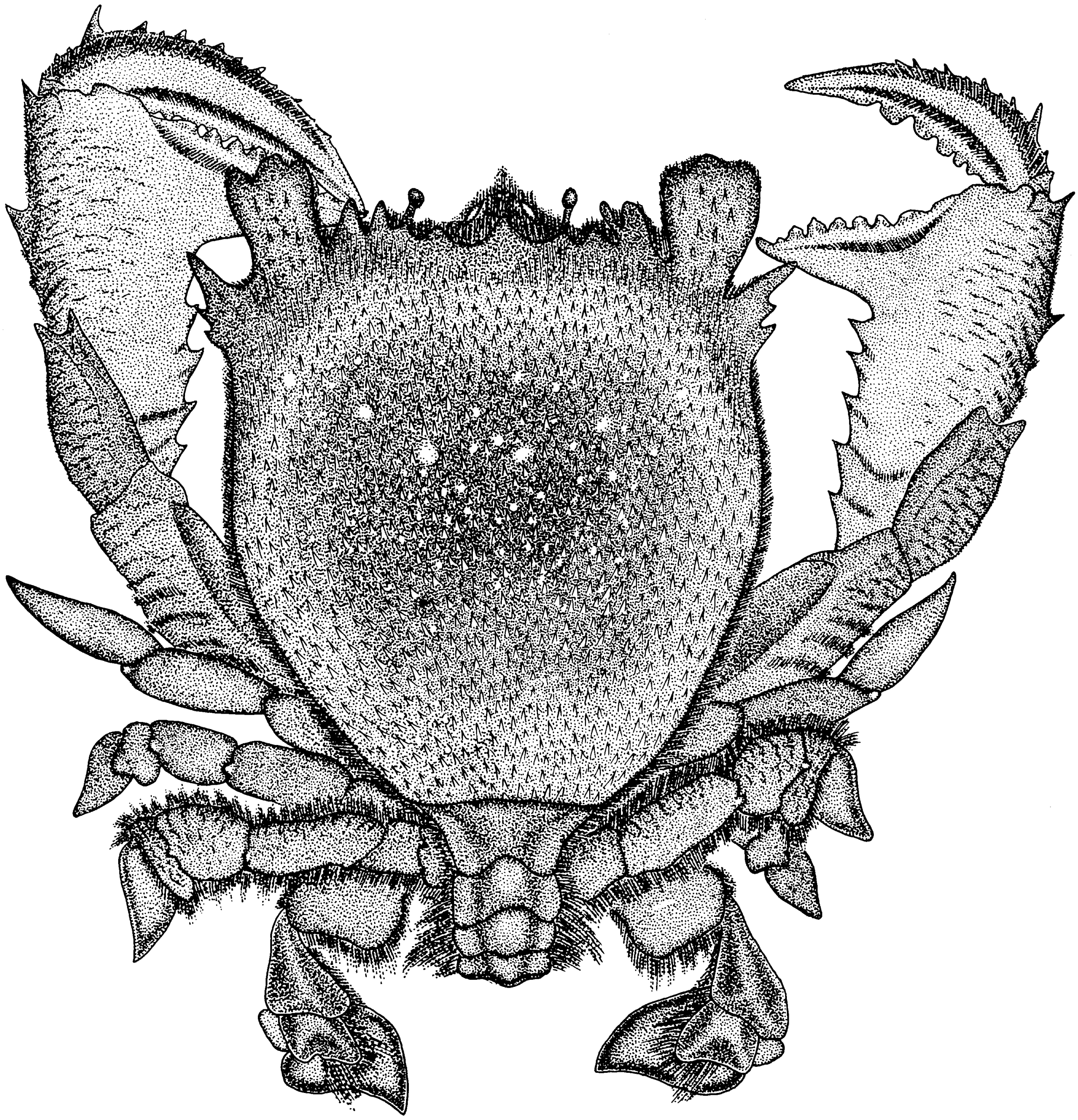

Total allowable commercial catch calculations for Queensland spanner crab (*Ranina ranina*), with data to December 2025 for managed area A

April 2026

Queensland Government

This publication has been compiled by M. F. O'Neill and J. G. McGilvray of Fisheries Queensland, Department of Primary Industries.

The Department of Primary Industries proudly acknowledges all First Nations peoples (Aboriginal peoples and Torres Strait Islanders) and the Traditional Owners and Custodians of the country on which we live and work. We acknowledge their continuing connection to land, waters and culture and commit to ongoing reconciliation. We pay our respect to their Elders past, present and emerging.

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Executive summary

Introduction

The Queensland commercial spanner crab fleet primarily fishes in offshore waters between Rockhampton and the New South Wales border; called management area A. For these waters, standardised commercial (sCPUE) and fishery independent survey (sFIS) catch rates of spanner crab are used every two years in calculations of total allowable commercial catch (TACC) (Queensland Government 2020).

In 2024 and 2025, the commercial spanner crab harvest in managed area A was 565 tonnes (t) and 496 t respectively. These harvests averaged 67% of the 797 t per year TACC.

This report informs on TACC for the forthcoming two quota years 1 July 2026 to 30 June 2027 and 1 July 2027 to 30 June 2028. The scope for this report was to use existing methods and TACC calculations.

Methods

Legal sized spanner crab catch rates were standardised using generalised linear models for 2000–2025. The analyses standardised for temporal and spatial changes in fishing, fishing power between vessels and amounts of gear used (Clayton et al. 2024). The catch rates were compared against reference points for TACC calculations.

Results

Catch rates

The average 2024–2025 catch rate indicators from two years were: sCPUE = 0.747 kilograms per dilly-net lift and sFIS = 5.129 crab per ground-line.

The harvest strategy target catch rates were 95% of 2006–2010 average catch rates: target sCPUE = 1.386 kilograms per dilly-net lift and target sFIS = 10.497 crab per ground-line.

The stock indices were the ratio of the catch rates compared to their targets. The calculated stock indices were less than 1, signalling catch rates were below target: sCPUE ratio = 0.539 and sFIS ratio = 0.489.

The pooled index was 0.514 (average of the two stock indices). The pooled index means that the fishery was at 51% of its target.

Catch rates are illustrated in Figure 1, showing an increase to 2008–2010, and lower thereafter.

TACC

By referencing the pooled index against the harvest strategy (Appendix C), a **no change 797 t total allowable commercial catch** was calculated for the forthcoming two quota years. This harvest strategy TACC was estimated to potentially yield a commercial GVP of approximately $14 million per year, assuming fully caught and an average beach price of $17.86 per kg.

TACC reductions of 26–50 t were initially signalled by the calculations. However, this reverted to no changed under the decision rules (see Appendix C).

Conclusion

In summary, the fishery 2024 and 2025 abundance indices were below target catch rates, but above the commercial catch rate limit reference point of 0.5 kg per dilly lift. Annual harvests in the last six years were less than the TACC quotas. For the levels of harvest taken, there appeared to be no increase in abundance (or surplus production) as indicated by catch rates.

Two more years of monitoring stock indices have passed and the harvest strategy expired in 2026. As stock indices have not improved, additional TACC considerations might be required, including to review methods, target indicators, and management procedures. Additional concern was that the main fishing region 4 decline in catch rate was associated with higher levels of fishing effort and catch.

New work is recommended to refine data and analyses for the management procedure. This includes: a) collect new fishing power data for current and proposed alternate gears, b) improve catch rate standardisation for more detailed latitude-longitude patterns of fishing, c) adjust the management TACC procedure for consideration of reduced catch rates in zones 2 and 3, and d) research a stock synthesis population model to compare abundance estimates and TACC calculations.

