



Australian Government

Department of the Environment and Heritage

**Assessment of the
Gulf of Carpentaria Developmental
Finfish Trawl Fishery**

Approvals and Wildlife Division

November 2004

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This document is an assessment carried out by the Department of the Environment and Heritage of a commercial fishery against the Australian Government Guidelines for the Ecologically Sustainable Management of Fisheries. It forms part of the advice provided to the Minister for the Environment and Heritage on the fishery in relation to decisions under Parts 13 and 13A of the *Environment Protection and Biodiversity Conservation Act 1999*. The views expressed do not necessarily reflect those of the Minister for the Environment and Heritage or the Australian Government.

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Assessment of the ecological sustainability of management arrangements for the Gulf of Carpentaria Developmental Finfish 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 Gulf of Carpentaria Developmental Finfish Trawl Fishery* (the submission) was received by the Department of the Environment and Heritage (DEH) in August 2004. The submission was released for a thirty-day public comment period that expired on 10 September 2004. Two public comments were received. Minor changes were made to the submission as a result of public comment.

The submission reports on the Gulf of Carpentaria Developmental Finfish Trawl Fishery (GOCDFTF) 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 response to the comments.

Table 1: Summary of the Gulf of Carpentaria Developmental Finfish Trawl Fishery

Area	Northern Gulf of Carpentaria waters beyond 25 nautical miles (nm) off the coast to the edge of the Australian Fishing Zone. The western edge is bounded by the Qld/NT sea border.
Fishery status	Underfished*
Target Species	Red Snappers 61% of catch [includes Saddletail Snapper (<i>Lutjanus malabaricus</i>) - 23% of catch by weight and Crimson Snapper (<i>Lutjanus erthropterus</i>) - 38% of catch by weight]
Key Byproduct Species	Make up 39% of the catch and include: <ul style="list-style-type: none"> • Mangrove Jack (<i>Lutjanus argentimaculatus</i>) - 15% • Sweetlip (Various species) - 6% • Red Spot and Red emperors - 6% • Spanish mackerel - 2% • Goldband Snapper (<i>Pristipomoides</i> spp) - 3% • Other species - 7%
Gear	Finfish trawl gear meeting specifications which define an 'environmentally friendly net'
Season	All year but offloading and transport of product limited by wet season (December to March)
Commercial harvest 03	190.4 tonnes (7 months of fishing)
Value of commercial harvest 2003	Approx \$2 million
Recreational and Indigenous harvest	Likely to be negligible.
Commercial licences issued	5 permits (3 currently active)
Management arrangements	A range of input and output controls including a TAC for target species, limited entry, gear restrictions, catch restrictions (see Table 2 for more detail).
Export	Majority of product sold on the domestic market.
Bycatch	38% of the total catch by weight (28.5% of fish bycatch by weight)
Interaction with Threatened Species	Low level of interaction with sawfish, turtle and seasnakes.

* Caton 2003

The GOCDFTF operates in northern Gulf of Carpentaria (GOC) waters beyond 25 nm from the Queensland coast to the edge of the Australian Fishing Zone¹. The western edge of the fishery is bounded by the Queensland / Northern Territory sea border. Most of the fishing effort is concentrated within the eastern half of the fishery nearest to Weipa.

GOCDFTF operators predominantly target Red Snappers *Lutjanus malabaricus* (saddletail snapper) (23% of catch by weight) and *Lutjanus erythropterus* (crimson snapper) (38%) that together comprise 61% of the average total annual catch by weight. Byproduct species comprise 39% of the catch and include mangrove jack (*Lutjanus argentimaculatus*) (15% of average total annual catch), sweetlip (mixed species) (6%), Red and Red Spot Emperors species (*Lutjanus sebae* and *Lethrinus lentjan*) (6%), Spanish Mackerel (*Scomberomorus commerson*) (2%) and Goldband Snapper (*Pristipomoides* spp) (3%). Other byproduct (7%) for the GOCDFTF include threadfin bream (*Nemipterus* spp), trevally (Carangidae), cod (Epinephillidae), grouper (Serranidae), and various butterfish, hairtail and lizardfish.

Red Snapper² is a general species group name for schooling Lutjanid species such as *Lutjanus erythropterus* (Crimson Snapper) and *L. malabaricus* (Saddletail Snapper). Red Snappers are demersal fish found in the northern half of Australian waters and the Indo-Pacific region. They are highly fecund and are batch or serial spawners which breed through an extended summer period or year round with seasonal peaks in activity. Fecundity in Red Snappers increases with size and mature females can produce at least 5-7 million eggs per season. Eggs and larvae are pelagic. Larvae, which grow through their juvenile phase in shallow (4-7 m) waters, move into surface waters at night and deeper into the water column during the day. Both these species mature at approximately 300 mm standard length (SL) (Anon 2003). Saddletail Snapper can reach a maximum age of 31 years and 100 cm total length³. Newman (2002) has shown that Saddletail Snapper off the Pilbara Coast in Western Australia have a low-production potential and that the species is vulnerable to overfishing. Newman (2002) has suggested large spatial refugia to provide adequate protection of spawning stocks from fishing may be an appropriately conservative management approach to improve stock sustainability.

Red Snapper species are commonly associated with submerged deeper reefs and shoals and feed mostly at night, primarily on fish with small amounts of benthic crustaceans, cephalopods and other invertebrates. The life characteristics of the three most commonly targeted species, Red Snapper (Crimson and Saddletail snapper) and Red Emperor are long-lived species (up to 32 years) and grow slowly once reproductively mature (Newman *et al* 2000). These life history traits are characteristic of species with a low capacity to recover from over-fishing. Newman *et al.* (2000) also suggests that the slower growing Red Emperor may form a good indicator species for a monitoring program for this group of species. They recommended that a cost effective program could be implemented to determine the age of species using an otolith weight and age relationship, using samples obtained from the fisheries. Australian stocks of Red Snapper appear to be separate to Indonesian stocks.

Mangrove jack (*Lutjanus argentimaculatus*) has a wide distribution spanning from tropical Australia, throughout the Indo-west pacific, to Samoa and Africa (Russell *et al.* 2003). In addition to their importance to recreational fisheries mangrove jack are a byproduct species taken in the Qld commercial line, net and trawl fisheries in the GOC and in the WA and NT finfish trawl fisheries.

The size, age and reproductive status of mangrove jack stocks are yet to be determined for the GOC. The majority of research on Queensland mangrove jack is from east coast populations. Genetic studies by Russell *et al.* (2003) suggested there was a high level of gene flow between

¹ See Figure 1.1 of DPI&F submission for a detailed map.

² Red Snapper is also termed Sea perch or Redfish.

³ White and Sumpton, 2002.

Queensland east coast, GOC and northern Australia mangrove jack populations indicating a high likelihood that a single genetic stock exists across these areas and possibly Australia. Mangrove Jack have distinct inshore (juvenile) and offshore (adult) life histories phases and prefer complex habitats (snags, reefs, shoals, rock bars etc.) to open sand and mud areas. Spawning takes place offshore, usually around reef areas. Spawning occurs between October and March on the east coast of Queensland, with peaks in December (Russell *et al.* 2003). In Queensland, most mangrove jack mature at about 450 mm and 7 years for males and about 510 mm and 8 years for females. They can attain a maximum length greater than 650 mm and are long lived with some individuals estimated at 37 years old (Russell *et al.* 2003).

Red Emperor (*Lutjanus sebae*) occurs in coral reefs often over sand flats in water between 10 and 100 m in depth. Red Emperor feed on fishes, crabs, stomatopods other benthic crustaceans and cephalopods. They are estimated to live up to 12 years and can reach a maximum length of 100 cm but are common at 60 cm in length (Allen 1985).

Results indicate that Goldband Snapper (*Pristipomoides multidens*) in Indonesian and Australian waters are a separate stock with multiple stocks within Indonesian waters (Lloyd *et al.* 2000). There is also evidence to suggest that there is genetic dissimilarity between stocks across northern Australia (Ovenden *et al.* 2002).

There is an extensive history of foreign fishing activity in areas of Australia's northern continental shelf targeting Red Snappers. In what were then international waters, Japanese stern trawlers fished the demersal resources of the Arafura Sea area in the late 1950s, and later those of the Timor Sea and Northwest Shelf. Thai and Taiwanese pair trawlers also intensively fished these areas from the early 1970s. Foreign fleets continued fishing under fee-fishing arrangements following the ratification of the Australian Fishing Zone (AFZ) in November 1979. Taiwanese pair trawlers (1979-1990), Thai-Australian stern trawlers (1985-90) and Chinese pair trawlers (1989) operated in the AFZ waters.

