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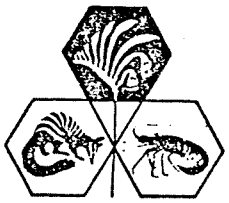

REPORT No 28

DEPARTMENT OF
FISHERIES AND WILDLIFE
WESTERN AUSTRALIA

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The Western Rock Lobster Fishery 1974–1975

BY

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AND

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PERTH
WESTERN AUSTRALIA

1977

Department of Fisheries and Wildlife

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THE WESTERN ROCK LOBSTER FISHERY 1974-75

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I INTRODUCTION

The fishery for the western rock lobster *Panulirus cygnus* 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 the fourth of a series of annual reviews of the previous rock lobster season 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 fishmen at various ports as well as from comments made in research log books.

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 1974 the "whites" run commenced on about 21 November in both northern and southern areas which is about the average time, and approximately three days earlier than the previous season.

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

"Whites" catch	=	2 550 820 kg
"Whites" effort	=	2 561 362 pot lifts
"Coastal Reds" catch	=	4 401 586 kg
"Coastal Reds" effort	=	6 365 254 pot lifts
Abrolhos catch	=	1 307 608 kg
Abrolhos effort	=	1 328 864 pot lifts
Total Catch	=	8 260 014 kg
Total Effort	=	10 255 480 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 617 400 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 catchability in the month (Morgan, 1974), the total effective fishing intensity was 8 035 419 units of effort, which was 12.7% greater than the 1973/74 season.

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, Lancelin, Dongara and Jurien 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 (breakdown, etc.) which prevented the data from being collected.

C. NUMBER OF BOATS

The number of boats licensed in Zones A, B, C, D, and E 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 1974-75	=	809
Number of boats licensed north of 30°S	=	406
Number of boats licensed south of 30°S	=	403

D. FORECAST OF 1974/75 RECRUITMENT

The increased puerulus settlement and consequent higher juvenile densities that occurred from 1970-71 onwards (B.F. Phillips, personal communication) were reflected in the increased catches in the 1974-75 season.

E. INTRODUCTION OF NEW LEGISLATION

1. As from 1 November 1974 the area closed to the taking of rock lobsters on the north, south, and west sides of Rottnest Island was reduced from 3 200 metres to 1 600 metres for professional fishermen.

2. Commonwealth notices published on 8 April 1975 under the Fisheries Act 1952-75 closed four areas off the Western Australian coast to lobster boats unless their licences were endorsed for the rock lobster fishery in proclaimed waters between 34° 20'S and 21° 44'S. In addition the number of pots per boat has been formally controlled by notice.

   The purpose of the new notices is to implement, under the amendments to the Fisheries Act that come into force on 1 January 1975, the same measures that had been implemented prior to that date by administrative means. The entitled boats and their pot quotas have not been varied.

3. The name of a licensed fishing boat shall not be changed or altered while that vessel remains in the fishing industry. This still applies even if the vessel is sold or otherwise transferred but retains its fishing licence.

   Should an owner wish to use the same name on a replacement vessel he is permitted to do so provided the figure two is used after the name on the replacement vessel.

   Boats transferred or sold out of the fishing industry (and which do not retain the fishing licence) may have the name changed provided that if the boat subsequently re-enters the industry, and is licensed as a fishing boat, it must resume its former name.

4. Licensing fees for commercial fishing in Commonwealth Proclaimed Waters were increased as from 1 January 1975, to coincide with the introduction of the amended Commonwealth Fisheries Act. From 1 January a commercial fisherman's licence cost $10 (an increase of $9) and boat licences, which depend on overall length, have increased by approximately $20.

The new licence fees are:

For a boat less than 15 m	$20
For a boat of 15 m but less than 20 m	$25
For a boat of 20 m or more	$30
Processing boat	$50
Carrier boat	$40

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. 7 No. 4 (Dec 1974) pp. 65, 66; Vol. 8 No. 1 (March 1975) pp. 15, 22; Vol. 8 No. 2 (June 1975) p. 31.

F. EFFECTS OF NEW LEGISLATION

The changes in the legislation were of an administrative nature and hence had little direct effect on the fishery.

G. INNOVATIONS TO BOATS AND GEAR

Figures supplied by the Harbour and Light Department showed that a total of 16 boats were replaced during the period 1 July 1974 to 30 June 1975 and ranged in length from 5.18 m to 12.49 m. This represented a drop of 63% in the number of boats that were replaced during the same period in 1973/74 and reflected the generally depressed economy of the industry. The boat replacements were constructed of:

	Wood	Fibre Glass	Aluminium
Fremantle	3	5	2
Geraldton	2	4	-
	5	9	2

In the northern area the boats replaced were on the average 10% (1.16 m) greater in length than boats replaced in the southern area.

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	13%	82%	6%
South	73%	20%	7%

H. BAIT

The combinations of bait used throughout the season consisted of: cattle hocks or pieces of hide together with fish heads, whole fish or pieces of fish. The range of fish baits consisted of: Western Australian salmon heads *(Arripis trutta esper)*, Eastern salmon heads *(Arripis trutta marginata)*, pieces of salmon flesh, Australian herring or ruff *(Arripis georgianus)*, New Zealand snapper heads *(Chrysophrys auratus)*, mullet *(Mugil cephalus)*, Yellow-eyed mullet *(Aldrichetta forsteri)*, Pilchards *(Sardinops neopilchardus)*, Bony herring *(Fluvialosa vlaminghi)*, Scaly mackerel *(Amblygaster postera)*, Canadian salmon heads *(Oncorhynchus* sp.), Eastern States barracouta heads *(Leionura atum)*, Eastern States and Western Australian tuna heads and tuna meat, blue sprats *(Spratelloides robustus)*, New Zealand trevally heads *(Caranx lutescens)*, New Zealand cod heads *(Pseudophycis bacchus?)*, New Zealand King Snapper heads *(Trachichthodes gerrardi?)* and pieces of kangaroo *(Marcropus* sp.).

Prices of the various types of bait, with the exception of hocks which generally remained stable, rose in price from the 1973/74 season, by between 9% and 31%.

Craylure, a prepared bait for lobsters was used by fishermen for the first time during the 1974/75 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. Throughout the season the usual pattern of fishing occurred, i.e. 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), depending on weather and density of rock lobsters, 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 Worked	11.7	24.2	16.7	18.9	20.6	21.2	18.4	15.6	14.4	8.9

The average number of days worked per month during November and December was 1.7% up on the 1973/74 season and for the period

January to August was 4.2% up on the 1973/74 season.

The average number of days worked per month for the 1974/75 season was 17.6, which was an increase of 3.5% on the 1973/74 season.

*K. PRICE OF ROCK LOBSTERS

Price to fishermen $2.82 - $2.85 per kg.

The range of prices paid on the New York wholesale market:

Grade	$ Aust. per kg
4 - 6 ozs (113 - 170 g.)	8.22 - 10.03
6 - 8 ozs (170 - 226 g.)	8.46 - 9.78
8 - 10 ozs (226 - 283 g.)	8.46 - 9.70
10 - 12 ozs (283 - 340 g.)	8.42 - 9.70
12 - 16 ozs (340 - 453 g.)	8.32 - 9.61
16 - 20 ozs (453 - 566 g.)	7.72 - 9.37
over 20 ozs (over 566 g.)	7.35 - 9.01

*L. MARKET TRENDS AND ECONOMIC FACTORS

In 1974/75, 99% of frozen rock lobster tails were shipped to the U.S.A.

France took 50% of whole rock lobsters in 1974/75 while 17% went to Japan and 5% to U.S.A.

Exports of frozen rock lobster tails increased by 11% while exports of whole rock lobsters declined by 30% compared to the previous year. Holdings of frozen rock lobster tails in the U.S.A. at 30 June 1975 were 2 404 tonnes, an increase of 35% over the previous year.

M. AVERAGE VALUE PER POT ON POT REDISTRIBUTION

About $260 - $280.

N. SEA WATER TEMPERATURES AND SALINITIES

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

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

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 24.2°C on 2 February, 1975 and a minimum of 15.8°C on 27 July, 1975. The average salinity during the season at Waterman (aquarium) was 35.535°/oo with a maximum of 36.490°/oo on 17 March, 1975 and a minimum of 34.898°/oo on 14 July, 1975.

Bottom temperatures and surface salinities in waters of various depths in the Fremantle, Lancelin, Jurien and Dongara areas were collected as part of the monitoring of rock lobster catches (Item B) and are shown in Table 4. Other records are maintained by CSIRO.

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 fathoms (Chittleborough, pers. comm.). Hence the data for December, January, and February from all depths with the exception of Jurien over 30 fathoms 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 Lancelin and Fremantle than at either Dongara or Jurien with the mean sizes being 92 mm for Jurien, 97 mm for Dongara, 103 mm for Fremantle and 107 mm for Lancelin. By comparison the mean sizes at first breeding (i.e. the smallest carapace length at which 50% have been mated) were found to be 96 mm at Fremantle, 95 mm at Lancelin, 86 mm at Jurien and 91 mm at Dongara.

P. SEX RATIOS

The sex ratios 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

An improvement in the settlement of puerulus larvae from 1970/71 onwards resulted in apparently higher densities of legal size animals being available during the 1974/75 season than in the previous two seasons. This is reflected in the increased catch per unit of effort shown, for the 1974/75 season, in Table 2. These greater densities, together with a 12.7% increase in the total effective fishing intensity, resulted in a significant increase in total catch, of 21.8% when compared with the 1973/74 season. This was above the upper limit of sustainable catch suggested by Bowen and Chittleborough (1966).

The increase in the total effective fishing intensity was partly a result of a very mild winter (data supplied by the Australian Bureau of Meterology) which led to an increase in the number of boat days worked during the season. A downturn in the economy of the industry, with cost increases for bait and fuel exceeding the small price increase

or rock lobsters, may also have contributed to the increased fishing intensity. This economic downturn was reflected in the reduced numbers of boat replacements during the season.

V ACKNOWLEDGEMENTS

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TABLE 1

CATCH (IN KGS WEIGHT) AND EFFORT (IN POT LIFTS) FOR THE 1974/75 ROCK LOBSTER SEASON IN VARIOUS STATISTICAL BLOCKS.

