

72/14.

FISHING INDUSTRY RESEARCH TRUST ACCOUNT  
REPORT ON PROJECT CONCLUDED 1972/73

29

1. Title:- Establishment of juvenile rock lobster sampling sites for prediction of catch fluctuations.
2. Name of Applicant:- Department of Agriculture, Tasmania.
3. Division, Department or Section:- Fisheries Division.
4. Proposal:- To locate sites at which samples of juvenile rock lobster can be readily obtained for comparison of the relative abundances of different year-classes for catch prediction purposes.
5. Name of Person Responsible for Programme:- Originally Mr. R.H. Winstanley, later Mr. J.H. Bradbury (BSc), Marine Biologist.
6. Qualifications of Staff Employed:-  
Mr. A. McGifford (appointed 30 January 1973 - project completion)  
Mr. G. Kiddle (appointed 15 February resigned, 16 May 1973)  
Mr. B. Lennox (appointed 7th May - project completion).  
All staff were competent divers with small boat experience.
7. Objectives:- To enable the future recruitment to legal sized stocks to be estimated for different parts of the State by assessing the relative abundance of juvenile year-classes from samples obtained by SCUBA - diving.  
  
Data for the proposed monitoring programme could be simply derived from samples collected (by Fisheries divers) in one or two days field work in each sampling area each year.
8. Proposal in detail including Procedures:- Two divers with a mobile unit comprising vehicle, runabout and trailer will dive in waters down to 15 m. around as much of Tasmania's coastline as possible using road access and in some areas transportation provided by fishermen. At

each diving site the divers will endeavour to collect 500 to 1000 juveniles ranging in total carapace length from 20 to 90 mm. They will record location, diver hours and total catch which will allow the relative abundance of juveniles from area to area to be assessed. Length frequency distribution of sample animals will be analysed to calculate the relative abundance of the year classes at each site. These data will also yield information on variations in juvenile growth rates around the State.

9. Commencement date:- February 1973.

Completion date:- August 1973

10. Project Report:-

a) Research - From a basis of encouraging observations on the prediction of year class strengths by sampling juvenile rock lobster at Tarooma, the project aimed to locate similar sites in other parts of Tasmania. In view of the lack of knowledge on the distribution, abundance and accessibility of juvenile rock lobsters the project was, to a large extent a logistic assessment.

63 sites were examined by divers who caught, measured, sexed and noted shell condition in rock lobster samples and who recorded notes on bottom topography, algae cover and dominant fauna. Generally rough conditions along the West Coast lead to a paucity of sampling there and no sites were examined successfully in the northern West Coast. Nine sites were sampled along the southern west coast. The remaining effort (54 sites) was well-distributed in the south and south eastern area (16 sites), the east (13), north (9) and Bass Strait Islands (16 sites).

Logistically, such a broad survey proved difficult, not only with considerable weather and transport problems, but also with sampling; few sites yielded juvenile rock lobster near projected capture rates of 250-500 per diver day, and patchy distributions and size dependent catchability made representative sampling difficult. However, a number of sites in each fishing area yielded sufficient rock lobster for valid analyses.

Size frequency distributions in these successful sites showed anticipated year class modes. Comparison of samples within fishing areas showed that while, in some areas, a majority of samples were representative of the area, there were exceptions in each. Thus, it could not be said that any one site was representative of a broader area. In fact, when site data within each area were grouped, distinct year class modes were not evident in the resulting size distributions, presumably due to minor growth and settlement differences. Although such a result casts some doubt on the ability to predict catches (ie recruitment) over a meaningfully large fishing area, several sites unknown before the survey, are considered worthy of annual examination. With more intensive annual sampling to achieve reliable size (and hence age) distributions, the major objective of predicting catches will be tested.

Results, reported here in brief, are now detailed in a draft manuscript for publication in Tasmanian Fisheries Research.

TASMANIAN DIVING SURVEY OF PRE-RECRUIT  
ROCK LOBSTER POPULATIONS

by J.H. BRADBURY,  
Marine Biologist.

Abstract

Sampling southern rock lobster (*Jasus novaehollandiae*) at a study reef suggested diving as a possible economical technique for determining State-wide, pre-recruit, size frequency distribution for catch predictions.

Rock lobster from seven areas, comprising forty six sites, were sampled in sixty collections by two divers. Larger samples grouped to distinct year classes, indicating discrete annual settlement; sites yielding sufficient accessible numbers of pre-recruit rock lobster were not generally available; on open coasts individual sites were representative of larger areas; growth rates within areas were consistent. Extension of the technique to catch prediction would need intensive sampling at certain sites within each fishing area.

