NSW Total Allowable Fishing Committee

Report and Determinations for the 2020–21 Fishing Period

NSW Ocean Trap and Line Fishery: Spanner Crab.

18 May 2020

EXECUTIVE SUMMARY

Preamble

The NSW Total Allowable Fishing Committee (the Committee) has responsibility under the NSW Fisheries Act (1994, No. 38, as amended) to determine the Total Allowable Commercial Catch (TACC) of spanner crab (*Ranina ranina*) taken in the NSW Ocean Trap and Line Fishery (OTLF). The TACC in this Determination report is for the period 1 July 2020 to 30 June 2021, the 2020–21[1] Fishing Period. The TACC is based on information available about the spanner crab stock and its harvest in NSW to date, the most up-to-date assessments of stock status and likely future trends, reports from fishery managers, comments from fishers, and input at a teleconference of the Committee, Department officers, and interested commercial fishers or their representatives on April 16th 2020.

Determination

The Committee has determined that the Total Allowable Commercial Catch of spanner crab by commercial fishers in the NSW Ocean Trap and Line (Spanner Crab) Fishery during the 2020–21 Fishing Period should not exceed ***135.5 tonnes*** (t).

Recommendations

The Committee provides the following recommendations to the Minister, the Department of Primary Industries (the Department), and the OTLF industry (Industry), in addition to the above Determination components, towards improving performance of the fishery.

Recommendation 1: The Department improve collaboration with Queensland to harmonise the assessment and management of the NSW and Queensland spanner crab fisheries.

Recommendation 2: The Department develop a harvest strategy for spanner crab that explicitly outlines biological and economic objectives for the fishery, associated target and limit reference points, and the performance indicators that will be used to guide management.

Recommendation 3: The Department quantify discard rates in the spanner crab fishery in order to inform future TACC-setting and implements actions to reduce discard mortality.

Recommendation 4: The Department research, preferably in collaboration with Queensland scientists, the spatial population dynamic relationships between Queensland and NSW populations of spanner crab.

Recommendation 5: The Department and Industry seek appropriate mechanisms to record prices of share transactions and gather operational economic information for the fishery to inform future TACC-settings.

Recommendation 6: The Department monitor recreational catches of spanner crab as part of regular recreational fishing surveys in NSW.

Stock Status

The east-coast spanner crab stock is considered a single stock that is harvested by fisheries in Queensland (QLD) and NSW, with around 90% of annual catch taken in Queensland. There is no common or joint stock assessment between NSW and QLD and the Committee accordingly considered assessments from both states. There is clear evidence of material decline of spanner crab populations in QLD over the last decade and strong evidence of more recent decline in the NSW portion of the stock, despite peaks in commercial and fishery independent survey catch rates just 4 years ago. The Committee has concluded therefore that the spanner crab population off NSW is in decline and currently is most likely at levels last seen around 2012–13. That conclusion is consistent with the 2018 Status of Australian Fish Stocks (SAFS) conclusion that the then current level of fishing mortality for spanner crab (QLD TACC 847 t, NSW TACC 164 t) likely would cause the stock to become recruitment impaired.

Continued absence of joint assessments between QLD and NSW will perpetuate risks of each jurisdiction having a (differently) blinkered view of the status of the common stock and create greater uncertainty around future TACC-setting than is in the interests of fisheries in either state. A more formal assessment, coordinated with QLD, and embedded within a harvest strategy with clear objectives and reference points, would provide a clearer indication of the time and conditions within which the NSW TACC might be raised effectively and forecast periods when further constraint is necessary to rebuild stocks.

[1] All full-year (e.g., 2020–21) and year-range references (e.g. 2009–20) in this report are to financial years from July 1 in the first stated year to June 30 in the second, coincident with fishing periods, unless specified otherwise.

Economic Considerations

The NSW spanner crab fishery has been subject to a number of external factors that potentially have reduced economic performance in 2019–20. Floods in February 2020 are believed to have affected catches in that month, while international trade restrictions and domestic social restrictions due to the COVID-19 pandemic have limited export and domestic markets since late January 2020. Catches in the fishery are lower than in recent years aside from the above effects, and the TACC is unlikely to be reached in 2019–20.

The fishery is currently benefiting from increasing prices for spanner crab but that benefit is being offset to a by falling catch rates and higher costs of capture. Information on costs and earnings in the fishery is not available, while available quota lease price information also is less informative than in other fisheries because the existing TACC is not limiting catches. Assessing economic performance of the fishery is difficult as a consequence. It appears, however, that economic performance of the fishery has declined since Individual Transferable Quotas (ITQs) were first introduced in 2015–16, although likely remains higher than in pre-ITQ years. That decline largely is attributable to the non-binding TACCs that have undermined the expected effectiveness of the quota system in improving economic outcomes.

The spanner crab stock is shared with Queensland, and there are potential economic and sustainability benefits from developing formal resource sharing arrangements, agreed target and limit reference points, combined assessments at the stock level, and complementary TACCs set to achieve agreed targets. Such cross-jurisdiction cooperation also will assist in gaining Marine Stewardship Council certification, initiated by Industry, which has potential to result in higher prices on domestic and international markets.

Management Considerations

The NSW spanner crab fishery is a component of the OTLF, which is a share managed, multi-species, multi-gear fishery covering the entire NSW coastline. The spanner crab component, however, only operates in waters north of Korogoro Point (Hat Head) and operates as a single species fishery using gear that exclusively targets spanner crabs. Spanner crab harvest in NSW is managed via a suite of tools including limited entry, TACCs, ITQs, gear limits, spatial and temporal closures, and a Minimum Legal Size (MLS) limit. There is no harvest strategy in place for this fishery.

Annual spanner crab catches in the OTLF have fluctuated between 78.5 t and 146.1 t since 2009–10, significantly below the historical high catches of over 400 t in the late 1980s and 1990s. Reported effort also has declined since 1997, despite the market price for spanner crab increasing over that period. Landings in 2017–18 and 2018–19 totalled 146.1 t and 114.4 t respectively, well below the TACC of 169 t. Only 44.5% of the 2019–20 TACC had been caught up to 20 March 2020, suggesting that catch for the 2019–20 Fishing Period also is likely to be well below the 169 t TACC. There are no estimates available for recreational, Aboriginal, or illegal catches, though all are considered likely to be small.

There is considerable uncertainty about the status of the spanner crab stock, particularly in NSW, but it appears that stock biomass has been depleting in both NSW and Queensland. NSW catch rates have decreased over the past 3 years and the TACC continues to be under-caught. The biological and economic viability of the NSW fishery cannot be controlled via management of the NSW harvest alone. There is some informal cooperation between NSW and Queensland on data exchange and science for spanner crab, but there are no formal cooperative mechanisms to ensure management and TACCs in both jurisdictions are compatible with long term viability of the stock.

Cross-jurisdictional coordination and management action with Queensland is necessary to reverse stock declines and improve biological and economic outcomes for this fishery. Clear objectives for the fishery and a harvest strategy that defines target and limit reference points for biomass (or catch rate proxies) need to be developed to guide management decisions, including TACC setting.

Conclusion

The Committee has concluded that the NSW spanner crab TACC should be set at about the level of recent catches, as a balanced response to the current status of the broader east-coast stock. Recent NSW TACCs have not been realised and so are not effectively regulating catch, nor at a point where relatively minor adjustments could be used to improve fishery performance. A TACC set at the realised catches over recent years means that: (a) the required immediate adjustment should cause relatively little short-term economic constraint on the fishery; and (b) relatively smaller future TACC adjustments, whether increases or decreases, will be effective levers to optimise the fishery as new information on stock status is presented, or more formal harvest strategies are implemented. The Committee is concerned that there is a long-term risk that failing to reduce the TACC now to an effective level will necessitate potentially deeper future cuts.

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1. INTRODUCTION

The Total Allowable Fishing Committee (the Committee) is established under Part 2A S40 of the *Fisheries Management Act 1994* No 38. The committee in 2020 was:

- Dr Bruce Mapstone— Chair;
- Dr Rich Little — fisheries science;
- Ms Alice McDonald — fisheries management;
- Dr Sean Pascoe — natural resources economics; and
- Dr Keith Sainsbury[2] — fisheries science.

The Committee has been directed by the Minister to determine the Total Allowable Commercial Catch (TACC) of spanner crab (*Ranina ranina*) for the commercial Ocean Trap and Line Fishery (OTLF) in NSW during the 2020–21[3] Fishing Period, from July 1st 2020 to June 30th 2021.

TACCs for spanner crab previously have been set by administrative declaration for the 5 Fishing Periods during 2015–20[4]. A TACC of 164.1 tonne (t) applied only to the northern zone of the fishery until June 2018, after which an overall TACC of 169 t was applied to the northern and southern zones of the fishery. This Determination for the 2020–21 Fishing Period is the first by this Committee.

