Fisheries

Western Zone Blacklip Abalone (*H. rubra*) and Greenlip Abalone (*Haliotis laevigata*) Fisheries in 2022/23

B. Stobart

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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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ABBREVIATIONS

AVG	Abalone Viral Ganglioneuritis
AIASA	Abalone Industry Association of South Australia
CPUE	Catch Per Unit Effort
FD	Fishery Dependent
FI	Fishery Independent
HS	Harvest Strategy
MDS	Multi-Dimensional Scaling
MLL	Minimum Legal Length
NFSRF	National Fishery Status Reporting Framework
PI	Performance indicator
PIRSA	Department of Primary Industries and Regions
PropG1	Proportion of Grade 1 (Greenlip Abalone in the catch)
SAAF	South Australian Abalone Fishery
SARDI	South Australian Research and Development Institute
SAU	Spatial Assessment Unit
TACC	Total Allowable Commercial Catch
WZ	Western Zone
WZAF	Western Zone Abalone Fishery
VCL	Voluntary catch limit

EXECUTIVE SUMMARY

This report assesses the status of the Blacklip Abalone (*Haliotis rubra*) and Greenlip Abalone (*H. laevigata*) stocks (hereafter referred to as blacklip and greenlip, respectively) in the Western Zone (WZ) of the South Australian Abalone Fishery (SAAF) in the 2022/23 financial year. The assessment includes application of the harvest strategy (HS) included in the Management Plan for the South Australian Commercial Abalone Fishery (PIRSA 2021) to determine stock status. The stock status from the HS is aligned with the National Fishery Status Reporting Framework (NFSRF; Piddocke et al. 2021). The HS uses financial year information to recommend a zonal catch for the following (calendar) quota year for the fishery. Unless otherwise stated, all years in this report refer to financial year and are indicated by the second year (e.g., 2022/23 financial year will be referred to as 2023).

Blacklip

During 2023, blacklip comprised 51% (42.8 t) of the combined abalone catch in the WZ, with total catches decreasing 48% since 2012 (100.7 t). This reduction primarily reflects lower TACCs and the removal of one licence from the WZ in 2014.

Application of the HS resulted in a zone score of 3.15 and a zone trend score of 5.0 (reflecting a stable trend), defining the stock status for blacklip in the WZ in 2023 as **'sustainable'**. This was the same as the stock status from 2020 to 2022. A zone score of 3.15 translates to a recommended zonal catch of 44.95 t for the 2024 calendar year quota period which is 3.4% higher than the TACC set for 2023 (43.5 t).

The 2023 stock status of 'sustainable' follows a long-term decline in harvestable biomass from 2006 to 2019 and continues to reflect evidence that the decline abated from 2019 onwards. The change to 'sustainable' in 2019 was due to a modest improvement in stock abundance evidenced primarily by small increases in CPUE for the WZ and some SAUs between 2019 and 2020 and increasing estimates of legal density at three FIS sites. These changes continued in 2021 and 2022 suggesting that the the long-term decline in harvestable biomass since 2006 likely abated and that stock recovery may have started. Evidence that the improvement continued between 2022 and 2023 included increases in WZ CPUE continuing between 2022 and 2023, CPUE increasing or stabilising at several SAUs, and the legal density at Sheringa increasing to the highest value on record. In contrast, the legal density at Drummond South and Avoid Bay decreased between 2021 and 2023.

Despite the recent increases in CPUE at multiple SAUs and in legal density at Sheringa, the harvestable biomass of blacklip in the WZ has remained historically low for the past nine years (zone scores below 3.5). The low biomass is likely to reflect a combination of overfishing and environmentally driven changes in productivity. While the HS is constraining catch to a relatively low level, given the unique life-history traits of abalone species, low densities result in a high risk of recruitment impairment.

Greenlip

During 2023, greenlip comprised 49% (41.2 t) of the combined abalone catch in the WZ, with total catches decreasing 48% since 2012 (79.8 t). The catch in 2023 was the lowest on record. This reduction reflects lower total allowable commercial catches (TACCs) and the removal of one licence from the WZ in 2014.

Application of the HS resulted in a zone score of 4.86 and was an increase from 3.02 in 2022. In combination with the zone trend score of 7.34 (reflecting an increasing trend) this defines the stock status for greenlip in the WZ in 2023 as **'sustainable'**. A zone score of 4.86 translates to a recommended zonal catch of 75.60 t for the 2024 calendar year but, after application of the "increasing TACC" metarule, is constrained to 55.64 t. This recommended catch for 2024 is 31% above the TACC for 2023.

The HS greenlip status for 2023, 'sustainable' follows a long-term decline in harvestable biomass from 2005 to 2014 and continues to reflect evidence that the decline has likely abated. The large increase in zone score for 2023 is due to the largest inter-annual increase in CPUE for the WZ that is apparent at multiple SAUs and suggests a large increase in biomass between 2022 and 2023. However, such large interannual changes in biomass are unexpected for long-lived, slow growing species such as abalone, with the contribution of recent changes in fishing practices on CPUE being poorly understood. The influences of these changes on the large increase in CPUE and zone score require further interrogation.

Conclusion

The 2023 HS outcome for both blacklip and greenlip remains '**sustainable**'. The HS score for blacklip is among the lowest recorded, while that for greenlip increased considerably to a value close to 5 in 2023. The recent increase in the greenlip HS score is likely influenced by changes to fishing practices impacting the relationship between abundance and CPUE; this requires further explanation. Overall, it is likely that the biomass of blacklip remains relatively low in 2023, while that for greenlip has increased.

The success of the HS relies on realistic zonal target catches paired with settings that deliver a recommended zonal catch that is adequately conservative to protect the fishery and allow a continuation and timely recovery of both the blacklip and greenlip stocks. Given the risk, to ensure the recovery of both stocks, they will require careful monitoring to determine whether the low blacklip biomass increases and the large greenlip CPUE increase observed between 2022 and 2023 reflects a true increase in harvestable biomass.

Key summarised WZ blacklip and greenlip statistics: **Calendar Year** - number of licences (No. licences); total allowable commercial catch (TACC); voluntary catch limit (VCL) and total commercial catch (TCC); **Financial Year** - stock status from the harvest strategy (HS). tmw = tonnes meat weight.

Calendar Year	No licences	TACC (tmw)	VCL (tmw)	TCC (tmw)	Financial Year	HS Stock Status
BLACKLIP						
2019	22	58.6	53	51.08	2018/2019	Depleting
2020	22	43.0	NA	40.39	2019/2020	Sustainable
2021	22	47.3	44.3	45.19	2020/2021	Sustainable
2022	22	43.5	NA	44.04	2021/2022	Sustainable
2023	22				2022/2023	Sustainable
GREENLIP						
2019	22	73.01	66.4	66.05	2018/2019	Depleting
2020	22	51.0	NA	49.05	2019/2020	Depleting
2021	22	48.9	NA	51.02	2020/2021	Sustainable
2022	22	44.1	NA	46.72	2021/2022	Sustainable
2023	22				2022/2023	Sustainable

Keywords: Blacklip abalone (*Haliotis rubra*), Greenlip abalone (*Haliotis laevigata*), Stock assessment, Harvest strategy, Stock status, South Australia.

1 GENERAL INTRODUCTION

1.1 Background

This report provides a fishery assessment for Blacklip Abalone (*Haliotis rubra*, hereafter referred to as blacklip) and a stock status for Greenlip Abalone (*H. laevigata*; hereafter referred to as greenlip) in the Western Zone (WZ) of the South Australian Abalone Fishery (SAAF; Figure 1.1) in the 2022/23 financial year. The level of reporting for the two species differs because species-specific assessments are undertaken biennially as part of an overall rationalisation of the research program. These form part of the South Australian Research and Development Institute's (SARDI – Aquatic Sciences) ongoing assessment program for greenlip and blacklip fisheries and update previous fishery assessment and status reports (see Stobart and Mayfield 2021). This report (1) assesses the status of each resource; (2) identifies the uncertainty associated with each assessment; and (3) documents future research needs for both species.

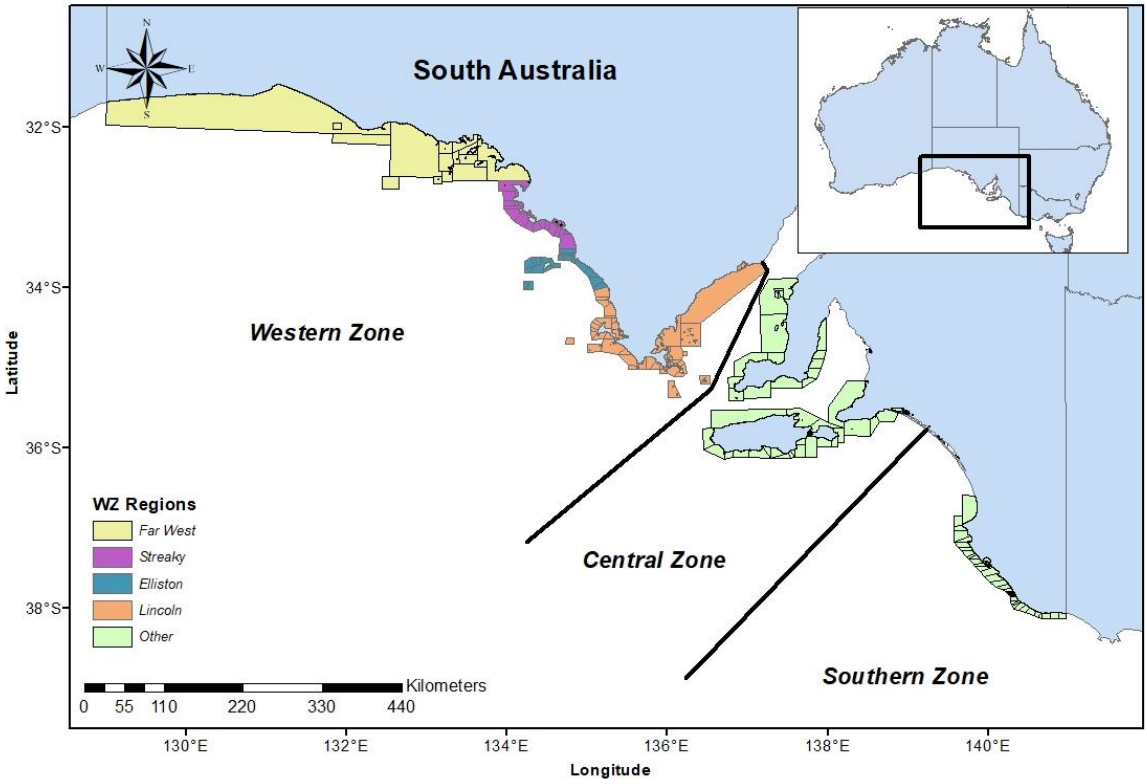


Figure 1.1. Fishing zones and mapcodes of the South Australian Abalone Fishery and regions of the WZ.

Data are presented for three spatial scales (Zone, Spatial assessment units (SAU), and Regions) and by financial year, as financial year is the time step specified by the harvest strategy (HS)

described in the Management Plan for the fishery (PIRSA 2021), noting the quota is set by calendar year. Thus, unless otherwise stated, information provided throughout this report is by financial year and referred to by the last year (e.g. 2022/23 financial year would bereferred to as 2023), noting that this is a change from previous reports where financial year was referred to by the first year (e.g. stobart et al. 2022). The HS includes assignment of stock status consistent with the NFSRF (Table 1.1; Stewardson et al. 2018, Piddocke et al. 2021) adopted by PIRSA Fisheries and Aquaculture for classifying fish stocks (PIRSA 2015).

Table 1.1. Terminology for the status of key Australian fish stocks reports (Stewardson et al. 2018).

	Stock status	**Description**	**Potential implications for management of the stock**
	Sustainable	Stock for which biomass (or biomass 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	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

1.2 History and description of the fishery

1.2.1 Commercial fishery (calendar year)

A review of the management history of the SAAF since its inception in 1964 is provided by (Mayfield et al. 2012). The calendar year historical annual catch and quota (Figure 1.2) and listed major management milestones (Table 1.2) are provided for reference. Notably, prior to the introduction of quota, average annual greenlip catch from 1968 to 1973 was 215 t, almost double that during the following eleven years prior to the introduction of quota in 1985 (128 t) and more than double that during the first decade post-quota (87 t). In contrast, the average catch for blacklip was 98 t from 1968 to 1973, a third more than in the eleven years prior to quota (68 t) and similar to the first decade post-quota (102 t).

Entrants to the fishery increased in the late 1960s and exceeded 100 operators by 1970. In 1971, the SAAF was divided into three zones (Western (WZ), Central and Southern; Figure 1.1). During the same year, licences were made non-transferable to reduce the number of operators in the fishery and by 1976 had fallen to 35 licences. These 35 licences remained in the fishery until 2013. From 1 January 2014, removal of one licence from the WZ, as part of the marine park buy-back scheme, reduced the total number of licences in the SAAF to 34.

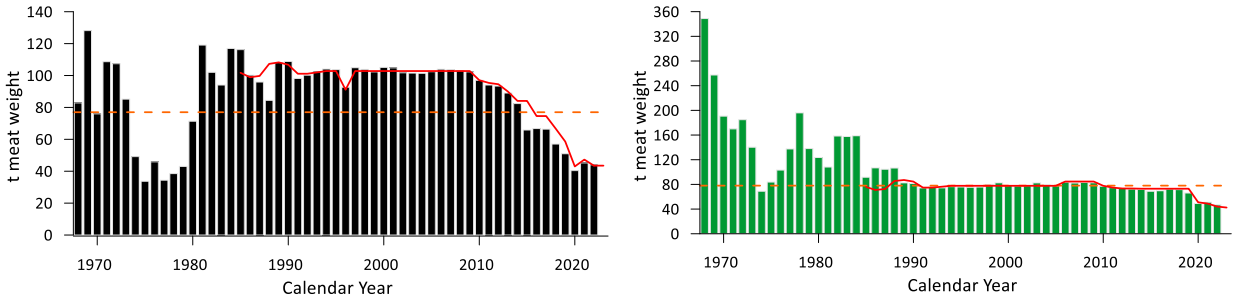


Figure 1.2. Western Zone Catch (t, meat weight), total allowable commercial catch (red line) and target catch from the Harvest Strategy (dashed red line) for blacklip (black bars) and greenlip (green bars) from the 1968 to 2022 **calendar years**.

The WZ of the SAAF includes coastal waters of South Australia between the Western Australia/South Australia border and eastern Eyre Peninsula (Figure 1.1). This zone was subdivided into Region A and Region B in 1985. In Region A, annual Total Allowable Commercial Catches (TACCs) were introduced for blacklip and greenlip in 1985 and amended to the calendar year fishing season from 1989 (Nobes et al. 2004).

For Region B, both species were included under a single annual TACC that was introduced in 1991. Regions A and B were recombined in 2014. There are currently 22 licences operating in the WZ, and the fishing season extends from 1 January to 31 December each year.

Commercial catch and effort data on this fishery have been collected since 1968 and are used in stock assessment and status reports for each zone. A catch and effort logbook must be completed for each fishing day and submitted to SARDI Aquatic Sciences at the end of each month.

Since 1997, the WZ fishery has operated under the control of formal management plans (Zacharin 1997, Nobes et al. 2004, PIRSA 2012, PIRSA 2021). These plans guide management through a regime of input (e.g., limited entry) and output (e.g., minimum legal lengths (MLLs) and quotas) controls. Some of the current management arrangements in the WZ are summarised in Tables 1.2 and 1.3.

Table 1.2. Management milestones: Western Zone of the South Australian Abalone Fishery.

Calendar year	Milestone
1964	Fishery started
1970	More than 100 operators
1971	Licences made non-transferable, Fishery divided into three zones (Western, Central and Southern) Minimum legal length (MLL) set at 130 mm shell length (SL) for both species
1976	30 licences remained; 5 additional licences issued
1978	Sub-zones and fishing blocks replaced by map numbers and codes
1980	Licences became transferable
1984	Greenlip minimum legal length amended to 145 mm SL
1985	Western Zone divided into regions A and B Quota introduced to Region A (97.75 t blacklip; 97.75 t greenlip)
1989	Total allowable commercial catch (TACC) in Region A greenlip fishery reduced to 69 t
1991	Quota introduced to Region B (9.2 t both species)
1993	Abolition of owner-operator regulation, TACC in Region B increased to 11.5 t
1994	TACC in Region B increased to 13.8 t
1996	TACC in Region A blacklip fishery decreased to 86 t
1997	Management Plan implemented (Zacharin 1997), TACC in Region A blacklip fishery increased to 97.8 t
2004	Management Plan reviewed (Nobes et al. 2004)
2006	TACC in Region A greenlip fishery increased to 75.9 t
2010	TACC in Region A - blacklip fishery decreased to 92 t, greenlip fishery decreased to 69 t
2011	TACC in Region B fishery decreased to 9.2 t Voluntary closed season in Region B from October to February
2012	New Management Plan including harvest strategy (PIRSA 2012) TACC in Region B fishery decreased to 6.9 t
2013	TACC in Region A blacklip fishery decreased to 87.4 t
2014	Regions A and B amalgamated; Number of licences reduced to 22. TACC for greenlip increased to 73 t; TACC for blacklip decreased to 84.1 t Ministerial exemption to harvest *Haliotis roei* in with a TACC of 11 t granted from February 2014
2015	Harvest strategy review commenced; voluntary agreement to limit catch to 66.4 t
2016	TACC in blacklip fishery decreased to 74.6 t; voluntary agreement to limit catch to 66.4 t
2017	Voluntary agreement to limit catch to 67.0 t
2018	TACC in blacklip fishery decreased to 66.6 t; voluntary agreement to limit catch to 58.6 t Minor adjustment to mapcodes constituting Searcy, Baird, Venus and Anxious Bays (see Figure 1.2).
2019	TACC in blacklip fishery decreased to 58.6 t; voluntary agreement to limit catch to 53.0 t TACC in greenlip fishery remained at 73.0 t; voluntary agreement to limit catch to 66.4 t
2020	TACC in blacklip fishery decreased to 43 t. Under a Section 79 notice, catch from Drummond capped at 11 t, WZAF closed to fishing from 1 October to 31 December and area East of Cape Carnot closed to fishing from 1 January to 31 March TACC in greenlip fishery decreased to 51 t. Under a Section 79 notice, WZAF closed to fishing from 1 October to 31 December and area East of Cape Carnot closed to fishing from 1 January to 31 March.
2021	TACC in blacklip fishery increased to 47.3 t; voluntary agreement to limit catch to 44.3 t. WZAF closed to fishing from 1 October to 31 December. TACC in greenlip fishery decreased to 48.9 t. WZAF closed to fishing from 1 October to 31 December.
2022	TACC in blacklip fishery decreased to 43.5 t. WZAF closed to fishing from 1 August to 31 October. TACC in greenlip fishery decreased to 44.1 t. WZAF closed to fishing from 1 August to 31 October.
2023	TACC in blacklip fishery remained at 43.5 t. WZAF closed to fishing from 1 August to 31 October. TACC in greenlip fishery decreased to 42.5 t. WZAF closed to fishing from 1 August to 31 October.

Table 1.3. Western Zone commercial abalone fishery management arrangement summary.

Management strategy	Western Zone management arrangements in the 2023 calendar year
Licence holders	22
Target species	*Haliotis rubra* (blacklip), *H. laevigata* (greenlip), *H. roei* (roei; not fished 2022 & 2023)
Minimum legal length	Blacklip 130 mm shell length (SL), Greenlip 145 mm SL, Roei 75 mm SL
Quota year	1 January to 31 December (note section 79 restrictions in Table 1.2 above)
Quota transferability	Yes
Other species permitted	*H. scalaris*, *H. cyclobates* when SL ≥130 mm
Method of capture	By hand – dive fishery
By-catch	Negligible

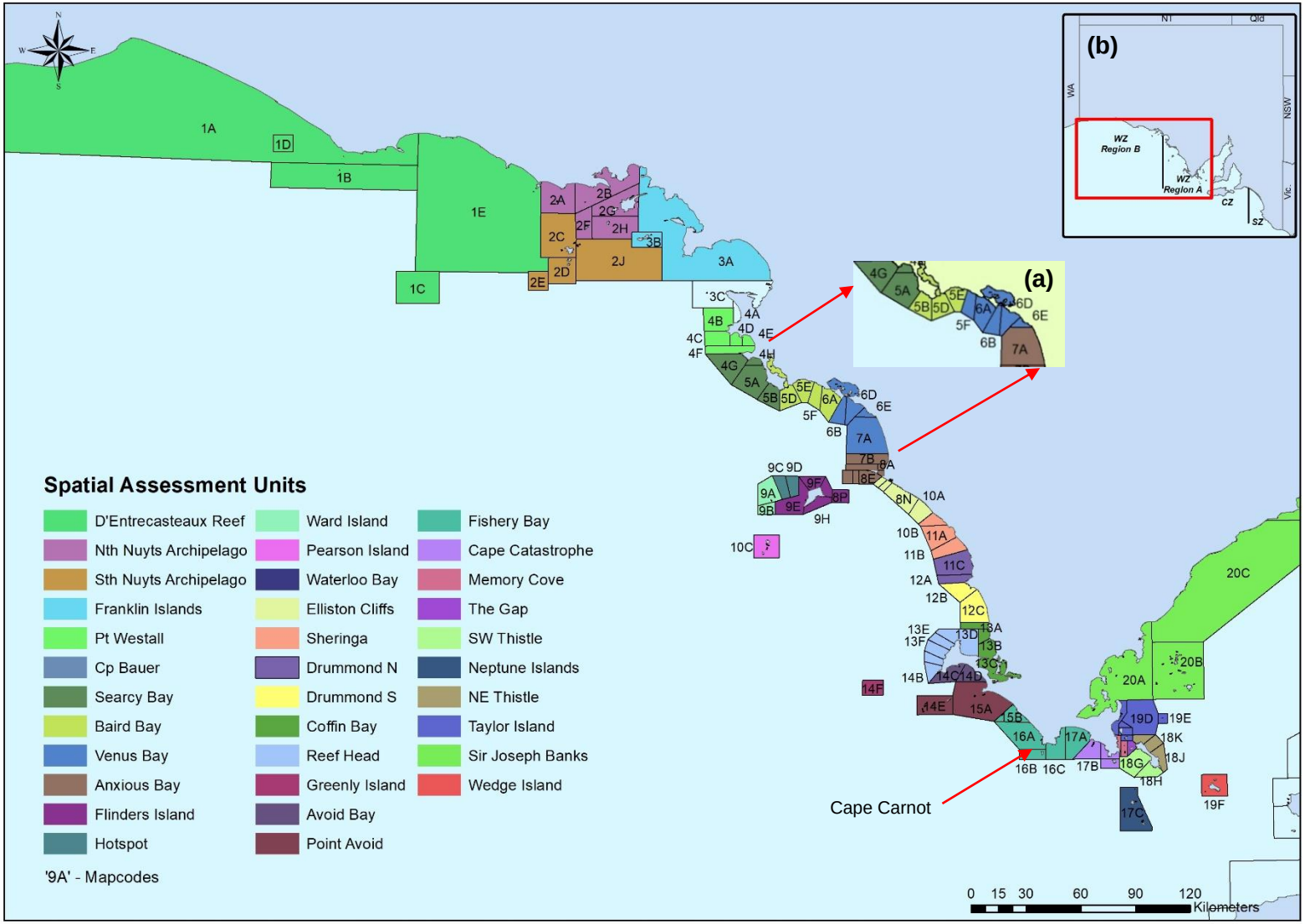


Figure 1.3. Spatial Assessment Units (SAUs) and map codes of the Western Zone South Australian Abalone Fishery. Inlay (a) shows old mapcode groupings for SAUs Searcy, Baird, Venus, and Anxious Bays; inlay (b) shows old WZ region split.

1.2.2 Recreational fishery

The most recent recreational abalone catch estimate for South Australia was for the 2021/22 financial year and was 3,296 blacklip and 3,795 greenlip individuals (47% blacklip, 53% greenlip; (Beckman et al. 2023). This equates to an estimated 2.94 t meat weight, a 44% increase since the previous survey from in 2013/14 (Giri 2015). Recreational fishing for the West Coast and Lower Eyre Peninsula was estimated at 11% of the state take during 2021/22 (Beckman et al. 2023), equating to 323 kg or ~780 abalone assuming equal take throughout the state.

1.3 Management Plan

The Management Plan for the SAAF (PIRSA 2021) describes the management goals and objectives for the fishery that reflect current policy drivers including Section 7 of the *Fisheries Management Act 2007*, and Ecologically Sustainable Development as described in the *Environmental Protection and Biodiversity Conservation Act 1999*.

This report is directly relevant to the first goal of the Management Plan, for which the objectives are to maintain the stocks above ecologically sustainable levels and to ensure enough data and information are available to undertake the HS which underpins the management decisions. The HS is described in the Management Plan and is the primary tool used to achieve the goal of sustainably harvesting the abalone resource and allocating stock status in accordance with the NFSRF (PIRSA 2021). The HS is consistent with the *National Guidelines to Develop Harvest Strategies* (Sloan et al. 2014) and the *South Australian HS Policy* (PIRSA 2015).

The HS provides a structured, species-specific, and spatially explicit, framework for decision making and includes assignment of stock status consistent with the NFSRF. It has three main phases: (1) a monitoring phase in which information is collected for the two performance indicators, CPUE and legal density of abalone from fishery independent surveys (FIS), along with other relevant fishery information; (2) the stock assessment phase where the performance of each SAU is scored based on a CPUE score and, for some key SAUs, a legal density score. This scoring is based on limit and target reference points. Aggregated scores for the SAUs provide an overall stock status based on trigger reference points for biomass (zone score used as a proxy) and fishing mortality (zone score trend used as a proxy); and (3) the final step where zone score is translated to a recommended zonal catch. During this step a workshop is held with industry to share relevant information, and SAU catches can be adjusted within a 10% range based on the information through harvest decision rules. The summed adjusted SAU catches inform setting of the TACC for the following season.

1.4 Abalone biology

The biology of blacklip and greenlip in the WZ is described in previous stock assessment reports (e.g. (Stobart et al. 2015, Stobart and Mayfield 2016). Additional information on the biology of both species is also provided in Appendix 6.1. Greenlip and blacklip are present throughout southern Australia but have differing overall distributions. Blacklip range from Coffs Harbour (New South Wales) to Rottnest Island (Western Australia), while greenlip range from Flinders Island (Tasmania) to Cape Naturaliste (Western Australia). Typically, these two species occupy different habitats, with blacklip mostly inhabiting crevices and caves or the bottom of steep rock faces of topographically complex rocky reefs (1 to 30 m depth) and greenlip tending to inhabit the edge of reefs and boulders near sand or seagrass (5 to >50 m depth).

Blacklip populations can show significant genetic differentiation between sites less than 15 km apart (Shepherd and Brown 1993, Temby et al. 2007, Miller et al. 2009), suggesting limited dispersal among 'metapopulations' (Fleming 1997, Miller et al. 2009). In contrast, greenlip dispersal appears to be more widespread as reflected in population genetics that suggest 'metapopulations' cover spatial scales of up to 135 km (Miller et al. 2014). The limited dispersal of abalone has implications for depleted stock recovery, contrasting with many other marine organisms, whose widespread dispersal makes them more resilient to localised depletion.

Abalone are prone to several diseases that can cause significant mortality and/or affect the quality of meat for sale. The two primary diseases affecting Australian stocks are the protozoan parasite *Perkinsus olensi* (Goggin and Lester 1995) and abalone viral ganglioneuritis (AVG; Mayfield et al. 2012). *Perkinsus* is established in South Australia and negatively impacts three commercially harvested abalone species (Goggin and Lester 1995, Lester and Heyward 2005), but AVG has not been recorded in the State. Animals chronically infected with *Perkinsus* often exhibit extensive macroscopic lesions rendering the product unsaleable. Avoidance of fishing areas in the WZ of the SAAF that have a high prevalence of *Perkinsus*-related lesions displaced ~10% (11 $t.yr^{-1}$) of blacklip catch to alternative fishing grounds, exacerbated the need for quota reductions and likely cost the fishery in excess of $10 million over the past ten years. The disease is currently visibly expressed (i.e., animals with lesions are present) in fishing grounds near Port Lincoln and in the Baird Bay SAU (SARDI unpublished data).

2 METHODS

2.1 Blacklip assessment

2.1.1 Data used and spatial scales of analyses

This assessment uses fishery dependent (FD) and fishery independent (FI) data. The FD data consist of catch and effort from 30 June 1968 to 30 June 2023. The FI data consist of density estimates and length frequency distributions from surveys conducted periodically at selected SAUs.

Data were analysed at three spatial scales: (1) the WZ; (2) four regions of the WZ (termed Port Lincoln, Elliston, Streaky Bay, and Far West); and (3) the SAUs and combined SAUs defined in the HS (see Figure 1.3 and PIRSA 2021). The regions of Port Lincoln, Elliston, Streaky Bay, and Far West are comprised of SAUs typically accessed from each respective regional centre (see Figure 1.1). Data are presented by financial year and, where referred to and in figures, are described using their last year (e.g., 2023 refers to the 2022/23 financial year).

2.1.2 Fishery-dependent data

Commercial catch and effort data have been collected since 1968 in the form of daily entries to commercial logbooks submitted to SARDI, allowing spatial and temporal analyses of catch (t, meat weight), fishing effort by depth category (hours) and mean CPUE ± standard error (se). Multi-dimensional scaling (MDS) was used to evaluate temporal changes in the distribution of the proportion of catch among SAUs; closer proximity among years indicates greater similarity. MDS results were further interpreted with similarity percentage (SIMPER) analysis and hierarchical cluster analysis (CLUSTER) using complete linkage. SIMPER indicates which SAUs are contributing most to the differences between years and CLUSTER identifies “natural groupings” of years where years within a group are more like each other than years outside of the group that fall into other groups.

Spatial and temporal analyses of annual CPUE were compared across financial years. CPUE is estimated as the catch-weighted mean of daily CPUE where; 1) the percentage of the target species in the catch for each daily record is used as a weighting factor in calculating the arithmetic mean of daily CPUE records; and 2) effort is split based on the species proportion in the daily catch, assuming equal catch rate for each species (Appendix 6.2, Table 6.12). In all instances, prior to calculation of CPUE, daily data were filtered to remove records where effort was <3 and >8 hours and the ratio of total catch over total hours was >66.7 $kg.hr^{-1}$. Daily records with <30% of the target species were also excluded from data used to estimate CPUE. The minimum sample

size used to calculate CPUE was 10 fishing records. For CPUE, where less than ten records are available for the year, the HS allows the estimation of CPUE by the inclusion of additional data from previous years (as described in the new HS, PIRSA 2021). These CPUE values can be identified in the plots as they lack error bars. Where there is a complete absence of CPUE data for a particular year CPUE is not estimated. The combined trend of CPUE and catch is also displayed as a time series of relative catch multiplied by relative CPUE, where the metric for each year is divided by that in 1979 prior to multiplication, as an approximation to a Kobe plot (Kell 2012).

2.1.3 Fishery-independent data

Blacklip abundance and size structure were obtained from SARDI FIS which are currently undertaken biennially. The FI output statistics include mean density (± se) of legal and sub-legal-sized blacklip and length-frequency distributions. In 2023, FI data were scheduled for five SAUs – Drummond, Sheringa, Point Westall, Avoid Bay and Anxious Bay– and were estimated from cross-drop surveys (Chick et al. 2012).

Length frequency distributions are shown in plots of number of blacklip by size bin. In order to aid the interpretation of the length-frequency distributions, the numbers are also converted to percentages and the percentage of large blacklip (LARGE) from FI survey length-frequency distributions is defined as the ratio of 'large' blacklip (≥145 mm SL) to all legal-sized (*i.e.,* ≥130 mm SL) measurements. The percentage of small blacklip (SMALL) is defined as the ratio of 'small' blacklip (<100 mm SL) to all sub-legal-sized blacklip (*i.e.,* ≥100 mm to <129 mm SL).

2.2 Greenlip status

Data sources and methods used for greenlip are described in Stobart et al. (2020) and generally mirror those described above for blacklip. There were three differences between greenlip and blacklip performance indicators. First, for greenlip, the proportion grade 1 greenlip, the largest grade category where abalone weigh ≥ 230g meat weight (PropG1), is used as a secondary indicator to inform the assessment. Second, data for Drummond North and Drummond South were combined and reported as Drummond because there was insufficient data for greenlip to report Drummond North and Drummond South separately. Third, greenlip FI surveys use 100m lead lines as opposed to cross drops used for blacklip. For PropG1, records where the total catch was >1% different from the sum of all three weight-grade categories were excluded, as were all records with zero catch. The minimum sample size used to calculate PropG1 was 10 fishing

records; therefore, the absence of data for this measure in any one year indicates fewer records were available.

2.3 Harvest Strategy – Blacklip and Greenlip

The HS is described in the Management Plan for the South Australian Commercial Abalone Fishery (PIRSA 2021). Briefly, the HS uses financial year FD and FI data. The FD data are used to estimate CPUE, and the FI data are used to estimate density of legal-sized abalone. SAU-specific limit and target reference points, determined from pre-identified reference periods, are used to score CPUE and legal-density for each SAU. Low-catch SAUs are combined by region to allow the determination of CPUE scores. Scores of the two performance indicators (PIs) are combined to achieve a final SAU score which is a measure of overall stock performance for the SAU. If both PIs are available, they are calculated using a 50:50 weighting, otherwise the available PI equals the final score. For detail of scoring where there are missing years see PIRSA (2021).

On collating this report, the outcome of the HS for 2023 for blacklip was affected because FIS surveys at Point Westall and Anxious Bay were not yet completed. There was, therefore, no FIS score contribution from these two SAUs to the 2023 financial year HS scoring in the HS outcome presented in the results section of this report. The HS was therefore also calculated using an alternative approach where the Point Westall and Anxious Bay density values from the 2021 survey were carried over to 2023 (the proposed HS currently only allows FIS carryover for one year).

2.4 Quality Assurance

Quality assurance systems form an integral part of stock assessments undertaken by SARDI. These systems are designed to ensure high quality project planning, data collection and storage, analyses, interpretation of results and report writing. Details of the five individual components are provided in Appendix 6.3.

3 RESULTS

3.1 Blacklip

3.1.1 Western Zone annual patterns in catch, CPUE and fishing depth

Total catches were relatively stable from the introduction of Region A quota in 1985 (98 t) to 2013 (Figure 3.1a). Within this period, fluctuations in catch were primarily attributed to the introduction of quota to Region B in 1991 (9.2 t), increases to the Region B TACC in 1993 (11.5 t), 1994 (13.8 t) and Region A in 1997 (97.8 t), a reduction to the Region A TACC in 1996 (86 t), 2010 (92 t) and 2013 (87.4 t) and Region B in 2011 (9.2 t) and 2012 (6.9 t), and the variation in the proportion of blacklip caught in Region B (Figure 3.1a). Subsequently, catch decreased 60% between 2013 (101 t) and 2020 (40.7 t) following the removal of one licence in 2013 and reductions to the WZ TACC in 2016 (74.6 t), 2018 (66.6 t), 2019 (58.6 t) and 2020 (43 t).

CPUE was generally stable over two periods: 1980 to 1989 (mean 23.8 kg.hr-1) and 1990 to 2000 (mean 25.6 kg.hr^{-1}), after which it increased rapidly (20%) to a historic high in 2006 (30.7 kg.hr^{-1}; Figure 3.1a). CPUE then declined over 13 years between 2006 and 2019 (20.0 kg.hr^{-1}; 35%) and, in 2019, was the lowest value on record. Subsequently, CPUE has increased but, in 2023 (22.1 kg.hr^{-1}) remained among the lowest values on record (Figure 3.1 a,b). The 2023 value from the combined trend of relative catch and relative CPUE was the third lowest value on record (Figure 3.1c), with the four lowest values occurring between 2020 and 2023.

