Australian Government

Department of the Environment and Heritage

Assessment of the

Northern Demersal Scalefish Managed Fishery

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Disclaimer

This document is an assessment carried out by the Department of the Environment and Heritage of a commercial fishery against the Australian Government 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 Environment Protection and Biodiversity Conservation Act 1999. The views expressed do not necessarily reflect those of the Minister for the Environment and Heritage or the Australian Government.

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Assessment of the ecological sustainability of management arrangements for the Northern Demersal Scalefish Managed Fishery

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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 *Final Application to the Australian Government Department of Environment and Heritage on the Northern Demersal Scalefish Managed Fishery* (the submission) was received by the Department of the Environment and Heritage (DEH) in June 2004. The submission was released for a thirty-day public comment period that expired on the 2 August 2004. No public comments were received.

The submission reports on the Northern Demersal Scalefish Managed Fishery (NDSMF) against the Australian Government *Guidelines for the Ecologically Sustainable Management of Fisheries*. The DEH assessment considers the submission and associated documents.

Table 1: Summary of the Northern Demersal Scalefish Managed Fishery

Area	Waters off the Kimberley coast adjacent to the State of Western Australia (WA) out to 200 nautical miles (Commonwealth and State waters) – inshore waters around Broome closed to commercial fishing.
Fishery status	Fully exploited
Target Species (% by weight of landed catch)	goldband snapper *Pristipomoides multidens* (35%) red emperor *Lutjanus sebae* (23%)
By-product Species	Around 42% by weight of annual harvest, primarily comprising scarlet perch *Lutjanus malabaricus*, spangled emperor *Lethrinus nebulosus* and cod and grouper species (Serranidae).
Gear	Mainly use fish traps - rectangular traps with single opening and 50 mm x 70 mm rectangular mesh panels. Minimal use of handlines/droplines – maximum 5 lines set per vessel with limit of 6 hooks per line.
Bait	Mainly pilchards imported from other regions of WA, with occasional use of blue mackerel.
Season	Unrestricted – year-round
Commercial harvest 2002	434 tonnes
Value of commercial harvest 2002	$2.4 million
Effort in 2002	1,760 standard fishing days allocated - 900 used
Recreational harvest	Not quantified for most of the fishery area. Expected to be concentrated around Broome inshore sector that is closed to commercial fishing. Likely commercial species caught include red emperor, spangled emperor, Rankin cod and goldband snapper.
Commercial licences issued	4 licences for the inshore fishing zone. 11 licences for offshore fishing zone (available effort allocated for these licences used by 6 vessels).
Management arrangements	Input controlled through: Transferable annual effort quota

	Limited entry Gear controls Defined fishery area, including inshore closures. Mandatory fitting of Vessel Monitoring System (VMS) Legal minimum lengths for 3 species. Maximum size limit for all cods and groupers. No landing of Scombridae, Isiophoridae, Xiphiidae, Coryphaenidae or invertebrates such as molluscs, crustaceans and echinoderms. Strict trip limits on shark landings and no shark finning. Bag and size limits for recreational catch
Export	Catch sold on domestic markets and exported.
Bycatch	Estimated from past surveys as low, primarily starry triggerfish (*Abalistes stellatus*) and minor catches of other scalefish (including under-sized fish of target species), seasnakes and potato cod.
Interaction with Threatened Species	Estimated limited interactions overall, minor incidence of interactions with sea snakes and potato cod.

The area of the NDSMF includes all waters off the north coast of WA east of longitude 120^{o} E to the Northern Territory border out to the edge of the Australian Fishing Zone (AFZ). Part of the 483,600 sq kilometre fishery area is in Commonwealth waters, however the entire fishery is managed by Western Australia under an Offshore Constitutional Settlement (OCS) between the Australian Government and the Government of WA. The fishery is divided into an inshore zone that covers waters out to the 30 metre depth contour, and a much larger offshore zone for waters beyond the 30 metre contour depth line. Waters deeper than 200 metres in the offshore zone are designated as a "research fishing zone" and can only be accessed through an agreed research framework.

The fishery primarily targets two species of long lived, high value demersal scalefish - red emperor, *Lutjanus sebae,* and goldband snapper, *Pristipomoides multidens.* These species collectively comprise around 58% of the landed catch in the NDSMF. A wide range of at least 30 taxa of other scalefish are also landed, primarily scarlet perch, *Lutjanus malabaricus,* spangled emperor, *Lethrinus nebulosus,* and a range of cod and grouper species from the Serranidae family, including Rankin, spotted, eight bar and maori cod and duskytail grouper. A range of species are prohibited from landing in the fishery, including species in the families Scombridae, Isiophoridae, Xiphiidae, Coryphaenidae and all invertebrates in the Phyla Mollusca, Crustacea and Echinodermata, while there are strict limits on the landing of sharks. There is no limit on the quantity of other species that may be taken as byproduct by the fishery. Further discussion on byproduct management is contained in Part II Principle 1 of this report.

The target species are both members of the Lutjanidae family and are widely distributed across northern Australia and through the Indo-Pacific. In Australia, red emperor range from Sydney around the northern coast to Cape Naturaliste in WA, while goldband snapper range from Moruya, New South Wales, across the northern coast to Cape Pasley, WA (34 ^{o} S). These species are also harvested – to varying degrees - in other trap, trawl, line and recreational or charter fisheries off northern Australia, including the Pilbara coast and Timor and Arafura Sea regions. Genetic studies of the populations of red emperor and goldband snapper show little genetic differentiation for red emperor and some gene flow among Australian populations of goldband snapper. However, the limited movement of red emperor adults and site-specific genetic signatures for goldband snapper suggest that separate regional stocks exist for fisheries management purposes.

Red emperor and goldband snapper are slow growing, long lived species that favour demersal habitats such as coral reef lagoons, offshore reefs, shoals, areas of hard flat bottom, limestone sand flats or gravel patches. Red emperor occur to depths of 180 metres, have a mean age-at-maturity of 8 years and can live

to 40 years, with a mean size-at-maturity in the NDSMF of around 460 mm for females and 490 mm for males, reaching a maximum length of at least 1,000 mm. Goldband snapper occur in depths of 60 to 245 metres, have a mean age-at-maturity of 8 years for males and 8.2 years for females, can live to 30 years, with a mean size-at-maturity in the NDSMF of around 520 mm for females and 549 mm for males and maximum size up to 900 mm. Both species are gonochoristic (do not undergo sex change) and carnivorous, feeding mostly at night on crustaceans, fish, cephalopods and gastropods.

Juveniles of both species generally occur in inshore waters and tend to form schools and to move further offshore with age. Spawning seasons in the NDSMF differ for the two target species, with red emperor spawning between October and March, peaking in October, while goldband snapper spawn from January to April with a peak in March.

Major byproduct species such as spangled emperor and scarlet perch are also long lived, slow growing species with separate regional stocks and have similar distribution and biological characteristics to the target species. Apart from Rankin cod, which has similar characteristics to some of the above species, less is known about the range of other cod and grouper species (Serranids) that collectively comprise the other significant proportion of byproduct in the NDSMF.

There is an extensive fishing history in areas of Australia's northern continental shelf, such as the North West Shelf, Timor Sea and Arafura Sea (areas near the Kimberley region), of foreign trawling for demersal scalefish such as those harvested by the NDSMF. Catches peaked at around 30,000 tonnes in the 1970s in the Pilbara region and around 10,000 tonnes from the Arafura Sea in 1983. A Taiwanese pair trawl fishery operated in the Kimberley region in the 1980s. Data from this fishing activity contributed to preliminary stock assessment work for tropical snapper stocks in the region. The Commonwealth Scientific and Industrial Research Organisation (CSIRO) conducted stock assessments on scalefish fisheries in the adjoining North West Shelf and Timor Sea areas from 1980 to 1991. Assessments in 1991 for the North West Shelf, that includes the Pilbara region but only covers the western portion of the Kimberley region, provided annual preliminary yield estimates for tropical snappers such as red emperor in the range of 840 to 1760 tonnes. Subsequent research in 2000 estimated a notional catch limit of 800 tonnes for the fishery.

Domestic trap and line operations replaced foreign trawling activity in the region from the late 1980s. The Kimberley Trap Fishery was established under OCS arrangements in 1992 and the Kimberley Demersal Line Interim Managed Fishery under revised OCS arrangements in 1995. Both trap and line operations were incorporated into a single management framework by the *Northern Demersal Interim Managed Fishery Management Plan 1997* that achieved full management status on 1 January 2000 through the current *Northern Demersal Scalefish Fishery Management Plan 2000*. The Plan designates separate inshore and offshore zones for the fishery, with specific licence and management requirements for each zone. Licences are restricted to 4 and 11 for the inshore and offshore zones respectively. The vast majority of fishing activity takes place in the offshore zone through use of fish traps.

