Extraordinary Claims in Great Barrier Reef Assessment Require Evidence

Walter Starck

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Typical Great Barrier Reef Seascape

A vast panorama of reefs stretching over the horizon without a fishing boat in sight is the norm. You don't need a PhD with a computer model to tell that fishing pressure is very low, (The white marks are breaking waves, not boats.)

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A new Great Barrier Reef Marine Park Authority report claims remarkably rapid, large, widespread and diverse environmental and economic benefits from the expanded protected areas introduced on the Great Barrier Reef in 2004. An examination of this report finds:

- **The authors declare no conflict of interest, yet all 21 are employed by or recipients of generous funding from GBRMPA and they are reviewing outcomes of their own findings and recommendations.**
- **Claimed results of protection are notably larger, more rapid, widespread and uniformly positive than has been observed anywhere else or than appears probable.**
- **Several of the most important claims are contradicted by other more extensive work from the same researchers and such disparity is glossed over or ignored.**
- **The major claim of a doubling of fish on protected reefs rests on a single example inconsistent with abundant other evidence including that which is presented in the report itself.**
- **Economic analysis is heavily distorted by attributing total value for all tourism in the region to the reef, when only half of visitors even take a one day reef tour.**
- **Scant actual evidence is provided to support claims.**

A recent report (McCook *et al.*, 2010) published in the prestigious U.S. scientific journal *Proceedings of the National Academy of Sciences* (*PNAS*) makes claims of remarkably rapid, large, widespread and diverse environmental benefits from the expanded no-take (green) zones introduced on the Great Barrier Reef (GBR) in 2004. For a variety of reasons many of these claims are doubtful.

Rather than subjecting the general reader to the tedious details of an exhaustive examination, this discussion will be restricted to a sampling of key points as emphasized in the report and in the press release (Anon., 2010) issued by the lead research institution involved in the study, the ARC Centre of Excellence for Coral Reef Studies at James Cook University in Townsville.

Claims from the Report

The quoted text below is from the report itself. The comments and questions which follow are by the author.

1. The expanded protected zones have resulted in, *"…major, rapid benefits of no-take areas for targeted fish and sharks…."*

The changes reported are no more rapid or major than what is known to often occur naturally and the benefit of substantially increasing two species of predators is only assumed, not considered.
Q. What is the actual evidence for, and nature of, the benefit from increased numbers of coral trout and grey reef sharks?

2. In the report the claim is made that, *"Monitoring has documented very fast and sustained recovery, with up to 2-fold increases in both numbers (of coral trout) and size of fish on many no take reefs." "...With 32% of GBR reef area in no-take reefs, and fish densities about two times greater on those reefs, fish populations across the ecosystem have increased considerably."*

Only one reef area of the 8 featured in the report showed a 2-fold increase and that area had the lowest amounts to begin and lowest difference between fished and unfished reefs. Ayling (1997) had this to say regarding his earlier much longer term and more extensive coral trout surveys:

> *"Is the protection that has been afforded some reefs by Marine Park zoning preventing overall coral trout numbers from declining in the face of continuing fishing pressure? Counts that have been made on protected and fished reefs since 1986 suggest that this is not the case. In 1986, coral trout were counted on 12 reefs in the Capricorn-Bunker Group off Gladstone (Ayling and Ayling 1996a). Six of these reefs had been closed to fishing for an average of about five years, while the other six were open to fishing. There were more coral trout on the closed reefs than on the fished reefs but this difference was not significant (Table 1). In 1991 fish were counted on a large number of reefs in the Cairns Section (Dunk Island up to Lizard Island). Of these reefs, 29 were open to fishing and 18 had been closed to fishing for seven years. Coral trout density on the two groups of reefs was almost exactly the same (Mapstone and Ayling unpublished data). In 1992 another set of counts was made in the Cairns Section, using five different closed reefs and five fished reefs (Ayling and Ayling 1992). Once again there was no difference in density between the two groups of reefs (Table 1). The 1996 CRC Effects of Fishing count of coral trout on 24 reefs between Lizard Island and the Swain Group, recorded fish numbers on 16 closed reefs and 8 fished reefs. This survey found more common coral trout on the fished reefs than on the protected reefs, but this difference was also not significant (Table 1)."*

See also Ayling (undated) which is appended. It should be noted as well that the level of fishing pressure has also been reduced in recent years by a variety of other new restrictions.
Q. What is the evidence (actual data) to support the blanket claim of a 2-fold increase in protected areas and why have the extensive earlier Ayling surveys been ignored, especially since he is a co-author of the present study?

