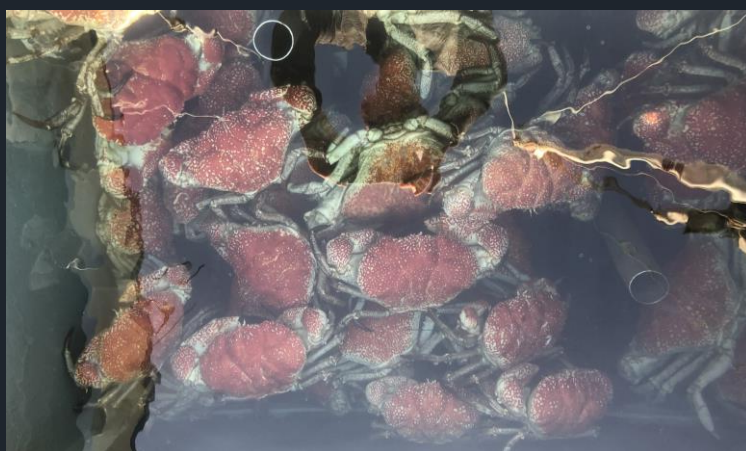


# **Victorian Giant Crab Fishery**

## **Stock Assessment Report**

### **2019/2020 Season**



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**SAFETY**



Giant Crab - *Pseudocarcinus gigas*

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# Contents

<b>Executive Summary.....</b>	<b>1</b>
<b>Introduction .....</b>	<b>1</b>
<b>Catch data .....</b>	<b>2</b>
<b>CPUE Analysis.....</b>	<b>4</b>
Background .....	4
Soak time correction .....	4
Impact of size limit change .....	4
CPUE trend .....	5
<b>Size Structure .....</b>	<b>8</b>
<b>Evaluation.....</b>	<b>10</b>

# Victorian Giant Crab Fishery

## Stock Assessment Report for the 2019/20 Season

### Executive Summary

In 2019/20, the total allowable commercial catch (TACC) for giant crab was 10.5 tonnes. The total landed catch during the TAC season (1 Jul 2019 to 30 June 2020) was 9.5 tonnes, which was almost entirely targeted. During the fishing year (November 2019 to September 2020) the catch was 11.7t.

The minimum legal size for male giant crabs was reduced from 150mm to 140mm on August 1 2019. This brings the size limit in line with Tasmania and was based on an analysis that indicated both economic benefits and improvement in egg production. In line with this change, the length-frequency data collection program has been expanded, with 986 giant crabs measured since commencement in May 2018. CPUE data has also had to be adjusted for this, as discussed in the section “Impact of size limit change”, consequently a CPUE range is now provided.

The targeted catch rate in 2019 /20 was between 0.95 and 1.14 kg/24 hour pot-lift. This is a substantial reduction from the recent 2017/18 peak of 1.27kg/24 hour pot-lift but remains well above the limit reference point of 0.52 kg/24 hour pot-lift for the fishery.

### 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 and this section has not been updated.

## Catch data

The total landed catch of giant crab by all fishers in 2019/20 quota season (July 1 to June 30) was 9.8t which was almost entirely targeted (Figure 1). Reference points for this fishery are based on the fishing year (November-September), during this period the catch was 11.7t. The fishing year catch exceeds the TACC in this instance as seasonal fishing patterns changed slightly and the fishing year includes two partial TACC years.

