Fisheries

Stock Status Report for the West Coast Prawn (*Penaeus (Melicertus) latisulcatus*) Fishery in 2021

C. J. Noell

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August 2022

Report to PIRSA Fisheries and Aquaculture

Government of South Australia
Department of Primary Industries and Regions

SARDI
SOUTH AUSTRALIAN RESEARCH AND DEVELOPMENT INSTITUTE

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TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

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EXECUTIVE SUMMARY

This report provides an assessment of the South Australian West Coast Prawn Fishery (WCPF) for the 2021 fishing season (March–December). The aim of the report is to provide a synopsis of information available for the WCPF and assess the status of the Western King Prawn (WKP) resource. Stock status was determined using the harvest strategy for the fishery that was developed in alignment with the National Fishery Status Reporting Framework (NFSRF) classification system that is used to determine the status of all South Australian fish stocks.

In 2021, the WCPF required 1,238 h (over 43 fleet nights) to harvest a total catch of 68 t. Although catch and effort had increased since 2020, the increase in effort was proportionally greater than catch (by 26% cf. 3%), which resulted in a reduction in CPUE from 66 to 55 kg h^{-1} (by 18%). Since 88% of the total catch was taken from Venus Bay (with the remainder mostly from Coffin Bay), the annual total catch statistics for the whole fishery were largely driven by fishing in that region.

In the current assessment, an increase in CPUE of recruits in Ceduna during the March fishery-independent survey (FIS) and Venus Bay during the June FIS suggests recent strong recruitment combined with transport from Ceduna to Venus Bay. The next assessment will help to confirm this interpretation.

Application of the harvest strategy demonstrated opposite trends for two indicators: (1) the harvest strategy CPUE (HSCPUE, the commercial CPUE from March–September) decreased by 14% from 2020; whereas (2) the Venus Bay FIS CPUE (VBCPUE, obtained from Mar and June surveys combined) increased by 32%. As a result, the key performance indicator for this fishery, the CPUE index (the mean of the HSCPUE and VBCPUE) increased (by 1%) to 48.7 kg h^{-1} (from 48.1 kg h^{-1} in 2020), which is above the limit reference point (36 kg h^{-1}) but below the trigger reference point (54 kg h^{-1}).

Given the CPUE index is below the trigger reference point and an El Niño event is absent, the WCPF stock classification for 2021 is retained as **'depleting'**. This is the third consecutive year the WCPF has received this classification.

Table ES. Summary of fishery performance indicators and fleet metrics.

Indicator	2018	2019	2020	2021
Catch	116 t	84 t	65 t	68 t
Effort	1,778 h (58 nights)	1,668 h (53 nights)	984 h (36 nights)	1,238 h (43 nights)
Total commercial CPUE	65 kg h^{-1}	50 kg h^{-1}	66 kg h^{-1}	55 kg h^{-1}
HSCPUE	72 kg h^{-1}	48 kg h^{-1}	65 kg h^{-1}	56 kg h^{-1}
VBCPUE	63 kg h^{-1}	38 kg h^{-1}	32 kg h^{-1}	42 kg h^{-1}
CPUE index	68 kg h^{-1}	43 kg h^{-1}	48 kg h^{-1}	49 kg h^{-1}
Stock status	Sustainable	Depleting	Depleting	Depleting

Keywords: Western King Prawn (WKP), fishery-independent survey (FIS), catch per unit effort (CPUE), harvest strategy, stock status.

1. INTRODUCTION

1.1. Overview

This report updates previous stock status reports for Western King Prawn (WKP) (*Penaeus (Melicertus) latisulcatus*) in the West Coast Prawn Fishery (WCPF) (e.g. Heldt and Beckmann 2021) and is part of the South Australian Research and Development Institute (SARDI) Aquatic Sciences ongoing assessment program for the fishery. The WCPF targets WKP at night using demersal otter trawls between March and December in waters along the west coast of South Australia (Fig. 1.1). This report presents data from 1968 to the end of 2021. The aim of the report is to provide a synopsis of information available for the WCPF and assess the status of the WKP resource.

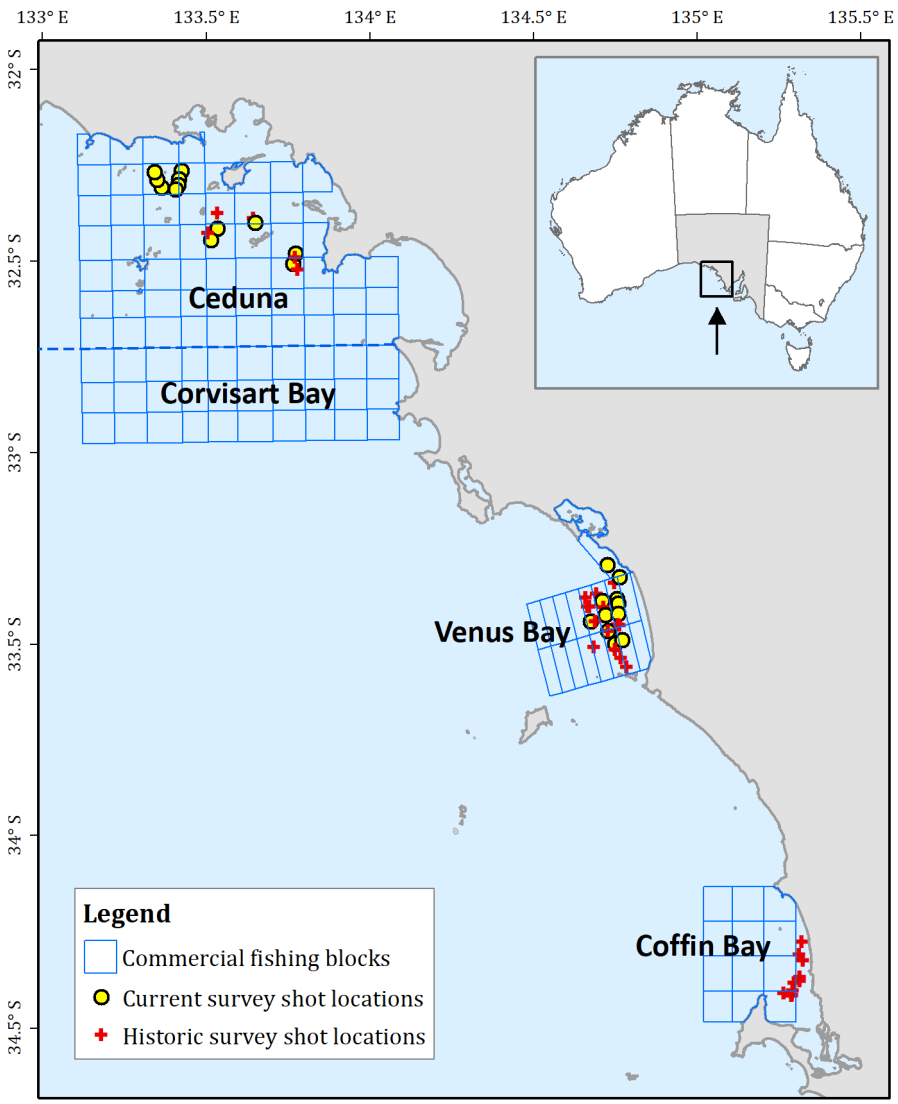

Figure 1.1. Commercial fishing blocks, regions, and fishery-independent survey shot locations (current and historic) of the West Coast Prawn Fishery.

1.2. Stock status classification and management arrangements

The status of the WKP resource is determined according to the WCPF harvest strategy (PIRSA 2019), which comprises a suite of reference points (RPs), biological performance indicators (PIs) and harvest decision rules. Development of the harvest strategy and stock status classification decision rules (Fig. 1.2) was consistent with the National Fishery Status Reporting Framework (NFSRF; Flood *et al* 2014, Stewardson *et al* 2016), which is used to determine the status of all fish stocks in South Australia. However, following implementation of the harvest strategy, the terminology for stock status classifications in the NFSRF was revised (Stewardson *et al* 2018; Table 1.1). The 2021 stock status for WKP is assessed under this updated terminology.

