Department of Agriculture and Fisheries

Sustainable Fisheries Strategy 2017–2027

Queensland Sea Cucumber Fishery (East Coast) Scoping Study

August 2021

Queensland Government

This publication has been compiled by Fisheries Queensland, Department of Agriculture and Fisheries

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Feature	Details
Species targeted	*Commercial* – burrowing blackfish (*Actinopyga spinea*), white teatfish (*Holothuria fuscogilva*), black teatfish (*Holothuria whitmaei*), prickly redfish (*Thelenota ananas*), curryfish (*Stichopus herrmanni, Stichopus vastus),* blackfish (*Actinopyga palauensis*)
Fisheries symbols	B1 – Queensland Sea Cucumber Fishery (east coast) (*formerly Bêche-de-mer Fishery*)
Fisheries Legislation	From 1 September 2019: *Fisheries Act 1994* and subordinate legislation
Working Group	Sea Cucumber Fishery Working Group
Harvest Strategy	Draft under development. Harvest strategy updates available at: https://www.daf.qld.gov.au/business-priorities/fisheries/sustainable/harvest-strategy.
Gear	The following apparatus are currently permitted for use within the Queensland Sea Cucumber Fishery: *Commercial* • Hand collection using approved underwater breathing apparatus – hookah, SCUBA or free dive *Recreational* • Hand collection only (excluding hookah/SCUBA) *A full description of the types of apparatus prescribed for each fishery symbol can be found in the Fisheries (General) Regulation 2019, Fisheries (Commercial Fisheries) Regulation 2019,* and *Fisheries Declaration 2019*
Main management methods	*Commercial* • Size limits • Limited entry/access • Species-specific ITQs for black teatfish and white teatfish • Combined ITQ for other species • Spatial closures • Vessel and tender restrictions • Rotational Harvest Arrangement (RHA) • Burrowing Blackfish Zones (BFZ) *Recreational* • Possession limits (5) • Closed waters south of Bowen and in the Gulf of Carpentaria • Gear restrictions (no take by SCUBA) • No take species (Black and White Teatfish)
Quota	White teatfish TACC: 53t Black teatfish TACC: 30t

Feature	Details
	Basket quota (all sea cucumbers): 308t including up to 225t of burrowing blackfish from Lizard Island (120t), Bunker Reef (60), and Gould Reef (45t)
Fishing Season	1 July – 30 June
Commercial Fishery licences	B1 – 18 licences
Total annual harvest by sectors	*Commercial*: 391t (TACC) *Recreational*: Unknown but considered to be marginal Charter: Unknown but considered to be marginal Harvest by Aboriginal and Torres Strait Island peoples: Unknown
GVP	$4,691,469 (2009)
Stock Status	White teatfish (*Holothuria fuscogilva*) listed as 'Sustainable' by SAFS 2020 Burrowing blackfish (*Actinopyga spinea*) listed as 'Sustainable' by SAFS 2020
Accreditation under the *EPBC Act* (Part 13 & 13A)	Part 13: Accredited (expires 30 September 2021) Part 13A: Accredited (expires 30 September 2021)

1 Overview

1.1 Commercial fishery

The Queensland Sea Cucumber Fishery (QSCF) is a hand collection fishery that operates in Queensland and Commonwealth waters from Cape York to Tin Can Bay, including parts of the Great Barrier Reef Marine Protected Area (GBRMPA). The commercial QSCF has an estimated Gross Value of Production of $4,691,469 (2009 data) and a large proportion of the retained product is exported for sale.

A multi-species fishery, operators primarily target burrowing blackfish (*Actinopyga spinea*), prickly redfish (*Thelenota ananas*), white teatfish (*Holothuria fuscogilva*), and curryfish (*Stichopus herrmanni* and *Stichopus vastus*). Black teatfish (*Holothuria whitmaei*) are also retained in this fishery and the species makes up a notable proportion of the pre-2000 QSCF catch. In 1999, sustainability concerns led to the Total Allowable Commercial Catch (TACC) limit for black teatfish being set at 0t, effectively making it a no-take species. However, population surveys in 2016 demonstrated that the health of regional black teatfish stocks had improved to levels suitable for harvest. This led to a precautionary 30t TACC limit being established for black teatfish in 2019/20 and the recommencement of fishing for this species.

In order to access the QSCF operators must hold a B1 fishery symbol. This symbol governs the area where an operator can fish and the types of apparatus permitted for use. Under the B1 symbol, fishing operations are restricted to waters east of longitude 142°31'49"E between latitude 10°41’S and 26°S, parallel to Tin Can Bay (Appendix A). Of this fishing area, approximately 37 per cent is permanently closed to fishing and a significant part of the prescribed fishing area is not accessed due to diver safety limits *i.e.* deep-water environments. The B1 symbol operates under conditions that limit the number of operators permitted to collect sea cucumbers, imposes vessel restrictions, and defines catch limits at a whole-of-fishery and species-specific level. These conditions are supplemented by additional management restrictions that are imposed through an extensive, industry-based Memorandum of Understanding (see Section 3).

Note—A well-established sea cucumber fishery exists in the Torres Strait: The Torres Strait Beche-De-Mer-Fishery. The Torres Strait Beche-De-Mer Fishery has a prominent commercial fishing sector and traditional/subsistence fishing sector. This fishery operates in Commonwealth waters and comes under the governance of the Australian Government. Accordingly, fishing activities in the Torres Strait Beche-De-Mer Fishery will not be reviewed as part of this scoping study or assessed in subsequent Ecological Risk Assessments.

1.2 Non-commercial Fishing

While the take of sea cucumber is permitted in the recreational and charter fishing sectors, non-commercial take is restricted to waters north of Bowen. Harvest rates in these sectors are controlled through in-possession limits (5), spatial closures, and gear restrictions prohibiting the use of breathing apparatus such as SCUBA or hookah. Due to concerns over the vulnerability of several species, white and black teatfish remain no-take species in both the recreational and charter fishing sectors.

In addition to the recreational and charter fishing sectors, species retained in the QSCF will be harvested by Aboriginal and Torres Strait Islander peoples. Catch and effort in this fishing sector

remains the least understood. However, DAF anticipates that this sector has comparatively low levels of effort with fishing activities more aligned with the recreational and charter fishing sectors.

Information on catch and effort data for the recreational and charter fishing sectors has been made available through QFish; Queensland's publicly accessible data mining site (http://qfish.fisheries.qld.gov.au/). Additional information on recreational catch compositions can also be found through the *Queensland Statewide Recreational Fishing Survey* (https://www.daf.qld.gov.au/business-priorities/fisheries/monitoring-research/monitoring-reporting/recreational-fishing/statewide-recreational-fishing-surveys)

2 Legislation & Advisory Bodies

The QSCF is managed in accordance with the broader objectives of the *Fisheries Act 1994*, and subordinate legislation including the *Fisheries (General) Regulation 2019, Fisheries (Commercial Fisheries) Regulation 2019,* and *Fisheries Declaration 2019*. This report was prepared prior to the implementation of a harvest strategy, scheduled for implementation in September 2021 as part of the *Queensland Sustainable Fisheries Strategy 2017–2027* (Department of Agriculture and Fisheries, 2017c).

A Sea Cucumber Fisheries Working Group (FWG) assists the Department of Agriculture and Fisheries (DAF) with the management of the fishery. While various iterations of the FWG have been in operation since the late 1990s, the most recent iteration was formally established through the *Queensland Sustainable Fisheries Strategy 2017–2027*. The FWG includes a wide range of stakeholders from the scientific community, management agencies, conservation groups, and the commercial and recreational fishing sectors. While the terms of reference are more complicated (Department of Agriculture and Fisheries, 2020b), the FWG:

- Provides advice to Fisheries Queensland on operational issues and management of harvest fishing within the QSCF;
- Assist with the development of management options that are consistent with the *Queensland Sustainable Fisheries Strategy 2017–2027*; and
- Assist with the development of a harvest strategy for the fishery.

