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The Western Rock Lobster Fishery 1980–1981

BY

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PERTH
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Fisheries Department

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R E P O R T

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THE WESTERN ROCK LOBSTER FISHERY 1980/81

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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. Western Australia produced 9 957 tonnes in 1980/81, out of a total Australian catch of rock lobster of 15 565 tonnes. The fishery is governed by a complex set of regulations which have been reviewed by Bowen (1971) and Hancock (1981) and which are designed to limit the total fishing 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 fishing 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 calculations of fishing effort.

This paper is the eleventh 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 towards a better understanding of the status of the fishery.

II METHODS

Catch and effort data were extracted from figures obtained from fishermen's monthly returns and supplied by the Australian Bureau of Statistics and also from rock lobster 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.

III RESULTS

A. CATCH AND EFFORT DATA

The fishing season extends from 15 November to 30 June 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; and (ii) the "coastal red" fishery which begins on 1 January and ends on

30 June; and (iii) the Abrolhos Islands fishery which is restricted to 15 March to 30 June.

In fishing seasons prior to 1977/78 both the coastal and the Abrolhos Islands fisheries ended on 14 August. The season was shortened by six weeks in 1977/78 as a conservation measure (Hancock, 1981).

In 1980 the "whites" run commenced in Geraldton on about 25 November, in Jurien about 27 November and in Fremantle about 27 November.

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

"Whites" catch	(15 Nov-31 Dec)	=	3 084 262 kg
"Whites" effort	(" " ")	=	2 909 274 Pot lifts
"Coastal Reds" catch	(1 Jan-30 June)	=	5 343 752 kg
"Coastal Reds" effort	(" " ")	=	6 749 283 Pot lifts
Abrolhos catch	(15 Mar-30 June)	=	1 529 156 kg
Abrolhos effort	(" " ")	=	1 238 019 Pot lifts
Total		=	9 957 170 kg
Total effort		=	10 896 576 Pot lifts

These figures do not include unrecorded sales (i.e. rock lobsters which are sold for cash, etc. and are not recorded in the fishermen's monthly returns of catches but which totalled approximately 9 000 kg, or the total amateur catch which has been estimated at approximately 200 000 kg (Norton, 1981). Figure 1 shows comparative catch, fishing effort, i.e. the number of pot lifts[+] and catch per fishing effort data from previous years.

Catch and effort data from various statistical blocks (Figure 2) are shown in Table 1 with catches expressed in kg weight and fishing effort as number of pot lifts. Table 2 shows catch per pot data for the same statistical blocks. The total fishing effort was 10 896 576 units of fishing effort, 1.6% greater than the 1979/80 season.

B[*] EXPORTS AND GRADE CATEGORIES

Rock lobster tails processed for export are graded by weight and packed in 11.34 kg cartons. The various grades, together with the percentage of cases packed in each grade for the period November 1980 to June 1981 were as follows:

[+] Fishing effort is measured as the number of pot lifts (pulls) recorded by fishermen in their Australian Bureau of Statistics monthly returns. In the annual reports prior to 1977/78 fishing effort was calculated as effective fishing effort by the method of Gulland (1969).

[*] Section B is based on data provided by selected processing establishments from Fremantle to Geraldton.

Grade	% of Cases
A (140 - 179 grams)	38.7
B (180 - 239 grams)	32.1
C (240 - 279 grams)	11.0
D (280 - 359 grams)	8.5
E (360 - 479 grams)	5.4
F (480 - 599 grams)	2.6
G (600 - grams)	1.6

C. 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.

D. 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. As at July 1981, the number of boats licensed to fish in the various zones was as follows:

Total number of licensed boats = 785
Number of boats licensed in Zone A = 198
Number of boats licensed in Zone B = 170
Number of boats licensed in Zone C = 401
Number of boats licensed in Zone D = 7
Number of boats licensed in Zone E = 9

E. FORECAST OF 1980/81 RECRUITMENT

Puerulus settlement in previous years was above average, this above average settlement resulted in good recruitment to the fishery and a high commercial catch.

F. INTRODUCTION OF NEW LEGISLATION

Two changes were made to the conditions governing the opening of the Abrolhos Islands rock lobster season on 15 March:

(a) Under Section 32, baited rock lobster pots may not be set in the Abrolhos Islands Zone before 6.00 a.m. on 14 March each year.

(b) As from 30 January 1981 fishermen holding Abrolhos Islands concessions will only be permitted to set pots in coastal waters deeper than 20 fathoms during the fortnight (1 March - 14 March) before the opening of the Islands season.

The regulations governing amateur daily bag limits for rock lobsters were amended from eight western rock lobsters to eight rock lobsters of any species.

As from 22 May 1981 an area two square kilometres around Quobba Point was set aside solely for divers fishing for rock lobsters. The taking of rock lobsters by pots within the area is now prohibited.

As from 26 September 1980 a fishing boat unless authorised shall not be used for the purpose of taking, transporting or storing any western rock lobster in any waters south of thirty-four degrees twenty-four minutes south latitude and west of Pt. D'Entrecasteaux.

