

Coral Sea Fishery

Hand Collection Sector: Sea Cucumber

Overview of the fishery

The Coral Sea Fishery is comprised of several sub-fisheries:

- the hand collection sub-fishery, which includes the following sectors:
 - aquarium
 - lobster and trochus
 - sea cucumber (beche-de-mer)
- the line sector sub-fishery, which includes auto-longlining, demersal longlining and other line fishing
- the otter trawl sub-fishery
- the finfish trap sub-fishery

In recent years 40-160t per year was taken across all Coral Sea sub-fisheries (40t in 1988/89; 150t in 2001/02). The GVP of the combined Coral Sea Fishery was \$1,201,200 in 2002/03, \$850,000 in 2003/04, \$1,100,000 in 2004/05.

Seven of the 18 CSF permits are for the hand collection sectors. These include two Aquarium, three lobster and trochus and two sea cucumber fishing concessions. Collection is by hand only for the lobster and trochus, and sea cucumber sectors, while scoop nets, cast nets, seine nets and handheld rods are permitted within the aquarium sector.

The overall status of the fishery is uncertain and most stocks are not assessed. With exception of the sea cucumber sector, all sectors are considered underdeveloped. An Australian Institute of Marine Science (AIMS) long-term survey showed no evidence of localized depletions resulting from the Aquarium sector take (McLoughlin 2006). There has been evidence of depletion in other sea cucumber fisheries, and for black teatfish in this fishery (McLoughlin 2006).

The sea cucumber, or beche-de-mer sector currently catches up to 16 species but mostly targets white teatfish, black teatfish, prickly redfish and surf redfish. The total sea cucumber catch was 50 t in 2000, 30 t in 2001 and declined further in 2002 (note, however, that reduced TACs for black and white teatfish were introduced in 2002).

Review of current management of the fishery

Participation is by limited entry. As at October 2007 there were 18 permits held by eight permit holders across the demersal line, otter trawl, finfish trap, sea cucumber, aquarium collection, lobster and trochus collection sectors. There has been no additional access granted since 1997. Prior to 2000, permits were non-transferable; but all permits were made transferable in 2002 subject to performance criteria.

AFMA has set what are considered to be precautionary catch limits (based on landed weight) for each of the 5 high-value sea cucumber species (totalling 45 t [across both permits]) and has allocated a total sea cucumber catch (across all species and permits) of 150 t. The black and white teatfish TACs were set based on the results of a research study so are biologically

meaningful (Benzie and Uthicke, 2003). There are also minimum size limits for the take of sea cucumbers.

Fishery-independent surveys were conducted on sea cucumber on the Great Barrier Reef to assess the level of reduction in sandfish abundance in 1995/96, 1998, 2000 & 2002 (Benzie and Uthicke, 2003; Furlani *et al.*, 2006d).

There are "move on" provisions that provide precautionary limits and mitigate against localized depletion. A maximum of 5 t of combined species of sea cucumber may be taken from one reef (per permit), and subsequent collection beyond this limit may not continue within a 15 nautical mile anchorage.

There is a three year rotational harvesting arrangement that was established as an operator initiative. The plan identifies 21 reefs and gives the number of days fishing on any one reef per year with each reef only able to be fished one year in three (Furlani *et al.* 2006d).

Black teatfish probably represent one extreme (effectively closed via quota reduction 3-4 years ago: a 500kg quota was allocated to facilitate research) with respect to vulnerability (highly accessible, high value, slow growth and low recruitment). As at 2007, there is minimal effort in the sub-fishery. At the October 2006 stakeholder meeting, it was agreed that TAC for black teatfish would remain low until industry indicate that they believe stocks have reached levels warranting its re-evaluation. This re-evaluation would determine whether or not the TAC should be revised in the context of the perceived stock status and age structure.

While raw logbook data is provided, the 5-boat ruling and constraints of confidentiality prohibit presentation of detailed data. No observer data had previously been collected for any of the three Hand Collection sectors.

Proxies against the Harvest Strategy Policy Reference Points

There are no direct biomass estimates or assessments yielding target and limit reference points. The conservative TACs and trigger points, together with the spatial closures, move-on provisions and size limits should mitigate against overexploitation while enabling controlled expansion of the fishery and hence the potential for yield to be optimized.

