Ecological Risk Assessment of the Other Species component of the Coral Reef Fin Fish Fishery

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1 Introduction

In 2005, the Queensland Department of Primary Industries and Fisheries (DPI&F) compiled an Ecological Assessment Report for the Coral Reef Fin Fish Fishery (CRFFF). The report was submitted to the Australian Government Department of the Environment and Water Resources (DEW)[1] for assessment against the 'Guidelines for the Ecologically Sustainable Management of Fisheries', developed under the *Environment Protection and Biodiversity Conservation Act 1999*. In November 2005, DEW accredited the CRFFF as an approved Wildlife Trade Operation (WTO) allowing export of native species harvested in the fishery.

Continued export approval in the CRFFF is contingent upon the fishery meeting a number of recommendations that DEW applied as part of its accreditation. These recommendations cover a range of issues relevant to the sustainable management of the fishery, including sustainable harvest levels, bycatch, ecological impacts, compliance, research, monitoring and assessment.

This document addresses the specific recommendation for DPI&F **"*to undertake a risk assessment to identify other coral reef fin fish most at risk from the fishery*."** Other coral reef fin fish species (OS) include all species defined as coral reef fin fish in the *Fisheries Regulation 1995* (Appendix 1), other than coral trout (*Plectropomus* and *Variola* spp.) and red-throat emperor (*Lethrinus miniatus*).

Given the requirement to address DEW's recommendations, and the Queensland Government's commitment to manage fisheries sustainably, DPI&F facilitated a two-day stakeholder meeting in January 2007 to conduct an assessment to identify the ecological risks to OS in the CRFFF. This document rationalises and provides recommendations on the risk ratings determined through the workshop and further stakeholder consultation.

The results of this risk assessment will feed into future assessments and reviews of the fishery as recommended by DEW. The relevant recommendations are highlighted in Appendix 2.

2 Methods

The 'Ecological Risk Assessment for Effects of Fishing (ERAEF)[2] Level One model (developed by the CSIRO and case-study tested on a range of AFMA-managed Commonwealth fisheries) provides a framework for assessing risks to the target, bycatch and byproduct species, threatened, endangered and protected species, and habitats and ecosystems impacted upon by a fishery. This model was selected as an appropriate methodology to assess risks to OS in the CRFFF. It is widely acknowledged that target, byproduct and bycatch species are not exclusive of one another in the CRFFF. For the sake of this assessment, OS are referred to as secondary target species. This assessment does not refer to the major target species of the CRFFF (i.e. coral trout and red throat emperor).

The ERAEF model uses a step-wise process involving the development of three 'Scoping Documents' to build the final 'Scale, Intensity and Consequence Analysis (SICA)' table which details the risk assessment rating for each issue.

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[1] Formerly the Department of the Environmnent and Heritage (DEH)

[2] AJ Hobday, A Smith, H Webb, R Daley, S Wayte, C Bulman, J Dowdney, A Williams, M Sporcic, J Dambacher, M Fuller and T Walker, *Ecological Risk Assessment for the Effects of Fishing: Methodology*, Report RO4/1072 for the Australian Fisheries Management Authority, Canberra, 2006.

The initial phase of the risk assessment was the production and consideration by participants of scoping documents. These documents outlined the characteristics and trends of the CRFFF fishery, focusing on the OS component. A document entitled "Scoping document 1: General Fishery Characteristics" (Appendix 3) gave readers a brief synopsis of the fishery. Scoping documents 2 and 3 provided details of the hazards to be assessed through the process and the selection of sub-components (species characteristics) to which risk ratings were to be applied.

For the second phase of the risk assessment the DPI&F facilitated a two-day stakeholder meeting (23rd - 24th January 2007) to conduct an assessment of the identified risks to OS that currently or potentially result from the range of activities that occur in the CRFFF.

The main goals of the workshop were to:

1. Identify ecological risks for each of the key species groups in the fishery.
2. Agree on ecological risk ratings for these issues.
3. Draft SICA tables for further development and consideration by ReefMAC

Attendees of the stakeholder workshop included:

Brigid Kerrigan (DPI&F – Fishery Manager)
Tara Smith (DPI&F – Fishery Management Officer; workshop facilitator)
Shannon Ryan (DPI&F – Assessment & Monitoring; workshop co-facilitator)
Rob McDonald (DPI&F – Boating & Fisheries Patrol)
Chad Lunow (DPI&F – Long Term Monitoring Program)
Wayne Sumpton (DPI&F – Research)
Ashley Williams (JCU – Research)
Rob Williams (Professional CRFFF fisher - deepwater)
Richard & Lyn Hack (Professional CRFFF fishers – GBR)
Lance Murray (Sunfish – recreational fishing representative)
Martin Russell (GBRMPA – Fisheries Issues Team)

The workshop was structured so that the initial component was used to familiarise attendees with the EREAF process, the characteristics of the fishery, and fishery catch data. Following on from the familiarisation component, the group assigned risk ratings for a specified set of hazards on each of the four main taxonomic families taken in the OS category. For each hazard, the group was asked the following questions, with the answer to be provided as a scaled numerical value for some and as a qualitative response for others:

(i) Is the hazard present or absent in the fishery for the family being assessed?
(ii) What is the spatial scale of the hazard?
(iii) What is the temporal scale of the hazard?
(iv) What species, group of species or life history stage is most at risk from the hazard (i.e. what is the indicator)?
(v) What biological/ecological sub-component is most at risk from the hazard?
(vi) What is the likelihood of being able to detect an impact to the sub-component as a result of the hazard (i.e. what is the intensity)?
(vii) What is the consequence of the hazard to the sub-component?

Taxonomic groups assessed:

Family Lethrinidae (emperors)
Family Serranidae (cods and groupers)
Family Lutjanidae (tropical snappers and sea perches)
Family Labridae (wrasses and tuskfish)

Sub-components to select from:
Population size
Geographical range
Genetic structure
Age/size/sex structure
Reproductive capacity
Behaviour/movement

Hazards:
The potentially hazardous activities are listed in the first column of each table in the section of this report entitled “Risk ratings”.

Scores:
Appendix 4 provides details of the scoring system used to assign consequence ratings in relation to each sub-component.

3 Risk ratings

Each of the key fish families in the OS component taken by the fishery was assigned risk ratings for each of the potential hazards identified in the ERAEF model. Ratings were assigned based on interactions with OS species. It is widely acknowledged that target, byproduct and bycatch species are not exclusive of one another in the CRFFF and therefore the mainly opportunistic nature of OS catches was considered as targeted fishing.

‘Incidental behaviour’, for the purpose of this assessment, is defined as interactions with OS species during a CRFFF fishing trip when commercial fishing activities are not occurring (e.g. in the crew’s downtime). The aspect of bycatch appears in the risk ratings where stakeholders selected an indicator species or group of species because of its level of discarding and associated vulnerability. For example, while bommie cod (*Cephalopholis cyanostigma*) of legal size (over 35cm) may be retained, the majority of the catch of this species is undersized and consequently discarded as bycatch.

Consequence score of 1 = Negligible risk; 2 = Minor; 3=Moderate; 4=Major; 5=Severe; 6=Intolerable.

Consequence scores of 3 or higher require a management response regarding the mitigation of the identified risk.

Readers should note that scoring of consequences was conducted in a precautionary manner based on knowledge or expert opinion about the most vulnerable species and elements of each family. Ratings of 3 or greater are not necessarily indicative of the risk to the entire family and are not to be used to make broad generalisations about the status of individual species stocks.

