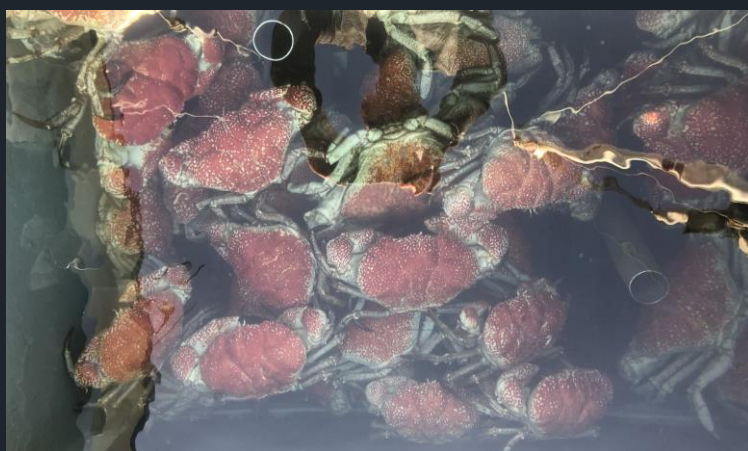


Victorian Giant Crab Fishery

Stock Assessment Report

2020/2021 Season





Giant Crab - *Pseudocarcinus gigas*

© The State of Victoria, Victorian Fisheries Authority, February 2022



This work is licenced under a Creative Commons Attribution 3.0 Australia licence. You are free to re-use the work under that licence, on the condition that you credit the State of Victoria as author. The licence does not apply to any images, photographs or branding, including the Victorian Coat of Arms, the Victorian Government logo and the Victorian Fisheries Authority logo. To view a copy of this licence, visit <http://creativecommons.org/licences/by/3.0/au/deed.en>

Printed by Victorian Fisheries Authority, Melbourne, Victoria

Preferred way to cite this publication:

VFA (2022) 2020/21 Victorian Giant Crab Stock Assessment. Victorian Fisheries Authority Report Series No.27

ISBN 978-0-6454159-0-2 (Print)

ISBN 978-0-6454159-1-9 (Online)

Contact Details:

Victorian Fisheries Authority
1 Spring Street
Melbourne VIC 3001

Copies are available from the website www.vfa.vic.gov.au

For more information, contact the Customer Service Centre on 136 186.

Accessibility

If you would like to receive this publication in an alternative format, please telephone the Customer Service Centre on 136 186, email customer.service@ecodev.vic.gov.au, or via the National Relay Service on 133 677, www.relayservice.com.au.

This document is also available on the internet at www.vfa.vic.gov.au

Disclaimer

This publication may be of assistance to you but the State of Victoria and its employees do not guarantee that the publication is without flaw of any kind or is wholly appropriate for your particular purposes and therefore disclaims all liability for any error, loss or other consequence which may arise from you relying on any information in this publication.

Contents

Victorian Giant Crab Fishery	1
Executive Summary.....	1
Introduction	2
Catch data	3
CPUE Analysis.....	5
Background	5
Data filtering	5
Soak time correction	5
Effort Correction	6
Impact of size limit change	6
CPUE trend	6
Size Structure	9
Evaluation.....	11

Victorian Giant Crab Fishery

Stock Assessment Report for the 2020/21 Season

Executive Summary

In 2020/21, the total allowable commercial catch (TACC) for giant crab was 10.5 tonnes. The total landed catch during the TAC season (1 Jul 2020 to 30 June 2021) was 8.1 tonnes, which was almost entirely targeted. During the fishing year (November 2020 to September 2021) the catch was 7.0t.

A large correction to effort data has been applied which fundamentally changes the perspective of the CPUE trend over the last seven years and the current stock status. This indicates that CPUE declined during this time to the present value of 0.55 kg/24 hour pot-lift which is just above the limit reference point. The 2020/21 CPUE was 54% of the CPUE observed in the last 2012/13 peak which had 1.02kg/24 hour pot-lift. Current CPUE is substantially lower than that experienced during the relatively stable period from 2003/04 to 2008/09. The 2020/21 CPUE was 34% of the peak 2006/07 value during this period.