BLOCK	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	TOTAL
2612	-	-	-	-	-	-	-	-	-	-	-
2613	-	-	-	1280 (3260)	1928 (1980)	-	31185 (2880)	17578 (2325)	1474 (1480)	-	53445 (11925
2712	-	-	-	-	-	-	-	-	-	-	-
2713	5288 (7988)	29102 (22610)	35566 (44997)	20913 (27619)	19350 (25791)	30832 (28839)	21831 (24470)	20810 (23275)	13714 (23033)	13223 (15284)	210629 (243906
2714	6842 (10185)	25617 (20112)	18423 (21559)	6845 (15014)	10333 (15084)	15618 (18303)	19960 (15530)	12993 (16714)	9887 (15071)	4251 (5549)	130769 (153121
2812	-	-	-	-	3743 (2410)	2291 (2320)	906 (2512)	2241 (3787)	604 (1551)	408 (1068)	10193 (13648
2813	563 (1911)	-	2270 (6885)	1258 (2985)	446698 (268826)	516273 (457198)	215932 (320765)	45613 (110517)	55053 (121633)	27039 (49925)	1311699 (1340645
2814	77167 (131272)	272962 (261903)	44030 (112954)	41459 (97407)	76135 (96368)	68601 (91294)	32904 (70703)	28426 (59124)	30403 (55329)	26360 (35392)	699447 (1011746
2912	60 (310)	786 (1701)	176 (972)	-	-	-	-	-	-	-	1022 (2983
2913	867 (1512)	10384 (7620)	4065 (5472)	1107 (3402)	6424 (5112)	17189 (13708)	3547 (8487)	139 (420)	374 (1561)	889 (2133)	44985 (49427
2914	147326 (249265)	538117 (470355)	129264 (223155)	127737 (235210)	205169 (233602)	159464 (199576)	96317 (172919)	79283 (131433)	73065 (28684)	35144 (56713)	1590886 (2100912
3012	-	-	-	-	849 (1674)	818 (1395)	-	-	-	-	1667 (3069
3013	359 (1296)	6581 (5260)	2370 (4435)	642 (2235)	1901 (4385)	1171 (2178)	-	-	-	-	13024 (19789
3014	74360 (138417)	397111 (313410)	156456 (191629)	108393 (182658)	192056 (228534)	170146 (200629)	68225 (111803)	49564 (85135)	41707 (81865)	29883 (41706)	1287901 (1575936
3015	18279 (26731)	71827 (65376)	49415 (56562)	45416 (56547)	57848 (61429)	45330 (55685)	14597 (29621)	11932 (21872)	8079 (16810)	4414 (10317)	327137 (400950
3112	761 (1410)	8737 (7020)	3000 (2961)	2700 (2961)	2681 (2961)	2750 (2820)	-	-	-	-	20629 (20133
3113	804 (1200)	2063 (2175)	-	3752 (1950)	2534 (1950)	2493 (3180)	1215 (1725)	1757 (1275)	-	-	14618 (13455
3114	11952 (20691)	68189 (57708)	46557 (51688)	39785 (54741)	42754 (55175)	30549 (38520)	3316 (6782)	4411 (12296)	4387 (8592)	2495 (5040)	254395 (311233
3115	121479 (199503)	509545 (416994)	243996 (322008)	248592 (365229)	292745 (383243)	186798 (287065)	89676 (176654)	73147 (153940)	53239 (104976)	22284 (42243)	1841501 (2451855
3212	-	-	-	-	-	-	-	-	-	-	-
3213	-	-	-	-	-	-	-	-	-	-	-
3214	-	-	-	-	-	-	-	-	-	-	-
3215	17346 (25602)	121939 (86017)	49176 (64433)	55854 (74884)	50760 (72427)	36019 (55384)	31888 (45801)	26642 (38789)	21594 (27812)	10292 (14398)	421510 (505547
3314	-	-	-	-	177 (360)	596 (1140)	-	-	-	-	773 (1500
3315	512 (1320)	3895 (4488)	2561 (3402)	1813 (2772)	1719 (2736)	8340 (2296)	715 (1440)	1971 (2550)	1041 (792)	747 (854)	23314 (22650
3414	-	-	470 (1000)	-	-	-	-	-	-	-	470 (1000
TOTAL	483965 (818613)	2066855 (1742749)	787795 (1114312)	707546 (1128874)	1415804 (1460047)	1295278 (1451530)	634214 (992092)	376507 (663452)	314621 (589189)	177429 (280622)	826001 (1025548

TOTAL CATCH = 8260014 .KGS

TOTAL EFFORT = 10255480 POT LIFTS

EFFORT FIGURES ARE SHOWN IN PARENTHESIS AND CATCH FIGURES ARE UNDERLINED.

TA: 2 - CATCH/EFFORT DATA FOR 1974/75 SEASON IN VARIOUS STATISTICAL BLOCKS

BLOCK	NOV	DEC	JAN	FEB	MARCH	APRIL	MAY	JUNE	JULY	AUG	TOTAL
2612	-	-	-	-	-	-	-	-	-	-	-
2613	-	-	-	0.39	0.97	-	10.83	7.56	1.00	-	4.48
2712	-	-	-	-	-	-	-	-	-	-	-
2713	0.66	1.29	0.79	0.76	0.75	1.07	0.89	0.89	0.60	0.87	0.86
2714	0.67	1.27	0.85	0.46	0.69	0.85	1.29	0.78	0.66	0.77	0.85
2812	-	-	-	-	1.55	0.99	0.36	0.59	0.39	0.38	0.75
2813	0.29	-	0.33	0.42	1.66	1.13	0.68	0.41	0.45	0.54	0.98
2814	0.59	1.04	0.39	0.43	0.79	0.75	0.48	0.48	0.55	0.74	0.69
2912	0.19	0.46	0.18	-	-	-	-	-	-	-	0.34
2913	0.57	1.36	0.74	0.33	1.26	1.25	0.42	0.33	0.24	0.42	0.91
2914	0.59	1.14	0.58	0.54	0.88	0.80	0.56	0.60	0.57	0.62	0.76
3012	-	-	-	-	0.51	0.59	-	-	-	-	0.54
3013	0.28	1.25	0.53	0.29	0.43	0.54	-	-	-	-	0.66
3014	0.54	1.27	0.82	0.59	0.84	0.85	0.61	0.58	0.51	0.72	0.82
3015	0.68	1.10	0.87	0.80	0.94	0.81	0.49	0.55	0.48	0.43	0.82
3112	0.54	1.24	1.01	0.91	0.91	0.98	-	-	-	-	1.02
3113	0.67	0.95	-	1.92	1.30	0.78	0.70	1.38	-	-	1.09
3114	0.58	1.18	0.90	0.73	0.77	0.79	0.49	0.36	0.51	0.50	0.82
3115	0.61	1.22	0.76	0.68	0.76	0.65	0.51	0.48	0.51	0.53	0.75
3212	-	-	-	-	-	-	-	-	-	-	-
3213	-	-	-	-	-	-	-	-	-	-	-
3214	-	-	-	-	-	-	-	-	-	-	-
3215	0.68	1.42	0.76	0.75	0.70	0.65	0.70	0.69	0.78	0.71	0.83
3314	-	-	-	-	0.49	0.52	-	-	-	-	0.52
3315	0.39	0.87	0.75	0.65	0.63	3.63	0.50	0.77	1.31	0.87	1.03
3414	-	-	0.47	-	-	-	-	-	-	-	0.47
TOTAL	0.59	1.19	0.71	0.63	0.97	0.89	0.64	0.57	0.53	0.63	0.81

TOTAL CATCH 8 260 014 KGS

TOTAL EFFORT 10 255 480 POT LIFTS

TABLE 3 - MEAN CARAPACE LENGTHS (MM) OF MALE AND FEMALE ROCK LOBSTERS IN VARIOUS DEPTH CATEGORIES AT FREMANTLE, LANCELIN, JURIEN AND DONGARA THROUGHOUT THE FISHING SEASON.

YEAR	AREA	MONTH	0-10 Fms		10-20 Fms		20-30 Fms		30+ Fms	
			Male	Female	Male	Female	Male	Female	Male	Female
74/75	Fremantle	Nov	78	75	87	83				
		Dec	77	75			91	86	93	86
		Jan	79	76	93	87	94	90		
		Feb	75	72			104	98		
		Mar	78	75						
		Apr	77	77			91	86		
		May					98	92		
		Jun	76	73						
		Jly			88	85				
		Aug	77	74						
74/75	Lancelin	Nov	73	70						
		Dec	76	75	85	80				
		Jan	71	70	108	99				
		Feb	74	72	104	97	114	105		
		Mar	76	73	99	87				
		Apr	75	73			102	94		
		May	74	72						
		Jun	74	72						
		Jly	73	73						
		Aug	75	73	103	102				
74/75	Jurien	Nov	74	73	76	75				
		Dec	78	75	77	74				
		Jan	75	73			90	84	93	87
		Feb	75	73	79	75	89	83		
		Mar	75	73	79	76				
		Apr	77	74	79	79	96	88		
		May	76	74	77	75				
		Jun	76	73	77	79				
		Jly	75	72	79	76	93	90	98	91
		Aug	76	74						
74/75	Dongara	Nov	69	68						
		Dec	80	76	79	76				
		Jan	74	72	74	72	95	89	96	93
		Feb	75	74	76	74				
		Mar	76	74	79	76			98	90
		Apr	73	73	76	74			101	89
		May	76	74	81	78	94	86	103	92
		Jun								
		Jly	71	69	79	75	90	91		
		Aug	76	74			94	87		

TABLE 4 - BOTTOM TEMPERATURE (°C), AND SURFACE SALINITY IN PARTS PER THOUSAND FOR FREMANTLE, LANCELIN, JURIEN, AND DONGARA OF WATERS BETWEEN VARIOUS DEPTH CONTOURS FOR THE 1974/75 SEASON.

Area	Depth (Fath)	NOVEMBER Temp	Sal	DECEMBER Temp	Sal	JANUARY Temp	Sal	FEBRUARY Temp	Sal	MARCH Temp	Sal	APRIL Temp	Sal	MAY Temp	Sal	JUNE Temp	Sal	JULY Temp	Sal	AUGUST Temp	Sal
FREMANTLE	0-10	18.8	35.66	19.6		22.6	35.77	22.4	36.26	22.7	36.07	20.7	35.61			19.1	35.32			16.0	35.16
	10-20	19.4				21.0	35.68											20.0	35.17		
	20-30			20.1	35.63		35.57	21.4	35.68			20.4			35.40						
	30+			20.4	35.59																
LANCELIN	0-10	19.9	35.45	20.6	35.40	22.1	36.30	23.0	36.23	21.5	35.91	22.2	35.55	21.0	35.34	19.6	35.15	18.2	35.16	17.4	35.11
	10-20			20.2	35.46			22.3	35.90	21.8	35.51									18.9	35.18
	20-30					21.2	35.87	22.8	35.62			21.5	35.38								
	30+																				
JURIEN	0 10	19.6	35.74	20.2	35.58	21.8	36.13	22.9	35.99	22.8	36.38		35.69	20.6	35.51	18.6	35.29		33.66	18.6	35.14
	10-20	19.5	35.62	20.0	35.68			23.6		21.8	35.71			20.2	35.88			17.7	35.28		
	20-30					21.1	35.66	22.6	35.77				35.53					20.1	35.15		
	30+					21.1	35.68														
DONGARA	0-10	20.8	35.68	20.7		21.9	35.63	24.8	35.87	22.6	35.88		36.38	19.1	35.75			18.7	34.60	18.6	35.14
	10-20			20.4				24.1	35.85	22.2	35.83		36.00	21.3	35.65						
	20-30					21.2	35.66											20.6	35.10	18.8	35.35
	30+					21.4	35.45			23.2	35.43		35.17	23.2	35.37						

Temperatures were taken using an unprotected reversing thermometer and surface water samples were taken and later analysed to determine salinity.

