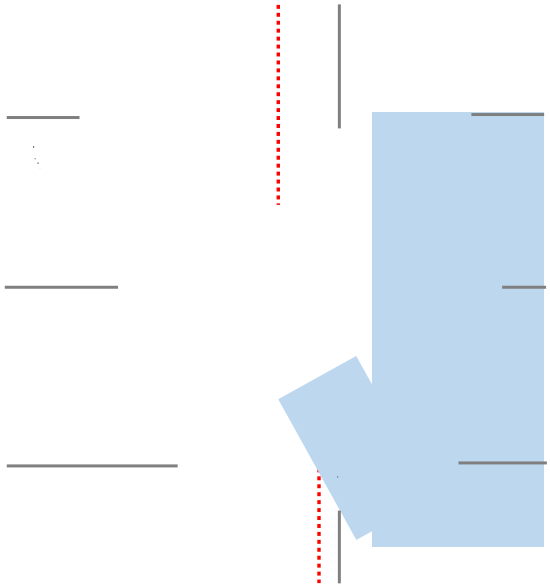

Figure 1. Map of Tasmania showing assessment areas (numbered), stock rebuilding zone (ECSRZ) (shaded) and the Eastern and Western Region boundary (red dotted line): a) ECSRZ that applied between 2013-14 and 2016-17; b) adjusted ECSRZ that applied from 2017-18.

This survey is the 18th in a series for rock lobster and the 17th for abalone undertaken since 1996. Key objectives include characterisation of the 2022–23 rock lobster and abalone fisheries in terms of participation, fishing effort and catch, with particular focus on the fishery off the east coast.

The survey applied the same methodology used in previous recreational rock lobster and abalone surveys (please refer to Lyle & Morton 2004, 2006; Lyle & Tracey 2010, 2012, 2014, 2016a,b, 2017; Lyle et al. 2008, 2019a, 2020b, 2021, Graba-Landry et al. 2022) and independently reviewed by Pollock (2010). The design involves two-stages: 1) an initial telephone interview to profile licence-holders, establish eligibility for the second stage and recruit participants, and 2) a telephone-diary survey in which fishing activity is monitored in detail over the diary period. This period included the licensing year up until the closure of the eastern region rock lobster fishery (1 November and 30 April).

3.1.1 2022–23 Catch and Effort

Information reported in this, and following sections, relates to diary survey data provided by fully responding licence holders and is presented as expanded estimates representative of the activities of all recreational rock lobster licence holders between November 2022 and April 2023, inclusive.

(including commercial activity), along with differing regional bag limits and the relative mix of fishing methods used (Figure 3), are key factors accounting for regional variability.

Table 2. Recreational rock lobster effort, harvest and harvest rates for all fishing methods pooled by fishing area for 2022–23. Values in parentheses represent the 95% confidence intervals.

1	38,988							

Figure 3. Proportion of regional hat

and D'Entrecasteaux Channel, whereas pots accounted for most of the harvest taken from all other sub-areas.[2]

Figure 4. Regional distribution of Area 1 harvest (%) and proportion of harvest by method (pie charts).

