

*E. Z. Webb*



NEW ZEALAND MARINE DEPARTMENT

FISHERIES TECHNICAL REPORT

No. 53

---

**NEW ZEALAND ROCK LOBSTER  
JASUS EDWARDSII  
CARAPACE AND TAIL MEASUREMENTS**

**J. H. SORENSEN**

---

WELLINGTON, NEW ZEALAND

1970

FISHERIES TECHNICAL REPORT

NO. 53

NEW ZEALAND ROCK LOBSTER

JASUS EDWARDSII

CARAPACE AND TAIL MEASUREMENTS

J.H. SORENSEN

FISHERIES DIVISION

WELLINGTON, NEW ZEALAND

1970

## CONTENTS

	Page
LIST OF FIGURES AND TABLES	
SUMMARY	1
INTRODUCTION	3
HISTORY OF REGULATIONS RELATING TO MEASUREMENTS	4
CARAPACE MEASUREMENTS	6
CARAPACE/TAIL/TOTAL LENGTH RELATIONSHIP	7
AN ALTERNATIVE CARAPACE MEASUREMENT	17
ACKNOWLEDGEMENTS	23
REFERENCES	24

## LIST OF FIGURES AND TABLES

- FIG. 1 Method of measuring rock lobster total length and tail length.
- FIG. 2 Rock lobster tail measuring sticks.
- FIG. 3 Graph showing crayfish (rock lobster) carapaces and tails to total length.
- FIG. 4 Carapace length/total length relationship; males and females.
- FIG. 5 Carapace length/total length relationship; combined males and females.
- FIG. 6 Tail length/total length relationship; males and females.
- FIG. 7 Tail length/total length relationship; combined males and females.
- FIG. 8 Suggested fishermen's gauge for measuring carapace length of rock lobsters (antennal platform to posterior border of carapace).
- TABLE 1 Rock lobster carapace and tail range by overall length.
- TABLE 2 Sample number (N), correlation coefficient (r), and least square regression line equations for data in Figures 4-7.
- TABLE 3 Carapace and tail length increments at 0.5 inch intervals from 6.0 to 11.0 inches total length in males, females, and combined sexes.

- TABLE 4      Sample number (N), mean ( $\bar{X}$ ), standard deviation (S) and 99% confidence limits for carapace measurements at 0.5 inch increments, 6.0 inches to 11.0 inches total length.
- TABLE 5      Sample number, mean, standard, deviation, etc., for tail lengths at 0.5 inch total length increments.
- TABLE 6      Expected carapace length from a given total length (A) males and (B) females.
- TABLE 7      Summary of carapace/total length relationships by all authors cited.

SUMMARY

This publication gives an account of the carapace length/total length and tail length/total length relationships in the New Zealand spiny lobster (Jasus edwardsii (Hutton 1875)), with special reference to those of 7 inches overall length (Otago or "Karitane" lobsters) and 10 inch overall length elsewhere, excepting the "tailing at sea area" from Waipapa Point to Bruce Bay and, of course, the Packhorse Lobsters (Jasus verreauxi). The summary below gives the findings:

1. The various legislative steps, implemented by regulation, governing measuring of rock lobster and their parts, from nil in August 1938 to a tail only measurement in December 1969 is given.
2. All regulatory provisions to date have referred to either or both rock lobster overall lengths or tail lengths. No mention is made of carapace length/total length.
3. In 1962 the Select Committee of Parliament which investigated the fishing industry, advocated a cessation of tailing lobsters at sea in the special area, and that as soon as all rock lobsters are landed whole measurement should be on a carapace length.
4. Clearly the measurement of the tail only is not satisfactory in that the tail is flexible and subject to some degree of variation. The overall measurement has the same defect, whereas the carapace is hard, inflexible, and easily measured with a fixed calibre device.
5. The various authors listed conducted a big series of rock lobster measurements on carapace/tail/whole length relationship. The actual average carapace measurement of males, females and mixed sexes, of 7 inch and 10 inch animals, are given in the various graphs and tables which follow.
6. Some evidence, supported by graphs and tables, is given for a change to a carapace measurement when tailing at sea ceases and all rock lobsters are landed alive.

