

**APPLICATION TO DEPARTMENT OF
ENVIRONMENT AND HERITAGE
ON THE
WEST COAST PURSE SEINE MANAGED
FISHERY AND SOUTH COAST PURSE SEINE
MANAGED FISHERY**

*Against the Commonwealth Guidelines for the
Ecologically Sustainable Management of Fisheries*

For Consideration under Part 13A of the
*Environment Protection and Biodiversity
Conservation Act 1999*

JUNE 2005



Department of Fisheries
Government of Western Australia



Fish for the future

**DEPARTMENT OF FISHERIES, WESTERN AUSTRALIA
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1. INTRODUCTION TO THE APPLICATION

1.1 DESCRIPTION OF INFORMATION PROVIDED

This is an application to Department of Environment and Heritage (DEH) to assess the West Coast Purse Seine Managed Fishery (WCPSMF) and the South Coast Purse Seine Managed Fishery (SCPSMF) against the Commonwealth guidelines for sustainable fisheries. The submission of a successful application against these guidelines is now needed to meet the requirements under Part 13A of the *Environment Protection and Biodiversity Conservation Act, 1999* (EPBC) to enable:

Pilchards (mulies) *Sardinops sagax*;

Scaly mackerel *Sardinella lemuru*;

Perth Herring *Nematalosa vlaminghi*;

Yellowtail scad *Trachurus novaezelandiae*;

Australian anchovy *Engraulis australis*; and

Maray *Etrumeus teres*,

* indicates key species

to remain on the section 303DB list of species exempt from export regulations (previously Schedule 4 of the *Wildlife Protection (Regulation of Exports and Imports) Act, 1982*) past December 2005. It should be noted that yellowtail scad are included in the present WCPSMF plan due to an error in common names. This error will be corrected under the new WCPSMF plan currently being drafted.

The information provided in this application covers all the elements specified in the *Guidelines for the Ecologically Sustainable Management of Fisheries* (located on the DEH website www.ea.gov.au/coasts/fisheries/assessment/guidelines.html) along with other information (at varying levels of complexity) considered relevant to those who wish to gain an understanding of the management of this fishery. The application includes:

- Comprehensive background information on the biology of the two key species listed above, the history of the WCPSMF off the west coast of Western Australia and the SCPSMF off the south coast of Western Australia, and a description of the management arrangements, which provides the context for assessing this application (see Section 2 for details).
- A description of the National Ecological Sustainable Development (ESD) reporting framework and methodology used to generate the information presented in the application (see Section 3 for details).
- Specific supporting statements relevant to each of the criteria within the Commonwealth Guidelines. These criteria include the “General Requirements”, which covers many of the governance aspects related to the management of the WCPSMF and SCPSMF, plus each of the objectives listed under “Principle 1” (target species issues) and “Principle 2” (broader ecosystem issues) of the Guidelines (see Section 4).
- Section 4 also has, where appropriate, specific links and reference to the detailed ESD component reports contained in Section 5. Referral to this additional information is facilitated by the incorporation of appropriately placed hyperlinks (electronic version only).

- At the end of Section 4 there is an [OVERVIEW TABLE](#) that for each issue, outlines which DEH Guidelines are relevant; if there is an operational objective, the availability of suitable data for the indicators, whether the current performance against the limit/measure chosen is acceptable, and a summary of what (if any) future actions are required.
- Section 5 includes a comprehensive account of the risk assessment outcomes and current performance of the WCPSMF and SCPSMF, presented in the ESD format, covering each of the environmental and governance issues relevant to this application. These reports cover each of the issues in a comprehensive manner and include either; the explicit objectives, indicators, performance measures, current and future management responses and justification for each major component; or a full justification for why specific management of this issue is not required.

1.2 OVERVIEW OF APPLICATION

The pilchard (*Sardinops sagax*) and scaly mackerel (*Sardinella lemuru*) are the key species targeted by these fisheries. From year to year varying quantities of maray, anchovies and yellowtail scad are also caught. In 2003, the WCPSMF landed a total of 1,164 tonnes of fish, which had an estimated value to the fishers of \$660,000. While some fish are utilised as high-value products for human consumption and recreational bait, slightly more than half of the catch in 2003 went to lower value uses such as pet food and commercial rock lobster and finfish trap bait. As a result fishery revenue fell by 40% in 2003. Owing to a significant increase in production from the South Australian pilchard fishery, the demand for West Australian product for use as tuna feed decreased throughout 2003.

The SCPSMF for the same year landed a total of 1,592 tonnes of fish, which had an estimated value to the fishers of \$1.59 million. The higher value angling block/trays and individually quick frozen fish continue to represent almost the entire catch. The bait market remains the preferred destination for the catch but again demand for pilchards from West Australia has not recovered to the previously high levels of the 1990's (Mitchell, Leary & Gaughan 2003).

The *Fish Resources Management Act, 1994* (FRMA) provides the legislative framework to implement the management arrangements for these fisheries. The FRMA and the specific management plans for the WCPSMF and SCPSMF, adhere to arrangements established under relevant Australian laws with reference to international agreements as documented in Section 5.4.2.

The stocks of pilchards are presently in recovery mode after the mass mortality events of 1995 and again in 1998/99. These events caused major depletion of mature pilchards on the southern and western coasts of WA. The cause for these mortalities has been indicated as a viral disease (*herpesvirus*) but the origin was never pinpointed. The virus only affected mature pilchards and did not affect any other species including other small pelagic species.

The maintenance of the pilchard stocks as well as the successful continuation of the fishery has been achieved through the combination of:

- past research projects to improve the relevancy and accuracy of information on the biology of pilchards and scaly mackerel and improve the management for the fishery;
- the sophisticated suite of management arrangements in place; and
- the proactive management used in the WCPSMF and SCPSMF.

The successful maintenance of the stocks will be sustained in the future by research and the continued application of effective, proactive management.

Small pelagic fish, typically pilchards and scaly mackerel, occupy a pivotal position of energy transfer in the food webs in which they occur and are often the main link between primary and secondary production and large predators. It should be noted that in normal circumstances the target Total Allowable Catch (TAC) of the WCPSMF and the quota in the SCPSMF is set at 10 –15% of spawning biomass, thus leaving 85 –90% available for reproduction and for natural predators (Mitchell, Leary & Gaughan 2002).

Purse seining has very little effect on the habitat. Although the purse seine gear used in WA can contact the sea floor in some areas, the relatively light construction of the gear suggests that there is no significant impact occurring to, for example, seagrass beds. However, purse seining can have a negative impact on protected species such as seabirds and dolphins. While the WCPSMF and SCPSMF have experienced some negative interactions with both dolphins and seabirds, the Department has been working with the industry to significantly reduce interactions through an improved code of practice and formation of a mitigation working group.

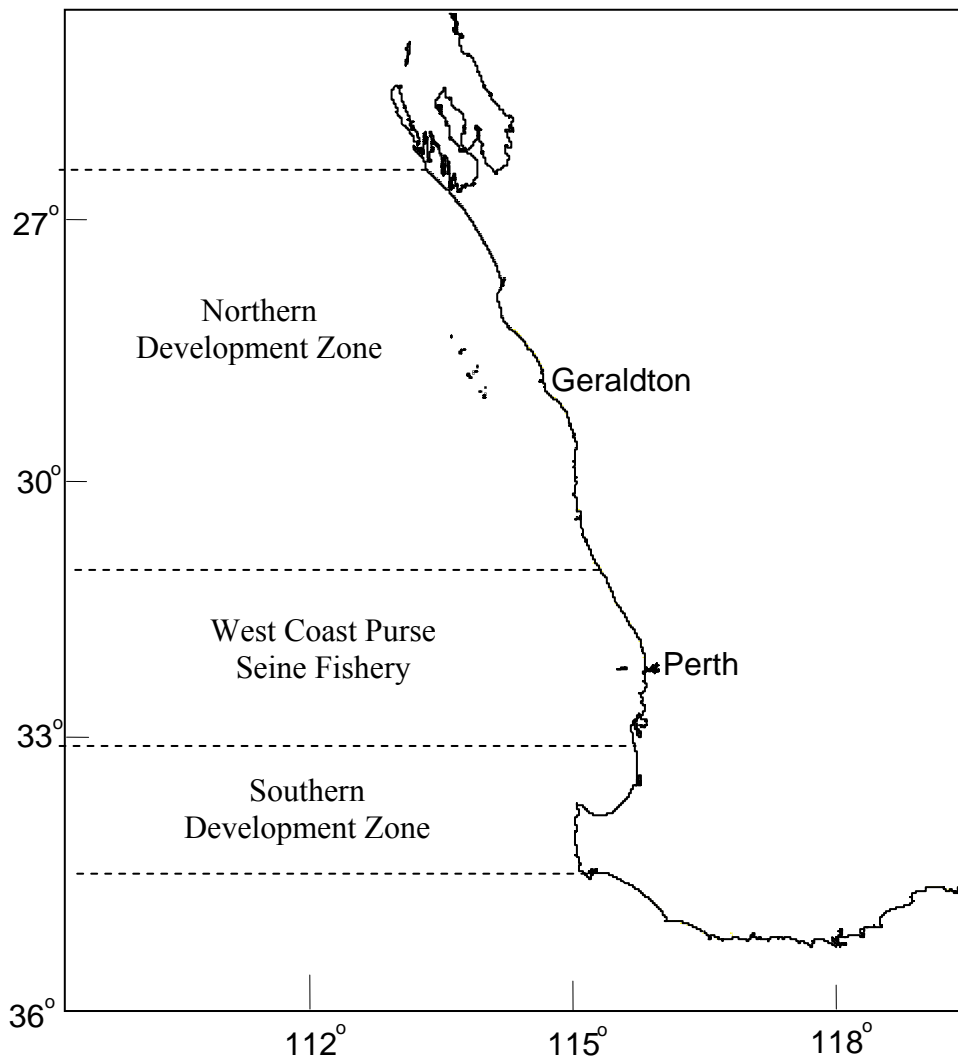
Consequently, the management regime for the WCPSMF and SCPSMF should meet the *Guidelines for the Ecologically Sustainable Management of Fisheries*. Detailed justification for this conclusion is documented within the remainder of this application.

2. BACKGROUND INFORMATION

2.1 DESCRIPTION OF THE FISHERY

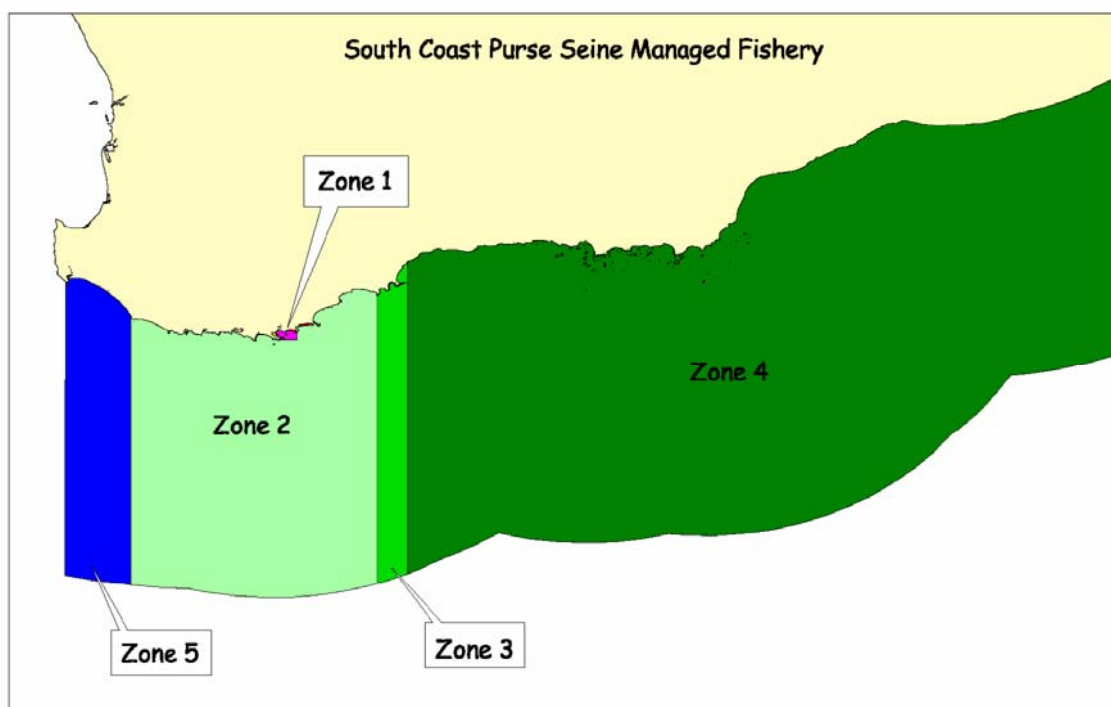
The WCPSMF is a purse-seine net-based fishery that operates in waters from Lancelin 31°00' S latitude to Cape Bouvard 33°00' S latitude. Due to onshore handling requirements the fishery operates from the major harbours in this area. There is a zone on both the northern and southern sides of the WCPSMF simply named the northern and southern development zones. These areas, as the name suggests, have been going through a developmental process to establish if the WCPSMF should be extended to include a larger section of the West Coast. The Department is planning to include the Northern and Southern Development zones within the existing west coast fishery in the new West Coast Purse Seine Management Plan. This will extend the area covered under the plan from Steep Point 26°08' S latitude to Cape Leeuwin 34° 40' S latitude.

Figure 1. The WCPSMF locality map.



The SCPSMF is a purse-seine net-based fishery that operates in waters between Cape Leeuwin and the WA/SA border. The fishery consists of three primary management zones. The Albany zone (Zone 2) extends from Point D'Entrecasteaux to Cape Knob. The King George Sound zone (Zone 1) is a subset of this area and the two zones are reported together. The Bremer Bay zone (Zone 3) extends from Cape Knob to longitude 120° E, and the Esperance zone (Zone 4) from 120° E to the WA/SA border. A further zone (Zone 5) exists between Cape Leeuwin and Point D'Entrecasteaux but has not been significantly fished to date.

Figure 2: The SCPSMF Locality Map



Zone 1 and 2: King George Sound and Albany Zone 3: Bremer Bay Zone 4: Esperance
Zone 5: Windy Harbour/Augusta.

The lower West Coast of Western Australia is unique in terms of the spatial overlap of pilchards and scaly mackerel, two similar sized species of sardines. Pilchards are a warm-temperate species with their distribution in WA extending only as far north as Geraldton, whereas scaly mackerel are a tropical sardine, distributed only as far south as the Perth metropolitan region. Both are typical of many small pelagic fish of the herring and sardine family in that they can respond rapidly to changes in conditions in their environment, such as changes in temperatures and food availability. The following diagrams illustrates the change in proportion of total catch that the two key species make up over different oceanic periods and different geographic location (Gaughan 2003).

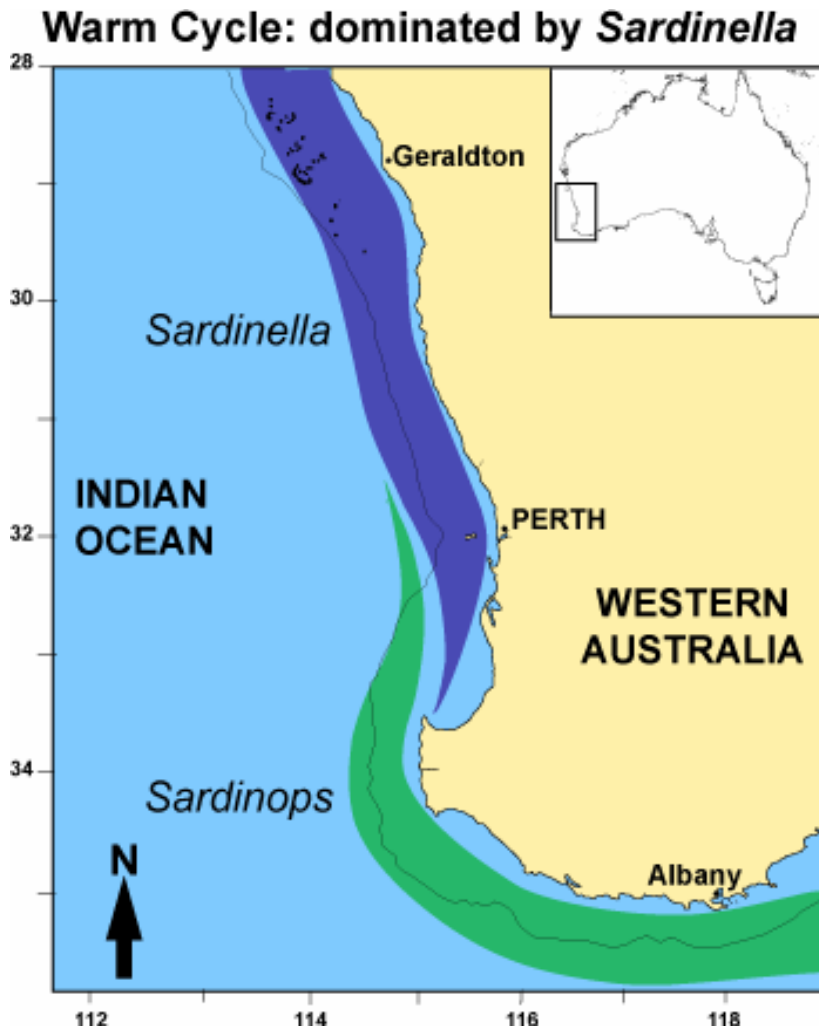


Figure 3: Schematic representation of distribution during warm water periods

A schematic representation of the relative latitudinal variations in abundance of pilchards and scaly mackerel along the WA coast between Perth and Geraldton in a warm water period. The shaded areas that represent relative abundance have only been shown for the area of interest. (Scaly mackerel extend north of Geraldton, while pilchards extend south and then east onto the south coast region.) The increased abundance of scaly mackerel in the Perth region shows that there is sufficient data to indicate the relative abundance of this species between Geraldton and Perth. Thus, while the Perth stock of scaly mackerel may be thought of as a southern "outpost", data are available to show the gradual decrease in pilchard abundance with distance northward from Perth (Gaughan 2003).

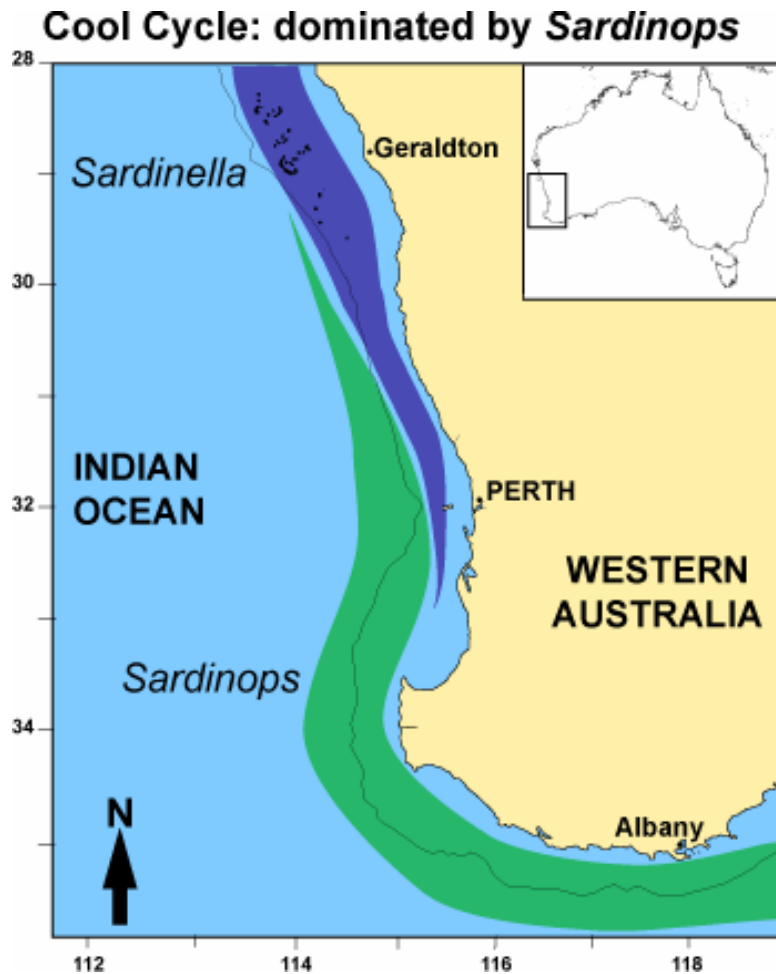


Figure 4: Schematic representation of distribution during cool water periods
A schematic representation of the relative latitudinal variations in abundance of pilchards and scaly mackerel along the WA coast between Perth and Geraldton in a cool water period. (Gaughan 2003).

