

Independent Review
Proposed Management Arrangements
for Queensland's East Coast Inshore Fin
Fish Fishery*

By

John Gunn, Frank Meere and John Stevens

*Review commissioned by the Hon Peter Garrett MP, Minister for the
Environment, Heritage and the Arts

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Executive Summary

The East Coast Inshore Fin Fish Fishery (ECIFF) is a complex multispecies, multi gear (multiple net types and line) fishery with more than 400 commercial fishers and some 750,000 recreational and charter fishers. Recreational fishers are believed to take at least half of the catch. The fishery has a large geographical footprint, extending from Cape York to the New South Wales border, the majority of which is in a World Heritage Area (WHA) encompassing the Great Barrier Reef Marine Park (GBRMP).

The ECIFF had a total catch of 5,700 t in 2006 and a gross value of production (GVP) of approximately \$23 million, which are of average size for an Australian fishery. Export markets exist for mullet roe, shark and small mackerel products. The remainder of the product is sold on the domestic market. Fishing operations tend to be small scale, multi-apparatus and often associated with other Queensland fisheries or alternative on-shore employment. The information available suggests that mean boat days per year have varied little over the last decade (between 50 and 60) and with the vast majority of operators catching between 1 and 15 t per year.

The fishery is currently managed primarily by a complex set of input controls with few firm catch limits (competitive total allowable catch -TACs) on target species. There is also scope for operators in the fishery to interact with a range of protected species, in particular dugong, turtles, sawfish, dolphins and sometimes whales.

In reviewing the proposed new management arrangements for the fishery, the Panel was asked to pay particular attention to the shark sector of the fishery, the potential for interactions with protected species, the need to limit effort in the fishery, the level of information required to effectively manage the fishery, data validation and performance measures and management responses.

The Panel was struck by the complexity of management arrangements in this fishery and the lack of knowledge of the status of resources which sustain it.

In submissions to and discussions with the Panel, DPI&F fishery managers noted the scale (geographic, numbers of operators and economic value), sectoral complexity, and management challenges of the ECIFF. They also emphasized the inter-dependence of management arrangements for different commercial sectors and between those for the commercial and recreational sectors.

In developing ecologically sustainable management arrangements for this fishery, ECIFF managers have given significant consideration to social factors such as maintenance of regional, lifestyle and large-scale commercial fisheries, and to resource sharing. It is clear that the proposed new management arrangements were developed after extensive consultation with many stakeholders, and represent a negotiated and complex balance of measures among commercial sectors and between the commercial and recreational sectors.

The Panel has concerns that the complexity and interdependency of the proposed arrangements, coupled with the relatively low value of the fishery, the large number of operators and the vast geographical distribution, constrain management options and responsiveness in relation to critical effort controls, catch limits, catch data collection, observer coverage and compliance programs.

While it is important that social and economic issues are considered in the ESD framework, particularly given that access in this fishery is shared between competing users, the Panel believes that even greater weighting should be given to ecological/sustainability considerations since the fishery operates (at least in part) in the GBRWHA. Such a shift in emphasis would be more in line with contemporary application of the ESD principles.

The Panel noted that in a best practice fisheries management framework, the scale of a fishery (geographic, landed volume, value and number of operators) should not dictate the levels of risk accepted by managers, nor the fisheries management arrangements applied to minimizing the ecological risk. In the case of the ECIFF the Panel is of the view that its location within a World Heritage Area, the ecological risk profiles of target and by-product species, and the known (and potential) interactions with protected species should be the primary determinants of the management framework and resources applied to the fishery.

There is no doubt that the proposed new management arrangements are a very positive step in the development of the ECIFF, and an improvement over existing management arrangements. However the Panel is of the view that these need to be further improved given the geographical location of the fishery, the majority of which is in a WHA encompassing the GBRMP. In addition, the species taken, which includes a range of shark species, and the scope for interactions with a wide range of protected species are of concern. There is also scope for a substantial increase in effective effort, which is of concern.

Given the lack of data available to gauge sustainability and manage the fishery, the limited information on the species composition of shark catches, and the fact that these species are taken by other sectors, the Panel considers that the proposed management arrangements pose a high risk to the sustainability of target and byproduct species, to protected species and potentially to the broader ecosystem. In the Panel's judgement the proposed measures do not adequately reflect a precautionary approach to managing the fishery in the face of the considerable unknowns and the high risks associated with these. The clear message, in the face of this uncertainty, is the need to lower catches and effort and hence reduce the risk.

The Panel has therefore suggested an integrated suite of conditions and recommendations, which if implemented as a package, will help move the management of the fishery towards "best practice" over a period of time (see summary below).

The Panel also considers that DPI&F should carefully consider future management options for the ECIFF. If these are to be based on managing effort they should provide for individual effort units and they will need to develop a system which assesses and quantifies annual effort creep and provides a mechanism to adjust effort in response to increases in effort. Alternatively they may wish to consider management models which implement firm catch limits for all key species and allow autonomous adjustment of the fleet as catch limits change.

Summary of recommended conditions and recommendations

Conditions/Recommendations

Data Issues

Condition 1: DPI&F to introduce a logbook for the ECIFF by 1 February 2009, that will provide information on all catches, discards, better recording of effort and species-specific data on shark catch (linked to new ID guide) including as a minimum:

- blacktip (*C. tilstoni* & *C. limbatus*);
- spot-tail (*C. sorrah*);
- milk (*R. acutus*, *R. taylori*); and
- hammerhead (*Sphyrna* spp)

and where necessary the product form of shark. Completion of the logbook while at sea should be mandatory.

Condition 2: By 1 July 2009, DPI&F to obtain estimates of take of ECIFF target species, split by species, from other Queensland fisheries, recreational fishing and indigenous fishing, with a particular focus on shark catch and mortality. These estimates should be updated regularly and factored into estimates of total catch and sustainability.

Observer Program

Condition 3: DPI&F to implement a statistically robust observer program by 31 December 2009, with an appropriate level of coverage to validate logbook estimates of total removals, species composition data for difficult-to-identify shark species, discard levels and interaction with protected species across all sectors of the commercial fishery.

Recommendation 1: There should be annual analysis and public reporting of observer data.

Shark Species Stock Status Concerns

Condition 4: By 31 December 2010 DPI&F to develop and implement a harvest strategy for shark catches (all species) in the ECIFF. The strategy should set limits to prevent a significant change in the species mix of sharks.

Condition 5: By 31 December 2010, DPI&F to implement an appropriate research program to determine exploitation rates for all commonly caught shark species, including tagging studies as appropriate.

Condition 6: By 31 December 2011, DPI&F to work with other relevant jurisdictions to develop and implement a stock assessment model for blacktip and spot-tail shark in the ECIFF.

Recommendation 2: DPI&F to increase research on shark species in the ECIFF to address the following areas:

- update demographic parameters and risk assessments;
- standardise catch rates of the main target shark species;
- spatial heterogeneity of shark species taken in the ECIFF, particularly inshore listed and highly vulnerable species;
- post-release survival of hook and net caught sharks from recreational and commercial sectors.

Recommendation 3: DPI&F to continue education programs across all sectors on species identification, safe handling and release procedures and conservation.

Protected Species

Recommendation 4: DPI&F to include in the annual reporting on the ECIFF, estimates of interactions and mortality of protected species based on the SOCI logbook, the observer program and surveillance and compliance information.

Condition 7: DPI&F to examine and report by 31 December 2009 on the conservation benefits of a closure of waters north of Cooktown to mesh net fishing to provide additional protection to dugong and sawfish.

Recommendation 5: DPI&F to continue education programs across all sectors on species identification, safe handling, release procedures and conservation.

Effort management

Condition 8: By 1 February 2009, DPI&F to review and lower the proposed trigger for effort from 34,000 net days to more closely reflect the average level of effort in the fishery over the last two years.

Condition 9: By 1 February 2009, DPI&F to develop and implement an appropriate management response to triggering of the effort cap.

Condition 10: DPI&F to develop and implement by 1 July 2009 a standardised unit of effort for both net and line fishing in the ECIFF.

Localized depletion/Spatial Management

Condition 11: DPI&F to conduct a review seeking broad public and scientific input on the use of spatial management in the ECIFF to reduce the potential for localised depletion of key species (ie grey mackerel but also garfish) and interactions with protected species such as dugong, inshore dolphins and humpback whales. The findings are to be implemented by the 31 December 2010.

Management Arrangements

Condition 12: DPI&F is to review and set a TAC of less than 700 tonnes for the shark fishery by 1 July 2009. Based on this revised TAC, DPI&F should review the desirability of management arrangements which provide for a target shark fishery. The TAC should be further reviewed once adequate data are available to update vulnerability and/or stock assessments for species caught by the fishery.

Condition 13: From 1 July 2009 DPI&F is to make at risk species such as narrow sawfish (*Anoxypristis cuspidata*), and white-spotted guitar fish (*Rhynchobatus* spp) no take species.

Condition 14: From 1 July 2009, DPI&F is to implement a catch receiver system, with enforcement checking to provide confidence in these data, to verify sales against landings and to cross check logbook catch data with catch landing data.

Recommendation 6: While recognising that ideally shark fins should be attached to trunks to facilitate compliance with management arrangements, where this is not possible the DPI&F should develop product to fin weight relationships for shark species and consider DNA random testing of landed product for no-take species.

Recommendation 7: DPI&F to review the hanging ratio for all nets to ensure they are fixed at a level that minimise capture of large sharks or protected species.

Recommendation 8: DPI&F to review management arrangements for the ECIFF and develop a management regime which:

- if based on managing effort provides for individual effort units, assesses and quantifies annual effort creep and provides a mechanism to adjust effort in response to increases in effort; or
- through alternative management models which implement firm catch limits for all key species and allows autonomous adjustment of the fleet as catch limits change.

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1. Introduction

On 19 September 2008, the Minister for the Environment, Heritage and the Arts, the Hon Peter Garrett MP announced an independent review of proposed new management arrangements for Queensland's East Coast Inshore Fin Fish Fishery (ECIFF) to assist in his upcoming assessment of the fishery under Parts 13 and 13A of the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act).

The Minister identified a number of significant concerns which had prompted the review, including the fact that the fishery operates (in part) within the Great Barrier Reef World Heritage Area (GBRWhA), the potential impacts of the fishery on shark¹ stocks and its interactions with protected species, particularly dugong, whales, dolphins, turtles and freshwater and green sawfish. The Terms of Reference (TOR) for the review were developed in consultation with Queensland's Minister for Primary Industries and Fisheries, the Hon Tim Mulherin MP.

Minister Garrett announced that an Independent Expert Review Panel (the Panel) would be established, chaired by John Gunn, Deputy Chief, CSIRO Marine and Atmospheric Research and include Dr John Stevens an eminent shark scientist and Frank Meere an international fisheries management consultant with qualifications in economics. The Panel was formally assisted by Dr Marinelle Basson, who provided scientific expertise on the development of stock assessments and harvest strategies, and helped draft the report.

The Panel was required to complete the review and present its report to the Minister by 31 October 2008.

1.1. Terms of Reference

The Panel will consider the proposed management arrangements for the ECIFF in particular those for the shark sector, against the relevant protected species and export provisions of the EPBC Act. In reflecting on this, the Panel will:

- 1) Consider any conditions and/or recommendations which may be required to ensure that the proposed management arrangements meet the requirements for accreditation under Parts 13 and 13A of the EPBC Act, including application of the precautionary principle as required by section 391 (3).
- 2) In considering (1) above, evaluate consistency with the *Guidelines for the Ecologically Sustainable Management of Fisheries 2nd Edition* (the Guidelines) and the EPBC Act, specifically:
 - i. any need for a limit on effort;

¹ Throughout the report, the Panel has used the term shark to refer to all elasmobranchs.

- ii. the appropriate level of data validation, and the level of information required to effectively manage the ECIFF; and
 - iii. the performance measures and management responses to ensure adequacy of the arrangements.
- 3) In relation to Part 13 of the EPBC Act, consider whether the proposed management arrangements require persons engaged in fishing under the regime to take all reasonable steps to ensure that members of listed species are not killed or injured as a result of the fishing.
 - 4) Make a recommendation as to the adequacy of the proposed management arrangements for the purposes of Parts 13 and 13A of the EPBC Act including appropriate conditions and/or recommendations to which any accreditation should be subject.
 - 5) The Panel must report to the Minister for the Environment, Heritage and the Arts on its findings by 31 October 2008.

1.2. The East Coast Inshore Fin Fish Fishery (ECIFF)

The ECIFF covers all Queensland's east coast tidal and near shore tropical, sub-tropical and temperate waters from Cape York in the north to the New South Wales (NSW) border in the south. It includes waters within the Great Barrier Reef World Heritage Area (GBRWHA) and the Great Barrier Reef Marine Park (GBRMP).

The commercial fishery is extremely diverse with fishing undertaken using mesh net, haul (seine) net, tunnel net, cast net and line. ECIFF fishers also frequently hold licenses which allow them to operate in other Queensland fisheries using pots and lines. Commercial fishers may interact with a range of protected species² including dugong, turtles, sawfish, dolphins and sometimes whales.

The ECIFF also includes an important recreational sector, involving up to 750,000 fishers, who use hook and line, cast net and small seine (bait) net to target a range of species. It is estimated, that recreational fishers take 3000 t with a further 4400t being released. In so doing they represent around half the ECIFF total catch.

Tropical species harvested by commercial fishers include threadfins, barramundi, whaler and hammerhead sharks, and grey and spotted mackerel. Subtropical species include mullet, tailor, school mackerel, various whiting species, bream, flathead and luderick. A range of other fin fish species are harvested as byproduct including garfish, queenfish, flathead, rabbitfish, trevally, pilchards, dart, and grunter.

² 'Protected species' means all species listed under Part 13 of the EPBC Act, including whales and other cetaceans and threatened, marine and migratory species.

The ECIFF had a total catch of 5,700 t in 2006 and a gross value of production (GVP) of approximately \$23 million, which are of average size for an Australian fishery. Export markets exist for mullet roe, shark and small mackerel products. The remainder of the product is sold on the domestic market. Fishing operations tend to be small scale, with the Queensland Department of Primary Industries and Fisheries (DPI&F) describing the fishery as multi-species, multi-apparatus and semi-artisanal. The information available suggests that mean boat days have varied little over the last decade (between 50 and 60 days per year) and with the vast majority of operators catching between 1 and 15 t per year.

Commercial fishing is restricted by a complex system of input and some output controls, including limited entry, boat size, net length, mesh size, spatial closures, catch limits, size limits and a proposed overall effort cap. Total effort in 2006 was approximately 25,745 net days and around 10,000 line days. Following concerns about sustainability, competitive Total Allowable Catches (TACs) for tailor and spotted mackerel were introduced in the commercial fishery during 2003 and are set at 120 t and 140 t respectively. In addition, a 700 t TAC for the shark fishery is proposed within the new management arrangements. Minimum and maximum size limits are in place for the majority of species and in possession limits are also in place to constrain the recreational catch.

The available catch and effort data for the fishery indicates that there were some increases in the harvest of several species between 2002 and 2004. Commercial catches of tropical sharks, grey mackerel and garfish increased to around 1200 t, 240t and 220 t respectively. Catches of barramundi and blue threadfin also increased, while catches of tailor and spotted mackerel decreased. More recently the catches of many of these species has returned to more historic levels.

Total effort in the commercial fishery (measured in boat days) has remained relatively stable with only small increases in fishing effort and the number of boats in the fishery between 1990-1992 and 2003-2004. Currently annual effort in the fishery is about 25,745 days fished by 438 boats.

There are a number of closures in place to protect target species, including seasonal closures of recognised spawning sites for major target fish species (e.g. barramundi and tailor) and permanent closures to commercial netting in nursery habitats where fish are in relatively high numbers and are more susceptible to net capture (e.g. inshore seagrass beds, upper estuaries of rivers and whole estuaries of some smaller creeks).

There are also closures in place to protect critical habitats for more vulnerable species, including a system of four grey nurse shark closures that protect key aggregating areas for the species. In addition, a system of 16 Dugong Protection Areas (DPAs) have been in place in the fishery since 1998 to minimise the likelihood and level of interaction between dugong and netting operations in areas that support high dugong numbers between Hinchinbrook Channel and the Great Sandy Straits.

The Panel was struck by the complexity of management arrangements in this fishery and the lack of knowledge of the resources which sustain it.

In submissions to and discussions with the Panel, DPI&F fishery managers noted the scale (geographic, numbers of operators and economic value), sectoral complexity, and management challenges of the ECIFF. They also emphasized the inter-dependence of management arrangements for different commercial sectors and between those for the commercial and recreational sectors.

In developing ecologically sustainable management arrangements for this fishery, ECIFF managers have given significant consideration to social factors such as maintenance of regional, lifestyle and large-scale commercial fisheries, and to resource sharing. It is clear that the proposed new management arrangements were developed after extensive consultation with many stakeholders, and represent a negotiated and complex balance of measures between commercial sectors and between the commercial and recreational sectors.

The Panel has concerns that the complexity and interdependency of the proposed arrangements, coupled with the relatively low value of the fishery, the number of operators and the vast geographical distribution, constrain management options and responsiveness in relation to critical effort controls, catch limits, catch data collection, observer coverage and compliance programs.

While it is important that social and economic issues are considered in the ESD framework, particularly given that access in this fishery is shared between competing users, the Panel believes that even greater weighting should be given to ecological/sustainability considerations since the fishery operates (at least in part) in the GBRWHA. Such a shift in emphasis would be more in line with contemporary application of the ESD principles.

The Panel noted that in a best practice fisheries management framework, the size of a fishery (geographic, landed volume, value and number of operators) should not dictate the levels of risk accepted by managers, nor the fisheries management arrangements applied to minimizing the ecological risk. In the case of the ECIFF the Panel views its location within a World Heritage Area, the ecological risk profiles of target and by-product species, and the known (and potential) interactions with protected species should be the primary determinants of the management framework and resources applied to the fishery.

1.3. What we did

As the time available to the Panel to undertake the review was short, the Panel did not call for submissions against its terms of reference. However, once the review was announced by the Minister a number of key stakeholders submitted a range of information for consideration.

The Panel met and/or held teleconferences with, the following agencies/groups:

- the Department of the Environment, Water, Heritage and the Arts (DEWHA) – 24 September;

- the DPI&F – 1 and 9 October;
- the Great Barrier Reef Marine Park Authority (GBRMPA) 2 and 8 October;
- the WWF Australia (WWF) and the Australian Marine Conservation Society (AMCS) on 10 October;
- the Queensland Seafood Industry Association (QSIA) 13 and 15 October; and
- Sunfish Queensland (Sunfish) 20 October.

DEWHA provided support to the Panel on an as needed basis.

1.4. Submissions

The DPI&F and GBRMPA provided extensive background material in support of their respective positions on the proposed management arrangements. Written submissions were also received from:

- The QSIA;
- WWF and AMCS;
- Sunfish Queensland (a recognised peak body in the State, representing recreational fishing interests);
- Network for Sustainable Fishing in Far North Queensland/Mossman Boating and Fishing Club; and
- Dr Ian Tibbetts, Centre for Marine Studies, University of Queensland.

1.4.1. Summary of Submissions

The submissions provided a range of useful information and as expected highlighted issues of key concern to the organisations or individuals submitting the submission. These included:

- Concern over protected species interactions and the sustainability/depletion of sharks and rays;
- The comprehensiveness and sustainability of the proposed arrangements given the history of the fishery and concern that pressures to reduce/stop shark fishing are based largely on trends and experience overseas;
- Proposals for the full protection of shark and ray species by the removal of a targeted shark fishery, a structural adjustment package to assist those affected, a zero bag limit for the recreational take of sharks, more conservation areas for at risk species, the development of a bycatch action plan for sharks and more research and education on sharks;
- Ensuring that any reduction in commercial shark fishing effort is removed from the fishery and does not become displaced effort and affect other sectors.

Allowing special arrangements for large specimens of particular shark species to be landed and recorded for State, National and World records (it was emphasised that this would be a rare occurrence).

- Particular concern over the localised depletion and potential collapse of grey mackerel and garfish stocks caused in some cases by the migration of large mesh net boats into the area.

1.5. Outline of the report and approach adopted

In considering the work required to address the TOR the Panel was particularly mindful of the special reference to the shark sector in the fishery and the fact that the fishery interacts with a range of protected species. The Panel was provided with a large amount of supporting material, some of which went into great depth outlining the process used to develop proposed arrangements and supporting them. The Panel was aware of the extensive consultation undertaken by the DPI&F in developing the proposed new management arrangements and noted the complexity of these arrangements.

The time available to review all this information, meet with key stakeholders and develop views on the arrangements in place or proposed, was very limited. The Panel did not seek, nor did the TOR require, that it undertake a full assessment of the fishery under the EPBC Act, but rather sought to focus and provide advice to the Minister on the key elements of the TOR, that is:

- Any conditions and/or recommendations required to ensure the proposed management arrangements meet the requirements of Parts 13 and 13 A of the EPBC Act;
- The proposed management arrangements for the shark sector of the ECIFF;
- The consistency of the proposed management arrangements with the *Guidelines for Sustainable Management of Fisheries 2nd Edition* (the Guidelines), specifically:
 - any need for a limit on effort;
 - the appropriate level of data validation and information necessary to manage the ECIFF;
 - performance measures and management responses; and
- Whether the management arrangements require fishers operating in the fishery to take all reasonable steps to ensure that members of listed species are not killed or injured as a result of fishing.

These issues are explored in more detail in subsequent sections of the report and a series of suggested conditions and recommendations are provided in Section 8.

In preparing its report the Panel believed it would be useful to explore how the management of the ECIFF was progressing along the continuum of best practice fisheries management.

The Panel concluded that in developing the proposed management arrangements the DPI&F had made significant progress improving management arrangements, albeit from a relatively low starting point. However, the nature of the fishery and its geographical location, in part within the GBRWHA suggested to the Panel that the fishery needed to be operating at the upper end of best practice fisheries management.

The report first outlines in very broad terms the requirements of Parts 13 and 13 A of the EPBC Act and the Guidelines, then reviews recent progress in developing management arrangements for the ECIFF. Section 4 describes the elements of best practice fisheries management that one might expect to see for a fishery meeting all contemporary national and international expectations and which would be expected of a fishery operating in a WHA. Section 5 looks specifically at the characteristics of sharks and shark fisheries. This is followed in Section 6 by an assessment in key areas of the proposed management arrangements against best practice. Section 7 undertakes an assessment of the performance measures and management responses and analyses the shark fishery against the Guidelines. Finally Section 8 provides suggested conditions and recommendations for the Minister's consideration.

2. EPBC Act and the Guidelines

2.1. Parts 13 and 13A of EPBC Act

Part 13 of EPBC Act sets up a system for regulating the international movement of wildlife specimens. Under Part 13A, the Minister may accredit the management arrangements for fisheries to allow the export of product from the fishery. All seafood products derived from Australian fisheries must be from a fishery whose management arrangements have been accredited under the EPBC Act in order for export take place. To date, approximately 125 Australian fisheries have been assessed for export approval under the EPBC Act.

Approved fisheries may be declared exempt from the controls of the EPBC Act (and listed on the List of Exempt Native Specimens), or declared a Wildlife Trade Operation.

