Kenneth Collins

Ms Melinda Cilento
Commissioner
Public Enquiry into Marine Fisheries and Aquaculture
Productivity Commission
GPO Box 1428
Canberra ACT 2601

March 30 2016

Dear Ms Cilento,

Please find attached a submission to the Productivity Commission's enquiry into Marine Fisheries and Aquaculture.

This report is the sum of an intermittent investigation made over more than two years to ascertain whether any facts in our observations supported anecdotal evidence of a noticeable decline in top-order predator fishes (the Coral Trout in particular) and other target fishes at island fringing reefs in the Great Barrier Reef Marine Park and at the reef itself.

The Coral Trout is much-sought by recreational fishers and is also a very important component of reef fin-fish catch because of the lucrative live-fish export market (total value of commercial gross value of production in the annual Coral Trout status report, including other species, for 2010 was $35 million). Officially in 2010 the Coral Trout was declared to be "sustainably fished". There is a reported strong collaboration between governmental scientific communities in Queensland, the CSIRO and James Cook University in assessing sustainability of the reef fin-fish fishery.

Statements to me by recreational fishers and others frequenting the Great Barrier Marine Park province claim a decline in all target fishes at islands and reef take-zones. The report to the commission suggests that from benchmarks some 20 years previous, or to the 1960s, there has been a decline in target-fish populations and mean size at the Great Barrier Reef and island habitats.

You will be aware of the almost unprecedented coral-bleaching event recorded this summer, affecting some 95 per cent of reefs from Cairns to Cape York. Scientists attribute the exceptionally high water-temperature to global warming, with the conditions perhaps exacerbated by the El Niño, the failure of the wet season and an unusually protracted period of clear skies in North Queensland. Irrespective, scientists warned government in the mid-1990s of the implications for the reef if atmospheric carbon levels were not reduced.

In the case of the Coral Trout is there an imperative to maintain the status quo of the live-export fishery because of its economic importance, when sustainability of the fishery may be in question or may need to be reassessed? The findings in the attached report suggest a decline in mature-size Coral Trout, near absence of the fish at coastal island take-zones and scarcity in offshore reef take-zones. Our observations of landed Coral Trout catch at Cooktown in October 2014 revealed fish mostly just above catch size.

SUGGESTIONS

1. There should be a streamlining of action by both Queensland and federal governments to review the Coral Trout live-fish export industry in 2016, to determine the population/mean size status of the trout and also the Redthroat Emperor at islands and selected reef take- and no-take zones.
2. The ecological implications of spear-fishing and line-fishing by recreational fishers should be thoroughly investigated and regulations adjusted if necessary to constrain activity where population and mean-size decline of fishes have been identified.
3. Real-time GPS monitoring of the Coral Trout live-fish export fleet should be introduced as a matter of urgency. Although no accusations of illegal fishing have to my knowledge been levelled at the Coral Trout fleet (a compliance rate of 95% in 2010) there have been claims in Tasmania of commercial fishers poaching Sand Flathead at night in waters closed to those fishers. Pressure from both commercial and recreational fishers has led to over-fishing of the species and last year the Tasmanian Government imposed a new take-size and bag limit to improve sustainability. The new take-size was to improve reproduction prospects of female flathead, which attain a take-size earlier than male fish.
4. The Great Barrier Reef stands as Australia's most important natural asset, with an economic value exceeding a claimed $5 billion in 2014. In terms of the emerging global climate issue, and of reef ecology overlying sustainability of the commercial and recreational fisheries, it is essential that governments take stock, review and tighten regulations if deemed necessary.

Yours sincerely,

Kenneth Collins

COVER NOTE

Great Barrier Reef Marine Park

REPORT

Observations, and summary of selected scientific reports on

Status of Coral Trout and other top-order predator fishes

The live Coral Trout export fishery, and other fin-fish reef fishes

Ecological impact of line fishing and spear fishing on reef fishes

Reason for observations and compilation of this report

ANECDOTAL evidence of recreational fishers, and sailors, suggests that there has been a significant decline in numbers of mature top-order predator fishes such as the Coral Trout in coastal and offshore Great Barrier Reef locations. This apparent decline is in comparison with fish stocks evident some 20 to 40 years previous. Comments state that fish stocks of all target species have declined in island habitats along the coast of Queensland and at Great Barrier Reef locations. Coastal sites are in easy reach of recreational fishers. It has also been stated that large specimens of top-order predator fishes are now scarce. Further, evidence also confirms that illegal fishing by recreational fishers has increased in Great Barrier Reef Marine Park protected (no-take) zones.

