



Australian Government

Department of the Environment and Heritage

Assessment of the
Queensland East Coast Otter Trawl Fishery

November 2004

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**Assessment of the ecological sustainability of management arrangements for the Queensland
East Coast Otter Trawl Fishery**

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EXECUTIVE SUMMARY

Background

The Queensland Department of Primary Industries and Fisheries (DPI&F) has submitted a document for assessment under Parts 13 and 13A of the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act). The draft document *Ecological Assessment of the Queensland East Coast Otter Trawl Fishery* (the submission) was received by the Department of the Environment and Heritage (DEH) in November 2002. The submission was released for a public comment period that expired on 17 January 2003. Eleven public comments were received and DPI&F provided a response to the issues raised.

The submission reports on the Queensland East Coast Otter Trawl Fishery (ECOTF) against the Australian Government *Guidelines for the Ecologically Sustainable Management of Fisheries*. The DEH assessment considers the submission, associated documents, public comments and DPI&F's response to the comments.

Table 1: Summary of the Queensland East Coast Otter Trawl Fishery

Area	All tidal waters (excluding estuaries) of Eastern Queensland, east to the outer edge of the Exclusive Economic Zone, south to the New South Wales border and north to Cape York. Approximately 42% of the fishery area is permanently closed to trawling.
Fishery status	Varies between sectors from fully-exploited to under-exploited. Stock assessments are available for several, but not all, target species. A preliminary risk assessment has been conducted on byproduct species.
Target Species	Prawns (tiger, king, banana, endeavour), scallops, Moreton Bay bugs and squid.
Byproduct Species	Permitted species include Balmain bugs, barking crayfish, cuttlefish, two species of pipefish, mantis shrimp, octopus, pinkies, blue swimmer crabs and redspot crabs.
Gear	Demersal otter trawl nets. Gear restrictions vary between different sectors and areas of the fishery in net size, configuration and mesh.
Season	Several seasonal closures specific to areas and fishers.
Commercial harvest 2003	8355 tonnes of prawns, scallops (meat only), bugs and squid.
Value of commercial harvest 2003	Approximately \$102 million.
Recreational harvest	Approximately 270 t of blue swimmer crabs, 7 t of prawns and an unknown quantity of squid are taken by recreational fishers annually.
Commercial licences issued	485 in May 2004.
Management arrangements	Target species are input controlled through: limited entry, effort allocation, boat and gear restrictions, spatial and temporal closures. Byproduct species are output controlled through: possession limits, and restrictions on size, sex and reproductive condition.

	Take is restricted to principal and permitted species as defined in the <i>Fisheries (East Coast Trawl) Management Plan 1999</i> .
Export	Significant export of frozen product.
Bycatch	Approximately 1000 species, although the majority are rarely taken. Composition and quantity varies between sectors of the fishery.
Interaction with Threatened Species	Seasnakes, syngnathids and turtles caught. Provisioning of dolphins and seabirds.

The ECOTF is Queensland's largest commercial fishery, extending from the tip of Cape York to the Queensland/New South Wales (NSW) border. The majority of the fishery occurs in Commonwealth waters, however, the entire fishery is managed by Queensland under an Offshore Constitutional Settlement (OCS) agreement between the Australian Government and the Government of Queensland.

The ECOTF area overlaps significantly with the Great Barrier Reef Marine Park (GBRMP) which was declared a World Heritage Area in 1981. Historically, about 70% of effort in the fishery has occurred within the Great Barrier Reef World Heritage Area (GBRWHA).

The fishery is composed of several sectors, based on target species and geographical location. The five main sectors include eastern king prawn (*Penaeus plebejus*), tiger/endeavour prawn (*P. esculentus*, *P. semisulcatus*, *P. monodon*, *Metapenaeus endeavouri* and *M. ensis*), scallop (*Amusium balloti balloti*, *A. pleuronectes*), red spot/western king prawn (*P. longistylus*, *P. laticulatus*) and bay/banana prawn (*M. bennettiae*, *P. merguensis*). Other principal species include Moreton Bay bugs (*Thenus* spp.) and squid (*Photololigo* spp., *Sepioteuthis* spp. and arrow squid of the family Ommastrephidae).

Permitted byproduct species include Balmain bugs (*Ibacus* spp.), barking crayfish (*Linuparus trigonus*), cuttlefish (*Sepia* spp., *Metasepia pfefferi*), mantis shrimp (*Squillaidea* spp.), octopus (*Octopus* spp.), pinkies (*Nemipterus* spp.), pipefish (*Solegnathus dunckeri* and *S. hardwickii*), blue swimmer crab (*Portunus pelagicus*) and red spot crab (*Portunus sanguinolentus*).

The majority of the species harvested in this fishery are widespread in northern Australian waters and many support commercial fisheries in other jurisdictions. The two permitted pipefish species are found in significant numbers within Queensland waters. All of the target species demonstrate highly variable catch rates, with high dependence on environmental and climatic fluctuations.

Eastern king prawns are endemic to Australian waters and are found on the east coast between Mackay in Queensland and north-eastern Tasmania. The population constitutes a single stock. While inhabiting estuaries as juveniles, eastern king prawns migrate into offshore waters at approximately 12 months of age. Tagging studies have shown that there is northward migration of eastern king prawns at this time. Eastern king prawns mature at approximately 12 to 18 months of age and can live for up to three years (Kailola *et al.*, 1993).

Brown tiger prawns (*P. esculentus*) are endemic to Australian waters and have a wide distribution along the northern coast of Australia, from Shark Bay in Western Australia to Wallis Lake in New South Wales. Black tiger prawns (*P. monodon*) have an even wider distribution, extending south to the Hawkesbury River in New South Wales. Grooved tiger prawns (*P. semisulcatus*) are restricted to more northerly waters, from northern Western Australia to Yeppoon in Queensland, but like the black tiger prawn, have a wider Indo-Pacific distribution. While no genetic differences have been detected between brown and grooved tiger prawns in different regions (Mulley and Latter, 1981), it

is thought they operate as functionally independent stocks. Genetic differences have been identified between black tiger prawn populations in Western Australia and those in Queensland and New South Wales (Benzie *et al.*, 1992). Brown and black tiger prawns are usually associated with shallower, inshore waters. Brown tiger prawns are found where there are substantial amounts of seagrass, while black tiger prawns are associated with sandy and muddy habitats. Grooved tiger prawns are found further offshore. Seagrass beds are the main juvenile habitat for all three tiger prawn species (Kailola *et al.*, 1993).

Endeavour prawns are distributed from Shark Bay in Western Australia, across northern Australia to New South Wales, with a high degree of genetic isolation between populations (Mulley and Latter, 1981). Adult endeavour prawns live primarily over sand and mud substrates and are generally found in coastal waters to 50 metres depth. Juvenile endeavour prawns are usually associated with seagrass habitats in shallow estuaries.

Banana prawns are distributed across northern Australia from Shark Bay in Western Australia to the Tweed River in northern New South Wales. Banana prawns generally inhabit shallow, estuarine and intertidal areas to depths of 45 metres. They live in turbid waters, inhabiting sheltered mangrove creeks as juveniles, and medium to low energy coastlines as an adult. Banana prawns are known to aggregate in high numbers forming a 'boil' on the surface. This behaviour makes them highly susceptible to exploitation. Banana prawns only live for 12 to 18 months, becoming sexually mature as early as 6 months of age (Kailola *et al.*, 1993). Banana prawn recruitment is positively correlated with rainfall, therefore the highest banana prawn catches are often associated with high rainfall during the preceding summer.

Western king prawns (*P. latisulcatus*) are distributed in South Australia, west to Ceduna, along the entire western and northern Australian coasts and on the east coast south to Ballina in northern New South Wales. Genetic differences have been detected between populations in the Gulf of Carpentaria and those in Western Australia and South Australia (Mulley and Latter, 1981). Juvenile western king prawns are often associated with coastal sandflats, moving into depths up to 90 metres as adults. Western king prawns can live for up to four years and mature between one and two years, depending on location, with those in tropical waters maturing faster. Red spot king prawns (*P. longistylus*) are found throughout south-east Asia. In Australia they are distributed from Shark Bay in Western Australia to Yeppoon in Queensland. Juvenile red spot king prawns inhabit estuaries or shallow reef lagoons. Even as adults, red spot king prawns are often found close to coral reefs, inhabiting inter-reef channels between depths of 18 and 60 metres (Kailola *et al.*, 1993).

Ballot's saucer scallops (*A. balloti balloti*) are distributed on the east Australian coast from Innisfail in Queensland to Jervis Bay in New South Wales. Delicate saucer scallops (*A. pleuronectes*) are distributed along the northern coast of Australia from the Bonaparte Archipelago in Western Australia to Yeppoon in Queensland. Within their broader range, saucer scallops inhabit discrete beds, which are up to 15 km in length. Beds are usually associated with bare sand or rubbly habitats in depths between 10 and 75 metres. Saucer scallops are broadcast spawners, with spawning temperature dependent. In Queensland, spawning of Ballot's saucer scallops peaks around June and August and settlement occurs within approximately three weeks. Ballot's saucer scallops live for three to four years (Kailola *et al.*, 1993).

Approximately 8355 tonnes of prawns, scallop meat, bugs and squid were harvested in the fishery in 2003, at an estimated value of \$102 million. Otter trawling on the Queensland east coast began in 1950 and new areas were progressively opened to trawling. The fleet grew to a peak of 1413 vessels in 1981. Management responses since that time reduced the number of licences and a more recent restructuring in 2001 has further reduced vessel numbers to 485 in May 2004. Total catch

has fluctuated in the last 20 years between 7834 tonnes in 2001 and 11572 tonnes in 1998. Catch is generally snap-frozen at sea and sold into both domestic and export markets.

The fishery currently uses many variations of otter trawl gear to target species. Net configuration varies from single to quad gear and there are restrictions on the size of the vessel and engine. In addition, there are controls on the weight of the ground chain, the size of the nets and mesh sizes in different sectors. Bycatch reduction devices (BRDs) and turtle excluder devices (TEDs) are now compulsory in all nets (with the exception of 'try' nets) in this fishery.

In addition to gear limitations, there is limited entry to the fishery, with 485 vessels currently licensed to operate. There is an effort cap in the fishery with effort units allocated to individual vessels. Surrender provisions apply if boats are replaced or licences and/or effort units are transferred. Other management arrangements include a number of spatial and temporal closures. Since the rezoning of the GBRMP came into effect on 1 July 2004, trawling is permanently excluded from 66.2% of the GBRMP and approximately 42% of the total fishery area.

As in any trawl fishery, bycatch to target ratios are high with a large variety of species caught incidentally. Some bycatch species in this fishery are currently listed as protected species under the Commonwealth EPBC Act. Protected species interactions in this fishery include the incidental capture of syngnathids (seahorses and pipefish), seasnakes and marine turtles, and the provisioning and possible habituation of dolphins and seabirds. These interactions are assessed under Principle Two of this report.

The species harvested in the ECOTF are also caught in a number of other Queensland fisheries, including the River and Inshore (Beam) Trawl Fishery and the Moreton Bay Trawl Fishery, in several New South Wales fisheries, including the Ocean Trawl Fishery, Estuary General Fishery and Estuary Prawn Trawl Fishery and by the Australian Government managed Northern Prawn Fishery. These fisheries are also subject to EPBC Act assessments, however, cross jurisdictional issues are considered in this report. The assessments of the Northern Prawn Fishery, NSW Estuary General and Estuary Prawn Trawl fisheries were completed in 2003 and the conclusions and assessment reports are available on the DEH website. There is minimal take of target species by the indigenous and recreational sectors, however, this is largely unquantified.