Fishing effort across depth ranges has remained relatively stable over the last fourteen years (Figure 3.1d).

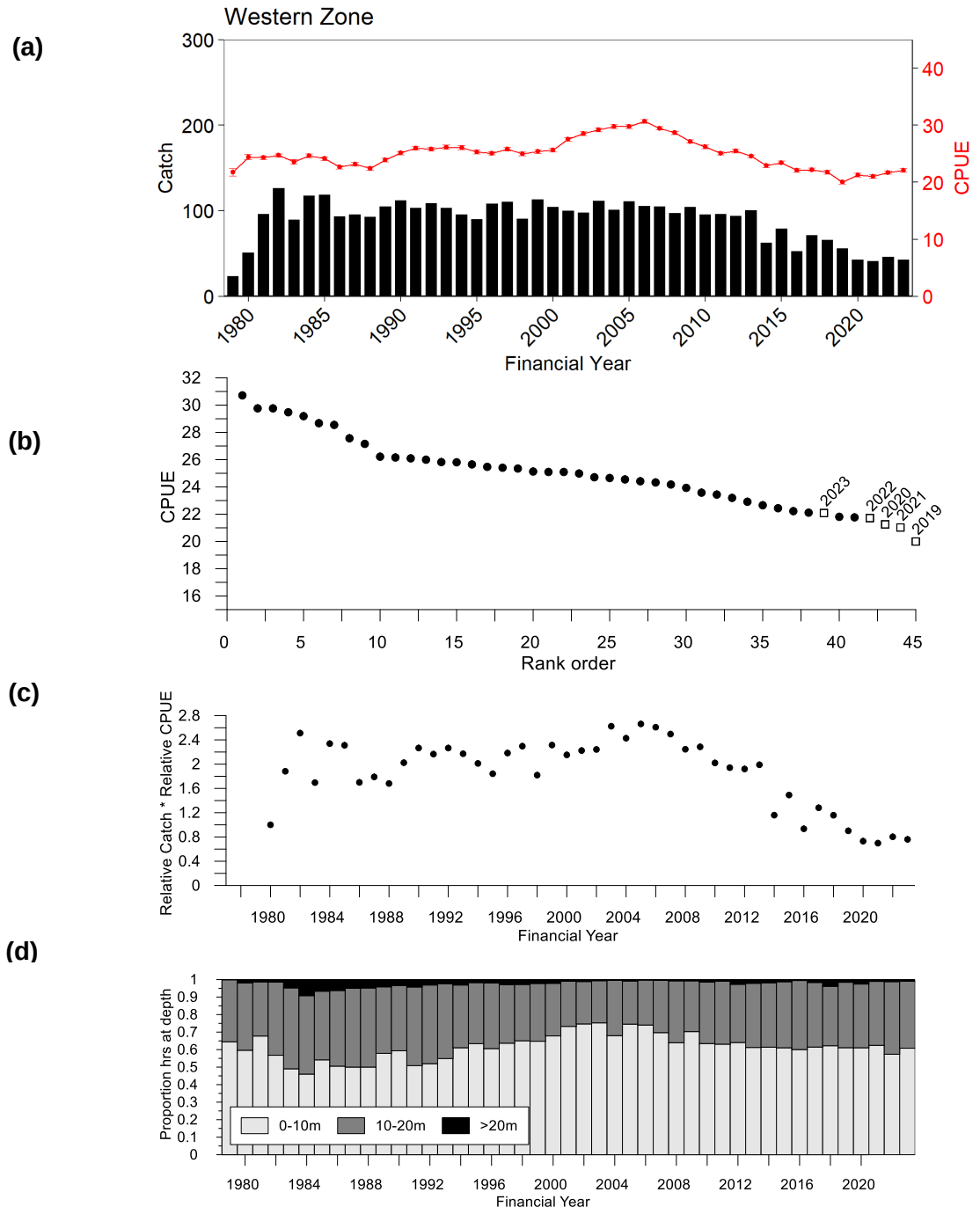


Figure 3.1. Blacklip **(a)** Catch (t, meat weight; black bars) and CPUE ± se (kg.hr^{-1}; solid red line) from the Western Zone from 1979 to 2023. **(b)** Rank order of Western Zone blacklip CPUE (kg.hr^{-1}). Last five years are marked with open square symbols. **(c)** Combined trend of relative catch and relative CPUE from the Western Zone from 1979 to 2023. **(d)** Proportion of hours fished in the Western Zone at three depth ranges (see legend) using fishing records where blacklip constituted 75% or more of the catch.

3.1.2 Catch and CPUE within Regions of the WZ

The percent of catch harvested from the four regions was similar from the introduction of quota in 1985 to 2006, whereafter it generally decreased in the Streaky Bay region from 2006 and Elliston from 2010 and increased substantially in Port Lincoln between 2010 and 2020 (Figure 3.2a). Catch from the Far West region remained relatively stable at a low percentage between 1984 and 2019 but decreased to zero in 2021 and 0.1 t in 2022 and 2023.

The CPUE in the Port Lincoln region was relatively stable from 1980 to 2000, whereafter it increased and, in 2007, reached a peak of 31.1 $kg.hr^{-1}$ (Figure 3.2b). CPUE then declined consistently from 2007 to 2019, with the 2019 value (18.5 $kg.hr^{-1}$) the lowest on record. Subsequently CPUE has increased and in 2023 was 20.1 $kg.hr^{-1}$. Similarly, the CPUE from the Elliston and Streaky Bay regions generally decreased from peaks in the mid-2000's, with CPUE from the Elliston region decreasing to the lowest value on record in 2020 (21.9 $kg.hr^{-1}$) but increasing by 2023 (Figure 3.2b; 24.3 $kg.hr^{-1}$). CPUE in the Streaky Bay region decreased from the peak in 2006 to 2010, whereafter it remained relatively stable at a lower level from 2010 to 2023. (Figure 3.2b). The Ceduna region CPUE was relatively stable from 1987 to 2009, whereafter it varied considerably among years and had the lowest recorded values for this region from 2017 to 2020, with CPUE not able to be estimated for the period 2021-2023 (Figure 3.2b).

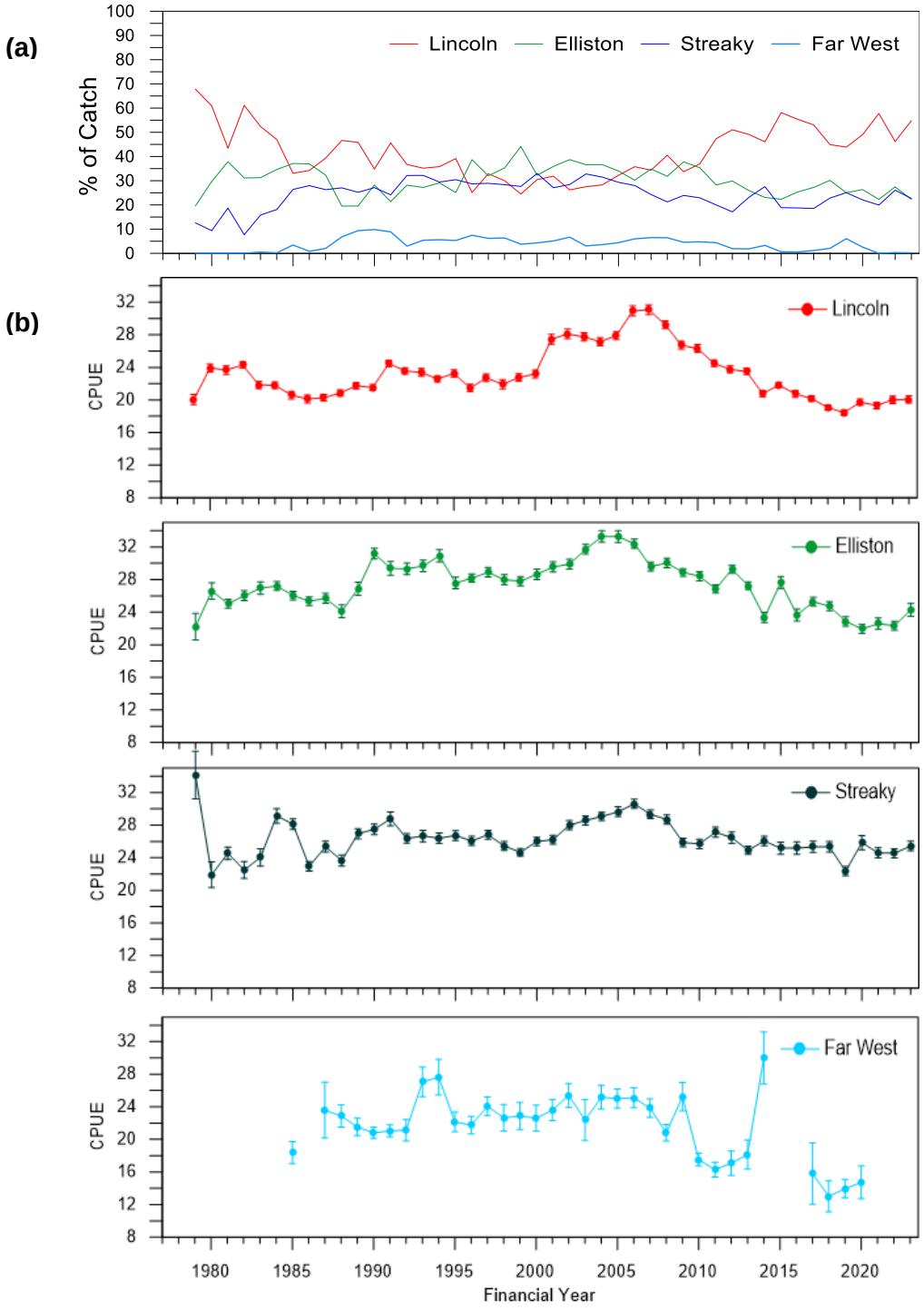


Figure 3.2. Blacklip **(a)** Comparison between percent catch and **(b)** CPUE ± se (kg.hr^{-1}) at Western Zone regions (see legend) from the 1979 to 2023 financial years.

3.1.3 Distribution of catch among spatial assessment units

In 2023, the seven SAUs from which more than 5% of the total blacklip catch was harvested were Drummond South (22.1%), Drummond North (14.3%), Sheringa (13.1%), Point Westall (11.4%), Searcy Bay (8.3%), Point Avoid (6.3%) and Reef Head (5.7%). Cumulatively, they represented 81% of the catch. This differed from the eight SAUs that exceeded 5% of the total blacklip catch in 2021 (Stobart et al. 2021) and represented 82% of the catch because catch decreased at Avoid Bay in 2023 (4.6%) and there has been an increase in the proportion of catch harvested from Drummond as South and North (15.8% and 9.8% in 2021, respectively). The distribution of catch among SAUs changed between 2022 and 2023, with the largest changes being increases at Drummond South (6.2 t; 13.5% to 9.5 t; 22.1%) and Drummond North (5.4 t; 11.8% to 6.1 t; 14.3%) and decreases at Sheringa (8.0 t; 17.4% to 5.6 t; 13.1%) and Point Westall (6.8 t; 14.7% to 4.9 t; 11.4%).

The MDS plot shows five groupings of years based on CLUSTER analysis (75% similarity) where the distribution of blacklip catch in SAUs within each group was similar (Figure 3.3). The longest period of similarity occurred during a period when the catch contribution from SAUs was more diverse and lasted 19 years from 1992 to 2010. During this period, the catch contribution was more evenly distributed among SAUs and generally changed less abruptly between years (Figure 3.4). Catch distribution over the last thirteen years formed another cluster, with blacklip catch obtained from fewer SAUs, primarily Drummond, Sheringa, Point Westall, Searcy Bay, Reef Head, Point Avoid, Avoid Bay and Anxious Bay. Notable catch reductions were observed from Ward Island, Venus Bay Flinders Island and Hotspot during this period.

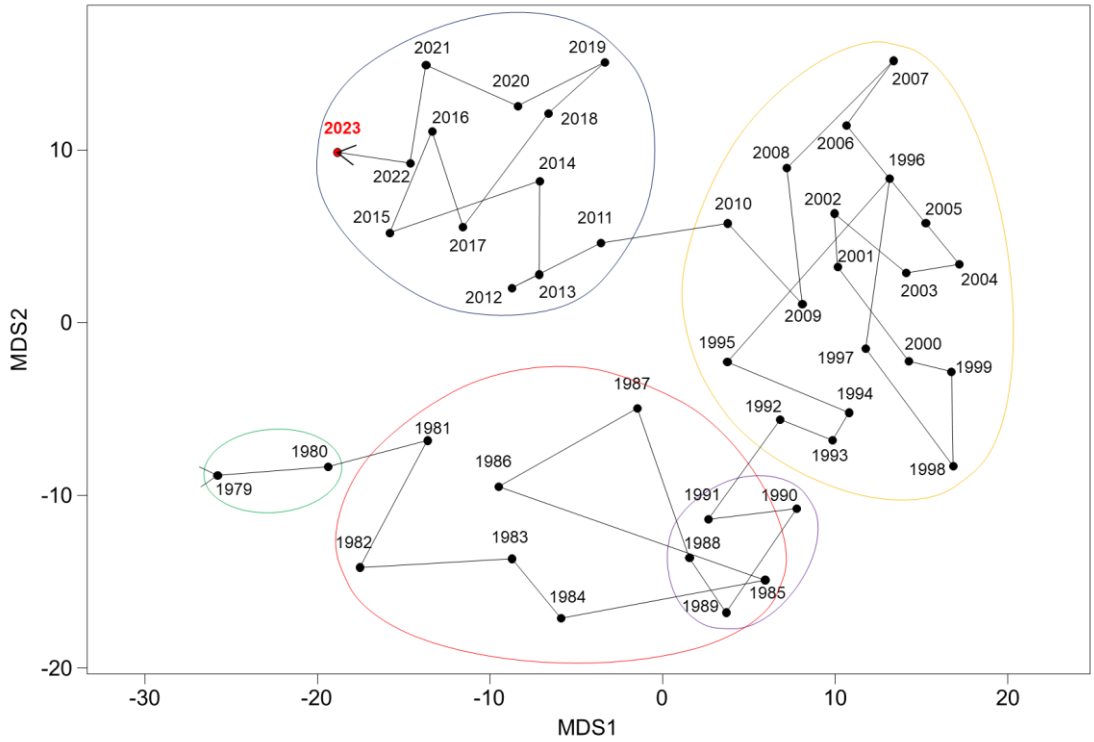


Figure 3.3. Multi-dimensional scaling (MDS) plot for SAUs showing similarity among years based on greenlip catch from the Western Zone from the 1979 to 2023 financial year. 2D stress = 0.20. coloured lines indicate numbered clusters with 75% similarity.

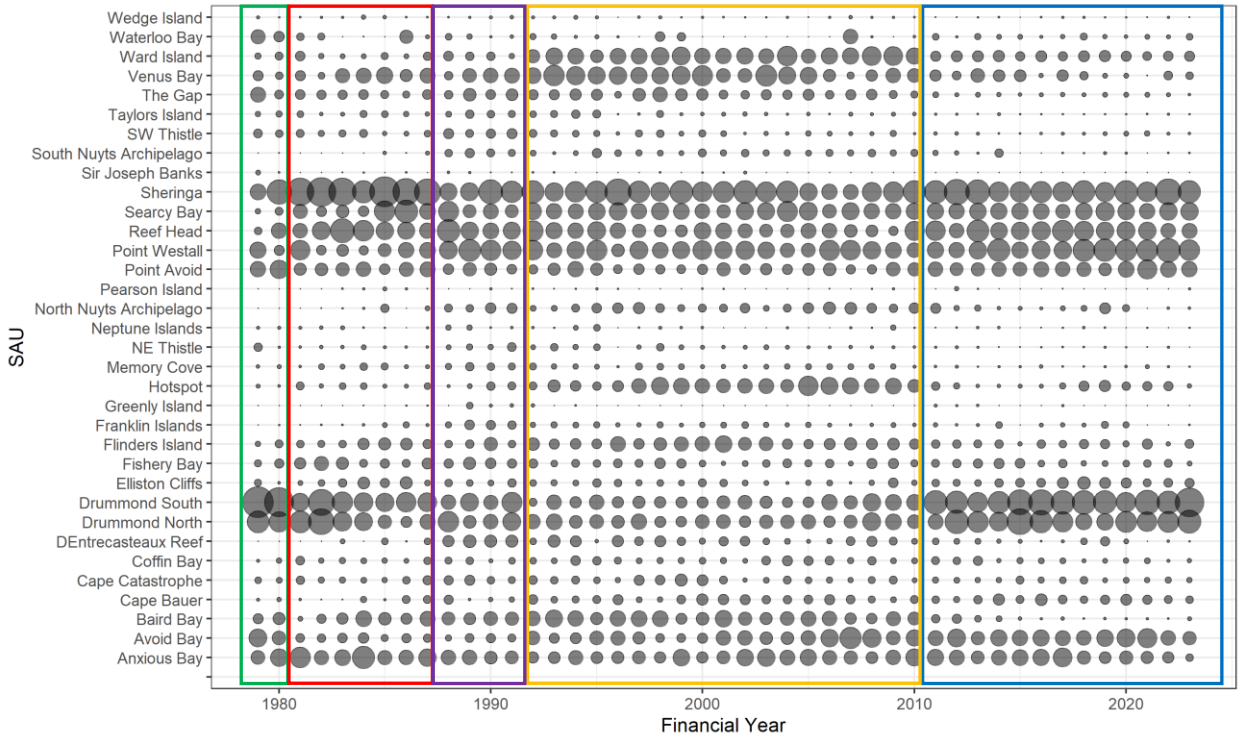


Figure 3.4. Bubble plot showing the spatial distribution of blacklip catch (% of total catch) among WZ SAUs from the 1979 to 2023 financial years. Coloured boxes represent clusters from the MDS in Figure 3.3.

3.1.4 Distribution of harvest strategy scores among spatial assessment units

Eleven of the 15 SAUs scored for CPUE had values below 5, as did two of the four amalgamated low catch SAUs (Figure 3.5). SAUs Drummond South and Avoid Bay scores for legal density were below 5 while that for Sheringa increased to the highest value on record (surveys for Anxious Bay and Point Westall are delayed and thus not scored for this assessment). There was insufficient data to determine CPUE at SAU Venus Bay and the Far West Low SAUs from 2021 to 2023 and thus their combined score was zero. The SAUs with a combined score below 5 contributed 74% of the 2023 financial year blacklip catch.

The combined scores did not change much from 2022 to 2023 (Figure 3.6a), with the exception of decreases in combined scores from Drummond South and Avoid Bay and Increases for SAUs close to Elliston, Sheringa and Streaky Bay, noting that the lower scores in 2023 for Point Westall and Anxious Bay in 2023 may be influenced by the delayed FIS for these areas. CPUE scores show relatively little change between 2022 and 2023 but highlight increases in score for SAUs close to Elliston, Seary Bay and Anxious Bay (Figure 3.6b).

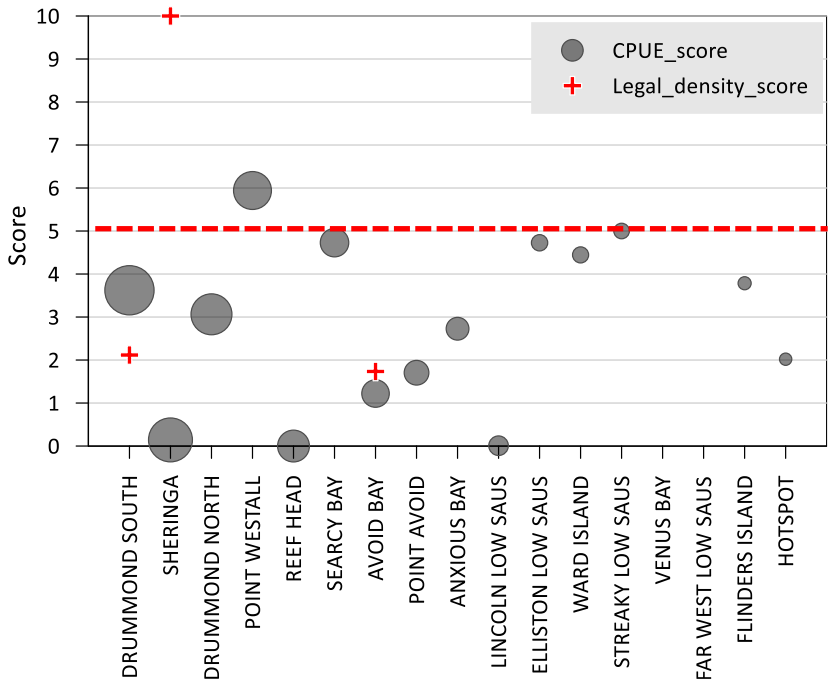


Figure 3.5. Blacklip SAU CPUE and legal density scores for the 2023 financial year (see legend). Bubble size for CPUE indicates % of WZ catch in the 2023 financial year. SAUs sorted left to right by decreasing HS catch contribution in 2023. Dashed red line shows target score of 5.

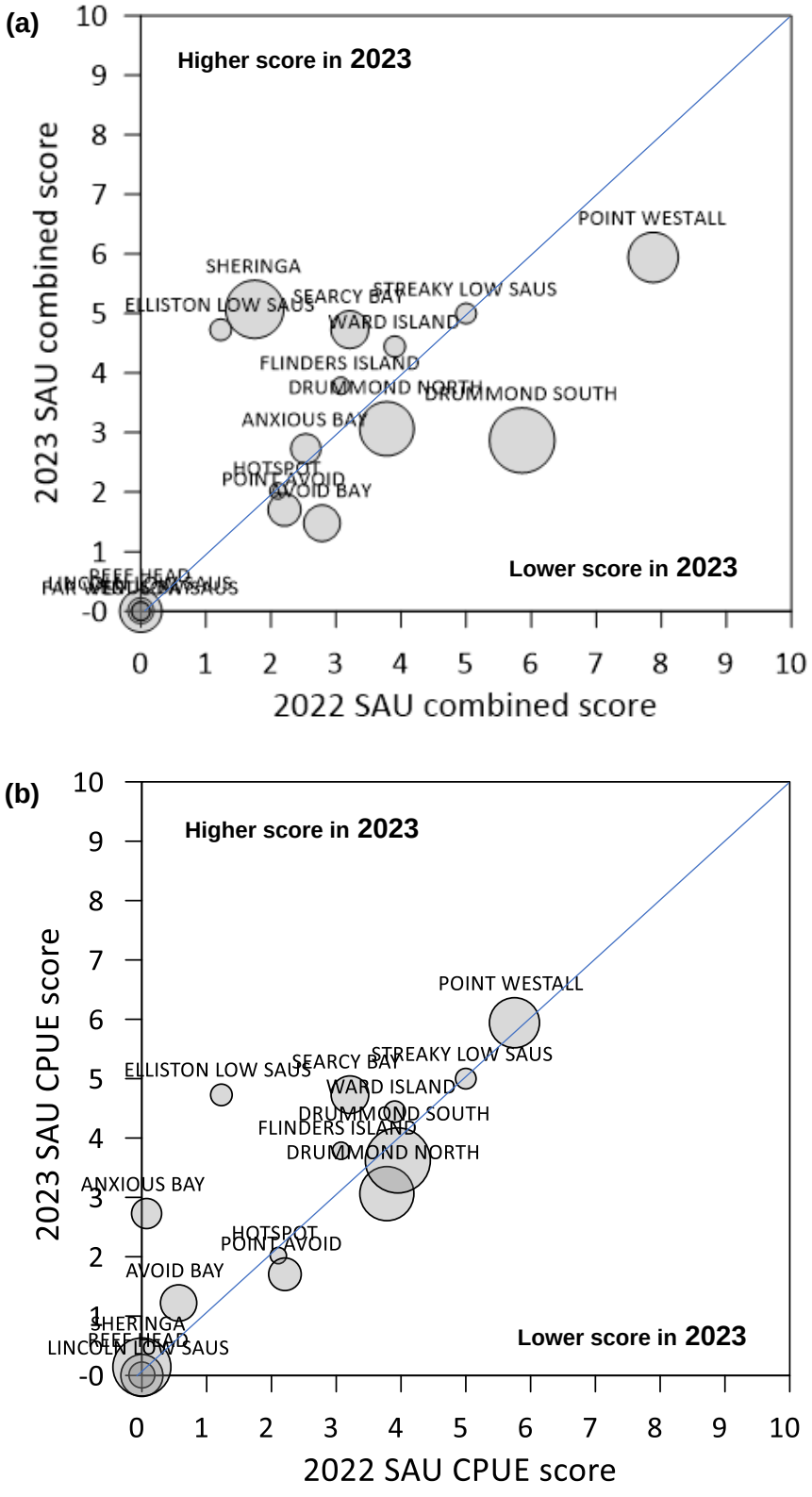


Figure 3.6. Comparison of blacklip HS (a) SAU combined scores and (b) SAU CPUE scores between 2022 and 2023. Bubble size indicates catch proportion in 2023.

3.1.5 Temporal patterns in spatial assessment units

Drummond South

Following very high catch in 1982 (23.3 t), catch generally decreased to the lowest on record in 1992 (1.6 t; Figure 3.7). Catch remained relatively low between 1993 and 2005, wheareafter it increased to a peak in 2011 (14.0 t). Catches from this SAU then decreased to 4.4 t in 2020 and have since increased to 9.5 t in 2023. CPUE generally increased from 1979 (22.0 kg.hr^{-1}) to the maximum in 2006 (32.2 kg.hr^{-1}) and then declined to the third lowest value in 2019 (19.7 kg.hr^{-1}). Subsequently, CPUE increased and, in 2023, was 21.5 kg.hr^{-1} but remains below the lower limit of the target reference band of the HS.

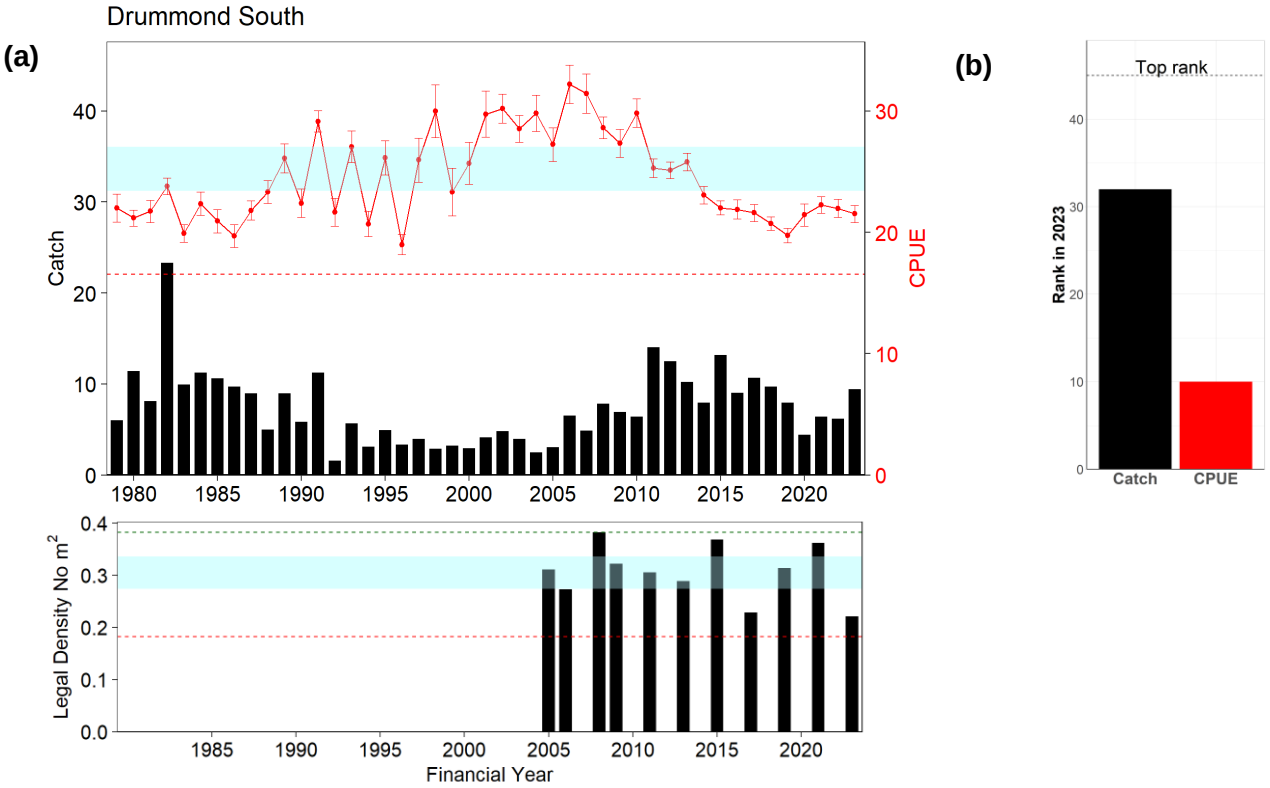


Figure 3.7. Drummond South blacklip **(a)** Catch (t meat weight, top plot black bars), CPUE ± se (kg.hr^{-1}, solid red line) and legal-sized mean density (abalone.m^{-2}, bottom plot black bars) from the 1979 to 2023 financial years. For the harvest strategy, the horizontal green and red dashed lines show the upper and limit reference points, respectively, and the target reference band is shaded light blue for performance indicators CPUE and legal-sized mean density. Density is from cross drop fishery-independent surveys from mapcode 12B. **(b)** Rank of Catch and CPUE in 2023 relative to historic.

FI surveys at Drummond South indicated the density of legal-sized blacklip in 2023 was the lowest recorded since surveys began in 2005 and below the target reference band of the HS (HS score 2.1; Figure 3.7). The density of sub-legal-sized blacklip remained similar from 2005 to 2021 but decreased 47% between 2021 and 2023 to the lowest values on record (Figure 3.8). The

percentage of LARGE blacklip varied between years (range: 12-40%), with the highest percentage recorded in 2019 (Figure 3.9). The percentage of SMALL blacklip was relatively low in 2006 and 2013 (10%), the lowest on record in 2021 (7%), and high in 2008 and 2009 and (> 25%; Figure 3.9).

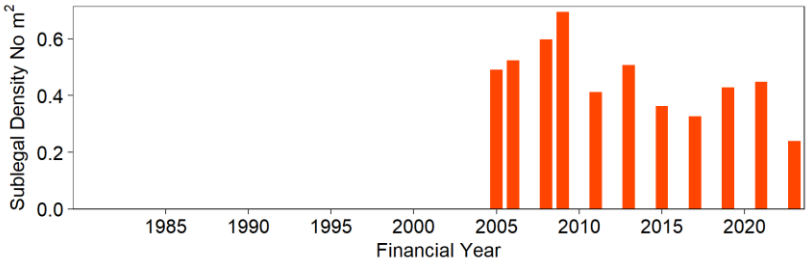


Figure 3.8. Mean density (abalone.m^{-2}) of sub-legal-sized blacklip at Drummond South from the 2005 to 2023 financial years. Density is from cross drop fishery-independent surveys from mapcode 12B).

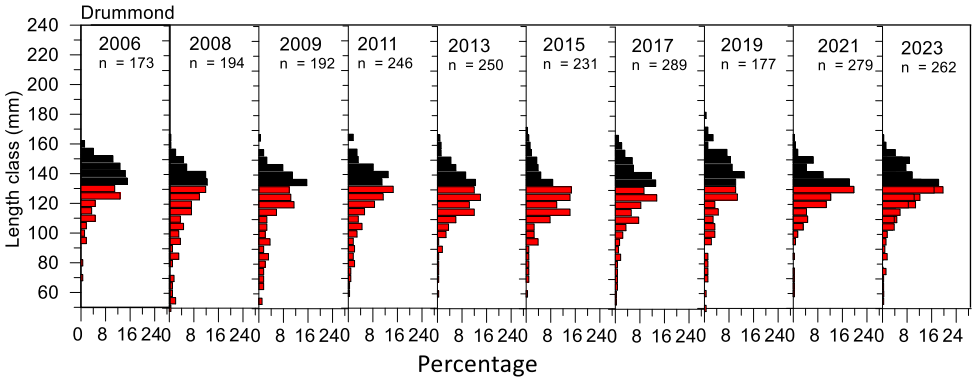


Figure 3.9. Length-frequency distributions of legal-sized (black bars) and sub-legal-sized (red bars) blacklip at Drummond South (mapcode 12B) observed in fishery independent surveys from the 2006 to 2023 financial years. Length classes represent the upper length of each 5mm bin. n = number of blacklip measured.

Drummond North

With the exception of very high catch in 1982 (22.3 t), and high catches in 2012 and 2015 (~13.7 t), catch from Drummond North has ranged between 2.7 t and 11.5 t (average 5.7 t; Figure 3.10). In 2023 catch was 6.1 t. CPUE generally increased from 1979 (21.1 kg.hr^{-1}) to the maximum in 2007 (31.3 kg.hr^{-1}). It subsequently declined consistently and, in 2019 was the lowest value on record (19.7 kg.hr^{-1}) and close to the lower limit reference point. CPUE has subsequently increased and in 2023 was 21.5 kg.hr^{-1}, but remains below the target reference band of the HS.

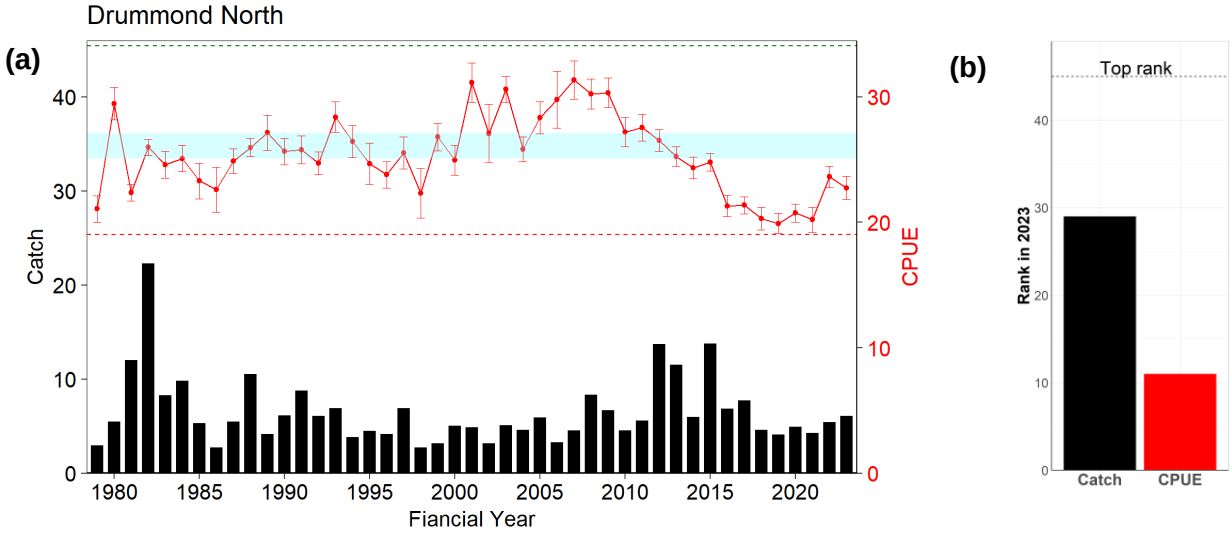


Figure 3.10 Drummond North blacklip **(a)** Catch (t meat weight, black) and CPUE ± se (kg.hr^{-1}, solid red line) from the 1979 to 2023 financial years. For the harvest strategy, the horizontal green and red dashed lines show the upper and limit reference points, respectively, and the target reference band is shaded light blue. **(b)** Rank of Catch and CPUE in 2023 relative to historic.