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

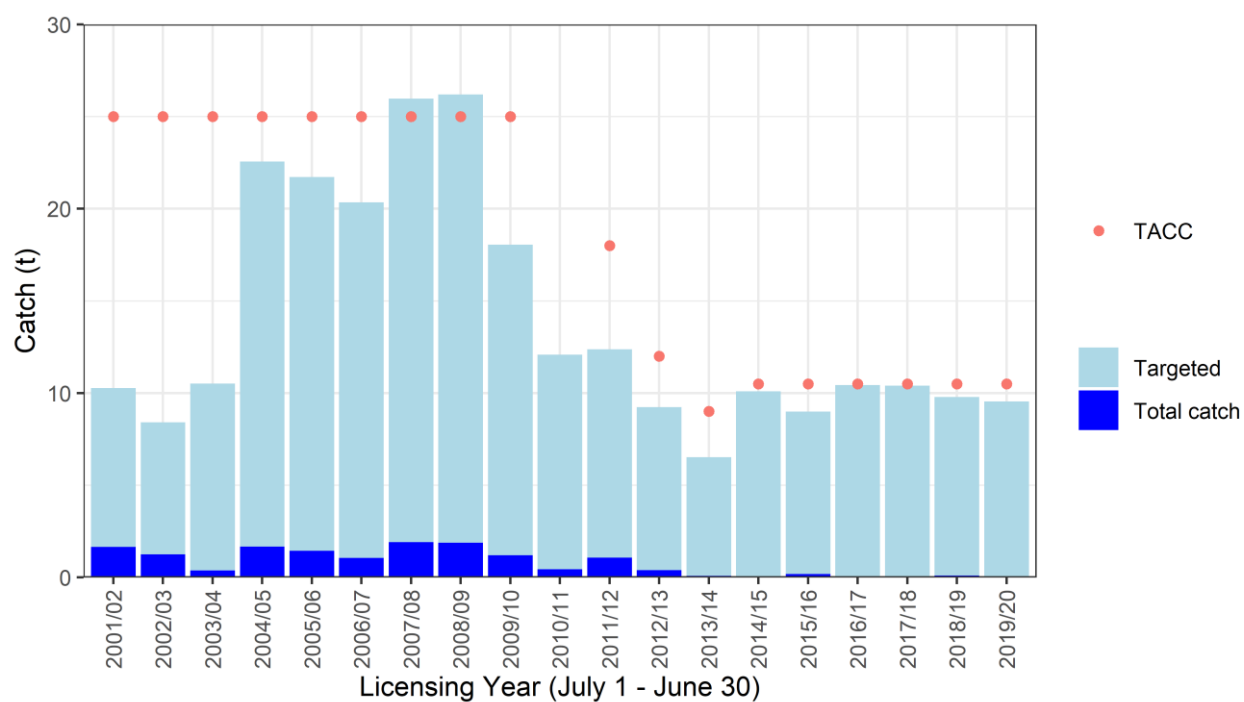
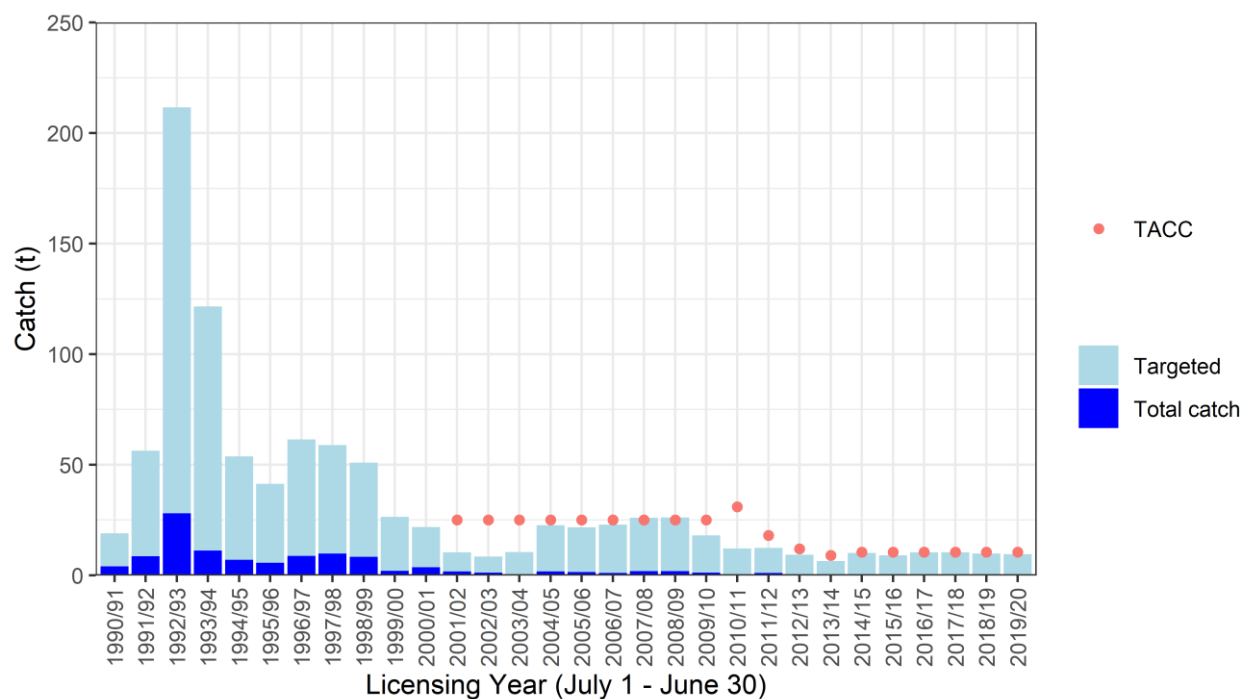