Further information regarding the Sea Cucumber Fisheries Working Group, including communiques is available at https://www.daf.qld.gov.au/business-priorities/fisheries/sustainable/fishery-working-groups. Changes being proposed for this fishery are outlined in the *Government direction on fisheries reforms—2018* paper: https://www.daf.qld.gov.au/__data/assets/pdf_file/0009/1427238/queensland-government-direction-on-fisheries-reform-2018.pdf

3 Management

The QSCF manages commercial catch and effort using a number of input and output controls including catch limits (TACC limits and Individual Transferrable Quota [ITQ]), gear/vessel restrictions, vessel tracking, limited entry, zoning limitations, and spatial closures. A number of these restrictions including catch limits are applied to the commercial fishery through licence conditions. These conditions are supported by additional restrictions and monitoring requirements contained within an industry-based Memorandum of Understanding (MoU; Section 3.2) and a Performance Measurement

System (PMS; Section 3.3). Under a current management proposal, arrangements outlined in the MoU and PMS will be formalised as part of a broader *Sea Cucumber Fishery Harvest Strategy* (Section 3.4).

3.1 General Restrictions

The number of vessels operating under a single licence is restricted to the primary boat and up to 4 tenders no longer than 7m in length (State of Queensland, 2019). When in operation, tenders must remain within 5 nautical miles of the primary vessel and each licence is not permitted the use of more than 10 divers. Gear is restricted to hand collection and the use of breathing apparatus such as SCUBA/hookah is only permitted in the commercial fishery.

At a species level, output controls are in place for white teatfish (53t TACC limit) and black teatfish (30t TACC limit). These restrictions are complemented by a 308t 'other species' basket TACC limit which incorporates all of the remaining species. This 'other species' basket quota includes a species-specific 225t TACC limit for burrowing blackfish (Department of Agriculture and Fisheries, 2020a). Catch limits for all species are currently enforced through licence conditions and implemented through ITQs.

As a large proportion of the sea cucumber effort occurs within the Great Barrier Reef Marine Park (GBRMP), provisions governing the use of resources within the marine park exert significant influence on the QSCF. For example, fishing (including for sea cucumbers) is prohibited in approximately 37 percent of the marine park. Outside of these protected areas, commercial fishers may apply for permits from the Great Barrier Reef Marine Park Authority (GBRMPA) to harvest sea cucumber in the General Use and Habitat Protection Zones. Further information on GBRMP zoning plan can be found at https://www.gbrmpa.gov.au/access-and-use/zoning/zoning-maps.

In the recreational and charter fishing sectors, fishers are not permitted the use of breathing apparatus (*e.g.* SCUBA or hookah). Harvest rates are restricted by an in-possession limit of 5 sea cucumbers (all species combined) and a total boat limit of 10 individuals (when two or more people on board). While the recreational and charter fishing sectors are not managed or included in the current quota limits, the recreational take of black and white teatfish is prohibited throughout Queensland waters, as is the take of all sea cucumbers south of latitude 20° South near Bowen.

Under the *Fisheries Act 1994*, Aboriginal and Torres Strait Islander peoples are entitled to the use of prescribed traditional and non-commercial fishing apparatus in waters open to fishing. Size and possession limits, and seasonal closures do not apply to Aboriginal and Torres Strait Islander peoples.

3.2 Memorandum of Understanding (MoU)

The MoU is an agreement between licence holders and DAF. This document was created to ensure sustainable and planned distribution of fishing effort to avoid localised depletion (Department of Agriculture and Fisheries, 2020a). This is achieved through the use of the Rotational Harvest Arrangement (RHA) in areas of the fishery that overlap with the GBRMP. The RHA subdivides these areas into 158 zones and restricts fishing access through a three-year rotational program (Fig. 1). Under this program, fishers are permitted access to 53 zones in year one, 53 zones in year two and 52 zones in year three (Fig. 1; Table 1). Each zone can only be fished for a maximum of 18 days every three years and quota holding percentages are used to determine the number of rotational

zones each licence holder can access (Department of Agriculture and Fisheries, 2020a). The RHA has been in place since 2004 and is considered an important tool in achieving and maintaining sustainability within the QSCF (Skewes *et al.*, 2014).

In addition to the RHA, the MoU includes supplementary zoning for the harvesting of burrowing blackfish (Burrowing Blackfish Zones, BFZs; Fig. 1). BFZs have been established at locations where burrowing blackfish are found in high abundances/densities and in areas where the take of sea cucumber is limited almost exclusively to this one species (Department of Agriculture and Fisheries, 2020a). Allowable catch limits are applied to each of these zones and a maximum of 225t can be retained across all regions (Department of Agriculture and Fisheries, 2020a). This catch is included as part of the other species sea cucumber basket quota (308 tonnes). These zones, while not specified in permit conditions or legislation, have specific rules and limits applied:

- No time limit applies when catching burrowing blackfish.
- In the first year of rotation, 15 days are allocated to each operator for the targeting of species other than burrowing blackfish in the BFZs.
- In the second and third rotation years, only burrowing blackfish may be taken.
- The operator who first identifies a BFZ has exclusive use of it for the first rotational year.
- A single fishing trip is limited to fishing operations in either the northern zone (north of 19° south) or the southern zone (south of 19° south, including Marion Reef), but not in both;
- From July 2004, three BFZs have been managed through individual TACCs: Lizard Island 120 t; Bunker Reef 60 t; Gould Reef 45 t.

The MoU also outlines commercial minimum size limits for each species, which are at least 15% larger than their size at maturity (Table 2). The setting of the limit above the size of sexual maturity helps ensure that an animal has reproduced at least once before recruiting to the fishery.

Table 1. *Rotational Harvest Arrangement (RHA) annual zone allocation, including for Ashmore (AS) and Boot (Boot) Reefs*

YEAR 1					YEAR 2					YEAR 3				
C3	C6	C7	C10	C13	C1	C4	C8	C11	M3	C2	C5	C9	C12	M1
M2	M5	M8	M11	M14	M6	M9	M12	M15	M18	M4	M7	M10	M13	M16
M17	M20	M23	M26	M29	M21	M24	M27	M30	M33	M19	M22	M25	M28	M31
M32	M35	M38	M41	M44	M36	M39	M42	M45	M48	M34	M37	M40	M43	M46
M47	M50	M53	M56	M59	M51	M54	M57	M60	M63	M49	M52	M55	M58	M61
M62	O1	O4	O7	O10	O2	O5	O8	O11	O14	O3	O6	O9	O12	O15
O13	O16	O19	O22	O24	O17	O20	O25	O28	O31	O18	O21	O23	O26	O29
O27	O30	O33	O36	O39	O34	O37	O40	O43	O46	O32	O35	O38	O41	O44
O42	O45	O48	O51	O54	O49	O52	O55	O58	O61	O47	O50	O53	O56	O59
O57	O60	O63	O66	O69	O64	O67	O70	O73	O76	O62	O65	O68	O71	O74
O72	O75	C14			O22a	CS1	AS & Boot			O77	CS2			

