Ecological Risk Assessment of the Queensland Coral Fishery

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The Department of Primary Industries and Fisheries (DPI&F) seeks to maximise the economic potential of Queensland's primary industries on a sustainable basis.

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Front cover: Commercial diver collecting coral (photo courtesy of Digital Dimensions).

INTRODUCTION

The Queensland Coral Fishery (QCF) is one of a range of harvest fisheries managed by the Department of Primary Industries and Fisheries (DPI&F). Marine aquarium coral species are marketed both domestically and internationally and are also collected recreationally. More information on the QCF can be found in McCormack (2006) and in the 2007 Annual Status Report (Department of Primary Industries and Fisheries 2008).

This ecological risk assessment is designed to provide a more formal assessment of the impacts of the fishery on harvested species.

The QCF was accredited as a two-year Wildlife Trade Operation (WTO), exempting the fishery from Part 13A export controls of the *Environment Protection and Biodiversity Conservation Act 1999*. The WTO expires on 1 July 2008.

The Australia Government Department of the Environment, Water Resources, Heritage and the Arts (DEWHA) made a number of recommendations that form part of the WTO declaration. The recommendations are designed to address any risks or uncertainties that were identified during assessment of the fishery.

The ecological risk assessment was based on a workshop held on 14 December 2007 in Townsville with key stakeholders. The stakeholders included:

- Experienced commercial collectors
- Science representatives
- Representative from GBRMPA
- Fishery managers
- DPI&F assessment and monitoring staff

A list of attendees can be found in Appendix 1.

The workshop outcomes are to be used to inform the upcoming Coral Fishery Policy Review in 2008 and assist DPI&F in meeting part of the Commonwealth responsibilities to maintain export accreditation for the fishery.

The objectives of the workshop were to:

- *Determine the level of risk to the ecological sustainability of coral species and 'living rock' harvested in the QCF.*
- *Develop management responses to species identified as greater than low risk.*

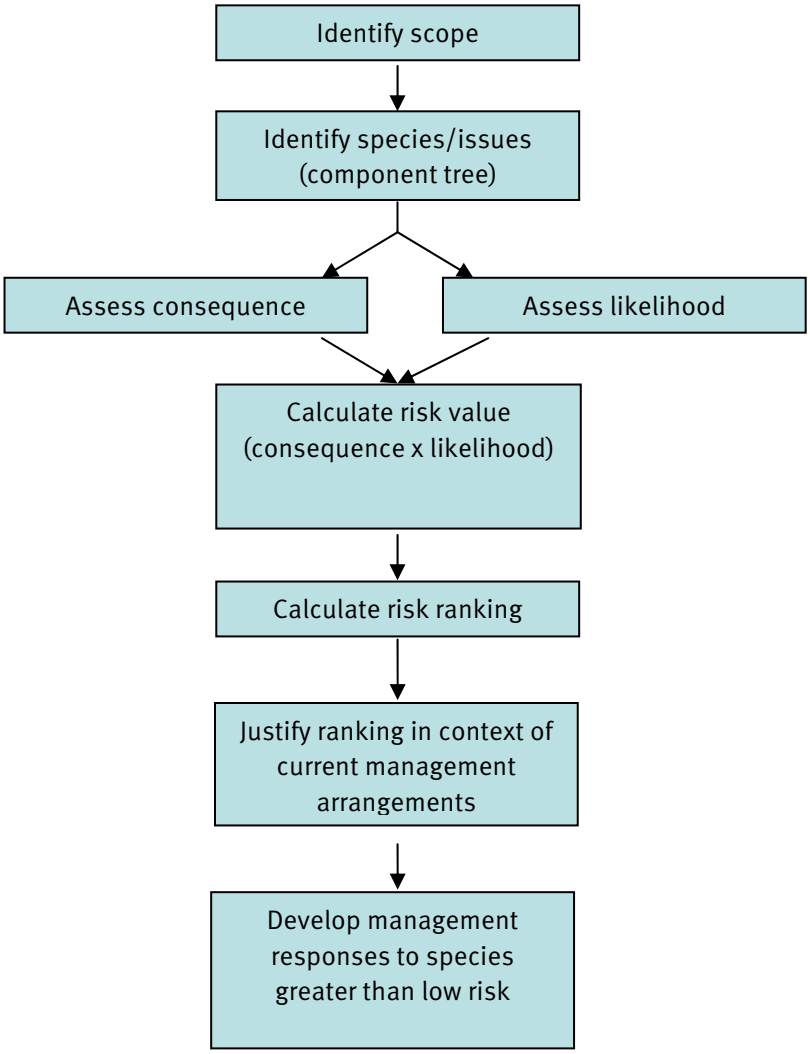

Figure 1. Risk assessment and performance measure development process

Process

Figure 1 provides an overview of the process that was followed in the workshop, highlighting the importance of justifying risks and developing management responses. The risk analysis tool used in this process is based upon the AS/NZ Standard, but adapted for use within the fisheries context (Fletcher *et al*, 2002). It works by assigning a level of consequence (from negligible to catastrophic) and the likelihood of this consequence occurring (from remote to likely) for each issue/species. The overall level of risk assigned to each species is based on the group's assessment of the perceived consequence multiplied by the perceived likelihood. Further information on the process can be found in Fletcher *et al*, 2002.

Much of the information necessary to make informed decisions in this risk assessment is already available or has already been compiled in the document 'A vulnerability assessment of coral species harvested in the Queensland marine aquarium trade' and in an assessment of Live Rock collection in the fishery (see Appendix 4). The outcomes of the vulnerability assessment formed the basis for developing the Scope, Issues and to calculate Risk Values at the workshop. The final values were validated and agreed to by all members of the workshop. Rationale behind the risk rankings was documented to support the decisions and is reported for each species/taxa group.

Scope

Issue identification (component trees)

Issue identification is an important step in any risk assessment process. The purpose of developing component trees is to assist the process of issue identification by moving through each of the ecological components of ESD in a comprehensive and structured manner, maximising consistency and minimising the chances of missing issues. Issues and species were discussed by the Working Group and subsequently added/deleted to a spreadsheet that forms the basis of the generic component tree (Figure 2).

