INSTITUTE FOR MARINE AND ANTARCTIC STUDIES
UNIVERSITY OF TASMANIA

UNDERSTANDING INTERACTIONS AND COMPETITION OVER ROCK LOBSTER RESOURCE ACCESS OFF THE EAST COAST OF TASMANIA

J.M. Lyle, K. Hartmann, B. Green
C. Gardner, and R. Colquhoun

June 2012

translatingnatureintoknowledge
www.imas.utas.edu.au

Institute for Marine and Antarctic Studies, University of Tasmania, Private Bag 49, Hobart, Tasmania 7001. E-mail: Jeremy.Lyle@utas.edu.au

Ph. (03) 6227 7277 Fax (03) 6227 8035

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EXECUTIVE SUMMARY

The east coast of Tasmania, and especially the Tasman Peninsula, is a particularly important region for the recreational rock lobster fishery as well as supporting commercial rock lobster fishing operations. Given recent declines in catch rates and growing competition for dwindling resources there is a need for management action to limit fishery impacts on the rock lobster populations as well as to better understand the interactions between fishers.

This study involved mapping the distribution of recreational and commercial pots through time in an area of the Tasman Peninsula between Deep Glen Bay and Cape Hauy, analysis of commercial logbook data from the Tasman Peninsula and interviews with recreational and commercial fishers. These interviews were designed to identify decision making processes that influence where fishers go fishing and perceptions about the nature of competition and interactions between and within sectors.

Mapping of gear placement revealed considerable overlap in terms of where and when recreational and commercial fishers set their pots within the area surveyed on the Tasman Peninsula. Overall, however, recreational effort tended to be more concentrated closer to the main access points (Pirates Bay and Fortescue Bay boat ramps) whereas commercial effort was spread more evenly throughout the surveyed area.

Recreational pot effort peaked in the survey area immediately following the opening of the season and then declined sharply after the opening weekend. In contrast, commercial effort was low in the survey area immediately following the opening of the commercial season despite effort within the broader Tasman Peninsula region being at its highest level, confirming that early season commercial effort was directed away from the main recreational fishing areas adjacent to the Pirates Bay and Fortescue Bay boat ramps.

Furthermore commercial effort was low during the Christmas/New Year period, suggesting that many commercial fishers take time off at this time of year, thereby reducing interactions/competition with recreational fishers during this period of peak activity for recreational fishers.

The distribution of recreational pot effort revealed no evidence that fishers tend to travel further afield as the season progressed, despite the progressive fish down of stocks close to the main access points.

Previous experience and prevailing or forecasted weather/sea conditions were key factors in determining where fishers deployed their gear, the former being more important amongst recreational fishers whereas the latter was more important for commercial fishers. The presence of other gear was a secondary and minor consideration in deciding where to set gear for most fishers.

The vast majority of fishers reported sighting other gear in the areas they fished on at least half of their fishing trips, the majority acknowledging that the gear included pots from both sectors. Most of the commercial fishers interviewed indicated that they tended to avoid areas where other gear was already present, whereas for the majority of recreational fishers the presence of other gear made little difference to their decision where to fish. At least in terms of interactions with other recreational pot fishers, most considered that this was either not an issue or only a minor issue in respect to crowding on the grounds and fishing enjoyment. By contrast, a greater proportion of the recreational fishers (just under half) considered competition with commercial fishers to be a major issue.

Recreational fishers who expressed a preference for fishing on weekdays and during non-holiday periods did so to reduce potential competition with other fishers. By contrast, those with a stated preference for fishing on weekends and during holiday periods did so mainly in response to opportunity, i.e. being able to work around work and/or family commitments. There was a relatively strong preference amongst recreational potters to fish at the start of the season, mainly due to an expectation of higher catch rates.

Both sectors generally acknowledged that the presence of other pots influenced their catch rates negatively and both expressed concern over the impact that recreational divers had on lobster stocks and the need to further restrict this method. Many recreational fishers also considered that commercial access inshore and especially in areas close to key boat ramps should be restricted or limited to reduce competition and pressure on inshore stocks.

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1 INTRODUCTION

The east coast of Tasmania is important for both commercial and recreational rock lobster fisheries. The region has particular significance for the recreational sector, typically yielding over two-thirds of the total recreational catch (Lyle and Tracey 2012). Catch rates have, however, declined in recent years and competition for the dwindling resources on the east coast has grown, stressing the need for management action to ensure that fishing pressure does not increase, especially in the inshore areas where the two fishing sectors overlap. Related to this, concerns surrounding resource sharing and access have also intensified, highlighting the need to better understand the nature of the interactions and fisher's perceptions of the issues. The Tasman Peninsula represents an area of high interest for recreational rock lobster fishers and an area for which strong opinions and concerns over inter-sectoral competition have been expressed.

The spatial fishing behaviour of rock lobster fishers is subject to a range of environmental, ecological, social, economic and technical factors and remains poorly understood. This study aims to describe the gear setting and ground holding behaviour of rock lobster fishers along selected sections of the Tasman Peninsula, to provide information concerning competition over fishing grounds and to assess fisher perceptions about the nature of the interactions and competition. This study also aims to identify preferences and attitudes towards management options intended to reduce spatial competition over access to the rock lobster resource.

The specific objectives are to:

1. map and analyse the ground holding and gear setting behaviour of rock lobster fishers at selected sites along the Tasman Peninsula coastline.
2. describe rock lobster fisher decision making inputs regarding pot placement during peak periods and throughout the season.
3. identify i) perceptions of resource sharing and ii) fisher preferences for management approaches to resource sharing between the recreational and commercial sectors.

2 MATERIALS AND METHODS

This study mapped the distribution and densities of recreational and commercial pots using boat based studies and commercial logbook data. The boat based study provided high spatial resolution whereas the commercial logbook data provided high temporal solution with continuous coverage during the survey period.

Pot mapping was combined with interviews of recreational and commercial fishers to identify decision making processes that influence where they go fishing, and their perceptions about the nature of competition and interactions between sectors. By comparing observed fishing behaviour with individual fisher perceptions it is possible to objectively understand the nature of the interaction and competition between fishers for rock lobster at the individual fisher and sector levels.

2.1 Mapping of pots

The area between Deep Glen Bay and Cape Hauy (Tasman Peninsula), approximately 49 km of coastline, was surveyed by boat on 22 occasions between November 2010 and April 2011 (Fig. 1). The coastline and known offshore reef areas (including the Hippolytes) was surveyed systematically for the presence of surface buoys, with pots classified as being recreational (buoys marked with a 'P'[1] and licence number) or commercial (buoys marked with the vessel distinguishing mark) and the location of each pot recorded using a GPS unit. Spatial dispersal of effort by sector and extent of spatial overlap of effort through key phases of the fishing season - namely at the start of the season (early November) when only recreational fishers are permitted to fish, at the start of the commercial fishery (mid-November) and during periods of heavy recreational fishing activity, namely during December, January and at Easter were examined.