Landings by Thai-Australian pair trawlers peaked at approximately 10,000 tonnes from the Arafura Sea in 1983. Due to increased activity by domestic operators and concerns about the possible over-fishing of snapper stocks, the Australian Fisheries Service introduced a development plan for the then Northern Fish Trawl Fishery in October 1990. Under the Plan, fishing access arrangements for foreign trawl fleets ceased and six licenses were issued to Australian vessels to operate in offshore trawl grounds in the Arafura Sea and GOC zone. As a result of the Revised Offshore Constitutional Settlement (OCS) arrangements in February 1995, management responsibility for the GOCDFTF was passed to the Queensland Fisheries Joint Authority (QFJA).

Catch for the GOCDFTF has varied from about 9 tonnes (t) to 195 t in 2002 probably reflecting the 'developmental' nature of the fishery with operators over time searching out the better fishing grounds and developing new markets for their catch. The catch per unit effort (CPUE) for operators in 2002 and 2003 (approximately 2 t/boatday) is lower than the average CPUE of 3.0 – 3.9 t/boatday reported for the Northern Territory Finfish Trawl Fishery (NTFTF) (Sly 2003).

DPI&F advises that the fishing gear used in the GOCDFTF are 'environmentally-friendly' semi-demersal nets separated by two otter boards. Trawling speeds are between 3.5 and 4 knots and shots are from 30 to 90 minutes in duration.

The full wing Wendy trawl net, designed cooperatively by industry and government, was designed to minimise habitat disturbance while maintaining viable levels of catch. The bridle design, light weighted footline and cut of the net allow it to lift high off the seabed, allowing the gear to be more workable as the net does not come into contact with the seabed. The net design reduces the

occurrence of catch of sponges, corals and other unwanted species that are associated with traditional demersal trawl operations and also improves the quality of the retained catch. Further commercial benefits of the net design include reduced wear and tear on the trawl net and rigging due to minimised contact with the substrate. The ground wire is surrounded by rubber disks that allow it to roll over the substrate with minimal impact on the rare occasions the net comes into contact with the seabed. In general operations the net will lift approximately 0.3-0.4 m off the seabed to target red snappers, which generally school off the bottom (Sly 2003).

A Champion cutaway wing net is more target specific and equally as low impacting to the substrate as a derivation of the Wendy net. Like the Wendy Net the ground wire is covered with rubber bobbins that allow it to roll over the substrate with minimal impact on the rare occasions the net comes into contact with the seabed and in general operations the nets lifts approximately 0.3- 0.4 m off the seabed. The net fishes from the seafloor up to approximately 5.5 m off the bottom.

Although net designs have minimised contact with the bottom, the design current still results in 9% of the catch by weight of benthos species including sponges, sea whips and gorgonians.

Most of the product is sold to domestic processors as whole fish. The GOCDFTF is a quota managed fishery and has a maximum total allowable catch of 1500 tonne of Red Snappers and Emperors (crimson snapper, saddletail snapper, red emperor and other emperors).

There are no controls on the species of byproduct that may be retained. Permit conditions restrict the level of take of some byproduct species. The holder of a permit for this fishery must not take barramundi, sharks, tuna and tuna-like fish (namely yellowfin tuna, southern bluefin tuna, bigeye tuna, longtail tuna, albacore tuna, northern bluefin tuna and skipjack tuna), all pomfrets (Family Bramidae) and all billfish. The holder of a permit may only take the TAC issued to their permit. They may only take finfish of all species of the Class Osteichthyes and the Class Chondrichthyes other than the above mentioned fish. Additionally, the permit holder must not take or possess at any one time more than:

- (a) 20 black jewfish (*Protonibea diacanthus*);
- (b) 20 queenfish (*Scomberoides spp.*);
- (c) 20 king salmon (*Polydactylus sheridani*);
- (d) 20 blue salmon (*Eleutheronema tetradactylum*);
- (e) 20 grey mackerel (*Scomberomorus semifasiatus*);
- (f) 20 Spanish mackerel (*Scomberomorus commerson*); and
- (g) 20 squid (*Photololigo spp.*)

There is no limit to the quantity of other byproduct species that may be retained.

Onboard monitoring data for the GOCDFTF from one observer trip in 2003 indicates that bycatch species comprise 38% of the total catch by weight. Bycatch are mainly fish species restricted by regulation, with 28.5% of the 2003 observer trip being fish bycatch by weight. The QFJA has adopted a cautious approach to the exploitation of non-target species which includes restricted availability of permits, gear restrictions and encouragement for bycatch limits in other fisheries (e.g., GOC line fisheries, Commonwealth Northern Prawn Fishery (NPF), NTFTF). To date low levels of interaction with protected species such as sawfish, turtle and seasnakes have been recorded. A Bycatch Action Plan (BAP) is being developed by stakeholders and DPI&F as a strategic plan to manage bycatch in the GOC.⁴ DPI&F advises that the Plan is due for implementation by 2006 and applies to all inshore fisheries in the GOC including the Net, Bait,

⁴ A draft copy is provided in Appendix 3 of the DPI&F submission.

Line and Crab Commercial Fisheries, Recreational Fishery and Indigenous Fisheries and developmental fisheries including the Developmental Finfish Trawl Fishery. Interactions with bycatch and protected species are further assessed under Principle Two of this report.

A commercial gillnet fishery, commercial line fishery, and a commercial pot fishery for mud crabs are the other Queensland-managed commercial fisheries in the GOC. These fisheries are subject to separate assessments. Only the commercial line fishery targets the same red snapper species as the GOCDFTF, however these two fisheries do not overlap in fishing areas. The Commonwealth Government managed NPF operates throughout Queensland and Northern Territory GOC waters. The NPF has seasonal byproduct limits in place and each of the approximately 100 vessels is permitted to keep up to 500 kg in total of red snappers and red emperor from 1 January to 30 June and 50 kg in total from 1 July to 31 December each year. The NPF also has possession bans in place for all sharks, rays/skates and all parts of these animals. DEH strongly encourages continued cooperation in the management of shared stocks in the above mentioned fisheries.

DPI&F advises that the Indigenous and recreational harvest of target, by-product and bycatch species taken the GOCDFTF is likely to be negligible.

The GOCDFTF is managed by the State government through DPI&F and the QFJA operating under the *Queensland Fisheries Act 1994* and the *Queensland Fisheries Regulation 1995*.

Overall assessment

The material submitted by DPI&F demonstrates that the management arrangements for the GOCDFTF 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 risks that must be managed to ensure that their impacts are minimised:

- No fishery specific objectives, performance measures and performance indicators for target species not covered by the TAC nor for byproduct, protected species and ecosystem impacts
- No clear process for responding to a breach of a performance indicator
- No comprehensive fishery status report
- No ongoing validation of commercial catch information
- Concerns with the level of the current bycatch performance measure
- No sustainable yield estimates for Red Snapper stocks since 1994
- Paucity of information on recreational and indigenous take
- No fishery independent data collection
- Limited information on composition and abundance of bycatch.

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 ensuring the stocks are fished sustainably.

The GOCDFTF has been in a developmental stage and has made considerable progress in developing sound management arrangements. 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 fishery is being managed in an ecologically sustainable manner and is working to 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 management regime, including a TAC for key target species, limited entry, area controls, use of Vessel Monitoring System (VMS), gear specifications and the development of a BAP, 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 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 contain the environmental risks in the long term. DEH considers that the fishery, as managed in accordance with the management regime is not likely to cause serious or irreversible ecological damage over the period of the export decision. Specifically, the WTO declaration would allow the export of product from the fishery for a period of three (3) years. The WTO declaration will require annual reporting on the progress of implementing the recommendations of this report and other managerial commitments. The implementation of the recommendations and other managerial commitments made in the submission 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, seasnakes, sawfish and seabirds. According to the current available information, the fishery has limited interaction with protected species. The actual and potential impact on Part 13 species under the management arrangements is considered low and adequate protection is provided. There are no listed threatened ecological communities in the fishery area.

DEH recommends that the Gulf of Carpentaria Developmental Finfish Trawl Fishery management regime 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 regime 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 regime requires that all reasonable steps are taken to avoid the killing or injuring of protected species, and the level of interaction under current fishing operations is low. On this basis, DEH considers that an action taken by an individual fisher, acting in accordance with the regime, would not be expected to have a significant impact on a listed threatened species or listed migratory species protected by the EPBC Act.

