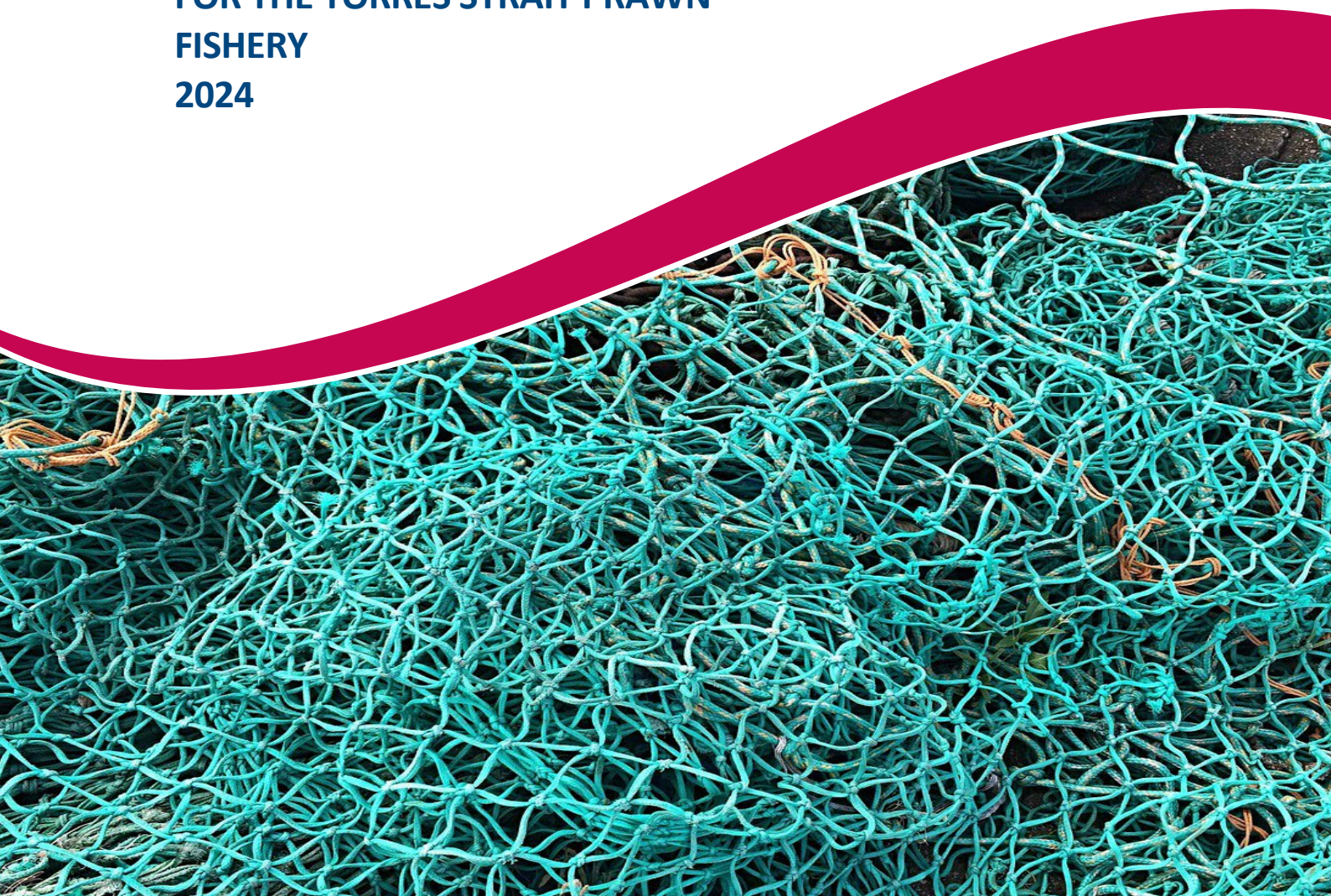
Australian Government

Australian Fisheries Management Authority

Harvest Strategy

FOR THE TORRES STRAIT PRAWN FISHERY 2024



Contents

Version	Updates	Approver
2	Changes to target reference points, triggers and related wording throughout the document.	

1 Glossary of Terms

B_{MEY}: Biomass at maximum economic yield. The average biomass expected to provide maximum economic yield, as estimated from the assessment model applied.