The majority of the fishing effort in the WCPSMF is concentrated around the metropolitan area with historical catch data showing 90% of the total west coast catch comes from the present managed fishery area. The licences presently permitted to take small pelagic fish in the WCPSMF consists of:

- **Southern Development zone**
 - a) Two licences in the Southern Zone that can, under the authority of an endorsement on a Fishing Boat License, take pilchards and other small pelagic fish by power hauled purse seine nets.
 - b) One licensee in the Southern Zone that can, under the authority of an endorsement on a Fishing Boat Licence, take all small pelagic fish, excluding pilchards, by power hauled purse seine nets.
 - c) One beach seine fisherman who, through the objection process, has established a claim to take pilchards and other small pelagic fish from dinghies using a hand hauled purse seine net within one kilometre of the beach within the Southern Zone.

- **WCPSMF**
 - d) One licensee operates under the authority of an endorsement on a Fishing Boat Licence allowing him to take small pelagic fish by power hauled purse seine nets, excluding pilchards within the Central Zone
 - e) Five supplementary licences under the existing West Coast Purse Seine Management Plan that can purse seine for pilchards and other small pelagic fish using hand hauled nets within the Central Zone.
 - f) Eight full managed fishery licences (as distinct from supplementary licences) that, under the existing West Coast Purse Seine Management Plan, can be utilised to take pilchards and other small pelagic fish by power hauled purse seine nets within the WCPSMF.
- **Northern Development zone**
 - g) One licensee who operates under the authority of an endorsement on a Fishing Boat Licence that allows him to fish in the Northern Zone with power hauled purse seine nets.

A full managed fishery licence allows fishermen to take small pelagic species with power haul nets whereas a supplementary licence allows the fishermen to only use hand haul nets.

The present management of the WCPSMF is under the West Coast Purse Seine Limited Entry Fishery Notice 1989 (WCPSMF). Since its inception date in October 1989 this Management Plan has limited the effort permitted in the fishery by a Total Allowable Catch, plus a number of input controls including limiting the number of fishermen, along with restrictions on;

- boat size (maximum 16 meters);
- type of net hauling equipment (power or hand);
- length of net (maximum 350 meters);
- size of mesh (minimum 18 mm); and
- limited species (to those mentioned at the start of this report).

The WCPSMF is currently undergoing change in the method of management of the fishery. In 2003, the Minister for Fisheries approved the drafting of new legislation to move from an input managed fishery to an individual transferable quota (ITQ) managed fishery, where units represent a proportion of the TAC of the fishery and will be a tradable item (R Gould, 2003).

The majority of the fishing effort in the SCPSMF is concentrated around the Albany area. The licences presently permitted to take small pelagic fish in the SCPSMF consists of:

- **Zone 1 -ALBANY**

20 licensees currently hold sufficient units to allow them to fish in zone 1 of the SCPSMF. Seven of these licensees also hold sufficient units to also fish in zone 2 of the fishery.
- **Zone 2 – KING GEORGE SOUND**

There are eight licensees that currently hold sufficient units to allow them to fish in zone 2 of the fishery. Seven of these also have access to zone 1.
- **Zone 3 –BREMER BAY**

7 licensees currently hold sufficient units to allow them to fish in zone 3 of the fishery. None of these licensees have units in other zones of the fishery.

- **Zone 4 – ESPERANCE**

There are currently five licensees with sufficient units to allow them to fish in zone 4 of the fishery. None of these licensees have units in other zones of the fishery.

The present management of the SCPSMF is under the South Coast Purse Seine Limited Entry Fishery Notice 1994 (SCPSMF). Since its inception date in 1994 this Management Plan has limited the effort permitted in the fishery by a number of input controls including limiting the number of licensees, such as in the WCPSMF.

Even though the fishing season for pilchards runs from 1 April to 31 March, data supplied in this report will be on a calendar year basis.

Fishing Operations

Pilchards are the target species for the WCPSMF, SCPSMF and the adjacent Southern Development Zone. Scaly mackerel are the target species within the Northern Development Zone. The purse seine boats are mostly a mixture of converted ex-rock lobster boats and purpose-built purse seine vessels.

The gear used by the majority of pilchard boats includes a purse seine net which is a fishing net designed to surround a shoal of fish which has a cork or float line and which has a series of rings attached to the lead or ground line through which is passed a purse line which, when hauled, closes the bottom of the net.

Catch rates are generally consistent throughout the year, with fishing trips around one day duration. This maximises the freshness of the fish reaching the factories and eventually the consumers.

History

Early History – 1950s to 1970s

Fishing for pilchards in WA began in the Fremantle area during the 1950's, however the fishery did not develop until the advent of purse seining in the 1970's. This led the fishery to expand around the coast of WA. Initially all vessels were limited in size and this prevented onboard processing of the fish. The rapid deterioration of fish prevented vessels being able to target stocks that were distant to on land processing facilities. The vessel length restrictions are planned to be lifted when output limits are placed on the fishery, therefore larger vessels are expected to be seen in the industry in the near future (Fletcher et al. 1997).

Fishing for pilchards in the Albany region commenced around 1963/64 using drop nets from the wharf in Princess Royal Harbour. The fishery developed slowly and methods changed little until the late 1970s when purse seining took over as the main method. By 1980/81, 80 per cent of the total catch was taken using purse seine nets.

The introduction of ITQs in the Southern Bluefin Tuna Fishery in 1983 and development of a pet food market in 1984 resulted in extra boats entering the pilchard

fishery in the mid 1980s. The number of boats operating in the King George Sound Pilchard Fishery increased from 13 in early 1984 to 25 by the end of 1985. During this time the catch more than doubled from 1596 tonnes in 1983/84 to 3517 tonnes in 1984/85.

In October 1985, the waters of King George Sound became a restricted entry fishery and certain criteria were required to be met before future access would be given. Based on these criteria, there were eight full time purse seine fishermen approved to continue operating in the King George Sound Fishery (Moore 1989).

The expansion of the South Coast Fishery prompted the setting up of a working group in November 1986 for the South Coast Purse Seine Fishery, to review management arrangements in the King George Sound Pilchard Fishery. Part of the charter for this group was also to investigate options for the WCPSMF. The recommendations of this group were adopted in November 1987, including a proposal to introduce limited entry measures for the Cockburn Sound and adjacent waters fishery. It also considered that development zones on either side of the Cockburn Sound and adjacent waters fishery were necessary (Moore 1989).

The working group recommendations were primarily aimed at curtailing fishing effort in King George Sound. Many of these recommendations were also included in the King George Sound Purse Seine Limited Entry Fishery Notice which was gazetted in 1988.

The recommended curtailing of fishing effort was achieved by creating different categories of licences. For example:

‘A Class’ licences were issued to those vessels which had remained active and had caught the minimum of 50 tonnes of pilchards in the three year period prior to 30 April 1985. ‘A Class’ licensees were permitted year round access to King George Sound. These licensees were provided ‘permanent’ access to the Fishery but were only permitted to transfer their licence to ‘B Class’ licensees and all vessels had to be owner operated. However, by 1989 ‘A Class’ licences became fully transferable.

‘B Class’ licences were given to those vessels which had not caught the minimum of 50 tonnes of pilchard in the 3 year period prior to 30 April 1985. ‘B Class’ licensees were permitted access to King George Sound on a seasonal basis. These licences were non-transferable with continued access to be reviewed in 1989. In December 1989 a decision was made to extend the seasonal access for ‘B Class’ licensees in King George Sound until 1990.

‘C Class’ access permitted a licence holder to operate in the Albany Development Zone outside of King George Sound.

Development of Formal Management Arrangements for the West Coast

In December 1987, the Minister announced that a development plan needed to be formulated to allow for ordered growth of purse seining in Western Australia. The ‘*Draft Management Plan For Perth Metropolitan Purse-Seine Fishery*’ (Fisheries Management Paper No.14) set out the controls needed for the development of the fishery. The report was put out for public comment and, after taking into

consideration issues raised in submissions the management plan for the 'Perth Metropolitan Purse-Seine Fishery', (Fisheries Management Paper No.24) was produced in 1989 (Moore 1989).

The management plan for the Perth metropolitan purse seine fishery was applicable to the area from Lancelin (31°S) to (33°S) near Cape Bouvard. Continued access was issued under two methods. A fully transferable limited entry licence was granted to licensed fishing boats that caught an average of 20 tonnes or more during the period of 1 July 1982 to 30 June 1986 inclusive by use of purse-seine nets in the central zone. A supplementary access endorsement, which is not transferable, was granted to a licensed fishing boat used to catch between one and twenty tonnes during the period of 1 July 1982 to 30 June 1986 inclusive by use of purse-seine nets in the central zone. This left eight full licence holders and five supplementary holders in the fishery.

Gear permitted under the WCPSMF management plan restricted boat size to 16 meters and the length of purse seine net to 350 meters with a minimum mesh size of 18 mm. Only limited entry licence holders were permitted to use mechanical assistance to haul nets.

The West Coast Purse Seine Limited Entry Fishery was gazetted in September 1989. Area closures included in the plan were;

- Cockburn Sound, Warnbro Sound and Marmion Marine Park;
- Within 1000 meters of shore north of 31°54'S and south of 32°16'S latitudes.

Development of the South Coast Fishery

The pilchard fishery based around Albany expanded in the 1970's to meet a growing demand for bait by the southern bluefin tuna fleet. Purse seining began to take off in 1980 and this type of fishing method was quickly adopted. By 1988 the catch around the Albany area was up to 8,500 tonnes with 32 boats operating. In the following years, fisheries management measures saw the fleet based in Albany reduced to 22 boats and quotas were established based on a total allowable catch, which varied between 3 – 5,000 tonnes per year. More recently, unprecedented events in the fishery have seen the Albany based fleet reduced to approximately 10 boats, as a response to the very low levels of pilchards immediately following the virus outbreaks, and the consequential zero quota for the following years.

In 1989, a processing unit was established along the coast east of Albany at Bremer Bay. Subsequently, the small pilchard fleet based in Bremer Bay rose from a 1,500 tonne TAC in 1990 to 2,500 tonne TAC in the following years until the mass deaths in 1995/1998. Due to the concerns for the health of pilchard stocks in Bremer Bay, the quota was also reduced to zero in 2000/2001 in this area. Stocks are currently rebuilding.

A small fleet has also been based around the town of Esperance which, after developing for several years, showed a steadily increasing catch. In 1995, permanent fishing rights were allocated to the Esperance-based fleet. From 1996 it has been managed in a similar fashion to the fleet at Bremer Bay and Albany (brought under formal management arrangements in 1994) with gear controls and a total allowable catch. There are currently only two boats operating out of Esperance.

The South Coast Purse Seine Limited Entry Fishery was gazetted in 1994.

Other gazetted notices relevant to the WCPSMF and the SCPSMF include;

- August 1988 prohibiting the use of purse seine nets.;
- April 1991 prohibiting the use of net hauling devices such as;
 - a fishing net drum;
 - a pneumatic power block; and
 - other similar devices for hauling a fishing net; and
 - October 1991 prohibiting all commercial fishermen from taking pilchards by any means.

The following legislation currently applies to the use of purse seine nets to take pilchards and other small pelagic fish off the south coast.

- *Net Hauling Restrictions Notice 1991* that prohibits persons from using fishing net drum, a pneumatic power block or other similar device for hauling a fishing net unless suitably endorsed.
- *Fishery Notice No 312* that relates to use of purse seine nets.
- *The Pilchard Fishing (Professional) Restrictions Notice 1992* prohibiting the taking of pilchard in Western Australian waters.
- *The South Coast Purse Seine Managed Fishery Management Plan 1994* (as amended).

All of the south coast came under one management plan in 1996 with 5 zones (Figure 1) extending from Cape Leeuwin to the South Australian border.

Up until 1988, the Western Australian Government did not have control over fishing in oceanic waters further than three miles from shore. In April 1988 the management of small pelagic fish and many other species came under state control with the signing of the Offshore Constitutional Settlement (OCS). This gave jurisdictional control of most small pelagic fish in the Australian Fishing zone, which extends to 200 miles, to the State Government. Small pelagic species that were not covered (outside 3 miles) include blue and jack mackerel (Peruvian & greenback jack mackerel) and yellowtail scad and redbait (Moore 1989).

Figure 5: Annual catch (t) of fish in the WCPSMF.

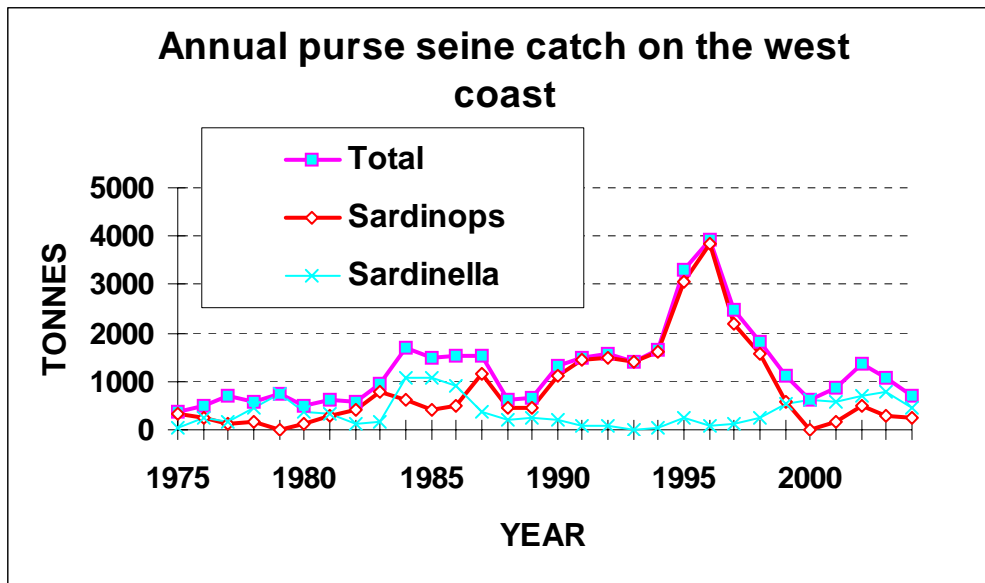
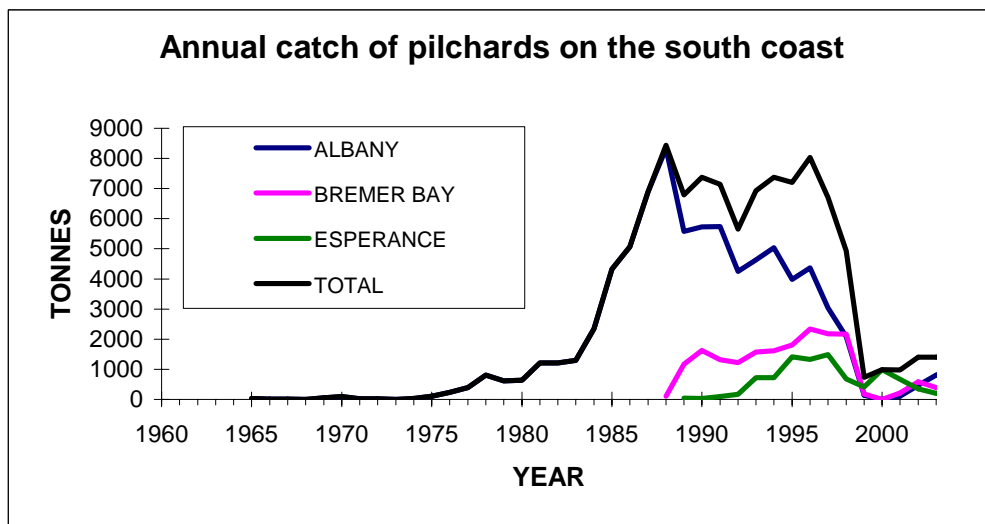


Figure 6: Annual catch (t) of fish in the SCPSMF



The catch statistics from the WCPSMF and SCPSMF reflect the combination of increased technology and operator experience as well as environmental effects on fish abundance. The statistics also show the ability of operators to target only desired species, with much lower amounts of other fish being caught after the industry was established, although low abundances of other species could also contribute to this result. The catch of fish other than pilchards and scaly mackerel increased post 1999 due to the lack of pilchards in the fishery. The graph also illustrates the effect that the virus outbreaks have had on the fishery.

In 1995, the whole pilchard industry off the Western Australian coast was hit with mass mortalities of adult pilchards. The first sign of the deaths was in March 1995 with dead pilchards lining the shores of beaches in South Australia. By the end of June, dead fish had been reported from Noosa Heads in Queensland to Carnarvon in

Western Australia. The spread of the disease was compared to a wild fire with the “front” moving at speeds of approximately 30km/day (Fletcher et al. 1997).

The pattern of deaths was similar with only adult pilchards greater than 13 centimetres affected. Juvenile pilchards were not affected moreover, predators and scavengers that consumed dead pilchards were also not affected.

Estimates from Fletcher et al (1997) suggest that 1270 tonnes of pilchards were killed in the west coast section of the fishery between Cape Naturaliste and Fremantle. Estimates were not made for pilchard stocks north of Fremantle. This weight was estimated to be between 10 and 15% of the spawning biomass of the areas and therefore was considered to only have a minor impact on the fishery as biomass changes of between 10 – 15% occur on a regular basis due to recruitment levels (Fletcher et al. 1997).

A second mass mortality of fish occurred in 1998. Again the most likely reason for the mortalities was due to the *herpesvirus*. The difference between the two mortalities was that in the 1998 outbreak, juvenile fish were affected and the number of fish killed by the virus was far greater. It was estimated that 60 –70% of the spawning biomass of pilchards in WA waters were killed, causing the immediate closure of all pilchard fisheries in WA.

As the stock has recovered, each of the fisheries including the WCPSMF and SCPSMF have been permitted a small TAC. This has been done with close monitoring of planktonic egg counts and monitoring of the size and age of commercial catch throughout each year.

Scaly Mackerel

The scaly mackerel fishery is relatively new, with the first attempt to purse seine for this species occurring in 1989. This venture failed due to a lack of onshore processing facilities. Subsequent ventures in 1990 –1992 also failed for the same reason. In 1993 two blast freezers dedicated to the fishery were built in Geraldton which allowed the fishery to increase rapidly and in 1994 there was approximately 2000 tonnes of fish caught.

Due to concerns over the rapid increase in catch and what effects this may have over the environment, a notional (non-legislated) TAC was set at 2700 tonnes in 1995. The concerns centred on the ecology of the Abrolhos Islands, which are a breeding ground for large numbers of bird species. The lack of information encouraged the Department of Fisheries to establish a research program to determine the impact the removal of fish will have on birds of the Abrolhos Islands. The work will also gain more information about the biology and stock size of scaly mackerel, therefore assisting in setting of the TAC in the future. In addition, the area is managed under s. 121 of the FRMA, which provides regulations relating the Abrolhos Islands reserve such as providing for the protection and conservation of fauna in the reserve.

Gaughan and Mitchell (2000) had difficulty in gathering information with regard to stock biomass, however indications from their research showed that the biomass may not be as large as first thought. Variability in fish catches over the year, as well as the low density of the stock in the ocean, suggests that the industry may not be viable in

the long term. They suggested that, due to the limited number of vessels involved, the monitoring of the age distribution of the commercial catch through sampling of the catch would provide sufficient information to assess trends in biomass of scaly mackerel for management purposes.

There is the potential for an increased emphasis on scaly mackerel catches translating into further resources being directed into determining the biology and sustainability of the scaly mackerel industry. However, once the Department is satisfied that the pilchard stock has recovered, resources used to examine the annual age structure of pilchards can be re-directed to scaly mackerel. Furthermore, because the bulk of the scaly mackerel catch in Western Australia occurs off the mid-west coast, the performance of that fishery will provide an indication of the status of the stock.

Impacts on Assessment Techniques

From 1989 to 1996 total catch within the WCPSMF and SCPSMF rapidly increased even though the fisheries were under a management arrangement. This is due to the fishery being managed mainly on an input basis, and the fishermen becoming more efficient at catching fish with the gear permitted.

The first virus outbreak occurred in 1995 and prompted the introduction of the TAC for pilchards in the South Coast fishery. This was followed by a second virus outbreak in 1998/99, which decimated stocks and prompted the introduction of the TAC for pilchards within the remaining pilchard fisheries. The TAC was split between full and supplementary licences and has been in place ever since. Some operators have been able to quickly fill their quota each year whilst others continually never catch their quota for the season. Therefore there is a discrepancy between TAC set and the total catch for each season.