3. In the report the claim is also made that, *"These increases appear to reflect genuine recovery of exploited fish populations on no-take reefs, rather than declines in abundance on fished reefs due to displaced fishing effort."*

In 5 of the 8 areas featured in the report the protected reefs actually showed a decline in trout numbers. On fished reefs, three areas showed increases in biomass while 5 showed declines. This is hardly the "*extraordinary*" 2-fold increase in protected areas being bannered. A doubling or halving of the numbers of trout observed by divers is not uncommon from reef to reef or between different years, seasons or weather conditions. In the area where the 2-fold increase occurred, it was between 2006 and 2008 and both fished and protected reefs showed similar rates of increase. Similar increases in numbers have been reported by Ayling (undated) on other reefs, including ones open to fishing.
Q. Is a 2-fold increase a widespread result or only an extreme case, not unlike the similar increase on fished reefs in the same region? Why is this increase attributed to increased protection when similar increases also occurred before the protected area was expanded? Why is such an increase not just a naturally occurring fluctuation in recruitment commonly observed in many marine populations? Post Climategate expert opinion is no longer good enough. Provide the data, all of it.

4. *"Critically, reserves also appear to benefit overall ecosystem health and resilience: outbreaks of coral-eating, crown-of-thorns starfish appear less frequent on no-take reefs, which consequently have higher abundance of coral…."*

A half century of global scientific effort has found no significant correlation between any human influence and Crown-of-Thorns outbreaks. Various other species of starfish and sea urchins also exhibit similar sporadic population blooms. There is reason to think that these starfish may even play a role in maintaining coral diversity (see Starck, 2005a, p.3). Starfish outbreaks are very irregular and of decadal or multi-decadal frequency on a given reef. In view of the small number of protected reefs and five year time span on which this claim is based, the level of statistical confidence for this claim would have to be quite low. These reserves are also among those established before 1994. They were not selected as representative, but at the recommendation of public submissions suggesting their protection because they were perceived to be of especial richness or other value. Although McCook *et al.* do acknowledge there is no known ecological mechanism which could explain how an absence of fishing might reduce starfish outbreaks, they still go on to attribute this to protection from fishing. It should also be noted that in other recent GBRMPA reports, the most likely explanation of starfish outbreaks is suggested to be nutrient runoff from agriculture.

Q. What reason is there not to attribute a low incidence of starfish outbreaks and high coral cover to natural causes rather than to starfish? Why is such an uncertain possibility of benefit labelled with a term of emotional index , *i.e. "Critically"*?

5. It is also claimed that, *"…fish abundances in no-entry zones suggest that even no-take zones may be significantly depleted due to poaching."*

In fisheries science the term "depleted" is used to indicate a stock where the biomass has fallen below the level of maximum sustainable yield (MSY). For most finfish, such as coral trout, MSY is usually attained in the range of 25 to 40% of the virgin or unfished biomass. Coral trout are the most heavily fished species on the GBR and nowhere on the GBR has there ever been evidence that it has been overfished to depletion. Use of this term to describe reductions in population that are still well above any limit of sustainability is misleading and scientifically incorrect.

Q. Where is the evidence of actual depletion for any GBR fish stock?

6. *"…the evidence suggests that coral trout stocks on inshore reefs generally were markedly depleted by 1984…."*

Not according to either the fishery statistics or the only extensive surveys from that era, those conducted by Ayling (see item 2. above)

Q. Where is the evidence?

7. *"…baseline populations of target fish may have been significantly more abundant than previously recognized, with stocks in most areas significantly depleted in comparison with that baseline."*

Q. Where is the evidence? Why did this not show up on the many closed reefs included in the extensive earlier surveys by Ayling?

