

# **New South Wales Fisheries Management**

## NSW Spanner Crab Harvest Strategy

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## Purpose

A harvest strategy is a framework that specifies pre-determined actions in a fishery for defined species (at the stock or management unit level) necessary to achieve the agreed ecological, economic and social management objectives.

This harvest strategy applies to the NSW component of the East Coast Spanner Crab (*Ranina ranina*) stock.

The Goal of the Spanner Crab Harvest Strategy (the Strategy) is:

*'To contribute, in cooperation with Queensland, to maintaining a robust and sustainable Spanner Crab stock to support a profitable commercial fishery, with social, cultural and economic benefits to the community.'*

The Strategy is established in accordance with the NSW Fisheries Harvest Strategy Policy, and brings together key scientific monitoring, assessment and management components necessary to meet legislated objectives including those established under the *Fisheries Management Act 1994* (the Act), the *Marine Estate Management Act 2014*, the Fisheries Management (Ocean Trap and Line Share Management Plan) Regulation 2006, and collaborative objectives established under the Strategy.

The Strategy recognises and supports the vision of the 2006 Fishery Management Strategy for the NSW Ocean Trap and Line Fishery (OTL FMS):

*"A profitable fishery that provides the community with fresh local seafood and carries out fishing in an ecologically sustainable manner."*

Introduction of harvest strategies and evaluation of ecological risk in NSW Fisheries are key activities under Initiative 6 of the NSW Marine Estate Management Strategy 2018-2028.

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## The Spanner Crab Fishery

The East Coast Spanner Crab stock is shared between Queensland (Qld) and New South Wales (NSW), with Qld accounting for the largest harvest with approximately 85% of historical catch. The Qld and NSW fisheries are highly connected as Spanner Crab are a non-migratory species with a pelagic larval phase, with stock connectivity via larval dispersal driven by prevailing ocean currents.

The majority of NSW harvest is taken by Spanner Crab endorsement holders as a discrete component of the Ocean Trap and Line Share Management Fishery (OTL Fishery). There are no estimates of recreational harvest from the broad-scale Recreational Fishery Independent Monitoring Program (RFIMP), data available on the level of Aboriginal cultural harvest, or estimates of illegal, unregulated or unreported (IUU) catch, indicating these components are likely low. Negligible harvest is taken in the NSW Ocean Trawl Fishery as incidental catch.

A summary of harvest sectors and management measures is provided at Table 1.

The fishery is predominantly managed under Spanner Crab Total Allowable Catch (TAC) determined for the OTL Fishery component. A TAC determination must be made by the independent Total Allowable Fishing Committee (TAF Committee) or by the Deputy Director General, DPI Fisheries (DDG DPI Fisheries) as delegate of the Secretary for each 12-month fishing period between 1 July and 30 June. The TAC is allocated to holders of Spanner Crab Quota Shares as individual transferable quota in proportion to shareholdings.

Fishery		Assumed nominal % of harvest	Methods	Key management measures
All		100%		Minimum size limit Spatial closures Prohibition on take of berried females Gear restrictions
Commercial	Northern Zone (Qld border to Yamba southern breakwall)	>95%	Spanner crab net (dilly), area <1.6m <sup>2</sup>	Single species fishery Total Allowable Catch and individual transferable quota Limited entry Vessel restrictions Crew limits Spatial and temporal closures Net (dilly) limits
	Southern Zone (Yamba southern breakwall to Korogoro Point (Hat Head))	<5%		
	Ocean Trawl (incidental catch)	Negligible (<1%)	Otter trawl net	Trip limits Temporal closure
Recreational (including Charter)		Unknown, assumed negligible	Spanner crab net (dilly), area <1.6m <sup>2</sup>	Daily and possession limit Net (dilly) limits
Aboriginal cultural		Unknown, assumed negligible	Cultural permit permissions	Aboriginal Cultural Fishing Interim Access Arrangement Permit restrictions

Table 1: Summary of Spanner Crab harvest and management measures

More detailed description and analysis of the OTL Fishery is available at <https://www.dpi.nsw.gov.au/fishing/commercial/fisheries/otl-fishery>

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## Strategy scope

Given low harvest in non-commercial sectors, this harvest strategy applies decision rules to the NSW Spanner Crab sector of the OTL Fishery (the Spanner Crab fishery), noting the objectives and decision rules aim to maintain biomass at levels also supporting the interests of non-commercial sectors as well as ecological sustainability.

The Strategy provides a framework specifying fishery objectives, monitoring arrangements and decision rules to support determining TAC for Spanner Crab. The Strategy recognises and is compatible with objectives and management arrangements established under the Act, Share Management Plan Regulations, and the commercial OTL Fishery Management Strategy (FMS). The Strategy has also been developed to contribute to complementary management consistent with the *Qld Spanner crab fishery harvest strategy: 2020-2025* (Qld harvest strategy).