Management Objectives and Issues

The Minister and the Department of Fisheries have a statutory obligation under section 3 of the FRMA to conserve, develop and share fish resources of the State for the benefit of present and future generations. These objectives are further amplified through the vision and mission statements and objectives as specified in various Strategic and Business plans for the Department.

The Purse Seine Management Advisory Committee (PSMAC) has existed informally since 1990, but was formally ratified by the Minister for Fisheries in 1995. The committee deals with all purse seine fishing under WA regulations. The membership of the committee consists of persons with relevant expertise. The WCPSMF has two members on the committee, one member from the WCPSMF and one from the combined northern and southern development zones. The remainder of the committee is made up by:

- an independent chair;
- a member from the processing industry;
- members from each of the three south coast purse seine zones;
- a member with recreational fishing expertise; and
- the Executive Director of the Department of Fisheries or his representative.

The functions of the PSMAC are to:

1. identify issues that affect the WCPSMF and SCPSMF;
2. advise the Minister on matters relating to the management and sustainability of the WCPSMF and SCPSMF; and
3. advise the Minister on matters relating to the fishery on which the advice of the Advisory Committee is sought by the Minister.

Current Management Arrangements

The SCPSMF is managed under a management plan which was gazetted in 1994. Although there have been several minor administrative amendments to this plan, since then, no significant changes to the management of the fishery, outside of those necessary to respond to the mass mortality event due to the *Herpesvirus* incident, and annual quota setting, have been implemented.

The WCPSMF is managed under a management plan which was gazetted in 1989. There have also been several minor administrative amendments to this plan but again, outside of the response to the mass mortality events, and annual TAC setting, no significant changes to management of the fishery have been implemented. In 1997 the Department of Fisheries put forward a proposal to amend the plan to implement quota-based management in the fishery. This amendment was disallowed by Parliament due to a lack consultation with the operators of the industry.

In February 2003, the Minister for Fisheries, Forestry and Agriculture, on advice from the PSMAC, approved the drafting of a new management plan for the WCPSMF based on a scheme of unitised entitlements and managed on an output basis. The plan aims to set a “capacity” for the fishery for each zone (ie. a quota) and provide the Executive Director the ability to change the capacity as required.

In the new management plan, the capacity for the fishery would separate the catch for pilchards from all other small pelagic species. As with most quota fisheries, the capacity of the WCPSMF would be divided evenly among the units of that fishery. The units will be transferable and tradeable in the normal fishing entitlement market.

The new management plan will allow the Department of Fisheries to maintain fishing at a sustainable level. The plan will also include the northern and southern development zones, which is a logical step as these two adjoining areas share both common target species and common fishing methods.

Decision Matrix

The Department uses a “decision matrix” (Appendix 3) to recommend the maximum catch in the State’s purse seine fisheries (both managed fisheries and the developmental fisheries). The “decision matrix” is also used to help establish the maximum catch in each of the zones of the South Coast Purse Seine Managed Fishery.

A key feature of the “decision matrix” is that to reduce the risks around ecological sustainability, it allows a maximum commercial catch of only 10% of available biomass.

The matrix uses the following annual data to arrive at a recommended maximum catch each year:

- a) The mean age of fish caught in the previous year calculated from catch sampling data. The objective in using this data is to ensure that more conservative catch amounts are recommended where the biomass features a disproportionate number of any age class (particularly very young or very old fish), and where accordingly the breeding biomass is considered to be more at risk of over-exploitation.
- b) The estimated biomass as a percentage as the estimated virgin or unfished biomass. Egg surveys and modelling is used annually to estimate both the available biomass and revise the estimate of the virgin biomass. The objective in using this data is to ensure that when the available biomass is at lower levels and both biological and ecological sustainability is more at risk more conservative (or zero) catch amounts are allowed.

The “decision matrix “ lists mean age of fish on the horizontal axis and the available biomass as a percentage the estimated virgin biomass down the vertical axis. A recommended percentage maximum catch as a percentage of the estimated available biomass is then read from the table. Columns “a” and “b” reflect areas where the MAC and the Department could not agree on the appropriate level for maximum catches and it was agreed that the MAC should make recommendations using the two columns and the upper and lower levels for recommending maximum catches.

Each year the Department’s scientists use modelling, catch sample data and egg survey data to provide fisheries managers and the Management Advisory Committee with estimates of available biomass, estimates of virgin biomass and the mean age of available biomass for each of the two managed fisheries and the zones within the south coast fishery. The Department and the MAC has been flexible in applying the “decision matrix” to zones in the southern fishery allowing some movement above the limits read off the matrix provided the overall maximum catch for zones does not exceed that indicated by the “decision matrix” for all of the south coast. That is, a zone might be granted a higher quota than the “decision matrix” indicates provided other zones are provided a lower maximum catch than allowed by the “decision matrix” so that the overall catch when the parameters for the whole managed fishery are use does not exceed that indicated by the “decision matrix.” This flexible approach has been used to help remove wide fluctuations in TAC from year to year in zones and help stabilise market and economic conditions in zones of the fishery. It also recognises that the zones fish a highly mobile common stock and that zone-based egg survey data and catch size data may not fairly reflect localised stock status.

The Department and MAC has considered further development of basis for making TAC and maximum catch decisions by refining the process in a way that:

- a) Evens out the TAC from year to year delivering more certainty for fishermen; and
- b) Minimising the field research required to develop estimates of biomass without increasing the biological or ecological risks.

This approach may provide even more conservative catch limits but should make it easier for fishers to make business plans and maximise the available sustainable return from the fishery.

Quota management.

The SCPSMF is controlled by the setting of a total allowable catch (TAC) for pilchards, and other small pelagic fish. Each zone in the fishery is allocated a fixed amount of transferable quota units, whose values change depending on stock assessment data. Currently there is a total of 890 quota units allocated across all of the five zones of the fishery.

The present catch limit on pilchards in the limited entry purse seine management plan will be the initial capacity for the new West Coast Purse Seine Managed Fishery. For other small pelagic species, the TAC will be set at a conservative level until research and catch data can be analysed to find an appropriate level. Strict controls placed on the completion of catch and disposal returns (CDR) will require fishermen to complete the CDR before the vehicle carrying fish moves from the point where fish are unloaded from the vessel. For simplicity and ease of compliance a tested standard container system will be used instead of weight as a method of gauging the quantity of fish covered by each CDR.

A minimum unit holding principle is also embodied within the new management plan for the WCPS fishery, which is already in place in the SCPS fishery. The aim of the minimum unit holding requirement is to set a maximum number of participants in the WCPSMF, each with a significant level of commitment to this fishery, which improves compliance effectiveness. The proposed minimum number of units is 445 units. This equates to the allocation of units for the present supplementary level access to the fishery. The weight for each unit is yet to be determined. In total, there will be 98,892 units for pilchards and 98, 892 units for other small pelagic species. The present practice is to divide the units as follows: 90% to existing full licence holders, 3% to supplementary licensees, and 7% to southern development zone licensees.

The TAC for scaly mackerel and other small pelagics is currently determined under the assumption that the average carrying capacity for small pelagic fish in the region is 30,000 tonnes (Gaughan *et al*, 2004). A sudden collapse in distribution of Pacific sardine (*Sardinops sagax*) in south-western Australia enables an objective re-assessment of biomass estimates. The management objective was therefore to limit the catch of all small pelagic fish to 3,000 tonnes (ie 10% of 30,000). This ecosystem-based approach was taken because it is unlikely that separate biomass estimates will become available for the species other than *Sardinops saga*. The 50:50 split between

pilchard and the other species reflects the uncertainty in the extent to which species (Pilchards of scaly mackerel) are dominant in the region at any one time. The advent of the management plan and concomitant real-time recording of catches as part of the catch and return recording system, will allow the catches to be well monitored during each fishing season.

Over- Quota Management.

Because of the nature of purse seining, where the actual catch cannot be determined until the fish are brought aboard, the management arrangements have needed to accommodate this issue. This issue can result in operators accidentally exceeding their quotas. It was intended under the original proposal discussed with industry that the new WCPSMF plan would allow licensees to **either**:

- i. Buy unused units (of the required species type in the relevant zone) from other licensees within 14 days of landing in excess of the quota to meet any difference between quota held and the amount of fish landed, **or**
- ii. take up to 5 tonnes in addition to their quota on the condition that one and one half times the estimated current market value (as estimated by the Executive Director) of the excess catch is paid into the State's Consolidated Revenue Fund.

Gear Restrictions.

As previously stated, there are currently several restrictions on boat and gear permitted in the WCPSMF;

- boat size (maximum 16 meters);
- type of net hauling equipment (as described above);
- length of net (maximum 350 meters);
- size of mesh (minimum 18 mm).

Under the new WCPSMF plan, as the fishery will become an ITQ managed fishery, gear restrictions will be minimal. Net type and mesh size will be the only restrictions, bringing it into line with the SCPSMF management arrangements.

Minimum Legal Size.

The large numbers of fish caught in any one haul make it impossible to place a minimum legal size on small pelagic species. Please refer to the biology section for age distribution of the present small pelagic catches including pilchards.

Spatial Closures.

The present closures that apply in the current WCPSMF management plan will continue under the proposed new management plan;

- Cockburn Sound, Warnbro Sound and Marmion Marine Park;
- Within 1000 meters of shore North of 31°54'S and South of 32°16'S latitudes,

Fish Rolling.

Fish rolling usually occurs when a skipper underestimates the size of a school of fish in the context of the vessel's capacity or in excess of the quota (if the catch was landed) or are a lower quality or of less valuable species than targeted (high grading). The net is then emptied, however in the process of capture, most of the fish are killed. Fish rolling is hard to police but will be considered a major offence under the new plan. Defence to prosecution will be the safety of the vessel and crew or under direction of the Department of Fisheries.

Closure of Fishery.

The new WCPSMF plan aims to provide for the closure of the fishery or zones in the fishery, or a declaration of new fishery capacity and periods by the Executive Director at short notice in circumstances such as in the SCPSMF where:

- i. it is considered continued fishing under the existing TAC is likely to place the long term biological sustainability of the Fishery or zone at undue risk, or
- ii. it is considered continued fishing is likely to place the ecological sustainability of the related marine environment at undue risk, or
- iii. there is a need to adjust capacity or unit allocations to cater for a change in the level of entitlement in the Fishery.

Compliance

Small pelagic fish are a valuable resource as a commercial catch but are inaccessible to the majority of fishermen due to the specialised gear required. For this reason compliance will be targeted within the fishery itself and will focus on the correct completion of CDR's and ensuring type of fish, container type and number match completed CDR and that containers are correctly labelled with the vessel that took them (LFB Number).

These result in the following compliance activities:

- Inspections of commercial catches at the point of landing.
- Catch inspections at processing factories.
- Inspections between fishing vessels and the factories
- Monitoring of pilchard quota system to detect unlawful "over quota" take.

Markets and the Commercial Sector

Traditionally the main market for small pelagic fish is to be sold through tackle shops for recreational fishing bait. However, the product has a variety of other uses including human consumption, commercial bait, tuna food and pet food (Mitchell, Leary & Gaughan 2002). However, increasingly more fish is recently being utilised and canned for human consumption.

Due to their tougher body construction and scales that don't fall off, the traditional market for scaly mackerel has been bait in western rock lobster fisheries. There has recently been an effort by local authorities to promote scaly mackerel for human

consumption that has achieved some levels of success. Due to the versatility of scaly mackerel it achieves a premium price over most other small pelagic fish (Gaughan & Mitchell 2000).

Research

Research on this fishery continues to use Catch and Effort Return data, biological monitoring of catches and spawning biomass estimates from egg surveys. The data were compiled into a status report and ultimately will be used to set and review total allowable catches (TACs) once the fishery moves to quota management. The most recent egg survey was completed in July 2005 with the specimens collected from this survey still being analysed.

A spawning biomass survey that was conducted in 2000 provided evidence that the stock was recovering strongly after the 1998/99 mass mortality event. The age structure of the pilchard catch was dominated by 3 and 4 year old fish, which indicates a healthy stock.

The West Coast spawning biomass was estimated to be 11,581 tonnes in 2002. An estimate of spawning biomass from the 3rd west coast survey in 2004 has also been completed. The spawning biomass is now estimated to be approximately 30,047 tonnes.

2.2 BIOLOGY OF SCALY MACKEREL

Distribution

Scaly mackerel are a tropical species with the centre of distribution lying within the Indo Chinese region, where apparent catches exceed 100,000 tonnes. There is some conjecture as to the identity of the majority of species in the catch. In Australia scaly mackerel can be found as far south as Fremantle

Gaughan and Mitchell (2000) used isotopic analysis to determine if there were any separate stocks of the species, but no conclusions on stock structure could be made. However it was found that there were large differences in results of oxygen isotope $\delta^{18}\text{O}$ between size classes of fish, leading to the conclusion that younger fish live in warmer waters than the main adult stock.

Figure 7: Distribution of Scaly Mackerel around the Western Australian Coast



Life History

Age & Growth

Gaughan and Mitchell (2000) used several methods to determine the age of scaly mackerel. This led to several contrasting results and therefore no confidence in any one set of results. The results of each set of analyses were compared to data on scaly mackerel stocks in warmer waters off Bali, and an assumption was made that fish off Geraldton would grow at a slower rate than those off Bali (Gaughan & Mitchell 2000).

Due to the difficulty in determining age of scaly mackerel annual mortality (Z) was also difficult to determine. Gaughan and Mitchell (2000), determined an average Z figure of 1.16 (SD = 0.32). This figure is lower than Z figures for stocks of fish off Bali as expected.

Reproduction and Recruitment

Research has shown that sex ratios in scaly mackerel change over different size classes but the overall sex ratio was 1:1. Fish begin to reach sexual maturity at 120mm fork length with 50% of 140-150mm fork length having attained maturity.

Spawning occurs off the mid-west coast during summer, and peaks in January/February. This is thought to coincide with the warmest water temperatures. Plankton surveys indicate that peaks of spawning in any one year could be as short as two weeks (Gaughan & Mitchell 2000).

Otolith and length frequency data suggests recruitment to the fishery occurs in two-three year olds, with full recruitment achieved in the three-four year old age class. The recruiting fish have reached maturity.

Sardines typically experience large annual fluctuations in recruitment strength and are also relatively short lived. These factors, along with the associated biological and environmental factors, can lead to large changes in stock size over short periods. While there is uncertainty over age structure and the mortality estimates of the commercial catch of scaly mackerel off Geraldton, the evidence strongly suggests that this species is short lived. Along with the likelihood of substantial inter-annual recruitment variability, the WCPSMF at Geraldton needs to be managed conservatively (Gaughan & Mitchell 2000).

Diet

Scaly mackerel, like most sardine species, are plankton feeders. Gaughan and Mitchell (2000) found the identification of gut content difficult and approximately 1/3 of the gut contents consisted of unrecognisable detritus. The identifiable component of scaly mackerel gut contents consisted of a wide variety of zooplankton organisms, with copepods usually the main dietary component. However extreme shifts in diet can occur, with phytoplankton on one occasion and salps on another occasion, being the dominant component.

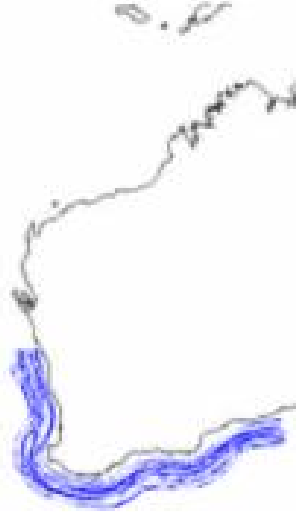
2.2 BIOLOGY OF PILCHARDS

Distribution

As mentioned previously, pilchards are widely distributed around the temperate coasts of Australia, from Carnarvon in the west to Noosa Heads in the east and around northern Tasmania. This is the largest, in terms of linear distance, of the distributions of stocks in the world, with other stocks of the same species being found around the State of California in the United States of America, South Africa, Japan and the continent of South America.

Mature pilchards are mainly found within continental waters. Limited evidence suggests juveniles inhabit sheltered bays and inlets, with incidental amounts of larvae being found in estuarine environments (Fletcher et al. 1997).

Figure 8: Distribution of pilchards around the Western Australian coast



Life History

Age & Growth

Pilchards mature during their second year at approximately 120 – 130 mm fork length and reach a maximum length of approximately 200mm (FL) in WA (Fletcher *et al.* 1997).

Reproduction and Recruitment

As expected with the widespread distribution of pilchards, the main time for spawning varies throughout Australia. There are two peak spawning periods, one occurring in August and the other in February-March. Pilchards are dioecious, synchronous multiple batch spawners (Fletcher *et al.* 1997).

Diet

There has not been a great deal of research completed on the diets of pilchards in WA. What research has been done has backed up world research on similar species. Research shows that pilchards are opportunistic feeders that consume the largest particles available. The majority of the diet is made up of zooplankton particularly copepods and phytoplankton (mostly diatoms), the percentages of each being determined by relative availability (Fletcher *et al.* 1997).

2.3 MAJOR ENVIRONMENTS

2.3.1 PHYSICAL ENVIRONMENT

The WCPSMF and SCPSMF cover a large portion of the west and south coast of Western Australia with climates ranging from temperate to Mediterranean to semi-arid. Pilchards or scaly mackerel can be found anywhere within continental shelf waters in this expanse of water. The major influence over this area is the Leeuwin Current, which moves down the coast bringing warm tropical water down to the southwestern tip of WA and onto the south coast. Due to sardines being a tropical species, the varying strength and proximity to the coast of the Leeuwin Current may have an influence on their reproductive success and adult distribution. Very little is known about juvenile pilchards. Research targeted to this area along the south coast began just as the mass mortalities of 1998 occurred and therefore had very limited results.

2.3.1 ECONOMIC ENVIRONMENT

Pilchards from the WCPSMF and SCPSMF are sold as bait after being individually quick frozen. Recently, a growing percentage of scaly mackerel and pilchards are being used for human consumption. Scaly mackerel receives a premium price over pilchards with prices between \$620/tonne to \$750/tonne (Mitchell, Leary & Gaughan 2002). This results in a high volume, low value fishery.

Annual turnover by the WCPSMF was \$660,000 in 2003. This is compared to \$1.6 million the previous year and well below the peaks in turnover during 1996 and 1997 of \$2 million just prior to the viral outbreak.

The annual turnover by the SCPSMF was \$1.59 million in 2003, which was slightly higher than the \$1.17 million the previous year. However, the annual turnover is still below the peaks seen just prior to the viral outbreak, just as in the WCPSMF.

2.3.2 SOCIAL ENVIRONMENT

The WCPSMF and SCPSMF are relatively minor fisheries compared to other larger fisheries that operate over the same geographic area, with only a small number of people employed in the catching process. Even at its peak before the mass mortality events, only 34 people were employed in the catching of pilchards. These fisheries are also situated in some of the most heavily populated sections of the Western Australian coastline and have not been shown to have major impact on the surrounding social and economic environment. However, the mass mortality events have forced major restructure of the industry with many licence holders and their crew needing to obtain income from other sources.

3. METHODOLOGY

3.1 SCOPE

The ESD report was generated by assessing “**the contribution of the WCPSMF and SCPSMF to ESD**”. This assessment examined the benefits and the costs of the Pilchard fishery across the major components of ESD (see Table 1). In doing so, it provides a report on the performance of the fishery for each of the relevant ecological, economic, social and governance issues associated with this fishery. However, given the timeframes involved, only the criteria required for the “Guidelines for the Ecologically Sustainable Management of Fisheries”, which cover mainly the environmental elements of ESD (outlined below in Table 1) were generated for this application.

Table 1: National ESD reporting framework components.