Introduction

The rock lobster (*Jasus novaehollandiae*) population at Taroona, near the Fisheries Research Laboratory, was sampled successfully by diving (Winstanley, 1972 unpublished ms). The sampling, part of a project aimed at determining growth rates, showed that length measurements were sufficient to determine year classes among smaller rock lobster.

On this basis extension of the sampling technique to other areas was proposed with a view to establishing year class strengths prior to recruitment of rock lobster to the fishery. As annual recruitment comprises a large proportion of the commercial catch, determination of pre-recruit year class strengths could lead to prediction of the magnitude of subsequent catches. Such predictions would enable rock lobster fishermen to direct efforts elsewhere in lean seasons.

In view of the lack of knowledge of the distribution and availability of small rock lobster this project aimed to locate sites within each major fishing area from which representative samples could be taken by diving. Such samples needed to be both large enough to establish year class size groups and their relative intensity, and be representative of a reasonably large geographic area. If such sites could be located it was proposed to sample them annually to establish a relationship between pre-recruit year class strengths and commercial catches in a number of geographical areas.

Methods

Two divers, equipped with an outboard powered runabout boat and hookah gear, travelled by road to coastal sites about the State, sampling as many sub-legal size

rock lobster as possible at each site in the available time. In areas inaccessible by road, Department research vessels "Penghana" and "Challenger" were used to convey the divers to sampling sites.

At each site sampled rock lobster were measured, sexed, and the shell condition noted. Data on meteorological conditions, bottom type, topography and depth, algal cover and other common animal species were recorded also.

### Results

Sites sampled are shown in Figure 1 together with the five fishing areas presently used in analysis of commercial catch and effort statistics. The number of rock lobster taken, diving time, capture rate, bottom type and algal cover are shown in Table 1.

Numbers of rock lobster taken were generally low, the maximum at one site being 178 specimens, but samples of about 100 or more rock lobster yielded size modes considered to represent year groups. Size frequency distributions of samples from all sites within one area were compared to establish if individual sites were representative of wider areas.

#### Storm Bay Area

Twelve sites were examined in this area. Size distribution of rock lobster taken at Taroona, where initial surveys were conducted, indicated that the heavy settlement year group of 1967 was still evident, although similar heavy settlements have not occurred since. The strong 1967 mode appears at about 90 mm for female rock lobster (Fig. 2, Site 9).

Other sites in the Storm Bay - Lower Derwent area also yielded samples with modes in their size frequency distributions (Fig. 2) and although these were at similar sizes among all samples within the area, not all were of equal amplitude. Accordingly, when samples were combined, smoothing of the length frequency distribution resulted (Fig. 2).

#### East Coast

Eleven east coast sites were sampled, four yielding reasonable numbers. Rock lobster from three of these four sites were consistent in size mode and modal intensity, whilst the fourth, the "Gardens" sample, showed one mode more intense than others (Fig. 3).

#### South Coast

Seven sites sampled in the south coast area yielded rock lobster in moderate to adequate numbers (Fig. 4). Several showed consistency in size frequency distribution (sites in the south central area: St. Georges Reef, Sullivan Reef, Actoen Island) although at one site (Recherche Bay) the sample contained a greater proportion of post-recruit numbers. From the size frequency graphs modal distributions were consistent at those sites. The sample from Cloudy Bay showed considerable variation in intensity of

