Fisheries

Stock Status Report for the West Coast Prawn (*Penaeus* (*Melicertus*) *latisulcatus*) Fishery in 2020

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Report to PIRSA Fisheries and Aquaculture

Government of South Australia
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SARDI
SOUTH AUSTRALIAN RESEARCH AND DEVELOPMENT INSTITUTE

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EXECUTIVE SUMMARY

This report assesses the status of the Western King Prawn (*Penaeus (Melicertus) latisulcatus*) stock in South Australia's West Coast Prawn Fishery (WCPF) in 2020 and provides the latest estimates of the biological performance indicators (PIs), information in context of the reference points (RPs) and stock status classification described in the Management Plan for the fishery. 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 2020, 65 t was harvested by the WCPF. This was a 23% decrease compared to 2019 (84 t) and the lowest annual catch since 2007 (12 t). In 2020, most of the catch was harvested from Venus Bay (49 t), followed by Coffin Bay (16 t). Fishery-wide effort declined by 41% from 1,668 hours (53 nights) in 2019 to 984 hours (36 nights) in 2020. Annual fishery-wide commercial catch per unit effort (CPUE) had been declining between 2015 and 2019 but increased to 66 $kg.h^{-1}$ in 2020. This was a 32% increase compared to 2019 (50 $kg.h^{-1}$) and the highest value recorded since 2017 (77 $kg.h^{-1}$).

In March 2020, the fishery independent survey (FIS) CPUE in Venus Bay was 30 ± 10 $kg.h^{-1}$, which was 7% higher than 2019 (28 ± 5 $kg.h^{-1}$). In Ceduna, the FIS CPUE during March 2020 was 32 ± 6 $kg.h^{-1}$, which was a 78% increase compared to 2019 (18 ± 2 $kg.h^{-1}$). However, the June FIS CPUE in Venus Bay decreased by 28% from 46 ± 10 $kg.h^{-1}$ in 2019 to 33 ± 5 $kg.h^{-1}$ in 2020. This estimate was the lowest recorded in June since 2016 (39 ± 3 $kg.h^{-1}$). The number of recruits sampled in the FIS in March 2020 from the key recruitment area off Ceduna was similar to that measured in March 2019 (2020: 715 ± 181 recruits.h^{-1}; 019: 734 ± 181 recruits.h^{-1}) and was the fourth lowest March estimate recorded since 2007.

In summary, the fishery-wide reduction in prawn abundance reported in the 2019 stock status report remains in 2020 as evidenced by:

1) 2020 FIS CPUE and commercial CPUE remaining relatively low and well below the 10-year mean. Despite increasing March FIS CPUE in Venus Bay and Ceduna, June FIS CPUE further declined in 2020.
2) Minimal change between the prawn stock size-structure between 2019 and 2020.
3) Relatively low estimates of recruitment since 2015.

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 limit RPs defined for the key PI relating to stock abundance - average catch rate. Average catch rate, where commercial

HSCPUE and VBCPUE from FISs are averaged and equally weighted, has declined steadily from 2015 to 2019 (43 kg.h^{-1}) but has increased by 12% to 48 kg.h^{-1} in 2020. This was above the limit RP (36 kg.h^{-1}) and below the trigger RP (54 kg.h^{-1}) defined for this PI. Using the decision matrix in the Harvest Strategy for the WCPF, the status of the stock is classified as '**Transitional-depleting'** (equates to **Depleting** in the 2018 NFSRF; Stewardson *et al*. 2018). This is the second consecutive year the WCPF stock has been classified as 'depleting'.

Table 1 Key statistics for the WCPF from 2017–2020

Indicator	2017	2018	2019	2020
Catch	162 t	116 t	84 t	65 t
Effort	2,099 hours (69 nights)	1,778 hours (58 nights)	1,668 hours (53 nights)	984 hours (36 nights)
Annual commercial HSCPUE	77 kg.h^{-1} (82 kg.h^{-1})	65 kg.h^{-1} (72 kg.h^{-1})	50 kg.h^{-1} (48 kg.h^{-1})	66 kg.h^{-1} (65 kg.h^{-1})
VBCPUE	54 kg.h^{-1}	63 kg.h^{-1}	38 kg.h^{-1}	32 kg.h^{-1}
Average catch rate index	68 kg.h^{-1}	68 kg.h^{-1}	43 kg.h^{-1}	48 kg.h^{-1}
Stock status classification	Sustainable*	Sustainable	Depleting	Depleting

Note- Average catch rate is considered a proxy for total prawn abundance and is used as a key PI to manage the fishery. This PI is the average of two key indicators; (1) nominal commercial catch per unit effort (HSCPUE) from at least three months of commercial fishing between March – September; and (2) FIS CPUE (VBCPUE) measured from the March and June surveys undertaken in Venus Bay. *Weight of evidence assessment conducted in 2017.

Keywords: Western King Prawn, harvest strategy, stock status, catch per unit effort (CPUE).

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) (Beckmann and Hooper 2020) 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 coastal waters of the eastern Great Australian Bight (Figure 1.1). This report presents data from 1968 to the end of the 2020 calendar year. The aim of the report is to provide a synopsis of information available for the WCPF and assess the status of the WKP stock in relation to the harvest strategy for the fishery (PIRSA 2019).

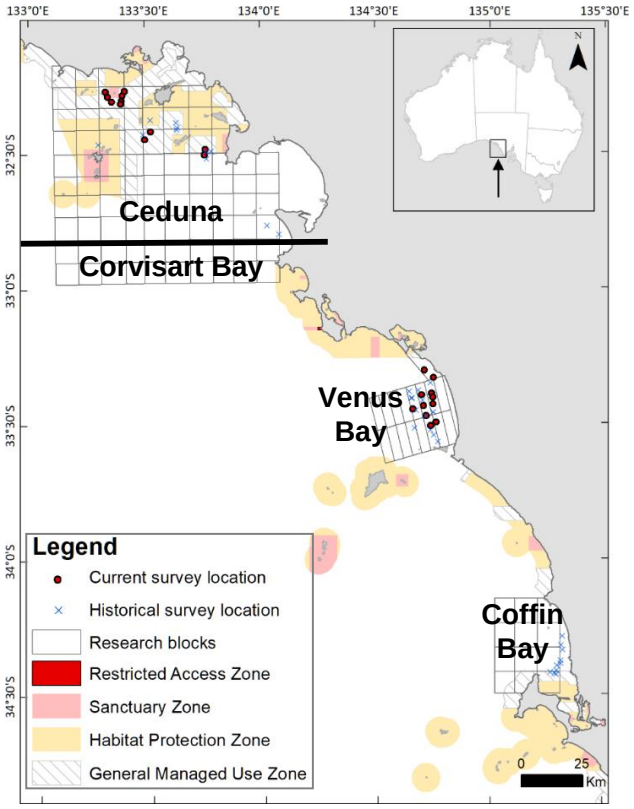


Figure 1.1 West Coast Prawn Fishery regions, restrictions, current and historic survey shot locations. Grids represent research blocks, dark line represents boundary between the Ceduna and Corvisart bay region.

1.2. Stock status classification and management arrangements

This report assesses the current status of the WKP resource in relation to reference points (RPs) defined for the key biological performance indicators (PIs) in the harvest strategy for the fishery. After the development of the harvest strategy and stock status classification decision rules (Figure 1.2), the terminology for stock status was updated (Table 1.1). The 2020 stock status for WKP is assessed under the updated terminology. Stock status determination within the harvest strategy is consistent with the National Fishery Status Reporting Framework (NFSRF), which is used to determine the status of all fish stocks in South Australia (Flood *et al.* 2014, Stewardson *et al*. 2016; Stewardson *et al*. 2018) (Table 1.1).

The harvest strategy for the WCPF outlines the PIs, RPs and management arrangements in place for the WCPF (PIRSA 2019). Average catch rate is considered a proxy for total prawn abundance and is used as a key PI to manage the fishery. This PI is the average of two key indicators; (1) HSCPUE, or nominal commercial catch per unit effort, used in the harvest strategy, (from at least three months of commercial fishing between March – September; and (2) VBCPUE, or Fishery Independent Survey (FIS) CPUE measured from the March and June surveys undertaken in Venus Bay.

