Status of Australian Fish Stocks 2020 – NSW Stock status summary – Spanner Crab (*Ranina ranina*)

Assessment Authors and Year

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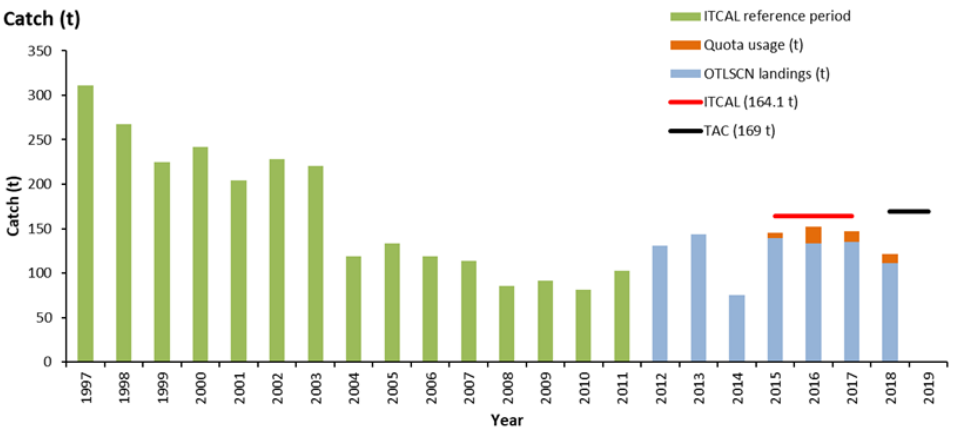
Stock Structure

Mitochondrial DNA analysis indicates that Spanner Crabs on the east coast of Australia comprise a single biological stock (Brown et al. 1999).

Stock Status

- **New South Wales**

Catch trends

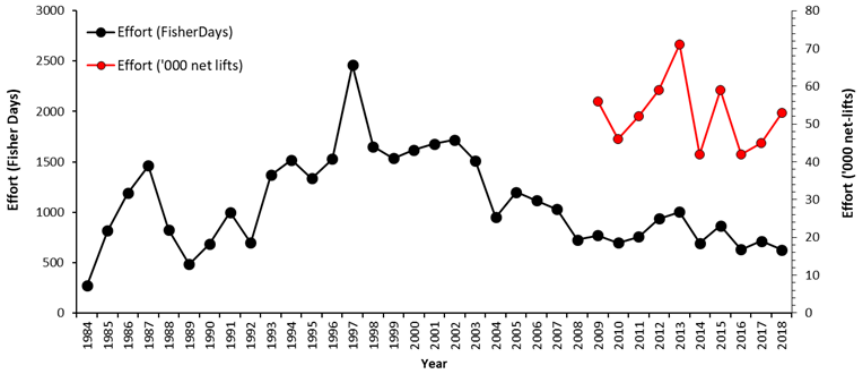


Summary of reported landings during the Interim Total Commercial Access level (ITCAL) reference period (green bars), reported landings (blue bars) and additional quota usage (orange bars) against the OTLSCN ITCAL (red line – 2015/16-2017/18) and fishery-wide catch quota (black line; 2018/19 - present). Note: 2019/20 fishing period not shown.

Recreational / Indigenous

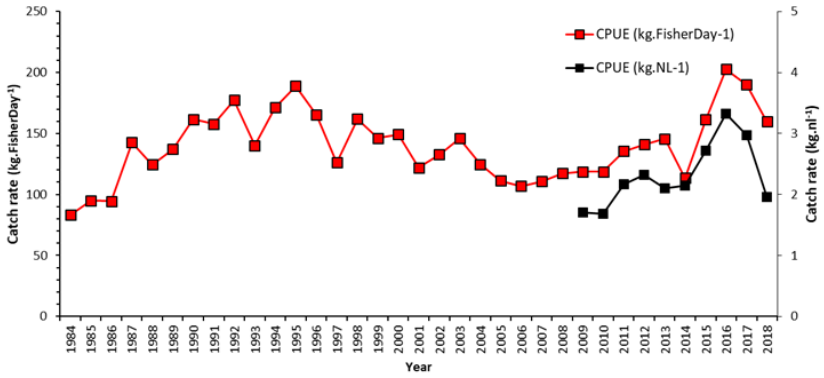
Fishing pressure from the recreational sector is negligible. The most recent recreational survey completed in New South Wales did not report the capture of any Spanner Crabs (West et al. 2015). However, the survey methodology is potentially too broad to pick up species, such as Spanner Crabs, which tend to be caught by relatively few fishers.

