

ECOLOGICAL RISK ASSESSMENT

NORTHERN TERRITORY COASTAL LINE FISHERY

NORTHERN TERRITORY DEPARTMENT OF RESOURCES

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CONTENTS

EXECUTIVE SUMMARY	5
INTRODUCTION	5
METHOD	5
ASSESSMENTS.....	12
Black jewfish (<i>Protonibea diacanthus</i>).....	12
Golden snapper (<i>Lutjanus johnii</i>).....	15
Shark - general	18
Grass emperor (<i>Lethrinus laticaudis</i>).....	21
Cods (<i>Epinephelus</i> spp.)	24
Spangled emperor (<i>Lethrinus nebulosus</i>)	26
Coral trouts (<i>Plectropomus</i> spp.).....	28
Red emperor (<i>Lutjanus sebae</i>).....	30
Blue threadfin (<i>Eleutheronema tetradactylum</i>).....	33
Parrotfish/Tuskfish (<i>Labridae</i> and <i>Scaridae</i>)	36
Trevallies (<i>Carangidae</i>)	39
Mangrove jack (<i>Lutjanus argentimaculatus</i>).....	42
Snapper – general	45
Stripey snapper (<i>Lutjanus carponotatus</i>).....	47
Saddletail snapper (<i>Lutjanus malabaricus</i>)	49
Reef fish/Mixed fish.....	52
SUMMARY	55
REFERENCES	55
FURTHER READING	55
APPENDIX 1 – WORKSHOP PARTICIPANTS.....	57

EXECUTIVE SUMMARY

A risk assessment workshop for the Northern Territory Coastal Line Fishery was held to formally rank the risks to the sustainability of each target and primary byproduct species (or group) thereby providing clarity as to the management and research priorities for this multi-species, multi-sector fishery. The suite of risk assessment criteria for each species/group was considered separately for those areas of the fishery subject to high and low fishing intensity.

Black jewfish and golden snapper received the highest risk values in both high and low fishing effort areas and require immediate management action to ensure sustainability. Cods, coral trouts, red emperor, grass emperor, sharks and mangrove jack (most of which are significant to the recreational sector) received intermediate values in the high intensity or both areas and require prompt management action if stocks are to be maintained. The remaining species (or groups) all received low risk ratings and do not require further management action at this time (acknowledging that this situation may change in future).

The outcomes of this risk assessment will be used by the NT Coastal Line Fishery Management Advisory Committee to develop management recommendations to support the sustainability of this important fishery.

INTRODUCTION

This report is based upon the outcomes of a risk assessment workshop for the NT Coastal Line Fishery (CLF), which was held at Berrimah Farm, Darwin on 24 June 2009. The assessment was conducted in order to identify and assess the risks to each of the target and primary byproduct species (or groups) in the fishery and to determine if current management strategies and research programs were sufficient to meet future needs of the fishery.

The report sets out the steps undertaken to assess the risks and describes the rationale behind the assigned risk levels.

The list of workshop participants appears in Appendix 1.

METHOD

The risk to each species (or group) harvested by the fishery and its priority for management action was assessed using a combination of the following elements:

- vulnerability to fishing;
- current exploitation status;
- management information needs; and
- value to sectors
 - commercial gross value of production
 - recreational participation/importance
 - ecological/cultural significance.

As a consequence of the variable species abundance and fishing effort across NT coastal waters, the assessment process was expanded to generate separate ratings for stocks in areas of high and low fishing intensity. Waters within approximately 150 km of Darwin, as well as areas around Gove and Borroloola were defined as high fishing pressure areas. The remaining NT coastal waters were classified as areas subject to low fishing pressure. Each species/group was then assessed against the elements of their vulnerability to fishing, current exploitation status, management information needs and their value to the sectors. The later element consists of three sub-elements; commercial gross value of production, recreational participation/importance and ecological/cultural significance.

It should be noted that the combined ratings from the first two elements above provide the basic level of risk to the sustainability of each stock under current management arrangements. The rating from the third element indicates the level of research data required for reliable management decision making processes in the area under current levels of exploitation. The ratings for the fourth element indicate the relative importance of the stock to the NT community in general. The total risk values for all species/groups were then sorted in decreasing order thereby providing a prioritised list for management action.

The guidelines used to generate the score for the various species/groups against each of these elements were as follows:

Relative vulnerability to fishing

Considering the biology, current exploitation levels and current management, determine the vulnerability of the species/group (see Table 1 for examples).

Biology

- What habitats are species/groups found in?
- What is the growth rate, at what age does the species/group reach sexual maturity and what is the maximum age?
- What are the estimates of natural mortality?
- What are the spawning dynamics, including seasonality (short – long), relative fecundity, larval behaviour/dispersal?
- Do the species/groups form spawning aggregations?
- Are there sex changes, sexual dimorphism or territoriality?
- What size/age-related migrations are there and what is the mixing amongst regions?
- What are the main methods of capture and would the species or group be susceptible to hyper-stability in catch rates (i.e. catch rates that remain stable until the stock collapses)?

Vulnerability

- Does their biology and behaviour make the species/groups more or less vulnerable to fishing?
- Has there been successful management of this species/group elsewhere?
- Have there been population crashes anywhere and, if so, what was the recovery period?
- What are the patterns of annual recruitment – relatively consistent among years, moderately variable about a mean, or relatively long periods with little recruitment interspersed with good years every decade or so?

Table 1. Vulnerability categories/scores and examples of biological characteristics that fall within these groups

Risk	Score	Descriptor
Low	1	Wide distribution, very short life cycles, very regular recruitment, much of the stock is not vulnerable to fishing (e.g. prawns).
Minimal	2	Age ranges at capture short to moderate <10 years, reasonably predictable recruitment.
Moderate	3	Capture age range 10 – 30 years or shorter lived and highly variable recruitment cycles or susceptible to overfishing.
High	4	Long lived species > 30 years (Lutjanids etc), sex change.
Extreme	5	Very localised species/stock distribution, low recruitment levels and long lived (long lived sharks).

Current risk to stock/exploitation status

This is based on current management and available information. Recent commercial and Fishing Tour Operator (FTO) catch data for each species (or group) of concern are presented to illustrate contemporary catch/harvest trends for these sectors.

This score may be determined by using the standard risk assessment techniques from the National ESD Framework (Fletcher et al., 2002). This requires an assessment of the consequence and likelihood scores (Tables 2 and 3).

The risk should be assessed at the level appropriate to the relevant reproducing population – or unit stock of the species, not some arbitrary spatially based unit.

Table 2 describes the qualitative suite of potential consequences that may occur to a population due to fishing. This extends from virtually no impact to complete extinction. This is the appropriate spread of consequences for this type of interaction.

Table 2. Consequence categories for the target and primary byproduct species (modified from Fletcher et al., 2002)

Level	Ecological Consequences
Negligible (0)	Insignificant impacts to populations. Unlikely to be measurable against background variability for this population.
Minor (1)	Possibly detectable, but minimal impact on population size and none on dynamics.
Moderate (2)	Full exploitation rate, but long-term recruitment/dynamics not adversely impacted.
Severe (3)	Stock reduced to levels that are directly affecting future recruitment or severely affecting their capacity to increase (i.e. recruitment overfishing).
Major (4)	Stock and recruitment reduced to levels that are likely to cause at least local extinctions or significant species range contraction > 50% (i.e. may require listing of species in an appropriate category of the endangered species list).
Catastrophic (5)	Are currently on, or would be eligible for, an endangered IUCN category and extinctions are imminent (i.e. within the period of assessment).

Table 3. Likelihood definitions

Level	Descriptor
Likely (6)	It is expected to occur.
Occasional (5)	May occur.
Possible (4)	Some evidence to suggest this is possible here.
Unlikely (3)	Uncommon, but has been known to occur elsewhere.
Rare (2)	May occur in exceptional circumstances.
Remote (1)	Never heard of, but not impossible.

For most Australian fisheries, a moderate level of consequence will be the norm as most fisheries have objectives related to full harvest, but not overfishing, of species. For those species where there is a chance that recruitment overfishing may occur, a higher consequence level should be chosen (but the likelihood of this actually occurring needs to be determined).

For example, abalone fisheries will often have potential consequence values in the 'severe' to 'major' categories, depending upon the effectiveness of management controls and compliance because they are especially prone to overfishing (but if management is working properly the likelihood of this occurring should not be greater than 'possible'). Species with more robust dynamics, such as prawns, are unlikely to ever get past a 'severe' consequence.

The consequence and likelihood scores chosen (based on the definitions in Tables 2 and 3) are then multiplied to obtain a risk value as shown in Table 4. These were then ranked as per Table 5.

Table 4. Risk matrix – numbers in cells indicate risk value, the colours/shades indicate risk rankings

		Consequence					
		Negligible	Minor	Moderate	Severe	Major	Catastrophic
Likelihood		0	1	2	3	4	5
Remote	1	0	1	2	3	4	5
Rare	2	0	2	4	6	8	10
Unlikely	3	0	3	6	9	12	15
Possible	4	0	4	8	12	16	20
Occasional	5	0	5	10	15	20	25
Likely	6	0	6	12	18	24	30

Table 5. Risk scores – use Table 4 to determine combination

Risk rankings	Risk values	Risk score
Negligible	0	1
Low	1-6	2
Moderate	7-12	3
High	13-18	4
Extreme	> 18	5

Management information needs

This score reflects the current information level needed to make the agreed management arrangements operate (this is not just the stock assessment component, but the ongoing inputs to allow the management regime to work).

Table 6. Definition of information needs categories

Data need	Score	Descriptor
Minimal	1	No data is used (or will be used) within a season or even between most years to manage activities (i.e. it is not managed directly).
Minor	2	Little or no data is used within a season and only minor levels of data are needed for assessments between seasons (i.e. logbooks).
Moderate	3	Some data may be used within a season but it is often necessary between seasons. The data need not be sophisticated (logbooks, some ancillary biological data).
High	4	Some data is needed within a season and/or high amounts are needed between seasons because management can alter greatly depending upon results (e.g. logbooks, age structure data for models).
Substantial	5	An extremely large amount of data needs to be collected to enable the fishery management regime to operate each year due to real time management needs.

Value to sectors

Commercial gross value of production (GVP)

Use current or likely GVP levels to score the importance of the stock to the commercial sector.

Table 7. Definition of GVP scores

Score	Descriptor
0	not relevant – no commercial value
1	< \$ 0.5M.
2	\$0.5 -1M.
3	\$1-5M.
4	\$5-20M.

Recreational participation/importance

How important is this species to recreational fishers within the area under consideration?

Table 8. Definition of relative priority scores for recreational fishers

Score	Descriptor
0	Not relevant (i.e. not a recreational species)
1	Small incidental take only
2	Only a secondary species (e.g. cods)
3	Highly targeted but only by a few (e.g. billfish)
4	A popularly caught species but not one of the primary species
5	One of the three-four primary target species for the bioregion/zone (e.g. snapper, jewfish)

Ecological/cultural significance

What is the level of social concern or significance afforded to the species by the wider community (i.e. what do non-fishers think). This may be of greater interest regarding iconic species.

Table 9. Definition of community concern scores

Score	Descriptor
0	Not relevant
1	Minimal additional social value
2	Some broader community issues involved
3	Identifiable community concerns issues
4	Issue is causing major troubles in region
5	State-wide issue of public concern (e.g. catching dolphins/whales)

Risk scores for ranking management action requirements

The scores/values for the six different criteria assessed for both high and low fishing effort areas were then summed and ranked as per Table 10 (thereby providing a prioritised list for management action).

Table 10. Definition of risk ranking

Risk rankings	Risk values	Risk score
Negligible	0-5	1
Low	6-11	2
Moderate	12-17	3
High	18-23	4
Extreme	> 23	5

ASSESSMENTS

Black jewfish (Protonibea diacanthus)

The commercial Coastal Line (A1) Fishery accounts for the bulk of the commercial black jewfish harvest in the NT although the proportion caught by other commercial fisheries has increased in recent years (Figure 1). The catch of this species rose sharply from 1999 to 2004 but has declined since. This may be due to a combination of decreased fishing effort and differences in skill levels between fishers leaving and entering the fishery. The decline may also indicate some level of localised stock depletion.

