

Coral Sea Fishery

Hand Collection Sector: Aquarium

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).

The aquarium sector collects a broad range of finfish including damselfish, butterflyfish, angelfish, wrasse, anemone fish, surgeonfish, blennies and gobies. Fishing is a mixture of attempting to supply pre-ordered specimens, and opportunistic collecting. Trends/fads often drive demand and determine the species composition taken. With the exception of damselfish (25-32%), no one species group has comprised more than 17% of the total catch.

While the operators supply large public aquaria, the majority of specimens are for hobbyists. Juveniles of these species are taken, so fishing is targeting the life stage with the highest natural mortality.

Aquarium catch data are recorded at genus or family level only, although operators maintain private databases that include recording catch by numbers to species level, size data, effort data and detailed spatial information. In 2003, the catch was estimated at approximately 60,000 specimens (McLoughlin 2006). Industry stakeholders have advised that recent catches (as at 2007) are of the order of 12000-30000 specimens/year.

The fishery is experimental and developing, and this development should not be inhibited under the harvest strategy.

Review of the 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 & 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.

The aquarium sector has the following input controls: chemical/explosive use is prohibited; and gear restrictions on scoop net, cast net and seine net specifications, including maximum total net size/diameters, mesh sizes, handle/shaft lengths, and net lengths. Spatial closures also apply within Coringa-Herald and Lihou Reef National Nature Reserves. (Note also that 30% of the Great Barrier Reef is also closed). There is a 40 t limit on the take of live rock (dead coral encrusted with micro and macroscopic marine life, found on the seabed, and used as a biological nitrification base of an aquarium). In addition, there is a trigger of 200 days combined fishing.

While raw logbook data is provided, the 5-boat ruling & constraints of confidentiality prohibit presentation of detailed data for the 3 Hand Collection sectors. An aquarium collection trip was completed in March 2006 with observer coverage but the report is not yet finalized (as at October 2007). In total, three trips with observer coverage have been undertaken to date. No observer data had previously been collected for any of the 3 Hand Collection sectors.

DEW has requested performance measures and indicators that account for fishing, bycatch and ecosystem effects of fishing in the Coral Sea Fishery, but effort is so low in the fishery that the cost of obtaining this may exceed the GVP. Within the aquarium sector, DEW wants identification preferably to species level, but this is difficult and expensive (although individual operators do maintain private records).

A minimum number of fishing days were in place to obtain data, but they have been costly and in the context of future directions, information requirements, and how effort might be better focused to obtain information (e.g. observers, or “one-off” surveys every 5-8 years), this requirement was removed from July 2007.

As at September 2007, the fishery is up for re-assessment under the *Environmental Protection and Biodiversity Conservation Act 1999* as a Wildlife Trade Operation (WTO). The harvest strategy is expected to drive some rationalisation of the management arrangements. Any new management arrangements coming out of the harvest strategy are expected to improve on the arrangements currently in place and which are being assessed for WTO approval. In line with the provisions of the WTO approval DEW will be advised of any new arrangements.

An industry code of practice/conduct is currently being developed by industry associations jointly across the State and Commonwealth fisheries.

Proxies against the Harvest Strategy Policy Reference Points

There is little concern regarding resource sustainability given the low degree of relative exploitation. Given the developmental status of the fishery, together with its temporally variable species composition, there is as yet no qualitative or quantitative notion of target

reference points in terms of maximum economic yield. Moreover, the input controls are such that there is little potential for fishery expansion in terms of increased effort.

The series of triggers proposed under the harvest strategy is designed to allow for controlled expansion of the fishing, and hence optimize economic yield, while at the same time being precautionary in detecting changes in species composition and setting conservative values for triggers against key functional species groups that provide checks if the fishery expands. The decision rules are associated with evaluations and/or increased monitoring so that the risk associated with further expansion is minimized, and that more robust revised trigger and/or TAC values may be set.

The fishery captures over 500 species. Clearly it is not possible to set meaningful triggers against each of these, particularly given the changes in demand over time. However, by setting triggers against key functional species groups, it is hoped that the entire fishery will be vicariously represented and hence managed.