Fishing effort trends



Annual reported commercial effort in units of FisherDays (1984/85 to 2017/18) and net lifts (2009/10 to 2018/19). Note: changes in reporting requirements limit consistent interpretation of the effort (FisherDays) time series.

Catch rate trends



Annual reported catch rate (kg.nl^{-1} and kg.day^{-1}) from 1984/85 to 2018/19.

Stock Assessment Methodology

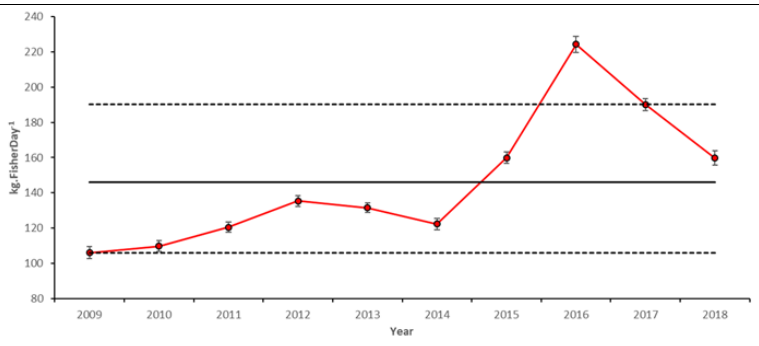
Year of most recent assessment	2020
Assessment method	Weight of evidence approach, including; standardised commercial catch rates and an index of relative abundance derived from annual fishery-independent surveys (FIS). Catch rate kg.day^{-1} were standardised by year, month, net-lifts, catch, fisher experience, fishing power and lunar phase. The adjusted catch rate is compared to upper and lower deciles which are calculated from a 10-year historical mean (mean of catch rate).
Main data inputs	1. Landed commercial catch -1984/85 to 2018/19. 2.NSW Standardised catch rates - kg.dy^{-1} 2009/10 to 2018/19, 3.NSW - CPUE- kg.dy^{-1} 1984/85 to 2018/19, 4.Standardised catch-rates from fishery-independent surveys (QLD & NSW) 2005/06 - 2016/17 (number.Groundline^{-1}), 5.Nominal catch rates from fishery-independent surveys (NSW) 2005/06 – 2018/19.
Key model structure and assumptions	1.Spanner Crab standardised catch rates were predicted from generalised linear models (GLM). The GLM statistical modelling provided an estimate of mean catch rates that were corrected for a variety of variables that bias raw data. The GLM models were fitted using the statistical software packages GenStat (VSN International, 2017) and R (R Development Core Team 2017). The importance of individual model terms was assessed