Assessing stock status for this sector is expensive and problematic; consequently, it is difficult to conclusively demonstrate that catch is sustainable. However, the black and white teatfish TACs are based on the results of a research study and so are biologically meaningful (Benzie and Uthicke, 2003). The harvest strategy provides an approach to minimize impact and prevent local depletion.

Indirectly, there is a proxy B_{LIM} in the sense that the fishery self-regulates: the two permit holders feel that they are in the best position to advise when they feel that the stock status is worthy of re-evaluation before they recommence fishing. Otherwise, the overarching/combined TAC is effectively a proxy B_{LIM} above which no more catch of any species may be taken.

General description of the harvest strategy

Fishery Issues; justification for approach

The small size of the sub-fishery, its low GVP and the effectiveness of existing management arrangements negate the need for a more complicated harvest strategy. Indeed, the confidentiality constraints limit the presentation or publication of detailed analyses of fishery data. The fishery is effectively a “Tier 5” fishery on the Southern and Eastern Scalefish and Shark Fishery (SESSF) Tier scales – that is, one with minimal information. The existing management arrangements were modified to be more precautionary and decision rules were assigned to triggers. Spatial closures and move-on provisions were important given the relatively sessile nature of the species.

Given the potential for depletion, particularly with regard to black teatfish, it is important to set conservative TACs and to carefully monitor spatial catch patterns. The existing TACs for black and white teatfish were based on the results of a research study undertaken on the adjacent Great Barrier Reef and based on extrapolation are somewhat biologically meaningful (Benzie and Uthicke, 2003).

As weight and size of sea cucumber varies depending upon the degree of hydration, catch figures can be misleading. As part of the monitoring program under the harvest strategy, periodic (suggest a minimum of 1 per 3 years) fishery-independent surveys on indicator/key reefs are recommended (with indicator/key reefs to be determined within the first 12 months).

Harvest Strategy Overview

- Total catch limit (TAC) of 150 t (across both permits)
- 36 t of 150 t TAC assigned to the five main species as follows:
 - white teatfish 4 t, black teatfish 1 t, prickly redfish 20 t, sandfish 1 t, surf redfish 10 t (each permit allocated half of these totals)
- Remaining 105 t combined TAC applies across the other 10-11 species.
- Trigger points for the remaining 10-11 species:
 - 5 t per species, combined across permits, EXCEPT
 - 10 tonnes lollyfish and greenfish
- Move-on provision: 5 t combined species from one reef annually (i.e. all permits as opposed to per permit); subsequent collection may not continue within 15 nautical mile anchorage.
- Monitoring and data collection:
 - Ensure accurate catch and effort data recorded to the finest possible spatial scale (reef as a minimum)

- Consider fishery-independent surveys on indicator/key reefs; suggest a minimum of 1 per 3 years.

Decision Rules (see subsequent section for annotated version with additional explanation and rationale)

- If the catch triggers are reached
 - cease fishing on that species (in that fishing year) until assessment completed
 - undertake an assessment in the form of data analysis:
 - This should include a consideration of the spatial distribution of catch and effort, as this will influence the sustainability of the fishery
 - Analyses should aim to establish conservative TACs on a species-by-species basis.
 - If the data is considered insufficient to deliver a TAC, cost-effective abundance surveys may be considered.
 - Use SESSF Tier 4 rules to adjust TACs for all species. These rules are generally of the form **TAC = (1 + b*slope) * CCUR**, where CCUR is average catch over the past four years, and includes landings plus discards; “slope” is the slope in the trend in standardised CPUE (or other relevant indicator) over the past four years (longer where CPUE is cyclical) (Smith and Smith 2005)

Consistency with Harvest Strategy Policy

The harvest strategy provides for conservative limits within which fishing operations can continue without significant new information or management requirements.

Having a total overriding/combined TAC, together with TACs on the 5 main species, and separate catch triggers for each of the remaining species, in combination mitigate against the potential for overfishing or depletion. The TACs are set conservatively acknowledging the global state of overfishing and the susceptibility of sea cucumber species to localized depletion. Move-on provisions augment the TACs in ensuring no one area is at risk of being overfished.

Assigning trigger points or TACs to all species captured is consistent with the Policy requirement for harvest strategies to embrace all key commercial species.

