwealth and NSW in an attempt to further simplify the agreement and meet fishers' requirements and expectations. These negotiations are continuing, and issues under consideration include tuna and tuna-like species, fishing in waters surrounding Lord Howe Island, a proposal to return jurisdiction for some fish trawl grounds off the south coast of NSW to the Commonwealth, and a proposal to cooperatively manage the catch of school and gummy sharks.

iii) Recreational fishery

The level of interaction between ocean trawl fishers and recreational fishers off NSW could be described as relatively low. Ocean trawlers generally fish further offshore than most recreational fishers, however on some occasions when trawlers are targeting inshore species (e.g. school prawns, sand flathead, southern calamari or school whiting) there is potential for considerable interaction between the groups. There is also a perception amongst recreational fishers that trawlers operating in an area capture a high percentage of fish present, making recreational fishing less successful. During the past 10 - 15 years, increased ownership of recreational boats capable of fishing offshore has led to an increase in the potential for conflict with ocean trawl fishers.

iv) Indigenous fishery

As most Indigenous fishing occurs in estuarine and near shore ocean waters, the level of interaction between the ocean trawl fishery and Indigenous fisheries is also thought to be low. However a number of species taken by the OTF have also been found to be targeted by Indigenous fishers, including eastern king prawns, school prawns, blue swimmer crabs, octopus, squid, leatherjackets, silver trevally, sand flathead, flounder and shovelnose rays (Schnierer and Faulkner, 2002).

4. Goals, Objectives and Management Responses

This section sets out the long term goals, objectives and management responses for the OTF that have been developed in order to achieve the vision for the 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 management responses may assist in achieving more than one goal due to the complex relationships that exist, particularly in a multi-method multi-species fishery.

For example, a closure to trawling implemented primarily to protect sensitive habitats and conserve biodiversity may also reduce conflict between resource users, and can provide 'refuge' areas which reduce the impact of trawling on the target fish species or other species (e.g. threatened species). This outcome provides a range of benefits for the fishery over and above protecting habitat (see Figure 3).

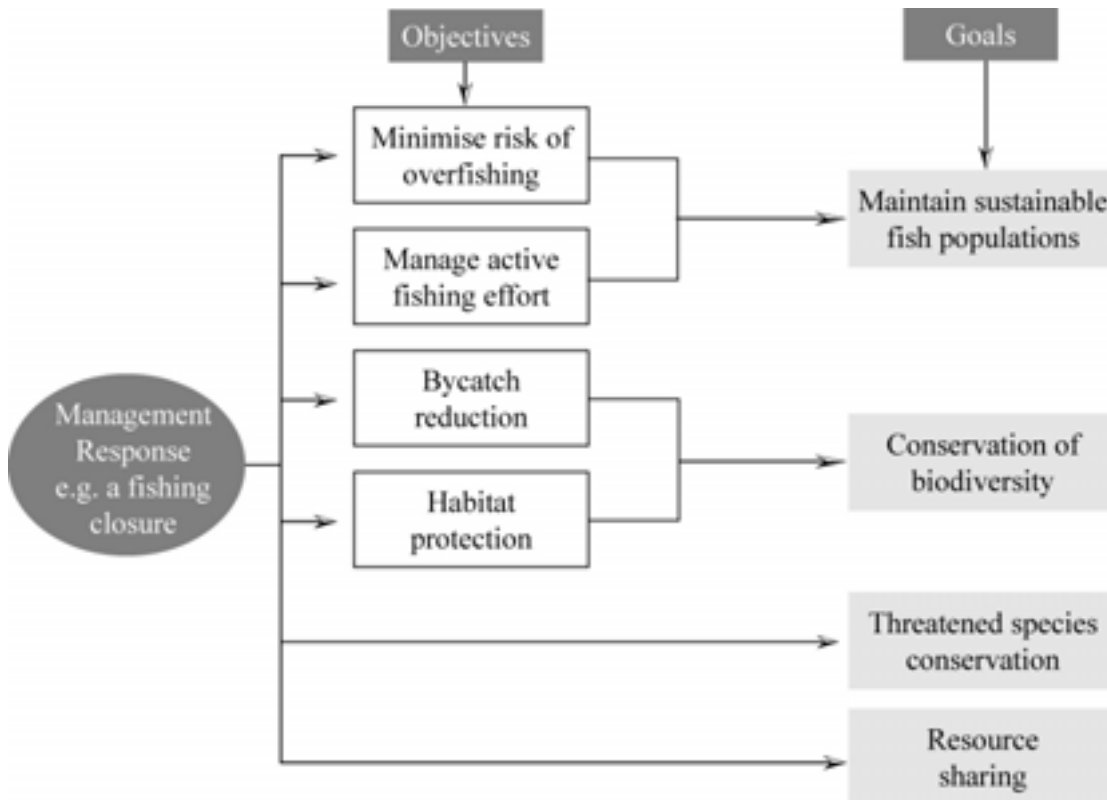


Figure 3. An example of how a single management response affects multiple goals and objectives.

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. Management responses with an asterisk (*) indicate new management actions that are to be implemented to address the outcomes of the EIS risk assessment on the existing operation of the fishery.

Information relating to the implementation of management responses is provided in a table located in Appendix 2. The implementation table outlines the time periods within which each management response is scheduled to be implemented, as well as information relating to the head of power for implementation and the group who has the lead responsibility for carrying out the actions.

The management responses listed in the following section relate to specific actions that directly contribute to meeting the goals and associated objectives defined for the OTF. The overall management regime for the OTF includes the management responses (below), the principles and guidelines contained within the harvest strategy (see section 3), as well as the general requirements of the FM Act and associated Regulations (including the share management plan and supporting plan).

b) Goals, objectives and management responses

GOAL 1. Manage the Ocean Trawl Fishery in a manner that promotes the conservation of biological diversity in the marine environment

Objective 1.1 Mitigate the impact of trawling in NSW ocean waters on ecosystem integrity (species, populations, and ecological communities)

- *1.1(a) Define and map the extent of 'trawling grounds' and determine the intensity of trawling on each of these grounds

Background: Currently, the extent of trawl grounds off NSW and the frequency of trawling on each ground are not accurately recorded. New trawl grounds are sometimes 'opened up' by industry and there are presently no controls on this expansion of trawling, with the exception of areas protected within Marine Parks or other fishing closures. The impact of trawling on biodiversity has not been quantified in NSW, however international literature indicates that significant impacts are likely and therefore a cautious approach should be adopted. All fish trawl, prawn trawl and whiting trawl grounds will be accurately mapped and the intensity of trawling on each ground will be quantified to allow an assessment of the impact of trawling on each ground.

- *1.1(b) Implement a series of closures to trawling to protect the range of ocean habitats and associated biodiversity, including closure of all reefs and depths greater than 1100 metres, and review the need for additional closures

Background: In the absence of detailed information on the location and extent of the various marine habitat types in NSW ocean waters, the most effective way of addressing concerns about the impacts of trawling on biodiversity is to provide for a series of trawl closures which take in the range of habitat types. Such closures should be regarded as precautionary measures while more detailed information on habitats is assembled, and pending the establishment of the full range of Marine Parks in NSW coastal waters. Marine Parks under NSW jurisdiction only extend 3 nautical miles to sea from the coastline, and it would be consistent with the objectives of this goal to establish trawl closures in waters outside 3 nm to conserve biological diversity on a range of habitats.

It is the intention of this strategy to restrict trawling to areas of soft substrate (eg. sand or mud) where the effects of trawling on the habitat are likely to be less significant than on harder substrates and where the target species predominantly occur. Reef areas (where the seabed is comprised of hard rock) are in practice infrequently trawled, are areas of high biological diversity and provide refuge areas for finfish species. Such habitats take a long time to recover from the effects of trawling, and it is important for the maintenance of ecosystem health that such areas be protected from trawling (or allowed to recover if they have been previously trawled).

The closure of reef areas to trawling will also assist in resolving many of the social conflicts that can occur between the OTF and the Ocean Trap and Line Fishery, Lobster Fishery and possibly the recreational fishery.

Under this management response, approximately 75 percent of all State waters located south of Barrenjoey Point will be closed to all trawling. Industry representatives and NSW DPI will

work together to identify and map those areas, and the reef (i.e. hard rock) areas in waters north of Barrenjoey Point.

A range of closures are proposed in this FMS and will be introduced in the short to medium term. A review will occur within four years of the commencement of the FMS to determine the need for any additional closures. This review will consider factors including available research and monitoring results, completed mapping work, the fishery's economic state at the time and compliance considerations.

Note: management response 6.3c outlines a process for working with industry to rationalise the 'package' of closures applying to the OTF, taking into account the environmental outcomes sought and the impacts on commercial fishing at a regional level.

- 1.1(c) Continue the prohibition on using fish trawl nets north of Smoky Cape, and implement additional Bycatch Reduction Device requirements for prawn trawl nets south of Smoky Cape (to minimise the incidental catch of fish in prawn trawl nets used in this area)

Background: The use of fish trawl nets is prohibited north of Smoky Cape (South West Rocks) in recognition that trawling in this area is primarily targeted at prawns. However, finfish of species that are subject to a minimum length, and are greater than the minimum length, may be retained when taken in a prawn trawl net north of Smoky Cape.

Currently, the taking fish that are subject to a 'minimum legal length' using prawn trawl nets in waters south of Smoky Cape is prohibited, and such fish, if caught, must be returned to the water (with unknown chance of survival). The requirements to be introduced south of Smoky Cape will encourage the use of effective Bycatch Reduction Devices to minimise the incidental catch of finfish in prawn nets. Once it can be demonstrated that effective BRDs are being used in the fishery, the current prohibition on the retention of fish with a minimum legal length may cease in order to avoid wastage, although a limit on the carriage of a single net type – prawn or fish trawl – aboard each vessel may be needed.

- 1.1(d) Promote research and collaborate with research institutions to improve our understanding of ecosystem functioning and how it is affected by trawling

Background: There is a general lack of knowledge about the way in which biodiversity in marine ecosystems is affected by fishing and how to measure those effects. This is especially true for diverse and complex systems like the environment in which the OTF operates. A better knowledge of how these ecosystems function is needed to understand the effects of trawling upon these systems, although this is inevitably a long term aim. NSW DPI is undertaking a collaborative research program on 'Ecologically Based Fishery Management' with the University of British Columbia. The results of this study, and other studies currently being undertaken on the effects of trawling in other Australian fisheries, will be discussed with the Ocean Trawl MAC, with a view to identifying additional research that may need to be undertaken to better evaluate the impacts of trawling in NSW ocean waters.

- *1.1(e) Prohibit mid-water trawling in NSW waters

Background: Anecdotal information suggests that the method of mid-water trawling has not been used in waters under NSW jurisdiction in recent times. To prevent large, factory style trawlers from mid-water trawling, a closure was implemented in 2004 to prohibit fishing vessels larger than 32 m in length from taking fish in NSW waters. To reinforce the prevention of any future expansion of mid-water trawling activities and as a precautionary measure, this management response will prohibit, by regulation, mid-water trawling in NSW waters.

Objective 1.2 Mitigate the impact of the Ocean Trawl Fishery on non-retained species

- *1.2(a) Design and implement an industry funded scientific observer program to document the degree of interaction of commercial designated fisheries, including the Ocean Trawl Fishery, with non-retained and threatened species and to collect information on the use and effectiveness of Bycatch Reduction Devices

Background: Onboard observer studies were carried out in both prawn trawl and fish trawl sectors of the fishery in the late 1980s and early 1990s, however fishing practices and gear have changed significantly since these studies (e.g. by the introduction of mandatory Bycatch Reduction Devices in ocean prawn trawl nets). Also, significant changes in the areas in which different fishing gears may be used are proposed in this strategy, which will necessitate an updated assessment of the incidental catches taken with each type of trawl gear. Previous studies have demonstrated that the most cost-effective way of obtaining rigorous estimates of incidental catches of a fishery is through a properly designed onboard observer study. The part of the observer study relevant to the OTF will be designed in consultation with the Ocean Trawl MAC. The observer program should also include observations on the use and effectiveness of Bycatch Reduction Devices, gear selectivity for retained species (e.g. silver trevally) and any interactions with threatened or protected species.

- 1.2(b) Refine and improve methods for reducing incidental catches, including the introduction of more effective Bycatch Reduction Devices for prawn trawl nets. In particular, modify the approved 'square mesh panel' BRD to conform to the following specifications:

- (i) a single panel to be comprised of either a) minimum of 65 mm mesh with minimum surface area of 770 square cm and minimum width of 200 mm, or b) minimum of 75 mm mesh with minimum surface area of 650 square cm and minimum width of 200 mm, and
- (ii) a maximum twine diameter of 4 mm, and
- (iii) bating rates to the top and bottom of the panel to be as follows: if minimum of 65 mm mesh is used then 3 points to each bar; if minimum of 75 mm mesh is used then 4 points to each bar, and
- (iv) the base of the panel to be positioned within 1.2 metres from the cod end drawstring (to be measured in a fully stretched position)

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.

One of the eight approved Bycatch Reduction Devices (BRDs) for the NSW ocean prawn trawl fishery, the square mesh panel, is a less effective version of the composite square mesh panel developed by NSW DPI during the early 1990's for the NSW ocean prawn trawl fleet. When BRDs became mandatory in June 1999 the square mesh panel was introduced instead of the composite panel to minimise the impact that mandatory use of BRDs would have on catches of school whiting. There are also practical difficulties associated with the installation of the composite square mesh panel. The introduction of the modified square mesh panel as required in this response is in line with the results from relevant research. While the specifications listed in (i), (ii) & (iii) are scheduled for immediate implementation, (iv) will be implemented within 12 months of commencement of the FMS, within which time the panel can continue to be positioned within 40 meshes from the cod end drawstring in order that whiting catches are not significantly affected.

This FMS proposes the development of alternative management arrangements and trawl gear for fishers who wish to target school whiting. The short term timeframe for the implementation of (iv) will provide time for industry and DPI to identify a limited number of designated whiting grounds and times within which a square mesh panel comprising 40 mm mesh could be used.

As part of the observer program planned for the fishery, data will be collected on the levels of use of the approved BRDs and the resulting reductions in bycatch. Analysis of the effectiveness of each of the BRDs approved for use in commercial trawling operations will be discussed with the Ocean Trawl MAC, with the longer term aim of ensuring that the most efficient BRDs are implemented in prawn trawl nets in the NSW OTF.

1.2(c) Investigate alternative handling practices to improve survival of incidental species that are to be returned to the water, and in particular:

- i) prohibit the at-sea finning of sharks and discarding carcasses
- *ii) ban the “riddling” of prawns
- *iii) restrict the use of “spikes” to those times when other handling methods would present an unacceptable occupational health or safety risk

Background: In addition to modifying fishing gear and managing the spatial and temporal distribution of fishing in order to minimise incidental catch, various techniques have been developed in recent years to maximise the survival rate of incidental catch that is returned to the water (i.e. discards). These techniques and alternative handling practices will be investigated and implemented where appropriate to further minimise the impact of trawling on biodiversity. The finning of sharks and the discarding of carcasses is prohibited because it is a wasteful practice, and this prohibition will continue.

Fishers sometimes use a device known as a riddler to grade the sizes of prawns. In response to industry concerns about the practice of riddling, the discarding of cooked prawns was prohibited in January 2003 because it is a wasteful practice. Riddlers are not often used in the ocean prawn trawl sector of the fishery and having regard to the improvements in gear selectivity in this FMS, they will be prohibited in the OTF.

Fishers often use a "spike" to sort and remove catch from the sorting table or deck of the boat. A spike generally consists of a piece of timber with a nail through it and is used by piercing incidental catch and flicking it overboard. Under the FMS the use of spikes on fish to be discarded will be restricted to only those species that can harm skippers or crew and for which no alternative handling technique is available (the list of harmful species will be developed in consultation with the OT MAC).

*1.2(d) Develop a Code of Practice for ocean trawl fishers to:

- i) encourage the effective use of Bycatch Reduction Devices and avoid fishing in areas and/or at times when juvenile or small fish are abundant
- ii) promote best practice handling of bycatch to reduce injury to non-retained catch and achieve a premium quality product for the retained catch
- iii) minimise the accidental capture of marine mammals and any threatened or protected species (and advise of the appropriate way in which to deal with any such interactions);
- iv) minimise the levels of pollutants associated with the fishing operation, including exhaust, greenhouse gas emissions, noise and fuels and oils in bilge water

- v) assist in reducing the amount of marine debris by retaining for disposal onshore any rubbish recovered during fishing operations and unwanted fishing gear (eg. off-cuts), and
- vi) respect the rights and recognise the needs of people operating in other fisheries or undertaking other ocean based boating activities, in particular to mitigate local conflicts between trap and trawl fishers

Background: Codes of practice will be developed under the management strategies for all designated commercial fisheries and will contain voluntary measures to encourage appropriate behaviour, to complement other regulatory controls in each fishery. Fish trawl operators who are also endorsed to operate in the Commonwealth SESSF abide by an "Industry Code of Conduct for Responsible Fishing in the South East Trawl Fishery" and a "Code of Fishing Practice to Minimise Incidental By-Catch of Marine Mammals in the South East Trawl Fishery", developed by the South East Trawl Fishing Industry Association (SETFIA). Such codes of practice provide a guide to fishers concerning socially and environmentally acceptable behaviour, and are especially useful for encouraging such behaviour in cases where ensuring compliance with regulations may be extremely difficult or overly expensive. A code of practice for trawling in ocean waters off NSW will be developed in consultation with the Ocean Trawl MAC.