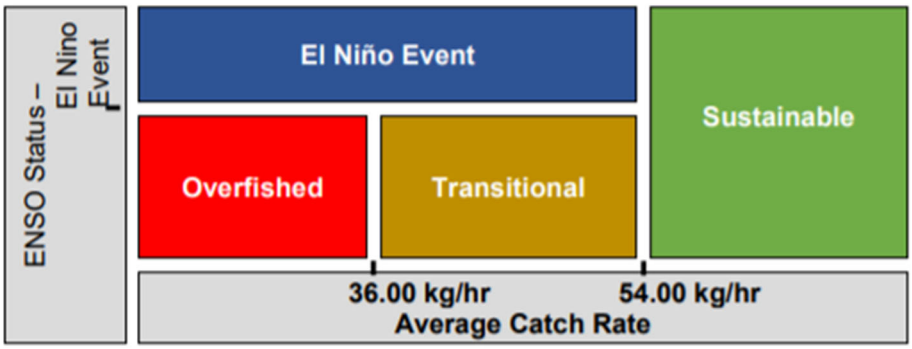

Figure 1.2. Stock status classification decision rules for the West Coast Prawn Fishery (PIRSA 2019).

Table 1.1. Terminology and interpretation of stock status classifications (reproduced from Stewardson et al 2018).

	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 (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 mortality 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 non-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.

The performance of the WCPF is based on the premise that catch rate is a proxy for prawn abundance. The key PI, the catch per unit effort (CPUE) index, is the mean of two PIs: (1) the harvest strategy CPUE (HSCPUE), which is the commercial CPUE obtained from at least three months of fishing between March and September; and (2) the Venus Bay CPUE (CPUE), which is the fishery-independent survey (FIS) mean CPUE obtained from the February/March and June/July surveys undertaken in Venus Bay.

The stock status classification decision rules are relative to trigger and limit RPs (Fig. 1.2). The status of the WKP stock is classified as 'sustainable' when the CPUE index is above the trigger RP, 'transitional' (equivalent to 'depleting' or 'recovering' under the NFSRF) when the CPUE index is between the trigger RP and limit RP, and 'overfished' (equivalent to 'depleted') when the CPUE index is below the limit RP. Where the fishery is classified as 'transitional', the maximum number of fishing nights and areas available to the fleet each month are reduced to prevent the stock from becoming recruitment impaired or to promote stock recovery where recruitment impairment has occurred.

The only exception to these classifications is when the performance of the fishery is affected by adverse environmental or climatic factors. Specifically, the abundance and distribution of WKP in the WCPF are likely to be limited by El Niño conditions (e.g. enhanced upwelling, lowered sea level and a raised thermocline, reduced wintertime shelf-edge currents, and a reduced warm Leeuwin Current that flows from north-west to south-east) (Carrick and Ostendorf 2005, Middleton and Bye 2007, Carrick 2008). The fishery will be classified as 'environmentally-limited' (equivalent to 'depleted') if the CPUE index falls below the trigger RP *and* the El Niño-Southern Oscillation (ENSO) outlook (provided by the Bureau of Meteorology) indicates an El Niño event in three or more consecutive months within the 24-month period prior to 30 September in the year of the assessment. Under these conditions, alternative decision rules are used to manage the fishery (PIRSA 2019). In the first year of an El Niño event, the previous year's management arrangements are adopted (with a few exceptions), and for two or more consecutive years of an El Niño event, management arrangements follow decision rules related to the relevant classification of 'depleting', 'recovering' or 'depleted'.

2. METHODS

Information relating to the sources of data presented in this report are described in detail in Beckmann and Hooper (2016). In summary, there are two main data sources: (1) FIS data; and (2) fishery-dependent catch and effort data. Fishery-independent surveys—undertaken using industry vessels and crews with SARDI observers—have been undertaken in most years since 1989 (Table A.1, Appendix A), with surveys from 2003 having a greater consistency in shot locations and sample number. Each survey involved 30-minute trawl shots along a predetermined path at fixed locations (Fig. 1.1) in Ceduna in February/March and Venus Bay in February/March and June/July. Data collected at each location included total catch, catch of small, or '20+' grade prawns (i.e. more than 20 prawns per pound), number of nets used, trawl duration, tide direction, and number of prawns in a 7-kg bucket (referred to in the industry as a 'bucket count' and used as an expedient measure of average prawn size). In addition, a random sample of 100 prawns from each shot is sampled, and these data are used to obtain length-frequency distributions and estimates of recruitment (Figs B.1–B.4, Appendix B).

For each FIS, mean CPUE (± standard error, SE) was determined for total catch (in kg h^{-1}) and recruits (recruits h^{-1}). 'Recruits' are defined here as prawns ≤32 mm carapace length (CL) for males and ≤34 mm CL for females. Recruit CPUEs were scaled according to sample weight and total catch. Where sample weight data were unavailable, length-weight relationships developed for the Spencer Gulf Prawn Fishery (Noell and Hooper 2019) were used to estimate sample weight.

Fishery-dependent commercial catch and effort data were obtained from the mandatory daily logbook program administered by SARDI Aquatic Sciences. Nominal estimates of catch, effort and CPUE are presented at a fishery-wide level (Table C.1, Appendix C) and by region. Temporal patterns in catch are also presented for the WCPF during early spawning (November and December), late spawning (January–March) and non-spawning (April–October) periods. Prawn grade weights were allocated to five size categories (Table 2.1) and presented as a percentage of the total catch.

Table 2.1. Size categories assigned to reported grades from commercial logbook data for the West Coast Prawn Fishery. Numeric grades denote the number of prawns per pound (e.g. 'U10' = under 10 prawns per pound).

Size category	Industry size grades reported in logbook
Extra-large	'U6', 'XL', 'U8', 'U10', 'L'
Large	'9/12', 'U12', 'LM', '10/15', '13/15', '10/20' (50%), '12/18' (50%)
Medium	'10/20' (50%), '12/18' (50%), 'M', '16/20'
Small	'SM', '19/25', '21/25', 'S', '20+', '21/30', '26+', '30+', '31/40', '41/50'
Soft and broken	'S&B', 'B&D', 'MIX', 'REJ', 'SMS', 'ERR', *(blank)*

The CPUE index, the key PI for the fishery, was calculated as the mean of the HSCPUE (the commercial CPUE obtained from at least three months of fishing between March and September) and VBCPUE (the FIS CPUE obtained from the Venus Bay surveys conducted in February/March and June/July). The ENSO outlook status (BOM 2022) is also presented, and an 'El Niño event' identified when three or more consecutive months are declared as El Niño by the Bureau of Meteorology in the 24 months prior to 30 September of the assessment year (the assessment period).

3. RESULTS

3.1. Commercial catch and effort

3.1.1. Catch

In 2021, the total commercial catch was 68 t (Fig. 3.1a). This is only marginally greater (by 3%) than the 2020 catch of 65 t, which was the lowest catch since 2007 (12 t), and below the previous 10-year mean (142 ± 13 t). During the 2021 season, 88% of the total catch (59 t) was landed during the non-spawning period (April-October), 11% (7 t) during the early spawning period (November and December), and 2% (1 t) during the late spawning period (January–March; Fig. 3.2). Venus Bay continues to be the most productive region since 2007, with 88% of the total catch (60 t) landed in 2021 (Fig. 3.3e). Most of the remaining catch was harvested from Coffin Bay (7 t; Fig. 3.3g), with less than 0.5 t was taken from Corvisart Bay (Figs 3.3c).

3.1.2. Effort

Total effort increased by 26% from 984 h (36 nights) in 2020 to 1,238 h (43 nights) in 2021 (Fig. 3.1a) but remained below the previous 10-year mean (1,912 ± 125 h). In Venus Bay, effort increased by 40% from 754 h (26 nights) in 2020 to 1,058 h (35 nights) in 2021 (Fig. 3.3e). In 2021, 173 h (10 nights) were fished in Coffin Bay, a reduction of 25% from 2020 (229 h over 11 nights; Fig. 3.3g). Less than 10 h were fished in Corvisart Bay in 2021, and this continues the sequence of zero or negligible effort in Ceduna and Corvisart Bay since 2009 and 2018, respectively (Figs 3.3a,c).

3.1.3. CPUE

There has been a general decline in total commercial CPUE from 2015 (102 kg h^{-1}) to 2021 (55 kg h^{-1}) (Fig. 3.1b), where it remains below the previous 10-year mean (73 ± 4 kg h^{-1}). Declines in CPUE from 2020 to 2021 were also observed at the regional scale—by 13% in Venus Bay (from 65 to 56 kg h^{-1}) and 39% in Coffin Bay (from to 70 to 43 kg h^{-1}) (Figs 3.3f,h). Both measures were below their respective 10-year mean (74 ± 5 and 68 ± 6 kg h^{-1}). Given the zero or negligible catches and/or effort in Ceduna and Corvisart Bay in recent years, CPUE for these regions is considered unreliable.

