

Fisheries

Stock Status Report for the South Australian Giant Crab (*Pseudocarcinus gigas*) Fishery in 2022-23



L. McLeay

**SARDI Publication No. F2011/000332-13
SARDI Research Report Series No. 1212**

**SARDI Aquatic and Livestock Sciences
PO Box 120 Henley Beach SA 5022**

February 2024

Final Report to PIRSA Fisheries and Aquaculture



**Government
of South Australia**

Primary Industries
and Regions SA



Stock Status Report for the South Australian Giant Crab (*Pseudocarcinus gigas*) Fishery in 2022-23

Fishery Status Report to PIRSA Fisheries and Aquaculture

L. McLeay

**SARDI Publication No. F2011/000332-13
SARDI Research Report Series No. 1212**

February 2024

The South Australian Research and Development Institute respects Aboriginal people as the state's first people and nations. We recognise Aboriginal people as traditional owners and occupants of South Australian land and waters. We pay our respects to Aboriginal cultures and to Elders past, present and emerging.

This publication may be cited as:

McLeay, L. (2024). Stock Status Report for the South Australian Giant Crab (*Pseudocarcinus gigas*) Fishery in 2022-23. Fishery Status Report to PIRSA Fisheries and Aquaculture. South Australian Research and Development Institute (Aquatic and Livestock Sciences), Adelaide. SARDI Publication No. F2011/000332-13. SARDI Research Report Series No. 1212. 17pp.

DISCLAIMER

The authors warrant that they have taken all reasonable care in producing this report. The report has been through the SARDI internal review process and has been formally approved for release by the Research Director, Aquatic and Livestock Sciences. Although all reasonable efforts have been made to ensure quality, SARDI does not warrant that the information in this report is free from errors or omissions. SARDI and its employees do not warrant or make any representation regarding the use, or results of the use, of the information contained herein as regards to its correctness, accuracy, reliability and currency or otherwise. SARDI and its employees expressly disclaim all liability or responsibility to any person using the information or advice. Use of the information and data contained in this report is at the user's sole risk. If users rely on the information they are responsible for ensuring by independent verification its accuracy, currency or completeness. The SARDI Report Series is an Administrative Report Series which has not been reviewed outside the department and is not considered peer-reviewed literature. Material presented in these Administrative Reports may later be published in formal peer-reviewed scientific literature.

© 2024 SARDI

This work is copyright. Apart from any use as permitted under the *Copyright Act 1968* (Cth), no part may be reproduced by any process, electronic or otherwise without the specific written permission of the copyright owner. Neither may information be stored electronically in any form whatsoever without such permission.

Author(s): L. McLeay

Reviewer(s): B. Stobart, F. Bailleul (SARDI) and C. Rollins (PIRSA)

Approved by: S. Mayfield
Program Leader - Fisheries

Signed: 

Date: 21 February 2024

Distribution: PIRSA Fisheries and Aquaculture, SARDI Aquatic and Livestock Sciences, Parliamentary Library, State Library and National Library

Circulation: OFFICIAL

ALL ENQUIRIES

South Australian Research and Development Institute - Aquatic and Livestock Sciences

2 Hamra Avenue West Beach SA 5024

PO Box 120 Henley Beach SA 5022

P: (08) 8207 5400 F: (08) 8207 5415

E: pirsa.sardiaquatics@sa.gov.au W: <http://www.pir.sa.gov.au/research>

TABLE OF CONTENTS

LIST OF TABLES v

LIST OF FIGURES..... v

ACKNOWLEDGEMENTS vi

EXECUTIVE SUMMARY..... vii

1. INTRODUCTION 1

 1.1. Overview 1

 1.2. Biology 1

 1.3. Management arrangements and harvest strategy 1

 1.4. Stock status classification..... 3

2. METHODS..... 5

 2.1. Sources of data 5

 2.2. Primary Performance Indicator 5

 2.3. Additional Performance Indicators 6

3. RESULTS..... 7

 3.1. Total catch 7

 3.2. Targeted catch and effort 8

 3.3. Catch per unit effort (CPUE)..... 9

 3.4. Pre-recruit abundance 11

 3.5. Sex ratio 11

 3.6. Mean weight..... 12

 3.7. Spawning female abundance 12

4. SUMMARY 13

 4.1. Stock status..... 13

 4.2. Future research needs 14

5. REFERENCES 15

LIST OF TABLES

Table 1. Giant Crab Fishery statistics between 2019/20 and 2022/23.	viii
Table 2. Stock status terminology for the status of key Australian fish stocks reports ...	4
Table 3. Target catch versus total catch of Giant Crab between 2000 and 2022..	8

LIST OF FIGURES

Figure 1. Total catch and TACC of Giant Crab and percentage of Giant Crab TACC caught State-wide in the GCF between 1986 and 2022.	7
Figure 2. State-wide targeted fishing effort in the GCF between 2000 and 2022.	9
Figure 3. State-wide annual commercial CPUE of legal-size Giant Crab in the GCF between 2000 and 2022.	9
Figure 4. State-wide five-year average (\pm SE) commercial CPUE of legal-size Giant Crab in the GCF between 2004 and 2022.	10
Figure 5. State-wide trends in the CPUE of Giant Crab pre-recruits caught in the GCF between 2000 and 2022..	11
Figure 6. State-wide trends in the sex ratio of Giant Crab caught in the GCF between 2000 and 2022.....	11
Figure 7. State-wide trends in the mean weight of legal-size Giant Crab caught in the GCF between 2000 and 2022..	12
Figure 8. State-wide trends in Giant Crab female spawning abundance in the GCF between 2000 and 2022..	12

ACKNOWLEDGEMENTS

Funds for this research were obtained through licence fees managed by Primary Industries and Regions South Australia (PIRSA). John Feenstra (SARDI) provided catch data through data extraction procedures run from the South Australian Rock Lobster (SARL) database. Kylie Howard (SARDI) provided valuable and timely administrative support to data entry and management required in the SARL database. The report was formally reviewed by Dr Ben Stobart (SARDI) and Dr Fred Bailleul (SARDI) and approved for release by Dr Stephen Mayfield, Program Leader, Fisheries (SARDI).

EXECUTIVE SUMMARY

This report provides an assessment of the status of the South Australian Giant Crab Fishery (GCF) using data to the end of the 2022 fishing season that extends from 1 October 2022 to 31 May 2023. It analyses fishery-dependent data at a State-wide scale, collected from two management zones, the Northern Zone (NZ) and Southern Zone (SZ), and from three commercial fishing sectors: (1) Miscellaneous Fishery sector; (2) South Australian Rock Lobster Fishery (SARLF) quota sector (RL-quota); and (3) SARLF by-product sector (RL by-product).

The long-lived and slow-growth life-history characteristics of the Giant Crab render the species susceptible to recruitment overfishing. Catch declines have been reported across core areas of the species' distribution in Victoria and Tasmania, despite multiple total allowable commercial catch (TACC) reductions in these states. In South Australia, the recent declines in catch, pre-recruit abundance and catch per unit effort (CPUE) to their lowest levels since a TACC was introduced in 1999 signal a period of reduced fishery performance.

