



Australian Government  
Department of Agriculture,  
Fisheries and Forestry



# Ecological Risk Assessment for Effects of Fishing

Report for the Aquarium Sector of the Coral Sea Fishery

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Research by the Australian Bureau of Agricultural and Resource Economics and Sciences

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### Acknowledgement of Country

We acknowledge the continuous connection of First Nations Traditional Owners and Custodians to the lands, seas and waters of Australia. We recognise their care for and cultivation of Country. We pay respect to Elders past and present, and recognise their knowledge and contribution to the productivity, innovation and sustainability of Australia's agriculture, fisheries and forestry industries.

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# Summary

The Coral Sea Fishery (CSF) Aquarium Sector is highly selective hand collection fishery, with over 500 target species for the aquarium trade, including groupers (*Serranidae*), wrasses (*Labridae*), damselfish (*Pomacentridae*), bristletooths, surgeonfish, tangs and unicorn fish (*Acanthuridae*), blennies (*Blenniidae*), gobies (*Gobiidae*), angel fish (*Pomacanthidae*), Humphead Maori wrasses (*Cheilinus undulatus*), stony corals (*Acroporidae*), and live rock.

An Ecological Risk Assessment (ERA) was undertaken for the CSF Aquarium Sector consisting of a level 1 scale, intensity and consequence analysis (SICA). SICA is a comprehensive but qualitative analysis that uses an exposure-effect risk assessment approach to the most vulnerable unit of an ecological component. The assessment was informed by the reported logbook catch and effort data from 1997–1998 to 2023–2024, CSF industry provided operator’s species catch (excluding effort) for 2008–2009 to 2023–2024, and expert opinion through a stakeholder workshop.

Out of the 32 possible hazards, 19 were identified to have the potential to occur in the CSF Aquarium Sector, including 16 internal and 3 external. All fishing hazards were eliminated at Level 1 (i.e. no components with risk scores of 3 (moderate) or above. The only hazard identified with a moderate or above risk score was an external hazard (other anthropogenic activities - climate change) for target species, protected species, habitat and community components.

Under the ERA process only components assessed in the SICA that have consequence scores of 3 or above for internal fishing activities are examined at level 2. No components were assessed to have an internal fishing activity with a consequence score of 3 or above. The only components (target species, protected species, habitat and community) that were assessed to have consequence scores of 3 or above were for an external hazard (climate change). Because external hazards are not considered at level 2 in the PSA analysis no level 2 analysis was undertaken.

# 1 Introduction

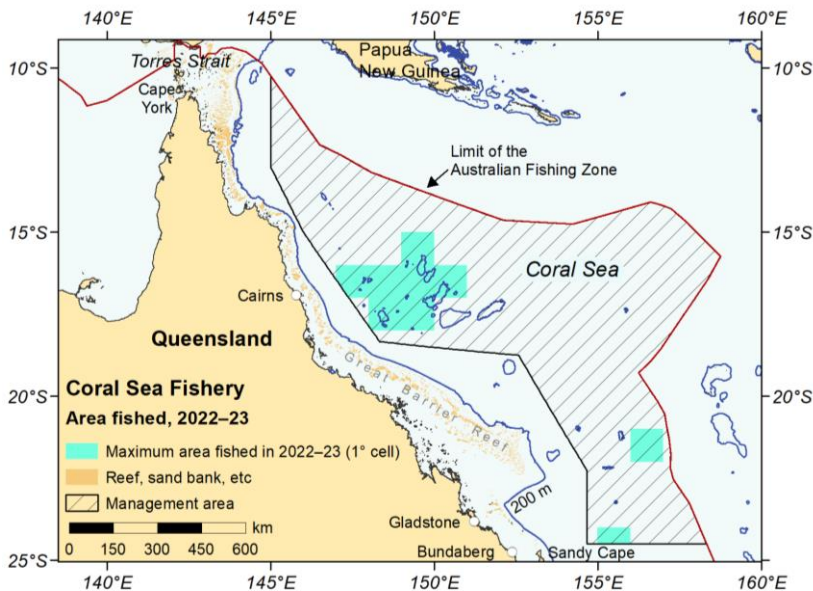
## 1.1 Coral Sea Fishery – Aquarium Sector

The Coral Sea Fishery (CSF) is a multispecies, multi-gear fishery targeting a diverse variety of fish, sea cucumbers and crustaceans in the Coral Sea (Keller et al. 2024). The CSF extends from Cape York to Sandy Cape, Queensland (Map 1). It is bounded on the east by the Australian Fishing Zone and on the west by a line 0 to 100 nautical miles east of the eastern boundary of the Great Barrier Reef Marine Park (AFMA 2021).

Fishing methods include hand collection, demersal line, dropline, mechanised handline, rod and reel, and trotline. since the Coral Sea Marine Park was established, use of traps is no longer permitted and there are specific gear restrictions for different zones (AFMA 2024a). The sectors and fishing permits of the CSF are based on fishing techniques, which are Line Sector (demersal longline, trotlines, droplines, setlines and handlines, Sea Cucumber Sector (hand collection), Lobster and Trochus Sector (hand collection), and Aquarium Sector (hand collection, barbless hook and line, scoop, cast and seine nets).

There are over 500 species caught within the Aquarium sector, including reef fish, coral and live rock. Due to the vast number of species retained within this sector, no formal stock assessments have been conducted for these species in the Coral Sea. The Aquarium Sector Harvest Strategy sets annual catch triggers for key family groups based on conservative estimates of stock size to meet the sustainability objectives of the Commonwealth Fisheries Harvest Strategy Policy (Department of Agriculture and Water Resources 2018).

**Map 1 Area fished within the Coral Sea Fishery, 2022–23 fishing season**



Source: ABARES Fishery Status Report 2024

## **1.2 Environmental Risk Assessment for the Aquarium sector of the Coral Sea fishery**

Ecological Risk Assessment for the Effects of Fishing (ERAEF) framework evaluates the risks commercial fisheries may pose to the marine environment. ERAEF was designed to support ecological sustainable development objectives in Commonwealth fisheries and is used by decision makers to develop ecosystem-based management arrangements.

Ecological risk assessments (ERAs) considers the impacts of fishing on five key components of the marine environment, including commercial species, byproduct species and bycatch species, protected species, habitats, and communities. ERAs allows for a broad range of species to assessed under a single framework and for the rapid identification of high and low risk species, as well as those that are data deficient.

The ERA framework involves a hierarchical approach that begins with a scoping stage to establish the context and identify hazards for the fishery that then moves to a comprehensive and qualitative analysis of risk at level 1, and if required through to move a semi-quantitative analysis at level 2, and then to a highly focused and fully quantitative model-based analysis at level 3 (Hobday et al. 2007; Smith et al. 2007). The methods are summarised in Appendix A of this report.

The last ERA for the CSF Aquarium Sector was conducted in 2007 (Furlani et al. 2007). The current wildlife trade operation (WTO) approval for the Coral Sea Fishery includes a condition requiring Australian Fisheries Management Authority (AFMA) to undertake and publish a risk assessment for the CSF Aquarium Sector by 31 January 2025. ABARES have undertaken an updated ERA, and this report presents the findings of this work.

## 2 Results

The results presented below are for the Aquarium Sector of the Coral Sea Fishery for the level 1 SICA analysis only. Further details on the general characteristics of the Aquarium Sector, including current management arrangements, can be found in the CSF Aquarium Sector scoping document (AFMA 2025).

Out of the 32 possible hazards within the Aquarium Sector, 19 were identified to have the potential to occur in the fishery (AFMA 2025) and were assessed with the SICA methodology. For further information, see CSF Aquarium Sector scoping document (S4 Hazard Identification; AFMA 2025).

### 2.1 Stakeholder workshop

The stakeholder workshop was held virtually on Wednesday 4<sup>th</sup> December 2024. In attendance were representatives from ABARES, DCCEEW, AFMA, CSF Industry and coral reef researchers (Appendix B).

The workshop participants discussed the draft results of the SICA and confirmed scores for the intensity and consequence of the identified fishing hazards (Table 1).

**Table 1 Level 1 SICA summary table of the stakeholder involvement regarding CSF Aquarium Sector.**

ERA Stage	Date	Format received	Stakeholder	Summary of outcome
Scoping	Nov 2024	Email	AFMA	Fisheries data, general fishery characteristics provided to ABARES
SICA	Dec 2024	Email	Workshop participants	Draft report for comment
	Dec 2024	Email	AFMA; Workshop participants	Species list provided to ABARES and workshop participants; Comments on draft report

### 2.2 Species Component

#### 2.2.1 Target species

Target species are considered as a species or group of species whose capture is the goal of a fishery, sub-fishery, or fishing operation.

There are over 500 species caught or harvested within the Aquarium sector, including reef fish, coral and live rock, of which are reported to family group level in fishery logbooks to AFMA (Table 2; AFMA 2025).

For further information, see CSF Aquarium Sector Scoping Document (S2: Ecological Unit of Analysis – Target Species Component; AFMA 2025).



**Table 2 Reported logbook catch (number of individuals) for the CSF Aquarium Sector for the three previous fishing seasons**

Family name	Standard name <sup>a</sup>	2021-22	2022-23	2023-24
<i>Serranidae</i>	Anthias	8,813	5,823	2,991
<i>Labridae</i>	Wrasses	7,984	5,673	1,621
	Humphead Maori wrasse	6	5	8
<i>Pomacentridae</i>	Damselfish	4,800	4,085	705
<i>Acanthuridae</i>	Surgeonfish	3,004	4,023	573
<i>Blenniidae &amp; Gobiidae</i>	Blennies & Gobies	1,687	868	447
<i>Pomacanthidae</i>	Angelfish, Pygmy Angels	2,490	771	176
<i>Acroporidae</i> <sup>b</sup>	Stony corals	410kg	520kg	245kg
	Live rock	2460kg	720kg	1710kg

**Source:** AFMA 2025. **a** Species are reported to family level excluding Humphead Maori Wrasse. **b** Reported catch in kilograms of wet weight.

Initially, the target species component was assessed on the family level grouping and presented to the stakeholder workshop, as detailed species list was not available at that time of the assessment. Of the 34 target family groups identified for the Aquarium Sector, 5 were considered the most vulnerable by certain fishing activities:

- Acropora corals (Genus *Acropora*)
- Wrasse (Family Labridae)
- Anthias (Family Serranidae)
- Gobies, Blennies, (Families Gobiidae, Blenniidae)
- Hermit crabs (Superfamily Paguroidea)

A species list was provided by the one of the two operators and assumed by ABARES to be representative of the Aquarium Sector catch. Of the 545 species caught within the CSF, the following were considered most vulnerable to identified fishing activities (Table 3):

- Acropora corals (Genus *Acropora*)
- Humphead maori wrasse, *Cheilinus undulatus*
- Green chromis, *Chromis viridis*
- Lawnmower blenny, *Salarias fasciatus*
- Spotted hermit crab, *Dardanus megistos*
- Reef sharks (Family Carcharhinidae)

**Table 3 SICA results for the Target Species Component**

Direct impact of Fishing	Fishing Activity	Hazard (1/0)	Spatial scale (1-6)	Temporal scale	Sub-component	Unit of analysis	Objective	Intensity Score	Consequence (1-2)	Confidence (1-2)	Rationale	Internal/External
Capture	Bait collection	0	--	--	--	--	--	--	--	--	Bait is purchased rather than collected	--
	Fishing	1	4	4	Population size	Humphead maori wrasse ( <i>Cheilinus undulatus</i> ); Green chromis, ( <i>Chromis viridis</i> )	1.2	3	2	1	<b>Hazard:</b> Capture of organisms due to actual fishing. Humphead maori wrasse has species specific harvest limits. From the operator species list, green chromis has been the most caught species between 2008-09 and 2023-24); Standing biomass of spawning stock may be affected; <b>Scale:</b> Potential fishing area 100-500 nm, 100-200 days per year; <b>Intensity:</b> Likely moderate and potential to be severe at localised scale (most effort focused on 2 reefs) scale; <b>Consequence:</b> Likely minor due to low fishing effort and catch levels reported; <b>Confidence:</b> Low, with no data to confirm or refute, no stock assessment or CPUE data.	I
	Incidental behaviour	0	--	--	--	--	--	--	--	--	No activities that result in capture while not fishing	--
Direct impact without capture	Bait collection	0	--	--	--	--	--	--	--	--	Bait is purchased rather than collected	--
	Fishing	1	4	4	Behaviour/movement	Lawnmower blenny ( <i>Salarias fasciatus</i> )	6.1	2	1	1	<b>Hazard:</b> Benthic species such as Lawnmower blenny ( <i>Salarias fasciatus</i> ) may be disturbed by divers moving over them, and by contact with hand nets without actual capture. Impact considered minimal and reef edges and rubble areas are targeted, as opposed to coral areas, primarily to avoid damage to collection nets. Hand collection gear including cast, scoop and seine nets; <b>Scale:</b> Potential fishing area 100-500 nm, 100-200 days per year; <b>Intensity:</b> Likely minor. Reef edges and rubble areas are targeted, as opposed to coral areas (from scoping doc 1; what are coral areas? coral in reef edge, slope, flat etc), primarily to avoid damage to collection nets; <b>Consequence:</b> Likely negligible, no gear is set overnight, divers must not use of chemicals and/or explosives; <b>Confidence:</b> Low, with no data to confirm or refute	I
	Incidental behaviour	1	4	3	Population size	Spotted Hermit crab ( <i>Dardanus megistos</i> )	1.1	1	1	1	<b>Hazard:</b> Periodically go ashore onto islands during the day, hermit crabs may be physically damaged by tender boats and/or people. Boat lights at night may have minimal impact on birdlife; <b>Scale:</b> Potential fishing area 100-500 nm, 1-100 days per	I