The Strategy provides guidance to statutory decisions of the TAF Committee or DDG DPI Fisheries as delegate of the Secretary for determining Spanner Crab TAC, and will be used for determining TAC in accordance with the Strategy decision rules for the life of this strategy (5 years), noting that:

- Determinations of TAC remain the decision and responsibility of the TAF Committee or DDG DPI Fisheries as delegate of the Secretary, and
- Departure of decisions from strategy guidance must contain clear justification.

Specific objectives or decision rules for changes to non-commercial harvest may be considered as information and consequent need changes over time. The Strategy does not establish defined resource sharing arrangements within NSW or between NSW and Qld.

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## Ecologically sustainable development

NSW harvest strategies will seek to integrate ecological, economic, social and cultural dimensions of fisheries management as far as possible and over time as data and information improve.

An Environmental Impact Assessment and FMS have been completed for the OTL Fishery to assess and monitor environmental performance. An Ecological Risk Assessment (ERA) is scheduled to be completed for the OTL Fishery in 2023. If the ERA identifies fishing impacts primarily responsible for generating an undesirable level of ecological risk, they will be managed either through mechanisms identified within the harvest strategy or other appropriate fishery management mechanisms.

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## Objectives

### Goal

To contribute, in cooperation with Queensland, to maintaining a robust and sustainable Spanner Crab stock to support a profitable commercial fishery and social, cultural and economic benefits to the community

### Strategic objectives

The strategic objectives of the harvest strategy are to:

1. Maintain sustainable stock levels and avoid severely compromising recruitment
  2. Manage risks and improve opportunities for profitable commercial fishing in the Spanner Crab fishery over the long term to support flow on effects to the community
  3. Consider the interests of recreational fishers and Aboriginal people in management of the fishery
-

## Operational objectives

1. To maintain Spanner Crab stock biomass around a target of 48% of unfished biomass
2. To implement a targeted rebuilding strategy if biomass decreases to or below 20% of unfished biomass

## Indicators and Reference Points

Indicators are used to measure fishery and strategy performance, with operational objectives and the primary indicator structured around standardised catch rates derived from NSW commercial catch and effort data and the NSW and Qld Fishery Independent Surveys.

Reference points are determined based on historical performance of the NSW Spanner Crab fishery, and to be consistent with the Qld harvest strategy noting larger nets permitted to be used in the NSW fishery.

Indicator	Reference point	Reference level
<b>Primary</b>		
<b>sCPUE</b> : Standardised commercial catch rate of Spanner Crabs in kg/net lift averaged over two consecutive years	Target reference point (proxy for 48% biomass)	2.190 kg/net lift, equivalent to the average standardised catch rate 2009/10–2020/21
<b>FIS<sub>LEGAL</sub></b> : Standardised catch rate (crabs per groundline) of legal-sized Spanner Crabs from NSW and Qld fishery-independent surveys averaged over two consecutive years	Target reference point (proxy for 48% biomass)	9.117 crabs per groundline, equivalent to the average standardised catch rate 2005-2021
<b>Pooled Index</b>	1	Average of sCPUE and FIS <sub>LEGAL</sub>
<b>sCPUE<sub>TRIGGER</sub></b> : Standardised commercial catch rate of Spanner Crabs in kg/net lift averaged over two consecutive years	Trigger reference point	1.600 kg/net lift
<b>sCPUE<sub>LIMIT</sub></b> : Standardised commercial catch rate of Spanner Crabs in kg/net lift averaged over two consecutive years	Limit reference point (proxy for 20% biomass)	≤0.800 kg/net lift
<b>nFIS<sub>USM</sub></b> : Standardised catch rate (crabs per groundline) of undersize male Spanner Crabs from NSW Fishery Independent Surveys averaged over two consecutive years	Average recruitment in NSW	2.854 crabs per groundline, equivalent to the average standardised catch rate 2009/10–2020/21
<b>Secondary</b>		
<ul style="list-style-type: none"> <li>• Economic surveys, market, share and quota trading data,</li> <li>• Estimates of recreational and Aboriginal cultural harvest,</li> <li>• Estimates of IUU harvest.</li> </ul> <p><b>Note:</b> Secondary indicators are used:</p>		

1. *By the TAF Committee or DDG DPI Fisheries as delegate of the Secretary in accepting the stock assessment, fishery performance and decision rules as a reasonable basis for the TAC determination,*
2. *As a measure of economic performance for the commercial sector.*

Table 2: Indicators and reference points

## Monitoring & assessment

While the Strategy is designed to inform the determination of TAC for the NSW component of the East Coast stock, FIS and CPUE information from both NSW and Qld is reviewed and used considering the shared nature of the stock.