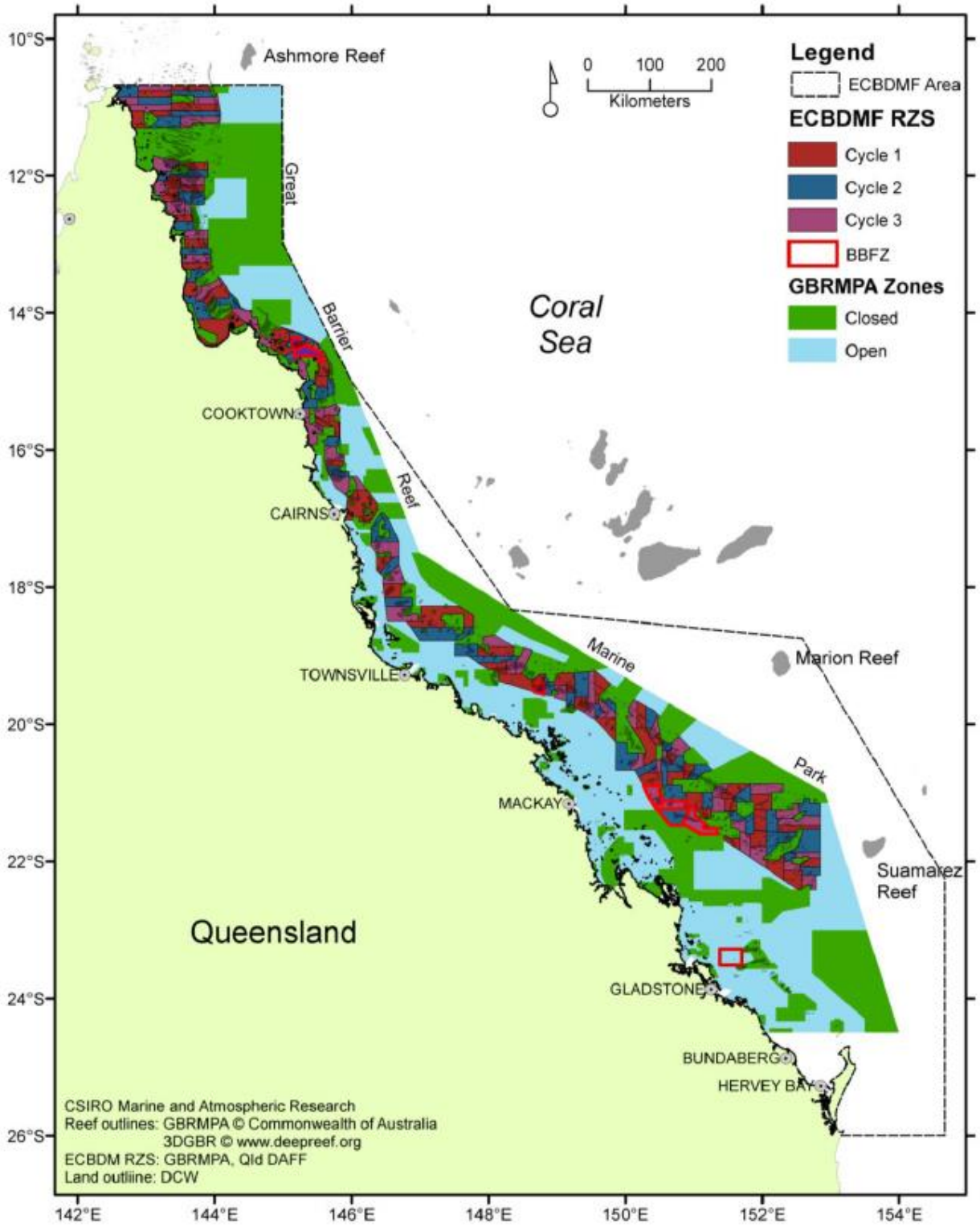

Figure 1. *Map of the Queensland Sea Cucumber Fishery (formerly the Bêche-de-mer Fishery) as of 2014 showing the RHA zones, existing BFZs, two QSCF offshore fishing zones (Suamarez and Marion Reefs), and one general fishery permit area (Ashmore Reef). The remainder of the GBRMPA area is divided into zones that are either open or closed to sea cucumber fishing (Skewes et al., 2014).*

Table 2. *Minimum size limits for target sea cucumber species in the Queensland Sea Cucumber Fishery MOU.*

Common Name	Species Name	Minimum size limit
Sandfish	*Holothuria scabra*	20cm
White teatfish	*Holothuria fuscogilva*	40cm
Prickly redfish	*Thelenota ananas*	50cm
Blackfish	*Actinopyga palauensis, Actinopyga spinea*	20cm
Redfish	*Actinopyga echinites*	20cm
Surf redfish	*Actinopyga mauritiana*	25cm
Black lollyfish	*Holothuria atra*	20cm
Greenfish	*Stichopus chloronotus*	20cm
Curryfish	*Stichopus herrmanni, Stichopus vastus*	35cm
Elephant's trunkfish	*Holothuria fuscopunctata*	40cm
Brown sandfish	*Bohadschia vitiensis*	25cm
Leopardfish	*Bohadschia argus*	35cm
Amberfish	*Thelenota anax*	50cm

3.3 Performance Measurement System (PMS)

The PMS formalises the objectives, performance indicators, performance measures and management responses developed by DAF with input from stakeholders (Department of Primary Industries and Fisheries, 2008). The PMS was subject to Management Strategy Evaluation (MSE) testing by the CSIRO (Skewes *et al.*, 2014) and the management regime was found to be working effectively in terms of mitigating the sustainability risks for key species.[1] While the PMS is not legislated, it provides insight on the long-term objectives of the QSCF. The objectives of the PMS are to:

- Maintain stocks of sea cucumbers at sustainable levels, minimise risks of unsustainable harvest and to recover stocks of sea cucumber that are considered to have been fished to below sustainable levels.
- Protect endangered and threatened species.
- Minimise fishery impacts on the ecosystem.
- Ensure adequate compliance.
- Establish management responses if any aspect of the MoU is not adhered to *e.g.* effort in each rotation zone exceeding the permitted 18 days per zone, which can be monitored through vessel tracking.

[1] *The MSE report is publicly available at: https://publications.csiro.au/rpr/pub?pid=csiro:EP1311565.*

Under the PMS, sustainable catch limits (where possible) are set at no more than ≤10% of estimated biomass with 'sustainable' being defined as biomass not falling by ≥15% (Department of Primary Industries and Fisheries, 2008). The intention of the PMS being to ensure catch limits do not exceed 10% of estimated biomass. The PMS also includes Review Reference Points (RRP) or catch triggers for each species (Table 3). These triggers were developed in consultation with CSIRO, are conservative in nature, and account for the fact the stocks are not heavily targeted. If a RRP is exceeded, the PMS includes several management responses that can be applied by DAF. The management responses are listed below from least to most severe:

- Increase the RRP.
- Commit to intervention/further action if a RRP is reached in a subsequent year.
- Allow fishing above RRP to continue for next quota year and require that it remain below RRP until a resource assessment is delivered by industry and partially defined catch limit(s) are endorsed by the FWG.
- Fishing to return to levels below RRP until a resource assessment (with methodology endorsed by the FWG) is delivered by industry and spatially defined catch limit(s) endorsed by the FWG.
- Fishing for species to cease in certain area(s) (key targeted area(s)) and fishing in all other areas to continue below RRP while a resource assessment (with methodology endorsed by FWG) is delivered by industry for the targeted area.
- Fishing for species to cease until a resource assessment (with methodology endorsed by the FWG) is delivered by industry and spatially defined catch limit(s) endorsed by the FWG.

