# TASMANIAN RECREATIONAL ROCK LOBSTER AND ABALONE FISHERIES: 2019-20 FISHING SEASON

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# Executive Summary

This report provides an assessment of the 2019-20 recreational rock lobster and abalone fishing season and continues the time series monitoring trends in these fisheries commenced in the mid-1990s.

During 2019-20 almost 17,200 persons held at least one recreational rock lobster licence and 10,600 persons held a recreational abalone licence; representing a 5% fall in licence numbers when compared with 2018-19.

The assessment is provided by a survey involving a random sample of licence-holders who were contacted by telephone prior to the start of the 2019-20 fishing season and invited to participate in a phone-diary survey to monitor their rock lobster and abalone fishing activity between November 2019 and April 2020. A total of 506 respondents (402 valid licence-holders) completed the survey (83% effective response rate), providing detailed catch and effort information for each fishing trip undertaken. These data were scaled up to represent the activity of all licence-holders.

## Rock Lobster

The 2019-20 rock lobster season for all waters outside of the East Coast Stock Rebuilding Zone (ECSRZ) opened on 2 November 2019 and closed on 30 April 2020 in the Eastern region and 31 August 2020 in the Western region. The ECRSZ opened on 7 December 2019, representing the second year that a split season opening has been applied in the Eastern region. Rock lobster fishing activity was monitored up to the end of April, which meant complete coverage of the fishery in the Eastern region but partial coverage of the Western region fishery. Up until the end of April, licensed recreational fishers were estimated to have harvested 53,655 (95% CI: 46,216 – 61,126) rock lobster, based on 70,473 fisher days of effort. Potting was the dominant method, representing 82% of the effort (days fished) and contributing 66% of the harvest. Dive collection accounted for 18% of the effort and 31% of the harvest, while ring usage contributed <1% of the effort and 3% of the harvest. The state-wide average catch rate was 0.76 lobster per day fished, with daily harvest rates for dive collection (1.27 lobster) more than double that for pots (0.62 lobster).

The rock lobster fishery was concentrated off the east coast with this area accounting for 75% of the harvest (by number). The remaining harvest was split more or less evenly between the north and west coasts. Conversion of lobster numbers to weight produced a state-wide harvest estimate of 54.3 tonnes for the survey period, with catches from the east coast accounting for 72%, the north coast 13%, and the west coast 14% by weight. Overall, the recreational catch represented about 32% of the total allowable recreational catch (TARC) of 170 tonnes and was equivalent to about 4% of the 2019-20 total allowable catch (TAC) of 1221 tonnes, which includes the total allowable commercial catch (TACC) of 1051 tonnes.

A key component of the East Coast Stock Rebuilding Strategy has been the implementation of an east coast recreational catch share target, set at 35 tonnes for the stock rebuilding zone in 2019-20. The recreational catch for the rebuilding zone was, estimated at 33.6 tonnes indicating that the catch target was not exceeded. The under catch of 1.4 tonnes, or 4% of the target, compares with “over-catches” of between 8.2 - 13.6 tonnes in three seasons and “under-catches” of between 0.6 and 6.3 tonnes in two seasons since 2014-15 (refer to table). Both of the seasons when “under-catches” occurred were impacted by biotoxin closures off the east coast during the normal peak fishing period. This resulted in a marked reduction in recreational fishing effort for rock

lobster and hence catches were lower than might have been expected. Similarly, the current season was impacted by external circumstances, in this case the COVID-19 pandemic which involved a range of population movement restrictions that impacted on recreational fishing activity and hence effort and catch in the fishery. Thus, despite recent management changes applying to the stock rebuilding zone (e.g. reduced bag limit, shorter season) it is evident that current management settings alone are insufficient to constrain east coast catches to within recreational catch targets.

**East Coast Stock Rebuilding Zone recreational catches relative to catch targets.**

| Season | 2014-15 | 2015-16 | 2016-17 | 2017-18 | 2018-19 | 2019-20 |
|---|---|---|---|---|---|---|
| Catch target | 42 t | 42 t | 42 t | 41 t | 40 t | 35 t |
| Catch estimate | 55.6 t | 35.7 t | 50.2 t | 40.4 t | 48.6 t | 33.6 t |
| Over/under catch | +13.6 t | - 6.3 t | + 8.2 t | - 0.6 t | + 8.6 t | -1.4 t |
| Relative difference | + 32% | - 15% | + 19% | - 1% | + 21% | - 4% |

## Abalone

The recreational abalone harvest up until the end of April 2019 was estimated at 25,495 (95% CI: 19,146 – 33,694) individuals, based on 8,064 diver days of effort. Blacklip Abalone accounted for almost 90% and Greenlip Abalone 10% of the total numbers. Over 75% of the catch was taken from the east coast, with a further 13% from the north and 10% from the west coasts. The Eastern region daily bag limit of 5 abalone was achieved on about half of all dives targeting the species, with an overall average harvest rate of 3.5 abalone per day. By contrast, the Western region daily bag limit of 10 abalone was taken on about one in ten dives.

By converting numbers to weights, the recreational harvest was estimated at 12.6 tonnes, equivalent to just over 1% of the 2020 TACC (1,019.5 tonnes), noting however, the survey only accounts for recreational harvest up until April rather than the full year. There are currently no performance indicators or a TARC for the Tasmanian recreational abalone fishery.

## Fisher's observations

Fishers were asked a range of questions about the rock lobster fishery that included impacts of the COVID-19 restrictions, general fisher satisfaction and issues relevant to non-compliance, key findings included:

- Overall, 63% of respondents stated that social distancing and travel restrictions implemented as part of the COVID-19 response had impacted their lobster fishing activities, 24% reported that their fishing was not impacted and 13% had already completed their planned lobster fishing before the restrictions were imposed.
    - 86% of impacted respondents fished less because of the restrictions, just 1% reported fishing more than expected.
    - Inability to fish for lobster in usual or preferred fishing locations was a commonly cited impact (89% respondents) of the travel restrictions
- Two-thirds of respondents who fished in 2019-20 indicated that they were at least quite satisfied with their catch rates. By fishing method, however, divers were more likely to be satisfied (79%) than pot fishers (53%), which is consistent with the observation that divers tend to have a lower proportion of unsuccessful trips and average higher daily catches.
    - Based on individual catches, fishers were generally satisfied if they had achieved catch rates averaging at least 0.6 lobster per day, whereas

most fishers expressed dissatisfaction with catch rates of below 0.5 lobster per day. When method is considered, divers tended to express dissatisfaction with catch rates of under about 1.0 lobster per day, this compared with 0.4 lobster per day for pot fishers.

- Catch per unit effort represents an important metric in assessing fishery performance; as an indicator of stock biomass, economic performance in commercial fisheries and, as suggested by this study, an indicator of recreational satisfaction against which fishery performance can be assessed.
- Non-compliance in the lobster fishery based on pulling other fishers' gear and stealing the catch was considered at least quite common by half of the respondents. Catching lobsters for other licence-holders was considered at least quite common by 40% of respondents. Retaining more than the bag limit or undersized rock lobsters were not considered to be common forms of non-compliance
    - Catch sharing, whereby individuals who catch more than their daily bag limit share the excess catch with other license holders in the same fishing party such that, collectively, no one has more than the bag limit in their possession, was considered to be reasonable or acceptable practice by three quarters of respondents.

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# 1 INTRODUCTION

Rock lobster and abalone have long represented an important food source for the local Aboriginal population as well as being highly prized by recreational fishers in Tasmania. Southern Rock Lobster (*Jasus edwards*ii) and occasionally the Eastern Rock Lobster (*Sagmariasus verreauxi*) are taken by a variety of methods including pots, ring nets and dive collection. Two species of abalone, Blacklip Abalone (*Haliotis rubra*) and Greenlip Abalone (*H. laevigata*), are targeted by recreational divers; the former species harvested around the state and dominating the catch and the latter species generally restricted to the north coast and Bass Strait Islands. In addition to recreational importance, Rock lobster and abalone support major commercial fisheries in Tasmania, both of which are subject to catch quotas.

Recreational licences (first introduced in the late 1970s) are required to harvest rock lobster and abalone in Tasmania. The licences are method-based and prior to the mid-1990s consisted of a pot and a general dive licence; the latter permitting the capture of rock lobster, abalone, and scallops by diving. The licensing system was revised in 1995 and the general dive licence was split into lobster dive, scallop dive and abalone licences. In 1998, a lobster ring licence was introduced to formally recognise this capture method in the licensing system. Pot fishers are permitted to use one pot, ring fishers up to four rings, and divers can use artificial breathing apparatus (scuba or surface air supply, the latter commonly known as hookah). Although a licence is not required for Aboriginal persons, rock lobster pots and rings used by Aboriginal fishers must be marked with a Unique Identifying Code (approximately 1,700 have been issued since 2014).

Recreational licences are issued annually, with the licensing year extending from November to the following October. In a given year, recreational fishers may hold up to three categories of lobster licence (pot, ring and/or dive) and/or an abalone licence[1]. In addition to licensing, minimum size limits, closed seasons, and a ban on the taking of females carrying eggs, referred to as in 'berry', apply to rock lobster. Minimum size limits apply for abalone. Recreational fishers are also subject to daily bag and possession limits for both rock lobster and abalone and a boat limit for rock lobster.

Following the introduction of the current licensing system, the number of persons holding recreational rock lobster licences more than doubled from about 8500 in 1995-96 to 21,000 by 2007-08 (Fig. 1). Increases occurred in each of the licence categories, with over 18,000 pot, 9,000 dive and 5,600 ring net licences issued in 2007-08. Rock lobster licence numbers remained relatively stable up until 2009-10, then declined over the following three seasons before increasing slightly to levels comparable to the mid-2000s. A sharp fall in licence numbers was experienced in 2015-16, largely influenced by closures of parts of the east coast early in the season due to harmful algal blooms (biotoxin events). Similar biotoxin events were experienced during the 2017-18 season, contributing to a 5% decline in licence sales compared with 2016-17. In the current season almost 17,200 persons (about 1,000 fewer than in 2018-19) held at least one rock lobster licence category, with about 14,400 pot, 8,060 dive and 4,060 ring licences issued. Abalone licence sales have followed a similar trend, almost tripling between 1995-96 and 2007-08, to a peak of 13,500 licences (Fig. 1). Sales have remained relatively stable since 2010-11 but at a lower level, with 10,600 licences issued in 2019-20 (600 fewer than in 2018-19).

[1] Note, the licensing system also includes gillnet, beach seine, setline and scallop licence categories.

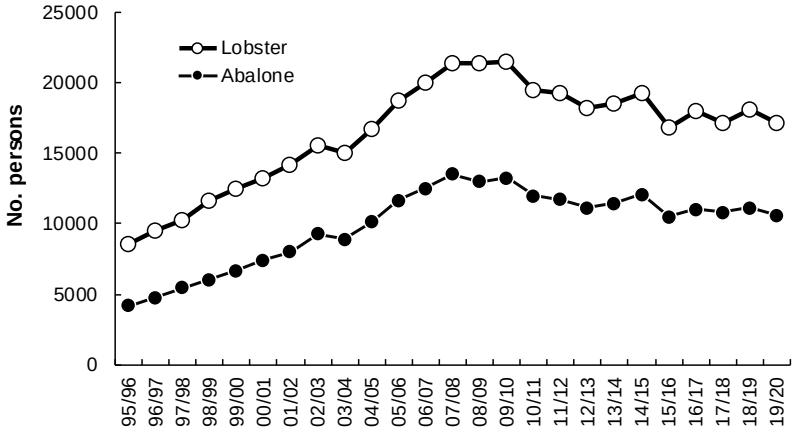



**Fig. 1.** Number of persons holding recreational rock lobster and abalone licences by licensing year.

Concurrent with the initial increase in recreational licence sales was the introduction of quota management for the commercial rock lobster fishery in 1998. This was implemented to address the objective of reducing catches to sustainable levels and allow rebuilding of legal-sized biomass (Ford 2001). The total allowable commercial catch (TACC) was initially set at 1,502 tonnes and represented a reduction in landings which had previously averaged over 1,700 tonnes per annum for the decade prior to 1998. The TACC was increased to 1,523 tonnes in 2002 and was maintained at this level until 2008-09. In response to concerns about declining stock levels, a situation exacerbated by a protracted period of poor recruitment (Linnane *et al*. 2010), the TACC was then progressively reduced to 1,050.7 tonnes by 2014-15 and has been maintained at this level in subsequent seasons.

In the 2005 management review of the Tasmanian Rock Lobster Fishery, provision was made for an explicit allocation to the recreational sector. Under these arrangements, a notional total allowable recreational catch (TARC) was set at 170 tonnes or 10% of the total allowable catch (TAC), whichever is the larger quantity. Based on these criteria, the TARC defaulted to 170 tonnes for 2019-20 which, when added to the TACC, resulted in a notional TAC of 1,220.7 tonnes. Recreational catch information is required to evaluate performance against the TARC and also as an input into the rock lobster assessment developed to model stock status and undertake risk assessments under different management scenarios (Hartmann *et al.* 2013, 2019).