B_{MSY}: Biomass at maximum sustainable yield. The average biomass expected to provide maximum sustainable yield, as estimated from the assessment model applied.

B_{LIM}: Biomass limit reference point. The biomass level below which there is a high risk of recruitment impairment and risk to the stock is unacceptably high.

B_{TARG}: Biomass target reference point. The desired biomass level of the stock, chosen to achieve MEY or MSY.

Byproduct species: species that are not targeted but are taken incidentally in a fishery that have some commercial value and are retained for sale.

CPUE: Catch per unit of effort, which for the TSPF is kilograms of targeted prawn catch per boat per day.

E_{MEY}: Effort at Maximum Economic Yield. The long-term effort associated with maintaining the stock at or near B_{MEY}.

E_{MSY}: Effort at Maximum Sustainable Yield. The long-term effort associated with maintaining the stock at or near B_{MSY}.

MEY: Maximum economic yield. The sustainable catch or effort level for a commercial fishery that allows net economic returns to be maximised. In this context, maximised equates to the largest positive difference between total revenue and total cost of fishing.

MSY: Maximum sustainable yield. The maximum average annual catch that can be removed from a stock over an indefinite period under prevailing environmental conditions.

Nominal CPUE: The raw, unprocessed, measure of CPUE reported by the fishery (kilograms per boat per day).

PZJA: Protected Zone Joint Authority.

Reference point: Specified level of an indicator used as a benchmark within a harvest strategy, such as B_{TARG} or B_{LIM}.

Standardised CPUE: There are many factors that affect or bias CPUE, which do not represent changes in abundance. Therefore, CPUE is often "standardised" using a variety of statistical techniques to remove or correct for the effect of those factors that are known not to be related to stock abundance, such as vessel characteristics, fishing area, period fished or depth.

TAE: Total allowable effort. The annual effort limit set for a stock, species or species group. Used to control fishing mortality to a predetermined optimum level to meet the management objectives for a fishery.

Target species: A species that is or has been, specifically targeted and is, or has been a significant component of a fishery, contributing much of the economic return of the fishery.

2 Overview

2.1 The Torres Strait Harvest Strategy

The Torres Strait Prawn Fishery (TSPF) Harvest Strategy (HS) sets out the management actions necessary to achieve defined biological and economic objectives, and describes the indicators used for monitoring the condition of stocks, the types of assessments conducted and the rules applied to maintain the stock around the chosen reference points. The TSPF HS was first implemented in 2011. This updated (2024) HS has been guided by the 2018 Commonwealth Harvest Strategy Policy (CHSP) and is consistent with objectives of the *Torres Strait Fisheries Act 1984* (the Act) and the *Torres Strait Prawn Fishery Management Plan 2009* (the Plan).

The TSPF Tiger prawn stock is the main commercial target in the fishery and because Tiger prawns are more vulnerable to overfishing, this stock size is used as the measure for sustainability of the fishery. The Tiger prawn stock was assessed in 2019 to be at 60 – 88 percent of the pre-exploitation biomass level (B_0). This range is well above the estimated B_{MSY} for the fishery.

However, the 2011 TSPF HS, which has been used to monitor the Tiger prawn stock with fishing effort and catch triggers, is not appropriate for monitoring stock abundance and therefore does not meet the guidance in the CHSP.

The 2024 TSPF HS uses CPUE-based indicators and triggers to monitor stock abundance trends annually under a constant total allowable effort setting (9,200 days). The triggers will provide appropriate warning of stock decline and allow effective measures to be taken to keep the stock at sustainable levels and trending towards the target reference point, which is set at a level considered to be around the Maximum Economic Yield for the fishery. Catch per unit of effort (CPUE) is commonly assumed to be proportional to stock abundance and is used, in standardised form, as an index of abundance in the TSPF stock assessment. Nominal CPUE is closely aligned with standardised CPUE for the TSPF Tiger prawn stock and is considered a very reliable indicator of abundance for TSPF tiger prawn stocks (Penney, 2019; Turnbull, 2019).

In addition to the target reference point, a precautionary trigger and a limit reference point are in place to prompt consideration of appropriate action should the stock decline significantly below the target. A summary of the reference points and triggers are below:

Target Reference Point: A biomass target at a nominal CPUE of 141kg/boat day, which corresponds to 60% of unfished biomass ($0.6B_0$). This level reflects the recent catch rates in the fishery. The fishery is considered stable and delivering good economic returns around this level under current market conditions (Penney, 2019).