The CPUE data is derived from a very small fishing activity and strongly susceptible to changes in fishing practice that are not captured in logbooks. However, given the strong economic incentive to maintain higher catch rates, the current CPUE raises strong concerns about this stock and is consistent with the depleted classification of the adjacent and separately classified Tasmanian fishery.

Note that although a revised harvest strategy is in the process of being developed this has not yet been finalised and this assessment compares the fishery against existing reference points using the existing methodology. However an application of the unfinalized methodology in the new harvest strategy also indicates that CPUE is close to the draft limit reference points contained in that harvest strategy.

Introduction

This document assesses the Victorian component of the giant crab (*Pseudocarcinus gigas*) stock. Giant crabs have been caught as by-product of rock lobster fishers operating in deeper waters from the early to mid 1900s. These early catches were sporadic, non-targeted and of limited value. In the early 1990s a substantial live market in Asia, Melbourne and Sydney was established. This significantly increased the value of giant crab and resulted in extensive targeting. The combined Victorian and Tasmanian catch peaked in the mid 1990s and likely exceeded 400t per annum. Due to the long life history of giant crabs these high catches resulted in rapid depletion of the stock. Insufficient data is available to assess the Victorian stock, but analyses indicate that the Tasmanian component of the stock dropped below 10% of the unfished biomass.

The low CPUE arising from the stock depletion resulted in a rapid reduction of fishing effort and catch, however the remaining fishing activity was sufficient to continue decreasing the CPUE in Tasmania and retaining it at low levels in Victoria. Consequently, a TACC was introduced in 2000/01 in Victoria (see Table 1). Since the introduction of the TACC, CPUE which is the primary biomass indicator has remained above the present trigger and limit reference points.

Due to the limited scale of this fishery there is no routine industry independent monitoring program and the data available to conduct the assessment is limited. The assessment is consequently focussed on data collected from mandatory daily logbook returns. In 2018/19 an industry based voluntary length-frequency data collection commenced which has provided promising initial data and is likely to become an important component of the stock assessment in future years, however no new length-frequency data was available in 2019/20 or 2020/21 and this section has not been updated.

A FRDC project to address the lack of length frequency data is currently underway. This project is titled "*Giant Crab Enhanced Data Collection - Innovative approaches to enhance data collection in the Victorian, South Australian and Tasmanian Giant crab fisheries*" (FRDC 2019-114). It aims to develop imaging systems and hardware to facilitate onboard length-frequency data collection across fishing fleets in all three jurisdictions. This would provide a substantial development in data collection and enable new assessment and management options.

Catch data

The total landed catch of giant crab by all fishers in 2020/21 quota season (July 1 to June 30) was 8.1t which was entirely targeted (Figure 1). Reference points for this fishery are based on the fishing year (November-September), during this period the catch was 7.0t.

Table 1: Giant crab total allowable commercial catch by quota year between 2001–02 and 2019–20.

Year	Quota Season	TACC Set (t)
2001-02	16 Nov – 31 Mar	25
2002-03	1 Apr – 31 Mar	25
2003-04	1 Apr – 31 Mar	25
2004-05	1 Apr – 31 Mar	25
2005-06	1 Apr – 31 Mar	25
2006-07	1 Apr – 31 Mar	25
2007-08	1 Apr – 31 Mar	25
2008-09	1 Apr – 31 Mar	25
2009-10	1 Apr – 31 Mar	25
2010-11	1 Apr – 30 Jun	31
2011-12	1 Jul – 30 Jun	18
2012-13	1 Jul – 30 Jun	12
2013-14	1 Jan 14 – 30 Jun	9
2014-15	1 Jul - 30 Jun	10.5
2015-16	1 Jul - 30 Jun	10.5
2016-17	1 Jul - 30 Jun	10.5
2017-18	1 Jul – 30 Jun	10.5
2018-19	1 Jul – 30 Jun	10.5
2019-20	1 Jul – 30 Jun	10.5
2020-21	1 Jul – 30 Jun	10.5