The Committee is to give effect to relevant objectives of the *Fisheries Management Act 1994,* and as since amended *(1997, 2004, 2006, 2010, 2015, 2018)*, and is not subject to control or direction from the Minister as to the outcomes of Committee considerations. The Act states (Section 40E):

(1) In making a fishing determination, the TAF Committee is to give effect to the objects of this Act and is to have regard to all relevant scientific, industry, community, social and economic factors.

(2) The TAF Committee is also to have regard to—

(a) the need to ensure that the exploitation of fisheries resources is conducted in a manner that will conserve fish stocks in the long term, and

(b) the impact of fishing activities on all species of fish and the aquatic environment, and

(c) the precautionary principle, namely, that if there are threats of serious or irreversible damage to fish stocks, lack of full scientific certainty should not be used as a reason for postponing measures to prevent that damage.

The Committee interprets 'threat' in this context to mean an 'indication of probable harm to come'. The Committee therefore must respond to evidence before it proves future harm to the fishery or the stocks and not postpone action to prevent that harm occurring even if there is uncertainty surrounding such evidence. Similarly, the Committee should not take pre-emptive decisions on issues such as increasing the TACC when there is insufficient verifiable information on which to base such decisions. The Committee may be consulted out of session on a range of management issues.

The Committee must consider, as far as possible, the full extent of exploitation that might affect resource sustainability to meet its statutory obligations. Total removals from the stocks considered here are made up of, to varying degrees:

- Quotas allocated to commercial fishers in the OTLF;
- Total legal catch by recreational and Aboriginal fishers, including those from charter fishing;
- Mortality of animals released after capture because they were smaller than the Minimum Legal Size (MLS) for harvest; and
- Catches by commercial, recreational, or Aboriginal fishers not sanctioned by the Regulations controlling the fishery and not recorded in catch statistics (illegal catches).

The Committee makes determinations on the TACC and matters it is required to regard that affect directly that TACC. This report has been prepared in support of the TACC Determination for 2020–21. The report also includes recommendations for management of the fishery related to setting the TACC, based on the experience and background of the Committee members, reports received by the Committee, and submissions or comments from stakeholders. The degree to which the Committee's other suggestions or recommendations are accepted is a matter entirely for the Minister and the Department. Constructive dialogue between the Committee, the Department, and Industry on fishery-related issues is an important and valuable part of the Committee's deliberations.

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[2] Dr Sainsbury did not participate in these Determinations.

[3] All full-year (e.g., 2020–21) and year-range references (e.g. 2009–20) in this report are to financial years from July 1 in the first stated year to June 30 in the second, coincident with fishing periods, unless specified otherwise.

[4] The effective TACC was set as an Interim Total Commercial Access Limit (ITCAL) during 2015–18 and was set at the average catches in the spanner crab northern zone over the financial years period 1997–2012.

2. PROCEDURES

2.1 Public Consultation by the Committee

The Committee, through the Department, called for public submission on the appropriate total allowable commercial catches under the requirements of Sections 40F and 284 of the *Fisheries Management Act* 1994. Spanner crab fishers, relevant industry and stakeholder bodies, and the community were invited to make submissions on the Total Allowable Commercial Catches of spanner crab from NSW. The consultative process is set out in Appendix 1. Six written non-government submissions were received during that process.

The Committee normally would have obtained input from participants in a Total Allowable Fishing Committee (TAFC) Open Forum meeting in Sydney during April 2020. The occurrence of the COVID 19[5] pandemic, however, precluded such a public meeting and a teleconference of the Committee, Departmental officers, and interested commercial fishers was convened instead on April 16th 2020. Reports considered by the Committee and referred to in that teleconference included those from:

- NSW Department Primary Industries (DPI) Fisheries Research;
- NSW Department Primary Industries Commercial Fisheries Management; and
- NSW Department Primary Industries Fisheries Compliance.

Verbal submissions to the Committee also were invited in the teleconference. The Committee also held *in-camera* discussions with the Department to clarify various administrative and data matters relevant to this Determination.

2.2 Matters considered

The Committee considered the following matters before reaching its Determinations:

- The administrative TACC Determinations for 2019–20 and previously;
- The data and assessment reports for spanner crab stocks provided by the Department;
- Catches of spanner crab in Queensland and relevant stock assessments from Queensland;
- Advice on the status of management of the fishery provided by the Department;
- Advice on the economic status of the fishery from the Department and Industry representatives;
- Advice on compliance with regulations from the Department and Industry representatives;
- The current state of the fishery;
- The spatial nature of the fishery; and
- Submissions, commentary, and presentations provided in writing and at the Open Forum.

2.3 Format of the Report

This report covers the three key areas affecting management of the fishery and setting of the allowable commercial catch:

- Status of the stocks;
- Economic considerations; and
- Management considerations.

The key considerations for each of these areas are presented in the following sections 3, 4, and 5, respectively. The Committee's conclusions in view of those considerations are presented in section 6, together with the details of this year's Determination.

The Committee has made several recommendations with the Determination to clarify the position of the Committee on a number of issues related to the TACCs. The primary recommendations are included in the Executive Summary.

The Determination of the Committee is to be published by the Minister. The Minister is required to review the regulations and any other instruments under the Act In the light of the Determination. The Determination is to be implemented in accordance with the Act.

[5] COVID-19 is the World Health Organisation authorised acronym for Coronavirus Disease 2019, which was officially declared a pandemic on March 11 2020.

3. STATE OF THE STOCKS

3.1 Introduction

The Committee relied heavily on the technical assessment provided by the Department (Johnson 2020[6]). The Committee also considered several assessment-related documents about the Queensland (QLD) spanner crab Fishery. All assessment reports were based on assessments of commercial CPUE[7] analyses that included standardisation, as well as CPUE from Fishery Independent Surveys[8] (FISs). FISs have been done annually since 2000 calendar year in QLD and in since 2005 calendar year in NSW.

Spanner crabs (*Ranina ranina*) mainly are found in sandy habitats in shelf waters of 10–100 m depth off the Australian east coast between Yeppoon in QLD (~21°S) and Nowra in NSW (~35°S). A small population also has been reported off Australia's west coast. Genetic analysis indicates that the species comprises a single biological stock along the east coast. Spanner crabs live for up to 15 years and reach maximum sizes of around 160 mm and 120 mm carapace length for males and females respectively. Approximately 50% of females mature before reaching 70 mm carapace length and produce eggs in batches of approximately 80,000–250,000 in summer. Male spanner crabs grow faster than females and recruitment to the NSW fishery occurs at about 4 years of age for males and 5–6 years for females. NSW has a Minimum Legal Size (MLS) for harvest of 93 mm orbital carapace length, which is equivalent to the QLD MLS of 100 mm rostral carapace length.

The east coast spanner crab stock is harvested in both QLD and New South Wales with QLD accounting for 73–94% of annual harvests since 1990 (calendar years) and around 85–93% of catches annually since 2009. The spanner crab stock in QLD is assessed relative to target and limit reference points defined in terms of expected CPUE metrics at 60% and 20% of unfished biomass respectively. A formal harvest strategy for 2020–25 has been developed recently for the QLD fishery.

Spanner crab is caught commercially in NSW in the OTLF by fishers holding spanner crab shares in one of two fishing zones: Ocean Trap and Line Spanner Crab Northern Zone (OTLSCN) extending from the NSW–QLD boarder at Tweed Heads to the southern breakwall at Yamba; and the Ocean Trap and Line Spanner Crab Southern Zone (OTLSCS) extending from the Yamba southern breakwall to Korogoro Point (Hat Head). Landings from the OTLSCN zone have accounted for around 98% of spanner crab commercial catch in NSW since 2009–10. Quota use during the four complete quota years 2015–2019 was 87.9%, 81.4%, 89.1%, and 67.7% respectively[9].

An annual TACC[10] of 164.1 tones (t) was applied to the northern zone from July 1 2015 to June 30 2018, after which application of the TACC was extended to include the southern zone and increased to 169 t. No harvest strategy, including objectives or reference points, exists for the NSW spanner crab fishery.

3.2 Stock Status and Trends

Catch data for spanner crab harvest in NSW stretch back to 1984–85. The highest annual catches reported were 487.9 t, 443.6 t, and 423.6 t in 1987–88, 1994–95, and 1995–96 respectively, with over 300 t taken annually in 1986–87 and during 1991–98. Annual catches after 1997–98 declined steadily to lows of 83–92 t in 2008–11. Catches have rebounded somewhat since to 103–146 t during 2011–19, notwithstanding a low of 78.5 t in 2014–15. The average annual catch of spanner crabs in the OTLF since 2009–10 was 118.0 t and the average during 2015–19, since introduction of quota management, was 136.1 t[11]. No data are available in NSW for recreational or indigenous catches of spanner crab.