3.1.4. Prawn Size

The 2021 commercial catch comprised 27% small prawns, 24% medium prawns, 25% large prawns, and 19% extra-large prawns, with soft and broken prawns making up the remaining 5% (Figure 3.4). This distribution of sizes indicates that, since 2020, a trade-off had occurred between an increase in the proportion of small prawns (from 23 to 27%) and a reduction in the proportion of extra-large prawns (from 24 to 19%). Long-term interannual comparisons reveal that these 2021 figures represent the largest proportion of small prawns since 2005 and the lowest proportion of extra-large prawns since 2010.

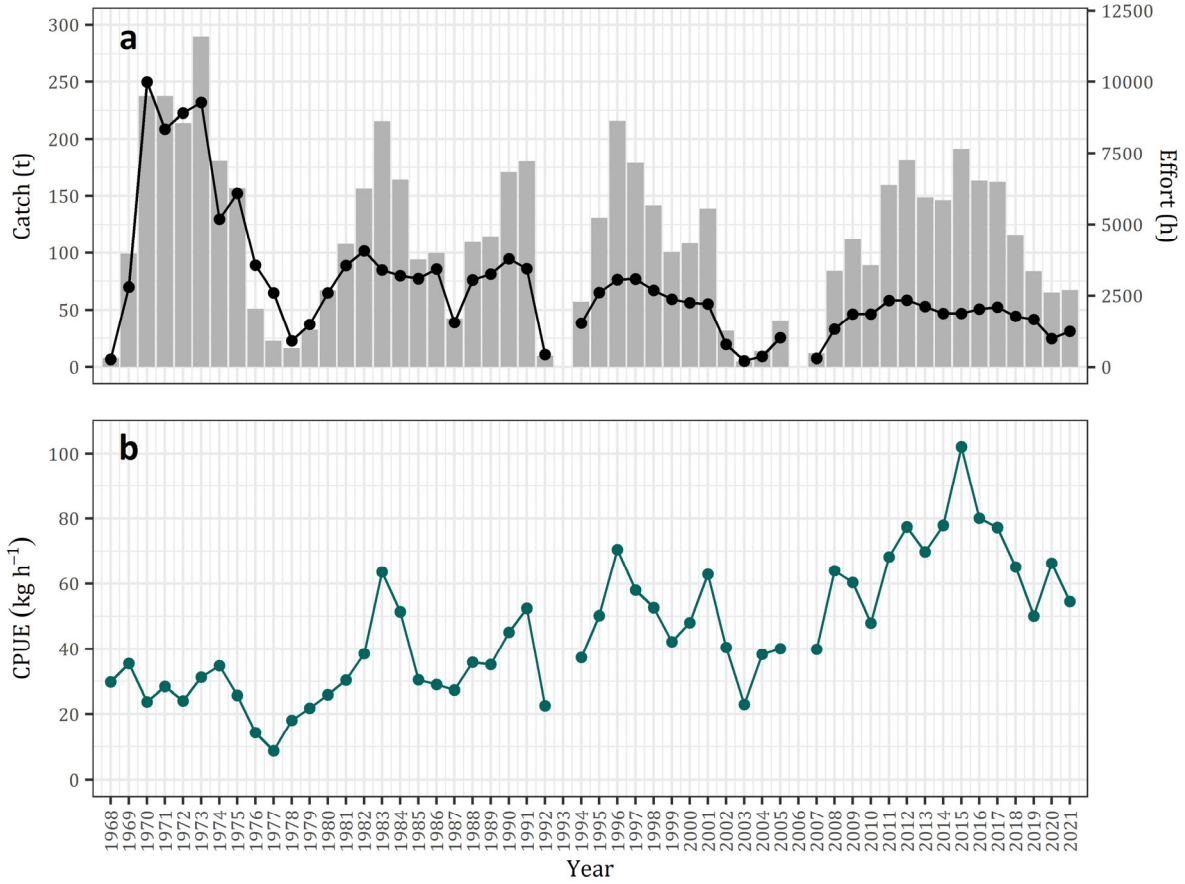

Figure 3.1. Annual commercial (a) catch (grey bars) and effort (black line), and (b) catch per unit effort (CPUE) for the West Coast Prawn Fishery from 1968–2021.

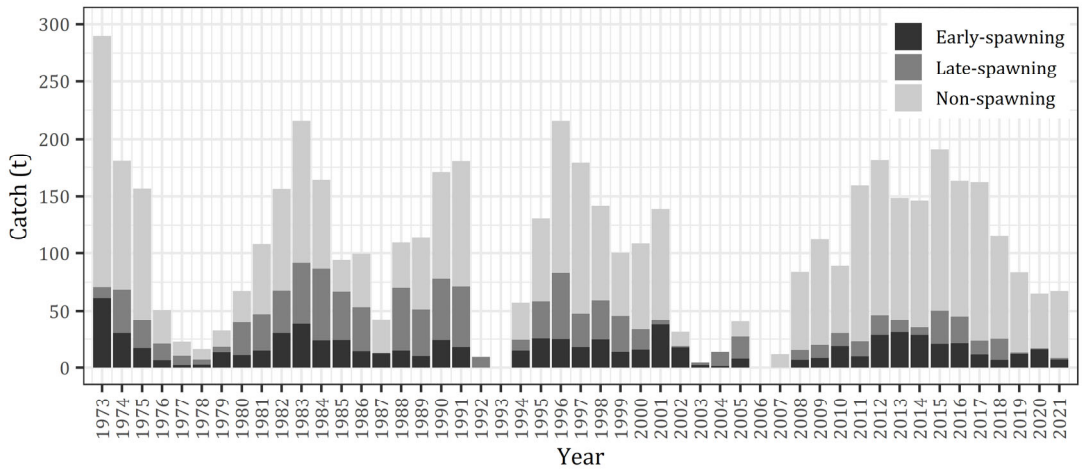

Figure 3.2. Annual commercial catch during early spawning (November and December), late spawning (January–March) and non-spawning (April–October) periods for the West Coast Prawn Fishery from 1973–2021.