Precautionary Reference Point Trigger: A biomass trigger at a nominal CPUE of 93kg/boat day which corresponds to 40% of unfished biomass ($0.4\ B_0$). Triggering this precautionary relative biomass level (B_{PA} – precautionary approach) would indicate that the stock has moved away from the target and is more than half way towards the limit reference point ($0.25B_0$). At this point further investigation would be required to confirm the decline in CPUE, determine reasons for this decline and consider management action to prevent further declines and ensure a return to target levels.

Limit Reference Point: A biomass limit trigger at a nominal CPUE level of 58 kg/boat-day, corresponding to 25% of unfished levels ($0.25B_0$). If triggered, the stock would be assumed to have declined to the limit reference point and immediate management action would be needed to halt further declines and to take

corrective action to increase the stock. This limit reference point has been set above the default limit under the harvest strategy policy, to build extra precaution into the triggers.

Fixed Total Allowable Effort Limit: With the introduction of the CPUE based management triggers, this harvest strategy maintains a fixed effort Total Allowable Effort (TAE) at the current E_{MSY} level (9,200 days). Under the requirements of the *Torres Strait Prawn Fishery Management Plan 2009* (the Plan), the TAE is reviewed at least every three years [1]by the PZJA. Under the harvest strategy, the TAE would also be reviewed if the CPUE triggers are breached. The introduction of the CPUE based triggers within this harvest strategy adds additional precaution and ensures that the stock is monitored regularly against reference points and triggers and with annual reviews of CPUE based indicators.

Estimating maximum economic yield in the TSPF

It is not currently considered necessary to conduct a management strategy evaluation (MSE) using a bio-economic analysis to determine an optimal target biomass reference point related to Maximum Economic Yield (MEY). A Target Reference Point of $0.6B_0$ at current levels of effort is considered to be a suitable target until further bio-economic analysis becomes warranted, for example, should effort levels increase markedly.

Due to economic constraints limiting fishing effort in the TSPF, the risk of the stocks collapsing due to unsustainable fishing effort or over-exploitation of fishing is low, particularly at current stock size. The most recent stock assessment (Turnbull et al., 2019) and trends in the commercial catch rates (Turnbull and Cocking, 2022) indicate that Tiger and Endeavour prawn stocks are in good condition. The PZJA therefore considers the biggest short-term risk to the fishery is continued decline in effort due to economic factors.

Setting a B_{MEY} target of $0.6B_0$ allows the fishery to start to move towards management using MEY, and test this target level, while assessing the need for more formal management strategy evaluation to formally estimate B_{MEY} and develop formal harvest control rules, which would be a significant and currently unnecessary financial investment.

3 Background of the TSPF

The TSPF is managed under the Act by the Protected Zone Joint Authority (PZJA), which was established by the Act and encompasses the Commonwealth and Queensland Minister's responsible for Fisheries and the Chair of the Torres Strait Regional Authority. The purpose of the Act is to give effect, under Australian law, to the fisheries elements of the *Torres Strait Treaty*. In particular, section 8 of the Act which outlines objectives to be pursued in the management of Torres Strait fisheries. Section 8 states:

> "*In the administration of this Act, regard shall be had to the rights and obligations conferred on Australia by the Torres Strait Treaty.*"

The Torres Strait prawn stock is considered a straddling stock as it is found in both the Australian and Papua New Guinea (PNG) area of jurisdiction in the Torres Strait Protected Zone (TSPZ). The waters of the TSPZ and TSPF are divided into areas of Australian and PNG jurisdiction and the fishery is managed through the PZJA agencies comprising of:

[1] Note: changes to the Plan to amend the total period for setting the TAE from 3 years to 5, have been recommended by TSPMAC and if approved by the PZJA will come into effect in 2024 or 2025, aligning the TAE determination period with the schedule for the stock assessment and harvest strategy review.

- Fisheries Queensland, Department of Agriculture and Fisheries;
- The Torres Strait Regional Authority (TSRA);
- The Australian Fisheries Management Authority (AFMA);
- The Department of Agriculture, Fisheries and Forestry; and where appropriate
- In consultation with the Papua New Guinea, National Fisheries Authority (NFA).