Sheringa

Annual catches from Sheringa have oscillated among years with substantially larger catches (>27 t) harvested from this SAU in 1982 and 1985 (Figure 3.11). Lower catches from 2006 to 2007 were the consequence of industry agreeing with PIRSA to reduce the level of catch from this SAU for this period. Catches increased from 2008 and, in 2012 (16.0 t), catch was at the highest level since 1996. Catch remained high in 2013 (15.2 t) but then decreased 58% by 2014 (6.4 t) and has remained relatively low thereafter. CPUE generally increased from 1979 to a peak in 2006 (35.1 kg.hr^{-1}), then decreasing, with the value in 2020 (21.7 kg.hr^{-1}) the lowest on record and below the limit reference point of the HS for Sheringa. CPUE subsequently increased to 23.5 kg.hr^{-1} in 2023 but remains on the limit reference point of the HS.

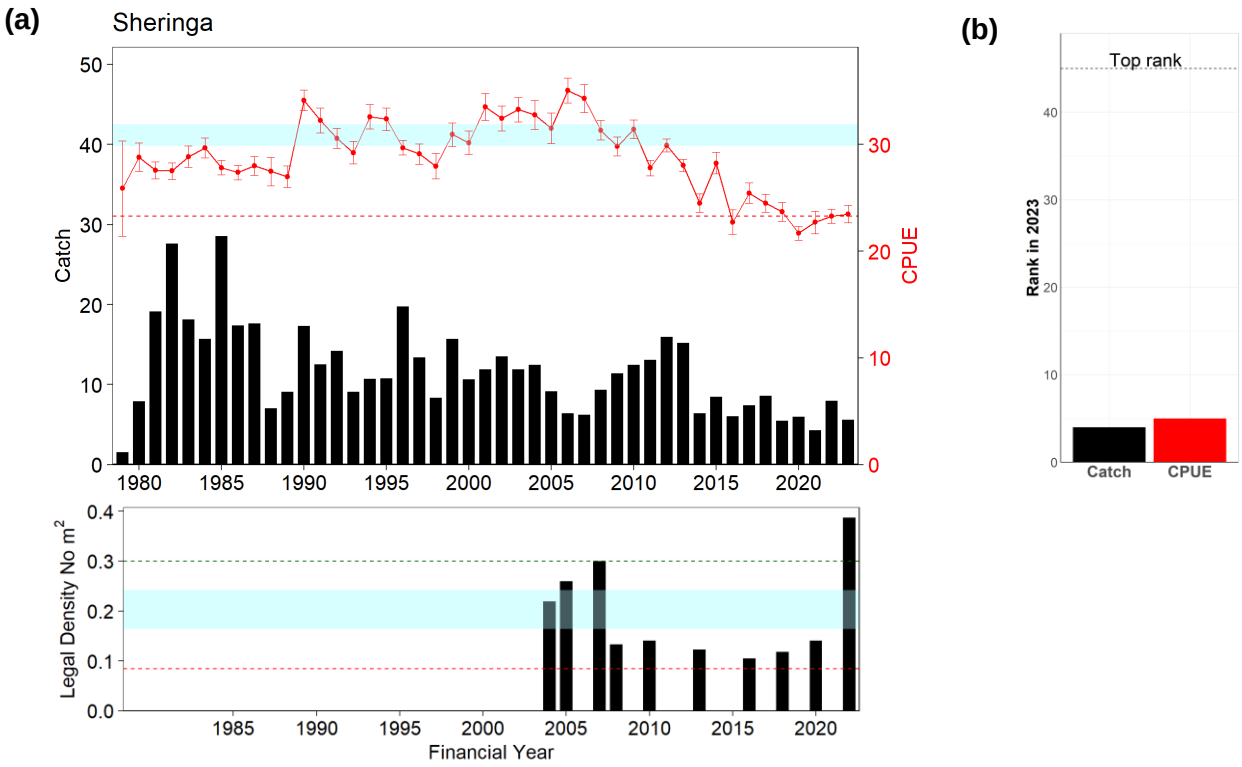


Figure 3.11. Sheringa blacklip **(a)** Catch (t meat weight, top plot black bars), CPUE ± se (kg.hr^{-1}, solid red line) and legal-sized mean density (abalone.m^{-2}, bottom plot black bars) from the 1979 to 2023 financial years. For the harvest strategy, the horizontal green and red dashed lines show the upper and limit reference points, respectively, and the target reference band is shaded light blue for performance indicators CPUE and legal-sized mean density. Density is from cross drop fishery-independent surveys from mapcode 11A. **(b)** Rank of Catch and CPUE in 2023 relative to historic.

The FI surveys at Sheringa indicate that the density of legal-sized blacklip halved between 2008 and 2009, remained relatively low until 2021 (<0.15 m^{-2}) and, in 2023, more than doubled to the highest value on record (Figure 3.11). Excepting higher values in 2005 and 2008, the density of

sub-legal-sized blacklip oscillated at a relatively low level from 2005 to 2021 and, in 2023, increased to the highest value on record (Figure 3.12). The percentage of LARGE blacklip varied considerably between 2004 and 2018 (range: 43-73%), with the largest size classes evident in all years (Figure 3.13). The percentage of SMALL blacklip was also variable between years (range 8-40%).

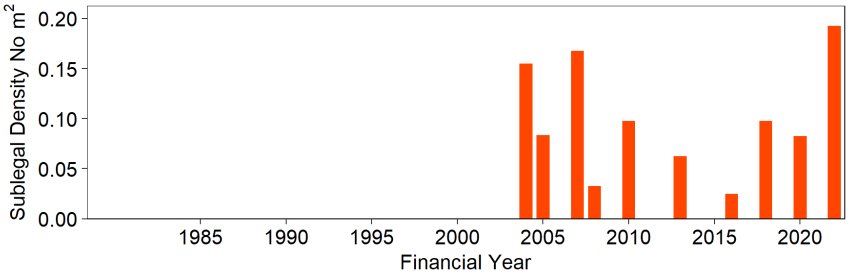


Figure 3.12. Mean density (abalone.m^{-2}) of sub-legal-sized blacklip at Sheringa from the 2005 to 2023 financial years. Density is from cross drop fishery-independent surveys from mapcode 11A.

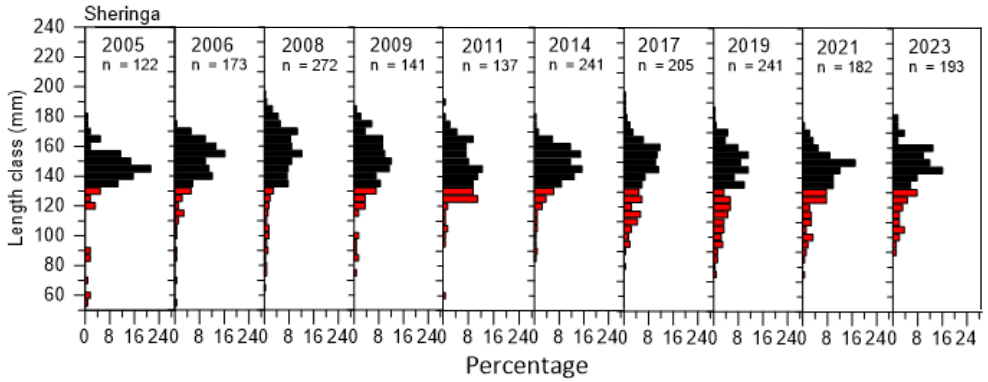


Figure 3.13. Length-frequency distributions of legal-sized (black bars) and sub-legal-sized (red bars) blacklip at Sheringa (mapcode 11A) observed in fishery independent surveys from the 2005 to 2023 financial years. Length classes represent the upper length of each 5mm bin. n = number of blacklip measured. Bin classes < 50mm SL pooled.

Point Westall

Except for the high catch in 1981 (9.9 t), catches from Point Westall increased from 1979 to a peak in 1989 (13.2 t; Figure 3.14). Subsequently, catch has oscillated between 1990 and 2023, ranging between 12.t and 4.4 t. Catch in 2023 was 4.9 t. Except for a high value in 1979 (40.1 kg.hr^{-1}) and the lowest value recorded in 1982 (19.0 kg.hr^{-1}), CPUE has remained relatively stable and, in 2023, was 26.0 kg.hr^{-1} and above the target reference band of the HS.

The density of legal-sized blacklip remained relatively stable from 2005 to 2015, was the lowest recorded in 2017, and subsequently increased in 2019 and 2021, with these being the highest values recorded (Figure 3.14).

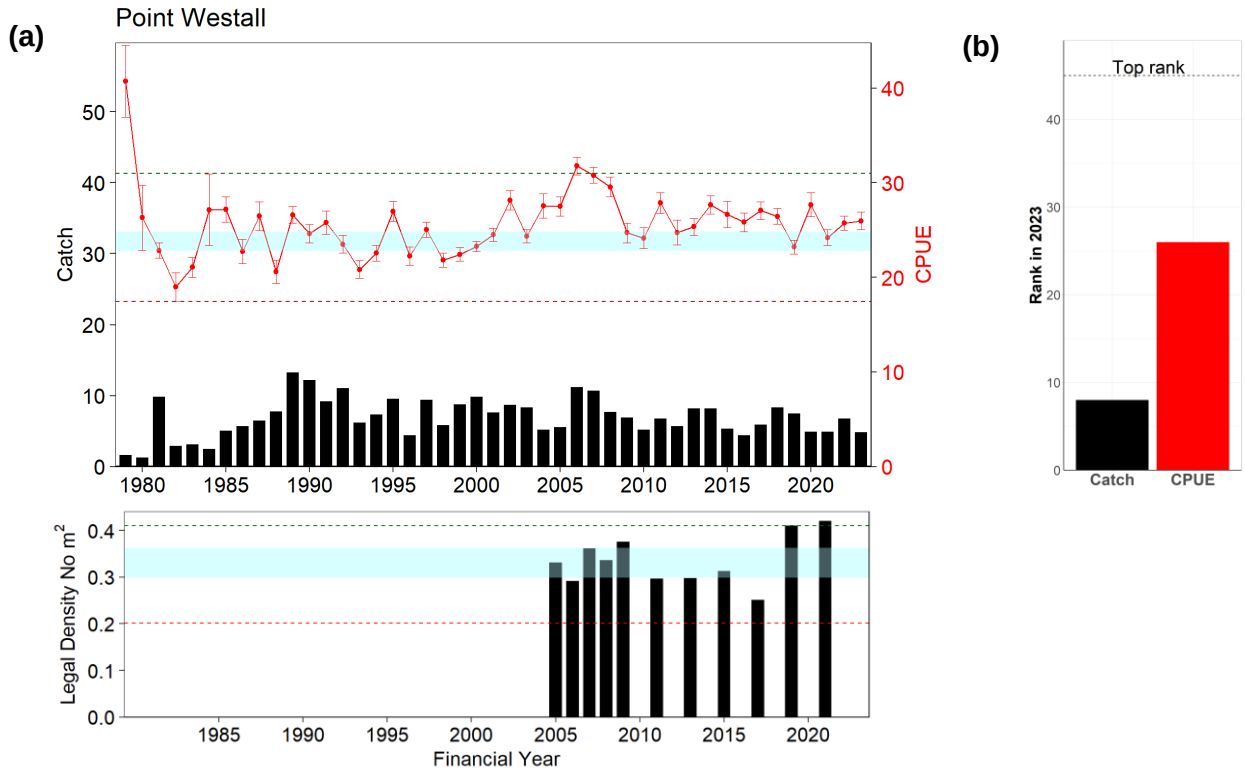


Figure 3.14. Point Westall blacklip **(a)** Catch (t meat weight, top plot black bars), CPUE ± se (kg.hr^{-1}, solid red line) and legal-sized mean density (abalone.m^{-2}, bottom plot black bars) from Point Westall from the 1979 to 2023 financial years. For the harvest strategy, the horizontal green and red dashed lines show the upper and limit reference points, respectively, and the target reference band is shaded light blue for performance indicators CPUE and legal-sized mean density. Density is from cross drop fishery-independent surveys from mapcode 4B. **(b)** Rank of Catch and CPUE in 2023 relative to historic.

Sub-legal-sized blacklip at Point Westall remained relatively stable from the year surveys began in 2005 to 2013, whereafter they almost halved in 2015 (Figure 3.15). Sub-legal density then increased consistently from the low value in 2015 to the highest recorded value in 2021. The percentage of LARGE blacklip has remained relatively stable, with the highest percentage

recorded in 2019 (range: 17-37%; Figure 3.16). The range of the percentage of SMALL blacklip was similar, with the highest percentage in 2015 (range: 16-26%).

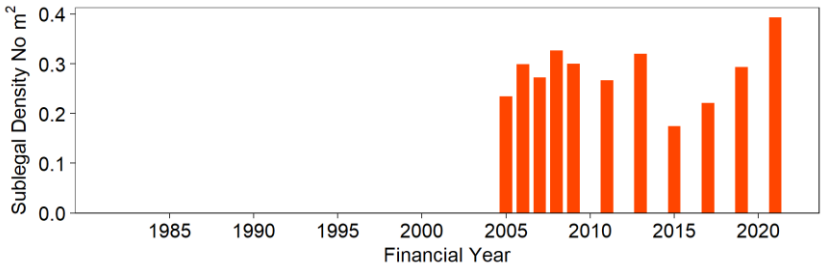


Figure 3.15. Mean density (abalone.m^{-2}) of sub-legal-sized blacklip at Point Westall from the 2005 to 2021 financial years. Density is from cross drop fishery-independent surveys from mapcode 4B.

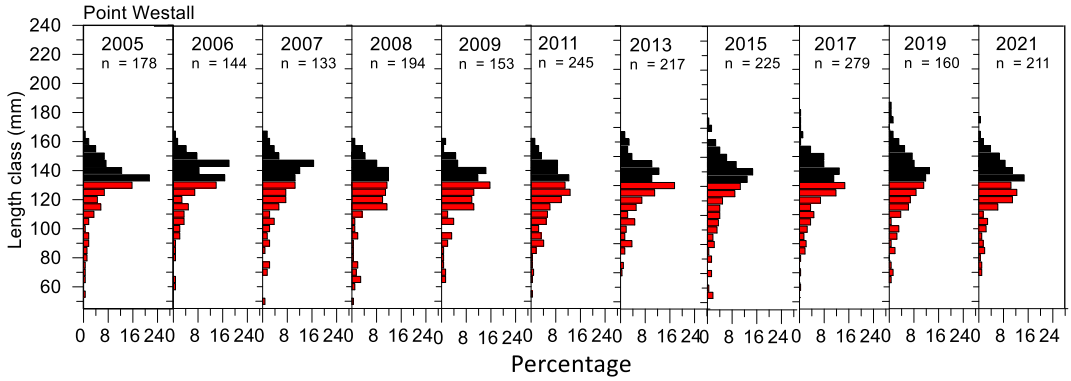


Figure 3.16. Length-frequency distributions of legal-sized (black bars) and sub-legal-sized (red bars) blacklip at Point Westall (mapcode 4B) observed in fishery independent surveys from the 2005 to 2023 financial years. Length classes represent the upper length of each 5mm bin. n = number of blacklip measured.

Avoid Bay

Catch from Avoid Bay was relatively low between 1979 and 1991 (< 2.5 t), variable from 1992 to 2000 and relatively stable, ranging from 4-8 t between 2001 and 2021 (Figure 3.17) except for the three-year period from 2006 to 2008 and 2012 when catch was higher (8-13 t). Catch has subsequently halved between 2021 (4.0 t) and 2023 (2.0 t). CPUE has varied considerably among years but has recently declined from the high levels through the mid-2000s to 2015 when it was relatively low (18.1 kg.hr^{-1}) and close to the lower limit reference point of the HS. CPUE has remained low and close to the limit reference point from 2015 to 2023 (average 18.8 kg.hr^{-1}).

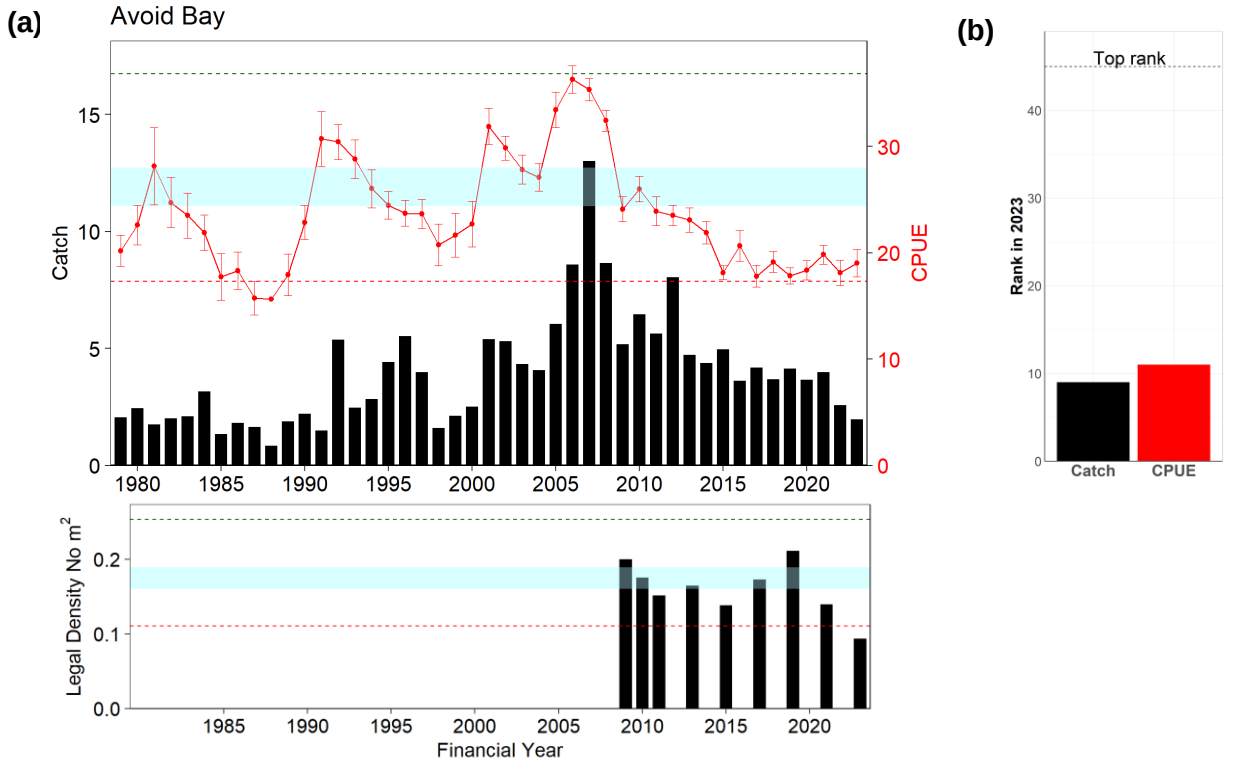


Figure 3.17. Avoid Bay blacklip **(a)** Catch (t meat weight, top plot black bars), CPUE ± se (kg.hr^{-1}, solid red line) and legal-sized mean density (abalone.m^{-2}, bottom plot black bars) from the 1979 to 2023 financial years. For the harvest strategy, the horizontal green and red dashed lines show the upper and limit reference points, respectively, and the target reference band is shaded light blue for performance indicators CPUE and legal-sized mean density. Density is from cross drop fishery-independent surveys from mapcode 14D. **(b)** Rank of Catch and CPUE in 2023 relative to historic.

Except for high values in 2009 and 2019, the density of legal-sized blacklip has fluctuated from 2009 when surveys began to 2021 but has subsequently decreased in 2023, when it was the lowest value recorded and below the lower limit reference point of the HS (Figure 3.17).

The density of sub-legal-sized blacklip decreased by over 50% between 2013 and 2015, subsequently increased to the highest density on record in 2019 (Figure 3.18) but has since decreased and, in 2023, was the lowest value on record. The percentage of LARGE blacklip varied between years (26-52%), with the lowest percentage occurring in 2015 (Figure 3.19). The percentage of SMALL blacklip was highest in 2015.

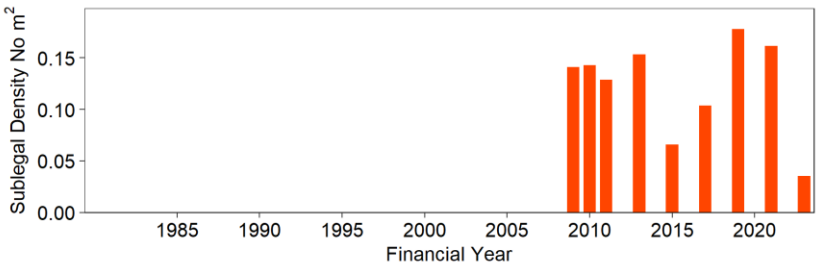


Figure 3.18. Mean density (abalone.m^{-2}) of sub-legal-sized blacklip at Avoid Bay from the 2009 to 2023 financial years. Density is from cross drop fishery-independent surveys from mapcode 14D.

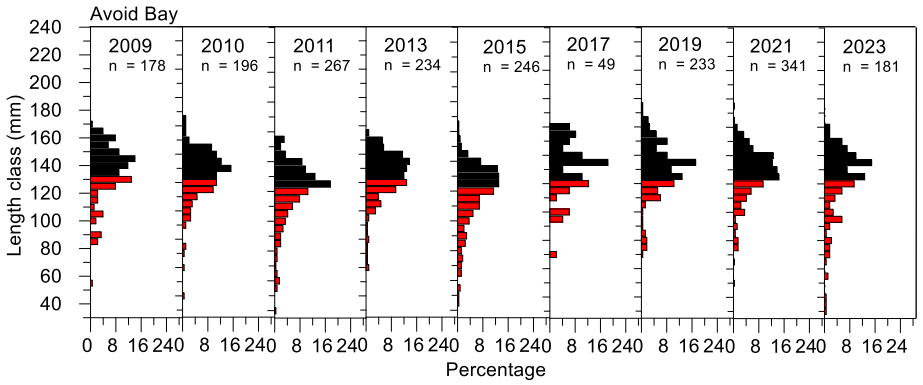


Figure 3.19. Length-frequency distributions of legal-sized (black bars) and sub-legal-sized (red bars) blacklip at Avoid Bay (mapcode 14D) observed in fishery independent surveys from the 2009 to 2023 financial years. Length classes represent the upper length of each 5mm bin. n = number of blacklip measured.

Anxious Bay

With the exception of high catches in 1981 (10.5 t) and 1984 (15.6 t), annual catches from Anxious Bay have ranged between 2 and 9 t.yr^{-1} (Figure 3.20). However, catch declined consistently from 2017 to 2023 when it was 0.6 t, the lowest value on record. CPUE was variable between 1979 and 2001, whereafter it increased and remained above the HS target reference point between 2002 and 2012 (average 28.2 kg.hr^{-1}). CPUE then declined and, in 2023 (20.5 kg.hr^{-1}), was among the lowest values on record.

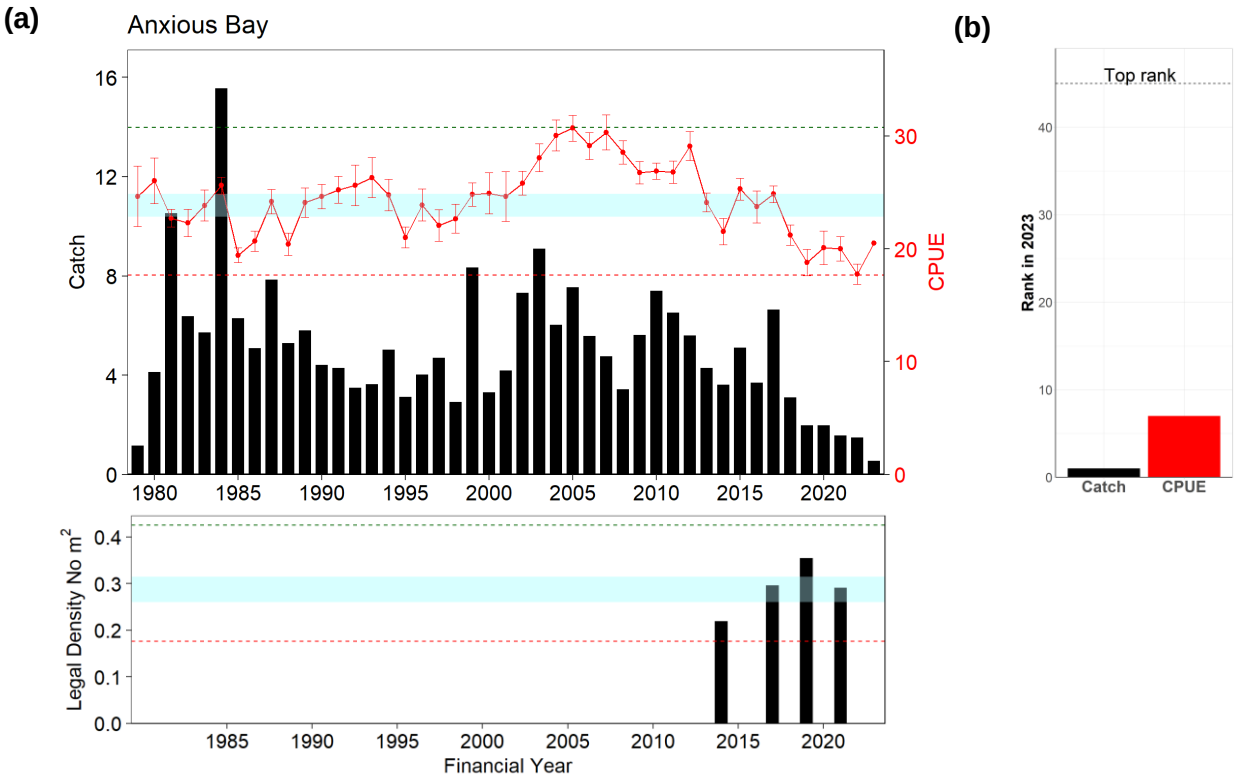


Figure 3.20. Anxious Bay blacklip **(a)** Catch (t meat weight, top plot black bars), CPUE ± se (kg.hr^{-1}, solid red line) and legal-sized mean density (abalone.m^{-2}, bottom plot black bars) from the 1979 to 2023 financial years. For the harvest strategy, the horizontal green and red dashed lines show the upper and limit reference points, respectively, and the target reference band is shaded light blue for performance indicators CPUE and legal-sized mean density. Density is from cross drop fishery-independent surveys from mapcode 8B. **(b)** Rank of Catch and CPUE in 2023 relative to historic.

The density of legal-sized blacklip increased since surveys began in 2014 and, in 2021, remained relatively high (Figure 3.20). Sublegal density in 2021 was the highest recorded (Figure 3.21). The percentage of LARGE blacklip was similar between years (Figure 3.22; 26-31%), with the lowest percentage occurring in 2019. In contrast, the percentage of SMALL blacklip was highest in 2019.

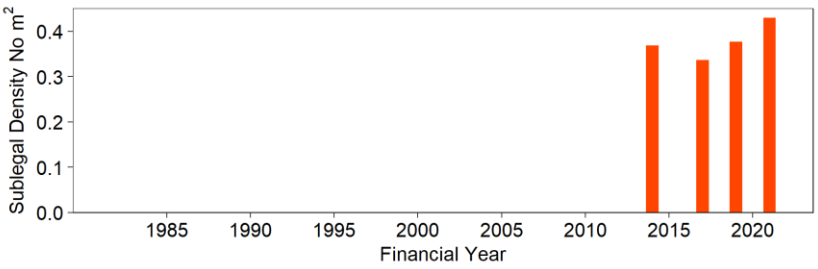


Figure 3.21Figure 3.22. Mean density (abalone.m^{-2}) of sub-legal-sized blacklip at Anxious Bay from the 2014 to 2023 financial years. Density is from cross drop fishery-independent surveys from mapcode 8B.

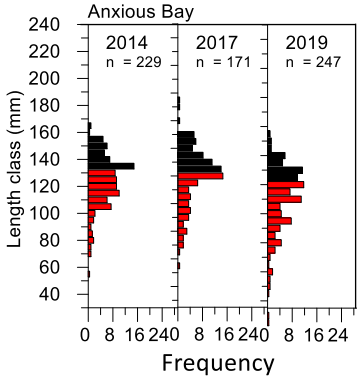


Figure 3.22. Length-frequency distributions of legal-sized (black bars) and sub-legal-sized (red bars) blacklip at Anxious Bay (mapcode 8B) observed in fishery independent surveys from the 2014 to 2023 financial years. Length classes represent the upper length of each 5mm bin. n = number of blacklip measured.

Reef Head

Annual catch from Reef Head generally oscillated and declined from a historic high in 1983 (13.5 t) to the second lowest on record in 2009 (2.1 t; Figure 3.23). Catch then increased 358% from 2009 to 2010 (9.6 t), remaining relatively high until 2017, whereafter it again decreased and, in 2023, was 2.4 t and the third lowest catch on record. CPUE declined 40% from the third highest value on record in 2002 (27.7 kg.hr^{-1}) to the lowest value on record in 2023 (13.8 kg.hr^{-1}), 13% below the HS lower limit reference point and with a HS score of zero.

Searcy Bay

Catch from Searcy Bay increased from the lowest on record in 1979 (0.3 t) to the highest values on record in 1985 and 1986 (~13 t), whereafter it remained relatively stable, ranging between 4 and 11 t.yr^{-1} from 1987 to 2015 (Figure 3.23). Catch then decreased and, in 2023, was 3.5 t. CPUE varied among years from 1980 to 2008, mostly remaining within, or above, the target

reference band of the HS from 1990 to 1997 and 2002 to 2008 , but subsequently decreasing and, in 2023 was 25.4 kg.hr^{-1} and below the target reference band of the HS.

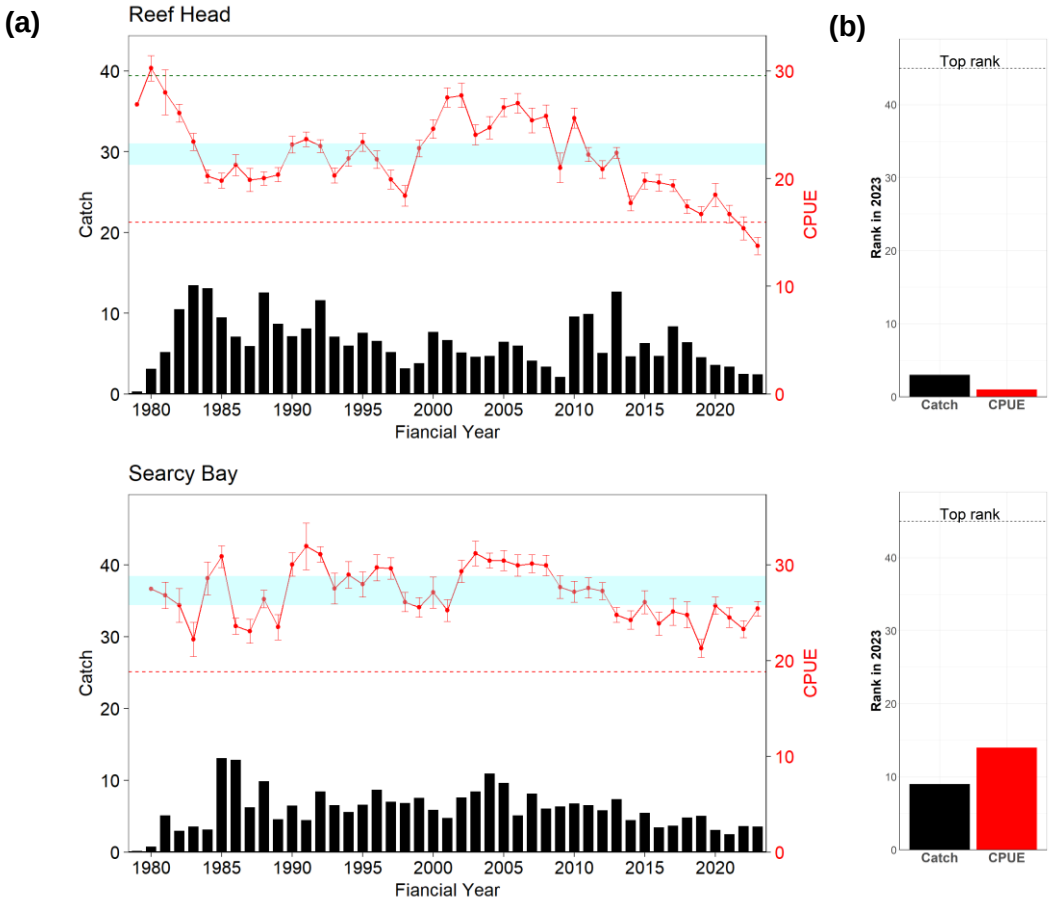


Figure 3.23. Reef Head and Searcy Bay blacklip **(a)** Catch (t meat weight, black) and CPUE ± se (kg.hr^{-1}, solid red line) from the 1979 to 2023 financial years. For the harvest strategy, the horizontal green and red dashed lines show the upper and limit reference points, respectively, and the target reference band is shaded light blue. CPUE points lacking error bars are harvest strategy estimates. **(b)** Rank of Catch and CPUE in 2023 relative to historic.

Point Avoid

The annual catch from Point Avoid has been relatively stable since 1979, ranging between 1.5 and 6.4 t.yr^{-1} (Figure 3.24). Catch in 2023 (2.7 t) was below to the average observed over the 45 years of the fishery (3.6 t). CPUE has fluctuated considerably among years, but gradually increased from 1979 to the historical peak observed in 2006 (33.2 kg.hr^{-1}) and then generally declined from 2006 to the lowest value on record in 2018 that was on the lower limit reference point of the HS. From 2018 to 2023 CPUE has remained close to the lower limit and, in 2023, was 18.8 kg.hr^{-1}.

Ward Island

Annual catches from Ward Island were less than 2.2 t between 1979 and 1991 (Figure 3.24). Following this, catch more than doubled, remaining high from 1992 to 2010 (about 7 t). In 2011, catch decreased by 62% to the lowest level since 1990 (2.3 t), decreasing to less than 1t in 2020 and remaining below this value from 2021 to 2023. In 2023 catch was 1.1 t. CPUE was above or within the target reference band between 1989 and 2010, with a peak of 40.3 kg.hr^{-1} in 2005. CPUE then declined and remained within or below the target reference band of the HS between 2011 and 2023.

Venus Bay

Catch from Venus Bay increased substantially from 1979 to 1985 and, except for low catch in 1988, oscillated at a higher level among years up to 2005. Catch then generally decreased and has remained <1 t from 2019 to 2023 (Figure 3.24). With the exception of a low value in 2000, CPUE was relatively stable between 1989 and 2002, whereafter it increased to a historic high in 2005 (34.3 kg.hr^{-1}). CPUE then decreased 49% between 2005 and 2020, the lowest value on record, and could not be calculated from 2021 to 2023 due to insufficient data.