Figure 1: Total catch (t) and targeted catch history for the Victorian Giant Crab Fishery. Top: from 1990 onwards, bottom: detailed view of period since quota commencement. Red dots indicate the TACC which was first introduced for the 2001/02 season.



# 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 this 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.

## 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.

## 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 of the 3090 landed crabs 475 were between 140mm and 150mm. This corresponds to 15% of the landed catch. These crabs would not have constituted legal catch under the old system and consequently resulted in an increased CPUE compared to previous years.

This bias was investigated using two methods, firstly by correcting the 2019/20 CPUE by removing 15% of the catch. This effectively assumes that the 140mm-150mm crabs have a weight equal to the mean weight of the overall catch and is consequently conservative (Figure 3). The second method considered the catch rate of crabs in numbers per potlift, from which the number of crabs in the 140-150mm size limit could easily be deducted as they are reported in logbooks in addition to the total number of legal size crabs caught.

A CPUE range consisting of the above methods has therefore been included for consideration throughout the stock assessment report.

## CPUE trend

The targeted catch rate in 2019/20 was between 0.95 and 1.14 kg/24 hour pot-lift (Figure 2, Figure 3, Table 2) – a reduction from the recent high of 1.27 kg/24 hour pot-lift in 2017/18 but within the range observed in the last decade where CPUE has typically fluctuated between 0.8 and 1.1 kg / 24 hour pot-lift (Table 2). A similar trend is observed when examining CPUE expressed as numbers per potlift (Figure 4).