Trap and line catch and effort fluctuated in the early to mid 1990s during the developmental period of domestic fishery operations, which included the activation of latent effort, with catches peaking at 949 tonnes in 1996. The introduction of management controls associated with the new management plan arrangements in 1998, including annual effort quota for the offshore zone, has resulted in lower and more stable catch and effort levels with an annual average catch of 505 tonnes and effort levels between 900 and 1100 fishing days, with a large proportion of the allocated effort remaining unutilised each year for both the trap and line sectors.

The predominant fishing method in the NDSMF is by fish traps. Line fishing through handline and dropline is permitted in both the inshore and offshore zones, but is restricted to up to 5 handlines set at any time and a maximum of six hooks per line. Since 1998 line fishing has not exceeded 15% of the total catch of the NDSMF and has been less than 5 tonnes per year in the inshore zone. Trap fishing is

restricted to the offshore zone. Trap catches tend to target feeding aggregations of fish around bottom structures or habitat features. Fishing trips can involve 60-120 trap lifts/day and take from 5 to 12 days through the ports of Broome or Darwin. Catches are chilled in brine, then packed and held at 1- 4 ^{o}C in chilled holds ready for local processing or transfer to Perth markets. Traps used in the fishery are made of 50 x 70 mm galvanised steel mesh with dimensions of 1600 mm by 1500 mm by 900 mm and a single opening of approximately 100 mm by 900 mm. While there are no specific limits on the number of traps that can be deployed from each licensed vessel, the effort limits in place curtail the number of traps that can be deployed each year.

The primary management tool in the fishery is the annual effort quota system for the offshore zone. The effort system is managed to ensure that catches do not exceed a nominal total sustainable catch of demersal scalefish of 800 tonnes per year, based on historical average catches. This figure has not been reached since formal management arrangements were introduced in 1998. The effort allocation system is based on the use of a standard number of traps or lines set per standard fishing day (20 and 5 respectively) so that any additional use of gear requires a proportional reduction of allocated fishing days. Transfer of effort quota has effectively reduced the fleet size to around 5 to 7 vessels operating in the fishery each year. In addition to effort caps and quotas and limited licences, fishery management arrangements include gear restrictions, legal minimum lengths for some species, and a prohibition on the take of a range of scalefish and invertebrates (see Table 1). There is no specific limit on the amount of permitted byproduct species that may be retained, although the management objective of limiting demersal scalefish catch to 800 tonnes each year includes byproduct species. The compulsory use of VMS in the offshore zone, along with sea and port inspections and periodic sea patrols and radar watches in the region, provide a sound basis to monitor effort and general compliance arrangements with the limited number of operators in the NDSMF.

Further information on management measures in the fishery is provided in Parts I and II of this report.

Bycatch is currently not recorded by fishers. Anecdotal information and a one-off observer survey on board industry vessels in 1998-99 indicate that starry triggerfish *Abalistes stellatus* is the most common bycatch species, with smaller numbers of a wide variety of other scalefish and undersized target species, notably red emperor, discarded in the fishery. Limited evidence to date suggests that interaction with any protected species group is very low, with only infrequent captures of sea snakes and potato cod that are generally released alive. Bycatch and protected species interactions are assessed further under Principle Two of this report.

No other commercial fisheries target demersal scalefish in the Kimberley region. DFWA advises that since the change in management arrangements for the NDSMF in 1998, no other commercial sectors are permitted to take commercial scalefish in the area of the fishery. Recreational catch in the fishery is largely unquantified, but thought to be relatively small in relation to the total commercial catch and focused around inshore waters near Broome, which are closed to commercial fishing. The only recent quantified survey of recreational fishing covered the Pilbara and western Kimberley regions and identified spangled emperor and red emperor as the most prominent commercial species targeted by the NDSMF that were also caught by recreational fishers. There is a growing charter fishery operating further offshore, with 85 fishing tour licences issued for the northern coast region off the Pilbara and Kimberley coasts. A catch and effort logbook system was introduced for the charter fishery in 2001. The target commercial species, in particular goldband snapper, are regularly caught by charter operations. DFWA advises that there is no indigenous fishery for species targeted by the fishery, and no data available for indigenous catch, although any catch that may occur is considered more likely to take place in the inshore zone.

The NDSMF is managed under the *Northern Demersal Scalefish Fishery Management Plan 2000*, the WA *Fish Resources Management Act 1994* and various regulations under the WA *Fish Resources Management Regulations 1995*. DFWA has prepared an Ecologically Sustainable Development (ESD)

report for the fishery that, when completed, will also become part of the formal management documentation for the fishery and be publicly available. This includes a formal assessment, based on the best available information, of the risks posed by the fishery to target, byproduct and bycatch species, threatened species and communities, and the environment.

Overall assessment

The material submitted by DFWA indicates that the NDSMF operates in accordance with the Australian Government *Guidelines for the ecologically sustainable management of fisheries*. DEH considers that the NDSMF 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 comprehensive management regime of limited entry, effort quota system and the strategic performance measures and indicators in place, suggests that the fishery is being managed in an ecologically sustainable way.

In making its assessment, DEH considers that the information collection system, stock and risk assessments and management arrangements are sufficient to ensure the fishery is conducted in a manner that does not lead to over-fishing and that stocks are not currently overfished. Considering the reliable fishery-dependent information collection, the caps on fishing effort to limit total catch, the comprehensive performance review system and the commitments made by DFWA to enhance data collection for target and non-target species, DEH considers that fishing operations are managed to minimise their impact on the structure, productivity, function and biological diversity of the ecosystem. Management of this fishery has a history of precautionary management of threats to sustainability and DEH is confident that DFWA will continue to provide this high quality management.

The assessment finds that the fishery is managed in an ecologically sustainable way and its operation is consistent with the objects of Part 13A of the EPBC Act. DEH recommends that the export of species taken in the fishery should be exempt from the export requirements of Part 13A of the EPBC Act, with that exemption to be reviewed in 5 years. DEH considers that the fishery, as managed in accordance with the management plan is not likely to cause serious or irreversible ecological damage over this period.

As the official fishery area encompasses Commonwealth as well as State waters, consideration under Part 13 of the EPBC Act is required regarding the impact of the fishery on listed threatened species, listed migratory species, cetaceans and listed marine species.

Protected species occurring in the fishery area include sea snakes, sygnathids, cetaceans, turtles, crocodiles, sawfish, seabirds, potato cod and dugongs. While there are anecdotal reports of some interactions with seasnakes and potato cod, the incidence of interactions is low and the consequences are likely to be minimal due to the scale of the fishery and the mode of fishing operations. Measures to further minimise the risk, such as reporting systems, are to be implemented in the short term. DEH considers the actual and potential impact on Part 13 species under the management arrangements to be low and the level of protection adequate. There are no listed threatened ecological communities in the fishery area.

DEH recommends that the *Northern Demersal Scalefish Fishery Management Plan 2000* 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 Management Plan relates does not, or is not likely to, adversely affect the survival in nature of listed threatened species or population of that species, or the conservation status of a listed migratory species, cetacean species or listed marine species or a population of any of those species. DEH also considers that the Management Plan 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.

To further strengthen the effectiveness of the management arrangements for the NDSMF, and to contain the environmental risks in the medium to long term, DEH has developed a series of recommendations. The implementation of recommendations and other commitments made by DFWA in the submission and ESD report will be monitored and reviewed as part of the next DEH review of the fishery in five years time.

Recommendations

1. 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 3 months of the change being made.

2. DFWA to ensure, where appropriate, that any relevant indigenous, conservation, world heritage and recreational interests in the fishery are considered through consultative mechanisms.

3. The ESD report, including all performance measures, responses and information requirements, to be incorporated into the management regime and decision making process.

4. DFWA, within 2 years, to incorporate into the management regime fishery specific objectives, performance indicators and performance measures for all key byproduct species or species groups where annual landed catch is greater than 10 tonnes. DFWA, within 1 year, to also incorporate into the management regime, an objective to minimise protected/listed species interactions, to minimise or maintain at sustainable levels the take of other non-retained species and to minimise impacts on the marine environment.

5. 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.

6. DFWA to develop and implement, within 18 months, a system to validate fishery dependant data on catch and effort for all target and byproduct species in the NDSMF.