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[6] Johnson, D.D. 2020. *Stock assessment report 2020 — Ocean trap and Line Fishery — Spanner Crab (Ranina ranina)*. NSW Department of Primary Industries, Port Stephens Fisheries Institute. 31pp.

[7] Catch-per-unit effort (CPUE), or catch rate, is an indirect measure of stock abundance. Effort is often standardised to account for effects of different vessels with different fishing characteristics operating to different degrees over a number of years and environmental effects on catchability or fishing opperations.

[8] Fishery-independent surveys provide valuable measures of relative abundance, rates of population change, and size and sex composition from scientific sampling and are less subject to the numerous and often confounding factors that complicate the interpretation of fishery-dependent indices of stock status.

[9] These percentages reflect updates to catch data provided by the Department during preparation of this report and differ slightly from those provided previously in McKinnon, F. 2020. *Fishing Determination Summary Report*. Department of Primary Industries, Coffs Harbour. 20 pp.

[10] The effective TACC was set as an Interim Total Commercial Access Limit (ITCAL) during 2015–18 and was set at the average catches in the spanner crab northern zone over the financial years period 1997–2012.

[11] Includes late-reported catches advised to the Committee during report preparation.

Commercial catch rates in kg/FisherDay go back to 1984–85 but effort measurements were changed in 2009–10 to net (pot) lifts in recognition of heterogeneity in a FisherDay that could not be accounted for in CPUE standardisations. Commercial effort peaked at over 2,500 FisherDays in 1997–98 and varied over 1,000–2,000 FisherDays for 18 of the other 23 years between 1984–85 and 2007–08. Effort since 2008–09 has been less than 1,000 FisherDays annually, with the single exception of 2003–04 (1,064 FisherDays). There have been around 40,000–75,000 (average 53,796) net-lifts per year since 2009–10.

Raw annual average commercial catch rates from the northern zone of the fishery, where most catch is taken, fluctuated between about 83 kg/FisherDay in 1984–85 and 205 kg/FisherDay in 2016–18. Annually averaged standardised catch rates during 2009–14 varied over approximately 110–140 kg/FisherDay and then increased sharply to above 220 kg/FisherDay in 2016–17 before sharply dropping to below 160 kg/FisherDay in 2018–19. Data to the end of January in the 2019–20 fishing period indicated the current standardised CPUE has fallen further to around 137 kg/FisherDay, approximately midway between those of 2012–13 and 2013–14. The average standardised catch rate over the 10 years since 2009–10 was about 147 kg/FisherDay and the peak in 2016–17 was notable as being above the 90th percentile of the distribution of values over that period. That unusual peak in CPUE coincided with some changes in management regime, including introduction of quota management, and reduction in fishing hours as fishers adjusted to supplying markets for live crabs. Industry commentary suggested that those changes resulted in more targeted fishing over shorter period each day, and tended to increase CPUE. It is not clear whether or why such effects on catch rates would have diminished since then, however, suggesting that recent declines in catch rates likely were influenced more by stock abundance than by fishing practices.

NSW FIS catch rates also peaked recently (May 2015, May 2016[12]) at 50% above the 10-year average. FIS catch rates since have been close to the long-term average, whilst those prior to 2015 were at or below the long-term average. Thus, both FIS and fishery CPUEs indicated a recent upturn in spanner crab abundance from the long-term average, though the indicators differ slightly in the scale and timing of that increase. Both indices are in agreement since 2017, however, showing a decline coming off the peak to levels more consistent with, or below, long-term averages. Both indices also were relatively stable over the 10 years prior to the 2015–16 peak, when catches fluctuated between 78 t and 146 t. That relationship perhaps indicates a 'sweet spot' in the relation between biomass (indicated by CPUE) and yield (catches).

Standardised commercial catch rates in QLD generally declined consistently from 2008–10 calendar years, when they were slightly above the target reference point, to a minimum close to the limit reference point in 2017. There is some indication in the region-specific standardised catch rates of a north-south sequences in peaks, with peaks in the more southern regions lagging those in the northern regions by 3–4 years, and leading the peak in NSW by 4–5 years. QLD commercial catch rates stabilised or increased slightly in 2018 and 2019 in all regions but remained closer to the limit than target reference value. QLD FIS catch rates also declined from a peak in 2008, driven mainly by a peak in the central region, north of the Sunshine Coast and south of Bundaberg (Region 4), but showed an intermediate peak in 2015 before continuing to decline to a minimum in 2017, similar to the pattern seen in the NSW FIS data for 2015–17. Catch rates from the QLD FIS for 2019 showed an increase in the total number of legal sized crabs compared 2018, again particularly in the central region. The reason for the 2015 peak in FIS CPUEs and 2016 peak in commercial CPUE is unclear.

Male spanner crabs grow more quickly and reach bigger maximum sizes than females. Length frequency distributions from the NSW FIS indicate that most of the legal sized spanner crabs caught are males whilst only a small fraction of females, which mature at about 70 mm, were caught above the MLS. Early research[13] indicated that post-discard mortality of spanner crabs is high, likely close to 100% for crabs that suffer limb loss and 60–70% that suffer limb damage during removal from gear, and it has been estimated that overall discard-related mortality in the QLD fishery is around 39%. No estimates of discard rates are available for the NSW spanner crab fishery and so it is impossible to estimate the population-level mortality associated with discarding under-size crabs. The relatively high mortality of crabs likely to be discarded places a higher than expected pressure on the spawning capacity of the stock and raises questions on the effectiveness of MLS as a management tool to limit over-fishing in the species unless discard practices can be improved to minimise damage to released animals.

[12] It should be noted that commercial catch rates are reported in the financial year (July-June) whereas the FIS catch rates are reported by calendar in which the survey was conducted (in May each year).

[13] Kennelly, S. J., Watkins, D. & Craig, J.R. 1990, *Mortality of discarded spanner crabs Ranina ranina (Linnaeus) in a tangle-net fishery – laboratory and field experiments*, JEMBE 140, 39-48.

Catch-MSY modelling[14] of the entire stock (Queensland and NSW) indicated a current stock status at 33% of unfished biomass, about mid-way between the target (Maximum Sustainable Yield, MSY) and limit reference points used for the QLD fishery. These modelling results represent an average of "feasible" biomass trajectories, subjected to historical catches, and were highly uncertain with a 95% probability of being between 8% and 49% of unfished biomass. The modelling also indicated that the harvest rate from those feasible trajectories, on average have been generally declining since 1997 and currently are around 10%, which is close to the value the model calculated at MSY. Five-year projections of the model under constant catch levels of 1,000 t, 1,200 t and 1,400 t all produced stable or slightly increasing average trajectories of stocks, but all also included many credible projections that resulted in stock collapse.

3.3 Conclusions

The FIS and commercial CPUE indicators of abundance were relatively consistent with each other within each jurisdiction but indicated different patterns in stock abundances between jurisdictions. Recent abundance indices have come off an all-time low in QLD, where highs occurred around a decade ago. The NSW values had all-time highs approximately 4 years ago and remain above historical lows but now are declining. The prospect that stock status in NSW might follow that in QLD with around a 3–5 year lag should be investigated as part of a more comprehensive investigation of relationships between QLD and NSW spanner crab populations and their dynamics.

The absence of a common stock assessment shared or agreed between NSW and QLD raises the risk of each jurisdiction having a (differently) blinkered view of the status of the common stock. The likely predominantly southerly transport of spanner crab larvae, and limited migration of settled individuals, leads the Committee to conclude that the spanner crab stock in NSW likely is dependent on the status of the QLD portion of the stock, and thus influenced materially by management actions in QLD. An agreed approach to management between the jurisdictions that includes monitoring, assessment, and harvest controls rules (i.e. a harvest strategy) would help responses to seemingly contradictory results, and possible conflicting and counter-acting management actions.

The Committee has placed considerable emphasis on the results of the QLD assessment, as well as the NSW assessment. The QLD reports demonstrate that the QLD population has declined in a relatively consistent manner since 2006–10, and only seems to have showed signs of initial recovery in the past two years. The NSW assessment indicates that the NSW population has been declining since 2016–17 and shows no signs of rebound this year. The Committee also is concerned about the dearth of data about discard rates from the fishery, given that discarded animals likely have low survival. The Committee accordingly concluded that a reduction in the NSW TACC to a level close to recent (last 10 years) catches is warranted and represents a balanced response to the current status of the broader stock. That conclusion is consistent broadly with the 2018 Status of Australian Fish Stocks (SAFS) conclusion that the then current level of fishing mortality for spanner crab (QLD TACC 847 t, NSW then TACC 164 t) was likely to cause the stock to become recruitment impaired.