Information regarding these changes to the legislation governing the rock lobster fishery, as well as the Fisheries Department's policies on various issues, may be found in the following volumes of the Fishing Industry News Service (F.I.N.S.):

Vol. 14 No. 1 (1981) P. 22

Vol. 14 No. 2 (June 1981) P.28

Vol. 14 No. 3 (September 1981) P. 21

G. EFFECTS OF NEW LEGISLATION

As a result of Abrolhos Islands concession holders not being allowed to fish coastal waters less than twenty fathoms two weeks prior to the opening of the Abrolhos Islands season, fishing pressure on the shallow coastal ground was reduced.

The other changes in the legislation were of an administrative nature and hence had little direct effect on levels of catch and fishing effort.

H. INNOVATIONS TO BOATS AND GEAR

Data supplied by the Marine and Harbours Department showed that a total of 63 boats were replaced during the period 1 July 1980 to 30 June 1981. In the northern area a total of 30 boats were replaced, these ranged in size from 7.90 metres to 16.05 metres with an average size of 11.92 metres, whilst in the southern area a total of 33 boats were replaced ranging in size from 9.70 metres to 21.93 metres and averaging 13.78 metres in length. As in the previous season a similar pattern of boat replacement (size) occurred with medium to large sized vessels being replaced in the southern area and small to medium sized vessels being replaced in the northern area. During this

period there was a reduction of 11% on the number of boats replaced during the 1979/80 season. The boat replacements were constructed as follows:

	WOOD	FIBREGLASS	ALUMINIUM
Fremantle	11	12	10
Geraldton	1	17	12
	12	29	22

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

	STICK AND CANE BEEHIVE	BATTEN	STEEL BEEHIVE	TRAPS
NORTH 30°S	12%	81%	4%	3%
SOUTH 30°S	60%	21%	10%	9%

The use of large wire covered steel pots with side entrances constructed of trawl mesh (traps) continued, with a greater number being used throughout the fishery (mainly in the southern areas) than the previous season. Oversize beehive and batten pots continued to gain in popularity and small numbers of plastic pots were again used.

Geraldton designed and made mechanical rope coilers were first used by Abrolhos Island boats during the 1980/81 Island season.

I BAIT

Data from research log books showed the following usage of bullock hocks and pieces of cattle hide as holding bait in both northern and southern areas:

	HOCKS	HIDES
NORTH 30°S	42%	58%
SOUTH 30°S	42%	58%

A great variety of fish baits are available for use by rock lobster fishermen. During the 1980/81 season the most popular

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* 23.7% of skippers voluntarily submitted rock lobster research records during the 1980/81 season.

fish baits (listed in order of popularity) used in combination with hocks and pieces of bullock hide were: north of 30°S, Australian herring or ruff *(Arripis georgianus)*, mullet *(Mugil cephalus)*, scaly mackerel *(Amblygaster postera)*, Australian salmon heads *(Arripis trutta esper* and *Arripis trutta marginata)* and New Zealand salmon heads and pieces of salmon meat *(Arripis trutta trutta)*, bonito heads *(Sarda sp.)* and pieces of kangaroo meat *(Marcropus sp.)*. South of 30°S the following fish baits (listed in order of popularity) also used in combination with hocks and pieces of bullock hide were: Australian and New Zealand salmon heads and pieces of salmon meat, New Zealand and Australian snapper heads *(Chrysophrys auratus* and *Chrysophrys unicolor)*, mullet, scaly mackerel, Australian herring or ruff and pilchards *(Sardinops neopilchardus)*.

J 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, February, back to the shallows during the latter part of February, March and April and in mixed depths (mainly shallower), depending on weather and density of rock lobsters, throughout the remainder of the season.

As in the two previous seasons vessels again fished for rock lobsters from South Passage in Shark Bay. Two vessels also fished for rock lobsters from the anchorage south of the Blowholes (Quobba Point).

During January and early February good catches of rock lobsters were again taken from very deep water (80-90 fathoms) from west of Garden Island to west of Mandurah by boats fishing from Fremantle, Safety Bay and Mandurah. The catches taken during this period in this particular area were not of the size taken the previous season, although more boats, hoping for another repeat of the 1979/80 deep water bonanza, fished the area.

A number of vessels fished for western rock lobsters from Augusta, the catches taken by these boats were outside the W.A. rock lobster limited entry fishery concession area.

K. AVERAGE NUMBER OF DAYS WORKED PER BOAT PER MONTH

NORTH 30°S

MONTH	NOV*	DEC	JAN	FEB	MAR	APR	MAY	JUN
DAYS WORKED	14.5	26.1	14.5	17.6	21.5	27.0	21.7	15.7

* from 15 November.

SOUTH 30°S

MONTH	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN
DAYS WORKED	9.3	25.5	17.5	18.7	25.0	21.2	14.3	10.5

TOTAL

MONTH	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN
DAYS WORKED	11.7	25.7	16.2	18.2	23.3	24.0	17.9	13.4

The average number of days worked per boat during November and December was 2.2% up on the 1979/80 season and for the period January to June was 0.5% down on the 1979/80 season.