The fishery is managed under the *Fisheries (East Coast Trawl) Management Plan 1999* (the Trawl Plan), which obtains its authority from the Queensland *Fisheries Act 1994*.

Overall assessment

The material submitted by DPI&F demonstrates that the management arrangements for the ECOTF meet most of the requirements of the Australian Government *Guidelines for the Ecologically Sustainable Management of Fisheries*.

While the fishery is relatively well managed, DEH has identified a number of issues that must be managed to ensure that their impacts are minimised, including:

- Deficiencies in the data used for fishery assessment and management, including a paucity of fishery independent data;
- No validation of commercial catch/effort data;
- A number of the target species are being fished at the maximum sustainable yield (MSY) levels, taking into account data and assessment uncertainties;
- No stock assessments and only a preliminary risk assessment for byproduct species and no risk assessment for bycatch;

- A lack of robust performance indicators and a clear process and timeframe for management action when performance measures are not met;
- Current management arrangements do not effectively deal with spatial partitioning of effort and effort reductions, should this be required;
- Regular and transparent public reporting of the performance of the fishery has been limited to date.

Recommendations to address these issues have been developed to ensure that the risk of impact is minimised in the longer term. Through the implementation of the recommendations, and the continuation of a responsible attitude to the management of the fishery, management arrangements are likely to be sufficiently precautionary and capable of controlling, monitoring and enforcing the level of take from the fishery, while that ensuring the stocks are fished sustainably.

The management regime aims to ensure that fishing is conducted in a manner that does not lead to over-fishing and for fishing operations to be managed to minimise their impact on the structure, productivity, function and biological diversity of the ecosystem. On balance, the Trawl Plan contains management measures that aim to manage the fishery in an ecologically sustainable manner, address existing problems and minimise environmental risks.

The operation of the fishery is consistent with the objects of Part 13A of the EPBC Act. Given the management arrangements specified in the Trawl Plan, DEH considers that the fishery will not be detrimental to the survival or conservation status of the taxon to which it relates in the short term. Similarly, it is not likely to threaten any relevant ecosystem in the short to medium term. DEH therefore recommends that the fishery be declared an approved Wildlife Trade Operation (WTO) with the actions specified in the recommendations to be undertaken by DPI&F to minimise the environmental risks in the long term. DEH considers that the fishery, as managed in accordance with the management plan is not likely to cause serious or irreversible ecological damage over the period of the export decision. DEH recommends a separate WTO declaration be declared for the incidental harvest of *Solegnathus hardwickii* and *Solegnathus dunckeri* in the ECOTF. Specifically, the WTO declarations would allow the export of product from the fishery for a period of 3 years. The WTO declarations will require annual reporting on the progress of implementing the recommendations of this report, other managerial commitments and managerial changes. The implementation of the recommendations will be monitored and reviewed as part of the next DEH review of the fishery in 3 years time.

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

Protected species occurring in the fishery area include marine turtles, syngnathids, seasnakes and sharks. With respect to marine turtles, the use of TEDs has significantly reduced the incidence of marine turtle capture in the ECOTF. The retention of all syngnathids, with the exception of *Solegnathus hardwickii* and *S. dunckeri*, is prohibited under the Trawl Plan. The take of syngnathids is incidental in the ECOTF and DPI&F has implemented a possession limit of 50 for the two syngnathid species permitted to be retained in the ECOTF to prevent targeting. Export of these species has been permitted since 2002. Seasnakes are taken in large numbers in this fishery and potentially effective BRDs, such as the square mesh panels, have not, to date, been widely used in the fishery. DPI&F has committed to further work in reducing the capture and mortality of protected species in the ECOTF. There are no listed threatened ecological communities in the fishery area.

DEH recommends that the Queensland *Fisheries Regulation 1995* and the Queensland *Fisheries (East Coast Trawl) Fishery Management Plan 1999*, to the extent the Regulations and Plan relate to the ECOTF, be declared an accredited management plan under Sections 208A, 222A, 245 and 265 of the EPBC Act. In making this judgement, DEH considers that the fishery to which the management plan relates does not, or is not likely to, adversely affect the survival in nature of listed threatened species or population of that species, or the conservation status of a listed migratory species, cetacean species or listed marine species or a population of any of those species. DEH also considers that the management plan requires that all reasonable steps are taken to avoid the killing or injuring of protected species, and the level of interaction has been reduced significantly by the introduction of BRDs and TEDs and a series of permanent closures. On this basis, DEH considers that an action taken by an individual fisher, acting in accordance with the Queensland *Fisheries Regulation 1995* and the Queensland *Fisheries (East Coast Trawl) Fishery Management Plan 1999*, would not be expected to have a significant impact on a listed threatened species or listed migratory species protected by the EPBC Act.

The assessment also considered the possible impacts of the fishery on the World Heritage values of the GBRMP. In conducting this assessment and formulating recommendations, the DEH has liaised closely with Great Barrier Reef Marine Park Authority (GBRMPA), which is responsible for management of the GBRMP. GBRMPA's goal is to provide for the protection, wise use, understanding and enjoyment of the Great Barrier Reef in perpetuity through the care and development of the GBRMP. This assessment has drawn on the findings of the *Audit of the Management of the Queensland East Coast Trawl Fishery in the Great Barrier Reef Marine Park* (the Audit Report) released by GBRMPA in May 2003.

Since the rezoning of the GBRMP came into effect on 1 July 2004, 66.2% of the GBRMP is protected from trawling, offering significant benefits to benthic habitats and the species they support. In addition, an effort cap, that changes in line with estimated effort creep, will continue to operate in the GBRWHA (see **Recommendation 8**) and DPI&F is moving to improve the efficiency of TEDs and BRDs used in the fishery (see **Recommendation 14** and **Recommendation 17**). On this basis, DEH considers that an action taken by an individual fisher, acting in accordance with the Queensland *Fisheries (East Coast Trawl) Fishery Management Plan 1999*, would not be expected to have a significant impact on the World Heritage values of the GBRMP protected by the EPBC Act.

The implementation of recommendations and commitments made by DPI&F in the submission will be monitored and reviewed as part of the next DEH review of the fishery in 3 years time.

Recommendations

1. DPI&F to inform DEH of any intended amendments to the management arrangements that may affect sustainability of the target species or negatively impact on byproduct, bycatch, protected species or the ecosystem.
2. DPI&F to monitor the status of the fishery in relation to the performance measures (review events and/or reference points) specified in the Trawl Plan. Within three months of becoming aware that a performance measure has not been met, DPI&F to finalise a clear timetable to the implementation of appropriate management responses.
3. From 2005, DPI&F to report publicly on the status of the fishery on an annual basis, including explicit reporting against each performance measure specified in the Trawl Plan.

4. By the end of 2005, DPI&F to review the adequacy of the current Long Term Monitoring Program (LTMP) for the ECOTF in terms of survey design and the value of the survey data for fishery assessment purposes. DPI&F to implement changes to the LTMP based on the results of this review and within available resources.
5. By the end of 2006, DPI&F to develop and implement a robust system to validate catch logbook and Species of Conservation Interest (SOI) logbook data.
6. DPI&F to develop, and make publicly available, a strategic research plan within one year. The research plan will identify information gaps in the knowledge required to manage the fishery sustainably, priorities for future research, and consider strategies through which research needs can be met on a continued basis.
7. DPI&F to develop a robust and regular fishery assessment process, that provides a basis for management decisions, which are precautionary and recognise the uncertainty and level of risk. The assessment process will examine the ecological sustainability of the principal and permitted species and bycatch, within three years, using stock or risk assessments. Appropriate management responses will be developed to reduce risks to the high-risk species or groups.
8. DPI&F to implement an effort cap in the Great Barrier Reef World Heritage Area, which changes periodically in line with the most current estimates of effort creep. DPI&F to implement appropriate management arrangements to account for effort creep across the fishery.
9. DPI&F to manage effort in the ECOTF at ecologically sustainable levels. DPI&F to identify appropriate management issues and options flowing from the General Effort Review, make the findings publicly available, and implement any necessary management changes before the end of 2005.
10. DPI&F to investigate the feasibility of implementing finer scale spatial management in the ECOTF.
11. As part of the Review of the Trawl Plan (to be completed and changes implemented before November 2006), DPI&F to revise current review events and develop appropriate limit and target reference points for principal and permitted species by the end of 2005.
12. DPI&F to continue to cooperate with other relevant jurisdictions to pursue complementary management and research of shared stocks for all principal and permitted species, which may be affected by cross-jurisdictional issues. In particular, DPI&F will cooperate with AFMA, WA and NT fisheries management agencies in relation to squid and with NSW Fisheries in relation to eastern king prawn.
13. By the end of 2006, DPI&F to develop and implement a system sufficient to identify changes in the composition and quantity of bycatch in the ECOTF over time.
14. DPI&F to continue to pursue a reduction in the amount of bycatch taken in the ECOTF through the refinement of bycatch mitigation technology and to support the investigation of methods for increasing the survivability of bycatch species. Any effective and appropriate methods identified should be implemented in the Trawl Plan within 18 months.

15. DPI&F to develop sustainability risk indicators for bycatch based on the Seabed Biodiversity Mapping Project (FRDC Project number 2003/021). In the interim, DPI&F to, by the end of 2005, implement precautionary performance measures related to bycatch.
16. DPI&F to promote research into the impact of the fishery on protected species including syngnathids and seasnakes, and to take all reasonable steps to reduce protected species interactions. Each year, the DPI&F to report publicly on interactions with protected species, incorporating the latest research findings.
17. Within 12 months, DPI&F to amend the definition of “recognised Turtle Excluder Devices” (TEDs) in the Trawl Plan to ensure that TEDs used in the ECOTF allow the effective escape of those turtle species caught in the fishery. DPI&F to undertake sufficient and effective enforcement activities, including at-sea and in-port inspections, to monitor the compliance with the TED provisions of the Trawl Plan.
18. DPI&F to, within three years, initiate a review and provide a preliminary report on the adequacy of protection provided to species and benthic habitats in the ECOTF by the current system of closures within and outside the Great Barrier Reef Marine Park (GBRMP), and whether additional closures are required outside the GBRMP.

PART I - MANAGEMENT ARRANGEMENTS

The Queensland East Coast Otter Trawl Fishery (ECOTF) is managed by the Queensland Department of Primary Industries and Fisheries (DPI&F). A significant proportion of the fishery area is within the Great Barrier Reef Marine Park (GBRMP). As a result, the Great Barrier Reef Marine Park Authority (GBRMPA) is involved with the management, compliance and enforcement of the fishery.

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

- The *Fisheries (East Coast Trawl) Management Plan 1999* (Trawl Plan);
- The *Queensland Fisheries Act 1994*; and
- The *Queensland Fisheries Regulation 1995*.

A number of other documents, including research reports, status reports, scientific literature and discussion papers are integral to the management of the fishery. Of direct relevance is the *Review of the Sustainability of Fishing Effort in the Queensland East Coast Trawl Fishery* (also referred to as the General Effort Review (GER)), which was released by DPI&F in September 2004 (Kerrigan *et al.*, 2004). The findings of the GER are discussed in detail later in this report.