7. Opinions in respect of a change to the use of the antennal platform, in place of the rostral spine, as an anterior reference point, are given, and a suggested measuring device is figured (Fig. 8).
8. It appears from the figures quoted that if a change to carapace measurement is made it should be preceded by the measuring of a big series of male and female rock lobsters by both "rostral spine" and "antennal platform" techniques.

INTRODUCTION

The current legislative requirements in respect of rock lobsters are contained in "The Rock Lobster Regulations 1969", the name Rock Lobster being defined as "... any spiny crayfish or packhorse crayfish, and includes the tail or any other part of any such crayfish." Spiny crayfish means "... the species of crayfish known as Jasus edwardsii", and it is this species alone to which this account refers.

The above regulations supercede the rock lobster requirements contained in "The Fisheries (General) Regulations 1950 (Reprint)", which incorporate Amendments 1 to 8 inclusive, and the separate Amendments 9 to 13 inclusive. An historical summary of legislation relating to measuring rock lobsters is given later.

Under the present regulations all rock lobsters carry a minimum tail size limit which is  $4\frac{1}{2}$  inches for the Otago "Karitane" rock lobsters and 6 inches elsewhere. An exception is made for the "Packhorse" species Jasus verreauxi which carries a minimum tail size limit of  $8\frac{1}{2}$  inches. However, it is to the rock lobster Jasus edwardsii only that the following account refers, because it is the most abundant and valuable, and carries the most data relating to overall size and carapace and tail sizes.

The matter of a universal carapace measurement has been looked at from time to time, since the carapace is inflexible and shows no post-mortem shrinkage or elongation, whilst both whole and tail lengths are subject to these defects. Carapace and tail measurements, relative to overall rock lobster lengths of 7 inches and 10 inches, by a number of workers since 1953 are given below and summated in Table 7. Although it has long been known that Jasus edwardsii exhibited sexual dimorphism by way of presence or absence of chelae on the fifth pereopods, presence or absence of endopodites on the abdominal pleopods, and the position of the genital orifices basally on the fifth pair of walking legs of the male, and on the third pair on the female, the series of measurements disclose that for rock lobsters of equal size overall males have a slightly longer carapace and shorter tail than females. It is important to know the magnitude of this difference since if a carapace measurement was



adopted a decision would need to be made as to whether one figure would suffice for both sexes or whether males and females should be separated.

Should a carapace measurement be adopted at any time a decision must also be reached as to which anterior point shall be used - the tip of the median rostral spine, or the antennal platform. The figures which follow disclose little evidence for separation of male and female rock lobsters in respect of either carapace or tail measurements or, indeed, for any marked difference between the two forms of measuring, i.e., using either the rostral spine or the antennal platform as an anterior reference point. What is now required is an adequate series of measurements of both sexes, using both the above techniques. Such an experiment would reveal whether one method showed a consistent difference from the other and indicate what minimum size limits should be applied, at least in respect of carapace lengths.

#### HISTORY OF REGULATIONS RELATING TO MEASUREMENTS

1. Before August 1938 rock lobster fishing was not separately controlled, but was subject only to the same regulations as fishing in general. In August 1938 regulations were brought down which implemented the recommendations of the Sea Fisheries Investigation Committee 1937-38 in respect of rock lobsters. These regulations made it unlawful, amongst other things, to catch rock lobsters of less than 9 inches total length from the tip of the head (rostrum or beak) to the end of the tail (telson).
2. The 9 inch minimum overall length was changed several times and settled down to 8 inches in the 1947 regulations.
3. In 1948 the minimum overall length for rock lobsters generally was set at 9 inches, whilst no minimum size was specified for those taken in Otago waters lying between the Waitaki River in the north and the Waipati River in the south. "Length" was defined as the measurement from the tip of the rostrum (or beak) to the tip of the tail, measured along the back with the animal spread as flat as

possible. The regulations made no reference to tails or their measurement.

4. The 1947 regulations were reprinted in 1950. Amendment No. 1 to the 1950 regulations was enacted in 1952 and increased the minimum permitted overall size from 9 to 10 inches. The tailing of rock lobsters at sea was prohibited except in the area between Waipapa Point in Southland and Bruce Bay to the north of Fiordland and only boats registered at Bluff, Dunedin, Greymouth and Westport were permitted to operate in this area. A minimum tail length of  $5\frac{1}{4}$  inches was prescribed, the tails to be measured ".... from the after side of the calcified bar or sternum on the underside of the first segment, to the end of the tail, along the under or ventral side with the tail laid flat on its back".

