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The Western Rock Lobster Fishery 1971-1972

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PERTH
WESTERN AUSTRALIA

1976

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PERTH

R E P O R T

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THE WESTERN ROCK LOBSTER FISHERY 1971-72

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I INTRODUCTION

The fishery for the western rock lobster* is one of the most important single fisheries in Australia and an important export earner for the State. The fishery is governed by a complex set of regulations which have been reviewed by Bowen (1971) and which are designed to limit the total effort to acceptable levels and to enforce a legal minimum size. It is thus important to constantly monitor the state of the fishery both to ensure that the effort is remaining within the accepted limits and that the regulations are adequately performing their function of maintaining reasonably stable catches. Inherent in this monitoring of the fishery is a careful examination of fishing practice, gear, etc., which may lead to increases in efficiency which may not be detectable through the usual calculated effort figures.

This paper is one of a series of annual reviews of previous rock lobster seasons which will discuss fishing practice, catches, effort, mean size and various other factors, a knowledge of which will help toward a better understanding of the status of the fishery.

II METHODS

Catch and effort data were extracted from figures supplied by the Australian Bureau of Statistics and also from research log book data, while mean size information was gathered from measurements made by Departmental Research Staff aboard commercial vessels fishing from Dongara, Jurien, Lancelin and Fremantle. Information on trends in fishing practice was gathered principally from conversation with fishermen at various ports as well as from comments made in research log books.

* Referred to as *Panulirus cygnus* George (Morgan, 1974), *P. longipes cygnus* George (Chittleborough and Thomas, 1969) and *P. longipes* (Milne-Edwards) (Dall, 1974).

III RESULTS

A. CATCH AND EFFORT DATA

The fishing season extends from 15 November to 14 August and may be subdivided into three distinct phases viz. (i) the "whites" fishery (George, 1958) which begins suddenly in late November (as pale-coloured newly-moulted rock lobsters leave the shallow reef areas) and arbitrarily finishes on 31 December, (ii) the "coastal red" fishery, which begins on 1 January and ends on 14 August and (iii) the Abrolhos Islands fishery which is open from 15 March to 14 August.

In 1971 the "whites" run commenced on about 20 November in Fremantle, 27 November in Jurien and 24 November in Geraldton which is about the average time but several days later than the previous season.

Catches and effort (in number of pot lifts) were as follows:

"Whites" catch	=	2 496 953 kg
"Whites" effort	=	2 423 562 pot lifts
"Coastal Reds" catch	=	4 247 891 kg
"Coastal Reds" effort	=	6 268 926 pot lifts
Abrolhos catch	=	1 425 908 kg
Abrolhos effort	=	1 263 361 pot lifts
<hr/>		
Total Catch	=	8 170 752 kg
Total Effort	=	9 955 849 pot lifts

These figures do not include "cash" sales (i.e. rock lobsters which are sold for cash and are not recorded in the fisherman's monthly returns of catches) totalling approx. 454 500 kg, or amateur catches for which estimates have so far not been obtained.

Figure 1 shows comparative catch, corrected effort and catch per effort data from previous years. Catch and effort data from various statistical blocks (Figure 2) are shown in Table 1 with catches expressed in kgs weight and effort as number of pot lifts. Table 2 shows catch per pot data for the same statistical blocks. Using the method of Gulland (1969) to calculate effective fishing intensity with each month's effort in pot lifts being weighted according to the relative catch-ability in that month (Morgan, 1974), the total effective fishing intensity was 7 535 694 units of effort, which was 4.47% less than the 1970/71 season.

B. MEAN SIZE

Samples of rock lobsters were measured aboard commercial vessels using standard pots with 54 mm escape gaps in four depth categories at various ports. The sample would hence include all commercial size rock lobsters plus undersize which would have been reduced in number by selection by the escape gap (Bowen, 1963). Mean carapace lengths of males and females in the various depth categories at Fremantle, Jurien and Dongara throughout the fishing season have been compared in Table 3. The many omissions in the Table are due to either fishermen not fishing the area in question or to some circumstance (breakdowns, etc.) which prevented the data from being collected.

C. NUMBER OF BOATS

The number of boats licensed to fish for rock lobsters is carefully controlled, though boat owners are able to nominate their choice of fishing area viz. north or south of 30°S.

Number of boats licensed in 1971-72	=	810
Number of boats licensed North of 30°S	=	414
Number of boats licensed South of 30°S	=	395
Number of boats for which fishing area was not recorded	=	1

D. FORECAST OF 1971/72 RECRUITMENT

Records are not available of the puerulus settlement in 1967/68, the survivors from which would be expected to contribute to the fishery in 1971/72.

E. INTRODUCTION OF NEW LEGISLATION

As part of the encouragement for freezer boats to withdraw from the industry they were permitted to have their pots redistributed under a financial arrangement approved by the department. The boat from which the pots had been distributed had to be removed permanently from the rock lobster industry.