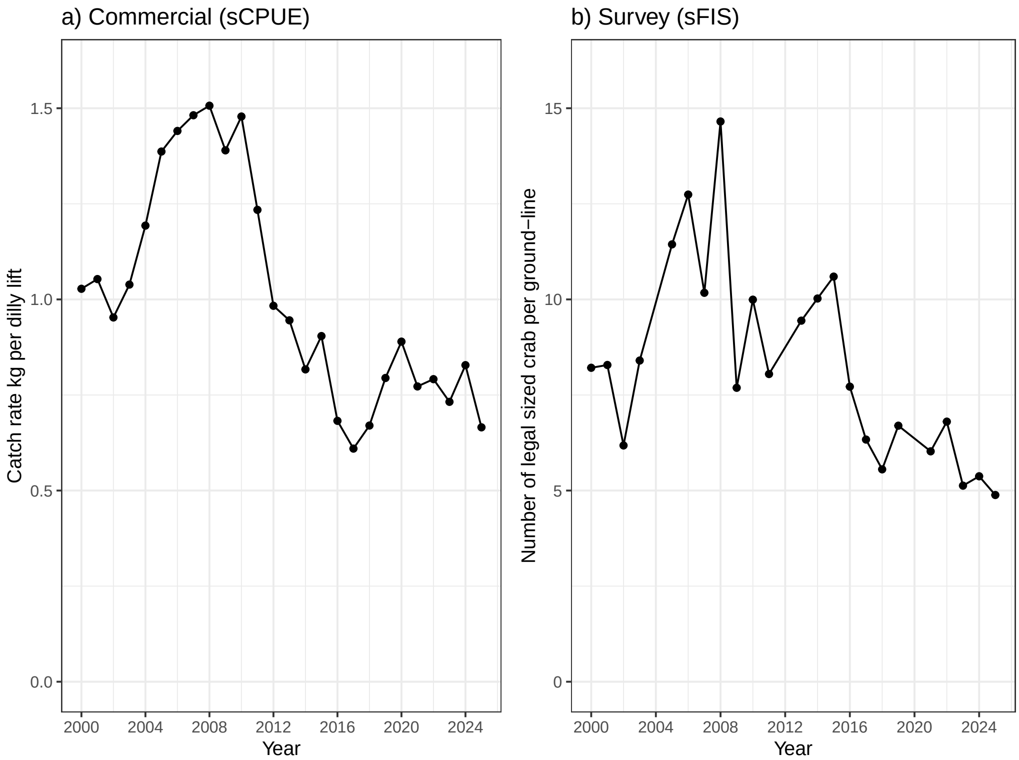

Figure 1: Standardised average catch rates of spanner crab by year for a) commercial fishing (sCPUE) and b) survey sampling (sFIS) for managed area A.

Acknowledgements

We thank monitoring staff and fishers who completed the FIS and data collation.

The harvest strategy would not be possible without the logbook catch rate data provided by fishers, and their engagement to build the management procedure.

The authors acknowledge the fishers and scientists who have contributed to past research on Spanner crab.

Finally, we would like to thank Fisheries Queensland staff for reviewing and providing comments on the draft report.

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Glossary

BDO	Independent business for economic research and analysis.
boat day	A single day of fishing by a primary commercial vessel operation.
CI	Confidence interval.
CL	Rostral carapace length in centimetres (cm).
DPI	Department of Primary Industries, Queensland.
FIS	Fishery independent survey, conducted by FM and industry.
FM	Fisheries Monitoring (managed by Fisheries Queensland, DPI).
FP	Fishing power measured the annual fleet effectiveness at catching crab. The units refers to a proportional measure of deviation from a standard unit of effort.
FQ	Fisheries Queensland.
FRDC	Fisheries Research and Development Corporation.
GAM	Generalised additive model. Extends GLM and complexity by allowing non-linear relationships.
GFP	General fisheries permit.
GitHub	Version control system used for the spanner crab project. The software tracks code history for data analysis integrity.
GLM	Generalised linear model.
GVP	Gross Value of Production. The Australian dollar value of annual catch for the commercial fishing sector.
Harvest	Retained catch of legal sized spanner crab.
ITQ	Individual transferable quota.
kg	Weight measured in kilograms.
MAA	Managed Area A.
MEY	Maximum economic yield.
MLS	Minimum legal size CL (10 cm).
NSW	New South Wales.
Qld	Queensland.
Quantile	A set of percentiles which divide a frequency distribution into groups.
R	Open source computer programming language for statistical computing and graphics.
SAFS	Status of Australian fish stocks (www.fish.gov.au).
sCPUE	Standardised commercial catch rate of legal sized spanner crab. Units were kg per dilly lift.
sFIS	Standardised fishery independent survey catch rate of legal sized spanner crab. Units were number of crabs per ground-line.
t	Tonnes. Metric unit of weight equal to 1000 kilograms.
TACC	Total allowable commercial catch (t) per fishing year of legal sized crab.
Year	The assessment year was a calendar year. Fishing / quota years were financial years.

1 Introduction

Spanner crabs (*Ranina ranina*) sustain an important offshore commercial fishery along Australia's east coast. Here, the crab species belong to a single biological population (stock), with harvests shared by New South Wales and Queensland (Brown et al. 1999; McGilvray and Johnson 2024).

Fishing is concentrated in southern Queensland and northern New South Wales waters, mostly between Rockhampton and Coffs Harbour. Over 95% of spanner crab harvest was by commercial fishing and about 80% of harvest from Queensland waters.

The fishing gear is designed for catching spanner crab by entangling their legs on tightly strung mesh over a flat metal frame. In Queensland the frame area is set to be no larger than 1 m^2. The meshed frames are called dilly-nets, dillies or sometimes generally as pots.

In southern Queensland waters, commercial fishing for spanner crabs is managed under a licence with a C2 fishery-symbol for managed area A (Queensland Government 2020). The managed area A fishery is fully developed and accounts for over 95% of the total harvest of spanner crabs from Queensland. The TACC has been reviewed every two years in line with the harvest strategy, with vessel catch allocations determined annually by individual transferable quota (ITQ) ownership and leasing.

As of January 2026, 205 C2 licence symbols were registered and there were 34 quota holders for fishing or leasing catch in managed area A. TACC was set at 797 t for the 2024–2025 fishing years. This was reduced by 50 t after 2022–2023, down from the peak TACC of 1631 t in 2017–2018.

Gear limits changed from 1 September 2019, where the number of spanner crab dillies per licence was limited to 45 for one person on board a vessel, or 75 for two or more people on board. General fisheries permits (GFP) allowing vessels to use excess dillies expired 1 January 2020.

In Queensland, a closed fishing season for spanner crab is enforced from 1 November to 15 December. This closure aims to coincide with the main part of the species' spawning period (Brown 1986). Additionally, females carrying eggs must be returned alive to the ocean.

This report was prepared to inform Fisheries Queensland and stakeholders on retained commercial catch and catch rates to calculate annual TACC of spanner crabs in managed area A (Queensland Government 2020).

2 Methods

2.1 Brief

The commercial catch rate data was extracted from Fisheries Queensland logbook databases, representing daily commercial spanner crab harvests in kg per fishing operation up to 31 December 2025.

The commercial data was extracted on 29 January 2026. Eighteen catch rate records were removed from 2025. These exclusions were the reported crabs taken during the 2025 FIS survey. In the survey, participants were allowed to keep and report crab to offset costs, and they were not representative commercial catches.

All fishery-independent survey data from Queensland, in units of numbers of spanner crab per ground line, were analysed for years 2000 to 2025.

Spanner crab catch rates were standardised using generalised linear models (GLM) (McCullagh and Nelder 1989). The models were fitted using the programming language R. The importance of individual model terms were assessed formally using F statistics by dropping individual terms from the full models.

Th GLM models employed a quasi-Poisson method and assumed over dispersed Poisson error using a log link function (Clayton et al. 2024).

Predictions of standardised catch rates used methods from previous spanner crab analyses and reports (Campbell et al. 2016a; O'Neill et al. 2022; Clayton et al. 2024).

For TACC calculation, standardised catch rates were compared against reference points (Table 2.1).

2.2 In detail

2.2.1 Commercial catch rates

The commercial spanner crab GLM response variable consisted of the daily catch (kg) taken by each fishing-operation (boat).

Explanatory model terms included interactions between fishing years and regions, seasonality and region, and the natural logarithm (log) of the number of dilly lifts by type of general fishery permit (GFP).

GLM main effects were also fitted for catch rate differences between fishing operations and the lunar cycle.

The same fishing power offset was used as detailed in the previous TACC review (Clayton et al. 2024). The offset accounted for three variables: skipper experience, use of advanced/integrated computer mapping software, and staying at-sea overnight. Between 2000 and 2017, the fishing power offset increased by about 12% ± 4% for the 95% confidence interval (Clayton et al. 2024). No change was assumed post 2017.