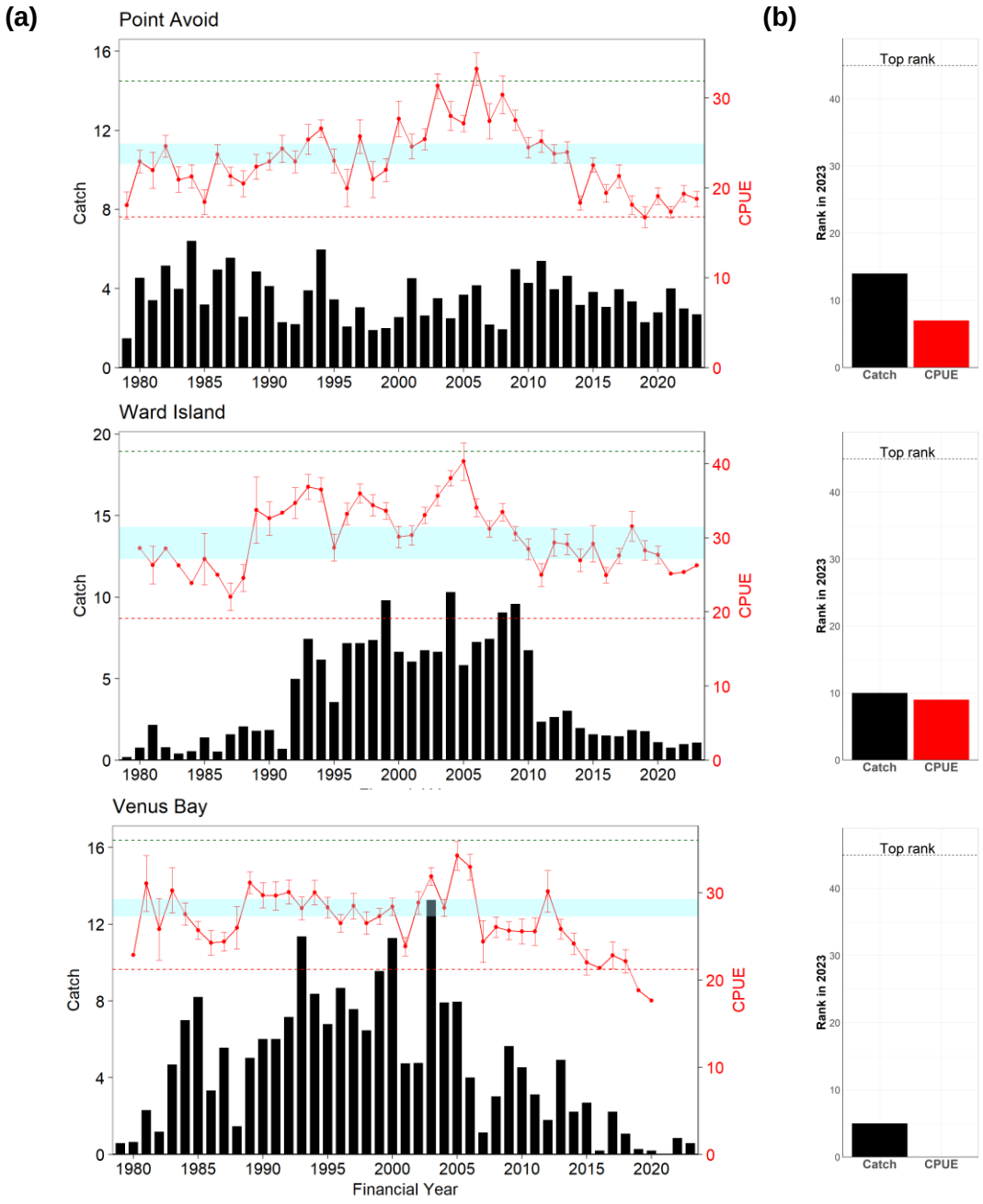


Figure 3.24. Point Avoid, Ward Island and Venus Bay blacklip **(a)** Catch (t meat weight, black) and CPUE ± se (kg.hr^{-1}, solid red line) from the 1979 to 2023 financial years. For the harvest strategy, the horizontal green and red dashed lines show the upper and limit reference points, respectively, and the target reference band is shaded light blue. CPUE points lacking error bars are harvest strategy estimates. **(b)** Rank of Catch and CPUE in 2023 relative to historic.

Flinders Island

Catch from Flinders Island generally increased from 1979 (0.1 t) to the highest on record in 2001 (7.5 t; Figure 3.25). Subsequently, catch decreased between 2001 and 2015 (0.4 t), whereafter it has remained relatively low. CPUE has fluctuated considerably between years and, in 2023, was 22.0 kg.hr^{-1} and below the target reference band for the HS.

Hotspot

The annual catch for Hotspot was low from 1979 to 1989 (~1 t) whereafter it increased to a peak in 2005 (11.4 t; Figure 3.25). Subsequently, catch decreased to the third lowest value recorded in 2014 (0.1 t) and, with the exception of 2018 and 2019, has remained below 1 t thereafter. CPUE has fluctuated considerably between years and, in 2023, was 23.8 kg.hr^{-1} and below the target reference band for the HS.

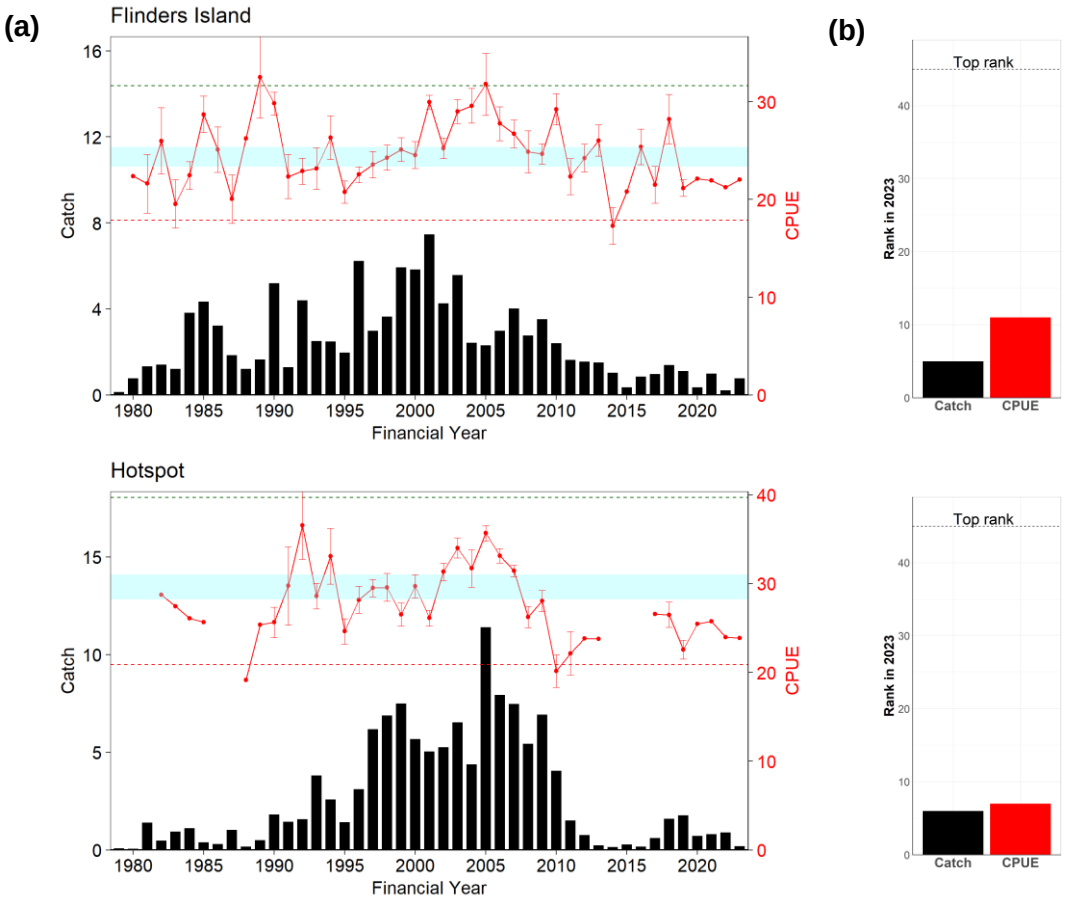


Figure 3.25. Flinders Island and Hotspot blacklip **(a)** Catch (t meat weight, black) and CPUE ± se (kg.hr^{-1}, solid red line) of blacklip from the 1979 to 2023 financial years. For the harvest strategy, the horizontal green and red dashed lines show the upper and limit reference points, respectively, and the target reference band is shaded light blue. CPUE points lacking error bars are harvest strategy estimates. **(b)** Rank of Catch and CPUE in 2023 relative to historic.

Temporal patterns in pooled low-catch spatial assessment units

Annual catch and CPUE for the individual low-catch SAUs is provided in Appendix 6.4, while the data pooled by regions is summarised and provided below.

Lincoln low SAUs

Catch has oscillated among years, with peaks in 1982 (13.9 t), 1989 (19.6 t), 1998 (14.9 t) and 2005 (9.8 t; Figure 3.26). However, catch generally decreased from the peak in 1989 to the lowest value on record in 2023 (0.8 t). CPUE was relatively stable from 1979 to 2001 (~20 kg.hr^{-1}), then increased rapidly to a peak of 28.5 kg.hr^{-1} in 2004 and remained above the upper target reference point until 2011. Subsequently CPUE decreased to a value below the lower limit reference point in 2014 (15.4 kg.hr^{-1}) and has remained relatively low from 2014 to 2023 with the latter year (16.1 kg.hr^{-1}) the third lowest value on record (HS score of 0).

Elliston low SAUs

Catch from Elliston has been relatively stable from 1979 to 2023 (average of 1.9 t), excepting high catches in 1986 (7.9 t) and 2007 (6.0 t; Figure 3.26). CPUE has fluctuated between years with low values at or below the limit reference point of 19.4 kg.hr^{-1} in 1979, 1980 and 1999. CPUE was again low in 2020 (19.7 kg.hr^{-1}) but has subsequently increased and, in 2023, was 25.6 kg.hr^{-1} close to the lower limit of the target reference band of the HS.

Streaky low SAUs

Catch generally increased from the lowest value on record in 1979 (0.6 t) to the highest value in 2006 (11.5 t). Catch then decreased and, in 2023, was 0.7 t, the third lowest value on record (Figure 3.26). CPUE was relatively low from 1979 to 1983 and in 1986 (~ 21 kg.hr^{-1}) and varied among years at a higher value between 1984 and 2023 (average 26.4 kg.hr^{-1}). In 2023, CPUE was within the target reference band of the HS (26.9 kg.hr^{-1}).

Far West low SAUs

Annual catches were low between 1979 and 1984 (Figure 3.26). Following this, except for 1986 (0.8 t), catch increased substantially and averaged 5.7 t from 1985 to 2011. Catch then decreased 57% from 2011 (4.2 t) to 2012 (1.8 t), and except for 2019, varied at a lower level from 2012 to 2023. Catch in 2023 was 0.1 t. CPUE was relatively stable from 1995 to 2009 (~ 23.5 kg.hr^{-1}) whereafter, except for a high value in 2014 (30.0 kg.hr^{-1}), it generally decreased to the lowest value on record in 2016 (13.0 kg.hr^{-1}), remaining low and below the lower limit reference point of the HS from 2016 to 2020. CPUE was unestimated from 2021 to 2023 due to insufficient data.

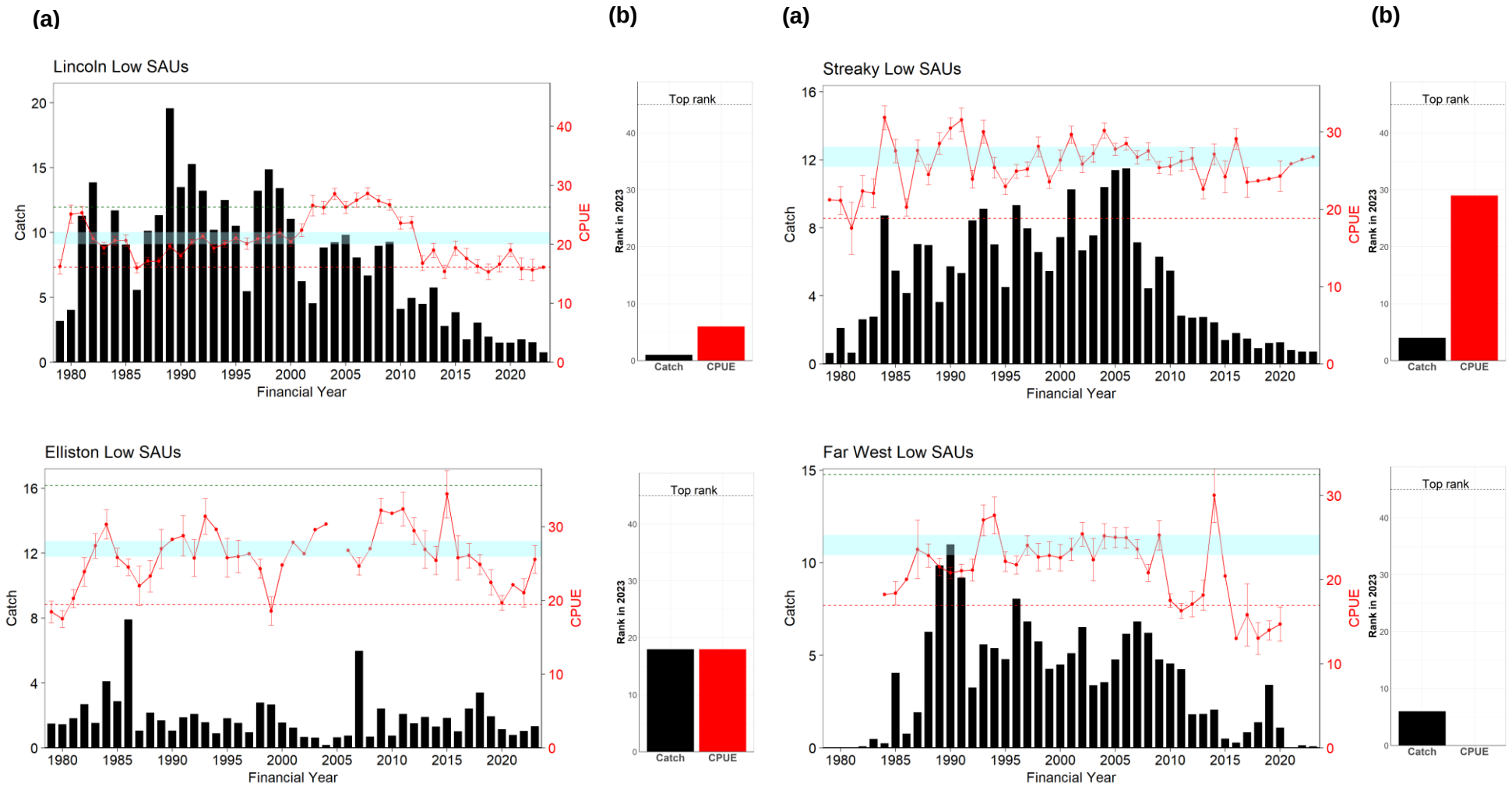


Figure 3.26. Lincoln, Elliston, Streaky and Far West blacklip Low SAUs **(a)** Catch (t meat weight, black) and CPUE ± se (kg.hr^{-1}, red) from 1979 to 2023. **(b)** Rank of Catch and CPUE in 2023 relative to historic.

3.1.6 Harvest strategy – zone score and stock status

The catch-weighted zonal score for the 2023 financial year was 3.15 (Table 3.1, Figure 3.27). In combination with the zone trend score of 5.0 (Appendix 6.6, Table 6.19; reflecting a stable trend), these define the stock status for blacklip in the WZ in the 2023 financial year as 'sustainable' (Figure 3.28). The zone score of 3.15 for 2023 translates to a recommended zonal catch of 44.95 t for the 2023 calendar year.

The outcome of the HS for 2023 is affected by the lack of FIS information for Point Westall and Anxious Bay in 2023 (see section 2.3). Calculation of the HS using the alternative approach where density estimates from these SAUs for 2021 are carried over to 2023 is provided in Appendix 6.5 (Table 6.18). This alternative option also defines stock status as 'sustainable', and the recommended zone catch increases to 49.63 t for the 2024 calendar year.

Table 3.1. Outcome of application of the harvest strategy described in the Management Plan for the South Australian Abalone Fishery to blacklip in the 2023 financial year. Combined score is half the sum of the CPUE and legal density scores.

SAU	CPUE	CPUE score	Legal density	Legal density score	Combined score	Catch proportion	2022/23 Catch	Weighted SAU score
DRUMMOND SOUTH	21.54	3.62	0.22	2.12	2.87	0.15	9.45	0.42
SHERINGA	23.49	0.14	0.39	10.00	5.07	0.13	5.6	0.64
DRUMMOND NORTH	22.75	3.06			3.06	0.12	6.11	0.36
POINT WESTALL	25.97	5.94			5.94	0.11	4.86	0.62
REEF HEAD	13.77	0.00			0.00	0.08	2.44	0.00
SEARCY BAY	25.42	4.73			4.73	0.07	3.53	0.33
AVOID BAY	19.04	1.22	0.09	1.73	1.48	0.07	1.96	0.10
POINT AVOID	18.77	1.70			1.70	0.06	2.7	0.10
ANXIOUS BAY	20.50	2.73			2.73	0.05	0.55	0.14
LINCOLN LOW SAUs	16.12	0.01			0.01	0.04	0.77	0.00
ELLISTON LOW SAUs	25.55	4.73			4.73	0.03	1.34	0.13
WARD ISLAND	26.25	4.44			4.44	0.03	1.09	0.11
STREAKY LOW SAUs	26.78	5.00			5.00	0.02	0.73	0.12
VENUS BAY					0.00	0.02	0.58	0.00
FAR WEST LOW SAUs					0.00	0.02	0.09	0.00
FLINDERS ISLAND	22.02	3.79			3.79	0.01	0.77	0.06
HOTSPOT	23.85	2.02			2.02	0.01	0.19	0.02
				Total Catch and Zone Score			***42.75***	***3.15***

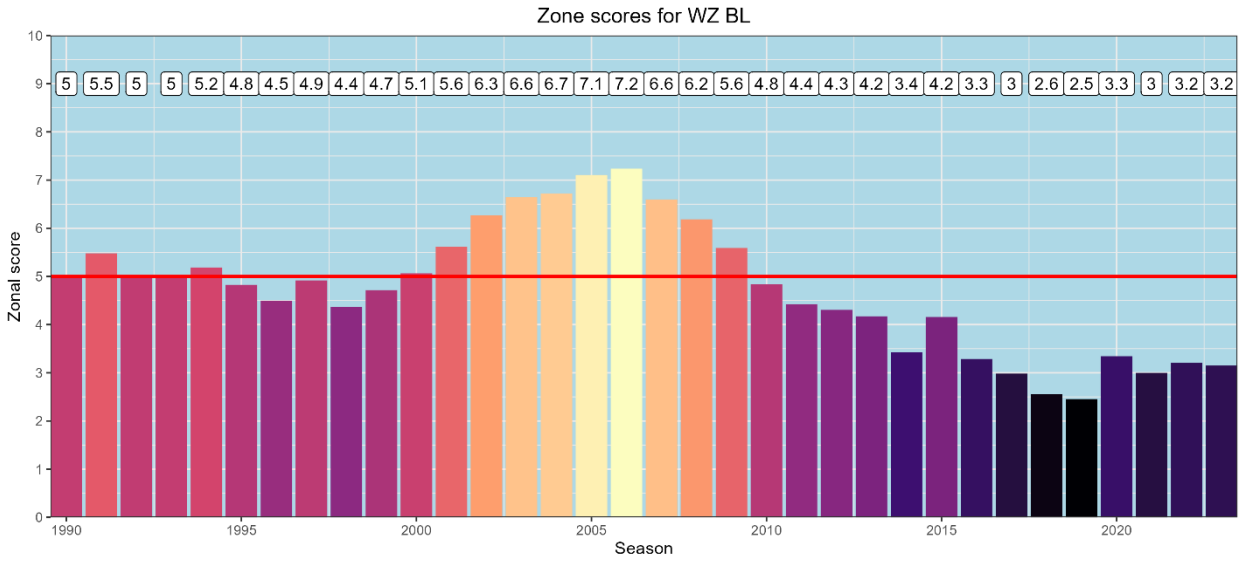


Figure 3.27. Zone score for blacklip from 1990 to 2023. Red line indicates target zone score of 5, numbers above bars are the zone score.

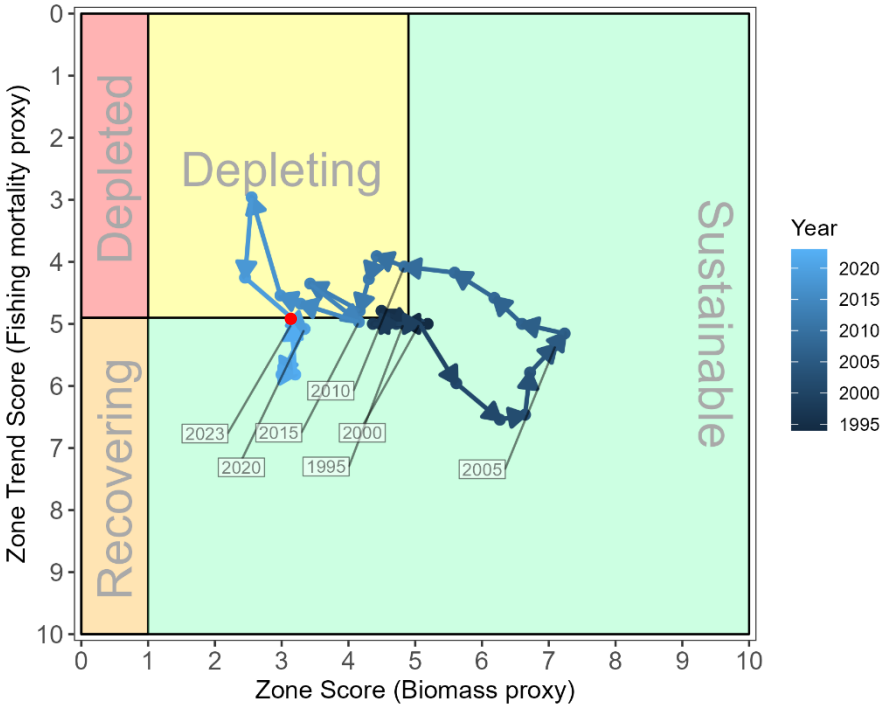


Figure 3.28. Phase plot showing the WZ changes in blacklip stock status from 1994 to 2023.

3.2 Greenlip

3.2.1 Western Zone

Total catches were relatively stable from the introduction of Region A quota in 1985 (98 t) to 2019, with catch ranging from 62.1 in 2014 to a high of 120.8 t in 1988 over this period (Figure 3.29 a). Subsequently, greenlip catch has reduced 40% between 2019 (69.1 t) and 2023 (41.2 t).

CPUE fluctuated from 1979 to 1998 (mean 21.5 $kg.hr^{-1}$), whereafter it increased to a peak of 29.9 $kg.hr^{-1}$ in 2005. CPUE then decreased 34% from 2005 to 2019, the fifth lowest value on record (Figure 3.29 a, b). CPUE has subsequently increased consistently from 2020 to 2023, with the largest increase occurring from 2022 to 2023 (17%). The increase in CPUE between 2022 (20.8 $kg.hr^{-1}$) and 2023 (24.4 $kg.hr^{-1}$) was the greatest inter-annual change in CPUE in the history of the fishery and was observed in multiple SAUs (See Appendix 6.5). The 2023 value from the combined trend of relative catch and relative CPUE remained similar to that in 2022, the lowest value on record, with the 2023 value the third lowest (Figure 3.29 c).

Fishing effort in the 0-10 depth range has observed small decreases over the last twenty one years, with corresponding small increases occurring in the 10-20m range (Figure 3.29 d).

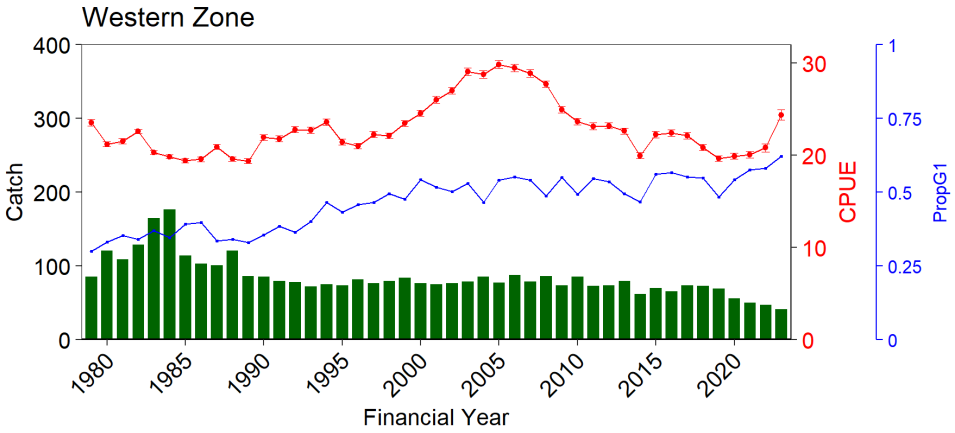
The recent increase in CPUE coincides with increasingly fishing greenlip in mid to late autumn to early winter (April – June) rather than summer (Figure 3.30 a). However, the recent increase in CPUE remains evident if the CPUE estimate is restricted to April-June and back calculated to the 1919/80 financial year (Figure 3.30 b). This suggests that the recent increase in CPUE is the result of either increased greenlip density, an alternative factor (e.g. change in the greenlip size targeted or the location of new fishing areas) or a combination of these.

3.2.2 Regions and spatial assessment units

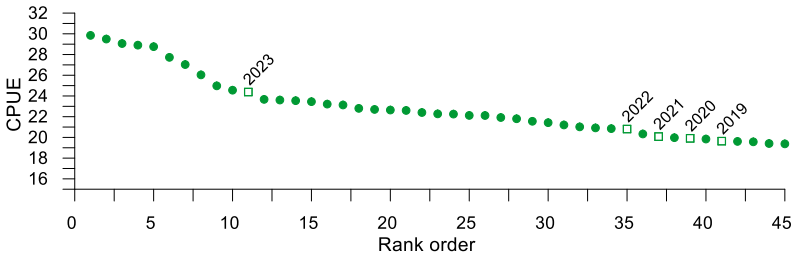
The 2023 CPUE estimates for all four regions were higher than those observed in 2022 and above the average values for each region. The Far West had the highest CPUE value on record in 2023 (31.0 $kg.hr^{-1}$).

There were small changes in the distribution of annual catches among SAUs between 2022 and 2023. These included increases in catch from Baird Bay, Taylor Island and Drummond and decreases at The Gap, Avoid Bay and Anxious Bay (Figure 3.32). Five of the 14 SAUs scored for CPUE had values below 5, while the three amalgamated low SAUs that were scored had score values at or above 5. The three SAUs scored for legal density had scores below 2.5, with Anxious Bay scoring zero (Figure 3.33). Greenlip combined and CPUE scores for 2023 were mostly higher than those for 2022, reflecting the large increases in CPUE observed in many SAUs (Figure 3.34)

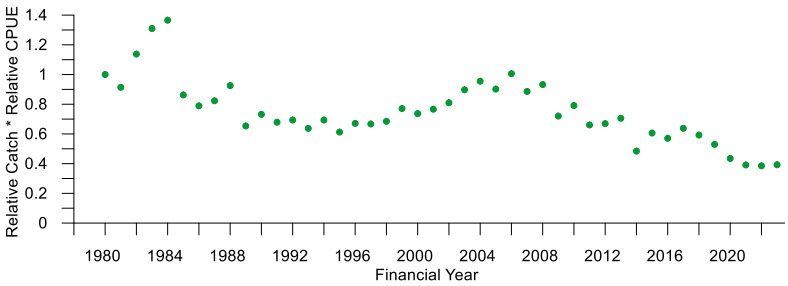
(a)



(b)



(c)



(d)

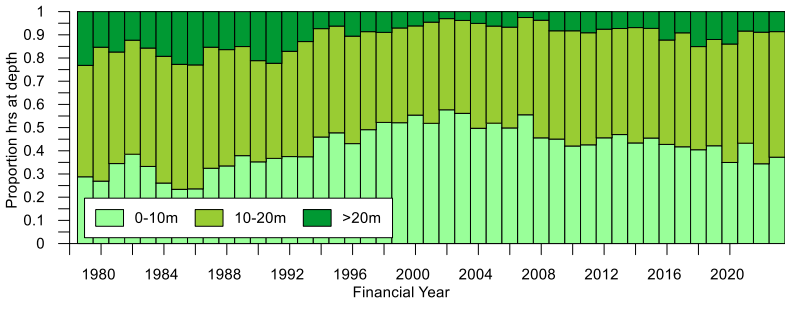


Figure 3.29. Greenlip **(a)** Catch (t, meat weight; green bars), CPUE ± se (kg.hr^{-1}; solid red line) and proportion of grade 1 greenlip (blue line) from the Western Zone from 1979 to 2023. **(b)** Rank order of Western Zone CPUE (kg.hr^{-1}) from 1979 to 2023. Last five years are marked with open square symbols **(c)** Combined trend of relative catch and relative CPUE from the Western Zone from 1979 to 2023. **(d)** Proportion of hours fished in the Western Zone at three depth ranges (see legend) using fishing records where Greenlip constituted 75% or more of the catch.

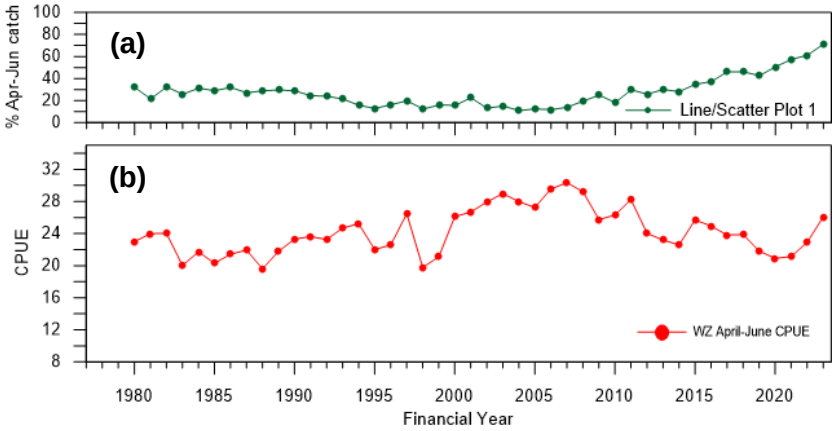


Figure 3.30. Percent greenlip catch in April – June (solid green line) and CPUE ± se (kg.hr^{-1}; solid red line) from the Western Zone from 1979 to 2023. CPUE was calculated using only months April-June.

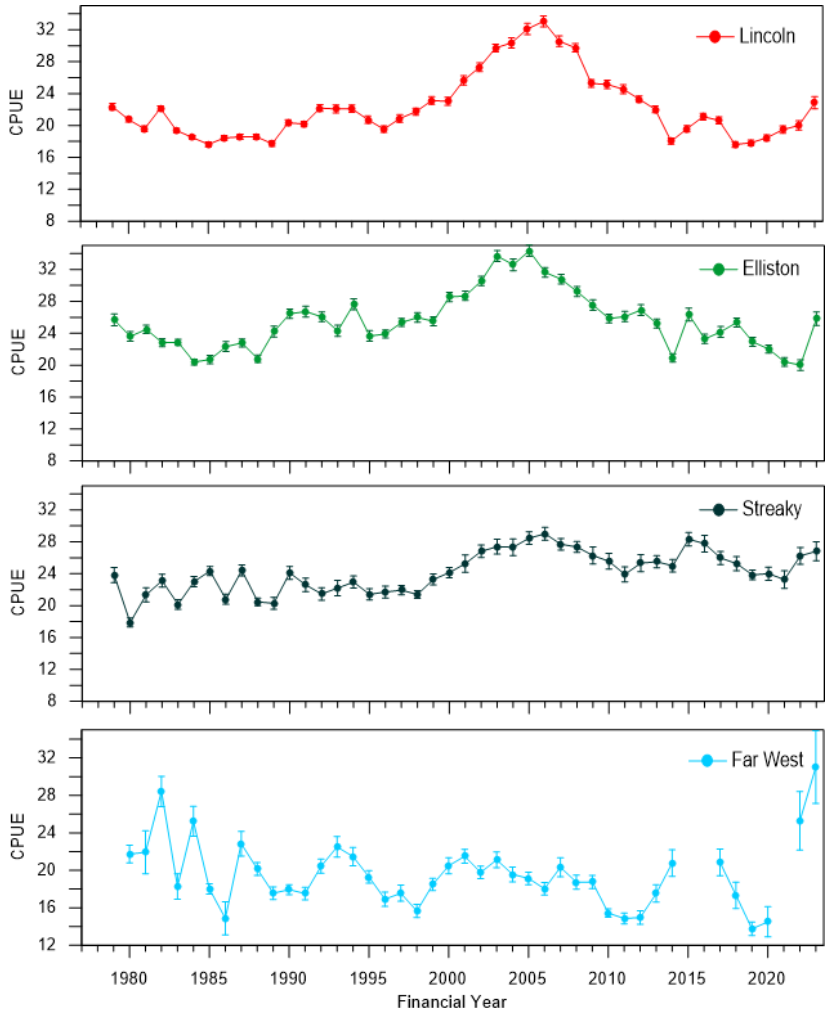


Figure 3.31. Comparison between CPUE ± se (kg.hr^{-1}) of greenlip at SAUs located near Port Lincoln, Elliston, Streaky Bay and Far West (see legend) from the Western Zone from 1979 to 2023.

Figure 3.32. Bubble plot showing the spatial distribution of Greenlip catch (% of total catch) among the SAUs in the WZ from 1979 to 2023 by financial year.

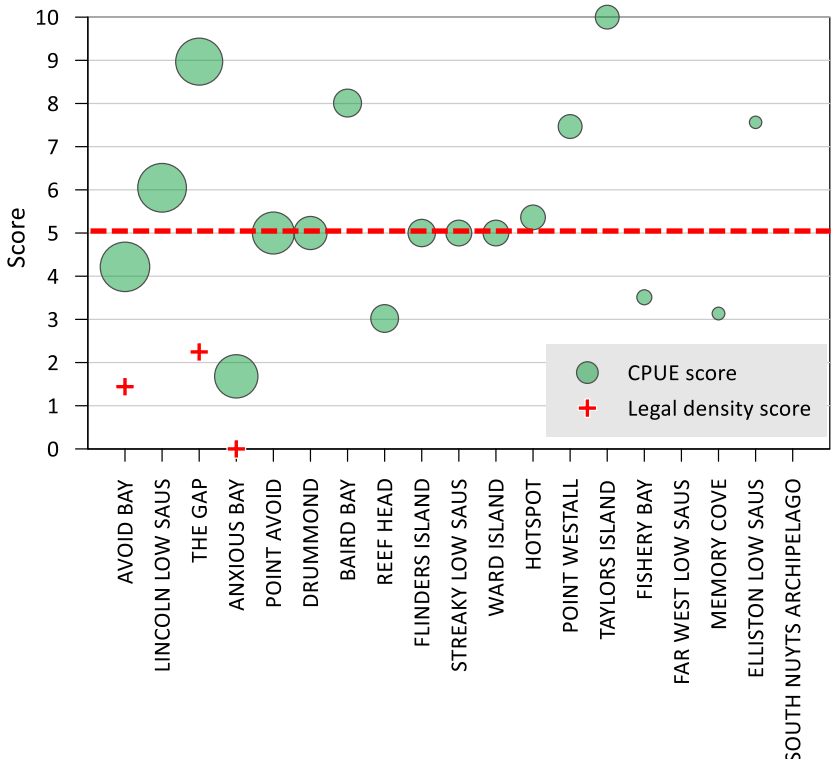


Figure 3.33 Greenlip SAU CPUE and legal density scores for the 2023 financial year (see legend). Bubble size for CPUE indicates % of WZ catch in the 2023 financial year. SAUs sorted left to right by decreasing HS catch contribution in 2023. Dashed red line shows target score of 5.

