TASMANIAN SCALEFISH FISHERY ASSESSMENT 2019/20

Kate Fraser, Klaas Hartmann and Nils Krueck

October 2021

This assessment of the Tasmanian Scalefish Fishery is produced by the Institute for Marine and Antarctic Studies (IMAS) using data downloaded from the Department of Primary Industries, Parks, Water and Environment (DPIPWE) Fisheries Integrated Licensing and Management System (FILMS) database. The information presented here includes all logbook returns for the 2019/20 season.

IMAS Fisheries and Aquaculture
Private Bag 49
Hobart TAS 7001
Australia

Email: nils.krueck@utas.edu.au
Ph: +61 3 6226 8226

Contents

Executive Summary

The Tasmanian Scalefish Fishery is a multi-species fishery that operates in state waters and encompasses a wide variety of species and capture methods. The Scalefish Fishery Management Plan (amended in 2015) provides the legislative framework for the fishery.

Fishery assessment

Since the early 1990s, annual commercial catches of the major species have generally declined. This decline can be explained in part by changed targeting practices and market demand, declines in species abundance or biomass, the introduction of the Scalefish Fishery Management Plan in 1998, and the transfer of the Southern Shark Fishery to the Commonwealth in 2000.

The number of vessels participating in the scalefish fishery and the number of scalefish fishing licences have declined notably since 2000. Commercial catches have also declined over this period, however this is only partly attributable to declining effort and there is ongoing concern or insufficient information about the status of multiple routinely assessed species. There is also concern regarding the level of latent capacity within the fishery from licence holders who are currently participating either at low levels or not active (only 20–50% of licences are active depending on the type).

Highest commercial catches in 2019/20 were reported for Southern Calamari (85.8 t), Wrasse (52.4 t), and Eastern School Whiting (43.7 t). Summary tables detailing commercial catches for all assessed species and various other species groups are available in Appendix 3. Catch and effort information for the recreational fishery, which are estimated periodically, demonstrate that the recreational catch represents most or a significant component (>50%) of the total harvest of several key species, including Sand Flathead, Striped Trumpeter and Bastard Trumpeter. The latest survey of recreational catches was conducted in 2017/18 and outcomes of the associated report were summarised in the last scalefish assessment report for 2018/19 (Krueck et al. 2020).

Species status

The status of all main scalefish species was assessed based on information available through previous assessments, new data on catch, effort, and species biology for 2019/2020, as well as updated stock assessments by the Fisheries Research and Development Corporation (FRDC) and the Australian Bureau of Agricultural and Resource Economics and Sciences (ABARES). The outcomes of species assessments are detailed below, noting that IMAS and DPIPWE have initiated a continuous data quality control and assessment procedure, which can cause changes to the FILMS database and stock assessment calculations to be presented in future reports. Historical stock status classifications of each species assessed for the current season are available in Appendix 4.

Species status was assigned according to the national stock reporting framework used in the Status of Australian Fish Stocks (SAFS) reporting scheme (Sustainable, Recovering, Depleting, Depleted or Undefined) (refer to the FRDC webpage for further explanation). We note that the stock reporting framework adopted here only defines the stock against the limit reference point of whether it is likely to be recruitment overfished or not. Target reference points (i.e., those that correspond to levels of biomass and fishing pressure that are considered to provide for desirable conditions) remain to be defined. We further note that Banded Morwong assessments are reported separately. This change from previous reporting reflects differences in the period for setting the annual Total Allowable Catch (TAC) for Banded Morwong (based on quota year) compared with routine assessment reporting for other scalefish species (based on financial year). Octopus catches are reported following the same reporting period as Banded Morwong and, thus, are also assessed in an independent report.

Species assessments for 2019/2020

Species/Species group	Preliminary status	Explanation
State assessed species		
Australian Sardine *Sardinops sagax*	**SUSTAINABLE**	There is effectively no current commercial fishing for Australian Sardine in Tasmanian waters, with all Developmental Australian Sardine Permits now expired. As such, the current level of fishing pressure in Tasmania is unlikely to cause the biological stock to become recruitment impaired. The species was classified as not overfished nor subject to overfishing by ABARES for 2019/20. Similarly, all Australian stocks are currently classified as Sustainable in the 2018 Status of Australian Fish Stocks report.
Barracouta *Thyrsites atun*	**UNDEFINED**	Catches of Barracouta have declined steadily since the mid-2000s, presumably due to a decrease in targeted effort resulting from a lack of market demand. Low levels of fishing effort mean that catch and catch rate data are unreliable indicators of abundance and stock status. Therefore, there is insufficient information to confidently classify the stock.
Bastard Trumpeter *Latridopsis forsteri*	**DEPLETED**	Trends in commercial and recreational catches of Bastard Trumpeter suggest record low population levels and that the species is recruitment overfished. The current minimum legal size limit is below the size of maturity such that the fishery is based almost entirely on juvenile fish. Data-limited stock assessment methods suggest that stock recovery under current levels of catch is theoretically possible, but evidence of recovery is lacking.
Eastern Australian Salmon *Arripis trutta*	**SUSTAINABLE**	Eastern Australian Salmon has a long history of exploitation across south-eastern Australia. Low commercial landings in Tasmania in recent years are driven by market demand rather than abundance. The current level of fishing pressure in Tasmania is well below historically sustained levels and thus unlikely to cause the biological stock to become recruitment impaired.
Flounder *Pleuronectidae* family	**UNDEFINED**	Greenback Flounder (*Rhombosolea tapirina*) constitute the majority of the commercial catch, which remains low due to a ban on overnight gillnetting and limited market demand. Due to low effort, catch and catch rates are considered unreliable estimators of abundance and, thus, the status of the stock remains undefined.
King George Whiting *Sillaginodes punctatus*	**SUSTAINABLE**	King George Whiting is a range-extending species that has attracted increasing interest from both the commercial and recreational sector. The current level of fishing pressure on King George Whiting within Tasmanian waters is unlikely to cause the biological stock to become recruitment impaired. Pre-emptive monitoring and management might be required if interest in this species continues to increase.
Leatherjackets *Monacanthidae* family	**SUSTAINABLE**	Several species of Leatherjacket are found in coastal waters around Tasmania. Most likely captured by

		coastal fisheries are the Brown-striped (*Meuschenia australis*), Toothbrush (*Acanthaluteres vittiger*), and Six-spine Leatherjacket (*Meuschenia freycineti*). Leatherjackets are largely a by-product and not actively targeted due to a lack of market demand. Therefore, catch is not a good indicator of abundance. However, fishing mortality is likely to be low and long-term monitoring of fish assemblages within and outside of Tasmanian MPAs showed no significant differences in Leatherjacket abundance that could be attributed to fishing activity.
Longsnout Boarfish *Pentaceropsis recurvirostris*	**UNDEFINED**	Longsnout Boarfish are a by-product species of the gillnet fishery for Banded Morwong, with low catches due to the large minimum legal size. There is insufficient information available to confidently classify this stock.
Snook *Sphyraena novaehollandiae*	**SUSTAINABLE**	Due to low market demand Snook is not actively targeted and current catches are approaching the historically lowest level. Therefore, catch and catch rates are considered unreliable indicators of abundance. Recent biological analyses indicate that the current level of fishing mortality is unlikely to cause the stock to become recruitment impaired.
Southern Calamari *Sepioteuthis australis*	**DEPLETING**	Sharp regional increases and subsequent fluctuations in catch and effort in recent years suggest that fishing pressure on Southern Calamari is likely to be too high to be sustainable. Despite closures during part of the spawning season, many operators rely on targeting spawning aggregations, which presents a high risk of recruitment impairment. Aggregation fishing also means that data on catch and catch rates are unlikely to reflect abundance. Data-poor stock assessment results give further reason for concern that fishing mortality might have been excessive and that stocks on the south-east and east coast might be depleted or still recovering, while more recently targeted stocks on the north coast might be depleting.
Southern Garfish *Hyporhamphus melanochir*	**DEPLETED**	Both catch and effort data for Southern Garfish showed an overall declining trend in recent years. Catch rates have fluctuated substantially but do show a recently reversing trend back to higher levels. However, given the schooling nature of the species, catch rates are unlikely to be a reliable proxy of abundance. In agreement with fisher perceptions, data-limited stock assessment methods suggest that recovery of the population under current levels of catch is theoretically possible, but empirical evidence for recovery is lacking.
Southern Sand Flathead *Platycephalus bassensis*	**DEPLETING**	Recreational catches dominate landings of Southern Sand Flathead in Tasmania. Fishery independent surveys suggest relatively low abundances of legal sized fish in southeast and eastern Tasmania where populations are subject to heavy fishing pressure. While the increase in the minimum size limit in 2015 and a reduction in the bag limit seemed to reduce catches, current levels of fishing pressure, particularly on females, could still cause the stock to become recruitment impaired.
Striped Trumpeter	**DEPLETED**	Following first records of young fish in biological

Latris lineata		samples in the last two seasons, clear evidence of population recovery of Striped Trumpeter is still lacking. In 2019/20, reference points for low commercial catch, high recreational catch, and a high proportion of recreational catch were triggered. Commercial catches are close to the historical low, but total levels of fishing pressure (commercial and recreational combined) could still be too high to allow for recovery, especially since the minimum size limit is below the estimated size at maturity. More data are needed to clarify population status and trends.
Wrasse: *Notolabrus spp.* **Bluethroat Wrasse** *Notolabrus tetricus* **Purple Wrasse** *Notolabrus fucicola*	**SUSTAINABLE**	Catches, effort and catch rates of Wrasse have remained relatively stable for almost a decade, providing little reason for concern that the current level of fishing mortality is too high. Uncertainty remains over levels of potential localised depletion, and about the size of the catch taken by rock lobster fishers and used for bait.
Yelloweye Mullet *Aldrichetta forsteri*	**SUSTAINABLE**	Yelloweye Mullet are most abundant in estuarine habitats, where netting is prohibited or restricted, thereby providing a high degree of protection throughout most of their range. Catches are at low levels, but unlikely to reflect abundance. It is overall unlikely that the stock is recruitment impaired or that the current fishing pressure is high enough for the stock to become recruitment impaired in the future.
Commonwealth assessed species		
Blue Warehou *Seriolella brama*	**DEPLETED**	Blue Warehou is a predominately Commonwealth-managed species that has been classified as "Overfished" in the ABARES Fishery Status Reports 2019. It has been classified as Depleted in the 2020 Status of Australian Fish Stocks Report. This species is sporadically abundant in Tasmanian waters. Despite a reduction in Total Allowable Catch (TAC) for the Commonwealth fishery to 118 t and the initiation of a stock rebuilding strategy in 2008, there is no evidence of stock recovery.
Common Jack Mackerel *Trachurus declivis*	**SUSTAINABLE**	Jack Mackerel is a predominately Commonwealth-managed species that has been classified as "Not overfished nor subject to overfishing" by ABARES for 2019. Only minor catches of this species have been taken from Tasmanian waters in recent years due to one operator leaving the fishery. Patterns of catch and effort are unlikely to reflect stock status, but the currently low level of fishing pressure in Tasmania is unlikely to cause the stock to become recruitment impaired.
Eastern School Whiting *Sillago flindersi*	**SUSTAINABLE**	Eastern School Whiting is a predominately Commonwealth-managed species that has been classified as "Not overfished nor subject to overfishing" by ABARES for 2019. It has been classified as Sustainable in the 2020 Status of Australian Fish Stocks Report. Tasmanian catches fluctuate due to market demand, but generally represent only a small proportion of the Commonwealth commercial catch.
Gould's Squid *Nototodarus gouldi*	**SUSTAINABLE**	Gould's Squid is a predominately Commonwealth-managed species that has been classified as "Not overfished nor subject to overfishing" by ABARES for 2019. Dual-licensed vessels fish in Tasmanian

		waters, especially in years of peak abundance. The species is characterised by high inter-annual variability in abundance in state waters and generally low catches in recent years.
Jackass Morwong *Nemadactylus macropterus*	**SUSTAINABLE**	Jackass Morwong is a predominately Commonwealth-managed species that has been classified as “Not overfished nor subject to overfishing” by ABARES for 2019. It has been classified as “Sustainable” in the Status of Australian Fish Stocks Report 2020. Commercial catch and effort in Tasmania are low.
Tiger Flathead *Platycephalus richardsoni*	**SUSTAINABLE**	Tiger Flathead is a predominately Commonwealth-managed species that has been classified as “Not overfished nor subject to overfishing” in the ABARES Fishery Status Reports 2019. It has been classified as Sustainable in the 2020 Status of Australian Fish Stocks Report. In Tasmania, Tiger Flathead are caught predominately by the commercial sector. Catches fluctuate substantially, but they typically represent a small proportion of Commonwealth trawl landings.

1. Introduction

This report covers assessments of 21 selected taxa within the Tasmanian Scalefish Fishery, including species of both teleosts and cephalopods. Stock status classifications follow the national reporting scheme used in the Status of Australian Fish Stocks (SAFS) reports. SAFS reports include four categories: “Sustainable”, “Depleting”, “Depleted” or “Recovering”. These four categories define the state of the stock exclusively in terms of recruitment impairment, which represents a limit reference point. Recruitment impairment occurs when the mature adult population (spawning biomass) is depleted to a level where it no longer has the reproductive capacity to replenish itself. Potential target reference points (e.g., the biomass supporting maximum sustainable yield are not considered). For more detailed information on status classification categories, please refer to the TasFisheriesResearch webpage.

A full list of common and scientific names of all species landed in the Tasmanian Scalefish Fishery is presented in Appendix 1. We note that the status of most Tasmanian fishery species included in this report (15) are assessed exclusively by IMAS. However, formal assessments of six selected species, which are primarily caught under Commonwealth jurisdiction (e.g., Tiger Flathead, Blue Warehou, Jackass Morwong, Eastern School Whiting and Jack Mackerel), are undertaken by the Southern and Eastern Scalefish and Shark Fishery Assessment Group (SESSF-AG). These formal assessments are summarised in fishery status reports produced by the Australian Bureau of Agricultural and Resource Economics and Sciences (ABARES) (Patterson et al. 2020). The stock status classifications reported here for this subset of species are based on the status determined by SESSF-AG.

Data sources and analyses

Commercial catch and effort data are collected through compulsory Tasmanian Commercial Catch, Effort and Disposal Returns, and Commonwealth non-trawl (GN01 and GN01A) and Southern Squid-jig Fishery (SSJF) logbook returns. Unless noted otherwise, catch and effort data reported in this assessment relate to the commercial sector. Catch and effort information for the recreational sector are collected from surveys that are conducted periodically (generally every 5 years) and published on the IMAS webpage. Previous assessment reports included more detailed information on the fishery, management objectives, data analysis, assessment criteria, and general fishery trends. This information can now be accessed online through the TasFisheriesResearch webpage.

Routine analyses

Routine assessments involve the analysis of time series of catch, effort, and catch-per-unit-effort (CPUE). Reference points determined for most assessed species are then used to flag whether catch and CPUE data from the current year are indicative of concerning changes in fishing activities or stock status. More detailed information on these analyses of fishery performance based on catch and effort data is available online through the TasFisheriesResearch webpage.

Data-poor stock assessment approach: Catch-MSY

In addition to routine analyses of spatio-temporal trends in catch and effort, we used several catch-only methods to estimate stock depletion and catch relative to the estimated maximum sustainable yield (MSY). The results shown here are based on the “Catch-MSY” method (Martell and Froese 2013), which refers to a model-assisted stock assessment approach developed for data-poor conditions. The approach relies on the Schaefer production model, which defines the relationship between biomass and catch based on the intrinsic population growth rate (r), and which assumes that the biomass delivering MSY is equal to 50% of the unfished biomass. According to a time series of catch records and the assumed resilience of the target species (“very low” ,“low”, “medium”, or “high”, and associated ranges of plausible r values), Catch-MSY can be used for a stock reduction analysis based upon which credible Schaefer model predictions are inferred to estimate management reference points for MSY and biomass depletion (Haddon 2018; Haddon et al. 2019) .

Biomass depletion fluctuating around 50% of unfished levels is a commonly defined target (B_{target} = B_{MSY} = 0.5 B/B0, where B = biomass and B0 = unfished biomass), but has also been used as a threshold in precautionary Australian harvest strategies to initiate reductions in catch of data-poor fish populations so that biomass remains above or recovers back to target levels (B > 0.5 B/B0) (see e.g., DPIRP (2020)). Biomass depletion below 20% is an internationally applied limit reference point (B_{limit}), beyond which directed fisheries under Australian harvest strategies are closed (Rayns 2007; Smith et al. 2009; Punt et al. 2014).

The Catch-MSY analyses conducted here were based on the commercial component of total fishery catch, generally excluding estimates of recreational catch. The Catch-MSY method appears to be robust to the exclusion of recreational catch data unless trends in recreational vs commercial catch over time are divergent (Haddon 2018).

Scalefish species selected for Catch-MSY analyses (Table 1) were those for which we assumed that changes to management over the duration of recorded fishery catch did not severely undermine the use of catch data to infer trends in abundance. The same implicit assumption was made with respect to changes in the spatial distribution of fishing effort and catch.

To confirm Catch-MSY results, we estimated stock depletion and MSY by also using both the more recent “CMSY” method (Froese et al. 2017) as well as the Optimised Catch-Only Method (“OCOM”) (Zhou et al. 2017). All three methods produced similar results for all assessed species; therefore, only Catch-MSY results were included in this report.

Table 1 Assessment of the suitability of catch data available for state-assessed species for application of the Catch-MSY approach. BMSY = biomass assumed to deliver the maximum sustainable yield, with a commonly defined target around 50% of unfished biomass.

Species name	**Historical depletion beyond target biomass**	**Suitable for Catch-MSY**	**Comment**
Australian Sardine *(Sardinops sagax)*	Unlikely	No	This fishery was in a developmental stage over recent years, but no permits are currently active and, thus, limited or no catch has been recorded.
Barracouta *(Thyrsites atun)*	Likely	No	Historical catches were high (1960s – 1970s) and subsequent declining trends could not be aligned with credible population trends using Catch-MSY.
Bastard Trumpeter *(Latridopsis forsteri)*	Likely	Yes	Bastard Trumpeter was highly abundant in Tasmanian waters prior to commercial and recreational fishing; however, abundance has declined substantially with fishing. Current low market demand means catches may not adequately reflect abundance.
Eastern Australian Salmon *(Arripis trutta)*	Possible	No	Only a few operators target this species opportunistically. A substantial drop in catch was noted when one major operator stopped targeting Eastern Australian Salmon in 2013/14.
Flounder *(Pleuronectidae* family)	Possible	No	Two undifferentiated species complicate the use of catch data to infer stock status. Additionally, a fundamental management change (a ban on night netting) substantially reduced commercial catches.
King George Whiting *(Sillaginodes punctatus)*	Unlikely	No	The fishery is in development, with commercial catch data not yet revealing informative trends.
Leatherjackets *(Monacanthidae* family)	Uncertain	No	Multiple undifferentiated species complicate the use of catch data to infer stock status.
Longsnout Boarfish *(Pentaceropsis recurvirostris)*	Uncertain	No	The species is not targeted, which complicates the use of catch data to estimate population depletion and maximum sustainable catch.
Snook *(Sphyraena novaehollandiae)*	Uncertain	Yes	The species is no longer targeted commercially.
Southern Calamari *(Sepioteuthis australis)*	Possible	Yes	Spatial shifts in the distribution of fishing effort require regional applications of Catch-MSY simulations.

Southern Garfish *(Hyporhamphus melanochir)*	Likely	Yes	Anecdotal reports suggest that current catches do not adequately reflect abundance.
Southern Sand Flathead *(Platycephalus bassensis)*	Likely	No	Recreational landings dominate catches of this species (~90%), but sporadically available recreational catch data cannot meaningfully be used for Catch-MSY simulations.
Striped Trumpeter *(Latris lineata)*	Likely	Yes	Commercial catch close to historical low but total fishing pressure may still be too high to allow recovery.
Wrasse *(Notolabrus spp.)* Bluethroat Wrasse *(Notolabrus tetricus)* Purple Wrasse *(Notolabrus fucicola)*	Uncertain	Yes	Substantial changes have occurred within the fishery that are likely to affect estimates of biomass depletion. These include a substantial decline in the use of fish traps from 2006/07, with replacement by hooks leading to reduced catches for Purple Wrasse. In addition, restaurant closures following the start of the COVID-19 pandemic reduced the demand for live fish.
Yelloweye Mullet *(Aldrichetta forsteri)*	Unlikely	No	Low catches, also because the species is protected across much of its range.

Formal risk assessment of recruitment impairment (MSC approach)

We further introduced a risk analysis following protocols by the Marine Stewardship Council (MSC) based on an approach established by the CSIRO (Hobday et al. 2011). The MSC is globally recognised and produces a widely used Fisheries Standard for assessing if a fishery is well managed and sustainable. The Risk-Based Framework (RBF) described within the MSC Standard is suitable for assessing fisheries with limited data and for which primary indicators may be unavailable or problematic. If the Tasmanian Scalefish Fishery were assessed under the MSC Fisheries Standard, it is likely that for most species there would be sufficient information to use the default assessment method. However, application of the RBF is straight-forward and provides and alternate perspective.

The RBF draws on information about the productivity of a target species and its susceptibility to fishery-related impacts (Productivity Susceptibility Analysis), as well as the consequence of the susceptibility (Consequence Analysis). Application of the RBF approach culminates in an overall score, which is indicative of the relative sustainability of the fishery. Scores > 80 are regarded as passing the assessment with a low risk of stock damage. Scores of 60 – 80 are also regarded as passing the assessment, but with a moderate risk of stock damage. Scores < 60 fail the assessment with a substantial risk of stock damage. We note that the RBF is precautionary and will likely result in a lower score than the default MSC assessment method.

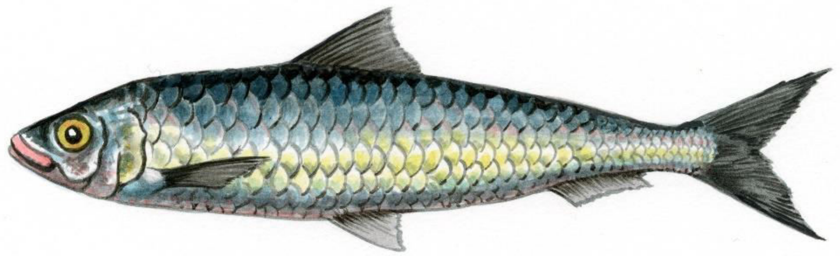
Given the RBF is designed for data-poor fisheries, a cautious (worst-plausible) approach is recommended in the absence of credible information, meaning that limited species information likely results in a lower final score. The RBF approach assumes that fisheries operating at relatively high levels of exploitation inherently pose a greater risk to ecological components with which they interact than under-utilised fisheries. Therefore, lower scores will be derived for highly utilised species unless credible information is available to indicate otherwise. More information, including details on the RBF scoring system, is available on the TasFisheriesResearch webpage.

The RBF was used to assess the stock status of all exclusively state-assessed target species within the Tasmanian Scalefish Fishery.

2. State-assessed species

Australian Sardine *(Sardinops sagax)*

STOCK STATUS	SUSTAINABLE
There is effectively no current commercial fishing for Australian Sardine in Tasmanian waters, with all Developmental Australian Sardine Permits now expired. As such, the current level of fishing pressure in Tasmania is unlikely to cause the biological stock to become recruitment impaired. The species was classified as not overfished nor subject to overfishing by ABARES for 2019/20. Similarly, all Australian stocks are currently classified as Sustainable in the 2018 Status of Australian Fish Stocks report.	
IMPORTANCE	Minor
STOCK(S)	Tasmanian Scalefish Fishery
INDICATOR(S)	Catch, effort and CPUE trends
Managing Jurisdiction	State (Tasmania)



Australian Sardine *(Sardinops sagax)*
Source: DPIPWE (by Peter Gouldthorpe)

Australian Sardine is a highly productive species with a wide range, inhabiting estuaries to the continental shelf in southern Australia, from Rockhampton, Queensland, to Shark Bay, Western Australia, including northern Tasmania (Edgar 2008). The Tasmanian commercial fishery for Australian Sardine is still under development with no active permits currently in place. Australian Sardine is primarily captured using purse seine gear; however, some beach seine gear is also used to target this species. Holders of a Scalefish Fishing Licence are entitled to a 10 kg trip limit. Australian Sardine is not a significant recreational species in Tasmania (Lyle et al. 2019). More detailed information on biological characteristics and current management of Australian Sardine fisheries is available from the TasFisheriesResearch webpage.

Catch, effort and CPUE

The 2019/20 total commercial catch of Australian Sardine in Tasmanian waters was only 41 kg (Figure 1A). Historically, this species has constituted a minor and sporadic component of the scalefish fishery, with peak catches of 15.4 t recorded in 1997/98, 14.5 t in 2008/09 and 33.3 t in 2016/17, which were interspersed among years of little or no catch (Figure 1A). The earlier peak catches largely reflect incidental take of Australian Sardine by fishers targeting other small pelagic fishes (e.g., redbait). Targeted fishing for the species under the developmental fishery permit commenced in 2016/17 with fishing activity over the last five years based around the north coast, primarily the northeast coast (Figure 2). There are no active permits currently in place. Notable catches of Australian Sardine have been reported for purse seine in previous years.

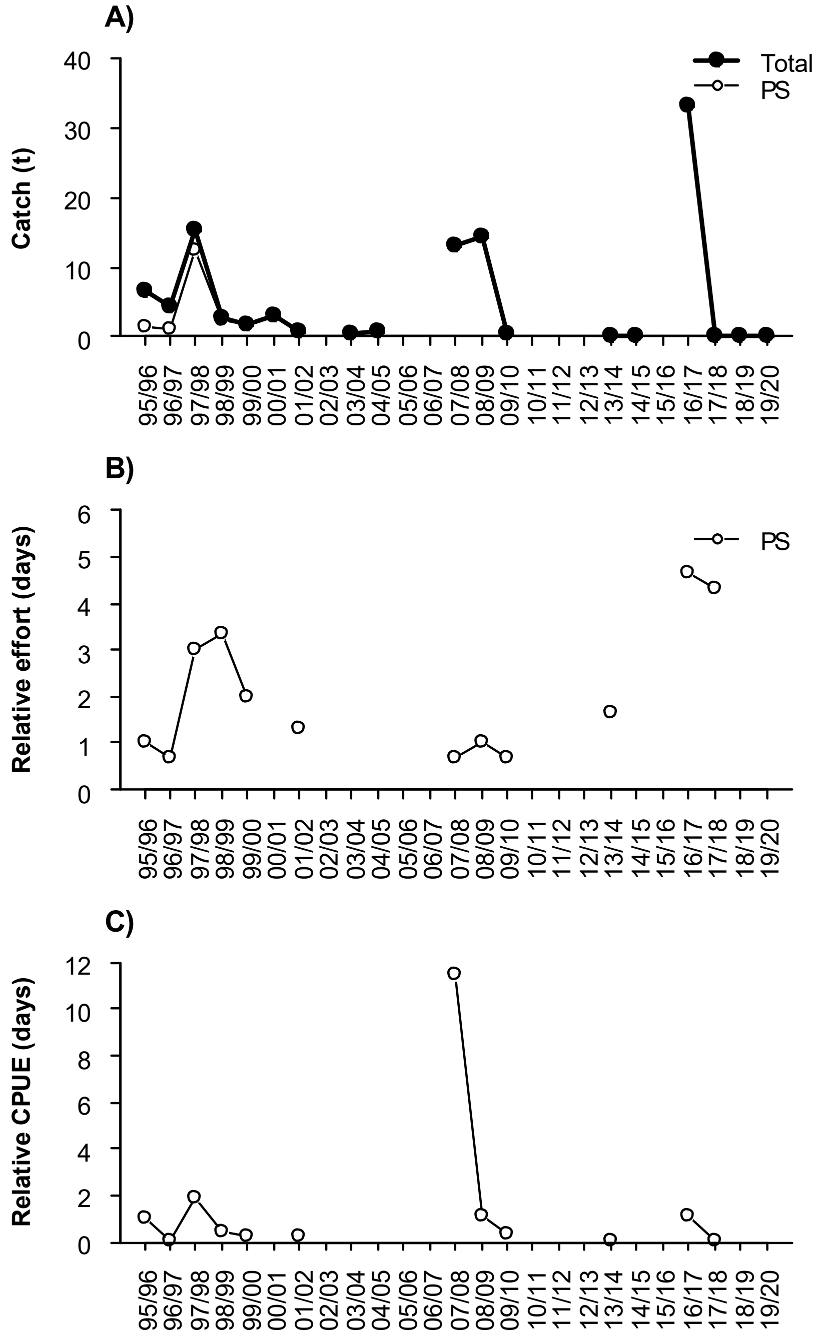


Figure 1 A) Annual commercial catch (t) by gear. B) Commercial effort by method based on day fished relative to 1995/96. C) Commercial catch per unit effort (CPUE) based on weight per day fished relative to 1995/96. PS=purse seine.

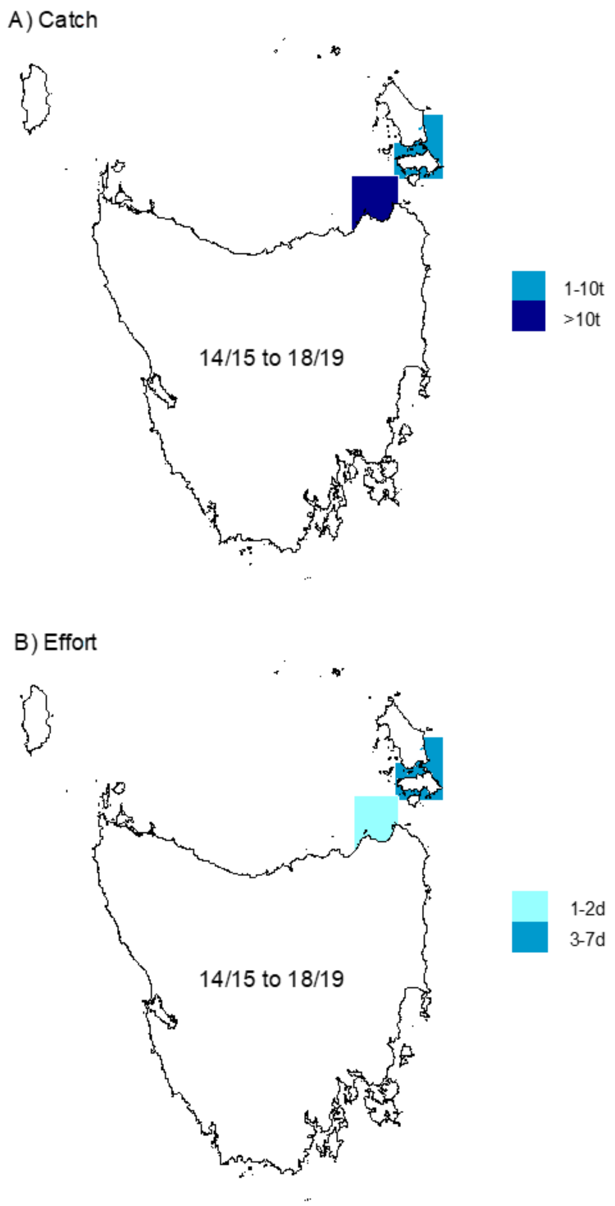


Figure 2 (A) Australian Sardine catches (t) and (B) effort (days) for beach seine and purse seine by fishing block averaged from 2013/14 to 2018/19. With no active permits in the current season, catch in 2019/20 was negligible (41 kg).

Risk-Based Framework Assessment

The Australian Sardine fishery scored > 80 in the RBF analysis, passing assessment with low risk of stock damage. Australian Sardine is a highly productive species and, although purse seine gear presents a high risk of capturing schools, fishing effort is minimal as the fishery was still under development and is not currently in operation. Detailed information on the scoring that led to this assessment outcome is available from the TasFisheriesResearch webpage, however the assessment outcome is likely to change as the fishery is developed.

Reference points

As this fishery is a developmental and currently inactive fishery in Tasmanian waters, a full suite of reference points is yet to be established.

Stock status

SUSTAINABLE

Overall, catches of Australian Sardine in Tasmanian waters reflect only a minor proportion of the Bass Strait–Port Phillip Bay stock with surveys conducted in 2014 indicating a spawning biomass of approximately 10,962 t off northern Tasmania.

Since 2008, Australian Sardine populations in the Commonwealth Small Pelagic fishery have been considered to be not overfished nor subject to overfishing (Patterson et al. 2020), and all four Australian stocks considered during the 2018 Status of Australian Fish Stocks assessments (Eastern Australia, South-Eastern Australia, South-Western Australia and Southern Australia) were classified as sustainable (Ward et al. 2018). Given that current levels of effort are unlikely to result in recruitment overfishing, this ranking has been applied to the Tasmanian fishery.

Barracouta *(Thyrsites atun)*

STOCK STATUS	UNDEFINED
Catches of Barracouta have declined steadily since the mid-2000s, presumably due to a decrease in targeted effort resulting from a lack of market demand. Low levels of fishing effort mean that catch and catch rate data are unreliable indicators of abundance and stock status. Therefore, there is insufficient information to confidently classify the stock.	
IMPORTANCE	Minor
STOCK(S)	Tasmanian Scalefish Fishery
INDICATOR(S)	Catch, effort and CPUE trends
Managing Jurisdiction	State (Tasmania)

Barracouta *(Thyrsites atun)*
Source: DPIPWE (by Peter Gouldthorpe)

Barracouta is a predatory, schooling species that inhabits coastal bays and open ocean as deep as 550 m. This species is widely distributed in temperate latitudes of the southern hemisphere (Edgar 2008), including southern Australia. Barracouta was an historically important fishery species in Tasmania, with a large commercial trolling fishery operating in the 1960s and 1970s when catches ranged from 600 – 1600 t per year (Kailola et al. 1993). Market demand for barracouta declined substantially in the mid-1970s. With relatively minimal catch and effort, current management restrictions of commercial barracouta fishing are limited to the requirement of a Scalefish Fishing Licence. More detailed information on biological characteristics and current management of Barracouta fisheries is available from the TasFisheriesResearch webpage.

Catch, effort and CPUE

Records of total commercial catches of Barracouta peaked in the early 2000s with a maximum of 136 t, but gradually declined from 101 t in 2004/05 to a historical low of 0.4 t in 2015/16 (Figure 3A). The commercial catch in 2019/2020 was 0.7 t. Trolling and handline are the main fishing methods used to target Barracouta. After the peak in the early 2000s, effort declined and, since 2007/08, has stabilised at a low level (Figure 3B). Catch rates have been relatively stable over the most recent fishing years (Figure 3C). However, it is likely that fishers utilising fishing gears historically used to target Barracouta are now targeting other species and, in consequence, catch-based statistics are unlikely to be a reliable indicator of abundance. Catches and fishing effort were traditionally concentrated off southern Tasmania (Emery et al. 2017). However, over the last few fishing seasons, fishing effort has been concentrated off the north coast (Figure 4).

Barracouta are targeted and taken as by-product by the recreational sector. Catches were estimated at 46.9 t in 2000/01 (Lyle 2005), 10.8 t in 2007/08 (Lyle et al. 2009), 31 t in 2012/13

(Lyle et al. 2014b) and 2.8 t in 2017/2018 (Lyle et al. 2019).Therefore, recreational catch generally and sometimes considerably exceed the commercial harvest (Figure 3A).

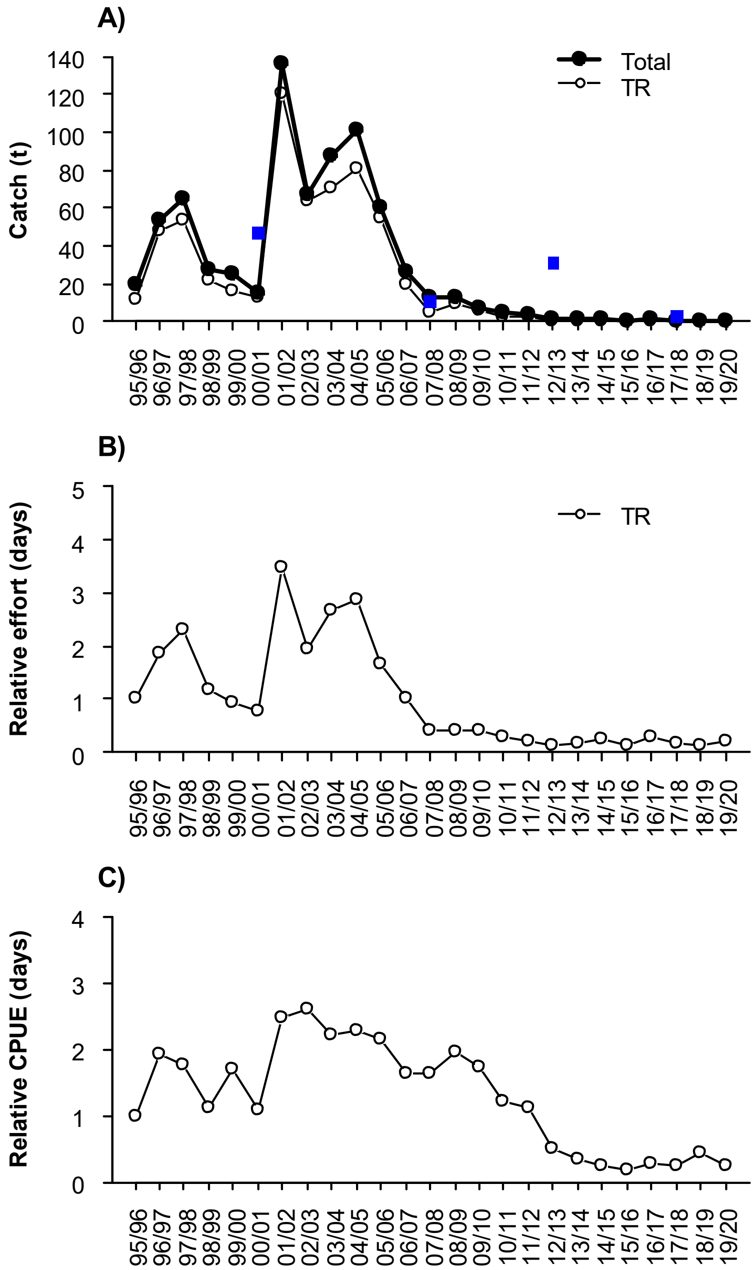


Figure 3 A) Annual commercial catch (t) by gear, including best estimates of recreational catches (blue squares), and region (right). B) Commercial effort based on days fished relative to 1995/96. C) Commercial catch per unit effort based on days fished relative to 1995/96. TR=troll.

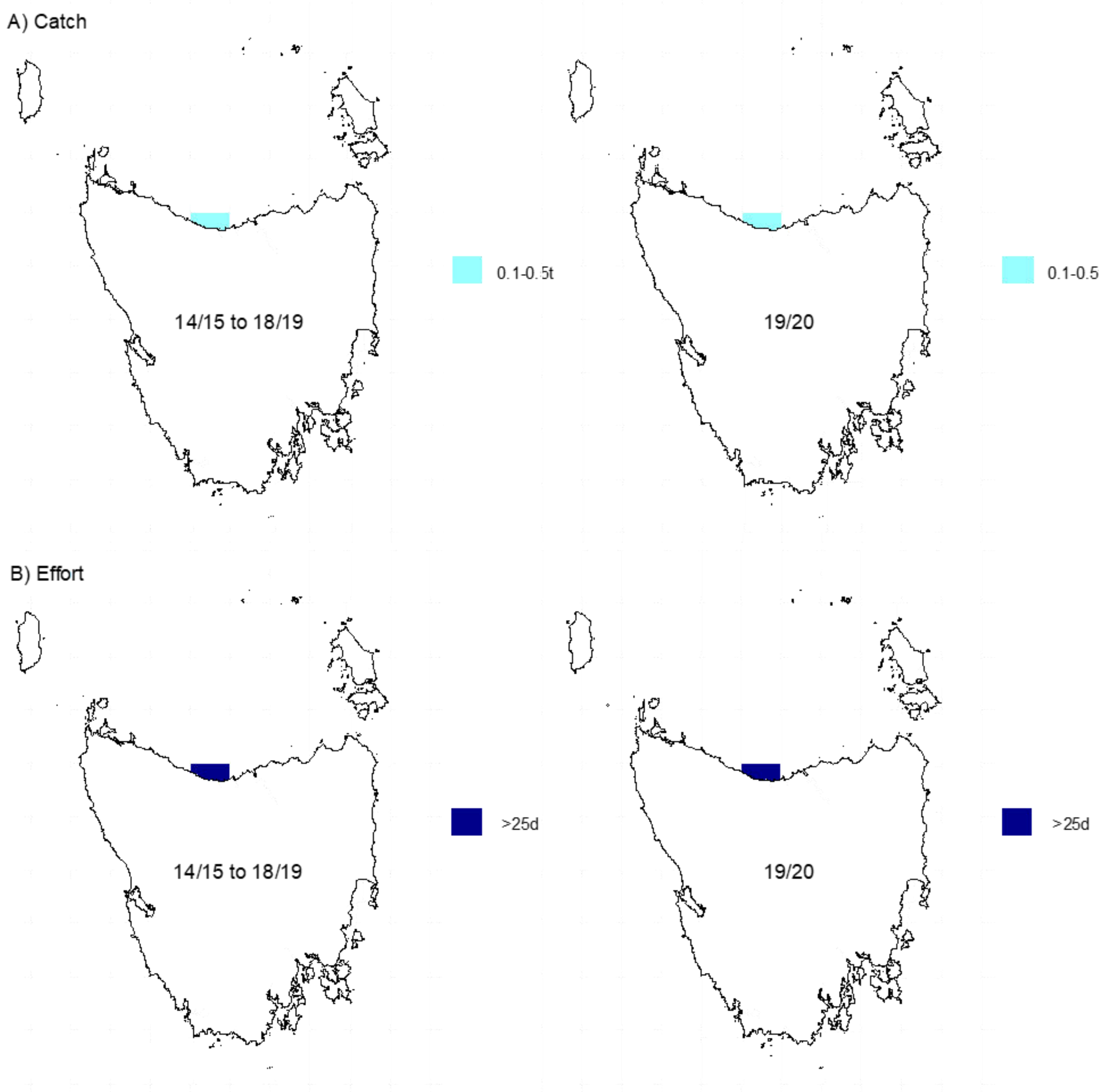


Figure 4 (A) Barracouta catches (t) and (B) effort (days) for troll and hand-line fishing methods by fishing blocks averaged from 2013/14 to 2018/19 (left) and during 2019/20 (right).

Risk-Based Framework Assessment

The Barracouta fishery scored > 80 in the RBF analysis, passing assessment with low risk of stock damage. Reduction in targeted effort for Barracouta in concert with market demand means there has been minimal impact on stock structure and recruitment dynamics during the reference period (since 1995), despite dramatically reduced catch, effort, and CPUE from historical peaks. Detailed information on the scoring that led to this assessment outcome is available from the TasFisheriesResearch webpage.

Reference points

Performance indicators	Proposed reference points	Breached?	By how much?
Fishing mortality	• Catch > 3rd highest catch value from the reference period (87.5 t)	No	
	• Catch < 3rd lowest catch value from the reference period (25.0 t)	Yes	↓ 24.3 t (97.1%)
	• Latest recreational catch estimate > recreational catch estimate from the reference period (46.9 t)	No	
	• Proportion of recreational catch to total catch > previous proportion estimate (96.6% in 2012/13)	No	
Biomass	• Rate of CPUE decline over last 3 years is greater than the largest 3-year CPUE decline during the reference period (-0.0091)	No	

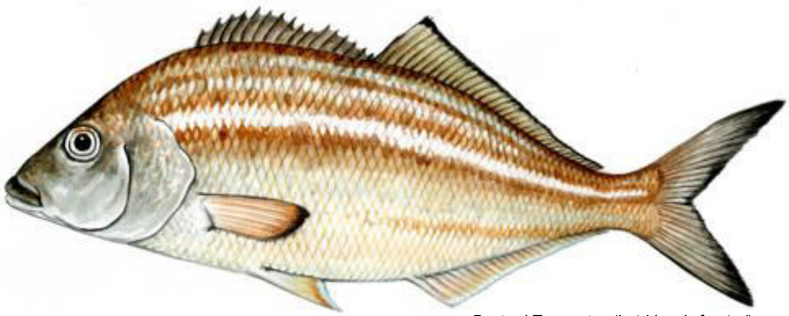
Stock status

UNDEFINED

Historically, the population of Barracouta has undergone large fluctuations in size and availability, possibly linked to recruit variability and environmental factors. Catches of Barracouta in Tasmanian waters have been declining steadily since the mid-2000s due to a decrease in targeted effort as a result of a lack of market opportunities. The increase in recreational catch proportion mainly reflects the sharp fall in commercial landings rather than increased targeting by recreational fishers. Discards of Barracouta in the South East Trawl Fishery sector of the Southern and Eastern Scalefish and Shark Fishery (SESSF) have previously estimated to be around 12% of the total discarded non-quota catch (Knuckey 2006), equating to roughly 1356–1920 t annually. The fate of such discards is unknown. While this situation suggests that Barracouta may be locally abundant within the SESSF, a lack of targeted commercial catches complicates consideration of catch rates in Tasmania as a proxy of stock status. As such, there is insufficient information to confidently classify this stock.

Bastard Trumpeter *(Latridopsis forsteri)*

STOCK STATUS	DEPLETED
Trends in commercial and recreational catches of Bastard Trumpeter suggest record low population levels and that the species is recruitment overfished. The current minimum legal size limit is below the size of maturity such that the fishery is based almost entirely on juvenile fish. Data-limited stock assessment methods suggest that stock recovery under current levels of catch is theoretically possible, but evidence of recovery is lacking.	
IMPORTANCE	Key
STOCK(S)	Tasmanian Scalefish Fishery
INDICATOR(S)	Catch, effort and CPUE trends
Managing Jurisdiction	State (Tasmania)



Bastard Trumpeter *(Latridopsis forsteri)*
Source: DPIPWE (by Peter Gouldthorpe)

Bastard Trumpeter was one of the first fish species to be commercially exploited in Tasmania, with early European settlers targeting this species on shallow reefs close to Hobart. Bastard Trumpeter is a schooling species with adults inhabiting deeper water (≤ 160 m), while juveniles are associated with shallow reef. For this reason, the Tasmanian commercial and recreational fisheries are based almost entirely on juvenile fish. In recent years, including 2019/20, Bastard Trumpeter has been taken more as a by-product of commercial fishing activities rather than as a target species, with recreational catch similar to, or exceeding, commercial landings (André et al. 2014). Since 2010, the stock status of this species has steadily declined. More detailed information on biological characteristics and management of Bastard Trumpeter is available from the TasFisheriesResearch webpage.

Catch, effort and CPUE

Bastard Trumpeter catches have been declining steadily since the mid-1990s. Catch has been <10 t since 2010/11, with 6.1 t landed in 2019/20 – a slight increase from the previous year (Figure 5A). Bastard Trumpeter are taken almost exclusively by gillnet from inshore waters off the east, south, and west coasts (Figure 6). Catches and effort in 2019/20 were concentrated primarily around the southeast and southwest coasts (Figure 6). Bastard Trumpeter have been predominantly taken by recreational gillnet fishers in recent years, although the latest estimated catches in 2012/13 and 2017/18 were also historic lows (9.8 t and 3.4 t, respectively) (Lyle et al. 2014b; Lyle et al. 2019).

Commercial gillnet effort has followed a downward trend similar to catches since the mid-1990s, with a slight increase in the current season (Figure 5B). Daily catch rates have remained relatively stable since 2006/07. However, a declining trend is evident over the most recent years with a sharp increase in 2019/20 (Figure 5C). Bastard Trumpeter are taken primarily as by-product rather than as a target species. The majority of gillnet effort is now targeting Banded Morwong with 140 mm mesh sizes, selecting only the largest Bastard Trumpeter. Previously, a larger proportion of fishers used smaller mesh sizes (<114 mm) to target Bastard Trumpeter and Blue Warehou.

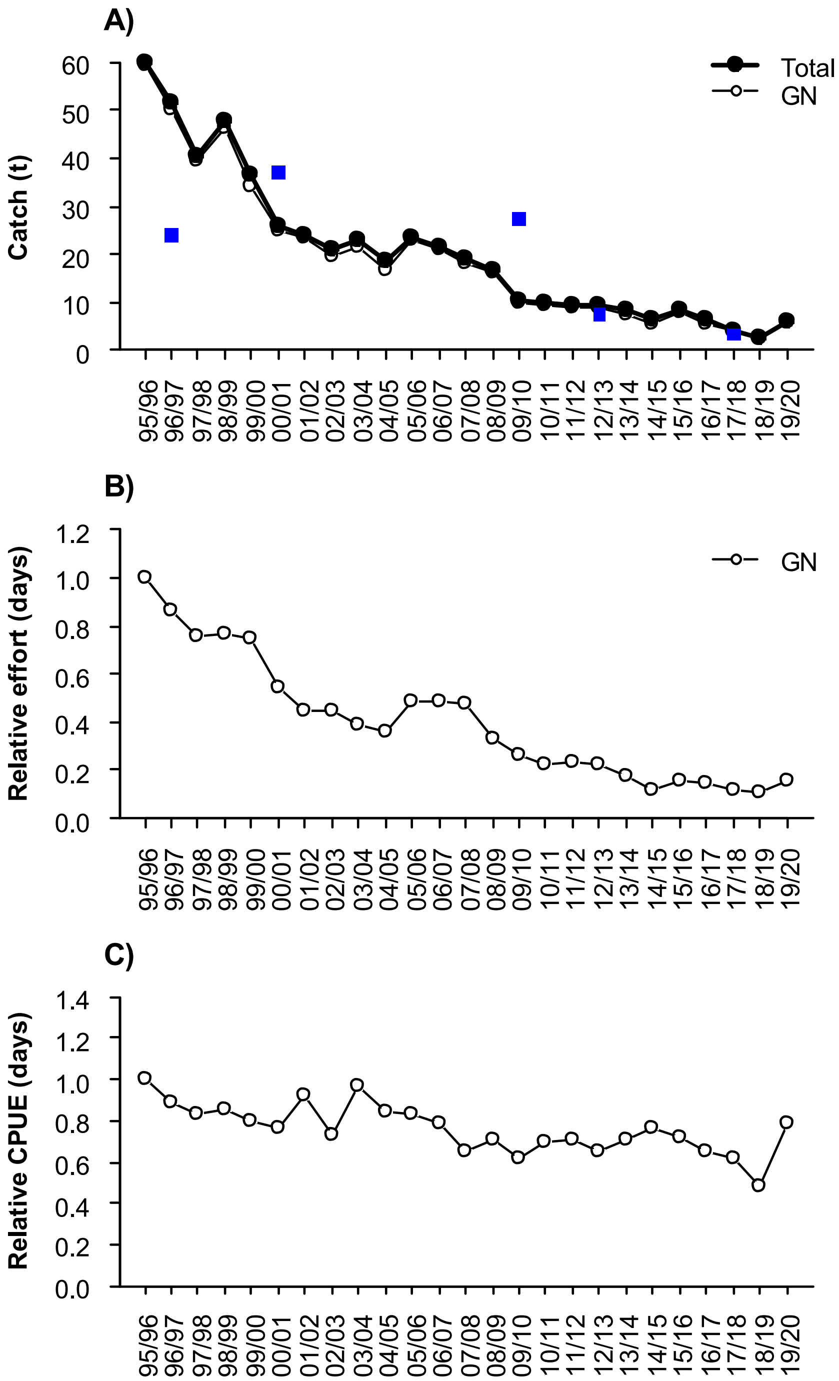


Figure 5 A) Annual commercial catch (t) by gear and best estimates of recreational catches (blue squares). B) Commercial effort by method (almost exclusively gillnet) based on days fished relative to 1995/96. C) Commercial catch per unit effort (CPUE) based on weight per day fished relative to 1995/96. GN=gillnet. Data includes Australian Fisheries Management Authority (AFMA) catch in State waters.

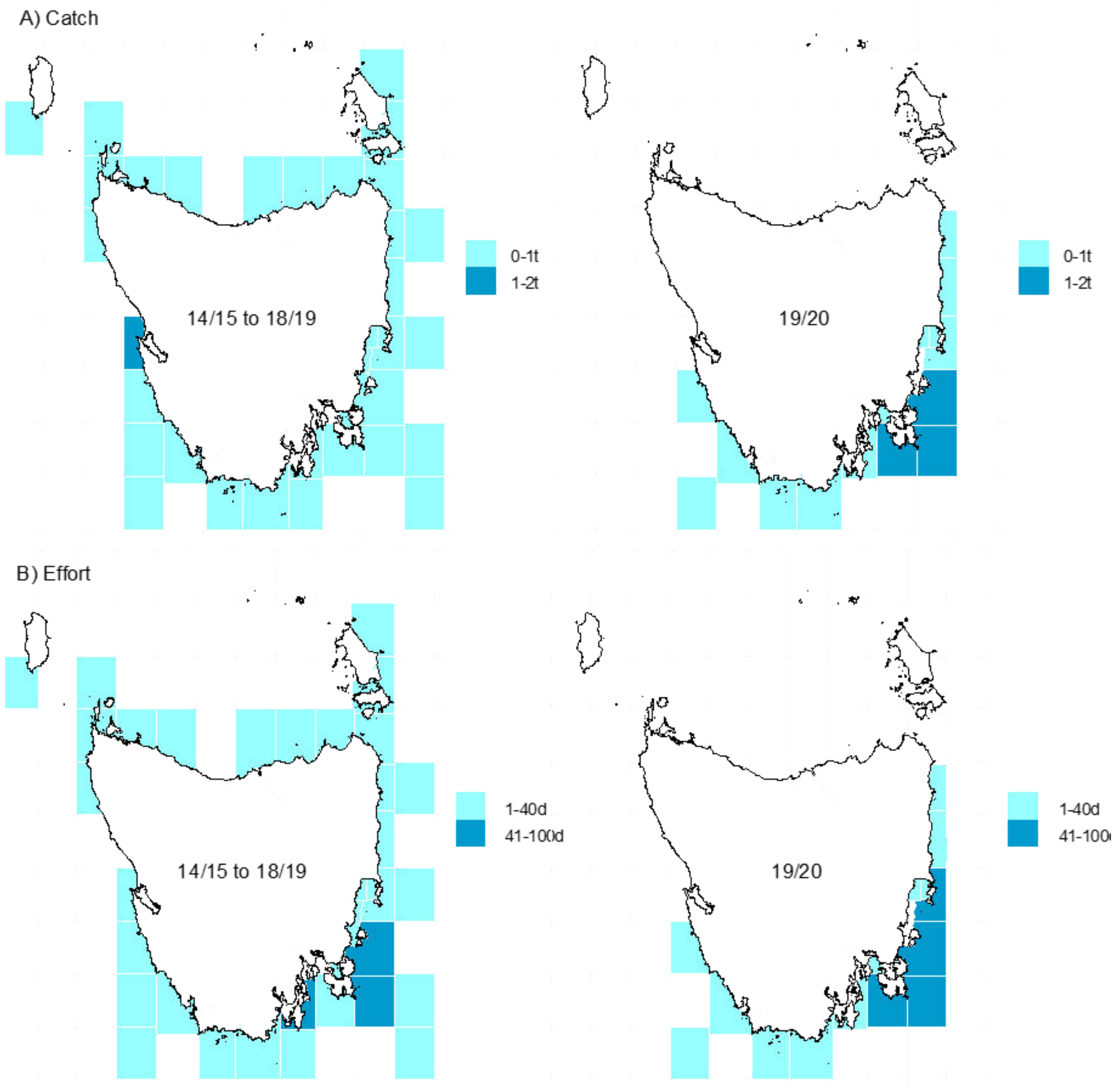


Figure 6 (A) Bastard Trumpeter catches (tonnes) and (B) effort (days) for gillnet fishing by fishing blocks averaged over the last five seasons (left) and during the current season (right). Data includes Australian Fisheries Management Authority (AFMA) catch taken in State waters.