The code should include the investigation and adoption of energy efficient measures across the trawl fleet to reduce greenhouse gas emissions and the willingness of NSW operators to collaborate in any national programs implemented with the aim of tracking or reducing marine debris caused by trawl gear (consistent with management response 6.5a).

- *1.2(e) Identify areas and/or times of problem incidental catch to target catch ratios and restrict trawling appropriately. In particular, implement closures to trawling around river entrances during times of high river discharge in accordance with the program described in Appendix 3

Background: Incidental catches of juvenile fish and prawns and estuarine fish species are generally greater when trawling around river entrances during times of high river discharge (i.e. during and after flood conditions). This FMS incorporates the introduction of pre-defined closures around river entrances during times of high river discharge. The closures would be triggered using river discharge information provided by the Bureau of Meteorology or if trial shots show that incidental catch is unusually high. The program will be implemented upon commencement of the FMS and is subject to further review by the Ocean Trawl MAC.

Objective 1.3 Mitigate the impact of the Ocean Trawl Fishery on ocean habitats and their associated biota

1.3(a) Require the use of trawl gear designs that minimise impacts on habitats and associated biota, and in particular:

- i) prohibit the use of bobbins on the ground ropes of fish trawl nets north of Seal Rocks
- ii) limit the maximum size for bobbins used on fish trawl nets south of Seal Rocks 100 mm diameter, subject to a further review of available worldwide scientific literature concerning the potential environmental impacts or benefits of bobbin gear
- *iii) restrict trawl nets to a single ground chain of no greater than 12 mm gauge
- *iv) make ‘droppers’ such as the “Texas drop” mandatory for ocean prawn trawl nets.

Background: ‘Bobbin’ gear refers to rollers or round bobbins placed on the ground rope of trawl nets to facilitate fishing on more uneven bottoms than could be fished with nets rigged with chains or wire rope alone. Restrictions on bobbin gear were first introduced during 2001. Bobbin gear is prohibited in waters north of Seal Rocks and bobbins of up to 100 mm (4 inches) may be used south of Seal Rocks. The reason for permitting 100 mm bobbins is for the protection of ground gear when trawling over harder bottom, while preventing the fitting of large bobbins that would allow trawlers to fish very rough bottom.

During the public consultation phase of the OTF EIS, the continued use of bobbin gear was particularly topical, with many submissions requesting that it be banned. A preliminary review of some overseas studies (e.g. Main & Sangster, 1979; Jones, 1992; He et al., 2004; ICES, 2004) suggests that bobbin gear designed to allow the trawl to move over, rather than plough through, the seabed, will result in less bottom contact and is therefore likely to result in less damage to the habitat. Accordingly, it would be prudent to undertake a more extensive review of the available worldwide scientific literature prior to making any decisions to prohibit bobbin gear altogether. If, however, it becomes apparent that bobbin gear is being used by trawler operators to work over reef areas that have been closed to trawling, then, in the absence of a VMS system (ie. the most effective compliance tool for area-based management), use of bobbin gear should be prohibited.

Heavy ground gear and chain can increase the impacts of trawl gear on benthic habitats. To minimise this impact, the gauge of ground chain is to be restricted. In Queensland only one ground chain of no greater than 10 mm is permitted in the inshore fishery and in the offshore fishery the gauge of chain is restricted to 12 mm.

‘Droppers’ provide a gap (10 to 20 cm) between the foot rope of the net and the ground line, enabling bottom dwelling fish species such as flathead and flounder to escape beneath the net, whereas the target species (prawns) jump up in the water column and are captured in the net.

Objective 1.4 Prevent the introduction and translocation of marine pests and diseases by fishing activities

1.4(a) Implement, in consultation with the relevant MACs, measures required in accordance with any marine pest or disease management plans

Background: The Minister for Primary Industries or other authorities may alter management arrangements from time to time to minimise or mitigate the impact of marine pests and diseases. Recent examples of outbreaks were the suspected incidence of white spot disease in

NSW prawns and the mass mortality of pilchards across southern Australia. At times it will be a requirement for the commercial fishing industry to respond to such outbreaks by modifying fishing practices. Proposed measures will be discussed with the Ocean Trawl MAC prior to implementation.

GOAL 2. Maintain stocks of primary and key secondary species harvested by the Ocean Trawl Fishery at sustainable levels

Objective 2.1 Prevent overfishing of the stocks of primary and key secondary species by ocean trawl fishers

- *2.1(a) Monitor the quantity, length and/or age and sex composition of the primary and key secondary species taken by commercial designated fishing activities, including the Ocean Trawl Fishery, as part of the overall resource assessment system

Background: In addition to the collection of information about activities in the fishery, it is necessary to collect relevant information about the composition of the catch of the important species exploited by the fishery. During the development of this strategy a total of 28 species and species groups were identified as primary or key secondary species for ocean trawling in NSW. For many of these species there is currently little or no information available about the size or age composition of the exploited population, and for some groups (e.g. octopus and cuttlefish) there is little information about which species comprise the bulk of landed catches. A catch monitoring program will be established as part of the management strategy, to provide sufficient information to support an assessment of the status of the stocks of the primary and key secondary species taken in the fishery.

The environmental performance of the new category 1 share management fisheries will be reviewed every two years (in conjunction with the production of the biennial performance reports) to determine ongoing need for the fishery monitoring programs and relative priorities. These reviews are necessary to ensure the ongoing effectiveness of the monitoring program and the best use of the industry funds contributed for this purpose.

- *2.1(b) Using the approved resource assessment framework, conduct resource assessments of the primary and key secondary species taken by commercial designated fishing activities, including the OTF, where necessary, and review the assessments at least every three years thereafter with an external review of the assessment framework at least every four years

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. For the primary species and key secondary species, the monitoring program will change from the use of commercial landings for most species to the use of catch-per-unit-effort data, length composition data and, in some cases, age composition data. These data will help to determine the stock status of these species. For the key secondary species, the short term aim will be to gather and analyse information which will enable an initial assessment of the status of the stock to be completed (often for the first time). More details about the methods to be used to develop and undertake these resource assessments can be found in Scandol (2004) and NSW Department of Primary Industries (2006).

It is important to note that resource assessments are done on a species basis and are therefore reliant on harvest estimates from all sectors and adjacent jurisdictions. Furthermore, the scope and reliability of the assessments will vary for each species depending on its life history, biological characteristics and availability of research and monitoring information.

The results of resource assessments will be fed into decision making processes about sustainable levels of catch and/or effort for priority species including eastern king prawns and school prawns. A periodic review of resource assessments is important for ensuring ongoing improvement in the assessments and the programs providing information for them.

- *2.1(c) Monitor the commercial landings of all secondary species (other than the key secondary species) taken in the fishery annually for comparison against an historical range for each of those species or groups of species, as part of the overall resource assessment system

Background: It is important that available resources for resource assessment are directed towards assessing the primary and key secondary species (note that resource assessments will be undertaken for some species that are considered 'secondary' in the OTF because they are 'primary' species in another designated fishery).

The catch of secondary species (other than the key secondary species) will be monitored to determine if it is outside the historical range of catches. This ensures species that are less widespread in the fishery will still be monitored at a broad scale. This monitoring will aim to detect unprecedented changes in landings of the species taken in very small quantities by the OTF. Given the number of species involved, the 'other secondary' species may be monitored in groups as appropriate.

- *2.1(d) Ensure that the selectivity of the gear used in the fishery is appropriate in relation to the biology of the species being targeted. In particular:

- i) require each prawn trawl net to be comprised of: (a) diamond mesh in the wings and body of between 40-75 mm mesh, (b) square mesh (hung on the bar) in the cod-end of between 35-45 mm mesh, constructed using single twine that is not more than 3 mm in diameter, and (c) a cod-end with a length of between 1-3 m and a circumference of not more than 2 m, and
- ii) restrict fish trawl net cod-ends to a maximum of 100 meshes round (hanging ratio of 1:1), constructed with single twine of maximum 6 mm diameter and with a mesh size of at least 90 mm
- iii) implement specific management arrangements for trawling for school whiting as detailed in Appendix 4
- iv) review and modify the restrictions applying to prawn trawl and fish trawl nets on the basis of research results on the selectivity of trawl nets, including assessment of mesh size and shape

Background: The restrictions (e.g. size of mesh) currently applying to fish and prawn trawl nets were introduced on the basis of research conducted many years ago, and the nets currently used in most sectors of the fishery may not provide the optimum selectivity for species targeted by that sector. Numerous studies have demonstrated that the 40 mm mesh used in conventional prawn trawl cod-ends (with circumferences of 100 to 200 meshes) is inappropriate for selecting the target prawn species at the optimum sizes. Similarly, the current mesh used in the fish trawl nets has inappropriate selectivity characteristics for some of the key retained species.

NSW DPI has completed several research projects on the selectivity of prawn and fish trawl nets and alternative designs (e.g. square mesh cod-end) to enhance selectivity. The results of these projects are being used to implement more selective trawl nets for use in both the fish and prawn trawl sectors. The intent of this management response is to improve the selectivity of

trawl nets in the short term, but provide for modifications over time taking account of future research that may identify alternative net designs which improve selectivity even further for the key species.

With respect to the prawn trawl net changes, in order to provide industry with sufficient time to change their gear from the conventional cod-end mesh (e.g. acquiring new netting material or modifying existing cod-end material) and/or to undertake research on alternative net designs they believe are equally effective, this requirement will only be made mandatory from 31 December 2007. The opportunity will therefore exist for industry to initiate and fund research into alternative larger sized diamond mesh cod-ends (or other possible configurations) to target whiting, under a research project approved by DPI and administered using permits under section 37 of the FM Act. Any alternative gear developed would need to demonstrate an equivalent or improved performance with respect to selectivity of the target species and bycatch reduction before being approved for ongoing use in the fishery. Until the square mesh cod-end is mandated, prawn trawl cod-end circumference is to be limited (with 100 meshes round in the anterior section and a maximum of 150 meshes round in the posterior section).

With respect to fish trawl nets, a recent research project in the Commonwealth trawl sector of the SESSF demonstrated that fish trawl gear in use in the fishery at that time (2001/02) had selection lengths for some of the important species that were much smaller than the optimum sizes (e.g. 50% selection of tiger flathead at 23 cm, redfish at 14 cm, ocean perch at 18 cm and ling at 43 cm). As a result of this work, Commonwealth fish trawl fishers are (as at July 2006) required to use a cod-end comprising either: (i) 90 mm single twine mesh, or (ii) ≥ 102 mm double twine mesh, or (iii) 90 mm double twine mesh incorporating one or more approved BRDs. Appendix 4 outlines a research program that will be conducted over the medium term to design and implement a single rig trawl net to target school whiting with minimal bycatch.

*2.1(e) Maintain and enhance the effectiveness of the “juvenile king prawn” closures, and in particular:

- i) modify the juvenile king prawn closure off South West Rocks to minimise the harvesting of juvenile king prawns between the beach and the inshore boundary of the closure, and investigate the potential for similar changes to other juvenile king prawn closures, and
- ii) make all juvenile king prawn closures year-round closures, except in areas and at times when, following authorised trial shots, the Director-General, NSW DPI, determines that sufficient quantities of school prawns are present, the size of the school prawns exceeds that which produces a count of 100 per half-kilogram and bycatch levels are acceptably low, and
- iii) investigate the need to extend juvenile prawn closures to be adjacent to the mouths of all major estuaries along the NSW coast, taking account of the aim of harvesting prawns at a size greater than that which produces a count of 50 king prawns or 100 school prawns per half-kilogram.

Background: The ocean prawn trawl fishery has progressively introduced spatial and temporal closures since 1982 to protect small or juvenile prawns, for example most recently off Crowdy Head. At the commencement of the FMS, there were nine "juvenile king prawn" closures off the NSW coastline (three of which are year-round closures), and some additional closures proposed by industry were still under consideration.

Whilst an adjustment to juvenile king prawn closures will be made to apply year-round, the FMS takes account of the need to trawl those areas occasionally to harvest school prawns by

permitting trawling in those areas provided certain opening criteria are met (see point (iii) in the response). The opening criteria will ensure that trawlers do not operate in those areas at times when the prawns are below optimum size or when bycatch is abundant. The threshold bycatch levels that will apply will be set in consultation with the Ocean Trawl MAC. These factors will be reviewed and updated in light of any future gear selectivity changes.

An investigation will be undertaken of the need for expansion of the juvenile king prawn closures, and be guided by the objective of harvesting prawns above the minimum sizes specified. The prawn counts will also be used to guide the definition of any other closures applicable to the fishery and will be reviewed in 2007 when the results of a three-year research project on the growth and mortality of school prawns are due to become available. See also management response 6.3c for information about the process of rationalising the 'package' of closures that apply to the OTF.

***2.1(f) Develop strategies to establish 'refuge' areas and spawning closures for species targeted by trawling**

Background: Indications from recent research are that the establishment of 'refuge' areas (where the effects of fishing are minimised or removed completely) can contribute significantly to the sustainable operation of commercial fisheries. There is considerable potential to better manage the spatial and temporal distribution of trawling in ocean waters to promote a sustainable trawl fishery, protect habitats and to mitigate conflicts with other stakeholders. In conjunction with the definition and mapping of trawl grounds, the Ocean Trawl MAC will discuss strategies for defining and establishing 'refuge' areas for the important species taken in the fishery. These closures will be established to protect any vulnerable life history stages of fish and prawns (and their associated habitats) from the effects of trawling.

Taking into account the outcomes from management response 1.1b, and relevant research information on the species caught, marine ecosystems, interactions with other fishing sectors, and the economic implications for commercial ocean trawl fishers, a mechanism and criteria will be developed for listing areas that are open or closed to trawling on a temporary or indefinite basis. The lists will be reviewed and updated every five years, in order to provide improved resource security for fishers and an orderly process for implementing any necessary management changes. See also management response 6.3c for information about the process of rationalising the 'package' of closures that apply to the OTF.

Note: management response 6.3c outlines a process for working with industry to rationalise the 'package' of closures applying to the OTF, taking into account the environmental outcomes sought and the impacts on commercial fishing at a regional level.

***2.1(g) Investigate the cost effectiveness of using fishery independent surveys to provide abundance indices and other information for resource assessment of the primary species taken in the Ocean Trawl Fishery**

Background: One of the key pieces of information needed to develop quantitative resource assessments is a time series of relative abundance estimates. Due to changes in fishing practices and varying catchability of different fishing gears, this can be difficult to obtain from commercial landings data. Fishery independent surveys can be designed to reduce biases due to the above factors, however such studies are expensive to implement and need long-term commitment to funding. In the OTF it is likely that fishery independent surveys may only be appropriate for a small number of primary species (e.g. eastern king prawn assessments may benefit from fishery independent surveys, however the usefulness of such surveys for school prawn and royal red prawn assessments may be limited). It is important to assess the potential

usefulness of such studies for the resource assessment of ocean trawl species, and whether the fishery independent surveys being conducted in estuaries will be likely to provide sufficient information for some species in the OTF.

- *2.1(h) Review the efficacy of minimum size limits for fish species taken in the Ocean Trawl Fishery, including the need for minimum legal sizes to be implemented for additional species, and the regulations pertaining to fish with a minimum legal length that are captured in prawn trawl nets south of Smoky Cape

Background: Legal minimum lengths are used to prevent the retention of small and immature fish and some crustaceans. This assists to conserve stocks and promote recruitment to the spawning population so that the risks of recruitment overfishing are minimised. Size limits already apply to many species of fish taken in the OTF, and need to be responsive to new scientific information. There are a number of primary and key secondary species in the fishery that are not currently subject to a minimum legal size (e.g. fiddler shark, angel shark). The efficacy of minimum size limits should be reviewed following the implementation of effective BRDs in prawn trawl nets and addressing selectivity issues in fish trawl nets, in consultation with the Ocean Trawl MAC. Additionally, the prohibition on landing any species with a minimum legal length from prawn trawl catches south of Smoky Cape will be reviewed in conjunction with the implementation of more effective BRDs for prawn trawl nets, to ensure the optimum utilisation of the resources.

- *2.1(i) Utilise onboard observers to collect additional biological information, including size at maturity and fecundity/brood size data, for the important elasmobranch species taken by the fishery

Background: An Australian National Plan of Action for the Conservation and Management of Sharks was released in 2003 (AFFA 2003a). This document sets out the need for concerted national action to reduce the risks of commercial and recreational fishing to the variety of shark species found in Australian waters. Two of the primary recommendations found in the plan involve improving the identification of captured sharks, thereby increasing the accuracy of reported catch data, and undertaking targeted research on shark species. Elasmobranchs are also an important traditional target species for Indigenous fishers.