COMMITMENT to an amateur assessment of reef habitats from the Capricornia Bunker Group in southern Queensland to reefs up to Lizard Island and coastal islands in north Queensland, over intermittent periods in two and a half years. The purpose of these observations was to determine whether anecdotal evidence was supported by any facts ascertained in this survey, that there is a declining population of top-order predator fishes and declining numbers of other fish targeted by anglers and spear-fishers.

UNESCO WORLD HERITAGE CENTRE: The attached report was lodged to the World Heritage Centre in 2015 for consideration by the World Heritage Committee in its deliberations on the status of the Great Barrier Reef Marine Park, whether the park should be declared at-risk.

CONCLUSIONS IN THE FOLLOWING REPORT

1. Relative scarcity of large top-order predator fishes at reefs and coastal islands; scarcity of reef fishes generally in coastal habitats; population status of at least one targeted species uncertain.
2. Unknown impact of line-fishing on Coral Trout populations; impact of spear fishing on the Coral Trout is poorly understood; claimed decline in mean size and numbers of reef fish from 1961 to 1989.
3. Fishing fleet in live Coral Trout export industry permitted to fish at discretion in take zones; no real-time GPS monitoring of the fleet to determine take locations and time; a steady decline in commercial quota and catch of Coral Trout; rise in recreational catch of Coral Trout in same period; rise in illegal fishing by recreational fishers in Great Barrier Reef Marine Park no-take zones.

Great Barrier Reef Marine Park

REPORT

Observations, and summary of selected scientific reports on

Status of Coral Trout and other top-order predator fishes
The live Coral Trout export fishery, and other fin-fish reef fishes
Ecological impact of line fishing and spear fishing on reef fishes

CONTENTS

I, Ken Collins, and my wife Guo Hua Zou from July 2012 to December 2014 made visits by private yacht for diving and research at various locations in the Great Barrier Reef Marine Park province. These visits were in both protected zones (no-take marine park) and multi-use take zones at coastal islands and relatively remote outer barrier reefs. The purpose of these visits was for observation, recreational diving and photography. We cite a range of examples of areas visited in differing zones, from the Whitsunday Island group and the Great Barrier Reef directly east, to the Capricorn Bunker Group, the ribbon reefs east of Cooktown and Lizard Island.

Observations on the prevalence of top-order predator fishes (eg: the Coral Trout)

Lizard Island: During 2014 diving took place at Lizard Island (Lizard Island is both a terrestrial and marine national park) over four weeks. Despite the protected status we observed few large top-order predator fishes at the fringing reefs, including favourable environment in the Lagoon. During visits mainly to outer barrier reefs (Ribbon Reef south of Lizard Island) we observed the following:

1. **At Ribbon Reef No 5** (Habitat Protection Zone, but permitting line fishing and spear fishing) we dived along the drop-off zone on the southern end of the reef flanking a marine national park (MNP 15-1037) and in the marine park mentioned. This drop-off zone into a 35-metre deep channel offered most suitable habitat (canyons, gulches, caves) for top-order predator fishes such as the Coral Trout. We noted few large top-order predator fishes, the Coral Trout and other favoured take-species. A few juvenile specimens were observed. At Ribbon Reef No 5 we noted a private vessel. One of the crew was involved in spear fishing at the southern end of the reef. We crossed a channel from Ribbon Reef No 5 to the marine park (MNP 15-1037) and observed no mature top-order predator fishes such as the Coral Trout.
2. **At Ribbon Reef No 2** (Marine National Park, no-take zone) we dived on reefs satellite to the main reef. These were shallow platforms with near-vertical drop-offs to about 30 metres. Habitat was most suitable for the Coral Trout and other top-order predator fishes but no mature fishes of target species were observed. Large fishes here comprised mostly Humphead Maori Wrasse (species protected after significant decline in the 1970s, believed due to impact of spear fishing) and parrotfishes (coral grazers).
3. **At Ribbon Reef No 1** (Habitat Protection Zone, but permitting line fishing and spear fishing) we dived at various satellite reefs in deep water west of the main platform reef, where there is suitable habitat for the Coral Trout and other top-order predator fishes. The various satellite reefs and drop-off from the platform reef showed few mature or juvenile Coral Trout.