Direct impact of Fishing	Fishing Activity	Hazard (1/0)	Spatial scale (1-6)	Temporal scale	Sub-component	Unit of analysis	Objective	Intensity Score	Consequence (1-2)	Confidence (1-2)	Rationale	Internal/External
											year; <b>Intensity:</b> Likely negligible; <b>Consequence:</b> Likely negligible; <b>Confidence:</b> Low, with no data to confirm or refute	
	Gear loss	0	--	--	--	--	--	--	--	--	Gear is operated by hand and unlikely to be lost. Equipment is custom made so fishers are highly incentivised to preserve gear between fishing locations and trips.	--
	Anchoring/ mooring	1	4	3	Population size	Acropora Coral (Family Acroporidae)	1.1	2	2	1	<b>Hazard:</b> Possible damage to animals and corals where anchor drops. Motherships are anchored on sand where possible. Light anchors are used to secure tenders on reefs. Permanent moorings are not used as they do not lend themselves to the spread of fishing effort; <b>Scale:</b> Potential fishing area 100-500 nm, 1-100 days per year, assuming not moving once anchored for a number of days; <b>Intensity:</b> Likely minor on localised scale; <b>Consequence:</b> Likely minor; <b>Confidence:</b> Low, with no data to confirm or refute	I
	Navigation/ steaming	1	5	4	Behaviour/ movement	Humphead maori wrasse ( <i>Cheilinus undulatus</i> );	6.1	1	1	2	<b>Hazard:</b> Navigation and steaming of the vessels will introduce noise (engine noise and echo-sounders) and visual stimuli into the environment, which both may temporarily affect the behaviour of adult reef fish; <b>Scale:</b> Potential impact area over 500 nm, 100-200 days per year; <b>Intensity:</b> Likely negligible; <b>Consequence:</b> Likely negligible; <b>Confidence:</b> High, research into effects	I
Addition/ movement of biological material	Translocation of species	1	5	4	Genetic Structure	Acropora Coral (Family Acroporidae)	3.1	2	2	1	<b>Hazard:</b> Could occur incidentally via boat hulls, or fouling or nets, involving introduced species or movement of species from coastal areas into the Coral Sea Fishery area; <b>Scale:</b> Potential impact area over 500 nm, 100-200 days per year; <b>Intensity:</b> Likely minor at broader scale or moderate at local scale, with operators travelling between multiple reefs per trip; <b>Consequence:</b> Likely minor. Mitigation policy in place to eliminate risk of translocation - no species caught by aquarium operators are ever returned to the water. Holds and transport containers are sterilised intermittently with anti-fouling chemical. Only one port is used by all operators (Cairns). Freshwater net sterilisation or drying all nets between trips Coral collection does not take place during coral spawning which also ensures translocation risk is reduced; <b>Confidence:</b> Low, with no data to confirm or refute	I
	On board processing	0	--	--	--	--	--	--	--	--	Fish are caught, transported, and delivered live. There is no onboard processing involved.	--

Direct impact of Fishing	Fishing Activity	Hazard (1/0)	Spatial scale (1-6)	Temporal scale	Sub-component	Unit of analysis	Objective	Intensity Score	Consequence (1-2)	Confidence (1-2)	Rationale	Internal/External
	Discarding catch	0	--	--	--	--	--	--	--	--	No discarding due to highly selective fishing methods	--
	Stock enhancement	0	--	--	--	--	--	--	--	--	Does not occur	--
	Provisioning	1	4	3	Behaviour/movement	Reef sharks (Family <i>Carcharhinidae</i> )	6.1	2	1	1	<b>Hazard:</b> Berley cage with pilchard bait (purchased from bait provider) used to attract some species; <b>Scale:</b> Potential fishing area 100-500 nm, 100-200 days per year; <b>Intensity:</b> Likely minor; <b>Consequence:</b> Likely negligible, and likely not detectable against natural variation of species composition; <b>Confidence:</b> Low, with no data to confirm or refute	I
	Organic waste disposal	1	4	3	Behaviour/movement	Humphead maori wrasse ( <i>Cheilinus undulatus</i> );	6.1	2	1	1	<b>Hazard:</b> Disposal of organic wastes (sewage) from the permit boat. MARPOL guidelines apply. There is no offal or catch discarding in this fishery; <b>Scale:</b> Potential fishing area 100-500 nm, 1-100 days per year; <b>Intensity:</b> Likely negligible; <b>Consequence:</b> Likely negligible; <b>Confidence:</b> Low, with no data to confirm or refute	I
Addition of non-biological material	Debris	0	--	--	--	--	--	--	--	--	Rubbish not thrown overboard. MARPOL guidelines apply	--
	Chemical pollution	1	4	3	Population size	Acropora Coral (Family <i>Acroporidae</i> )	1.1	2	1	1	<b>Hazard:</b> Oil spills, anti-fouling chemicals, MARPOL guidelines apply. Dishwashing liquids, shampoos etc; <b>Scale:</b> Potential fishing area 100-500 nm, 1-100 days per year; <b>Intensity:</b> Likely negligible; <b>Consequence:</b> Likely negligible; <b>Confidence:</b> Low, with no data to confirm or refute	I
	Exhaust	1	4	3	Behaviour/movement	Humphead maori wrasse ( <i>Cheilinus undulatus</i> );	6.1	1	1	1	<b>Hazard:</b> Exhaust as a result of diesel and other engines; <b>Scale:</b> Potential fishing area 100-500 nm, 1-100 days per year; <b>Intensity:</b> Likely negligible; <b>Consequence:</b> Likely negligible; <b>Confidence:</b> Low, with no data to confirm or refute	I
	Gear loss	0	--	--	--	--	--	--	--	--	Gear is operated by hand and unlikely to be lost. Fishers are highly incentivised to preserve their gear as they are custom made. Retention of equipment is critical for the next dive and remainder of the trip.	--
	Navigation/steaming	1	5	4	Behaviour/movement	Humphead maori wrasse ( <i>Cheilinus</i>	6.1	1	1	1	<b>Hazard:</b> Navigation and steaming of the vessels will introduce noise (engine noise and echo-sounders) and visual stimuli into the environment, which both can affect the behaviour of reef fish; <b>Scale:</b> Potential impact area over 500 nm, 100-200 days per	I

Direct impact of Fishing	Fishing Activity	Hazard (1/0)	Spatial scale (1-6)	Temporal scale	Sub-component	Unit of analysis	Objective	Intensity Score	Consequence (1-2)	Confidence (1-2)	Rationale	Internal/External
						<i>undulatus</i> );					year; <b>Intensity</b> : Likely negligible; <b>Consequence</b> : Likely negligible; <b>Confidence</b> : Low, with no data to confirm or refute	
	Activity/presence on water	1	5	4	Behaviour/movement	Humphead maori wrasse ( <i>Cheilinus undulatus</i> );	6.1	1	1	1	<b>Hazard</b> : The activity of the vessels will introduce noise and visual stimuli into the environment. May interact with wildlife such as dolphins riding bow wave, birds settling on boat. Lights at night may have minimal impact; <b>Scale</b> : Potential impact area over 500 nm, 100-200 days per year; <b>Intensity</b> : Likely negligible; <b>Consequence</b> : Likely negligible; <b>Confidence</b> : Low, with no data to confirm or refute	I
Disturb physical processes	Bait collection	0	--	--	--	--	--	--	--	--	Bait is purchased rather than collected	--
	Fishing	1	4	4	Population size	Acropora Coral (Family Acroporidae)	1.1	1	1	1	<b>Hazard</b> : Divers may disturb sediments locally that may impact on feeding or reproduction of sedentary organisms through habitat modification; <b>Scale</b> : Potential impact area 100-500 nm, 100-200 days per year; <b>Intensity</b> : Likely negligible; <b>Consequence</b> : Likely negligible; <b>Confidence</b> : Low, with no data to confirm or refute	I
	Boat launching	1	4	3	Behaviour/movement	Humphead maori wrasse ( <i>Cheilinus undulatus</i> );	6.1	1	1	1	<b>Hazard</b> : Main vessels in fishery come from designated ports that are outside the Coral Sea Fishery (Cairns), boat launching on/off islands, Within the CSF, tenders launched from the mothership; <b>Scale</b> : Potential impact area 100-500 nm, 1-100 days per year; <b>Intensity</b> : Likely negligible; <b>Consequence</b> : Likely negligible. Within the CSF, the mothership on a mooring, tender launched from the mothership. Periodically go ashore onto islands during the day; <b>Confidence</b> : Low, with no data to confirm or refute	I
	Anchoring/mooring	1	4	3	Population size	Acropora Coral (Family Acroporidae)	1.1	2	2	1	<b>Hazard</b> : Anchoring may affect the physical processes where anchors and chains contact the seafloor. Tenders often anchor directly to reef; <b>Scale</b> : Potential impact area 100-500 nm, 1-100 days per year; <b>Intensity</b> : Likely minor on localised scale; <b>Consequence</b> : Likely minor. Within the CSF, the mothership on a mooring, tender launched from the mothership and anchor on reefs, although light gear is used to minimise impact; <b>Confidence</b> : Low, with no data to confirm or refute	I
	Navigation/steaming	1	5	4	Behaviour/movement	Humphead maori wrasse ( <i>Cheilinus</i>	6.1	1	1	2	<b>Hazard</b> : Navigation /steaming may affect the physical processes on the benthos and the pelagic by turbulent action of propellers or wake formation; <b>Scale</b> : Potential	I

Direct impact of Fishing	Fishing Activity	Hazard (1/0)	Spatial scale (1-6)	Temporal scale	Sub-component	Unit of analysis	Objective	Intensity Score	Consequence (1-)	Confidence (1-2)	Rationale	Internal/External
						<i>undulatus</i> );					impact area over 100 nm, 1-100 days per year; <b>Intensity</b> : Likely negligible; <b>Consequence</b> : Likely negligible; <b>Confidence</b> : High	
External hazards	Other fisheries	1	5	6	Population size	Acropora Coral (Family Acroporidae)	6.1	1	1	1	<b>Hazard</b> : Effort overlap is only considered for hand collection sectors, and of those only sea cucumbers harvest from reefs directly. Fishing activity occurs over the same reef systems within a limited spatial range. Likely only overlap would be mooring as sea cucumber harvesting occurs on different sections of the reef to that of the Aquarium Sector. There can be daily fishing activity during total few months a year; <b>Scale</b> : Potential impact area 500-1000 nm, 300-365 days per year; <b>Intensity</b> : Likely negligible; <b>Consequence</b> : Likely negligible, different target species; <b>Confidence</b> : Low, with no data to confirm or refute	E
	Aquaculture	0	--	--	--	--	--	--	--	--	Fishery is located offshore and not impacted	--
	Coastal development	0	--	--	--	--	--	--	--	--	Fishery is located offshore and not impacted	--
	Other extractive activities	0	--	--	--	--	--	--	--	--	At present, no current petroleum permits exist, and no new leases have been granted for the CSF area	--
	Other non-extractive activities	1	5	5	Behaviour/movement	Reef sharks (Family Carcharhinidae)	6.1	2	2	1	<b>Hazard</b> : Shipping likely occurs in the Coral Sea but unlikely to impact on species. Increasing diving/tourism in area which may affect species behaviour. As of 2024, overlap with tourism operators is low (operators don't go to fixed sites, 1-2 trips a year). Previous history of tourism operators provisioning sharks at Holmes Reefs that has impacted shark behaviour; <b>Scale</b> : Potential impact area 500-1000 nm, 200-300 days per year; <b>Intensity</b> : Likely minor; <b>Consequence</b> : Likely minor; <b>Confidence</b> : Low, with no data to confirm or refute	E
	Other anthropogenic activities	1	6	6	Population size	Acropora Coral (Family Acroporidae)	1.1	5	4	2	<b>Hazard</b> : Anthropogenic activities that increase the risk and impact climate change, which may increase biological, non-biological and physical disturbance factors. Climate change resulting in marine heatwaves, causing mass bleaching events of corals in the Coral Sea and Great Barrier Reef. Recorded bleaching events and subsequent declines in coral cover, on shallow reefs (<15 m depth) in the Coral Sea	E

Direct impact of Fishing	Fishing Activity	Hazard (1/0)	Spatial scale (1-6)	Temporal scale	Sub-component	Unit of analysis	Objective	Intensity Score	Consequence (1-2)	Confidence (1-2)	Rationale	Internal/External
											(including Holmes Reef) in 2016,2017, 2020, 2021, 2022 and 2024; <b>Scale:</b> Potential impact area over 1000 nm, 300-365 days per year; <b>Intensity:</b> Likely Severe; <b>Consequence:</b> Likely major with wide and long-term effects - increased risk of mass coral bleaching, increased risk of cyclones; <b>Confidence:</b> High	

## 2.2.2 Bycatch and byproduct species

Byproduct refers to any part of the catch that is kept or sold by fishers, but which is not a target species. Bycatch as defined in the Commonwealth Bycatch Policy refers to:

- The part of a fisher's catch which is returned to the sea either because it has no commercial value or because regulations preclude it being retained; and
- The part of the catch that does not reach the deck but is affected by interaction with the fishing gear

In the ERAEF method, the part of the target or bycatch that is discarded is included in the assessment of the target or byproduct species.