Catch-MSY results

Catch-MSY results based on the assumption of “medium” resilience suggest that Bastard Trumpeter biomass should theoretically be recovering (Figure 7), with catch and estimated harvest rates well below estimates of sustainable limits (F_{target} = 0.20; MSY = 27.40) (Figure 8**,** Figure 9). Estimates of median biomass depletion peaked at 10% of unfished levels in 2010/11 (lower 90% CI = 7%) compared to 27% in the current season (lower 90% CI = 10%) (Figure 7).

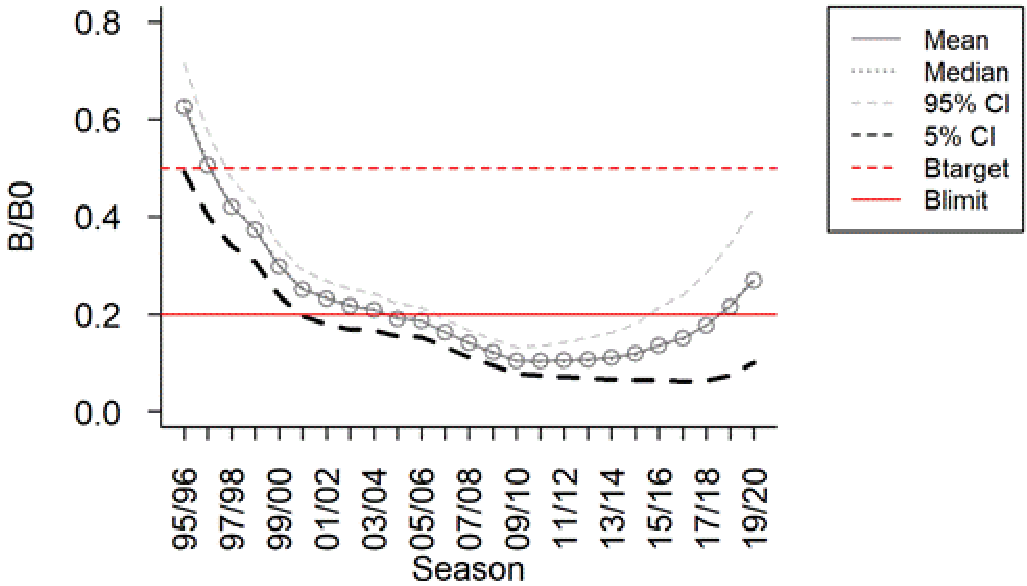


Figure 7 Trends in estimated biomass depletion (biomass divided by unfished biomass) and associated confidence intervals (CIs). The dotted red line marks a common target reference point, which is the biomass assumed to deliver the maximum sustainable yield (B_{target}). The continuous red line marks a limit reference point (B_{limit}).

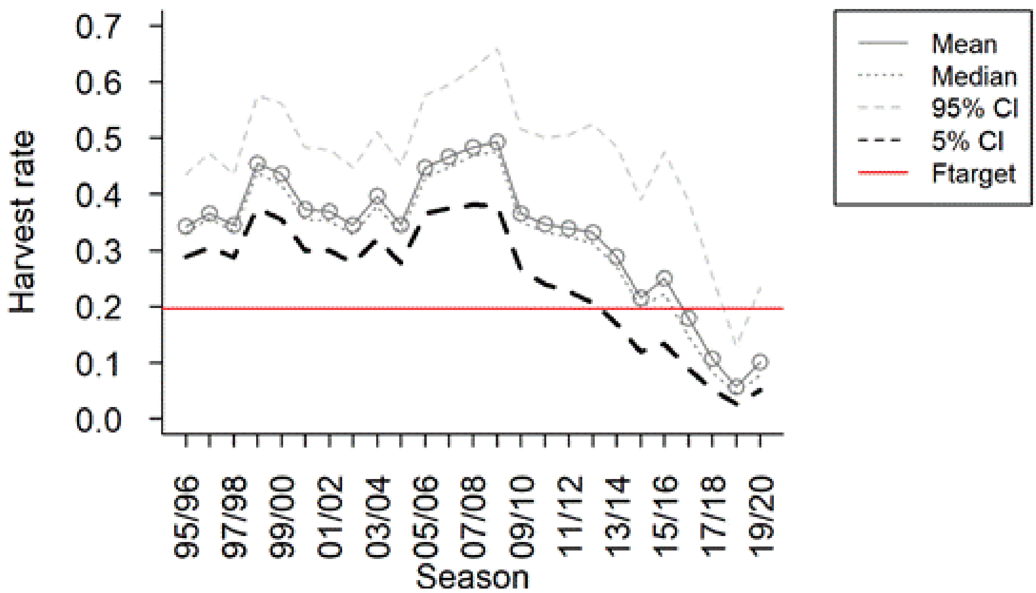


Figure 8 Trends in harvest rate and associated confidence intervals (CIs) relative to the estimated target fishery mortality (F_{target}).

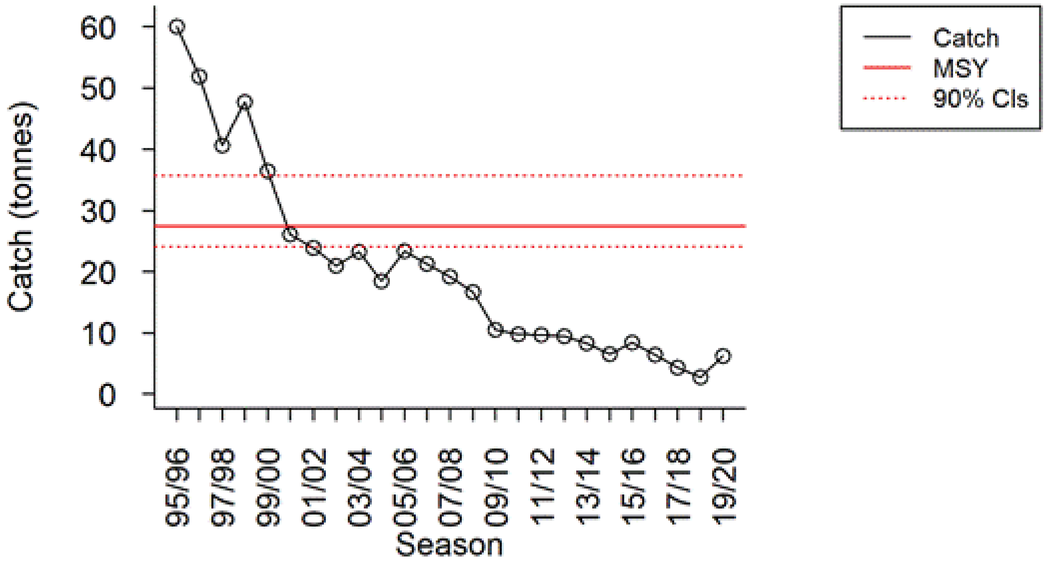


Figure 9 Trends in catch relative to the estimated maximum sustainable yield (MSY) and associated confidence intervals (CIs).

Risk-Based Framework Assessment

The Bastard Trumpeter fishery scored < 60 in the RBF analysis, failing assessment with high risk of stock damage. Bastard Trumpeter has low productivity – slow to mature and relatively long-lived, with low fecundity. The Tasmanian Bastard Trumpeter fishery is based almost entirely on juvenile fish and fishing effort overlaps with > 30% of stock distribution. Detailed information on the scoring that led to this assessment outcome is available from the TasFisheriesResearch webpage.

Reference points

Performance indicators	Proposed reference points	Breached?	By how much?
Fishing mortality	• Catch > 3rd highest catch value from the reference period (47.7 t)	No	
	• Catch < 3rd lowest catch value from the reference period (21.3 t)	Yes	↓ 15.1 t (70.8%)
	• Catch variation from the previous year above the greatest inter-annual increase from the reference period (7 t)	No	
	• Catch variation from the previous year above the greatest inter-annual decrease from the reference period (-11.3 t)	No	
	• Latest recreational catch estimate > recreational catch estimate from the reference period (24 t)	No	
	• Proportion of recreational catch to total catch > previous proportion estimate (73.6% in 2010)	No	
Biomass	• CPUE< 3rd lowest CPUE value from the reference period (0.0108 t/days fished)	No	

	• Rate of CPUE decline over last 3 years is greater than the largest 3-year CPUE decline during the reference period (-0.0011)	No	

Stock status **DEPLETED**

As Bastard Trumpeter is a by-product species, catch is a presumably better indicator of abundance than commercial catch rate. Consequently, the trend in commercial production suggests that inshore population abundance is still at historically low levels, albeit with a first increase in 2019/20 compared to last year. In accordance with this observation, industry, recreational and conservation representatives have expressed concerns about the scarcity of the species in recent years (Emery et al. 2017), although a lack of market demand for Bastard Trumpeter appears to be an additional factor influencing landings. On-board observations suggest that legal-sized Bastard Trumpeter are sometimes discarded by Banded Morwong fishers, but research suggests that post-release survivability is high (Lyle et al. 2014a). Given that the majority of gillnet effort is now targeted at Banded Morwong, thus using larger mesh sizes than those used historically to target Bastard Trumpeter, it is possible that trends in neither catch nor catch rates are representative of population status. However, fishing practices have remained fairly consistent in recent years (2007/08 – present), which is why declining catches and catch rates are likely to represent a population that has not substantially rebuilt despite significant reduction in both commercial and recreational gillnet effort. First increases in both catch and catch rates in 2019/20 compared to last year might be indicative of recovery, but clearer evidence in the form of a trend is still lacking.

The Tasmanian Bastard Trumpeter fishery is based almost entirely on juveniles. As fish grow, they appear to move offshore and are rarely caught. No information is available on the adult portion of the population, but it is clear that fishing pressure exerted on those larger individuals that evade the inshore fishery is low and by-catch in shark nets, trawl, Danish seine or deep-water fish traps used by the Commonwealth SESSF appears to be negligible. The species exhibits high recruitment variability, resulting in short-term variation in catches, which has been a feature of this fishery over the past century (Harries and Croome 1989). Anecdotal reports and low inshore catches suggest that recruitment has been low in recent years. Low recruitment together with limited length frequency data available for 2011 and 2012 indicates a reduction in the number of smaller-sized individuals in the fishery relative to the late 1990s (Emery et al. 2016). Studies have demonstrated significantly higher abundances of Bastard Trumpeter in unfished marine reserves relative to fished sites around Tasmania (Edgar and Barrett 2012), which in combination with the fact that commercial and recreational fisheries are based entirely on juveniles, suggests that recruitment as well as growth overfishing may be occurring.

It is worth noting that the temporary stabilisation of catch from 2009/10 corresponds to the introduction of several management measures for the species (increase in the minimum legal size, introduction of commercial trip limits and reduction in recreational bag and possession limits). However, the current minimum size limit of 38 cm TL is still well below the size at maturity (>45 cm FL (Murphy and Lyle 1999)). While there have been discussions about an increase of the minimum size limit to enable stock recovery, this management intervention was opposed during the 2015 review of the management plan because it would effectively close the current commercial and recreational fisheries for the species. Further reductions in the recreational bag limit for this species were introduced in 2015.

Given the continued reduction in catch and the current minimum legal-size limit below the size at maturity, Bastard Trumpeter are classified as depleted.

Eastern Australian Salmon *(Arripis trutta)*

STOCK STATUS	SUSTAINABLE
Eastern Australian Salmon has a long history of exploitation across south-eastern Australia. Low commercial landings in Tasmania in recent years are driven by market demand rather than abundance. The current level of fishing pressure in Tasmania is well below historically sustained levels and thus unlikely to cause the biological stock to become recruitment impaired.	
IMPORTANCE	Key
STOCK(S)	Tasmanian Scalefish Fishery
INDICATOR(S)	Catch, effort and CPUE trends
Managing Jurisdiction	State (Tasmania)

Eastern Australian Salmon *(Arripis trutta)*
Source: DPIPWE (by Peter Gouldthorpe)

There are two species of Australian Salmon inhabiting Tasmanian waters: *Arripis trutta* (Eastern Australian Salmon) and *Arripis truttaceus* (Western Australian Salmon). Eastern Australian Salmon constitutes approximately 94% of Tasmanian commercial catches. Eastern Australian Salmon is a schooling species, mainly caught by Tasmanian commercial fishers in inshore waters using beach seine, as well as some gillnet and purse seine gear. Australian Salmon have a long history of exploitation in Tasmania, with large-scale commercial fishing occurring since at least 1958 (Stewart et al. 2011). There are two distinct sectors in the commercial fishery: (1) a small number of large vessels specifically equipped to capture and store large quantities of Australian Salmon, and (2) a large number of small vessels that target the species on an opportunistic basis or take them as by-product. A single company operating up to three vessels has typically accounted for more than 80% of Australian Salmon landings. Australian Salmon is the second most important species for recreational fishers (Lyle 2005; Lyle et al. 2009; Lyle et al. 2014b; Lyle et al. 2019), who target this species mainly by using line fishing methods. More detailed information on biological characteristics and current management of Eastern Australian Salmon fisheries is available from the TasFisheriesResearch webpage.

Catch, effort and CPUE

Commercial landings over the last few years have been low, with only 10 t landed in 2019/20 (Figure 10A). The low catch in recent years has been due to a dramatic decline in the landings by beach seine fishers that have historically landed most of the catch (Figure 10A). The majority of the catch in 2019/20 was also taken using beach seine. Recent catches came from the north coast, and from the east and south-east coasts (Figure 11). Both effort and catch rates remain low compared with historic peaks (Figure 10B, C). However, catch rates do not reveal clear trends and are thus unlikely to reflect abundance, which is a common problem for schooling species, such as Eastern Australian Salmon.

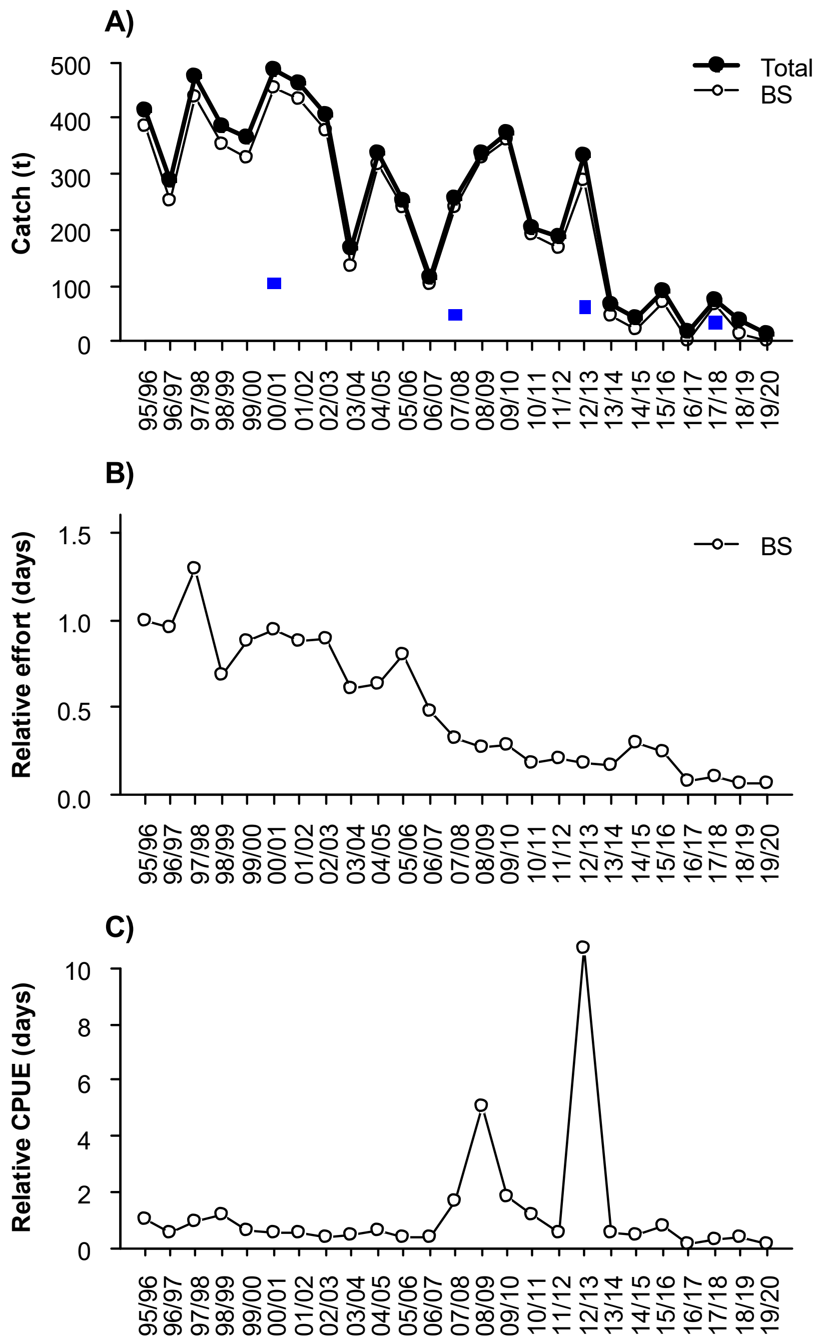


Figure 10 A) Annual commercial catch (t) by gear, and best estimates of recreational catches (blue squares). B) Commercial effort by method based on days fished relative to 1995/96. C) Commercial catch per unit effort (CPUE) based on weight per day fished relative to 1995/96. BS=beach seine.

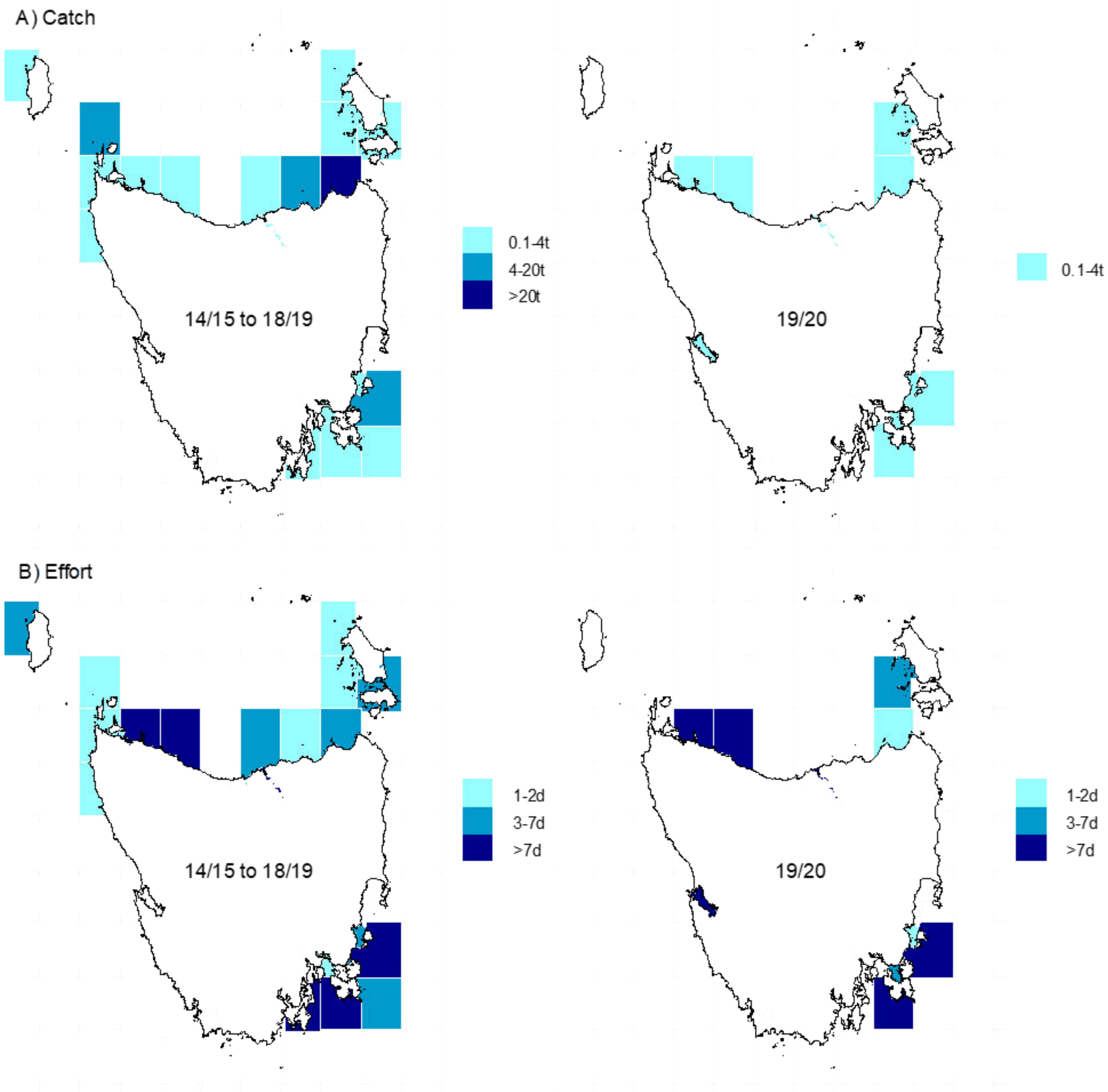


Figure 11 (A) Annual Eastern Australian Salmon catches (t) and (B) effort (days) for beach seine, gillnet, small mesh net and purse seine fishing methods by fishing block averaged over the last five seasons (left) and during 2019/20 (right).

Risk-Based Framework Assessment

The Eastern Australian Salmon fishery scored > 80 in the RBF analysis, passing assessment with low risk of stock damage. Although the use of beach seine gear places the species at high risk of capture, recently low catches reflect reduced market demand rather than abundance and the stock is unlikely to be recruitment impaired as a result of fishery activity. Detailed information on the scoring that led to this assessment outcome is available from the TasFisheriesResearch webpage.

Reference points

Given that beach seine catch rates are not a sensitive indicator of stock status due to the schooling behaviour of the species, the biomass performance indicators (based on CPUE and CPUE trends) were not calculated for Eastern Australian Salmon. The reference point for low catch was breached in 2019/20. However, low catches are more likely to reflect low effort and market demand than changes in abundance.

Performance indicators	Proposed reference points	Breached?	By how much?
Fishing mortality	• Total commercial catch >435 t	No	
	• Catch > 3rd highest catch value from the reference period (462.1 t)	No	
	• Catch < 3rd lowest catch value from the reference period (254.2 t)	Yes	↓ 239.7 t (94.3%)
	• Catch variation from the previous year above the greatest inter-annual increase from the reference period (188.7 t)	No	
	• Catch variation from the previous year above the greatest inter-annual decrease from the reference period (240.0 t)	No	
	• Latest recreational catch estimate > recreational catch estimate from the reference period (105.2 t)	No	
	• Proportion of recreational catch to total catch > previous proportion estimate (19% in 2012/13)	Yes	Latest estimate (2017/18) 31.7%

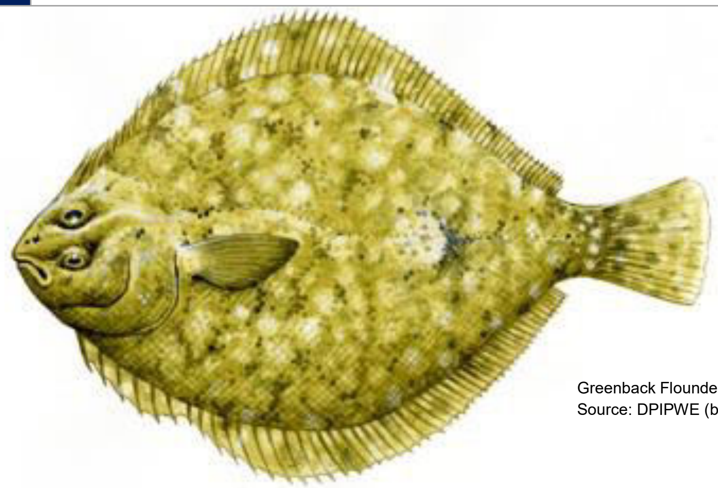
Stock status

SUSTAINABLE

Eastern Australian Salmon represent a single, well-mixed stock along southeast Australia (Stewart et al. 2011). There appears to have been little change in the size and age composition of this species while monitored in commercial catches in NSW from the 1970s up to 2008/09 with the eastern Australian biological stock classified as sustainable in the Status of Australian Fish Stocks (SAFS) 2018 report (Stewart et al. 2018). Noting that the Tasmanian fishery catches mostly sub-adults and that the combined commercial and recreational catch in Tasmania is currently well below historical levels, it is unlikely that current fishing pressure will cause the population of Eastern Australian Salmon in Tasmania to become recruitment impaired.

Flounder *(Pleuronectidae* family)

STOCK STATUS	UNDEFINED
Greenback Flounder *(Rhombosolea tapirina)* constitute the majority of the commercial catch, which remains low due to limited market demand and the requirement for fishers to attend gear for most overnight gillnetting. Due to low effort, catch and catch rates are considered unreliable estimators of abundance and the status of the stock remains uncertain.	
IMPORTANCE	Minor
STOCK(S)	Tasmanian Scalefish Fishery
INDICATOR(S)	Catch, effort and CPUE trends
Managing Jurisdiction	State (Tasmania)



Greenback Flounder *(Rhombosolea tapirina)*
Source: DPIPWE (by Peter Gouldthorpe)

Flounder inhabit sheltered sand, silt, and mud habitat in estuaries and coastal waters of Tasmania. Since 2010, there has been a requirement for commercial fishers to attend their gear when gillnetting at night, unless they hold an unattended night netting endorsement for Bass Strait or are gillnetting in Macquarie Harbour. As a result, there has been a marked reduction in Flounder catch. Flounder in Tasmanian waters are primarily caught using spear. There is a substantial recreational fishery for Flounder, with most fishers using spear. More detailed information on biological characteristics and current management of Flounder fisheries is available from the TasFisheriesResearch webpage.

Catch, effort and CPUE

Flounder landings have declined steadily since the mid-1990s, reaching an historical low of 1 t in 2015/16 (Figure 12A). Catches increased slightly from 2.2 t in 2018/19 to 2.7 t in 2019/20, which is similar to catches five years ago. Since the ban on night gillnetting, Flounder have been caught almost exclusively using spear (Figure 12B). Commercial catches and effort have contracted spatially over recent years to Norfolk Bay, the Tamar estuary, and Macquarie Harbour

Consistent with the trend in catches, effort for both methods has been declining steadily since the mid-1990s (Figure 12B). Catch rates showed increasing trends for both gillnet and spear in the current year (Figure 12C).

Flounder are relatively important recreational species, and in recent years, catches for the recreational sector have matched or exceeded those of the commercial sector (Figure 12). Similar to commercial catches, recreational catches appear to have declined progressively over recent years. Recreational catches were estimated at 15.2 t in 2000/01 (Lyle 2005), 10.1 t in 2007/08 (Lyle et al. 2009), 7.2 t in 2012/13 (Lyle et al. 2014b), and 3.8 t in 2017/18 (Lyle et al. 2019).

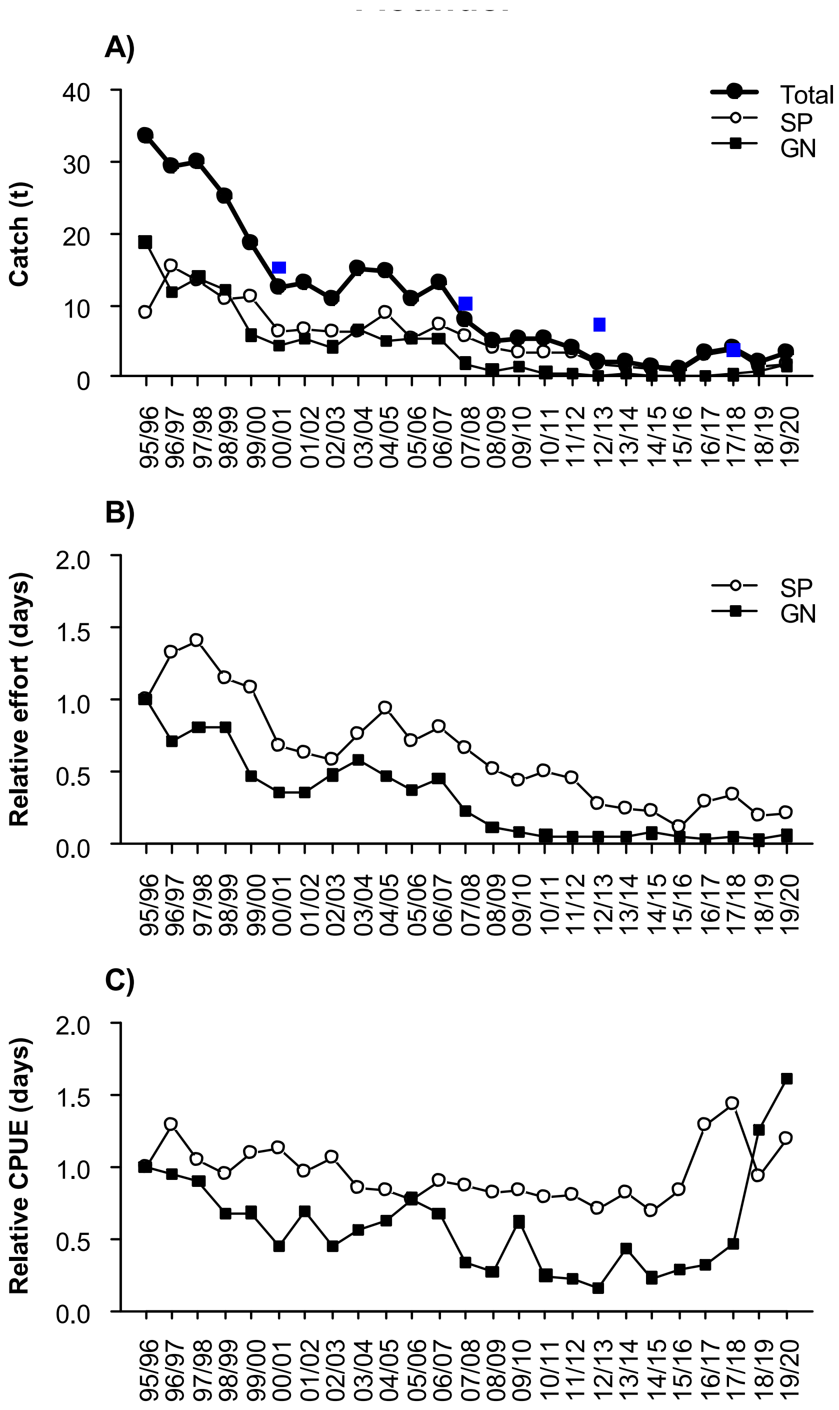


Figure 12 A) Annual commercial catch (t) by gear and best estimates of recreational catches (blue squares). B) Commercial effort by method based on day fished relative to 1995/96. C) Commercial catch per unit effort (CPUE) based on weight per day fished relative to 1995/96. SP=spear, GN=gillnet.

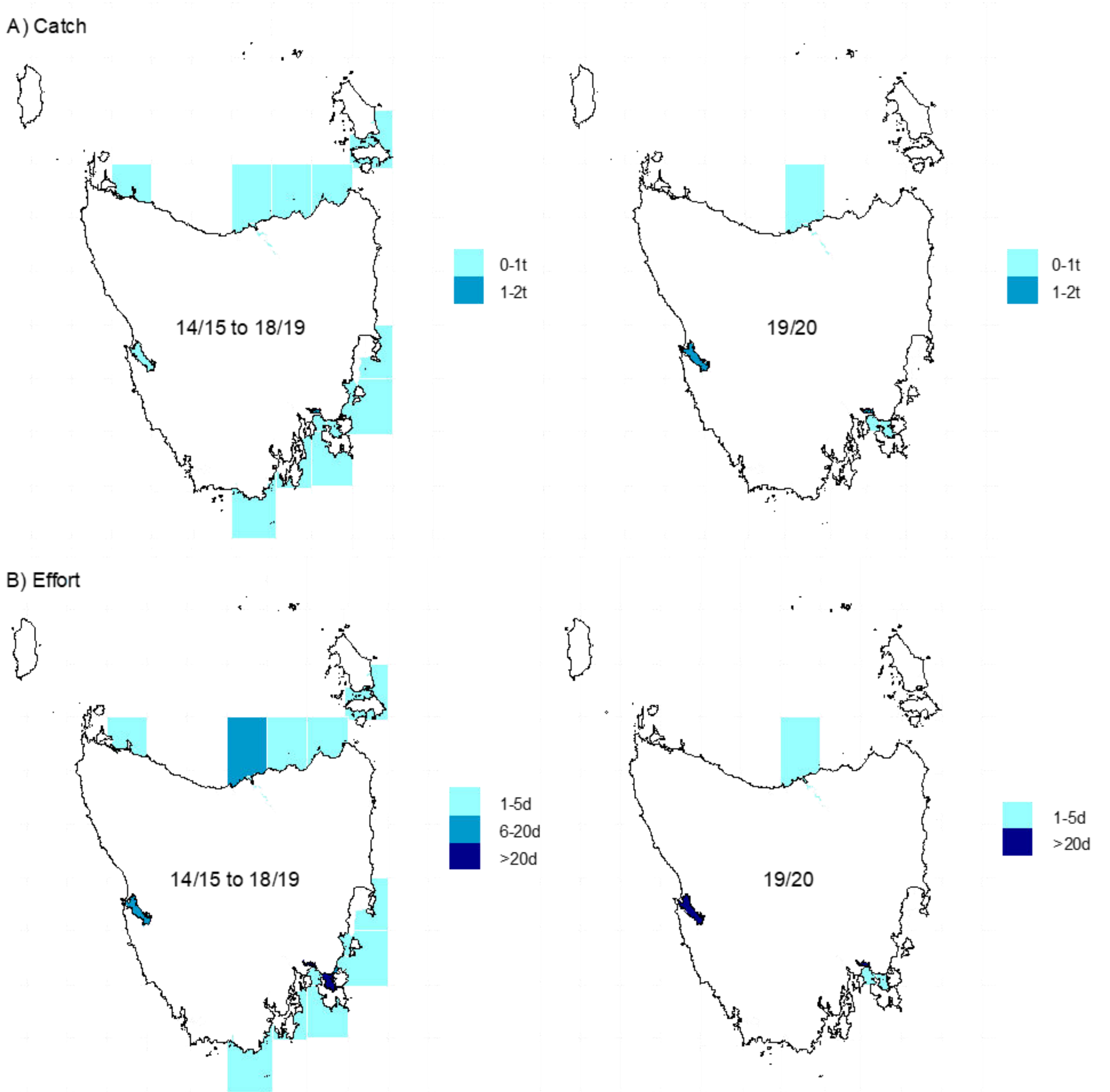


Figure 13 (A) Flounder catches (t) and (B) effort (days) by fishing blocks averaged over the last five assessment years (left) and in the current assessment year (right).

Risk-Based Framework Assessment

The Flounder fishery scored > 80 in the RBF analysis, passing assessment with low risk of stock damage. Greenback Flounder is a highly productive species with low susceptibility to capture and damage by the fishery, largely because fishing effort is minimal and limited to the shallow component of the species' depth range. Detailed information on the scoring that led to this assessment outcome is available from the TasFisheriesResearch webpage.

Reference points

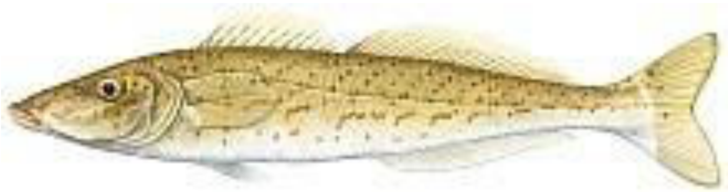
Performance indicators	Proposed reference points	Breached?	By how much?
Fishing mortality	• Catch > 3rd highest catch value from the reference period (29.4 t)	No	
	• Catch < 3rd lowest catch value from the reference period (12.3 t)	Yes	↓ 8.9 t (72.1%)
	• Latest recreational catch estimate > recreational catch estimate from the reference period (15.2 t)	No	
	• Proportion of recreational catch to total catch > previous proportion estimate (77.4% in 2012/13)	No	
Biomass	• Rate of CPUE decline over last 3 years is greater than the largest 3-year CPUE decline during the reference period (-0.0017)	No	

Stock status	**UNDEFINED**

The declining catch of Flounder is presumably related to reduced market demand. However, the restrictions placed on overnight gillnetting are another influencing factor. The Tasmanian catch is sold locally and demand for Flounder has decreased over the last two decades to the extent that catch and catch rates are considered unreliable estimators of trends in abundance. Thus, there is insufficient information to confidently classify this stock.

King George Whiting *(Sillaginodes punctatus)*

STOCK STATUS	SUSTAINABLE
King George Whiting is a range-extending species that has attracted increasing interest from both the commercial and recreational sector. The current level of fishing pressure on King George Whiting within Tasmanian waters is unlikely to cause the biological stock to become recruitment impaired. Pre-emptive monitoring and management might be required if interest in this species continues to increase.	
IMPORTANCE	Minor
STOCK(S)	Tasmanian Scalefish Fishery
INDICATOR(S)	Catch, effort and CPUE trends
Managing Jurisdiction	State (Tasmania)



King George Whiting *(Sillaginodes punctatus)*
Source: DPIPWE (by Peter Gouldthorpe)

King George Whiting are found in Australia's southern coastal waters, including northern Tasmania. This species is associated with sand and seagrass habitat, with juveniles commonly found abundantly in patches of sand among sheltered, shallow seagrass, while adults normally inhabit more exposed sandy areas (Edgar 2008). Commercial exploitation of King George Whiting in mainland state waters is well established and there exists a small but developing commercial fishery in northern Tasmania. Commercial operators use gillnet and handline gear in exposed coastal waters near Stanley in the northwest and in the Tamar estuary in the north. King George Whiting are also caught commercially around Flinders Island using beach seine, purse seine and small mesh nets. While commercial catch and effort have been increasing in northern Tasmania since 1995, catch is still relatively low and the increase is minor compared with the expansion of the recreational fishery. Recreational fishing likely accounts for the majority of landings and comprises mostly juvenile fish taken from estuaries. King George Whiting is a potential range-extending species, with some evidence of increasing numbers and distribution in Tasmanian waters (Robinson et al. 2015), including possible movement down the east coast south of St Helens (Redmap Australia 2021). More detailed information on biological characteristics and current management of King George Whiting fisheries is available from the TasFisheriesResearch webpage.

Catch, effort and CPUE

The 2019/20 commercial catch of King George Whiting in Tasmanian waters was 1.64 t (Figure 14A), which is substantially lower than the most recent estimate of recreational catch of 7.2 t for 2017/18 (Lyle et al. 2019). Relative effort and CPUE have fluctuated over the duration of fishery records but both show increasing trends (Figure 14B, C). Fishing activity over the last five years has been based around Flinders Island with a notable expansion to the northwest coast near Stanley in the current season (Figure 15).

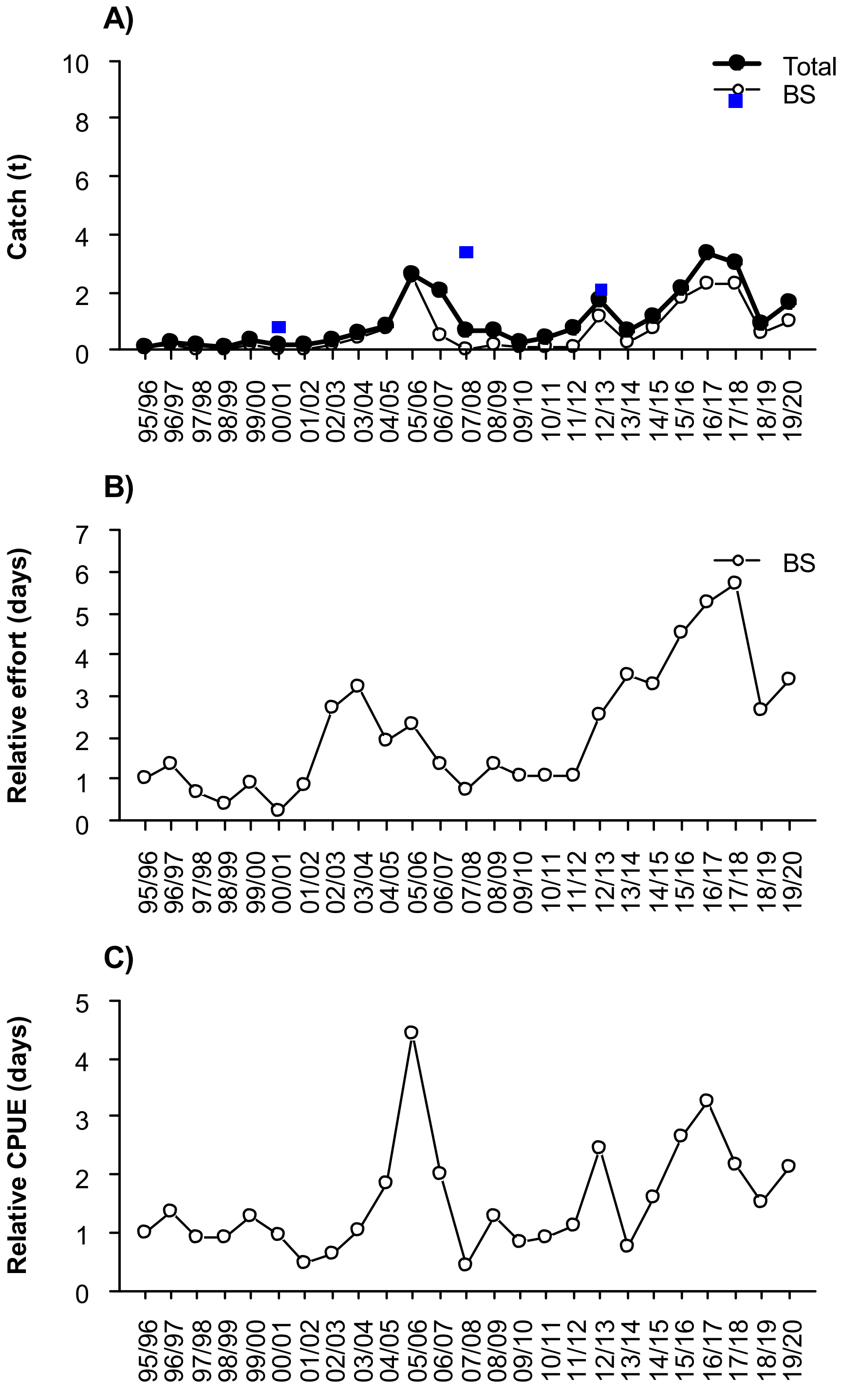


Figure 14 A) Annual commercial catch (t) by gear. B) Commercial effort by method based on day fished relative to 1995/96. C) Commercial catch per unit effort (CPUE) based on weight per day fished relative to 1995/96. BS=beach seine.

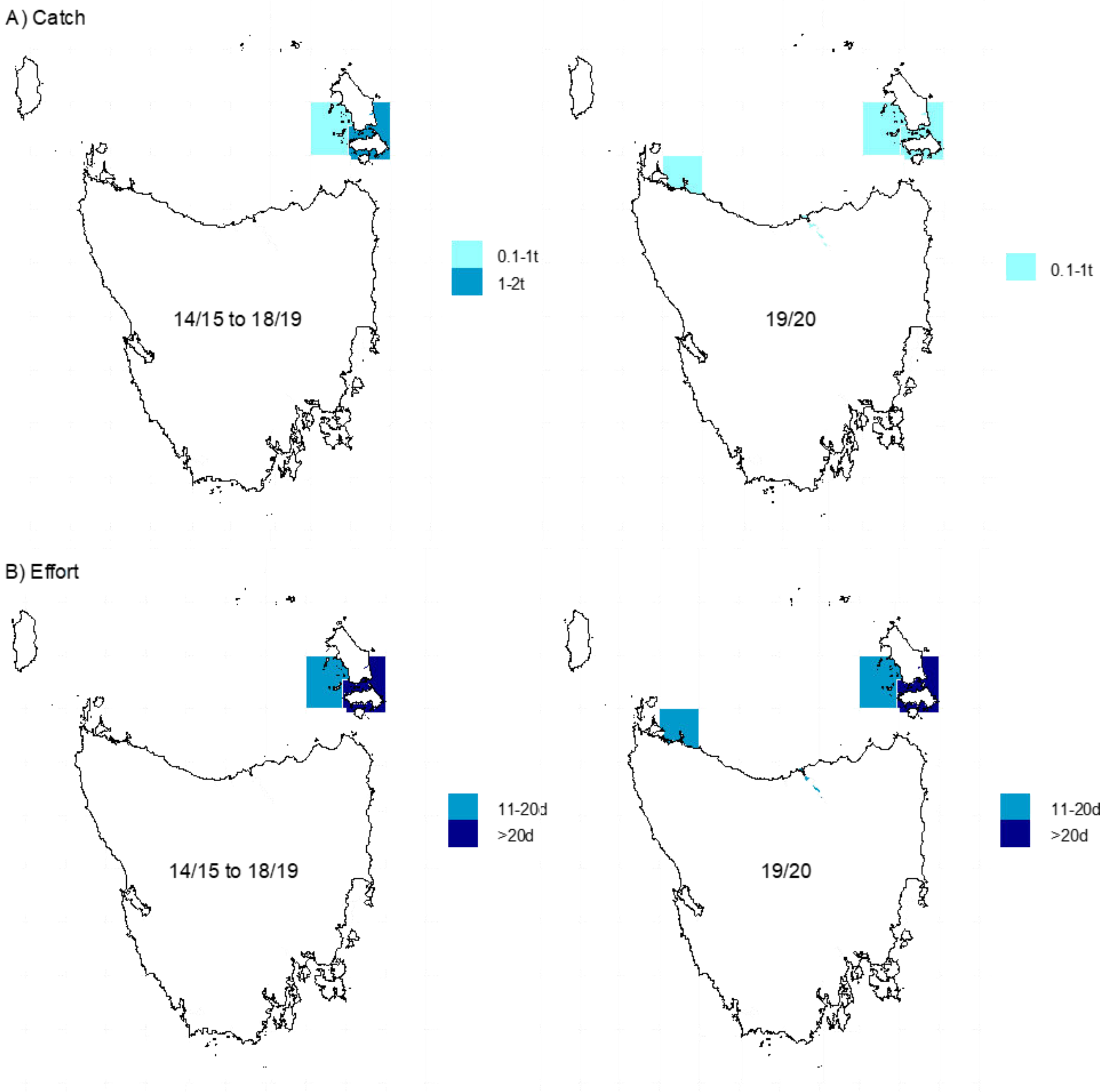


Figure 15 (A) King George Whiting catches (t) and (B) effort (days) for beach seine, small mesh net, gill net, purse seine, and handline by fishing blocks averaged over the last five assessment years (left) and in the current assessment year (right).

Risk-Based Framework Assessment

The King George Whiting fishery scored 60 – 80 in the RBF analysis, passing assessment with medium risk of stock damage. Fishing activity overlaps substantially with the known distribution of King George Whiting in Tasmanian waters and, although the abundance and range of this species appear to be increasing as environmental conditions change, the fishery is likely to continue developing. Detailed information on the scoring that led to the current assessment outcome is available from the TasFisheriesResearch webpage.

Reference points

As this fishery is currently under developmental in Tasmanian waters, a full suite of reference points is yet to be established.

Stock status | **SUSTAINABLE**

The Tasmanian fishery for King George Whiting is developing, with both catch and effort still relatively low. However, an increasing trend in catch and effort, along with a potential range expansion of the species, suggest that the fishery will continue to develop. The current levels of fishing is unlikely to result in recruitment overfishing.

Leatherjackets *(Monacanthidae* family)

STOCK STATUS	SUSTAINABLE
Several species of Leatherjacket are found in coastal waters around Tasmania. Most likely captured by coastal fisheries are the Brown-striped (*Meuschenia australis*), Toothbrush (*Acanthaluteres vittiger*), and Six-spine Leatherjacket (*Meuschenia freycineti*). Leatherjackets are largely a by-product and not actively targeted due to a lack of market demand. Therefore, catch is not a good indicator of abundance. However, fishing mortality is likely to be low and long-term monitoring of fish assemblages within and outside of Tasmanian MPAs showed no significant difference in Leatherjacket abundance that could be attributed to fishing activity.	
IMPORTANCE	Minor
STOCK(S)	Tasmanian Scalefish Fishery
INDICATOR(S)	Catch, effort and CPUE trends
Managing Jurisdiction	State (Tasmania)

Brown Striped Leatherjacket *(Meuschenia australis)*
Source: DPIPWE (by Peter Gouldthorpe)

Leatherjackets are reef-associated species of the *Monacanthidae* family (Edgar 2008). There is no substantial commercial fishery for Leatherjackets in Tasmania, with minimal local market demand. There is also a small recreational fishery for this family. In the commercial fishery, Leatherjackets are a generally discarded by-product of fish traps and netting operations. More detailed information on biological characteristics and current management of Leatherjacket fisheries is available from the TasFisheriesResearch webpage.

Catch, effort and CPUE

Leatherjacket catches have declined continuously since the early 2000s reaching a minimum of 1.3 t in 2015/16 t (Figure 16A). Total commercial catch in 2019/20 was 2.3 t. Leatherjackets are now primarily caught on the southeast coast (Figure 17).

Leatherjackets are also caught by the recreational sector with catch estimates in recent surveys at a similar level to commercial catches (Figure 16A). Estimates were 8.2 t in 2000/01 (Lyle 2005), 2.6 t in 2007/08 (Lyle et al. 2009), 2.3 t in 2009/10, 1.8 t in 2012/13 (Lyle et al. 2014b), and 4.9 t in 2017/18 (Lyle et al. 2019).

Both fish trap and gillnet fishing effort have decreased through time (Figure 16B). Fish trap effort has shown a slight increase over recent years, followed by a notable decrease in the current year. Catch rates have remained relatively stable over time for gillnets, while fluctuating more for fish traps and showing a rise to historical peak levels in both 2018/19 and the current year (Figure 16C).

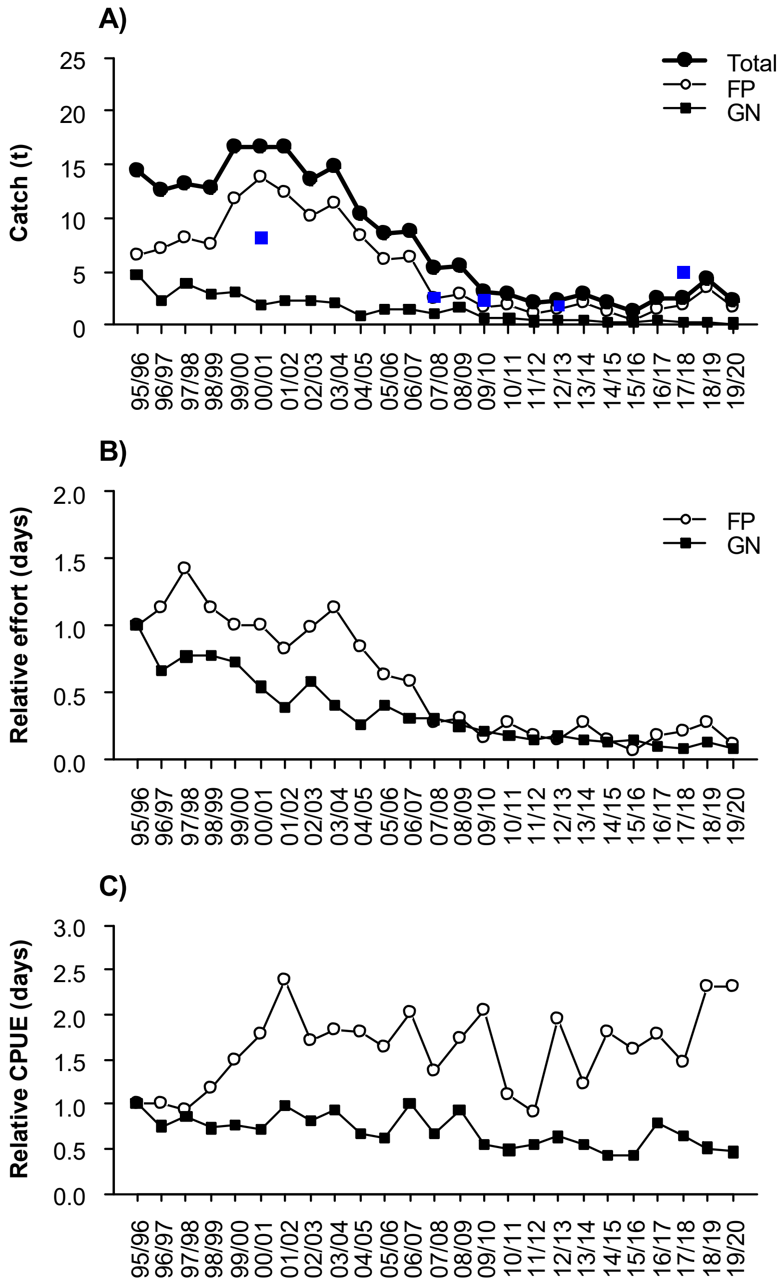


Figure 16 A) Annual commercial catch (t) by gear and best estimates of recreational catches (blue squares). B) Commercial effort by method based on day fished relative to 1995/96. C) Commercial catch per unit effort (CPUE) based on weight per day fished relative to 1995/96. FP=fish trap, GN=gillnet.