Pot locations were mapped using GIS software and potting intensity mapped in 3 Ha hexagons (i.e. number of pots per 3 Ha) to reveal how potting effort varied throughout the survey area and between sectors. Minimum (straight line) travel distances from the main access points in the study region (Pirates Bay boat ramp and Fortescue Bay boat ramp) were also determined for each pot.

[1] Buoys attached to recreational gillnets were distinguished by the presence of a 'G' rather than 'P'.

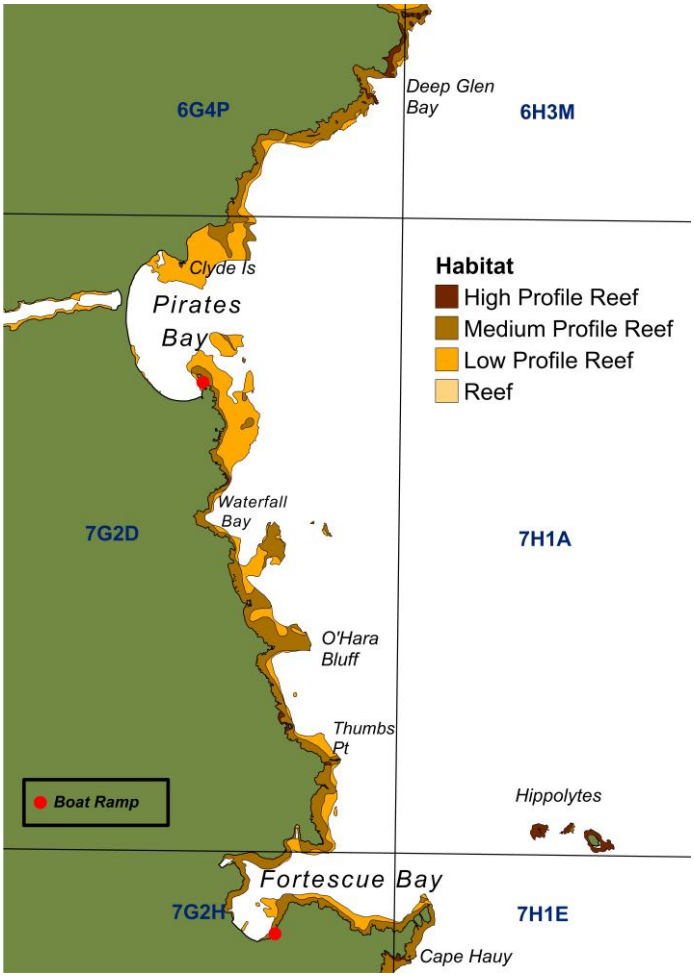

Fig. 1. Map of survey area indicating reef habitat (to 40 m), the location of key access points (boat ramps) and location of commercial fishing block boundaries and their reference codes.

2.2 Commercial logbook data

Commercial effort obtained from this study was compared to commercial effort recorded in logbooks during the study period. Commercial effort is recorded in 0.125 degree blocks, consequently this study completely overlapped one block (7G2D) and partially overlapped three other blocks (7GH2, 6G4P and 7H1E) (Fig. 1). During this study some pots were also observed in offshore blocks (east of 148), however no effort was recorded in these blocks for the entirety of 2010 and 2011. This suggests that fishers are attributing effort in these offshore blocks (which contain minimal fishing ground) to their inshore equivalents.

Data entry of commercial logbook records for February, March and April 2011 was nearly complete at the time of writing, however it is anticipated that effort for these months could increase by up to 10-20% when data entry is completed.

2.3 Stakeholder interviews

2.3.1 Recreational fishers

A sub-sample of licensed recreational rock lobster pot fishers who had participated in the 2010/11 rock lobster fishery survey (Lyle and Tracey 2012) and had fished for at least five days with pots off the east coast of Tasmania was interviewed by telephone at the end of the 2010/11 fishing season (September 2011). Out of a gross sample of 123 eligible licence-holders[2], 120 responded to the survey.

2.3.2 Commercial fishers

There were 22 commercial rock lobster fishers who had reported fishing off the Tasman Peninsula during 2010, ten of whom were surveyed by telephone in April 2012. The responding group accounted for 48% of the total commercial pot effort in the Tasman Peninsula region during 2010 and included four of the five most active commercial operators in that region.

2.3.3 Questionnaires

The survey was administered as a structured questionnaire in which a series of questions was asked of both sectors. Questions addressed factors in deciding where to fish, the impacts of other gear in the water in decision making, influence of other gear on catch rates, factors that influenced when recreational potters went fishing, and the need for further management measures to reduce completion between fishers and between sectors.

[2] Eligibility was also based on respondent's age, being limited to those 18 years or older.

3 RESULTS

3.1 Placement of pots

Almost 2500 pots were recorded during the surveys, representing an average of 113 pots per day within the survey area (range 23-246 per day), with overall pot numbers distributed equally between recreational and commercial sectors (Table 1). On average, however, there were 57 recreational pots (range 0–242) within the area each day compared with an average of 66 commercial pots (range 16-124) , noting that there were three fewer days surveyed when commercial fishing was permitted.

Table 1 Sampling details and number and proportion of pots by sector for the survey area.
Weekend or public holidays are indicated in bold. Na not applicable

		No. of pots			
Date	**Days since start of season**	**Recreational**	**Commercial**	**Total**	**% rec**
06/11/2010	**0**	**242**	**na**	**242**	**100**
08/11/2010	2	136	na	136	100
14/11/2010	**8**	**75**	**na**	**75**	**100**
15/11/2010	9	70	24	94	74
19/12/2010	**43**	**51**	**80**	**131**	**39**
20/12/2010	44	35	124	159	22
22/12/2010	46	32	99	131	24
30/12/2010	**54**	**158**	**16**	**174**	**91**
31/12/2010	**55**	**127**	**26**	**153**	**83**
17/01/2011	72	15	8	23	65
19/01/2011	74	21	33	54	39
25/01/2011	80	33	49	82	40
26/01/2011	**81**	**33**	**35**	**68**	**49**
27/01/2011	82	54	34	88	61
06/04/2011	151	9	121	130	7
07/04/2011	152	6	109	115	5
10/04/2011	**155**	**4**	**62**	**66**	**6**
17/04/2011	**162**	**0**	**90**	**90**	**0**
18/04/2011	163	6	90	96	6
22/04/2011	**167**	**36**	**100**	**136**	**26**
23/04/2011	**168**	**55**	**98**	**153**	**36**
24/04/2011	**169**	**50**	**48**	**98**	**51**
Total		1248	1246	2494	50