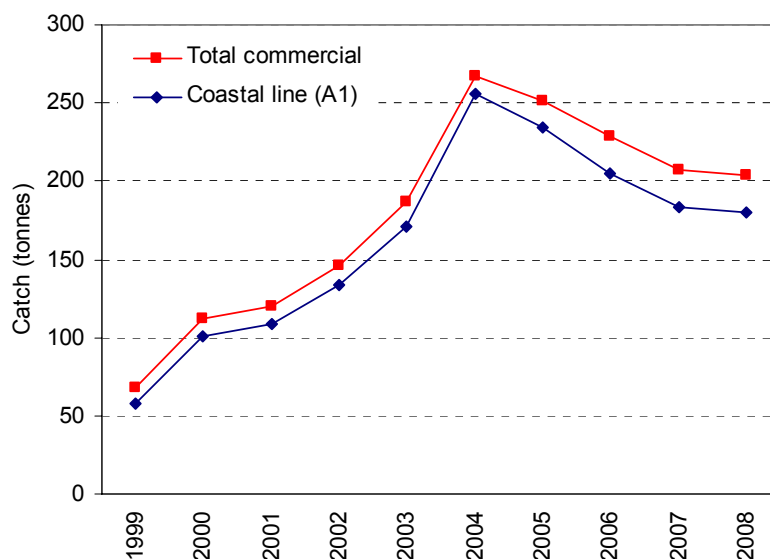


Figure 1. Commercial harvest of black jewfish from the Coastal Line Fishery (A1) compared to the total harvest across all fisheries

The FTO harvest of black jewfish (by number – multiply by 0.0087 for tonnage) tripled between 1999 and 2008 (Figure 2). The actual impact in terms of fishing mortality may be closer to the catch estimates as black jewfish are highly susceptible to barotrauma when caught from water deeper than 10 m (Phelan, 2008).

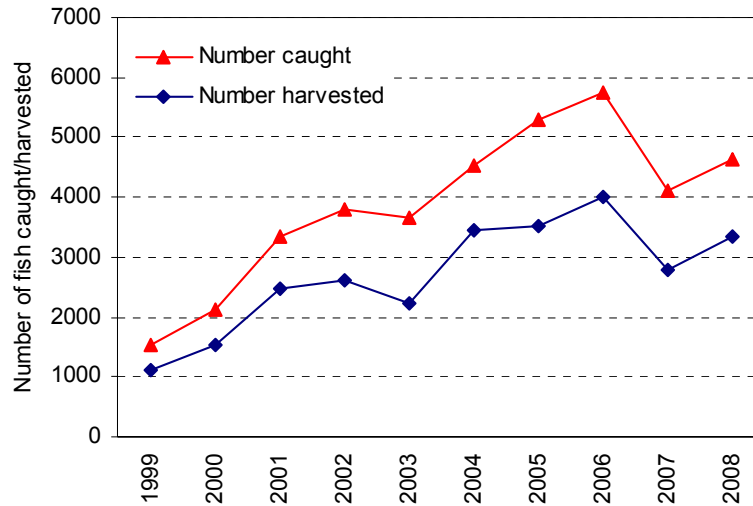


Figure 2. Fishing Tour Operator catch and harvest of black jewfish

The recreational harvest and release tonnages for black jewfish in 2000 were estimated at 155 and 96 tonnes, respectively (derived from Henry and Lyle, 2003 and Coleman, 2004). A portion of the 96 tonnes of released jewfish will have died from the cumulative effects of barotrauma.

No estimates of the indigenous harvest of black jewfish in the NT were given in Henry and Lyle, 2003, and there is no indication as to when the next indigenous fishing survey will take place.

Given population growth, improvements in fishing technology, information sharing and increased boat ownership (using registration of boat trailers ≥ 4.5 m as a proxy) in the NT, the impacts of recreational (and possibly indigenous) fishing on black jewfish stocks may have risen since 2000. It should be noted that the recreational possession limit for black jewfish was reduced from five to two on 1 January 2010. Results of the current recreational fishing survey will be available in late 2010 with the Coastal Line Fishery ERA to be updated thereafter.

Table 11. Details of the black jewfish assessment for the Coastal Line Fishery

Black jewfish	Area	Score	Notes on basis for score adopted
Vulnerability	All waters	3	Fast growing, early maturing species but highly vulnerable to fishing pressure due to their aggregating behaviour - possibly all year round (not just during spawning). Highly susceptible to barotrauma when caught from >10 m. The recreational harvest is now constrained by a possession limit of two (it was five prior to 1 January 2010). The lack of effective controls to contain total catch (across all sectors) heightens the risk to this species.
Current exploitation status	Darwin, Gove, Borroloola	4	Anecdotal evidence suggests that aggregations close to Darwin are being depleted.
	Outer NT areas	2	Limited fishing of the stock in outer areas. Commercial catches low due to limited access to market and lack of infrastructure.
Management information needs	Darwin, Gove, Borroloola	4	Detailed age structure monitoring of the harvest by all sectors is required in addition to recreational catch estimates. Schooling behaviour requires age-structured models for stock assessment, as CPUE does not provide an accurate indication of abundance.
	Outer NT areas	3	At this stage, commercial and FTO logbook records sufficient for the areas outside of major population centres.
Recreational significance	Darwin, Gove, Borroloola	5	High recreational significance - major target species prized as both a food fish and sporting target.
	Outer NT areas	5	As above.
Community [non fishing] significance	All waters	2	The apparent depletion of aggregations close to Darwin has not yet become a public issue, but has the potential to do so if catches fall significantly.
Commercial GVP [CLF only]	All waters	2	Current commercial catch value is below \$1M; this value may under state its local significance as the product is mostly sold around Darwin.
Total	Darwin, Gove, Borroloola	20	Risk ranking = High
Total	Outer NT areas	17	Risk ranking = Medium

Golden snapper (*Lutjanus johnii*)

The annual commercial coastal line (A1) harvest of golden snapper has fluctuated over the last decade but the general trend is downwards (Figure 3). Part of this decline is probably due to a reduction in fishing effort (i.e. fewer fish being caught), but it may also be due to the harvest of smaller fish. Also note that the proportion of golden snapper harvested by other commercial fisheries has increased since 2004.

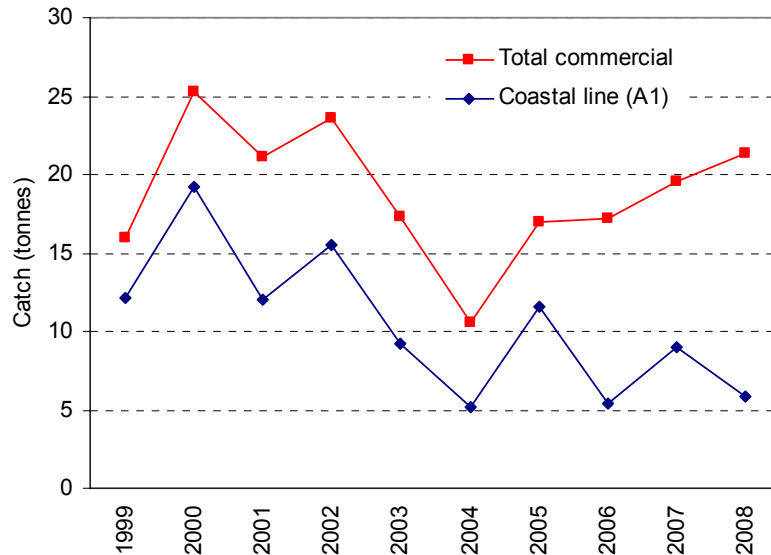


Figure 3. Commercial harvest of golden snapper from the Coastal Line Fishery (A1) compared to the total harvest across all fisheries

The number of golden snapper caught by the FTO sector (multiply by 0.0009 for tonnage) has risen by over 50% in the last decade (Figure 4), but the number of fish harvested has shown little net increase during this time (although it did rise and then fall). Given golden snapper is a highly prized table fish this trend may suggest a shift in the size distribution of this species (from larger to smaller). It is important to realise that such a shift, if occurring, is being driven by all sectors of the fishery.

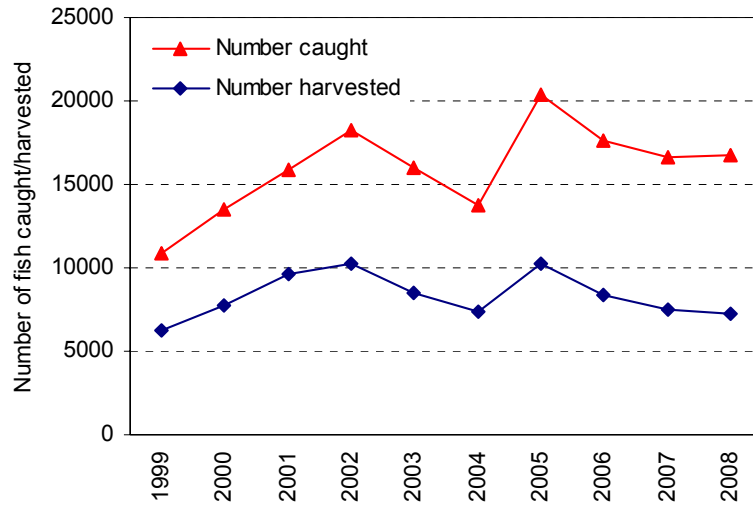


Figure 4. Fishing Tour Operator catch and harvest of golden snapper

The recreational harvest and release amounts for golden snapper in 2000 were estimated at 61 and 41 tonnes, respectively (derived from Henry and Lyle, 2003 and Coleman, 2004). A portion of the 41 tonnes of released golden snapper will have died from the cumulative effects of barotrauma.

The indigenous harvest of all snappers (except red emperor) in 2000 was estimated to be 25 tonnes (Henry and Lyle, 2003). Given the factors mentioned previously, the impacts of both recreational and indigenous fishing on golden snapper stocks may have increased since the surveys of Henry and Lyle in 2000/2001.

Table 12. Details of the golden snapper assessment for the Coastal Line Fishery

Golden snapper	Area	Score	Notes on basis for score adopted
Vulnerability	All waters	4	High risk, long lived, late maturing species. Exhibits ontogenetic migration (inshore/offshore). Appears susceptible to barotrauma. The recreational harvest is constrained by a possession limit of five. The lack of effective controls to contain total catch (across all sectors) heightens the risk to this species.
Current exploitation status	Darwin, Gove, Borroloola	4	Limited habitat around Darwin concentrates stock into well known areas. Almost all size groups harvested.
	Outer NT areas	2	May be being targeted by Indigenous communities.
Management information needs	Darwin, Gove, Borroloola	4	Depleted local areas need detailed spatial data on catches.
	Outer NT areas	3	As above if target fishing of this species increases in remote areas.
Recreational significance	Darwin, Gove, Borroloola	5	Major target species close to Darwin. Almost all size groups harvested.
	Outer NT areas	5	As above.
Community [non fishing] significance	All waters	2	May be recognised by non-fishers; low significance among general public.
Commercial GVP [CLF only]	All waters	1	Small (and decreasing) component of the commercial CLF catch.
Total	Darwin, Gove, Borroloola	20	Risk ranking = High
Total	Outer NT areas	17	Risk ranking = Medium

Shark - general

The shark – general category, only forms a minor component of the commercial coastal line harvest (Figure 5). The annual catch peaked at 12 tonnes in 2002 but has remained steady (at just under 5 tonnes) for the last four years. The rapid drop in the total commercial harvest of this category is due to improved shark reporting protocols (to genus or species level) in other, larger commercial fisheries.

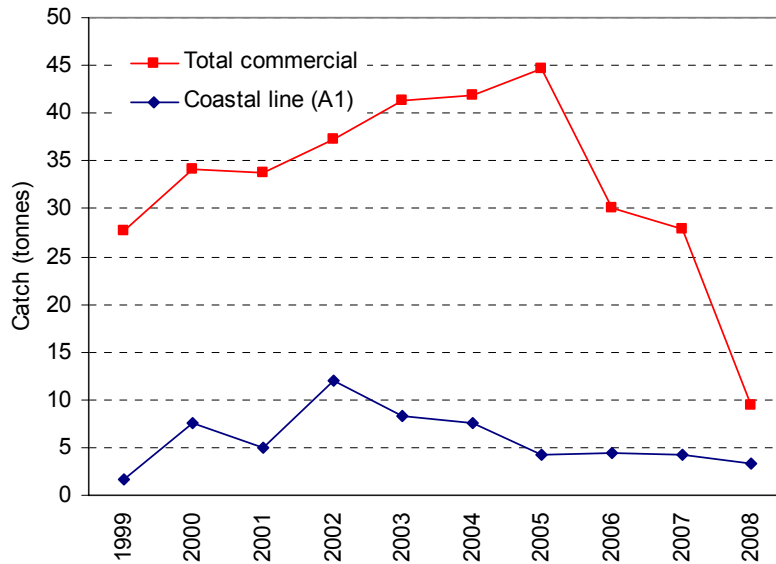


Figure 5. Commercial harvest of sharks from the Coastal Line Fishery (A1) compared to the total harvest across all fisheries

Although the number of sharks (multiply by 0.003 for tonnage) caught by the FTO sector has doubled over the last decade, the vast majority of them are released (Figure 6). In fact, the shark harvest has declined steadily from 2002. It should be noted that the increase in shark captures mirrors the concurrent increase in FTO reef fishing line hours.