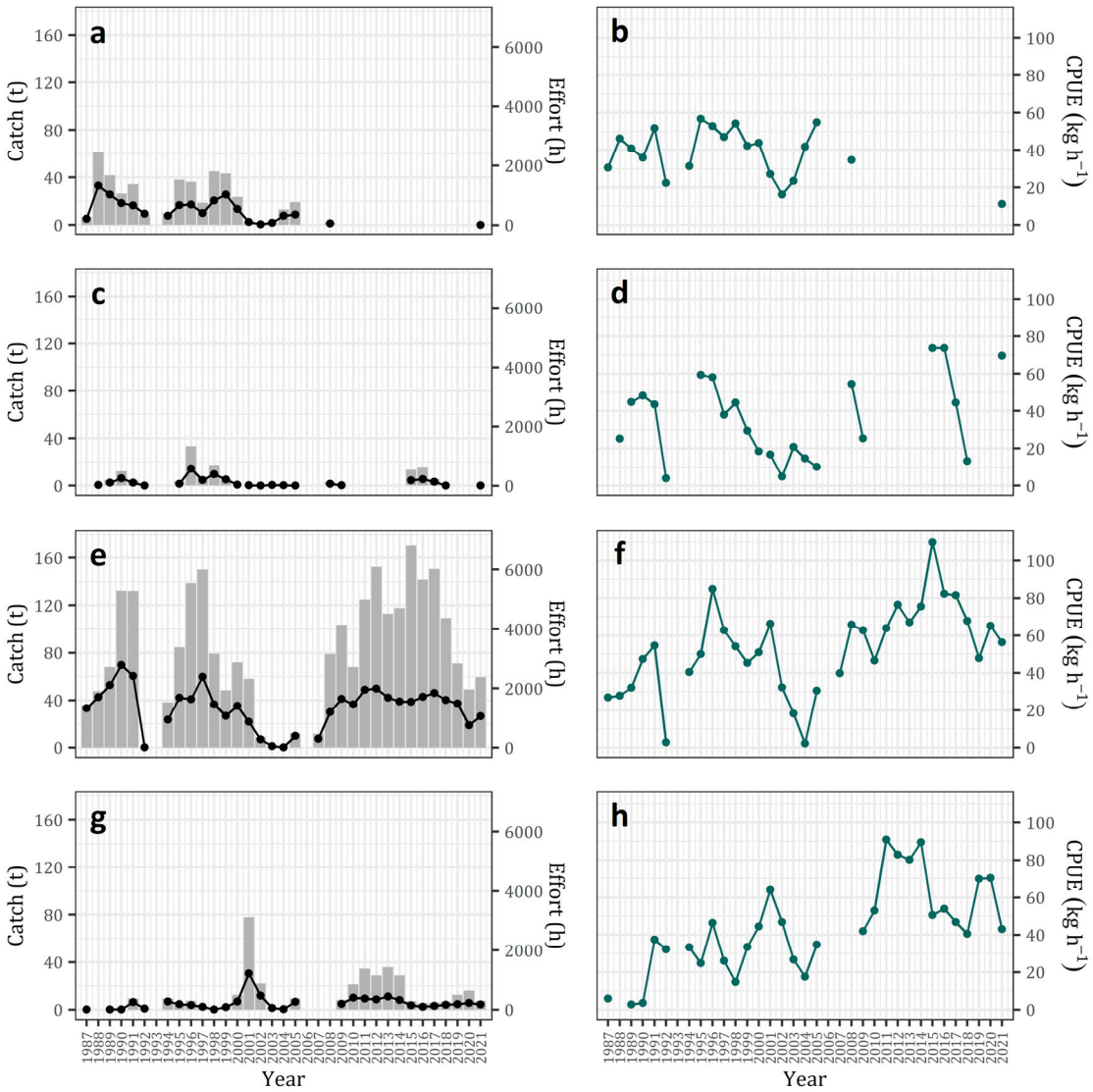

Figure 3.3. Annual commercial catch (grey bars), effort (black line) and catch per unit effort (green line) for Ceduna (a, b), Corvisart Bay (c, d), Venus Bay (e, f) and Coffin Bay (g, h) regions of the West Coast Prawn Fishery from 1987–2021.

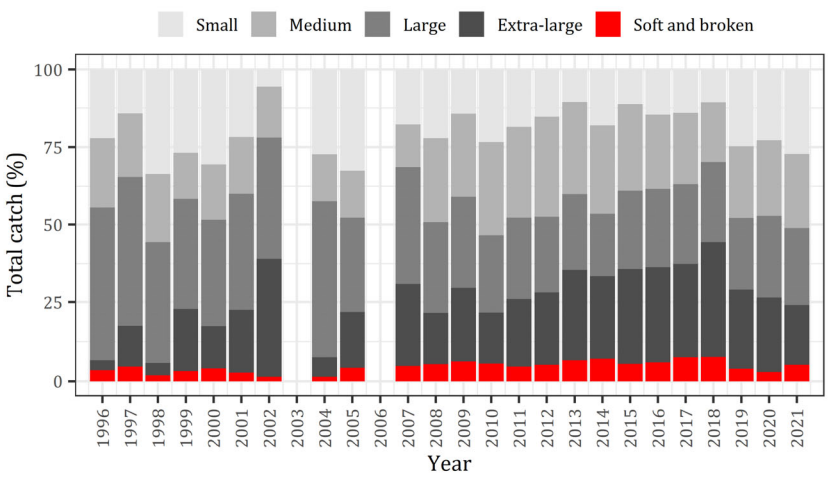

Figure 3.4. Size composition of the annual commercial catch of the West Coast Prawn Fishery from 1996–2021.

3.2. Fishery-independent surveys

3.2.1. CPUE

In 2021, FISs were undertaken in Ceduna on 10 March (12 shots) and Venus Bay on 11 March (10 shots) and in Venus Bay on 2 June (12 shots) (Table A.1, Appendix A).

The mean FIS CPUE for Ceduna was 35.9 ± 6.4 kg h^{-1} (Fig. 3.5a), which is 10% greater than 2020 (32.5 ± 5.8 kg h^{-1}) but below the previous 10-year mean (45.8 ± 7.1 kg h^{-1}). For Venus Bay, the mean FIS CPUE for the March survey was 24.8 ± 18.7 kg h^{-1} (Fig. 3.5a), which was 16% less than in 2020 (29.7 ± 9.7 kg h^{-1}) and below the previous 10-year mean (March: 64.5 ± 8.7 kg h^{-1}), whereas the mean FIS CPUE for the June survey was 55.8 ± 7.6 kg h^{-1} (Fig. 3.5b), which was 68% greater than in 2020 (June: 33.3 ± 4.6 kg h^{-1}) but below the previous 10-year mean (56.8 ± 4.8 kg h^{-1}).

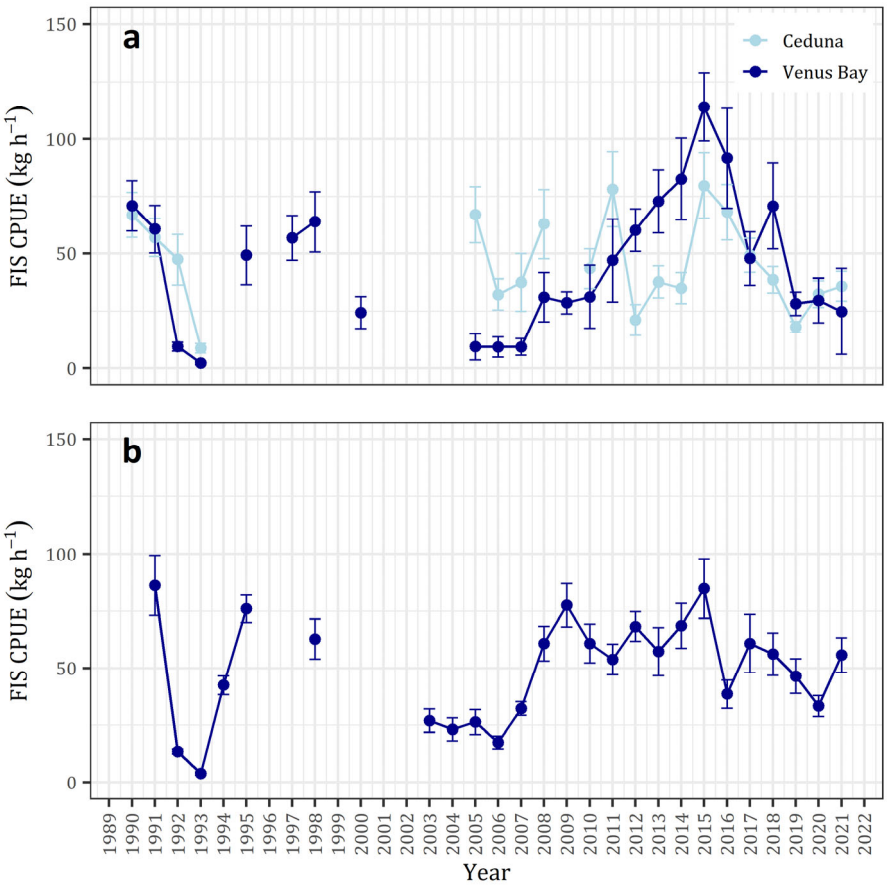

Figure 3.5. Fishery-independent survey (FIS) catch per unit effort (CPUE, mean ± SE) for Ceduna and Venus Bay during (a) February/March and (b) June/July from 1989–2021.

3.2.2. Recruitment

For the Ceduna FIS in March 2021, the CPUE for recruits was 1,550 ± 463 recruits h^{-1}, which is more than double the amount observed in the corresponding survey in 2020 (715 ± 181 recruits h^{-1}), and the largest since 2015 (Fig. 3.6a). At Venus Bay, the FIS CPUE for recruits in March was 157 ± 87 recruits h^{-1}, which represents a 59% reduction since 2020 (380 ± 204 recruits h^{-1}) and the lowest on record (since 2007) (Fig. 3.6a). In contrast, the CPUE for recruits in June of 949 ± 129 recruits h^{-1} reflects a 74% increase (from 546 ± 201 recruits h^{-1}) and is the highest recorded since 2010 (Fig. 3.6b).