The Strategy requires the average standardised FIS catch rates from two years (e.g., mean FIS<sub>LEGAL2020</sub> and FIS<sub>LEGAL2021</sub>). If no FIS is completed, an estimate of the missing FIS will be required. Options include the mean of the nearest FIS values before and after the missing year, or a log 'proportional gap' using commercial sCPUE from the missing year. The latter was applied in the Qld harvest strategy in 2021.

### Monitoring

Information used to monitor primary and secondary indicators relative to reference points includes:

- Commercial fishery logbook: catch, effort, location, and real-time quota reporting using mobile applications,
- Annual fishery-independent surveys of stock abundance,
- Fisher interviews to qualitatively evaluate CPUE trends,
- Surveys of recreational catch in NSW (occasional historical; and currently biennial surveys),
- Cultural permit harvest (if available),
- Estimates of IUU harvest (if available),
- Economic surveys, market, share and quota trading data.

### Assessment

A weight-of-evidence approach is used to assess the NSW Spanner Crab stock, incorporating results from standardised commercial catch rates and standardised catch rates from annual fishery-independent surveys. No modelled stock assessments are currently applied to the East Coast stock or within Qld or NSW.

NSW commercial catch rates are standardised to account for a range of variables that bias raw data to provide improved measures of stock density. Explanatory model terms consider different catch rates between fishing years, seasons, individual fisher operations, their transformed fishing effort (the number of net-lifts, being a function of the number of ground-lines used, nets per ground-line and ground-line lifts per day; log or cube root scale), and the spatial locations of catches based on 6 x 6 min latitude and longitude grids. Annual fishing power estimates from Qld were offset to investigate their effect but are not included in the assessment.

Fishery independent monitoring is undertaken in Management area A of the Qld fishery and in NSW as part of a collaborative arrangement which monitors the shared Spanner Crab stock. The current NSW survey design is based on the Qld long-term monitoring program and has been used in NSW since 2005. Annually, four 6 x 6 nm grids are sampled off northern NSW from Ballina to Cudgen. From a possible 100 sampling sites (10 x 10 grid), fifteen locations are randomly selected for sampling at each site. At each site a string of ten 1 x 1 m dillies are set, with a soak-time of not less than 40 minutes and if possible, not longer than 60 minutes. All crabs caught from a string are sexed and measured for rostral carapace length, noting minimum legal size in NSW is defined as orbital carapace length measured from the base of eye orbit to mid carapace base. To support



comparison of FIS and commercial measures of CPUE, FIS catch rates are standardised for the number of total, legal (male + female) and undersize male crabs.

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## Decision rules for determining Total Allowable Catch

Decision rules below are designed to guide the TAC setting process by defining how changes in the indicators should be interpreted and by linking them to decision rules for adjusting the TAC allocated to the commercial sector of the fishery.

Multi-year TAC's (MyTACs, being determinations for two consecutive fishing periods) may be determined that align with operation of the Qld harvest strategy following the third TAC determination made under this strategy. In determining whether MyTACs may be determined, the following criteria should be considered:

- sCPUE is greater than trigger and does not show a decreasing trend over the most recent three years,
- Proxy for biomass (sCPUE and FISLEGAL) can be predicted at an acceptable precision for the multiyear TAC period,
- Maximum change buffer (200 tonnes) has not applied for the respective period/s in the Qld Harvest Strategy,
- Public submissions have been sought for the relevant periods.

Each year, annual assessments will be undertaken to review fishery indicators, performance of the fishery in relation to the harvest strategy objectives and decision rules and any changes to the East Coast stock.

The decision rules use the performance indicators in Table 2 and are summarised in the decision tree diagram in Appendix A: Decision rules to set the Spanner Crab TAC.

### Decision rules

#### TAC increase or adjustment

The TAC is increased when:

1. The pooled index is greater than 1, the current index is above the previous year's index and  $nFIS_{USM}$  is greater than the target reference point.

The TAC increase will be equal to:

- a. the proportion of change between the current index and the previous year index (or 1 if previous index < 1), **subject to:**
  - i. an increase of no more than 20 tonnes in any given year, and
  - ii. the new TAC must not exceed 150 tonnes.

**or**

2. The pooled index is greater than 1, the current index is above the previous year's index and  $nFIS_{USM}$  is less than the target reference point.

The TAC increase will be equal to:

- a. the proportion of change between the current index and the previous year index (or 1 if previous index < 1), **subject to:**
  - i. an increase of no more than 10 tonnes in any given year, and
  - ii. the new TAC must not exceed 150 tonnes.