For the Coral Sea Aquarium Sector, no byproduct or discard species were identified due to the highly selective fishing method (AFMA 2025).

## 2.2.3 Protected species

Species that are listed as Endangered, Threatened, or Protected (ETP) under the Environmental Protection and Biodiversity Conservation Act (EPBC Act). ETP species are often poorly reported by fisheries due to the low frequency of direct interaction. Both direct (capture) and indirect (e.g. food source captured) interactions are considered in the ERAEF approach.

For each fishery, the list of ETP species is compiled by reviewing all available fishery literature. Species considered to have potential to interact with fishery (based on geographic range & proven/perceived susceptibility to the fishing gear/methods and examples from other similar fisheries across the globe) are included.

For further information, see CSF Aquarium Sector Scoping Document (S2: Ecological Unit of Analysis – ETP Species Component; AFMA 2025).

Of the 102 ETP species identified for the Aquarium Sector, 5 were considered the most vulnerable by certain fishing activities and therefore assessed in the SICA were (Table 4):

- Spectacled Sea Snake (*Hydrophis kingii*)
- Spotted Seahorse (*Hippocampus kuda*)
- Streaked Shearwater (*Calonectris leucomelas*)
- Flatback turtle (*Natator depressus*)
- Pipefish and seahorses (Family Syngnathidae)



**Table 4 SICA results for the Protected species Component**

Direct impact of Fishing	Fishing Activity	Hazard (1/0)	Spatial scale (1-6)	Temporal scale	Sub-component	Unit of analysis	Objective	Intensity Score	Consequence (1-2)	Confidence (1-2)	Rationale	Internal/External
Capture	Bait collection	0	--	--	--	--	--	--	--	--	Bait is purchased rather than collected	--
	Fishing	0	--	--	--	--	--	--	--	--	No fishing activities result in the capture of ETP species due to selective nature of fishing methods	--
	Incidental behaviour	0	--	--	--	--	--	--	--	--	No activities that result in capture while not fishing	--
Direct impact without capture	Bait collection	0	--	--	--	--	--	--	--	--	Bait is purchased rather than collected	--
	Fishing	1	4	3	Interaction with fishery	Spotted Seahorse ( <i>Hippocampus kuda</i> )	7.2	1	1	2	<b>Hazard:</b> Benthic species may be disturbed by divers moving over them, and by contact with hand nets without actual capture. Hand collection gear including cast, scoop and seine nets; <b>Scale:</b> Potential fishing area 100-500 nm, 1-100 days per year; <b>Intensity:</b> Likely negligible; <b>Consequence:</b> Likely negligible; <b>Confidence:</b> High, from reporting data and highly selective nature of the gear	I
	Incidental behaviour	1	4	3	Interaction with fishery	Flatback turtle ( <i>Natator depressus</i> )	7.2	1	1	2	<b>Hazard:</b> Periodically go ashore onto islands during the day, turtle may be disturbed by tender boats and/or people. Boat lights at night may have minimal impact on birdlife; <b>Scale:</b> Potential fishing area 100-500 nm, 1-100 days per year; <b>Intensity:</b> Likely negligible; <b>Consequence:</b> Likely negligible; <b>Confidence:</b> High, from ETPs reporting data	I
	Gear loss	0	--	--	--	--	--	--	--	--	Gear is operated by hand and unlikely to be lost. Fishers are highly incentivised to preserve their gear as they are custom made. Retention of equipment is critical for the next dive and remainder of the trip.	--
	Anchoring/mooring	1	4	3	Behaviour/movement	Streaked Shearwater ( <i>Calonectris leucomelas</i> )	6.1	2	1	2	<b>Hazard:</b> Some birds may be attracted to anchored vessels briefly. Boat lights at night may have minimal impact on birdlife; <b>Scale:</b> Potential fishing area 100-500 nm, 1-100 days per year; <b>Intensity:</b> Likely minor; <b>Consequence:</b> Likely negligible; <b>Confidence:</b> High, interactions with seabirds must be reported, ETPs reporting	I
Navigation/steaming	1	4	3	Behaviour/movement	Streaked Shearwater	6.1	2	1	2	<b>Hazard:</b> Seabirds may be attracted to the vessels. Boat lights at night may have minimal impact on birdlife; <b>Scale:</b> Potential fishing area 100-500 nm, 1-100 days per	I	

Direct impact of Fishing	Fishing Activity	Hazard (1/0)	Spatial scale (1-6)	Temporal scale	Sub-component	Unit of analysis	Objective	Intensity Score	Consequence (1-2)	Confidence (1-2)	Rationale	Internal/External
						<i>(Calonectris leucomelas)</i>					year; <b>Intensity:</b> Likely minor; <b>Consequence:</b> Likely negligible; <b>Confidence:</b> High, interactions with seabirds must be reported, ETPs reporting	
Addition/movement of biological material	Translocation of species	1	5	4	Population size	Pipefish and seahorses (Family Syngnathidae)	1.1	1	1	1	<b>Hazard:</b> Could occur incidentally via boat hulls, or fouling or nets, involving introduced species or movement of species from coastal areas into the Coral Sea Fishery area. Introduced species could change the species composition and impact habitat for pipefish and seahorses; <b>Scale:</b> Potential impact area over 500 nm, 100-200 days per year; <b>Intensity:</b> Likely negligible; <b>Consequence:</b> Likely negligible. Mitigation policy in place to eliminate risk of translocation – no ETP species caught by aquarium operators are ever returned to the water. Only 1 port is used (Cairns). Freshwater net sterilisation or drying all nets between trips also ensures translocation risk is reduced; <b>Confidence:</b> High, highly selective nature of fishing gear	I
	On board processing	0	--	--	--	--	--	--	--	--	Fish are caught, transported, and delivered live. There is no onboard processing involved.	--
	Discarding catch	0	--	--	--	--	--	--	--	--	No discarding due to highly selective fishing methods	--
	Stock enhancement	0	--	--	--	--	--	--	--	--	Does not occur	--
	Provisioning	1	4	3	Behaviour/movement	Streaked Shearwater ( <i>Calonectris leucomelas</i> )	7.2	1	1	1	<b>Hazard:</b> Berley cage with mackerel and trevally bait used to attract specimen fish and may attract seabirds to the vessel temporarily; <b>Scale:</b> Potential fishing area 100-500 nm, 1-100 days per year; <b>Intensity:</b> Likely negligible; <b>Consequence:</b> Likely negligible; <b>Confidence:</b> Low, with no data to confirm or refute	I
	Organic waste disposal	1	4	3	Behaviour/movement	Streaked Shearwater ( <i>Calonectris leucomelas</i> )	6.1	1	1	2	<b>Hazard:</b> Seabirds may be attracted to the vessels; <b>Scale:</b> Potential fishing area 100-500 nm, 1-100 days per year; <b>Intensity:</b> Likely negligible, two or fewer vessels in the fishery; <b>Consequence:</b> Likely negligible, MARPOL regulations via Protection of the Sea (Prevention of Pollution from Ships) Act 1983 prohibits domestic and operational waste discharge from vessels; <b>Confidence:</b> High, regulated through MARPOL	I
	Debris	0	--	--	--	--	--	--	--	--		--

Direct impact of Fishing	Fishing Activity	Hazard (1/0)	Spatial scale (1-6)	Temporal scale	Sub-component	Unit of analysis	Objective	Intensity Score	Consequence (1-2)	Confidence (1-2)	Rationale	Internal/External
Addition of non-biological material	Chemical pollution	1	4	3	Population size	Streaked Shearwater ( <i>Calonectris leucomelas</i> )	1.1	1	1	2	<b>Hazard:</b> Birds may become sick or unable to feed if in contact with noxious chemicals or oiled on surface waters; <b>Scale:</b> Potential fishing area 100-500 nm, 1-100 days per year; <b>Intensity:</b> Likely negligible; <b>Consequence:</b> Likely negligible, would be localised and birds likely to avoid area; <b>Confidence:</b> High, regulated through MARPOL	I
	Exhaust	1	4	3	Interaction with fishery	Spectacled Sea Snake ( <i>Hydrophis kingii</i> )	7.2	1	1	1	<b>Hazard:</b> Exhaust as a result of diesel and other engines; <b>Scale:</b> Potential fishing area 100-500 nm, 1-100 days per year; <b>Intensity:</b> Likely negligible; <b>Consequence:</b> Likely negligible; <b>Confidence:</b> Low, with no data to confirm or refute	I
	Gear loss	0	--	--	--	--	--	--	--	--	Gear is operated by hand and unlikely to be lost. Fishers are highly incentivised to preserve their gear as they are custom made. Retention of equipment is critical for the next dive and remainder of the trip.	--
	Navigation/steaming	1	5	4	Behaviour/movement	Flatback turtle ( <i>Natator depressus</i> )	6.1	1	1	1	<b>Hazard:</b> Navigation and steaming of the vessels will introduce noise (engine noise and echo-sounders) and visual stimuli into the environment, which both can affect the behaviour of whale sharks, cetaceans and marine turtles; <b>Scale:</b> Potential impact area over 500 nm, 100-200 days per year; <b>Intensity:</b> Likely negligible; <b>Consequence:</b> Likely negligible; <b>Confidence:</b> Low, with no data to confirm or refute	I
	Activity/ presence on water	1	4	3	Behaviour/movement	Streaked Shearwater ( <i>Calonectris leucomelas</i> )	6.1	1	1	1	<b>Hazard:</b> Seabirds and particularly albatross are highly olfactory and are attracted to fishing operations. Some birds may be attracted to anchored vessels briefly. Boat lights at night may have minimal impact on birdlife; <b>Scale:</b> Potential fishing area 100-500 nm, 1-100 days per year; <b>Intensity:</b> Likely negligible; <b>Consequence:</b> Likely negligible; <b>Confidence:</b> High, interactions with seabirds must be reported, ETPs reporting	I
Disturb physical processes	Bait collection	0	--	--	--	--	--	--	--	--	Bait is purchased rather than collected	--
	Fishing	1	4	4	Population size	Spotted Seahorse ( <i>Hippocampus kuda</i> )	1.1	1	1	1	<b>Hazard:</b> Divers may disturb sediments locally that may impact on feeding or reproduction of pipefish and seahorses through habitat modification; <b>Scale:</b> Potential impact area over 100 nm, 100-200 days per year; <b>Intensity:</b> Likely negligible; <b>Consequence:</b> Likely negligible; <b>Confidence:</b> Low, with no data to confirm or refute	I