8. *"Increases in the marine reserve network in 2004 affected fishers, but preliminary economic analysis suggests considerable net benefits, in terms of protecting environmental and tourism values."*

Neither fishing nor tourism has experienced any increase in volume or profitability attributable to the expanded green zones. These have, however, resulted in decreased production and profitability in the fishing industry, greatly increased prices and decreased availability of local seafood for consumers, increased costs for tourist operators and considerable inconvenience and harassment for all reef users.

Q. What specifically are the "*considerable net benefits" to anyone other than GBRMPA and grant seeking researchers"?*

9. *"Given the major threat posed by climate change, the expanded network of marine reserves provides a critical and cost-effective contribution to enhancing the resilience of the Great Barrier Reef."*

The threat of climate change is far from "*given*". It is in fact decidedly uncertain in magnitude, effects and timing. If it indeed approaches anything close to the predictions being made, increased

"*resilience*" of the GBR from green zones would be about as significant as a hand fan in Hades. This is simply gratuitous eco-gibberish offered without a shred of evidence.

Q. How does one ascertain the cost-effectiveness of providing a totally ineffectual response to a problem of unknown effects, timing, intensity and probability no matter how low the cost? How is cost determined when no assessment of constraints on productive activity has been made?

10. In the body of the report it is further claimed that (The GBR), *"…is under serious threat from a range of human causes, with climate change at the fore...."*

Grant seeking researchers have been inventing purported threats to the reef for the past half century. None have ever become serious and all of the hundreds of millions of dollars spent on reef research has never resulted in a practical solution for any of them.

Q. What threat other than climate change is not actually trivial and decreasing?

11. The report also states that, *"In surveys of reefs zoned before 1992, whitetip (Triaenodon obesus) and gray reef (Carcharhinus amblyrhynchos) sharks respectively were ≈4 and 8 times more abundant on no-entry reefs than on fished reefs in the central GBR. …. Gray reef sharks were up to 30 times more abundant on no-entry reefs than on fished reefs in the northern GBR."*

Heupel *et al.*, 2008 in the most extensive study to date of GBR shark populations found a 2-fold difference between closed and open reefs in areas that are regularly fished. In view of the slow growth to maturity and low reproductive capacity of sharks, this difference seems credible. The much higher differences cited by McCook *et al.* were based on diver observations and are subject to a major source of bias. Sharks have acoustical ability to detect divers from far beyond the limits of human vision underwater. They also have visual contrast discrimination superior to humans and can see a diver from a distance where the diver cannot see them. On regularly dived reefs where they are familiar with divers, above water observations from an elevated position reveal they often turn away from divers at a distance where they are unseen by the divers. Conversely, on reefs where they are unfamiliar with divers, they are attracted to them at first and substantial numbers may closely approach and circle divers on initial dives. After a few dives, however, they lose interest and the numbers seen soon become more like those seen on regularly dived reefs. Spear a fish, though, and they quickly reappear in numbers. Comparison of the numbers seen by divers on reefs where entry is normally prohibited, with the numbers seen on regularly dived reefs can be highly misleading.

It should also be noted that in the area of Lizard Island where the largest differences in shark numbers were seen, the reefs are subject to very low fishing pressure. The ELF study (Mapstone *et al.,* 2004) found no significant difference between coral trout on open or closed reefs there and this was attributed to the low fishing pressure. In addition, Heupel *et al.*, 2010, in a study of *Large–Scale Movement and Reef Fidelity of Grey Reef Sharks* reported that, *"...few individuals showed fidelity to an individual reef suggesting that current protective areas have limited utility for this species."*

Q. Why is attraction to divers on previously undived reefs not a more credible explanation for the much higher numbers seen there than is the very low level of fishing pressure in the area studied? Please also explain the apparent clear contradiction between Heuple's findings and those in McCook *et al.* where Heupel is a co-author?