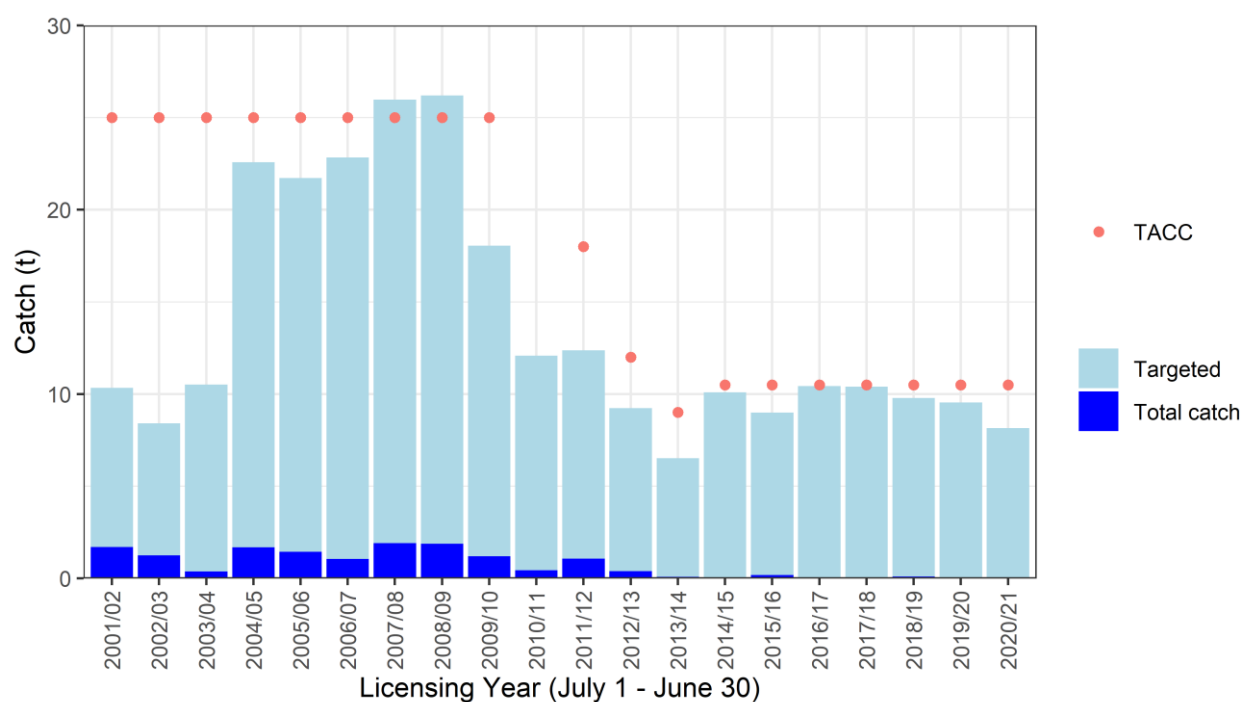
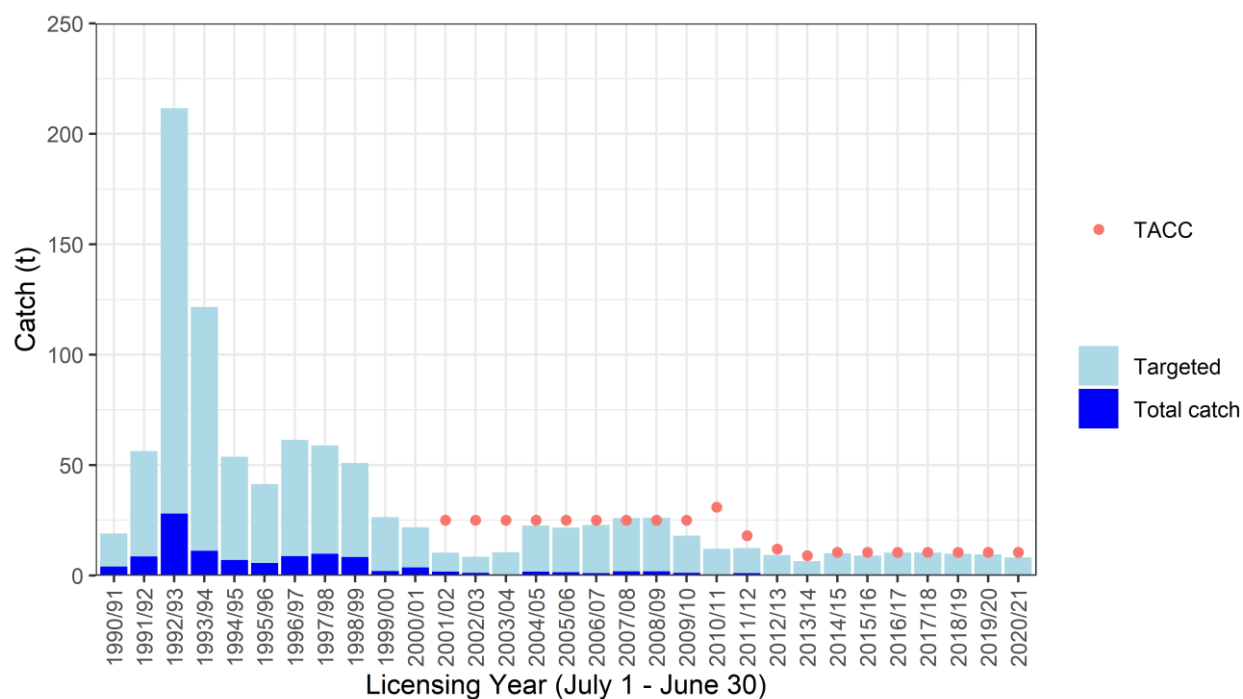