The R equation form of the commercial GLM was:

$$\begin{aligned} \text{kg} \sim \exp(&\text{boat} + \text{year} * \text{region} + \text{region} : \text{s1cos} + \text{region} : \text{s1sin} + \text{region} : \text{s2cos} + \text{region} : \text{s2sin} + \\ &\text{region} : \text{s3cos} + \text{region} : \text{s3sin} + \text{gfp} + \text{gfp} : \log(\text{netlifts}) + \\ &\text{lunar} + \text{lunaradv} + \text{offset}(\log(\text{fishingpower}))) \end{aligned} \tag{2.1}$$

where the GLM type and variables were:

- *kg*: daily harvest per boat of spanner crab (kg)
- *boat*: authority chain numbers (ACNs) for different boats (factor)
- *year*: calendar year 2000 to 2025 (factor)
- *region*: spatial zones 2 to 6 within management area A (factor)
- *s1 to s3*: six seasonality variables defined by cosine and sine functions (variates)
- *gfp*: fishing under a GFP permit, where yes = 1 and no = 0 (factor)
- *netlifts*: number of net lifts for the boat day (variate)
- *lunar*: luminance measure followed a sinusoidal pattern (variate)
- *lunaradv*: lunar copied and advanced 7 days for a quarter lunar cycle (variate)
- *fishingpower*: annual proportional increase (variate; log transformed and offset)
- *GLM family and link function*: quasi-Poisson and log link

The seasonality of spanner crabs in each region was modelled using sinusoidal data for the time of year (Clayton et al. 2024). The approach reduce the number of parameters in analysis. In total six trigonometric covariates were used.

The lunar phase (luminance) data was a sinusoidal measure of the moon cycle with values ranging between 0 = new moon and 1 = full moon for each day of the year. The luminance measure was copied and advanced 7 days (for a quarter lunar cycle) into a new variable (lunaradv) to quantify the cosine of the lunar data (O'Neill and Leigh 2006). The two variables together contrast waxing and waning patterns of the moon.

The five fishing regions, zones 2 to 6 in management area A, were calculated using latitude and longitude as follows:

- region 2 = between 23°S inclusive and 24°S,
- region 3 = between 24°S inclusive and 25°S,
- region 4 = between 25°S inclusive and 26.5°S,
- region 5 = between 26.5°S inclusive and 27.5°S, and
- region 6 = between 27.5°S inclusive and 28.2°S.

General fishery permits (GFP) were coded from a table listing the fishing operations using more than 45 dillies. A fishing operation was coded as GFP = 1 if their catch dates were between the GFP start and valid-to dates. If not, then the operation was not fishing with excess gear and coded as non GFP = 0.

GFP allocations finished 1 January 2020. Post GFP, and to be consistent with the previous factor coding, operations using up to 45 dillies were coded as non GFP, and those using between 46 and 75 dillies were factored as GFP. The GFP factor was interacted with the log of fishing effort: log(number of dilly-lifts).

In 2012, fishers noted a bias related to the discarding of legal sized crabs (Brown 2013). Consequently, adjustments were made for the mixed reporting of legal and undersized discards in regions 4 and 5, following the procedures described in Brown (2013), Campbell et al. (2016b), and Clayton et al. (2024).

From the GLM, standardised catch rates were formed following a predict-then-aggregate procedure (Hoyle et al. 2024; VSN International 2021). This was done in R by using two steps, to ensure consistency with previous analyses and reports. Prediction of a full factor interaction table was formed in step A. Secondly this table was then averaged in step B.

The first step A, was to calculate the full table of predictions using R's PREDICT command, classified by every factor in the GLM. For any variate in the model, the predictions were formed at its mean, unless they were specified for the prediction table. If so, the variate values were then taken as a further classification of the full table of predictions. By default, the predictions were made to the last year of the log fishing power offset.

The second step B, was to average the full table of predictions from step A. Factors that were not specified in prediction, were averaged by what was called marginal weights applied to each factor level. That was, by the number of data occurrences, scaled to proportions, of each of it's factor levels in the whole dataset.

The resulting predictions from step B were standardised kg per boat-day (the logbook reporting unit). Units of kg per dilly-lift, used by the harvest strategy, were calculated by standardising for the mean log dilly-lifts per boat-day used in analysis (Clayton et al. 2024).

Patterns of higher catch rates associated with Spring and Autumn, on the waxing moon phase, and for region 4 of the fishery were graphically presented in Clayton et al. (2024).

2.2.2 Survey catch rates

Since 2000, annual fishery independent surveys (FIS) of spanner crab were conducted in Queensland waters during May, except for 2004, 2012 and 2020. Catch rate measures of abundance were collected from 25 areas (6 × 6 minute grids) across the fishery (Figure 2.1); 5 areas per region. In all, 15 individual ground-lines (the sampling units), each consisting of ten dilly nets, were set in each area. The net soak times, typically 40–60 minutes, with the number of spanner crabs caught, their sex, and size (rostral carapace length cm) were recorded.

In 2023, in Region 4, two aspects of the FIS changed: 1) sampling was delayed and extended into June, and 2) a different vessel and skipper were employed. Historically, similar vessels had been used in each region to ensure continuity.

The 2025 survey was undertaken by industry. The survey used selected licenced fishers with operational costs subsidised by Fisheries Queensland. Fisheries Queensland staff were not on board the vessels during the survey. The overall survey design remained the same, but captured crabs were only counted, as measuring each individual crab was considered a burden for fishers.

Any effects of these survey changes were not detected. Survey methodology and gear remained consistent.

The survey spanner crab GLM response variable consisted of the number of legal crab per ground-line. Explanatory model terms included the interaction between years and regions, plus the log of the number of net hours (soak time) per ground-line.

The R equation for the survey GLM was:

$$\text{NumLegalSize} \sim \exp(\text{year} * \text{region} + \log(\text{nethours})) \tag{2.2}$$

where the GLM type and variables were:

- *NumLegalSize*: number of legal sized crab per ground-line (number)
- *year*: calendar year 2000 to 2025 (factor)
- *region*: spatial zones 2 to 6 within management area A (factor)
- *nethours*: hours soak time for the ground-line (variate)
- *GLM family and link function*: Over dispersed (quasi) poisson and log link

From the survey GLM, standardised catch rates were formed following following the predict-then-aggregate method.