12. *"The economic value of a healthy GBR to Australia is enormous, currently estimated to be about A$5.5 billion annually...." "Relative to the revenue generated by reef tourism, current expenditure on protection is minor." "Tourism accounts for the vast majority of reef-based income and employment. ...income from tourism is estimated to be about 36 times greater than commercial fishing."*

These claims are highly misleading. The economic value cited includes the total value for all tourism in the region when half of all tourists do not even visit the reef. For those who do, the reef component of the large majority is a one day, one time participation in a reef tour and the value of reef tours is similar to the value of commercial fishing. If one also considers the even higher economic value of recreational fishing as well as retail fish sales and seafood meals in restaurants, the total value of fishing is closer to twice that of reef tours. In addition, the reef tour industry

regularly uses only about 2 dozen out of the 2500 reefs of the GBR and, even on those which it does use, the actual area visited would only be about 1% of the area of those reefs. Unfished reefs to optimise scenic value for tourism could easily coexist with an order of magnitude greater fishing effort and no detriment at all to tourism. The attribution of total tourism value to the reef is no more justifiable than attributing it all to the similar numbers who visit the rainforest or who eat seafood meals while visiting the region. Such grossly misleading claims have been repeatedly made by GBRMPA. If used by a business to promote itself, such misinformation would invite prosecution for violations of advertising and corporate laws. To see this done repeatedly and now see it included in a report in a leading scientific journal is a sad indictment of GBRMPA sponsored science as well as basic honesty.

Q. How can such misleading and *prima facie* extraordinary claims be presented without evidence and pass peer review both in house at GBRMPA and the research institutions involved as well as the formal outside review by a leading journal? How can 21 scientists described in their own press release as *"from a 'who's-who' of Australian coral reef scientists"* put their names to such material? Now that attention has been drawn to this, will any correction or retraction be made?

13. *"A large scale manipulative study of offshore reefs found that no-take reefs generally, but not always, had more, larger,and older fish for the two main target species than did reefs open to fishing....)*

Although this sounds like supporting evidence from an earlier study, examination of that study (Mapstone *et al.*, 2004) reveals a quite different picture. "*generally, but not always"* is the operative phrase. Generally the differences were longer to appear, quite mixed and much less than the doubling claimed for the 2004 closures. Since Climategate, "trust us, we're experts" is no longer good enough.

Q. Where is the evidence? (Note that Mapstone, the senior author of the earlier study, is a co-author of the McCook *et al.*, report.

14. *"The major economic cost associated with the rezoning was a once-off, structural adjustment package for commercial fishing industries, which totalled A$211 million at July 2009...."*

In initially arguing for the expanded green zones, GBRMPA initially estimated such costs would not exceed S1.5 million. This was later revised to $2.5 million. After the zones were implemented the actual cost proved to be over 10,000% higher. The *"A$211 million at July 2009"* is only the costs to that point. The final total has been estimated to be over $300 million before all claims are settled and this does not include permanent ongoing future losses to production. Local fish shops now have only meagre supplies of local product and what they do have is so expensive few can afford it.

Q. When are we going to see a genuine economic audit of GBR management by qualified economic analysts , not a chorus of researchers singing for their supper?

Claims from the Supplementary Material Online at PNAS

15. *"Surveys of fish abundance and size on no-take and fished reefs before the 2004 zoning found generally similar effects to those found after the 2004 zoning."*

See items 2. and 11. above.

Q. This is untrue. Where is the evidence?

16. *"Surveys of* (unfished prey species) *fish abundance and size on no-take and fished reefs before the 2004 zoning found generally similar effects to those found after the 2004 zoning."*

It seems remarkable that the claimed doubling or more of large fish easting predators would have no discernable effect on the population of prey species.

Q. Will the experts please explain why it is that such a large increase in predators who are resident all day, every day, year around has no apparent effect but occasional low level predation by humans has such a dramatic effect? Why is this not in fact evidence that the increase in large predators has actually been considerably less than has been estimated?