The WCPF harvest strategy provides guidance on the assessment of stock status and decision rules relative to target, trigger and limit RPs (Figure 1.2). When the average catch rate is above the trigger RP, the status of the WKP stock is considered sustainable. When the average catch rate is between the trigger RP and limit RP, the relative biomass of WKP is considered to be transitional (equivalent to depleting or recovering under the NFSRF), and decision rules, that outline maximum number of fishing nights and fishing areas for each month, are in place to prevent the stock from becoming recruitment impaired or to promote stock recovery where recruitment impairment has occurred. When average catch rate is below the limit RP, the fishery is considered to be overfished (equivalent to depleted).

Data relating to ENSO are also considered when assessing stock status since the abundance and distribution of WKP in the WCPF may be influenced by environmental drivers such as the El Niño-Southern Oscillation (ENSO) (Carrick and Ostendorf 2005; Carrick 2008). Under the harvest strategy, the fishery is considered to be influenced 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; Middleton and Bye, 2007) when the Bureau of Meteorology classes three or more consecutive months of the 24

months prior to 30 September in the fishing season as El Niño. If the average catch rate is below the trigger RP in an El Nino period, which are characterised by times of reduced fishery performance, alternative decision rules are used to manage the fishery (PIRSA 2019). In the first year of an El Nino event, the harvest strategy uses the previous year's management arrangements with a few additional exceptions, and for two or more consecutive years of an event, management arrangements follow decision rules related to the relevant classification of Transitional or Overfished.

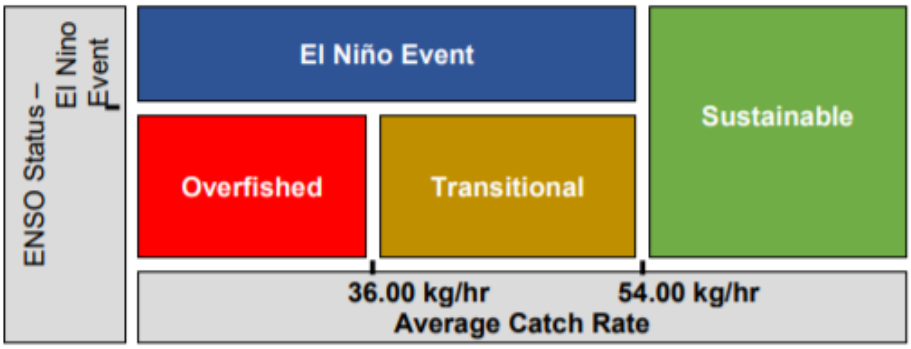


Figure 1.2 Stock status classification decision rules for the West Coast Prawn Fishery (PIRSA 2019).

Table 1.1 Stock status terminology (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

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. FIS's using industry vessels with SARDI observers have been undertaken in most years since 1989 (Appendix A), with surveys from 2003 having a greater consistency in shot locations and sample sizes. Pre-determined trawl shots (Figure 1.1) are sampled for 30 minutes and data is collected for each shot location including the total catch, catch of small prawns (20+ grade), number of nets used, trawl duration, tide direction, and number of prawns in a 7 kg bucket (bucket count). Nominal average CPUE is estimated and presented by region and survey period. In addition, a random sample of 100 prawns from each shot is sampled, and these data are used to obtain estimates of recruitment and length-frequency information (see Appendix B).

FIS CPUE was calculated as the average CPUE (± standard error, SE) across shots sampled during February/March, June/July and October/November in each region. The mean CPUE (± SE) of recruits per trawl-hour was determined for surveys conducted in Venus Bay from 2006-2020 and Ceduna from 2007-2020. 'Recruits' are defined for this purpose as prawns ≤ 32 mm CL for males ≤ 35 mm CL for females. Recruit CPUEs were scaled according to total catch and sample weight. Where sample weight data were unavailable, the length-weight relationship developed for the Spencer Gulf Prawn Fishery (Noell and Hooper, 2019) was used to estimate the total weight based on individual prawn measurements.

The 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 (see Appendix C) and by region. Temporal patterns in catch are also presented for the WCPF during early spawning (November–December), late spawning (January–March) and non-spawning (April–October). Prawn grade data from commercial fishing nights has been summarised into five categories (Table 2.1) and is presented as a percentage of the total catch.

The outputs provided for average catch rate index, the primary PI in the harvest strategy are (1) HSCPUE which is the nominal commercial CPUE (at least three months of commercial fishing between March – September), (2) VBCPUE which is the average (± SE) FIS CPUE from March and June surveys conducted in Venus Bay. The average catch rate index is the average of (1) and (2). The ENSO outlook status is also presented. An "El Niño event" classification may be

given 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).

Table 2.1 Categories assigned to reported prawn grades from commercial logbook data for the West Coast Prawn Fishery. The grade is determined from the number of prawns to the pound (e.g. 'U10' = under 10 prawns per pound.

Prawn Grade	**Categories in Logbook**
Extra Large	U6, U8, U10
Large	U12, 10/15, 10/20 (50%), 12/18 (50%)
Medium	15/20, 16/20, 10/20 (50%), 12/18 (50%)
Small	19/25, 20/30, 20+, 21/25, 25/35, 26+, 30+, S
Soft & Broken	B and D, ERR, S/B

3. RESULTS

3.1. Commercial catch and effort

Catch

In 2020, the total fishery-wide harvest was 65 t. This was a 23% decrease compared to 2019 (84 t), the lowest annual catch since 2007 (12 t), and below the previous 10-year mean (144 ± 12 t; Figure 3.1a). During the 2020 season, 74% of the total catch (49 t) was harvested during the non-spawning period (April-October), 25% (16 t) during the late spawning period (January–March), and 1% (1 t) during the early spawning period (November–December; Figure 3.2).

The largest proportion of the catch in 2020 was harvested from Venus Bay (49 t) (Figure 3.3a). However, catch in Venus Bay decreased by 31% since 2019 (71 t) and was the lowest recorded since 2007 (12 t). The remaining catch in 2020 was harvested from Coffin Bay (16 t), which increased 23% since 2019 (13 t; Figure 3.3b) and was the highest recorded since 2014 (29 t), but below the 10-year mean (19 ± 4 t). Historically, catch harvested from Corvisart Bay (≤34 t; Figure 3.3c) and Ceduna (<45 t since 1998) have been relatively low. There was no catch reported from 2019–2020 in Corvisart Bay and from 2009–2020 in Ceduna (Figure 3.3d).

Effort

Fishery-wide effort declined 41% from 1,668 hours (53 nights) in 2019 to 984 hours (36 nights) in 2020. Effort in 2020 was well below the 10-year mean (2,000 ± 72 hours; Figure 3.1a). In Venus Bay effort decreased by 49% from 1,488 hours (46 nights) in 2019 to 754 hours (26 nights) in 2020 (Figure 3.3a). In 2020, 229 hours (11 nights) were fished in Coffin Bay, an increase of 27% since 2019 (180 hours over 8 nights; Figure 3.3b). In 2020, there was no fishing in April, which was due to market prices being impacted by COVID-19 (April 10-year average = 281 hours). Since 2000, effort levels in Corvisart Bay have been relatively low (≤ 217 hours or 10 nights (Figure 3.3 c), and in Ceduna, low levels of effort have been reported since 2002 (≤ 350 hours or 16 nights). No effort was reported from Corvisart Bay in 2019-2020 and from Ceduna in 2009–2020 (Figure 3.3d).

CPUE

CPUE declined from 2015 to 2019 and increased to 66 $kg.h^{-1}$ in 2020, reflecting a 32% increase since 2019 (50 $kg.h^{-1}$) (Figure 3.1b). Prior to 2020, a serial decline in fishery-wide annual commercial CPUE was observed from 2015 (102 $kg.h^{-1}$) to 2019 (50 $kg.h^{-1}$). In 2020, CPUE was below the 10-year mean (72 ± 5 $kg.h^{-1}$).

In Venus Bay, annual commercial CPUE in 2020 was 65 kg.h^{-1}, a 35% increase compared to 2019 (48 kg.h^{-1}) but still below the 10-year mean (72 ± 6 kg.h^{-1}; Figure 3.3a). In 2020, the annual commercial CPUE in Coffin Bay was 70 kg.h^{-1}, which was consistent with 2019 and above the 10-year mean (66 ± 6 kg.h$^{-1;}$ Figure 3.3b). Historically, CPUE from Corvisart Bay (range: 4–74 kg.h$^{-1,}$ Figure 3.3c) and Ceduna (range: 16–57 kg.h$^{-1,}$ Figure 3.3d) has been highly variable, with low levels of catch influencing the reliability of CPUE estimates since the 2000's. Fishing was not reported in Corvisart Bay from 2019–2020 or in Ceduna from 2009–2020, and the last recorded CPUE values were 13 kg.h^{-1}and 35 kg.h^{-1}, respectively.