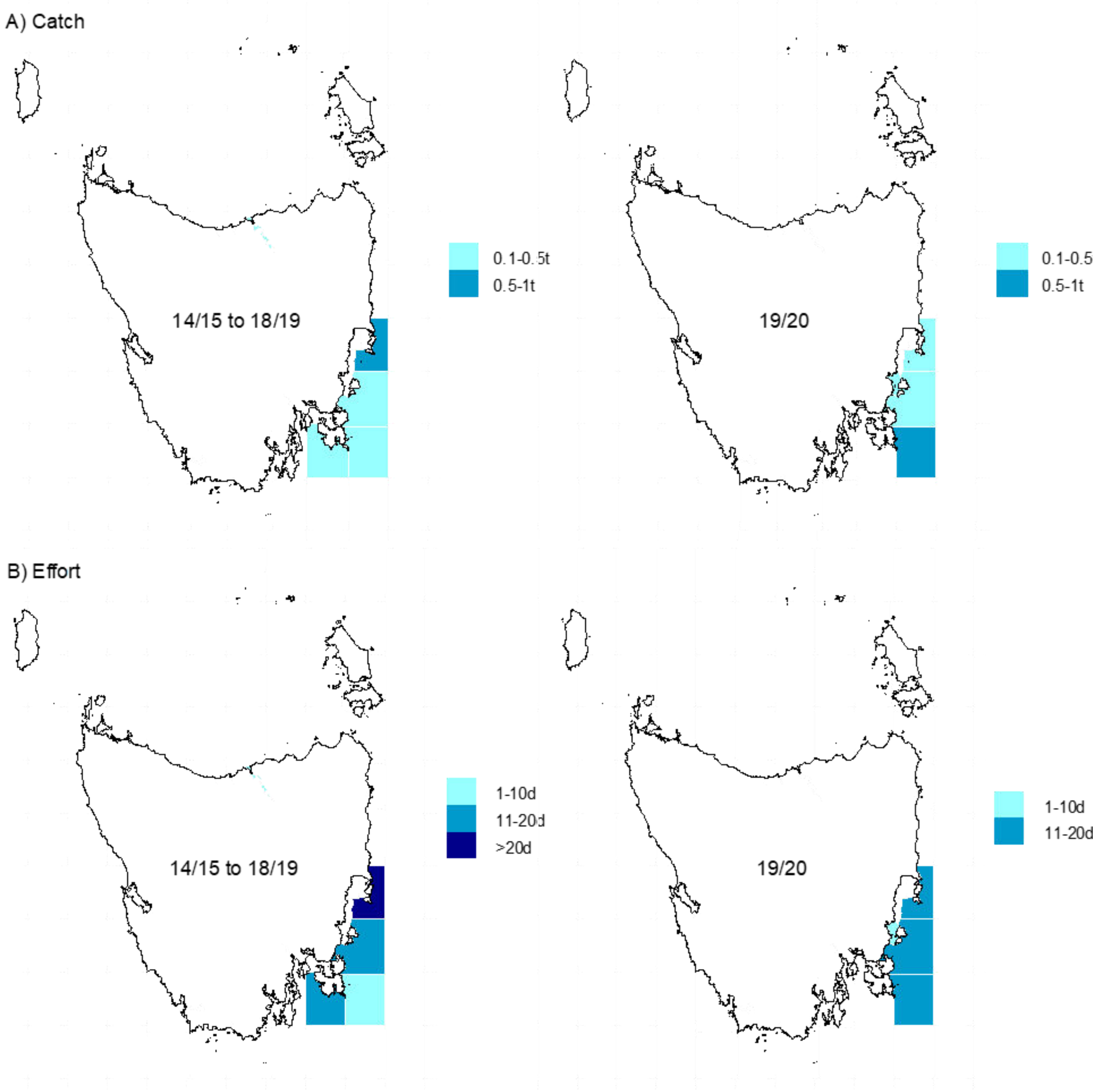


Figure 17 (A) Leatherjacket catches (t) and (B) effort (days) for fish trap and gillnet by fishing blocks averaged over the last five assessment years (left) and in the current assessment year (right).

Risk-Based Framework Assessment

Leatherjacket catch data do not distinguish among genera or species and the high level of diversity within the *Monacanthidae* family meant an accurate RBF assessment could not be conducted.

Reference points

Performance indicators	Proposed reference points	Breached?	By how much?
Fishing mortality	• Catch > 3rd highest catch value from the reference period (16.6 t)	No	
	• Catch < 3rd lowest catch value from the reference period (10.4 t)	Yes	↓ 8.1 t (78.2%)
	• Latest recreational catch estimate > recreational catch estimate from the reference period (8.2 t)	No	
	• Proportion of recreational catch to total catch > previous proportion estimate (42.9% in 2012/13)	Yes	Latest estimate (2017/18): 65.4%
Biomass	• Rate of CPUE decline over last 3 years is greater than the largest 3-year CPUE decline during the reference period (-0.0015)	No	

Stock status

SUSTAINABLE

Consistently low landings of Leatherjacket mean that reference points for the lowest catch and for the proportion of recreational to commercial catch were breached in recent assessments. However, low catches are the likely result of a general decline in the use of fish traps and a lack of demand rather than an indication of relative abundance.

Twenty-five years of monitoring Tasmanian Marine Protected Areas (MPAs) indicated no significant difference in the abundance of several Leatherjacket species, including Brown-striped and Toothbrush Leatherjacket, when data from sites within MPAs were compared with data from sites external to MPAs (Barrett et al. 2007; Barrett et al. 2018). This means impacts of fishing activity on Leatherjacket abundance were indiscernible.

Although Leatherjackets are generally discarded by-product species, they are assumed to show high post-release survival following capture in gillnets (Lyle et al. 2014a). Post-release survival from fish traps is uncertain. However, Leatherjackets are highly susceptible to barotrauma so survival may be minimal if fish traps are set >25 m deep or retrieved too quickly (Leon et al. 2020).

Despite catch data being an unreliable indicator of abundance, low total catches and fishery-independent monitoring suggest that the current level of fishing is unlikely to cause the stock to become recruitment impaired.

Longsnout Boarfish *(Pentaceropsis recurvirostris)*

STOCK STATUS	UNDEFINED
Longsnout Boarfish are a by-product species of the gillnet fishery for Banded Morwong, with low catches due to the large minimum legal size. There is insufficient information available to confidently classify this stock.	
IMPORTANCE	Minor
STOCK(S)	Tasmanian Scalefish Fishery
INDICATOR(S)	Catch, effort and CPUE trends
Managing Jurisdiction	State (Tasmania)

Longsnout Boarfish *(Pentaceropsis recurvirostris)*
Source: DPIPWE (by Peter Gouldthorpe)

Longsnout Boarfish is a by-product of gillnetting operations primarily targeting Banded Morwong. Trip limits, the large minimum size limit, and the requirement to release undersized fish mean captured Longsnout Boarfish are regularly discarded. The survival rate of released Longsnout Boarfish is high (99.7%) (Lyle et al. 2014a). Longsnout Boarfish are reef-associated and inhabit depths of 4 – 260 m (Edgar 2008), however the ban on spearing this species means it is unlikely they are commonly caught by recreational fishers. No data are available for recreational gillnet landings of this species. More detailed information on biological characteristics and current management of Longsnout Boarfish fisheries is available from the TasFisheriesResearch webpage.

Catch, effort and CPUE

In Tasmania, Longsnout Boarfish catches are now primarily derived from gillnet, however for the time since 2011/12 there was some by-product catch recorded from the shark net fishery in the current year (Figure 18A). Catches have been declining through time, however, appear to have stabilised at low levels since 2013/14 with landings of 0.5 t reported in 2019/20 (Figure 18A). Catches are taken exclusively from the east coast (Figure 19). Longsnout Boarfish are not caught by rod and line and no recreational catch estimates are available for gillnet for this species. However, about 1000 individuals were recorded (both kept and released) in the 2012/13 survey (Lyle et al. 2014b), which indicates that Boarfish are not a common recreational species.

Following a peak in 2007/08, commercial gillnetting effort has declined slowly and then stabilised at low levels since 2013/14 (Figure 18B). Catch rates have remained relatively stable with a slight increase in 2017/18 and an historic low in 2019/20 (Figure 18C).

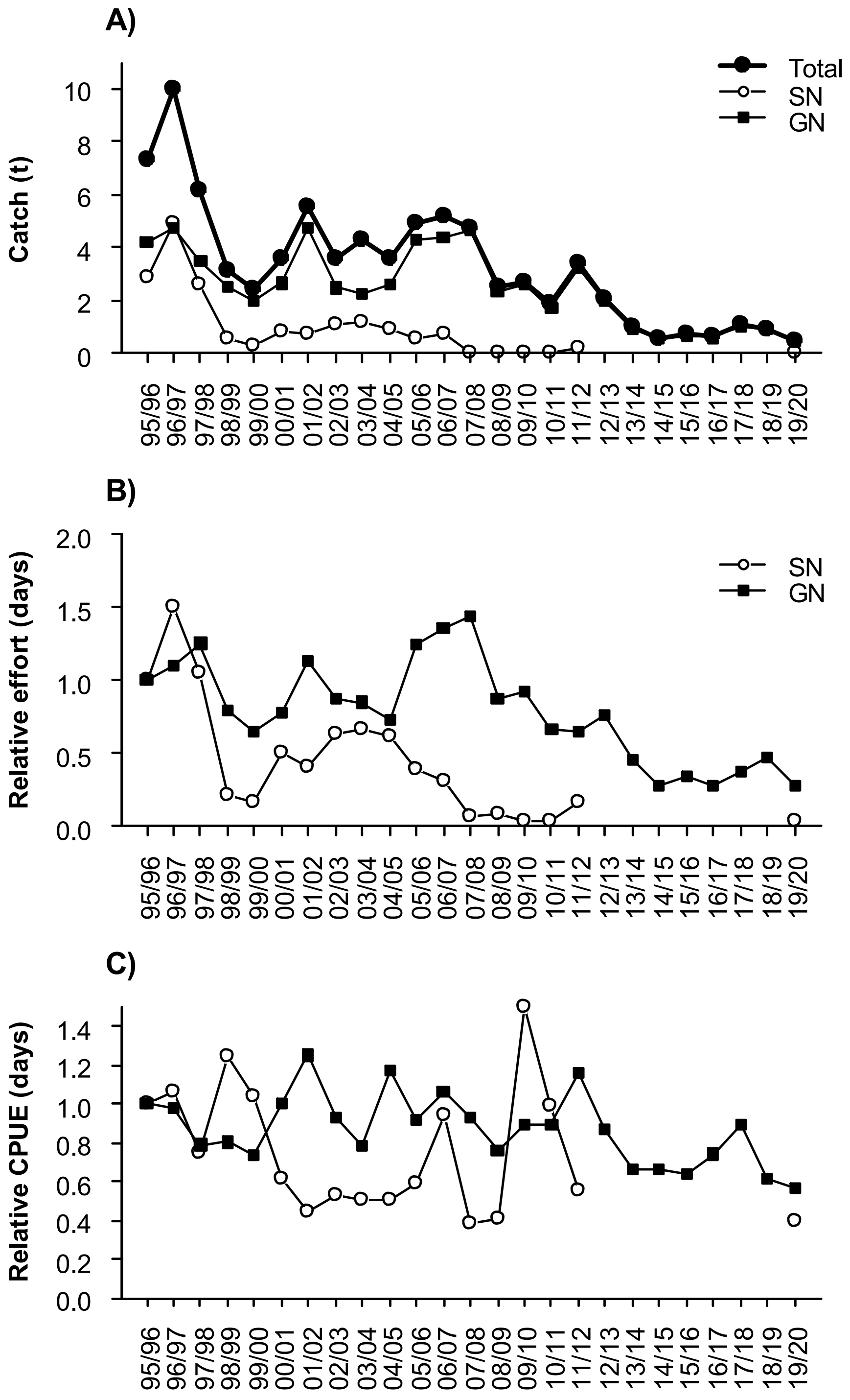


Figure 18 A) Annual commercial catch (t) by gear and best estimates of recreational catches (blue squares). B) Commercial effort by method based on day fished relative to 1995/96. C) Commercial catch per unit effort (CPUE) based on weight per day fished relative to 1995/96. GN=gillnet. SN=shark net.

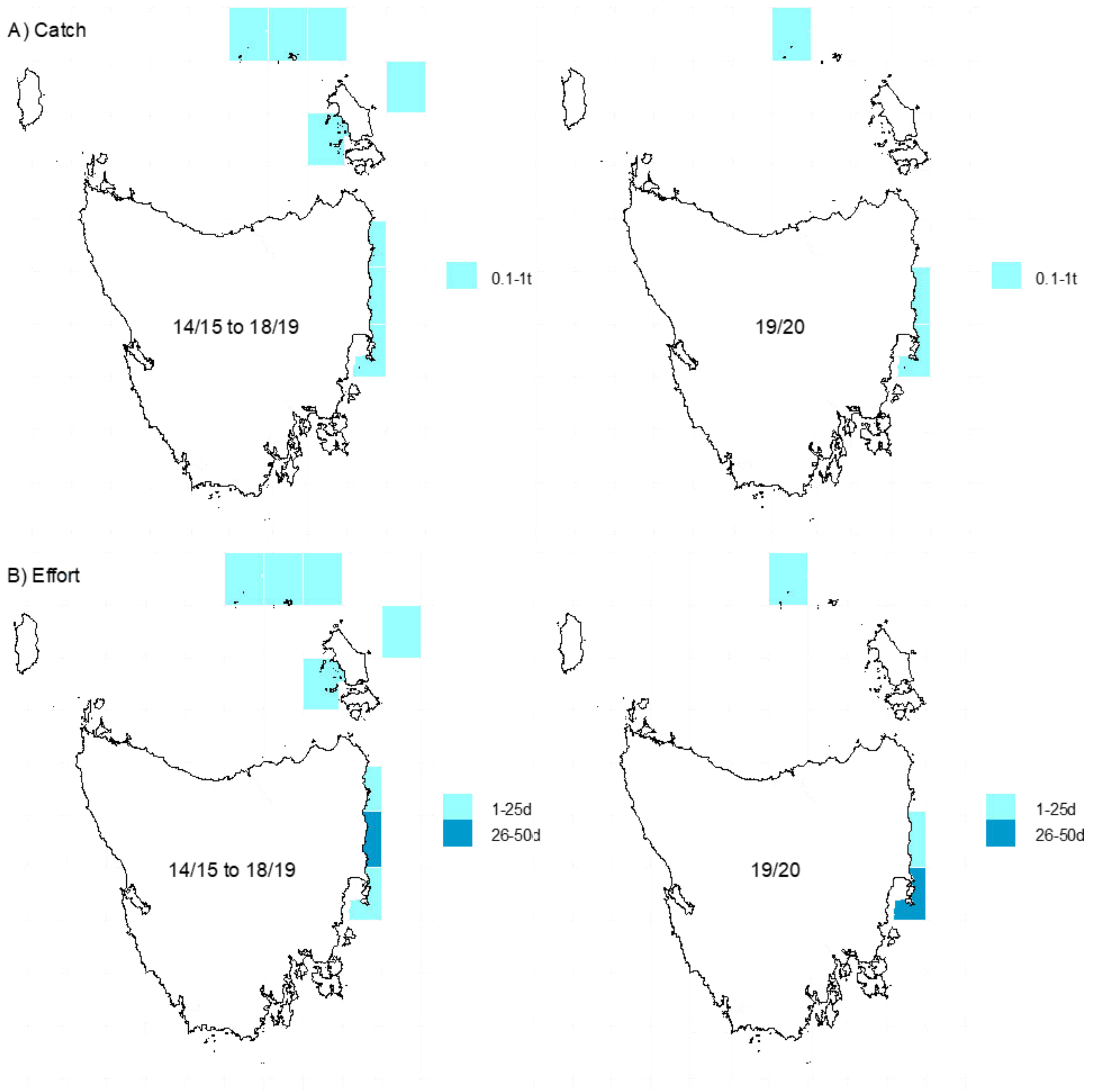


Figure 19 (A) Longsnout Boarfish catches (t) and (B) effort (days) for gillnet fishing by fishing blocks averaged over the last five assessment years (left) and in the current assessment year (right).

Risk-Based Framework Assessment

The RBF principle presented in this report was developed for assessing the stock status of target species, not by-catch species. As such, Longsnout Boarfish was not assessed using the RBF.

Reference points

Performance indicators	Proposed reference points	Breached?	By how much?
Fishing mortality	• Catch > 3rd highest catch value from the reference period (6.2 t)	No	
	• Catch < 3rd lowest catch value from the reference period (3.6 t)	Yes	↓ 3.1 t (86.3%)
	• Latest recreational catch estimate > recreational catch estimate from the reference period	Not estimated	
	• Proportion of recreational catch to total catch > previous proportion estimate	Not estimated	
Biomass	• Rate of CPUE decline over last 3 years is greater than the largest 3-year CPUE decline during the reference period (-0.0009)	No	

Stock status

UNDEFINED

The reference point associated with low catch was breached in all recent assessments. This situation is due to reduced gillnetting effort compared to the reference period, noting that catch rates have remained relatively stable over time. Boarfish are a by-product that is taken in very small quantities. In addition to catches taken in state waters, there is also a by-product fishery from Commonwealth shark netting activity. The high minimum size limit and commercial trip limit of 50 kg mean that many individuals are released, but the species is assumed to show high post-release survival (Lyle et al. 2014a). Overall, there is insufficient information available to confidently classify this stock.

Snook (*Sphyraena novaehollandiae*)

STOCK STATUS	SUSTAINABLE
Current catches of Snook approach historically lowest levels, because low market demand means that the species is not actively targeted. Therefore, catch and catch rates are considered unreliable indicators of abundance. Recent biological analyses indicate that the current level of fishing mortality is unlikely to cause the stock to become recruitment impaired.	
IMPORTANCE	Minor
STOCK(S)	Tasmanian Scalefish Fishery
INDICATOR(S)	Catch, effort and CPUE trends
Managing Jurisdiction	State (Tasmania)

Snook inhabits shallow coastal and surface (≤ 20 m) offshore waters, often occurring in large schools. This species is mainly targeted using troll and small mesh net gear but is also a by-product of beach seining and gillnetting. Snook is not an important recreational target species in Tasmania; however, landings do occur. Another species of ‘Pike’, *Dinolestes lewini* (Longfin Pike) is also caught in Tasmanian waters, however the vast majority of ‘Pike’ catches are likely to be Snook. More detailed information on biological characteristics and current management of Snook fisheries is available from the TasFisheriesResearch webpage.

Catch, effort and CPUE

Snook catches were variable yet followed a relatively stable trend around 5 t since 1998/99. An historical low of 2.4 t was recorded in 2015/16. Catch in the current season is down again to similarly low levels (2.7 t), with no change from the previous year (Figure 20A). Snook catch and effort tended to concentrate on the north coast over recent years, including the current season (Figure 21).

There are no estimates of recreational landings (by weight) but past surveys suggest that neither Pike species is an important target for recreational fishers (Lyle et al. 2009), and that around 57% of all Pike caught by recreational fishers are released (Lyle et al. 2009). Nevertheless, in 2012/13, 3,895 Pike were estimated to have been landed by recreational fishers (Lyle et al. 2014b). In 2017/18, landings were estimated at 9,441 individuals (Lyle et al. 2019). Assuming an average weight of 1 kg per fish, this number translates to approximately 9 t.

Commercial troll effort, the main capture method for Snook, has been variable through time and is currently fluctuating around values similar to the reference year (Figure 20B). Beach seine effort has remained stable over time, but Snook are a by-product not a target of beach seining.

Catch rates for troll have remained high and variable through time, which is influenced by species availability and targeting practices, whereas catch rates for both beach seine and mesh net have been low and comparatively stable (Figure 20C).

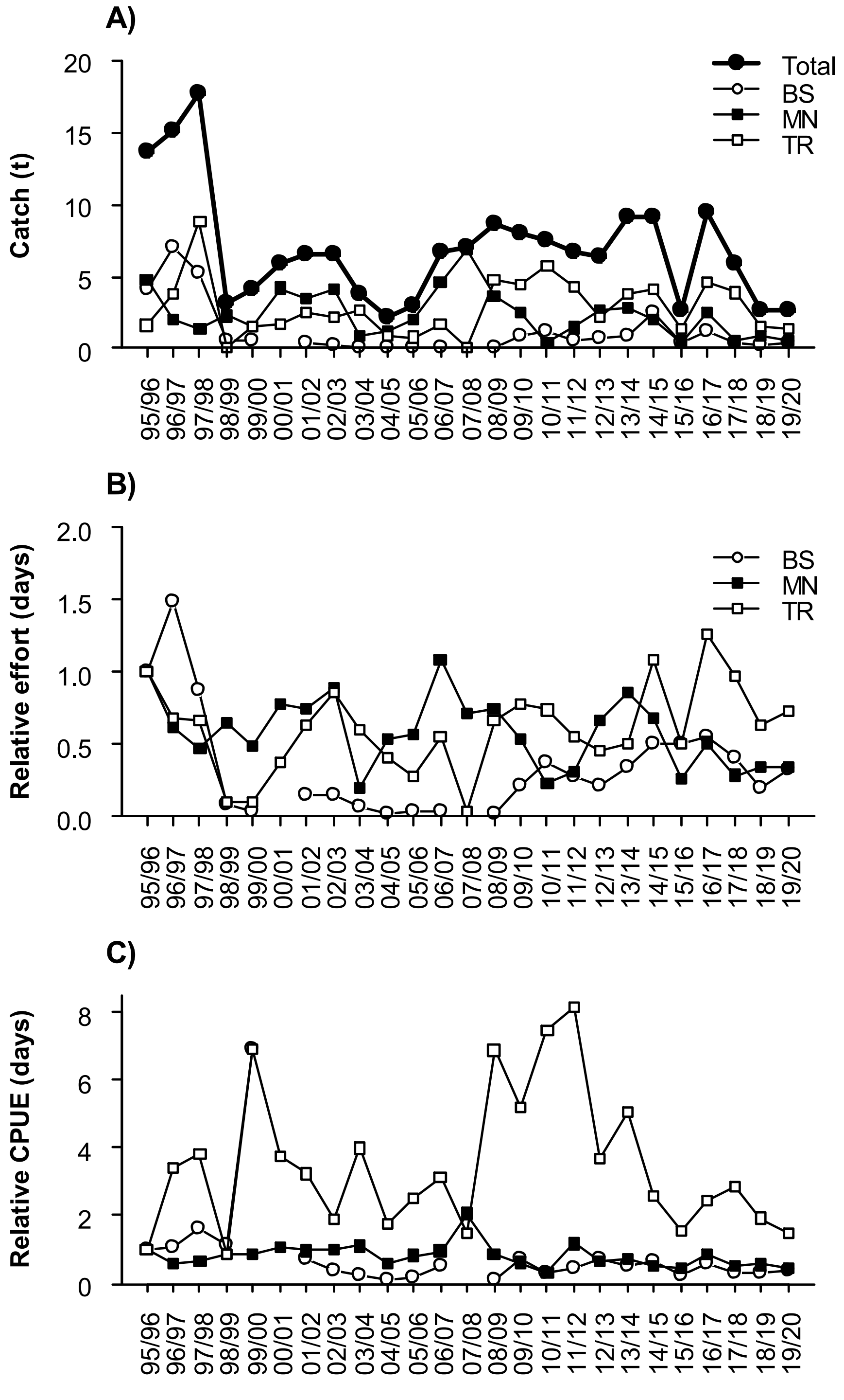


Figure 20 A) Annual commercial catch (t) by gear. B) Commercial effort by method based on day fished relative to 1995/96. C) Commercial catch per unit effort (CPUE) based on weight per day fished relative to 1995/96. BS=beach seine, MN=small mesh gillnet, TR=troll.

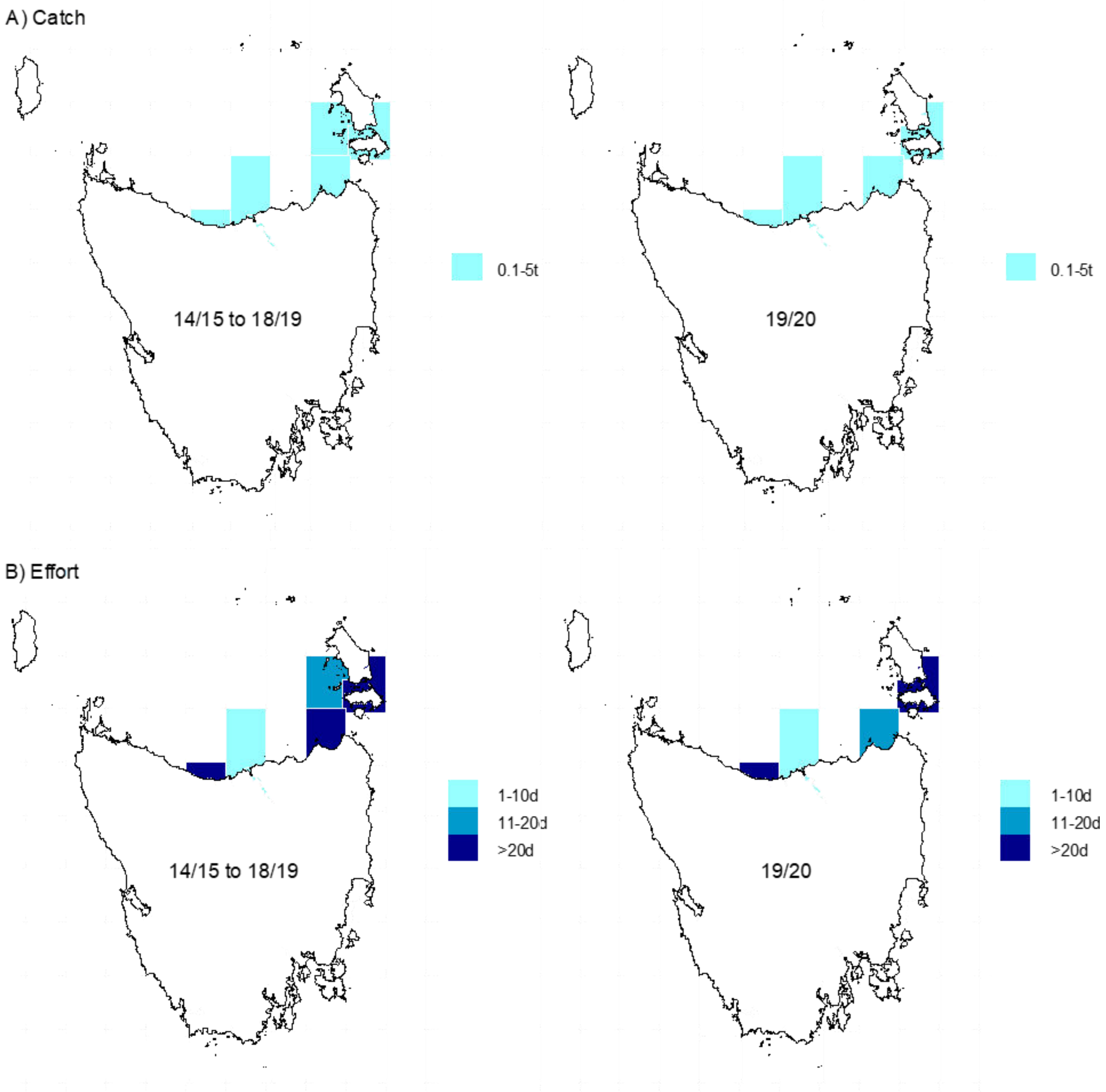


Figure 21 (A) Snook catches (t) and (B) effort (days) for troll, beach seine and small mesh net by fishing blocks averaged over the last five assessment years (left) and in the current assessment year (right).

Catch-MSY results

Catch-MSY results based on the assumption of "low" resilience suggest that Snook biomass could be depleted/depleting (Figure 22), with estimated catch and harvest rates having frequently exceeded corresponding sustainable limits in the past (F_{target} = 0.12; MSY = 6.73) (Figure 23, Figure 24). Median estimates of biomass depletion peaked at 28% of unfished levels in 2018/19 (lower 90% CI = 10%), with estimates of depletion at 30% of unfished levels in 2019/20 (lower 90% CI = 9%) (Figure 22).

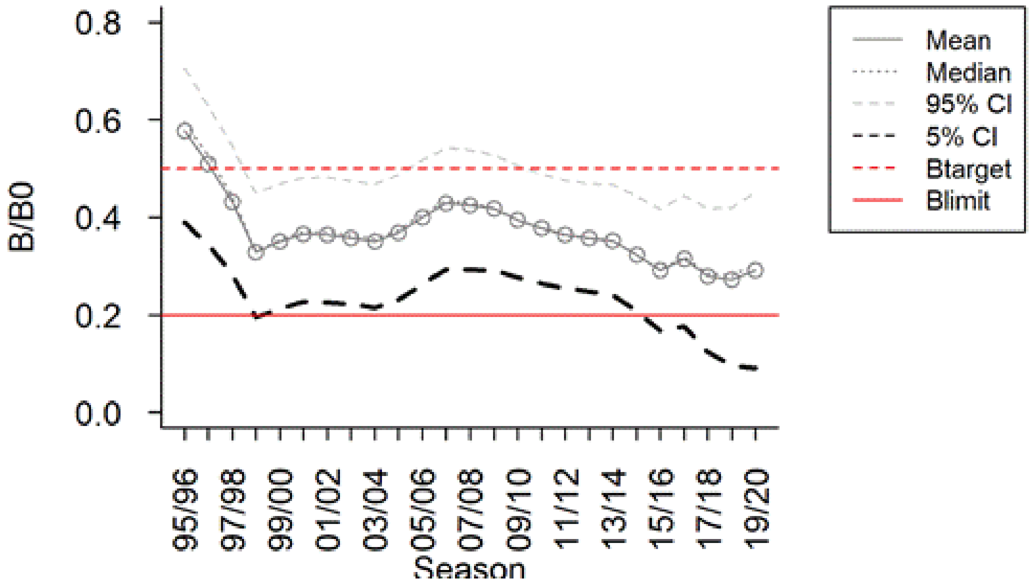


Figure 22 Trends in estimated biomass depletion (biomass divided by unfished biomass) and associated confidence intervals (CIs). The dotted red line marks a common target reference point, which is the biomass assumed to deliver the maximum sustainable yield (B_{target}). The continuous red line marks a limit reference point (B_{limit}).

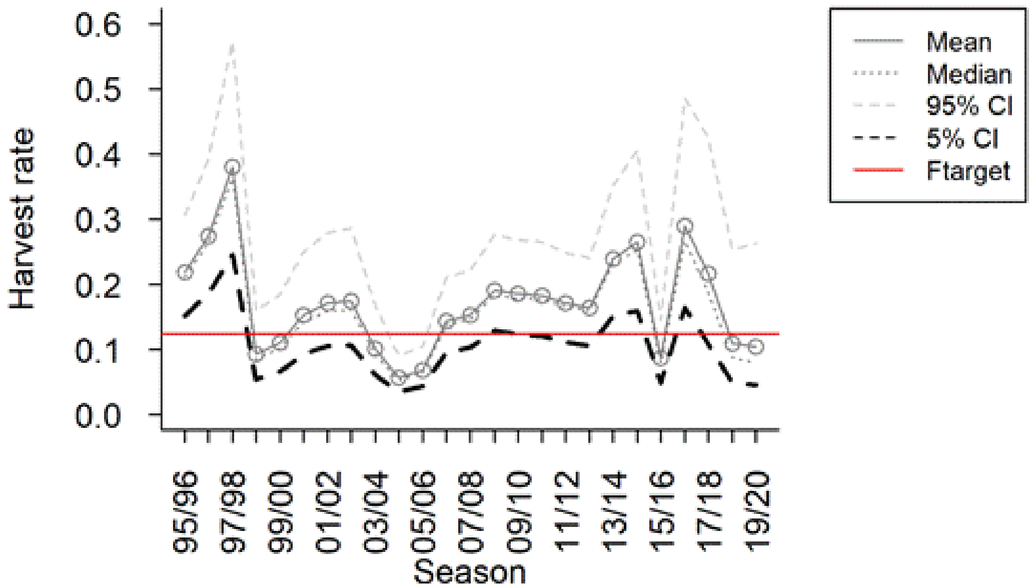


Figure 23 Trends in harvest rate and associated confidence intervals (CIs) relative to the estimated target fishery mortality (F_{target}).

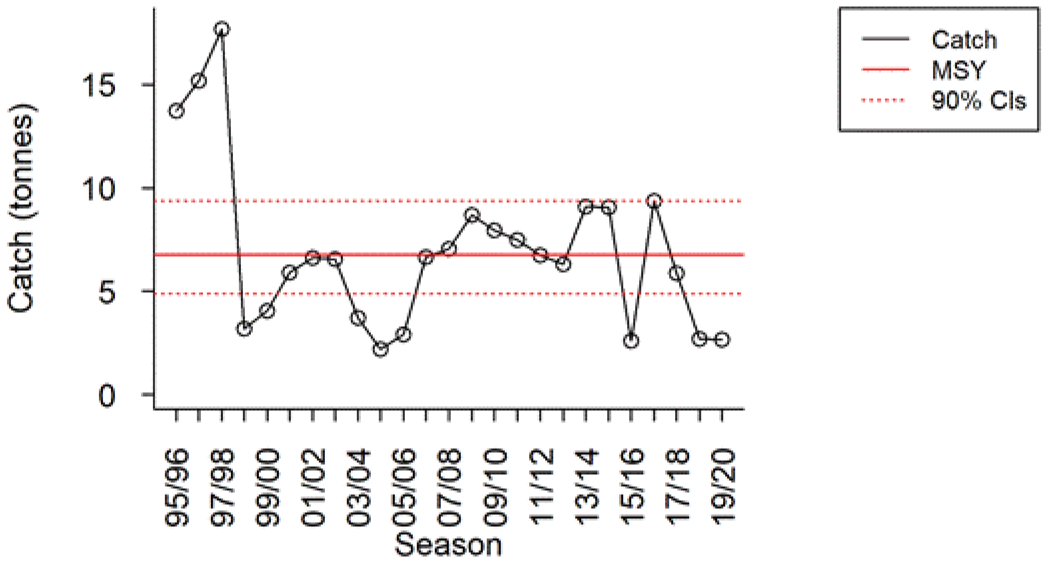


Figure 24 Trends in catch relative to the estimated maximum sustainable yield (MSY) and associated confidence intervals (CIs).

Risk-Based Framework Assessment

The Snook fishery scored 60 – 80 in the RBF analysis, passing assessment with medium risk of stock damage. Fishing effort overlaps substantially with the distribution of Snook in Tasmanian waters and the primary habitat of this species is commonly fished. Detailed information on the scoring that led to this assessment outcome is available from the TasFisheriesResearch webpage.

Reference points

Performance indicators	Proposed reference points	Breached?	By how much?
Fishing mortality	• Catch > 3rd highest catch value from the reference period (13.7 t)	No	
	• Catch < 3rd lowest catch value from the reference period (3.2 t)	Yes	↓ 0.5 t (15.7%)
	• Latest recreational catch estimate > recreational catch estimate from the reference period (based on numbers)	No	
	• Proportion of recreational catch to total catch > previous proportion estimate	Likely according to numbers caught (catch in weight was not assessed)	Latest estimate (2017/18): Possibly >50%
Biomass	• Rate of CPUE decline over last 3 years is greater than the largest 3-year CPUE decline during the reference period (-0.0035)	No	

Stock status	**SUSTAINABLE**

The commercial fishery for Snook is relatively small and commonly limited to the northern part of Tasmania. Despite comparatively high estimates of recreational landings, the species is not assumed to be an important target for recreational fishers. A recent fishery-dependent sampling program conducted in the north of the state estimated that fishing mortality (F) is approximately one quarter of natural mortality (M) (F=0.06 per year and M=0.24 per year) (Webb 2017), which is indicative of sustainable exploitation. The current level of fishing pressure is thus unlikely to cause the stock to become recruitment impaired.

Southern Calamari *(Sepioteuthis australis)*

STOCK STATUS	DEPLETING
Sharp regional increases and subsequent fluctuations in catch and effort in recent years suggest that fishing pressure on Southern Calamari is likely to be too high to be sustainable. Despite closures during part of the spawning season, many operators rely on targeting spawning aggregations, which presents a high risk of recruitment impairment. Aggregation fishing also means that data on catch and catch rates are unlikely to reflect abundance. Data-poor stock assessment results give further reason for concern that fishing mortality might have been excessive and that stocks on the south-east and east coast might be depleted or still recovering, while more recently targeted stocks on the north coast might be depleting.	
IMPORTANCE	Key
STOCK(S)	Tasmanian Scalefish Fishery
INDICATOR(S)	Catch and CPUE trends
Managing Jurisdiction	State (Tasmania)

Southern Calamari *(Sepioteuthis australis)*
Source: DPIPWE (by Peter Gouldthorpe)

Southern Calamari is endemic to Australia and northern New Zealand and inhabits shallow, inshore waters. Females deposit eggs in collective egg masses over several months (September to February), attaching capsules to the substrate (often seagrass) (Pecl 2004). Temporal fishery closures are in place to protect regional stocks during part of the spawning season, but fishers generally target spawning aggregations of Southern Calamari outside of these regional 1-month closure periods. Southern Calamari landings (predominantly by squid-jig) represented the highest catch of all Scalefish Fishery species in 2019/20 and the stock status of this species was classified as 'Depleting' in both the 2017/18 and 2018/19 assessments. More detailed information on biological characteristics and current management of Southern Calamari fisheries is available from the TasFisheriesResearch webpage.

Catch, effort and CPUE

The total commercial catch of Southern Calamari in 2019/20 was 85.3 t, a substantial decline from last year's return to historic peak levels of > 100 t (Figure 25A, Figure 26A). Declines in both catch and effort compared with last year were evident in the Mercury Passage (MP) (Figure 26), while on the northeast coast (NEC) catch declined despite increased effort (Figure

25). Slight increases in both catch and effort occurred in Great Oyster Bay (GOB) (Figure 26) and the northwest coast (NWC) (Figure 25). The northwest coast had the highest catch of all regions in the current year: > 30 t (Figure 25B).

Recent estimates of recreational catches are 63.5 t in 2012/13 (Lyle et al. 2014b) and 31.4 t in 2017/18 (Lyle et al. 2019), which represent between 50-100% of commercial landings during these two years. Thus, recreational harvest remains a significant component of fishing mortality.

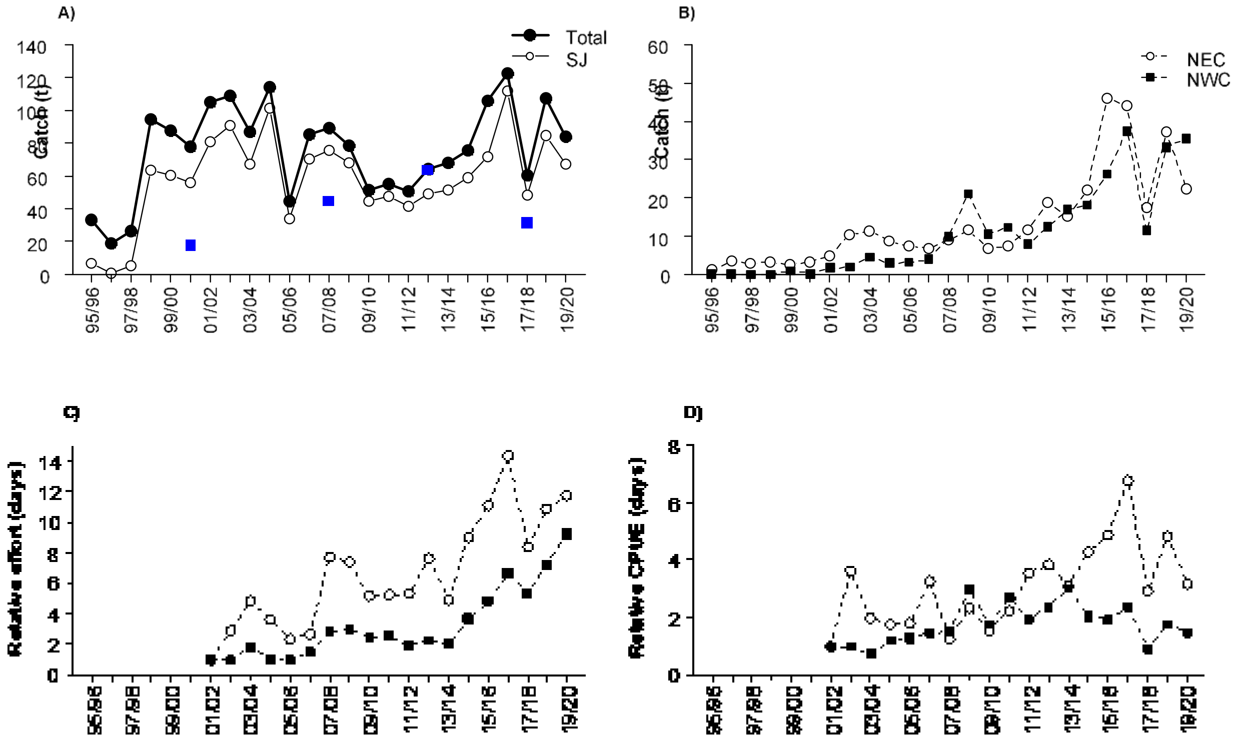


Figure 25 A) Annual commercial catch (t) by gear, including estimates of recreational catches in single blue squares. B) Annual commercial catch by region. C) Commercial squid-jig effort based on days fished relative to relative to 2001/02 for NEC and NWC. D) Commercial squid-jig catch per unit effort (CPUE) based on weight per day; SJ=squid jig, NWC=Northwest coast, NEC=Northeast coast.

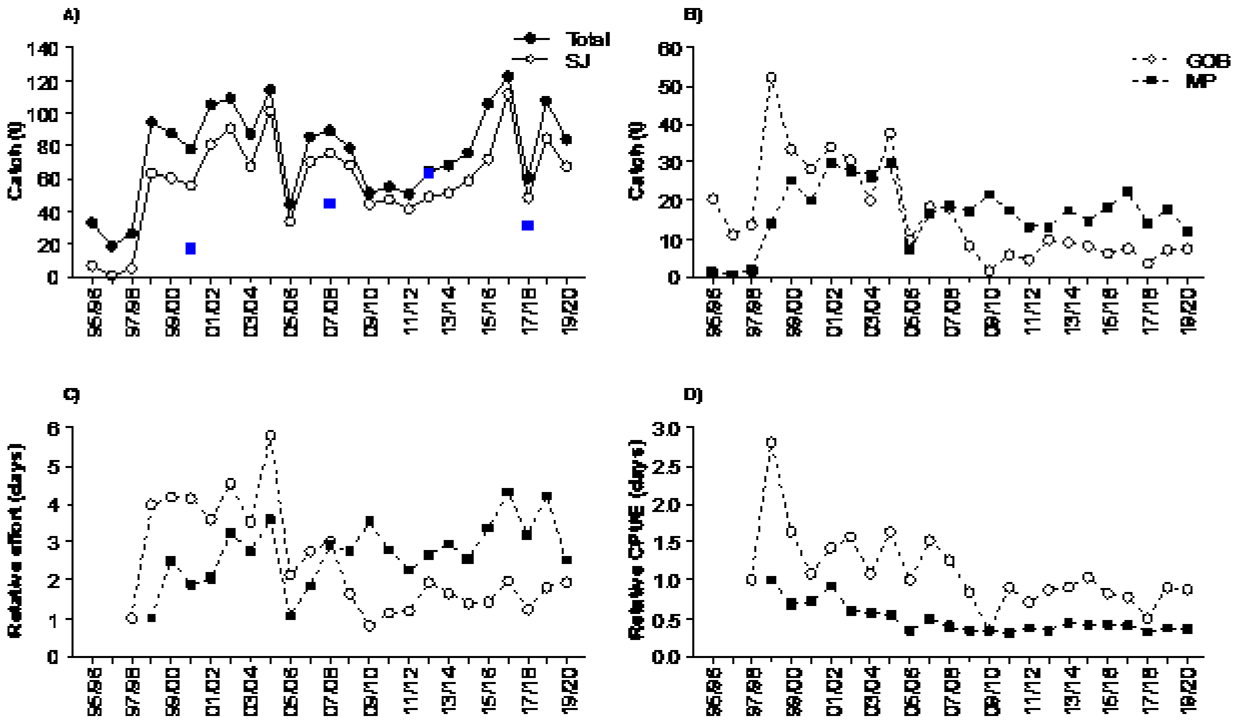


Figure 26 A) Annual commercial catch (t) by gear, including estimates of recreational catches in single blue squares. B) Annual commercial catch by region. C) Commercial squid-jig effort based on days fished relative to 1998/99 for MP and 1997/98 for GOB. D) Commercial squid-jig catch per unit effort (CPUE) based on weight per day. SJ=squid jig, GOB=Great Oyster Bay, MP=Mercury Passage.

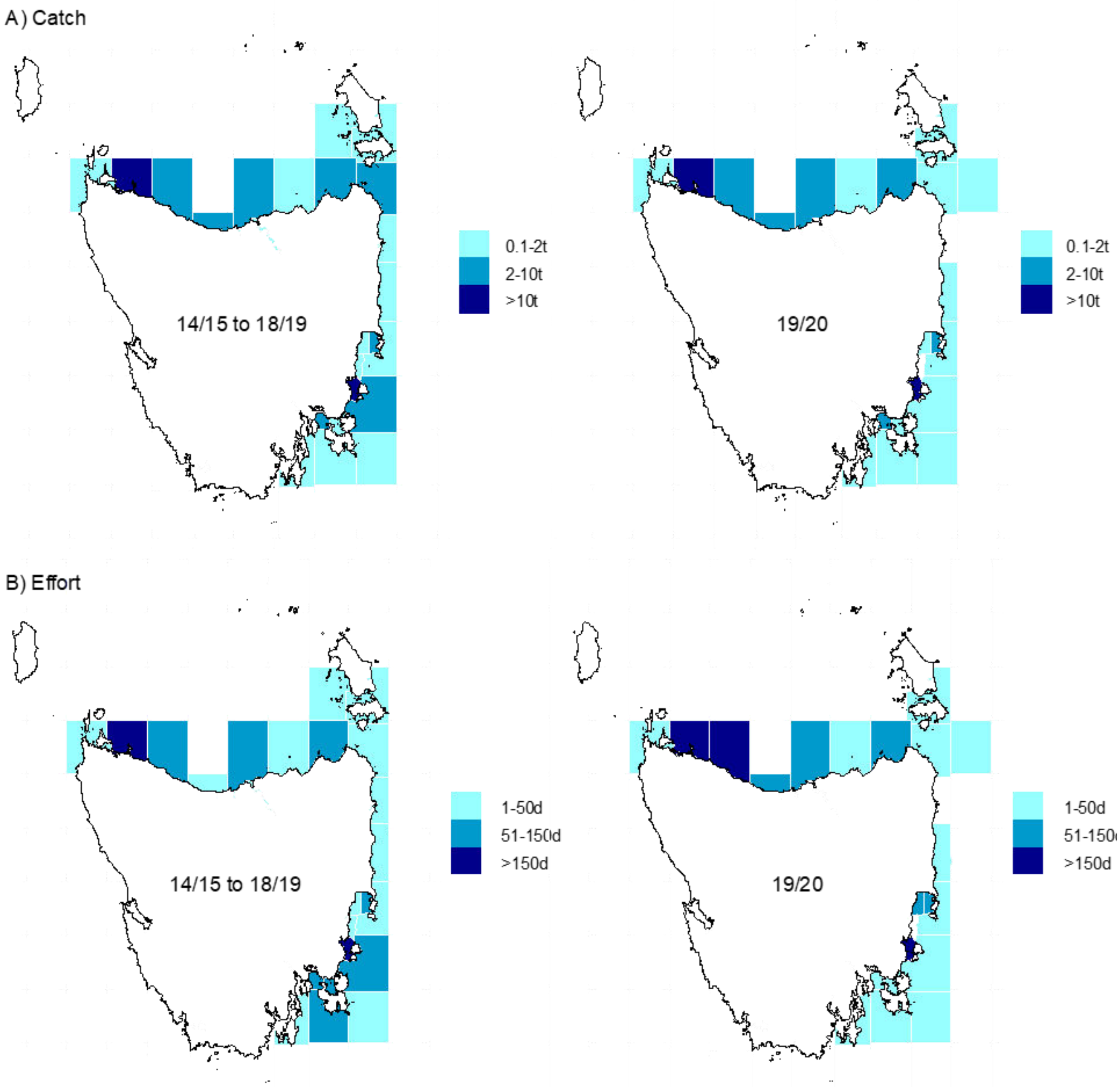


Figure 27 (A) Calamari catches (t) and (B) effort (days) for squid jig and purse seine by fishing blocks averaged over the last five assessment years (left) and in the current assessment year (right).

Catch-MSY results

Catch-MSY results based on the assumption of "high" resilience are presented below for the northeast and northwest coast regions. Results suggest that Southern Calamari biomass is depleting in both regions (Figure 28, Figure 31). Estimates of harvest rates and catch indicate that fishing pressure may have started exceeding sustainable limits (northeast coast F_{target} = 0.43 MSY = 26.8, see Figure 29 and Figure 30; and northwest coast F_{target} = 0.47 and MSY = 25.0, see Figure 32 and Figure 33). Median estimates of biomass depletion in the northeast peaked at 38% of unfished levels (lower 90% CI = 30%) in 2019/20 (Figure 28). Median estimates of biomass depletion in the northwest peaked at 54% of unfished levels in 2017/18 (lower 90% CI = 49%) and were at 55% of unfished biomass in 2019/20 (lower 90% CI = 46%) (Figure 31). Results for initial key fishing grounds on the south-east coast and east coast are not shown here but indicate possible depletion beyond limit reference points (20% of unfished levels) associated with substantially reduced catches and harvest rates. Overall, the results indicate that Southern Calamari populations in these regions might be in a depleted state and that populations on the north coast might follow the same trajectory.

Northeast Coast

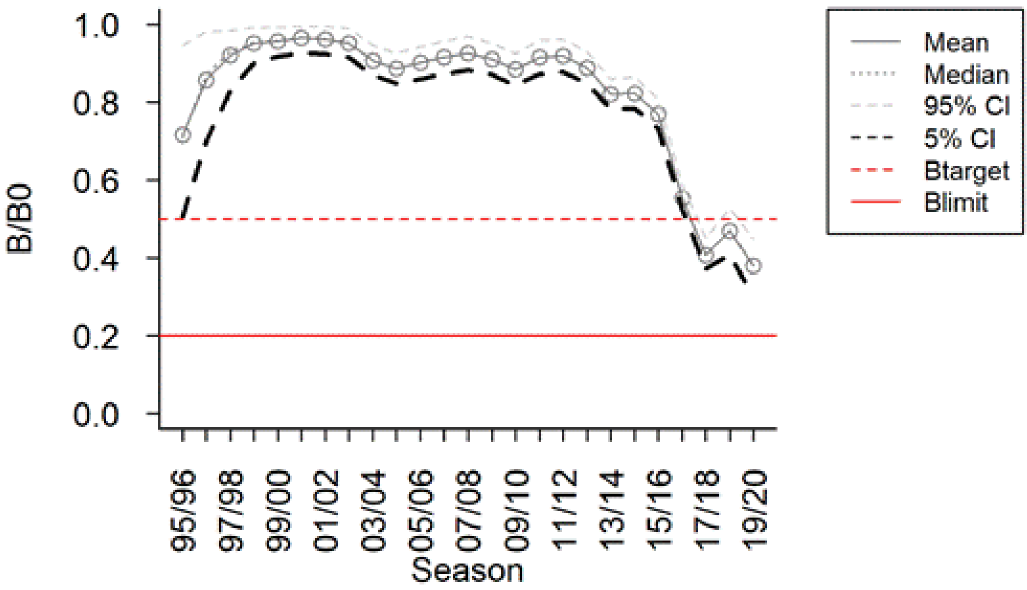


Figure 28 Trends in estimated biomass depletion (biomass divided by unfished biomass) and associated confidence intervals (CIs). The dotted red line marks a common target reference point, which is the biomass assumed to deliver the maximum sustainable yield (B_{target}). The continuous red line marks a limit reference point (B_{limit}).