Claims from the official press release

(Issued by the ARC Centre of Excellence for Coral Reef Studies)

17. *"The researchers say that preliminary economic analysis points to considerable net benefits, both to the environment and to tourism, fishing and related enterprises."*

Q. Please specify and provide evidence?

18. *"The Great Barrier Reef generates far more economic benefit to Australia than the cost of protecting it"*

GBRMPA provides hypothetical solutions to imaginary problems while prohibiting a great deal of potential for sustainable productive activity and severely restricting that which is allowed to exist. It now spends over $45 million annually to conduct a charade of management which in reality has delivered only increasing cost and decreasing productivity.

Q. Protection from what at what cost? Please identify any clear benefit from GBRMPA management that is not already adequately addressed by other agencies and regulations?

Discussion

Coming at a time when public credibility in science is being seriously eroded by ongoing revelations of malpractice in what the world was categorically assured was incontestable fact and settled science regarding climate change, these "*extraordinary*" (their own description) green zone claims demand clarification and confirmation in answer to a number of important questions.

In 2006, barely two years after the green zone expansion, the Great Barrier Reef Marine Park Authority (GBRMPA) announced finding dramatic increases in fishes in the protected areas. These increases were not only well above anything found in earlier protected areas on the GBR, they were too soon to be credible as new recruits could not grow fast enough to explain the claimed increases in larger fish. Considerable public doubt was expressed and when no responding evidence was forthcoming, public attention moved on.

Now, three year further on, these and even more dramatic claims appear. In reading through this report over 40 dubious claims which are clearly conflicted by other evidence were noted.

Extraordinary claims demand strong evidence. This report presents little evidence and what it does offer is equivocal. It appears that, along with fishing, evidence too has been declared no-take in the GBR green zones. The claim of *"major, rapid benefits"* from the expanded green zones is inconsistent with the evidence offered, previous more extensive research by some of the same researchers, the very low level of fishing pressure on most of the GBR and plain common sense. Such conflicting evidence is rarely acknowledged; and, in a few cases where it is mentioned, it is misrepresented.

McCook *et al.* also state that, *"Another important observation emerging from this review is the extent of relevant data that are not published or readily accessible. A full picture of the effects and effectiveness of zoning on the GBR has required extensive use of gray literature, previously unpublished data, and collation of separate data sources."*

GBRMPA has been the sponsor of most research on the GBR and, through the permit system, they exercise control over the terms of all research conducted there. They are also a major publisher of GBR literature, both scientific and non-technical. The extent to which relevant data is not published or readily accessible is their direct responsibility and something they should address. As the data referred to has now been assembled for the McCook review, it would be a relatively easy task to make it available via the internet and this should be a particular priority. Unsupported scientific claims used to justify major public costs and policies are not good enough. Proper science demands that **evidence must be made available for independent examination; and, that should include all of**

it, not just a cherry-picked selection. Although PNAS also requires that authors, "*…make materials, data, and associated protocols available to readers*." It seems that this critical requirement has been ignored by all concerned in this study.

Babcock *et al.*, 2010 in another study published in the same journal on the same day as McCook *et al.* also examined the ecological effects of marine protected areas. However, this report is much more widely based geographically and longer term than the GBR study. Although the observed effects were generally positive they were decidedly less large, rapid, extensive, and uniformly positive than those reported for the GBR. All of these MPAs were also in areas subject to much greater fishing pressure than the GBR. One might thus expect that increased protection for the least impacted areas would result in a less marked beneficial effect rather than the much more widespread rapid and dramatic benefits claimed for the GBR. For example, Babcock *et al.,* "*…found that the time to initial detection of direct effects on target species … was 5.13 ± 1.9 years….*" Note that this was the time to initial detection, not the even longer time required to reach a doubling of population. When compared to the much greater effects claimed for the GBR over only two years, the latter do indeed appear to be "*extraordinary*".