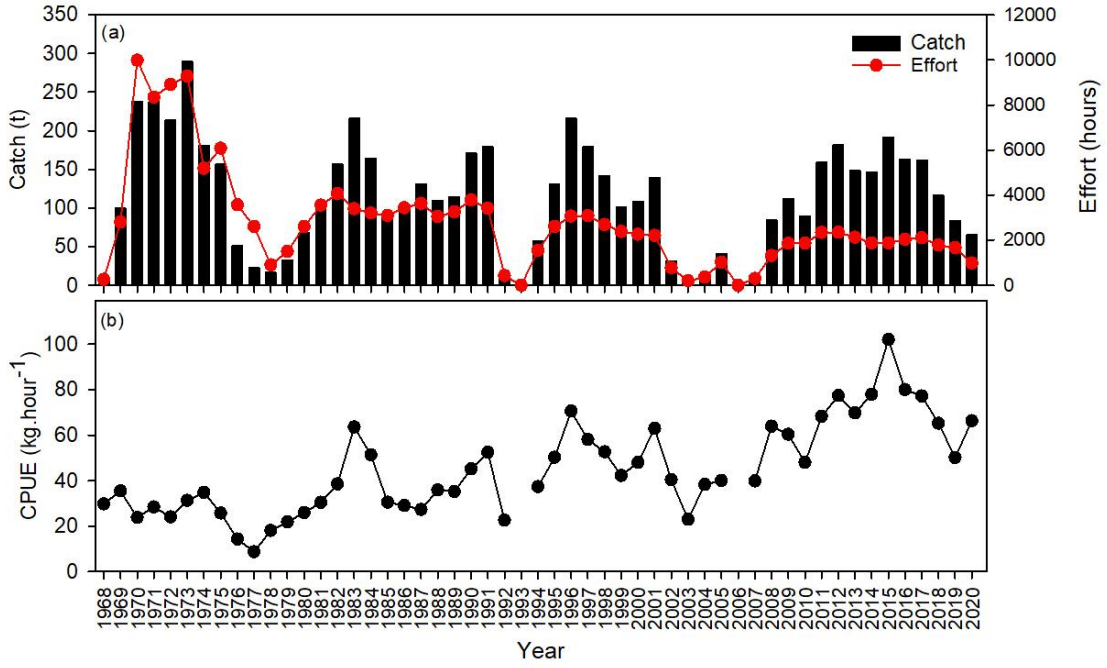


Figure 3.1 Annual (a) catch (t) and effort (hours); and (b) nominal commercial catch per unit effort (CPUE, $kg.h^{-1}$) for the West Coast Prawn Fishery from 1968–2020.

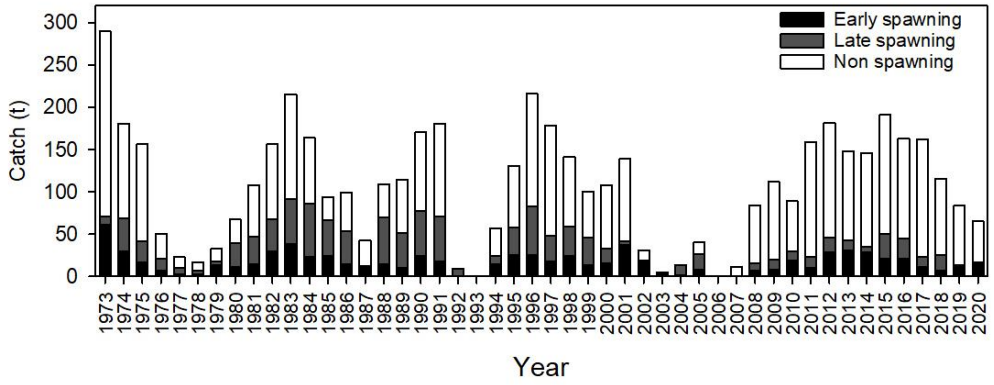


Figure 3.2 Annual catch (tonnes) during: early spawning (November–December), late spawning (January–March); and non-spawning (April–October) periods for the West Coast Prawn Fishery from 1973–2020.

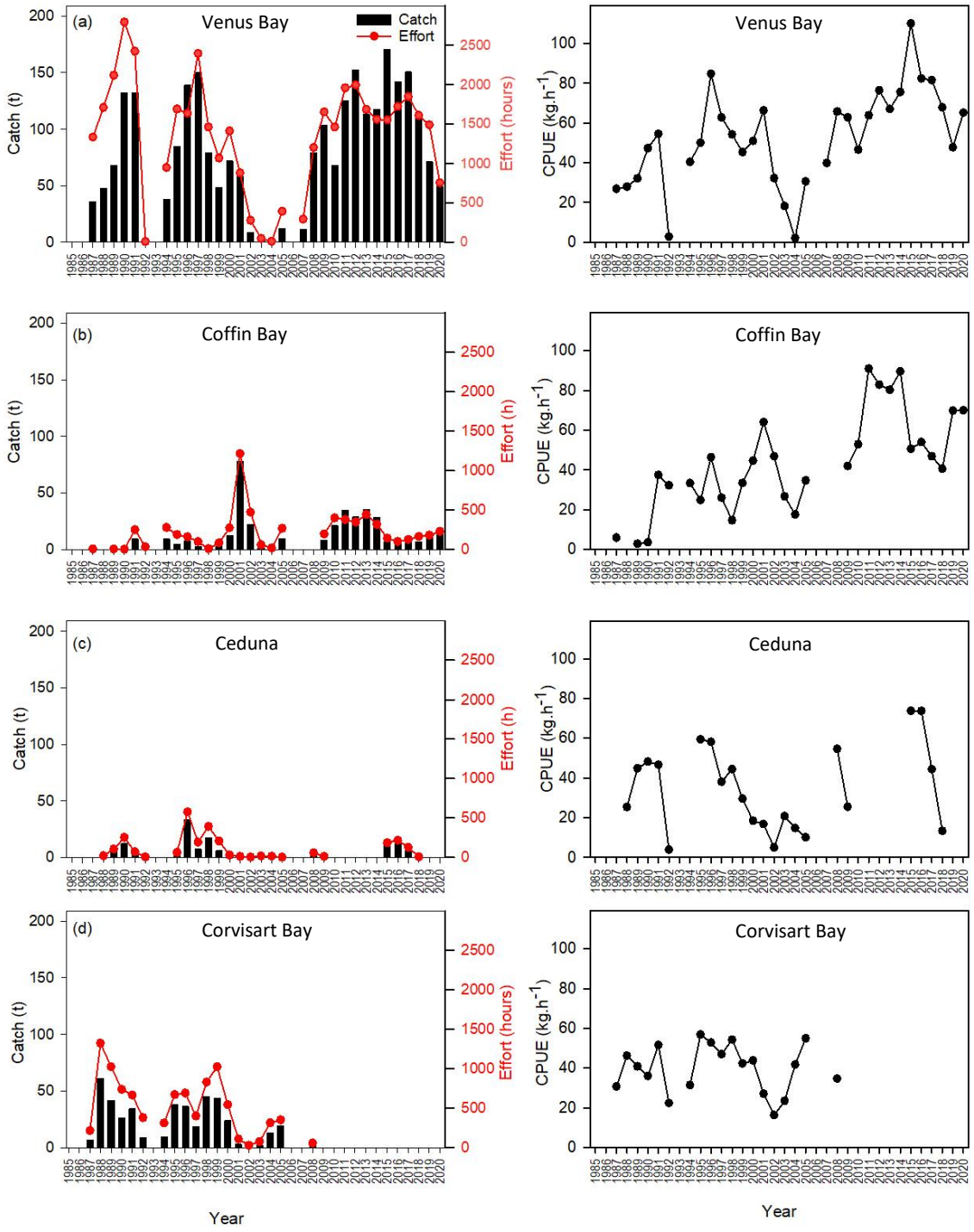


Figure 3.3 Annual catch (tonnes), effort (hours), and nominal commercial catch per unit effort (CPUE, kg.h^{-1}) for the (a) Venus Bay, (b) Coffin Bay, (c) Ceduna and (d) Corvisart Bay regions of the West Coast Prawn Fishery. Note that low levels of catch and effort in Coffin Bay, Corvisart Bay and Ceduna may influence the reliability of CPUE estimates in these regions.