In addition to the size and sex composition data collected for primary and secondary species under management response 2.1a it is necessary that data be obtained on the important biological characteristics governing maturation and fecundity for those elasmobranch species which are significant in trawl catches. The generally slow growth rates and low reproductive rates of elasmobranchs make them particularly susceptible to overfishing. The paucity of relevant biological data for the main species taken in the trawl fishery needs to be addressed in order to determine if any of these species require more targeted management actions to prevent overfishing of the stocks. This work is best done by onboard observers as shark species are generally cleaned aboard the catching vessel prior to landing.

Objective 2.2 Promote the recovery of overfished species

*2.2(a) Where the Ocean Trawl Fishery is a major harvester of a species determined as overfished in NSW, develop and implement a recovery program for that species as detailed in the harvest strategy, and in particular:

- i) develop and implement a recovery program for silver trevally (growth overfished)
- ii) determine if a recovery program is required for any other species identified as 'high risk' in the environmental assessment conducted in conjunction with the development of this strategy or subsequent research, and implement necessary actions.

Background: There are three recognised types of overfishing: recruitment overfishing, overfishing, and growth overfishing. Development of a recovery program is not required for all species determined as growth overfished, provided certain circumstances apply. See section 3(b)(vi) for further details about the definitions and responses to overfishing.

As the OTF is a major harvester of silver trevally in NSW, the recovery program for silver trevally will be developed as part of this FMS, and will specify:

- a minimum legal length for silver trevally of 30 cm (total length)
- a minimum cod-end mesh size of 90 mm and other requirements for fish trawl nets as specified in management response 2.1d.

Data from the periodic observer program will be used to help assess the effectiveness of the recovery program in preventing the capture and marketing of large numbers of small trevally, including the recording of any discarding of trevally smaller than the new minimum legal length. Over time, information from associated research and the observer program will be used to determine if a more appropriate cod-end mesh size needs to be implemented when fishers are targeting silver trevally.

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

- i) determine if additional measures are needed to improve the selectivity of fish trawl nets for redfish (considering the cod-end regulations to be introduced as part of the recovery program for silver trevally)
- ii) implement the provisions of the recovery program for gemfish to be developed under the Ocean Trap and Line Fishery Management Strategy.

Background: The resource assessments available for redfish taken in the Commonwealth SESSF indicate the stock is growth overfished. Redfish are a slow growing, long lived (>30 years) species. The cod-end regulations to be introduced as part of this FMS should assist in addressing the growth overfished status of redfish, as far as trawlers operating in the NSW OTF are concerned. The impact of these changes will be assessed as part of research and monitoring associated with the silver trevally recovery program, and any additional measures that may be necessary will be discussed with the Ocean Trawl MAC.

Arrangements are already in place to assist the recovery of gemfish (in NSW a 'trip limit' of 50 kg applies to all commercial methods). These will be reviewed and a recovery program for eastern gemfish will be developed under the Ocean Trap and Line FMS. Ocean trawl fishers will need to contribute to and comply with provisions contained in that recovery program.

GOAL 3. Promote the conservation of threatened species, populations and ecological communities likely to be impacted by the operation of the Ocean Trawl Fishery

Objective 3.1 Identify and minimise or eliminate any impacts of fishing activities on threatened species, populations, ecological communities and habitats (including mammals, birds, reptiles, finfish, shellfish and other invertebrates, and vegetation) and promote their recovery

*3.1(a) Modify, in consultation with the Ocean Trawl MAC, the mandatory reporting arrangements to enable collection of information on interactions with or sightings of threatened or protected marine species, and gear interactions with other threatened or protected species

Background: The guidelines for 'ecologically sustainable' fisheries 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. Information on interactions with threatened species will come from the modified reporting arrangements, observer studies and any other verifiable interactions with threatened or protected species.

It is important that fishers are able to distinguish threatened and protected species from similar species in order to correctly identify and where possible avoid interactions with them. An example of this type of information is the grey nurse shark identification material. For this purpose, information will be disseminated to endorsement holders to assist them in identifying and avoiding protected and threatened species.

3.1(b) Implement, in consultation with the Ocean Trawl MAC, the provisions of any relevant threatened species recovery plans, threat abatement plans, priorities action statements, or other similar management arrangements designed to protect threatened species and/or critical habitat areas

Background: Once a species, population or ecological community has been listed as threatened, a recovery plan may be developed. A priorities action statement must also be prepared for species listed as threatened under NSW legislation. These are designed to return the species, population or ecological community to a point where its survival in nature is assured. The plans and statements referred to in this response could include those being developed under the FM Act, the Threatened Species Conservation Act 1995 or other State or Commonwealth legislation.

Additionally, threatened species legislation requires the development of a threat abatement plan for any listed key threatening processes. A threat abatement plan outlines actions to eliminate or manage the key threatening process, and identifies the authorities responsible for carrying out those actions. Such plans may include the protection from fishing of areas or habitats designated as critical for the survival of threatened species.

This response recognises that the statutory provisions of a threatened species recovery plan or threat abatement plan must be implemented and given precedence over the provisions of this management strategy.

- *3.1(c) Using the Code of Practice, promote the use of fishing techniques that avoid the capture of or interaction with protected fish and fish protected from commercial fishing

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 FM Act. A range of measures could be included in the Code of Practice that will minimise interactions with or impacts on protected fish and fish protected from commercial fishing such as the times and areas worked, the length of trawl shots, and promoting best practice handling techniques. It is already unlawful for any person to retain a protected species and as such the focus of this response is to encourage fishers to avoid interactions with species that have 'protected' status.

- *3.1(d) Determine, through the periodic onboard observer program, the level of interaction between the fishery and marine turtles and seals (protected under the *Threatened Species Conservation Act 1995*) and assess the need to introduce Turtle or Seal Excluder Devices, or other measures to minimise impacts on these species

Background: The NSW Ocean Prawn Trawl Fishery interacts with various species of turtle, particularly in waters north of South West Rocks. The level of interaction is thought to be low, however it is not monitored or accurately recorded. Many fishers are aware of how to revive and release turtles that have been taken in nets. Turtle Exclusion Devices are mandatory in the Queensland East Coast Trawl Fishery, but not in NSW.

Fish trawlers in the Commonwealth trawl sector of the SESSF have documented interactions with seals, and depending on the outcomes of negotiations about jurisdiction for the fish trawl fishery south of Barrenjoey Point, it may be appropriate to also consider seal interactions and exclusion devices under this response.

The Ocean Trawl MAC will consider the outcomes of relevant data and risk assessments to determine the need for implementation of TEDs and SEDs in defined sectors of the OTF.

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

Objective 4.1 Provide for appropriate access to the fisheries resource by other stakeholders (eg. recreational, Indigenous), acknowledging the need of seafood consumers to access quality shellfish and finfish

- *4.1(a) Estimate the total catch of 'primary' and 'key secondary' species in the Ocean Trawl Fishery, taking account of the recorded commercial catch and estimates of recreational, Indigenous and illegal catch

Background: Estimates of harvest rates from all sectors are vital for resource assessments and to ensure access to resources is appropriately shared. Information on the recreational and Indigenous catch will be drawn from the results of the National Recreational and Indigenous Fishing Survey, related studies to be undertaken in NSW and information obtained from other sources such as charter boat logbooks. (note: some Indigenous communities have expressed concern over the research methods used in the survey for collecting information on Indigenous catches). Information on illegal catches will come mainly from the results of compliance actions and associated intelligence.

Objective 4.2 Provide for fair and equitable sharing of the fisheries resources with other commercial fisheries (NSW, interstate and Commonwealth)

- *4.2(a) Monitor management arrangements and the annual landings of key ocean trawl species in fisheries that are outside NSW jurisdiction but which impact on stocks shared with the NSW Ocean Trawl Fishery, as part of the resource assessment system

Background: Many of the primary and key secondary species in the OTF are also significant in landings of fisheries under other jurisdictions. Increased targeting or harvesting of particular species can have implications for sustainability and sharing of access to that stock. Monitoring changes in harvest levels by other fisheries can allow implications arising from increased targeting or landings to be detected early and appropriate action to be taken.

- *4.2(b) Monitor the annual landings of secondary species (other than the 'key secondary' species) within each sector of the Ocean Trawl Fishery, as part of the resource assessment system

Background: A large number of species are taken incidentally in the OTF, and while quantities landed are small this response seeks to identify and limit any unusual increases in landings of secondary species. Some of these species are significant in landings of other commercial or recreational fisheries.

- 4.2(c) Use cross-fishery and cross-jurisdictional consultation to discuss and then manage issues relating to, but not limited to, the multiple use of specific fishing grounds, collaborative research, fair and equitable access to stocks, complementary management arrangements and other interactions between fishing sectors

Background: There have been recent examples of interactions between the trawl fishery and the lobster and trap and line fisheries where cross-fishery consultation provided a useful mechanism to resolve conflicts. There will be times when direct consultation between fishers

within NSW and/or with other jurisdictions (such as Queensland and the Commonwealth) is required. Cross-fishery and cross jurisdictional consultation and the management tools in this strategy will be used to provide for fair and equitable access to fisheries resources. NSW should also work with the Commonwealth and adjacent States with the aim of achieving management arrangements that are complimentary or consistent and work collaboratively on research on straddling stocks and data sharing.

The existing Management Advisory Committee (MAC) and Advisory Council processes are typically used for cross-fishery consultation however the Minister may at times establish working groups to address specific cross-fishery issues. An example of this is the Juvenile Prawn Summit Working Group that was formed during 2000 to provide advice on harvesting the State's prawn stocks.

Objective 4.3 Provide for the fair and equitable sharing of the fisheries resource within the Ocean Trawl Fishery

- *4.3(a) Limit operations of 'offshore' prawn trawlers to depths less than 275 metres (150 fathoms), and limit operations of 'deepwater' prawn trawlers to depths greater than 275 metres

Background: Offshore prawn trawling and deepwater prawn trawling both take place in waters outside 3 nautical miles, but there is currently no separation between the two sectors based on area fished. Offshore prawn trawlers generally target king prawns out to the edge of the continental shelf (approximately 230 metres or 125 fathoms), whereas deepwater prawn trawlers take species of deepwater prawns, such as royal red prawns, at depths in excess of 310 metres (approximately 170 fathoms). Under this response, prawn trawlers in each sector will be limited to operating in accordance with the depths specified. Only those operators holding both endorsements will be able to trawl across the 275 metre depth separation.

- *4.3(b) Respond, where necessary, to information about significant changes in relative catches of the primary and key secondary species taken in each of the major sectors of the Ocean Trawl Fishery

Background: The primary and key secondary species are of major importance to the fishery. It is important to monitor the relative catch levels across fishing methods to detect any changes that may occur within the fishery. This monitoring will occur in accordance with the performance monitoring program – see section 5.

- 4.3(c) Manage the multiple use of trawl grounds within the Ocean Trawl Fishery and minimise adverse interactions

Background: Similar to interactions between trawlers and other sectors of the industry, there are sometimes adverse interactions between trawler operators. For example there have been interactions between trawlers targeting whiting during the day and those targeting prawns on the same or nearby grounds the following night. Information on the frequency of trawling on particular grounds will be discussed with the MAC and measures implemented as required to minimise adverse interactions.

Objective 4.4 Identify and mitigate any negative impacts of the Ocean Trawl Fishery on Aboriginal, cultural or other heritage

***4.4(a) Manage the Ocean Trawl Fishery in a manner consistent with the Indigenous Fisheries Strategy and Implementation Plan**

Background: The Indigenous Fisheries Strategy and Implementation Plan (IFS) was released in December 2002. The IFS puts in place a process that will ensure discussion and negotiation to resolve problems and challenges in relation to Indigenous involvement in the fisheries of NSW. A funding application is being developed to conduct a significant research program that would determine the fish species, areas and/or harvest techniques of cultural importance to Aboriginal people, so that any interactions with the OTF may be identified. Such a program may identify species that are taken in ocean-based commercial fisheries but spend part of their life cycle within estuaries or near-shore waters where cultural fishing practices are more common.

4.4(b) Modify the activity, where relevant, in response to new information about areas or objects of cultural significance in order to minimise the risk from fishing or fishing activities

Background: Fishers in the OTF must respond appropriately to any new information about items or locations of Aboriginal and other cultural significance (e.g. a recently discovered shipwreck), and this management response seeks to reinforce that intention.

Objective 4.5 Provide for resolution of conflicts between the Ocean Trawl Fishery and other community interests

4.5(a) Modify the activity, in consultation with the Ocean Trawl MAC, to respond appropriately to conflicts that arise between ocean trawl operators and other members of the community

Background: Conflict between ocean trawl fishers and other community members may not always revolve around conflict over the fish resources. Other conflict issues may include spatial conflicts (e.g. concern over the operation of prawn trawlers in near-shore areas). This response provides a means of resolving such conflicts by measures such as improved data collection, improved communications or small spatial and temporal closures to trawling.

GOAL 5. Promote a viable Ocean Trawl Fishery, consistent with ecological sustainability

Objective 5.1 Manage the harvesting of the primary and key secondary species to achieve the best outcome in terms of optimising biological yield and maximising economic return

***5.1(a) Determine and implement arrangements to optimise the biological yield for the primary and key secondary species taken in the fishery**

Background: Results of research into the selectivity of gear used in the Commonwealth SESSF have shown that many important fish species (including tiger flathead, redfish, ocean perch and ling) are being taken at sizes well below the optimum size for the species. For many of the important species taken by trawling in NSW ocean waters, given some knowledge of the biology, growth and mortality rates of individuals in the population, it is possible to determine the 'optimum' biological size to harvest each species. This generally corresponds with the size that will, on average, produce the maximum yield (in weight) for a catch of a given number of fish of that species. However, to guard against recruitment overfishing, the reproductive biology of the species also needs to be taken into account to ensure individuals are not subject to excessive harvesting prior to the size at maturity. Priorities will be set taking account of the large number of primary and key secondary species harvested by the OTF, which complicate the determination of the requirements for optimum yield. The outcomes will inform decisions to optimise the gear and harvest strategies in the fishery. See also management response 5.1b with regard to optimising yield for market requirements.

***5.1(b) Identify and implement strategies to maximise the economic return to the fishery, taking into account the conditions required to optimise the biological yield for the range of species taken**

Background: In addition to determining the optimum gear and harvest strategies to address the biological characteristics of the main species taken by the fishery, it will be necessary to assess the economic factors relevant to these species, and to take these into account in any consideration of appropriate gear and harvest strategies. This would also include the costs incurred by fishers in any change from the existing regulations to alternative gear or harvest regimes.

***5.1(c) Implement suitable gear, area and operational specifications for targeting school whiting (see specific controls in Appendix 4)**

Background: The implementation of effective BRDs in ocean prawn trawl nets (see response 1.2b) is expected to significantly reduce the quantity of school whiting taken in these nets. Additionally, the introduction of appropriate gear specifications for improving the selectivity of fish trawl nets (management response 2.1d) is also expected to significantly reduce catches of school whiting in fish trawl nets. While a net designed to target both prawns and whiting at appropriate sizes has been developed for the prawn trawl sector, a single gear net (or nets) specifically designed to catch school whiting (and minimise the incidental catch of other species) should be developed to ensure an ongoing yield of school whiting to help meet local marketing and processing needs. In order to satisfy environmental assessment guidelines and maintain annual landings of school whiting at about recent levels, the use of any new gear would have to be regulated (area and times of permitted operation will be specified) and adequate reporting and observer coverage would be required to accurately assess the level of incidental catch taken.

The arrangements will be reviewed on an ongoing basis and corrective action will be taken to address any problems, including consideration of implementing a separate limited entry fishery if the gear controls do not sufficiently limit the fishing capacity.

Objective 5.2 Establish a level of fishing effort to achieve a fishery that is commercially viable (and ecologically sustainable) over the longer term

*5.2(a) Manage fishing effort in the Ocean Trawl Fishery by:

- i) limiting the number of each endorsement type so as to minimise the potential activation of latent fishing effort, and
- ii) maintaining the hull capacity, engine power and net length restrictions that apply to the offshore prawn sector and extend these rules to the other sectors of the fishery (i.e. inshore prawn trawl, deepwater prawn trawl, northern fish trawl and southern fish trawl), and
- iii) establishing a maximum level of fishing effort for each sector of the fishery to be achieved within 10 years of the commencement of the share management plan, and
- iv) limiting the number of days/nights each boat may work in the prawn trawl and fish trawl sectors of the fishery

Background: It is the intent of this management response to reduce the total fishing effort to a level that is ecologically sustainable and commercially viable. The desired level of fishing effort will be determined in consultation with the Ocean Trawl MAC, and can be adjusted using tools such as minimum shareholdings and changes to the unitisation system, and can take account of any other supplementary options to facilitate an orderly process of structural adjustment. The program will establish effort milestones to be achieved over the restructuring period.

With respect to point (i) of this response, latent fishing effort includes endorsements that are never used or used at very low levels. There is a high level of latent fishing effort in each sector of the OTF that, if activated, could have a significant adverse impact on the commercial viability of fishing businesses that are reliant on the fishery. Minimum shareholding requirements and other tools can be used to restructure each sector of the fishery, and the rate of restructure can be adjusted over time if required.