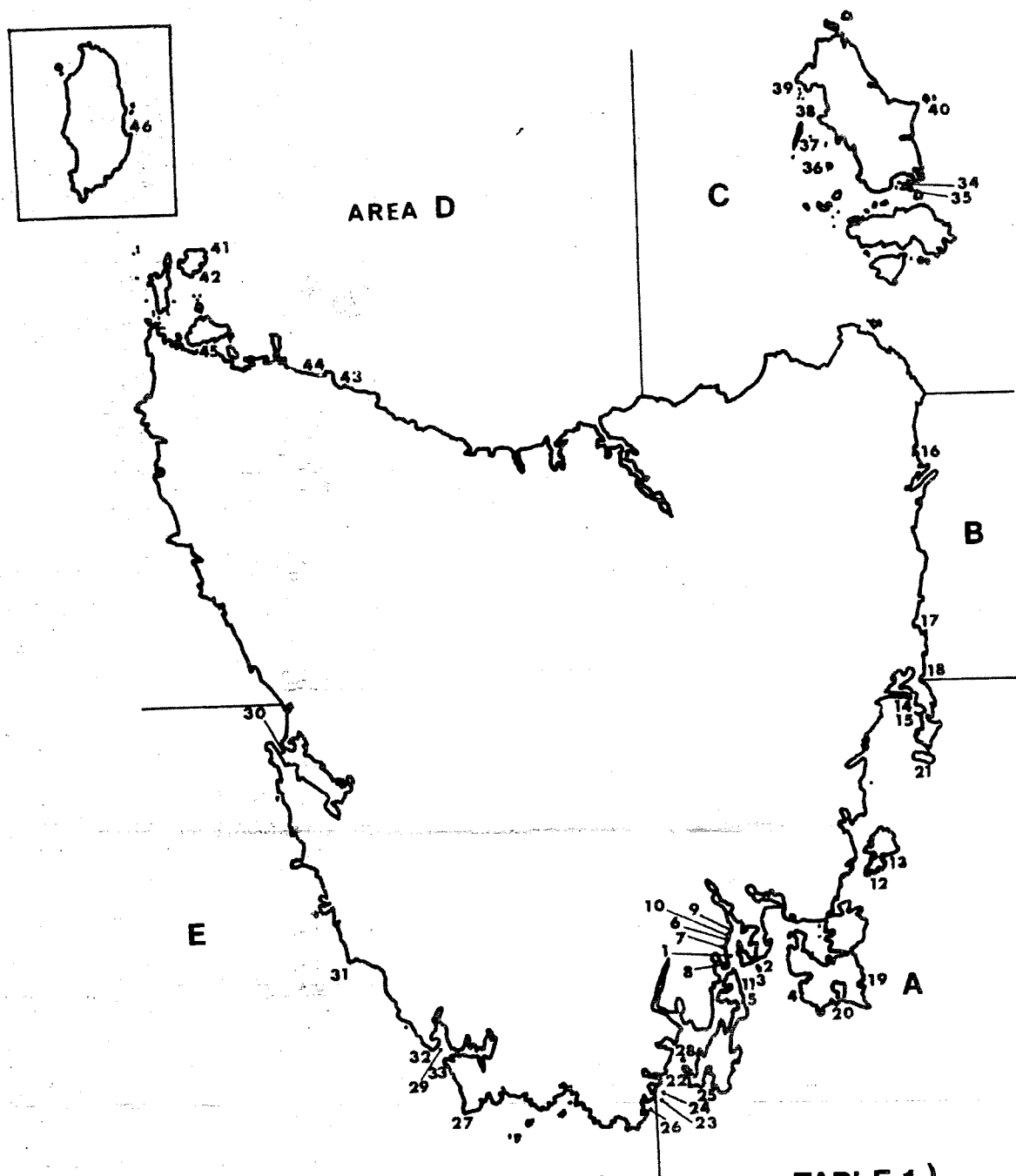


FIG.1. Location of sampling sites. (For key, see TABLE 1.)