Nb: *Only those ESD components in bold* are reported in this application.*

National ESD Framework – ESD COMPONENTS

Contribution to Ecological Wellbeing

Retained Species*

Non-Retained Species*

General Ecosystem*

Contribution to Human Wellbeing

Indigenous Community Issues

Community Issues

National Social and economic Issues

Ability to Achieve

Governance*

Impact of the environment on the fishery*

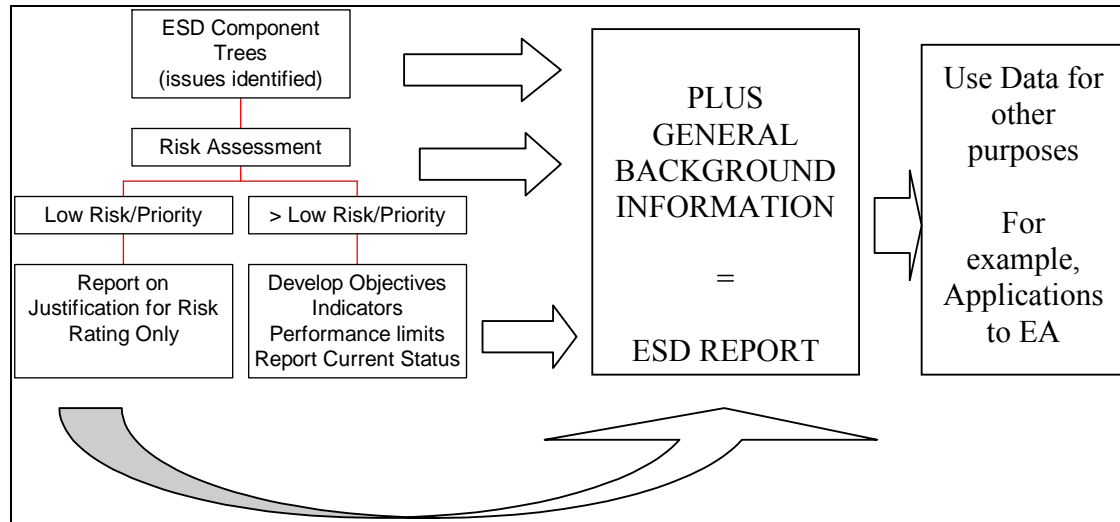
3.2 OVERVIEW

There were four steps involved in completing the ESD report for the WCPSMF and SCPSMF fisheries. It was based upon using the National ESD Reporting Framework, which is outlined in detail in the WA ESD policy paper (Fletcher, 2002) and in the “How to Guide” (Fletcher et. al., 2002) located on the website (<http://www.fisheries-esd.com/>):

- A risk assessment/prioritisation process was completed that objectively determined, which of these identified issues was of sufficient significance to warrant specific management actions and hence a report on performance. The justifications for assigning low priority or low risk were, however, also recorded.
- An assessment of the performance for each of the issues of sufficient risk to require specific management actions was completed using a standard set of report headings where operational objectives, indicators and performance measures, management responses etc were specified.

- An overview assessment of the fishery was completed including an action plan for activities that will need to be undertaken to enable acceptable levels of performance to continue or, where necessary, improve the performance of the fishery.

Figure 9: Summary of the ESD reporting framework processes.

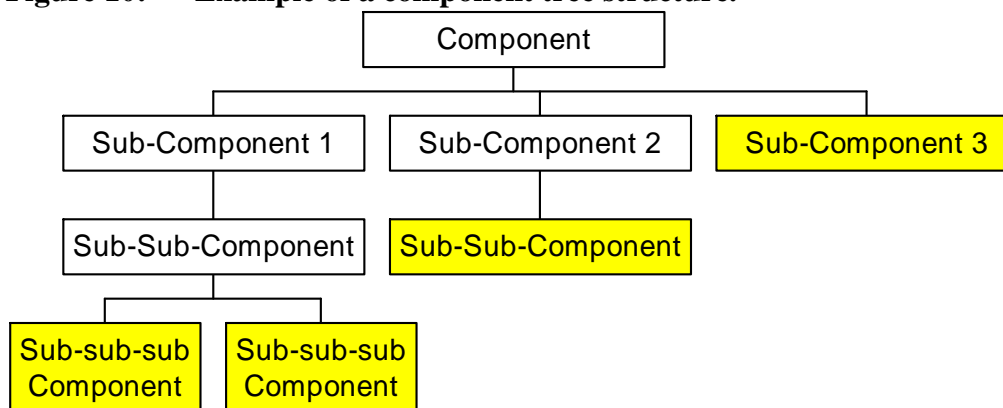


3.3 ISSUE IDENTIFICATION (COMPONENT TREES)

The National ESD Reporting Framework has eight major components, which fall into three categories of the “contributions to ecological wellbeing”, “contributions to human wellbeing” and the “ability to achieve the objectives” (Table 1). Each of the major components is broken down into more specific sub-components for which ultimately operational objectives can be developed.

To maximize the consistency of the approach amongst different fisheries, common issues within each of the components were identified by the Standing Committee for Fisheries and Agriculture (SCFA) and ESD reference groups within each of the major component areas and arranged into a series of “generic” component trees (See Fletcher (2002) and the www.fisheries-esd.com web site for a full description). These generic trees were used as the starting point for identifying the issues. These trees were subsequently adapted into trees specific to the WCPSMF. This was achieved by expanding (splitting) or contracting (removing/lumping) the number of sub-components as required (Figure 9).

Figure 10: Example of a component tree structure.



3.4 RISK ASSESSMENT/PRIORITISATION PROCESS

After the components/issues were identified, a process to prioritise each of these needs was completed using a formal risk assessment process. The risk assessment framework that was applied was consistent with the Australian Standard AS/NZS 4360:1999 Risk Management, concentrating on the risk assessment components. The general Risk Assessment process is well documented but in summary, it considers the range of potential consequences of an issue/activity and how likely those consequences are to occur. The combination of the level of consequence and the likelihood is used to produce an estimated level of risk associated with the particular hazardous event/issue in question.

A realistic estimate of the consequence level for each issue was made by the group at the workshop. This level was from 0-5, with 0 being negligible and 5 being catastrophic/irreversible (see Appendix 2 for details of consequence tables). This assessment was based upon the combined judgement of the participants at the workshop, who collectively had considerable expertise in the areas examined.

The level of consequence was determined at the appropriate scale for the issue. Thus for target species the consequence of the WCPSMF and SCPSMF was based at the population, not at the individual level. Obviously catching one fish is always catastrophic for the individual but not for the population. Similarly, when assessing possible ecosystem impacts this was done at the level of the whole ecosystem or at least in terms of the entire extent of the habitat, not at the level of an individual patch or individuals of non-target species.

The likelihood of a consequence occurring was assigned to one of six levels from remote to likely. In doing so, the workshop group again considered the likelihood of the “hazardous” event (consequence) actually occurring based upon their collective wisdom, which included an understanding of the scale of impact required.

From these two figures (consequence and likelihood), the overall risk value, which is the mathematical product of the consequence and likelihood levels ($\text{Risk} = \text{Consequence} \times \text{Likelihood}$), was calculated. Finally, each issue was assigned a Risk Ranking within one of five categories: High, Moderate, Acceptable, Low and Negligible based on the risk value (see Table 2).

Table 2: Risk ranking definitions.

RISK	Rank	Likely Management Response	Reporting
Negligible	0	Nil	Short Justification Only
Low	1	None Specific	Full Justification needed
Moderate	2	Specific Management Needed	Full Performance Report
High	3	Possible increases to management activities needed	Full Performance Report needed
Extreme	4	Likely additional management activities needed	Full Performance Report needed

In general, only the issues of sufficient risk (Moderate, High & Extreme), - those that require specific management actions need to have full performance reports completed. Nonetheless, the rationale for classifying issues as low risk or even negligible were also documented and formed part of the ESD report. This allows all stakeholders and interested parties to see why issues were accorded these ratings. This process is summarized in Table 2(above).

3.5 COMPONENT REPORTS

Only the issues of sufficient risk or priority that require specific management actions have a full performance report completed (which form section 5 of this application). Nonetheless, the rationale for classifying issues as low risk/priority were also documented and forms part of the report so that stakeholders can see where all the identified issues have finished.

For each of the lowest level sub-components (assessed as being of sufficient risk/priority to address), a detailed assessment of performance is generated. Table 3 lists the 10 standard headings each of which need to be addressed. Added to this list a further heading, “**Rationale for Inclusion**”, has been added. This specific heading allows the issues raised within the risk assessment process to be explicitly recorded. A full description of each of these headings is located in the WA ESD policy (Fletcher, 2002), which is available on the WA Department of Fisheries website.

Table 3: The National ESD reporting framework headings used in this report.

<ol style="list-style-type: none">1. Rationale for Inclusion2. Operational Objective (+ justification)3. Indicator4. Performance Measure (+ justification)5. Data Requirements6. Data Availability7. Evaluation8. Robustness9. Fisheries Management Response<ul style="list-style-type: none">-Current-Future-Actions if Performance limit is exceeded10. Comments and Action11. External Drivers

Progress towards completing these reports was made by a variety of Departmental staff. The number of issues identified for this fishery was relatively few and their risks were relatively minor.

4. ASSESSMENT OF THE WEST COAST PURSE SEINE LIMITED ENTRY FISHERY and SOUTH COAST PURSE SEINE LIMITED ENTRY FISHERY MANAGEMENT REGIMES AGAINST THE COMMONWEALTH (DEH) GUIDELINES FOR ASSESSING THE ECOLOGICALLY SUSTAINABLE MANAGEMENT OF FISHERIES

GENERAL REQUIREMENTS OF THE DEH GUIDELINES

The management arrangements must be:

Documented, publicly available and transparent;

As per the FRMA “the Executive Director is to cause a copy of every order, regulation and management plan in force under this Act-

- To be kept at the head office of the Department; and
- To be available for inspection free of charge by members of the public at that office during normal office hours.”

In addition to the legislative requirements, the current management regime, as documented in the formal set of management regulations, can be purchased by interested parties from the State Law Publisher. Additionally, copies of the FRMA, FRMR, Management Plans and all Statutory Orders are available through the Departmental website: www.fish.wa.gov.au.

Also, any discussion papers and proposals for modifications to these management arrangements are distributed widely to stakeholder groups automatically and other interested individuals by request in hard copy format. Where appropriate, they are now also available from the Departmental web site www.fish.wa.gov.au.

Finally, once completed, the full ESD Report for the WCPSMF and SCPSMF will be made publicly available via publication and electronically from the Departmental website. This will provide increased transparency through explicitly stating objectives, indicators, performance measures, management arrangements for each issue and how the fishery is currently performing against these criteria. As a result, the Department of Fisheries is meeting this guideline.

Developed through a consultative process providing opportunity to all interested and affected parties, including the general public;

The Department of Fisheries is meeting this guideline through a variety of consultative processes. S64 and S65 of the FRMA define the requirement for procedures that must be undertaken before determining or amending all management plans. More specifically, the current management arrangements for the WCPSMF

were developed through formal consultation with the industry through the Purse Seine Management Advisory Committee and direct consultation with industry members and other relevant stakeholders.

Ensure that a range of expertise and community interest are involved in individual fishery management committees and during the stock assessment process;

The range of expertise and community interests that have been involved in the process of determining management and reviewing stock assessments is extensive. Through the PSMAC, groups that have been involved in the generation and review of the information contained in this application include:

- Department of Fisheries, WA;
- Western Australian Fishing Industry Council (WAFIC);
- Recfishwest; and
- Conservation Council of WA.

Be strategic, containing objectives and performance criteria by which the effectiveness of the management arrangements are measured;

The Department of Fisheries is achieving this guideline through the ESD Component Reports. These reports (see Section 5 Performance Reports) contain the available objectives, indicators and performance measures for measuring the effectiveness of the management arrangements for the WCPSMF and SCPSMF. For some components, the objectives, indicators and performance measures are well established and the data are available to demonstrate levels of performance over time. For other components, the objectives, indicators and performance measures have only just been developed and/or the necessary data collection is only just being initiated. The status of this information is documented within each of the individual component reports within the National ESD Reporting Framework in Section 5.1-5.4.

Be capable of controlling the level of harvest in the fishery using input and/or output controls;

The FRMA and specifically the management plans for the WCPSMF and SCPSMF provide the legislative ability to control the level of harvest within these fisheries. For example, the use of a sophisticated and effective egg surveys to estimate spawning stock levels along with age determination of present catch are used in a matrix system (Appendix 3) to govern output control measures based upon a pilchard cap system.

Historical arrangements have not included a TAC due to the industry being regulated by boat size and equipment used. A cap or TAC was introduced when the mass mortality event of 1998 occurred. In addition, boat size limitations are also planned to be removed under the new management arrangement in the WCPSMF allowing for wider distribution of effort and an increased safety at sea without adversely impacting on the fishery.

The Minister has approved the drafting of a new management plan for the WCPSMF. This will change the fishery to a full Individual Transferable Quota system and remove the majority of input restrictions. The new plan includes a TAC for all species covered by the Purse Seine Management Plan improving the ecological sustainability of the fishery. This is already the case in the SCPSMF.

Contain the means of enforcing critical aspects of the management arrangements;

The Department of Fisheries employs operational staff to ensure compliance with the critical aspects of the management arrangements for the WCPSMF and SCPSMF. This includes at-sea patrols to ensure restrictions on gear and other operational rules are being adhered to as well as inspections of catches at the point of landing and processing factories.

The future WCPSMP plan will be heavily dependant on output limitations that will result in catch and return information submitted by fishers as the critical point to a quota system. To aid the compliance of this issue, catch and return paperwork must be completed before the fish leave the point of unloading. The issue has also been simplified by the use of trays of specified sizes to accurately estimate catch quantities.

The quota will be broken into three areas, along the lines of the northern and southern development zones and a central zone taking the place of the present WCPSMF. Before being permitted to enter the fishery each vessel will be required to have a Vessel Monitoring System (VMS) fitted. This will enable the Department to monitor closed areas and relate fishing activity to quota allocated.

Provide for the periodic review of the performance of the fishery management arrangements and the management strategies, objectives and criteria;

The Department is meeting this guideline through the annual “State of the Fisheries” report and the five-year review of this document. There is an annual review of the performance of the major aspects of the fishery through the completion of the “State of the Fisheries” report. This is updated and published each year including periodic reviews by the Office of the Auditor General (OAG). It forms an essential supplement to the Department’s Annual Report to the WA Parliament with the latest version located on the Departmental website www.fish.wa.gov.au.

The ESD Component Reports contain a comprehensive performance evaluation of the fishery based upon the framework described in the ESD policy (Fletcher, 2002). The reports include the development of objectives, indicators and performance measures for all aspects of this fishery and include status reports for those components that are subject to annual assessment. The Department intends to complete and review externally this full assessment, including examination of the validity of the objectives and performance measures, every five years.

Be capable of assessing, monitoring and avoiding, remedying or mitigating any adverse impacts on the wider marine ecosystem in which the target species lives and the fishery operates; and

The Department of Fisheries is meeting this guideline through the development of this report. Capabilities for the assessment, monitoring and avoidance, remedying or mitigating any adverse impacts on the wider marine ecosystem are documented in the “General Environment” Section 5.3.

The fact this fishery is recovering strongly from the *herpesvirus* outbreaks of 1995 and 1998/99 illustrates that the management arrangements are capable of remedying adverse impacts on the fishery.

Require compliance with relevant threat abatement plans, recovery plans, the National Policy on Fisheries Bycatch, and bycatch action strategies developed under that policy.

Currently the Department does not have any formal bycatch action strategies for the WCPSMF and SCPSMF. However, this issue is formally addressed under Section 2 of this Report.

PRINCIPLE 1 OF THE COMMONWEALTH GUIDELINES

OBJECTIVE 1. MAINTAIN VIABLE STOCK LEVEL OF TARGET SPECIES

The fishery shall be conducted at catch levels that maintain ecologically viable stock levels at an agreed point or range, with acceptable levels of probability.

The component tree detailing the retained species within the WCPSMF and SCPSMF is shown below. There are two target species for these fisheries, pilchards and scaly mackerel. Of the target species, the pilchards were assessed with the appropriately detailed reports having been compiled (Section 5.1.1.1). The Risk Assessment classified this as a **Low risk** and therefore does not warrant detailed attention. However, even though this component was not rated as a high risk, detailed information is still provided in the following sections. The scaly mackerel rated a negligible risk and again, justification for this is included in the following sections.

The by-product species were all classified to be at **NEGLIGIBLE risk**. Full justifications for not specifically assessing these components (i.e. maray and other small pelagic species etc) are located in Section 5.1.2. These decisions were largely related to the relatively small quantities taken by the WCPSMF and SCPSMF.

An assessment of the current performance of this fishery demonstrates that the stocks of pilchards are recovering well after the 1998 mass mortalities. Thus, in summary:

- Catch of pilchards and scaly mackerel have remained within target levels over the past two years.
- The catch level is rising in accordance with the recovery of stocks
- The pilchard TAC management is based on a matrix system that takes into consideration age of stock and estimates of spawning stock biomass (Appendix 3).
- The level of capture of other by-product species by this fishery is relatively small and therefore does not have a significant impact on their dynamics.

Consequently, this fishery is meeting the requirement of Principle 1. The information relevant to this principle for these species is detailed below.

Information Requirements

1.1.1 There is a reliable information collection system in place appropriate to the scale of the fishery. The level of data collection should be based upon an appropriate mix of fishery independent and dependent research and monitoring.

Data are collected through a combination of Department of Fishery egg collection surveys and commercial fishermen capturing adult stock. Due to the type of gear required it is not practical to undertake fishery independent data collection on the fishery stock.

The specific data requirements needed to assess performance for each of the relevant objectives are detailed in the relevant sections of the ESD reports in Section 5.1 Retained Species. Listed below are the current data collection systems in place.

Table 4: Data collection systems for WCPSMF and SCPSMF

Monitoring Program	Information Collected	Robustness
CAES returns	Provided on a monthly basis by fishers the total catch of all species landed and effort- days fished.	Moderate
Size Frequency and Age frequency Information	Lengths and ages of a sub-sample of pilchards and scaly mackerel landed by the fishery.	High (but can be skewed as industry targets a certain size/age class)
Egg Surveys	Plankton survey collection of eggs used to determine spawning stock biomass	Moderate

Assessment

1.1.2 There is a robust assessment of the dynamics and status of the species/fishery and periodic review of the process and the data collected. Assessment should include a process to identify any reduction in biological diversity and/or reproductive capacity. Review should take place at regular intervals but at least every three years.

The target species, pilchards and scaly mackerel, are classified as being close to fully exploited. A review of the performance for the WCPSMF and SCPSMF is conducted at least once a year. This review includes an assessment of the total catch by the fishery, the level of effort to take the catch, the distribution of effort, both spatially and temporally across the season and the calculated catch rates. Samples are taken during each season to determine age distribution of catch. Every second year egg surveys are carried out to monitor the size of the spawning stock.

Full details of the current evaluation and a discussion of the robustness of the analyses used are located in 5.1.1.1. These assessments are then reported annually within the State of the Fisheries Report.

Due to the pilchard stock still in the process of recovering, exploitation of stocks is being kept to a minimum to allow full recovery to occur.

1.1.3 The distribution and spatial structure of the stock(s) has been established and factored into management responses.

In WA, pilchards are found from the South Australian border through to Geraldton. The species are found in continental shelf waters as well as marine embayments.

Research has shown that there appears to be two separate spawning stocks - the west coast and the south coast. Although there are indications that there may be some level of finer separation within south coast stocks, the west coast fishery has been considered as one stock (Fletcher et al. 1997).

In addition, the Department has the ability to be able to close certain areas to fishing as a management response in the SCPSMF and this will also be a feature of the new WCPSMF management plan.

1.1.4 There are reliable estimate of all removals, including commercial (landings and discards), recreational and indigenous, from the fished stocks. These estimates have been factored into stock assessments and target species catch levels.

The only catch of pilchards is by commercial fishermen - recreational or indigenous groups do not target or catch pilchards. Due to the type of equipment required and the value of the species caught there is also no illegal catch of product.

Table 5: Data collection commercial catch for WCPSMF and SCPSMF

Sector	Catch Data Collected	Frequency
Commercial	Catch and disposal Record form- daily basis, Fishers monthly returns (CAES), Size frequency Information	Daily or monthly during the season
Recreational	Not applicable	Not applicable
Indigenous	Not applicable	Not applicable
Illegal	Not applicable	Not applicable

1.1.5 There is a sound estimate of the potential productivity of the fished stock/s and the proportion that could be harvested.

Productivity of the stock is determined from year to year by the using a combination of the estimates of spawning stock biomass along with annual age distribution of samples taken from the commercial catch.

Due to the stock being in a recovery position TAC is set between 5 - 10% of the estimated spawning stock, levels of take being determined by combining age distribution and estimated spawning stock size. This is well below sustainability levels and recent catch data indicate the stock is recovering strongly (Mitchell, Leary & Gaughan 2002).

Management Responses

1.1.6 There are reference points (target and/or limit) that trigger management actions including a biological bottom line and/or a catch or effort upper limit beyond which the stock should not be taken.

TAC is set from season to season after the Department of Fisheries research division has completed analysis of current catch age structure and combined this with the most

recent egg survey information. There are strong penalties if individual quotas are breached.

As can be seen by the matrix in appendix 3, fishing is halted depending on the level of spawning biomass and age of commercial catch.

1.1.7 There are management strategies in place capable of controlling the level of take.

A full description of the management arrangements is located in the attached West Coast Purse Seine Management Plan and South Coast Purse Seine Management Plan. A full discussion of the main regulations and their justifications are located in Section 2.