Recreational effort peaked on the first day of the season (6 November), with 242 pots set in the survey area and then declined rapidly to a third of this level by the following weekend (Table 1, Fig. 2A). Relatively high levels of recreational effort (>125 pots) were evident in the lead up to New Year's day but at other times, including Easter, effort levels were

generally low (< 50 pots). Commercial effort in the survey area was quite variable, with relatively few pots set in the area at the start of the commercial season (15 November) and around the New Year holiday period. As the season progressed (April) and with recreational effort low, commercial effort was relatively consistent, with two to three vessels (based on the number of pots observed and vessel identification marks) fishing regularly within the survey area.

Overall pot effort exceeded the daily average (113 pots) at the start of the season, during the Christmas/New Year period and at Easter (Fig. 2A). Proportionally, recreational effort exceeded commercial effort at the start of the season (November), in late December and fluctuated in significance during January (Fig. 2B). By April, commercial effort generally exceeded recreational effort.

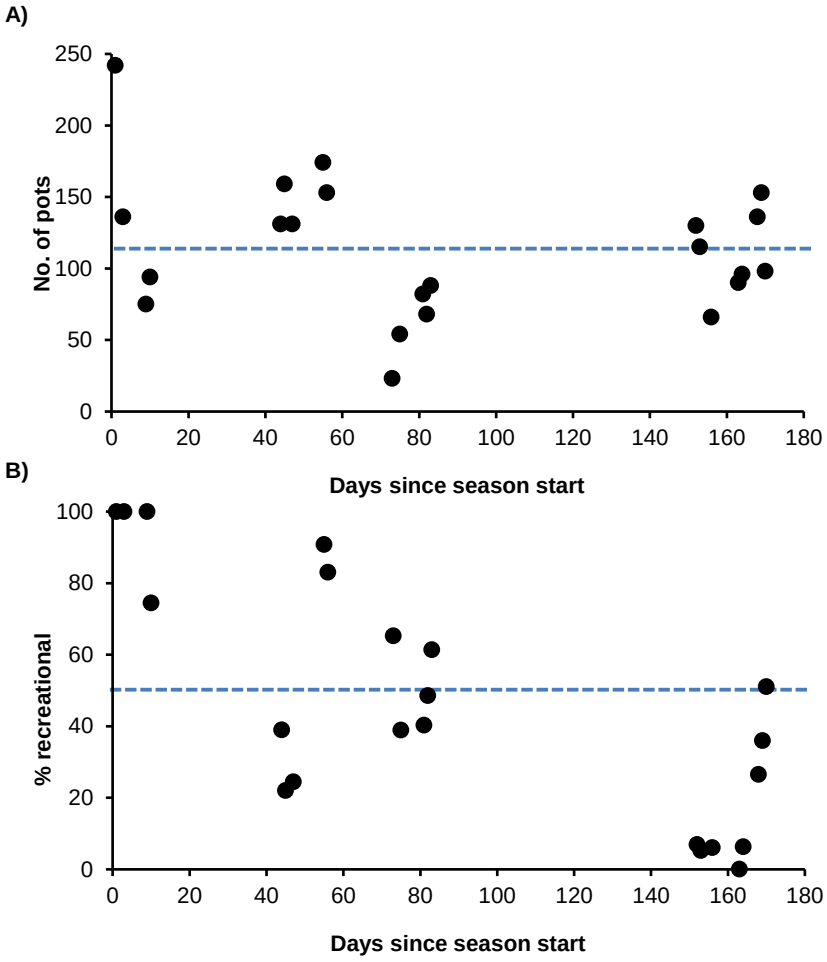

Fig 2. A) Number of rock lobster pots and B) proportion of recreational pots located within the survey area since the start of the season (6 November)

Recreational and commercial potting effort was distributed throughout the inshore reef area within the survey area, and for the most part pot placements for the two sectors overlapped (Fig. 3). The only area of inshore reef that recreational effort was particularly sparse was the region south of Waterfall Bay (in particular south of O'Hara Bluff) through to Thumbs Point,

it is unclear whether this is an artefact of limited sampling or reflects a degree of spatial segregation between sectors, possibly influenced by the distance from the nearest access points.