Recommendations

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

Recommendation 2: *By the end of 2006 DPI&F to develop fishery specific objectives, performance indicators and precautionary performance measures for target, byproduct, bycatch, protected species and impacts on the ecosystem. Data collection programs appropriate to monitor the performance measures to be implemented.*

Recommendation 3: *DPI&F to monitor the status of the fishery in relation to the performance measures once developed. Within 3 months of becoming aware that a performance measure has not been met, DPI&F to finalise a clear timetable for the implementation of appropriate management responses.*

Recommendation 4: *From 2005, DPI&F to report publicly on the status of the fishery on an annual basis, including explicitly reporting against each performance measure, once developed.*

Recommendation 5: *DPI&F to maintain data validation mechanisms for target, byproduct, bycatch and protected species interactions and implement alternative data collection validation techniques if observer trips are no longer feasible or are insufficient to provide robust information on the fishery.*

Recommendation 6: *Within 18 months, DPI&F to develop a process to improve estimates of recreational and Indigenous take and factor these into stock assessments and management controls to ensure overall catch levels are sustainable.*

Recommendation 7: *DPI&F to continue to seek out alternative cost effective fishery independent monitoring techniques, particularly for target species, and report outcomes in the annual status report from 2005.*

Recommendation 8: *DPI&F to continue to cooperate with other relevant jurisdictions to pursue complementary management and research of shared stocks for all target and byproduct species that may be affected by cross-jurisdictional issues.*

Recommendation 9: *DPI&F to implement appropriate management measures for species identified through the risk assessment as being high risk within 12 months of completion of the risk assessment.*

Recommendation 10: *DPI&F to continue to pursue reduction in the amount of bycatch, including protected species, taken in the GOCDFTF through the refinement of management measures and to investigate methods for further increasing the survivability of bycatch species. Any suitable methods identified to be implemented in a timely manner.*

Recommendation 11: *DPI&F to review the appropriateness of the current bycatch performance measure within 1 year.*

Recommendation 12: *To support the implementation of the SOCI logbook DPI&F to develop and implement an education program for fishers to promote the importance of protected species protection and accurate incident reporting within one year.*

PART I - MANAGEMENT ARRANGEMENTS

The QFJA manages the GOCDFTF under Queensland law. QFJA fisheries operate under the OCS agreement and resulting Memorandum of Understanding (MOU) between the Queensland, Northern Territory and Australian Governments. The QFJA provides for the Commonwealth and the State to jointly manage the fishery given the likelihood of shared resources with adjacent national and international jurisdictions. The QFJA was established under the Queensland *Fisheries Act 1994* and manages fisheries for all northern demersal and pelagic finfish in waters relevant to Queensland in the GOC excluding the commercial harvest of:

- a) tuna and tuna like species;
- b) barramundi, king threadfin, blue threadfin, jewfish, spotted grunter-bream and queenfish;
- c) fish taken whilst trawling for prawns in the Northern Prawn Fishery; and
- d) incidental catch of fishing operations for (a) and (c) above.

A Fishery Assessment Group, comprised of DPI&F, the Australian Fisheries Management Authority (AFMA) and the Commonwealth Scientific and Industrial Research Organisation (CSIRO), was formed to undertake assessments of the status of stocks and impacts on the ecosystem by the developmental fishery, and to conduct the day-to-day management of the fishery on behalf of the QFJA, under Queensland legislation. The recreational and Indigenous fishing sectors in the GOC are managed under the *Fisheries (Gulf of Carpentaria Inshore Finfish) Management Plan 1999*.

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

- *Fisheries Act 1994* (Fisheries Act);
- *Fisheries Regulation 1995* (Fisheries Regulation);⁵
- Policy Statement for the Developmental Finfish Trawl Fishery in Queensland waters of the Gulf of Carpentaria (May 1997)
- Relevant Gazetted notices and permit conditions;

All Queensland legislation is available from the web.⁶ A number of other documents, including research reports, observer reports and scientific literature are integral to the management of the fishery. DEH considers that the management regime for the GOCDFTF is adequately documented, publicly available and transparent.

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. Export decisions 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. A change from a developmental fishery would require a new assessment.

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

⁵ Qld Fisheries legislation is available from the website <http://www.legislation.qld.gov.au/Legislation%20Docs/CurrentF.htm>

⁶ <http://www.legislation.qld.gov.au/LEGISLTN/CURRENT/F/>

The GOCDFTF is currently operating under the developmental fishery policy to determine whether or not the fishery is commercially viable, socially acceptable and ecologically sustainable, as defined in section 3 of the Fisheries Act. If developmental fishing activity is to be approved it must be demonstrated that the impact on the marine ecosystem, on non-target species and on non-target groups in the target species itself (juveniles/breeding stock) is minimised and meets acceptable management standards. Although developmental fishing permits have been issued since 1996, the future of the fishery has not yet been determined.

Since 1995, the Gulf Management Advisory Committee (GulfMAC - previously Tropical Finfish MAC) has provided advice to the fishery management agency on matters for strategic management of the GOCDFTF. GulfMAC includes members with expertise in commercial and recreational/charter fishing, processing/marketing, conservation, enforcement, scientific and fisheries management and is led by an independent Chair. Indigenous interests in the GOC are also represented on the MAC. The Cape York Land Council and the Carpentaria Land Council also have observers attend meetings. GulfMAC meetings are held at a minimum twice a year.

Specialist scientific and technical advice is provided to fishery management through a number of sub-committees. External scientific input to management decisions is provided through the scientific advisors who provide relevant scientific information and assessments to the GulfMAC. Assessments of the fishery have benefited from a range of externally recognised scientific expertise with scientists not only from DPI&F but also CSIRO, James Cook University, the Northern Territory Government, the Australian National University, the University of Miami and the University of British Columbia.

Following a consultation process involving stakeholders, including Government, industry, recreational, conservation bodies and the relevant advisory committees (Tropical Finfish MAC (now Gulf MAC) & Gulf of Carpentaria Zonal Advisory Committee), the QFJA developed a policy for a Developmental Finfish Trawl Fishery.⁷ This policy sets out the requirements and conditions under which fishers in the GOCDFTF must operate, including the establishment of a Total Allowable Catch, provisions for permits and the establishment of a fishery assessment group.

DEH considers that the GOCDFTF provides adequate mechanisms to ensure that the management regime takes into account management arrangements for the GOCDFTF species in adjacent fisheries and jurisdictions. Ideally, management arrangements for fisheries affecting a single stock should be under a single jurisdiction or at least be complementary. If this is not achievable, management arrangements should, as a minimum, take into account the harvest and management regime in other jurisdictions fishing the same population, particularly when assessing stock status and availability for harvest. A *Memorandum of Understanding* (MOU) was developed in 1995 between the NT and Qld governments to facilitate the co-operative management of GOC demersal and pelagic stocks. The MOU provides for consultation and co-operation about:

- (a) catch and effort data;
- (b) results of scientific research;
- (c) monitoring and surveillance; and
- (d) proposed management regimes.

To maintain cooperation and coordination of these initiatives between the Queensland and the NT Governments, a representative from the NT government is present at GulfMAC to help ensure an awareness of complementary management arrangements that are in place or being considered.

The status of shared fish stocks is reviewed annually at the Northern Australian Fisheries Management Forum (NAFMF) meeting, attended by fisheries managers, researchers and

⁷ Provided in Appendix 1 of the DPI&F submission

compliance officers from Western Australia, the Northern Territory, Queensland and the Commonwealth. These workshops provide opportunities to address cross jurisdictional issues, particularly stock assessment and bycatch issues.

DEH acknowledges the steps that are being taken by Queensland, Northern Territory and Commonwealth Government agencies to fill the remaining knowledge gaps for stocks of some species and to expand knowledge on the effects on the fishery by the commercial, recreational and Indigenous sectors. Cross-jurisdictional issues are covered in more detail under Principle 1.

Management of the fishery incorporates a sound range of consultative mechanisms and a clear commitment to effective consultation with a variety of stakeholders. DEH considers the level of consultation to be adequate and is confident that the management agency will continue to ensure interested parties are consulted appropriately.

The Fisheries Act has broad objectives for the management of Queensland fisheries but there is little in the way of GOCDFTF specific operational objectives in relation to target, byproduct, bycatch, protected species and ecosystem impacts. DEH suggests that DPI&F incorporate into the management regime fishery specific objectives for target, byproduct and bycatch as well as an objective to minimise protected/listed species interactions, to minimise or maintain at sustainable levels the take of other bycatch and to minimise impacts on the marine environment. DEH recognises that the take of target species (currently 61% of retained catch) is managed through a precautionary TAC and that there is a performance measure for the level of bycatch taken. However DEH has concerns that there are currently no fishery specific performance indicators and precautionary performance measures for byproduct (currently 39% of the retained catch) by which the effectiveness of the management arrangements could be measured. This concern was also raised during public comment. There is also no performance measure to detect a decline in catch for target and byproduct species. In order to be able to monitor the status of the fishery against the performance measures, appropriate data collection systems need to be in place.