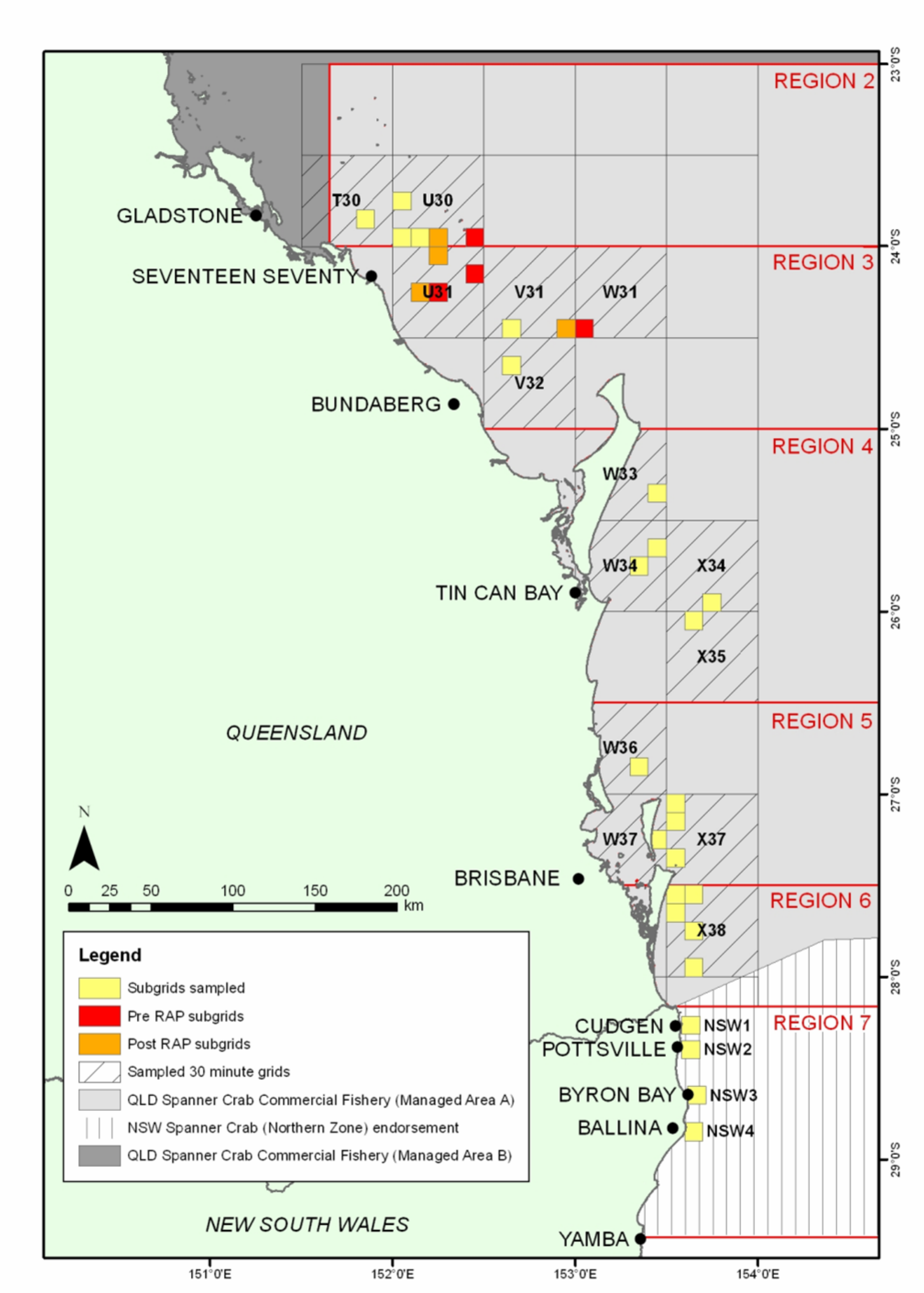

Figure 2.1: Chart of the spanner crab fishery, showing the location of fixed 30 x 30 minute grids within regions and fixed 6 minute subgrids within grids for the extended monitoring FIS survey.

2.2.3 TACC indicators

Two indicators were used to describe fishery performance in managed area A:

- standardised catch rate of legal-sized spanner crabs from commercial fishing (labelled: sCPUE).
- standardised catch rate of legal-sized spanner crabs from survey fishing (labelled: sFIS).

The harvest strategy averaged the annual sCPUE and sFIS from two years, and then converted into a 'stock index' ratio by dividing by their respective target catch rate. The stock index ratios were then averaged together into a 'pooled index'. This was used to inform the TACC, for the reference points in Table 2.1.

The target catch rates for sCPUE and sFIS were set at 95% of the average of the reference years, 2006–2010. The target reference points aimed for higher spanner crab catch rates like experienced during the reference years (Queensland Government 2020). These reference years assumed the legal-sized stock was near 60% biomass.

Table 2.1: Performance indicators and reference points.

Aspect	Reference point	Reference level
Standardised commercial catch rate of spanner crabs in kilogram per dilly lift (sCPUE)	Target reference point proxy for 60% biomass	95% of the 2006–2010 average standardised catch rate
Catch rate of spanner crabs from the standardised fishery independent survey in legal crabs per ground line (sFIS)	Target reference point proxy for 60% biomass	95% of the 2006–2010 average standardised catch rate
sCPUE of spanner crabs averaged over two consecutive years	Limit reference point proxy for 20% biomass	0.5 kg per dilly lift
Pooled index – average of the sCPUE and sFIS stock index ratios	Target reference point	1
TACC	TACC upper limit	1300 tonnes
TACC	TACC minimum if above limit reference point	300 tonnes
TACC	Minimum change buffer	50 tonnes
TACC	Maximum change buffer	200 tonnes

3 Results

3.1 Commercial catch rates

Figure 3.1 shows the commercial standardised catch rate of spanner crab since 2000 in managed area A. The results were:

- Catch rates experienced various trends: an initial increase from 2000–2010, a decline from 2011–2017, followed by an increase from 2018–2020, and then a modest decline to 2025.
- The magnitude of the decline in catch rate from 2010–2017 was near 60%.
- The coefficient of variation CV on mean catch rates was $\approx$ 4–5% (Figure 3.1).
- In 2025, regional catch rates were consistently lower when compared to 2024. A general downward trend in catch rates across all regions has been observed since approximately 2010. The magnitude of this decline varies across regions, highlighting the importance of continuous monitoring across regions and adaptive management strategies (Figure 3.2).
- The model percentage of mean deviance accounted for was 54.4%, with a dispersion of 78 kg per boat-day.
- Nominal fishery statistics are summarised in Appendix A.

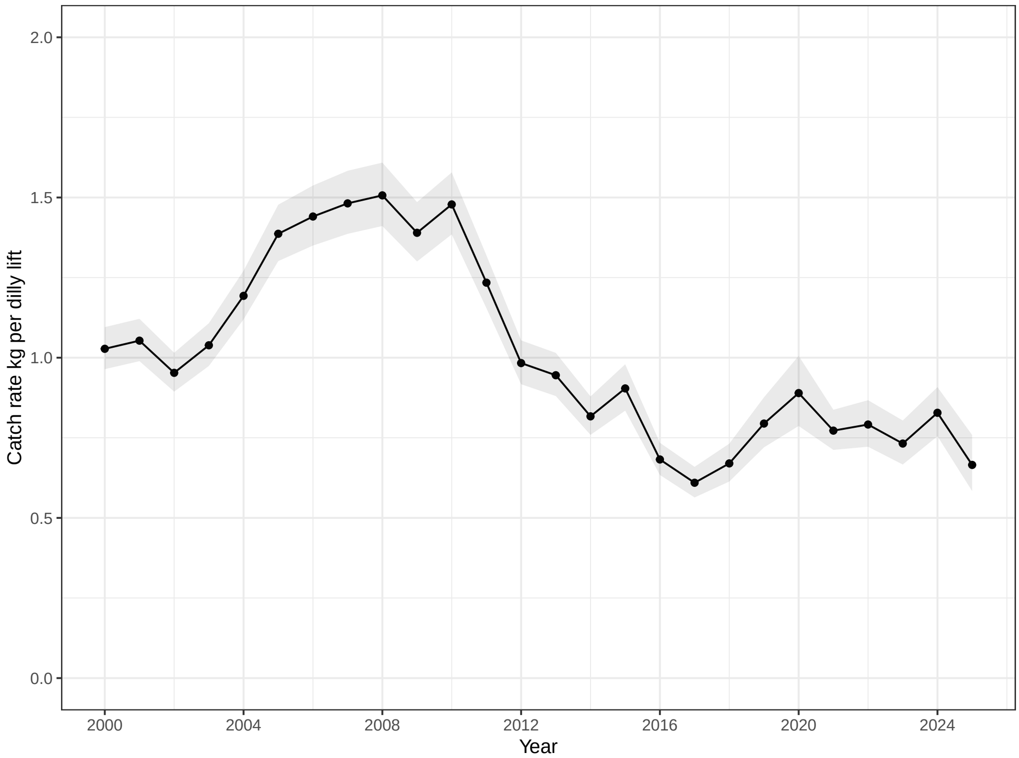

Figure 3.1: Standardised commercial catch rates (sCPUE) of spanner crab by year for managed area A. The ribbon shading illustrated the 95 percent CI.

