Australian Government

Department of the Environment and Heritage

# Assessment of the
# Western Australian Mackerel Fishery

**October 2004**

ISBN: 0 642 55113 8

**Disclaimer**

This document is an assessment carried out by the Department of the Environment and Heritage of a commercial fishery against the Commonwealth Guidelines for the Ecologically Sustainable Management of Fisheries. It forms part of the advice provided to the Minister for the Environment and Heritage on the fishery in relation to decisions under Parts 13 and 13A of the EPBC. The views expressed do not necessarily reflect those of the Minister for the Environment and Heritage or the Commonwealth Government.

While reasonable efforts have been made to ensure that the contents of this report are factually correct, the Commonwealth does not accept responsibility for the accuracy or completeness of the contents, and shall not be liable for any loss or damage that may be occasioned directly or indirectly through the use of, or reliance on, the contents of this report. You should not rely solely on the information presented in the report when making a commercial or other decision.

## TABLE OF CONTENTS

# EXECUTIVE SUMMARY

## Background

The Department of Fisheries, Western Australia (DFWA) has submitted a document for assessment under Parts 13 and 13A of the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act). The draft document "*Application to the Australian Government Department of Environment and Heritage on the WA Mackerel Fishery"* (the submission) was received by the Department of the Environment and Heritage (DEH) in June 2004. The submission was released for a 30 day public comment period that expired on 6 August 2004. Two sets of comments were received and DFWA provided a response to the issues raised by the comments. No changes were made to the submission as a result of public comment.

The submission reports on the Western Australian Mackerel Fishery (WAMF) against the Australian Government *Guidelines for the Ecologically Sustainable Management of Fisheries*. The DEH assessment considers the submission, associated documents, public comments and DFWA response to comments.

**Table 1 Summary of the WAMF**

| | |
|---|---|
| **Area** | From Geraldton in south-west Western Australia (WA) north to the Northern Territory (NT) border in waters out to 200 nautical miles (nm). |
| **Fishery status** | Spanish mackerel (*Scomberomorus commerson*) is considered fully exploited and Grey mackerel (*Scomberomorus semifasciatus*) is considered under-exploited. |
| **Target species** | Spanish mackerel (> 90% of total catch) and Grey mackerel (8% of total catch) which is only targeted in Gascoyne West Coast sectors. |
| **Byproduct species** | Grey mackerel (taken as byproduct in the Pilbara and Kimberley sectors) comprises around 80% of total byproduct; School mackerel *(S. queenslandicus)* and Spotted mackerel (*S. munroi*) each comprise around 7% of byproduct; other byproduct species include other mackerels, other finfish including tunas, various species of trevally and reef fish, and smaller sharks. |
| **Bycatch species** | Low bycatch overall but includes various species of finfish and sharks. |
| **Interaction with threatened species** | No known interactions. |
| **Gear** | Trolling and hand lining. |
| **Season** | From 1 August 2004 the following fishing seasons apply:<br>• Area 1 (Kimberley) - 1 June to 30 November<br>• Area 2 (Pilbara) - 1 April to 30 September<br>• Area 3 (Gascoyne-West Coast) - 1 March to 30 September. |
| **Commercial harvest 2003** | • Spanish mackerel: 457.2 tonnes (t) (with value of $2.7 m)<br>• Other mackerel: 47 t (with value of $0.2m) |
| **Recreational/charter and indigenous harvest** | Recreational bag limits (2 Spanish or Grey mackerel/fisher/day in the Gascoyne-West Coast and 4/fisher/day in other sectors) and legal minimum size apply. Charter operators are required to report catches. A 2000/2001 survey estimates total annual recreational take of mackerels in WA at around 360 t[1]. |

[1] Excluding blue mackerel (*Scomber australasicus*) and including mackerels caught and released.

| | |
|---|---|
| | No records of traditional fishing are available. A 2000/2001 survey suggests a small take of mackerels by indigenous fishers in WA (<2 t/year). |
| **Management arrangements** | From 1 August 2004: three management areas, limited entry, fishing seasons by area, and research logbooks. From 1 January 2005: total allowable commercial catches (TACC) and individual transferable quotas (ITQs) by area, and the introduction of a vessel monitoring system (VMS). |
| **Commercial licences issued:** | From 1 August 2004 access to the mackerel fishery was limited to those meeting entry criteria established under the *Mackerel Fishery (Interim) Management Plan 2004* (IMP). It is expected that 20-25 permits will be issued for each of the three management sectors with the final number depending on appeals. |
| **Export** | Most mackerel from the Gascoyne-West Coast region is exported, mainly to Taiwan. Product from other sectors is sold predominantly on the domestic market. |

The main target species in the WAMF is Spanish mackerel (*Scomberomorus commerson*). Spanish mackerel is found throughout tropical and subtropical waters of the Indo-pacific, from Africa to Fiji. In Australian waters, it occurs from Geographe Bay in south-western WA, throughout northern Australian waters and down the east coast as far as St Helens in Tasmania (Kailola *et al*., 1993). In WA, Spanish mackerel is fished commercially from Geraldton, north to the NT border. There is a single genetic stock along the northern Australian coast (including Western Australia and the NT) which is distinct to stocks around Indonesia and eastern Australia (Ovenden *et al*., in prep.).

Spanish mackerel across northern and western Australia are likely to exist as spatially discrete sub-populations of adults, which are genetically similar but function as distinct management units. Spanish mackerel is a relatively large, relatively fecund, fast growing, predatory fish. It reaches sexual maturity at a young age (<2 years). These characteristics suggest some resilience to fishing pressure. However the species' habit of aggregating for feeding and spawning makes it more susceptible to fishing. The WAMF targets spawning aggregations (Crowe *et al*., 1999) but it is believed that spawning occurs at a large number of locations and over a protracted period so that many spawning aggregations escape fishing pressure each year. Spanish mackerel comprises more than 90% of the total catch in the WAMF.

Spanish mackerel is usually captured at or near the surface in coastal areas around reefs, headlands and shoals. The main fishing method is by trolling baits and lures, with up to seven lines trolled at a time. Baits and lures drifted or cast from an anchored or drifting boat are also used to target Spanish mackerel and incidental catches may occur when using handlines and droplines.

Grey mackerel currently comprises 8% of the total catch in the WAMF. It is targeted in the Gascoyne-West Coast area of the fishery and taken as the major byproduct in the Pilbarra and Kimberley areas. There is considerable interest in developing catch of this species for the export market. Its distribution and biology are poorly understood and research is required to generate the biological data needed to adequately manage the harvest of this species.

Trolling is a very selective fishing method. This, together with the targeting of aggregations of Spanish mackerel, means that incidental catches in the fishery are low. While a range of byproduct and bycatch species are taken, these comprise only around 2% of the total catch of the fishery each year. Byproduct species include School mackerel (*Scomberomorus queenslandicus*), Shark mackerel *(Grammatorcynus bicarinatus),* Wahoo (*Acanthocybium solandri*), Cobia (*Rachycentron canadum*), Bonito (*Sarda australis*), Yellowfin Tuna (*Thunnus albacares*), Longtail Tuna (*Thunnus tonggol*) and Skipjack Tuna (*Katsuwonus pelamis*), Dolphinfish (*Coryphaena hippurus*), smaller sharks, trevally and occasional reef fish. Of these byproduct species, fishers are subject to retention limits for tunas. Catch of tunas over and above these limits is discarded as bycatch. Other bycatch

species include sailfish, billfish, pike, barracuda, shark, mackerel tuna, queenfish and some species of trevally.