The Department of the Environment and Heritage (DEH) considers it important that management arrangements remain flexible to ensure timely and appropriate managerial decisions. Due to the importance of the management plan and documents referred to above to DEH's assessment of the fishery, an amendment could change the outcomes of the assessment and decisions stemming from it. Decisions resulting from this assessment relate to the arrangements in force at the time of the decision. In order to ensure that these decisions remain valid, DEH needs to be advised of any changes that are made to the management regime and make an assessment that the new arrangements are equivalent or better, in terms of ecological sustainability, than those in place at the time of the original decision.

Recommendation 1: *DPI&F to inform DEH of any intended amendments to the management arrangements that may affect sustainability of the target species or negatively impact on byproduct, bycatch, protected species or the ecosystem.*

DPI&F has established a consultative framework to assist in the management of the ECOTF. The Trawl Management Advisory Committee (TrawlMAC) consists of an independent chair and members with expertise in commercial and recreational fishing, processing/marketing, fisheries management, conservation, enforcement, fisheries science and Great Barrier Reef World Heritage Area (GBRWHA) management. DEH is a permanent observer on TrawlMAC. The role of TrawlMAC is to provide advice to the Deputy-Director General of DPI&F to assist in making management decisions. TrawlMAC generally meets 3 times a year.

TrawlMAC is advised by several sub-committees which provide specialist scientific and technical advice. These groups are the Scientific Advisory Group (SAG), the Technical Working Group (TWG) and the Scallop Working Group (SWG). In addition, steering committees can be developed to progress specific issues. One example of this is the General Effort Review Steering Committee, which was formed to oversee and advise on the GER.

DEH is strongly supportive of the consultative mechanisms used in the management of the ECOTF, however there are several areas that could be improved. DPI&F has found it difficult to find appropriate Indigenous representation in relation to the ECOTF. DPI&F recognises the importance

of such consultation and DEH is confident that DPI&F will continue to improve Indigenous consultation in relation to developments in the Trawl Plan. The transparency of the TrawlMAC process could also be improved by making the minutes of TrawlMAC meetings publicly available. DPI&F should also advise TrawlMAC formally of its management decisions, including its reasons for the rejection or adoption of TrawlMAC's recommendations.

The ECOTF is managed according to the Trawl Plan. This management plan contains five objectives for the fishery, actions to achieve the objectives and a series of performance measures that will trigger a review if they are not met (the Trawl Plan refers to these as review events). Concerns have been raised over the appropriateness and effectiveness of these objectives, performance measures and review events and these are assessed in detail under the relevant section of Part Two of this report. DEH is also concerned that if a performance measure is not met, there is no timeframe for reviews to be undertaken and appropriate management responses implemented and recommends that DPI&F develop a process for this.

Recommendation 2: *DPI&F to monitor the status of the fishery in relation to the performance measures (review events and/or reference points) specified in the Trawl Plan. Within three months of becoming aware that a performance measure has not being met, DPI&F to finalise a clear timetable for the implementation of appropriate management responses.*

Management of the fishery is largely based on input controls. Such controls include:

- Limited entry, currently with 485 licences;
- Gear and vessel restrictions;
- Various seasonal closures throughout the fishery;
- Numerous permanent spatial closures; and
- An effort cap with transferable effort units allocated to all operators with surrender provisions on transfer.

There are some output controls also in place in the ECOTF including:

- Restrictions on species that may be retained;
- Size limits for some species; and
- Possession limits (for some species) relating to quantity, size, sex or reproductive status.

DEH is concerned that while a total effort cap applies in the ECOTF, DPI&F has limited ability to manage the harvest levels in different sectors of the fishery. A detailed discussion of the management regime in the ECOTF is included in Part Two of this report.

Compliance and enforcement tools implemented in the ECOTF include a Vessel Monitoring System (VMS) and random at-sea and port inspections. A 24-hour toll-free hotline has also been established to enable the general public to report suspected illegal activity. The *Status of the East Coast Trawl Fishery 2002* (Queensland Fisheries Service, 2003) report indicates that there were 51 convictions recorded in 2002, 31 of these being Serious Fisheries Offences (SFOs) as defined under the Trawl Plan (this number would also include convictions recorded in the Moreton Bay Trawl Fishery and the River and Inshore Beam Trawl Fishery). Convictions were recorded for closed waters offences, VMS incursions, turtle excluder device (TED)/bycatch reduction device (BRD) offences and regulated fish offences. If convicted of a SFO, the boat operator or licence holder may be required to show cause why their licences should not be suspended. The data available on compliance for the ECOTF does not detail what actions have been taken against persons convicted of SFOs. A review of the *Fisheries Regulation 1995*, including an assessment of the offences and penalties used by the Regulation and its subordinate legislation, is scheduled for completion by the end of 2005. This will incorporate a review of the SFOs contained in the Trawl Plan and a

restructure of the current penalty system. DEH welcomes this review, as it will provide DPI&F with the opportunity to improve the effectiveness of the penalty system.

Public comments received on the DPI&F submission raised concerns regarding the ability of DPI&F to enforce possession limits on some species, such as shark, which are permitted to be retained under separate commercial fishing endorsements (for example, the Reef Line Fishery). Other public comments raised the issue of fishing occurring in closed waters and questioned the ability of VMS to detect this. DEH notes the complexity of enforcing management arrangements when a number of endorsements are held by a single operator. However, DEH considers that the compliance tools used in the ECOTF are sufficient to enforce the critical management arrangements used in the fishery.

DEH is concerned that DPI&F does not have an appropriate review event in relation to compliance. The Trawl Plan includes a review event that triggers if more than 5% of vessels are used to commit an offence under the Trawl Plan. It is difficult for DPI&F to monitor the progress of the fishery against this review event as the number of boats used to commit an offence each year cannot be accurately determined. Prosecutions can be undertaken in a different year to when the offence was committed and offences may be recorded under the provisions of the *Fisheries Act 1994*, not the Trawl Plan. In reviewing the performance measures contained in the Trawl Plan (see **Recommendation 11**) consideration should be given to whether a more appropriate compliance/enforcement related performance measure should be developed.

The Trawl Plan includes a number of reviews to ensure that the management arrangements are achieving sustainability outcomes. Section 227 of the Trawl Plan sets out the requirements for a review to decide whether fishing effort in the fishery is ecologically sustainable. DPI&F prepared the GER in response to this requirement. The GER was released in September 2004 (Kerrigan *et al.*, 2004). The GER provides a systematic review of many aspects of the fishery since the introduction of the Trawl Plan including: the change in fleet profile, spatial changes in fishing effort, the sustainability of principal, permitted and bycatch species and the economic sustainability of the ECOTF fleet. The findings of the GER, as they relate to target, byproduct and bycatch species, are further discussed in the relevant sections of Part Two of this report.

The Trawl Plan also includes a requirement for a General Review of the entire plan to commence between November 2004 and November 2006. The purpose of the General Review is to decide whether the provisions of the Trawl Plan remain appropriate. DEH is satisfied that this five year review of the entire fishery is suitable, while critical aspects are reviewed regularly. However, there are no timeframes provided in the Trawl Plan for when the review should be completed and any necessary management changes implemented. DEH suggests that DPI&F develop a timetable for the commencement and completion of the general review of the entire plan, including the opportunity for public input and the implementation of the recommendations of the review. The outcomes of the General Review will be a key consideration in the reassessment of the ECOTF in 2007.

The management arrangements for the ECOTF are also regularly reviewed and discussed by TrawlMAC. DPI&F produces reports on the status of fisheries through the periodic release of the *Queensland's Fisheries Resources Current Condition and Recent Trends* reports. The latest condition and trend report was released in 2002 (Williams, 2002) and covered the period 1988 to 2000. More recently, DPI&F has produced a yearly status report for the East Coast Trawl Fishery, the most recent status report available is for 2002 (Queensland Fisheries Service, 2003). DEH notes the efforts that have been made by DPI&F to improve reporting on the ECOTF but is still concerned about the regularity of these reports. Also, the level of public reporting, especially

against the performance measures (such as review events and reference points) specified in the Trawl Plan needs to be improved.

Recommendation 3: *From 2005, DPI&F to report publicly on the status of the fishery on an annual basis, including explicit reporting against each performance measure specified in the Trawl Plan.*

Fishery-dependent data relating to the target species and protected species interactions is collected on a regular basis in the ECOTF. Some fishery independent information is also collected through research projects and the Long Term Monitoring Program (LTMP). Discussion of the information collection system can be found in Part Two of this report.

The nature of trawl fishing means that species other than those targeted by the fishery are captured, often in significant quantities. Bycatch assessment and management and an analysis of the fishery's capacity for assessing, monitoring and avoiding, remedying or mitigating any adverse impacts on the wider marine ecosystem in which the target species lives and the fishery operates is contained under Principle Two of this report.

A number of the target and byproduct species taken in the ECOTF are also harvested by other fisheries, managed by both Queensland and other jurisdictions. A detailed discussion of cross-jurisdictional issues is included in Part Two of this report. Queensland participates in both the Australian Fisheries Managers Forum (AFMF) and the Northern Australian Fisheries Management Workshop (NAFMW) to facilitate cross-jurisdictional cooperation.

A number of recovery plans are of relevance to the ECOTF, including the *Recovery Plan for Marine Turtles in Australia* (Environment Australia, 2003) and the *Recovery Plan for the Grey Nurse Shark (Carcharias taurus) in Australia* (Environment Australia, 2002). The *National Plan of Action for the Conservation and Management of Sharks* (Shark Advisory Group and Lack, 2004) is also relevant to the ECOTF. DEH is satisfied that the current management arrangements comply with all relevant threat abatement plans, recovery plans, the National Policy on Fisheries Bycatch, and bycatch action strategies developed under that policy. DEH expects that DPI&F will also ensure compliance with any future plans or policies as they are developed. DPI&F has, in the past, demonstrated its capacity and willingness to amend arrangements as required.

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

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

The ECOTF has been operating within the area of the current Great Barrier Reef World Heritage Area since the late 1950s, well before the declaration of the World Heritage Area in 1981. Under

the EPBC Act, a person may not take an action that has, will have or is likely to have a significant impact on the world heritage values of a declared World Heritage property. People that are taking actions that are a lawful continuation of a use of land, sea or seabed, that was occurring immediately before the commencement of the EPBC Act, may continue to take those actions. An enlargement, expansion or intensification of a use is not a continuation of a use. Since the rezoning of the GBRMP came into effect on 1 July 2004, 66.2% of the GBRMP is protected from trawling, offering significant benefits to benthic habitats and the communities that these support. For this reason, and the outcomes of the assessment as listed throughout Part Two of this assessment report, DEH considers that fishing activities as currently practiced in this fishery are unlikely, over the next three years, to have a significant impact on the World Heritage values of the Great Barrier Reef. Any significant change to existing practices, which is likely to significantly impact on the Great Barrier Reef's World Heritage values, may require approval by the Australian Government Minister for the Environment and Heritage.

Conclusion

DEH considers that the ECOTF management regime is documented, publicly available and transparent, and is developed through a consultative process. The management arrangements are adaptable and underpinned by objectives and performance criteria. DEH considers that the performance criteria could be improved, and this is discussed in detail in Part Two of this report.

The management arrangements are capable of controlling the harvest through a combination of input and output controls appropriate to the size of the fishery. The existence of an overall effort allocation to the ECOTF limits the ability of DPI&F to manage different sectors of the fishery and this is further discussed in Part Two of this report. Periodic review of the fishery is provided for, as are the means of enforcing critical aspects of the management arrangements.