The TACC of the GCF has been caught in only three seasons since its inception and has not been caught in the last ten seasons. Catches have declined since 2012. In 2022, the catch of 13.7 t comprised 62% of the 22.1 t TACC, which is the second lowest catch on record since a TACC was introduced (Table 1). The amount of targeted catch in the Miscellaneous Fishery sector and RL-quota sector in 2022 was also the second lowest on record. Seasonal estimates of pre-recruit (undersize Giant Crab) abundance have also steadily declined since 2008, with 2019–2022 returning the lowest estimates on record.

The primary biological performance indicator (PI) for the GCF is the five-year average CPUE (kg/potlift) of legal-size Giant Crab. Estimates for this PI have declined since 2008. In 2022, the index was 1.88 kg/potlift, which is 3.6% below the Trigger Reference Point ($RP_{\text{trig}} = 1.95$ kg/potlift), and the lowest estimate on record (Table 1). The low five-year average is a consequence of annual estimates of CPUE decreasing in recent years.

Within the management policy for the GCF, the status of the Giant Crab stock is not prescribed below RP_{trig} (PIRSA 2018). However, using a weight-of-evidence approach, and noting the declining trend in CPUE to below RP_{trig} , and historical lows in GCF catch and recruitment, the status of the South Australian Giant Crab stock is classified as **'depleting'** in 2022.

Table 1. Giant Crab Fishery statistics between 2019/20 and 2022/23. **Bold:** five-year average commercial CPUE of legal-size Giant Crab is the primary biological performance indicator (PI) listed in the management policy for the GCF. **Confidential data (<5 licence holders).

Statistic	2019/20	2020/21	2021/22	2022/23
Total Allowable Commercial Catch (TACC)	22.1 t	22.1 t	22.1 t	22.1 t
Total commercial catch	14.2 t	15.4 t	10.9 t	13.7 t
% of TACC caught	64%	70%	49%	62%
Target effort	**	7,727 potlifts	6,083 potlifts	7,604 potlifts
Five-year average commercial CPUE of legal-size Giant Crab*	2.10 kg/potlift	2.11 kg/potlift	1.99 kg/potlift	1.88 kg/potlift
Pre-recruit abundance	**	0.47 pre-recruits/potlift	0.41 pre-recruits/potlift	0.31 pre-recruits/potlift
Mean weight	**	3.09 kg	3.16 kg	3.18 kg
Sex ratio ($N_{\text{♀}}/N_{\text{♀+♂}}$)	**	0.51	0.58	0.57
Status	Sustainable	Sustainable	Sustainable	Depleting

Keywords: Giant Crab, King Crab, *Pseudocarcinus gigas*, fishery, South Australia.

1. INTRODUCTION

1.1. Overview

This status report for the South Australian Giant Crab (*Pseudocarcinus gigas*) Fishery (GCF) updates previous stock assessment and status reports for this species (Currie and Ward 2005; Currie *et al.* 2006; Currie 2008; Currie and Ward 2009; Currie 2010; Currie 2011a, b; Chick 2013; Stobart 2014; McLeay 2015; 2016; 2018; 2019; 2020; 2021; 2022; 2023) and is part of SARDI Aquatic and Livestock Sciences' assessment program for the fishery. The report provides a synopsis of the information available for the GCF collected from commercial logbook returns from 1 November 1986 to 31 May 2023, identifies uncertainty associated with the assessment, and assesses the current status of the Giant Crab resource in South Australia.

1.2. Biology

Giant Crab (*P. gigas*), also known as King Crab, is endemic to southern Australian waters and distributed from southern Western Australia to central New South Wales (Kailola *et al.* 1993). Giant Crab is considered to be a single biological stock across southern Australia (Levings *et al.* 2001). They are a long-lived (>30 years), slow growing xanthoid crab, reaching over 10 kg in weight with males growing to at least twice the size of females. While they occur at depths ranging from 20 to 600 m, the highest population densities are found at the edge of the continental shelf at depths of approximately 140 to 270 m (Levings *et al.* 1995). Mating occurs from June to July and females carry eggs for approximately four months before hatching occurs in October to November. Larval duration is approximately 50 days.

1.3. Management arrangements and harvest strategy

A detailed description of the history and management arrangements for the fishery is provided in Sloan (2002; 2003), PIRSA (2018), and previous stock assessment and status reports (Currie and Ward 2005; Currie *et al.* 2006; Currie 2008; Currie and Ward 2009; Currie 2010; Currie 2011a, b; Chick 2013; Stobart 2014; McLeay 2015; 2016; 2018; 2019; 2020; 2021; 2022; [Publications and reports - PIRSA](#)).

In summary, targeted fishing for Giant Crab began in South Australia in 1992 under Commonwealth licence arrangements. In 1997, management of the GCF was transferred solely to the Government of South Australia and separated into two zones, the Southern Zone (SZ) and Northern Zone (NZ), which are consistent with those designated for the South Australian Rock Lobster Fishery (SARLF). In 1999, an annual Total Allowable Commercial Catch (TACC) of 26 t was implemented for the GCF (NZ: 13.4 t and SZ: 12.6 t). In 2000, the TACC was reduced to 22.1 t (NZ: 13.4 t and SZ: 8.7 t) and has since remained unchanged (PIRSA 2009, 2018).

Commercial access to the Giant Crab resource is limited to licence holders in the South Australian Miscellaneous Fishery (Miscellaneous Fishery) and the SARLF. Within the SARLF, Giant Crab quota is allocated to some licence holders as a unit holding (RL-quota). In 2022, the TACC was allocated among 16 licence holders: one in the Miscellaneous Fishery and 15 in the SARLF. A total of 5% of the quota in each zone is reserved for SARLF fishers with no Giant Crab quota to account for Giant Crab taken as by-product (RL by-product)(non-targeted).

The Giant Crab fishing season is between 1 October–31 May, with the fishing season in the SZ between 1 October and 30 April, and the NZ between 1 November and 31 May. Fishing in each zone is managed via a mix of input and output controls (refer to Table 1 in PIRSA 2018). Fishers use a maximum of 100 steel-framed pots that must comply with pot-dimension specifications. A minimum legal-size limit of 150 mm carapace length is set for the GCF and females with external eggs are protected and must be returned to the water as soon as possible following capture.

The management policy for the fishery describes the overarching management arrangements and harvest strategy for the fishery (PIRSA 2018). The harvest strategy developed for the fishery is consistent with the South Australian Harvest Strategy Policy and Guidelines (PIRSA 2015a, b) and the National Harvest Strategy Guidelines (Sloan *et al.* 2014), and considers an assessment of data sources and performance indicators (PIs) for the fishery conducted by SARDI in 2017 (summarised in McLeay 2018).

The harvest strategy identifies five-year average commercial catch per unit effort (CPUE) of legal-size Giant Crab as the primary biological PI, with reference points for this PI based on targeted catch and effort information from 2000/01 to 2009/10. To inform the harvest strategy, five-year average commercial CPUE of legal-size Giant Crab (kg/potlift), calculated as a moving average using CPUE of legal-size Giant Crab from the current and previous four fishing seasons, is applied within decision rules described in the management policy (PIRSA 2018).

Decision rules are linked to defined Limit, Trigger and Target Reference Points for this PI to guide management arrangements and TACC setting in the following season. The Target Reference Point (RP_{targ}) for commercial CPUE of legal-size Giant Crab is 2.60 kg/potlift. Consistent with the National Harvest Strategy Policy (Sloan *et al.* 2014), the Trigger Reference Point (RP_{trig}) is set at 75% of RP_{targ} (1.95 kg/potlift) and the Limit Reference Point (RP_{lim}) is set at 50% of RP_{targ} (1.30 kg/potlift) (PIRSA 2018).