The average number of days worked per boat per month for the 1980/81 season was 19.1, which was 0.5% up on the 1979/80 season.

L. PRICE OF ROCK LOBSTERS

From the commencement of the season to the end of March 1981 the price paid to fishermen was $5.50 per kg. The price then increased to $6.00 and remained at that price until the end of the season.

The range of prices paid on the New York wholesale market for rock lobster tails were:

	GRADE	$AUST. PER KG
A	5 - 6 oz (140-179 grams)	19.18
B	6 - 8 oz (180-239 grams)	18.86
C	8 - 10 oz (240-279 grams)	17.30
D	10 - 12 oz (280-359 grams)	17.26
E	12 - 16 oz (360-479 grams)	16.69
F	16 - 20 oz (480-599 grams)	NA
G	over 20 oz (600- grams)	NA

M. MARKET TRENDS AND ECONOMIC FACTORS

The U.S.A. market for W.A. lobster tails fluctuated in the 1980-81 financial year as U.S. economic activity continued to decline. The first half weakening of the U.S. dollar by 2.0% against the Australian dollar made it difficult for Australian exporters to sell on the depressed U.S. market and hence prices eased. The increasing U.S. interest rates caused seafood inventories to be held at a minimum level in the first half of the financial year. This, together with a reduced supply of imported lobster tails, caused a second half price increase of 15.0% to 23.0% up on the previous season.

The Australian dollar depreciated 4.0% against the U.S. dollar in the second half, though the devaluation when averaged over the year was only 2.0%. This left exchange rates at virtually the same level as two years ago.

N. AVERAGE VALUE PER POT ON POT REDISTRIBUTION

From about $1,600 to $1,400.

O. 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 30 June) at Waterman (Aquarium Header Tank) was 21.06°C with a maximum of 23.1°C in week commencing 4 January 1981 and a minimum of 16.5°C in week commencing 21 June 1981.

The average salinity during the season at Waterman (aquarium) was 35.70% with a maximum of 36.73% on 2 March 1981 and a minimum of 34.85% on 29 June 1981.

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.

P. SPAWNING ROCK LOBSTERS

While most of the breeding females are found in the 20-30 fathom 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 Fremantle than at either Lancelin, Jurien or Dongara, with the mean sizes being 109.2 mm at Fremantle, 95.4 mm at Lancelin, 89.7 mm at Jurien and 92.7 mm at Dongara. By comparison the mean sizes at first breeding (i.e., the smallest carapace length at which 50% have been mated) were found to be 102.9 mm at Fremantle, 94.9 mm at Lancelin, 93.7 mm at Jurien and 95.5 mm at Dongara.

IV DISCUSSION

The 1980/81 catch fell by 740 890 kg (6.9%) to 9 957 170 kg from the previous season's catch of 10 698 060 kg. This drop in total catch occurred in spite of a marginal increase (1.6%) in total fishing effort to 10 896 576 pot lifts from 10 724 109 pot lifts which occurred in the 1979/80 season. As would be expected the average number of days worked per boat per month rose slightly (0.5%) on the previous season and the average catch per pot lift dropped from 0.998 kg in 1979/80 to 0.914 kg per pot lift in 1980/81.

The slight increase in puerulus settlement in previous years (1975/76 to 1976/77) was not sufficiently high enough to bring about an increase in the total catch. However, as a result of the levels of puerulus settlement that occurred in those years the catch remained relatively stable.

Because of unfavourable conditions experienced on the export markets (see Section M. Market Trends and Economic Factors) the price that fishermen received for their catch actually fell on the previous season, this together with a stiff increase in the price of distillate (boat fuel) and increases in the price of almost all of the more popular lines of rock lobster bait resulted in lower net returns within the industry. This was also reflected in the number of new boat replacements which fell by 11.0% on the previous season.

V ACKNOWLEDGEMENTS

Measurements on board fishing vessels were performed by Mr G. Lymn and Mr M. Rossbach. The information on Market Trends and Economic Factors was provided by Mr P. Rogers of the Fisheries Department.

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TABLE 1: CATCH (IN KG WEIGHT) AND FISHING EFFORT (IN POT LIFTS) FOR THE 1980/81 ROCK LOBSTER SEASON IN VARIOUS STATISTICAL BLOCKS.