Two essential elements of the then existing policy on redistribution of pots were:

1. Owners of boats having less than 3 pots per ft. (.305 m) of registered length may share in an approved pot redistribution to raise the number of pots to 3 per ft (.305 m) of boat length.

2. If a person owns two boats he may withdraw both from the industry and build a bigger boat combining the pots of the two.

The policy was then altered to allow pot redistribution under the following proposals :

1. Those fishermen who had received permission to replace their vessel with a boat already built but which is slightly larger than the vessel being replaced.
2. Those fishermen who wished to replace their vessel with a new vessel, but slightly larger in size.
3. Those fishermen who wish to extend their vessel in length for one purpose or another. Any pot redistribution proposal was and still is considered under the framework of the existing boat replacement policy, viz. ;
 1. A boat over 25 ft (7.62 m) in registered length may not be replaced unless it is 8 years old.
 2. A boat of 25 ft (7.62 m) registered length or less may be replaced at any time with a boat up to but not exceeding 25 ft (7.62 m) registered length.

As from 8 August 1972 the taking of western rock lobster or any species of fish known as or called "rock lobster" in all Western Australian waters is now prohibited between 15 August and 15 November inclusive in every year. In the past the closed season on rock lobsters applied only to the area between 24°S latitude and 34°S latitude and included all species of lobsters. This restriction applies to any method of capture and applies to both professional and amateur fishermen.

As from 1 December 1972 the movement of boats licensed to fish north of 33°S latitude shall be restricted to the extent that only those vessels which had traditionally operated in the area over a number of years shall be permitted to continue their operations south of 33°S latitude.

The Department's policy of temporary approval for another boat to work the pots of a disabled or lost rock lobster vessel for a short period was altered viz. no approval will be given for some other licensed rock lobster vessel to work the pots.

Information regarding these changes to the legislation governing the rock lobster fishery, as well as the Department of Fisheries and Wildlife's policies on various issues, may be found in the following volumes of the Fishing Industry News Service (F.I.N.S.) :- Vol. 4 No. 3 (Sept. 1971) p. 48 . Vol. 5 No. 1 (March 1972) p.3.

F. EFFECTS OF NEW LEGISLATION

As a result of the encouragement given to freezer boats to withdraw from the industry a total of 14 boats withdrew and their pots were subsequently redistributed throughout the industry. The remaining legislation and policies implemented throughout the 1971/72 season were only minor in nature and therefore have not been commented on.

G. INNOVATIONS TO BOATS AND GEAR

The number of boats replaced during the period 1 July 1971 to 30 June 1972 was 89.3% greater than 1970/71. There was a noticeable trend in the northern areas (i.e. north of 30° south) toward the replacement of boats in fibreglass, this was especially evident in the smaller class of vessel or "scooter-boat". This increase in the number of boat replacements was largely due to an increase in the catch per unit of effort during that season as well as an increase in price paid to fishermen. Figures supplied by the Harbour and Light Department showed that a total of 53 boats were replaced ranging from 6.17 m - 19.51 m in length and were constructed of:

	WOOD	FIBREGLASS	PLASTIC	STEEL
FREMANTLE	16	3	1	2
GERALDTON	11	20	-	-
	27	23	1	2

Data from research log books showed the following usage of various types of pots by fishermen north and south of 30° south:

	BEEHIVE	BATTEN	STEEL BEEHIVE
NORTH	14%	71%	14%
SOUTH	70%	20%	10%

Although not in great numbers, large multi-necked pots were used throughout the fishery.

H. BAIT

Data from research log books showed the following usage of various types of bait by fishermen north and south of 30° south:

In the northern areas the most popular combinations of bait were Australian herring or ruff (*Arripis georgianus*), Australian salmon (*Arripis trutta*) each in combination with cattle hocks. Hocks were also used in combination with assorted fish and fish heads. In the southern areas the most popular combinations of bait were hocks used in combination with Australian salmon heads or pieces of Australian salmon, or hocks used in combination with assorted fish and fish heads.

Both hocks and salmon heads increased in price from the 1970/71 season.

As a rock lobster bait, bullock hide pieces made their first appearance during the 1971/72 season.

I. DISTRIBUTION OF FISHING

The distribution of fishing is shown in Table 1. The pattern of fishing does not vary greatly from season to season and is dependent on the density of rock lobsters in the various depth categories.

In a normal season the pattern of fishing would be as follows: concentrated in the shallows during November and December, followed by deep water potting during the latter part of December, January and February, back to the shallows during the latter part of February, March and April and in mixed depths (mainly shallow), throughout the remainder of the season.

J. AVERAGE NUMBER OF DAYS WORKED PER BOAT PER MONTH

Month	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.
Days	9.9	25.0	17.8	16.6	20.8	20.7	16.9	15.6	14.7	8.2

The average number of days worked per month during November and December was the same as the 1970/71 season, and for the period January to August was 1.2% down on the 1970/71 season. The average number of days worked per month for the 1971/72 season was 17.2 which was a drop of 1.1% on the 1970/71 season.

