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Exploratory Fishing for Rock Lobsters in Offshore Areas near Gisborne

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Contents

Introduction

The commercial fishery for rock lobsters around New Zealand is primarily an inshore, shallow-water, pot fishery, usually within 3 km of the coast in depths of less than 50 fathoms (fm) (about 100 m). Exploratory fishing has been done by commercial fishermen in many offshore areas in the past. However, it was often limited in scale, and information on catches was generally unavailable. Hence, little is known about the distribution and abundance of rock lobsters offshore.

Rock lobsters from offshore areas may contribute to inshore stocks through the movements of juveniles and adults and the production of larvae that settle inshore. Street (1969) suggested that inshore-offshore movements of the red or spiny rock lobster, *Jasus edwardsii*, occur in association with moulting and/or breeding cycles. The estimated long lifespan (12–22 months), and widespread distribution, of rock lobster larvae (Lesser 1978) suggest that larvae hatched offshore may contribute to inshore stocks and vice versa.

One area where rock lobster potting has been done offshore by commercial fishermen is the east coast of the North Island near Gisborne, especially off Mahia Peninsula. Although fishing offshore has not been extensive in recent years, information was available from local fishermen on where rock lobsters were caught. Thus, it was decided to concentrate initial exploratory fishing in this area.

The aims of this study were to:

1. Locate offshore populations of rock lobsters near Gisborne;
2. Determine the catch rates in these areas and compare them with catch rates in the inshore commercial fishery;
3. Determine the size-frequency distributions and sex ratios of the catch;
4. Estimate the size at onset of sexual maturity of females;
5. Investigate movement patterns and estimate growth rates from tag returns.

Methods

Potting was done on three trips on the Fisheries Management Division (Ministry of Agriculture and Fisheries) fisheries technology vessel *W. J. Scott* (April-May 1978, July 1978, and January 1979) and on one trip on the chartered commercial fishing vessel *Lady Sarah* (June 1980). Fishing was concentrated offshore of Mahia Peninsula, though the area near Ariel Rock, and grounds from Tuaheni Bank north to offshore of Anaura Bay, were also investigated (Fig. 1).

Most fishing was at depths from about 90 to 275 m on the continental shelf and upper slope. Fishing was concentrated on areas that appeared rocky on the depth sounder trace, but pots were also set on other bottom types. The pots had frames built of 12-mm-diameter steel, were covered with a synthetic trawl mesh, and had no escape gaps. They ranged in size from $1.0 \times 1.0 \times 0.5$ m to $1.3 \times 1.3 \times 0.5$ m. Bait was obtained from local fish processing sheds and consisted of whole fish and fish "frames" of various species. Details of dates, areas, and depths fished, numbers of pots lifted, and catch rates are shown in Appendix 1.

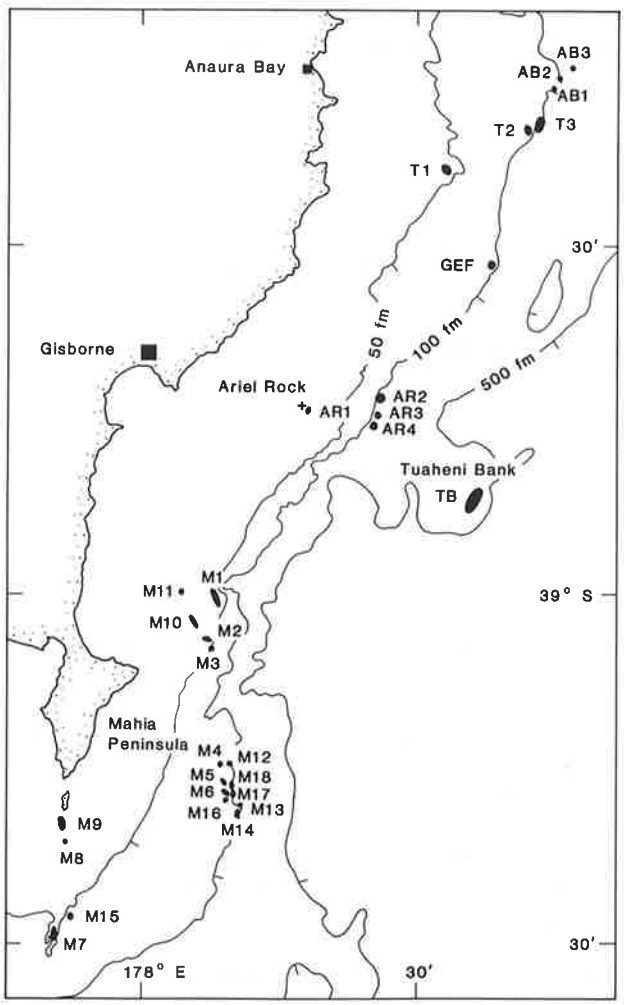

Fig. 1: Offshore areas fished near Gisborne and places mentioned in the text.