TABLE 5 - 1974/75 SEX RATIO BY MONTH AND DEPTH CATEGORY, FIGURES GIVEN ARE % OF FEMALES IN THE TOTAL

AREA	DEPTH RANGE FATH.	NOVEMBER	DECEMBER	JANUARY	FEBRUARY	MARCH	APRIL	MAY	JUNE	JULY	AUGUST
Dongara	0-10	50	60	52	52	56	60	51		51	53
	10-20		63	58	53	58	58	52		49	
	20-30			68				54		76	63
	30+			68		68	56	54			
Jurien	0-10	48	62	54	50	49	59	58	56	50	59
	10-20	47	60		61	59	64	66	41	54	
	20-30			67	60		69			84	
	30+			65						72	
Lancelin	0-10	52	48	55	48	58	62	58	58	58	55
	10-20		57		61	55					70
	20-30			59	78		59				
	30+										
Fremantle	0-10	56	48	46	47	52	60		54		52
	10-20	43		53						54	
	20-30		57	68	75		38	62			
	30+		50								

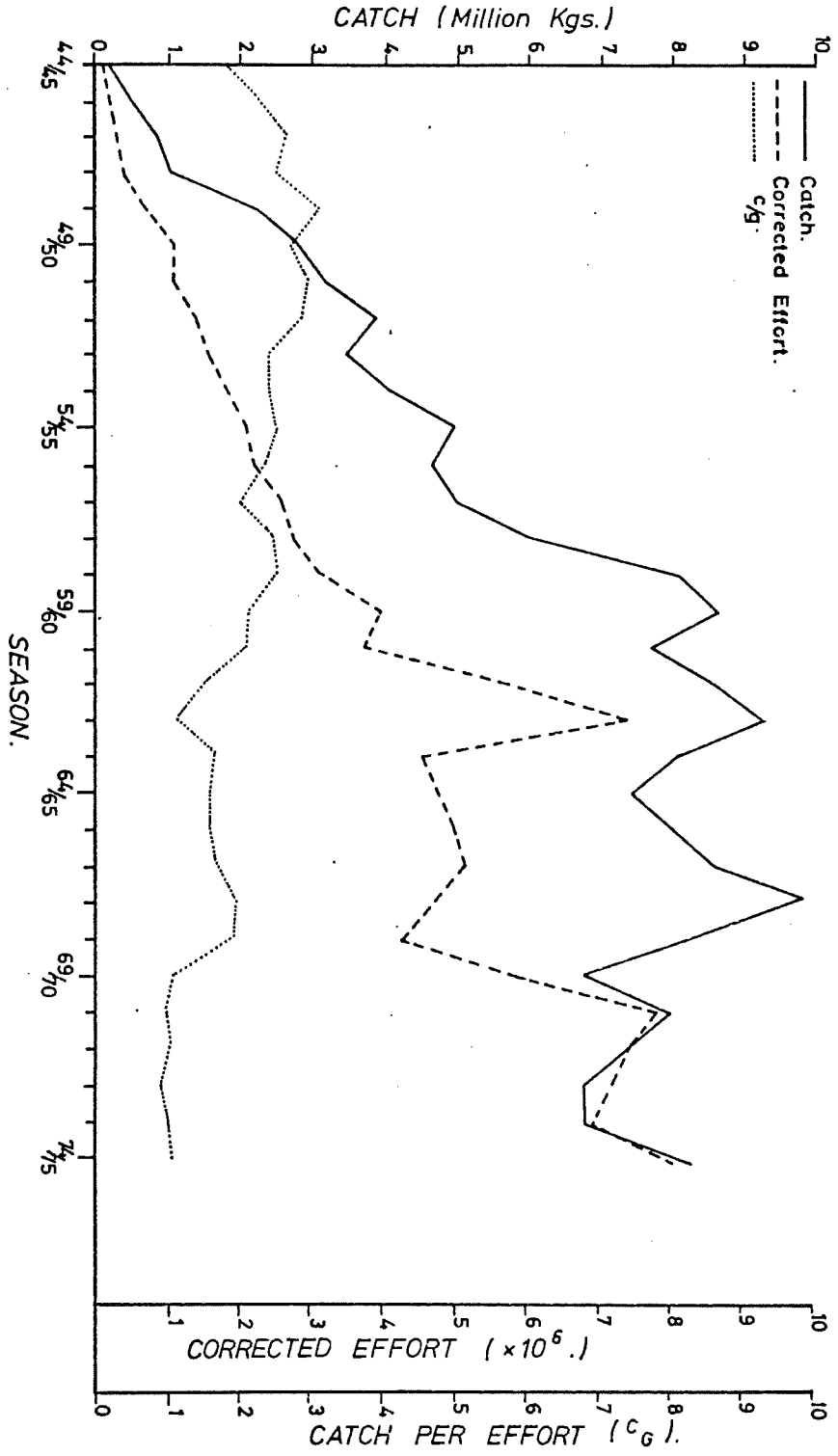

FIGURE 1. Rock Lobster Catch, Corrected Effort and Catch per Unit of Effort Data.