Part 13 of the EPBC Act relates to species and communities in Commonwealth areas. Fisheries that operate in Commonwealth waters are required to seek accreditation under Part 13 of the EPBC Act. Accreditation under Divisions 1, 2, 3 and 4 of Part 13 removes the strict liability penalties of the protected species provisions for individual fishers operating in accordance with an accredited fishery management regime.

Divisions 1, 2, 3 and 4 relate respectively to: listed threatened species and ecological communities, migratory species, whales and other cetaceans, and listed marine species. In order to accredit the management arrangements for a fishery under Part 13 of the EPBC Act, the Minister must be satisfied that the management arrangements require fishers to take all reasonable steps to ensure that species listed under Part 13 (other than species listed under Division 1 as conservation dependent) are not killed or injured as a result of fishing, and that

the fishery does not, or is not likely to, adversely affect the conservation status of a species or population of that species, or the survival or recovery in nature of a listed threatened species.

2.2. Guidelines for the Ecologically Sustainable Management of Fisheries 2nd Edition

The Guidelines were developed to ensure an ecosystem approach to fisheries management and reflect the requirements of the EPBC Act. Under the EPBC Act the Australian Government holds a legislative requirement to ensure that:

- 1) all Commonwealth managed fisheries undergo strategic environmental impact assessment before new management arrangements are brought into effect; and
- 2) all fisheries, from which product is exported, undergo assessment to determine the extent to which management arrangements will ensure the fishery is managed in an ecologically sustainable way.

To assist in this assessment process the Australian Government developed, after extensive consultation with industry, governments and environmental groups, the Guidelines. The Guidelines aid in ensuring rigorous and transparent assessments are conducted in close cooperation with fisheries agencies, the fishing industry and the wider community.

Some important aspects of the Guidelines with respect to the ECIFF include:

- management arrangements demonstrate a precautionary approach, particularly in the absence of information;
- when designing a management regime a minimum level of information be available before a fishery is established. Thus information collection and ongoing research is of significant importance and may be inversely proportional to the level of precaution that a fishery takes in setting management measures;
- sources of uncertainty within the data should be identified and where possible quantified. Until research on the specific stock provides information, a precautionary approach should set conservative limits to account for the unknown level of uncertainty; and
- a precautionary approach should be used in all stages of fishery management, from planning through to assessment, enforcement and then re-evaluation.

Recommendations made in line with the Guidelines require fishery management agencies to demonstrate improved environmental performance, and actively enhance the ecologically sustainable management of fisheries in the short to medium term.

To satisfy the Australian Government requirements for a demonstrably ecologically sustainable fishery, the fishery must operate under a management regime that meets Principles 1 and 2 (below). The management regime must take into account arrangements in other jurisdictions, and adhere to arrangements established under Australian laws and international agreements.

PRINCIPLE 1.

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

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;

Objective 2. Where the fished stock(s) are below a defined reference point, the fishery will be managed to promote recovery to ecologically viable stock levels within nominated timeframes.

PRINCIPLE 2.

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

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

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

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

2.3. Precautionary Principle

Section 391(2) of the EPBC Act defines the precautionary principle as:

(2) The precautionary principle is that lack of full scientific certainty should not be used as a reason for postponing a measure to prevent degradation of the environment where there are threats of serious or irreversible environmental damage.

The Guidelines define the precautionary approach as:

Precautionary approach - used to implement the precautionary principle. In the application of the precautionary principle, public and private decisions should be guided by:

- 1) careful evaluation to avoid, wherever practicable, serious or irreversible damage to the environment; and
- 2) an assessment of the risk-weighted consequences of the various options.

A precautionary approach should be implemented where the extent of risk is unclear and involves consideration of the adequacy of current or proposed management arrangements having regard to the current levels of knowledge of risk. Managing the take of a species in a manner consistent with the precautionary principle involves considering risk-weighted options in the context of all sources of mortality.

An inevitable consequence of the precautionary approach is that one needs to be more cautious with management in a data poor situation than in a data rich situation in order to achieve the same level of risk. The Panel has been particularly mindful of the lack of data and hence the high uncertainty about the adequacy of the proposed management measures in the ECIFF. In the face of this uncertainty, the Guidelines have led us to adopt the precautionary approach which implies more cautious management recommendations than may have been the case in a data rich situation.

3. History of the ECIFF - Assessment under the EPBC Act

3.1. November 2006 assessment

In their November 2006 assessment of the ECIFF, the then Department of the Environment and Heritage (DEH, now DEWHA) concluded:

“The material submitted by DPI&F demonstrates that the management arrangements for the ECIFF meet, on-balance, the requirements of the Australian Government *Guidelines for the Ecologically Sustainable Management of Fisheries*. DEH has however identified a significant number of risks that must be managed to ensure that any adverse impacts are eliminated or minimised in the longer term. These include:

- a history of a piecemeal approach to management, particularly the progress in the development and implementation of a formal Management Plan;
- lack of capacity to monitor the effectiveness of management arrangements;
- the absence of regular robust quantitative stock assessments for most of the target, byproduct and bycatch species;
 - in particular there are concerns about the sustainability of shark catch given the increasing reliance of shark as a target species;
- a lack of verified data on the majority of species taken in commercial fishery operations, especially bycatch;
- the impact of the fishery on a range of protected species, particularly dugong and increasingly interactions with turtles (particularly green turtles) but also on crocodiles, cetaceans (possibly 2 species of dolphin and humpback whales), sawfish and possibly also sea snakes;
- a lack of validated catch and bycatch from the recreational sector, including charter vessels, or from Indigenous fishers;
- lack of a risk-based compliance programme (particularly including black marketing of recreational catches); and
- possible ongoing latent effort issues.”

In light of these concerns, DEH made the following conditions and recommendations on the Wildlife Trade Operation (WTO) declaration for the fishery:

Conditions

1. Operation of the fishery will be carried out in accordance with the management regime in force under the Queensland *Fisheries Act 1994* and the *Fisheries Regulation 1995*.
2. DPI&F to inform DEH of any intended amendments to the management regime or managerial commitments made in the submission that may affect sustainability of the target/byproduct species or have a negative impact on the status of bycatch, protected species or the ecosystem.
3. DPI&F to finalise the development of a formal management regime, including fishery specific objectives, performance measures and criteria and management responses, that addresses the ecological sustainability of target (including byproduct) and bycatch species (including protected species) taken in the East Coast Inshore Fin Fish Fishery.
4. DPI&F to conduct the program of stock assessments for species taken in the fishery based on priorities established through a risk assessment analysis.
5. DPI&F to report on progress in developing the formal management arrangements for the fishery and progress in conducting stock assessments for species considered at risk by 1 November 2008.

Recommendations

1. DPI&F to inform DEH of any intended amendments to the management regime that may affect sustainability of the target or negatively impact on byproduct, bycatch, protected species or the ecosystem.
2. From the end of 2007, DPI&F to report publicly on the status of the ECIFF on an annual basis and to report explicitly against each performance measure specified in the management regime to be developed for the fishery.
3. In developing the management regime for the ECIFF, DPI&F to:
 - develop fishery specific objectives for target, byproduct, bycatch, protected species and impacts on the ecosystem and which are linked to performance indicators by which these objectives are to be attained and performance measures against which the indicators will be assessed;
 - develop and formalise management response processes and timelines to triggers being activated; and
 - develop and formalise a list of species permitted to be taken in the fishery, which clearly defines target and byproduct species and a clear process for the inclusion of any additional target species on the list.
4. Within one year, DPI&F to develop a management regime for the ECIFF, capable of controlling the level of take of target, byproduct and bycatch species and of minimising interactions with protected species and impacts on the ecosystem and to implement the statutory Management Plan for the ECIFF before the end of the declaration.

5. DPI&F to undertake a review of latent effort in the fishery and incorporate into the management arrangements controls to ensure the activation of latent effort does not jeopardize the long term sustainability of the fishery.
6. DPI&F to complete a compliance risk assessment for the ECIFF and implement a risk-based compliance plan within three years taking into account risks of non-compliance associated with:
 - catch, possession, size and gear restrictions (including net attendance requirements) and shark finning at sea;
 - reporting of protected species interactions;
 - area and fishery closures; and
 - black marketing of product by recreational fishers, including charter vessel operators.
7. DPI&F to implement a pilot observer programme by the end of 2007 and a full observer programme by the end of the declaration and to ensure that the observer programme is capable of providing the required information at, where appropriate, a statistically robust level and provides for the collection of at least the following:
 - validation of commercial catch information for use in stock assessments and management;
 - accurate identification of retained species to ensure logbook accuracy;
 - data on bycatch (including composition and abundance);
 - protected species interactions; and
 - ecosystem impacts of fishing operations (to the extent possible noting the nature of the fishing operations).
8. Should the pilot observer program identify species identification problems, DPI&F to review the logbook to ensure it provides for adequate reporting of catch on a species basis and to ensure that fishers are equipped to make accurate species identification by the end of the declaration.
9. DPI&F to review within 12 months from the date of the declaration, the current methods for estimating recreational catch, including from charter vessels, of ECIFF species and the basis for the conversion of numbers of fish taken in the recreational catch, including from charter vessels, to weights for incorporation into stock assessments and subsequently into management controls to ensure overall (commercial and recreational) catch levels are sustainable.
10. DPI&F to ensure that:
 - a risk analysis is conducted within 18 months to identify those target and byproduct species, other than elasmobranchs, at most risk from the fishery;
 - based on the risk analysis, develop and conduct scientifically robust stock assessments, commencing with those species considered at most risk (noting that where data on which to base stock assessments are of poor quality or does not exist, qualitative assessment methods will be employed); and
 - stock assessments for the principal and/ or high risk species are conducted at least every three years and, consistent with this risk analysis and timetable, that the following assessment are considered as priorities:

Barramundi 2007

Tailor 2007
Bream 2008
Flathead 2008
Whiting 2008
Sea Mullet 2008
Spotted Mackerel 2009.

11. DPI&F to continue to pursue collaborative management of shared stocks with New South Wales (for species such as tailor, mullet and mackerel) and Northern Territory Fisheries (tropical sharks).
12. DPI&F to ensure the commercial take of shark does not exceed the catch levels when the investment warning (8 April 2002) was issued, unless assessments for particular species demonstrate that catches at a particular level are sustainable.
13. Within six months of the completion of a tropical shark fishery situation report in 2009/2010, and taking into account the results of any prior research undertaken, DPI&F to implement appropriately precautionary management responses for elasmobranchs species taken in the ECIFF, including consideration of banning all finning at sea for all elasmobranchs.
14. DPI&F to include in the management regime a requirement that rebuilding strategies, including reference points (target and or limit) and time frames, be developed for species if assessments indicate that stocks are overfished.
15. DPI&F to develop a Bycatch Action Plan for the fishery within 3 years.
16. DPI&F to review use of the charter fishing logbook in the ECIFF and based on the findings, develop a strategy for continued catch reporting through the charter logbook including a requirement to provide information on interactions with endangered, threatened and protected species within 2 years.
17. Within two years of the date of the declaration, DPI&F to review the effectiveness of the range of closed areas to address take/ interaction of protected species (particularly dugong and marine turtle) and if warranted develop and implement additional/ alternative mitigation measures and include these in the bycatch action plan and/ or in the management regime as appropriate.
18. DPI&F to analyse available information on the interactions of the various gear types used in the fishery with dugong, turtles, crocodiles, sea snakes and cetaceans within 12 months and implement appropriate mitigation measures to minimize interactions with these species.

3.2. What was required and what was done

The Conditions and Recommendations above provide a good indication of what is required to meet some of the risks and concerns identified by DEH in their 2006 assessment. DPI&F is making progress against the 18 recommendations but this appears somewhat inconsistent across the group as Table 1 below illustrates.

Table 1 – DPI&F progress in implementing the recommendations from the DEH Assessment of ECIFB November 2006

Adequate progress	Maybe meets requirement	Inadequate progress
1) changes to management regime	5) latent effort review – but controls may not be effective	3) fishery specific objectives for target, byproduct and bycatch species linked to performance indicators; management responses to triggers; formal list of species permitted to be taken
2) annual reporting	8) pilot observer program – logbook does not cover discards	4) management regime which controls the level of take for target, byproduct and bycatch species and minimises interactions with protected species
6) compliance risk assessment – still one year to complete	10) risk assessments and stock assessments but unclear if on schedule	7) pilot observer program by the end of 2007
11) shared stock management	18) analyse information on the interaction of various gear types with protected species and implement mitigation measures	9) estimation of recreational catch
12) limit on shark catch		17) review of closed areas to address the take/interaction of protected species
13) shark situation report pending		
14) rebuilding strategies – but no clear understanding of the stocks		
15) Bycatch Action Plan pending		
16) charter fishing logbook review		

Annex 1 provides a summary of arrangements prior to the 2006 assessment and the proposed changes to management arrangements since the 2006 assessment. This is not intended to be a complete listing of all that has been achieved or is proposed in the new management

arrangements. Rather, it is intended to provide an overview of progress and illustrate the work undertaken by DPI&F to enhance management arrangements for this fishery.

3.3. Management Approach

In acknowledging the significant progress that has been made in addressing the recommendations and conditions arising from the 2005 DEH assessment, the Panel believes that there continue to be some significant gaps in a number of important areas which make managing the ECIFF difficult. These will be noted throughout the report and include factors such as: the serious lack of data; no independent verification of data; very limited stock assessments for key target species; complex management arrangements; potential for interactions with protected species; potential for increases in real effort and the complexity and cost of enforcing the management arrangements.

While a statutory management plan is not a requirement in relation to satisfying the provisions of Parts 13 and 13A of the EPBC Act, the panel was interested to learn of the complex policy and legislative framework in place in Queensland for managing fisheries. It appears that many relatively routine fisheries management adjustments need Queensland Cabinet and sometimes parliamentary approval before they can be implemented. DPI&F explained that in some circumstances, depending on the issue, it could take up to 12 months to implement a relatively simple change, such as a response to a trigger, if this were not built in to the original management regime. Such a delay in providing a management response can be extremely costly to a resource or the broader ecosystem.

Fisheries management by its nature is demanding. Managers are seeking to meet an increasing number of often conflicting objectives in a complex dynamic environment with very limited data. In this environment, management arrangements which are as simple as possible, transparent to all those involved, and which have built in responses to the changes which inevitably occur are likely to be the most successful. Likewise, where possible, management arrangements should use market based approaches so that fishers can make decisions on participation, level of activity and possible returns based on economic incentives rather than a regulatory framework which may have substantial hidden costs. Such a system is also likely to minimise future calls on the public purse when circumstances change and restructuring is required. The Panel believes there may be considerable scope to improve the management framework in Queensland and would encourage further discussion and review of policy and legislative settings.

4. Best practice fisheries management

A brief overview of what the Panel considers 'Best Practice Fisheries Management' is provided in this section. It is not comprehensive, but considers those areas which are of particular relevance to this review. The overview draws heavily on the *Guidelines for the Ecologically Sustainable Management of Fisheries 2nd Edition* (Australian Government, 2007a) and the *FAO Code of Conduct for Responsible Fisheries* (FAO, 1995). With regard to shark fisheries, the *FAO Technical Guidelines for Responsible Fisheries* dealing with the

Conservation and Management of Sharks (FAO, 2000) and the *National Plan of Action for the Conservation of Sharks* (Shark Plan) (DAFF, 2004), are of particular relevance. The *Commonwealth Harvest Strategy Policy* (Australian Government, 2007b), provides valuable guidance for the section on harvest strategies.

Two of the most important principles that underlie best practice in fisheries management include:

- management for ecological sustainability;
- application of the precautionary principle.

Both principles are also at the heart of the EPBC Act and are discussed in Section 2. Application of these principles has led to substantial changes to the way in which best practice fisheries management is conducted. The basic components of data collection, stock assessment and management response, are still critical, but they are integrated into a harvest strategy which links the components in a pre-agreed manner. One substantial change has been in the way uncertainty is recognised and taken into account in a harvest strategy. ‘Data’ and ‘Stock Assessment’ are first discussed separately (Sections 4.1 and 4.2); the integration of the components, and reasons why this approach has been adopted, are discussed under ‘Harvest Strategy’ (Section 4.3).

The precautionary principle together with science-based decision-making for management means that research also forms a crucial part of the process (Section 4.4). Without compliance, no management strategy is likely to work (Section 4.5). The last two sections consider best practice in dealing with threatened or vulnerable species (Section 4.6), and the most challenging aspect, ecosystem-based fisheries management (4.7).

4.1. Data

The first basic data requirement for managing any fishery is a full description of the nature of the fisheries under consideration. This should include the different fishing groups, their characteristics and number of ‘units’ (e.g. vessels or individuals) involved and the fishing grounds they use.

The second basic data requirement is that the species composition of the catch can be determined. In the case of sharks, this will be complicated by the general taxonomic uncertainties associated with a large number of species of sharks. Also, the practice of processing at sea exacerbates the problem of identifying the species of a shark in the catch. Genetics-based identification techniques can be adopted for determining species, but these techniques require expensive and time-consuming procedures which may not be suitable for routine monitoring. Hence, effective onshore monitoring of the catch requires the sharks to be landed in a form that enables species identification. In addition, identification information (a species guide or similar) needs to be readily available for fishers, observers and compliance officers.

The third basic data requirement is information on the magnitude of the catch by species, location and date, the characteristics of the catch (e.g. size, age and sex of animals) by species and the effort which generated the catch.

The impact fishing has on a population and on the ecosystem is reflected by the total catch, not just the landed catch. Stock assessments also require information on all mortalities. Information on discards should therefore always be recorded or estimated. If animals are released alive, this should also ideally be recorded with an indication of the life status of the animal. If capture and release (e.g. in a recreational fishery) is potentially a large source of mortality, attempts should be made to determine the proportion of such releases that may survive. Catch information on bycatch and by-product species, whether retained or discarded, should also be recorded.

If there are concerns about potential illegal fishing occurring on the same stocks, best practice management indicates a need to estimate the magnitude, and associated uncertainty, of the illegal catch.

The catch is usually reported in numbers and/or weight. Since the catch is often processed at sea, logbook instructions need to be clear about whether estimated live weight or processed weight should be recorded. There should be appropriate conversion factors to convert between live and processed weight (also see 4.5 Compliance).

Effort should be measured in sufficient detail to avoid undetected changes in real fishing effort. For example, if gill net effort is measured in 'days', but fishing practices change to setting longer nets more often in a day, then the real fishing effort would have changed without being detected. Fishing effort in stock assessments can be related to fishing mortality. This requires relating fishing effort very closely to specific gear use, and this varies with gear. For gillnets, appropriate units of fishing effort can be kilometre-lifts, kilometre-hours or kilometre-net-hours. This requires recording the total length of gillnets and soak time (FAO, 2000). Height and mesh-size of gillnets should also be recorded.

Irrespective of whether the data are used to construct catch-per-unit-effort (CPUE) indices, or used to monitor and manage total effort in the fishery, the aim should be to quantify the real 'catching power' of each fleet. The power of vessel, presence of navigational aids (e.g. Global Position System, colour echo sounders) or other vessel characteristics relevant to fishing power should also be recorded. This information is particularly relevant for the standardisation of CPUE and monitoring of effort creep.

Data for monitoring stock and fishery status, and for quantitative stock assessments, are usually collected through a combination of logbook data and observers. Observers play a crucial role in validating logbook data, and it is not best practice to assume that logbook data are accurate; there are many examples in fisheries worldwide where the quality of logbook data has been shown to be very poor. Observers can also play a crucial role in filling in gaps in data (e.g. where logistic or practical difficulties affect logbook data collection) and

collecting information that is difficult for fishers to provide (e.g. size-frequency data, or species identification for species that are visually almost identical).

The design of observer schemes and decisions about coverage in different fleets, areas and times can be complicated in multi-gear, multi-species fisheries. Of particular relevance are questions related to the bycatch of rare species. In such cases, the total amount of observer coverage may be largely determined by considerations of: how much precision is enough, and how much will the program cost? If sufficient observer coverage cannot be achieved, best practice points to a re-evaluation of the amount of fishing effort (and hence potential for bycatch) in the fishery.

Best practice also requires that fisheries dependent data be supplemented with fisheries independent data. Two familiar categories are fisheries independent indices of abundance (such as indices based on scientific trawl surveys or acoustic surveys) and mark-recapture data (from tagging programs). Tagging with conventional tags requires fishers to return recaptured tags, and is therefore only semi-fishery independent. An observer program is generally used to provide data for estimating reporting rates. Genetic tagging only relies on taking samples from the catch (it is unknown whether an individual is 'tagged' or not until the genetic analysis has been done), and is therefore less fishery-dependent (see also 4.4 Research).

Good data management is also part of best practice fisheries management. Data should be maintained in a suitable database, and there is a need for long-term commitment to supporting data management applications. It is worth investing in the development of automated procedures that allow for easy data checking and quality control, and that facilitate data summaries and syntheses.

4.2. Stock assessment

The role of stock assessments in best practice fisheries management has changed over the past two decades, and this is considered in the next section (4.3 Harvest Strategy). Here the data requirements for stock assessments are discussed.

Stock structure and stock identification are integral components of fisheries stock assessment. Knowledge of stock structure is also required for effective fisheries management and protection of endangered or severely depleted species. In the case of highly mobile and migratory species, it is usually more difficult to establish stock structure than it is for less mobile species. If stock structure is uncertain, the harvest strategy approach calls for different plausible assumptions to be considered. If the resource is shared with fisheries in other jurisdictions (managed by other States or operating on the high-seas), collaborative stock assessments should be undertaken and management should be coordinated.

It may be impractical to collect sufficient data and invest the resources to develop full quantitative stock assessments for all harvested species, but there are a range of approaches that can provide quantitative information to inform management actions. These approaches include:

- monitoring indicators of stock status for changes;
- fitting simple models to aggregate catch data and an index of abundance;
- fitting age-based models of various levels of complexity to one or several data sources; and
- estimating stock size and/or harvest rate directly.

Best practice implies that at least one of these approaches should be considered for each of the target species and for any vulnerable (high risk) bycatch or byproduct species. Not all approaches will be equally suitable in all situations, but there is a large body of international fisheries science literature which can be consulted (e.g. FAO, 2000).

Stock assessments usually require at least five years of data, before reasonable estimates of stock size and harvest rate can be obtained. Age-based assessments where only a small number of age classes are exploited, may require even longer time-series. Tagging programs can provide estimates of harvest rate within shorter periods (e.g. two years). Tagging programs also potentially provide information on movement and growth rates; estimation of natural mortality and absolute abundance are sometimes also possible³. Although tagging programs are usually applied to target species (i.e. for which a large proportion of returns are expected), the approach should also be considered for byproduct or potentially vulnerable bycatch species. A low number of returns will imply more uncertainty in the estimated quantities. However, even an uncertain estimate of exploitation rate would be an improvement over no estimate.

Risk assessments differ from stock assessments in that they seek to quantify the relative vulnerability of a stock, or species, to being harvested. Stock assessments seek to quantify stock abundance and harvest rate. Risk assessments for sharks are partly based on considerations of demographic parameters (i.e. age at maturity, natural mortality, number of pups etc.). The same demographic parameters, with associated uncertainties, can be used to estimate sustainable harvest rates. Such estimates can then be used as reference points when evaluating the sustainability of actual harvest rates from tagging programs.

