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Department of the Environment and Heritage

Assessment of the

Southern and Eastern Scalefish and Shark 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's Guidelines for the Ecologically Sustainable Management of Fisheries. It forms part of the advice provided to the Minister for the Environment and Heritage on the fishery in relation to decisions under Parts 13 and 13A of the EPBC Act. 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 Southern and Eastern Scalefish and Shark Fishery

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Executive Summary

Background

The Southern and Eastern Scalefish and Shark Fishery (SESSF) is one of the major Commonwealth managed fisheries, landing over 35,000 tonnes annually and with a value of around $95 million. The SESSF is a complex multi species fishery that targets scalefish and shark stocks of various size, distribution and composition. Overall the SESSF covers nearly half the waters of the Australian Fishing Zone of mainland Australia and Tasmania, extending from 80 nautical miles off the coast near Fraser Island to Cape Leeuwin in Western Australia. The fishery operates in both Commonwealth and State waters under complex jurisdictional arrangements due to different Offshore Constitutional Settlements (OCS) with State Governments.

Attachment A provides an overview of the various sectors of the SESSF including gear types, areas, species targeted and management controls.

The SESSF is an amalgamation of 4 fisheries currently under separate management arrangements – the South East Trawl (SET), South East Non-Trawl (SENT), Southern Shark (SS) and Great Australian Bight Trawl (GABT) fisheries. The draft SESSF Management Plan, when approved, will create a single fishery under one overarching management regime with common goals and objectives, that will contain 3 sectors related to the former fisheries as follows:

- South East Trawl Sector – the former SET Fishery plus the former Victorian Inshore Trawl and the developmental East Coast Deepwater Zone near Lord Howe Island;
- Great Australian Bight Trawl Sector – the former GABT fishery; and
- Hook, Gillnet and Trap Sector – the former SENT and SS Fisheries.

The SET sector is by far the major component of SESSF, comprising 81% of the landed catch and 73% of the value of the SESSF. Of the remaining sectors, the hook, gillnet and trap sector comprises 12% of landed catch and 20% of value (mainly from the shark fishing component), while the GABT sector is a very small fishery comprising 7% of the landed catch and value of the SESSF. While the majority of active operators are in the SET sector, many are licensed to operate in more than one sector of the SESSF.

These sectors are determined by the types of gear used and areas fished. The fishery primarily targets around 18 scalefish and 4 shark species for commercial landings. These species are managed in all sectors, apart from the GABT sector, under Individual Transferable Quotas (ITQs) set under a Total Allowable Catch (TAC), that will be allocated as Statutory Fishing Rights (SFRs) under the SESSF Management Plan. The range of gears used, the overlapping sector areas and linked distributions of many species

in the fishery means that many quota species are caught at times as both target species and major byproduct across the various sectors of the fishery.

Catch records show that a high number of species are regularly landed across the various sectors of the SESSF, ranging from over 120 in the SET sector, over 90 in the hook, gillnet and trap sector and around 80 in the GABT sector. However, quota species comprise around 84% of the total commercial landed catch in the SESSF, with the majority of the remaining catch comprising non quota byproduct species such as arrow squid, oreos, alfonsino, ribbonfish, hapuka, king dory and black shark. Many species targeted by one method of fishing are also caught as byproduct by other fishing methods in other sectors.

While a wide range of species are landed across the SESSF sectors, a limited number of target species comprise the greater proportion of landed catch and value in each sector. These are:

- SET sector – blue grenadier, orange roughy, spotted warehou, flathead and ling comprise up to 75% of the landed catch;
- GABT sector – deepwater flathead, bight redfish and orange roughy comprise around 65% landed catch; and
- Hook, gillnet and trap sector – blue eye trevalla and ling comprise over 75% of scalefish landed catch while gummy shark comprise around 65% of the shark gillnet landed catch.

There is a comprehensive information collection system across all sectors of the SESSF through daily catch and effort logbooks and verified catch disposal records, supported by age and length sampling data. Data on catch composition and discarding levels has been limited in the past. Integrated Scientific Monitoring Programs (ISMP), supported by on board and on shore independent observers, have been established in all sectors apart from shark gillnetting (where independent fixed station surveys providing similar catch monitoring data are being implemented) to provide enhanced catch sampling data on target and non target species, including catch composition, size, length, weight, and discard rates. ISMP or equivalent catch monitoring programs have been in place in the SET sector for over 10 years but are only recent introductions over the last 2 years in the other sectors of the SESSF.

There is considerable variability in underlying productivity elements such as of maximum age, growth rate, age at maturity for species targeted in the SESSF, with several slow growing and long lived species being amongst the most highly targeted species (blue eye trevalla, orange roughy, blue grenadier, redfish, jackass morwong, ling, ocean perch, silver trevally, school shark, deepwater flathead). Basic ecology is similarly variable ranging from mid water predators to in-shore, mid-shelf and upper slope demersal species, with depth ranges from shallow sandflats down to 1500 metre seamounts and canyons. There are strong distributional correlations between several target species, particularly in the trawl sectors, so that a number of quota species such as

silver trevally, john dory and ocean perch are usually not directly targeted but mainly taken as byproduct.

Management focus in the SESSF is primarily through output controls in the form of quota management for most of the target species caught by the fishery. TACs are set for 20 species allocated through ITQs that are tradeable across sectors. In the GABT sector input controls in the form of strict limited entry, limiting vessel size to 40 metres for shelf fishing and gear limitations are used in place of quota management for the 3 primary target species. Apart from TACs there is a range of other output and input controls across the SESSF including limit entry; gear restrictions such as mesh size, net length, depth setting, hook limits, trap dimensions; bycatch and size limits for certain species; some localized closures.

There are structured annual stock assessment and TAC setting arrangements for quota and primary target species involving fishery assessment groups and management advisory committees with government, non government, scientific and industry representation, supported as required by TAC and research sub committees. As yet there is limited available information on the stock structure and productivity of most species to provide reliable estimates of sustainable yields and biomass levels, with only 4 quota species (orange roughy, blue grenadier, eastern gemfish and school shark) having current stock biological reference points based on biomass estimates. Most of the species are managed as single stocks under global TACs although there are indications of distinct stock structuring for several target species including blue eye trevalla, blue warehou, flathead, ling, jackass morwong, ocean perch, school whiting and redfish.

Stock assessment processes have improved in recent years with individual assessment groups established for highly fished or over exploited species such as orange roughy, blue grenadier, eastern gemfish, redfish and blue warehou and integrated stock assessment models established for 8 quota species (orange roughy, blue grenadier, eastern gemfish, redfish, blue warehou, spotted warehou, gummy shark and school shark) and preliminary assessment models for a further 5 quota or primary target species (ling, tiger flathead, school whiting, deep water flathead and bight redfish). However most assessments for quota and primary target species are primarily dependent on trends in catch rates, with most stock reference points based on maintaining catches above the lowest levels recorded in periods prior to 1994.

The Bureau of Rural Sciences (BRS) 2001 Fishery Status Report classifies 5 quota species in the SESSF as overfished (orange roughy, eastern gemfish, blue warehou, redfish and school shark) with a further 11 quota or primary target species having uncertain stock status.

The primary response mechanism available in the SESSF when performance criteria are triggered is to lower the TAC. AFMA has addressed past concerns on the TAC setting process and validity of associated stock indicators and management strategies through a working group from the existing South East Fishery Assessment Group (SEFAG) that has recommended the establishment of enhanced performance indicators, reference points,

management strategies and decision rules for determining TACs through harvest strategies for both quota and non quota species. The harvest strategies for most species should precipitate improvements in fishery independent monitoring, stock assessment and implementation of decision rules for setting precautionary TACs.

Apart from GABT primary target species, only very preliminary analysis has been conducted on non quota species with no formal assessments conducted or reliable reference points set. AFMA's formal ecological risk assessment process to be implemented in 2003 will identify the extent of susceptibility of non quota species to fishing impacts and give an impetus to assessing the status of higher risk non quota species.

Bycatch is a significant issue for the trawl sectors of the SESSF with discard rates of 35% and 37% respectively for the SET and GABT sectors. In comparison bycatch levels are relatively low in hook, gillnet and trap sector. Formal risk assessments are yet to be conducted for bycatch or byproduct species. AFMA is relying on the ecological risk assessment process to further assess the susceptibility of bycatch species. Priority has been given to shark species with preliminary risk assessments conducted on the impacts on minor shark and ray species by fishing in the shark gillnet sector. Further research is currently being undertaken to implement rapid assessment procedures for shark and ray byproduct and bycatch species across all sectors of the SESSF.

Bycatch action plans, due for review in 2003, exist for all sectors of the SESSF. There has been limited progress in developing and implementing bycatch mitigation measures as required by these plans, although some promising outcomes in reducing bycatch and undersize target species have been achieved in a pilot project in the SET sector testing larger trawl mesh size and different mesh configurations.

Protected species interactions in the SESSF include fur seals, sea lions, spiny pipefish, White's seahorse, great white shark, dolphins, killer whales and a range of seabirds. The most significant interactions are with Australian and New Zealand fur seals in the trawl sectors (up to 700 caught annually in the SET sector), great white sharks in the hook and gillnet sectors (around 73 caught annually) and pipefish by Danish seining in the SET sector (catch unconfirmed).

Further species caught in the SESSF are likely to be listed for protection under the EPBC Act in the near future, including Harrison's dogfish, Endeavour dogfish and Southern dogfish, while eastern gemfish is undergoing preliminary assessment for listing. AFMA has implemented trip limits on these 3 dogfish species to reduce current impacts. The likely increase in listed species in the SESSF, the data collection requirements associated with relevant recovery plans and the pending introduction of further management frameworks for species groups such as the National Plan of Action for Sharks places an increasing importance on the Department of the Environment and Heritage (DEH) and the Australian Fisheries Management Authority (AFMA) implementing improved reporting arrangements for interactions with protected species in the SESSF.

While AFMA's submission states that the merging of the previously separate sectors into one fishery under a consolidated management plan will facilitate an ecosystem based management approach, there is limited information available on the impacts of the fishery on the broader ecosystem. The most significant impacts are from demersal trawling on the benthic environment, with the other forms of fishing being more targeted and having more localized impacts. A range of research including habitat and fishing effort mapping and studies of trophic dynamics has been conducted and the outcomes are expected to feed into the harvest strategy and ecological risk assessment processes. The pending South East Regional Marine Plan (SERMP) will provide for a range of management measures consistent with a broader ecosystem management approach and management that takes account of the particular bioregion values across the various sectors of the fishery.

Overall Assessment

The size and complexity of the SESSF as a multi species, multi gear, multi sector and multi jurisdictional fishery presents substantial challenges to implement effective ecologically sustainable management changes in the short term. DEH has focussed its assessment on areas where more fundamental changes are required in the management approach to provide a basis for improved ecological sustainability in the coming years.

DEH considers the key issues for the SESSF are the number of highly exploited commercial stocks, uncertainty of stock structure and status for most species, over reliance on ITQ management at the expense of input controls, limited management of non quota species in the face of expanding fishing effort, high discard rates, impacts on benthic habitats and interactions with some protected species (seals, great white sharks and syngnathids).

The documentation provided by AFMA, including the draft SESSF management plan, indicates a sound management structure for each of the sectors in terms of collection and analysis of fishery dependent data. The draft SESSF management plan along with recent management initiatives also provides for a range of enhancements in sustainable management measures, including development of harvest strategies, structured programs to monitor fishing impacts on target species, bycatch, ecologically related species and the marine environment and a plan to strategically address high risks identified from the ecological risk assessment process.

DEH commends the commitment under the SESSF management plan to develop harvest strategies for all quota species. The development of harvest strategies will be a considerable undertaking given the wide range of quota and non quota species regularly taken in the SESSF and the absence of comprehensive biological data for many species. Given the wide range of non quota species caught by the fishery and minimal management controls currently in place for most non quota species, DEH considers the harvest strategy process needs to be extended to non quota species. AFMA has invested considerable effort and resources into the development of a highly structured and comprehensive ecological risk assessment process to be implemented in 2003 in the SESSF to determine the level of susceptibility of species to impacts of fishing in the

SESSF and the ability of populations to recover from fishing impacts. DEH considers this is a very positive step to improve the sustainable management of both quota and non quota species and would be further enhanced if linked to management responses that address existing high impacts areas such as localised depletions, low productivity species and cumulative gear impacts.

DEH considers that the ecological risk assessment process should also be used as the trigger to target appropriate management measures for non quota species identified as high risk by this process. DEH considers that initially precautionary management controls should be in place for identified high risk non quota species, with harvest strategies required for any subsequent increases in catches of these species.

There is an acknowledged need to obtain more comprehensive data under structured monitoring arrangements to establish effective harvest strategies and fully assess the risks from fishing activities. DEH therefore recommends a commitment to defining a structured process to monitoring in the fishery that will address priority issues such as the extent of discarding, interactions with protected species, fishery independent data requirements necessary for developing effective harvest strategies, and appropriate observer coverage to ensure statistically robust and verified data is provided for harvest strategies and management measures are effectively validated.

In keeping with the more comprehensive harvest strategies approach, suitable reference points and TACs need to be applied to enable stocks to be maintained above biological limits to prevent the need for more extreme recovery measures being applied to a growing list of species in the SESSF. Where stocks are below reference points there needs to be an explicit requirement to implement recovery strategies and rebuild stocks above reference points. The move towards ecosystem based management also requires greater account in the TAC setting process for distinct spatial parameters of stocks and the ecological implications of harvesting the TAC on associated species that may be susceptible to particular gear types. DEH considers these to be key issues for ecologically sustainable fishing and recommends amendments to include explicit provisions addressing these issues in the draft SESSF management plan.

The existing reliance on quota management as the primary means of controlling impacts of fishing on the SESSF environment does not appear appropriate if AFMA's stated aim of a more ecosystem based management approach under the combined SESSF management plan is to be achieved. DEH considers that a structured system of spatial management is essential if ecologically sustainable management is to be effectively implemented in a fishery the size and scope of the SESSF. Such a system needs to adequately protect representative parts of the environment from the effects of fishing, take account of the high risks identified from the ecological risk assessment process and ensure any currently unfished areas are adequately protected, and any expansion into these areas is managed in a structured and precautionary manner.

DEH recommends establishment of a comprehensive spatial management system that addresses the above components. As an essential first step, available catch and effort data

and research results from recent fishing effort and habitat mapping projects should be used to broadly identify those areas not previously fished and developing arrangements for ecologically sustainable harvesting before expanding fishing activity into these new areas.

The range of new management initiatives being introduced under the SESSF management plan, and as a result of recommendations made by this assessment, will necessarily entail a complementary elevation in compliance measures across the fishery. DEH recommends that priority is therefore given under the fishery's strategic compliance program to implementing a range of monitoring and validation measures, that may include further introduction of VMS, to ensure effective implementation of these new management arrangements.

The high levels of bycatch and discarding in the trawl sectors have been a concern for some time and are would appear unsustainable for some species. The initial Bycatch Action Plans (BAPs) and the draft SESSF management plan do not stipulate bycatch or discarding limits or reference points. DEH recommends reduction targets for discards be set, after consultation with relevant stakeholders, to promote the use of suitable management measures, such as spatial closures and gear modifications, to progressively reduce bycatch and discarded target species to more acceptable levels. Substantial reductions across the trawl sectors are necessary given the high impacts already being experienced from mixed species fishing on the shelf regions. Whilst not as significant an issue for the non trawl sector of the SESSF, further reductions in discards should be achievable in this sector to enhance protection for non targeted species.

Bycatch reduction is likely to be a continuing issue for the SESSF and as such bycatch limits, targets and reduction measures needs to be more explicitly mentioned in the context of BAP provisions in the draft SESSF management plan. DEH has suggested appropriate amending text to the draft plan.

While a range of bycatch mitigation measures to reduce discarding and bycatch have been trialed in the SESSF the management regime does not provide any conditions for the eventual uptake of mitigation measures. A requirement to introduce appropriate measures into the operation of the fishery after a suitable trial and development period of up to 3 years should be an immediate management condition in the SESSF as a means of giving priority to reducing future bycatch interactions.

In this regard priority needs to be given to the significant fur seal interactions in the SET sector, so that research and field trials conducted in recent years on mitigation measures, such as seal excluder devices, can be converted into firm management arrangements to reduce seal mortalities and interactions across the SESSF.

Interactions with protected species in the SESSF are unlikely to pose an immediate threat to the survival of existing populations. However interactions are not well quantified and a more strategic approach is required to the development of mitigation measures. The level of interactions with seals in the SET sector is quite significant, and the uncertainty of

impacts on pipefish is also of concern. Both these species groups require additional measures to enhance understanding and eventual avoidance of interactions. The ecological risk assessment process should assist with informing the development of more suitable mitigation measures for protected species, in particular reducing direct impacts on syngnathids and great white sharks and indirect impacts on seabirds.

Whilst threatened ecological communities are not currently listed in the SESSF their requirement for protection under the EPBC Act, and hence inclusion in the relevant BAPs, should be explicitly mentioned in the draft SESSF management plan.

DEH provides further information on issues such as the revised BAPS, research priorities and stock recovery strategies in the body of this report.

DEH also recommends that AFMA report annually to DEH on the progress made with implementing the actions recommended above and performance criteria in the SESSF management plan.

Conclusion

Part 10 of the EPBC Act requires that Commonwealth managed fisheries undergo strategic assessment to determine whether actions taken in the fishery have a significant impact on the environment in Commonwealth marine areas. Under this Part, the Minister may accredit a management plan to exempt actions taken in accordance with the management plan from further impact assessment approval. The submission provides a comprehensive account of the impact of the fishery on the marine environment. DEH is satisfied that there has been an adequate assessment of the current and likely impacts on the environment in a Commonwealth marine area of activities taken in accordance with the management plan.

DEH considers that actions taken in this fishery will not have an unacceptable or unsustainable impact on the environment in a Commonwealth marine area.

DEH also considers that actions taken in this fishery will not have an unacceptable or unsustainable impact on the environment in a Commonwealth marine area over the next three years while the recommendations below, proposed to improve the management of the fishery for ecological sustainability, are implemented.

DEH therefore recommends that the *Southern and Eastern Scalefish and Shark Fishery Management Plan 2003* be accredited for the purposes of making a declaration under section 33 of the EPBC Act in relation to actions affecting the environment in a Commonwealth marine area. If commitments made in the submission are not undertaken, or if further analysis shows there is an unsustainable impact in the long term, the Minister for the Environment and Heritage may revoke the declaration and accreditation of the plan under section 33 of the EPBC Act.

As the fishery operates in Commonwealth 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. AFMA's commitment to ecological risk assessment and harvest strategies, and agreement to implement recommendations for management controls on non quota species, including bycatch reduction levels, establishment of comprehensive spatial management arrangements, and specific recommendations on developing mitigation measures for protected species and other bycatch species, provides for a significant capacity to minimise future protected species interactions.

DEH considers that under these arrangements the various sectors of the fishery are unlikely to have an unacceptable impact on protected species, and that the plan requires that all reasonable steps are taken to avoid the killing or injuring of protected species. A declaration under Sections 208A, 222A, 245 and 265 of the EPBC Act is therefore considered appropriate. Such a declaration would serve to accredit the SESSF management plan and provide individual fishers, operating in the various sectors of the fishery in accordance with the plan, with an exemption from permit requirements if they are at risk of taking or injuring listed species in Commonwealth waters.

DEH is of the view 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.

The operation of the fishery is consistent with the objects of Part 13A of the EPBC Act. Given the management arrangements specified in the SESSF management plan, the development of more comprehensive management measures for target and non-target species, such as harvest strategies and ecological risk assessments and the work towards reducing levels of bycatch and increasing the protection for high risk non quota species, DEH is satisfied that the fishery will not be detrimental to the survival or conservation status of the taxon to which it relates in the short term. Similarly, it is not likely to threaten any relevant ecosystem in the short term.