The WAMF is not known to interact with any protected, endangered or threatened species and there are no threatened ecological communities in the area of the fishery.

Mackerel was targeted in Northern Australian waters by international fishers, particularly the Taiwanese gill net fishers who caught considerable amounts, until the declaration of the Australian Fishing Zone (AFZ) in 1979. After 1979 Taiwanese gill-netters continued to operate in the AFZ under an access agreement that included a catch quota. Overall reductions in catch rate and mean fish size in the Taiwanese fishery during the early 1980s suggest that stocks may have been overfished (Stevens and Davenport, 1991). WA fishers have expanded their participation in the fishery since 1980 and total landings of Spanish mackerel have ranged from 98 t (in 1980) to 468 t (in 2002). Spanish mackerel is now considered to be fully exploited. It is thought that there is potential to increase catches of Grey mackerel.

In 2003 the total commercial catch of the WAMF was just over 500 t valued at nearly $3 m. Catch is generally processed at sea and sold headed and gutted or filleted on the domestic market and as whole fish on export markets (mainly Taiwan).

Management of the commercial fishery was in a transitional phase during the development of the DFWA submission and the conduct of this assessment by DEH. Phase 1 of new management arrangements came into force on 1 August 2004 under the IMP. Under Phase 2 of the arrangements further changes to management will be implemented on 1 January 2005. DEH has assessed the fishery on the basis of the new management arrangements, Phases 1 and 2.

Until the introduction of the IMP on 1 August 2004 all holders of an unrestricted WA Fishing Boat Licence could take mackerel. In 2003, 75 boats reported mackerel catch, but of these only around 12 specifically targeted mackerel. Under the IMP it is anticipated that 20-25 permits will be issued for each of the three management areas and from 1 January 2005 catch limits and individual quotas for each area will be implemented. The IMP also specifies a fishing season for each management area, restriction on the use of dories, the use of VMS and the submission of research logbooks. Existing restrictions on minimum sizes for mackerel species have been retained.

Mackerel is a popular target of recreational and charter fishers. Charter vessels are required to report catches and in 2002 the total reported charter catch of Spanish mackerel was 18 t. Estimates of recreational catch rely on periodic surveys undertaken by DFWA. The latest DFWA data available are for 1999/2000 in the Pilbara area of the fishery. Those data estimate annual mackerel catch by the recreational sector in that area at around 30 t. Earlier survey data from other areas of the WAMF suggest annual catches of 13 t and 59 t in the West Coast and Gascoyne areas of the fishery respectively. The National Recreational and Indigenous Fishing Survey (Henry and Lyle, 2003), conducted in 2000/2001, estimates that between 306 and 413 t of mackerel (Spanish, Grey, School, Shark and "other" mackerel and Wahoo) were taken by recreational fishers in WA. These estimates include catches subsequently released, however the submission indicates that mortality rates of released mackerel are likely to be high.

DFWA's submission includes an ecologically sustainable development (ESD) report for the WAMF using the National ESD Reporting Framework (Fletcher *et al*., 2002). An account of the risk assessment outcomes and current performance of each of the environmental and governance components of that framework was provided as a basis for assessment of the fishery against the Guidelines. The actions, performance measures and monitoring requirements contained in the ESD report have been considered in preparing the DEH assessment.

**Overall assessment**

The material submitted by DFWA indicates that the fishery operates in accordance with the Commonwealth *Guidelines for the Ecologically Sustainable Management of Fisheries*. DEH considers that the WAMF is a well-managed fishery that is unlikely to have an unacceptable or unsustainable impact on the environment in the short to mid term. Recommendations have been developed to ensure that the risk of impact is minimised in the longer term. Overall the precautionary management regime including limited entry according to criteria specified in the IMP and the proposed introduction of TACCs from 1 January 2005 together with the use of a relatively benign fishing method suggest that the fishery is being managed in an ecologically sustainable way.

In making this assessment, DEH is satisfied that the information collection system, risk assessment, management arrangements and objectives are sufficient to ensure that the WAMF is conducted in a manner that does not lead to overfishing and that stocks are not currently overfished. The management regime has been developed through a consultative process, is underpinned by adequate objectives and includes performance criteria for the major target species, Spanish mackerel, aimed at managing the fishery in an ecologically sustainable manner. The management arrangements in place are adaptable, have the ability to control the level of commercial take from the fishery and are reviewable and enforceable.

DEH has some concerns about the lack of information on Grey mackerel and the potential under the IMP for catch of this species to increase. DEH has made a number of recommendations to ensure that that the fishery does not have an unacceptable or unsustainable impact on this species in the medium to long term.

DEH notes the large proportion of total removals of mackerel accounted for by the recreational sector and the relatively *ad hoc* nature of the surveys used to monitor this catch. DFWA has acknowledged the need for ongoing assessment of the impact of the recreational sector on the effectiveness of management of the WAMF. DEH has made recommendations aimed at ensuring that this need is addressed.

As the area of the fishery includes Commonwealth waters, consideration under Part 13 of the EPBC Act is required in relation to the impact of the fishery on threatened species, migratory species, cetaceans and listed marine species. The management regime, including the WA *Fish Resources Management Act 1994* (FRMA), the WA *Fish Resources Management Regulations 1995* (FRMR) and the IMP were considered in the assessment of the impact on protected species in the WAMF.

A number of protected species occur in the fishery area including green, hawksbill and loggerhead turtles and grey nurse, great white and whale sharks. However, the information available suggests that the fishery has no interaction with these species and DEH considers that the risk of impact on species protected under Part 13 of the Act is low. While there is currently no formal mechanism for the recording of interactions with protected/listed species in the WAMF, DEH understands that DFWA will implement a system for the recording of such interactions.

DEH recommends that the WAMF IMP be declared an accredited management plan under sections 208A, 222A, 245 and 265 of the EPBC Act. In making this judgement, DEH considers that the fishery to which the plan relates does not, or is not likely to, adversely affect the survival in nature of listed threatened species or populations of that species, or the conservation status of a listed migratory species, cetacean species or listed marine species or a population of any of these species. DEH also considers that the WAMF IMP requires that all reasonable steps are taken to avoid the killing or injuring of protected species, and the level of interaction under current fishing operations is low.

On this basis, DEH considers that an action taken by an individual fisher, acting in accordance with the management plan, would not be expected to have a significant impact on a listed threatened species or listed migratory species protected by the EPBC Act. DEH recommends that this fishery be accredited under Part 13 of the EPBC Act.

The assessment concludes that the fishery is managed in an ecologically sustainable way. DEH recommends that the export of species taken in the fishery should be exempt from the export permit requirements of Part 13A of the EPBC Act, with that exemption to be reviewed in five years.