The position in respect of Otago rock lobsters, (or "Karitane" sizes as they came to be described), remained the same - i.e., no minimum size limit applied.

5. In 1959 Amendment No. 5 re-enacted, in an amended form, the provisions relating to the measurement of rock lobster, and increased the minimum permitted size of tail from  $5\frac{1}{4}$  inches to 6 inches.

The exemption of the Otago area from a legal size limit was ended by the 1959 amending regulations, an overall size limit of 6 inches being set as a minimum for the so-called "Karitane" rock lobster.

6. The principal changes in 1963, introduced by Amendment No. 6, were to increase the minimum legal overall length of Otago rock lobsters from 6 inches to 7 inches, and to alter the southern boundary northward to Nugget Point; also to re-define "length" in relation to whole rock lobsters, and to rock lobster tails. Diagrams were included as a Schedule (see Fig. 1) to show the way in which measurements were to be taken.

7. The Rock Lobster Regulations 1969 consolidated all previous rock lobster legislation and changed to a system of sizing by measurement of tail alone - a 6 inch tail generally except in Otago waters where a  $4\frac{1}{4}$  inch tail was permissible in an open season from 21 June to 19 December in each year.

In terms of the 1969 regulations the size must be measured using a measuring stick of a type approved by the Secretary for Marine and stamped by the Department with its stamp. Patterns of measuring sticks are illustrated in the regulations as a Schedule thereto and reproduced here as Fig. 2.

#### CARAPACE MEASUREMENT

It will be noted that all regulatory provisions to date, relating to the taking of measurements, refer to either or both rock lobster tails or overall length. It has been suggested from time to time that a change be made to a carapace measurement only, since the present measuring of tails or total length have the inherent defect of being subject to variation on post-mortem relaxation of the abdominal muscles. This allows stretching to meet the minimum legal length requirements. The carapace of the rock lobster, on the other hand, is relatively inflexible and measurements show no post-mortem shrinkage or elongation.

The Select Committee of Parliament, which investigated the Fishing Industry in 1961-62, examined the rock lobster position at that time and in their report to Parliament in 1962 made reference to carapace measuring as follows:

- (a) Para. 174, p. 40 - "...Tailing crayfish at sea also precluded the use universally of the carapace measure which was a simpler method for measuring whole crayfish."
- (b) Para. 178, p. 41 - "(1) That tailing of crayfish at sea should cease", and,
  - "(2) As soon as all crayfish are landed whole measurement should be on a carapace length."

The above recommendations of the Select Committee have not yet been fully implemented and tailing at sea is still permitted in the area first delineated in 1952, i.e., between Waipapa Point and Bruce Bay.

In the tailing at sea area the carapace is not retained and therefore the use of a carapace length cannot be adopted for universal use throughout the country. Once tailing at sea is abolished, however, and all rock lobsters are landed whole and alive, the change to carapace measuring will be relatively simple. Measuring of the tail is not wholly satisfactory in that it is flexible, subject to some degree of variation with stages of "liveliness", and difficult to measure on board the fishing boats. The carapace is hard and can be easily measured with a fixed calibre device.

Carapace measurements were included in early drafts of the Rock Lobster Regulations 1969, but it was decided that rather than prescribe a tail length size limit for the tailing at sea area, and carapace size limits elsewhere, it would be better to prescribe tail length size limits throughout the country, at least until carapace lengths could be applied universally throughout New Zealand.

#### CARAPACE/TAIL/TOTAL LENGTH RELATIONSHIP

1. About 1953 Sorensen (unpublished report on Marine Department file) measured 196 male rock lobsters and 90 females in the overall size range of 9.6 inches to 10.3 inches. This exercise was conducted in the Wellington area and was carried out principally to determine the relationship of a 6 inch tail to a 10 inch overall measurement. Opportunity was also taken of the chance to obtain carapace measurements. The subjoined Table 1 shows the carapace and tail ranges for each group sampled and, in parentheses, the averages,

It will be noted that 10 inch males had a carapace range of 3.6 inches to 3.9 inches (3.776) and a tail length ranging between 5.75 inches to 6.1 inches (5.876). Females had a carapace range of 3.5 inches to 3.65 inches (3.606) and tail range of 5.75 inches to 6.1 inches (5.957). This indicates that male rock lobsters have a slightly longer carapace and a slightly shorter tail than females of the same total length.