Unlike on land, no marine species in Australia has ever been lost due to human impacts nor are any now in danger of such extinction. The Great Barrier Reef is in near pristine condition. Of the over 2500 named reefs in the complex, only a few dozen near population centres are regularly visited. Over 90% of the reefs are seldom or never fished or even visited by anyone. Most are too far offshore to be affected by human activities on the coast and most of that remains undeveloped. The GBR commercial fishing harvest is limited by quota to a total which equates to an average harvest rate of about 9 Kg/Km²/yr (or 90 gm/Ha). This is less than one-quarter of 1% of the 4000 Kg/Km²/yr conservative estimate of the average sustainable harvest rate for coral reef fisheries. All this is easily verified, non-controversial fact. The reality of this situation is readily observable to anyone by making an extended reef cruise or a flight over the reef. Away from the proximity of the few small population centres, boats are hard to find and one passes reef after reef with no fishing vessel anywhere in sight.

The GBR is not actually threatened by anything. For over 40 years it has survived unscathed from a constant litany of purported threats, all dire, all demanding urgent attention, and of course funding. Hundreds of millions of dollars have been spent on research with little achieved other than the establishment of a parasitic industry predicated on imaginary threats. This reef salvation industry now supports hundreds of researchers, bureaucrats and activists when we can't afford enough police, teachers or health care workers to properly provide for vital services where very real need exists.

Generations of researchers have been schooled in a culture wherein threats to the reef are an unquestionable belief and all evidence is interpreted from such perspective. When evidence of good news cannot credibly be explained away, it is simply shelved, as were the extensive coral trout surveys by Ayling and the large ENCORE (Anon., 1994) experiment on enhanced nutrients. For a researcher to question the prevailing orthodoxy and insist on presenting evidence contrary to consensus belief would be professional suicide. The gravy boat steams on.

It is disheartening to see capable researchers, whose other extensive work clearly conflicts with claims made in this report, lending their names to it and, worse yet, such conflicting evidence being glossed over or ignored.

It should be noted that the lead author is employed by GBRMPA, all of the 20 additional authors are either employed by them or are recipients of substantial funding from them and this study was funded by them. The authorship and rather unrestrained positive spin on the benefits and cost effectiveness achieved by GBRMPA management presents the appearance of a promotion piece for

and by GBRMPA which the most productive and respected beneficiaries of their research funding have been invited to endorse. In such case, it would have been very difficult for any to decline or to offer much objection to the claims made. At the same time, their names and status would provide credibility and deterrence of criticism while greatly increasing the prospect of acceptance for publication in a prestigious journal. It is incongruous to note that all these employees and repeated recipients of generous GBRMPA funding, could, *"…declare no conflict of interest.*" (see footnote, p.1 of the report) when they are in fact assessing the value of their own work and that of the organisation which supports them. To compound the impropriety even further, PNAS also requires that, *"Authors must acknowledge all funding sources supporting the work."* There appears to be no such disclosure in this study either.

In December 2009 another study involving GBRMPA management was produced by the ARC Centre of Excellence for Coral Reef Studies. It is titled, *Marine protected area management costs: an analysis of options for the Coral Sea* (Ban *et al.*, 2009). This was prepared for the "Protect Our Coral Sea campaign". It found that the most cost effective management would be to make the entire Coral Sea area a protected zone with no fishing and for GBRMPA to manage it. No assessment of losses from prohibition of actual or potential productive activity was conducted and none was made for any need of management beyond what is already provided. Followed by the McCook e*t al.* report, it does not seem unduly suspicious to wonder if an agenda may be involved. It would be interesting to learn how much the Ban *et al.* study cost and where the money for it actually came from.

For an alternative perspective on the Coral Sea MPA issue see Diggles, 2010.

It almost seems that somewhere there must be a handbook for agenda science as the reef salvation industry has managed to cover all of the same points of scientific malpractice as revealed by Climategate:

- ☒ Hide or ignore conflicting evidence.
- ☒ Dramatic claims and language.
- ☒ Massage data.
- ☒ Misrepresent data.
- ☒ Offer conclusions only. Employ opaque data and methods.
- ☒ Use peer review to publish in prestigious journals and block publication of conflicting studies.
- ☒ Denigrate dissent without addressing its substance.
- ☒ Assert authority and expertise,
- ☒ Claim Noble Cause to excuse excesses.
- ☒ Maximise credibility and defence with as many authors from as many institutions as possible.