**Recommendations**

To further strengthen the effectiveness of the management arrangements for the WAMF and to contain the environmental risks in the medium to long term, a series of recommendations have been developed and agreed with DFWA. The implementation of these recommendations and other commitments made by DFWA in the submission will be monitored and reviewed as part of the next Commonwealth review of the fishery in five years time. These are:

1. *DFWA to develop a compliance strategy for the WAMF. The strategy will provide for periodic review and explicitly address the effectiveness of the input regime, the proposed ITQ regime and those controls applying to the recreational sector.*
2. *The ESD report, including all performance measures, responses and information requirements to be incorporated into the management regime and decision making process.*
3. *DFWA, in its annual State of the Fisheries Report, to report on the performance of the fishery against performance measures that relate to the sustainability of the fishery.*
4. *DFWA, within 2 years, to incorporate into the management regime fishery specific objectives, performance indicators and performance measures for byproduct species or species groups and for bycatch. DFWA, within 1 year, to also incorporate into the management regime objectives to minimise interactions with protected/listed species and to minimise impacts on the marine environment.*
5. *DFWA to ensure, where appropriate, that any relevant charter boat, conservation and recreational interests in the fishery are considered through consultative mechanisms.*
6. *DFWA to advise DEH of any material change to the fishery's legislated management plan and/or arrangements that could affect the criteria on which EPBC decisions are based, within three months of that change being made.*
7. *DFWA to develop and implement, within 18 months, a robust system to validate fishery dependent data on catch and effort for all target and byproduct species.*
8. *Within 18 months, DFWA to develop a process to improve estimates of recreational take, particularly in the West Coast and factor these into stock assessments and management controls to ensure overall catch levels are sustainable.*
9. *DFWA to review monitoring and research needs and priorities to meet the stock assessment and management information requirements for the WAMF. DFWA to also develop a monitoring and research strategy to address priority needs, including stock assessment research needs for Spanish and Grey mackerels.*
10. *DFWA to implement a system to improve the identification and recording of elasmobranch species taken as byproduct in the WAMF.*
11. *DFWA to review the effectiveness of measures to control recreational catch of Spanish mackerel, particularly in the West Coast to ensure that these measures are appropriate and adequately constrain recreational effort. Should the review indicate that existing measures are not appropriate, DFWA will initiate new measures within 12 months of that finding.*

12. *DFWA will provide a mechanism by which fishers are able to record interactions with those non-retained species that are at risk from the fishery.*

13. *DFWA to provide a mechanism, which allows fishers to record interactions with protected/listed species. DFWA to implement an education program to ensure that industry has the capacity to make these reports at an appropriate level of accuracy.*

# PART I MANAGEMENT ARRANGEMENTS

The WAMF is managed by DFWA. The management regime is described in the following documents, all of which are, or will be publicly available:

- The FRMA;
- The IMP;
- The FRMR;
- The *Mackerel Fishery Ecologically Sustainable Development Report*;
- Relevant Gazetted notices and Fishing Boat Licence conditions.

A number of other documents, including research reports and scientific literature, are integral to the management of the fishery. Any discussion papers and proposals for modification to the above management arrangements are distributed widely to stakeholder groups and, where appropriate, are available on the DFWA website.

Extracts of the ESD Report are included in the submission. ESD issues that needed to be addressed for the WAMF were determined by an internal workshop. The ESD Report specifies operational objectives, indicators and performance measures for Spanish mackerel, which comprises over 90% of the WAMF catch. An assessment of the effectiveness of these measures is included in Part II of this report. The ESD Report has not yet been finalised and is not currently a formal component of the legislative arrangements for the fishery. Impacts of the fishery on Grey mackerel and other byproduct species (mackerels, other finfish and sharks) were assessed as low or negligible and operational objectives, indicators and performance measures were not developed for these impacts.

In line with DFWA policy on consultation in smaller fisheries, consultation in the WAMF takes the form of direct annual meetings between departmental officers and the fishing industry and through the production of discussion papers on proposed fisheries management arrangements. There is no management advisory committee for the WAMF. These arrangements are likely to provide adequate scope for participation by industry but they provide limited opportunity for participation by other stakeholders.

Section 64 of the FRMA specifies the requirements for consultation prior to determining a management plan. These requirements include that interested persons be invited to comment on the draft plan and to make representations to the Minister on the draft. DEH accepts that these requirements were met in determining the IMP. However Section 65 of the FRMA requires only that those specified in the Plan itself be consulted when amending the Plan. Section 5 of the IMP requires only licence holders to be consulted before the plan is amended or revoked. This is not conducive to broader stakeholder participation or transparency in management decision making. **Recommendation 5** addresses the need for wider consultation generally.

From 1 August 2004 the IMP provides for management by:

- three management areas (Kimberley, Pilbara and Gascoyne-West Coast);
- limited entry to each of these management areas;
- restrictions on the number and size of dories;
- specified fishing seasons for each management area; and
- minimum size limits for Spanish, Grey, School, Spotted and Shark mackerel and Wahoo.

DFWA has announced that in 2005 the management arrangements for the WAMF will also include a TACC for each management area, the allocation of ITQs and the requirement for a VMS to operate in the fishery (Rogers, 2004). The IMP provides for the operation of VMS. DFWA has advised that it is likely that the IMP will be amended to specify the initial (2005) TACCs and the procedure to be followed prior to the gazettal of subsequent TACCs.

Under the new limited entry arrangements it is expected that 20-25 permits will be issued for each of the three management areas of the WAMF.

Compliance and enforcement tools implemented in the fishery include:

- the introduction of a VMS in 2005 to facilitate monitoring of vessel catches against quota and enforce closed seasons and access by management area;
- at-sea and port inspections; and
- specified ports for unloading by management area.

DEH is satisfied that the compliance regime is generally adequate to ensure that the management objectives of the fishery can be met. However, given the introduction of ITQs in 2005, DEH recommends that a compliance risk assessment be undertaken to assess the risks associated with non-compliance with catch limits and to ensure that the nature and level of compliance activity is appropriate. The submission makes no reference to the level of compliance with bag limits on Spanish mackerel in the recreational sector. Given the high proportion of total removals incurred by the recreational sector this should form part of the compliance risk assessment.
The risk assessment should form the basis of a compliance strategy that should be subject to periodic reviews and include measurable performance criteria and possibly incorporate the development of an education campaign to improve commercial and recreational fishers and processors compliance with new requirements.

**Recommendation 1:** *DFWA to develop a compliance strategy for the WAMF. The strategy will provide for periodic review and explicitly address the effectiveness of the input regime, the proposed ITQ regime and those controls applying to the recreational sector.*

The annual State of the Fisheries Report reviews the performance of the major aspects of the WAMF and is published following review by the WA Office of the Auditor General. In addition, the ESD report will be reviewed every five years. DFWA has advised that it is its intention to commence consultation on revised management arrangements approximately 18 months before the expiry of the IMP on 31 December 2009. These revised arrangements will form part of DEH's next review of the fishery. DEH is satisfied that a five-year review of the entire fishery together with annual reviews of the major aspects of the fishery represent an appropriate level of periodic review for the WAMF.

An analysis of the fishery's capacity for assessing, monitoring and avoiding, remedying or mitigating any adverse impacts on the wider marine ecosystem in which the target species live and the fishery operates is contained under Principle Two of this report.