TABLE 1

## ROCK LOBSTER

Carapace and Tail Range by Overall Length

(in inches)

(a) <u>Males - 196</u>			
Length	No. in Sample	Carapace Range	Tail Range
9.6	50	3.5 - 3.8 (3.632)	5.4 - 5.9 (5.674)
9.7	23	3.6 - 3.7 (3.668)	5.5 - 6.0 (5.690)
9.8	30	3.6 - 3.8 (3.724)	5.5 - 6.0 (5.740)
9.9	20	3.7 - 3.9 (3.775)	5.6 - 5.9 (5.800)
10.0	23	3.6 - 3.9 (3.776)	5.75 - 6.1 (5.876)
10.1	17	3.7 - 3.9 (3.835)	5.8 - 6.05 (5.909)
10.2	20	3.75 - 3.95 (3.880)	5.8 - 6.25 (5.982)
10.3	13	3.75 - 4.0 (3.915)	5.8 - 6.3 (6.050)
(b) <u>Females - 90</u>			
9.6	14	3.37 - 3.6 (3.497)	5.7 - 5.9 (5.797)
9.7	17	3.3 - 3.6 (3.518)	5.7 - 5.93 (5.829)
9.8	8	3.5 - 3.65 (3.559)	5.8 - 6.0 (5.900)
9.9	2	3.56 - 3.6 (3.580)	5.8 - 5.87 (5.835)
10.0	13	3.5 - 3.65 (3.606)	5.75 - 6.1 (5.957)
10.1	10	3.5 - 3.75 (3.670)	6.0 - 6.2 (6.065)
10.2	11	3.5 - 3.8 (3.660)	5.87 - 6.3 (6.110)
10.3	15	3.65 - 3.8 (3.750)	6.0 - 6.4 (6.193)

2. Also circa 1953 Sorensen (unpublished report on Marine Department file) produced a graph of the average rock lobster carapaces and tail lengths to total lengths of 312 males and females ranging from  $1\frac{1}{4}$  inches to  $13\frac{1}{2}$  inches long.

The original graph is reproduced below as Fig. 3 and shows how neatly the 6 inch tail averages, and 3.7 inch carapace averages, fit the 10 inch overall length; also how the increment lines indicate that rock lobsters of 7 inches overall length will produce a tail averaging 4.25 inches and a carapace of 2.6 inches. Even the 24 sub-5 inch rock lobsters measured fit the tail and carapace increment lines.

3. In 1966-1967 Mr J. Bain (Jnr) attached temporarily to Fisheries Division, Marine Department, investigated the total length/carapace length in rock lobsters at three fishing centres in the South Island - Picton, Kaikoura and Motunau Island. The results of this study were published in 1967 as Fisheries Technical Report No. 23, under the title "Total Length/Carapace Length in Crayfish".

In the introductory section of his report Bain states:

"At the present time the minimum legal size for crayfish caught off the New Zealand coast is 10 inches in total length. The only exception to this applies to fishing boats registered at Dunedin and Oamaru landing their catch between the Waitaki River and Nugget Point. Here the minimum legal size is 7 inches. Total length is defined as the distance between the rostral spine and the centre of the telson measured along the dorsal surface when the crayfish is laid out as flat as possible."

(Note: As previously stated the Rock Lobster Regulations 1969 changed the name crayfish to rock lobster, and altered the measurement from a 10 inch overall length to a 6 inch tail length and, in respect of Otago, from a 7 inch overall length to a 4.25 inch tail. The method of measuring, and type of measuring device to be used, was also defined).

Bain also stated that the 1967 method of measuring the overall length of rock lobsters was not satisfactory, mainly because of the flexibility at the carapace/tail junction. He did not make any reference to the method of measuring rock lobster tails which also have the disadvantage of being flexible and easily stretched.

As an alternative to measuring the total length of rock lobsters Bain proposed the use of a carapace measurement which, he stated, had certain very definite advantages:

- (a) The carapace is rigid and therefore not subject to stretching and shrinking.
- (b) It would be far easier for the fishermen to measure the carapace than the total length. There would be no need to lay the lobster out flat and the whole process would be far quicker.