All rock lobsters caught were sexed, and their carapace lengths were measured to the nearest 0.1 mm from the antennal platform to the posterior margin of the carapace along the dorsal midline. The sexual maturity of females only was determined by the presence or absence of setae on the pleopods (Annala, McKoy, Booth, and Pike 1980).

Most rock lobsters caught were tagged with the "western rock lobster tag" (Chittleborough 1974). Tagged animals were released over the side of the vessel as soon as possible to minimise losses due to handling and as close as possible to their capture site to minimise any displacement effects. Any losses due to predation, or displacement by currents while tagged animals were sinking through the water column, are unknown. When possible, only undamaged animals were tagged, and no animals missing more than two appendages (antennae or pereopods) were used. Fishermen who caught tagged rock lobsters were asked to provide details of the date, area, method, and depth of capture and to return the entire animal, so that its carapace length and sexual maturity (for females) could be determined.

Results and Discussion

Catch rates

The catch rates of rock lobsters by area fished for each of the four trips are shown in Appendix 1. A total of 1145 rock lobsters (894 males, 251 females), all *J. edwardsii*, were taken from 710 pot-lifts. The highest catch rates were in January 1979 (1.99 per pot-lift) and June 1980 (3.36 per pot-lift) and the lowest in April-May 1978 (0.50 per pot-lift) and July 1978 (0.52 per pot-lift).

Rock lobsters were taken from only 9 areas off Mahia Peninsula (a total of 1140 rock lobsters) and 1 off Ariel Rock (5 rock lobsters); none were taken from the other 20 areas fished.

The total for all 18 areas off Mahia Peninsula (M1–M18) was 1140 from 596 pot-lifts, an average of 1.91 per pot-lift. When only the 9 areas where rock lobsters were caught are included, the total number of pot-lifts is 527, and the average per pot-lift is 2.16. The most productive areas were M14 (4.18 per pot-lift), M15 (4.54 per pot-lift), and M17 (4.68 per pot-lift).

The highest average catch rates came from the deepest areas. At M14 and M17, at depths of 185–275 m, 492 rock lobsters were taken from 110 pot-lifts, an average of 4.47 per pot-lift.

Intermediate catch rates generally came from areas of intermediate depth, except at M15, where the catch rate was high. At M5, M6, M15, and M16, at depths of 90–145 m, 576 rock lobsters were taken from 289 pot-lifts, an average of 1.99 per pot-lift.

The lowest catch rates came from the shallowest areas. At M1, M2, and M9, at depths less than 90 m, 72 rock lobsters were taken from 128 pot-lifts, an average of 0.56 per pot-lift.

Size-frequency distributions

Size-frequency distributions of male and female rock lobsters caught on each trip and combined size-frequency distributions for the four trips are shown in Fig. 2.

A notable feature of the catches was the high proportion of larger males, which is often characteristic of an unfished or lightly fished population. Comparison of the combined size-frequency distribution of males with that of males caught during 1978–79 by commercial fishermen from adjacent heavily fished inshore waters along the eastern side of Mahia Peninsula (see Fig. 6 *in* Annala 1980) shows that there was a greater proportion of large individuals in the male catch from offshore areas. The inshore and offshore size-frequency distributions were compared by use of the *G*-test (Sokal and Rohlf 1969, pages 598–601). Male rock lobsters were grouped into 5-mm size classes, and only animals equal to or greater than 100 mm carapace length were compared, because this is the smallest size at which males from this area were fully retained in the commercial catch. The results of the test ($G = 52.837$, $df = 9$, $P < 0.005$) show that there was a significant difference between the two size-frequency distributions.

The combined size-frequency distribution for females was also compared with that of females caught by commercial fishermen off the eastern side of Mahia Peninsula during 1978–79 (see Fig. 8 *in* Annala 1980). Female rock lobsters were grouped into 1-mm size classes beginning at 95 mm, the smallest size at which females from this area were fully retained in the commercial catch. The results of a *G*-test ($G = 24.862$, $df = 25$, $P > 0.1$) show that there was no significant difference between the two size-frequency distributions (that is, the females from one area were not larger than those from the other).