DEH is satisfied that the current and proposed management arrangements will ensure that the fishery complies with all relevant threat abatement plans and recovery plans. DEH concurs that on the basis of the available information it is not necessary to develop a bycatch action plan for the fishery. DEH does however recommend that the proposed research logbook for the WAMF provide for the monitoring of bycatch and that DFWA provides for the recording of shark species taken as bycatch and byproduct in accordance with the data collection requirements of Appendix E of the

*National Plan of Action for the Conservation and Management of Sharks* (NPOA-Sharks) (Shark Advisory Group and Lack, 2004). This issue is addressed through **Recommendation 11**.

DFWA has demonstrated its commitment to the ecologically sustainable management of the fishery through the implementation of the IMP and by developing the ESD report.

The ESD report, on which the submission is largely based, is also an integral part of the management regime. It examines benefits and costs associated with the fishery. It also identifies and assesses risks posed by the fishery and environmental components. When finalised the ESD report will document the performance of the fishery and its management in terms of the ecological, economic, social and governance issues. This report will be publicly available in hard copy and on the DFWA website. The management commitments specified in this report have been fundamental in DEH's assessment and consequent recommendations. The management objectives, indicators and performance measures for Spanish mackerel included in the ESD report are important to the ecological management of this fishery. The ESD report is currently not a formal component of the legislative framework for the fishery. Although satisfied that this lack of a legislative base will not cause issues in the fishery in the short term, DEH recommends that the performance measures, management responses and actions contained in the ESD report be formally incorporated in the management regime and decision making process.

**Recommendation 2:** *The ESD Report, including all performance measures, responses and information requirements to be incorporated into the management regime and decision making process.*

DEH considers that a review of the WAMF IMP in 2009 is appropriate provided that periodic review of the performance of the fishery against performance measures is undertaken on a regular basis and is publicly available. The outcomes of these reviews should be made publicly available in the annual State of the Fisheries Report, including any breaches of performance measures.

**Recommendation 3:** *DFWA, in its annual State of the Fisheries Report, to report on the performance of the fishery against performance measures that relate to the sustainability of the fishery.*

While objectives, performance indicators and performance measures have been established in the WAMF for the primary target species, the current ESD report does not contain a set of specific strategic objectives and performance measures relating to byproduct, bycatch, protected species and the environment. Minimising the take of bycatch, including protected species, and impacts on the marine environment should be an explicit priority in the management of the fishery, regardless of the level of impact.
Byproduct and bycatch should be closely monitored to detect changes in catch trends, including those related to market shifts. DEH recommends that performance indicators and performance measures be developed for byproduct species or group (where it is appropriate to use groupings, for example finfish) based on the best available information. DEH also recommends that DFWA develop performance indicators and a performance measure for bycatch, so that once data are collected, changes to the composition and quantity of bycatch can be detected and responded to, if required.

**Recommendation 4:** *DFWA, within 2 years, to incorporate into the management regime fishery specific objectives, performance indicators and performance measures for byproduct species or species groups and for bycatch. DFWA, within 1 year, to also incorporate into the management regime objectives to minimise interactions with protected/listed species and to minimise impacts on the marine environment.*

DEH suggests that performance indicators and measures, once developed, should be capable of detecting and responding to changes in the fishery. This would require ongoing monitoring of the fishery against such performance measures and a clear process for responding to breaches of performance measures. DFWA has advised that if there is a breach in a performance measure, this will be reported in the State of the Fisheries Report. If a breach materially affects the sustainability of the target species or negatively impacts on byproduct, bycatch, protected species or the ecosystem, the breach will be reported to the Minister for Fisheries within 3 months for subsequent management review and action with timeframes for implementation.

DEH considers that opportunities for interests other than licensees, in particular conservation and recreational sector interests, to participate in consultation on management of the fishery should be facilitated by DFWA. Two means by which broader stakeholder consultation could be encouraged are the holding of an external stakeholder workshop as part of the five-year ESD review and amending the IMP to ensure that stakeholders, in addition to licensees, are consulted prior to changing the IMP and in canvassing management arrangements to take effect upon expiry of the IMP on 31 December 2009.

The FRMA defines the requirement to consult before a management plan is amended or revoked. Under the new IMP, there is a minimum requirement to consult with permit holders, before making any amendments to the plan. DEH considers that transparency in management should include the opportunity for all stakeholders, as opposed to only the permit holders, to input into any proposed amendments to the IMP.

DFWA meet annually with industry to discuss the management arrangements of the fisheries but there is no formal Management Advisory Committee and little consultation with stakeholder groups, other than the industry, on the management arrangements of the fishery.

DEH considers that recreational fishing, charter fishing, conservation and general community interests as well as the commercial sector should also have a key role in all stock assessment, management and research planning processes that relate to the WAMF.

**Recommendation 5:** *DFWA to ensure, where appropriate, that any relevant charter boat, conservation and recreational interests in the fishery are considered through consultative mechanisms.*

The IMP and the ESD Report for the WAMF have been key considerations in DEH's assessment of the fishery. DEH considers it is important that management arrangements remain flexible to ensure timely and appropriate managerial decisions. The decisions arising from this assessment relate to the arrangements in force at the time of the decision. In order to ensure that these decisions remain valid, DEH needs to be advised of any changes that are made to the management regime in order to make an assessment that the new arrangements are equivalent or better, in terms of ecological sustainability, than those in place at the time of the original decision.

**Recommendation 6:** *DFWA to advise DEH of any material change to the fishery's legislated management plan and/or arrangements that could affect the criteria on which EPBC decisions are based, within three months of that change being made.*

**Conclusion**

DEH considers that the WAMF management regime is documented, publicly available and transparent, and is developed through a consultative process. The management arrangements are adaptable and underpinned by appropriate objectives and performance criteria by which the effectiveness of the management arrangements can be measured, enforced and reviewed.

The management arrangements are capable of controlling the harvest through a combination of input and output controls appropriate to the size of the fishery. Periodic review of the fishery is provided for, as are the means of enforcing critical aspects of the management arrangements.

The management regime takes into account arrangements in other jurisdictions, and adheres to arrangements established under Australian laws and international agreements.

DEH considers that there is scope to further refine the management arrangements and has provided a number of recommendations for improvement in the longer term.

# PART II GUIDELINES FOR THE ECOLOGICALLY SUSTAINABLE MANAGEMENT OF FISHERIES

**Stock Status and Recovery**

Principle 1: "*A fishery must be conducted in a manner that does not lead to over-fishing, or for those stocks that are over-fished, the fishery must be conducted such that there is a high degree of probability the stock(s) will recover*."

**Maintain ecologically viable stocks**

Objective 1: "*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*."