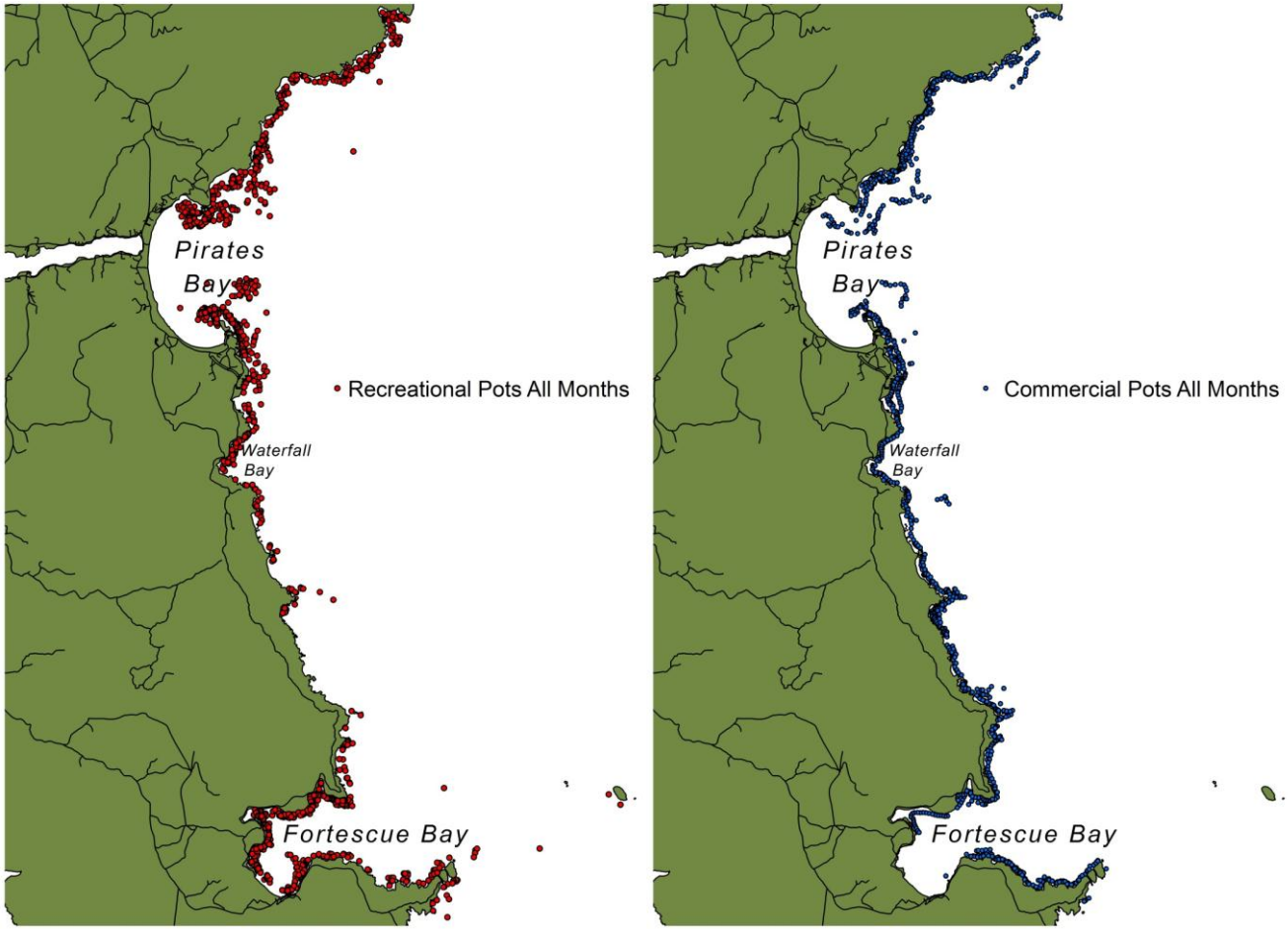

Fig 3. Maps showing the location of all recreational (left) and commercial (right) lobster pots encountered during the surveys.

Recreational potting effort intensity was relatively high on the reef immediately adjacent to the Pirates Bay, at the northern end of Pirates Bay (around Clyde Island), and along the northern shore of Fortescue Bay (Fig. 4). By contrast, commercial effort was most intense further north of Pirates Bay towards Deep Glen Bay as well as around O'Hara Bluff.

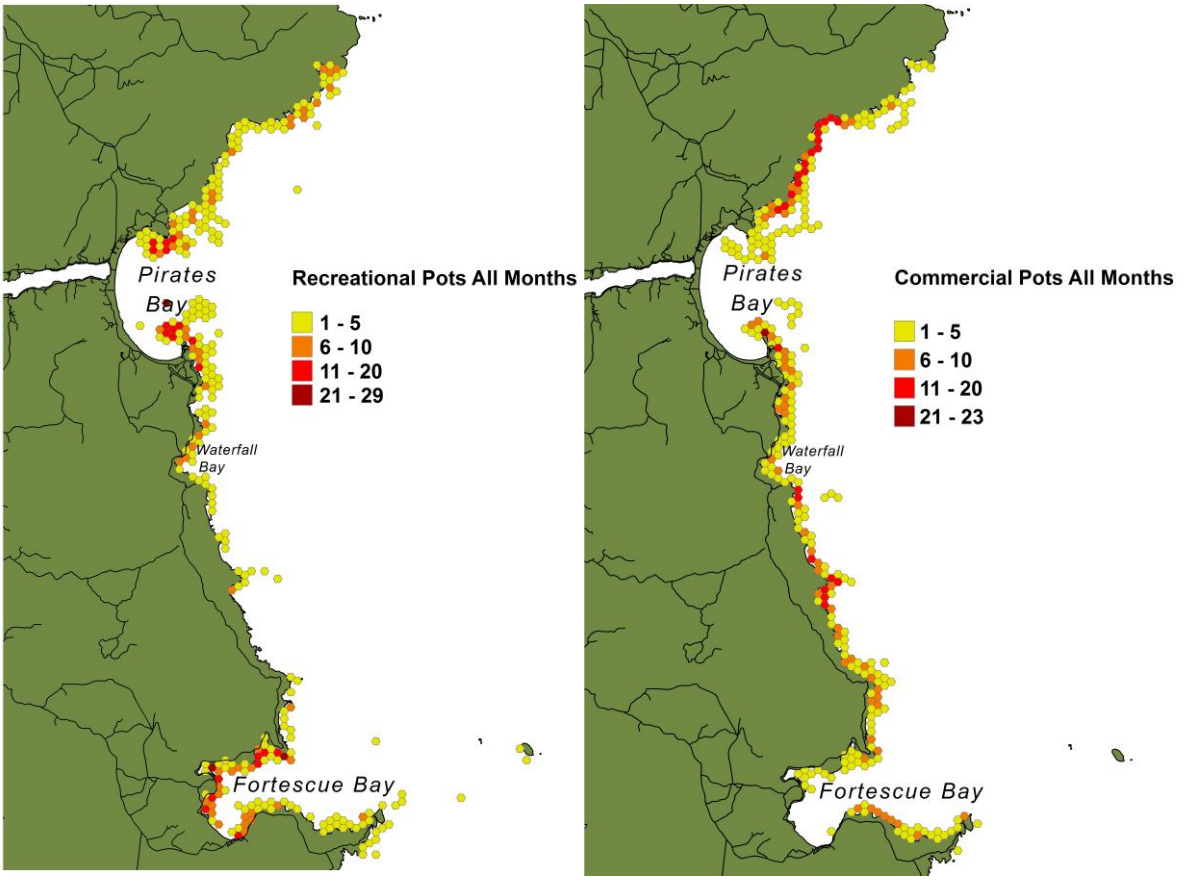

Fig. 4. Maps showing relative effort based on 3 Ha hexagons for recreational (left) and commercial (right) pots

The dispersal of recreational effort in relation to proximity to key access points can be expressed in terms of the shortest straight line distance from either Pirates Bay or Fortescue Bay boat ramps to each pot. There was no evidence to suggest that recreational fishers tend to fish further afield as the season progresses, with the average shortest distance of close to 2.5 km in each of the months surveyed (Table 2). An alternative way of representing the data is to compare the distance frequency distributions through time (Fig. 5). Although there was some variability in the location of the modes (501-999 m in November, 2501-2999 m in December/January and 1000-1499 m in April) over 80% of all pots were set within 4 km (straight line) of the nearest access point in each instance. A secondary peak of effort at around at around 6 km was apparent in April, almost exclusively pots set north of Pirates Bay.