Table 3. *Catch triggers listed in the Performance Measurement System (PMS).*

Species	Catch trigger	Species	Catch trigger
White teatfish (*Holothuria fuscogilva)* *Zone 1* *Zone 2*	 40 tonnes 13 tonnes	Sandfish (*Holothuria scabra*)	15 tonnes
		Brown sandfish (*Bohadschia marmorata*)	25 tonnes
Burrowing blackfish (*Actinopyga spinea*) *Zone 1* *Zone 2* *Lizard* *Gould* *Bunker*	 15 tonnes 15 tonnes 120 tonnes 45 tonnes 60 tonnes	Golden sandfish (*Holothuria scabra / versicolor*)	10 tonnes
		Leopardfish (*Bohadschia argus*)	30 tonnes
		Surf redfish (*Actinopyga mauritiana*)	25 tonnes
		Deep water redfish (*Actinopyga echinites*)	25 tonnes
		Stonefish (*Actinopyga lecanora*)	10 tonnes
Blackfish *(Actinopyga palauensis)*	25 tonnes	Tigerfish (*Bohadschia argus*)	25 tonnes
Prickly redfish (*Thelenota ananas*)	40 tonnes	Greenfish (*Stichopus chloronotus*)	50 tonnes
Curryfish (*Stichopus hermanni)*	50 tonnes	Flowerfish (*Bohadschia graeffei*)	25 tonnes
Curryfish *(Stichopus vastus)*	25 tonnes	Lollyfish (*Holothuria atra*)	50 tonnes
Amberfish *(Thelonata anax)*	50 tonnes	Snakefish (*Holothuria coluber*)	25 tonnes
Elephant trunkfish (*Holothuria fuscopunctata*)	50 tonnes	Pinkfish (*Holothuria edulis*)	50 tonnes

3.4 Harvest Strategy

The management regime for the QSCF is complex and relies on a mosaic of restrictions that are imposed on the fishery through licence conditions, the MoU and the PMS. In a number of instances, key restrictions are imposed through instruments that are not fully supported within the legislation and/or rely on a high level of industry-managed support and compliance.

Management of the QSCF has been reviewed as part of the *Queensland Sustainable Fisheries Strategy 2017–2027.* This review is ongoing with DAF progressing a number of reforms that will improve and streamline management arrangements for the fishery. This is being done in consultation with the FWG and as part of the harvest strategy development process. Some of the reforms being considered for the QSCF include:

- Making the minimum size limits part of an industry standard operating procedure.
- Making TACC limits as declared quotas in legislation instead of licence conditions.
- Establishing a harvest strategy which covers:
    - The RHA aspect of the MoU;
    - Sectoral catch shares; and
    - Catch triggers for tier 2 species (see below) and the management responses currently outlined in the PMS.

The *Sea Cucumber Fishery Harvest Strategy 2021–2026* was released for public consultation in September 2020. Public consultation closed on 31 January 2021 and the final strategy will be implemented in September 2021 pending approval. The harvest strategy defines three species as Tier 1 target species; black teatfish, white teatfish, and burrowing blackfish. As Tier 1 species, the management regime will include performance indicators surrounding biomass reference points produced by stock assessments. Tier 1 management will also involve reactive trigger points connected to biomass levels, set to reduce fishing pressure as necessary. The remaining sea cucumber species will be classed as Tier 2, and will be managed by reactive catch triggers prompting the implementation of a TACC for relevant species (Department of Agriculture and Fisheries, 2020c).

The above reforms aim to establish a more transparent and predictable decision making framework for the QSCF. More importantly, the harvest strategy will set out a pre-determined management action that will be given effect through the *Fisheries Regulation 2019, Fisheries (Commercial Fisheries) Regulation 2019, Fisheries Declaration 2019* and/or the *Fisheries Quota Declaration 2019*. For example, quota declarations are made under the Regulation, in accordance with decision rules set out in the harvest strategy (Department of Agriculture and Fisheries, 2017a; b). To this extent, the harvest strategy will formalise key aspects of the management regime that are currently contained in the MoU and PMS.

4 Assessment History

In 2004, a fishery-wide assessment investigated the ecologically sustainable management of the fishery against the principles, objectives, and guidelines of Ecologically Sustainable Development (Roelofs, 2004). This assessment has not been updated and an analogous fisheries-wide ERA has yet to be completed for the fishery. This can be partly attributed to the risk-mitigation strategies already employed in the fishery and the (low) level of concern surrounding the impact of the fishery on

byproduct, bycatch, and protected species (Department of Agriculture and Fisheries, 2020a). These factors make the fishery a low priority in terms of ERAs and supports the development of species-specific research projects.

While the 2004 assessment has not been updated, a Management Strategy Evaluation was completed for the fishery in 2014 (Skewes *et al.*, 2014). Outputs from the MSE indicated that the management regime (in general) posed a low risk to most species and reduced the risk of localised depletion. However, this study also identified a number of information gaps, including on the biology, distribution and stock structure of key species. At the time of the assessment, this information was viewed as being critical to the sustainable use of the resource in the GBR (Skewes *et al.*, 2014).

At present, no key species in the QSCF have been the subject of a detailed stock assessment. Limited spatial density analyses have been undertaken for burrowing blackfish and these estimates formed the basis of the BFZ catch triggers (set at 5% of standing biomass). Stock assessments have been identified as a key area by the FWG and are now being progressed through the harvest strategy development process. Under the current harvest strategy schedule, black teatfish and white teatfish will be prioritised for stock assessments (Department of Agriculture and Fisheries, 2020a). The need for subsequent stock assessments will be determined by the species being targeted, harvest rates, and conservation or sustainability concerns.

While stock assessments have not been completed for key species, white teatfish and burrowing blackfish were included in the 2020 *National Status of Australian Fish Stocks* (SAFS). This process classified both species as 'sustainable' in the Queensland East Coast and Torres Strait (Commonwealth) fisheries (Roelofs, 2020; Roelofs *et al.*, 2020) (Appendix B). In previous years, stock status evaluations have been completed for white teatfish and burrowing blackfish in Queensland. In both instances these species were classified as 'sustainable' (Department of Agriculture and Fisheries, 2018) (Appendix B).

Under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act), species being exported from Australia must originate from an approved commercial source such as a Wildlife Trade Operation (WTO). Prior to 2019, black and white teatfish were exempt from requiring an export approval due to the fishery being included on the List of Exempt Native Species (LENS). In 2019, a proposal to include black and white teatfish in CITES Appendix II was adopted. This listing came into effect in August 2020 and triggered a review of the export approval for this fishery. In a subsequent re-assessment, the QSCF was granted conditional WTO approval. Among these conditions was a requirement to undertake further assessment and monitoring of key species (black teatfish, white teatfish). In line with this condition, a survey assessing the population biomass of black teatfish was completed in April 2021, the results of which will be included in future stock assessments. Similarly, a feasibility study was completed to assess the population biomass of white teatfish.

5 Licence & Symbol Summary

5.1 Commercial fishing authorities / fishery symbols

Access to Queensland's commercial fisheries is managed using fishery symbols that define what gear can be used in each fishery (*e.g. N* = net, *L* = line) and the area of operation. In each fishery, the total number of symbols represents the number of fishers that could potentially access the fishery at any one time. This differs from data on the number of 'active' licences, which represents the number of operators that have used their symbol to access the fishery over a 12-month period.

The B1 fishery symbol covers all commercial sea cucumber hand collection operations on the Queensland east coast. This symbol does not include the harvest of sea cucumber in adjacent areas (*e.g.* the Gulf of Carpentaria or the Torres Strait) and catch/effort from these regions have not been included in the Scoping Study. There are currently 18 B1 fishery symbols that can be used in the QSCF. As Queensland has a limited licencing policy, this number will not increase without management intervention.

5.2 Trends in commercial fishing authorities

Reporting systems used by DAF will classify a licence as 'active' when the operator has reported catch and effort from a fishery. This will be done irrespective of the days fished, the frequency of the fishing events or the amount of catch that is reported. Consequently, data on the number of 'active' licences may include operators that have fished infrequently, have small catch quantities or undertake very limited fishing events.