The following is a summary of the management arrangements for the WCPSMF and SCPSMF:

- The fishery is managed through input controls (including number of licenses and gear restrictions) and output controls (quotas).
- The annual fishing season has a TAC (currently 1,500 tonnes for pilchards and other small pelagic species in WCPSMF and 1,500 tonnes per zone for SCPSMF) for 2003-04. Closures and quota limitations can be made mid-season by the Department of Fisheries.
- Compliance policing monitors both the commercial fishermen and processors.
- Any significant declines in the stock either from environmental effects or due to fishing are observed in time to implement appropriate risk management interventions.
- The performance of the fishery is reviewed and reported on annually.

Significant effort is put into ensuring adequate compliance with these regulations. Inspections of purse seine boats at the point of landing are carried out by Fisheries Officers, which enables checks of quantities and licences. Furthermore, there are catch inspections completed at the processors, which further ensure quotas are being followed in the fishery. Additionally, at-sea inspections of the purse seine fleet are carried out whenever possible.

1.1.8 Fishing is conducted in a manner that does not threaten stocks of by-product species.

The manner of purse seine fishing minimises by-product catches. Skippers can usually identify the type of species in any school at sea before seining begins. Therefore the take of by-products is limited to mixed schools or misidentification. Fish misidentified can be released by releasing the purse string (i.e. not rolling them out) if they are not desired prior to landing with very limited mortality.

1.1.9 The management response, considering uncertainties in the assessment and precautionary management actions, has a high chance of achieving the objective.

The WCPSMF and SCPSMF have been in operation for the past 15 years. Past management measures have limited the explicit control of the fishery, although this issue has been rectified in the SCPSMF Management Plan, and will soon be rectified as part of the new WCPSMF Management Plan. The plan presently being proposed for the WCPSMF has been developed in conjunction with fishermen and other peak bodies in WA. The present recovery of the fishery from a loss of 60 – 70% of spawning stock in 1998 shows that past management has allowed the industry to adjust for significant events. The new plan will continue this operation but will set specific guidelines to be followed for each stage of the operation.

Under the proposed WCPSMF Management Plan, the fishery will be fully quota-managed on a year round basis. Furthermore, the changes simplify the complex management and administrative arrangements previously in place while providing more flexibility for both the industry and Department of Fisheries.

Strategies available to offer further protection to the spawning stock of pilchards, as fluctuations are monitored through plankton surveys and age distribution, would include:

- Reduce quota allocations for the following season;
- Additional area closures; and
- Instigate temporal closures.

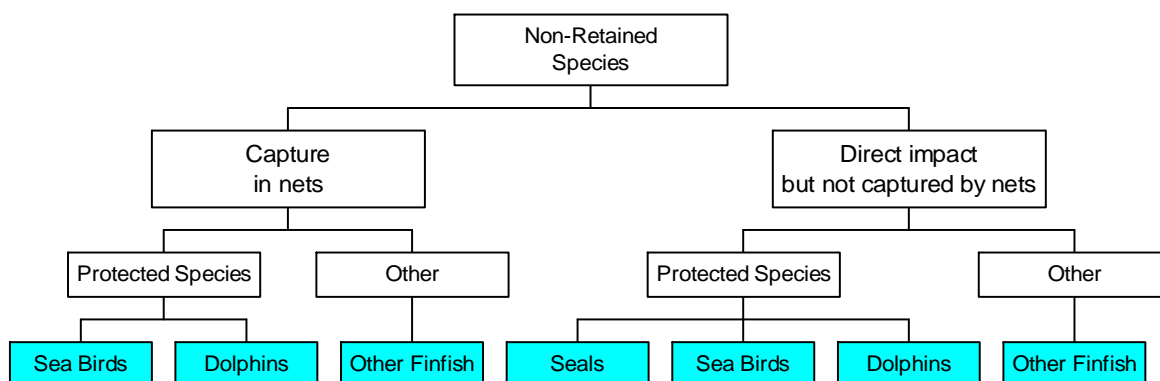
Each of the above strategies can be implemented mid season should such an event occurred that would require such measures.

OBJECTIVE 2. RECOVERY OF STOCKS

Where the fished stock(s) are below a defined reference point, the fishery will be managed to promote recovery to ecologically viable stock levels within nominated timeframes.

As mentioned previously the pilchard stocks are presently well below targets due to the mass mortality event of 1995 and 1998. The mortalities resulted in closure of all Western Australian pilchard fisheries. As research data have determined levels of losses, and therefore remaining stock numbers, TAC levels have been introduced to allow operators to return to the fishery, thus maintaining operators' financial viability whilst keeping catch numbers restricted well below past sustainable levels, allowing spawning stocks to recover.

PRINCIPLE 2 OF THE COMMONWEALTH GUIDELINES



OBJECTIVE 1. BYCATCH

The fishery is conducted in a manner that does not threaten bycatch species.

Schools of pelagic fish are discrete and skippers can identify the majority species of a school before shooting the net. Therefore it is extremely unlikely that other species of fish are threatened by the actions of purse seine fishermen in the WCPSMF and SCPSMF.

Information Requirements

2.1.1 Reliable information, appropriate to the scale of the fishery, is collected on the composition and abundance of bycatch.

Information on the levels of interaction with non-retained species has been obtained from interviews and discussions with fishers. Departmental staff are also in the process of collecting observer information aboard vessels operating in both the WCPSMF and SCPSMF.

Assessments

2.1.2 There is a risk analysis of the bycatch with respect to its vulnerability to fishing.

The risk assessment for the identified non-retained/bycatch species concluded that the WCPSMF and SCPSMF are of negligible risk to Seals, Dolphins and other finfish.

Sea Birds – Summary

ERA Risk Rating (C0 L3 NEGLIGABLE)

The risk assessment workshop agreed that it was likely that a small number of birds will dive into the net during the shot and may become entangled. It was also assumed that as most of the fishing is carried out at night, when most birds are inactive, the occurrence of this is low and the majority of birds are released unharmed.

Since the workshop it has been discovered that the level of interaction with seabirds and mortality of seabirds from the interaction with purse seiners is greater than was

understood. In the south coast fishery, particularly around Albany, where much of the fishing activity is adjacent to the breeding sites for seabirds and where daytime fishing is still very common, there is a high level of interaction with Fleshy-footed Shearwaters, (*Puffinus carneipes*), particularly during the chick-rearing period. While some estimates of the level of Fleshy-footed Shearwater mortality during the three month peak of the breeding season is as high as six birds per day per boat, it is not considered that this level of mortality is placing this species of seabird at risk. Nonetheless, given the protected status of all seabirds and as the Fleshy-footed Shearwater is also the subject to the Japan Australia Migratory Bird Agreement and the Albatross and Petrel Convention, the Department, in liaison with fishermen and Conservation and Land Management Officers and the WA Conservation Council, is working to reduce interactions and mortalities to the lowest possible levels. A seabird mitigation working group has been formed to investigate the various methods that can be used to minimise seabird interactions with purse seine fishing gear. The WA Conservation Council Sustainable Fisheries Liaison Office has developed a research project to gather baseline data on seabird interactions and do preliminary research into using shark liver oil as a seabird deterrent.

Seal & Dolphin – Summary

ERA Risk Rating (C0 L3 NEGLIGABLE)

At the risk assessment workshop it was agreed that the current occurrence of interactions with seals, sea lions and dolphins was very low and little to no harm was done. However, since then it has been found that there have been several dolphin mortalities in the past, and a few in recent years, and the fishermen acknowledge that dolphins have been known to ram the net and sometimes get their rostrums caught in the mesh. It is also acknowledged that, while the fishermen do all they can to immediately free the dolphins, there are occasional mortalities. Strategies that fishermen use to avoid adverse dolphin interaction include stopping the boats before operation to deter the dolphins before they ‘hone in’ on the fishing operations. Also, some operators chum outside of the net to keep the dolphins occupied away from the net itself.

The relatively small boats and nets used on the south coast also reduces the risk of mortalities and make it easier for the fishermen to quickly and effectively free any dolphins, sea lions or seals that are captured within the net.

In some cases individual dolphins reportedly appear to have formed an almost symbiotic relationship with purse seiners assisting in herding schools into the net and sharing in the catch before the net is pursed. Certainly some individual dolphins appear to habitually visit some purse seine boats on a regular basis and become well know to the fishermen. These interactions with dolphins are more common on the south coast with fishers operating inshore during daylight.

Fishermen usually report mortalities to the local Conservation and Land Management officers but the Department is upgrading the log books supplied to fishermen so that all such interactions and mortalities are also automatically reported to the Department of Fisheries. The Department of Conservation and Land Management (CALM) have previously published information on past dolphin mortalities (Coleman, 1997). The data indicates a number of mortalities and interactions around Bremer Bay between

1990 and 1996. Over this time, 2 interactions were recorded with dolphins and purse seine nets, 4 mortalities were associated with purse seine nets and 8 mortalities were associated with unidentified nets. Twelve to fifteen carcasses were found on beaches that were badly decomposed and cause of death was unknown. It is considered likely that at least some of these mortalities were a result of adjacent purse seine fishing activities. Currently, the Department of CALM have confirmed that in the last 12-18 months, fishermen have reported just two dolphin mortalities in 2004/2005. However, a workshop to discuss seabird interactions with the fishermen indicated that many were not aware of the reporting requirements and reporting procedures relating to interaction with, and mortalities of, protected species. The two reported mortalities followed that meeting and it is possible that an additional two mortalities ascribed to 'unknown sources' by CALM might also have been from the purse seine fishery. The Department of Fisheries is revising the log book reporting system so interactions and mortalities are automatically reported to it and, together with the adoption of a new industry code of conduct (Appendix 4), this should provide improved data collection and allow better monitoring.

The anecdotal evidence so far is that the numbers of seal, sea-lion and dolphin mortalities are very low or rare. However, the Department will monitor the revised log book returns to determine if there is a requirement to develop a proactive mitigation strategy.

Other Finfish– Summary

ERA Risk Rating (C0 L5 NEGLIGABLE)

There are two different methods other finfish can be captured by pelagic operators. Firstly, as for seals and dolphins, if predatory fish are feeding on a school prior to or during seining then they can be captured or interact with the net. Capture is at a relatively low frequency as during the time it takes to encircle and close the school of fish, predators can dive and swim away from capture.

Secondly, when operators are working in relatively shallow water, the net may scrape the ocean floor. This can lead to small numbers of small demersal finfish being caught. Numbers caught by this method are extremely low and therefore do not pose any risk to the species concerned.

Management Responses

2.1.3 Measures are in place to avoid capture and mortality of bycatch species unless it is determined that the level is sustainable (except in relation to endangered, threatened or protected species). Steps must be taken to develop suitable technology if none is available.

Bycatch for the WCPSMF and SCPSMF were considered to be of negligible risk and therefore do not require specific management responses.

2.1.4 An indicator group of bycatch species is monitored.

Not applicable.

2.1.5 There are decision rules that trigger additional management measures when there are significant perturbation in the indicator species numbers.

Not applicable.

2.1.6 The management response, considering uncertainties in the assessment and precautionary management actions, has a high chance of achieving the objective.

Not applicable.

OBJECTIVE 2. PROTECTED/LISTED SPECIES

The fishery is conducted in a manner that avoids mortality of, or injuries to, endangered, threatened or protected species and avoids and minimises impacts on threatened ecological communities.

Information Requirements

2.2.1 Reliable information is collected on the interaction with endangered, threatened or protected species and threatened ecological communities.

Information on the levels of interaction with non-retained species has been obtained from interviews and discussions with fishers. As previously mentioned, Departmental staff are also in the process of collecting observer information aboard vessels operating in both the WCPSMF and SCPSMF. The next independent observer program is planned to commence in 2006. In addition, information is received from logbooks provided to the licensees. As previously mentioned, the logbooks are currently being revised in order to provide more detail on interactions with protected species.

Assessments

2.2.2 There is an assessment of the impact of the fishery on endangered, threatened or protected species.

The WCPSMF has been known to have a negligible impact on protected species such as seabirds and dolphins. While there is a lack of an observer programs, frequent trips carried out by research staff are considered reliable and no dolphin interactions have been recorded. However, as pilchards play an important part of the food chain for many species, there is some evidence that there may be indirect impacts due to changes in food availability. The issue of indirect impacts is discussed in environmental section 5.3.

The SCPSMF has a direct impact on some seabird species, as previously mentioned. However, the Department of Fisheries has formed a working group consisting of research scientists, fisheries managers and industry in order to trial methods of reducing seabird interactions with purse seine fishing gear.

2.2.3 There is an assessment of the impact of the fishery on threatened ecological communities.

There are no threatened ecological communities associated with the WCPSMF or SCPSMF.

Management Responses

2.2.4 There are measures in place to avoid capture and/or mortality of endangered, threatened or protected species.

Current management in both the WCPSMF and SCPSMF prohibits the landing of endangered, threatened or protected species. A seabird mitigation working group has been established to deal with the issue of capture of seabirds when interacting with the purse seine fishing gear. Additionally the Department and Industry have agreed that a specific logbook system needs to be established to report the seabird catches. A code of practice/handling is also under development and is due to be implemented in the near future with Industry support. Operators in the fishery previously used to collect seabirds that had been captured in the fishing gear for autopsy, and have expressed interest in continuing this practise. However, no Government Department currently wants the carcasses, and the Department of CALM has specifically requested that any dead birds are left in the water.

This issue was been discussed at the last PSMAC meeting. It was noted that there is a range of mitigation actions to be considered from use of shark oil as a deterrent, setting at night, use of scaring devices etc. There is a general agreement that there is a 2 month 'hotspot' around February and March during the season for bird catches. This is most likely coinciding with the chick-rearing period, which leads to short range foraging. A university research project is being developed through the seabird working group in order to test the range of mitigation methods considered in the PSMAC meeting. In dealing with dolphin interaction, the Department is revising the log book reporting system, which is separate from the catch and return records, so that interactions and mortalities are automatically reported and, together with the adoption of a new industry code of conduct, should provide improved data collection, allow better monitoring and minimise ngative interactions with protected species.

2.2.5 There are measures in place to avoid impact on threatened ecological communities.

The decision matrix limits total commercial take to 10-15% of estimated spawning stock biomass. However, there are not considered to be any threatened ecological communities affected by these fisheries

2.2.6 The management response, considering uncertainties in the assessment and precautionary management actions, has a high chance of achieving the objective.

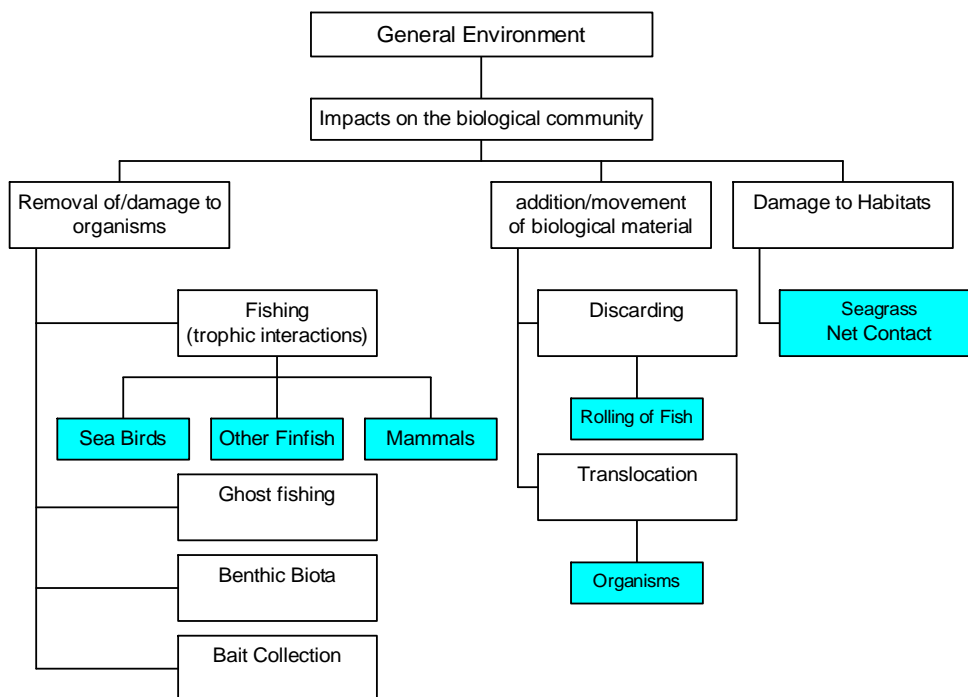
Given the moderate levels of interaction of this fishery with protected species, it is likely that the current situation is having only negligible impacts on these species. However, as noted above, the Department has adopted a number of management responses and measures to avoid impact on protected species and threatened ecological communities.

OBJECTIVE 3. GENERAL ECOSYSTEM

The fishery is conducted, in a manner that minimises the impact of fishing operations on the ecosystem generally.

The issues that relate to the broader ecosystem identified for the WCPSMF are shown below in the component tree. A formal risk assessment process subsequently assessed each of these issues with the information relating to each issue detailed in Section 5.3.

All four issues identified for the WCPSMF and SCPSMF were rated as **NEGLIGIBLE risk** (trophic interactions (seabird, other finfish), translocation of organisms on vessel hull, rolling of fish and net contact with seagrass beds). Consequently, the WCPSMF and SCPSMF current performance is meeting Objective 3 and this acceptable performance is likely to at least continue or improve in the future. Subsequently, since the risk assessment workshop, it was discovered that the level of interaction with seabirds was greater than previously understood. However, as previously mentioned, a seabird mitigation group has since been formed and the WA Conservation Council has also initiated a research project to gather baseline data on seabird interactions and possible deterrents.



Information Requirements

2.3.1 Information appropriate for the analysis in 2.3.2 is collated and/or collected covering the fisheries impact on the ecosystem and environment generally.

Appropriate levels of information have been obtained for most of the issues identified, which has allowed a sensible assessment of the level of risk to be made. This information includes data collected, which is directly related to the WCPSMF and SCPSMF - in terms of levels of catch and effort. There are also a number of

publications that provide valuable information on trophic interactions in addition to the research that the Department of Fisheries has undertaken and is currently working on.

2.3.2 Information is collected and a risk analysis, appropriate to the scale of the fishery and its potential impacts, is conducted into the susceptibility of each of the following ecosystem components to the fishery.

A formal risk assessment was completed (see Section 5.3 for details) on each of the identified issues relevant to the WCPSMF and SCPSMF (see component tree for issues). The identified issues were assessed and a summary of the outcomes is located in Table 6. Complete justifications are located in the performance reports in Section 5.3.

Table 6: Summary of risk assessment outcomes for environmental issues related to the WCPSMF and SCPSMF

ISSUES	RISK	SUMMARY JUSTIFICATION	FULL DETAILS
Removal of material from the environment:			
Impact of removing all species	Low	Small pelagic fish play an important part in the transfer of energy from autotrophs to heterotrophs in many food webs. It is estimated that when the WCPSMF is returned to full fishing pressure between 10-15% of the spawning biomass is removed from the environment. This leaves between 85 – 90% to predators of small pelagic fish. For this reason it has a low risk associated with fishing operations	5.3.1.1
Addition/Movement of material to the environment:			
Translocation of organisms on vessel hulls	Negligible	There is already a strong natural connection of species along the western coast due to the Leeuwin Current, which provides for the natural movement of species along the coast.	5.3.2.1
Rolling Fish	Negligible	The releasing of unwanted fish by rolling them out of nets significantly increases the mortality of fish over other methods of release. The occurrence of this method is low and under the proposed plan will be made illegal.	5.3.2.2
Damage to habitats:			
Seagrass Net Contact	Negligible	The area that is affected by nets coming into contact with seagrasses would represent less than 1% of seagrass area. The light weight of nets used also means the damage done is minimal.	5.3.3.1

Management Response

2.3.3 Management actions are in place to ensure significant damage to ecosystems does not arise from the impacts described in 2.3.1.

The trophic effect of removals are not likely to be significant as long as the removals are restricted to 5-10% of the spawning biomass. However, both fisheries have some locations where fishing occurs close to Island Nature Reserves with significant populations of breeding seabirds. There is evidence that some pilchard fishing birds have foraging ranges when breeding that are similar to the ranges of the operators. It is considered that there is some potential for short term local depletion of pilchards which may reduce the reproductive output of these colonies. Therefore, local depletion of the pilchard resource could potentially cause ecological impacts even within the context of a very conservative TAC.

Further reports on removals are available in Section 5.3.