**Information requirements**

Fishery dependent data are obtained from commercial fishers through mandatory submission of monthly catch and effort returns. These Catch and Effort Statistics System (CAESS) returns provide information on total monthly catch of all species landed (target and byproduct) and effort (days fished) by location and method. The data, available since 1979, are considered by DFWA to be moderately robust although there is no ongoing verification process.
Under the IMP fishers will be required to submit daily logbook returns on a monthly basis. DFWA has advised that the research logbook being prepared for the WAMF will require the monthly submission of daily data on time spent fishing, the type and quantity of gear used and the species and quantity of mackerel caught.
The submission acknowledges the difficulties in determining fishing effort for mackerel. CAESS records report total fishing effort by fishing days/month. These data include effort by all methods and for all species. The meaningful interpretation of the fishing day measure is further compromised by variation between fishers in the number of hooks trolled and the number of hours fished per day. The introduction of research logbooks under the IMP will provide a far more detailed understanding of fishing effort than that currently available from CAESS returns.

Fishery independent data have been collected through two research projects on stock structure and movement of Spanish mackerel in northern Australia (Fisheries Research and Development Corporation (FRDC) project 1998/159) and stock status of Spanish mackerel in WA waters (FRDC project 1999/151). The first study used genetic markers, stable isotope ratios in fish otoliths and the parasitic fauna to determine stock structure. The study showed that the population units sampled comprise functionally distinct independent management units or separate "stocks" for many of the purposes of fisheries management. The second study reviewed catch and effort data for the fishery and gathered biological information on reproduction, age, growth and diet. Biomass dynamic models were developed and preliminary stock assessments were undertaken. The results of this study underlie the IMP and will form the basis of future stock assessments.

DEH concurs that the logbook information to be provided by commercial fishers under the IMP and by charter boat operators is generally appropriate to the size and scale of the fishery. DEH notes, that observers from the Research Division are periodically placed on commercial fishing vessels and DFWA has committed to continue to do so. Additional measures that will assist in data validation efforts includes the introduction of VMS and improved logbooks that will provide an improved understanding of spatial distribution of the catch and effort.

DFWA's assessment of the WAMF performance is primarily reliant on un-validated catch and effort data. Given the low level of fishery independent data collection, robust validation of commercial data is essential to verify the effectiveness of management measures in place. DEH recommends that DFWA expand on its existing measures and develop and implement a robust data

collection and validation system to validate commercial catch and effort data for target and byproduct species.

**Recommendation 7:** *DFWA to develop and implement, within 18 months, a robust system to validate fishery dependent data on catch and effort for all target and byproduct species.*

DFWA periodically conducts surveys of recreational fishing to collect data on recreational take of mackerels. Recreational survey data are available for the West Coast in 1996/97 (Sumner and Williamson, 1999), the Gascoyne in 1998/99 (Sumner *et al*., 2002) and the Pilbara in 1999/2000 (Williamson *et al*., in prep.). The surveys showed that the recreational take in the West Coast was about 45% of the total catch of Spanish mackerel (recreational and commercial) and related species and in the Gascoyne the recreational share was 40%.

DEH notes the high proportion of total removals of mackerel accounted for by the recreational/charter sector. This underscores the importance of collecting timely and accurate estimates of recreational catch of mackerel species.

Since 2001 charter vessels have been required to submit monthly reports of catch and effort by trip. Catches of Spanish mackerel by these vessels appear to be relatively minor, with 0.9 tonnes recorded during 2001. These data are not validated.

The National Recreational and Indigenous Fishing Survey (Henry and Lyle, 2003), conducted in 2000/2001, estimates that between 306 and 413 t[2] of mackerel (Spanish, Grey, School, Shark and "other" mackerels and Wahoo) were taken by recreational fishers in WA in that year. This estimate generally supports the findings of earlier surveys by DFWA in terms of the proportion of total catch of mackerel taken by the recreational sector.

DEH notes the irregularity of the DFWA surveys of recreational fishing and the failure of these surveys to account for mortality associated with mackerel that is caught and released. The submission indicates that this mortality may be high. Given the significance of the recreational catch to total removals of Spanish mackerel particularly in the West Coast, reliable and up to date estimates of catch from this sector are needed. Concerns about the paucity of data on recreational catch were raised in public comments on the DFWA submission. DEH considers that all removals from the fishery need to be taken into account in the stock assessment and management processes to ensure long term sustainability of target and non target stocks.

**Recommendation 8:** *Within 18 months, DFWA to develop a process to improve estimates of recreational take, particularly in the West Coast and factor these into stock assessments and management controls to ensure overall catch levels are sustainable.*

The following research needs for Spanish mackerel have been identified (Mackie *et al*., 2003):

- Development of an age-structured model to enable more reliable examination of population dynamics and simulation of management scenarios
- Further examination of Spanish mackerel biology and ecology to increase certainty in modelling and management decisions
- Improved estimation of mortality rates
- Examination of the stock-recruitment relationship

[2] This estimate includes catch caught and released whereas DFWA surveys only record fish retained. The national survey estimated that, nationally, some 36% of the mackerel catch was released.

The submission acknowledges the poor understanding of the distribution and biology of Grey mackerel and the need for further research to address this.

The submission provides no indication as to the priority and timing of, or availability of funding for, research to address the above needs. The fishery does not have a strategic research plan. Concerns about the lack of commitment to address research needs were raised in public comments on the DFWA submission.

DEH considers that the monitoring, research and assessment requirements as a whole for the fishery need to be evaluated and a research strategy developed. This strategy should be used to determine and prioritise data requirements necessary to effectively manage the fishery.

**Recommendation 9:** *DFWA to review monitoring and research needs and priorities to meet the stock assessment and management information requirements for the WAMF. DFWA to also develop a monitoring and research strategy to address priority needs, including stock assessment research needs for Spanish and Grey mackerels.*

**Assessment**

Catch and effort data, biological information and biomass dynamics and yield-per-recruit modelling have been used to do an initial stock assessment of Spanish mackerel. Biological attributes of fast growth and young age at sexual maturity (< 2 years) suggest resilience to fishing pressure by Spanish mackerel. However, individuals are susceptible to fishing at an early age, are likely to be relatively site-attached and form aggregations that can be targeted by fishers. Aggregating behaviour also causes bias in the catch rate data used as an index of abundance. Taken together these factors dictate a cautious approach to management (DFWA, 2003).

Biomass dynamics modelling has only been possible for the Gascoyne-West Coast sector. Modelling suggests that between 1994 and 2001 the commercial catches have been between 9 and 11% of the estimated biomass. In 2001 the combined recreational and commercial catch was approximately 20% of the 2001 biomass estimate. Buckworth and Hall (1993) recommend that a limit of 20-30% of the fishable biomass is a safe level of fishing for Spanish mackerel.

Modelling has not been successful in other regions of the WAMF. DFWA submits that the higher catch rates and larger catches in those regions suggest that the carrying capacities of the Kimberley and Pilbara regions are likely to be substantially higher than the West Coast region.

Yield-per-recruit analysis indicate the appropriate fishing mortality for Spanish mackerel in the Pilbara and Gascoyne sector at 0.2 and in the Kimberley sector at 0.3. It is thought that current fishing mortality is likely to be similar to, or slightly above, these target levels.

Based on the preliminary results of the stock assessment project, DFWA submits that the current rates of exploitation around the WA coastline appear to be allowing sufficient survival of the breeding stock to maintain recruitment levels. DFWA analysis indicates that at current catch levels Spanish mackerel is fully exploited and further increases in effort would not be appropriate. DEH concurs with this analysis.