BLOCK	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	TOTAL
2412	-	-	-	-	-	2,327	-	-	2,327
	-	-	-	-	-	(2,040)	-	-	(2,040)
2413	1,274	2,718	1,327	4,500	8,066	2,527	877	-	21,289
	(984)	(1,896)	(1,200)	(5,595)	(5,622)	(2,565)	(990)	-	(18,852)
2512	-	-	596	12,068	8,954	2,164	2,442	1,801	28,025
	-	-	(1,860)	(11,148)	(5,453)	(2,673)	(2,178)	(2,475)	(25,787)
2612	-	-	5,263	8,219	3,112	13,404	8,374	3,385	41,757
	-	-	(6,169)	(6,191)	(3847)	(11,302)	(5,820)	(2,020)	(35,349)
2613	-	-	4,581	15,128	-	2,513	2,138	2,681	27,041
	-	-	(4,488)	(9,904)	-	(3,340)	(3,630)	(2,164)	(23,526)
2712	-	-	3,435	4,695	2,241	-	4,182	2,401	16,954
	-	-	(3,300)	(3,420)	(2,160)	-	(3,300)	(3,310)	(15,490)
2713	14,275	73,393	41,867	32,163	41,082	69,625	31,618	21,651	325,674
	(13,553)	(44,883)	(42,571)	(39,546)	(41,011)	(48,723)	(35,481)	(28,954)	(294,722)
2714	7,700	44,573	15,598	9,468	23,389	24,035	12,121	12,854	149,738
	(8,544)	(27,884)	(19,570)	(17,232)	(26,902)	(19,105)	(19,284)	(15,544)	(154,065)
2812	-	-	-	-	-	-	-	-	-
	-	-	-	-	-	-	-	-	-
2813	1,414	7,409	2,808	1,992	551,235	614,016	268,567	95,338	1,542,779
	(1,935)	(6,390)	(5,710)	(6,594)	(272,004)	(451,599)	(343,805)	(170,611)	(1,258,648)
2814	83,321	321,949	64,366	40,327	72,672	74,226	49,957	41,730	748,548
	(139,831)	(229,502)	(128,053)	(105,993)	(79,793)	(72,771)	(69,039)	(58,029)	(883,011)
2912	-	-	-	-	-	-	-	-	-
	-	-	-	-	-	-	-	-	-
2913	-	2,659	2,714	452	20,866	20,655	5,292	936	53,574
	-	(3,480)	(2,880)	(1,024)	(8,820)	(13,547)	(7,209)	(1,150)	(38,110)
2914	214,323	751,264	144,492	132,847	251,362	283,122	139,488	86,063	2,002,961
	(301,563)	(557,522)	(246,617)	(281,128)	(274,559)	(256,139)	(187,957)	(147,376)	(2,252,861)
3012	-	-	-	-	-	-	-	-	-
	-	-	-	-	-	-	-	-	-
3013	-	-	-	-	-	-	-	-	-
	-	-	-	-	-	-	-	-	-
3014	55,995	501,183	198,875	85,188	179,206	246,509	81,370	34,455	1,382,781
	(122,260)	(354,447)	(187,591)	(175,247)	(265,969)	(245,534)	(157,683)	(70,810)	(1,579,541)
3015	16,039	132,142	50,831	37,128	64,333	96,886	16,362	4,822	418,543
	(33,306)	(93,976)	(57,843)	(60,922)	(82,129)	(73,770)	(36,796)	(14,000)	(452,742)
3112	-	-	-	-	-	-	-	-	-
	-	-	-	-	-	-	-	-	-
3113	-	-	-	-	-	-	-	-	-
	-	-	-	-	-	-	-	-	-
3114	3,926	44,043	35,378	21,240	34,181	27,495	2,165	1,226	169,654
	(9,690)	(38,998)	(34,204)	(28,890)	(41,027)	(32,915)	(5,106)	(3,807)	(194,637)
3115	75,011	473,482	346,040	215,500	311,198	234,296	85,354	37,624	1,778,465
	(175,175)	(467,867)	(313,617)	(327,966)	(440,149)	(362,586)	(212,179)	(101,108)	(2,400,647)
3212	-	-	-	-	-	-	-	-	-
	-	-	-	-	-	-	-	-	-
3213	-	-	-	-	-	-	-	-	-
	-	-	-	-	-	-	-	-	-
3214	243	11,991	81,010	31,320	7,121	6,092	2,859	3,046	143,682
	(648)	(7,599)	(35,300)	(22,754)	(11,776)	(9,333)	(5,704)	(4,156)	(97,270)
3215	10,901	223,465	363,087	113,220	124,469	88,759	39,829	25,133	988,863
	(46,512)	(210,724)	(169,720)	(150,811)	(198,762)	(147,631)	(89,477)	(46,239)	(1,059,876)
3314	-	-	13,847	10,876	9,168	5,320	1,657	660	41,528
	-	-	(9,053)	(8,954)	(6,769)	(4,617)	(2,170)	(512)	(32,075)
3315	1,504	6,400	13,255	11,602	8,767	5,927	6,849	7,055	61,359
	(2,055)	(5,170)	(7,895)	(10,985)	(8,491)	(7,667)	(10,599)	(7,375)	(60,237)
3414	300	1,365	1,320	3,293	3,131	1,299	770	150	11,628
	(900)	(1,980)	(1,380)	(3,645)	(3,565)	(3,540)	(1,600)	(480)	(17,090)
3415	-	-	-	-	-	-	-	-	-
	-	-	-	-	-	-	-	-	-
3416	-	-	-	-	-	-	-	-	-
	-	-	-	-	-	-	-	-	-
3515	-	-	-	-	-	-	-	-	-
	-	-	-	-	-	-	-	-	-
TOTAL	486,226	2,598,036	1,390,690	791,226	1,724,513	1,821,197	762,271	383,011	9,957,170
	(856,956)	(2,052,318)	(1,279,021)	(1,277,949)	(1,778,808)	(1,771,397)	(1,200,007)	(680,120)	(10,896,576)

TOTAL CATCH = 9,957,170 KG
TOTAL EFFORT = 10,896,576 POT LIFTS

EFFORT FIGURES ARE SHOWN IN PARENTHESIS AND CATCH FIGURES ARE UNDERLINED.
NOT INCLUDED IN THESE CATCH FIGURES ARE 8245 KG OF ROCK LOBSTERS TAKEN BY DIVING.
THESE FIGURES ARE DERIVED FROM DATA KINDLY PROVIDED BY THE AUSTRALIAN BUREAU OF STATISTICS AND REFLECT SLIGHTLY MORE INTENSIVE EDITING BY THE DATA PROCESSING SECTION OF THE FISHERIES DEPARTMENT.