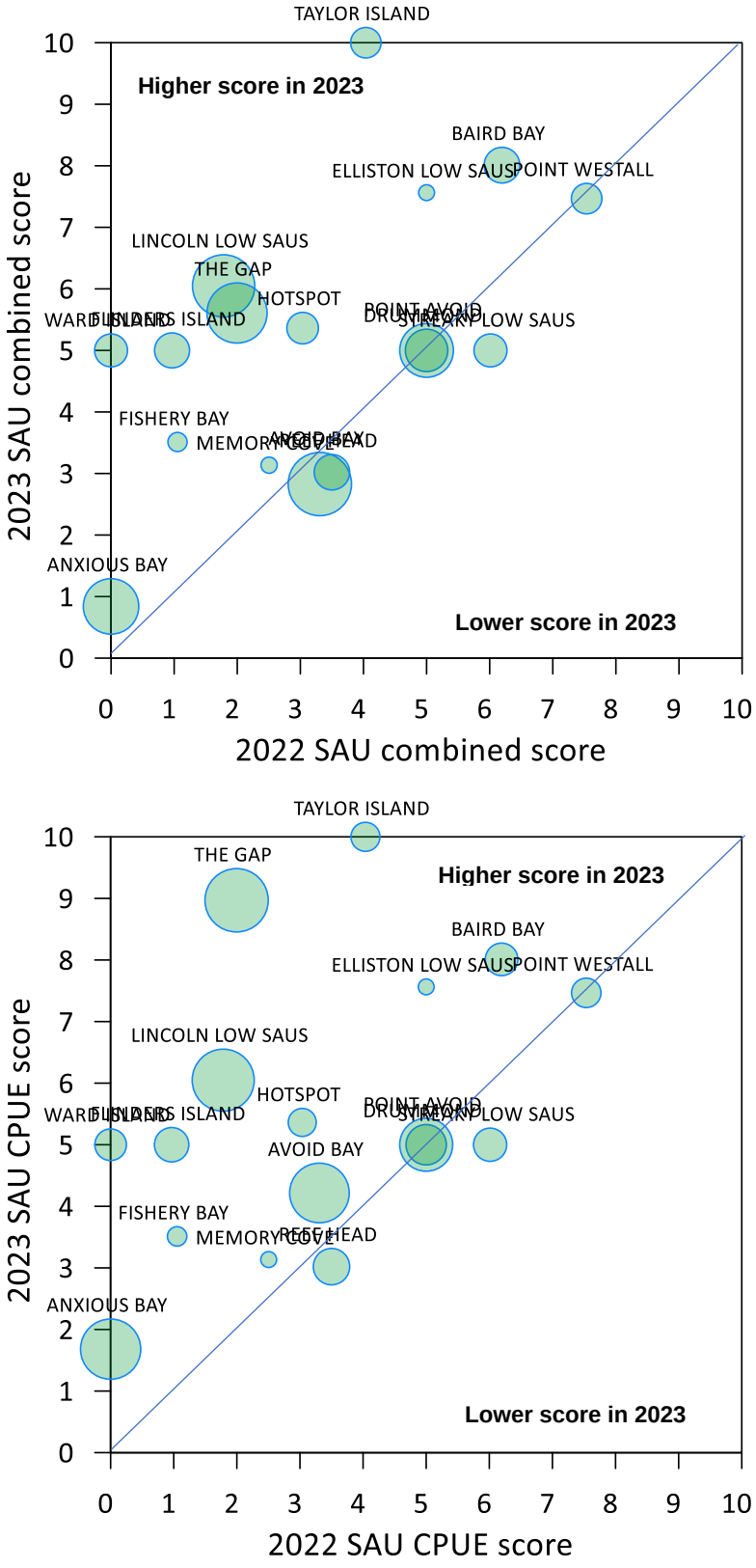


Figure 3.34. Comparison of greenlip HS (a) SAU combined scores and (b) SAU CPUE scores between 2022 and 2023. Bubble size indicates catch proportion in 2023.

3.2.3 Harvest strategy – zone score, trend in zone score and stock status

The catch-weighted zonal score for the 2023 financial year was 4.86 (Table 3.2, Figure 3.35). In combination with the zone trend score of 7.34 (Appendix 6.6, Table 6.19; reflecting an increasing trend), these define the zonal stock status for greenlip in the WZ in the 2023 as **'sustainable'** (Figure 3.36)**.** The zone score of 4.86 for 2023 translates to a recommended zonal catch of 75.60 t for the 2024 calendar year, and 55.64 t after application of the increasing TACC metarule as described in the Management Plan (PIRSA 2021).

Table 3.2. Outcome of application of the harvest strategy described in the Management Plan for the South Australian Abalone Fishery to greenlip in the 2023 financial year. Combined score is half the sum of the CPUE and legal density scores.

SAU	CPUE	CPUE score	Legal density	Legal density score	Combined score	Catch proportion	2022/23 Catch	Weighted SAU score
AVOID BAY	24.56	4.22	0.03	1.44	2.83	0.09	5.11	0.27
LINCOLN LOW SAUs	23.94	6.05			6.05	0.09	3.78	0.56
THE GAP	28.59	8.97	0.05	2.25	5.61	0.09	1.83	0.50
ANXIOUS BAY	20.99	1.68	0.02	0.00	0.84	0.08	1.47	0.07
POINT AVOID	20.15	5.00			5.00	0.08	3.79	0.40
DRUMMOND	23.85	5.00			5.00	0.06	3.42	0.31
BAIRD BAY	30.29	8.01			8.01	0.05	2.98	0.42
REEF HEAD	17.24	3.02			3.02	0.05	2.03	0.16
FLINDERS ISLAND	24.15	5.00			5.00	0.05	2.34	0.26
STREAKY LOW SAUs	21.87	5.00			5.00	0.05	1.58	0.24
WARD ISLAND	28.41	5.00			5.00	0.05	1.83	0.24
HOTSPOT	28.80	5.36			5.36	0.05	2.85	0.25
POINT WESTALL	26.11	7.47			7.47	0.04	1.53	0.33
TAYLOR ISLAND	26.75	10.00			10.00	0.04	2.77	0.44
FISHERY BAY	18.40	3.51			3.51	0.03	0.87	0.10
FAR WEST LOW SAUs					0.21	0.02	0.77	0.00
MEMORY COVE	17.21	3.14			3.14	0.02	0.63	0.07
ELLISTON LOW SAUs	26.07	7.56			7.56	0.02	0.92	0.17
SOUTH NUYTS					4.46	0.01	0.74	0.06
				Total Catch and Zone Score			**41.21**	**4.86**

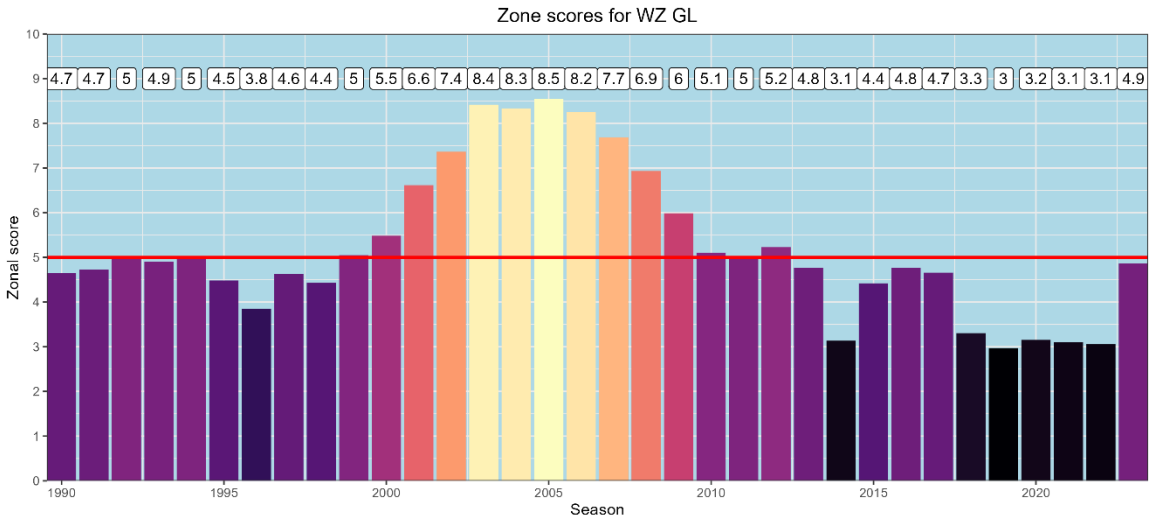


Figure 3.35. Zone score for greenlip from 1990 to 2023. Red line indicates target zone score of 5, numbers above bars are the zone score.

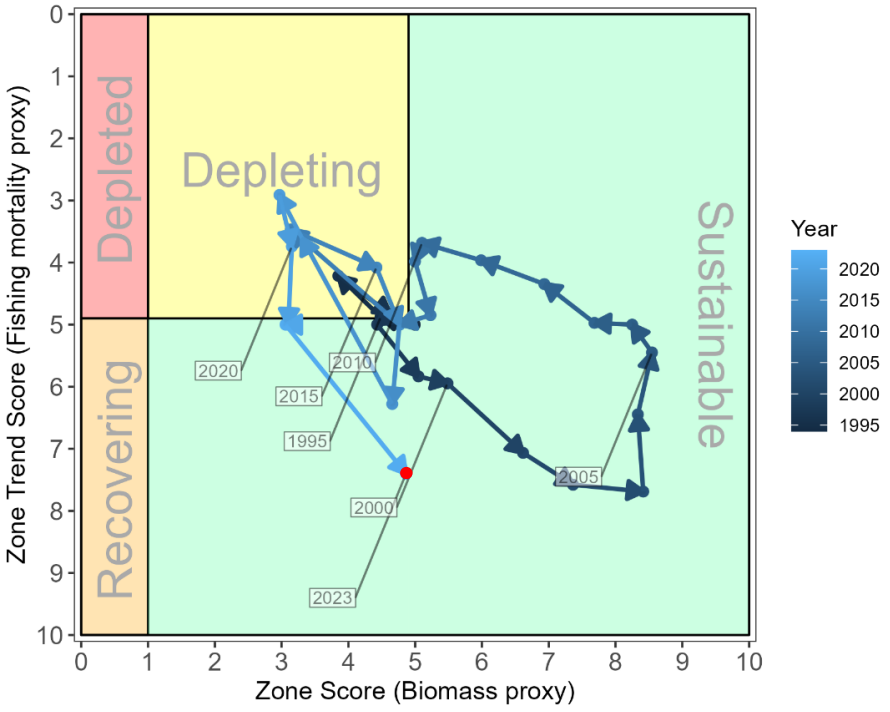


Figure 3.36. Phase plot showing the WZ greenlip stock status from 1994 to 2023.

4 DISCUSSION

4.1 Current status of greenlip and blacklip in the WZ

4.1.1 Uncertainties in assessment

There were five key limitations to this assessment:

(1) CPUE is used as a key index of legal-sized abalone abundance, based on the assumption that it represents relative abundance of the fishable stock and that it can detect changes in relative abundance of the stock (Tarbath et al. 2005). However, CPUE can be influenced by numerous factors unrelated to abalone abundance (Stobart et al. 2017a) and is often viewed as a biased index of relative abundance (Harrison 1983, Breen 1992, Prince and Shepherd 1992, Gorfine et al. 2002, Stobart et al. 2017b);

(2) There have been substantial changes in the distribution of catch among SAUs since 2011 that are difficult to interpret (Stobart et al. 2017a), and these also influence the estimates of CPUE;

(3) Except for greenlip at The Gap, the FIS are available for a relatively short time period and cover spatially discreet areas making comparison between FD and FIS-based measures of abundance difficult (Stobart et al. 2017a);

(4) Grading weights for grade 1 greenlip have been subject to a minor reduction at the abalone processor that processes most of the WZ catch, with the minimum weight for grade 1 greenlip decreasing from 232 g to 225g. This complicates the interpretation of change to grades as an unknown proportion of greenlip, previously assigned lower grades, will now become grade 1; and

(5) in 2023, abalone processors have reduced the price differential between very large greenlip and smaller grade 1 greenlip and, in some cases, encouraged the targeting of smaller greenlip (AIASA personal communication). The impact of these changes on estimates of CPUE are currently poorly understood and require further analysis as they have the potential to alter the relationship between CPUE and abundance.

4.1.2 Blacklip

During the 2023 financial year, blacklip comprised 51% (42.8 t) of the combined abalone catch in the WZ, having decreased 58% from 2013 (100.7 t) to the lowest catch recorded. This 58 t reduction to a catch of 42.8 t in 2023 reflects lower TACC's, and the removal of one licence during the implementation of marine park sanctuary zones (see table 1.2). This decline in catch is analogous with many other abalone fisheries across southern Australia, which are currently

characterised by ongoing low levels of catch and productivity (Piddocke et al. 2021, Burnell and Mayfield 2023, McAllister and Mundy 2023).

Based on a weight of evidence approach, blacklip was classified as ‘depleting’ from the 2013 to 2018 calendar years under the NFSRF (noting that from 2013 to 2016 the term ‘transitional depleting’ was used under the NFSRF and subsequently changed to ‘depleting’ in 2017). Status determination changed from calendar year to financial year in 2020 (Stobart et al. 2020) with the first implementation of the new HS described in the Management Plan for the SAAF (PIRSA 2021). From the 2020 to 2022 financial years blacklip was classified as ‘sustainable’ based on the HS. The weight of evidence statuses are mostly consistent with the retrospective outcomes of the HS that classified blacklip as ‘depleting’ from 2010 to 2019 (Appendix 6.6,Table 6.19). While status was not assigned in 2010 using the weight of evidence approach, the stock status report for Region A in 2010 (Stobart et al. 2011) did highlight the decline in blacklip CPUE and the risk that “If CPUE is hyperstable, the abundance of legal-sized blacklip in 2010 would be below that in the late 1990’s”. This suggests that the HS may be appropriately responsive to early decreases in stock abundance. The change in classification from ‘depleting’ in 2019 to ‘sustainable’ in 2020 was the result of the decline in zone CPUE abating in 2019, the HS zone score increasing from 2019, and the consequent increase in the zone trend score from 4.3 in 2019 to 5.11 in 2020 (see Appendix; Table 6.19). The zonal trend score also remained above 5 in 2021 and 2022. Evidence for the stabilisation at that time included CPUE increasing in 79% of SAUs (63% of 2020 catch) between 2019 and 2020, including several high catch SAUs (e.g. Drummond South and Point Westall). There was also an increase in the overall WZ CPUE between 2019 and 2020 and continuing small increases from 2020 to 2023.

The outcome of the HS for the 2022 financial year was ‘sustainable’. For 2023 the outcome remained **‘sustainable’**, reflecting a small zone score increase from 3.10 in 2022 to 3.15 in 2023 with a trend score of 5.0 (stable trend). The 2023 zone score of 3.15 translates to a recommended zonal catch of 44.95 t for the 2024 calendar year, representing a 0.84 t increase from the recommended zonal catch of 44.11 t for the 2023 calendar year (Stobart and Mayfield 2021) and is 3.4% higher than the TACC set for 2023 (43.49 t).

The HS blacklip status for 2023, ‘sustainable’, continues to reflect the evidence that the decline in harvestable biomass abated from 2019 onwards. This is because (1) the small increases in CPUE observed for the WZ from 2019 to 2020 and 2021 to 2022 continued between 2022 and 2023; (2) CPUE increased or stabilised at a number of SAUs (e.g. Sheringa, Anxious Bay, Searcy Bay and the Elliston Low SAUs); and the legal density at Sheringa increased to the highest value

on record. In contrast, there have been recent decreases in combined SAU scores for key SAUs that provide a large proportion of the catch, in particular decreases in score for Drummond South and Drummond North that alone accounted for 36% of the blacklip catch in 2023. The SAU score from Drummond South decreased in 2023 due to a modest decline in CPUE and a decrease in the FIS density estimate to the lowest value on record. There was also a score decrease at Point Westall despite having a small increase in CPUE between 2022 and 2023. This is because the score for Point Westall was previously increased by its FIS score of 10, with an updated score currently not available for 2023.

Although the improvement in CPUE of multiple SAUs from 2019 to 2023 being accounted for in the HS, this is the fourteenth consecutive year in which the zone score has been less than 5. In particular, biomass has remained historically low for the past eight years (zone scores below 3.5), with the zone score for 2019 the lowest on record (zone score 2.5). CPUE estimates for some SAUs (e.g. Sheringa, Avoid Bay and Reef Head) remain at, or are among, the lowest on record despite recent lower catches and 80% of SAUs for which CPUE could be estimated had values lower than the target reference point. The low biomass was also reflected in the combined trend of relative catch and relative CPUE, with the four lowest values on record occurring from 2020 to 2023. The CPUE values remained relatively low despite CPUE being prone to hyperstability (Shepherd et al. 2001, Dowling et al. 2004, Stobart et al. 2012). In addition, reductions in CPUE have also likely been moderated by changes in effective fishing effort (e.g. differences in skipper/diver skill or technological differences; (McCluskey and Lewison 2008, Heldt et al. 2021). Neither hyperstability, nor changes in effective fishing effort, have been quantified or accounted for in this assessment. Consequently, the harvestable biomass in 2023 and recent years may be lower than indicated by the zone score. The low biomass is also reflected in FIS-based legal density estimates in the Drummond South and Avoid Bay SAUs in 2023 that both have the lowest estimates on record. In contrast, the Sheringa legal density increased to the highest value on record in 2023. Similarly, the density of sub-legal-sized blacklip was also the lowest on record at Drummond South and Avoid Bay and the highest at Sheringa.

Despite evidence of a small increases in zone CPUE from 2019 to 2023, increases in CPUE from some SAUs from 2022 to 2023, the large increase in legal density at Sheringa and the reduced zone catch during this period, blacklip biomass remained among the lowest on record in 2023 (zone score of 3.15). In addition, the FIS score for Drummond South in 2023 decreased to 2.12 from 7.77 in 2021, reflecting the lowest density recorded from this high catch SAU. Notably, only the Point Westall SAU and the Streaky Low SAUs maintained a relatively high catch rate in 2023,

with all other SAUs and combined low catch SAUs having HS scores below 5. The SAUs with scores below 5 accounted for 89% of the blacklip catch in 2023. The low biomass is likely to reflect the impacts of fishing and environmentally driven changes in productivity, likely via reductions in recruitment, as evident for other fisheries across southern Australia (e.g. Rock Lobster; Linnane et al. 2010, Linnane et al. 2019). While the HS is constraining catch to a relatively low level, for abalone, given the unique life-history traits of abalone species, low densities result in a high risk of recruitment impairment.

4.1.3 Greenlip

For 2023, greenlip comprised 49% (41.2 t) of the combined abalone catch in the WZ, having decreased 48% from 2012 (79.8 t). This 39 t reduction reflects lower TACCs and the removal of one licence during the implementation of marine park sanctuary zones.

The outcome of the HS for the 2022 financial year was ‘sustainable’. For 2023, the outcome remained ‘**sustainable**’, reflecting a zone score increase from 3.02 in 2022 to 4.86 in 2023 with a zone trend score of 7.34 (increasing trend). The zone score of 4.86 for 2023 translates to a recommended zonal catch of 75.60 t for the 2024 calendar year, and is 55.64 t after application of the “increasing TACC” metarule from the HS. This is 29% above the recommended catch for 2023 (Stobart et al. 2022).

The ‘sustainable’ HS outcome for greenlip in 2023 is the third consecutive year this status has been maintained. The change in zone score between 2022 and 2023 is considerable and reflects the highest increase in zone CPUE in the history of the fishery (17% increase). This large increase in CPUE is reflected in SAUs The Gap, Taylor Island, Flinders Island, Hotspot, Ward Island and the Lincoln Low SAUs. Only 5 SAUs had combined scores below 5 in 2023 (Avoid Bay, Anxious Bay, Reef Head, Fishery Bay and Memory Cove), this was half the number below 5 observed in 2022. The rapid increase in catch rate observed between 2022 and 2023 is unlikely to be entirely the result of increasing abundance, as abalone are long-lived animals with relatively slow growth rates and therefore likely to slowly increase in abundance over several years once fishing pressure eases. The increasing seasonal targeting of greenlip also fails to explain the change in CPUE because zone CPUE also increases 14% between 2021 and 2023 when season is accounted for, suggesting the seasonal change may have only increased CPUE by ~3%. A more probable reason for the change is spatial expansion, or changes to the size of fish targeted due to market or processor preference changes. The latter is most likely given there have been reported changes to market pricing that have lowered the price differential between very large greenlip and smaller animals that still fall into the grade 1 category and there have also been

reports of targeted fishing of smaller greenlip that had larger than expected meat weights over the last financial year (AIASA personal communication). These would both be expected change the relationship between CPUE and abundance, most likely increasing the catch rates.

The uncertainty in the relationship between CPUE and abundance described above means that, while biomass is likely to have increased between 2022 and 2023, the actual change implied from the observed CPUE increases is poorly understood and requires further explanation. Given the recent low CPUE and FIS scores from 2022 (Stobart et al. 2022) and that the combined trend of relative catch against relative CPUE also remained among the lowest on record in 2023, it is likely that greenlip biomass still remains low in 2023. The rapid increase in HS score to 4.86 in 2023 and consequent increase to the recommended greenlip catch for 2024 should therefore be considered with caution because the high risk of recruitment impairment for greenlip identified in the 2022 report (Stobart et al. 2022) remains and requires careful consideration of increases to future catch.

4.1.4 Conclusion

The 2023 HS outcome for both blacklip and greenlip remains ‘sustainable’. The HS score for blacklip remains among the lowest recorded, while that for greenlip increased considerably to a value close to 5 in 2023. The recent increase in the greenlip HS score is likely influenced by changes to fishing practices and thus the relationship between abundance and CPUE may have changed and requires further explanation. Overall, as in the previous assessment (Stobart et al. 2022), the biomass of blacklip is likely to remain relatively low while that for greenlip is likely to have increased but the quantum of the increase is poorly understood.

The success of the HS relies on realistic zonal target catches paired with settings that deliver a recommended zonal catch that is adequately conservative to protect the fishery and allow a continuation and timely recovery of both the blacklip and greenlip stocks. Given the risk, to ensure the recovery of both stocks, they will require monitoring to determine whether the low blacklip biomass continues to increase and the large greenlip CPUE increase observed between 2022 and 2023 reflects a true increase in harvestable biomass.

4.2 Future research needs

There are three high priority research needs for the WZ Abalone Fishery:

1) To develop and validate a method for stock enhancement to aid the recovery and rebuilding of the high value greenlip fishery. This is a high research priority given wild catches of abalone have decreased 40% in South Australia over the past 40 years, and 50% nationally. Abalone is a high-value product so small increases in volume aimed at recovering depleted and depleting stocks can translate to large increases in GVP. The first phase of a project to support production and release of hatchery-reared abalone for enhancement/aquaculture was finalised in 2023 (FRDC Project 2020/116).

2) Collect data and then develop, validate and, if appropriate, integrate PIs from GPS and diver-based depth logger data – potentially including biomass – into the assessment program for the fishery. GPS and depth logger data have the potential to transform abalone stock assessments because the data are collected at finer spatial scales than the current FD catch and effort data (Mundy et al. 2018a); see FRDC project 2011/201) and the use of these data can ease the burden of heavy reliance on traditional FD data (principally catch and CPUE) for assessing these stocks. However, for these data to be used, their suitability will need to be validated following several years of data collection.

3) Establish and validate an index of recruitment for use as a leading indicator. This is because the development of an index of recruitment for use as a leading indicator of harvestable biomass is essential to be able to predict suitability of future catch levels. A juvenile abalone monitoring method has recently been developed by the Institute of Marine and Antarctic Studies in Tasmania (FRDC project 2014/010; (Mundy et al. 2018b)).

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6 APPENDIX

6.1 Blacklip and Greenlip biology

Table 6.1. Size at L_{50} (mm, shell length) for blacklip at different sites in the Western Zone. a is the maximum proportion of mature blacklip (the asymptote) and b is the slope of the logistic ogive. The equation is of the form ($f(x) = a/(1+\exp(-((x-L_{50})/b))$). N = total number sampled, *n* = number of abalone sampled within length range of maturity transition.

Site	Year	Month	a	b	L_{50}	*N*	n	Reference
Anxious Bay	2013	5	0.9947	4.670	88.1	150	60	SARDI unpublished
Avoid Bay	2012	7	0.9867	0.892	92.0	108	16	SARDI unpublished
Hotspot	2004	5	1.0042	7.495	82.3	124	31	SARDI unpublished
Hotspot	2005	5	1.0094	5.359	94.3	192	32	SARDI unpublished
Reef Head	2001	5	0.9979	6.784	87.7	189	126	SARDI unpublished
Pt Drummond	2011	6	0.9923	6.253	99.3	222	102	SARDI unpublished
Searcy Bay	2014	5	0.9720	0.102	79.9	84	26	SARDI unpublished
Sheringa	2004	5	1.0022	5.369	97.3	130	46	SARDI unpublished
Tungketta	2004	5	0.9942	8.135	103.0	88	37	SARDI unpublished
Ward Island	2001	5	1.0353	10.72	92.0	65	36	SARDI unpublished
Ward Island	2005	5	1.0000	0.333	91.8	145	7	SARDI unpublished
West Bay	2001	6	0.9917	7.040	96.1	222	185	SARDI unpublished

Table 6.2. Relationships between shell length (SL, mm) and fecundity (F, millions of eggs) for legal sized (130 mm) blacklip at different sites in the Western Zone. The equation is of the form $F = aSL^b$. * indicates calculations based on anterior counts only.

Site	Year	a	b	r	n	SL	F	Reference
Avoid Bay	2010	1.01E+01	2.46	0.49	15	130	1.60E+06	SARDI unpublished
Hotspot*	2005	2.00E-04	4.58	0.83	22	130	9.47E+05	SARDI unpublished
Point Drummond	2011	2.07E-02	3.59	0.70	20	130	8.07E+05	SARDI unpublished
Ward Island*	2005	1.87E-01	3.29	0.70	27	130	1.68E+06	SARDI unpublished

Table 6.3. Relationships between shell length (SL, mm) and total weight (TW, g) of blacklip abalone at various sites in the Western Zone. TW is calculated total weight for 130 mm legal-sized blacklip. The equation is of the form $TW = aSL^b$.

Site	Year	a	b	TW	r	n	Reference
Avoid Bay	2012	3.0E-04	2.90	405	0.95	204	SARDI unpublished
Flinders Island	1998	6.7E-05	3.16	321	0.95	85	SARDI unpublished
Hotspot	2004	7.1E-05	3.19	391	0.98	124	SARDI unpublished
Hotspot	2005	3.0E-04	2.90	399	0.98	192	SARDI unpublished
Kiana	1999	3.2E-02	1.93	378	0.73	46	SARDI unpublished
Drummond Point	1998	6.2E-05	3.21	370	0.94	54	SARDI unpublished
Drummond Point	2011	6.4E-05	3.20	377	0.98	222	SARDI unpublished
Point Labatt	1999	1.4E-03	2.58	396	0.85	102	SARDI unpublished
Point Whidbey	1998	4.9E-05	3.26	387	0.97	49	SARDI unpublished
Price Island	1999	5.3E-04	2.75	345	0.83	50	SARDI unpublished
Reef Head	1999	1.1E-02	2.16	411	0.79	44	SARDI unpublished
Reef Head	2004	6.0E-04	2.72	345	0.94	63	SARDI unpublished
Sheringa	2004	2.0E-05	3.44	379	0.98	130	SARDI unpublished
Smoothpool	1999	6.0E-04	2.72	340	0.92	127	SARDI unpublished
Tungketta	2004	9.8E-05	3.12	395	0.98	88	SARDI unpublished
Waldegrave Island	1998	1.0E-04	3.05	274	0.94	100	SARDI unpublished
Waldegrave Island	2005	1.0E-04	3.06	294	0.98	94	SARDI unpublished
Waterloo Bay	2005	5.0E-04	2.77	362	0.94	162	SARDI unpublished
Ward Island	1998	3.0E-04	2.90	399	0.92	100	SARDI unpublished
Ward Island	2005	3.0E-04	2.86	329	0.98	145	SARDI unpublished
West Bay	1998	2.0E-04	2.94	331	0.95	99	SARDI unpublished
West Bay	1999	7.0E-04	2.72	386	0.89	99	SARDI unpublished

Table 6.4. Growth rate, k ($yr.^{-1}$) and L_∞ (mm SL) for blacklip tagged and recaptured at different sites in the Western Zone. Size ranges are shell length at time of tagging for recaptured abalone (mm). n is the number of recaptures. For 'year tagged' * indicates uncertainty over aspects of the data including the year of tagging, time period at liberty may not adhere to criteria used for SARDI data (Geibel *et al.* 2010) while for 'size range'*indicates size ranges estimated from published graphs.

Site (Year recovered)	Year tagged	r^2	k	L_∞	Size range	n	Reference
Avoid Bay (2013)	2012	0.462	0.236	156.3	56-170	113	SARDI unpublished
Reef Head (2002)	2001	0.176	0.102	153.6	52-116	29	SARDI unpublished
Reef Head (2003)	2002	0.404	0.177	132.8	66-133	58	SARDI unpublished
Sheringa (2004)	2002	0.571	0.190	152.4	54-135	20	SARDI unpublished
Venus Bay (2002)	2001	0.448	0.295	152.7	66-124	54	SARDI unpublished
Venus Bay (2003)	2001	0.369	0.155	167.9	62-117	34	SARDI unpublished
Ward Is. (2001)	2000	0.053	0.086	217.4	57-135	27	SARDI unpublished
Ward Is. (2002)	2000	0.182	0.139	150.2	67-129	18	SARDI unpublished
Ward Is. (2002)	2001	0.244	0.180	152.5	58-117	24	SARDI unpublished
Ward Is. (2005)	2004	0.363	0.172	167.4	40-153	24	SARDI unpublished
Waterloo Bay*	1969	0.911	0.406	144.0	57-150	52	(Shepherd and Hearn 1983)
West Bay (2001)	2000	0.078	0.078	244.0	59-127	53	SARDI unpublished

Table 6.5. Size at L_{50} (mm, shell length) for greenlip at different sites in the Western Zone. a is the maximum proportion of mature greenlip (the asymptote) and b is the slope of the logistic ogive. The equation is of the form (f(x) = a/(1+exp(-((x-L50)/b)). N = total number sampled, *n* = number of abalone sampled within period of maturity transition.

Site	Year	Month	a	b	L_{50}	*N*	n	Reference
Anxious Bay	2005	11	0.983	7.312	76.6	119	32	SARDI unpublished
Hotspot	2006	11	1.005	3.637	111.6	109	36	SARDI unpublished
Hotspot	2010	8	1.011	6.812	120.8	144	52	SARDI unpublished
The Gap	2003	9	1.018	4.441	94.0	96	54	SARDI unpublished
The Gap	2004	9	0.984	1.952	93.8	124	62	SARDI unpublished
The Gap	2010	9	1.010	4.170	100.6	160	18	SARDI unpublished
Waterloo Bay	1974	-	-	-	102.0	-	34	(Shepherd and Laws 1974)
Ward Island	2006	11	1.033	11.548	127.7	90	62	SARDI unpublished

Table 6.6. Relationships between shell length (SL, mm) and fecundity (F, millions of eggs) for legal sized (145 mm) greenlip at different sites in the Western Zone. The equation is of the form $F = aSL^b$.

Site	Year	a	b	r	n	SL	F	Reference
Anxious Bay	1987	2.94E-02	3.70	0.74	15	145	2.9E+06	(Shepherd et al. 1992b)
Flinders Bay	2010	2.50E-03	4.07	0.46	10	145	1.6E+06	SARDI unpublished
Hotspot	2010	3.90E-08	6.33	0.85	17	145	1.9E+06	SARDI unpublished
Maclaren Point	1987	1.93E-06	5.61	0.97	14	145	2.6E+06	(Shepherd et al. 1992b)
Sceale Bay	1987	6.19E-10	7.24	0.90	17	145	2.8E+06	(Shepherd et al. 1992b)
Taylor Island	1987	7.55E-06	5.33	0.94	15	145	2.5E+06	(Shepherd et al. 1992b)
The Gap	2011	8.20E-03	4.18	0.75	26	145	8.9E+06	SARDI unpublished
Waterloo Bay	1987	6.40E-03	3.85	0.76	15	145	1.3E+06	(Shepherd et al. 1992b)
Yanerbie	1987	1.11E-02	3.87	0.87	14	145	2.6E+06	(Shepherd et al. 1992b)

Table 6.7. Relationships between fecundity (F, millions of eggs) and whole weight (W, g) for greenlip at different sites in the Western Zone. The equation is of the form F = c + dW.

Site	c	d	Reference
Sceale Bay	-1.13	0.011	(Shepherd and Baker 1998)
Thorny Passage	-1.57	0.014	(Shepherd and Baker 1998)
Waterloo Bay	-0.36	0.004	(Shepherd and Baker 1998)
Ward Island	-1.87	0.008	(Shepherd and Baker 1998)

Table 6.8. Relationships between shell length (SL, mm) and total weight (TW, g) of greenlip abalone at various sites in the Western Zone. TW is calculated total weight for 145 mm legal-sized greenlip. The equation is of the form $TW = aSL^b$.

Site	Year	a	b	TW	r	n	Reference
Anxious Bay	1987	1.0E-04	3.07	432	0.99	46	(Shepherd et al. 1992b)
Anxious Bay	2004	4.0E-04	2.79	422	0.97	52	SARDI unpublished
Anxious Bay	2005	2.9E-05	3.30	407	0.99	110	SARDI unpublished
Flinders Island	1998	3.0E-04	2.90	551	0.94	69	SARDI unpublished
Flinders Island	1999	7.2E-04	2.69	469	0.68	47	SARDI unpublished
Flinders Bay	2004	2.4E-05	3.34	404	0.98	53	SARDI unpublished
Hotspot	1998	2.8E-05	3.33	439	0.94	80	SARDI unpublished
Hotspot	1999	3.5E-05	3.29	441	0.90	35	SARDI unpublished
Hotspot	2004	4.0E-04	2.81	479	0.93	53	SARDI unpublished
Hotspot	2006	6.1E-05	3.18	453	0.98	109	SARDI unpublished
Hotspot	2010	1.8E-05	3.41	404	0.98	144	SARDI unpublished
Maclaren Point	1987	5.8E-05	3.12	321	0.99	47	(Shepherd et al. 1992b)
Price Island	1997	5.0E-05	3.20	417	0.97	47	SARDI unpublished
Price Island	1999	2.0E-04	2.89	361	0.90	43	SARDI unpublished
Rowly Bay	1991	1.0E-04	3.04	363	0.93	65	SARDI unpublished
Searcy Bay	1999	7.0E-04	2.68	437	0.94	127	SARDI unpublished
Taylor Island	1987	4.7E-05	3.16	318	0.99	45	(Shepherd et al. 1992b)
The Gap	1998	2.0E-04	2.99	578	0.96	88	SARDI unpublished
The Gap	2000	1.5E-03	2.51	390	0.77	43	SARDI unpublished
The Gap	2003	4.8E-05	3.22	442	0.98	27	SARDI unpublished
The Gap	2004	6.1E-05	3.15	392	0.95	87	SARDI unpublished
The Gap	2010	4.7E-05	3.20	394	0.98	160	SARDI unpublished
Ward Island	1998	6.7E-05	3.15	425	0.94	75	SARDI unpublished
Ward Island	2004	1.0E-04	3.05	396	0.97	72	SARDI unpublished
Waterloo Bay	1987	2.0E-04	2.92	409	0.99	57	(Shepherd et al. 1992b)
Waterloo Bay	1999	6.0E-04	2.72	445	0.74	152	SARDI unpublished
Waterloo Bay	2005	2.8E-05	3.33	428	0.97	150	SARDI unpublished
Yanerbie	1987	4.6E-05	3.20	379	0.98	53	(Shepherd et al. 1992b)

Table 6.9. Growth rate (mm yr^{-1}) (± se) of sublegal greenlip at different sites in the Western Zone.

Site	Size range (mm)	Growth rate ($mm.yr^{-1}$ ± S.E.)	Reference
Anxious Bay	25-95	20.4 ± 1.5	(Shepherd and Breen 1992)
Avoid Bay	45-115	19.7 ± 2.4	(Shepherd and Triantafillos 1997)
Maclaren Point	20-140	20.3 ± 0.4	((Shepherd et al. 1992a))
Sceale Bay	45-110	20.4 ± 1.8	(Shepherd et al. 1992a)
Taylor Island	15-145	39.6 ± 0.9	(Shepherd et al. 1992a)
Ward Island	60-125	25.7 ± 1.5	(Shepherd et al. 1992a)
Yanerbie	15-110	15.3 ± 0.9	(Shepherd et al. 1992a)

Table 6.10. Growth rate, k ($yr.^{-1}$) and L_∞ (mm SL) for greenlip tagged and recaptured at different sites in the Western Zone. Errors are standard errors. Size ranges are shell length at time of tagging for recaptured abalone (mm). n is the number of recaptures. For 'tag period' * indicates uncertainty over aspects of the data including the year of tagging, time period at liberty may not adhere to criteria used for SARDI data (Geibel *et al.* 2010) while for 'size range' * indicates size ranges were estimated from published graphs.