The assessment recognizes the need to improve the ecologically sustainable management arrangements in the fishery across a range of key management areas to ensure that the risk of fishing impact is minimized in the longer term. The recommendations made to address these issues will lead to substantial enhancements to the existing management arrangements.

DEH therefore recommends that the fishery be declared an approved Wildlife Trade Operation (WTO) with the actions specified in the recommendations to be undertaken by AFMA to contain the environmental risks in the longer term.

Specifically, the WTO declaration would allow the export of product from the fishery under permits. This declaration would be effective for a period of three years. The WTO declaration will include in its conditions a requirement for annual reporting on the progress of implementing the recommendations of this report and other managerial

commitments to ensure adequate improvements are being made to the ecologically sustainable management of the fishery.

Recommendations

1. A report to be produced annually and presented to the DEH and to include a statement of the extent to which the performance criteria of the Southern and Eastern Scalefish and Shark Management Plan were met in the year; and information sufficient to allow assessment of the progress of AFMA in implementing the following recommendations 2 to 18 as stated below.

2. Section 7(1)(b) of the draft SESSF management plan be amended to:

"that data is collected, appropriately verified and analysed to enable:

(i) timely evaluation of the effectiveness of the management measures implemented to maintain the resources of the fishery at, or rebuild those resources to, an acceptable level; and

(ii) timely modification of those management measures"

3. AFMA will develop a single document within 2 years that describes the structured monitoring program required under Section 6(a) of the Management Plan. The program will address priority monitoring issues such as discarding rates, threatened and listed species interactions and appropriate levels of observer coverage and fishery independent studies in all sectors of the fishery.

4. Section 6(f) of the draft SESSF management plan be amended to:

"setting TACs, harvest strategies and reference points for non quota species"

5. AFMA to establish a schedule to develop and implement, within 3 years, harvest strategies, including decision rules and reference points, for quota species and high risk non quota species identified from the ecological risk assessment process. Harvest strategies will include:

- monitoring of landed catch;
- TACs or trigger ranges/levels of acceptable catch; and
- development of management responses when reference points or trigger ranges/levels are reached.

6**.** Within 3 years AFMA will identify and implement management responses to fishing impacts identified from the ecological risk assessment process, taking into account known fishing impacts on:

- vulnerable and/or overfished species;
- listed threatened species under the EPBC Act in the fishery;

- species with low productivity;
- key species in the food chain such as squid and jack mackerel;
- areas of localized depletion;
- cumulative gear impacts across the life cycles of species in the SESSF and adjoining fisheries;
- species with increasing levels, or significant potential for increased levels, of catch landings.

7. Sections 12c) and 16c) of the draft SESSF management plan be amended to:

"c) must take into account:

i all fishing mortality from all sectors within the fishery and overlapping or adjacent fisheries for the species; and

ii the ecological implications of harvesting the TAC; and

iii the distribution and population structure of the species."

8. Section 7(g) of the draft SESSF management plan be amended to:

"that stocks of quota species, and other species for which reference points have been determined, are above the reference points for the species"

9. Within two years, as an interim measure, AFMA will implement management actions to monitor the level of catches of those non quota species identified as high risk in the ecological risk assessment process and implement appropriate precautionary management controls to ensure harvest levels are ecologically sustainable**.** Harvest strategies for high risk non quota species must be developed before catches of those species may be increased.

10. AFMA will develop and implement within 3 years a system of spatial and temporal management to assist the fishery to be managed in an ecologically sustainable manner. The system of strategic closures will take account of impacts of fishing on:

- species and populations identified by the ecological risk assessment process as high risk;
- the recovery of overfished stocks;
- important spawning / pupping / juvenile / feeding /refuge grounds;
- benthic habitats and associated impacts on productivity of quota and non quota species;
- species vulnerable to particular methods of fishing such as deepwater dogfish;
- various stages of the life cycle of species eg ling, blue eye trevalla and sharks; and
- species and associated habitats taken as target species by other fisheries;
- species or habitats fished at particular depth ranges by particular gear types.

11. As an initial measure for the proposed system of spatial management, AFMA will, within two years, implement precautionary management for the development of new fishing grounds. AFMA will broadly identify, for each fishing sector and associated gear

types, those areas that have never been fished by those sectors and associated gear types prior to the end of 2002. Expansion of fishing activity to new areas for the particular sectors and gear type will be under structured and precautionary management arrangements to ensure ecologically sustainable harvesting.

12. AFMA will ensure that the strategic compliance program required under section 6(j) of the management plan identifies and implements appropriate tools to effectively monitor and validate compliance with all management measures, including spatial management, administered under the SESSF management plan.

13. AFMA will, in consultation with industry and other stakeholders:

- develop and implement management arrangements to significantly reduce the current total level of quota and non quota discards in the SESSF within 3 years; and
- within 12 months as part of the bycatch plan, determine reduction levels and baselines for future discarding in the fishery that are acceptable to Environment Australia.

14. Effective management requirements to use discard and other bycatch mitigation measures will be introduced at the conclusion of a trial and development period of up to three years. AFMA will monitor the extent of uptake of mitigation measures and introduce mandatory measures where voluntary uptake of measures is insufficient.

15. Section 7(1)(m) of the draft SESSF management plan be amended to:

"that, if the stock of a species is found to be below the reference point for the species, effective recovery strategies are implemented within 12 months to ensure that, to the extent that the deficit of the stock is attributable to factors related to the management of the fishery, the depleted stock is rebuilt above the reference point."

16. Section 8 of the draft SESSF management plan be amended to:

"(3A) For paragraph (3)(d), actions that must be required include, as appropriate:

a) defining and implementing appropriate bycatch limits; and
b) setting targets for bycatch reduction; and
c) implementing bycatch reduction measures within set time periods."

17. Section 8(4)(b)(iv) of the draft SESSF management plan be amended to:

"(4) In developing a bycatch action plan, AFMA must take into account:

(b) the requirements under the EPBC Act for the protection of :

(iii) listed threatened ecological communities."

18. AFMA, in consultation with industry, DEH, researchers and other stakeholders, to further assess and reduce the extent of interactions of seals, cetaceans and seabirds across all sectors of the SESSF, and interactions with syngnathids in the trawl sectors and white sharks in the gillnet and hook sector. AFMA will, for all the above species:

- within 12 months, establish robust data collection and reporting systems to quantify the extent of interactions; and
- within 3 years assess, trial and implement as appropriate mitigation or avoidance measures including further trials of bycatch exclusion devices and spatial or temporal closures.

For seals and sea lions, AFMA will, within 18 months, extend across the trawl sectors management measures assessed as effective to help reduce interactions with seals and sea lions.

For syngnathid and seabird species, AFMA will, within two years, assess under the ecological risk assessment process the risks of fishing activities in the SESSF to syngnathid and seabird species and develop appropriate management responses to the outcomes of the ecological risk assessment.

PART I - MANAGEMENT ARRANGEMENTS

The Southern and Eastern Scalefish and Shark Fishery (SESSF) is to be managed by the Australian Fisheries Management Authority (AFMA). The proposed SESSF is an amalgamation of four existing Commonwealth managed fisheries - South East Trawl Fishery (SETF), the South East Non-trawl Fishery (SENT), the Southern Shark Fishery (SSF) and the Great Australian Bight Trawl Fishery (GABTF), along with the former Victorian Inshore Trawl Fishery (VITF) and the East Coast Deepwater Zone (ECDWZ) around Lord Howe Island. The new fishery will comprise 3 separate sectors:

- South East Trawl (SET) sector – the former SETF plus the VITF and ECDWZ;
- Great Australian Bight Trawl (GAB) sector – the former GABTF;
- Hook, Gillnet and Trap sector – former SENT and SSF.

Management arrangements for the SESSF will come into effect once the draft SESSF management plan is approved and tabled in Parliament, expected to be in the first quarter of 2003. The respective sectors of the SESSF are currently managed under statutory management plans for the SET and GABT sectors (*Great Australian Bight Trawl Fishery Management Plan 1993* and *South East Trawl Fishery Management Plan 1998*) and a range of SFR conditions and permits. While the new SESSF management plan will provide an overarching management framework for all sectors of the SESSF, separate arrangements will continue for the ongoing management of the respective sectors of the fishery due to the different gear types and areas relevant to each sector.

In addition to the management plan, the key components of the management regime for the SESSF are:

- *Fisheries Management Act 1991* (FMA);
- *Fisheries Administration Act 1991;*
- *Fisheries Management Regulations;*
- AFMA Corporate Plan;
- AFMA 5 year Strategic Research Plan and strategic research plans for each sector of the SESSF (to be redeveloped under the new management plan);
- Bycatch Action Plans for each sector (under review);
- Compliance and monitoring strategies for each sector of the fishery;
- Directions, determinations and license conditions made under the management plan.

The FMA provides the general principles on the management of Commonwealth fisheries, including the objectives established for the management of individual fisheries such as the SESSF. The AFMA Corporate Plan and Strategic Research Plan provide the direction for the development and implementation of management strategies for Commonwealth fisheries, such as the setting of biological reference points.

The draft SESSF management plan will provide the overarching statutory management framework for all sectors of the new fishery. The draft plan includes objectives for the management of the fishery, primarily drawn from the objectives of the FMA Act, a wide range of measures to implement these objectives and performance criteria by which the effectiveness of the management arrangements are to be measured. The scope of the management objectives and measures is broad, reflecting the extensive area, high number of targeted species and wide range of fishing techniques and gears to be managed in the SESSF. The management plan contains provisions to address the controlled take of both commercial and non commercial species, minimization of the levels of bycatch, development of monitoring, risk assessment, stock assessment, stock recovery, communications and strategic research strategies and the protection of the broader marine environment. The plan also contains environmental obligations for individuals operating in the fishery. The management plan will be supported by a range of instruments including regulations, conditions on SFRs, management Directions and permit conditions.

DEH recognizes the need for flexibility in management arrangements, particularly with respect to adapting numerous changes under the new management plan across all the sectors of the SESSF. Many changes are expected to occur between now and the next review of the fishery, including changes to Bycatch Action Plans, research and monitoring plans and compliance strategies, which may be significant in terms of the outcomes of this assessment.

DEH therefore recommends that AFMA report annually to DEH and includes a statement on the extent the performance criteria in the SESSF were met in the year, along with information on any significant changes to management arrangements or other issues relevant to the fishery to allow assessment of the progress of AFMA in implementing the recommendations made on the SESSF from this assessment.

The scope of the SESSF, in area, range of gears used, number of operators and mixed range of species targeted, requires comprehensive consultation arrangements if effective outcomes to SESSF objectives are to be delivered. There is a sound range of consultative mechanisms in place across the SESSF sectors and a commitment to effective consultation with a variety of stakeholders.

The draft SESSF management plan and AFMA's assessment report for the SESSF has been developed through an extensive public consultation processes with industry, conservation and government stakeholders and the general public. Both documents have been available on the AFMA website since the commencement of the 30 day public comment period. The availability of the draft Plan was also advertised through newspapers, AFMA News and mail outs.

The primary consultative mechanisms in the SESSF are the Management Advisory Committees (MACs). MACs provide the opportunity for the two way flow of information between participants of the fishery and provide advice on the management of the fishery to the AFMA Board and Environment Committee. Summary outcomes of each MAC

meeting are published on the AFMA website. MACs exist for each sector of SESSF under existing separate fishery arrangements and specific MACs for each sector will continue to operate under the SESSF management regime. Membership on the MACs usually includes an independent chair, fishing industry members, environment/conservation member, scientific member and AFMA manager of the fishery, and permanent observers from State Government organisations and DEH. There is no representation by the recreational or indigenous sectors given the extremely low level of recreational or indigenous take across the sectors of the fishery.

Fishery Assessment Groups (FAGs) exist for each sector of the fishery to advise the MACs and the AFMA Board on the scientific basis for setting the Total Allowable Catches (TACs). The FAGs can include representatives from the fishing industry, AFMA, conservation groups, scientists and economists and allow for observers from State agencies and DEH and for independent experts to attend FAG meetings as required. The FAGs produce Fishery Assessment Reports annually on the status of the respective sectors of the fishery and individual species. These reports can be made available to the public.

An additional consultative group, South East Trawl Fishery Ecological Assessment Group (SETFEAG), comprising fishing industry, scientific, environmental group, AFMA, DEH and National Oceans Office representatives, has been formed to address the particular ecological impacts arising from trawling operations in the SESSF.

AFMA also conducts annual public meetings, workshops, port visits and distributes discussion papers and information circulars to promote discussion and understanding of the status and operations of the various sectors of the SESSF. The draft SESSF management plan includes provision for the development and implementation of a communication strategy involving regular reports on the status and management of the fishery to the fishery's stakeholders and the broader Australian community.

The large area covered by the SESSF, nearly half the waters of the Australian Fishing Zone of mainland Australia and Tasmania, extending from 80 nautical miles off the coast near Fraser Island to Cape Leeuwin in Western Australia, means that the fishery interacts with a high number of other Commonwealth or State managed fisheries. The following Commonwealth fisheries overlap the area of the SESSF:

- Bass Strait Central Zone Scallop Fishery;
- Small Pelagic Fishery (formerly Jack Mackerel Fishery);
- Southern Squid Jig Fishery;
- East Coast Tuna and Billfish Fishery;
- Southern Bluefin Tuna Fishery;
- Southern and Western Tuna and Billfish Fishery.

There are around 28 State managed fisheries in waters overlapping or adjacent to the various sectors of the SESSF, harvesting a range of scalefish, abalone, rock lobster, crab,

prawn, scallop and shark species. Many SESSF operators also hold licences in some of these fisheries.

The stock assessment process for all sectors of the SESSF accounts for removals in overlapping or adjoining fisheries of species managed by the SESSF. The management regime of the SESSF provides for bycatch limits for State managed scalefish, crustaceans and molluscs, along with catch limits on species such as marlin and swordfish targeted by overlapping fisheries. Similarly State organizations impose recreational fishing size and bag limits on a range of SESSF quota managed species.

State agencies participate as observers on most of the SESSF MACs and provide an ongoing exchange of information on cross jurisdictional management arrangements. Under the Offshore Constitutional Settlement some complex management arrangements have arisen affecting commercial species targeted in both the SESSF and in overlapping or adjoining fisheries, giving rise to variations in management controls such as size, trip and bycatch limits and gear restrictions between the SESSF and adjoining jurisdictions. DEH understands that the MACs in the various SESSF sectors have given consideration to addressing variations in management controls for overlapping target species, particularly for size and catch limits for some quota species. As the new SESSF management plan provides for enhanced cross sectoral management arrangements within the SESSF, DEH considers that further priority under the new management plan should be given to ensuring effective complementary management arrangements with overlapping and adjoining fisheries.

The harvest management focus for most sectors of the SESSF is primarily through managing major target and byproduct species under quota in the form of ITQs. The exception is the GABT sector that is managed by a range of input controls underpinned by very restricted vessel entry conditions. ITQs are allocated from an annual TAC set by the AFMA Board for each SFR holder permitted access to the various sectors of the fishery. SFRs provide an additional control by requiring an operator to hold both the appropriate boat SFR and quota SFR to fish for quota species. The ITQ system applies to 20 species across the various sectors of the fishery.

Other output controls in the fishery include carry over and under provisions, trip limits for some non quota species, size limits for some quota species. Input controls include limited vessel entry, boat and gear specific SFRs, and gear restrictions.

Comments received during the public consultation period and made in the 2000-2001 BRS Fishery Assessment Report suggested the SESSF had an over-reliance on output controls and required further input controls for a more precautionary approach to control ecological impacts from fishing across the various sectors. Further discussion on management controls is in Part 2 of this report.

Fishery dependent information is collected on a regular basis across the SESSF through compulsory daily commercial logbooks that record shot by shot catch and effort data, which is subsequently validated against catch disposal records. Trials of electronic log

books have recently commenced in the SET sector to improve the collection and transmission of catch data. Age and length sampling data is regularly collected through samples provided to a Central Ageing Facility. More comprehensive catch sampling is undertaken through an Integrated Scientific Monitoring Program (ISMP) conducted by observers on a sample of all trips for all fishing sectors apart from shark gillnetting to determine weight and size composition of retained and discarded catch.

Structured independent data collection programs are limited in the SESSF and the need for more fishery independent data to enhance stock assessments and reference levels applied across the fishery has been raised in stock assessment and management forums on the various sectors of the fishery. A fixed station survey program has recently commenced for shark gillnetting to provide fisheries independent abundance data on the main targeted shark species. Further discussion on information collection systems is in Part 2 of this report.

The SESSF is covered by a range of compliance arrangements coordinated by AFMA. The draft SESSF management plan includes a performance measure to implement and review a strategic compliance program for the fishery. AFMA develops compliance operational plans for each sector of the SESSF that are risk based and required to be reviewed on an annual basis. Compliance measures used across the SESSF include:

- Prior landing, pre-departure and change of area reports;
- Periodic port visits/inspections by fisheries officers;
- Education programs for operators to improve compliance with catch data recording requirements;
- Targeted vessel, fish receiver and processor inspections;
- Specific observer programs to verify catch data and monitor compliance with and effectiveness of new fishing arrangements (such as trials of auto-longlining in the hook, gillnet and trap sector and factory vessel deepwater trawling for blue grenadier in the SET sector);
- Targeted investigations and covert operations surveillance to verify catch and catch receipt;
- single jurisdiction trips and State waters trip limits;
- periodic aerial patrols and at sea inspections.

The compliance operational plans identify the introduction of integrated Vessel Monitoring Systems (VMS) as a key compliance response strategy. VMS is only mandatory for the deepwater fleet of the SET sector and the auto longline sector, although a number of vessels operating in the various sectors have voluntarily agreed to install VMS equipment (such as all vessels in the GABT sector) or have been required to fit VMS units due to operational requirements in other fisheries for which they are licensed. The various MACs across the SESSF sectors are giving further consideration to VMS introduction. With a range of new initiatives being introduced under the new SESSF management plan, DEH considers there will be a greater need for enhanced cross sectoral compliance measures such as use of VMS in most areas of the fishery.

The SESSF management plan is subject to review every 5 years by AFMA and the relevant MACs. The MACs are required to assess each year the extent that the performance criteria in the plan have been met and AFMA must include a statement to this effect in its annual report. DEH considers that the new plan contains a range of monitoring, stock and risk assessment, catch control and bycatch initiatives that are essential to enhancing the ecologically sustainable management of the SESSF.

The draft SESSF management plan includes an objective and performance measure requiring management of the SESSF to take account of Australia's obligations under international agreements. SESSF management is not directly linked to any international or regional management regimes. The interaction with some protected and migratory species in the SESSF requires domestic management arrangements to take account of Australia's obligations under international agreements such as the Food and Agricultural Organisation's International Plan of Action on Sharks, the *Convention on Migratory Species* and the *Convention on the International Trade in Endangered Species of Wild Fauna and Flora (CITES)*. As the fishery operates in Commonwealth waters, operators are required to comply with the International Convention on Marine Pollution (MARPOL). AFMA's assessment submission notes a range of MARPOL regulations covering oil pollution, waste management and disposal are required to be implemented in the SESSF. Compliance is considered by AFMA to be high with these regulations.

The SESSF is influenced by a range of domestic programs and policies involving the protection and recovery of a range of listed or protected species that occur in the area of the fishery. These include:

- Threat Abatement Plan for the Incidental Capture of Bycatch of Seabirds during Oceanic Longline Fishing Operations;
- Recovery Plan for Albatrosses and Giant Petrels;
- National Action Plan on Seals;
- National Action Plan on Australian Cetaceans;
- Recovery Plans for the Great White Shark and the Grey Nurse Shark;
- National Plan of Action for Sharks [under development].