3.1 Family Lethrinidae (emperors)

Table 3.1.1: Risk ratings for the family Lethrinidae

Direct impact of fishing	Fishing Activity	Indicator (unit of analysis)	Sub-component	Intensity Score (1-6)	Consequence score (1-6)
Capture	Bait collection	Small lethrinids (i.e. young fish and/or small-growing species)	Age/size/sex structure	1	1
	Fishing	Spangled emperor	Population size	3	2
		Spangled emperor	Age/size/sex structure	3	2
	Incidental behaviour	N/A	N/A	0	0
Direct impact without capture	Bait collection	N/A	N/A	0	0
	Fishing	Spangled emperor	Population size	1	1
	Incidental behaviour	N/A	N/A	0	0
	Gear loss	No indicator	Population size	1	1
	Anchoring/ mooring	N/A	N/A	0	0
	Navigation/ steaming	N/A	N/A	0	0
Addition/ Movement of Biological Material	Translocation of species	N/A	N/A	0	0
	On Board processing	Spangled emperor	Behaviour / movement	3	1
	Discarding catch	No indicator	Behaviour / movement	1	1
	Stock enhancement	N/A	N/A	0	0
	Provisioning	N/A	N/A	0	0
	Organic waste disposal	No indicator	Behaviour / movement	1	1
Addition of Non-Biological Material	Debris	No indicator	Behaviour / movement	1	1
	Chemical pollution	N/A	N/A	0	0
	Exhaust	N/A	N/A	0	0
	Gear loss	N/A	N/A	0	0
	Navigation/ steaming	No indicator	Behaviour / movement	1	1
	Activity/ presence on water	Emperors	Behaviour / movement	1	1
Disturb Physical Processes	Bait collection	N/A	N/A	0	0
	Fishing	N/A	N/A	0	0
	Boat launching	Juveniles of most lethrinids	Behaviour / movement	1	1
	Anchoring/ mooring	N/A	N/A	0	0
	Navigation/ steaming	N/A	N/A	0	0
External Hazards	Other capture fishery method	Abundant species in trawling areas (e.g. pink-eared emperor); juveniles	Population size	2	2
	Aquaculture/ Mariculture	Juvenile / nearshore fish	Behaviour/ movement if short-lasted, geographic range or population size if impact ongoing	1	1
	Coastal development	Juveniles/ nearshore fish	Geographic range	2	2
	Other extractive activities	N/A	N/A	0	0
	Other non-extractive activities	N/A	N/A	0	0
	Other human activities	Emperors	Behaviour / movement	2	2

The family Lethrinidae did not receive any consequence scores of 3 or above, which suggests that all activities in the CRFFF pose a negligible or minor risk to OS emperor species.

Fishery catch and effort data suggests that spangled emperor (*Lethrinus nebulosus*) and pink-eared emperor (*L. lentjan*) are the prominent OS emperor species in CRFFF catches. However, the majority of emperor catch has historically been recorded as either "emperor" or "sweetlip" (as per industry's common names for the group). This does not allow the DPI&F to identify particular species of importance. In response to this problem, the DPI&F has consulted with stakeholders and confirmed that the dominant emperor species in OS catches is spangled emperor and all other species are landed in small quantities. The line fishery logbook is currently being amended to separate the key species from each group for better reporting resolution. All minor species can either be recorded as "other emperors", "other cods", etc., or specified by the fisher in a blank row.

3.2 Family Serranidae (cods and groupers)

Table 3.2.1: Risk ratings for the family Serranidae

Direct impact of fishing	Fishing Activity	Indicator (unit of analysis)	Sub- component	Intensity Score (1-6)	Consequence score (1-6)
Capture	Bait collection	Small cods: Bommie, specklefin	Population size	2	2
	Fishing	Large cods: Greasy, Flowery, Camouflage	Population size	3	4
		Bommie, specklefin	Population size	4	3
		Key L8 cods (eight bar grouper, bar rockcod, comet grouper)	Population size	3	3
	Incidental behaviour	N/A	N/A	0	0
Direct impact without capture	Bait collection	N/A	N/A	0	0
	Fishing (breaking off from gear)	Large cods: Greasy, Flowery, Camouflage	Population size	1	1
		Bommie, specklefin	Population size	2	1
		Key L8 cods (eight bar grouper, bar rockcod, comet grouper)	Population size	1	1
	Incidental behaviour	N/A	N/A	0	0
	Gear loss	No indicator	Population size	1	1
	Anchoring/ mooring	N/A	N/A	0	0
	Navigation/ steaming	N/A	N/A	0	0
Additional/ Movement of Biological Material	Translocation of species	N/A	N/A	0	0
	On Board processing	Grouper/ Morgan's cod	Behaviour / movement	3	2
	Discarding catch	No indicator	Population size	1	
	Stock enhancement	N/A	N/A	0	0
	Provisioning	N/A	N/A	0	0
	Organic waste disposal	Grouper/ Morgan's cod	Behaviour / movement	1	1
Addition of Non-Biological Material	Debris	No indicator	Behaviour/movement	1	2
	Chemical pollution	N/A	N/A	0	0
	Exhaust	N/A	N/A	0	0
	Gear loss	N/A	N/A	0	0
	Navigation/ steaming	No indicator	Behaviour / movement	1	1
	Activity/ presence on water	No indicator	Behaviour / movement	2	1

Disturb Physical Processes	Bait collection	N/A	N/A	0	0
	Fishing	N/A	N/A	0	0
	Boat launching	Inshore species and/or juveniles that occupy inshore waters	Behaviour/movement	1	1
	Anchoring/ mooring	N/A	N/A	0	0
	Navigation/ steaming	N/A	N/A	0	0
External Hazards	Other capture fishery method	GBR cods	Population	1	1
	Aquaculture/ Mariculture	Species taken as broodstock	Behaviour/ movement if short-lasted, geographic range or population size if effects ongoing	1	1
	Coastal development	Inshore cods or juveniles that occupy inshore waters	Geographic range	2	2
	Other extractive activities	N/A	N/A	0	0
	Other non-extractive activities	N/A	N/A	0	0
	Other human activities	Flowery	Behaviour / movement	2	2

A major consequence score (4) was determined for the impacts of fishing (with capture) on the large cod and grouper species taken in the fishery.

Fishing for large cods and groupers occurs throughout fishery area (i.e. ~1000n mile) and throughout the year (apart from the 3 nine day closures per year). Stakeholders determined that fishing at current levels with current management arrangements is most likely to influence population size due to the removal of reproductively important large fish. There was some argument as to whether factors such as reproductive capacity were useful in this exercise, given that the end result would generally be an effect to population size, which is considered to be more serious. The general direction from this point on was to select population size as the most vulnerable sub-component if there was likely to be an impact (immediate or eventual) on the population size, whether or not it was preceded by impacts on reproductive capacity.

Minimum size limits effectively reduce targeting of smaller individuals and maximum size limits for some species protect reproductively important male fish such as serranids targeted in the fishery which exhibit protogynous traits , however the post release survival of some large discarded fish is poor. Cods with a maximum size limit (greasy rockcod (*Epinephelus tauvina*), camouflage rockcod (*E. polyphekadion*) and flowery cod (*E. fuscoguttatus*)) were chosen as indicator species due to this discard vulnerability, their long life-cycles, low abundance/density and their target status in the fishery, relative to other cod species.

Due to their low densities, targeted fishing may have severe detectable effects at a local scale but only moderate at a broader scale. Heavy fishing in certain areas (which is possible but not likely to be occurring) could have a severe reduction effect and reduce the local populations' capacity to increase. However local extinction is not likely to occur because a portion of the population will always be preserved through size limits, targeting of legal sized fish, handling techniques that reduce post-release survival, and also spatial closures in the GBR. Stakeholders acknowledged that risk ratings could be higher if non-compliance with rules was taken into consideration.

A moderate consequence score (3) was determined for the impacts of fishing (with capture) on the small cod species taken in the fishery.