7. Within 18 months, DFWA to develop a process to improve estimates of recreational and indigenous take and factor these into stock assessments and management controls to ensure overall catch levels are sustainable.

8. DFWA to continue to work towards developing more refined yield estimates of target and major byproduct species to determine sustainable harvest levels, particularly for red emperor and goldband snapper.

9. DFWA to continue to cooperate with other relevant jurisdictions to pursue complementary management and research of shared stocks for all target and by-product species that may be affected by cross-jurisdictional issues.

10. 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.

11. 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 Northern Demersal Scalefish Managed Fishery (NDSMF) is managed by the Department of Fisheries, Western Australia (DFWA).

The management regime is described in the following documents, all of which are publicly available:

- *Northern Demersal Scalefish Fishery Management Plan 2000*
- *Fish Resources Management Act* 1994 (FRMA)
- *Fish Resources Management Regulations* 1995
- annual State of the Fishery reports.

Relevant legislation is available on the State Law Publishing website. A number of other documents, including research reports, scientific literature and discussion papers, are integral to 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.

DEH considers it important that management arrangements remain flexible to ensure timely and appropriate managerial decisions. Due to the importance of the management plan to DEH's assessment of the fishery, an amendment could change the outcomes of our assessment and decisions stemming from it. Hence DEH requests that DFWA advises of any changes to the management plan that may impact on the ecological sustainability of the NDSMF.

Recommendation 1: *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 3 months of the change being made.*

The management plan and legislation were developed and amendments are made through processes that include consultation and the opportunity for involvement of stakeholders and members of the public. The FRMA outlines specific procedures for amending a management plan, which includes specification of who is to be consulted before the plan is amended and consultation with that group on any proposed amendments. The Northern Demersal Scalefish Management Advisory Committee, which previously involved representatives from licensees, charter, recreational and indigenous sectors to discuss management of the fishery, has recently been disbanded, replaced by an independently chaired consultative committee that discusses management issues annually with fishing operators.

The submission indicates that an annual consultative forum may also be held in future for all interested members of the local community. While workshops involving major stakeholders (industry, conservation, government, recreational and indigenous fishing interests) have been held to develop the ESD report for the larger Pilbara Trawl Interim Managed Fishery (PTIMF), no such workshop was held for the stakeholders of the NDSMF. DFWA drew on the outcomes of the PTIMF workshop to consider the broader stakeholder issues in developing the ESD report for the NDSMF. DEH considers that DFWA should ensure that the broader stakeholder interests are appropriately consulted so that all stakeholders have the opportunity to contribute to the key managements arrangements for the NDSMF.

Recommendation 2: *Department of Fisheries, Western Australia to ensure, where appropriate, that any relevant indigenous, conservation, world heritage and recreational interests in the fishery are considered through consultative mechanisms.*

Section 5 of the NDSMF submission outlines the ESD report and includes details of the operational objectives, performance indicators and performance measures by which the effectiveness of the management arrangements are measured, with an emphasis on long-lived target species. It also outlines the strategies being used to meet the objectives. In relation to the target species, DEH believes that the

arrangements specified are sufficiently strategic and that the objectives, performance indicators, performance measures and responses outlined are important elements that should be formally incorporated into the management regime and decision making process.

The ESD report, on which the submission is largely based, is an integral part of the management regime. It examines benefits and costs associated with the fishery. It also identifies and assesses risks posed to the fishery and environmental components. The management commitments specified in the ESD report have been fundamental in DEH's assessment and consequent recommendations. The ESD report is currently not a formal component of the legislative framework for the fishery. Although DEH is satisfied that this lack of a legislative base will not cause issues in the fishery in the short term, we recommend that the ESD report be formally incorporated into the management regime and decision making process. DFWA has advised that it proposes to formally publish the management objectives and performance measures for the fishery as part of a series of Ministerial guidelines, as an adjunct to the management plan. The Ministerial Policy Guidelines will provide the policy framework for the management for each fishery. This document will reflect the management objectives, philosophy and guidance for decision making, including the legislated management plan, the ESD report, and as relevant, reference to other documents.

Recommendation 3: *The ESD report, including all performance measures, responses and information requirements, to be incorporated into the management regime and decision making process.*

The ESD report contains, for target species, triggers for management responses should performance measures not be met. A range of indicators are used to inform the performance measures, including spawning biomass of key target species and catch levels and catch rates of major target species. Specific response timeframes are not stipulated in the management regime in the event of the performance measures being triggered. Part II Principle 1 of this report provides further discussion on the details and appropriateness of existing performance indicators and measures for target species.

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.

While objectives, performance indicators and performance measures have been established in the NDSMF for the indicator target species and the major group of byproduct species, the current ESD report does not contain specific strategic objectives and performance measures in relation to the sustainability of the fishery in terms of other major byproduct species, and does not contain specific objectives to minimise impacts on 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.

In 2002 byproduct comprised around 41% of the total scalefish catch of the NDSMF and included a broad range of at least 30 taxa. Under the current management arrangements in the NDSMF any species with catches above 10 tonnes per annum is designated a key byproduct species. At the 2002 review of stocks those species or species groups that would be designated as key byproduct species were scarlet perch, spangled emperor, spotted cod and a group of unspecified cods and groupers (mixed Serranids) comprising up to 16 species. Of these four species or species groups, only the mixed Serranids are currently subject to specific performance review measures. Scarlet perch and spangled emperor are long lived species vulnerable to fishing pressure. Spangled emperor is commonly targeted by other fishing sectors such as the recreational sector, while the catches of scarlet perch have increased in the NDSMF in

recent years to the extent that in 2002 it was the byproduct species with the highest catch level (14% of the total NDSMF catch and 38% of the total WA catch of scarlet perch). The biological characteristics and susceptibility to fishing pressures of these species could be considered equivalent to the group of Serranid (cod and grouper) byproduct species.

DEH considers that similar levels of performance monitoring should be extended at least to other key byproduct species in the fishery. DEH recommends that performance indicators and performance measures be developed for key byproduct species or groups (where it is appropriate to use groupings) based on the best available information. DEH considers that the predominantly trap fishing operations present less risk of impacting adversely on bycatch species, including protected species, and the broader marine environment. While fishery specific performance indicators and measures are not considered necessary at this stage for these components of the NDSMF, DEH urges DFWA to give further attention to obtaining more robust information on the fishery's interactions with bycatch, protected species and the marine environment in the event that performance measures and indicators are required for future management. Further details on information collection for bycatch and protected species and the marine environment are provided in Part II of this report.

Recommendation 4: *DFWA, within 2 years, to incorporate into the management regime fishery specific objectives, performance indicators and performance measures for all key byproduct species or species groups where annual landed catch is greater than 10 tonnes. DFWA, within 1 year, to also incorporate into the management regime, an objective to minimise protected/listed species interactions, to minimise or maintain at sustainable levels the take of other non-retained species and to minimise impacts on the marine environment.*

DFWA's *State of the Fisheries Report* provides an annual 'report card' on ESD performance for all of the State's major commercial fisheries and some recreational fisheries. The annual reports include assessments of target and byproduct stocks, non-retained species, ecosystem effects and a research summary. This provides the mechanism to review the performance of the major aspects of the NDSMF. This report also includes periodic review by the WA Office of the Auditor General. In addition, the ESD report will be reviewed every five years. This review will include an external review and full assessment, including examination of the validity of the objectives and performance measures. The full ESD report, once finalised, will be available via publication and on the DFWA website.

DEH considers that a 5 year review of the overall NDSMF management is suitable provided that critical aspects, such as periodic review of the performance of the fishery against performance measures, is undertaken on a regular basis with the outcomes of these reviews publicly available in the annual *State of the Fisheries Report*.

Recommendation 5: *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.*

DEH considers that, once more comprehensive consultation and strategic management arrangements are developed (see Recommendations 2 and 4), DFWA will have, through the annual *State of the Fisheries Report*, ESD report and annual stakeholder workshops, a comprehensive, transparent and highly accessible framework for reporting on the NDSMF.

Management of the fishery is based on a mixture of output and input controls, including:

- limited entry with 11 licences in the offshore zone and 4 licences in the inshore zone;
- annual effort control through effort quota allocations for the offshore zone (major fishing area);
- tradable effort quotas and no limit on trap numbers, enabling flexible and efficient use of resources;

- nominal total sustainable catch of 800 tonnes for demersal scalefish (as benchmark for effort levels) and total effort allocation of 1,760 fishing days;
- spatial closure for commercial fishing in key recreational fishing area;
- mandatory VMS to aid monitoring and enforcement;
- gear restrictions – specified dimensions for fish traps, limit of 5 handlines set at any time and a maximum of six hooks per line;
- legal minimum lengths for one target species - red emperor, and one major byproduct species - spangled emperor (both 41 cm).