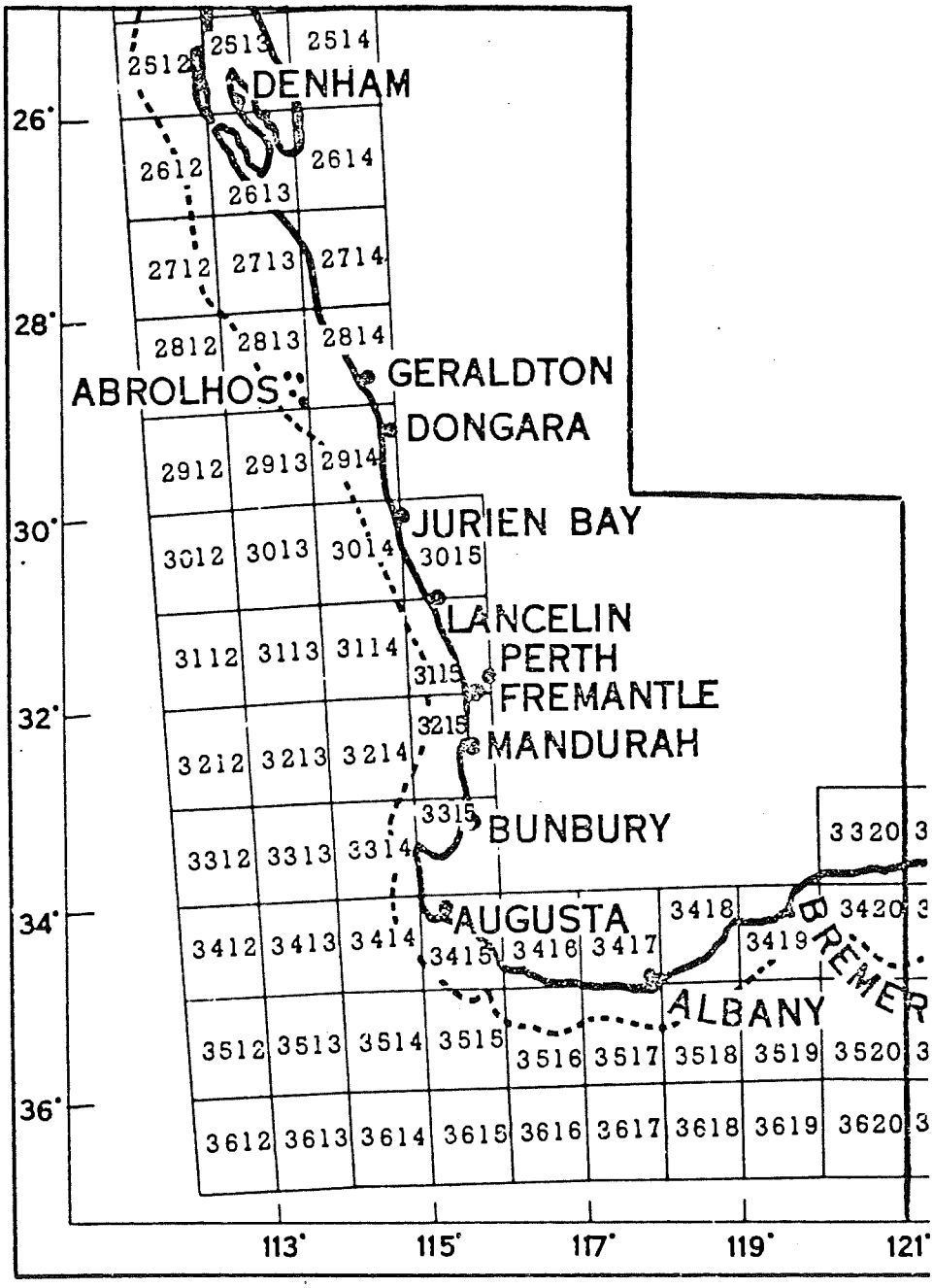

FIGURE 2. Rock Lobster Fishing Areas

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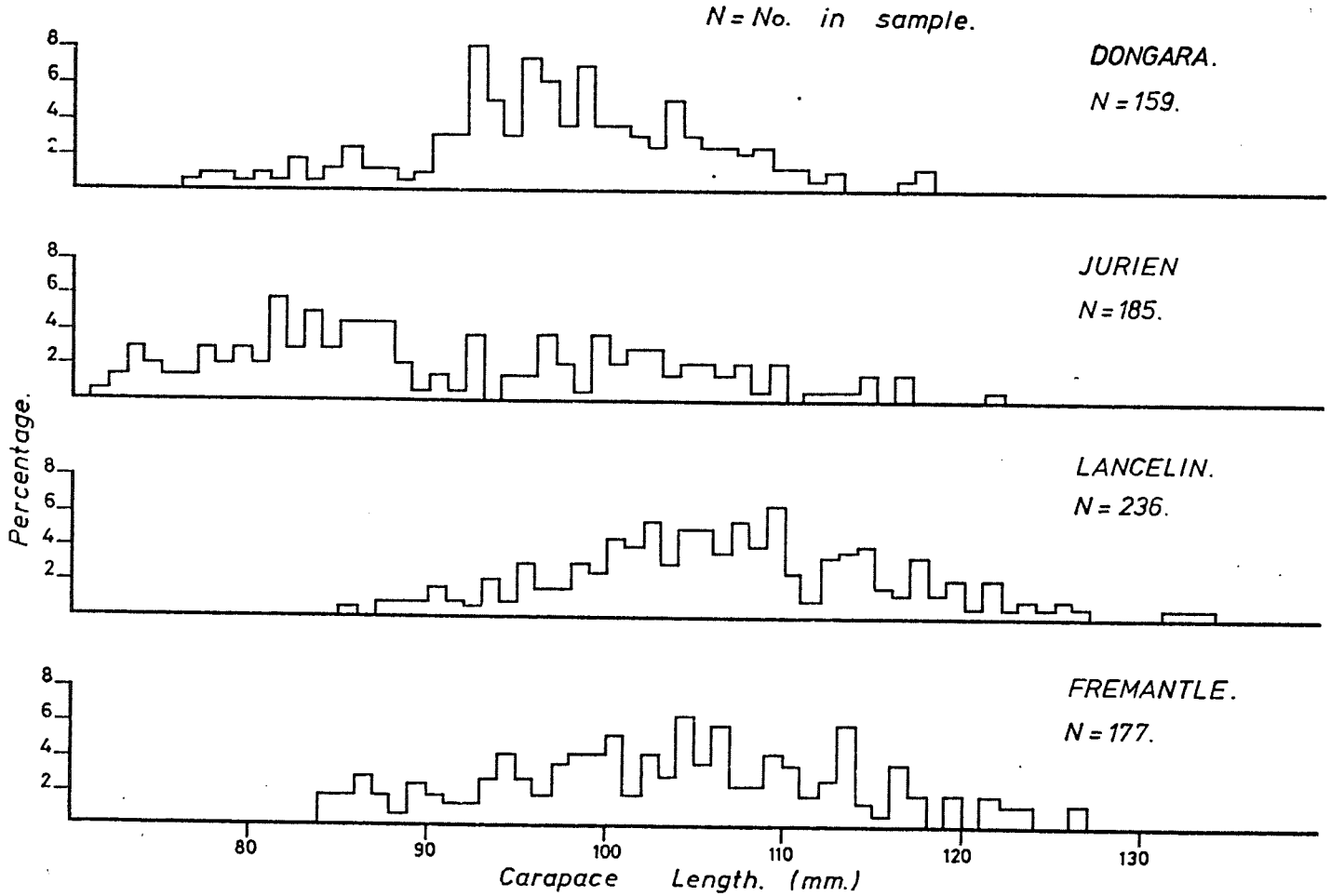

FIGURE 3. Length Frequency of Breeding Female Rock Lobsters Taken From December 1974 to February 1975.

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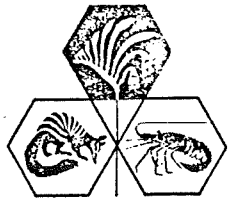

DEPARTMENT OF
FISHERIES AND WILDLIFE
WESTERN AUSTRALIA

REPORT No 19

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The Western Rock Lobster Fishery 1973–1974

BY

G. R. MORGAN

AND

E. H. BARKER

PERTH
WESTERN AUSTRALIA

1975

CORRIGENDUM

Morgan, G.R. and Barker, E.H. (1975), THE WESTERN ROCK LOBSTER FISHERY 1973-1974. Dept. Fish. Wildl. West. Aust. Rept. No. 19, 1975.

Page 7 C. NUMBER OF BOATS

Figures 800 should read 813.

Figures 391 should read 405.

Department of Fisheries and Wildlife

108 Adelaide Terrace

PERTH

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THE WESTERN ROCK LOBSTER FISHERY 1973-74

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1 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 the second of a series of annual reviews of the previous rock lobster season which will discuss fishing practise, catches, effort, mean size and various other factors, a knowledge of which will help toward a better understanding of the status of the fishery.

11 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.

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

111 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 1973 the "whites" run commenced on about 24 November in both northern and southern areas which is about the average time, and only a day earlier than the previous season.

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

"Whites" catch	=	1 693 043 kg
"Whites" effort	=	2 514 074 pot lifts
"Coastal Reds" catch	=	3 853 296 kg
"Coastal Reds" effort	=	6 070 310 pot lifts
Abrolhos catch	=	1 233 333 kg
Abrolhos effort	=	1 279 868 pot lifts
Total Catch	=	6 779 672 kg
Total Effort	=	9 864 252 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 catchability in that month (Morgan, 1974), the total effective fishing intensity was 7 127 385 units of effort, which was about 1.73% less than the 1972/73 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, Lancelin, Dongara and Jurien 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 1973-74	=	800
Number of boats licensed North of 30°S	=	409
Number of boats licensed South of 30°S	=	391

D. Forecast of 1973/74 Recruitment

The poor puerulus settlement that occurred during 1969-70 was reflected in the reduced catches in the 1973-74 "white" fishery (Chittleborough and Phillips, 1975).

E. Introduction of New Legislation

1. As from 1 November 1973 the fishing industry changed over to the metric system, and all measurements and distances referred to in the Fisheries Act Regulations were changed to metric units.

2. The period that professional rock lobster fishermen may take rock lobsters in the area between 800 metres offshore and 1600 metres offshore from Parker Point to Cape Vlaming was extended. Fishermen may now fish in this defined area from 15 November to 15 January (previously 15 November to 31 December).

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. 6 No. 3 (Sept 1973) pp, 61, 62, 63. Vol. 6 No. 4 (Dec 1973) back page.

F. Effects of New Legislation

1. The change over to the metric system proceeded smoothly, with the majority of fishermen completing their returns and research log books in kg.

2. The decision to extend the time that fishermen may take rock lobsters in the above defined area at Rottnest was well received by fishermen. Production figures are however not available for this area as the monthly returns and log book data supplied by fishermen are not sufficiently detailed.

G. Innovations to Boats and Gear

The number of boats replaced during the period 1 July 1973 to 30 June 1974 was 36% less than for the same period in 1972/73. This was due to a general decline in the economy of the industry. Figures supplied by the Harbour and Light Department showed that a total of 43 boats were replaced ranging from 6.35 m - 16.46 m in length and were constructed of:

	WOOD	FIBRE GLASS	ALUMINIUM	STEEL
FREMANTLE	12	8	2	-
GERALDTON	12	8	-	1
	24	16	2	1

The trend was still towards lighter hulls and greater speed with larger vessels becoming unpopular due to higher overhead costs and reduced profitability.

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	10.4%	83.0%	6.6%
SOUTH	67.6%	27.5%	5.0%

The use of large single necked pots (converted large multi-necked pots which were banned during the 1972/73 season) continued to decline.

H. Bait

The type of bait used does not vary greatly from season to season. However price and availability does to some extent affect the individual's choice of a particular bait. The most popular combinations of bait were, cattle hocks or pieces of cattle hide together with fish heads, whole fish or pieces of fish. The range of fish baits consisted of: Western Australian salmon heads (*Arripis trutta esper.*), Eastern salmon heads (*Arripis trutta marginata*), pieces of salmon flesh, Australian herring or ruff (*Arripis georgianus*), New Zealand snapper heads (*Chrysophrys auratus*), mullet (*Mugil cephalus*), Yellow-eyed mullet (*Aldrechetta forsteri*), pilchards (*Sardinops neopilchardus*), bony herring (*Fluvialosa vlaminghi*), scaly mackerel (*Amblygaster postera*), Canadian salmon heads (*Oncorhynchus* sp.), Eastern States barracouta heads (*Leionura atun*), Eastern States and Western Australian tuna heads and tuna meat.

In the northern areas (i.e. north of 30° South) the most popular baits were, hocks and/or cattle hide used in combination with herring or other assorted fish and fish heads.

In the southern areas (i.e. south of 30° South) the most popular combinations of bait were hocks and/or pieces of hide together with herring, salmon heads and pieces of salmon plus assorted fish and fish heads.

Pieces of hide became increasingly popular (especially in the southern areas) due to lower cost, longer lasting qualities, ease of storage and more baits per bag.

Although still popular, salmon heads declined slightly in use due to poor availability and high cost. The cost of salmon heads rose by approx. 9.6% from the 1972/73 season. Eastern States salmon heads being smaller in size and thereby giving more baits to the bag, were generally more popular than local salmon heads.

I. Distribution of Fishing

The distribution of fishing is shown in Table 1. The usual pattern of fishing occurred i.e. 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), depending on weather and density of rock lobsters, throughout the remainder of the season.

J. Average Number of Days Worked per boat per Month

Month	Nov	Dec	Jan	Feb	March	April	May	June	July	Aug
Days worked	10.8	24.5	16.6	16.7	21.7	20.1	15.9	14.7	15.0	6.6

The average number of days worked per month during November and December was 2.5% down on the 1972/73 season and for the period January to August was 7.4% up on the 1972/73 season.

The average number of days worked per month for the 1973/74 season was 17.0, which was an increase of 4.9% on the 1972/73 season.

*K. Price of Rock Lobsters

Price to fishermen $2.64 - $2.75 per kg.

Wholesale New York price

Grade	$Aust. per kg.
5 - 6 oz (142 - 170 g.)	7.93 - 8.51
6 - 8 oz (170 - 226 g.)	7.66 - 8.88
8 - 10 oz (226 - 283 g.)	6.96 - 8.54
10 - 12 oz (283 - 340 g.)	7.11 - 8.54

12 - 16 oz (340 - 453 g.)	6.80 - 8.39
16 - 20 oz (453 - 566 g.)	6.67 - 7.72
over 20 oz (over 566 g.)	6.26 - 7.42

*L. Market Trends and Economic Factors

The majority (99%) of frozen rock lobster tails were again exported to the U.S.A. Export of whole rock lobster decreased by 46% from the record level of 1972/73. 53% of exports of whole rock lobster went to Japan and 21% to the U.S.A.

Holdings of frozen rock lobster tails in the U.S.A. at 30 June 1973 were 1 973 tonnes a decrease of 23% on holdings a year earlier.

In September 1973 the Australian dollar was devalued by 12%. This resulted in an increase in the price paid to fishermen.

M. Average Value per Pot on Pot Redistribution

About $250 - $270.

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 24.1°C on 27 January 1974 and a minimum of 16.3°C on 21 and 28 July 1974.

The average salinity during the season at Waterman (aquarium) was 35.570 °/oo, with a maximum of 36.597 °/oo on 24 February 1974 and a minimum of 33.931 °/oo on 12 August 1974.

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

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

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 Lancelin and Fremantle than at either Dongara or Jurien with the mean sizes being 88.0 mm for Jurien, 94.6 mm for Dongara, 105.4 mm for Fremantle and 107.4 mm for Lancelin. By comparison the mean sizes at first breeding (i.e. the smallest carapace length at which 50 per cent have been mated) was found to be 99.0 mm at Fremantle, 92.0 mm at Lancelin and 92.0 mm at Jurien. Insufficient data was available for Dongara.