Sex ratios

The percentage of males in the catch from all areas combined ranged from 59% in July 1978 to 90% in June 1980, with 78% of the combined catch from all four trips being males (Appendix 1). In

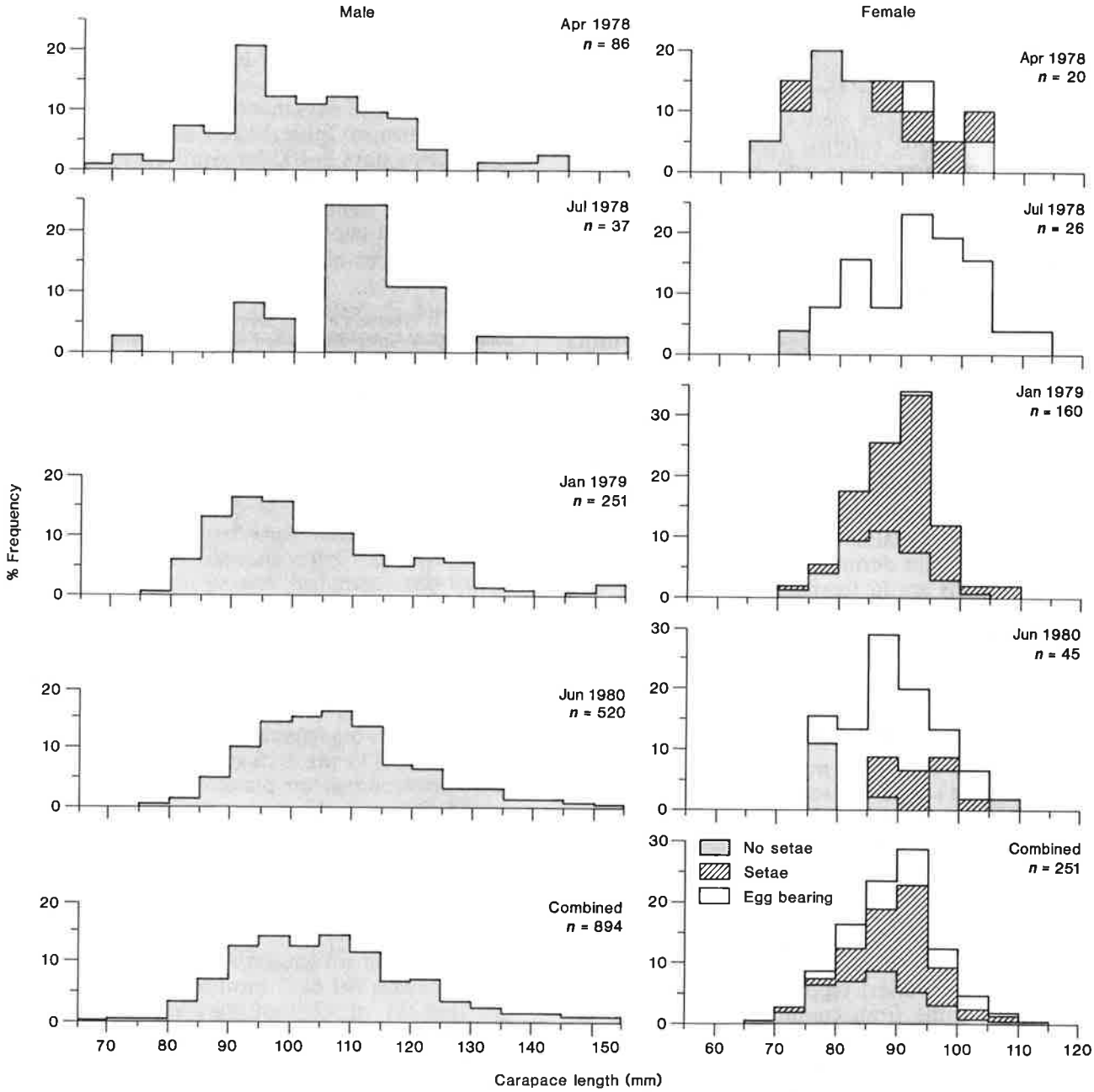

Fig. 2: Size-frequency distributions of male and female rock lobsters (*J. edwardsii*) caught in offshore areas near Gisborne, 1978–80.

addition, males dominated the catch from each area for all months combined; they constituted at least 65% of the catch from any area. However, in the two areas with the largest sample sizes (M15 and M17) the sex ratios varied between months. The percentage of males in the catch for M15 was 60% in January 1979 and 98% in June 1980; for M17 the figures were 57% in January 1979 and 92% in June 1980.

The reasons for the greater proportion of males in the catch and the variation in sex ratios between months are not known. Possible causes of the former include a greater overall abundance of males in these areas, a higher mortality rate for females, and a lower catchability of females. Changes in catchability associated with moulting and breeding cycles are likely causes of the variation in sex ratios between months.