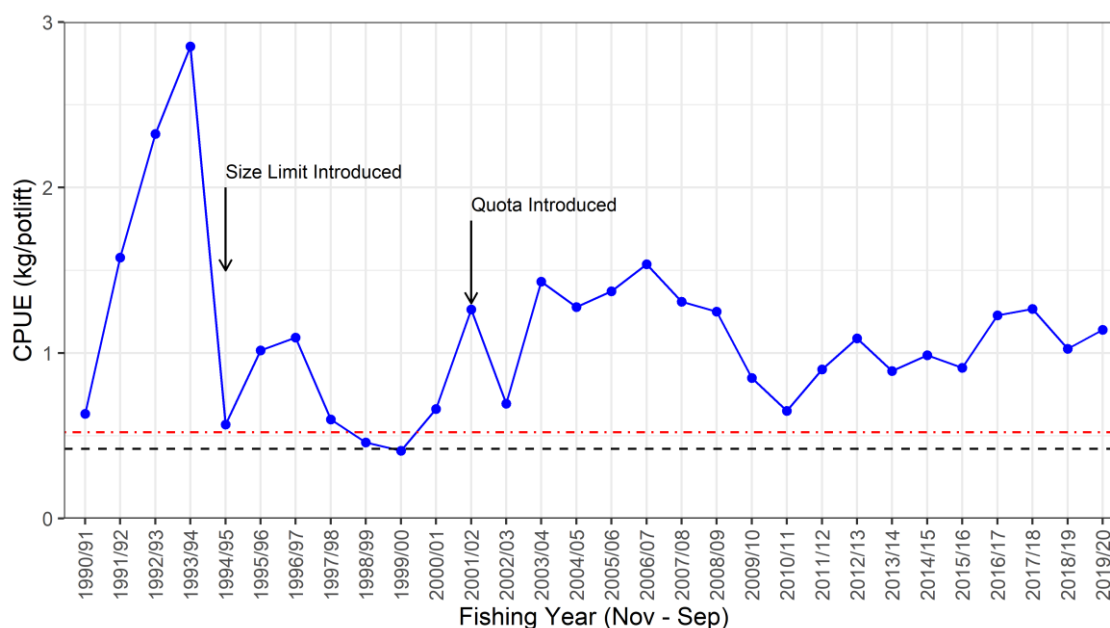


Figure 2: Catch rate of giant crab (kg/24 hour pot lift) corrected for a maximum of 4 days soak, with a slope of 0.38 for all fishers landing > 1000kg of giant crab in a given year and with > 300 days of fishing overall. Dashed red line and solid black line represent limit and trigger reference points, respectively.

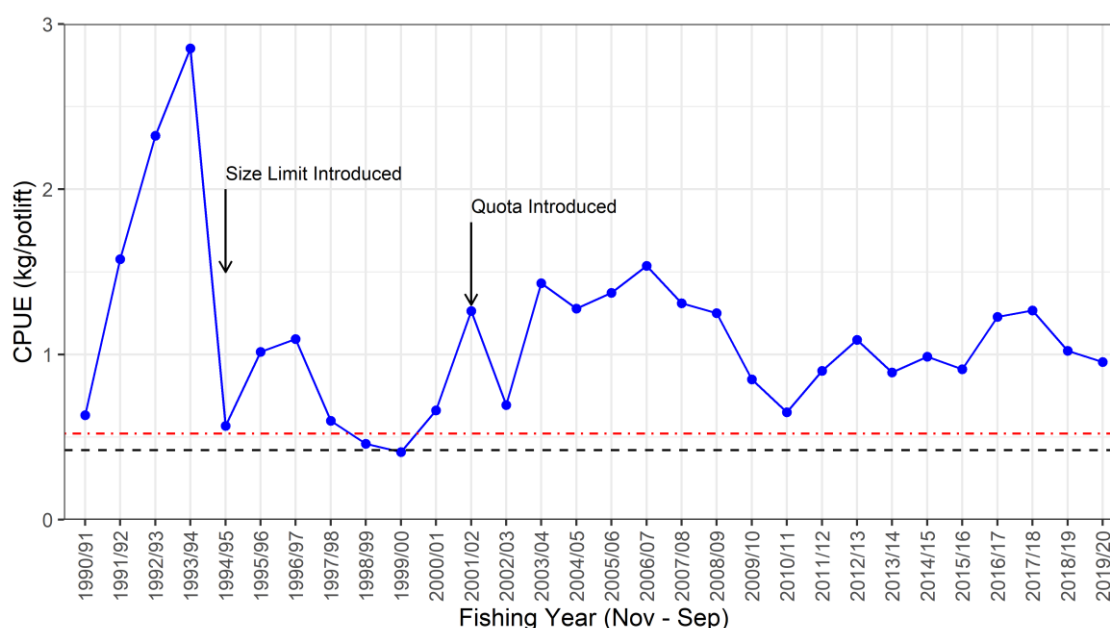


Figure 3: Catch rate of giant crab (kg/24 hour pot lift) corrected for a maximum of 4 days soak, with a slope of 0.38 for all fishers landing > 1000kg of giant crab in a given year and with > 300 days of fishing overall. Dashed red line and solid black line represent limit and trigger reference points, respectively. Years after the size limit change are corrected (conservatively) assuming that male crabs within the new 140-150mm size bracket have a weight equal to the average across the whole catch that year.