Reef Salvation score - Ten out of ten.

Bureaucratic restrictions, requirements and charges imposed by GBRMPA have become a major deterrent to any healthy productive use of the GBR. At the same time, it has fostered a substantial pseudo-industry of research and PR serving to promote its own institutional agenda. In a world facing serious economic difficulties, bloated unaccountable bureaucracies addressing non-problems are a luxury we can no longer afford. It is time for the electorate and the Parliament to start demanding answers and pruning the rot. In the lead up to the last election, Kevin Rudd said that, if elected, he would, *"…take a meat ax to the bureaucracy."* This is a good place to start.

An excellent essay on "***How government corrupts science***" (Robinson, 2010) is well worth reading. Although it focuses on climate science, the situation it describes is endemic across the environmental sciences and many parallels with the reef salvation industry are obvious.

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Note: All references are available for download at the links provided. All but Heupel *et al.*, 2009 are free.

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Ayling Coral Trout Survey Document

For a time, before the period of public debate leading up to the imposition of expanded green zones on the GBR, an informative summary of Dr. Ayling's coral trout surveys was available on the web at: www.fastinternet.net.au/~rock/trout.htm . It was entitled: WHERE ARE ALL THE CORAL TROUT? In September 2003 Shortly afyer attention was drawn to the availability of this document it disappeared from the web page. Fortunately, it was cited in full in a legal submission made by the recreational fishing group, Sunfish, Townsville, in the lead up to the introduction to the expansion of the Green Zones. The copy below is from that source.

Are Trout Overfished

WHERE ARE ALL THE CORAL TROUT?

Or are coral trout numbers on the GBR being reduced by current levels of fishing?

Notes prepared by Dr. Tony Ayling, a private marine biological consultant not affiliated with any Government Department.

Over the past 14 years we have made extensive underwater surveys of coral trout numbers on several hundred reefs along the entire length of the Great Barrier Reef. This has included repeat surveys on some reefs over a period of more than 10 years to get some idea of the long term changes that have been taking place. We have also made counts on many of the protected reefs in the Marine Park to see if protecting them from fishing has made any difference to coral trout numbers.

We will look first at the effect of protection on coral trout numbers:

In 1986, we counted coral trout numbers on 12 reefs in the Capricorn-Bunker Group off Gladstone. Six of these reefs had been closed to fishing for an average of about 5 years, while the other six were open to fishing. Average coral trout density on the protected reefs was 57 per hectare (an hectare in an area of 100 x 100 metres), compared with 49 per hectare on the fished reefs. Although there appear to be about 15% fewer coral trout on the fished reefs, by using statistical techniques we can show that this difference is not significant as it may just have been due to the variability in the counts.

In 1991 we counted fish on a large number of reefs in the Cairns Section of the Marine Park (Dunk Island up to Lizard Island). Of these reefs, 29 were open to fishing and 18 had been closed to fishing for 7 years. Average coral trout density on the protected reefs was 33.9 fish per hectare compared to 34.6 per hectare on the fished reefs. Basically, coral trout numbers were the same on both groups of reefs.

In 1992 we made another set of counts in the Cairns Section, using five different closed reefs and five fished reefs. Once again there was no difference between the two groups of reefs, with 28.4 fish per hectare on the protected reefs and 27.8 on the fished reefs.

From these figures it is obvious that coral trout numbers have not increased on reefs that have been closed to fishing. What does this mean? There can be three different interpretations:

1. Coral trout may move around a lot between reefs, and so any extra fish on the protected reefs quickly move onto nearby open reefs and average out the numbers. However, tagging and movement studies show that while a very few coral trout do in fact move from one reef to another most of them stay on the same reef, and even on the same place of the same reef.

2. Closed reefs are not protected from fishing. It may be that fishermen are ignoring reef zoning and that enforcement levels are not high enough to prevent this happening. Recent analysis of vessel sightings by coast watch has indicated that there is probably a lot of fishing on reefs that are supposedly closed.