Size at onset of maturity of females

Size at onset of sexual maturity (SOM) was defined as the smallest carapace length size, or size class, in which at least 50% of females in a sample were mature. Females were regarded as mature if they were bearing external eggs attached to the pleopods or if there were well developed setae on the endopodites of the pleopods. Annala *et al.* (1980) estimated SOM for female *J. edwardsii* from catches during April-May 1978, July 1978, and January 1979. For the smallest 5-mm size class the estimate of SOM was 85–89 mm, whereas the estimate based on the probability paper technique of Wenner, Fusaro, and Oaten (1974) was 85 mm. Data from June 1980 were added to those from the earlier trips and SOM was recalculated; this resulted in small reductions in these estimates (80–84 mm and 84 mm respectively). These estimates are larger than the estimate (less than 75–79 mm) for adjacent inshore waters along the eastern side of Mahia Peninsula by Annala *et al.* (1980).

Egg-bearing females were caught at all depths. Most were caught during July 1978 and June 1980 (these months are in the main egg-bearing period for adjacent inshore waters), whereas few were taken during April 1978 and January 1979 (Fig. 2).

Tagging and tag returns

A total of 1033 (806 males, 227 females) rock lobsters were tagged and released during the 4 trips (Appendix 1). Five rock lobsters (all males) were tagged at Ariel Rock (AR1), whereas the remainder were tagged off Mahia Peninsula. A total of 55 tagged animals were returned (53 were recaptured once and 2 twice, a total of 57 recoveries). Of these recoveries, 36 were by Fisheries Research Division (FRD) staff on the same (12 recoveries) or subsequent (24 recoveries) tagging trips. The other 21 recoveries came from commercial fishermen. Of those tagged off Mahia Peninsula, 53 were returned, of which 51 were males and 2 were females. Of the five males tagged at AR1, two were returned.

The highest recapture rates were from the April-May 1978 and July 1978 taggings (21% and 17% of the total numbers tagged respectively). Of the 160 rock lobsters tagged on these trips, 60 (38%) were tagged at area M2, a moderately nearshore and shallow (about 60 m) area occasionally fished by commercial fishermen. Of the 31 tagged animals returned from the 2 trips combined, 18 were taken by commercial fishermen (12 of these were tagged at M2) and the other 13 by FRD.

Of all the areas off Mahia Peninsula, the highest number of tagged animals returned (13), and the highest percentage of those tagged which were returned (22%), came from those released at M2. Other areas further offshore with moderately high return rates were M6 (10, 10%), M14 (10, 3%), and M5 (7, 9%).

The number of days that recaptured animals were free is shown in Table 1. The peaks in recapture rates during days 1–100 for April-May 1978, days 451–500 for January 1979, and days 1–50 for June 1980 resulted from recaptures by FRD on the same or subsequent trips.

TABLE 1: Numbers of rock lobsters (*J. edwardsii*) recaptured during 50-day intervals between tagging and recapture for four sampling trips in offshore areas near Gisborne, 1978–80

No. of days free	Apr-May 1978	Jul 1978	Jan 1979	Jun 1980
1–50	5		1	6
51–100	4			1
101–150				1
151–200		3		
201–250	1	2		
251–300				
301–350	2			
351–400				
401–450				
451–500			15	
501–550	1	2		
551–600	1			
601–650	4			
651–700		1		
701–750		2		
751–800	2			
801–850				
851–900				
901–950				
951–1 000			1	
1 001–1 050				
1 051–1 100		1		
No recapture date	1			
Total number of recaptures	21	11	17	8

Growth

Of the 51 tagged males returned with known recapture dates, 33 had grown. The 18 that had not grown were all free for less than 108 days. Growth increment and days free for those which had grown are plotted in Fig. 3. The large range in growth increments for recaptures taken at similar times shows the large variability in growth between individuals. The growth increments for males from offshore areas were similar to those for males tagged off the east coast of Mahia Peninsula (see Figs. 12–14 *in* McKoy and Esterman 1981).

The two males which had grown and were recaptured within 200 days of tagging were assumed to have moulted once. This assumption was based on data from off the east coast of Mahia Peninsula

(McKoy and Esterman 1981). One of these males grew 7.4 mm from a carapace length at tagging of 99.4 mm; the other grew 4.9 mm from 119.2 mm. Annual growth was estimated from the growth increments of the two males recaptured within ± 35 days of the anniversary of tagging. One, of 92.0 mm carapace length, grew 8.2 mm; the other, of 104.1 mm, grew 10.2 mm. These values were similar to the single moult increments and annual growth increments, respectively, seen for males off the east coast of Mahia Peninsula by McKoy and Esterman (1981).

The above data are not sufficient to determine the relationship between initial carapace length and either single moult or annual growth increments. However, 14 males tagged in January 1979 were recaptured in June 1980, 478–500 days after tagging. This 22-day recapture period is thought to be short enough to provide a reasonable estimate of growth for the 16 months these males were free. They were tagged at areas M6, M14, M15, and M17, and all were recaptured where released. There is a significant negative correlation ($r = -0.627$, $n = 14$, $P < 0.05$) between growth increment and initial carapace length. A decrease in the growth increment with increasing size as seen here is a feature common to most spiny and rock lobster species studied (Morgan 1980).