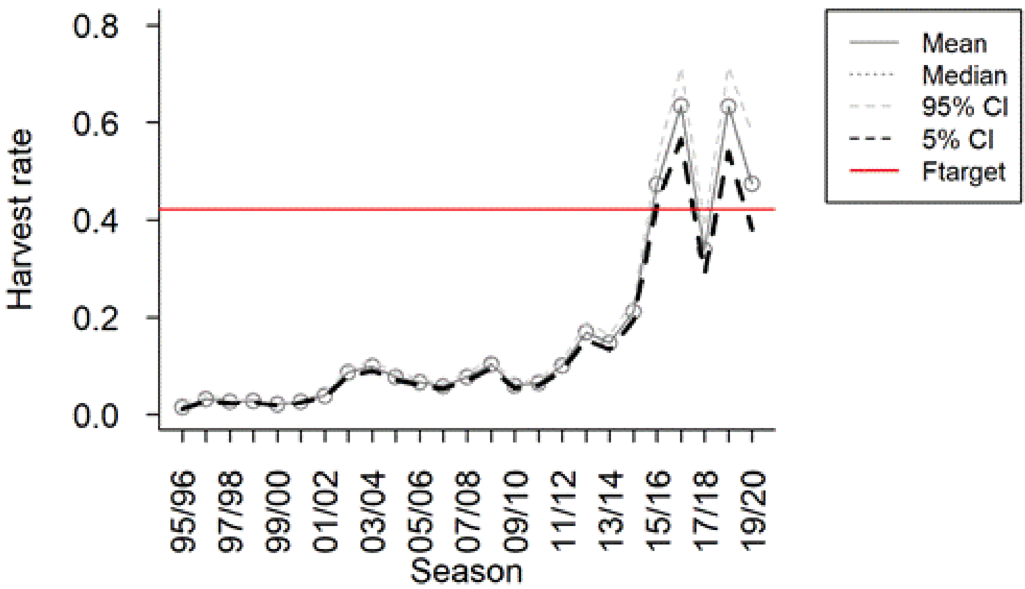


Figure 29 Trends in harvest rate and associated confidence intervals (CIs) relative to the estimated target fishery mortality (F_{target}).

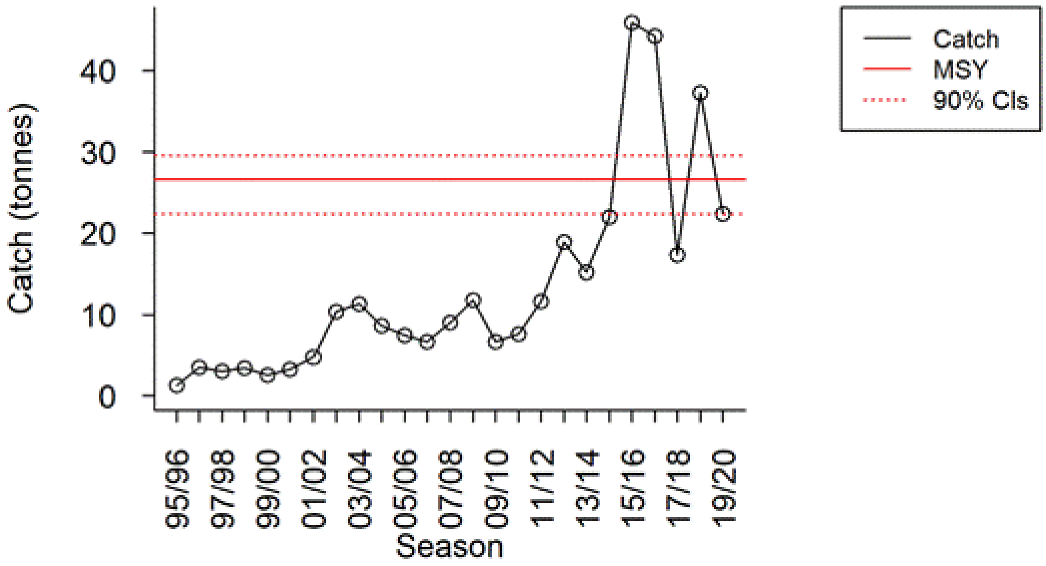


Figure 30 Trends in catch relative to the estimated maximum sustainable yield (MSY) and associated confidence intervals (CIs).

Northwest Coast

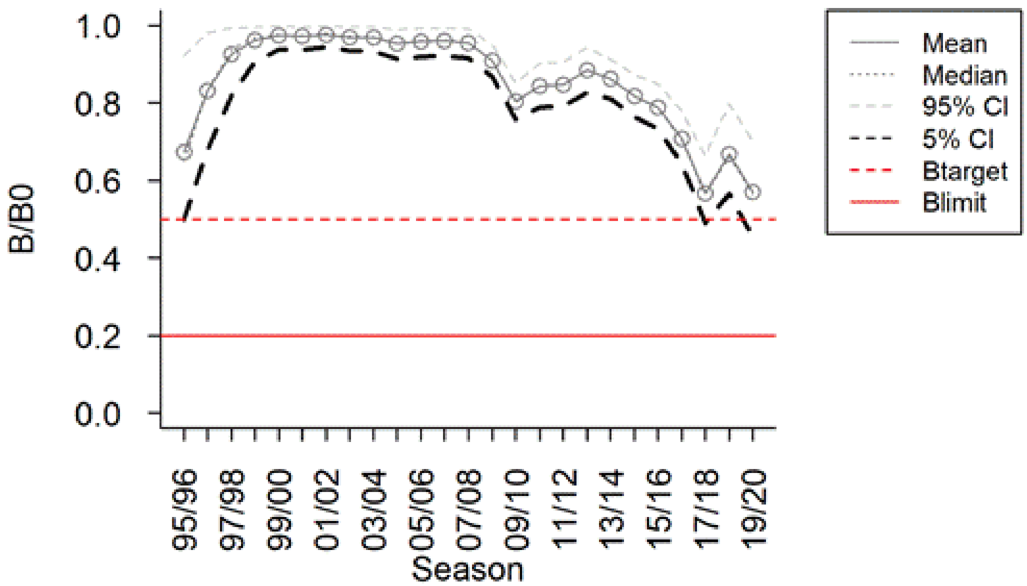


Figure 31 Trends in estimated biomass depletion (biomass divided by unfished biomass) and associated confidence intervals (CIs). The dotted red line marks a common target reference point, which is the biomass assumed to deliver the maximum sustainable yield (B_{target}). The continuous red line marks a limit reference point (B_{limit}).

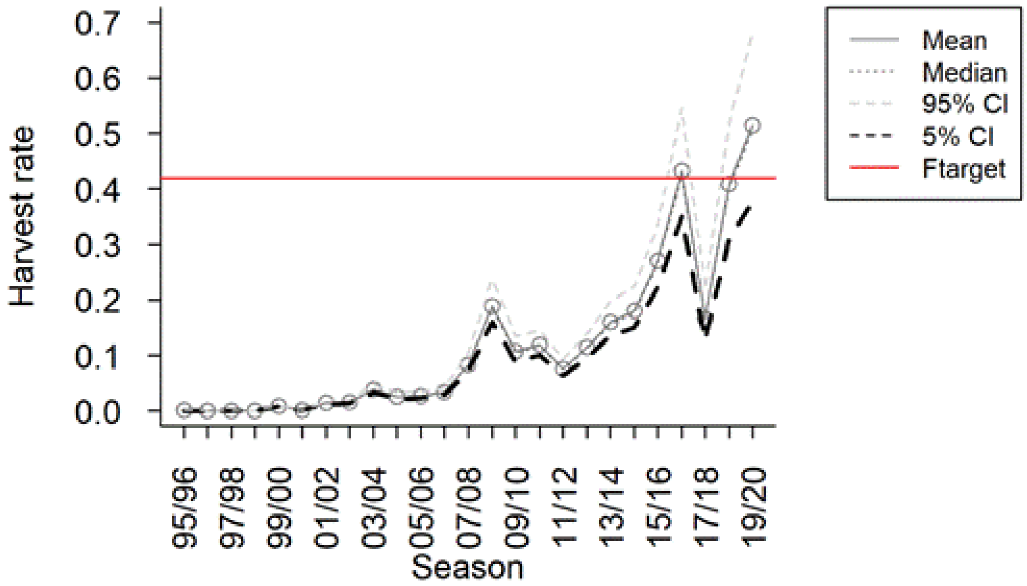


Figure 32 Trends in harvest rate and associated confidence intervals (CIs) relative to the estimated target fishery mortality (F_{target}).

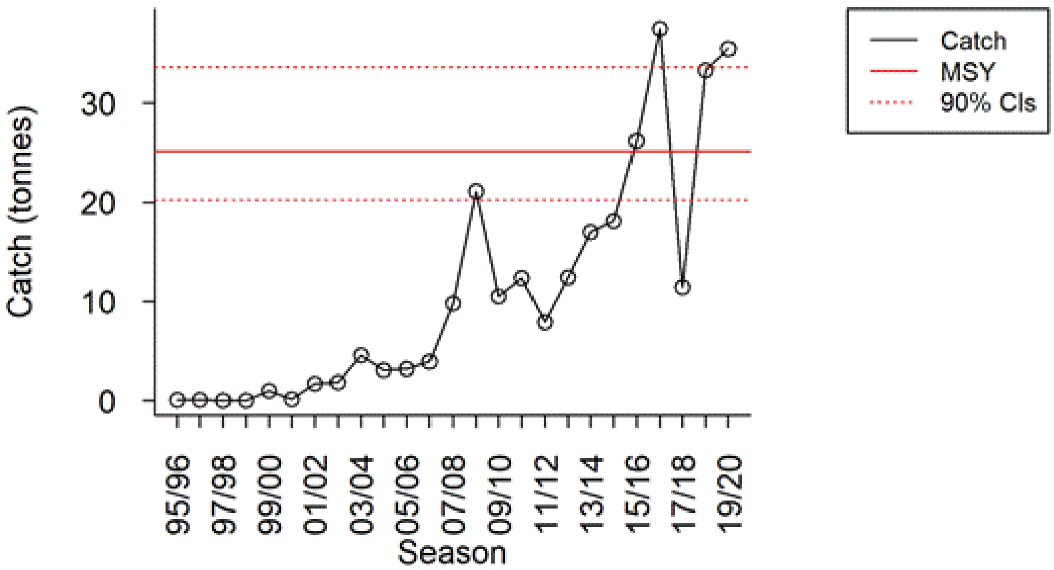


Figure 33 Trends in catch relative to the estimated maximum sustainable yield (MSY) and associated confidence intervals (CIs).

Risk-Based Framework Assessment

The Southern Calamari fishery scored < 60 in the RBF analysis, failing assessment with high risk of stock damage. Fishing effort overlaps with > 30% of the stock distribution and spawning aggregation fishing poses a high risk to stock structure and recruitment dynamics. Detailed information on the scoring that led to this assessment outcome is available from the TasFisheriesResearch webpage.

Reference points

Performance indicators	Proposed reference points	Breached?	By how much?
Fishing mortality	• Catch > 3rd highest catch value from the reference period (105.2 t)	No	
	• Catch < 3rd lowest catch value from the reference period (33.0 t)	No	
	• Catch variation from the previous year above the greatest inter-annual increase from the reference period (67.9 t)	No	
	• Catch variation from the previous year above the greatest inter-annual decrease from the reference period (-69.6 t)	No	
	• Latest recreational catch estimate > recreational catch estimate from the reference period (17.7 t)	Yes	Latest estimate (2017/18): 31.4 t (+77%)
	• Proportion of recreational catch to total catch > previous proportion estimate (51.3% in 2012/13)	No	
Biomass	• CPUE< 3rd lowest CPUE value from the reference period (0.0198 t/days fished)	No	
	• Rate of CPUE decline over last 3 years is greater than the largest 3-year CPUE decline during the reference period (-0.0030)	No	

Stock status

DEPLETING

Commercial catches fell markedly in 2017/18 relative to the preceding two fishing years when the commercial catch reference point was breached due to ongoing high landings of Southern Calamari from northern areas of the state. In line with this trend, the estimated recreational catch in 2017/18 was also substantially lower than for previous estimates. In 2018/19 commercial catches returned to historically highest levels and it is probable that recreational catches also increased, however catch fell again in 2019/20 despite continued increases in effort. This suggests that the overall fishing pressure on Southern Calamari is likely to be at levels too high to sustain consistent catch.

Vulnerability of Southern Calamari to fishing pressure is unclear, but presumably high because individuals are targeted at spawning aggregations. Considering the species' annual or sub-annual life span, this situation renders the stock susceptible to recruitment failure. Moreover, catch rates for aggregation fisheries are unlikely to reflect abundance, which is a phenomenon referred to as "hyperstability". Spatial and temporal closures have been implemented to address these challenges by reducing fishing pressure during part of the spawning period. With a regional species-specific fishing licence in place, commercial effort has effectively been capped in the traditional fishing grounds in southeast Tasmania (defined as waters between Whale Head to Lemon Rock for Southern Calamari management). However, fishing effort has subsequently shifted to the north coast, including a number of new entrants who did not qualify for a licence to fish in the southeast.

Sharp declines and increases in recent catch and effort raise concerns about the sustainability of current fishing levels, especially since fishing activities target the species during its peak spawning period. Egg surveys conducted from 2016 on the north coast confirm that commercial catches are closely correlated with spawning activity, and that the historically highest catches in 2016/17 were followed by comparatively low abundance of eggs and thus spawning adults and catch in 2017/18 (Ewing et al. 2020). Although the roles of local environmental drivers of spawning activity are unclear, these current findings suggest that recruitment might be sensitive to the number of individuals left to reproduce in any given spawning season. Furthermore, Catch-MSY results provide new evidence of likely population depletion in previously targeted regions (south-east and east coast), which is indicative of the future trajectory of north coast populations that are subject to similar levels of fishing pressure in recent years.

On this basis, Southern Calamari in Tasmania is classified as a depleting stock.

Southern Garfish *(Hyporhamphus melanochir)*

STOCK STATUS	DEPLETED
Both catch and effort data for Southern Garfish showed an overall declining trend in recent years. Catch rates have fluctuated substantially but do show a recently reversing trend back to higher levels. However, given the schooling nature of the species, catch rates are unlikely to be a reliable proxy of abundance. In agreement with fisher perceptions, data-limited stock assessment methods suggest that recovery of the population under current levels of catch is theoretically possible, but empirical evidence for recovery is lacking.	
IMPORTANCE	Key
STOCK(S)	Tasmanian Scalefish Fishery
INDICATOR(S)	Catch, effort and CPUE trends; changes in size/age composition
Managing Jurisdiction	State (Tasmania)

Southern Garfish *(Hyporhamphus melanochir)*
Source: DPIPWE (by Peter Gouldthorpe)

Southern Garfish is endemic to southern Australia and inhabits shallow (≤20 m) inshore waters in association with seagrass beds (Gomon et al. 2008). Southern Garfish is a schooling species, feeding near the surface at night. Catches of the traditional winter beach seine fishery were centred off the Northeast coast, including Flinders Island. More recently, the fishery has extended to the East and Southeast coasts. Following the introduction of dip-nets, catches have also increasingly been taken over the summer months. Today, Garfish on the Northeast coast are caught mostly by beach seine while on the Southeast and East coasts they are caught mainly by dip-nets. More detailed information on biological characteristics and current management of Southern Garfish is available from the TasFisheriesResearch webpage.

Catch, effort and CPUE

At 10.7 t, the total commercial catch of Southern Garfish for 2019/20 was slightly higher than last year but still among the lowest on record. This follows a trend of declining landings since 2009/10 (Figure 34A). After many years of relative stability in Southern Garfish catches of 80–90 t per annum, catches fell sharply in 2006/07 and 2007/08. Catches then recovered to around 60 t before the current general decline commenced. Catches were generally concentrated off the northeast coast, but in contrast to the current year, commonly included some landings on the east coast (Figure 35).

Recreational Southern Garfish catches are low compared to commercial catches, estimated at around 2 t in 2000/01 (Henry and Lyle 2003), 2007/08 (Lyle et al. 2009) and 2012/13 (Henry and Lyle 2003; Lyle et al. 2014b) and only 300 kg in 2017/18 (Lyle et al. 2019).

Effort of both major commercial gear types has been steadily decreasing and reached historic lows in 2018/19, with a slight increase in 2019/20 (Figure 34B). Catch rates have fluctuated more substantially and with a notable peak in 2012/13 (Figure 34C). This peak was followed by a strong declining trend until 2017/18, which substantiated concerns about the status of Southern Garfish stocks. In the last two years, catch rates have stabilised or increased. Catch rates for dip-net remain close to the reference value, while those for beach seine are still reduced.

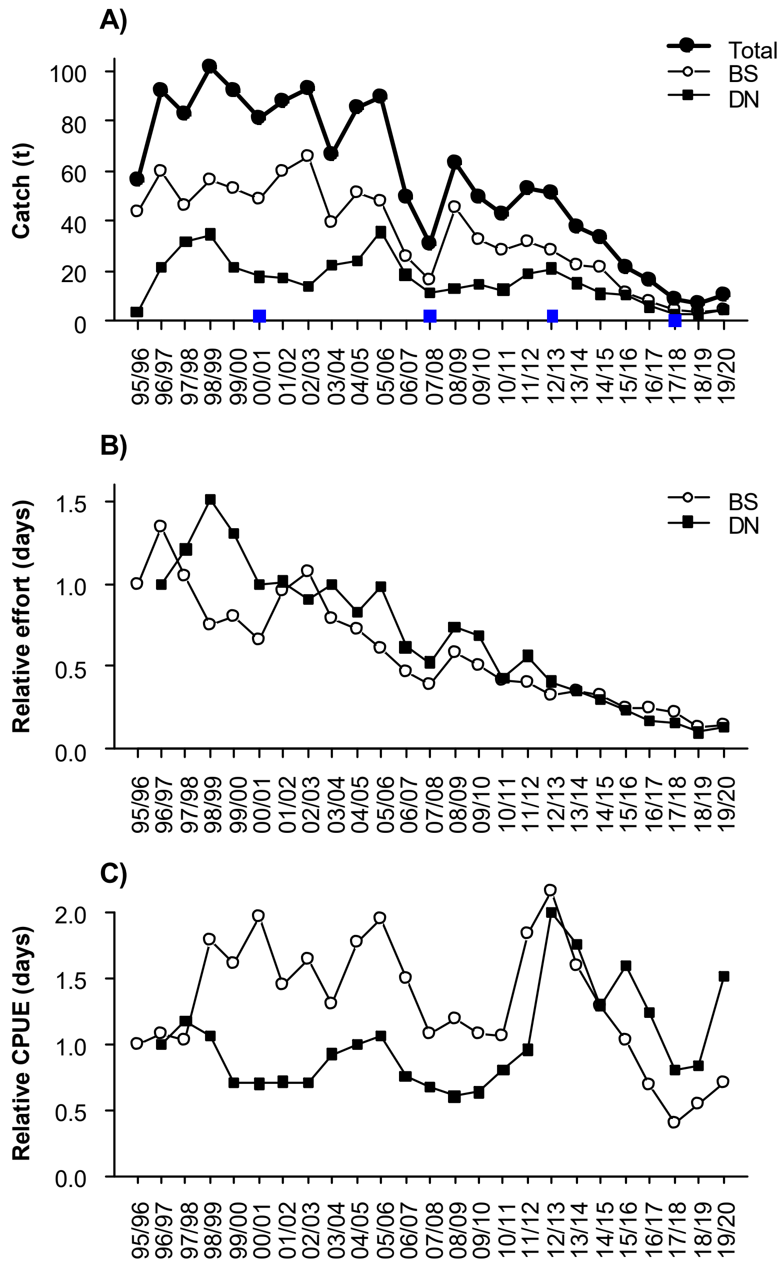


Figure 34 A) Annual commercial catch (t) by gear and best estimates of recreational catches (blue squares). B) Commercial effort by method based on day fished relative to 1995/96. C) Commercial catch per unit effort (CPUE) based on weight per day fished relative to 1995/96. BS=beach seine, DN=dip-net.

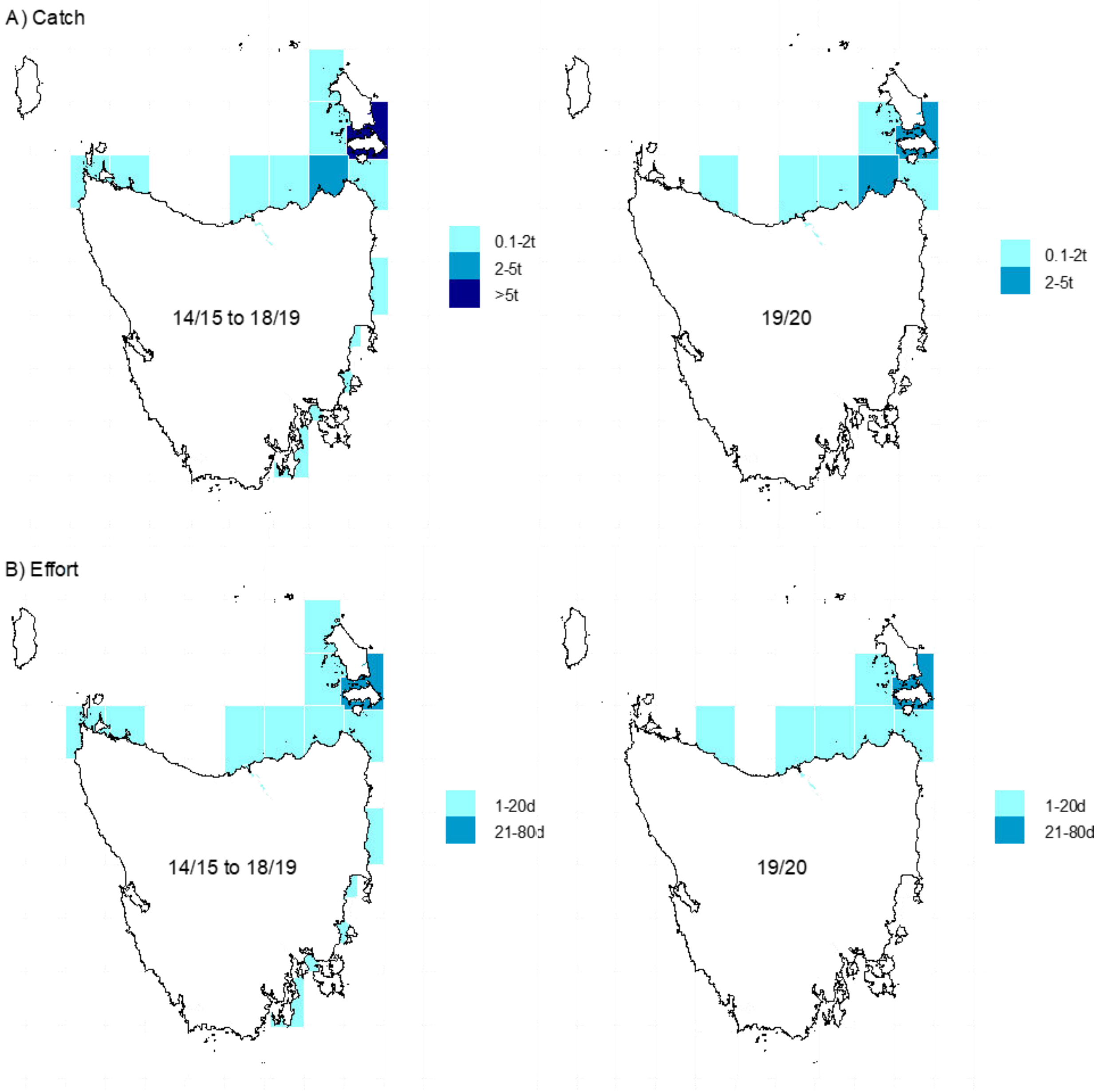


Figure 35 (A) Garfish catches (t) and (B) effort (days) for beach seine and dipnet by fishing blocks averaged over the last five assessment years (left) and in the current assessment year (right).

Catch-MSY results

Catch-MSY results based on the assumption of "medium" resilience suggest that Southern Garfish biomass should theoretically be recovering (Figure 36), with estimates of harvest rate and catch both well below estimates of corresponding sustainable limits (F_{target} = 0.21; MSY = 66.40) (Figure 37, Figure 38). Median estimates of biomass depletion peaked at 13% of unfished levels in 2015/16 (lower 90% CI = 7%) and should have theoretically recovered to 28% of unfished levels in 2019/20 (lower 90% CI = 8%) (Figure 36). However, empirical evidence of recovery is lacking.

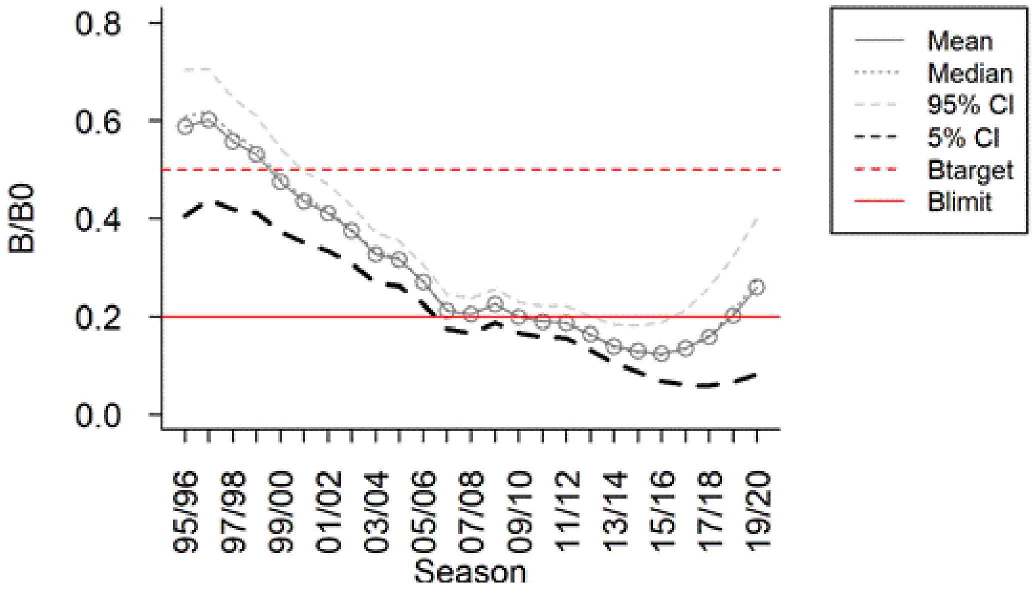


Figure 36 Trends in estimated biomass depletion (biomass divided by unfished biomass) and associated confidence intervals (CIs). The dotted red line marks a common target reference point, which is the biomass assumed to deliver the maximum sustainable yield (B_{target}). The continuous red line marks a limit reference point (B_{limit}).

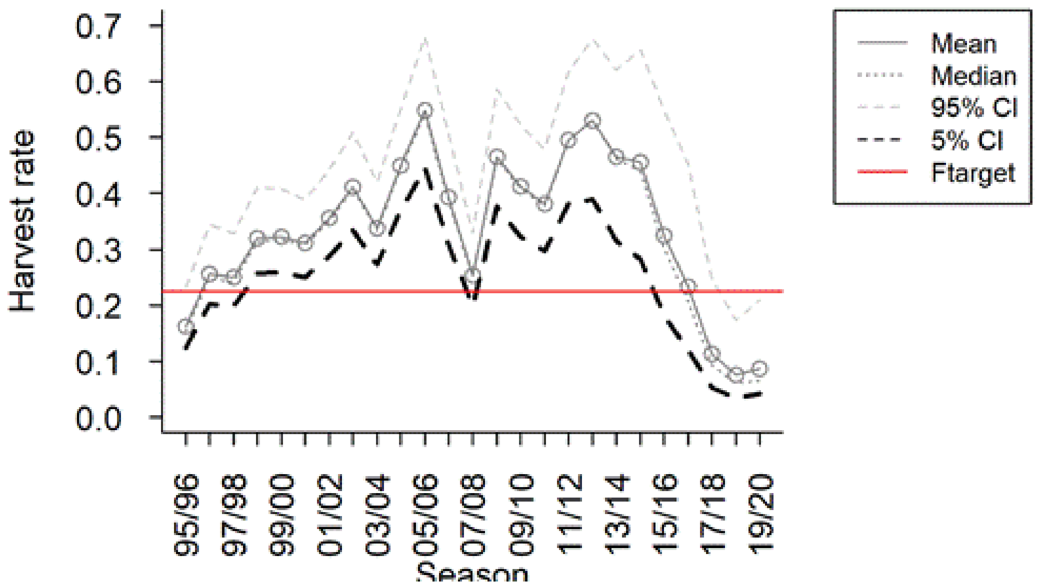


Figure 37 Trends in harvest rate and associated confidence intervals (CIs) relative to the estimated target fishing mortality (F_{target}).

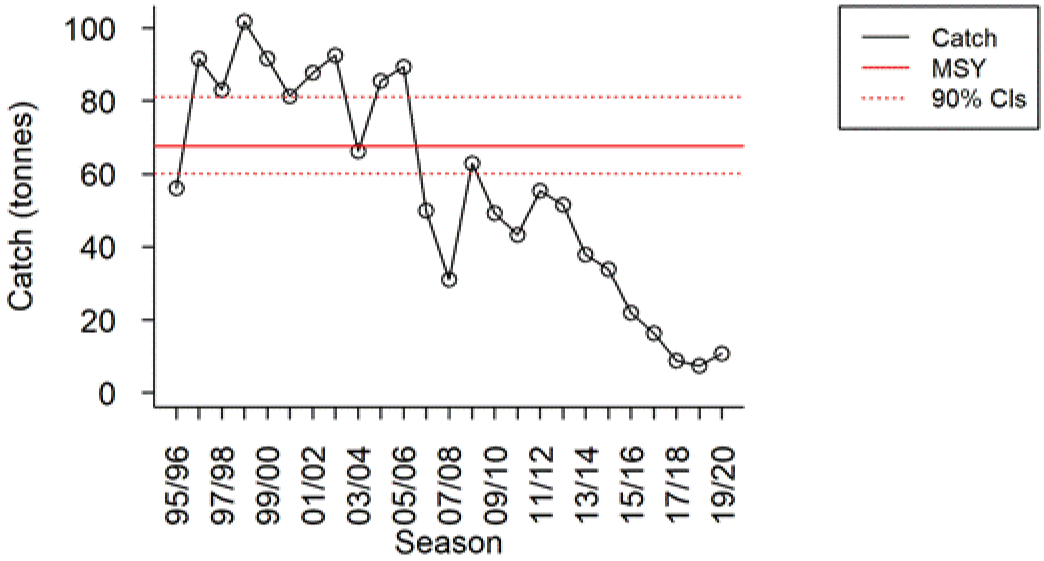


Figure 38 Trends in catch relative to the estimated maximum sustainable yield (MSY) and associated confidence intervals (CIs).

Risk-Based Framework Assessment

The Southern Garfish fishery scored < 60 in the RBF analysis, failing the assessment with high risk of stock damage. As a schooling species that inhabits the surface of the water column, the risk of encountering dip net and beach seine gear is high, and there is a high risk of immature fish being captured with the school. Detailed information on the scoring that led to this assessment outcome is available from the TasFisheriesResearch webpage.

Reference points

Performance indicators	Proposed reference points	Breached?	By how much?
Fishing mortality	• Catch > 3rd highest catch value from the reference period (91.7 t)	No	
	• Catch < 3rd lowest catch value from the reference period (66.2 t)	Yes	↓ 55.5 t (83.8%)
	• Catch variation from the previous year above the greatest inter-annual increase from the reference period (35.5 t)	No	
	• Catch variation from the previous year above the greatest inter-annual decrease from the reference period (-39.4 t)	No	
	• Latest recreational catch estimate > recreational catch estimate from the reference period (1.9 t)	No	
	• Proportion of recreational catch to total catch > previous proportion estimate (3.8% in 2012/13)	No	
Biomass	• CPUE< 3rd lowest CPUE value from the reference period (0.05 t/days fished)	Yes	↓ 0.0097 days fished (19.3%)
	• Rate of CPUE increase over the last 3 years is greater than the largest 3-year CPUE increase during the reference period (0.0075)	Yes	↑ 0.002 (26.6%)
	• Rate of CPUE decline over last 3 years is greater than the largest 3-year CPUE decline during the reference period (-0.0073)	No	

Stock status **DEPLETED**

Spawning closures introduced in 2009 appear to have initiated population recovery (increasing size and age in 2012), but subsequent declines in catches and catch rates suggest that any such assumed recovery was short-lived. Current fishing mortality is likely to exceed values estimated for the late 2000s, when catches dropped sharply and the stock was assumed to be in a depleted state (Reid 2018), implying that stock biomass has remained at depleted levels.

In general, the vulnerability of Southern Garfish to fishing pressure is likely to be moderate or high, considering: (1) the schooling behaviour of the species, which means that individuals can be effectively targeted even if stocks are depleted and that catch rates are thus unlikely to reflect abundance (hyperstability); and (2) that the species is short-lived and its Tasmanian populations are dominated by a few age classes, which makes them sensitive to recruitment variability. Based on the available evidence, Southern Garfish is therefore classified as depleted. However, recent trends in CPUE are positive and fishers seem to note a possible increase in availability.

Southern Sand Flathead *(Platycephalus bassensis)*

STOCK STATUS	**DEPLETING**
Recreational catches dominate landings of Southern Sand Flathead in Tasmania. Fishery independent surveys suggest relatively low abundances of legal sized fish in southeast and eastern Tasmania where populations are subject to heavy fishing pressure. While the increase in the minimum size limit in 2015 and a reduction in the bag limit seemed to reduce catches, current levels of fishing pressure, particularly on females, could still cause the stock to become recruitment impaired.	
IMPORTANCE	Key
STOCK(S)	Tasmanian Scalefish Fishery
INDICATOR(S)	Catch, effort and CPUE trends
Managing Jurisdiction	State (Tasmania)

Southern Sand Flathead *(Platycephalus bassensis)*
Source: DPIPWE (by Peter Gouldthorpe)

Southern Sand Flathead inhabit sheltered, shallow, coastal waters, typically over sand or silt (Edgar 2008). This is the most important species in the Tasmanian recreational fishery, with the most recent estimate of recreational harvest more than 85 times greater than the total commercial catch in 2019/20 (Lyle et al. 2019). Commercially, Southern Sand Flathead are caught primarily by handline, with some by-catch in the gillnet and Danish seine fisheries. The stock status for this species was classified Depleting in the 2018/19 Scalefish Fishery Assessment (Krueck et al. 2020). More detailed information on biological characteristics and current management of Southern Sand Flathead fisheries is available from the TasFisheriesResearch webpage.

Biological characteristics

Concerns surrounding the abundance of Southern Sand Flathead led to the establishment of an annual fishery-independent survey, which has been conducted since 2012 (Ewing and Lyle 2020). The survey uses fishing gear and targeting practices typical of recreational fishers in areas of significant effort, including the D'Entrecasteaux Channel, Norfolk Bay and Frederick Henry Bay, and Great Oyster Bay, with sampling occurring during February and March. Fishing was generally conducted over three (not necessarily consecutive) days per region with 19-21 standard sites fished in each region. The sampling sites represent a range of suitable habitats (including depths) for targeting Southern Sand Flathead, providing wide spatial coverage in each region.

Size composition

Length frequency histograms from the fishery-independent survey indicate that the majority of Southern Sand Flathead in the D'Entrecasteaux Channel and Norfolk Bay and Frederick Henry Bay were below the minimum size limits, which indicate a low abundance of legal sized fish. Fish caught in Great Oyster Bay during previous surveys typically showed a higher proportion of legal sized fish than other regions. However, catches in the 2020 survey at Great Oyster Bay showed a lower proportion of legal sized fish than any other year (Figure 39).

Age composition

Age frequency histograms from the fishery-independent survey indicate that fish younger than five years old represent the dominant age classes of Southern Sand Flathead, especially in the D'Entrecasteaux Channel, Norfolk Bay and Frederick Henry Bay (Figure 40). Older age classes up to 12 years tend to be rare in all regions, but in previous surveys were least obviously so in Great Oyster Bay, where large fishes above the legal size limit were most common. However, in the 2020 survey, catches in Great Oyster Bay showed a relative rarity of older, legal sized fish. It is further evident that the abundance and proportion of females declines notably in the older age classes most likely reflecting an earlier fishery exposure due to the faster growth of females.

Mortality

Estimates of fishing mortality F from the period prior to the increase in the minimum size limit (2012–2015), after the expected recovery period (2017–2018), and in the last two assessment years (2019–2020) are presented in (Table 2) below. The overall fishing mortality rate for females was highest prior to the increase in the minimum size limit (over three times natural mortality (M)) but has stabilised at a lower level (about two times M) in subsequent years (Table 2). Fishing mortality for males has tended to remain stable through time, at a rate slightly higher than M. While there is some regional variability in mortality rates the trends through time are relatively consistent.

Table 2 Sand Flathead fishing mortality estimates (F) by region for the years prior to the increase in the minimum size limit, the years following the increase, and in the last two survey seasons. DEC=D'Entrecasteaux Channel region, FHNB=Frederick Henry-Norfolk Bay region, GOB=Great Oyster Bay region. Z is total mortality derived from catch curves, M is the mean of two estimates of natural mortality (Hoenig and Lawing 1982; Ewing et al. 2014), F is fishing mortality [Z – (mean of 2 estimates for M)]. Parameters with a 2012–15 subscript represent mortality prior to the increase in the MSL, the 2017/18 subscript represents mortality just after the recovery period, and the 2019/20 subscript represents mortality in the last two years.

Parameter	DEC		FHNB		GOB	
	Fem	Male	Fem	Male	Fem	Male
M_{Mean}	0.2	0.2	0.20	0.20	0.20	0.20
$Z_{2012-15}$	0.90	0.46	0.92	0.44	0.67	0.42
$Z_{2017/18}$	0.70	0.54	0.92	0.45	0.68	0.29
$Z_{2019/20}$	0.73	0.46	0.80	0.48	0.66	0.42
$F_{2012-15}$	0.70	0.26	0.72	0.24	0.47	0.24
$F_{2017/18}$	0.50	0.34	0.72	0.25	0.48	0.09
$F_{2019/20}$	0.53	0.26	0.60	0.28	0.46	0.22
Δ_{age}	1.65	-	1.82	-	1.54	-

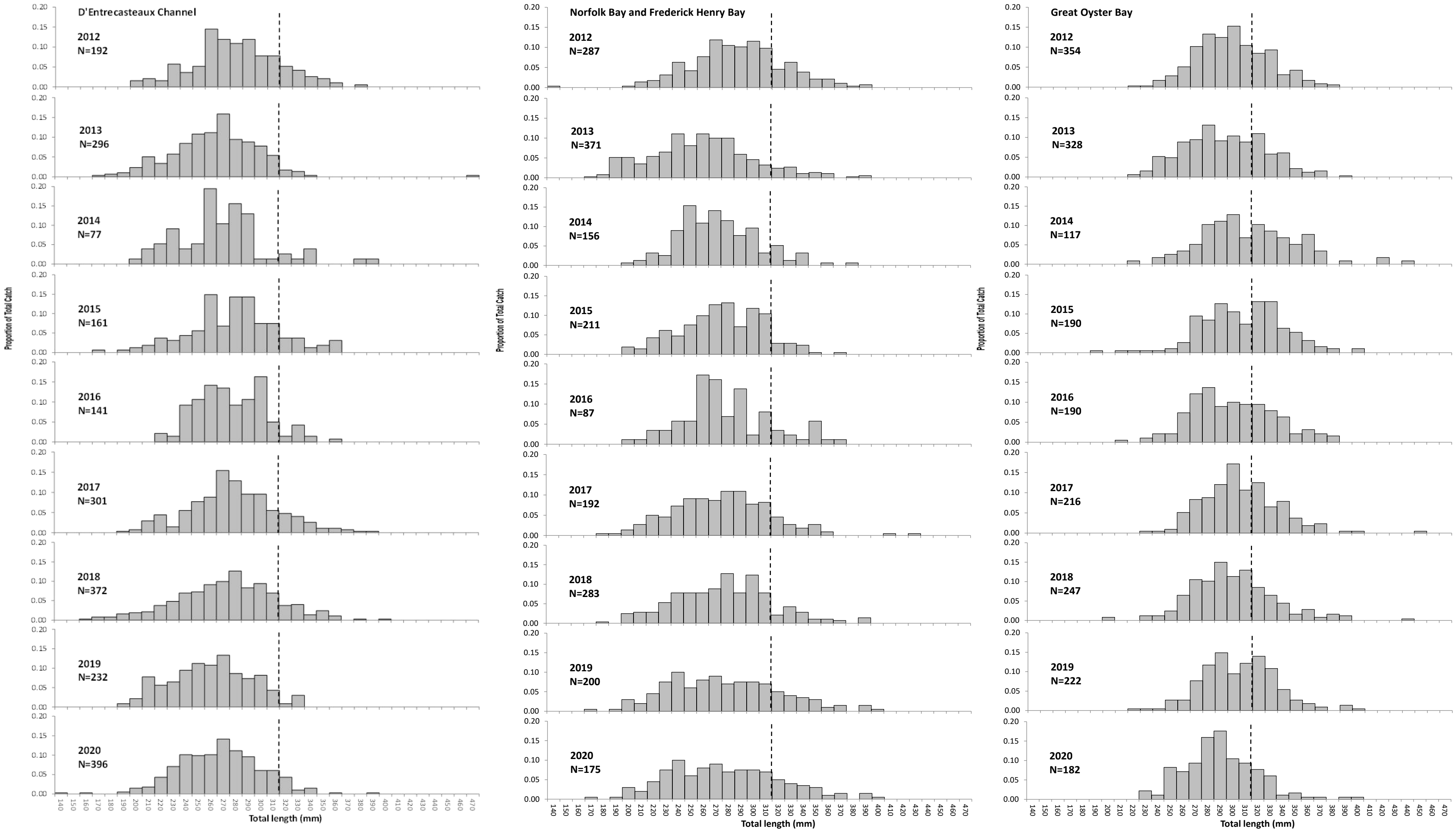


Figure 39 Length frequency histograms for Southern Sand Flathead captured in (1) D'Entrecasteaux Channel (left), (2) Norfolk and Frederick Henry Bay (centre), and (3) Great Oyster Bay (right). Dotted lines indicated minimum legal size limits (300 mm applied to 2015, 320 mm thereafter).

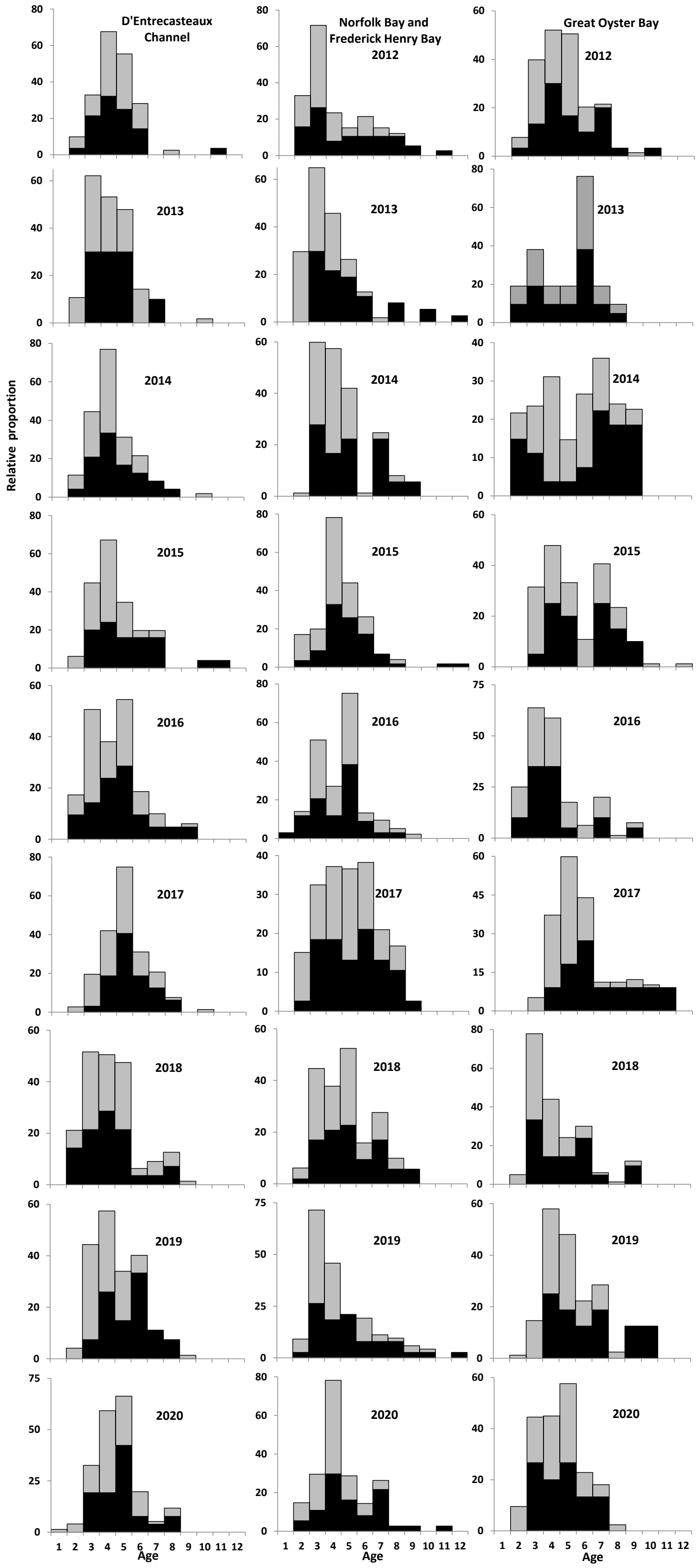


Figure 40 Age frequency histograms for aged Southern Sand Flathead in (1) D'Entrecasteaux Channel (left), (2) Norfolk and Frederick Henry Bay (centre), and (3) Great Oyster Bay (right). The black bars indicate males and grey bars indicate females.

Survey-based CPUE

Catch rates in each of the regions initially declined to their lowest levels between 2014 and 2016 before recovering to levels comparable to, or greater than, those in 2012 (Figure 41). By comparison with 2019, catch rates were higher in the D'Entrecasteaux Channel but substantially lower than in Frederick Henry-Norfolk Bay and Great Oyster Bay regions (Figure 41).

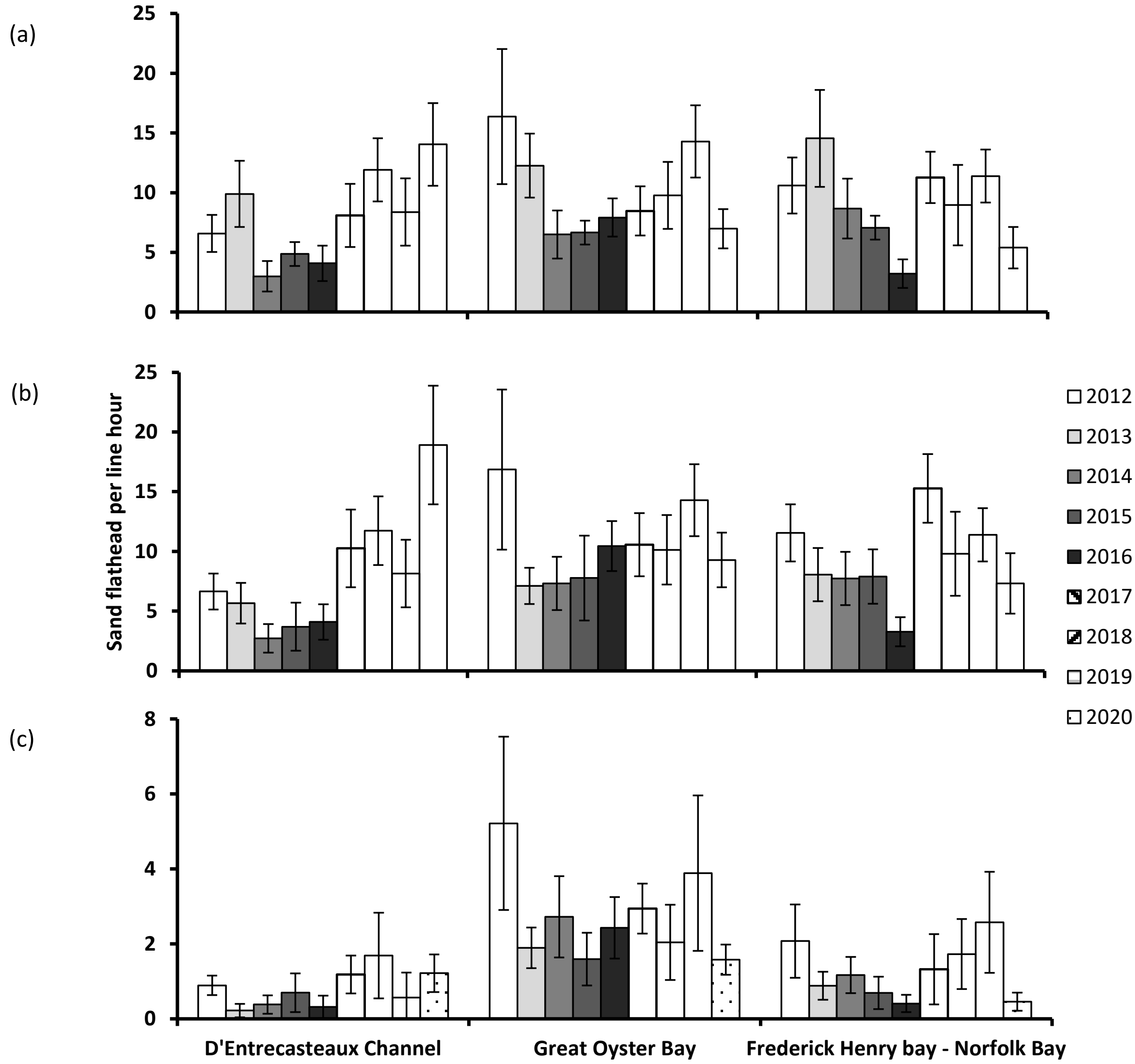


Figure 41 Mean catch rates (fish per line hour) by region and year for Sand Flathead: (A) raw catch rates; (B) standardised catch rates; (C) standardised catch rates for fish above the 320mm MLS. Error bars represent 95% confidence intervals.

Commercial catch, effort and CPUE

The commercial fishery for Flathead has not undergone major changes in its operations since 1995/96. It was therefore possible to back calculate catches for Southern Sand Flathead prior to 2007 (when the two main flathead species were not distinguished) based on the average proportion of species by gear type from 2007/08 to 2011/12 (Figure 42). Southern Sand Flathead catches remained relatively stable until 2008/09 but have generally declined since then reaching an historical low of 2.1 t in 2019/20 (Figure 42), down from 3.5 t and 2.8 t in the previous two years. In the last two years, almost all Southern Sand Flathead catch was taken by handline on the east, southeast, and northwest coasts (Figure 43, Figure 44).

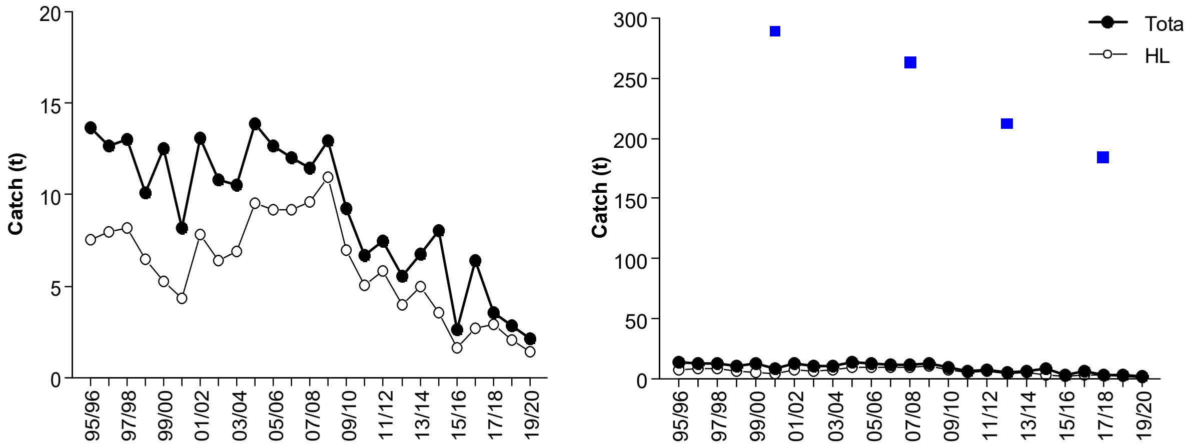


Figure 42 Back-calculated annual commercial catch (t) for Southern Sand Flathead (left). The second graph on the right shows the same data but highlighting in blue squares the dominance of recreational catches estimated for this species (right). HL=handline (catches taken by other methods are not shown).

Handline fishing effort declined over the last three years, and in combination with declining catches, resulted in declining catch rates (Figure 43). However, commercial catches of this species are negligible when compared to estimates for the recreational sector. For all flathead species combined, recreational catches were estimated at 361 t in 2000/01 (Lyle 2005), 292 t in 2007/08 (Lyle et al. 2009) and 235.9 t in 2012/13 (Lyle et al. 2014b), representing approximately 90% Southern Sand Flathead. In 2017/18, the recreational fishing survey for the first time considered the two flathead species separately. The recreational catch of Southern Sand Flathead was estimated at 184.3 t, which was appr. 92% of the estimated total for both species (Lyle et al. 2019).