The draft SESSF management plan explicitly provides for adherence to requirements under the EPBC Act for protection of whales and cetaceans and other listed marine, threatened or migratory species, and by implication to relevant threat abatement plans, recovery plans and other measures taken to protect species under the EPBC Act.

The World Heritage Area around Lord Howe Island is within the area of the SESSF fishery, however the SESSF fishing activities near the World Heritage Area have additional controls (such as a fishing exclusion zones around Lord Howe Island) and are unlikely to have significant impacts on the World Heritage values.

The draft SESSF management plan requires that AFMA develop and implement Bycatch Action Plans (BAPs) for the fishery. The BAPs are currently under review and DEH considers that the revised BAPs should include specific targets for bycatch reduction and

mitigation measures and actions to achieve them. Further discussion on the BAPs the fishery's capacity for assessing, monitoring and avoiding or mitigating adverse impacts on the wider marine ecosystem in which the fishery operates is in Part 2 Principle 2 of this report.

Recommendation

1. AFMA report annually to DEH and includes a statement on the extent the performance criteria in the SESSF were met in the year, along with information on any significant changes to management arrangements or other issues relevant to the fishery to allow assessment of the progress of AFMA in implementing the recommendations made on the SESSF from this assessment.

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 stocks 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

The current management regime and draft SESSF management plan provide for a comprehensive range of data to be collected across all sectors of the fishery, particularly for the 20 quota managed species.

The draft management plan includes direct provisions that relate to the collection and provision of information on the fishery such as:

- Developing a structured monitoring program on fishing impacts on targeted and bycatch species, ecologically related species and the marine environment;
- A plan to address high risks identified during ecological risk assessments;
- A communication strategy providing information on the status and management of the fishery;
- Development of a 5 year strategic research plan(s).

Fishery dependent data is the primary source of information for all sectors of the fishery. All sectors have compulsory daily scientific logbooks recording shot-by-shot catch and effort data for each species caught, with longer term logbook data sets in the SET and GABT sectors. Logbooks also provide for the collection of vessel and gear details and for data on catches or interactions with non-target, bycatch and protected species, although with the wide range of species caught across the sectors of the SESSF, non target species logbook data has not been comprehensive. Electronic logbooks are being trialed in the SET sector to improve real time reporting, with the expectation of extending these trials to the other SESSF sectors.

Logbook data is validated by catch disposal records that are completed at the end of each fishing trip for all sectors, providing weight of landed species that is verified by licensed fish receivers. Further catch validation is provided by requirements for advance reporting

of catch before arrival in port for all sectors, apart from the GABT, to enable random port sampling of landed catch by fisheries officers.

AFMA is currently examining options for the mandatory introduction of VMS across all sectors of the SESSF. This has the potential to further validate catch and effort data.

DEH considers that the ongoing verification measures are crucial to improving the quality of data collected across the SESSF and subsequently to enhancing stock assessment processes. **DEH therefore recommends that Section 7(1)(b) of the draft SESSF management plan be amended to:**

"that data is collected, appropriately verified and analysed to enable:

(i) timely evaluation of the effectiveness of the management measures implemented to maintain the resources of the fishery at, or rebuild those resources to, an acceptable level; and

(ii) timely modification of those management measures"

As many stocks of SESSF target species are also shared with adjoining fisheries, relevant catch estimates for quota species are obtained from other State fisheries for consideration in the stock assessment process. The 2000-2001 BRS Fishery Status Report has noted the need for improved timeliness and compatibility of some of this data with SESSF logbooks. Historical catch and biological data collected by State agencies prior to the introduction of standard SESSF scientific logbooks are also collated and used in the stock assessment process for quota species.

Information to support the stock assessment processes is collected through various means across the different sectors of the fishery. The Central Aging Facility managed by Marine and Freshwater Research Institute (MAFRI) provides key age composition data from samples of most target scalefish species in the SET, GABT and hook, gillnet and trap sectors. The GABT and shark gillnet operations also have port sampling and monitoring programs to collect age, sex and size data from targeted commercial scalefish and shark species.

Structured scientific monitoring programs to provide more detailed information for the stock assessment process, and to monitor the impacts of fishing on non quota species, are relatively recent initiatives in the SESSF. Integrated Scientific Monitoring Programs (ISMP), to provide statistically sound estimates on species caught, including size and age composition for both retained and discarded catches of quota and non quota species, have been operating for 10 years in the SET sector but have only been in operation on a trial basis since 2001 for the hook component of the hook, gillnet and trap sector and since 2000 for GABT sector. ISMP data is collected by independent observers on commercial vessels and in ports. ISMP coverage of annual fishing effort varies across the sectors, from 2-8% in the SET sector, to around 5% in the non-trawl sector and 8% in the GABT sector. AFMA considers that the current rates of ISMP sampling are adequate for stock assessment requirements for quota species.

DEH considers that further ISMP data will be crucial for improved stock assessment and management of non quota species to supplement past deficiencies with non-target species logbook data. AFMA acknowledge that the original focus and design of ISMP was to address the level of discarding and the stock assessment needs of target species in the SET sector. AFMA has made a commitment to continue ISMP programs and to shortly review the ISMP arrangements to obtain better data for non-target and protected species. ISMP are to be reviewed every 3 years under current contractual arrangements.

In place of an ISMP a fixed station survey program has operated in the shark gillnet sector since 1999 to obtain independent abundance data on the main targeted species of school and gummy shark along with data on discards, bycatch and protected species interactions. AFMA is currently examining arrangements to continue the program and expand on the initial 3 sampling sites. Since 1986, MAFRI has also undertaken the southern shark fishery monitoring project which collects similar information to the ISMP.

DEH notes that while a comprehensive system of fishery dependent information collection and validation has been established over the years in all sectors of the SESSF, fishery independent data is limited. Apart from the independent fixed station surveys to monitor shark populations caught in the gillnet sector, a systematic program of fishery independent abundance surveys to monitor population trends in species impacted by fishing has not been established. AFMA's assessment report and reports on stock assessments for the SESSF sectors have acknowledged the need for more independent data, such as an ongoing monitoring program to collect fishery independent data to provide better relative abundance estimates and develop more reliable indicators and reference points across the fishery.

Strategic research plans have previously been established by the fishery assessment groups for each sector of the SESSF help determine the data collection and research project priorities. AFMA has acknowledged that these are now out of date for most sectors and will need to be revised to accommodate the outcomes of this strategic assessment. Fishery Assessment Groups across the various sectors of the SESSF determine research priorities and an appropriate mix of fishery dependent and independent research. However it is not evident in the existing management arrangements how priorities for fishery independent monitoring or research are determined.

The assessment report notes a range of research projects that have examined biological and geographical characteristics of certain species, plus some abundance surveys for both targeted and non targeted species in parts of the SET sector.

DEH considers that on board independent observers to collect and validate a wide range of scientific data (for both retained and discarded species) and monitor changes in fishing practices will be an increasingly important factor across all sectors of the SESSF. Adequate observer coverage will be an essential factor in enhancing ISMP data to improve the stock assessment process for both quota and non quota species. The existing management regime does not provide specific commitments to the levels of observer

coverage in the SESSF, nor does it identify a mechanism for apportioning observer coverage across the various SESSF sectors.

The commitment in the draft SESSF management plan for a structured program approach to monitor fishing impacts on target species, bycatch, ecologically relate species and the marine environment provides the basis for improving assessment and management of fishing impacts across the SESSF. DEH notes that the priorities for such monitoring programs have not been defined in the management regime. DEH considers that current deficiencies with fishery independent data and data on protected species interactions should be key elements in future monitoring programs, along with close monitoring of the levels of discarding across the SESSF to improve assessment of non quota species impacts. An assessment of and commitment to adequate observer coverage levels to obtain and verify the necessary discard, protected species and independent survey data from the structured monitoring program will also be essential under the new cross-sectoral management regime for the SESSF. DEH considers that a strategic statement on what the structured monitoring program constitutes and how it will be delivered should be developed in consultation with SESSF stakeholders

DEH therefore recommends that AFMA develop within 2 years a single document that describes the structured monitoring program under Section 6(a) of the SESSF management plan, that will address priority monitoring issues such as discarding rates, threatened and listed species interactions and appropriate levels of observer coverage in all sectors of the fishery and fishery independent studies in all sectors of the fishery.

Assessment

Management arrangements across the sectors of the SESSF provide for a structured stock assessment and TAC setting process for quota and primary target non quota species. Logbook data, ISMP and fixed station survey data, catch sampling data such as age and length composition and research data are used in assessments along with stock assessment models that are at varying stages of development for the different quota and primary target species.

Fishery Assessment Groups (FAGs) review the status of all quota and primary target non quota species in all sectors of the SESSF and results are available annually in fisheries assessment reports, including an analysis of previous and current stock assessments.

Analysis of trends in stock status, stock assessment outcomes and environmental issues for all sectors of the SESSF are also addressed by the BRS Fishery Status Reports for Commonwealth managed fisheries, the latest published for the 2000-2001 fishing seasons.

AFMA also reports in its annual report on achievements against the respective performance criteria in fishery management plans, including a criterion that SESSF maintains biological resources above reference points. More detailed scalefish

assessments are undertaken in the SET sector by individual species advisory groups for orange roughy, eastern gemfish, blue warehou, redfish and blue grenadier to provide more comprehensive stock assessment reports as these key quota species have been subject to over exploitation or are currently significant commercial target species.

Formal stock assessments are conducted by the FAGs on a periodic basis when suitable data is available. Improving the reliability of stock assessments is a significant issue for all sectors of the SESSF. Stock assessment processes in the sectors of the SESSF primarily rely on available time series data on catch and effort trends, trends in age and size composition and background biological data.

Species that are considered to have a comprehensive stock assessment process – comprising a fully developed integrated stock assessment model that includes stock biomass estimates from independent surveys, long time series of catch and age composition data and external peer review of assessments – are currently restricted to 3 quota species in the SET sector (blue grenadier, orange roughy and eastern gemfish) and one quota species (school shark) in the hook, gillnet and trap sector.

Preliminary integrated assessment models with less extensive time series and biological data have been developed for 6 other quota species in the SET sector (blue warehou, spotted warehou, ling, flathead, school whiting, redfish), for gummy shark, the primary target quota species in the hook, gillnet and trap sector, and for bight redfish and deepwater flathead, the primary target (non quota) species in the GABT sector. Formal quantitative stock assessments have been conducted in recent years on all of these species, using the stock models with other available information on stock structure, spatial variability, gear use and fishing patterns to improve estimates of abundance.

For the remaining 10 SESSF quota species, quantitative stock assessments are yet to be developed and assessments are primarily reliant on trends in catch rates and limited size and age frequency data. The uncertainty with stock abundance levels and stock assessment processes is reflected in the use of stock status indicators in the SESSF. Only the 4 quota species (orange roughy, eastern gemfish, blue grenadier and schoolshark) with fully developed integrated stock assessment models have an established biomass indicator of stock status. The remaining quota and target species are reliant on catch rate indicators as proxies for trends in biomass and recruitment, with the predominate criterion that catch rates do not fall below an historical level (in most cases the lowest level between 1986 and 1994).

The 2000-2001 BRS Fishery Status Reports highlights the uncertainty in sustainable yields and recruitment of most SESSF species. Four quota species caught primarily in the SET sector (orange roughy, blue warehou, redfish and eastern gemfish) and one primarily from the hook, gillnet and trap sector (school shark) are classified as overfished. A further 8 quota species primarily caught from the SET sector (ling, silver trevally, school whiting, western gemfish, John dory, mirror dory, spotted warehou, royal red prawns), blue eye trevalla from the hook, gillnet and trap sector and all 3 primary target species (deepwater flathead, bight redfish and orange roughy) from the GABT sector, are

classified as having uncertain stock status. Of the remaining quota species, 4 in the SET sector (jackass morwong, blue grenadier, ocean perch and flathead) and gummy shark in the hook, gillnet and trap sector, were fully fished, while insufficient information was available to classify saw sharks and elephant fish, the two most recent quota species in the hook, gillnet and line sector. The BRS report also noted that 9 species across the SESSF were below their catch rate criterion, indicating some concerns with declining long term sustainable yields of these species if the downward trend in catch rates continue.

There is a further degree of uncertainty with the stock structure and spatial distribution for many species in the SESSF. While tagging and genetic studies indicate that most species do not have distinct genetic stocks within the fishery, there is evidence of spatial structuring for many species within the SESSF boundaries. Targeted studies of stock structure have been conducted for only 5 quota species in the SET and hook sectors (gemfish, blue grenadier, whiting, blue eye trevalla and orange roughy) with the stock structures largely uncertain for most quota species despite a range of past tagging and genetic studies. Stock structures are uncertain for the 3 targeted commercial species in the GABT sector, although there are indications from spawning aggregations of a separate GAB orange roughy stock to those managed under quota in the SET sector. The spatial structures of gummy shark and school shark in the shark gillnet are also uncertain, although improvements in the stock assessment processes have been achieved in recent years by incorporating movement dynamics and allowance for separate sub populations in the assessments.

In addition to stock structuring, there are other factors that influence the distribution of species across the SESSF at various times. Temporal variability is evident for a number of species such as orange roughy, blue grenadier and eastern gemfish that form spawning aggregations in the SET sector. There is also evidence from catch records of an inverse relationship between catches of some quota species such as flathead and school whiting in the SET sector and deepwater flathead and bight redfish in the GABT sector. While consideration of these factors can occur in the stock assessment processes there are limited management responses in the management regime that directly address these stock variations.

Management focus has been on establishing global TACs across SESSF sectors and single jurisdictional management arrangements for stocks that extend into State waters, with only eastern gemfish and orange roughy having separate management zones with corresponding zonal TACs. There are indications from past research and stock assessments of distinct stock structuring across areas of the SESSF for a number of other quota species including ocean perch, ling, jackass morwong, flathead, blue warehou, school whiting, blue eye trevalla, gummy shark and redfish.

The complexity of the SESSF and high number of species taken across the fishery provides a challenge in accurately determining removals for the stock assessment and TAC setting processes. Daily scientific logbooks and supporting catch disposal records provide a sound basis for the collection of information on commercial catches and

independent verification of catch by licenced fish receivers. AFMA oversees a structured compliance and audit process through a compliance and monitoring strategy for the SESSF that, amongst other things, contains measures to ensure adherence to allocated quotas. More comprehensive data on catch composition and levels of bycatch and discarding is obtained through the ISMP in the SET, GABT and hook sectors and fixed station surveys in the shark gillnet sector.

Discarding of quota and non quota species is a major issue for the SESSF, particularly in the SET and GABT sectors, and has been highlighted in assessment reports from the relevant FAGs and in the BRS Fishery Status Reports. Discards of all species are recorded across the SESSF sectors by ISMP and shark fixed station surveys and taken into account in the stock assessment processes. Recent ISMP data in AFMA's submission for the SET and GABT sectors indicates around 35% of total catch discarding, compared with less than 10% for dropline, demersal longline and trap fishing, around 19% for scalefish gillnetting and between 26 to 28% for shark gillnetting. A higher proportion of discarded species are released alive by gillnetting and line fishing.

While initial ISMP data indicates that discarding in the GABT sector mainly constitutes non commercial species, discarding of targeted commercial species is a significant issue for some areas of the SET sector. Quota species generally comprise less than 5% of total catch discards in the SET sector but the high variability in discard rates for some species has resulted at times in discarding in excess of 30% of the catch of quota species such as blue warehou, ocean perch, redfish, flathead, mirror dory and eastern gemfish, largely as unwanted juvenile and undersize bycatch caught while targeting other species. With the uncertain stock status of many of these species DEH has concerns that the fishing pressure associated with these continuing high discarding rates could have adverse impacts on the ongoing productivity and sustainable yield levels of these species.

The draft SESSF management plan provides for estimates of the level of discards to be considered in fishery assessment reports. DEH has already highlighted the need for discard rates to be given priority when implementing the provisions in the management plan for structured monitoring programs.

AFMA note that estimates of removals from State fisheries and from recreational and indigenous catches are considered in the stock assessment and TAC setting processes. There are State representatives on the various SESSF sector MACs to assist with the cross flow of management information such as catch estimates. The assessment report provides little insight into the level of recreational and indigenous catch of commercial species caught in the SESSF apart from assuming these are low. Recreational fishing is managed by State agencies with State minimum size and bag limits applying to many SESSF quota species caught by recreational fishers. The assessment report notes that flathead is the main quota species targeted by recreational fishers, whilst other species such as silver trevally and some shark species are known to be targeted by recreational and charter fishing.

AFMA is relying on the outcomes of the recently commissioned National Recreational and Indigenous Fishing Survey under the Fisheries Action Program to further verify recreational catch incorporated into stock assessments. Given the uncertain stock status of many quota species and the importance of considering all removals from the fishery in the stock assessment process, DEH considers that AFMA should closely monitor the level of recreational removals from the SESSF, particularly for species with overfished or uncertain stock status.

The above uncertainties with the assessment process, spatial structure, discard rates and status of many stocks of species within the SESSF indicate a clear need for more comprehensive harvest management arrangements to provide more certainty in the TAC setting process. The absence of decision rules to direct the TAC setting process and management responses when reference points are reached has also been noted in past assessments of the various sectors of the fishery by FAGs and BRS. DEH considers that priority should be given to the development and implementation of harvest strategies in the SESSF for all quota and key non quota species, and that decision rules to support more reliable stock reference points should be an essential component developed under these harvest strategies.

The draft SESSF management plan provides for harvest strategies to be determined for quota species but not for non quota species. There is a range of non quota species such as deepwater sharks that are highly susceptible to the impacts of fishing in the region. Additionally there is scope to enhance the harvest arrangements of a range of key byproduct species across the SESSF sectors such as arrow squid, jack mackerel, oreos, ribbonfish, alfonsino and hapuka that are caught and retained in significant quantities. In particular DEH notes that no reference points have been set to monitor impacts of removal of key prey species in the SESSF despite the continued high catch of known prey species such as arrow squid and a growing interest in developing further markets for midwater trawled species such as mackerels**.**

DEH recommends that section 6(f) of the draft SESSF management plan be amended to:
“setting TACs, harvest strategies and reference points for non quota species”

AFMA has taken initial steps by establishing a harvest strategies working group under the existing South East Fisheries Assessment Group (SEFAG). The working group has also recommended that harvest strategies for the SESSF include monitoring strategies, stock assessment modeling and decision rules, with an initial focus given to suitable assessment strategies for the wide range of species currently without quantitative stock assessment models.

DEH supports this approach and recommends that a structured process is implemented to ensure that harvest strategies are brought into effect at the earliest available opportunity. While DEH acknowledges that the development of reliable harvest strategies will require considerable data collection and analysis and consultation with SESSF stakeholders, a firm commitment needs to be made to address the current range of assessment limitations

for quota species. Similarly key non quota species, such as those mentioned above, are significant byproduct species in the SESSF yet limited systematic data collection and stock assessment has been conducted for these and other non quota species and little is known about their age and size composition, stock structure and spatial distribution or impacts of their removal.

DEH therefore recommends that AFMA establish a schedule to develop and implement, within 3 years, harvest strategies, including decision rules and reference points, for quota species and high risk non quota species identified from the ecological risk assessment process. Harvest strategies will include:

- **Monitoring of landed catch;**
- **TACs or trigger ranges/levels of acceptable catch; and**
- **Development of management responses when reference points or trigger ranges/levels are reached.**

The SEFAG harvest strategies working group has noted the need to consider a range of biological and population dynamics factors in developing harvest strategies and associated reference points, such as accommodating separate spatial stocks in subsequent stock models, allowing for ecological interrelationship in the catch of certain species and taking account of trophic roles for key species in the food chain such as squid and mackerels and low productivity of long lived and low reproducing species such as orange roughy and several shark species. DEH supports further investigation of these issues in the development of harvest strategies.