Prawn Size

In 2020, the reported size-grade composition was evenly spread with the catch comprising 24% extra-large prawns, 23% small prawns, 24% medium prawns and 26% large prawns (Figure 3.4). Similar to previous years, a small amount of soft and broken prawns was reported (3%). For each size-grade, the percentage of prawns reported in the catch was similar between 2019 and 2020. For example, the percentage of large prawns increased slightly from 23% in 2019 to 26% in 2020, while the percentage of extra-large prawns decreased slightly from 25% to 24%. Overall, small prawns comprised an increased proportion of the catch in 2019 (25%) and 2020 (23%) compared to previous years (2011-2018, range of 11-18%). This increase corresponded with lower catch of XL prawns in 2019 (25%) and 2020 (24%) compared to previous years (2015-2018, range of 30-37%). In 2020, only the percentage of large (26%) and small (23%) prawns was above the 10-year average (24 ± 1% and 16 ± 2%, respectively).

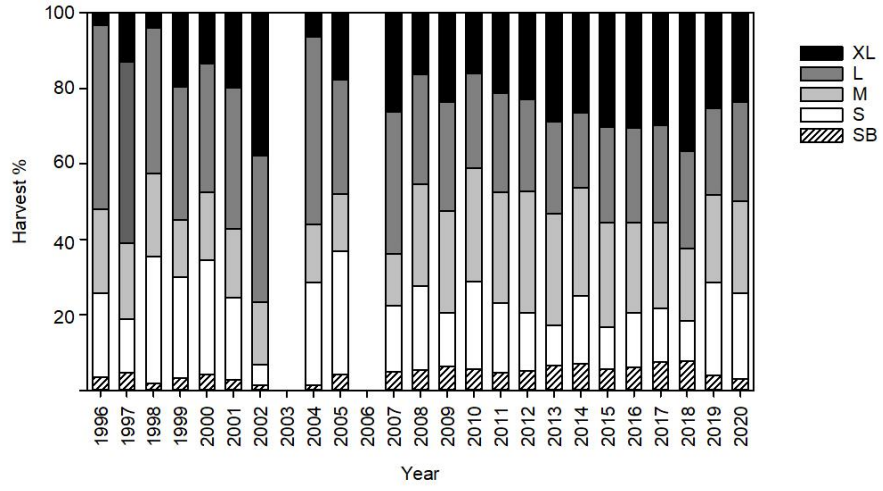


Figure 3.4 Size grade composition (%) of annual harvests in the West Coast Prawn Fishery from 1996–2020. Size grades included extra-large (XL), large (L), medium (M), small (S) and soft and broken (SB) prawns.

3.2. Fishery-independent surveys

CPUE

The average Venus Bay FIS CPUE in March 2020 was 30 ± 10 kg.h^{-1}. This was 7% higher than the 2019 estimate of 28 ± 5 kg.h^{-1}, the fourth lowest VBCPUE observed in March since the low in 2006 (9 ± 4 kg.h^{-1}), and lower than the 10-year mean (65 ± 5 kg.h^{-1}).

In Venus Bay, the estimate of FIS CPUE increased by 10% from 30 ± 10 kg.h^{-1} in March 2020 to 33 ± 5 kg.h^{-1} in June 2020. The June 2020 estimate of FIS CPUE was 28% lower than the June 2019 estimate of 46 ± 8 kg.h^{-1} and was the lowest recorded since 2007 (32 ± 3 kg.h^{-1}).

In Ceduna, an estimate of 32 ± 6 kg.h^{-1} FIS CPUE was recorded during March 2020, which was a 78% increase compared to 2019 (18 ± 2 kg.h^{-1}) but was the fourth lowest estimate of March FIS CPUE on record since 2005 and below the 10-year mean (47 ± 4 kg.h^{-1}).

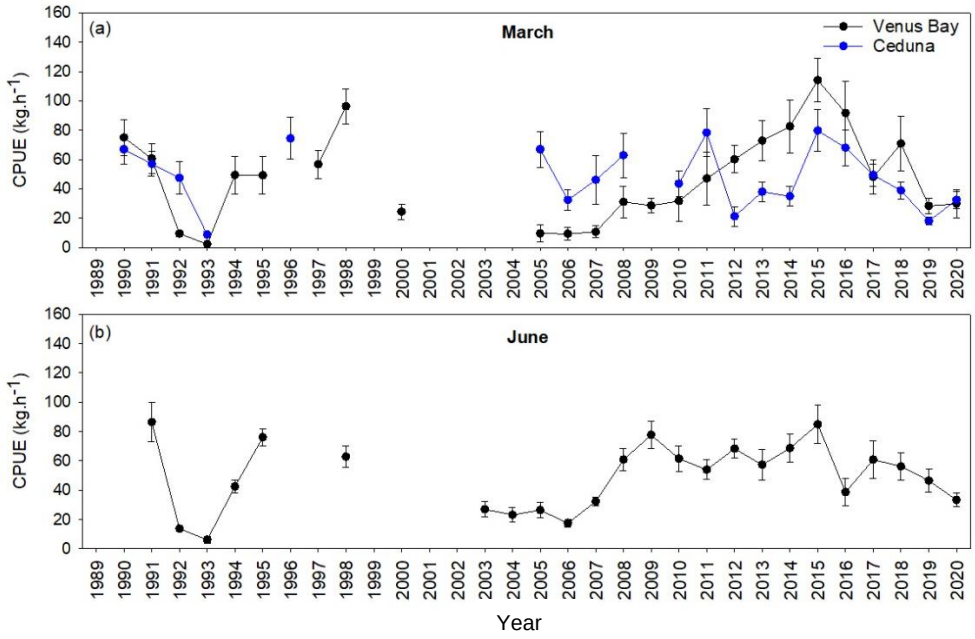


Figure 3.5 Average (± SE) fishery-independent survey CPUE (kg.h^{-1}) during (a) March and (b) June for Venus Bay (black line) and Ceduna (blue line) from 1989–2020.

Recruitment

In March 2020, the FIS CPUE of recruits in Ceduna was 715 ± 181 recruits.h^{-1}, which was a 3% decrease since 2019 (734 ± 181 recruits.h^{-1}). The CPUE of recruits in Ceduna was the second highest recorded since the low in 2018 (304 ± 265 recruits.h^{-1}) and the fourth lowest on record (Figure 3.6a).

During 2020, the recruit CPUE for Venus Bay was highest in June at 546 ± 201 recruits.h^{-1} (Figure 3.6b). This was 24% lower than the March CPUE in Ceduna (715 ± 181 recruits.h^{-1}), which typically shows the highest levels across all regions and surveys. The FIS CPUE of recruits recorded in Venus Bay June 2020 decreased by 23% compared to 2019 (712 ± 77 recruits.h^{-1}) and was the sixth lowest estimate on record.