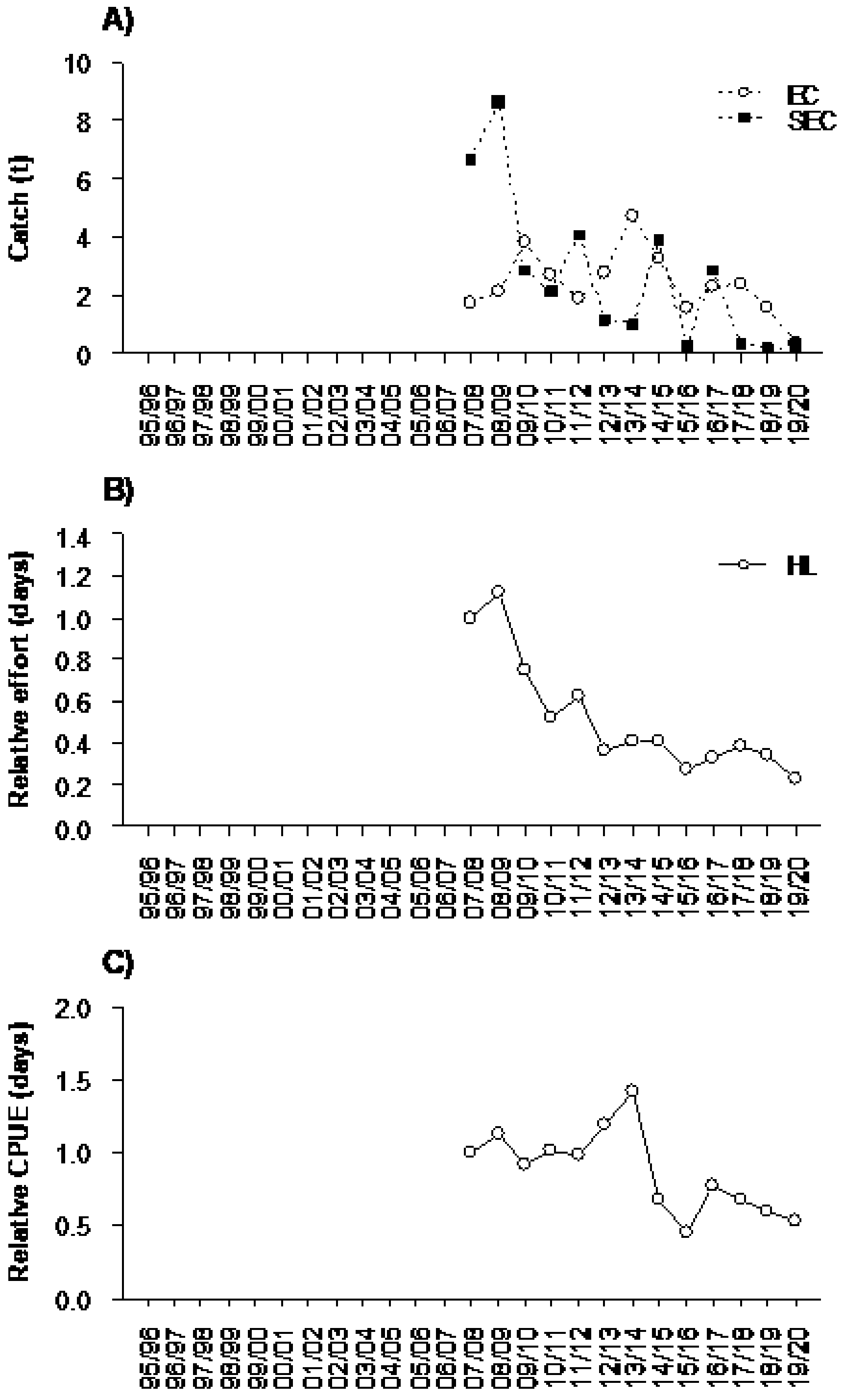


Figure 43 A) Southern Sand Flathead annual commercial catch by region. B) Southern Sand Flathead commercial effort by method based on gear units relative to 2007/08. C) Southern Sand Flathead commercial catch per unit effort (CPUE) based on weight per gear unit relative to 2007/08. HL=hand-line, SEC=southeast coast, EC=east coast.

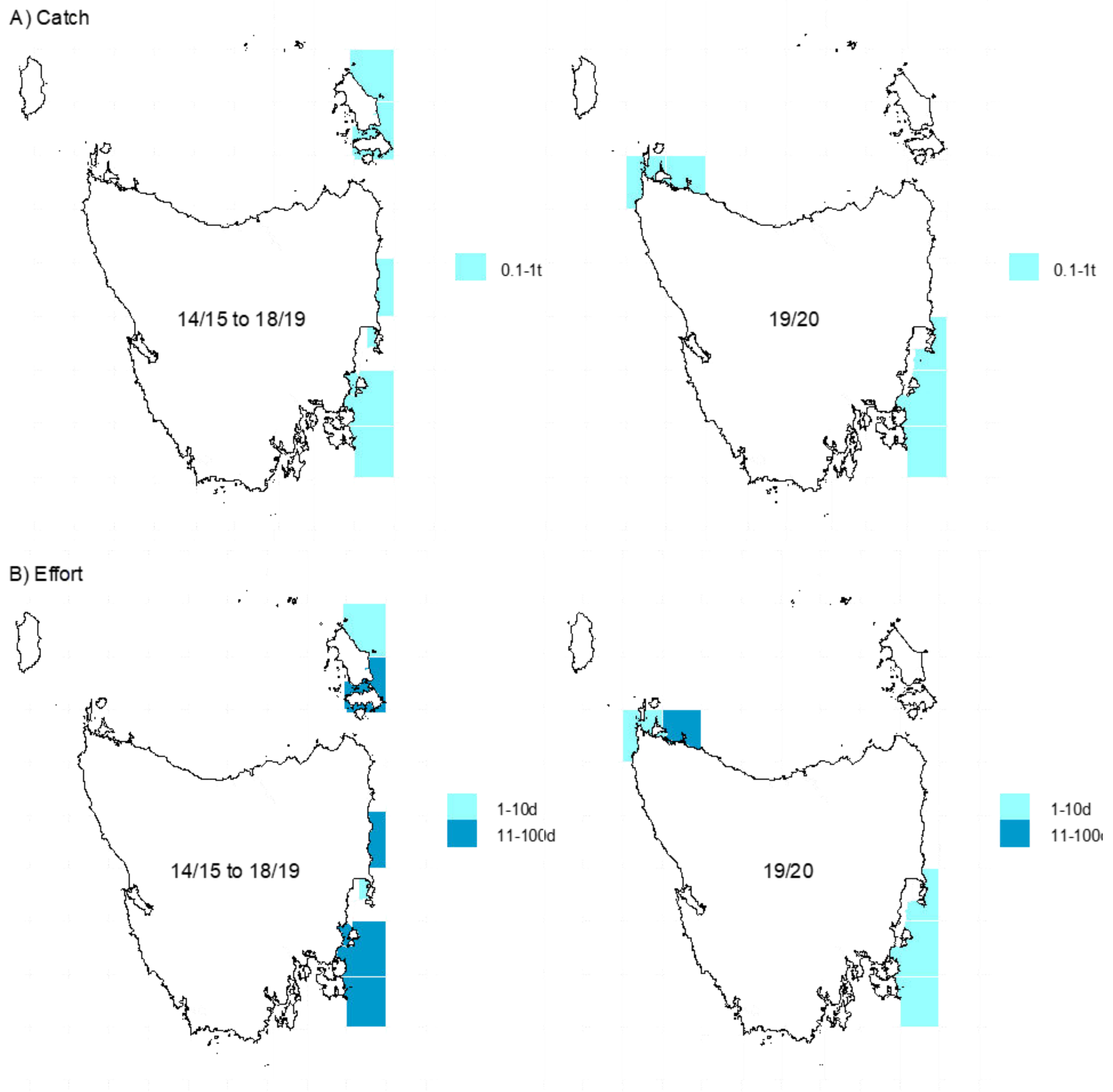


Figure 44 (A) Southern Sand Flathead catches (t) and (B) effort (days) by fishing blocks averaged over the last five assessment years (left) and in the current assessment year (right).

Risk-Based Framework Assessment

The Southern Sand Flathead fishery scored < 60 in the RBF analysis, failing assessment with high risk of stock damage. Southern Sand Flathead is heavily fished on its preferred habitat and may be considered a fully exploited species in Tasmania, with evidence of damage to the population size, reproductive capacity, age/size/sex structure, and geographic range of the stock. Detailed information on the scoring that led to this assessment outcome is available from the TasFisheriesResearch webpage.

Reference points (Flathead species combined)

Performance indicators	Proposed reference points	Breached?	By how much?
Fishing mortality	• Catch > 3rd highest catch value from the reference period (63.1 t)	No	
	• Catch < 3rd lowest catch value from the reference period (50.5 t)	Yes	↓ 32 t (63.4%)
	• Catch variation from the previous year above the greatest inter-annual increase from the reference period (43.5 t)	No	
	• Catch variation from the previous year above the greatest inter-annual decrease from the reference period (-31.9 t)	No	
	• Latest recreational catch estimate > recreational catch estimate from the reference period (361 t)	No	
	• Proportion of recreational catch to total catch > previous proportion estimate (85.5% in 2012/13)	No	
Biomass	• CPUE< 3rd lowest CPUE value from the reference period (0.013 t/days fished)	No	
	• Rate of CPUE decline over last 3 years is greater than the largest 3-year CPUE decline during the reference period (-0.0020)	No	

Stock status	**DEPLETING**

The main impact on Southern Sand Flathead stocks is from the recreational sector with commercial catches estimated to represent less than 2% of the combined total catch. Due to an absence of targeting among commercial fishers, a Southern Sand Flathead fishery-independent survey commenced in 2012 to support the assessment of this species.

The survey over recent years has identified a low relative abundance of legal-size fish in the D'Entrecasteaux Channel, Frederick Henry-Norfolk Bay, and Great Oyster Bay, suggesting that stocks in the main fishing areas are depleted. In late 2015, various management changes were introduced to improve the status of this species including: (1) an increase in the minimum size limit from 300 mm to 320 mm, and the introduction of (2) a daily bag limit of 20 per fisher and (3) a possession limit of 30 per fisher. Estimates of fishing mortality and catch rates suggest that these management measures have likely started to initiate stock recovery. However, fishing mortality of females remains high and close monitoring is required for more in-depth analysis of the extent of this assumed stock recovery. With current fishing pressure still high and potentially causing the stock to become recruitment impaired, Southern Sand Flathead remains classified as depleting.

Striped Trumpeter *(Latris lineata)*

STOCK STATUS	DEPLETED
Following records of young fish in biological samples in the last two seasons, evidence of population recovery of Striped Trumpeter is still lacking. In 2019/20, reference points for low commercial catch, high recreational catch, and a high proportion of recreational catch were triggered. Commercial catches are close to the historical low, but total levels of fishing pressure (commercial and recreational combined) could still be too high to allow for recovery, especially since the minimum size limit is below the estimated size at maturity. More data are needed to clarify population status and trends.	
IMPORTANCE	Key
STOCK(S)	Tasmanian Scalefish Fishery, Commonwealth fisheries
INDICATOR(S)	Catch, effort and CPUE trends
Managing Jurisdiction	State (Tasmania)

Striped Trumpeter *(Latris lineata)*
Source: DPIPWE (by Peter Gouldthorpe)

Striped Trumpeter is a relatively large and long-lived species. Juveniles inhabit shallow inshore reefs moving offshore with maturity to deeper exposed reefs ≤ 300 m (Edgar 2008; Gomon et al. 2008). Striped Trumpeter are mainly caught offshore using handline, with some offshore dropline and inshore gillnet use. Management of Striped Trumpeter stocks has changed significantly over time, incorporating Tasmanian commercial operators and Commonwealth operators. Trip limits and a temporal closure during spawning are currently in place, however the minimum legal size is below the size at maturity and the population of Striped Trumpeter is generally aging. More detailed information on biological characteristics and current management of Striped Trumpeter fisheries is available from the TasFisheriesResearch webpage.

Length frequency composition

The length frequency distribution of Striped Trumpeter has been monitored since 1998/99. Sampling has been limited and opportunistic in some years, and consequently, some samples are unlikely to adequately represent population dynamics. Overall, there appears to have been a shortage of small fish (recruitment) up until 2009/10 (Figure 45). In 2009/10, new recruits appear to have entered the fishery, which has clearly contracted the range and median of lengths. From 2012/13 onwards, length frequency distributions have started to flatten again. The stabilising trend indicates an ageing population similar to the years before 2009/10, albeit with evidence of recruitment of smaller individuals in recent years (Figure 45).

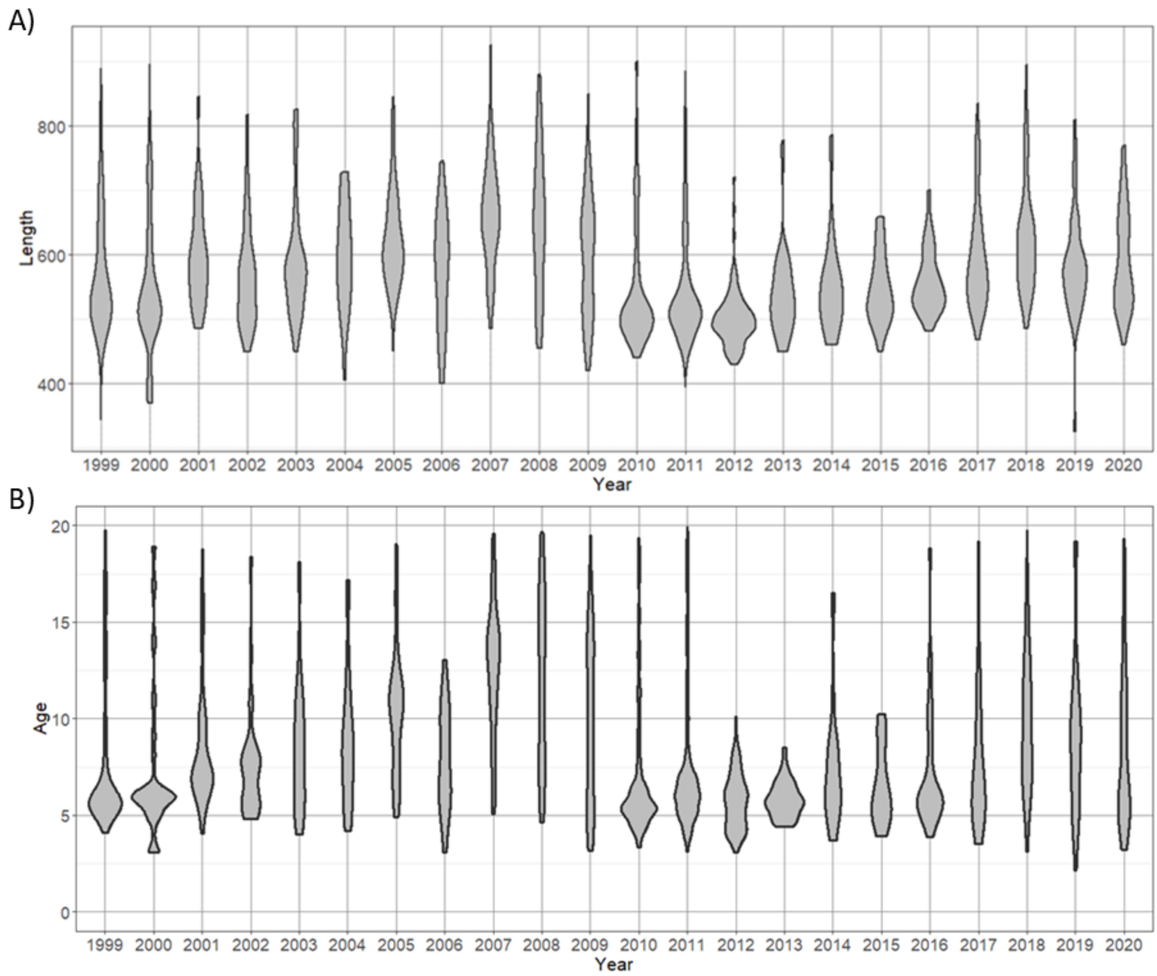


Figure 45 A) Striped Trumpeter length composition from 1998/99 (1999) to 2019/20 (2020) sampled from both commercial and recreational catches. Length is fork length in mm. B) Striped Trumpeter age composition between 1998/99 (1999) and 2019/20 (2020) sampled from both commercial and recreational catches. Note that, for clarity, the graph excludes individuals older than 20 years of age, which accounted for 4.6% of all samples.

Age frequency composition

As expected, age data showed trends very similar to length data, revealing an increasing lack of young individuals (3–5-year-olds) up until 2009/10 (Figure 45). During this period, the population might have been sustained largely by strong year classes recruited during the 1990s. In 2009/10, new recruits appear to have contracted the age frequency distribution similarly to what was observed in the 1990s. Samples up until 2015/16 were then dominated by 4–6-year-olds, which is the age at which the species tends to recruit to the offshore line fishery. However, the relative strength of cohorts in samples is unknown and the number of individuals sampled between 2012/13 and 2015/16 was low. Previous assessments suggested that the adult segment of the population is likely to remain in a depleted state due to continued fishing under a lack of recruitment over many years. Some young fish have entered the population in recent years, but there is an overall trend of an ageing population similar to that observed in the years before 2009/10 (Figure 45).

Mortality and Spawning Potential

Using Poisson regression in R (‘fishmethods’ package) applied to age data for Striped Trumpeter, total mortality (Z) was estimated at 0.17, averaging 0.22 ± 0.20 (mean ± SD) across years. Assuming a maximum age of 43 years, natural mortality (*M*) has previously been estimated at 0.096 (using the equation of Hoenig and Lawing (1982); (Tracey and Lyle 2005)), which indicated that fishing mortality (*F* = *Z* -*M*) relative to natural mortality (*F*/*M*) averaged approximately 1.32 ± 2.1. Massive standard deviation around this estimate can be explained by a combination of large variation in sample sizes across years, including opportunistic coverage of sampling regions.

These regression-based results for *F/M* ratios were overall similar to those estimated using the length-based spawning potential ratio (LBSPR) approach. The SPR is defined as the fraction of lifetime egg production or spawning biomass per recruit relative to unfished levels. LBSPR was run based on default settings using the associated 'LBSPR' package in R, and by including von Bertalanffy parameters estimated using R packages 'fishmethods' and 'gfplot', size selectivity parameters estimated using R package 'TropFishR', and length at maturity estimated using published models (Tracey et al. 2007). LBSPR results indicated that pooled length samples masked important differences in population status and mortality among regions and, to a lesser extent, sex. However, due to a high level of uncertainty about LBSPR results, preliminary estimates of the SPR and relative fishing mortality are shown here only for the most intensely sampled region in the south-east of Tasmania (Figure 46).

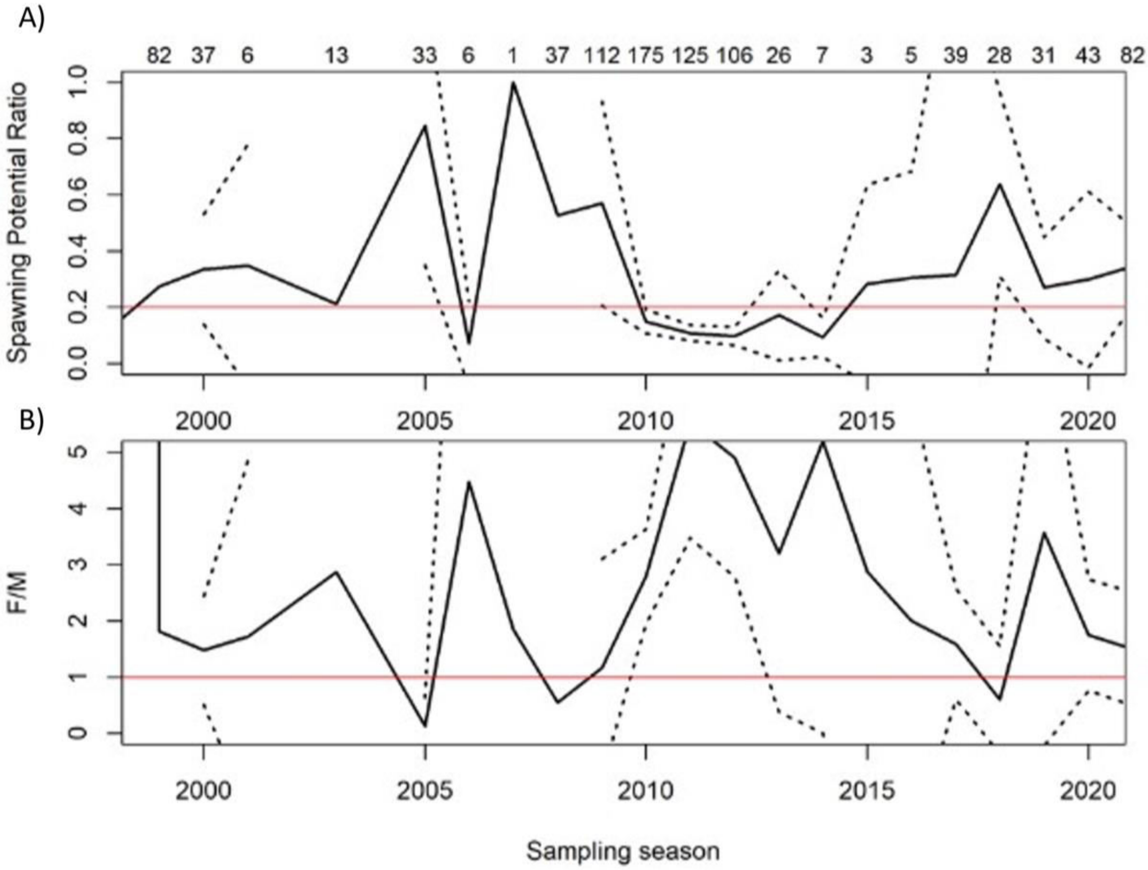


Figure 46 Annual estimates of the spawning potential ratio (A) and of fishing mortality relative to natural mortality (*F/M*) (B) based on length-frequency data of Striped Trumpeter sampled from the south-east coast between 1998/99 (1999) and 2020/21 (2021). Dotted lines indicate 90% confidence limits. Sample sizes per year are given above the plot. Red lines highlight widely adopted limit reference points to assess whether the spawning potential of a stock falls below critical levels (20% of unfished levels). Note that the y-axis in (B) was cropped at a value of 5.

LBSPR results for the south-east coast revealed that the key period during which length samples yielded finite confidence intervals above or below common limit reference points was in the early 2010s, when sample sizes exceeded 100 and length-frequencies included relatively high numbers of small and young individuals. The estimated SPR during these years was below 0.2, indicating that Striped Trumpeter stocks fished in this region could be depleted below the commonly adopted limit reference point of 20% of unfished levels. Estimates of relative fishing mortality during the early 2010s were above presumably sustainable levels of 1 (Figure 46B).

We note that even for the south-east coast samples sizes per year were generally below minimum numbers (n = 100) and never close to recommendable numbers (n = 1000) required to expect reliable assessment outcomes. Thus, more comprehensive and regionally representative data on length frequencies are needed to corroborate our preliminary findings. Additional analyses that relax some of the inherent assumptions of the LBSPR approach (e.g., asymptotic selectivity) are also recommended.

Catch, effort and CPUE

The more recent catch history in waters south of latitude 39° 12'S (i.e., waters incorporated within the OCS agreement for Striped Trumpeter) shows significant catches by Victorian vessels, peaking at around 37 t in the early 1990s (Table 3). Since the mid-1990s, data from this sector have been unavailable, though it is assumed that subsequent catches have been reported in Commonwealth logbooks. Excepting years around 1999/2000, Commonwealth catches have been comparatively low with generally less than 5 t caught.

Total annual production was highest at over 110 t in the early 1990s with Victorian vessels accounting for 17–39% of this total, but then fluctuated between 70–80 t through the mid-1990s before increasing again to over 100 t by the late 1990s (Table 3). Catches almost halved in 2000/01 to less than 50 t and have remained low since that time. This trend was observed across fishing methods in Tasmania (Figure 47A). In 2015/16, the total catch fell to an historic low of 7.1 t. After slight increases in 2016/17 and 2017/18, total catch fell to 7.1 again in 2018/19. In the current season, total catch increased slightly to 7.8 t.

The Commonwealth catch reported in 2019/20 was 1 t, but catches are believed to have been substantially underreported in the past. Coupled with limited information on recreational catches, this situation represents a major source of uncertainty in estimating mortality.

The recreational fishery has heavily targeted Striped Trumpeter in the past with an estimated 38 t caught in 2000/01 (Lyle 2005) and an uncertain combined catch of 19 t for both Striped and Bastard Trumpeter in 2007/08 (Lyle et al. 2009). The most recent estimates for Striped Trumpeter in 2011/12, 2012/13 and 2017/18 are 31.9 t, 15.2 t and 29.1 t, respectively (Lyle et al. 2014b; Lyle et al. 2019), which all substantially exceeded the commercial catch of the species in these years (Figure 47A). Notably, recreational catch estimates do not fully represent catches by charter boats.

Table 3 Annual commercial catches of Striped Trumpeter (t) south of latitude 39° 12'S. Data based on Tasmanian (General Fishing return), Victorian and Commonwealth catch returns.

	Catch (t)			
Year	Tasmania	Victoria	Commonwealth	Combined
1990/91	74.5	37.1		111.6
1991/92	58.2	36.8		95.0
1992/93	52.7	19.8		72.5
1993/94	56.5	16.0		72.5
1994/95	72.4	14.6		87.0
1995/96	60.3			60.3
1996/97	79.7		0.7	80.4
1997/98	75.4		5.7	81.1
1998/99	98.4		8.9	107.4
1999/2000	86.3		14.5	101.8
2000/01	41.2		7.5	49.6
2001/02	40.0		4.8	44.9
2002/03	36.8		3.2	40.0
2003/04	36.8		3.7	40.5
2004/05	24.0		2.2	26.2
2005/06	19.1		4.7	23.8
2006/07	18.8		3.5	22.3
2007/08	13.1		3.0	16.1
2008/09	10.5		2.8	13.3
2009/10	10.0		2.3	12.3
2010/11	15.0		4.8	19.8
2011/12	15.9		5.4	21.3
2012/13	12.3		5.1	17.4
2013/14	8.0		2.5	10.5
2014/15	9.6		3.4	13.0
2015/16	6.0		1.1	7.1
2016/17	8.3		4.0	12.3
2017/18	7.8		6.3	14.1
2018/19	4.5		2.6	7.1
2019/20	6.8		1.0	7.8

Striped Trumpeter catches have historically been reported from all areas around the state. Fishing activity in 2019/20 was focused mainly on the southeast and southwest coasts (Figure 48).

Catch trends appear to reflect the influence of strong year classes assumed to have entered the fishery before 1998/99. This was followed by a lack of recruitment and associated declines in catches in the early 2000s. Industry representatives suggest that the trip limit of 250 kg from 2000 provided a disincentive for operators to target the species, which might have contributed to the continued reduction in dropline and handline effort since 2000/01 (Figure 47B).

Catch rates for handline and dropline, as the currently dominant gear types, have been variable, but with downward trend in recent years. Catch rates for handline were at a historic low point in 2018/19, with a notable increase in the current year (Figure 47C).

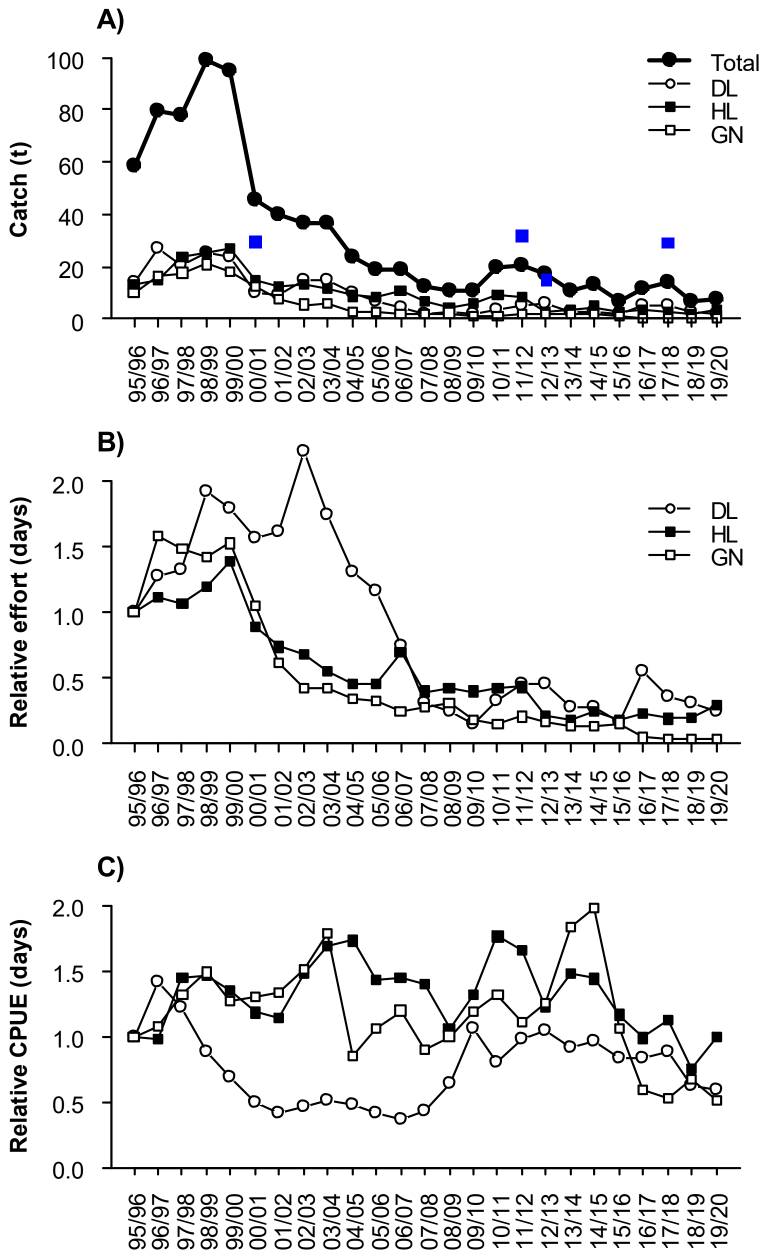


Figure 47 A) Annual commercial catch (t) by gear and best estimates of recreational catches (blue squares). B) Commercial effort by method based on day fished relative to 1995/96. C) Commercial catch per unit effort (CPUE) based on weight per day fished relative to 1995/96. HL=handline, GN=gillnet, DL=dropline. Data includes Australian Fisheries Management Authority (AFMA) catch in state waters.

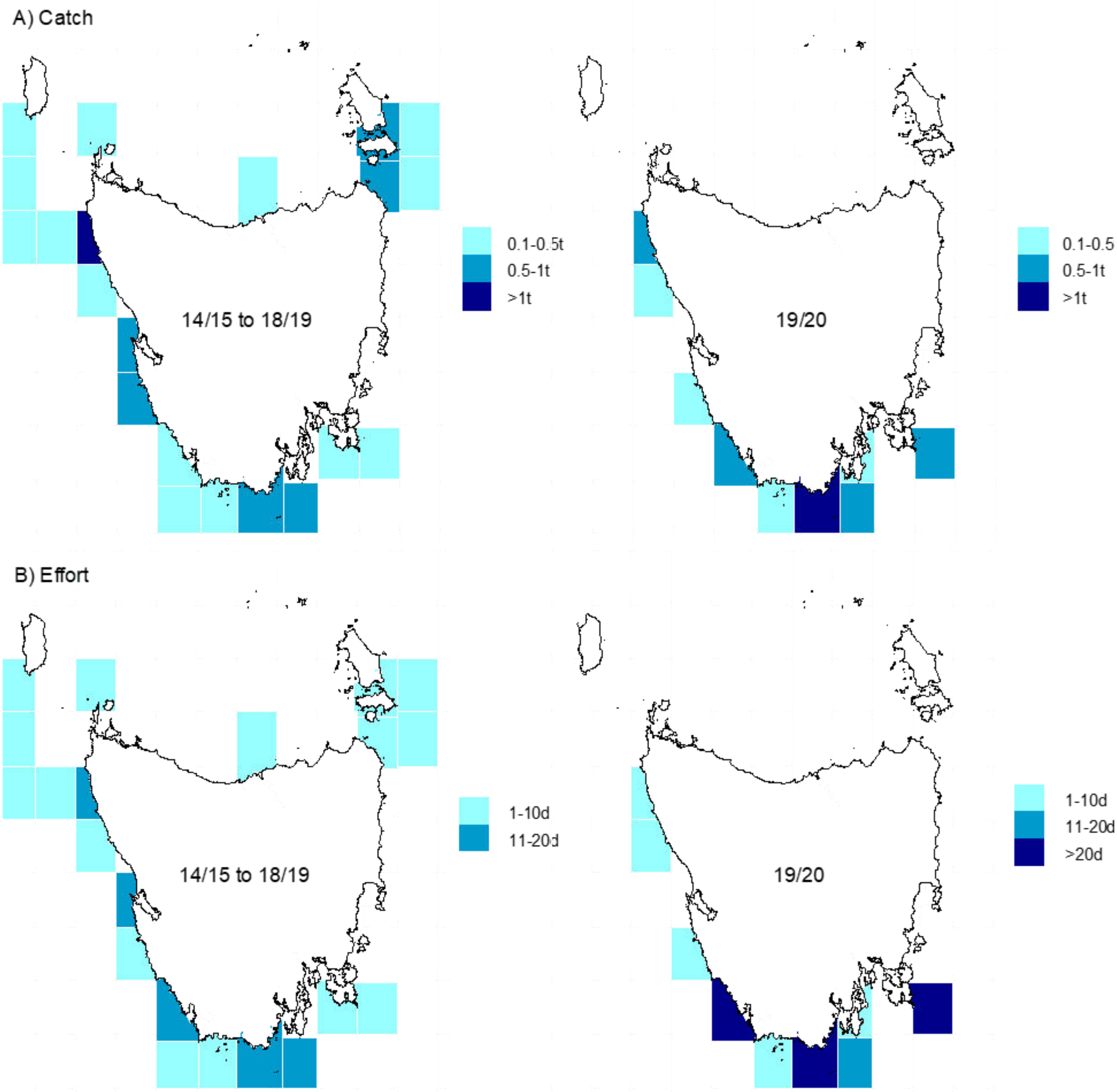


Figure 48 (A) Striped Trumpeter catches (t) and (B) effort (days) for dropline, handline and gillnet by fishing blocks averaged over the last five assessment years (left) and in the current assessment year (right). Data includes Australian Fisheries Management Authority (AFMA) catch in state waters.

Catch-MSY results

Catch-MSY results based on the assumption of "very low" resilience suggest that Striped Trumpeter biomass could be depleted (Figure 49), with estimates of harvest rate and catch both below estimates of corresponding sustainable limits (F_{target} = 0.04; MSY = 20.70) (Figure 50, Figure 51). Median estimates of biomass depletion peaked at 20% of unfished levels in 2013/14 (lower 90% CI = 10%) with depletion estimates at 23% of unfished levels in 2019/20 (lower 90% CI = 7%) (Figure 49).

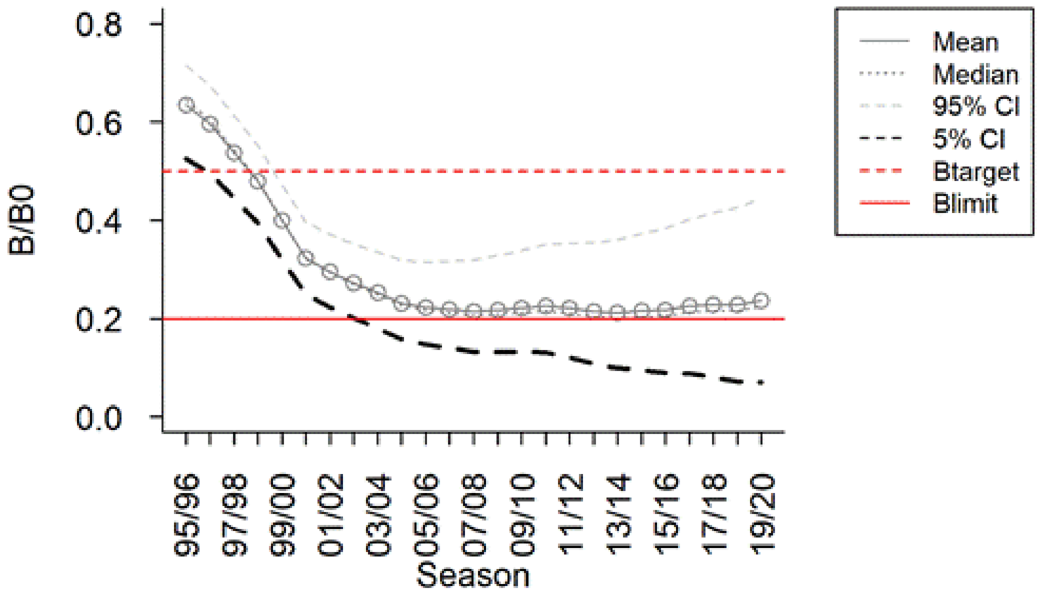


Figure 49 Trends in estimated biomass depletion (biomass divided by unfished biomass) and associated confidence intervals (CIs). The dotted red line marks a common target reference point, which is the biomass assumed to deliver the maximum sustainable yield (B_{target}). The continuous red line marks a limit reference point (B_{limit}).

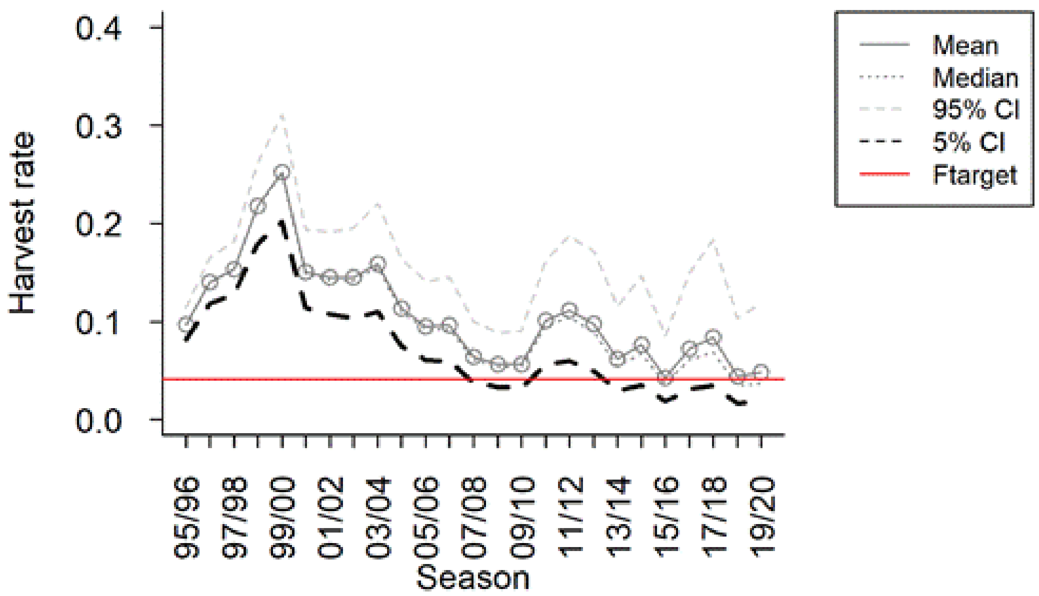


Figure 50 Trends in harvest rate and associated confidence intervals (CIs) relative to the estimated target fishery mortality (F_{target}).

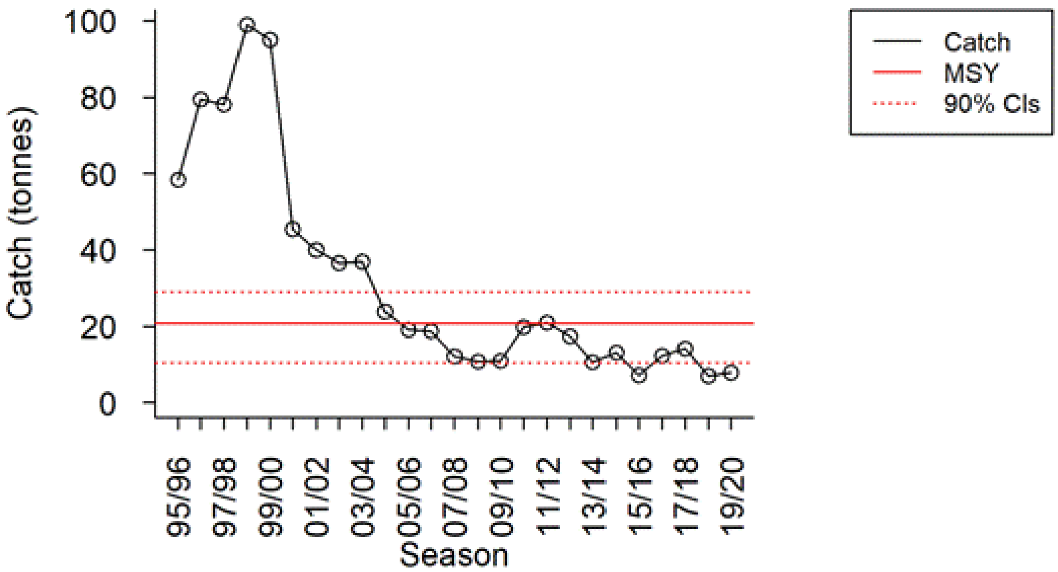


Figure 51 Trends in catch relative to the estimated maximum sustainable yield (MSY) and associated confidence intervals (CIs).

Risk-Based Framework Assessment

The Striped Trumpeter fishery scored < 60 in the RBF analysis, failing assessment with high risk of stock damage. The minimum legal size limit for Striped Trumpeter in Tasmania is below the species' size at maturity and the age structure of the stock suggests recruitment dynamics are at high risk of continued damage. Detailed information on the scoring that led to this assessment outcome is available from the TasFisheriesResearch webpage.

Reference points

Performance indicators	Proposed reference points	Breached?	By how much?
Fishing mortality	• Catch > 3rd highest catch value from the reference period (79.4 t)	No	
	• Catch < 3rd lowest catch value from the reference period (23.9 t)	Yes	↓ 16 t (67%)
	• Catch variation from the previous year above the greatest inter-annual increase from the reference period (21.1 t)	No	
	• Catch variation from the previous year above the greatest inter-annual decrease from the reference period (49.5 t)	No	
	• Latest recreational catch estimate > recreational catch estimate from the reference period (19.6 t)	Yes	Latest estimate (2017/18): 29.1 t (+48.5%)
	• Proportion of recreational catch to total catch > previous proportion estimate (61.1% in 2011/12)	Yes	Latest estimate (2017/18): 67.4%

Biomass	• CPUE< 3rd lowest CPUE value from the reference period (0.0210 t/days fished)	No	
	• Rate of CPUE decline over last 3 years is greater than the largest 3-year CPUE decline during the reference period (-0.0034)	No	

Stock status

DEPLETED

Sharp declines in commercial catches since 2000/01 gave reason for concerns about the status of Striped Trumpeter stocks. Several management measures have since been implemented to address these concerns. For example, a spawning season closure during September and October (not recognised by the Commonwealth managed sector), when fish are particularly vulnerable to capture, was introduced in 2009. Additionally, a bag limit of four fish and a boat limit of 20 fish was implemented to help to constrain recreational harvest.

The 2017/18 assessment highlighted the presence of 4–6-year-old individuals between 2010 and 2016, providing indication of recruitment after a prolonged period of limited or no recruitment. This observation led to the stock status of Striped Trumpeter being revised from undefined to transitional-recovering to recovering. The status as recovering was maintained in 2018/19, but with a higher level of uncertainty about a positive stock trajectory. In 2019/20, there are still no clear signs of population recovery, indicating that even current levels of catch could risk further depleting the spawning biomass and recruitment potential of the stock. The recreational sector is of particular concern in this respect, given that it represents an increasingly significant proportion of total fishing mortality (estimated at 67% for 2017/18). Options to reduce fishing pressure by the recreational sector include a higher minimum size limit. Research undertaken during 2010 highlights that the current minimum size limit (55 cm TL) is still below the estimated size at maturity (> 60 cm TL), subjecting the population to potential growth overfishing. Aligning the size limit with the assumed size at maturity should allow more fish to spawn before they become vulnerable to capture, thus, likely increasing spawning biomass and recruitment potential. Increasing the minimum size limit should also help discourage high grading, which is likely to result in high discard mortality as fishers seek to maximise the weight of their catch under the reduced bag limit.

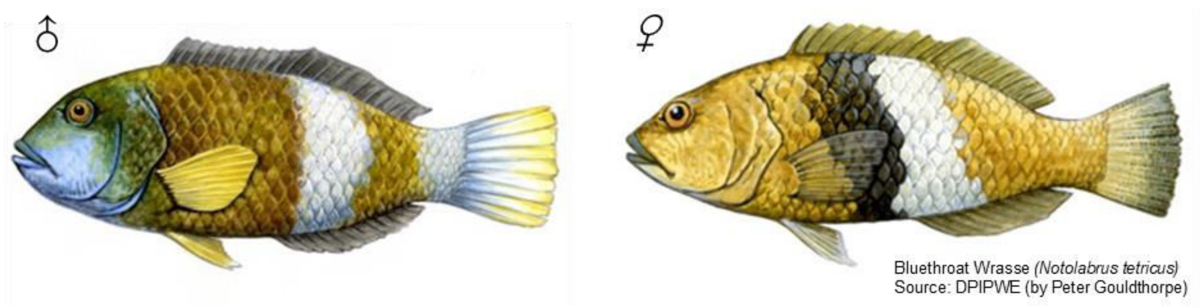
Population depletion and fishing mortality need be analysed and monitored more closely in the future to ensure a positive trajectory of Striped Trumpeter stocks.

Wrasse *(Notolabrus* spp.)

Bluethroat Wrasse *(Notolabrus tetricus)*

Purple Wrasse *(Notolabrus fucicola)*

STOCK STATUS	**SUSTAINABLE**
Catches, effort and catch rates of Wrasse have remained relatively stable for almost a decade, providing little reason for concern that the current level of fishing mortality is too high. Uncertainty remains over levels of potential localized depletion, and about the size of the catch taken by rock lobster fishers and used for bait.	
IMPORTANCE	Key
STOCK(S)	Tasmanian Scalefish Fishery
INDICATOR(S)	Catch, effort and CPUE trends
Managing Jurisdiction	State (Tasmania)



Bluethroat Wrasse *(Notolabrus tetricus)*
Source: DPIPWE (by Peter Gouldthorpe)

Two species of Wrasse are taken commercially in Tasmanian waters: *Notolabrus tetricus* (Bluethroat Wrasse) and *Notolabrus fucicola* (Purple Wrasse). The two species have only been distinguished in catch data since 2007, despite their different size, depth, and tendency to be captured by different gear. Both species are protogynous hermaphrodites, with all individuals beginning life as females and some undergoing a sex inversion after maturity. Both Wrasse are reef-associated and are targeted primarily using fish trap (mainly Purple Wrasse) and handline (mainly Bluethroat Wrasse). Live fish trade is the main interstate market for Wrasse, while the local market comprises dead Wrasse for rock lobster bait and some human consumption. The live-fish fishery has accounted for > 90% of total reported catch since 2001/02 and there is no significant recreational fishery for these species. More detailed information on biological characteristics and current management of Wrasse fisheries is available from the TasFisheriesResearch webpage.

Catch, effort and CPUE

Wrasse catches fluctuated between approximately 75 t and 110 t from 1995/96 until 2007/08 and peaked at 113 t in 2006/07 (Figure 52A). Lower catches since the late 2000s were accompanied by a decline in the use of fish traps that resulted from the prohibition of abalone gut usage as bait. This prohibition was a response to the appearance of the abalone viral ganglioneuritis in Victoria and forced fishers to seek alternative, but less effective baits.

In 2019/20, total commercial landings of 52.3 t were recorded (comprising 40.9 t of Bluethroat Wrasse, 11.4 t of Purple Wrasse, and 0.012 t of unspecified Wrasse), which is somewhat lower than recent years. This is likely due to the impact of the COVID-19 pandemic on live fish markets, with widespread restaurant closures. Catch and effort for fish traps have been at low levels for over a decade. Fish trap catch rates have been relatively constant during this period, however, had slightly higher levels in recent years. In contrast, handline catch, effort, and catch rates have been stable or slightly increasing over the last decade, with a notable decline in the current year (Figure 52A, B, C). Wrasse are targeted all around Tasmania with exception of the west coast (Figure 53).

Wrasse traded dead and used as bait in rock lobster pots have been historically under-reported. These data are not included in the catch data described above.

With Bluethroat Wrasse being more susceptible to line fishing methods and Purple Wrasse more vulnerable to trap capture, Bluethroat Wrasse are now taken in larger quantities in the live fishery. Gillnets account for the bulk of the remaining catch, but because survival in nets is poor, gillnet caught Wrasse are rarely marketed live.

Recreational catches were estimated at 13.6 t in 2000/01 (Lyle 2005), 10.3 t in 2007/08 (Lyle et al. 2009), 6.4 t in 2012/13 (Lyle et al. 2014b) and 9.6 t in 2017/18 (Lyle et al. 2019), representing around 10% of the total catch. Further, Bluethroat Wrasse are a reasonably common by-catch of recreational gillnet fishers with research showing that this species has a moderate to low post-release survival, particularly when gillnets are deployed for more than 4 hours (Lyle et al. 2014a).

It is important to note that state-wide analyses are insensitive to changes in abundance at the level of individual reefs at which the fishery impacts the stocks. Marked regional shifts of effort have occurred in the fishery over the years and may have masked localised depletions with fishers moving to new or lightly fished areas to maintain catches and catch rates.

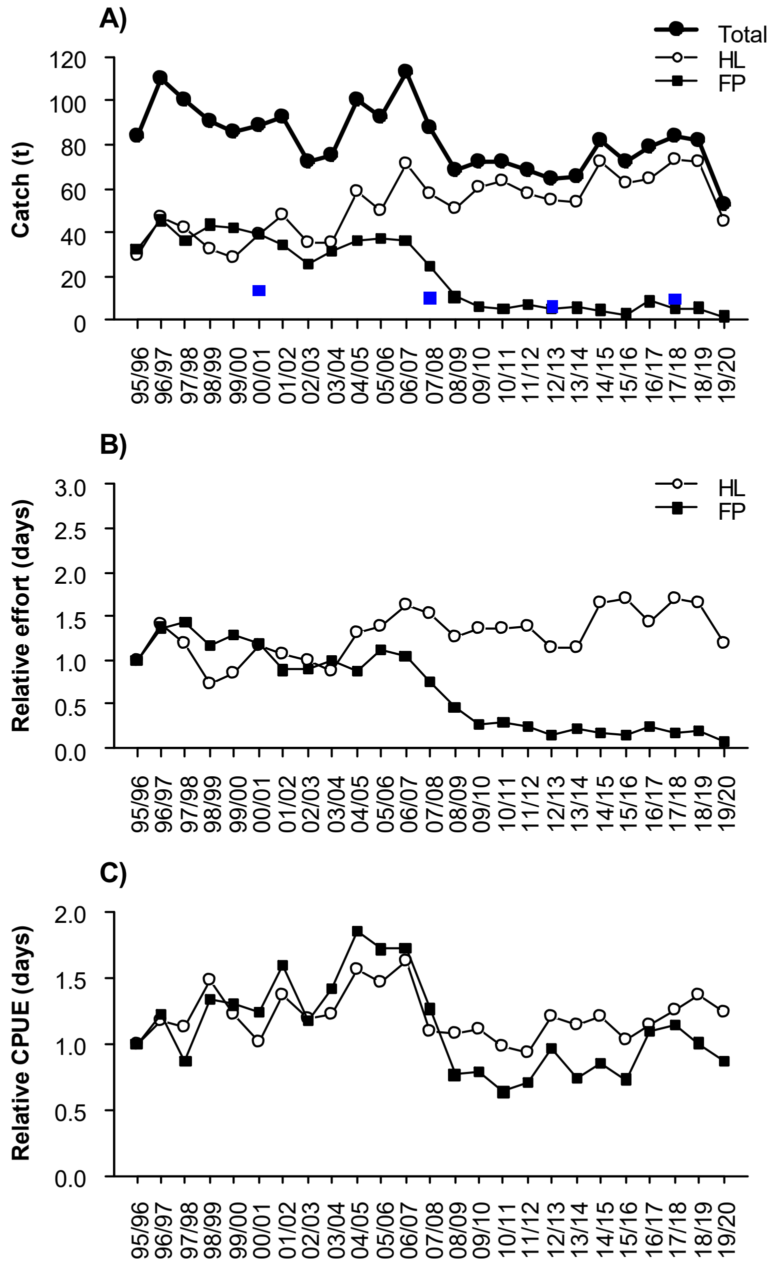


Figure 52 A) Annual commercial catch (t) by gear best estimates of recreational catches (blue squares). B) Commercial effort by method based on day fished relative to 1995/96. C) Commercial catch per unit effort (CPUE) based on weight per day fished relative to 1995/96. HL=handline, FP=fish trap.

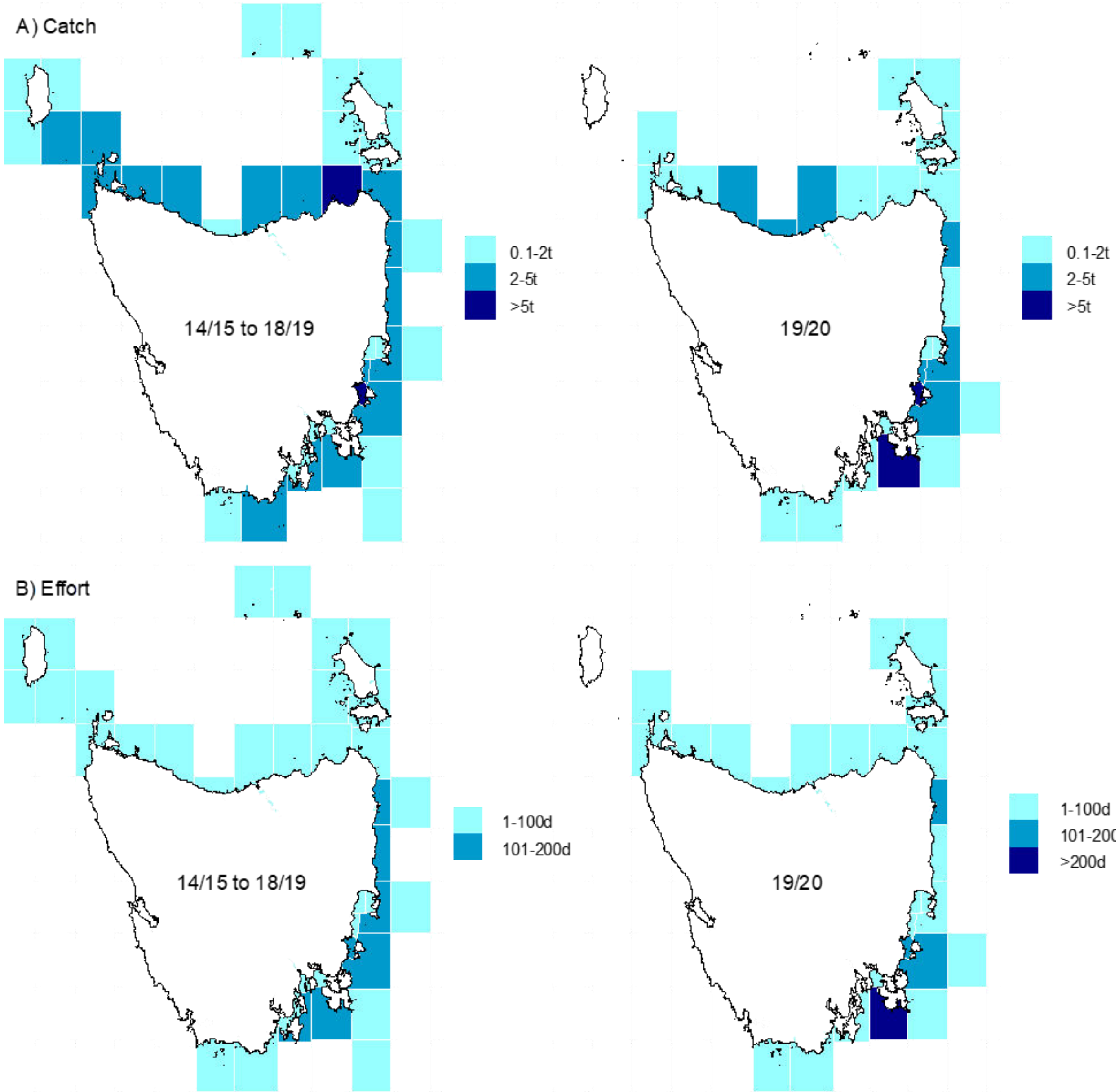


Figure 53 (A) Wrasse catches (t) and (B) effort (days) for fish trap, handline and by fishing blocks averaged over the last five assessment years (left) and in the current assessment year (right).