Regarding point (ii), input controls including restrictions on hull size, engine power and net length are used to limit the fishing capacity of commercial fishing boats, indirectly controlling the level of fishing effort able to be applied to the target fish stocks. Boats authorised for the offshore sector of the ocean prawn trawl fishery have been subject to hull, engine and net length restrictions since 1985. This process is known as 'unitisation'. Units have recently been allocated to all other boats endorsed in the OTF and will apply consistently across all sectors of the fishery.

Point (iii) involves defining a desired level of total fishing effort and requires consideration of the extent to which vessels are used (i.e. both the number of entitlements and time at sea) and the capacity of those vessels (i.e. a measure of the capability to catch fish or prawns). The number of entitlements and time at sea can be controlled through minimum shareholding requirements and/or limits on the number of days/nights fished, and the fishing capacity can be controlled through the unitisation scheme. However, irrespective of the mechanism being used for effort reduction, there is a need to define the overall target for effort levels in the longer term, and how it will be achieved. To ensure that targets are achieved, effort milestones will be

set at various points throughout the 10 year period that trigger additional management action if effort levels are not sufficiently reduced by those times.

Regarding point (iv), in addition to any adjustment of the number of operators, fishing effort will be managed by limiting the total number of days or nights fished in the prawn trawl and fish trawl sectors of the fishery. The Ocean Trawl MAC previously recommended that an initial cap of 200 days/nights per boat per year be introduced across the fishery and that the future allocation of nights be based on shareholdings in the fishery. Within two years of the commencement of the share management plan, the total number of days/nights able to be worked in the fishery will be limited to currently active levels, and the total allowable days/nights will be allocated amongst ocean trawl businesses in proportion to shareholdings. Note that the share management plan may provide for the creation and issue of further classes of shares for this purpose. Once proportionally allocated, any maximum individual caps preventing the purchase of additional shares/days/nights would be removed.

The days/nights based management system can be a central tool used in the 10 year effort plan discussed above. The total allowable days/nights allocation should be adjusted as necessary over time to ensure that the level of fishing effort seeks to maintain a fishery that is both ecologically sustainable and commercially viable.

In conjunction with the setting of a total allowable days/nights regime, the other input controls in the fishery will be reviewed with a view to removing those that are not necessary for the ongoing viability or sustainability of the fishery, so as to promote the economic efficiency of trawl operations and the delivery of efficient fishery management services. The Ocean Trawl MAC and broader industry will be fully consulted in the development of the approach.

5.2(b) Maintain the prohibition on trawling south of Byron Bay for fishing businesses with vessels currently holding a P4 offshore prawn trawl endorsement

Background: NSW and the Commonwealth signed an Offshore Constitutional Settlement in December 1990 that gave NSW jurisdiction over prawn trawling in waters more than 3 nautical miles from the coast. To minimise the impact upon Queensland based boats that worked in NSW waters before the agreement came into effect, under reciprocal arrangements NSW granted these boats concessional access to NSW waters. There are currently five P4 offshore prawn trawlers and these vessels are restricted when working under the authority of an offshore prawn trawl endorsement to waters north of Cape Byron (Byron Bay). While the P1-P4 authorisations will no longer exist when the share management plans commence, the offshore prawn trawl endorsements held by businesses that currently have a P4 authorised vessel will be subject to a condition limiting their operations to north of Byron Bay.

Objective 5.3 Promote the economic viability of the Ocean Trawl Fishery, and assess the economic benefits of the fishery to the community

*5.3(a) Refine the performance indicator for monitoring trends in the commercial viability of fishing businesses within each designated commercial fishing activity, so as to be based on net returns

Background: Previous draft versions of the FMS included a performance indicator for monitoring economic viability using gross returns. However, net return rather than gross return is a better indicator of economic performance as it accounts for changes in fishers' costs over time. An understanding of the average net return across fishing businesses requires data on seafood prices, as well as the cost of inputs such as fishing gear, fuel and bait. A process will be developed in consultation with the MACs to determine how best to collect data on the costs of going fishing, taking into account confidentiality/privacy concerns and the cost-

effectiveness of the data collection methods. Once this process is developed, the performance indicator can be modified accordingly.

- *5.3(b) Investigate the data available to assess the economic multiplier (flow-on) effects of commercial fishing, including the Ocean Trawl Fishery, to the broader community, and develop strategies to improve the quality/usefulness of such data

Background: There have been few detailed assessments of the economic benefits of commercial fishing, in terms of flow-on effects for local and regional economies, or returns to the broader community for access to a community owned resource. Fishing activities (and in this case expenditure and income associated with the activity of trawling in ocean waters) are believed to be important to many local economies (e.g. Evans Head). There is no doubt that some coastal communities derive significant economic benefits from trawling in ocean waters, not only from direct employment but also from the provision of ancillary services. There may be some areas where the economic impacts of proposed management changes need to be directly assessed, taking account of the actions in this strategy. Advice will be sought from the MACs and experts in economic analysis on the best data to use to describe the multiplier effects of the commercial fisheries, and to assess any significant impacts.

- 5.3(c) Identify and promote post-harvest practices which will ensure the best return in dollars per kilogram for product of the fishery

Background: The economic viability of the fishery is dependent on obtaining the best return possible for the product landed. There will be many examples of where the economic return to the fishery can be increased by improving handling practices or value adding (especially when combined with appropriate gear selectivity measures), and it is in the interests of the fishery to widely promote such practices. Good post-harvest practices can be promoted through the Code of Practice to be prepared for the fishery. See also management responses concerning optimising biological and economic yield, and gear selectivity.

- 5.3(d) Develop a cost recovery framework, in consultation with the MAC and the Ministerial advisory body relating to commercial fishing

Background: A cost recovery framework is currently being developed and will be subject to consultation with industry advisory bodies. The framework will allow for the fair charging of the costs of management and access rights and give industry a greater ability to plan. The cost recovery framework and any future economic analyses of the OTF will consider and address the cumulative impact of increased management charges for each fishery on fishing businesses as a whole. See section 3(c)(xiii) for further information on the cost recovery policy.

Objective 5.4 Provide secure fishing entitlements for ocean trawl fishers

- 5.4(a) Implement the share management provisions of the *Fisheries Management Act 1994* for the prawn trawl sector of the fishery and the fish trawl sector north of Barrenjoey Point

Background: The category 1 share management provisions allow for the allocation of shares in perpetuity, with the payment of statutory compensation for the market value of the shares if the Government decided to close the fishery and cancel the shares. Category 1 share management provides a secure property right and a stronger incentive for business investment and resource husbandry.

Pending resolution of jurisdictional arrangements with the Commonwealth, the fish trawl sector of the fishery south of Barrenjoey Point will continue as a restricted fishery.

As well as issuing property rights, there are a range of programs already underway or planned that promote industry development, training and profitability, including: Regional Partnership Program, Seafood Services Australia's Seafood Industry Development Funds, Seafood Supply Chain Innovation Project, Australian Seafood Standard, NFIS Australian Seafood Strategy for Export Growth, National Food Industry Strategy, Environmental Management Systems Incentive Program (including vocational training for seafood industry participants), and Correct labelling of seafood (and standard fish names).

Objective 5.5 Manage food safety risks in the harvesting of shellfish and finfish in the fishery

- 5.5(a) Co-operate with NSW Food Authority in the development and implementation of food safety programs relevant to the fishery

Background: Food safety plans covering the production and distribution of seafood in NSW are currently being developed and implemented by NSW Food Authority. These plans may impose statutory requirements on fishers to comply with the approved standards. Supporting food safety programs is an effective way of promoting consumer confidence in products harvested by the fishery and contributing to the future viability of the industry.

GOAL 6. Facilitate effective and efficient compliance, research and management of the Ocean Trawl Fishery

Objective 6.1 Promote and maximise compliance with the provisions contained in the Ocean Trawl Fishery Management Strategy

***6.1(a) Develop, implement and monitor a compliance plan for commercial designated fishing activities, including the Ocean Trawl Fishery**

Background: Currently, compliance plans are developed by NSW DPI compliance officers at the district level. Relevant aspects of these plans will be reviewed and combined into a compliance plan for commercial designated fishing activities, including the OTF, on a state-wide basis. The Ocean Trawl MAC will regularly review the operation of the parts of the compliance plan relevant to each of the fishery sectors.

Compliance with the FMS can be encouraged through participation of fishers in decision-making. The cost of compliance with provisions in the FMS will be minimised if fishers are involved in the development of those provisions and understand the potential benefits. Such participation should seek to encourage the flow of information between fishery operators and their representatives on the MAC, and an appropriate level of explanation to all endorsed fishers about the reasons for decisions regarding management of the fishery.

***6.1(b) Review developments in electronic vessel monitoring systems (VMS) and associated catch and effort reporting systems and implement a cost-effective VMS for the fishery**

Background: NSW DPI and the MAC have been monitoring developments in Vessel Monitoring Systems (VMS) in other States and countries over the last few years with a view to introducing a cost effective system in NSW. Some NSW trawl fishers with Commonwealth entitlements already have a requirement to install VMSs on their vessels as part of the Commonwealth management arrangements.

VMS uses satellite technology to report the position, speed and other information on commercial fishing vessels. A VMS (or alternative system that meets the same need) would enhance management flexibility and compliance with regard to jurisdictional boundaries, inter-fishery boundaries, juvenile king prawn closures, Marine Park zoning schemes and any other spatial closures. A suitable adjunct to the VMS allows for enhanced catch and effort reporting, communication between fishers, NSW DPI and markets (via computer) and can provide valuable information on the spatial distribution of commercial fishing.

However, VMS systems are currently relatively expensive to implement and maintain and efforts should be made to seek external funding to offset the cost of its introduction. The utility of VMS should be considered during the review of fishing closures scheduled to be undertaken within four years of commencement of the FMS (see management response 1.1b).

- 6.1(c) Implement a penalty points scheme (incorporating endorsement suspension and share forfeiture for serious offences and habitual offenders)

Background: It is crucial that effective deterrents are in place to discourage illegal activity in the fishery, especially given the difficulty in enforcing compliance at sea. The penalty points scheme will be similar to the demerit points scheme used by the RTA for driver's licences and will be applied across fisheries. The detail of the scheme will be developed in consultation with industry and implemented through regulation or in the share management plan.

- 6.1(d) Develop strategies to support appropriate practices and behaviour in commercial fisheries, including development of training and accreditation courses in core competencies and the introduction of fit and proper person requirements

Background: The training and accreditation standards foreshadowed in this response will aim to ensure that skippers have a sound understanding of the fishery and the rules that apply, including the need for provision of accurate data. New licence holders are currently provided with an introduction to NSW fisheries at the local NSW DPI fisheries office, but the type and level of detail discussed varies from office to office. Increasing the professionalism of operators can provide long term benefits to the industry. Any such strategies will need to consider existing training or accreditation programs run by the seafood industry or by other agencies, such as the NSW Maritime Authority.

Furthermore, strategies should be developed to ensure that persons licensed to fish in NSW are fit and proper (ie. do not have an unacceptable history of breaches of fisheries legislation and policies). This may include implementing minimum standards of past compliance with the laws of NSW, other States/Territories or the Commonwealth upon the issue of any new commercial fishing licences.

Objective 6.2 Identify research priorities required to provide for the sustainable operation of the Ocean Trawl Fishery

- *6.2(a) Develop and implement a Research Strategic Plan for designated commercial fishing activities including the Ocean Trawl Fishery, taking account of the priorities for research outlined in the harvest strategy

Background: Draft research plans have previously been prepared and discussed with the Ocean Trawl MAC, along with the assignment of priorities to research proposals. Such plans will be reviewed in consultation with the MAC, to ensure their relevance and efficacy in relation to the goals and objectives of the approved FMS and the priorities outlined in the harvest strategy. A new Research Strategic Plan for the fishery, detailing the priorities and possible sources of funding, would then be developed. Development of the plan will be informed by the risk assessment and identification of knowledge gaps in the Environmental Impact Statement.

Objective 6.3 Ensure effective and efficient management of the Ocean Trawl Fishery

***6.3(a) Develop and implement the fishing business (skipper) card system**

Background: Only one person may be nominated to hold endorsements in respect of a fishing business. The FM Act limits the number of people able to hold endorsements in respect of a fishing business to one, except in the case of skipper endorsements where multiple endorsements can be issued although they are often linked to the boats attached to a specific business. Under current circumstances, for a skipper to work another boat, a new licence with endorsements must be issued; a process that can take several weeks to complete.

To increase the flexibility for business owners to acquire a skipper at short notice a new system will be developed; the fishing business card system. Under this system the owner of a fishing business with entitlements in the OTF will be issued a Fishing Business Card. The fishing business owner can then register a pool of appropriately licensed fishers associated with their business. A registered person will only be taken to be endorsed with respect to that business when they are in possession of the card. They may operate in all fisheries specified on the card. The fisher may also be restricted to the vessel specified on the card. All registered persons and those in possession of the card must abide by all rules and regulations that would normally apply to the endorsed fishing business owner.

***6.3(b) Modify the arrangements for trawling in the area south of Barrenjoey Point (within 3 nautical miles) to achieve greater complementarity with the management of the adjacent Commonwealth Southern and Eastern Scalefish and Shark Fishery and to manage fish stocks in State waters on a sustainable basis and minimise other environmental impacts**

Background: On the south coast fish trawling inside 3 nautical miles is managed by the State and fish trawling outside 3 nautical miles is managed by the Commonwealth, with linkages between the fishery resources and respective management regimes. A consultation paper was distributed to southern fish trawl endorsement holders during November 2002 detailing three proposals; (A) prohibit fish trawling inside 3nm, (B) hand over jurisdiction of major fish trawl grounds to the Commonwealth and close other waters to trawling or (C) maintain the current agreement. At the time, fishers responded with significant support for a 'single jurisdiction' to cover trawling under option B. During the development of the FMS, however, the MAC representative for the southern trawl sector advised that some fishers wanted to retain NSW jurisdiction in these waters. The arrangements for trawling south of Barrenjoey Point need to be reviewed and modified to achieve greater complementarity with the management of the adjacent Commonwealth SESSF. For example, all vessels in that area may be required in the short to medium term to be monitored using a VMS. The FMS does not prevent these waters from being transferred to Commonwealth jurisdiction if so agreed by the State and Commonwealth governments.

***6.3(c) Rationalise the areas closed to trawling (as outlined in this management strategy) taking account of the combined effect of fishing closures, addressing the environmental risks identified in the EIS, and the implications for trawling operations at a regional level**

Background: There is a range of closures to trawling that currently apply and will apply under the management strategy. Many closures are established to achieve a particular outcome, including juvenile king prawn closures, marine protected areas (e.g. Marine Parks), flood bycatch closures, etc, yet provide benefits to several other aspects of environmental management. There should be opportunities to rationalise the closures that apply to ocean trawling while still achieving the aim and overall environmental protection provided by the

'package' of closures. NSW DPI will work with fishers at a regional level to identify any opportunities for rationalisation. Any rationalisation would need to ensure that the range of benefits afforded by the closures are achieved, either collectively or individually.

Objective 6.4 Provide effective and efficient communication and consultation mechanisms in relation to management of the Ocean Trawl Fishery

- *6.4(a) Utilise a key consultative body, such as the Ocean Trawl Management Advisory Committee (MAC), when undertaking industry consultation on all aspects of the OTF, with the services of an independent Chairperson, as the primary consultative body for issues affecting the fishery

Background: The Ocean Trawl MAC provides advice to the Minister for Primary Industries on a broad range of issues relating to the management of the OTF. The MAC includes endorsed commercial fishers elected to represent the interests of those in the OTF and non-industry members, appointed by the Minister for Primary Industries, to represent other interest groups such as indigenous, recreational and conservation groups to promote cross-sector input. The Indigenous Fisheries Strategy provides support for improving indigenous participation in the MAC process. The implementation of independent Chairs to each of the commercial Management Advisory Committees in 2000 has been successful in promoting full and informed discussions at MAC meetings, and in effectively presenting stakeholder views to the Minister and NSW DPI.

Objective 6.5 Implement this strategy in a manner consistent with related Commonwealth and State endorsed programs aimed at protecting aquatic environments and achieving the objectives of ecological sustainable development

- 6.5(a) Manage the Ocean Trawl Fishery consistently with other jurisdictional or natural resource management requirements, such as the marine parks program, aquatic biodiversity strategy, threatened species program, Indigenous Fisheries Strategy, compliance and other relevant strategies

Background: The management strategy will be operating alongside other programs relating to the management of marine resources, and in most instances 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 marine environment.

- 6.5(b) Provide for the issue of permits under Section 37 of the *Fisheries Management Act 1994* authorising the use of 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 fishing gear in a manner that is different to that specified in this management strategy, or the associated regulations. This response allows approval to be given to industry members who are participating in research programs to trial new approaches to fishing gear design.