[14] Catch-MSY is a model technique that calculates all possible biomass trajectories that do not collapse the stock or exceed an hypothesised carrying capacity and fall within pre-determined final depletion ranges by randomly selecting population parameter values. The mean of all retained trajectories provides a measure of the most likely stock status, while the mean parameter values of the retained trajectories are used to calculate MSY.

4. ECONOMIC CONSIDERATIONS

4.1 Introduction

The NSW spanner crab fishery administratively sits within the NSW OTLF but operationally is a single species targeted fishery that operates only in the northern third of State waters. The fishery operates under endorsements for two spatial zones, one north and one south of Yamba. Spanner crabs are taken as byproduct in the Ocean Trawl Fishery, but that catch typically is below 0.01% of total annual landings.

The fishery included 27 shareholders at March 2020, with 21 holding access shares for the northern zone, 19 of which held sufficient shares to be eligible for an endorsement to fish, and 6 holding access shares for the southern zone. A single TACC controls the harvest of spanner crab from both zones, distributed as Individual Transferable Quotas (ITQs) amongst all quota shareholders. Ninety-seven percent (97%) of the TACC is allocated to shareholders with northern zone access shares and 3% is allocated to the 6 businesses with access shares to the southern zone.

Twenty-two of the 27 fishing business with shares in the spanner crab fishery have endorsements in other fisheries, with only 5 fishing businesses being solely dependent on the spanner crab fishery[15]. Most of the other endorsements held by spanner crab fishing businesses are for other components of the OTLF (e.g. line or fish trap endorsements), with few having endorsements in unrelated fisheries.

4.2 Volume and Value of Production

The gross value of production (GVP) is a broad indicator of the economic importance of a fishery to the region in which it occurs. Changes in GVP often will be associated with changes in the demand for local inputs (e.g. repairs, fuel, and other inputs) and secondary economic activity (e.g. freight, accountancy and other administrative services, etc.), incomes generated (crew, skipper, and local supporting business) and employment opportunities (direct and induced through the associated economic activity).

GVP is a function of price received for product(s) and the quantities of product(s) landed. Both of these may change for fisheries as a result of changes in fishing activity, changes in the stock conditions, or changes due to external factors. A broad understanding of the drivers of these changes, most of which are likely to be inter-linked, is important to understanding the economic performance of a fishery.

4.2.1 Markets and market prices

The main market for the NSW spanner crab fishery is domestic. Information provided by Industry representatives in the 2020 TAFC teleconference suggested that most of the product is sold directly, with most going to the Sydney Fish Market (SFM). Supplementary information provided by the Department suggested that 73% of the reported quota use[16] between August 2019 and January 2020 was sold through the SFM, consistent with the information from Industry.

Some of the remainder of the total catch was believed to be sold directly by producers, rather than through the SFM or local cooperative, to obtain higher prices, while some was exported. The quantity exported is uncertain and not captured clearly in the ABS trade statistics[17], although information provided by the Department suggested that direct exports arise from only a small number of fishing businesses.

Prices on the SFM have increased in both real[18] and nominal terms over the last decade, with real prices increasing by an average of around 9–10% a year between 2015–16 and 2018–19. The average price of spanner crabs on the SFM was $15.66/kg in 2018–19. Anecdotal information from Industry suggested that the price was around $18–19/kg in April 2020, which is broadly consistent with recent price increases. These price increases do not appear to be related to reductions in quantities supplied, although there is insufficient information available to quantify a price-quantity relationship. Understanding

[15] The Committee was advised that 4 of the 5 businesses were owned by people who held other fishery endorsements in other businesses, meaning only one fisher depended exclusively on the spanner crab fishery.

[16] There is a discrepancy between reported landings and reported quota use due to delays in submission of logbook information. Reported quota use is used here as the measure of production for GVP estimation.

[17] Australian Bureau of Statistics, *International trade, Australia,* cat. No. 5465.0, Canberra. Spanner crabs are included in a general crab category that includes mud crabs and other crab species. It is possible also that some or all of the NSW spanner crab exports are being included with Queensland crabs, as the information is based on the state from which the product is exported, not where it is caught.

[18] Real prices are adjusted for changes in inflation, while nominal prices are the values as they were originally reported at transaction time. Real price adjustments are calculated using Australian Bureau of Statistics “all groups” Consumer Price Index data from the December quarter of the appropriate year.

the implications of changes in TACCs for prices, and hence revenue, is an important, but currently difficult, economic consideration when setting TACCs.

The closure of Chinese export markets in late January in response to the COVID-19[19] epidemic, and later pandemic, may have affected prices received by those who exported their product. Imports of seafood into China were not banned but closure of key markets and restrictions on social gatherings in China resulted in a substantial decrease in demand. Transport constraints linked to reduced international flights also have had an ongoing effect on access to export markets, while social distancing restrictions still in place in most countries have continued to depress demand for many Australian seafood exports.

4.2.2 Production volume

Reported quota use in the 2019–20 Fishing Period to the end of March 2020 was 79.3 tonnes, 23% lower than at the same time in the 2018–19 Fishing Period.

The fishery has been subject to a number of environmental and other issues that potentially have affected production this fishing period. Flooding in the NSW northern rivers region in early February 2020 may have been associated with low quota use that month, with just 1.2 t reported in February 2020 — less than half that landed in all but one February since 2011–12. Anecdotal evidence from Industry suggested that spanner crabs move to avoid freshening water over the fishing grounds following periods of heavy rainfall, making them less available to the fishery. The COVID-19 pandemic effects on the Chinese and other international markets from late January (above) also might have contributed to the decline in production in February. Fishing businesses focused on export markets might have suspended production, at least temporarily, while assessing options, though anecdotal information suggested that that would have affected very few businesses.

Sixty-one percent (61%) of the total quota use in 2018–19 occurred during July–December, while 75% occurred July–January, with January normally being an above average month. Quota use reported up to December 2019 was only 89% of that of the same interval in 2018–19 whilst total catch so far reported in logbook returns for the period was only 69% of the average for analogous periods between 2009–10 and 2018–19. The number of days fished up to December 2019 was 96% of that of over the same period in the 2018–19 Fishing Period and 74% of the 2009–19 average. These comparisons suggest that market-related factors do not explain fully reduced production during 2019–20, implying that at least some of the diminished production was due to lower catch rates.

Ongoing restrictions of social behaviours domestically and internationally likely will continue to affect markets for the remainder of the 2019–20 Fishing Period, and possibly persist into the start of the 2020–21 Fishing Period. Estimating the likely 2019–20 catch in such uncertain market conditions is complex. Reported monthly quota use from February and March typically is lower than in the other months of the year. Quota use in April–June 2020 at similar levels to that in April-June 2019 would realise a total catch for 2019–20 around 99.3 t, a reduction of around 20% on the 2018–19 Fishing Period (Figure 4.1), but that is likely to be an upper estimate given the prevailing market conditions.

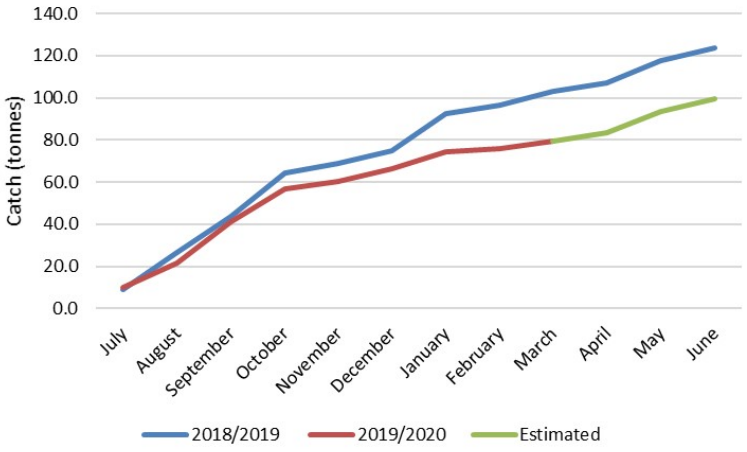

Figure 4.1. Cumulative catch in 2018-19 and 2019-20, to March 2020, with catch April–June 2020 estimated based on 2018–19 monthly quota use over the same months.

[19] COVID-19 is the World Health Organisation authorised acronym for Coronavirus Disease 2019, which was officially declared a pandemic on March 11 2020.

4.2.3 Gross value of production

Gross value of production (GVP) of the spanner crab fishery during the 2018–19 Fishing Period was estimated to be $2.1m.[20,21] GVP in 2019–20 to March 2020 was estimated to be $1.43m, based on quota use to March and a current SFM price of $18/kg. Full-year 2019–20 GVP derived from forward estimation of landings is likely to be no more than $1.79m, around 80% of that of the previous year.