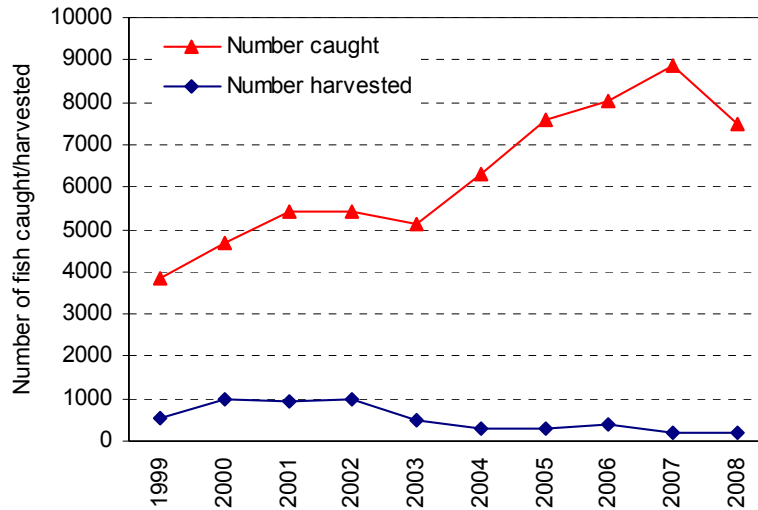


Figure 6. Fishing Tour Operator catch and harvest of sharks

The recreational harvest and release for sharks/rays in 2000 were estimated at 24 and 205 tonnes, respectively (derived from Henry and Lyle, 2003 and Coleman, 2004). Most of the 205 tonnes of released sharks/rays will have survived as they show little sign of barotrauma-induced injury. This feature also means that the impact of catch and release fishing on shark/ray stocks is not as great as that for species that are prone to barotrauma.

The indigenous harvest of sharks/rays in 2000 was estimated to be 37 tonnes (Henry and Lyle, 2003). Given the factors mentioned previously, the impacts of both recreational and indigenous fishing on sharks/rays may have increased since the surveys of Henry and Lyle in 2000/2001.

Table 13. Details of the shark assessment for the Coastal Line Fishery

Sharks general	Area	Score	Notes on basis for score adopted
Vulnerability	All waters	4	Basic biology and low fecundity makes most sharks vulnerable. Not affected by barotrauma. The recreational harvest is now (as of 1 January 2010) constrained by a possession limit of three (with no take of protected sharks). The commercial (A1) harvest of sharks (as byproduct) is restricted through a 500 kg (whole weight) trip limit.
Current exploitation status	Darwin, Gove, Borroloola	2	Some local depletion possible through incidental capture.
	Outer NT areas	1	Sharks appear abundant along entire NT coastline.
Management information needs	Darwin, Gove, Borroloola	2	General category highlights need for improved logbook reporting. Very little data from recreational and indigenous sectors.
	Outer NT areas	2	As above.
Recreational significance	Darwin, Gove, Borroloola	1	Low - no target fishing.
	Outer NT areas	1	Low - no target fishing.
Community [non fishing] significance	All waters	3	General community concerns about sharks are not immediately obvious in NT.
Commercial GVP [CLF only]	All waters	1	Minor component of the commercial CLF catch.
Total	Darwin, Gove, Borroloola	13	Risk ranking = Medium
Total	Outer NT areas	12	Risk ranking = Medium

Grass emperor (Lethrinus laticaudis)

Most grass emperor harvested in the NT are extracted by the Finfish Trawl Fishery, which accounts for 72 to 99% of the annual commercial harvest of this species over the last decade. Grass emperors are considered a byproduct species in the commercial Coastal Line Fishery (as the annual harvest is less than 10 tonnes - Figure 7) and are generally retained when target fishing for black jewfish or golden snapper.

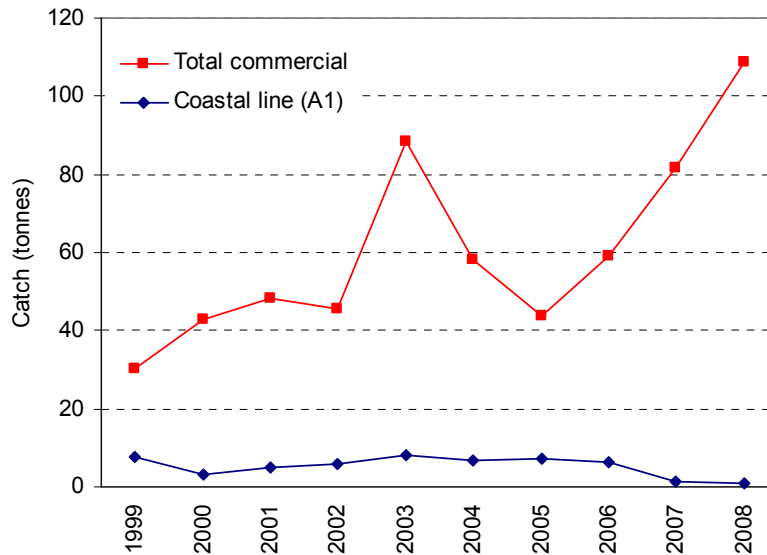


Figure 7. Commercial harvest of grass emperor from the Coastal Line Fishery (A1) compared to the total harvest across all fisheries

Both the FTO catch and harvest of grass emperors (by number – multiply by 0.0006 for tonnage) have fluctuated over the last decade, but to different degrees (Figure 8). The annual catch increased more than three-fold from 1999 to 2005 but dropped considerably thereafter. The annual harvest doubled from 1999 to 2005 but now is similar to the 1999 figure.

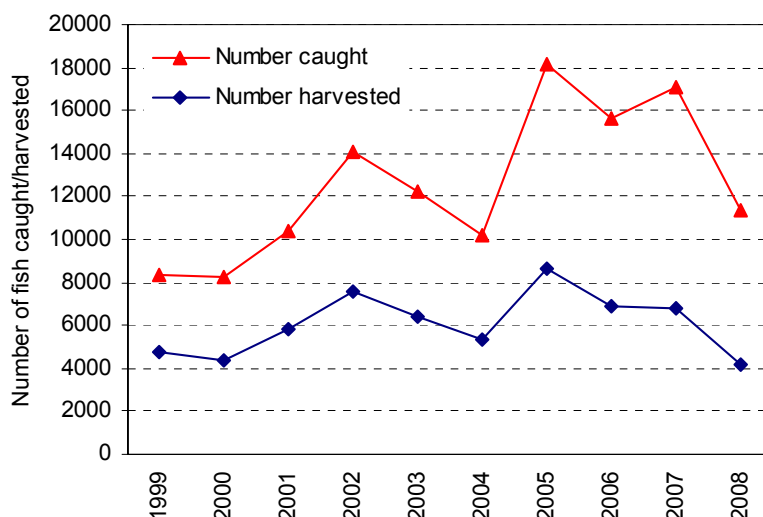


Figure 8. Fishing Tour Operator catch and harvest of grass emperor

Estimates of the recreational harvest and release tonnages for grass emperor are unavailable. However, harvest and release amounts pooled for all emperors (i.e. *Lethrinus* sp.) in 2000 were estimated at 7 and 13 tonnes, respectively (derived from Henry and Lyle, 2003 and Coleman, 2004).

The indigenous harvest of all emperors in 2000 was estimated to be 0.4 tonnes (Henry and Lyle, 2003). Given the factors mentioned previously, the impacts of both recreational and indigenous fishing on grass emperor stocks may have increased since the surveys of Henry and Lyle in 2000/2001.

Table 14. Details of the grass emperor assessment for the Coastal Line Fishery

Grass emperor	Area	Score	Notes on basis for score adopted
Vulnerability	All waters	2	Relatively short life-history, matures at small size, species has been robust in heavily exploited fisheries. The recreational harvest is constrained by the General Personal Possession Limit (GPPL) of 30. The lack of effective controls to contain total catch (across all sectors) heightens the risk to this species.
Current exploitation status	Darwin, Gove, Borroloola	3	Heavily exploited in Darwin, and a few large older fish remain.
	Outer NT areas	1	Limited fishing in remote areas.
Management information needs	Darwin, Gove, Borroloola	3	At this stage, commercial and FTO logbook records sufficient. Very little data from recreational and indigenous sectors.
	Outer NT areas	2	As above.
Recreational significance	Darwin, Gove, Borroloola	2	Valuable species, retained when other species availability low. Bigger fish still present in less accessible areas.
	Outer NT areas	2	Good size fish available in remote areas.
Community [non fishing] significance	All waters	1	Rarely recognised by non-fishers; low significance among general public.
Commercial GVP [CLF only]	All waters	1	Minor component of the commercial CLF catch.
Total	Darwin, Gove, Borroloola	12	Risk ranking = Medium
Total	Outer NT areas	9	Risk ranking = Low

Cods (*Epinephelus spp.*)

The harvest of cods by the commercial Coastal Line Fishery constitutes a small proportion of the overall commercial take of this group, most of which are extracted by the Timor Reef, Demersal and Finfish Trawl fisheries. Cods are a byproduct species of the commercial Coastal Line Fishery with the annual harvest less than 8 tonnes (Figure 9).

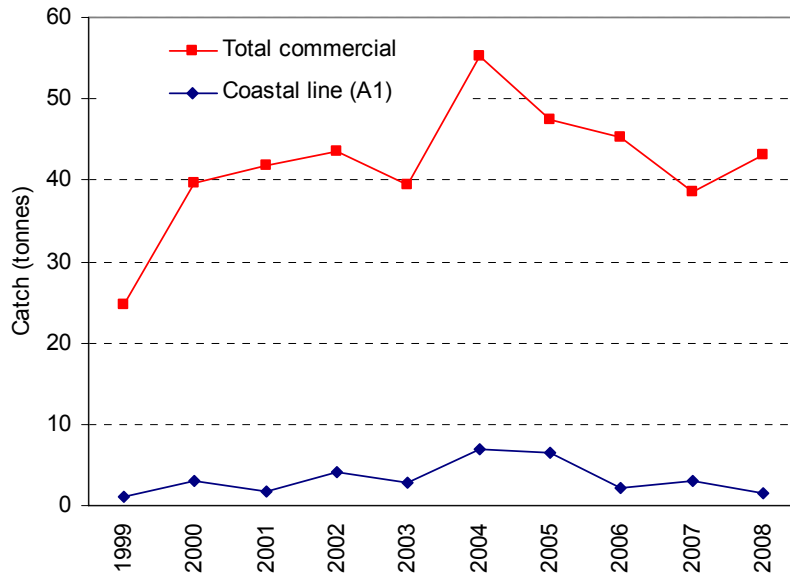


Figure 9. Commercial harvest of cod from the Coastal Line Fishery (A1) compared to the total harvest across all fisheries

Both the catch and harvest of cods (by number - multiply by 0.001 for tonnage) by the FTO sector has increased by a factor of about two over the last decade (Figure 10). It should be noted that the increase in cod catch/harvest mirrors the concurrent increase in FTO reef fishing line hours.