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

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

PART II – GUIDELINES FOR THE ECOLOGICALLY SUSTAINABLE MANAGEMENT OF FISHERIES

Stock Status and Recovery

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

Maintain ecologically viable stocks

Objective 1: *‘The fishery shall be conducted at catch levels that maintain ecologically viable stock levels at an agreed point or range, with acceptable levels of probability’*

Information requirements

Fishery dependent data are obtained through compulsory daily logbooks. These logbooks have been in place since 1988. The information collected in logbooks has been improved over time. Prior to 2000, catch and effort data from 30’ x 30’ grids was collected for key species, including tiger, endeavour, king, banana and bay prawns, scallops, bugs, squid and crabs. Since 2000, reporting has been required at 6’ x 6’ grids for an extended range of species including some byproduct and protected species. In 2003 a revised logbook was issued which provides improved species specific catch data and better information on gear used across the fishery. A companion logbook to collect more detailed information on interactions with protected species, the Species of Conservation Interest (SOI) logbook, was also introduced in 2003. There are penalty procedures in place to encourage timely submission of logbook information.

Since 1992, logbook data have been transferred to the Commercial Fisheries Information System (CFISH) database, which DPI&F uses to monitor all commercial catch reporting. DPI&F advises that quarterly compliance checks are undertaken on the CFISH database to verify lodgement of logbook returns by fishers. In 2000, DPI&F undertook a major comparison of data on the CFISH database by cross-referencing with archived logbook returns. The results showed a high level of consistency (approximately 90%) between the data on the CFISH database and logbook returns.

The Trawl Plan requires that all vessels operating in the ECOTF have a VMS installed. The VMS receives at least one position every hour from each vessel and, when a vessel is close to a scallop replenishment area (SRA), positions are received more frequently.

Fishery independent data have been collected annually, since 1999, through the LTMP. These surveys have been introduced for the collection of long term trend data for use in the stock assessments of trawl target species. Resource priority setting workshops in 1998 identified the tiger/endeavour prawn sector and the scallop sector as the top priorities for this program for the ECOTF. Other ECOTF species sampled in the LTMPs include bugs, blue swimmer crabs and pipefish.

While eastern king prawns are not included in the LTMP, work has been undertaken to develop suitable indicators for long-term monitoring of recruitment levels.

The LTMP provides valuable information on species abundance and recruitment to the fishery. One of the limitations of the current LTMP is that it is conducted only in major commercial grounds, making it difficult to extrapolate about the abundance and recruitment of species in other areas of the fishery. A review of the LTMP, as it relates to the ECOTF, is recommended to ensure that maximum benefit is derived from this research, given the expense associated with conducting it. The review should consider the survey design and data required for fishery assessment purposes.

Recommendation 4: *By the end of 2005, DPI&F to review the adequacy of the current Long Term Monitoring Program (LTMP) for the ECOTF in terms of survey design and the value of the survey data for fishery assessment purposes. DPI&F to implement changes to the LTMP based on the results of this review and within available resources.*

Commercial catch data are not currently validated, and this creates a major source of uncertainty in the stock assessment process. While effort data could be validated against VMS data, this does not currently occur. The reliance on non-validated fishery-dependent information for the assessment of many of the target and byproduct species taken in this fishery is of concern. The LTMP is improving this information collection system, however, this program is relatively new and currently restricted to surveys of two of the five main sectors of the ECOTF. DEH recommends that DPI&F develop and implement a robust system to validate catch logbook and SOCI logbook data.

Recommendation 5: *By the end of 2006, DPI&F to develop and implement a robust system to validate catch logbook and Species of Conservation Interest (SOCI) logbook data.*

A significant amount of research has been undertaken relevant to the ECOTF and this is summarised in the Audit Report (GBRMPA, 2003) and the GER (Kerrigan *et al*, 2004). Historically, research focused on obtaining biological data for the key target species, development of TEDs and quantifying the environmental impacts of trawling, especially with regard to bycatch. More recently, research has focussed on reducing the ecological impact of trawling, by the development of an improved range of bycatch reduction measures, and developing and improving stock assessment models for the key target species.

New directions for research and endorsements of research proposals are usually considered at the TrawlMAC and SAG. However, apart from a brief list of key research areas that have been identified for the wider East Coast Trawl Fishery, there is not an agreed strategic direction for research. Given the need for increased public accountability, and the limited availability of research funds, the development of a strategic research plan is essential. DEH recommends that DPI&F develop and make publicly available a strategic research plan that identifies information gaps in the knowledge required to manage the fishery sustainably, priorities for future research and considers strategies through which research needs could be met on an ongoing basis.

Recommendation 6: *DPI&F to develop, and make publicly available, a strategic research plan within one year. The research plan will identify information gaps in the knowledge required to manage the fishery sustainably, priorities for future research, and consider strategies through which research needs can be met on a continued basis.*

A range of fishery dependent and fishery independent data are gathered by DPI&F in relation to the ECOTF. Continuation of existing data collection and research programs, combined with some extension and refinement of such activities will be important for the future management of the fishery. DEH has made recommendations regarding the need to review the LTMP, implement a system to validate logbook data and develop a strategic research plan for the fishery.

Assessment

DPI&F has produced several reports and scientific papers that include an assessment of the species targeted by the ECOTF. The most recent of these was the GER (Kerrigan *et al.*, 2004), which investigated sustainability of principal, permitted and bycatch species. Until recently, the main indicator of sustainable harvest used by DPI&F was catch rate trends using unstandardised, unvalidated catch per unit effort (CPUE) data from logbooks. Recently, measures of changes in

fishing power have been developed, so standardised CPUE data can now be incorporated into future assessments. Data used in these fishing power analyses were obtained from surveys conducted prior to the introduction of the Trawl Plan and the restructure of the ECOTF. Given the changes that have occurred as a result of the Trawl Plan, DEH expects that these analyses will be re-run to obtain the most current estimates of fishing power for use in stock assessments. Validation of catch and effort logbook data is also important to increase the robustness of the stock assessments (see **Recommendation 5**).

Work has also progressed on developing stock assessment models with alternative reference points for a number of target species, including eastern king prawn, saucer scallop and tiger/endeavour prawns. DEH is highly supportive of the work being done to improve the assessment of key target species and views this as a priority area for further refinement as increased knowledge about the fishery is obtained. A brief discussion of the assessment conducted in the GER for the principal and permitted species of the ECOTF is included below.

The entire eastern king prawn stock (including the component harvested by the NSW Ocean Trawl Fishery) was assessed using a monthly delay-difference model. The model showed that in 2001 the catches of eastern king prawn were well above maximum sustainable yield (MSY) levels, however as the effort levels in 2001 were the lowest on record, the GER concluded that recruitment was good and the stock had been fished to levels that produce MSY. The model also indicated that between 1991 and 1999 eastern king prawns were over-exploited. The GER noted that managing stocks at MSY is an inherently risky strategy and that stocks should be managed at some proportion of MSY (for example, 75% of MSY). DEH is concerned about the status of the eastern king prawn stock, given the uncertainties surrounding the data used in the stock assessment. DEH considers that the analysis should be reviewed, using 2002 and 2003 data and revised estimates of fishing power, as soon as possible and expects DPI&F will implement appropriate responses.

The saucer scallop stock was assessed using an age structure model. The stock assessment concluded that the scallop component is currently under-exploited, and even using a precautionary target of 75% of the effort levels needed to achieve maximum sustainable yield (E_{MSY}), recommended a significant increase (of approximately 1400 nights) in effort in this sector. DPI&F is currently investigating several management options to increase yield from this sector, commencing with a trial period of lowering the minimum legal size in late 2004. DEH notes there was much higher exploitation of this stock in the early 1990s, with the 2002 Condition and Trend Report (Williams, 2002) stating the stock was heavily exploited. While DEH is supportive of increasing the yield from this under-utilised sector, DEH urges DPI&F to conduct modelling and develop appropriate performance measures to monitor the ecological sustainability of the stock before new management measures are permanently implemented.

The tiger/endeavour prawn sector, of which tiger prawns are the major species, was assessed using a surplus production model. The stock assessment concluded that the stock is being fished at MSY. DEH is concerned about the status of the tiger prawn stock, given the uncertainties surrounding the data used in the stock assessment and the analysis was conducted on pre-2002 data. Given that using MSY as a reference point is high-risk, and tiger prawns have been shown to be able to be overfished by a much smaller fleet in the Northern Prawn Fishery (NPF), DEH considers that the analysis should be reviewed as soon as more current data are available.

The GER acknowledges that data on black tiger prawns taken in the fishery are limited, with provision made to report this species separately only made in 2003. The GER used the results of a Fisheries Research and Development Corporation (FRDC) project on the sustainability of current harvest levels of black tiger prawn populations for broodstock supply (Gribble *et al.*, 2002). This report concluded that while catches and catch rates of black tiger prawns are highly variable, there

has been no general decline in catches. While no recruitment drivers were identified, given the biological characteristics of the species (short-lived, highly fecund), the report suggested that recruitment is more dependent on environmental conditions than spawning biomass. The report concluded that the black tiger prawn stock was reasonably sustainable under current effort levels, although it should be noted that the analysis was based on unvalidated commercial catch data.

A stock assessment for reef king prawns has not been undertaken. At present the only performance measure by which this stock can be assessed is using the 70% CPUE review event detailed in the Trawl Plan. This method compares the CPUE of reef king prawns in a given year to the historical pre-Plan average from 1988 to 1997. The GER concludes that the CPUE trends for this stock indicate that it is being fished at sustainable levels, however, this assessment is based on pre-2002 data. DEH considers that work should be done on progressing the development of a stock assessment model for reef king prawns in order for a more formal analysis to be conducted.

No formal stock assessment is undertaken for bay prawns, and as for reef king prawns, the 70% CPUE review event outlined in the Trawl Plan is used to assess the stock. This analysis suggests that the stock is not currently overexploited. DEH is concerned that the bay prawn stock includes the juveniles of other key target species, such as eastern king, banana and tiger prawns. The impact of taking juveniles of these species is not taken into account in the individual stock assessments of these species. In addition, bay prawns are harvested by the River and Inshore Beam Trawl Fishery (RIBTF) and by the recreational sector. Given the findings of the GER that some of these target species are being harvested at MSY levels, incorporation of the take of juveniles from other sectors or fisheries into the stock assessments is critical.

Moreton Bay bugs are a target species of the ECOTF, although the majority of the harvest occurs as an incidental catch when targeting other higher value species. A 2002 assessment undertaken, utilising yield-per-recruit modelling, indicated that the catch of this stock has declined since 1996. DPI&F suggests this is not indicative of a sustainability concern, as other management measures, including TEDs and improved reporting between bug species, are thought to have reduced the reported catch of this stock. In the GER, Moreton Bay bugs were assessed using the 70% CPUE review event outlined in the Trawl Plan. However, given that these species are often an incidental catch, a CPUE reference point would not appear to be a suitable indicator for these species. The GER attempted to overcome this problem by only using data from high catch areas, as this was thought to be representative of targeted bug harvesting. The analysis illustrated that CPUE fell below the reference point in January and February 2002, however this was attributed to the effects of the northern closure (specified in the Trawl Plan and applicable to all waters north of 22°S from mid-December to the end of March) and the influence of TEDs on legal bug catch. DEH considers that a more appropriate method of assessing bugs is required.