Stakeholders selected bommie cod (*Cephalopholis cyanostigma*) and speckled-fin rockcod *(Epinephelus ongus*) as indicator species for this sub-group due to the anecdotal evidence that they are caught in large quantities on an ongoing basis and are largely discarded because of their small size relative to the general minimum size limit for cods (35cm). Because they are mainly discarded, these catches do not show up in logbook returns.

Post release survival of the bommie (blue-spotted) cod and speckled-fin rockcod may be low due to barotraumas, lengthy or rough handling and the increased risk of predation on fish in a weakened condition. They are also a long-lived species and particularly susceptible to fishing pressure. Population size is the most likely of the sub-components to be impacted by fishing capture. Stakeholders determined that fishing at current levels (as indicated by logbooks and anecdotal information) may represent full exploitation but without damage to long term recruitment, which is protected to some extent by the extensive network of Marine Park closures in the fishery area.

Stakeholders suggested that research and/or monitoring would be useful in determining the impacts of discarding of small cods in the CRFFF and that education on release techniques could assist in minimising those impacts.

A moderate consequence score (3) was determined for the impacts of fishing (with capture) on key cod species taken in the deepwater multiple hook (L8) fishery.

Fishing for deepwater cods (e.g. eight bar grouper (*E. octofasciatus*), bar rockcod (*E. ergastularius*), comet grouper (*E. morrhua*)) in the L8 fishery occurs at a spatial scale of 500-1000n mile, for <100 days of the year. The L8 fishery is a limited entry fishery that operates under RQ quota (mostly OS). Mortality of fish is high upon capture from depth.

Although mainly large fish are targeted, the activity of fishing (with capture) is likely to affect population size to a greater extent than age/size/sex structure. Severe effects on population size may be detectable at a local scale due to localised fishing on particular sites/bommies, as fishable ground is limited in the fishery area. Stakeholders expressed concern for possible population declines of key L8 cods in key areas.

3.3 *Family Lutjanidae (tropical snappers and sea perches)*

Table 3.3.1: Risk ratings for the family Lutjanidae

Direct impact of fishing	Fishing Activity	Indicator (unit of analysis)	Sub- component	Intensity Score (1-6)	Consequence score (1-6)
Capture	Bait collection	Stripey, hussar, moses perch	Population size	1	2
	Fishing	Nannygai, red emperor	Population size	3	4
		Jobfish (taken in L8 fishery)	Population size	3	3
		Stripey, hussar, moses perch	Population size	3	2
	Incidental behaviour	N/A	N/A	0	0
Direct impact without	Bait collection	N/A	N/A	0	0
	Fishing (breaking off	Red emperor & nannygai	Population size	1	1

capture	from gear)				
	Incidental behaviour	N/A	N/A	0	0
	Gear loss	Jobfish (taken in L8 fishery)	Population size	1	1
	Anchoring/ mooring	N/A	N/A	0	0
	Navigation/ steaming	N/A	N/A	0	0
Additional/ Movement of Biological Material	Translocation of species	N/A	N/A	0	0
	On Board processing	No indicator	Behaviour / movement	1	1
	Discarding catch	Predatory species	Behaviour / movement	1	1
	Stock enhancement	N/A	N/A	0	0
	Provisioning	N/A	N/A	0	0
	Organic waste disposal	N/A	N/A	0	0
Addition of Non-Biological Material	Debris	Nannygai, red emperor	Behaviour / movement	3	3
		Jobfish (taken in L8 fishery)	Behaviour / movement	1	2
	Chemical pollution	N/A	N/A	0	0
	Exhaust	N/A	N/A	0	0
	Gear loss	N/A	N/A	0	0
	Navigation/ steaming	No indicator	Behaviour / movement	1	1
	Activity/ presence on water	No indicator	Behaviour / movement	1	1
Disturb Physical Processes	Bait collection	N/A	N/A	0	0
	Fishing	N/A	N/A	0	0
	Boat launching	Inshore lutjanids (including juveniles)	Behaviour / movement	1	1
	Anchoring/ mooring	N/A	N/A	0	0
	Navigation/ steaming	N/A	N/A	0	0
External Hazards	Other capture fishery method	Red emperor, nannygai	Population size	2	2
		Jobfish (taken in L8 fishery)	Population size	1	1
	Aquaculture/ Mariculture	Moses perch, stripey, juvenile red emperor	Behaviour/ movement if short-lasted, geographic range or population size if effects ongoing	1	1
	Coastal development	Moses perch, stripey, juvenile red emperor	Geographic range	1	1
	Other extractive activities	N/A	N/A	0	0
	Other non-extractive activities	N/A	N/A	0	0
	Other human activities	No indicator	Behaviour / movement	1	1

A major consequence score (4) was determined for the impacts of fishing (with capture) on large lutjanids in the GBR region.

Lutjanids are fished daily, throughout the fishery area. Large “reds” (i.e. red emperor (*Lutjanus sebae*), small mouth nannygai (*L. erythropterus*), and large mouth nannygai (*L. malabaricus*)) were selected as indicators because logbook records indicate they are the most heavily targeted and retained species of lutjanid in the GBR component of the fishery. These “reds” are vulnerable to over fishing because of their slow growth. Nannygai

are known to be vulnerable to fish down effects, where large fish are removed from the population first followed by the smaller fish, creating a tendency for localised reductions.

Fishing (with capture) at current levels is considered to have a moderately detectable effect on population size at a broad spatial scale or severe at a local scale (on heavily fished shoals and reefs). Stakeholders determined that localised depletion is possible and recruitment states in certain areas may be affected (consequence = 4) but overall recruitment/dynamics of the entire population are unlikely to be disrupted due to the protection afforded to populations by the extensive network of fishing closures in place throughout the fishery area.

A moderate consequence score (3) was determined for the impacts of fishing (with capture) on lutjanids taken in the deepwater multiple hook (L8) fishery.

Stakeholders selected jobfish (*Etelis* spp., *Parapristipomoides* spp. *and Pristipomoides* spp.) as an indicator group of lutjanids taken in the L8 fishery, as they dominate the catch of that sector and are one of the key target groups in deep water line fishing operations. Industry stakeholders suggested that due to the large size of hooks used, only a small proportion (<1%) of jobfish landed in the L8 fishery are undersized, However, if fish are discarded for other reasons, post-release mortality is high due to the depth of fishing operations. Fishing occurs on a local scale (e.g. on a particular bommie) and fishers have indicated that it can become harder to find new fishable sites over time. This may indicate that exploitation of fishable areas is high.

Heavily fished (depleted) populations of jobfish have been identified to a moderate extent (intensity = 3) and some have been known to recover with long term dynamics not affected (consequence = 3). These ratings do not include trap fishing, as at the time of this assessment, there was limited information available on which to base assessments of the trap sector.

A moderate consequence score (3) was determined for the impacts of the existence of debris on the behaviour and movement of large lutjanids in the GBR region.

Stakeholders considered boat wrecks to be the main source of debris in the fishery as they introduce new (proxy) habitat for fish. The “reds” have been observed to be particularly susceptible to changes in their normal behaviour/movement as a result of the presence of wrecks. Whilst the impact of introduction of the proxy habitat is not considered to be particularly adverse to the fish, it is possible that the fish may not return to their normal movements/habitats for months after the debris is removed. Under the ERAEF scoring system, this impact represents a consequence score of 3 (moderate), however stakeholders determined that the effect is unlikely to put the fish at any increased risk than they would be under in their normal habitat. Stakeholders further speculated that as wrecks disintegrate the proxy habitat is reduced and there may be an effect analogous to natural habitat loss.