*K. PRICE OF ROCK LOBSTERS

Price to fishermen \$2.64 - \$2.86 per kg.
Wholesale New York price.

Grade	\$ Aust. per kg
5 - 6 oz. (142 - 170 g)	8.36 - 8.77
6 - 8 oz. (170 - 226 g)	7.85 - 8.69
8 - 10 oz. (226 - 283 g)	7.69 - 8.44
10 - 12 oz. (283 - 340 g)	7.69 - 8.44
12 - 16 oz. (340 - 453 g)	7.69 - 8.25
16 - 20 oz. (453 - 566 g)	7.36 - 7.69
over 20 oz. (over 566 g)	7.17 - 7.98

*L. MARKET TRENDS AND ECONOMIC FACTORS

Again the majority (97%) of rock lobsters were processed into frozen tails. In 1971/72 98% of frozen rock lobster tails were exported to the U.S.A.

Forty-nine percent of whole rock lobsters went to France, 24% to Japan and 11% to the U.S.A. Exports of frozen rock lobster tails increased by 4% and whole rock lobster increased by 22% from the 1970/71 level.

Holdings of frozen rock lobster tails in the U.S.A. at 30 June 1972 were 3 051 tonnes an increase of 64% on holdings a year earlier.

M. AVERAGE VALUE PER POT ON POT REDISTRIBUTION

About \$160 - \$200

N. SEA WATER TEMPERATURES AND SALINITIES

These have relevance to the behaviour and catch rates of rock lobsters (Morgan, 1974).

The average sea water temperature during the rock lobster season (i.e. 15 November to 14 August) at Waterman (aquarium intake temperature) was 20.3°C with a maximum of 24.9°C on 6 February 1972 and a minimum of 15.8°C on 13 August 1972.

* Sections K and L, are based on data provided by the Australian Department of Primary Industry.

The average salinity during the season at Waterman (aquarium) was 35.701 ‰, with a maximum of 36.514 ‰ on 13 March 1972 and a minimum of 34.880 ‰ on 15 November 1971. These records are maintained by CSIRO.

Bottom temperatures in waters of various depths in the Fremantle, Jurien and Dongara areas were collected as part of the monitoring of rock lobster catches (item B) and are shown in Table 4.

O. SPAWNING ROCK LOBSTERS

While most of the breeding females are found in the 20-30 fathom depth range, no variation has been observed in the size at first breeding from one depth category to another, except at Jurien over 30 fms (Chittleborough, pers. comm.). Hence the data for December, January and February from all depths with the exception of Jurien over 30 fms. may be pooled to indicate the size frequency of breeding (i.e. "berried" and mated) females and this has been done in Figure 3. The mean size of breeding females was greater at Fremantle than at either Jurien or Dongara with the mean sizes being 104.3 mm for Fremantle, 90.5 mm for Jurien and 95.4 mm for Dongara. By comparison the mean sizes at first breeding (i.e. the smallest carapace length at which 50 percent have been mated) was found to be 98 mm at Fremantle, 88 mm at Jurien and 87 mm at Dongara.

P. SEX RATIOS

The sex ratio of rock lobsters taken by commercial pots was calculated from the information gathered from the catch monitoring programme and is shown in Table 5.

IV DISCUSSION

The 1971/72 catch was just below the upper limit of sustainable yield calculated by Bowen and Chittleborough (1966). Economically the industry was in a buoyant condition with prices paid to fishermen significantly higher than in 1970/71, whilst prices of bait and fuel only increased marginally. The buoyant condition of the industry was probably a major factor in the significant decrease in the total effective fishing intensity from the previous season.

The large increase in the number of boat replacements also reflected the upturn in the economy of the industry. The average number of boat days worked per month decreased slightly, and, based on data

from the Australian Bureau of Meteorology, this was probably a result of poor weather during the winter months. During 1971/72 the trend towards increased efficiency of the fishing fleet continued.