Direct impact of Fishing	Fishing Activity	Hazard (1/0)	Spatial scale (1-6)	Temporal scale	Sub-component	Unit of analysis	Objective	Intensity Score	Consequence (1-2)	Confidence (1-2)	Rationale	Internal/External
	Boat launching	1	4	3	Behaviour/movement	Flatback turtle ( <i>Natator depressus</i> )	6.1	1	1	1	<b>Hazard:</b> Main vessels in fishery come from designated ports that are outside the Coral Sea Fishery (Cairns), boat launching on/off islands; <b>Scale:</b> Potential impact area over 100 nm, 1-100 days per year; <b>Intensity:</b> Likely negligible; <b>Consequence:</b> Likely negligible. Within the CSF, the mothership on a mooring, tender launched from the mothership. Periodically go ashore onto islands during the day; <b>Confidence:</b> Low, with no data to confirm or refute	I
	Anchoring/mooring	1	4	3	Behaviour/movement	Streaked Shearwater ( <i>Calonectris leucomelas</i> )	6.1	2	1	2	<b>Hazard:</b> Seabirds may be attracted to anchored vessels briefly. Boat lights at night may have minimal impact on birdlife; <b>Scale:</b> Potential fishing area 100-500 nm, 1-100 days per year; <b>Intensity:</b> Likely minor; <b>Consequence:</b> Likely negligible; <b>Confidence:</b> High, interactions with seabirds must be reported, ETPs reporting	I
	Navigation/steaming	1	5	4	Behaviour/movement	Flatback turtle ( <i>Natator depressus</i> )	6.1	1	1	1	<b>Hazard:</b> Navigation and steaming of the vessels will introduce noise (engine noise and echo-sounders) and visual stimuli into the environment; <b>Scale:</b> Potential impact area over 500 nm, 100-200 days per year; <b>Intensity:</b> Likely negligible; <b>Consequence:</b> Likely negligible; <b>Confidence:</b> Low, with no data to confirm or refute	I
External hazards	Other fisheries	1	5	6	Population size	Streaked Shearwater ( <i>Calonectris leucomelas</i> )	1.1	2	1	2	<b>Hazard:</b> Other CSF hand collection sub-fisheries (Tropical rock lobster, Trochus, sea cucumbers), line and trawl sectors, state fisheries and recreational fishing; <b>Scale:</b> Potential impact area 500-1000 nm, 300-365 days per year; <b>Intensity:</b> Likely moderate on localised scale; <b>Consequence:</b> Likely negligible; <b>Confidence:</b> High, reporting required for ETPS	E
	Aquaculture	0	--	--	--	--	--	--	--	--	Fishery is located offshore and not impacted	--
	Coastal development	0	--	--	--	--	--	--	--	--	Fishery is located offshore and not impacted	--
	Other extractive activities	0	--	--	--	--	--	--	--	--	At present, no current petroleum permits exist, and no new leases have been granted for the CSF area	--
	Other non-extractive activities	1	5	5	Population size	Flatback turtle ( <i>Natator depressus</i> )	1.1	2	1	1	<b>Hazard:</b> Shipping likely occurs in the Coral Sea but unlikely to impact on species. Increasing diving/tourism in area which may affect fish behaviour; <b>Scale:</b> Potential	E

Direct impact of Fishing	Fishing Activity	Hazard (1/0)	Spatial scale (1-6)	Temporal scale	Sub-component	Unit of analysis	Objective	Intensity Score	Consequence (1-2)	Confidence (1-2)	Rationale	Internal/External
											impact area over 100-500 nm, 200-300 days per year; <b>Intensity:</b> Likely minor; <b>Consequence:</b> Likely minor; <b>Confidence:</b> Low, with no data to confirm or refute	
	Other anthropogenic activities	1	6	6	Population size	Spotted Seahorse ( <i>Hippocampus kuda</i> )	1.1	5	4	2	<b>Hazard:</b> Anthropogenic activities that increase the risk and impact climate change, which may increase biological, non-biological and physical disturbance factors. Climate change resulting in marine heatwaves, causing mass bleaching events of corals in the Coral Sea and Great Barrier Reef. Recorded bleaching events and subsequent declines in coral cover, on shallow reefs (<15 m depth) in the Coral Sea (including Holmes Reef) in 2016, 2017, 2020, 2021, 2022 and 2024; <b>Scale:</b> Potential impact area over 1000 nm, 300-365 days per year; <b>Intensity:</b> Likely Severe; <b>Consequence:</b> Likely major with wide and long-term effects - increased risk of mass coral bleaching, increased risk of cyclones; <b>Confidence:</b> High	E

## 2.3 Habitat Component

Risk assessment for the habitats include demersal and pelagic habitats. Demersal or benthic habitats considers both the seafloor structure and its attached invertebrate fauna, such as corals. Pelagic habitat considers the water column that overlies the demersal habitat.

Habitat data used for assessment of the Coral Sea Fishery sectors were largely derived from geophysical and fishery data from a list of potential habitat types for the fishery, and is considered precautionary (Hobday et al, 2007; AFMA 2025).

Of the 42 benthic habitats and 2 pelagic habitats identified to exist within the extent of the CSF, 3 benthic habitats and both pelagic habitats were considered the most vulnerable by certain fishing activities and therefore assessed in the SICA were (Table 3):

- Fine sediments, unrippled, mixed faunal community (inner shelf, depth 25 – 100 meters)
- Coarse sediments, wave rippled, sedentary, inner shelf (inner shelf, depth 25 – 100 meters)
- Rock/biogenic matrix, low outcrop, mixed faunal community (inner shelf, depth 25 – 100 meters)
- Northern Pelagic Province – Coastal
- North-Eastern Pelagic Province – Plateau

For further information, see CSF Aquarium Sector Scoping Document (S2: Ecological Unit of Analysis – Habitat Component; AFMA 2025).

**Table 5 SICA results for the Habitat Component**

Direct impact of Fishing	Fishing Activity	Hazard (1/0)	Spatial scale (1-6)	Temporal scale	Sub-component	Unit of analysis	Objective	Intensity Score	Consequence (1-2)	Confidence (1-2)	Rationale	Internal/External
Capture	Bait collection	0	--	--	--	--	--	--	--	--	Bait is purchased rather than collected	--
	Fishing	1	4	4	Habitat types	Rock/ biogenic matrix, low outcrop, mixed faunal community, inner shelf	4.1	2	2	2	<b>Hazard:</b> Fishing targets marine aquarium fish and coral from coral reef habitats, with fishing mostly occurs between 0-30 m depth by free dive, scuba, hookah. Fish species are captured individually by scoop nets, hook/line, herding via nets and fishing method may damage habitats. Some target species can have site specific habitats (e.g. symbiosis with specific coral or anemone species). Coral species are harvested causing habitat loss. Habitat function may be reduced if algal overgrowth impairs normal coral function, may depend on species harvested. Other species associated with coral likely removed with coral; <b>Scale:</b> Potential fishing area 100-500 nm, 100-200 days per year; <b>Intensity:</b> Likely minor with potential to moderate at local (individual reef - most effort focused on 2 reefs); <b>Consequence:</b> Likely minor, productivity in the Coral Sea is assumed to be high, individual coral regeneration may be rapid (depending on the species and location on the reef, and sensitivity to disturbance), although recruitment of 'new' coral is low; <b>Confidence:</b> High, documented effect, low reported catch for coral and live rock	1
	Incidental behaviour	0	--	--	--	--	--	--	--	--	No activities that result in capture while not fishing	--
Direct impact without capture	Bait collection	0	--	--	--	--	--	--	--	--	Bait is purchased rather than collected	--
	Fishing	1	4	3	Habitat structure and function	Rock/ biogenic matrix, low outcrop, mixed faunal community, inner shelf	5.1	2	1	1	<b>Hazard:</b> Direct impacts without capture is possible if fishing gear contact coral and other fragile species during removal of target species; <b>Scale:</b> Potential fishing area 100-500 nm, 1-100 days per year; <b>Intensity:</b> Likely minor, may be localised if same reef system is harvested too frequently; <b>Consequence:</b> Likely negligible, productivity in the Coral Sea is assumed to be high, individual coral regeneration may be rapid ( depending on the species and location on the reef, and sensitivity to disturbance), although recruitment of 'new' coral is low; <b>Confidence:</b> Low	1

Direct impact of Fishing	Fishing Activity	Hazard (1/0)	Spatial scale (1-6)	Temporal scale	Sub-component	Unit of analysis	Objective	Intensity Score	Consequence (1-2)	Confidence (1-2)	Rationale	Internal/External
	Incidental behaviour	1	4	3	Habitat structure and function	Rock/ biogenic matrix, low outcrop, mixed faunal community, inner shelf	5.1	1	1	1	<b>Hazard:</b> Periodically go ashore of a daytime on an island, once per six months. Fringing reef habitats may be physically damaged by both tender boats and people during landing and leaving; <b>Scale:</b> Potential fishing area 100-500 nm, 1-100 days per year; <b>Intensity:</b> Likely negligible; <b>Consequence:</b> Likely negligible; <b>Confidence:</b> Low, with no data to confirm or refute	I
	Gear loss	0	--	--	--	--	--	--	--	--	Gear is operated by hand and unlikely to be lost. Fishers are highly incentivised to preserve their gear as they are custom made. Retention of equipment is critical for the next dive and remainder of the trip.	--
	Anchoring/ mooring	1	4	3	Habitat structure and function	Coarse sediments, wave rippled, sedentary, inner shelf	5.1	2	1	1	<b>Hazard:</b> Tender boats and mother boat anchor to fish. Direct impact to coral structure will occur with use of anchors. Motherships are anchored on sand where possible. Light anchors are used to secure tenders on reefs. Permanent moorings are not used as they do not lend themselves to the spread of fishing effort. In frequently used anchoring locations coral death is possible, and an observed effect of activity; <b>Scale:</b> Potential fishing area 100-500 nm, 1-100 days per year, assuming not moving once anchored for a number of days; <b>Intensity:</b> Likely minor on localised scale; <b>Consequence:</b> Likely negligible, may be locally minor if the same reef area is harvested too frequently; <b>Confidence:</b> Low, with no data to confirm or refute	I
	Navigation/ steaming	1	5	4	Habitat structure and function	Northeastern Pelagic Province - Plateau	5.1	1	1	2	<b>Hazard:</b> Navigation/steaming occurs daily during fishing trips and to/from the offshore reefs. Pelagic water quality may change with increased turbulence from movement of the vessels through water; <b>Scale:</b> Potential impact area 500-1000 nm, 100-200 days per year; <b>Intensity:</b> Likely negligible; <b>Consequence:</b> Likely negligible and unable to be detected at any scale; <b>Confidence:</b> High	I
Addition/ movement of biological material	Translocation of species	1	5	4	Habitat structure and function	Rock/ biogenic matrix, low outcrop, mixed faunal	5.1	2	2	1	<b>Hazard:</b> Could occur incidentally via boat hulls, or fouling or nets, involving introduced species or movement of species from coastal areas into the Coral Sea Fishery area. Introduced species could change the species composition and impact habitat; <b>Scale:</b> Potential impact area 500-1000 nm, 100-200 days per year; <b>Intensity:</b> Likely minor; <b>Consequence:</b> Likely minor. Mitigation policy in place to eliminate risk of translocation -	I



Direct impact of Fishing	Fishing Activity	Hazard (1/0)	Spatial scale (1-6)	Temporal scale	Sub-component	Unit of analysis	Objective	Intensity Score	Consequence (1-2)	Confidence (1-2)	Rationale	Internal/External
						community, inner shelf					no species caught by aquarium operators are ever returned to the water. Holds and transport containers are sterilised intermittently with anti-fouling chemical. Only one port is used by all operators (Cairns). Freshwater net sterilisation or drying all nets between trips also ensures translocation risk is reduced; <b>Confidence:</b> Low, with no data to confirm or refute	
	On board processing	0	--	--	--	--	--	--	--	--	Fish are caught, transported, and delivered live. There is no onboard processing involved.	--
	Discarding catch	0	--	--	--	--	--	--	--	--	No discarding due to highly selective fishing methods	--
	Stock enhancement	0	--	--	--	--	--	--	--	--	Does not occur	--
	Provisioning	1	4	3	Habitat structure and function	Northeastern Pelagic Province - Plateau	5.1	1	1	1	<b>Hazard:</b> Berley cage used to attract target fish, including shark species, may impact pelagic habitat during use; <b>Scale:</b> Potential fishing area 100-500 nm, 1-100 days per year, assuming not using berley every fishing day; <b>Intensity:</b> Likely negligible; <b>Consequence:</b> Likely negligible, impact unlikely to be detected at scale of target stock; <b>Confidence:</b> Low, with no data to confirm or refute	I
	Organic waste disposal	1	4	3	Water Quality	Northeastern Pelagic Province - Plateau	1.1	1	1	1	<b>Hazard:</b> Disposal of organic wastes (sewage) from the permit boat. MARPOL guidelines apply. There is no offal or catch discarding in this fishery; <b>Scale:</b> Potential fishing area 100-500 nm, 1-100 days per year; <b>Intensity:</b> Likely negligible; <b>Consequence:</b> Likely negligible; <b>Confidence:</b> Low, with no data to confirm or refute	I
Addition of non-biological material	Debris	0	--	--	--	--	--	--	--	--	Rubbish not thrown overboard. MARPOL guidelines apply	--
	Chemical pollution	1	4	3	Water Quality	Northeastern Pelagic Province - Plateau	1.1	1	1	2	<b>Hazard:</b> Oil spills, anti-fouling chemicals, MARPOL guidelines apply. Dishwashing liquids, shampoos etc. Any large chemical spill would be accidental and localised; <b>Scale:</b> Potential fishing area 100-500 nm, 1-100 days per year; <b>Intensity:</b> Likely negligible; <b>Consequence:</b> Likely negligible, localised and readily dispersed; <b>Confidence:</b> high	I
	Exhaust	1	4	3	Air Quality	Northeastern Pelagic	2.1	1	1	2	<b>Hazard:</b> Exhaust from engines might affect air quality but very localised and dispersed rapidly; <b>Scale:</b> Potential fishing area 100-500 nm, 1-100 days per year; <b>Intensity:</b> Likely	I