3.1.4 Seasonal [illegible] Southeasfrmvfrcfrmvomrfr 26easemo

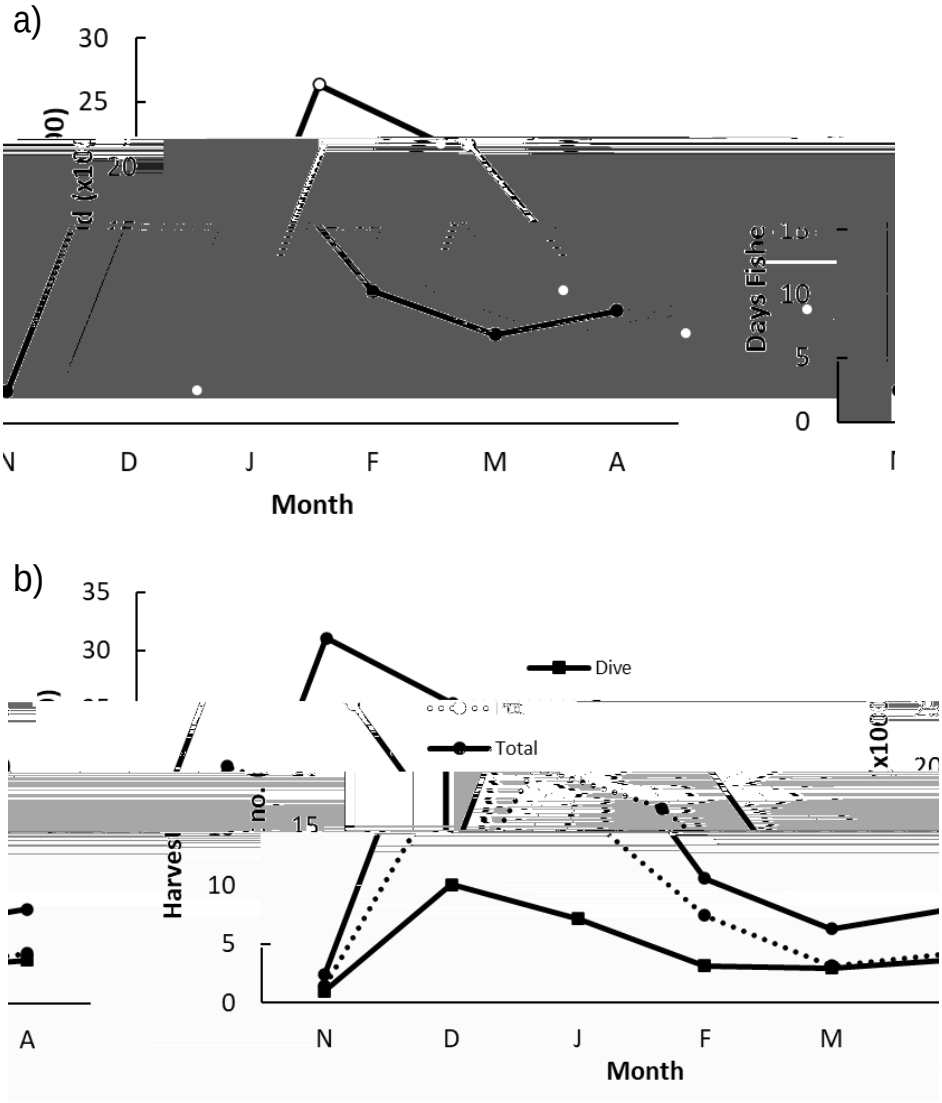

Figure 5. Recreational rock lobster harvest (numbers) and effort (days fished) by month and method for the 2022–23 fishing season.

3.1.5 Daily Harvest

Daily catch distributions differed markedly by fishing method and between management regions (Figure 6). For example, potting days resulting in no retained catch were 41% and 27% of total pot fishing days in the eastern (Areas 1–4) and western (Areas 5–8) regions, respectively. The eastern region daily bag limit of two lobster was achieved on 29% of pot-days fished whereas in the western region 46% of pot-days resulted in catches of at least two lobsters, with 4% resulting in the western region bag limit of five being taken. By contrast, divers had higher success rates, with 82% of all dives in both regions resulting in the harvest of at least one lobster. The daily bag limit of two lobster was achieved in 66% of the eastern region dives whereas in the western region divers took at least two lobsters in 42% of dives and the daily bag limit of five lobster in 9% of dives.

Figure 6. Distribution of daily rock lobster harvest by fishing method and management region.

3.1.6 Individual Seasonal Harvest

Individual season limits for recreational fishers have been flagged as a potential management option to constrain the overall recreational harvest and share catches more equitably between fishers. It was, therefore, worthwhile to report on the numbers of rock lobster retained by individual fishers up to the end of April (Figure 7). State-wide, 11.2% of the active fishers harvested no legal sized lobsters, 50.4% harvested 5 or fewer lobsters and 9.5% took 16 or more lobsters during the survey period. The proportional breakdown was similar when limited to the east coast fishery.

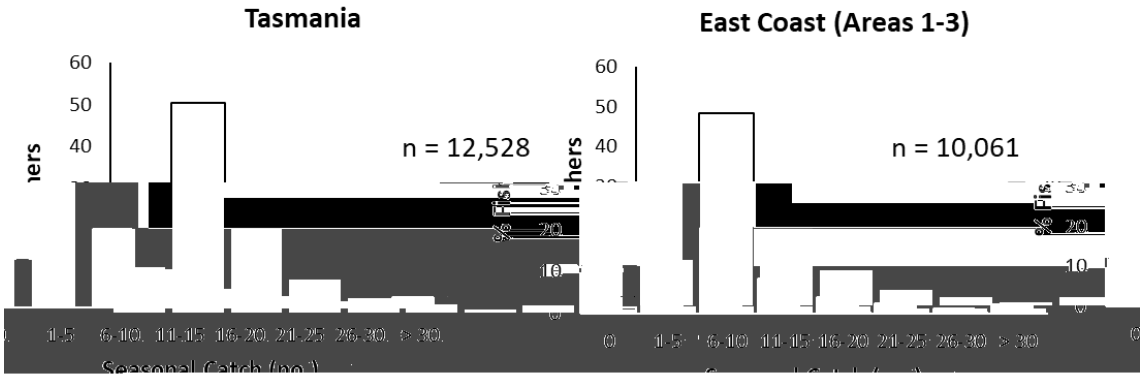

Figure 7. Seasonal harvest of rock lobster for fishers who were active within the east coast (Areas 1–3) and for the whole fishery. n is estimated number of active licence-holders.