Recommendation 2: *By the end of 2006 DPI&F to develop fishery specific objectives, performance indicators and precautionary performance measures for target, byproduct, bycatch, protected species and impacts on the ecosystem. Data collection programs appropriate to monitor the performance measures to be implemented.*

DEH suggests that along with the development of fishery specific objectives, linked to performance indicators and performance measures, DPI&F need, to develop a defined process to respond to a breach of a performance measure eg: there will be a review of the breach, including consultation; a report to the Minister within 3 months of the breach, including reasons for the breach and recommendations for remedial action; and that the report is made public. Concern with the lack of a clearly defined process once a performance measure is breached was also raised during public comment.

Recommendation 3: *DPI&F to monitor the status of the fishery in relation to the performance measures once developed. Within 3 months of becoming aware that a performance measure has not been met, DPI&F to finalise a clear timetable for the implementation of appropriate management responses.*

Management of the GOCDFTF is based on a mixture of input and output controls including limited entry, TAC (with an allocation to each permit of a maximum of 500 t for full time operators and 250 t for part time operators), possession limits, catch and area restrictions and gear restrictions (detailed in Table 2). As mentioned previously there is also a performance measure for bycatch, which will be discussed in more detail in Part 2.

DPI&F may make an Emergency Fisheries Declaration⁸ effecting an emergency closed season, closed waters declaration or regulated fish declaration. Such a declaration may be made only if DPI&F is satisfied that urgent action is needed to meet a significant threat to fisheries resources or a fish habitat or another emergency. DPI&F must publish the declaration but is not required to enter into consultation about the declaration. The declaration expires within 2 months of its gazettal unless earlier repealed. Where the declaration is inconsistent with a Regulation or Management Plan unless earlier repealed, the declaration expires 21 days after gazettal. There have been no emergency fisheries declarations for the GOCDFTF.

DEH considers that the combination of input and output management controls are capable of controlling the level of harvest in the fishery in the short to mid term while sustainable yield estimates for the target species are refined and performance measures developed and monitored for byproduct species (see **Recommendation 2**).

Table 2: Input and Output controls in the Gulf of Carpentaria Developmental Finfish Trawl Fishery

Control	Description
Limited Entry	Limited to Five permits (currently 3 active) which are issued and reviewed annually.
Catch limits	TAC of 1500 t of target species (crimson and saddletail snappers and red and other emperors) with an allocation to each permit of a maximum of 500 t for full time operators and 250 t for part time operators. Target species must not be taken above the TAC.
In possession limits for some byproduct species	(a) 20 black jewfish (<i>Protonibea diacanthus</i>); (b) 20 queenfish (<i>Scomberoides spp.</i>); (c) 20 king salmon (<i>Polydactylus sheridani</i>); (d) 20 blue salmon (<i>Eleutheronema tetradactylum</i>); (e) 20 grey mackerel (<i>Scomberomorus semifasiatus</i>); (f) 20 Spanish mackerel (<i>Scomberomorus commerson</i>); and (g) 20 squid (<i>Photololigo spp</i>)
Catch restrictions	May only take finfish of all species of the Class Osteichthyes and the Class Chondrichthyes other than barramundi, sharks, tuna and tuna-like fish (namely yellowfin tuna, southern bluefin tuna, bigeye tuna, longtail tuna, albacore tuna, northern bluefin tuna and skipjack tuna), all pomfrets (Family Bramidae) and all billfish.
Area restrictions	Fishery limited to an area in the North east of the GOC
Gear restrictions	Finfish trawl net meeting specifications which define an 'environmentally friendly net' (see DPI&F submission for details)
Size Limits	Size limits established under the <i>Fisheries Regulation 1995</i> apply

DPI&F Queensland Boating and Fisheries Patrol (QBFP) officers stationed at Karumba, Weipa and Thursday Island are responsible for ensuring compliance with fishery legislation in the GOCDFTF. There are six officers in total covering over 1000 kilometres of coastal foreshores enclosing around 25 major river systems. Queensland officers liaise and coordinate with NT Fisheries Officers when cross-border incidents occur.

⁸ s.46 of the *Fisheries Act 1994 (Qld)*

All GOC fisheries are regularly checked for fisheries regulations compliance including the monitoring of logbooks, permits, possession limits on permitted species regulated by number, size and volume. The QBFP provides a compliance report detailing breaches of the Fisheries Act and prosecutions reported by fishing sector within the fishery for the period leading up to each GulfMAC meeting. Enforcement priorities in the GOCDFTF are discussed by GulfMAC members as appropriate and forwarded to the QBFP representative for consideration in future operations. GOCDFTF permit conditions also include:

- monitoring of fishing operations by an electronic VMS
- notification of landings to a nominated fisheries officer at least two hours prior to such landing occurring
- details of any product transfers at sea from the permitted vessel, if any, must be notified and approved by the QFJA prior to the event happening.

DPI&F advises that there have been very few incidents of non-compliance with the QFJA permit conditions or the Fisheries Regulations⁹.

DPI&F considers that as the GOCDFTF is a small, limited entry fishery with only a single port for offloading, current compliance levels are adequate for enforcing the critical aspects of management for the fishery, namely gear and quota breaches. DEH concurs with this assessment at current levels of fishing.

Management arrangements and strategies are reviewed by DPI&F through GulfMAC. Statewide summaries of annual statistics of Queensland's major finfish fishery resources are released publicly as fishery status reports (eg. Queensland's fisheries resources: Current condition and recent trends 1988–2000 (Williams 2002)), published on the web at: www.dpi.qld.gov.au/fishweb/. Annual catch statistics, licensing information and updates on fishery and habitat management changes are also available on the DPI&F Fishweb site.

The QFJA produces an annual report for the previous financial year that documents the condition of the fishery in terms of harvest levels of the principle and other species, number of licences and permits to operate granted by the authority, the financial arrangements for the QFJA and any legislation amendments that have occurred during the reporting period. These are publicly available through the DPI&F bookshop.

DEH notes that while the Condition and Trend Reports and the QFJA annual report provide valuable information about the status of fish resources under Queensland management, public reporting of performance on a fishery-by-fishery basis would be beneficial. It is also unclear if the existing reporting framework for the Condition and Trend reports is intended to be ongoing. DEH suggests that for each fishery, DPI&F publicly report against each fishery performance measure, once developed, on an annual basis.

Recommendation 4: *From 2005, DPI&F to report publicly on the status of the fishery on an annual basis, including explicitly reporting against each performance measure, once developed.*

Fishery-dependent data relating to the target species is collected on a regular basis in the fishery. Some fishery independent information has historically also been collected. Discussion of the information collection system can be found in Part Two of this report.

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

⁹ R. Russell, QBFP, Weipa pers.comm. 2003 cited in DPI&F submission.

DEH considers 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.

No regional or international management regimes, to which Australia is a party, are of direct relevance to the fishery. The prime international regime affecting the fishery is the United Nations Convention on the Law of the Sea (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.

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

Conclusion

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

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

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

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

Data collection systems in use in the GOCDFTF include the Commercial Fisheries Information System (CFISH) Daily Fisher Logbook Program, the Recreational Fishing Information System (RFISH) Recreational Fishing Surveys and Fishing Diaries and fishery research projects undertaken across northern Australia.

Fishery Dependant Data

The CFISH database, along with a comprehensive compulsory daily logbook program for Queensland’s commercial fisheries, was established in 1988. The operators in the GOCDFTF use the NT Daily Logbook Sheet as it is also appropriate for the Queensland fishery. Logbook entries, recorded daily and reported monthly, report numbers of fish as well as weight (estimated whole weight), increasing the value of the catch data. DPI&F advises that although presently the GOCDFTF has no requirement to report on Species of Conservation Interest (SOCI) this provision will be implemented in 2005.

A permit condition for the GOCDFTF requires the holder to support an observer program, logbook program and VMS and share in the costs of these programs. The inclusion of onboard fisheries observers enables monitoring of information such as catch, bycatch and fate of discards. DPI&F has a target that at least 10% of the total fishing time is to be monitored through the observer program during the fishing year. Only one observer trip has been undertaken (in 2003) despite the fishery being in operation since June 1998. DPI&F advises that due to the very low participation rate and effort levels in the fishery between 1999 and 2002, the observer program was considered by the QFJA an unnecessary and an unfair impost on the operator and consequently suspended the observer program in January 1999. The observer program recommenced in 2003 when fishing became more economically feasible and fishing levels increased.

DEH is concerned that there is no commitment to an ongoing structured monitoring and validation system for information on catch, bycatch, and protected species interactions temporally and spatially. DEH supports an observer coverage design that is distributed across the span of the fishery such that it can detect seasonal events. DEH supports the development and implementation of an alternative mechanism for data collection if observer trips are no longer feasible or are insufficient to provide robust information on the fishery.