These controls are coupled with a range of operational objectives, performance indicators and measures and management actions for the primary target species described in the ESD report.

Compliance in the fishery includes a mix of sea and land patrols, fishery and processing factory inspections and compulsory use of VMS since 1998 for spatial and temporal coverage of the fleet and adherence to effort controls. The *State of the Fisheries Report* also provides detailed statistics on Departmental activities in relation to ensuring fishers' compliance with the management arrangements for each fishery. The submission notes that only minor offences that have not warranted prosecution have been reported in the fishery in recent years. In terms of controlling the level of harvest to ensure the NDSMF remains sustainable, the two main issues to be addressed are compliance with fishery boundaries and the closed area and ensuring that effort quotas are not exceeded. The combination of the small scale of the fishery (average 5 to 7 vessels operating in recent years) and the use of VMS assists in the management of these risks, backed by random patrols, annual licence checks and gear inspections. DEH considers that these compliance measures contain the means of enforcing critical aspects of the management arrangements for the fishery.

Fishery-dependent commercial catch, effort and locality data relating to the target and byproduct species are collected on a regular basis in the fishery through Catch and Effort Statistical System (CAESS) returns and from VMS data, with catch and effort reporting on each fishing trip to be introduced from 2005. Periodic surveys of catch composition have been conducted, the most recent in 1998-99. In the absence of ongoing fishery independent information relating directly to the fishery, supporting information has also been drawn from the nearby fisheries in the Pilbara region. While recreational catch across the fishery is yet to be quantified, charter vessels have been required to complete catch and effort logbooks since 2001. Discussion of the information collection system can be found in Part II of this report.

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 lives and the fishery operates is contained under Principle 2 of this report.

While most of the target and byproduct species occur widely across northern Australia and beyond, DFWA has concluded, on the basis of available data such as species movement, distribution and habitat preferences, that the major catch species can be managed satisfactorily as separate regional stocks. The current management arrangements in the NDSMF therefore do not include explicit collaborative stock assessment or research arrangements with other jurisdictions. DFWA is informed on common stock issues through participation in the Northern Australian Fisheries Management Workshop (NAFMW), which includes State, Territory and Commonwealth Fisheries managers, researchers, and compliance staff, as well as representatives from Indonesia and East Timor. These workshops provide opportunities to address cross jurisdictional issues, particularly stock assessment and bycatch issues. DEH considers that such an approach is appropriate to the management of stocks in this region. Further discussion of complementary management requirements is in Part II Principle 1 of this report.

DEH considers that the current management arrangements are consistent with all relevant threat abatement plans, recovery plans, the National Policy on Fisheries Bycatch, and bycatch action strategies

developed under that policy. DFWA has committed to complying with any future plans or policies. The *Fish Resources Management Act* 1994 provides mechanisms that allow for amendments to management of fishing practices so that they comply with any future plans of these types.

No regional or international management regimes, to which Australia is a party, are of direct relevance to the fishery. The prime international regime affecting the fishery is the United Nations Convention on the Law of the Sea. The management regime essentially complies with this. Other international regimes are applicable to fisheries management but do not explicitly involve this fishery. For example, the 1992 Convention on Biological Diversity and in particular the 1995 Jakarta Mandate require that, in relation to the sustainable use of marine and coastal biological diversity, the precautionary principle should apply in efforts to address threats to biodiversity. While these agreements are not specifically addressed in the submission, the fishery's compliance with their requirements can be assessed by examination of Part II of this report. The application of the International Convention for the Prevention of Pollution from Ships (MARPOL) to vessels operating in the fishery is explicitly discussed under Principle 2, Objective 3.

DEH considers it is incumbent on all authorities to develop a thorough understanding of the framework of national, regional and international agreements and their applicability to export-based fisheries for which they are responsible.

Conclusion

DEH considers that the NDSMF management regime is documented, publicly available and transparent, and is developed through a consultative process that could be further improved. The current fishery management arrangements are adaptable and have been used effectively to maintain target stocks at a sustainable level. These arrangements would be enhanced with the inclusion of more comprehensive objectives, performance indicators and performance measures so that fishery impacts on byproduct, bycatch, protected species and the environment can be more effectively 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 improvements 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 for the NDSMF are obtained through compulsory CAESS returns which fishers complete at the end of each month and return to DFWA. These returns provide for recording of details on all retained catch by species or species group (in kilograms) and fishing effort (days fished, number of traps pulled/day). Catch location is reported by 1 degree blocks. Monthly CAESS data on catch and effort are available for the fishery since 1985. The submission notes that catch and effort reporting on a trip basis will commence from January 2005. The introduction of VMS in 1998 has provided DFWA with finer scale spatial data to validate commercial fishing effort and location.

Fishery independent data for the NDSMF is primarily drawn from a Fisheries Research Development Corporation (FRDC) funded research project from 1997 to 2000 when observer surveys provided baseline research data on growth rates, age structure, reproductive biology and yield analyses of the target species, red emperor and goldband snapper, and also provided an indication of catch composition, including bycatch species. The submission notes that observer surveys of catch composition are to be conducted every two to three years and that ongoing collection of age structure data to inform the stock assessment process is proposed. In the absence of a research or data monitoring strategy, it is unclear what commitments are in place for these surveys or what they will entail. The ESD report notes that age structure data for each of the key species would provide a more robust indicator of stock status than catch data alone. DEH encourages the further development and implementation of ongoing catch sampling and catch composition surveys to supplement the predominantly fishery dependant catch and effort data relied on in the stock assessment process and management controls across the fishery.

DEH has concerns, in the absence of an ongoing observer program, on the extent of validation processes for commercial catch and effort data. While VMS data provide the primary mechanism to validate effort data through regular spatial and temporal monitoring of vessel position, catch data and the rate of trap usage do not appear to be regularly validated by on-board or in-port observations or by other means such as checks against processor records or catch and disposal records. DEH has particular concerns with the reliance on unvalidated data to inform the stock assessment and fishery performance measurement. Given the predominant reliance on fishery dependant data to support the management of the NDSMF, DEH considers that robust validation of fishery dependant commercial data is essential to verify management measures in place, in particular the primary management tool of effort quota allocations and adjustments based around a nominal total sustainable catch limit.

DFWA has indicated it will undertake a program involving at least two observer/research monitoring trips each year to validate catch composition, including details of bycatch and interactions with protected species. DEH commends DFWA on this approach and recommends that DFWA continue to develop and implement reliable systems to validate commercial catch and effort for target and byproduct species in the NDSMF.

Recommendation 6: *DFWA to develop and implement, within 18 months, a system to validate fishery dependant data on catch and effort for all target and byproduct species in the NDSMF.*

Since 2001 charter operators have been required to complete logbooks with trip summaries of catch and effort. Estimates of recreational catch are reliant on periodic catch surveys. The most recent survey in the region was a 12 month creel survey of recreational boat and shore-based fishing in the Pilbara and west Kimberley regions in 1999-2000 that extended only as far north as Broome. This survey identified significant recreational catches in the order of 300 tonnes in the area from Onslow to Broome, including estimated catches of 12 and 6 tonnes respectively for the key commercial species, spangled emperor and red emperor. DFWA expects to complement the results from this survey with data from the 2000-01 National Recreational and Indigenous Fishing Survey (NRIFS). The submission notes that recreational catch has not been quantified for the east Kimberley region.

DFWA considers that there is little recreational or charter boat fishing effort directed towards the deepwater demersal fin fish species targeted by commercial fishers, and that most recreational targeting of demersal finfish species is likely to occur in the commercially closed inshore area around Broome. DFWA expects that recreational fishing effort and catch in the NDSMF is small relative to the total commercial catch. Similarly, DFWA has limited data on the extent of indigenous catch but also expects it is minimal, located in the inshore zone of the fishery and not impacting on commercially targeted species.

The ESD report states the that WA north coast region has experienced significant growth in recreational fishing activity in recent years, with an estimated 12% of WA's recreational anglers fishing marine waters between Onslow and the WA/Northern Territory border and generating around 1 million fishing days. The ESD report notes that a significant increase in recreational take would require a reassessment of both the recreational and commercial management arrangements in the fishery. DEH has concerns that while structured data collection or analysis has been undertaken for the charter boat sector, no such mechanisms to provide reliable catch estimates exist for the remaining recreational or indigenous sectors, and that the impacts of these sectors on demersal finfish stocks in the NDSMF remain largely uncertain. The submission states that the magnitude of both the recreational and charter boat catch along the entire Kimberley coast and the degree of overlap with the inshore zone of the NDSMF remains to be investigated.