No stock assessment is available for Grey mackerel, which is a target species in the Gascoyne-West Coast sector and a major byproduct in the other sectors of the WAMF. The submission acknowledges the lack of information on the biology and distribution of this species. The significance of this lack of data is increased by the provision for increased catch of this species under the IMP. Apart from the improved data collection under the IMP research logbooks, the submission gives no indication as to plans for specific monitoring or research to address this need.

DEH notes that a recent review of research needs for northern mackerel species (FRDC project 2002/096) identified the need for research to investigate stock structure, obtain baseline biological data, develop a validated age-determined protocol and establish a framework for ongoing monitoring and assessment of the fisheries for Grey mackerel. No such research is underway and is the basis for **Recommendation 9**.

Grey mackerel are found throughout northern Australian waters and in there is a general lack of knowledge of stocks throughout its range.

Catch of other byproduct species is very low in the WAMF. The submission indicates that in 2001 for example, species other than Spanish and Grey mackerel comprised only 3.5% of the total trolling catch. The total non-mackerel finfish byproduct was 9.3 t and the total shark catch by trolling was 3.8 t. These byproduct catches comprised more than 15 species. The low levels of byproduct catch taken together with the distribution of these species well outside the range of the fishery suggests that the WAMF is unlikely to have a significant impact on stocks of byproduct species. The ESD Report for the WAMF assessed the risks to other mackerel species as low, and to other finfish and sharks as negligible. DEH notes the absence of species-specific data on shark byproduct and the requirement of the NPOA-Sharks for data on shark catch in fisheries where sharks are taken as byproduct to be recorded to species level.

**Recommendation 10:** *DFWA to implement a system to improve the identification and recording of elasmobranch species taken as byproduct in the WAMF.*

**Management response**

In response to its analysis suggesting that Spanish mackerel is fully exploited the DFWA has implemented the IMP, including the setting of TACCs in three separate management areas. Commercial, recreational and charter catches are taken into account in setting the TACC. The details of the IMP have been outlined in Part I of this report.

A Grey mackerel TACC and one for Spanish mackerel, and all other mackerel species combined, labeled “Other mackerel” have been set. The “Other mackerel” TACC is based on 95% of the long-term average Spanish mackerel catch only. Other mackerels in this TACC include school, spotted and shark mackerel taken in small quantities as byproduct of targeted fishing for Spanish mackerel. The TACC for “Other mackerel” effectively caps both the catch of Spanish mackerel and other mackerels. DEH agrees this is a precautionary measure and unlikely to increase fishing pressure on non-Spanish mackerel species. The "Other mackerel" TACC will be set initially at 410 t.

While, as noted in public comments on the DFWA submission, this TACC is significantly higher than the average commercial catch over the last 20 years it represents a reduction on catches in the most recent years (468 and 499 t in 2002 and 2003 respectively).

The ESD Report specifies the operational objective for Spanish mackerel as “To maintain the spawning stock of Spanish mackerel at or above a level that minimises the risk of recruitment overfishing." The specified indicators are total annual catch and regional annual catch and the performance measures are set as an acceptable total catch of between 246 and 410 t and acceptable regional ranges of 110-205 t (Kimberley), 80-126 t (Pilbara) and 56-79 t (Gascoyne-West Coast). The catch ranges are based on historic catch trends and their breadth reflects fluctuations due to natural variations in recruitment.

The Grey mackerel TACC will allow for development of this fishery and will be set initially at 180 t. This compares with an average annual catch of around 7 t between 1995 and 2001. However catches have been increasing in response to a lucrative export market. Catches in 2000 and 2001 were significantly above the average (21.1 and 12.8 t respectively). There are no operational

objectives or performance measures for Grey mackerel. This issue has been addressed in **Recommendation 4**.

DFWA recognises that the recreational sector requires ongoing monitoring as it is a growing sector that takes a significant proportion of the mackerel catch. Recreational catch is limited by the use of bag limits. The effectiveness of these can be compromised by ineffective compliance. The submission provides no details of the level or effectiveness of compliance activities in the recreational sector. In addition, as acknowledged by the submission, the release of catch over and above these limits is likely to incur significants levels of mortality. This is supported by recent work by McLeay *et al*. (2002) who found that Spanish mackerel are highly susceptible to post-capture mortality compared to other species studied. DEH also notes that Spanish mackerel are not included in Phase two of the FRDC-funded study "Investigating Survival of Fish released in Australia's Tropical and Subtropical Line Fisheries.

Recent surveys indicate that the number of mackerel taken by shark while being landed by recreational fishers may be significant and can result in a much higher impact than the bag limit implies.

To address these issues DFWA has flagged the need to conduct an assessment of the recreational sector and examine the usefulness of current minimum size and bag limits. DEH supports this approach and shares DFWA's concern on the ability of current management measures to adequately control existing effort. Size and bag limits across such a vast fishery area may not be appropriate if enforcement activities cannot guarantee adequate compliance. Management measures, by focusing on size and bag limits may not adequately constrain effort. DEH considers this pertinent, given the level of harvest by the recreational sector, particularly in the more heavily populated West Coast, and the potential for increasing recreational effort over time.

**Recommendation 11:** *DFWA to review the effectiveness of measures to control recreational catch of Spanish mackerel, particularly in the West Coast to ensure that these measures are appropriate and adequately constrain recreational effort. Should the review indicate that existing measures are not appropriate, DFWA will initiate new measures within 12 months of that finding.*

**Conclusion**

DEH considers that the management regime in the WAMF is appropriately precautionary and provides for the fishery to be conducted in a manner that does not lead to over-fishing. DEH considers that the information collection system and stock assessment and management arrangements generally are sufficient to ensure that the fishery is conducted at catch levels that maintain ecologically viable stock levels with acceptable levels of probability.

DEH considers that there is scope to further refine some of the existing information collection, assessment and management responses and has provided a number of recommendations for improvements in the longer term.

**Promote recovery to ecologically viable stock levels**

Objective 2: "*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*."

This objective does not appear to be applicable to the fishery at present, however without established performance indicators and measures, the point at which Grey mackerel is considered overfished is not defined. A recommendation regarding the development of reference points for Grey mackerel and other byproduct stocks has been made (**Recommendation 4**).

**Conclusion**

DEH considers that the Spanish mackerel stocks are not below the defined reference point for that stock. Further DEH considers that should Spanish mackerel, or any of the stocks for which DFWA sets reference points under **Recommendation 4**, fall below defined reference points in the future, the fishery is conducted such that there is a high degree of probability the stock would recover to ecologically viable stock levels within nominated timeframes.

**Ecosystem Impacts**

Principle 2: "*Fishing operations should be managed to minimise their impact on the structure, productivity, function and biological diversity of the ecosystem.*"

**Bycatch Protection**

Objective 1*: "The fishery is conducted in a manner that does not threaten bycatch species."*

**Information requirements**

No formal information is available on the level or nature of bycatch in the WAMF. The submission relies on information obtained from personal communication with WAMF fishers and unspecified monitoring programs in other WA fisheries with similar methods.