Figure 1: Total catch (t) and targeted catch history for the Victorian Giant Crab Fishery. Top: from 1990 onwards, bottom: detailed view of period since quota commencement. Red dots indicate the TACC which was first introduced for the 2001/02 season.

CPUE Analysis

Background

Giant crab CPUE is the primary biomass indicator used to assess the status of this fishery. A major difficulty in calculating CPUE arises from the catch being a mix of by-catch and targeted fishing. This is further complicated as historically targeting has been poorly documented and the proportion of by-catch versus targeted catch has varied through time.

Separate giant crab and southern rock lobster fishing returns were mandated with the introduction of quota management in November 2001. For returns prior to April 1998, the target species was not specified and the effort targeted at giant crab was separated from effort targeted at southern rock lobster on the basis of two criteria. Where pots were set at depths greater than 140 metres or where more than 70% of the combined catch of these two species was giant crab, all of the effort was assumed to be targeted at giant crab.

Following the introduction of quota management, separate logbooks for the giant crab and southern rock lobster fisheries led to some inconsistencies in the reporting of the target species. This resulted in a reduced giant crab catch per unit effort (CPUE) overall, which was inconsistent with the observations of the most active fishers. A second measure of CPUE was therefore introduced involving the targeted catch and effort for only those fishers landing more than one tonne of giant crab in a fishing year. The criteria for inclusion (1t landed crab) has had to be relaxed in the 2020/21 assessment to allow inclusion of key data.

Data filtering

The Giant Crab Fishery requires careful data filtering as a substantial portion of the catch through time has been taken in conjunction with rock lobster fishing and sporadically by small catchers. To obtain data that is most representative of the underlying biomass it is therefore important to filter the data. The following criteria have been used for over 5 years:

- A fisher must exceed 1000kg of crab catch in a fishing year for their data from that year to be included
- A fisher must have >300 records in the database (crab or lobster) over all years
- A fisher must have recorded they are targeting Crab or Both
- Removal of identified erroneous records.

For the 2020/21 assessment the first two criteria have been relaxed to 500kg and >200 records. This was necessary as the existing criteria would have excluded key data and prevented calculation of a meaningful CPUE index for this year. To provide a consistent index these criteria have been applied across all years. This has altered the exact values of historic CPUE but not the trends or overall impression of stock status.

It should be noted that additional data filtering changes are under consideration through the development of the new harvest strategy. However utilisation of these requires updating of the associated reference points as they fundamentally alter what the CPUE index is representing. Consequently they are not used here.

Soak time correction

Giant crab targeted CPUE is expressed as kg per 24 hour pot-lift because the pots are usually left to soak for several days. Prior to 2001/02, soak days were estimated by counting days between entries in the daily logbook, with the maximum soak days in this calculation capped at seven days. Logbooks were modified during the 2001/02 fishing year to collect soak days directly.

A review undertaken by the Victorian Rock Lobster and Giant Crab Resource Assessment Group highlighted that a four-day soak-time cap was more appropriate. Consequently, a relationship between catch and soak time was introduced. This substantially altered the CPUE time series as typical soak times had changed in recent years. This relationship was re-analysed in 2017; whilst the current coefficient gives the best fit between catch and soak-

time, there is substantial uncertainty around this relationship and the CPUE time series is sensitive to the relationship used. Coupled with the small number of operators in this fishery this indicates that caution should be used when interpreting the CPUE time series.