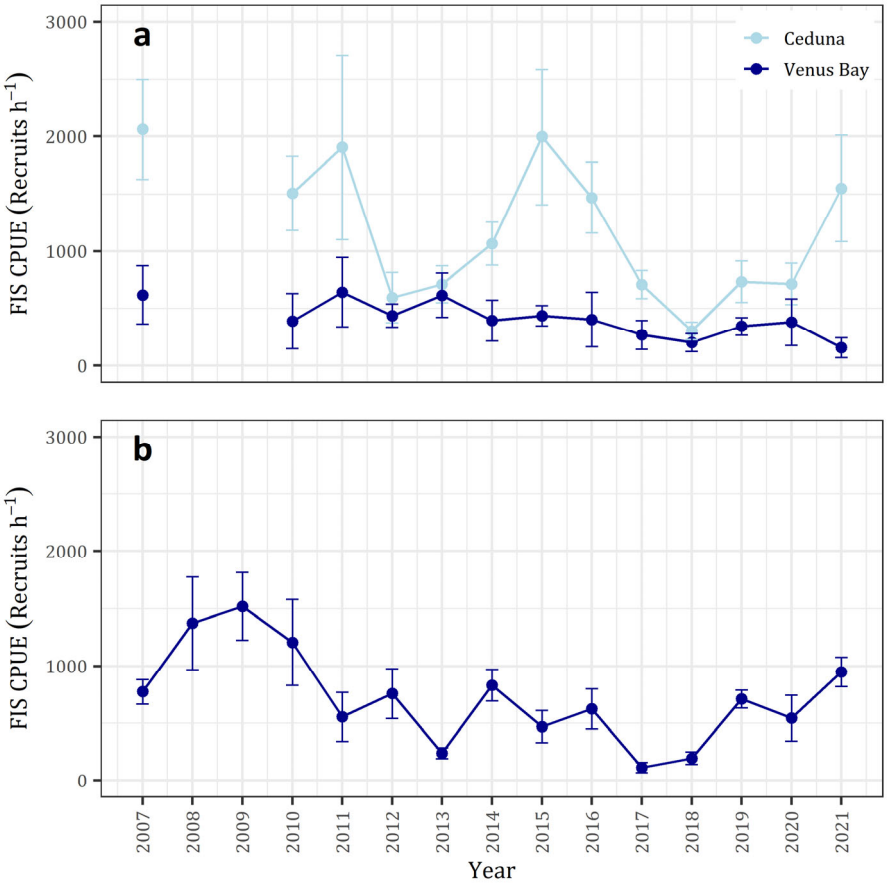

Figure 3.6. Fishery-independent survey (FIS) catch per unit effort (CPUE, mean ± SE) of newly recruited prawns for Ceduna and Venus Bay during (a) February/March and (b) June/July from 2007–2021.

4. HARVEST STRATEGY APPLICATION

4.1. Key performance indicator

The HSCPUE in 2021 was 55.7 kg h^{-1}, a reduction of 14% since 2020 (64.6 kg h^{-1}) (Fig. 4.1) and below the previous 10-year mean (74.4 ± 5.1 kg h^{-1}). The mean VBCPUE for 2021 was 41.7 ± 9.8 kg h^{-1}. This represents a 32% increase from 2020 (31.5 ± 5.2 kg h^{-1}), but was below the previous 10-year mean (60.8 ± 6.1 kg h^{-1}) (Fig. 4.1). Comparatively, VBCPUE has remained the same or greater than HSCPUE since 2004. Nevertheless, the CPUE index for 2021 was 48.7 kg h^{-1} (Fig. 4.2), a 1% increase from 2020 (48.1 kg h^{-1}), but remaining below the trigger reference point of 54 kg h^{-1}.

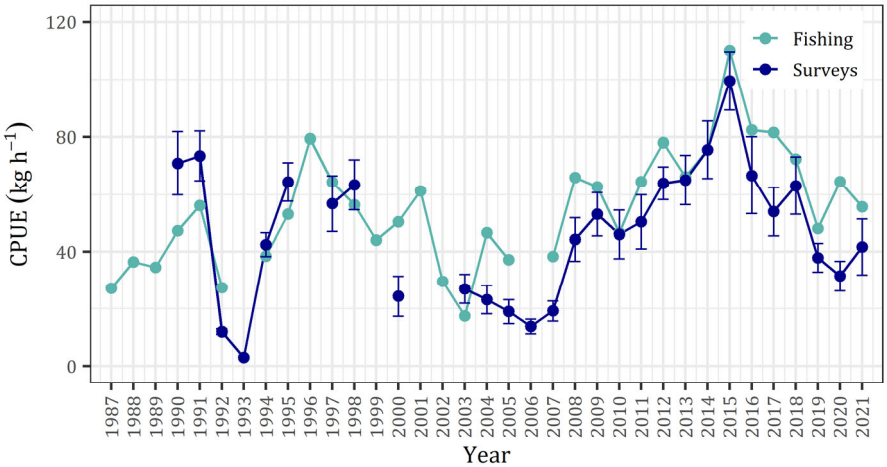

Figure 4.1. Catch per unit effort (CPUE, mean ± SE) for commercial fishing (March–September) and fishery-independent surveys in Venus Bay (February/March and June/July) from 1987–2021.

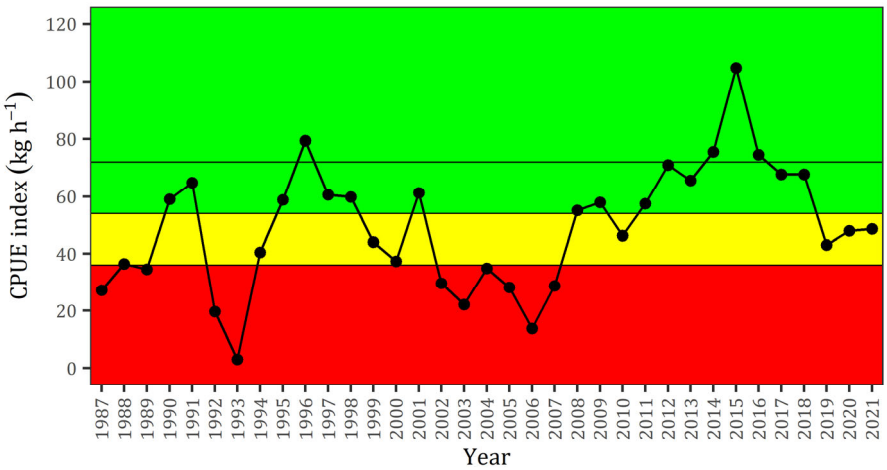

Figure 4.2. Mean catch per unit effort (CPUE) index, the performance indicator for the West Coast Prawn Fishery, from 1987–2021 relative to provisional stock status (red: 'depleted', yellow: 'transitional'; green: 'sustainable') and reference points (horizontal lines, in ascending order: limit, trigger and target reference points).

4.2. El Niño - Southern Oscillation (ENSO) status

During the assessment period (October 2019–September 2021), no months were classified as having El Niño conditions (Fig. 4.3), rather a La Niña was declared from October 2020–March 2021. The most recent El Niño event occurred from May 2015 to March 2016 and was outside of the current assessment period.

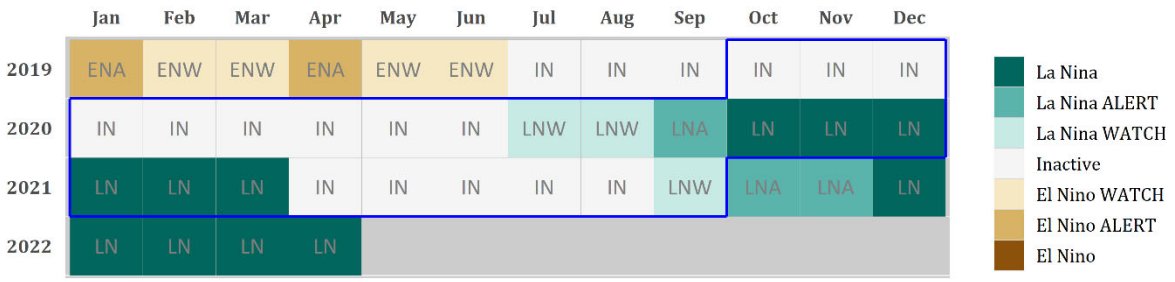

Figure 4.3. El Niño–Southern Oscillation (ENSO) monthly status from January 2019–April 2022 (BOM 2022).

5. SUMMARY

There has been little change since the previous assessment in terms of the reported reduction in prawn biomass since 2019 (Heldt and Beckmann 2021), based on the 2021 FIS and commercial CPUEs remaining below their respective previous 10-year means and the combined mean, the CPUE index, increasing by 1% since 2020. While CPUE has generally declined since 2015, there are some positive signs for the fishery. Relative to previous declining trends in CPUE—from 1991–1993 and 1996–2006—this latest decline started from a considerably higher level, which may be indicative of a larger harvestable biomass that has resulted from more conservative management arrangements (under the current harvest strategy) and lower exploitation.

While the increased proportion of small prawns and corresponding reduction in extra-large prawns of the commercial catch alone might be of some economic concern, it may indicate a disproportionately greater increase in recruits (within the 20+ size grade) relative to other size categories. The Spencer Gulf Prawn Fishery experienced a similar reduction in average prawn size in recent years; however, this was due to an overwhelming influx of newly recruited prawns to that stock, which ultimately resulted in increases in total commercial catch and CPUE in subsequent years (Noell and Hooper 2021).