In addition, fishing symbols can be transferred (permanently or temporarily) to another licence. In these instances, the reporting system may show that two separate licences were active in the fishery, despite the operators using the same fishery symbol at different times of the year (*e.g.* the licence holder and the lessee). As a result, the number of 'active' licences for some years may exceed the total number of symbols (Table 4). Despite these anomalies, data on the number of active licences was presented as it provides insight into the number of operators that accessed the QSCF over a 12-month period.

Table 4. *QSCF data summary including fishing symbols, active licences, retained catch and effort. Effort data were sourced from AIVR and commercial logbooks, with catch data sourced from Buyers Reporting Logbooks. Effort is reported in primary vessel days. Note: Where active licences appear higher than the total number of fishing symbols, this is a result of 'licence leasing' as discussed above.*

Financial year	No. symbols	Active licences	Effort (primary vessel days)	Catch (tonnes)
2000-2001	17	21	1,010	244
2001-2002	18	21	1,178	262
2002-2003	18	20	970	283
2003-2004	18	21	1,024	267
2004-2005	18	21	804	367
2005-2006	18	24	852	286
2006-2007	18	13	805	284
2007-2008	18	12	869	317
2008-2009	18	9	703	356
2009-2010	18	8	665	355
2010-2011	18	6	610	387
2011-2012	18	6	535	329
2012-2013	18	7	525	334
2013-2014	18	4	489	318
2014-2015	18	7	528	361
2015-2016	18	5	534	356
2016-2017	18	4	532	338
2017-2018	18	5	418	314
2018-2019	18	6	581	302
2019-2020	18	6	382	395

Data collected from the fishery show that participation rates in the QSCF peaked between 2000 and 2006. After which, the number of active licences declined by approximately 70% before stabilising at around four and seven active licences per financial year over (Table 4). As symbol numbers remained the same from 2000 to 2020, this decline is likely due to changing fishing behaviours, changes in market demand, and licence consolidation *verse* management intervention (*e.g.* licence buybacks). Active licence variance is complex and difficult to quantify. However, the observed variability may relate to the availability of skippers/divers, quota transfers across licences, weather events, streamlining the number of owners of a licence, and various other phenomenon.

6 Catch & Effort

6.1 Data Collection

Catch and effort in the QSCF is monitored from multiple data sources. Fishers utilise the *Automated Interactive Voice Recording* (AIVR) system to prior report catches before coming into port, and *Unloaded Fish Notices* once landed. Managers use this information to monitor quota usage, and (if applicable) implement additional measures if/when the TACC limits are approached and reached.

Catch in the QSCF can also be verified using the *Beche-de-mer Buyers Reporting Logbook* (BB02) (Appendix C). This logbook is used at the point of sale and functions in the same way as *Catch Disposal Records* (CDR). This logbook provides a more detailed, species-specific account of the weighed and processed product, and provides an added method to validate data collected through AIVR and Unloaded Fish Notices.

Fishers must also complete the *Bêche-de-mer and Trochus Fisheries Logbook* (BD04) (Appendix D). This commercial logbook records information on;

- The retained catch;
- Fishing times;
- Location of catch and effort;
- Fishing equipment used (in this case, the number of divers and diving hours).

While commercial logbooks record catch, historical records are based on numbers of individuals and required the use of an estimated weight conversion factor. This, at times, overestimated the amount of catch being retained in this fishery. This situation was rectified in 2014 with the introduction of the BD04 commercial logbook. While noting these improvements, *Buyers Reporting Logbook* data / *Unloaded Fish Notices* provide a more accurate account of historical catch trends and individual rates of harvest in this fishery. For this reason, catch data collected through the *Buyers Reporting Logbook* and *Unloaded Fish Notices* is used to monitor long-term catch trends, assess individual rates of harvest and account for quota usage (*Unloaded Fish Notices* only). This same data is also used in stock assessments and indicative sustainability evaluations (*e.g.* SAFS). In line with this approach, all data presented in this Scoping Study is based on the *Buyers Reporting Logbook* data and *Unloaded Fish Notices* (Table 4; Fig. 2; Appendix E).

There are no discards in the QSCF due to the highly selective nature of hand collection fisheries, and as such there is no requirement to report this. Interactions with Species of Conservation Interest (SOCI) are required to be reported in the SOCI logbook. However, the QSCF has low to negligible interactions with the SOCI.

Reporting requirements for the QSCF are also being reviewed as part of the harvest strategy development process. This review will consider the suitability and applicability of implementing more responsive catch reporting systems *e.g.* introducing electronic logbooks (via a smartphone application) to enable reporting of catch and effort in real time. These initiatives build on measures already in place in the fishery *e.g.* mandating the use of the *Vessel Monitoring System*. A summary of *Buyers Reporting Logbook* catch data (2000–2020 inclusive) is provided in Appendix E.