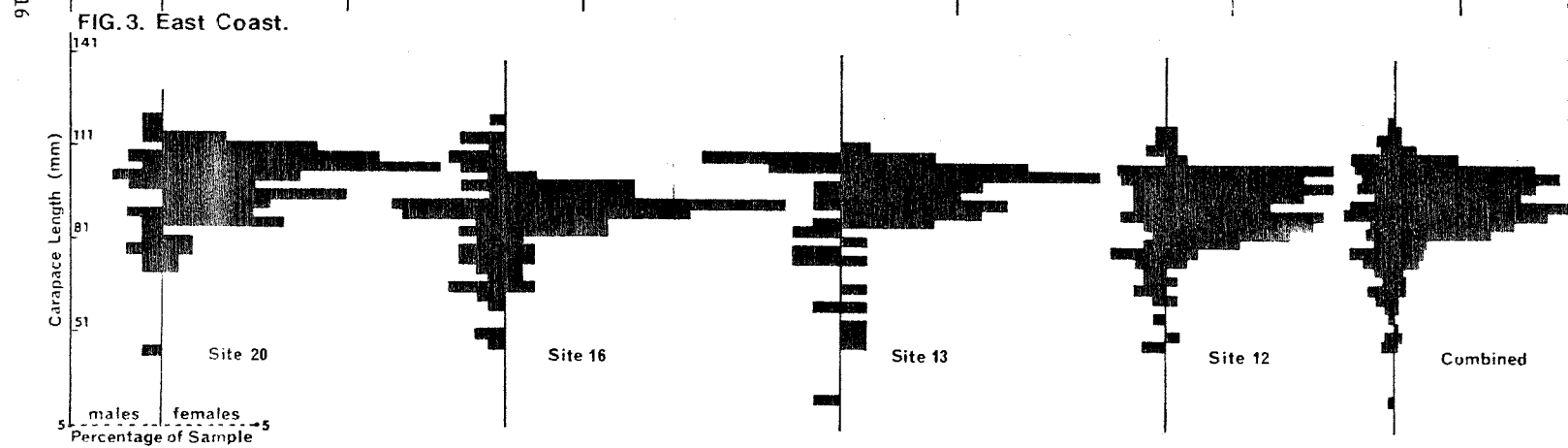
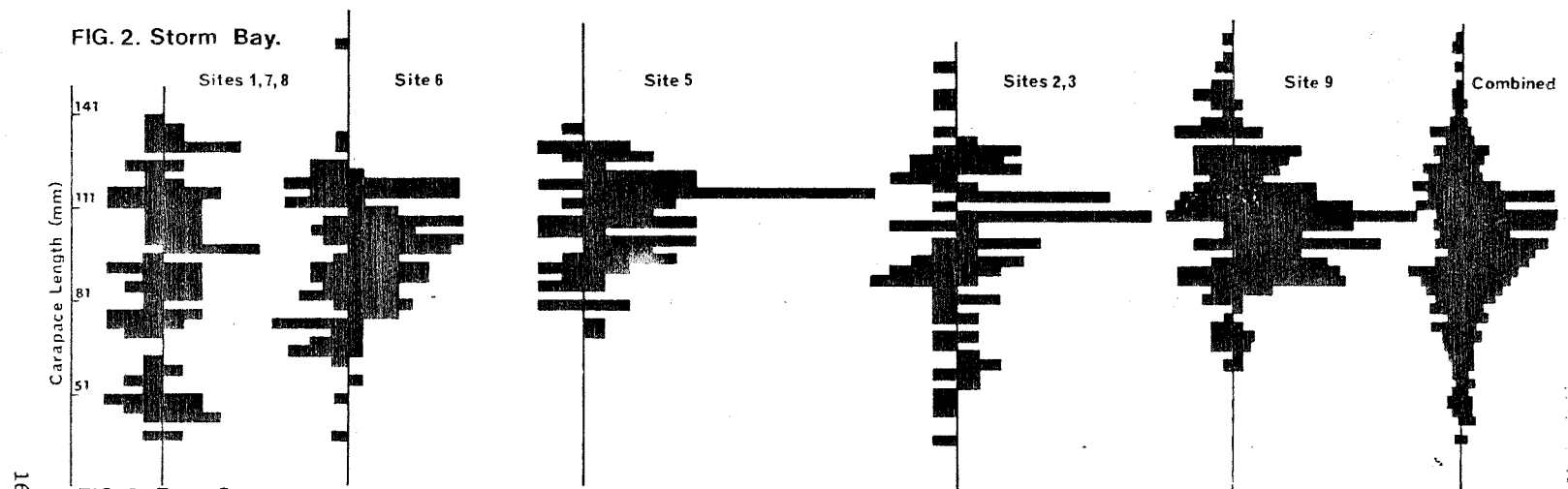
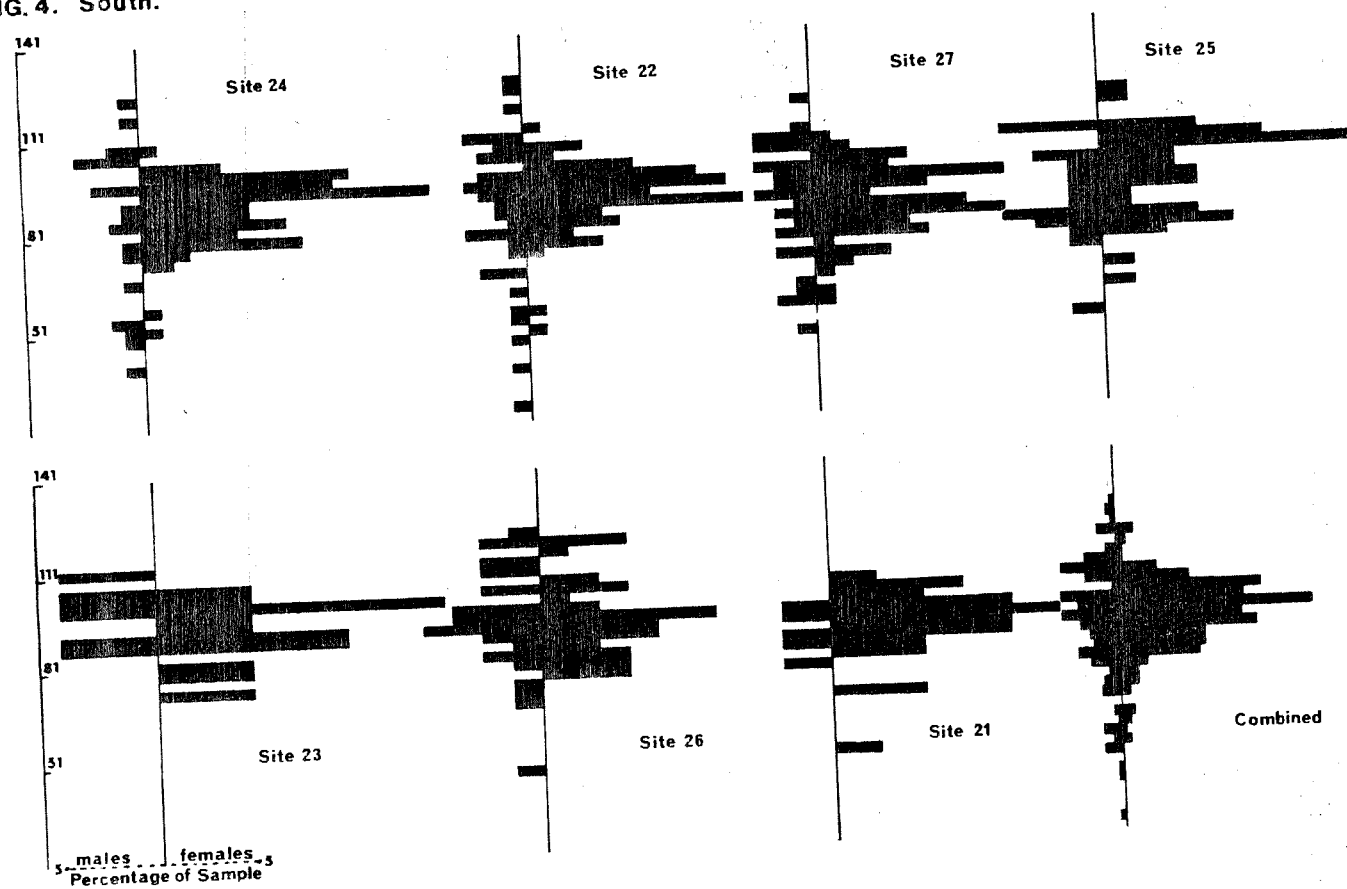