DFWA has advised that the information available from the NRIFS and the existing program of WA recreational creel surveys has improved estimates of take from these sectors in recent years and that any estimates that are obtained from surveys will, if appropriate, be incorporated into assessments of the status of key species taken in the fishery. DFWA intends to develop measures to improve estimates on indigenous take in the fishery within the next 18 months, although it has also acknowledged that additional funding will be required to undertake any future indigenous fishing survey work.

DEH considers that without accurate knowledge on the level of take it is not possible to reliably factor recreational or indigenous impacts into the overall stock assessment. DEH therefore considers that DFWA should establish a process to improve estimates of the take by both sectors to ensure long term sustainability of target and non target stocks.

Recommendation 7: *Within 18 months, DFWA to develop a process to improve estimates of recreational and indigenous take and factor these into stock assessments and management controls to ensure overall catch levels are sustainable.*

Assessment

The ESD report notes that the target species in the NDSMF have a long history of exploitation from first foreign trawl vessels and then domestic trap and line vessels. Extensive foreign trawling activity for demersal finfish occurred in the Kimberley or nearby regions from the 1960s to the 1980s. Domestic operations at a much lower fishing scale replaced foreign fishing by the late 1980s and have provided catch and effort data for over 15 years on demersal scalefish harvesting for use in the stock assessment under the current management arrangements for the NDSMF.

NDSMF primarily targets goldband snapper and red emperor, both high value, long lived demersal finfish species whose biological characteristics make them vulnerable to overfishing. The stock assessment and management controls in the fishery are primarily based around the status of these two species. In the 2002 review of the fishery, red emperor and goldband snapper comprised 23% and 35% respectively of the 433 tonnes of demersal finfish caught in the fishery.

The status of the breeding stocks and inter-annual variations for the target and major byproduct species are assessed each year along with a review of the performance of the fishery. This review includes assessment of total catch, catch rates, spatial and temporal distribution of effort across the season and estimates of the total spawning biomass of the target species relative to virgin spawning biomass levels (assumed to be 1980 levels). The assessment is reported in the annual *State of the Fisheries Report*. DEH has recommended broader stakeholder participation in management arrangements such as reviews of the fishery (Recommendation 2) and periodic reviews of the performance of the fishery against performance measures that relate to the sustainability of the fishery (Recommendation 5). Major stock assessments, including risk assessments of the management options for the key demersal finfish species, are undertaken for the NDSMF every 3 years.

Estimates of sustainable yield for the fishery have been derived from extended catch and effort datasets and research collected on the fishery. This data has been used to develop both fishery wide and species specific performance indicators and measures to determine the sustainability of stocks and appropriate management controls. Research by the Commonwealth Scientific and Industrial Research Organisation in 1991 in the Pilbara and Kimberley regions on yield limits for demersal scalefish, along with historical average catch records for the NDSMF, have been used as the basis to establish an acceptable catch limit, or nominal Total Sustainable Catch (TSC) limit, of 800 tonnes for the combined catch of the 6 major demersal finfish species in the NDSMF. The TSC is a key reference point in the NDSMF as it provides the basis for the primary management tool in the fishery, the total allowable effort allocation. The submission notes that the TSC has not been exceeded since its introduction. The status of stocks is determined through annual monitoring of performance measures based on estimates of spawning biomass, total catch levels and trap catch rates of red emperor and goldband snapper. As these two target species comprise the majority of catch in the fishery, DFWA manages the fishery on the principle that management actions that provide for sustainable catch levels of red emperor and goldband snapper are likely to afford similar protection to other long lived species harvested by the fishery. DEH has previously recommended a broader approach to more directly address other components of the fishery, such as byproduct and bycatch species, including protected species.

A preliminary age structured stock assessment model for red emperor and goldband snapper has been developed using age, growth and other biological data from the above mentioned 1997-2000 FRDC research project survey data. This model is also informed by time series of catch data from 1980 and effort data from 1995 to provide annual spawning biomass estimates for the target species. For the 2002 review, red emperor was assessed at 54% of virgin spawning biomass, and goldband snapper 41%, both achieving the performance target point of maintaining the proportion of virgin spawning biomass above 40%. The ESD report notes that while red emperor has had stable catch and catch rates in recent years, there have been fluctuations in the total catch and catch rates indicators for goldband snapper. However, neither target species has been outside the acceptable performance limits for the respective catch and

catch rate performance measures since 1999. DFWA concludes that the range of performance information confirms that the current breeding stock and catch levels are adequate for the target species.

While DEH concurs with this assessment, based on the available information, the submission also notes that no fishery independent data is available to confirm the status of breeding stocks. The ESD report also acknowledges that some limitations exist with the stock assessment and review processes, including:

- the risk that reliance on catch rate information alone may lead to "hyperstability" tendencies in the assessments, whereby stable catch rates may not be an accurate indicator of stock status but the result of directed fishing practices such as targeting of aggregated species, mobility of the fleet and ease of locating fish due to known habitat association;
- the need for further age composition data to supplement catch and catch rate information and provide more robust indicators of stock status;
- the need to further evaluate changes in fishing power and fleet efficiency through time as part of the analyses of catch and effort;
- the need for further catch composition sampling to verify species composition and magnitude of landed and non-landed catch.; and
- the need to review the current nominal TSC to provide a more reliable long term sustainable catch level in the fishery and to give further consideration within this limit to catches at species level, in particular the two target species.

DEH acknowledges that DFWA is attempting to address many of these issues, including developing proposals with industry for ongoing age-structure monitoring of red emperor and goldband snapper to further refine the age-structure stock assessment model. DEH strongly encourages the pursuit of this monitoring work to progress the development of species-specific sustainable yield limits. DEH recommends DFWA take further steps to address the above limitations and ensure adequate information is obtained to improve the confidence in the sustainable yield and harvest limits for larger species and major by-product species, such as scarlet perch, spangled emperor and mixed species of serranids.

Recommendation 8: *DFWA to continue to work towards developing more refined yield estimates of target and major byproduct species to determine sustainable harvest levels, particularly for red emperor and goldband snapper*.

The distribution of the target and major byproduct species is well understood from past studies and extensive harvesting of these species by both foreign and domestic fisheries in northern Australian waters over many years. The submission notes that limited larval dispersal and limited adult movement within populations support the existence of separate regional stocks for fisheries management purposes. DEH concurs with this view, noting that, as previously mentioned in Part I of this report, DFWA has an ongoing involvement in the NAFMW that provides the opportunity to further consider research and management developments with potentially shared stocks (such as goldband snapper in northern waters) on a cross-jurisdictional basis.

DEH notes that there is still a degree of uncertainty on the extent of shared tropical snapper stocks in northern waters, particularly for species such as goldband snapper, and that research is still being undertaken on the extent of overlapping stocks. DEH also notes that the 2002-03 *State of the Fisheries Report* for the Pilbara demersal finfish fisheries identifies the potential for exchange of eggs and larvae of goldband snapper between the Kimberley and Pilbara regions and the need to consider the implications of any impacts on stock recruitment for this species. While DEH understands that past research has concluded that there is unlikely to be substantial movement of goldband snapper between WA and NT waters, it recommends that DFWA continue to work with NT, Queensland and other relevant jurisdictions to verify any shared stock implications for target and byproduct species, while ensuring appropriate precautionary stock management arrangements are in place in the interim.

Recommendation 9: *DFWA to continue to cooperate with other relevant jurisdictions to pursue complementary management and research of shared stocks for all target and by-product species that may be affected by cross-jurisdictional issues.*

Understanding of the stocks in the deepwater areas of the fishery in depths greater than 200 metres remains largely uncertain. This area is not exploited by existing fishing operations in the NDSMF and is managed as a research fishing zone. The submission notes that commercial operators have had limited success with catches from previous deepwater trips, and that while these deeper waters are likely to comprise a different suite of species from the existing regular fishing grounds in the NDSMF, DFWA expects that any sustainable catch from deeper waters is likely to be low. DEH expects that DFWA will continue to manage this component of the fishery on an appropriately precautionary basis.