V ACKNOWLEDGEMENTS

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TABLE 1

CATCH (IN KG WEIGHT) AND EFFORT (IN POT LIFTS) FOR THE
1971/72 ROCK LOBSTER SEASON IN VARIOUS STATISTICAL BLOCKS

BLOCK	Nov	Dec	Jan	Feb	March	April	May	June	July	Aug.	Total
2612	491 (1800)	<u>14924</u> (6400)	<u>1374</u> (4142)	<u>1091</u> (3600)							<u>7880</u> (15942)
2613				<u>2155</u> (3078)							<u>2155</u> (3078)
2712											-
2713	<u>7456</u> (6679)	<u>18765</u> (16181)	<u>30050</u> (29053)	<u>14645</u> (21178)	<u>8950</u> (16892)	<u>21925</u> (26756)	<u>21532</u> (25749)	<u>14079</u> (19281)	<u>14578</u> (20508)	<u>12876</u> (7798)	<u>159856</u> (190075)
2714	<u>3528</u> (9278)	<u>21296</u> (23164)	<u>15443</u> (17837)	<u>4147</u> (8586)	<u>6632</u> (14222)	<u>7896</u> (10500)	<u>11580</u> (15675)	<u>5957</u> (7855)	<u>10937</u> (16049)	<u>3479</u> (4723)	<u>90895</u> (127889)
2812	<u>358</u> (672)				<u>21875</u> (12220)	<u>16397</u> (15665)	<u>4467</u> (7071)	<u>1075</u> (2364)	<u>3263</u> (6306)	<u>1248</u> (2830)	<u>48683</u> (47128)
2813	<u>834</u> (1782)	<u>2863</u> (4051)	<u>1999</u> (5012)	<u>805</u> (1196)	<u>508401</u> (262734)	<u>538650</u> (413905)	<u>234582</u> (297497)	<u>51499</u> (111459)	<u>64971</u> (128090)	<u>27805</u> (49676)	<u>1432409</u> (1275402)
2814	<u>42559</u> (114799)	<u>256305</u> (275340)	<u>65860</u> (148350)	<u>39090</u> (91213)	<u>70682</u> (91837)	<u>77731</u> (98326)	<u>37187</u> (69177)	<u>36685</u> (65325)	<u>53716</u> (81367)	<u>23314</u> (32804)	<u>703129</u> (1068538)
2912			<u>4881</u> (5681)	<u>1664</u> (3600)		<u>4952</u> (2700)			<u>30</u> (220)	<u>264</u> (660)	<u>11791</u> (12861)
2913	<u>1218</u> (3132)	<u>6950</u> (6086)	<u>10364</u> (960)		<u>14838</u> (9630)	<u>20800</u> (15908)	<u>5263</u> (7704)	<u>88</u> (360)	<u>3806</u> (6046)	<u>1632</u> (2416)	<u>64959</u> (52242)
2914	<u>83114</u> (221237)	<u>695372</u> (543649)	<u>201815</u> (291266)	<u>125140</u> (226341)	<u>214932</u> (277924)	<u>167915</u> (232255)	<u>100105</u> (169461)	<u>81008</u> (147312)	<u>90994</u> (152587)	<u>33805</u> (67728)	<u>1794200</u> (2329760)
3012	<u>258</u> (684)	<u>1783</u> (990)									<u>2041</u> (1674)
3013		<u>15046</u> (8707)	<u>4923</u> (7160)	<u>4788</u> (4715)	<u>1825</u> (2700)	<u>1340</u> (1755)					<u>27922</u> (25037)
3014	<u>36904</u> (90332)	<u>502785</u> (327909)	<u>230821</u> (203667)	<u>94571</u> (158244)	<u>174107</u> (222714)	<u>139635</u> (181910)	<u>57038</u> (102387)	<u>44902</u> (11414)	<u>38251</u> (71218)	<u>25831</u> (43595)	<u>1344845</u> (1483390)
3015	<u>7175</u> (19899)	<u>110221</u> (78423)	<u>54570</u> (60160)	<u>28064</u> (44185)	<u>43665</u> (59806)	<u>34673</u> (55353)	<u>10641</u> (20554)	<u>7817</u> (14495)	<u>5314</u> (11757)	<u>2700</u> (5109)	<u>304840</u> (369741)
3112		<u>5951</u> (4320)	<u>4682</u> (5050)	<u>4219</u> (6735)	<u>1500</u> (2407)	<u>545</u> (2240)					<u>16897</u> (20752)
3113	<u>784</u> (4419)	<u>11955</u> (6930)	<u>7482</u> (7257)		<u>3831</u> (5190)	<u>1485</u> (1980)					<u>25537</u> (25776)
3114	<u>5631</u> (10610)	<u>62214</u> (50676)	<u>55427</u> (47942)	<u>27957</u> (45353)	<u>25566</u> (44303)	<u>19950</u> (38476)	<u>4495</u> (10166)	<u>3850</u> (10788)	<u>1903</u> (6777)	<u>530</u> (2400)	<u>207523</u> (267491)
3115	<u>40331</u> (104506)	<u>458456</u> (388190)	<u>315540</u> (310411)	<u>166798</u> (276277)	<u>224566</u> (333613)	<u>135265</u> (242100)	<u>58393</u> (129218)	<u>71794</u> (155931)	<u>51792</u> (112366)	<u>22731</u> (45335)	<u>1545666</u> (2097947)
3212										<u>295</u> (1095)	<u>295</u> (1095)
3213				<u>1187</u> (1600)							<u>1187</u> (1600)
3214				<u>1300</u> (3906)							<u>1300</u> (3906)
3215	<u>4543</u> (7634)	<u>84682</u> (73968)	<u>79058</u> (77520)	<u>38125</u> (62327)	<u>48495</u> (80634)	<u>32494</u> (67383)	<u>13916</u> (30334)	<u>19044</u> (36679)	<u>16584</u> (29831)	<u>5707</u> (9288)	<u>342648</u> (475598)
3314	<u>253</u> (938)	<u>245</u> (800)	<u>912</u> (1140)		<u>1591</u> (1530)	<u>1000</u> (1360)	<u>99</u> (680)				<u>4100</u> (6448)
3315	<u>900</u> (1510)	<u>5700</u> (6595)	<u>4022</u> (5487)	<u>865</u> (1080)	<u>2581</u> (5055)	<u>2308</u> (4456)	<u>1309</u> (3169)	<u>1306</u> (3217)	<u>3347</u> (3568)	<u>1007</u> (1356)	<u>23345</u> (35493)
3414		<u>103</u> (1272)	<u>2499</u> (6152)		<u>3366</u> (5622)	<u>494</u> (2320)	<u>187</u> (1620)				<u>6649</u> (16986)
	<u>231337</u> (599911)	<u>2265616</u> (1823651)	<u>1091722</u> (1234247)	<u>556611</u> (963214)	<u>1377403</u> (1449033)	<u>1225455</u> (1415348)	<u>560794</u> (890462)	<u>339104</u> (656480)	<u>359486</u> (646690)	<u>163224</u> (276813)	
					Total catch =	170 752 kg					
					Total effort =	9 955 849 pot lifts					