Decision rules are outlined within the management policy (PIRSA 2018) as follows:

- When five-year average commercial CPUE of legal-size Giant Crab is ≥ 1.95 kg/potlift (i.e. above RP_{trig}) it is recommended the TACC be set at 22.1 t for the entire GCF with 13.4 t of that TACC set for the NZ and 8.7 t set for the SZ.
- When the five-year average catch rate is < 1.95 kg/potlift and ≥ 1.30 kg/potlift it is recommended the TACC be set at 9.31 t for the entire area of the activity with 6.7 t of that TACC set for the Northern Zone and 2.61 t set for the Southern Zone. *##Note, that this decision rule incorporates an amendment as of 1 September 2023 made in response to the estimate of five-year average commercial CPUE dropping to below RP_{trig} and a review of the GCF being undertaken.*
- When five-year average commercial CPUE of legal-size Giant Crab is < 1.30 kg/potlift (i.e. below RP_{lim}) a review of the GCF will be undertaken and appropriate management arrangements may be introduced for the fishery in a timely fashion.

1.4. Stock status classification

A National Fishery Stock Status Reporting Framework (NFSRF) was developed to enable the consistent assessment of the status of Australian fish stocks (Pidcocke *et al.* 2021). The system combines information on both the current stock size and level of catch into a single classification for each stock using defined biological reference points. Each stock is then classified as 'sustainable', 'recovering', 'depleting', 'depleted', 'undefined' or 'negligible' (Table 2) ([FRDC 2023](#)). PIRSA has adopted this classification system to determine the status of all South Australian fish stocks (PIRSA 2015a).

Following the assessment of data sources and PIs undertaken for the fishery by SARDI in 2017, Giant Crab stock status is now defined in relation to how the single PI, five-year average commercial CPUE of legal-size Giant Crab, aligns against the reference points within the management policy (PIRSA 2018). Within the management policy, the Giant Crab stock status is classified as 'sustainable' if the five-year average commercial CPUE of legal-size Giant Crab is at or above RP_{trig} (1.95 kg/potlift). Determination of stock status below RP_{trig} is not prescribed under the management policy.

Table 2. Stock status terminology for the status of key Australian fish stocks reports (Pidcocke *et al.* 2021).

	STOCK STATUS	DESCRIPTION	POTENTIAL IMPLICATIONS FOR MANAGEMENT OF THE STOCK
■	Sustainable	Biomass (or proxy) is at a level sufficient to ensure that, on average, future levels of recruitment are adequate (i.e. recruitment is not impaired) and for which fishing mortality (or proxy) is adequately controlled to avoid the stock becoming recruitment impaired (overfishing is not occurring).	Appropriate management is in place
■	Depleting	Biomass (or proxy) is not yet depleted and recruitment is not yet impaired, but fishing mortality (or proxy) is too high (overfishing is occurring) and moving the stock in the direction of becoming recruitment impaired	Management is needed to reduce fishing pressure and ensure that the biomass does not become depleted
■	Recovering	Biomass (or proxy) is depleted and recruitment is impaired, but management measures are in place to promote stock recovery, and recovery is occurring	Appropriate management is in place, and there is evidence that the biomass is recovering
■	Depleted	Biomass (or proxy) has been reduced through catch and/or fishing effects, such that recruitment is impaired. Current management is not adequate to recover the stock, or adequate management measures have been put in place but have not yet resulted in measurable improvements	Management is needed to recover this stock; if adequate management measures are already in place, more time may be required for them to take effect
■	Undefined	Not enough information exists to determine stock status	Data required to assess stock status are needed
■	Negligible	Catches are so low as to be considered negligible and inadequate information exists to determine stock status	Assessment will not be conducted unless catches and information increase

2. METHODS

2.1. Sources of data

Fishery-dependent data have been collected from the three commercial fishing sectors that have access to the Giant Crab resource (Miscellaneous Fishery, RL-quota and RL by-product) since 1986. Data are unavailable to identify SARLF licence holders that held Giant Crab quota between 1999 and 2005. Data within this period were allocated to the RL-quota sector by referencing SARLF licence holders who held Giant Crab quota in 2006, and an additional SARLF licence holder (between 1999 and 2002). From 2006, PIRSA has provided information to SARDI to identify licence holders among each fishing sector with Giant Crab entitlement. All other fishery-dependent data from SARLF licence holders without allocated Giant Crab quota are assigned to the RL by-product sector.

Prior to 2000, data relating to Giant Crab catch were reported via a mandatory daily logbook program implemented for the SARLF. From 2000, a separate logbook reporting system was implemented for the GCF. Data from quota holders (Miscellaneous Fishery, RL-quota sectors) are reported through this system. Data from Rock Lobster fishers who catch Giant Crab incidentally (RL by-product sector) are reported through the logbook program in the SARLF. Data for Giant Crab catch recorded by the Miscellaneous Fishery and RL-quota sectors since 2000 are considered the most robust in assessing the stock status of the GCF, as they more accurately capture targeted fishing effort towards Giant Crab (McLeay 2018).

All data are entered into a database and maintained by PIRSA. Data are checked for errors during data entry, and further validated during data entry and reporting operations. PIRSA staff contact licence holders to correct any errors or missing information identified in the quality assurance process. All references to a fishing season in this report refer to the year the fishing season started (e.g. data reported for 2022 includes data from 1 October 2022 to 31 May 2023). Due to confidentiality, where data are from <5 licence holders, data from each zone and sector are aggregated and presented at a State-wide scale. All means are reported \pm standard error.

2.2. Primary Performance Indicator

The primary biological PI for the GCF is the five-year average commercial catch per unit effort (CPUE) (kg/potlift) of legal-size Giant Crab (PIRSA 2018). This PI is calculated as the moving average of annual CPUE measured from the current and previous four fishing seasons. It uses data relating to targeted fishing collected through catch logs recorded by the Miscellaneous Fishery and RL-quota sectors in the NZ and SZ since 2000. Reference points for this PI are based on targeted catch and effort information from 2000/01 to 2009/10.

2.3. Additional Performance Indicators

Catch (total and % of TACC), effort, mean weight, pre-recruit abundance, sex ratio and spawning female abundance are additional indicators that provide context for assessing future performance of the GCF and reported using data from targeted fishing for Giant Crab in the Miscellaneous Fishery and RL-quota sectors since 2000. Catch of Giant Crab includes all catch reported through both GCF and SARLF logbook programs and consequently includes non-targeted catch of Giant Crab by non-quota holders in the SARLF (RL by-product sector).

3. RESULTS

3.1. Total catch

State-wide catches of Giant Crab landed by all three fishing sectors were negligible prior to 1992. Thereafter, catches increased but varied annually, averaging 20.8 ± 4.1 t between 1992 and 1998, including a historical high of 34.1 t in 1997 (Figure 1). Following introduction of a TACC in 1999, catches remained relatively stable up until 2012, ranging from 18.0 t in 2003 to 27.0 t in 1999, whereafter they generally decreased, and in 2022 the total catch was 13.7 t. The catch in the 2021 and 2022 seasons was lowest and second lowest on record, respectively, since TACC was implemented. The TACC has been caught in three seasons since its inception (1999, 2000 and 2012) and not been caught for the last ten seasons (Figure 1). In 2022, the catch comprised 62% of the 22.1 t TACC.