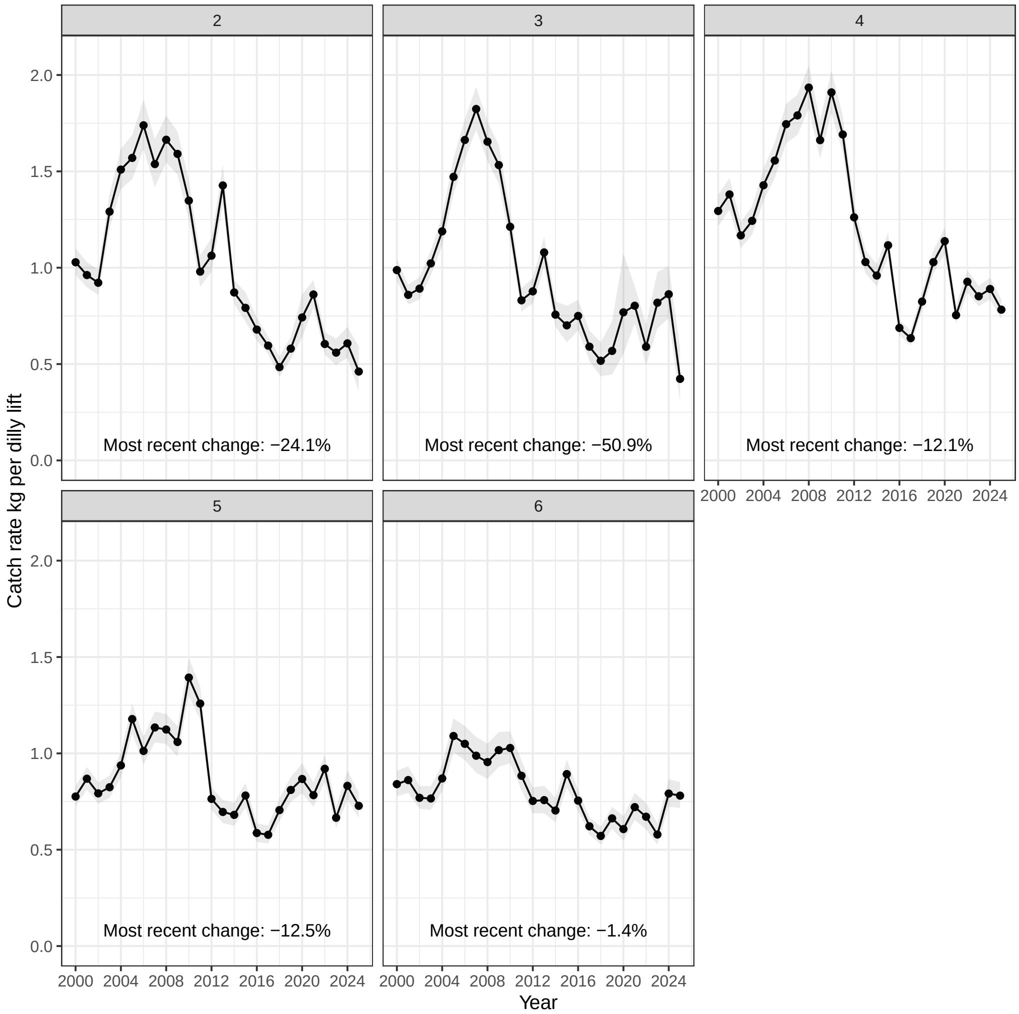

Figure 3.2: Standardised commercial catch rates (sCPUE) of spanner crab by year and regions 2 to 6 for managed area A. Annotations denote the 2025 percentage change from 2024.

3.2 Survey catch rates

Figure 3.3 illustrated the survey standardised catch rate of legal-sized spanner crabs since 2000 in managed area A. Analysis results showed:

- Survey catch rates exhibited fluctuating trends, with an increase observed from 2000–2008, followed by variable rates between 2009 and 2016, and a decrease to around 5–7 legal crabs per ground line from 2017–2025.
- The catch rate decline post-2015 was approximately 33%, with regions 2 and 3 recording low catch rates (Figure 3.4).
- The model percentage of mean deviance accounted for was 31%, with a dispersion of 10.4 crabs.
- The CV on catch rates were approximately 13% (Figure 3.3).

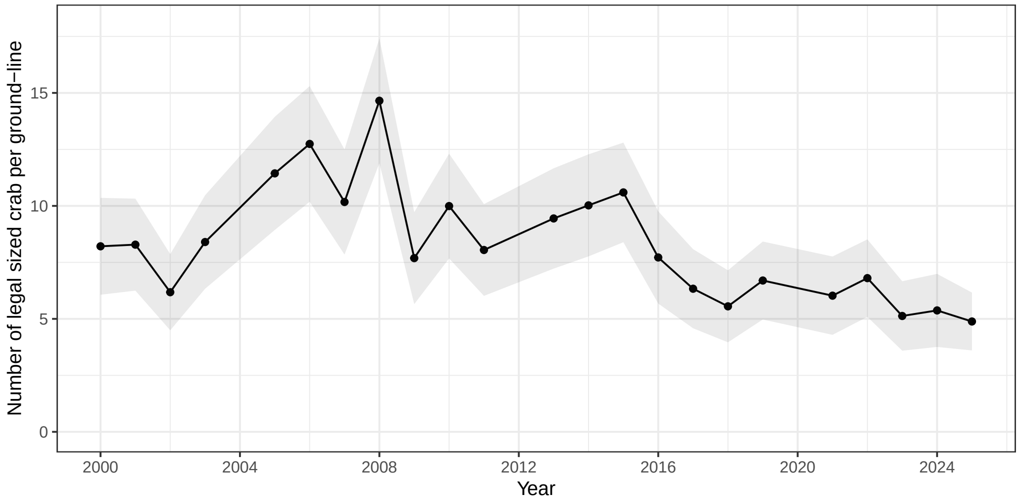

Figure 3.3: Survey standardised catch rates (sFIS) of spanner crab by year for managed area A.

Regional catch rates for 2025 have mostly remained low (Figure 3.4). Region 4 experienced a downturn although there was more variance in region 4's survey catch rates. Region 6 catch rate increased significantly in 2025.

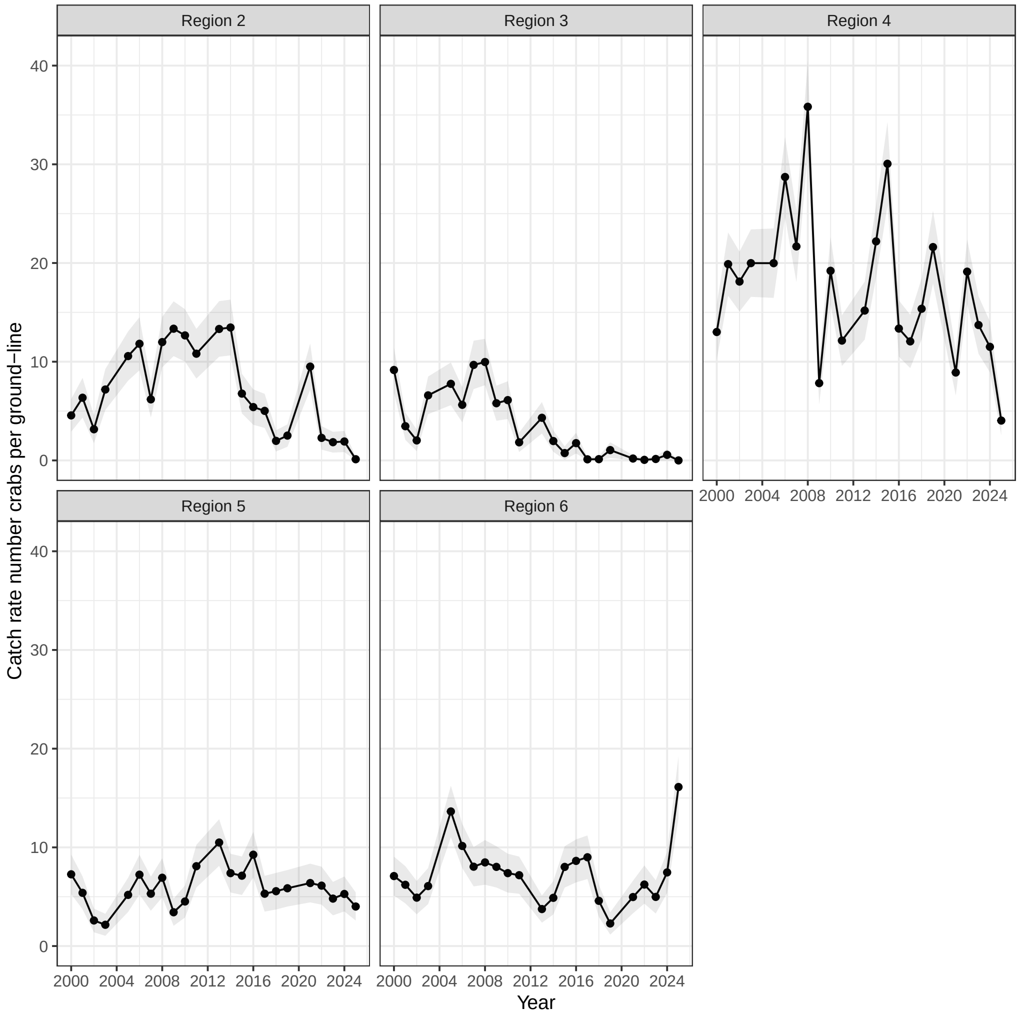

Figure 3.4: Standardised survey catch rates (sFIS) of legal sized spanner crab by year and region for managed area A.