The submission states that catches by all methods in the commercial sector of the NDSMF (both trap and line) and from all sectors, including recreational, charter and other commercial fisheries, are taken into account in the stock assessment process. Long term commercial catch datasets are available on the fishery dating back to 1980 for the domestic fishery and some earlier data relating to foreign trawling in the Kimberley and surrounding regions. Since the revised management arrangements in 1998, other commercial fisheries in the Kimberley region are prohibited from landing demersal scalefish species, which, along with gear restrictions and gear modifications in other fisheries, such as the pending introduction of Fish Exclusion Devices in the Kimberley Prawn Managed Fishery, limits the potential for any significant take of demersal finfish from other fisheries. The submission states that negligible amounts of catch are reported by overlapping commercial fisheries. As previously noted in this report, charter catch and effort is now monitored from compulsory catch and effort logbook returns but the recreational catch component is uncertain and, if similar to that revealed by the recent creel surveys in the Pilbara region, likely to be substantial. DEH has recommended DFWA take steps to obtain more accurate estimates of recreational and indigenous catch to factor into the stock assessment process and resultant management measures (see Recommendation 7).

Discards are not recorded in the fishery. The ESD report notes that undersize red emperors, caught in traps in the NDSMF, are the only target species discarded in the fishery. No estimate is provided on the extent of these discards and while survival rates are unknown, DFWA concedes that survival rates are likely to be low given the fishing depths are generally greater than 80 metres. The ESD report states that as red emperors have a high rate of natural mortality before reaching maturity, the extent of discards in the fishery is likely to have minimal impacts on red emperor stocks. DEH considers that the while this may be the case, the impact of discarding major target and byproduct species should be further quantified in the stock assessment process and in determining more refined species-specific yield estimates (see Recommendation 8).

Management response

The management regime for the NDSMF includes a comprehensive suite of operational objectives and performance indicators and performance measures. The overall catch objective for the fishery is to maintain the total catch of the major demersal finfish species within the historical acceptable catch range of the 6 major demersal finfish species. This acceptable catch range is plus or minus 20% of the TSC limit of 800 tonnes that is based on historical catch levels. The introduction of effort controls in 1998 has seen a commensurate drop in overall catch levels below the lower acceptable catch range limit of 600 tonnes, mainly due to a large proportion of the effort allocation remaining unutilised each year. The appropriateness of the current TSC is under review to provide a long term sustainable catch level for the offshore zone of the NDSMF.

Performance indicators and performance measures for the two target species, red emperor and goldband snapper, provide a more detailed analysis of indicative stock trends in the fishery. The performance measures require the maintenance of median spawning biomass at above 40% of the estimated virgin

spawning biomass levels, the annual catch of the two target species not to increase by more than 20% above the average annual catch of the previous four years, and the annual trap catch rate of the target species not to decrease in two consecutive years. Trap catch rates alone are used as they are more consistent than line catch rates in the fishery and trap is the main fishing method. These performance limits have not been triggered for either target species since 1999.

The ESD report notes the requirement to conduct a review to determine the causes of breaches in the performance measures for the fishery. Management responses to these breaches depend on whether there is evidence of declines in spawning biomass, and if so, the main tool used is an adjustment of effort allocations. As noted in Part I of this report, where a breach of a performance measure materially affects the sustainability of the target species or negatively impacts on byproduct, DFWA is committed to reporting to the Minister for Fisheries within 3 months for subsequent management review and action with implementation timeframes.

The current fishery management regime aims to maintain ecologically viable and productive stock levels through a range of input controls and limited output controls for certain species. These measures are outlined in Part I of this report.

The fishery has been managed on a zonal basis since 1998, commensurate with the differences in species types and fishing effort. The low commercial activity in the inshore zone is managed through tight gear restrictions (no traps, hook restrictions through a maximum of 5 handlines and 6 hooks per line, no power hauling equipment) and limited entry of 4 licences. Commercial effort in the inshore zone has been minimal with catches of less than 5 tonnes per year since 1998, suggesting that the management measures in place are adequate. A comprehensive effort allocation system has applied in the offshore zone since 1998 involving allocation of Individual Transferable Effort quotas. A total allowable effort (TAE) allocation of 1,760 fishing days applies for the offshore zone based on the nominal TSC of 800 tonnes. Standard fishing days used in the calculation of the TAE are defined as 20 traps or 5 lines per day. The effort allocation system has effectively capped the number of fishing days and assisted in reducing latent effort in the fishery to the point that an average of 5 to 7 vessels now operate across the fishery. Fishing days and location of fishing effort are monitored by VMS and indicate that effort is widespread across the offshore zone, generally in depths of 70 to 130 metres.

For both zones there are also minimum legal size limits that apply for some of the commercial finfish species targeted in the Kimberley region, with a legal minimum size of 41 cm applying for red emperor and spangled emperor and 28 cm for blue spot emperor.

DEH considers that the combination of input and output controls and the suite of objectives, performance indicators and performance measures currently in place and to be put in place provide a sound basis for protection of stocks while the sustainable yield estimates of key species are further refined (see Recommendation 8).

DEH considers that the combination of mandatory VMS, sea and land patrols, radar watches, fishery and gear inspections and annual licence checks provides adequate measures to enforce compliance with the management arrangements given the scale of the fishery. The introduction of VMS monitoring has ensured the high level of compliance with effort quotas essential to effectively control the annual take. The ESD report notes that since the introduction of VMS in 1998, only minor offences relating to reporting have been detected and were not considered by DFWA to be serious breaches. The ESD report also notes that a compliance risk assessment for the fishery will be used to direct priorities for compliance measures. There is no commitment regarding the scope of the risk assessment, nor when it would be implemented. As the remoteness of the region has some inherent compliance risks, DEH urges DFWA to give priority to the early development and implementation of a compliance risk assessment for the NDSMF.

The regulated trawl and trap fisheries provide for structured management responses to control the removal of demersal finfish. However, DEH is concerned that the unconstrained take by the commercial line, recreational and charter fishing sectors has the potential to undermine the effectiveness of these management measures and the overall sustainability of fishing for the target species.

The ESD report noted that the recreational fishery in the region is subject to bag and size limits but otherwise there was no limit on access by charter or recreational fishers to demersal finfish in the Kimberley region. The inshore commercial fishing closure around Broome is thought by DFWA to cater for most of the recreational fishing effort that targets demersal finfish in the region, however this is yet to be quantified. DEH has previously raised concerns in this report about the magnitude of charter and recreational fishing in the region and the need to obtain better estimates of recreational catch (see Recommendation 7). DFWA acknowledges in the ESD report that there is a large recreational component fishing demersal finfish in the Kimberley region and that an integrated management approach needs to apply for the NDSMF. The ESD report notes the recent boom in charter operations in the region, with 85 fishing tour licences and 5 ecotour licences now issued for the north coast bioregion, which will exacerbate demands on demersal finfish resources from the various sectors.

DEH considers that the growing significance of recreational use of demersal finfish resources in the Kimberley region requires that further attention be given to the adequacy of management measures for that sector. The ESD report notes that an Integrated Fisheries Management Review Committee (IFRMC) has been established in WA to develop a strategy to integrate the management and sustainable use of fish resources. The IFRMC is addressing the issue of resource allocation for fish stocks across WA and reported to the WA Fisheries Minister on a proposed allocation framework in November 2002. The Minister is expected to respond to the report in 2004. DEH encourages DFWA to give early consideration to the decisions made concerning resource allocation to ensure that a sustainable management system is in place to address the impacts of all sectors on demersal finfish stocks in the Kimberley region.

While the management plan does not provide for the landing of a wide range of species, including mackerels, billfish, dolphinfish, crustaceans, molluscs and echinoderms, finfish byproduct still comprises around 41% of the landed catch in the NDSMF. Information is collected for byproduct species through the CAESS monthly returns. Species with catches above 10 tonnes each year in the NDSMF are designated as key byproduct species, and those in excess of 100 tonnes (red emperor and goldband snapper) as target species. In 2002 the key byproduct species were scarlet perch (61 tonnes), spangled emperor (34 tonnes) and mixed Serranids (49 tonnes from up to 16 species such as spotted cod, Rankin cod, eight bar cod, maori cod and duskytail grouper). These species have similar biological characteristics (slow growth, long lived and relatively sedentary) as the target species. Minor byproduct catches were recorded for sea bream (6.6 tonnes), longnose emperor (4 tonnes) and red snapper (2.5 tonnes). A wide range of other finfish species were caught in very minor quantities of less than 2 tonnes.