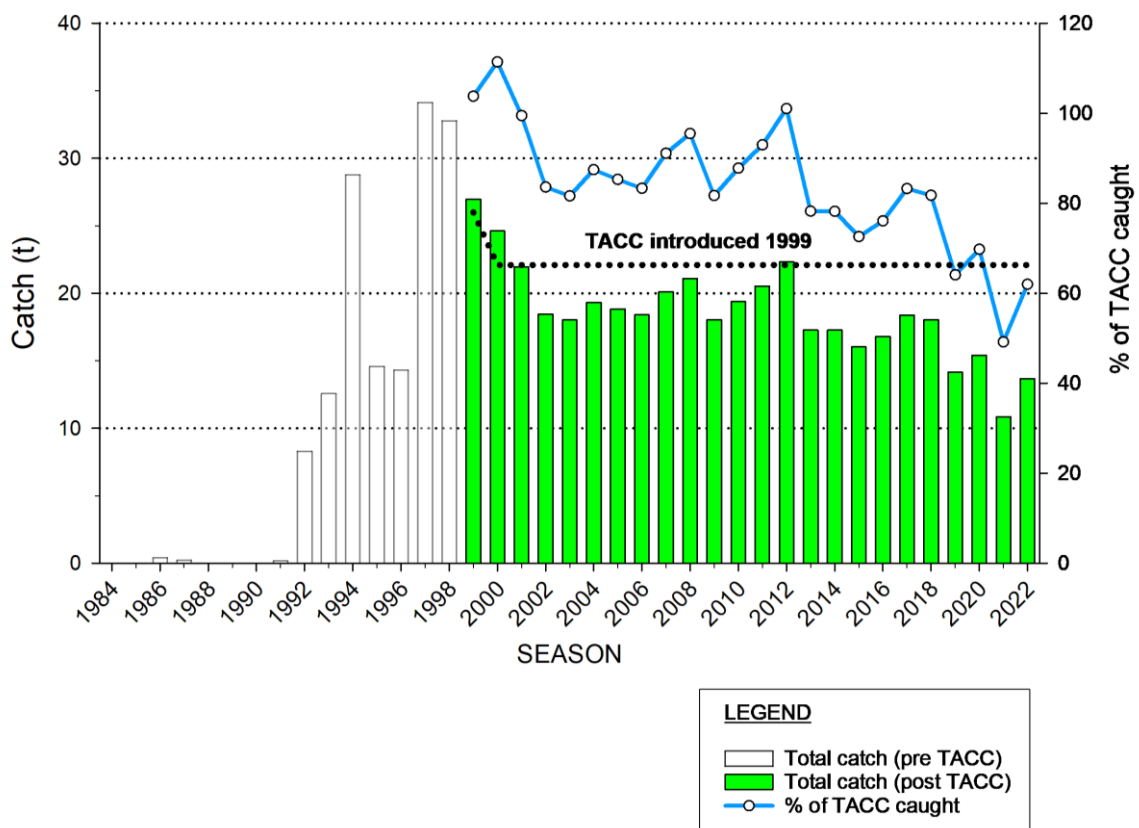


Figure 1. Total catch and TACC (black dotted line) of Giant Crab and percentage of Giant Crab TACC caught State-wide in the GCF between 1986 and 2022.

3.2. Targeted catch and effort

Targeted catch of Giant Crab landed within the Miscellaneous Fishery and RL-quota sectors represents 91.1% of the total catch reported in the GCF since 2000 (Table 3). In 2022, targeted catch landed by the Miscellaneous Fishery and RL-quota sectors was the second lowest on record. Note, some data are not presented due to confidentiality requirements (<5 licence holders).

Table 3. Target catch versus total catch of Giant Crab between 2000 and 2022.
**Confidential data (<5 licence holders).

SEASON	Target catch (t)	Total catch (t)	% Target catch
2000	21.7	24.6	88.1
2001	17.6	22.0	80.2
2002	16.1	18.5	86.9
2003	**	18.0	**
2004	**	19.3	**
2005	**	18.9	**
2006	**	18.4	**
2007	**	20.1	**
2008	**	21.1	**
2009	16.1	18.1	89.3
2010	18.9	19.4	97.3
2011	19.7	20.6	96.0
2012	21.8	22.3	97.7
2013	16.4	17.3	95.0
2014	17.0	17.3	98.1
2015	15.1	16.0	93.9
2016	16.1	16.8	98.2
2017	17.2	18.4	93.6
2018	16.8	18.1	92.9
2019	**	14.2	**
2020	14.8	15.4	96.2
2021	10.3	10.9	95.0
2022	13.3	13.7	97.2

Since 2000, the average targeted fishing effort was $7,398 \pm 278$ potlifts per season (Figure 2). Annual targeted fishing effort in the Miscellaneous Fishery and RL-quota sectors reached a maximum of 9,457 potlifts in 2009. The annual targeted effort recorded in 2022 was 7,604 potlifts and was 25% higher than in 2021 (6,083 potlifts).

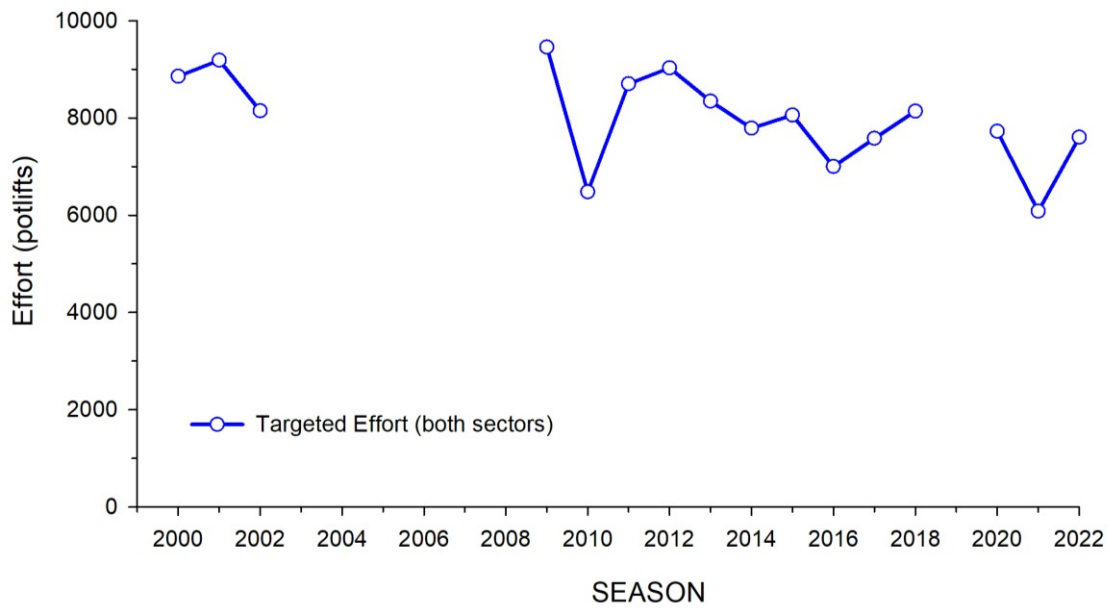


Figure 2. State-wide targeted fishing effort in the GCF between 2000 and 2022. Confidential data (<5 licence holders) not presented.