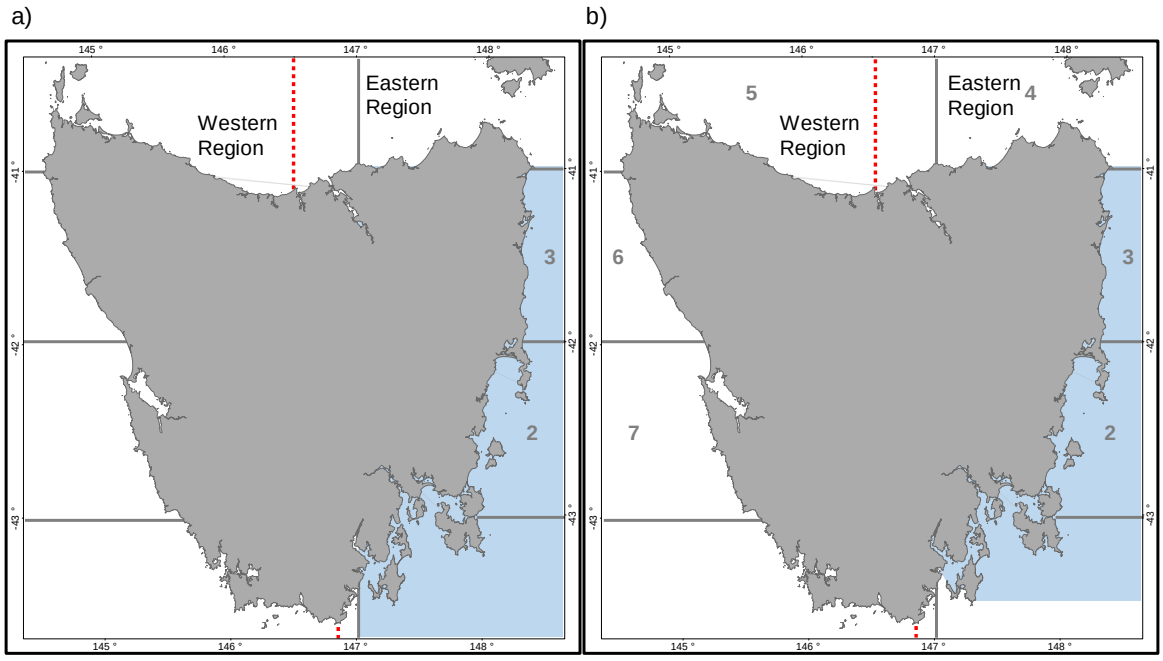
Concerns around declining rock lobster stocks in Tasmania were identified in the late 2000s and in 2011-12 east coast stocks were assessed to have hit historically low levels, attributed to a combination of years of below average recruitment and heavy fishing pressure (Hartmann et al., 2013, 2019). In response, a formal stock rebuilding strategy was implemented in 2013 with a goal to rebuild east coast stocks to greater than 20% of the unfished stock level by 2023 (DPIPWE 2013). A key element of this strategy, referred to as the East Coast Stock Rebuilding Strategy (ECSRS), is to limit the average annual total catch (recreational and commercial) off the east coast of Tasmania to 200 tonnes. However, because the rebuilding strategy was judged to be behind schedule this catch target has been gradually lowered and is set at 169 tonnes for the 2020-21 quota year.

In order to focus management in the area of most concern, the fishery was split into two regions in 2011 (Fig. 2) and in the Eastern region bag and possession limits were reduced from 5 to 3 and from 10 to 6, respectively and the season opening was delayed by two weeks. Bag and possession limits for the Western region remained unchanged

at 5 and 10 lobsters, respectively. Boat limits were also introduced for the first time and were set at 15 lobsters for the Eastern region and 25 for the Western region. Eastern region daily bag, possession and boat limits were further reduced to 2, 4 and 10 lobsters, respectively in 2015 and the fishing season closed on 30th April, some four months earlier than in previous years. These more recent changes were implemented to further constrain recreational catches from the east coast. Under the rebuilding strategy, the commercial fishery is subject to an East Coast catch cap which is monitored within the quota management system.

In 2016, the Minister for Primary Industries and Water (Tasmania) determined that the catch limit for the east coast stock rebuilding zone (ECSRZ) be split 79% to commercial and 21% to recreational sectors, reflecting the historic proportion of commercial and recreational catches from within the rebuilding zone. This sharing arrangement meant that the east coast catch target was initially split 158 tonnes to the commercial fishery and 42 tonnes to the recreational fishery. From 2017-18 the southern boundary of the ECSRZ was adjusted to a line running south from Southport to Bruny Island and then east from Tasman Head (Fig. 2b) (DPIPWE 2018). The revised ECSRZ catch split for the 2017-18 quota year[2] (March to February) was determined to be 134 tonnes for the commercial fishery and 41 tonnes for the recreational fishery while for 2018-19 the split was revised to 131 tonnes for the commercial fishery and 40 tonnes for the recreational fishery. In 2019-20, catches were further reduced, with 113 tonnes allocated to the commercial fishery and 35 tonnes for the recreational fishery.

In 2019, a split season opening was applied for the Eastern region, with waters outside of the ECSRZ opening on the same date as the Western region (2 November 2019) while opening of the ECSRZ was delayed by five weeks (7 December 2019) as a measure to help constrain recreational catches within the rebuilding zone.




[2] Note quota years (March to February) and recreational licence years (November to October) are different, in practice a quota year spans parts of two licence years which complicates catch comparison between sectors.

**Fig 2**. 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.

Prior to the current recreational fishing season, the daily bag and possession limits for abalone were set at 10 and 20 abalone, respectively. Rule changes implemented in November 2019 included reduction in the state-wide possession limit to 10 abalone and, for the Eastern Region (refer Fig. 2), a reduction in the daily bag limit to 5 abalone and the introduction of a boat limit of 25 abalone.

The TACC for abalone has been progressively reduced since 2010, from 2660 to 1018.5 tonnes in 2020 (934.5 tonnes for Blacklip Abalone and 84 tonnes for Greenlip Abalone). While there are no specific management performance indicators relating to the recreational fishery for Abalone, recreational catch data are taken into account in the annual assessment process (Mundy & McAllister 2019).

This survey represents the fifteenth in a series for rock lobster and the fourteenth for abalone undertaken since 1996. Key objectives include characterisation of the 2019-20 rock lobster and abalone fisheries in terms of participation, fishing effort and catch, with particular focus on the fishery off the east coast.

# 2 METHODS

## 2.1 Survey design

The methodology applied is based on that used successfully in previous surveys and independently reviewed by Pollock (2010). The design involves a two-stage process; an initial telephone interview to profile licence-holders and establish eligibility for a telephone-diary survey in which fishing activity is monitored in detail. The diary period included the 2019-20 licensing year up until the closure of the Eastern region rock lobster fishery (i.e. between 1 November 2019 and 30 April 2020).

### 2.1.1 Survey sample

The survey sample was selected from the 2018-19 recreational licensing database administered by the Department of Primary Industries, Parks, Water and Environment. While the majority of licence-holders are Tasmanian residents, a small number of interstate residents also take out licences. Commercial fishers are eligible to hold recreational licences, although restrictions controlling recreational gear and its use on commercial fishing trips apply. Persons under 10 years of age are not eligible to hold a licence.

The database of all persons holding a 2018-19 recreational rock lobster licence was divided into five regional (i.e. residential) strata. For Tasmanian residents, regions corresponded to the Australian Bureau of Statistics (ABS) ASGS Statistical Areas (Level 4), namely Hobart, South East, Launceston and North East, and West and North West. Interstate residents were grouped into a fifth 'Interstate' stratum. A stratified random sample was selected from the database, with a constant sampling fraction applied to each of the South East and Launceston and North East strata and a lower sampling fraction (two thirds of that for the South East and Launceston and North East) applied to the three remaining strata. Higher sampling rates for residents of the South East and Launceston and North East strata were intended to improve the precision of estimates of east coast fishing activity.

### 2.1.2 Screening survey

Respondents were contacted by telephone during October 2019 and asked about their fishing for rock lobster and abalone during the 2018-19 season (number of days fished and estimated retained catch for either species) and whether they expected to renew their fishing licences for the 2019-20 fishing season. Sampling was conducted without replacement, i.e. persons without a telephone listing or those who did not respond were not substituted in the sample.

### 2.1.3 Telephone-diary survey

Respondents who indicated an intention to renew their licences were deemed eligible and were invited to participate in the diary survey. Those who accepted were mailed a simple diary and letter of introduction. Diarists were contacted by telephone shortly afterwards to confirm receipt of their survey kit and have reporting requirements explained. Diarists were then contacted regularly by telephone throughout the survey period by experienced interviewers who recorded details of any rock lobster and/or abalone fishing activity since last contact. The frequency of the contact was tailored to the needs and behaviour (level of fishing activity) of individual respondents and thus detailed information was routinely collected soon after each fishing event, minimising recall bias for non-diarised data. By maintaining regular contact, typically at least once

a month, interviewers were also able to clarify any misunderstandings or inconsistencies at the time of the interview, thereby maximising overall data quality and completeness.

Information collected for each fishing activity or 'event' included the date, location, method used, target species for divers, start and finish times (including any significant breaks from fishing), and the numbers of lobster and/or abalone kept (harvested). In addition, the numbers of lobster released and reason(s) for release were recorded. Fishing locations were allocated into the eight areas used for lobster fishery assessment reporting (refer Fig. 2), though further disaggregation was feasible since more specific location information was routinely collected.

By definition, a fishing event was described in terms of method and fishing region. If more than one method was used or different regions were fished on a given day, separate events were recorded. For example, two separate events were recorded if a respondent used a pot and dived for lobster on the same day, with catch and effort information linked separately to each method.

Pots were generally fished overnight, although in a small number of instances they were not checked for several days, generally because unfavourable sea conditions prevented retrieval. The start of a fishing day was taken as the time the pot was set and the finish as the last time on a given day that it was checked or hauled. In cases where the pot was checked more than once in a day, the reported catch related to the total number of rock lobster taken for that day. For the purposes of calculating effort, overnight sets were considered to represent a single pot-day of effort.

The enumeration period for lobster was from the opening of the season (2nd November 2019 for all waters outside of the ECSRZ and 7th December 2019 for waters within ECSRZ) until closure of the Eastern region fishery (30th April 2020). The survey period was from 1st November 2019 to 30th April 2020 for abalone, and thus only providing a partial season estimate.

### 2.1.4 Wash-up survey

At the completion of the diary survey fully responding diarists aged 18 years and older were asked a series of questions relating to their fishing activity, perceptions relating to the quality of the fishery, and impacts of the COVID-19 pandemic on their fishing activities.

## 2.2 Data analysis

### 2.2.1 Catch and effort

Although initial sample selection was based on the 2018-19 licence database, licence details for 2019-20 were used for data expansion. That is, the licence status (licences held and dates of issue) was established for all diarists by reference to the 2019-20 licence database and expansion factors calculated as the size of the licensed population divided by the number of licensed diarists.

Since the number of licensed fishers increased progressively during the season, the sample size (i.e. number of *licensed* diarists) and total number of licensed fishers changed within the diary enumeration period. For instance, 41% of licences were issued by the end of November, 83% by the end of December 2019 and 94% by the end of January 2020. In order to account for this dynamic, the number of licence holders registered on the licence database and the number of licensed diarists at the end of

each month (sensitive to the stratification) provided the basis for calculating expansion factors that were applied to fishing activity for the given month.

The survey scope was confined to licensed recreational fishing activities; namely, the use of pots, rings and dive methods to harvest rock lobster and the harvesting of abalone. Any fishing activity reported by diarists whilst unlicensed (either prior to renewing a licence or by diarists who did not renew licences) was considered out of scope and thus excluded from all analyses.

The 'bootstrap' method was used to estimate 95% confidence limits using the percentile method (Haddon 2001). In each instance 1000 simulations were conducted.

## 2.3 Size composition

Size composition information for recreationally caught rock lobster was provided by volunteer diarists. At screening, potential diarists who had reported substantial fishing activity during the 2018-19 fishing season were asked whether they would also measure their catch as part of the survey. Respondents who expressed an interest were provided with a set of callipers and an instruction sheet showing how to measure and sex rock lobster. Sex and carapace length (mm) information reported by respondents was linked to capture events, enabling size composition information to be made sensitive to fishing method and region.

Lengths were converted into weights using the following relationships:

$$W = 0.000285L^{3.114} \quad \text{males}$$

$$W = 0.000271L^{3.135} \quad \text{females}$$

where $W$ is body weight (g), $L$ is carapace length (mm) (Punt & Kennedy 1997). Average weights by method and region were then applied to convert harvest numbers to weight for the purpose of comparison with the TARC and the east coast recreational catch share.

# 3 RESULTS

## 3.1 Response rates

### 3.1.1 Screening survey

From a random sample of 919 licence-holders selected from the 2018-19 licence database, 73 (7.9%) either had no telephone listing or the number was disconnected or incorrect. This represented sample loss and reduced the effective sample to 846. Contact was made with 752 licence-holders, of whom 708 fully responded, representing a screening survey response rate of 83.7%. Non-contacts (despite multiple attempts by telephone over a period of several weeks) accounted for 11.1% of the net sample and refusals or other non-response a further 5.2% (Table 1).