2.3.4 There are decision rules that trigger further management responses when monitoring detects impacts on selected ecosystem indicators beyond a predetermined level, or where action is initiated by application of the precautionary approach.

The Department needs to further develop fishery management objectives, reference and trigger points based on seabirds as an indicator. This will be an objective of the Department's seabird mitigation working group.

2.3.5 The management response, considering uncertainties in the assessment and precautionary management actions, has a high chance of achieving the objective.

The risk assessment identified that under current management arrangements there have been minimal or negligible impacts from the WCPSMF and SCPSMF on the broader ecosystem even after around 30 years of fishing. It is, therefore, highly likely that the fishery will continue to meet the objectives of having only acceptable levels of impact. If future studies indicate that further management is required for one or more of the various habitat types and the bycatch species, then appropriate actions will be developed.

5. PERFORMANCE REPORTS

5.1 RETAINED SPECIES

COMPONENT TREE FOR RETAINED SPECIES OF THE WCPSMF FISHERY

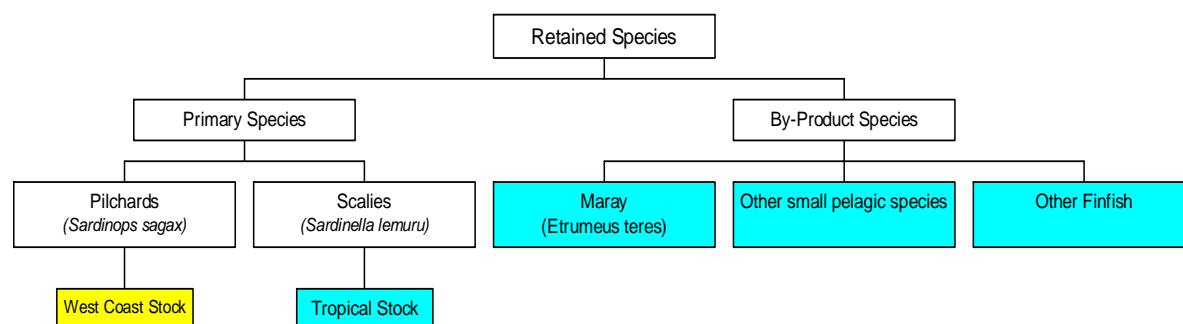


Figure 11: Component tree for the retained species.

Yellow boxes indicate that the issue was considered high enough risk at the October 2003 to warrant having a full report on performance. **Blue boxes** indicate the issue was rated as a low risk and no specific management is required – generally only the justification is presented.

5.1.1 PRIMARY SPECIES

5.1.1.1 PILCHARDS AND SCALY MACKEREL

Rationale for Inclusion

Pilchards (*Sardinops sagax*) and scaly mackerel (*Sardinella lemuru*) are the target species for this fishery and therefore the potential impact of the fishery on their stocks needs to be assessed.

ERA Risk Rating: Impact on breeding population

(Scaly Mackerel COL6 Negligible)

Scaly mackerel are a tropical species with Perth being the southernmost limit of their natural distribution, which centres around Indo-China. Preliminary research was inconclusive as to the recruitment status of this fishery but indications are that fish have migrated from warmer waters (Gaughan & Mitchell 2000). Even though the effort in this fishery is close to fully exploited the consequence of any over fishing was rated as negligible as the fishery is active in only a very small area of the natural distribution of the species.

(Pilchards C2 L2 LOW)

Fletcher (2002) in the Guide for development of ESD reports recommends this risk is low to moderate due to disease. Disease can effect the population of any species but only affects management if an outbreak occurs. If disease is considered a risk in this industry it should be considered for all fish species because they can all suffer from disease. Disease should be considered as an external ecological influence.

Pilchards are distributed around the southern section of Australia from Noosa in the east to Geraldton in the west. A great deal of research has concentrated on the amount interaction between stocks surrounding each fishery. It has been found that the west coast stock is isolated from its nearest neighbours along the south coast. Therefore management is based on the premise that little if any recruitment will come from surrounding stocks of fish and the spawning stock levels needs to be maintained to a level where self-replacement will occur.

The potential consequences of over-fishing on the stocks of pilchards were classified as 'severe' but the likelihood of this occurring is rated as 'rare'.

The WCPSMF and SCPSMF are in the unusual circumstance where management capabilities can be proven to withstand a major change in spawning stock numbers (see final component tree, Figure 16). The disease outbreaks of 1995, and more particularly 1998, decimated spawning stock numbers as the outbreak affected mature fish. Management was able to implement changes that prevented further pressure on mature fish by removing fishing effort. Following the implementation of effort controlled measures, management has since monitored spawning stock numbers and catch controls were introduced that allowed spawning stock numbers to recover to past levels. The latest indications show spawning stock biomass recovering from as low as 30% to be now estimated at 60% of pre 1995 levels.

Once spawning stock levels have returned to pre 1995 estimates, then catch levels will be permitted to return to allow 10 – 15% of the spawning stock to be taken each year. This is a conservative amount when considering other small fast growing species similar to pilchards, but is a cautious limit until a better understanding is known of the juvenile stages of the species and what ecological events affect recruitment.

Therefore, it was only considered **rare** that a **severe** consequence (recruitment overfishing) could occur. This results in the overall risk rating of 4, which is a **LOW Risk**. Thus continued explicit management is required to maintain acceptable performance.

Operational Objective

To maintain the spawning stock of pilchards at or above an identified level that minimises the risk of recruitment overfishing or other as yet unknown ecological impacts.

Justification:

An operational objective that maintains the potential for recruitment to continue at historical levels is consistent with the statutory obligation under section 3 of the FRMA “ to conserve, develop and share fish resources of the State for the benefit of present and future generations.”

Indicator

Egg surveys in association with sexual stage of commercial catch.
Age distribution of commercial catch throughout the year.

When used in conjunction with the analysis of the sexual state of mature fish in the same area, egg surveys have been used for many years to predict spawning stock numbers in fisheries throughout the world (Fletcher et al. 1996). They cannot be used alone to manage the WCPSMF and SCPSMF. Due to the high variability of recruitment, age distribution of the commercial catch needs to be monitored for indications of consistent changes in maturing fish.

Performance Measure

Management uses a matrix to develop TAC for subsequent season. The matrix is also used throughout the year in conjunction with age distribution to monitor age structure of the present catch.

Justification:

The pilchards of the WCPSMF and SCPSMF are considered to be fully exploited at a removal level of 10-15% of the mature stock. Once more information is known on the ecological effects of removing more mature fish, and there is a better understanding of the life cycle and what affects the life cycle of the pilchard, then new indicators may be used and a change in the proportion of the fishable stock may be targeted.

Management arrangements have been capable of withstanding a massive reduction in spawning stock whilst still allowing fishermen to remain in the industry. Recovery of stock to date appears to very strong.

Table 7: Data Requirement for Indicator (and Availability)

Data Required	Availability
Egg survey results	This is available from analysis of plankton surveys taken by the Department of Fisheries Patrol vessels. This data is collected every second year.
Sexual stage of mature fish at time of egg collection	Samples of commercial catch taken at the same time as egg collection
Age distribution of commercial catch	Samples are taken from each commercial catch to be analysed at WAMRL

Evaluation

Summary: Egg surveys conducted in 2000 and 2002 provided evidence that the stock is recovering strongly. Age distribution of the 2003 season supported this with the commercial catch being dominated by 3 to 4 year old fish.

Landings: Catches of pilchards from the WCPSMF during 2003 were 237 tonnes. Likewise, catches of pilchards from the SCPSMF during 2003 were 1653 tonnes (Mitchell, Leary & Gaughan 2003).

Scaly mackerel and other small pelagic species are also targeted by both the WCPSMF and SCPSMF. In 2003, 468 tonnes of Scaly Mackerel and other small pelagic species were landed in the WCPSMF. The SCPSMF landed just 6 tonnes of other small pelagic species in the same year.

Fishing effort: The small number of vessels in the WCPSMF, which in 2003 together fished for a total of 525 days, whereas the vessels in the SCPSMF in 2003 fished for 841 days in Albany, 514 days in Bremer Bay and 201 days in Esperance. It is important to note that fishing effort changes annually in response to changes in the TAC for each region and the local availability of market-size fish. For example, fishing effort increased in Albany by 267% and in Bremer Bay by 119% reflecting the increased TAC's and the reasonable availability of pilchards in these zones. In contrast, although Esperance also had a higher TAC, the low availability of market-sized fish led to lower effort levels being applied.

Catch rate: The catch rate for small pelagic fish was 2,218 kg/day for 2003 in the WCPSMF. The catch rate in the SCPSMF for the same year was 900 kg/day for Albany, 1,156 kg/day in Bremer Bay and 1,197 kg/day in Esperance. Due to the stock being in a recovery position, it is unrealistic to compare these figures to past effort in the fishery.

Recreational component: There is no recreational component to the stock of pilchards on the west coast of WA.

Robustness : HIGH

The link between egg counts and sexual stage of mature fish and spawning stock biomass has been proven as a strong relationship and is used by many fisheries around the world (Fletcher et al. 1996). The reinforcement of this figure by monitoring age distribution of current commercial catch gives the fishery an excellent basis for achieving the objective of the management plans.

Fisheries Management Response

Current:

The WCPSMF and SCPSMF have been in operation since the mid 1980's with limited entry and input controls limiting the total catch.

In 1995 a disease outbreak (a *herpesvirus*) infected the stocks of mature pilchards. This first outbreak was estimated to have killed between 10 – 15% of spawning fish. It was estimated that the fishery natural fluctuations were of this order and therefore the fishery would recover without making any management changes.

In 1998/99 the same *herpesvirus* infected mature fish, with estimates of 60 – 70% of mature fish being killed. The Executive Director closed the fishery. Once further research had been completed the fishery was re-opened with a cap on the number pilchards any one license could catch. This cap has been slowly increased as the spawning stock numbers have increased.

Future:

Presently the Department of Fisheries, in conjunction with operators in the fishery and with the advice received from the PSMAC have developed a new management plan for the WCPSMF. The new plan changes the management of effort from an input only limited fishery to an input and output limited fishery. The number of licences permitted under the new plan remains the same and the fishery will remain a limited entry fishery. Other key points from the new plan include;

- removal of boat size restriction;
- individual transferable quotas for pilchards;
- individual quotas placed on all species of small pelagic fish;
- northern and southern development zones;
- prohibiting rolling of fish (unless for safety purposes); and
- over-quota management arrangements.

Actions if Performance Limit is Exceeded:

Under the new Management Plan for the WCPSMF, the TAC for each season will be set after the data from egg surveys have been combined with age distribution information from the previous year, as is already the case in the SCPSMF. Given the average small pelagic carrying capacity of 30,000 tonnes, catches of scaly mackerel will be decreased proportionally to any increases in pilchard TAC. Should an event such as the disease outbreak in the past re-occur, the plans allow the Executive Director to close the fishery(s) by way of notice in the Government Gazette. All operators would be advised of the expected closure through verbal and written methods.

The ability to implement these strategies is provided for within the *Fish Resources Management Act 1994* and Regulations.

Comments and Actions

The WCPSMF and SCPSMF have been in operation for 30 years and have been managed through two major disease outbreaks with management having the ability to adjust effort in the industry to prevent further stock reduction and allow the stock to recover. The new WCPSMF management plan that has been approved for adoption will make management of this fishery simpler in the future.

External Drivers

The recent changes in the market for scaly mackerel show how a change in marketplace can affect this fishery, as fishers were able to continue operations by targeting scaly mackerel instead of pilchards. The changing of the WCPSMF management plan puts limits on all small pelagic fish (as is already the case in the SCPSMF). Therefore, should future marketing arrangement for other species change, the elements for the controlling these fisheries are already in place.

5.1.2 BY-PRODUCT SPECIES

ERA Risk Rating: Impact on breeding population

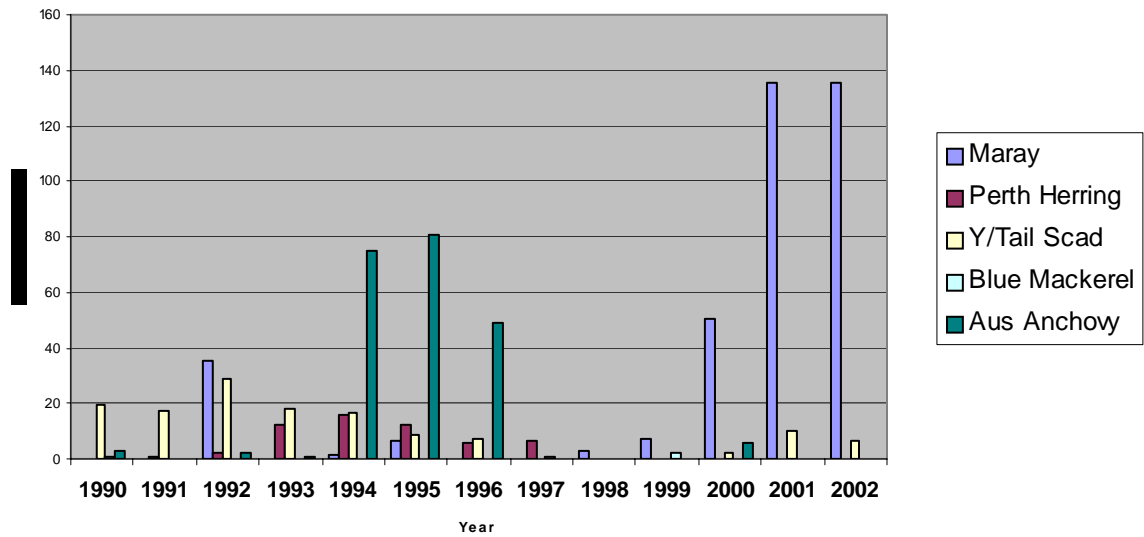
(Other Small Pelagic Fish COL6 Negligible)

There are several other small pelagic fish that are permitted to be caught under the WCPSMF and SCPSMF but are not generally targeted. These include;

- Perth herring
- Yellowtail scad
- Australian anchovy
- Maray

All these species are widely distributed and the area that is fished is small (<1%) therefore it is considered that the WCPSMF and SCPSMF will have minimal affect on breeding populations. The total weights of each minor species by year are shown in the following graph.

Figure 12: Non target species history in SCPSMF and WCPSMF of landed weight by year



Other Finfish– Summary

ERA Risk Rating (C0 L5 NEGLIGABLE)

There are two different methods other finfish can be captured by pelagic operators. Firstly, if predatory finfish are feeding on a school prior to or during seining, then they can potentially be captured or interact with the net. Capture however, is at a relatively low frequency as during the time it takes to encircle and close off the school of fish, the finfish can dive and swim away from capture.

Secondly, when operators are working in relatively shallow water, the net may scrape the ocean floor. This can lead to small numbers of small demersal finfish being caught. Numbers caught by this method however are extremely low and therefore do not pose any risk to the species concerned.

5.2 NON-RETAINED

COMPONENT TREE FOR NON-RETAINED SPECIES

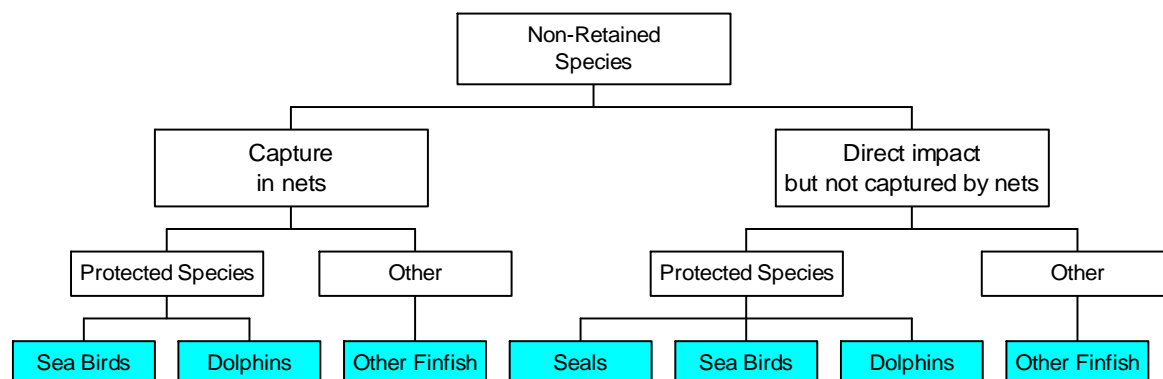


Figure 13: Component tree for non-retained species.

Yellow boxes indicate that the issue was considered high enough risk at the October 2003 to warrant having a full report on performance. **Blue boxes** indicate the issue was rated as a low risk and no specific management is required- only the justification is presented.

5.2.1 CAPTURED BY NETS

5.2.1.1. PROTECTED/LISTED SPECIES COMMON DOLPHIN

Rationale for Inclusion:

Participants of the WCPSMF and SCPSMF have been known to catch species that predate on small pelagic fish such as common dolphins. The WCPSMF and SCPSMF are taking all reasonable steps to ensure that cetaceans are not harmed or killed through an extensive Industry Code of Practice (Appendix 4).

ERA Risk Rating: Impact on breeding population (C0 L3 NEGLIGIBLE)

The common dolphin is found throughout southern ocean waters. They have been known to be caught in purse seine nets trying to get an easy feed. Very few dolphins are caught and under nearly all circumstances they are released unharmed. Although, as previously discussed in Section 2, the SCPSMF has recorded 2 dolphin interactions in the last 12 months. However, at the risk assessment workshop it was agreed that the occurrence is very low and little to no harm is done to the dolphin breeding population. In addition, the WCPSMF is active in only a very small (<1%) area of the waters that are populated by dolphins. On this basis, the risk was ranked as negligible and therefore this issue does not require a full report.

5.2.1.2. PROTECTED/LISTED SPECIES SEA BIRDS

Rationale for Inclusion:

Participants of the WCPSMF and SCPSMF have been known to catch species that predate on small pelagic fish such as sea birds. This has been covered in detail in section 2. The WCPSMF and SCPSMF are taking all reasonable steps to ensure that seabirds are not harmed or killed through an extensive Industry Code of Practice (Appendix 4) and the formation of a seabird mitigation group.

ERA Risk Rating: Impact on breeding population (C0 L2 NEGLIGIBLE)

As previously noted, sea birds can be caught by purse seine operators while trying to feed on fish already caught in nets, which can lead to the occasional incidence of birds actually becoming tangled in the net. However, the incidence is low and on this basis it was considered to be of negligible risk and therefore does not require a full report. Although after the risk assessment workshop it was discovered that the level of interaction with seabirds was greater than previously understood, the Department has since introduced mitigation measures such as forming a seabird mitigation working group as described in section 2.1.2.

5.2.1.3. OTHER SPECIES FINFISH

Rationale for Inclusion:

Participants of the WCPSMF and SCPSMF have been known to catch species that predate on small pelagic fish such as other pelagic and some demersal finfish.

ERA Risk Rating: Impact on breeding population (C0 L5 NEGLIGIBLE)

As many species of large fish predate on small pelagic fish, there is an occasional occurrence of finfish being caught whilst feeding on small pelagic fish. The majority of these fish are returned to the ocean unharmed. This fishery is a species limited fishery and the catching of species not listed in the management plan is prohibited. A very small percentage may be landed for personal consumption of the crew of the vessel. The amount of fish impacted within this category does not warrant further management changes.

5.2.2 DIRECT IMPACT

5.2.2.1. PROTECTED/LISTED SPECIES COMMON DOLPHIN

Rationale for Inclusion:

Due to the barrier that a purse seine net presents in the ocean, a number of species that may be feeding on small pelagic fish may hit the net once it has been placed around the fish.

ERA Risk Rating: Impact on breeding population (C0 L3 NEGLIGIBLE)

As mentioned earlier the common dolphin is found throughout southern ocean waters. Dolphins sometimes try to ram the net to break a hole in to allow them to continue feeding. Operators try to limit the occurrence of this by removing the fish from the water as quickly as possible, hence the use of pumps to bring fish aboard the vessel. The lightweight and small mesh size means dolphins do not get caught by this method and are not injured in any way by their actions.

5.2.2.2. PROTECTED/LISTED SPECIES SEALS AND SEA BIRDS

Rationale for Inclusion:

Due to the barrier that a purse seine net presents in the ocean a number of species that may be feeding of small pelagic fish may hit the net once it is has been placed around the fish.

ERA Risk Rating: Impact on breeding population (C0 L2 NEGLIGIBLE)

The incidence of collision occurring is rare and due to the lightweight and small size of the mesh, entanglement does not usually occur and there have been no reported incidences of injury or capture of seals. Seabird interactions have been described previously in Section 2.