AFMA has initiated and funded the Ecological Risk Assessment (ERA) process currently being developed for all Commonwealth fisheries by CSIRO, BRS and MAFRI. This is due for implementation in the SESSF in 2003. The ERA is expected to provide quantitative risk assessments of the impacts on target, byproduct and bycatch species along with the broader ecological impacts across the fishery. This is a major commitment for all Commonwealth fisheries and will provide the basis for targeting management actions, research and monitoring needs to the areas of highest risk in the SESSF.. The draft SESSF management plan supports the implementation of this process by providing for the development of a plan to strategically address the high risks in the SESSF identified by this risk assessment process. DEH considers that as with harvest strategies there should also be an explicit commitment to identifying and implementing appropriate management responses as part of this process. This will be particularly important for a number of non quota species that may be identified as high risk in the ecological risk assessment process but not necessarily warrant harvest strategies in the short term. In developing these responses AFMA needs to take account of a range of known fishing impacts in the SESSF that could have implications for effectively managing high risk species.

DEH therefore recommends that within 3 years AFMA will identify and implement management responses to fishing impacts identified from the ecological risk assessment process, taking into account known fishing impacts on;

- **Vulnerable and/or overfished species;**
- **Listed threatened species under the EPBC Act in the fishery;**
- **Species with low productivity;**
- **Key species in the food chain such as squid and jack mackerel;**
- **Areas of localized depletion;**
- **Cumulative gear impacts across the life cycles of species in the SESSF and adjoining fisheries;**
- **Species with increasing levels, or significant potential for increased levels, of catch landings.**

Management response

There are stock reference points or performance criteria to estimate stock trends in the SESSF for all quota species and primary target non quota species in the GABT sector. For the remaining non quota species, preliminary reference points have been set for 5 shark or deepwater species following preliminary risk assessments to identify species vulnerable to over exploitation of non-target species in the hook, gillnet and trap sector. The impending ecological risk assessment is expected to precipitate the establishment of further reference points for high risk non quota species.

As previously discussed, biological reference points currently are in place for only 4 quota species in the SESSF – blue grenadier, orange roughy and eastern gemfish in the SET sector and school shark in the hook, gillnet and trap sector. Of these only blue grenadier has established target and limit reference points with the target of maintaining spawning biomass above 40% of pre-exploitation period levels (average between 1979-1988) and not falling below the limit of 20%. Recent stock assessments indicate that the TAC levels for blue grenadier are likely to maintain stock above target levels. In contrast the reference points for orange roughy, eastern gemfish and school shark set only biological limits for recovery of these overfished species, and serve more as stock rebuilding reference points. Currently all 3 species are below their limit reference points. Discussion of stock recovery strategies for these species is provided under Principle 1, Objective 2 of this report.

In the absence of appropriate biological data, all other reference points for SESSF species are trigger points based on catch rate criteria of maintaining catch above the lowest catch rate during a specified period (as previously noted, usually lowest level of standardized reference period between 1986 and 1994). Triggering of these criteria requires review action but not defined management responses. In the absence of defined decision rules the response strategies for most species below reference points or triggering catch rate criteria is a review of the TAC.

Given the emphasis on quota management in the SESSF, the primary stock recovery measure for stocks below reference points has been to revise the TACs. As discussed above, with the development of harvest strategies and reference points, DEH considers

that the TACs should not only account for the removals of individual species across all sectors of the SESSF and other fisheries impacting on those species, but take account of each species particular biological characteristics and ecological roles. This would include the separate spatial structures and distinct populations for certain species, the ecological inter-relationships that have bycatch implications when targeting certain species, the productivity levels of long lived and slow growing species and the key roles of certain species in the food chain.

DEH therefore recommends that sections 12c) and 16c) of the draft SESSF management plan be amended to:

"c) must take into account:

- **i all fishing mortality from all sectors within the fishery and overlapping or adjacent fisheries for the species; and**
- **ii the ecological implications of harvesting the TAC; and**
- **iii the distribution and population structure of the species."**

Harvest strategies and associated decision rules when implemented, should also provide a more definitive process for setting TACs. The SEFAG harvest strategies working group has suggested that, as an interim measures while harvest strategies are under development, a "decision framework" that addresses a suite of indicators be developed to justify the eventual TAC determined. DEH supports this approach and considers it should be adapted for future TAC setting arrangements.

The development, under harvest strategies, of more reliable stock reference points and decision rules linked to management responses are expected to address more comprehensive stock management arrangements. AFMA also intends to use the outcomes of a current CSIRO research project on best practice reference points (applicable to all Commonwealth managed fisheries) and the FRDC 98/102 project "Defining robust harvest strategies, performance indicators and monitoring strategies for the South East Fishery" to help implement comprehensive reference points and harvest strategies across all sectors of the SESSF.

The SEFAG harvest strategies working group and AFMA's chief scientist have noted the need to manage stocks well above biomass limit levels and preferably at or above biological target levels. DEH agrees with this approach and considers that harvest strategies should aim to develop target and limit reference points where possible and establish management responses to maintain stocks at or above the more precautionary target levels.

The draft SESSF management plan provides for the setting of ecologically sustainable reference points for all quota species, and for non quota species as required. The current stock reference levels for almost all species in the SESSF are managed with a single stock reference indicator which equates mostly to the biological limit of sustainability.

DEH considers that until harvest strategies and specified target reference points are developed that stocks should at least be managed above reference levels set to reduce the possibility of stock collapse and other undesirable ecological effects.

DEH therefore recommends that section 7(g) of the draft SESSF management plan be amended to "that stocks of quota species, and other species for which reference points have been determined, are above the reference points for the species"

As a multi-species and multi-gear fishery a range of management measures are needed across the SESSF sectors to help monitor and control the level of catches in the fishery. While the assessment report identifies a range of both input and output controls that contribute to controlling the level of take, there is a predominate reliance on TACs, implemented through an ITQ system, as the management strategy to control not only the take of quota species but also of other species across the fishery.

The combination of input and output controls that apply in each sector of the fishery include:

> SET sector – input controls of minimum mesh size restrictions for demersal trawlers, Danish seiners and prawn trawlers, entry limited to 118 concessions, some area closures. Output controls of ITQs on 17 scalefish and 4 shark species, some size limits, trigger TAC and incidental catch trip limits for quota and non quota species in East Coast Deepwater Zone, trip limits for some deepwater dogfish and some State managed species;
>
> GABT sector –primarily input controls for 3 target species (bight redfish, deepwater flathead, orange roughy), comprising limited entry of 10 vessels, similar minimum mesh size restrictions for SET demersal trawl, boat length limit of 40 metres for vessels operating inside the 400 metre isobath. Output controls restricted to preventing targeting of shark byproduct with ITQs for 4 shark species (gummy shark, school shark, saw shark and elephant fish) that are targeted in other SESSF sectors, trip limits for some State managed species;
>
> Hook, gillnet and trap sector – input controls of limited entry of 89 gillnet SFRs, 135 hook SFRs, 5 trap permits and limits on permits for state coastal waters, gillnet length restrictions of 4200 metres, 15-16.5 cm mesh size and 20 mesh depth setting, limit of 100 traps and restriction on trap dimensions, limit of 15,000 hooks for auto longlining and operations restricted to waters deeper than 183m, inshore area closures . Output controls of ITQs for same range of species as SET sector, some size limits, trip limits for some State managed species.

All sectors are continuing to discuss ways to improve on the management arrangements in place in their sector and the new fishery overall. For example, GABMAC is currently examining compatible management controls for the range of scalefish species caught in the GABT sector that are managed under quota in the other SESSF sectors. A trigger TAC of 200 tonnes for one of the GABT primary target species, orange roughy, has been

established for the eastern areas of the GABT sector to be more compatible with the quota management arrangements in the neighbouring orange roughy western zone of the SET sector. Further consideration is being given to implementing TACs or ITQs for orange roughy fishing for the entire GABT sector.

The above output and input controls also apply directly to a substantial proportion of byproduct species taken across the SESSF. AFMA's assessment report states that a number of quota species in the SESSF, such as silver trevally, ocean perch, John dory and school shark, are primarily taken as byproduct while several other quota species, such as redfish, mirror dory and gummy shark, are taken as both target and byproduct species. Quota species controls, such as TACs, logbook and catch disposal record monitoring and stock assessments, are in place to manage the levels of quota species taken as byproduct. The management regime does not provide for a list of permitted byproduct species so all landed catch can potentially be retained as byproduct if markets can be found. AFMA states that it is only economical to operate in the SESSF by targeting quota species (or the 3 primary target non quota species in GABT) and therefore considers the quota species controls to provide an effective limit on extent of non quota byproduct taken in the fishery.

The byproduct composition and associated management measures across the various sectors are as follows.

SET sector:

- around half of the SESSF quota species being taken at times as byproduct;
- over 100 non quota species are landed;
- non-quota species represent ~15% by weight of all landings in this sector;
- major byproduct species such arrow squid, oreos, deepwater sharks, ribbonfish and king dory have catch weights in the order of some SESSF quota managed species;
- some specific bycatch measures are in place to prevent targeting of identified overfished stocks eg.100 tonne TAC applies to the quota managed eastern gemfish to allow incidental byproduct catches, and a combined trip limit of 150 kg are applies to catches of southern, endeavour and harrison's dogfish.

GABT sector:

- highest proportion of byproduct relevant to target species in SESSF with byproduct 35% of the catch from around 80 non target species (although individual byproduct species catches minor compared with main targeted species);
- majority of byproduct comprising quota species such as jackass morwong and western gemfish and non quota species such as squid and knifejaw;
- bycatch TACs are applied to quota managed school shark, gummy shark, saw shark and elephant fish species to prevent targeting.

Hook, gillnet and trap sector:

- minor levels of byproduct compared with the trawl sectors – byproduct species mainly quota managed school shark, elephant fish, sawshark, ling and blue eye trevalla;
- major non quota byproduct species, hapuka, is being incorporated into the blue eye trevalla stock assessment process;
- preliminary risk assessment conducted for minor shark byproduct species and reference points set for high risk species.

The ecological risk assessment process and the development of harvest strategies linked to management responses should provide a greater level of assessment and control of non quota catches in the SESSF. DEH considers short term controls on the level of catches of no quota species most at risk from fishing activities in the SESSF are a priority. DEH recommends AFMA take a precautionary approach to the harvest of non quota species identified as high risk from the ecological risk assessment process by monitoring the current catch rates of these species and ensuring that adequate management controls are in place to ensure these catch levels are ecologically sustainable. Given the need for a greater level of certainty in the management of these species an appropriate harvest strategy would first need to be in place before any increase in the catch rates of high risk species was condoned.

DEH therefore recommends that within two years, as an interim measure, AFMA will implement management actions to monitor the level of catches of those non quota species identified as high risk in the ecological risk assessment process and implement appropriate precautionary management controls to ensure harvest levels are ecologically sustainable. Harvest strategies for high risk non quota species must be developed before catches of those species may be increased.

DEH also considers that advising on and developing non quota species catch caps should be an integral part of the respective SESSF FAGs scientific assessment advice over the next 12 months.

The existing range of management strategies in place to control the take of quota and non quota species generally have a single species management focus. The current mix of input and output controls do not appear adequate to curtail persistently high discard rates for some species in some areas of the SESSF, control escalating fishing effort, minimize impacts on vulnerable non quota species, such as deepwater sharks, or enhance the recovery of overfished target species. In particular, spatial management arrangements are limited for such a large and diverse management area involving complex multi-species and multi-gear interactions.

Spatial management arrangements under the existing fishery management regime are mainly applied to address specific species management requirements, such as:

- 6 management zones for the SET sector that determine separate zonal TACs for orange roughy and gemfish;

- gillnet sector shark fishing closures for Victorian coastal waters, with further closures being negotiated with States to close inshore areas off South Australia and Tasmania, to protect nursery grounds and enhance the recovery of overfished school shark stocks;
- gillnet sector closure in waters deeper than 200 metres south of 41^{o} South;
- Scalefish hook operators proposal through their MAC to only operate in waters deeper than 100 fathoms to avoid incidental catches of school and gummy shark;
- recently agreed closure to trawling in the SET sector of St Helen's Hill off eastern Tasmania for 3 years to provide a refuge for recruitment of overfished orange roughy stock;
- excluding setting of fish traps in waters south of 42 degrees 20 minutes South and in depths shallower than 200 metres;
- precluding access to inshore seamounts within the East Coast Deepwater Zone of the SET sector to protect spawning biomass and grounds of blue eye trevalla and other commercial species.

Research over the years has provided significant information on the extent of the fishing grounds across the SESSF. BRS has conducted substantial fishing effort mapping for different gear types in the south east region in recent years for the regional marine planning process. AFMA has commissioned a major CSIRO and fishing industry joint project to enable it to develop spatial management options for both biodiversity protection and fishery resource management. The project, due to be completed in mid-2003, will integrate fishing industry and scientific knowledge to provide fine scale integrated maps of fishing catch and effort and related ecosystem habitats in the SET sector, along with developing video technology to monitor habitats in the fishery from commercial fishing vessels. This project will provide significant impetus in developing sound spatial management arrangements across the fishery and make available additional data on aspects such as habitat vulnerability to inform the ecological risk assessment process.

Another major CSIRO research project expected to obtain funding seeks to evaluate the strategic options for management of Commonwealth fisheries in south eastern Australia. It intends to identify the key economic and environment issues facing the SESSF and the regional and fishery specific management objectives and strategies, encompassing the full range of management measures available; evaluate integrated management strategies against regional and fishery specific management objectives; and use evaluated management options as a basis for negotiated agreement on an integrated operational management plan for SE fisheries. The project is expected to be completed in 2006.

While further application of spatial management measures has been under consideration for some time within the relevant sectors of the SESSF, a structured system of assessing and implementing spatial and temporal closures has not been developed. AFMA has indicated that the management arrangements for the SESSF have been established to take a more ecosystem based approach to managing the previously separate fisheries. The National Oceans Office, in the context of proposed management arrangements for the South East Regional Marine Plan, and the World Wide Fund for Nature in a recent

detailed submission on implementing ecosystem based management in the SESSF, have advocated consideration of more spatially-based management measures as key elements of an ecosystem based management system.

The AFMA Board has also requested spatial management measures be investigated as a means of reducing localized fishing pressure and more effectively managing several key SESSF quota species, including flathead, blue eye trevalla, blue grenadier, jackass morwong, redfish and ling.

DEH considers that a strategic approach to spatial management be progressively implemented to restrict further impacts on target, byproduct, bycatch and protected species and critical habitats. Such a system would have the capacity to protect key species and habitats from future expansions in fishing effort and be compatible with regional marine planning initiatives under the forthcoming South East Regional Marine Plan. A targeted system spatial and temporal closures would also provide effective management response options to address the high risks identified from the ecological risk assessment process and help implement more effective harvest strategies.

DEH considers that spatial or temporal closures should be considered across the SESSF, in combination with other measures, to address prominent fishing impacts already identified for the SESSF. The impacts include the slow recovery of overfished stocks, indications of declining stocks for many quota species, localized stock depletions, high rates of bycatch in some sectors of the fishery and adverse impacts on threatened species and low productivity deepwater species such deepwater dogfish. There are also a wide range of high biodiversity value areas, such as spawning and breeding grounds, shelf top reef systems, slope canyon and shelf break systems, that are afforded limited direct protection under current management arrangements.

DEH therefore recommends that AFMA develop and implement within 3 years a system of spatial and temporal management to assist the fishery to be managed in an ecologically sustainable manner. The system of strategic closures will take account of impacts of fishing on:

- **Species and population identified by the ecological risk assessment process as high risk;**
- **The recovery of overfished stocks;**
- **Important spawning/pupping/juvenile/feeding/refuge grounds;**
- **Benthic habitats and associated impacts on productivity of quota and non quota species;**
- **Species vulnerable to particular methods of fishing such as deepwater dogfish;**
- **Various stages of the life cycle of species eg. Ling, blue eye trevalla and sharks;**
- **Species and associated habitats taken as target species by other fisheries; and**
- **Species or habitats fished at particular depth ranges by particular gear types.**

DEH considers that in implementing the spatial management system consideration should also be given to further zonal management arrangements to minimise cumulative impacts from the range of fishing gears in the SESSF. A suitable zonal system that addresses the above requirements could comprise:

- Confining gillnet fishing for sharks to shallower shelf waters but away from vulnerable inshore breeding and feeding/deeper water migratory grounds;
- Confining hook fishing to deepwater areas beyond the productive shelf break areas;
- Confining trawling to shelf waters and upper slope areas and away from the vulnerable deepwater benthic habitats and slow moving and growing species. Targeted deepwater fishing for specific commercial species such as blue grenadier would be managed under controlled conditions to mitigate impacts on benthic habitats.

Such arrangements should assist the recovery of overfished school shark and dogfish species, and provide ongoing protection to the highly productive and diverse shelf breaks regions and associated refuge habitats and slow regenerating deepwater benthic environments. Area and depth based gear restrictions have already been given consideration in the hook, gillnet and trap sectors and should be further explored under the proposed spatial management system.

DEH acknowledges that the establishment of a structured spatial management system will require extensive consultation with stakeholders and further analysis of available data and additional research in certain areas. DEH also notes that stock assessments reports have noted a progressive increase in fishing effort in recent years through movement to fishing grounds previously not exploited by a particular method of fishing, such as increases in trawling in the western Bass Strait region. The current management regime and provisions under the new SESSF management plan contain limited direct controls on the level of fishing effort and fishing power, which could potentially expand in some sectors given the greater facilitation of quota trading under the SESSF management regime. DEH considers that while the above spatial management system is being established there is the potential for further fishing damage to sensitive habitats and localized impacts on key feeding, breeding and refuge areas from expanded fishing effort and cumulative impacts of multiple fishing methods.

DEH considers that, as a precautionary measure, particular fishing methods should be subject to an appropriate system that assesses ecological impacts before expanding each method of fishing into new areas. Available catch and effort data and outcomes from the current fishing effort and habitat mapping project in the SESSF sector should provide a sound basis to identify the extent of existing fishing grounds for each method of fishing. The development of new fishing grounds would not be precluded but needs to proceed under more controlled arrangements that include an initial ecological impact assessment on species and habitats and progressive monitoring of impacts on the expanded fishing areas. The impending ecological risk assessment process to be introduced across the

fishery in 2003 should assist in identifying the risks involved in developing new fishing grounds and the appropriate measures required to minimize potential fishing impacts.

DEH therefore recommends that, as an initial measure for the proposed system of spatial management, AFMA will, within two years, implement precautionary management for the development of new fishing grounds. AFMA will broadly identify, for each fishing sector and associated gear types, those areas that have never been fished by those sectors and associated gear types prior to the end of 2002. Expansion of fishing activity to new areas for the particular sectors and gear types will be under structured and precautionary management arrangements to ensure ecologically sustainable harvesting.

Establishment of a structured system of spatial management, along with a range of other proposed new initiatives for the SESSF, is likely to require enhancement of existing compliance arrangements across the SESSF. As discussed in Part I of this report, compliance and monitoring strategies have been developed for the various sectors of the SESSF, while the new SESSF management plan includes a specific performance measure to develop and implement a strategic compliance program for the fishery. Any structured spatial management system for an area the size of the SESSF will need to be supported by a comprehensive system of surveillance and data validation to effectively manage compliance with area closures. AFMA has recently been examining options to extend the use of VMS across all sectors of the SESSF. Further implementation of an integrated vessel monitoring system (VMS) across all sectors of the fishery would support the ongoing monitoring of spatial or temporal closures in the SESSF, although VMS may not be a viable option for all sectors of the fishery. . Other compliance options need to be explored to address not only the need for improved collection and verification of fishery data but also support the implementation of appropriate fishing effort controls.