Effort Correction

In early 2021, after the release of the 2019/20 assessment report it became evident that a large correction to effort data for two fishers was required due to inconsistent effort reporting for both soak time and potlifts. This correction is applied from 2014/15 to April 2021. It is unclear how appropriate it is for earlier years in that period, but the corrected effort (and consequent CPUE value) in 2020/21 is considered reliable, hence the decline from 2013/14 to 2020/21 is also considered reliable (as reliable as can be expected given the other aspects of the dataset).

Impact of size limit change

The size limit for male crabs was reduced to 140mm in August 2019. This was shortly before the end of the fishing season, consequently only 12 crabs were landed within the new size limit in 2018/19 assessment period with negligible impact on CPUE. In 2019/20 15% of landed crabs were between 140mm and 150mm. In 2020/21 this fell to 7%.

In the previous assessment a correction was applied to provide a CPUE trends across a consistent size range. In this assessment this correction is not considered as the effect is secondary to the effort correction. Furthermore restricting CPUE as an indicator of legal size biomass is consistent with the intent of monitoring exploitation rate. This approach is also proposed for the harvest strategy under development.

CPUE trend

The targeted catch rate in 2020/21 was 0.74 kg /24 hour pot-lift prior to correction, and 0.55 kg / 24 hour potlift after correction for inconsistent effort reporting (Figure 2 ,

Table 2). This is 54% of the CPUE observed in the recent peak (2012/13) which had 1.02kg/24 hour pot-lift. Current CPUE is also substantially lower than that experienced during the relatively stable period from 2003/04 to 2008/09. The 2020/21 CPUE was 34% of the peak 2006/07 value during this period.