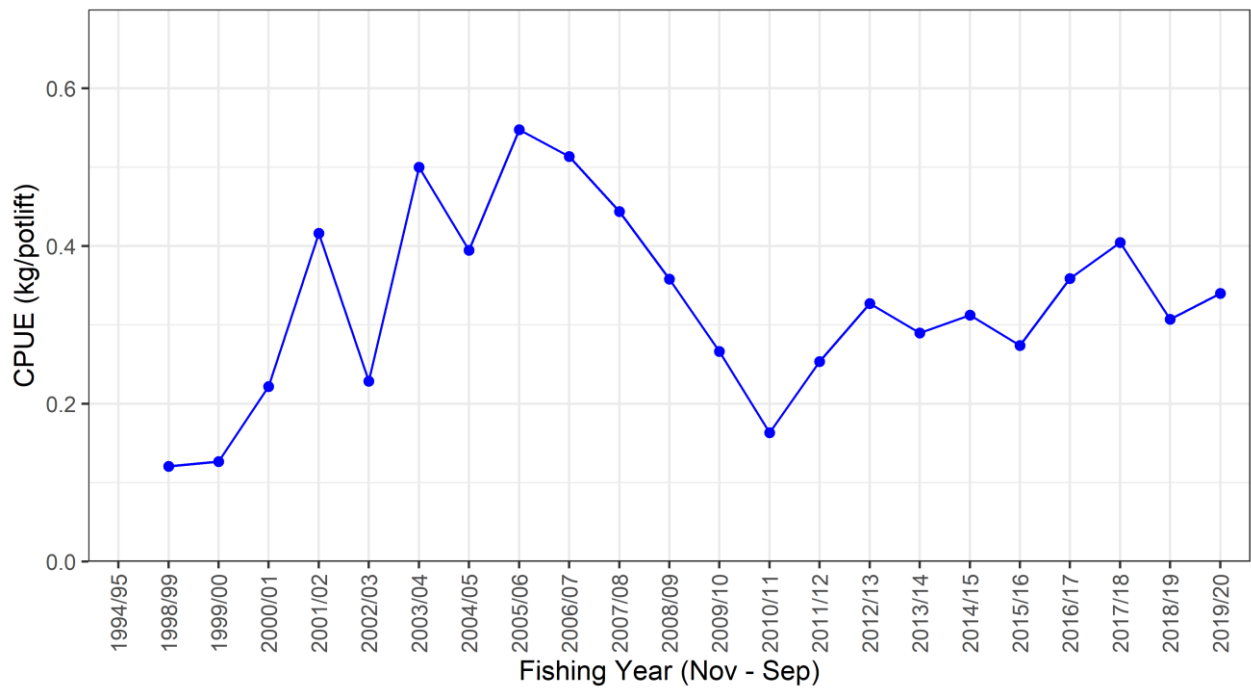


Figure 4: Catch rate of giant crab (numbers/24 hour pot lift) corrected for a maximum of 4 days soak, with a slope of 0.38 for all fishers landing > 1000kg of giant crab in a given year and with > 300 days of fishing overall. For the years after the size limit change, these are corrected (by only counting crabs within the old size limit). See "Impact of size limit change" section for details.

Table 2: Giant crab total catch and catch rate during fishing years (16 November–14 September) from 1990/91 to 2019/20. The CPUE estimate for 2019/20 is given as a range that is likely to bracket the true value (see Figure 2 and Figure 3) to account for the size limit change.

Fishing Year	Total Catch (t)	Catch Rate (fishers > 1t)
1990/91	18.9	0.63
1991/92	56.7	1.58
1992/93	226.8	2.32
1993/94	122.3	2.85
1994/95	38.8	0.57
1995/96	44.4	1.02
1996/97	68.7	1.09
1997/98	51.0	0.60
1998/99	50.4	0.46
1999/00	25.3	0.41
2000/01	19.7	0.66
2001/02	9.5	1.26
2002/03	8.4	0.69
2003/04	10.5	1.43
2004/05	22.7	1.28
2005/06	21.7	1.37
2006/07	20.3	1.54
2007/08	27.6	1.31
2008/09	27.2	1.25
2009/10	16.4	0.85
2010/11	11.3	0.65
2011/12	12.6	0.90
2012/13	8.8	1.09
2013/14	6.5	0.89
2014/15	10.5	0.99
2015/16	10.0	0.91
2016/17	10.0	1.23
2017/18	10.0	1.27
2018/19	9.2	1.03
2019/20	11.7	0.95 to 1.14

## 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.

A new length-frequency data collection program commenced in 2018. This has resulted in the measurement of 986 crabs. However no new data was available for the 2019/20 season at the time of producing this report, so this analysis has not been updated from the previous assessment.