The mixed Serranids group is the only byproduct species with species-specific objectives, performance indicators and performance measures. The total annual catch and annual trap rate of Serranids are reviewed annually to monitor the stock status of these species as a group. Catch levels and catch rates have generally been stable for this species group since the introduction of formal management arrangements in 1998. Maximum size limits of 30 kg and 1200 mm also apply to all cods and groupers in WA waters. The ESD report concedes that the robustness of the current indicators is low for determining stock trends for the individual Serranid species and notes that DFWA proposes to conduct observer catch composition surveys every 2 to 3 years to obtain more species-specific data on Serranids, leading to specific performance measures for selected Serranid species.

DEH considers that a similarly precautionary approach should be extended to other byproduct species, in particular the other key byproduct species of scarlet perch and spangled emperor. Both species are not only prominent components of the NDSMF catch (14% and 8% respectively of the 2002 total catch) but

of the overall WA catch of these species (38% and 18% respectively) and have similar vulnerabilities to overfishing as the target species.

DEH has recommended earlier in this report (see Recommendation 4) the development of precautionary objectives, performance indicators and performance measures for byproduct species or groups, based on best available information, so that any adverse trends can be more readily detected and addressed.

Conclusion

DEH considers that the management regime in the NDSMF is appropriately precautionary and has provided for the fishery to be conducted in a manner that has not led to over-fishing and is unlikely to do so in the short term. DEH considers that the quality of information being collected, the information collection systems and the stock assessment approach are generally sufficient in the short term, under the current scale of operations, 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 data validation, stock assessment and performance measures for both target and byproduct species 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 is not applicable to the fishery at present. Performance measures and management responses are in place, or under consideration, to ensure that the risk of overfishing any of the target stocks remains low. Target species are within defined reference limits. DEH considers that while the existing performance reporting system indicates target stocks are being harvested and managed at sustainable levels, more robust and integrated stock monitoring and assessment measures are required to provide further certainty on the status and trends of species-specific target and byproduct stocks. Recommendations to this effect have been made earlier in this report.

Conclusion

DEH considers that the NDSMF target stocks are not below defined reference points but should that occur in the future, the fishery is conducted such that there is a high degree of probability the stocks would recover to ecologically viable stock levels within nominated timeframes. The adoption of recommended improvements to catch and effort data validation, recreational fishing estimates and performance measures for byproduct species should result in even greater confidence in the future.

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 system is currently in place for the ongoing collection of information on bycatch caught in the NDSMF. Discards are currently not recorded by fishers and catch sampling or independent monitoring programs are not established as regular measures in the fishery. The ESD report notes that with the move to trip reporting in 2005, the reporting requirements in the fishery will be modified to accommodate the recording of bycatch data and reporting of interactions with protected species.

A one-off estimate of the extent and composition of bycatch was obtained from 1998-99 surveys of commercial catch. This information is supplemented by anecdotal information on bycatch and data extrapolated from the Pilbara trawl fishery. The bycatch survey in the trawl fishery was undertaken in 2002 over a 5 month period and provides a single estimate of bycatch species in the areas of the Pilbara trawl fishery. This survey provided estimates of scalefish, sharks and rays and invertebrates caught and discarded in the trawl fishery, including species such as triggerfish that are also known to be caught in the Kimberley Prawn Managed Fishery. DEH has concerns regarding the extrapolation of bycatch data from the Pilbara trawl fishery given the functionally separate stocks, limited overlap between areas of the fishery sectors and differences in the composition and likely survival rates of bycatch between traps and trawl nets.

While estimates of bycatch from the earlier catch surveys in the NDSMF were relatively low, follow up surveys are needed to verify whether individual or groups of non-retained species are at risk from the fishery, including discarded target species. DEH has noted, earlier in this report, the need to further quantify the level of discarding of undersize target species such as red emperor to enhance the stock assessment process and to develop more refined species-specific yield estimates. The ESD report expects that further bycatch data can be obtained from observer programs every 2 to 3 years to determine catch composition in the NDSMF. DFWA has advised earlier in this report of its intention to conduct annual observer/research monitoring trips that will also gather data on bycatch species.

The submission notes that as more monitoring data becomes available, the suitability of current performance limits may need to be reviewed, and that any significant changes in the composition or level of bycatch in the NDSMF will be reported in the annual review of the fishery. DEH considers that DFWA should continue to give priority to implementing ongoing mechanisms to record bycatch interactions to identify changes in the composition and quantity of bycatch in the NDSMF, and periodically validate these bycatch details.

Recommendation 10: *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 outlines the risk assessment approach undertaken for the impacts of the NDSMF on bycatch species. The assessment drew mainly on data from the 1998-99 catch composition survey in the NDSMF and anecdotal reports of fishers. The outcomes of this assessment found that the extent of discarding in the NDSMF presented only negligible risks to elasmobranches and unmarketable scalefish and that catches of non-target species are very low. The assessment found that discards constituted around 1.3% by numbers of the total NDSMF catch, with triggerfish (mainly *Abalistes stellaris*) comprising around 85% of the discarded catch. This translated to around 6.4 tonnes in 2001 and 5.6 tonnes in 2002 of triggerfish bycatch. Anecdotal information suggests a reasonable survival rate for these species, although the submission states that there is no data on the survivability of bycatch species in the NDSMF. Estimates on the remainder of the non-retained catch are around 0.8 to 1 tonne and mainly comprise bannerfish, squirrelfish and lionfish. These species were caught in very small quantities and their vulnerability to fishing was found to be minimal due to their broad distribution and their not being retained by commercial or recreational fisheries in north western Australia. The ESD report notes that limited information is available on the catch levels or species composition of elasmobranches. Anecdotal

information suggests elasmobranch catches are very small. DFWA considers that the impact on elasmobranch species is likely to be negligible because of the small trapping area relative to the distribution of each species.

DEH has previously recommended the development of an objective to minimise the take of non-retained species (see Recommendation 4). The uncertainty with the bycatch levels of species vulnerable to overfishing such as elasmobranches and the fairly significant catch of species such as starry triggerfish further supports the need to give priority to implementing ongoing and reliable bycatch monitoring mechanisms in the NDSMF (see Recommendation 10).

Management response

The existing management arrangements do not include any specific bycatch mitigation measures, apart from the stipulated mesh size for the traps that allows for escapement of smaller non-target species and a requirement that traps which are left in the water unattended must be unbaited and have their access panels open to allow free exit of fish. DEH considers the relatively short time period for traps to be in the water before retrieval (from 2 to 5 hours) should also contribute to reducing the susceptibility of bycatch species to capture. DFWA considers that the management arrangements in place for target species in the NDSMF, primarily the low total fishing effort, area closures and small area fished (relative to the distribution of bycatch species), provides for minimal impacts on non-target species.

The ESD report notes that fish traps catch undersize target species such as red emperor. While minimum legal size limits apply for red emperor and spangled emperor, the depths that the fishery generally operates at would most likely result in landed catch of these species suffering some form of barotrauma that would adversely impact on the survival of any discarded undersize catch. The traps used in the NDSMF do not include separate escape gaps or panels and the ESD report states that selectivity trials have indicated that escape gaps are not suitable for the release of undersize red emperors. An alternative approach may be to minimise the retention in the traps of non-target species and small fish of target species through use of optimal mesh size in the traps. The 50 x 70 mm mesh size used in traps is capable of retaining smaller target fish species and other bycatch. DEH notes that traps used in the Northern Territory Demersal Fishery, that targets a similar range of finfish species in the Timor Sea region, have a slightly larger mesh size of 50 x 75 mm. DEH considers that the potential benefits of larger mesh sizes should be examined as a means of minimising impacts on bycatch (including undersized target species) and protected species in the NDSMF.

No indicator species or species-groups are being monitored to measure the impact of the NDSMF on bycatch species. This situation is unlikely to change until the measures proposed in Recommendation 10 are implemented and prospective indicator species are identified. DEH suggests that DFWA further consider and implement appropriate management strategies such as spatial management or gear modifications in response to any adverse trends arising from the recommended bycatch monitoring mechanisms.

Conclusion

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

Recommendations have been developed and commitments made by DFWA to ensure that the risk of unacceptable impact on bycatch species is detected and minimised in the longer term.

Protected species and threatened ecological community protection

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

As with general bycatch species, no system is currently in place for the ongoing collection of information on NDSMF interactions with protected species. Available information on the extent of interactions is drawn from the 1998-99 catch composition survey in the NDSMF, anecdotal information and data on protected species interactions from nearby fisheries. The ESD report notes that the revised trip reporting arrangements being introduced in 2005 will include compulsory reporting of catch, release and mortality details of all protected species, with the details on protected species interactions reported in the annual review of the fishery. DFWA has also advised earlier in this report of its intention to conduct annual observer/research monitoring trips that will also gather data on bycatch species and protected species interactions.