Amongst the respondents, 69 indicated that they were not likely to renew their licence(s) in 2019-20 and hence were not eligible for inclusion in the diary survey. The balance (639) indicated they were likely to renew their licence(s) (Table 1). Of this latter group, 75.6% were determined to have renewed their licence(s) based on the 2019-20 licence database, this compared with a renewal rate of 23.2% for those respondents who did not expect to take out a licence in 2019-20.

**Table 1 Sample details and response rates for the screening and diary survey components**

| | Sample | % sample/ % eligible | Licence renewed 2019-20 | Licence not renewed | % renewed |
|---|---|---|---|---|---|
| **Screening survey** | | | | | |
| Gross sample | 919 | | 562 | 357 | 61.1 |
| Sample loss | 73 | 7.9 | | | |
| Net sample | 846 | | 597 | 249 | 70.6 |
| Full response | 708 | 83.7 | 514 | 194 | 72.5 |
| Non-response | 44 | 5.2 | 33 | 11 | 75.0 |
| Non-contact | 94 | 11.1 | 50 | 44 | 53.1 |
| **Eligible for diary** | | | | | |
| Y- Likely to renew | 639 | | 483 | 141 | 75.6 |
| *N - Not likely to renew* | 69 | | 16 | 53 | 23.2 |
| **Diary Survey** | | | | | |
| Full response | 506 | 79.2 | 402 | 104 | 79.4 |
| Partial response | 36 | 5.6 | 30 | 6 | 83.3 |
| Refuse diary | 97 | 15.2 | 66 | 31 | 68.0 |

### 3.1.2 Telephone-diary survey

In total 639 respondents were deemed eligible to participate in the diary survey (i.e. likely to renew), of whom 542 initially accepted the diary with 506 completing the survey. Of the responding diarists, 104 (20.5%) did not take up a licence during 2019-20 despite

rating themselves as 'quite likely' or 'very likely' to do so. Among the remaining 402 licensed respondents, 401 held at least one category of lobster licence and 255 were licensed for abalone. Considering the total number of eligible respondents who renewed their licences (483) this represented an *effective* survey response rate of 83.2%. Data for the diarists who partially responded (i.e. declined to participate for the full period or with whom contact was lost) have been excluded from all analyses.

The numbers of individual lobster and abalone licences (population) and the sample of responding diarists are presented in Table 2. Overall, about one in 45 of all 2019-20 licence holders completed the survey.

**Table 2 Total number of 2019-20 lobster and abalone licence holders, numbers sampled (fully responding) and sample fraction by licence type.**

| Licence type | Licence holders | Diarists | % sampled |
|---|---|---|---|
| Rock lobster pot | 14,413 | 352 | 2.44 |
| Rock lobster dive | 8,064 | 201 | 2.49 |
| Rock lobster ring | 4,059 | 92 | 2.27 |
| Abalone | 10,600 | 255 | 2.41 |
| Total licences | 37,136 | 900 | 2.42 |
| Total persons | 17,789 | 402 | 2.26 |

Fully responding diarists reported a total of 1,945 fishing events during the survey period, 1,900 (98%) of which were considered valid events[3]. In total, 83% of all valid fishing events were reported as being diarised, the balance was based on recalled fishing activity (typically collected by survey interviewers within a few weeks of the activity taking place).

## 3.2 Rock Lobster

### 3.2.1 2018-19 participation

Information provided in the screening survey indicated that 82.3% (SE 1.4%) of 2018-19 rock lobster licence holders fished for rock lobster during that season, with 68.9% (SE 1.7%) harvesting at least one lobster. That is, out of the 18,176 persons licensed in 2018-19, 14,954 fished for rock lobster with 12,518 harvesting one or more lobster during that season. This information is, however, subject to recall bias as it was collected retrospectively and as such is considered indicative only.

### 3.2.2 2019-20 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 2019 and April 2020, inclusive.

An estimated 70.4% (SE 2.3%) of licence holders fished for rock lobster at least once during the fishing season with 55.8% (SE 2.5%) harvesting at least one lobster during the diary period. That is, out of the 17,182 licence-holders, 12,090 actually fished for lobster with 9,589 retaining at least one for the period.

[3] Events reported by diarists whilst unlicensed were considered out of scope and not valid.

Overall, total fishing effort was estimated to be 70,473 fisher days[4] for the period November to April, yielding a total harvest of 53,655 lobster (Table 3). This represented an average harvest rate of 0.76 lobster per day fished. Pots were the most popular fishing method (accounting for 66% of the total harvest) followed by dive collection (31%) and rings (3%) (Table 3). More than four times as many fisher days of effort was spent using pots compared with diving, however, the total pot catch was just over double that taken by divers. This difference reflects the higher average catch rate for divers (1.27 lobster per day) compared to that for potters (0.62 lobster per day). Although ring usage is comparatively low, recreational fishers are permitted to use up to four rings at a time and the method can be very effective, with the average reported catch rate (1.83 lobster per day) higher than for dive collection.

**Table 3. Rock lobster effort, harvest and harvest rates for the 2019-20 season up until 30 April**

Values in parentheses represent the 95% confidence intervals. Note: since multiple methods can be used on a day, total fishing days may be less than the sum of the method totals

| Method | Harvest (no.) | Effort (days) | Mean harvest rate (no. day$^{-1}$) |
|---|---|---|---|
| Pot | 35,649 (29,233 – 42,157) | 57,583 (47,714 – 67,215) | 0.62 |
| Dive | 16,515 (12,102 – 21,585) | 13,052 (9,774 – 17,001) | 1.27 |
| Ring | 1,491 (410 – 2,814) | 815 (214 – 1,624) | 1.83 |
| Total | 53,655 (46,216 – 61,126) | 70,473 (60,967 – 79,347) | 0.76 |

### 3.2.3 Regional catch and effort

Catch, effort and catch rates by fishing areas are summarised in Table 4 and Fig. 3a and indicate that the fishery was primarily concentrated on the east coast (Areas 1-3). This combined region accounted for 75% of the total estimated harvest (40,079 lobster) and attracted 82% of the total effort (58,316 fisher days) during the survey period. Area 1 accounted for 42% of the state-wide harvest and 47% the total effort. The north coast (Areas 4 & 5) accounted for 12% of the harvest (6,450 lobster) and 12% of effort (8,843 fisher days) while the west coast (Areas 6 - 8) contributed 13% of the total harvest (7,126 lobster) and 6% of total effort (4,291 fisher days).

Marked regional differences were evident in the proportion of the rock lobster harvest taken by different fishing methods (Fig. 4). Pots accounted for the bulk of the harvest in Areas 1 - 4 (65 - 72%) and Areas 6 and 8 (74-80%), while dive collection was the primary capture method in Areas 5 (56%). Rings were most commonly used off the west coast, accounting for up to 32% of the harvest in Area 7.

Mean daily harvest rates were highly variable around the state, ranging from 0.66 lobster per day in Area 1 to 2.79 in Area 7 (Table 4). Stock abundance and fishing pressure (including commercial activity), along with differing regional bag limits and the relative mix of fishing methods used (Fig. 4), represent key factors contributing to this regional variability.

[4] A fisher day is defined as a day in which lobster was a nominated target species and/or lobster were caught.

**Table 4. Recreational rock lobster effort, harvest and harvest rates by fishing area for 2019-20**

Values in parentheses represent the 95% confidence intervals

| Area | Harvest (no.) | Effort (fisher-days) | Harvest rate (no. per fisher-day) |
|---|---|---|---|
| 1 | 22,316 (17,396 – 27,272) | 33,633 (25,923 – 41,465) | 0.66 |
| 2 | 9,367 (6,662 – 12,559) | 12,513 (8,559 – 16,602) | 0.75 |
| 3 | 8,396 (4,690 – 12,290) | 11,344 (6,623 – 15,828) | 0.74 |
| 4 | 4,699 (2,687 – 6,884) | 6,426 (3,657 -9,772) | 0.73 |
| 5 | 1,751 (475 – 3,388) | 2,417 (1,084 – 3,834) | 0.72 |
| 6 | 2,916 (1,193 – 4,941) | 2,430 (1,324 – 3,600) | 1.20 |
| 7 | 3,034 (910 – 5,795) | 1,087 (338 – 2,055) | 2.79 |
| 8 | 1,176 (138 – 2,491) | 623 (92 – 1,362) | 1.89 |

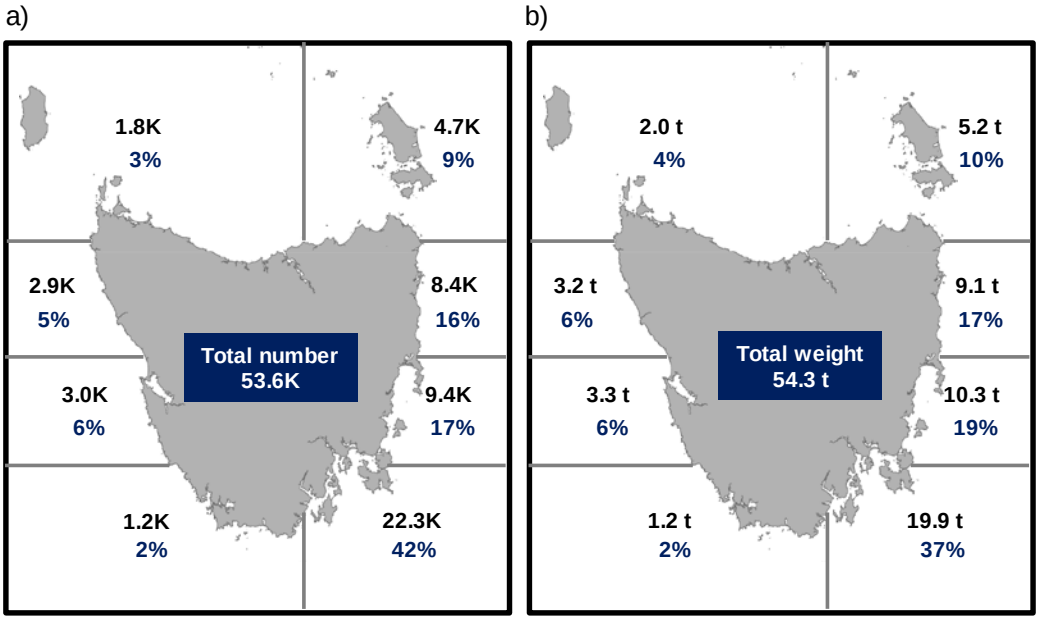



**Fig. 3.** Recreational harvest of rock lobster by assessment area: a) Numbers harvested (in 1000s or K) and proportion (%) of total number; b) Estimated harvest weight and proportion (%) of total weight.

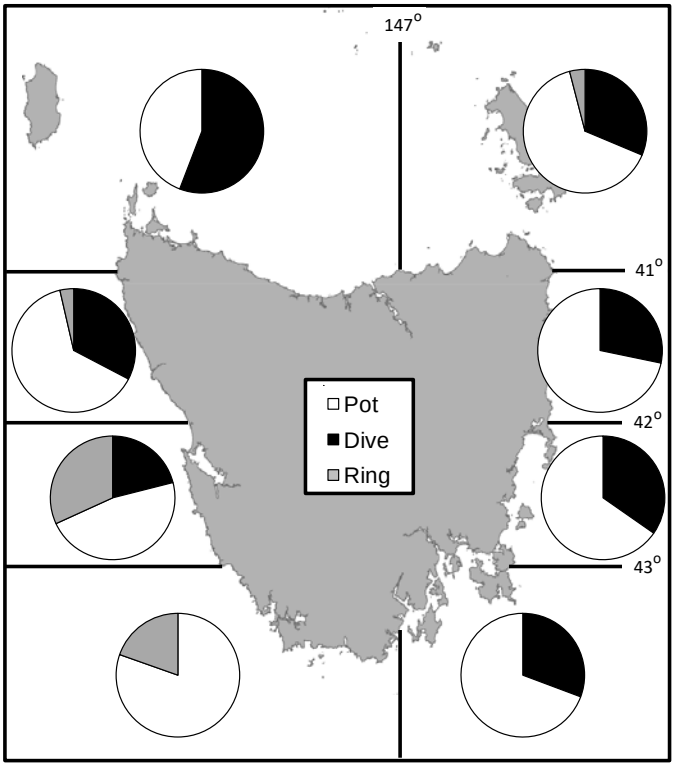



**Fig. 4.** Proportion of regional harvest by fishing method (pie charts).

### 3.2.4 Southeast coast

Catch data for Area 1 have been disaggregated into five sub-areas to better describe the spatial characteristics of the fishery in the southeast (Fig. 5). Waters surrounding the Tasman Peninsula and Storm Bay (including eastern Bruny Island) accounted for 44% of the harvest by number, with the area to the south of Bruny Island a further 30% of the regional harvest. Norfolk-Frederick Henry Bay and the D'Entrecasteaux Channel contributed 14% and 10%, respectively, while comparatively low catches were reported from the Derwent Estuary.

Pots accounted for the majority of the catch taken from the Tasman Peninsula and Storm Bay and the area to the south of Bruny Island, dive collection increased in importance in the other areas and dominated catches from Norfolk-Frederick Henry Bay and the Derwent Estuary (Fig. 5).