3.4 *Family Labridae (wrasses and tuskfish)*

Table 3.4.1: Risk ratings for the family Labridae

Direct impact of fishing	Fishing Activity	Indicator (unit of analysis)	Sub- component	Intensity Score (1-6)	Consequence score (1-6)
Capture	Bait collection	N/A	N/A	0	0
	Fishing	Venus tuskfish	Age/ size/ sex	3	3
	Incidental behaviour	N/A	N/A	0	0
Direct impact without capture	Bait collection	N/A	N/A	0	0
	Fishing (breaking off from gear)	Venus tuskfish	Age/ size/ sex	1	1
	Incidental behaviour	N/A	N/A	0	0
	Gear loss	No indicator	Population size	1	1
	Anchoring/ mooring	N/A	N/A	0	0
	Navigation/ steaming	N/A	N/A	0	0
Additional/ Movement of Biological Material	Translocation of species	N/A	N/A	0	0
	On Board processing	No indicator	Behaviour / movement	2	1
	Discarding catch	N/A	N/A	0	0
	Stock enhancement	N/A	N/A	0	0
	Provisioning	N/A	N/A	0	0
	Organic waste disposal	N/A	N/A	0	0
Addition of Non-Biological Material	Debris	N/A	N/A	0	0
	Chemical pollution	N/A	N/A	0	0
	Exhaust	N/A	N/A	0	0
	Gear loss	N/A	N/A	0	0
	Navigation/ steaming	No indicator	Behaviour / movement	1	1
	Activity/ presence on water	No indicator	Behaviour / movement	1	1
Disturb Physical Processes	Bait collection	N/A	N/A	0	0
	Fishing	N/A	N/A	0	0
	Boat launching	Inshore species/ life history stages	Behaviour / movement	1	1
	Anchoring/ mooring	N/A	N/A	0	0
	Navigation/ steaming	N/A	N/A	0	0
External Hazards	Other capture fishery method	Harlequin tuskfish	Age / size / sex structure	2	1
	Aquaculture/ Mariculture	Blackspot tuskfish	Behaviour/ movement if short-lasted, geographic range or population size if effects ongoing	1	1
	Coastal development	Blackspot tuskfish	Geographic range	1	1
	Other extractive activities	N/A	N/A	0	0
	Other non-extractive activities	N/A	N/A	0	0
	Other human activities	No indicator	Behaviour / movement	1	1

A moderate consequence score (3) was determined for the impacts of fishing (with capture) on tuskfish taken in the deepwater multiple hook (L8) fishery.

Commercial fishing for wrasses occurs throughout fishery area (>1000n mile) and year-round. Amateurs in some areas (e.g. the Capricorn Bunker group) also have high catches of wrasse. Stakeholders selected Venus tuskfish (*Choerodon venustus*) as an indicator species because both logbook records and industry claims indicate that this species forms the significant majority of commercial catch in the wrasse group. Large catches of Venus tuskfish are common even when they are not being targeted. Fishing mortality is exaggerated by the species' high discard mortality rates.

Tuskfish display gender conversion from female to male at large sizes. Larger fish are more heavily targeted and/or caught by fishers, therefore stakeholders considered that age/size/sex structure is the biological characteristic most at risk from fishing. Changes to sex/size structure have the potential to affect long-term population dynamics. Limited research has suggested that fish on heavily fished reefs may display gender conversion at a smaller size than unfished reefs. The limited research makes it difficult to assess the consistency and intensity of this effect, but at worst case scenario, severe effects may be detected locally and moderate effects broadly (intensity = 3). The consequence for heavily fished reefs was considered to represent full exploitation with long-term recruitment dynamics of the broader population unlikely to be adversely affected (consequence = 3). However, if heavy fishing was common across many reefs and research suggested consistent effects to the size/sex structure of sub-populations, the risk rating would likely increase.

4 Stakeholder consultation and recommendations

On 27 March 2007, the Reef Fisheries Scientific Advisory Group (ReefSAG) considered the outcomes (risk ratings and rationale) of the stakeholder risk assessment workshop. The ReefSAG identified a range of management, monitoring and educational mechanisms that could potentially be utilised to address the moderate to high risks and improve understanding of these risks. The following points outline those options:

- An educational program focused on enhancing survivability of discarded fish
- Closures for the protection of spawning aggregations/periods
- Greater species resolution with regards to catch limits (commercial and recreational)
- Size limits that reflect biological characteristics of species
- Greater species resolution in logbooks
- Obtaining better biological information for species taken in the L8 fishery
- More intensive catch monitoring through regular reviewing of logbook data and higher coverage by the Fisheries Observer Program

Specific advice from the SAG included the following:

- Increasing minimum size limits or reducing bag limits for tuskfish are not appropriate measures given the high discard mortality of the species.
- Species specific bag limits may be appropriate for red emperor and nannygai, given that they are key target species in both commercial and recreational sectors, however the risk of high-grading may negate such measures.
- Activities attracting moderate risk ratings are unlikely to warrant intervention other than an educational program on responsible releasing techniques for survival of

fish, greater species resolution in the fishery logbook and more intensive catch monitoring.
- A management response for the impact of debris on the behaviour/movement of lutjanids in the GBR is inappropriate and unlikely to reduce risks to the group.

The Reef Management Advisory Committee (ReefMAC) considered the advice of ReefSAG on 2-3 April 2007. ReefMAC recommended that an educational program on releasing techniques be pursued as an initial response to the identified risks. It also suggested that the options identified by ReefSAG may be appropriate should further monitoring and assessment suggest that the risks are being approached or realised.

ReefMAC further recommended that an upcoming review of spawning closures for the CRFFF includes red emperor and any other key OS species for which there is sufficient information on spawning and other biological factors.

5 Management actions to address risks

Over the next 12 months, the DPI&F will determine and implement appropriate actions and/or mechanisms to address the risks to OS as identified in this assessment. This will be undertaken in consideration of the stakeholder recommendations outlined in section 4 of this document. Results of the assessment have already assisted in informing the development of a new commercial logbook for the line fisheries to be implemented in July 2007. The majority of indicator species identified in the assessment are now specifically identified on logbooks to encourage reporting at a species level. Whilst it is acknowledged that species-level information cannot be obtained for the entire fishery, the new logbook will provide a much stronger platform for obtaining improved information on the key OS species taken in the fishery.

Appendix 1: List of Coral Reef Fin Fish species

Common name	Scientific name
cods and gropers	
areolate rockcod	*Epinephelus areolatus*
barramundi cod	*Cromileptes altivelis*
bar rockcod	*Epinephelus ergastularius*
blacksaddle rockcod	*Epinephelus howlandi*
black-tipped rockcod	*Epinephelus fasciatus*
blue-lined rockcod	*Cephalopholis formosa*
blue Maori	*Epinephelus cyanopodus*
blue-spotted rockcod	*Cephalopholis cyanostigma*
brown-barred rockcod	*Cephalopholis boenak*
camouflage rockcod	*Epinephelus polyphekadion*
chinaman rockcod	*Epinephelus rivulatus*
comet grouper	*Epinephelus morrhua*
coral cod	*Cephalopholis miniata*
coral rockcod	*Epinephelus corallicola*
dothead rockcod	*Cephalopholis microprion*
dwarf spotted rockcod (wire netting rockcod)	*Epinephelus merra*
eight bar grouper	*Epinephelus octofasciatus*
flagtail rockcod	*Cephalopholis urodeta*
flowery cod	*Epinephelus fuscoguttatus*
four-saddle rockcod	*Epinephelus spilotoceps*
greasy rockcod	*Epinephelus tauvina*
hapuku	*Polyprion americanus* and *P. oxygeneios*
hexagon rockcod	*Epinephelus hexagonatus*
leopard rockcod	*Cephalopholis leopardus*
longfin rockcod (honeycomb rockcod)	*Epinephelus quoyanus*
Maori cod	*Epinephelus undulatostriatus*
oblique-banded grouper	*Epinephelus radiatus*
peacock rockcod	*Cephalopholis argus*
potato cod	*Epinephelus tukula*
Queensland grouper	*Epinephelus lanceolatus*
redmouth rockcod	*Aethaloperca rogaa*
six bar rockcod	*Epinephelus sexfasciatus*
six spot rockcod	*Cephalopholis sexmaculata*
snubnose rockcod	*Epinephelus macrospilos*
speckled-fin rockcod	*Epinephelus ongus*
speckled grouper	*Epinephelus magniscuttis*
strawberry rockcod	*Cephalopholis spiloparaea*
thinspine rockcod	*Gracila albomarginata*
tomato rockcod	*Cephalopholis sonnerati*
trout cod	*Epinephelus maculatus*
white-lined rockcod	*Anyperodon leucogrammicus*
white-spotted rockcod	*Epinephelus caeruleopunctatus*
coral trout	
barred-cheek coral trout	*Plectropomus maculatus*
chinese footballer (blue spot trout)	*Plectropomus laevis*
coral trout (leopard trout)	*Plectropomus leopardus*
coronation trout	*Variola louti*
highfin coral trout	*Plectropomus oligacanthus*
lyretail trout	*Variola albimarginata*