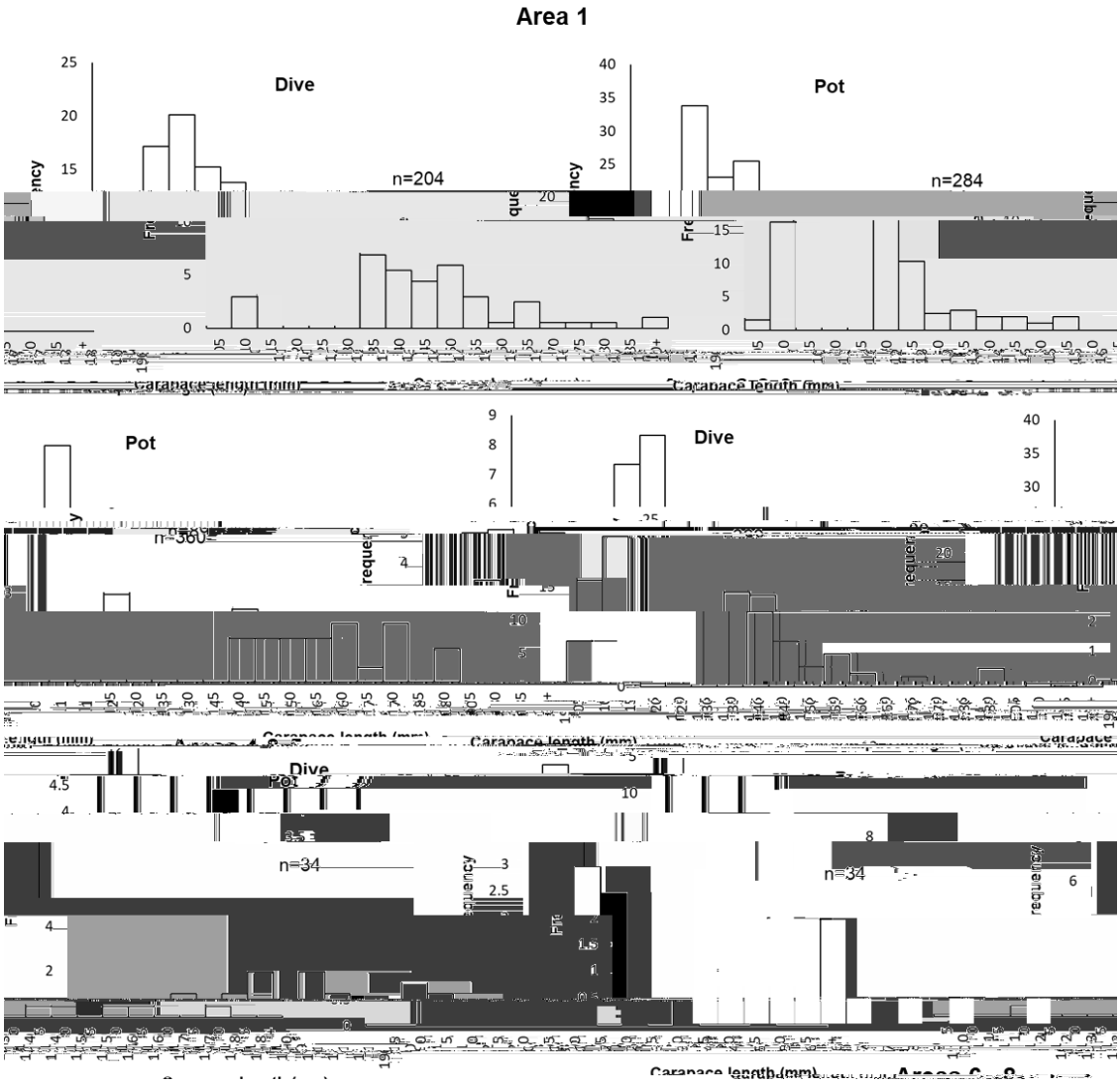

Figure 8. Length frequency distributions by 5 mm size class for recreationally caught rock lobster taken by pot and dive fishing methods by assessment area(s). n is sample size.

3.1.9 Harvest Weights

The weight of the 2022–23 recreational harvest was estimated by multiplying average lobster weights by the number of lobsters harvested by method and area. Average weights by area and method used to determine harvest weights are presented in Table 3.

Table 4. Abalone harvest, effort and harvest rates by fishing area for 2022–23. Values in parentheses represent the 95% confidence intervals, * average weight based on commercial catch sampling data; ** weighted in accordance with the proportion of Blacklip and Greenlip Abalone in the catch and average species weight.

1	26,185 (16,385–34,877)	947 (133–2,226)	6,319 (4,252–8,044)	4.3	514**	13,954
2	4,290 (1,793–6,588)	-	1,992 (1,102–2,859)	2.2	517	2,218
3	5,185 (1,538–8,560)	-	1,051 (396–1,665)	4.9	528	2,738
4	2,869 (647–5,844)	3,263 (1,094–6,021)	1,914 (960–3,133)	3.2	386**	2,368
5	2,366 (389–2,971)	1,315 (0–1,545)	684 (194–851)	5.4	417**	1,536
6	1,277 (0–3,024)	48 (0- 142)	276 (86–550)	4.8	493**	654
7	238 (0–732)	-				

Figure 9. Recreational harvest of abalone by assessment area: a) Numbers harvested (in 1000s or K) and proportion (%) of total number; b) Estimated harvest weight and proportion (%) of total weight.