Site	Tag period	r^2	k (± se)	L_∞ (± se) (mm)	Size range	n	Reference
Anxious Bay	1988*	0.744	0.385(0.07)	119.5(5.3)	43-102*	26	(Shepherd et al. 1992a)
Anxious Bay	1999-2000	0.302	0.343	157.0	110-156	40	SARDI unpublished
Flinders Is	2004-2005	0.692	0.365	162.8	64-177	153	SARDI unpublished
Hotspot	2002-2003	0.477	0.256	213.5	63-158	120	SARDI unpublished
Hotspot	2002-2004	0.659	0.306	181.7	63-131	53	SARDI unpublished
Maclaren Pt.	1988*	0.534	0.368(0.10)	178.3(7.7)	31-163*	35	(Shepherd et al. 1992a)
Sceale Bay	1988*	0.856	0.186(0.04)	186.3(28.2)	79-148*	9	(Shepherd et al. 1992a)
Taylor Island	1988*	0.713	0.552(0.08)	180.4 (10.3)	32-158*	41	(Shepherd et al. 1992a)
Taylor Island	1996	0.658	0.271	195.0	68-115	23	SARDI unpublished
The Gap	2002-2003	0.658	0.278	152.8	45-159	77	SARDI unpublished
The Gap	2002-2004	0.731	0.263	155.0	44-165	108	SARDI unpublished
The Gap	2009-2010	0.686	0.344	139.3	42-167	82	SARDI unpublished
Ward Island	1988*	0.81	0.413(0.053)	167.2(5.2)	76-167*	36	(Shepherd et al. 1992a)
Waterloo Bay	1969*	0.921	0.595(0.036)	147.8(1.8)	52-169	126	(Shepherd and Hearn 1983)
Yanerbie	1988*	0.642	0.268(0.076)	140.4(8.6)	62-135*	19	(Shepherd et al. 1992a)

Table 6.11. Natural mortality rates (yr^{-1}) for adult (emergent) greenlip at different sites in the Western Zone.

Site	M (yr^{-1})	Reference
Sceale Bay	0.25	(Shepherd and Baker 1998)
Thorny Passage	0.25	(Shepherd and Baker 1998)
Waterloo Bay	0.40	(Shepherd and Baker 1998)
Ward Island	0.13	(Shepherd and Baker 1998)

6.2 Performance indicators and other metrics

Table 6.12. Summary of the PIs and other metrics and the formulae and data constraints underpinning their computation. In formula: *Cs* = species-specific catch; *E* = total daily effort; and *w* = catch weighting.

Metric use	Description	Formulae	Data constraints
Performance indicator			
CPUE	Commercial catch-per-unit effort ($kg.hr^{-1}$)	$CPUE_{wp} = \frac{\Sigma_{i=1}^{n} wi(\frac{Csi}{Ei * wi})}{\Sigma_{i=1}^{n} wi}$	All records where: CPUE (total catch/total effort) was >66.66 $kg.hr^{-1}$; fishing effort was >8 hr.; fishing effort was <3 hr.; the reported catch of both species was zero; or the catch of the species for which CPUE was being estimated was <30% of the total catch were excluded. Minimum sample size: 10 records
$Density_{legal}$	Density of legal-sized abalone on surveys	$\text{Density}_{\text{Legal}} = \frac{\sum \text{Legal counted}}{\text{Total area surveyed}}$	>90% of survey completed Blacklip ≥130 mm SL defined as legal-sized Greenlip ≥145 mm SL defined as legal-sized
General assessment			
Proportion Grade 1 (greenlip)	Proportion Grade 1 greenlip abalone in commercial catch	$\text{PropG1} = \frac{\sum \text{Grade 1 Meats (kg)}}{\sum \text{Meats (kg)}}.$	All records where the total catch was >1% different from the sum of the three weight-grade categories were excluded. Records with zero catch were excluded. Minimum sample size: 10 records
$Density_{sublegal}$	Density of sublegal (i.e. those under the MLL) abalone on surveys	$\text{Density}_{\text{Pre-recruit}} = \frac{\sum \textit{Sublegal}}{\text{Total area surveyed}}$	>90% of survey completed Blacklip <130 mm SL defined as sublegal Greenlip <145 mm SL defined as sublegal

6.3 Quality Assurance

6.3.1 Research planning

The requirements of PIRSA Fisheries and Aquaculture were discussed in December 2012 and subsequently provided to representatives of the WZ abalone fishery to confirm their understanding of proposed deliverables. This ensures that the research undertaken and deliverables provided are consistent with the needs of PIRSA to meet their obligations under the *Fisheries Management Act 2007.*

6.3.2 Data collection

Commercial fishers are advised on the procedures and requirements for commercial catch sampling and completion of the required fishing logbook on a regular basis, usually at the commencement of each fishing season. The data provided by commercial fishers are checked by PIRSA Fisheries and Aquaculture prior to acceptance and potential errors corrected through direct correspondence with individual commercial fishers. SARDI staff are trained to undertake FI data collection using the standardised method described in the SARDI Abalone Research Group Quality Assurance and Fishery-Independent Survey Manual.

6.3.3 Data entry, validation, storage and security

All logbook data are entered and validated according to the quality assurance protocols identified for the abalone fisheries in the SARDI Information Systems Quality Assurance and Data Integrity Report (Vainickis 2010). The data are stored in an Oracle database, backed up daily, with access restricted to PIRSA Fisheries and Aquaculture Information Systems staff. Copies of the database are provided to SARDI abalone researchers on request. All FI data are entered into Excel spreadsheets. A subset of the data (20%) is checked against the original data sheets in accordance with the Abalone Data Library Management Protocol. Once validated, data are uploaded to an Access database stored on the Port Lincoln network drive. The database is regularly backed up to an external hard drive and to a web-based data storage system called Objective.

6.3.4 Data and statistical analyses

Data are extracted from the databases using established protocols. A subset (10%) of data extractions is checked to ensure extraction accuracy. This occurs in two ways. First, data are compared to those extracted previously. Second, the data extractions are undertaken by two SARDI researchers and subsequently compared. Most of the data are analysed using the open-source software R. A subset (~10%) of the outputs from R are compared against estimates made in an alternative software package (e.g. Excel).

6.3.5 Data interpretation and report writing

The results, their interpretation and conclusions provided in the reports are discussed with peers, PIRSA and abalone licence holders. All co-authors review the report prior to the report being formally reviewed by two independent scientists at SARDI in accordance with the SARDI report review process (Bennett et al 2009). Following necessary revision, the report is reviewed by PIRSA to ensure it is consistent with their needs and objectives for the fishery.

6.4 Temporal patterns in low catch spatial assessment units – Blacklip and Greenlip

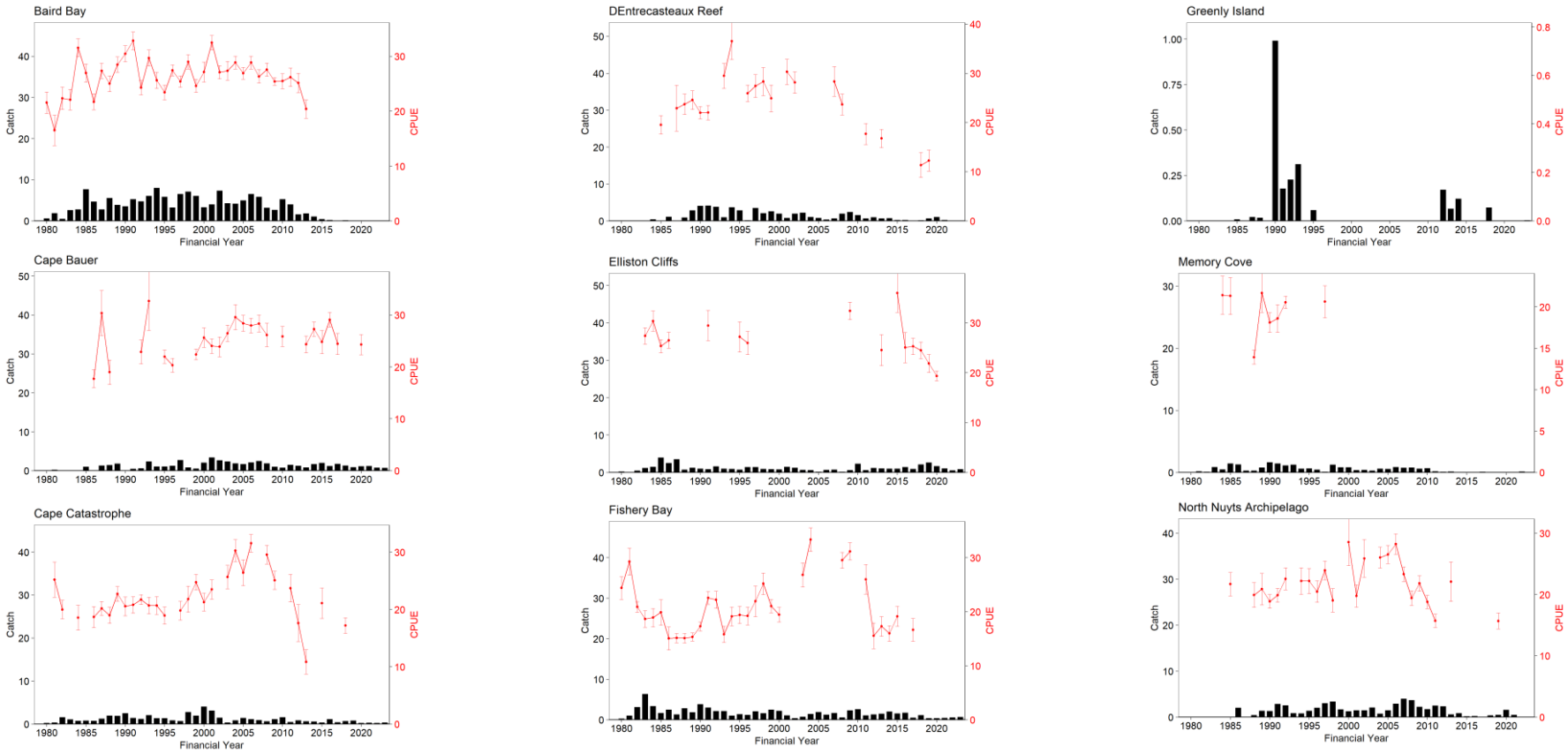

Figure 6.1. Blacklip low catch SAU's (indicated by plot names) showing Catch (t, meat weight, black bars) and CPUE ± se (kg.hr^{-1}; solid red line) from 1980 to 2023.

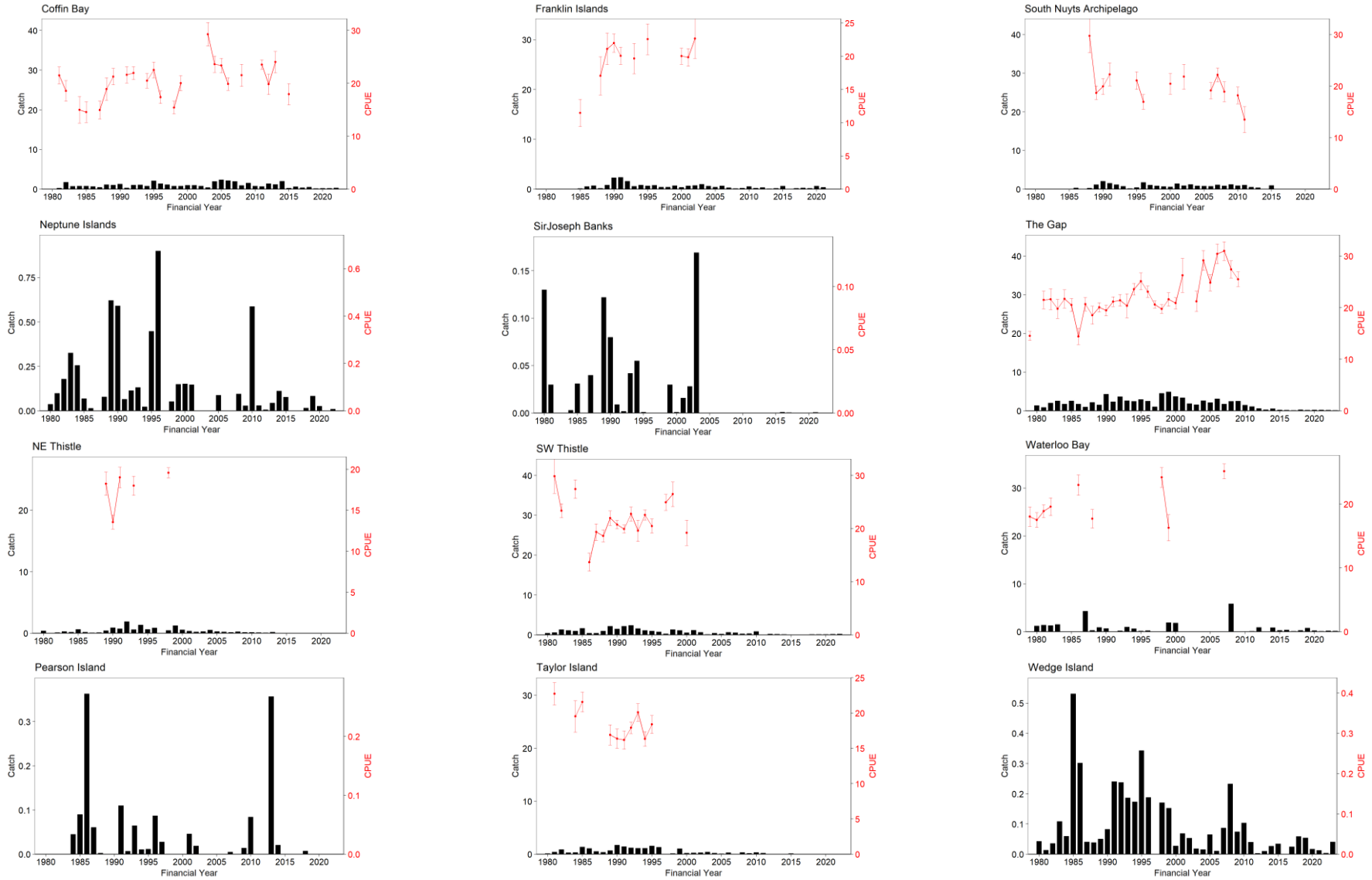

Figure 6.2. Blacklip low catch SAU's (indicated by plot names) showing Catch (t, meat weight, black bars) and CPUE ± se (kg.hr^{-1}; solid red line) from 1980 to 2023.

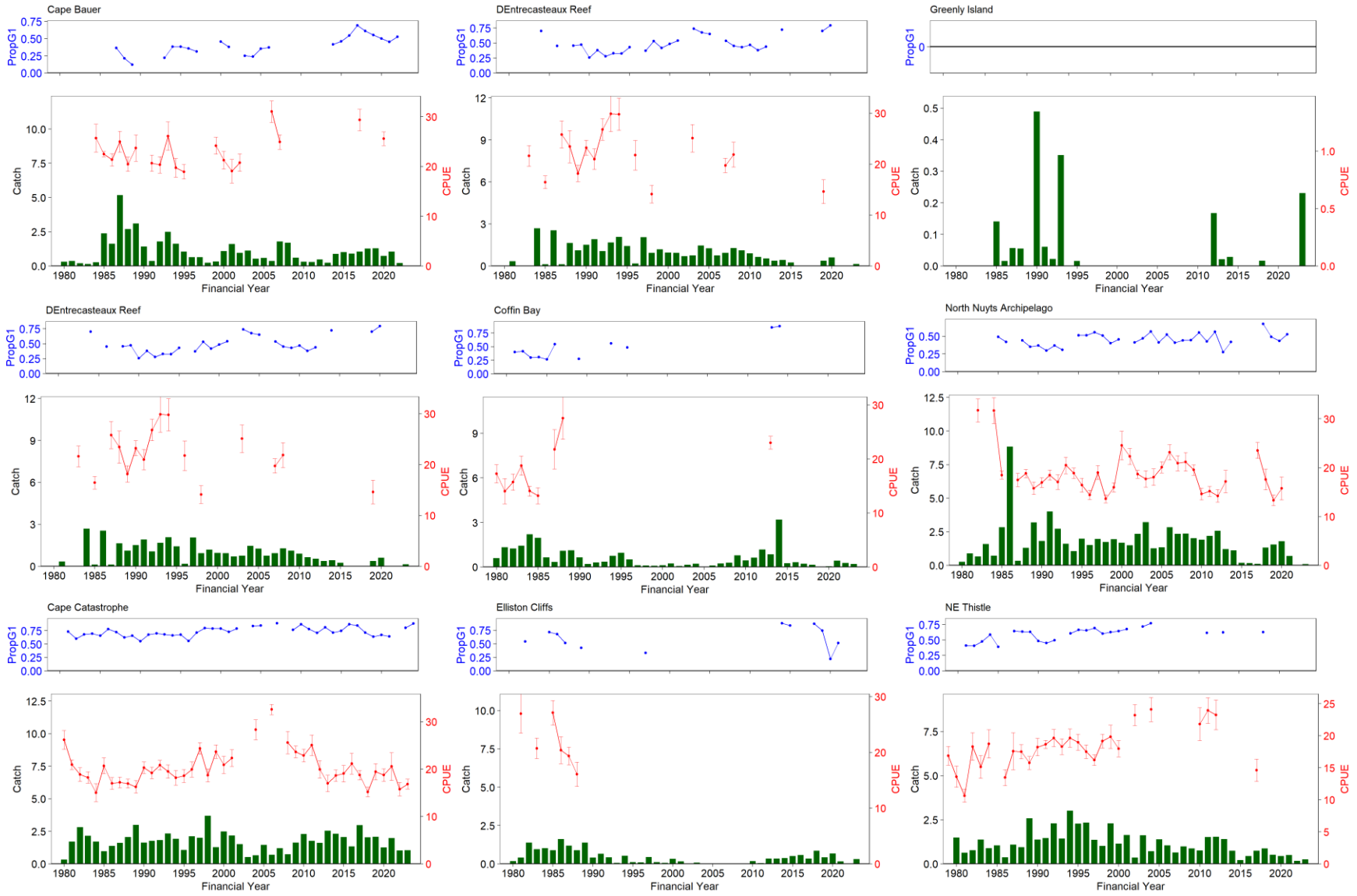

Figure 6.3. Greenlip low catch SAU's (indicated by plot names) showing Catch (t, meat weight, green bars), CPUE ± se (kg.hr^{-1}; solid red line) and PropG1 (solid blue line) from 1980 to 2023.

Figure 6.4. Greenlip low catch SAU's (indicated by plot names) showing Catch (t, meat weight, green bars), CPUE ± se (kg.hr^{-1}; solid red line) and PropG1 (solid blue line) from 1980 to 2023.

6.5 Harvest strategy scoring – Greenlip

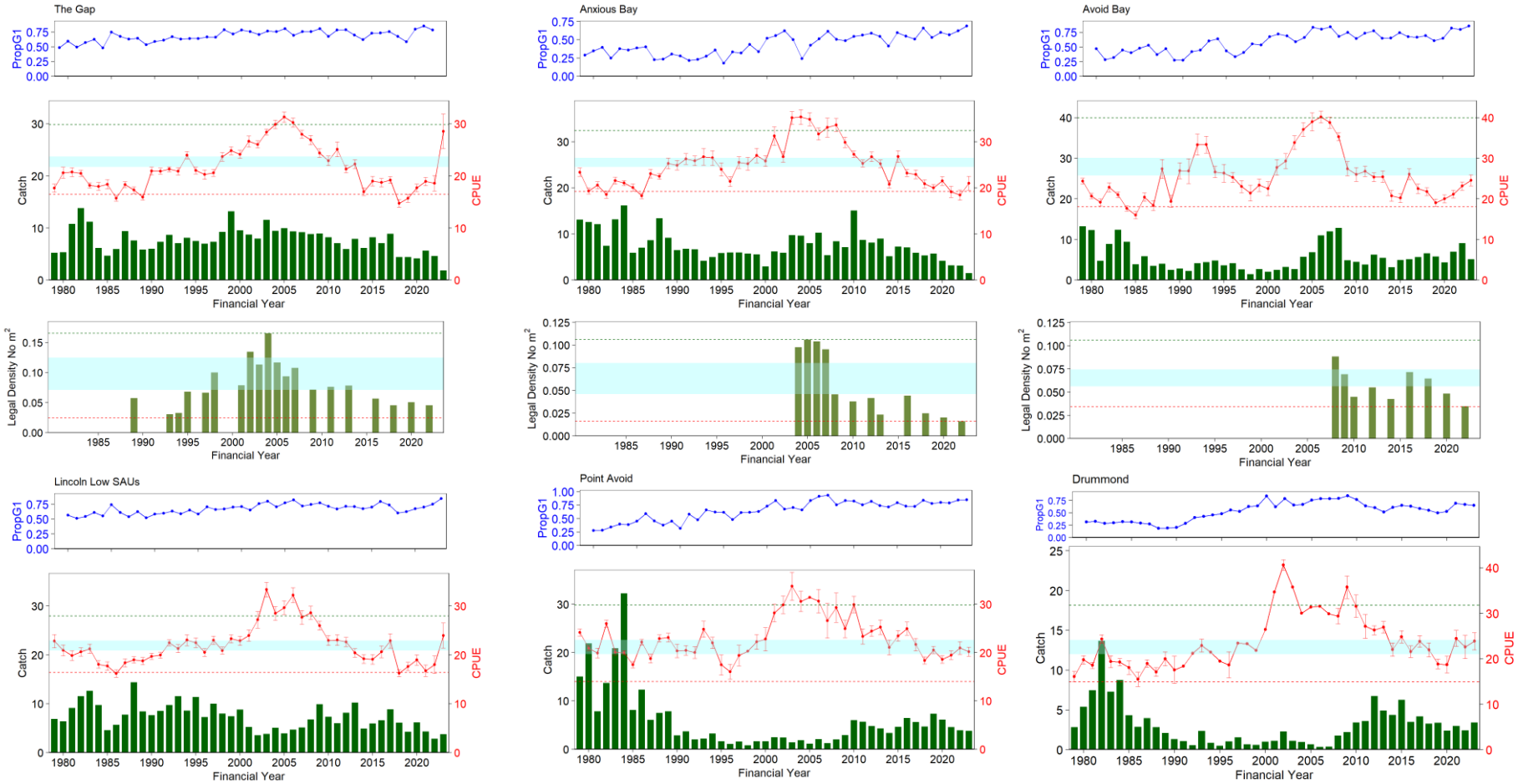

Figure 6.5. Greenlip SAUs (indicated by plot names) showing performance indicator CPUE ± se (kg.hr^{-1}, red) from 1979 to 2023. Catch (t meat weight; green bars) and proportion of grade 1 greenlip (blue line) are also included for reference. Densities are fishery independent surveys from surveyed years. On relevant plots the green and red dashed lines and pale blue bands are the upper and lower limit reference points and target reference band from the harvest strategy performance indicators CPUE and legal density, respectively.

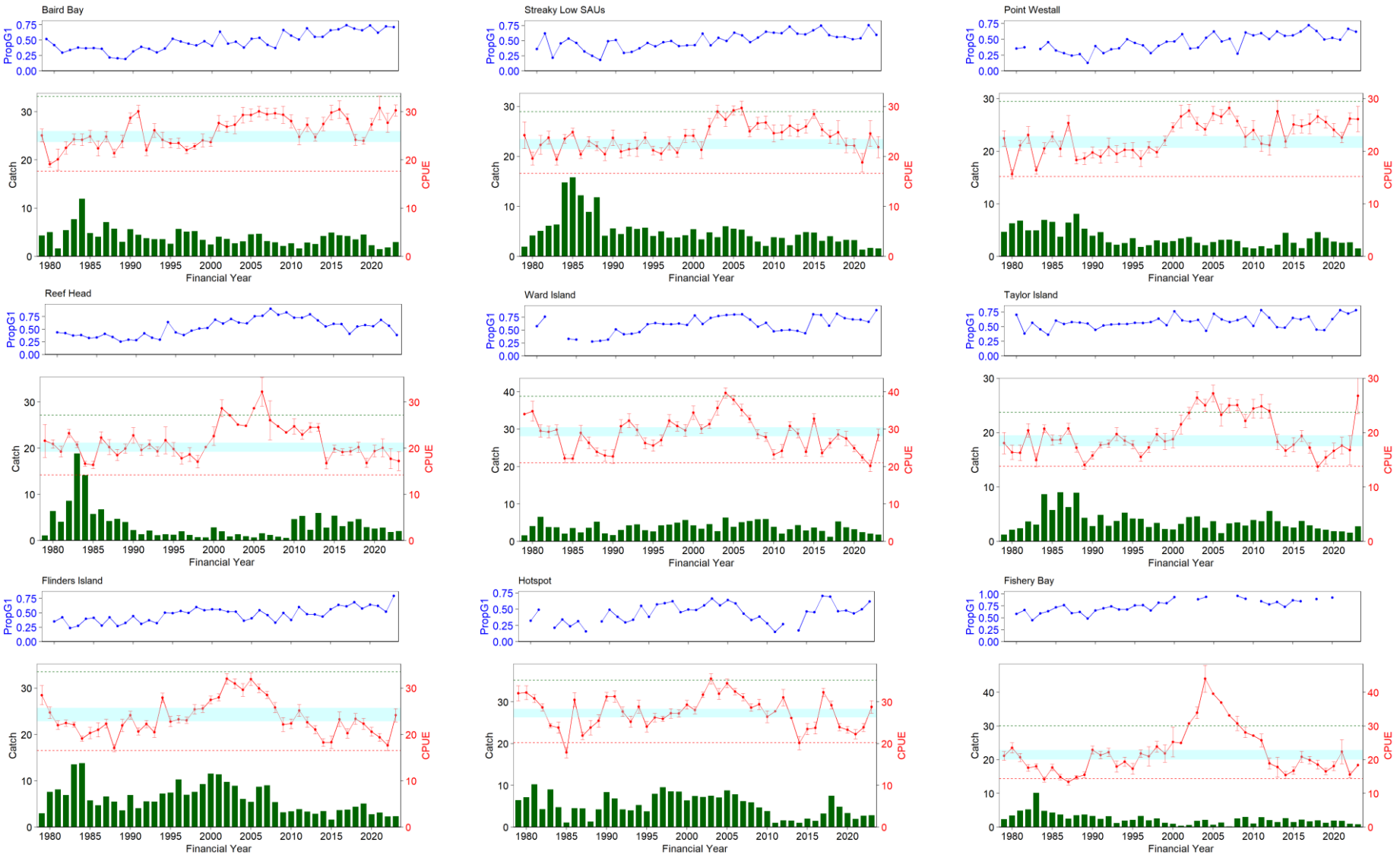

Figure 6.6. Greenlip SAUs (indicated by plot names) showing performance indicator CPUE ± se (kg.hr^{-1}, red) from 1979 to 2023. Catch (t meat weight; green bars) and proportion of grade 1 greenlip (blue line) are also included for reference. The green and red dashed lines and pale blue bands are the upper and lower limit reference points and target reference band from the harvest strategy performance indicator CPUE.

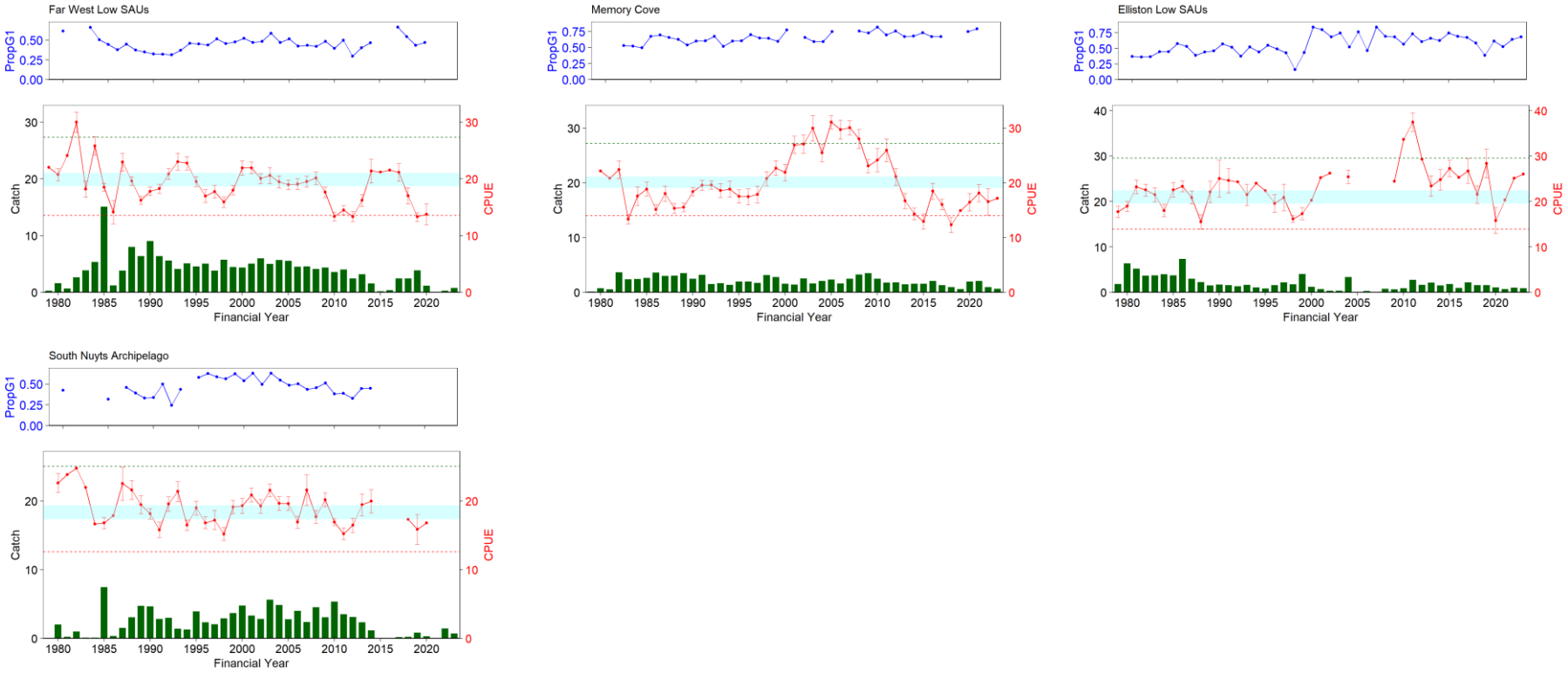

Figure 6.7. Greenlip SAUs (indicated by plot names) showing performance indicator CPUE ± se (kg.hr^{-1}, red) from 1979 to 2023. Catch (t meat weight; green bars) and proportion of grade 1 greenlip (blue line) are also included for reference. The green and red dashed lines and pale blue bands are the upper and lower limit reference points and target reference band from the harvest strategy performance indicator CPUE.

6.6 Summary tables

Table 6.13. Financial year blacklip catch (tons MW) from the Western Zone SAUs and HS pooled data limited SAUs (ordered alphabetically). Empty cells denote no catch.