4.3 Quota Market Functioning

A well functioning quota market is a necessary (but not sufficient) requirement for economic benefits to be generated under an ITQ system. The quota system in the NSW spanner crab fishery is more complex than some other NSW fisheries. There are two types of shares in the fishery: access shares that determine where fishers can operate (northern or southern zones for the spanner crab fishery); and quota shares that determine the distribution of the TACC among fishers as ITQs. The spanner crab fishery since July 2018 has been subject to a single TACC for both fishing zones with ITQs able to be traded temporarily or permanently within or between zones. That is, species quota is not spatially allocated and can be filled from either zone by fishers with the appropriate access shares.

4.3.1 Catch distributions and quota allocations

ITQs often are believed to result in concentration of ownership with a few individuals and consequential displacement of the smaller operators in a fishery. This criticism is related to social objectives around equity more than economic efficiency. Twenty of the 25 fishing businesses endorsed to take spanner crab in NSW have reported spanner crab catches in 2018–19. Four of those fishing business landed over 50% of the reported catch. A similar distribution of catch existed in 2009–10, when five of the 21 then-active fishing businesses landed approximately 60% of the catch. There appears to be no evidence thus far of undue concentration of ownership or displacement of businesses following the move to ITQs.

4.3.2 Share and quota trading

Information on share trading was not available for 2018–19 or 2019–20. Fifteen northern zone shares, 145 southern zone shares, and 33 species quota shares, however, were transferred in the 2017–18 financial year. The total numbers of shares effective in each zone at the time were not available, so it is unknown what proportion of the fishery was involved in those transactions. Reliable price information for those transfers also was unavailable.

Temporary quota leasing trades represent short term transfers of quota within a fishing period. Eighteen temporary quota transfers were made in the 2018–19 Fishing Period, representing 12.8% of the TACC. Ten temporary quota transfers have been made to date (end of March) in the 2019–20 Fishing Period, representing 7.86% of the TACC. These proportions are low relative to other NSW ITQ fisheries but the TACCs to date have not been limiting spanner crab catches and it is likely that most fishers would have had little need to obtain additional quota through quota leasing or share purchase.

The fact that trades are occurring, albeit at a low level, suggests that quota markets are operating relatively efficiently in the spanner crab fishery. Industry representatives did identify difficulty in obtaining addition quota as an issue, however, and problems with identifying individuals holding quota that could potentially be leased seemed a key obstacle to quota trading. This appears to be a common issue in most of the NSW ITQ fisheries and improving transparency of quota holdings and availability will be of benefit to several fisheries. The Industry likely would benefit from greater reporting by managers on the level of quota uptake, along the lines of the AFMA Catchwatch reports.[22] Greater promotion of the buy and sell features of FishOnLine also might help fishers to find quota to lease or shares to purchase.

4.4 Economic Performance Indicators

Explicit economic information on the performance of the fishery (e.g. cost and earnings data) is not available, though some indications of changes in economic performance in recent years can be derived indirectly from available data.

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[20] McKinnon, F. 2020. Fishing Determination Summary Report - Spanner Crab 2020, Reference number (OUT20/), NSW Department of Primary Industries, Coffs Harbour.

[21] From McKinnon (2020), total reported landings in 2018-19 was 123.7 tonnes, and the average price was estimated at $15.66, giving a GVP of $1.94m.

[22] https://www.afma.gov.au/fisheries-services/catchwatch-reports

4.4.1 Autonomous adjustment

A key advantage of ITQs is that they provide incentives for less efficient fishers to exit a fishery through transferring their shares to more efficient fishers, with average efficiency of the fishery increasing as a result. Such 'autonomous adjustment' also removes excess (unused) capacity from the fishery. Capacity utilisation is a relative measure of the extent to which fixed inputs (e.g. vessels) are being used for fishery production. For example, 10 boats operating for 50 days each on average is more efficient than 50 boats operating for 10 days each, even though effects on the stocks and catch might be the same. This example illustrates considerable excess capacity because 50 boats are catching what could be taken by 10 boats, which results in a higher cost per unit of capture and lower economic returns per unit of effort.

There is evidence of autonomous adjustment in the spanner crab fishery over the last decade, with the number of fishing businesses in the northern zone declining from 34 to 21 and in the southern zone from 11 to 6. Most of this adjustment had taken place immediately after the introduction of the catch quota system in July 2015, however, with little subsequent adjustment. The lack of subsequent adjustment likely reflects that total catch limits have not been binding since they were introduced in 2015. Reported catches averaged around 86% of the TACC for the first three years of the quota system (2015–18) but subsequently declined to 68% in 2018–19, with a further decline expected in 2019–20.

4.4.2 Quota prices

Quota leasing prices reflect the profit associated with the use of the quota in the time period in which it was leased (a short-term measure), while quota share trading prices reflect the discounted flow of expected profits over time through owning the share. These values are most informative when TACCs are limiting catches effectively, but quota will trade for less than its potential value when there is excess unused quota in the market and diminished need to acquire quota to realise desired catches. Information on quota share and quota lease prices were not available for the spanner crab fishery but information provided by Industry representatives suggested that quota had been leased at around $3–$5/kg, with the higher prices being realised in the earlier years when a higher quota utilisation existed.

4.4.3 Catch rates

Catch rates (CPUE) can provide insights to changes in stock status but also can provide an indication of the changes in the costs of capture. Falling catch rates mean that the amount of fishing effort required to catch a given quantity of product increases and hence cost per unit of catch increases. Changes in CPUE and the associated cost index are shown in Figure 4.2. Real costs of capture (assuming constant input prices) have increased in recent years as catch rates have declined. Costs of capture are still lower than in the pre-ITQ years (prior to 2015–16), however, suggesting some efficiency gains in the fishery following introduction of ITQs. Real costs per kg were lowest in 2016–17, when catch rates were highest.

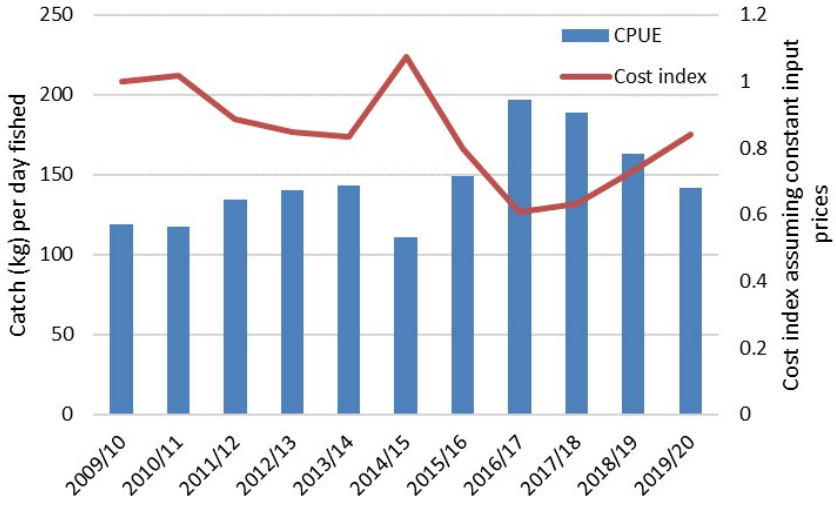


Figure 4.2. Changes in catch per unit of effort (CPUE, kg per day) and real costs of capture.

The cost index in Figure 4.2 is based on input prices remaining constant (at least in real terms). Lower fuel prices in 2020 might provide some benefits to the industry in the short term, but the true economic performance of the fishery is difficult to assess without information on the cost structures (and earnings) of vessels and reliable data on quota lease prices.

4.5 Economic Targets for the Fishery

The fishery is yet to have developed a harvest strategy and no formal biological or economic targets for the fishery have been identified. The spanner crab stock is shared between QLD and NSW, with QLD accounting for the largest share of the harvest, roughly 90 per cent in recent years. Queensland has developed explicit target and limit reference points against which they assess their "share" of the stock: 60% and 20% of unexploited biomass for target and limit reference points respectively. The Committee has taken the target reference point as a proxy for the level of biomass at MSY in the absence of any targets specified for the NSW fishery.

It is likely that achieving the target in QLD will require co-ordination between the QLD and NSW jurisdictions, including a common set of management targets, even though the NSW harvest represents a minor component of the overall harvest of spanner crabs. Adopting the QLD target thus likely will result in improved economic and sustainability outcomes for NSW fishers.