GOAL 7. Improve knowledge about the Ocean Trawl Fishery and the resources on which it relies

Objective 7.1 Improve the community's understanding and public perception of the Ocean Trawl Fishery

*7.1(a) Promote awareness of the Ocean Trawl Fishery as part of the overall communication strategy across all commercial designated fishing activities by implementing issue-focused education programs

Background: As an initial step, the FMS and EIS and any resulting reports will be made available to the public by placing them on the NSW DPI website, providing copies at NSW DPI (Fisheries) Offices and doing targeted mail-outs to key stakeholder groups. Other examples include educating ocean trawl fishers about the potential impacts of trawling on ocean habitats and ecosystems, and arranging for media releases, educational material for schools and public meetings and other relevant publications advocating pro-active industry initiatives, the benefits of protecting fish habitat and nursery grounds, and how the OTF is managed to remain ecologically sustainable.

Objective 7.2 Promote scientific research to collect relevant information about the biology of the primary and key secondary species, the impact of trawling on other species and the environment, and the status of the fishery as a whole, including economic and social factors

*7.2(a) Promote and support targeted research projects that are relevant to:

- i) the biology or resource assessment of the primary and key secondary species in the Ocean Trawl Fishery
- ii) the distribution of marine habitats off NSW and the potential impacts of trawling on these habitats
- iii) the impacts of trawling on biodiversity and the environment (including mapping of fishing grounds, the effectiveness of trawl closures and 'refuge' areas, and research into the use and effectiveness of approved Bycatch Reduction Devices in reducing unwanted bycatch)
- iv) economic and social factors affecting the fishery.

Background: The current level of knowledge about most of these proposed areas of research is much less than needed to properly understand the functioning of this fishery. In particular, the extent of different habitats and the potential impacts of trawling on these habitats is poorly known for the waters off NSW. It would be advantageous to support research proposals aimed at improving our knowledge of the extent of the various habitat types, their importance to fish resources, and any possible impacts that trawling might have. Some initial work on identifying habitats associated with trawl grounds will be conducted in conjunction with industry as part of the definition and mapping of trawl grounds (management response 1.1a).

The MAC, through the FMS and contributing to a Research Strategic Plan, should identify and promote the research projects outlined in this response, and offer whatever assistance can be practically provided by fishers or others connected with the fishery. Ideally, the MAC will also be pro-active in the development of necessary research projects, and in supporting such projects to obtain competitive funding.

- 7.2(b) Implement targeted surveys of endorsement holders to obtain more accurate information on the economic and social status of commercial fisheries, including the Ocean Trawl Fishery

Background: Historically, there has been little data collected which would assist in monitoring the economic and/or social factors that affect commercial fisheries. This response seeks to establish a method to conduct surveys on an episodic basis to provide this kind of information. The approach to be taken will be developed in consultation with the MACs. The findings of this work will be used to progressively inform decisions on targets for structural adjustment and refinement of the economic performance indicators for commercial fisheries.

Objective 7.3 Improve the quality of the catch and effort information collected from endorsement holders

- 7.3(a) Periodically review the mandatory catch and effort return forms submitted by ocean trawl fishers and implement changes if:

- i) the data are perceived to be of poor quality or insufficient for the purpose of conducting resource assessments or an environmental assessment, or
- ii) the forms are found to be exceedingly complex for fishers to complete, ensuring an emphasis on quality rather than quantity of information collected.

Background: Ocean trawl fishers submit a catch and effort return form to NSW DPI each month and the information is used to increase our understanding of the fishery and the resources on which it relies. An informal working group involving commercial fishers and NSW DPI staff has been established to periodically review the current catch and effort return forms. The working group will make recommendations for changes that are considered necessary to improve the quality of data collected. Any recommendations of this working group will be discussed with the Ocean Trawl MAC.

It is desirable that ocean trawl fishers complete a catch and effort return that provides more useful information than is currently the case (e.g. a daily summary or 'shot-by-shot' logbook). The information to be collected in such a format needs to be discussed with the Ocean Trawl MAC as part of the initial review.

- *7.3(b) Assess the accuracy of the current catch recording system, and species identification in catch records, and provide advice to industry to make needed changes

Background: Correct species identification is critical to the performance of many areas of the management strategy. Most species in the fishery are accurately reported, however some species are not (e.g. shovelnose rays are reported as fiddler sharks; pink tilefish are reported as 'moonfish' and are recorded in the catch database as 'opah'). The onboard observer study will provide first hand information on local names for fish and any patterns in the use of those names. This information will also be used to ensure that industry education is appropriately targeted.

5. Performance Monitoring and Review

a) Performance monitoring

Many of the management responses listed in section 4 of this FMS 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 FMS against the seven goals (i.e. the major objectives). A periodic report will, however, be prepared (as outlined later in this section) detailing the progress made in implementing each of the management responses.

i) *Performance indicators*

The performance indicators provide the most appropriate indication of whether the management goals are being attained. A number of monitoring programs are to be used to gather information to measure performance indicators. These performance indicators are detailed in Table 9. It should be noted that a number of relatively direct performance indicators have been selected rather than using a large number of surrogate indicators, in order that the limited resources available for implementation of the management strategy can be most effectively utilised. These will be further refined in light of the practical implementation of the management strategy.

Data requirements and availability

The data requirements and availability for each performance indicator in Table 9 relate to the collection of information used to measure the performance indicators and the data that are available. The data requirements 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.

Robustness

The robustness ratings applied to each performance indicator in Table 9 have been selected using the definitions outlined in Table 8 below.

Table 8. Robustness Classifications (source: Fletcher *et al.*, 2002)

Robustness level	Description
High	The indicator is a direct measure of the goal or, if indirect, is known to closely reflect changes in the issue of interest
Medium	The indicator is suspected to be a reasonably accurate measure against the goal, or the known error is in the conservative direction
Low	The degree to which the indicator measures against the objective is largely unknown or known to be low. Often this will involve surrogate indicators

ii) *Trigger points*

The trigger points specify the point when a performance indicator has reached a level that suggests a potential problem with the fishery and a review is required. The review will determine the suspected reasons for the breach of the trigger point and whether any action is required (see section 5(c)(ii) for further information on reviews in response to trigger points).

Table 9 establishes the performance indicators and trigger points that will be used to measure whether each of the management goals described in section 4 of this FMS 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 possible that better performance indicators will become apparent over the course of the next few years and it would then be an inefficient use of resources to continue monitoring the performance indicators that appear in the 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 Minister for Primary Industries may amend the management strategy 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 Ocean Trawl MAC.

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.

c) Reporting on the performance of the management strategy

There are two types of performance monitoring reports to be prepared under this management strategy. One is a performance report, which reports generally on the performance of the fishery with respect to the management strategy. The other type of report is a review report, which is to be prepared if a performance indicator for the fishery is breached. Both types of reports are discussed in further detail below.

i) Performance assessment and report

A performance assessment examining each performance indicator will be undertaken annually and a report on the performance indicators will be submitted to the Minister for Primary Industries within two years of the commencement of the FMS, and biennially thereafter. The report is the formal mechanism for reporting on performance indicators and trigger points, and will be made publicly available. It will also include a review of progress made in implementing each of the management responses. The performance report may be submitted to the Minister for Primary Industries in conjunction with performance reports for other relevant fishery management strategies.

The vast majority of management responses in the management strategy are linked to specified implementation timeframes. 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 Primary Industries¹.

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 triggering of performance indicators are being considered through the review process and/or by the Minister for Primary Industries.

¹ 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 2005, but it is actually completed in October 2005). When this occurs, it is not necessary to proceed with a review.

ii) 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 Ocean Trawl 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.

NSW DPI will collect and analyse information relevant to the performance of the fishery, such as compliance rates, economic data, catch data and other statistics as the information becomes available and prior to the preparation of reports relating to performance monitoring in the management strategy. 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 DPI. 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. Consultation will then occur with the Ocean Trawl MAC and other relevant advisory bodies either through a meeting or out of session. During this consultation, advice will be sought on the suspected reasons for any breaches. During this consultation the MAC will also be able to provide advice on the preparation of any review reports that are required.

A review report outlining the remedial actions recommended in response to trigger point breaches, is to be provided to the Minister for Primary Industries within 6 months of the trigger point being breached.

Where economic, biological or ecological sustainability are factors for concern in a review, the review 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.

Review reporting 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 fishery objectives would be compromised if the fishery continued to operate unchanged, management action must be taken with the objective of returning 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.

If a review considers that the management objectives or performance monitoring provisions are inappropriate and need to be modified, the management strategy itself may be amended by the Minister for Primary Industries. If the reasons are considered to be due to the impacts on the resource

from factors external to the fishery, these factors should be identified in the review and referred to any relevant managing agency for action.

A review 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 that is caught in multiple fisheries.

All review reports will be publicly available.

External drivers

External drivers are factors that are known to potentially impact on the performance of the fishery but which are outside of the control of NSW DPI or the commercial fishing industry (e.g. market prices, pollution etc.). Any external influences that may contribute to a trigger being breached will be identified during the review and, if necessary, referred to any relevant managing agency for action.

Accordingly, 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.

Table 9. Performance indicators and trigger points for the fishery.

GOAL 1. Manage the Ocean Trawl Fishery in a manner that promotes the conservation of biological diversity in the marine environment					
No.	Performance indicator	Data requirements and availability	Trigger point	Robustness	Justification/comments
1	The estimated quantity of ocean trawl catch (by method) which is discarded	Estimates of discarded catch for any observed method, and information on any relevant gear changes in the fishery	The quantity of discards for any observed method increases between consecutive observer surveys	Low	It is difficult to directly measure the impact of this fishery on biodiversity in the estuarine environment. The development of more appropriate indicators is required but it is acknowledged that this is a long term objective that will need to draw on a variety of expertise and knowledge. The performance indicators listed here will be used as surrogates until more direct indicators can be developed. Continuous improvements in fishing gear design and efficiency and fishing practices are a feature of the FMS. Until an appropriate baseline or reference point is established, interpretation of changes in the discarded component of catches will not be able to be clearly linked to fishery-based improvements.
2	Species composition (for all retained and bycatch species) for fishing methods used within the fishery	Quantitative landings from fisher logbooks and discard data from onboard observer surveys	Significant shift in species composition detected between consecutive observer surveys for any method	Medium	Similar to the indicator above, interpretation of changes in the species composition of catches will not be able to be clearly linked to changes in fishing practices until a baseline exists. Gray (1997) describes a range of species richness indexes which may assist in determining whether significant shifts in species composition have occurred.
3	Response of the fishery to marine pest and disease incursions	Reports on the monitoring of marine pests and diseases are needed and will be provided to the Ocean Trawl MAC as needed	Guidelines specified in any Marine Pest and Disease Management Program are not adopted by the ocean trawl fishery	Low	Marine Pest and Disease Management Programs are responsible for monitoring marine pests and diseases (e.g. noxious fish), and developing contingency plans in the event of new incursions. This performance measure monitors whether management of the fishery is responsive to existing or new marine pest or disease incursions that may threaten the biodiversity in the marine environment.
4	Areas closed to commercial ocean trawling in NSW managed waters	Spatial information is required for all closures (including marine parks, aquatic reserves and s.8 fishing closures). This information is available through the Marine Parks Authority and through NSW DPI in the event of any future fishing closures implemented for fishery management purposes	Areas closed to commercial ocean trawling become open after the commencement of the FMS	Medium	Significant closed areas prevent any direct impacts of the fishery on biodiversity in those areas, thus minimising the total impact on biodiversity at the regional or state scale. A triggered review would consider the merits of opening and/or closing different areas to the OTF.

GOAL 2. Maintain stocks of primary and key secondary species harvested by the Ocean Trawl Fishery at sustainable levels					
No.	Performance indicator	Data requirements and availability	Trigger point	Robustness	Justification/comments
1	Changes in the exploitation status of primary or key secondary species to 'overfished' or 'recruitment overfished'	The exploitation status of primary and key secondary species as determined each year by fisheries scientists in accordance with the <i>Framework for the Assessment of Harvested Fish Resources in NSW</i> (Scandol, 2004), considering reported catch and effort data, any available observer data, biological sampling data and any fishery independent data	The exploitation status of a primary or key secondary species is changed to 'overfished' or 'recruitment overfished' by NSW DPI	High	There are two types of overfishing of serious concern. 'Overfishing' occurs when fishing mortality is much greater than natural mortality and indices of stock abundance have declined. 'Recruitment overfishing' is used to describe cases where the fishing pressure has reduced the spawning stock to such a low level that recruitment is significantly affected. The management responses under Objective 2.2 already provide for the development of a recovery program in the event that a species is identified as overfished. This indicator aims to detect any increase in the number of primary or key secondary species being identified as 'overfished' or 'recruitment overfished', as that may indicate that the FMS is not moving the fishery towards a sustainable basis.
2	Total annual landings of all secondary species (other than key secondary species) taken by the prawn and fish trawl sectors of the fishery as a percentage of the total annual landings for those sectors	Requires commercial landings data for all species taken in each sector of the fishery. Data will be obtained through mandatory catch reporting by endorsed ocean trawl fishers	Contribution of secondary species to total trawl landings exceeds 5% in any one year	Low	This indicator does not measure sustainability levels per se, but might indicate shifts in targeting or sudden declines in catch of primary/key secondary species or increases in catch of secondary species. Normal ratios are around 3%. The fish trawl and prawn trawl sectors will be analysed separately.

GOAL 3. Promote the conservation of threatened species, populations and ecological communities likely to be impacted by the operation of the Ocean Trawl Fishery					
No.	Performance indicator	Data requirements and availability	Trigger point	Robustness	Justification/comments
1	Interactions between the fishery and any threatened species, population or ecological community that are likely to threaten the survival of that threatened species, population or ecological community	Data will be obtained and available through catch reporting provided by endorsed OTF fishers, and also by any onboard observer surveys and reports from compliance officers	Any interactions between the fishery and a threatened species, population or ecological community reported by endorsement holders in the fishery or observed during an observer survey that are likely to threaten the survival of that threatened species, population or ecological community, as determined by the Director-General of NSW DPI on advice from relevant threatened species experts	High	Currently, little information is available on interactions between the OTF and threatened species. Commercial fishers are required to report a variety of details when an interaction occurs with a threatened species including contact or capture with gear and condition upon release. Every interaction recorded will be referred to the relevant threatened species authority to determine whether the interaction is likely to threaten the survival of a threatened species, population or ecological community. Any such assessment should include consideration of trends in the number or degree of interactions as well as any other cumulative impacts.
2	Interactions between the fishery and protected species that are likely to threaten the survival of a protected species	Data will be obtained through catch reporting provided by endorsed OTF fishers, and also by any onboard observer surveys and reports from compliance officers	A biennial review undertaken by NSW DPI of interactions between the fishery and a protected species reported by endorsement holders in the fishery or observed during an observer survey is likely to threaten the survival of that protected species, as determined by the Director-General of NSW DPI on advice from relevant threatened species experts	High	Currently, little information is available on interactions between the OTF and protected species. Commercial fishers are required to report a variety of details when an interaction occurs with a protected species including contact or capture with gear and condition upon release. NSW DPI will undertake a biennial review of the level of interaction with protected species to determine whether the levels are likely to threaten the survival of a protected species. Any such assessment should include: consultation with the relevant authority; consideration of trends in the number or degree of interactions as well as any other cumulative impacts.

GOAL 4. Appropriately share the resource and carry out fishing in a manner that minimises negative social impacts					
No.	Performance indicator	Data requirements and availability	Trigger point	Robustness	Justification/comments
1	Change in the distribution of landings between the <i>commercial sector</i> and <i>non-commercial sectors</i> (combining recreational and Indigenous) for each OTF primary species	Requires commercial landings data and a time series of information (or estimates) of catches by other stakeholder sectors. Data and estimates will be obtained through mandatory catch reporting by commercial fishers and through any recreational or Indigenous fishing surveys, and compliance observations	Maximum absolute difference in the distribution of landings between the commercial and non-commercial sectors is greater than 25 percentage points when compared every five years	Medium	Further work would be needed to define specific targets for appropriate sharing of the resource and what might be considered a negative social impact. In the interim, an arbitrary trigger point has been specified that will detect a relative large shift in catch over time between the commercial sector and other stakeholder harvest sectors. This performance indicator can only be measured if updated estimates of non-commercial catch become available between comparison years.
2	Change in the distribution of landings among the <i>NSW commercial fisheries</i> for each OTF primary species	Requires commercial landings data from NSW commercial fisheries, that will be collected and available through mandatory catch reporting arrangements	Maximum absolute difference in the distribution of landings between the assessment and reference years is greater than 15 percentage points	Medium	This indicator compares the distribution of landings among the NSW commercial fisheries for each OTF primary species over time. The data used in the assessment year will be the total landings from the two fiscal years prior to that assessment year. This will be compared to the total landings of two reference years from five years previous. This cycle will continue with assessments occurring every five years.
3	Change in the distribution of landings among the ocean prawn trawl and ocean fish trawl <i>gear types</i> for each OTF primary species	Requires commercial landings data from NSW OTF fishers, that will be collected and available through mandatory catch reporting arrangements	Maximum absolute difference in the distribution of landings between the assessment and reference years is greater than 25 percentage points	Medium	This indicator compares the distribution of landings between ocean prawn trawl and fish trawl gears for each OTF primary species over time and will assist in monitoring and managing equitable allocations within the fishery. The data used in the assessment year will be the total landings from the two fiscal years prior to that assessment year. This will be compared to the total landings of two reference years from five years previous. This cycle will continue with assessments occurring every five years.