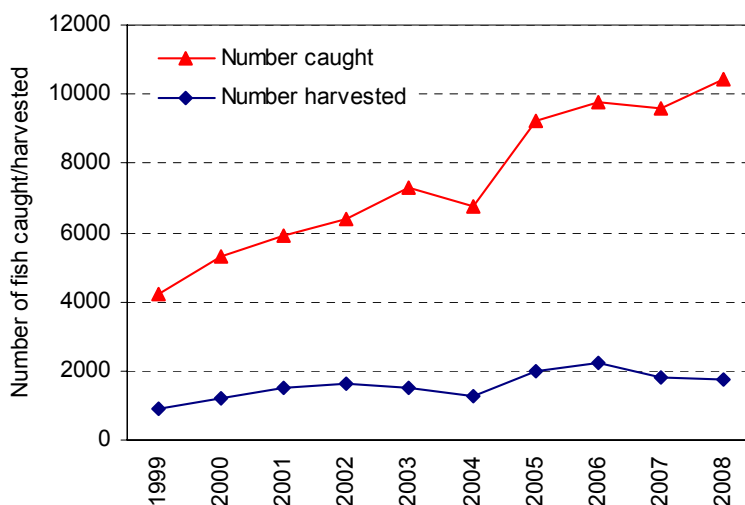


Figure 10. Fishing Tour Operator catch and harvest of cods

Recreational harvest and release tonnages pooled for all cods (i.e. *Epinephelus* spp.) in 2000 were estimated at 20 and 42 tonnes, respectively (derived from Henry and Lyle, 2003 and Coleman, 2004).

The indigenous harvest of all cods in 2000 was estimated to be 4 tonnes (Henry and Lyle, 2003). Given the factors mentioned previously, the impacts of both recreational and indigenous fishing on cods may have increased since the surveys of Henry and Lyle in 2000/2001.

Table 15. Details of the cod assessment for the Coastal Line Fishery

Cods general	Area	Score	Notes on basis for score adopted
Vulnerability	All waters	3	Generally long lived and therefore vulnerable to overfishing. May be susceptible to barotrauma. The recreational harvest of cods is constrained by the GPPL of 30 and a maximum size limit of 1.2 m. The lack of effective controls to contain total catch (across all sectors) heightens the risk to this group of fishes.
Current exploitation status	Darwin, Gove, Borroloola	3	A variety of species taken, although some large fish still available.
	Outer NT areas	1	Low fishing pressure generally as wider range of preferred target species available.
Management info needs	Darwin, Gove, Borroloola	3	At this stage, commercial and FTO logbook records sufficient. Very little data from recreational and indigenous sectors.
	Outer NT areas	2	Low requirements as need for management action low.
Recreational significance	Darwin, Gove, Borroloola	2	Cod species may be kept but generally not targeted.
	Outer NT areas	2	As above.
Community [non fishing] significance	All waters	2	Protection of large cod for visual observation is an issue elsewhere but not critical in the Darwin area where diving is limited.
Commercial GVP [CLF only]	All waters	1	Minor component of the commercial CLF catch. Less than 5 tonnes currently.
Total	Darwin, Gove, Borroloola	14	Risk ranking = Medium
Total	Outer NT areas	11	Risk ranking = Low

Spangled emperor (Lethrinus nebulosus)

The commercial Coastal Line Fishery accounts for almost all of the local commercial harvest of spangled emperors over the last decade (albeit in relatively small amounts – Figure 11).

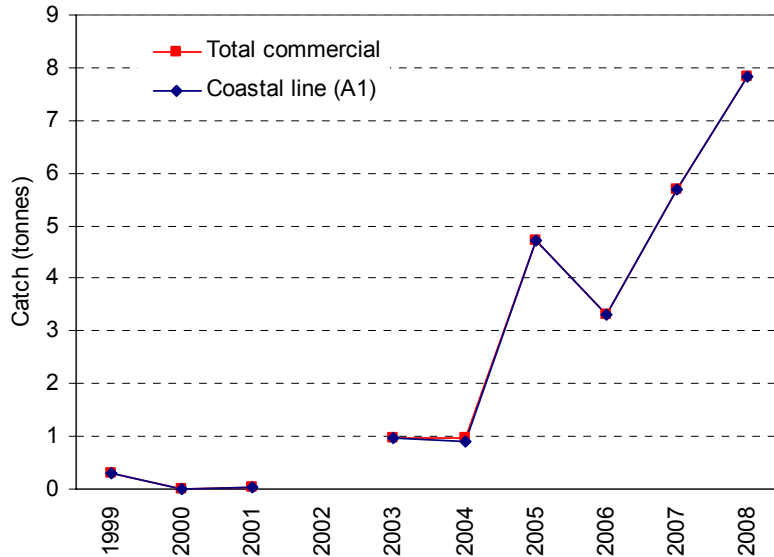


Figure 11. Commercial harvest of spangled emperor from the Coastal Line Fishery (A1) compared to the total harvest across all fisheries (lines overlap)

Spangled emperors are rarely caught by FTO clients. Hence, no meaningful time series is available.

Estimates of the recreational harvest and release tonnages for spangled emperor are unavailable. However, harvest and release tonnages pooled for all emperors (i.e. *Lethrinus* sp.) in 2000 were estimated at 7 and 13 tonnes, respectively (derived from Henry and Lyle, 2003 and Coleman, 2004).

The indigenous harvest of all emperors in 2000 was estimated to be 0.4 tonnes (Henry and Lyle, 2003). Given the factors mentioned previously, the impacts of both recreational and indigenous fishing on spangled emperor stocks may have increased since the surveys of Henry and Lyle in 2000/2001.

Table 16. Details of the spangled emperor assessment for the Coastal Line Fishery

Spangled emperor	Area	Score	Notes on basis for score adopted
Vulnerability	All waters	3	Long lived, late maturing, changes sex from female to male, medium vulnerability to exploitation. Moderately susceptible to post-release mortality (hook injuries etc). The recreational harvest is constrained by the GPPL of 30. The lack of effective controls to contain total catch (across all sectors) heightens the risk to this species.
Current exploitation status	Darwin, Gove, Borroloola	3	Historically some larger fish were present in Darwin region, but not generally present in significant numbers possibly due to limited suitable habitats.
	Outer NT areas	1	Juveniles reasonably common in remote areas amongst coral reef habitat. Adults generally associated with offshore hard bottoms rather than reefs.
Management info needs	Darwin, Gove, Borroloola	2	At this stage, commercial and FTO logbook records sufficient. Very little data from recreational and indigenous sectors.
	Outer NT areas	2	As above.
Recreational significance	Darwin, Gove, Borroloola	1	Limited due to naturally low abundance in Darwin. Maybe more significant around Gove.
	Outer NT areas	1	Not a major target species elsewhere.
Community [non fishing] significance	All waters	1	Rarely recognised by non-fishers; low significance among general public.
Commercial GVP [CLF only]	All waters	1	Minor component of the commercial CLF catch (< 5 tonnes).
Total	Darwin, Gove, Borroloola	11	Risk ranking = Low
Total	Outer NT areas	9	Risk ranking = Low

Coral trouts (*Plectropomus spp.*)

The commercial Coastal Line Fishery accounts for almost all of the local commercial harvest of coral trouts (albeit in relatively small amounts – Figure 12). The large fluctuations in annual catch may be due to the occasional discovery (and possible depletion) of aggregations of this group of fishes.

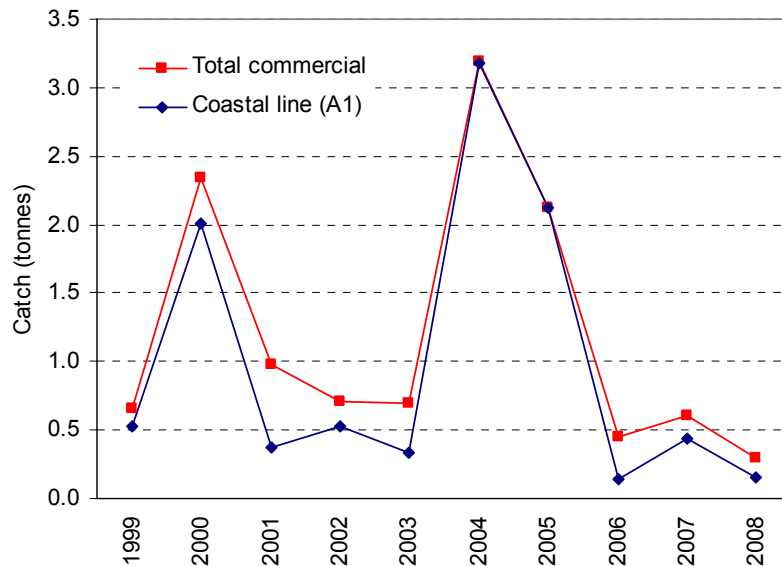


Figure 12. Commercial harvest of coral trouts from the Coastal Line Fishery (A1) compared to the total harvest across all fisheries

Similar to the commercial fishery, the annual FTO catch/harvest of coral trouts (by number - multiply by 0.00085 for tonnage) has fluctuated over the last decade (Figure 13). Again, this may be due to the occasional discovery (and possible depletion) of aggregations of this group of fishes.

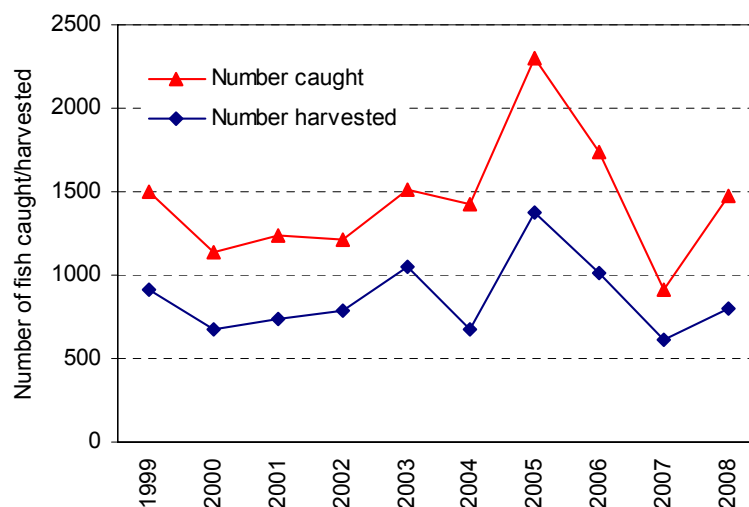


Figure 13. Fishing Tour Operator catch and harvest of coral trouts

The recreational harvest and release tonnages for coral trouts in 2000 were estimated at 8 and 10 tonnes, respectively (derived from Henry and Lyle, 2003 and Coleman, 2004). Coral trouts can withstand the effects of barotrauma better than many other fishes and so post-release mortality in this group appears less of a problem than for snappers and emperors.

The indigenous harvest of coral trouts in 2000 was estimated to be 0.7 tonnes (Henry and Lyle, 2003). Given the factors mentioned previously, the impacts of both recreational and indigenous fishing on coral trout stocks may have increased since the surveys of Henry and Lyle in 2000/2001.

Table 17. Details of the coral trout assessment for the Coastal Line Fishery

Coral trouts	Area	Score	Notes on basis for score adopted
Vulnerability	All waters	3	Shorter lived early maturing species, but vulnerable due to sedentary nature, aggressive feeding and therefore ease of capture. Able to withstand the effects of barotrauma, at least from shallow water (< 19 m) and possibly deeper. The recreational harvest is constrained by the GPPL of 30. The lack of effective controls to contain total catch (across all sectors) heightens the risk to this group of fishes.
Current exploitation status	Darwin, Gove, Borroloola	3	Low abundance in Darwin, but a significant species in Gove, where it is actively targeted.
	Outer NT areas	2	Not subject to significant targeting in outer areas.
Management info needs	Darwin, Gove, Borroloola	2	At this stage, commercial and FTO logbook records sufficient. Very little data from recreational and indigenous sectors.
	Outer NT areas	2	As above.
Recreational significance	Darwin, Gove, Borroloola	3	Low numbers in Darwin but always retained. A significant target species around Gove.
	Outer NT areas	3	Highly prized whenever caught.
Community [non fishing] significance	All waters	1	May be recognised by non-fishers; low significance among general public.
Commercial GVP [CLF only]	All waters	1	Minor component of the commercial CLF catch.
Total	Darwin, Gove, Borroloola	13	Risk ranking = Medium
Total	Outer NT areas	12	Risk ranking = Medium

Red emperor (Lutjanus sebae)

The harvest of red emperor by the commercial Coastal Line Fishery constitutes a minor proportion (less than 2 tonnes annually – Figure 14) of the overall commercial take of this species, most of which is extracted by the Timor Reef, Finfish Trawl and Demersal fisheries. Whilst these fisheries typically operate offshore (outside 15 nm of the NT coastline) the potential for connectivity between inshore and offshore populations must be borne in mind.