Although it may take several years to know if the WCPF will experience similar benefits, the observed increase in CPUE of recruits in Ceduna during the March FIS followed by an increase in CPUE of recruits and total catch in Venus Bay in the June FIS supports the idea of recent strong recruitment and progression to Venus Bay. If these prawns persist in the main fishing grounds through the summer/autumn months, when Western King Prawns undergo the highest growth rates (Noell et al 2015), combined with ongoing reduced fishing effort (as per the harvest strategy), the next assessment (of the 2022 fishing season, due November 2022) should demonstrate an increase in stock abundance.

The current harvest strategy for the WCPF (PIRSA 2019) uses decision rules for classifying the status of the WKP stock relative to limit, trigger and target RPs defined for the key PI relating to stock abundance, the CPUE index, where commercial HSCPUE and FIS VBCPUE are averaged and equally weighted. In 2021, the HSCPUE decreased by 14% from the previous year, whereas the VBCPUE increased by 32%. Overall, this resulted in an increase in the CPUE index to 48.7 kg h^{-1} (from 48.1 kg h^{-1} in 2020) which is above the limit reference point (36 kg h^{-1}) but below the trigger reference point (54 kg h^{-1}) defined in the harvest strategy for the WCPF (PIRSA 2019).

Under these circumstances, the harvest strategy for the fishery also considers environmental conditions (ENSO status) in determining stock status. The stock was not considered to be under the influence of an El Niño event during the assessment period (October 2019–September 2021) and consequently the stock has not been identified as ‘environmentally limited’. According to the Bureau of Meteorology, the ENSO outlook remains at La Niña, with most climate models showing a return to neutral ENSO (i.e. inactive) during winter (BOM 2022) of the current (2022) fishing season.

The increase in recruitment and catch rates observed in Ceduna and Venus Bay may have been positively influenced by settlement success associated with the recent La Niña and stronger easterly

Leeuwin current (as seen for Western Rock Lobster in Western Australia; Caputi 2008). Prior to the assessment period, La Niña conditions had not occurred since 2011/12, which were followed by record high catch rates in the WCPF. Should the fishery once again experience increased catch rates (and potential recovery) following the current La Nina, then this is expected to be most evident in Venus Bay (the main fishing ground) during March and April (after peak recruitment).

Since the CPUE index was below the trigger reference point and similar to that in 2020 (48.1 kg h^{-1}) when the stock was classified as transitional-depleting, the WCPF stock classification for 2021 is retained as being 'transitional-depleting' according to the 2014 NFSRF (Flood et al 2014), which equates to **'depleting'** under the 2018 NFSRF (Stewardson et al 2018)—the third consecutive year the WCPF stock has received this classification. Under a transitional fishing strategy, the total number of fishing nights allowed for the season are reduced (relative to 'sustainable', i.e. reduced once, not successively each year 'depleting' has been retained), and no fishing is permitted in October or Ceduna at any time (PIRSA 2019).

The most pressing research need is the analysis of a revised survey design and re-calibration of reference points as part of the development of the next harvest strategy for the fishery. This work will be undertaken in 2022/23, in lieu of a status report delivery. Further, while El Niño conditions were selected as the trigger for an environmentally limited status due to historical trends (i.e. the 1991/92 and 2002/03 El Niño events) coinciding with low-catch periods for the fishery, future harvest strategy development may also benefit from investigating other potential environmental triggers such as sea level (as a proxy for Leeuwin current strength) or sea surface temperature anomalies.

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APPENDIX A. SURVEY DETAILS

Table A.1. Number of fishery-independent survey shots completed in Ceduna and Venus Bay during February/March, June/July and October/November from 1989–2021. Note: October/November surveys were discontinued in 2020. Abbreviation: -, no survey/data.

Year	Month	Ceduna	Venus Bay	Total
1989	Nov	7	19	26
1990	Feb	6	20	26
1990	Jun	6	-	6
1990	Nov	7	20	27
1991	Feb	17	20	37
1991	Jun	17	20	37
1991	Nov	16	11	27
1992	Feb	17	20	37
1992	Jun	17	20	37
1992	Jul	9	12	21
1992	Oct	16	20	36
1993	Feb	17	20	37
1993	Jun	17	20	37
1994	Jun	-	20	20
1995	Feb	-	20	20
1995	Jul	-	26	26
1997	Feb	-	22	22
1998	Mar	-	19	19
1998	Jun	-	12	12
2000	Feb	-	6	6
2003	Jul	-	14	14
2003	Oct	9	10	19
2003	Nov	7	9	16
2004	Jun	9	13	22
2004	Oct	9	11	20
2005	Feb	8	11	19
2005	Jun	-	14	14
2005	Nov	6	10	16
2006	Feb	8	11	19
2006	Jun	-	13	13
2006	Nov	7	11	18
2007	Mar	9	12	21
2007	Jun	-	9	9
2007	Nov	6	10	16
2008	Mar	7	10	17
2008	Jun	-	8	8
2008	Oct	7	10	17
2009	Mar	-	10	10
2009	Jun	-	10	10
2009	Nov	6	10	16
2010	Mar	7	10	17
2010	Jun	-	10	10
2010	Nov	6	10	16
2011	Mar	7	10	17
2011	Jul	-	10	10
2011	Nov	6	10	16
2012	Mar	6	10	16
2012	Jun	-	9	9
2012	Nov	6	9	15
2013	Mar	7	9	16
2013	Jun	-	9	9
2013	Oct	6	9	15
2014	Mar	6	9	15
2014	Jun	-	9	9
2014	Oct	-	10	10
2015	Mar	7	10	17
2015	Jun	-	10	10
2015	Nov	-	9	9
2016	Mar	12	9	21
2016	Jul	-	8	8
2016	Nov	-	9	9
2017	Mar	12	10	22
2017	Jun	-	9	9
2017	Nov	-	9	9
2018	Mar	12	9	21
2018	Jun	-	10	10
2018	Oct	-	9	9
2019	Mar	12	9	21
2019	Jun	-	10	10
2019	Nov	-	9	9
2020	Mar	12	10	22
2020	Jul	-	10	10
2021	Mar	12	10	22
2021	Jun	-	12	12