TABLE 2: CATCH (KG) PER UNIT OF FISHING EFFORT (IE. KILOGRAM OF ROCK LOBSTERS PER POT LIFT) DATA FOR 1980/81 SEASON IN VARIOUS STATISTICAL BLOCKS (SEE FIGURE 2).

BLOCK	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	TOTAL
2412	* -	-	-	-	-	1.14	-	-	1.14
2413	1.29	1.43	1.11	0.80	1.43	0.99	0.89	-	1.13
2512	-	-	0.32	1.08	1.64	0.81	1.12	0.73	1.09
2612	-	-	0.85	1.33	0.81	1.19	1.44	1.68	1.18
2613	-	-	1.02	1.53	-	0.75	0.59	1.24	1.15
2712	-	-	1.04	1.37	1.04	-	1.27	0.73	1.09
2713	1.05	1.64	0.98	0.81	1.00	1.43	0.89	0.75	1.11
2714	0.90	1.60	0.80	0.55	0.87	1.26	0.63	0.83	0.97
2812	-	-	-	-	-	-	-	-	-
2813	0.73	1.16	0.49	0.30	2.03	1.36	0.78	0.56	1.23
2814	0.60	1.40	0.50	0.38	0.91	1.02	0.72	0.72	0.85
2912	-	-	-	-	-	-	-	-	-
2913	-	0.76	0.94	0.44	2.37	1.52	0.73	0.81	1.41
2914	0.71	1.35	0.59	0.47	0.92	1.11	0.74	0.58	0.89
3012	-	-	-	-	-	-	-	-	-
3013	-	-	-	-	-	-	-	-	-
3014	0.46	1.41	1.06	0.49	0.67	1.00	0.52	0.49	0.88
3015	0.48	1.41	0.88	0.61	0.78	1.31	0.44	0.34	0.92
3112	-	-	-	-	-	-	-	-	-
3113	-	-	-	-	-	-	-	-	-
3114	0.41	1.13	1.03	0.74	0.83	0.84	0.42	0.32	0.87
3115	0.43	1.01	1.10	0.66	0.71	0.65	0.40	0.37	0.74
3212	-	-	-	-	-	-	-	-	-
3213	-	-	-	-	-	-	-	-	-
3214	0.38	1.58	2.29	1.38	0.60	0.65	0.50	0.73	1.48
3215	0.23	1.06	2.14	0.75	0.63	0.60	0.45	0.54	0.93
3314	-	-	1.53	1.21	1.35	1.15	0.76	1.29	1.29
3315	0.73	1.24	1.68	1.06	1.03	0.77	0.65	0.96	1.02
3414	0.33	0.69	0.96	0.90	0.88	0.37	0.48	0.31	0.68
3415	-	-	-	-	-	-	-	-	-
3416	-	-	-	-	-	-	-	-	-
3515	-	-	-	-	-	-	-	-	-
TOTAL	0.57	1.27	1.09	0.62	0.97	1.03	0.64	0.56	0.91

* - = NO RECORD OF FISHING

TOTAL CATCH = 9,957,170 KG
TOTAL EFFORT = 10,896,576 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
1980/81	FREMANTLE	NOV	77	75						
		DEC	80	76	88	83	101	94		
		JAN	70	68			106	94	95	88
		FEB	71	67	79	77			94	89
		MAR	69	68			90	88		
		APR	73	71	82	77			105	94
		MAY	70	69			89	82		
		JUN	72	70			100	87		
1980/81	LANCELIN	NOV								
		DEC	73	71						
		JAN							90	83
		FEB	72	69	78	76				
		MAR	71	69	78	75				
		APR	71	70					93	89
		MAY	73	71						
		JUN	74	73						
1980/81	JURIEN	NOV	73	70						
		DEC	76	72	75	72	83	76		
		JAN	74	71					79	74
		FEB	72	70	74	74	82	81	90	87
		MAR	75	71			85	82	87	83
		APR	72	69	73	71	81	78		
		MAY	73	70	74	71	89	83		
		JUN	74	70						
1980/81	DONGARA	NOV	76	75	77	74				
		DEC	76	73	81	77	84	80		
		JAN	66	61	74	73			86	84
		FEB	75	72	75	74	90	85	86	80
		MAR	76	75	77	74	80	78		
		APR	75	73	75	74	91	82	88	83
		MAY	75	74	77	74	96	90	92	83
		JUN	77	74	75	74				

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 1980/81 SEASON.