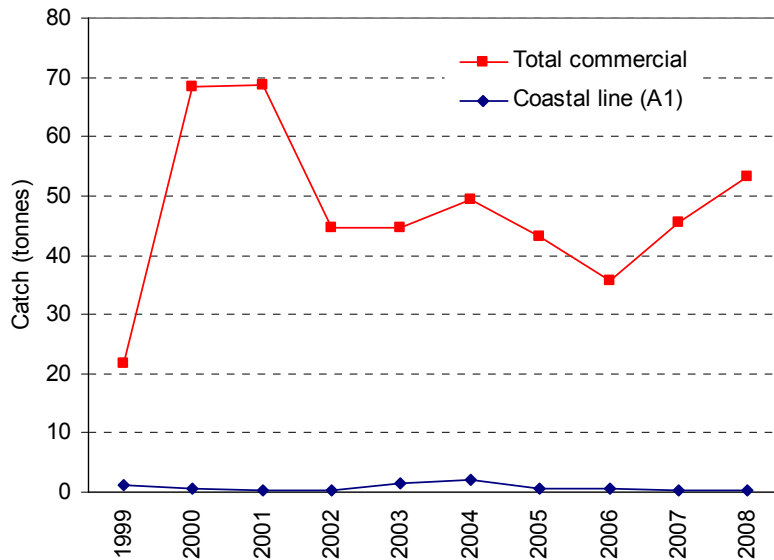


Figure 14. Commercial harvest of red emperor from the Coastal Line Fishery (A1) compared to the total harvest across all fisheries

Adult red emperor generally inhabit deeper offshore waters, which are only accessible by larger FTO vessels. This in turn limits the catch/harvest of this species (as reflected in Figure 15 - multiply by 0.0015 for tonnage). Although the annual FTO catch and harvest (by number) of red emperor has fluctuated over the last decade, the general trend in both cases is downwards.

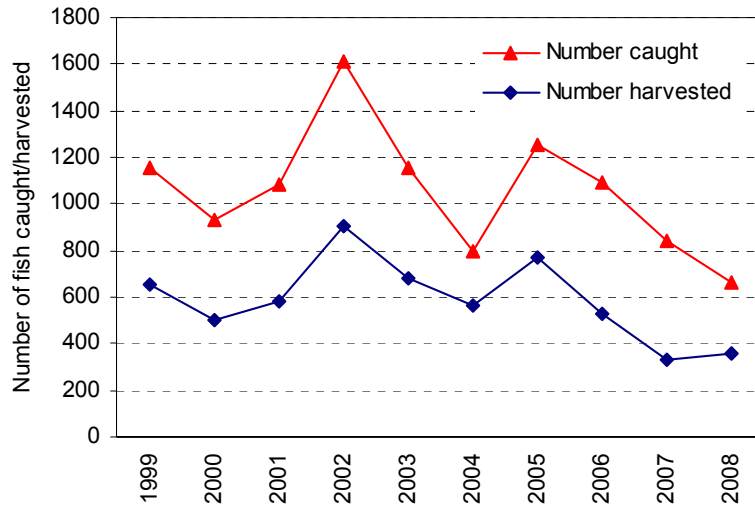


Figure 15. Fishing Tour Operator catch and harvest of red emperor

The recreational harvest and release tonnages for red emperor in 2000 were estimated at 10 and 5 tonnes, respectively (derived from Henry and Lyle, 2003 and Coleman, 2004). Red emperor can withstand the effects of barotrauma better than other snappers and so post-release mortality of this species appears less of a problem than for other *Lutjanids*.

The indigenous harvest of red emperor in 2000 was estimated to be 5 tonnes (Henry and Lyle, 2003). Given the factors mentioned previously, the impacts of both recreational and indigenous fishing on red emperor stocks may have increased since the surveys of Henry and Lyle in 2000/2001.

Table 18. Details of the red emperor assessment for the Coastal Line Fishery

Red emperor	Area	Score	Notes on basis for score adopted
Vulnerability	All waters	3	Long lived species with special mating behaviour. More resilient to the effects of barotrauma than other snappers. The recreational harvest is constrained by the GPPL of 30. The lack of effective controls to contain total catch (across all sectors) heightens the risk to this species.
Current exploitation status	Darwin, Gove, Borroloola	2	Low natural abundance in Darwin.
	Outer NT areas	1	Uncommon in inshore waters.
Management info needs	Darwin, Gove, Borroloola	2	At this stage, commercial and FTO logbook records sufficient. Very little data from recreational and indigenous sectors.
	Outer NT areas	2	As above.
Recreational significance	Darwin, Gove, Borroloola	4	Highly prized target species despite its low abundance.
	Outer NT areas	4	As above.
Community [non fishing] significance	All waters	1	May be recognised by non-fishers; low significance among general public.
Commercial GVP [CLF only]	All waters	1	Minor component of the commercial CLF catch (< 1 tonne at present).
Total	Darwin, Gove, Borroloola	13	Risk ranking = Medium
Total	Outer NT areas	12	Risk ranking = Medium

Blue threadfin (*Eleutheronema tetradactylum*)

The commercial Coastal Net Fishery has been the major commercial harvester of blue threadfin over the last decade, followed by the Restricted Bait Net, Barramundi and Coastal Line Fisheries. The comparatively small blue threadfin harvest by the commercial sector of the Coastal Line Fishery (Figure 16) relative to the large stock size, is unlikely to threaten the sustainability of the stock/s. However, it should be noted that research on blue threadfin from Queensland has revealed marked genetic isolation between populations separated by as little as 100 km. This suggests that blue threadfin may be susceptible to localised depletion under heavy fishing pressure.

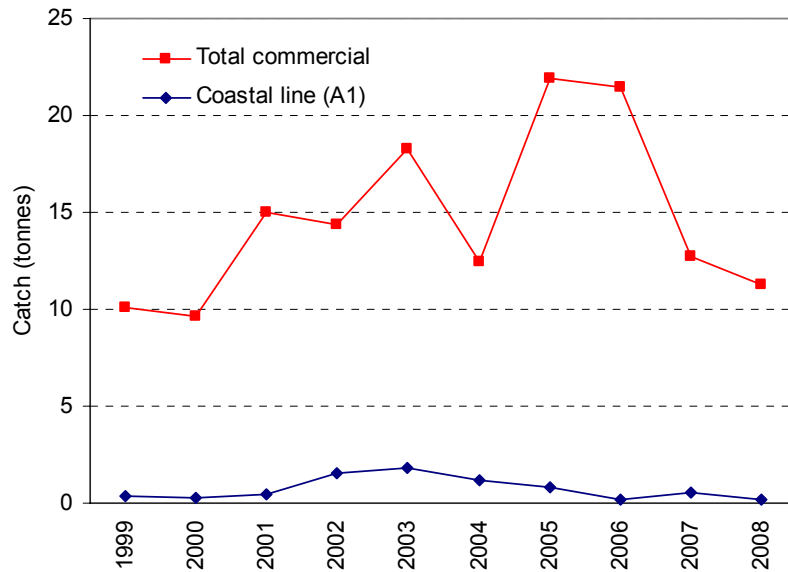


Figure 16. Commercial harvest of blue threadfin from the Coastal Line Fishery (A1) compared to the total harvest across all fisheries

The FTO catch and harvest of blue threadfin (by number - multiply by 0.0015 for tonnage) over the last decade has remained relatively steady at roughly 3500 and 1000 fish per annum, respectively (Figure 17). The current blue threadfin harvest by the FTO sector of the Coastal Line Fishery is unlikely to threaten the sustainability of the stocks.

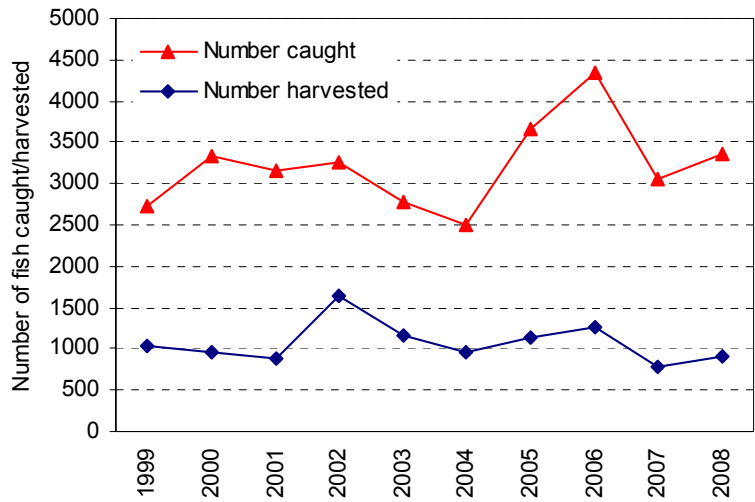


Figure 17. Fishing Tour Operator catch and harvest of blue threadfin

Estimates of the recreational harvest and release for blue threadfin are unavailable. However, harvest and release tonnages pooled for all threadfins (i.e. blue threadfin and king threadfin) in 2000 were estimated at 55 and 11 tonnes, respectively (derived from Henry and Lyle, 2003 and Coleman, 2004). Most of the 11 tonnes of released threadfin will have survived as they show little sign of barotrauma-induced injury. This feature also means that the impacts of catch and release fishing on blue threadfin stocks are not as great as that for species that are prone to barotrauma.

The indigenous harvest of all threadfins in 2000/2001 was estimated to be 13 tonnes (Henry and Lyle, 2003). Given the factors mentioned previously, the impacts of both recreational and indigenous fishing on blue threadfin stocks may have increased since the surveys of Henry and Lyle in 2000/2001.

Table 19. Details of the blue threadfin assessment for the Coastal Line Fishery

Blue threadfin	Area	Score	Notes on basis for score adopted
Vulnerability	All waters	1	Fast growing species maturing at a small size and about 2 years of age. Does not appear prone to barotrauma. The recreational harvest is constrained by the GPPL of 30. Other catch controls are not considered necessary at present.
Current exploitation status	Darwin, Gove, Borroloola	2	Species appears unaffected at current level of exploitation as species is common even near population centres.
	Outer NT areas	1	As above.
Management info needs	Darwin, Gove, Borroloola	2	At this stage, commercial and FTO logbook records sufficient. Very little data from recreational and indigenous sectors.
	Outer NT areas	2	As above.
Recreational significance	Darwin, Gove, Borroloola	4	A secondary species; good fighting and eating fish. Popular species for lure fishing.
	Outer NT areas	4	As above.
Community [non fishing] significance	All waters	1	Rarely recognised by non-fishers; low significance among general public.
Commercial GVP [CLF only]	All waters	1	Minor component of the commercial CLF catch.
Total	Darwin, Gove, Borroloola	11	Risk ranking = Low
Total	Outer NT areas	10	Risk ranking = Low

Parrotfish/Tuskfish (Labridae and Scaridae)

The commercial Coastal Line Fishery accounts for almost all of the local commercial harvest of parrotfish and tuskfish (albeit at less than 2 tonnes annually – Figure 18), with a very small fraction taken by commercial Demersal and Finfish Trawl Fishers. Hence, the tuskfish/parrotfish harvest by the commercial sector of the Coastal Line Fishery is unlikely to threaten the sustainability of this group of fishes.

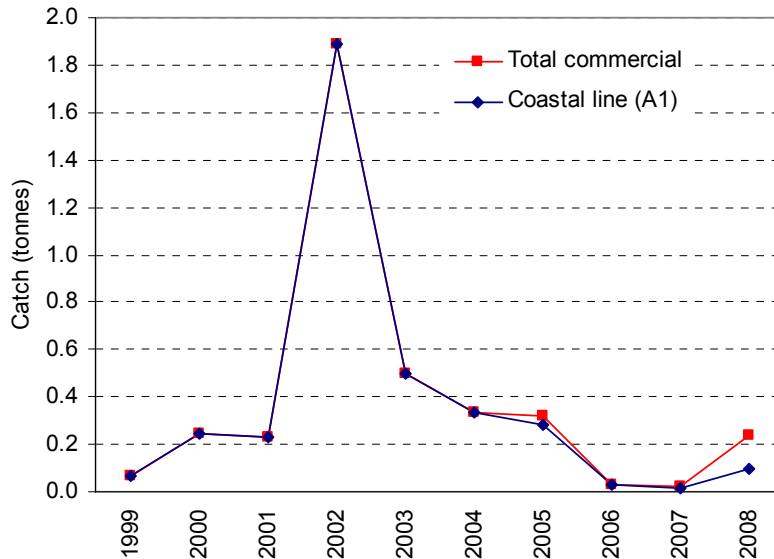


Figure 18. Commercial harvest of parrotfish and tuskfish from the Coastal Line Fishery (A1) compared to the total harvest across all fisheries (lines overlap)

When converted to tonnage (using a multiplier of 0.001), the FTO catch of tuskfish/parrotfish approximates the range of values reported by the commercial coastal line sector over the last decade (i.e. 1 to 2 tonnes). Hence, the tuskfish/parrotfish harvest by the FTO sector of the Coastal Line Fishery is unlikely to threaten the sustainability of this group of fishes.