3.2.3 Seasonal Catch and Effort

The abalone fishery exhibited a strong seasonal pattern, with catch and effort peaking in December (Figure 10). The traditional peak in catch and effort during November was not evident in 2022 (also absent in 2020 and 2021), highlighting the links between the rock lobster and abalone fisheries (most abalone licence-holders also hold rock lobster

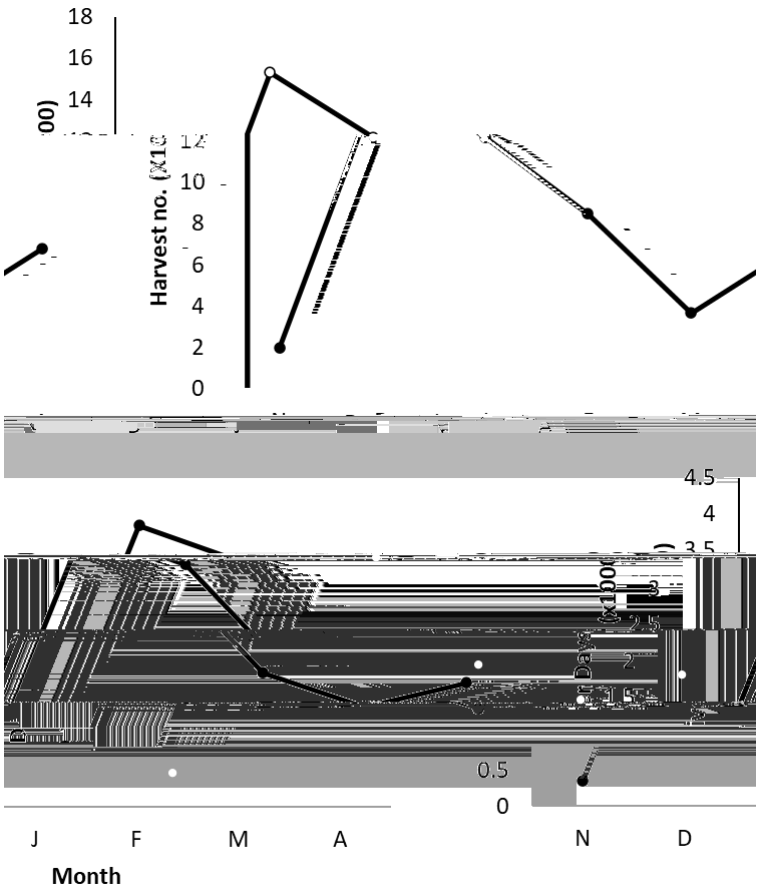

Figure 10. Recreational abalone harvest (numbers) and effort (days fished) by month during the 2022–23 fishing season.

3.2.4 Daily Harvest

The daily bag limit of 10 abalone was achieved in the eastern region in about 12% of all targeted dives and around 18% of dives in the western region (Figure 11). However, the sampling strategy was weighted towards respondents likely to fish off the east coast of Tasmania and thus expansion of data for the western region was limited due to sample size and thus the variance around the estimate is less precise and needs to be treated with caution.

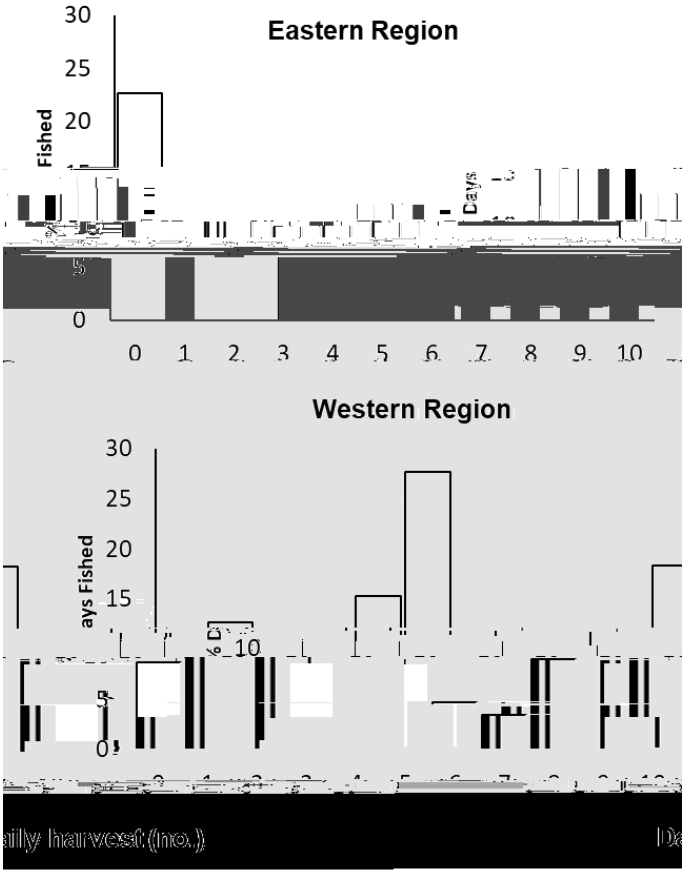

Figure 11. Distribution of daily abalone harvest by management zone for 2022–23 licence holders.

3.2.5 Individual Seasonal Harvest of Abalone

State-wide, 7% of the active fishers harvested no legal sized abalone, 42% harvested 5 or fewer abalone and 18% took 16 or more abalone during the survey period (Figure 12).