FIG. 4. South.





modal groups, although the sample was small. Rock lobster sampled from South West Cape had similar size distribution to those of the central south coast area except that small modal groups were better represented.

#### West Coast

Four west coast sites yielded rock lobster in numbers sufficient for analysis (Fig.5). Small rock lobster were not taken in large numbers, but size frequency distributions revealed reasonable year group separation to modes among larger sub-legal sized rock lobster. Samples taken at Port Davey and North Head, geographically close, had similar size frequency distributions but these differed from those of Low Rocky Point and Macquarie Heads. The Macquarie Heads sample showed one strong mode at 87-89 mm, which corresponded with a weak representation at Port Davey and North Head stations. The Low Rocky Point sample was strongly represented in the 96-98 and 102-104 mm ranges, corresponding with weak representation in the Macquarie Heads sample and only moderate representation in the other two. Again, some smoothing was evident in the combined west coast samples (Fig.5).

#### Furneaux Group

Only one site in this area yielded a sample of rock lobster of any consequence and that sample, from Babel Island (55 rock lobster), proved too small to establish annual size modes from the size frequency distribution (Fig.6).

#### North West and King Island

Again only one sample from the area was of any consequence: 78 specimens from Sea Elephant Bay (Fig.7). This was insufficient to indicate year group modes from the size frequency distribution.

#### Discussion

Ideally to achieve the proposed objectives of this study, sample areas must:

- (1) contain large numbers of sub-legal size rock lobsters accessible to dive sampling;
- (2) have annual settlement of larvae that is concise within the area, and (3) have a growth rate for rock lobster that is uniform throughout the area from settlement to recruitment. For extension of sampling results to the fishery the sample site chosen must be representative of a larger area.

Given those conditions it is necessary that the size frequency distribution of a representative sample fall into modal groups representing year classes. From the amplitude of these modes an assessment of relative annual recruitment could be made. Continued study would establish an estimate of growth rate from annual progression of the modes, to confirm the assumed growth rate.

FIG. 5. West Coast.