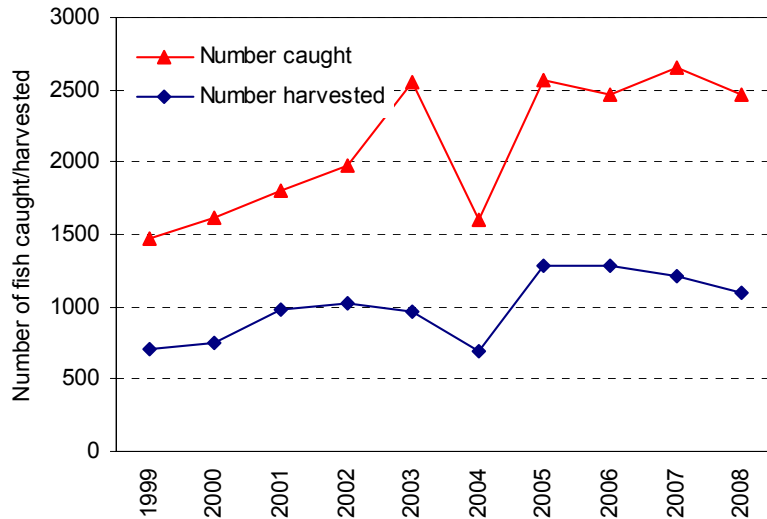


Figure 19. Fishing Tour Operator catch and harvest of parrotfish/tuskfish

Estimates of the recreational harvest and release tonnages for ‘tuskfish/parrotfish’ are unavailable. However, harvest and release tonnages pooled for all tuskfish in 2000 were estimated at 15 and 6 tonnes, respectively (derived from Henry and Lyle, 2003 and Coleman, 2004).

The indigenous harvest of tuskfish/parrotfish in 2000-01 was estimated to be 9 tonnes (Henry and Lyle, 2003). Given the factors mentioned previously, the impacts of both recreational and indigenous fishing on parrotfish/tuskfish stocks may have increased since the surveys of Henry and Lyle in 2000/2001.

Table 20. Details of the parrotfish/tuskfish assessment for the Coastal Line Fishery

Tusk/parrot fish	Area	Score	Notes on basis for score adopted
Vulnerability	All waters	3	Medium vulnerability due to school formation with the largest females undergoing sex change to males. Fishing can selectively remove males and limit reproductive capacity, but matures at a relatively small size. The recreational harvest of parrotfish/tuskfish is constrained by the GPPL of 30. The lack of effective controls to contain total catch (across all sectors) heightens the risk to this group of fishes.
Current exploitation status	Darwin, Gove, Borroloola	2	Low natural abundance in Darwin zone due to limited coral reef habitat. Mostly harvested around Gove where coral habitat is more common.
	Outer NT areas	1	Dependent on effort and habitat availability.
Management info needs	Darwin, Gove, Borroloola	1	At this stage, commercial and FTO logbook records sufficient. Very little data from recreational and indigenous sectors.
	Outer NT areas	1	As above.
Recreational significance	Darwin, Gove, Borroloola	1	Not a target species in Darwin due to low abundance.
	Outer NT areas	1	Not a target species elsewhere.
Community [non fishing] significance	All waters	1	Rarely recognised by non-fishers; low significance among general public.
Commercial GVP [CLF only]	All waters	1	Minor component of the commercial CLF (< 1 tonne).
Total	Darwin, Gove, Borroloola	9	Risk ranking = Low
Total	Outer NT areas	8	Risk ranking = Low

Trevallies (*Carangidae*)

The harvest of trevallies by the commercial Coastal Line Fishery constitutes a small (less than 3 tonne annually – Figure 20) proportion of the overall commercial take of this group, most of which is extracted by the Finfish Trawl Fishery. The harvest of trevallies by the commercial sector of the Coastal Line Fishery is unlikely to threaten the sustainability of this group of fishes.

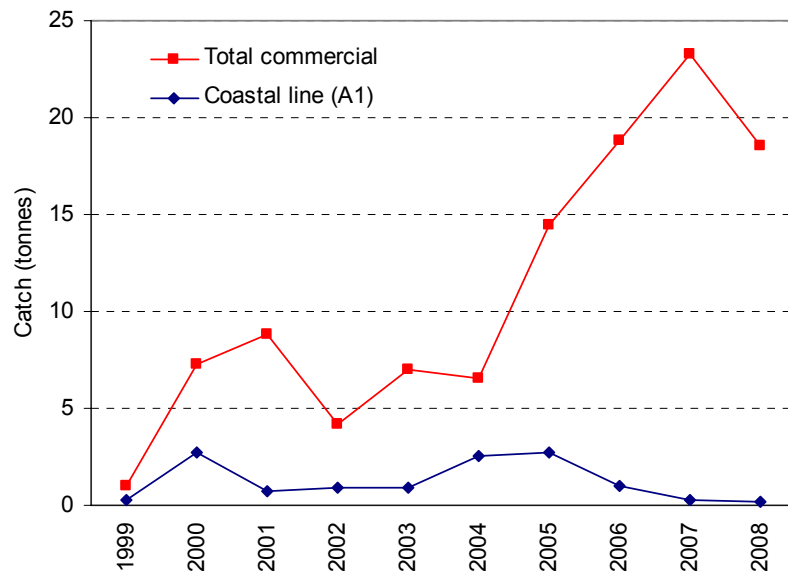


Figure 20. Commercial harvest of trevallies from the Coastal Line Fishery (A1) compared to the total harvest across all fisheries

Whilst the annual FTO catch of trevallies has increased by roughly 50% over the last decade, the annual harvest has never exceeded 1000 fish in any calendar year (Figure 21 - multiply by 0.0015 for tonnage). The harvest of trevallies by the FTO sector of the Coastal Line Fishery is unlikely to threaten the sustainability of this group of fishes.

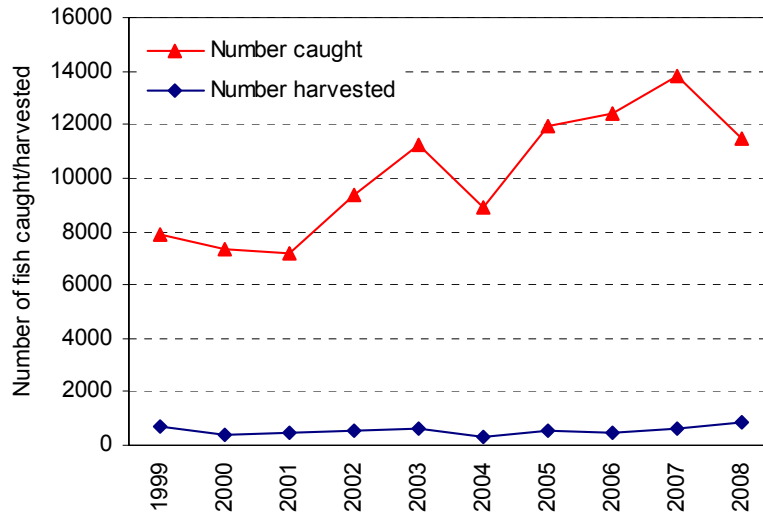


Figure 21. Fishing Tour Operator catch and harvest of trevallies

Estimates of the recreational harvest and release for individual trevally species are unavailable. However, harvest and release amounts pooled for all trevallies in 2000 were estimated at 27 and 56 tonnes, respectively (derived from Henry and Lyle, 2003 and Coleman, 2004). Most of the 56 tonnes of released trevallies will have survived as they show little sign of barotrauma induced injury. This feature also means that the impacts of catch and release fishing on trevallies are not as great as that for species that are prone to barotrauma.

The indigenous harvest of all trevallies in 2000 was estimated to be 12 tonnes (Henry and Lyle, 2003). Given the factors mentioned previously, the impacts of both recreational and indigenous fishing on trevallies may have increased since the surveys of Henry and Lyle in 2000/2001.

Table 21. Details of the trevally assessment for the Coastal Line Fishery

Trevally	Area	Score	Notes on basis for score adopted
Vulnerability	All waters	1	Fast growing highly mobile species. Does not appear susceptible to barotrauma. The recreational harvest is constrained by the GPPL of 30. Other catch controls are not considered necessary at present.
Current exploitation status	Darwin, Gove, Borroloola	2	A byproduct species taken in relatively small quantities. Harvest probably well below maximum sustainable yield.
	Outer NT areas	1	As above.
Management info needs	Darwin, Gove, Borroloola	1	At this stage, commercial and FTO logbook records sufficient. Very little data from recreational and indigenous sectors.
	Outer NT areas	1	As above.
Recreational significance	Darwin, Gove, Borroloola	3	Excellent sport fish but not a popular table fish. Many fish are released.
	Outer NT areas	3	As above.
Community [non fishing] significance	All waters	1	May be recognised by non-fishers; low significance among general public.
Commercial GVP [CLF only]	All waters	1	Minor component of the commercial CLF catch.
Total	Darwin, Gove, Borroloola	9	Risk ranking = Low
Total	Outer NT areas	8	Risk ranking = Low

Mangrove jack (*Lutjanus argentimaculatus*)

The annual harvest of mangrove jack by the commercial Coastal Line Fishery (i.e. < 1 tonne - Figure 22) constitutes a minor proportion of the overall commercial take of this species, most of which is extracted by the Finfish Trawl Fishery. Hence, the harvest of mangrove jack by this sector of the Coastal Line Fishery is unlikely to threaten the sustainability of the species.

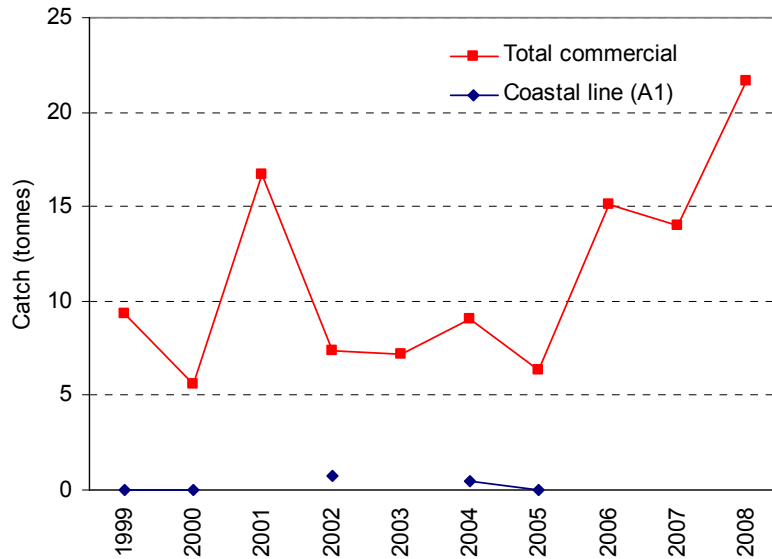


Figure 22. Commercial harvest of mangrove jack from the Coastal Line Fishery (A1) compared to the total harvest across all fisheries

The FTO catch by number of mangrove jack (multiply by 0.0009 for tonnage) over the last decade has almost doubled whilst the FTO harvest of this species has remained more or less the same (Figure 23). Given that the mangrove jack is a highly prized table fish, this trend may suggest a shift in the size distribution of this species (from larger to smaller). It is important to realise that such a shift, if occurring, is being driven by all sectors of the fishery.