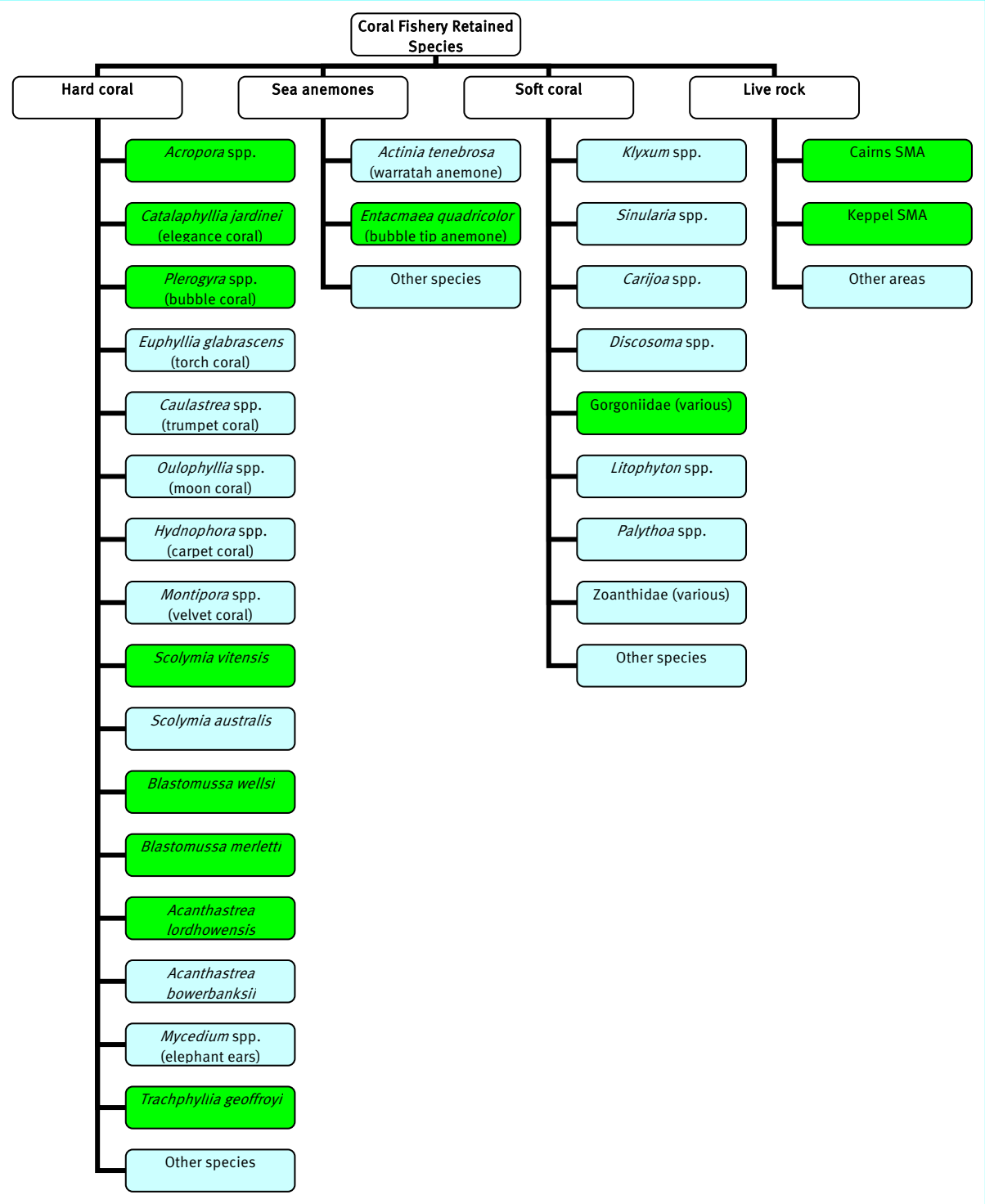

Figure 2. Component tree for retained species in the Queensland Coral Fishery

The Working Group agreed to base the retained species component tree on species assigned a moderate (or greater) level of the risk through the Queensland Coral Fishery Vulnerability Assessment(Roelofs & Silcock 2008). Additionally, species were identified by industry members as to their export status. It was recognised that the outcomes of this assessment may be used to inform decisions on the global trade status of coral species (e.g., CITES listings etc.). Species that are currently exported from the QCF, or species that may be in the future, were therefore assessed as to whether an ecological risk ranking was required. The Working Group determined that not all species required further individual risk ranking, and these do not appear on the retained species component tree (refer to Tables 6—9 for detailed workshop outcomes).

Risk assessment

The risk analysis tool used in this process is based upon the AS/NZ Standard, but adapted for use within the fisheries context (see Fletcher et al. 2002). It works by assigning a level of consequence (from negligible to catastrophic) and the likelihood of this consequence occurring (from remote to likely) for each issue/species. The overall level of risk assigned to each species is based on the group's assessment of the perceived consequence multiplied by the perceived likelihood.

A realistic estimate was made by the group, based upon the combined judgment of the participants, who have significant expertise or experience in the fishery.

When considering the level of consequence or likelihood, participants made an assessment in context of what existing control measures and management arrangements are already in place. When assessing consequence, participants noted the consequence on a population or region, not an individual animal. The consequence and likelihood tables can be found in Appendix 2.

A risk ranking was given, based on the risk value (see Table 3 and 4 in Appendix 2). The risk ranking dictates the amount of justification required and also the extent of management likely to be needed to address the risk.

No taxa collected in the QCF were ranked higher than low risk. Subsequently there is no requirement to develop management responses to mitigate ecological risk for any taxa collected in the fishery. Justification of the risk values and ratings are provided in Appendix 3 (Tables 5—9).

Research and monitoring needs

Working group members recognised that the issues and the associated risk scores reflect the current focus of the QCF. Members supported the concept of a 'watching brief' on harvest rates of all species so that shifts in targeting by the industry and increases in catch rates of species identified as a low risk can be picked up early and the risk level evaluated. The most appropriate management tool for this watching brief role is through a Performance Measurement System (PMS) for this fishery. The QCF PMS is planned to be developed in 2008 and will provide a formal process for the review of catch data.

The QCF ecological risk assessment will also be reviewed every three years to account for new information on coral collection fisheries.

APPENDIX 1–LIST OF WORKSHOP ATTENDEES

Lyle Squire Jnr	Commercial coral collector
Allan Cousland	Commercial coral collector
Rob Lowe	Commercial coral collector
Ros Paterson	Commercial coral collector
Scott Smithers	James Cook University
Morgan Pratchett	ARC Centre of Excellence for Coral Reef Studies, James Cook University
Russell Kelley	Independent Science representative
Jacqui Wolstenheim	James Cook University
Margie Atkinson	Great Barrier Reef Marine Park Authority
Brigid Kerrigan	Fisheries resource management, DPI&F
Tara Smith	Fisheries resource management, DPI&F
Anthony Roelofs	Assessment and Monitoring Unit, DPI&F

APPENDIX 2–CONSEQUENCE AND LIKELIHOOD TABLES

Table 1. Detail of consequence table for retained species or species groups. Adapted from Fletcher et al. (2002).