GOAL 5. Promote a viable Ocean Trawl Fishery, consistent with ecological sustainability					
No.	Performance indicator	Data requirements and availability	Trigger point	Robustness	Justification/comments
1	Net economic returns to the fishery	Requires data on the average market price of fish (CPI adjusted), total commercial landings in the fishery, indicative operational costs and management costs. Average price data is available from the Sydney Fish Market. Landings data are available through the catch returns submitted by fishers. Indicative data on operational costs will need to come from a variety of direct and indirect sources. NSW DPI will supply management cost information	The Director-General of NSW DPI is satisfied that the gross value of production of the fishery has not exceeded the sum of indicative industry operational costs and government management costs relevant to the fishery for three consecutive years	High	This indicator provides a measure of economic viability of the fishery by monitoring the net returns to the fishery. Net return is a better indicator of economic performance than gross returns as it accounts for changes in fishers' costs over time. A process of determining indicative operational costs will need to be developed in consultation with the Seafood Industry Advisory Council and the MAC. The data obtained will be used to underpin the ten year share-based effort program that will be developed in consultation with the MAC for this fishery. The trigger point may need to be reviewed if inconsistent with the objectives of that program.
2	Average market value of OTF shares when traded	The market value of shares will be collected and recorded by the Share Registrar upon share transfer	Trigger to be determined within two years of the commencement of the share management plan	Medium	Market value of shares provides a general indication of investor's confidence in the economic viability of participating in the OTF, as it takes account of a range of contributing factors.

GOAL 6. Facilitate effective and efficient compliance, research and management of the Ocean Trawl Fishery					
No.	Performance indicator	Data requirements and availability	Trigger point	Robustness	Justification/comments
1	Percentages of total annual inspections in the OTF which result in the detection of minor or major offences	Data requirements include a record of the number and types of offences detected, records of which are kept by NSW DPI	Percentage of inspections resulting in the detection of offences exceeds either of the following: (i) 20% for minor offences; (ii) 10% for major offences	Low	This indicator provides a simple low cost measure of compliance by OTF fishers with management rules. Differentiation between major and minor offences will be determined during the development of the penalty points scheme. In the interim, an overall compliance rate of less than 85% will be used as the trigger point.
2	Number of Ocean Trawl MAC meetings held each year	The number of Ocean Trawl MAC meetings held is available through records kept by NSW DPI	Number of Ocean Trawl MAC meetings is less than 2 in any calendar year, unless otherwise agreed to by the MAC	Low	Holding two Ocean Trawl MAC meetings per year is currently a requirement of the Regulation, which ensures that regular consultation is taking place.
3	Reviews and outcomes of strategic plans for research and compliance in the OTF	Data about frequency and outcomes of reviews required will be available through records kept by NSW DPI	The research or compliance strategic plans expire without being reviewed by NSW DPI, or the strategic plans are not modified consistent with the approved outcomes of a review	Medium	Strategic plans focus research and compliance activities and help to ensure maximum efficiency and cost effectiveness of the programs undertaken. It is important that they are reviewed and updated within the timeframes specified therein.

GOAL 7. Improve knowledge about the Ocean Trawl Fishery and the resources on which it relies					
No.	Performance indicator	Data requirements and availability	Trigger point	Robustness	Justification/comments
1	Number of primary and key secondary species in the OTF with an 'uncertain' or 'undefined' exploitation status	Exploitation status for each primary and key secondary species is stated in the FMS and will be reported in status reports to be produced each odd-numbered year from 2007	The number of primary and key secondary species with an 'uncertain' or 'undefined' exploitation status has not decreased between two consecutive odd-numbered years	High	A reduction in the number of key species with an 'uncertain' or 'undefined' exploitation status will demonstrate an improvement in the knowledge base for the primary and key secondary species in the fishery.
2	The difference between the current and target resource assessment class for primary and key secondary species of the OTF	Target resource assessment classes are outlined in the Resource Assessment Framework and current resource assessment classes will be obtained status reports to be produced each odd-numbered year from 2007	The sum of the difference between the current and target assessment class for primary and key secondary species has not decreased between two consecutive odd-numbered years	High	The Resource Assessment Framework defined five classes of resource assessment into which all harvested species can be placed. Each primary and key secondary species was allocated a target resource assessment class. A movement of primary and key secondary species towards their target resource assessment class demonstrates an improvement in the knowledge base for these species.
3	The number of research projects underway which have a flow of benefits to the OTF and fill information gaps identified by the EIS	Relevant data will be held by NSW DPI and/or external funding bodies	The number of relevant research projects relevant to identified information gaps falls to less than two during any one year	Medium	This is a general indication of the minimum commitment consistent with improving the knowledge base relating to the fishery. Note: the number of research projects does not include routine monitoring and observer programs.
4	Accuracy of catch return data (in terms of quantity of product, record completeness and species identification)	Requires commercial landings, marketing data and information on species identification. Information available from catch returns submitted by fishers, Registered Fish Receiver data and through the observer program	The percentage of species records with poor reporting does not decline after 1 year of operation of new reporting procedures	High	Improving the accuracy of data, in terms of quantity of product retained and species identification, is important for improving the knowledge base. This performance indicator picks up on the re-design of the 'returns' form and the accuracy of reporting of both quantity retained and species identification.

d) Contingency plans for unpredictable events

In addition to the circumstances outlined above, the Minister for Primary Industries may order a review and/or make a modification to the fishing regulatory controls, administrative arrangements or the management strategy in circumstances declared by the Minister for Primary Industries as requiring contingency action, or upon the recommendation of the Ocean Trawl MAC. In the case of the former, the Minister for Primary Industries must consult the Ocean Trawl 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 for Primary Industries 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, the Minister for Primary Industries may also make amendments to the management strategy that the Minister considers to be minor in nature at any time.

e) Monitoring performance of resource 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 varies enormously. Resource assessment processes for the OTF need to be defined to suit the resources available. To achieve this, short-term and long-term approaches will be applied.

A resource assessment process for primary and key secondary species has been developed (Scandol, 2004). This framework summarises the issues associated with resource assessment in NSW and proposes a long term strategy to monitor stock status and assess stocks. Because of the relatively large number of primary species, and the range of knowledge about these species or species-groups, the resource assessment strategy will need to be appropriately based on the level of existing knowledge, the data likely to be available, and the value of the fishery. A long-term approach will be used to assess the status of the primary and key secondary species. Two principles will apply to the long-term proposal for resource assessments:

assessment methods will be consistent with the data (i.e. 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 applied to assess the state of a resource has required the development of novel approaches (see NSW Department of Primary Industries, 2006). Performance indicators and trigger points will be an integral component of the resource assessment proposal and, where possible, the robustness of the indicators and trigger points will be evaluated. An independent review of the assessment methods will be completed within three years, 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 to 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 resource assessments cannot and should not be the same for all primary and key secondary species. Priorities for each species should be determined in consultation with the fishery scientists and the appropriate MACs.

References

Note: articles that have not been externally peer reviewed and published in a journal or book are denoted with an asterisk (*).

- *AFFA (2003a) *Australian National Plan of Action for the Conservation and Management of Sharks*. Shark Advisory Group; Lack, M. (ed). Australian Government Department of Agriculture, Fisheries and Forestry, 76pp.
- *Bureau of Rural Sciences (BRS) (2003). *Fishery Status Reports 2002-03*. Bureau of Rural
- *Courtney, A. J. (1997). Spawning stock dynamics of penaeid prawns in south-east Queensland and considerations for preventing recruitment overfishing. Unpublished PhD Thesis, May 1997, University of Queensland. 168pp.
- *Fletcher, W.J., Chesson, J., Fisher, M., Sainsbury, K.J., Hundloe, T., Smith, A.D.M. and Whitworth, B. (2002). *National ESD reporting framework for Australian Fisheries: the 'How to' guide for wild capture fisheries*. Fisheries Research and Development Corporation Final Report, Project No. 2000/145, Canberra, Australia.
- Gordon, G. N. G., Andrew, N. L. and Montgomery, S. S. (1995). Deterministic compartmental model for the eastern king prawn (*Penaeus plebejus*) fishery in New South Wales. *Marine and Freshwater Research* **46**:793-807.
- Hall, S. J. (1999). *The Effects of Fishing on Marine Ecosystems and Communities*. Fish Biology and Aquatic Resources Series, Volume 1. Blackwell Science, Oxford. 274 pp.
- He, P., Winger, P., Fonteyne, R., MacMullen, P., Lokkeborg, S., van Marlen, B., Moth-Poulsen, T., Zachariassen, K., Sala, A., Thiele, W., Hansen, U., Grimaldo, E., Revill, A., and Polet, H. (2004) Mitigation measures against seabed impact of mobile fishing gears. In: ICES (2004) Report of the ICES-FAO Working Group on Fishing Technology and Fish Behaviour (WGFTFB). ICES CM2004/B:05. Report from the meeting of the EGFTFB in Gdynia, Poland on 20-23 April 2004.
- Hilborn, R. and Walters, C. J. (1992). *Quantitative fisheries stock assessment – choice, dynamics and uncertainty*. Chapman and Hall, London, p. 570.
- ICES (2004) Report of the ICES-FAO Working Group on Fishing Technology and Fish Behaviour (WGFTFB). ICES CM2004/B:05. Report from meeting of the EGFTFB in Gdynia, Poland on 20-23 April 2004.
- Jennings, S. and Kaiser, M.J. (1998). Effects of fishing on marine ecosystems. *Advances in Marine Biology* **34**:201-352.
- Jones, J.B. (1992) Environmental impact of trawling on the seabed: a review. *New Zealand Journal of Marine and Freshwater Research* **26**:59-67.
- Kaiser, M. J. and de Groot, S. (eds) (2000). *Effects of Fishing on Non-target Species and Habitats: Biological, Conservation and Socio-Economic Issues*. Blackwell Science, Oxford.
- Kennelly, S. J., Liggins, G. W. and Broadhurst, M. K. (1998). Retained and discarded by-catch from oceanic prawn trawling in New South Wales, Australia. *Fisheries Research* **36**:217-236.

- *Liggins, G. W. (1996). The interaction between fish trawling (in NSW) and other commercial and recreational fisheries. *Final Report to Fisheries Research and Development Corporation* Project No. 92/79.
- Main, J. & Sangster, G.I. (1979) A study of Bottom Trawling Gear on both Sand and Hard Ground. Scottish Fisheries Research Report No. 14.
- *Montgomery, S. S. (2000) Status of eastern king and school prawn stocks. Proceedings, Juvenile Prawn Summit, Cronulla 26-27 June 2000. NSW Fisheries, Cronulla.
- Myers, R.A. and Worm, B. (2003). Rapid worldwide depletion of predatory fish communities. *Nature* **423**:280-283.
- NSW Department of Primary Industries (2006). Determining the biological sustainability of wild fisheries in NSW: Concepts and definitions. An information paper by the Systems Research, Wild Fisheries Program. 27pp. (Available at www.dpi.nsw.gov.au)
- *NSW Fisheries Indigenous Fisheries Strategy and Implementation Plan (2002). 6 pp.
- *Rowling, K. R. (2001). *Stock Assessment Report for Redfish, 2000*. South East Fishery Assessment Group. Australian Fisheries Management Authority, Canberra.
- *Rowling, K. R. and Raines, L. P. (2000). *Description of the biology and an assessment of the fishery for silver trevally Pseudocaranx dentex off New South Wales*. FRDC Project 97/125 NSW Fisheries Final Report Series No. 24. September, 2000. NSW Fisheries, Cronulla.
- *Rowling, K. R. and Makin, D. L. (2001). *Monitoring of the fishery for gemfish Rexea solandri, 1996 to 2000*. NSW Fisheries Final Report Series, No. 27. NSW Fisheries Research Institute, Cronulla.
- *Roy Morgan Economic Survey (RM-ES). (2001). Economic Survey Results, Unpublished Research, Roy Morgan Research, Sydney. May/June 2001.
- *Sainsbury, K.J., Campbell, R.A. and Whitelaw, A.W. (1993). Effects of trawling on the marine habitat on the North-West shelf of Australia and implications for sustainable fisheries management. **In:** *Sustainable Fisheries Through Sustaining Fish Habitat* (ed. Hancock, D.A.). Proceedings of Australian Society for Fish Biology Workshop, Victor Harbour, 12-13 August, 1992, pp. 137-143. Bureau of Resource Sciences, Canberra.
- Scandol, J. P. (2003). Use of cumulative sum (CUSUM) control charts of landed catch in the management of fisheries. *Fisheries Research* **64**: 19-36.
- *Scandol J. P. (2004). *A Framework for the Assessment of Fish Resources in NSW (Draft)*. NSW Fisheries Fishery Resource Assessment Series, Cronulla.
- *Schnierer, S. and Faulkner, A. (2002). *A description of the aboriginal fisheries of NSW*. Centre for Indigenous Fisheries, School of Environmental Sciences, Southern Cross University.
- *Smith, A. D. M. and Wayte, S. E. (eds) (2002). *The South East Fishery 2002*. Fishery Assessment Report compiled by the South East Fishery Assessment Group. Australian Fisheries Management Authority, Canberra.

Appendices to the FMS

Appendix 1	Copy of Minister's Determination made in respect of the Ocean Trawl Fishery under the <i>Environmental Planning and Assessment Act 1979</i>
Appendix 2	Implementation table
Appendix 3	Supporting policy for ocean trawl bycatch reduction and prawn yields
Appendix 4	Specific management arrangements for trawling for school whiting
Appendix 5	Classes of resource assessment for species harvested in NSW

Appendix 1. Copy of Minister's determination made under the EP&A Act

DETERMINATION WITH RESPECT TO A DESIGNATED FISHING ACTIVITY UNDER SECTION 115O OF THE ENVIRONMENTAL PLANNING AND ASSESSMENT ACT 1979

I, IAN MACDONALD, MLC, Minister for Primary Industries, pursuant to section 115O of the Environmental Planning and Assessment Act 1979 ("the Act"), determine to permit the designated fishing activity described in Schedule 1 to be carried out subject to such modifications as will eliminate or reduce the detrimental effect of the activity on the environment set out in Schedule 2.

I have examined and taken into account to the fullest extent possible all matters affecting or likely to affect the environment by reason of the designated fishing activity.

I have considered inter alia:

1. the Environmental Impact Statement ("EIS") for the Ocean Trawl Fishery published by NSW Department of Primary Industries in August 2004 and the representations duly received with respect to the designated fishing activity to which the EIS relates;
2. the report and recommendations of the NSW Department of Planning dated February 2006;
3. the recommendations of the Director-General, NSW Department of Primary Industries dated March 2006;
4. the matters required to be considered under section 115N of the Act relating to threatened species conservation; and
5. the matters referred to in section 19(2) and section 20(3) of the Marine Parks Act 1997.

Dated this 7th day of June 2006.

IAN MACDONALD, MLC
Minister for Primary Industries

SCHEDULE 1

Designated fishing activity

Fishing activities for commercial purposes in the ocean trawl fishery as described in Schedule 1 of the Fisheries Management Act 1994.

SCHEDULE 2

Modifications

The draft fishery management strategy exhibited in August 2004 as part of the Environmental Impact Statement for the designated fishing activity is revised so as to incorporate:

- a) the amendments expressly stated in the preferred strategy report for the activity dated November 2005;
- b) the recommendations of NSW Department of Planning dated February 2006; and
- c) the recommendations of the Director-General, NSW Department of Primary Industries dated March 2006.

Appendix 2. Implementation table

The following implementation table outlines the target time periods within which each management response detailed in the Fishery Management Strategy is scheduled to be implemented. The table also provides information relating to the head of power for implementation and who has the lead responsibility for carrying out the action(s). A general description of the terms used in the table with respect to target timeframes follows:

Term	Description
Immediate	Upon the date of approval of the strategy
Short Term	Within one year of the date of approval of the strategy
Medium Term	Within 3 years of the date of approval of the strategy
Long term	In excess of three years of the date of approval of the strategy
As required	Whenever the circumstances warrant action
Ongoing	Continuing into the future

Despite the target timeframes listed below, some programs may need to be reprioritised or rescheduled over time in order to direct the limited resources available for implementation to the most critical program areas for designated periods. This may involve prioritising programs within this FMS as well shared or separate programs scheduled in other fisheries. For example, it may be a better use of resources to temporarily divert funding originally targeted for fishery monitoring purposes into addressing some of the critical structural adjustment issues facing the fishery and the industry. One of the key factors to consider in any reprioritisation or rescheduling exercise is the level of relative environmental risk.