A similar analysis of commercial data was not undertaken for two main reasons; first the fleet is less limited in its capacity to cover relatively large distances and second, commercial operators are entitled to use up to 50 pots and thus the distribution of individual pots are not independent. In practice commercial operators generally set their gear in a continuous line following the coastline or area of reef.

Table 2. Shortest distance (m) from an access point (either Pirates Bay or Fortescue boat ramp) to each recreational pot (average and standard deviation) by month

Month	Av distance (m)	SD	No. pots
November	2,610	2091	523
December	2,525	1927	403
January	2,500	1549	156
April	2,530	1942	166

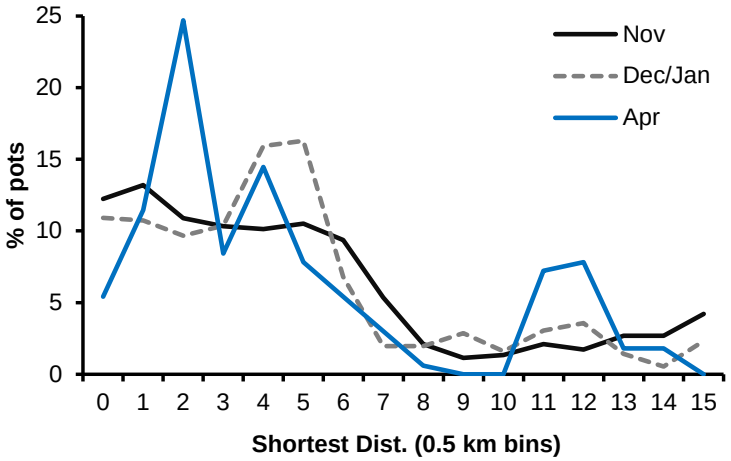

Fig 4. Shortest distance from an access point (either Pirates Bay or Fortescue Bay boat ramp) and the location of recreational pots (by 0.5 km bins) at different stages of the fishing season.

3.2 Commercial logbook data

3.2.1 Comparison with the pot survey

The commercial logbook data offers the opportunity to provide the temporal resolution that a field survey is unable to provide. A prerequisite for using the commercial logbook data for this study or any study conducted at this spatial scale is the existence of a good correlation with the pot survey on those days on which it was conducted. Table 3 shows the number of pots that were surveyed and recorded in commercial logbooks. The data from the commercial logbooks has also been split by depth with a limit of 25 m to account for the possibility of some deeper ground being inadequately covered by the survey. Block 7G2D was covered entirely by the survey and consequently should provide a good match to the logbook data. The survey counted 50% of the pots recorded in the logbooks or 62% when pots set in >25 m are excluded.

The survey provides a snapshot of the number of pots in the water at one time during the day whereas the logbooks provide indicate the number of pot-lifts[3] hence they provide an upper bound for the survey. The difference in magnitude is not in itself a concern as long as the two measures correlate. Hence a series of linear regressions was conducted between the two sources of data. The first regressions considered each block in turn. Table 3 shows the corresponding r-squared values; these are extremely low given that the two datasets should be highly correlated. Fig. 5 compares the pot measurements for block 7G2D and provides a visual indication of the low correlation between the two data sources.

The limited relationship between the two sources of commercial effort data is remarkable, especially in the block completely included in the survey. Possible causes for this discrepancy include:

- survey timing that is inconsistent with the timing of commercial shots (especially night shots and double night shots)
- commercial fishers consistently reporting effort against the wrong block and/or depth (e.g. attributing effort in 7H1E to 7G2H)
- simplification in the logbooks -- each shot only has a single entry, hence a shot across a block boundary will be fully allocated to one of the blocks, thereby creating a mismatch with the survey data.

Table 3. The total number of pots in each block on the days that the survey was conducted. Results from the survey and the commercial logbooks are shown. A subset of data from the logbooks with depths under 25 m (shallow) is also shown.

		Surveyed Pots		Logbook Pots		
Block	Location	Rec.	Comm.	Shallow	Total	R-Squared
6G4P	North	200	279	183	275	0.02
7G2D	Middle	730	824	1323	1645	0.28
7G2H	South	279	117	599	1261	0.16
7H1E	Southeast	36	25	0	0	N/A

[3] Excluding multiple pot-lifts in a day reduces the estimate of pot effort (expressed as pot-days) by about 4%.

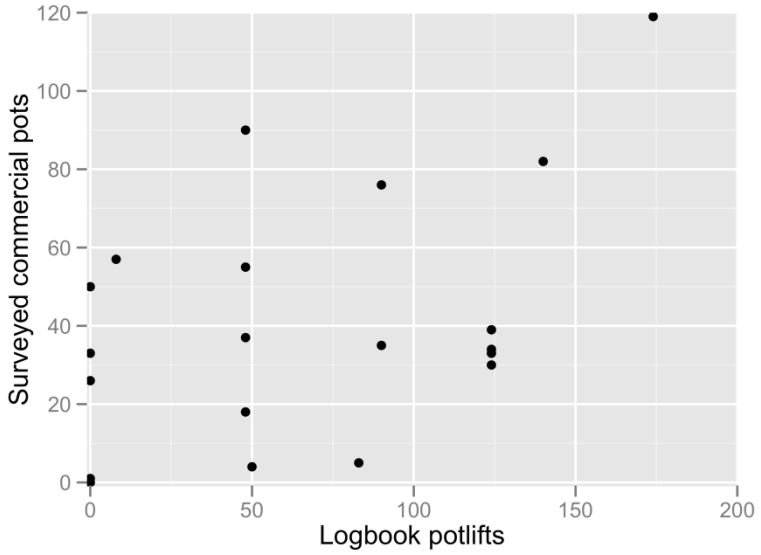

Fig. 5: The commercial pot count from the survey plotted against the logbook count on the same dates. Both datasets were restricted to 7G2D. Each point corresponds to a single survey date.

3.2.2 Temporal patterns in logbook data

The logbook data was used to explore temporal patterns that cannot be examined with the survey data due to the limited number of survey dates. Based on the results in the previous section our analysis was restricted to the blocks with the best correlation between logbook and survey data. Pot-lifts from the logbooks during the study period are shown in Fig. 6 alongside survey results for the same two blocks. This figure illustrates that:

a. recreational effort is subsiding from an initial peak as the commercial season begins
b. commercial effort is highest from opening through to ~22nd December, decreasing before the recreational peak over Christmas/New Year.
c. commercial effort resumes at a lower level on 2nd January before increasing in February.
d. commercial effort is low in the new quota year (March 2011 onwards), however this may increase by up to 20% as data entry for this period is incomplete.