Level	Ecological sustainability of retained species
Negligible (0)	Insignificant impacts to populations, (dynamics/structure/size)
Minor (1)	Detectable, but minimal localised impact on populations
Moderate (2)	Noticeable local impact, likely minimal impact on regional populations
Severe (3)	Significant impacts on populations
Major (4)	Long term local depletion if continued
Catastrophic (5)	Regional depletions are imminent that may result in extinctions

Table 2. Detail of likelihood table for target species or species groups. Adapted from Fletcher et al. (2002).

Level	Descriptor
Likely (6)	Is expected to occur often
Occasional (5)	Is expected to occur moderately
Unlikely (4)	Is expected to occur only infrequently
Possible (3)	Unlikely, but has been known to occur elsewhere
Rare (2)	Happens only very rarely
Remote (1)	Never heard of, but not impossible

Table 3. Risk matrix – numbers in cells indicate risk value, the colours/shades indicate risk rankings (see Table 4 for details). Adapted from Fletcher et al. (2002).

		Consequence					
Likelihood		Negligible	Minor	Moderate	Severe	Major	Catastrophic
		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 4. Risk ranking definitions. Adapted from Fletcher et al. (2002).

RISK		Reporting	Management Response
Negligible	0	Short Justification Only	Nil
Low	1-6	Full Justification needed	None Specific
Moderate	7-12	Full Performance Report	Continue Current Management Arrangements
High	13-18	Full Performance Report	Changes to management required
Extreme	19-30	Full Performance Report	Substantial additional management needed urgently

Output from the Risk Assessment

The actual risk assessment is not just the scores generated during the assessment process but needs to include the appropriate level of documentation/justification for the categories selected.

APPENDIX 3–RISK RATINGS

Table 5. Risk ranking – Summary

Retained Species				Consequence	Likelihood	Risk value	Risk ranking
Live rock							
Cairns SMA				1	1	1	Low
Keppel SMA				1	1	1	Low
Other areas				0		0	Negligible
Family	Genus	Species	Common name				
Sea anemones – Order Actiniaria							
Actiniidae	*Actinia*	*tenebrosa*	Waratah Anemone	0		0	Negligible
Actiniidae	*Entacmaea*	*quadricolor*	Bubble tip anemone	1	1	1	Low
All others				0		0	Negligible
Soft corals – Order Alcyonacea							
Alcyoniidae	*Klyxum*	spp.	Leather Corals	0		0	Negligible
Alcyoniidae	*Sinularia*	spp.	Leather Corals	0		0	Negligible
Clavulariidae	*Carijoa*	spp.	Soft coral	0		0	Negligible
Corallimorphidae	*Discosoma*	spp.	Corallimorph	0		0	Negligible
Gorgoniidae	*Various*	spp.	Gorgonians	1	1	1	Low
Nephtheidae	*Litophyton*	spp.	Nepthea coral	0		0	Negligible
Zoanthidae	*Palythoa*	spp.	Champagne cups	0		0	Negligible
Zoanthidae	*Various*	spp.	Zooanthid	0		0	Negligible
All others				0		0	Negligible
Hard corals – Order Scleractinia							
Acroporidae	*Acropora*	spp.	Staghorn coral	1	1	1	Low
Caryophyllidae	*Catalaphyllia*	*jardinei*	Elegance coral	1	2	2	Low
Caryophyllidae	*Plerogyra*	spp.	Bubble coral	1	1	1	Low
Caryophyllidae	*Euphyllia*	*glabrascens*	Torch coral	1	1	1	Low
Dendrophyllidae	*Duncanopsammia*	*axifuga*	Whisker coral	1	1	1	Low
Faviidae	*Caulastrea*	spp.	Trumpet coral	0		0	Negligible
Faviidae	*Oulophyllia*	spp.	Moon coral	0		0	Negligible
Merulinidae	*Hydnophora*	spp.	Carpet coral	0		0	Negligible
Acroporidae	*Montipora*	spp.	Velvet coral	0		0	Negligible
Mussidae	*Scolymia*	*vitensis*		1	1	1	Low
Mussidae	*Scolymia*	*australis*		0		0	Negligible
Mussidae	*Blastomussa*	*wellsi*		1	1	1	Low
Mussidae	*Blastomussa*	*merletti*		1	1	1	Low
Mussidae	*Acanthastrea*	*lordhowensis*		1	1	1	Low
Trachyphyllidae	*Trachyphyllia*	*geoffroyi*	Open brain coral	1	1	1	Low
All others				0		0	Negligible

Appendix 4–Detailed workshop outcomes for all groups

Table 6. Risk ranking–Living rock

Live Rock	Industry practices ▪ Collection depth varies: mainly between 0-5m in northern regions and 6—15m in southern regions/Keppels. ▪ Collectors take loose rock (algae cover on all sides) mainly from natural collection areas. ▪ Market forces and effort input/economics dictate that live rock is taken from high energy areas where it accumulates and can be removed by hand and is therefore of saleable quality. ▪ Live rock removal at current rates and staggered collection practices used by industry is unlikely to be to detectable Science representatives comments ▪ Two types of live rock–1. live rock that looks identifiably like dead coral (e.g., branching Acropora pieces) and 2. 'rock' like live rock. ▪ Rate of formation may be highly variable between the 2 types. Age can be determined however radioactive dating of coral is expensive. ▪ Some live rock may be formed from $CaCO_3$ laid down over hundreds of years. ▪ Fringing reefs on inner GBR don't tend to have unidirectional currents but material tends to accumulate at the reef front. ▪ 10kg $CaCO_3/m^2$ per year at reef slopes (5m+; 100% live coral cover). 4kg per year on crests. Less production on lower sides (sandy) 0.8kg. ▪ Rate of infill of live rock accumulation areas is a function of the size of reef and sea level stability. ▪ Rates of formation dependant on the source type of coral (e.g. Porites) and disturbance that breaks down the live source corals to become live rock. ▪ Old live rock tends to be massive, solid coral based, newer rock - branching types. ▪ Could take educated guess on source coral based on coral types in the surrounding community. ▪ Live rock tends to be ephemeral/dynamic habitat, unconsolidated, delivered by hydrodynamic energy ▪ Unlikely to be many species that specifically benefit from the habitat and removal in typically disturbed habitats likely to have negligible ecological effect. ▪ Suggestion that review of live rock collection should involve an independent visual assessment of the collection areas relative to control sites (identify as a research need) to determine impact of removal.

	Consequence	Likelihood	Risk level	Export	Justification
Cairns area	1	1	1	No	Perception of issue considered in consequence score. 1 is precautionary. Likelihood 1 because impact is not heard of but is possible. Regular collection sites may be avoided at times due to insufficient quality of live rock.
Keppel area	1	1	1	No	No necessity to move away from regular collection areas because no noticeable change in production/availability of rock. It is considered that collectors could not possibly take enough live rock to have a significant impact on the structure of the reef, which is the essential function of live rock's presence. Industry observation that live coral growth is more likely on substrate with less coralline growth. Keppel's receives frequent natural disturbances. System demonstrates resilience to frequent disturbance. Aerial photography could provide a rudimentary estimate of live rock cover. frequent less severe disturbances creates resilience in the ecosystem.