General description of the harvest strategy

Fishery Issues; justification for approach

The aquarium sector of the hand collection sub-fishery has only two permit holders, each restricted to eight operators per boat, fishing <1% of coral reef area in the Coral Sea, for more than 500 species over a maximum of 200 days per annum. It is unlikely that the fishery will significantly expand (in terms of effort) unless the number of operators increases, which is again unlikely. Permit holders have stressed that the input controls provide strong control over the fishery to the extent of limiting the potential for any increases in effort. In the context of these points, the catch is considered to be precautionary.

Permit holders have highlighted that catches vary considerably due to changing demand such that catch history is not likely to be a useful indicator of issues in the fishery.

The fishery lacks the data and GVP for sophisticated stock assessments (note also that species-specific data is not available to AFMA as at 2007). Moreover, the fishery is so small that, unless there is a major regime shift, its overall impact is likely to remain small. The fact that the fishery catches over 500 species across two permits (and often targets life history stages at which there is high natural mortality), together with the existing spatial closures, and the developing industry code of practice, the future likelihood of overfishing would appear to be low. As such, a risk-based approach of setting trigger points that allow for controlled fishery expansion appears to be the most pragmatic harvest strategy framework.

Harvest Strategy Overview

The previously existing management arrangements are effectively a harvest strategy, but additional triggers have been added to allow for controlled expansion by including conservative checkpoints at which some analysis and hence justification for continued expansion must occur. In addition to detecting fishery expansion, the catch composition triggers should detect any changes in targeting and/or availability across the fishery.

At higher trigger levels, if the fishery wishes to continue to expand, more detailed evaluations and/or increased monitoring are proposed so that the risk associated with

further expansion is minimised. Management measures such as the introduction of spatial closures and/or move-on provisions are also considerations at higher trigger levels. The nature of these evaluations should be determined when lower-level triggers are reached, in the context of the perceived status of the fishery and the species/functional groups for which the lower-level triggers have been exceeded.

The following triggers are proposed:

- Trigger of 200 days' fishing (total as distinct from individual operator)
- Total catch in numbers trigger: 40000 specimens.
 - If exceeded, review data and revise or maintain trigger. A revised trigger may be set in the context of species-specific catch information.
- Conservative annual triggers in terms of numbers for each key species/functional group
 - Set on a pro-rata of the 40000 specimens overall trigger, using the average relative proportions of each group that have comprised the historical catch composition
 - If the initial trigger level is reached, based on the outcomes of the analyses undertaken in accordance with the decision rule, a second, higher trigger level may be set for the species/functional group.
- Catch composition: a significant change in the relative proportion of the catch of a functional group IF no other triggers have been reached, AND the number of specimens is greater than 500 (to avoid trigger being reached unnecessarily)
- 20 t trigger and 40 t limit on the take of live rock

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

- Total catch in numbers trigger: 40000 specimens.
 - If exceeded, review data and revise or maintain trigger. A revised trigger may be set in the context of species-specific catch information.
- Conservative annual triggers in terms of numbers for each key species/functional group. If triggers reached within any year:
 - Assess fishery data via
 - detailed logbook analysis (including spatial and possibly trip-specific information)
 - Industry consultation in an attempt to determine why the observed change is occurring and whether it is deemed to be significant from an industry viewpoint.
 - Revised risk analysis

- If a reasonable justification for the change in the fishery can be made that does not relate to potential overfishing, then the fishery may continue with no management intervention. However, in the absence of any other explanation, a precautionary management response may be invoked. This may include
 - The introduction of spatial closures and/or move-on provisions
 - Increased monitoring (e.g. by species and/or by area)
- Based on the outcomes of the analyses, set a second, higher trigger level for the species/functional group. If and when this trigger is reached, invoke a management response (in consultation with stakeholders), such as:
 - spatial management
 - maximum number of animals to be taken: pending a more detailed assessment if desire a TAC set higher than the trigger level
- If the 20 t live rock trigger is reached within a season:
 - Undertake an assessment in form of data review
 - If the above trigger has not been reached within 3 years, an assessment of the sustainable take of live rock must be undertaken within the next 3 years

Consistency with Harvest Strategy Policy

While the existing management arrangements are effectively a harvest strategy, additional triggers have been added to allow for controlled expansion by including conservative checkpoints at which some analysis and hence justification for continued expansion must occur. In addition to detecting fishery expansion, the catch composition triggers should detect any changes in targeting and/or availability across the fishery.