PRINCIPAL ZONES EXAMINED IN DECEMBER 2014

RIBBON REEF No 5 to RIBBON REEF No 1

(south-east of Cooktown, north Queensland)

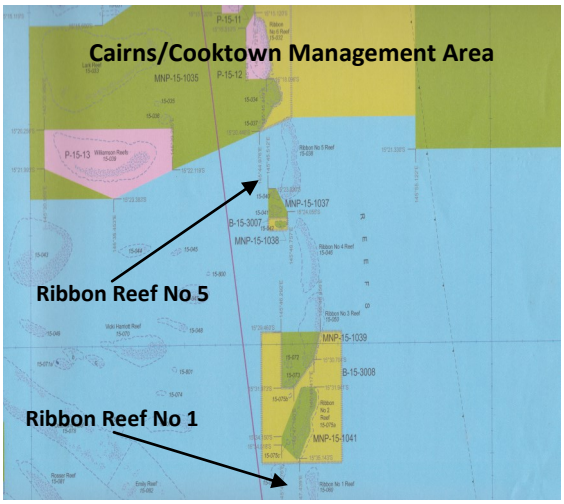
Zoning

Blue (Habitat Protection Zone) line fishing/spear fishing permitted

Yellow (Scientific Research Zone) No take zone

Green (Marine National Park) No take zone

Pink (Preservation Zone) No take. No public entry



LIZARD ISLAND and nearby ZONES

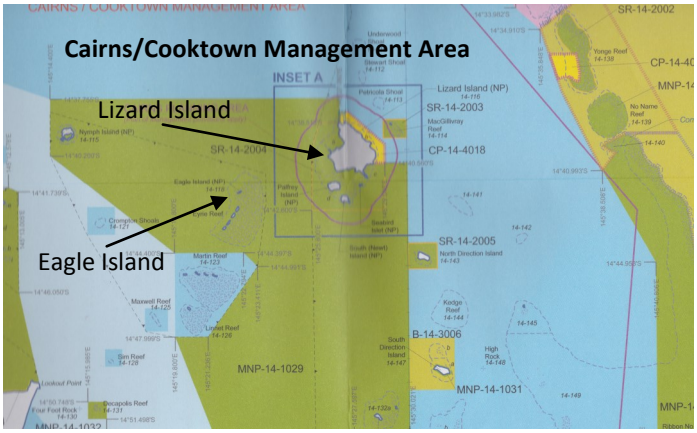
(including Eagle Island, Marine National Park)

Zoning

Blue (Habitat Protection Zone) line fishing/spear fishing permitted

Light Blue (General Use Zone)

Yellow (Scientific Research Zone) No take zone



4. At Lady Musgrave Island, Capricornia Group (both Marine National Park and Habitat Protection Zone, permitting line fishing and spear fishing). An investigation of reef fishes at Lady Musgrave Island was made in August 2012. Coral Trout and other top-order predator fishes were absent in the lagoon and on the northern side (Marine National Park) of the cay and reef, in examination in relatively shallow water. Generally we noted a scarcity of larger non-target reef fishes within the lagoon.

5. At Bait Reef (east of Whitsunday Island group, Marine National Park). An examination in relatively shallow water was made in this no-take zone. Observations revealed few coral trout, mature or juvenile.

6. At Fitzroy Island (south-east of Cairns, north Queensland [Conservation Park Zone]). This is a take-zone permitting fishing by line and spear; netting of bait; taking of crabs by trap; trolling for pelagic fish. Observation on the northern side of the island revealed few Coral Trout. Other top-predator fishes were absent.

CONCLUSION FROM PERSONAL OBSERVATIONS

The following remarks are qualified in saying that this assessment and personal report is only a snapshot of the reef environments suitable for Coral Trout and other top-predator fishes, selected at random. Although the Coral Trout commercial fishery is officially considered sustainable, current observations in this assessment and from some 20 years previously suggest the top-order predatory fishes, of mature size in particular, are generally scarce or absent in relatively shallow but suitable environment in protected zones and take zones. Research into the impact of both recreational line fishing and, more importantly, spear fishing is inconclusive (*see comments further in this report).* The question is whether these observations on the Coral Trout and other take species can be extrapolated to the marine park generally.