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 6). 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. Ongoing monitoring of the length-frequency data collected in a consistent manner by the new program will provide greater insight in future assessments.

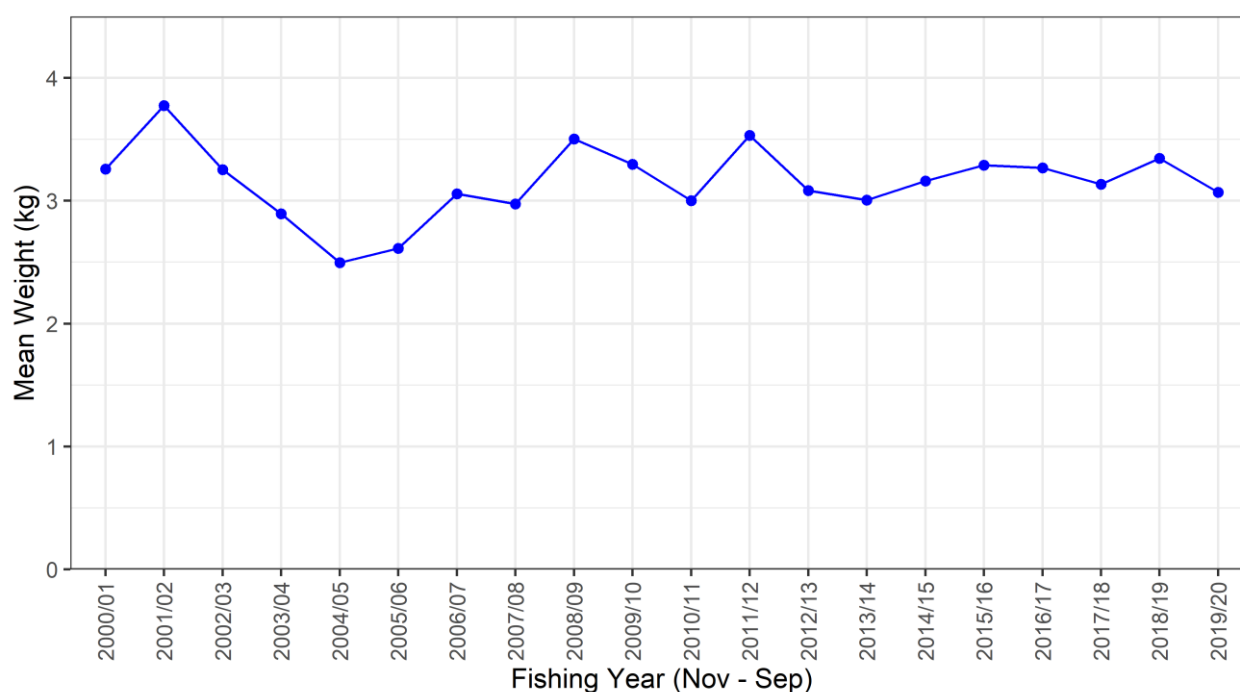


Figure 5: Mean weight (kg) per crab for all fishers from the 2000/01 fishing year onwards.