Table 7. Risk ranking–Sea anemones

Sea anemones (Order Actiniaria)								
Family	Genus	Species	Common name	Consequence	Likelihood	Overall Risk level	Export	Justification
Actiniidae	*Actinia*	*tenebrosa*	Waratah Anemone	0		0	Yes	Occur in diversity of environments – fishery accessibility only to some of these. Very abundant where they are found. Unlikely to be effected by coral bleaching given their intertidal distribution and rock pool habitat preferences.
Actiniidae	*Entacmaea*	*quadricolor*	Bubble tip anemone	1	1	1	No	Issue in Keppel region (bleached). Shallow water colonise vulnerable to bleaching, deeper water colonies more robust during bleaching events. Majority of colonies deeper than 3m. Industry unlikely to collect from shallows. ERA scores assigned just for Keppel area.
Stichodactylidae	*Stichodactyla*	*mertensii*	Mertens' sea anemone			0	No	Negligible risk
Stichodactylidae	*Stichodactyla*	*haddoni*	Haddon's sea anemone			0	No	Negligible risk
Stichodactylidae	*Heteractis*	*magnifica*	Magnificant sea anemone			0	No	Negligible risk
Stichodactylidae	*Heteractis*	*crispa*	Leathery sea anemone			0	No	Negligible risk
Stichodactylidae	*Heteractis*	*aurora*	Beaded sea anemone			0	No	Negligible risk
Stichodactylidae	*Stichodactyla*	*gigantea*	Gigantic sea anemone			0	No	Negligible risk

Table 8. Risk ranking–Soft corals

Soft corals (Order Alcyonacea)	Take is artificially restricted by market demand (comprises between 10-50% of the take during trips). Soft coral taxonomy much more complicated than scleractinian taxonomy (often requires spicule analysis). Public interest more advanced than scientific knowledge.							
Family	Genus	Species	Common name	Consequence	Likelihood	Overall Risk level	Export	Justification
Alcyoniidae	*Klyxum*		Leather Corals	0		0	No	Only parts of colony are removed (always some left to regenerate) so vulnerability rating is considered over-precautionary. Range extends to 10m depth. Soft coral harvest typically restricted by market demand.
Alcyoniidae	*Rhytisma*					0	No	Negligible risk
Alcyoniidae	*Lobophytum*		Leather corals			0	No	Negligible risk
Alcyoniidae	*Cladiella*		Leather Corals			0	No	Negligible risk
Alcyoniidae	*Sinularia*		Leather Corals	0		0	Yes	Northern species (north of Mackay). Fairly abundant, only select small specimens.
Alcyoniidae	*Paraminabea*		Soft coral			0	No	Negligible risk
Alcyoniidae	*Sarcophyton*		Leather corals			0	No	Negligible risk
Antipathidae	*Cirrhipathes*		Spiral coral			0	No	Negligible risk
Axinellidae	*Phakellia*		Leather coral			0	No	Negligible risk
Briareidae	*Briareum*		Star Polyps			0	No	Negligible risk
Clavulariidae	*Carijoa*		Soft coral	0		0	No	Widespread (tropical & temperate). Collected at 5—12m depth.
Clavulariidae	*Clavularia*		Waving hand			0	No	Negligible risk
Corallimorphidae	*Discosoma*		Corallimorph	0		0	Yes	Exported in small numbers but expected to increase. Found in extensive beds, exhibits budding (readily). Form clumping colonies. Larger pieces better.
Discosomatidae	*Rhodactis*		Elephant ears			0	No	Negligible risk
Discosomatidae	*Amplexidiscus*		Mushroom coral			0	No	Negligible risk
Ellisellidae	*Ellisella*		Deepwater gorgonia,			0	No	Negligible risk
Ellisellidae	*Ctenocella*		Whip coral			0	No	Negligible risk
Gorgoniidae	Various		Gorgonians	1	1	1	Yes	Industry would export as curio if not for confusion with black coral - common misidentification. Is exported live. Absence of knowledge about this group. Occur in deeper areas - limited accessibility. Suggested that they are so rarely disturbed by natural disturbance that collection would be likely to have impact on some of the populations (Consequence = 1, Likelihood =1)
Helioporidae	*Helioporidae*	*coerulea*	Blue coral			0	No	Negligible risk

Family	Genus	Species	Common name	Consequence	Likelihood	Overall Risk level	Export	Justification
Melithaeidae	*Melithaea*		Gorgonian coral			o	No	Negligible risk
Nephtheidae	*Litophyton*		Nepthea coral	o		o	No	Potential export group. Require extra care to extend travelling time over 30hrs. Literauture suggests rare on GBR, industry suggest more locally abundant than this. Harvested in a grazing manner - only a few taken despite high abundance (as with other soft corals). Have to detach soft corals from substrate, which forces selective harvesting.
Nephtheidae	*Scleronephthya*		Cauliflower corals,			o	No	Negligible risk
Nephtheidae	*Stereonephthya*		Golden soft coral			o	No	Negligible risk
Nephtheidae	*Dendronephthya*		Cauliflower corals			o	No	Negligible risk
Nephtheidae	*Nephthea*		Soft coral			o	No	Negligible risk
Nephtheidae	*Capnella*		Soft coral			o	No	Negligible risk
Nephtheidae	*Paralemnalia*		Soft coral			o	No	Negligible risk
Nephtheidae	*Lemnalia*		Soft coral			o	No	Negligible risk
Nidaliidae	*Siphonogorgia*		Soft coral			o	No	Negligible risk
Tubiporidae	*Tubipora*		Organ pipe coral			o	No	Negligible risk
Clavularidae	*Pachyclavularia*					o	No	Negligible risk
Xeniidae	*Efflatounaria*		Waving Hand Coral			o	No	Negligible risk
Xeniidae	*Asterospicularia*					o	No	Negligible risk
Xeniidae	*Xenia sp1*		Pulse coral			o	No	Negligible risk
Xeniidae	*Anthelia*		Waving Hand Coral			o	No	Negligible risk
Xeniidae	*Sympodium*		Waving Hand Coral			o	No	Negligible risk
Xeniidae	*Xenia sp2*		Waving Hand Coral			o	No	Negligible risk
Xeniidae	*Cespitularia*		Waving Hand Coral			o	No	Negligible risk
Zoanthidae	*Palythoa*		Champagne cups	o		o	Yes	Spread rapidly, matting, encrust substrate. Selective harvesting only - select isolated or protuding pieces that are readily removable, leaving the majority to regenerate.
Zoanthidae	Various		Zooanthid	o		o	Yes	Spread rapidly, matting, encrust substrate. Selective harvesting only - select isolated or protuding pieces that are readily removable, leaving the majority to regenerate.