Direct impact of Fishing	Fishing Activity	Hazard (1/0)	Spatial scale (1-6)	Temporal scale	Sub-component	Unit of analysis	Objective	Intensity Score	Consequence (1-)	Confidence (1-2)	Rationale	Internal/External
						Province - Plateau					negligible, 2 vessels or less in the fishery, localised and readily dispersed; <b>Consequence:</b> Likely negligible, localised and readily dispersed; <b>Confidence:</b> high	
	Gear loss	0	--	--	--	--	--	--	--	--	Gear is operated by hand and unlikely to be lost. Fishers are highly incentivised to preserve their gear as they are custom made. Retention of equipment is critical for the next dive and remainder of the trip.	--
	Navigation/steaming	1	5	4	Habitat structure and function	Northeastern Pelagic Province - Plateau	5.1	1	1	1	<b>Hazard:</b> Navigation and steaming of the vessels will introduce noise (engine noise and echo-sounders) and visual stimuli into the environment; <b>Scale:</b> Potential impact area over 500 nm, 100-200 days per year; <b>Intensity:</b> Likely negligible; <b>Consequence:</b> Likely negligible; <b>Confidence:</b> Low, with no data to confirm or refute	I
	Activity/presence on water	1	5	4	Habitat structure and function	Northeastern Pelagic Province - Plateau	5.1	1	1	1	<b>Hazard:</b> The activity of the vessels will introduce noise and visual stimuli into the environment. May interact with wildlife such as dolphins riding bow wave, birds settling on boat. Lights at night may have minimal impact; <b>Scale:</b> Potential impact area over 500 nm, 100-200 days per year; <b>Intensity:</b> Likely negligible; <b>Consequence:</b> Likely negligible; <b>Confidence:</b> Low, with no data to confirm or refute	I
Disturb physical processes	Bait collection	0	--	--	--	--	--	--	--	--	Bait is purchased rather than collected	--
	Fishing	1	4	4	Substrate Quality	Fine sediments, unrippled, mixed faunal community, inner shelf	3.1	1	1	1	<b>Hazard:</b> Fishing activity concentrates along the outer reef systems and along reef edge and slope. Hand collection is unlikely to disturb sediment processes; <b>Scale:</b> Potential impact area 100-500 nm, 100-200 days per year; <b>Intensity:</b> Likely negligible; <b>Consequence:</b> Likely negligible; <b>Confidence:</b> Low, with no data to confirm or refute	I
	Boat launching	1	4	3	Substrate Quality	Rock/ biogenic matrix, low outcrop, mixed faunal community, inner shelf	3.1	1	1	1	<b>Hazard:</b> Main vessels in fishery come from designated ports that are outside the Coral Sea Fishery (Cairns), boat launching on/off islands, Within the CSF, tenders launched from the mothership; <b>Scale:</b> Potential impact area 100-500 nm, 1-100 days per year; <b>Intensity:</b> Likely negligible; <b>Consequence:</b> Likely negligible. Within the CSF, the mothership on a mooring, tender launched from the mothership. Periodically go ashore onto islands during the day; <b>Confidence:</b> Low, with no data to confirm or refute	I

Direct impact of Fishing	Fishing Activity	Hazard (1/0)	Spatial scale (1-6)	Temporal scale	Sub-component	Unit of analysis	Objective	Intensity Score	Consequence (1-6)	Confidence (1-2)	Rationale	Internal/External
	Anchoring/ mooring	1	4	3	Substrate Quality	Coarse sediments, wave rippled, sedentary, inner shelf	5.1	2	1	1	<b>Hazard:</b> Tender boats and mother boat anchor to fish. Direct impact to coral structure will occur with use of anchors. Motherships are anchored on sand where possible. Light anchors are used to secure tenders on reefs. Permanent moorings are not used as they do not lend themselves to the spread of fishing effort. In frequently used anchoring locations coral death is possible, and an observed effect of activity; <b>Scale:</b> Potential fishing area 100-500 nm, 1-100 days per year, assuming not moving once anchored for a number of days; <b>Intensity:</b> Likely minor on localised scale; <b>Consequence:</b> Likely negligible, may be locally minor if the same reef area is harvested too frequently; <b>Confidence:</b> Low, with no data to confirm or refute	I
	Navigation/ steaming	1	5	4	Water Quality	Northeastern Pelagic Province - Plateau	1.1	1	1	1	<b>Hazard:</b> Navigation/ steaming may occur daily during fishing season. Disturbance of physical processes will occur during the normal course of steaming throughout the fishing zone. Turbulence and disturbance of pelagic water quality is unlikely to affect normal water column processes for long. Any disruption to these processes can therefore be expected to alter habitat function only briefly for macroscopic fauna; <b>Scale:</b> Potential impact area over 500 nm, 100-200 days per year; <b>Intensity:</b> Likely negligible; <b>Consequence:</b> Likely negligible; <b>Confidence:</b> Low, with no data to confirm or refute	I
External hazards	Other fisheries	1	5	6	Water Quality	Northeastern Pelagic Province - Plateau	1.1	1	1	1	<b>Hazard:</b> Effort overlap is only considered for hand collection sectors, and of those only lobster and trochus harvest from reefs directly. Fishing activity occurs over the same reef systems within a limited spatial range, over which there can be daily fishing activity during total few months a year; <b>Scale:</b> Potential impact area 500-1000 nm, 300-365 days per year; <b>Intensity:</b> Likely negligible; <b>Consequence:</b> Likely negligible; <b>Confidence:</b> Low, with no data to confirm or refute	E
	Aquaculture	0	--	--	--	--	--	--	--	--	Fishery is located offshore and not impacted	--
	Coastal development	0	--	--	--	--	--	--	--	--	Fishery is located offshore and not impacted	--
	Other extractive activities	0	--	--	--	--	--	--	--	--	At present, no current petroleum permits exist, and no new leases have been granted for the CSF area	--

Direct impact of Fishing	Fishing Activity	Hazard (1/0)	Spatial scale (1-6)	Temporal scale	Sub-component	Unit of analysis	Objective	Intensity Score	Consequence (1-2)	Confidence (1-2)	Rationale	Internal/External
	Other non-extractive activities	1	5	5	Habitat structure and function	Northeastern Pelagic Province - Plateau	5.1	1	1	1	<b>Hazard:</b> Shipping likely occurs in the Coral Sea but unlikely to impact on habitat. Increasing diving/tourism in area which may affect coral reef habitat; <b>Scale:</b> Potential impact area 500-1000 nm, 200-300 days per year; <b>Intensity:</b> Likely negligible; <b>Consequence:</b> Likely negligible; <b>Confidence:</b> Low, with no data to confirm or refute	E
	Other anthropogenic activities	1	6	6	Habitat structure and function	Mixed faunal community, inner shelf,	5.1	5	4	2	<b>Hazard:</b> Anthropogenic activities that increase the risk and impact climate change, which may increase biological, non-biological and physical disturbance factors. Climate change resulting in marine heatwaves, causing mass bleaching events of corals in the Coral Sea and Great Barrier Reef. Recorded bleaching events and subsequent declines in coral cover, on shallow reefs (<15 m depth) in the Coral Sea (including Holmes Reef) in 2016, 2017, 2020, 2021, 2022 and 2024; <b>Scale:</b> Potential impact area over 1000 nm, 300-365 days per year; <b>Intensity:</b> Likely Severe; <b>Consequence:</b> Likely major with wide and long-term effects - increased risk of mass coral bleaching, increased risk of cyclones; <b>Confidence:</b> High	E

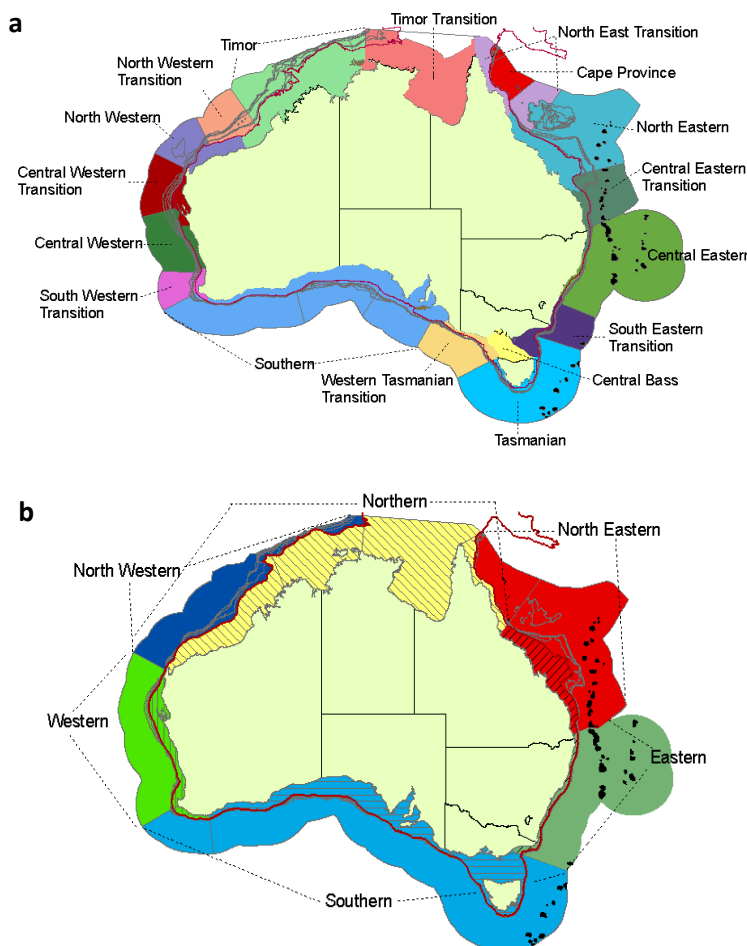
## 2.4 Community Component

In the ERAEF context, communities on the Australian and sub-Antarctic islands continental shelves and slopes were defined as the species assemblage that occupy the large-scale provinces and biomes generally identified by the bio-regionalisation projects (Map 2). Community biota are classified as all mobile fauna, vertebrate or invertebrate, but not including sessile organisms such as coral that are largely structural and therefore classified as habitat.

For the Aquarium Sector, the two demersal communities identified were northeastern plateau (depth range: 0-110m) and northeastern seamount (depth range: 0-110m) (Map 2a; Table 6). The overlying pelagic communities identified were northeastern plateau oceanic (1; depth range: 0-600m) and northeastern seamount oceanic (1; depth range: 0-600m) (Map 2b; Table 6).

For further information, see CSF Aquarium Sector Scoping Document (S2: Ecological Unit of Analysis – Community Component; AFMA 2025).

**Map 2 Australian marine demersal communities and pelagic provinces**



**Note:** Demersal communities around mainland Australia based on bioregionalisation schema. Some inshore (0-110 m) communities comprise more than one community. Australian pelagic provinces. Hatched areas indicate coastal epipelagic zones overlying the shelf. Offshore (oceanic) provinces comprise two or more overlying pelagic zones. Seamounts (black) and plateaux (light green) are illustrated in the provinces. **Source:** Hobday et al. (2007).

**Table 6 SICA results for the Community Component**

Direct impact of Fishing	Fishing Activity	Hazard (1/0)	Spatial scale (1-6)	Temporal scale	Sub-component	Unit of analysis	Objective	Intensity Score	Consequence (1-2)	Confidence (1-2)	Rationale	Internal/External
Capture	Bait collection	0	--	--	--	--	--	--	--	--	Bait is purchased rather than collected	--
	Fishing	1	4	4	Species composition	<b>Demersal</b> - Northeastern Plateau 0-110m; Northeastern Seamount 0-110m	1.1	2	2	1	<b>Hazard:</b> Targeted fishing occurs on reefs, affecting demersal communities where fishing/harvesting occurs; <b>Scale:</b> Potential fishing area 100-500 nm, 100-200 days per year; <b>Intensity:</b> Likely minor with potential to moderate at local (individual reef - most effort focused on 2 reefs); <b>Consequence:</b> Likely minor, with only minor changes in relative abundance; <b>Confidence:</b> Documented effect but lack data	I
	Incidental behaviour	0	--	--	--	--	--	--	--	--	No activities that result in capture while not fishing	--
Direct impact without capture	Bait collection	0	--	--	--	--	--	--	--	--	Bait is purchased rather than collected	--
	Fishing	1	4	3	Species composition	<b>Demersal</b> - Northeastern Plateau 0-110m; Northeastern Seamount 0-110m	1.1	2	1	1	<b>Hazard:</b> Benthic species may be disturbed by divers moving over them, and by contact with hand nets without actual capture, possible mortality of species that escape the nets. Impact considered minimal and reef edges and rubble areas are targeted, as opposed to coral areas, primarily to avoid damage to collection nets; <b>Scale:</b> Potential fishing area 100-500 nm, 100-200 days per year; <b>Intensity:</b> Likely minor; <b>Consequence:</b> Likely negligible, and likely not detectable against natural variation of species composition; <b>Confidence:</b> Low, with no data to confirm or refute	I
	Incidental behaviour	1	4	3	Species composition	<b>Demersal</b> - Northeastern Plateau 0-110m	1.1	1	1	1	<b>Hazard:</b> Periodically go ashore on an island during the daytime, once per six months. Lights at night may have an impact on bird life, likely minimal; <b>Scale:</b> Potential fishing area 100-500 nm, 100-200 days per year; <b>Intensity:</b> Likely negligible; <b>Consequence:</b> Likely negligible, and likely not detectable against natural variation of species composition; <b>Confidence:</b> Low, with no data to confirm or refute	I
	Gear loss	0	--	--	--	--	--	--	--	--	Gear is operated by hand and unlikely to be lost. Fishers are highly incentivised to preserve their gear as they are custom made. Retention of equipment is critical for the next dive and remainder of the trip.	--