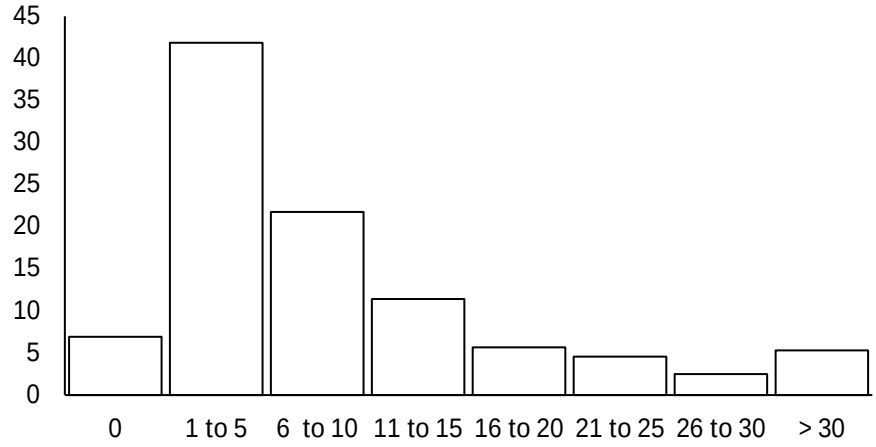

Figure 12. Seasonal harvest of abalone for fishers who were active within the whole fishery (*n* = 4,728).

3.2.6 Harvest Weights

Size composition information was not available for recreationally caught abalone. However, based on commercial catch sampling, the average legal-sized abalone for the major fishing regions was estimated as 514 g off the south coast (Area 1), 386 g off the north coast (Area 4) and 508 g off the west coast (Areas 6, 7 and 8) (Table 4). Using these values, the total statewide recreational harvest between November and April was estimated to be about 23.8 tonnes. M.1 (a)-21 (m)3.(har)6.2 (v)-

3.3.1 General

Of the 434 respondents who completed the diary survey, 311 (71.6%) also completed the wash-up survey.

3.3.2 Constraints to Fishing

Diarists who did not report any lobster or abalone fishing activity were asked why they did not fish during the season. A lack of time due to work and/or family commitments was the most cited reason, followed by opportunities limited by poor weather (Figure 13). A lack of time was also the most cited reason for not renewing licences, with the weather being of secondary importance. (Figure 14).

Figure 13

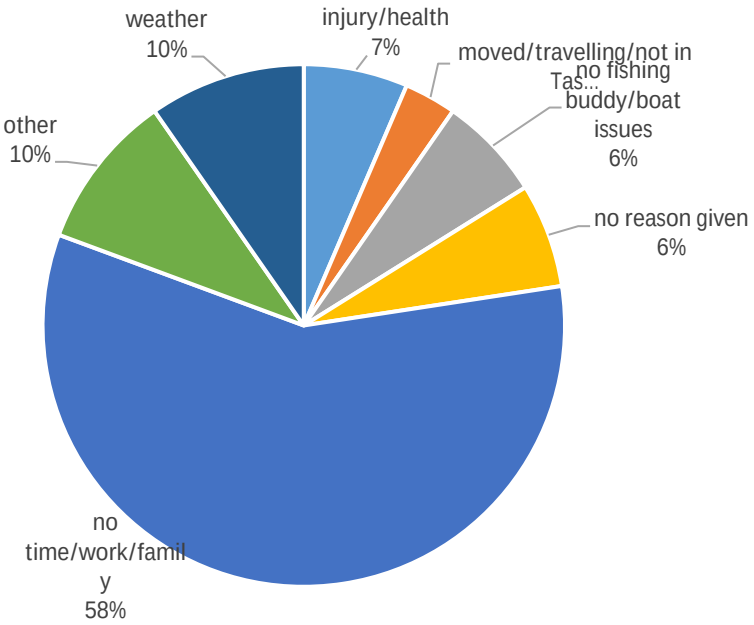

Figure 14. Main reason for not renewing rock lobster or abalone licences during 2022-23 season (*n* = 31).

3.3.3 Fishing Quality

3.3.3.1 Rock Lobster

About 85% of respondents who fished for rock lobster during the 2022-23 season indicated that the overall quality of the fishery was about the same or better than in the previous season (Figure 15). This is an increase of almost 10% compared with responses to the same question asked at the end of the 2021–22 season (Lyle et al., 2021). Eight percent of respondents indicated that the current season was worse than the previous one – approximately half the responses to the same question in 2021–22.