3.3. Catch per unit effort (CPUE)

Annual estimates of CPUE of legal-size Giant Crab increased from 2.45 kg/potlift in 2000, reaching a maximum in 2008 (data confidential). Annual CPUE then decreased reaching 1.87 kg/potlift in 2015 (Figure 3). From 2016 to 2020, annual CPUE remained between 1.92 and 2.30 kg/potlift. In 2022, annual commercial CPUE of legal-size Giant Crab was 1.75 kg/potlift, which was similar to 2020 (1.70 kg/potlift), and the third lowest on record since 2000 (Figure 3).

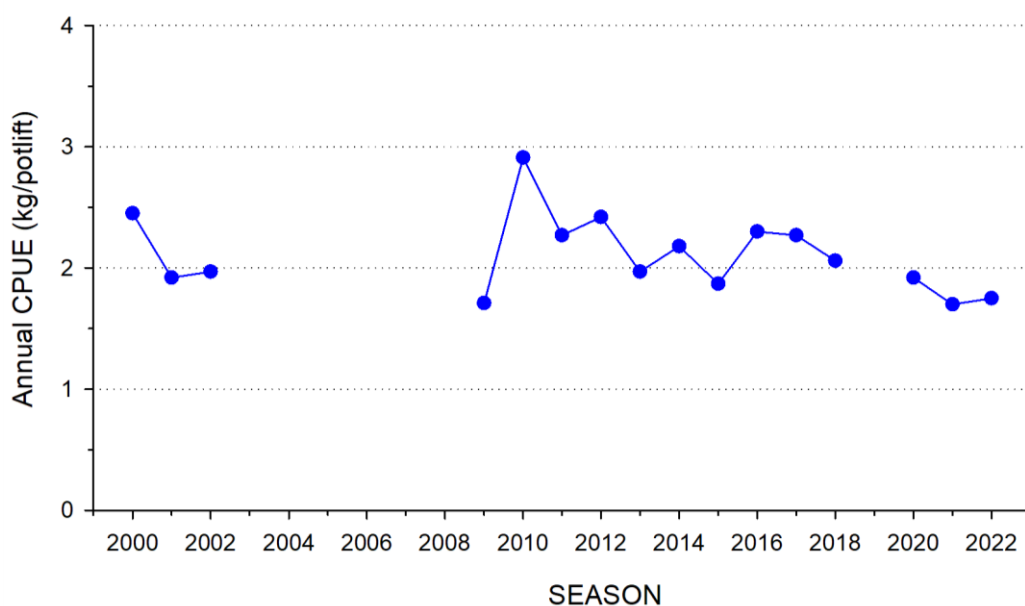


Figure 3. State-wide annual commercial CPUE of legal-size Giant Crab in the GCF between 2000 and 2022. Confidential data (<5 licence holders) not presented.

From 2004, five-year average commercial CPUE of legal-size Giant Crab increased from 2.32 kg/potlift reaching a peak in 2008 (data confidential), before decreasing to 2.14 kg/potlift in 2015 (Figure 4). From 2015 to 2020, five-year average commercial CPUE remained relatively stable at 2.10–2.15kg/potlift and >80% of the Target Reference Point ($RP_{\text{targ}} = 2.60$ kg/potlift).

Five-year average commercial CPUE then decreased from 2020, and in 2022 was 1.88 kg/potlift, which is 3.6% below the Trigger Reference Point ($RP_{\text{trig}} = 1.95$ kg/potlift) and the lowest estimate on record (Figure 4).

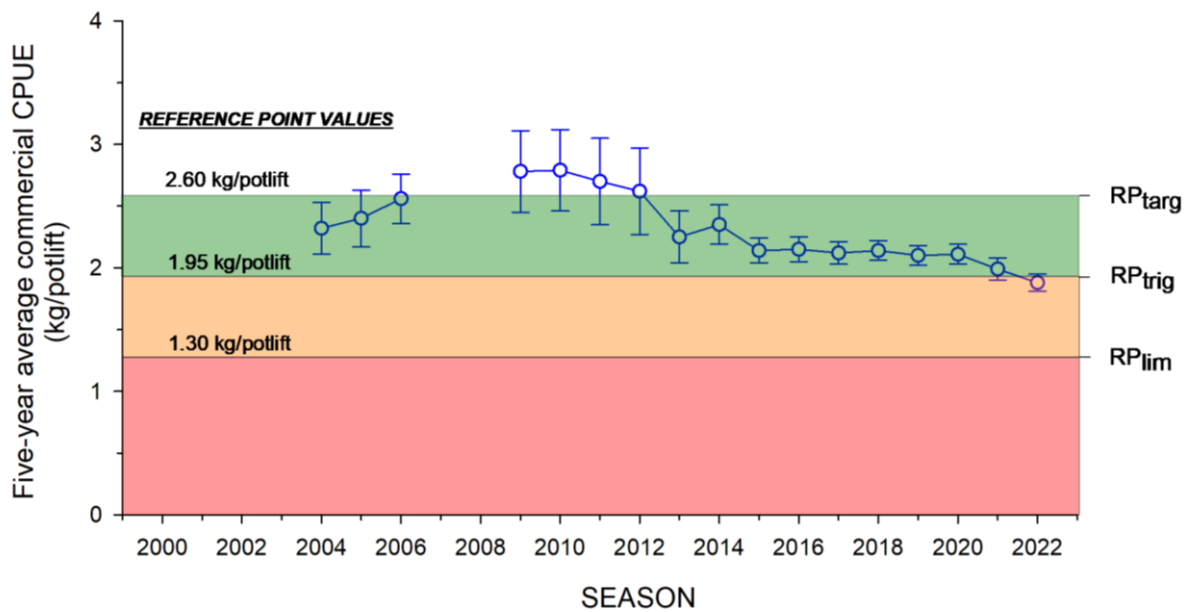


Figure 4. State-wide five-year average (\pm SE) commercial CPUE of legal-size Giant Crab in the GCF between 2004 and 2022. Target Reference Point = RP_{targ} ; Trigger Reference Point = RP_{trig} ; Limit Reference Point = RP_{lim} . Confidential data (<5 licence holders) not presented.

3.4. Pre-recruit abundance

State-wide seasonal estimates of pre-recruit (undersize Giant Crab) abundance have steadily declined since 2008 (data confidential), with 2019–2022 among the lowest estimates on record, and 2022 the lowest estimate on record (2022: 0.31 pre-recruits/potlift) (Figure 5).