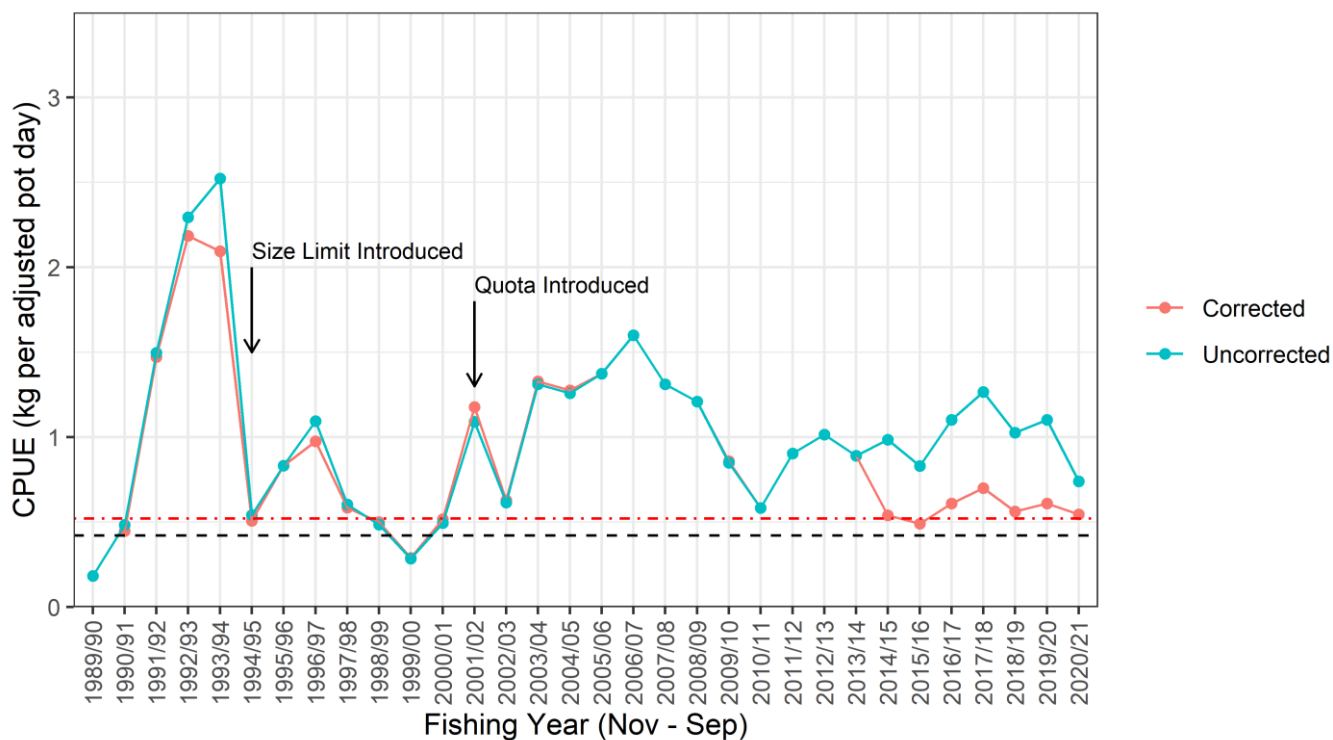


Figure 2: Catch rate of giant crab (kg/24 hour pot lift) corrected for a maximum of 4 days soak, with a slope of 0.38 for all fishers landing > 500kg of giant crab in a given year and with > 200 days of fishing overall. Dashed red line and solid black line represent limit and trigger reference points, respectively. The blue line indicates data that has not been corrected for inconsistent effort reporting whilst the red line shows the corrected data which corresponds to the best estimate of CPUE.

Table 2: Giant crab total catch and catch rate during fishing years (16 November–14 September) from 1990/91 to 2020/21.

Fishing Year	Total Catch (t)	Catch Rate (fishers > 0.5t)
1990/91	18.9	0.45
1991/92	56.7	1.47
1992/93	226.8	2.19
1993/94	122.3	2.09
1994/95	38.8	0.51
1995/96	44.4	0.83
1996/97	68.7	0.98
1997/98	51.0	0.58
1998/99	50.4	0.50
1999/00	25.3	0.29
2000/01	19.7	0.52
2001/02	9.5	1.18
2002/03	8.4	0.63
2003/04	10.5	1.33
2004/05	22.7	1.28
2005/06	21.7	1.37
2006/07	20.3	1.60
2007/08	27.6	1.31
2008/09	27.2	1.21
2009/10	16.4	0.85
2010/11	11.3	0.58
2011/12	12.6	0.90
2012/13	8.8	1.02
2013/14	6.5	0.89
2014/15	10.5	0.54
2015/16	10.0	0.49
2016/17	10.0	0.61
2017/18	10.0	0.70
2018/19	9.2	0.56
2019/20	11.7	0.61
2020/21	7.0	0.55

Size Structure

The average size of landed crabs is available through landings and daily catch reports. Consequently, a full time series of this data is available throughout the duration of the fishery. This data has remained relatively consistent since 2006/07. The decrease in mean weight in 2019/20 is influenced by the reduction in the male size limit in that year. The mean weight in 2020/21 was consistent with that in 2019/20.

A new length-frequency data collection program commenced in 2018. This has resulted in the measurement of 986 crabs. However no new data was collected since this time.

When compared to previous measurements from the mid and late 2000s, there was a broader size range of crabs in 2018 and 2019, particularly males (Figure 4). In combination with similar CPUE levels this suggests a lower exploitation rate is being applied to the population. However, the lower frequency of 160-169mm and 170-179mm animals is either inconsistent with this view or indicative of a period of comparatively low recruitment.

The interpretation must be treated with caution due to the small nature of the fishery. Furthermore, comparison with historical data can be misleading due to the substantial changes that have occurred between the two length-frequency measurement data sets. A consistent approach to the monitoring of length-frequency data would provide greater insight in future assessments.