At higher trigger levels, if the fishery wishes to continue to expand, more detailed evaluations and/or increased monitoring are proposed so that the risk associated with further expansion is minimised. Management measures such as the introduction of spatial closures and/or move-on provisions are also considerations at higher trigger levels.

Given the low GVP and developmental status of the fishery, the strategy aims to avoid imposing additional restrictions unless the fishery shows signs of expansion or significant change. However, its suite of conservative triggers provides a precautionary basis on which the fishery may develop.

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

The existing management arrangements, should apply as follows:

- chemical/explosive use prohibited, unless negotiated under scientific permit (e.g. to allow rapid collection at depth). The use of anaesthetics for deep diving may be considered for future inclusion in ongoing permit conditions if this proves to be a viable proposition following successful trials.
- gear restrictions on scoop net, cast net and seine net specifications, including maximum total net size/diameters, mesh sizes, handle/shaft lengths, and net lengths.
- spatial closures (main ones being Great Barrier Reef Marine Park Authority (GBRMPA), and the Coringa-Herald and Lihou Reef closures)
- 40 t limit on the take of live rock
- Trigger of 200 days' fishing

Key species/species groups must be identified, plus “vulnerable” species/species groups:

- In identifying species groups, industry members have suggested wrasses as a consistently targeted group, and cautioned that tangs would not be a good choice due to high variability associated with cyclonic events periodically destroying key habitat.
- Functional groups could be assigned according to longevity, life history and territorial/social behaviour.
- In the interim, consider the 5 functional groups with the highest reported catches over the available time series, plus “vulnerable” species?
- Undertake risk assessment to identify any other “vulnerable” species to add
- The 2007 QDPI&F report should be accessed and used as supporting information, to assist with the choice and/or revision of key species/species groups for the CSF Aquarium sector. This study has undertaken a risk assessment for each of the approximate 550 species against a range of criteria including habitat and accessibility. Obviously some species will not be present in the Coral Sea Fishery, while other Coral Sea species will not be represented, but the overall extent of species overlap will be high as the fisheries are very similar.

A set of trigger values should be determined that encapsulate the dynamics of the fishery in such a way that is demonstrably consistent with the intent of the Harvest Strategy Policy.

Three sets of triggers are proposed, as follows:

1. Total catch in numbers trigger
 - Current catches 12000-30000 specimens/year; set 40000 specimen trigger.
 - If exceeded, review data and revise or maintain trigger. A revised trigger may be set in the context of species-specific catch information.

2. For each key species/functional group, set conservative annual triggers in terms of numbers, such that the Harvest Strategy obligations are met without placing limitations on the development of the fishery

These should be set via a pro-rata of the 40000 specimens overall trigger, using the average relative proportions of each group that have comprised the historical catch composition (see Supplementary Analysis section below).

If triggers are reached within any year, the following decision rules apply:

- Assess fishery data via
 - i. detailed logbook analysis (including spatial and possibly trip-specific information)
 - ii. Industry consultation in an attempt to determine why the observed change is occurring and whether it is deemed to be significant from an industry viewpoint.
 - iii. Revised risk analysis
- If a reasonable justification for the change in the fishery can be made that does not relate to potential overfishing (e.g. new market for species), then the fishery may continue with no management intervention. However, in the absence of any other explanation, a precautionary management response may be invoked. This may include
 - i. The introduction of spatial closures and/or move-on provisions
 - ii. Increased monitoring (e.g. by species and/or by area)
- Based on the outcomes of the analyses, set a second, higher trigger level for the species/functional group. If and when this trigger is reached, invoke a management response (in consultation with stakeholders), such as:
 - i. spatial management
 - ii. maximum number of animals to be taken: pending a more detailed assessment if desire a TAC set higher than the trigger level

3. Catch composition

This trigger is associated with detecting a significant change in catch composition.