Figure 15. Perceptions about the quality of the rock lobster fishery in 2022-23 relative to respondent's experience in 2021

Respondents who had reported fishing for rock lobster were asked whether they were satisfied with their catch rates (number of lobsters kept per day fished) during the 2022–23 season. Overall, 79% indicated that they were at least quite satisfied (Figure 17). Bsed age

Figure 18. Diver satisfaction with rock lobster catch rates achieved during the 2022–23 season (*n* = 113)16(bal)1.5 .09 935 (he)]TJi993a575 0C 2160.02 72 50C .02 -J0 2lBT/TT0 -2 (at)7he

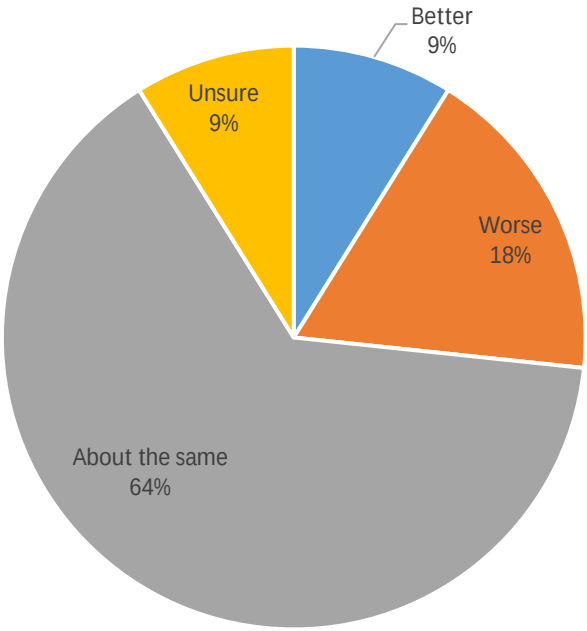

Figure 20. Perceptions of the quality of the abalone fishery in 2022–23 season compared with the 2021–22 season (*n* = 90).

Abalone fishers were also asked whether they were satisfied with their 2022–23 catch rates (average number of abalone kept per day fished). Overall, 85% indicated that they were at least quite satisfied (Figure 21).

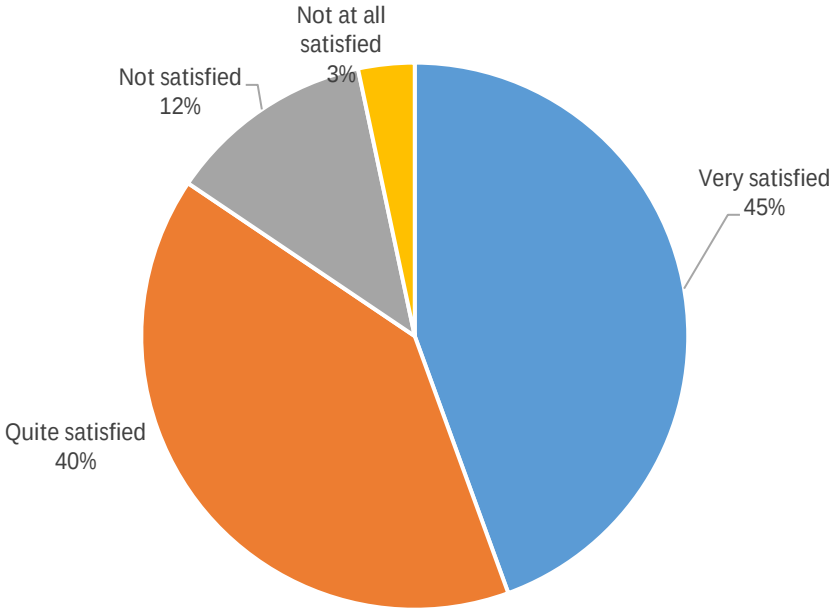

Figure 21. Fisher satisfaction with abalone catch rates during 2022–23 season (*n* = 90).

Abalone fishers were also asked to rate the importance of various ways in which they use their abalone catch. Sharing abalone catch with family and friends was rated as either very or quite important by 92% of respondents, followed closely by eating it fresh with family and friends (89%) and sharing with fishing buddies (75%) (Figure 22).

The main ways in which respondents use their abalone catch is eating fresh with their immediate family and friends (42%) and sharing with immediate family and friends (27%) (Fig 23).

Figure 23. Fisher preferences for main method of using abalone catch (*n* = 91).

Figure 24. The response profile for a series of questions asked relating to perception on non-compliance in the recreational Rock Lobster and Abalone fisheries.

3.3.5 Management options

3.3.5.1 Abalone management options

Respondents were provided with a range of possible management options to recover abalone stocks and asked to rate their support for each option on a scale from 1 (no support) to 10 (strong support). The strongest support was for closing an area until it had replenished with 71% of respondents providing a response of five or greater (Figure 25). Using the same means of assessment, this was followed in descending order by [illegible]

Figure 26. Respondent opinion on whether app reporting is a reliable way to estimate the size of the recreational catch for rock lobster (*n* = 311).

Figure 27. Respondent opinion on whether app reporting is acceptable to most rock lobster fishers (*n* = 311).

n

Table 7. Perceived major issues with mandatory smartphone reporting (*n* = 208).

Abalone catches have also declined since the early 2000s (Figure 30) though licence numbers continued to grow up until 2008–09 (Lyle et al., 2021). The 2022-23 harvest estimate increased by 16% from last season's estimate (41,552 in 2020–21 in numbers; Table 8). Lower catches in the 2019–20 and 2020–21 seasons were linked to a marked fall in the average catch rate to less than four per day (Lyle et al., 2021), itself associated with halving of the Eastern region bag limit (from 10 to 5 abalone per day) in 2019. However, the average catch rate in 2021–22 has increased to 4.7, approximating the old bag limit of five. However, this year the catch rate declined to 3.9 and divers reached the bag limit of 10 in about 12% of all targeted dives in the eastern region, slightly lower than 14% in 2021–22. of 2021

Figure 28. Tasmanian recreational rock lobster fishery: a) estimated state-wide harvest (numbers); b) estimated state-wide harvest (tonnes); c) effort (fisher days) by fishing season; d) and average catch rate (number per fisher-day). Error bars indicate 95% confidence intervals.