Catch-MSY results

Bluethroat Wrasse

Catch-MSY results based on the assumption of "medium" resilience suggest that Bluethroat Wrasse biomass is depleting (Figure 54). However, this apparent trend is likely to be driven fishery changes rather than abundance, including a known substantial decline in fish trap use after 2006/07 and the recent lack of restaurant demand for live fish during the start of the COVID-19 pandemic. Median estimates of biomass depletion peaked at 33% of unfished levels in 2008/09 (lower 90% CI = 25%) with depletion at 35% of unfished levels in 2019/20 (lower 90% CI = 15%) (Figure 54).

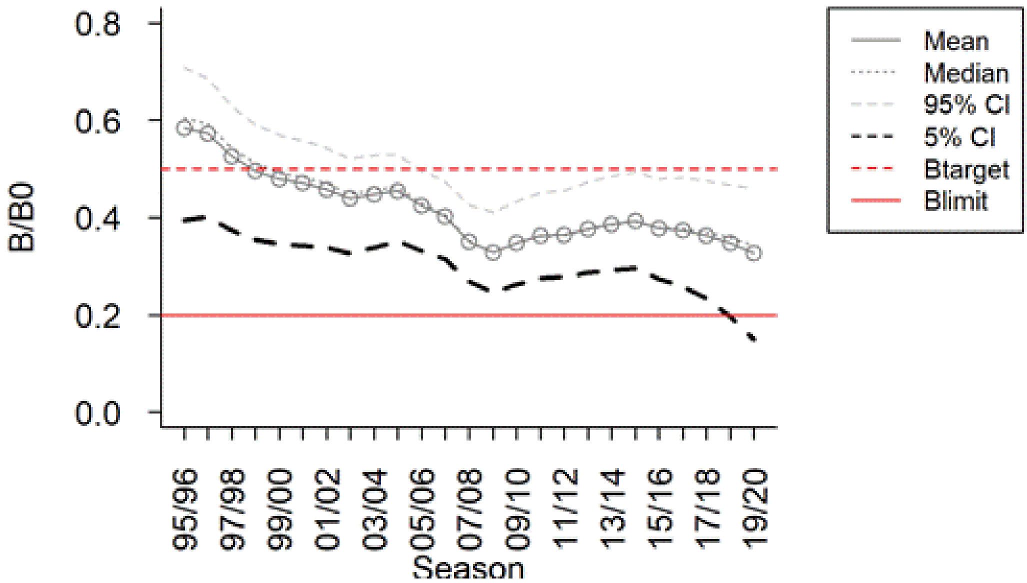


Figure 54 Trends in estimated biomass depletion (biomass divided by unfished biomass) and associated confidence intervals (CIs). The dotted red line marks a common target reference point, which is the biomass assumed to deliver the maximum sustainable yield (B_{target}). The continuous red line marks a limit reference point (B_{limit}).

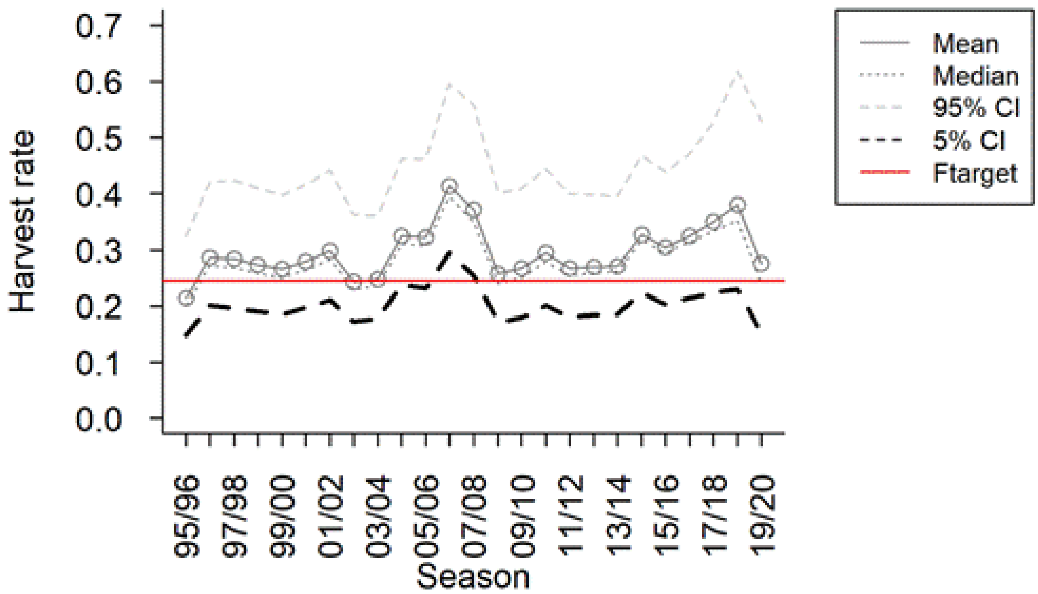


Figure 55 Trends in harvest rate and associated confidence intervals (CIs) relative to the estimated target fishery mortality (F_{target}).

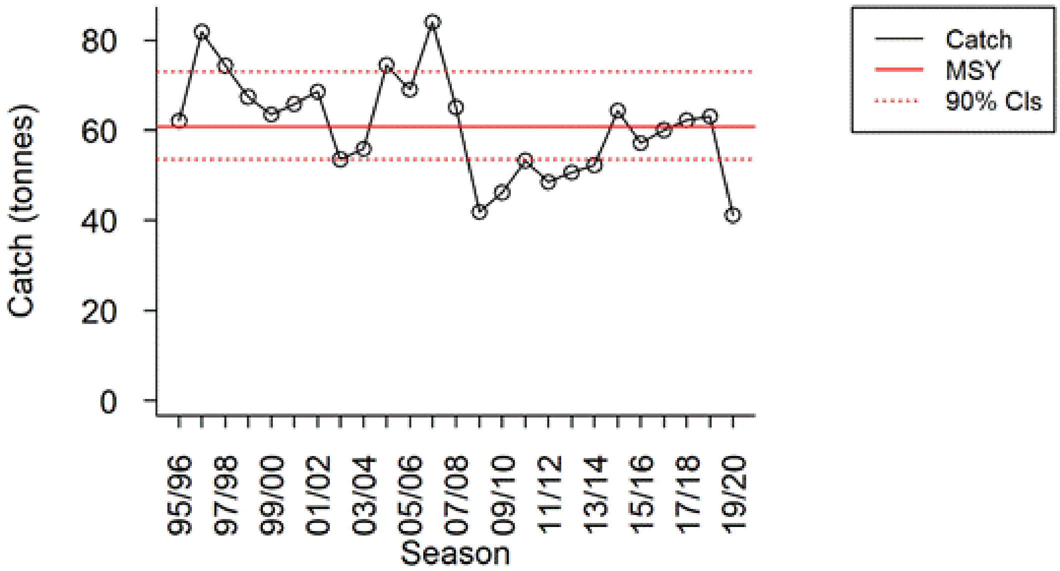


Figure 56 Trends in catch relative to the estimated maximum sustainable yield (MSY) and associated confidence intervals (CIs).

Purple Wrasse

Catch-MSY results based on the assumption of "medium" resilience suggest that Purple Wrasse biomass is depleting (Figure 57). However, this apparent trend is likely to be driven fishery changes rather than abundance, including a known substantial decline in fish trap use after 2006/07 and the recent lack of restaurant demand for live fish during the start of the COVID pandemic. Median estimates of biomass depletion peaked at 30% of unfished levels in 2012/13 (lower 90% CI = 20%) with depletion at 32% of unfished levels in the 2019/20 (lower 90% CI = 10%) (Figure 57).

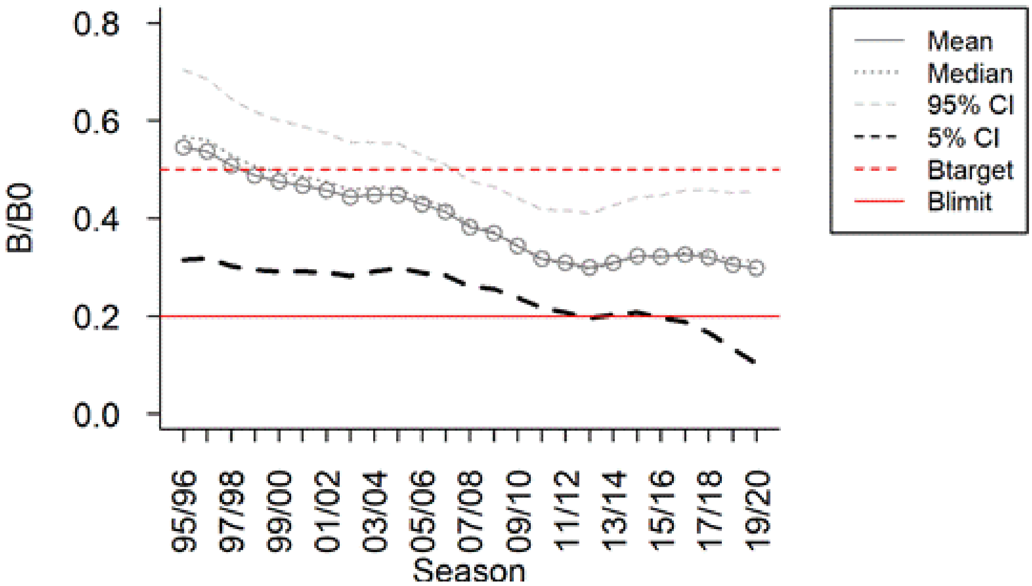


Figure 57 Trends in estimated biomass depletion (biomass divided by unfished biomass) and associated confidence intervals (CIs). The dotted red line marks a common target reference point, which is the biomass assumed to deliver the maximum sustainable yield (B_{target}). The continuous red line marks a limit reference point (B_{limit}).

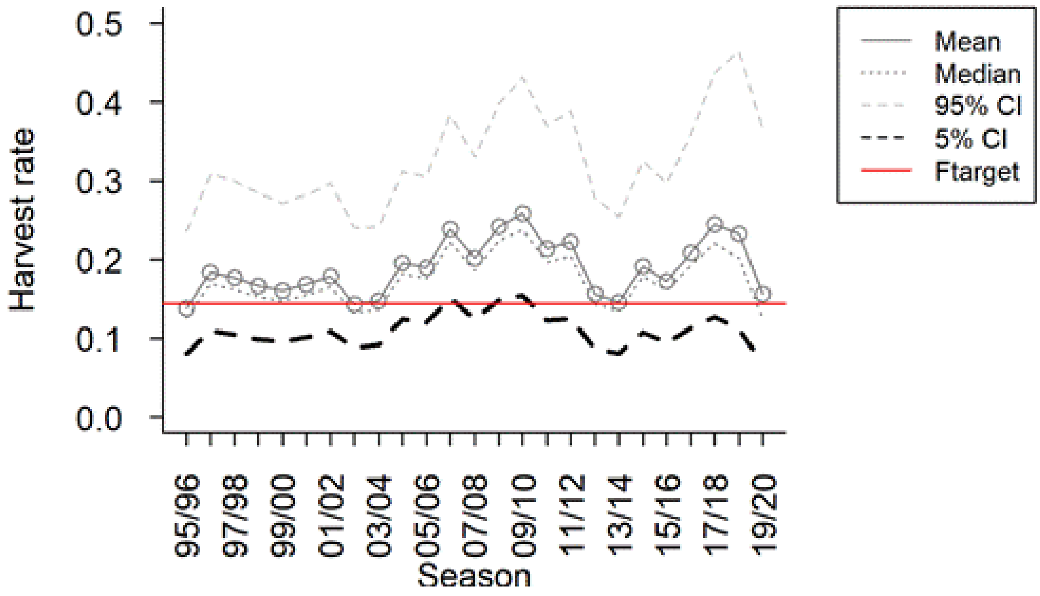


Figure 58 Trends in harvest rate and associated confidence intervals (CIs) relative to the estimated target fishery mortality (F_{target}).

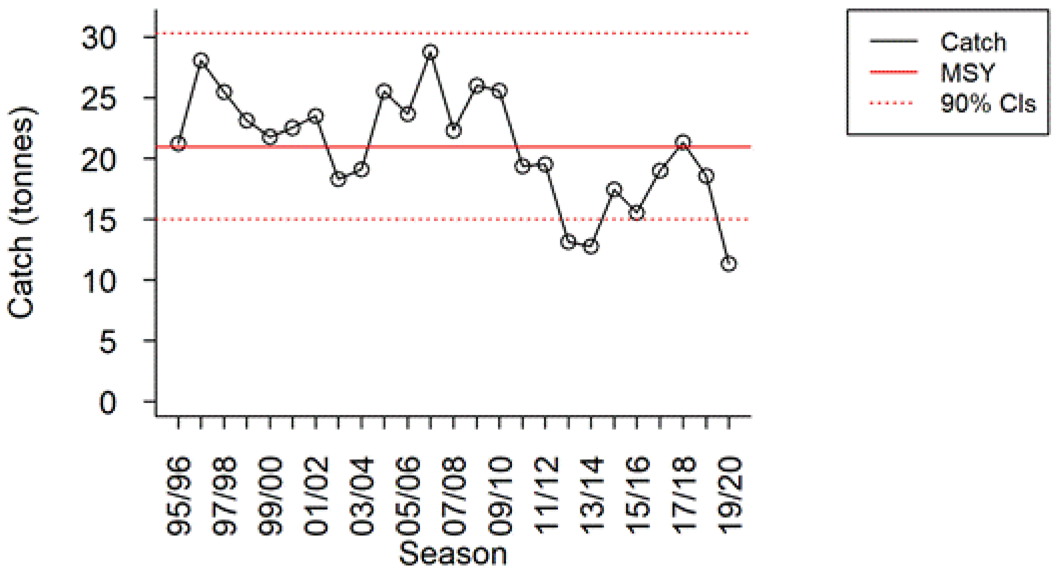


Figure 59 Trends in catch relative to the estimated maximum sustainable yield (MSY) and associated confidence intervals (CIs).

Risk-Based Framework Assessment

The Wrasse fishery scored > 80 in the RBF analysis, passing assessment with low risk of stock damage. Both Wrasse species are highly productive, with low catch rates over time suggesting stock status and recruitment dynamics are unlikely to be significantly impacted by the fishery. Detailed information on the scoring that led to this assessment outcome is available from the TasFisheriesResearch webpage.

Reference points

Performance indicators	Proposed reference points	Breached?	By how much?
Fishing mortality	• Catch > 3rd highest catch value from the reference period (100.1 t)	No	
	• Catch < 3rd lowest catch value from the reference period (83.4 t)	Yes	↓ 31 t (37.2%)
	• Catch variation from the previous year above the greatest inter-annual increase from the reference period (26.7 t)	No	
	• Catch variation from the previous year above the greatest inter-annual decrease from the reference period (-25.3 t)	No	
	• Latest recreational catch estimate > recreational catch estimate from the reference period (13.6 t)	No	
	• Proportion of recreational catch to total catch > previous proportion estimate (13.1% in 2007/08)	No	
Biomass	• CPUE< 3rd lowest CPUE value from the reference period (0.0135 t/days fished)	No	
	• Rate of CPUE decline over last 3 years is greater than the largest 3-year CPUE decline during the reference period (-0.0014)	No	

Stock status

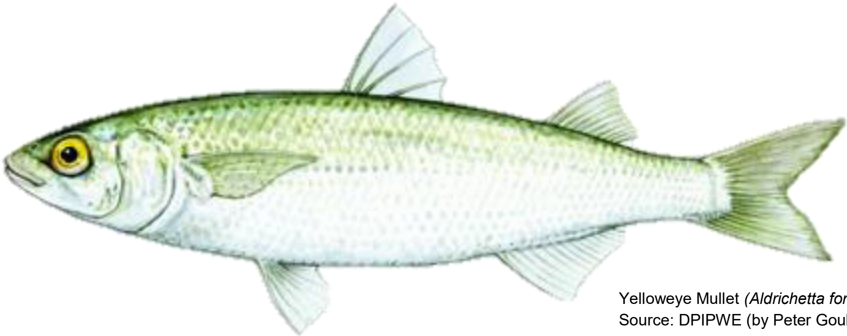
SUSTAINABLE

The minimum size limit should provide protection for several years from reaching maturity to spawning age for Purple Wrasse and for female Bluethroat Wrasse. Male Bluethroat Wrasse, in contrast, develop from sex change typically after they have entered the fishery. This situation, along with the fact that male Wrasse are strongly site-attached and have a higher catchability (being more aggressive than females), suggests that males are vulnerable to fishing.

Underwater visual census revealed contrasting results about the abundance of Wrasse in accessible sites (e.g., areas near boat ramps) vs. protected sites (Stuart-Smith et al. 2008; Walsh et al. 2017), highlighting the possibility that localised fishing pressure could deplete local populations and spawning potential. Previous assessments have shown that increasing catches up to 2006/07 reflected a strong interest in the species and was associated with concerns that fishing mortality might not be sustainable given notable declines in catch rates. Close monitoring of potential localised depletions is mandatory, especially in areas where effort is known to be concentrated. However, state-wide catch rates have been relatively stable over almost a decade, providing overall little concern that current levels of fishing mortality are too high. Wrasse are therefore classified as sustainable.

Yelloweye Mullet *(Aldrichetta forsteri)*

STOCK STATUS	SUSTAINABLE
Yelloweye Mullet are most abundant in estuarine habitats, where netting is prohibited or restricted, thereby providing a high degree of protection throughout most of their range. Catches are at low levels, but unlikely to reflect abundance. It is overall unlikely that the stock is recruitment impaired or that the current fishing pressure is high enough for the stock to become recruitment impaired in the future.	
IMPORTANCE	Minor
STOCK(S)	Tasmanian Scalefish Fishery
INDICATOR(S)	Catch, effort and CPUE trends
Managing Jurisdiction	State (Tasmania)



Yelloweye Mullet *(Aldrichetta forsteri)*
Source: DPIPWE (by Peter Gouldthorpe)

Yelloweye Mullet is a schooling species that inhabits shallow (≤20 m), sheltered waters over sand and seagrass, with highest abundances recorded in estuaries (Edgar 2008). Yelloweye Mullet are occasionally targeted commercially using beach and purse seine nets as well as small mesh nets. The vast majority of commercial Mullet catch in Tasmanian waters is considered to be Yelloweye Mullet; however, some catch may include Sea Mullet (*Mugil cephalus*). Recreationally, Yelloweye Mullet are targeted using rod and line or small mesh gillnets ('mullet nets'). More detailed information on biological characteristics and current management of Yelloweye Mullet fisheries is available from the TasFisheriesResearch webpage.

Catch, effort and CPUE

After peaking in 1999/2000 at about 5 t, commercial Mullet catches have decreased to generally less than 2 t since 2006/07. The commercial catch in 2019/20 was 0.5 t (Figure 60A). Beach seine has historically been the dominant fishing method used to harvest Mullet, but small mesh nets started to increase in relative importance since 2010/11. Recent fishing activity tended to be concentrated off the north coast (Figure 61). Recreational catches of Mullet were estimated at 6.5 t in 1996/97, 30 t in 2000/01 (Lyle 2005), 1.7 t in 2009/10 and 7.1 t in 2012/13 (Lyle et al. 2014b), and 4.6 t in 2017/18 (Lyle et al. 2019) (Figure 60A), and thus, represent a more considerable source of impact on species than commercial activities.

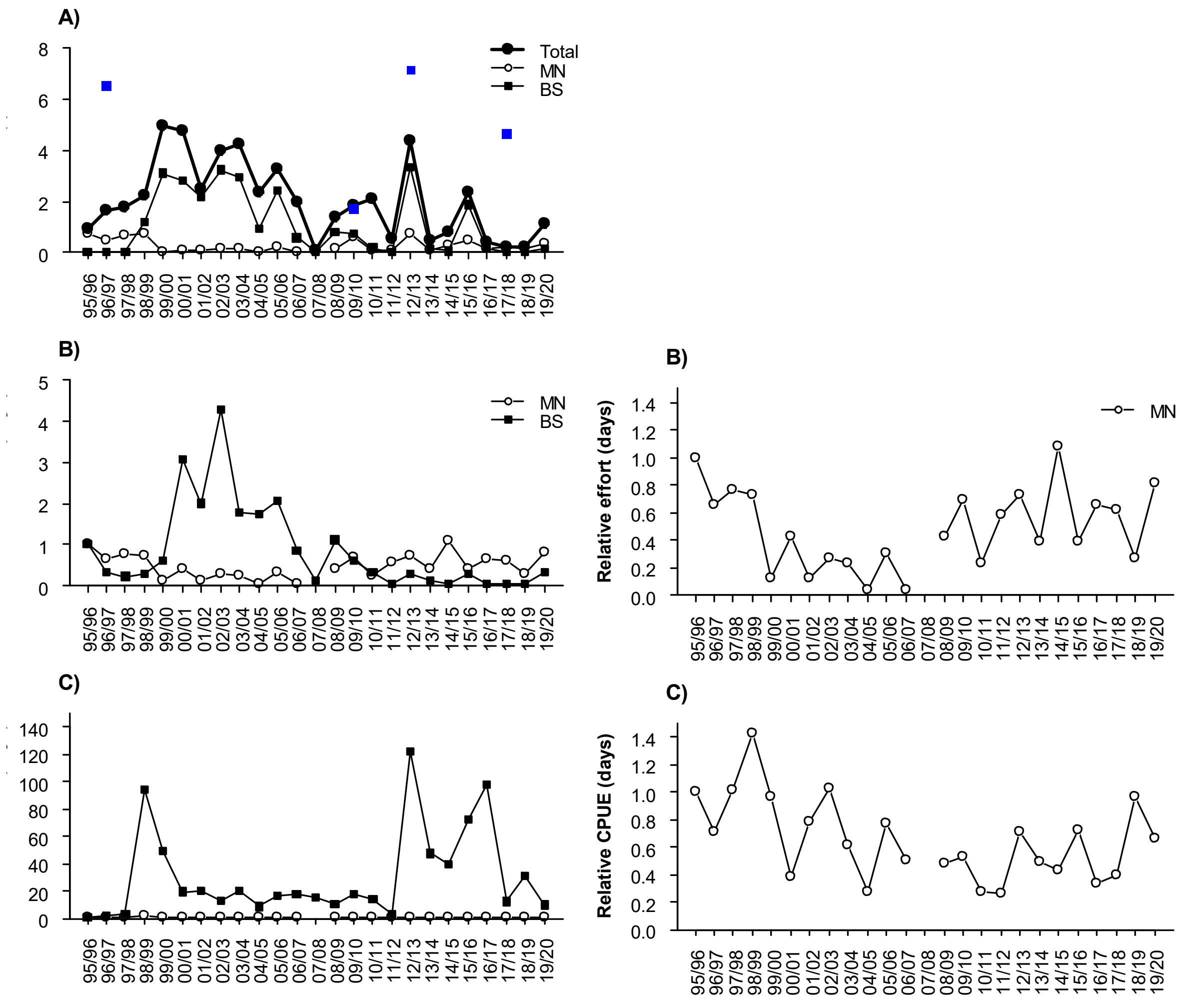


Figure 60 A) Annual commercial catch (t) by gear and best estimates of recreational catches (blue squares). B) Commercial effort by method based on days fished relative to 1995/96. C) Commercial catch per unit effort (CPUE) based on weight per day fished relative to 1995/96. BS=beach seine, MN=small mesh net. For clarity, plots on the right show trends for mesh net separately.

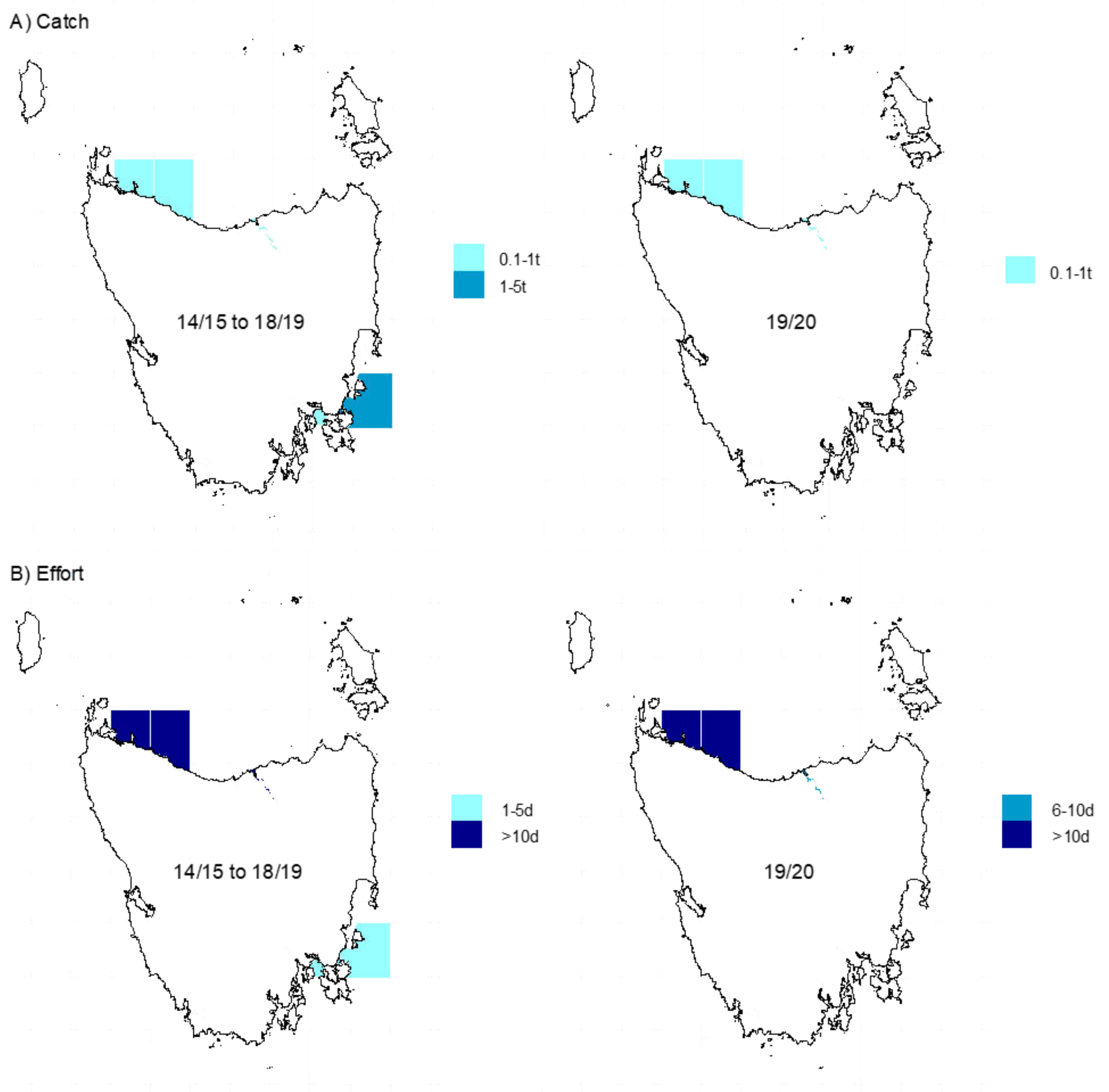


Figure 61 (A) Mullet catches (t) and (B) effort (days) for by fishing blocks averaged over the last five assessment years (left) and in the current assessment year (right).

Risk-Based Framework Assessment

The Yelloweye Mullet fishery scored > 80 in the RBF analysis, passing assessment with low risk of stock damage. The ban on netting in most estuaries offers high protection for this species given abundance is generally highest in estuaries and Yelloweye Mullet use estuarine habitats for spawning. Detailed information on the scoring that led to this assessment outcome is available from the TasFisheriesResearch webpage.

Reference points for Mullet (combined species)

Performance indicators	Proposed reference points	Breached?	By how much?
Fishing mortality	• Catch > 3rd highest catch value from the reference period (4.3 t)	No	
	• Catch < 3rd lowest catch value from the reference period (1.7 t)	Yes	↓ 0.6 t (34.3%)
	• Latest recreational catch estimate > recreational catch estimate from the reference period (30.0 t)	No	
	• Proportion of recreational catch to total catch > previous proportion estimate (73.3% in 2007/08)	Yes	Latest estimate (2017/18): 93.9%
Biomass	• Rate of CPUE decline over last 3 years is greater than the largest 3-year CPUE decline during the reference period (-0.013)	No	

Stock status

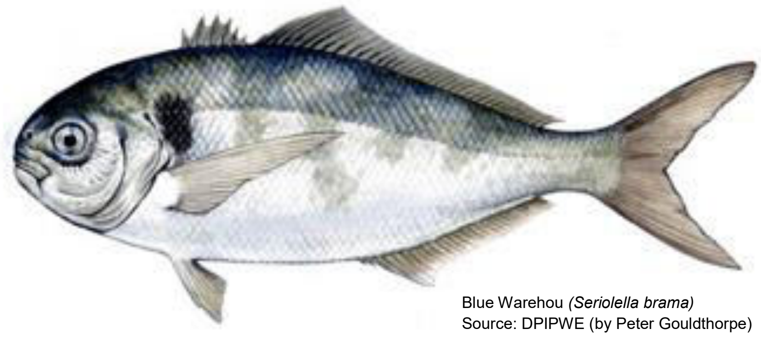
SUSTAINABLE

Yelloweye Mullet are the by far most abundant mullet species in southern Australia and are highly abundant in Tasmanian estuaries (Edgar 2008). Excepting 2012/13, catches of mullet (predominantly Yelloweye Mullet) have been stable at low levels for the past six years, following a decrease in effort in the traditional fishing grounds in northern Tasmania. Limited commercial fishing and no recreational gillnetting occurs in most Tasmanian estuaries, meaning that the species experiences a high degree of protection throughout much of its range. Recreational catches are the main source of fishing mortality for Yelloweye Mullet (>90% of total fishing mortality in 2017/18), but total catches on the order of 5 t are unlikely to result in recruitment impairment. Yelloweye Mullet stocks in Tasmanian waters are thus classified as sustainable.

3. Commonwealth-assessed species

Blue Warehou *(Seriolella brama)*

STOCK STATUS	DEPLETED
Blue Warehou is a predominately Commonwealth-managed species that has been classified as “Overfished” in the ABARES Fishery Status Reports 2019. It has been classified as Depleted in the 2020 Status of Australian Fish Stocks Report. This species is sporadically abundant in Tasmanian waters. Despite a reduction in Total Allowable Catch (TAC) for the Commonwealth fishery to 118 t and the initiation of a stock rebuilding strategy in 2008, there is no evidence of stock recovery.	
IMPORTANCE	Key
STOCK(S)	Tasmanian Scalefish Fishery/Southern and Eastern Scalefish and Shark Fishery (Commonwealth)
INDICATOR(S)	Catch, effort and CPUE trends
Managing Jurisdiction	Commonwealth



Blue Warehou *(Seriolella brama)*
Source: DPIPWE (by Peter Gouldthorpe)

Blue Warehou is a highly mobile schooling species, occurring seasonally with inter-annual variability in Tasmanian inshore waters, mostly likely in association with prevailing oceanographic conditions and the availability of prey species (mostly salps). A small recreational gillnet fishery for Blue Warehou represents < 10% of the total annual harvest of this species in Tasmanian waters. The Blue Warehou stock has been classified as Depleted (Overfished) since 2008, despite the Blue Warehou Stock Rebuilding Strategy that has been in place since then (AFMA 2014). The stock rebuilding strategy established Blue Warehou as an incidental catch only species and the Commonwealth Total Annual Catch at the Commonwealth level has decreased a number of times. More detailed information on biological characteristics and current management of Blue Warehou fisheries is available from the TasFisheriesResearch webpage.

Catch, effort and CPUE

In Tasmania, Blue Warehou is taken primarily using gillnet gear (Figure 62A). A variety of methods is used by Commonwealth fisheries, including other gillnet categories (e.g., shark gillnets), Danish seine, and trawl.

Due to the low availability of Blue Warehou since the early 2000s, the species has been rarely targeted. Catch had increased from an historic low of 2.8 t in 2014/15 to 12.6 t in 2017/18 prior to declining to a new historic low of 0.75 t in 2019/20 (Figure 62A). Peak Tasmanian landings were 317.6 t in 1991/92, which corresponded with the peak of Australia-wide landings of almost 3,000 t (AFMA 2014). Commonwealth commercial catches have also been down in recent years with only 25 t or less harvested in the 2017/18 and preceding fishing season, and 10.1 t harvested in 2019/20 (Patterson et al. 2020). Two stocks of Blue Warehou are believed to occur in southern Australian waters: the east and the west Bass Strait stocks (Bruce et al. 2001), which has led to the species being managed by AFMA as two stocks. The Tasmanian fishery is now mainly centred off the southeast coast (Figure 63), and thus probably concentrated on the eastern stock. Historically, catches have also been taken off the north and northwest coasts, which are presumably harvested from the western stock.

In Tasmania, Blue Warehou are also targeted by recreational fishers using gillnets, and to a lesser extent line fishing. Historically, recreational catches have been lower than Tasmanian commercial catches (Figure 62A), although in 2010 catch estimates were similar for both sectors (32.5 t for recreational and 37.5 t for commercial). In 2012/13 the recreational catch of 15.4 t (Lyle et al. 2014b) was for the first time almost double the commercial catch of 8.5 t. However, in 2017/18, a recreational catch of only 0.8 t was estimated (Lyle et al. 2019), which is substantially less than the commercial catch in that year (12.6 t) but slightly more than commercial catch in the current season (0.75 t).

Following an increase in commercial gillnet effort and catch rates between 1995/96 and 1998/99 that resulted in an increase in landings, effort has fallen to substantially lower levels and has remained low ever since (Figure 62B, C). This situation is influenced by the limited availability of Blue Warehou in Tasmanian waters. After an initial increase and subsequent drop, catch rates have stabilized since 2000/01 showing notable fluctuations around the reference value.

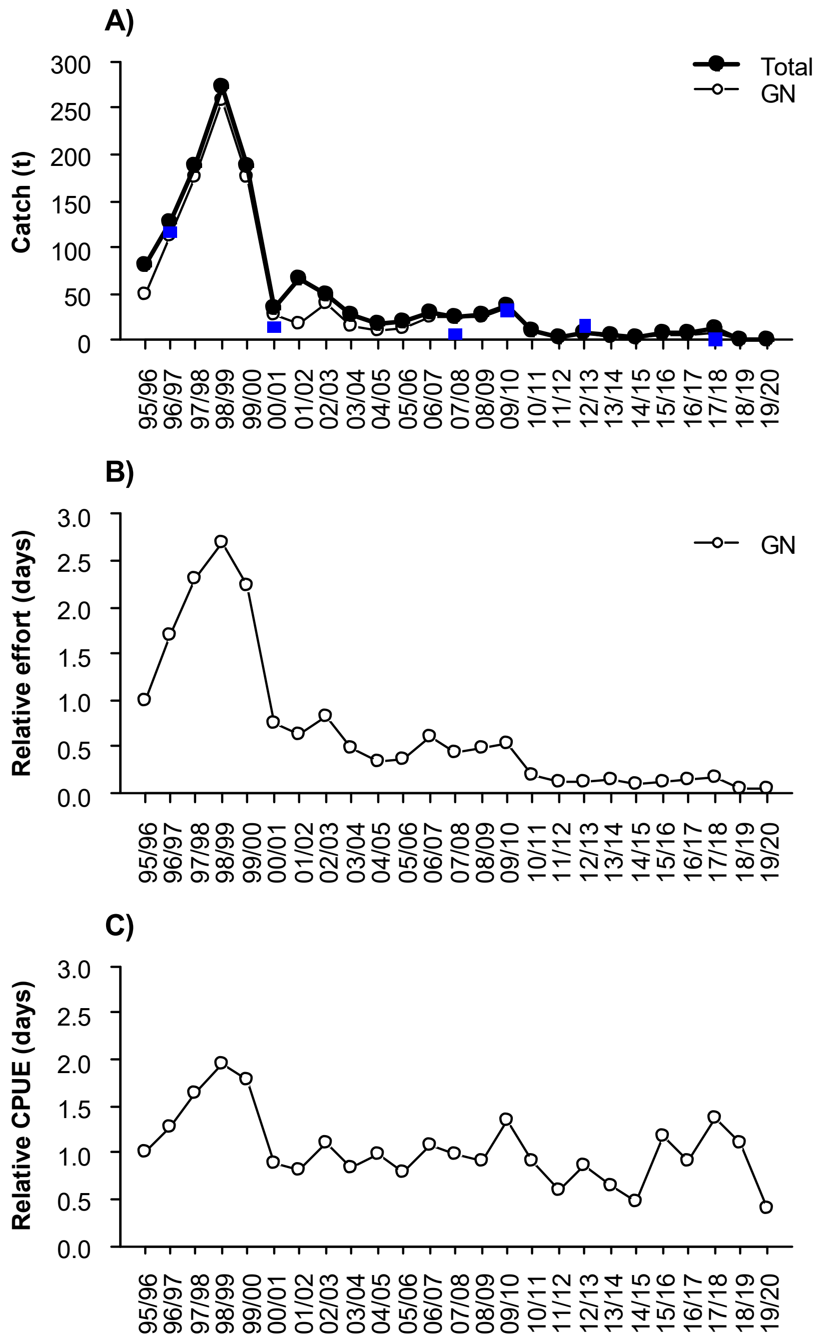


Figure 62 A) Annual commercial catch (t) by gear and best estimates of recreational catches (blue squares). B) Commercial effort by method based on day fished relative to 1995/96. C) Commercial catch per unit effort (CPUE) based on weight per day fished relative to 1995/96. GN=gillnet.

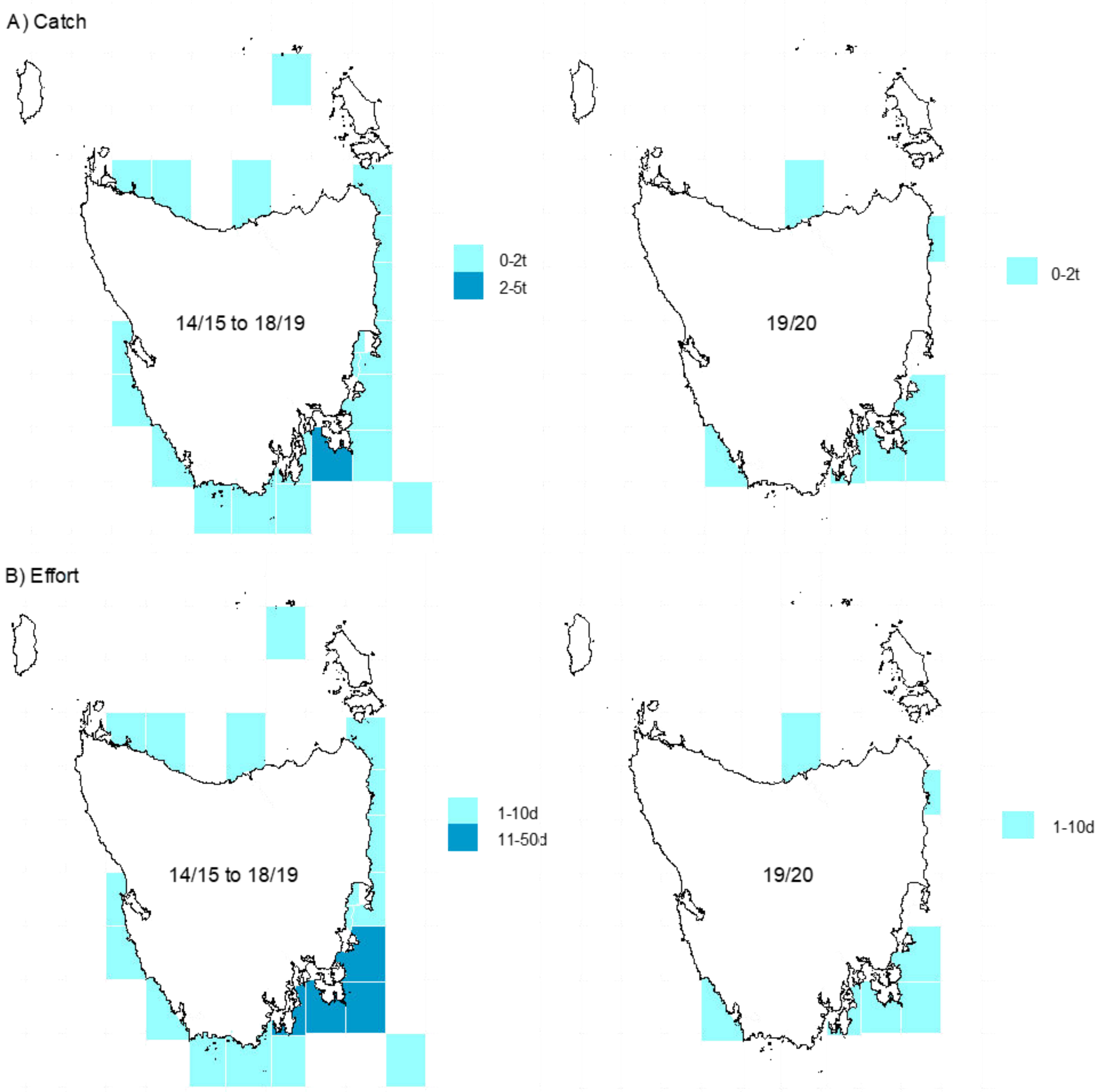


Figure 63 (A) Blue Warehou catches (t) and (B) effort (days) for gillnet fishing by fishing blocks averaged over the last five years (left) preceding the current year of assessment (right).

Reference points

Performance indicators	Proposed reference points	Breached?	By how much?
Fishing mortality	• Commercial catch limit of 318 t as per Memorandum of Understanding (MoU)	No	
	• Catch > 3rd highest catch value from the reference period (187 t)	No	
	• Catch < 3rd lowest catch value from the reference period (27.6 t)	Yes	↓ 26.9 t (97.4%)
	• Catch variation from the previous year above the greatest inter-annual increase	No	

	from the reference period (84.7 t)		
	• Catch variation from the previous year above the greatest inter-annual decrease from the reference period (152.8 t)	No	
	• Latest recreational catch estimate > recreational catch estimate from the reference period (65.3 t)	No	
	• Proportion of recreational catch to total catch > previous proportion estimate (63.6%, in 2012/13)	No	
Biomass	• CPUE < 3rd lowest CPUE value from the reference period (0.0229 t/days fished)	No	
	• Rate of CPUE decline over last 3 years is greater than the largest 3-year CPUE decline during the reference period (-0.0126)	No	

Stock status **DEPLETED**

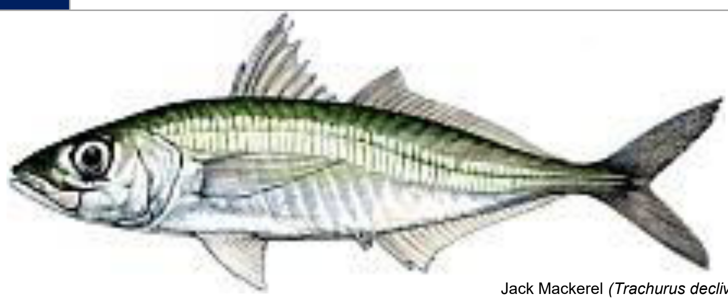
The decreasing catch of Blue Warehou over the last 20 years is almost certainly linked to reduced biomass. This situation is predominantly a result of overfishing by Commonwealth and state fisheries during the 1990s when catches exceeded 2500 t in several years and consistently reached > 1000 t annually between 1987 and 1998 (AFMA 2014). These figures include state landings, of which Tasmanian catches accounted for about 10% of the total throughout much of this period (AFMA 2014). In recent years, catches of Blue Warehou have declined substantially and it is now possible, as it was in the 2017/18 season, that the Tasmanian recreational catch exceeds the commercial catch. While the reduced Commonwealth and Tasmanian catches should benefit stock recovery, a lack of both fishery-dependent and fishery-independent data makes the “true” state of stock(s) difficult to assess.

Blue Warehou is under a Commonwealth stock rebuilding strategy (first introduced in 2008 and later reviewed in 2014), which aims in the first instance to rebuild both east and west coast stocks to or above the default limit reference biomass point (B_{LIM}) of 20 per cent of the unfished spawning biomass by 2024 (AFMA 2014). Consequently, the Commonwealth Total Allowable Catch (TAC) for Blue Warehou has been progressively reduced since 2003, and it was further reduced to 118 t (split 27 t in the east and 91 t in the west) in 2012/13 (AFMA 2012). AFMA considers the reduction in recent Commonwealth catches (1.9 t in 2015/16, 16 t in 2016/17, 25 t in 2017/18, 54 t in 2018/19, and 10. t in 2019/20) to be due in part to their active management and education program. Further management measures include SESSF fishery closures and gear restrictions. There was also a voluntary Commonwealth industry closure implemented between 2008 and 2012 in areas of high Blue Warehou abundance, which were believed to be spawning grounds. However, this assumption was challenged following a review in 2013 due to the patchiness and unpredictability of the species in these areas (AFMA 2014). In Tasmania, management measures include recreational bag and possession limits and a minimum size limit. However, if Blue Warehou stocks start to recover, these regulations may be insufficient to prevent excessive catches from commercial and recreational fishers.

Despite the Commonwealth and Tasmanian management measures outlined above, there have been few signs of recovery of the species, which is why the ABARES Fishery Status Reports classified Blue Warehou stocks as “Overfished” (for biomass) and “Uncertain” (for fishing mortality) (Patterson et al. 2020). Thus, Blue Warehou remains classified as Depleted in Tasmanian waters.

Common Jack Mackerel *(Trachurus declivis)*

STOCK STATUS	**SUSTAINABLE**
Jack Mackerel is a predominately Commonwealth-managed species that has been classified as "Not overfished nor subject to overfishing" by ABARES for 2019. Only minor catches of this species have been taken from Tasmanian waters in recent years due to one operator leaving the fishery. Patterns of catch and effort are unlikely to reflect stock status, but the currently low level of fishing pressure in Tasmania is unlikely to cause the stock to become recruitment impaired.	
IMPORTANCE	Minor
STOCK(S)	Tasmanian Scalefish Fishery/Small Pelagic Fishery (Commonwealth)
INDICATOR(S)	Catch, effort and CPUE trends
Managing Jurisdiction	Commonwealth



Jack Mackerel *(Trachurus declivis)*
Source: DPIPWE (by Peter Gouldthorpe)

Jack Mackerel is a schooling species that inhabits open water over the continental shelf from southern Queensland to Shark Bay, Western Australia, including Tasmania. Jack Mackerel are mainly targeted using purse seine and beach seine gear. The Jack Mackerel fishery in Tasmania peaked in 1986/87 with a catch > 40,000 t (Kailola et al. 1993). However, by 2000 surface schools were less available in Tasmanian waters and fishers began midwater trawling in Commonwealth waters. There was another, smaller peak in the Tasmanian commercial fishery in 2008/09 due to a sharp increase in purse seine effort, however since then both catch and effort have been low. There is a small recreational fishery for Jack Mackerel using line gear in Tasmania. More detailed information on biological characteristics and current management of Jack Mackerel fisheries is available from the TasFisheriesResearch webpage.

Catch, effort and CPUE

Catches of Jack Mackerel in Tasmanian waters that are reported in the General Fishing Returns have been variable since 1995/96, oscillating between 2.6 and 59.8 t up until 2007/08, when there was a sharp increase in purse seine effort targeting Jack Mackerel (Figure 64). Jack Mackerel catches peaked at 919.6 t in 2008/09, however, declined sharply in 2010/11 and 2011/12 to around 60 t because the major purse seine operator ceased activities. In 2019/20, only 136 kg of Jack Mackerel were recorded in Tasmania, slightly up from the historic low of 66 kg recorded in 2016/17. Purse and beach seine catches are usually taken on the southeast coast, but in the current year all reported catch was taken as a by-product by either gillnet (mostly), small mesh net or handline on the northeast coast.

It should be noted that between 1995 and 1999, purse seine catches were taken as part of a separately documented fishery (Zone A fishery) ranging from 447 t in 1995/96 to 8458 t in 1997/98 and averaging 4485 t per year for that period. These data are not presented in Figure 64.

Jack Mackerel is not a significant recreational species with catches estimated at 3.2 t in 2000/01 (Lyle 2005), 1.0 t in 2007/08 (Lyle et al. 2009), 5.2 t in 2012/13 (Lyle et al. 2014b), and 900 kg in 2017/18 (Lyle et al. 2019).

The use of purse seine gear by a major operator between 2008/09 to 2009/10 resulted in a spike in effort and catch during this particular period. Beach seine effort has been declining slowly over time, noting that Jack Mackerel represents a by-product and no meaningful catch rate trends can be drawn from these data (Figure 64). Purse seine catch rates were low until the species began being targeted in 2008/09 and remained high until 2011/12 when the species ceased being targeted (Figure 64). Since that time, landings have been low and there has been no targeted fishing in Tasmanian waters. In contrast, landings increased sharply in the Commonwealth Small Pelagic Fishery due to the start of operations of a large factory trawler.

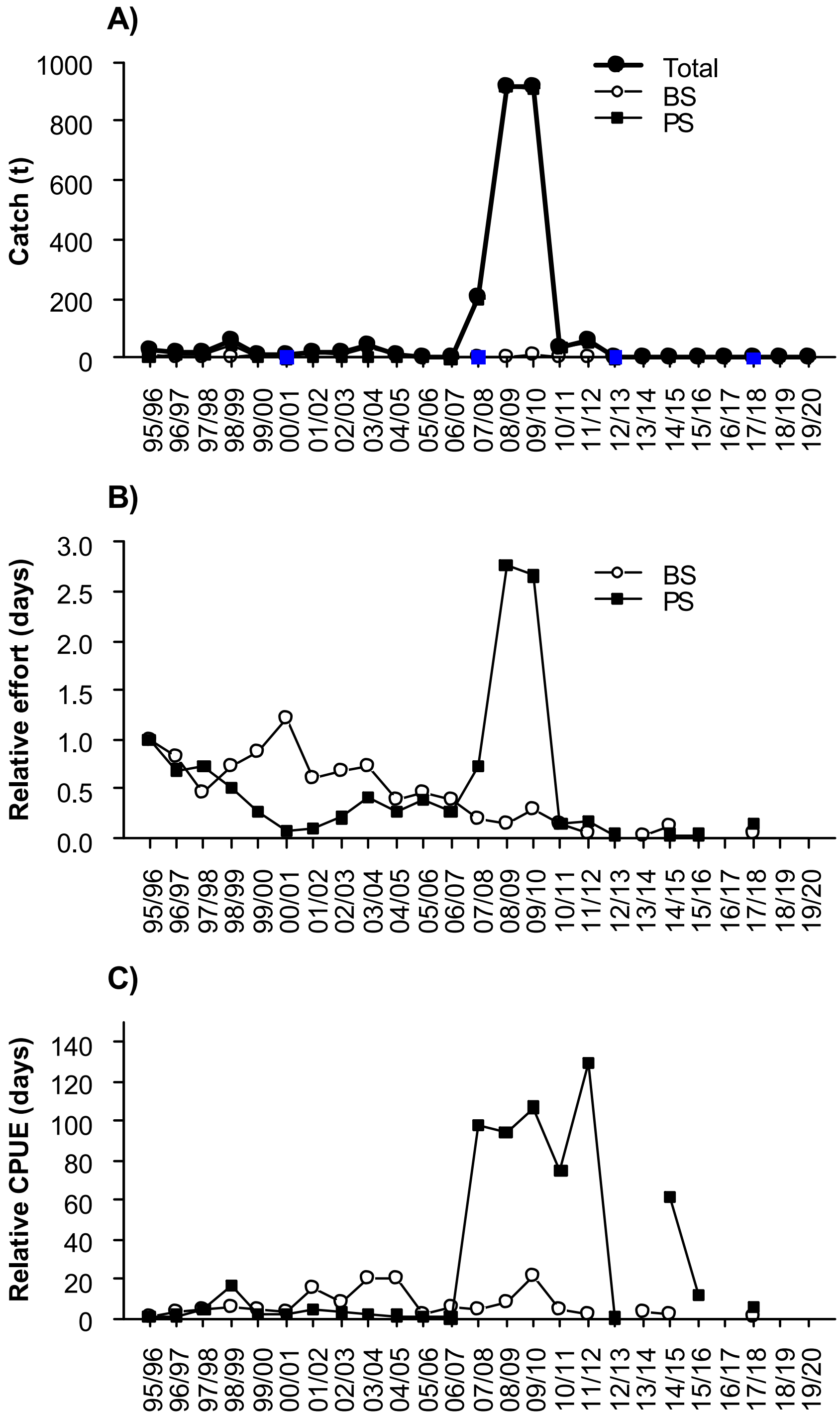


Figure 64 A) Annual commercial catch (t) by gear and best estimates of recreational catches (blue squares). B) Commercial effort by method based on day fished relative to 1995/96. C) Commercial catch per unit effort (CPUE) based on weight per day fished relative to 1995/96. BS=beach seine, PS=purse seine. Note: no purse seine catch for Jack Mackerel was reported in Tasmanian waters during 2013/14, and no beach seine or purse seine catch for Jack Mackerel was recorded in 2016/17, 2018/19, or the current year 2019/20.