P. Sex Ratios

The sex ratios 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 1973/74 catch was down slightly on the previous season although still just within the lower range of sustainable level of catch calculated by Bowen and Chittleborough (1966). The reduced catches of the 1972-3 and 1973-4 seasons were probably a result of the poor puerulus settlement that occurred during 1969 and 1970. The total effective fishing intensity also showed some reduction from the previous season and it could well be that, under the present regulations and economic conditions, the effort expended by the fleet is stabilizing. There was a general decline in the economy of the industry brought about by increased costs while prices only increased marginally. These will be fully documented in the current economic survey being conducted by the Australian Department of Agriculture. A 12% revaluation of the Australian dollar in September 1973 did, however, help to offset increased overheads and charges. The

reduction in the number of boat replacements from the previous season also reflected the downward trend in the economy of the industry. The trend towards increased efficiency of the fishing fleet continued during the 1973/74 season, and this together with above average weather conditions resulted in an increase in the average number of boat days worked per month from the previous season.

V ACKNOWLEDGEMENTS

A substantial part of this work was financed by a grant from the Fishing Industry Research Trust Account. Measurements aboard commercial fishing vessels were performed by Mr. R. Bell and Mr. N. Travers.

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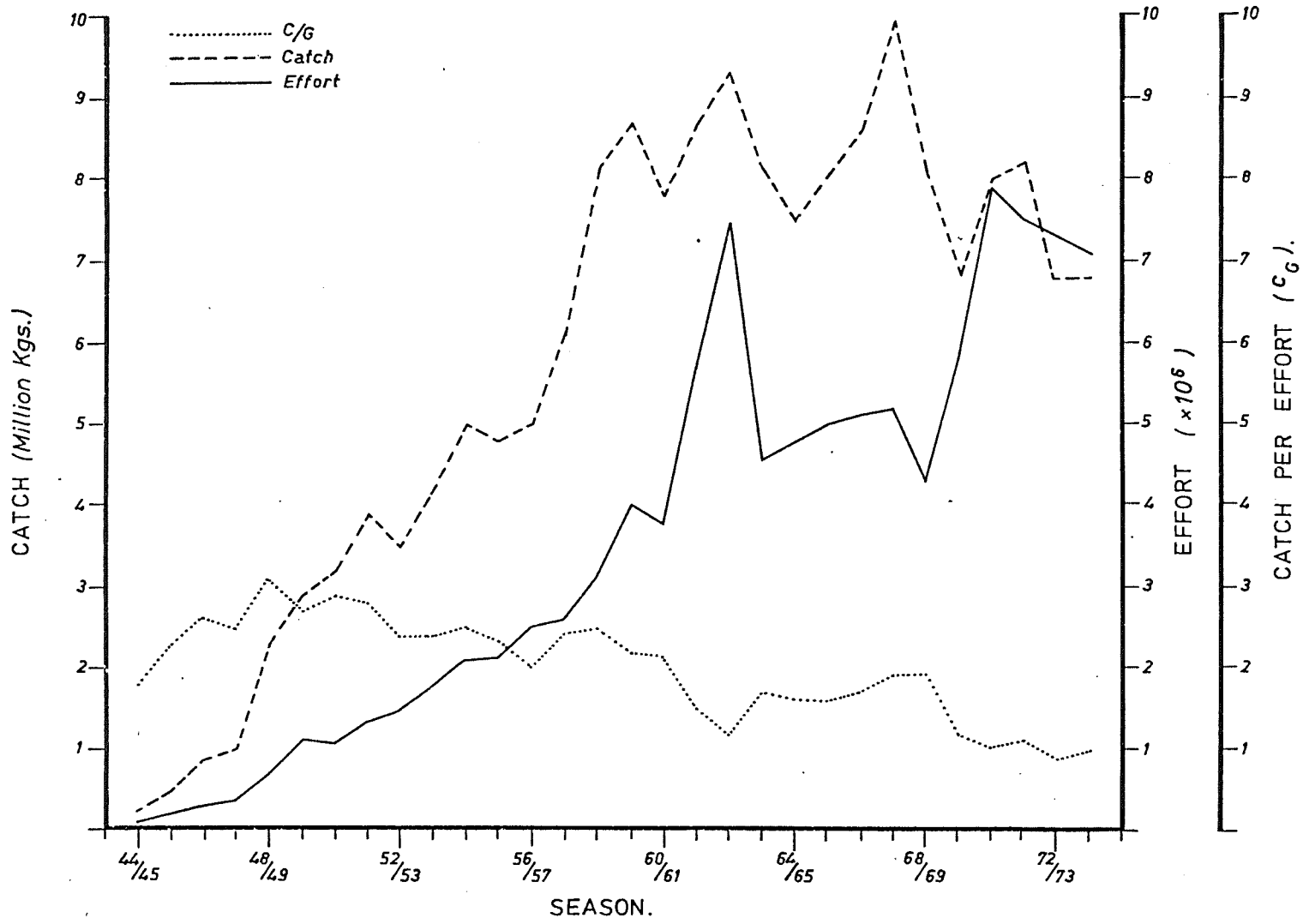