5.2.2.3. OTHER SPECIES FINFISH

Rationale for Inclusion:

Due to the barrier that a purse seine net presents in the ocean a number of species that may be feeding of small pelagic fish may hit the net once it is has been placed around the fish.

ERA Risk Rating: Impact on breeding population (C0 L2 NEGLIGIBLE)

The incidence of collision occurring is rare and due to the lightweight and small size of the mesh entanglement does not occur and it is assumed minimal injury would be sustained if mesh entanglement was to occur.

5.3 GENERAL ENVIRONMENT

COMPONENT TREE FOR THE GENERAL ENVIRONMENT

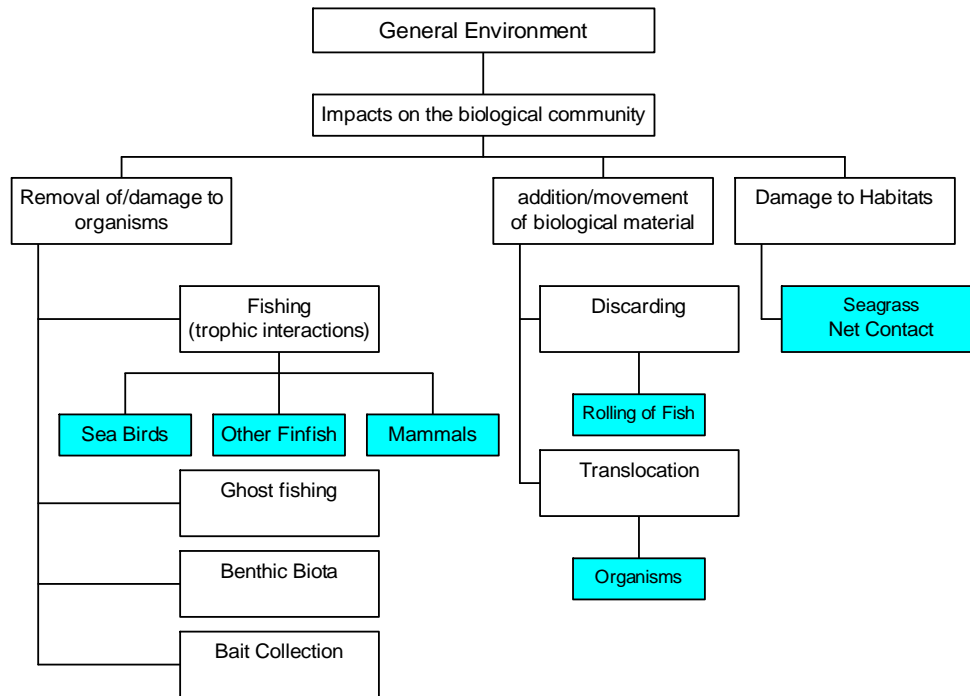


Figure 14: Component tree for the general environment.

Yellow boxes indicate that the issue was considered high enough risk at October 2003 to warrant having a full report on performance. **Blue boxes** indicate the issue was rated as a low risk and no specific management is required- only the justification is presented.

5.3.1 IMPACTS FROM REMOVAL OR DAMAGE TO ENVIRONMENT

5.3.1.1 REMOVAL OF SMALL PELAGIC SPECIES

Rationale for Inclusion:

The assessment of what indirect ecosystem impacts could result from the removal of individuals of the target and other species by a fishery should always be considered. For the WCPSMF and SCPSMF, there is no evidence that the effects of the removal of any one of the captured species should be examined separately – as the species are all very similar and play a “keystone role” in this ecosystem. It was, therefore, most appropriate to examine the impact of the total removals.

ERA Risk Rating: Impact on the environment (C2 L3 LOW)

Other Finfish

Present levels of effort in the WCPSMF and SCPSMF are set lower than in the past to allow for the rebuilding of stocks to pre 1995 levels. Once estimates of breeding biomass reach pre 1995 levels, the TAC will be set at 10% of the spawning biomass leaving 90% to predator species. It has been reported by Fletcher et al (1997) that fluctuations in stocks due to natural causes can be as high as 15% therefore it unlikely that there would be unreasonable levels of impact on predators species.

In their review of scientific studies on the effects of fishing on marine ecosystems, Jennings and Kaiser (1998) concluded that “*where the functional and species diversity of fishes is relatively high, the indirect effects of fishing on the abundance of unfished prey species appears to be minor.*” Additionally, when looking at the geographical range of the other species of scalefish taken and the relatively small quantities involved (Table 4), the removal of these fish is not considered to present a threat to the sustainability of each of these stocks.

ERA Risk Rating (C1 L4 NEGLIGIBLE)

Seabirds and Mammals

Gaughan et al (2002) were unable to prove unequivocally the importance of small pelagic species to breeding seabirds that inhabit the Abrolhos Islands. Evidence suggests that some species of birds need to feed on certain small pelagic fish species for reproductive success. For this reason, it was suggested that, as a precautionary measure, fishing pressure not be increased over the present TAC of 2700 tonnes for scaly mackerel in the Northern Development Zone.

As for other finfish, the TAC for the fisheries are set at a low level. Therefore fishing pressure alone should not impact on other species that feed on small pelagic fish. Should another incident such as the virus outbreak occur, the matrix system used for management will reduce fishing pressure accordingly. Reducing fishing effort reduces the impact it has on species that rely on small pelagic fish for a high percentage of their diet. The impact the environment has on the fishery is discussed in section 5.5.

5.3.1.1 TAKING ALL BY-PRODUCT SPECIES

ERA Risk Rating (C0 L4 NEGLIGIBLE)

The quantity of by product species taken by the WCPSMF and SCPSMF is at such a low level that impact on the environment is considered to be negligible

5.3.2 ADDITION OF MATERIAL TO THE ENVIRONMENT

5.3.2.1 TRANSLOCATION OF ORGANISMS ON VESSEL HULLS

Rationale for Inclusion:

The movement of fishing vessels may provide a mechanism for marine species to be transported beyond their natural ranges. In the extreme circumstance, fishing vessels could provide a vector for movement of disease and exotic species. Only the hulls of the vessels used in the WCPSMF and SCPSMF could provide the opportunity for translocation to occur since these vessels do not contain water ballast. However the hulls are regularly anti-fouled, and the vessels operate within a single biogeographical area. Therefore this is a negligible risk.

ERA Risk Rating: Impact on the environment (C3 L1 NEGLIGIBLE)

Although the consequence of introducing a non-native species or disease is potentially severe, the likelihood is quite low. Given that there is a strong natural connection of species along the western coast due to the Leeuwin Current, which provides for the natural movement of species along the coast, the fishery would not add to the likelihood of transferral.

5.3.3 DAMAGE TO HABITATS

5.3.3.1 NET CONTACT WITH SEAGRASS

Rationale for Inclusion:

Fishing operations in the WCPSMF and SCPSMF may involve net coming into contact with seagrass beds. This activity may have localised effects on seagrass beds.

ERA Risk Rating: Impact on habitats (C0 L5 NEGLIGIBLE)

Schools of fish occasionally enter shallow water bays. When the schools are caught, the nets may come into contact with seagrass beds. However, due to the light structure of the net, damage to seagrass is minimal and is kept to a very small area.

5.4 GOVERNANCE

COMPONENT TREE FOR THE GOVERNANCE OF THE WCPSMF AND SCPSMF

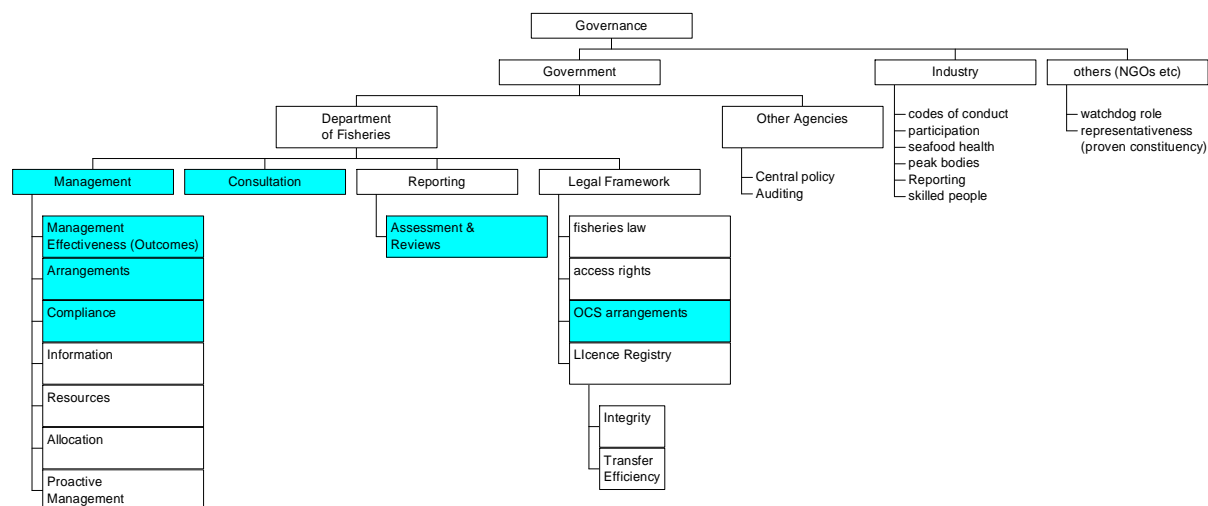


Figure 15: Component tree for governance.

Nb- no generic components have been removed from the tree but only those boxes that are blue will be reported in this application.

5.4.1 DEPARTMENT OF FISHERIES – MANAGEMENT

5.4.1.1 MANAGEMENT EFFECTIVENESS (OUTCOMES)

Rationale for Inclusion:

The effectiveness of management activities is reflected by the extent to which the WCPSMF and SCPSMF continues to maintain expected outcomes. The expected outcome in this case is the rebuilding of spawning stock biomass whilst continuing some fishing effort. Once spawning stock biomass has reached planned goals, effort can then be returned to the ecologically sustainable levels with continued use of the effort matrix.

Operational Objective

To return spawning stock biomass to levels evident prior to the disease outbreaks of 1995, whilst maintaining activity and therefore commercial viability of fishermen that have been affected by the mass mortalities.

Justification:

Small pelagic fish play a key role in the many food webs of the ocean, therefore numbers cannot be reduced to levels that affect other species. TAC of the fishery is set in such a way that numbers of the breeding stock biomass are kept at a level equivalent to the virgin biomass.

This fishery has been hit by two major disease events. Considerable effort has been spent to identify the source or the trigger of this event, however no conclusive results have been produced. The management option is to continuously monitor the situation with plans in place so that should a similar event occur again, management changes can be put in place with a minimum of effort and with all parties involved knowing how the situation will be handled.

Indicator

Egg surveys used in conjunction with spawning biomass.
Age distribution of fish to indicate a stable spawning stock.

Performance Measure

There are two performance measures used to evaluate management effectiveness of these fisheries.

- Firstly, egg counts from plankton net surveys need to stabilise at or around 80-90% before TAC can be returned to original levels.
- Secondly, the age distribution of fish needs to be determined during each season. The ideal is to have a range of ages from 3 to 5 year olds, which will indicate that the spawning stock has stabilised.

Justification:

The use of egg surveys to determine spawning stock biomass has become a key tool in the management of many fisheries throughout the world. Although information has been collected for a relatively short period of time for the fishery, it is accepted as a viable measure of biomass spawning estimation.

Data Requirements for Indicator

Data Requirement	Data Availability
Planktonic egg counts	Yes – undertaken by the Department every 2 years
Sexual stage of mature fish at time of Planktonic egg count	Yes – Department samples commercial catch at the same time as egg collection
Age distribution of commercial catch	Yes – samples are taken from each commercial catch to be analysed by the Department

Evaluation

Planktonic egg surveys were conducted in 2000 and 2002 and provided evidence that the spawning stock is recovering strongly. The age distribution of the commercial catch in 2003 also supported this evidence with the commercial catch dominated by 3 to 4 year old fish.

Robustness

Medium/High.

The data required for the indicator are readily available.

In addition, new methods for setting a sustainable method of calculating TAC are presently being investigated by the Department.

Fisheries management Response

Current

The WCPSMF is presently undergoing a change in the management regime, transferring management from a restricted entry input and output limited fishery to a limited entry individual quota system (output limited fishery). This is expected to simplify the management of the fishery and help with management should future environmental impacts occur.

It will also allow for the incorporation of the two development zones with the present WCPSMF to become one managed fishery, which will also simplify compliance and administration of the fishery.

Future

The Department aims to continue to limit fishing pressure until stock levels reach pre virus outbreak levels. Studies in conjunction with other states are continuing into the cause of the disease outbreaks in the past, the aim of which is to minimise impacts of future outbreaks.

Response if performance limit triggered

Should egg counts fall below target levels, then reductions in TAC of the remaining or future seasons will occur. While this arrangement is already in place in the SCPSMF, it is being built into the new WCPSMF management arrangements.

External Driver Checklist

As yet unquantified environmental factors such as climatic changes, ocean currents, disease etc may impact the size and availability of the exploitable biomass.

5.4.1.2 MANAGEMENT ARRANGEMENTS

Rationale for Inclusion:

In Western Australia, a number of instruments are used to articulate the management arrangements for fisheries. The FRMA contains elements that affect all fisheries; in addition to this there are Management Plans, Orders, Regulations, Ministerial Policy Guidelines (MPG) and Policy Statements. The objects of the FRMA are to conserve, develop and share fish resources of the State for the benefit of present and future generations.

In particular, the Act has the following objectives;

- a) to conserve fish and to protect their environment;
- b) to ensure that the exploitation of fish resources is carried out in a sustainable manner;
- c) to enable the management of fishing, aquaculture and associated industries and eco –tourism
- d) to foster the optimum economic, social and other benefits from the use of fish resources;
- e) to enable the allocation of fish resources between users of those resources;
- f) to provide for the control of foreign interests in fishing, aquaculture and associated industries;
- g) to enable the management of fish habitat protection areas and the Abrolhos Island reserve.
- h) The FRMA sets out the objects for the sustainable management of fish resources in WA and provides the framework for developing and implementing management plans for the State’s fisheries.

The management plans are essentially a set of rules as to how the fisheries operate. The *West Coast Purse Seine Management Plan*, *South Coast Purse Seine Management Plan* (the Plans) and subsequent amendments are provided for under the FRMA and, in conjunction with the Fisheries Resources Management Regulations (FRMR) and MPG, effectively sets out the rules under which the WCPSMF and SCPSMF operate. The Plans and associated documents (which include this ESD report) should include all information expected to be in a “best practice” set of management arrangements (as defined in the Department’s ESD Policy – Fletcher 2001).

These arrangements contain:

- An explicit description of the management unit.
- The issues addressed by the plans.
- Descriptions of the stocks, their habitat and the fishing activities.
- Clear operational (measurable) objectives and their associated performance measures and indicators.
- Clearly defined rules, including what actions are to be taken if performance measures are triggered.
- Economic and social characteristics of the groups involved in the fisheries.
- Management and regulatory details for the implementation of the actual management arrangements.
- The reporting and assessment arrangements.
- How and when reviews of the plans will occur (including consultation mechanisms).
- A synopsis of how each of the ESD issues is being addressed.

These arrangements include (but are not limited to) the criteria to operate in the WCPSMF and SCPSMF, the manner of fishing, fishing zones, licence renewals, transfers and cancellations, offences and major provisions and the process for amending the Plans.

The Offshore Constitutional Settlement (OCS) arrangements, which took effect during 1987 and 1988, set out to simplify legal arrangements for the management of fisheries operating in both State and Commonwealth waters (Fisheries Department of WA, 1988). The OCS of 1995 further refined those management arrangements. The OCS arrangements between Western Australia and the Commonwealth Government of 1988 established that pilchards and stocks of similar species including scaly mackerel, yellowtail scad, sandy sprat, blue sprat, Australian anchovy, Perth herring and moray, occur largely inshore, and consequently jurisdiction was handed to Western Australia. Blue and jack mackerel, which could potentially be taken by large purse seiners, were not covered by this agreement. Additionally, fishermen who catch pilchards as live bait for tuna industry were also excluded from the agreement.

Under the OCS of 1988, State jurisdiction for Western Australia was extended from longitude 125°E on the south coast, seaward to the 200 nautical mile outer limit of the Australian fishing zone, and north to longitude 120°E. Outside of these areas, previous management arrangements apply.

Operational Objective

The Department, in consultation with the PSMAC and other stakeholders, periodically review the Plans, related legislation, regulations and arrangements to ensure they remain relevant and aligned with the management objectives of the WCPSMF and SCPSMF and if they collectively cover the 10 main principles (as described above).

Justification:

To have an effective and understandable Plan for the management of the WCPSMF and the SCPSMF with all 10 principles covered within the suite of arrangements developed for the fisheries.

Indicator

The extent to which the Plans and supporting documentation addresses each of the issues and has appropriate objectives, indicators and performance measures along with planned management responses.

Performance Measure

This should be 100%.

Evaluation

Twice yearly, a Management Advisory Committee meeting is organised for the industry and Department to raise any issues. As a result, a periodic review is done on an annual basis. Outside of this timeframe any major problems with management arrangements can be raised by anyone (industry or the Department) at any time and they will be addressed by the Department.

The performance of the management arrangements is evaluated on two levels – the micro level (that is, the relevance of individual clauses and the role they play) and the macro level (that is, the relevance of the Plan as a whole and the role it plays).

The current performance is assessed against each of the main principles, which are required under the collective management arrangements:

1. **An explicit description of the management unit** – the management unit for the WCPSMF is explicitly described within Clause 4 and Schedule 1 of the Management Plan. Similarly, the management unit for the SCPSMF is explicitly described within the Management Plan.
2. **The issues addressed by the Plan** – the issues that need to be addressed by the Plan have been examined thoroughly and are documented within this ESD component trees and their reports.
3. **Description of the stock/s, their habitat/s and the fishing activities** – the Pilchard fishery and fishing activities are described in Section 2.
4. **Clear operational (measurable) objectives and their associated performance measures and indicators** – these are located in Section 5 (component reports) of this Report for each of the major issues.
5. **Clearly defined rules, including what actions are to be taken if performance measures are triggered** – for each of these major issues, the management actions that will be taken if performance limits are exceeded are now articulated in Section 5 (Component Reports) of this Report.
6. **Economic and social characteristics of the groups involved in the Fishery** – a brief description of the economic and social characteristics is located in Section 2 of this Report and there is to be a greater level of detail accumulated during the process of completing the remainder of the ESD components.
7. **Management and regulatory details for the implementation of the actual management arrangements** – the regulatory framework for the WCPSMF and SCPSMF are located in the Plans, the FRMR and Orders (a set of which has been provided to DEH).
8. **The reporting and assessment arrangements** – these arrangements are documented in Section 5.4.4 of this Report and include annual reporting against current agreed performance limits and targets and a five yearly review of these arrangements and assumptions.
9. **How and when reviews of the management arrangements will occur (including consultation mechanisms)** – the FRMA clearly sets out how the process for the review of any Management Plan must occur. The new Management Plan also includes specifics on the processes that must be followed prior to the plan being altered.
10. **A synopsis of how each of the ESD issues are being addressed** – a synopsis of ESD issues has been compiled within the Overview Table of this report.

Robustness High.

The management arrangements for the WCPSMF and SCPSMF represent a comprehensive set of management legislation. The fact that the management arrangements are contained within enforceable legislation provides a high degree of

stability with respect to how the WCPSMF and SCPSMF are managed. The processes for achieving the changes to the management arrangements are well understood by the majority of stakeholders and the system is flexible enough so that the management process can respond to external stimuli.

Fisheries Management Response

The proposed new management plan for the WCPSMF will allow the fishery to be managed in a more ecologically sustainable manner by limiting the total take from the fishery through ITQ management arrangements, as is already the case in the SCPSMF. The Plans will achieve this whilst maintaining the legislative enforceable control over the fisheries. The proposed plan for the WCPSMF will also allow for uncomplicated compliance monitoring, as is already the case in the SCPSMF. The new plan for the WCPSMF is expected to be introduced in the near future.

Comments and Actions

The WCPSMF and SCPSMF are managed in a dynamic and consultative manner (that is, they respond readily to changed circumstances), but fishermen are often resistant to change. Consequently, before catch-reduction methods are accepted by fishermen, they require evidence of the need for such measures. While most fishermen have a very high level of confidence in the Department's research activities, sometimes members of industry demand certain knowledge before accepting the need for change and can then be sceptical of research findings no matter how statistically valid. Individual fishermen's views can understandably be greatly influenced by their own experiences and observations while fishing, and these sometimes give them a contrary view of the state of the WCPSMF and SCPSMF. Nonetheless, there is generally a very good relationship between fishermen and the Departmental research scientists and most will accept the advice of the researchers (albeit after questioning it in the context of their own experiences).