Bain measured a series of rock lobsters for carapace and total length relationship and concluded:

- (a) "It would appear from the data that a crayfish with a total length of 25.4 cm (10") can be expected to have a carapace length of approximately 9.7 cm ( $3\frac{3}{4}$ ")."
- (b) "The data shows that there is a positive linear correlation between the carapace length and the total length of crayfish."
- (c) "If carapace measurements were adopted the most appropriate length to be considered would probably be  $3\frac{3}{4}$ " because this carapace measurement would cover most crayfish with a total length of 10 inches, the current minimum length by regulation."

4. In 1968, in an unpublished report to Marine Department dated 6 August, Fisheries Scientist R.J. Street of Dunedin has this to say concerning the mean total length/carapace length relationship of a large number of rock lobsters measured by him in Otago, Southland, and Fiordland waters:

"Measurements of carapace length are from the tip of the middle rostral spine to the after end of the carapace, and total length from the middle rostral spine to the tip of the telson. Crayfish measuring 17.8 cm (7 inches) in total length have a mean carapace length of 6.7 cm (2.63 inches) in males, and 6.6 cm (2.60 inches) in females. Crayfish measuring 25.4 cm (10 inches) in total length have a mean carapace length of 9.7 cm (3.81 inches) in males and 9.4 cm (3.70 inches) in females."

In respect of total length/tail length relationship for males and females, Street records as follows:

"Tail lengths were measured on a ruler by the regulation method. Crayfish 17.8 cm (7 inches) in total length have a mean tail length of 10.5 cm (4.13 inches) for both males and females. Crayfish measuring 25.4 cm (10 inches) in total length have a mean tail length of 15.0 cm (5.9 inches) in males and 15.2 cm (6.0 inches) in females."

Street also concluded:

"A carapace measurement would appear to be the most suitable one for use in areas where catch is landed whole. It is quicker to apply than either a total length or a tail length and, being a rigid measurement, it does not alter after cooking the crayfish. A carapace measurement of  $3\frac{1}{4}$  inches would substitute for the 10 inch size limit, and  $2\frac{5}{8}$  inches for the 7 inch size limit applying in Otago."



5. In 1969 Mr R.J. Street produced, as Fisheries Technical Report No. 30, an account of some of his rock lobster investigations in southern New Zealand. In his section "Total Length/Carapace Length/Tail Length Relationship", (supported by his Figures 3, 4, 5 and 6), Street concluded:

"Males have a proportionately longer carapace and smaller tail length than females of the same total length"; and

"the carapace length in cm is a figure slightly less than the total length in inches, e.g., the mean carapace lengths of crayfish 10 inches in total length are 9.7 cm for males and 9.4 cm for females."

6. From unpublished data collected by Sorensen from the Wellington area during 1953 regression lines have been drawn for the carapace length (C.L.)/total length (T.L.) relationship for males, females and for the combined male and female data (Figs. 4 and 5), and for the tail length (t.L.)/total length relationship for males, females and for the combined male and female data (Figs 6 and 7).

To construct these linear regression lines C.L. and t.L. measurements of five rock lobsters of each sex (where possible) were used at each 0.1" increment in length over the 6.0" - 11.0" T.L. range. Over a large T.L. size range the C.L./T.L. relationship is probably best fitted using some curve other than a straight line but for the 6.0" - 11.0" T.L. size range straight lines fitted for C.L./T.L. and t.L./T.L. gave very high correlation. Sample numbers (N), correlation coefficients (r), and least square regression line equations for the data in Figs 4 - 7 are given in Table 2 below.

TABLE 2 Sample number (N), correlation coefficient (r), and least square regression line equations for the data in Figs 4 - 7.

	Male	Female	Male and Female
N	192	203	395
-	-	-	-
C.L./T.L.	r = .989 Y=0.389X-0.131	r = .989 Y=0.352X+0.114	r = .984 Y=0.372X- 0.024
-	-	-	-
t.L./T.L.	r = .989 Y=0.571X+0.196	r = .991 Y=0.604X-0.032	r = .989 Y=0.586X+0.091

Table 3 gives the values of carapace length and tail length sizes at each 0.5" T.L. increment between 6.0" - 11.0" T.L., using the appropriate least square regression equations.