Table 9. Risk ranking – Hard corals

Hard corals (Order Scleractinia)								
Family	Genus	Species	Common name	Consequence	Likelihood	Overall risk level	Export	Justification (workshop notes)
Acroporidae	*Acropora*		Staghorn coral	1	1	1	Yes	CITES doesn't require to be broken down to species. Assigning single vulnerability ratings to whole group won't paint accurate picture due to diversity within group. Small staghorn growth-form colonies are most popular in live trade (as they grow quickly in tanks). Curio targets finger corals, some plating, larger robust branches of colonies. No removal of whole large colonies (base plate is left to regrow). There are a few species that could be rare (e.g. colonies found in halomeda beds and channels). Not considered to be an issue in this fishery. *Acropora* is dominant in GBR reefs so is of importance ecologically. Some fish species dependent on presence of Acropora (estimated at 10% of reefal fish communities).
Caryophyllidae	*Catalaphyllia*	*jardinei*	Elegance coral	1	2	2	Yes	Quite widely distributed through Indo-Pacific. Can be found in high current waters but generally in turbid waters so is not particularly specialised in niche requirements. Found in areas of large tidal movement in WA and Mackay. Collected to 15—20m but extends below 30m. Locally abundant. Large pieces can be segmented so only part of colony removed. Whole small colonies also taken. Rarer in southern waters. In north, some evidence of decline in heavily fished areas. Other areas have exhibited no noticeable decline over many years of collection.
Caryophyllidae	*Plerogyra*		Bubble coral	1	1	1	Yes	Not very popular in aquarium trade. Industry suggests locally abundant
Caryophyllidae	*Euphyllia*		Branching hammer coral			0	Yes	See species breakdown below
	Euphyllia	*cristata*				0	Potential	Desire to export but not specifically on export list.
	Euphyllia	*parancora*				0	Potential	Desire to export but not specifically on export list.
Caryophyllidae	*Euphyllia*	*glabrascens*	Torch coral	1	1	1	Yes	Industry suggests very common in certain areas, particularly inter-reefal areas. Important species to QLD fishery and subject to some global concerns.
Caryophyllidae	*Physogyra*		Bubble coral			0	Yes	Negligible risk

Family	Genus	Species	Common name	Consequence	Likelihood	Overall risk level	Export	Justification (workshop notes)
Dendrophyllidae	*Duncanopsammia*	*axifuga*	Whisker coral	1	1	1	Yes	Industry suggests more abundant than descrbed in the Vulnerability assessment. Occurs in inter-reefal habitat to 30m (majority of collection) and as shallow as 2m in coastal waters. Eco-niche more generalist than specialist. Important to industry and on international radar.
Dendrophyllidae	*Dendrophyllia*		Cup corals			o	No	Not present in certain areas for years, pop up occasionally.
Dendrophyllidae	*Turbinaria*		Cup coral			o	Yes	Negligible risk
Dendrophyllidae	*Tubastrea*		Daisy coral			o	No	Forms complex group with *Dendrophyllia* - difficult to distinguish between the two species.
Dendrophylliidae	*Balanophyllia*		Flower coral			o	No	Solitary; bottom dwelling; with or without zooxanthellae
Dendrophylliidae	*Heteropsammia*		Button coral			o	No	Negligible risk
Faviidae	*Caulastrea*		Trumpet coral	o		o	Yes	Not a rare coral and not restricted in niche. Industry is focused on *C.furcata* (this is the more common species).
Faviidae	*Platygyra*		Maze coral			o	Yes	Negligible risk
Faviidae	*Moseleya*		Corrallimorph coral			o	Yes	Negligible risk
Faviidae	*Leptastrea*		Star coral			o	No	Negligible risk
Faviidae	*Plesiastrea*		Star coral			o	No	Negligible risk
Faviidae	*Oulophyllia*		Moon coral			o	Yes	Negligible risk. Some of industry has difficulties distinguishing from *Platygyra*
Faviidae	*Favites*		Moon coral			o	Yes	Negligible risk
Faviidae	*Goniastrea*		Honeycomb coral			o	Yes	Negligible risk
Faviidae	*Montastrea*		Moon coral			o	No	Negligible risk
Faviidae	*Leptoria*		Maze coral			o	Yes	Negligible risk
Faviidae	*Favia*		Moon coral			o	Yes	Negligible risk
	Syphastrea						Yes	Negligible risk
	Echinopora						Yes	Negligible risk
Fungidae	*Fungia*		Disk coral			o	Yes	Negligible risk
Fungiidae	*Cycloseris*		Domed mushroom coral			o	No	Negligible risk
Fungiidae	*Diaseris*		Diaseris			o	Yes	Negligible risk
Fungiidae	*Heliofungia*	*actinoformis*	Tentacled mushroom			o	Yes	Negligible risk
Fungiidae	*Polyphyllia*		Slipper coral			o	No	Negligible risk
Merulinidae	*Hydnophora*		Carpet coral	o		o	Yes	Hard to get specimens suitable for sale/collection. Collect small colonies mainly of species exesor. Not only found in protected habitats/areas

Family	Genus	Species	Common name	Consequence	Likelihood	Overall risk level	Export	Justification (workshop notes)
Merulinidae	*Merulina*		Ruffled coral			0	Potential	Negligible risk
Acroporidae	*Montipora*		Velvet coral	0		0	Potential	Can occur in deeper water but most commonly <10m. Increasing popularity in aquarium trade. This genera includes numerous species.
Mussidae	*Symphyllia*		Lobed brain coral			0	No	Negligible risk
Mussidae	*Scolymia*		Donughnut coral			0	Yes	See species breakdown below
Mussidae	*Scolymia*	*vitensis*		1	1	1	Yes	Name often interchangeable with *Cynarina deshayesiana*. Inter-reefal soft bottom, 15—30m. Small monocentric (solitary) colonies (lawn bowl sized - smaller ones not valuable). Moderately common in ideal habitat (around 20m depth) - abundant where *Catalaphyllia* not so abundant. Selected for colour, not size. Variety of colours occur together. Typically byproduct. No observed detriment from collection over 10+yrs.
Mussidae	*Scolymia*	*australis*		0		0	Yes	Occurs on solid substrate (reefal walls and solid inter-reefal shoal). Can occur in shallow waters where overhangs are present (i.e. shade). Mostly 12-20m. Moderately common. Solitary disc-shaped colonies. Selected for colour. Collected pieces are mostly red and green, striped varieties in southern waters however majority of corals are brown and are not collected. Chiseled or levered from substrate but substrate left intact (this is the case with all corals growing on solid structure).
Mussidae	*Micromussa*		Micromussa			0	No	Negligible risk
Mussidae	*Blastomussa*		Pineapple coral			0	Yes	See species breakdown below
Mussidae	*Blastomussa*	*wellsi*		1	1	1	Yes	Generally found in turbid, deeper water habit (>12m, typically 16—35m+). More common on reef but extends to inter-reefal shoals. Requires consolidated substrate. Not common in large colonies. Moderately common in deep waters. EU concern and problems in Indo.
Mussidae	*Blastomussa*	*merletti*		1	1	1	Yes	Found in large colonies. Moderately common. Commonly in 15—20m reef edge but also inter-reefal hard substrate. Mostly on hard substrate but forms bommies on soft sediment.
Mussidae	*Acanthastrea*		Starry cup coral			0	Yes	Check updated log records for policy review.
Mussidae	*Acanthastrea*	*lordhowensis*		1	1	1	Yes	Market demand for multi-coloured specimens so plain varieties not collected. Quite common.