Financial Year	Western Zone	ANXIOUS BAY	AVOID BAY	BAIRD BAY	CAPE BAUER	CAPE CATASTROPHE	COFFIN BAY	DENTRECASTEAUX REEF	DRUMMOND NORTH	DRUMMOND SOUTH	ELLISTON CLIFFS	ELLISTON LOW SAUS	FAR WEST LOW SAUS	FISHERY BAY	FLINDERS ISLAND	FRANKLIN ISLANDS	GREENLY ISLAND	HOTSPOT	LINCOLN LOW SAUS	MEMORY COVE	NE THISTLE	NEPTUNE ISLANDS	NORTH NUYTS	PEARSON ISLAND	POINT AVOID	POINT WESTALL	REEF HEAD	SEARCY BAY	SHERINGA	SIR JOSEPH BANKS	SOUTH NUYTS	STREAKY LOW SAUS	SW THISTLE	TAYLORS ISLAND	THE GAP	VENUS BAY	WARD ISLAND	WATERLOO BAY	WEDGE ISLAND
1979	23.6	1.2	2.0	0.6	0.0	0.2	0.0	0.0	3.0	6.0	0.3	1.5	0.0	0.3	0.1	0.0	0.0	0.1	3.2	0.1	0.4	0.0	0.0	0.0	1.5	1.6	0.3	0.1	1.6	0.1	0.0	0.6	0.4	0.1	1.4	0.6	0.2	1.2	0.0
1980	50.9	4.1	2.4	1.9	0.2	0.4	0.3	0.0	5.5	11.4	0.1	1.4	0.0	1.1	0.8	0.0	0.0	0.1	4.0	0.2	0.0	0.1	0.0	0.0	4.5	1.2	3.1	0.8	7.9	0.0	0.0	2.1	0.6	0.4	0.9	0.7	0.8	1.4	0.0
1981	96.1	10.5	1.7	0.5	0.1	1.6	1.8	0.0	12.0	8.1	0.5	1.8	0.0	3.1	1.3	0.0	0.0	1.4	11.3	0.1	0.1	0.2	0.0	0.0	3.4	9.9	5.2	5.1	19.1	0.0	0.0	0.7	1.3	0.9	2.1	2.3	2.2	1.3	0.0
1982	126.3	6.4	2.0	2.6	0.0	1.1	0.7	0.0	22.3	23.3	1.2	2.7	0.1	6.4	1.4	0.1	0.0	0.5	13.9	0.9	0.3	0.3	0.0	0.0	5.2	2.9	10.5	3.0	27.6	0.0	0.0	2.6	1.1	0.3	2.6	1.2	0.8	1.5	0.1
1983	89.4	5.7	2.1	2.8	0.0	0.8	0.8	0.4	8.3	10.0	1.5	1.5	0.5	3.4	1.2	0.0	0.0	0.9	9.1	0.5	0.2	0.3	0.0	0.0	4.0	3.1	13.5	3.5	18.1	0.0	0.0	2.8	1.0	0.3	1.8	4.7	0.4	0.0	0.1
1984	117.8	15.6	3.2	7.7	1.0	0.8	0.8	0.0	9.8	11.3	4.0	4.1	0.2	1.7	3.8	0.1	0.0	1.1	11.7	1.5	0.6	0.1	0.1	0.1	6.4	2.5	13.1	3.2	15.7	0.0	0.0	8.7	1.7	1.4	2.6	7.0	0.6	0.0	0.5
1985	118.8	6.3	1.3	4.7	0.1	0.7	0.7	1.1	5.3	10.7	2.5	2.9	4.1	2.5	4.3	0.6	0.0	0.4	9.1	1.3	0.2	0.0	2.0	0.4	3.2	5.0	9.5	13.1	28.5	0.0	0.3	5.5	0.5	1.1	1.8	8.2	1.4	0.0	0.3
1986	93.2	5.1	1.8	2.8	1.3	1.3	0.5	0.0	2.7	9.7	3.5	7.9	0.8	1.3	3.2	0.7	0.0	0.3	5.6	0.3	0.1	0.0	0.0	0.1	5.0	5.7	7.1	12.9	17.4	0.0	0.0	4.2	0.5	0.5	1.0	3.3	0.5	4.3	0.0
1987	95.9	7.8	1.6	5.5	1.4	2.0	1.2	1.0	5.5	9.0	0.8	1.1	1.9	2.8	1.9	0.2	0.0	1.0	10.1	0.3	0.1	0.1	0.5	0.0	5.5	6.5	5.9	6.2	17.6	0.0	0.3	7.1	1.0	0.4	2.2	5.6	1.6	0.3	0.0
1988	93.1	5.3	0.8	3.9	1.8	1.9	1.1	2.8	10.5	5.0	1.3	2.2	6.3	1.9	1.2	0.8	0.0	0.2	11.3	0.8	0.4	0.6	1.4	0.0	2.6	7.8	12.6	9.9	7.0	0.1	1.2	7.0	2.2	0.7	1.6	1.5	2.1	0.9	0.1
1989	105.1	5.8	1.9	3.5	0.1	2.5	1.3	4.1	4.2	9.0	1.0	1.7	9.9	3.9	1.7	2.3	1.0	0.5	19.6	1.6	0.9	0.6	1.3	0.0	4.9	13.2	8.7	4.6	9.1	0.1	2.1	3.6	1.5	1.7	4.3	5.0	1.8	0.7	0.1
1990	112.0	4.4	2.2	5.3	0.5	1.4	0.4	4.2	6.1	5.8	0.9	1.1	11.0	3.0	5.2	2.4	0.2	1.8	13.5	1.5	0.7	0.1	2.9	0.1	4.1	12.2	7.2	6.5	17.3	0.0	1.6	5.7	2.2	1.4	2.4	6.0	1.8	0.1	0.2
1991	103.5	4.3	1.5	4.7	0.6	1.2	1.0	3.8	8.8	11.2	1.7	1.9	9.2	2.1	1.3	1.6	0.2	1.5	15.3	1.1	1.9	0.1	2.5	0.0	2.3	9.2	8.1	4.5	12.5	0.0	1.2	5.3	2.4	1.2	3.7	6.0	0.7	0.2	0.2
1992	109.1	3.5	5.4	6.1	2.3	2.1	1.1	1.0	6.1	1.6	1.0	2.1	3.3	2.1	4.4	0.6	0.3	1.6	13.2	1.2	0.6	0.1	0.8	0.1	2.2	11.0	11.6	8.4	14.2	0.0	0.8	8.4	1.6	1.1	2.6	7.2	5.0	1.0	0.2
1993	103.1	3.6	2.5	8.1	1.1	1.4	0.8	3.7	6.9	5.7	0.9	1.6	5.6	1.0	2.5	0.9	0.0	3.8	10.2	0.6	1.4	0.0	0.8	0.0	3.9	6.2	7.1	6.5	9.1	0.1	0.2	9.1	1.1	1.1	2.5	11.4	7.4	0.6	0.2
1994	95.8	5.0	2.8	5.9	1.1	1.3	2.1	2.9	3.8	3.1	0.7	0.9	5.4	1.4	2.5	0.7	0.1	2.6	12.5	0.6	0.6	0.4	1.4	0.0	6.0	7.3	6.0	5.6	10.7	0.0	0.4	7.0	1.0	1.6	3.0	8.4	6.2	0.2	0.3
1995	90.3	3.1	4.4	3.3	1.3	0.9	1.4	0.2	4.5	4.9	1.5	1.8	4.8	1.2	2.0	0.8	0.0	1.4	10.5	0.5	0.9	0.9	2.0	0.1	3.4	9.6	7.6	6.6	10.8	0.0	1.8	4.5	0.8	1.3	2.5	6.8	3.6	0.3	0.2
1996	108.1	4.0	5.5	6.5	2.7	0.7	1.2	3.5	4.1	3.4	1.4	1.5	8.1	2.1	6.2	0.4	0.0	3.1	5.5	0.1	0.0	0.0	3.0	0.0	2.1	4.4	6.6	8.7	19.7	0.0	1.1	9.3	0.3	0.0	1.1	8.7	7.2	0.1	0.0
1997	110.5	4.7	4.0	7.1	0.8	2.8	0.8	2.1	6.9	4.0	1.0	1.0	6.8	1.6	3.0	0.5	0.0	6.2	13.2	1.2	0.5	0.1	3.4	0.0	3.1	9.4	5.2	7.0	13.4	0.0	0.9	8.0	1.3	0.2	4.5	7.6	7.2	0.0	0.2
1998	90.5	2.9	1.6	6.1	0.5	1.9	0.8	2.6	2.7	2.9	0.9	2.8	5.7	2.5	3.6	0.7	0.0	6.9	14.9	0.8	1.2	0.2	1.7	0.0	1.9	5.8	3.2	6.8	8.3	0.0	0.7	6.6	1.2	1.1	5.0	6.5	7.4	1.9	0.2
1999	113.2	8.3	2.1	3.3	2.1	4.1	1.0	2.0	3.2	3.2	0.8	2.7	4.3	2.2	5.9	0.4	0.0	7.5	13.4	0.8	0.6	0.2	1.3	0.0	2.0	8.7	3.8	7.6	15.7	0.0	0.6	5.5	0.6	0.2	3.8	9.6	9.8	1.8	0.0
2000	104.3	3.3	2.5	4.0	3.4	3.1	1.0	0.8	5.0	3.0	1.5	1.6	4.5	1.1	5.8	0.7	0.0	5.7	11.1	0.4	0.4	0.1	1.5	0.0	2.6	9.8	7.7	5.9	10.6	0.0	1.4	7.4	1.2	0.3	3.4	11.3	6.6	0.0	0.1
2001	100.2	4.2	5.4	7.3	2.7	1.5	0.8	2.0	4.9	4.1	1.2	1.2	5.1	0.4	7.5	0.8	0.0	5.0	6.3	0.4	0.2	0.0	1.5	0.0	4.5	7.6	6.7	4.7	11.9	0.0	0.9	10.3	0.7	0.3	1.9	4.8	6.0	0.0	0.1
2002	97.6	7.3	5.3	4.3	2.4	0.4	0.5	2.2	3.2	4.8	0.7	0.7	6.5	0.7	4.2	1.0	0.0	5.3	4.5	0.3	0.3	0.0	2.1	0.0	2.6	8.7	5.1	7.6	13.5	0.2	1.2	6.7	0.1	0.4	1.6	4.8	6.7	0.0	0.0
2003	111.7	9.1	4.3	4.2	1.9	0.9	2.0	1.1	5.1	4.0	0.6	0.6	3.4	1.5	5.6	0.6	0.0	6.5	8.8	0.6	0.5	0.0	0.8	0.0	3.5	8.3	4.6	8.5	11.9	0.0	0.9	7.6	0.5	0.2	2.7	13.3	6.6	0.0	0.0
2004	101.3	6.0	4.1	5.0	1.7	1.4	2.4	0.8	4.6	2.5	0.2	0.2	3.6	1.9	2.4	0.4	0.0	4.4	9.3	0.6	0.3	0.1	1.5	0.0	2.5	5.2	4.7	10.9	12.5	0.0	0.8	10.4	0.3	0.1	2.1	7.9	10.3	0.0	0.1
2005	111.2	7.5	6.0	6.6	2.1	1.1	2.2	0.4	5.9	3.1	0.6	0.6	4.8	1.3	2.3	0.7	0.0	11.4	9.8	0.9	0.2	0.0	2.9	0.0	3.7	5.6	6.5	9.6	9.1	0.0	0.8	11.4	0.7	0.3	3.1	8.0	5.8	0.0	0.0
2006	105.5	5.6	8.6	5.9	2.5	0.9	2.0	0.7	3.3	6.5	0.8	0.8	6.2	1.7	3.0	0.3	0.0	7.9	8.1	0.7	0.2	0.0	4.0	0.0	4.2	11.2	6.0	5.1	6.4	0.0	1.2	11.5	0.6	0.0	1.8	4.0	7.3	0.0	0.1
2007	105.2	4.8	13.0	3.2	1.8	0.7	0.9	2.0	4.5	4.9	0.1	6.0	6.8	0.6	4.0	0.1	0.0	7.5	6.7	0.8	0.3	0.1	3.7	0.0	2.2	10.7	4.1	8.1	6.2	0.0	0.9	7.1	0.3	0.3	2.5	1.1	7.4	5.8	0.2
2008	97.3	3.4	8.7	2.7	1.0	1.1	1.6	2.5	8.4	7.8	0.6	0.7	6.2	2.3	2.8	0.2	0.0	5.4	9.0	0.6	0.2	0.0	2.3	0.0	1.9	7.7	3.4	6.0	9.3	0.0	1.3	4.4	0.3	0.2	2.5	3.0	9.1	0.1	0.1
2009	104.5	5.6	5.2	5.3	0.8	1.6	0.8	1.6	6.7	7.0	2.3	2.4	4.8	2.6	3.5	0.5	0.0	6.9	9.3	0.7	0.2	0.6	1.7	0.1	5.0	6.9	2.1	6.3	11.4	0.0	0.9	6.3	0.9	0.3	1.5	5.7	9.6	0.0	0.1
2010	95.7	7.4	6.5	4.0	1.5	0.5	0.7	0.7	4.5	6.4	0.6	0.8	4.6	1.1	2.4	0.2	0.0	4.1	4.1	0.2	0.1	0.0	2.5	0.0	4.3	5.2	9.6	6.8	12.5	0.0	1.1	5.5	0.1	0.2	1.1	4.5	6.7	0.1	0.0
2011	96.1	6.5	5.6	1.6	1.3	0.9	1.4	1.0	5.6	14.0	1.2	2.1	4.2	1.3	1.6	0.4	0.2	1.5	4.9	0.1	0.1	0.0	2.4	0.0	5.4	6.7	9.9	6.5	13.1	0.0	0.6	2.8	0.2	0.1	0.7	3.1	2.3	0.9	0.0
2012	93.7	5.6	8.0	1.8	0.9	0.7	1.2	0.7	13.7	12.5	1.1	1.5	1.8	1.5	1.6	0.1	0.1	0.8	4.5	0.2	0.2	0.0	0.6	0.4	4.0	5.7	5.1	5.8	15.9	0.0	0.4	2.7	0.2	0.1	0.3	1.8	2.6	0.1	0.0
2013	100.7	4.3	4.7	1.1	1.7	0.6	2.0	0.7	11.5	10.2	1.0	1.9	1.8	2.0	1.5	0.2	0.1	0.2	5.8	0.0	0.1	0.1	0.8	0.0	4.6	8.2	12.7	7.4	15.2	0.0	0.1	2.7	0.2	0.1	0.6	4.9	3.0	0.9	0.0
2014	62.8	3.6	4.4	0.4	2.0	0.4	0.3	0.2	6.0	8.0	1.0	1.3	2.1	1.6	1.0	0.7	0.0	0.1	2.8	0.1	0.0	0.1	0.2	0.0	3.2	8.2	4.7	4.5	6.4	0.0	1.0	2.5	0.0	0.1	0.3	2.2	2.0	0.3	0.0
2015	79.0	5.1	5.0	0.2	1.2	1.1	0.7	0.2	13.8	13.2	1.5	1.9	0.5	1.7	0.4	0.0	0.0	0.3	3.8	0.1	0.0	0.0	0.3	0.0	3.8	5.3	6.3	5.5	8.5	0.0	0.0	1.4	0.0	0.0	0.2	2.7	1.6	0.4	0.0
2016	52.5	3.7	3.6	0.0	1.8	0.4	0.4	0.0	6.9	9.1	0.9	1.0	0.3	0.5	0.9	0.2	0.0	0.2	1.8	0.1	0.0	0.0	0.1	0.0	3.1	4.4	4.7	3.4	6.0	0.0	0.0	1.8	0.1	0.0	0.2	0.2	1.5	0.1	0.0
2017	71.6	6.6	4.2	0.2	1.3	0.7	0.6	0.1	7.7	10.7	2.1	2.4	0.8	1.1	1.0	0.3	0.1	0.6	3.0	0.0	0.0	0.0	0.4	0.0	4.0	5.9	8.4	3.7	7.4	0.0	0.0	1.5	0.1	0.0	0.3	2.2	1.5	0.3	0.1
2018	66.1	3.1	3.7	0.0	0.9	0.8	0.2	0.7	4.6	9.7	2.6	3.4	1.4	0.4	1.4	0.2	0.0	1.6	2.0	0.0	0.0	0.1	0.5	0.0	3.3	8.3	6.4	4.8	8.6	0.0	0.0	0.9	0.1	0.0	0.2	1.1	1.9	0.8	0.1
2019	56.0	2.0	4.1	0.1	1.2	0.3	0.3	1.1	4.1	8.0	1.7	1.9	3.4	0.4	1.1	0.6	0.0	1.8	1.5	0.0	0.0	0.0	1.6	0.0	2.3	7.5	4.6	5.0	5.4	0.0	0.1	1.2	0.2	0.0	0.3	0.3	1.8	0.2	0.0
2020	42.7	2.0	3.7	0.0	1.2	0.3	0.2	0.2	4.9	4.4	1.1	1.2	1.1	0.4	0.4	0.4	0.0	0.7	1.5	0.1	0.0	0.0	0.5	0.0	2.8	4.9	3.6	3.1	5.9	0.0	0.0	1.3	0.2	0.0	0.2	0.2	1.1	0.1	0.0
2021	41.2	1.6	4.0	0.0	0.8	0.3	0.3	0.0	4.3	6.4	0.6	0.8	0.0	0.5	1.0	0.0	0.0	0.8	1.8	0.2	0.0	0.0	0.0	0.0	4.0	4.9	3.4	2.5	4.3	0.0	0.0	0.8	0.2	0.0	0.2	0.0	0.8	0.2	0.0
2022	45.9	1.5	2.6	0.0	0.7	0.4	0.1	0.1	5.4	6.2	0.9	1.0	0.1	0.7	0.2	0.0	0.0	0.9	1.5	0.0	0.0	0.0	0.1	0.0	3.0	6.8	2.5	3.6	8.0	0.0	0.0	0.7	0.1	0.0	0.2	0.9	1.0	0.2	0.0
2023	42.8	0.6	2.0	0.2	0.6	0.2	0.2	0.0	6.1	9.5	0.9	1.3	0.1	0.2	0.8	0.0	0.0	0.2	0.8	0.0	0.0	0.0	0.0	0.0	2.7	4.9	2.4	3.5	5.6	0.0	0.0	0.7	0.0	0.0	0.1	0.6	1.1	0.4	0.0

Table 6.14. Financial year blacklip CPUE (kg.hr-1) from the Western Zone SAUs and HS pooled data limited SAUs (ordered alphabetically). Empty cells denote no catch or insufficient data to estimate CPUE.

Financial Year	Western Zone	ANXIOUS BAY	AVOID BAY	BAIRD BAY	CAPE BAUER	CAPE CATASTROPHE	COFFIN BAY	DENTRECASTEAUX REEF	DRUMMOND NORTH	DRUMMOND SOUTH	ELLISTON CLIFFS	ELLISTON LOW SAUS	FAR WEST LOW SAUS	FISHERY BAY	FLINDERS ISLAND	FRANKLIN ISLANDS	GREENLY ISLAND	HOTSPOT	LINCOLN LOW SAUS	MEMORY COVE	NE THISTLE	NEPTUNE ISLANDS	NORTH NUYTS	PEARSON ISLAND	POINT AVOID	POINT WESTALL	REEF HEAD	SEARCY BAY	SHERINGA	SIR JOSEPH BANKS	SOUTH NUYTS	STREAKY LOW SAUS	SW THISTLE	TAYLORS ISLAND	THE GAP	VENUS BAY	WARD ISLAND	WATERLOO BAY	WEDGE ISLAND
1979	21.8	24.7	20.2						21.1	22.0		18.4							16.2						18.1	40.7	26.9		25.9			21.2			14.5			18.0	
1980	24.4	26.0	22.6	21.6					29.5	21.2		17.5		24.4	22.4				25.1						22.9	26.3	30.3	27.5	28.8			21.2				22.9	28.6	17.5	
1981	24.3	22.7	28.1	16.5		25.2	21.5		22.4	21.7		20.3		29.3	21.6				25.3						22.0	22.9	28.0	26.8	27.6			17.6	29.9	22.7	21.5	31.1	26.3	18.9	
1982	24.7	22.3	24.7	22.4		20.0	18.6		26.0	23.8		23.9		20.9	26.0			28.8	21.0						24.6	19.0	26.1	25.8	27.5			22.4	23.4		21.7	25.8	28.5	19.6	
1983	23.6	23.8	23.5	22.1					24.6	19.9	27.4	27.4		18.7	19.5			27.5	19.4						20.9	21.1	23.4	22.2	28.9			22.1			19.8	30.3	26.3		
1984	24.6	25.6	21.9	31.6		18.5	15.0		25.1	22.4	30.3	30.3	18.2	18.9	22.5			26.1	20.6	21.4					21.3	27.1	20.2	28.6	29.7			31.9	27.4	19.5	21.7	27.6	23.9		
1985	24.2	19.4	17.7	27.0			14.6	19.5	23.3	20.9	25.3	25.8	18.4	19.9	28.7	11.5		25.6	20.6	21.3			21.7		18.4	27.2	19.8	30.9	27.8			27.6		21.6	20.5	25.7	27.2		
1986	22.7	20.7	18.3	21.7	17.7	18.7			22.6	19.7	26.5	24.5	20.0	15.1	25.1				16.0						23.7	22.7	21.3	23.6	27.4			20.3	13.7		14.4	24.3	25.0	23.0	
1987	23.2	24.2	15.7	27.3	30.4	20.2	15.0	22.9	24.9	21.8		22.0	23.6	15.1	20.1				17.2						21.3	26.5	19.9	23.1	28.0			27.6	19.3		20.7	24.4	22.0		
1988	22.4	20.4	15.6	25.0	19.0	19.0	18.9	23.7	26.0	23.3		23.3	22.9	15.1	26.2	17.1		19.1	17.1	13.9			19.9		20.5	20.6	20.0	26.4	27.5		29.7	24.5	18.6		18.5	26.0	24.6	17.7	
1989	23.9	24.1	17.9	28.5		22.7	21.3	24.6	27.1	26.1		27.0	21.5	15.3	32.5	21.1		25.4	19.7	21.7	18.3		20.9		22.3	26.6	20.4	23.5	27.0		18.7	28.5	22.0	16.9	20.1	31.1	33.7		
1990	25.1	24.7	22.9	30.5		20.5		22.0	25.7	22.4		28.3	20.8	17.3	29.8	22.0		25.6	18.0	18.1	13.6		18.9		22.9	24.6	23.2	30.1	34.2		20.0	30.5	20.8	16.4	19.5	29.7	32.6		
1991	26.0	25.2	30.7	32.8		20.8	21.6	22.0	25.8	29.2	29.5	28.8	21.0	22.5	22.4	20.1		29.7	20.4	18.6	19.0		19.9		24.3	25.8	23.7	31.9	32.3		22.3	31.6	19.9	16.2	21.2	29.7	33.4		
1992	25.8	25.6	30.4	24.3	22.9	21.7	22.0		24.7	21.7		25.7	21.1	22.2	22.9			36.6	21.4	20.5			22.6		22.9	23.5	23.0	31.1	30.6			23.9	22.8	17.9	21.5	30.1	34.7		
1993	26.2	26.3	28.8	29.7	32.7	20.7		29.5	28.4	27.1		31.4	27.1	15.8	23.2	19.7		28.6	19.3		18.0				25.4	20.8	20.3	27.5	29.2			30.0	19.6	20.1	20.4	28.2	36.9		
1994	26.1	24.8	26.0	25.6		20.7	20.5	36.5	26.5	20.7		29.6	27.6	19.1	26.3			33.1	20.1				22.2		26.6	22.6	21.9	29.0	32.6			25.4	22.6	16.3	23.6	30.0	36.5		
1995	25.3	21.0	24.5	23.4	22.0	18.9	22.6		24.7	26.1	27.2	25.8	22.1	19.4	20.8	22.6		24.6	21.0				22.2		23.0	27.0	23.4	28.0	32.4		21.1	23.0	20.5	18.4	25.1	28.3	28.7		
1996	25.1	23.9	23.7	27.5	20.4		17.4	25.9	23.8	19.0	26.0	26.0	21.7	19.2	22.5			28.2	20.1				20.5		20.0	22.3	21.8	29.7	29.7		16.9	24.9			23.1	26.5	33.2		
1997	25.8	22.1	23.7	25.4		19.8		27.4	25.5	26.0		26.3	24.1	21.9	23.6			29.5	20.9	20.6			23.9		25.7	25.1	19.9	29.6	29.1			25.2	25.0		20.6	28.5	36.0		
1998	25.0	22.7	20.7	29.0		21.8	15.4	28.3	22.3	30.0		24.3	22.7	25.2	24.3			29.6	21.3		19.6		19.0		21.0	21.8	18.4	26.1	28.0			28.1	26.5		19.8	26.5	34.4	24.2	
1999	25.4	24.8	21.6	24.6	22.4	24.8	20.0	24.9	26.8	23.3		18.6	22.9	21.0	25.1			26.5	21.9						22.0	22.4	22.8	25.6	30.9			23.5			21.6	27.3	33.6	16.3	
2000	25.7	24.9	22.7	27.1	25.6	21.3			25.0	25.7		24.8	22.6	19.5	24.5	20.0		29.7	20.4				28.5		27.7	23.3	24.6	27.1	30.2		20.5	26.4	19.2		20.9	28.4	30.1		
2001	27.6	24.6	31.9	32.5	24.0	23.5		30.3	31.2	29.8		27.8	23.6		30.0	19.9		26.1	22.4				19.8		24.6	24.5	27.5	25.2	33.5			29.7			26.3	23.8	30.3		
2002	28.5	25.8	29.8	27.1	23.9			28.1	27.1	30.2		26.3	25.4		25.2	22.7		31.3	26.6				25.9		25.4	28.1	27.7	29.3	32.5		21.8	25.8				28.9	33.0		
2003	29.2	28.1	27.8	27.4	26.5	25.6	29.3		30.6	28.5		29.6	22.4	26.8	29.0			34.0	26.2						31.3	24.3	24.1	31.2	33.3			27.2			21.2	31.9	35.7		
2004	29.8	30.1	27.1	28.9	29.6	30.2	23.6		25.8	29.8		30.4	25.2	33.3	29.6			31.7	28.5				26.0		28.0	27.6	24.8	30.5	32.8			30.2			29.2	28.3	38.0		
2005	29.8	30.7	33.5	26.9	28.4	26.4	23.4		28.3	27.2			25.0		31.8			35.7	26.3				26.5		27.1	27.5	26.6	30.5	31.5			27.8			24.8	34.3	40.3		
2006	30.7	29.1	36.3	28.9	28.0	31.5	19.9		29.8	32.2		26.8	25.0		27.8			33.1	27.5				28.2		33.2	31.8	27.0	29.9	35.1		19.1	28.5			30.4	33.0	34.1		
2007	29.5	30.3	35.4	26.3	28.4			28.4	31.3	31.4		24.6	23.6		26.7			31.4	28.6				23.3		27.4	30.8	25.4	30.1	34.3		22.2	26.7			31.0	24.4	31.2	25.1	
2008	28.7	28.6	32.4	27.6	26.2	29.6	21.5	23.7	30.2	28.6		27.0	20.8	29.5	24.9			26.2	27.3				19.4		30.4	29.6	25.8	30.0	31.3		18.9	27.5			27.4	26.1	33.5		
2009	27.2	26.7	24.1	25.4		25.1			30.3	27.3	32.4	32.2	25.3	31.2	24.7			28.0	26.7				21.8		27.5	24.7	21.0	27.7	29.8			25.4			25.5	25.7	30.6		
2010	26.2	26.9	26.0	25.5	25.9				27.2	29.8		31.8	17.5		29.2			20.1	23.6				18.8		24.5	24.1	25.6	27.2	31.4		18.2	25.6				25.6	28.5		
2011	25.1	26.8	23.9	26.2		23.7	23.6	17.7	27.6	25.3		32.4	16.3	26.0	22.3			22.1	23.7				15.7		25.2	27.9	22.2	27.6	27.8		13.5	26.2				25.6	25.0		
2012	25.5	29.1	23.5	25.2		17.6	19.8		26.5	25.1		29.4	17.1	15.6	24.2			23.8	16.8						23.8	24.7	20.9	27.3	29.9			26.6				30.2	29.3		
2013	24.5	24.1	23.1	20.4	24.4	10.9	24.0	16.8	25.3	25.8	24.5	26.9	18.2	17.3	26.0			23.8	19.0				22.1		24.0	25.4	22.4	24.8	28.0			22.6				25.9	29.1		
2014	22.9	21.5	21.9		27.3				24.4	23.1		25.4	30.0	16.0	17.3				15.4						18.3	27.7	17.7	24.2	24.5			27.1				24.2	27.0		
2015	23.4	25.3	18.1		24.8	21.1	18.0		24.8	22.0	36.0	34.4	20.4	19.1	20.8				19.4						22.5	26.7	19.8	26.1	28.3			24.2				22.0	29.2		
2016	22.1	23.7	20.6		29.1				21.3	21.9	25.1	25.8	13.0		25.4				17.6						19.4	25.8	19.6	23.9	22.7			29.1				21.4	25.0		
2017	22.2	24.9	17.8		24.4				21.4	21.6	25.3	26.1	15.8	16.7	21.5			26.6	16.3						21.3	27.1	19.4	25.1	25.4			23.5				22.8	27.6		
2018	21.8	21.2	19.1			17.2		11.4	20.3	20.7	24.5	24.9	13.0		28.2			26.5	15.3						18.1	26.4	17.4	24.8	24.5			23.7				22.1	31.5		
2019	20.0	18.8	17.8					12.3	19.9	19.7	21.9	22.4	14.0		21.2			22.5	16.6				15.7		16.7	23.2	16.7	21.3	23.7			23.9				18.8	28.3		
2020	21.3	20.1	18.4		24.3				20.8	21.4	19.4	19.7	14.7		22.1			25.4	19.0						19.1	27.7	18.5	25.8	21.7			24.3				17.6	27.7		
2021	21.0	20.0	19.8						20.2	22.3		22.1			21.9			25.7	15.9						17.3	24.2	16.7	24.5	22.7			25.9					25.1		
2022	21.7	17.7	18.1						23.6	22.0		21.0			21.2			24.0	15.7						19.4	25.7	15.4	23.3	23.3			26.4					25.4		
2023	22.1	20.5	19.0						22.8	21.5		25.5			22.0			23.8	16.1						18.8	26.0	13.8	25.4	23.5			26.8					26.3		

Table 6.15. Financial year greenlip catch (tons MW) from the Western Zone SAUs and HS pooled data limited SAUs (ordered alphabetically). Empty cells denote no catch.

Financial Year	Western Zone	ANXIOUS BAY	AVOID BAY	BAIRD BAY	CAPE BAUER	CAPE CATASTROPHE	COFFIN BAY	DENTRECASTEAUX REEF	ELLISTON CLIFFS	ELLISTON LOW SAUS	FAR WEST LOW SAUS	FISHERY BAY	FLINDERS ISLAND	FRANKLIN ISLANDS	GREENLY ISLAND	HOTSPOT	LINCOLN LOW SAUS	MEMORY COVE	NE THISTLE	NEPTUNE ISLANDS	NORTH NUYTS	PEARSON ISLAND	POINT AVOID	POINT WESTALL	REEF HEAD	SEARCY BAY	SHERINGA	SIR JOSEPH BANKS	SOUTH NUYTS	STREAKY LOW SAUS	SW THISTLE	TAYLORS ISLAND	THE GAP	VENUS BAY	WARD ISLAND	WATERLOO BAY	WEDGE ISLAND
1979	85.1	13.1	13.2	4.3	0.3	0.3	0.6	0.0	0.2	1.8	0.3	2.3	3.0			6.5	6.9	0.1	1.5	1.7	0.3		15.0	4.7	1.1	0.3	0.4	0.1		1.9	1.7	1.2	5.2	1.3	1.6	1.2	1.0
1980	120.9	12.6	12.3	5.0	0.4	1.7	1.3	0.3	0.4	6.4	1.6	3.4	7.6	0.4		7.1	6.4	0.8	0.6	0.4	0.9		21.9	6.3	6.4	1.3	2.5	0.1	2.0	4.2	1.5	2.1	5.4	2.5	4.1	3.5	0.7
1981	108.6	12.1	4.8	1.7	0.2	2.8	1.2		1.4	5.2	0.7	4.9	8.1	0.0		10.2	9.1	0.5	0.8	1.3	0.7		7.8	6.8	4.0	4.0	2.0		0.2	5.1	1.8	2.4	10.8	0.9	6.6	1.8	1.2
1982	128.9	7.4	8.9	5.4	0.2	2.2	1.4		1.0	3.7	2.6	5.2	6.9	1.0		4.3	11.5	3.7	1.4	2.1	1.6	0.2	13.7	4.9	8.6	3.6	1.9	0.1	1.0	6.1	3.3	3.6	13.8	2.3	3.8	0.6	1.1
1983	165.0	13.2	12.4	7.7	0.3	1.7	2.2	2.7	1.0	3.8	3.9	10.2	13.6	0.5		9.0	12.6	2.4	0.9	0.8	0.7	1.0	20.9	4.9	18.8	3.2	1.7	0.1	0.1	6.4	2.9	3.1	11.2	2.8	3.8		4.0
1984	176.3	16.2	9.4	12.0	2.4	1.0	2.0	0.1	0.9	3.9	5.4	4.8	13.8	2.4	0.1	4.7	9.7	2.5	1.0	0.5	2.8	0.6	32.2	6.9	14.2	6.3	2.4	0.1	0.1	14.8	2.5	8.7	6.2	5.1	2.1	0.1	2.6
1985	113.8	5.9	3.9	4.9	1.6	1.4	0.6	2.6	1.6	3.7	15.1	4.3	5.8	3.7	0.0	1.1	4.6	2.6	0.4	0.4	8.8	0.2	8.1	6.6	5.8	11.6	2.0		7.5	15.8	0.9	5.8	4.7	2.2	3.6		0.9
1986	103.3	7.0	5.8	4.1	5.2	1.6	0.3	0.1	1.2	7.4	1.2	3.7	4.7	0.8	0.1	4.5	5.7	3.6	1.1	0.4	0.3	1.5	12.3	3.7	6.7	4.7	1.7	0.0	0.4	12.2	1.4	9.0	5.9	2.4	2.4	3.0	0.8
1987	100.8	8.6	3.5	7.1	2.7	2.1	1.1	1.6	0.9	3.0	3.8	2.5	6.6	0.9	0.1	4.5	7.8	3.0	1.0	0.5	1.3	0.3	6.1	6.4	4.2	2.6	1.6		1.5	8.9	1.7	6.3	9.4	3.1	3.6	0.2	1.5
1988	120.9	13.4	4.0	5.7	3.1	3.0	1.1	1.1	1.4	2.3	8.0	3.5	5.5	3.7		1.3	14.4	3.0	2.6	1.5	3.2		7.5	8.1	4.7	6.1	0.4	0.2	3.1	11.8	4.0	8.9	7.6	2.2	5.2	0.5	2.0
1989	86.4	9.1	2.5	3.0	1.4	1.6	0.6	1.5	0.4	1.5	6.4	3.7	3.6	3.0	0.5	4.2	8.4	3.5	1.4	1.6	1.8		7.8	5.2	4.0	1.5	0.9	0.1	4.7	4.1	1.4	4.3	5.8	1.2	2.1	0.3	1.2
1990	85.5	6.5	2.8	5.6	0.4	1.8	0.2	1.9	0.7	1.7	9.1	3.3	6.9	3.1	0.1	8.4	7.6	2.5	1.5	0.2	4.0	0.4	2.9	3.9	2.3	2.6	0.6		4.7	5.6	1.6	2.8	6.0	2.6	1.7	0.1	2.3
1991	79.8	6.8	2.2	4.5	1.8	1.8	0.3	1.1	0.4	1.6	6.4	2.4	4.1	2.6	0.0	6.9	8.5	3.2	2.3	0.4	2.7	0.2	3.7	4.6	1.4	2.1	0.7	0.1	2.8	4.5	2.4	4.9	7.3	0.6	3.0	0.3	1.2
1992	77.9	6.6	4.1	3.8	2.5	2.3	0.4	1.7	0.1	1.3	5.6	3.3	5.6	2.3	0.4	4.2	9.7	1.5	1.4	0.2	1.6	0.4	2.0	2.7	2.2	1.6	0.5	0.1	3.0	5.9	1.6	2.8	8.7	1.8	4.3	0.4	3.4
1993	71.9	4.1	4.4	3.6	1.6	1.9	0.7	2.1	0.5	1.6	4.1	1.2	5.5	1.0		4.0	11.5	1.6	3.0	1.4	1.1	0.3	2.2	2.2	1.2	1.7	0.6	0.1	1.4	5.5	2.5	3.8	7.1	2.2	4.5	0.2	1.8
1994	75.2	5.0	4.8	3.6	1.1	1.1	1.0	1.4	0.1	1.1	5.1	2.0	7.2	1.7	0.0	5.3	8.6	1.4	2.3	1.1	2.0	0.1	3.2	2.5	1.3	2.8	0.6	0.0	1.3	5.7	1.5	5.3	8.1	1.9	3.0	0.3	1.6
1995	73.2	5.8	3.6	2.6	0.6	2.1	0.5	0.2	0.1	0.8	4.5	2.1	7.5	2.9		3.8	11.3	2.0	2.3	2.5	1.5	0.4	1.7	3.4	1.2	2.0	0.2	0.2	3.9	4.1	1.2	4.2	7.5	1.5	2.6	0.1	2.5
1996	81.8	6.0	4.1	5.7	0.6	2.0	0.1	2.1	0.4	1.6	5.0	3.3	10.3	1.0		8.0	7.2	2.0	1.4	0.2	2.0	0.2	1.1	1.8	2.0	2.2	0.8	0.1	2.4	5.0	1.2	4.1	7.0	2.1	4.3	0.2	2.2
1997	76.7	6.0	2.6	5.1	0.2	3.7	0.1	0.9	0.1	2.2	3.8	2.0	7.0	1.1		9.6	10.0	1.7	1.0	1.4	1.7		1.6	2.1	1.2	1.5	2.1	0.3	2.1	3.7	1.8	2.6	7.3	2.1	4.5		1.8
1998	79.3	5.7	1.5	5.2	0.3	1.3	0.1	1.2	0.1	1.7	5.8	2.5	7.6	2.6		8.6	8.0	3.1	2.3	0.6	1.9	0.1	0.8	3.1	0.7	1.3	0.4	0.3	2.9	3.8	2.0	3.4	9.3	2.2	5.0	1.2	1.4
1999	84.2	5.6	2.7	3.4	1.1	2.5	0.1	0.9	0.3	4.0	4.5	1.3	9.3	1.8		8.5	7.4	2.8	1.1	0.6	1.7		1.6	2.6	0.7	1.2	0.5	0.2	3.7	4.2	1.4	2.3	13.2	1.8	5.7	3.2	1.5
2000	76.9	2.9	2.0	2.4	1.6	2.2	0.2	0.9	0.2	1.2	4.4	1.0	11.6	2.0		6.4	8.8	1.5	1.6	0.8	1.5	0.6	1.6	2.9	2.9	1.0	0.5	0.2	4.8	5.5	1.9	2.2	9.6	2.8	4.3		1.9
2001	75.4	6.2	2.5	4.1	0.9	1.5	0.1	0.7	0.0	0.7	5.1	0.4	11.4	2.0		7.5	5.2	1.4	0.4		2.3	0.2	2.5	3.4	2.0	1.6	0.5	0.1	3.3	3.4	1.8	3.2	8.7	0.8	3.4		1.4
2002	76.8	5.9	3.2	3.6	1.1	0.5	0.1	0.7	0.1	0.4	6.0	0.6	9.8	2.0		7.2	3.6	2.5	1.6		3.2		2.4	3.7	0.9	1.7	0.3	0.5	2.8	4.8	0.6	4.5	8.0	2.0	4.6		0.2
2003	79.1	9.8	2.7	2.7	0.5	0.7	0.2	1.5	0.0	0.4	5.0	1.9	8.9	2.3		7.5	3.8	1.6	0.7		1.3	0.0	1.4	2.6	1.3	1.1	0.3	0.0	5.7	3.8	1.4	4.6	11.5	1.4	2.7		0.9
2004	85.1	9.6	5.7	3.1	0.6	1.5	0.0	1.3	0.0	3.4	5.7	2.2	6.1	2.3		7.1	5.1	2.1	1.4	0.1	1.3		1.8	2.1	0.9	1.8	0.2		4.9	6.0	1.3	2.5	9.4	0.6	6.4	3.1	0.9
2005	77.4	8.0	6.8	4.6	0.4	0.7	0.1	0.8	0.0	0.1	5.5	0.7	5.4	1.8		8.8	3.9	2.3	1.1		2.8		1.2	2.7	0.7	2.4	0.1	0.2	2.8	5.6	1.1	3.7	10.0	0.4	3.9		0.7
2006	87.4	10.2	11.0	4.7	1.8	1.2	0.2	0.9	0.0	0.3	4.5	1.3	8.7	1.2		7.9	4.7	1.6	0.6		2.3	0.3	2.1	3.1	1.6	1.0	0.1		4.0	5.4	1.4	1.5	9.3	0.0	5.1		1.2
2007	78.5	5.4	12.0	3.2	1.7	0.7	0.3	1.3		0.1	4.5	0.2	9.0	0.7		6.2	5.1	2.5	1.0	0.3	2.4		1.3	3.2	1.2	1.3	0.1		2.4	4.0	1.2	3.3	9.2	0.1	5.4		1.6
2008	86.2	8.4	12.8	2.9	0.6	1.6	0.8	1.1	0.0	0.8	4.1	2.6	5.4	1.0		5.9	6.8	3.3	0.9	0.8	2.0	0.3	2.0	2.9	0.8	1.3	0.4	0.0	4.6	3.0	1.2	3.5	8.8	0.5	5.9		1.4
2009	73.9	7.1	4.9	2.2	0.3	2.3	0.4	0.9	0.2	0.7	4.4	3.0	3.2	1.6		4.7	9.9	3.5	0.8	0.9	1.9	0.1	2.9	1.7	0.6	1.1	0.4	0.2	3.1	2.1	3.0	2.9	8.9	0.7	6.0		2.2
2010	85.6	15.1	4.4	2.7	0.3	1.8	0.6	0.6	0.0	0.9	3.6	1.1	3.4	0.8		3.9	7.3	2.5	1.5	0.4	2.2		6.0	1.5	4.6	1.6	0.3		5.4	3.8	1.4	3.9	8.2	2.0	3.9	0.5	1.5
2011	73.1	8.7	3.8	1.7	0.5	1.6	1.2	0.5	0.3	2.8	4.0	2.9	3.9	0.9	0.2	1.0	6.0	1.8	1.5	0.4	2.6		5.7	1.9	5.3	1.0	0.5		3.5	3.7	0.7	3.7	7.1	2.2	2.1	2.0	0.5
2012	73.9	8.1	6.3	2.9	0.2	2.5	0.8	0.4	0.3	1.7	2.5	2.1	3.3	0.9	0.0	1.6	8.2	1.8	1.4	0.8	1.2	0.2	4.8	1.5	2.3	0.9	0.8		3.1	2.2	1.6	5.6	5.9	1.1	3.2	0.4	1.0
2013	79.8	9.0	5.5	2.5	0.9	2.3	3.2	0.4	0.4	2.2	3.2	1.5	2.9	1.7	0.0	1.5	10.2	1.4	0.7	1.6	1.1	0.3	4.3	2.2	6.0	1.2	0.7	0.0	2.4	4.3	1.3	3.7	7.9	2.2	4.3	0.8	1.0
2014	62.1	5.2	3.1	4.2	1.0	2.1	0.3	0.2	0.5	1.5	1.5	2.7	3.5	1.1		1.0	4.9	1.6	0.2	1.1	0.2	0.2	3.3	4.5	2.8	1.4	0.3		1.2	4.8	0.9	2.7	6.2	2.4	2.9	0.5	0.4
2015	69.8	7.2	4.9	4.9	0.9	1.3	0.3	0.0	0.6	1.8	0.2	1.5	1.6			2.0	5.9	1.6	0.4	0.6	0.2		4.6	2.6	5.4	1.9	0.4	0.0	0.0	4.8	1.6	2.5	8.2	1.9	3.7	0.8	1.6
2016	65.2	7.1	5.1	4.4	1.0	3.0	0.2		0.3	0.9	0.4	2.2	3.6	0.2		1.5	6.6	2.1	0.7	0.1	0.1		6.5	1.5	3.1	0.7	0.3			3.1	1.1	3.7	7.1	1.3	2.8	0.3	1.4
2017	73.9	5.9	5.7	4.2	1.3	2.0	0.1	0.0	0.9	2.2	2.5	1.7	3.8	1.1	0.0	3.2	8.9	1.3	0.9	2.1	1.3	0.1	5.6	3.4	4.1	0.9	0.8		0.2	4.0	2.4	2.9	8.9	1.9	1.2	0.4	1.3
2018	72.8	5.3	6.6	3.5	1.3	2.1	0.0	0.4	0.4	1.6	2.5	2.0	4.4	0.5		7.5	6.1	0.9	0.5	1.3	1.5		4.7	4.6	4.6	1.4	0.6	0.1	0.2	3.0	0.8	2.3	4.4	0.2	5.3	0.5	1.2
2019	69.1	5.7	5.8	4.5	0.7	1.3	0.1	0.6	0.7	1.6	3.9	1.3	5.1	1.5		4.9	4.3	0.6	0.4	0.2	1.8		7.3	3.5	2.9	1.8	0.3		0.8	3.3	1.4	2.1	4.4	0.8	3.7	0.6	0.9
2020	55.9	4.1	4.4	2.3	1.0	2.0	0.4	0.0	0.2	1.1	1.2	1.9	2.8	0.4		3.4	6.2	2.0	0.5		0.7		6.1	2.8	2.6	1.6	0.7	0.2	0.3	3.3	2.1	1.9	4.2	0.7	3.2	0.3	1.0
2021	49.9	3.2	7.0	1.5	0.2	1.0	0.3		0.0	0.7		1.9	3.1			2.0	4.3	2.1	0.2	0.1			4.6	2.6	2.8	0.8	0.4			1.4	1.8	1.8	5.6	0.3	2.5	0.3	0.9
2022	47.4	3.1	9.0	1.8	0.0	1.1	0.2	0.1	0.3	1.0	0.3	1.0	2.3	0.1	0.2	2.8	2.8	1.0	0.3	0.1	0.1		3.9	2.7	1.8	1.5	0.5		1.4	1.7	0.8	1.6	4.6	0.2	2.1	0.2	0.1
2023	41.2	1.5	5.1	3.0	0.1	1.1	0.6	0.2	0.2	0.9	0.8	0.9	2.3	0.1		2.8	3.8	0.6	0.4	0.4	0.4	0.0	3.8	1.5	2.0	1.0	0.4	0.3	0.7	1.6	0.5	2.8	1.8	0.4	1.8	0.3	0.4