APPENDIX B. LENGTH FREQUENCY DATA

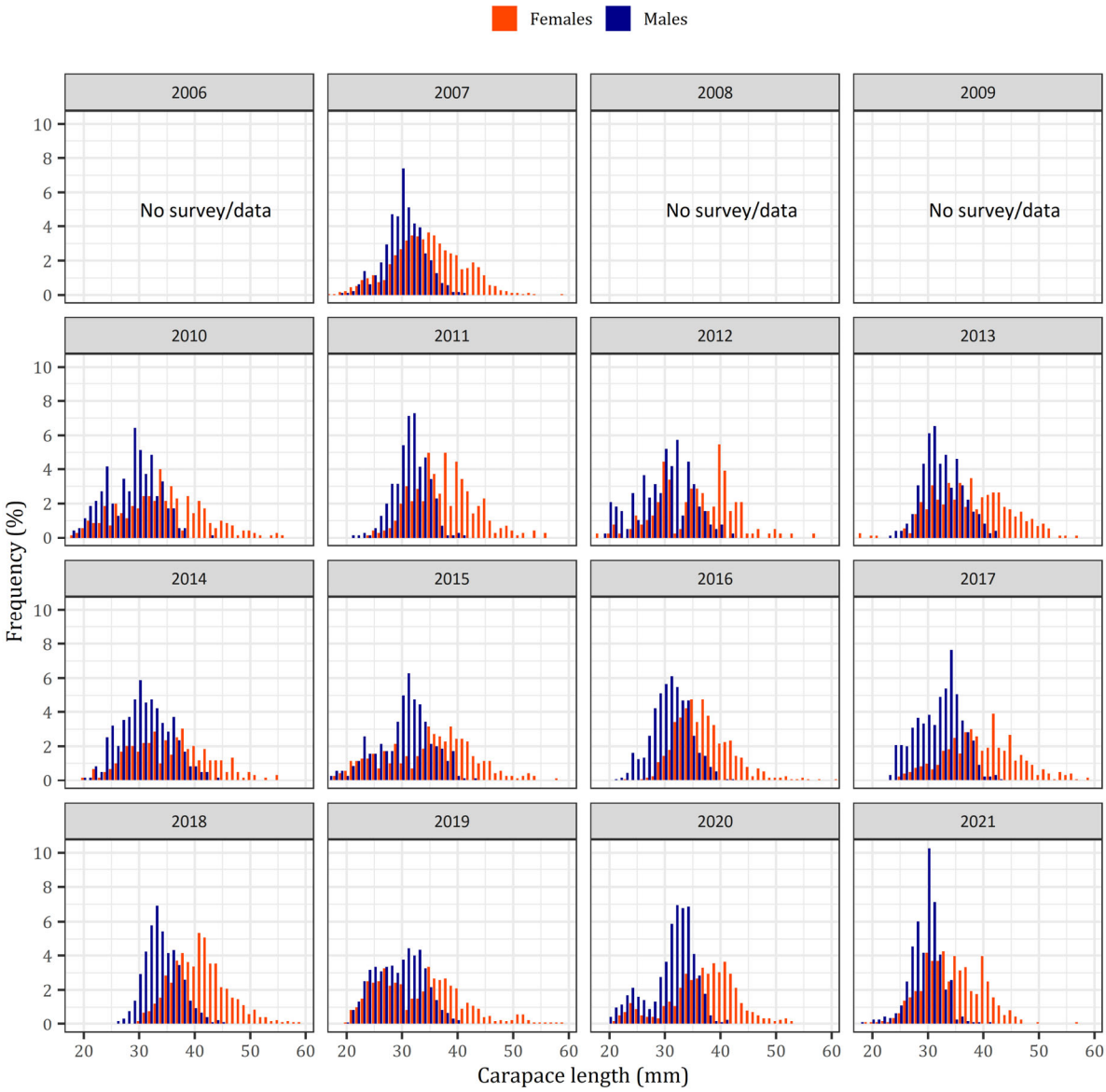

Figure B.1. Length-frequency distributions of male and female Western King Prawns from February/March fishery-independent surveys in Ceduna from 2006–2021.

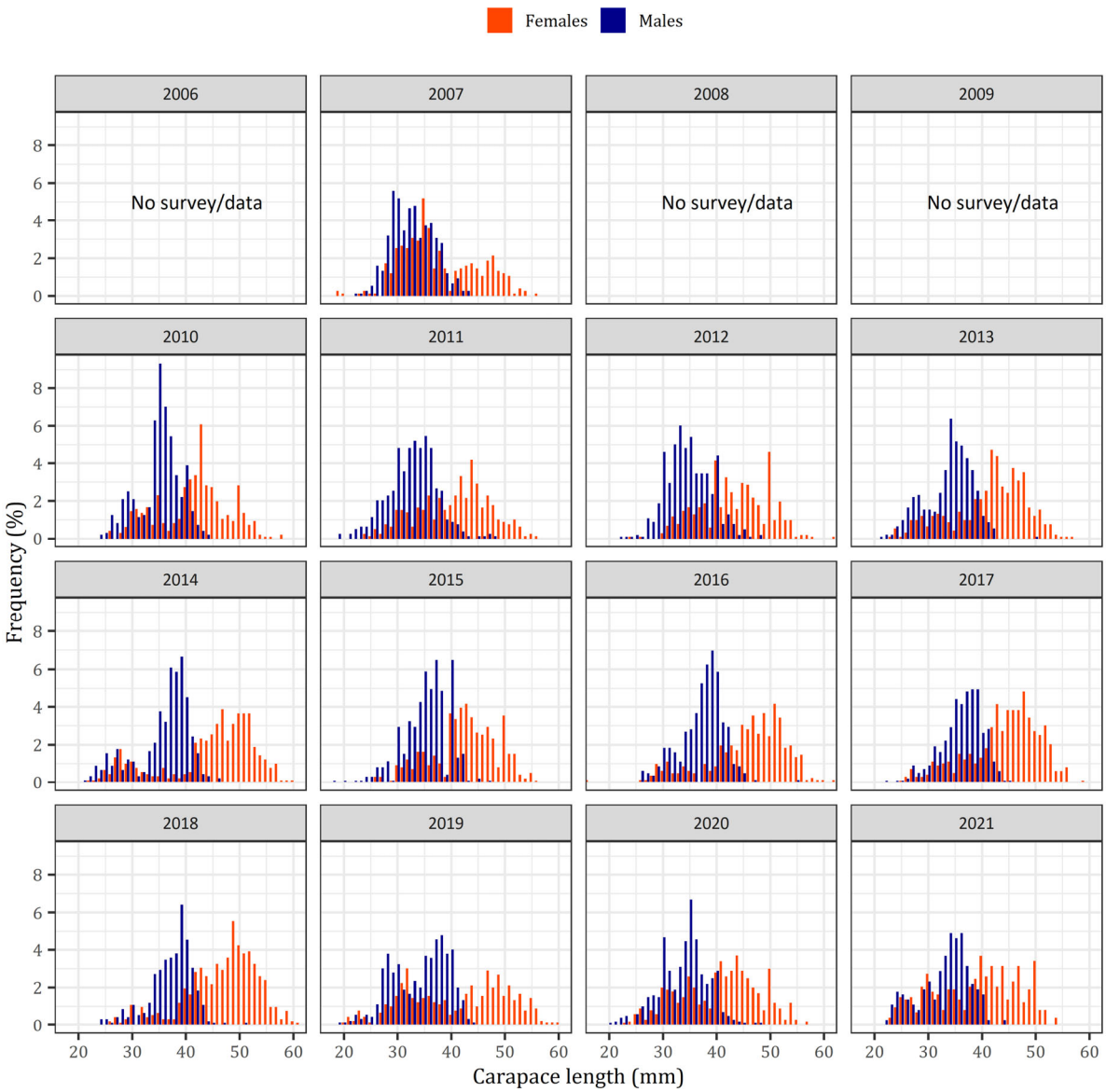

Figure B.2. Length-frequency distributions of male and female Western King Prawns from February/March fishery-independent surveys in Venus Bay from 2006–2021.

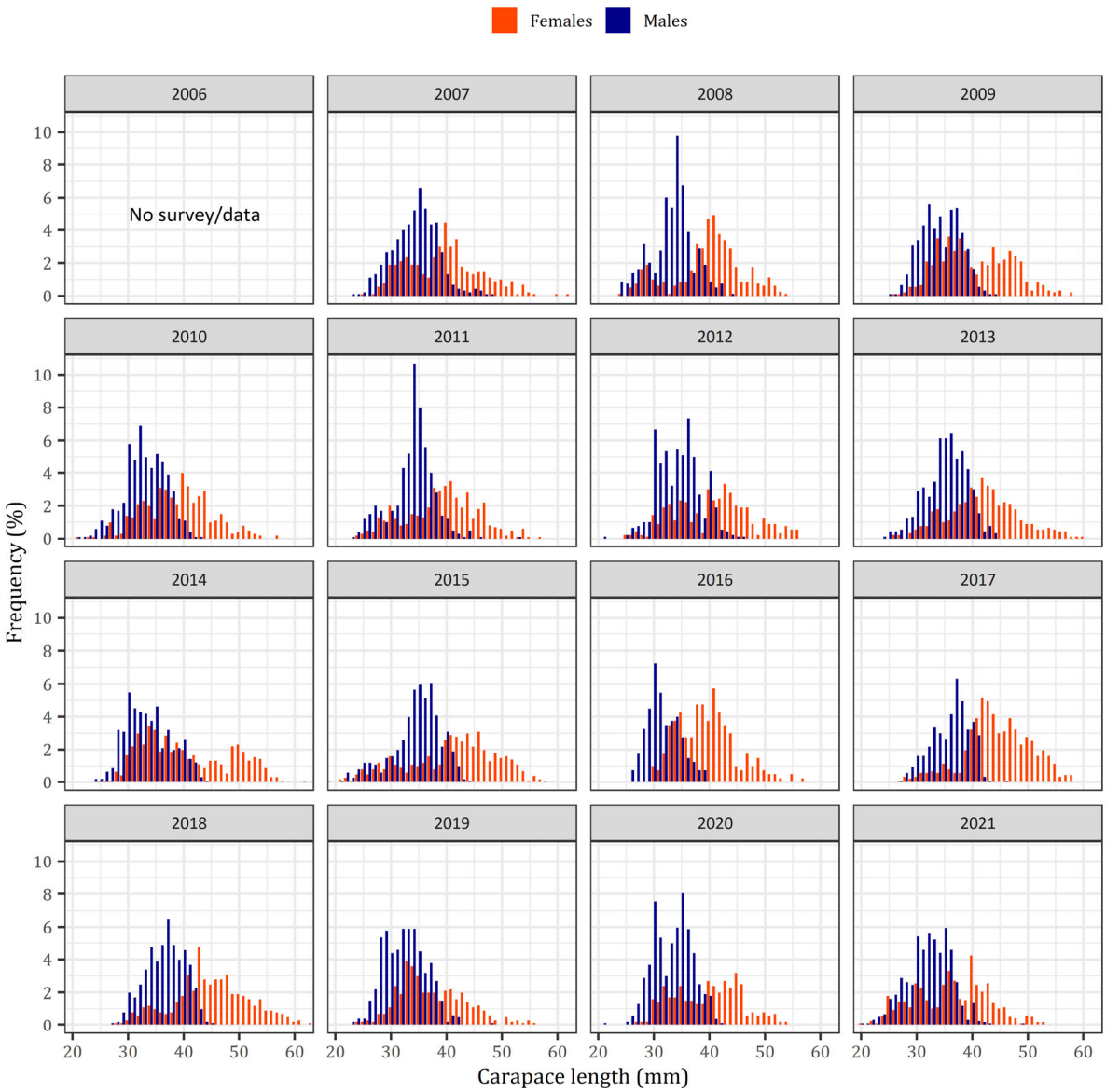

Figure B.3. Length-frequency distributions of male and female Western King Prawns from June/July fishery-independent surveys in Venus Bay from 2006–2021.