The majority of squid harvested in the East Coast Trawl Fishery is taken in Moreton Bay, not the ECOTF. Catches of squid are highly variable and given the lack of knowledge regarding the biology of the species, assessment of the stock is difficult. The GER assessed the CPUE of identified squid targeting boats from 1990 to 2002. Prior to the introduction of the Trawl Plan there was a decline in CPUE of squid, however, since 1999 the trend in CPUE is positive. DEH acknowledges the difficulties in assessing the status of squid, but notes that a requirement of the strategic assessment of the NPF is to develop a biologically based harvest limit for squid. This is being considered by the NAFMW and could have benefits for the assessment of squid in the ECOTF (see **Recommendation 12**).

Assessment of the banana prawn fishery is challenging, as any CPUE based assessment would be confounded by the species strong schooling behaviour and an apparent positive relationship

between rainfall and recruitment. DPI&F is currently developing stock assessment models for banana prawns that incorporate environmental parameters and preliminary results are expected by mid 2005. DEH notes that no stock assessment is undertaken for banana prawns in the NPF, where this species constitutes a major component of the fishery. The most recent Condition and Trend report (Williams, 2002) included a brief analysis of banana prawns, concluding only that the catch of banana prawns had been highly variable between 1988 and 2000 and that catch rate was not a useful performance measure for this species.

No review events or reference points for any byproduct (or permitted) species in the ECOTF are included in the Trawl Plan. Assessment of byproduct species is difficult as limited biological information is available about many of these species and logbook data on byproduct has only been collected since 2000. To overcome this, the GER used a two-phase risk assessment. Phase one involved a Productivity Susceptibility Assessment (PSA) to determine the risk associated with overfishing these species based on biological characteristics. Phase two considered the management responses currently in place to address issues identified through the PSA. The GER acknowledged that PSA is a preliminary assessment tool that can be used to identify sustainability concerns and aid in the consideration of management responses. A summary of the GER risk assessment results regarding byproduct species is included below.

Table 2: PSA results for byproduct species outlined in the GER

Species/Species Group	Risk Rating	Conclusion
Blue Swimmer Crab	Low Risk	Sustainable: robust species, good knowledge regarding biology and ecology.
Red Spot Crab	Moderate Risk	Sustainable: similar to blue swimmer crabs, but less abundant in non-trawled areas.
Octopus	Moderate – Possible High Risk	Sustainable: some species data deficient.
Pinkies	Moderate – Probable High – True High Risk	Potential for further protection by improving BRD technology.
Cuttlefish	Possible High Risk	Risk rating due to lack of data, may be over-precautionary. Methods to identify specific cuttlefish areas should be considered.
Barking Crayfish	Probable High Risk	Risk rating due to lack of data, introduction of a minimum legal size should ensure sustainability.
Mantis Shrimp	Possible – Probable High Risk	Risk rating due to lack of data, further management interventions should be considered.
Balmain bugs	True High Risk	Introduction of species specific MLS will provide greater spawning protection.
Pipefish	True High Risk	Biological characteristics makes them highly vulnerable. Detailed spatial data needed to reduce risk of overfishing.

While the PSA is a valuable first step, more formal assessment should be conducted on byproduct species as CPUE data and further biological information becomes available.

Overall, DEH considers the assessment processes employed in the ECOTF to be adequate for some species, such as eastern king prawn, saucer scallop and tiger prawns, but in need of improvement or more regular application for other species, such as reef king prawns, bay prawns, Moreton Bay bugs and byproduct species generally.

DEH recommends that DPI&F develop a fishery assessment process for the ECOTF that periodically examines the ecological sustainability of the harvest of target and byproduct species and bycatch (note that full discussion of bycatch assessment is included in Objective 2). DEH considers that the fishery assessment process should be robust in that it should:

- use the best available information (including logbook, VMS, research, observer, survey and historical fishery data), comment on the accuracy of these data;
- incorporate where possible, the continued development of fishery assessment models, which test for the sensitivity of the assessment results to uncertainty;
- incorporate estimates of historic and current levels of effort creep based on logbook gear information, surveys and other relevant technological data;
- include a robust process whereby species may be added to or removed from the principal and permitted species list depending on their stock status; and
- evaluate stock status for principal species under a range of management scenarios adopting various levels of risk and a precautionary approach to setting sustainable effort levels.

Recommendation 7: *DPI&F to develop a robust and regular fishery assessment process, that provides a basis for management decisions, which are precautionary and recognise the uncertainty and level of risk. The assessment process will examine the ecological sustainability of the principal and permitted species and bycatch, within three years, using stock or risk assessments. Appropriate management responses will be developed to reduce risks to the high-risk species or groups.*

Management response

The ECOTF is managed primarily through a range of input controls (including effort capping and reduction, spatial and temporal closures, gear restrictions) and restrictions on which species may be retained. Some output controls are also used, including possession limits for size, sex and the quantity of certain species that may be harvested.

Following the adoption of the Trawl Plan in 1999, a voluntary structural adjustment scheme resulted in the removal of 99 licences from the East Coast Trawl Fishery and a voluntary reduction by industry removed a further 5% of effort from the fishery. The Trawl Plan set a maximum number of fishing days to be allocated in the East Coast Trawl Fishery, which was equivalent to the 1996 level of fishing. Effort in the fishery was unitised, with the allocation based on fishing history and hull size. Effort units are tradeable, allowing further self-adjustment and rationalisation of the fleet. To further reduce effort in the fishery, the Trawl Plan outlines a number of surrender provisions, including upon boat replacement, effort unit trading and licence surrender/transfer provisions.

When the Trawl Plan was introduced, agreement was reached between the Australian Government and the Government of Queensland that effort would not migrate back into the GBRWHA. The Trawl Plan therefore made provisions for an effort cap to be in place in the GBRWHA. Until 2003,

the effort cap decreased in line with what was estimated to be the level of effort creep in the fishery when the plan was first developed (i.e. 3%). In 2004 the effort cap from 2003 was rolled over. Acknowledging that the level of effort creep in the fishery post-restructure needs to be assessed, the principle has been agreed that the GBRWHA effort cap needs to change in line with effort creep. DEH recognises that in the future, DPI&F may develop management measures (based on the outcomes of robust stock assessments) which alleviate the need for an effort cap. However, over the 3 year term of this approval, DEH is not anticipating significant progress on this issue. Therefore, DEH recommends that DPI&F continue to implement an effort cap in the GBRWHA that periodically changes in line with the most current estimates of effort creep. DEH also recommends that DPI&F develop management measures to account for effort creep across the entire ECOTF.

Recommendation 8: *DPI&F to implement an effort cap in the GBRWHA, which changes periodically in line with the most current estimates of effort creep. DPI&F to implement appropriate management arrangements to account for effort creep across the fishery.*

DEH is concerned that while total effort across the fishery and in the GBRWHA is capped, DPI&F has no mechanisms by which to reduce total effort if required for ecological sustainability purposes, or to partition effort across the different sectors of the fishery. As outlined in the assessment section, some of the target species are considered to be fully-exploited, while others, such as scallop, are being under-utilised. The GER noted that since the introduction of the Trawl Plan there had been a 6% shift in effort towards the eastern king prawn sector, one of the target species that is fully-exploited. As DPI&F has no management tools to control effort in various sectors of the ECOTF, there is a risk that some species could become overfished. DEH notes that a variety of options are available to DPI&F to address this issue, including area based effort caps, species based effort caps or stock based endorsements. DEH has made two recommendations regarding the need to manage effort in the fishery at ecologically sustainable levels and the need to investigate implementing finer scale spatial management in the ECOTF.

Recommendation 9: *DPI&F to manage effort in the ECOTF at ecologically sustainable levels. DPI&F to identify appropriate management issues and options flowing from the GER, make the findings publicly available and implement any necessary management changes before the end of 2005.*

Recommendation 10: *DPI&F to investigate the feasibility of implementing finer scale spatial management in the ECOTF.*

A number of spatial and temporal closures apply in the ECOTF. The *Status of the East Coast Trawl Fishery 2002* (Queensland Fisheries Service, 2003), reported that 32% of the total fishery area was permanently closed to trawling. This has increased to 42% since the re-zoning of the GBRMP in July 2004. Currently, 66.2% of the GBRMP is permanently closed.

In addition to these permanent closures, several seasonal closures are specified in the Trawl Plan:

- First Northern Closure, applicable to all waters north of 22°S (except deepwater trawl areas) from 15 December to the end of February;
- Second Northern Closure, applicable to all waters (except deepwater trawl areas) north of 22°S from 1 March to 14 May. Closed to vessels that fished during the first northern closure;
- First Southern Closure, applicable to all waters south of 22°S (except deepwater trawl areas and Moreton Bay) from 20 September to 1 November; and

- Second Southern Closure, applicable to all waters south of 22°S (except deepwater trawl areas and Moreton Bay) from 1 November to 12 December. Closed to vessels that fished during the first southern closure.

The northern seasonal closures protect some of the target species of the ECOTF at some stage of their lifecycles, including juvenile recruitment of brown tiger prawns, reef king prawn recruits and the early recruits of grooved tiger prawns. Minimal protection is provided for endeavour prawns (Gribble *et al.*, 1995). The southern closures were implemented to increase yield from the scallop sector and prevent the transfer of effort from northern Queensland.

The Trawl Plan also identifies more than 150 specific closures in force in the East Coast Trawl Fishery area, for a variety of reasons, including stock sustainability, social, economic and environmental reasons. These include a complex system of rotational closures designed to protect the scallop spawning biomass while still allowing for exploitation of the stock. Closures implemented for environmental reasons include a permanent inshore closure between Cairns and Cape York to protect seagrass habitats and a seasonal closure near Bundaberg to protect turtle nesting sites.

In addition to the various closures specified in the Trawl Plan, DPI&F has emergency powers to close waters under the “emergency fisheries declaration” provisions of the *Fisheries Act 1994*. This allows the closure of waters for up to two months without prior consultation to prevent the over-exploitation of any fishery. An emergency fisheries declaration was used to declare the original scallop replenishment areas (SRAs) in January 1997, when low recruitment levels raised concerns of overfishing. On expiry of the emergency declaration, the SRAs were declared closed areas under the *Fisheries Regulation 1995* and later were incorporated into the Trawl Plan.

The Trawl Plan also outlines a number of restrictions on vessel size, engine power, headrope length and net mesh size, which ensures that the efficiency of trawling activity does not exceed current levels.

The Trawl Plan identifies a list of principal (target) and permitted (byproduct species). Species which are not included on these lists cannot be retained by fishers in the ECOTF. A number of target and byproduct species also have possession regulations, involving a minimum legal size (MLS), sex or quantity permitted to be retained. The size limits for byproduct species were introduced in 2001, following a review of permitted species by DPI&F. The MLS are based on stock assessments and other biological data such as size at maturity. DEH notes that DPI&F is currently progressing work on amending the size limits for Balmain bugs to make them species specific and introducing a MLS for barking crayfish. Given the results of the GER, which indicated that at least some species of octopus rated in the possible high risk category, yet concluded that overall octopus are considered sustainable, DEH suggests that DPI&F review the current possession limit of 66 litres to ensure it is sufficiently precautionary.

The Trawl Plan includes an objective to ensure fisheries resources taken in the fishery are taken in an ecologically sustainable way. This objective is supported by a number of review events. A review event is triggered if the CPUE for one of a number of principal species (bay prawns, eastern king prawns, Moreton Bay bugs, red spot king prawns, saucer scallops and tiger prawns) is less than 70% of the average CPUE during specified months for each species between 1988 and 1997. The 70% trigger is a limit reference point based on a percentage decline in CPUE in a recruitment overfishing event for tiger prawns in Western Australia. The submission does not specify why the reference points are static values between 1988 and 1997 rather than dynamic points that incorporate new CPUE data from fishing in subsequent years. Neither does it specify timeframes

for the implementation of management responses identified by any review undertaken. This last concern has been addressed by **Recommendation 2**.