Recommendation 5: *DPI&F to maintain data validation mechanisms for target, byproduct, bycatch and protected species interactions and implement alternative data collection validation techniques if observer trips are no longer feasible or are insufficient to provide robust information on the fishery.*

Information provided by commercial fishers is validated through the observer program, as well as through checks in place to monitor data provision compliance and data irregularities. Quarterly compliance runs on the CFISH database allow checks to be made on lodgment of logbook returns by fishers. Comprehensive range checks are conducted of the data prior to CFISH data analysis to detect logbook entry anomalies. Anomalous data that cannot be adequately verified from original logbook records or the fisher are omitted from the analyzed dataset. DPI&F advises that assessment of processor/trader returns in association with the November 2003 observer trip resulted in no outstanding data/logbook/processor records discrepancies. Given that the management of the fishery is based almost solely on fisheries dependant data, DEH considers that data validation should be an important consideration in management.

DPI&F advises that enforcement officers from the QBFP assist the verification process by follow-up investigation of abnormal catch and logbook entries when they undertake fishing vessel inspections during surveillance patrols and by direct contact with license holders if required. Vessel position is monitored regularly through a compulsory satellite VMS.

DEH notes that logbook information is inherently reliant on the goodwill and honesty of the operator but acknowledges that operators in the GOCDFTF are committed, through the Gulf of Carpentaria Commercial Fishermen's Association (GOCCFA) Code of Conduct, to ensure compliance with GOC fisheries regulations including providing logbook information.

Charter operators are required under their permits to return logbook information containing the number of passengers and anglers, the total number of fish kept and fish discarded and the total weight of fish harvested. These data are entered into the CFISH database.

DEH believes that commercial data reliability for target species is reasonable and that compliance and enforcement activities have the capacity to ensure the ongoing reliability of data in the fishery.

Some information on the take from the Indigenous and recreational sector for the general North Queensland region has been gathered through the Queensland RFISH surveys and the National Recreational and Indigenous Fishing Survey (NRIFS), however, very little data specifically relates to recreational fishing in the Gulf region and has limited applicability to the GOCDFTF. DPI&F advises that the Indigenous and recreational harvest of target, by-product and bycatch species taken the GOCDFTF is likely to be negligible.

DEH has concerns that recreational fishing in the GOC is increasing with no commensurate increase in data collection or analysis. There is no firm understanding of the nature and degree of impact on fish stocks. With no accurate knowledge on the level of take it is not possible to factor Indigenous and recreational impacts into overall stock assessment. Therefore, it is necessary to establish a process to improve estimates of the take by both sectors.

Recommendation 6: *Within 18 months, DPI&F to develop a process to improve estimates of recreational and Indigenous take and factor these into stock assessments and management controls to ensure overall catch levels are sustainable.*

DEH has concerns regarding the combining of Red Snapper species, Goldband Snapper species and cod species in reporting for stock assessment purposes and the risk that some species in these groupings may be more vulnerable or susceptible to fishing pressure. DEH is satisfied that an Ecological Risk Assessment (ERA) is to be undertaken of target species by 2006 and encourages DPI&F to investigate the species in these groupings in order to establish greater confidence that there no individual species are more vulnerable or susceptible to fishing and may require additional management responses. Management responses could include a species-specific logbook reporting requirement coupled with education of fishers on species identification.

DEH has concerns with the various naming systems used for species in the fishery. DPI&F advises that they are seeking greater consistency in the future through adoption of the Australian Fish Names List. DEH strongly supports this approach.

Fishery Independent Data

Several fisheries research studies have been conducted in the Australian sector of the Arafura Sea and have provided a large quantity of fishery independent data on the target populations of snapper including the status of the stocks, spatial structure and indices of abundance (Ramm 1997). DPI&F advises that as the Arafura Sea or Basin extends into the northern section of the GOC the results of these studies represent the best available information relevant to GOCDFTF fish stocks.

Research on juvenile Red Snapper habitats and genetic composition has also been undertaken by the Australian Centre for International Agricultural Research (ACIAR) project 97/165 (Anon 2001 and Anon 2003). This study aimed to identify nursery habitats and determine if there are specific Red Snapper habitats. Habitats for juvenile *L. erythropterus* were found in two sites near Darwin between depths of 4 – 7 m with bottom types of coral rubble, rock, sponges or gorgonians. DEH strongly encourages further research, and appropriate management responses, on the location of spawning and nursery grounds for juvenile Red Snappers.

A partnership between the NT Fisheries Group, WA Fisheries, DPI&F and CSIRO has undertaken a series of projects to determine the distribution of Red and Goldband Snapper stocks in northern Australia and southern Indonesian waters using mitochondrial DNA and otolith microchemistry analysis. Work undertaken on parasite populations of red snappers is adding further clarification to the degree of overlap of these stocks (Anon 2003). Results suggest that there is unlikely to be significant movement of Red and Goldband Snapper between Australia and Indonesia (Ovenden *et al.* 2002 and Anon 2003). DEH strongly encourages continued work on the extent of fish movements within the fishery.

DPI&F advises that a list of research priorities was developed at the 6 May 2004 GulfMAC meeting.

DEH considers that the fishery dependent information system is generally reliable and appropriate to the scale of the fishery. There is currently no commitment to ongoing fishery independent monitoring in the GOCDFTF. Ongoing monitoring to collect fishery independent data is required to provide better relative abundance estimates and develop more reliable indicators and performance measures across the fishery. DEH acknowledges that fishery independent data collection is cost prohibitive at this stage and recommends that DPI&F continue to seek alternative cost effective methods and report on progress through the annual status report. DEH strongly encourages the timely implementation of any cost effective independent monitoring techniques identified that meet the need of management. Close cooperation will be required with NT Fisheries on shared stock research.

Recommendation 7: *DPI&F to continue to seek out alternative cost effective fishery independent monitoring techniques, particularly for target species, and report outcomes in the annual status report from 2005.*

Assessment

Assessment of the target species in the GOCDFTF is undertaken using a range of techniques including a basic assessment undertaken routinely which reviews catch rate and effort data from fisher logbooks. DPI&F advises that the compulsory commercial fishery logbook data provide the

key source of fishery dependent catch/effort data for the GOCDFTF and currently forms the primary basis for fishery assessment. There is currently no formal stock assessment process for target stocks in the GOCDFTF. DPI&F advises that more detailed stock assessments are planned for the principal target species once stock boundary issues are resolved and adequate time series data are available. DEH has recommended the development of fishery specific objectives, performance indicators and measures to monitor and assess the fishery status (see **Recommendation 2**) as well as reporting against these annually (see **Recommendation 4**).

Fisheries researchers from WA, Queensland and NT meet annually at the NAFMF. The workshops facilitate discussion of fisheries that target fish species straddling State/Territory boundaries.

The status of the GOC Red Snapper stocks was assessed in 1994 when estimates of annual sustainable yields were developed as part of an Australia-Indonesia Northern Fisheries Workshop. The estimated sustainable yield for Red Snapper in the GOC was between 2900 and 9000 t (McLoughlin *et al.* 1995). This estimate has been factored into target species catch level assessments for the GOCDFTF with the Total Allowable Catch for the fishery set at 1500 t of red snappers and emperors, which, taking into account the recent NT finfish trawl catch levels in the NT section of the GOC, is well below the lower estimate of a sustainable harvest level of 2900 t. DEH has concerns that the yield estimate has not been revisited since the 1994 assessment.

The Queensland Developmental fishing policy states that a Fisheries Assessment Group (FAG) is to be formed to undertake assessments of the status of stocks and impacts of the ecosystem by the developmental fishery. The FAG is to be comprised of DPI&F, AFMA and CSIRO. DPI&F advises that the FAG has not met since the initial setting of the quota however it is expected to be reformed in early 2005 and will then meet on an as-needs basis. DEH strongly encourages the reforming of the FAG.

Only 118 t of Red Snappers were harvested by operators in the GOCDFTF in 2003. This figure when combined with CFISH data from all other GOC Queensland commercial fishing sectors totals a maximum catch of around 136 t in 2003 which is less than 7% of the annual minimum sustainable yields suggested for the combined species of Red Snappers for the GOC. DEH considers that DPI&F are managing the overall take of the TAC managed species in the fishery in a precautionary manner given the lack of recent detailed stock assessments.