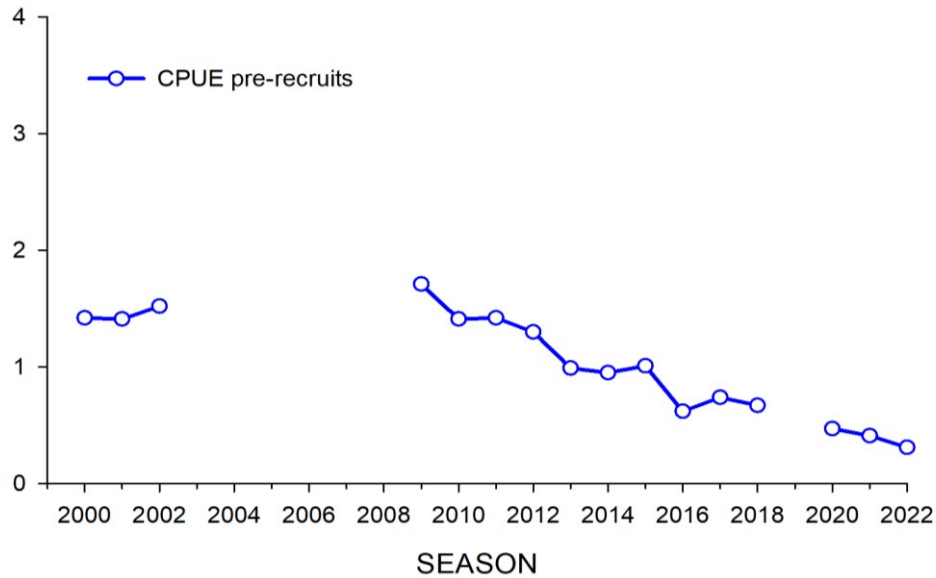


Figure 5. State-wide trends in the CPUE of Giant Crab pre-recruits caught in the GCF between 2000 and 2022. **Confidential data (<5 licence holders) not presented.

3.5. Sex ratio

State-wide seasonal trends in sex ratio averaged 0.5 ± 0.01 since 2000 with the highest number of females recorded in the catch in 2012 (0.64) (Figure 6).

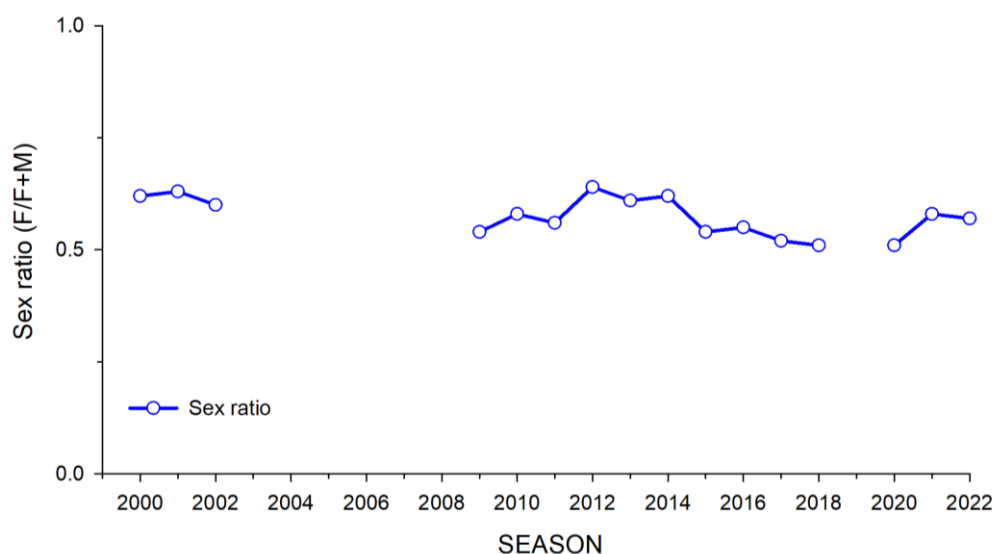


Figure 6. State-wide trends in the sex ratio of Giant Crab caught in the GCF between 2000 and 2022. A sex ratio of 0.5 equates to 50% of females in the catch. F = Female; M = Male. Confidential data (<5 licence holders) not presented.

3.6. Mean weight

Since 2000, State-wide seasonal estimates of the mean weight of legal-size Giant Crab have ranged between 2.85 and 3.20 kg per crab per season (average: 3.0 ± 0.02 kg) (Figure 7). The estimate of mean weight of legal-size Giant Crab in 2022 was 3.18 kg, similar to that in 2021 (3.16 kg) and the second highest on record.

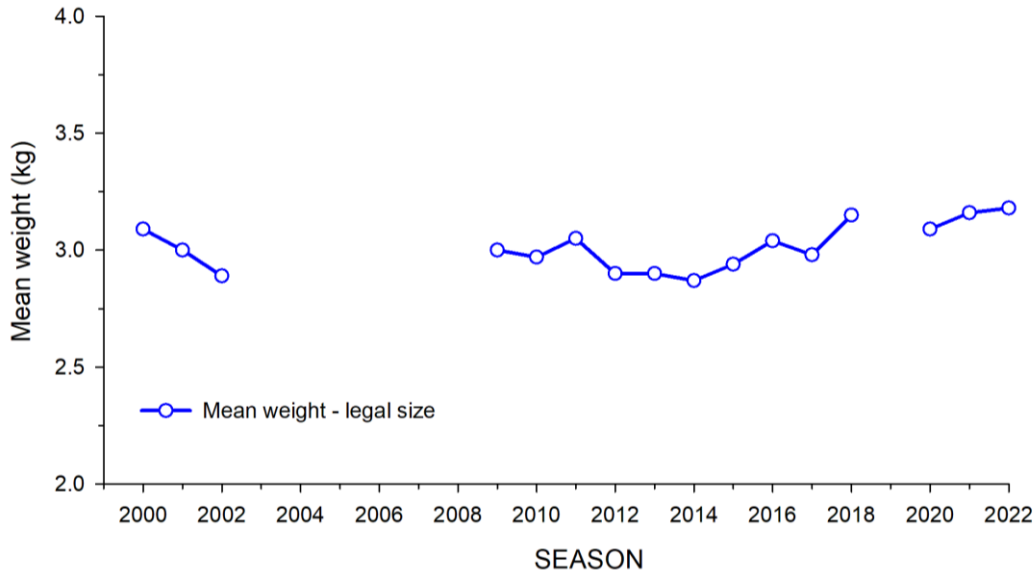


Figure 7. State-wide trends in the mean weight of legal-size Giant Crab caught in the GCF between 2000 and 2022. Confidential data (<5 licence holders) not presented.

3.7. Spawning female abundance

State-wide seasonal trends in the number of spawning females reported in the catch steadily increased from 2000 to 2016, reaching a maximum of 0.14 spawning females/potlift in 2016 before decreasing to 0.03 spawning females/potlift in 2022 (Figure 8).

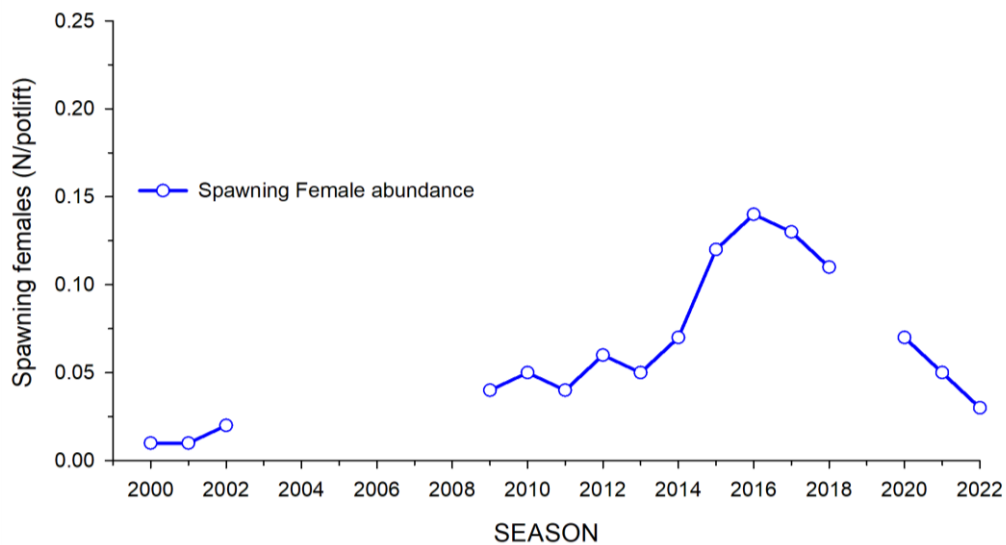


Figure 8. State-wide trends in Giant Crab female spawning abundance in the GCF between 2000 and 2022. Confidential data (<5 licence holders) not presented.