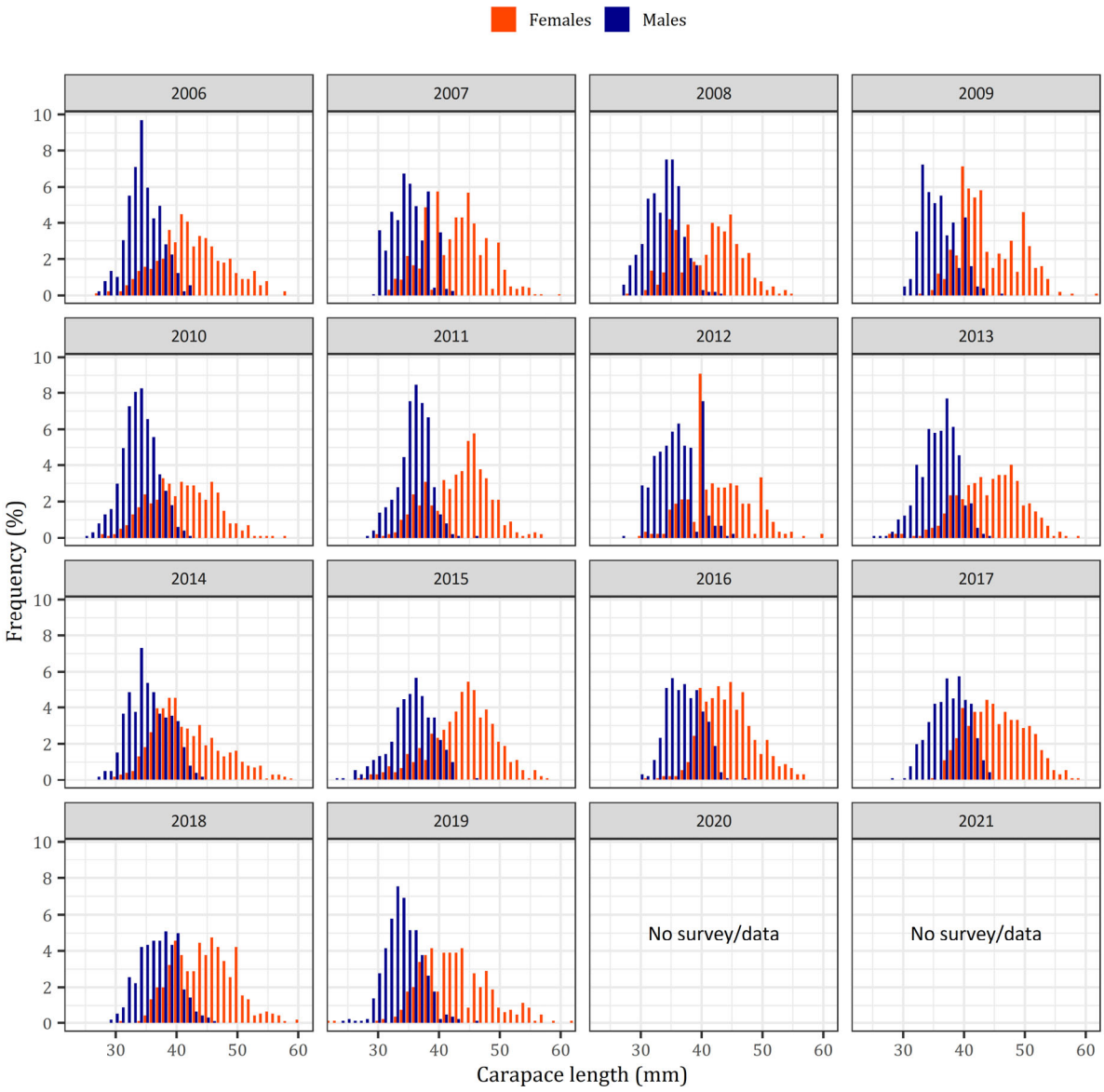

Figure B.4. Length-frequency distributions of male and female Western King Prawns from October/November fishery-independent surveys in Venus Bay from 2006–2021.

APPENDIX C. KEY DATA SUMMARY

Table C.1. Key data summary for the West Coast Prawn Fishery from 1968–2021, including total commercial catch, effort and catch per unit effort (CPUE), mean commercial CPUE from March–September (HSCPUE), mean fishery-independent survey CPUE for Venus Bay during February/March and June/July (VBCPUE), and the CPUE index (i.e. mean of HSCPUE and VBCPUE). Abbreviations: -, no fishing/survey/data.

Year	Catch (t)	Effort (h)	Effort (nights)	Total commercial CPUE (kg h^{-1})	HSCPUE (kg h^{-1})	VBCPUE (kg h^{-1})	CPUE index (kg h^{-1})
1968	8	257	-	30	-	-	-
1969	99	2800	-	35	-	-	-
1970	237	9987	-	24	-	-	-
1971	238	8345	-	28	-	-	-
1972	214	8907	-	24	-	-	-
1973	290	9276	-	31	-	-	-
1974	181	5192	-	35	-	-	-
1975	157	6081	-	26	-	-	-
1976	51	3562	-	14	-	-	-
1977	23	2605	-	9	-	-	-
1978	16	907	-	18	-	-	-
1979	33	1491	-	22	-	-	-
1980	67	2601	-	26	-	-	-
1981	108	3548	-	30	-	-	-
1982	156	4061	-	39	-	-	-
1983	216	3392	-	64	-	-	-
1984	164	3197	-	51	-	-	-
1985	94	3091	-	30	-	-	-
1986	100	3433	-	29	-	-	-
1987	42	1555	66	27	27	-	27
1988	109	3051	138	36	37	-	37
1989	114	3252	132	35	35	-	35
1990	171	3784	136	45	47	71	59
1991	180	3442	124	52	56	74	65
1992	10	426	23	23	27	12	20
1993	-	-	-	-	-	3	3
1994	57	1536	68	37	39	43	41
1995	131	2608	101	50	53	64	59
1996	216	3061	118	71	79	-	79
1997	179	3082	111	58	64	57	61
1998	142	2692	97	53	56	63	60
1999	101	2381	92	42	44	-	44
2000	108	2256	87	48	50	24	37
2001	139	2210	84	63	61	-	61
2002	31	778	35	40	30	-	30
2003	5	200	14	23	17	27	22
2004	14	356	17	38	47	23	35
2005	41	1014	38	40	37	19	28
2006	-	-	-	-	-	14	14
2007	12	294	11	40	38	19	29
2008	84	1314	50	64	66	44	55
2009	112	1857	64	60	63	53	58
2010	89	1860	65	48	47	46	46
2011	159	2335	80	68	65	51	58
2012	181	2341	81	77	78	64	71
2013	148	2128	73	70	66	65	66

Continued.

Year	Catch (t)	Effort (h)	Effort (nights)	Total commercial CPUE (kg h^{-1})	HSCPUE (kg h^{-1})	VBCPUE (kg h^{-1})	Mean CPUE index (kg h^{-1})
2014	146	1876	63	78	76	76	76
2015	191	1875	63	102	110	100	105
2016	163	2039	70	80	82	67	75
2017	162	2099	69	77	82	54	68
2018	116	1778	58	65	72	63	68
2019	84	1668	53	50	48	38	43
2020	65	984	36	66	65	32	48
2021	68	1238	43	55	56	42	49