Status of the commercial and recreational fishery Coral Trout and other fin-fish species for year 2011

Targeted species: Coral Trout , Redthroat Emperor, other coral reef fin-fish species including cods, emperors and tropical snappers.

Total number of commercial licences in 2010–11: **365** (these vessels have a total of **711** dories attached to them, for line fishing.) The crew fish on a commission basis. In the 2013-14 season only **165** licences were operating from the total **365**.

Commercial harvest: About 1,479 tonnes comprising 797 tonnes of Coral Trout, 256 tonnes of Redthroat Emperor and 426 tonnes of other cods. A quota system is in place and the 2014-15 quota is 1,088 tonnes for Coral Trout. The total harvest comprises:

Coral Trout: 882,995 fish

Redthroat Emperor: 254,630 fish

Other coral reef fishes: 445,473 fish

Recreational harvest (last estimate 2005): About 2,600 tonnes.

Harvest by charter boat: About 289 tonnes comprising approximately 64 tonnes of Coral Trout, 73 tonnes of Redthroat Emperor and 151 tonnes of other reef fishes.

Indigenous harvest (last estimate from 2000–01): About 108 tonnes.

Export destination country for live Coral Trout species: Hong Kong, and distribution to mainland China.

Monitoring of commercial licensed vessels: Vessels are not restricted to any specific zone in the Great Barrier Reef Marine Park. They are monitored by logbook to 6 nautical miles grid location. Catch must be declared to authorities 3 to 6 hours before disembarking. GPS or other electronic monitoring of vessels is being investigated. Most of the catch is taken south of Bowen, particularly from the Swain Reefs (most southerly reefs in the Great Barrier Reef Marine Park province).

REDTHROAT EMPEROR

Official population status: UNCERTAIN/UNDEFINED

The **Redthroat Emperor** is a target coral reef fish. The species has been heavily fished by both commercial and recreational fishers. Its status is uncertain. Data is insufficient to assess stock; or where data exists there are conflicting signals on actual population status. **Commercial catch 2011:** 256 tonnes

STATUS: Possibly at risk

The Coral Trout (comprising 7 species) Commercial catch data

The Coral Trout can live for up to 18 years and reach up to seven kilograms and 80 centimetres in length. Individuals attain the minimum size limit of 38 centimetres at around two to three years of age. However, the Coral Trout exhibits great variation in size relative to age. The minimum take-size is 38 centimetres, or of two to three years of age.

NOTE: Observations at the sites examined for this report revealed mostly juvenile Coral Trout of about 15-20 centimetres in length.

In 1962 Coral Trout stock for the entire Queensland coast was estimated using government data, commercial fishing logbooks from the 1980s to current, coral trout biology and underwater surveys.

The Coral Trout stock for **2014** is estimated to be 60 per cent of the **1962** assessment. Fisheries authorities aim for a benchmark of 40 per cent of unfished stock levels, below which restocking strategies are triggered.

COMMERCIAL CATCH

(2000-01 to 2010-11)

Total catch of Coral Trout in tonnes in the financial year 2001-02:

About 2,100 tonnes

Catch in financial year 2010-11

About 900 tonnes

Reduction in fleet: In 2004 the commercial fleet was reduced and a quota set at 1,350 tonnes. The quota has been further reduced to 1,088 tonnes due to new quota-setting rules in 2014.

CONCLUSION: Officially the commercial and recreational catch is considered sustainable. However, there has been a steady decline in commercial quota and catch. Recreational catch has risen during this reporting period.

Photographs courtesy Queensland Department of Agriculture, Fisheries and Forestry

Commercial fishery bycatch

Fish discarded as too small or of incorrect species

Information from observers shows the amount of discarded reef fin-fish, including Coral Trout, caught by commercial fishers exceeded 10 per cent of the total catch in 2010-11. However, the actual total percentage confirmed is 28 per cent of total catch.

The total of all reef fin-fish reported caught in year 2011 from the Great Barrier Reef Marine Park was **1,583,098** landed for sale. A discard as bycatch (fish below size, non-targeted species) of 28 per cent equals a discard of **443,267** fish. It is stated that mortality of these discarded fish is low because of catch in shallow water. This author could not find data to support a claim of limited mortality.