These results are consistent with the findings in Section 3.1, however they further highlight that the peak periods for the commercial fishery (opening to 22nd December and February) do not coincide with peak periods in the recreational fishery. To formalize this a linear regression was conducted between the surveyed number of commercial and recreational pots. This showed a significant negative correlation that was largely driven by two New Year weekend samples. Omitting these no relationship was evident. This indicates that the two sectors are targeting different periods and are not necessarily actively avoiding each other's peak periods.

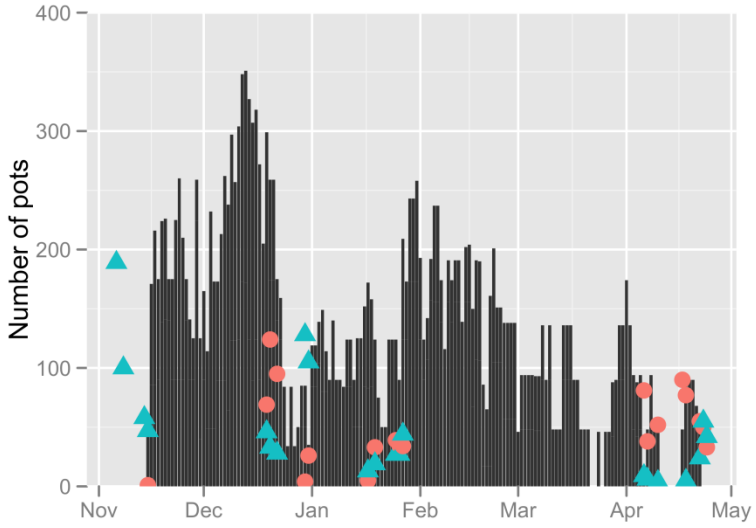

Fig. 6 The number of pots during the study period in blocks 7G2D and 7G2H. The black bars indicated commercial pot-lifts from logbooks occurring in waters < 25 m. The orange circles are recreational pot counts from the survey and the green triangles are commercial pot counts from the survey.

3.3 Stakeholder Interviews

3.3.1 Decision making – where to fish

Respondents were asked to think back to the first day that they set their pots in the season (not necessarily November for recreational potters) and identify which factors were important in determining where they set the gear, noting that there may be multiple contributing factors. Previous experience and prevailing or forecasted weather/sea conditions were the most commonly cited reasons amongst recreational fishers whereas all commercial fishers cited that weather/ sea conditions was an important factor and to a lesser extent previous experience (Table 4). Proximity to launching point, advice of others and simple guess work were secondary factors for recreational fishers. The presence of other gear in the water was cited as a minor factor by both sectors, the response to which was not determined (either as a place suggesting that it could be a good place to fish or as a place to avoid). In terms of the single main factor influencing where fishers set their gear for the first time in the season previous experience was the most commonly cited factor identified by recreational fishers whereas weather/sea conditions was the primary factor for commercial fishers.

Table 4. Factors identified by respondents as being important (mention) and most important (main) when deciding where to set pot(s) for the first time, at the start of the fishing season.
Rec recreational fishers, Comm commercial fishers

	Mention		Main factor	
	Rec	Comm	Rec	Comm
Factors	**%**	**%**	**%**	**%**
Previous experience	67	40	48	10
Prevailing or forecasted weather/sea conditions	57	100	28	90
Close to launching point (i.e. convenience)	26	-	8	-
Advice of others	16	-	5	-
Gut feeling/guess work	15	-	6	-
Presence of other gear in the water, whether acting as a guide or place to avoid	12	20	3	-
Other factors	5	-	3	-
No. of respondents	120	10	119	10

Respondents were re-asked the previous questions but as they related to subsequent fishing during the rock lobster season. The main difference in the relative importance of factors was the greater reliance on previous experience in determining where gear was set for commercial fishers, although weather and sea conditions remained the most commonly cited factor (Table 5). The presence of other gear in the water remained a minor factor for both sectors in determining where they set their pots.

Table 5. Factors identified by respondents as being important (mention) and most important (main) when deciding where to set their pot(s) for subsequent days fishing during the season.
Rec recreational fishers, Comm commercial fishers

	Mention		Main factor	
	Rec	Comm	Rec	Comm
Factors	**%**	**%**	**%**	**%**
Previous experience	60	80	42	20
Prevailing or forecasted weather/sea conditions	51	100	36	70
Close to launching point (i.e. convenience)	24	-	8	-
Advice of others	10	-	2	-
Gut feeling/guess work	22	-	8	-
Presence of other gear in the water, whether acting as a guide or place to avoid	13	20	1	10
Other factors	11	-	5	-
No. of respondents	119	10	119	10

3.3.2 Decision making – when to fish

Whereas commercial fishers have economic imperatives that drive when they go fishing recreational fishers respond to a range of social factors that include opportunity (when set against other demands or commitments) and experiential expectations (catch something, reduced competition, spend time with friends and family, being on the water, etc).

Recreational fishers were asked whether they preferred to go fishing for rock lobster on weekends and public holidays, weekdays or whenever they were able. Almost half indicated no specific preference (whenever they were able), the remainder were split more or less evenly between weekend/public holidays and weekdays (Table 6). Respondents who indicated a preference were asked about their reasons for their choice; the main reason for fishing weekend and holiday periods was opportunity (working around other commitments) whereas for those who preferred weekdays the primary reason cited was to reduce competition with other fishers.

Table 6. Recreational fishers' preference for day type when fishing for rock lobster.

Preferred day type	%
Weekend & public holidays	28
Weekdays	24
No specific preference	48
No. of respondents	120

Respondents were also asked what period of the season they most preferred to fish for rock lobster (not necessarily when they fished), with presented options being at the start of the season, Christmas holiday period, Easter, outside the main holiday periods or at no specific times. Almost 40% of respondents elected for the start of the season, this was followed in descending order by no specific times, Christmas, and non-holiday periods (Table 7). The main reason cited by those respondents who reported start of the season was that catch rates tended to be higher than at other times, for those who opted for Christmas holiday period opportunity to take time off from other commitments was the main reason cited, while the preference for non-holiday periods was mainly related to less competition with other fishers.