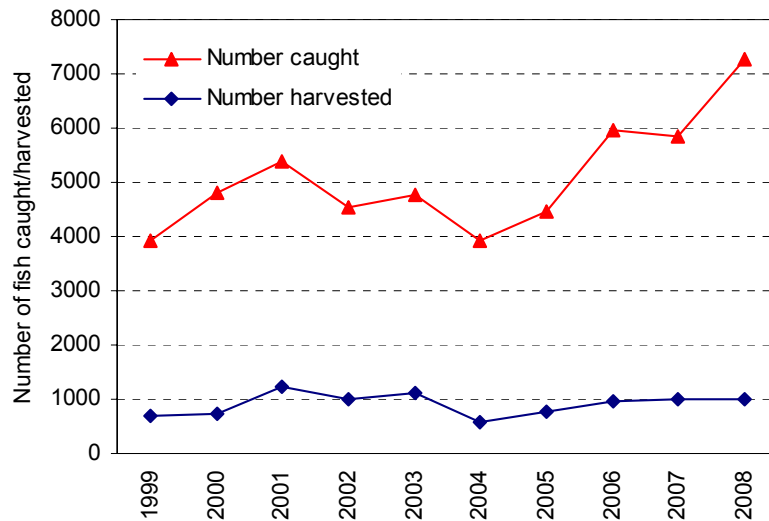


Figure 23. Fishing Tour Operator catch and harvest of mangrove jack

The recreational harvest and release amounts of mangrove jacks in 2000 were estimated at 18 and 9 tonnes, respectively (derived from Henry and Lyle, 2003 and Coleman, 2004). Whilst large (adult) mangrove jacks are caught in deep water, recreational fishers usually target small to medium (immature) fish in shallow estuaries.

The indigenous harvest of all snappers (except red emperor) in 2000 was estimated to be 25 tonnes (Henry and Lyle, 2003). Given the factors mentioned previously, the impacts of both recreational and indigenous fishing on mangrove jack stocks may have increased since the surveys of Henry and Lyle in 2000/2001.

Table 22. Details of the mangrove jack assessment for the Coastal Line Fishery

Mangrove jack	Area	Score	Notes on basis for score adopted
Vulnerability	All waters	4	Comparatively large size at sexual maturity. Exhibits ontogenetic migration (inshore/offshore). May be susceptible to the effects of barotrauma (particularly adults in deep water). The recreational harvest is constrained by the GPPL of 30. The lack of effective controls to contain total catch (across all sectors) heightens the risk to this species.
Current exploitation status	Darwin, Gove, Borroloola	2	Not a commercial target species, largely because it is not common. Highly prized by recreational sector when caught. May suffer from localised depletion under heavy fishing pressure.
	Outer NT areas	1	Little exploitation away from population centres.
Management info needs	Darwin, Gove, Borroloola	2	At this stage, commercial and FTO logbook records sufficient. Very little data from recreational and indigenous sectors.
	Outer NT areas	2	As above.
Recreational significance	Darwin, Gove, Borroloola	3	Not common around Darwin but highly prized if caught.
	Outer NT areas	3	More common in the Gulf of Carpentaria where it is highly prized.
Community [non fishing] significance	All waters	1	Rarely recognised by non-fishers; low significance among general public.
Commercial GVP [CLF only]	All waters	1	Minor component of the commercial CLF catch.
Total	Darwin, Gove, Borroloola	13	Risk ranking = Medium
Total	Outer NT areas	12	Risk ranking = Medium

Snapper – general

Fishes recorded as 'Snapper - general' represent a combination of snappers that have not been identified to species level. Species grouped into this category may include: golden snapper (*Lutjanus johnii*); mangrove jack (*Lutjanus argentimaculatus*); crimson snapper (*Lutjanus erythropterus*); saddletail snapper (*Lutjanus malabaricus*); moses snapper (*Lutjanus russelli*); stripey snapper (*Lutjanus carponotatus*) or red emperor (*Lutjanus sebae*). Grass emperor (*Lethrinus laticaudis*), known locally as tricky snapper, may also be included in this category because of its common name.

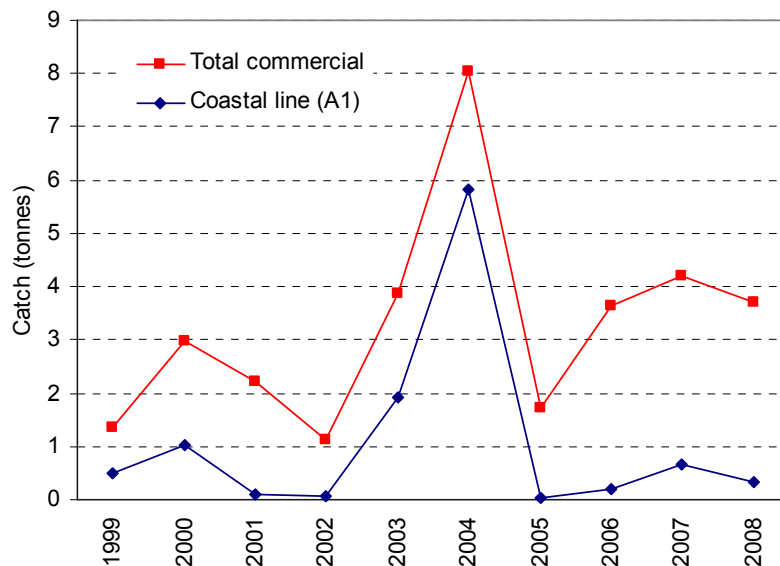


Figure 24. Commercial harvest of snapper - general from the Coastal Line Fishery (A1) compared to the total harvest across all fisheries

The years 2003 and 2004 represent the only instances in the last decade when there has been a considerable deviation in the reporting of the 'snapper – general' category (Figure 24). Otherwise less than 1 tonne of snapper is reported this way in any given year.

FTOs have not recorded 'snapper – general' in their catch returns. Hence, no data is available. This grouping (or similar) has been used in recreational and indigenous fishing surveys in the past. However, the snapper species composition is inconsistent between surveys and any comparisons are considered invalid.

Table 23. Details of the ‘snapper – general’ assessment for the Coastal Line Fishery

Snapper - general	Area	Score	Notes on basis for score adopted
Vulnerability	All waters	4	Unknown, but there may be some vulnerable species within this broad group. Some component species may be susceptible to barotrauma. With the exception of golden snapper (personal possession limit = five), the recreational harvest of snapper species is constrained by the GPPL of 30. The lack of effective controls to contain total catch (across all sectors) heightens the risk to this group of fishes.
Current exploitation status	Darwin, Gove, Borroloola	3	Unknown, as there may be differential exploitation of unidentified component species.
	Outer NT areas	1	As above.
Management info needs	Darwin, Gove, Borroloola	2	Need for improved reporting of snapper species.
	Outer NT areas	2	As above.
Recreational significance	Darwin, Gove, Borroloola	4	NA.
	Outer NT areas	4	NA.
Community [non fishing] significance	All waters	1	NA.
Commercial GVP [CLF only]	All waters	1	Minor component of the commercial CLF catch.
Total	Darwin, Gove, Borroloola	15	Risk ranking = Medium
Total	Outer NT areas	13	Risk ranking = Medium

Stripsey snapper (*Lutjanus carponotatus*)

The commercial Coastal Line Fishery accounts for almost all of the local commercial harvest of stripey snapper (albeit in relatively small amounts – Figure 25). Hence, the stripey snapper harvest by this sector of the Coastal Line Fishery is unlikely to threaten the sustainability of the species.

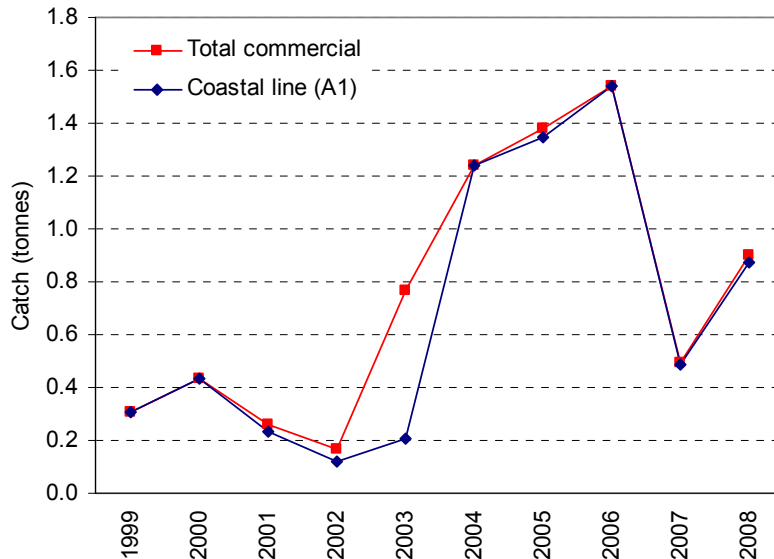


Figure 25. Commercial harvest of stripey snapper from the Coastal Line Fishery (A1) compared to the total harvest across all fisheries

Both the catch and harvest of stripey snapper (by number - multiply by 0.0009 for tonnage) by the FTO sector has increased by a factor of two or more over the last decade (Figure 26). It should be noted that the increase in stripey snapper catch/harvest mirrors the concurrent increase in FTO reef fishing line hours.

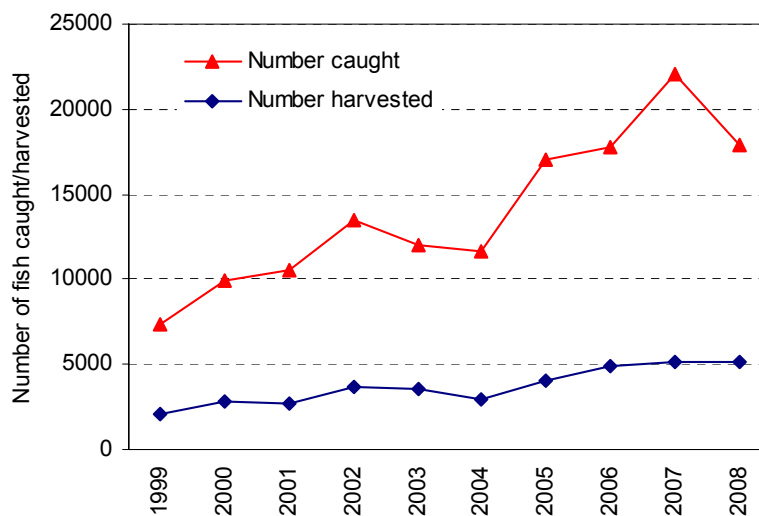


Figure 26. Fishing Tour Operator catch and harvest of stripey snapper

The recreational harvest and release amounts of stripey snapper in 2000 were estimated at 20 and 36 tonnes, respectively (derived from Henry and Lyle, 2003 and Coleman, 2004). A portion of the 36 tonnes of released stripey snapper will have died from the cumulative effects of barotrauma.

The indigenous harvest of all snappers (except red emperor) in 2000 was estimated to be 25 tonnes (Henry and Lyle, 2003). Given the factors mentioned previously, the impacts of both recreational and indigenous fishing on stripey snapper stocks may have increased since the surveys of Henry and Lyle in 2000/2001.

Table 24. Details of the stripey snapper assessment for the Coastal Line Fishery

Stripey snapper	Area	Score	Notes on basis for score adopted
Vulnerability	All waters	3	Relatively fast growth and small size at maturity. Schooling fish that is easily caught. Appears susceptible to barotrauma. The recreational harvest is constrained by the GPPL of 30. The lack of effective controls to contain total catch (across all sectors) heightens the risk to this species.
Current exploitation status	Darwin, Gove, Borroloola	3	Not a target species but schooling behaviour (and thus ease of capture) results in moderate exploitation.
	Outer NT areas	1	Limited exploitation away from population centres.
Management info needs	Darwin, Gove, Borroloola	2	At this stage, commercial and FTO logbook records sufficient. Very little data from recreational and indigenous sectors.
	Outer NT areas	2	As above.
Recreational significance	Darwin, Gove, Borroloola	2	Secondary species, small fish commonly used for live baiting of Spanish mackerel. Growing significance due to the removal of other species from reef systems.
	Outer NT areas	2	As above.
Community [non fishing] significance	All waters	1	Rarely recognised by non-fishers; low significance among general public.
Commercial GVP [CLF only]	All waters	1	Minor component of the commercial CLF catch.
Total	Darwin, Gove, Borroloola	12	Risk ranking = Medium
Total	Outer NT areas	10	Risk ranking = Low

Saddletail snapper (Lutjanus malabaricus)

The harvest of saddletail snapper by the commercial Coastal Line Fishery constitutes a minor proportion (less than 1 tonne annually – Figure 27) of the overall commercial take of this species, most of which is extracted by the Finfish Trawl, Timor Reef and Demersal fisheries. Whilst the latter fisheries typically operate offshore (outside 15 nm of the NT coastline) the potential for connectivity between inshore and offshore populations must be borne in mind.