Data in Table 2 indicate very good correlation of carapace length and tail length with total length.

However, Sorensen's unpublished measurements (1953), which approximated a normal distribution with the mean size at 9.0" T.L., were subsampled to construct the lines in Figs. 4 - 7 (i.e., 5 randomly chosen C.L. and t.L. measurements/0.1" increment between 6.0" - 11.0" T.L.). This gives bias toward good correlation coefficient values and also does not allow a good estimate of the variation in carapace length or tail length at any given total length.

TABLE 3      Carapace length and tail length increments  
at 0.5" increments between 6.0" - 11.0"  
total length for male, female, and male plus  
female rock lobsters  
(in inches)

Total Length	Carapace Length			Tail Length		
	Male	Female	Male and Female	Male	Female	Male and Female
6.0	2.21	2.22	2.21	3.62	3.59	3.61
6.5	2.40	2.40	2.40	3.91	3.90	3.90
7.0	2.59	2.58	2.58	4.19	4.20	4.20
7.5	2.79	2.75	2.77	4.48	4.50	4.49
8.0	2.98	2.93	2.96	4.76	4.80	4.78
8.5	3.18	3.10	3.14	5.05	5.11	5.08
9.0	3.37	3.28	3.33	5.33	5.41	5.37
9.5	3.57	3.46	3.51	5.62	5.71	5.66
10.0	3.76	3.63	3.70	5.90	6.01	5.96
10.5	3.96	3.81	3.89	6.19	6.31	6.25
11.0	4.15	3.98	4.07	6.48	6.62	6.54

Thus all the available data from Sorensen's (1953 unpub) rock lobster measurements were used to calculate mean values, standard deviations and 99% confidence limits of C.L. and t.L. at each 0.5" increment between 6.0" - 11.0" T.L. This data is given in Tables 4 and 5.

TABLE 4 Sample Number (N), Mean ( $\bar{X}$ ), standard deviation (S), and 99% confidence limits (99% limits) for carapace measurements at 0.5" total length increments  
(Sorensen unpub. data 1953)

Total Length (Inches)	Carapace Length (Inches)									
	Male			Female			Combined male and female data			
	N	$\bar{X}$	S	N	$\bar{X}$	S	N	$\bar{X}$	S	99% limits
6.0	2	2.23	-	2	2.23	-	4	2.23	-	-
6.5	1	2.45	-	1	2.40	-	2	2.43	-	-
7.0	1	2.65	-	1	2.60	-	2	2.63	-	-
7.5	2	2.83	-	6	2.73	-	8	2.76	-	-
8.0	17	3.04	.10	18	2.93	.07	35	2.99	.10	2.73 - 3.24
8.5	44	3.19	.06	49	3.11	.06	93	3.15	.06	2.99 - 3.31
9.0	69	3.39	.06	61	3.28	.07	130	3.34	.08	3.14 - 3.54
9.5	59	3.60	.06	41	3.48	.06	100	3.55	.08	3.34 - 3.76
10.0	23	3.78	.12	13	3.61	.05	36	3.73	.12	3.42 - 4.04
10.5	17	3.99	.06	10	3.82	.05	27	3.93	.11	3.65 - 4.20
11.0	19	4.20	.09	9	4.01	.07	28	4.14	.13	3.81 - 4.47

TABLE 5 Sample Number (N), Mean ( $\bar{X}$ ), standard deviation (S), and 99% confidence limits (99% limits) for tail length measurements at 0.5" total length increments (Sorensen unpub. data 1953)

Total Length (Inches)	Tail Length (Inches)									
	Male			Female			Combined male and female data			
	N	$\bar{X}$	S	N	$\bar{X}$	S	N	$\bar{X}$	S	99% limits
6.0	2	3.60	-	2	3.60	-	4	3.60	-	-
6.5	1	3.90	-	1	3.95	-	2	3.93	-	-
7.0	1	4.15	-	1	4.15	-	2	4.15	-	-
7.5	2	4.43	-	6	4.53	-	8	4.51	-	-
8.0	17	4.74	.11	18	4.83	.08	35	4.79	.11	4.52 - 5.06
8.5	44	5.05	.08	49	5.11	.07	93	5.08	.08	4.88 - 5.30
9.0	69	5.35	.07	61	5.42	.07	130	5.39	.12	5.09 - 5.69
9.5	59	5.62	.09	41	5.71	.10	100	5.66	.10	5.39 - 5.93
10.0	23	5.88	.08	13	5.96	.10	36	5.91	.11	5.63 - 6.19
10.5	17	6.09	.09	10	6.30	.13	27	6.17	.15	5.80 - 6.55
11.0	19	6.37	.13	9	6.62	.15	28	6.45	.18	6.00 - 6.90