Effort figures are shown in parenthesis and catch figures are underlined.

TABLE 2
CATCH/EFFORT DATA FOR 1971/72 SEASON IN VARIOUS
STATISTICAL BLOCKS

Month	Nov	Dec	Jan	Feb	March	April	May	June	July	Aug	Total
BLOCK											
2612	0.27	0.77	0.33	0.30	-	-	-	-	-	-	0.49
2613	-	-	-	0.70	-	-	-	-	-	-	0.70
2712	-	-	-	-	-	-	-	-	-	-	-
2713	0.37	1.16	1.03	0.69	0.53	0.82	0.84	0.73	0.71	1.65	0.84
2714	0.38	0.92	0.87	0.48	0.47	0.75	0.74	0.76	0.68	0.74	0.71
2812	0.53	-	-	-	1.79	1.05	0.63	0.45	0.52	0.44	1.03
2813	0.47	0.71	0.40	0.67	1.94	1.30	0.79	0.46	0.51	0.56	1.12
2814	0.37	0.93	0.44	0.43	0.77	0.79	0.54	0.56	0.66	0.71	0.66
2912	-	-	0.86	0.46	-	1.83	-	-	0.14	0.40	0.92
2913	0.39	1.14	10.80	-	1.54	1.31	0.68	0.24	0.63	0.68	1.24
2914	0.38	1.28	0.69	0.55	0.77	0.72	0.59	0.55	0.60	0.50	0.77
3012	0.38	1.80	-	-	-	-	-	-	-	-	1.22
3013	-	1.73	0.69	1.02	0.68	0.76	-	-	-	-	1.12
3014	0.41	1.53	1.13	0.60	0.78	0.77	0.56	0.55	0.54	0.59	0.91
3015	0.36	1.41	0.91	0.64	0.73	0.63	0.52	0.54	0.45	0.53	0.82
3112	-	1.38	0.93	0.63	0.62	0.24	-	-	-	-	0.81
3113	0.18	1.73	1.03	-	0.74	0.75	-	-	-	-	0.99
3114	0.53	1.23	1.16	0.62	0.58	0.52	0.44	0.36	0.28	0.22	0.78
3115	0.39	1.18	1.02	0.60	0.67	0.56	0.45	0.46	0.46	0.50	0.74
3212	-	-	-	-	-	-	-	-	-	0.27	0.27
3213	-	-	-	0.74	-	-	-	-	-	-	0.74
3214	-	-	-	0.33	-	-	-	-	-	-	0.33
3215	0.60	1.14	1.02	0.61	0.60	0.48	0.46	0.52	0.56	0.61	0.72
3314	0.27	0.31	0.80	-	1.04	0.74	0.15	-	-	-	0.64
3315	0.60	0.86	0.73	0.80	0.51	0.52	0.41	0.41	0.94	0.74	0.66
3414	-	0.08	0.41	-	0.60	0.21	0.12	-	-	-	0.39
	0.39	1.24	0.88	0.58	0.95	0.87	0.63	0.52	0.56	0.59	
Total catch				8 170	752	kg					
Total effort				9 955	849	pot lifts					

TABLE 3

MEAN CARAPACE LENGTHS (MM) OF MALE AND FEMALE ROCK LOBSTERS
IN VARIOUS DEPTH CATEGORIES AT FREMANTLE, JURIEN AND DONGARA
THROUGHOUT THE FISHING SEASON