AREA	DEPTH FATH	NOV		DEC		JAN		FEB		MAR		APR		MAY		JUN	
		TEMP	SAL	TEMP	SAL	TEMP	SAL	TEMP	SAL	TEMP	SAL	TEMP	SAL	TEMP	SAL	TEMP	SAL
FREMANTLE	0-10	22.4	35.53	20.7	35.95	22.8	36.19	20.6	36.90	20.6	36.43	21.2	35.80	20.4	35.80	17.6	35.55
	10-20			20.0	35.97			21.9	35.99			22.4	35.52				
	20-30			20.2	35.83	20.5	35.94			21.5	35.72			21.0	35.68	19.7	-
	30+							-	35.80			22.1	35.38				
LANCELIN	0-10			21.8	35.89			22.2	36.58	21.2	36.37	21.8	36.00	20.9	35.50	17.0	35.45
	10-20							20.8	36.10	21.1	36.17						
	20-30																
	30+					21.6	-					22.0	35.52				
JURIEN	0-10	20.7	35.99	21.9	35.91	24.0	36.45	21.6	36.76	21.4	36.27	22.0	36.12	20.4	35.74	18.6	35.55
	10-20			22.1	35.87							22.2	35.91	-	35.51	20.4	35.42
	20-30							21.1	35.81	21.2	35.71	22.2	35.63	22.0	35.44		
	30+					23.2	35.78	20.8	35.80	21.2	35.72						
DONGARA	0-10	21.1	35.86	21.0	35.79	22.2	36.20	21.8	36.61	-	36.08	22.1	35.99	21.4	35.80	-	35.34
	10-20	20.8	35.79	21.0	35.70	22.0	35.80	21.2	35.96	-	35.90	22.3	36.08	21.2	35.66	-	35.45
	20-30			20.6	35.72					-	36.12	22.1	35.41	22.2	35.60		
	30+					21.9	35.70	20.8	35.78			22.3	35.37	23.6	35.31		

TEMPERATURES WERE TAKEN USING A PROTECTED REVERSING THERMOMETER AND SURFACE WATER SAMPLES WERE TAKEN AND LATER ANALYSED TO DETERMINE SALINITY.

TABLE 5: 1980/81 SEX RATIO BY MONTH AND DEPTH CATEGORY, FIGURES ARE % OF FEMALES IN THE TOTAL SAMPLED CATCH.

AREA	DEPTH RANGE FATH.	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN
DONGARA	0-10	57	53	62	53	67	64	58	58
	10-20	59	62	59	64	61	60	53	67
	20-30		69		64	68	71	66	
	30+			80	50		83	72	
JURIEN	0-10	55	69	49	50	57	46	60	53
	10-20		59		62		53	63	
	20-30		65		66	71	65	76	
	30+			80	79	58			
LANCELIN	0-10		56		50	53	54	54	52
	10-20			61	61				
	20-30								
	30+			59			69		
FREMANTLE	0-10	57	60	49	57	56	55	56	55
	10-20		55		55		61		
	20-30		57	51		64		68	69
	30+			49	48		72		