Direct impact of Fishing	Fishing Activity	Hazard (1/0)	Spatial scale (1-6)	Temporal scale	Sub-component	Unit of analysis	Objective	Intensity Score	Consequence (1-2)	Confidence (1-2)	Rationale	Internal/External
	Anchoring/ mooring	1	4	3	Species composition	<b>Demersal</b> - Northeastern Plateau 0-110m	1.1	2	2	1	<b>Hazard:</b> Possible damage to animals and corals where anchor drops, habitat disturbance may result in change in species composition. Motherships are anchored on sand where possible. Light anchors are used to secure tenders on reefs. Permanent moorings are not used as they do not lend themselves to the spread of fishing effort. <b>Scale:</b> Potential fishing area 100-500 nm, 100-200 days per year; <b>Intensity:</b> Likely minor with potential to moderate at local (individual reef - most effort focused on 3 reefs) <b>Consequence:</b> Likely minor, with only minor changes in relative abundance: <b>Confidence:</b> Low, with no data to confirm or refute	I
	Navigation/ steaming	1	5	4	Species composition	<b>Pelagic</b> - Northeastern Plateau (1) 0-600m; Northeastern Seamount Oceanic (1) 0-600m	1.1	1	1	2	<b>Hazard:</b> Steaming/navigation between fishing grounds may alter the distribution of pelagic fish species composition above the reefs, or bird communities may be disturbed by attraction to the vessel, pelagic species may encounter vessels resulting in vessel strikes and mortality; <b>Scale:</b> Potential impact area over 500 nm, 100-200 days per year; <b>Intensity:</b> Likely negligible, 2 or less motherships in the fishery; <b>Consequence:</b> Likely negligible; <b>Confidence:</b> High	I
Addition/ movement of biological material	Translocation of species	1	5	4	Species composition	<b>Demersal</b> - Northeastern Plateau 0-110m	1.1	1	1	1	<b>Hazard:</b> Could occur incidentally via boat hulls, or fouling or nets, involving introduced species or movement of species from coastal areas into the Coral Sea Fishery area. Introduced species could change the species composition and impact habitat; <b>Scale:</b> Potential impact area 500-1000 nm, 100-200 days per year; <b>Intensity:</b> Likely negligible at broader scale or, minor at local scale, with activity in restricted areas; <b>Consequence:</b> Likely negligible. Mitigation policy in place to eliminate risk of translocation - no species caught by aquarium operators are ever returned to the water. Holds and transport containers are sterilised intermittently with anti-fouling chemical. Only one port is used by all operators (Cairns). Freshwater net sterilisation or drying all nets between trips. Coral collection does not take place during coral spawning which also ensures translocation risk is reduced; <b>Confidence:</b> Low, with no data to confirm or refute	I

Direct impact of Fishing	Fishing Activity	Hazard (1/0)	Spatial scale (1-6)	Temporal scale	Sub-component	Unit of analysis	Objective	Intensity Score	Consequence (1-)	Confidence (1-2)	Rationale	Internal/External
	On board processing	0	--	--	--	--	--	--	--	--	Fish are caught, transported, and delivered live. There is no onboard processing involved.	--
	Discarding catch	0	--	--	--	--	--	--	--	--	No discarding due to highly selective fishing methods	--
	Stock enhancement	0	--	--	--	--	--	--	--	--	Does not occur	--
	Provisioning	1	4	3	Distribution of the community	<b>Demersal</b> - Northeastern Plateau 0-110m	3.1	1	1	1	<b>Hazard:</b> Berley cage with pilchard bait (purchased from bait provider) used to attract some species; <b>Scale:</b> Potential fishing area 100-500 nm, 100-200 days per year; <b>Intensity:</b> Likely negligible; <b>Consequence:</b> Likely negligible, and likely not detectable against natural variation of species composition; <b>Confidence:</b> Low, with no data to confirm or refute	I
	Organic waste disposal	1	4	3	Distribution of the community	<b>Pelagic</b> - Northeastern Plateau (1) 0-600m	3.1	1	1	1	<b>Hazard:</b> For pelagic communities (and not demersal reef) due to the location of effort. Disposal of organic wastes (sewage, food scraps) from the permit boat. MARPOL guidelines apply. There is no offal or catch discarding in this fishery. Higher predators may be attracted to the vessel temporarily due to food scraps; <b>Scale:</b> Potential fishing area 100-500 nm, 100-200 days per year; <b>Intensity:</b> Likely negligible, limited number of vessels in the fishery; <b>Consequence:</b> Likely negligible; <b>Confidence:</b> Low, with no data to confirm or refute	I
Addition of non-biological material	Debris	0	--	--	--	--	--	--	--	--	Rubbish not thrown overboard. MARPOL guidelines apply	--
	Chemical pollution	1	4	3	Species composition	<b>Pelagic</b> - Northeastern Plateau (1) 0-600m; Northeastern Seamount Oceanic (1) 0-600m	1.1	1	1	2	<b>Hazard:</b> For pelagic communities (and not demersal reef) due to the location of effort. Oil spills, anti-fouling chemicals, MARPOL guidelines apply. Dishwashing liquids, shampoos etc. Any large chemical spill would be accidental and localised; <b>Scale:</b> Potential fishing area 100-500 nm, 1-100 days per year; <b>Intensity:</b> Likely negligible; <b>Consequence:</b> Likely negligible, localised and readily dispersed; <b>Confidence:</b> high	I



Direct impact of Fishing	Fishing Activity	Hazard (1/0)	Spatial scale (1-6)	Temporal scale	Sub-component	Unit of analysis	Objective	Intensity Score	Consequence (1-)	Confidence (1-2)	Rationale	Internal/External
	Exhaust	1	4	3	Distribution of the community	<b>Pelagic</b> - Northeastern Plateau (1) 0-600m; Northeastern Seamount Oceanic (1) 0-600m	3.1	1	1	2	<b>Hazard:</b> Exhaust from engines might affect air quality but very localised and dispersed rapidly. For pelagic communities (and not demersal reef) due to the location of effort; <b>Scale:</b> Potential fishing area 100-500 nm, 1-100 days per year; <b>Intensity:</b> Likely negligible, 2 vessels or less in the fishery, localised and readily dispersed; <b>Consequence:</b> Likely negligible, localised and readily dispersed; <b>Confidence:</b> high	I
	Gear loss	0	--	--	--	--	--	--	--	--	Gear is operated by hand and unlikely to be lost. Fishers are highly incentivised to preserve their gear as they are custom made. Retention of equipment is critical for the next dive and remainder of the trip.	--
	Navigation/steaming	1	5	4	Distribution of the community	<b>Pelagic</b> - Northeastern Plateau (1) 0-600m; Northeastern Seamount Oceanic (1) 0-600m	3.1	1	1	1	<b>Hazard:</b> Navigation and steaming of the vessels will introduce noise (engine noise and echo-sounders) and visual stimuli into the environment. For pelagic communities (and not demersal reef) due to the location of effort; <b>Scale:</b> Potential impact area over 500 nm, 100-200 days per year; <b>Intensity:</b> Likely negligible; <b>Consequence:</b> Likely negligible; <b>Confidence:</b> Low, with no data to confirm or refute	I
	Activity/presence on water	1	5	4	Distribution of the community	<b>Pelagic</b> - Northeastern Plateau (1) 0-600m; Northeastern Seamount Oceanic (1) 0-600m	3.1	1	1	1	<b>Hazard:</b> The activity of the vessels will introduce noise and visual stimuli into the environment. May interact with wildlife such as dolphins riding bow wave, birds settling on boat. Lights at night may have minimal impact. For pelagic communities (and not demersal reef) due to the location of effort; <b>Scale:</b> Potential impact area over 500 nm, 100-200 days per year; <b>Intensity:</b> Likely negligible; <b>Consequence:</b> Likely negligible; <b>Confidence:</b> Low, with no data to confirm or refute	I
	Bait collection	0	--	--	--	--	--	--	--	--	Bait is purchased rather than collected	--

Direct impact of Fishing	Fishing Activity	Hazard (1/0)	Spatial scale (1-6)	Temporal scale	Sub-component	Unit of analysis	Objective	Intensity Score	Consequence (1-2)	Confidence (1-2)	Rationale	Internal/External
Disturb physical processes	Fishing	1	4	4	Distribution of the community	<b>Demersal</b> - Northeastern Plateau 0-110m	3.1	2	1	1	<b>Hazard:</b> Divers may disturb sediments locally. Impact considered to be low. Targeted fishing occurs on reefs, affecting demersal communities; <b>Scale:</b> Potential fishing area 100-500 nm, 100-200 days per year; <b>Intensity:</b> Likely minor with potential to moderate at local (individual reef - most effort focused on 2 reefs); <b>Consequence:</b> Likely negligible, with only minor changes in relative abundance; <b>Confidence:</b> Documented effect but lack data	I
	Boat launching	1	4	3	Distribution of the community	<b>Pelagic</b> - Northeastern Plateau (1) 0-600m; Northeastern Seamount Oceanic (1) 0-600m	3.1	1	1	1	<b>Hazard:</b> Main vessels in fishery come from designated ports that are outside the Coral Sea Fishery (Cairns), boat launching on/off islands, Within the CSF, tenders launched from the mothership. For pelagic communities (and not demersal reef) due to the location of effort; <b>Scale:</b> Potential impact area 100-500 nm, 1-100 days per year; <b>Intensity:</b> Likely negligible; <b>Consequence:</b> Likely negligible. Within the CSF, the mothership on a mooring, tender launched from the mothership. Periodically go ashore onto islands during the day; <b>Confidence:</b> Low, with no data to confirm or refute	I
	Anchoring/ mooring	1	4	3	Distribution of the community	<b>Demersal</b> - Northeastern Plateau 0-110m	3.1	1	1	1	<b>Hazard:</b> Tender boats and mother boat anchor to fish. Direct impact to coral structure will occur with use of anchors. Motherships are anchored on sand where possible. Light anchors are used to secure tenders on reefs. Permanent moorings are not used as they do not lend themselves to the spread of fishing effort. In frequently used anchoring locations coral death is possible, and an observed effect of activity; <b>Scale:</b> Potential fishing area 100-500 nm, 1-100 days per year, assuming not moving once anchored for a number of days; <b>Intensity:</b> Likely moderate on localised scale; <b>Consequence:</b> Likely moderate, may be locally intense if the same reef area is harvested too frequently; <b>Confidence:</b> Low, with no data to confirm or refute	I
	Navigation/ steaming	1	5	4	Distribution of the community	<b>Pelagic</b> - Northeastern Plateau (1) 0-600m; Northeastern	3.1	1	1	1	<b>Hazard:</b> Navigation/ steaming may occur daily during fishing season. Disturbance of physical processes will occur during the normal course of steaming throughout the fishing zone. Turbulence and disturbance of pelagic water quality is unlikely to affect normal water column processes for long. Any disruption to these processes can therefore be expected to alter habitat function only briefly for macroscopic fauna;	I

Direct impact of Fishing	Fishing Activity	Hazard (1/0)	Spatial scale (1-6)	Temporal scale	Sub-component	Unit of analysis	Objective	Intensity Score	Consequence (1-)	Confidence (1-2)	Rationale	Internal/External
						Seamount Oceanic (1) 0-600m					<b>Scale:</b> Potential impact area over 500 nm, 100-200 days per year; <b>Intensity:</b> Likely negligible; <b>Consequence:</b> Likely negligible; <b>Confidence:</b> Low, with no data to confirm or refute	
External hazards	Other fisheries	1	5	6	Distribution of the community	<b>Demersal</b> - Northeastern Plateau 0-110m	3.1	1	1	2	<b>Hazard:</b> Effort overlap is only considered for CSF hand collected sea cucumber sub fishery, who harvest from reefs directly. Fishing activity occurs over the same reef systems within a limited spatial range, over which there can be daily fishing activity during total few months a year; <b>Scale:</b> Potential impact area 500-1000 nm, 300-365 days per year; <b>Intensity:</b> Likely negligible; <b>Consequence:</b> Likely negligible; <b>Confidence:</b> High	E
	Aquaculture	0	--	--	--	--	--	--	--	--	Fishery is located offshore and not impacted	--
	Coastal development	0	--	--	--	--	--	--	--	--	Fishery is located offshore and not impacted	--
	Other extractive activities	0	--	--	--	--	--	--	--	--	At present, no current petroleum permits exist, and no new leases have been granted for the CSF area	--
	Other non-extractive activities	1	5	5	Distribution of the community	<b>Pelagic</b> - Northeastern Plateau (1) 0-600m; Northeastern Seamount Oceanic (1) 0-600m; <b>Demersal</b> - Northeastern Plateau 0-110m; Northeastern Seamount 0-110m	3.1	2	2	1	<b>Hazard:</b> Shipping likely occurs in the Coral Sea but unlikely to impact on pelagic communities. Increasing diving/tourism in area which may affect demersal communities; <b>Scale:</b> Potential impact area 500-1000 nm, 200-300 days per year; <b>Intensity:</b> Likely minor; <b>Consequence:</b> Likely minor; <b>Confidence:</b> Low, with no data to confirm or refute	E