Family	Genus	Species	Common name	Consequence	Likelihood	Overall risk level	Export	Justification (workshop notes)
Mussidae	*Acanthastrea*	*bowerbanksi*				o	Yes	Not common. Most are dull-coloured colonies and are not taken.
Mussidae	*Acanthastrea*	*hillae*				o	Yes	Not common. Most are dull-coloured colonies and are not taken.
Mussidae	*Mussa*		Spiny flower coral			o	No	Not in Australia
Mussidae	*Cynarina*	*lacrymalis*	Button coral			o	Yes	Negligible risk
		deshayesiana				o	Yes	Negligible risk
	Lobophyllia					o	Yes	Negligible risk
Occulinidae	*Galaxea*		Galaxy coral			o	No	Negligible risk
Pectinidae	*Pectinia*		Lettuce coral			o	Yes	Negligible risk
Pectiniidae	*Mycedium*		Elephant ears			o	Yes	Grouped with *Echinophyllia* and *Acanthastrea* as generic plating group
Pectiniidae	*Echinophyllia*		Encrusting coral			o	Yes	Negligible risk
Pocilloporidae	*Stylophora*		Finger coral			o	Yes	Negligible risk
Pocilloporidae	*Seriatopora*		Birds nest coral			o	Yes	Negligible risk
Pocilloporidae	*Pocillopora*		Cauliflower coral			o	Yes	Negligible risk
Poritidae	*Alveopora*		Daisy coral			o	No	Negligible risk
Poritidae	*Porites*		Boulder coral			o	Yes	Negligible risk
Poritidae	*Goniopora*		Flowerpot coral			o	Yes	Negligible risk
Siderastreidae	*Pavona*		Leaf coral			o	No	Negligible risk
Trachyphyllidae	*Trachyphyllia*	*geoffroyi*	Open brain coral	1	1	1	Yes	Found in narrow inlets, off Arlington lagoon bommies (15—30m depth, common in 18m+). Similar habit to *Catalaphyllia* but possibly more generalist/widespread. Not observed in southern waters. Locally prolific. Size and colour selected. Max about lawn bowl sized, average baseball-sized. Approx 5-10% of cover of this species will be colourful enough for collection. No observed decline in abundance in regularly dived sites over long time period (e.g. 10yrs). Inter-reefal habitats have ephemeral algal growth that can camouflage coral.
Milleporidae/Millepora	*Millepora*		Fire coral			o	No	Negligible risk
Stylasteridae	*Distichopora*		Miniature fan coral			o	Yes	Negligible risk

Appendix 4: Background Paper: Harvest of Live Rock in Queensland and Ecological Risk Assessment Workshop outcomes

DPI&F, Revised February 2008

INTRODUCTION

Live rock is composed of dead coral skeletons colonised by a suite of micro-organisms and algal material. Live rock is used in aquaria as both substrate and a living filtration system. Live rock is harvested in the Queensland Coral Fishery and is the major portion of the catch in the fishery (by weight).

This paper outlines the characteristics of the fishery for live rock on the Great Barrier Reef and identifies a preliminary list of issues for which expertise is sought to aid an assessment of the sustainability of live rock harvest.

Live rock harvest in the coral fishery

The coral fishery is mainly focused in two regions – the Cairns offshore area (CNS) and the Keppel Bay & Islands area (KPL). The harvest of coral and live rock in other areas is very minor and will not be discussed in detail in this paper.

Figure 1 shows the harvest of different types of coral across the different regions in the 2006-07 financial year. Previous years catches are not presented or discussed in this paper due to the limitations in the data collected prior to July 2006.

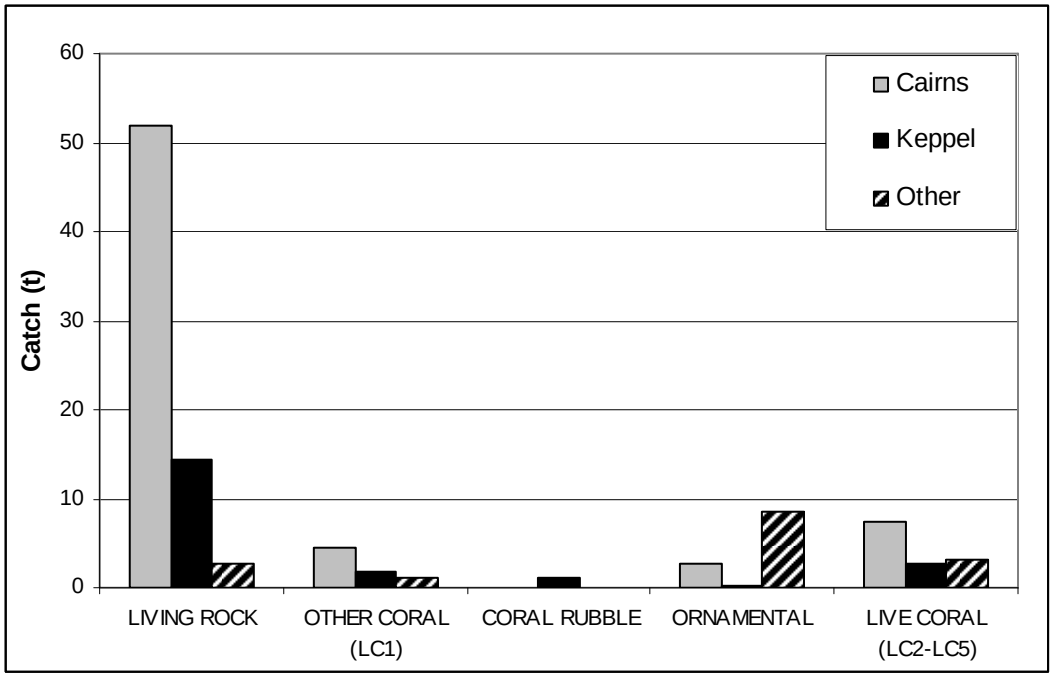

Figure 1: Harvest of coral by category by region (note: LC1 is a category comprising very small corals and small corals with attached live rock)

The harvest of live rock from CNS and KPL dominates the overall catch in the coral fishery.