FIGURE 1. Rock Lobster Catch, Corrected Effort and Catch per unit of Effort Data

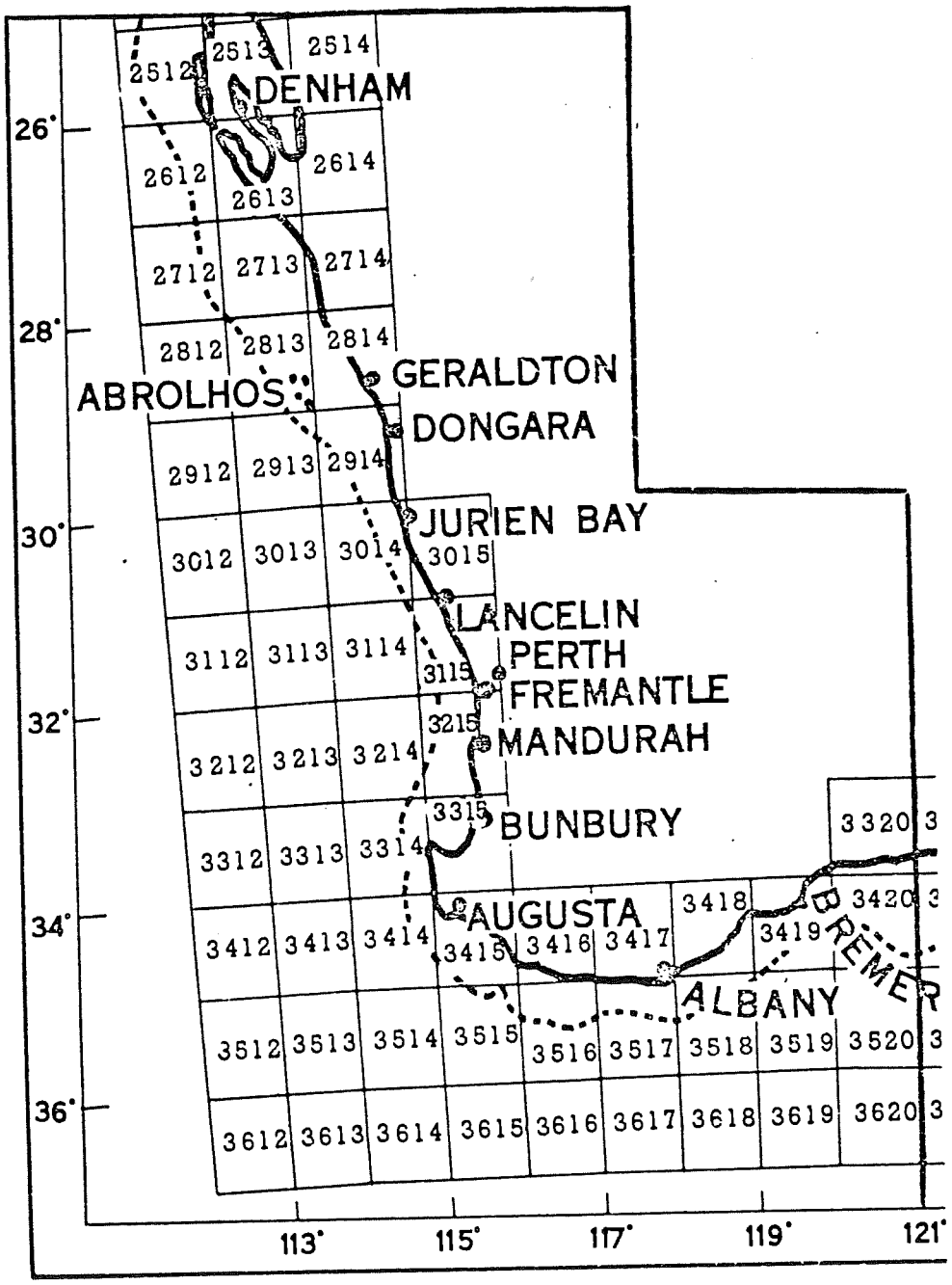


FIGURE 2. Rock Lobster Fishing Areas

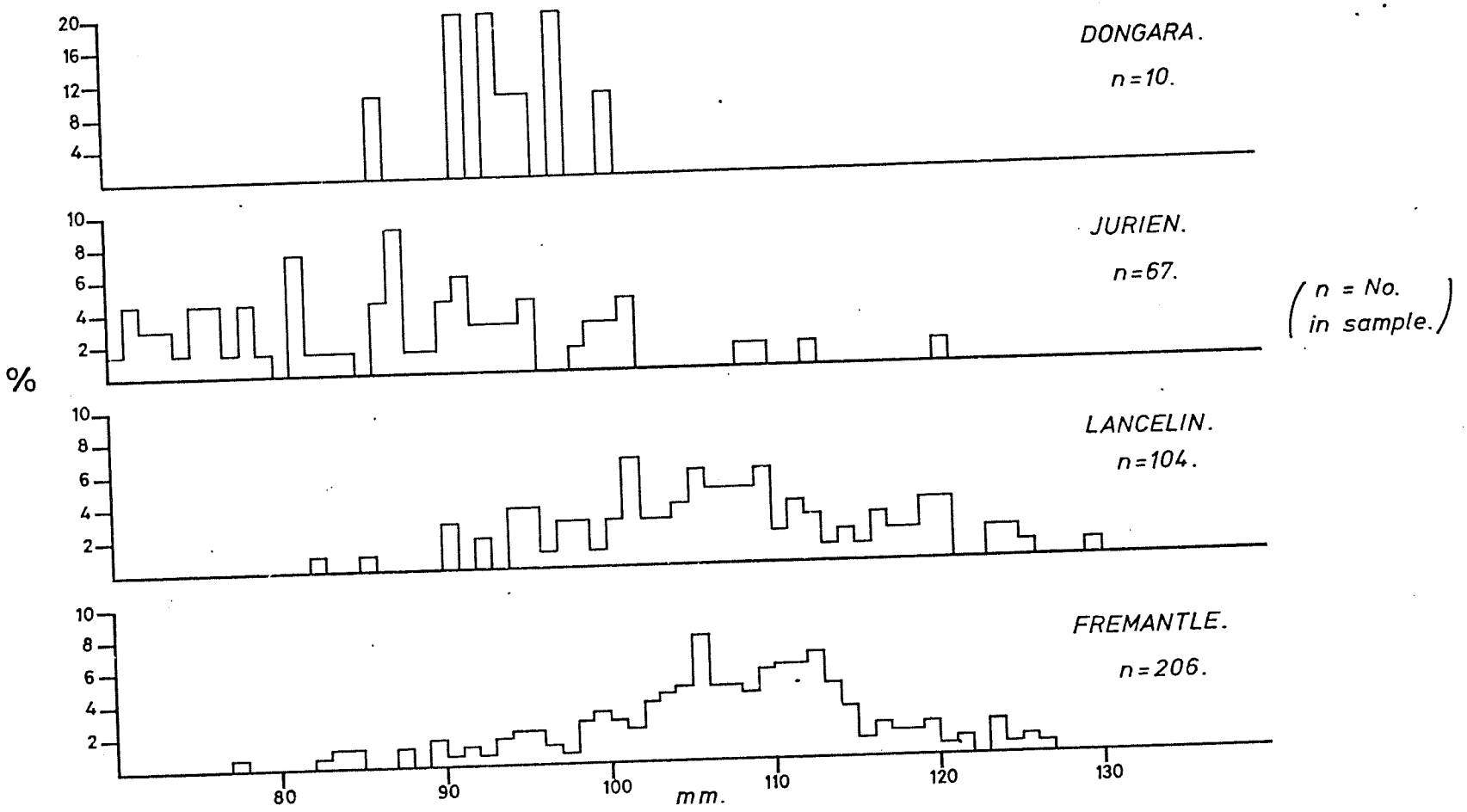


FIGURE 3. Length Frequency of Breeding Female Rock Lobsters taken from December 1973 to February 1974.

TABLE 1. Catch (in kgs weight) and Effort (in pot lifts) for the 1973/74 Rock Lobster Season in Various Statistical Blocks.

Block	Nov	Dec	Jan	Feb	March	April	May	June	July	Aug	Total
2612	-	-	-	-	-	-	-	-	-	-	-
	-	-	-	-	-	-	-	-	-	-	-
2613	-	1133	276	-	1659	1590	6193	-	977	318	12146
	-	(1800)	(840)	-	(3795)	(1148)	(3749)	-	(2560)	(840)	(14732)
2712	-	-	-	-	-	-	-	-	-	-	-
	-	-	-	-	-	-	-	-	-	-	-
2713	3492	19215	36891	10285	20654	29559	19484	14636	8125	2740	165081
	(6131)	(16390)	(34417)	(21669)	(27217)	(19764)	(19331)	(20238)	(20723)	(4912)	(190792)
2714	5222	15584	19793	6729	14714	19936	13490	10816	5661	181	112126
	(7721)	(12283)	(24736)	(14056)	(18353)	(18895)	(16465)	(14608)	(8923)	(558)	(136598)
2812	-	1158	155	147	6214	5270	2600	892	100	-	16536
	-	(1350)	(836)	(968)	(5100)	(5430)	(4026)	(1260)	(855)	-	(19825)
2813	2532	5899	1040	987	448513	439725	197973	53525	73750	19847	1243791
	(4368)	(11404)	(2754)	(3108)	(252303)	(430173)	(286275)	(110252)	(156999)	(43866)	(1301502)
2814	56328	205694	41148	37449	75247	60074	40654	36569	42453	14714	610330
	(128540)	(277555)	(112174)	(96715)	(96238)	(91601)	(75368)	(66099)	(70309)	(22953)	(1037552)
2912	-	-	-	-	3960	2410	-	-	-	-	6370
	-	-	-	-	(3640)	(2400)	-	-	-	-	(6040)
2913	1006	9567	2870	1780	37969	23804	6976	937	3602	642	89153
	(2712)	(13747)	(5574)	(3585)	(19467)	(22812)	(10222)	(2622)	(5460)	(1740)	(87941)
2914	136459	344408	151500	112922	187432	120055	81635	60716	83199	20832	1299158
	(242518)	(503001)	(277244)	(221712)	(233336)	(184873)	(134444)	(116411)	(132781)	(37058)	(2083378)
3012	1550	7755	1574	2177	1759	2498	-	-	-	-	17313
	(3462)	(8079)	(1989)	(2674)	(1879)	(2223)	-	-	-	-	(20306)
3013	448	7094	4646	3551	6425	2870	52	505	120	-	25711
	(810)	(5778)	(7392)	(6966)	(9888)	(4962)	(135)	(1683)	(560)	-	(38174)
3014	61325	256441	131558	101809	200228	134301	49528	45629	41397	10505	1032721
	(125731)	(306305)	(223471)	(189217)	(255396)	(198234)	(99590)	(88369)	(84394)	(25236)	(1595943)
3015	12351	69758	29261	20701	49072	26685	10027	12842	7442	2703	240842
	(26657)	(81041)	(49134)	(38808)	(64289)	(34967)	(18124)	(20135)	(15883)	(4273)	(353311)
3112	318	5742	2772	2539	3236	-	-	-	-	218	14825
	(987)	(5666)	(3102)	(2874)	(3384)	-	-	-	-	(420)	(16433)
3113	801	3388	1185	3027	1764	650	873	1181	1027	491	14387
	(3184)	(4392)	(1386)	(4732)	(1950)	(1200)	(3150)	(2850)	(2410)	(794)	(26048)
3114	6812	31901	40874	27372	40937	22009	3807	1245	945	336	176238
	(18966)	(44164)	(55790)	(43046)	(52993)	(34181)	(8655)	(3035)	(2120)	(600)	(263550)
3115	54603	286582	213702	187263	323401	122554	55987	50502	36613	13705	1344912
	(158313)	(374687)	(285330)	(301537)	(379095)	(240525)	(129709)	(124162)	(89158)	(28730)	(2111245)
3212	-	-	-	-	-	-	-	-	-	-	-
	-	-	-	-	-	-	-	-	-	-	-
3213	-	-	-	-	-	-	-	-	-	-	-
	-	-	-	-	-	-	-	-	-	-	-
3214	-	2727	-	-	-	350	-	-	-	-	3077
	-	(4050)	-	-	-	(1184)	-	-	-	-	(5234)
3215	4120	66817	54259	51596	62398	26139	19739	23457	15371	7508	331404
	(14007)	(90140)	(77082)	(79032)	(100118)	(52524)	(34945	(33508)	(23038)	(8040)	(512434)
3314	-	-	3103	-	-	-	-	-	-	891	3994
	-	-	(2535)	-	-	-	-	-	-	(450)	(2985)
3315	1144	3669	2692	3139	788	757	261	1417	2732	870	17469
	(2498)	(5637)	(4022)	(6838)	(3000)	(2570)	(1204)	(4663)	(2850)	(2036)	(35318)
3414	-	-	265	995	702	126	-	-	-	-	2088
	-	-	(690)	(2221)	(1760)	(240)	-	-	-	-	(4911)
Total	348511	1344532	739564	574468	1487072	1041362	509279	314869	323514	96501	6779672
	(746605)	(1767469)	(1170498)	(1039758)	(1533201)	(1349906)	(845391)	(609895)	(619023)	(182506)	(9864252)

TOTAL CATCH = 6 779 672 kgs

TOTAL EFFORT = 9 864 252 Pot Lifts

Effort figures are shown in parenthesis and catch figures are underlined

TABLE 2. Catch/Effort Data for 1973/74 Season in Various Statistical Blocks.

Block	Nov	Dec	Jan	Feb	March	April	May	June	July	Aug	Total
2612	-	-	-	-	-	-	-	-	-	-	-
2613	-	0.63	0.33	-	0.44	1.39	1.65	-	0.38	0.38	0.82
2712	-	-	-	-	-	-	-	-	-	-	-
2713	0.57	1.17	1.07	0.47	0.76	1.50	1.01	0.72	0.39	0.56	0.87
2714	0.68	1.27	0.80	0.48	0.80	1.06	0.82	0.74	0.63	0.32	0.82
2812	-	0.86	0.19	0.15	1.22	0.97	0.65	0.71	0.12	-	0.83
2813	0.58	0.52	0.38	0.32	1.78	1.02	0.69	0.49	0.47	0.45	0.96
2814	0.44	0.74	0.37	0.39	0.78	0.66	0.54	0.55	0.60	0.64	0.59
2912	-	-	-	-	1.09	1.00	-	-	-	-	1.05
2913	0.37	0.70	0.51	0.50	1.95	1.04	0.68	0.36	0.66	0.37	1.01
2914	0.56	0.68	0.55	0.51	0.80	0.63	0.61	0.52	0.63	0.56	0.62
3012	0.45	1.00	0.79	0.81	0.94	1.12	-	-	-	-	0.85
3013	0.55	1.23	0.63	0.51	0.65	0.58	0.39	0.30	0.21	-	0.67
3014	0.49	0.84	0.59	0.54	0.78	0.68	0.50	0.52	0.49	0.42	0.65
3015	0.46	0.86	0.60	0.53	0.76	0.76	0.55	0.64	0.47	0.63	0.68
3112	0.32	1.01	0.89	0.88	0.96	-	-	-	-	0.52	0.90
3113	0.25	0.77	0.86	0.64	0.90	0.54	0.28	0.41	0.43	0.62	0.55
3114	0.36	0.72	0.73	0.64	0.77	0.64	0.44	0.41	0.45	0.56	0.67
3115	0.34	0.76	0.75	0.62	0.85	0.51	0.43	0.41	0.41	0.48	0.64
3212	-	-	-	-	-	-	-	-	-	-	-
3213	-	-	-	-	-	-	-	-	-	-	-
3214	-	0.67	-	-	-	0.30	-	-	-	-	0.59
3215	0.29	0.74	0.70	0.65	0.62	0.50	0.56	0.70	0.67	0.93	0.65
3314	-	-	1.22	-	-	-	-	-	-	1.98	1.34
3315	0.46	0.65	0.67	0.46	0.26	0.29	0.22	0.30	0.96	0.43	0.49
3414	-	-	0.38	0.45	0.40	0.53	-	-	-	-	0.43
TOTAL	0.47	0.76	0.63	0.55	0.97	0.77	0.60	0.52	0.52	0.53	0.69

TOTAL CATCH 6 779 672 kgs

TOTAL EFFORT 9 864 252 Pot Lifts.