4.3. Harvest strategy

Best practice management no longer consists of doing a stock assessment to estimate current stock size and harvest rate, and then negotiating, or making ad-hoc decisions about, the management response. This approach proved to have many shortcomings, including a tendency to focus on the short-term at the expense of long-term sustainability, to delay difficult decisions (e.g. to reduce catches) and a general lack of a consistent set of objectives informing management decisions and agreed to by key stakeholders.

Best practice fisheries management is now based on a simulation tested harvest strategy. A harvest strategy consists of a set of pre-agreed rules which use pre-specified data to provide recommendations for management action. The fact that the rules are pre-agreed by managers and stakeholders implies that the decision-making process is transparent and not subject to

³ This depends on the details of the tagging program and information on reporting rates or recaptured tags.

last minute changes due to short-term considerations or pressure from particular stakeholders. The data and set of rules can involve conducting a full quantitative stock assessment, or a much simpler set of analyses such as monitoring indicators for increases or decreases. Alternatively, it could be based on direct estimates of population size (e.g. from a research survey) or harvest rate (e.g. from a tagging program).

The simulation testing procedure is called ‘management strategy evaluation’ (MSE). The reason for simulation testing is to ensure that the harvest strategy is robust to the underlying uncertainties (e.g. about the productivity of the stocks involved, or stock structure), and that it has an acceptable level of risk. A major advantage of simulation testing is that it can evaluate the performance of different harvest strategies against the main management objectives and illustrate the trade-offs. Biological reference points can be explicitly considered, both in terms of the set of rules (also called ‘decision rules’) and in the evaluation of the performance of alternative harvest strategies.

The harvest strategy approach is not just applicable to data rich fisheries, but also to small and to data poor fisheries (e.g. Dowling *et al.* 2007(see ⁴)). The pre-agreed rules can be simple. For example, it could be that fishing continues until a particular level of bycatch is reached, and then some management action is taken. It is important that the action is fully defined, brings about change and is achievable; it is not sufficient for the action to be “consider what to do next”. An appropriate action may be: “reduce effort in the fishery by X%” (where X is specified).

The simulation testing for small or data poor fisheries does not have to be as extensive as it might be for large or data rich fisheries. What is important though, is to recognise the direct relationship between the extent of our knowledge about a species (or system) and the appropriate level of catch in order to avoid unacceptably high levels of risk to sustainability. This requires a degree of precaution commensurate to the degree of uncertainty, risk and reversibility of the impacts (e.g. <http://www.fao.org/fishery/topic/13302/en> : Precautionary approach to fisheries management). The MSE approach provides a framework for quantifying the relative risks of alternative harvest strategies.

A good example of a framework which explicitly recognises the relationship between the level of information and the level of catch is the harvest strategy framework developed for the Southern and Eastern Scalefish and Shark (SESS) fishery; a Commonwealth fishery managed by the Australian Fisheries Management Authority (AFMA). The description given here is based on information in Smith *et al.* 2007⁵. This framework adopts a tiered approach

⁴ Dowling, N.A., D.C. Smith, A.D.M. Smith. 2007. Finalisation of Harvest Strategies for AFMA’s small fisheries. Final report for Project 2007/834 to the Australian Fisheries Management Authority, Canberra.

⁵ Smith, A.D.M., E.J. Fulton, A.J. Hobday, D.C. Smith and P. Shoulder. 2007. Scientific tools to support practical implementation of ecosystem-based fisheries management. ICES Journal of Marine Science: Journal du Conseil 64(4):633-639.

to deal with the broad range of information available for the 34 stocks managed by quota. There are four tiers, tier 1 is used if a robust and recent quantitative stock assessment is available, and tier 2 corresponds to a more uncertain, preliminary, or less recent quantitative assessment. Tier 3 is based on estimates of fishing mortality derived from catch curves, and tier 4 on recent trends in commercial catch per unit effort.

Harvest control rules are applied at each tier level to calculate a recommended biological catch to be used as the basis for setting a total allowable catch (TAC).

Several aspects of the framework are designed to ensure that the overall approach will be precautionary. The harvest control rules associated with the first three tier levels are designed such that the recommended catch will be reduced successively as the tier level increases, corresponding to an increase in the uncertainty about stock status. Other precautionary elements built into the framework are that exploitation rates (not just catch levels) are reduced as stocks drop below target levels.

One of the features is that the framework provides an incentive structure for investment in research and monitoring to reduce uncertainty. Industry and management are confronted directly with the trade-off between investment in research and monitoring, and lower TACs if stocks remain at higher tier levels. The overall management aim is that the risks to the stock should be comparable, no matter the tier level at which it is managed.

4.4. Research

Fisheries management is conducted in an environment of considerable uncertainty where we will never have ‘full’ knowledge. The precautionary principle implies that the less is known, the more caution is required about levels of harvest or incidental capture. Scientific research can play a critical role in increasing knowledge, reducing uncertainty and quantifying the risk of ‘current’ management measures. This may provide an opportunity - although not a guarantee - for justifying an increase in catch. Scientific research may also highlight additional uncertainty which may necessitate a reduction in catch. Most importantly, though, research should provide the scientific basis for fisheries management.

As noted in the FAO Technical Guidelines for Responsible Fisheries (FAO, 2000), appropriate research should be undertaken into all aspects of fisheries including biology, ecology, technology, environmental science and economics. Research results should be used as a basis for setting management objectives, biological reference points, sustainability indicators, acceptable risk levels, timeframes and performance criteria, as well as ensuring adequate linkages between applied research and fisheries management. Particularly in the case of shared stocks, the sharing of data and results, and collaborative monitoring and research programmes are strongly encouraged.

Eight areas of research on sharks and shark fishing that require urgent attention are identified in the FAO Technical Guidelines (FAO, 2000), and quoted here (text in italics is the Panel's addition):

- Taxonomic problems need to be resolved, particularly with batoids, before effective monitoring, research and management can be achieved.
- Heading, gutting and finning sharks at sea creates difficulties in identifying species after landing.
- Available catch and effort data for sharks and other chondrichthyans are inadequate in most fisheries.
- Biological parameters of growth and reproduction have been determined for some species, but other fundamental data, such as fishing effort, catch and species, sex, length and age composition of the catch required for stock assessment, are not available for most species.
- Widespread multi-species fisheries take a variety of species all with different potential for sustainable use. Thus, when sharks constitute part of the catch it may be difficult to achieve a management goal for sharks only (*or for targeted sharks only*).
- There is a general lack of knowledge about critical habitat areas for sharks and other chondrichthyans.
- There is little facility to coordinate collection of information on trans-boundary species due to lack of responsibility for these stocks, particularly in international waters.
- There is a lack of funds for monitoring, research and management of sharks and other chondrichthyans.

Some of these areas of research are likely to be more relevant and urgent than others in the context of the ECIFF.

4.5. Compliance

A critical component of a best practice harvest strategy is a strong compliance program based on management measures which are as clear as possible and simple to enforce. A harvest strategy will not perform according to expectations if, for example, TACs are consistently exceeded or catches are taken from closed areas. This will lead to increased risk of over-exploitation, particularly if there is no estimate of the extent of the overcatch.

Good management uses market based approaches to avoid over-capitalisation and management arrangements which allow for continuous autonomous adjustment, thus eliminating latent effort. If correctly developed and properly enforced such arrangements will reduce the dissipation of economic rent and substantially improve profitability. Transparent market based management arrangements which produce a profitable fishery are also likely to benefit compliance because they reduce the extent to which the limits are likely to be exceeded.

It is highly desirable to keep the functions of data collection for compliance purposes separate from data collection for research purposes. It is not, for example, desirable to use observers to conduct compliance duties at the same time. Best practice for monitoring catch compliance includes data sources other than just logbooks. Validation of landed catch

through, for example, catch documentation schemes, fish receiver permits, buyers' (or catch receivers') receipts or sales records is critical.

Other management measures, such as specific gear requirements, bycatch mitigation measures or area closures, will also only be effective if complied with. It is important that there be appropriate surveillance and compliance arrangements in place to encourage compliance and where this is not forthcoming appropriate sanctions imposed on those who choose not to comply. Good fisheries management arrangements should be as simple as possible, transparent and take account (as much as possible) of the particular circumstances and environment within which the fishery operates.

4.6. Dealing with threatened or vulnerable species

The FAO Code of Conduct for Responsible Fisheries (FAO, 1995) recognises the existence of endangered species that need to be protected, and the need for measures to minimise fisheries impacts on them (Articles 7.2.2 and 7.6.9). Measures could include technical modifications to gear, changes to fishing operations, temporary spatial or seasonal closures, and overall reductions in fishing effort. There is a wealth of information in the fisheries literature on best practice approaches to minimising bycatch for a range of gear and type of bycatch species.

It is important to note that the ratio of bycatch to the retained catch may have little to do with the potential biological or ecological impacts. A low bycatch may still generate serious impacts. Similarly, a low number of interactions and incidental mortality may still generate a serious impact on the population. Such impacts must be evaluated on a species-by-species basis.

One of the difficulties in collecting data on interactions with vulnerable and threatened species, particularly if population sizes are very low, is that interactions are likely to be relatively rare events. This implies the need for relatively high observer coverage to obtain a specified precision in estimates of the number of interactions and their likely outcome (e.g. animal dies or is released alive). For more frequently caught species, the same precision may be obtainable with much lower observer coverage. However, if it is particularly important to get precise estimates of bycatch for a particular species, then higher coverage will be needed.

It is not sufficient to rely on the voluntary (or even compulsory) completion of logbooks to obtain reliable estimates of bycatch on protected species. Experience in other fisheries shows that voluntary provision of interactions/mortalities data on protected species is associated with gross underestimates of these quantities. A well-designed observer program with appropriate level of coverage is therefore required.

In addition to quantifying and monitoring the bycatch of protected species, there is a need to ensure that measures are adhered to. This requires a well designed surveillance program.

4.7. Ecosystem based fisheries management

One definition⁶ of ecosystem-based fisheries management (EBFM) is that it considers the impact that fishing has on all aspects of the marine ecosystem, not just the target species. This includes byproduct and bycatch species (including protected species), habitats and communities.

Operationalising ecosystem-based fisheries management and following best practice in this regard is admittedly challenging. This is particularly true if EBFM is misconstrued as requiring a complicated ecosystem model. Such models can play important and useful roles in, for example, evaluating the likely impacts of alternative management strategies, but they are not essential. Much of practical EBFM relates to best practice with regard to target species, non-target species, minimising discards and bycatch of protected species. Significant steps towards best practice can be taken without the need for first developing extensive ecosystem models with their large requirements of data and process understanding.

In “The ecosystem approach to fisheries: Issues, terminology, principles, institutional foundations, implementation and outlook”, Garcia *et al.* (2003) note that FAO Code of Conduct for Responsible Fisheries (FAO, 1995) contains a significant number of ecosystem-related provisions which, when considered together, provide a good basis for an ecosystem approach to fisheries. They discuss operational objectives and measures for developing ecosystem-based fisheries management under a list of twenty topic areas. These include:

- Improving Conventional Management;
- Maintaining Reproductive Capacity of Target Resources;
- Targets, Constraints, Indicators and Reference Points;
- Reducing Bycatch and Discards;
- Reducing Uncertainty and Risk;
- Improving Statistics and Inventories;
- Monitoring and Indicators;
- Improving the Decision-making Framework;
- Improving Research Capacity;

They also include areas that are more obvious, or expected, aspects of EBFM, such as:

- Maintaining Biological Diversity;
- Protecting and Enhancing Habitats;
- Protecting Selected Marine Areas;

The authors stress that not all of the objectives and measures are immediately needed in all fisheries and note that the implementation challenge can often only be faced if a stepwise approach is adopted. The main reasons for listing this broad range of topics here are (i) to emphasise that best practice EBFM includes best practice management for target, byproduct and bycatch species, (ii) that all the previous sections on best practice are therefore also relevant and (iii) that progress towards best practice is achievable.

⁶ See e.g. http://www.afma.gov.au/environment/eco_based/default.htm

When catch (or effort) limits for target species are based on considerations of the implications for bycatch, byproduct and protected species, these arrangements reflect the spirit of EBFM. The same is true when other management measures are introduced to reduce interactions with protected species, to reduce discards and waste of unwanted captures. EBFM therefore implies the need to collect information on bycatch, byproduct species in catches and discards, and on interactions with (and outcomes of those interactions) with protected species.

EBFM also requires consideration of the indirect effects of removals, particularly of target species, from the ecosystem. When the likely effect of removal of, for example, large numbers of apex predators, or large quantities of a key prey species, is unknown, EBFM and best practice requires a precautionary approach. This may imply setting catches below levels that would be sustainable in the single-species context. When even single-species sustainable catch levels are unknown, then the precautionary approach calls for developing a fishery slowly enough that sufficient data can be collected to avoid a problem from occurring before it has been detected.

5. Sharks and shark fisheries – vulnerability

The FAO International Plan of Action for the Conservation and Management of Sharks (IPOA-Sharks) focused world attention on the global status of shark populations. The life-history attributes of this group of fishes are often characterised by low reproductive rates, late age at maturity, low natural mortality and high longevity. The resulting low productivity of this group is generally less than that of bony fishes and more similar on average to that of marine mammals. As a consequence, shark populations are generally more vulnerable to exploitation than are bony fish populations. Shark stocks can be rapidly depleted and may be slow to recover from the effects of overfishing.

The question of whether sustainable shark fisheries are even possible has been debated over many years. The argument is not so much about whether they can be fished sustainably but more about the relative productivities of different shark species which, like any group of animals, differs widely. Obviously a higher proportion of the biomass can be taken sustainably from the population of a species of high productivity than from a species of low productivity. However, the same characteristics that make sharks vulnerable to over-exploitation can also provide for stable populations and stable fisheries. Their large size at birth makes survival and recruitment less likely to fluctuate from year to year in response to environmental variability than is the case with the eggs and larvae of bony fish.

Arguably, Australia leads the world in shark fisheries management. Experience has shown that management of shark populations is best achieved by having a clearly defined, strictly managed, relatively small fleet where catch or effort can be easily controlled. While the best studied of these shark fisheries (the Southern and Eastern Scalefish and Shark (SESS) fishery for gummy shark) is based on a relatively productive species, the dusky shark fishery in Western Australia suggests that a sustainable take of even highly unproductive species is possible, but only with tight controls and a relatively small catch.

These fisheries adopt a 'gauntlet' approach where the catch is targeted at the younger age classes while providing protection of the breeding biomass. In the gummy shark fishery, escapement of mature fish is regulated by restricting mesh size of the gillnets (the larger fish tend to bounce off the nets without meshing). In the Western Australian dusky shark fishery, the catch is restricted to neonate and one year old individuals. Tagging and demographic studies suggest that up to 65% of these youngest age classes can be removed without severely impacting the stock providing fishing does not occur on any other age class. For this species, only a 4% sustainable removal is possible when fishing is spread across all age classes. The effectiveness of the gauntlet approach relates to the fact that in sharks, unlike bony fish, there is a much closer relationship between the number of young produced and the adult stock size. The inherent risk of these gauntlet fisheries is if the sustainable take of the young age classes is not carefully determined. If there is overfishing of these juveniles then, depending on the productivity of the individual species, it may be many years before these effects translate into a reduced breeding biomass and are picked up as subsequent reduced recruitment to the fishery. In the case of the highly unproductive dusky shark, that time period is more than 25 years. For the most productive species it would take 2-5 years for overfishing to manifest itself while for many species of medium to low productivity it would take 10-15 years.

Even in Australia within the well studied SESS fishery there are still some serious problems. The original target species was the very unproductive school shark rather than the currently targeted gummy shark. School shark are currently assessed to be over-fished and at between 9-14% of their pre-fished biomass. Rebuilding has been underway for some years and in 2005, as part of a Ministerial Direction on a range of fisheries issues, AFMA was required to rebuild these stocks to levels that will ensure their long-term sustainability and productivity.

Generally, detailed population models to determine the sustainable yield of the numerous shark species taken commercially are not practical. Consequently risk assessment techniques have been developed to determine the relative vulnerability of different shark species to exploitation and a number of these assessments have been carried out in Australia.

The risk a fishery poses to a particular shark population is dependent on the fishing effort, the catchability and biology of the individual species. The risk assessment methodology uses a ranking system to qualitatively assess the risk to individual species based on their 'susceptibility' to capture by fishing and their 'productivity' or recovery capacity once populations are fished. Susceptibility includes parameters such as the species distribution with respect to the area of the fishery and the species depth behaviour in relation to the fishing gear while productivity includes demographic parameters related to growth and reproductive potential. The overall susceptibility and recovery ranks are plotted to estimate the species that are likely (or least likely) to be sustainable. This method only produces a relative indication of risk and does not determine the actual likelihood of over-exploitation.

A number of high risk shark species are now listed as threatened under the EPBC Act including the freshwater and green sawfish, spartooth shark, northern river shark, grey

nurse, white shark and whale shark. All species of sawfish are also listed on the IUCN Red List as well as on CITES Appendix 2.

Shark has become an increasingly important component of the ECIFF in recent years. Proposed management arrangements would provide limited entry to a number of operators who target sharks and should enable better data collection and monitoring through an observer program. However, a number of sectors access the resource, including net and line fishers for whom shark may be a target, byproduct or bycatch, a large recreational component and other commercial fisheries (trawl and CRFFF). The current information base to determine the species mix of shark taken is very poor and there is little idea of total removals and mortality (no recording of discards and unknown mortality of recreational releases from a potentially very large catch).

What information is available on species mix suggests that while the majority of the targeted catch is based on relatively productive species (milk sharks, spot-tail and Australian blacktip) a number of much less productive species are also taken. An added complication is that catches of Australian blacktips (*Carcharhinus tilstoni*) appear to be mixed with the common blacktip (*C. limbatus*); these two species are very difficult to tell apart. However common blacktips are much less productive and their abundance in the catch would increase in southern areas of the fishery.

Some listed and protected species are also taken by the fishery, particularly in the coastal margin. Sawfish populations have been extirpated in many parts of the world and while relatively healthy populations of some species still occur in parts of Australia, there are data suggesting major declines of sawfish on the Queensland east coast. All sawfish species are listed on Appendix 2 of CITES which prevents international trade unless their take can be demonstrated to be sustainable. Together with sawfish, white-spotted guitarfish (*Rhynchobatus* spp) have some of the highest value fins in the international shark fin trade. Risk assessments for white-spotted guitarfish are not currently valid as recent taxonomic work has shown there are at least three species (some of which are endemic) rather than one wide-ranging form, and their demographic parameters are currently unknown. Effort levels in the fishery are currently difficult to quantify and control and the range of vessels from relatively large net-reel boats to aluminium dinghies and recreational vessels make monitoring of catch difficult.

All these factors provide a challenging environment for managers given that management of shark populations is best achieved by having a clearly defined, strictly managed, relatively small fleet where catch or effort can be easily controlled.

6. Assessment of proposed management arrangements

6.1. Introduction

In this section the proposed management arrangements and the proposed Performance Measurement System (PMS) (see Annex 2-5) are considered against 'Best Practice'

principles, particularly with regard to the following aspects: sharks, data, effort, the performance measurement system, and protected species. The Panel recognises that management of the ECIFF has been significantly improved over recent years. In some regards, the current proposals are moving towards best practice, but there is still much scope for improvement towards best practice.

This section is not meant to reflect an unrealistic or unachievable goal, but rather to point to those areas which require improvement, and ways in which those improvements can be achieved. The Panel recognises that many fisheries will be unable to attain best practice in all regards, and recognises the need for a balance between the scale of the fishery and the investment in its management. The intention is therefore also to emphasise the relationship between the risk implied by the level of harvest, and the associated data collection, observer coverage and surveillance programs to underpin and inform management.

By any measure, the management arrangements in place for this fishery are complex and the information upon which to make management decisions very limited. Despite what appears to be a relatively stable fishery as measured in net days there would appear to be scope for further increases in effort (see section 6.4). In addition, there appear to be few immediate responses available to fishery managers should the effort cap be reached other than to close some or all of the fishery. The complexity of the management arrangements also highlights the potential scope for non compliance with management measures. The information available suggests that human and financial resources are limited with regard to monitoring existing arrangements and further developing or refining management arrangements in response to changes in the fishery. This applies more specifically to enforcing the proposed management arrangements. Even using a risk based compliance approach; resources are likely to be stretched thus weakening the operation of proposed management arrangements. This has direct implications for some of the more important management changes proposed for example net attendance in the commercial sector and size and bag limits in the recreational and charter fishing sectors.

The information presented in this section is mainly in tabular form in which we summarise the measures proposed by DPI&F with respect to the situation before the proposed plan (status quo) and what we consider to be best practice for the fishery along with possible recommendations to move the fishery towards best practice. These are discussed in more detail in Section 8.

6.2. Sharks

In response to global concerns about the sustainability of shark stocks and in response to actions articulated in the Australian National Plan of Action for the Conservation and Management of Sharks, DPI&F proposed an integrated package of measures focused on constraining the catch of the target species as well as protecting the more vulnerable species. This package represents a major step forward and includes measures to reduce access to the shark fishery, limit the catch and effort in the fishery, improve data collection and give some protection to more vulnerable species. The proposed management arrangements were

developed after an extensive review process involving input through public meetings and a working group comprised of the various stakeholders to address the shark issues.

The proposed DPI&F management arrangements for sharks fall under the following general headings:

- Measures to restrict access to offshore shark component and prevent further effort expansion;
- Constraining catch of target shark species as well as protecting more vulnerable species;
- Collection of better information on shark (new logbook, ID guide, compulsory observers, reporting of protective species interactions);
- Reducing the take of large sharks;
- Minimising the take of listed and threatened species;
- Limiting the take of vulnerable species; and
- Recreational fishery bag limits.

The shark sector of the ECIFF spans state and Commonwealth waters off the east coast, comprises net and line gear types (including various net entitlements), has an indigenous component, a very large recreational component (including charter operators) and interacts with other fisheries that take some of the same species. The information base with which to manage this highly complex fishery is poor (in particular there is little information on species composition or total removals), will improve only slowly with time, and is currently inadequate to set sustainable catch limits. While the proposed new measures are a substantial improvement the Panel feels that they are still not sufficiently precautionary (i.e. still pose too high a risk) for operating in a data poor environment within a World Heritage Area.

Table 2 The ECIFF status quo, 2008 QDPI proposed plan, best practice and recommendations for shark.

Status Quo	2008 Plan	Best Practice	Recommendations
Restrict access & effort			
<p>About 1500 net & line fishers can access shark.</p> <p>About 450 net fishers can use up to 1200 m of net</p>	<p>New S symbol for shark (500 kg entry) will limit the number of fishers taking shark to about 175.</p> <p>New N4 (<25 operators) 1200 m of net in > 20 m. Two other net symbols surrendered.</p> <p>Restrict length of N1 offshore nets to 600 m.</p> <p>Attainment of 34,000 net days will trigger review of arrangements.</p> <p>Total annual recreational harvest should not exceed 4000t/year.</p>	<p>Uncertainties over species mix & total removals suggest a precautionary approach, and reducing the risk by further limiting access/effort until more information on sustainable levels of harvest is available.</p> <p>Further removal and close monitoring of latent net effort (see section 6.4)</p>	<p>Reduce the effort trigger to less than 34,000 net days & develop a response if this is exceeded.</p> <p>Standardise the unit of net effort.</p>
Constraining shark catch			
No catch limit	700 t whole weight based on	Determine sustainable catch or	Reduce catch to less than 700 t.