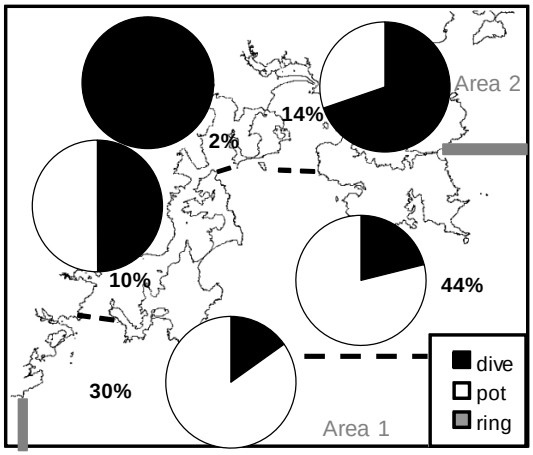



**Fig. 5.** Regional distribution of Area 1 harvest (%) and proportion of harvest by method (pie charts).

### 3.2.5 Seasonal catch and effort

The Western region along with waters north of Eddystone Point and waters south of Bruny Island were opened during the first weekend in November. The remainder of the east coast (the East Coast Stock Rebuilding Zone) was not opened until 7th December. The delay in opening of this key area of the fishery is reflected in the peak in fishing activity occurring in December (Fig. 6). Catch and effort levels had fallen dramatically by February and continued to trend downwards to the end of the survey period.

The underlying seasonal pattern of catch and effort in the fishery was influenced most strongly by variation in pot fishing activity, with over 75% of the pot catch and effort undertaken between December and January (Fig. 6). Dive catch (72%) and effort (65%) was also focussed in these months. There was no evidence of the typical increase in fishing activity associated with Easter holiday period in April, a consequence of COVID-19 travel restrictions implemented during March.

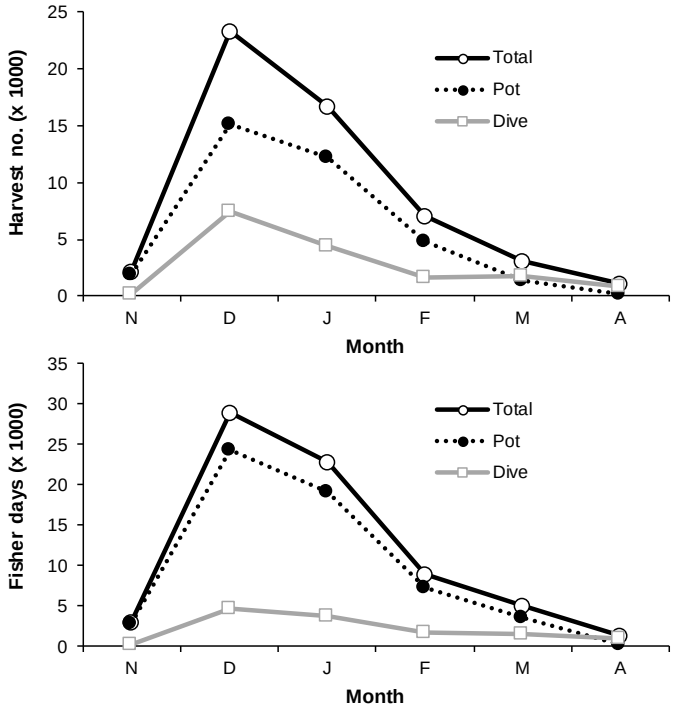



**Fig. 6.** Recreational rock lobster harvest (numbers) and effort (days fished) by month and method for the 2019-20 fishing season.

### 3.2.6 Daily harvest

Daily catch distributions differed markedly by fishing method and between management regions (Fig. 7). For instance, over half of the total pot effort in the Eastern region (Areas 1-4) resulted in no retained catch, this compared with 34% for the Western region (Areas 5-8). The Eastern region daily bag limit of two lobster was achieved on 15% of the days fished whereas in the Western region 32% of pot-days resulted in catches of at least two lobster, with 4% resulting in the Western region bag limit of five being taken. Divers had higher success rates, with half of all dives in the Eastern region producing at least two lobster compared with 36% for the Western region. Overall, 11% of dives in the Western region resulted in the bag limit of five lobster being attained. There was limited reported ring effort, in the Eastern region 20% of which resulted in a catch of two lobster while in the Western region 18% of the fishing days resulted five lobster being caught.

The actual dive method used had a strong effect on catch rates. Average daily harvest rates were highest for hookah (1.53 lobster state-wide; 1.59 for Eastern region[5]), followed by scuba (1.42 lobster state-wide; 1.36 and 2.05 for Eastern and Western regions, respectively) and snorkel (0.88 lobster state-wide; 0.83 and 1,12 for Eastern and Western regions, respectively). Catches taken by hookah divers accounted for 38% of the total dive harvest; scuba contributed 37% and snorkel a further 25% to the total.

[5] Few hookah dive trips were reported by diarists in the Western region.

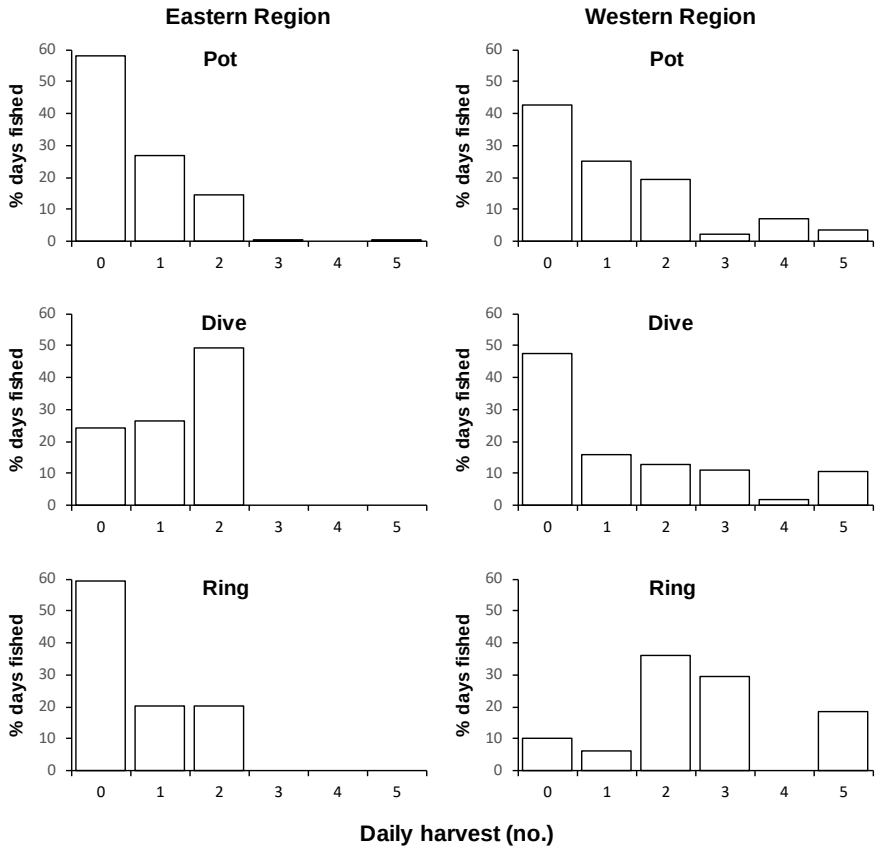



**Fig. 7.** Distribution of daily rock lobster harvest by fishing method and management region.

### 3.2.7 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 the 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 (Fig. 8). State-wide 21% of the active fishers harvested no legal sized lobsters, 46% harvested 5 or fewer lobsters and just 5% took 16 or more lobsters during the survey period. The proportional breakdown was similar when limited to the fishery off the east coast. In both instances, fishers taking 16 or more lobsters for the season accounted for more than 20% of the total harvest, highlighting the influence that a relatively small number of avid fishers can have in determining the total harvest.

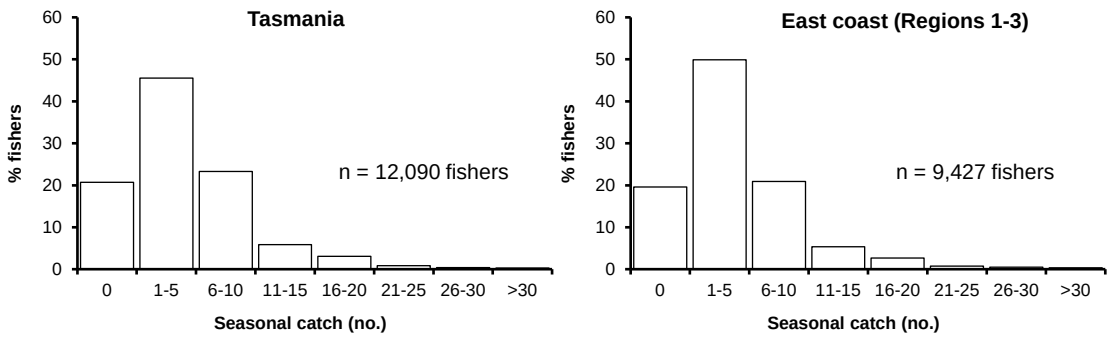



**Fig. 8.** Seasonal harvest of Rock Lobster for fishers who were active within the east coast (Areas 1-3) and for the whole fishery. n is estimated number of active licence-holders.

### 3.2.8 Released catch

A total of 32,849 rock lobster (95%CL 23,994 – 43,720) were estimated to have been released from pot catches, equivalent to 0.9 for every retained lobster. About 91% of pot releases were due the capture of undersized rock lobster, 7% of releases were due to over bag limit catches, and 1% were discarded dead or damaged or 'in berry'.

Although divers release some rock lobster much of this 'sorting' probably occurs underwater and therefore a similar analysis of reasons for release by divers was not attempted.

### 3.2.9 Size composition

Diarists reported lengths for 538 pot caught and 201 dive caught rock lobster from around Tasmania. Pot caught rock lobster ranged between 105-214 mm carapace length (CL), when converted to weight this equated to an overall average of 1,038 g. Dive caught rock lobster had a similar size range,105–200 mm CL, but were larger, with an average weight of 1,156 g. Male to female sex ratios for pot (1.0:0.72) and for dive (1.0:0.53) catches indicated that significantly more males than females were retained for both methods. Length frequency distributions by region are presented in Fig. 9. Apart from the east coast (Areas 1-3) data were limited and may not be representative.

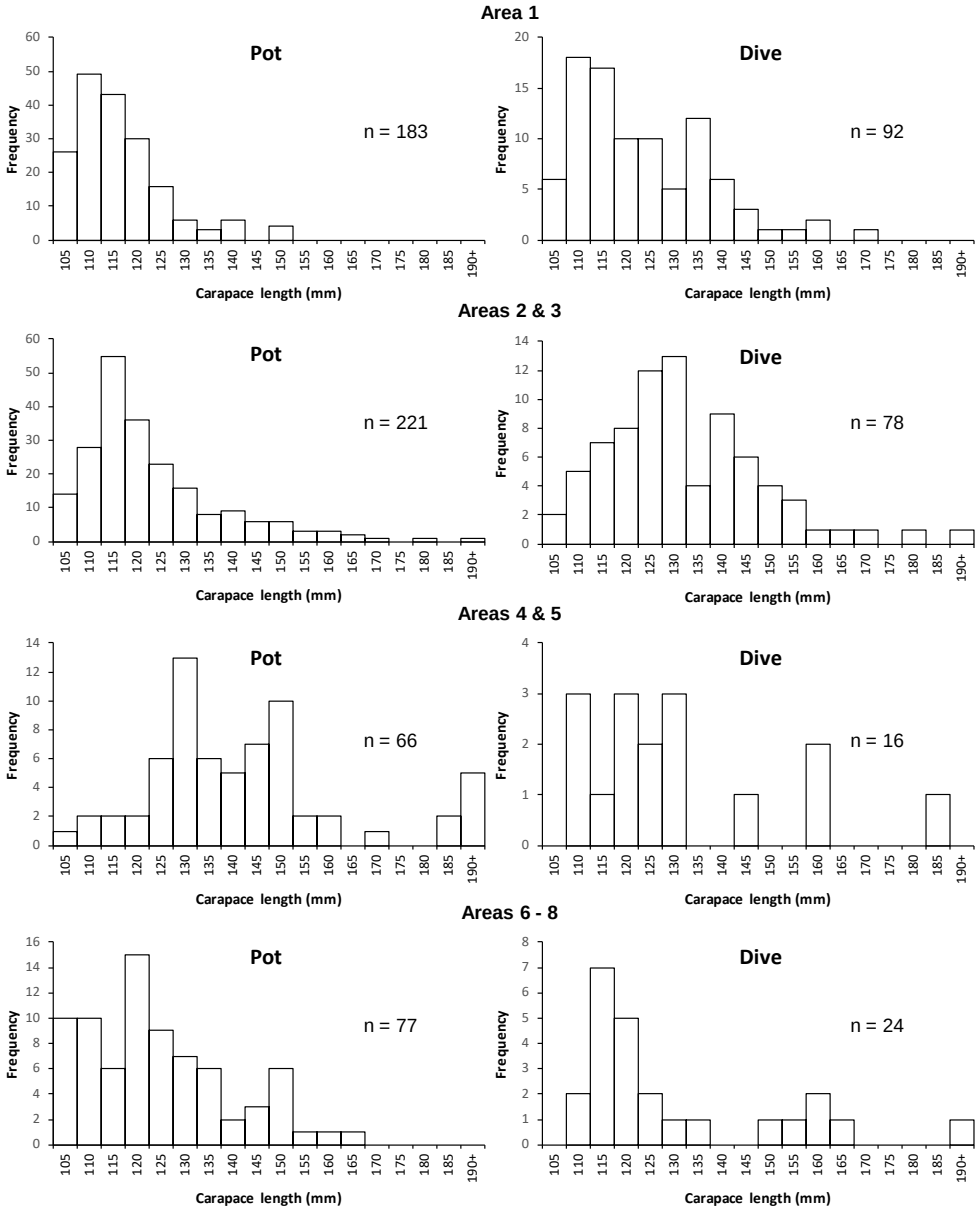



**Fig. 9.** Length frequency distributions by 5 mm size class for recreationally caught rock lobster taken by pot and dive fishing methods by assessment area(s). n is sample size.