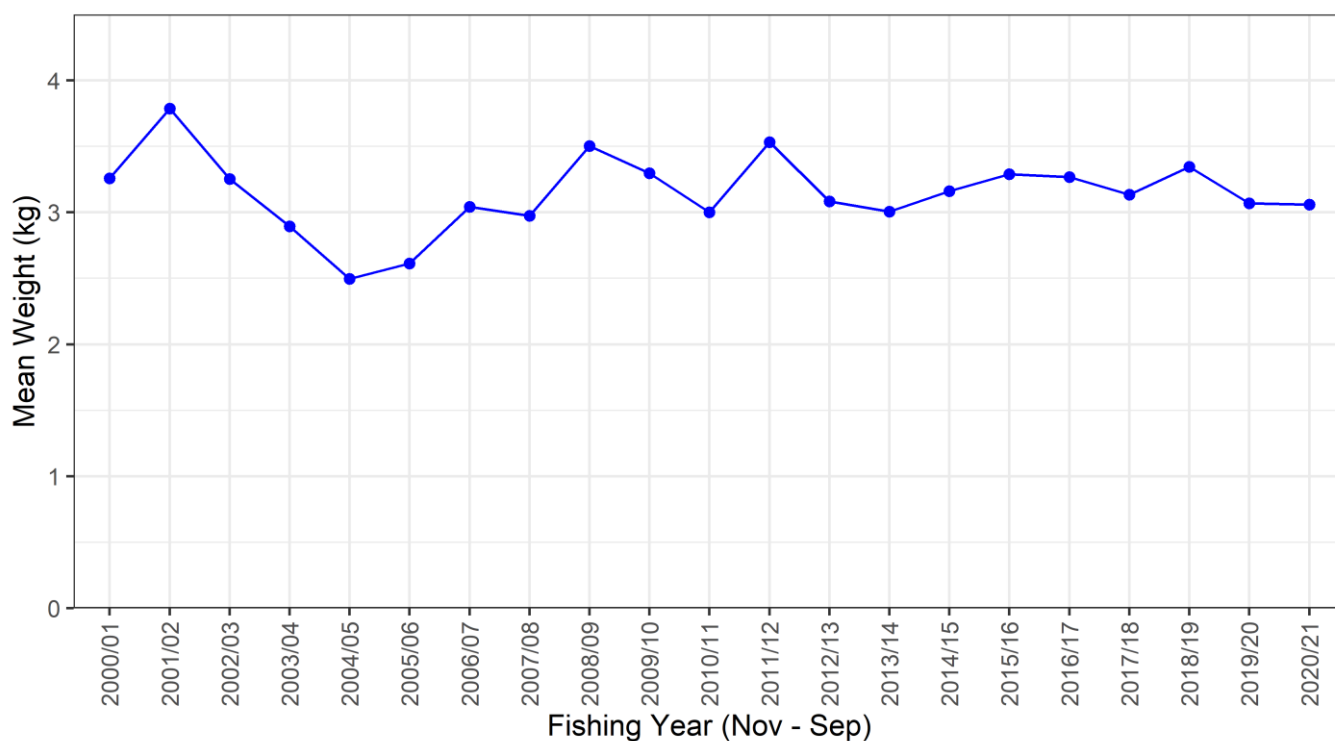


Figure 3: Mean weight (kg) per crab for all fishers from the 2000/01 fishing year onwards.