DEH therefore recommends that AFMA ensure that the strategic compliance program required under section 6(j) of the SESSF management plan identifies and implements appropriate tools to effectively monitor and validate compliance with all management measures, including spatial management, administered under the SESSF management plan.

As discussed under the Assessment section, the level of discarded quota and non quota bycatch is a significant issue for the trawl sectors and to a lesser extent for the shark gillnetting sector. AFMA's assessment report states that the current tight restrictions on the range of gillnet mesh size is effective in precluding catch of undersize sharks and the larger breeding population of overfished school sharks. Independent shark survey data tabled in the assessment report indicates that the predominate catch from gillnets is of target and major byproduct species.

High levels of discarding and bycatch are inherent problems with trawl fishing, particularly in many areas of the SESSF involving mixed species targeting. The draft SESSF management plan contains provisions for estimating the level of discards and setting of bycatch limits and targets as required. DEH considers that reductions in

discarded species need to be quantified to provide an impetus to implement management measures to reduce the level of discarded commercial and non commercial species to more sustainable levels. The extent of reductions required across the respective sectors will need to be carefully assessed by the relevant stakeholders in the fishery, but the high levels of discarding currently recorded in the trawl sectors justifies setting targets that deliver substantial reductions in the existing discarding rates. Achievement of any reduction targets will require careful monitoring and development of management strategies with appropriate response measures to bring these reductions into effect. DEH has already recommended in this report that discarding rates and observer coverage be addressed as priority issues in the structured monitoring program prescribed in the draft SESSF management plan.

The strategies used to achieve these reductions will necessarily require a mix of management responses. The range of spatial management measures proposed above for the SESSF has the capacity to significantly reduce the level of incidental species interactions and can be targeted to address discarding "hotspots". Further gear controls and modifications that provide for a "cleaner" catch of commercial size species and reduce the level of incidental catch should also be included in the discard reduction strategies.

DEH therefore recommends that AFMA, in consultation with industry and other stakeholders:

- **develop and implement management arrangements to significantly reduce the current total level of quota and non-quota discards in the SESSF within 3 years; and**
- **within 12 months as part of the bycatch plan determine target reduction levels and baselines for future discarding in the fishery that are acceptable to Environment Australia.**

The SESSF management regime currently does not have mandatory requirements to use gear changes or changes to fishing practices developed specifically to reduce discards and bycatch. While AFMA's strategic research plan 1999-2004 for Commonwealth fisheries has the development of bycatch reduction technologies and fishing practices as a key research area, it is not clear from the AFMA's assessment report what priorities are given under research program to development and implementation of bycatch reduction devices.

The initial BAPs for the trawl sectors of the SESSF had specific actions to address the reduction of discarding and high grading. AFMA has supported a significant project on trawl gear modifications to promote more targeted trawl fishing and reduce the level of discarded and bycatch species caught by the current trawl operations in parts of the SESSF. The project, "Effects of trawling sub-program: Maximising yield and reducing discards in the South East Trawl Fishery", has recently completed a range of field trials using 90, 100 and 110mm mesh sizes and diamond and square mesh configurations. Significant reductions in discarded fish and a reduction in catch of smaller commercial

species were achieved at various stages of these trials, along with reductions of around 10-15% of landed weight of commercial catch. A follow up extension project “Promoting industry uptake of gear modifications to reduce bycatch in the South East Trawl Fishery” is underway using the outcomes of the above gear selectivity project to encourage industry participation and support for the further use of modified trawl mesh gear. The assessment report notes further research work is being undertaken for gear selectivity and modification of gillnets to improve targeting of catches. AFMA has also recently introduced size limits in the SET sector for flathead, a key quota species in that sector, as a complementary measure to gear modifications to reduce the catch and discarding of undersize target catch. DEH suggests similar measures should be considered for other target species in the trawl sectors.

DEH considers that the gear modifications trials in the SET sector are a positive approach to the problems with discarding and the uptake of these gear modifications should be pursued as an integral element in achieving the recommended discard reduction targets for the trawl sectors. The existing management requirements for use of discard and other bycatch reduction devices are open ended in terms of the development, trial and eventual uptake of modified gear or fishing practice. DEH considers there needs to be a close management linkage between the proposed discard reduction targets and implementation of bycatch reduction measures such as gear modifications within defined periods to support the achievement of these reduction targets. DEH considers that bycatch reduction measures should still be developed in close consultation with stakeholders and relevant experts and tested under appropriate conditions to verify their effectiveness, but with an express objective aim of maximizing uptake of the outcomes within a defined period.

DEH therefore recommends that effective management requirements to use discard and other bycatch mitigation measures be introduced at the conclusion of a trial and development period of up to three years. AFMA should monitor the extent of uptake of mitigation measures and introduce mandatory measures where voluntary uptake of measures is insufficient.

Conclusions

As a large mixed species and mixed gear fishery, AFMA faces considerable challenges to maintain the wide range of commercial stocks at ecologically sustainable levels. At current levels of exploitation the majority of stocks are either overexploited or there is a high degree of uncertainty about sustainability of current catch rates. The overarching management framework under the new SESSF management plan for the 4 previously separate fisheries provides the basis for assessing and controlling the broad range of target and byproduct species across the various sectors of the fishery but needs to be supplemented by further direct controls on fishing activity to ensure stocks are maintained at ecologically viable stock levels.

The stock assessment process for all sectors is well structured and stock assessment models are in various stages of development for quota species. The science underpinning the stock assessment processes for most species is still evolving and requires further long

term biological data to provide greater certainty with harvest management arrangements. AFMA systematically collects a comprehensive range of fishery dependent data to support the stock assessment process but there is an acknowledged shortage of fishery independent data to inform estimates of relative abundance and stock productivity and establish more reliable reference points and catch rates. Monitoring programs need to give priority to determining and collecting fishery independent data appropriate to the scientific understanding of the harvested species and scale of the fishery.

The structured monitoring programs required under the draft SESSF management plan need to give priority to defining the type and level of discarding across the SESSF. The need for more extensive data in the SESSF also requires a commitment to adequate and ongoing observer requirements that is not evident under the proposed management regime. Observer coverage needs to be a priority and commitments defined in the structured monitoring programs.

Structured harvest strategies are an urgent requirement for quota and non quota species across all sectors of the SESSF to address uncertainties in stock structures and stock assessments, define further data requirements and establish more reliable reference points and catch limits. A structured process of management responses to maintain stocks above reference points is not in place for most SESSF species and needs to be an essential component of any harvest strategies developed. As the substantial proportion of catch in the SESSF is from quota and a range of major byproduct or target non quota species, AFMA should build on the preliminary work undertaken within the South East Fishery Assessment Group and give priority to implementing harvest strategies for these species.

Monitoring measures and catch controls on non quota species, apart from the primary target species in the GABT sector, have been limited in the SESSF, despite indications of declining stocks for a range of these species, such as deepwater sharks. While the ecological risk assessment process being implemented shortly in the SESSF will define the level of risks for both quota and non quota species, effective outcomes will only be achieved by developing specific response measures to the identified risks. Known and potential threats in the fishery, such as cumulative gear impacts and susceptible species groups, such as listed threatened species, species with low productivity and key species in the food chain should be considered in the context of these responses to ensure a more ecosystem based level of protection to species and habitats.

DEH considers that the immediate focus on development of harvest strategies should be for quota and high risk non quota species. In the absence of formalized catch controls applicable to quota species, catches of high risk non quota species need to be closely monitored and additional measures applied to ensure their catch rates are sustainable, including development of harvest strategies for increases in the catch of these species.

Removals from the fishery to determine TACs are for the most part adequately addressed although the spatial distribution and population structures of a number of species, and the complex inter-relationships of species caught in certain areas of the fishery, needs further

definition and attention in the stock assessment processes and should be reflected in the relevant TACs applicable for each sector of the fishery.

All sectors of the fishery have been managing most commercial species at around limit reference point levels. Ideally management should maintain stocks at or above target reference points to provide greater security to ongoing stock levels above critical biological limits. DEH accepts that it will take considerable time to define and implement meaningful target reference points for many species in the fishery. As preliminary reference points may in effect remain as limit levels, the SESSF management plan should provide for stocks to be maintained above reference points.

The predominate means of controlling the level of take in the SESSF is through output controls of ITQs based on TACs. The extent of input controls is quite limited in the SESSF for the wide range of species caught and gear used, with limited measures in place to control expanding fishing effort or address high rates of discarded catch in some sectors of the fishery. A structured system of spatial management should be implemented to address AFMA's aim to take a more ecosystem based management approach under the SESSF management plan and provide effective management options to control fishing effort, protect representative parts of the marine environment, adequately protect unfished areas and address the high risks identified in the ecological risk assessment.

Persistent high discard levels present a significant threat to the ongoing sustainability of catches, particularly in the trawl sectors where higher levels of bycatch have broad ecological implications. In the absence of specific discard reduction measures in the current management regime, a targeted reduction strategy for discarded species should be put in place to provide an incentive to use measures that are more effective in targeting catches. Setting significant reductions across the trawl sector should also be accompanied by measures that lead to the adoption of appropriate gear modifications and other bycatch mitigation measures after defined trial and development periods, to help attain the discard and bycatch reduction targets.

Compliance arrangements in the SESSF are well structured but need to be enhanced to improve reliability of data for stock assessments and also to enforce compliance with future spatial management and other management initiatives such as bycatch reduction proposed for the fishery.

Recommendations

2. Section 7(1)(b) of the draft SESSF management plan be amended to:

"that data is collected, appropriately verified and analysed to enable:
i) timely evaluation of the effectiveness of the management measures implemented to maintain the resources of the fishery at, or rebuild those resources to, an acceptable level; and
ii) timely modification of those management measures"

3. AFMA develop within 2 years a single document that describes the structured monitoring program under Section 6(a) of the SESSF management plan, that will address priority monitoring issues such as discarding rates, threatened and listed species interactions and appropriate levels of observer coverage in all sectors of the fishery and fishery independent studies in all sectors of the fishery.

4. Section 6(f) of the draft SESSF management plan be amended to:
"setting TACs, harvest strategies and reference points for non quota species"

5. AFMA establish a schedule to develop and implement, within 3 years, harvest strategies, including decision rules and reference points, for quota species and high risk non quota species identified from the ecological risk assessment process. Harvest strategies will include:

- **Monitoring of landed catch;**
- **TACs or trigger ranges/levels of acceptable catch; and**
- **Development of management responses when reference points or trigger ranges/levels are reached.**

6. Within 3 years AFMA will identify and implement management responses to fishing impacts identified from the ecological risk assessment process, taking into account known fishing impacts on;

- **Vulnerable and/or overfished species;**
- **Listed threatened species under the EPBC Act in the fishery;**
- **Species with low productivity;**
- **Key species in the food chain such as squid and jack mackerel;**
- **Areas of localized depletion;**
- **Cumulative gear impacts across the life cycles of species in the SESSF and adjoining fisheries;**
- **Species with increasing levels, or significant potential for increased levels, of catch landings.**

7. Sections 12c) and 16c) of the draft SESSF management plan be amended to:

"c) must take into account:
i) all fishing mortality from all sectors within the fishery and overlapping or adjacent fisheries for the species; and
ii) the ecological implications of harvesting the TAC; and
iii) the distribution and population structure of the species."

8. Section 7(g) of the draft SESSF management plan be amended to "that stocks of quota species, and other species for which reference points have been determined, are above the reference points for the species."

9. Within 2 years, as an interim measure, AFMA will implement management actions to monitor the level of catches of those non quota species identified as high risk in the ecological risk assessment process and implement appropriate precautionary management controls to ensure harvest levels are ecologically sustainable. Harvest strategies for high risk non quota species must be developed before catches of those species may be increased. A harvest strategy for non quota species must be developed before allowable catches of that species may be increased.

10. AFMA develop and implement within 3 years a system of spatial and temporal management to assist the fishery to be managed in an ecologically sustainable manner. The system of strategic closures will take account of impacts of fishing on:

- **Species and population identified by the ecological risk assessment process as high risk;**
- **The recovery of overfished stocks;**
- **Important spawning/pupping/juvenile/feeding/refuge grounds;**
- **Benthic habitats and associated impacts on productivity of quota and non quota species;**
- **Species vulnerable to particular methods of fishing such as deepwater dogfish;**
- **Various stages of the life cycle of species eg. Ling, blue eye trevalla and sharks;**
- **Species and associated habitats taken as target species by other fisheries; and**
- **Species or habitats fished at particular depth ranges by particular gear types.**

11. As an initial measure for the proposed system of spatial management, AFMA will, within two years, implement precautionary management for the development of new fishing grounds. AFMA will broadly identify, for each fishing sector and associated gear types, those areas that have never been fished by those sectors and associated gear types prior to the end of 2002. Expansion of fishing activity to new areas for the particular sectors and gear types will be under structured and precautionary management arrangements to ensure ecologically sustainable harvesting.

12. AFMA will ensure that the strategic compliance program required under section 6 (j) of the management plan identifies and implements appropriate tools to effectively monitor and validate compliance with all management measures, including spatial management, administered under the SESSF management plan..

13. AFMA, in consultation with industry and other stakeholders:

- **develop and implement management arrangements to significantly reduce the current total level of quota and non-quota discards in the SESSF within 3 years; and**

- **within 12 months as part of the bycatch plan determine target reduction levels and baselines for future discarding in the fishery that are acceptable to Environment Australia.**

14. Effective management requirements to use discard and other bycatch mitigation measures will be introduced at the conclusion of a trial and development period of up to three years. AFMA will monitor the extent of uptake of mitigation measures and introduce mandatory measures where voluntary uptake of measures is insufficient.

Promote recovery to ecologically viable stock levels

Objective 2 – "where the fished stocks are below a defined reference point, the fishery will be managed to promote recovery to ecologically viable stock levels within nominated timeframes"

Five quota species in the SESSF are classified in the 2001 BRS Fishery Status Report as overfished – eastern gemfish, blue warehou, orange roughy and schoolshark as recruitment overfished, and redfish as growth overfished. Eastern gemfish and schoolshark have been categorized as "overfished" since 1992, and while the other 3 species have only recently been classified as "overfished" there are indications from stock assessments over recent years of continual declines in catch levels and catch rates for these species.

The BRS report also identifies a further 11 quota or primary targeted species that are classified as "uncertain" in stock status in the SESSF. Of these species, 7 were below their catch rate trigger level used as the reference point for stock status. As discussed under Objective 1 there is considerable uncertainty with the stock assessment processes and reference points applied for most quota species. This uncertainty needs to be addressed by developing and improving harvest strategies. Stock recovery measures for most species below their catch rate trigger levels generally focus on a review of their TAC at the annual TAC allocation process. AFMA has used available information on stock status to adjust TACs accordingly. Species persistently below their trigger rates, such as jackass morwong, silver trevalley and mirror dory, have had their TACs reduced by around 20% in recent years.

Of the identified overfished species, biological limit reference points have been agreed and set for school shark, eastern gemfish and orange roughy.

Stock rebuilding strategies supported by biological limit reference points and target rebuilding reference points are in place for orange roughy, schoolshark and eastern gemfish. The rebuilding strategies are:

- Orange roughy –maintain spawning biomass above 30% of pre-fishing levels as at 1988. Where there is a greater than 50% probability that the stock is below 30% of the 1988 spawning biomass, the TAC is set such that the biomass reaches 30% by 2004 (or 2010 for the later developed Cascade Plateau zone).

- Eastern gemfish – set TAC to zero until spawning biomass has 50% probability of exceeding 40% of the 1979 biomass.

- Schoolshark – 80% probability that the mature biomass in 2011 exceeds the mature biomass in 1996.

The most recent stock assessments indicate that the above recovery targets will take some time to achieve, based on the following assessment outcomes:

- orange roughy is below its limit biological reference points in the eastern, southern and western management zones, and is likely to be above its reference point in the Cascade Plateau zone, although a quantitative stock assessment for this zone is yet to be completed.;
- eastern gemfish is well below its limit biological reference point;
- school shark productivity is lower than previously assessed and requires a much longer recovery period than set by the current stock rebuilding target. More recent information suggests that the original target may still be achievable.

Quantitative stock assessments for blue warehou and redfish have been conducted to give estimates of current stock levels compared with pre-exploitation periods. These are currently less than 30% for blue warehou and between 33 to 40% for redfish. The management strategy for blue warehou is to maintain spawning biomass above 30% of pre-fishing levels as at 1986-87. The 2001-2002 AFMA Annual Report notes that current stock estimates for both species are uncertain and further refinement to stock assessment models is required to improve reliability of stock status and associated recovery measures. The Blue Warehou Assessment Group is currently refining the stock assessment model to address east and west stocks, rather than a single stock as previously assumed, and this will have implications for future recovery strategies for this species.

In the SESSF, stock recovery actions are triggered when performance criteria, based on stocks being managed above the biological "bottom line" where biological reference points have been established, or above the lowest level of pre-determined historical catch rates, are not met. The recovery strategies in place for overfished quota species are substantially dependent on monitoring and adjusting relevant TACs. There have been substantial reductions in TACs for some overfished species in recent years. For orange roughy, the eastern zone TAC has fallen from 2,000 tonnes in 2000 to 820 tonnes in 2003; in the southern zone from 700 tonnes in 2000 to 340 tonnes; and in the western zone from 1,250 tonnes in 2000 to 450 tonnes in 2003. For eastern gemfish a zero targeted TAC has been set since 1993 and the incidental bycatch TAC for the species progressively reduced to 100 tonnes by 2003. For blue warehou the TAC has fallen from 1,500 tonnes in 2000 to 300 tonnes in 2003. For schoolshark the TAC has been reduced from 432 tonnes in 2001 to 309 tonnes in 2003, to limit targeted fishing and manage the species more as incidental byproduct of targeted gummy shark fishing.

AFMA considers that TAC reductions and further refinement of quantitative stock assessments provide appropriate measures to promote recovery of overfished stocks. Given the past high fishing levels, uncertain stock assessments, low productivity and slow recovery rates for most overfished species, DEH considers more comprehensive recovery strategies are required to ensure stock recovery to established target levels and within set timeframes. DEH notes that eastern gemfish has been nominated for assessment as an endangered species under the EPBC Act and if listed will require more comprehensive monitoring and catch mitigation measures as part of formal recovery plan arrangements under the EPBC Act.

A range of additional measures have been undertaken in recent years to further assess and rebuild stocks of overfished quota species, including:

- gear restrictions such as reducing gillnet maximum mesh sizes and standardized gillnet depth restrictions depths of gillnet setting to avoid targeting of school shark;
- recent quantitative stock assessments or assessment workshops for blue warehou, redfish and orange roughy;
- zero TAC overcatch and undercatch provisions for blue warehou, school shark, redfish and some orange roughy zones to provide additional restriction on the total catches of these species;
- area closures such as the key spawning grounds of St Helen's Hill in the orange roughy eastern zone, inshore Victorian waters closed to targeted shark fishing and further inshore area closures to targeted shark fishing off Tasmania and South Australia being investigated to protect school shark nursery and breeding grounds.