Line fishing for Coral Trout

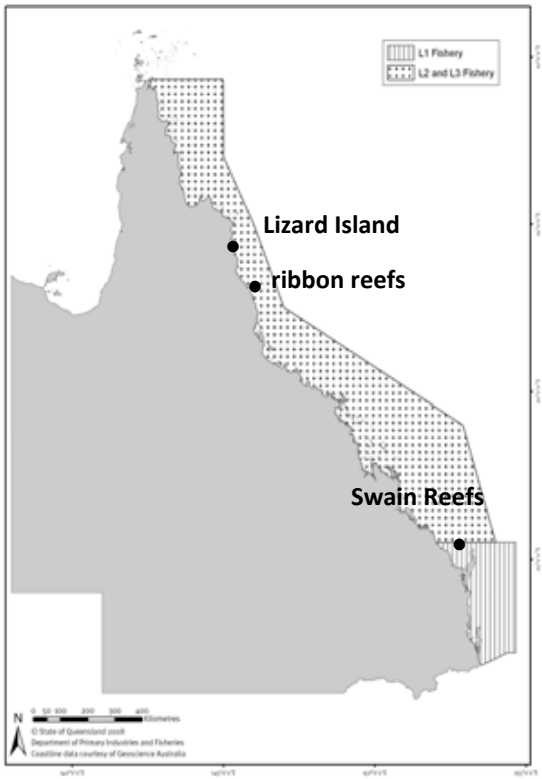
Unknown environmental impact

Researchers consider that line fishing for Coral Trout is likely to have little direct effect on the marine environment. However, they state there is evidence that the removal of predators (such as the Coral Trout) can lead to an increase in the abundance of their prey species, affecting the food web. **In Tasmania**, island State of Australia, the over-fishing of large Rock Lobster by commercial and recreational fishers on the mid-East Coast of the state caused an expansion in sea-urchin numbers (mainly by the alien Long -Spined Urchin) with over-grazing by the urchins of algae and kelp plants, defoliating the rocky stratum. Large specimens of the Rock Lobster, a predator of large sea urchins, were released to try to halt the damage.

Ecological effect unknown: Researchers in Australia state that the impact of the removal of Coral Trout and other predators from the Great Barrier Reef Marine Park province is unknown.

Impact of cyclones on Coral Trout stock: The most recent Queensland Coral Trout stock assessment states that cyclones impact on Coral Trout stock and reduce catch rates. Coral Trout catch rates have declined by about one-third in regions with the most damage to reef, with catch rates depressed for up to 2 years after impact.

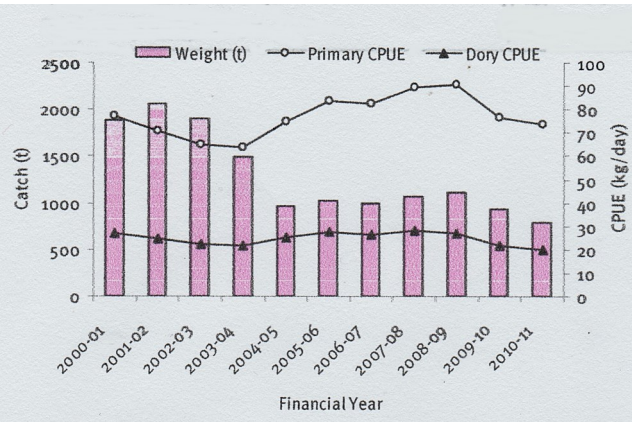
Other ecosystem impacts: Climate change has been linked to increases in the number and extent of coral bleaching events. These events have the potential to impact on Great Barrier Reef fish populations that rely on reef habitat for refuge or food.



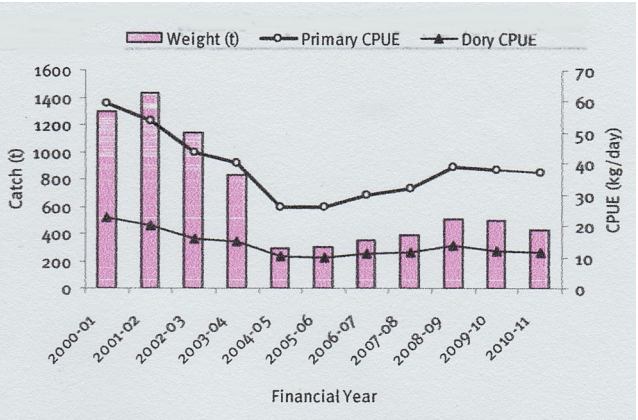
Great Barrier Reef Marine Park: Coral Trout fishery (commercial and recreational): A principal take-zone is the Swain Reefs. Lizard Island and ribbon reefs, for reference as main dive sites.