The GER identified some issues with using CPUE reference points for a number of species which are either incidentally caught or exhibit an aggregating behaviour. The GER also identified that CPUE reference points can trigger at high population sizes, causing inappropriate changes in effort. Conversely, they can fail to trigger at low population sizes. With the development of a robust fishery assessment process (**Recommendation 7**), reviews of the biological status of species should not rely entirely on CPUE data. The limitations of the current review events have been recognised by DPI&F and a review of the performance indicators and associated review events has commenced. DEH recommends that DPI&F revise the current review events and develop appropriate limit and target reference points for principal and permitted species by the end of 2005. DEH notes that a review of the Trawl Plan is required to commence between November 2004 and November 2006 and is supportive of DPI&F implementing this recommendation as a part of the Trawl Plan review.

Recommendation 11: *As part of the review of the Trawl Plan (to be completed and changes implemented before November 2006), DPI&F to revise the current review events and develop appropriate limit and target reference points for principal and permitted species by the end of 2005.*

Several prawn fisheries in Australia target the same species that are caught in the ECOTF and the distribution and spatial structure of these stocks have been investigated and are believed to be well understood. DPI&F states that the target species in the ECOTF, with the exception of eastern king prawns and squid, operate as functionally independent stocks. Consequently, management arrangements for these stocks are restricted to Queensland only.

The eastern king prawns harvested in the ECOTF partially rely on recruitment from NSW waters. Ideally, management arrangements affecting a single stock should be under a single jurisdiction or at least complementary. DEH notes that DPI&F has attempted to incorporate NSW data into the latest stock assessment for eastern king prawn, but differences in the spatial scale of these data makes comparison difficult. DEH recommends that DPI&F continue to engage with NSW in the management and research of the eastern king prawn stock.

Concerns were raised in the NAFMW in September 2002 that increasing fishing pressure and opportunistic targeting of squid in fisheries around the coast could significantly affect the status of this shared stock. The annual harvest levels of squid taken in Queensland fisheries range between 125 and 225 tonnes. Approximately 80% of the squid harvested in Queensland is taken in the fisheries that constitute the East Coast Trawl Fishery. While squid are a target species in the ECOTF, the majority of the catch is taken in the Moreton Bay fishery. There is the potential for landings of squid in the ECOTF to increase, therefore DEH recommends that DPI&F continue to cooperate with other jurisdictions in relation to management and research on squid.

Recommendation 12: *DPI&F to continue to cooperate with other relevant jurisdictions to pursue complementary management and research of shared stocks for all principal and permitted species, which may be affected by cross-jurisdictional issues. In particular, DPI&F will cooperate with AFMA, WA and NT fisheries management agencies in relation to squid and with NSW Fisheries in relation to eastern king prawn.*

Conclusion

DEH considers that the management actions contained in the Trawl Plan aim to manage the ECOTF in an ecologically sustainable manner and prevent over-fishing. DEH is concerned that the eastern king prawn and tiger/endeavour stocks are being harvested at MSY, which is a high-risk

management strategy and there are uncertainties in the data used in the stock assessments. Current management arrangements do not effectively deal with spatial partitioning of effort and effort reductions, should these be required. DPI&F also has no mechanisms by which to spatially adjust effort in the fishery. Improvements in several areas are required to ensure that the management regime further reduces the risk of over-fishing.

DEH considers that there is scope to further refine some of the existing information collection, assessment and management responses and has provided a number of recommendations for improvements over the three year period of this approval.

Promote recovery to ecologically viable stock levels

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

The GER illustrated that eastern king prawn and tiger/endeavour prawn stocks have been fished to the limit of maximum sustainable yields, and in 2001, eastern king prawns may have been fished over this limit. The GER commits to conducting a further assessment of the eastern king prawn stock, incorporating 2002 and 2003 data. This assessment, and the development of any management options flowing from it, will be conducted in cooperation with NSW Fisheries. The GER identifies spawning or key nursery closures as additional management measures that may be needed to improve the status of the eastern king prawn stock. In relation to the tiger/endeavour prawn stock, the GER does not identify any management measures but states the assessment should be reviewed when more biological data becomes available.

DEH is concerned that despite the GER identifying that two sectors are operating at or above MSY, and acknowledging that this is a high-risk reference point to use, the GER does not identify any immediate actions to be undertaken. DEH has made a number of recommendations in this report regarding the need to conduct a robust fishery assessment process (**Recommendation 7**), ensure that effort levels in the fishery are managed at ecologically sustainable levels (**Recommendation 9**) and develop more appropriate reference points for target and byproduct species (**Recommendation 11**), and expects that through the implementation of these recommendations, stock levels will be managed at more precautionary levels.

Conclusion

The recent assessment that some of the target stocks are being fished at or above MSY is concerning. DEH expects that the suite of recommendations made in this report will assist DPI&F in managing these stocks at a more precautionary level. DEH expects that, if the next round of stock assessments undertaken on eastern king prawns and tiger/endeavour prawns shows the status of the stocks has not improved, DPI&F will develop a recovery strategy for these stocks.

Ecosystem impacts

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

Bycatch protection

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

Information requirements

No ongoing fishery dependent or independent data collection of bycatch has been undertaken across the entire ECOTF, rather data collection has been focused on individual sectors of the fishery.

Fishers are not required to report the bycatch in commercial logbooks. However, some protected species reporting is required, which is discussed under Objective Two of Principle Two.

Several studies conducted in the fishery over the last five years have reported the quantity, composition and spatial distribution of trawl bycatch species in various sectors of the fishery. Bycatch quantity estimates in the ECOTF range from 2 to 10 times that of the retained species. A ratio of 6 to 10:1 for bycatch to prawn catch was reported in the far northern section of the GBRMP (Poiner *et al.*, 1999).

The FRDC research project 2000/170 commenced in 2000 to determine the composition and abundance of bycatch in the scallop, eastern king prawn and tiger/endeavour prawn sectors of the fishery. The primary aim of this project was to estimate and compare the effects of BRDs and TEDs fitted to the commercial trawl gear of vessels in these sectors, not to provide a statistically robust assessment of bycatch in the ECOTF as a whole. However, the data from this project indicates that prior to the introduction of TEDs and BRDs, the shallow water eastern king prawn sector would have caught approximately 7 600 tonnes of bycatch annually with a bycatch to retained species ratio of approximately 8:1 (Courtney *et al.*, in draft). A reduction in bycatch, equating to between 370 and 1 049 tonnes annually, has been achieved by the introduction of BRDs and TEDs in this sector, (Courtney *et al.*, in draft).

A pilot observer program was undertaken in the eastern king prawn sector of the ECOTF in 2003-04 comprising four trips. Data were collected on retained species and bycatch, including discards of principal, permitted and other species. The results indicated that between 200 and 800 kilograms of bycatch was caught per shot, with stout whiting being a significant component of this (McGilvray, 2004).

Some bycatch data are also collected through the LTMP, especially in the scallop fishery. In addition, a project on the use of on-board hoppers in the banana prawn sector is assessing whether these devices are capable of enhancing survival of bycatch species before they are returned to the water.

While DEH notes the work conducted to date to quantify the bycatch in various sectors of the ECOTF, this research has been opportunistic, based on available funding and there is no stable funding base to carry out such bycatch monitoring work on a continued and regular basis. Furthermore, the areas studied may not always be representative of the operations of the commercial fleet. These issues, combined with the absence of ongoing fishery dependent or independent bycatch data collection, result in there being no mechanism by which DPI&F can monitor bycatch in the fishery. Given the large impacts of a demersal trawl fishery on bycatch, DEH recommends that DPI&F implement a system sufficient to detect changes in the composition and quantity of bycatch in the entire ECOTF on an on-going basis.

Recommendation 13: *By the end of 2006, DPI&F to develop and implement a system sufficient to identify changes in the composition and quantity of bycatch in the ECOTF over time.*

Assessment

As a result of the limited bycatch data available, no routine bycatch monitoring or assessment is conducted in the ECOTF. The total weight of bycatch caught annually in the East Coast Trawl Fishery is unknown, but prior to the introduction of TEDs, BRDs and effort reductions, it was suggested to be in excess of 25000 tonnes (Robins and Courtney, 1998). Bycatch rates in the ECOTF are highly variable due to the large area of the fishery and the number of different target species. A study conducted in the shallow water eastern king prawn sector identified 422 taxa in the bycatch (Courtney *et al.*, in draft). Gurnards, lizard fish, stout whiting, threadfin bream, flathead, dragonnets and portunid crabs dominated the bycatch by weight. Most species were uncommon, with 80% of species occurring in less than 10% of samples (Courtney *et al.*, in draft). The survival rates of most bycatch species encountered by the ECOTF are largely unknown, but are believed to be low.

A risk assessment process is proposed for bycatch components using a modified approach that was developed by Stobutski *et al.* (1999). However, no timelines or requirements have been specified for this risk assessment. The most recent assessment of the sustainability of bycatch in the ECOTF was included in the GER, however, this did not provide the risk assessment outlined in DPI&F's submission. Instead, the analysis in the GER links reductions in bycatch to reductions in effort, spatial shifts in the fishery, the introduction of BRDs and TEDs and closures since the introduction of the Trawl Plan.

DEH considers that a more formal risk assessment should be undertaken of bycatch in the ECOTF and has incorporated this into **Recommendation 7**.

Management response

Several management measures in the ECOTF contribute to avoiding and minimising bycatch.

The GER suggests that the largest reductions in bycatch have been achieved through effort reductions implemented since the introduction of the Trawl Plan. There has been a 40% reduction in the number of days fished since 1996 and the GER argues that the reductions in both the area trawled and the amount of bycatch would be comparable to this figure. While DEH accepts that the large reductions in effort would have resulted in a significant reduction in bycatch taken by the ECOTF, DEH is less convinced that a 40% reduction in bycatch has been achieved by this measure alone. Research conducted in the far northern section of the GBRMP has shown the relationship between the number of shots and quantity of bycatch is not linear, but that the majority of bycatch is removed in the first few shots (Poiner *et al.*, 1999).

TEDs and BRDs have been compulsory in all trawl nets, with the exception of 'try' nets (small nets used for quick shots to sample the abundance of target species) since 2001 and 2002, respectively. These devices were used voluntarily by some vessels and were mandatory in specific areas prior to becoming compulsory in the entire ECOTF. Currently five recognised BRDs are defined in the Trawl Plan. The effectiveness of these devices and TEDs in various sectors of the fishery has been studied (FRDC Project number 2000/170 as reported in the GER). The best results were from the scallop sector where a 77% bycatch reduction was achieved using a square mesh codend and a TED. Total bycatch reductions achieved using BRD/TED combinations in the eastern king prawn and tiger/endeavour prawn sectors ranged from 20 to 29% (Kerrigan *et al.*, 2004). Results from the

shallow water eastern king prawn sector suggest that the bycatch composition was largely unchanged (Courtney *et al.*, in draft).

DEH notes that there have been compliance and inefficiency issues regarding the use of BRDs and TEDs in the ECOTF. However, DPI&F has demonstrated a commitment to addressing this through improved enforcement and trialing of new bycatch mitigation measures to ensure the Trawl Plan contains the most effective devices for the reduction of bycatch. DEH is highly supportive of the work being undertaken and recommends that DPI&F continue this approach. Further discussion of TEDs is included under Principle Two, Objective Two of this report.