DPI&F advises that the Indigenous and recreational harvest of target, by-product and bycatch species taken the GOCDFTF is likely to be negligible. DPI&F argues that the GOCDFTF TAC limits are conservative and fall far below the maximum sustainable yield for red snapper and emperors stocks in the GOC and that catches by the recreational and Indigenous sector are unlikely to increase the total annual catch significantly. DPI&F advises that any new estimates of catch from these two sectors will also be included in the ERA of commercially caught fish species in the GOC to be completed by the end of 2006. Additionally, DPI&F advises that it will incorporate data from these two sectors with CFISH data to facilitate a comprehensive GOC stock assessment for major species. No timeframe has been provided for this process.

Commercial tour operators removed an estimated 5 t of fish from emperor, mangrove jack and red snapper stocks in the GOCDFTF area in 2002. They release annually, on average, between 20% (Saddletail snapper) and 85% (Crimson snapper) of these species caught during charter operations. DEH would encourage the timely implementation of management responses resulting from current research into survivability of release fish.

The Queensland and Northern Territory finfish trawl fisheries adjoin each other and the single operator in the NT fishery also operates in the Queensland fishery. Information gathered on northern Australian stocks of Red Snapper (particularly that which refers to the Arafura Sea or

Basin) presented in Sly (2003) is the best available fishery independent data of relevance to the GOCDFTF stocks. DEH has concern that there is no specific information for the distribution and spatial structure of target stocks in the GOC.

The distribution of tropical snapper was initially investigated by plotting catch data collected from Taiwanese trawl logbooks during the 1970s and 1980s (Ramm 1994). This information was further refined in 1990 and again in 1992 from independent trawl surveys in the Timor and Arafura seas by the NT Fisheries Division and 1990 and 1991 trawl surveys by the CSIRO in the GOC. These surveys in the Australian sector of the Timor and Arafura seas and GOC allowed species distributions and densities to be identified spatially (Ramm 1997). Logbook and trawl survey data provided the information to determine the spatial distribution and stock densities of tropical snappers in the finfish trawl fishery. This information has provided the means to determine the current management arrangements, including the existing boundaries of the fishery.

Demersal and pelagic stocks fished in the GOCDFTF are likely to be shared with Northern Territory and Commonwealth licensed fishers. Within the GOC, the QFJA under the Queensland Fisheries Act and the Fisheries Regulation jointly manages these species with the Northern Territory and the Commonwealth governments. DPI&F advise that the degree of sharing of fish stocks in terms of catch and genetic overlap with Northern Territory commercial, recreational and Indigenous fisheries is largely species dependent and at this point in time, poorly understood.

The main uncertainty in the fishery concerns the degree to which snapper stocks are shared with Indonesia. The spatial distribution of genetic stocks of red snapper and goldband snapper species is presently being investigated as outlined previously. DEH strongly encourages continued work on the extent of fish movements within the fishery.

DPI&F advises that given the uncertainties in stock sharing, the joint fisheries management arrangements in place for the GOCDFTF will continue to conservatively manage Red and Goldband Snappers as a single shared stock across northern Australia. DEH supports this interim precautionary management response and considers that DPI&F is working cooperatively with adjacent jurisdictions to determine the spatial structure of the key species in the GOCDFTF. DEH strongly encourages continued cooperation on complementary management and research of shared stocks.

Recommendation 8: *DPI&F to continue to cooperate with other relevant jurisdictions to pursue complementary management and research of shared stocks for all target and byproduct species that may be affected by cross-jurisdictional issues.*

Potential removals from species targeted by the GOCDFTF include direct harvest by this fishery, recreational and indigenous harvest, direct harvest and mortality from damage caused by line, trawl and net fishing operations and discarding of the species in this fishery.

Compulsory commercial fishing catch and effort data, including weight/numbers of target species and landed byproduct species, and Charter catch information have been continuously collected through the compulsory CFISH logbook program since 1998.

There is currently limited information on indigenous and recreational catch of species taken in the GOCDFTF.

A single observer trip in the GOCDFTF in 2003 recorded 28.5% of fish bycatch by weight. DPI&F advises that further information by fisheries onboard observers will need to be collected to more confidently estimate the percentage of discards in the GOCDFTF seasonally and spatially. Discard

levels are currently not factored into target species catch levels. DEH considers that bycatch data are important for stock assessment purposes and to measure the overall impact the fishery may be having on not only the target species, but also other components of the marine environment.

Prawn trawling in the Commonwealth NPF discards a large percentage of an estimated annual incidental catch of 50, 000 t of fish species (Caton 2003), some of which are important to the GOCDFTF. Caton (2003) considers that bycatch reduction devices, now mandatory in the NPF, as well as in possession limits, should reduce the take and bycatch markedly.

Management response

Tropical snappers (Family Lutjanidae - currently over 75% of the catch) are particular vulnerable to fishing pressure due to their biological characteristics of early growth to maximum size, long life, relatively large size at sexual maturity, sex changing reproductive strategy and low natural mortality. Consequently, DEH supports a cautious approach to harvesting these fish to ensure ecologically sustainable management of these resources.

The current GOCDFTF management regime aims to maintain ecologically viable stock levels through a range of input and output controls including limited entry, a TAC on key target species and gear restrictions (as outlined in Table 2). DEH considers that the combination of input and output controls should ensure adequate protection of the target stocks, but notes that this is contingent upon the TAC being set at a sustainable level.

DPI&F have committed to undertake an ERA for target, byproduct and bycatch species caught in Queensland Commercial fisheries operating in the GOC by 2006. There is however no commitment to implementation of appropriate management responses in a timely manner.

Recommendation 9: *DPI&F to implement appropriate management measures for species identified through the risk assessment as being at high risk within 12 months of completion of the risk assessment.*

As outlined previously, there is a combined TAC of 1500 t for crimson and saddletail snapper and red and other emperors, beyond which fish cannot be taken. DEH has recommended that DPI&F complement this management response with a performance measure to detect a decline in catches as well as a performance measure for byproduct species (see **Recommendation 2**). DEH has also recommended that a clear process be developed for when a performance measure is breached (see **Recommendation 3**). As outlined previously DPI&F can also declare emergency changes to management if required under an emergency fisheries declaration.

DEH considers that the current input and output controls in combination with the development of fishery specific objectives, indicators and precautionary performance measures should ensure adequate protection of the target stock while sustainable yield estimates are refined.

Information is collected for byproduct species through the compulsory commercial logbook system. DPI&F recognises that there is currently limited information about the biology, ecology and stock status of the majority of byproduct fish species in the GOCDFTF.

DPI&F comments that the assessments of the dynamics, status and future directions for management and resources assessment of commercially important species across northern Australia are discussed at the annual Northern Australia Fisheries Management Workshop. Anecdotal information is also being provided to DPI&F managers through regular meetings of GulfMAC where research priorities and concerns are discussed.

No estimates of available biomass exist for the byproduct species in the GOCDFTF.

DPI&F advises that due to low catch and effort levels before 2002 the limited knowledge of Mangrove Jack stocks has only been of minor concern to the overall sustainability of the species. However, the recent increases in catch levels in the GOCDFTF suggest that a risk assessment for the continued take of Mangrove Jack should be undertaken. DPI&F advises that this will be undertaken as part of a risk assessment of all commercial byproduct species scheduled to be completed by 2006. DEH strongly suggests that DPI&F develop a precautionary species specific performance indicator and measure for Mangrove Jack in the interim.

DPI&F argues that byproduct species are covered by the range of cautious management strategies for the GOCDFTF including; size and total catch limits of the major byproduct species for recreational fishers and size and catch limits for some of the other by-product species; restriction on the number of commercial permits (5); a TAC (1500 t) for key target species; and gear restrictions.

Although DPI&F contends that the current low level of byproduct species harvested by the small number of operators ensures that the threat to byproduct stock sustainability is minimal there are no measures to ensure that this catch remains low. DEH has concerns that there is currently no limit on the take of byproduct species and no specific performance measures that trigger management actions. DEH has recommended the development of fishery specific objectives, performance indicators and measures for byproduct in the GOCDFTF (see **Recommendation 2**). DPI&F has committed to undertake a risk assessment for byproduct species caught in Queensland commercial fisheries operating in the GOC in 2006. DEH encourages the timely implementation of any resultant management actions required from the risk assessment (see **Recommendation 9**).

Conclusion

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

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

Promote recovery to ecologically viable stock levels

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

This objective is not applicable at present as catch levels in the GOCDFTF are below the estimated sustainable harvest levels of the target stocks of Red Snappers in the GOC. Input and output controls are in place to avoid the risk of overfishing. DEH has also suggested the development of fishery specific objectives performance indicators and measures to effectively monitor stock status for target and byproduct species (see **Recommendation 2**). DPI&F can also use the Emergency Fisheries Declaration if urgent management action is required.