There are a suite of new provisions in the draft SESSF management plan that can enhance the monitoring and recovery of both quota and non quota stocks, including:

- strategic plan to address high risks identified from ecological risk assessments;
- ecologically sustainable reference points and harvest strategies to be established for both quota and non quota species;
- implementation of structured monitoring programs on fishing impacts and implementing and reviewing stock recovery strategies;
- TACs to take account of a range of fishing implications such as ecological implications of harvesting, mortalities from within the fishery and from adjoining and overlapping fisheries and spatial structure of stocks;
- allocation of separate hook SFRs for scalefishers in the gillnet, hook and trap sector with different operating areas and shark catch limits to minimise further catch of school shark.

Stock assessment groups and the AFMA Board have also highlighted the need to consider additional recovery measures for overfished species such as:

- Gear modifications to minimise growth overfishing and discarding;
- Area and temporal closures to protect critical habitat and aggregations of vulnerable stocks;
- Complementary management measures developed with adjoining State jurisdictions targeting the same species;
- Establishment of separate TACs and restrictions on quota transfer to cater for spatially distinct stocks;
- Targeted research programs to improve understanding of stock abundance and dynamics;
- More rigorous monitoring programs.

AFMA is currently examining the use of suitable stock recovery measures to address these issues. DEH considers that these measures should be part of more structured stock recovery strategies that take account of the above issues and include more closer monitoring arrangements and agreed timeframes and targets for stock recovery.

DEH notes that, for the most part, insufficient data is currently available to reliably quantify the recovery targets in place. The proposed structured monitoring program provides the opportunity to give further priority to the particular data collection and monitoring requirements of overfished species, such as stock biological status and catch rates to improve the reliability of reference points and inform appropriate recovery responses.

The measures proposed by DEH (discussed under Objective 1 of this report) to reduce discards, develop and implement discard and bycatch mitigation measures and establish a system of spatial and temporal closures across the SESSF provide for a more comprehensive range of direct actions that can protect and support recovery of overfished stocks.

The pending establishment of harvest strategies with decision rules should also provide for improved data collection and more certainty in the setting of TACs and reference points, along with supporting actions for achieving recovery targets. DEH understands that developing and enhancing harvest strategies for all overfished species will be one of the priorities under the harvest strategy process. The SEFAG harvest strategies working group has recommended to AFMA that in setting reference points there should be an objective of maintaining stocks above well-defined minimum biologically acceptable levels and consideration should be given to establishing target reference points above these biological limits as a focus for rebuilding strategies.

As discussed under Objective 1 existing reference points in the SESSF generally been established at biological limit point levels, so stocks should be managed and rebuilt above the set reference points, at least until clearly defined biological target points are defined in recovery strategies.

DEH therefore recommends that section 7(1)(m) of the draft SESSF management plan be amended to: "that, if the stock of a species is found to be below the reference point for the species, effective recovery strategies are implemented within 12 months to ensure that, to the extent that the deficit of the stock is attributable to factors related to the management of the fishery, the depleted stock is rebuilt above the reference point."

Apart from quota species, a number of non quota species are recognized as under fishing pressure but with insufficient information available for most species to ascertain whether these species are below biological limits. Where preliminary reference points do exist, such as trigger limits recently set for high risk non quota shark species in the gillnet, hook and trap sector, recovery actions are limited to monitoring fishing effort and reviewing management measures as required. The forthcoming ecological risk assessment process

and the recommended measures discussed under Objective 1 of this report on the establishment of harvest strategies, capping of current non quota species catch levels, spatial management systems and bycatch mitigation measures provide a sound basis to significantly improve the assessing and monitoring of the status of key non quota species in the SESSF, and support the recovery of non quota stocks.

Recommendation

15. DEH recommends that section 7(1)(m) of the draft SESSF management plan be amended to: "that, if the stock of a species is found to be below the reference point for the species, effective recovery strategies are implemented within 12 months to ensure that, to the extent that the deficit of the stock is attributable to factors related to the management of the fishery, the depleted stock is rebuilt above the reference point."

Ecosystem Impacts

Principle 2: "Fishing operations should be managed to minimize 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

Bycatch in the SESSF is quite extensive and diverse due to the range of fishing operations across the sectors and species targeted and retained for commercial sale. Bycatch can constitute discarded quota and non quota species or catches of species other than fish, such as marine wildlife, or benthos such as sponges. Catches of quota and non quota species that were not targeted but retained in the landed catch have also been identified at times as bycatch, although for the purposes of this assessment they are classified as byproduct.

The draft SESSF management plan includes a number of provisions relevant to bycatch data collection and analysis, including:

- a structured monitoring program on the impacts of fishing that includes monitoring of bycatch;
- determining reference points and TACs for species taken in the fishery;
- estimating discard levels and including this in fishery assessment reports; and
- the requirement to develop and implement Bycatch Action Plans (BAPs) that includes actions to gather information on the impact of the fishery on bycatch species.

There is a range of information collection measures in place across the various sectors of the fishery to estimate and classify bycatch. Information is primarily collected through daily logbooks and observer monitored ISMP or independent fixed station surveys.

As discussed under Principle 1, daily logbooks provide for inclusion of bycatch data although AFMA acknowledges there have been limitations with the quality of this data. Revision of logbook data recording to more effectively address bycatch data has been an action under the initial BAPs. DEH considers this issue should be further pursued in the revised BAPs. AFMA states in its assessment report that the new electronic logbooks currently being trialed in the SET sector have greater capacity to record and identify bycatch information. Bycatch species identification guides, such as a new guide to shark and ray species, have been distributed to operators to assist with bycatch identification and recording.

More comprehensive bycatch information in the SESSF is from the ISMP and fixed station survey programs discussed under Principle 1. These programs provide bycatch composition and abundance data that is verified by observers. AFMA acknowledges that the design of ISMP coverage is focused more on target landed species. The initial BAPs included actions to review the ISMP and modify the sampling design as required to address more representative bycatch data. DEH considers this is another issue that should be further pursued under the revised BAPs.

As discussed under Principle 1, only the SET sector has an ISMP or similar bycatch sampling program of any significant duration (around 10 years). The Southern Shark fishery monitoring project has also been in place since 1986. A longer term time series of data will be required across the SESSF to more accurately assess the ecological impacts of fishing on bycatch. Further consideration will be needed on bycatch monitoring under the structured monitoring program to ensure representative sampling of bycatch is undertaken in all sectors. DEH has recommended under Principle 1 that appropriate observer coverage be examined as a priority for the structured monitoring programs. This will need to include both ongoing and specific requirements for bycatch monitoring. The existing observer support of ISMP, covering around 2-8% of trawl trips and around 5% of non trawl trips, may not be adequate if additional sampling programs are required for more representative bycatch monitoring.

The assessment report notes other sources of information on bycatch can be drawn from ongoing consultation with industry and scientists, port visits and scientific research programs. Consultation with industry and scientists, through forums such as MACs, FAGs and associated working groups, has provided background advice on fishing practices and gear types that contribute to bycatch and rate of discard survivals. AFMA notes that the ongoing program of port visits is used to inform operators on data collection requirements and discuss means of improving bycatch data collection.

A broad range of research programs have been conducted in the south east region over recent years that are relevant to bycatch management, including assessment of bycatch in the trawl sectors, gear modification trials, trophic relationships and habitat mapping and description. Detailed independent surveys of bycatch species are limited, with the most recent being the *Kapala* replicate survey of 1997 that compared changes in relative abundance and composition of target and non-target species off the NSW south coast with a similar survey in 1976-77. The AFMA 1999-2004 strategic research plan identifies a range of key research areas relevant to bycatch that should be addressed in Commonwealth fisheries. Structured research arrangements for bycatch are not stipulated in the BAPs or the recently lapsed research plans for the SESSF sectors. DEH considers further attention should be given to setting priorities for research arrangements in the revised BAPs and SESSF strategic research plans.

Assessment

The major bycatch species for the SESSF sector identified from recent ISMP or fixed station surveys include:

- SET sector – quota species such as redfish and mirror dory, occasional commercial byproduct species such as southern frostfish, barracouta and jack mackerel, non commercial species such as gurnards, stingarees, whiptails, cucumber fish, deepwater burrfish, draughtboard shark, New Zealand dory.
- GABT sector – latchet, chinaman leatherjacket, wide stingaree, sponges.
- Hook, gillnet and trap sector – draughtboard shark, (all gear types), whiptails, skates (longline), greeneyed dogfish (dropline, scalefish gillnetting) spider crab (trap), gemfish (scalefish gillnetting) Port Jackson shark (shark and scalefish gillnetting) jack mackerel (scalefish gillnetting), piked spurdog (shark gillnetting).

The most significant bycatch is from the SET sector. As discussed under Principle 1 ISMP identifies up to up to 35% of the weight of species caught in the SET sector as discarded bycatch. A wide range of species are caught by the demersal trawl operations, with around 390 species or species groups caught in the 2001 ISMP sample described in AFMA's assessment report, although over half of these in total constitute less than 20% of the total catch. The high discarded bycatch levels for redfish, mirror dory and ocean perch quota species has been a continuing concern in terms of ineffective targeting and potential ecological impacts.

The GABT sector also has a high rate of bycatch with 2001 ISMP data identifying 37% of catch by weight discarded from around 168 species caught, the majority of which are caught in small amounts and usually discarded. While the bycatch rate is as high as the SET sector the volumes of bycatch compared to the size of the fishery and fished areas are generally much smaller than in the SET sector.

The hook, gillnet and trap sectors have significantly lower levels of bycatch, below 10% for the line and trap fishing methods. While fixed station survey data indicates that gillnetting has higher bycatch rates, in the order of 26% by number for shark gillnetting and around 19% for scalefish gillnetting the great majority of bycatch comprised a small number of species such as draughtboard and Port Jackson sharks that were captured and released alive.

AFMA's assessment report notes there is currently little information about the vulnerability of most bycatch species to fishing and as yet no formal risk analysis of the SESSF bycatch. The South East Fishery Assessment Group's fisheries assessment reports have also noted that the trophic implications of bycatch and discarding within the fishery are poorly understood. DEH considers that the extension and further analysis of ISMP and fixed station survey and southern shark fishery monitoring programs and data, supplemented by fishery independent monitoring to compare relative abundance and distribution of bycatch species, will be necessary to more accurately determine the ecological impacts of harvesting on bycatch species, particularly in the trawl sectors.

The assessment report notes that there are several programs underway to address bycatch risk assessments. For example risk assessments to determine the vulnerability of bycatch species to fishing are an integral component of the BAPs for the various SESSF sectors.

Risk assessments have been limited to date to the shark risk assessments mentioned under Principle 1 that identified 5 high risk species and set preliminary reference points for these species. This risk assessment approach will be supported by an FRDC project "Rapid assessment of sustainability for ecological risk of shark and other chondrichthyan bycatch species taken in the Southern Shark Fishery, South East Non Trawl Fishery, South East Trawl Fishery and Great Australian Bight Trawl Fishery"

The impending ecological risk assessment process to be implemented across the SESSF from 2003 will provide quantitative risk analysis for quota and non quota species including bycatch species. DEH has recommended under Principle 1 that a range of fishing impacts and potentially impacted species groups be examined in the context of responses to the outcomes of the ecological risk assessment process. The bycatch implications of shifts in fishing effort due to changes in markets or availability of former high priority quota species is an issue that may need to be further examined in the context of risk assessment processes. Another issue with bycatch implications is the expansion of midwater trawling using finer mesh nets to target key pelagic species, which has been given further consideration recently in the trawl sectors.

Management response

The BAPs, developed in 2001 for each sector of the SESSF and currently under review, include a range of key aims or issues, supported by recommended actions, to address in the mitigation of bycatch. The priority issues include:

- Quantifying the extent of discarding;
- Investigating methods to reduce bycatch and discarding;
- Identifying and monitoring bycatch species of concern;
- Improving bycatch data collection systems;
- Minimising the impacts of fishing gear interactions on marine species and the benthic environment;
- Increasing awareness and support for bycatch mitigation activities.

The management regime includes a range of generic input and output controls that can have implications for restricting bycatch levels, including:

- Limited vessel entry to all SESSF sectors;
- Minimum trawl mesh size limits for finfish, Danish seine and prawn trawling;
- Minimum and maximum gillnet mesh sizes;
- Minimum trap dimensions;
- Bycatch trip limits for certain State managed species, such as 5 king crabs per trap fishing trip.

AFMA acknowledge in their assessment report that shark species are at risk of being vulnerable due to their low productivity, and have implemented several measures across the sectors to reduce their capture and mortality, including:

- Area closures for inshore Victorian waters and further closures proposed for inshore South Australian and Tasmanian waters;
- Prohibition on shark landings without fins;
- Bycatch limits of 5 carcasses for southern shark quota species;
- Prohibition on targeting of species such as pelagic sharks not defined as 'scalefish' or 'shark' in fishing endorsements;
- Trip limits of 150 kg for southern, endeavour and Harrison's dogfish (currently under assessment for listing as threatened species under the EPBC Act).

As previously mentioned the hook, gillnet and trap sector of the SESSF is the only sector to have undertaken risk assessments of shark species taken in the fishery, and subsequently annually review species identified with higher impacts.

No other process has been undertaken in the SESSF to date to identify an indicator group of bycatch species for ongoing monitoring or to establish reference points supported by decision rules. The assessment report indicates that AFMA is relying on the outcomes of the ecological risk assessment process to provide the basis for identifying indicator or high risk species and the CSIRO project "Ecological indicators for fishery management: Non-target species, habitats and food chains" to identify robust ecological indicators that can also apply to bycatch indicator species. DEH's recommendation under Principle 1 that the draft SESSF management plan be amended to include the provision for harvest strategies and reference points for non quota species should also provide an impetus to determine benchmark bycatch species for monitoring.

DEH has recommended in Principle 1 that management responses to the risks identified from the ecological risk assessment process take account of a range of key factors that are relevant to bycatch species, such as species with low productivity, areas of localized depletion, key species in the food chain and species vulnerable to fishing pressure. The recommendations also require for precautionary management to be implemented for non quota species identified as high risk by the ecological risk assessment process to ensure that catches of these species are maintained at or below current levels.

The high level of discards and bycatch that exists for the trawl sectors warrant more definitive commitments in the draft SESSF management plan to address bycatch reduction, in particular the use of targets and bycatch limits and reduction measures that are effected within set time frames. These are issues that have not been explicitly addressed in the BAPs so far and DEH considers that they need to be given prominence in the management plan provisions to provide ongoing incentive to pursue bycatch reduction in the BAPs and other arrangements under the SESSF management regime.

"DEH therefore recommends that section 8 of the draft SESSF management plan be amended to:

"(3A) For paragraph (3)(d), actions that must be required include, as appropriate:

a) defining and implementing appropriate bycatch limits; and

b) setting targets for bycatch reduction; and

c) implementing bycatch reduction measures within set time periods."

The recommended setting of discard reduction targets ofor the trawl sectors and the hook, gillnet and trap sector proposed by DEH under Principle 1 will require significant reductions in bycatch to be achieved over the coming years. Similarly the recommended use of discard and bycatch mitigation measures after defined trial and development periods, also discussed under Principle 1, takes a more proactive management approach to adopting suitable bycatch mitigation measures across the relevant areas of the SESSF. This approach will be particularly important for gear modification measures such as the recent trawl mesh gear selectivity trials in the SET sector to help reduce the current high rate of discarded undersize quota species such as redfish. Apart from targeting more sustainable yields and reducing commercial and non commercial fish, bycatch gear bycatch mitigation measures need to also address gear modifications to reduce impacts on the benthic environment, such as controls on the size and configuration of footrope gear and sweeps.

Expanding effort across the fishery and indications of the targeting of a wider range of species has the potential to have significant impact on bycatch levels in the fishery. Currently only shark gillnet operations of the SESSF have management requirements to monitor fishing effort and review management measures as required. Spatial management measures provide an appropriate response to mitigate expanded fishing effort impacts, particularly as limiting interactions with fishing activity is likely to be the only feasible option to prevent further deleterious impacts on vulnerable species such as deepwater sharks. The initial BAPs listed spatial management as a specific remedial action to address bycatch reduction and the development of spatial management arrangements should be maintained as a key measure in the revised BAPs.

The structured spatial management system recommended under Principle 1 provides for a comprehensive suite of mitigation measures to help reduce bycatch, and specifically requires that spatial arrangements take account of a range of issues and circumstances relevant to bycatch in the SESSF, such as high risk species identified by the ecological risk assessment process, benthic habitats and species vulnerable to particular fishing methods. Spatial and temporal controls are likely to be key tools in achieving the reduction targets for discarded species.

Conclusions

Bycatch levels are a significant management issue in the trawl sectors and also require some attention in the non trawl sector. The extent and quality of data on the take of bycatch species and understanding of the abundance and dynamics of bycatch populations is limited in comparison to the scale of bycatch taken in the SESSF. ISMP and fixed station surveys need to be extended to build more comprehensive long term data series and more strategic research incorporated into revised BAPS and SESSF research programs to monitor whether bycatch reduction objectives are being achieved. As with targeted species, adequate observer coverage will be crucial for enhanced data on and assessment of bycatch impacts and should be addressed as a priority issue under structured monitoring programs in the SESSF.

Risk assessments of bycatch species are limited as are specific management responses to reduce current bycatch levels. The pending ecological risk assessment process provides the basis for a broad scale assessment of the risks for bycatch species and a requirement for further remedial action where risks are identified as significant.

Proactive management of bycatch has been addressed to some extent in the initial BAPs although progress on a number of defined actions has been limited. The range of new provisions in the SESSF management plan and recommended conditions for the fishery management, such as discard and bycatch targets, harvest strategies and reference point setting for quota and non quota species and structured spatial management systems provides the basis for a much stronger management response to controlling and reducing bycatch levels.

Recommendation

16. "DEH recommends that section 8 of the draft SESSF management plan be amended to:

"(3A) For paragraph (3)(d), actions that must be required include, as appropriate:

- **a) defining and implementing appropriate bycatch limits; and**
- **b) setting targets for bycatch reduction; and**
- **c) implementing bycatch reduction measures within set time periods."**

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 minimizes impacts on the threatened ecological communities."

Information requirements

Information on interactions with protected species is collected via daily logbooks and the ISMP and fixed station surveys. More detailed information is collected on specific observer-supported initiatives such as the current trial of introducing auto-longlining in the hook, gillnet and trap sector and trials of seal excluder devices in the blue grenadier fishery of the SET sector. AFMA's assessment report indicates that daily logbooks provide for the recording of a range of information on protected species interactions, including type, depth and time of interaction, and length, weight, sex and approximate age of species encountered. AFMA also acknowledges that recording and reporting of protected species interactions are unreliable. AFMA intends to introduce a separate protected species reporting logbook in the near future to provide more detailed information on protected species interactions. AFMA and DEH are currently addressing

the improvement of reporting arrangements of protected species interactions including the development of new logbooks or other appropriate reporting requirements. AFMA intend to support the logbooks' introduction with an education program for operators including port visits.

AFMA's assessment report notes that while the ISMP provides for the collection and classification of a wide range of catch including protected species it is not designed to provide statistically robust data on protected species interactions. AFMA acknowledges that the proposed review of ISMP to improve the robustness of ISMP data can also consider protected species information.

The enhancement of information on protected species interactions would appear to be dependent on adequate observer support to independently verify information on at-sea interactions. AFMA provides a more comprehensive observer coverage to address compliance with major operational changes and national policy requirements, such as monitoring of factory trawler operations and their impacts on seals in the winter blue grenadier fishery off Tasmania and monitoring impacts on seabirds in accordance with the Commonwealth Threat Abatement Plan (TAP) for the Incidental Catch (or Bycatch) of Seabirds During Oceanic Longline Fishing Operations. Ongoing observer requirements to verify other protected species interactions across the SESSF are not defined in the current or proposed SESSF management regime. DEH has previously recommended under Principle 1 that the structured monitoring programs required under the SESSF management plan give priority to threatened and listed species interactions and define appropriate levels of observer coverage for the SESSF. DEH considers that observer coverage levels for protected species interactions should also be addressed as part of the development and introduction of new protected species logbooks and review of ISMP data collection systems and the BAPs.