Concern about reef fish stocks
(GBRMPA report 1989)

- A decline in the mean size of reef fish caught from 2.6kg in 1961 to 1.4kg in 1985 off Townsville (Craik, unpublished data)
- The mean number of reef fish caught at reefs off Cairns is lower than that immediately north or south (Craik, unpublished data)
- The mean number of reef fish caught increases with increasing distance from shore off Cairns (Craik, 1979)
- The relatively smaller average size of coral trout at fished reefs in Capricornia compared with "closed" reefs (Ayling and Ayling, 1986)
- Greater abundance of coral trout at reefs off Townsville reported to be subject to "low" fishing pressure compared with reefs subject to high fishing pressure



Total commercial catch of Coral trout by quota year from 2000-01 to 2010-11. Catch declined from about 2,100 tonnes in 2001-02 to 797 tonnes in 2010-11.



Total commercial catch of other fin-fish species by quota year from 2000-01 to 2010-11. Catch declined from 1,450 tonnes in 2001-02 to about 500 tonnes.

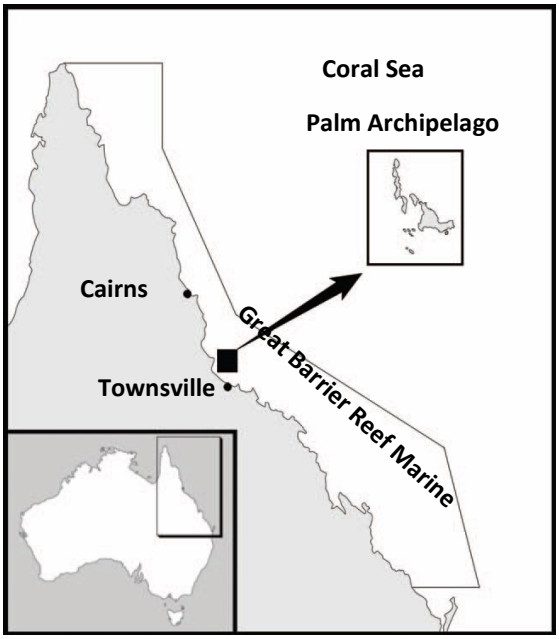
Spear fishing

Effects on reef fish populations in a multi-use area of the Great Barrier Reef

Spear fishing is a popular recreational method for taking target species such as the Coral Trout in multi-use zones of the Great Barrier Reef Marine Park. Many multi-use zones are accessible by small boats close inshore and at islands, while more distant and remote sections are visited by larger private boats and commercial vessels offering spear-fishing charters. Overfishing has been identified as one of the greatest threats to coral reef ecology. Spear fishing allows not only the targeting of desired fish such as the Coral Trout (sought also by line fishers) but also important reef species such as the herbivorous parrotfishes.

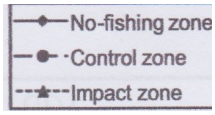
Ecological effects: Recent studies and a report in 2012 by researchers in Australia state that the impact of spear fishing on fish populations is poorly understood and this lack of knowledge makes it difficult to assess the desirability and legitimacy of spear fishing in multi-use reserves. A change in management policy on multi-use reserves permitted a study of the Palm Archipelago (*see maps*) fringing reefs from 2004 to 2009. In the control zone mean density of Coral Trout was stable but in the spear fishing zone (impact zone) trout numbers declined by 54 per cent, indicating a significant impact of spear fishing. Densities of non-target species such as Stripey Snapper and parrotfish were unchanged. The mean size of Coral Trout in the no-fishing zone was generally larger than those fish in the control zone and impact zone (spear fishing zone), with the size of Coral Trout declining by 27 per cent from 2004 to 2009 in the take-zone.