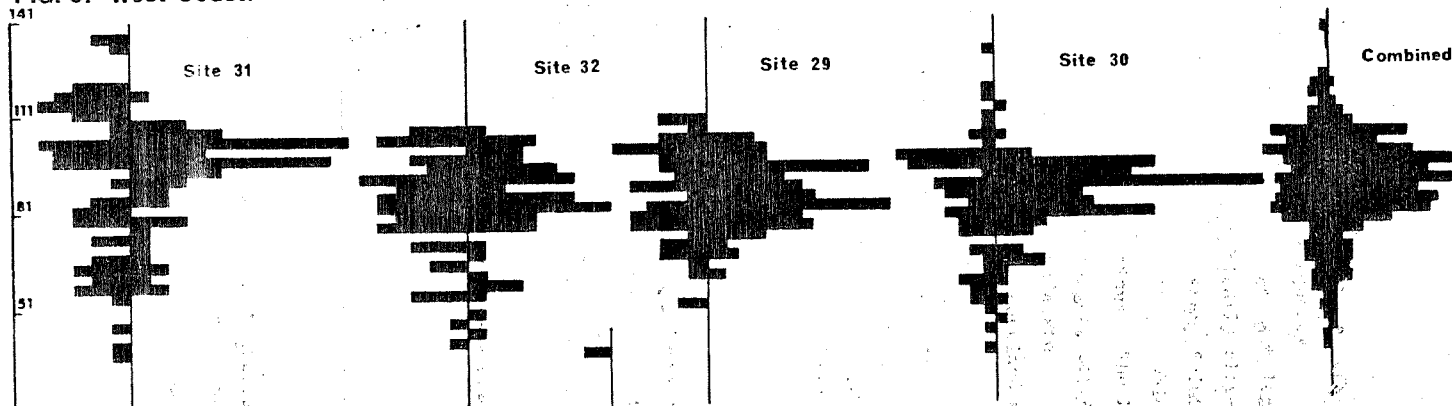
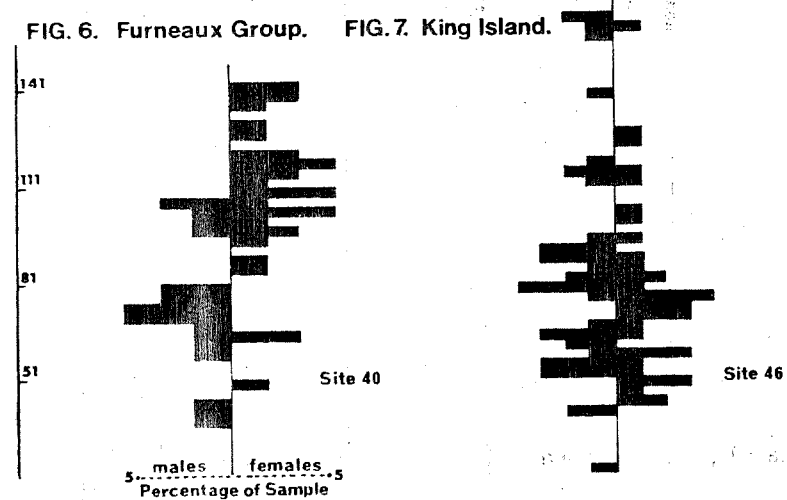


FIG. 6. Furneaux Group.

FIG. 7. King Island.



In this study it was assumed, of the above, that annual settlement is concise and that, within each area, annual growth rate is consistent. Concise settlement had been shown for rock lobster at Tarooma, and the annual modal progressions followed. That sites sampled were representative of wider regions of the fishery could not be assumed, nor that areas containing large numbers of accessible juveniles were available. This project set out to establish whether such sites occurred, whether they were representative of their areas, and to confirm the above assumptions regarding annual settlement and growth rate.

Comparison of samples taken from the same area indicated some variability of settlement, thus one sampling site could not always be taken as representative of the whole area. This applied more to enclosed areas, such as the Storm Bay and lower Derwent area, than to open areas such as the East Coast. In the Storm Bay and lower Derwent area exceptional settlement at Tarooma in 1967 was not evident at all other sites in the area, where samples indicated three different years of exceptional settlement. Sampling sites along the East Coast were more consistent throughout the area. Similarly, of South Coast sites, the sample from the relatively enclosed Cloudy Bay indicated that settlement there was less consistent than at other sites, heavier settlement occurring there in 1966 and 1969 (assuming growth rates based on Tarooma findings). Another exception to the size frequency distribution of the area as a whole occurred at Recherche Bay where, although the pre-recruit size distribution was similar to those of other areas, there occurred a larger proportion of post recruit specimens. This could, however, reflect fishing pressure rather than exceptional settlement years. Similarly, South West Cape samples indicated that while settlement has, in the main, been like that of other sites within the South Coast area, over the past two to three years settlement has been more consistent at that point.