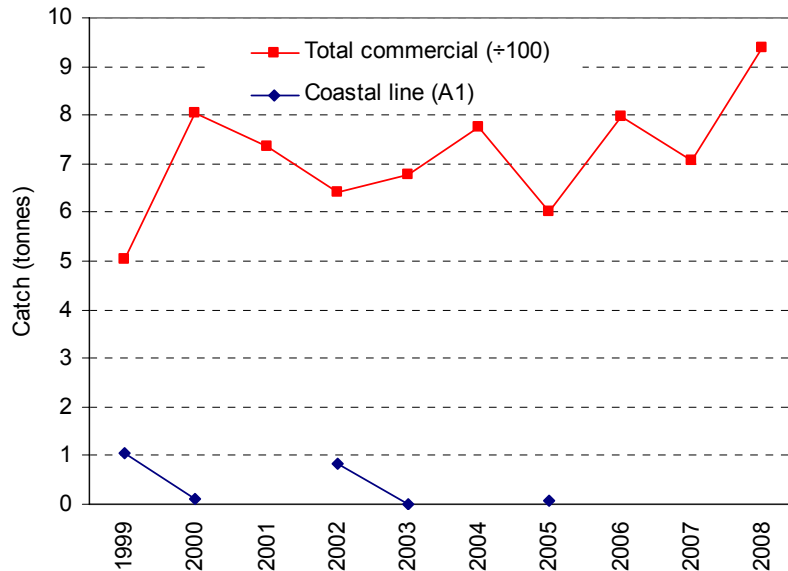


Figure 27. Commercial harvest (±100) of saddletail snapper from the Coastal Line Fishery (A1) compared to the total harvest across all fisheries

The FTO catch and harvest of saddletail snapper (by number - multiply by 0.0009 for tonnage) over the last decade has increased by a factor of roughly three and five, respectively (Figure 28). Again, these figures approximate the concurrent increase in FTO reef fishing line hours over the same period.

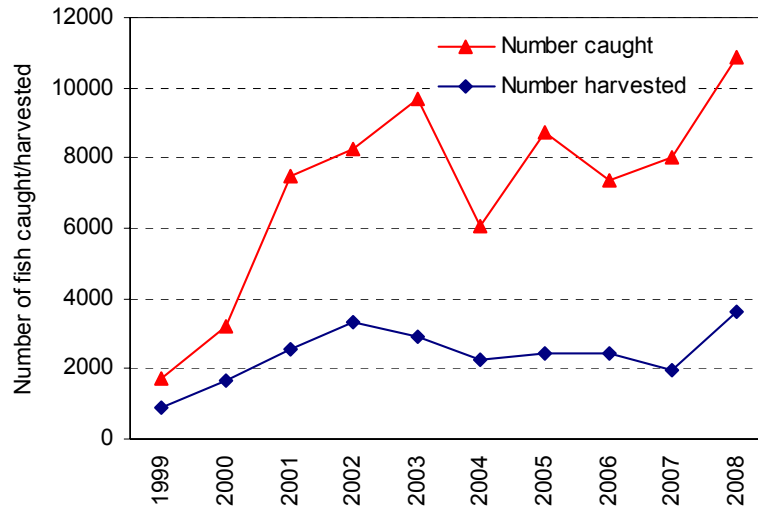


Figure 28. Fishing Tour Operator catch and harvest of saddletail snapper

The recreational harvest and release amounts for saddletail snapper in 2000 were estimated at 20 and 15 tonnes, respectively (derived from Henry and Lyle, 2003 and Coleman, 2004). A portion of the 15 tonnes of released saddletail snapper will have died from the cumulative effects of barotrauma.

The indigenous harvest of all snappers (except red emperor) in 2000 was estimated to be 25 tonnes (Henry and Lyle, 2003). Given the factors mentioned previously, the impacts of both recreational and indigenous fishing on saddletail snapper stocks may have increased since the surveys of Henry and Lyle in 2000/2001.

Table 25. Details of the saddletail snapper assessment for the Coastal Line Fishery

Saddletail snapper	Area	Score	Notes on basis for score adopted
Vulnerability	All waters	4	Schooling species that exhibits ontogenetic migration (inshore/offshore). Appears highly susceptible to the effects of barotrauma. The recreational harvest is constrained by the GPPL of 30. The lack of effective controls to contain total catch (across all sectors) heightens the risk to this species.
Current exploitation status	Darwin, Gove, Borroloola	2	Large quantities of this species taken in some offshore locations by other commercial fisheries. This may exacerbate high fishing pressure around population centres.
	Outer NT areas	1	Low level exploitation away from population centres and targeted offshore fishing operations.
Management info needs	Darwin, Gove, Borroloola	2	At this stage, commercial and FTO logbook records sufficient. Very little data from recreational and indigenous sectors.
	Outer NT areas	2	As above.
Recreational significance	Darwin, Gove, Borroloola	1	Not a target species in populated areas.
	Outer NT areas	1	Not a target species elsewhere.
Community [non fishing] significance	All waters	1	Rarely recognised by non-fishers; low significance among general public.
Commercial GVP [CLF only]	All waters	1	Minor component of the commercial CLF catch.
Total	Darwin, Gove, Borroloola	11	Risk ranking = Low
Total	Outer NT areas	10	Risk ranking = Low

Reef fish/Mixed fish

The reef fish/mixed fish categories include a range of fish species that are harvested by commercial fishers in the NT. These categories are primarily used (in order of frequency) by the commercial Timor Reef, Barramundi, Coastal Line, and Demersal fisheries. The decline in the proportion of reef fish/mixed fish categories reported by commercial coastal line operators (Figure 29) is probably due to improved identification and reporting of common names.

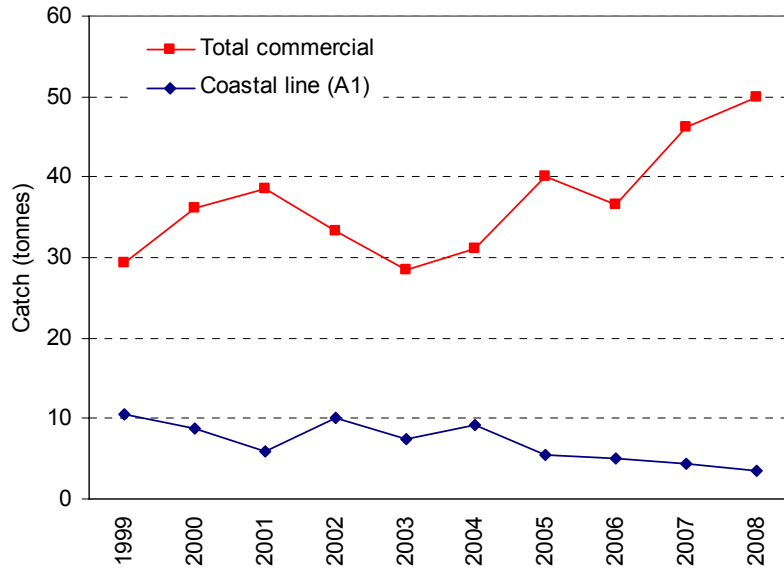


Figure 29. Commercial harvest of reef fish/mixed fish from the Coastal Line Fishery (A1) compared to the total harvest across all fisheries

Fishing tour operators have not recorded 'reef fish/mixed fish' in their catch returns. Hence, no data is available. These groupings are not used in recreational or indigenous fishing surveys either and so comparisons are not possible.

Table 26. Details of the reef fish/mixed fish assessment for the Coastal Line Fishery

Reef fish/mixed fish	Area	Score	Notes on basis for score adopted
Vulnerability	All waters	3	Unknown, but there may be some vulnerable species within these broadly defined groups. Some species may also be susceptible to barotrauma.
Current exploitation status	Darwin, Gove, Borroloola	2	Unknown, as there may be differential exploitation of unidentified component species.
	Outer NT areas	1	As above.
Management info needs	Darwin, Gove, Borroloola	2	Broad categories highlight need for improved logbook reporting (at least to family level).
	Outer NT areas	2	As above.
Recreational significance	Darwin, Gove, Borroloola	1	NA.
	Outer NT areas	1	NA.
Community [non fishing] significance	All waters	1	NA.
Commercial GVP [CLF only]	All waters	1	Minor component of the commercial CLF catch.
Total	Darwin, Gove, Borroloola	10	Risk ranking = Low
Total	Outer NT areas	9	Risk ranking = Low

Table 27. Summary of assessment scores and resulting management priority

Species	Vulnerability	Current exploitation status		Management information needs		Recreational significance		Cultural significance	GVP	TOTAL		Management action requirements	
		Populated areas (Darwin, Gove, Borroloola)	Other waters	Populated areas (Darwin, Gove, Borroloola)	Other waters	Populated areas (Darwin, Gove, Borroloola)	Other waters			Populated areas (Darwin, Gove, Borroloola)	Other waters	Populated areas (Darwin, Gove, Borroloola)	Other waters
Jewfish	3	4	2	4	3	5	5	2	2	20	17	H	M
Golden snapper	4	4	2	4	3	5	5	2	1	20	17	H	M
Shark – general	4	2	1	2	2	1	1	3	1	13	12	M	M
Coral trouts	3	3	2	2	2	3	3	1	1	13	12	M	M
Red emperor	3	2	1	2	2	4	4	1	1	13	12	M	M
Snapper – general	4	3	1	2	2	4	4	1	1	15	13	M	M
Mangrove jack	4	2	1	2	2	3	3	1	1	13	12	M	M
Grass emperor	2	3	1	3	2	2	2	1	1	12	9	M	L
Cods	3	3	1	3	2	2	2	2	1	14	11	M	L
Stripey	3	3	1	2	2	2	2	1	1	12	10	M	L
Spangled	3	3	1	2	2	1	1	1	1	11	9	L	L
Trevallies	1	2	1	1	1	3	3	1	1	9	8	L	L
Blue threadfin	1	2	1	2	2	4	4	1	1	11	10	L	L
Parrotfish/Tuskfish	3	2	1	1	1	1	1	1	1	9	8	L	L
Saddletail	4	2	1	2	2	1	1	1	1	11	10	L	L
Reef/mixed fish	3	2	1	2	2	1	1	1	1	10	9	L	L

SUMMARY

Based on the above scores, the species/groups in the two areas have been placed in order of management priority in Table 27. This ranking process indicates that the highest priorities for management in both the high and low fishing effort areas are black jewfish and golden snapper. These species appear to be at most risk of overfishing, particularly in the high effort zone. The next priority for management action is cods, coral trouts, red emperor, grass emperor and mangrove jack, all of which are significant to the recreational sector. Sharks (mainly taken as an incidental catch) fell into this category due to their susceptibility to fishing, resulting from their generally slow growth, age at maturity and very low fecundity. The remaining stocks all fell into the low priority for management where only basic monitoring of catches is required at present levels of harvesting.

In the outer low fishing pressure zone, basic monitoring is likely to be sufficient until such time as commercial fishing operations expand into these areas and/or greater access is provided to recreational anglers.

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FURTHER READING

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APPENDIX 1 – WORKSHOP PARTICIPANTS

Name	Expertise	Affiliation
Mr Steven Matthews	Fisheries Management / workshop facilitator	DoR, NT Fisheries
Mr Adam Collins	Commercial fishing interests	NT Coastal Line Fishery Licencee Committee
Mr David Baumber	Commercial fishing interests	NT Coastal Line Fishery Licencee Committee
Mr Rob Fish	Commercial fishing interests	NT Seafood Council
Mr Chris Makepeace	Recreational fishing interests	Amateur Fishermen's Association of the NT
Mr Steve Compain	Fishing tour operator	Top End Tackle World
Ms Lyn Lambeth	SeaNet	Oceanwatch Australia
Dr Barry Russell	Marine biodiversity	NRETAS
Sergeant Glenn McPhee	Fisheries compliance	PMFES
Dr Jim Penn	Fisheries research/management	CLFMAC Chair
Dr Mark Grubert	Fisheries Research	DoR, NT Fisheries
Dr Andria Handley	Fisheries Research	DoR, NT Fisheries
Mr Ian Curnow	Fisheries Management	DoR, NT Fisheries
Ms Patti Kuhl	Fisheries Management	DoR, NT Fisheries