Conclusion

DEH considers that the species targeted in the GOCDFTF are not currently overfished but should that occur in the future, the fishery is conducted such that there is a high degree of probability the stock would recover to ecologically viable stock levels within nominated timeframes.

Ecosystem impacts

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

Bycatch protection

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

Information requirements

A permit condition requires recording of bycatch levels by operators in the GOCDFTF however the DPI&F submission provides no information on the level of information collected.

A condition of each operator's permit is that they make provisions for the carrying of an onboard fisheries observer. Only one observer trip has been undertaken (in 2003) despite the fishery being in operation since June 1998. As discussed previously DPI&F advises that due to the very low participation rate and effort levels in the fishery between 1999 and 2002, the observer program was suspended in January 1999 and recommenced in 2003 when fishing became more economically feasible and fishing levels increased. DPI&F has a target that at least 10% of the total fishing time is to be monitored through the observer program during the fishing year. DEH notes that an action of the BAP requires the collection and assessment of bycatch data with the view to producing a scientifically validated data set for future risk to stock assessments.

Information on the catch of shark species is sought from fishers, particularly in light of concerns about the sustainability of sharks characterised by low fecundity and high vulnerability to fishing effort. Operators in the GOCDFTF cannot retain sharks, rays and sawfish. DPI&F advises that they are developing a simple shark key so that fishers can provide better species identification of any interactions they have with protected/listed endangered shark species. The key will aid in obtaining accurate data and fulfilling Queensland's responsibilities under the National Plan of Action for the Conservation and Management of Sharks (NPOA-Shark). DEH strongly encourages the timely implementation of the key.

DEH is concerned that there is no commitment to an ongoing structured information collection system for bycatch composition and abundance, temporally and spatially, and has recommended the development of an ongoing program to collect such data (See **Recommendation 5**).

Assessment

Onboard monitoring data from the one observer trip for the GOCDFTF in 2003 indicated that bycatch species comprised 38% of the total catch by weight and was mainly unmarketable finfish (29%) and benthos (9%). Fish species that dominated the observed fish bycatch by number, were trevallies and jacks (42.3%), threadfin breams (9.1%), snappers (8.1%), triggerfishes (5.1%), grunter breams (4.8%), and emperors and breams (4.5%). A significant portion of the bycatch appears to be undersized individuals of regulated species. The benthos mostly comprised massive stalked cup-shaped disc sponge, massive vase shaped sponges (mainly *Xestospongia* spp.), sea whips (*Junceella* spp.) and Gorgonians (sea fans).

Observers in the NTFTF found bycatch levels of less than 20% of the total catch by numbers (Errity 2003), the majority of these species (by weight) comprised of sharks and rays that are released alive. DPI&F notes that it is difficult to make comparisons between the two fisheries as bycatch levels are calculated using two different measures – weight and numbers. Trawl fisheries bycatch is usually calculated as a proportion of catch weight. DEH strongly encourages DPI&F to coordinate with NT Fisheries to standardize bycatch information collection in these two fisheries.

DPI&F considers that the level of bycatch in the GOCDFTF is low by trawl fishery standards although only one quantitative observer study has been done to fully substantiate this. Although considering bycatch in the GOCDFTF to be low, DPI&F is undertaking a risk assessment including all available fishery information, to be completed by 2006, that covers all bycatch species caught in GOC commercial fisheries.

Management response

A BAP is being developed by stakeholders and DPI&F as a strategic plan to manage bycatch in all of the Queensland managed GOC fisheries. DPI&F advises that the BAP is to be implemented by 2006. DEH notes that while the BAP is Queensland Government policy and has no legislative powers, actions in the BAP can be implemented through fisheries permit conditions. DPI&F advises that the implementation and effectiveness of the BAP will be reviewed against performance indicators on a regular basis.

DPI&F comments that generally the limited level of effort, environmentally friendly fishing gear and species targeting practices limit the take of species other than Red Snappers. GOCDFTF fishing methods includes the use of a trawl design that allows the net to skim sufficiently above the sea floor to avoid the smaller marine fauna and the majority of sponges and other bottom benthos. The net also includes adequate mesh size to allow the escape of the smaller species including juveniles of the target species. With these designs, bottom contact of the trawl has been reduced by as much as 95% (Mounsey and Ramm 1991).

One of the vessels is fitted with a hopper which has a guard arranged in a grid pattern (30/30cm) through which target species fall through to a conveyer belt to be sorted. Most stingrays and sharks cannot pass through the hopper guard which is located at the stern of the vessel enabling their immediate release. No sharks, rays or sawfish are legally able to retained by the operator. The hopper is then filled with sea water from a deck hose before the conveyer belt passes the catch to a sorting area. The discarded fish, the majority of which are still alive, are sorted from the commercial catch and returned down a chute of running water to the ocean. Vessels without a hopper are likely to experience higher bycatch mortality rates and probably poorer quality product for sale than vessels with a hopper installed. One of the vessels is leased, and the operator does not consider the economic investment of installing a hopper appropriate for a fishery that is still developmental. DPI&F advises that should the GOCDFTF become a developed fishery, then the QFJA would make the use of a hopper a mandatory condition of entry for all vessels in the fishery. DEH strongly supports this proposal and the development of further mechanisms to reduce the capture of bycatch and maximise the survival of bycatch.

DEH supports the ongoing research and refinement of bycatch mitigation measures in the GOCDFTF through the development of hoppers and environmentally friendly trawl gear and the need for work to continue to pursue bycatch reduction. In addition, the survival of bycatch species that are released from hoppers is still largely uncertain in most, if not all, trawl fisheries in Australia. DEH acknowledges that current technology and competing priorities limit the extent to which fisheries managers can assess these reductions in a single fishery. This is a significant issue in a number of fisheries in Australia and is an area that DEH considers should be a priority for research in the future.

Recommendation 10: *DPI&F to continue to pursue reduction in the amount of bycatch, including protected species, taken in the GOCDFTF through the refinement of management measures and to investigate methods for further increasing the survivability of bycatch species. Any suitable methods identified to be implemented in a timely manner.*

DPI&F advises that the level of bycatch will be deemed to be significant if it “consistently exceeds” 50% of the landed catch by weight of retained species as defined on the permits. DEH considers that this does not provide a clear performance measure to trigger management action and recommends that DPI&F review the appropriateness of this measure. There is also no performance measure to detect a reduction in bycatch. Concern with the level of this performance measure was also raised during public comment.

Recommendation 11: *DPI&F to review the appropriateness of the current bycatch performance measure within 1 year.*

DPI&F advises that a risk analysis, completed for shark species caught as NPF trawl bycatch (Stobutzki *et al.* 2001) is being modified to be applicable to the commercial finfish trawl, recreational and Indigenous sectors in the GOC.

DPI&F advises that as present bycatch levels are low to negligible, an indicator group of bycatch species has not been identified for the GOCDFTF. The risk assessment of bycatch species, to be undertaken by 2006, may identify appropriate indicator species to monitor.

Conclusion

Given the current level of fishing activity DEH considers that 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

A draft turtle and Marine Mammal Records Sheet has been circulated for use by fishers in the GOC fisheries. The record sheet clearly states that it is a legal requirement to report the capture of turtles or marine mammals to the relevant Commonwealth or State agency and outlines the procedures and information required by DEH should fishers accidentally capture turtles or marine mammals/protected species in trawl fishing gear.

Information on protected species interaction will also be collected through the observer surveys.

DPI&F advise that a SOCI reporting logbook, proposed for distribution to fishers in the GOCDFTF by 2005, will enable further detailed assessments of the type and level of interactions that the fishery has with endangered, protected and threatened species.

Data on protected species interactions in this fishery are currently not very robust. DEH recognises that the introduction of the SOCI logbook should address this gap, but notes that one of the biggest barriers to successful commercial reporting of protected species interactions is the capacity of the fishers to identify the species involved. Both of these barriers can be reduced through tailored education programs and opportunistic advice from observers and researchers as appropriate.

Recommendation 12: *To support the implementation of the SOCI logbook DPI&F to develop and implement an education program for fishers to promote the importance of protected species protection and accurate incident reporting within one year.*

There are currently no threatened ecological communities listed under the EPBC Act 1999 within the area of operation for the GOCDFTF.

Assessment

DPI&F advise that encounters with threatened species in the GOCDFTF are rare. The single observer report and advice from the operators indicate that sea turtles, sawfish and sea snakes are caught on rare occasions before being released alive almost immediately. Stobutzki et al (2001) suggests that sawfishes and some ray species should be a high priority for research and management as they are least likely to be able to sustain capture as bycatch in trawl fisheries. DPI&F is collaborating in research with NT and WA Fisheries and CSIRO to better understand the distribution, abundance and life history characteristics of these species and develop appropriate management responses to ensure impacts from fishing on high-risk species are minimised.