Thus, although the concept of a single site being representative of an area is on the whole acceptable for open areas, there may arise exceptions that limit extension of the concept to all sites.

Of the sampling techniques as a means to determine size distributions, it was found impossible to achieve a suitable rate of capture at most sites. While several sites yielded rock lobster in numbers greater than one hundred, capture rates were all below 1.9/diver minute. Sites within each area might provide annual samples of adequate number but the effort would have to be considerably greater than feasible at most sites.

As a pilot study therefore this project has shown (i) samples of sufficient numbers, when represented as size frequency distributions, group into modal ranges indicating that annual settlement is discrete and that within the size range considered (settlement to recruitment) year classes remain distinct by size frequency; (ii) sites yielding sufficient numbers of rock lobster are exceptional; (iii) individual sites within each area may be representative of the majority of the area on open coasts, but are not so in bays and estuaries and (iv) that growth rates of pre-recruit rock lobster

within the areas are consistent.

Although this study indicates that recruitment predictions by dive sampling could be made, extended, expensive sampling would be required. This would involve increased intensity to achieve both samples of sufficient size and a meaningful geographical coverage.

#### Acknowledgments

I wish to acknowledge the assistance of Messrs. A. McGifford and B. Lennox who carried out most of the diving collections for this survey.

TABLE 1

	<u>Site</u> <u>No.</u>	<u>Male</u>	<u>Female</u>	<u>Total</u>	<u>Dive No.</u> <u>Min. Divers</u>	<u>Total</u> <u>Min.</u>	<u>Catch</u> <u>/Min.</u>	<u>Av.</u> <u>Depth</u> (m)	<u>Rock Type</u>	<u>Weed</u>	<u>Conditions</u>
<b>STORM BAY (See Fig. 2)</b>											
Blackmans Bay & Tinderbox 6/3/73	1	35	37	72	165 2	330	.22	5	shelves & boulders	light	slight
Black Jack Reef 20/3/73	2	16	14	30	50 2	100	.3	8	granite & sandstone	kelp	slight
Betsy Island 20/3/73	3	23	34	57	80 2	160	.36	10	granite & boulders	light	slight
Wedge Island 28/3/73	4	10	5	15	60 2	120	.13	10	-	light	slight/moderate
Variety Bay 29/3/73	5	22	61	83	105 2	210	.40	10	granite boulders	kelp	moderate/rough
Tuna Rocks 30/3/73	6	59	88	147	100 2	200	.74	10	dolerite	kelp	moderate
23/8/73		7	11	18	35 2	70	.26	12	granite boulders	string kelp	calm
Boronia Beach 30/3/73	7	12	14	26	90 2	180	.14	-	-	-	moderate
Tinderbox 23/8/73	8	9	15	24	35 2	70	.34	9	shelves & boulders	string kelp	calm
Taroona Point 27/3/73	9	45	59	104	40 3	120	.87	6	dolerite & boulders	light	calm
21/2/73		3	3	6	45 2	90	.07		dolerite & boulders	light	rough
2/4/73		26	15	41	40 2	80	.51	9	dolerite & boulders	light	moderate
Taroona Cliffs 15/2/73	10	15	19	34	90 2	180	.19	9	dolerite boulders	light	calm
19/3/73		31	41	72	60 3	180	.40	10	dolerite boulders	light	calm
One Tree Point 26/2/73	11	13	21	34	130 2	260	.13	10	granite boulders	string kelp	calm
<b>EAST COAST (See Fig. 3)</b>											
Crayfish Bay 4/7/73	12	48	130	178	90 2	180	1.0	14	granite boulders	kelp & string	slight
Cape Mourourard 5/7/73	13	21	59	80	90 2	180	.44	12	granite slabs	kelp & string	calm
Refuge Island 29/5/73	14	-	-	-	60 2	120	-	10	smooth granite	kelp & string	calm