Table 7. Recreational fisher's preferred period during the season to fish for rock lobster

Preferred period	%
Start of season	39
Christmas	20
Easter	3
Non-holiday periods	11
No specific time	28
No. of respondents	120

3.3.3 Interactions with other fishers

Respondents were asked several questions relating to interactions with other fishers' gear whilst fishing for rock lobster. The vast majority of fishers from both sectors reported observing other pots in the vicinity of where they had intended or where they actually set their own gear during the fishing season on at least half of the occasions they potted for rock lobster (Table 8). When asked whether the gear was mainly recreational, commercial or both the majority noted that the observed gear was both recreational and commercial (Table 9). A quarter of the recreational fishers reported that the observed other gear was mainly recreational pots whereas none of the commercial operators suggested that the gear that they observed was mostly recreational. Responses to the question of whether the presence of other gear influenced decisions about where to fish revealed a much higher response (80%) from commercial fishers to avoid the area compared with recreational fishers (36%) (Table 10). By contrast the presence of other gear had little or no influence on where the majority of recreational fishers set their gear.

Table 8. Response by sector (Rec - recreational; Comm – commercial) to questions relating to how frequently respondents observed other pots in the vicinity of where they intended or actually set their gear (Other pots) and how frequently other fishers set their gear in close proximity to the respondents gear (Crowding).

	Other pots		Crowding	
	Rec	Comm	Rec	Comm
Response	**%**	**%**	**%**	**%**
Almost every time I went fishing	68	80	9	-
Over half of the times I went fishing	24	20	10	40
Hardly ever	8	-	74	60
Unsure	-	-	7	-
No. of respondents	118	10	118	10

Table 9. Response by sector (Rec - recreational; Comm - commercial) to a question relating to whether pots observed in the vicinity of where they intended or actually set their gear were mainly recreational, commercial or both.

	Rec	Comm
Observed other gear	**%**	**%**
Recreational	25	-
Commercial	10	40
Both	62	60
Unsure	4	-
No. respondents	113	10

Table 10. Response by sector (Rec - recreational; Comm - commercial) to a question examining the reaction to the presence of other pots in the area.

Presence of other gear	Rec %	Comm %
Avoid fishing at the location	36	80
Suggest it may be a good spot	6	20
Made little difference to your decision	58	-
No. of respondents	112	10

The concept of 'crowding' of gear was introduced in a question about whether respondents had experienced other fishers setting their gear 'over;' theirs, i.e. in very close proximity. For both sectors the majority of respondents identified this as an infrequent occurrence, just 20% of recreational and 40% of commercial fishers indicated that they had experienced crowding (as defined above) on at least half of their trips (Table 8). For the majority of respondents who reported crowding, the greatest majority identified recreational fishers as the main group responsible (82% of recreational respondents and all commercial respondents) followed by commercial operators (56% of recreational and 75% of commercial respondents) (Table 11).

Table 11. Response by sector (Rec - recreational; Comm - commercial) for those respondents who reported crowding and identified which group were mainly responsible.

Setting over gear	Rec %	Comm %
Recreational	39	25
Commercial	13	-
Both	43	75
Unsure	4	-
No. respondents	23	4

3.3.4 Competition

Respondents were asked whether they considered that the presence of other pots (regardless of sector) in the areas they fished had had a major influence on their catch rates. Almost half of the recreational fishers and over half of the commercial fishers indicated that they believed that their catches rates were affected by the presence of other gear (Table 12), which the majority expressing concern that high localised fishing pressure on rock lobster stocks was an issue. Just over 40% of recreational and 30% of the commercial fishers, however, did not consider other gear had had a major influence on their catch rates.

Table 12. Responses by sector (Rec – recreational; Comm – commercial) to a question about whether the presence of other gear had a major influence on their catch rates of rock lobster

Other gear influence catch rates	Rec %	Comm %
Yes	48	60
No/not really	43	30
Unsure	9	10
No. of respondents	113	10

Recreational fishers were asked whether, in the areas they fished, competition from other recreational pot fishers and/or commercial rock lobster fishers was an issue for their fishing in terms of crowding on the grounds and overall fishing enjoyment. For the majority of respondents, competition with other recreational fishers was either not considered to be an important issue or it was of minor importance, less than 10% considered competition with other recreational fishers to be a major issue (Table 13). Conversely, more 40% of respondents reported that competition with commercial fishers was a major issue with a further 27% identifying it as a minor issue. Less than 30% of recreational respondents indicated that competition with commercial fishers was not an issue for them.

Table 13. Responses for recreational fishers in relation to whether they considered that competition with other recreational pot fishers (Rec pot) or commercial fishers (Comm) was a major, minor or not an issue in terms of crowding on the fishing ground and fishing enjoyment

Competition	Rec pot	Comm
Major	8	42
Minor	34	29
Not issue	56	27
Unsure	2	3
No. of respondents	120	120

Commercial fishers were asked whether they considered that, in the Tasman Peninsula area, recreational pot fishers, recreational divers and/or commercial fishers take too many lobsters The vast majority of respondents considered that commercial fishers do not too many lobster whereas recreational divers do take too many (Table 14). By contrast, respondents were divided over whether they considered that recreational potters take too many lobsters or not.

Table 14. Responses for commercial fishers in relation to whether they considered that recreational pot fishers, recreational divers or commercial fishers take too many lobster from the Tasman Peninsula area

No. respondents 10

	Yes	No	Unsure
Rec potters take too many lobsters	40	40	20
Rec divers take too many lobsters	90	10	-
Commercial fishers take too many lobsters	10	90	-

3.3.5 Management of sectoral competition

All respondents were asked, as an open-ended question, whether they considered that there was a need for additional management measures to reduce competition between commercial and recreational fishers and whether there was a need for additional management measurers to reduce competition within their own sector. In relation to competition between sectors, the majority of commercial fishers indicated that further restrictions were required whereas less than a third of the recreational respondents considered more restrictions were required (Table 15). The vast majority of commercial fishers indicated that there was no need for further restrictions within their sector whereas as just over a third of recreational fishers identified the need for further restrictions to reduce competition with other recreational fishers.

Overwhelmingly the most common suggestion to reduce competition between sectors from recreational fishers related to limiting commercial access to inshore waters and in particular areas in close proximity to key access points. Interestingly, apart from a suggestion that recreational fishers should have individual catch limits, several commercial fishers suggested that the commercial season should open at the same time as the recreational season. In relation to the need for further restrictions to reduce competition within sectors, the majority (75%) of comments from the recreational sector related to the need for increased restrictions on divers, either by prohibiting the use of compressed air (i.e. snorkel only), banning diving all together or reduced bag limits (and greater enforcement).

Table 15. Responses by sector (Rec – recreational; Comm – commercial) to the question of whether further management restrictions were required to reduce competition between sectors and within their own sector.