**or**

3. If the pooled index has increased or decreased consecutively over each of the three most recent years and no change to the TAC has occurred, the TAC must be adjusted by 10 tonnes to reflect the recent trend, subject to an upper limit of 150 tonnes.

### **TAC decrease where sCPUE > trigger reference point**

The TAC is decreased when:

4. The pooled index is less than 1, the current index is below the previous year's index, and sCPUE is greater than 1.600 kg per net lift.

The TAC decrease will be equal to:

- a. the proportion of change between the current index and the previous year index, **subject to:**
  - i. a decrease of no more than 20 tonnes in any given year, and
  - ii. the new TAC must not be less than 70 tonnes.

or

5. If the pooled index has decreased consecutively over each of the three most recent years and no change to the TAC has occurred, the TAC must be decreased by 10 tonnes to reflect the recent trend, subject to a lower limit of 70 tonnes.

### **TAC decrease where sCPUE ≤ trigger reference point**

The TAC is decreased when:

6. sCPUE is equal to or less than 1.600 kg per net lift.

The TAC decrease will be equal to:

- a. the proportion of change between the sCPUE from the current and previous stock assessments, **subject to:**
  - i. a decrease of no more than 30 tonnes in any given year, and
  - ii. the new TAC must not be less than 50 tonnes.

or

7. If the trend in the regression line fitted to sCPUE over the three most recent years is not positive and no change to the TAC has occurred, the TAC must be decreased by 10 tonnes to reflect the recent trend, subject to a lower limit of 50 tonnes.

### **No change to TAC**

The TAC is to remain unchanged if:

8. none of the above conditions are met, or
9. the new TAC is within 5 tonnes of the current TAC.

### **Fishery Rebuilding Closure where sCPUE ≤ limit reference point**

The TAC will be equal to zero if:

10. sCPUE averaged over two consecutive years is equal to or less than 0.800 kg per net lift.

### **Meta rules for TAC decision rules**

11. If any new information becomes available indicating that the assessment and TAC-setting arrangements are not consistent with the sustainable management of the fishery, the decision rules must be reviewed and, if appropriate, the reference points must be adjusted, or
12. If the TAC becomes equal to zero, appropriate surveys may be undertaken to determine reopening of the fishery where reopening is consistent with operation of this strategy.

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## Harvest Strategy review

This strategy will be reviewed through a consultative Working Group established by DPI within 5 years from commencement, or if required by decision rules.

The DDG DPI Fisheries may decide to review this harvest strategy at any time if, considering the best available information, that its objectives are unlikely to be achieved, or where clear justification (such as availability of additional stock, economic or operational information) becomes available.

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## Strategic development

There are several strategic issues that this first harvest strategy does not fully resolve. These could be addressed in a future revised harvest strategy as better information becomes available and if there is support from stakeholders.

The following operational issues are identified for future development:

1. Integrate reporting of effort to current real time catch reporting requirements to improve data integrity and assessments of fishery performance,
2. Contribute to the development of a single assessment for the East Coast stock, incorporating data from both Qld and NSW,
3. Develop programs to collect data for non-retained catch and size distribution of retained and non-retained catch to support alternate assessment methods including size-based methods,
4. Collection of environmental data to further understand the range of physical oceanographic processes affecting the recruitment and catchability of Spanner Crabs.

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## Definitions

**Decision Rule:** pre-agreed management actions to control intensity of fishing in order to achieve the objectives

**Indicator:** a quantity that can be measured and used to track changes with respect to an objective

**Limit Reference Point:** the value of an indicator that is unacceptable because the stock or management unit has become depleted or recruitment-overfished

**Objective:** an objective that has a direct and practical interpretation in the context of a fishery and against which performance can be evaluated

**Qld Harvest Strategy:** Spanner crab fishery harvest strategy: 2020-2025 (Queensland Government 2020)

**Reference point:** the value of an indicator that can be used as a benchmark of performance against an operational objective

**Secretary:** Secretary of the Department of Regional New South Wales

**String/groundline:** Series of spanner crab dillies tethered to a single main line

**TAC:** Total Allowable Catch, being the total catch limit determined for the commercial sector

**TAF Committee:** Total Allowable Fishing Committee, being the independent statutory Committee with responsibility for determining total allowable catch or effort in NSW

**Target Reference Point:** the value of an indicator that is desirable or ideal and at which fisheries management should aim

**Trigger Reference Point:** the value of an indicator for a fish stock or management unit at which a change in the level of monitoring or management is considered or adopted

# Appendix A: Decision rule summary flowchart for setting TAC