- Initially, changes in the relative take of key functional groups should be used
- If a significant change (e.g. X% [30%? – see “Supplementary Analysis below]) in the relative proportion of catch of one or more functional groups, BUT no other triggers have been reached, AND the number of specimens is greater than 500 (to avoid trigger being reached unnecessarily)
 - i. Assess data
 - ii. Increase monitoring (e.g. by species and/or by area)
- Depending on the magnitude of the percentage change that is set, for increasing catch this trigger may be reached before or after the absolute trigger described

above. The important point, however, is that the two triggers have different objectives. The absolute value triggers become important as the fishery expands and provide checks so that expansion may occur in a controlled manner. The catch composition triggers may be reached irrespective of the number of specimens caught. These are designed to detect changes in the overall species makeup of the fishery, both in terms of relative increases OR decreases in any functional group. Finally, as the fishery develops, absolute trigger values may be assigned to specific species as well as to functional groups, while composition triggers may apply only to functional groups (noting that these become less effective on an individual species basis in a fishery with so many species).

The following triggers should apply to live rock, in addition to the existing 40t limit:

- 20t trigger; undertake assessment in form of data review if this trigger is reached within a fishing season
- Undertake an assessment of the sustainable take of live rock within 3 years, if the above trigger has not been reached
- Spatial management zones may be considered if considered relevant when the trigger is reached.
- Industry Code of Conduct? (with links to wider region, particularly Queensland)

Note that there may be potential problems with data confidentiality if species-specific information is required

Process for review

The nature of data reviews and analyses in response to triggers being reached should be explicitly defined.

The effectiveness of the functional groups as being representative of the entire fishery will need to be periodically assessed, as this is likely to change over time with changing species demand.

The effectiveness of the catch composition trigger will need to be reviewed in terms of its definitions and sensitivity to ensure that it is performing in a robust manner.

The review process should pay close attention to the status of the state fishery. In addition, outcomes of state-based studies (such as the 2007 QDPI&F report) should be used where possible to help inform the Commonwealth harvest strategy.

The necessity or otherwise for species specific information should be revisited in the context of the effectiveness of functional group-based triggers.

Supplementary analysis

The table below shows the average catch proportions for the 5 main functional groups (with proportions calculated across the TOTAL aquarium sector catch [excluding live rock] – i.e NOT just across the catch taken from the five groups) and the absolute triggers corresponding to these proportions applied to a total of 40000 specimens. It also gives the percentage catch composition triggers (both lower and upper) for a trigger of 30% change about the historical average proportions. As an example, these are translated to absolute catch values for the 2005/06 catch. It can be seen that, for that year, the upper catch composition trigger is just below the absolute trigger value. However, in other years, this translated value will vary according to the total catch. The relevant currency for this trigger is the percentage value.

For a trigger of 30% change, the relative catch proportions across the groups in each historical year were generally within the trigger bounds. The exceptions were:

- 2000/01: gobies below (2.6% < 3.6% trigger - but less than 500 specimens), surgeon fish above (17.4% > 14.5% trigger)
- 2004/05: angelfish below (4.4% < 5.4% trigger), surgeon fish below (4.5% < 7.8% trigger)
- 2005/06: angelfish above (10.2% > 10.1% trigger – should probably round triggers to nearest percentage, however)

FUNCTIONAL GROUP	Average catch proportion (%) 2001-2006 (across TOTAL catch)	ABSOLUTE TRIGGERS based on pro rata of 40000 specimens	CATCH COMPOSITION TRIGGERS			
			Percentages		Example of catch composition trigger values for 2005/06 catch	
			greater than plus 30%	less than minus 30%	plus 30%	minus 30%
Angelfish - other	7.75	3101	10.08	5.43	2899	1561
Damsel fish	28.36	11343	36.86	19.85	10604	5710
Gobies	5.12	2050	6.66	3.59	1916	1032
Surgeon fish	11.14	4458	14.49	7.80	4168	2244
Wrasses	14.80	5920	19.24	10.36	5535	2980