	Between sectors		Within sector	
Need for further management restrictions	Rec	Comm	Rec	Comm
Yes	31	60	35	10
No	63	40	59	90
Unsure	6	-	6	-
No. respondents	119	10	112	10

4 DISCUSSION

There was considerable overlap in terms of where and when the commercial and recreational fishers set their gear within the area surveyed on the Tasman Peninsula, undoubtedly contributing to perceptions about competition for rock lobsters and access to fishing grounds, not only between sectors but also within each sector. Overall, recreational effort tended to be concentrated closer to the main access points of Pirates Bay and Fortescue Bay boat ramps whereas commercial effort was spread more evenly throughout the region. Notwithstanding this, some commercial pots were often set in close proximity to the access points and as such would have been obvious to recreational fishers, potentially reinforcing the perception that commercial operators selectively fish in areas readily accessible to recreational fishers. Presumably related to this, the most frequently cited response from recreational fishers who considered that commercial operators should be subject to additional management measures was to restrict commercial access inshore and especially in areas in close to key boat ramps.

Recreational pot effort peaked in the survey area immediately following the opening of the season and then declined sharply after the opening weekend, peaking again during the Christmas/New Year holiday period, at which time recreational effort exceeded commercial effort within the survey area. By contrast later in the season (April) commercial effort dominated, with one to three vessels working the area on a regular basis. Overall, mapping and logbook data indicated that commercial effort was relatively low on the Tasman Peninsula during the Christmas/New Year period, implying that many commercial fishers take time off from fishing at this time. This effectively reduced interactions and competition with recreational fishers during what is a peak period for recreational fishing activity (Lyle and Tracey 2012).

Our data did not support anecdotal reports that commercial fishers set large quantities of gear close to access points at the start of the season, in direct competition with recreational fishers, before moving further afield to less accessible areas. On the contrary, while commercial logbook data indicated that effort was high within the Tasman Peninsula region as a whole at the opening of the season, effort within the surveyed area was very low on the opening day. By avoiding areas already heavily fished by recreational fishers (due to the earlier opening of the recreational season) commercial fishers are presumably able to achieve higher catch rates as well as limiting interactions with other fishers.

The distribution of recreational pot effort revealed no evidence that fishers tend to travel further afield as the season progresses and stocks are fished down in the more accessible areas. The most obvious temporal trend was the sharp decline in recreational effort after the Christmas/New Year period, a pattern observed in surveys of the recreational rock lobster fishery (Lyle and Tracey 2012).

Previous experience and prevailing or forecasted weather/sea conditions were key factors determining where fishers deployed their gear, the former being more important amongst recreational fishers and the latter more important for commercial fishers. The presence of

other gear, i.e. direct competition, was a secondary and minor consideration in deciding where to set pots for most fishers.

The vast majority of pot fishers reported sighting other gear in the areas they fished on at least half of the fishing trips, the majority acknowledging that the gear included pots from both sectors. Most of the commercial fishers indicated that they tended to avoid areas where other gear was already present, whereas for the majority of recreational fishers the presence of other gear made little difference to their decision of where to fish. At least in terms of interactions with other recreational pot fishers, most recreational fishers considered that this was either not an issue or only a minor issue in respect to crowding on the grounds and fishing enjoyment. By contrast, a greater proportion of the recreational fishers (just under half) considered competition with commercial fishers was a major issue.

Recreational fishers who expressed a preference for fishing on weekdays and during non-holiday periods did so mainly with the expectation of reduced competition with other fishers. By contrast, those with a stated preference for fishing on weekends and during holiday periods did so mainly in response to opportunity, i.e. being able to work around work and/or family commitments. There was a relatively strong preference amongst recreational potters to fish at the start of the season, mainly in the expectation of higher catch rates. The exclusion of commercial fishers (reduced competition) from the fishery during the first week or so of the season may also be a factor (though not explicated stated by respondents).

Both sectors generally acknowledged that the presence of other gear influenced their catch rates negatively, however, when asked whether recreational potters, divers and/or commercial fishers took too many lobster from the Tasman Peninsula, the vast majority of the commercial fishers surveyed suggested that divers took too many lobsters. Similarly, the majority of recreational pot fishers who expressed a need for further restrictions to reduce competition with other recreational fishers identified that divers should be further restricted. Concern over the impact of divers can be attributed to several factors; dive catch rates tend to be significantly higher than those for pots, divers are able to selectively target larger lobsters (Lyle and Tracey 2012), and the potential for damaging lobsters that either evade capture or are released is higher than for pot caught individuals. To put these concerns into context, it is worth noting that during 2010/11 there were more than twice as many recreational pot licences issued and state-wide pot effort (days fished) was six times greater than that for divers, resulting in the total catch taken by pots being 1.65 times greater (based on numbers) than that taken by divers (Lyle and Tracey 2012). For the south-east coast, including the Tasman Peninsula, divers accounted for about 40% of the recreational catch in 2010/11, the majority of the catch was taken by pot fishers.

An unexpected finding of this study was the large discrepancies between the commercial logbook data and the commercial pot surveys. This may be due to a number of factors which can be categorised as biases with the survey method (timing of some surveys may have corresponded with vessels moving and resetting gear and thus were not counted) and/or misreporting/simplification of location information in logbooks. The former would mean that commercial effort was underestimated by the surveys and the latter indicates that commercial

logbook data may be inappropriate for informing management decisions at the spatial scale that this study was conducted. Regardless, this study has shed light on the nature of the interactions between recreational and commercial sectors; competition between sectors being perceived generally as a significant problem whereas competition within sectors a lesser issue, at least for potters. Both observed and reported behaviour suggest that commercial fishers generally operated in a manner that reduced the level of direct competition with recreational fishers during periods of greatest recreational activity, either by directing effort away from the key access points (November) or taking time off from fishing (Christmas/New Year). Ultimately, however, both sectors are competing for the same resource and thus resource access and share at the level of the individual fisher and for the fishing sector remain an issue. By better understanding how other fishers operate, the potential for conflict over resource access can be reduced.

Acknowledgements

Funding assistance for this study was provided by the Fishwise Community Grants Scheme administered by the Department of Primary Industries, Parks, Water and Environment.

Special thanks are extended to all the staff and volunteers with assisted with the field work, they include Matty Campbell-Ellis, Steve Cooper, Kylie Cahill, Dave Faloon and Sean Tracey. We also acknowledge our team of very capable interviewers- Elizabeth, Helen, Jennie, Sandra, Sheelagh, Shirley and Trish. Vanessa Lucieer provided helpful advice on the analysis of the spatial data.

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

Reference

Lyle, JM and Tracey, SR (2012). Tasmanian recreational rock lobster and abalone fisheries: 2010/11 fishing season. Institute for Marine and Antarctic Studies Report, University of Tasmania, 39p.