TABLE 3. Mean Carapace Lengths (mm) of Male and Female Rock Lobsters in Various Depth Categories at Fremantle, Lancelin, Jurien and Dongara throughout the Fishing Season.

Year	Area	Month	0-10 Fathoms		10-20 Fathoms		20-30 Fathoms		30+ Fathoms	
			Male	Female	Male	Female	Male	Female	Male	Female
73/74	Fremantle	Nov	77	75						
		Dec	78	73	87	82				
		Jan	74	70	78	76			101	97
		Feb	76	71			106	103		
		March	79	76			101	98		
		April								
		May								
		June								
		July								
		Aug								
73/74	Lancelin	Nov	72	71						
		Dec	70	69	78	76				
		Jan	74	71	71	69	120	100		
		Feb	73	70			98	96		
		March	73	72						
		April					113	113		
		May	75	73						
		June	75	73						
		July	74	73	96	97				
		Aug								
73/74	Dongara	Nov								
		Dec	77	74	77	75				
		Jan	71	70	77	77				
		Feb	71	71	77	74	80	77		
		March	80	76	76	75			101	89
		April	74	73			94	88	104	91
		May	76	75					98	88
		June	72	71			94	86	110	93
		July	72	70			85	89	101	93
		Aug	72	70			88	90		
73/74	Jurien	Nov	71	71						
		Dec			77	76	79	78		
		Jan	74	70			87	86	90	85
		Feb	71	69	74	70			89	85
		March	75	73					93	92
		April	74	72	77	75	98	89		
		May	74	70						
		June	75	72						
		July	69	68						
		Aug	75	70						

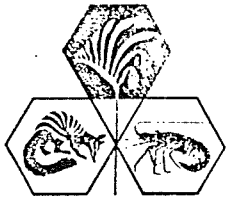
TABLE 4. Bottom Temperature (^{o}C) for Fremantle, Lancelin, Jurien and Dongara of Waters between various depth contours for the 1973/74 Season.

Area	Depth	Nov.	Dec.	Jan.	Feb.	March	April	May	June	July	Aug.
Fremantle	0-10	20.6	21.4								
	10-20		21.0	23.2							
	20-30				21.6	21.8					
	30+			20.0							
Lancelin	0-10	20.1	20.1		22.0	22.3		19.3	19.7		
	10-20		20.1	24.2						18.8	
	20-30						21.2				
	30+										
Jurien	0-10				22.4	23.0	21.5	22.1	16.0	18.6	17.9
	10-20		20.6		22.2		21.6				
	20-30		20.3	21.8			23.4				
	30+			22.0	20.8	22.2					
Dongara	0-10				25.2	24.0	21.2	18.6	18.6	18.3	18.3
	10-20		23.2	22.3	23.2	22.6					
	20-30				23.1		21.3		21.9	20.1	20.3
	30+					23.7	21.6	22.9	22.0	21.0	

Temperatures were taken using an unprotected reversing thermometer.

TABLE 5. 1973-74 Sex Ratio by Month and Depth Category. Figures given are % of Females in the Total

Area	Depth Range Fath.	Nov	Dec	Jan	Feb	March	April	May	June	July	Aug
Dongara	0-10		51%	54%	48%	59%	54%	45%	59%	58%	57%
	10-20		38%	42%	43%	59%					
	20-30				44%		70%		48%	61%	64%
	30+					70%	59%	62%	49%	77%	
Jurien	0-10	50%	50%		47%	50%	53%	52%	50%	56%	61%
	10-20		53%		46%		58%				
	20-30		52%	63%			64%				
	30+			54%	42%	74%					
Lancelin	0-10	46%	43%	47%	46%	60%		54%	55%	56%	
	10-20		50%	57%						67%	
	20-30			76%	59%		59%				
	30+										
Fremantle	0-10	60%	47%	51%	46%	61%					
	10-20		54%	47%							
	20-30				68%	64%					
	30+			59%							



DEPARTMENT OF
FISHERIES AND WILDLIFE
WESTERN AUSTRALIA

REPORT No 22

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The Western Rock Lobster Fishery 1971–1972

BY

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AND

E. H. BARKER

PERTH
WESTERN AUSTRALIA

1976

Department of Fisheries and Wildlife

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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
Total Catch	=	8 170 752 kg
Total Effort	=	9 955 849 pot lifts

These figures do not include "cash" sales (i.e. rock losbters 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.

Vol. 5 No. 2 (June 1972) p. 31. Vol. 5 No. 3 (Sept. 1972) p. 47.
Vol. 5 No. 4 (Dec. 1972) p. 66.

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 mult-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.

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* 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 °/oo, with a maximum of 36.514 °/oo on 13 March 1972 and a minimum of 34.880 °/oo 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)	14924 (6400)	1374 (4142)	1091 (3600)							7880 (15942)
2613				2155 (3078)							2155 (3078)
2712											- -
2713	7456 (6679)	18765 (16181)	30050 (29053)	14645 (21178)	8950 (16892)	21925 (26756)	21532 (25749)	14079 (19281)	14578 (20508)	12876 (7798)	159856 (190075)
2714	3528 (9278)	21296 (23164)	15443 (17837)	4147 (8586)	6632 (14222)	7896 (10500)	11580 (15675)	5957 (7855)	10937 (16049)	3479 (4723)	90895 (127889)
2812	358 (672)				21875 (12220)	16397 (15665)	4467 (7071)	1075 (2364)	3263 (6306)	1248 (2830)	48683 (47128)
2813	834 (1782)	2863 (4051)	1999 (5012)	805 (1196)	508401 (262734)	538650 (413905)	234582 (297497)	51499 (111459)	64971 (128090)	27805 (49676)	1432409 (1275402)
2814	42559 (114799)	256305 (275340)	65860 (146350)	39090 (91213)	70682 (91837)	77731 (98326)	37187 (69177)	36685 (65325)	53716 (81367)	23314 (32804)	703129 (1068338)
2912			4881 (5681)	1664 (3600)		4952 (2700)			30 (220)	264 (660)	11791 (12861)
2913	1218 (3132)	6950 (6086)	10364 (960)		14838 (9630)	20800 (15908)	5263 (7704)	88 (360)	3806 (6046)	1632 (2416)	64959 (52242)
14	83114 (221237)	695372 (543649)	201815 (291266)	125140 (226341)	214932 (277924)	167915 (232255)	100105 (169461)	81008 (147312)	90994 (152587)	33805 (67726)	1794200 (2329760)
3012	258 (684)	1783 (990)									2041 (1674)
3013		15046 (8707)	4923 (7160)	4788 (4715)	1825 (2700)	1340 (1755)					27922 (25037)
3014	36904 (90332)	502785 (327909)	230821 (203667)	94571 (158244)	174107 (222714)	139635 (181910)	57038 (102387)	44902 (81414)	38251 (71218)	25831 (43595)	1344845 (1483390)
3015	7175 (19899)	110221 (78423)	54570 (60160)	28064 (44185)	43665 (59806)	34673 (55353)	10641 (20554)	7817 (14495)	5314 (11757)	2700 (5109)	304840 (369741)
3112		5951 (4320)	4682 (5050)	4219 (6735)	1500 (2407)	545 (2240)					16897 (20752)
3113	784 (4419)	11955 (6930)	7482 (7257)		3831 (5190)	1485 (1980)					25537 (25776)
3114	5631 (10610)	62214 (50676)	55427 (47942)	27957 (45353)	25566 (44303)	19950 (38476)	4495 (10166)	3850 (10788)	1903 (6777)	530 (2400)	207523 (267491)
3115	40331 (104506)	458456 (388190)	315540 (310411)	166798 (276277)	224566 (333613)	135265 (242100)	58393 (129218)	71794 (155931)	51792 (112366)	22731 (45335)	1545666 (2097947)
3212										295 (1095)	295 (1095)
3213				1187 (1600)							1187 (1600)
3214				1300 (3906)							1300 (3906)
3215	4543 (7634)	84682 (73968)	79058 (77520)	38125 (62327)	48495 (80634)	32494 (67383	13916 (30334)	19044 (36679)	16584 (29831)	5707 (9288)	342648 (475598)
	253 (938)	245 (800)	912 (1140)		1591 (1530)	1000 (1360)	99 (680)				4100 (6448)
3315	900 (1510)	5700 (6595)	4022 (5487)	865 (1080)	2581 (5055)	2308 (4456)	1309 (3169)	1306 (3217)	3347 (3568)	1007 (1356)	23345 (35493)
3414		103 (1272)	2499 (6152)		3366 (5622)	494 (2320)	187 (1620)				6649 (16986)
	231337 (599911)	2265616 (1823651)	1091722 (1234247)	556611 (963214)	1377403 (1449033)	1225455 (1415348)	560794 (890462)	339104 (656480)	359486 (646690)	163224 (276813)	

Total catch = 8 170 752 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

			0-10 fms		10-20 fms		20-30 fms		30+ fms	
Year	Area	Month	♂	♀	♂	♀	♂	♀	♂	♀
71/72	F'tle	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
		Jul					107	110		
		Aug					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						
		Jul	78	74			92	94		
		Aug	79	76						
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		
		Jul	70	69	77	74				
		Aug			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				21.0	
	20-30		18.5	19.7	20.9	21.5					
	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	
	0-10 outside mile		61	53	57	56	64	60	50	54	
	10-20		69	59	53	65	63	60		56	61
	20-30		62	73	65		71	64	60		76
	30+			49	75	73					
JURIEN	0-10 inside mile	57	55								
	0-10 outside mile		58	49	54	55	60	54	58	55	50
	10-20		59	54	55	60	61	58		79	
	20-30		66	46	67	63	66				
	30+		59	64		71					
FREMANTLE	0-10 inside mile										
	0-10 outside mile	29	57		50	46	60		51		
	10-20		45				52		54		
	20-30			56	57	54				71	64
	30+								83		