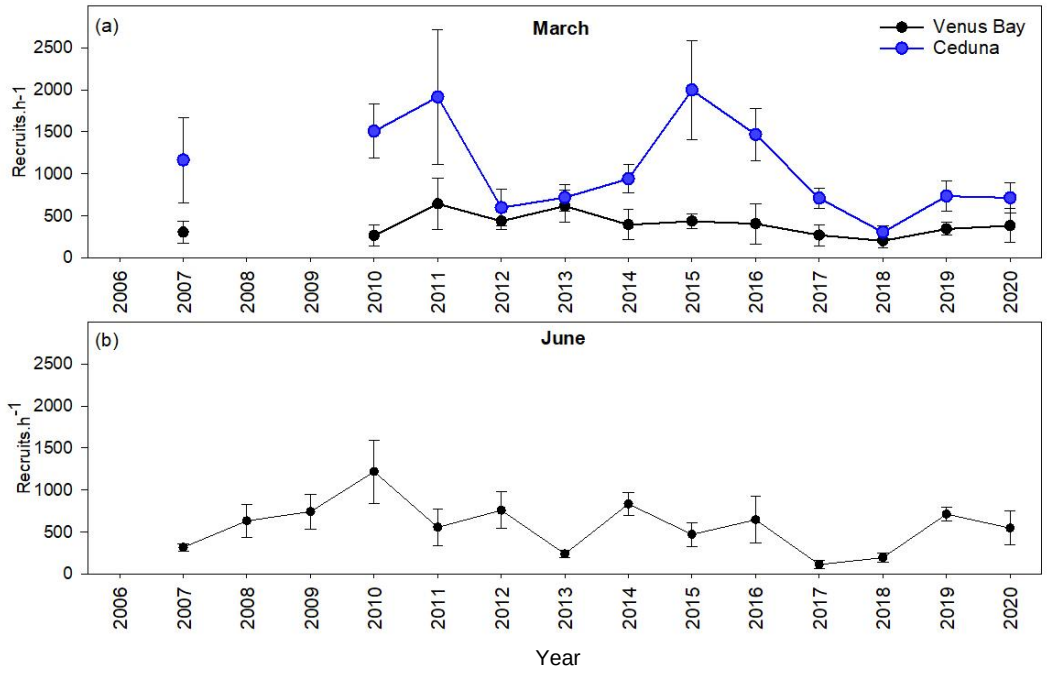


Figure 3.6 Average (± SE) fishery-independent survey CPUE of recruits (recruits.h^{-1}) during (a) March and (b) June for the Venus Bay (black line) and Ceduna (blue line) from 2006–2020.

4. HARVEST STRATEGY

4.1. Average catch rate

Commercial catch and effort data were available for 5 months between March and September 2020. The total catch during this period was 49 t, which is 28% lower than the 2019 catch of 68 t. The total effort in the WCPF between March and September 2020 was 762 trawl hours, which was 46% less than that recorded in 2019 (1,407 trawl hours). In 2020, the estimate of commercial HSCPUE was 65 kg.h^{-1}, an increase of 35% from 2019 (48 kg.h^{-1}) (Figure 4.1).

In 2020, average VBCPUE (March and June combined) was 32 ± 5 kg.h^{-1} (Figure 4.1). This represents a 16% decrease from 2019 (38 ± 5 kg.h^{-1}) and is the second lowest estimate of average VBCPUE (March and June combined) since the most recent low in 2006 (14 ± 3 kg.h^{-1}).

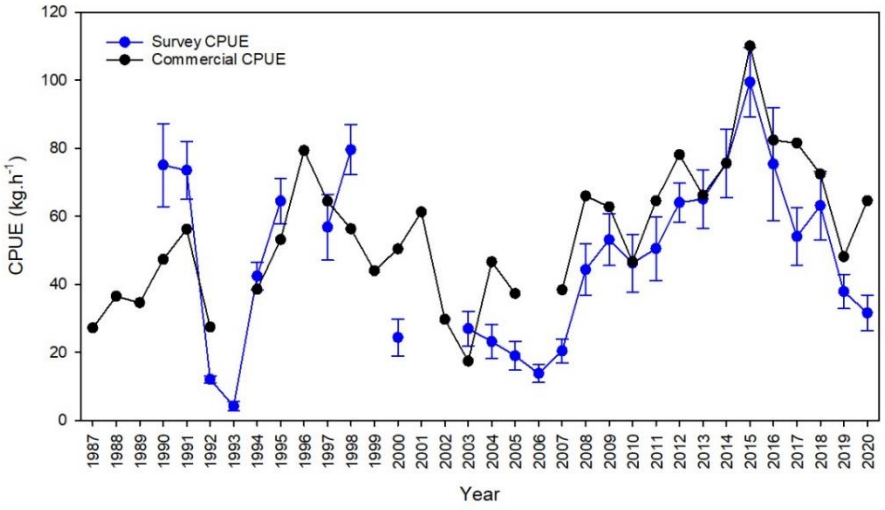


Figure 4.1 Average fishery-independent survey VBCPUE (March and June) and commercial HSCPUE (March-September) from 1987-2020.

In 2020, the average catch rate, estimated from nominal commercial HSCPUE recorded between March and September, and VBCPUE from the March and June surveys, was 48 kg.h^{-1} (Figure 4.2). This estimate represents a 12% increase in average catch rate from 2019 (43 kg.h^{-1}) but remains below the Trigger Reference Point of 54 kg.h^{-1} for this PI.

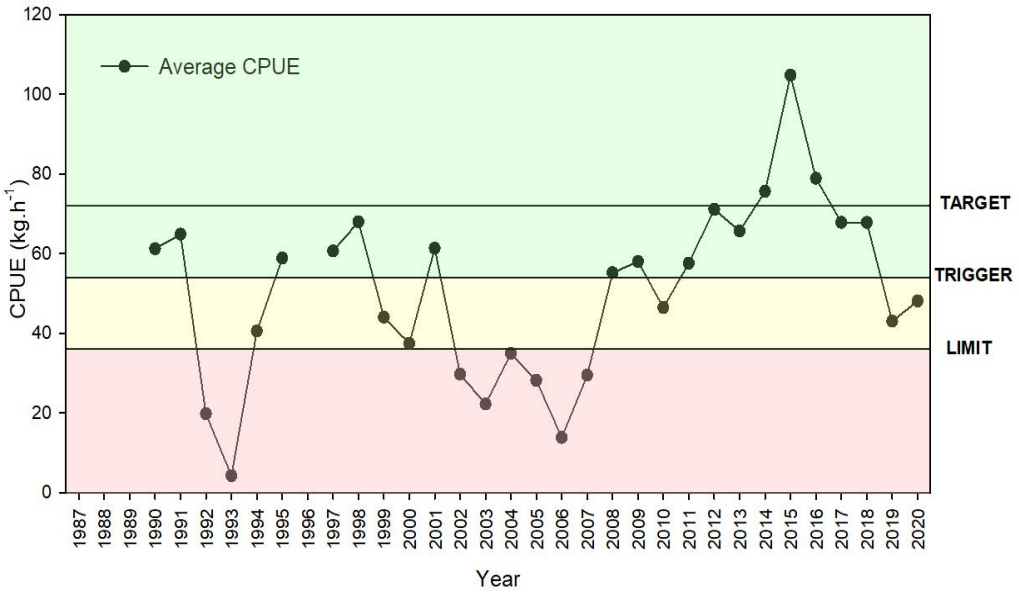


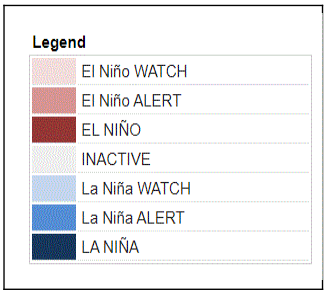
Figure 4.2 The average catch rate performance indicator for the West Coast Prawn Fishery.

4.2. El Niño - Southern Oscillation (ENSO) status

During the assessment period (October 2018–September 2020) there were no months classified as having El Niño conditions (Table 4.1). The most recent El Niño event occurred from May 2015 to March 2016 and was outside of the assessment period.

Table 4.1 ENSO outlook summary from the Bureau of Meteorology (BOM 2021). El Niño conditions (EN), El Niño alert (ENA), El Niño watch (ENW), La Niña (LN), La Niña watch (LNW), La Niña alert (LNA) inactive (N).

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2018	LN	LN	IN	IN	IN	ENW	ENW	ENW	ENW	ENA	ENA	ENA
2019	ENA	ENW	ENW	ENA	ENW	ENW	IN	IN	IN	IN	IN	IN
2020	IN	IN	IN	IN	IN	IN	LNW	LNW	LNA	LN	LN	LN
2021	LN	LN	LN	IN	na	na	na	na	na	na	na	na



5. SUMMARY

The fishery-wide reduction in prawn abundance from 2019 remains and is signalled in: 1) overall 2020 FIS CPUE and commercial CPUE remaining relatively low and well below the 10-year mean; 2) little change between the prawn stock size-structure between 2019 and 2020, indicating that the increased proportion of small prawns, and corresponding lower catch of XL prawns, reported from the commercial catch in 2019 remain present in 2020; and 3) relatively low estimates of recruitment since 2015. Despite the June 2020 FIS CPUE being lower than that in 2019, there is some evidence that the stock decline may have slowed. For example, the FIS CPUEs in Venus Bay and Ceduna in March 2020 were higher than 2019 and commercial CPUE has increased slightly from July 2020 in Venus Bay, which was after the March and June 2020 surveys but reflective of a relatively low number of fishing nights.