Direct impact of Fishing	Fishing Activity	Hazard (1/0)	Spatial scale (1-6)	Temporal scale	Sub-component	Unit of analysis	Objective	Intensity Score	Consequence (1-4)	Confidence (1-2)	Rationale	Internal/External
	Other anthropogenic activities	1	6	6	Species composition	<b>Demersal</b> - Northeastern Plateau 0-110m; Northeastern Seamount 0-110m	1.1	5	4	2	<b>Hazard:</b> Anthropogenic activities that increase the risk and impact climate change, which may increase biological, non-biological and physical disturbance factors. Climate change resulting in marine heatwaves and increased risk of mass coral bleaching and cyclones, impacting demersal communities that rely on reefs. Recorded bleaching events and subsequent declines in coral cover, on shallow reefs (<15 m depth) in the Coral Sea (including Holmes Reef) in 2016, 2017, 2020, 2021, 2022 and 2024; <b>Intensity:</b> Likely severe; <b>Consequence:</b> Likely major with wide and long-term effects - increased risk of mass coral bleaching, increased risk of cyclones; <b>Confidence:</b> High	E

## 2.5 Summary of the SICA results

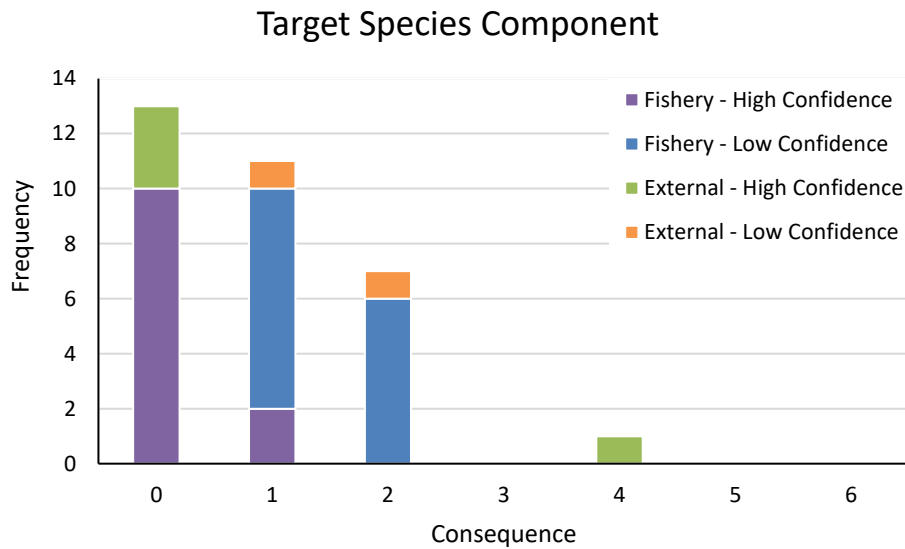
In summary, for the target species, protected species, habitat and community components, only an external activity scored 3 or higher for the consequence scores (Table 7). No byproduct or bycatch species were identified for the for the Aquarium Sector of the CSF.

**Table 7 Summary table of the consequence scores for all activity for the component combinations.**

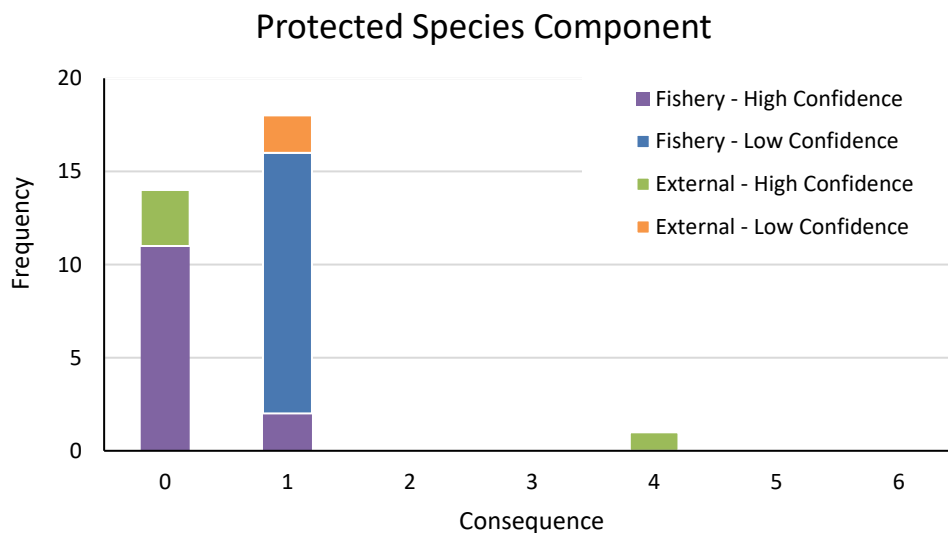
Direct impact	Activity	Target Species	Bycatch/ byproduct species	Protected Species	Habitat	Community
Capture	Bait collection	--	--	--	--	--
	Fishing	2	--	1	2	2
	Incidental behaviour	--	--	--	--	--
Direct impact without capture	Bait collection	--	--	--	--	--
	Fishing	1	--	1	1	1
	Incidental behaviour	1	--	1	1	1
	Gear loss	--	--	--	--	--
	Anchoring/ mooring	2	--	1	1	2
	Navigation/ steaming	1	--	1	1	1
Addition/ movement of biological material	Translocation of species	2	--	1	2	2
	On board processing	--	--	--	--	--
	Discarding catch	--	--	--	--	--
	Stock enhancement	--	--	--	--	--
	Provisioning	1	--	1	1	1
Addition of non-biological material	Organic waste disposal	2	--	1	1	1
	Debris	--	--	--	--	--
	Chemical pollution	2	--	1	1	1
	Exhaust	1	--	1	1	1
	Gear loss	--	--	--	--	--
	Navigation/ steaming	1	--	1	1	1
Disturb physical processes	Activity/ presence on water	1	--	1	1	1
	Bait collection	--	--	--	--	--
	Fishing	1	--	1	1	1
	Boat launching	1	--	1	1	1
	Anchoring/ mooring	2	--	1	1	1
External hazards	Navigation/ steaming	1	--	1	1	1
	Other fisheries	1	--	1	1	1
	Aquaculture	--	--	--	--	--
	Coastal development	--	--	--	--	--
	Other extractive activities	--	--	--	--	--
	Other non-extractive activities	2	--	1	1	2

Direct impact	Activity	Target Species	Bycatch/byproduct species	Protected Species	Habitat	Community
	Other anthropogenic activities	<b>4</b>	--	<b>4</b>	<b>4</b>	<b>4</b>

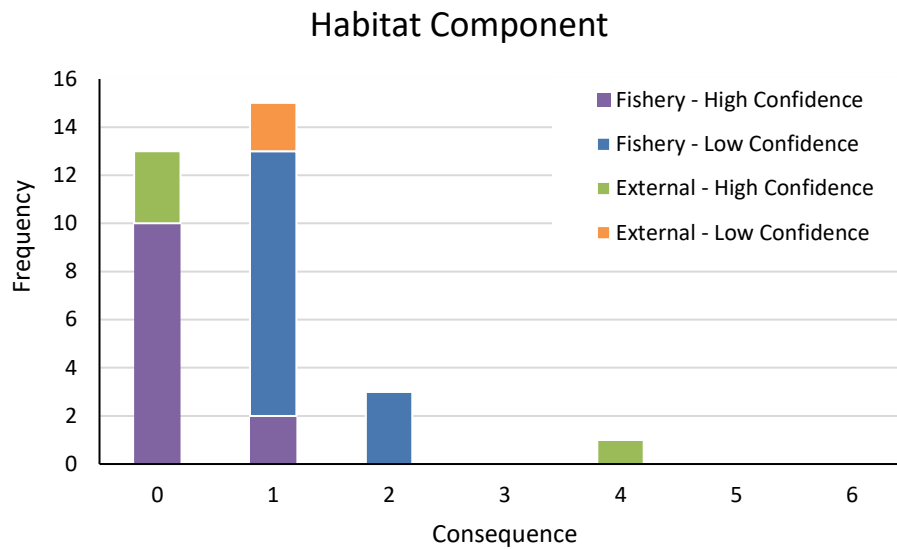
**Note:** Scores in bold if high confidence. External hazards are not considered at Level 2.



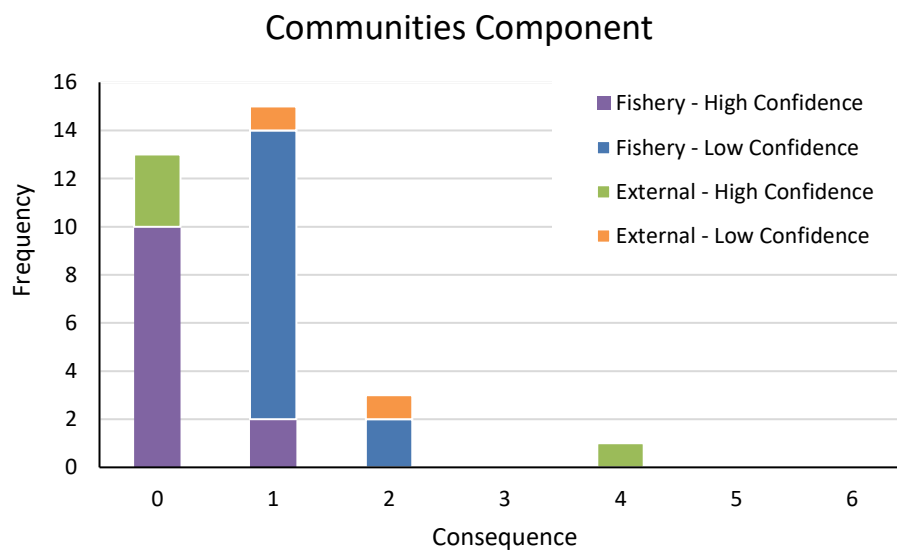
**Figure 1** Frequency of the consequence scores by high and low confidence for the Target species component



**Figure 2** Frequency of the consequence scores by high and low confidence for the Protected species component



**Figure 3** Frequency of the consequence scores by high and low confidence for the Habitat component



**Figure 4** Frequency of the consequence scores by high and low confidence for the Communities component

# 3 Discussion and recommendations

## 3.1 General discussion

Out of the 32 possible hazards, 19 were identified to have the potential to occur in the CSF Aquarium Sector, including 16 internal and 3 external. No internal hazards were identified as moderate risk or higher. The only high-risk components were due to external hazards (climate change) for the four assessed components (target species, protected species, habitat, and community).

### ***Target species component***

There are over 500 species caught in the Aquarium sector, including reef fish, coral and live rock. Under current AFMA permit conditions, operators in the CSF Aquarium Sector are only required to provide in logbooks species level identification of Acroporid coral catches and family level for marine aquarium species. This means the initial level 1 assessment for the target species component was conducted at the family level based on logbook information from 1997–98 to 2023–24. Because of the aggregated nature of this data, this hindered the ability to determine which species are the most vulnerable to fishing hazards. At the family level, the most vulnerable target species for direct impact of fishing was determined to be wrasses (Family Labridae). This family had the highest total catch in the logbook time series. The impact of direct capture of fishing on wrasses was highly uncertain and assessed initially as a moderate risk due to the lack of species-specific catch and effort data.

Operators keep their own records at the species level. One of the two operators in the fishery supplied this data to ABARES which covered the period 2008–09 to 2023–24. This data was used to update the target species component assessment. The most vulnerable target species were determined to be Humphead maori wrasse due to its IUCN status, and Green chromis, as it was the most highly caught species. The final assessment of the direct impact of fishing for these species was deemed to be minor, due to the low levels of catch that likely represent a small proportion of the estimated overall population. This was confirmed by stakeholders after reviewing the catch figures.