### 3.2.10 Harvest weights

The weight of the 2019-20 recreational harvest was estimated by multiplying the average rock lobster weights by the numbers harvested by method and area. Average weights by area and method used to determine harvest weights are presented in Table 5.

The state-wide harvest was estimated to be 54.3 tonnes[6], equivalent to 32% of the TARC. Regional harvest estimates ranged from 19.9 tonnes (Area 1) to 1.2 tonnes (Area 8) (Table 5 and Fig. 3b). As a proportion of the state-wide recreational harvest, the east coast (Areas 1-3) accounted for 72%, north coast (Areas 4&5) 13%, and west

[6] Any illegal harvest taken by recreational fishers, whether due to fishing whilst unlicensed or catches in excess of legal limits, is not included in the harvest estimates.

coast (Areas 6-8) 14% of the total weight. As for harvest based on numbers (refer Fig. 3a), the importance of the east coast fishery to the recreational sector is clearly evident.

**Table 5. Average rock lobster weight (g) by method and estimated harvest (kg) by area**

| | Av. weight (g) | | | % |
|---|---|---|---|---|
| Area | Pot/Ring | Dive | Harvest (kg) | total |
| 1 | 836 | 1013 | 19,872 | 36.6 |
| 2 | 1015 | 1271 | 10,337 | 19.0 |
| 3 | 1015 | 1271 | 9,127 | 16.8 |
| 4 | 1038 | 1254 | 5,196 | 9.6 |
| 5 | 1038 | 1254 | 2,029 | 3.7 |
| 6 | 1042 | 1268 | 3,253 | 6.0 |
| 7 | 1042 | 1268 | 3,305 | 6.1 |
| 8 | 1042 | 1268 | 1,226 | 2.3 |
| Total | | | 54,345 | |

## 3.3 Abalone

### 3.3.1 2018-19 participation

Information provided in the screening survey suggested that 61.9% (SE 2.3%) of 2018-19 licence holders fished for abalone during that season and that 58.1% (SE 2.4%) kept at least one abalone. That is, out of 11,271 persons licensed in 2018-19, an estimated 6,976 fished for abalone with 6,548 harvesting at least one abalone. However, as this information was collected retrospectively at the end of the 2018-19 season it is subject to recall bias and as such is considered indicative only.

### 3.3.2 2019-20 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 recreational abalone licence holders between November 2019 and April 2020, inclusive.

During the survey period an estimated 31.5% (SE 3.0%) of abalone licence holders (i.e. 3,341 out of the 10,600 licence-holders) fished for abalone with 28.6% (SE 2.9%) (3,031 persons) harvesting at least one abalone.

The total estimated harvest was estimated to be 28,150 abalone (95% CI: 19,146 – 33,694), the result of 8,064 fisher days of effort[7]. This represented an average harvest rate of 3.5 abalone for each day fished. Blacklip Abalone dominated the catch, accounting for almost 90% of the total catch numbers (22,840) while Greenlip Abalone represented 10% of the state-wide total (2,655) (Table 6).

[7] A fishing day was defined as one in which Abalone was a nominated target species and/or Abalone were caught.

**Table 6. Abalone harvest, effort and harvest rates by fishing area for 2019-20**
Values in parentheses represent the 95% confidence intervals, * average weight based on commercial catch sampling data; ** weighted in accordance to the proportion of Blacklip and Greenlip Abalone in the catch and average species weight.

| Area | Harvest (no.) Blacklip Abalone | Greenlip Abalone | Effort (fisher days) | Harvest rate (no. per fisher day) | Av. weight (g)* | Harvest (kg) |
|---|---|---|---|---|---|---|
| 1 | 12,108 (7,241 – 17,507) | - | 3,527 (2,261 – 4,894) | 3.43 | 522 | 6,321 |
| 2 | 4,298 (2,064 – 6,972) | - | 1,284 (719 – 1,994) | 3.35 | 517 | 2,222 |
| 3 | 3,116 (996– 5,833) | - | 809 (286 – 1,405) | 3.85 | 528 | 1,645 |
| 4 | 225 (0 – 1,562) | 1,569 (319 – 3,194) | 897 (332 – 1,593) | 2.00 | 324** | 581 |
| 5 | 487 (0 – 2,196) | 1,085 (28 – 2,463) | 1,047 (429 – 1,818) | 1.50 | 357** | 562 |
| 6 | 2,386 (750 – 4,503) | - | 455 (145 – 834) | 5.24 | 501 | 1,195 |
| 7 | - | - | - | - | - | - |
| 8 | 219 (0 – 657) | - | 44 (0 - 131) | 5.00 | 531 | 116 |
| Total | 22,840 (16,260 – 30,457) | 2,655 (960 – 4,448) | 8,064 (6,199 – 10,237) | 3.49 | | 12,642 |

### 3.3.3 Regional catch and effort

Regional catch, effort and harvest rates for abalone are presented in Table 6. The recreational fishery was concentrated off eastern Tasmania, and in particular off the southeast coast (Area 1, 43% total harvest) (Fig. 10a). Blacklip Abalone were taken from all areas whereas Greenlip Abalone were restricted to the north coast. Regional harvest rates varied between 2.5 and ~ 5 abalone per day, the highest catch rates were in the west (Area 6) of the state.

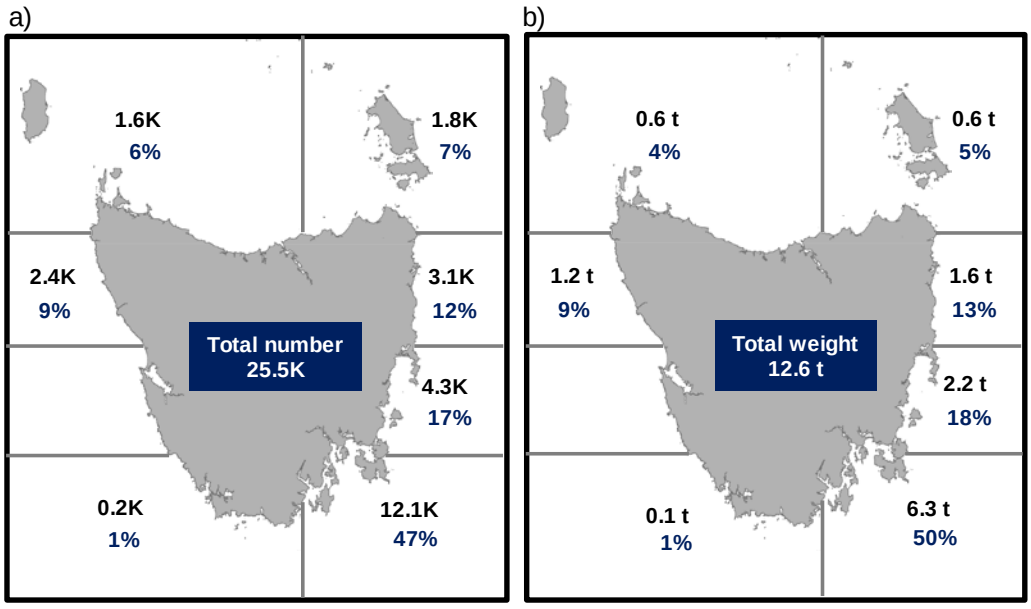



**Fig. 10.** Recreational harvest of abalone by assessment area: a) Numbers harvested (in 1000s or K) and proportion (%) of total number; b) Estimated harvest weight and proportion (%) of total weight.

### 3.3.4 Seasonal catch and effort

The fishery for abalone exhibited a strong seasonal pattern, with catches peaking in December and effort peaking in January (Fig. 11). The traditional peak in catch and effort during November was not evident in 2019, highlighting the links between the rock lobster and abalone fisheries (the majority of abalone licence-holders also hold rock lobster dive licences). Furthermore, the sharp decline in catch and effort in April can be linked to travel restrictions associated with the COVID-19 pandemic response.

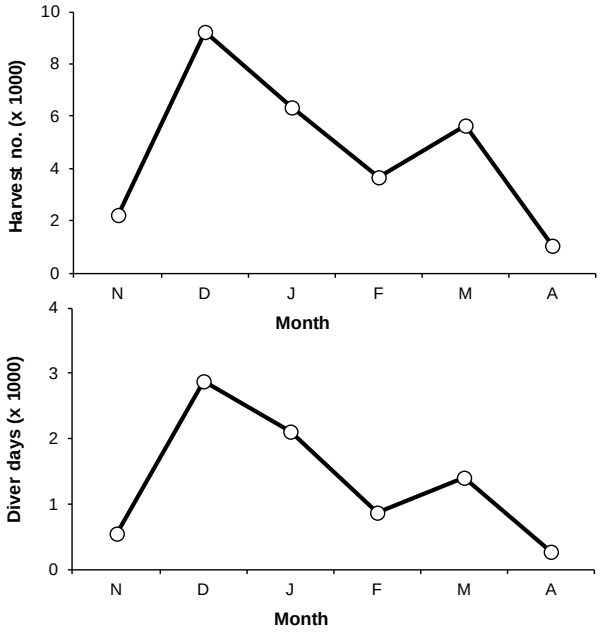



**Fig. 11.** Recreational abalone harvest (numbers) and effort (days fished) by month during the 2019-20 fishing season.

### 3.3.5 Daily harvest

The Eastern region daily bag limit of 5 abalone was achieved in about half of all targeted dives, by contrast the Western Region bag limit of 10 abalone was achieved in just over 10% of dives (Fig. 12). However, the sampling strategy was weighted towards respondents likely to fish off the east coast of Tasmania and thus data for the Western Region was limited and thus needs to be treated with caution.

Based on the fishery in the Eastern Region, snorkel divers reported the highest average catch rate (3.7 abalone per day), took the bag limit of 5 abalone more frequently (59% of dives) than either of the other two dive method and accounted for just over half of the total harvest. Average daily catch rates for hookah (3.6) were higher than for scuba divers (3.1), but the higher effort expended by scuba divers meant that the total catch taken by either method was similar (24% each).

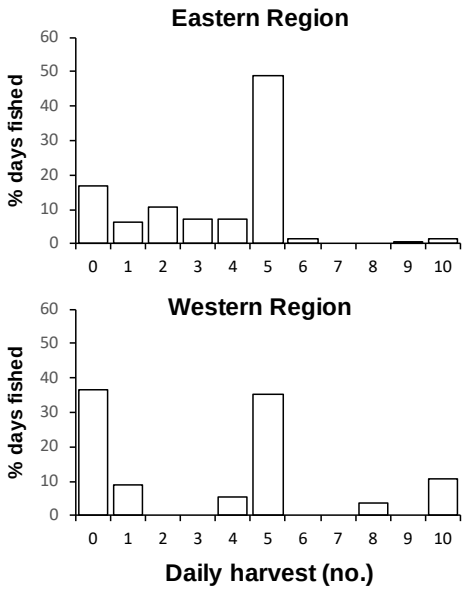



**Fig. 12.** Distribution of daily abalone harvest by management zone for 2019-20 licence holders

### 3.3.6 Harvest weights

Size composition information was not available for recreationally caught abalone. However, based on commercial catch sampling, the average legal-sized abalone by the major fishing regions was estimated to vary between 531 g off the south coast (Area 8) and 324 g off the north coast (Area 4) (Table 6). Using these values, the recreational harvest between November and April was estimated to be about 12.6 tonnes. Regionally, harvest estimates ranged from 6.3 tonnes in Area 1 to less than one tonne in Areas 4-5 and 8 (there were no reports from Area 7) (Table 6 and Fig. 10b). The catch for the combined east coast (Areas 1-3) was 10.2 tonnes, the north coast (Areas 4&5) 1.1 tonnes, and the west coast (Areas 6-8) 1.3 tonnes.

## 3.4 Wash-up survey

### 3.4.1 General

The overall response rate to the wash-up survey was 93.5% (462 out of an eligible sample of 494)[8].

### 3.4.2 Constraints to fishing

Diarists who did not fish for lobster during 2019-20 were asked, as an open-ended question, about their main reasons for not fishing during the season. Lack of time due to work and/or family commitments was the most commonly cited reason for licensed respondents, followed by the weather (Table 7). Lack of time was also the most commonly cited reason for not renewing licences, with the impacts of COVID-19 restrictions of secondary importance. In addition to their primary reasons for not fishing, 39 diarists reported that the impacts of the COVID-19 restrictions had an influence on their decision not to fish.

[8] Eligible respondents were those who completed the diary survey and were over 18 years of age.