The catch sharing arrangements for the fishery and stock are discussed annually at the Australian and Papua New Guinea Bilateral Fisheries meeting.

The TSPF Harvest Strategy has been developed in accordance with objectives outlined in the Act and the Plan. Further details of the legislation underpinning the TSPF can be found at www.pzja.gov.au.

A detailed history of the TSPF can be found in the 2009 TSPF Strategic Assessment on the PZJA Website (www.pzja.gov.au) and the Torres Strait Prawn Fishery Data Summary 2021 on the PZJA website.

3.1 Current closures/Exclusion Zones

Management of the TSPF uses both seasonal closures and spatial closures to achieve a number of objectives including:

- protecting juvenile and smaller sized prawns in order to attain better economic yield from the prawns harvested in the fishery; and
- protecting areas of importance to the traditional sector such as fishing grounds for tropical rock lobster or pearl shell or breeding and feeding grounds for dugong and turtle.

The area of the fishery and closures can be found in the TSPF Handbook 2010, on the PZJA website.

4 TSPF Harvest Strategy

An independent review of the TSPF HS was initiated in 2019, when an update of the Tiger Prawn stock assessment revealed problems with the effort-based triggers being used in the 2011 TSPF HS.

The independent review of the 2011 TSPF HS noted that effort-based triggers are not suitable for fisheries using an effort cap as the primary management tool, and that effort does not give any indication of the underlying stock biomass level and is not a useful indicator of sustainability (Penney, 2019).

Instead, triggers based on nominal CPUE were proposed. Tiger Prawn CPUE is closely correlated with stock biomass in the TSPF, and changes in CPUE reliably indicate changes in underlying stock biomass, and the risk of overfishing. CPUE triggers relate to changes in underlying biomass and are intended to prompt consideration of management options to halt the CPUE decline and rebuild the stock towards the target.

If triggers are breached, consideration will be given to reducing the TAE to lower fishing mortality and allow for stock rebuilding. This may include the development of formal effort control rules that require the TAE to be reduced as CPUE declines below the B_{PA} ($0.4B_0$) or B_{LIM} ($0.25B_0$) levels. A full stock assessment update is conducted at least every five years to evaluate stock status and to inform the need to possibly revise the TAE and/or CPUE triggers. The stock assessment includes consideration of the catch rates in current and previous fishing seasons and changes in fishing power. A stock assessment may be brought forward if triggers are breached and the Torres Strait Prawn Fishery Management Advisory Committee (TSPMAC) consider the decline to be a result of stock status rather than economic factors. In the event of a breach of CPUE triggers,

the MAC will also consider economic indicators and conditions to determine what further management action may be needed, depending on the likely cause of the changes to CPUE – economic or sustainability driven.

Due to the consistently low effort in the fishery, there is scope to manage the fishery using a constant TAE model, combined with CPUE based sustainability triggers. The TAE cap (9,200 days), which has been in place since 2006, should not need to be revised unless the CPUE triggers are breached, indicating substantial stock declines (see section 4.2.2). The fishery is currently under-fished and the stock is at historically high levels. While the TAE will not be revised unless the HS CPUE triggers are breached, there is a legislative requirement under section 2.5 of the Plan that the PZJA can only set the TAE for a defined period.

Even though the TAE is set at a level estimated to achieve MSY, this harvest strategy is more conservative through having a target reference point associated with MEY.

4.1 Objectives

The objectives of the 2021 TSPF HS have been developed with guidance from the Commonwealth HSP. As well as economic and biological objectives, the TSPF HS has social objectives. Social objectives are of particular importance for fisheries operating in the Torres Strait Projected Zone, needing to consider the effects that management and operation of the fishery may have on Torres Strait communities.

4.1.1 Economic objective

a) Maintain catch rates at or around current levels, which equate to $0.6B_{0,}$ which deliver good economic returns.
b) Minimise the risk of catch rates dropping below economically viable levels (B_{40}).