McKoy and Esterman (1981) found no significant correlations between annual growth and initial carapace length for males from any of the areas near Gisborne. They also found no significant correlations between growth per moult and initial carapace length, except for "Gisborne Local", where the correlation was negative. The lack of significant correlations was attributed to the small size range at tagging and the large variability in growth increments.

The sizes of males at tagging for inshore waters near Gisborne ranged from 71 to 149 mm for single moult increments and from 79 to 136 mm for annual growth increments (McKoy and Esterman 1981). The sizes at tagging for the 14 males from offshore waters in this study ranged from 86 to 153 mm (Fig. 4). Thus, growth increment data were available for smaller animals inshore than offshore.

If the large male of 153 mm is excluded from the offshore data, the correlation between size at tagging and growth increment is not significant ($r = -0.485$, $n = 13$, $P > 0.05$). This shows the strong influence of this single large individual on the results of the data analysis and may explain the difference between the results of the two studies. Growth increments may not decrease until males reach a carapace length of about 130 mm. However, the sample size is small and the variability in growth increments of smaller individuals is large.

One of the two tagged females returned had grown. It was mature at tagging, at an initial carapace length of 94.0 mm, and grew 2.8 mm over 550 days. This growth increment was similar to that of females tagged off the east coast of Mahia Peninsula and free for similar periods (see Figs. 16 and 17 *in* McKoy and Esterman 1981).

Movements

Of the 57 recoveries, there was information on the recapture sites of 55 (53 males, 2 females). Of these, 51 were caught at the tagging site; 36 by FRD and 15 by commercial fishermen. Only four (7%), all of which were males, moved from the tagging site and were caught by commercial fishermen in inshore waters (Fig. 5).

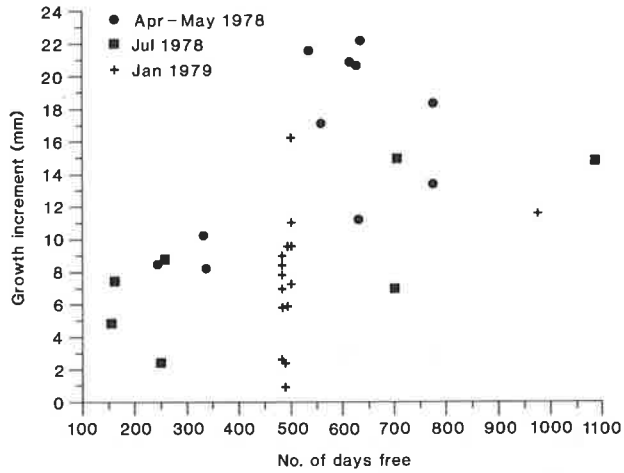

Fig. 3: Growth increments (carapace length) of male rock lobsters (*J. edwardsii*) with known recapture dates tagged in offshore areas near Gisborne, 1978–80.

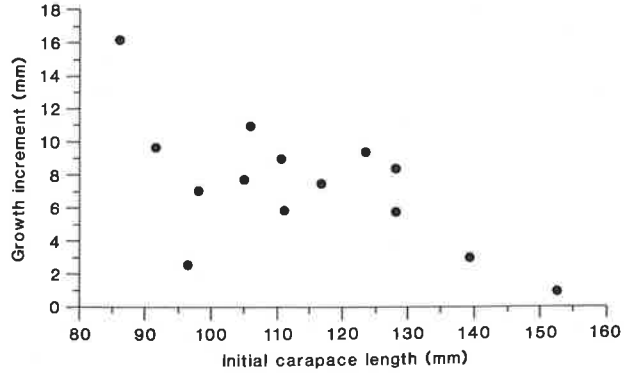

Fig. 4: Growth increments (carapace length) of male rock lobsters (*J. edwardsii*) tagged in January 1979 and recaptured in June 1980 in offshore areas near Gisborne.