External Driver Check List

In regards to management arrangements of the WCPSMF and SCPSMF external drivers such as Parliamentary disallowance of any legislative change, Capricious Management Plan amendments dictated by the Minister and Legal challenges to the Plans could all have an effect on the Plans.

5.4.1.3 COMPLIANCE

Rationale for Inclusion:

Effective compliance is vital to achieve the management objectives of any fishery. There are no direct figures in relation to cost of compliance in this fishery as inspections are carried out in combination with a number of other activities. Compliance uses a mix of different methods, which include sea patrols and surveillance, land patrols, quota database inspections, processing factory inspections, covert surveillance operations and education programs. Due to the difficulties with weighing large quantities of fish, it has been agreed that under the proposed new plan

standardised containers will be used instead of weights up until fish are weighed at the factory.

Operational Objective

To have sufficiently high levels of compliance with the FRMA, FRMR and the Plans.

Justification:

The activities of the participants in the WCPSMF and SCPSMF need to be sufficiently consistent with the management framework and legislation to make it likely that the expected outcomes and objectives will be achieved.

Indicator

The degree of understanding and acceptance of the rules governing the operation of the Fishery by the licensees.

The level of compliance by licensees with the legislation.

Performance Measure

That the cap for pilchards is not exceeded in any one season and the rolling of fish is eliminated from the fishery.

Data Requirements for Indicator

- Data acquired from inspections of landings
- Data acquired from inspections of vessels and gear
- Data acquired from inspections of processing factories
- Data acquired from any reported small pelagic fish mortalities in the area of the fisheries
- Comparison of catch cap per vessel and daily catch records.

Robustness

High.

Due to the number of active operators within the WCPSMF and SCPSMF and in the WCPSMF the proximity to high population density, fish mortalities from fish rolling are detected shortly after the event. Compliance is high, and it is expected to remain high especially the operators being involved in the development of the new WCPSMF plan Fish Rolling is a major offence under the SCPSMF Management Plan and will become a major offence under the proposed new WCPSMF Management Plan.

In addition, due to the number of enforcement officers, the likelihood of inspection on vessel or processors occurring is high and therefore the level of compliance is also high.

Fisheries Management Response

Current program.

Compliance staff will continue to conduct routine and targeted inspections of operators and processors to ensure the Plans are being adhered to. Offences relating to the completion of catch and disposal records are treated as major offences given that the integrity of the system relies heavily on accurate completion of the catch and disposal record forms.

Future program

Compliance inputs into the WCPSMF and SCPSMF will remain at a fairly high level. In addition, once the new management plan is introduced in the WCPSMF compliance inputs will be increased until such time as industry becomes fully conversant with the legislative requirements.

Furthermore, compliance staff will continue to be engaged in an educational role in addition to an enforcement role to raise the awareness of the legislative requirements relating to the WCPSMF and SCPSMF.

External Driver Checklist

External factors, which may detract from the level of compliance include: unnecessarily complicated and ambiguous management arrangements.

5.4.2 DEPARTMENT OF FISHERIES- CONSULTATION

5.4.2.1 CONSULTATION

Rationale for Inclusion:

Consultation is required prior to any changes to legislation. Typically the Department consults with the Minister for Fisheries, industry, the relevant MAC, the recreational sector, indigenous interests, AFMA, conservation interests and the wider community prior to implementing changes.

The FRMA has certain requirements with regard to consultation that must be undertaken in the course of managing fisheries. The management of the WCPSMF and SCPSMF is based around an extensive consultation and communication process.

There are sections in the FRMA that relate to the development of a management plan (Section 64) and to the amendment of a management plan (Section 65). Given that the Pilchard fishery already has a management plan, Section 65 is the most relevant.

This states that:

S 65. Procedure before amending management plan

(1) A management plan must specify an advisory committee or advisory committees or a person or persons who are to be consulted before the plan is amended or revoked.

(2) Before amending or revoking a management plan the Minister must consult with the advisory committee or advisory committees or the person or persons specified for that purpose in the plan.

(3) Despite subsection (2), the Minister may amend a management plan without consulting in accordance with that subsection if, in the Ministers opinion, the amendment is –

- (a) required urgently; or*
- (b) of a minor nature*

(4) If –

- (a) the Minister amends a management plan; and*
- (b) the amendment is made without consultation because it is, in the Minister's opinion , required urgently,*

the Minister must consult with the advisory committee or advisory committees or the person or persons specified for that purpose in the plan as soon as practicable after the plan has been amended.

The particular group, which must be consulted for the WCPSMF and SCPSMF, is designated in the management plan as the PSMAC.

Operational Objective

To administer a consultation process that is in accordance with the requirements of the FRMA and allows for the best possible advice from all relevant stakeholders to be provided to the decision maker (Minister/Executive Director) in a timely manner.

Indicators

The Minister (or the Department on his behalf) conforms to the consultation requirements of the FRMA and the level to which licensees consider that they are adequately and appropriately consulted.

Performance Measures

- Proper consultation procedures are followed in any amendments of the management plans; and
- Industry meetings are held annually.

Data Requirements

- The views of industry are collected from licensees at each annual meeting
- The view of the members of the PSMAC collected at each meeting
- When an amendment is proposed, documentation of the formal consultation procedures is available.
- All the aforementioned data requirements are available.

Evaluation

Consultation on management of the WCPSMF and SCPSMF is conducted in an open, accountable and inclusive environment where all sectors of the industry and the Department (that is, management, compliance and research) collectively identify and discuss appropriate courses of action.

The PSMAC is functional in providing advice to the Minister for Fisheries on all aspects of industry management. Decision makers are provided with advice based on this consultation and reasons are provided for decisions that vary from consultation-based advice.

Robustness

High.

The consultation process is extremely well understood with relatively high levels of participation from various stakeholder groups.

Fisheries Management Response

The Department has relatively strong links to the purse seine fishing industry. These links have been strengthened recently with the high interaction between the Department and licence holders, which have been necessary to develop the guidelines for the new management plan.

Comments and Actions

The Department will continue to consult with licensees (as per legislation) as well as the PSMAC as a courtesy to ensure all relevant persons are aware of issues and are provided with the opportunity to input.

External Driver Check List

Despite the robustness of the consultation processes used, disaffected parties may still seek to use political avenues to further their cause, which may result in new legislation being 'disallowed' by Parliament.

5.4.3 DEPARTMENT OF FISHERIES- REPORTING

5.4.3.1 ASSESSMENTS AND REVIEWS

Rationale for Inclusion:

It is important that the outcomes of the fisheries management processes administered by the Department for the WCPSMF and SCPSMF are available for review by external parties. It is also important that the community is sufficiently informed on the status of the fisheries, given that they are utilising a community resource. The reports that are currently provided annually are: the State of the Fisheries Report which is tabled in Parliament, the Annual Report to Parliament, the ESD reference report, and this application to DEH. There is a longer-term plan to have the entire system of management audited by the WA Environmental Protection Authority (EPA).

Operational Objective

To continue to report annually to the Parliament and community on the status of all fisheries including the WCPSMF and SCPSMF and to prepare a framework for reporting on ESD for all Western Australian fisheries.

Indicators

The extent to which external bodies with knowledge on the management of fisheries resources have access to relevant material and the level of acceptance within the community.

Performance Measure

General acceptance of the management arrangements by the community.

Data Requirements

The majority of data required to generate reports is already collected in the course of pursuing resource management objectives. The Department conducts an annual survey of the community with respect to its opinion on the status of the State's fisheries and their attitudes to the performance of the Department.

Evaluation

The Department has implemented more than one process to report on the performance of the WCPSMF and SCPSMF and in doing so has ensured that the community has access to this information.

In addition to this base level reporting the development of a new process that will see the pilchard fishery undergo regular independent audits ensures this sub-component is well in hand.

The Department has been the recipient of a number of awards for excellence for its standard of reporting - Premiers Awards in 1998, 1999 for Public Service excellence, Category Awards in Annual Reporting in 1998, 1999, 2000; Lonnie Awards in 2000, 2001.

Current reporting arrangements for this WCPSMF and SCPSMF include:

State of Fisheries

Annual reporting on the performance of the fishery against the agreed objectives within the "State of the Fisheries Report". This document is available in hard copy format but is also available from the Department's web site in PDF format.

Annual Report

The Department also produces an Annual Report, which is tabled in Parliament. The Annual Report includes Performance Indicators that are reviewed by the OAG.

ESD

The Department is currently completing a full ESD report (of which the material presented in this application is a subset), which will cover not only the environmental aspects of the WCPSMF and SCPSMF but the full social and economic issues. Once completed this too will be available from the web site.

Reports to industry

Each year, the status of the resource, effectiveness of current management, predictions for future years catches and any proposals for alterations to arrangements are presented to fishermen at an annual meeting.

Fisheries Management Papers

Since 1986, the Department has produced 165 Fisheries Management Papers on all aspects of fisheries management. Those papers which are of direct relevance to all WA purse seine fisheries include;

- No 6 The King George Sound Purse Seine Fishery Working Group (1986)
- No 14. Draft Management Plan for the Perth Metropolitan Purse Seine Fishery (1987)
- No 20 The Offshore Constitutional Settlement, Western Australia (1988)
- No 22 Economics and marketing of Western Australian pilchards. (1988)
- No 24 Management of the Perth metropolitan purse-seine fishery. (1989)
- No 77 The Offshore Constitutional Settlement Western Australia (1995)
- No 99 Management of the South Coast Purse Seine Fishery (1999)

Robustness

High

Fisheries Management Response

Current

For many years the Department has produced substantial and high quality documents that report on the operation of the Department and the status of its fisheries (including the WCPSMF and SCPSMF)– these reports are the Annual Report and the State of the Fisheries.

Future

The Department is working with the EPA to prepare a framework for reporting on ESD for all Western Australian fisheries. It is proposed that this framework will be linked to a regular audit cycle involving the EPA and periodic reporting to the Office of the Auditor General. The Department is working to combine the processes for reporting to the States and the Commonwealth and believes that this can best be achieved by using a Bilateral Agreement with DEH under the EPBC.

Comments and Actions

The processes already established and those new external review processes that are all but established ensure that there will be many opportunities for appropriateness of the management regime and the importantly the results it produces to be reviewed.

External Driver Check List

The assessments provided by independent review bodies and the community.

5.5 EXTERNAL ENVIRONMENT

COMPONENT TREE FOR THE EXTERNAL ENVIRONMENT

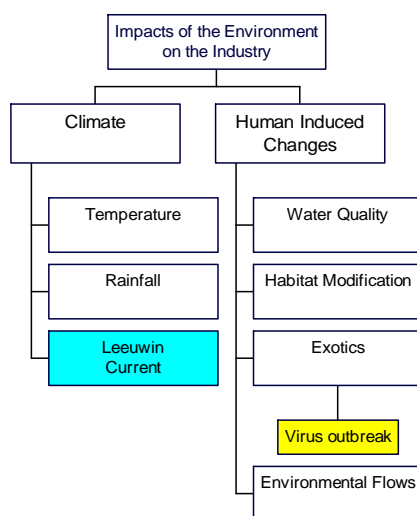


Figure 16: Component tree for the external environment.

Yellow boxes indicate that the issue was considered high enough risk at October 2003 to warrant having a full report on performance. Blue boxes indicate the issue was rated as a low risk and no specific management is required- only the justification is presented.

5.4.1 IMPACTS FROM EXOTIC VIRUS OUTBRDEHK

Rationale for Inclusion:

ERA Risk Rating: Impact of the virus outbreak (C3 L4 Moderate)

The inclusion of the environmental impact on the fishery tree is a necessary one, as this fishery has been drastically affected by a virus outbreak that has hit all Australian pilchards. The virus responsible for this outbreak is considered to be the *herpesvirus* although it has not been possible to officially categorise the virus. The origin of the virus is also not known.

What is known is that the virus is exotic to pilchards in Australian waters and the effects of the outbreaks were devastating (Fletcher et al. 1997). Changes in management arrangements were necessary to reduce fishing pressure on the spawning biomass of fish that did not succumb to the virus. In April 2000, the WCPSMF and SCPSMF were closed to all fishing. By May 2001 the fishery was reopened with a pilchard cap set on all operators in the industry.

In 1996 a plankton egg survey was used to determine spawning stock size. Estimates from this survey put the spawning stock biomass at approximately 20000 tonnes. A second survey was carried out just prior to the 1998 outbreak with results putting the spawning stock biomass at approximately 18985 tonnes. The second survey results were considered more robust than the first as a greater number of adult fish were sampled. Therefore a greater confidence interval was achieved. Due to the smaller than expected spawning stock biomass the issue of quotas was discussed and it was

suggested that a quota should be introduced to reduce the quantity of fish taken to a sustainable level of 15% of spawning stock biomass.

It was considered essential to carry out a post virus spawning stock survey with results showing that the spawning stock had been reduced to an estimated 5275 tonnes. This was in line with estimates from South Australia and the south coast of Western Australia that the virus had killed 70% of mature fish.

The post viral survey was the instigator for the change in management and the introduction of a pilchard cap. A working group was set up to determine the cap for pilchards and they came up with a matrix system for the setting of the pilchard cap for each season.

Due to the lack of information on the juvenile stage and therefore recruitment to the fishery, egg production only gives an indication of present spawning stock but has no correlation to future recruitment. Therefore age distribution of the current catch is also monitored, giving an indication on how many juveniles are being fully recruited to the fishery. If age distribution is biased towards older fish then recruitment has been low and a reduction in the cap needs to be introduced as per the matrix.

Future

The proposed new management plan for the WCPSMF fishery is based on quota management, as in the SCPSMF, with the quota being based on the matrix system that is presently being utilised. This gives consideration to any fluctuations in spawning stock biomass and age distribution. All participants in the WCPSMF fishery have been involved in drawing up the new management guidelines and therefore understand how they are set and what the implications are should variation in key indicators occur. Therefore future quota should be able to be met and not exceeded, making the new management plan for the fishery a more sustainable option.

5.4.2 IMPACTS FROM LEEUWIN CURRENT

Rationale for Inclusion:

ERA Risk Rating: Impact of the Leeuwin Current (C2 L5 LOW)

There is reasonable evidence that the Leeuwin Current (LC) affects the pilchard and scaly mackerel fishery. As scaly mackerel are a tropical species, their distribution further south is governed by the presence of warmer water. In years of strong LC the number of scaly mackerel being caught within the WCPSMF and SCPSMF is considerably increased. During weak LC the scaly mackerel appear to be dispersed further from the coast, including around the Geraldton area.

The full impacts of the LC on egg dispersal and juvenile development, and distribution of pilchards and scaly mackerel have not been fully investigated. As there is insufficient information to determine management procedures to offset the effects of the LC on either of the above two issues and the effects are negated once the LC has returned to a “normal” pattern. Therefore it is considered to only have a negligible impact on the fishery.

6. REFERENCES

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Appendix 1: Acronyms

AQIS-	Australian Quarantine Inspection Services
CAES-	Catch and Effort Statistics
CAESS-	Catch and Effort Statistics System
CDR-	Catch and Disposal Record
CPUE-	Catch per unit effort
DEH-	Department of Environment
EPA-	Environment Protection Authority
EPBC-	Environment Protection and Biodiversity Conservation Act, 1999
ESD-	Ecologically Sustainable Development
FBL-	Western Australia Fishing Boat Licence
FRDC-	Fisheries Research and Development Corporation
FRMA-	Fisheries Resources Management Act, 1994
FRMR-	Fisheries Resources Management Regulations, 1995
GPS-	Geographical Positioning Systems
ITQ-	Individually Transferable Quota
MPG-	Ministerial Policy Guidelines
MSY-	Maximum Sustainable Yield
OAG-	Office of the Auditor General
OCS-	Offshore Constitutional Settlement
RFAC	Recreational Fishing Advisory Committee
SCFA-	Standing Committee for Fisheries and Aquaculture
WCPSMF-	West Coast Purse Seine Managed Fishery
TAC-	Total Allowable Catch
WA-	Western Australia
WAFIC-	Western Australia Fishing Industry Council
LC-	Leeuwin Current
VMS-	Vessel Monitoring System

Appendix 2: Details of Consequence Tables

Level	Ecological
Negligible	<p><i>General - Insignificant impacts to habitat or populations, Unlikely to be measurable against background variability</i></p> <p>Target Stock/Non-retained: undetectable for this population</p> <p>Byproduct/Other Non-Retained: Area where fishing occurs is negligible compared to where the relevant stock of these species reside (< 1%)</p> <p>Protected Species: Relatively few are impacted.</p> <p>Ecosystem: Interactions may be occurring but it is unlikely that there would be any change outside of natural variation</p> <p>Habitat: Affecting < 1% of area of original habitat area</p> <p><i>No Recovery Time Needed</i></p>
Minor	<p>Target/Non-Retained: Possibly detectable but little impact on population size but none on their dynamics.</p> <p>By-Product/Other non-retained: Take in this fishery is small (< 10% of total) compared to total take by all fisheries and these species are covered explicitly elsewhere.</p> <p>Take and area of capture by this fishery is small compared to known area of distribution (< 20%).</p> <p>Protected Species: Some are impacted but there is no impact on stock</p> <p><i>Ecosystem: Captured species do not play a keystone role – only minor changes in relative abundance of other constituents.</i></p> <p>Habitat: Possibly localised affects < 5% of total habitat area</p> <p><i>Rapid recovery would occur if stopped - measured in days to months.</i></p>
Moderate	<p>Target/Non Retained: Full exploitation rate where long term recruitment/dynamics not adversely impacted</p> <p>ByProduct: Relative area of, or susceptibility to capture is suspected to be less than 50% and species do not have vulnerable life history traits</p> <p>Protected Species: Levels of impact are at the maximum acceptable level</p> <p><i>Ecosystem: measurable changes to the ecosystem components without there being a major change in function. (no loss of components)</i></p> <p>Habitat: 5-30 % of habitat area is affected.</p> <p>or, if occurring over wider area, level of impact to habitat not major</p> <p><i>Recovery probably measured in months – years if activity stopped</i></p>
Severe	<p>Target/Non Retained: Affecting recruitment levels of stocks/ or their capacity to increase</p> <p><i>ByProduct:Other Non-Retained: No information is available on the relative area or susceptibility to capture or on the vulnerability of life history traits of this type of species</i></p> <p>Relative levels of capture/susceptibility greater than 50% and species should be examined explicitly.</p> <p><i>Protected Species: Same as target species</i></p> <p>Ecosystem: Ecosystem function altered measurably and some function or components are missing/declining/increasing outside of historical range</p>

	<p>&/or allowed/facilitated new species to appear. Habitat: 30- 60 % of habitat is affected/removed. <i>Recovery measured in years if stopped</i></p>
Major	<p>Target/Non Retained: Likely to cause local extinctions By-Product:Other non-retained:N/A Protected Species: same as target species Ecosystem: A major change to ecosystem structure and function (different dynamics now occur with different species/groups now the major targets of capture) Habitat: 60 - 90% affected <i>Recovery period measured in years to decades if stopped.</i></p>
Catastrophic	<p>Target/NonRetained:Local extinctions are imminent/immediate By-Product/Other Non-retained N/A Protected Species: same as target Ecosystem: Total collapse of ecosystem processes. Habitat: > 90% affected in a major way/removed <i>Long-term recovery period will be greater than decades or never, even if stopped</i></p>

Appendix 3: Catch Matrix

	Mean age								
	(0-1)	(1-2)	a(2-3)*	b(2-3) *	(3-4)	(4-5)	(5-6)	(6-7)	(7-8)
% Of Virgin									
0-20	0	0	0	0	0	0	0	0	0
20-30	0	0	2	5	5	5	5	5	2
30-40	0	0	2	5	7.5	7.5	5	3	0
40-50	0	0	2	5	10	10	6	4	0
50-60	0	0	3	5	10	10	7	5	0
60-70	0	0	4	5	10	10	8	6	0
70-80	0	0	5	5	10	10	9	7	0
80-90	0	0	6	5	10	10	10	10	0
90-100	0	5	7	5	10	10	10	10	0
>100	0	10	10	5	10	10	10	10	0

*

Reading down: % of virgin = (Biomass in year x)/(Virgin biomass)

Reading across Mean Age is derived from the annual age composition data.

Appendix 4: Code of Conduct

Please refer to separate attachments named:

- WA Purse Seine Appendix 4a
- WA Purse Seine Appendix 4b
- WA Purse Seine Appendix 4c
- WA Purse Seine Appendix 4d
- WA Purse Seine Appendix 4e