squaretail coral trout (passionfruit trout)	*Plectropomus areolatus*
emperors	
big-eye bream	*Monotaxis grandoculis*
collared sea bream	*Gymnocranius audleyi*
gold-lined sea bream	*Gnathodentex aureolineatus*
Japanese sea bream	*Gymnocranius euanus*
lancer	*Lethrinus genivittatus*
long-nosed emperor	*Lethrinus olivaceus*
miscellaneous emperor, other than grass emperor (grass sweetlip)	*Lethrinus* spp., other than *Lethrinus laticaudis*
Mozambique large-eye bream	*Wattsia mosambica*
orange-striped emperor	*Lethrinus obsoletus*
pink-eared emperor	*Lethrinus lentjan*
red-eared emperor	*Lethrinus rubrioperculatus*
Robinson's sea bream	*Gymnocranius grandoculis*
spangled emperor	*Lethrinus nebulosus*
spotted sea bream	*Gymnocranius* sp.
sweetlip emperor (red-throat emperor)	*Lethrinus miniatus*
thumbprint emperor	*Lethrinus harak*
variegated emperor	*Lethrinus variegatus*
yellowlip emperor	*Lethrinus xanthochilus*
yellow-spotted emperor	*Lethrinus erythracanthus*
yellow-striped emperor	*Lethrinus ornatus*
yellow-tailed emperor	*Lethrinus atkinsoni*
fusiliers	
fusiliers	*Caesio* spp. / *Pterocaesio* spp.
parrotfishes	
bicolour parrotfish	*Cetoscarus bicolor*
bumphead parrotfish	*Bolbometopon muricatum*
miscellaneous parrotfish	*Calotomus* spp., *Chlorurus* spp., *Hipposcarus* spp., *Leptoscarus* spp. and *Scarus* spp.
surgeonfishes	
surgeonfishes	*Acanthurus* spp. and *Ctenochaetus* spp.
unicornfish	*Naso* spp. and *Prionurus* spp.
sweetlips	
miscellaneous sweetlips	*Plectorhinchus* spp.
painted sweetlips (slaty bream)	*Diagramma* spp.
tropical snappers and sea perches	
bigeye seaperch	*Lutjanus lutjanus*
black and white seaperch	*Macolor niger*
black-spot snapper	*Lutjanus fulviflamma*
bluestripe seaperch	*Lutjanus kasmira*
brownstripe seaperch (brown hussar)	*Lutjanus vitta*
chinamanfish	*Symphorus nematophorus*
crimson jobfish (rosy jobfish)	*Pristipomoides filamentosus*
crimson seaperch (small mouth nannygai)	*Lutjanus erythropterus*
dark-tailed seaperch	*Lutjanus lemniscatus*
five-lined seaperch	*Lutjanus quinquelineatus*

flame snapper	*Etelis coruscans*
goldband snapper	*Pristipomoides multidens* and *P. typus*
green jobfish	*Aprion virescens*
hussar (pink hussar)	*Lutjanus adetii*
lavender jobfish	*Pristipomoides sieboldii*
Maori seaperch	*Lutjanus rivulatus*
midnight seaperch	*Macolor macularis*
miscellaneous jobfishes	*Aphareus* spp., *Etelis* spp., *Parapristipomoides* spp., and *Pristipomoides* spp.
miscellaneous seaperches, other than mangrove jack and large scale seaperch (fingermark)	*Lutjanus* spp., other than *Lutjanus argentimaculatis* and *Lutjanus johni*, and *Paracaesio* spp.
moses perch	*Lutjanus russelli*
onespot seaperch	*Lutjanus monostigma*
paddletail	*Lutjanus gibbus*
red bass	*Lutjanus bohar*
red emperor	*Lutjanus sebae*
ruby snapper	*Etelis carbunculus*
saddletail seaperch (large mouth nannygai)	*Lutjanus malabaricus*
sailfin snapper	*Symphorichthys spilurus*
small-toothed jobfish	*Aphareus furca*
spanish flag (stripey)	*Lutjanus carponotatus*
yellow-margined seaperch	*Lutjanus fulvus*
wrasses	
anchor tuskfish	*Choerodon anchorago*
blackspot tuskfish	*Choerodon schoenleinii*
blue tuskfish	*Choerodon cyanodus*
grass tuskfish (purple tuskfish)	*Choerodon cephalotes*
hogfish	*Bodianus* spp.
humphead Maori wrasse	*Cheilinus undulatus*
redbreasted Maori wrasse	*Cheilinus fasciatus*
tripletail Maori wrasse	*Cheilinus trilobatus*
venus tuskfish	*Choerodon venustus*

Appendix 2: WTO conditions and recommendations

CONDITIONS ON THE APPROVED WILDLIFE TRADE OPERATION DECLARATION FOR THE CRFFF
Operation of the fishery will be carried out in accordance with the *Fisheries (Coral Reef Fin Fish) Management Plan 2003* in force under the *Queensland Fisheries Act 1994* and the *Queensland Fisheries Regulation 1995*.
DPI&F will inform the Department of the Environment and Heritage (DEH) of any intended amendments to the Coral Reef Finfish Fishery management regime that may affect the sustainability of the target species, or negatively impact on bycatch, protected species or the ecosystem.
Reports to be produced and presented to DEH annually, and to include: o information sufficient to allow assessment of the progress of DPI&F in implementing the recommendations made in the *Assessment of the Coral Reef Finfish Fishery*; o a description of the status of the fishery and catch and effort information; o a statement of the performance of the fishery against objectives, performance indicators and measures once developed; and o research undertaken or completed relevant to the fishery.