Industry representatives have noted that the fishery has undergone a pre-evaluation assessment by the Marine Stewardship Council (MSC). MSC accreditation, if successful, could result in increased prices on both domestic and international markets. Full accreditation requires that the fishery adopt a harvest strategy and that stock levels fluctuate at or above MSY and accreditation of fisheries of shared stocks (such spanner crab) expects that participating states have formal sharing agreements, with consistent harvest control rules used by those states[23]. There are potential economic and sustainability benefits from developing formal resource sharing arrangements between QLD and NSW, including agreed reference points, joint assessments at the stock level, and bilaterally consistent TACC-setting processes.

4.6 Management Cost Recovery and Community Contribution

Annual management charges are payable by fishing business owners in the OTLF, as with other NSW fisheries. Management charges in most NSW fisheries are based on the number of access share classes owned, and are not linked directly to the number of quota shares held, meaning that the cost burden is relatively higher, as a proportion of earning potential, for smaller shareholdings than for larger shareholdings. Management charges contribute to the cost of managing NSW commercial fisheries, though the costs of managing fisheries generally are not fully-recovered. Fishing businesses also are subject to a flat $100 community contribution in recognition that the resource is publicly owned.

The frequencies of businesses with spanner crab access shares alone or one or more shareholdings in other fisheries indicates that total management charges from the spanner crab fishery in 2019–20 likely are around $50,000, equivalent to approximately 2.8% of the fishery's estimated GVP. Those charges will be apportioned across the multiple fisheries in which shares are held, however, and the maximum management charge accruing from spanner crab shareholdings alone, including the flat community charge, would be $34,668 or 1.9% of estimate GVP in 2019–20.

4.7 Conclusion

The NSW spanner crab fishery has been subject to a number of external factors that potentially have reduced economic performance of the fishery in 2019–20. In particular, floods in February are believed to have affected catches while international trade restrictions have limited export markets. Catches in the fishery are lower than in recent years, however, including outside the periods for which these externalities were effective, and the TACC of 169 t is unlikely to be achieved in 2019–20.

The fishery currently benefits from increasing prices but that benefit is being offset to a large extent through falling catch rates and higher costs of capture. Information on costs and earnings in the fishery is not available and available lease price information is less informative than in other fisheries because quota is not limiting catches. Assessing the economic performance of the fishery therefore is very difficult. It appears on balance, however, that economic performance likely has declined since ITQs were first introduced in 2015–16, although might still be higher than in pre-ITQ years. That decline likely is attributable to the non-binding TACCs that have limited the effectiveness of the quota system in improving economic outcomes.

[23] MSC (2018) MSC Fisheries Standard and Guidance v2.01. Marine Stewardship Council, London.

5. MANAGEMENT CONSIDERATIONS

5.1 The Ocean Trap and Line Fishery — Spanner Crab

The NSW spanner crab fishery is a component of the Ocean Trap and Line Fishery (OTLF), a share managed, multi-species, multi-gear fishery operating off the entire NSW coast out to the 4000 m isobath. There are two share types in the fishery. Access shares determine the area where a fisher can operate and the gear they can use. Species quota shares determine the amount of quota for a species that a shareholder is allocated in each fishing period. The spanner crab component of the OTLF (OTLSC) is a single species fishery using gear that exclusively targets spanner crabs and operates only in waters north of Korogoro Point (Hat Head) to the NSW-Queensland border. A Total Allowable Commercial Catch (TACC[24]), implemented via Individual Transferable Quotas (ITQs), has applied to harvest of spanner crab since 2015–16. No other species are allowed to be landed using spanner crab nets.

The spanner crab fishery is divided into two endorsement zones: the northern zone (OTLSCN) extends north from the southern breakwall at Yamba to the Queensland border, and the southern zone (OTLSCS) extends south from Yamba to Korogoro Point. Fishing businesses, or nominated fishers, need to hold a minimum number of access shares for a zone to be eligible for an endorsement to fish in that zone. Nineteen shareholders held the minimum shareholding for endorsement to take spanner crab in the northern zone and six shareholders were endorsed to fish in the southern zone in 2019–20. Fishing businesses can hold access shares for both zones, though none did in 2019–20. All but five businesses[25] with spanner crab endorsements held at least one endorsement in other fisheries during 2019–20.

Species quota shares are not spatially constrained, so quota allocated against species quota shares can be filled by fishing in either zone for which an operator holds access shares and a current endorsement to fish. The trade of any species quota, either temporarily within-season by leasing quota or permanently by sale of quota shares, also is not spatially constrained, meaning that species quota could be traded from an operator in one zone to another operator in either the same or other zone.

5.2 Catch History

The NSW spanner crab fishery has caught 78.5 t (2014–15) to about 146 t (2013–14, 2017–18) annually since 2009–10. Catches have fluctuated within this range since 2004–05 but recent catches are significantly lower than the historical peaks of over 400 t landed in the 1980s and 1990s. Reported effort also declined since the 1990s, despite the market price for spanner crab increasing significantly.

Catch in the northern zone of the fishery accounted for around 98% of the total NSW spanner crab catch over the last decade. Average landings from the southern zone since 2009–10 have been around 1–6 t annually. Forty-five percent of the TACC for the 2019–20 fishing period had been caught by 20 March 2020, 71 % of the way through the fishing period. Industry indicated that current weather and market conditions mean that a large increase in catches in the final months of the fishing period is not expected. A small amount of spanner crab, up to 40 kg per year, also is landed in the NSW Ocean Trawl Fishery.

Catch rates (CPUE) of spanner crab were relatively stable between 1997–98 and 2014–15, peaked above those levels during 2015–18, and have since fallen back to levels last seen around 2011–13. Catch rates in the spanner crab fishery must be interpreted with caution, however, as catchability is known to be affected by several physical oceanographic parameters, including effects of terrestrial runoff following high rainfall. The Department also has advised that recent spikes in catch rates may have been triggered by changes in permitted net (dilly) numbers and soak time, and shorter fishing days driven by market transport requirements.

Queensland has a large spanner crab fishery (the Queensland Spanner Crab Fishery, SCF) that harvests from the same stock as NSW and has account for 85–93% of total annual catches since 2009 (Table 5.1). Landings in the QLD SCF have fluctuated around 1,000 t since 2009–10, significantly below the historical highs of over 3,000 t caught in the mid-1990s.

[24] The effective TACC was set as an Interim Total Commercial Access Limit (ITCAL) during 2015–18 and was set at the average catches in the spanner crab northern zone over the financial years period 1997–2012.

[25] The Committee was advised that 4 of the 5 businesses were owned by people who held other fishery endorsements in other businesses, meaning only one fisher depended exclusively on the spanner crab fishery.

Continued decline in catches in both NSW and QLD contributed to the stock status being declared as "depleting" in the SAFS stock status assessment done in 2018[26]. There remains considerable uncertainty and inconsistent signals of stock health between the QLD and NSW biomass indicators and the Committee has relied on both the NSW and QLD stock assessments for this Determination. The Committee accordingly considers the stock to be below optimal levels and in decline.

Table 5.1: NSW Spanner Crab (Ocean Trap and Line Fishery) and QLD (Spanner Crab Fishery) annual landed catches, Total Allowable Commercial Catches, and effort from 2009–10 to 2019–20.

	New South Wales					Queensland		
	Catch (t)		Effort			Catch (t)		Effort
F-Year*	Landed	TACC	Fisher-Days	Net lifts	C-Year*	Landed	TACC	Fisher-Days
2009–10	91.4	N/A	770	57,000	2009	1,168.0	1631	3,481
2010–11	82.5	N/A	695	48,000	2010	1,148.6	1631	3,329
2011–12	102.3	N/A	755	52,000	2011	1,298.2	1631	3,633
2012–13	131.7	N/A	937	60,000	2012	1,039.4	1631	3,085
2013–14	145.9	N/A	1,002	75,000	2013	945.0	1631	2,834
2014–15	78.5	N/A	693	47,000	2014	918.0	1631	3,009
2015–16	143.6	164.1	892	64,000	2015	1,177.2	1631	3,146
2016–17	140.2	164.1	681	45,000	2016	1,095.8	1631	4,015
2017–18#	146.1	164.1	787	50,000	2017	905.2	1631	3,769
2018–19#	114.7	169.0	707	56,000	2018	846.0	847	3,072
2019–20#+	65.3	169.0	466	37,000	2019	N/A	847	N/A

* Note that Fishing Periods, and associated reporting periods, differ between states with NSW data for financial years and QLD data for calendar years.

Includes late-reported catches advised to the Committee during report preparation.

+ 1 July 2019 – 20 March 2020.