A combined limit of 140 t applies to the take of live rock, ornamental coral, coral rubble and certain small corals (collectively known as "other coral") in the coral fishery. With a total of 69 t harvested in the last financial year, live rock comprised more than 75% of the take from the "other coral" category. Table 1 provides the catch figures per region for live rock.

Table 1: Live rock harvest by region for the 2006-07 financial year.

Category	CNS catch (tonnes)	KPL catch (tonnes)	Outside regions catch (tonnes)	Total catch (tonnes)
Living Rock (Whole Live)	51.821	14.405	2.691	68.917

Cairns region

The following maps illustrate the spatial extent in which live rock was harvested in the CNS high use region.

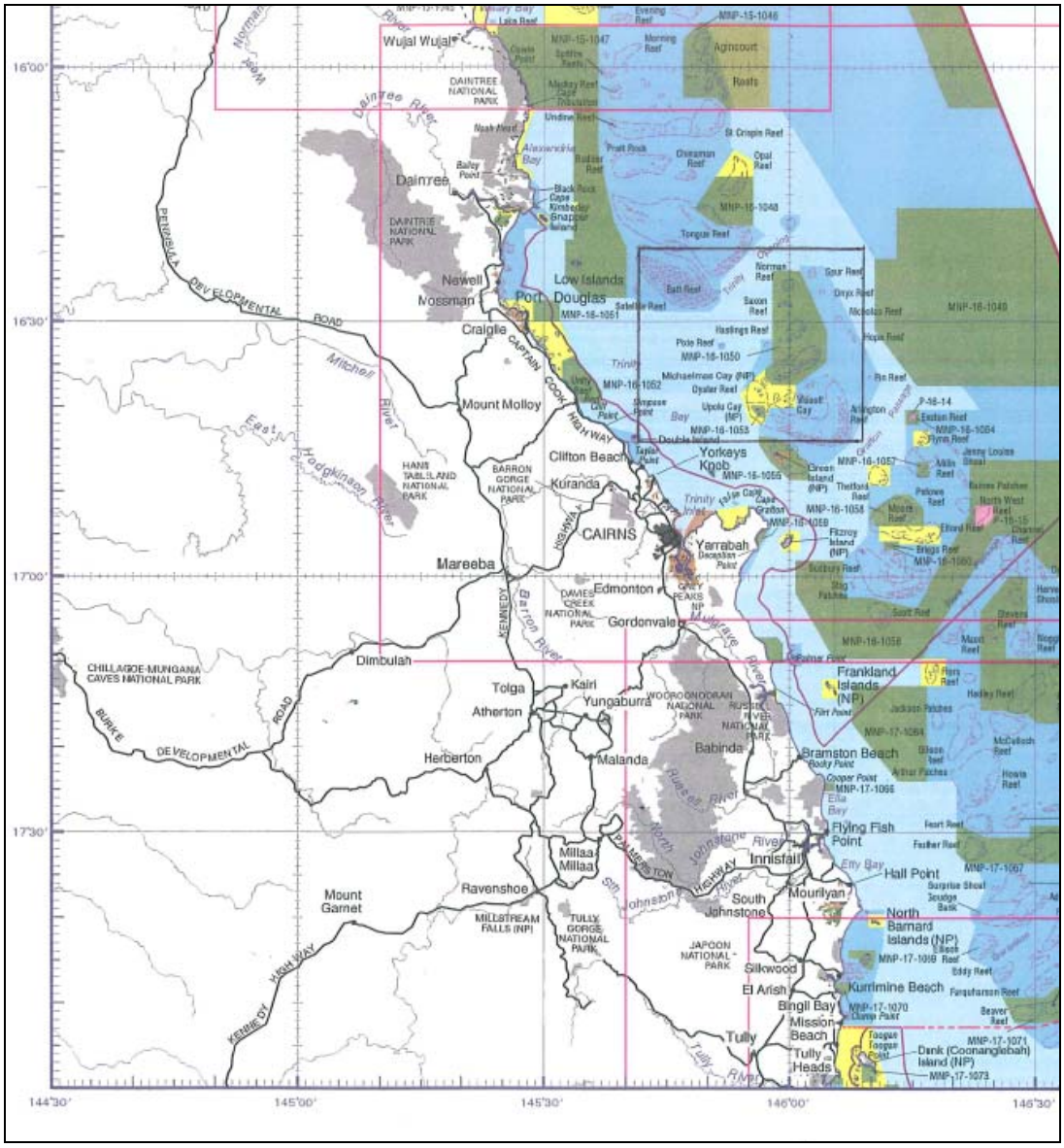

Figure 2: Map showing area of live rock harvest (indicated by black box) in the Cairns region

See Figure 3 for higher resolution of the area of harvest indicated in the figure above.