DPI&F have conducted research on increasing survival of bycatch through a FRDC funded project that evaluated the effectiveness of hoppers in the Queensland East Coast Prawn Trawl Fishery (Dell *et al.*, 2003). This research established that the use of hoppers can double the short term survival, compared to tray sorting. DPI&F also contributed to a handbook outlining hoppers in Australian Trawl Fisheries and promoting best practice use of hoppers (Ocean Watch Australia, 2004). DEH recommends that DPI&F continue to support investigation of methods for increasing the survivability of bycatch species that are landed on deck, such as on-board hoppers, where appropriate. The survival of bycatch species that escape through BRDs is still largely uncertain in most, if not all, trawl fisheries in Australia. Reducing the catch landed on the vessel of some species by 50% does not necessarily equate to a 50% reduction in fishing mortality of that species. Current technology and competing priorities limit the extent to which researchers can assess these reductions in a single fishery. This is a significant issue in a number of fisheries in Australia and DEH is supportive of research in this area in the future.

Recommendation 14: *DPI&F to continue to pursue a reduction in the amount of bycatch taken in the ECOTF through the refinement of bycatch mitigation technology and to support the investigation of methods for increasing the survivability of bycatch species. Any effective and appropriate methods identified should be implemented in the Trawl Plan within eighteen months.*

Significant reductions in bycatch have been achieved in many prawn trawl fisheries by limiting trawling to night hours or by implementing closures associated with the lunar phase. Six daylight closures operate in the ECOTF, with daylight trawling only significant in the scallop and bay/banana prawn sectors. The applicability and effectiveness of lunar closures should be considered by DPI&F if bycatch rates are unable to be reduced further by current measures.

Since the GBRMP re-zoning, approximately 42% of the ECOTF is permanently closed to trawling. Of the area of the fishery that was open to trawling in 2002, approximately 40% of the area was fished (Queensland Fisheries Service, 2003). DPI&F argues that these permanent closures, along with the suite of temporary closures in the ECOTF offer a significant level of refuge to bycatch species. While DEH acknowledges that the closures in the ECOTF are a precautionary management measure for bycatch, the capacity of untrawled habitats to sustain populations of bycatch species is uncertain.

No specific bycatch species or species group is being monitored. The Trawl Plan contains a review event that requires a 40% reduction in bycatch by January 2005. This target was a recommendation from the Premier's Working Group on the fishery after negotiation with the industry and was developed without specific knowledge regarding the levels of reduction required to achieve sustainability. Concerns were raised in public comments regarding the absence of reliable baseline data, and continued monitoring, to assess progress in achieving this target. DEH also has concerns over DPI&F's ability to report against this measure, given that there has been no continuous monitoring across all sectors of the fishery on bycatch composition and quantity.

With concerns over the measurability of the current review event, and the fact this review event will not be valid after January 2005, DEH recommends that DPI&F develop sustainability risk indicators for bycatch. DPI&F has advised that the Seabed Biodiversity Mapping Project (FRDC Project number 2003/021) currently underway will assist in the development of these risk indicators. This project is further discussed under Principal 2, Objective 3). As the results of this project are not expected until 2007, DEH recommends that DPI&F develop interim, precautionary performance measures related to bycatch by the end of 2005.

Recommendation 15: *DPI&F to develop sustainability risk indicators for bycatch based on the Seabed Biodiversity Mapping Project (FRDC Project number 2003/021). In the interim, DPI&F to, by the end of 2005, implement precautionary performance measures related to bycatch.*

Conclusion

DEH considers that, given the effort cap and system of closures operating in the ECOTF, and the use of bycatch mitigation devices, it is likely that the fishery is conducted in a manner that does not threaten bycatch species. Should this situation change, or a risk assessment process indicate otherwise, DEH expects that DPI&F would undertake appropriate actions to ensure that bycatch species are not threatened by this fishery.

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

Protected species and threatened ecological community protection

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

Information requirements

DPI&F has implemented improved fishery dependent data collection of protected species interactions through the introduction of the SOCI reporting logbook in 2003. The SOCI logbook records data on interactions with turtles (species specific), syngnathids, seasnakes, dugong, cetaceans and grey nurse sharks. Since March 2000, the commercial logbooks have provided for the voluntary reporting of turtle interactions and the retained catch of the two syngnathid species permitted to be harvested in the fishery. There has been no validation of these data however, and the reliability of assessments based on these data must be questioned. DEH considers it important that fishery dependent data collected on protected species interactions are accurate and has therefore included a recommendation for the validation of SOCI logbook data as part of **Recommendation 5**.

Data on protected species interactions have also been collected through the independent surveys, research projects, and a pilot observer program conducted in 2003-04. This information collection was relatively limited, being dependent on funding and resource availability. In addition, these data often were not species specific. The LTMP in the scallop sector provides regular data on seasnake and syngnathid catches.

One of the biggest barriers to successful commercial reporting of protected species interactions is the capacity of the fishers to identify the species involved. In addition, many operators may not be aware of the importance of reporting the species involved. Both of these barriers can be reduced through education programs and opportunistic advice from observers and researchers as appropriate.

Assessment

With the exception of turtles and pipefish, limited data are available on protected species interactions in the ECOTF. A risk assessment for turtles was undertaken in 1998 (Slater *et al.*, 1998) and a further assessment of the effectiveness of TEDs in the ECOTF was completed in June 2004 (DPI&F, 2004). The GER included a risk assessment for the two species of pipefish permitted to be retained in the ECOTF. No assessment of the impact of the fishery on seasnakes has been done.

The reported catches of turtles have reduced from an estimated 5901 annually between 1991 and 1996, to 22 (including 3 mortalities) in 2002 and 14 (including 1 mortality) in 2001. Turtle species captured included flatback (*Natator depressus*), green (*Chelonia mydas*), hawksbill (*Eretmochelys imbricata*), loggerhead (*Caretta caretta*) and Olive ridley (*Lepidochelys olivacea*). In 2001, 85% of this catch was from the far northern areas of the fishery. DPI&F attributed this dramatic reduction to the introduction of TEDs in the fishery. While encouraging, these figures are based on unvalidated data.

Given the relatively recent introduction of SOCI logbooks to report catches of seasnakes in the ECOTF, limited data are available on which to base an assessment of the impact of the fishery on seasnake populations. DPI&F advises that four species of seasnake (*Lepemis hardwickii*, *Hydrophis elegans*, *Disteira major* and *D. kingii*) have been recorded from the banana and tiger/endeavour prawn sectors, prior to the use of BRDs in the ECOTF. In a recent pilot observer program in the eastern king prawn sector of the ECOTF, two species of seasnake, *H. elegans* and *Aipysurus* spp. were caught and released alive (McGilvray, 2004). Research indicates that *H. elegans* has a high post-trawl survival rate (Stobutzki *et al.*, 1999). The limited data available indicates that the survival rates of other species caught in the ECOTF may not be as high. A risk assessment of bycatch undertaken for the NPF indicated that the incidental capture of seasnakes by this fishery was unlikely to threaten the sustainability of any species (Stobutzki *et al.*, 1999). This type of risk assessment is not possible on the ECOTF at this time given the limited data available.

From March 2000 to July 2001, 10597 syngnathids were recorded as incidental captures in the ECOTF. Data gathered through the LTMP and processor records indicate that 85% of these were *Solegnathus hardwickii* and *S. dunckeri*. A number of smaller species of pipefish and seahorses are discarded.

Although there are some data on interactions with these species, these data are unvalidated and unstandardised. In addition there appears to be no utilisation of these data in an environmental impact assessment of the fishery on these species. The GER does not comment on the sustainability of the management arrangements in relations to protected species, apart from the two species of syngnathid permitted to be retained. Pipefish were identified as a 'true' high-risk group and DEH supports DPI&F's conclusion that detailed spatial data are needed to minimise the risk of overfishing these species. DEH has recommended an assessment of the ecological sustainability of bycatch in the ECOTF and expects that protected species will be included in this assessment (see **Recommendation 7**).

DEH recommends that DPI&F promote research into the impact of the fishery on protected species and take all reasonable steps to reduce protected species interactions. DEH also feels that public reporting on protected species interactions in the ECOTF will improve the assessment and public accountability of protected species issues in the fishery. DPI&F have committed to incorporating protected species interaction reports in annual status reports, commencing in the 2003 status report, which is due for release in December 2004.

Recommendation 16: *DPI&F to promote research into the impact of the fishery on protected species, including syngnathids and seasnakes, and to take all reasonable steps to reduce protected species interactions. Each year, DPI&F to report publicly on interactions with protected species, incorporating the latest research findings.*

There are no listed ecological communities in the fishery area.

Management response

Several management measures in the ECOTF contribute to minimising the impact of the fishery on protected species.

One of the key management responses to reduce the impact of the fishery on protected species is the requirement for all trawl nets (except 'try' gear) to be fitted with TEDs and BRDs. Research in the ECOTF and other trawl fisheries has demonstrated that large bycatch species such as turtles and sharks, are removed by TEDs, as long as these devices are installed correctly and operating efficiently. A recent inspection, by experts from the United States of America, of TEDs used in the ECOTF recommended some changes to the TED specifications outlined in the Trawl Plan. DPI&F has recently conducted a study into the morphometrics of turtle species found in the ECOTF area and concluded that in order to effectively remove some of the larger individuals, the specifications would need to be modified (DPI&F, 2004). DEH recommends that DPI&F amend the definition of "recognised TEDs" in the Trawl Plan in line with the findings of this study and undertake sufficient enforcement activities to ensure compliance with the legislated TED provisions.

Recommendation 17: *Within twelve months, DPI&F to amend the definition of "recognised Turtle Excluder Devices" in the Trawl Plan to ensure that TEDs used in the ECOTF allow the effective escape of those turtle species caught in the fishery. DPI&F to undertake sufficient and effective enforcement activities, including at-sea and in-port inspections, to monitor the compliance with the TED provisions of the Trawl Plan.*

The Trawl Plan contains a review event related to turtle interactions, however, the trigger point is based on pre-TED data and is therefore no longer appropriate for the ECOTF. The *Status of the East Coast Trawl Fishery 2002* (Queensland Fisheries Service, 2003) comments that this performance measure is being reviewed to ensure that turtle capture rates are ecologically sustainable. DEH expects this would also be an outcome of **Recommendation 11**.

Research undertaken in the NPF indicates that square mesh panels are potentially effective at reducing seasnake capture (Stobutzki *et al.*, 1999). DEH considers that while the ECOTF currently catches large number of seasnakes, this impact could be reduced by encouraging the use of BRDs that have been shown to more effectively reduce the catch of seasnakes. DEH recommends that DPI&F continue to support research into impacts of the ECOTF on protected species and take all reasonable steps to reduce the interaction of the fishery with protected species (see **Recommendation 16**).