The assessment report does not elaborate on research on protected species in the SESSF. There has been some research such as CSIRO's Great White Shark report and existing data to map sea lion colonies to inform permit conditions, but more specific research addressing protected species has mainly been confined to the seal excluder device trials in the blue grenadier fishery. DEH notes that the while the initial BAPs include proposed actions to investigate and minimize the injury and death of marine species caused by fishing gear, limited information has been obtained on species survivability to fishing activities and limited research, apart from the seal project, has been directed at this issue in the SESSF. Additionally the initial BAPs do not directly address the issue of provisioning and its impacts on protected and other non-target species. There is the potential for considerable impacts and changes in behaviour and foraging given the extent of discarding in some sectors of the fishery.

DEH considers further priority should be given to these issues in the revised BAPs.

Information on protected species has been provided to operators in the form of identification guides for species such as saw sharks and dogfish. AFMA assisted in the development of the South East Trawl Fishing Industry Association's (SETFIA) Code of

Fishing Practice that includes guides on identifying and handling seals encountered in the SET sector. The Gillnet, Hook and Trap sector has also released a Code of Conduct for Responsible Fishing that includes actions to pursue the achievement of the sustainability of stocks in the SESSF, addressing specifically protected species. AFMA intend to provide further information material on protected species in conjunction with the implementation of the new protected species logbooks.

Assessment

The BAPs provide the overall mechanism to monitor and address protected species interactions in various sectors of the fishery. The key issues identified in the initial BAPs included improving data collection methods, quantifying the extent of interactions with marine mammals, investigating methods to reduce impacts on marine mammals and other protected species, and increasing the education and awareness of the general community and industry on bycatch issues. DEH considers protected species considerations should be given further attention in the revised BAPs.

There are actual or potential interactions in the SESSF with a range of protected shark, seal and sea lion, cetacean, syngnathid, seabird and turtle species. No overall risk assessment has been undertaken to date on protected species in the SESSF, apart from the shark assessments in the hook, gillnet and trap sector discussed under Principle 1. The shark assessment identified as high risk, species such as Endeavour dogfish that are pending listing as a threatened species under the EPBC Act. The forthcoming ecological risk assessment process should provide further information on the scale of threats presented to protected species through SESSF fishing activities. AFMA will then use this information to develop and implement appropriate management responses to these threats.

Catch data from the fishery and recent research has indicated that the most prominent interactions with protected species within the SESSF are with great white sharks and fur seals.

Great white sharks are listed as vulnerable under the EPBC Act. The assessment report notes that the recent CSIRO review of the biology and status of white sharks in Australian waters indicated that the most impacts on great white sharks in the SESSF occur in the hook, gillnet and trap sector, where gillnets and longlines capture around 73 great white sharks each year, with around 50% released alive. The report considered the catch of great white sharks by demersal trawl to be very low and highly unlikely by droplines. AFMA notes the CSIRO report as indicating that the current catch of great white sharks in the SESSF did not present a major threat to survival of the species. AFMA's assessment report noted that for the other threatened shark species found in the SESSF, the grey nurse shark, 4 grey nurse sharks had been caught in the SESSF in the last 10 years. AFMA note in their assessment report that the critical habitats for grey nurse shark primarily fall within waters under State fisheries jurisdiction.

The main seal and sea lion species that occur in the SESSF are Australian and New Zealand fur seals and Australian sea lion. Other protected seal species such as

Subantarctic fur seals and Southern elephant seals sporadically range into the area of the SESSF but are not known to have significant interactions with SESSF fishing operations. The assessment report notes that there are no quantitative assessments of the impacts of fishing on Australian sea lions, Australian fur seals or New Zealand fur seals. The most significant interactions in the SESSF occur with Australian fur seals in the SET sector, although AFMA's assessment report also notes some seal deaths, although rare, result due to gillnets. Reliable catch data on seals across all the SESSF sectors is not available for this assessment. Based on estimations from ISMP sample data an average of around 720 seal are caught in the SET sector each year.

The available information and monitoring of seals and sea lion interactions in the SESSF indicates that around 90% of seal killed in the SESSF are males that can be readily replaced in the breeding populations. Recent fur seal research and available information from SESSF fishery logbooks, observer and incidental reporting indicates that populations of both Australian and New Zealand fur seal species are rising and that the SESSF does not pose an immediate threat to the populations of these species. Information on Australian sea lions is limited but AFMA's assessment report indicates from anecdotal evidence and low level of interaction recorded in the SESSF that the fishery is not a threat to sea lion populations.

AFMA acknowledges the need to obtain further data on seal interactions in the SESSF and develop seal mitigation measures to reduce catches of Australian fur seals. The National Seal Action Plan requires the estimation of sea lion and fur seal bycatch in gillnet, trawl, dropline and longline fisheries and quantification of interactions with fishing equipment. The initial BAPs for each of the SESSF sectors include actions to quantify and reduce impacts of fishing activities on marine mammals, although the focus of most data monitoring and mitigation action has been with fur seal interactions in the Tasmanian winter blue grenadier fishery. DEH consider that quantification of seal interactions across all sectors of the SESSF, in particular the trawl sectors, should be given greater priority in the revised BAPs.

The main interactions with other protected species in the SESSF are with some syngnathid species, cetaceans and some seabirds species.

AFMA's assessment report notes that impacts by SESSF fishing on sygnathids is mainly through Danish seine fishing on spiny pipefish. ISMP data records only limited interactions with white's and pot bellied seahorses and AFMA is confident that fishing impacts are not significant given the low numbers of these species caught and the limited range of their habitats trawled. AFMA acknowledge there is more uncertainty with the extent of impacts on spiny pipefish. While AFMA note in their assessment report that Danish seiners cannot operate over reef or rubble habitats that are thought to be preferred by spiny pipefish, the report also notes the uncertainty with the distribution and habitat preference of this species and that population sizes could be low. The 2002 Conservation Overview and Action Plan for Australian Threatened and Potentially Threatened Marine and Estuarine Fishes indicated limited evidence of a population decline in spiny pipefish but also recommended further research and baseline monitoring in the SET sector to

acquire baseline data on abundances, distribution and habitats. The initial BAPs for the trawl sectors both contain actions to quantify the extent of syngnathid interactions. Limited progress has been made to date and these actions need to be given priority under the revised BAPs.

AFMA acknowledges the difficulty in identifying pipefish species caught in trawl gear and have arranged for ISMP observers to cooperate with the University of Tasmania's Project Seahorse by retaining specimens of pipefish for further analysis.

AFMA's assessment report notes that ISMP data in the trawl sector and logbooks in the hook, gillnet and trap shark sector indicate very low interactions with seabirds. Oceanic Longline fishing has been identified as a key threatening process for seabirds under the EPBC Act. The seabird TAP requires less than 5 seabirds killed per 100,000 hooks set. AFMA notes that records in the SESSF indicate only one seabird killed for over 5,000,000 hooks set. A review of demersal longline operations prior to the current trial of automatic longlining in the SESSF observed 150,000 hooks set and hauled with no seabird mortalities. The current trial of automatic longlining, due for completion at the end of 2003, is subject to strict conditions under the seabird TAP including observer coverage for 25% of trips. AFMA's assessment report notes that scientific projects in the region such as the Australian Antarctic Division's project on cumulative impacts on Southern Ocean seabirds will provide further confirmation of fishery impacts on seabirds in the region.

The assessment report confines its assessment of cetacean interactions in the SESSF to dolphin species and notes that the only recorded capture and mortalities of dolphins are from gillnets, with 10 mortalities recorded over the last 2 years. The Action Plan of Australian Cetaceans does not list gillnetting as a threat to dolphin survival. While the SESSF is unlikely to have significant impact on dolphin species, DEH notes that AFMA's assessment report does not address growing concerns with the significant interactions reported to be occurring with killer whales in the SESSF. Recent press reports have noted substantial loss to killer whales of catch from line fishing, particularly drop line fishing for blue eye trevalla. While these interactions do not give an indication of being a threat to cetacean populations, DEH considers the revised BAPs need to give attention to assessing the extent and implications in terms of injury or mortalities due to these interactions.

Some protected turtle species such as leatherback turtles are known to occur in some areas of the SESSF but available records indicate interactions with fishing operations is very rare, with only one death in a gillnet recorded. Turtle ranges are generally outside the areas and gear depths of fishing operations of the SESSF.

There are several species occurring in the SESSF that are currently under consideration for listing as protected under the EPBC Act. Three deepwater dogfish species that are extremely vulnerable to the impacts of commercial fishing, Endeavour dogfish, Harrison's dogfish and southern dogfish, are currently under assessment for nomination as protected species under the EPBC Act. AFMA has acknowledged concerns with the

impacts of fishing operations on deepwater shark species and has established a combined trip limit of 150 kilograms in the SESSF as an interim measure to prevent targeting of these species while further data collection and mitigation measures are developed. DEH notes that AFMA will need to give priority to further measures to avoid all catch of these species to accord with the additional protection and recovery requirements for threatened species under the EPBC Act.

DEH also notes that eastern gemfish is under consideration for listing as a protected species under the EPBC Act and may require more significant monitoring, assessment and stock recovery actions than current management arrangements provide for it as a non-target quota species in the SESSF.

While there are no ecological communities in the area of the SESSF that are listed as threatened under the EPBC Act, the draft SESSF management plan, in the context of requirements for developing BAPS, needs to include explicit reference to protection afforded under the EPBC Act to listed threatened ecological communities in the event of one of these being declared in the SESSF during the lifetime of the management plan.

DEH therefore recommends that section 8(4)(b)(iv) of the draft SESSF management plan be amended to:

"(4) In developing a bycatch action plan, AFMA must take into account:

(b) the requirements under the EPBC Act for the protection of :

(iv) listed threatened ecological communities."

Management responses

The draft SESSF management plan includes specific requirements for fishers to take all reasonable steps to avoid interactions with cetaceans, listed threatened, migratory and marine species and listed ecological communities.

DEH's recommendations under Principle 1 concerning management responses to the outcomes of the ecological risk assessment process, establishment of spatial management systems, reductions in discarded species and mandatory use of bycatch mitigation measures after trial and development periods provide a suite of management options to minimise interactions with protected species.

A range of inshore spatial closures for shark fishing are in place or planned in Victoria, South Australia and Tasmania in the hook, gillnet and trap sector to aid the recovery of depleted school shark populations. These closures are potentially in areas of significant great white shark interactions and should assist in reducing great white shark interactions. Tagging studies are also conducted in the SESSF to obtain further information on biology and movement of great white sharks. A range of actions are required under the Commonwealth Recovery Plan for great white sharks including enhancement of monitoring and reporting of great white shark bycatch, identification of critical habitats

and development of measures to avoid great white shark interactions. DEH considers that further attention should be given to these matters under the revised BAP to ensure compliance with the objectives of the recovery plan.

A range of measures have been undertaken to address the high interactions with fur seals in the SET sector. In response to the high catch rates of seals in the winter blue grenadier fishery, a 3 year joint industry and scientific research project, focusing on factory trawlers in this fishery, has been undertaken to develop means of minimizing fur seal interactions and mortalities in the trawl sectors. Initiatives tested under the project include:

- the development of an industry *Code of Fishing Practice to Minimise Incidental By-catch of Marine Mammals in the South East Trawl Fishery* that includes a range of measures such as gear deployment and offal discharge mitigation measures to avoid seal captures;
- seal catch cap limits, move-on and other avoidance provisions;
- review of ISMP data to quantify seal interactions;
- 25% observer coverage to monitor catch and seal interactions;
- trial of seal excluder devices (SEDs) to reduce seal mortalities;
- biological analysis of seal bycatch, dietary analysis and satellite tracking of seal movements.

Preliminary results from the trial suggest that in combination these measures are helping to reduce seal captures in this particular fishery. SEDs trialed included various configurations of steel grids and escape hatches and while results so far are not conclusive in reducing seal bycatch and mortality, further trials are planned in 2003 to determine the most effective designs. AFMA has funded a further project to address seal bycatch by other trawlers in the SET sector. The project included monitoring of seal interactions, review of existing research on population dynamics and trophic impacts and stakeholder workshops to examine available seal bycatch mitigation measures.

The Natural Resource Management Marine and Coastal Committee recently agreed to establish a working group to facilitate complementary approaches to seal conservation, research and management. The working group will include representatives of AFMA, DEH, the National Oceans Office and relevant State fisheries and environmental agencies, and receive advice, where necessary, from conservation groups, scientists and fishing industry.

DEH considers these are positive steps and, given the growing fur seal populations across the area of the fishery, the uptake of the outcomes of the seal bycatch reduction projects should be given high priority in the revised BAPs. In particular, the voluntary code of practice contains a range of measures that have proved effective for factory trawlers in the blue grenadier fishery in avoiding seal interactions and should be adopted for all vessels in the trawl sectors.

DEH considers that further attention needs to be given to determining and addressing the impacts on pipefish, particularly in the SET sector. Given the uncertainty with the impacts on syngnathids, AFMA has prohibited the retention of syngnathids caught in the SET sector as a means of discouraging targeting of these species. DEH considers that this uncertainty should be addressed by giving initial priority to pipefish species in the ecological risk assessment process so that appropriate response strategies can be developed. AFMA's assessment report indicates that avoidance of syngnathid habitats is the most effective means of preventing their incidental deaths from trawl activity. DEH suggests that AFMA should use outcomes from habitat mapping projects and other available fishing effort data to examine suitable spatial closure options under the recommended system of spatial management. DEH also considers that priority should also be given in the revised BAPs to improving the monitoring of syngnathids to quantify the extent of impacts in the trawl sectors and improve understanding of key characteristics such as abundance, distribution and habitat preference.

AFMA has implemented a number of measures to address the primary threat to seabirds in the SESSF from auto-longlining, including:

- an assessment report on management options for mitigating potential seabird interactions;
- conditions for the current trials of auto-longlining consistent with the seabird TAP for long line fishing, such as bird scaring tori lines, 15,000 hook limit, 25% observer coverage, approved baiting systems and VMS coverage;
- review of measures before further development of auto-longlining.

While the existing impacts of the fishery on seabirds do not appear significant, DEH considers that an expansion of auto-longlining could change the extent of impacts.. Appropriate mitigation measures that may warrant further investigation include integrated weights in auto longlines and use of fish meal plants. Additional actions should include observer and ongoing sampling programs that allow for an assessment of seabird interactions across a wider range of the SESSF sectors than previous reviews. A number of albatross and giant-petrel species listed under the EPBC Act frequent the areas of the SESSF and feed on key species that are targeted in the SESSF, such as squid. DEH considers the trophic implications of fishing the food resources of seabirds should be given careful consideration in assessing the impacts on seabirds under the ecological risk assessment process.

DEH notes that the area closures and gillnet restrictions can contribute to minimizing cetacean interactions, particularly with dolphins. Apart from monitoring the use of 'pinger' technology, the assessment report and current BAPs do not address cetacean impacts to any extent. While there is little evidence of the SESSF having a detrimental impact on cetacean populations, the previously mentioned issue of whale interactions with line fishing needs to be addressed in the revised BAPs and reported through the new protected species logbooks or other agreed arrangements. DEH notes that the issue of cetacean interactions with line fisheries has been given attention recently in regional forums such as the South Pacific Regional Environment Program and the outcomes from

this and other forums should be considered in assessing and developing suitable management response actions for cetaceans in the SESSF.

As there are a number of generic management enhancements suggested above for a range of protected species, DEH's recommendations for all species are provided following the Conclusions below as a suite of conditions in Recommendation 18.

Conclusions

DEH is satisfied that the SESSF is generally conducted in a manner that aims to minimise and avoid death and injuries to protected species and that ongoing populations of protected species are not under significant threat from the fishing activities of the SESSF. This system could be strengthened to minimise the risk of unacceptable impact on certain species through the implementation of the recommendations below.

The revised BAPs should include an increased focus on actions to assess and reduce protected species interactions. The recommendations below should be incorporated into specific revised BAP actions along with actions that stem from the pending ecological risk assessment process and the recommended spatial management system and bycatch mitigation measures proposed by DEH under Principle 1.

Quantifying the extent of protected species interactions in the SESSF through improved data collection programs and reporting arrangements will be a key priority in addressing the uncertainty with the impacts on some protected species in the SESSF and meeting obligations under the EPBC Act. Data collection and reporting requirements should be key actions in the revised BAPs.

Recommendations

17. DEH recommends that section 8(4)(b)(iv) of the draft SESSF management plan be amended to:

"(4) In developing a bycatch action plan, AFMA must take into account:

(b) the requirements under the EPBC Act for the protection of :

(iv) listed threatened ecological communities."

18. AFMA, in consultation with industry, DEH, researchers and other stakeholders, to further assess and reduce the extent of interactions of seals, cetaceans and seabirds across all sectors of the SESSF, and interactions with syngnathids in the trawl sectors and white sharks in the gillnet and hook sector. AFMA will, for all of the above species:

- **within 12 months, establish robust data collection and reporting systems to quantify the extent of interactions; and**
- **within 3 years assess, trial and implement as appropriate mitigation or avoidance measures including further trials of bycatch exclusion devices and spatial or temporal closures.**

For seals and sea lions, AFMA will, within 18 months, extend across the trawl sectors management measures assessed as effective to help reduce interactions with seals and sea lions.

For syngnathid and seabird species, AFMA will, within two years, assess under the ecological risk assessment process the risks of fishing activities in the SESSF to syngnathid and seabird species and develop appropriate management responses to the outcomes of the ecological risk assessment.

Minimising ecological impacts of fishing operations

Objective 3 – "The fishery is conducted in a manner that minimizes the impact of fishing operations on the ecosystem generally"

Information requirements

The management regime contains some provisions that directly relate to the wider ecological implications of fishing in the SESSF. The provisions in the draft SESSF management plan relevant to structured monitoring programs on the impacts of fishing includes requirements to monitor the impacts on ecologically-related species and the marine environment and implement strategies to ensure their sustainability.
A wide range of both fishery dependent and independent information has been collected across the various sectors of the SESSF to help inform these measures, such as catch and effort data, bycatch data, spatial fishing effort data, research on species distribution, dietary requirements, feeding habits and primary production and oceanographic patterns in the region. However information collection has been more focussed on single species stock assessment and not collected in a way that could make a systematic analysis of the impact of the SESSF on the broader marine ecosystem.

ISMP programs or equivalent established for all sectors of the fishery are building information on the species structure for various regions across the fishery. The longstanding catch and effort data records that exist across the fishery have provided the basis for initial mapping of spatial fishing effort across the fishery that has also contributed to the regional marine planning process under Australia's Oceans Policy. Further research projects such as CSIRO's 5 year study of the southeastern Australian continental shelf and the current joint CSIRO and industry fishing effort and habitat mapping project discussed under Principle 1 have used existing scientific and fishing industry data and knowledge of the shelf and upper slope fishing grounds to provide better understanding of the impacts of trawling on species communities and assist with the development of strategies for an ecologically sustainable fishery.

Some targeted research on ecosystem dynamics has been undertaken that will support the pending ecological risk assessment process for the SESSF. A current CSIRO project "Trophic dynamics of the eastern shelf and slope of the South East Fishery: impacts of and on the fishery" is expected to develop food web models, assess changes resulting from increases in marine mammals and reductions in fishery discarding, and provide a quantitative assessment of food web related risks.