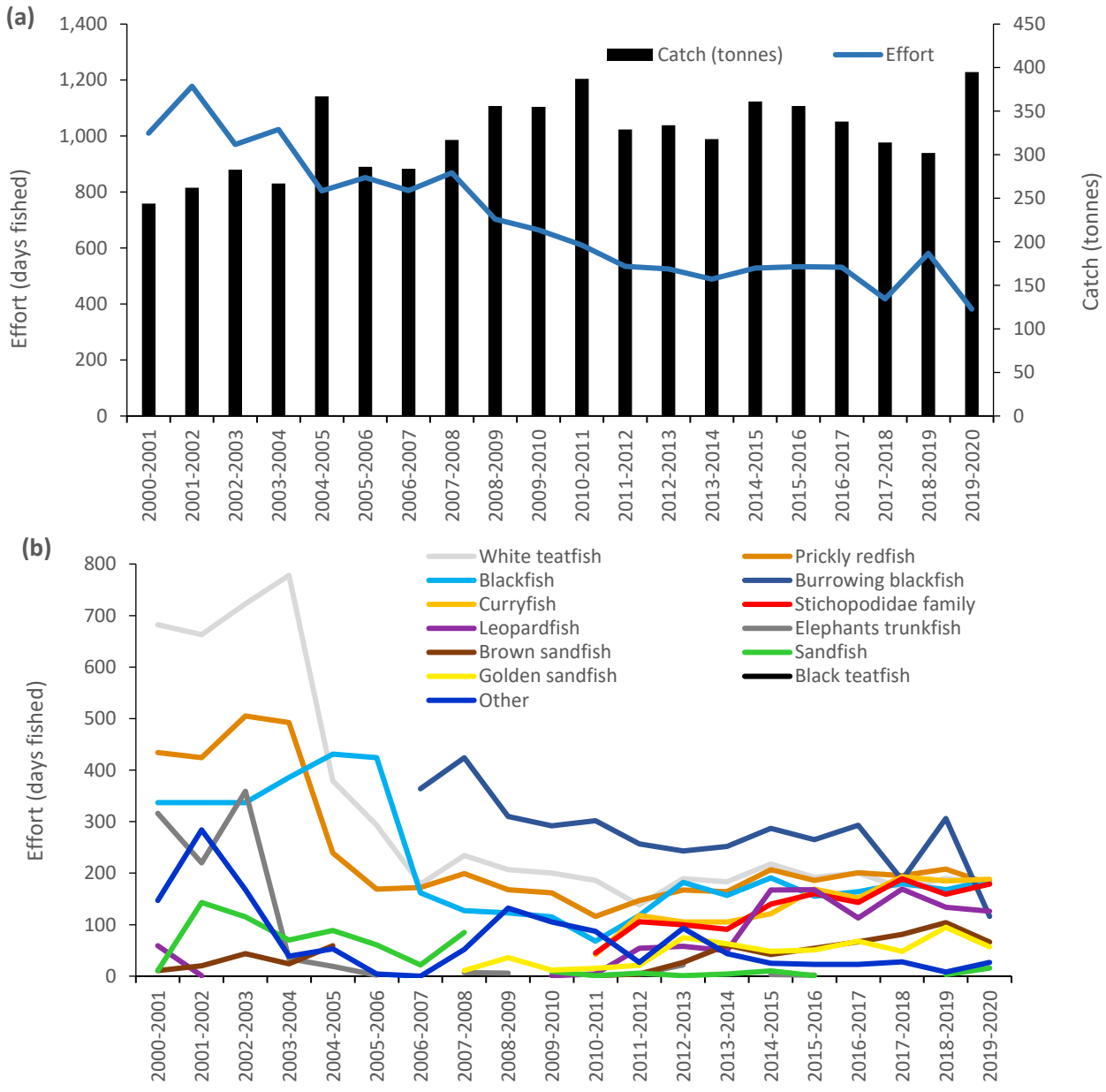

Figure 2. *Catch and effort summary for the QSCF: a) catch and effort trends from 2000/01–2019/20 (inclusive) and b) annual effort (days fished) trends for each species in the QSCF. Commercial logbook data used for effort, with Buyers Reporting Logbook data used for catch. 'Other' refers to the species displaying less than 600 days fished total over the 2000/01–2019/20 period including: 'sea cucumbers', 'beche de mer - unspecified', surf redfish (A. mauritiana), amberfish (T. anax), black lollyfish (H. atra), redfish (A. obesa), stonefish (A. lecanora), greenfish (S. chloronotus), and long stickyfish.*

6.2 Effort

Effort (days fished) in the QSCF peaked in the 2001/02 financial year and declined progressively over the post 2007/08 period (Table 4; Fig. 2a). While showing a degree of variability, these declines have stabilised since 2011/12 with total effort fluctuating between 380 and 580 days fished (Table 4; Fig. 2). While difficult to quantify, this decline could be attributed to a range of factors including changing fishing behaviour, shifting effort to adjacent jurisdictions (*e.g.* Torres Strait), management interventions, and the expansion of the GBRMP representative areas program.

The majority of the sea cucumber effort is directed towards white teatfish, burrowing blackfish, prickly redfish, curryfish, blackfish, and now black teatfish. When combined, these six species account for more than 70% of the effort reported against B1 licences over the 2000/01–2019/20 period (Fig. 2). Data collected over this period shows effort for five[2] of these species declined after 2004; along with a number of the secondary species (Fig. 2b). Changes made to the management arrangements for the main target species would more than likely have contributed to this decline *e.g.* the introduction of the RHA, BFZs and species-specific TACC limits.

Sea cucumber effort has spread over time with a large proportion of the east coast effort grids now registering between one and 10 days fished. However, the majority of effort remains localised around areas north of Cairns, to the east of Mackay/Rockhampton, and along the Great Barrier Reef. Rotational harvesting is used within these fishing grounds to reduce the risk of localised depletions and the overexploitation of key sea cucumber species (Fig. 1). On this basis, the fishing grounds are divided up into zones to be fished on a rotational basis only once every three years (see Section 3.2). Due to privacy factors involved in Queensland Fisheries reporting, effort distribution maps cannot be provided for fisheries operating with less than five vessels.

6.3 Catch

Catch data for the QSCF gives an absolute value (*i.e.* not Catch per Unit Effort) of what is harvested across the Queensland east coast (Fig. 2). This data shows some variability and catch trends display low to moderate symmetry with those observed in the effort data. For example, total catch over the 2000/01 to 2019/20 period increased (244t in 2000/01, 395t in 2019/20) with participation rates and effort (days fished) both decreasing (Table 4, Fig. 2). Across the reporting period, the specificity of logbook reporting requirements has improved with the fishery moving towards finer-scale or species-specific reporting. This is particularly evident in the post-2014 period (Fig. 3a) where logbooks were changed to accommodate species-specific reporting for curryfish (*S. herrmanni* and *S. vastus*), golden sandfish and brown sandfish. These changes have seen a fanning out of the sea cucumber data / catch contribution percentages (Fig. 3a).

Catch data for the QSFC shows a general diversification of the harvest percentages from the 2010/11 and 2011/12 financial years. In the pre-2010/11 period, the catch was largely dominated by white teatfish and the blackfish / burrowing blackfish complex. While white teatfish and burrowing blackfish are still retained in notable quantities, prickly redfish and curryfish have increased in prominence (Fig. 3a; c). Within the current fishing environment, six species make up around 90% of the reported catch: burrowing blackfish, white teatfish, black teatfish, prickly redfish, curryfish, and blackfish (Fig. 3a).

[2] *The TACC limit for black teatfish was set at 0t from 1999 up until the 2019/20 season,*

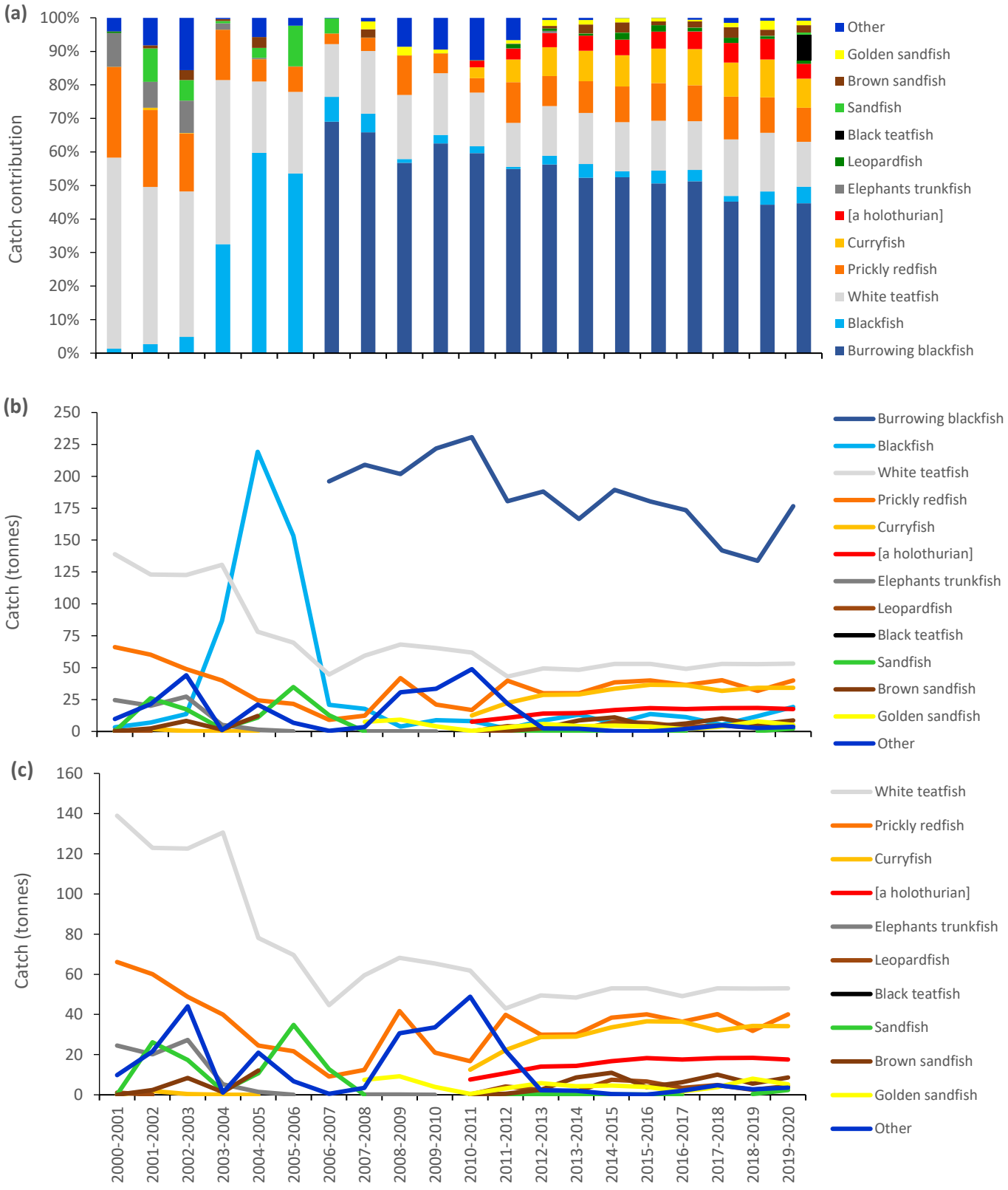

Figure 3. *Species composition summary: a) Species proportions, b) catch (t), c) catch burrowing blackfish and blackfish (deepwater) for better visual interpretation of the composition data of lesser harvested species. Note: 'Other' includes: 'sea cucumbers' 'beche de mer – unspecified', surf redfish (A. mauritiana), amberfish (T. anax), black lollyfish (H. atra), redfish (A. obesa), stonefish (A. lecanora), greenfish (S. chloronotus), and long stickyfish.*