4.1.2 Biological objectives

a) To ensure tiger prawn stocks are maintained around the target reference point, $0.6B_0$, as a proxy target for B_{MEY}.
    - the agreed B_{TARG} is more precautionary than the proxy B_{MEY} (biomass at maximum economic yield) of $0.48B_0$ as outlined in the HSP.

b) To maintain all stocks above the limit biomass level (B_{LIM}), of $0.25B_0$ at least 90 percent of the time.
    - the agreed B_{LIM} is more precautionary than the proxy of $0.2B_0$ as outlined in the HSP

Separate triggers and reference points have not been set to monitor performance against the objectives for endeavour and red spot king prawns, because the Tiger and Endeavour prawn stocks have a very large spatial overlap. When species overlap to this extent, it is not possible to set different effort limits for the different species, as both species are caught within the same shot.

Performance measures from stock models indicate that Endeavour prawns are more resilient to fishing pressure than Tiger prawns at all levels of fishing effort. Therefore, as long as the more sensitive species, the Tiger prawn, is being fished sustainably under the harvest strategy, the less susceptible Endeavour prawns are also fished sustainably by default. The Red Spot King prawn is a by-product with relatively low levels of catch recorded. In summary, although this harvest strategy does not set specific objectives, trigger points and decision rules to manage the Endeavour prawn (secondary target species) and the Red Spot King prawn (by-product species) stocks, these stocks are indirectly managed by default due to the stock overlap and relationship to the Tiger prawn species discussed above.

4.1.3 Social objectives

a) Maintain a viable and flexible fishery to provide employment opportunities.
b) Ensure that the issues of significance to the traditional sector are considered when setting the TAE for the fishery, as per the objectives of the Plan and the Act.

4.2 Reference Points, Indicators, Triggers and decision rules

The reference points and triggers in this section will be monitored annually based on the nominal CPUE of Tiger prawn. At the end of each fishing season, the nominal CPUE for that season will be compared to the limit trigger under section 4.2.1. A 3-year preceding average will also be calculated using the most recent year and the two year preceding it (3 years total). This 3-year average will be compared against the precautionary trigger under section 4.2.1.

A base line stock assessment will also be carried out at least every five years (sooner if the TSPMAC deem it necessary when a trigger is reached). The most recent stock assessment for the TSPF was completed in 2019, estimating biomass at around $0.60B_0$ - $0.88B_0$. The triggers below will allow the PZJA to monitor the stock between assessments and, if a trigger is breached TSPMAC can consider whether a stock assessment should be brought forward.

Using reference points and triggers in terms of nominal CPUE allows performance against triggers to be easily and rapidly assessed without the need for more regular stock assessment with standardised CPUE. Nominal CPUE is monitored by AFMA throughout the fishing season to track the status of the stock against the reference points, and results of this analysis are considered by TSPMAC at least once annually. The PZJA is notified as required. As well as monitoring nominal CPUE, factors that may influence CPUE will be monitored, including economic and market factors that may impact fishing behaviour and CPUE, to determine whether CPUE decreases are likely a result of a stock decline, or changed fishing behaviour.

Target reference point (TRP): 141kg/ boat/ day – corresponding to a biomass of $0.6B_0$

The target biomass reference point (B_{TARG}) has been set at $0.6B_0$ which is an estimate of B_{MEY} and corresponds to a nominal CPUE of 141kg / boat / day. The previous TRP of B_{MSY} (previously assessed at 28% of unfished levels) is not an economic target as it corresponds with low catch rates that would reduce economic returns in the fishery. Replacing it with a target reference point set at where the stock is currently, at around 60% of unfished biomass level ($0.6B_0$), is considered to be an appropriate target in the absence of bio-economic modelling.

Precautionary reference point (triggered if reached two years in a row): 93kg/day/boat– corresponding to a biomass of $0.4B_0$.

The nominal CPUE indicator for this trigger will be calculated as the 3-year preceding rolling average of nominal CPUE for tiger prawns. The trigger (93kg) needs to be reached two years in a row to trigger the below response.

The precautionary trigger is intended to indicate that the stock has declined below the target and is halfway to the limit reference point ($0.25B_0$). Management action may be needed to prevent further declines and rebuild the stock to target levels.

Responses to breaching the precautionary reference point:

- The TSPMAC meets to consider the implications and management advice including:
  - Consider if a stock assessment is necessary (*noting a minimum base level stock assessment (without fishing power updates) should be undertaken at least every five years*).
    - Consider whether a fishing power survey should be undertaken, as a part of a stock assessment, if one is completed (noting these are probably not required every five years, unless significant changes to the fleet are known).
  - Review non-stock factors that may have led to lower CPUE, including but not limited to:
    - Are the economic and market conditions influencing fishing behaviour *e.g.* changes in fuel prices and prawn prices, low number of vessels etc. resulting in lower CPUE? Are fishers changing target species *e.g.* targeting Endeavour Prawns rather than Tiger Prawns?
  - Consider whether a reduction in TAE or actual fishing effort is required to halt overfishing and facilitate rebuilding of the stock towards the target.