In addition to specific research projects, the National Oceans Office, as part of the development of the South East Regional Marine Plan, has made available additional bioregionalisation assessments for areas outside 200 metres depth that provide further information on the wider marine environment in which the fishery operates.

AFMA's 5 year strategic research plan for Commonwealth fisheries includes amongst its key research areas identifying effects of fishing on benthic and other habitats and on other changes to the marine environment such as trophic dynamics, food web sand species assemblages, and developing suitable amelioration strategies. The data collection and research programs in the SESSF management regime do not currently appear to be structured to fully address these issues in a systematic process. DEH considers that the systematic data requirements for ecosystem impacts be further examined in the context of the current review of the BAPs and revised strategic research plans for the respective SESSF sectors, along with the proposed plan to strategically implement the outcomes of the ecological risk assessment process and the priorities for the structured monitoring programs on fishing impacts (discussed under Principle 1).

Assessment

Limited specific information is available on impacts of fishing in the SESSF on the general ecosystem components of the environment in which the fishery is located. Risk assessments have yet to be conducted on the impacts on ecological communities, food chains or the physical environment. AFMA's assessment report notes that risk assessment of these aspects will be included in the formal ecological risk assessment process for the SESSF to be implemented in 2003.

AFMA's assessment report identifies impacts on seabed habitats by demersal trawling as the most significant ecosystem impact by SESSF fishing, although the submission also notes that the extent of impacts on bycatch and the broader ecosystem are currently unknown. The assessment report also notes that more passive and targeted fishing techniques in the gillnet, hook and trap sector, with lower bycatch rates and less direct contact with benthic communities and seabed habitats than the trawl sectors, would have a low impact on the broader ecosystem covered by the SESSF. While overall impacts may be low DEH considers that intensive fishing by non-trawl methods may have significant localized impacts on some vulnerable areas such as refuge or spawning grounds, particularly where areas overlap with trawling grounds.

AFMA acknowledges in the assessment report that demersal trawling impacts on seabed habitats are poorly understood in the SESSF. There is no established systematic process

or trawl impact models to monitor and assess the intensity of trawl effort, rate of species removals and capacity to recover between trawls, location of trawling in relation to vulnerable seabed communities, and determine effects of different gear types.

Some preliminary research has been conducted on classifying the seabed habitat types in the SESSF and their vulnerability to trawling, along with research on feeding interactions of benthic communities and other environmental influences such as changes in hydrodynamic climates. AFMA is relying on the current CSIRO and industry joint fishing effort and habitat mapping project to more closely identify the extent of aggregation of trawling effort and trawled grounds in the SET sector and provide further video footage on the comparative impacts on trawled and untrawled grounds. The joint CSIRO and Queensland Department of Primary Industries (QDPI) study between 1991 and 1996 previously identified certain impacts of trawling on seabed fauna between trawled and untrawled grounds. These included significant depletions when repeatedly trawling over the same grounds and that heavily trawled areas more likely to support faster growing, more robust species than slow growing more "trawl vulnerable" species (many of which can be found in the cooler temperate deep waters of the SESSF).

GIS mapping of trawl effort by BRS in the SET sector indicates that intensive trawling is confined to a low proportion of the overall management area of the fishery (less than 5%), and is concentrated on historical fishing grounds. AFMA's assessment report suggests that most trawling still occurs in the historical shelf break areas to the east of Bass Strait off southern NSW where the available shelf break trawlable grounds has previously been estimated by independent surveys to be of the order of 30%. AFMA note unconfirmed information from fishers indicating trawling in the waters less than 1,000 metres west of Bass Strait to be less than 5% of the fishery area. AFMA also note that the GABT sector fishes an even smaller proportion of the SESSF area than the SET sector.

AFMA acknowledge that in a multi species fishery like the SESSF the ecological relationships and food chain linkages are very complex and difficult to assess. AFMA's assessment report notes a range of scientific studies on faunal structure and trophic linkages in the SESSF has indicated that pelagic oceanic production supports many commercial species, crustaceans and squid are key species in the food chains, commercial species such as redfish are part of the prey for many other commercial species and that predator-prey relationships are loose. AFMA will be relying on the current CSIRO trophodynamics project and the formal ecological risk assessment process to identify further ecological risks to the food chains from bycatch removal.

DEH considers that given the acknowledged importance of crustaceans, squid, small midwater fish and commercial species such as whiting and redfish in the diets of many species in the food chain, priority needs to be given to these species in determining responses to identified ecological risks that take account of the broader ecological implications. Similarly, as recent data and studies show that the populations of several top order predator species such as whales and seals are increasing in the SESSF area, appropriate management responses to the growing competition for species targeted by the

fishery needs to be addressed in the revised BAPs and management outcomes to the ecological risk assessment process.

AFMA acknowledges that discarding can affect a change in the feeding system for marine mammals and seabirds through habituation to the fishery. The SEF fishery assessment report notes that the trophic implications of bycatch and discarding practices are poorly understood. While the level of discarding is reported in fishery assessment reports and considered in the stock assessment process for quota species the ecological implications of discarding are not specifically monitored or addressed in the initial BAPs. Provisioning of species through discarding has the capacity to impact on a range of scavenging animals, particularly seabirds. AFMA is relying on the CSIRO trophodynamics project and formal ecological risk assessment process to identify significant risks from discarding on the various components of the ecosystem before developing appropriate management responses. DEH has already made recommendations concerning the reduction of discard levels and risk assessment to address the dietary requirements of seabirds, and considers that the ecological implications of discarding should be given further attention in the revised BAPs.

AFMA's assessment report notes that the major non-fishing gear related impacts on habitats of the fishery relate to water quality. As discussed under Part 1 of this report, operators are required to comply with strict regulations concerning disposal of garbage and other wastes and compliance is understood to be high. The size of the fishery and broad areas covered by most fishing trips operations suggests that limited impact is made on the water quality of the overall fishery by offal discharge and other biological discarding. Given the dynamic nature of offshore currents in the southern regions it is highly likely that discharged matter that is not taken by scavengers is dispersed by currents in the water column systems before causing localized build up of nutrients on sea floor substrates.

Management responses

Specific ecosystem-based management responses are limited in the SESSF at this stage. AFMA is primarily relying on the implementation of the ecological risk assessment process and outcomes of current habitat mapping and trophodynamic studies before developing specific management responses to the impacts of fishing activities on ecologically related or dependent species.

The provisions in the draft SESSF management plan to establish harvest strategies will require AFMA to give further consideration to the ecological implications of harvesting both quota and non quota species, and for this to be reflected in the relevant reference points and associated management decision rules. DEH has previously recommended in this report that changes be made to the draft SESSF management plan to provide for the TAC to take account of the ecological implications of harvesting, such as bycatch implications of targeting certain species in particular areas or with particular gear types.

Other recommendations DEH has made earlier in this report should contribute substantially towards addressing ecosystem wide impacts of fishing activity in the

SESSF. Recommendations concerning management responses to the ecological risk assessment process include the requirement to take account of impacts on integral ecosystem-wide factors such as key species in the food chain, species with low productivity, cumulative gear impacts or areas of localized depletion. The recommended reductions in bycatch levels across the SESSF and the emphasis on use of bycatch mitigation measures provides for minimizing the impacts of the fishery on the food chain structures and productivity of the ecosystem. Further development and implementation of gear modifications currently being trialed such as seal excluder devices and various trawl mesh configurations to minimize bycatch are particularly important measures to reduce the impacts of removing non targets species form the ecosystem, such as undersize quota species like redfish, that are key components in the SESSF food chain.

DEH considers that the extent of spatial management across the SESSF is currently inappropriate to effectively address the size of the area and diversity of ecosystem components. The recommended system of spatial and temporal management provides for closures to be established to address more sensitive areas such as spawning grounds, highly productive shelf break areas, fragile benthic habitats such as corals and sponge beds, cumulative impacts of different gear types targeting the same species across its lifecycle and localized impacts on both commercial target and protected species, and for a more precautionary expansion into previously unfished areas.

The National Representative System of Marine Protected Areas (NRSMPA) process coordinated by DEH has established several marine protected areas within the area of the SESSF including the Great Australian Bight Marine Park, Tasmanian Seamounts Marine Reserve and the Lord Howe Island Marine Park. A suite of newly created State marine reserves have also been established under the NRSMPA process along the Victorian coast. These MPAs provide comprehensive protection to benthic communities and habitats by precluding demersal trawling in most areas of these reserves.

Broad areas of interest for potential marine protected areas are being identified under the regional marine planning process for the south east region under the South East Regional Marine Plan (SERMP) currently being developed by the National Oceans Office in consultation with a wide range of government and non government stakeholders in the region. These broad areas of interest, based on bioregions that have been determined on a combination of geology, biogeomorphic features, ocean currents, biota and associated ecosystem processes and habitats. They have been identified across a range of areas in the SESSF and will be subject to further assessment to determine their suitability for management as protected areas. The proposed system of spatial management for the SESSF will build on, and as appropriate be integrated with, the NRSMPA process to more appropriately address the spatial variability across the south east ecosystem.

AFMA has established the South East Trawl Fishery Ecological Advisory Group (SETFEAG), initially focused on the SET sector but proposed to address all sectors of the SESSF, to provide advice on appropriate responses to environmental impacts of the fishery. SETFEAG provides the opportunity to consider the broader ecosystem impacts of fishing operations across all sectors and implement management measures consistent

with an ecosystem-based management approach. AFMA expect SETFEAG to play a key role in developing management responses to the ecological risk assessment process, including development of ecological decision rules and models to trigger management responses to ecosystem indicators. The outcomes of the current CSIRO project "Ecological indicators for fishery management: non-target species, habitats and food chains" are expected to assist with establishing appropriate ecosystem indicators for this process.

Conclusions

Recommendations made previously in this report to improve the sustainable management of both targeted and bycatch species across the fishery, including a structured process of spatial management appropriate to the scale and diversity of the fishery, should also substantially contribute to minimizing the impacts of fishing operations on the broader ecosystem.

The ecological risk assessment process and current research projects in trophodynamics and habitat mapping will assist in quantifying the risk to various ecosystem components and developing appropriate management responses. However the current research and data collection approach to ecosystem impacts appears unstructured and in need of a greater focus on areas such as the impacts of trawling and bycatch to provide confidence that significant ecosystem impacts are factored into the management arrangements.

The high levels of bycatch and discarding are significant factors impacting on the broader ecosystem of the SESSF, particularly for the trawl sectors. The proposed harvest strategies and revised BAPs need to take a more ecosystem level approach on bycatch issues such as defining actions to address provisioning through discarding and factoring the trophic implications of species into the determination of catch rates, reference points and decision rules.

List of Acronyms

AFMA	Australian Fisheries Management Authority
AFZ	Australian Fishing Zone
BAP	Bycatch Action Plan
BRD	Bycatch Reduction Device
BRS	Bureau of Rural Sciences
CSIRO	Commonwealth Scientific and Industrial Research Organisation
DEH	Department of the Environment and Heritage
ECDZ	East Coast Deepwater Zone
EPBC Act	*Environment Protection and Biodiversity Conservation Act 1999*
ESD	Ecologically Sustainable Development
FAG	Fishery Assessment Group
FRDC	Fisheries Research and Development Corporation
ISMP	Integrated Scientific Monitoring Programs
ITQ	Individually Transferable Quota
MAC	Management Advisory Committee
MAFRI	Marine and Freshwater Research Institute (Victoria)
MARPOL	International Convention on Marine Pollution
NRSMPA	National Representative System of Marine Protected Areas
OCS	Offshore Constitutional Settlement
SEFAG	South East Fishery Assessment Group
SENT	South East Non Trawl
SERMP	South East Regional Marine Plan
SESSF	Southern and Eastern Scalefish and Shark Fishery
SET	South East Trawl
SETFEAG	South East Trawl Fishery Ecological Advisory Group
SETFIA	South East Trawl Fishing Industry Association
SFR	Statutory Fishing Right
SSF	Southern Shark Fishery
TAC	Total Allowable Catch
UNCLOS	United Nations Convention on the Law of the Sea
VITF	Victorian Inshore Trawl Fishery
VMS	Vessel Monitoring System
WTO	Wildlife Trade Operation

Attachment A

Summary of SESS Fishery - by relevant sectors

History	SESSF is amalgamation of 4 existing fisheries – South East Trawl (to become SET sector), Great Australian Bight Trawl (to become GABT sector), South East Non Trawl (SENT) and Southern Shark (to become hook, gillnet and trap sector). SESSF officially in place when SESSF management plan comes into effect in 2003. Background of former fisheries is: Southern Shark – operating since 1927, with gillnetting the main source of shark fishing since the early 1970s. South East Non Trawl - hook and line methods in operation since the early 1900s. South East Trawl – developed from steam trawlers in early 1900s fishing the continental shelf species in depths of less than 200m, to Danish seiners from 1950s to 1970s to progressively larger trawlers targeting deepwater species such as orange roughy and blue grenadier. Great Australian Bight Trawl – opportunistic demersal trawling from 1912, expanded in the late 1980's with development of orange roughy fishing.
Area	SESSF overall from 80nm off Fraser Island, Qld to Cape Leeuwin in WA. Complex area coverage for individual sectors. General sector coverage includes: Hook, gillnet and trap sector - Gillnet fishing in waters from the NSW/ Vic border to the SA/ WA border including waters around Tasmania from the low water mark to the extent of the AFZ. Hook fishing in all the AFZ waters off SA, VIC, TAS to the low water mark and waters off south. Qld (south of Sandy Cape) and NSW outside 60-80 nm from the coast. Trap fishing in hook fishing area north of 42 degrees 20' S. South east Trawl sector- including Victorian Inshore Trawl and East Coast Deepwater Zone – from waters south of Sandy Cape Qld to Cape Jarvis off SA, except for waters inside 25nm around Lord Howe Is., inside of 3nm off the Tasmanian and SA coasts, inside 3nm off NSW coast S of Barrenjoey Point and out to 80 nm off the NSW coast N of Barrenjoey Pt. and out to 80nm off Qld coast.

	Great Australian Bight Trawl fishery- incorporates trawling in AFZ waters from Cape Jervis to Cape Leeuwin, WA, except for most eastern and western continental shelf waters out to the 200m. bathymetric line.
Gear	Hook, gillnet and trap sector - gillnet demersal longlines, droplines, hand lines and traps SET sector - Demersal otter trawls, Danish seines, mid water trawls, demersal deepwater prawn trawling GABT - Demersal otter trawls, mid water trawls.
Management Arrangements: Commercial	Output controls - individual transferable quotas allocated as Statutory Fishing Rights (SFRs) from annual TAC for target species in hook, gillnet and trap sector and SET sector and for major byproduct species in GABT and gillnet sectors. Legal minimum catch lengths and bycatch limits for some species. Input controls SESSF – limited entry and mesh size restrictions. Additional sector input controls - Vessel size restrictions for GABT. Trap numbers and dimensions, gear setting depth limits, hook numbers and gillnet length restrictions for hook, gillnet and trap sector.
Fleet	Approximately 210 active vessels in the SESSF. Some operators may have a number of licences for different fishery methods. SET sector- 120 eligible concessions, 90 active inshore and deepwater trawlers (20 Danish seiners, remainder otter board trawlers) GABT sector - 10 vessels Hook, gillnet and trap sector - 145 line licences although only about 12 vessels currently operate in the fishery full time using demersal longlines and droplines. 5 trap operators, although only one active operator currently. 191 shark fishing permit holders, about 60-90 vessels actively operating.
Target Species	Around 390 species of finfish and invertebrates caught in the entire SESSF, with approx 85 species targeted. Hook, gillnet and trap sector – main shark gillnet target species gummy shark, with minor targets school shark, sawshark and elephant fish. Main hook and line target species blue eye trevalla, ling and blue warehou. Main trap target species is ling. SET sector- main target commercial species are blue grenadier, flathead, spotted warehou, orange roughy and ling. GABT sector- targets mainly deepwater flathead and Bight redfish or orange roughy.

Commercial harvest catch	2001 total landed catch 35,192 t. comprising 81% from SETF (28,000t), 7% from GABTF (2,200t), 3% from hook and trap sector and 9% from gillnet sector. Around 82% of landed catch taken from 22 quota managed species and primary target species in GABT.
Value	Total SESSF value around $95 million - $72 million SET sector, $7 million GABT sector, $16 million hook, gillnet and trap sector.
Bycatch Species	SET sector – high levels of bycatch, several hundred species recorded as caught but mostly in low amounts, 35% discard rate. GABT sector – high levels of bycatch, approx 180 species caught, discard rates of 37 %, although low volume of bycatch due to small number of operators in fishery. Hook, gillnet and trap sector – low levels of bycatch due to more targeted fishing methods.
Byproduct	SET sector – around 100 species retained as byproduct, several quota species taken primarily as byproduct, eg. Silver trevally, ocean perch, john dory, eastern gemfish, sawshark, elephant fish. Major non-quota byproduct species are oreos, barracouta, ribbonfish, hapuka, king dory, black shark, alfonsino and arrow squid. GABT sector – around 80 species retained as byproduct. Major byproduct catches are leatherjackets, arrow squid, boarfish, angel shark and quota species from SET sector such as jackass morwong and western gemfish. Hook, gillnet and trap sector - Elephant fish and sawshark are a major byproduct for gillnets, . Common and southern sawshark main byproduct mainly taken in gillnets. Hapuka, ocean perch and ribaldo main byproduct species.
Fishery status/ development stage	5 quota species in SESSF overfished - Orange roughy, eastern gemfish, redfish, blue warehou and school shark. 9 other quota species categorised as uncertain stock status - blue eye trevalla, eastern school whiting, john dory, royal red prawn, silver trevally, spotted warehou, ling and western gemfish; plus three GABT target species (bight redfish, deepwater flathead and orange roughy) not managed under quota. Remainder quota species including gummy shark, tiger flathead, blue grenadier, jackass morwong, ocean perch fully fished or not assessed (elephant fish and sawshark).
Stock assessment	Good reliability for eastern gemfish, blue grenadier, orange roughy and school shark with reference biomass level targets and integrated stock assessment

reliability	models (4 species). Moderate for blue warehou, redfish, tiger flathead, bight redfish, deepwater flathead, school whiting, ling, redfish and gummy shark with assessments primarily dependent on catch rates and size and age composition (9 species). Ongoing quantitative assessments for blue grenadier, blue and spotted warehou, eastern gemfish, orange roughy, redfish, school and gummy sharks (8 species) with periodic assessment workshops and working groups for eastern school whiting, blue eye trevalla, ling and flathead (4 species). Limited stock assessment information on remaining species.
Bait species	Not applicable for the trawl / gillnet sectors. Drawn from other fisheries for the hook sector eg jack mackerel, salmon from small pelagic fishery.
Export	Main export products from SESSF include shark fins and cartilage, blue grenadier, school whiting, orange roughy, ling and blue eye trevalla.
Endangered/ Threatened/ Protected species interactions	SET sector – most significant interactions with Australian and New Zealand fur seals and spiny pipefish. Minor interactions with great white shark, White's seahorse. Hook, gillnet and trap sector – Most significant interactions with great white sharks, killer whales. Minor interactions with seabirds such as mutton birds and albatrosses, fur seals, sea lions and turtles. GABT sector – potential interactions with syngnathids but no significant interactions recorded.
Ecosystem impacts	Most significant impacts by trawl sectors on the benthic environment. Magnitude of impacts not quantified. Low impacts from other forms of fishing.
Recreational component – management	All recreational fishing is managed by State fishing agencies. State minimum size and / or bag limits for all quota and target species in the SEESF. Catches of several commercial species in SESSF also targeted by recreational fishers including flathead, blue warehou, john dory, school whiting, shark species and silver trevally. Recreational catch estimates derived from National Recreational and Indigenous Fishing Survey.