Status Quo	2008 Plan	Best Practice	Recommendations
Declared retained catch from commercial sector logbooks	<p>recent catch levels.</p> <p>If catch limit reached go to possession limit (10 net, 4 line).</p> <p>Declared retained catch from commercial sector logbooks.</p> <p>No record of commercial discards.</p> <p>Recreational fishing surveys & voluntary diaries to inform on catch (unknown mortality on releases).</p> <p>Recreational bag limit of 1.</p>	<p>set more precautionary limit.</p> <p>Account for all removals (all sectors & all fisheries).</p> <p>Monitor species mix & prevent increase in take of less productive species.</p>	<p>Implement catch landing system.</p> <p>Collect data from all sectors on all species (see below)</p> <p>Develop harvest strategy and stock assessment process.</p>
Better data collection on shark			
<p>Compulsory daily logbook for commercial fishers (monthly submission). Data validation system in place.</p> <p>Logbooks record whalers & hammerheads only (No. & Wt.)</p>	<p>Logbooks record whalers & hammerheads (number and weight) but there are plans to include more species</p> <p>Fortnightly logbook returns</p> <p>Compulsory observer program</p>	<p>See section 6.3.</p> <p>Ideally logbooks are species-specific but where not possible can compromise on practicality (number and weight). Should record discards.</p>	<p>Redesign logbook to record at least 5 species or groups (see Section 8).</p> <p>Logbooks must record discards.</p> <p>Observer program to cover all ECIFF commercial sectors (not necessarily at the same level of</p>

Status Quo	2008 Plan	Best Practice	Recommendations
<p>Voluntary observer program, but limited coverage.</p>	<p>for S symbols & ID guide for fishers.</p> <p>Report protected species interactions.</p> <p>Compulsory VMS for N4 symbols.</p> <p>Recreational fishing surveys & voluntary diaries to inform on catch.</p>	<p>Observer program to validate logbook data and provide a range of other information not collected in logbooks.</p> <p>(existing ‘validation’ procedures appear to be primarily ‘checking’ rather than cross-validating with observer data)</p>	<p>coverage).</p> <p>Endorse ID guide</p> <p>Endorse reporting of protected species interactions (see below)</p> <p>Endorse VMS</p> <p>Endorse recreational fishing surveys & voluntary diaries</p> <p>Examine spatial structure of shark species catch.</p> <p>Studies on post-release survival.</p>
Reduce take of large shark			
<p>No size limit</p> <p>Max mesh size in offshore waters is up to 24.5 cm</p>	<p>1.5 m total length for line fishers.</p> <p>16.5 cm mesh for net fishers.</p> <p>Fins to remain with body.</p>	<p>Size limit supports ‘gauntlet’ approach of protecting breeding biomass but needs to be combined with sustainable harvest rate on juveniles.</p> <p>Fins should be attached to</p>	<p>Size limit is appropriate.</p> <p>A fixed hanging ratio for gillnets that minimises entanglement of large sharks.</p> <p>Determine exploitation rates of</p>

Status Quo	2008 Plan	Best Practice	Recommendations
	<p>1.5 m total length for recreational fishers.</p> <p>Exemption (except no take & restricted take species) for aquarium symbols & recreational gear records.</p>	<p>trunks or accurate fin/product ratios established.</p> <p>Monitor catches.</p> <p>Monitor landings.</p>	<p>different species to prevent recruitment over-fishing (inherent risk of gauntlet approach).</p> <p>Establish fin/product weight ratios.</p>
Limit take of protected species			
<p>Required to report interactions with species listed under the EPBC Act.</p> <p>Report protected species interactions (SOCİ logbook).</p> <p>Grey nurse & white shark no take: no other possession limits.</p>	<p>No take for grey nurse, white, spartooth & whale shark & freshwater, green & dwarf sawfish.</p> <p>Possession limit of 1 for grey reef & whitetip shark & 5 for narrow sawfish & white-spotted guitarfish.</p> <p>Report protected species interactions (SOCİ logbook).</p> <p>Nets to be attended at all times.</p> <p>Closed areas for grey nurse shark aggregation sites.</p>	<p>Minimise potential for interaction with protected species.</p> <p>Determine interaction rate with, and estimate resulting mortality of, protected species.</p> <p>Protect critical habitat of protected species.</p> <p>Require live release wherever possible.</p>	<p>Logbook and observer program to determine interaction rate with protected species.</p> <p>Education program about protected species for all sectors.</p> <p>Code of practice for live release for all sectors.</p> <p>Consider further spatial closures that would benefit sawfish.</p> <p>No take for narrow sawfish & white-spotted guitarfish.</p> <p>Refine risk assessments for</p>

Status Quo	2008 Plan	Best Practice	Recommendations
			<p>protected species.</p> <p>Work with indigenous fishers on take of protected species.</p> <p>Endorse net attendance rule</p> <p>Endorse closed areas for grey nurse shark aggregation sites (see Section 6.4)</p>

6.3. Data

Some of the data considerations have been covered under section 6.2, particularly with regard to improved species-specific catch data for sharks. Several points about data collection and data quality in general are made here.

Accurate and reliable data are a key input into fisheries management. In spite of proposed improvements in particular sectors and the existence of logbooks, data collection still seems a long way from best practice. The general lack of cross-validation of logbook data with observer data, and gaps in data on the total mortality (including discards) of all target and byproduct species from all sectors is not best practice. The lack of independent verification of landings data for sharks, particularly in the light of a proposed TAC for sharks is not best practice. The level of detail in the effort data, particularly for gillnet fishing, is insufficient for monitoring, catch rate interpretation and management.

Reliable, verified and accurate data on interactions with protected species and the outcomes of those interactions (i.e. estimates of numbers of mortalities by species or species group) are also required. This is particularly relevant since the fishery partly operates in the ecologically-sensitive GBRWHA. Logbooks for collecting these data exist, but there is very limited observer coverage for verification and it is impractical to rely on research studies to provide the time series of data required for monitoring.

A well designed observer scheme to validate and supplement logbook data is essential for best practice fishery management. This need not be an unachievable goal, but requires serious consideration of the trade-off between the level of uncertainty (in estimates of critical quantities such as total catch) that a particular level of observer coverage can achieve and the level of harvest that is commensurate with that uncertainty.

Best practice further calls for the collection of fishery independent data and these sources of data are critical for robust stock assessments. Serious consideration should be given to the use of tagging, not just for target shark species, but also for byproduct and possibly bycatch shark species. If only small numbers of animals can be tagged and low numbers of returns are expected, it would imply higher levels of uncertainty in estimated quantities (e.g. higher coefficients of variance for estimates of fishing mortality). This would, however, be an improvement over not knowing what current exploitation rates are and whether they are likely to be sustainable.

There is also much scope for improvement of data collection and data sharing for monitoring of ecosystem effects. Current proposals rely entirely on monitoring of the catch data which has limitations if any effects occur in parts of the food chain that are not being exploited. This is admittedly a very challenging aspect of fisheries management.

The trade-off between the level of monitoring that can be achieved and the appropriate (or commensurate) level of harvest that should be taken, is again relevant.

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6.4. Effort

This section comments on the “Package of arrangements for constraining effort” (Annex 3) in relation to Best Practice fisheries management.

Table 3 The ECIFF status quo, 2008 QDPI proposed plan, best practice and recommendations for effort control.

Status Quo	2008 Plan	Best Practice	Recommendations
Reducing potential for effort expansion			
Most N2 symbol holders also hold an N1 symbol, which allows them to undertake similar activities. The symbols can be split and one transferred to a different primary license	N1/N2 amalgamation so that the symbols cannot be split	Limit/control real and potential fishing effort; avoid undetected expansion or increase in effort and fishing power. Link fishing effort closely to fishing mortality – this requires a clear understanding of sustainable harvest rates and/or sustainable catch.	Develop standardised effort units for each commercial gear type; collect effort data at a suitable level of detail (also see below, “Restricting access.”)
As above, but with the ocean beach fishery	N1/K amalgamations so that the symbols cannot be split	as above	as above

Status Quo	2008 Plan	Best Practice	Recommendations
Restricting access to smaller number of operators			
About 1500 net and line fishers can access shark through existing fishery symbols.	New S symbol (around 175 operators)	<p>Limit/control real and potential fishing effort; avoid undetected expansion or increase in effort and fishing power. Link fishing effort closely to fishing mortality – this requires a clear understanding of sustainable harvest rates and/or sustainable catch.</p> <p><i>Note: the new number of operators (“around 175”) is an estimate of likely participants.</i></p>	<p>Effort in “number of participants” is a coarse measure of real effort.</p> <p>If basing management on effort control, develop individual effort units, assess and quantify annual effort creep. Consider effort limits in the light of catch limits to avoid having substantially more potential effort than the catch implies.</p>
Around 450 net fishers could use tunnel net apparatus through existing fishery symbols currently	New N10 symbol (25)	as above	as above
Around 450 net fishers could use 1200m of net currently	New N4 symbol (25)	as above	as above
Every commercial fisher in	Rationalise use of bait net (N6	Best practice would set an	Develop a management

Status Quo	2008 Plan	Best Practice	Recommendations
Queensland holds an N6 symbol which allows them to use a bait net to target a range of species for either personal use or sale	symbol) <ul style="list-style-type: none"> • Set criteria in order to retain N6 for selling bait • Allow crab and line fishers to use a bait net for their personal use (not for sale) 	overall limit on the amount of bait which can be taken and also consider some spatial management, particularly for bait species vulnerable to localized depletion. Ecosystem considerations, e.g. the potential effects of substantial removals of bait species, are taken into account.	strategy for bait species based on consideration of regional/spatial catch levels and potential for localised depletion.
Removal of effort			
NA	Surrender provisions associated with the N4 and N10 fishery symbols	Remove excess and latent effort; ensure that effort is not transferred elsewhere in the fishery	Recommended if this really implies the removal of effort. If it implies a potential transfer of effort reconsider potential implications in the light of other recommendations (particularly for effort on sharks).
Net Attendance			
Currently, offshore fishers can set a net and then return to port	200m attendance rule	Attend net; set net only for necessary soak time and record	Enforce net attendance, collect effort logbook data (by set,

Status Quo	2008 Plan	Best Practice	Recommendations
		soak time information. Ensure adequate surveillance to ensure management objective is being met	soak time etc) in sufficient detail and monitor with observer coverage
Effort cap on days - as part of Performance Measurement System			
NA	Proposed effort cap of 34,000 net days	Effort measured in terms of real effective effort; effort limit is commensurate with sustainable catch levels or based on reliable data; in absence of knowledge, low effort levels are set; when limit is reached active management action is taken to prevent or limit further effort	Lower the proposed effort cap (34,000 days is based on data considered to be unreliable) to a level closer to that in recent years. Develop a more appropriate effort unit than “net days” and an active management response when the limit is reached.

6.5. Performance measures and responses

This section comments on the proposed Performance Measurement System (PMS; Annex 2) in relation to Best Practice. Additional comments are provided in Section 7.

The Panel considers it informative to quote the following detail (from the 2006 Strategic Assessment of the ECIFF) regarding the role the PMS is expected to play:

“DEH’s assessment of the management regime relies heavily on DPI&F’s stated intention to review the current management regime and to implement a formal Management Plan for the fishery. The Management Plan must address the issues already identified, include clear objectives for the management of the fishery and also include performance measures, performance criteria and reference points (target and/or limit). A clear process for responding to a performance measure not being met is also required to ensure that where such an event is determined to be the result of fishery impact prompt management action is taken to address any threats to sustainability. This should include timelines in which a review should be undertaken and in which management responses must be implemented (if warranted). As bycatch is a significant issue in the fishery appropriate measures to mitigate the level of bycatch (including interactions with protected species) must also be a high priority in the formulation of the Management Plan.”

The DPI&F submissions indicate that the PMS is designed to “measure trends in the status of the fishery” and the “effectiveness of management to achieving sustainable use of fish stocks”. The PMS is a substantial improvement towards monitoring the fishery. It’s effectiveness in achieving sustainable exploitation of fish stocks is, however, less clear because of the nature of the management responses. The PMS is also very different in nature from the concept of ‘harvest strategies’, which is currently considered best practice. It should nonetheless be possible to develop the PMS into an effective set of harvest strategies.

The objectives should, where possible, explicitly reflect biological/ecological objectives. This is particularly relevant in the context of ecosystem-based fisheries management, where byproduct, bycatch and ecosystem effects should also be considered. The harvest strategy framework provides for explicitly stating the (often conflicting) multiple objectives (biological objectives for target species, for bycatch species, socio-economic objectives for the fishery, etc.) In broad terms, best practice would require moving towards the inclusion of explicit biological objectives for the species taken or incidentally affected by the fishery.

The sustainability of a fishery is closely linked to the sustainability of the resources it harvests, the associated species which are incidentally taken and the ecosystem within which fishing takes place. However, the performance of a fishery may not always

provide a reliable or complete indication of the underlying status of the resources. Ideally, the performance of the fishery management arrangements - with regard to biological and ecological sustainability - should primarily be based on measures of stock status and ecosystem condition. This may be feasible for target and byproduct species (e.g. stock assessment), but it usually becomes more difficult for bycatch species and it is particularly challenging for ecosystems.

Where such measures are not available, the performance of the fishery itself is often considered a proxy. A long history of fisheries, however, indicates the need for caution when using fishery status as a proxy for stock status. For example, catch as an indicator of stock status is risky because it is susceptible to influences from external factors such as fuel and market prices, and to changes in fishing practices. This is true even when the catch data are verified and reliable. When catches and discards (and mortality of live releases) are combined, it provides an indicator of total mortality. What is most relevant though is the proportion of the population that is being removed.

The majority of proposed performance measures are based on fisheries indicators, and in many cases not in an ideal form (e.g. total catches, effort in days). There is much scope for improvement in the 'units' and ways in which the performance measures are measured. Improvement in effort data has already been mentioned. In spite of the known weaknesses and potential problems with CPUE, standardised catch rates based on verified catch and effort data remain potentially useful and informative. Where there is no other information (e.g. stock assessment, tagging data) monitoring of catch rates even for aggregating stocks⁷ is highly relevant. Other stock status indicators (e.g. size-based indicators) should also be considered, though size-based indicators are unlikely to be informative for sharks when only a small size range is being captured. Ideally, fishery independent indicators should also be considered in a best practice system.

Indicators should be well designed to avoid providing misleading signals or not providing signals of changes. For example, the percentage of a particular species in the catch can remain the same while the catch increases, if the catches of other species are also increasing. Changes in indicators should be considered in the context of their variability and level of uncertainty. For example, if total catches from all sectors contain estimated components (e.g. discards estimated from observers) it is essential to consider the point estimates and their associated variances.

⁷ CPUE for highly aggregating stocks may not be reliable because it may not indicate a decline in the population until the stock is close to collapse. It is, however, still useful as a 'minimum' indicator; i.e. if it DOES show a decline then urgent action is required. There are also ways of quantifying effort (e.g. including search time) that would make CPUE more appropriate in such cases.

The submissions also state that the PMS “does not include any prescriptive management responses”; instead, actions triggered are generally reviews of existing management measures. A harvest strategy usually contains a prescriptive, pre-agreed management response, usually specified through the decision rule. The aim is to have a transparent and consistent process on which management decisions, particularly in relation to the setting of TACs or total allowable effort (TAEs) can be based. In some cases, it may be appropriate to specify “a review” as part of the response, but best practice requires that additional management measures are in place while the review is being undertaken.

6.6. Protected Species

The ECIFF has recorded interactions with a number of protected species, and may interact with a number of others.

Part 13 of the EPBC Act includes provisions for protected species in Commonwealth waters.

Division 1 – Listed threatened species and ecological communities

The full list of listed threatened fauna can be found on DEWHA’s website:

<http://www.environment.gov.au/cgi-bin/sprat/public/publicthreatenedlist.pl?wanted=fauna>

Threatened species that the ECIFF may interact with:

Carcharias taurus – Grey Nurse Shark (east coast population) – Critically endangered

Glyphis sp. A – Speartooth Shark – Critically endangered

Caretta caretta – Loggerhead Turtle – Endangered

Lepidochelys olivacea – Pacific Ridley, Olive Ridley – Endangered

Chelonia mydas – Green Turtle – Vulnerable

Dermochelys coriacea – Leathery Turtle, Leatherback Turtle, Luth – Vulnerable

Eretmochelys imbricata – Hawksbill Turtle – Vulnerable

Natator depressus – Flatback Turtle – Vulnerable

Megaptera novaeangliae – Humpback Whale – Vulnerable

Carcharodon carcharias – White Shark – Vulnerable

Pristis microdon – Freshwater Sawfish – Vulnerable

Pristis zijsron – Green Sawfish, Dindagubba, Narrowsnout Sawfish – Vulnerable

Rhincodon typus – Whale Shark – Vulnerable

Division 2 – Listed migratory species

The full list of listed migratory species can be found on DEWHA’s website:

<http://www.environment.gov.au/biodiversity/migratory/list.html>

Listed migratory species include:

- all migratory species that are native species and are listed in the appendices to the Bonn Convention

[http://www.cms.int/documents/appendix/Appendices COP8 E.pdf](http://www.cms.int/documents/appendix/Appendices_COP8_E.pdf)

- all migratory species includes in the annexes established under Japan-Australia Migratory Birds Agreement (JAMBA) and China-Australia Migratory Birds Agreement (CAMBA)

JAMBA - <http://www.austlii.edu.au/au/other/dfat/treaties/1981/6.html>

CAMBA - <http://www.austlii.edu.au/au/other/dfat/treaties/1988/22.html>

- all native species identified in international agreements approved by the Minister

Migratory species that the ECIFF may interact with:

Dugong dugon – Dugong

Megaptera novaeangliae – Humpback whale

Balaenoptera bonaerensis – Minke whale

Balaenoptera edeni – Bryde’s whale

Orcaella brevirostris – Irrawaddy Dolphin

Orcaella heinsohni – Australian Snubfin Dolphin

Sousa chinensis – Indo-Pacific Humpback Dolphin

Stenella attenuata – Pantropical spotted dolphin (eastern tropical Pacific population, Southeast Asian populations)

Stenella longirostris– Spinner dolphin (eastern tropical Pacific populations, Southeast Asian populations)

All native species in the family Cheloniidae (marine turtles), for which Australia is a Range State.

All native species in the family Dermochelidae (leatherback turtle), for which Australia is a Range State.

Crocodylus porosus – Saltwater Crocodile

Carcharodon carcharias –White Shark

Rhincodon typus – Whale Shark

(Note that for some of these species, including the oceanic dolphins and some of the great whales, interactions are unlikely and have not been reported)

Division 3 – Whales and other cetaceans

All whales, dolphins and porpoises (Family Cetacea) are protected in Commonwealth waters.

Cetaceans that the ECIFF may interact with:

The ECIFF may interact seasonally with some of the great whales when they move inshore (eg Humpback Whale, Minke Whale) and with some dolphins, particularly the coastal dolphins. Some interactions with Humpback Whales have been reported.

Division 4 – Listed marine species

The full list of listed marine species can be found on DEWHA’s website:

<http://www.environment.gov.au/coasts/species/marine-species-list.html>

Listed marine species include:

- All species in the Family Hydrophiidae (sea snakes)
- All species in the Family Laticaudidae (sea snakes)
- All species in the Family Otariidae (eared seals)
- All species in the Family Phocidae (“true” seals)
- All species in the Genus *Crocodylus* (crocodiles)
- All species in the Genus *Dugong* (dugong)
- All species in the Family Cheloniidae (marine turtles)
- The species *Dermochelys coriacea* (leatherback turtles)
- All species in the Family Sygnathidae (seahorses, sea dragons and pipefish)
- All species in the Family Solenostomidae (ghost pipefish)
- All species in the Class Aves (birds) that occur naturally in Commonwealth marine areas.

Marine species that the ECIFF may interact with:

Sea snakes

Saltwater Crocodiles

Dugongs

Marine turtles and leatherback turtles

Some inshore seabirds, for example pelicans and cormorants

There are a number of ECIFF closures in place that include seasonal spawning sites for barramundi and tailor and permanent closures to commercial netting in nursery habitats such as inshore seagrass beds, upper estuaries of rivers and whole estuaries of some smaller creeks. Some rivers are closed to all forms of fishing. From July 2004, additional closures implemented through GBRMP Representative Areas Program removed commercial netting from some inshore grounds. Around 30% of the GBR is now protected from commercial netting. These closures will have benefit for protected species.

See also the section on Limited take of protected species in Section 6.2.

Table 4 The ECIFF status quo, 2008 QDPI proposed plan, best practice and recommendations for protected species.

Status Quo	2008 Plan	Best Practice	Recommendations
Protected species			
<p>In 1998, 16 Dugong Protection Areas were implemented in which netting is restricted.</p>	<p>Considering 500 m exclusion zone from HWM in B Zone DPA's.</p> <p>Proposed netting arrangements in DPA's are unclear...but exclude use of 200 m barramundi set net.</p>	<p>No netting in DPA's.</p>	<p>Great Barrier Reef Ministerial Council to consider a broader review of dugong protection in the World Heritage Area.</p>
	<p>Closures at four grey nurse shark aggregation sites.</p>	<p>No take, minimise interactions with and incidental mortality of grey nurse shark; close aggregation sites to fishing.</p>	<p>Endorse grey nurse shark aggregation site closures.</p>
	<p>No take for freshwater dwarf & green sawfish, grey nurse, white & whale shark & <i>Glyphis</i> spp.</p> <p>Provision of education & awareness material to increase accuracy of reporting interactions and best practice</p>	<p>No take of any sawfish species, all are listed on Appendix 2 of CITES</p>	<p>Make narrow sawfish (<i>Anoxypristis cuspidata</i>) a no take species.</p> <p>Examine the conservation benefits of further spatial closures that would benefit protected species, including possible closure to netting of</p>

Status Quo	2008 Plan	Best Practice	Recommendations
	release techniques for protected species.		area north of Cooktown. Endorse provision of education and awareness material
2003 introduction of SOCI 01 logbooks for reporting interactions with protected species.	As status quo	Validation of protected species interactions & mortality through a statistically robust observer program.	Design & implement an observer program capable of providing statistically robust estimates of protected species interactions.
Fishers can return to shore after setting nets.	Fishers to be in attendance of nets at all times.	Fishers to be in attendance of nets at all times and be able (with assistance if necessary) to remove protected species. Measure is enforced and complied with.	Endorse net attendance rule. Ensure sufficient surveillance to make rule effective
Maximum mesh size in offshore waters is 24.5 cm. BRDs are currently non-prescribed apparatus and are therefore technically illegal. The netting regulations are	Reduction in maximum net mesh size to 16.5 cm should reduce catch of protected species such as grey nurse & white shark & <i>Glyphis</i> spp. Introduction of turtle excluder device in the tunnel net fishery.	Where possible, modify gear to reduce interactions with / capture of protected species. Minimise bycatch using the best available BRD; encourage further development and refinement of BRDs over time	A fixed hanging ratio for gillnets that minimises entanglement of large individuals of protected sharks and other protected species. Require use of BRDs in tunnel nets.