**Table 7. Main reasons for not fishing for rock lobster during 2019-20**

| Reasons | Not Licensed | % | Licensed | % | Combined | % |
|---|---|---|---|---|---|---|
| Lack of time/work and/or family commitments | 38 | 48.7 | 41 | 41.4 | 79 | 44.6 |
| Weather | 4 | 5.1 | 17 | 17.2 | 21 | 11.9 |
| Health/age | 7 | 9.0 | 10 | 10.1 | 17 | 9.6 |
| Lack of interest, alternative interest | 3 | 3.8 | 10 | 10.1 | 13 | 7.3 |
| Coronavirus | 8 | 10.3 | 4 | 4.0 | 12 | 6.8 |
| Lack of opportunity/fishing partner | 4 | 5.1 | 6 | 6.1 | 10 | 5.6 |
| Moved interstate, travelling did not visit Tasmania | 5 | 6.4 | 2 | 2.0 | 7 | 4.0 |
| Lack of boat or equipment | 3 | 3.8 | 4 | 4.0 | 7 | 4.0 |
| Other | 6 | 7.7 | 5 | 5.1 | 11 | 6.2 |
| No. Respondents | 78 | | 99 | | 177 | |

### 3.4.3 Fishery quality

About 70% of the respondents who fished for rock lobster in 2019-20 indicated that the overall quality of the fishery was about the same or better than in the previous year (Table 8); itself a slight decline to the same question posed to respondents in 2018-19. Almost one in four respondents indicated that the current season was worse than the previous one, this compares with fewer than one in five respondents in 2018-19 (Lyle *et al.,* 2019a).

**Table 8. Response to the question relating to the perceived quality of the 2019-20 rock lobster season relative to 2018-19**

| Response | No. | % |
|---|---|---|
| Better | 52 | 18.5 |
| Worse | 64 | 22.8 |
| (About the) Same | 146 | 52.0 |
| Unsure | 19 | 6.8 |
| Total respondents | 281 | |

### 3.4.4 Policing and enforcement

Out of 280 active fishers who responded to questions about policing, 58 (20.7%) indicated that they had been checked by Marine Police whilst fishing for lobster during 2019-20 (222 or 79% were not checked). On-water inspections were reported by 75% of those checked while off-water inspections (e.g. at boat ramps) were reported by 33% of fishers (note some respondents were subject to on- and off-water checks).

Reported inspection rates for the previous four seasons were generally comparable to or slightly higher than in the current year: 15% in 2018-19, 25% in 2017-18, 23% in 2016-17, and 20% in 2015-16.

### 3.4.5 Impacts of Coronavirus (COVID-19)

#### 3.4.5.1 Local sales of rock lobster

Commercial rock lobster fishers were impacted by the loss of their export markets in late January and started selling lobsters locally at reduced prices. With this in mind, respondents were asked whether they or a member of their household had purchased lobster locally and if so, whether this had influenced how much rock lobster fishing they did themselves.

Rock lobster were purchased locally by 54 (12%) of respondent households, 407 (88%) did not purchase rock lobster. Of those respondents who purchased commercially available rock lobster, one third reported that this local availability had influenced their decisions to fish for rock lobster, either because it was “cheaper” to buy rock lobster than go fishing for them or that there was no longer a “need” to go fishing for lobster.

#### 3.4.5.2 Rock lobster fishing opportunities

Respondents were asked if the social distancing and travel restrictions implemented as part of the coronavirus response had influenced their lobster fishing activities. Overall, 63% (291) of respondents who answered this question stated that the restrictions had influenced their lobster fishing, whereas 24% (112) reported that their fishing was not influenced by the restrictions and 13% (57) indicated they had already completed their planned lobster fishing for the season before the restrictions were imposed.

To better understand how fishing activities were affected by the restrictions, respondents were asked to consider the effects in terms of number of lobster fishing trips, where they could fish and fishing partners. The vast majority (86%) of affected respondents indicated that they had fished less because of the restrictions. By contrast, 13% of respondents noted that the restrictions had no impact the number of trips undertaken while <1% fished more than expected (Table 9).

Inability to fish for lobster in usual or preferred fishing locations was a commonly cited impact (89% respondents) of the travel restrictions which dictated that Tasmanians could not travel outside of their home municipality to undertake recreational activities. Just 11% of respondents indicated that these restrictions had no impact on their choice of where they fished for rock lobster. (Table 9),

Travel and social distancing restrictions also limited opportunities for usual fishing partners to come together to fish for rock lobster. Just over half of respondents (57%) indicated that they were unable to fish with their usual fishing partners (for a variety of reasons) whereas 41% of respondents noted that the restrictions were not an issue in terms of fishing partners (Table 9).

**Table 9: Nature of the impact of coronavirus restrictions on rock lobster fishing.** (Number of respondents = 291)

| Type of impact to lobster fishing | No. responses | % respondents |
|---|---|---|
| **Number of trips** | | |
| Increased | 2 | 0.7 |
| Unaffected | 39 | 13.4 |
| Reduced by 1-5 trips | 153 | 52.6 |
| Reduced by 6-10 trips | 24 | 8.2 |
| Reduced by >10 trips | 10 | 3.4 |
| Reduced (amount not defined) | 63 | 21.6 |
| **Fishing locations** (*multiple responses permitted*) | | |
| Unaffected | 32 | 11.0 |
| Unable to fish south east coast | 64 | 22.0 |
| Unable to fish east coast | 84 | 28.9 |
| Unable to fish north east coast | 24 | 8.2 |
| Unable to fish north west coast | 6 | 2.1 |
| Unable to fish west coast | 31 | 10.7 |
| Unable to fish usual area | 61 | 21.0 |
| **Fishing partners** | | |
| Unaffected | 119 | 40.9 |
| Restricted due to boat limits | 18 | 6.2 |
| Restricted due to travel bans | 18 | 6.2 |
| Restricted due to social distancing rules | 8 | 2.7 |
| Restricted to maintain safety for elderly family members | 3 | 1.0 |
| Restricted (no reason supplied) | 119 | 40.9 |

#### 3.4.5.3 Other recreational fishing activities

Respondents were also asked whether the social distancing and travel restrictions imposed as part of the coronavirus response had influenced other recreational fishing activities. Overall, 63% (291) of respondents stated that the restrictions had impacted their other recreational fishing activities, the remaining 37% reported that their fishing activities (whether or not they had plans) were unaffected by the restrictions.

The majority (84%) of affected respondents indicated that they fished less often as a result of the restrictions, 15% indicated that their fishing activity was not influenced and 1% of respondents actually fished more often as a result of the restrictions (Table 10).

The loss of access to usual or preferred fishing locations was the most common impact of the travel restrictions, just 16% of respondents indicated that their choice of fishing location was unaffected by the restrictions (Table 10).

There was an even split between respondents who indicated an impact or no impact in terms of access to fishing partners (Table 10).

Respondents were asked to consider the range of their fishing activities impacted by the restrictions and consistent with the general importance of line fishing amongst recreational fishers in Tasmania (Lyle et al. 2019b), this was identified as the primary method impacted (78% respondents) (Table 10). No access to inland areas due to the travel restrictions was identified as an issue for some respondents, in turn impacting on their ability to go freshwater fishing (9% respondents).

**Table 10: Nature of the impact of coronavirus restrictions on other recreational fishing activities.** (Number of respondents = 291**)**

| Type of impact to recreational fishing | | No. responses | % respondents |
|---|---|---|---|
| **Number of trips** | | | |
| | Unaffected | 44 | 15.1 |
| | Increased | 4 | 1.4 |
| | Reduced by 1-5 trips | 125 | 43.0 |
| | Reduced by 6-10 trips | 33 | 11.3 |
| | Reduced by 11+ trips | 11 | 3.7 |
| | Reduced (amount not defined) | 74 | 25.4 |
| **Fishing Location** (multiple responses allowed) | | | |
| | Unaffected | 48 | 16.5 |
| | Unable to fish the south east coast | 67 | 23.0 |
| | Unable to fish the east coast | 74 | 25.4 |
| | Unable to fish the north east coast | 21 | 7.2 |
| | Unable to fish the north west coast | 22 | 7.6 |
| | Unable to fish the west coast | 10 | 3.4 |
| | Unable to fish in inland waters | 16 | 5.5 |
| | Unable to fish usual area | 51 | 17.5 |
| **Fishing Partners** | | | |
| | Unaffected | 144 | 49.5 |
| | Restricted due to boat limits | 7 | 2.4 |
| | Restricted due to travel bans | 22 | 7.6 |
| | Restricted due to social distancing rules | 9 | 3.1 |
| | Restricted to maintain safety for elderly family members | 2 | 0.7 |
| | Restricted (no reason supplied) | 103 | 35.4 |
| **Fishing method** (*multiple responses permitted*) | | | |
| | Line | 227 | 78.0 |
| | Freshwater fishing | 25 | 8.6 |
| | Abalone dive | 16 | 5.5 |
| | Scallop dive | 15 | 5.2 |
| | Net | 11 | 3.8 |
| | Spear | 3 | 1.0 |

#### 3.4.5.4 Other outdoor activities

Respondents were asked whether, as a consequence of the coronavirus restrictions, they had changed the amount of time devoted to outdoor activities other than fishing. Most respondents (327 out of 457) indicated some changes, 78% (256) reporting a reduction in the time spent doing one or more outdoor activities whereas 38% (126)

reported increased time (noting that some individuals reported increases as well as decreases depending on the activity in question) (Table 11). Hunting, camping, local sports and bushwalking were the more common of the activities for which times were decreased whereas walking and home maintenance were the main activities attracting increases.

**Table 11: Changes time spent doing reported types of outdoor activities.** (Number of respondents = 327)

| Activity | Number of respondents | % respondents |
|---|---|---|
| Decreased | | |
| Hunting | 53 | 16.2 |
| Camping | 43 | 13.1 |
| Local sports | 38 | 11.6 |
| Bushwalking | 37 | 11.3 |
| Golf | 27 | 8.3 |
| Bike riding | 20 | 6.1 |
| Motorbike riding | 17 | 5.2 |
| Travelling | 15 | 4.6 |
| Surfing | 11 | 3.4 |
| Other *(34 different activities)* | 109 | 33.3 |
| Increased | | |
| Walking | 62 | 19.0 |
| Home maintenance & renovations | 41 | 12.5 |
| Gardening | 17 | 5.2 |
| Other *(17 different activities)* | 34 | 10.4 |

### 3.4.6 Catch rates and fisher satisfaction

Respondents who had reported fishing for rock lobster during the survey period were asked whether they were satisfied or not with the actual catch rates (average number of lobsters kept per day fished) they achieved during the 2019-20 season. Overall, two-thirds of the respondents indicated that they were at least quite satisfied with their catch rates (Table 12). Based, on fishing method (i.e. main method used), however, it was evident that divers were more likely to be satisfied (79%) than pot fishers (53%), which is consistent with the observation that divers tend to have a lower proportion of unsuccessful trips (i.e. zero catch days) and higher daily catches than pot fishers (refer section 3.2.6).

**Table 12. Fisher satisfaction with rock lobster catch rates achieved during 2019-20 season.**

| | | % | | |
|---|---|---|---|---|
| Response | No. | All | Pot | Dive |
| Very satisfied | 72 | 25.8 | 24.1 | 29.3 |
| Quite satisfied | 116 | 41.6 | 39.0 | 47.6 |
| Not very satisfied | 67 | 24.0 | 28.2 | 14.6 |
| Not at all satisfied | 24 | 8.6 | 8.7 | 8.5 |
| Total respondents | 279 | | | |

Since the recreational lobster fishery is highly consumptive, that is the release of lobster that could legally be retained is extremely rare (in contrast to voluntary releases observed in many sport fisheries), fisher satisfaction is expected to be strongly correlated to harvest rate. To test this assumption, catch rates (total number of retained lobster divided by number of days fished) were calculated for each diarist who reported fishing for lobster. This analysis was restricted to those diarists who fished in the Eastern region only so as to avoid potential complications linked to differing bag limit regulations that apply in Tasmania. Overall fishers were generally satisfied with average catch rates of at least 0.6 lobster per day, whereas fishers expressed dissatisfaction with catch rates of below 0.5 lobster per day (Fig 13a). When these data are considered in the context of the main fishing method used by the fishers, it is clear most divers expressed dissatisfaction with catch rates of under about 1.0 lobster per day compared with 0.4 lobster per day for pot fishers (Fig 13b).

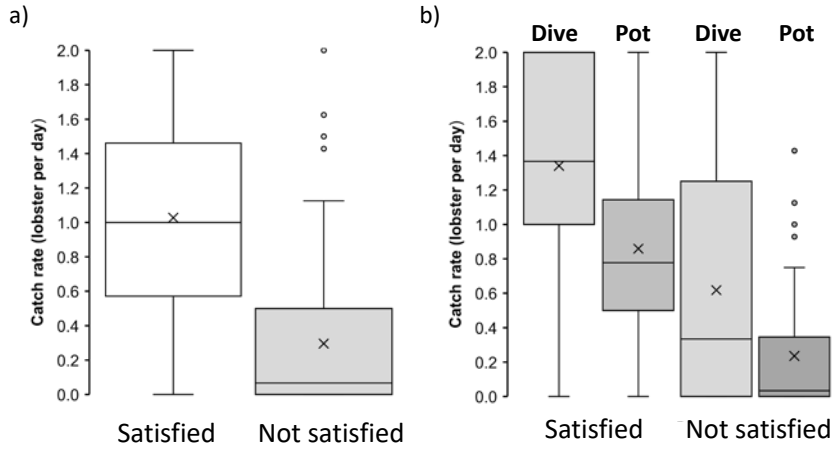



**Fig. 13.** Fisher satisfaction plotted against the average catch rate they achieved for the 2019-20 Eastern region fishing season for a) all diarists and b) based on primary fishing method used. Data relate to those diarists who fished exclusively in the Eastern region. Median (horizontal line in the box) and mean (x) values are indicated. Number of respondents = 244.