RECOMMENDATIONS ON THE APPROVED WILDLIFE TRADE OPERATION DECLARATION FOR THE CRFFF
DPI&F to inform DEH of any intended amendments to the management arrangements that may affect sustainability of the target species or negatively impact on bycatch, protected species or the ecosystem.
From 2006, DPI&F to report publicly on the status of the CRFF on an annual basis including explicitly reporting against each performance measure.
DPI&F to reassess the review events in the *Fisheries (Coral Reef Fin Fish) Management Plan 2003* to ensure their appropriateness, that they are quantitative where possible and they are consistent with the application of operational objectives for the fishery. By December 2006, DPI&F is to establish revised objectives, performance measures and indicators for bycatch, protected species and impacts on the ecosystem.
DPI&F to monitor the status of the fishery in relation to the review events and performance measures. Within three months of becoming aware that a review event has been triggered, DPI&F to finalise a clear timetable for the implementation of appropriate management responses.
DPI&F to complete a compliance risk assessment for the CRFF by mid 2006 and implement a risk-based compliance strategy by December 2006 taking into account risks associated with non-compliance with: o catch, possession, size and gear limits; o reporting of protected species interactions; o area and fishery closures; and o quota limits.
DPI&F to implement a program to validate logbook data by June 2006. DPI&F to ensure that the program enables collection of information on the composition of 'other coral reef fin fish' sufficient for DPI&F to monitor and respond to changes in the composition of this group.
By end 2006, DPI&F to develop a robust and regular fishery assessment process, that provides a basis for management decisions which are precautionary and recognise the uncertainty and level of risk. The assessment process will examine the ecological sustainability of the take of Coral trout (*Plectropomus leopardus*) and Red-throat emperor (*Lethrinus miniatus*) using robust stock assessments.
Within 18 months, DPI&F to undertake a risk assessment to identify 'other coral reef finfish' most at risk from the fishery. Actions seeking to reduce risk to be implemented as appropriate within a further 12 months.

DPI&F to develop a process to improve estimates of recreational take and factor this into stock assessments and management controls to ensure overall catch levels are sustainable.
DPI&F to reassess the appropriateness of the total allowable commercial catches for the main target species and 'other coral reef finfish', taking into account the outcomes of the stock and risk assessments for CRFF species by end 2007.
DPI&F to review current management arrangements and ensure that adequate protection is being given to spawning stocks of the main target species.
DPI&F to use the results of stock and risk assessments, and research projects, to review the need for specific bycatch management measures and introduce effective and appropriate methods to reduce bycatch, or increase survivability, as needed.
DPI&F to continue to work with industry and other management agencies to reduce the impact of the CRFF on the broader ecosystem, including impacts relating to anchoring.

Appendix 3: Scoping Document 1 - General Fishery Characteristics

General Fishery Characteristics	
Fishery name	Other Species (OS) component of the Coral Reef Fin Fish Fishery (CRFFF)
Species/ taxonomic groups	As many as 20 primary target species exist in the CRFFF (all components). Two of these are coral trout (CT) and red throat emperor (RTE), which are not included in this assessment. Another 80 or more species are regularly retained as byproduct/incidental catch. All CRFFF species other than CT and RTE are within the OS quota group. The OS fishery consists of mostly demersal species principally associated with shallow and deeper water coral reef and inter-reef habitats, belonging to the families: 1. Serranidae - cods, groupers and trout; 2. Lutjanidae - tropical snappers and sea perches; 3. Lethrinidae - emperors; 4. Labridae - wrasses; 5. Scaridae - parrot fish (negligible catch in fishery); 6. Acanthuridae - surgeon fish (negligible catch in fishery); 7. Haemulidae – sweetlips (minor catch in fishery); and, 8. Caesionidae - fusiliers (negligible catch in fishery). Species of particular importance in the fishery include: • Serranids – camouflage rockcod, flowery cod, Maori cod, bar rockcod, comet groper, goldspot (greasy) rockcod. • Lutjanids – red emperor, Spanish flag (stripey), hussar, crimson seaperch (small mouth nannygai), saddletail seaperch (large mouth nannygai), jobfish. • Lethrinids – spangled emperor; redspot (pink-eared) emperor. • Labrids – Venus tuskfish.
Sub-fisheries	OS is a sub-fishery of the CRFFF – symbol ‘RQ’. Sub-fisheries within the OS category are: • L2 and L3 symbols operate in the GBRMP; • L1, L6 and L7 operate south of 24 deg 30 min; • L8 symbol operates in deepwater (CT and red emperor cannot be retained in this sub-fishery).
Start date	The RQ symbol, including OS quota was introduced in December 2003. Quota allocated to RQ licences became active from 1 July 2004. In the early days of commercial fishing, a general line fishing ‘L’ endorsement allowed a line fisher to catch most fin fish species and to operate in most areas. However, a number of distinct line fisheries have developed as the target species diversified, the areas fished expanded, and the fishing gear and technology used increased.
Market	Domestic and international trade of filleted, whole, and gilled and gutted product. Most OS product is marketed domestically.

Geographic extent of fishery	• Under the *Fisheries Regulation 1995*, the fishery area essentially comprises Queensland tidal waters east of longitude 142º31'49" east; south of latitude 10º48' south • In terms of operation, the CRFFF (including CT and RTE) is focussed almost exclusively within the Great Barrier Reef (GBR), with over 95 percent of the total catch taken within the Great Barrier Reef Marine Park (GBRMP).
Fishing season	• The fishery operates year round, except for three x nine day spawning closures between October and December each year in waters between 10^{o}40' S and 24^{o}50' S. • *Fishery data will be presented at the meeting to illustrate seasonal patterns.*

Relationship with other fisheries	• The only fishery symbols other than RQ that can take coral reef fin fish are those for the Marine Aquarium Fish Fishery (MAFF; symbols A1 and A2), which supplies domestic and international markets with marine ornamental species. Like the CRFFF, the MAFF targets coral reef fin fish species and is primarily based within the GBRMP. However, because the MAFF supplies the ornamental fish industry, all fish are collected by hand and landed live.
	• Several other line fisheries that operate in the same general area as the CRFFF (OS component) include:
	  • CT and RTE, which together with OS make up the CRFFF;
	  • the East Coast Spanish Mackerel Fishery, which extends along the east coast and uses pelagic troll fishing methods to target Spanish mackerel;
	  • the Rocky Reef Fin Fish Fishery, which is located in southern Queensland waters and uses hook and line fishing methods to target a range of demersal fin fish species associated with rocky reef habitats;
	  • the Deepwater Fin Fish Fishery, which is located in deepwater habitats >200m and uses droplines and bottom-set trotlines to target a range of demersal species; and
	  • line fisheries which take fin fish other than coral reef fin fish.
	• The CRFFF (OS) overlaps spatially with a number of other fisheries targeting different species and using different methods of catch (e.g. trawl, net and harvest fisheries).
	• The majority of commercial fishers landing OS also target CT and RTE.

Fishing methods and gear	• The line fishing gear used in the CRFFF consists of fishing lines, hooks and weighted sinkers. • Commercial operators with an RQ(L8) symbol take OS by using drop lines (max 6 lines, each with max 50 hooks) or bottom set lines (max 3 lines, max 300 hooks in total at a time). • Apart from RQ(L8) fishers, the commercial sector operates predominantly with single baited hooks fished using a handline. A maximum of three lines and six hooks can legally be used. • The recreational sector, which includes recreational anglers on charter boats, uses a combination of handlines and rod and reel, and is more likely to use more hooks per line than the commercial sector. A maximum of three lines and six hooks can legally be used. • Recreational fishers are also able to use spear fishing equipment in certain areas (without the aid of SCUBA or Hookah).