Limit Reference Point (triggered if reached in one year): 58 kg/day/boat – corresponding to a biomass of $0.25B_0$.

The nominal CPUE indicator for this trigger calculated is the nominal CPUE for tiger prawns in any one year (not a 3-year rolling average as in the precautionary trigger).

The limit trigger signals that the stock has declined substantially to the limit and immediate management action is needed to halt further declines below the limit reference point and to rebuild the stock towards the target.

Responses to breaching the limit reference point:

- Considering recommendations from the TSPMAC, implement measures to limit fishing mortality to levels that will halt overfishing and rebuild stock levels towards the target.
- Consideration should be given to conducting MSE evaluation and developing formal effort control rules that respond to future breaches of the CPUE triggers.
- Responses to breaching the LRP in multiple years will result in escalating management responses.

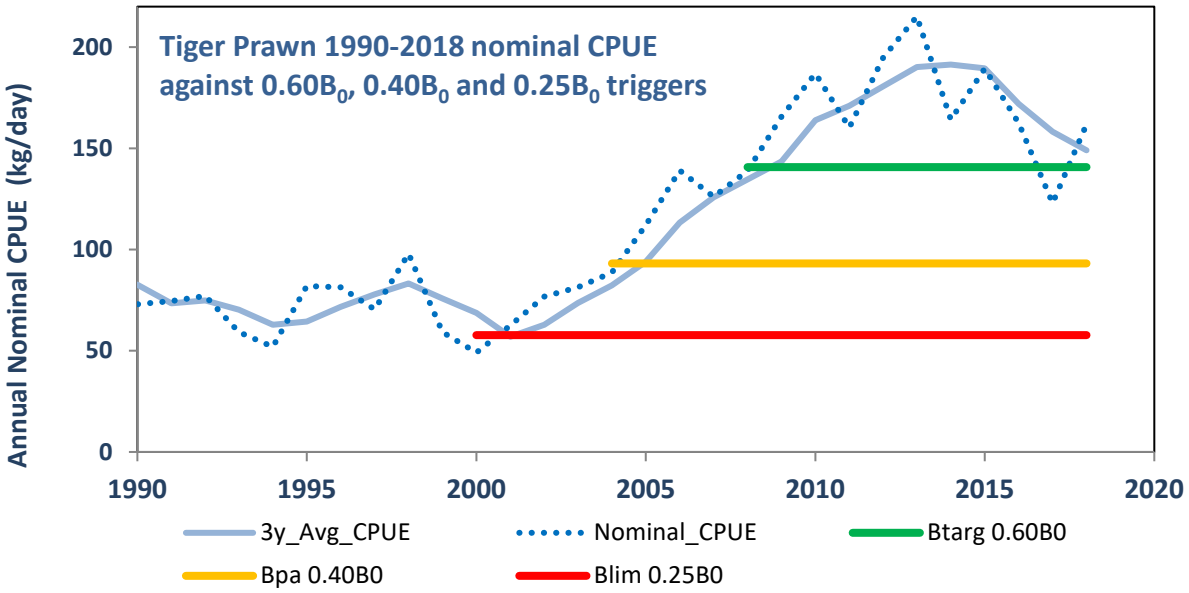


Figure 1. Tiger prawn 1990-2018 nominal CPUE against $0.6B_0$, $0.4B_0$ and $0.25B_0$.

Setting the TAE:

The TAE for the fishery will be set for the Tiger prawn stock at 9,200 days for the maximum period allowable under the Plan. This is a constant effort management approach that recognises fishers will tend to reduce fishing effort as CPUE decreases. While the HS does not include formal decision rules for revising the TAE, if triggers are breached, management actions will be considered. This may include the development of formal effort control rules for TAE adjustments or other actions that can rebuild the stocks.

4.3 Monitoring

Collecting quality information about the fishery and undertaking periodic assessments is critical to monitoring the health of the prawn stocks. The monitoring regime described below outlines the data required to support the TSPF HS, particularly monitoring CPUE against the triggers, and undertaking stock assessments.