Annotated description of Triggers and Decision Rules (providing extra explanation and rationale), and additional Harvest Strategy details

The proposed harvest strategy is a simple extension of the current management arrangements, (primarily in terms of assigning trigger points to all targeted species), and is

designed to minimise impacts and prevent local depletion while still being practical given the low GVP of the fishery.

- Current management arrangements:
 - Total catch limit (TAC) of 150 t (across both permits)
 - 45 t of 150 t TAC is assigned to the 5 main species:
 - white teatfish 4 t, black teatfish 1 t, prickly redfish 20 t, sandfish 10 t (but NB see below for amendment), surf redfish 10 t (each permit allocated half of these totals)
 - Remaining 105 t combined TAC applies across all other species. (but NB see below for amended species specific triggers)
 - Move-on provision: 5 t combined species from one reef annually per permit; subsequent collection may not continue within 15 nautical mile anchorage.
 - Note that the definition of a “reef” is not explicit and should be resolved as an immediate priority
- Additional:
 - Set trigger points for the remaining (10-11) species:
 - 5 t per species, combined across permits, except:
 - 10 tonnes lollyfish and greenfish (these two species are the two most abundant species in east Torres Strait (51.6 and 27.5 per ha respectively (Skewes *et al.*, 2003) and are considered as abundant, ubiquitous species throughout the tropical west Pacific)
 - Reduce sandfish TAC to 1 tonne (sandfish have not been captured in the CSF to date but a low TAC should apply in the event of these becoming a targeted species)
 - If the catch triggers are reached
 - cease fishing on that species (in that fishing year) until assessment completed
 - undertake an assessment in the form of data analysis:
 - This should include a consideration of the spatial distribution of catch and effort, as this will influence the sustainability of the fishery
 - Analyses should aim to establish conservative TACs on a species-by-species basis.
 - If the data is considered insufficient to deliver a TAC, cost-effective abundance surveys may be considered.
 - Use SESSF Tier 4 rules to adjust TACs for all species. These rules are generally of the form **TAC = (1 + b*slope) * CCUR**, where CCUR is average catch over the past four years, and includes landings plus

discards; “slope” is the slope in the trend in standardised CPUE (or other relevant indicator) over the past 4 years (longer where CPUE is cyclical) (Smith and Smith 2005)

- Note that the current TAC of 150 t is very high relative to the current catch. Any proposed increases in the TAC arising from the outcome of the analyses would have to be carefully considered given evidence of depletion in other fisheries, and for black teatfish in this fishery (McLoughlin 2006).
- Note that nominal CPUE is not a reliable indicator in this fishery unless the same divers are consistently fishing (T. Smith (Qld. DPI&F) pers.comm.)
- Move-on provision: consider 5 t total (i.e. all permits as opposed to per permit) combined species from one reef annually – note rotational fishing strategy
- It should be noted that the weight and size of sea cucumber varies considerably depending on the degree of hydration. Consequently catch figures can be misleading.
- The TAC for black teatfish will remain low until industry indicate that they believe stocks have reached levels warranting its re-evaluation. This re-evaluation would determine whether or not the TAC should be revised in the context of the perceived stock status and age structure.
- Monitoring and data collection:
 - Ensure accurate catch and effort data recorded at correct spatial scale
 - Consider fishery-independent surveys on indicator/key reef; suggest a minimum of 1 per 3 years

Process for review

Fishery-independent surveys were conducted on sea cucumber to assess the level of reduction in sandfish abundance in 1995/96, 1998, 2000 & 2002 (Benzie and Uthicke; Furlani *et al.*, 2006d). It may be worthwhile considering the results from these surveys in the context of evaluating the appropriateness of the trigger values.

Catch and effort data should be audited with a view to implementing SESSF Tier 4 rules to refine TACs.

The exact nature of the assessment to be undertaken in response to triggers being reached needs to be clarified.

As at 2007, the level of effort is relatively low, and permit holders wish to be responsible for indicating when they feel the fishery is worthy of re-evaluation. Once the fishery has been evaluated, it is recommended that the criteria for determining whether exploitation then occurs should be formalised in terms of some limit reference point (e.g. some minimum tonnage available across some minimum number of reefs).