Selectivity of fishing methods	Assessments of the potential and actual ecological impacts of a broad range of commercial fishing gears and methods (in 2003 and 2004) concluded that, compared to other methods, line fishing has a relatively low impact on endangered, threatened or protected (TEP) species, bycatch and on the environ mileent generally. The Australian Marine Conservation Society's (AMCS, 2004, p4) 'Fishing Gear in Focus' assessment found that rod-and-reel and handline fishing has a low potential impact on wildlife generally stating that "*handlining...is relatively benign in terms of bycatch and direct impacts on marine habitats*". Morgan and Chuenpagdee's (2003) findings for line fishing supported those of the AMCS. Using an expert-based survey, including input from fishers, managers, researchers and conservation groups, hook-and-line fishing was considered to have the (equally) least severe ecological impacts, rating 4 points out of a possible 100 in a relative severity of fishing gear classes matrix.
Ecological impacts of the fishery - target, bycatch/byproduct and TEP species; habitat; and community.	
Target Species issues	As many as 20 primary target species exist in the CRFFF (all components), with another 80 or more species regularly retained as byproduct. The top 20 target species account for approximately 95 percent of the total harvest. This figure includes CT and RTE, which are not being addressed in this assessment.
Byproduct and bycatch issues	Byproduct: • The target species in this fishery are often byproduct species in the CT and RTE components of the CRFFF. • CT and RTE can also be byproducts of the OS component if quota is held for those species but OS is being targeted on a particular fishing trip/event. Bycatch: • Bycatch in the CRFFF is composed, for the most part, of target species under the minimum legal size. • The dominant bycatch species for both live and dead fishing operations are: coral trout (*P. leopardus*), red-throat emperor (*Lethrinus miniatus*), grassy sweetlip (*L. laticaudis*), stripey seaperch (*Lutjanus carponotatus*) and hussar (*L. adetti*). Trevally species (Family Carangidae) and blacktip rockcod (*Epinephelus fasciatus*) are also common bycatch species for dead and live fishing operations respectively. • Bycatch species and target species are largely one and the same in the CRFFF. • Because of the basic fishing method employed in the line fishery, there are few avoidance strategies that may reduce the incidental catch of undersized or unwanted fish. Commercial fishers do have some capacity to target specific individual fish (i.e. through view buckets), however, recreational and charter anglers are less likely to be able to actively reduce the amount of undesirable or regulated fish they catch. For line fisheries, such as the CRFFF, 'risk to bycatch species' is therefore primarily an issue of the susceptability of the individual line-caught species to post release mortality (McLeay *et al.,* 2002), which is likely to vary between different species and with different fishing operations.
TEP issues	• SOCI (Species of Conservation Interest) log books have been issued to all CRFFF fishers (since 1 July 2004), with fishers required to report all interactions with listed SOCIs. • The Queensland Parks and Wildlife Service (QPWS) have compiled a Wildlife Stranding and Mortality Database for several species of conservation interest, including dugongs, cetaceans, pinnipeds and turtles.

	Monitoring of the species on the database occurs on an annual basis and QPWS publish summary reports periodically. DPI&F, with the assistance of ReefMAC consider the database information in addressing issues regarding interactions with ETP species in the CRFFF. • Small Great white sharks may be susceptible to being hooked or captured, however the likelihood of encounter is low and the likelihood of capture, even if a line fisher hooked one, is even lower. There are no known records of encounters of Great white sharks by CRFFF fishers. • Grey nurse sharks exhibit different spatial distributions and habitat requirements relative to coral reef fin fish species, suggesting there is only a minimal likelihood of interactions with CRFF fishers. • Line fishing activities were identified as having a minimal impact on marine turtles due to the relatively low rates of hooking turtles on line fishing gear and the short release time involved if a turtle is hooked. However, fishing line has been found in the gut of deceased marine turtles. The logical assumption was made that the ingestion of line was the cause of the mortality, meaning that around 2% of the reported total turtle mortalities in 2000 were attributable to ingesting fishing line. • As the preferred dugong habitat is considerably different from the fishing grounds sought by CRFFF fishers, the likelihood of impacts on dugongs is very low. • The likelihood of CRFFF fishers interacting with most species of cetaceans is rated as remote, with the exception of bottlenose dolphins (*Tursiops truncatus*), Indo-Pacific humpback dolphins (*Sousa chinensis*) and killer whales (*Orcinus orca*) with which the likelihood of interactions is rated as possible. • There is limited research into the interactions between line fishing and seabird populations in the GBRMP and the effects are not known. The dominant sea birds in the GBRMP are shearwaters, noddies, sooty terns and boobies. Because fishers are targeting demersal fish species and sink their baits quickly, it is unlikely that baits would be taken by sea birds.
Habitat issues	• There is consensus among fishers, researchers and managers in Queensland that general ecosystem impacts are minimal (ecological communities, food chains and the physical environment). • Two recent reviews of the collateral impacts of various fishing gears (Morgan and Chuenpagdee, 2003 and AMCS, 2004) have assessed hook and line fishing as among the least harmful of all fishing methods, with only minimal impacts to either benthic habitats or marine fauna. • The severity of gear impacts on the habitat depend on the type, width, weight and number of units used and the duration of contact. Gear towed across the bottom (such as trawls and dredges) causes linear disturbances that are more widespread and severe than impacts from hook and line gear which contacts the habitat only at discrete points. • Anchor damage from all vessels is unlikely to significantly affect the ecological integrity of the GBR on a broad regional scale, however localised impacts may arise in heavily used areas. Novel anchor designs are used in the commercial sector of the CRFFF to minimise damage to benthic habitats/communities. • Gear loss is not significant and unlikely to have significant impacts on habitats.
Community issues	• Catch of OS is unlikely to have a significant impact on ecosystem structure and function, given the small quantities taken of each species. • Large, predatory fish may be vulnerable to baited hooks. Knowledge of direct and indirect trophic effects on the structure of coral reef fish communities by the removal of predators is limited. Doherty and Wiliams (1988) findings suggest that although predation is important in regulating

	secondary production of coral reef fishes, the success of recruitment events is more likely to control population levels.
Current entitlements	412 fishing licences were endorsed with a RQ fishing symbol as of 1 July 2006, including 41 which were held in an inactive state by the DEH; OS entitlements can be traded between RQ holders. • L8 sub-fishery – 5 licences (also included in tallies below) endorsed to take coral reef fin fish • L2/L3 sub-fishery – 394 licences endorsed to take coral reef fin fish • L1 sub-fishery – 368 licences (352 of which are included in above figures) endorsed to take coral reef fin fish *These figures are subject to change due to symbol transferability introduced on 1 July 2006.*
Current effort by method	Effort levels are difficult to determine from logbooks due to the incidental nature of most OS catch in CRFFF.
Current catch by method	*These figures will be provided at the Workshop*
Recent catch trends	*These figures will be provided at the Workshop*
Current GVP (Aus $)	From 1999 to 2004, the value of the commercial CRFFF fluctuated between $35 million and $50 million gross value of product (GVP) per year. Economic productivity flows on to the charter sector, the tourism sector and fishing retailers.
Discarding	• Target species: Discarding of target species is primarily due to non-compliance with minimum size limits. Large fish may also be discarded due to storage capacity restrictions and absence of authorisation to fillet particular species. • By-product species: By-product species may be discarded due to the nature of the operation for the trip (i.e. live or dead catch), as most trips will attempt to maximise economic productivity by targeting species of a particular value. This may also be influenced by storage capacity on the vessel and/or possession of a permit to fillet the particular by-product species.
Management	
Management objectives: • **Input controls** • **Output controls** • **Technical measures**	The major management controls applying to the Fishery are: • Limited entry commercial fishery: all Queensland commercial fisheries are managed as limited entry fisheries. Under the limited entry arrangements, no new licences are being issued. To enter the commercial fishery an existing license endorsed with a RQ symbol must be acquired via transfer. • Control of the species that may be taken: Species that cannot be taken are the humphead Maori wrasse (*Cheilinus undulatus*), Queensland grouper (*Epinephelus lanceolatus*), potato cod (*Epinephelus tukula*) and barramundi cod (*Cromileptes altilevis*), Red bass (*Lutjanus bohar*), chinaman fish (*Symphorus nematophorus*) and paddletail (*Lutjanus gibbus*). • Minimum size limits: Conservative minimum legal size limits have been set