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 limit RPs defined for the key PI relating to stock abundance - average catch rate - where commercial HSCPUE and FIS VBCPUE are averaged and equally weighted. In 2020, the estimate of commercial HSCPUE increased 35% while the average VBCPUE (March and June combined) decreased 16%. The increase in commercial CPUE primarily occurred from July in Venus Bay, which is after surveys that occur in March and June. Commercial CPUE is also representative of a smaller spatial area than surveys, which may have further contributed to the differences between commercial and FIS CPUE. Overall, average catch rate declined steadily from 2015 to 2019 and in 2020 increased slightly to 48 $kg.h^{-1}$. This 2020 estimate is below the trigger RP (54.0 $kg.h^{-1}$) defined for this PI.

The harvest strategy for the fishery also considers environmental conditions (ENSO status) in determining stock status. Under the harvest strategy for the WCPF, the stock was not considered to be under the influence of an El Niño event during the assessment period (October 2018–September 2020) and consequently the stock has not been identified as ‘environmentally limited’.

Although there were no known direct impacts of COVID-19 on the WCPF, it is important to note that there was no fishing effort in April due to market prices being impacted by COVID-19.

Using the decision matrix in the Harvest Strategy for the WCPF the 2020 status of the WCPF stock is classified as ‘**Transitional-depleting’** (equates to **‘Depleting’** in the 2018 NFSRF; Stewardson *et al*. 2018). This is the second consecutive year the WCPF stock has been classified as ‘depleting’. Under a Transitional Fishing Strategy, the total number of fishing nights allowed for the season is reduced and fishing is restricted in the Ceduna area and in October (PIRSA 2019).

6. REFERENCES

Beckmann, C. L. and Hooper, G. E. (2020). Status of the West Coast Prawn *Penaeus (Melicertus) latisulcatus* Fishery in 2019. Fishery Status Report to PIRSA Fisheries and Aquaculture. South Australian Research and Development Institute (Aquatic Sciences), Adelaide. SARDI Publication No. F2007/000772-11. SARDI Research Report Series No. 1069. 24pp.

Beckmann, C. L. and Hooper, G. E. (2016). Status of the West Coast Prawn *Penaeus (Melicertus) latisulcatus* Fishery in 2015. Fishery Status Report to PIRSA Fisheries and Aquaculture. South Australian Research and Development Institute (Aquatic Sciences), Adelaide. SARDI Publication No. F2007/000772-8. SARDI Research Report Series No. 906. 33pp.

Beckmann, C. L. and Hooper, G. E. (2019). Blue Crab (*Portunus armatus*) Fishery 2017/18. Fishery Assessment Report to PIRSA Fisheries and Aquaculture. South Australian Research and Development Institute (Aquatic Sciences), Adelaide. SARDI Publication No. F2007/000729-15. SARDI Research Report Series No. 1015. 55pp.

BOM (2021). *ENSO Outlook*, accessed 22 April 2021, http://www.bom.gov.au/climate/enso/outlook/

Carrick, N. A. (2008). Determining the impact of environmental variability on the sustainability, fishery dynamics and economic performance of the West Coast prawn fishery. FRDC Report 2005/082.

Carrick, N. A. & Ostendorf, B. (2005). Modelling prawn movement and spatial dynamics in the Spencer Gulf and West Coast Prawn Fisheries. Canberra, Australia.

Flood, M., Stobutzki, I., Andrews, J., Ashby, C., Begg, G., Fletcher, R., Gardner, C., McDonald, B., Moore, A., Roelofs, A., Sainsbury, K., Saunters, T., Smith, T., Stewardson, C., Stewart, J., and Wise, B. (2014) Status of key Australian fish stock reports 2014. Fisheries Research and Development Corporation, Canberra.

Middleton, J. F. & Bye, A. T. (2007). A review of the shelf-slope circulation along Australia's southern shelves: Cape Leeuwin to Portland. *Progress in Oceanography* **75**, 1–41.

Noell, C. J. and Hooper, G. E. (2019). Spencer Gulf Prawn *Penaeus (Melicerus) latisulcatus* Fishery. Fishery Assessment Report to PIRSA Fisheries and Aquaculture. South Australian Research and Development Institute (Aquatic Sciences), Adelaide. SARDI Publication No. F2007/000770-10. SARDI Research Report Series No. 1029. 60pp.

PIRSA (2019). West Coast Prawn Fishery Harvest Strategy South Australia. 21pp. Primary Industries and Resources SA.

Stewardson, C., Andrews, J., Ashby, C., Haddon, M., Hartmann, K., Hone, P., Horvat, P., Mayfield, S., Roelofs, A., Sainsbury, K., Saunders, T., Stewart, J., Stobutzki. I., and Wise, B. (eds) (2016), Status of Australian fish stocks reports (2016), Fisheries Research and Development Corporation, Canberra. www.fish.gov.au

Stewardson, C., Andrews, J., Ashby, C., Haddon, M., Hartmann, K., Hone, P., Horvat, P., Mayfield, S., Roelofs, A., Sainsbury, K., Saunders, T., Stewart, J., Nicol S., and Wise, B. (eds) (2018), Status of Australian fish stocks reports (2018), Fisheries Research and Development Corporation, Canberra. www.fish.gov.au

APPENDIX A: SURVEY DETAILS

Table A.1 Number of fishery-independent survey shots completed in the Ceduna and Venus Bay regions of the West Coast Prawn Fishery during February/March, June/July and October/November from 1989 to 2020. Note November surveys were discontinued in 2020.

Year	Month	Ceduna	Venus Bay	Total
1989	Nov	7	19	26
1990	Feb	6	20	26
	Jun	6	-	6
	Nov	7	20	27
1991	Feb	17	20	37
	Jun	17	20	37
	Nov	16	11	27
1992	Feb	17	20	37
	Jun	17	20	37
	Jul	9	12	21
	Oct	16	20	36
1993	Feb	17	20	37
	Jun	17	20	37
1994	Jun	-	20	20
1995	Feb		20	20
	Jul		26	26
1996	Feb	16	19	35
1997	Feb	-	22	22
1998	Mar	-	16	16
	Jun	-	18	18
2000	Feb	-	10	10
2002	Mar			0
2003	Jul		14	14
	Oct	9	10	19
	Nov	7	9	16
2004	Jun	9	13	22
	Oct	9	11	20
2005	Feb	8	11	19
	Jun	-	14	14
	Nov	6	10	16
2006	Feb	8	11	19
	Jun	-	13	13
	Nov	7	11	18
2007	Mar	14	11	25
	Nov	6	10	16
2008	Mar	7	10	17
	Jun	-	8	8
	Oct	7	10	17
2009	Mar	-	10	10
	Jun	-	10	10
	Nov	6	10	16
2010	Mar	7	10	17
	Jun	-	10	10
	Nov	6	10	16
2011	Mar	7	10	17
	Jun	-	10	10
	Nov	6	10	16
2012	Mar	6	10	16
	Jun	-	9	9
	Nov	6	9	15
2013	Mar	7	9	16
	Jun	-	9	9
	Oct	6	9	15
2014	Mar	6	9	15
	Jun	-	9	9
	Oct	-	10	10
2015	Mar	7	10	17
	Jun	-	10	10
	Nov	-	9	9
2016	Mar	12	9	21
	Jun	-	4	4
	Nov	-	9	9
2017	Mar	12	10	22
	Jun	-	9	9
	Nov	-	9	9
2018	Mar	12	9	21
	Jun	-	10	10
	Oct	-	9	9
2019	Mar	12	9	21
	Jun	-	10	10
	Nov	-	9	9
2020	Mar	12	10	22
	July	-	10	10