Year	Area	Month	0-10 fms		10-20 fms		20-30 fms		30+ fms		
			♂	♀	♂	♀	♂	♀	♂	♀	
71/72	F'itle	Nov	75	69							
		Dec	77	74	93	86					
		Jan					107	100			
		Feb	77	73			105	96			
		Mar	79	75			113	99			
		Apr	76	73	104	92					
		May									
		Jun	78	74	96	87				107	107
							107	110			
							95	99			
71/72	Jurien	Nov	74	71							
		Dec	76	73	78	73	81	76	87	82	
		Jan	77	73	77	73	81	75	87	82	
		Feb	74	72	73	70	92	86			
		Mar	78	75	78	75	102	91	92	86	
		Apr	75	73	77	74	92	83			
		May	75	73	75	73					
		Jun	77	73							
							92	94			
71/72	Dongara	Nov									
		Dec	76	73	78	75	87	80			
		Jan	71	69	74	72	93	85	102	88	
		Feb	75	73	72	70	105	92	92	90	
		Mar	77	75	77	75			100	90	
		Apr	70	70	74	72	96	91			
		May	70	67	74	72	102	90			
		Jun	72	67			92	85			
				77	74						
				75	74	93	94				

TABLE 4

BOTTOM TEMPERATURE (°C) FOR FREMANTLE, JURIEN AND DONGARA
OF WATERS BETWEEN VARIOUS DEPTH CONTOURS FOR THE 1971/72
SEASON

AREA	DEPTH	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG
F'TLE	0-10				23.1	23.1	19.5				
	10-20		20.0								
	20-30			21.1							
	30+										
JURIEN	0-10	21.2	20.2	20.9	22.3	22.6			20.0	17.8	18.3
	10-20		19.6	20.4	21.4	22.3					
	20-30		18.5	19.7	20.9	21.5				21.0	
	30+		18.7	19.4		22.3					
DONGARA	0-10		20.7	22.1	23.1	22.1			20.0	17.2	
	10-20		19.5	21.3	23.5	19.7					16.9
	20-30		19.5	20.4	22.2				21.8		18.7
	30+			20.8		15.8					

Temperatures were taken using an unprotected reversing thermometer.

TABLE 5

1971-72 SEX RATIO BY MONTH AND DEPTH CATEGORY. FIGURES
GIVEN ARE % OF FEMALES IN THE TOTAL

AREA	DEPTH RANGE FATH.	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG
DONGARA	0-10 inside mile	57	61	57	66	46	52	54	61	76	
	0-10 outside mile	61	53	57	64	50	54	60	54	56	
	10-20	69	59	53	63	60	60	60	60	60	
	20-30	62	73	65	71	64	64	64	60	60	
	30+		49	75	73						
JURIEN	0-10 inside mile	57	55	54	55	54	55	54	58	55	50
	0-10 outside mile		58	54	60	61	60	61	58	55	
	10-20		59	55	60	63	66	66	79	79	
	20-30		66	67	71						
	30+		59	64	71						
FREMANTLE	0-10 inside mile										
	0-10 outside mile	29	57	50	60	51	51	60	51	71	64
	10-20		45	57	52	54	54	52	54	54	
	20-30			56	57	83	83	83	83	83	
	30+										