Appendix 2. Implementation table for the OTF

Goal 1. Manage the Ocean Trawl Fishery in a manner that promotes the conservation of biological diversity in the marine environment					
OBJECTIVES	MANAGEMENT RESPONSES [Abbrev]	CONTRIBUTES TO GOALS	TARGET TIMEFRAME	RESPONSIBILITY	AUTHORITY
1.1 Mitigate the impact of trawling in NSW ocean waters on ecosystem integrity (species, populations, and ecological communities)	a) Define and map the extent of 'trawling grounds' and determine the intensity of trawling on each of these grounds	1, 2, 7	Medium term	NSW DPI OT Fishers	-
	b) Implement a series of closures to trawling to protect a range of ocean habitats and associated biodiversity, including closure of all reefs and depths greater than 1100 metres to all forms of trawling	1, 2, 4, 7	Depths >1100m - Immediate; Reefs and other areas - Immediate	NSW DPI	Regulatory
	c) Continue the prohibition on using fish trawl nets north of Smoky Cape, and implement additional BRD requirements for prawn trawl nets south of Smoky Cape (to minimise the incidental catch of fish in prawn trawl nets used in this area)	1, 2, 4, 6	Nth of Smoky Cape - Ongoing; Sth of Smoky Cape - see MR1.2b	NSW DPI	Regulatory
	d) Promote research and collaborate with research institutions to improve our understanding of ecosystem functioning and how it is affected by trawling	1, 2, 7	Long term	NSW DPI OT MAC	-
	e) Prohibit mid-water trawling in NSW waters	1, 2, 4	Short term	NSW DPI	Regulatory
1.2 Mitigate the impact of the OTF on non-retained species	a) Design and implement an industry funded scientific observer program to document the degree of interaction of commercial designated fisheries, including the ocean trawl fishery, with non-retained and threatened species and to collect information on the use and effectiveness of Bycatch Reduction Devices	1, 2, 3, 4, 5, 6, 7	Short term	NSW DPI OT MAC	Regulatory
	b) Refine and improve methods for reducing incidental catches, including the introduction of more effective BRDs for prawn trawl nets. In particular, modify the approved 'square mesh panel' BRD to conform to the following specifications: i) [dimensions] ii) [twine diameter] iii) [bating rates] iv) [positioning from cod-end drawstring]	1, 4, 5, 6	(i), (ii) & (iii) Immediate; (iv) Short term	NSW DPI OT Fishers	Regulatory
	c) Investigate alternative handling practices to improve survival of incidental species that are to be returned to the water	2, 4, 6	Ongoing	NSW DPI OT Fishers	Regulatory
	d) Develop a Code of Practice for ocean trawl fishers	1, 2, 3, 4, 6	Medium term	NSW DPI/OT Fishers	Various
	e) Identify areas and/or times of problem incidental catch to target catch ratios and restrict trawling appropriately. In particular, implement closures to trawling around river entrances during times of high river discharge in accordance with the program described in Appendix 3	1, 2, 4, 6	Short term, then ongoing	NSW DPI	Regulatory

Goal 1 cont. Manage the Ocean Trawl Fishery in a manner that promotes the conservation of biological diversity in the marine environment					
OBJECTIVES	MANAGEMENT RESPONSES [Abbrev]	CONTRIBUTES TO GOALS	TARGET TIMEFRAME	RESPONSIBILITY	AUTHORITY
1.3 Mitigate the impact of the OTF on ocean habitats and their associated biota	a) Require the use of trawl gear designs that minimise impacts on habitats and associated biota, and in particular: i) [prohibit fish trawl bobbins n/w of Seal Rocks] ii) [max. fish trawl bobbin size n/w of Seal Rocks of 100 mm diameter subject to further review of scientific literature] iii) [single ground chain of 12 mm or less gauge] iv) [mandatory droppers for prawn trawl nets]	1, 2, 4	Ongoing	NSW DPI	Regulatory
1.4 Prevent the introduction and translocation of marine pests and diseases by fishing activities	a) Implement, in consultation with the relevant MACs, measures required in accordance with any marine pest or disease management plans	1, 2, 3	As required	NSW DPI	Various

Goal 2. Maintain stocks of primary and key secondary species harvested by the Ocean Trawl Fishery at sustainable levels					
OBJECTIVES	MANAGEMENT RESPONSES [Abbrev]	CONTRIBUTES TO GOALS	TARGET TIMEFRAME	RESPONSIBILITY	AUTHORITY
2.1 Prevent overfishing of the stocks of primary and key secondary species by ocean trawl fishers	a) Monitor the quantity, length and/or age and sex composition of the primary and key secondary species taken by commercial designated fishing activities, including the OTF, as part of the overall resource assessment system	2, 5, 6, 7	Short term, then ongoing	NSW DPI	-
	b) Develop a system for and conduct resource assessments for each of the primary and key secondary species taken by commercial designated fishing activities, including the OTF, and review the assessments at least every three years thereafter	2, 4, 5, 7	Medium term	NSW DPI	-
	c) Monitor the commercial landings of all secondary species (other than the key secondary species) taken in the fishery annually for comparison against an historical range for each of those species or groups of species, as part of the overall resource assessment system	2, 4, 5, 7	Short term, then ongoing	NSW DPI	-
	d) Ensure that the selectivity of the gear used in the fishery is appropriate in relation to the biology of the species being targeted. In particular: i) [prawn trawl nets & cod-ends] ii) [fish trawl cod-ends] iii) [arrangements specific to school whiting] iv) [ongoing review and modification]	2, 5, 7	(i) & (ii) Short term; (iii) Medium term; (iv) Ongoing	NSW DPI	Regulatory
	e) Maintain and enhance the effectiveness of the “juvenile king prawn” closures and, in particular: i) [modify South West Rocks closure] ii) [year-round closures] iii) [investigate closures adjacent to the all estuary mouths]	1, 2, 4, 5, 6	(i) Short term; (ii) Immediate; (iii) Medium term	NSW DPI	Regulatory
	f) Develop strategies to establish ‘refuge’ areas and spawning closures for species targeted by trawling	2, 4, 5, 7	Medium term	NSW DPI OT MAC	-
	g) Investigate the cost effectiveness of using fishery independent surveys to provide abundance indices and other information for resource assessment of the primary species taken in the OTF	2, 5, 6, 7	Medium term	NSW DPI	-
	h) Review the efficacy of minimum size limits for fish species taken in the OTF, including the need for minimum legal sizes to be implemented for additional species, and the regulations pertaining to fish with a minimum legal length that are captured in prawn trawl nets south of Smoky Cape	2, 5, 7	Medium term	NSW DPI	Regulatory
	i) Utilise onboard observers to collect additional biological information, including size at maturity and fecundity/brood size data, for the important elasmobranch species taken by the fishery	1, 2, 4, 5, 6	Short term, then ongoing	NSW DPI	-

Goal 2 cont. Maintain stocks of primary and key secondary species harvested by the Ocean Trawl Fishery at sustainable levels					
OBJECTIVES	MANAGEMENT RESPONSES [Abbrev]	CONTRIBUTES TO GOALS	TARGET TIMEFRAME	RESPONSIBILITY	AUTHORITY
2.2 Promote the recovery of overfished species	a) Where the OTF is a major harvester of a species determined as overfished in NSW (recruitment overfished or growth overfished) develop and implement a recovery program for that species as detailed in the harvest strategy	2, 4, 5	Silver trevally - Short term Other species - as required	NSW DPI	Various
	b) Where the OTF is a minor harvester of an overfished species, contribute to the development of any recovery programs for that species, and adopt any measures required by a recovery program	2, 4, 5	As required	NSW DPI OT MAC	-

Goal 3. Promote the conservation of threatened species, populations and ecological communities likely to be impacted by the operation of the Ocean Trawl Fishery					
OBJECTIVES	MANAGEMENT RESPONSES [Abbrev]	CONTRIBUTES TO GOALS	TARGET TIMEFRAME	RESPONSIBILITY	AUTHORITY
3.1 Identify and minimise or eliminate any impacts of fishing activities on threatened species, populations, ecological communities and habitats (including mammals, birds, reptiles, finfish, shellfish and other invertebrates, and vegetation)	a) Modify, in consultation with the Ocean Trawl MAC, the mandatory reporting arrangements to enable collection of information on interactions with or sightings of threatened or protected marine species, and gear interactions with other threatened or protected species	3, 6, 7	Medium term	NSW DPI OT MAC	Policy
	b) Implement, in consultation with the Ocean Trawl MAC, the provisions of any relevant threatened species recovery plans, threat abatement plans, priorities action statements, or other similar management arrangements designed to protect threatened species and/or critical habitat areas	3, 6	As required	NSW DPI OT MAC	Various
	c) Using the Code of Practice, promote the use of fishing techniques that avoid the capture of or interaction with protected fish and fish protected from commercial fishing	3, 4	Medium term	NSW DPI	Regulatory
	d) Determine, through the on-board observer program, the level of interaction between the fishery and marine turtles and seals (protected under the <i>Threatened Species Conservation Act 1995</i>) and assess the need to introduce Turtle or Seal Excluder Devices, or other measures to minimise impacts on these species	3, 5, 7	Medium term, then ongoing	OT MAC	-

Goal 4. Appropriately share the resource and carry out fishing in a manner that minimises negative social impacts					
OBJECTIVES	MANAGEMENT RESPONSES [Abbrev]	CONTRIBUTES TO GOALS	TARGET TIMEFRAME	RESPONSIBILITY	AUTHORITY
4.1 Provide for appropriate access to the fisheries resource by other stakeholders, acknowledging the need of seafood consumers to access quality shellfish and finfish	a) Estimate the total catch of 'primary' and 'key secondary' species in the Ocean Trawl Fishery, taking account of the recorded commercial catch and estimates of recreational, Indigenous and illegal catch	2, 4, 5, 7	Ongoing	NSW DPI	-
4.2 In consultation with the Ocean Trawl MAC, provide for fair and equitable sharing of the fisheries resources with other commercial fisheries (NSW, interstate and Commonwealth)	a) Monitor management arrangements and the annual landings of key ocean trawl species in fisheries that are outside NSW jurisdiction but which impact on stocks shared with the NSW OTF, as part of the resource assessment system	2, 4, 5, 7	Ongoing	NSW DPI	-
	b) Monitor and manage the annual landings of secondary species (other than the 'key secondary' species) within each sector of the OTF, as part of the resource assessment system	1, 4, 6, 7	Ongoing	NSW DPI OT MAC	-
	c) Use cross-fishery and cross-jurisdictional consultation to discuss and then manage issues relating to, but not limited to, the multiple use of specific fishing grounds, collaborative research, fair and equitable access to stocks, complementary management arrangements and other interactions between fishing sectors	1, 2, 4, 5, 7	Ongoing	NSW DPI OT MAC	-
4.3 Provide for the fair and equitable sharing of the fisheries resource within the OTF	a) Limit operations of 'offshore' prawn trawlers to depths less than 275 metres (150 fathoms), and limit operations of 'deepwater' prawn trawlers to depths greater than 275 metres	1, 2, 6	Immediate	NSW DPI	Regulatory
	b) Respond to information about significant changes in relative catches of the primary and key secondary species taken in each of the major sectors of the OTF	2, 4, 5, 7	Ongoing	NSW DPI OT MAC	Various
	c) Manage the multiple use of trawl grounds within the OTF and minimise adverse interactions	4, 5, 7	Ongoing	NSW DPI OT MAC	Various
4.4 Identify and mitigate any negative impacts of the OTF on Aboriginal, cultural or other heritage	a) Manage the OTF in a manner consistent with the Indigenous Fisheries Strategy and Implementation Plan	4, 7	As required	NSW DPI	Various
	b) Modify the activity, where relevant, in response to new information about areas or objects of cultural significance in order to minimise the risk from fishing or fishing activities	4, 5, 7	As required	NSW DPI OT Fishers	Various
4.5 Provide for resolution of conflicts between the OTF and other community interests	a) Modify the activity, in consultation with the Ocean Trawl MAC, to respond appropriately to conflicts between ocean trawl operators and other members of the community	1, 2, 3, 4, 6	As required	NSW DPI OT Fishers	Various

Goal 5. Promote a viable Ocean Trawl Fishery, consistent with ecological sustainability					
OBJECTIVES	MANAGEMENT RESPONSES [Abbrev]	CONTRIBUTES TO GOALS	TARGET TIMEFRAME	RESPONSIBILITY	AUTHORITY
5.1 Manage the harvesting of the primary and key secondary species to achieve the best outcome in terms of optimising biological yield and maximising economic return	a) Determine and implement arrangements to optimise the biological yield for the primary and key secondary species taken in the fishery	2, 4, 5, 7	Long term	NSW DPI OT MAC	-
	b) Identify and implement strategies to maximise the economic return to the fishery, taking into account the conditions required to optimise the biological yield for the range of species taken	2, 4, 5, 7	Medium term	NSW DPI OT MAC	-
	c) Implement suitable gear, area and operational specifications for targeting school whiting (see specific controls in Appendix 4)	1, 2, 4, 5, 6, 7	Various (see Appendix 4)	NSW DPI	Various
5.2 Establish a level of fishing effort to achieve a fishery that is commercially viable (and ecologically sustainable) over the longer term	a) Manage fishing effort in the OTF by: i) [capping activity at currently active levels] ii) [maintaining & extending hull capacity, engine power and net length restrictions] iii) [10 year effort program] iv) [implementing days/nights management scheme]	1, 2, 3, 4, 5, 6	(i) Medium term; (ii) Ongoing; (iii) Short term; (iv) Medium term	NSW DPI	Various
	b) Maintain the prohibition on trawling south of Byron Bay for fishing businesses with vessels currently holding a P4 offshore prawn trawl endorsement	1, 2, 4	Ongoing	NSW DPI	Regulatory
5.3 Promote the economic viability of the OTF, and assess the economic benefits to the community of the fishery	a) Develop, in consultation with the Ocean Trawl MAC, a performance measure for assessing viability at the fishing business level	5, 7	Medium term	NSW DPI OT MAC	-
	b) Investigate the data available to assess the economic multiplier (flow-on) effects of the OTF to the broader community, and develop strategies to improve the quality/usefulness of such data	5, 7	Short term	NSW DPI OT MAC	-
	c) Identify and promote post-harvest practices which will ensure the best return in dollars per kilogram for product of the fishery	5, 6	Medium term	OT MAC	-
	d) Develop a cost recovery framework, in consultation with the MAC and the Ministerial advisory body relating to commercial fishing	4, 5, 6	Medium term	NSW DPI OT MAC	Regulatory
5.4 Provide secure fishing entitlements for OT fishers	a) Implement the share management provisions of the Fisheries Management Act 1994	2, 4, 5	Ongoing	NSW DPI	Regulatory
5.5 Manage food safety risks in the harvesting of shellfish and finfish in the fishery	a) Co-operate with the NSW Food Authority in the development and implementation of food safety programs relevant to the fishery	5, 6, 7	Ongoing	OT Fishers	FP Act

Goal 6. Facilitate cost-effective and efficient compliance, research and management of the Ocean Trawl Fishery					
OBJECTIVES	MANAGEMENT RESPONSES [Abbrev]	CONTRIBUTES TO GOALS	TARGET TIMEFRAME	RESPONSIBILITY	AUTHORITY
6.1 Promote and maximise compliance with the provisions contained in the FMS	a) Develop, implement and monitor a compliance plan for commercial designated fishing activities, including the OTF	1, 2, 3, 5, 6	Short term	NSW DPI	Policy
	b) Review developments in electronic vessel monitoring systems (VMS) and associated catch and effort reporting systems and implement a cost-effective VMS system for the fishery	1, 2, 5, 6, 7	5 years	NSW DPI OT MAC	-
	c) Implement a penalty points scheme (incorporating endorsement suspension and share forfeiture for serious offences and habitual offenders)	1, 2, 3, 5, 6	Medium term	NSW DPI	Regulatory
	d) Establish, in collaboration with the Ocean Trawl MAC, a minimum level of qualifications and training for ocean trawl skippers, to ensure that they are 'fit and proper' persons who will bring credit to the industry	1, 2, 3, 4, 5, 6	Long term	NSW DPI OT MAC	Regulatory
6.2 Identify research priorities required to provide for the sustainable operation of the OTF	a) Develop and implement a Research Strategic Plan for the OTF taking account of the priorities for research outlined in the harvest strategy	1, 2, 3, 4, 5, 6, 7	Short term	NSW DPI	Policy
6.3 Ensure cost effective and efficient management of the OTF	a) Develop and implement the fishing business (skipper) card system	5, 6	Medium term	NSW DPI/OT MAC	Regulatory
	b) For identified trawl grounds inside 3 nautical miles south of Barrenjoey Headland, enter negotiations with the Commonwealth with a view to transferring jurisdiction for fish trawling to the Commonwealth	1, 2, 3, 4, 5, 6, 7	Short term	NSW DPI	-
	c) Taking account of the need for trawling closures as outlined in this FMS and the associated EIS, review the combined effect of fishing closures and, where possible, rationalise the closure regime	1, 2, 3, 4, 5, 6	Medium term	NSW DPI OT MAC	Various
6.4 Provide effective and efficient communication and consultation mechanisms in relation to management of the OTF	a) Utilise a key consultative body, such as the Ocean Trawl Management Advisory Committee (MAC), when undertaking industry consultation on all aspects of the OTF, with the services of an independent Chairperson, as the primary consultative body for issues affecting the fishery	4, 5, 6	Ongoing	NSW DPI	Regulatory
6.5 Implement this strategy in a manner consistent with related Commonwealth and State endorsed programs aimed at protecting aquatic environments and achieving the objectives of ESD	a) Manage the OTF consistently with other jurisdictional or natural resource management requirements, such as the marine parks program, aquatic biodiversity strategy, threatened species program, Indigenous Fisheries Strategy and other relevant strategies	1, 3, 4, 5, 6	Ongoing	NSW DPI	Policy
	b) Provide for the issue of permits under Section 37 of the Fisheries Management Act 1994 authorising the use of modified fishing practices to assist research programs or for purposes consistent with the vision and goals of this management strategy	1, 2, 3, 5, 6, 7	Ongoing	NSW DPI	Regulatory

Goal 7. Improve knowledge about the Ocean Trawl Fishery and the resources on which it relies					
OBJECTIVES	MANAGEMENT RESPONSES [Abbrev]	CONTRIBUTES TO GOALS	TARGET TIMEFRAME	RESPONSIBILITY	AUTHORITY
7.1 Improve the community's understanding and public perception of the OTF	a) Promote awareness of the OTF as part of the overall communication strategy across all commercial designated fishing activities by implementing issue-focused education programs	4, 6, 7	Ongoing	NSW DPI OT MAC	-
7.2 Promote scientific research to collect relevant information about the biology of the primary and key secondary species, the impact of trawling on other species and the environment, and the status of the fishery as a whole, including economic and social factors	a) Promote and support targeted research projects relevant to: i) [biology or assessment of P & K2 species] ii) [habitat distribution and impacts] iii) [biodiversity impacts] iv) [economic and social factors]	1, 2, 3, 4, 5, 6, 7	Short term and ongoing	NSW DPI OT MAC	-
	b) Implement targeted surveys of endorsement holders to obtain more accurate information on the economic and social status of commercial fisheries, including the OTF	4, 5, 6, 7	Medium term	NSW DPI OT Fishers	-
7.3 Improve the quality of the catch and effort information collected from endorsement holders	a) Periodically review the mandatory catch and effort return forms submitted by ocean trawl fishers and implement changes if: i) [poor quality data] ii) [complex forms]	2, 3, 6, 7	Ongoing	NSW DPI OT MAC	Regulatory
	b) Assess the accuracy of the current catch recording system, and species identification in catch records, and provide advice to industry to make needed changes	2, 3, 6, 7	Medium term	NSW DPI	-

Appendix 3. Supporting policy for ocean trawl bycatch reduction and prawn yields

This policy aims to ensure that ocean trawlers do not operate in areas and at times when bycatch levels are likely to be high, such as after flooding events, and to help improve the yield of regional prawn fisheries. The intent is to encourage commercial fishers to take greater responsibility for their environmental performance.