Figure 29. Recreational abalone fishery: a) estimated state-wide harvest (numbers); b) estimated state-wide harvest (tonnes); c) effort (fisher days) by fishing season; d) and average catch.6.ty m6.7 (s)-2 (e)6tfiber-2

Table 8. Number of rock lobster and abalone licence holders, estimated number and proportion who fished, total and average harvest and effort per fisher by year and average daily harvest rates. * part year (Nov–Apr); nd not determined

	2000-01	2002-03	2004-05	2006-07	2008-09	2010-11	2012-13	2014-15	2015-16*	2016-17*	2017-18*	2018-19*	2019-20*	2020-21*	2021-22*	2022-23*

4.1.2 Fishing Methods

Pots have consistently been the main fishing method for rock lobster and have accounted for 55–67% of the total harvest numbers in each of the years surveyed (Figure 31). Dive methods have typically accounted for about a third (28.7–44%) of the harvest in all seasons. Lobster rings account for a relatively small proportion of overall catch (1.5–6.1%).

Figure 30. Proportion of the rock lobster harvest by method and fishing season.

4.1.3 Catch Rates

Catch per unit effort is an important metric for assessing fishery performance; as an indicator of stock biomass, economic performance in commercial fisheries and, an indicator of recreational satisfaction against which fishery performance could be assessed (Lyle et al., 2014, 2016a,b, 2017, 2019a, 2020b). Pot catch rates (i.e., kg of lobster per potlift) vary with lobster availability and catchability (behaviour). Therefore, the trend in pot catch rates over the past decade has been consistent with changes in rock lobster population biomass (Hartmann et al., 2019, Lyle et al., 2021).

The average daily harvest rate during 2022–23 for pots (0.90 lobster) was slightly higher than for 2020–21 (0.86 lobsters) which was, with the exception of 2016–17, higher than catch rates reported since 2006–07, despite higher daily bag limits prior to the 2015–16 season (Lyle et al., 2021). This suggests that pot harvest rates have remained largely insensitive to these bag limit changes, confirmed by two decades of survey data indicating that daily catches of two or more lobster per pot day are relatively rare (Table 8).

The 2022-23 average daily harvest number for divers was 1.53 lobsters per day—slightly lower than the 2021–22 season of 1.77 lobsters per day which was the highest since 2016–17 (Table 8). Divers actively search for lobsters and are able to maintain harvest rates by increasing search times such that a relatively high proportion of trips achieve the bag limits. Dive harvest rates for lobster have tended to fluctuate without obvious trend, apart from the reduction in catch rate to below 2 lobsters per day since 2012–13 corresponding with the reduction in the eastern region bag le y

Apart from 2020-21 and 2021-22, abalone catch rates have fluctuated without obvious trend through time, reflecting the fact that many divers regularly attain the bag limit (Table 8). The 2022–23 average daily harvest rate (3.9 abalone) decreased by ~20% from the 2021–22 season (4.7 abalone).

Bag limits represent a key management strategy to constrain recreational rock lobster and abalone catches. Bag limits have a limited impact on harvest rates, with only a small proportion of pot fishing days resulting in(c)-1.7 ()4.5r5 (he 2)-1.7 (bei(on (-1. (ted i)-h5r5 (he (i)-1

relevant to note that the 57.4 tonnes in 2020-21 is greater than in Table 9 as it accounts for the whole of Area 1, whereas the table reflects the reduced area of the ECSRZ. In 2017 the ECSRZ was amended to exclude waters south of Bruny Island, thereby re-focusing the rebuilding strategy to where stocks were in the poorest condition (DPIPWE 2018).

In 2022-23, the total estimated catch in the ECSRZ was 71.7 tonnes, 36.7 tonnes (104%) greater than the notional catch allocation (Table 9). During the 2022–23 season, recreational fishing effort was not affected by COVID restrictions or biotoxin closures. This was coupled with an increase in available biomass within the region[6].

Recreational catches in the ECSRZ have exceeded the notional catch allocation in most years since 2014–15, except for 2015–16, 2017–18 and 2019–20. (Table 9). For these years, however, external factors resulted in marked reductions in recreational effort (and catch), suggesting that management settings alone have been insufficient to constrain east coast catches to within recreational catch targets (Graba-Landry et al. 2022).

Table 9. East Coast Stock Rebuilding Zone recreational catches relative to notional catch allocations.