4.3.1 Logbooks

Logbook data are the primary source of information for applying the TSPF HS. It is necessary and mandatory for all Torres Strait prawn operators to complete prescribed logbooks. Logbooks are sent by operators to AFMA within two weeks after making port or two weeks after the season closes on 1 December. The logbook data are analysed to evaluate annual performance of the fishery. The statistics produced annually include:

- catch per unit effort;
- total catches throughout the season;
- total effort throughout the season (fishing days); and
- catch and effort trends, including catch composition (prawn species and grades)
- Basic fuel price and prawn value information.

As well as being used by AFMA to monitor the CPUE triggers described in this harvest strategy, these data are used to conduct stock assessments for the fishery.

4.3.2 Stock Assessments

The Tiger prawn stock assessment is used to calculate values for biomass B_{MSY} and fishing effort $E_{MSY,}$ which are used to evaluate the status of the stock against targets and to set the total allowable effort, if necessary.

Prior to the updated stock assessment, stock assessments were undertaken in 2004 and in 2006. The 2019 assessment was based on catch and effort data from logbooks for fishing years from 1980 to 2018. The 2019 assessment is undertaken using a Deriso-Schnute delay-difference model (used in previous assessments), coded in the statistical program “MATLAB”, and the Beverton-Holt stock recruitment relationship.

The 2019 assessment estimated the stock level to be at 60 – 88 percent of pre-exploitation biomass (0.60B0 – 0.88B0) with BMSY estimated at $0.32B_0$ and $0.40B_0$ (Beverton-Holt and Ricker stock recruit curves respectively). Post 2008 the annual tiger prawn harvest has been well below the estimates for MSY and the biomass well above BMSY. The current tiger prawn harvest is sustainable and could be increased if the economics of trawling improved, allowing a higher level of fishing effort.

Under this harvest strategy, stock assessments will be conducted at least every 5 years. Assessments may be brought forward if deemed necessary by the TSPMAC in response to breaching of a trigger.

4.3.3 Vessel Monitoring System

It is a condition of licenses that each vessel in this fishery be fitted with a Vessel Monitoring System (VMS). VMS data validates fishing effort reported in the logbook.

AFMA uses VMS to verify and decrement days fished by licence holders against each holder's annual allocation of fishing effort under the TAE system.

4.3.4 Observer Data

Observer coverage in the TSPF is set at 2.6 percent of actual seasonal fishing effort. The primary objective of the TSPF observer program is to collect independent data on by-catch and interactions with threatened, endangered and protected (TEP) species. Biological information on commercial catch and species of significance to the traditional sector are also collected. This data is compared to data provided by fishers in logbooks and is used to monitor interactions with TEP species and species that may be at risk to fishing, included species important to Torres Strait communities.

5 Performance Reporting

Reporting on the performance of the TSPF is done on an annual basis mainly through the PZJA annual report and relevant accreditation processes.

In 2017, the TSPF was granted a Wildlife Trade Operation (WTO) and list of exempt native specimens (LENS) accreditation until 9 October 2026.

The TSPF also has a responsibility to report to the various consultative processes, including TSPMAC, the PZJA Standing Committee and the PZJA.

Reporting on the monitoring of triggers will occur annually to TSPMAC.

6 Review and Amendments

The TSPF HS will be reviewed at least every five (5) years.

Under certain circumstances, it may be necessary to amend the harvest strategy in between scheduled reviews. These circumstances include when:

- the precautionary or trigger limit is breached.
- there is new information that substantially changes understanding of the status of a fishery, leading to improved estimates of indicators relative to reference points.
- drivers external to management of the fishery increase the risk to fish stock/s.
- it is clear the strategy is not working effectively, and the intent of the Harvest Strategy Policy is not being met.

Further explanation can be found in section 9 of the Commonwealth Harvest Strategy Policy Guidelines (DAWR 2018b). The consultative and technical processes for amending harvest strategies are set out in the Commonwealth Harvest Strategy Policy Guidelines in section 2.5.

7 References

Department of Agriculture and Water Resources (2018a) Commonwealth Fisheries Harvest Strategy Policy. Framework for applying an evidence-based approach to setting harvest levels in Commonwealth fisheries, Second Edition. Commonwealth of Australia, 21 pp.

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