3.3 TACC

The calculated TACC results were as follows:

2025–2026 TACC: 797 t

Catch rate targets: Target sCPUE = 1.386 kg per dilly lift and target sFIS = 10.497 crabs per ground-line. In Table 3.1.

Catch rate indicators: The 2024–2025 averages were: sCPUE = 0.747 kg per dilly lift and sFIS = 5.129 crabs per ground-line. In Table 3.1.

Stock indices: The stock index was the ratio of the indicator compared to the target. The calculated indices for 2024–2025 were: sCPUE = 0.539 and sFIS = 0.489. In Table 3.1.

Pooled index: The 2024–2025 pooled index was 0.514, being the average of the two stock index ratios. The pooled index indicates that the fishery was at 51% of its target in 2025 (Table 3.2).

Calculated TACC for 2026–2027 and 2027–2028: By referencing the indicators against the decision rules (Table 2.1 and Appendix C), the following annual TACC was calculated: 797 t.

Harvest strategy rules 2.1 and 2.2 calculated a 26 t reduction in TACC. However, after applying buffer rule 4.2 this resulted in no TACC change (Table 3.2).

A three-year consecutive decline in the pooled index was noted (Table 3.2). However, Rule 5.1 of the harvest strategy was not activated this time, as the TACC in 2024 was reduced by this rule (50 t) in the previous round (Table C.1). Rule 5.1 does not allow for repeat application in quota setting.

Rule 5.2 was activated, for the commercial index in region 3 being 40% or more below the previous year's index. Only a small number of 36 boat-days, by 4 vessels, was fished in region 3 in 2025. Similar low levels of effort were fished in region 2 in 2025.

Table 3.1: TACC indicators.

Indicator	sCPUE	sFIS
Year 2022	0.791	6.803
Year 2023	0.732	5.128
Year 2024	0.828	5.374
Year 2025	0.665	4.884
2022 - 2023 mean	0.762	5.965
2023 - 2024 mean	0.780	5.251
2024 - 2025 mean	0.747	5.129
Target ref pt, 95% 2006 - 2010	1.386	10.497
2022 - 2023 mean stock index	0.549	0.568
2023 - 2024 mean stock index	0.563	0.500
2024 - 2025 mean stock index	0.539	0.489

Table 3.2: TACC pooled index and result.

Indicator	Result
Year 2023 pooled index	0.559
Year 2024 pooled index	0.531
Year 2025 pooled index	0.514
Rule 3.1, close MAA	No
Rules 1., increase TACC	No
Rules 2., decrease TACC	Yes
Rule 4.2, TACC change within 50 tonnes	Yes
Rule 5.1, 3 yr trend in pooled index	No
Rule 5.2, 40% decrease in regional sCPUE	Yes
Calculated TACC tonnes	797

4 Discussion

To ensure science provision for the harvest strategy, it is important that data collection and analysis methods undergo continued refinement. Enhancing the accuracy and coverage of catch and effort reporting and expanding biological sampling and knowledge can reduce uncertainty in TACC assessments.

In 2025 the spanner crab working group discussed improving catch rate indicators. Refinements were suggested given concerns of possible loss of productivity of spanner crab in zones 2 and 3. This hypothesis was linked to the function of the Capricorn Eddie and ocean upwellings (see working group presentation by Dr Williams and Filar et al. (2021)). It is possible that accounting for environmental aspects might play a role in the harvest strategy (Filar et al. 2021; Clayton et al. 2024).

In addition, the working group discussed that the harvest strategy was based only on catch rates and that other data might help mitigate TACC variance. Spanner crab populations can fluctuate due to environmental factors, fishing pressure, and recruitment variability, and more TACC certainty was required for economic considerations relating to increasing costs of fishing, investment and limit reference point risk (to not close the fishery).

TACC certainty and estimates depend on regular stock assessments and robust decision rules. The following paragraphs note recommendations on data and methods to support the spanner crab harvest strategy.

"The Project", is a new industry collaboration with Fishwell consulting received funding under a Queensland's Commercial and Charter Fishing Grant 2024. This includes industry running a fishery-dependent monitoring program to collect data on size frequency by sex, berried, retained and discarded legal size and discarded under size catch. "The Project" will be undertaken by selected industry operators, with oversight from Fishwell scientists. Such ongoing data can broaden information used by the harvest strategy and potentially enable use of stock assessment population models.

Achievement of "The Project" requires representative spatial-temporal sampling to mitigate variance in data. To facilitate stock assessments, annual monitoring of fishery crab-size compositions, sex ratios and catch rates from dillies are fundamental to collect for both female and male crabs. This data can identify change in abundance, recruitment events, selectivity patterns and discard rates. Recent observer or research data are lacking. Dilly surveys requires design-control over the locations of sampling effort (Robins et al. 2025). Relative size-frequency distributions and sex ratios of crab can provide key information on measures of fishing mortality (Robins et al. 2025).

Use of electronic reporting systems can enhance the timely collection of catch and effort information and provide a more cost-effective method of gathering data. Further verification of catch and effort data would ensure the accuracy of indicators generated from commercial data. Knowing the spatial area fished by commercial operations, from VMS latitude and longitude coordinates, is important for improving the spatial resolution of data for catch rates and density measures.

The fishery independent survey size compositions and catch rate indicators are fundamental data inputs for stock assessment. More survey spatial replication would lessen assumptions and reliance on commercial catch rate indices.

New fishing power data and offset is required for 2017 onwards. Data pre 2017 chronicles the history of change in fishing vessels, skippers and technologies (O'Neill et al. 2022). Ideally, the collection of updated data on relevant fishing technologies could verify gear related fishing-power assumptions (via annual fishing gear log).

Also related to fishing power are the proposed alternate gear trials. Modifications to dilly and hauling techniques have been proposed to increase catch efficiency. Proposed modifications intend to enhance crab entanglement and reduce crab loss during hauling, thereby, increasing catch rates and fishing power. The development of a fishing power estimate is critical to ensure that changes in fishing efficiency are appropriately accounted for within abundance estimates and the TACC process. The fishing power estimate is best derived from a type of before-after/control-impact experimental design and to monitor fleet uptake annually. This is needed for future catch rate data to remain comparable to historical datasets obtained using traditional dillies.

A formal stock model could be researched and management strategy evaluation (MSE) tested, building in the BDO economic data for maximum economic yield calculations. This could act as a complimentary tool to monitor biomass trend and allow reference point checks for future harvest strategies beyond 2025. Example stock models were presented to the working group in 2018, and a model was published by Filar et al. (2021). To facilitate development, an MSE can support stock model decisions in how to deal with uncertainties in spanner crab longevity and natural mortality. An MSE simulation model was developed for testing the new harvest strategy, and can be extended to test a stock assessment model.

For stock assessment models, difficulties in ageing spanner crab mean that age are not available and growth estimates are less certain. Also, there are difficulties in monitoring information about young-of-the-year (0+ age group). Increased spatial and seasonal coverage by the FIS survey can potentially help monitor these aspects, to create more robust indices and increase use of these data in future assessments.

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A Appendix - Harvest summary

The total reported harvest was 564.6 t and 496.3 t for 2024 and 2025, respectively (Table A.1 and Figure A.1).

The 2024 and 2025 harvest resulted from 587.5 and 608.4 thousand net-lifts (Figure A.2), by 39 and 31 vessels respectively (Table A.1).

In the last four years, higher nominal catch rates in region 4 attracted more fishing effort and vessels (Table A.2).