In order to further explore the concept of catch rates and fisher satisfaction, respondents, regardless of whether or not they had fished, were offered a series of hypothetical scenarios based on different catch levels for five days fishing (with existing size and bag limits applied), namely 8 lobster (effectively 1.6 lobster per day), 6 lobster (1.2 per day) 5 lobster (1.0 per day) and 3 lobster (0.6 per day), and asked how satisfied they would be with each level of catch until the respondent indicated that they would not be satisfied. Results of the analysis are provided in Fig. 14 and demonstrate that the majority of respondents indicated general satisfaction with catches equivalent to at least one lobster per day. At a catch rate of 0.6 lobster more than half of the respondents indicated that they would not be satisfied. A small proportion of respondents (7%) indicated potential dissatisfaction with a catch of 8 lobster for five days fishing, when asked what catch level they would be satisfied with responses ranged between 10 lobster (effectively the Eastern region bag limit each day) to 25 lobster (effectively the Western region bag limit each day). Overall, this analysis of satisfaction based on *hypothetical* catch rates aligns closely with fisher satisfaction based on *actual* catch rates, indicating that at the individual fisher level there is an expectation that their catch rates should exceed 0.6 and preferably 1.0 lobster per day.

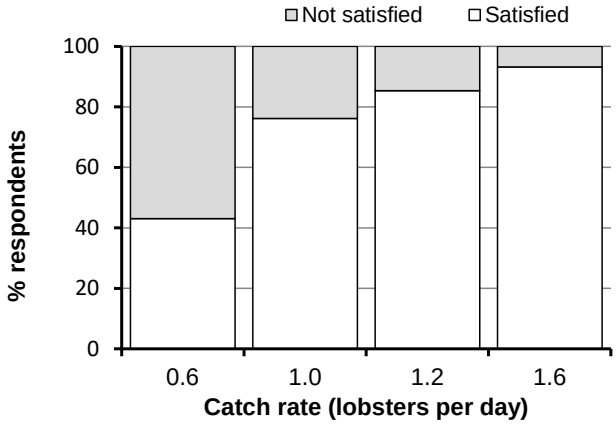



**Fig 14.** Fisher satisfaction with hypothetical lobster catch rates. Number of respondents= 457.

### 3.4.7 Compliance with Regulations

Diarists were asked for their opinions regarding levels of non-compliance with various fisheries regulations using a four-point scale ranging from "very common" to "not at all common". Pulling other fishers' gear and stealing the catch was considered at least quite common by half of the respondents, this was followed by catching lobsters for other licence-holders (40% of respondents) and retaining more than the bag limit (24%), retaining undersized lobsters perceived as the least common form of non-compliance (15%) (Table 13). These findings are generally consistent with those from previous surveys (Lyle et al. 2019a; 2020) and indicate that recreational fishers recognise non-compliance as an issue in this fishery. The actual magnitude of the issue in terms of unaccounted harvest, however, cannot be inferred from these surveys.

As suggested by respondents, and supported by anecdotal reports, catch sharing whereby individuals who catch more than their daily bag limit share the excess catch with other license holders in the same fishing party such that, collectively, no one has more than the bag limit in their possession is a relatively common practice amongst fishers. Respondents were asked whether they considered this practice to be reasonable or acceptable; 349 (76%) out of 456 respondents indicated yes, 94 (21%) no and 13 (3%) were unsure.

**Table 13: Respondents' opinions about non-compliance with certain regulations (n=444)**

| Compliance aspect | Very common | | Quite common | | Not very common | | Not at all common | | Unsure | |
|---|---|---|---|---|---|---|---|---|---|---|
| | No. | % | No. | % | No. | % | No. | % | No. | % |
| Keeping more than daily bag limit | 20 | 4.5 | 89 | 20.0 | 207 | 46.6 | 88 | 19.8 | 40 | 9.0 |
| Keeping undersized lobster | 6 | 1.4 | 57 | 12.8 | 182 | 41.0 | 166 | 37.4 | 33 | 7.4 |
| Pulling other fishers' gear & stealing catch | 52 | 11.7 | 164 | 36.9 | 115 | 25.9 | 74 | 16.7 | 39 | 8.8 |
| Catching lobsters for other licence holders | 32 | 7.2 | 144 | 32.4 | 92 | 20.7 | 109 | 24.5 | 67 | 15.1 |

# 4 DISCUSSION

## 4.1 Catch and effort

### 4.1.1 General trends

The recreational fishery has been monitored using fisher surveys since the mid-1990s during which time rock lobster stock abundances have varied markedly and there have been several management changes, mainly centred on the east coast. State-wide recreational catch, effort and catch rates have declined since the early 2000s, from a peak catch of almost 150 tonnes in 2002-03 (Fig. 15). The initial decline occurred despite a steady increase in licence numbers (refer Fig. 1) and corresponded with a general decline in overall stock abundance (Hartmann et al. 2019) and subsequent changes to management settings introduced as a component of the ECSRS. Overall, the state-wide harvest has not exceeded the TARC allocation of 170 tonnes in any year for which there is survey data. Estimated catches since 2015-16 have been equivalent to half or less of the TARC.

Abalone catches have also declined since the early 2000s (Fig. 16) even though licence numbers continued to grow up until 2008-09 (Fig. 1). The current harvest estimate was the lowest since surveys commenced, and about half that of the previous four seasons (Table 14). The decline in catch has been linked to declining effort and, in the current season, a marked fall in the catch rate that was associated with halving of the Eastern region bag limit (from 10 to 5 abalone per day).

Social (e.g. motivations, availability of time, access), biological (e.g. stock size, catch rates) and environmental (weather) factors all play a role in influencing fisher behaviour and highlight the need to understand the dynamics and drivers of this behaviour. For instance, since the early 2000s the proportion of licence-holders who utilised their licences (i.e. fished) has varied between 86-68% for lobster, and from 63-31% for abalone (Table 14). In the two seasons especially impacted by biotoxin closures (2015-16 and 2017-18) and the current season impacted by coronavirus restrictions about 30% of licence-holders did not fish for lobster. Lack of time (due work and/or family commitments) and the weather were the most commonly cited reasons for not fishing for lobster (and not renewing licences) during 2019-20.

Coupled with this trend has been a general decline in the average number of days fished per season by active fishers for both lobster (8.8 down to 5.5 days) and abalone (4.3 down to 2.4 days), contributing to declines in average seasonal harvest per fisher (from greater than 11 to 4-6 for lobster, and from 23 to 8-14 for abalone) (Table 14). Furthermore, daily harvest rates for lobster have declined since the early 2000s (1.3 to less than 1.0 per day); this decline being most influenced by pot catch rates which fell from 1.0 in 2002-03 to below 0.7 lobster per day in 2015-16 and again in the current season (Table 14).

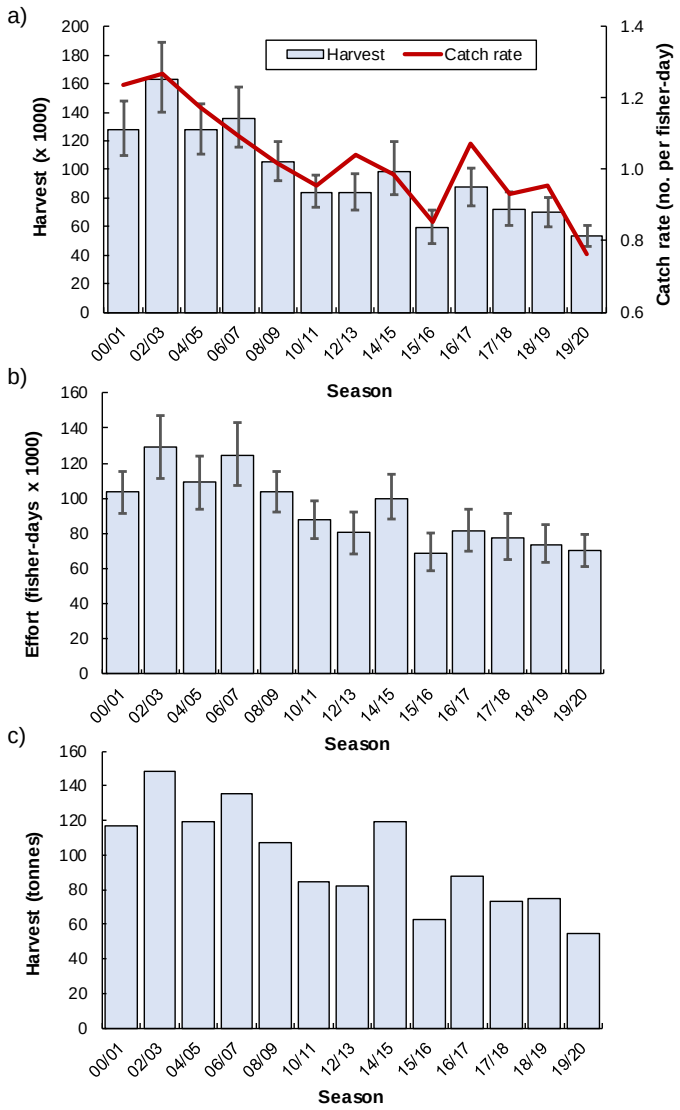



**Fig. 15.** Tasmanian recreational rock lobster fishery: a) estimated state-wide harvest (numbers) and average catch rate (number per fisher-day); b) estimated state-wide harvest (tonnes); c) effort (fisher days) by fishing season. Error bars indicate 95% confidence intervals.

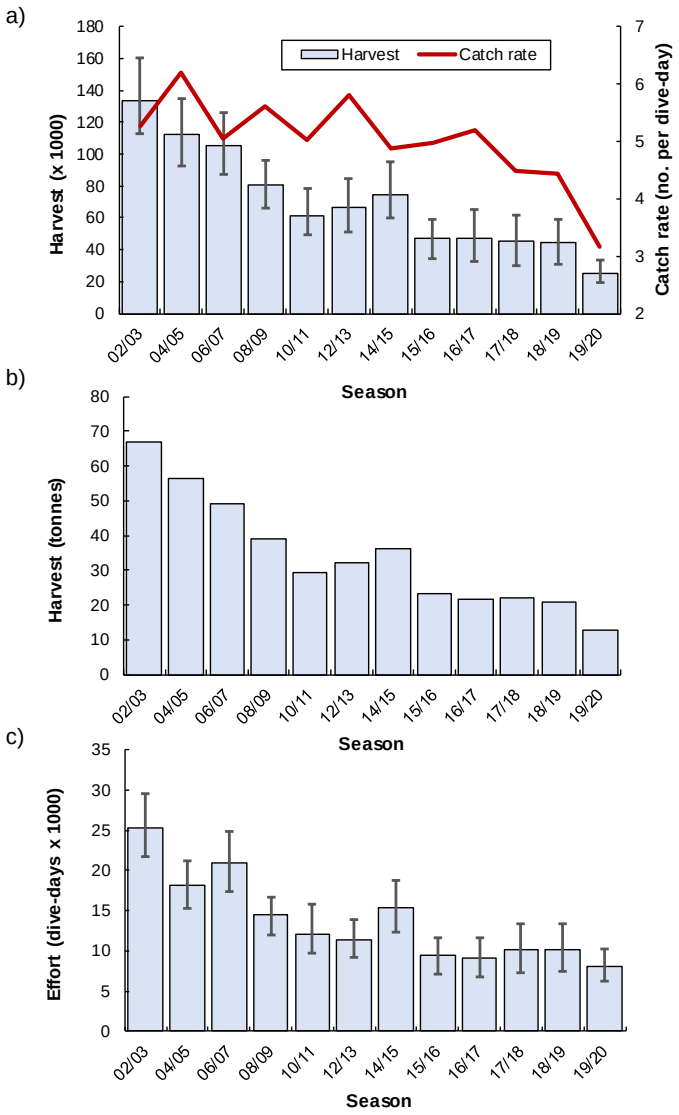



**Fig. 16.** Recreational abalone fishery: a) estimated state-wide harvest (numbers) and average catch rate (number per dive-day); b) estimated state-wide harvest (tonnes), c) effort (drive-days) by fishing season. Error bars indicate 95% confidence interval on estimates.