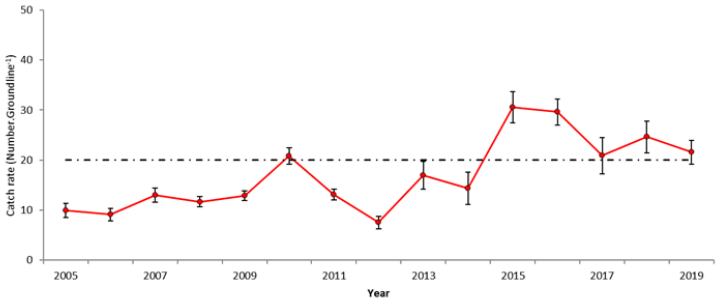
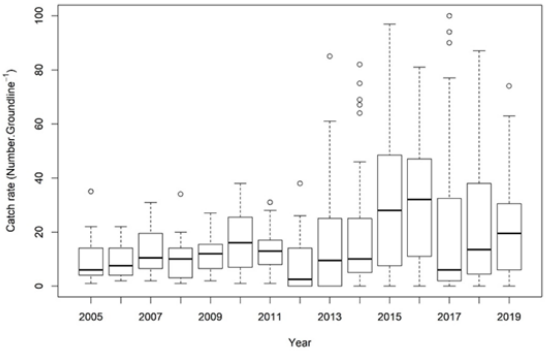
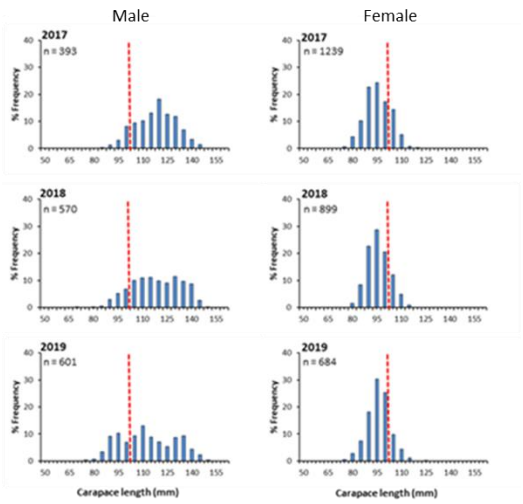
	formally using F statistics by dropping individual terms from the full model (VSN International 2017). Explanatory model terms considered different catch rates between fishing years, seasons, individual fisher operations, their transformed fishing effort (the number of net-lifts, which was a function of the number of ground-lines used, nets per ground-line and ground-line lifts per day; log or cube root scale), the spatial locations of catches based on 6 x 6 min latitude and longitude grids. Commercial catch rates were predicted from the model 'year' term using Genstat and R procedures for prediction, which provided the annual abundance estimates standardised to the mean number of net-lifts per fisher-day. *Assumptions*: that annual catch rates are a relative index of abundance and not unduly influenced by other factors that are not accounted for through standardisation. 2. Fishery-independent survey catches across the years exhibited a significant component of zero values (~23%). As no single statistical distribution can accommodate this inflated zero class, catches were standardised through a two-component approach, combining mean predictions from binomial regression of zero/non-zero catch and general linear regression on the conditionally distributed log-transformed non-zero catches (Campbell et al. 2016). Predicted survey catch rates from the log-normal model were adjusted using a common bias corrected back-transformation of adding half the model variance. These catch rates were then multiplied by the binary predicted proportions for non-zero catch, to predict the overall standardised average number of spanner crabs per ground-line equivalent to the median net-hours of fishing (see Campbell et al. 2016 for details).
Sources of uncertainty evaluated	NA

Status Indicators and Limits Reference Levels

Biomass indicator or proxy	None specified in a formal harvest strategy.
Biomass Limit Reference Level	None specified in a formal harvest strategy.
Fishing mortality indicator or proxy	None specified in a formal harvest strategy.
Fishing mortality Limit Reference Level	None specified in a formal harvest strategy.

Stock Assessment Results

1. Standardised commercial catch rate results indicate that the NSW OTLSCN fishery remained within the upper and lower deciles between 2009 and 2015. In 2016, catch rates were above the upper decile, the reasons for this require further investigation as factors other than improved population dynamics, including; changed fishing practices, locations, catch reporting and catchability may have attributed to the magnitude of increase.	 Standardised commercial catch rate (kg.fisher-day^{-1} + net lifts) ± 95% confidence interval. Solid line is the 10-year average mean of catch rate, dashed lines indicates upper (90th percentile) and lower deciles (10th percentile) of mean catch rate.