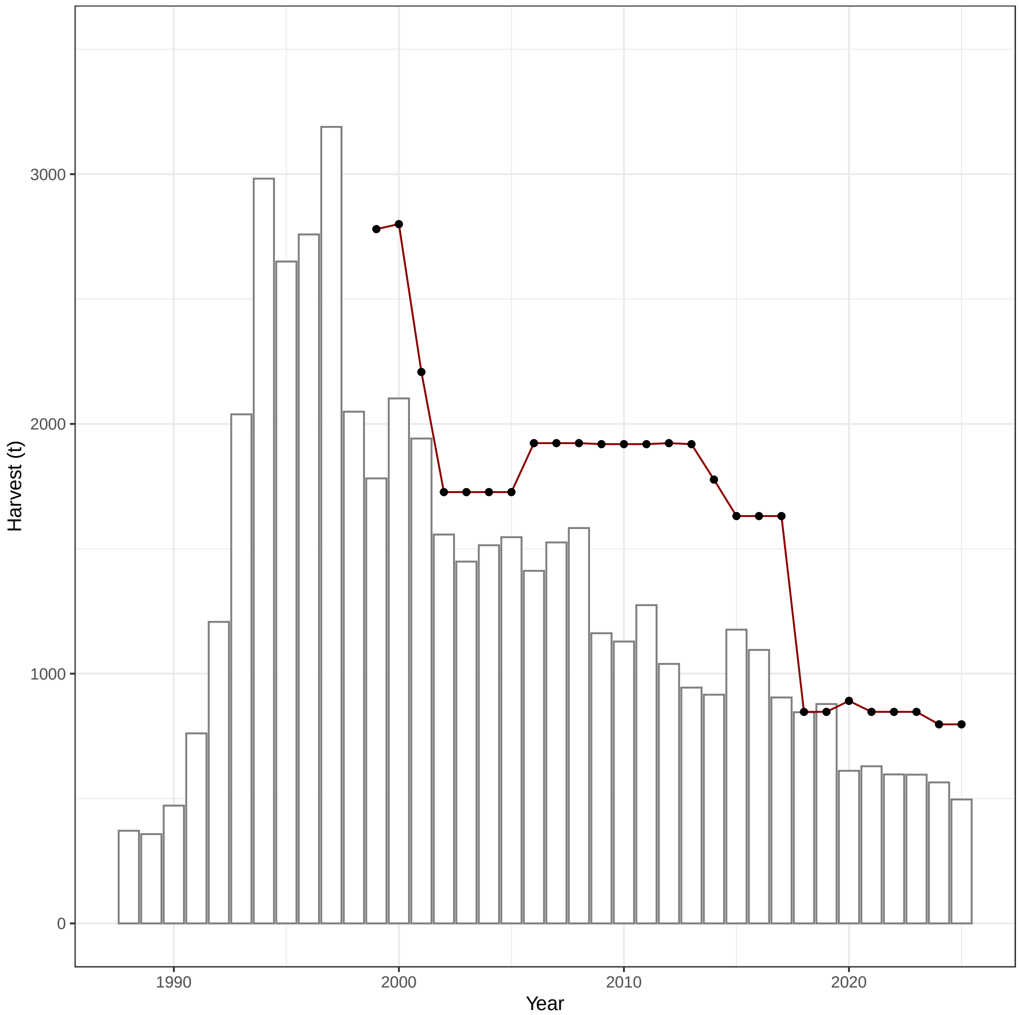

Figure A.1: Annual spanner crab harvest landings (tonnes) from managed area A (bar graph), compared against the TACC settings (line graph).

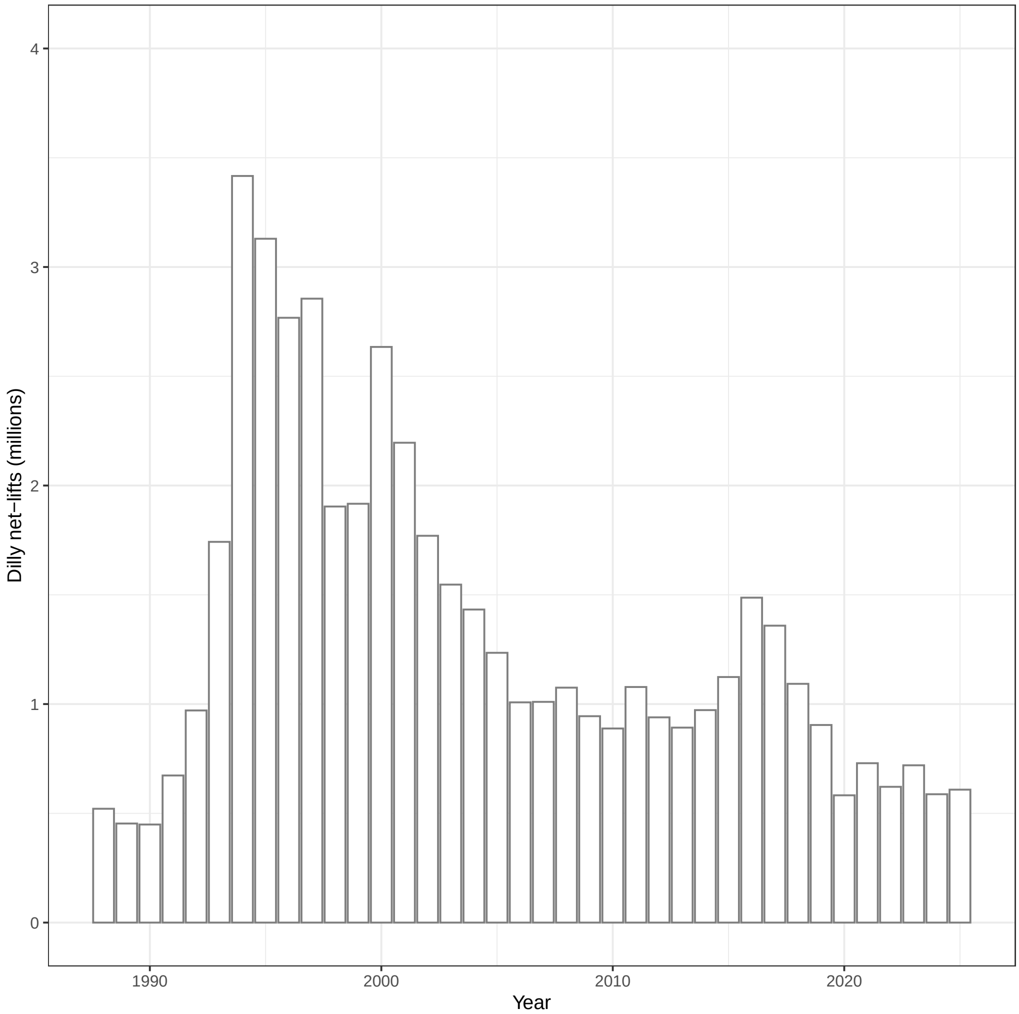

Figure A.2: Annual spanner crab fishing effort (millions of net-lifts) in managed area A.

Table A.1: Annual nominal logbook statistics for managed area A.

Year	Tonnes	NetLifts	KgPerNetLift	BoatDays	Boats
1988	370.987	520955	0.712	2578	93
1989	357.571	453406	0.789	2151	85
1990	471.649	448822	1.051	2216	68
1991	760.989	673245	1.130	2883	73
1992	1207.386	970827	1.244	4014	82
1993	2038.493	1742344	1.170	7627	166
1994	2982.158	3416658	0.873	14864	248
1995	2650.259	3129380	0.847	12766	213
1996	2758.618	2767703	0.997	12805	198
1997	3189.290	2855169	1.117	14624	196
1998	2048.914	1903962	1.076	8734	163
1999	1781.834	1916659	0.930	7056	138
2000	2102.097	2634286	0.798	9135	135
2001	1941.495	2195885	0.884	8241	131
2002	1557.056	1770127	0.880	7154	125
2003	1448.752	1546630	0.937	6319	113
2004	1514.213	1432599	1.057	5989	97
2005	1546.481	1234644	1.253	5416	92
2006	1411.636	1007884	1.401	4403	87
2007	1525.459	1010134	1.510	4119	71
2008	1583.091	1075170	1.472	3994	73
2009	1161.897	944522	1.230	3471	66
2010	1128.651	888224	1.271	3300	62
2011	1274.359	1078068	1.182	3586	61
2012	1039.131	939286	1.106	3086	63
2013	944.170	892212	1.058	2832	60
2014	915.742	972347	0.942	2975	56
2015	1176.312	1123739	1.047	3133	55
2016	1095.101	1486921	0.736	3998	72
2017	904.655	1358814	0.666	3789	60
2018	845.529	1092618	0.774	3081	51
2019	878.367	904255	0.971	2698	47
2020	611.042	582510	1.049	1717	38
2021	629.259	729455	0.863	2137	41
2022	596.543	621345	0.960	1868	36
2023	595.608	719885	0.827	2264	41
2024	564.649	587479	0.961	1843	39
2025	496.323	608399	0.816	1891	31

Table A.2: Annual nominal logbook statistics by region for the last four years. Data are shown for 5 or more boats.