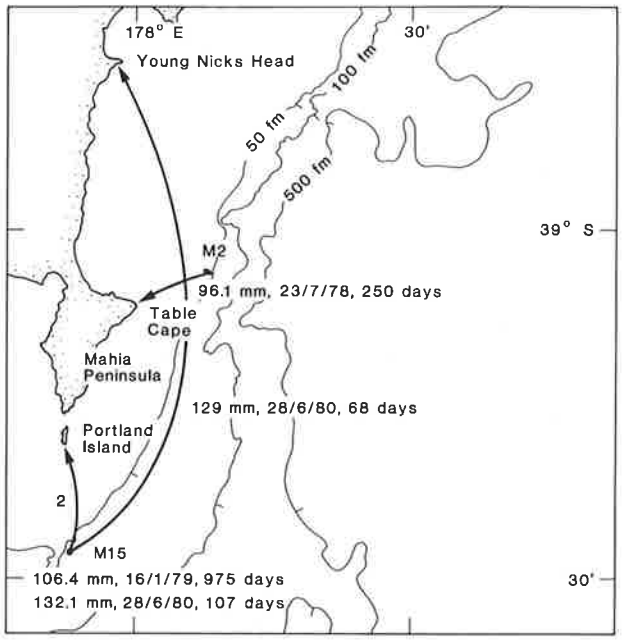

Fig. 5: Movements of four male rock lobsters (*J. edwardsii*) tagged and released in offshore areas near Gisborne and recaptured away from the tagging site. Data shown are the initial carapace length (mm), date of tagging, and number of days free.

Conclusions

Rock lobsters were not caught in depths over 275 m in this study; those caught at this depth were all taken from the area off Mahia Peninsula. Pots were not set deeper than 275 m in this area because of the lack of suitable bottom; though they were set to depths up to 400 m in other areas. There are probably no physiological restrictions to the depth distribution of rock lobsters, and maximum depth is probably limited by the availability of suitable habitat and food. The extent of the areas fished was limited, and stocks of rock lobsters may be found at other areas and depths not fished in this study.

The average catch per pot-lift was estimated from the size-frequency distributions of the catch. The minimum legal size of 152 mm tail length was assumed to equal 98 mm carapace length for males and 93 mm for females (these are the average values for adjacent inshore waters), and the length-weight regressions for animals from the Gisborne area were used (Saila, Annala, McKoy, and Booth 1979). The estimated total weight of legal sized animals (excluding berried females) taken from all areas and trips combined was 444 kg from 710 pot-lifts, an average of 0.63 kg per pot-lift. The estimated weight taken from the 9 areas near Mahia Peninsula where rock lobsters were caught was 441 kg from 520 pot-lifts, 0.85 kg per pot-lift. The most productive areas near Mahia Peninsula were M14 (1.53 kg per pot-lift), M15 (1.70 kg per pot-lift), and M17 (1.82 kg per pot-lift).

The average catch per pot-lift for statistical area 911 (which includes all of Mahia Peninsula), taken from fishing return forms supplied by commercial rock lobster fishermen, was 0.91 kg during 1979–82 (*Fisheries Research Division Occasional Publication: Data Series No. 1, 9, 12,* and *13.*) This figure is similar to the average for the nine deepwater areas near Mahia Peninsula and about half the average catch rate for the three most productive areas. However, a commercial fishery would probably not be sustained by these catch rates. Because of the greater depths, fewer pots could be lifted per day than in inshore areas. The cost of a unit of gear (pot, rope, and floats) to fish these depths, and the cost of fuel to reach offshore grounds, would be greater than the comparable costs incurred to fish adjacent inshore waters. However, further exploratory fishing may locate more productive grounds capable of supporting a commercial fishery.

The return rate of rock lobsters tagged offshore (5% of the total number tagged) was much less than the return rate for those tagged inshore near Gisborne. Of the 1178 rock lobsters tagged off the east coast of Mahia Peninsula between July 1976 and July 1978, 587 (50%) were returned, and of the 4613 tagged in inshore waters from all of the Gisborne area between October 1975 and July 1978, 2133 (46%) were returned (Annala 1981). The lower return rate offshore mainly reflects the low level of fishing activity in these areas. Commercial fishermen occasionally set pots in only a few of the offshore areas where rock lobsters were tagged. Most of the recaptures of those tagged offshore were taken by FRD on the same or subsequent tagging trips, whereas less than 1% of those tagged inshore were similarly taken by FRD. Moreover, the tagged rock lobsters may have moved to other offshore areas that are not fished.

The proportion of recaptures of those tagged offshore that moved (7%) was the same as the proportion of recaptures that moved a significant distance (at least 5 km) off the east coast of Mahia Peninsula (Annala 1981). These proportions are greater than those for all other areas near Gisborne (1%) (Annala 1981) and for most other areas around New Zealand, where generally less than 5% of those recaptured had moved significant distances (Annala 1983). However, the estimate of the proportion of those tagged offshore which moved is biased

upwards when compared with estimates from inshore areas because of the low level of fishing activity offshore and the low overall return rate of tagged animals. Animals which moved into the inshore fishery were more likely to be recaptured than those remaining offshore. This was clear when the numbers that moved were expressed as a percentage of the number tagged instead of the number of returns. Only 4 (0.4%) of the 1033 rock lobsters tagged offshore moved, whereas 44 (3.7%) of the 1178 tagged off the east coast of Mahia Peninsula moved.