Notional catch allocation	42 t	42 t	42 t	41 t	40 t	35 t	35 t	35 t	35 t
Catch estimate	55.6 t	35.7 t	50.2 t	40.4 t	48.6 t	33.6 t	51.1 t	46.5 t	71.7t
Over/under catch	+13.6 t	- 6.3 t	+ 8.2 t	- 0.6 t	+ 8.6 t	-1.4 t	+ 16.1 t	+11.5t	+36.7t
% over/under catch	+ 32%	- 15%	+ 19%	- 1%	+ 21%	- 4%	+ 46%	+ 32%	+ 104%

Since being established, the retained catch in the ECSRZ has trended upwards, with the largest increase in the 2022–23 fishing season (Figure 31). Effort (days fished) has increased slightly over the last eight seasons as has catch per unit of effort (from retained catch). The slight increase in effort and increasing catch rat

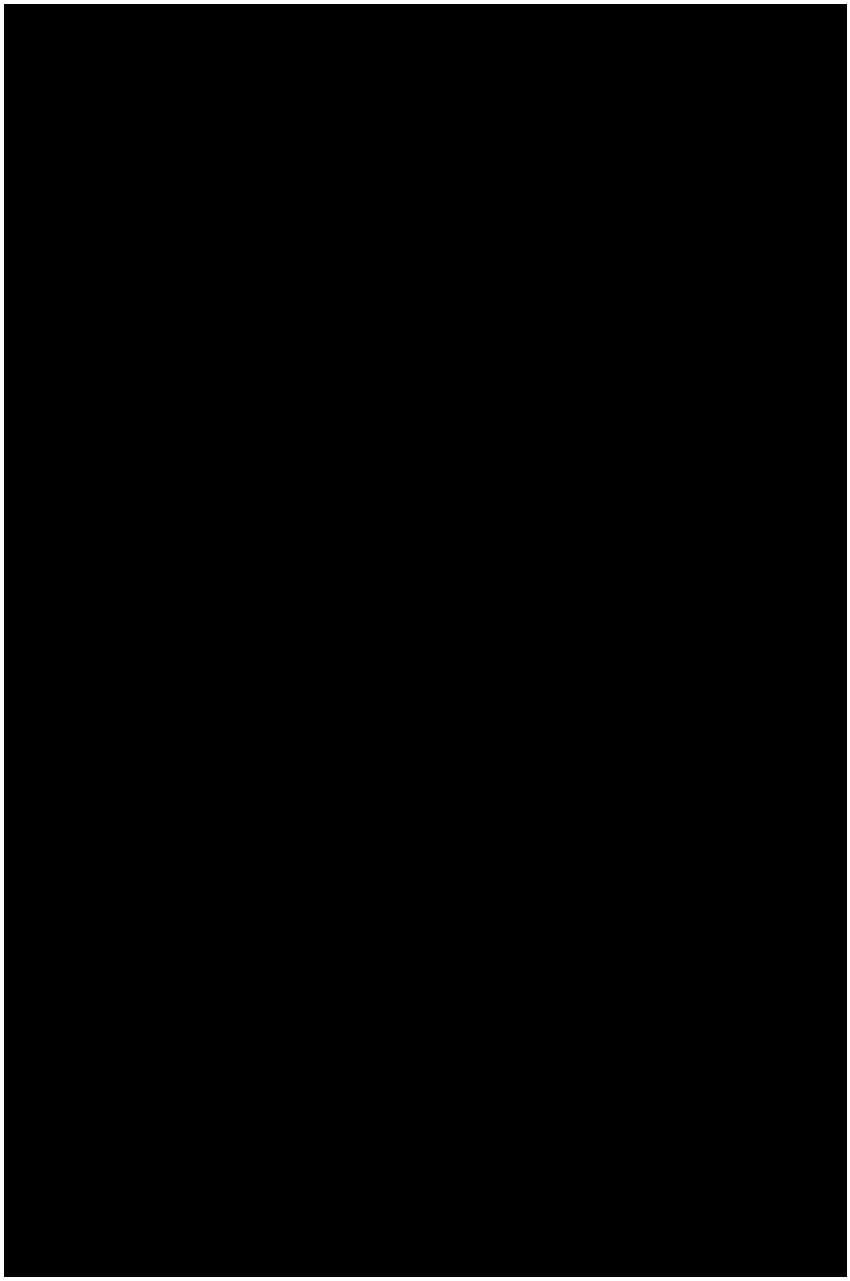

Figure 31. Catch, effort and CPUE (retained catch per day fish) for the East Coast Stock Rebuilding Zone, defined by the current spatial boundary (including assessment areas one [limited to the bottom of Bruny Island], two and three).

The recreational abalone harvest estimate of 23.8 tonnes was about 3% of the 2023 TACC (773.5 tonnes). Despite being a minor component of statewide catches, most of the recreational catch is taken from sheltered inshore areas of the east and south-east coasts where the impacts of recreational abalone fishing can be significant. While there are no management performance indicators utilised for the recreational abalone fishery, there is a need to explicitly include recreational catches into annual stock assessments and future management of the fishery. This is particularly important since recreational fishers may continue to fish areas even when abalone densities are low, risking localised depletion (Lyle et al., 2021).

Our team of proficient and committed interviewers: Frances, Josephine, Prudence, Cathy, Jacqui, and Christine - contributed to the success of the survey, encouraging the co-operation of fishers and maximising response rates, as well as ensuring data quality and completeness.

Finally, thanks are extended to the recreational fishers who participated in the survey.

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