There are concerns for localised depletion for both marine aquarium fish and Acroporid coral. This was due to the concentration of effort on only 2-3 reefs, as well as the lack of connectivity between isolated reefs in the Coral Sea (Hoey 2022; DCCEW 2024). Under current permit conditions, operators can only fish about 7% of suitable habitat within the CSF in any given year (Keller et al. 2024). During the stakeholder workshop, operators reported that they informally rotate between the two main reefs to harvest Acroporid coral and marine aquarium fish. In addition, under the conditions for the current wildlife trade operation approval, AFMA is to introduce effective management arrangements that distribute effort of coral harvest across different reefs in the Coral Sea to avoid localised depletion by 1 July 2025. The workshop also noted that the position data of shot fishing events looks to be in deep waters and some rounding of location data may be occurring. To manage localised depletion in future, exact location data would be beneficial. To understand and assess the potential impact of localised depletion for marine aquarium fish, future catch and effort reporting for the fishery logbook should be conducted to species level.

### ***Byproduct/bycatch species component***

Fishing in the CSF Aquarium Sector is highly selective, where fish species are captured individually by scoop nets, hook/line, herding via nets, and acropora are selectively harvested for particular colour



and form characteristics (AFMA 2025). As a result, there is no byproduct or by-catch from fishing and the byproduct and by-catch component was not assessed.

### ***Protected species component***

The protected species component was assessed in this analysis due to the potential of EPT species interacting with the fishery of the large geographical range of the CSF. There were no significant risks identified for EPT species from fishing hazards, with the exception of climate change as an external hazard to the fishery. In addition, there have been no reported interactions with any ETP species in the CSF, including the Aquarium sector since 2018 (AFMA 2024b).

### ***Habitat component***

The impact of fishing represented a minor risk to habitats with the CSF Aquarium Sector. The most vulnerable habitat was considered to be hard corals (including the targeted acropora coral) and live rock. Harvesting of coral may cause habitat loss and impair habitat function, if harvested at a high level. An annual total allowable catch of 40 t with catch triggers (Level 1 – 20 t, Level 2 – 40 t) have been set acropora corals. In addition, a total allowable catch (TAC) of 40 t with catch triggers (Level 1 – 20 t, Level 2 – 40 t) is permitted to be harvested for live rock. Due to the recent low catch (Table 2) that have not breached the precautionary TAC and catch triggers, impact of fishing on habitats was assessed as minor risk.

Translocation was considered minor risk for the habitat component in regard to corals. This was due to the current translocation mitigation policy of no species to be returned to the water once caught and cleaning practises, including intermittent sterilisation of holds and transport containers, and freshwater sterilisation of nets between trips. In addition, operators reported at the stakeholder workshop that fishing does not occur during coral spawning, further reducing the risk of movement of biological material.

### ***External hazards***

The current ERA framework does not have an identified hazard for the impacts of anthropogenic climate change. Given the high potential impact on coral reef ecosystems in the CSF, climate change was assessed under external hazards for all components and considered to be major impact with the potential for widespread and long-term effects. Over the last 7 years, marine heatwaves as a result of anthropogenic climate change have increased in the Coral Sea and led to a series of bleaching events between 2016 and 2023. As a result, there has been a substantial decline in coral cover with average declines of 66.9% between 2020 and 2023 in the central Coral Sea, and an average of 29.6% over the same period in the northern Coral Sea (Hoey et al. 2021, 2022a, 2023, 2024).

Individual coral species can vary in abundance and vulnerability to the impacts of climate change (Prachett 2020). The annual harvest limit for Acroporidae has been set based on conservative estimates of the growth of Acroporid corals. In order to factor in variation in abundance and vulnerability of taxa and considering the previous and future impacts of coral bleaching events, individual harvest limits should be established at the species or genus level (Prachett 2022) and reported to species level in the fishery logbooks.

## 3.2 Components to be examined at Level 2

Under the ERAEF process, only components assessed in the SICA that have consequence scores of 3 or above for internal fishing activities are examined at level 2. No components were assessed to have an internal fishing activity with a consequence score of 3 or above. The only components (target species, protected species, habitat and community) that were assessed to have consequence scores of 3 or above were for an external hazard (climate change). Because external hazards are not considered at level 2 in the PSA analysis no level 2 analysis was undertaken.

## 3.3 Recommendations

To understand the risk of localised depletion and overharvesting of individual species, and reduce uncertainty in the assessment of the CSF Aquarium Sector, it is recommended that:

- catch and effort reporting for the fishery logbook is conducted to species level for both marine aquarium species and Acroporid corals,
- catch and effort reporting locations are reported as exact positions and not rounded,
- harvest limits are established for individual species of *Acropora*.

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# 5 Appendix:

## Appendix A: Environmental risk assessment

Ecosystem based fisheries management (EBFM) is being used to address the direct and indirect impacts of fishing on marine species, habitat and ecosystems. The Ecological Risk Assessment for the Effects of Fishing (ERAEF) framework involves a hierarchical approach through four stages:

- (1) scoping,
- (2) an expert based comprehensive but qualitative analysis of risk at Level 1 (SICA – scale, intensity consequence analysis),
- (3) an empirically and semi-quantitative based Level 2 analysis (Sustainability Assessment for Fishing Efforts [SAFE] or Productivity susceptibility analysis [PSA]),
- (4) and fully quantitative “model based” Level 3 analysis

The amount of information required increases through the hierarchy and allows application in data-limited situations.

### 5.1.1 Scoping

The aim of the Scoping stage is to develop a profile of the fishery being assessed, including into sub-fisheries on the basis of fishing method and/or spatial coverage. This provides information needed to complete Level 1 and 2 analysis and inform discussions at the stakeholder workshops.

Scoping involves six key steps, and five corresponding scoping documents as documented below. These steps are described in more detail in Hobday et al. (2007) and Smith et al. (2007).

- (1) Documenting the general fishery or sector characteristics using information from sources such as the Fishery Management Plan, Assessment Reports, Bycatch Action Plans and other relevant background documentation (scoping document s1: general fishery characteristics).
- (2) Generation units of analysis lists by species (key commercial, byproduct, bycatch and protected species), habitat types (e.g. benthic, pelagic) and community types (e.g. demersal and pelagic) (scoping document s2: ecological unit of analysis).
- (3) Identification of objectives for the five ecological components (key commercial, bycatch/byproduct, and protected species, habitat and communities) and sub-components (scoping document s3: operational objectives).
- (4) Hazard identification for activities undertaken in the process of fishing and any external activities that have the potential to lead to harm (scoping document s4: hazard identification).
- (5) Bibliography and references for all documents (scoping document s5: bibliography).
- (6) Scision rules on the hazards (internal and external), components and scenarios to move to level 1 SICA analysis.

## 5.1.2 Level 1 Scale Intensity and Consequence Analysis

SICA is a comprehensive but qualitative analysis that uses an exposure-effect risk assessment approach to the most vulnerable unit of an ecological component.

SICA employs the precautionary principle through a “plausible worst-case scenario” approach to identify and evaluate hazards on spatial, temporal and intensity scales that lead to a significant impact to whole components (key commercial; bycatch and byproduct; protected species; habitat; and communities) and assign consequence scores. This results in a rapid and efficient screening process of low-risk components, as those assessed to be low risk will be documented, but not considered for further analysis in level 2. In addition, where judgements about risks are uncertain, the highest level of risk that is still regarded as plausible is selected. The rationale for the choices must be documented in detail.

The steps for the SICA are summarised below with the associated scoping document. The first 10 steps are performed for each fishery for each activity and component and correspond to the columns of the SICA table. The final three steps summarise the results for each component.

- (1) Record the hazard identification score (absence [0], presence [1] scores)
- (2) Score the spatial scale of the activity (Table A1)

**Table A1 Spatial score of the activity for Step 2 of SICA**

Spatial Scale (nm)	Score
<1	1
1 – 10	2
10 – 100	3
100 – 500	4
500 – 1000	5
>1000	6

- (3) Score the temporal scale of the activity (Table A2)

**Table A2 Temporal score of the activity for Step 3 of SICA**

Temporal Scale	Description	Score
Decadal	1 day every 10 years or so	1
Every several years	1 day every several years	2
Annual	1 – 100 days per year	3
Quarterly	100 – 200 days per year	4
Weekly	200 – 300 days per year	5
Daily	300 – 365 days per year	6

- (4) Chose the sub-component most likely to be affected by the activity
- (5) Chose the most vulnerable unit of analysis for the component (e.g. species, habitat type of community assemblage)

(6) Select the most appropriate operational objective

(7) Score the intensity of the activity for that subcomponent (Table A3)

**Table A3 Intensity score of the activity for Step 7 of SICA**

Intensity Scale	Description	Score
Negligible	Remote likelihood of detection at any spatial or temporal scale	1
Minor	Occurs rarely or in few restricted locations and detectability even at these scales is rare	2
Moderate	Moderate at broader spatial scales, or severe but local	3
Major	Severe and occurs reasonably often at broad spatial scales	4
Severe	Occasional but very severe and localised or less severe but widespread and frequent	5
Catastrophic	Local to regional severity or continual and widespread	6

(8) Score the consequence resulting for the intensity for that subcomponent (Table A4)

**Table A4 Consequence score of the activity for Step 8 of SICA**

Intensity Scale	Description	Score
Negligible	Impact unlikely to be detectable at the scale of stock/habitat/community	1
Minor	Minimal impact on stock/habitat/community structure or dynamics	2
Moderate	Maximum impact that still meets an objective (e.g. sustainable level of impact such as full exploitation rate for a target species)	3
Major	Wider and longer-term impacts (e.g. long-term decline in CPUE)	4
Severe	Very serious impacts now occurring, with relatively long time period likely to be needed to restore to an acceptable level (e.g. serious declines in spawning biomass limiting population increase)	5
Intolerable	Widespread and permanent/irreversible damage or loss will occur – unlikely to ever be fixed (e.g. extinction)	6

(9) Record the confidence/uncertainty for the consequence scores (Table A5)

**Table A5 Confidence score of the consequence scores for Step 9 of SICA**

Confidence	Rationale	Score
Low	Data exists, but is considered poor or conflicting No data exists Disagreement between experts	1
High	Data exists and is considered sound Consensus between experts Consequence is constrained by logical consideration	2

(10) Document the rationale for each of the above steps

(11) Summary of the SICA results

(12) Evaluation/discussion of level 1

(13) Components to be examined at level 2

SICA relies on expert judgement and stakeholder input to evaluate the risk to ecological components resulting from the stakeholder-agreed set of activities. Once the draft SICA has been conducted, the stakeholders provide feedback on the three key components of the SICA that are initially compiled by the assessor, selection of the most vulnerable unit of ecological component, and input on the draft scale and intensity scores and overall ranking, including appropriate rationale.

Detailed methodology for level 1 SICA is described in Hobday et al. (2007) and Smith et al. (2007).

### **5.1.3 Level 2 Semi-quantitative and quantitative methods**

When the risk of an activity at level 1 SICA on a species component is moderate or higher (i.e. consequence score 3 or greater) and no planned management interventions that would remove this risk is identified, an assessment is required at level 2.

There are various tools available at level 2 that have been designed to measure risk from direct impacts of fishing only (i.e. risk of overfishing, leading to overfished fishery). These tools include SAFE (base SAFE and enhanced SAFE [eSAFE]) as the preferred method where there is sufficient spatial and biological data available, and PSA when there is not sufficient data or species biological characteristics are insufficient to support SAFE analyses. At level 2, either PSA or SAFE methods should be applied to any given species, not both. For high-risk species, it is a management choice whether to progress to eSAFE, pursue a level 3 fully quantitative stock assessment, or to take more immediate management action to reduce the risk. The types of considerations required in making that choice (i.e. moving up the ERAEF assessment hierarchy or taking direct management action) are outlined in Chapter 5.5 of the AFMA ERM Guide (AFMA 2017).

It is also recognised that a number of additional tools, including some of the “data poor” assessment tools that are used to inform harvest strategies, could potentially be included within the level 2 toolkit. They are distinguished from level 3 quantitative tools (i.e. stock assessment models) that are more data rich and able to quantify uncertainty more precisely.

### **5.1.4 Level 3 Fully Quantitative assessment**

This stage of the risk assessment is fully quantitative and relies on in-depth scientific studies on the units identified as at medium or greater risk in the level 2. It will be both time and data intensive. Individual stakeholders are engaged as required in a more intensive and directed fashion. Results are presented to the stakeholder group and feedback incorporated, but live modification is not considered likely.



## Appendix B: Workshop participants

Table A6 Attendees of the SICA Workshop for Coral Sea Fishery Aquarium Sector

Name	Organisation	Sector
Trent Timmiss	ABARES	Government
Brooke D'Alberto	ABARES	Government
Darci Wallis	AFMA	Government
Sarah Kirkcaldie	AFMA	Government
Andrew Hoey	James Cook University	Researcher
Morgan Pratchett	James Cook University	Researcher
Lyle Squire Jnr	Cairns Marine	CSF Industry
Rene Jensen	Northern Barrier Marine Life	CSF Industry
Lucas Relic	DCCEEW	Government (Observer)