DEH recognises that fishing for Spanish mackerel uses specialised troll lines to target the schooling fish and is likely to involve limited bycatch. The submission indicates that catch may be discarded either because of its low market value (e.g. queenfish, pike and shark species) or because fishers do not possess a licence to retain them (e.g. tuna, billfish and demersal reef fish). The submission also indicates that a high proportion of these species is likely to survive capture and release.

The introduction of limited entry and catch restrictions for mackerels under the IMP should provide added protection to bycatch species.

DEH is concerned, however, at the lack of a formal mechanism for collection of bycatch data and believes that the introduction of the research logbook under the IMP should make provision for the recording of information on quantity, species and life status of bycatch.

Additional measures might take the form of ongoing collection and verification of bycatch data through logbooks or periodic surveys of bycatch by on-board observers. DEH, notes in particular the need for data on shark bycatch, as specified in Appendix E of the NPOA-Sharks.

**Recommendation 12:** *DFWA will provide a mechanism by which fishers are able to record interactions with those non-retained species that are at risk from the fishery.*

**Assessment**

The ESD Report for the WAMF assessed the risk to the identified bycatch species as negligible. On this basis DFWA does not intend to monitor any of these species. While DEH accepts that the quantity of bycatch is low, the lack of formal data on the quantity and nature of bycatch necessarily compromises the credibility of the ESD assessment.

**Management response**

No specific bycatch mitigation measures are in place. The ESD report does not include operational objectives, indicators or performance measures for bycatch. The fishery does not have a bycatch action plan and the submission indicates that DFWA does not intend to prepare one. DEH concurs that, based on the information available at this time, a bycatch action plan does not appear to be needed.

While DEH accepts that bycatch in this fishery is likely to be low, a greater level of confidence regarding the nature and level of bycatch in the WAMF is needed. The ESD process assessed the risk to identified bycatch species as low. DEH believes that a formal mechanism to identify and quantify bycatch species should be implemented so that the next ESD review has a scientifically defendable basis on which to assess the risk to these species. This will not be achieved unless a formal mechanism, consistent with the scale of the fishery, for collection of bycatch data is initiated.

As noted in Part I of this assessment, DEH also considers that the management regime should reflect explicitly the ongoing objective of minimising bycatch in the WAMF.

**Conclusion**

DEH considers that there is a high likelihood the fishery is conducted in a manner that does not threaten bycatch species. Should this situation change, or a risk assessment process indicate otherwise, DEH expects that DPIWE would undertake appropriate actions to ensure that bycatch species are not threatened by this fishery.

A recommendation has been developed to ensure that the risk of unacceptable impact on bycatch species is detected and minimised in the longer term.

**Protected species and threatened ecological communities**

Objective 2: "*The fishery is conducted in a manner that avoids mortality of, or injuries to, endangered, threatened or protected species and avoids or minimises impacts on threatened ecological communities.*"

**Information requirements**

There are currently no threatened ecological communities identified in WA waters. No formal information is available on the level or nature of interactions with endangered, threatened or protected species in the WAMF. The submission relies on information obtained from personal communication with WAMF fishers.

DEH welcomes DFWA's intention to implement a formal mechanism for quantifying and identifying interactions with endangered, threatened and protected species in the WAMF. This information will ensure that the next ESD review has a scientifically defendable basis on which to assess the risks to these species.

**Recommendation 13:** *DFWA to provide a mechanism, which allows fishers to record interactions with protected /listed species. DFWA to implement an education program to ensure that industry has the capacity to make these reports at an appropriate level of accuracy.*

**Assessment**

The submission states that a formal risk assessment for each of the identified bycatch species was completed and that assessment concluded that the WAMF did not capture or interact with any endangered, threatened or protected species.

Relevant species in the area of the fishery include Green, Loggerhead and Hawksbill Turtles and Grey Nurse, Great White and Whale Sharks. The relevant recovery plans do not identify the WAMF as a fishery that has or is suspected of having an impact on these species. As with bycatch generally, the lack of formal data on the quantity and nature of bycatch necessarily compromises the credibility of the risk assessment.

**Management response**

No management measures are in place in relation to minimising the threat to endangered, threatened or protected species. The submission indicates that this is based on the absence of any reports of captures or interactions between the fishery and any of these species. DEH accepts that such interactions are likely to be minimal, but notes that the absence of a formal reporting mechanism does not provide a sound basis for management decisions. DFWA has acknowledged this by signalling its intention to implement a monitoring system.

The ESD report does not include operational objectives, indicators or performance measures for interactions with endangered, threatened or protected species. This issue is addressed in **Recommendation 4**. The submission indicates that if the proposed monitoring system detects an increase in interactions, appropriate management measures will be implemented.

**Conclusion**

DEH notes that interactions with protected species in this fishery have not been reported and considers that the fishery is conducted in a manner that avoids mortality of, or injuries to, endangered, threatened or protected species and avoids or minimises impacts on threatened ecological communities. Should this situation change, or a risk assessment process indicate otherwise, DEH expects that appropriate actions will be undertaken to ensure the fishery avoids mortality or injury to these species and avoids or minimises impacts on threatened ecological communities.

A recommendation has been developed to ensure that the risk of unacceptable impact on protected species is minimised in the longer term.

**Minimising ecological impacts of fishing operations**

Objective 3: "*The fishery is conducted, in a manner that minimises the impact of fishing operations on the ecosystem generally*."

**Information requirements**

DFWA identified five issues as potentially having an impact on the ecosystem generally. These are:

- Trophic interactions;
- Bait collection;
- Benthic Biota;
- Discarding/Provisioning;

- Translocation.

No studies specific to these issues have been conducted in the WAMF. DFWAs consideration of these impacts was based on information currently collected from the fishery on catch and effort and from research projects in the WAMF and other similar fisheries and knowledge of the nature of the operations of the fishery.

**Assessment**

Of the issues identified above, DFWA assessed the impact of the fishery on trophic interactions, bait species, benthic biota and through discarding/provisioning as negligible. The impact on translocation was assessed as low. As a result of these assessments, full performance reports for these issues were not developed.

*Trophic interactions*
The submission states that:

- there is no evidence that any of the species taken by trolling play a keystone role in the ecosystem; and
- it has been shown (Jennings and Kaiser, 1998) 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.

On this basis the risk posed by the fishery was assessed by DFWA as negligible. DFWA has indicated that it will be investigating the development of research to identify any detectable changes in the structure of fish communities over the last 40 years, at a regional, rather than a fishery specific level. Public comments on the DFWA submission noted that recent research (Bellwood *et al*., 2004) suggests that the impact of fishing of functional groups in coral reefs may have a greater impact on the trophic structure of those reefs than previously thought. This may have implications for DFWA's assessment of the extent of the trophic impacts of the fishery for Spanish mackerel, a reef-associated species. DEH therefore supports DFWA's intention to investigate the trophic impacts of WA fisheries especially those associated with reef ecosystems.

*Bait collection*

The extent of bait collection in the fishery is relatively low. DFWA estimate that <1 t is caught in the Pilbara sector each year and <0.5 t in the Gascoyne-West coast sector. Three fishers are known to catch bait and, of these, two do so regularly. Garfish, mullet and whiting are the main bait species used in the WAMF. DFWA advises that the sustainability of bait species used in the WAMF is dealt with through management arrangements in the fisheries from which the bait is sourced and that these fisheries are highly regulated in WA. DEH concurs with DFWA's assessment that the risk posed by the WAMF to bait species is negligible.