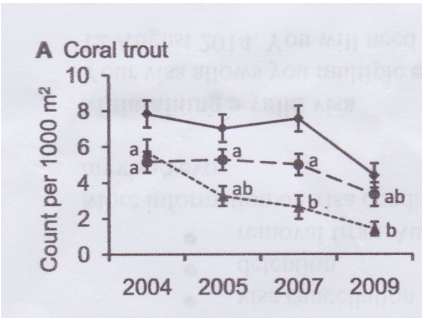
Discussion: The decline in Coral Trout numbers at Palm Island is attributed to spear fishing and confirms that such a method of fishing can have a rapid and substantial impact on reef fish, even where size and bag limits apply.

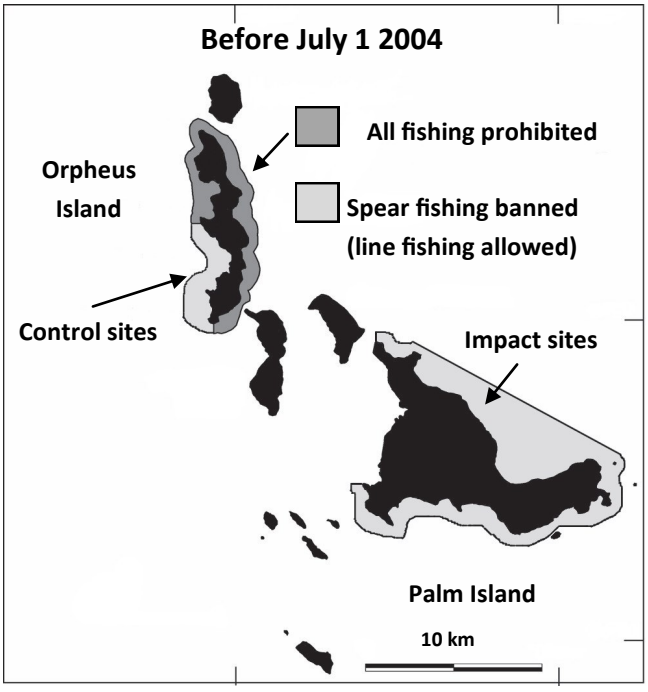


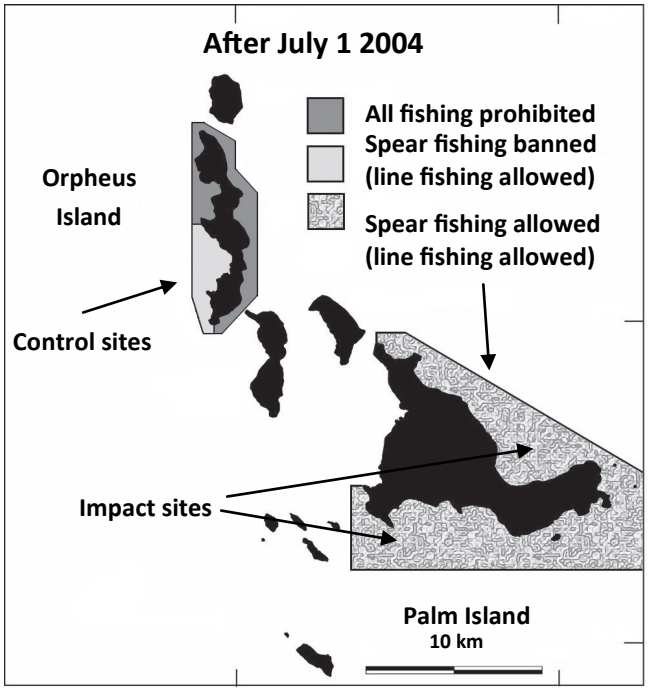
The Palm Archipelago, Great Barrier Reef Marine Park.

Population density of Coral Trout for one square km in spear fishing/line fishing zone declined from 6 in 2004 to 1 in 2009









Spear fishing

Effects on reef fish populations in a multi-use area of the Great Barrier Reef

FINDINGS

The consensus is that excessive fishing, including spear fishing:

1. Reduces the abundance, mean size and reproductive potential of target fishes.

2. Pervasively alters community-level interactions that ultimately reduce ecological resilience and biodiversity.

3. Impacts on mean fish size. Coral Trout are hermaphrodites (change sex from female to male), so size-selective fishing, as with spear fishing, can alter sex ratios through the removal of large, mature Coral Trout and reduce sperm availability. Reproductive output declines exponentially with decreasing fish size. Fishing selection is considered strongest for spear fishing because it is size selective. Depletion of larger fish can rapidly precipitate over-fishing.