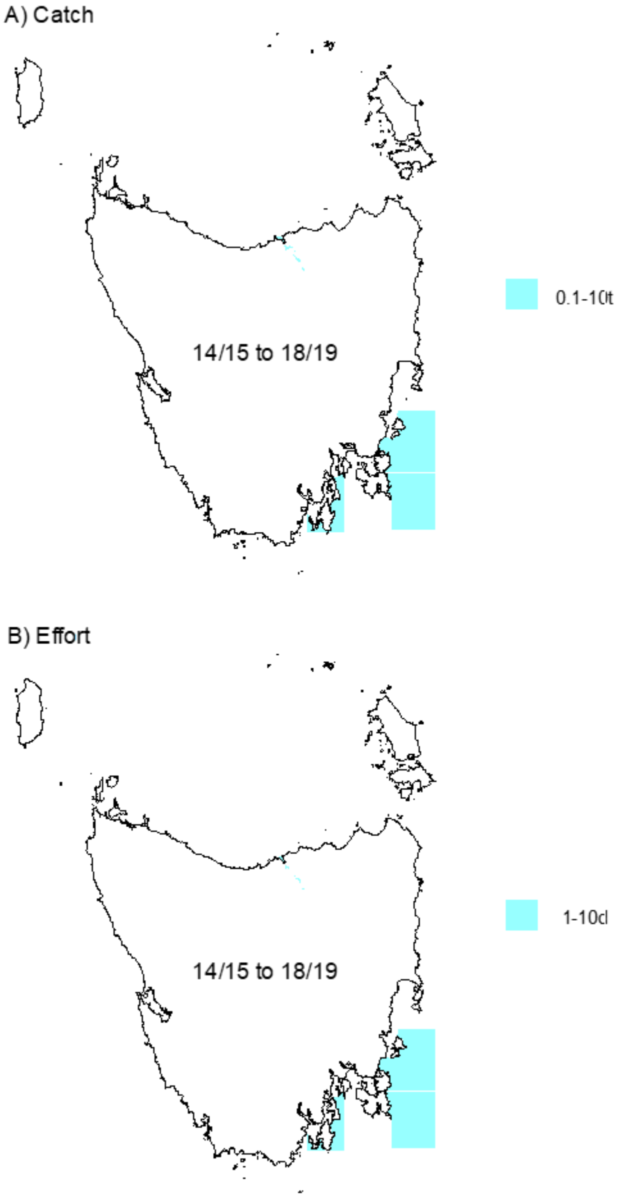


Figure 65 (A) Jack Mackerel catches (t) and (B) effort (days) for beach seine and purse seine by fishing blocks averaged over the last five assessment years. Note: no beach seine or purse seine catch for Jack Mackerel was recorded in Tasmanian waters in 2016/17, 2018/19, or the current year 2019/20.

Reference points

Performance indicators	Proposed reference points	Breached?	By how much?
Fishing mortality	• Catch > 3rd highest catch value from the reference period (26.2 t)	No	
	• Catch < 3rd lowest catch value from the reference period (9.1 t)	Yes	↓ 9.0 t (98.4%)
	• Latest recreational catch estimate > recreational catch estimate from the reference period (3.2 t)	No	
	• Proportion of recreational catch to total catch > previous proportion estimate (96.3% in 2012/13)	No	
Biomass	• Rate of CPUE decline over last 3 years is greater than the largest 3-year CPUE decline during the reference period (-0.0254)	No	

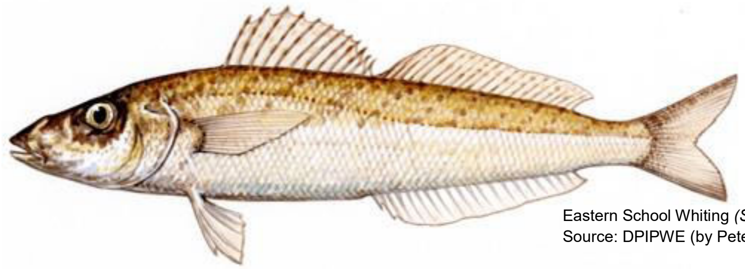
Stock status

SUSTAINABLE

The reference point for lowest catch was breached due to minimal fishing occurring in 2019/20. Very low commercial catch in recent years also means that the proportion of recreational catch tends to be higher than historically. Recent trends in the commercial fishery have been the response of a single operator entering and leaving the fishery and do not reflect the stock status. A 2014 study assessed the spawning stock biomass for eastern Australia to be in the order of 150,000 tonnes (Ward et al. 2015). Jack Mackerel are assessed by the Commonwealth Small Pelagic Fishery Scientific Panel and, based on current catch levels and spawning biomass, the eastern Jack Mackerel stock is assessed as Sustainable (Patterson et al. 2020). This assessment has been applied to the Tasmanian component of the fishery.

Eastern School Whiting *(Sillago flindersi)*

STOCK STATUS	SUSTAINABLE
Eastern School Whiting is a predominately Commonwealth-managed species that has been classified as "Not overfished nor subject to overfishing" by ABARES for 2019. It has been classified as Sustainable in the 2020 Status of Australian Fish Stocks Report. Tasmanian catches fluctuate due to market demand, but generally represent only a small proportion of the Commonwealth commercial catch.	
IMPORTANCE	Minor
STOCK(S)	Tasmanian Scalefish Fishery/Southern and Eastern Scalefish and Shark Fishery (Commonwealth)
INDICATOR(S)	Catch, effort and CPUE trends
Managing Jurisdiction	Commonwealth


Eastern School Whiting *(Sillago flindersi)*
Source: DPIPWE (by Peter Gouldthorpe)

Eastern School Whiting is endemic to south-eastern Australia, from southern Queensland to western Victoria and around Tasmania. This schooling species is associated with sandy habitats and is found in deeper coastal waters as well as coastal lakes and estuaries (Gomon et al. 2008). In Tasmania, Eastern School Whiting is caught primarily using Danish Seine gear in the south of the state. Danish seine fishing operations target either Eastern School Whiting or Flathead (primarily Tiger Flathead) and each target species represents the main by-catch species when the other is targeted, leading to opposing trends in catch and effort for Eastern School Whiting and Tiger Flathead. There is a small recreational line fishery for Eastern School Whiting in southern Tasmania. More detailed information on biological characteristics and current management of Eastern School Whiting fisheries is available from the TasFisheriesResearch webpage.

Catch, effort and CPUE

Eastern School Whiting landings in Tasmania have fluctuated widely since 1998/99. A catch of 43.7 t in 2019/20 is close to historical peaks (Figure 66A). Catches are influenced by the practices of a small number of operators. Catches in 2019/20 were concentrated on the southeast coast (in particular the Derwent Estuary) as has been the case in previous years (Figure 67). Recreational catches are generally low with estimated weights of 0.8 t in 2000/01 (Lyle 2005), 3.4 t in 2007/08 (Lyle et al. 2009), 2.1 t in 2012/13 (Lyle et al. 2014b), and 8.6 t (including King George Whiting) in 2017/18 (Lyle et al. 2019) (Figure 66A).

Danish seine fishing effort has been variable over time, showing several notable drops in some years (Figure 66B). Effort declined slightly in 2019/20 but catch and catch rate remained similar to the previous year (Figure 66C).

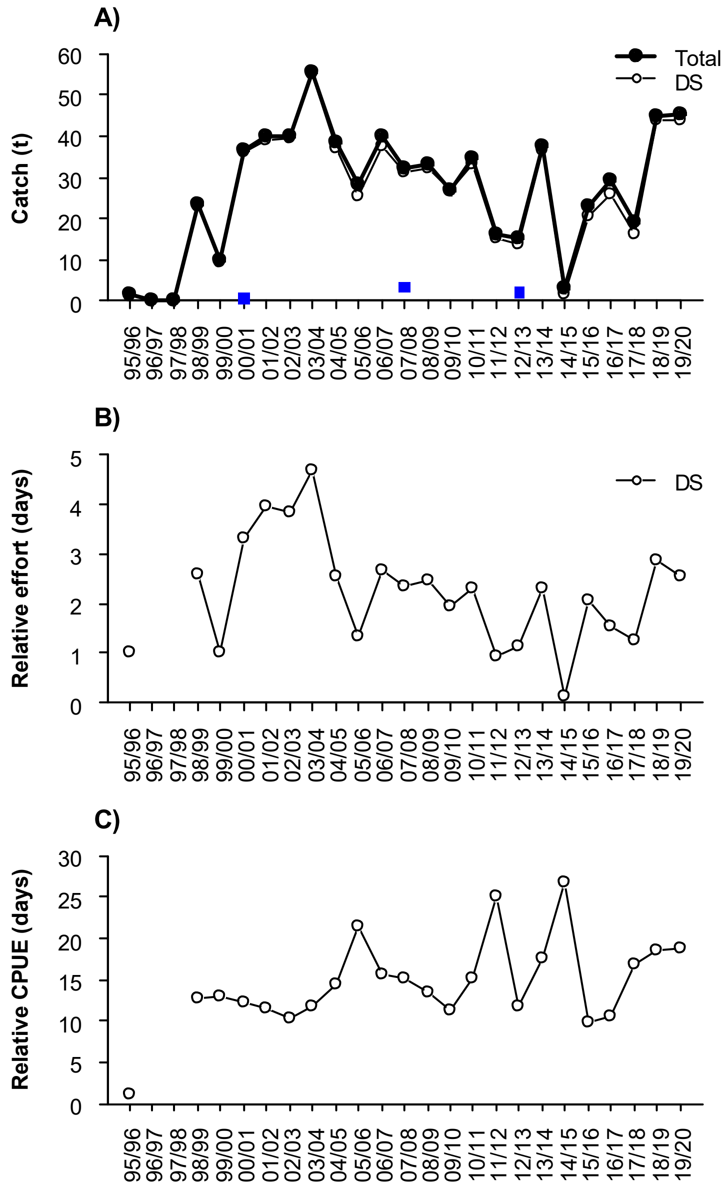


Figure 66 A) Annual commercial catch (t) by gear and best estimates of recreational catches (blue squares). B) Commercial effort by method based on day fished relative to 1995/96. C) Commercial catch per unit effort (CPUE) based on weight per day fished relative to 1995/96. DS=Danish seine.

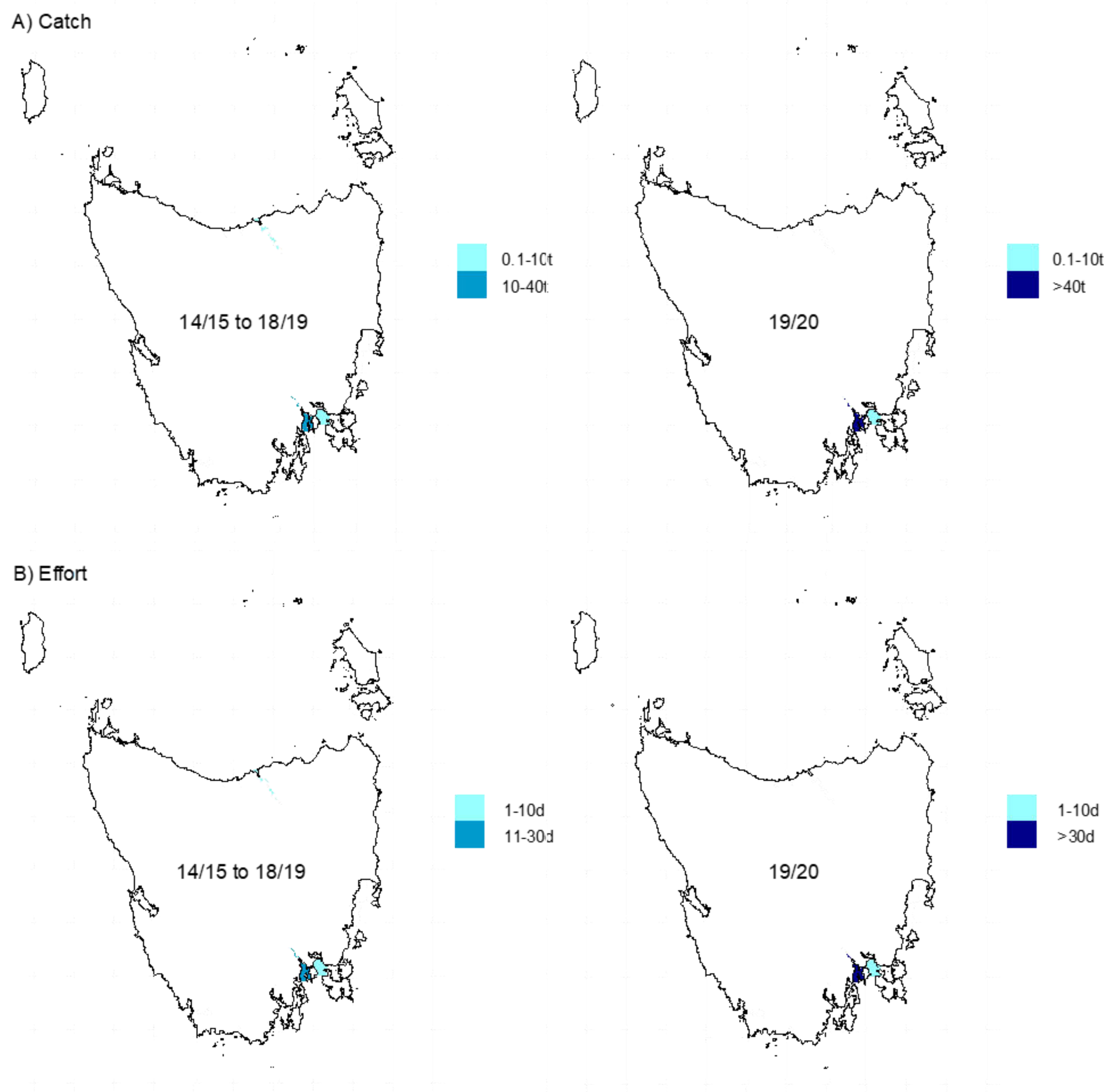


Figure 67 (A) Eastern School Whiting catches (t) and (B) effort (days) for Danish seine by fishing blocks averaged over the last five assessment years (left) and in the current assessment year (right).

Reference points

Performance indicators	Proposed reference points	Breached?	By how much?
Fishing mortality	• Catch > 3rd highest catch value from the reference period (38.1 t)	Yes	↑ 5.4 t (13.5%)
	• Catch < 3rd lowest catch value from the reference period (1.4 t)	No	
	• Latest recreational catch estimate > recreational catch estimate from the reference period (0.8 t)	Yes	Latest estimate (2017/18): 1.4 t (175%)
	• Proportion of recreational catch to total catch > previous proportion estimate (8.7% in 2007/08)	No	
Biomass	• Rate of CPUE decline over last 3 years is greater than the largest 3-year CPUE decline during the reference period (-0.0954)	No	

Stock status

SUSTAINABLE

Catch, effort, and catch rate patterns for Eastern School Whiting have been determined to a large extent by the level of targeting. The primary fisher is known to switch between Tiger Flathead and Eastern School Whiting, presumably depending on market demand. While the most recent recreational catch estimate was higher than during the reference period, catches by the recreational sector remain low and are inconsequential given the assumed size and distribution of the Eastern School Whiting stock.

Overall, the Tasmanian component of the fishery lands only a small proportion of the catch when compared with Commonwealth landings (537 t and 788 t in the last two years). The latest Fishery Status Report (Patterson et al. 2020) classifies the Eastern School Whiting fishery as Sustainable in terms of both stock status and current fishing mortality. In accordance with this assessment, the Tasmanian component of this fishery is classified as Sustainable.

Gould's Squid *(Nototodarus gouldi)*

STOCK STATUS	**SUSTAINABLE**
Gould's Squid is a predominately Commonwealth-managed species that has been classified as "Not overfished nor subject to overfishing" by ABARES for 2019. Dual-licensed vessels fish in Tasmanian waters, especially in years of peak abundance. The species is characterised by high inter-annual variability in abundance in state waters and generally low catches in recent years.	
IMPORTANCE	Minor
STOCK(S)	Tasmanian Scalefish Fishery/Southern Squid-jig Fishery (Commonwealth)
INDICATOR(S)	Catch, effort and CPUE trends
Managing Jurisdiction	Commonwealth

Gould's Squid *(Nototodarus gouldi)*
Source: DPIPWE (by Peter Gouldthorpe)

Gould's Squid is targeted by the Commonwealth Southern Squid-Jig Fishery, a single gear, single species fishery that operates in Bass Strait waters using automatic squid jig gear. Like most cephalopod species, Gould's Squid has a very brief life cycle, is semelparous (reproduces once before death), and can vary significantly in abundance among years, probably depending on oceanographic conditions. Occasionally, Gould's Squid are available in high abundance in south-eastern Tasmanian waters, however there is limited local market demand for the commercial fishery, with a preference for Southern Calamari. Consequently, dual-licensed fishing vessels tend to operate in state waters during summer before moving back to Commonwealth fishing grounds in Bass Strait. There is a substantial recreational fishery for Gould's Squid in Tasmania. More detailed information on biological characteristics and current management of Gould's Squid fisheries is available from the TasFisheriesResearch webpage.

Catch, effort and CPUE

Gould's Squid availability in Tasmanian waters is highly variable as reflected in its catch history (Figure 68A). Since 1995/96, there have been a few peaks of abundance, notably in 1999/2000, 2011/12, 2012/13 and again in 2015/16. The Gould's Squid catch for 2012/13 was the highest since 1995/96 (~1000 t) with the Australia-wide catch predominantly coming from Tasmanian waters (Flood et al. 2014). In 2017/18 a total of 528 t of Gould's Squid were taken from Tasmanian waters, all but 1.0 t of which was caught by automatic jig. In 2019/20, a total of 15.8

t was caught. The majority of the catch in 2019/20 was taken around south east and northern Tasmania (Figure 69).

Gould's Squid catches from the recreational sector (Figure 68A) were estimated at 5 t in 2000/01 (Lyle 2005), 36.6 t in 2007/08 (Lyle et al. 2009), 21.4 t in 2012/13 (Lyle et al. 2014b), and 23.7 t in 2017/18 (Lyle et al. 2019). These numbers match levels of commercial catches during normal (i.e., low catch) seasons, including the 2019/20 season.

Effort tends to match temporal patterns in catch, presumably resembling the availability of the species. In some years, higher catches have been achieved with relatively low effort, including the peak in catch observed in 2012/13 (Figure 68B). In the 2019/20 season, both catch and effort were notably lower than in 2018/19.

Overall, catch rates remained comparatively low until 2008/09. In the more recent years, catch rates generally fluctuated around values 5-10 times higher than during the reference period, however declined again in the current season (Figure 68C).

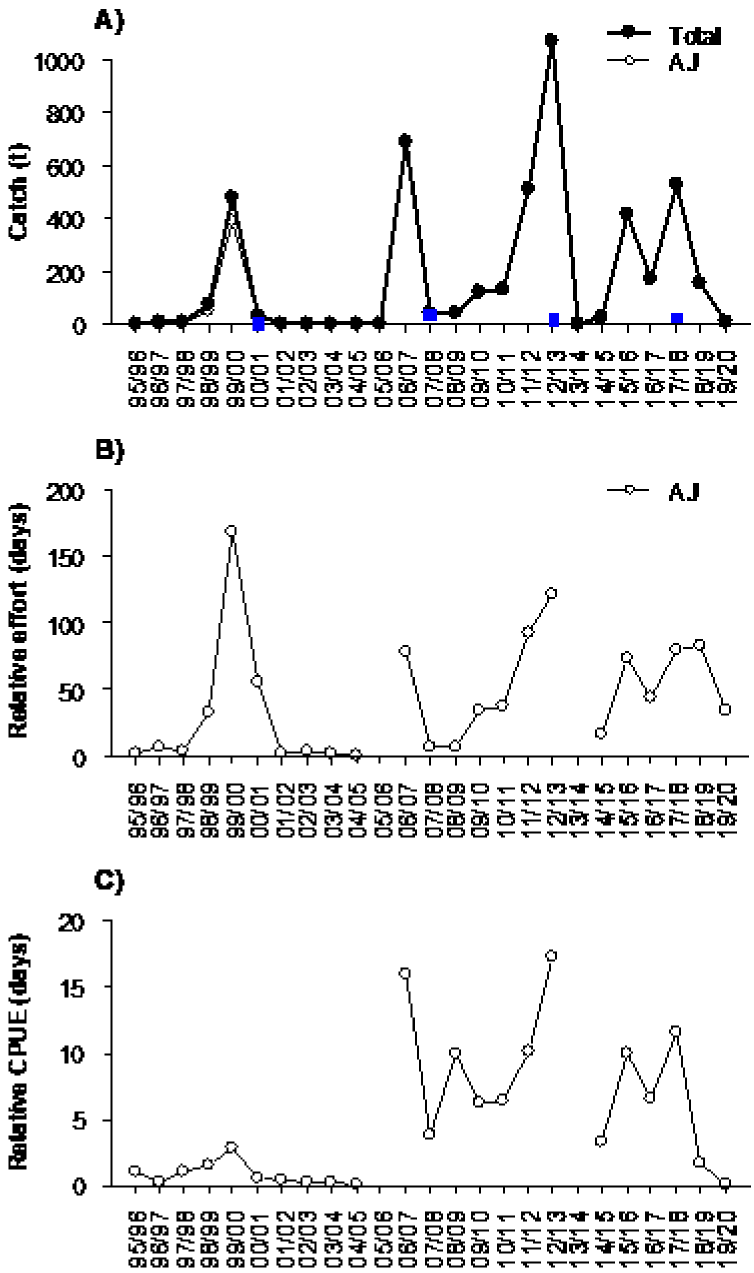


Figure 68 A) Annual commercial catch (t) by gear and best estimates of recreational catches (blue squares). B) Commercial effort by method based on days fished relative to 1995/96. C) Commercial catch per unit effort (CPUE) based on weight per day fished (right) relative to 1995/96. AJ=automatic squid jig. Data includes Australian Fisheries Management Authority (AFMA) catch in State waters. Note: no catch or effort using Automatic squid jig was recorded for 2005/06, 2006/07 or 2013/14

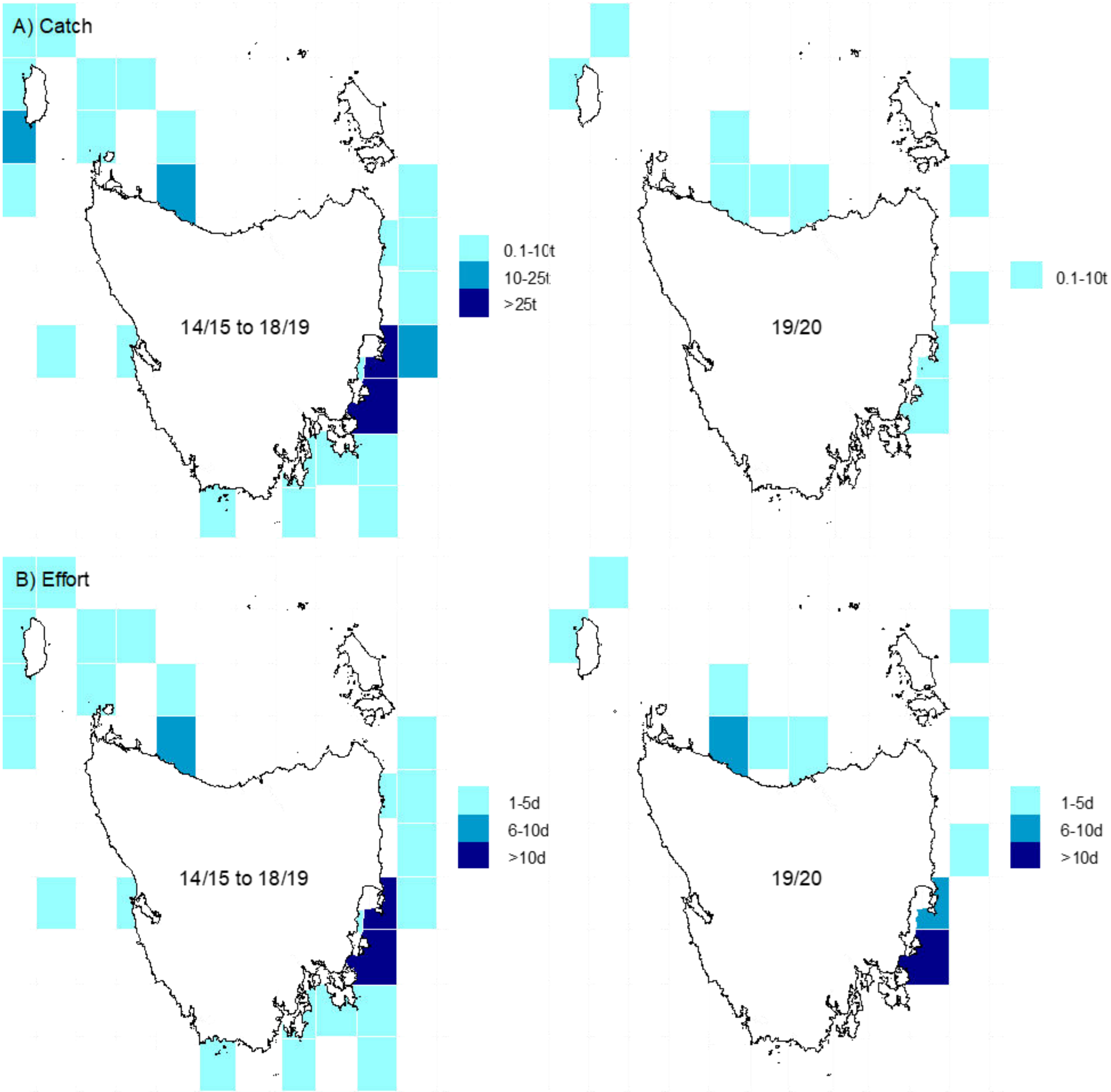


Figure 69 (A) Gould's Squid catches (t) and (B) effort (days) by fishing blocks averaged over the last five assessment years (left) and in the current assessment year (right). Data includes Australian Fisheries Management Authority (AFMA) catch in Tasmanian state waters.

Reference points

Performance indicators	Proposed reference points	Breached?	By how much?
Fishing mortality	• Catch > 3rd highest catch value from the reference period (79.7 t)	No	
	• Catch < 3rd lowest catch value from the reference period (2.1 t)	No	
	• Latest recreational catch estimate > recreational catch estimate from the reference period (5 t)	Yes	↑ 18.7 t (+474%)
	• Proportion of recreational catch to total catch > previous proportion estimate (44.4% in 2007/08)	No	
Biomass	• Rate of CPUE decline over last 3 years is greater than the largest 3-year CPUE decline during the reference period (-0.0657)	Yes	↓ 0.08 (-121.8%)

Stock status

SUSTAINABLE

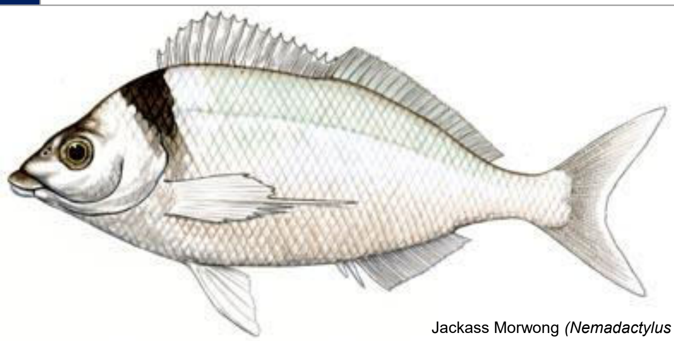
Gould's Squid are short lived, spawn year-round and display highly variable growth and size/age at maturity, which means that they can show rapid increases in abundance during favourable environmental conditions. As a result, Gould's Squid might be less susceptible to overfishing than longer-lived species (Flood et al. 2012). However, their short life span (1 year) implies a reliance on a single cohort, which leaves the species susceptible to environmental and fishing impacts on subsequent recruitment.

Fishing effort in the Commonwealth Southern Squid-jig Fishery has decreased markedly since the late 1990s, presumably due to economic factors. A study on the depletion of the Gould's Squid stock concluded that no overfishing had occurred (Sahlqvist and Skirtun 2011). Peak catches in Tasmanian waters (e.g., > 500 t in 2017/18) represent less than half of the total Commonwealth catch in recent years (828 t in 2017 and 1649 t in 2018), which is assumed to be sustainable (Patterson et al. 2020).

Although one reference point for stock status were breached in the current assessment (high recreational catch), the highly dynamic nature of the fishery makes it difficult to assess catch and effort dynamics against a fixed baseline value. In accordance with Commonwealth assessments and the most recent Status of Australian Fish Stock Reports (Flood et al. 2012; Flood et al. 2014; Noriega et al. 2018), the Tasmanian Gould's Squid fishery is thus classified as Sustainable.

Jackass Morwong *(Nemadactylus macropterus)*

STOCK STATUS	SUSTAINABLE
Jackass Morwong is a predominately Commonwealth-managed species that has been classified as “Not overfished nor subject to overfishing” by ABARES for 2019. It has been classified as Sustainable in the Status of Australian Fish Stocks Report 2020. Commercial catch and effort in Tasmania are low.	
IMPORTANCE	Minor
STOCK(S)	Tasmanian Scalefish Fishery/Southern and Eastern Scalefish and Shark Fishery (Commonwealth)
INDICATOR(S)	Catch, effort and CPUE trends
Managing Jurisdiction	Commonwealth



Jackass Morwong *(Nemadactylus macropterus)*
Source: DPIPWE (by Peter Gouldthorpe)

Jackass Morwong is a large, long-lived species associated with exposed sand and silt habitat from central Queensland to southern Western Australia, including Tasmania (Edgar 2008). Abundance of Jackass Morwong is low in Tasmanian waters and, as such, this is not a target species in Tasmania, rather a by-product of gillnetting. Commonwealth assessment indicated Jackass Morwong stocks were overfished from 2008 to 2010, however they have been classified as sustainable since then (Patterson et al. 2020). There is a significant recreational fishery for Jackass Morwong, primarily using gillnet gear. More detailed information on biological characteristics and current management of Jackass Morwong fisheries is available from the TasFisheriesResearch webpage.

Catch, effort and CPUE

Total commercial catch of Jackass Morwong in Tasmania was 2.5 t in 2019/20, slightly less than 2018/19 (2.6 t) (Figure 70A). Commercially, Jackass Morwong is caught mainly by gillnet. Landings have declined steadily since 1995/96, fluctuating between 1 and 4 t in recent years. The majority of the catch is taken from the southeast and east coast (Figure 71).

Jackass Morwong is an important recreational species with all estimates of catch at higher levels than those of the commercial fishery (Figure 70A). Estimates were 31.9 t in 2000/01 (Lyle 2005), 6.8 t in 2007/08 (Lyle et al. 2009), 7.7 t in 2011/12 (Tracey et al. 2013), 16.1 t in 2012/13 (Lyle et al. 2014b), and 8.4 t in 2017/18 (Lyle et al. 2019). In addition to gillnetting, Jackass Morwong are commonly caught by handline and often associated with targeted fishing for Striped Trumpeter.

Catches seem to fluctuate in agreement with fishing effort (Figure 70B), which has resulted in relatively stable catch rates over recent years (Figure 70C). However, when compared to the period from 1995/96 until 2004/05 the recent catch rates are notably reduced.

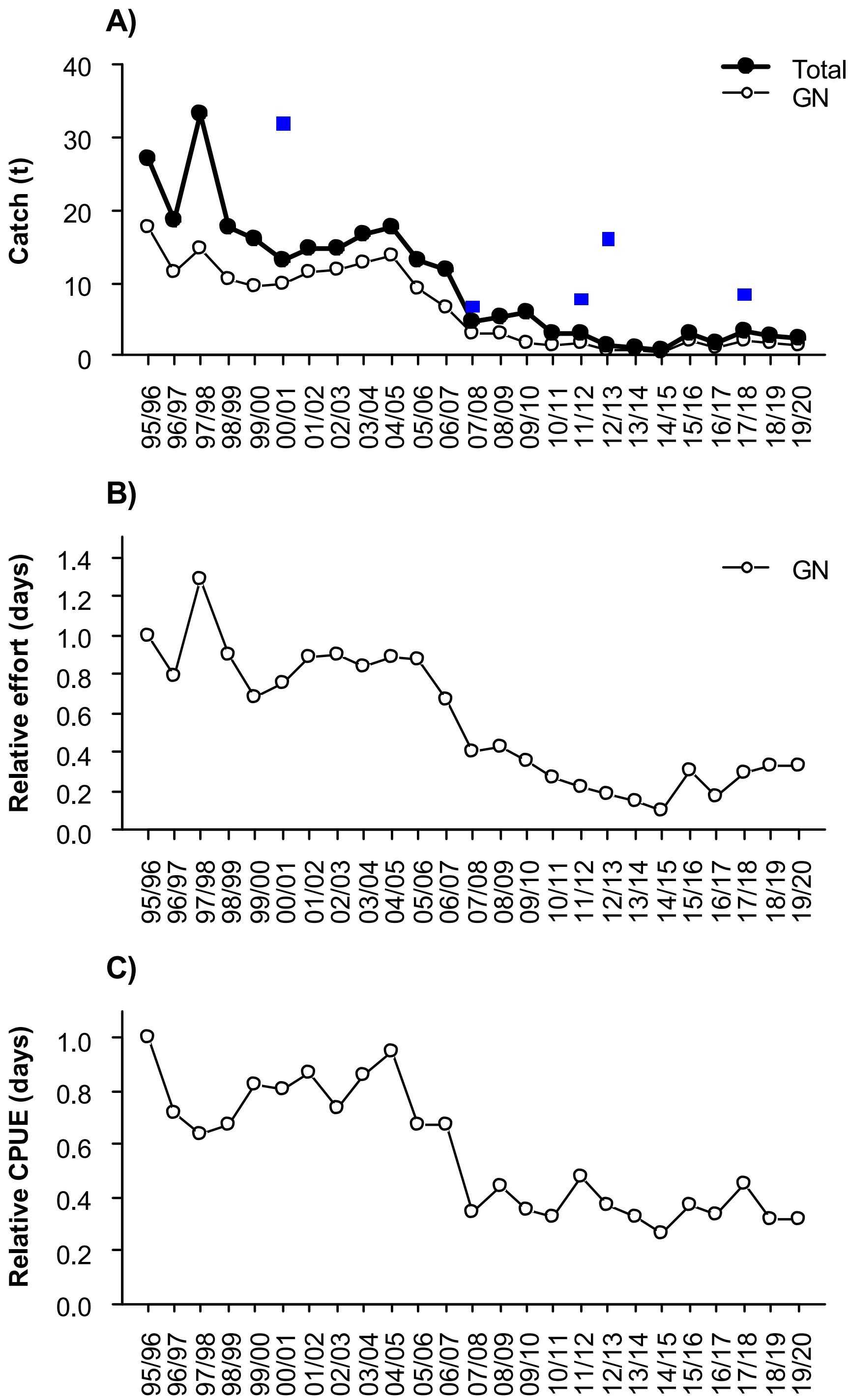


Figure 70 A) Annual commercial catch (t) by gear (left) and best estimates of recreational catches (blue squares). B) Commercial effort by method based on day fished relative to 1995/96. C) Commercial catch per unit effort (CPUE) based on weight per day fished relative to 1995/96. GN=gillnet.

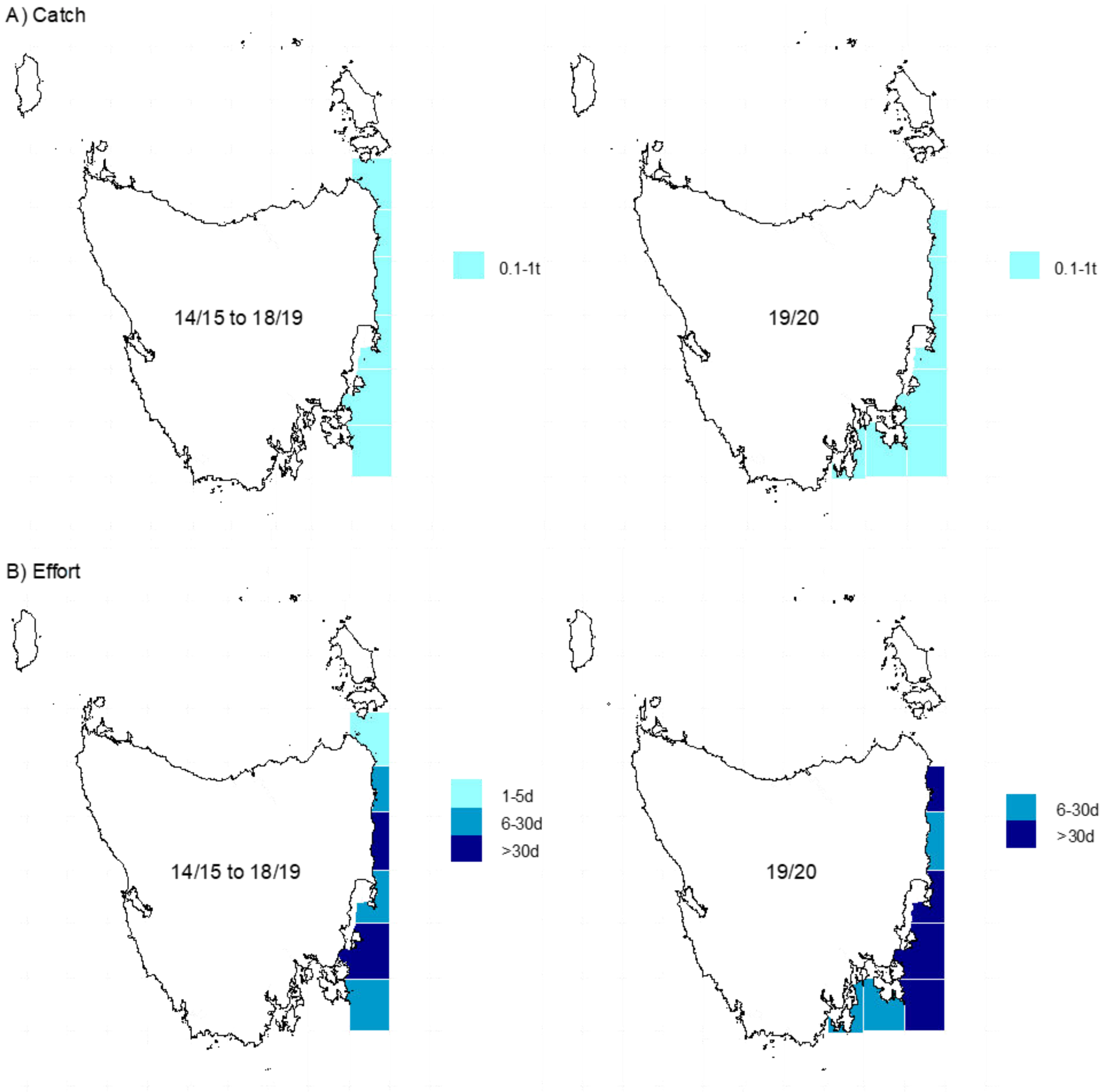


Figure 71 (A) Jackass Morwong catches (t) and (B) effort (days) for gillnet, handline and dropline by fishing blocks averaged over the last five assessment years (left) and in the current assessment year (right).

Reference points

Performance indicators	Proposed reference points	Breached?	By how much?
Fishing mortality	• Catch > 3rd highest catch value from the reference period (18.7 t)	No	
	• Catch < 3rd lowest catch value from the reference period (13.1 t)	Yes	↓ 10.6 t (80.7%)
	• Latest recreational catch estimate > recreational catch estimate from the reference period (31.9 t)	No	

	• Proportion of recreational catch to total catch > previous proportion estimate (88.5% in 2012/13)	No	
Biomass	• Rate of CPUE decline over last 3 years is greater than the largest 3-year CPUE decline during the reference period • (-0.0017)	No	

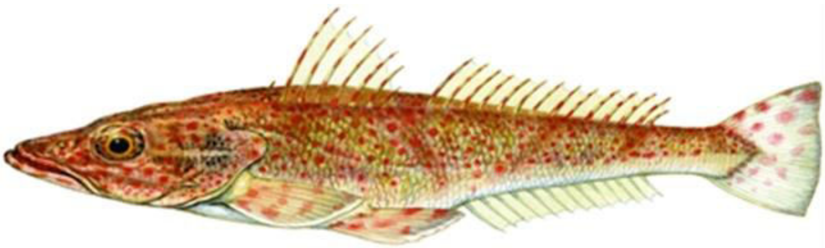
Stock status **SUSTAINABLE**

A single east Australian stock of Jackass Morwong is shared between the Commonwealth and Tasmania. Catch and catch rates have declined in a similar fashion between the two jurisdictions. Catch declines may have been driven, in part, by a prolonged period of reduced recruitment that might be a result of climate-induced changes to ocean current flow in eastern Tasmania (Wayte 2013). Due to an extended early life history period of Jackass Morwong in the open ocean, the species might be particularly sensitive to changes in ocean current flow, which can cause widespread larval dispersal and highly variable levels of recruitment success (Wayte 2013).

The Jackass Morwong stock was considered to be “Overfished” in the late 2000s, but since 2011 has been classified as “Not overfished nor subject to overfishing” (Woodhams et al. 2013; Flood et al. 2014; Patterson et al. 2020). The change of assessment status was associated with a reduction of catches for the species in response to management actions in the Commonwealth fishery as well as a revision of the stock assessment model. The total catch estimate (recreational and commercial) of Jackass Morwong in Tasmania (10.9 t in 2019/20) is low compared to the Commonwealth catch (109.1 t in 2019/20). Commonwealth assessment of the eastern Jackass Morwong stock (fished in Tasmania) indicated significant increases in spawning biomass from 2011 to 2014 (Tuck et al. 2015), with unpublished Commonwealth data suggesting the east coast stock is still rebuilding under current total allowable catch levels. No further reductions in allowable catch are anticipated. Given Fishery Status Reports describe both the stock biomass and fishing mortality as Sustainable (Patterson et al. 2020) this classification is applied to the Tasmanian fishery.

Tiger Flathead *(Platycephalus richardsoni)*

STOCK STATUS	**SUSTAINABLE**
Tiger Flathead is a predominately Commonwealth-managed species that has been classified as "Not overfished nor subject to overfishing" in the ABARES Fishery Status Reports 2019. It has been classified as Sustainable in the 2020 Status of Australian Fish Stocks Report. In Tasmania, Tiger Flathead are caught predominately by the commercial sector. Catches fluctuate substantially, but they typically represent a small proportion of Commonwealth trawl landings.	
IMPORTANCE	Key
STOCK(S)	Tasmanian Scalefish Fishery/ Southern and Eastern Scalefish and Shark Fishery (Commonwealth)
INDICATOR(S)	Catch, effort and CPUE trends
Managing Jurisdiction	Commonwealth



Tiger Flathead *(Platycephalus richardsoni)*
Source: DPIPWE (by Peter Gouldthorpe)

Tiger Flathead is associated with exposed sand and silt at depths of 10 – 400 m in southeast Australian waters of New South Wales, Victoria, and Tasmania (Edgar 2008). Southern Sand Flathead and Tiger Flathead are the most commonly targeted flathead species in Tasmania, with Tiger Flathead most dominant in commercial catches. Commercially, Tiger Flathead is taken mainly by Danish seine, with some recreational handline catches. More detailed information on biological characteristics and current management of Tiger Flathead fisheries is available from the TasFisheriesResearch webpage.

Catch, effort and CPUE

The 2019/20 total commercial catch of Tiger Flathead was 16.7 t, similar to the previous year (16.8 t) but down from recent peaks of > 60 t in 2015/16 and 2016/17. Tiger Flathead and Southern Sand Flathead were not routinely distinguished in commercial catch returns prior to 2007. However, since the commercial fishery for Flathead has not undergone major changes in its operations since 1995/96 it was feasible to back-calculate catches prior to 2007 using the species proportions, by method, for catches taken between 2007/08 and 2011/12 (Figure 72). Tiger Flathead landings have been variable over time, fluctuating between 20 and 80 t per annum without an obvious trend (Figure 72, Figure 73).

Danish seine fishing effort in 2019/20 declined in trend with the previous two years. However, catch rates increased (Figure 73). Given historically substantial fluctuation, it is possible that these variations reflect the degree of targeting of the species (Figure 73). Peaks in Danish seine catches, effort and CPUE are influenced by a small number of operators that have primarily targeted Tiger Flathead during those years. All catches in recent years were derived from the southeast and east coasts (Figure 74).

Recreational flathead catches were estimated at 361 t in 2000/01 (Lyle 2005), 292 t in 2007/08 (Lyle et al. 2009) and 235.9 t in 2012/13 (Lyle et al. 2014b). Tiger Flathead constitute a minor component of the total recreational flathead harvest (around 10% with Southern Sand Flathead constituting the remainder). In 2017/18, the recreational fishing survey first considered the two flathead species separately. The recreational catch of Tiger Flathead was estimated at 15.4 t, which was about 8% of the recreational catch estimate for Southern Sand Flathead (184.3 t) (Lyle et al. 2019).

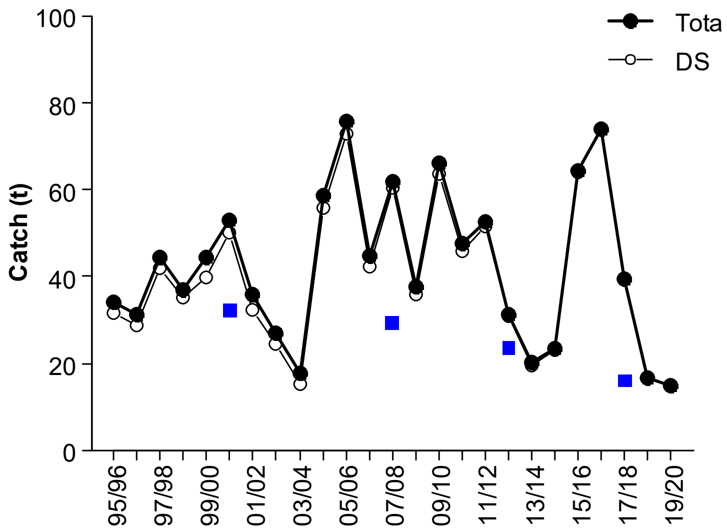


Figure 72 Back-calculated annual commercial catch (t) by gear for Tiger Flathead. Blue squares represent estimates of recreational catches from independent surveys. DS=Danish seine.

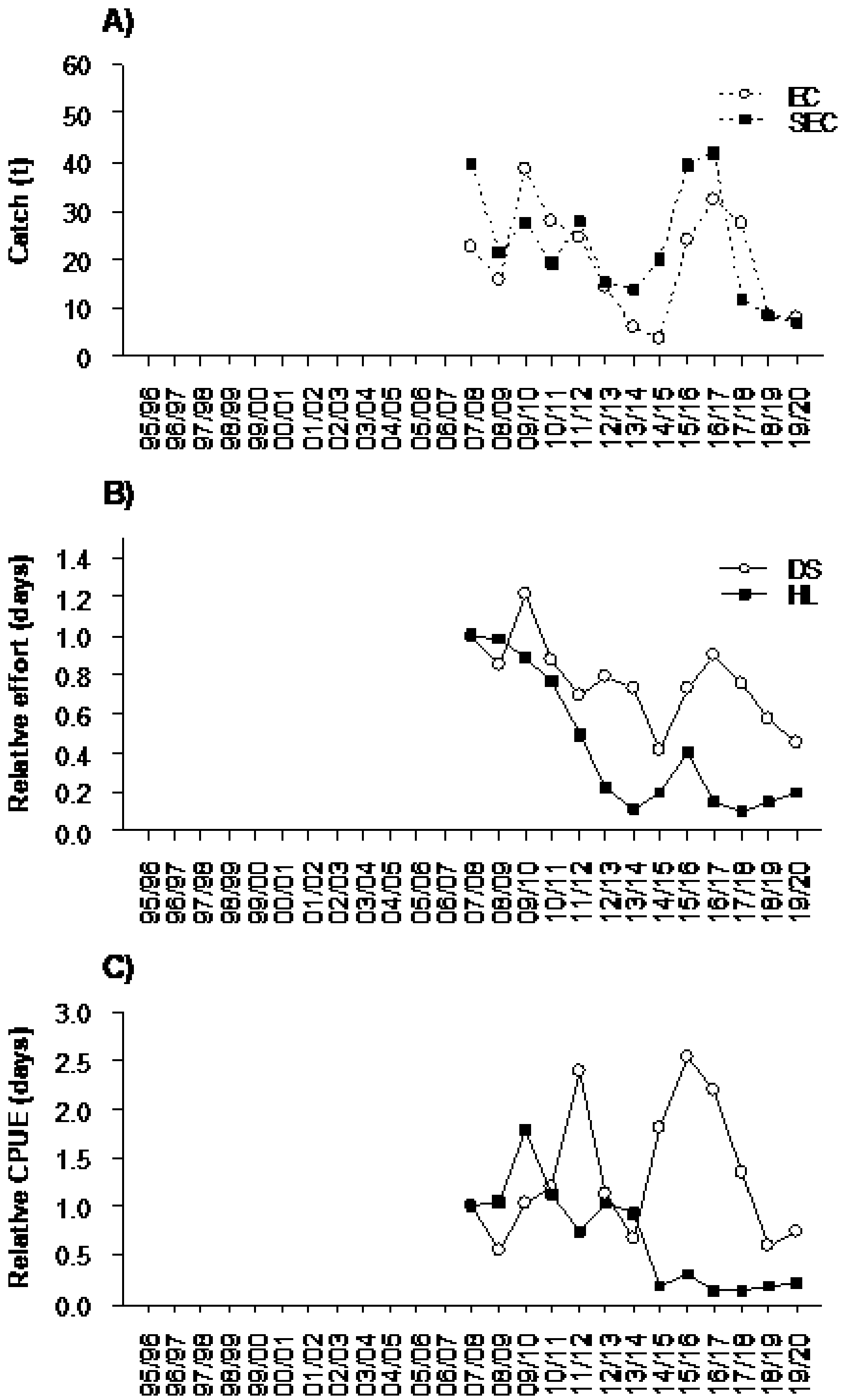


Figure 73 A) Tiger Flathead annual commercial catch (t) by region. B) Tiger Flathead commercial effort by method based on days fished relative to 2007/08. C) Tiger Flathead commercial catch per unit effort (CPUE) based on weight per day fished (right) relative to 2007/08. SEC = Southeast Coast, EC = East Coast. DS=Danish Seine, HL=Handline.

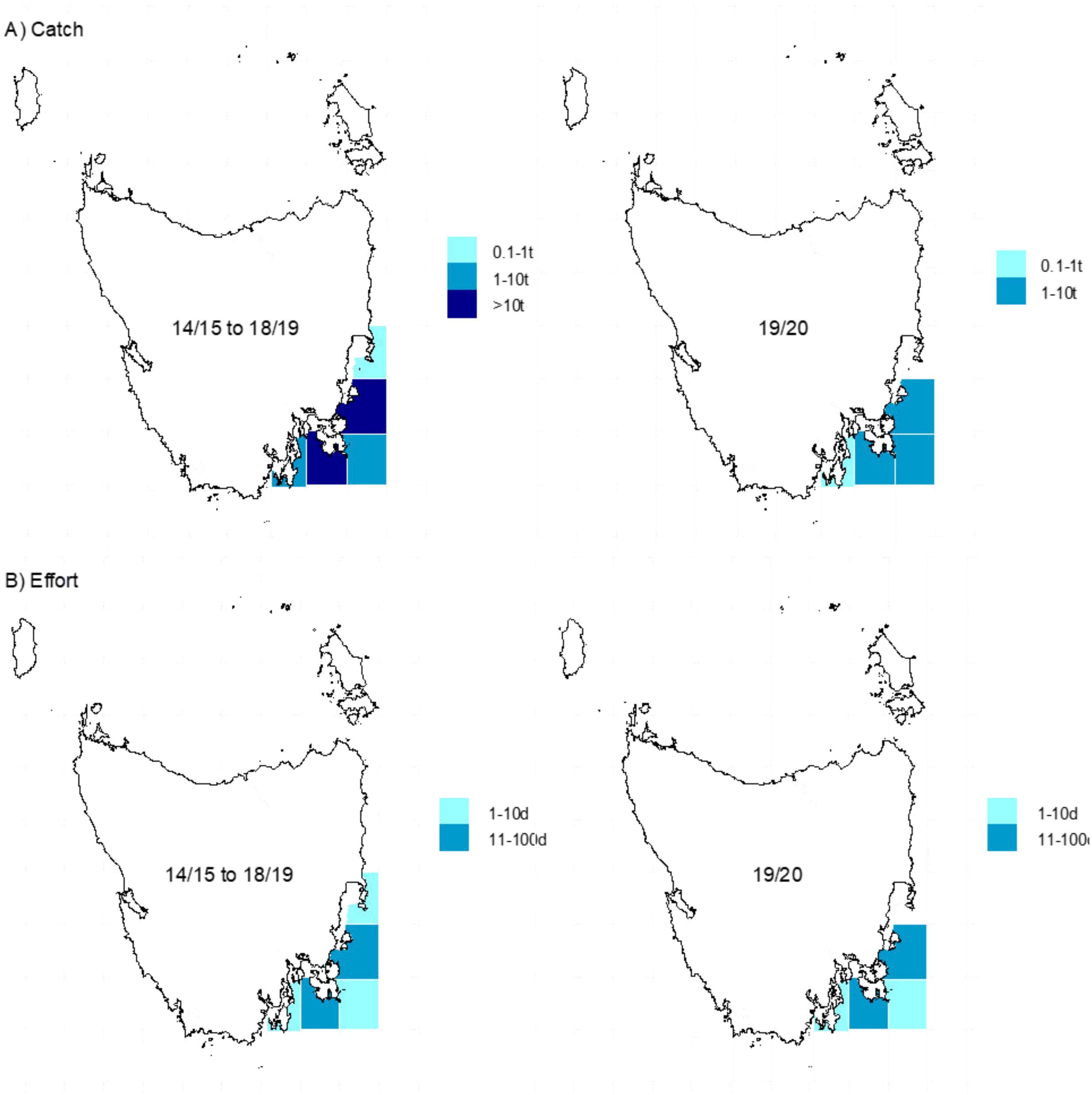


Figure 74 (A) Tiger Flathead catches (t) and (B) effort (days) by fishing blocks averaged over the preceding five years (left) and in the current assessment year (right).