Status Quo	2008 Plan	Best Practice	Recommendations
currently very prescriptive	Allow for net fishers to use “recognised BRDs”		Allow use of “recognised BRDs”

7. Assessment against the Guidelines for the Ecologically Sustainable Management of Fisheries 2nd Edition

The Panel has been asked to evaluate consistency with the Guidelines, specifically including “the performance measures and management responses to ensure adequacy of the (proposed management) arrangements”. In this section the proposed Performance Measurement System (PMS) (Annex 2) and the proposed management arrangements (Annexes 3,4&5) are considered with regard to each of the objectives of the Guidelines.

Comments on the Performance Measurement System.

As noted in Section 6, the management arrangements or plan for a fishery (under WTO assessment) should include clear objectives for the management of the fishery and also include performance measures, performance criteria and reference points (target and/or limit). A clear process for responding to a performance measure not being met is also required to ensure that, where such an event is determined to be the result of fishery impact, prompt management action is taken to address any threats to sustainability. This should include timelines in which a review should be undertaken and in which management responses must be implemented (if warranted).

The DPI&F submissions state that the PMS is designed to “measure trends in the status of the fishery” and the “effectiveness of management to achieving sustainable use of fish stocks”. The performance measures are almost all measures of fishery status and only potential indicators of stock status by proxy. The sustainability of a fishery is obviously closely linked to the sustainability of the stocks it harvests, but fishery indicators on their own can be misleading and there are, for example, no direct measures of stock status (e.g. stock assessment estimates of biomass) for sharks. The operational objectives are closer to “fishery” objectives than biological or ecological “stock status” objectives. This causes some concern when viewed in the context of the Guidelines which emphasise the importance of biological/ecological reference points and objectives.

The submissions also state that the PMS “does not include any prescriptive management responses”; instead, actions triggered are generally reviews of existing management measures. In this regard, the PMS should not be confused with, or seen as, a “harvest strategy” as outlined in Section 4.3 Harvest Strategy, for example. The key difference is that a harvest strategy contains, as a core component, a pre-agreed decision rule (which takes data as input and provides a recommended management response) or a pre-agreed management action, which could include a review, but which could also be a fishery closure, or reduction in effort. The ‘in-possession limit’ proposed for sharks when the total TAC is reached, is closest in spirit to a harvest strategy. Harvest strategies are discussed in more detail in Section 6; it is arguably this very different approach to fisheries management - the harvest strategy approach, versus a “wait and see” approach - that has generated much of our commentary.

Effort and Retained catch

The operational objectives for most of the target and by-product species, and for overall effort, are framed in terms of maintaining catch and effort at current levels, or remaining within historic levels. It appears that an implicit assumption has been made that current levels are sustainable and precautionary.

The reason why 'current' levels of catch are considered precautionary by DPI&F is not adequately articulated. It appears that this assumption is based on considerations of "stable" catches, "stable" unstandardised catch rates and/or no evidence of "a problem". These "quantities" are, however, risky as indicators of stock abundance or of sustainability. It may also be because the proposed trigger of 700t is below the recent average catch of around 970t (2005 to 2007). The trigger, however, only relates to one component of the shark catch; the recreational fishery can potentially account for substantial shark mortalities. Also, when the trigger is reached, the in possession limits and potentially continued bycatch and discarding could result in an overall catch well above 700t. The Panel recognises that the introduction of a catch limit for sharks is a major step forward, but still have concerns about the potentially high risk implied by the likely overall catch.

In the case of sharks, the sustainable level of catch, or bycatch, is unknown for all but those species which are already protected (and where the take should be as close to zero as possible). In addition, catches by species are unknown and, equally, historic changes in catch composition are unknown. Even a low catch in tonnage of one species, could imply many individuals, particularly if only small, young, individuals are being taken. For practical reasons, the limit is defined in terms of the catch of a combination of shark species. In theory, the catch of a particular species could increase substantially if the species mix changes. In the absence of knowledge about the sustainability of current (or historic) catches for any of the species, and the aggregated nature of the catch limit, the implied risk that the limit is unsustainable for one or more species is, in our view, high and the proposed management arrangements are therefore not consistent with the precautionary approach. Although it is not currently possible to say what level of catch would be sustainable, it is the case that the lower the catch, the lower the associated risk.

The ecosystem approach to fisheries management also requires that not just target species, but also byproduct and bycatch species (some of which may have low productivity) are considered in terms of sustainability of catches and management objectives. This requires an understanding of these species, their relative vulnerability, and (ideally) their interactions. As noted above, the higher the real effort and the higher the catch, the higher the risk that the exploitation rate is too great for one or more species in the catch. The lower the catch, the lower this risk, and the more time there is likely to be to collect adequate data and monitor changes. The proposed operational objectives and performance measures for sharks do not take this into account.

In many cases it would be risky to interpret the proposed indicators as indicators of stock abundance (e.g. catches which are subject to external influences, effort measured in coarse units such as days, and unstandardised catch rates). Information on and monitoring of, total catches and total (real) effort are obviously important. Also, monitoring of the status of the fishery itself is relevant and important, but this should not be confused with monitoring of stock status.

Regarding effort, the chosen performance measure is based on the peak effort recorded in logbooks. There is, however, some concern about the reliability of the logbook data in that year (since it followed an investment warning) and the Panel has been told that fishers “inflated” catches recorded in logbooks as a means to maintain their licences. This suggests that the cap on effort has been set above the actual maximum and also well above the current level. In addition, the implicit assumption is that “net days” adequately reflect real effort. The net attendance rule may have substantial effects on effort in the offshore component of the fishery. In theory this could lead to a decrease in effort (some fishers may not bother to go fishing because they cannot leave their nets) or an increase in real effort (some fishers may go out but set the nets several times during the day or night). The coarse measure of effort, the potential for activation of latent effort within a day’s fishing and the substantial uncertainty about the sustainable levels of effort for target, byproduct and bycatch species leads to concern about the likely effectiveness of this measure.

Many of the catch-based performance measures are designed to trigger a management response when there is a reduction in catch (suggesting that the catch is being interpreted as an indicator of stock status). A substantial increase in catch should also trigger a management response since it could reflect a substantial increase in mortality. This is particularly relevant when combined with a change in the species composition of the catch.

When a performance measure, such as a level of effort or catch, is reached and a management response triggered, the response should ideally prevent (or at least firmly control) any further increase in the effort or catch. Most actions in the PMS consist of reviews, time-tables for management changes or considerations of “what to do next”. This is intentional (in the design of the PMS), but it does not constitute good fisheries management practice, because it potentially perpetuates delaying action to limit fishing - often until it is too late. Reviews may well be appropriate as one part of a response, but while reviews are being conducted, there should be clear indications of what the catch or effort limits should be and how they will be achieved. These management responses should be pre-agreed and transparent so that fishers know what will happen when a trigger point is reached.

Bycatch

Objectives in this section are appropriate; objectives are to minimise the percentage of commercial catch that is bycatch, or in the recreational and charter fisheries to minimise the bycatch of species that have high release mortalities.

The performance measures are based on the percentage bycatch (and it is unclear whether this is by species, or aggregated in groups “teleosts” and “sharks”). This choice again provides limited information on the species-specific absolute catch levels and limited power for monitoring stock status of those species. If the total effective effort and total catch in the fishery increase, or if targeting and fishing practices change, this could lead to an increase in the total bycatch (and/or bycatch of a given species) while the bycatch as a percentage of the total may show no change and therefore not trigger management action. The approach is also based on the implicit assumption that the proposed “current” percentages are adequately low, though little justification is provided (apart from the notion that bycatch is low as a percentage of the processed catch; primarily based on a research study completed in 2001). Even a very small number of removals from an already small population with low productivity may be unsustainable.

To be consistent with the precautionary approach, there is a need to collect reliable time-series data on bycatch and develop informative indicators with active management responses (e.g. spatial or temporal closures, or reductions in effort in given areas and time periods when triggers are reached).

Protected Species

A trigger has been set at the maximum number of interactions recorded in 2005 and 2006 for each category of protected species. This implies that those levels, and the mortalities implied by that number of interactions, are considered to be acceptably low. The justification for this assumption is not adequately articulated. It is also questionable whether those levels are acceptably low for all species. It is, for example, unclear how reliable the unverified data from logbooks (SOCi logbooks) are and there is very limited observer data. It is interesting that reported interactions suggest most animals are released alive, whereas the limited observer data suggest that most animals die. Inferences about total mortalities of protected species are therefore substantially different depending on which data source is used. This underlines the critical need for better information on interactions and their outcomes; this will require sufficient observer coverage and surveillance. The requirement for net attendance is a positive step, but will only be effective if complied with. The major concern is the limited reliable data and lack of an assessment of the impact of the fishery on protected species. The fact that part of the fishery occurs in a WHA highlights the importance of the issue.

The proposed management response calls for a review of management measures, but this can be a lengthy process. As in other cases, there is a need for a specified action if triggers are reached to avoid further mortalities from interactions.

Ecosystem impacts

This aspect of fisheries management has been recognised as challenging. The proposed measure makes a start, but it would be prudent to develop a suite of potential indicators and

make use of a wide range of data sources (not just fisheries data, but also survey or other monitoring data, including from other institutions). The main weakness of the proposed measures is that they only allow for monitoring of those parts of the ecosystem taken in the fishery. This does not allow for monitoring effects of the removal of predators (including sharks) from the ecosystem – either on a very local spatial scale, or over the broader geographic range of the fishery.

In the absence of such information, the precautionary approach calls for low catches to reduce the risk of unforeseen or undetected detrimental effects to the ecosystem.

Comments on the three “Packages of arrangements”

The set of tables below comment on the proposed management measures in relation to the Guidelines. There is inevitably some overlap between this and the comments on the PMS above. Any very recent proposals for improvements (e.g. to logbook design, data provision and validation) that DPI&F may have made, but that are not reflected in the packages of arrangements or the performance measure system, may not be reflected in the tables below; this is unintentional.

The tables focus on the areas in the Panel’s terms of reference: the shark sector, effort, data validation, and interactions with species protected species. Noting the relevance of all sources of mortality for the sustainability of shark populations, the Panel also comments on arrangements for other fishery sectors which catch sharks. In submissions to the Panel, we were made aware that some stakeholders have serious concerns about localised depletion of fin fish, including grey mackerel, garfish and fingermark. Some comments in the tables may also be applicable to other components of the ECIFF.

PRINCIPLE 1.

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

Objectives	Comments
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 1.1.1 There is a reliable information collection system in place appropriate to the scale of the fishery. The level of data collection should be based upon an appropriate mix of fishery independent and dependent research and monitoring.	<ul style="list-style-type: none">• There are several data collection systems in place including fishery logbooks and species of conservation interest (SOCI) logbooks.• The reliability and adequacy of the data are, however, questionable, particularly for sharks.• There is no checking or validation of logbooks, although this is now being proposed.• There is no independent catch monitoring system for sharks (e.g. catch receiver receipts).• The level of detail in catch data has been inadequate (no species identification of sharks in catch), and discards have not been recorded.• The level of detail in effort data is inadequate because a “net day” is not well defined (it can imply different lengths of net, set a different number of times, or for different lengths of time).• As a result catch rates in kg/day is inadequate for monitoring population density.• Proposed revisions to the logbook may address some of these issues and the new shark species identification guide is a very positive step.• There is limited observer data on sharks; the proposed expansion of the observer program is a positive step.• There are no fishery independent monitoring data (e.g. surveys, tagging data). The long term

Objectives	Comments
	<p>monitoring program does not currently include sharks, though there are shark-specific research projects which collect biological/genetic information.</p>
<p>Assessment</p> <p>1.1.2 There is a robust assessment of the dynamics and status of the species/fishery and periodic review of the process and the data collected. Assessment should include a process to identify any reduction in biological diversity and /or reproductive capacity. Review should take place at regular intervals but at least every three years.</p>	<ul style="list-style-type: none"> • There are no assessments of stock status, or exploitation rates, for sharks. There are limited data on which to base even a simple stock assessment. • Risk assessments have been conducted, but they only provide information on relative vulnerability of different species, not on sustainable catches or exploitation rates (although the latter could be obtained from the demographic information used in risk analyses). • Catches over time are monitored as indicators of population status, but this is risky (catches can be affected by a range of external factors e.g. market price, input costs), and not informative because of the absence of a breakdown by species. • The use of unstandardised catch rates for all species combined, and measured in terms of kg/day (instead of e.g. kg/kilometre-net-hours), is not meaningful. • There is no formal data collection scheme or process for monitoring biological diversity of sharks over time.
<p>1.1.3 The distribution and spatial structure of the stock(s) has been established and factored into management responses.</p>	<ul style="list-style-type: none"> • There is very limited information on the spatial distribution of species and very little data on the spatial distribution of catches at a species level. • Work is underway, and some results are available (e.g. from genetic studies) to determine stock structure for key target shark species. Collaborative studies with other States on these uncertainties are underway.
<p>1.1.4 There are reliable estimates of all removals, including commercial (landings and discards), recreational and indigenous, from the fished stock. These estimates have been factored into stock assessments and target</p>	<ul style="list-style-type: none"> • There are estimates of landings from some sectors, but reliability is unknown since there appears to be no validation of logbook data and no independent validation (e.g. through catch receiver receipts). Validation procedures are now being proposed. • There are no reliable estimates for recreational fishing mortality, particularly since post-release mortality is unknown. • There are no (or very limited) estimates for indigenous fishing; there are no estimates of discards.

Objectives	Comments
species catch levels.	
<p>1.1.5 There is a sound estimate of the potential productivity of the fished stock/s and the proportion that could be harvested.</p>	<ul style="list-style-type: none"> • There appear to be no estimates of the proportion that could be harvested for the shark species that occur in the catch. • There are estimates of relative vulnerability from risk assessments. The demographic parameters used in risk assessments could potentially provide estimates of sustainable harvest rates, but for many species there is still great uncertainty about the values of demographic parameters. • Current management proposals include protection of large breeding adults and focusing fishing at smaller individuals. However, without knowledge about sustainable harvest rates, this approach has a high risk of recruitment overfishing which may take a long time to detect (see Section 5). Elsewhere, where the ‘gauntlet’ approach is used (e.g. WA shark and SESS fisheries), management is supported by stock assessments and substantial monitoring programs. The lack of this supportive evidence in the ECIFF is a concern. • Collaborative work is underway with NT and WA to develop stock assessments for some shark species.
<p>Management responses</p> <p>1.1.6 There are reference points (target and/or limit), that trigger management actions including a biological bottom line and/or a catch or effort upper limit beyond which the stock should not be taken.</p>	<ul style="list-style-type: none"> • There are no biological reference points set and there appears to be no explicit (quantified) biological management objectives. (This need not be done in terms of biomass; proxies or harvest rates can be used instead.) • A total catch limit is proposed for all sharks, but not by species. This implies that catches on some species could potentially increase substantially even if the total catch limit is not exceeded. • A total effort limit is proposed, but it is defined in net days which do not adequately reflect the real potential effort or ‘catching ability’; there is still latent effort that could be activated. • Also the level of targeting on sharks could increase.
<p>1.1.7 There are management strategies in place capable of controlling the level of take.</p>	<p>Effort limits:</p> <ul style="list-style-type: none"> • There is a proposed series of management actions involving the merging of symbols, new dedicated shark, S and N4 symbols and surrender of existing entitlements, all aimed at reducing effort and

Objectives	Comments
	<p>DPI&F have provided an estimate of the likely changes in the numbers of operators accessing the fishery.</p> <ul style="list-style-type: none"> • Other than the N4 symbol; proposed to be limited to a maximum of 25 operators and a qualifying threshold of 500kg for the S symbol there does not appear to be formal cap on other symbols other than the number currently issued. • A total effort limitation in net days, even with upper limits on net length, still implies a wide range of possible levels of real effort (depending on how many sets are made per day and soak time). • Even if the upper limit set on the ‘number of net days’ is not reached, the real effort could still increase. Effort targeted on sharks could also increase. • If the limit on number of days is reached, there is no pre-agreed action to control further fishing. • It is unclear whether strategies are in place to deal with a further expansion of effort. <p>Catch limits:</p> <ul style="list-style-type: none"> • There is a proposed catch limit for sharks (700t) which if reached DPI&F have indicated they propose catches revert to possession limits only. However, given the large number of operators in the fishery, these could still account for considerable catch/mortality. • It appears that discards will not be included in the catch limit as there is currently no requirement to record discards. If they are not included, this will imply a potentially higher mortality. • Verification of catch limits will require more sophisticated catch monitoring arrangements than currently in place and an increase in surveillance. • It is unclear what level of commercial catch the proposed level of surveillance will be able to cover and hence what level of confidence there can be in not breaching catch limits. • It is unclear whether there will be sufficient compliance/surveillance in the recreational fishery to enforce possession limits. • also see Comments on Performance Measure System, under ‘Effort and Retained Catch’ in this section. •

Objectives	Comments
<p>1.1.8 Fishing is conducted in a manner that does not threaten stocks of byproduct species. (Guidelines 1.1.1 to 1.1.7 should be applied to byproduct species to an appropriate level)</p>	<ul style="list-style-type: none"> Given the absence of information on species composition in the shark catch, and the absence of estimates of current stock status and sustainable catches, it is unknown whether fishing under the proposed set of management measures threatens any stocks of byproduct shark species.
<p>1.1.9 The management response, considering uncertainties in the assessment and precautionary management actions, has a high chance of achieving the objective.</p>	<ul style="list-style-type: none"> As above: given the absence of information on species composition in the shark catch, and the absence of estimates of current stock status and sustainable catches, it is unknown whether fishing under the proposed set of management measures threatens stocks of byproduct shark species, or the target species. As noted, the use of catches as indicators of population status is risky. The use of total (all species) catches as indicators of species-specific populations is inappropriate and risky. The use of unstandardised catch rates measured in terms of kg/day is risky. The claim that there is no evidence for a need to reduce catches is not based on sound information for all species, and does not take the precautionary principle in the absence of information into account.
<p>Objective 2. Where the fished stock(s) are below a defined reference point, the fishery will be managed to promote recovery to ecologically viable stock levels within nominated timeframes</p>	
<p>1.2.1 A precautionary recovery strategy is in place specifying management actions, or staged</p>	<ul style="list-style-type: none"> It is unknown whether any of the fished (targeted, bycatch or byproduct) shark species are below best practice reference points since there are no species-specific indicators or direct estimates of abundance, and no agreed biological reference points.

Objectives	Comments
<p>management responses, which are linked to reference points. The recovery strategy should apply until the stock recovers, and should aim for recovery within a specific time period appropriate to the biology of the stock.</p>	
<p>1.2.2 If the stock is estimated as being at or below the biological and / or effort bottom line, management responses such as a zero targeted catch, temporary fishery closure or a ‘whole of fishery’ effort or quota reduction are implemented.</p>	<ul style="list-style-type: none"> • See comment above (1.2.1). • There is a lack of information for assessing stock status relative to biological (or proxy) reference points. • In addition, there is no harvest strategy (with decision rule) in place, and there appears to be limited mechanisms for rapid implementation of management responses (such as zero targeted catch, temporary fishery closure etc.) • Comments on the proposed TAC and in-possession limits when the TAC is reached have been made above; the implicit assumption appears to be that the harvested shark stocks are not in this category

PRINCIPLE 2.

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

	Comments
<p>Objective 1. The fishery is conducted in a manner that does not threaten bycatch species.</p> <p>Objectives</p>	
<p>Information requirements</p> <p>2.1.1 Reliable information, appropriate to the scale of the fishery, is collected on the composition and abundance of bycatch.</p>	<ul style="list-style-type: none"> • The fishery is very large in scale and requires much data to be collected to improve understanding of the spatial and temporal interactions between the fisheries and the broad range of bycatch species which includes rays, sharks and sawfish (as well as teleosts). • There is very poor information on the species composition of the catch, and limited information on total mortality by species. • Apart from information contained in one research study (completed in 2001) there appears to be no time-series of statistically robust estimates of bycatch across gears, sectors and regions. • There is no information on abundance at a species level. • There are no fishery independent data. • The proposed expansion of the observer program is an important positive step in this regard.
<p>2.1.2 There is a risk analysis of the bycatch with respect to its vulnerability to fishing</p>	<ul style="list-style-type: none"> • There is a risk analysis for sharks, however it is limited by a paucity of demographic data for many species. Risk assessments do not generally provide estimates of sustainable catch levels or harvest rates. • A research study (completed in 2001) showed that bycatch is low as a proportion of the processed catch; it appears that this is taken by DPI&F to mean that bycatch levels have a low risk, but it does not consider the proportion of the stock that is being removed and whether that is sustainable.
<p>2.1.3 Measures are in place to avoid capture and mortality of bycatch</p>	<ul style="list-style-type: none"> • Many measures are in place – e.g. spatial and temporal closures, gear limits and gear specifications – and additional new measures have been proposed (see Section 6 and Annex 1). • The implications of the proposed changes are unclear. There will still likely be some bycatch and

Objectives	Comments
<p>species unless it is determined that the level of catch is sustainable (except in relation to endangered, threatened or protected species). Steps must be taken to develop suitable technology if none is available.</p>	<p>there is no information on the sustainability of current levels of catch; in addition the level of bycatch by species is very poorly estimated.</p> <ul style="list-style-type: none"> • A much enhanced observer program is required to evaluate the performance and adequacy of these measures <p>(<i>Comments on protected species are provided below</i>)</p>
<p>2.1.4 An indicator group of bycatch species is monitored.</p>	<ul style="list-style-type: none"> • There is no monitoring of an indicator group of bycatch species. • One of the proposed Performance Measures is “a measurable change in species composition of the commercial and/or recreational catch”. This measure is important and relevant, but does not represent an “indicator group” and does not reflect relative abundance of such a group.
<p>2.1.5 There are decision rules that trigger additional management measures when there are significant perturbations in the indicator species numbers.</p>	<ul style="list-style-type: none"> • See comment above (2.1.4). • Even if there was a suitable indicator, the proposed management responses (in the PMS) are almost entirely phrased in terms of conducting further consultations, drawing up timetables etc. rather than in terms of direct management action. Based on the need and extent of public consultation required for the development of the proposed PMS, this could cause critical delays in management action.
<p>2.1.6 The management response, considering uncertainties in the assessment and precautionary management actions, has a high chance of achieving the objective.</p>	<ul style="list-style-type: none"> • As in the case of target species, the absence of information on species composition in the shark catch and the absence of estimates of current stock status or sustainable catches imply that it is unknown whether fishing under the proposed set of management measures threatens stocks of bycatch shark species.