This approach would involve the establishment of joint industry/NSW DPI regional working groups to review and advise on the need for closures to trawling when the conditions so warrant, in order to meet the targets for bycatch reduction and prawn yields outlined in this policy. Peer influence would be used to encourage local trawl operators to avoid areas where the levels of bycatch or small prawns are likely to be high. The working groups would be empowered to request NSW DPI to close an area in the event that some operators did not comply. NSW DPI would implement the closures in circumstances where a working group is not established or not achieving the aim of the policy.

Consistent with the intent to rationalise area closures, this policy will support many of the existing fishing closures that exist around the mouths of estuaries. In areas where permanent closures that extend to the beach already apply this policy would not need to apply.

The effectiveness of the policy and its application will be monitored on an ongoing basis. NSW DPI, in consultation with the MAC, will review and amend the arrangements at a coast wide or regional level in light of practical experience, the implementation of more effective bycatch devices or more selective trawl gear, and the findings from the scientific observer program.

The following arrangements will provide guidance as to the circumstances under which trawling in certain areas or at certain times should be avoided.

Area of interest

Temporary closures introduced under this policy will in most cases be located in ocean waters adjacent to the rivers as detailed in Table 10 attached. GPS co-ordinates will be used to define the boundaries. NSW DPI and regional fisher representatives can examine the option of dividing the closures into pre-defined sections.

Triggers for adopting temporary closures

Triggers include, but are not restricted to:

- Notifications from the Bureau of Meteorology that the river adjacent to the closure area is in flood (Moderate or Major), or
- A 'trial' or a trawl shot that produces in excess of 2 parts bycatch to 1 part retained catch in the case of prawn trawl, or the case of fish trawl 1 part bycatch to 1 part retained catch, or
- A 'trial' or a trawl shot that produces prawns smaller than a count of 50 prawns per ½ kilogram in the case of king prawns or 100 prawns per ½ kilogram in the case of school prawns.

Consultation with regional industry representatives

The working group and regional Ocean Trawl MAC members will be consulted if the above triggers are reached. Ocean Trawl MAC members from adjacent regions should also be informed.

Notification of areas to be avoided by trawlers

Notices of areas to avoid or formal closures should be placed in the Fishermen's Co-operatives closest to the port and directly adjacent ports where the fishing closure applies, and in a prominent location at the wharf from which the majority of endorsed vessels operate. A radio broadcast to fishing vessels should also be made. The notice and broadcast should specify the relevant area, the date(s) and the methods of trawling affected. The notices should provide information on any new or expiring closures.

Time period

The time periods relevant to each closure event are detailed in Table 1 and are subject to early lifting if conditions warrant a change. The period that closures would apply have been determined having regard to the size of the river catchment and the severity of flooding (ie. 'major' or 'moderate' floods).

Any closure that is invoked following a 'trial' should apply for a minimum of one week, or a longer period if agreed by the relevant working group.

Early lifting of a closure

During the period of a closure, regional Ocean Trawl MAC members may request that a 'trial' be undertaken to determine if the closure, or part thereof, should be lifted early. A closure can be lifted if the results fall within the triggers listed above and in the case of a closure introduced for the purposes of improving prawn yields, the prawns caught exhibit hard shells.

Other relevant factors

The following factors should also be observed with respect to this policy:

- A 'trial' should not to be undertaken within 7 days of another 'trial'.
- A Fisheries Officer or duly authorised observer should be present during the trial.
- A 'trial' is to be conducted at no cost to NSW DPI other than the time spent preparing for, observing and follow-up by a Fisheries Officer or duly authorised observer.
- The vessel to be used during the trial must be fitted with a BRD of the following specifications, unless the relevant working group otherwise agree – square mesh panel at the minimum allowable dimensions of 450 square cm and consisting of 55 mm mesh.
- A closure may be lifted to specified methods of trawling (ie. fish or prawn trawling or with specified BRDs installed) if deemed appropriate.
- Where a closure under this program overlaps one of the existing juvenile king prawn closures, the juvenile king prawn closure or parts thereof may also be opened subject to the criteria above. The juvenile king prawn closure will be reinstated on a date determined by NSW DPI in consultation with regional industry representatives, but not exceeding two (2) weeks from its opening.

- Despite closure of waters to trawling under this program, trawling would be permitted by the vessel(s) approved by NSW DPI for the purpose of undertaking a trial in accordance with this program.

Appendix 3. Bycatch and prawn yield closure specifications

River	Area of closure	Period of closure	Comments
Tweed River	From the intersection of mean high water mark and 28°10'S, then north east to the point 28°08.100'S, 153°36.360'E, then south to 28°15'S, 153°36.360'E, then west to the mean high water mark, then generally north along the mean high water mark to the point of commencement.	Major: 3 weeks Moderate: 2 weeks	The same area as the Tweed Heads juvenile king prawn closure (offshore boundary is approx 2½ nautical miles to sea).
Brunswick River	From the mean high water mark 2 nautical miles north of the northern break wall, east 1.2 nautical miles, then generally south 1.2 nautical miles off the mean high water mark for 7 nautical miles, then due west to the mean high water mark, then generally north along the mean high water mark (and across the river entrance) to the point of commencement.	Major: 3 weeks Moderate: 2 weeks	The same area as the Brunswick Heads juvenile king prawn closure extended inshore to the mean high water mark (offshore boundary is approx 1½ nautical miles to sea).
Richmond River	From the intersection of mean high water mark and 28°48.42'S, east to 28°48.42'S, 153°37.10'E, then east to the point 28°48.432'S and 153°37.836'E, then south to the point 28°52.154'S and 153°37.836'E, then south west to the point 28°53.580'S and 153°37.360'E, then south west to the point 28°57.530'S and 153°33.420'E, then south west to the point 29°00.000'S and 153°30.988'E, then due west to the mean high water mark, then generally north along the mean high water mark (and across the river entrance) to the point of commencement.	Major: 4 weeks Moderate: 2 weeks	The same area as the Ballina juvenile king prawn closure extended inshore to the mean high water mark from the northern and southern extremities (offshore boundary is approx 1½ nautical miles to sea).
Evans River	From the intersection of the mean high water mark and the eastern most extremity of Joggly Point (Evans Head), due north for a distance of 2km, then due west to the mean high water mark on the Airforce Beach, then generally south along the mean high water mark (and across the river entrance) to the point of commencement.	Major: 3 weeks Moderate: 2 weeks	The same area as the closure directly off the river entrance and first introduced during the 2001 floods (ie. Not the juvenile king prawn closure to the south). Note this closure applies for 12 months of the year (offshore boundary is approx 1 nautical mile from the river entrance).
Clarence River	The intersection of the mean high water mark and 29°22.4'S then east to a point 3 nautical miles from WOODY HEAD at 29°22.4'S and 153°25.87'E, then south to a point 3 nautical miles east of YAMBA POINT at 29°26.48'S and 153°25.78'E, then south to a point 3 nautical miles east of ANGOURIE POINT at 29°29.2'S and 153°25.5'E, then south to a point 3 nautical miles east of BROOMS HEAD at 29°36.8'S and 153°23.8'E, then west to mean high water mark at BROOMS HEAD at 29°36.8'S and 153°20.4'E, then along the mean high water mark (and across the river entrance) to the point of commencement at WOODY HEAD.	Major: 4 weeks Moderate: 2 weeks	The same area as the Angourie Point juvenile king prawn closure extended inshore to the mean high water mark from the northern and southern extremities (offshore boundary is approx 3 nautical miles to sea)
Bellinger Nambucca Hastings Clyde Moruya	From the mean high water mark 2 nautical miles north of the northern bank of the river entrance (or northern break wall), then due east for 2 nautical miles, then due south to a point 2 nautical miles south of the river entrance (or southern break wall), then due west to the mean high water mark, then generally north along the mean high water mark (and across the river entrance) to the point of commencement.	Major: 3 weeks Moderate: 2 weeks	New Closures

<p>Macleay Manning Hunter Hawkesbury Shoalhaven</p>	<p>From the mean high water mark 3 nautical miles north of the northern bank of the river entrance (or northern break wall), then due east for 3 nautical miles, then due south to a point 3 nautical miles south of the river entrance (or southern break wall), then due west to the mean high water mark, then generally north along the mean high water mark (and across the river entrance) to the point of commencement.</p>	<p>Major: 4 weeks Moderate: 2 weeks</p>	<p>New Closures</p>
---	--	---	---------------------

Appendix 4. Specific management arrangements for trawling for whiting

The following arrangements will apply with respect to trawling activities for the targeting of whiting.

Species

Red spot whiting (*Sillago flindersi*) and stout whiting (*Sillago robusta*).

Catch and effort controls

The level of catch and fishing effort will be monitored to help determine whether the harvest of whiting is sustainable and commercially viable. A target range for the annual landed catch of whiting will be set at 1,110 to 1,400 tonnes per year (the two species combined), with a trigger to review the arrangements for harvesting whiting if the annual catch lies outside this range. In the event that the upper catch trigger is exceeded, consideration will be given to implementing more stringent controls on whiting fishing effort, including creating a separate limited access fishery.

If additional biological information shows significant differences between red spot whiting and stout whiting, the catch ranges may need to be set differently for each of them.

Prawn gear and areas

Prawn trawl endorsement holders will be required to use square mesh cod-ends (that retain prawns and whiting at an appropriate size) when trawling in all waters open to trawling (see management response 2.1(d)(i)). Prawn trawl nets will also need to include an approved BRD, such as the modified 'square mesh panel' (see management response 1.2(b)).

The FMS provides a period of one year before the modified square mesh panel will need to be positioned within 1.2 metres from the cod-end drawstring so that it effectively excludes small fish, including whiting. This provides a one year period for industry and DPI to identify a limited number of designated whiting grounds and associated times within which a square mesh panel comprising 40 mm mesh can continue to be used. The 40 mm mesh panel will still retain appropriately sized whiting whereas the standard 65 or 75 mm minimum mesh panel will not.

Fish gear and areas

Fish trawl endorsement holders can use a net with a minimum 90 mm mesh throughout and a cod-end made of double braided twine in all waters open to trawling that are less than 55 metres (30 fathoms), subject to a firm commitment to conduct and implement the results of research relating to the selectivity of a single rig net designed specifically to catch whiting at optimum sizes and to minimise bycatch - i.e. testing gear configurations such as mesh orientation, cod-end circumference, hanging ratio, twine diameter, etc. This research will be completed within the next three years and will be funded by fishing businesses with entitlements in the OTF, with industry input in the form of a working group to oversee the project. Opportunities for supplementary funding through external sources will be explored.

Ongoing review

The above arrangements will be subject to ongoing review pending the outcomes of research, such as on the biology or stock dynamics of red spot whiting or stout whiting.

Appendix 5. Classes of resource assessment for species harvested in NSW

Class One

Class One or dynamic assessment models have been built and successfully applied to the management of the NSW eastern rock lobster, abalone and gemfish fisheries. This class of assessment calibrates complex population models to indices of abundance and other information about population structure. These models require a credible and high contrast index of abundance or the integration of other data. Projecting the stock dynamics forward in time can be used as the basis of a quantitative risk analysis of alternative harvesting options. The “trigger points” of these models should be interpreted in terms of the limit/target biological reference points, such as B/B_0 or $F/F_{0.1}$, that are used to manage international fisheries. Such models are time consuming and expensive to prepare, execute and analyse. The best forecast results of these models are obtained when an index of recruitment is available and applied. Application of stock-recruitment relationships will degrade the forecasts from these models.

It is recommended that lobster and abalone fisheries continue to use Class One assessments. Other primary/target species will be provided with Class One assessments upon the basis of assessment priority and research opportunity. In the short term (less than three years) most species will not have a research program focussed upon the completion of Class One assessments. Effective and efficient management systems will be built upon other classes of resource assessment. The proposal to use the TAC Committee to determine the effort in the commercial prawn fisheries will require improvements to the resource assessment of these stocks. The socio-economic and biological consequences of allocating effort between fisheries requires additional consideration and analysis. Prawns support the most valuable commercial fishery in NSW and require prioritisation within resource assessment research programs. The ARC Linkage (PhD-based) project to investigate these fisheries was initiated in March 2004². Even if the TAC Committee does not play a significant role in the management of these stocks, this research should generate important outcomes for these fisheries and raise the assessment of these important stocks to Class One.

Class Two

Class Two assessment would be applied when there is a good understanding of the individual growth and total mortality in NSW and a credible, though not necessarily excellent, index of abundance for that species (such as a credible CPUE time-series). The population structure would be monitored with indicators derived from age and length-based data (only lengths would be used for crustaceans).

Class Two assessments would thus be completed using empirical indicators only. These indicators and the associated target and trigger points would be determined and, after appropriate consultation, included in an amended FMS. Targets and trigger points for these indicators will be determined using: biological knowledge of a species (such as length at maturity); and/or simulation testing methods. Certain primary/target species would be promoted to Class One assessments as priorities indicate. Species identified as primary or target species within an FMS would be given

² Mathew Ives was selected as the successful candidate and is expected to complete his PhD on a “Quantitative Analysis of Prawn Harvesting Strategies in NSW” by the end of 2006.

Class Two assessments along with as many key secondary species as possible (but with lower priority).

Class Three

Class Three assessment would be applied to the more valuable species when the indicator of abundance was less credible or there was no potential for any age structured monitoring to occur. Length structured monitoring and assessment would be applied to these species only. There should be basic local information on the biology and mortality of species undergoing Class Three assessments. Class Three assessments would thus be completed using empirical indicators only. These indicators and the associated target and trigger points would be determined and, after appropriate consultation, included in an amended FMS. Targets and trigger points for these indicators will be determined using: biological knowledge of a species (such as length at maturity); and/or simulation testing methods. All species identified as byproduct or key secondary species (but not given a Class Two assessment) should be assessed in this way. Some non-key secondary or byproduct species could be included as growth and mortality information became available.

Class Four

Class Four assessments would be applied only to species of very low value and where very little information exists apart from landings data. Resource assessment would be based upon landings or catch per fisher data only. The method currently used to define the trigger points for commercial landings within the completed FMS will continue to be used until a superior methodology can be justified. This would be the simplest form of resource assessment and only used for any secondary or byproduct species that are not assessed with Class Two or Class Three methods. There must be at least credible information on commercial landings for this method to be applied.

Class Five

Class Five assessment recognises that no species-specific resource assessment can be undertaken (usually because there is no locally collected information from commercial or recreational fisheries). Assessment of these species could be based upon data from the observer program or fishery independent surveys as it became available but such work is not likely to be high priority. It is probable that assessment of these species will be via “ecosystem” indicators and/or indicators of discarding. This class is reserved for species where there is no information at present but where the species is known to experience some type of fishing mortality.