3. The current level of fishing on the GBR has no effect on coral trout numbers.

It is probably a combination of low effect of fishing on coral trout numbers, and illegal fishing on closed reefs, that is responsible for the lack of difference in coral trout numbers we have shown between closed and fished reefs.

If surveys on closed and fished reefs are not giving us a good idea of what is going on with coral trout numbers, perhaps the long-term counts we have done can give us a better picture.

We have counts from three reefs off Townsville (John Brewer, Lodestone and Davies) over the period from 1983 to 1994. These reefs are close to the coast and are fished by both recreational and commercial fishermen. In 1983 the average density of coral trout on these reefs was 34 per hectare, in 1989 it was 34.3 and in 1994 it was 66 per hectare.

In the Cairns Section we have counts from some reefs in 1983 and again in 1991. In 1983 average density of coral trout was 22.5 per hectare and this had increased to 31.7 by 1991.

Off the Whitsundays, on the three reefs Hook, Line and Hardy, mean density of coral trout was 57 per hectare in 1984, 84 in 1988 and 124 in 1994.

All these figures suggest that far from decreasing in numbers that has been a marked increase in the numbers of coral trout on the GBR over the past 10 years.

So why is it that a lot of fishermen are always talking about the good old days? Why is it that the general consensus is that there has been a drop in catch rates of coral trout over the past few decades? This apparent contradiction can be resolved if we separate catchability from numbers. Poor catches do not mean that the fish are not there, just that they are not taking the bait. Reported catch rates by commercial fishermen from experimental fishing done for scientists on protected reefs are three to four times those from fished reefs, in spite of the similar densities we have mentioned above. This indicates that naïve populations of coral trout, ie those that are not often fished, are far more catchable that exploited populations. Similar results were reported from Heron Island where catch rates were much higher on protected parts of the reef than in fished parts, but no significant density differences between the two areas could be found. It is often reported by fishermen that catches are good after a long spell of bad weather when fishing activities are restricted; the fish have become more naïve and more catchable.

Another way of looking at the effect of fishing on coral trout is to use the count figures we have from along the GBR to get some idea of the total number of trout out there, and compare this to the number taken by fishermen. The Marine Park Authority has listed about 2,500 reefs on the GBR but our counts on charts and maps of the reef area indicate that there are about 1,200 major reefs. Measurements from these maps show that the average major reef has about 500 hectares of reef slope where coral trout are common, and about 2,500 hectares of reef flat and lagoon where coral trout are not very common. Our density figures indicate that the average density of coral trout on the reef slope is about 50 per hectare, compared with about 10 per hectare in the lagoon and reef flat. Length estimations show that an average of half of these are over 38 cm long and able to be taken by fishermen. From these figures we can calculate that there are about 30 million adult coral trout on the GBR.

These figures do not include inter-reef numbers of coral trout. There are large areas of broken ground between the true reefs that also support coral trout, and the true figure may be twice or more the 30 million we have calculated.

The Marine Park Authority and DPI have made recent estimates of the total annual catch of coral trout from the GBR of about 2 million kilograms, including both the recreational and commercial catch. Given the average size of coral trout this equates to about 3 million fish or only about 10% of the available stock.

We have also made counts of young coral trout on the reefs we have surveyed. By young coral trout I mean those that have resulted from the spawning season in the previous year. These figures show that an average of about 20% of the total coral trout on any reef are these young of the year (often called juveniles). Thus the annual input of young coral trout is equivalent to about 40% of the available stock,

far higher than the annual catch of 10% of available stock.

In addition coral trout grow rapidly, the fastest growing individuals reach 30 cm long in about 12 months and most individuals are over 38 cm at the end of two years.

These figures are all rather approximate but they are based on actual records and probably give a good indication of what is happening in the fishery. On this basis it seems unlikely that the present exploitation levels of coral trout on the GBR are any threat to coral trout numbers. On the contrary is seems possible that numbers will increase, as some of our counts are already indicating.

Just remember: the number of fish that are caught does not relate to the number of fish that are there, but to how easy they are to catch.

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