Reference points for Flathead (combined).

Performance indicators	Proposed reference points	Breached?	By how much?
Fishing mortality	• Catch > 3rd highest catch value from the reference period (63.1 t)	No	
	• Catch < 3rd lowest catch value from the reference period (50.5 t)	Yes	↓ 32 t (63.4%)
	• Catch variation from the previous year above the greatest inter-annual increase from the reference period (43.5 t)	No	
	• Catch variation from the previous year above the greatest inter-annual decrease from the reference period (-31.9 t)	No	
	• Latest recreational catch estimate > recreational catch estimate from the reference period (361 t)	No	
	• Proportion of recreational catch to total catch > previous proportion estimate (85.5% in 2012/13)	No	
Biomass	• CPUE< 3rd lowest CPUE value from the reference period (0.013 t/days fished)	Yes	↓ 0.0039 t/day fished (-29.9%)
	• Rate of CPUE decline over last 3 years is greater than the largest 3-year CPUE decline during the reference period (-0.0020)	No	

Stock status **SUSTAINABLE**

Danish seine catches are highly variable and have historically tended to be inversely related with catches of School Whiting (refer Figure 66) which are targeted using the same fishing method. Thus, a decrease in catches of Tiger Flathead in 2018/19 was associated with an increase in catches of Eastern School Whiting (from 19 t in 2017/2018 to 42 t in 2018/19). Catch for both species remained similar in 2019/20. Total commercial catches of Tiger Flathead have been maintained at comparable levels in the past with the most significant landings taken from Commonwealth waters by the South East Trawl (Patterson et al. 2020). In 2019/20, the total Commonwealth catch of flathead (almost exclusively Tiger Flathead) was 1955 t, slightly down from 2035 t in 2018/19 and 2434 t in 2017/18 (Patterson et al. 2020). Tasmanian catches represent only a small fraction of these more significant catches, which have been classified as sustainable (Patterson et al. 2020). In accordance with this assessment, Tiger Flathead in Tasmanian waters is therefore classified as Sustainable.

While Tiger Flathead constitute a minor component of the recreational flathead catch, various management changes were introduced in 2015 to improve the sustainability of flatheads in State waters, including an increase in the minimum size limit from 300 mm to 320 mm, and the introduction of both a daily bag limit of 20 per fisher and a possession limit of 30 per fisher.

References

AFMA (2012) Blue Warehou (*Seriolella brama*) stock rebuilding strategy: Southern and Eastern Scalefish and Shark Fishery (SESSF) - Revised April 2012. Australian Fisheries Management Authority, Canberra, Australia

AFMA (2014) Blue warehou (*Seriolella brama*) stock rebuilding strategy. Australian Fisheries Management Authority, Canberra, Australia

André J, Lyle J, Hartmann K (2014) Tasmanian Scalefish Fishery Assessment 2010/12. Institute for Marine and Antarctic Studies, University of Tasmania

Barrett NS, Edgar GJ, Buxton CD, Haddon M (2007) Changes in fish assemblages following 10 years of protection in Tasmanian marine protected areas. J Exp Mar Biol Ecol 345: 141-157

Barrett NS, Edgar GJ, Oh E, Cooper A, Soler GA (2018) Surveys of subtidal reef biota of the Tinderbox Marine Nature Reserve 1992-2017. Institute for Marine and Antarctic Studies, University of Tasmania, Hobart, Australia

Bruce B, Neira F, Bradford R (2001) Larval distribution and abundance of blue and spotted warehous (*Seriolella brama* and *S. punctata*: Centrolophidae) in south-eastern Australia. Marine and Freshwater Research 52: 631-636 doi 10.1071/MF99150

DPIRP (2020) Estuarine and Nearshore Finfish Resource of South-West Western Australia Harvest Strategy 2020-2025. Department of Primary Industries and Regional Development, Perth, Australia

Edgar GJ (2008) Australian Marine Life, revised edition. New Holland Publishers, Melbourne, Vic.

Edgar GJ, Barrett NS (2012) An assessment of population responses of common inshore fishes and invertebrates following declaration of five Australian marine protected areas. Environ Conserv 39: 271-281 doi 10.1017/S0376892912000185

Emery TJ, Lyle JM, Hartmann K (2016) Tasmanian Scalefish Fishery Assessment 2014/15. Institute for Marine and Antarctic Studies, University of Tasmania, Hobart, Australia

Emery TJ, Lyle JM, Hartmann K (2017) Tasmanian Scalefish Fishery Assessment 2015/16. Institute for Marine and Antarctic Studies, University of Tasmania, Hobart, Australia

Ewing G, Forbes E, Lyle J, Krueck N, Pecl G, Tracey S (2020) Where do calamari spawn in northern Tasmania and how will this information aid the management of the calamari fishery in northern Tasmania? Institute for Marine and Antarctic Studies, University of Tasmania, Hobart, Australia

Ewing G, Lyle JM, Mapleston A, Stehfest KM, Semmens J (2014) Developing a low-cost monitoring regime to assess relative abundance and population characteristics of Sand Flathead. Institute for Marine and Antarctic Studies, University of Tasmania, Hobart, Australia

Ewing GP, Lyle JM (2020) Fishery-independent monitoring of Sand Flathead abundance and population characteristics, 2020 update. Institute for Marine and Antarctic Studies, University of Tasmania, Hobart, Australia

Flood M, Ilona S, Andrews J, Ashby C, Begg G, Fletcher W, Galeano D, Gardner C, Gibson B, Gray C, Hone P, Horvat P, McDonald B, Quinn R, Rowling K, Sainsbury K, Saunders T, Sloan S, Smith T, Ward T (2012) Status of key Australian fish stocks reports 2012. Fisheries Research and Development Corporation, Canberra, Australia

Flood M, Ilona S, Andrews J, Ashby C, Begg G, Fletcher W, Gardner C, Georgeson L, Hansen S, Hartmann K, Hone P, Horvat P, Maloney L, McDonald B, Moore A, Roelofs A, Sainsbury K, Saunders T, Smith T, Wise B (2014) Status of key Australian fish stocks reports 2014. Fisheries Research and Development Corporation, Canberra, Australia

Froese R, Demirel N, Coro G, Kleisner KM, Winker H (2017) Estimating fisheries reference points from catch and resilience. Fish Fish 18: 506-526 doi 10.1111/faf.12190

Gomon MF, Bray DJ, Kuiter RH (2008) Fishes of Australia's southern coast. New Holland Chatswood, Australia

Haddon M (2018) *Catch-MSY* Vignette for the catch-MSY Method, contained in *simpleSA* R package and in Haddon et al., (2019): 27p.

Haddon M, Burch P, Dowling N, Little R (2019) Reducing the number of undefined species in future status of Australian Fish Stocks Reports: Phase Two - training in the assessment of data-poor stocks. CSIRO Oceans and Atmosphere and Fisheries Research and Development Corporation., Hobart, Australia

Harries DN, Croome RL (1989) A review of past and present inshore gill netting in Tasmania with particular reference to the bastard trumpeter *Latridopsis forsteri* Castelnau. Pap Proc R Soc Tasman 123: 97-110 doi 10.26749/rstpp.123.97

Henry GW, Lyle JM (2003) The national recreational and indigenous fishing survey. Fisheries Research and Development Corporation, Canberra, Australia

Hobday AJ, Smith ADM, Stobutzki IC, Bulman C, Daley R, Dambacher JM, Deng RA, Dowdney J, Fuller M, Furlani D, Griffiths SP, Johnson D, Kenyon R, Knuckey IA, Ling SD, Pitcher R, Sainsbury KJ, Sporcic M, Smith T, Turnbull C, Walker TI, Wayte SE, Webb H, Williams A, Wise BS, Zhou S (2011) Ecological risk assessment for the effects of fishing. Fisheries Research 108: 372-384 doi 10.1016/j.fishres.2011.01.013

Hoenig J, Lawing W (1982) Estimating the total mortality rate using the maximum-order statistic for age. Int Counc Explor Sea CM/D 7: 13

Kailola PJ, Williams MJ, Stewart PC, Reichelt RE, McNee A, Grieve C (1993) Australian Fisheries Resources. Bureau of Resource Science and Fisheries Research and Development Corporation, Canberra, Australia

Knuckey IA (2006) Southern and Eastern Scalefish and Shark Fishery - bycatch utilisation scoping study. Department of Primary Industries Agribusiness Group, Victoria, Australia

Krueck NC, Hartmann K, Lyle J (2020) Tasmanian Scalefish Fishery Assessment 2018/19. Institute for Marine and Antarctic Studies, University of Tasmania, Hobart, Australia

Leon R, Perkins N, McLeay L, Reilly D, Kennelly S (2020) Ensuring monitoring and management of bycatch in Southern Rock Lobster Fisheries is best practice. Institute of Marine and Antarctic Studies, University of Tasmania, Hobart, Australia

Lyle JM (2005) 2000/01 Survey of recreational fishing in Tasmania. Tasmanian Aquaculture and Fisheries Institute, University of Tasmania, Hobart, Australia

Lyle JM, Bell JD, Chuwen BM, Barrett N, Tracey SR, Buxton CD (2014a) Assessing the impacts of gillnetting in Tasmania: implications for by-catch and biodiversity. Institute for Marine and Antarctic Studies, University of Tasmania, Hobart, Australia

Lyle JM, Stark KE, Ewing GP, Tracey SR (2019) 2017-18 Survey of recreational fishing in Tasmania. Institute for Marine and Antactic Studies, University of Tasmania, Hobart, Australia

Lyle JM, Stark KE, Tracey SR (2014b) 2012/13 Survey of recreational fishing in Tasmania. Institute for Marine and Antarctic Studies, University of Tasmania, Hobart, Australia

Lyle JM, Tracey SR, Stark KE, Wotherspoon S (2009) 2007/08 Survey of recreational fishing in Tasmania. Tasmanian Aquaculture and Fisheries Institute, University of Tasmania, Hobart, Australia

Martell S, Froese R (2013) A simple method for estimating MSY from catch and resilience. Fish Fish 14: 504-514 doi 10.1111/j.1467-2979.2012.00485.x

Murphy RJ, Lyle JM (1999) Impact of gillnet fishing on inshore temperate reef fishes, with particular reference to banded morwong. Tasmanian Fisheries and Aquaculture Institute, University of Tasmania, Hobart, Australia

Noriega R, Lyle J, Hall K, Moore B (2018) Status of Australian Fish Stocks (SAFS) Report: Gould's Squid. Fisheries Research and Development Corporation, Canberra, Australia

Patterson H, Woodhams J, Larcombe J, Curtotti R (2020) Fishery status reports 2020. Australian Bureau of Agricultural and Resource Economics and Sciences, Canberra, Australia

Pecl GT (2004) The in situ relationships between season of hatching, growth and condition in the southern calamary, *Sepioteuthis australis*. Marine and Freshwater Research 55: 429-438 doi 10.1071/MF03150

Punt AE, Smith AD, Smith DC, Tuck GN, Klaer NL (2014) Selecting relative abundance proxies for B_{MSY} and B_{MEY}. ICES J Mar Sci 71: 469-483 doi 10.1093/icesjms/fst162

Rayns N (2007) The Australian government's harvest strategy policy. ICES J Mar Sci 64: 596-598 doi 10.1093/icesjms/fsm032

Redmap Australia (2021). Institute for Marine and Antarctic Studies, University of Tasmania

Reid J (2018) Decadal changes in the population dynamics and stock structure of southern sea garfish (*Hyporhamphus melanochir*) within Tasmania. Honous Thesis, Hobart, Australia

Robinson LM, Gledhill DC, Moltschaniwskyj NA, Hobday AJ, Frusher S, N.Barrett, Stuart-Smith J, Pecl GT (2015) Rapid assessment of an ocean warming hotspot reveals “high” confidence in potential species' range extensions. Global Environ Change 31: 28-37 doi 10.1016/j.gloenvcha.2014.12.003

Sahlqvist P, Skirtun M (2011) Southern Squid Fishery. In: Woodhams J, Stobutzki IC, Vieira S, Curtotti R, Begg G (eds) Fisheries Status Reports 2010: status of fish stocks and fisheries managed by the Australian Government. Australia Bureau of Agriculture and Resource Economics and Sciences, Canberra, Australia

Smith D, Punt A, Dowling N, Smith A, Tuck G, Knuckey I (2009) Reconciling approaches to the assessment and management of data-poor species and fisheries with Australia's harvest strategy policy. Marine and Coastal Fisheries: Dynamics, Management, and Ecosystem Science 1: 244-254 doi 10.1577/C08-041.1

Stewart J, Fowler A, Green C, Lyle J, Smith K, Moore B (2018) Status of Australian Fish Stocks (SAFS) Report: Australian Salmons. Fisheries Research and Development Corporation, Canberra, Australia

Stewart J, Hughes JM, McAllister J, Lyle JM, MacDonald CM (2011) Australian salmon (*Arripis trutta*): population structure, reproduction, diet and composition of commercial and recreational catches. NSW Department of Industry and Investment

Stuart-Smith RD, Barrett NS, Crawford C, Frusher SD, Stevenson DG, Edgar GJ (2008) Spatial patterns in impacts of fishing on temperate rocky reefs: are fish abundance and mean size related to proximity to fisher access points? J Exp Mar Biol Ecol 365: 116 - 125 doi 10.1016/j.jembe.2008.08.002

Tracey SR, Lyle JM (2005) Age validation, growth modeling, and mortality estimates for striped trumpeter (Latris lineata) from southeastern Australia: making the most of patchy data. Fish Bull 103: 169-182

Tracey SR, Lyle JM, Ewing GP, Hartmann K, Mapleston AJ (2013) Offshore recreational fishing in Tasmania 2011/12. Institute for Marine and Antarctic Studies, University of Tasmania, Hobart, Australia

Tracey SR, Lyle JM, Haddon M (2007) Reproductive biology and per-recruit analyses of striped trumpeter (*Latris lineata*) from Tasmania, Australia: implications for management. Fisheries Research 84: 358-367 doi 10.1016/j.fishres.2006.11.025

Tuck GN, Day J, Wayte SE (2015) Assessment of the eastern stock of Jackass Morwong (*Nemadactylus macropterus*) based on data up to 2014. Paper to Shelf Resource Assessment Group, CSIRO Oceans and Atmosphere, Hobart, Australia

Walsh AT, Barrett N, Hill N (2017) Efficacy of baited remote underwater video systems and bait type in the cool-temperature zone for monitoring 'no-take'marine reserves. Marine and Freshwater Research 68: 568-580 doi 10.1071/MF15165

Ward T, Marton N, Hall K, Norriss J, Stewart J (2018) Status of Australian Fish Stocks (SAFS) Report: Australian Sardine. Fisheries Research and Development Corporation, Canberra, Australia

Ward TM, Burnell O, Ivey A, Carroll J, Keane J, Lyle J, Sexton S (2015) Summer spawning patterns and preliminary daily egg production method survey of Jack Mackerel and Australian Sardine off the East Coast. Fisheries Research and Development Corporation and South Australian Research and Development Institute (Aquatic Sciences), 1921563737, Canberra, Australia

Wayte SE (2013) Management implications of including a climate-induced recruitment shift in the stock assessment for jackass morwong (*Nemadactylus macropterus*) in south-eastern Australia. Fisheries Research 142: 47-55 doi 10.1016/j.fishres.2012.07.009

Webb J (2017) Snook (*Sphyraena novaehollandiae*): growth, mortality, and reproductive biology in north-west Tasmania. Master of Applied Science with Honours Thesis, Hobart, Australia

Woodhams J, Vieira S, Stobutzki IC (2013) Fishery status reports 2012. Australian Bureau of Agricultural and Resource Economics and Sciences, Canberra, Australia

Zhou S, Punt AE, Smith ADM, Ye Y, Haddon M, Dichmont CM, Smith DC (2017) An optimized catch-only assessment method for data poor fisheries. ICES J Mar Sci 75: 964-976 doi 10.1093/icesjms/fsx226

Appendix 1: Common and scientific names of species

Common name	Scientific name	Common name	Scientific name
Alfonsino	*Beryx* spp.	Pilchard	Fam. Clupeidae
Anchovy	Fam. Engraulidae	Rays bream	Fam. Bramidae
Atlantic salmon	*Salmo salar*	Redbait	*Emmelichthys nitidus*
Australian Salmon	*Arripis* spp.	Red fish	Fam. Berycidae
Barracouta	*Thyrsites atun*	Red Mullet	*Upeneichthys* spp.
Boarfish	Fam. Pentacerotidae	Silverfish	Fam. Atherinidae
Bream	*Acanthopagrus butcheri*	Snapper	*Pagrus auratus*
Butterfish	Spp unknown	Stargazer	Fam. Uranoscopidae
Cardinal fish	Fam Apogonidae	Sweep	*Scorpis* spp
Cod deep sea	*Mora moro*	Tailor	*Pomatomus saltatrix*
Cod, bearded rock	*Pseudophycis barbata*	Thetis fish	*Neosebastes thetidis*
Cod, red	*Pseudophycis bachus*	Trevalla, white	*Seriolella caerulea*
Cod, unspec.	Fam. Moridae	Trevally, silver	*Pseudocaranx dentax*
Dory, john	*Zeus faber*	Trout, rainbow	*Oncorhynchus mykiss*
Dory, king	*Cyttus traversi*	Trumpeter, bastard	*Latridopsis forsteri*
Dory, mirror	*Zenopsis nebulosus*	Trumpeter, striped	*Latris lineata*
Dory, silver	*Cyttus australis*	Trumpeter, unspec.	Fam. Latridae
Dory, unspec.	Fam. Zeidae	Warehou, blue	*Seriolella brama*
Eel	*Conger* spp.	Warehou, spotted	*Seriolella punctata*
Flathead	Fam Plactycephalidae	Whiptail	Fam. Macrouridae
Flounder	Fam. Pleuronectidae	Whiting	Fam. Sillaginidae
Garfish	*Hyporhamphus melanochir*	Whiting, King George	*Sillaginoides punctata*
Gurnard	Fam. Triglidae & Fam. Scorpaenidae	Wrasse	*Notolabrus* spp.
Gurnard perch	*Neosebastes scorpaenoides*	**'Commonwealth' spp**	
Gurnard, red	*Chelidonichthys kumu*	Blue grenadier	*Macruronus novaezelandiae*
Hardyheads	Fam. Atherinidae	Gemfish	*Rexea solandri*
Herring cale	*Odax cyanomelas*	Hapuka	*Polyprion oxygeneios*
Kingfish, yellowtail	*Seriola lalandi*	Oreo	Fam. Oreosomatidae
Knifejaw	*Oplegnathus woodwardi*	Trevalla, blue eye	*Hyperoglyphe antartica*
Latchet	*Pterygotrigla polyommata*	Tunas	
Leatherjacket	Fam. Monocanthidae	Albacore	*Thunnus alalunga*
Ling	*Genypterus* spp.	Skipjack	*Katsuwonus pelamis*
Luderick	*Girella tricuspidata*	Southern bluefin	*Thunnus maccoyii*
Mackerel, blue	*Scomber australasicus*	Tuna, unspec.	Fam. Scombridae
Mackerel, jack	*Trachurus declivis*	**Sharks**	
Marblefish	*Aplodactylus arctidens*	Shark, angel	*Squatina australis*
Morwong, banded	*Cheilodactylus spectabilis*	Shark, blue whaler	*Prionace glauca*
Morwong, blue	*Nemadactylus valenciennesi*	Shark, bronze whaler	*Carcharhinus brachyurus*
Morwong, dusky	Fam. Cheilodactylidae	Shark, elephant	*Callorhynchus milii*
Morwong, grey	*Nemadactylus douglasii*	Shark, gummy	*Mustelus antarcticus*
Morwong, jackass	*Nemadactylus macropterus*	Shark, saw	*Pristophorus spp.*
Morwong, red	Fam. Cheilodactylidae	Shark, school	*Galeorhinus galeus*
Morwong, unspec.	Fam. Cheilodactylidae	Shark, seven-gilled	*Notorynchus cepedianus*
Mullet	Fam. Mugilidae	Shark, spurdog	Fam. Squalidae
Nannygai	*Centroberyx affinis*	**Cephalopods**	
Perch, magpie	*Cheilodactylus nigripes*	Calamari	*Sepioteuthis australis*
Perch, ocean	*Helicolenus* spp.	Cuttlefish	*Sepia* spp.
Pike, long-finned	*Dinolestes lewini*	Octopus	*Octopus* spp.
Snook	*Sphyraena novaehollandiae*	Squid, Gould's	*Nototodarus gouldi*

Appendix 2: Data restrictions and quality control

There have been a number of administrative changes that have affected the collection of catch and effort data from the fishery. The following restrictions and adjustments have been applied when analysing the data as an attempt to ensure comparability between years, especially when examining trends over time.

Tasmanian logbook data

i) Correction of old logbook landed catch weights

Prior to 1995, catch returns were reported as monthly summaries of landings. With the introduction of a revised logbook in 1995, catch and effort was recorded daily for each method used. Since catch data reported in the old general fishing return represent landed catch, it has been assumed to represent processed weights. For example, where a fish is gilled and gutted, the reported landed weight will be the gilled and gutted and not the whole weight. In contrast, in the revised logbook all catches are reported in terms of weight and product form (whole, gilled and gutted, trunk, fillet, bait or live). If the catch of a species is reported as gilled and gutted, then the equivalent whole weight can be estimated based on a conversion factor[1].

Without correcting for product form, old logbook and revised logbook catch weights are not strictly compatible. In an attempt to correct for this issue and provide a 'best estimate', a correction factor was calculated using catch data from the revised logbook and applied to catches reported in the old logbook. A species-based ratio of the sum of estimated whole weights (adjusted for product form) to the sum of reported catch weights was used as the correction factor.

ii) Effort Problems

Records of effort (based on gear units) of zero or null, or appearing to be recorded incorrectly (implausible), were flagged. While catch can then still be included in catch summaries, such records need to be excluded from calculations of gear unit effort, complicating associated calculations of catch rates for most species. However, all records of effort can be considered in calculating daily catch rates.

iii) Vessel restrictions

In all analyses of catch and effort, past catches from six vessels (four Victorian based and two Tasmanian based) have been excluded from historic records. These vessels were known to have fished consistently in Commonwealth waters and their catches of species, such as Blue Warehou and Ling tended to significantly distort catch trends. In fact, all four Victorian vessels and one of the Tasmanian vessels ceased reporting on the General Fishing Returns in 1994. With the introduction of the South East Fishery Non-Trawl logbook (GN01) in 1997, the remaining Tasmanian vessel ceased reporting fishing activity in the Tasmanian logbook.

[1] Conversion factors to whole weights are 1.00 for whole, live or bait; 2.50 for fillet; 1.50 for trunk; and 1.18 for gilled and gutted.

Commonwealth logbook data:

Commonwealth logbook data from Australian Fisheries Management Authority was included in the analyses so that the assessment of individual species reflected all catches from Tasmanian waters.

Commonwealth logbook records were only included if the catch was taken in fishing blocks adjacent to Tasmania (refer to Figure A1). Consideration of Commonwealth logbook records is relevant primarily for Striped Trumpeter, Bastard Trumpeter and Gould's Squid.

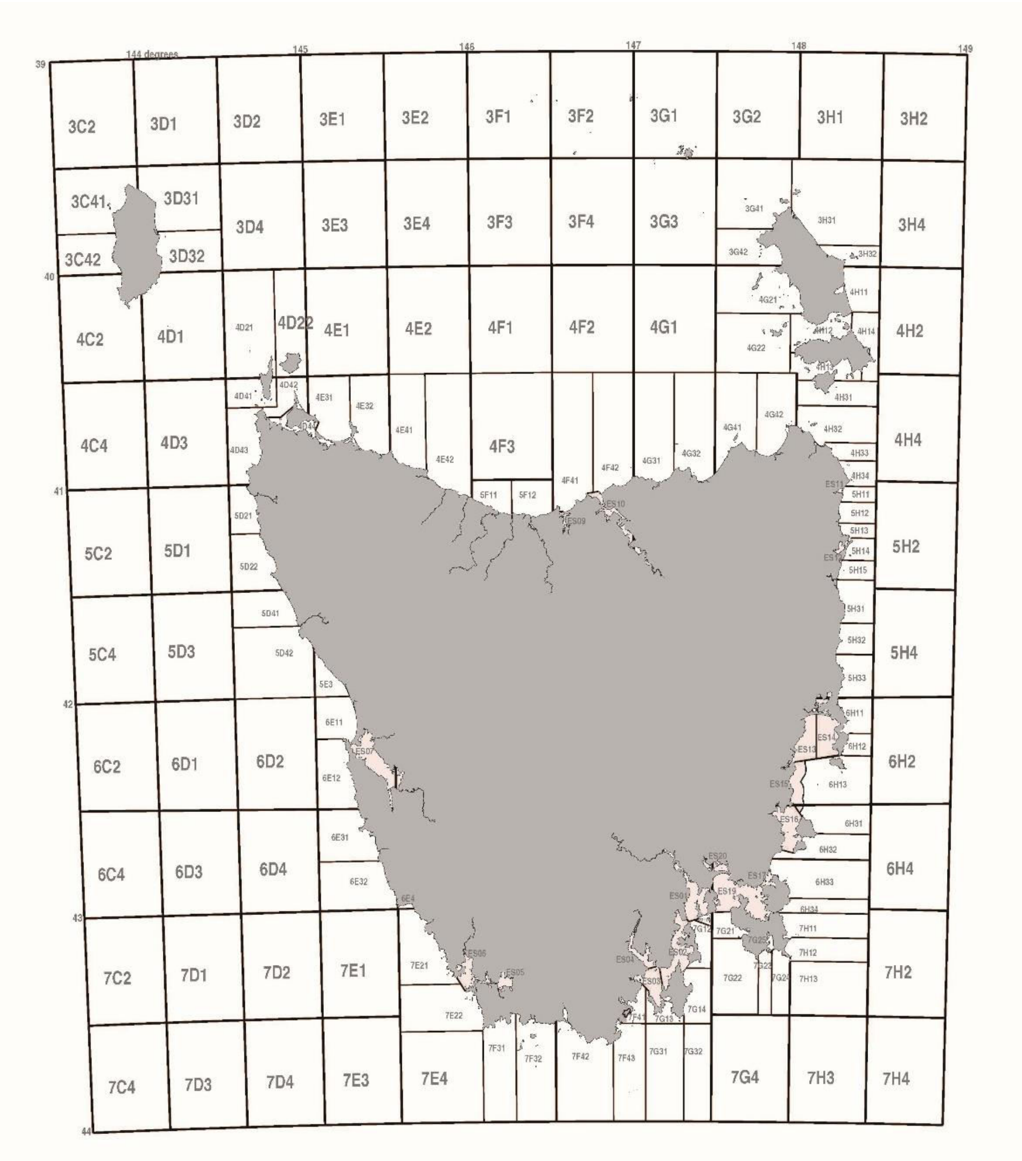


Figure A1 Numbers for fishing blocks used in calculation of catch figures.

Appendix 3: Annual Tasmanian Scalefish Fishery production

Table A1 Catch (tonnes) of selected species and species groups classified as finfish, small pelagics, cephalopods, and sharks.

Species	95/96	96/97	97/98	98/99	99/00	00/01	01/02	02/03	03/04	04/05	05/06	06/07	07/08	08/09	09/10	10/11	11/12	12/13	13/14	14/15	15/16	16/17	17/18	18/19	19/20
Selected finfish species (excl. small pelagics)																									
Australian Salmon	413.2	287.3	475.7	384.7	363.7	485.0	462.1	407.2	167.2	336.5	254.2	115.0	256.1	338.8	372.3	203.5	189.4	331.3	65.6	42.2	89.3	18.9	76.1	38.7	10.1
Barracouta	19.3	53.8	65.2	27.6	25.0	15.1	136.0	67.5	87.5	101.0	60.1	26.6	13.3	13.3	7.6	5.0	4.0	1.1	1.1	1.7	0.4	1.4	0.9	1.1	0.7
Boarfish	7.3	10.0	6.2	3.2	2.5	3.6	5.5	3.6	4.3	3.6	5.0	5.2	4.7	2.6	2.7	1.9	3.4	2.1	1.0	0.6	0.7	0.7	1.1	0.9	0.5
Cod	18.6	12.8	9.4	9.6	8.8	3.7	3.0	2.3	2.1	1.6	2.0	2.6	2.3	3.3	2.6	2.8	2.4	2.0	2.0	2.0	1.5	1.3	0.9	0.3	0.6
Flathead, sand	13.7	12.7	13.0	10.1	12.5	8.2	13.1	10.8	10.6	13.9	12.6	12.0	11.5	13.0	9.2	6.7	7.5	5.5	6.8	8.1	2.7	6.4	3.5	2.8	2.1
Flathead, tiger	34.1	31.3	44.5	37.1	44.4	53.0	35.9	27.2	17.9	58.8	75.7	44.8	62.0	37.8	66.3	47.6	52.7	31.2	20.2	23.5	64.4	74.0	39.4	16.8	16.7
Flounder	33.4	29.4	29.7	25.2	18.6	12.3	13.0	10.9	14.9	14.7	10.9	13.0	7.8	5.1	5.2	5.2	4.0	2.0	2.1	1.5	1.0	3.3	3.9	2.2	2.7
Garfish	56.2	91.6	83.0	101.7	91.7	81.4	87.8	92.5	66.2	85.5	89.3	50.0	31.0	63.0	49.3	43.2	53.0	51.5	37.9	33.8	21.9	16.4	8.9	7.4	10.7
Gurnard	13.5	10.4	9.1	7.0	9.6	7.4	5.3	9.7	6.8	6.1	5.1	5.7	4.7	2.6	1.5	2.1	1.2	1.1	0.6	1.9	2.1	2.7	1.8	1.0	2.1
Leatherjacket	14.5	12.6	13.3	12.9	16.6	16.7	16.6	13.7	14.8	10.4	8.5	8.8	5.3	5.5	3.0	2.9	2.2	2.4	2.9	2.1	1.3	2.6	2.6	4.3	2.3
Ling	15.0	13.3	8.3	4.3	1.8	1.2	0.9	0.4	0.8	0.7	0.4	0.4	0.4	0.1	0.1	0.1	0.1	0.1	1.2	0.0	0.1	0.1	0.1	0.1	0.3
Marblefish	3.5	5.6	3.0	2.6	4.2	4.0	4.4	3.1	0.6	1.1	0.5	2.2	2.3	1.1	0.5	0.2	0.2	0.3	0.2	0.3	0.3	0.3	0.0	0.1	0.1
Morwong, banded	85.8	78.0	72.6	42.4	34.2	39.0	53.7	56.0	46.4	45.6	54.4	50.3	52.6	37.1	44.6	40.9	40.3	37.9	34.1	30.1	32.9	34.0	30.3	36.0	31.3
Morwong, jackass	27.1	18.7	33.2	17.5	15.9	13.1	14.8	14.7	16.6	17.5	13.1	11.7	4.6	5.3	5.9	3.2	3.1	1.5	1.0	0.8	3.2	1.6	3.3	2.6	2.5
Morwong, other	5.4	7.4	7.4	6.3	1.4	0.6	1.4	1.9	1.2	1.8	1.3	1.3	2.5	1.4	1.2	0.9	0.7	0.7	0.6	0.7	0.3	0.6	0.3	0.4	0.2
Mullet	1.0	1.7	1.7	2.2	4.9	4.8	2.5	4.0	4.3	2.4	3.2	2.0	0.1	1.4	1.8	2.1	0.5	4.4	0.5	0.8	2.4	0.4	0.3	0.2	1.2
Snook	13.7	15.2	17.7	3.2	4.1	5.9	6.6	6.6	3.7	2.2	2.9	6.7	7.0	8.7	7.9	7.5	6.7	6.3	9.1	9.0	2.6	9.4	5.9	2.7	2.7
Trevally	8.4	6.0	5.4	6.5	2.7	1.6	4.7	5.9	3.4	3.7	6.3	3.6	8.8	4.5	3.8	1.9	2.1	5.4	4.3	5.7	2.8	3.6	3.3	3.7	11.4
Trumpeter, bastard	60.1	51.8	40.7	47.7	36.4	26.1	23.9	21.0	23.2	18.5	23.4	21.3	19.1	16.7	10.5	9.8	9.6	9.5	8.3	6.5	8.4	6.4	4.2	2.7	6.1
Trumpeter, striped	58.3	79.4	78.1	99.0	95.0	45.5	39.9	36.6	36.9	23.9	19.0	18.7	12.2	10.7	10.8	19.7	20.9	17.3	10.5	13.0	7.1	12.1	14.1	7.1	6.8
Trumpeter, unspec.	0.0	0.1	0.6	3.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.1	0.1	0.0	0.1	0.1	0.3	0.2	0.0	0.0	0.0	0.0
Warehou, blue	82.3	128.4	187.6	272.2	187.1	34.2	66.4	49.3	27.6	19.1	20.0	29.3	25.3	26.8	37.5	10.7	3.8	8.5	5.8	2.8	7.4	7.6	12.6	1.8	0.8
Warehou, other	14.6	15.6	4.2	1.0	0.0	0.0	0.1	0.2	0.1	0.8	0.1	0.0	0.1	0.6	0.2	0.0	0.0	0.2	0.0	0.1	0.3	0.4	1.2	0.5	0.0
Whiting, combined	1.4	0.1	0.0	23.3	9.6	36.5	39.6	35.9	50.9	31.6	2.3	38.1	31.4	32.5	26.7	34.2	15.5	13.8	36.6	1.9	20.7	26.0	16.1	41.5	45.3
Wrasse, combined	83.4	110.1	100.0	90.7	85.5	88.4	92.3	72.0	75.1	100.1	92.9	112.9	87.6	68.1	72.0	72.7	68.0	64.2	65.1	81.8	72.7	79.1	83.8	82.1	52.3
Total	**1084**	**1083**	**1310**	**1241**	**1076**	**987**	**1130**	**953**	**683**	**901**	**763**	**582**	**653**	**700**	**743**	**525**	**491**	**600**	**318**	**271**	**347**	**309**	**315**	**257**	**178**

Table A1 Continued. Whole weight in tonnes by financial year

Species	95/96	96/97	97/98	98/99	99/00	00/01	01/02	02/03	03/04	04/05	05/06	06/07	07/08	08/09	09/10	10/11	11/12	12/13	13/14	14/15	15/16	16/17	17/18	18/19	19/20
Small pelagics																									
Australian sardine	6.6	4.3	15.4	2.8	1.7	3.2	0.7	0.0	0.3	0.8	0.0	0.0	13.2	14.5	0.4	0.0	0.0	0.0	0.1	0.0	0.0	33.3	0.1	0.0	0.0
Mackerel, jack	26.2	19.3	19.7	59.8	14.7	9.1	19.4	19.4	41.1	12.8	6.8	2.6	202.8	919.7	910.2	35.7	56.4	0.2	0.4	5.5	1.0	0.1	2.0	0.2	0.1
Mackerel, other	2.0	1.3	1.0	0.5	2.1	0.1	0.0	0.1	0.0	0.5	0.5	0.2	10.3	0.2	0.3	0.8	0.1	1.9	4.2	1.1	0.2	2.8	0.5	0.2	0.6
Redbait	0.1	0.0	0.0	4.0	0.0	0.0	0.0	0.0	3.4	1.0	1.4	0.3	300.1	521.4	121.6	15.0	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total	**34.9**	**24.9**	**36.1**	**67.1**	**18.5**	**12.4**	**20.1**	**19.5**	**44.8**	**15.1**	**8.7**	**3.1**	**526.4**	**1456**	**1033**	**51.5**	**56.6**	**2.2**	**4.7**	**6.6**	**1.2**	**36.2**	**2.6**	**0.4**	**0.7**
Cephalopods																									
Calamari, southern	33.0	19.0	26.6	94.4	87.4	78.0	105.2	108.8	86.8	114.2	44.6	85.4	89.0	78.6	51.1	54.9	50.8	63.9	67.8	75.9	106.2	122.6	60.6	107.4	85.3
Cuttlefish	0.2	0.3	0.2	0.0	0.0	0.0	0.7	2.4	1.0	0.2	0.4	0.1	0.3	0.3	0.1	0.1	0.1	0.2	0.1	0.1	0.5	0.3	0.2	0.1	0.1
Octopus													3.0	2.2	2.1	5.9	3.8	4.5	8.3	4.7	7.5	19.2	6.7	1.1	0.3
Squid, Gould's	5.7	7.8	12.9	79.7	481.3	39.7	2.4	1.9	2.1	2.6	1.8	687.7	45.9	45.5	121.3	131.2	516.6	1071.8	0.0	31.4	416.8	175.6	528.0	23.9	15.8
Total	**38.9**	**27.1**	**39.7**	**174.1**	**568.7**	**117.7**	**108.3**	**113.1**	**89.9**	**117**	**46.8**	**773.2**	**138.2**	**126.6**	**174.6**	**192.1**	**571.3**	**1140.4**	**76.2**	**112.1**	**531**	**317.7**	**595.5**	**132.5**	**101.5**
Sharks[2]																									
Elephant shark	58.0	48.9	21.4	14.7	17.0	16.7	18.4	16.5	10.2	7.6	5.7	9.0	1.9	1.5	2.4	1.3	2.7	1.9	1.4	0.6	0.2	1.8	1.2	0.8	0.7
Gummy shark	750.5	543.8	348.6	113.4	109.7	53.9	23.5	14.2	24.7	41.6	12.4	13.6	13.8	9.8	9.8	9.3	7.5	7.9	6.0	7.6	8.2	11.1	9.1	7.7	6.9
Draughtboard shark	0.0	0.0	0.0	0.0	0.0	0.0	1.7	0.7	1.0	0.8	1.3	1.2	0.4	0.3	0.2	0.3	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Sawshark	127.4	74.4	29.2	6.8	3.4	12.3	21.4	20.4	20.6	23.5	5.9	3.4	0.3	0.1	0.1	0.1	0.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
School shark	252.1	171.5	71.7	31.5	11.3	1.7	2.2	1.4	7.0	2.6	0.6	1.8	1.0	0.7	1.8	1.4	1.9	2.1	1.1	1.4	1.1	1.7	2.0	1.4	1.6
Seven-gilled shark	6.1	4.9	6.1	1.9	10.3	16.3	18.8	7.4	11.5	8.4	3.8	3.9	0.5	2.3	1.1	1.4	1.1	0.8	0.7	1.0	1.1	0.4	0.2	0.3	0.0
Other shark	26.4	16.1	11.3	6.8	6.5	4.8	5.8	3.6	3.2	1.1	0.6	2.3	0.9	0.7	0.3	0.9	0.6	0.6	0.7	0.9	0.8	0.9	1.8	2.8	3.5
Total sharks	**1221**	**859.6**	**488.3**	**175.1**	**158.2**	**105.7**	**91.8**	**64.2**	**78.2**	**85.6**	**30.3**	**35.2**	**18.8**	**15.4**	**15.7**	**14.7**	**14.2**	**13.4**	**9.9**	**11.5**	**11.4**	**15.9**	**14.3**	**13.0**	**12.7**

[2] Since 2001/02, shark catches have been reported in Commonwealth logbooks. Tasmania has jurisdiction of all shark species inside 3 nm except gummy and school shark, and fishers are on bycatch possession limits for all species. Figures in the table refer to Tasmanian Scalefish Fishery records only.

Table A2 Catch (tonnes) of all species assessed in this report and ordered by volume in the 2019/20 season.

Species	95/96	96/97	97/98	98/99	99/00	00/01	01/02	02/03	03/04	04/05	05/06	06/07	07/08	08/09	09/10	10/11	11/12	12/13	13/14	14/15	15/16	16/17	17/18	18/19	19/20
Southern Calamari	33	19	26.6	94.5	87.4	78	105	109	86.8	114	44.6	85.4	89	78.6	51.1	54.9	50.8	63.9	67.8	75.9	106	123	60.6	108	84.3
Eastern School Whiting	1.4	0.1	0	23.3	9.6	36.5	39.6	35.9	50.9	31.6	2.3	38.1	31.4	32.4	26.7	34.2	15.4	13.7	36.5	1.8	20.6	26	16.1	43.9	43.6
Bluethroat Wrasse	5.5	2.1	3.5	2.9	3	3.1	7.3	11.6	7.1	13.4	3	2.2	39.6	41.9	46.2	53.3	48.5	50.7	52.3	64.3	57.1	60.1	62.2	63.1	41.1
Tiger Flathead													62	37.8	66.3	47.7	53	31.6	20.3	24.6	64.4	74	39.4	17.1	15.6
Eastern Australian Salmon	413	287	476	385	364	485	462	407	167	337	254	115	256	339	372	204	189	331	65.6	42.2	89.3	18.9	76.1	38.7	14.5
Purple Wrasse	5.6	6.8	2.4	0.3	1.3	1.4	5	9.7	3.8	0.8	3.9	5.3	20.1	26	25.6	19.4	19.5	13.2	12.8	17.5	15.6	19	21.4	18.6	11.4
Southern Garfish	56.2	91.6	83	102	91.7	81.4	87.8	92.5	66.2	85.5	89.3	50	31	63	49.3	43.2	53	51.5	37.9	33.8	21.9	16.4	8.9	7.4	10.7
Striped Trumpeter	58.3	79.4	78.1	99	95	45.5	39.9	36.6	36.9	23.9	19	18.7	12.2	10.7	10.8	19.7	20.9	17.3	10.5	13	7.1	12.1	14.1	7.1	7.8
Bastard Trumpeter	60.1	51.8	40.7	47.7	36.4	26.1	23.9	21	23.2	18.5	23.4	21.3	19.1	16.7	10.5	9.8	9.6	9.5	8.3	6.5	8.4	6.4	4.3	2.7	6.2
Greenback Flounder	8.7	7.8	7.6	4.6	13.9	10.8	13	10.7	13.9	14.7	10.8	12.9	3.4	4.3	5.2	4.9	3.7	1.9	2	1.5	1	3.3	3.9	2.2	3.5
Pike/Snook (Short Finned)	13.7	15.2	17.7	3.2	4.1	5.9	6.6	6.6	3.7	2.2	2.9	6.7	7	8.7	7.9	7.5	6.7	6.3	9.1	9	2.6	9.4	5.9	2.7	2.7
Jackass Morwong	27.1	19	34.1	18.2	16.8	13.7	14.8	14.7	16.6	17.5	13.1	11.7	4.6	5.3	5.9	3.5	3.4	1.7	1.1	3.3	3.1	1.6	3.3	2.6	2.5
Leatherjackets	14.5	12.6	13.3	12.9	16.6	16.7	16.6	13.7	14.8	10.4	8.5	8.8	5.3	5.5	3	2.9	2.2	2.4	2.9	2.1	1.3	2.6	2.6	4.3	2.3
Southern Sand Flathead													11.5	13	9.2	6.7	7.5	5.5	6.8	8.2	2.7	6.4	3.5	2.8	2.1
King George Whiting	0.1	0.3	0.2	0.2	0.3	0.2	0.2	0.3	0.6	0.8	2.6	2	0.7	0.7	0.3	0.4	0.7	1.7	0.7	1.2	2.1	3.3	3	0.9	1.6
Blue Warehou	82.3	129	190	274	189	36	66.4	49.3	27.6	19.1	20	29.3	25.3	26.8	37.5	10.9	4.1	8.5	5.8	2.8	7.4	7.6	12.6	1.8	0.8
Yelloweye Mullet	1	1.7	1.7	2.2	4.9	4.8	2.5	4	4.3	2.4	3.2	2	0.1	1.3	1.8	2.1	0.5	4.4	0.5	0.7	2	0.2	0.1	0.2	0.8
Barracouta	19.3	53.8	65.2	27.6	25	15.1	136	67.5	87.5	101	60.1	26.6	13.3	13.3	7.6	5	4	1.1	1.1	1.7	0.4	1.4	0.9	1.1	0.7
Longsnout Boarfish	0.6	1.2	0.4	0	2.3	3.6	5.5	3.6	4.3	3.6	5	5.2	0.7	1.5	2.7	1.9	2.9	2.1	1	0.6	0.7	0.6	1.1	0.9	0.5
Common Jack Mackerel	26.2	19.3	19.7	59.8	15.1	9.2	19.4	19.4	41.1	12.8	6.8	2.6	203	920	910	35.7	56.4	0.2	0.4	5.5	1	0.1	2	0.2	0.1
Australian Sardine	1.1	0	0	0	0	0.1							13.1	14.5	0.4				0.1	0		33.3	0.1	0	0

Table A3 Total commercial catches (t) in selected estuaries around Tasmania by fishing season.

a) By fishing year	ES01	ES06	ES07	ES08	ES09	ES10	ES11	ES12	ES17	ES18	ES19	ES20	Total
1995/96	17.39	0.67	4.43		0.41	10.75		0.43	2.92	26.44	14.12	3.22	80.78
1996/97	16.71	0.35	2.63		0.56	15.01		0.92	6.12	12.29	6.98	1.78	63.35
1997/98	14.28	0.16	1.41	<0.05	0.63	15.62		2.48	11.47	20.79	13.47	1.35	81.66
1998/99	14.21		1.38		0.90	19.60		1.59	10.04	36.50	23.19	4.87	112.28
1999/00	4.73		0.98		0.45	14.15	0.18	2.56	18.90	28.51	10.23	2.77	83.46
2000/01	16.10		0.25		0.13	12.70	0.05	1.17	15.46	27.93	27.33	1.88	103.00
2001/02	13.88		2.23		0.19	73.82		1.19	8.86	64.06	32.33	2.00	198.56
2002/03	28.13		8.02		0.16	27.64	0.55	0.81	14.55	35.23	23.00	1.57	139.66
2003/04	40.05		6.06		1.00	25.12			5.17	59.52	21.83	0.81	159.56
2004/05	25.99		4.93		1.76	34.47		<0.05	9.46	25.87	23.14	0.66	126.28
2005/06	2.19	0.07	23.16		0.95	33.15	1.29		6.64	14.18	9.67	0.84	92.14
2006/07	30.97	0.25	9.93		2.00	23.60	0.17		8.72	20.01	19.74	1.36	116.75
2007/08	31.87	<0.05	3.16			15.26		<0.05	12.31	26.94	12.11	0.87	102.52
2008/09	32.22		1.14		0.18	20.90		<0.05	8.38	15.75	10.45	2.07	91.09
2009/10	26.91		0.72		0.46	15.22	<0.05	<0.05	3.93	15.57	4.39	2.07	69.27
2010/11	27.84	0.11	0.44		0.60	10.25			5.65	5.82	13.71	1.69	66.11
2011/12	13.88		0.28			8.39			4.95	6.88	6.70	1.89	42.97
2012/13	12.19	0.07	0.13		<0.05	12.22	0.20		6.72	13.27	3.11	0.85	48.76
2013/14	32.28		1.06		0.29	9.69			2.97	6.74	8.75	1.09	62.87
2014/15	1.76	<0.05	<0.05		0.40	8.90		0.10	3.25	8.51	0.87	0.72	24.51
2015/16	17.51				0.82	10.34		0.13	3.10	5.11	3.81	0.58	41.40
2016/17	26.24		0.05		0.17	12.63			2.77	4.13	4.61	2.36	52.96
2017/18	16.07		0.78			8.79			1.94	6.59	3.81	3.03	41.01
2018/19	31.70		12.50			7.64			5.63	1.73	13.56	2.89	75.64
2019/20	42.33		18.67			7.74			1.91	4.55	4.60	1.58	81.33

ES	Description
ES01	Derwent River
ES06	Port Davey
ES07	Macquarie Harbour
ES08	Mersey River
ES09	Port Sorell
ES10	Tamar River
ES11	Ansons Bay
ES12	Georges Bay
ES17	Blackman Bay
ES18	Norfolk Bay
ES19	Frederick Henry Bay
ES20	Pitt Water

Table A4 Species catches > 0.2 tonnes from estuaries in the 2019/20 season.

Species	ES01	ES07	ES10	ES13	ES14	ES15	ES16	ES17	ES18	ES19	ES20
Eastern School Whiting	42.2									1.5	
Southern Calamari	0		1.2	1.7	5.4	0	10.4	1.1	0.8	2.5	
Bluethroat Wrasse			0.5	1.5	0.6	4.6	4.6	0.1		0.2	
Atlantic Salmon (Marine Farmed)		17.6									
Eastern Australian Salmon		1.4	3.1				0.4		1.5	0.2	
Gummy Shark				3.3	0.7	0.7	0.8				
Greenback Flounder	0	1.6	0						0	0.2	1.6
Maori Octopus			0						2		
Purple Wrasse			0	0	0.1	0.3	1.4	0		0.1	
Southern Garfish			1							0.1	
Leatherjackets			0.1	0	0	0	0.2	0.4			
Yelloweye Mullet			0.2				0	0.3			
Banded Morwong					0	0.2	0.1				
Draughtboard Shark					0.2						
Herring Cale			0.2								
King George Whiting			0.2								
Pike/Snook (Short Finned)			0.2								

Table A5 Catch (tonnes) of two emerging Scalefish Fishery species not assessed in this report.

Species	95/96	96/97	97/98	98/99	99/00	00/01	01/02	02/03	03/04	04/05	05/06	06/07	07/08	08/09	09/10	10/11	11/12	12/13	13/14	14/15	15/16	16/17	17/18	18/19	19/20
Yellowtail Kingfish	0.06	0.13	0.06	1.30	0.45	0.54	0.36	0.46	0.02	0.68	0.17	0.17	0.19	0.03	0.62	0.26	0.28	0.11	0.04	2.07	0.30	0.09	0.68	0.17	0.02
Pink Snapper	0.16	0.21	0.85	1.51	0.62	0.85	0.35	0.13	0.96	0.37	0.35	0.25	0.21	0.24	0.06	2.81	3.39	0.20	1.14	8.21	0.03	0.18	0.19	1.25	1.00

Appendix 4: Annual stock status classifications by species

Table A6 Annual stock status classifications of Tasmanian Scalefish Fishery species assessed in the current report. Terminology of status classifications has changed over time; however, colours represent equivalent classifications. Green: Sustainable; Yellow: Depleting; Orange: Recovering; Red: Depleted; Grey: Undefined. NA indicates catch, effort, and CPUE data for a species were included in an assessment report, but no classification was conducted. Blanks indicate a species was not considered in an assessment report.

Species	97/98	98/99	99/00	00/01	01/02	02/03	03/04	04/05	05/06	06/07	07/08	08/09	09/10	10/12	12/13	13/14	14/15	15/16	16/17	17/18	18/19	19/20
State-assessed species																						
Australian Sardine																			Green	Green	Green	Green
Barracouta														NA	NA	NA	NA	Grey	Grey	Grey	Grey	Grey
Bastard Trumpeter		NA	NA	NA	NA	Red	Red	Red	Red	Red	Red	Red	Red		Yellow	Yellow	Red	Red	Red	Red	Red	Red
Eastern Australian Salmon		NA	NA	NA	NA	Grey	Grey	Grey	Grey	Grey	Grey	Green	Green	Green	Green	Green	Green	Green	Green	Green	Green	Green
Flounder			NA	NA	NA	Grey	Grey	Grey	Grey					NA	NA	NA	NA	Grey	Grey	Grey	Grey	Grey
King George Whiting																						Green
Leatherjackets														Grey	Grey	Grey	Grey	Grey	Grey	Grey	Grey	Green
Longsnout Boarfish														NA	NA	NA	NA	Grey	Grey	Grey	Grey	Grey
Snook														NA	NA	NA	Grey	Grey	Grey	Green	Green	Green
Southern Calamari		Grey	Grey	Grey	Grey	Grey	Grey	Grey	Grey	Grey	Grey	Grey	Grey	Grey	Grey	Grey	Green	Green	Green	Yellow	Yellow	Yellow
Southern Garfish	Grey	Grey	Grey	Green	Green	Green	Green	Green	Green	Yellow	Yellow	Yellow	Yellow	NA	NA	Green	Yellow	Yellow	Yellow	Red	Red	Red
Southern Sand Flathead														NA	NA	NA	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow
Striped Trumpeter	Grey	Grey	Grey	Orange	Orange	Red	Red	Red	Red	Red	Red	Red	Red	Orange	Orange	Orange	Grey	Grey	Grey	Orange	Orange	Red
Wrasse	Grey	Grey	Grey	Grey	Grey	Grey	Grey	Grey	Grey	Grey	Grey	Grey	Grey	NA	NA	NA	Green	Green	Green	Green	Green	Green
Yelloweye Mullet														NA	NA	NA	Green	Green	Green	Green	Green	Green

Species	97/ 98	98/ 99	99/ 00	00/ 01	01/ 02	02/ 03	03/ 04	04/ 05	05/ 06	06/ 07	07/ 08	08/ 09	09/ 10	10/ 12	12/ 13	13/ 14	14/ 15	15/ 16	16/ 17	17/ 18	18/ 19	19/ 20
Commonwealth-assessed species																						
Blue warehou		NA	NA	NA	NA																	
Common Jack Mackerel																						
Eastern School Whiting														NA	NA							
Gould's Squid		NA			NA																	
Jackass Morwong			NA	NA	NA									NA	NA							
Tiger Flathead					NA										NA							