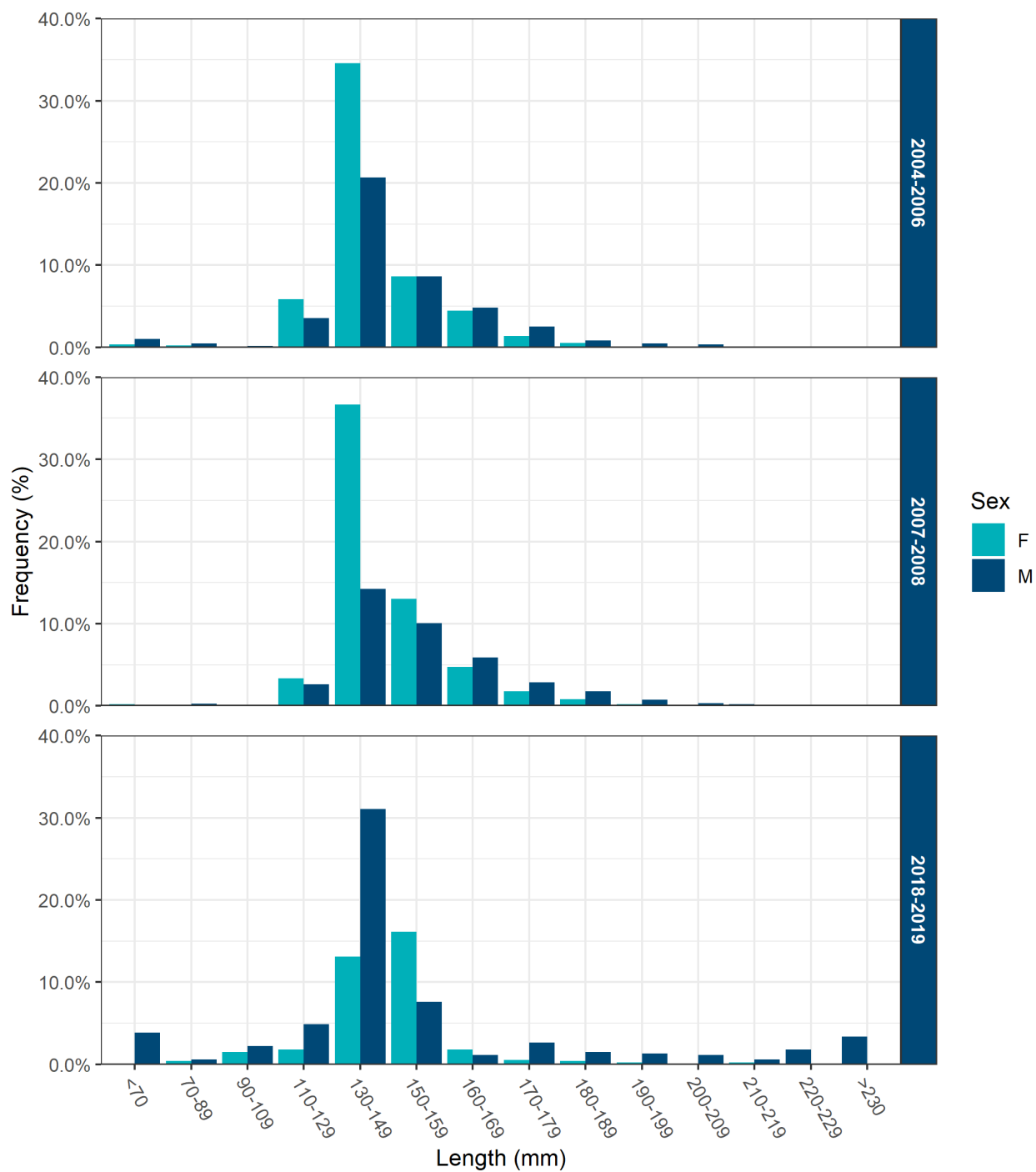


Figure 6: Length frequency measurements from the new industry based data collection program (bottom) and data from previous data collection periods binned using the same size categories. Note that crabs measuring less than 150mm are categorised into 20mm bins and above 150mm into 10mm bins.

## 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 0.95 and 1.14 kg/24 hour pot-lift, the targeted CPUE in 2019/20 was above the limit reference point (0.52 kg/24 hour pot-lift) and hence the trigger reference point. A CPUE range has been provided here to provide a plausible range of CPUE values updated for the size limit change.

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.

The Harvest strategy currently does not outline provisions for increasing the TACC. Whilst CPUE is well above the limit reference point, the limited data available to assess the stock requires a precautionary approach to be undertaken in setting the TACC.



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