Year	Region	Tonnes	NetLifts	KgPerNetLift	BoatDays	Boats
2022	2	56.405	83332	0.677	204	7
2022	3	11.260	18723	0.601	50	6
2022	4	345.839	327127	1.057	886	24
2022	5	134.269	131520	1.021	465	21
2022	6	48.769	60643	0.804	263	16
2023	2	30.684	56305	0.545	137	9
2023	3	11.572	14988	0.772	44	8
2023	4	404.507	440842	0.918	1215	28
2023	5	87.280	109145	0.800	418	26
2023	6	61.566	98605	0.624	450	11
2024	2	25.574	42770	0.598	111	9
2024	3	18.227	26612	0.685	87	8
2024	4	378.002	367943	1.027	1033	28
2024	5	68.103	68064	1.001	269	22
2024	6	74.743	82090	0.911	343	13
2025	4	331.218	401212	0.826	1138	23
2025	5	71.329	91938	0.776	299	18
2025	6	84.755	91110	0.930	382	14

B Appendix - Survey summary

The survey nominal catch statistics per year showed the FIS caught fewer crab in total since 2017 and reduced catch rate (CatchLegalMean: number of crabs per ground-line, Table B.1).

Table B.1: Catch statistics for the fishery independent survey. Units for CatchLegalMean = number of crabs per ground-line, else the units were total numbers of crab. MeanNetHours = mean number of net hours per ground-line soak. MLS = 10 cm.

SamplingYear	Catch	CatchLegal	CatchUnderSize	CatchLegalMean	MeanNetHours
2000	5630	3093	2537	8.25	8.65
2001	5669	3346	2323	8.92	9.16
2002	3788	2544	1244	6.78	8.89
2003	5071	3169	1902	8.45	8.71
2005	7537	4356	3181	11.62	8.73
2006	8135	4912	3223	13.10	9.08
2007	6963	3852	3111	10.27	8.99
2008	9040	5453	3587	14.54	8.67
2009	5636	2946	2690	7.75	8.75
2010	6972	3755	3217	10.01	8.69
2011	7500	3171	4329	8.48	9.43
2013	7400	3639	3761	9.70	9.09
2014	7457	3683	3774	9.82	8.54
2015	7372	3941	3431	10.54	8.61
2016	6936	2854	4082	7.61	8.33
2017	4579	2337	2242	6.23	8.30
2018	4405	1968	2437	5.25	8.05
2019	4760	2403	2357	6.39	8.63
2021	4253	2222	2031	5.93	8.24
2022	4638	2526	2112	6.74	8.08
2023	3398	1838	1560	4.90	8.03
2024	3868	2000	1868	5.36	8.51
2025	4076	1815	2261	6.37	10.39

C Appendix - TACC rules

TACC rules for managed area A.

The decision rules below were designed to provide guidance for the TACC-setting process by defining how changes in the pooled index should be interpreted and by linking them to a set of decision rules for adjusting the TACC (Table C.1 and Figure C.1).

Table C.1: TACC decision rules.

Increase in the TACC
The TACC is increased when the following conditions are met in a TACC-setting year:
1.1 The pooled index is greater than 1 and the current index is above the previous year's index.
If the above conditions are met, the TACC increase will be equal to:
1.2 the proportion of change between the current index and the previous year index, with
1.3 a limit of no more than 200 tonnes to be issued in any given year, and notwithstanding that
1.4 the new TACC must not exceed 1300 tonnes.

Decrease in the TACC The TACC is decreased when the following conditions are met in a TACC-setting year:
2.1 The pooled index is less than 1 and the current index is below the previous year's index.
If the above conditions are met, the TACC decrease will be equal to:
2.2 the proportion of change between the current index and the previous year index, with
2.3 a limit of no more than 200 tonnes to be issued in any given year, and notwithstanding that
2.4 the new TACC must not be less than 300 tonnes.

Closure of managed area A (this rule takes precedence)
The TACC for managed area A will be equal to zero if:
3.1 the average sCPUE is less than 0.5 kg per dilly lift.

No change in the TACC
The TACC is to remain unchanged if:
4.1 none of the above conditions are met in a TACC-setting year, or
4.2 the new TACC is within 50 tonnes of the current TACC.

Review of TACC or decision rules
5.1 If the pooled index has either increased or decreased consecutively over each of the three most recent years and no change to the TACC has occurred, the TACC for the forthcoming year must be adjusted by 50 tonnes to reflect the recent trend, or
5.2 If the commercial index in any monitoring region is 40% or more below the previous year's index, it must be determined why the decline occurred and whether further management intervention is required to reduce the risk of localised depletion, or
5.3 If any new information becomes available indicating that the assessment and TACC 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.

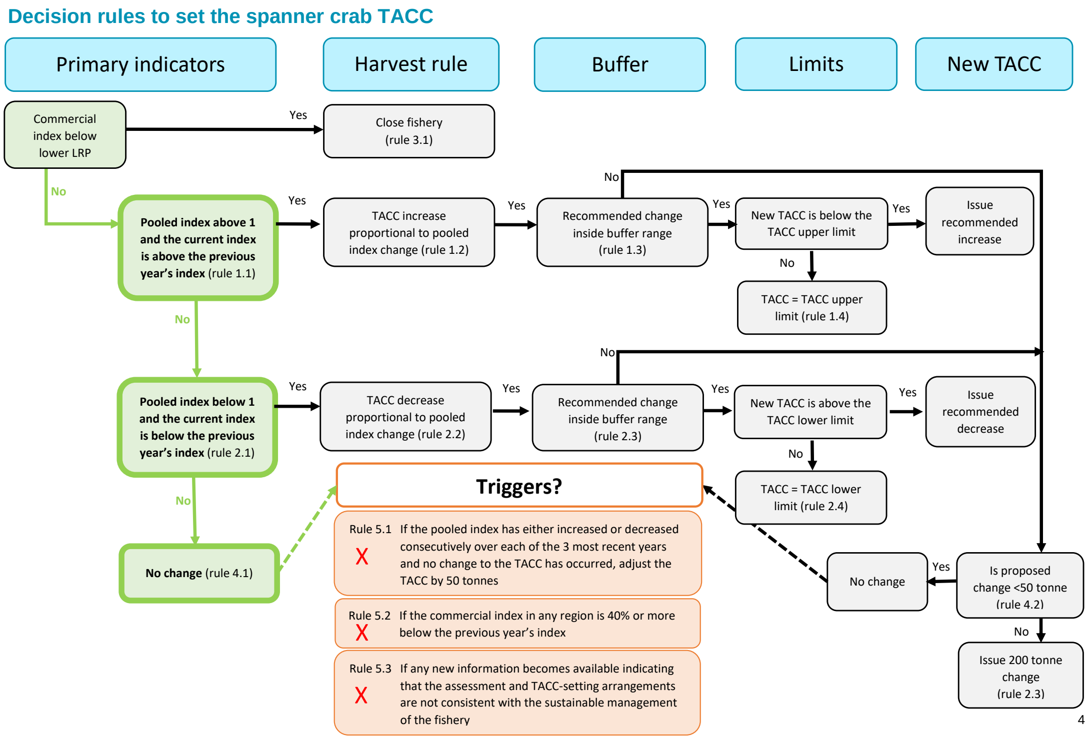

Figure C.1: Decision rules to set the spanner crab TACC.