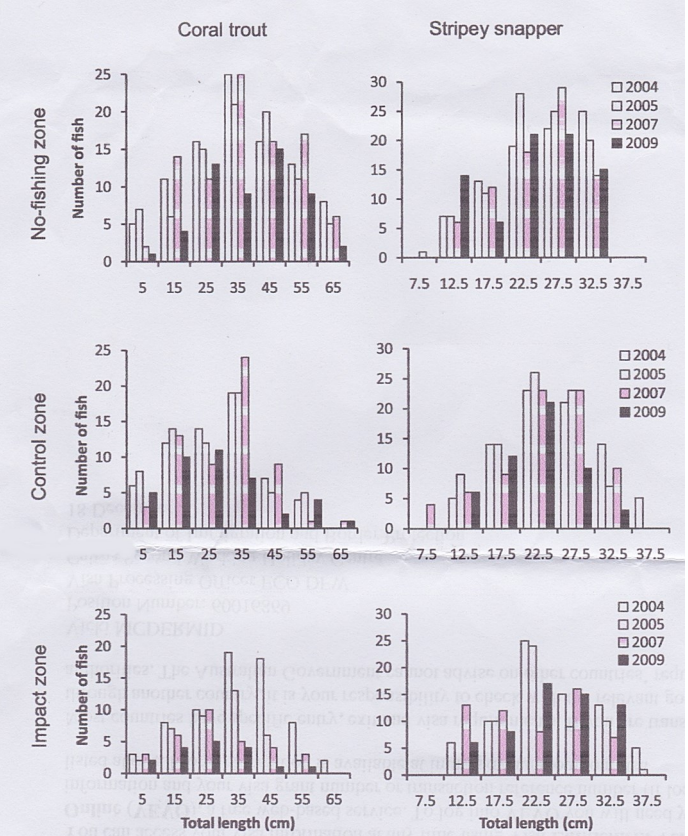
4. Given the difference of fish count in the take– and no -take zones (*see graph page 5*) the Coral Trout is subject to moderate to high fishing pressure at the Palm Archipelago. Evidence shows that no-take marine reserves, even small in size, provide substantial conservation benefits for the Coral Trout.

5. Careful management of spear fishing is required to ensure that conservation obligations are met and that fishery resources are harvested sustainably. There is concern over the status of herbivorous fishes such as the parrotfishes which are targeted in spear fishing. These fishes have a critical role in reducing algal growth and therefore promoting growth of coral. A call has been made for prohibition of spear fishing in favour of line fishing to protect these important reef-grazers.

6. Authorities managing fisheries in the Great Barrier Reef Marine Park province have been called on to adjust control of catch to preserve critical ecosystem functions (role of herbivorous fishes, the parrotfishes) and to "balance exploitation rates between primary and secondary target species, such as Coral Trout versus Stripy Snapper". It is stated that such a management strategy will help to maximise ecological resilience of coral reefs and minimize the effects of spear fishing on exploited species.

ILLEGAL FISHING

Reported increase in fishing by recreational fishers in the Great Barrier Reef no-take zones 2015.



The length-frequency distribution of Coral Trout and Stripey Snapper determined from 40 underwater visual transects made from 2004 to 2009. Conclusion: Coral trout size and frequency declined significantly from the no-fishing zone to the impact zone. In 2009 the maximum length of trout at the no-fishing zone was 47 cm but 22 cm at the impact zone.

Bramble Reef

Impact of re-opening of closed fishing-zone

For Palm Island, spear fishing in the zone opened in 2004 and it was assumed that spear-fishers had accessed the zone from July 1 2004. Recreational and commercial fishers have shown enthusiasm to exploit opportunity in reefs opened as multi-use zones.

When Bramble Reef, 30 kilometres north of Palm Island, was opened to fishing in 1995 after a 3.5 year closure some 45 vessels and 90 fishers (commercial and recreational) were present on opening day. Therefore, spear fishing at Palm Island is likely to have commenced immediately on opening of the take-zone in a multi-use marine park.

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Ken Collins, March 30 2016