Objectives	Comments
<p>Objective 2. The fishery is conducted in a manner that avoids mortality of, or injuries to, endangered, threatened or protected species and avoids or minimises impacts on threatened ecological communities.</p>	
<p>Information requirements</p> <p>2.2.1 Reliable information is collected on the interaction with endangered, threatened or protected species and threatened ecological communities.</p>	<ul style="list-style-type: none"> • There are SOCI logbooks, but without observer coverage to verify and complement this information, it is of limited use and its reliability unknown. • There is a wealth of evidence from other fisheries that voluntary provision of interactions/mortalities data on protected species is associated with gross underestimates of these quantities. Thus, a well-designed observer program with appropriate level of coverage is required.
<p>Assessments</p> <p>2.2.2 There is an assessment of the impact of the fishery on endangered, threatened or protected species.</p>	<ul style="list-style-type: none"> • There is currently no assessment of the impact of the ECIFF on these species. • Given their status, there is sufficient information (from a range of sources) to indicate the need for their protection (e.g. relative or absolute abundance estimates; estimates of rates of population decline).
<p>2.2.3 There is an assessment of the impact of the fishery on threatened ecological communities.</p>	<ul style="list-style-type: none"> • There are currently no threatened ecological communities listed under the EPBC Act or its amendments within the area of operation for the ECIFF. • Information from any ecosystem monitoring (e.g. in the GBRMP) should be considered for use in the ECIFF management plan.
<p>Management responses</p>	<ul style="list-style-type: none"> • There are many measures in place, including “no take” limits on protected species, spatial and temporal closures.

Objectives	Comments
<p>2.2.4 There are measures in place to avoid capture and/or mortality of endangered, threatened or protected species.</p>	<ul style="list-style-type: none"> • Further closures are being considered and there is a proposed “net attendance” rule which is expected to reduce mortality of some bycatch/protected species. • With more information on the number of interactions by time and geographic area, and the outcomes of those interactions (e.g. whether the animal was dead, or released alive and vigorous, etc.) improvements to existing measures should be possible. Note for example that even for no-take species, a large number of interactions could still imply a substantial mortality (e.g. sawfish which are difficult to release alive). • The proposed level of surveillance is unknown. The effectiveness of existing and proposed measures is therefore also unknown. Sufficient observer coverage and surveillance are required.
<p>2.2.5 There are measures in place to avoid impact on threatened ecological communities.</p>	<ul style="list-style-type: none"> • There are currently no listed threatened ecological communities; see 2.2.3 above
<p>2.2.6 The management response, considering uncertainties in the assessment and precautionary management actions, has a high chance of achieving the objective.</p>	<ul style="list-style-type: none"> • Comments regarding target and bycatch species again apply. There is a general lack of reliable information on the number of interactions and the outcomes of those interactions. • There is therefore great uncertainty about the actual impact of the fishery on protected species. • The success of existing and proposed measures will depend directly on the level of surveillance and compliance; this is recognised in the proposed performance measures. But we note there appears to be no proposed increase in the budget for surveillance and enforcement. • The management responses listed in the PMS do not provide confidence that rapid and effective management action can be taken if performance targets are exceeded.
<p>Objective 3. The fishery is conducted, in a manner that minimises the impact of fishing operations on the ecosystem generally.</p>	
<p>Information requirements</p>	<ul style="list-style-type: none"> • The collection of related ecosystem information is currently limited and it is unclear whether data collected by other institutions (e.g. GBRMPA) or research projects) are being considered for their

Objectives	Comments
<p>2.3.1 Information appropriate for the analysis in 2.3.2 is collated and/or collected covering the fisheries impact on the ecosystem and environment generally.</p>	<p>potential use in this regard.</p>
<p>Assessment</p> <p>2.3.2 Information is collected and a risk analysis, appropriate to the scale of the fishery and its potential impacts, is conducted into the susceptibility of each of the following ecosystem components to the fishery.</p> <p>1. Impacts on ecological communities</p> <ul style="list-style-type: none"> • Benthic communities • Ecologically related, associated or dependent species • Water column communities <p>2. Impacts on food chains</p> <ul style="list-style-type: none"> • Structure • Productivity/flows 	<ul style="list-style-type: none"> • One of the key issues relating to the ECIFF is the potential effect of removing large numbers of predators (apex or lower down in the food chain). This is a challenging task, but to be consistent with the precautionary principle, the level of removals should be commensurate with the level of knowledge about the potential effects of the harvest. • For the most common sharks in the catch, there is a need for information on the size ranges taken by the fishery and what those size classes feed on, in order to begin evaluating the potential risks of the removal of large numbers of sharks. • The PMS lists “a change in similarity measures relating to the species composition of the catch by sub-fishery/gear”. This is limited to the species taken by the fishery. • We are not aware of any other ‘assessments’ that relate to ecosystem monitoring in the ECIFF.

Objectives	Comments
<p>3. Impacts on the physical environment</p> <ul style="list-style-type: none"> • Physical habitat • Water quality 	
<p>Management responses</p> <p>2.3.3 Management actions are in place to ensure significant damage to ecosystems does not arise from the impacts described in 2.3.1.</p>	<ul style="list-style-type: none"> • The management action in relation to the performance measure noted above (2.3.2) is a review of management measures, although this could take substantial time. During the review period, other management measures should be in place (defined as part of the management response) to reduce the risk of significant damage to the ecosystem.
<p>2.3.4 There are decision rules that trigger further management responses when monitoring detects impacts on selected ecosystem indicators beyond a predetermined level, or where action is indicated by application of the precautionary approach.</p>	<ul style="list-style-type: none"> • There are no decision rules that trigger management action other than a review of management measures (also see 2.3.3)
<p>2.3.5 The management response, considering uncertainties in the assessment and precautionary management actions, has a high chance of achieving the objective</p>	<ul style="list-style-type: none"> • There is a lack of fishery independent monitoring of the ecosystem (particularly non-capture species) and a lack of information on the potential effects of the removal of sharks from the ecosystem. • This, combined with concerns about the potential effectiveness of the management proposals in the context of target and bycatch species, creates concerns about the chances of achieving the objective under the proposed management arrangements.

8. Conditions and Recommendations

ECIFF – Summary of Issues and suggested Conditions and Recommendations

General

The ECIFF is a multispecies, multi gear (gillnet and line) fishery with more than 400 commercial fishers and 750,000 recreational and charter fishers. Recreational fishers are believed to take at least half of the catch. The fishery has a large geographical footprint, extending from Cape York to the New South Wales border, the majority of which is in a World Heritage Area encompassing the Great Barrier Reef Marine Park.

The fishery is managed largely through a complex suite of input control measures. A serious lack of validated and species-specific data on the fishery catch means there is very limited knowledge of the sustainable levels of catch for most target, byproduct and bycatch species. In addition, there is inadequate fishery-independent data on the interactions with vulnerable and protected species that are susceptible to gillnets – the primary gear used in the ECIFF.

Against this background, the Panel has concerns over the level of precaution being adopted by DPI&F in the development of management arrangements and the setting of catch limits for target species. Guided by the EPBC Act and the DEWHA Guidelines for the Ecologically Sustainable Management of Fisheries 2nd Edition, the Panel's assessment is that under the management measures proposed by DPI&F and in the absence of more information the immediate risks for key target species and protected species are high, as is the risk to the broader ecosystem. The suggested conditions and recommendations reflect these risks, and a view that until more is known, catches should be reduced.

The Panel notes that conditions imposed under section 303FT of the EPBC Act must relate to the operation of the commercial fishery (ie the ECIFF). However as described in the Guidelines, there must be reliable estimates of all removals, including commercial, recreational and indigenous take. We have therefore made comments and suggestions regarding others sectors as part of the requirements necessary to manage target species and broader ecosystem interactions.

	Issue	Conditions/Recommendations
1	<p><u>Data Issues</u></p> <p>A key input into fishery management is accurate data on the total mortality of all target and by-product species. In an ecologically-sensitive area such as the GBRWHA, data are also required for by-catch and interactions with listed, threatened, endangered and protected species.</p> <p>The Panel believes there is inadequate data on which to base management decisions in this fishery. While basic data are available on the level of catch for key target species, in the case of sharks there is a lack of detail on species breakdown (currently only required to distinguish between two species groups - one of which includes 31 species) and for some years (2003 and 2004) catch figures are considered to be potentially highly inaccurate. Reporting of discards is not currently required, nor will this reporting be mandatory under the proposed new logbook. More information is also required on the effort expended in the fishery. Currently logbooks are frequently not filled out at sea and while required to be submitted regularly, there may be a considerable lag in this process. As an example of a current best practice logbook design, DPI&F may wish to refer to the AFMA NT01A logbook.</p> <p>There is also insufficient information on the take of ECIFF species by other Queensland commercial fisheries, the recreational and charter fishing sector and by indigenous fishing. It is important that estimates of all possible mortality are obtained regularly and factored into estimates of total catch and sustainability. Given the possibility of localised depletion of these species, every effort should be made to collect, verify and report these on a regional basis.</p> <p>There is currently little or no independent verification of logbook data, which is of particular concern when it comes to the take, discarding and interactions with the significant number of vulnerable and listed species in the ECIFF.</p>	<p>Condition 1: DPI&F to introduce a logbook for the ECIFF by 1 February 2009, that will provide information on all catches, discards, better recording of effort and species-specific data on shark catch (linked to new ID guide) including as a minimum:</p> <ul style="list-style-type: none"> • blacktip (<i>C. tilstoni</i> & <i>C. limbatus</i>); • spot-tail (<i>C. sorrah</i>); • milk (<i>R. acutus</i>, <i>R. taylori</i>); and • hammerhead (<i>Sphyrna</i> spp) <p>and where necessary the product form of shark. Completion of the logbook while at sea should be mandatory.</p> <p>Condition 2: By 1 July 2009, DPI&F to obtain estimates of take of ECIFF target species, split by species, from other Queensland fisheries, recreational fishing and indigenous fishing, with a particular focus on shark catch and mortality. These estimates should be updated regularly and factored into estimates of total catch and sustainability.</p>

2	<p><u>Observer program – lack of independently verified data</u></p> <p>The lack of data upon which to base management decisions in this fishery has already been discussed. Even with a contemporary and comprehensive logbook program, good practice dictates that logbook data be independently verified and that a range of other data which is not collected in logbooks be available for management. An observer program would provide such information and also facilitate improved biological data collection leading to a better understanding of species vulnerability, and to exploitation levels through estimation of reporting rates in future tagging programs.</p> <p>An observer program is required to provide verified information on a range of factors including:</p> <ul style="list-style-type: none"> • spatial, temporal catches by all sectors; • catch composition; • discard rates and non-retained mortality; • interactions with protected species; • data on effort; and • data on possible localised depletion. <p>While coverage may differ given logistic difficulties of some sectors, coverage must be high enough to estimate with reasonable certainty (we suggest to CV's <20%) total catch/interactions of low productivity bycatch and no-take protected species.</p>	<p>Condition 3: DPI&F to implement a statistically robust observer program by 31 December 2009, with an appropriate level of coverage to validate logbook estimates of total removals, species composition data for difficult-to-identify shark species, discard levels and interaction with protected species across all sectors of the commercial fishery.</p> <p>Recommendation 1: There should be annual analysis and public reporting of observer data.</p>
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3	<p><u>Shark species stock status concerns</u></p> <p>There are significant concerns and uncertainty about the stock status and sustainable harvest of shark spp in the ECIFF. As a multispecies, multi gear fishery, controlling the take of any one of these species presents challenges. The species taken in this fishery vary widely in their productivity and while the limited information available suggests that catches tend to be focussed on the more productive species, this information is based on a very limited sample size, from a small area of the fishery. In these circumstances continuing to operate at historic levels presents high risks to the more vulnerable species and is not precautionary. The precautionary approach requires a significant lowering of the catch level until more certainty can be given to the fishery impact on these species. Conditions 1-3 (above) will help provide the information necessary to lower this risk, but this will take time.</p> <p>The development of a harvest strategy using a tiered approach - see for example, the Commonwealth Fisheries Harvest Strategy Policy - will enable the risks to different species to be assessed and managed. Implementing an effective harvest strategy will also prevent an increase in the take of low productivity/high risk species.</p>	<p>Condition 4: By 31 December 2010 DPI&F to develop and implement a harvest strategy for shark catches (all species) in the ECIFF. The strategy should set limits to prevent a significant change in the species mix of sharks.</p> <p>Condition 5: By 31 December 2010, DPI&F to implement an appropriate research program to determine exploitation rates for all commonly caught shark species, including tagging studies as appropriate.</p> <p>Condition 6: By 31 December 2011, DPI&F to work with other relevant jurisdictions to develop and implement a stock assessment model for blacktip and spot-tail shark in the ECIFF.</p> <p>Recommendation 2: DPI&F to increase research on shark species in the ECIFF to address the following areas:</p> <ul style="list-style-type: none"> • update demographic parameters and risk assessments; • standardise catch rates of the main target shark species; • spatial heterogeneity of shark species taken
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		<p>in the ECIFF, particularly inshore listed and highly vulnerable species;</p> <ul style="list-style-type: none"> • post-release survival of hook and net caught sharks from recreational and commercial sectors. <p>Recommendation 3: DPI&F to continue education programs across all sectors on species identification, safe handling and release procedures and conservation.</p>
4	<p><u>Protected Species</u></p> <p>There is the potential for ECIFF net fishing to interact with a significant number of protected species, both in and outside of the GBRWHA. These species include white, grey nurse and whale sharks, <i>Glyphis</i> spp, freshwater and green sawfish, dugong, whales and dolphins, turtles, crocodiles, sea snakes and sygnathids.</p> <p>Despite the introduction of the Species of Conservation Interest (SOCI) logbook in 2003, there appears to be limited information on interactions with these protected species. The observer program (Condition 3 above) will improve the quantity and accuracy of the information available on interactions. Annual reporting will enhance the transparency of this information.</p> <p>In written submissions and subsequent discussions with the Panel, ECIFF stakeholders have suggested that for two important protected species (dugong and sawfish) a closure of the waters north of Cooktown to net fishing would potentially enhance their recovery/rebuilding. Concerns about impacts of net fishing on recreational fishing in this area indicate that DPI&F consideration of measures to</p>	<p>Recommendation 4: DPI&F to include in the annual reporting on the ECIFF, estimates of interactions and mortality of protected species based on the SOCI logbook, the observer program and surveillance and compliance information.</p> <p>Condition 7: DPI&F to examine and report by 31 December 2009 on the conservation benefits of a closure of waters north of Cooktown to mesh net fishing to provide additional protection to dugong and sawfish.</p> <p>Recommendation 5: DPI&F to continue education programs across all sectors on species identification, safe handling, release procedures and conservation.</p>

	avoid localised depletion of some fish stocks should be a high priority.	
5	<p><u>Effort management</u></p> <p>The ECIFF is managed primarily through input controls. Despite successfully removing considerable latent effort over the years, there remains considerable scope for operators in this fishery to increase effective effort over the current levels should economic conditions (e.g. reduced costs, increased demand and prices) allow. Based on DPI&F figures, average days fished by operators is between 50 and 60 days per year and average catches between 1 and 15 t. Many operators switch back and forth from the ECIFF to other Queensland fisheries during the year, or use the ECIFF as a supplement to predominantly land-based employment. Given the number of commercial operators, a huge recreational sector, uncertainty around sustainability of catch, interactions with vulnerable and protected species in a GBRWHA, and taking lessons from fishery management around the world, the relatively open possibility of effort expansion is of concern.</p> <p>Using a cap of “net days” as a management measure is also of concern given that the number of sets per net day is currently not limited, allowing fishers to set more than once per day if desired. Given the proposed new attendance rules, it is entirely possible that fishers will chose to set more than once per day, in so doing making a “net day” an imprecise measure and control mechanism. A standardised unit of effort needs to be developed for both net (see for example the SESS definition – km net/hrs) and line fishing to ensure changes in effective effort can be properly monitored.</p> <p>The trigger limit set to respond to changes in effort is at the top end of the effort recorded in the ECIFF. This is not considered to be precautionary by the Panel and Condition 8 requires a significant reduction in this figure to reduce the scope for a</p>	<p>Condition 8: By 1 February 2009, DPI&F to review and lower the proposed trigger for effort from 34,000 net days to more closely reflect the average level of effort in the fishery over the last two years.</p> <p>Condition 9: By 1 February 2009, DPI&F to develop and implement an appropriate management response to triggering of the effort cap.</p> <p>Condition 10: DPI&F to develop and implement by 1 July 2009 a standardised unit of effort for both net and line fishing in the ECIFF.</p>

	<p>substantial blow out in effort without a commensurate management response. A clear and decisive management response needs to be developed and announced so that action can be taken to manage any further fishing should the new effort trigger be reached.</p>	
6	<p><u>Localised depletion/spatial management</u></p> <p>Submissions to the Panel documented (albeit based largely on anecdotal information) localised depletion for some species. These depletions are not always obvious when fishery “assessments” are based on aggregate data, as they have been in the ECIFF. Yet in schooling species with local residency and/or those that form seasonal spawning aggregations, the risk of localised depletion is high e.g. grey mackerel. The panel notes that localised depletions of inshore sawfish populations (now largely absent from Southern Queensland) and documented reductions in numbers of dugong have occurred in the same area. While it is unlikely that these are solely due to mortality in the ECIFF, there is likely to have been a significant impact from the fishery.</p> <p>The DPI&F have indicated that they intend to explore greater spatial management once the proposed management changes have been implemented. The Panel considers that given the geographical size of the fishery and the potential for interactions with protected species this should be a priority. However, we recognise that improved data will be required (from Conditions 1-4 above) to ensure decisions are based on the best outcomes for the stocks and protected species.</p>	<p>Condition 11: DPI&F to conduct a review seeking broad public and scientific input on the use of spatial management in the ECIFF to reduce the potential for localised depletion of key species (ie grey mackerel but also garfish) and interactions with protected species such as dugong, inshore dolphins and humpback whales. The findings are to be implemented by the 31 December 2010.</p>

7	<p><u>Management arrangements</u></p> <p>As noted throughout this report, a serious concern for the Panel is the uncertainty and risk associated with the proposed TAC for shark catches by the commercial sector. In forming this view the panel is particularly mindful of:</p> <ul style="list-style-type: none"> • The general lack of data; <ul style="list-style-type: none"> ○ the lack of validated data; ○ the lack of species-specific catch data; ○ the lack of fishing mortality estimates for sharks from all catching sectors; • the vulnerability of shark stocks to overexploitation; • the lack of knowledge about sustainable catch levels by species; • the lack of reliable estimates of incidental mortality of protected species; and • the lack of knowledge about potential ecosystem effects. <p>The Panel is also mindful of the fact that the TAC, as proposed, will only apply to the commercial sector, and the total mortality of sharks could therefore be well above the proposed TAC. In addition, under the proposed arrangements even when the TAC is reached sharks can continue to be caught and landed (albeit at much lower levels) but additional directed and incidental mortality will occur.</p> <p>In addition, the resources available to effectively enforce a range of important management arrangements (and hence their overall effectiveness) including, net attendance rules, catch limits and no-take (i.e. no mortality) measures to manage both the commercial and recreational catch of shark are also of concern.</p> <p>A precautionary approach should be implemented where the extent of risk is unclear and involves consideration of the adequacy of current or proposed management arrangements having regard to the current levels of knowledge of risk. Managing</p>	<p>Condition 12: DPI&F is to review and set a TAC of less than 700 tonnes for the shark fishery by 1 July 2009. Based on this revised TAC, DPI&F should review the desirability of management arrangements which provide for a target shark fishery. The TAC should be further reviewed once adequate data are available to update vulnerability and/or stock assessments for species caught by the fishery.</p> <p>Condition 13: From 1 July 2009 DPI&F is to make at risk species such as narrow sawfish (<i>Anoxypristis cuspidata</i>), and white-spotted guitar fish (<i>Rhynchobatus</i> spp) no take species.</p> <p>Condition 14: From 1 July 2009, DPI&F is to implement a catch receiver system, with enforcement checking to provide confidence in these data, to verify sales against landings and to cross check logbook catch data with catch landing data.</p> <p>Recommendation 6: While recognising that ideally shark fins should be attached to trunks to facilitate compliance with management arrangements, where this is not possible the DPI&F should develop product to fin weight relationships for shark species and consider DNA random testing of landed product</p>
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<p>the take of a species in a manner consistent with the precautionary principle involves considering risk-weighted options in the context of all sources of mortality.</p> <p>Consequently the Panel, based on its experience, has assessed the risk associated with the proposed TAC as high; in our judgement too high. The lack of data and knowledge are such that the Panel cannot provide an indication of what might constitute a ‘safe’ TAC. However, the lower the TAC (and the lower the total catch of sharks), the lower the risk to the target, byproduct, bycatch and protected species and the less the urgency for rapid completion of condition 5.</p> <p>In developing Condition 13, the Panel considered the need to address the take of the species in question by the recreational fishing sector. The Panel believes that there should be a zero possession limit for these species in this sector but is not able to make such a condition.</p> <p>More generally, the proposed management arrangements for the ECIFF are complex and inter-dependent. DPI&F indicated to the Panel that the arrangements were akin to a house of cards - if one were removed, the house would collapse. Such an approach does not allow the flexibility necessary to deal with a fishery operating in a complex, dynamic, world heritage listed ecosystem. Similarly, the past approach in the ECIFF of developing stronger management measures (e.g. quota controls) only when information (anecdotal and research data) suggested there was a problem (e.g. spotted mackerel, tailor and most recently grey mackerel) is a concern.</p> <p>The management complexity in the proposed arrangements adds to the cost and difficulty in successfully implementing these arrangements and achieving the stated objectives for the fishery. DPI&F informed the Panel of the significant financial constraints under which ECIFF managers operate when it comes to compliance, monitoring and observing programs. The mixture of complexity and lack of resources lead the Panel to have significant concerns about how well the proposed</p>	<p>for no-take species.</p> <p>Recommendation 7: DPI&F to review the hanging ratio for all nets to ensure they are fixed at a level that minimise capture of large sharks or protected species.</p> <p>Recommendation 8: DPI&F to review management arrangements for the ECIFF and develop a management regime which:</p> <ul style="list-style-type: none"> • if based on managing effort provides for individual effort units, assesses and quantifies annual effort creep and provides a mechanism to adjust effort in response to increases in effort; or • through alternative management models which implement firm catch limits for all key species and allows autonomous adjustment of the fleet as catch limits change.
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<p>management measures could be implemented, enforced and ultimately made to work. It is clearly not enough to draw up measures without having the capability of enforcing them and measuring performance against management objectives.</p> <p>The Panel also has concerns over the potential impact of the fishery on highly vulnerable species, notably inshore dolphins and dugongs (particularly in the extensive non-DPA components of the fishery). Increasing numbers of humpback whales along the Queensland coast are also likely to see increased interactions with ECIFF gill nets.</p> <p>Finally while recognizing that management of the ECIFF has been significantly improved over recent years, and that DPI&F are committed to further advances towards best practice management in a WHA, the Panel suggests there needs to be a fundamental rethink of the management approach for the ECIFF over the next 3 years, to reduce complexity, ensure sustainability of all species, and to take into account significant spatial heterogeneity in the risks.</p>	
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References