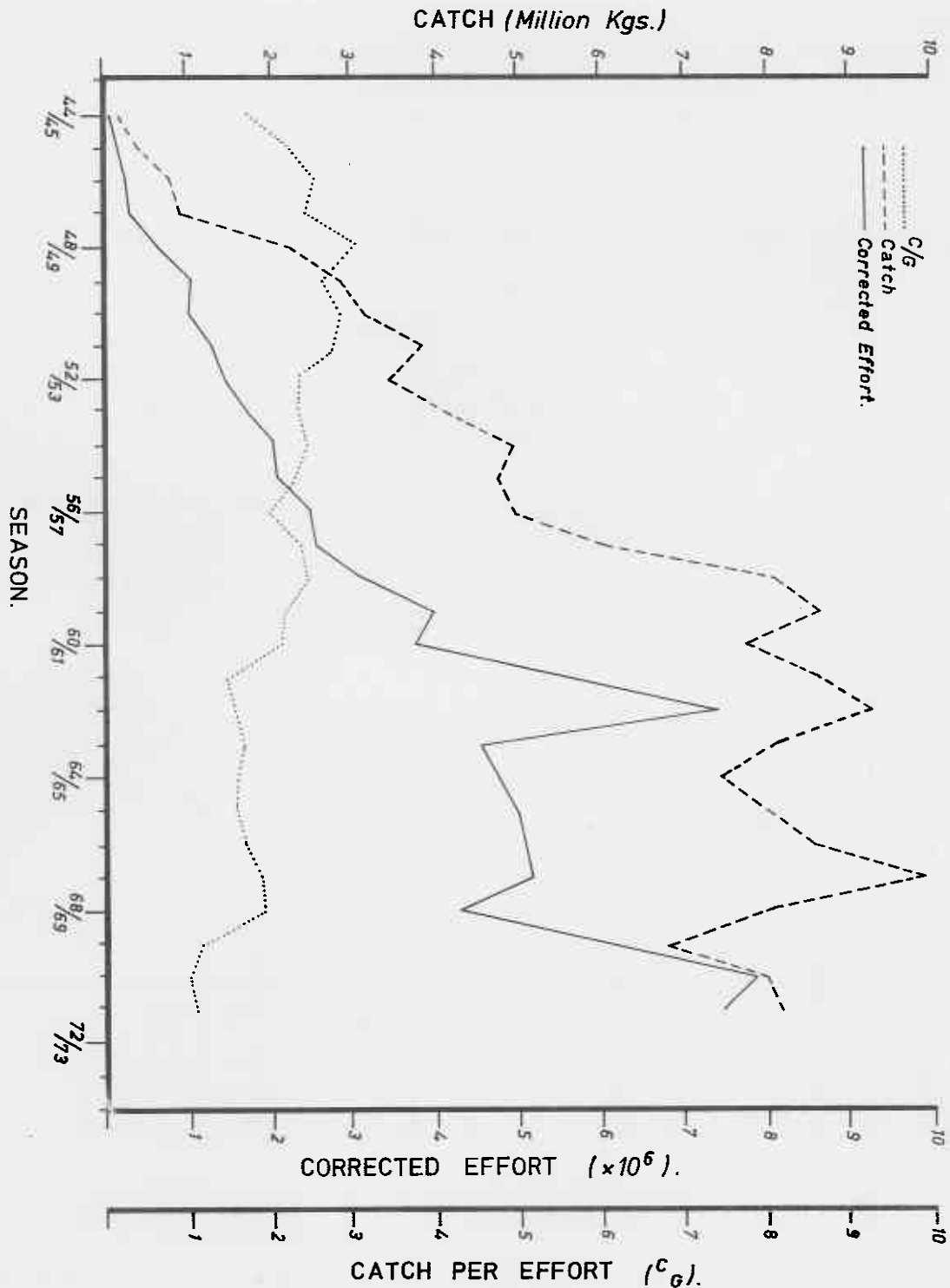


FIGURE 1. Rock Lobster Catch, Corrected Effort and Catch per Unit of Effort Data.