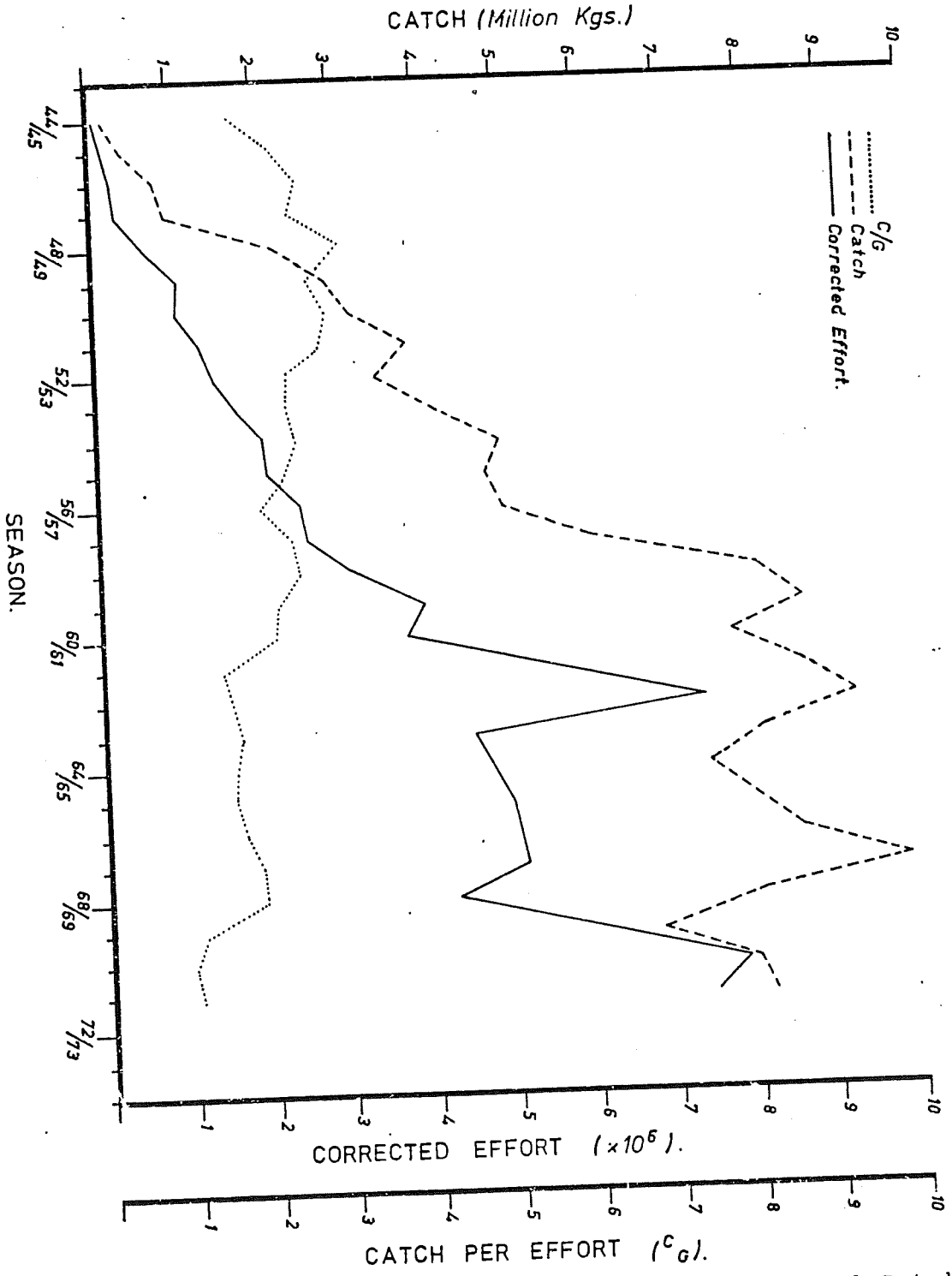

FIGURE 1. Rock Lobster Catch, Corrected Effort and Catch per Unit of Effort Data.

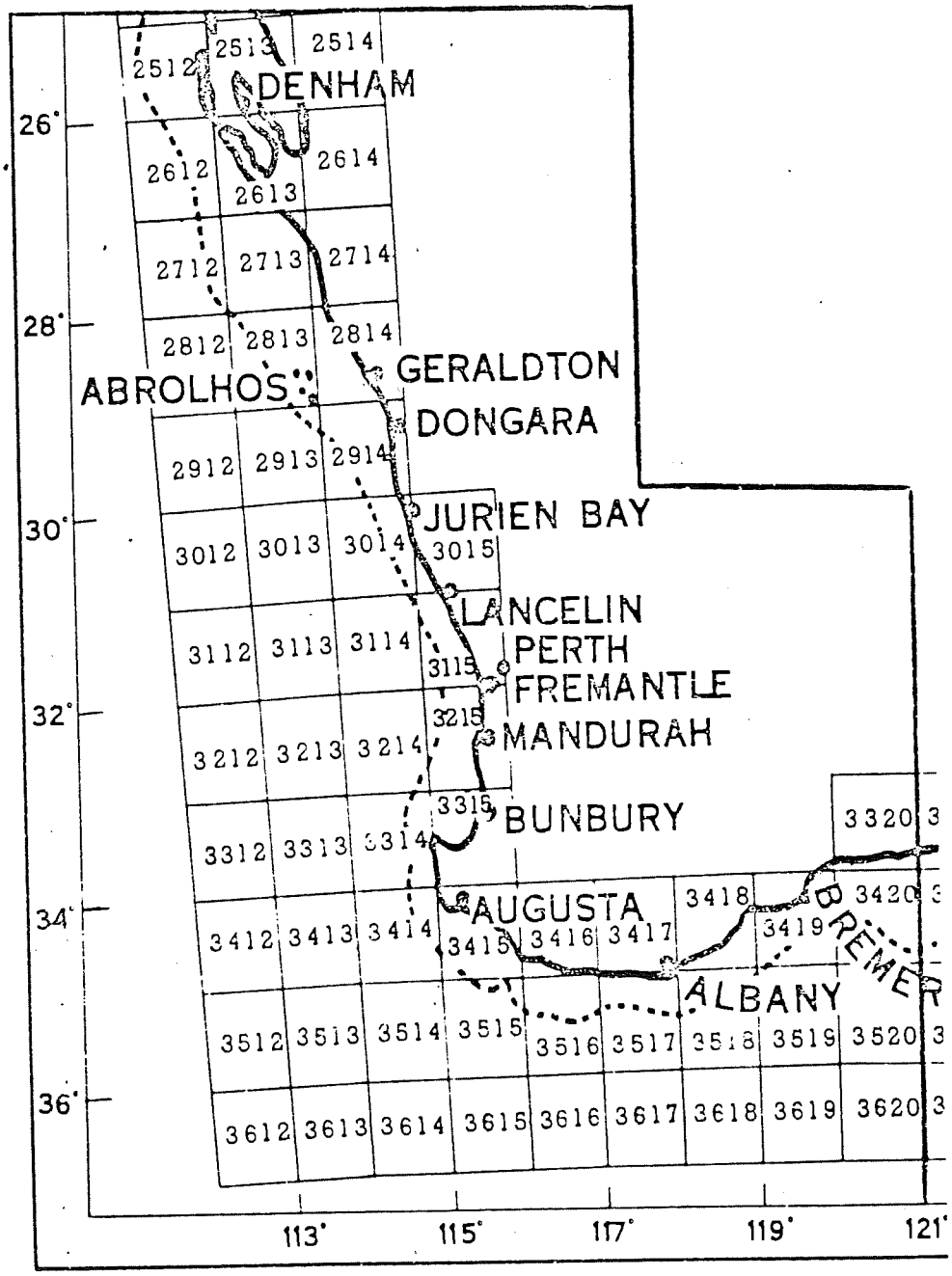

FIGURE 2. Rock Lobster Fishing Areas

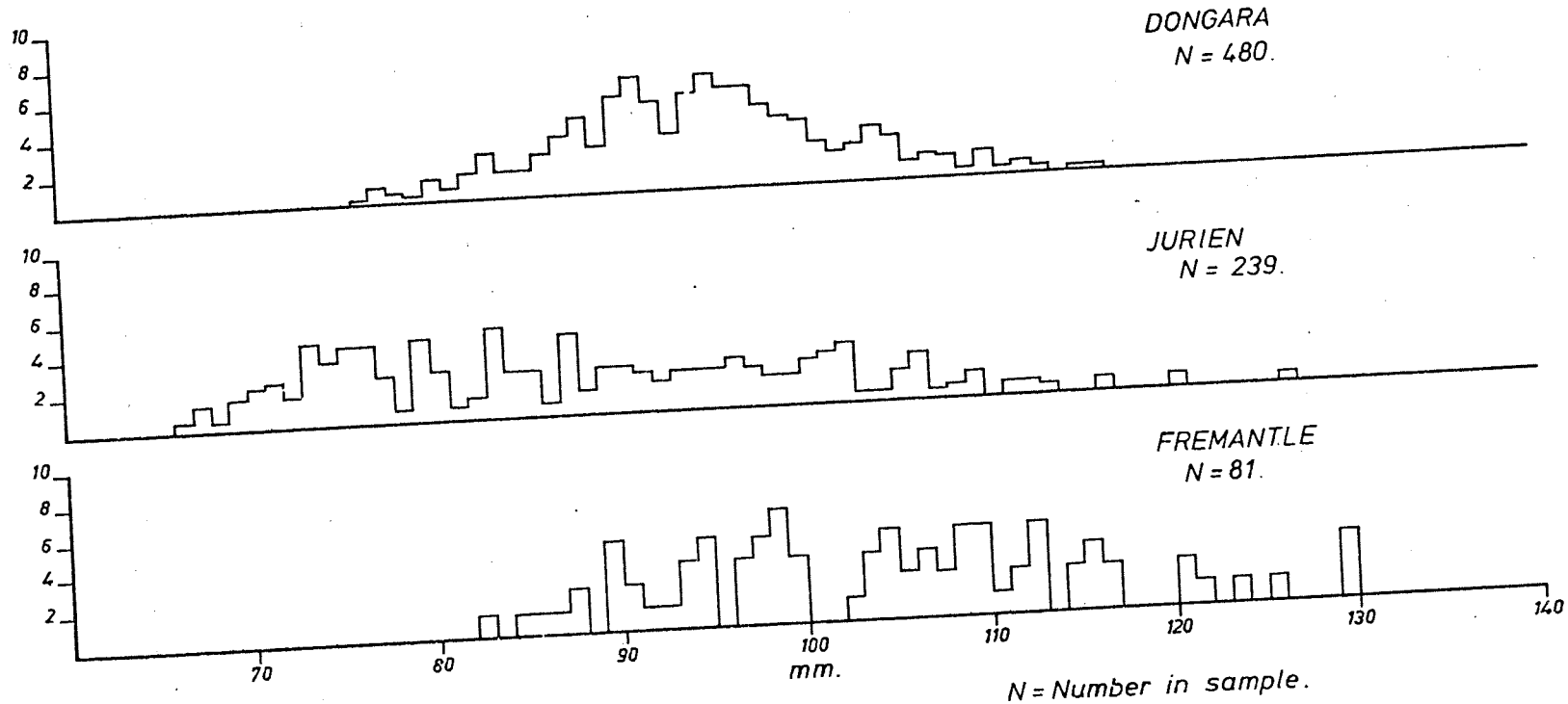

FIGURE 3. Length Frequency of Breeding Female Rock Lobsters taken from December 1971 to February 1972.