- Australian Government. 2007a. Guidelines for the ecologically sustainable management of fisheries 2nd Edition. Australian Government, Department of Environment and Water Resources.
- Australian Government. 2007b. Commonwealth Fisheries Harvest Strategy Policy Guidelines. Australian Government Department of Agriculture, Fisheries and Forestry, Canberra, Australia 55 p.
- Dowling, N.A., Smith, D.C. and Smith, A.D.M. 2007. Finalisation of Harvest Strategies for AFMA's Small Fisheries. Final report for Project 2007/834 to the Australian Fisheries Management Authority, Canberra.
- FAO. 2000. Fisheries management. 1. Conservation and management of sharks.
- FAO Technical Guidelines for Responsible Fisheries. No. 4, Suppl. 1. Rome, FAO. 37p.
- FAO. 1995. Code of Conduct for Responsible Fisheries. Rome, FAO. 41 p.
- Garcia, S.M., Zerbi, A., Aliaume, C., Do Chi, T., Lasserre, G. 2003. The ecosystem approach to fisheries. Issues, terminology, principles, institutional foundations, implementation and outlook. FAO Fisheries Technical Paper. No. 443. Rome, FAO. 71 p.
- Smith, A.D.M., E.J. Fulton, A.J. Hobday, D.C. Smith and P. Shoulder. 2007. Scientific tools to support practical implementation of ecosystem-based fisheries management. ICES Journal of Marine Science: Journal du Conseil 64(4):633-639

Acronyms

AMCS	Australian Marine Conservation Society
AFMA	Australian Fisheries Management Authority
CITES	Convention on International Trade in Endangered Species (of Wild Fauna and Flora)
CPUE	catch-per-unit-effort
CRFFF	Coral Reef Fin Fish Fishery
DEH	Department of the Environment and Heritage (Commonwealth), now DEWHA
DEWHA	Department of the Environment, Water, Heritage and the Arts (Commonwealth)
DPA	Dugong Protection Areas
DPI&F	Department of Primary Industries and Fisheries (Queensland)
ECIFF	East Coast Inshore Fin Fish Fishery (Queensland)
EBFM	ecosystem-based fisheries management
EEZ	Exclusive Economic Zone
EPBC Act	<i>Environment Protection and Biodiversity Conservation Act 1999</i>
FAO	Food and Agriculture Organization of the United Nations
GBRMC	Great Barrier Reef Ministerial Council
GBRMP	Great Barrier Reef Marine Park
GBRMPA	Great Barrier Reef Marine Park Authority
GBRWHA	Great Barrier Reef World Heritage Area
Guidelines	Guidelines for the Ecologically Sustainable Management of Fisheries - 2 nd Edition
GVP	Gross Value of Production
IPOA-Sharks	FAO International Plan of Action for the Conservation and Management of Sharks
IUCN	International Union for Conservation of Nature
MCS	Monitoring, control and surveillance
NGO	Non-government organisation
NPOA	National Plan of Action
Panel	Independent Expert Review Panel
PMS	Performance Measurement System
QSIA	Queensland Seafood Industry Association
SESS	Southern and Eastern Scalefish and Shark (fishery)
Shark Plan	National Plan of Action for the Conservation of Sharks
SOCI	Species of Conservation Interest (logbook)
Sunfish	Sunfish Queensland
TAC	Total allowable catch
VMS	Vessel Monitoring System
WHA	World Heritage area
WTO	Wildlife Trade Operation
WWF	WWF Australia

Annex 1 - Summary of key and proposed changes to management arrangements in the ECIFF since the 2006 DEH assessment⁸

Previous arrangement (at last DEH assessment)	Arrangements implemented since assessment	Arrangements proposed (not yet implemented) since assessment
Effort		
Latent effort (unused licenses) was reduced through a latent effort removal policy in 2004, the number of net licenses was reduced from 850 to 450.		Excess capacity in the small-mesh “bait” net fishery to be removed.
Latent effort existed in symbols that were able to be split off licenses e.g. if an operator held an N1 symbol and an N2 symbol, the package could be split and one of the symbols sold.	2008 – N1/K amalgamation to prevent license splitting, similar to N1/N2 amalgamation DPI&F advise 104 N1 symbols remain.	2008 – N1/N2 amalgamation to prevent license splitting (N2 symbols will now also endorse use of N1 nets. Operators who hold an N2 and an N1 will have the N1 removed, but will retain the ability to use N1 nets under the N2 symbol)
<i>The GBRMPA Representative Areas Program in 2004 included a Structural Adjustment Package funded by the Commonwealth Government which removed 58 active net symbols from the</i>		The Moreton Bay Marine Park structural adjustment program is currently underway (funded by the Queensland Government).

⁸ Changes in italics were not initiatives of the Queensland Government.

Previous arrangement (at last DEH assessment)	Arrangements implemented since assessment	Arrangements proposed (not yet implemented) since assessment
<i>fishery (including about 150 tonnes of shark catch history).</i>		
Net attendance is currently required for all nets except for offshore set nets for which net attendance is not required. Currently offshore set nets can be set and the fisher can return to port.		2008/09 – 200 metre net attendance rule proposed (in response to a requirement of the GBRMC for 100 metre attendance; change in distance based on safety concerns). DPI&F considers the requirement for net attendance will have a significant impact on effort in the offshore sector.
Approximately 1500 net and line fishers can currently catch and/or target sharks in Queensland		2008/09 – proposed new S symbol requiring catch history (500kgs) and surrender of an N1 symbol. DPI&F estimates the number of fishers able to target sharks will be reduced to around 175.
Approximately 450 net fishers can currently use tunnel net apparatus		2008/09 – proposed new N10 symbol for tunnel nets requiring history of apparatus use, and surrender of an N1 symbol. DPI&F estimates the number of operators able to use tunnel nets will be reduced to around 29.
Approximately 450 net fishers can currently use 1200 metres of net (generally used by offshore set nets to target sharks)		2008/09 – proposed new N4 symbol for offshore set nets, requiring catch history and surrender of two N symbols (N1 or N2). DPI&F advise a maximum of 25 operators may qualify to use 1200 metres of net, but estimate around 15

Previous arrangement (at last DEH assessment)	Arrangements implemented since assessment	Arrangements proposed (not yet implemented) since assessment
		operators will apply.
Every commercial fisher in Queensland currently holds an N6 symbol which allows them to use a bait net to target a range of species for either personal use or sale		2008/09 – proposed rationalisation of bait net (N6) symbol with requirement for catch history. DPI&F estimate about 500 N6 entitlements will remain following this process.
No performance measurement system (PMS) in place for the ECIFF		2009 – proposed PMS with effort triggers, including a 34,000 day trigger. DPI&F also proposes to research other options for effort management and to review effort levels after a year of data collection in 2010. Few management responses have been developed to date.
Protected species		
<i>In 2004 additional closures implemented through Great Barrier Reef Marine Park (GBRMP) Representative Areas Program removed commercial net fishing from significant areas of inshore fishing grounds, protecting around 30% of the Great Barrier Reef from commercial netting.</i>		
16 Dugong Protection Areas (DPAs) have been in place since 1998. Netting is restricted in these	A working group of the MAC suggested the extension of the Gladstone DPA to	2009 –proposed extension of the Gladstone/ Facing Island DPA.

Previous arrangement (at last DEH assessment)	Arrangements implemented since assessment	Arrangements proposed (not yet implemented) since assessment
areas.	include Facing Island, as well as prohibition on using offshore nets around headlands.	
Offshore set nets can currently be used off headlands provided the water is deeper than 2 metres.		2009 – proposed 500 metre exclusion zone around headlands for set nets.
Net attendance is currently required for all nets except for offshore set nets for which net attendance is not required. Currently offshore set nets can be set and the fisher can return to port. Currently near shore nets can be set and the operator return to shore provided they are within 100 metres.		2008/09 – 200 metre net attendance rule proposed for offshore set nets (see above). 2008/09 – proposal to require attendance at near shore nets that are not accessed from the shore to be “on the water”. Attendance requirements to mean that the fisher has to be able to access all parts of the net while it is in use.
Grey nurse shark closures: 2003 – DPI&F introduced four fisheries closures within a 1.2 km radius of a central coordinate to protect critical grey nurse shark habitat.	2006 – EPA declared the Great Sandy Marine Park and Wolf Rock a Marine National Park Zone within a 1.2 km area of a central coordinate. All extractive uses are prohibited within this area. An additional 300 m buffer zone extends beyond the marine national park zone and only trolling for pelagic fish is permitted within this area.	The Moreton Bay Marine Park Zoning Plan is currently under review with a new zoning plan expected to be released in late 2008. In the draft zoning plan released for public comment in December 2007, Flat Rock, Cherubs Cave and Henderson Rock (all key aggregation sites for grey nurse sharks in SE Qld) have been proposed as Marine National Park Zones which prohibit all extractive use.
BRDs are currently non-prescribed apparatus		2010 – proposal to require the use of a BRD in

Previous arrangement (at last DEH assessment)	Arrangements implemented since assessment	Arrangements proposed (not yet implemented) since assessment
and are therefore technically illegal.		tunnel nets, to exclude turtles. 2010 – proposal to allow net fishers to use “recognised BRDs” to encourage development of new types of nets that may reduce bycatch or minimise interactions with protected species.
Currently grey nurse sharks (listed as threatened under Queensland’s <i>Nature Conservation Act 1992</i>) and great white sharks are the only sharks not permitted to be taken under Queensland’s fishing regulations. The species of sharks listed under the EPBC Act are protected in Commonwealth waters but this is not reflected in Queensland’s legislation.		2009 – proposal to make whale shark, speartooth shark, freshwater sawfish, green sawfish and dwarf sawfish no take.
Species of Conservation Interest (SOCI) logbook introduced in 2003. Prior to this, fishers were not required to report interactions with protected species. DPI&F also signed a Memorandum of Understanding with the Commonwealth Government for reporting of protected species interactions.		
		A sawfish community education program is underway that aims to educate commercial and recreational fishers about ways of reducing interactions with sawfish and best practice

Previous arrangement (at last DEH assessment)	Arrangements implemented since assessment	Arrangements proposed (not yet implemented) since assessment
		release techniques.
Sharks		
Currently grey nurse shark (listed as threatened under Queensland's <i>Nature Conservation Act 1992</i>) and great white sharks are the only sharks not permitted to be taken under Queensland's fishing regulations (see above).		2009 – proposal to make spartooth shark, freshwater sawfish, green sawfish and dwarf sawfish no take. ⁹ (see above).
No limit on commercial take of non-protected sharks		2009 – Proposed in-possession limit of one for grey and whitetip reef sharks, and 5 for white spotted guitarfish and narrow sawfish.
No limit on commercial take of non-protected sharks		2009 – proposed in-possession limit for all commercial fishers who do not hold an S symbol, of 10 sharks for net fishers and 4 sharks for line fishers.
No limit on commercial take of non-protected sharks		2009 – proposed 700 tonne TAC. Response if this is met is not clear. DPI&F advise one possibility is that the Director-General will instruct S symbol holders (all target shark fishers) to revert to in-possession limits (10 sharks for net fishers and 4 for line fishers). 2010 – using improved data, decision rules on

⁹ DPI&F advises these restrictions will apply to fisheries on the east coast and in the Gulf of Carpentaria

Previous arrangement (at last DEH assessment)	Arrangements implemented since assessment	Arrangements proposed (not yet implemented) since assessment
		sharks to be amended if necessary.
No maximum size limit on sharks		2009 – Proposed maximum size limit of 1.5m for all commercial line and recreational fishers. Aims to protect large breeding sharks and reduce the practice of targeting large sharks for their fins. Note: it is uncertain as to whether this will apply to net fishers as well or only to line fishers. It is also likely the Marine Aquarium Fish Fishery will be exempted from the maximum size limit.
Maximum mesh size for offshore nets is currently 245mm (10 inch)		2009 – Proposed maximum mesh size of 160-165mm (6.5 inch) for offshore nets. Aims to increase selectivity for smaller sharks (less than 1.5m).
Approximately 1500 net and line fishers can currently catch and/or target sharks in Queensland		2008/09 – proposed new S symbol requiring catch history and surrender of an N1 symbol. DPI&F estimates the number of fishers able to target sharks will be reduced to around 175.
Approximately 450 net fishers can currently use 1200 metres of net (generally used by offshore set nets to target sharks)		2008/09 – proposed new N4 symbol for offshore set nets (see above) will be allowed 1200 metres of net all others will be limited to 600 metres.
Voluntary observer program with limited coverage to date	11 days in 2006, 38 days in 2007, 73 in 2008	2009 – proposal to introduce compulsory observer program for all S symbol holders to

Previous arrangement (at last DEH assessment)	Arrangements implemented since assessment	Arrangements proposed (not yet implemented) since assessment
		collect better data about the shark sector – no details of coverage
Logbook only identifies two species groups of sharks, hammerheads and whalers. Monthly logbook returns.		<p>2009 – proposed introduction of a new shark logbook and fortnightly returns, to gather information on catch composition and spatial distribution of catch. More timely monitoring of the catch will be achieved by requiring fortnightly returns.</p> <p>2009 – fishers will be issued with shark identification guides to assist accurate recording of catch.</p>
No requirement for VMS on any boats in the ECIFF		2009 – proposal to make VMS compulsory on N4 boats (offshore set net target shark sector).
Recreational catch of sharks		2009 – proposal for recreational in-possession limit of one shark or ray
Need for further research into sharks and rays		<p>2009 – proposal to investigate feasibility of tag/recapture program.</p> <p>2009 – “shark panel” to provide advice on research needs across northern shark fisheries and possible funding sources.</p> <p>2009 – “shark panel” to consider collaborative projects with the Gulf and NT (and possibly</p>

Previous arrangement (at last DEH assessment)	Arrangements implemented since assessment	Arrangements proposed (not yet implemented) since assessment
		<p>WA).</p> <p>2010 – outcomes of current research projects will be available (including MTSRF Inshore Biodiversity project and FRDC stock structure project)</p>
No harvest strategy or stock assessments		<p>2010 – proposal for “shark panel” to initiate the development of a harvest strategy and a stock assessment model.</p> <p>2011 – “shark panel” to consider a draft harvest strategy and agree on an appropriate stock assessment model for shark, depending on the data being collected (eg tag/recapture or age-structured information).</p> <p>2012 – “shark panel” to review outcomes of research initiated in 2009 and commence review of risk assessment to measure the effectiveness of shark management arrangements.</p> <p>2013 – proposal for stock assessments on key species completed and the risk assessment for vulnerable species to be updated.</p>
It is an offence under <i>Qld Fisheries Regulations 2008</i> , to possess a shark fin on board a boat		2009 – proposal for requirement for operators who do not hold an S symbol to keep sharks and

Previous arrangement (at last DEH assessment)	Arrangements implemented since assessment	Arrangements proposed (not yet implemented) since assessment
without possessing the body of the shark. This applies to all fishers, commercial and recreational. It is an offence for a person who possesses a shark to divide it into portions other than in a way that allows an inspector to easily count the number of sharks possessed by the person. For the purposes of the Regulation, shark is defined as all Elasmobranchs.		rays with fins attached.
Other		
		2009 – new size and bag limits for recreational fishers have been proposed through the RIS process.
		2009 – new minimum and maximum size limits have been proposed through the RIS process for some species, including an increase in the minimum sizes for grey mackerel and mullock.
		2009 – changes to netting arrangements have been proposed through the RIS process to attempt to simplify management of this sector.
In 2003, spotted mackerel became a line-only species. The 140 tonne TAC has never been met.		Remove the 150 fish in-possession limit for line fishers and increase the incidental net caught limit from 15 to 50 fish in order to reduce wastage.

Previous arrangement (at last DEH assessment)	Arrangements implemented since assessment	Arrangements proposed (not yet implemented) since assessment
Under-catching of quota for tailor was thought to be related to reporting systems rather than to the actual catch. Previously fishers only had to report catch of tailor against the TAC when they catch more than 100 kg.	Increasing numbers of inshore net fishers land tailor daily, but not in quantities greater than 100 kg. .	To better reflect the amount of TAC being used, the incidental limit has been reduced to 30kg
<p>2006 – age structured assessments of tailor, mullet and spotted mackerel stocks (incorporating commercial and recreational catch and effort data and environmental variables) were completed.</p> <p>Late 1990’s – yield-per-recruit studies were carried out for bream, tailor, flathead and whiting.</p> <p>2002 – biomass dynamic models for barramundi and threadfins.</p> <p>2004 – Semi-quantitative ecological risk assessment on sharks.</p> <p>2006 – FRDC Sharks and Rays Phase II risk assessment for northern sharks and rays</p>		
Recreational diary program conducted in 1996/1997, 1998/1999, 2001/2002		A further survey is currently in progress.

Previous arrangement (at last DEH assessment)	Arrangements implemented since assessment	Arrangements proposed (not yet implemented) since assessment
<p>Compliance: during 2006, 16,011 units, including 90 commercial line fishing vessels and 363 commercial net fishing vessels, were inspected in the ECIFFF, with an associated compliance rate of approximately 98% on units inspected. The majority of inspections were of recreational fishers.</p>		<p>A compliance risk assessment is scheduled for 2009.</p>

Annex 2 - DPI&F ECIFF Draft Performance Measurement System

Introduction

The East Coast Inshore Finfish Fishery (ECIFF) is a multispecies fishery utilising various netting methods and hook and line gears in inshore and estuarine waters adjacent to Queensland's east coast. Target species vary between tropical and subtropical regions. The species targeted commercially include mullet, shark, whiting, bream, tailor, small mackerel, threadfins and barramundi, with other tropical and temperate species, such as garfish, queenfish, flathead, trevally and dart harvested as byproduct. Mullet roe, shark and small mackerel products are exported. In 2006, there were 452 net boats and 367 line boats working ,in the fishery.

The ECIFF includes many species of recreational significance. For several species the estimated annual recreational catch is greater than the commercial catch. Recreational fishers target whiting, bream, trevally, flathead, tailor, barramundi and small mackerels, typically with hook and line gear. Indigenous fishers utilise traditional subsistence methods to catch a range of species for customary purposes to supply product for community use. There are a range of input and output controls in place to manage the harvest of ECIFF species by commercial and recreational fishers.

Measuring the performance of a fisheries management arrangements is integral to ensuring its long term viability and sustainability. The development of a Performance Measurement System (PMS) is also a requirement of the Wildlife Trade Operation (WTO) approvals granted under the *Environment Protection and Biodiversity Conservation Act 1999*, and is therefore helping to maintain export approvals. This PMS covers the Queensland East Coast Inshore Finfish Fishery.

A PMS will be a key component of any enhanced management arrangements for the ECIFF Fishery, as it provides a set of transparent and verifiable measures against which DPI&F can assess and report on the performance of the fishery and demonstrate its sustainability.

This PMS was developed in collaboration with the Inshore Management Advisory Committee (Inshore MAC). Views of representatives from the commercial & recreational fishing sectors, fishery stakeholders, fishery managers, researchers and assessment and monitoring staff were sought to ensure that the PMS was reliable, defensible and precautionary, taking into account data limitations but incorporating the most appropriate information available.

Performance measures developed for the ECIFF relate to:

- Retained (target and byproduct species);
- Bycatch;
- Endangered, threatened and protected species; and

- The Ecosystem

The PMS explicitly states broad whole of fishery objectives for commercial effort, recreational harvesting and shark harvesting and outlines the methods by which fishery performance will be measured. Impacts on threatened, endangered and protected species and the ecosystem are also dealt with on a whole of fishery basis.

Objectives that are more specific to species targeted by the range of fishing practices employed. in the ECIFF have been divided into relevant sub-fishery categories:

- The bait collection sub-fishery
- The barramundi sub-fishery
- The inshore estuarine sub-fishery
- The ocean beach sub-fishery
- The small mackerel and shark sub-fishery; and
- The spotted mackerel sub fishery

While indicators used to measure the rate of change in catch of most species are assessed at the sub-fishery level, the main exception is shark. Because shark is retained in several ECIFF sub-fisheries, a whole of fishery performance measure has been developed to monitor commercial shark harvest against a precautionary Total Allowable Catch, set at 700 t annually.

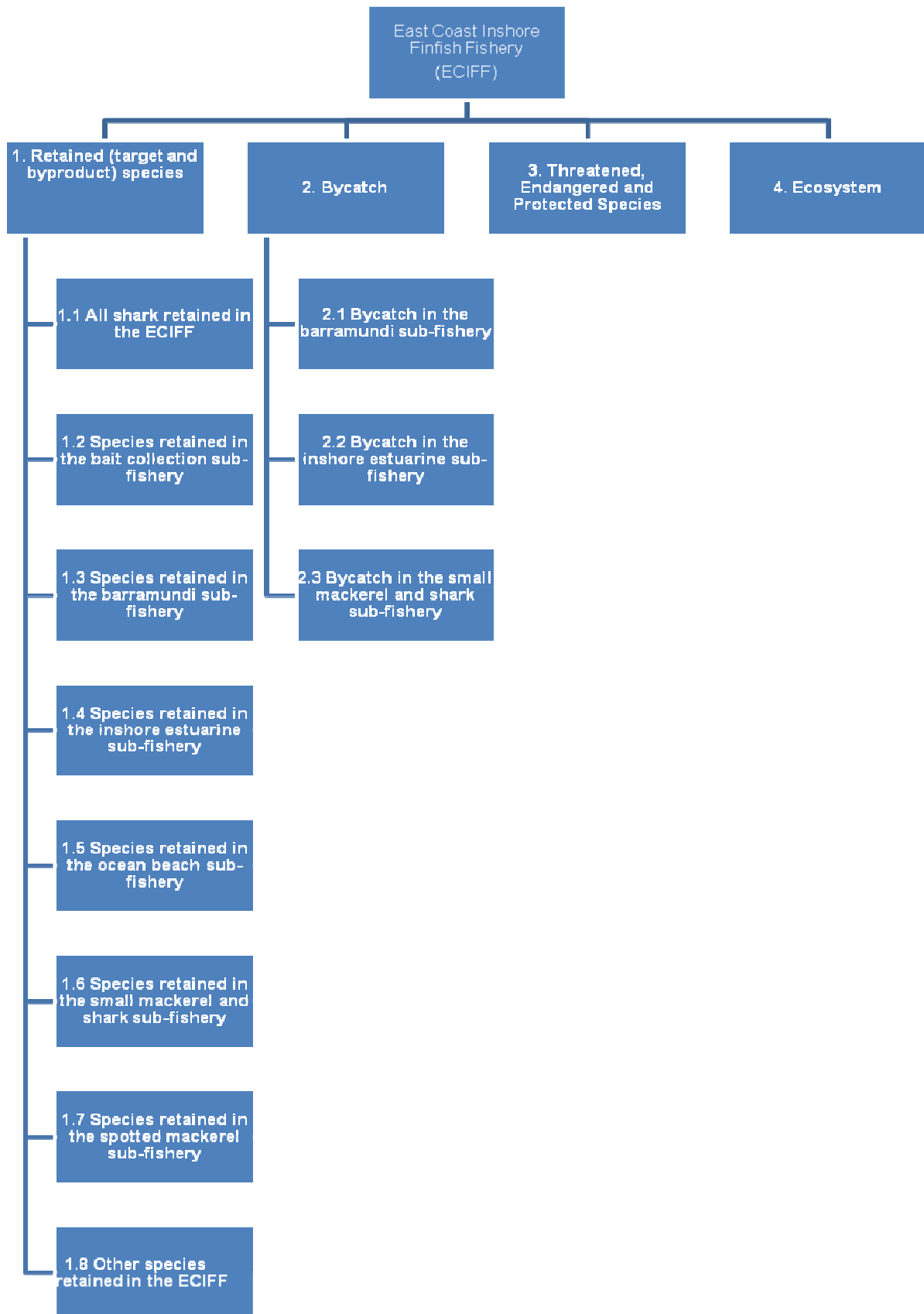
Incidental effects of fishing on bycatch species are recognised in the barramundi mesh net and line, the inshore estuarine net and the small mackerel and shark net and line sub-fisheries. Due to highly specific targeted fishing practices for migratory schooling fishes, the capture of bycatch species is considered negligible in other ECIFF sub-fisheries, particularly for line fisheries.