*Benthic Biota*

The methods of trolling and hand lining used in the WAMF do not impact on the benthic biota of the fishery. The fishery might impact on benthic biota as a result of anchoring overnight in the Pilbara and Kimberley Sectors. Anchoring occurs in shallow, sheltered locations over sand habitats that are naturally dynamic. DEH concurs with DFWAs assessment that the risk posed by the fishery to the benthic biota is negligible.

*Discarding/Provisioning*

The WAMF discards processed fish waste at sea in the Kimberley and Pilbara Sectors, where the bulk of the Spanish mackerel catch is taken. Fish in the Gascoyne-West Coast sector are predominantly sold whole.

Processed waste tends to sink and to be dispersed by currents, diffusing the impact. DFWA estimates annual waste in the Kimberley and Pilbara sectors at around 64 t and 12 t respectively. This quantity of waste is considered low relative to the biomass of food sources available.

The impact of discarding is considered to be low given the relatively low levels of bycatch and the high level of survival of discarded species.

DFWA assessed the impact of discarding/provisioning in the WAMF as negligible. DEH concurs with this analysis.

*Translocation of organisms*

Movement of vessels between sectors potentially provides a mechanism for transfer of exotic species and diseases. In the WAMF most vessels operate only in one sector and access to sectors will be restricted under the IMP. In addition, hulls are anti-fouled regularly. The impact of the Leeuwin Current on the environment in which the fishery operates is conducive to high levels of natural connectivity between sectors and it is considered that, relatively, the impact of the fishery is likely to be low. DEH concurs with this analysis and DFWA's conclusion that the risk posed by the WAMF is low.

**Management response**

None of the issues identified above have specific management responses. The submission identifies the prime mechanism for maintaining the general ecosystem as being the maintenance of biomass levels of mackerel species since this will assist to minimise other impacts on the environment. DEH concurs specific management measures to address the identified general ecosystem impacts do not appear necessary.

**Conclusion**

The trolling method has a relatively benign impact on the marine environment and DEH concludes that the impacts of the fishery on the general ecosystem appear to be minor. As acknowledged by DFWA, there is a lack of understanding of tropic interactions generally and DEH recommends that DFWA give priority to research on this issue, particularly in relation to removal of Spanish mackerel from reef ecosystems.

As noted in Part I of this assessment, DEH considers that the ongoing objective of minimising the impacts of the WAMF on the general ecosystem should be reflected in the management regime for the fishery.

## References


Bellwood, D.R., Hughes, T.P., Folke, C. and Nystrom, M. 2004 Confronting the coral reef crisis, *Nature*: 429, 24 June 2004. pp.827-833.

Buckworth, R.C. and Hall, N.G. 1993. Modeling with the minimum: The Northern Territory Spanish Mackerel fishery. *Seminar presented at the Australian Society for Fish Biology Annual Conference*, Perth, 1993.

Crowe, F., Lehre, W. and Lenanton, R. 1999. *A study into Western Australia's open access and wetline fisheries*. Fisheries Research Report No 118, 1999. Fisheries Western Australia.

DFWA 2003. *State of the Fisheries Report 2001/2002*.

Fletcher, W.J., Chesson, J., Fisher, M., Sainsbury, K.J., Hundloe, T., Smith A.D.M. and Whitworth, B. 2002. *National ESD reporting framework for Australian fisheries: the 'how to' guide for wild capture fisheries*. FRDC Project 2000/145. FRDC, Canberra.

Henry, G.W. and Lyle, J.M (Eds) 2003. *The National Recreational and Indigenous Fishing Survey*, FRDC Project No. 1999/158.

Jennings, S. and Kaiser, M.J. 1998. The effects of fishing on marine ecosystems. *Advances in Marine Biology* 34:201-352.

Kailola, P.J., Williams, M.J., Stewart, P.C., Reichelt, R.E., McNee, A. and Grieve, C. 1993. *Australian Fisheries Resources*. BRS. Canberra.

Mackie, M.C., Lewis, P.D., Gaughan, D.J. and Buckworth, R.C. 2003. *Stock assessment of Spanish Mackerel (Scomberomorus commerson) in Western Australia*. FRDC Project No. 1999/151. DFWA, Perth.

Mcleay, L., Jones, K. and Ward, T. 2002. *National strategy for the survival of line-caught fish – a review of research and fishery information*. Draft final report for comments by workshop participants. March 20, 2002. FRDC Project 2001/101. FRDC, Canberra/SARDI. Adelaide.

Ovenden, J.R., Street, R., Buckworth, R.C., Foschia, C. and Newman, S.J. (in prep.) Genetic identity and phylogeography of Australian and West Timor populations of narrow-barred Spanish mackerel (*Scomberomorus commerson*, Perciformes; Teleostei) populations from mitochondrial DNA data. *Marine and Freshwater Research*

Rogers, P. 2004. Management of the Commercial Mackerel Fishery*: Letter to all WA Fishing Boat Licence Holders*, 13 April 2004.

Shark Advisory Group and Lack, M. 2004. *National Plan of Action for the Conservation and Management of Sharks*, Department of Agriculture, Fisheries and Forestry, Canberra.

Stevens, J.D. and Davenport, S.R. 1991. Analysis of catch data from the Taiwanese gill-net fishery off northern Australia, 1979 to 1986. CSIRO Marine Laboratories Report 213. 51 pp.

Sumner, N.R. and Williamson, P.C. 1999. *A 12-month survey of coastal recreational boat fishing between Augusta and Kalbarri on the west coast of Western Australia during 1996-97*. Fisheries Research Report 117. DFWA. 52 pp.

Sumner, N.R., Williamson, P.C. and Malseed, B.E. 2002. *A 12-month survey of recreational fishing in the Gascoyne bioregion of Western Australia during 1998/99*. Fisheries Research Report 139. DFWA. 54 pp.

Williamson, P.C., Sumner, N.R. and Malseed, B.E. (in prep.) *A 12 month survey of recreational fishing in the Pilbara bioregion of Western Australia during 1999-2000*. Fisheries Research Report, DFWA.

## Acronyms

| | |
|---|---|
| AFZ | Australian Fishing Zone |
| CAESS | Catch and effort statistics system |
| DEH | Department of the Environment and Heritage |
| DFWA | Department of Fisheries Western Australia |
| EPBC Act | *Environment Protection and Biodiversity Conservation Act 1999* |
| ESD | Ecologically sustainable development |
| FRDC | Fisheries Research and Development Corporation |
| FRMA | *Fish Resources Management Act 1994* |
| FRMR | *Fish Resources Management Regulations 1995* |
| IMP | *Mackerel Fishery (Interim) Management Plan 2004* |
| ITQ | Individual transferable quota |
| WAMF | Mackerel Fishery |
| NPOA-Sharks | *National Plan of Action for the Conservation and Management of Sharks* |
| TACC | Total allowable commercial catch |
| VMS | Vessel monitoring system |