	<u>Site</u> <u>No.</u>	<u>Male</u>	<u>Female</u>	<u>Total</u>	<u>Dive</u> <u>Min.</u>	<u>No.</u> <u>Divers</u>	<u>Total</u> <u>Min.</u>	<u>Catch</u> <u>/Min.</u>	<u>Av.</u> <u>Depth</u> <u>(m)</u>	<u>Rock Type</u>	<u>Weed</u>	<u>Conditions</u>
Coles Bay 14/3/73	15	-	-	-	60	2	120	-	6	worn slabs	-	-
Gardens 15/3/73	16	59	74	133	35	2	70	1.9	3	smooth granite	kelp	moderate
Gulch 15/3/73	17	1	-	1	100	2	200	.05	9	smooth basalt	kelp	moderate
Friendly Beaches 29/5/73	18	2	10	12	60	2	120	.1	6	granite boulders	weed	calm
Fortescue Bay 23/2/73	19	7	14	21	70	2	140	.15	14	cracked granite	kelp	slight
Hen & Chicken Bay 9/7/73	20	21	100	121	80	2	160	.76	10	granite boulders	string kelp	calm
Port Arthur 7/7/73	21	7 4	16 15	23 19	45 40	2 2	90 80	.26 .24	6 6	mudstone boulder dolerite & granite	weed kelp	moderate moderate/rough
<u>SOUTH (See Fig. 4)</u>												
Sullivan Reef 4/4/73	22	41	83	124	125	2	250	.50	10	granite boulders	string kelp	moderate
Actoen Island 4/4/73	23	6	14	20	75	2	150	.13	12	granite boulders	string kelp	moderate
St. Georges Reef 5/4/73	24	24	96	120	120	2	240	.50	12	granite boulders	string kelp	moderate
Cloudy Bay 31/4/73	25	18	41	59	60	2	120	.49	8	granite	kelp	slight
Recherche Bay 8/5/73	26	28	38	66	60	2	120	.55	10	granite boulders	string kelp	moderate/rough
South West Cape 23/7/73	27	31	80	111	60	2	120	.93	10	granite boulders	string kelp	calm
Partridge Island 22/2/73	28	7	5	12	70	2	140	.09	9	dolerite boulders	kelp	slight
<u>WEST COAST (See Fig. 5)</u>												
Port Davey 4/4/73	29	54	72	126	120	2	240	.53	8	quartz	kelp	calm

	Site No.	M	Female	Total	Dive No. Min.	No. Divers	Total Min.	Catch /Min.	Av. Depth (m)	ck Type	Weed	Conditions
Macquarie Heads 17/4/73	30	60	96	156	180	2	360	.43	10	quartz pillars	kelp	moderate
Low Rocky Point 22/7/73	31	39	40	79	75	2	150	.53	9	granite boulders	kelp	moderate
North Head 22/7/73	32	52	55	107	75	2	150	.71	6	granite slabs	kelp	moderate
Caroline Rock 22/7/73	33	28	3	31	pots							
<u>FURNEAUX GROUP</u> (See Fig. 6)												
Lady Barron & Gr. Dog Island 9/6/73	34	4	4	8	35	2	70	.11	14	granite boulders	-	moderate
Little Dog Island 11/6/73 (and another dive Lady Barron Bay)	35	-	-	-	40	2	80	-	6	granite boulders	string kelp	calm
Kangaroo Island 10/6/73	36	-	-	-	80	2	160	-	14 & 3	granite boulders	short kelp	light
Prime Sea Island 12/6/73 (3 sites x depth)(3 dives, at 3 depths, this site)	37	-	-	-	135	2	270	-	3;6;14	granite boulders	kelp encrusting	moderate/ rough
Settlement Point 13/6/73 (4 dives at this site)	38	-	-	-	105	2	210	-	9	granite boulders	kelp	calm
Cape Franklin, Roden Island (near Babel Island) 1/8/73	39	2	2	4	60	2	120	.03	9	granite slabs	-	moderate/rough
Babel Island 2/8/73	40	23	32	55	85	2	170	.32	9	worn slabs	heavy kelp	moderate/rough
<u>NORTH AND NORTH WEST</u>												
Three Hummocks Island 18/5/73	41	9	13 (this is 2 stations close together - taken as at 1 site, 2 dives)	22	180	2	360	.06	7	granite boulders	weed	moderate
Three Hummocks Island 21/5/73	42	9	6 (3 stations close together - taken as 1 site, 3 dives)	15	110	2	220	.07	10	granite boulders	kelp	calm
Rocky Cape East 21/6/73	43	1	-	1	60	2	120	.01	2-9	shale	encrusting	moderate/rough
Rocky Cape West 20/6/73	44	-	-	-	60	2	120	-	5	-	-	-
Montague Island 22/6/73	45	-	-	-	60	2	120	-	5	basalt boulders	weed	moderate

	Site No.	Male	Female	Total	Dive No. Min.	No. Divers	Total Min.	Catch /Min.	Av. Depth (m)	Rock Type	Weed	Conditions
--	----------	------	--------	-------	---------------	------------	------------	-------------	---------------	-----------	------	------------

KING ISLAND (See Fig. 7)

Sea Elephant Bay 20/5/73	46	41	37	78	180	2	360	.22	5	dolerite boulders	sponge & weed	moderate
-----------------------------	----	----	----	----	-----	---	-----	-----	---	-------------------	---------------	----------