Street (1969) postulated the existence of inshore-offshore movements of *J. edwardsii* and suggested that these movements may be associated with moulting and/or breeding. Evidence from diving observations and sampling of the commercial catch from the Gisborne area suggests that some rock lobsters, especially large males, move into shallow water (depths as shallow as 3 m) to moult and/or mate and then move back into deeper water (J. L. McKoy pers. comm., J. H. Annala pers. obs.). McKoy and Esterman (1981) found that the main male moult period off the east coast of Mahia Peninsula is October-November. The four males that moved inshore were fairly large when recaptured (104.7–132.1 mm carapace length). One was recaptured in September and two in October, which suggests that they may have moved into inshore waters to moult.

The four rock lobsters tagged offshore and recaptured inshore were tagged in two fairly shallow (55–110 m) areas on the continental shelf. None of the animals tagged further offshore, or in deeper areas (over 185 m), was recaptured inshore; so there may be very limited or no interchange between these areas. Moreover, no rock lobsters tagged inshore were recaptured offshore. However, because of the limited fishing offshore, animals tagged inshore may have moved undetected to these areas.

Interchange between inshore and offshore populations could occur during the pelagic larval phase. The larval life of *J. edwardsii* has been estimated as being 12–22 months (Lesser 1978), which provides the potential for widespread larval distribution. This suggests that larvae hatched offshore could contribute to inshore stocks, and vice versa, provided that there are suitable current patterns and adequate settlement sites. Berried females were caught offshore (even in the deepest areas); so larvae are probably produced here, unless these females move inshore to hatch their eggs. However, the major known areas of puerulus settlement are in shallow subtidal areas (generally less than 4 m), and it is not known if puerulus larvae are capable of settling in deeper, offshore areas near the edge of the continental shelf. Thus, the available data suggest that interchange could occur between inshore and offshore areas, but the extent of any interchange cannot yet be determined.

Acknowledgments

We thank Fisheries Management Division for the use of *W. J. Scott*; the officers and crew of *W. J. Scott* and Colin Armstrong, skipper of *Lady Sarah*, for their help and co-operation; and all the fishermen who returned tagged rock lobsters. John Booth and John McKoy made constructive comments on the manuscript.

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Appendix 1

Details of fishing effort and the catches, tagging, and returns of rock lobsters (*J. edwardsii*) from offshore areas near Gisborne during four sampling trips, 1978–80. (Areas shown in Fig. 1. Multiple recaptures are included only once in the number returned.)

Date	No. of pots lifted	No. of rock lobsters caught			Av. No. of rock lobsters per pot	No. of rock lobsters tagged			No. (%) of tagged rock lobsters returned		
		Male	Female	Total		Male	Female	Total	Male	Female	Total
Area M1: about 30–50 fm (55–90 m)											
Apr-May 1978	39	2	0	2	0.05	2	0	2	0	0	0
Area M2: about 30 fm (55 m)											
Apr-May 1978	63	32	7	39	0.62	30	7	37	9 (30)	0	9 (30)
Jul 1978	14	8	15	23	1.64	8	15	23	3 (38)	1 (7)	4 (17)
Total for all trips	77	40	22	62	0.81	38	22	60	12 (32)	1 (5)	13 (22)
Area M3: about 50 fm (90 m)											
Apr-May 1978	7	0	0	0	0	0	0	0	0	0	0
Area M4: about 75–80 fm (135–145 m)											
Apr-May 1978	3	0	0	0	0	0	0	0	0	0	0
Jan 1979	6	0	0	0	0	0	0	0	0	0	0
Total for all trips	9	0	0	0	0	0	0	0	0	0	0
Area M5: about 75–80 fm (135–145 m)											
Apr-May 1978	33	17	10	27	0.82	15	10	25	5 (33)	0	5 (20)
Jul 1978	31	15	10	25	0.81	12	10	22	1 (8)	1 (10)	2 (9)
Jan 1979	12	6	5	11	0.92	4	4	8	0	0	0
Jun 1980	25	20	3	23	0.92	18	3	21	0	0	0
Total for all trips	101	58	28	86	0.85	49	27	76	6 (12)	1 (4)	7 (9)
Area M6: about 75–80 fm (135–145 m)											
Apr-May 1978	34	27	3	30	0.88	25	3	28	5 (20)	0	5 (18)
Jul 1978	10	0	0	0	0	0	0	0	0	0	0
Jan 1979	16	10	7	17	1.06	10	7	17	2 (20)	0	2 (12)
Jun 1980	32	60	5	65	2.03	55	5	60	3 (5)	0	3 (5)
Total for all trips	92	97	15	112	1.22	90	15	105	10 (11)	0	10 (10)
Area M7: about 40–50 fm (75–90 m)											
Apr-May 1978	10	0	0	0	0	0	0	0	0	0	0
Jul 1978	9	0	0	0	0	0	0	0	0	0	0
Total for all trips	19	0	0	0	0	0	0	0	0	0	0
Area M8: about 25 fm (45 m)											
Apr-May 1978	2	0	0	0	0	0	0	0	0	0	0
Area M9: about 10–20 fm (20–35 m)											
Apr-May 1978	12	8	0	8	0.67	8	0	8	2 (25)	0	2 (25)
Area M10: about 20–25 fm (35–45 m)											
Apr-May 1978	9	0	0	0	0	0	0	0	0	0	0
Area M11: about 20–25 fm (35–45 m)											
Jul 1978	5	0	0	0	0	0	0	0	0	0	0
Area M12: about 80–90 fm (145–165 m)											
Jul 1978	9	0	0	0	0	0	0	0	0	0	0
Area M13: about 90–100 fm (165–185 m)											
Jul 1978	4	0	0	0	0	0	0	0	0	0	0
Jul 1980	5	0	0	0	0	0	0	0	0	0	0
Total for all trips	9	0	0	0	0	0	0	0	0	0	0