DEH commends this ongoing monitoring and review approach to protected species interactions and suggests that its implementation be given priority in the fishery. DEH also notes that one of the biggest barriers to effective reporting of bycatch and protected species interactions is fishers' capacity to identify the species involved. In addition, many fishers may not be aware of the importance of this reporting. Both of these barriers can be reduced through education programs and opportunistic advice from observers and researchers as appropriate.

Recommendation 11: *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 risk assessment outlined in the ESD report for the impacts on bycatch species also addressed key impacts on protected species. Seasnakes, sawfish, marine turtles, dugong, seabirds, crocodiles, whales, dolphins, potato cod and syngnathids are found in the region of the NDSMF. The risk assessment found that the protected species most vulnerable to the fishery were sea snakes and potato cod. The analysis concluded that there was a negligible risk to the breeding stock of both these species groups.

While there are no available estimates of local seasnake populations, the risk assessment noted anecdotal information on the fishery that suggested a minimal catch of seasnakes and those that were caught were released alive. The ESD report also noted that studies from prawn fisheries in the Gulf of Carpentaria noted the high survival rates of seasnakes caught by prawn trawling. The ESD report noted that potato cod, which are protected under WA legislation, are rarely caught in tropical demersal finfish fisheries in WA. As with seasnakes, the level of incidental capture is unknown but anecdotal information suggests catches are rare.

DEH acknowledges that the above outcomes from the risk assessment and the relatively benign fishing methods employed in the fishery justify DFWA's rating of risks for these and other protected species by the existing NDSMF operations as negligible. DFWA's commitment to compulsory reporting of protected species interactions will provide a sounder basis on which to monitor and assess the extent of risks to protected species.

There are no listed ecological communities in the fishery area.

Management response

Although there are currently no management responses specific to protected species interaction, DFWA notes that as more monitoring data becomes available, performance limits may need to be reviewed and appropriate changes to fishing practices made. The implementation of Recommendation 4 will address the absence of a clear management objective to minimise interactions with protected species.

DEH considers that protected species interactions mentioned in the submission would be constrained by the relatively small number of fishing days conducted annually, the very short soak times (up to 5 hours) for traps and the small number of operators compared with the area of the fishery.

Conclusion

DEH notes that interactions with protected species in this fishery appear to be minimal 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 the risk assessment process indicate otherwise, DEH expects that appropriate actions would be undertaken by DFWA to ensure the fishery avoids mortality and injury to these species and avoids or minimises impacts on threatened ecological communities.

Recommendations have been developed to ensure that the risk of unacceptable impacts 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

The ESD workshop and report has drawn on information on the size, nature and operational area of the NDSMF to identify potential threats and to assess risks posed to the ecosystem. The main sources of information are fishery dependent reports of catch, effort and location, observer surveys, descriptions of fishing gear, its use and the spatial and temporal nature of fishing operations over the 15 year history of the fishery. Descriptions of the biology, distribution and habitat associations of target species and studies of trophic interactions and of other fisheries operating in the region have also contributed to DFWA's assessment. While no research has been undertaken on the impact of fishing activities on ecologically related, associated or dependent species, DFWA recognises the benefits of assessing the trophic impacts of fisheries at the regional level. To assist with improving the understanding of the trophic implications of fishing, DFWA proposes to investigate fishing impacts on the structure of fish communities in the region over the last 40 years.

DEH is concerned at the lack of information collection and research covering the fisheries impact on the ecosystem and environment generally and welcomes DFWA's proposal to investigate trophic impacts. DEH notes that information is lacking across a range of Australian and international fisheries and until appropriate research techniques and programs are developed and implemented this will continue to be the case. DEH strongly supports research in this area.

Assessment

The NDSMF risk assessment concluded that the fishery was of low risk to the ecosystem from trophic interactions and movement of biological material from hull translocations and bait use, and negligible risk from impacts on benthos, ghost fishing, discarding/provisioning, air and water quality.

While no research has been undertaken on the effects of removing upper level predators such as the targeted scalefish species from the local food chain, most of the scalefish species taken by the fishery are generalist carnivores that are not known to have a keystone role in the ecosystem. Due to low and stable levels of catch in the fishery, the harvesting effect is considered to be minimal. DEH understands that the limited understanding of the ecosystem effects of fishing is not unique to this fishery and that the amount of information available on these aspects in any of the world's fisheries is scant. DEH welcomes DFWA's intention to address the broader trophic implications of fishing through the above mentioned research on changes in the structure of coastal fishing communities in the region. The limited number of vessels operating in the fishery reduces the risks of translocation of biological material on hulls and the conditions surrounding the use of pilchard bait are considered by DFWA to be unlikely to be condusive to the introduction of exotic diseases. DEH agrees that the risks of disease introduction and fouling by wastes are low given the scale and mode of the fishery's operations.

Similarly the gear used and small scale of fishing operations compared to the overall area of the fishery is likely to involve minimal disturbance to substrate and benthic communities. Fishers in the NDSMF observe minimal epibenthos attached to retrieved traps, mostly small amounts of sea fans, seawhips, soft corals and coralline algae. Fishers have indicated that gear loss is low. The limited trap soak and retrieval times reduce the risk of lost gear. Fishers can leave traps unattended for use in future fishing trips but the provisions for unattended traps to be unbaited and escape doors left open significantly reduces the risks of incidental mortality from ghost fishing. The amount of discarded material is considered to be extremely low, as catch is not processed on board, and the estimated level of discarded catch compared to the area of the fishery is extremely low. Most of the bycatch comprises triggerfish species that are expected to survive after discarding.

As fishing mostly takes place in depths over 30 metres, the only interaction with the water column is when fishing gear is lowered and retrieved. Therefore interaction on water column communities is likely to be minimal. Impacts on water quality through the discharge of plastic wastes and pollution from vessels are controlled under MARPOL legislation. Operators are required to comply with the legislation and must retain any plastic waste and dispose of it only when the vessel returns to port. The small number of commercial operators reduces the likelihood of any significant impact on water and air quality.

DEH considers that the dispersed nature of the fishery, the short duration of trap lifts, sustainable take of target species and the mode of fishing operations and gear all mitigate against significant interactions with the ecosystem and environment generally.

Management response

Management measures that restrict the number of boats, gear used, fishing effort and take of target species over a large fishery area all contribute to the assessed low impacts of this fishery on ecological communities, food chains and the physical environment. The low incidence of bait discarding and the current measures in place to maintain healthy fish stocks are important factors which mitigate against impacts on higher or lower trophic levels. The proposed investigation of changes to coastal fish community structure in the region can be expected to improve the understanding of the impacts of trapping and other fishing on the fish community and trophic interactions.

DFWA notes the small number of operators in this fishery have a high level of awareness of their obligations. DEH accepts that the risks to the physical environment posed by the equivalent of 5 to 7 full time vessels in a fishing area of 483,600 sq kilometres are negligible.

Taken together, these factors suggest that no further specific management measures are needed at this stage to ensure against damage to the general ecosystem. DEH is confident that the fishery will continue to be managed in a manner that aims to minimise ecosystem and broader environmental impacts. DEH

has previously recommended in this report the implementation of a management objective to minimise the impact of the fishery on the marine environment (see Recommendation 4). Proposed enhancements to observer programs and recording of bycatch and protected species interactions should provide further data to validate the risk assessment at the next review in 5 years. DFWA has committed to take appropriate management action if future studies indicate it is required.

Conclusion

DEH considers that the fishery is conducted in a sufficiently precautionary manner to minimise the impact of fishing operations on the ecosystem generally. Recommendations have been developed to improve the information base on which future assessments are based and to ensure that the risk of significant impacts by the fishery on the marine environment generally is minimised in the longer term.

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LIST OF ACRONYMS

CAESS	Catch and Effort Statistical System
DEH	Department of Environment and Heritage (formerly Environment Australia)
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*
IFRMC	Integrated Fisheries Management review Committee
MARPOL	International Convention on Marine Pollution
NAFMW	Northern Australian Fisheries Managers Workshop
NDSMF	Northern Demersal Scalefish Managed Fishery
NRIFS	National Recreational and Indigenous Fishing Survey
NT	Northern Territory
PTIMF	Pilbara Trawl Interim Managed Fishery
OCS	Offshore Constitutional Settlement
TAE	Total Allowable Effort
TSC	Total Sustainable Catch
VMS	Vessel Monitoring System
WA	Western Australia