Table 6.16. Financial year greenlip CPUE (kg.hr-1) from the Western Zone SAUs and HS pooled data limited SAUs (ordered alphabetically). Empty cells denote no catch or insufficient data to estimate CPUE.

Financial Year	Western Zone	ANXIOUS BAY	AVOID BAY	BAIRD BAY	CAPE BAUER	CAPE CATASTROPHE	COFFIN BAY	DENTRECASTEAUX REEF	ELLISTON CLIFFS	ELLISTON LOW SAUS	FAR WEST LOW SAUS	FISHERY BAY	FLINDERS ISLAND	FRANKLIN ISLANDS	GREENLY ISLAND	HOTSPOT	LINCOLN LOW SAUS	MEMORY COVE	NE THISTLE	NEPTUNE ISLANDS	NORTH NUYTS	PEARSON ISLAND	POINT AVOID	POINT WESTALL	REEF HEAD	SEARCY BAY	SHERINGA	SIR JOSEPH BANKS	SOUTH NUYTS	STREAKY LOW SAUS	SW THISTLE	TAYLORS ISLAND	THE GAP	VENUS BAY	WARD ISLAND	WATERLOO BAY	WEDGE ISLAND
1979	23.5	23.4	24.4	25.1						17.7	22.0	21.1	28.5			32.1	22.8		16.9	32.1			24.1	22.4	21.6					24.2	26.0	18.1	17.7		34.0	16.2	
1980	21.2	19.3	20.7	19.1		26.2	17.3			19.0	20.8	23.5	24.7			32.2	20.9	22.2	13.6				20.9	15.6	20.9	25.4	26.8		22.6	19.6	23.2	16.4	20.6	17.5	34.8	17.0	
1981	21.6	20.6	19.1	20.1		20.9	14.0		26.9	23.2	24.1	20.7	22.0			30.8	19.8	20.8	10.6				19.9	21.1	19.3	26.6	22.2		23.9	22.3	21.6	16.3	20.7	13.7	29.6	21.2	
1982	22.6	18.5	22.8	22.5		18.9	15.7			22.5	30.0	17.6	22.5			28.7	20.6	22.4	18.3	26.5	31.7		26.0	23.1	23.2	26.4	18.7		24.8	23.7	24.7	20.4	20.5	20.8	29.3	17.5	23.0
1983	20.3	21.6	21.0	24.3		18.3	18.8	21.6	20.7	21.5	18.2	18.1	22.1			24.3	21.2	13.4	15.1				20.1	16.4	20.7	17.9	15.5		22.0	19.4	20.0	14.9	18.2	21.1	29.8		29.1
1984	19.8	21.0	17.6	24.2	25.7	15.0	14.1			18.0	25.8	14.2	19.1	21.0		23.8	18.0	17.6	18.7		31.7		19.9	20.6	16.7	24.0	16.1		16.7	23.5	19.7	20.7	18.0	22.1	22.2		23.7
1985	19.4	20.1	16.0	24.9	22.5	20.7	13.2	16.4	27.1	22.6	18.5	17.7	20.3	20.4		17.9	17.7	18.9			18.5		17.5	22.8	16.4	27.1	17.3		16.8	24.9	17.3	18.6	18.4	17.2	22.1		
1986	19.6	18.2	20.4	22.4	21.3	17.0			20.4	23.4	14.1	14.8	21.0	12.7		30.5	16.2	15.2	13.5			29.7	22.2	20.4	22.3	20.0			17.9	20.4	17.2	18.7	15.7	18.7	29.0	21.5	
1987	20.9	23.1	18.3	24.8	25.0	17.2	21.8	25.8	19.4	20.9	23.0	13.4	22.3			21.9	18.4	18.0	17.6		17.5		18.8	25.3	20.3	24.9	23.3		22.5	23.0	17.3	20.7	18.3	21.1	26.4		19.6
1988	19.6	22.5	27.4	21.4	20.4	17.0	27.6	23.4	16.1	15.5	19.6	14.8	17.1	19.7		23.8	19.0	15.4	17.5	23.3	18.8		22.9	18.3	18.5	23.5			21.6	22.0	18.6	17.2	17.3	20.6	24.0		20.7
1989	19.4	25.3	19.4	23.9	23.7	16.3		18.2		22.1	16.2	15.5	22.0	16.1		25.5	18.7	15.6	15.8	22.1	15.8		23.1	18.6	19.9	16.9			19.5	20.5	17.6	14.0	15.9	21.2	23.0		24.0
1990	21.9	24.9	27.0	28.7		20.3		23.2		25.0	17.8	22.9	24.2	17.0		31.3	19.7	18.4	18.2		17.0		20.3	19.8	22.8	25.2			18.2	23.7	18.3	15.8	21.0	21.4	22.7		21.5
1991	21.8	26.2	26.9	30.1	20.6	19.2		21.0		24.6	18.3	21.4	20.7	17.5		31.3	19.9	19.6	18.7		18.5		20.5	18.9	19.6	22.2			15.8	21.0	19.9	17.7	20.9		30.8		23.4
1992	22.8	25.9	33.4	22.0	20.3	20.8		26.8		24.3	20.9	22.2	22.3	20.7		27.7	22.5	19.6	19.6		17.1		20.0	20.8	20.8	24.3			19.6	21.4	21.9	17.9	21.3	21.9	32.3		25.3
1993	22.7	26.7	33.4	26.1	26.1	19.5		29.9		21.5	23.0	18.0	20.5	19.3		25.3	21.3	18.6	18.3		20.5		24.8	19.5	19.3	24.6			21.4	21.6	22.4	19.8	20.9	16.7	29.8		20.0
1994	23.6	26.5	26.6	24.1	19.7	18.1		29.8		24.0	22.8	19.4	27.9	23.3		28.9	23.0	18.9	19.6		18.9		22.0	20.2	21.7	24.4			16.5	23.7	20.2	18.5	24.0	27.2	26.3		26.7
1995	21.4	24.0	26.3	23.4	18.9	18.6				22.3	19.5	17.3	22.8	20.6		24.1	22.5	17.5	19.0	33.4	16.5		17.4	20.2	19.8	21.6			19.0	21.2	20.7	17.8	21.0		25.6		25.2
1996	21.0	21.4	25.3	23.5		19.9		21.8		19.6	17.0	21.9	23.3	17.0		26.3	20.5	17.5	17.5		14.4		16.0	18.6	17.8	22.1			16.8	20.5	19.6	15.5	20.3	18.0	27.1		25.7
1997	22.3	25.5	23.0	22.1		24.4				20.9	17.8	21.0	23.1	14.6		26.0	23.0	17.9	16.2		19.0		19.4	20.8	18.6	25.8	22.8		17.2	22.6	22.9	17.3	20.6	22.2	32.3		23.1
1998	22.1	25.2	21.4	22.8		18.7		14.1		16.2	15.9	23.9	25.4	18.1		27.3	20.9	20.8	19.2		13.6		20.3	19.8	17.1	17.7			15.2	20.7	20.8	19.7	23.7	22.0	30.8	15.7	
1999	23.5	27.0	23.4	24.0	24.2	23.7				17.3	18.0	21.9	25.6	18.6		27.2	23.3	22.7	19.8		16.0		22.2	22.0	20.2	23.8			19.2	24.1	22.2	18.4	24.9	23.2	29.7	16.3	
2000	24.6	25.8	22.5	23.7	21.3	20.9				20.3	21.9	25.3	27.5	20.4		29.3	22.9	21.9	18.0		24.5		22.8	24.5	22.6				19.3	24.2	24.1	18.8	24.2	27.3	34.4		28.7
2001	26.0	31.2	27.8	27.6	19.1	22.4				25.3	21.9	25.0	28.0	20.7		28.0	24.0	26.9			22.3		28.2	26.6	28.6	26.4			20.9	21.3	24.5	21.5	26.6		30.1		
2002	27.0	26.7	29.3	26.9	20.8					26.2	20.0	30.8	32.0	22.0		31.7	27.2	27.1	23.2		18.7		29.9	27.7	27.1	27.0			19.3	26.0		23.6	26.1		31.4		
2003	29.1	35.2	33.9	27.3				25.1			20.6	34.0	31.0	20.3		35.5	33.3	30.0			17.7		33.7	25.2	25.1				21.6	29.0		26.4	28.4	31.7	35.6		
2004	28.8	35.4	37.1	29.3		28.3				25.4	19.5	44.0	29.6	19.5		31.9	28.5	25.5	24.1		18.1		30.6	24.2	24.8	31.6			19.7	27.4		25.0	29.9		39.7	25.4	
2005	29.8	34.9	39.0	29.3							19.0	39.6	31.9	16.4		34.5	29.7	31.1			20.1		31.4	27.2	28.6	29.8			19.6	29.2		27.2	31.3		37.9		
2006	29.5	31.7	40.2	30.1	31.0	32.6					19.1	37.0	30.0	14.8		32.5	32.2	29.7			23.1		30.6	26.6	32.2				16.9	29.7		23.3	30.3		35.1		
2007	28.9	33.1	38.8	29.5	24.9			19.7			19.5	33.1	28.5	16.7		31.2	27.7	30.1			20.9		26.6	28.2	26.1	25.6			21.6	25.0		25.0	28.0		32.7		27.5
2008	27.7	33.6	35.3	29.7		25.6		21.9			20.2	30.8	25.8	17.2		28.6	28.6	28.0			21.2		29.3	25.7	24.8	29.5			17.7	26.6		25.1	26.9		28.6		
2009	25.0	29.9	27.4	29.3		23.7				24.4	17.6	28.1	22.1	15.3		29.4	26.0	23.1			19.5		24.9	22.7	23.4	27.3			20.2	26.8	27.2	22.1	24.4		27.9		28.2
2010	23.7	27.3	26.0	28.0		22.9				33.7	13.4	27.2	22.4	12.3		26.5	22.9	24.2	21.8		14.6		29.9	24.0	24.7	26.3			16.9	24.6	25.5	24.4	22.9	23.1	23.2		24.4
2011	23.1	25.3	26.8	24.8		25.1				37.5	14.5	25.8	25.2	12.3		27.8	23.0	26.0	23.9		15.2		23.3	21.4	22.9				15.2	24.8		24.9	25.1	23.3	24.2		
2012	23.2	26.7	25.3	27.3		19.9				29.3	13.3	18.9	22.7	12.3		31.0	22.7	21.1	23.2		14.2		24.5	21.2	24.5				16.5	26.1	20.9	24.0	21.3	27.2	30.8		
2013	22.6	25.2	25.5	24.7		17.0	23.0			23.4	16.2	17.8	21.0	17.0		26.2	20.4	16.7		27.4	17.2		25.2	27.6	24.5	24.1			19.5	25.2	18.5	18.3	22.3	25.1	28.8		
2014	20.0	20.7	20.8	27.5		18.6				24.8	21.4	15.5	18.3	26.6		20.2	19.2	14.3					21.0	21.8	16.8	25.5			20.0	26.0	18.6	16.7	17.0	25.2	24.0		
2015	22.2	26.8	20.2	29.8		19.1				27.3	21.2	16.8	18.3			23.5	19.1	12.9					23.4	25.1	19.9	27.4				28.5	17.7	17.8	19.0	28.4	32.8		21.7
2016	22.4	23.2	26.1	30.5		21.2				25.3	21.5	20.9	23.3			23.8	20.6	18.5					24.9	24.8	19.2					25.3	19.6	19.4	18.7	24.0	23.6		23.3
2017	22.1	22.9	22.5	28.5	29.3	18.7				26.7	21.2	19.9	20.2	18.8		32.3	22.9	16.1	14.6	49.6	23.5		21.6	25.2	19.4					23.9	21.1	17.2	19.2	20.9	26.3		20.3
2018	20.8	20.9	21.8	24.2		15.2				21.5	17.0	18.6	23.4			29.2	16.2	12.3		23.3	17.6		18.4	26.6	20.2	22.2			17.3	24.8	13.7	13.8	14.7		28.6		15.9
2019	19.6	20.0	19.0	23.9		19.5		14.6		28.4	13.3	16.6	22.3	13.0		23.9	17.6	15.0			13.3		20.5	25.5	16.8	25.1			15.9	22.2	17.1	15.4	15.7		27.5		16.3
2020	19.9	21.5	20.0	27.4	25.6	18.8				15.8	13.8	18.1	20.6			23.3	19.0	16.5			15.8		18.6	24.1	19.4	24.9			16.8	22.1	18.3	16.6	17.7		24.9		
2021	20.1	19.1	21.1	30.8		20.6				20.3		22.4	19.4			22.3	16.7	18.2					19.4	22.6	20.1	19.2				18.8	13.6	17.6	18.9		22.4		
2022	20.8	18.4	23.2	27.7		15.8				25.1		15.6	17.6			23.9	18.0	16.6					20.9	26.2	17.7	28.0				24.6	16.8	16.8	18.6		20.2		
2023	24.4	21.0	24.6	30.3		16.8				26.1		18.4	24.2			28.8	23.9	17.2					20.1	26.1	17.2	26.3				21.9		26.8	28.6		28.4		

Table 6.17. Financial year greenlip PropG1 from the Western Zone SAUs and HS pooled data limited SAUs (ordered alphabetically). Empty cells denote no catch or insufficient data to estimate PropG1.

Financial Year	Western Zone	ANXIOUS BAY	AVOID BAY	BAIRD BAY	CAPE BAUER	CAPE CATASTROPHE	COFFIN BAY	DENTRECASTEAUX REEF	ELLISTON CLIFFS	ELLISTON LOW SAUS	FAR WEST LOW SAUS	FISHERY BAY	FLINDERS ISLAND	FRANKLIN ISLANDS	GREENLY ISLAND	HOTSPOT	LINCOLN LOW SAUS	MEMORY COVE	NE THISTLE	NEPTUNE ISLANDS	NORTH NUYTS	PEARSON ISLAND	POINT AVOID	POINT WESTALL	REEF HEAD	SEARCY BAY	SHERINGA	SIR JOSEPH BANKS	SOUTH NUYTS	STREAKY LOW SAUS	SW THISTLE	TAYLORS ISLAND	THE GAP	VENUS BAY	WARD ISLAND	WATERLOO BAY	WEDGE ISLAND
1979	0.36	0.29		0.52																													0.49				
1980	0.40	0.35	0.47	0.42		0.73	0.40			0.37	0.62	0.58	0.35			0.32	0.57		0.41				0.28	0.35	0.44	0.36	0.42		0.43	0.36		0.70	0.59	0.36	0.58	0.32	
1981	0.42	0.40	0.28	0.30		0.60	0.41		0.54	0.36		0.66	0.42			0.49	0.51		0.41				0.28	0.37	0.42	0.67	0.37			0.62	0.51	0.38	0.49	0.45	0.76	0.24	
1982	0.41	0.25	0.32	0.34		0.68	0.30			0.37		0.45	0.24				0.54	0.53	0.48				0.34		0.37		0.39			0.22	0.60	0.57	0.57				
1983	0.44	0.38	0.45	0.38		0.69	0.31	0.70		0.45	0.66	0.59	0.28			0.21	0.61	0.52	0.59				0.40	0.35	0.38	0.42	0.46			0.45	0.52	0.45	0.63	0.48			0.86
1984	0.41	0.36	0.40	0.37		0.66	0.26		0.72	0.45	0.51	0.64	0.40			0.34	0.55	0.50	0.39		0.49		0.39	0.46	0.33	0.54	0.39			0.54	0.55	0.36	0.48	0.42	0.33		0.74
1985	0.47	0.39	0.48	0.37		0.78	0.55	0.45	0.68	0.58	0.45	0.72	0.41	0.53		0.24	0.74	0.67			0.42		0.45	0.32	0.34	0.46	0.45		0.32	0.46		0.60	0.75	0.47	0.31		
1986	0.48	0.40	0.53	0.36	0.36	0.72			0.51	0.53	0.38	0.76	0.28			0.32	0.61	0.69	0.64				0.59	0.28	0.41	0.20	0.58			0.32	0.58	0.54	0.68	0.54		0.40	
1987	0.40	0.22	0.37	0.22	0.21	0.63		0.46		0.39	0.45	0.60	0.42			0.16	0.54	0.66	0.64		0.44		0.46	0.24	0.35	0.14	0.29		0.46	0.25	0.52	0.58	0.63	0.37	0.28		0.45
1988	0.41	0.23	0.47	0.21	0.12	0.66	0.27	0.47	0.43	0.44	0.37	0.62	0.27	0.38			0.62	0.63	0.63	0.66	0.35		0.37	0.26	0.25	0.19	0.59		0.39	0.18	0.63	0.57	0.64	0.33	0.29		0.61
1989	0.40	0.30	0.27	0.19		0.55		0.26		0.46	0.35	0.48	0.33	0.44		0.31	0.52	0.54	0.49	0.51	0.37		0.45	0.13	0.29	0.26	0.52		0.33	0.49	0.45	0.55	0.53	0.69	0.31		
1990	0.43	0.28	0.27	0.32		0.68		0.38		0.57	0.33	0.65	0.44	0.31		0.49	0.59	0.60	0.45		0.30		0.32	0.39	0.28	0.29	0.65		0.34	0.51	0.74	0.44	0.59	0.71	0.51		0.55
1991	0.46	0.22	0.42	0.39		0.70		0.28		0.52	0.32	0.70	0.31	0.27		0.38	0.60	0.60	0.49		0.37		0.58	0.28	0.42	0.24	0.54		0.50	0.30	0.57	0.52	0.61	0.54	0.42		
1992	0.44	0.23	0.45	0.36	0.22	0.68	0.56	0.33		0.38	0.32	0.74	0.37	0.29		0.29	0.64	0.68			0.31		0.48	0.34	0.33	0.24	0.43		0.24	0.31	0.68	0.54	0.67	0.44	0.43		0.66
1993	0.48	0.28	0.60	0.30	0.38	0.66		0.33		0.52	0.37	0.67	0.32	0.33		0.34	0.59	0.52	0.61				0.66	0.36	0.30	0.31	0.63		0.43	0.37	0.61	0.55	0.63	0.42	0.46		0.61
1994	0.56	0.36	0.64	0.36	0.38	0.67	0.49	0.43		0.44	0.46	0.67	0.50	0.41		0.55	0.65	0.60	0.66		0.51		0.62	0.50	0.64	0.52	0.38			0.46	0.62	0.55	0.64	0.43	0.61		
1995	0.52	0.18	0.43	0.52	0.36	0.56				0.55	0.45	0.76	0.49	0.41		0.38	0.58	0.60	0.66	0.61	0.51		0.62	0.44	0.44	0.48	0.45		0.58	0.41	0.54	0.57	0.64	0.34	0.63		0.62
1996	0.55	0.33	0.33	0.48	0.31	0.71		0.37	0.33	0.49	0.44	0.77	0.53	0.39		0.57	0.71	0.70	0.69		0.56		0.48	0.41	0.38	0.53	0.54		0.63	0.48	0.60	0.56	0.67	0.46	0.61		0.76
1997	0.56	0.32	0.41	0.44		0.80		0.53		0.43	0.52	0.65	0.50			0.59	0.66	0.65	0.60		0.51		0.61	0.28	0.47	0.62	0.43		0.59	0.49	0.58	0.58	0.66	0.40	0.61		0.61
1998	0.59	0.44	0.55	0.41		0.79		0.42		0.16	0.46	0.82	0.60	0.54		0.62	0.67	0.65	0.63		0.40		0.61	0.40	0.52	0.47	0.36		0.56	0.41	0.63	0.64	0.79	0.39	0.63	0.00	
1999	0.57	0.34	0.54	0.48	0.46	0.79		0.48		0.43	0.48	0.81	0.54	0.49		0.45	0.70	0.60	0.64		0.46		0.63	0.46	0.52	0.56	0.70		0.62	0.42	0.67	0.52	0.72	0.32	0.60	0.37	
2000	0.65	0.52	0.68	0.41	0.38	0.73		0.54		0.84	0.52	0.94	0.56	0.49		0.49	0.71	0.77	0.68				0.73	0.47	0.69	0.47	0.78		0.54	0.42	0.64	0.76	0.78	0.43	0.78		0.75
2001	0.62	0.56	0.72	0.64		0.79				0.80	0.47		0.56	0.56		0.49	0.65				0.41		0.83	0.58	0.61	0.78	0.80		0.63	0.61	0.63	0.61	0.76	0.52	0.62		
2002	0.60	0.62	0.69	0.44	0.25			0.74		0.68	0.49		0.52	0.36		0.56	0.76	0.66	0.72		0.47		0.67	0.35	0.70	0.57	0.66		0.50	0.42		0.58	0.71	0.44	0.73		
2003	0.63	0.50	0.59	0.48	0.24	0.84		0.68		0.75	0.59	0.89	0.52	0.51		0.66	0.80	0.59	0.77		0.57		0.71	0.37	0.63	0.51	0.75		0.63	0.55	0.74	0.62	0.77	0.57	0.77		
2004	0.56	0.24	0.66	0.38	0.35	0.85		0.65		0.53	0.47	0.94	0.36	0.37		0.56	0.71	0.59			0.41		0.66	0.52	0.61	0.37	0.62		0.55	0.49		0.43	0.76	0.70	0.79		
2005	0.65	0.43	0.84	0.52	0.37					0.77	0.52		0.41	0.41		0.64	0.77	0.75			0.53		0.83	0.62	0.75	0.64	0.78		0.49	0.63		0.72	0.81	0.81	0.80		
2006	0.66	0.51	0.80	0.54		0.89		0.54		0.47	0.43		0.55	0.33		0.59	0.82				0.41		0.91	0.46	0.77	0.59	0.76		0.50	0.59	0.85	0.62	0.70		0.80		
2007	0.65	0.62	0.85	0.42				0.45		0.84	0.44		0.46			0.43	0.72				0.44		0.93	0.51	0.91	0.56	0.84		0.44	0.47		0.58	0.76		0.70		
2008	0.59	0.51	0.68	0.37		0.77		0.43		0.69	0.42	0.96	0.33	0.33		0.33	0.75	0.76			0.45		0.75	0.27	0.78	0.49	0.74		0.46	0.55		0.61	0.76	0.76	0.56		
2009	0.66	0.49	0.75	0.66		0.87		0.47		0.68	0.49	0.90	0.50	0.41		0.38	0.77	0.73			0.55		0.83	0.61	0.84	0.68	0.57		0.51	0.65	0.72	0.67	0.81	0.70	0.64		0.77
2010	0.59	0.55	0.64	0.57		0.78		0.38		0.57	0.40		0.37	0.30		0.28	0.71	0.82	0.62		0.43		0.83	0.56	0.73	0.70	0.79		0.38	0.63		0.51	0.68	0.59	0.48		
2011	0.65	0.56	0.73	0.51		0.71		0.44		0.73	0.50	0.84	0.60	0.31		0.15	0.67	0.69			0.56		0.76	0.60	0.72	0.65	0.78		0.39	0.62		0.78	0.79	0.65	0.50	0.72	
2012	0.64	0.59	0.78	0.69		0.81	0.85			0.61	0.30	0.78	0.48	0.33		0.27	0.71	0.76	0.62		0.28		0.82	0.50	0.79	0.63	0.59		0.33	0.73	0.71	0.65	0.79	0.85	0.50		
2013	0.59	0.55	0.65	0.55	0.41	0.71	0.88	0.72	0.88	0.66	0.40	0.83	0.47	0.29			0.71	0.67			0.42		0.74	0.63	0.67	0.63	0.72		0.45	0.62	0.48	0.49	0.70	0.69	0.49	0.53	
2014	0.56	0.41	0.65	0.55	0.46	0.75			0.84	0.63	0.47	0.73	0.43	0.51		0.17	0.67	0.68					0.72	0.56	0.55	0.43	0.64		0.45	0.60		0.48	0.62	0.75	0.44		
2015	0.67	0.60	0.74	0.66	0.55	0.87				0.75		0.87	0.56			0.46	0.70	0.73					0.79	0.56	0.61	0.64	0.69			0.67	0.72	0.65	0.73	0.77	0.81		0.67
2016	0.68	0.55	0.68	0.68	0.69	0.85				0.69		0.85	0.64			0.45	0.80	0.67					0.73	0.62	0.60	0.65	0.62			0.75	0.74	0.62	0.74	0.85	0.79		0.87
2017	0.66	0.51	0.67	0.74	0.61	0.71			0.87	0.68	0.67		0.61	0.66		0.70	0.74	0.67	0.63	0.88	0.68		0.73	0.73	0.41	0.75	0.57			0.59	0.82	0.67	0.76	0.50	0.58		0.50
2018	0.66	0.66	0.69	0.69	0.55	0.64		0.70	0.75	0.59	0.54	0.89	0.69	0.56		0.69	0.60				0.49		0.84	0.63	0.55	0.55	0.72			0.56		0.45	0.68		0.82		0.60
2019	0.58	0.53	0.61	0.66	0.50	0.67		0.79	0.22	0.39	0.44		0.58	0.28		0.47	0.62				0.43		0.78	0.50	0.58	0.57	0.62			0.56	0.67	0.44	0.59		0.73		
2020	0.65	0.60	0.65	0.74	0.45	0.64			0.52	0.62	0.47	0.93	0.64			0.48	0.68	0.75			0.53		0.80	0.52	0.56	0.65	0.64			0.52	0.72	0.63	0.80		0.70		
2021	0.69	0.57	0.82	0.62	0.53					0.53			0.62			0.43	0.70	0.79					0.79	0.49	0.68	0.60	0.50			0.54	0.59	0.78	0.85		0.70		
2022	0.70	0.62	0.80	0.72		0.80				0.64			0.52			0.50	0.75						0.84	0.67	0.57	0.75	0.61			0.76		0.73	0.78		0.66		
2023	0.74	0.69	0.86	0.71		0.89				0.68			0.80			0.62	0.85						0.85	0.62	0.38	0.67	0.72			0.60		0.78			0.89		

Table 6.18. Alternative outcomes of the HS for blacklip in 2023 based on whether the Point Westall and Anxious Bay FIS densities are rolled over from 2021 to 2023 or not.

Point Westall & Anxious Bay rollover	Zone Score	Score gradient	Zone trend	Status	Recommended zone catch (t)
No	3.15	-0.02	5.00	Sustainable	44.95
Yes	3.42	-0.01	5.00	Sustainable	49.63

Table 6.19. Annual HS zone score, score gradient, trend in zone score and status for blacklip and greenlip.

	Greenlip				Blacklip			
Year	Zone score	Score Gradient	Zonal trend	Status	Zone score	Score Gradient	Zonal trend	Status
1994	4.99	0.01	5.00	Sustainable	5.19	-0.02	5.00	Sustainable
1995	4.48	-0.03	4.88	Depleting	4.82	0.00	5.00	Sustainable
1996	3.85	-0.07	4.21	Depleting	4.50	-0.04	4.79	Depleting
1997	4.63	-0.04	4.83	Depleting	4.92	-0.02	5.00	Sustainable
1998	4.43	0.01	5.00	Sustainable	4.37	-0.02	5.00	Sustainable
1999	5.05	0.08	5.83	Sustainable	4.72	0.00	5.00	Sustainable
2000	5.48	0.08	5.95	Sustainable	5.07	0.02	5.00	Sustainable
2001	6.62	0.15	7.07	Sustainable	5.62	0.08	5.96	Sustainable
2002	7.36	0.18	7.58	Sustainable	6.27	0.12	6.54	Sustainable
2003	8.41	0.19	7.69	Sustainable	6.65	0.11	6.46	Sustainable
2004	8.34	0.11	6.45	Sustainable	6.72	0.07	5.78	Sustainable
2005	8.55	0.05	5.45	Sustainable	7.10	0.05	5.34	Sustainable
2006	8.25	0.00	5.00	Sustainable	7.33	0.04	5.23	Sustainable
2007	7.69	-0.03	4.97	Sustainable	6.69	0.00	5.00	Sustainable
2008	6.95	-0.06	4.36	Sustainable	6.44	-0.04	4.77	Sustainable
2009	6.01	-0.09	3.98	Sustainable	5.63	-0.08	4.18	Sustainable
2010	5.12	-0.10	3.69	Sustainable	4.88	-0.09	4.01	Depleting
2011	5.02	-0.09	3.99	Sustainable	4.47	-0.10	3.77	Depleting
2012	5.25	-0.03	4.85	Sustainable	4.35	-0.07	4.33	Depleting
2013	4.79	-0.01	5.00	Sustainable	4.17	-0.04	4.76	Depleting
2014	3.16	-0.12	3.48	Depleting	3.46	-0.07	4.33	Depleting
2015	4.42	-0.08	4.06	Depleting	4.19	-0.03	4.97	Depleting
2016	4.79	0.02	5.00	Sustainable	3.29	-0.04	4.68	Depleting
2017	4.68	0.10	6.28	Sustainable	3.00	-0.05	4.51	Depleting
2018	3.33	-0.11	3.65	Depleting	2.57	-0.15	2.97	Depleting
2019	2.99	-0.15	2.91	Depleting	2.48	-0.07	4.30	Depleting
2020	3.17	-0.10	3.75	Depleting	3.38	0.03	5.11	Sustainable
2021	3.12	-0.01	5.00	Sustainable	3.05	0.08	5.87	Sustainable
2022	3.06	0.00	5.00	Sustainable	3.26	0.08	5.87	Sustainable
2023	4.86	0.17	7.34	Sustainable	3.15	-0.02	5.00	Sustainable