Species compositions have varied through time and reflect broader changes in the management regime and logbook reporting requirements (Fig. 3a; Appendix E). This is best exemplified by catch data for blackfish (*Actinopyga palauensis*) and burrowing blackfish (*Actinopyga spinea*). Prior to 2006/07, 'blackfish' harvest was one of the more dominant features of sea cucumber harvest, making up 30–60% of the species composition (Fig. 3a). In the post-2006/07 period, catch for this species declined markedly and it was superseded by burrowing blackfish as the most targeted species (up to 70% of the total catch) (Appendix E). This change is linked directly to logbook amendments and the implementation of finer scale species reporting. This suggests that, while blackfish are retained in this fishery, percentages reported in the post 2006/07 are more representative of the harvest rates for this species (Fig. 3a).

Other examples of where management changes have influenced catch compositions include the introduction of BFZs and the re-commencement of fishing of black teatfish. BFZs and the associated species-specific TACC (225t) were introduced in 2004 and provided a direct mechanism to manage the catch of this species. Since their inception, burrowing blackfish has tapered off with the species now comprising around 45% of the reported catch (Fig. 3). In the black teatfish example, the species was previously managed under a 0t TACC. In 2019/20 the TACC limit was increased with black teatfish catch proportions mirroring that of prickly redfish and curryfish at 8–10% (30-40t) (Fig. 3a).

6.4 Bycatch including Species of Conservation Interest

As a hand collectable fishery, bycatch in the QSCF will be confined to target species that do not meet the regulations *e.g.* those that have previously been classified as 'no take' or species that are below minimum legal size limits. While it is possible for operators to encounter Species of Conservation Interest in an active fishing environment, the likelihood of interactions occurring with fishing apparatus is negligible due to the apparatus being used and the fishing method being employed.

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8 Appendices

Appendix A*—The B1 fishing symbol area for the Queensland Sea Cucumber Fishery (QSCF) – formerly the Bêche-de-mer Fishery.*

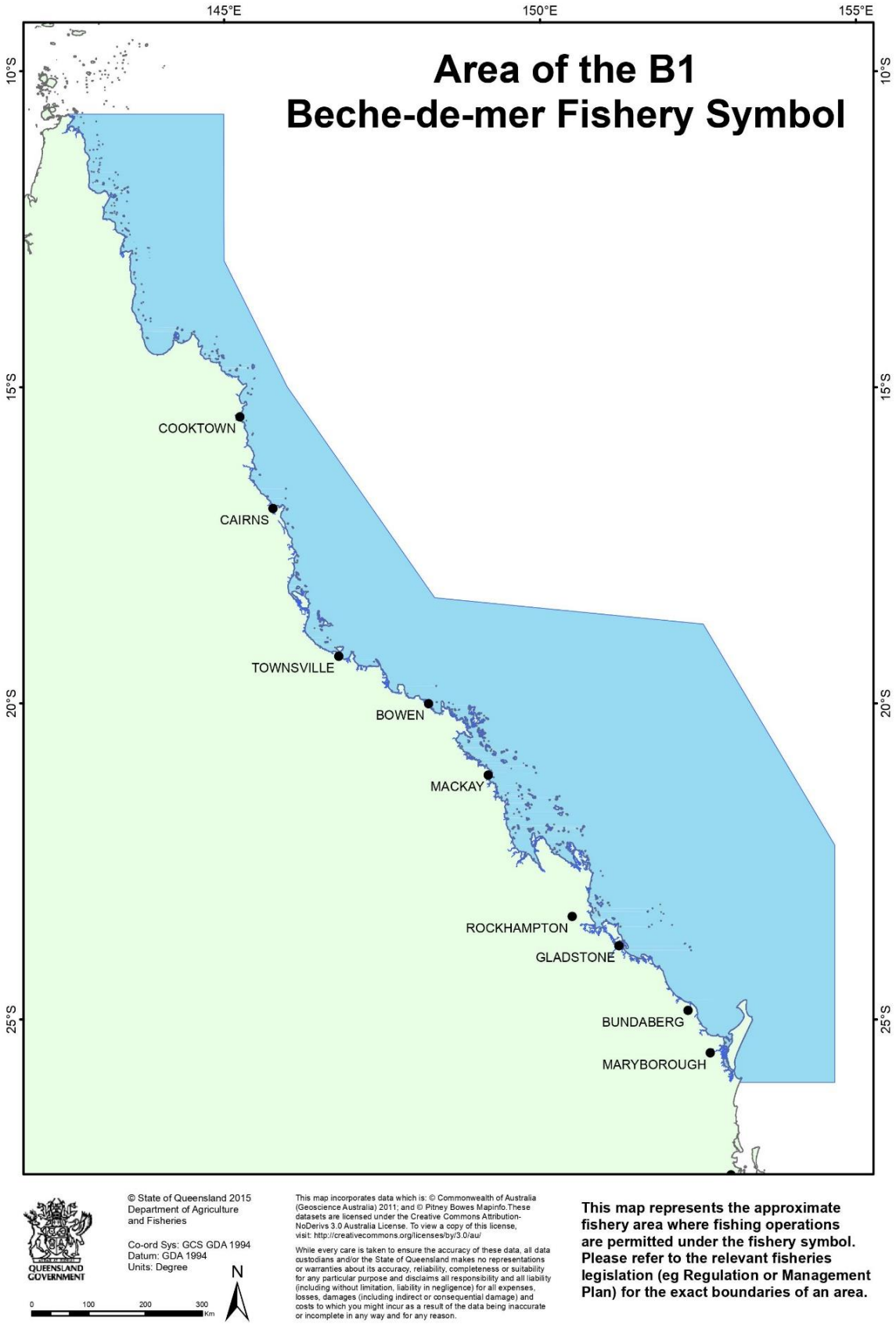
Appendix B*—Summary of the selected species retained in the Queensland Sea Cucumber Fishery that are assessed as part of the National Status of Australian Fish Stocks (SAFS) and Queensland Stock Status Process.*

Appendix C*—Beche-de-mer Buyer's Reporting Logbook (BB02)*

Appendix D*—Commercial fisher Beche-de-mer and Trochus Fisheries Trip Logbook (BD04)*

Appendix E*—Total annual catch (tonnes) for the QSCF by individual species.*

***Appendix A**—The B1 fishing symbol area for the Queensland Sea Cucumber Fishery (QSCF) (formerly Bêche-de-mer Fishery).*



***Appendix B**—Summary of the selected species retained in the Queensland Sea Cucumber Fishery that are assessed as part of the National Status of Australian Fish Stocks (SAFS) and Queensland Stock Status processes.*

Note: Queensland Stock Status assessments ceased after 2017. Greater emphasis is now placed on the results of National SAFS assessments conducted every two years.