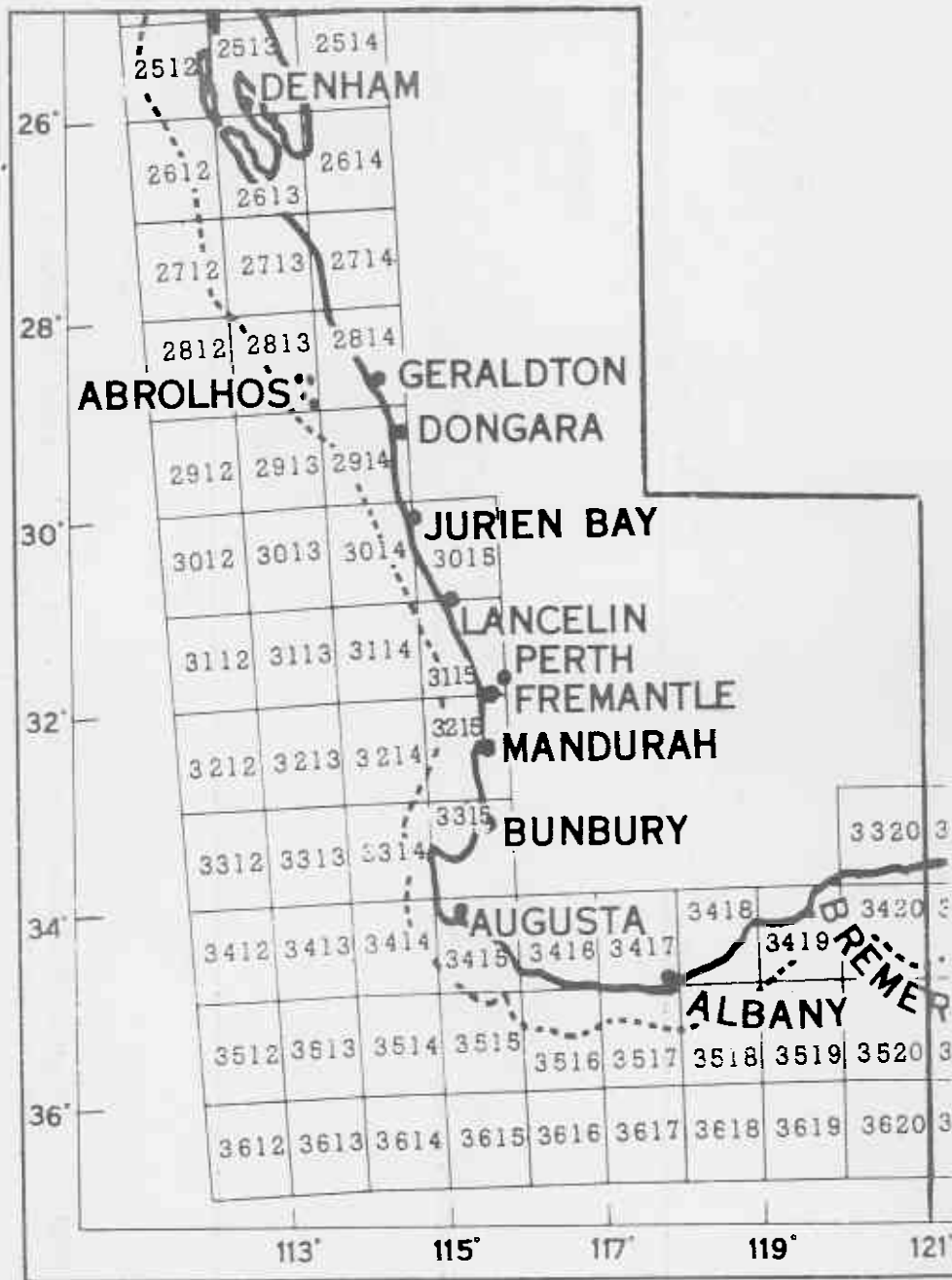


FIGURE 2. Rock Lobster Fishing Areas

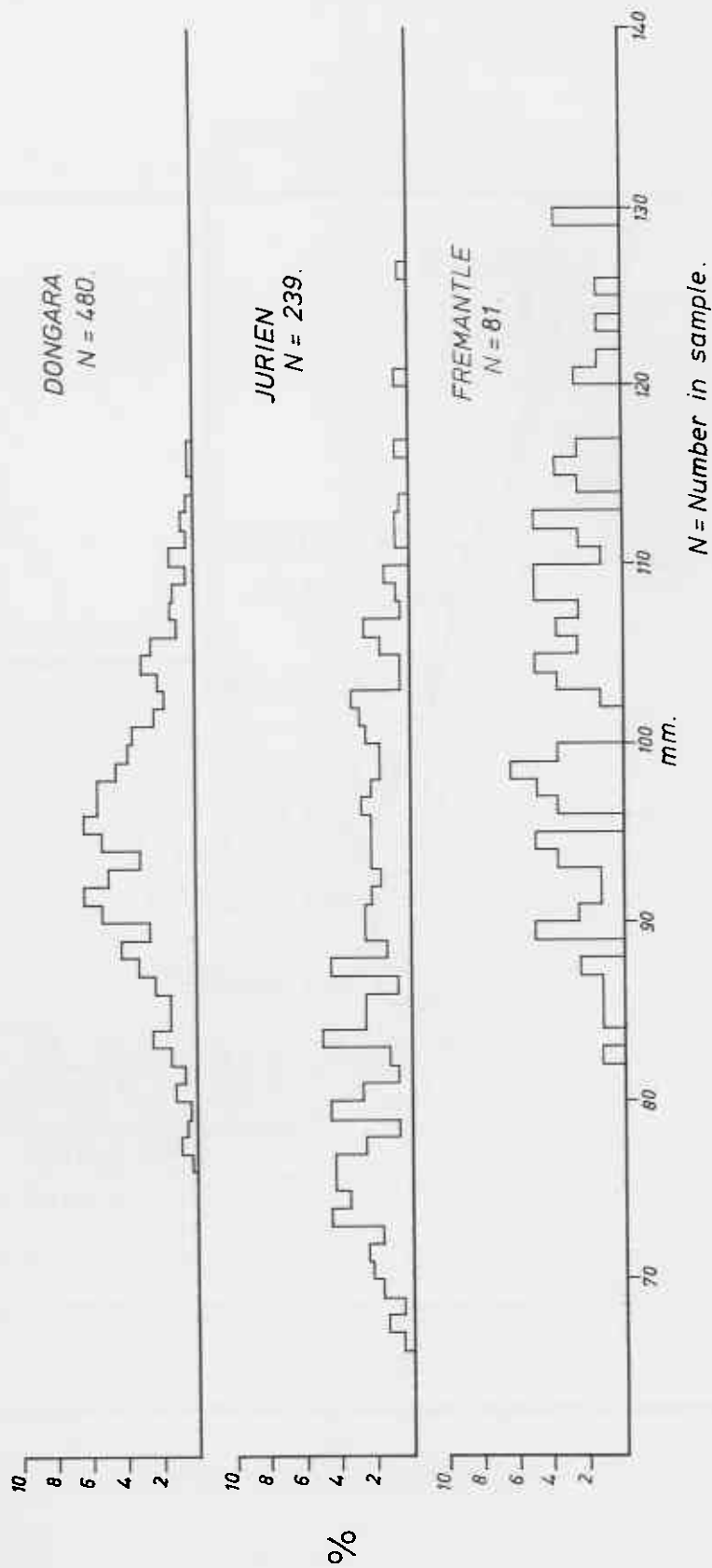


FIGURE 3. Length Frequency of Breeding Female Rock Lobsters taken from December 1971 to February 1972.