4. SUMMARY

4.1. Stock status

The 2022-season assessment of the South Australian Giant Crab stock updates previous stock assessments for this species that are available online ([Publications and reports - PIRSA](#)). The assessment is supported by information on the species' fisheries biology and stock structure (Levings *et al.* 2001), implementation of recommendations made in SARDI's 2017 assessment of data sources and PIs for the GCF (McLeay 2018), and the management policy for the GCF (PIRSA 2018). The classification of stock status is determined using the single biological PI of five-year average commercial CPUE of legal-size Giant Crab, with reference points derived from 2000/01 to 2009/10.

This approach does not consider the period immediately prior to the introduction of the TACC when catches were higher. Consequently, the current assessment is made in relation to a CPUE or stock biomass 'baseline' that may be different to that existing prior to 2000. The reliance on fishery-dependent data, and CPUE as the primary PI to inform stock status reflects the relatively small size of the fishery but increases uncertainty in the assessment. CPUE can also be influenced by gear selectivity or changes in fishing patterns, fleet efficiency or fleet dynamics (Quirijns *et al.* 2008; Maunder *et al.* 2006) that are not quantified in this assessment. In addition, data confidentiality requirements preclude presentation of data at relevant temporal and spatial scales.

The long-lived and slow-growth life-history characteristics of the Giant Crab render the species susceptible to recruitment overfishing. Catch declines have been reported across core areas of the species' distribution in Victoria and Tasmania, despite multiple TACC reductions in these states (Piddock *et al.* 2020).

In South Australia, the TACC of the GCF has been caught in only three seasons since its inception and has not been caught in the last ten seasons. Catches have declined since 2012 and were the lowest and second lowest on record in the 2021 and 2022 seasons, respectively, since TACC was implemented. In 2022, the total catch of 13.7 t comprised 62% of the 22.1 t TACC. Seasonal estimates of pre-recruit (undersize Giant Crab) abundance have also steadily declined since 2008, with 2019–2022 returning the lowest estimates on record. These trends support anecdotal reports from industry of low crab catchability and signal a period of reduced fishery performance.

The primary biological performance indicator (PI) for the GCF is the five-year average CPUE (kg/potlift) of legal-size Giant Crab. Estimates for this PI have declined since 2008. In 2022, the index was 1.88 kg/potlift, which is 3.6% below the Trigger Reference Point ($RP_{\text{trig}} = 1.95$ kg/potlift), and the lowest estimate on record. The low five-year average is a consequence of annual estimates of CPUE decreasing in recent years.

Within the harvest strategy for the Giant Crab Fishery, the status of the Giant Crab stock is not prescribed below RP_{trig} (≥ 1.95 kg/potlift) (PIRSA 2018). However, using a weight-of-evidence approach, and noting the declining trend in CPUE to below RP_{trig} , and historical lows in GCF catch and recruitment, the status of the South Australian Giant Crab stock is classified as '**depleting**' in 2022.

4.2. Future research needs

Four sources of assessment uncertainty require addressing:

- Firstly, it is recommended that the efficacy of the current harvest strategy in reducing fishery exploitation rates and maintaining its operational objectives is assessed in an upcoming review of the GCF management policy and harvest strategy in 2024.
- Secondly, statistical modelling procedures, such as Generalised Linear Modelling, should be developed to standardise estimates of commercial CPUE of legal-size Giant Crab to account for temporal, spatial, and fishery-related factors that may influence CPUE.
- Thirdly, it is recommended that data confidentiality issues be resolved so that data can be presented at the spatial and temporal scales necessary to better inform stock assessment and management; and
- Finally, future stock assessments may be enhanced through the implementation of cost-effective methods that yield additional data (e.g. length, sex, survival) to assess stock size. Vessel-based camera methods to collect this information are being developed under FRDC Project 2019/114 - *Giant Crab Enhanced Data Collection - Innovative approaches to enhance data collection in the Victorian, South Australian and Tasmanian Giant Crab fisheries*.

5. REFERENCES

- Chick, R.C (2013). South Australian Giant Crab (*Pseudocarcinus gigas*) Fishery. Status Report 2011/2012. Status Report to PIRSA Fisheries and Aquaculture. South Australian Research and Development Institute (Aquatic Sciences), Adelaide. SARDI Publication No. F2011/000332-3. SARDI Research Report Series No. 691. 20p.
- Currie, D.R. and Ward, T.M. (2005). South Australian Giant Crab (*Pseudocarcinus gigas*) Fishery. Fisheries Assessment Report to PIRSA. South Australian Research and Development Institute (Aquatic Sciences), Adelaide. SARDI Publication No. RD04/0215-2. 27p.
- Currie, D.R., Mayfield, S., McGarvey, R. and Gardner, C. (2006). South Australian Giant Crab (*Pseudocarcinus gigas*) Fishery. Fisheries Assessment Report for PIRSA. South Australian Research and Development Institute (Aquatic Sciences), Adelaide. SARDI Publication No. RD04/0215-3. SARDI Research Report Series 137.
- Currie, D.R. (2008). South Australian Giant Crab (*Pseudocarcinus gigas*) Fishery. Status Report for PIRSA Fisheries. South Australian Research and Development Institute (Aquatic Sciences), Adelaide. SARDI Publication No. F2008/000067-1. SARDI Research Report Series 268.
- Currie, D.R. and Ward, T.M. (2009). South Australian Giant Crab (*Pseudocarcinus gigas*) Fishery. Fisheries Assessment Report for PIRSA. South Australian Research and Development Institute (Aquatic Sciences), Adelaide. SARDI Publication No. F2007/000698-2. SARDI Research Report Series 345.
- Currie, D.R. (2010). South Australian Giant Crab (*Pseudocarcinus gigas*) Fishery Status Report 2008/09. Status Report to PIRSA Fisheries. South Australian Research and Development Institute (Aquatic Sciences), Adelaide. SARDI Publication No. F2007/000698-3. SARDI Research Report Series 427.
- Currie, D.R. (2011a). South Australian Giant Crab (*Pseudocarcinus gigas*) Fishery Status Report 2009/10. Fishery Status Report to PIRSA Fisheries and Aquaculture. South Australian Research and Development Institute (Aquatic Sciences), Adelaide. SARDI Publication No. F2011/000332-1. SARDI Research Report Series 568.
- Currie, D.R. (2011b). South Australian Giant Crab (*Pseudocarcinus gigas*) Fishery Status Report 2010/11. Fishery Status Report to PIRSA Fisheries and Aquaculture. South Australian Research and Development Institute (Aquatic Sciences), Adelaide. SARDI Publication No. F2011/000332-2. SARDI Research Report Series 591.
- FRDC (2023). How are the Status of Australian Fish Stock Reports done? <https://www.fish.gov.au/about/how-are-the-status-of-australian-fish-stock-reports-done>. Accessed 15/02/2023.
- Kailola, P.J., Williams, M.J., Stewart, P.C., Reichelt, R.E., McNee, A. and Grieve, C. (1993). Australian Fisheries Resources. Bureau of Resource Science and Fisheries Research and Development Corporation, Canberra. p. 422.
- Levings, A., Mitchell, B. D., Heeren, T., Austin, C. and Matheson, J. (1995). Fisheries Biology of the Giant Crab (*Pseudocarcinus gigas*, Brachyura, Oziidae) in Southern Australia. In: High Latitude Crabs: Biology Management and Economics. University of Alaska Sea Grant College Program Report No.96-02, Alaska. pp. 126-151.