2. The standardised catch rate of Spanner Crabs from an annual fishery independent survey (in Queensland 2000 –15 and in New South Wales 2006 –15) has increased since 2000. The time series of survey data shows significant low points between 2001 and 2003, and a gradual increase between 2005 and 2015. In 2015, the survey catch rate was above the target reference point (Campbell et al. 2016). The NSW-QLD FIS catch rate in 2017 was 10.7 crabs per ground-line, 23% below the target level of 13.972. This represented a decrease in FIS catch rates of about 10 crabs per ground-line, compared to the 2016 FIS. In region 7 (NSW), the FIS catch rate declined from a peak of 30.6 crabs per ground-line in 2015 to 20.9 crabs per-ground-line in 2017. The nominal survey catch rate of 21.5 crabs per ground-line in 2019 is above the NSW 10-year average catch rate.	 Nominal average survey catches of Spanner Crabs per ground-line (± standard error). Dashed line represents the 10-year average catch rate (NSW only).  Boxplot of the variation in FIS catch rates (number.Groundline^{-1}) by year. The box spans the interquartile range of the data, so that the middle 50% of the data lie within the box, with a horizontal line indicating the median. The vertical lines (whiskers) extend only to the most extreme data values which are at a distance of 1.5 times the interquartile range. Outlying data are plotted with circle symbols.
2. Fishery-independent survey results in both NSW and QLD indicate there is marked sexual dimorphism in Spanner crabs, with males being generally larger than females. In recent years, the proportion of female crabs protected by the legal-size limit (93 mm orbital carapace length = 100 mm rostral carapace length) in NSW ranged between 70 and 85% in 2016 and 2019, respectively. The NSW survey also shows consistent numbers of small male crabs (below the minimum legal size), indicating continued recruitment to the fishery. However, the degree to which the exploitable NSW stock is dependent on recruitment from QLD is unknown.	 Length-frequency distribution of male and female crabs caught from NSW fishery-independent surveys (2014 - 2019). Carapace-length refers to distance between centre spine and mid carapace base (Rostral carapace length – RCL, applied in QLD). Note: Minimum legal size (MLS) in NSW is defined as orbital carapace length (OCL- base of eye orbit to mid carapace base). The legal size limit is the same in both jurisdictions i.e. NSW 93 mm OCL = QLD 100 mm RCL (red dashed line).

Biomass status in relation to Limit	NA
Fishing mortality in relation to Limit	NA
Previous SAFS stock status	Sustainable 2016 (McGilvray & Johnson 2016)
Current SAFS stock status	Depleting 2018 (McGilvray & Johnson 2018)

Qualifying Comments

Standardised commercial catch rate results indicate that NSW OTLSCN fishery remained above the lower deciles between 2009/10 and 2018/19. Similarly, catch rates from fishery-independent surveys in NSW (2015-2019) have been greater than the target NSW-QLD reference catch rate and the NSW 10-year average catch rate. However, both performance indicators (average fishery and survey standardised catch rates in the most recent two completed years) have declined by more than 15%. Despite a 26% increases in reported net lifts in 2018/19, total reported landings and nominal catch rate (kg.FisherDay^{-1}) declined by 18 and 16%, respectively.

Assessment of the status of the stock of Spanner Crab that is fished by commercial and recreational fishers in Queensland is based on the modelling and assessment done for this species by Queensland Department of Agriculture and Fisheries (QDAF). The QLD fishery catches approximately 85% of total Australian catch of Spanner Crab. The primary mechanism for controlling the harvest of Spanner Crab in QLD is the allocation of an Annual Total Allowable Catch (TAC). Status of the QLD Spanner Crab stock is assessed relative to limit and target reference points prescribed in the harvest strategy/ management procedure (Campbell et al. 2016). The management procedure followed a process of a baseline quota and performance targets for standardised catch rates with range intervals. The stock performance indicators are the average fishery and survey standardised catch rates in the most recent two completed calendar years. In 2017, it was identified that the base quota of 1, 631 tonnes was not effectively constraining harvest and decisions rules were not adjusting the TAC in response to declining indicators. In response, QDAF declared a TAC of 847 tonnes for the 2018/19 fishing season (90% of the reported 2017 harvest of 941 tonnes). The purpose of the reduced TAC was to restrict total fishing mortality and increase protection on the spawning stock.

Given the small proportion of total landings taken in New South Wales (15% with revised QLD TAC of 847 t), it is unlikely that fishing of this part of the stock is having a detrimental effect on the entire East Coast stock. However, currently it is unknown if the NSW Spanner Crab fishery is represented by a small biomass of rapidly growing animals or a large, slow-growing biomass.

References

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