Appendix 1—*continued.*

Date	No. of pots lifted	No. of rock lobsters caught			Av. No. of rock lobsters per pot	No. of rock lobsters tagged			No. (%) of tagged rock lobsters returned		
		Male	Female	Total		Male	Female	Total	Male	Female	Total
					Area M14: about 100–150 fm (185–275 m)						
Jul 1978	4	0	0	0	0	0	0	0	0	0	0
Jan 1979	6	25	1	26	4.33	25	1	26	6 (24)	0	6 (23)
Jun 1980	35	141	21	162	4.63	134	20	154	0	0	0
Total for all trips	45	166	22	188	4.18	159	21	180	6 (4)	0	6 (3)
					Area M15: about 50–60 fm (90–110 m)						
Jul 1978	3	8	1	9	3.00	8	1	9	2 (25)	0	2 (22)
Jan 1979	48	121	80	201	4.19	98	69	167	4 (4)	0	4 (2)
Jun 1980	32	163	4	167	5.22	142	2	144	4 (3)	0	4 (3)
Total for all trips	83	292	85	377	4.54	248	72	320	10 (4)	0	10 (3)
					Area M16: about 75–80 fm (135–145 m)						
Jul 1978	13	1	0	1	0.13	1	0	1	0	0	0
					Area M17: about 100–150 fm (185–275 m)						
Jan 1979	26	89	67	156	6.00	79	58	137	4 (5)	0	4 (3)
Jun 1980	39	136	12	148	3.79	127	12	139	1 (1)	0	1 (1)
Total for all trips	65	225	79	304	4.68	206	70	276	5 (2)	0	5 (2)
					Area M18: about 100–150 fm (185–275 m)						
Jan 1979	7	0	0	0	0	0	0	0	0	0	0
					Areas M1–M18 combined						
Apr-May 1978	213	86	20	106	0.50	80	20	100	21 (26)	0	21 (21)
Jul 1978	98	32	26	58	0.59	29	26	55	6 (21)	2 (8)	8 (15)
Jan 1979	117	251	160	411	3.51	216	139	355	16 (7)	0	16 (5)
Jun 1980	168	520	45	565	3.36	476	42	518	8 (2)	0	8 (2)
Total for all trips	596	889	251	1 140	1.91	801	227	1 028	51 (6)	2 (1)	53 (5)
					Area AR1: about 20–30 fm (35–55 m)						
Jul 1978	24	5	0	5	0.21	5	0	5	2 (40)	0	2 (40)
					Areas AR2–AR4: about 100–200 fm (185–370 m)						
Jan 1979	22	0	0	0	0	0	0	0	0	0	0
					Areas T1–T3: about 33–120 fm (60–220 m)						
Jan 1979	31	0	0	0	0	0	0	0	0	0	0
					Areas AB1–AB3: about 70–120 fm (130–220 m)						
Jan 1979	17	0	0	0	0	0	0	0	0	0	0
					Area GEF: about 80–85 fm (145–155 m)						
Jan 1979	5	0	0	0	0	0	0	0	0	0	0
					Area TB: about 205–220 fm (375–400 m)						
Jan 1979	15	0	0	0	0	0	0	0	0	0	0
					All areas combined						
Apr-May 1978	213	86	20	106	0.50	80	20	100	21 (26)	0	21 (21)
Jul 1978	122	37	26	63	0.52	34	26	60	8 (24)	2 (8)	10 (17)
Jan 1979	207	251	160	411	1.99	216	139	355	16 (7)	0	16 (5)
Jun 1980	168	520	45	565	3.36	476	42	518	8 (2)	0	8 (2)
Total for all trips	710	894	251	1 145	1.61	806	227	1 033	53 (7)	2 (1)	55 (5)

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