Discard mortality is known to be high in spanner crabs, as animals have a high rate of mortality due to limb damage or loss during disentanglement from nets. Studies investigating mortality of undersize discarded spanner crab reported mortality rates of 60-70% of crabs with one or more dactyli removed, and 100% for crabs which lost whole limbs[27]. A recent QLD quota decision referenced a (overall) discard mortality rate of around 39%. There are no data available for the amount of catch discarded from the NSW fishery, meaning that population-level fishing-related mortality from discarding cannot be estimated directly. It seems likely, however, that discard mortality is significant and could affect sustainable harvests and the potential stocks to rebuild from a depleted status.

5.3 Current Management Arrangements

5.3.1 Commercial fishing

Management of the spanner crab fishery, as a component of the OTLF, is governed by the *Fisheries Management Act 1994* and the arrangements are set out in the *Fisheries Management (Ocean Trap and Line Share Management Plan) Regulation 2006*. The primary mechanisms to manage the commercial harvest of spanner crabs in NSW are limited entry (under access endorsements) and a TACC implemented via ITQs. A number of other mechanisms also are used to control harvest of spanner crabs, including:

- Gear — fishing gear is limited to the use of a spanner crab net and operators can use no more than 30 nets at a time in the southern zone or 40 nets at a time in the northern zone;
- Fishing Boats — boat length is limited to 16 m, though there are grand-fathered allowances for longer vessels that were operating before the OTLF Share Management Plan came into effect;
- Species — only spanner crab can be landed using a spanner crab net, with regulated specifications on net size and composition, and no other species are permitted to be landed;
- Limited Area — the fishery is limited to waters between Korogoro Point (Hat Head) and the NSW-Queensland border, divided into two endorsements zones north and south of the southern break wall at Yamba, and the fishery is subject to a number of spatial closures for the NSW network of Marine Protected Areas;

[26] McGilvray, J. & Johnson, D. 2018, Spanner Crab *Ranina ranina*, in Carolyn Stewardson, James Andrews, Crispian Ashby, Malcolm Haddon, Klaas Hartmann, Patrick Hone, Peter Horvat, Stephen Mayfield, Anthony Roelofs, Keith Sainsbury, Thor Saunders, John Stewart, Simon Nicol and Brent Wise (eds) 2018, *Status of Australian fish stocks reports 2018*, Fisheries Research and Development Corporation, Canberra.

[27] Kennelly, S. J., Watkins, D. & Craig, J.R. 1990, *Mortality of discarded spanner crabs Ranina ranina (Linnaeus) in a tangle-net fishery – laboratory and field experiments*, JEMBE 140, 39-48.

- Temporal closures — taking female crabs is prohibited between 21 October and 20 January each fishing period and taking males also is prohibited between 21 November and 20 December; and
- Minimum Legal Size (MLS) — fishers are prohibited from retaining spanner crabs less than 93 mm orbital carapace length, equivalent to 100 mm rostral carapace length (the MLS in QLD).

The catch quota system was introduced first in the northern zone of the fishery in 2015, when an Interim Total Commercial Access Limit (ITCAL) of 164.1 t was introduced, set at the average historical catches in the northern zone between 1997–98 and 2011–12. The northern and southern zones were merged into a single quota managed fishery from 1 July 2018 and quota shares were issued on the basis of the number of spanner crab shares held, though zone-specific access shares remain in place and regulate fishers' entitlements to fish in each zone. A TACC for the combined (northern and southern zone) NSW fishery of 169 t was introduced, which was an increase based on adding the average historical catch in the southern zone to the ITCAL applied previously to the northern zone. Catches comprised 87.9% of the ITCAL in 2015–16, 81.4% in 2016–17, and 89.1% in 2017–18 but then declined to and 67.7% (of the new TACC) in 2018–19. Catches in 2019–20 are expected to be well below the TACC of 169 t.

There is no harvest strategy for this fishery and the current management arrangements do not contain performance indicators or reference points to guide decision making or TACC Determinations. The Department currently is developing a harvest strategy policy and intends to prepare draft harvest strategies, including limit and target reference points, for a number of trial fisheries over the next year. Industry advised the Committee that the fishery is being considered for Marine Stewardship Council (MSC) certification and a preliminary assessment against the MSC Fisheries Standard flagged the need for a harvest strategy for this fishery.

5.3.2 Recreational and Aboriginal Fishing

Recreational fishers are subject to a minimum size limit of 93 mm, consistent with the commercial MLS, and are limited to using one net and possession of 10 spanner crabs per person per day. There are no data on recreational harvest of spanner crabs, as NSW recreational fishing surveys undertaken over the past 10 years have either not captured any spanner crab reports or collection of spanner crab data has been out of scope. Recreational fishing surveys in QLD have estimated that recreational harvest (including charter fishing) comprises 1% of the total QLD harvest of spanner crabs.

Similarly, no estimates are available of the catch of spanner crabs by Aboriginal people and communities in NSW. The Aboriginal Cultural Fishing Interim Access policy allows an Aboriginal person to take double the prescribed recreational bag or possession limit where elders, incapacitated, or other community members are unable to fish for themselves, or up to specified limits set by permit for certain species to provide for cultural needs. The Committee encourages the Department to increase their understanding of the contribution of Aboriginal people and communities to the landings of these and other species.

5.4 Cross-jurisdictional Considerations

The NSW and QLD spanner crab fisheries harvest from the same east coast spanner crab stock, with QLD catching on average 90% of the annual spanner crab harvest since 2009 calendar year. Annual catches in the QLD SCF have declined from the mid-1990s through to mid-2000s, and since have fluctuated around 1000 t. Stock assessments and indicators prior to 2017 suggested a declining biomass of spanner crab in QLD waters and QLD decided in 2017 to reduce the QLD TACC from 1,631 t to 847 t, in part because the existing TACC was not effectively constraining harvest, in spite of stock declines.

The QLD fishery is managed through a TACC and ITQ system, net (dilly) limits, spawning closures, a recreational possession limit, and a prohibition on the take of berried females. There also is a MLS of 100 mm rostral carapace length, which is consistent with the 93 mm orbital carapace length MLS in NSW. Both jurisdictions use similar management instruments but the timing of spawning closures, commercial and recreational net limits, and the recreational possession limits differ between NSW and QLD. There is no coordination with regards to stock assessments or setting or amending each jurisdiction's TACCs.

A harvest strategy approach is used to manage the QLD fishery but the harvest strategy in place in 2017 proved to be ineffective because the decision rules in it lead to the previous TACC being maintained at a high level despite sequential decreases in catch and CPUE. A revised harvest strategy, designed to rebuild the stock to acceptable levels, has been drafted since and is currently undergoing consultation with stakeholders. The draft harvest strategy includes a target reference point of 60% of the unfished exploitable biomass (B_0) and a limit reference point of 20% B_0, set as CPUE values that would be expected to be realised from the stock at each of those reference points.

The effect that the harvest and management of the QLD fishery has on the NSW fishery is unclear. The NSW fishery accounts for only about 10% of the annual landings of spanner crab, however, and the biological and economic viability of the fishery cannot be controlled via management of the NSW harvest alone. There is some informal cooperation between NSW and Queensland on data exchange and science for spanner crab assessment but there are no formal mechanisms to do joint 'whole-of-stock' assessments or cooperate on management of the shared stock to ensure the two TACCs together are compatible with the long term viability of the stock and fisheries.

5.5 Compliance

The Department uses a risk based approach to fisheries enforcement activities that uses State-wide and fishery-specific risk analysis. Compliance strategies employed include intelligence gathering and analysis, education, targeted patrols, and covert and overt operations.

Compliance effort is not recorded for spanner crab specifically but is allocated to the OTLF in general, meaning that effort dedicated to operators fishing spanner crabs (and therefore compliance rates for spanner crab fishers) is not documented. The small amount of compliance data available for spanner crab specifically do not suggest any major issues among commercial or recreational fishers. A small number of offences among commercial spanner crab fishers has been recorded each year, though those offences primarily relate to reporting issues and other minor offences.

Fishers are required to report their catch and effort through two different mechanisms. Quota use must be reported in real time through the FisherMobile Application and business owners (or their nominees) are also required to submit more detailed fishing data, including catch, effort, location, and method, in monthly log sheets using either paper logbooks or FisherDirect online reporting. Comparisons between quota reconciliation and reported catch and effort in logsheets showed underreporting of 12.6% in 2016–17 and 7.8% in 2017–18. The Department has advised that reporting issues increased as a result of the introduction of online reporting and other new requirements related to the introduction of ITQs, but compliance with these requirements is improving.

Only 237 spanner crabs and 2 spanner crab nets have been seized since July 2017, suggesting low levels of non-compliance among recreational fishers. Recreational offences primarily have been minor offences resulting in written cautions, with penalty notices issued on only 3 occasions in the past 7 years. Those notices have been spread across a number of individuals, suggesting that no persistent offenders have been detected.