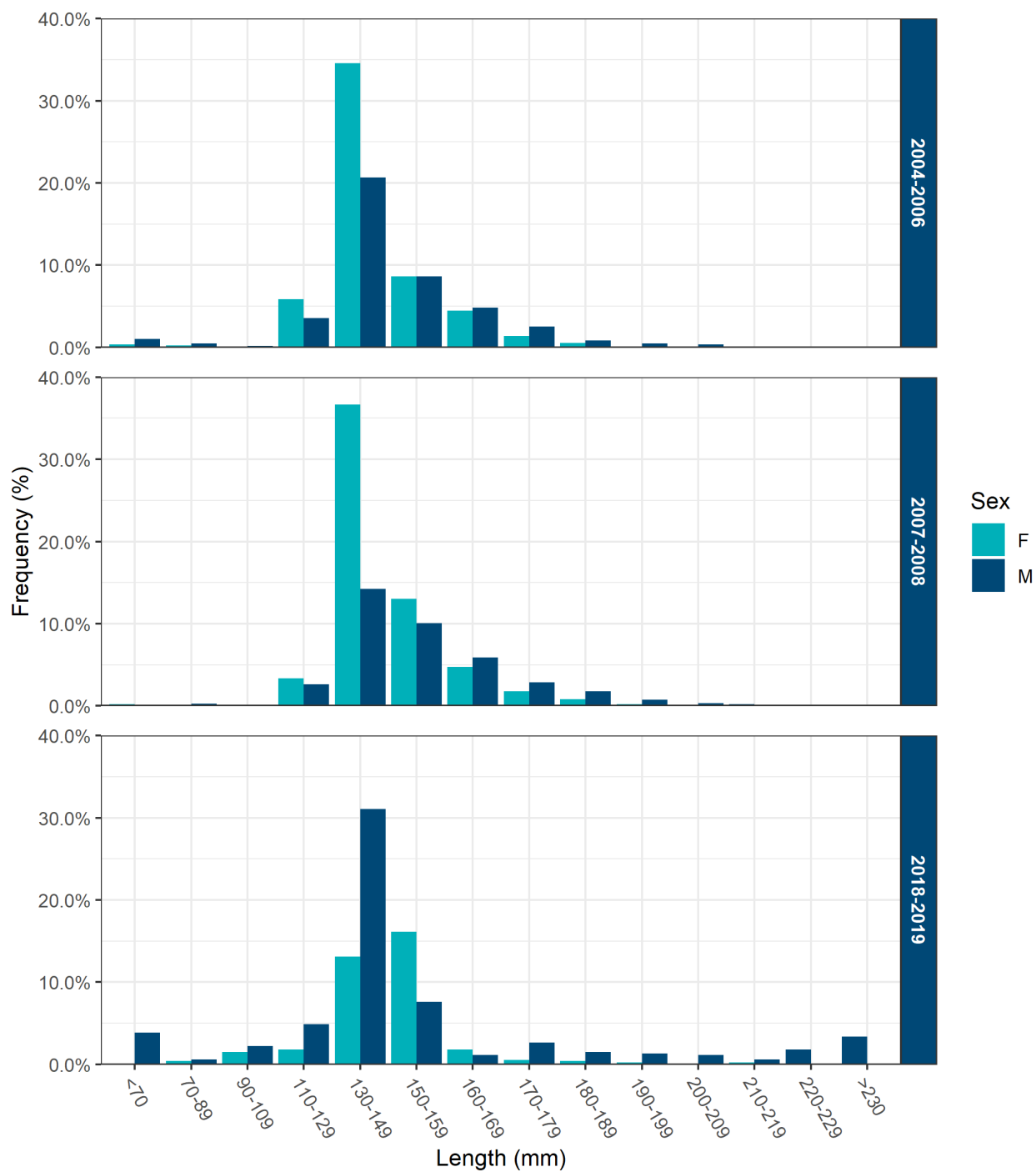


Figure 4: Length frequency measurements from the new industry based data collection program (bottom) and data from previous data collection periods binned using the same size categories. Note that crabs measuring less than 150mm are categorised into 20mm bins and above 150mm into 10mm bins.

Evaluation

The fishery was evaluated by comparing the biological stock performance indicator of targeted CPUE against the giant crab biological reference points (Figure 2). The reference points prescribed in the Management Plan are based on 'fishing year' (November–September) and include a limit reference point (mean for the 3-fishing-year period from 1998/99 to 2000/01) of 0.52 kg/24 hour pot-lift and a trigger reference point (80% of limit reference point) of 0.42 kg/24 hour pot-lift.

Based on the estimate of between 0.55 kg/24 hour pot-lift, the targeted CPUE in 2020/21 was above the limit reference point (0.52 kg/24 hour pot-lift) and consequently also the trigger reference point. The low CPUE value over recent years, coupled with the uncertainty in this data causes substantial concern for the stock.

There are no formal reference points associated with the additional size-frequency data collected in 2018/19. Development of an associated reference point may be desirable in the future, however several years of data are required to be able to obtain a consistently recorded time-series and determine an appropriate reference point.

Appendix 1: Historical events in the Giant Crab fishery

Year	Licensing Season	Significant event
From Early-Mid 1900s		Giant crabs caught as by-catch of rock lobster fishers operating in deep waters. Catches sporadic, non-targeted and of limited value.
Early 1990s		Substantial live market for giant crabs develops leading to extensive targeting
1993	1992-93	Peak giant crab catch
1994	1994-95	Legal minimum length of giant crab (both sexes) introduced at 150mm
2001	2001-02	Introduction of quota management Giant Crab Western zone
2004	2004-05	Introduction of Marine Protected Areas (MPAs) Western Zone
2019	2019-20	Male minimum legal length reduced to 140mm in August 2019



We're hooked on
SAFETY