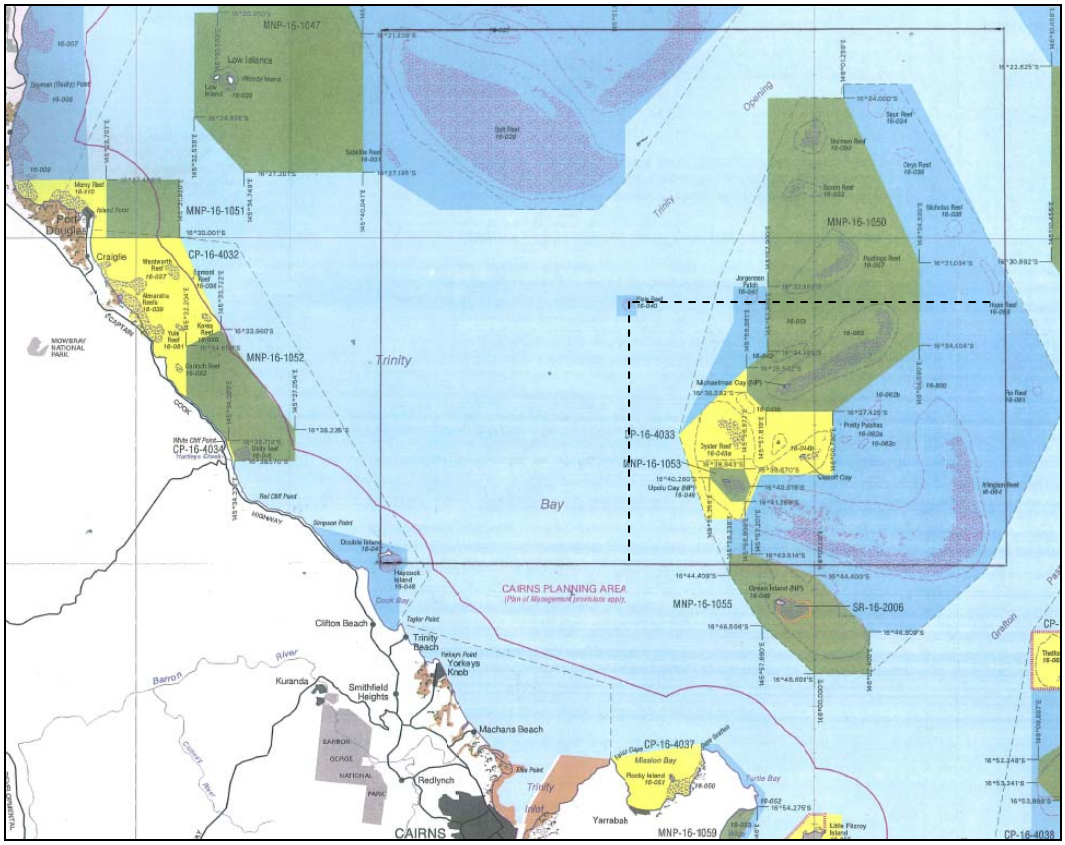

Figure 3: Map showing area of live rock harvest (indicated by black box) in the Cairns region and area of majority of live rock harvest (indicated by dashed box)

A total of 51.821 tonnes (t) of live rock taken equates to approximately 1295.5 m² or 0.13 hectares of substrate (slightly smaller than an Olympic-sized swimming pool). The live rock was taken from a fished area of about 10.85 km² (calculated as the area within a 150m radius of the recorded GPS point of each fished location) which equates to about 4.776 t /km². Assuming that each fished location and surrounding 150m radius is a continuous live rock patch, the harvest represents only 0.012% or 1/10,000 of the total live rock available at fished sites (approx. 434,000 t).

Keppel region

Figure 4 shows the area in which live rock was harvested in the KPL high use region.

A total of 14.404 t of live rock taken equates to approximately 360.1 m² or .036 hectares of substrate. The live rock was taken from an area of 3.35 km² (calculated as for Cairns), which roughly equates to 4.305 t /km². Assuming that each fished location and surrounding 150m radius is a continuous live rock patch, the harvest represents only 0.011% or 1/10,000 of the total live rock available at fished sites (approx. 1,340 t).

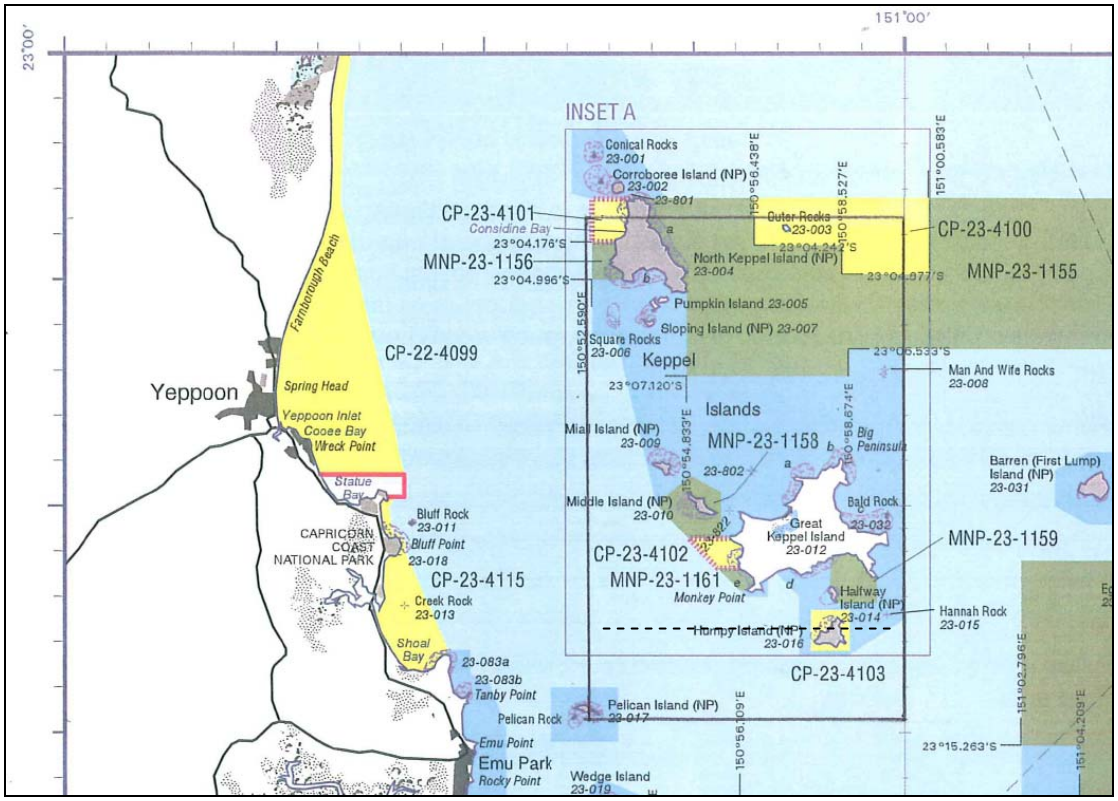

Figure 4: Map showing area of live rock harvest (indicated by black box) in the Keppel region and area of majority of live rock harvest (above dashed line).

Expected future harvest characteristics

It is expected that the majority of live rock harvest will continue to occur within the CNS and KPL regions in the future, therefore the appropriateness of the current harvest limits in relation to the ecology, productivity and hydrodynamic features of the two areas needs to be assessed.

Assessing sustainable harvest of live rock

The CNS and KPL regions demonstrate substantially different geographical and hydrodynamic characteristics, the former being part of a large, connected tropical reef system and the latter being a relatively isolated sub-tropical inshore system.

An assessment of the sustainability of live rock harvest in the CNS and KPL regions will require advice from experts in the fields of geology/oceanography and coral/reef ecology. Ideally, that expertise would provide advice on:

1. Rates of formation/deposition/replacement of live rock
2. Stability of the system (e.g. does live rock establish and provide long-term habitat in the system?)
3. Ecological importance of live rock in the system (ties in with point 2)
4. Exposure and susceptibility to environmental removal (e.g. storm damage)

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