DPI&F consider that given the low level of recorded interaction with protected species the risk of a significant impact by the GOCDFTF on these populations is considered minimal. DEH concurs with this conclusion based on the limited data available on protected species interactions. DEH considers that with increased data collection through implementation of the SOCI logbook and validation through the observer program DPI&F will be able to tailor appropriate management responses to reduce interactions if any risks are identified.

DPI&F advises that a formal risk assessment to determine the vulnerability of bycatch species including threatened or protected species in the GOCDFTF will be completed before the end of 2006. DEH suggests that this risk assessment for protected species should particularly focus on impacts of the fishery on sea turtles, sawfish and sea snakes.

Management response

DPI&F advise that the BAP, covering the GOCDFTF, developed in consultation with the industry and other stakeholders, contains specific objectives and performance indicators aimed at reducing identified impacts on endangered, threatened or protected species.

Measures to manage the impact of the trawl fishery on protected species include the development of a code of conduct for resuscitation of marine turtles, which is included in the GOCCFA Code of Conduct. Handling turtles in accordance with this Code of Conduct will ensure the survival of released turtles is maximised. Currently, all new commercial fishers are required to complete an Endangered Species Awareness Course that aids fishers in the identification, handling and release of protected species. DPI&F advises that the current operator in the fishery is investigating the use of Turtle Excluder Devices (TEDs) to minimise the capture of turtles. Despite the current low

reported interactions with turtles in the fishery DEH strongly encourages the continual refinement of management measures and methods to reduce bycatch particularly of protected species (see **Recommendation 10**).

In response to growing national and international concern over the sustainable management of the takes of sawfishes the Karumba branch of the Queensland Seafood Industry Association (QSIA) has developed a 'Handling and Release Procedures Document for Sawfishes' in collaboration with DPI&F. DEH commends this proactive approach by industry. The document was incorporated into the GOCCFA Code of Conduct, and fishers are participating in a tag and release program steered by DPI&F and endorsed by DEH, World Wide Fund for Nature, SUNFISH and ECOFISH.

DPI&F considers that the management arrangements including limited entry, the TAC for key target species and gear restrictions minimise the risk of capture and/or mortality to endangered, threatened or protected species.

Conclusion

DEH notes that according to available data there are minimal interactions with protected species in this fishery and considers that the fishery is conducted in a manner that avoids mortality of, or injuries to, endangered, threatened or protected species and avoids or minimises impacts on threatened ecological communities. Should this situation change, or the risk assessment process indicate otherwise, DEH is confident that DPI&F would undertake appropriate actions 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

DPI&F argues that no specific studies have been implemented to determine the impacts of the GOCDFTF on the ecosystem and environment generally because the apparatus used in this fishery is considered relatively benign to the environment. An appropriate level of information is collected on levels of catch and effort of target and byproduct species, fishing method, and bycatch. This information provides the basis for understanding the impact on the ecosystem and the environment, generally.

DEH is concerned at the lack of information collection and research covering the fishery's impact on the ecosystem and environment generally. However, DEH understands that this lack of information is the case across a range of Australian and International fisheries and until appropriate research techniques and programs are developed and implemented this will continue to be the case. DEH strongly supports research in this area.

There are no threatened ecological communities (current, past or proposed) that are affected by the GOCDFTF.

Assessment

While demersal trawling has the potential to resuspend sediments into the water column, it is likely that the impacts of this trawl fishery would be insignificant compared to that resulting from the frequent storms and cyclones and the significant tidal movement in this shallow environment.

The majority of the GOCDFTF fishing grounds are between 40 and 70 m and consists mostly of flat hard substrate dominated by sessile invertebrates (Ramm 1986). The semi-demersal trawl nets used in the fishery are designed to skim sufficiently above the sea floor (fly) to avoid the smaller marine fauna and the sponges and other bottom benthos and have adequate mesh size to allow escapement of the smaller species including juvenile target species. With this design, bottom contact has been reduced by as much as 95% (Mounsey and Ramm 1991). The effect of the semi-demersal trawl on benthic communities, such as those present on the GOCDFTF fishing grounds, is yet to be fully assessed.

DPI&F advise that there are only limited areas of offshore coral reefs with the majority found in the northern GOC and around Wellesley Islands.

There have been no studies on ecologically related, associated or dependent species at present due to the size of the fishery and small number of operators.

The effect of removing higher level predators in a tropical continental shelf fish community is not well understood and research specifically targeted at this issue has not yet been undertaken. DEH understands that this situation is not unique to this fishery and that the amount of information available on these aspects in any of the world's fisheries is scant.

Water quality is unlikely to be affected by the fishery due to the low number of participants, the unlikely concentration of potential impact sources, and the vast area of GOC fishery operations.

Management response

Because of enhancements to traditional finfish trawl gear to limit benthic interaction, the limited number of operators and offshore location, this fishery it is not considered to have a significant impact on the environment.

No evidence has emerged that the GOCDFTF impacts significantly on benthic or pelagic communities in the fishery area. This area is also subject to trawl effort from the Commonwealth managed Northern Prawn Fishery. DPI&F advises that if a threat to the benthic ecosystem was identified, either by DPI&F or from other sources of information made available to the DPI&F, an appropriate management response is capable of being developed through the QFJA in consultation and cooperation with AFMA. DEH have recommended the development of a fishery specific objective, indicator and measure relating to ecosystem impacts (see **Recommendation 2**).

The National Oceans Office is currently leading a regional marine planning process covering waters and adjacent coastal areas from the eastern Arafura Sea, through the GOC to the Torres Strait including the area of the GOCDFTF. The planning process aims to ensure the ecologically sustainable use of the resources in the planning area and will help to integrate management across jurisdictions and sectors. It will also identify potential candidate areas for the National Representative System of Marine Protected Areas (NRSMPA). The regional marine planning process is a potential vehicle for pursuing sustainable fisheries objectives, particularly where cross sectoral or cross jurisdictional approaches are required. DPI&F should continue to engage in the process as far as practical. More information is available at www.oceans.gov.au.

Conclusion

DEH considers that the fishery is conducted in a sufficiently precautionary manner to minimise the impact of fishing operations on the ecosystem generally. Recommendations have been developed to ensure that the risk of significant impact by the fishery on the marine environment generally is minimised in the longer term.

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Table 3: List of Acronyms

ACIAR	Australian Centre for International Agricultural Research
AFFS	Agency of Food and Fibre Sciences
AFMA	Australian Fisheries Management Authority
AFZ	Australian Fishing Zone
AGDEH	Australian Government Department of Environment and Heritage
BAP	Bycatch Action Plan
CFISH	Commercial Fisheries Information System
CPUE	Catch Per Unit Effort
CSIRO	Commonwealth Scientific and Industrial Research Organisation
CYPLUS	Cape York Peninsula Land Use Strategy
DAFF	Department of Agriculture, Fisheries and Forestry
DBIRD	NT Department of Business, Industry & Resource Development
DEH	Department of the Environment and Heritage
DPI&F	Department of Primary Industries and Fisheries
EPA	Queensland Environment Protection Agency
EPBC Act	Environment Protection and Biodiversity Conservation Act
ERA	Ecological Risk Assessment
FAG	Fisheries Assessment Group
FHA	Fish Habitat Area
FRDC	Fisheries Research and Development Corporation
GOC	Gulf of Carpentaria
GOCCFA	Gulf of Carpentaria Commercial Fishermen's Association
GOCDFTF	Gulf of Carpentaria Developmental Finfish Trawl Fishery
GulfMAC	Gulf of Carpentaria Management Advisory Committee
MOU	Memorandum of Understanding
NAFMF	Northern Australian Fisheries Management Forum
NHT	Natural Heritage Trust
NPF	Northern Prawn Fishery
NPOA-Shark	National Plan of Action for the Conservation and Management of Sharks
NRIFS	National Recreational and Indigenous Fishing Survey
NRSMPA	National Representative System of Marine Protected Areas
NT	Northern Territory
NTFTF	Northern Territory Finfish Trawl Fishery
OCS	Offshore Constitutional Settlement
QBFP	Queensland Boating and Fisheries Patrol
QFJA	Queensland Fisheries Joint Authority
QFMA	Queensland Fisheries Management Authority
QLD	Queensland
QSIA	Queensland Seafood Industry Association
RFISH	Recreational Fishery Information System
SOCI	Species of Conservation Interest
TAC	Total Allowable Catch
TED	Turtle Excluder Devices
TRAP	Tropical Resource Assessment Program
UNCLOS	United Nations Convention on the Law of the Sea
VMS	Vessel Monitoring System
WTO	Wildlife Trade Operation