APPENDIX B: LENGTH FREQUENCY DATA

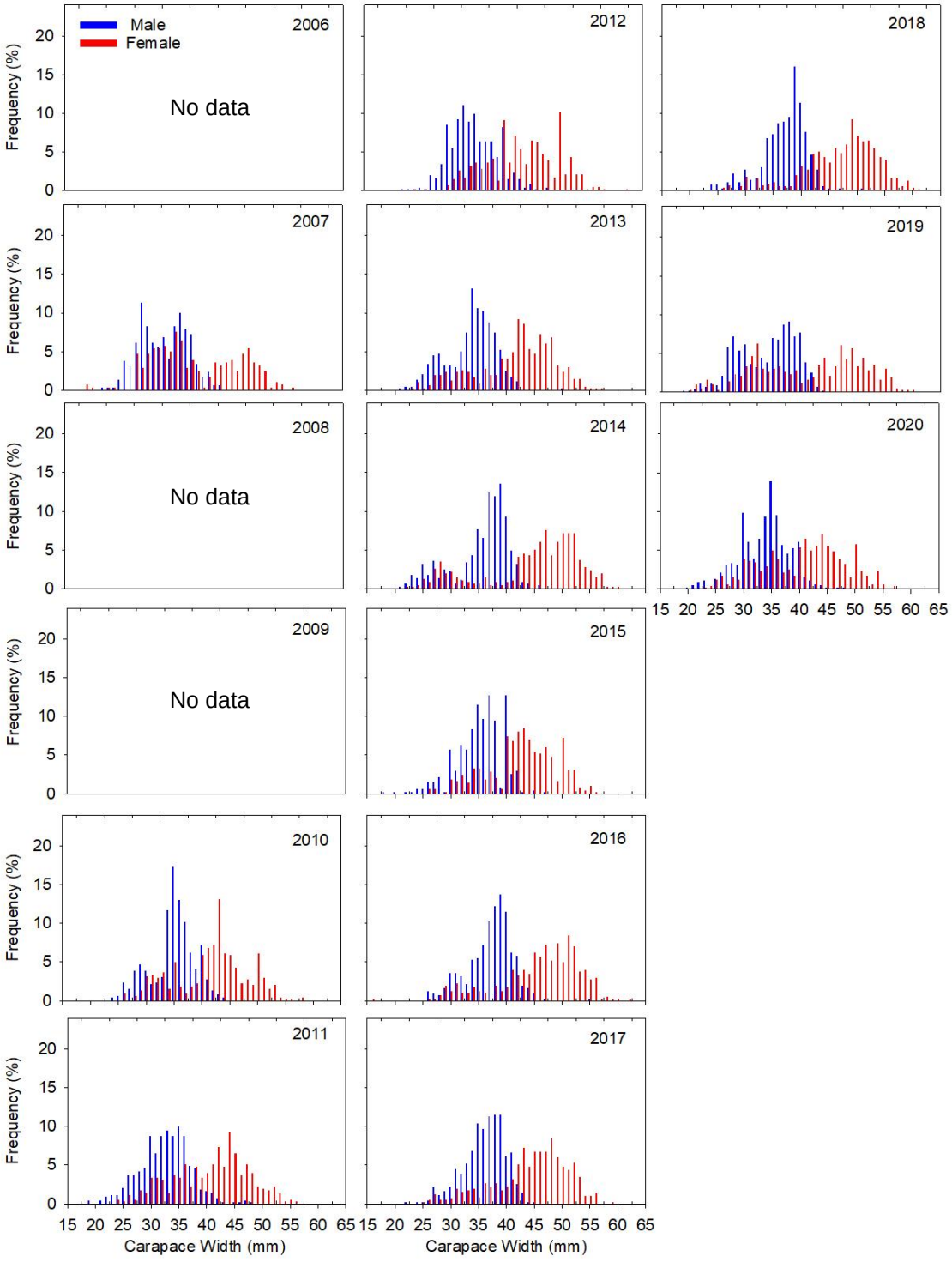


Figure B.1 Length frequency distributions (%) of male and female western king prawns from February/March fishery-independent surveys in Venus Bay.

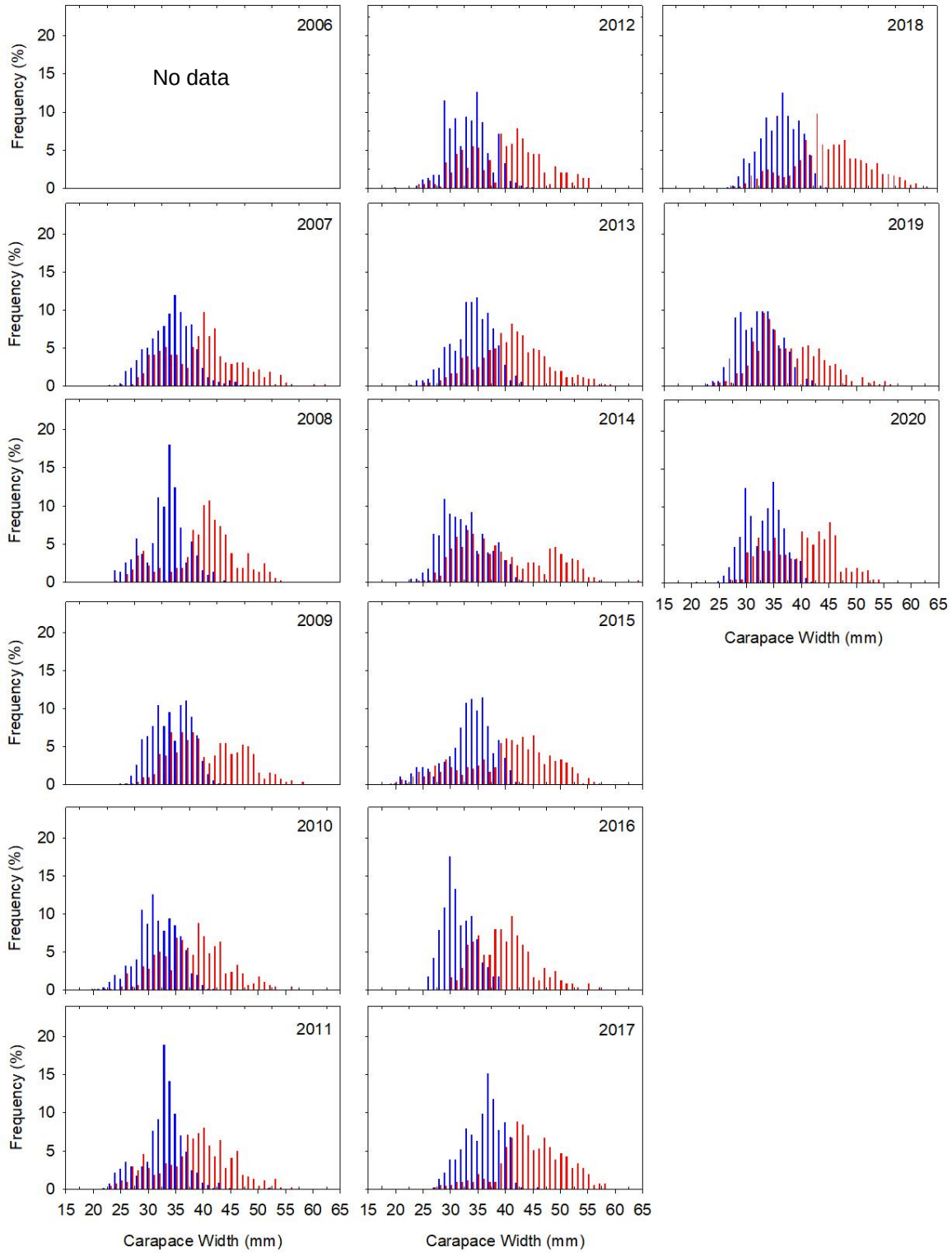


Figure B.2 Length frequency distributions (%) of male and female western king prawns from June/July fishery-independent surveys in Venus Bay.