In response to a 2001 review of permitted species under the Trawl Plan, DPI&F amended the Trawl Plan to include two species, *S. hardwickii* and *S. dunckeri* on the permitted species list with an in-possession limit of 50 individuals of both species to prevent targeting. These two species are the only syngnathids that fishers are permitted to retain. In July 2002, the then Minister for the Environment and Heritage, the Hon Dr David Kemp, declared the incidental harvest of these two species in Queensland waters to be an approved Wildlife Trade Operation (WTO) under the EPBC Act subject to a number of conditions. DPI&F has made good progress in meeting these conditions, including providing annual reports to DEH, expanding the logbook reporting of syngnathids,

conducting a pilot observer program for bycatch, collecting information from buyers of pipehorses, reviewing habitat types, distribution and the relationship with syngnathids, reporting on the life history characteristics of syngnathids taken in the ECOTF and refining vulnerability assessments. The outstanding conditions are covered by recommendations made in this assessment relating to promoting research into the impact of the ECOTF on protected species and reducing protected species interactions (**Recommendation 16**), implementing a system to identify changes in the composition and quantity of bycatch in the ECOTF over time (**Recommendation 13**) and examining the ecological sustainability of permitted species and bycatch in the ECOTF (**Recommendation 7**).

In addition to the use of TEDs and BRDs to mitigate protected species interactions, the large area of the fishery permanently closed to trawling, and a significant (40%) reduction in effort levels expended in the ECOTF since the introduction of the Trawl Plan, are precautionary management responses that are likely to have minimised the impact of the fishery on protected species.

Conclusion

DEH considers that with the exception of turtles, there is insufficient data to accurately quantify the protected species interactions in the ECOTF. However, DEH considers that the management arrangements in place in the fishery, notably the use of TEDs and BRDs, the large areas of permanent closures, and the in-possession limit for two species of syngnathid, make it likely that the fishery is conducted in a manner that avoids mortality of, or injuries to, endangered, threatened or protected species. Should this situation change, or a risk assessment process indicate otherwise, DEH expects that appropriate actions will be undertaken to ensure the fishery avoids mortality or injury to these species and avoids or minimises impacts on threatened ecological communities.

Recommendations have been developed to ensure that the risk of unacceptable impact on protected species is minimised in the longer term.

Minimising ecological impacts of fishing operations

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

Information requirements and assessment

A range of data collected along the Queensland East Coast during the history of the fishery can be used to assess the ecosystem impacts of the ECOTF. These data include records of catch and effort, fishing gear, climatic variations and sediment, habitat and plant/animal classifications.

Some LTMP surveys record information on associated demersal communities, including megabenthos. In addition, there have been two major projects to investigate the impact of trawling on the environment in the GBRMP and another study is currently underway.

A five-year study was conducted in the far northern section of the GBRMP to examine the environmental effects of prawn trawling (Poiner *et al.*, 1999). A follow-up study examined the recovery of seabed habitat after prawn trawling (Pitcher *et al.*, 2000). These studies focussed on the lagoonal and inter-reefal areas of the GBRMP. A large “Green Zone” which was closed to trawling in 1985, provided the opportunity to investigate the difference between the ecosystems of trawled and untrawled areas. The first study characterised five bio-physical zones across the continental shelf on the basis of sediment type and plant/animal community. The sand and hard bottom types exhibited a more diverse assemblage compared to muddier areas. Large epibenthos was generally found in rocky or rubble patches.

One component of the study was a trawl depletion experiment, which concluded that each pass of a trawl net removed between 5 and 25% of the seabed life. The effects of trawling were also shown to be cumulative, with 7 repeat trawls removing between 70 and 90% of the seabed assemblage. Some species were shown to be more susceptible to trawling, such as large sponges and flower pot corals, while seaweeds and gorgonians were more resistant to trawling. The recovery from trawling study concluded that in heavily trawled areas up to 80% of the most susceptible species may be removed from trawling annually. These results illustrate the importance of collecting fine scale spatial data on the effort employed within the fishery to accurately assess the impact of trawling.

Given the variety of benthic habitats from the northern area of the GBRMP to the southern area of the GBRMP, it is difficult to extrapolate results from studies conducted in the far northern region of the GBRMP to other areas. A third study that commenced in 2003 is mapping the biomass and distribution patterns of bycatch and seabed benthos assemblages across the entire GBR region for environmental risk assessment and sustainable management of the East Coast Trawl Fishery (FRDC project number 2003/021). This will provide information on areas of the fishery not yet studied and has a primary objective of developing sustainability risk indicators and reference points for bycatch (see **Recommendation 15**) and the wider ecosystem.

Less data are available on the trophic impacts of trawling in the ECOTF. The results of the effects of trawling project (Poiner *et al.*, 1999) indicate that three major scavenger groups consume discards from trawling in the far northern section of the GBRMP – seabirds, dolphins and sharks and small fish and invertebrates. The impact of trawling in the GBRMP on trophic pathways, including modelling of ecosystem dynamics for varying levels of fishing mortality of discarded bycatch has been undertaken (Gribble, 2001). This study suggested that prawn populations benefited from the large amount of bycatch taken in the ECOTF as this reduced predators and increased food in the form of discards. However, the study found that trawling had a negative impact on omnivorous fish and sea turtles.

Concerns were raised in public comments that the information used to consider the risks of the fishery to the environment is sparse and largely uncertain and therefore any conclusions would be inaccurate. DEH notes that more information is currently available or is being collected on the impacts of trawling in the ECOTF than in most other trawl fisheries in Australia, due to the operation of the fishery in the GBRMP. DEH considers that DPI&F needs to take the ECOTF fishery area that occurs outside of the marine park into consideration when assessing the impact of the fishery on the ecosystem and strongly supports the collection of data from this area of the fishery. However, DEH acknowledges the strong commitment by DPI&F to support research into the area of ecosystem impacts of trawling and DEH expects that DPI&F will continue to do so into the future.

Management response

A number of management measures used in the ECOTF minimise the risk of significant impacts of fishing on ecosystems and their components. While most management measures have been established to protect target species and their habitats, some have been implemented to protect and conserve non-retained and protected species. The location of a large proportion of the fishery within the GBRMP, which has significant closures implemented to protect ecological values, also aids the ECOTF in meeting this guideline.

As previously discussed, there has been a 40% reduction in effort in the East Coast Trawl Fishery from 1996 levels, achieved since the introduction of the Trawl Plan. The GER reports that there has also been a comparable reduction in the area swept by the fishery. DEH considers that this

reduction in effort and area swept has reduced the impact of the ECOTF on the ecosystem, particularly benthic habitats.

Currently 42% of the fishery area is permanently closed to trawling. The GER also indicates that of the area that was open to trawling in 2002, active fishing occurred over approximately 40% of this area. The submission indicates that a very small area of the fishery is very heavily trawled, with 20% of effort directed at 5% of the fishery area. The vast majority of permanent closures occur within the GBRMP, however, 30% of effort is expended outside of the GBRMP. DEH recommends that DPI&F should review the adequacy of the protection provided to species and benthic habitats in the ECOTF by the current system of closures operating across the fishery and consider whether additional closures are required outside of the GBRMP.

Recommendation 18: *DPI&F to, within three years, initiate a review and provide a preliminary report on the adequacy of protection provided to species and benthic habitats in the ECOTF by the current system of closures within and outside the Great Barrier Reef Marine Park (GBRMP), and whether additional closures are required outside the GBRMP.*

The compulsory use of TEDs and BRDs serves to minimise the impact of the fishery on food chain structure and productivity by reducing the amount of bycatch (and therefore biological material) taken out of the ecosystem. Ongoing work to refine these devices could be expected to further reduce this impact.

DPI&F has also employed gear restrictions to minimise the impact of the fishery on benthic communities. For example, the ground gear must be no heavier than 10 mm and 12 mm diameter for inshore and offshore trawl gear, respectively. In addition, only one length of chain may be used in front of a net and no additional weights may be fixed to the chain.

An objective of the Trawl Plan is that the impacts of trawling on benthos will be reduced by 25% between November 1999 and January 2005. The submission states that this is to be achieved by reducing effort, reducing the area of the fishery and gear modifications. While DEH supports the inclusion of performance measures related to ecosystem impacts, it is unclear exactly how this is to be measured or what will happen if this target is not met. While a specific recommendation regarding the need for performance measures related to ecosystem impacts has not been made, DEH would support the development of a new ecosystem related performance measures, based on the outcomes of the Seabed Biodiversity Project and in conjunction with the implementation of **Recommendation 15**.

Impacts on water quality through the discharge of plastic wastes and pollution from vessels are controlled under MARPOL legislation. The submission is silent on specific actions and requirements in the fishery related to the prevention of marine pollution from vessels. DEH expects that operators are required to comply with the legislation and retain any plastic waste and dispose of it only when the vessel returns to port.

Consideration also needs to be given to the possible impacts of the ECOTF on the World Heritage values of the GBRMP. Since the rezoning of the GBRMP came into effect on 1 July 2004, 66.2% of the GBRMP is protected from trawling, offering significant benefits to benthic habitats and the species they support. In addition, an effort cap, that changes in line with estimated effort creep, will continue to operate in the World Heritage Area (see **Recommendation 8**) and DPI&F is moving to improve the efficiency of TEDs and BRDs used in the fishery (see **Recommendation 14** and **Recommendation 17**). On this basis, DEH considers that an action taken by an individual fisher, acting in accordance with the Queensland *Fisheries (East Coast Trawl) Fishery Management Plan*

1999, would not be expected to have a significant impact on the World Heritage values of the GBRMP protected by the EPBC Act.

Conclusion

DEH considers that the fishery is conducted in a sufficiently precautionary manner to minimise the impact of fishing operations on the ecosystem generally. A recommendation has been developed to ensure that the risk of significant impact by the fishery on the marine environment generally is further reduced.

As the fishery operates in the GBRMP World Heritage Area, consideration needs to be given to potential impacts of the ECOTF on this matter of national environmental significance. DEH considers that the fishery, if operated consistently with the current management regime and given the large areas of the GBRMP protected from trawling, is unlikely to have a significant impact on the World Heritage values of the GBRMP.

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LIST OF ACRONYMS

AFMA	Australian Fisheries Management Authority
AFMF	Australian Fisheries Managers Forum
BRDs	Bycatch Reduction Devices
CFISH	Commercial Fisheries Information System
CPUE	Catch per Unit Effort
DEH	Department of the Environment and Heritage
DPI&F	Department of Primary Industries and Fisheries
ECOTF	East Coast Otter Trawl Fishery
E _{MSY}	Effort to achieve Maximum Sustainable Yield
EPBC Act	Environment Protection and Biodiversity Conservation Act 1999
FRDC	Fisheries Research and Development Corporation
GER	General Effort Review
GBRMP	Great Barrier Reef Marine Park
GBRMPA	Great Barrier Reef Marine Park Authority
GBRWHA	Great Barrier Reef World Heritage Area
LTMP	Long Term Monitoring Program
m	metre
mm	millimetre
MARPOL	International Convention for the Prevention of Pollution from Ships
MLS	Minimum Legal Size
MSY	Maximum Sustainable Yield
NAFMW	Northern Australian Fisheries Management Workshop
NPF	Northern Prawn Fishery
NSW	New South Wales
NT	Northern Territory
OCS	Offshore Constitutional Settlement
PSA	Productivity Susceptibility Assessment
RIBTF	River and Inshore Beam Trawl Fishery
SAG	Scientific Advisory Group
SFOs	Serious Fisheries Offences
SOCI	Species of Conservation Interest
SRA	Scallop Replenishment Area
SWG	Scallop Working Group
t	tonnes
TEDs	Turtle Excluder Devices
TrawlMAC	Trawl Management Advisory Committee
Trawl Plan	Fisheries (East Coast Trawl) Management Plan 1999
TWG	Technical Working Group
UNCLOS	United Nations Convention on the Law of the Sea
VMS	Vessel Monitoring System
WA	Western Australia
WTO	Wildlife Trade Operation