Levings, A., Mitchell, B.D., McGarvey, R., Mathews, J., Laurenson, L., Austin, C., Heeron, T., Murphy, N., Miller, A., Rowsell, M. and Jones, P. (2001). Fisheries Biology of the Giant Crab *Pseudocarcinus gigas*. Final report to the Fisheries Research and Development Corporation, Australia, for projects 93/220 & 97/132. Deakin University.

Maunder, M.N., Sibert, J.R., Fonteneau, A., Hampton, J., Kleiber, P. and Harley S.J. (2006). Interpreting catch per unit effort data to assess the status of individual stocks and communities. *ICES Journal of Marine Science*, 63: 1373-1385.

McLeay, L. (2015). South Australian Giant Crab (*Pseudocarcinus gigas*) Fishery Status Report 2013/14. Fishery Status Report to PIRSA Fisheries and Aquaculture. South Australian Research and Development Institute (Aquatic Sciences), Adelaide. SARDI Publication No. F2011/000332-5. SARDI Research Report Series No. 834. 17pp.

McLeay, L. (2016). South Australian Giant Crab (*Pseudocarcinus gigas*) Fishery Status Report 2014/15. Fishery Status Report to PIRSA Fisheries and Aquaculture. South Australian Research and Development Institute (Aquatic Sciences), Adelaide. SARDI Publication No. F2011/000332-6. SARDI Research Report Series No. 895. 16pp.

McLeay, L. (2018). Stock Status Report for the South Australian Giant Crab (*Pseudocarcinus gigas*) Fishery in 2016/17. Fishery Status Report to PIRSA Fisheries and Aquaculture. South Australian Research and Development Institute (Aquatic Sciences), Adelaide. SARDI Publication No. F2011/000332-7. SARDI Research Report Series No. 976. 19pp.

McLeay, L. (2019). Stock Status Report for the South Australian Giant Crab (*Pseudocarcinus gigas*) Fishery in 2017/18. Fishery Status Report to PIRSA Fisheries and Aquaculture. South Australian Research and Development Institute (Aquatic Sciences), Adelaide. SARDI Publication No. F2011/000332-8. SARDI Research Report Series No. 1009. 19pp.

McLeay, L. (2020). Stock Status Report for the South Australian Giant Crab (*Pseudocarcinus gigas*) Fishery in 2018/19. Fishery Status Report to PIRSA Fisheries and Aquaculture. South Australian Research and Development Institute (Aquatic Sciences), Adelaide. SARDI Publication No. F2011/000332-9. SARDI Research Report Series No. 1050. 19pp.

McLeay, L. (2021). Stock Status Report for the South Australian Giant Crab (*Pseudocarcinus gigas*) Fishery in 2019/20. Fishery Status Report to PIRSA Fisheries and Aquaculture. South Australian Research and Development Institute (Aquatic Sciences), Adelaide. SARDI Publication No. F2011/000332-10. SARDI Research Report Series No. 1090. 20pp.

McLeay, L. (2022). Stock Status Report for the South Australian Giant Crab (*Pseudocarcinus gigas*) Fishery in 2020/21. Fishery Status Report to PIRSA Fisheries and Aquaculture. South Australian Research and Development Institute (Aquatic Sciences), Adelaide. SARDI Publication No. F2011/000332-11. SARDI Research Report Series No. 1123. 20pp.

McLeay, L. (2023). Stock Status Report for the South Australian Giant Crab (*Pseudocarcinus gigas*) Fishery in 2021/22. Fishery Status Report to PIRSA Fisheries and Aquaculture. South Australian Research and Development Institute (Aquatic Sciences), Adelaide. SARDI Publication No. F2011/000332-12. SARDI Research Report Series No. 1173. 19pp.

Piddocke, T. Ashby, C., Hartmann, K., Hesp, A. Hone, P., Klemke, J., Mayfield, S., Roelofs, A., Saunders, T., Stewart, J., Wise, B. and Woodhams, J. (eds) (2021). Status of Australian fish stocks reports 2020, Fisheries Research and Development Corporation, Canberra. www.fish.gov.au/about/what-are-the-status-of-australian-fish-stock-reports.

PIRSA (2009). Ecological Assessment of the South Australian Giant Crab (*Pseudocarcinus gigas*) Fishery. Re-assessment report prepared for Commonwealth Department of the Environment, Water Heritage and the Arts, for the purposes of part 13 and 13 (A) of the *Environment Protection and Biodiversity Conservation Act 1999*.

PIRSA (2015a). South Australian Fisheries Harvest Strategy Policy. Primary Industries and Regions South Australia. Adelaide, Australia.

PIRSA (2015b). Guidelines for implementing the South Australian fisheries harvest strategy policy. Primary Industries and Regions South Australia. Adelaide, Australia.

PIRSA (2018). Management Policy for the South Australian Commercial Giant Crab Fishery. Primary Industries and Regions South Australia. Adelaide, Australia.

Quirijns, F.J., Poos, J.J. and Rijnsdorp, A.D. (2008). Standardizing commercial CPUE data in monitoring stock dynamics: Accounting for targeting behaviour in mixed fisheries. *Fisheries Research*. 89(1): 1-8.

Sloan, S. (2002). A report prepared for Environment Australia on the Management of the South Australian Giant Crab (*Pseudocarcinus gigas*) Fishery. For the purposes of section 303FN (Approved Wildlife Trade Operation) of the *Environment Protection and Biodiversity Conservation Act 1999*.

Sloan, S. (2003). Ecological Assessment of the South Australian Giant Crab (*Pseudocarcinus gigas*) Fishery. Assessment Report prepared for the Commonwealth Department of the Environment and Heritage, against the 'Guidelines for the ecologically sustainable management of fisheries'. For the purposes of Part 13 and 13(A) of the *Environment Protection and Biodiversity Conservation Act 1999*.

Sloan, S.R., Smith, A.D.M, Gardner, C., Crosthwaite, K., Triantafillos, L., Jeffries, B. and Kimber, N. (2014). National Guidelines to Develop Fishery Harvest Strategies. FRDC Report – Project 2010/061. Primary Industries and Regions, South Australia, Adelaide.

Stobart, B. (2014). South Australian Giant Crab (*Pseudocarcinus gigas*) Fishery Status Report 2012/13. Fishery Status Report to PIRSA Fisheries and Aquaculture. South Australian Research and Development Institute (Aquatic Sciences), Adelaide. SARDI Publication No. F2011/000332-4. SARDI Research Report Series No. 763. 15p.