Species	Stock name	2015 QLD stock status (Non-SAFS year)	2016 SAFS status	2017 QLD stock status (Non-SAFS year)	2018 SAFS status	2020 SAFS status
White teatfish (*Holothuria fuscogilva*)	*'East Coast Sea Cucumber Fishery'*	Sustainable	Not assessed	Sustainable	Sustainable	Sustainable
Black teatfish (*Holothuria whitmaei)*	*'Eastern Australia'*	Not assessed	Not assessed	Not assessed	Not assessed	Not assessed
Burrowing blackfish (*Actinopyga spinea)*	*'East Coast Queensland'*	Sustainable	Not assessed	Sustainable	Not assessed	Sustainable

Appendix C—*Beche-de-mer Buyer's Reporting Logbook (BB02)*

Beche-de-mer Buyers Reporting Logbook - BB02

LOGBOOK NO. 62	**PAGE NO.**
Buyer Licence No.	Buyer/Company Name
Contact Person	Phone Number

Date of Purchase	
Prior transaction #:	
Purchased from: Authority/Permit Holder	

Species	**No. of pieces**	**Species weight (KG) purchased**	**Form**
Burrowing blackfish			
Curryfish Hermani			
White teatfish			
Curryfish Vastus			
Prickly redfish			
Blackfish (Paluensis)			
Golden sandfish			
Brown Sandfish			
TOTAL			

Declaration: I declare that the above information is true and correct

Signature_____ Date_____

Beche-de-mer Buyers Reporting Logbook - BB02

LOGBOOK NO. 62	**PAGE NO.**
Buyer Licence No.	Buyer/Company Name
Contact Person	Phone Number

Date of Purchase	
Prior transaction #:	
Purchased from: Authority/Permit Holder	

Species	**No. of pieces**	**Species weight (KG) purchased**	**Form**
Burrowing blackfish			
Curryfish Hermani			
White teatfish			
Curryfish Vastus			
Prickly redfish			
Blackfish (Paluensis)			
Golden sandfish			
Brown Sandfish			
TOTAL			

Declaration: I declare that the above information is true and correct

Signature_____ Date_____

***Appendix D** — Commercial fisher Beche-de-mer and Trochus Fisheries Trip Logbook (BD04) in place from 2014 onwards.*

Queensland Government

Fisheries Act 1994

Bêche-de-mer and Trochus Fisheries Trip Logbook

BD04
Version 04

Logbook No.	Page No.	Vessel Name	Boat Mark	Licence Holder's/Nominee's Name	Harvest Licence No.	IF NOT FISHING FOR AN EXTENDED PERIOD, PLEASE SPECIFY:
						………/………/……… TO ………/………/……… Boat Activity Code ……… ………/………/……… TO ………/………/……… Boat Activity Code ………

Boat Activity or Non-Collection Codes

Fishing…………………… 0
Searching………………… 1
Steaming…………………… 2
Not fishing………………… 3

DAILY CATCH AND EFFORT DETAILS MUST BE COMPLETED BY THE END OF EACH FISHING DAY. LOGSHEETS ARE TO BE RETURNED TO THE LOGBOOK SECTION WITHIN 7 DAYS OF THE LAST DAY OF EACH FISHING TRIP

Departed from ……………………………………………… On ………/………/……… At ……………am/pm

Quota Reporter Prior Notice Number ……………………… Amended Prior Notice Number ………………………

Bêche-de-mer Form Codes
S = Salted FB = Frozen & Boiled

				EFFORT: Fishing Location (position of maximum catch)			EFFORT: Effort Details				HARVEST INFORMATION: Trochus		BDM Target Species	Burrowing Blackfish (BB)		Curryfish *hermanni* (CH)		White Teatfish (WT)		Curryfish *vastus* (CV)		Prickly Redfish (PR)		Blackfish (BF)		Golden Sandfish (GS)		Brown Sandfish (BS)		Other BDM Species			Did you have an interaction with any species of conservation interest? (please circle)	
Day	Month	Year	↓	Latitude or Grid	Longitude or Site or Reef ID Number	Rotational Zone or Burrowing Blackfish Zone (eg. O41 or Lizard)	No. Collectors	Total Collector Hours	Harvest Method (Hookah Scuba Wading)	Avg. Harvest Depth (m)	Number	Weight (kg)		Weight (kg)	Form	Weight (kg)	Form	Weight (kg)	Form	Weight (kg)	Form	Weight (kg)	Form	Weight (kg)	Form	Weight (kg)	Form	Weight (kg)	Form	Species Code	Weight (kg)	Form		
																																	Y	N
																																	Y	N
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																																	Y	N
										Trip Totals																								

Comments:

I certify that the information I have provided on this form is a true and accurate record of fishing activities and that interactions with species of conservation interest have been reported in the SOCI logbook. The weights provided in this logbook are estimates.

Licence Holder's/Nominee's Signature…………………………………………… Date ………/………/………

***Appendix C**—Total annual catch (tonnes) for the QSCF by individual species.*

Note: The fishery season runs from 1 July to 30 June. Species names are shown as they are reported in the Buyers Reporting Logbook. Some species are reported under general species groupings (e.g. [a holothurian], Black fish, Beche-de-mer - unspecified). These species groupings are likely to contain species also reported under species-specific catch categories. Where a zero (0t) catch is indicated for a species/complex in a particular year, this reflects a total catch of less than 1t. Where no catch is shown, this indicates where no catch has been reported for the species in a particular year.

Species	Annual Catch (tonnes) by Financial Year																			
	2000-2001	2001-2002	2002-2003	2003-2004	2004-2005	2005-2006	2006-2007	2007-2008	2008-2009	2009-2010	2010-2011	2011-2012	2012-2013	2013-2014	2014-2015	2015-2016	2016-2017	2017-2018	2018-2019	2019-2020
Blackfish - burrowing							196	209	202	222	231	181	188	167	189	180	173	142	134	177
White teat fish	139	123	123	131	78	70	45	59	68	65	62	43	49	48	53	53	49	53	53	53
Prickly red fish	66	60	49	40	24	22	9	12	42	21	17	40	30	30	38	40	36	40	32	40
Black fish	3	7	14	87	219	153	21	18	4	9	8	2	9	13	6	14	11	5	12	19
Curryfish	0	2	0	0	0						13	22	29	29	34	37	36	32	34	34
Black teat fish																				30
[a holothurian]											8	11	14	14	17	18	18	18	18	18
Sea cucumbers								3	27	33	49	22	1	1			0	4	3	1
Sand fish	0	26	17	2	11	35	13	0			0	0	0	0	0	0	0		0	2
Brown sandfish	0	2	8	1	12			8			0	1	2	9	11	4	6	10	6	9
Elephants trunk fish	24	20	27	5	1	0		0	0	0		0	2				0			
Golden sandfish								7	9	4	0	3	6	4	5	4	2	4	8	5
Beche de mer - unspecified		2	21	0	17	7												0		1
Leopardfish	1	0									0	4	2	2	7	7	3	5	3	4
Surf red fish	3	13	2	0	4	0	0	0	3		0	0	0	1	0	0		0	0	0
Black lolly fish	2	2	15					0			0				0		2		0	1
Amberfish	5	4	6	0						0			1					0		
Green fish	0	0						0			0			0	0	0	0		0	
Red fish	0	0	0	0	0					0	0									
Stonefish	0	0	0	0	0	0		0	0		0	0	0	0	0					
Long stickyfish															0					
Annual total	**244**	**262**	**283**	**267**	**367**	**286**	**284**	**317**	**356**	**355**	**387**	**329**	**334**	**318**	**361**	**356**	**338**	**314**	**302**	**395**