	for all CRFFF species, with specific limits for 49 species and a generic limit of 25cm for all others (excluding fusiliers); maximum size limits have been set for a camouflage rockcod, flowery cod, greasy rockcod, and Chinese footballer trout. • Bag limits: a possession limit of 20 fish in total (including CT and RTE) applies to all recreational fishers. Additional recreational bag limits apply to the following species groups: Cods & groupers – 5 Emperors (other than RTE) – 5 Parrotfishes, surgeonfishes, sweetlips – 5 Hussar (pink hussar) – 10 A combination of crimson jobfish (rosy jobfish) and lavender jobfish – 8 A combination of crimson seaperch (small mouth nannygai) and saddletail seaperch (large mouth nannygai) – 9 Any species of tropical snapper or sea perch, other than those listed above and regulated species – 5 A combination of anchor tuskfish, blackspot tuskfish, blue tuskfish, grass tuskfish (purple tuskfish) or venus tuskfish – 6 Any wrasse species other than those listed above and regulated species – 5 • Gear restrictions: a maximum of three lines and six hooks able to be used by both commercial and recreational fishers • Restriction on number and size of commercial vessels: Primary vessels must not be longer than 20m; tender vessels must not be longer than 7m. Unless they are fishing on the same reef in the L2 or L3 fishery area, a tender vessel must be no further than 5n mile from the primary vessel, however it must be no more than 800m from the primary vessel in the L8 fishery area. Limits on tender vessels are stated on each licence: o Up to 1 tender for an L3 symbol; o Up to 4 tenders for an L2 symbol; • Areas closed to fishing: Almost 33% of the GBRMP is closed through green zones under the Representative Areas Program, indirectly creating a network of fisheries closures in all bioregions. • Temporal closures: three x nine day annual spawning closures apply to all fishers in all east coast Queensland tidal waters between 10º41'south and 24º50'south • Total Allowable Catch for OS: 1011 tonnes • Restrictions on filleting: commercial fishers must hold a filleting permit to fillet OS. Each permit extends to a limited number of species.
Regulations	• The *Fisheries Act 1994* and subordinate legislation in the *Fisheries Regulation 1995* (Queensland) and the *Fisheries (Coral Reef Fin Fish) Management Plan 2003* • *Marine Parks Act 1982* (Queensland) • *Great Barrier Reef Marine Park Act 1975* (Commonwealth)

Other	• ReefMAC is the relevant stakeholder advisory body for the fishery. ReefSAG, composed of stakeholders with relevant scientific expertise, discuss scientific issues related to the fishery and provide advice to ReefMAC on their discussions/resolutions. • If the catches of any species or group in OS category significantly increases the Plan allows for these to be reviewed independently and appropriate management action taken if necessary.

Appendix 4: Guide to SICA risk ratings

Spatial scale score of activity:

<1n mile	1-10n mile	10-100n mile	100-500n mile	500-1000n mile	>1000n mile
1	2	3	4	5	6

Temporal scale score of activity:

Decadal	Every several years	Annual	Quarterly	Weekly	Daily
1	2	3	4	5	6

OR

1 day every 10 yrs or so	1 day every several yrs	1-100 days per yr	100-200 days per yr	200-300 days per yr	300-365 days per yr
1	2	3	4	5	6

Intensity score of activity:

Level	Score	Description
Negligible	1	Remote likelihood of detection at any spatial or temporal scale
Minor	2	Occurs rarely or in few restricted locations and detectability even at these scales is rare
Moderate	3	Moderate at broader spatial scale, or severe but local
Major	4	Severe and occurs reasonably often at broad spatial scale
Severe	5	Occasional but very severe and localised or less severe but widespread and frequent
Catastrophic	6	Local to regional severity or continual and widespread

Consequence score of activity:

Level	Score	Description
Negligible	1	Impact unlikely to be detectable at the scale of the stock/habitat/community
Minor	2	Minimal impact on stock/habitat/community structure or dynamics
Moderate	3	Maximum impact that still meets an objective (e.g. sustainable level of impact such as full exploitation rate for a target species)
Major	4	Wider and longer term impacts (e.g. long term decline in CPUE)
Severe	5	Very serious impacts occurring, with relatively long time period likely to be needed to restore to an acceptable level (e.g. serious decline in spawning biomass limiting population increase
Intolerable	6	Widespread and permanent/irreversible damage or loss will occur – unlikely to ever be fixed (e.g. extinction)

Consequence score of activity by each sub-component:

Sub-component	**Score/level**					
	1 Negligible	**2 Minor**	**3 Moderate**	**4 Major**	**5 Severe**	**6 Intolerable**
Population size	Insignificant change to population size/growth rate (r). Unlikely to be detectable against background variability for this population.	Possible detectable change in size/growth rate (r) but minimal impact on population size and none on dynamics.	Full exploitation rate but long-term recruitment dynamics not adversely damaged.	Affecting recruitment state of stocks and/or their capacity to increase	Likely to cause local extinctions if continued in longer term	Local extinctions are imminent/ immediate

Geographic range	No detectable change in geographic range. Unlikely to be detectable against background variability for this population.	Possible detectable change in geographic range but minimal impact on population range and none on dynamics, change in geographic range up to 5 % of original.	Change in geographic range up to 10 % of original.	Change in geographic range up to 25 % of original.	Change in geographic range up to 50 % of original.	Change in geographic range > 50 % of original.
Genetic structure	No detectable change in genetic structure. Unlikely to be detectable against background variability for this population.	Possible detectable change in genetic structure. Any change in frequency of genotypes, effective population size or number of spawning units up to 5%.	Change in frequency of genotypes, effective population size or number of spawning units up to 10%.	Change in frequency of genotypes, effective population size or number of spawning units up to 25%.	Change in frequency of genotypes, effective population size or number of spawning units, change up to 50%.	Change in frequency of genotypes, effective population size or number of spawning units > 50%.
Age/size/sex structure	No detectable change in age/size/sex structure. Unlikely to be detectable against background variability for this population.	Possible detectable change in age/size/sex structure but minimal impact on population dynamics.	Impact on population dynamics at maximum sustainable level, long-term recruitment dynamics not adversely affected.	Long-term recruitment dynamics adversely affected. Time to recover to original structure up to 5 generations free from impact.	Long-term recruitment dynamics adversely affected. Time to recover to original structure up to 10 generations free from impact.	Long-term recruitment dynamics adversely affected. Time to recover to original structure > 100 generations free from impact.
Reproductive capacity	No detectable change in reproductive capacity. Unlikely to be detectable against background variability for this population.	Possible detectable change in reproductive capacity but minimal impact on population dynamics.	Impact on population dynamics at maximum sustainable level, long-term recruitment dynamics not adversely affected.	Change in reproductive capacity adversely affecting long-term recruitment dynamics. Time to recovery up to 5 generations free from impact.	Change in reproductive capacity adversely affecting long-term recruitment dynamics. Time to recovery up to 10 generations free from impact.	Change in reproductive capacity adversely affecting long-term recruitment dynamics. Time to recovery > 100 generations free from impact.
Behaviour/ movement	No detectable change in behaviour/ movement. Unlikely to be detectable against background variability for this population. Time taken to recover to pre-disturbed state on the scale of hours.	Possible detectable change in behaviour/ movement but minimal impact on population dynamics. Time to return to original behaviour/ movement on the scale of days to weeks.	Detectable change in behaviour/ movement with the potential for some impact on population dynamics. Time to return to original behaviour/ movement on the scale of weeks to months.	Change in behaviour/ movement with impacts on population dynamics. Time to return to original behaviour/ movement on the scale of months to years.	Change in behaviour/ movement with impacts on population dynamics. Time to return to original behaviour/ movement on the scale of years to decades.	Change to behaviour/ movement. Population does not return to original behaviour/ movement.