The Department has advised that a small number of fishers may be involved in illegal activity, but there is insufficient information to determine the scale of that activity and therefore infer whether it has a material effect on the commercial fishery or the stock. The available evidence suggests that illegal catches to date likely have been insignificant but marked increases in markets and prices for spanner crab since 2009–10, from $8.73/kg to $15.66/kg in 2018–19, suggest the risk of illegal harvest and sale of spanner crab might increase. The Committee therefore encourages the Department to improve understanding of the scale of illegal catch and sale of spanner crabs.

5.7 Recommendations for Review of Management Arrangements

5.7.1 Improved understanding of non-commercial catch of spanner crab

Anecdotal information indicates that spanner crab harvest by recreational fishers does occur in NSW, meaning that the complete lack of information on recreational and Aboriginal spanner crab harvest is disappointing. That lack of information not only undermines attempts to manage non-commercial catches but also compromises comprehensive management of the total fishing-related mortality of spanner crab across the stock. The Committee encourages the Department to enhance their recreational fishing survey methods and their intelligence collection from fisheries officers to enable a basic assessment of the level of non-commercial harvest of spanner crabs in NSW.

5.7.2 Cross-jurisdictional management of spanner crab

The NSW spanner crab fishery accounts for less than 15% of the total annual catches from the east coast spanner crab stock. The sustainability of the stock and the viability of the NSW fishery therefore is dependent on responsible management of the species in both QLD and NSW. There currently are no formal mechanisms to ensure cross-jurisdictional cooperative management of spanner crab, notwithstanding some arrangements for periodic exchange of data between NSW and Queensland.

The Committee strongly recommends that the Department improve collaboration with Queensland and implement mechanisms to ensure cooperation and harmonisation of the management of their respective spanner crab fisheries. Cooperation should include mechanisms for resource sharing, development of consistent harvest strategies (including reference points), TACC setting, quota management, temporal closures, recreational rules, stock assessments, exchange of data, and research into the relationships between spanner crab populations in Queensland and NSW.

5.7.3 Discard rates and discard mortality

All potential sources of mortality must be considered in order to determine a responsible TACC. Discard mortality is known to be high in spanner crabs but the amount of catch that is discarded is not monitored and so the population-level mortality attributable to discarding is currently unknown for the NSW fishery. All available estimates suggest that discarding might represent a material source of mortality and so a significant source of uncertainty in fishery TACC-setting. The Committee considers discard losses to be an important consideration in TACC-setting and recommends that the Department (a) quantifies discard rates in the spanner crab fishery to inform future TACCs, and (b) develops management actions necessary to reduce discard mortality.

5.7.4 Development of a harvest strategy to guide decision making

There is no harvest strategy for this fishery and the management arrangements in place do not contain performance indicators or reference points to guide management decision making or TACC Determinations. The Committee recommends that the Department develop a harvest strategy for spanner crab that explicitly states biological and economic objectives for the fishery, associated target and limit reference points, and the performance indicators that will be used to guide management. A revised harvest strategy is being prepared currently by QLD, which is designed to result in the exploitable stock rebuilding to a target reference level of 60% of unfished biomass. The co-dependence of the QLD and NSW spanner crab fisheries on a common stock demands that any harvest strategy developed for the NSW fishery must be compatible with that in place in QLD.

6. CONCLUSION

6.1 Summary

The spanner crab fishery is a relatively small species-dedicated fishery with a reasonably stable catch history for the last decade following around two decades of steadily declining catches. Catch rates in the NSW portion of the east-coast spanner crab stock have been falling over the last 3 years, however, and total catch this year again is expected to be below recent peaks. That pattern appears to reflect, though with a short lag, patterns in data from the Queensland portion of the stock, from which it is likely most recruitment to NSW arises. Formal assessment estimates the Queensland stock is close to the accepted lower limit of stock biomass there, and in need of rebuilding. The Committee is concerned that the NSW portion of the stock also now is in decline and in need of stabilisation or rebuilding.

The introduction of catch regulation for spanner crab harvest in NSW from 2015, initially via an Interim Total Commercial Access Level (ITCAL), recognised the history of declining catch. The initially recommended ITCAL was accompanied by the statement "*... An alternate approach* [to setting the ITCAL] *has been applied. The standard methodology (the maximum annual catch over the 15 year period 1997/98 to 2011/12) would have result in an ITCAL in excess of 300 tonne which would be around three times recent catches.*" The ITCAL set initially at 164.1 for the northern zone of the fishery and subsequently revised to 169 t as a TACC for the entire fishery also proved to be well above the realised catches during the years those instruments applied. The current TACC therefore has failed to operate as an effective fishery control that could be adjusted efficiently to optimise catches in the medium–long term. A similar situation was recognised recently in the Queensland spanner crab fishery, where TACCs for several years were above actual catches despite evidence that the stock was being fully- or over-fished.

6.2 Total Allowable Commercial Catch for 2020–21

Resetting a TACC from above documented catches to a level closer to realised catches over recent years means that: (a) the immediate adjustment should cause relatively little short-term economic constraint on the fishery; and (b) relatively smaller future TACC adjustments, whether increases or decreases, will be effective in optimising spanner crab harvest as new information on stock status is presented.

The Committee is concerned that there is a long-term risk that failing to reduce the TACC now to an effective level will necessitate potentially deeper future cuts, especially given evidence of recently declining catch rates and stock condition. A more formal assessment, coordinated with Queensland and embedded within a harvest strategy with clear objectives and reference points, would provide a clearer indication of the time and conditions within which the TACC might be adjusted effectively. Reduction of the TACC is intended to establish a setting that can be used with real effect in future years to respond to evidence of either further stock decline or, hopefully, stock rebuilding.

The TACC in this Determination is set at the average of annual catches since 2015–16 (135.5 t), when quota management was introduced to the fishery. That TACC still is above the average annual catch over the last decade (117.6 t) and the total catch in 2018–19 (114.4 t) and that likely for 2019–20. The TACC thus is unlikely to reduce catches materially immediately, in the interests of avoiding an economic 'shock' to the fishery. That strategy is taken recognising that failing to constrain catches immediately carries a risk that recent stock declines might be perpetuated and require further TACC reduction in future. Some comfort that that risk is acceptable, however, arises from the most recent Queensland stock assessment in which the stock there appears to be starting to rebuild as catches are constrained.

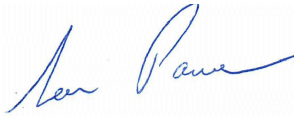
6.3 The Determinations

The Total Allowable Fishing Committee, pursuant to Division 2 of Part 2A of the Fisheries Management Act 1994 N^{o} 38, Determines that the total commercial catch of spanner crab by the NSW Ocean Trap and Line (Spanner Crab) Fishery should not exceed **135.5 tonnes** during the 2020–21 Fishing Period.

Bruce Mapstone, Chair

Alice McDonald, Fisheries Management

Rich Little, Fishery Scientist



Sean Pascoe, Resource Economist

APPENDIX 1. DETAILS OF PUBLIC CONSULTATION

Public consultation steps taken by the Committee, with support from the Department, are summarised in the table below. These steps effected the consultation requirements stipulated, *inter alia*, in the *Fisheries Management Act 1994, Part 2a, Division 2, S40.*

Date	Fisheries Management Act Reference	Consultation Stages
13.03.2020	Section 40F(1)	The Department called for public submissions on the appropriate level of the annual TACC for spanner crab for the 2020–21 fishing period.
13.03.2020	Section 284 (2)(c)	Individual calls for submissions sent to particular interest groups who the Committee considered might wish to provide collective submissions either due to their direct involvement in the Spanner Crab Fishery or their interest in related issues. These groups included: ■ Spanner Crab Fishery shareholders; ■ NSW Professional Fishermen's Association.
13.03.2020	Section 284 (2)(c)	Advertisement inviting public submissions placed in the "Open for Comment" section of the Department of Primary Industries web-site.
13.04.2020	Section 284 (2)(b)	Public consultation closing date, after at least 30 days.
08.04.2020	Section 40F (2)	The Committee received the following collated submissions: ■ NSW DPI — Commercial Fisheries Management Report; ■ NSW DPI — Spanner Crab Assessment Report; ■ NSW DPI — Fishery compliance report; Six submissions were received from stakeholders.
16.04.2020	Section 40F (2)	The Committee considered submissions and heard formal presentations and opinions at the Total Allowable Fishing Committee teleconference on 16th April 2020. The following people attended the teleconference: ■ Ms Fiona McKinnon, NSW DPI — Fishery Management ■ Daniel Johnson, NSW DPI Stock Status Report ■ Tricia Beatty, NSW Professional Fishermen's Association ■ Jennifer Bordin, spanner crab shareholder