**Table 14. 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

| | Licence year | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 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* |
| **Rock lobster** | | | | | | | | | | | | | |
| No. licence holders | 13,265 | 15,580 | 16,710 | 20,008 | 21,351 | 19,519 | 18,185 | 19,306 | 16,810 | 18,009 | 17,162 | 18,080 | 17,182 |
| % fished | 86.5 | 88.4 | 81.9 | 78.4 | 75.2 | 71.7 | 76.0 | 75.4 | 68.4 | 76.0 | 69.9 | 73.2 | 70.4 |
| No. active fishers | 11,408 | 14,308 | 13,679 | 15,687 | 16,050 | 13,997 | 13,814 | 14,552 | 11,500 | 13,686 | 12,004 | 13,239 | 12,090 |
| Harvest (no.) | 128,219 | 163,454 | 127,987 | 135,592 | 105,538 | 83,472 | 83,772 | 98,442 | 58,805 | 87,650 | 72,009 | 70,100 | 53,655 |
| Harvest (kg) | 116,509 | 148,526 | 119,354 | 135,067 | 107,027 | 84,261 | 81,849 | 118,996 | 63,022 | 87,941 | 73,187 | 74,982 | 54,345 |
| Av. no. per active fisher | 11.2 | 11.4 | 9.4 | 8.6 | 6.6 | 6.0 | 6.1 | 6.8 | 5.1 | 6.4 | 6.0 | 5.3 | 4.4 |
| Fisher days | 100,866 | 125,898 | 109,788 | 124,305 | 103,985 | 87,617 | 85,849 | 101,699 | 69,920 | 81,690 | 77,209 | 73,327 | 70,473 |
| Av. days per active fisher | 8.8 | 8.8 | 8.0 | 7.9 | 6.5 | 6.3 | 6.2 | 7.0 | 6.1 | 6.0 | 6.4 | 5.5 | 5.8 |
| Av. daily harvest (no.) | 1.27 | 1.30 | 1.17 | 1.09 | 1.01 | 0.95 | 0.98 | 0.97 | 0.84 | 1.07 | 0.93 | 0.96 | 0.76 |
| Av. daily pot-harvest (no.) | 0.87 | 1.00 | 0.90 | 0.94 | 0.75 | 0.68 | 0.78 | 0.71 | 0.65 | 0.87 | 0.74 | 0.74 | 0.62 |
| Av. daily dive-harvest (no.) | 2.61 | 2.30 | 2.31 | 2.15 | 2.27 | 2.36 | 1.83 | 1.92 | 1.61 | 1.90 | 1.59 | 1.67 | 1.27 |
| **Abalone** | | | | | | | | | | | | | |
| No. licence holders | | 9,272 | 10,133 | 12,514 | 12,976 | 11,972 | 11,157 | 12,084 | 10,509 | 11,035 | 10,797 | 11,127 | 10,600 |
| % fished | | 63.5 | 55.8 | 52.3 | 38.8 | 36.3 | 42.0 | 42.4 | 37.9 | 33.5 | 30.7 | 35.9 | 31.5 |
| No. active fishers | | 5,853 | 5,653 | 6,542 | 5,033 | 4,349 | 4,682 | 5,126 | 3,896 | 3,695 | 3,313 | 3,990 | 3,341 |
| Harvest (no.) | | 133,711 | 112,571 | 105,515 | 81,021 | 60,943 | 66,438 | 74,769 | 47,113 | 47,522 | 45,142 | 44,740 | 28,150 |
| Harvest (kg) | | 66,857 | 56,283 | 49,022 | 39,024 | 29,438 | 32,138 | 36,047 | 23,081 | 21,590 | 22,124 | 20,963 | 12,642 |
| Av. no. per active fisher | | 22.8 | 19.9 | 16.1 | 16.1 | 14.0 | 14.2 | 14.6 | 12.1 | 12.9 | 13.6 | 11.2 | 8.4 |
| Fisher days | | 25,342 | 18,185 | 23,201 | 14,445 | 12,117 | 11,428 | 15,110 | 9,548 | 9,136 | 10,079 | 10,081 | 8,064 |
| Av. days per active fisher | | 4.3 | 3.2 | 3.5 | 2.9 | 2.8 | 2.4 | 2.9 | 2.5 | 2.5 | 3.0 | 2.5 | 2.4 |
| Av. daily harvest (no.) | | 5.28 | 6.19 | 4.55 | 5.61 | 5.03 | 5.81 | 4.95 | 4.93 | 5.20 | 4.48 | 4.44 | 3.49 |

### 4.1.2 Fishing methods

Pots have consistently represented the main method used to catch rock lobster and apart from 2000-01, have accounted for 58-67% of the total harvest numbers in each of the years surveyed (Fig. 17). Dive methods have typically accounted for about a third of the harvest in all seasons apart from 2000-01, when divers were estimated to have taken 44% of the total. The reason for the apparent increase in the dive harvest proportion in that year was unclear and has not been evident in subsequent seasons. Rings represent a minor component of the fishery.

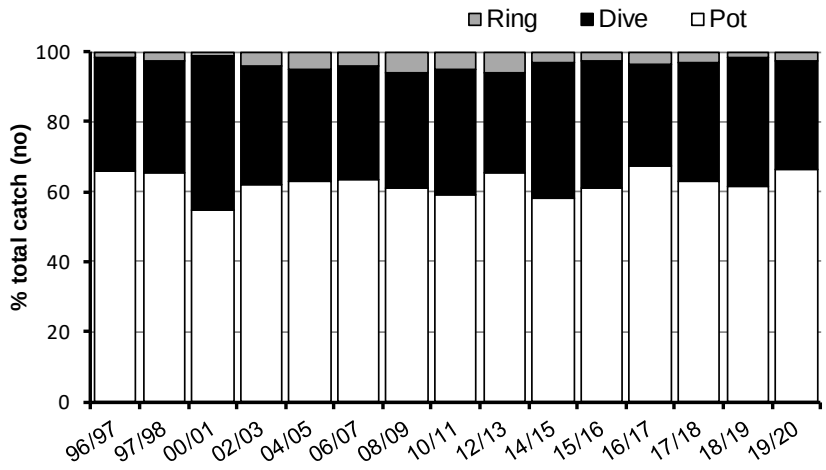



**Fig. 17.** Proportion of the rock lobster harvest by method and fishing season

### 4.1.3 Catch rates

The average daily harvest rate for pots (0.62 lobster) during 2019-20 was slightly lower than levels experienced between 2008-09 and 2014-15 when the daily bag limit was up to five and not two, as currently applies to the main segment of the fishery (Table 14). This suggests that pot catch rates have remained largely insensitive to these bag limit changes, confirmed by two decades of survey data indicating that catches of two or more lobster per pot day are rare. Pot catch rates are, however, more likely to be responsive to trends in rock lobster abundance and the trend in pot catch rates over the past decade has been consistent with changes in rock lobster population biomass (Hartmann *et al*. 2019). Dive catch rates, by contrast, have tended to fluctuate without obvious trend, apart from the obvious step down to below 2.0 lobsters per day since 2012-13 that corresponded with the reduction in the Eastern region bag limit. Unlike pots which are dependent upon lobster availability and catchability (behaviour), divers actively search for lobster and are able to maintain catch rates by increasing search times such that a relatively high proportion of trips achieve the bag limits.

Catch per unit effort represents an important metric in assessing fishery performance; as an indicator of stock biomass, economic performance in commercial fisheries and, as suggested by this study, an indicator of recreational satisfaction against which fishery performance could be assessed.

Apart from the current season, abalone catch rates have fluctuated without obvious trend through time, reflecting the fact that many divers regularly attain the bag limit. The average daily harvest rate for 2019-20 was the lowest on record (3.5), impacted by the

bag limit reduction that applied to the main region of the fishery (noting that the reduced bag limit was attained in about half of all dives).

Bag limits represent a key management strategy to constrain recreational rock lobster and abalone catches in Tasmania. As discussed above, bag limits have a less obvious impact on pot catches, with 15% of the pot effort in the Eastern region and 4% of the pot effort in the Western region resulting in the respective bag limits being achieved during 2019-20. By contrast, bag limits had a more obvious impact on dive catches, with 50% of the dive effort in the Eastern region and 11% of the dive effort in the Western region resulting in the bag limits being achieved. For divers, artificial breathing apparatus (hookah and scuba) conferred a clear advantage when targeting rock lobster, as reflected in catch rates and incidence of the bag limit being attained. Hookah and scuba were less of an advantage when diving for abalone, with free-diving proving particularly successful for this species.

### 4.1.4 Regional patterns

The recreational rock lobster and abalone fisheries are concentrated off the southeast and east coasts of Tasmania, with Areas 1-3 accounting for 75 and 77% of the harvest (by number), respectively. The remainder of the rock lobster harvest was split more or less evenly between the north (Areas 4 & 5) and west coasts (Areas 6-8). For abalone the north coast was slightly more important than the west coast, the former accounting for about 13% and the latter about 10% of the state-wide recreational harvest.

The intensity of the fishing activity off the southeast and east coasts reflects a combination of factors, including sheltered and accessible waters and proximity to major population and holiday centres. Factors such as accessibility of suitable reef habitat off the north coast (apart from the Bass Strait islands), and exposure to unfavourable sea conditions and limited access points off the west coast, contribute to the lower levels of recreational fishing pressure observed in those regions. Despite this, catch rates for rock lobster and abalone tend to be higher off the west coast than elsewhere, this region representing a very significant area for both commercial rock lobster and abalone fisheries (Hartmann *et al*. 2019, Mundy & Jones 2017).

There is considerable regional variability in the relative importance of the various rock lobster fishing methods. Pot catches clearly dominate the harvest off the southeast and east coasts, whereas dive collection is the dominant method off the north west coast. Pots, dive collection, and rings are each locally important in the west coast areas. Such method-based regional differences are consistent with patterns observed in previous seasons (Lyle 2000, 2008, 2018, Forward & Lyle 2002, Lyle & Morton 2004, 2006, Lyle & Tracey 2010, 2012, 2014, 2016a,b, 2017, Lyle et al. 2019a).

## 4.2 Management Implications

The 2018-19 rock lobster harvest estimate of 54.3 tonnes represented 32% the TARC (170 tonnes) and was equivalent to 4.4% of the 2019-20 TAC[9] (1,220.7 tonnes). Although this survey did not cover fishing activity that may have occurred between May and August (noting that the Eastern region was closed during that period), previous surveys have consistently indicated that recreational effort during the winter months is low and catches generally account for less than 5% of the seasonal totals. It can be concluded that the 2019-20 recreational catch did not, therefore, breach this management reference point.

[9] TACC plus TARC

The east coast (Areas 1-3) catch of 39.3 tonnes compares with 53.5 tonnes in 2018-19, with 45.3 tonnes in 2017-18, 50.2 tonnes in 2016-17 and 36.7 tonnes in 2015-16; the lower catch in 2015-16 being influenced by widespread biotoxin closures. In 2018 the east coast stock rebuilding zone was amended to exclude waters south of Bruny Island, thereby focusing the rebuilding strategy in the area where stocks are in poorest condition (DPIPWE 2018). A consequence of this reduced area has been that the target catch level for the recreational sector within the ECSRZ was set at 35 tonnes for 2019-20. When east coast recreational catches are limited to the rebuilding zone the total estimated catch was 33.6 tonnes in 2019-20 indicating that the notional catch share target was not exceeded and in fact there was an 'under catch' or 1.4 tonnes, or about 4%. Significantly, however, despite many fishers reporting that the COVID-19 restrictions had impacted the amount of fishing for lobster that they had expected to do this season, this under catch was only small. It is likely, therefore, that under normal conditions that the catch target would have been reached and probably exceeded.

Recreational ECSRZ catches have exceeded the stated notional catch share in most years since 2014-15, exceptions being an under catch of 6.3 tonnes in 2015-16 while in 2017-18 the catch target was effectively equalled (refer Table 15). In both of these years, however, biotoxin closures during peak fishing periods resulted in marked reductions in recreational effort (and catch), indicating that current management settings alone have been insufficient to constrain east coast catches to within recreational catch targets.

**Table 15. East Coast Stock Rebuilding Zone recreational catches relative to catch targets.**

| Season | 2014-15 | 2015-16 | 2016-17 | 2017-18 | 2018-19 | 2019-20 |
|---|---|---|---|---|---|---|
| Catch target | 42 t | 42 t | 42 t | 41 t | 40 t | 35 t |
| Catch estimate | 55.6 t | 35.7 t | 50.2 t | 40.4 t | 48.6 t | 33.6 t |
| Over/under catch | +13.6 t | - 6.3 t | + 8.2 t | - 0.6 t | + 8.6 t | -1.4 t |
| Relative difference | + 32% | - 15% | + 19% | - 1% | + 21% | - 4% |

Monitoring this fishery through time has revealed that the recreational sector is highly responsive in terms of the number of active fishers (more so than the number of licence-holders) and individual fishing activity levels in relation to changing lobster abundance (refer Table 14). As catch rates are expected to improve under the stock rebuilding strategy it is likely that more individuals will go fishing and fish more often for lobster, representing a major challenge for management in constraining the recreational catch to within the east coast catch share.

The recreational abalone harvest estimate of 12.6 tonnes was equivalent to 1.2% of the 2020 TACC (1,019.5 tonnes), indicating that the recreational fishery represents a minor component of the Tasmanian Abalone Fishery based on catches. While there are no management performance indicators relating to the recreational abalone fishery, there is a need to explicitly include recreational catches into on-going stock assessment 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.

## Acknowledgments

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Our team of proficient and committed interviewers – Shirley, Josephine, Sandra, Jennie, Colleen, Cathy and Frances - 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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