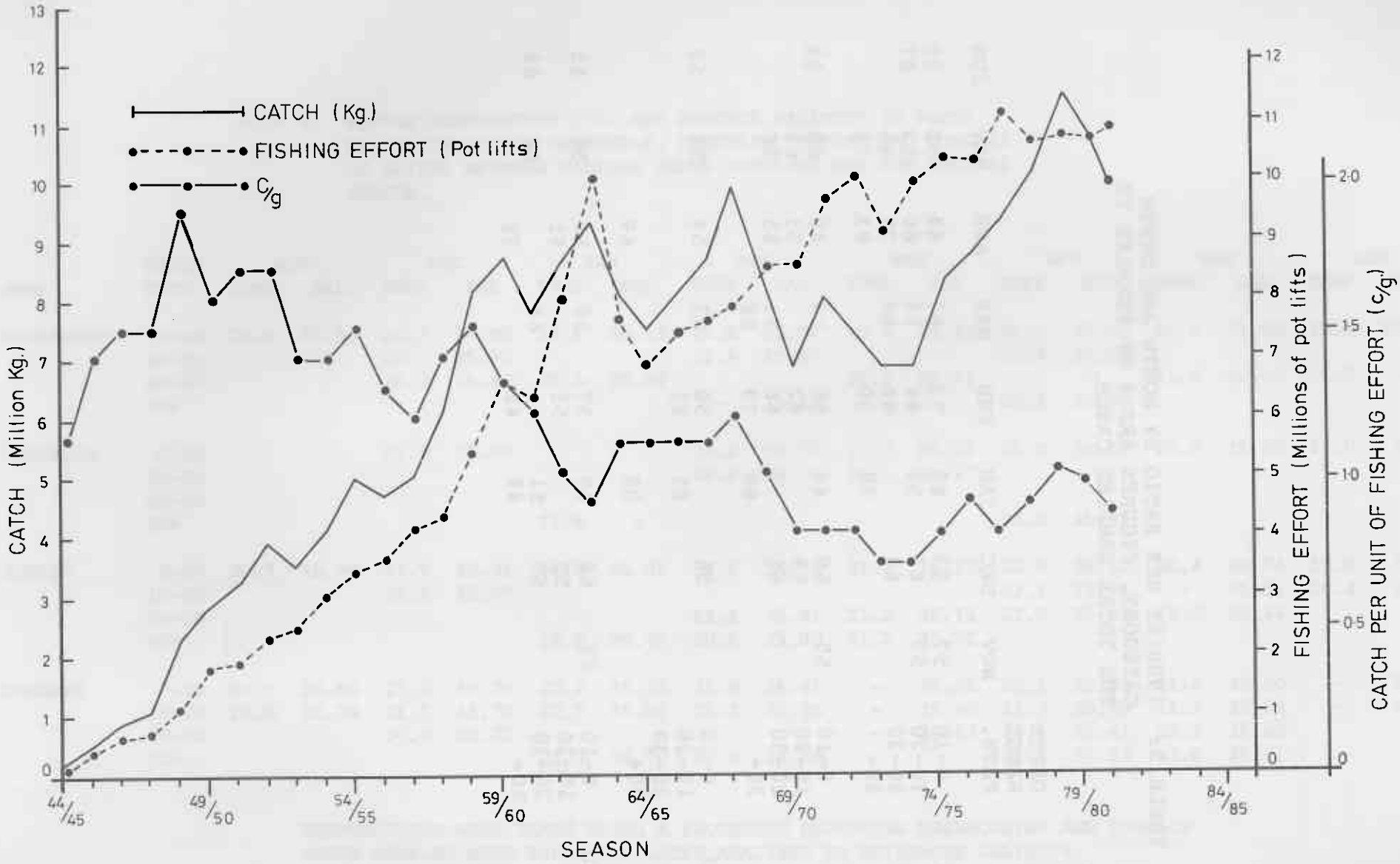

Figure 1. Rock Lobster catch (kg), fishing effort (pot lifts)* and catch per unit of fishing effort (c/g) data.

* Prior to the 1977/78 season, fishing effort was calculated as effective fishing effort by the method of Gulland (1969). The complete set of fishing effort data shown here (1944/45 to 1980/81) is obtained as described in the footnote on page 6.