This PMS will be reviewed after the first year of reporting to ensure that it remains:

- congruent with precautionary management;
- responsive to changing management priorities; and
- consistent with the objectives of the fishery.

Throughout this PMS, performance is measured against a reference limit, expressed either as discrete value (eg the TAC for shark) or as an acceptable rate of change (eg. a specified reduction in harvest weight over a specified period) beyond which a management response could be expected.

When finalised, the Performance Measurement System will be approved by the Chief Executive as a formal instrument for measuring the performance of the ECIFF.



Performance Measurement System Summary Table

Component	Operational Objectives	Indicators	Performance measures	Management response
Commercial net fishing effort	<i>i)</i> Constrain commercial net fishing effort to within historical levels	<i>i)</i> Number of days fished annually by commercial net fishers in the fishery. <i>ii)</i> Annual effort in each subfishery	<i>i)</i> The number of days fished in the commercial fishery should not exceed 34,000 in any year. <i>ii)</i> No performance measure for net fishing effort has been defined nor is there one needed as at June 2008.	<i>i)</i> Upon exceeding the performance measure, within 3 months DPI&F to consider appropriate mechanisms to constrain effort which may include a unitisation system for the east coast net fishery. <i>ii)</i> Review the Performance Measure when the results of the ECIFF structural adjustments are known.
Recreational harvest	<i>i)</i> Constrain recreational harvest to within historical levels	<i>i)</i> Estimate of the total annual recreational harvest weight. (RFISH)	<i>i)</i> The total annual recreational harvest weight should not exceed 4,000 tonnes in any year.	Upon exceeding the performance measure, management arrangements for the affected species will be reviewed by DPI&F in consultation with the MAC/SAG. A timetable for any

				management change will be identified within 3 months of becoming aware that the performance measure has been exceeded.
<p>1.1 Retained (target and byproduct) species – All shark</p>	<p><i>i)</i> Maintain harvest of shark at a precautionary level</p>	<p><i>i)</i> Estimates of annual commercial harvest and harvest rates by weight by species or species group, days fished and number of boats (logbook data)</p> <p><i>ii)</i> Estimates of annual recreational harvest and release by weight by species or species groups regionally (RFISH data)</p> <p><i>iii)</i> Estimates of annual charter harvest and release by weight by species or species groups regionally (logbook data)</p>	<p><i>i)</i> The commercial annual harvest should not exceed 700t.</p> <p><i>ii)</i> There is a reduction in commercial harvest rate above 30% over 3 years</p> <p><i>iii)</i> There is a change in recreational harvest or release above 50% over 2 estimate years</p> <p><i>iv)</i> There is a measurable change in species composition of the commercial and/or recreational catch</p>	<p>Upon exceeding the performance measure, management arrangements for the affected species will be reviewed by DPI&F in consultation with the MAC/SAG.</p> <p>A timetable for any management change will be identified within 3 months of becoming aware that the performance measure has been exceeded.</p> <p>DPI&F proposes that the <i>Fisheries Regulation 2008</i> be amended to give the Chief Executive authority to apply an in-possession limit when</p>

		<i>iv)</i> Composition of the commercial and recreational catch (using charter composition data as a proxy for the recreational sector?)		<p>monitoring suggests that the annual shark harvest has reached the precautionary level.</p> <p>Introduction of an in-possession limit will allow for policy or guideline development detailing the decision rules and type of information needed to make such a decision including catch data, time of year, observer information &, species composition.</p> <p>By 1 July 2009, a shark review panel will be convened & decision rules and a policy for sustainable management of shark resources will be developed.</p>
<p>1.2 Retained (target and byproduct) species – Bait sub-fishery</p>	<p><i>i)</i> Maintain harvest of garfish and other bait species at current levels</p> <p><i>ii)</i> Constrain effort in the commercial bait fishery at precautionary levels</p>	<p><i>i)</i> Estimates of annual commercial harvest and harvest rates by weight by species or species group,</p> <p><i>ii)</i> Estimates of annual commercial effort in the bait fishery (days fished and number of boats (logbook data)</p>	<p><i>i)</i> A reduction in commercial harvest or harvest rate of garfish or other specified bait species/species groups above 30% over 3 years.</p> <p><i>ii)</i> Annual effort should not increase by more than 10% over 2 consecutive years for individual bait species, or the bait fishery as a whole.</p>	<p>Upon exceeding the performance measure, management arrangements for the affected species will be reviewed by DPI&F in consultation with the MAC/SAG.</p> <p>A timetable for any</p>

				management change will be identified within 3 months of becoming aware that the performance measure has been exceeded.
<p>1.3 Retained (target and byproduct) species – Barramundi sub-fishery</p>	<p><i>i)</i> Maintain harvest of barramundi, threadfin and grunter at current levels</p> <p><i>ii)</i> Maintain harvest of barramundi and king threadfin at sustainable levels</p>	<p><i>i)</i> <i>Estimates of annual commercial</i> harvest and harvest rates by weight for each species or species group, and effort days fished and number of boats for barramundi, threadfin and grunter (logbook data)</p> <p><i>ii)</i> <i>Estimates of annual regional recreational</i> harvest and release by weight for each species or species group, and effort for barramundi, threadfin and grunter (RFISH data)</p> <p><i>iii)</i> Outputs (e.g. recommended TAC and biomass estimate) from stock</p>	<p><i>i)</i> A reduction in commercial harvest or harvest rate of barramundi, grunter, king threadfin or blue threadfin above 30% over 3 years</p> <p><i>ii)</i> A change (increase or reduction) in recreational harvest OR release of barramundi, grunter, king threadfin or blue threadfin above 30% over two estimate years</p> <p><i>iii)</i> The most recent biomass and MSY estimates for the east coast barramundi stocks are unreliable. Additional collection of age & selectivity data & verification of reliable catch & effort data is underway to reassess stock status (Campbell <i>et al.</i> 2008). Alternate performance</p>	<p>Upon exceeding the performance measure, management arrangements for the affected species will be reviewed by DPI&F in consultation with the MAC/SAG</p> <p>A timetable for any management change will be identified within 3 months of becoming aware that the performance measure has been exceeded.</p>

		assessments for barramundi and king threadfin	measures for barramundi will be developed when reliable stock status information is available	
1.4 Retained (target and byproduct) species – Inshore Estuarine sub-fishery	<p><i>i)</i> Maintain harvest of whiting, bream and flathead at current levels</p> <p><i>ii)</i> Maintain harvest of whiting, bream and flathead at sustainable levels</p> <p><i>iii)</i> Maintain harvest of mangrove jack at current levels</p>	<p><i>i)</i> <i>Estimates of annual commercial</i> harvest and harvest rates by weight for each species or species group, and effort days fished and number of boats for whiting, bream and flathead (logbook data)</p> <p><i>ii)</i> <i>Estimates of annual regional recreational</i> harvest and release by weight for each species or species group, and effort for whiting, bream, flathead, and mangrove jack (RFISH data)</p> <p><i>iii)</i> Outputs (e.g. recommended TAC and biomass estimate)</p>	<p><i>i)</i> A reduction in commercial harvest or harvest rate of whiting, bream or flathead above 30% over 3 years</p> <p><i>ii)</i> A change (increase or reduction) above 30% in recreational harvest <i>OR</i> release of whiting, bream, flathead, or mangrove jack over two estimate years.</p> <p><i>iii)</i> Further performance indicators linked to outputs of regional (South East Qld) stock assessment for bream, whiting and flathead</p>	<p>Upon exceeding the performance measure, management arrangements for the affected species will be reviewed by DPI&F in consultation with the MAC/SAG</p> <p>A timetable for any management change will be identified within 3 months of becoming aware that the performance measure has been exceeded.</p>

		from stock assessments for bream, whiting and flathead		
1.5 Retained (target and byproduct) species – Ocean beach sub-fishery	<p><i>i)</i> Maintain harvest of mullet, tailor and dart at current levels</p> <p><i>ii)</i> Maintain harvest of mullet and tailor at sustainable levels</p>	<p><i>i)</i> Outputs (e.g. recommended TAC and biomass estimate) from stock assessments for sea mullet and tailor</p> <p><i>ii)</i> <i>Estimates of annual commercial</i> harvest and harvest rates by weight for each species or species group, and effort days fished and number of boats for mullet, tailor and dart (logbook data)</p> <p><i>iii)</i> <i>Estimates of annual regional recreational</i> harvest and release by weight for each species or species group, and effort for mullet, tailor and dart (RFISH data)</p>	<p><i>i)</i> The total annual catch of sea mullet (from Qld and NSW) exceeds the recommended TAC of 3620 t (Bell <i>et al.</i> 2005)</p> <p><i>ii)</i> Biomass of tailor is estimated to be less than 40% of virgin levels (Leigh and O’Neill 2005) in the next stock assessment</p> <p><i>iii)</i> A reduction in commercial harvest or harvest rate of mullet, tailor and dart above 30% over 3 years</p> <p><i>iv)</i> A change (increase or reduction) above 30% in recreational harvest OR release of mullet, tailor and dart over two estimate years</p>	<p>Upon exceeding the performance measure, management arrangements for the affected species will be reviewed by DPI&F in consultation with the MAC/SAG</p> <p>A timetable for any management change will be identified within 3 months of becoming aware that the performance measure has been exceeded.</p>
1.6 Retained (target and byproduct) species	<i>i)</i> Maintain harvest of net caught grey	<i>i)</i> <i>Estimates of annual commercial</i> harvest	<i>i)</i> A reduction in commercial harvest or harvest rate of net	Upon exceeding the performance measure,

<p>– Small mackerel and shark sub-fishery</p>	<p>mackerel and school mackerel at current levels</p> <p><i>ii)</i> Maintain harvest of net caught school mackerel at sustainable levels</p>	<p>and harvest rates by weight for each species or species group, and effort days fished and number of boats for net caught school and grey mackerel.</p> <p><i>ii)</i> Outputs (e.g. recommended TAC and biomass estimate) from stock assessments for school mackerel</p>	<p>caught grey mackerel or school mackerel above 30% over 3 years</p> <p><i>ii)</i> Possible additional performance measures relating to the harvest of shark within this sub-fishery</p>	<p>management arrangements for the affected species will be reviewed by DPI&F in consultation with the MAC/SAG</p> <p>A timetable for any management change will be identified within 3 months of becoming aware that the performance measure has been exceeded.</p>
<p>1.7 Retained (target and byproduct) species – Spotted mackerel sub-fishery</p>	<p><i>i)</i> Maintain harvest of spotted mackerel, school mackerel, shark mackerel and trevally at current levels</p> <p><i>ii)</i> Maintain harvest of spotted mackerel and school mackerel at sustainable levels</p>	<p><i>i)</i> Outputs (e.g. recommended TAC and biomass estimate) for spotted mackerel (Begg <i>et al.</i> 2005) and subsequent stock assessments every 3 to 5 years for spotted mackerel and school mackerel.</p> <p><i>ii)</i> Estimates of annual commercial harvest and harvest rates by weight for each species or species group, and effort days</p>	<p><i>i)</i> The combined catch of spotted mackerel from all sectors exceeds the recommended catch limit of 296 t or 333 t (Age based production model versus historical proxy method (Begg <i>et al.</i> 2005).</p> <p><i>ii)</i> The biomass of the east coast spotted mackerel stock is estimated to be less than 33-63% of virgin biomass (Begg <i>et al.</i> 2005) in subsequent stock assessments</p>	<p>Upon exceeding the performance measure, management arrangements for the affected species will be reviewed by DPI&F in consultation with the MAC/SAG</p> <p>A timetable for any management change will be identified within 3 months of becoming aware that the performance measure has been</p>

		<p>fished and number of boats for spotted mackerel, school mackerel, shark mackerel and trevally.</p> <p><i>iii)</i> Estimates of annual regional recreational harvest and release by weight for each species or species group, and effort for spotted mackerel, school mackerel, shark mackerel and trevally.</p>	<p><i>iii)</i> The combined catch of spotted mackerel from all sectors exceeds the Queensland component of the TAC</p> <p><i>iv)</i> A reduction in commercial harvest or harvest rate of school mackerel, shark mackerel, trevally or bonito above 30% over 3 years.</p> <p><i>v)</i> A change in recreational harvest OR release above 30% over 2 estimate years for spotted mackerel, school mackerel, shark mackerel or trevally.</p>	<p>exceeded.</p>
<p>1.8 Retained (target and byproduct) species – Other species</p> <p>This category may be included to include those species that are not dealt with in any of the</p>	<p><i>i)</i> Maintain harvest of other species at current levels</p>	<p><i>i)</i> Combined catch from all sectors by weight and species or species groups (for years where estimates from all sectors are available)</p>	<p><i>i)</i> There is a reduction in the combined harvest from all sectors above 30% over two estimate years (for which estimates from all sectors are available)</p>	<p>Upon exceeding the performance measure, management arrangements for the affected species will be reviewed by DPI&F in consultation with the MAC/SAG</p>

<p>above defined sub-fisheries but for which the total annual catch from all sectors exceeds 10t.</p>				<p>A timetable for any management change will be identified within 3 months of becoming aware that the performance measure has been exceeded.</p>
<p>2. Bycatch</p> <p>PMS have been developed for sub-fisheries where incidental effects of fishing on bycatch species are recognised, i.e.;</p> <ul style="list-style-type: none"> • the barramundi, mesh net and line; • inshore estuarine net; and • Small mackerel/shark net and line sub-fisheries <p>The capture of bycatch species is negligible in other ECIFF sub-fisheries. Consequently,</p>	<p><i>i)</i> Minimise the percentage of commercial catch that is bycatch</p> <p><i>ii)</i> Minimise the recreational and charter bycatch of species that have high release mortalities</p>	<p><i>i)</i> Percentage weight and/or number of the total commercial catch that made up of teleost and elasmobranch bycatch</p> <p><i>ii)</i> Release estimates of recreational and charter species that have high release mortality</p>	<p><i>i)</i> The percentage weight and/or number of teleost and elasmobranch bycatch species in the total commercial catch should not exceed levels in Halliday <i>et al.</i> (2001) by 20%</p> <p><i>ii)</i> The percentage of bycatch increases in each of three consecutive estimates</p> <p><i>iii)</i> Any increase in the release rate (number released as a proportion of the total caught) of species with high release mortalities over two consecutive annual estimates in the recreational or charter sector.</p>	<p>Upon exceeding the reference point, a timetable for any management change will be identified within 3 months of becoming aware of the performance measure not being met.</p> <p>The proposed management response to the performance measure being exceeded needs further discussion with managers with regard to the response mechanism proposed to address the DEW recommendation in other fisheries. The actual wording for ECTF PMS is provided below for reference.</p>

<p>PMS development for the following sub-fisheries is considered a low priority and will not be considered at this time.</p> <ul style="list-style-type: none"> • the ocean beach seine ; • the spotted mackerel line; and • The baitfish net sub-fisheries 				<p>DPI&F will review the PMS annually, in a timely manner following the availability of all relevant data. The outcomes of the review will be included in the Annual Status Report for the fishery. Within three months of becoming aware that a review event has been triggered, the DPI&F to finalise a clear timetable for implementation of appropriate management responses. This would involve consultation with the Management Advisory Committee and Scientific Advisory Group.</p>
<p>3. Protected Species</p>	<p><i>i)</i> Minimise interactions between protected species and net and line gears in the ECIFF</p> <p><i>ii)</i> Enhance survival of released protected species in the net and line</p>	<p><i>i)</i> Total number of interactions with each category of protected species with net and line gears</p> <p><i>ii)</i> Total number of each category of protected species released alive from net and line gears</p>	<p><i>i)</i> Total number of interactions with each category of exceeds the maximum annual number of interactions recorded in 2005 and 2006</p> <p><i>ii)</i> Percentage of each category of protected species released alive does not exceed 90%</p>	<p>Upon exceeding the performance measure, management arrangements for the affected species will be reviewed by DPI&F in consultation with the MAC/SAG</p> <p>A timetable for any</p>

	gears in the ECIFF	<p><i>iii</i>) Percentage compliance with net attendance rules</p> <p><i>iv</i>) Percentage uptake / compliance with recognised BRDs</p> <p><i>v</i>) Status in risk level of SOCI species under EPBCA or NCA</p>	<p><i>iii</i>) Percentage of compliance with net attendance rules does not exceed 95%</p> <p><i>iv</i>) Percentage uptake / compliance with recognised BRDs does not exceed 20%</p> <p><i>v</i>) A species is assigned a higher EPBC or NCA risk ranking</p>	management change will be identified within 3 months of becoming aware that the performance measure has been exceeded.
4. Ecosystem Impacts	Maintain ecosystem structure	Species diversity (species composition and relative abundance) in the catch and bycatch by biogeographical region	A change in similarity measures relating to the species composition of the catch by sub-fishery/gear	<p>Upon exceeding the performance measure, management arrangements for the affected species will be reviewed by DPI&F in consultation with the MAC/SAG</p> <p>A timetable for any management change will be identified within 3 months of becoming aware that the performance measure has been exceeded.</p>

Proposed review procedures

Performance measures will be reported on annually in the East Coast Inshore Finfish Fishery Annual Status Report.

The PMS is designed to be a working document and may be reviewed and updated to reflect available data and to address any issues that may be highlighted by the data analysis process. Analysis will occur annually associated with monitoring the performance measures.

Annex 3 - Package of arrangements for shark

Current management	Proposed change	Outcome
No maximum size limit	Maximum size limit of 1.5m for all commercial line and recreational fishers	Protection of breeding sharks
Maximum mesh size for nets used in offshore waters is currently 245mm (around 10 inch)	Maximum mesh size for all nets used in offshore waters to be reduced to 165mm (6.5 inch)	Greater selectivity for smaller sharks (less than 1.5m) (to protect breeders)
1500 net and line fishers can access shark through existing fishery symbols	New “S” fishery symbol to limit number of commercial fishers who take shark (to around 175). Fishers will need to demonstrate catch history	Limited access to around 175 fishers. Ability to target monitoring and enforcement
No limits at all currently	In-possession limits for all other commercial fishers (10 for net fishers, 4 for line fishers)	Avoids wastage by those operators which occasionally catch shark
Around 450 net fishers can use 1200m of net	Cap the number of offshore net fishers who can use 1200m of net to 25 (N4 symbols).	Heavily restricts access to the target shark fishery which takes most of the east coast catch
Voluntary observer program in place, but limited coverage to date	Compulsory participation in the observer program for all S symbol holders	Collection of better data about the shark fishery
Logbook only identifies two species groups – hammerheads and whalers	Introduction of new shark logbook and fortnightly returns	Better information on catch composition, spatial distribution of catch. More timely monitoring of the catch (particularly for the 700 tonne

Current management	Proposed change	Outcome
		trigger)
Identification guide has just recently been completed.	Shark identification guide	Better information on the species composition
Currently no limit on the total catch	700 tonne performance measure (total commercial catch) with clear responses once this has been met, e.g. the Director-General of DPI&F to instruct S licence holders to revert to the in-possession limits (10 for net fishers and four for line fishers)	
Only two species are currently no-take – grey nurse shark and great white shark.	*New no take species: spartooth shark, freshwater sawfish, green sawfish and dwarf sawfish	Greater protection for more vulnerable species. Reflects those species listed under the EPBC Act
No limit currently on these species	*Commercial in-possession limit of 1 for grey and whitetip reef shark	Greater protection for more vulnerable species
No limit currently on these species	*Commercial in-possession limit of 5 for white spotted guitarfish and narrow sawfish	Greater protection for more vulnerable species

*Note: It is intended that the restrictions apply to both the East Coast and the Gulf of Carpentaria.

Annex 4 - Package of arrangements for constraining effort

Current management	Proposed change	Outcome
Most N2 symbol holders also hold an N1 symbol, which allows them to undertake similar activities. The symbols can be split and one transferred to a different primary licence	N1/N2 amalgamation so that the symbols cannot be split	Reduces the potential for symbol holders to split off the N1 symbol and sell to another licence holder, expanding effort in the N1 fishery
As above, but with the ocean beach fishery	N1/K amalgamations so that the symbols cannot be split	Reduces the potential for effort expansion
Currently, fishers can set a net and then return to port	200m attendance rule	Having to be in attendance of offshore nets will have a significant impact on effort in the offshore component of the fishery
1500 net and line fishers can access shark through existing fishery symbols currently	New S symbol (around 175)	Restricts access to a smaller number of operators
Around 450 net fishers can use tunnel net apparatus through existing fishery symbols currently	New N10 symbol (25)	Restricts access to a smaller number of operators
Around 450 net fishers can use 1200m of net currently	New N4 symbol (25)	Restricts access to a smaller number of operators
Every commercial fisher in Queensland holds an N6 symbol which allows them to use a bait net to target a range of species for either personal use or sale	Rationalise use of bait net (N6 symbol) <ul style="list-style-type: none"> Set criteria in order to retain N6 for selling bait Allow crab and line fishers to use a bait net for their personal use (not for sale) 	Restricts access to a smaller number of operators

NA	Surrender provisions associated with the N4 and N10 fishery symbols	Removes a number of N1 symbols
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Annex 5 - Package of arrangements for protected species

Current management	Proposed change	Outcome
No attendance rule currently for offshore set nets.	200m attendance rule for offshore set nets. (Note: The proposed change has been further tightened from what was proposed in the RIS (400m, with an exemption for those fishers who make the net inoperable and report where it is).	Promotes more responsible fishing practices. Ensures fishers can release any protected species should an interaction occur.
The Gladstone DPA currently provides protection for dugong. A number of interactions have been reported in recent years just outside the DPA.	Extension of Gladstone DPA to include waters off Facing Island	Minimises the likelihood of dugong interactions off Facing Island
Under current arrangements, offshore set nets can be used off headlands, where the water drops off to deeper than 2m.	500m exclusion zone around headlands	Minimises the risks of interaction in an important movement corridor for dugong and other protected species.
BRDs are currently non-prescribed apparatus and are therefore technically illegal	Require the use of a BRD in a tunnel net	Minimises the risks to turtles from tunnel net apparatus.
The netting regulations are currently very prescriptive	Allow for net fishers to use “recognised BRDs”	Encourages development of new types of nets that may reduce bycatch or minimise interactions with protected species.
There is currently no protection for these more vulnerable shark species.	New no take species: spartooth shark, freshwater sawfish, green sawfish and dwarf sawfish Note: It is intended that the restrictions apply to both the East Coast and the Gulf of Carpentaria.	Greater protection for more vulnerable species. Reflects those species listed under the EPBC Act

Current management	Proposed change	Outcome
	Commercial in-possession limit of 1 for grey and whitetip reef shark	Greater protection for more vulnerable species.
	Commercial in-possession limit of 5 for white spotted guitarfish and narrow sawfish	Greater protection for more vulnerable species.