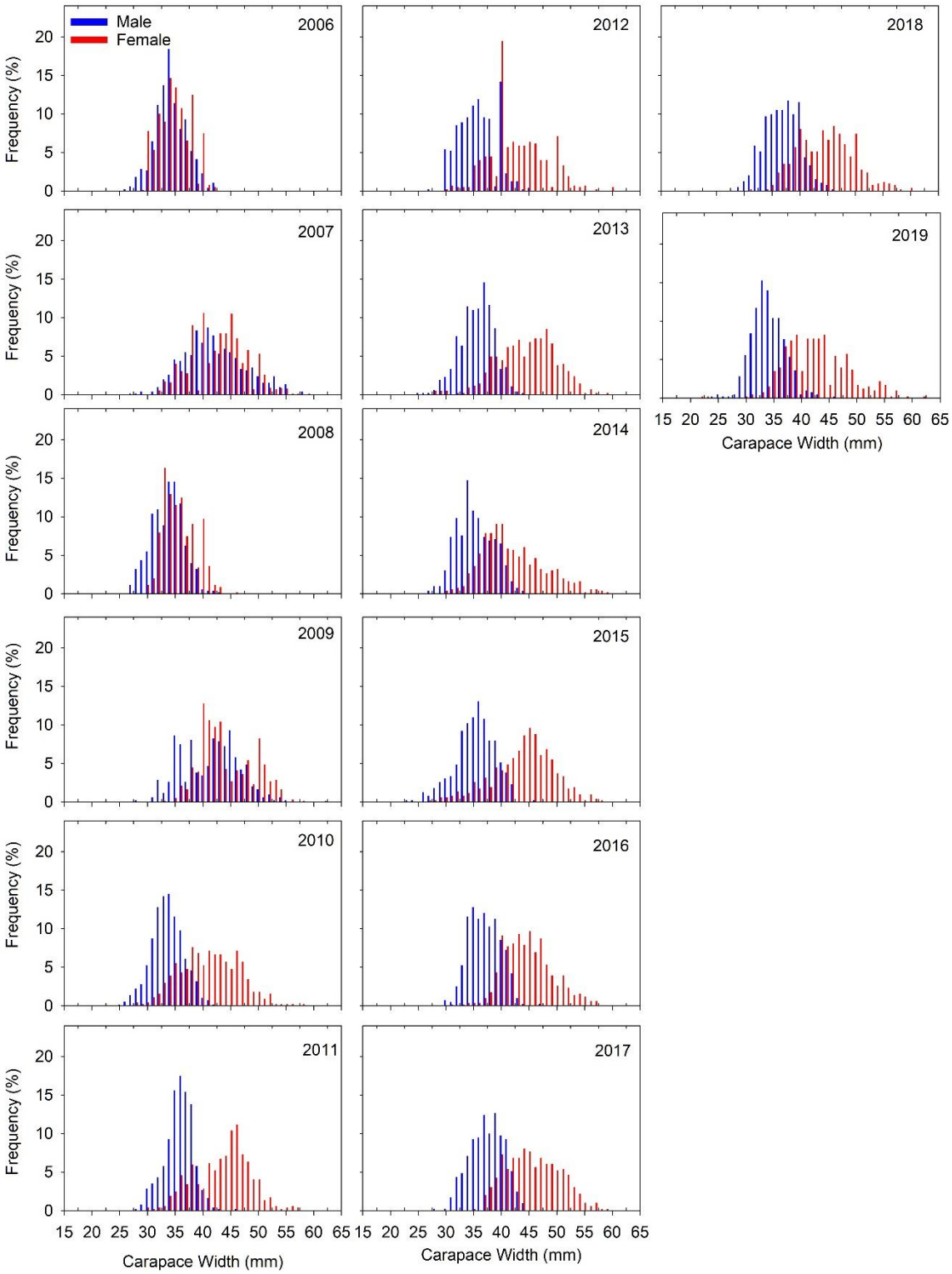


Figure B.3 Length frequency distributions (%) of male and female western king prawns from October/November fishery-independent surveys in Venus Bay.

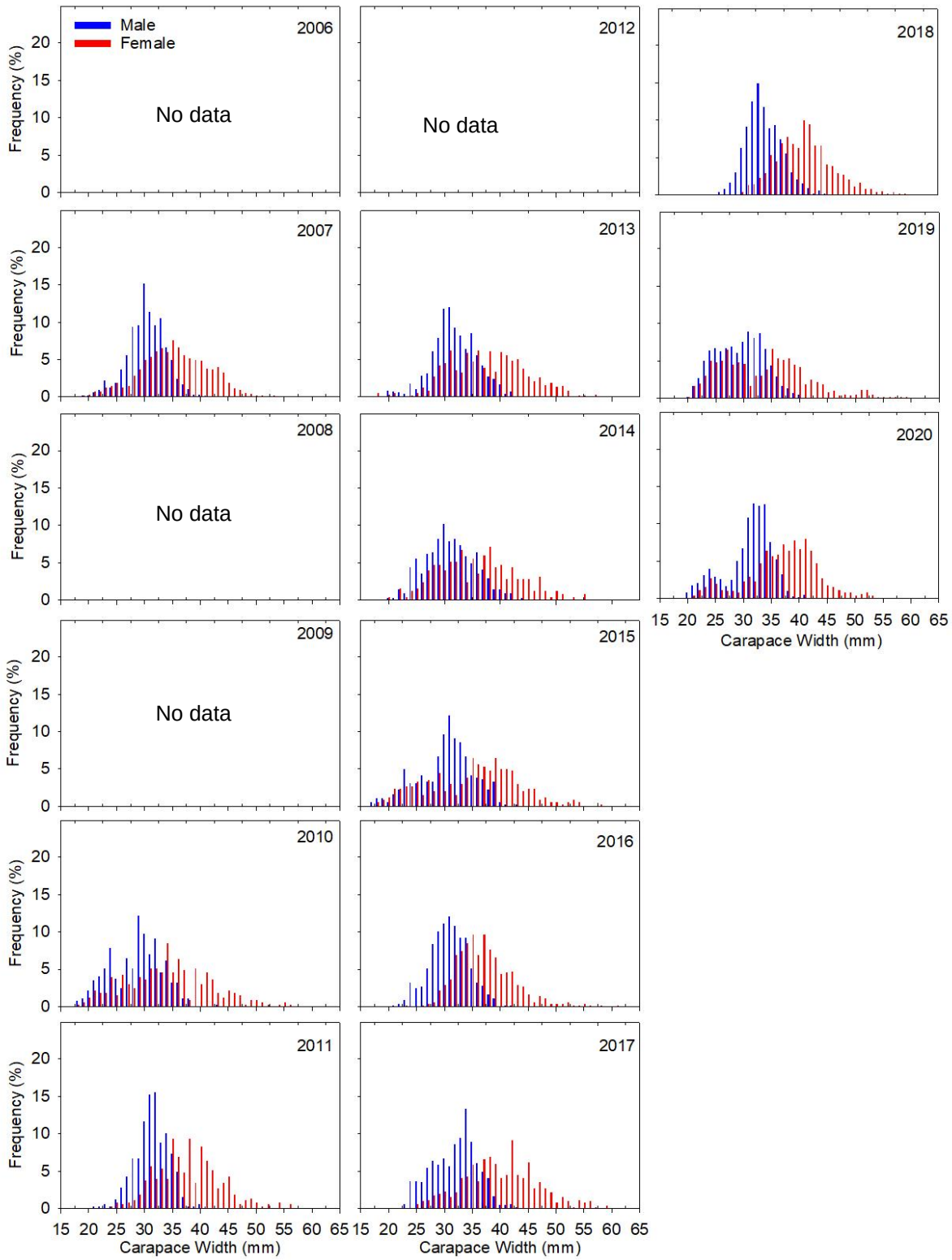


Figure B.4 Length frequency distributions (%) of male and female western king prawns from February/March fishery-independent surveys in Ceduna.

APPENDIX C: KEY SUMMARY DATA

Table C.2 Key summary data for the WCPF, including catch (t), effort (hours and nights), and annual CPUE, HSCPUE, VBCPUE, and average catch rate index ($kg.h^{-1}$).

Year	Catch (t)	Effort (hours)	Effort (nights)	Annual CPUE ($kg.h^{-1}$)	HSCPUE ($kg.h^{-1}$)	VBCPUE ($kg.h^{-1}$)	Avg Catch Rate 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	131	3629	66	27	27		
1988	109	3051	138	36	37		
1989	114	3252	132	35	35		
1990	171	3784	136	45	47	75	61
1991	179	3408	124	52	56	74	65
1992	10	426	23	23	27	12	20
1993	0	0	0	-	-	4	4
1994	57	1536	68	37	39	42	40
1995	131	2608	101	50	53	64	59
1996	216	3061	118	71	79		
1997	179	3082	111	58	64	57	61
1998	142	2692	97	53	56	80	68
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	0	0	0	-	-	14	14
2007	12	294	11	40	38	20	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
2014	146	1876	63	78	76	76	76
2015	191	1875	63	102	110	99	105
2016	163	2039	70	80	82	75	79
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