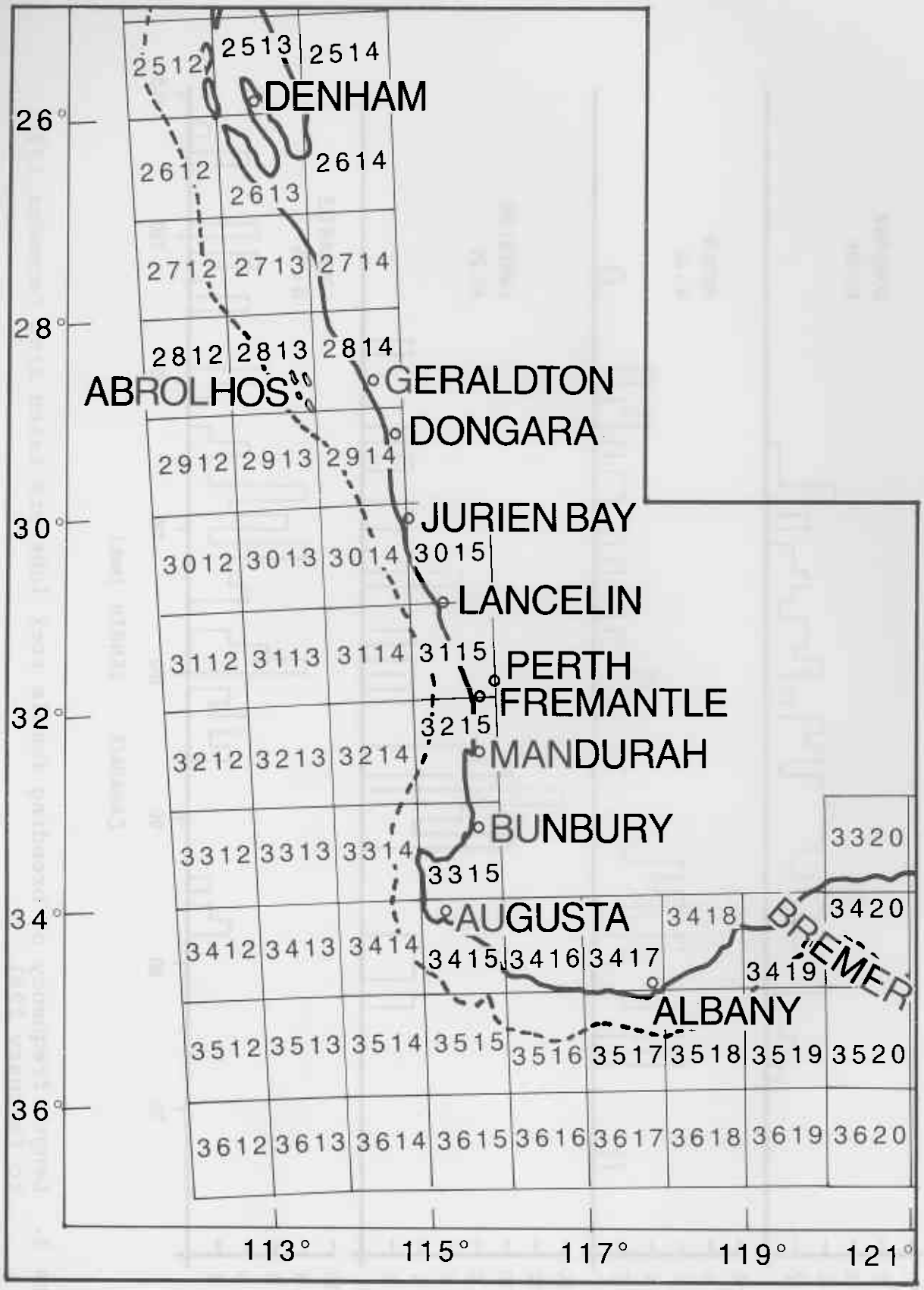

Figure 2. Rock Lobster fishing areas.

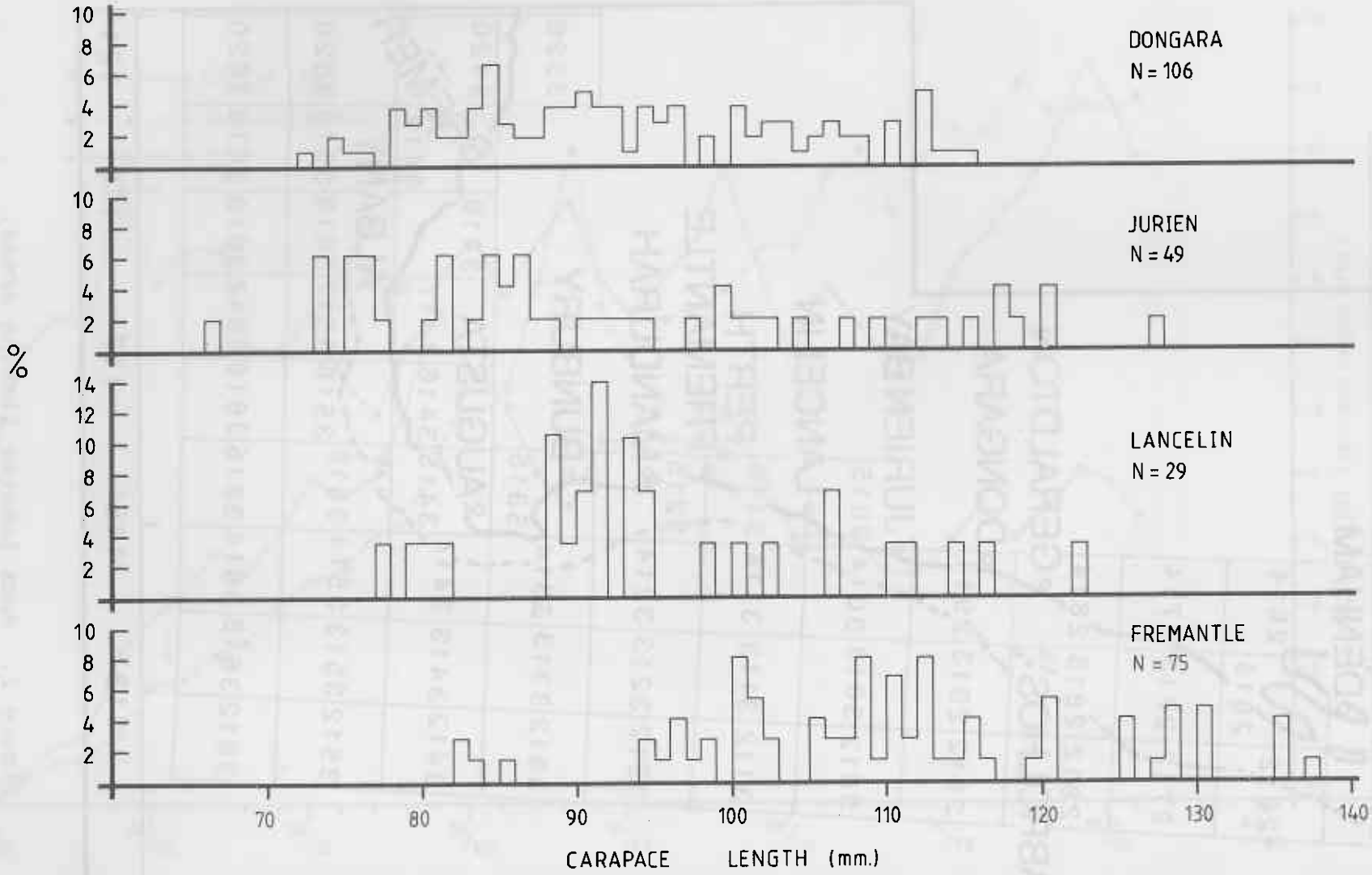

Figure 3. Length frequency of breeding female rock lobsters taken from December 1980 to February 1981.