Trends in variation of tail length and carapace length at 0.5" increments between 6.0" - 11.0" total length, are perhaps obscured by smallish sample sizes, but it appears that the variation increases with rock lobster size increase.

AN ALTERNATIVE CARAPACE MEASUREMENT

1. In his Fisheries Technical Report No. 23 of 1967, Mr J. Bain (Jnr) had this to say in respect of carapace measuring:

"If a change to carapace measurement was made this would be a good time to change the anterior terminal used in measuring, i.e., the rostral spine.

"The rostral spine is variable in length and orientation of the anterior tip, so that its value in measuring must be doubtful when such a critical measurement as carapace length is contemplated. I consider a better site for the anterior terminal would be the platform between the antennae; but this, of course, would mean that a new measuring device would be necessary. Rulers with a special attachment on the end for hooking in between the antennae are already used for measuring and have proved accurate."

2. Earlier, in September 1964, Mr P.T. Norris, then employed at the Marine Department Fisheries Research Laboratory in Wellington, produced a report entitled "Considerations of the Effects of Changing the Legal Length Limit of Crayfish". This report seems not to have been published and, with the author's permission and that of the Director of Research, is quoted extensively below:

"It has been suggested that the legal length limit of crayfish, which now stands at a total length of ten inches or 6" tail length, should be changed to a measurement based on the carapace length. There are several reasons for this, but probably the most important is that the measurement of the total length is subject to variation on the relaxation of the abdominal muscles at death. This allows stretching to meet the minimum legal length requirements.

"As part of a general survey on crayfish, samples were taken from Island Bay, Jackson Bay, Cape Campbell, Bay of Plenty, Napier, Ruapuke Island and Centre Island, when the carapace length and total length, tail lengths and tail widths were measured. For the purposes of this paper the relationship between carapace and total length only has been considered.

"The measurements taken are shown below (Table 6, A and B). The forward measurement is taken from the platform between the antennae, along the back to the mid-dorsal rear margin of the carapace, to give carapace length, and continued to the hind margin of the middle segment of the tail fan, or telson, for total length. Both lengths are therefore some  $3/16$ " longer than the usual measurement taken from the tip of the centre spine between the eyes (rostral spine). The rostral spine length is variable and the measurement taken from that position is neither as easy nor as consistently accurate as in the position shown above. The measurements were taken with a ruler, to the anterior end of which a 2" wedge-shaped metal spike was attached at right angles. This fits comfortably between the antennae and against the antennal platform. The measurement for total length was made by raising the tail to meet the ruler. All measurements were taken to the nearest millimeter; these measurements were retained until the conclusions when conversions to inches were made.

"It was immediately obvious that for any given total length a female crayfish was shorter in the carapace than a male, and so the two sexes were treated separately."

Mr Norris' table giving the expected carapace length from a given total length is given below; (A) in the case of males and, (B) in respect of females (Table 6, A and B).

TABLE 6 Expected Carapace Length from a Given Total Length(A) MALES

<u>Total Length</u> (Inches)	<u>Carapace length</u>	<u>Lower Limit</u>	<u>Upper Limit</u>
6	2.16	1.87	2.45
6.5	2.37	2.08	2.66
7.0	2.59	2.30	2.88
7.5	2.80	2.51	3.09
8.0	3.01	2.72	3.30
8.5	3.23	2.94	3.52
9.0	3.44	3.15	3.73
9.5	3.65	3.36	3.94
10.0	3.87	3.58	4.16
10.5	4.08	3.79	4.37
11.0	4.30	4.01	4.59
11.5	4.51	4.22	4.80
12.0	4.73	4.44	5.02

(B) FEMALES

<u>Total Length</u> (Inches)	<u>Carapace length</u>	<u>Lower limit</u>	<u>Upper Limit</u>
6	2.17	1.93	2.41
6.5	2.36	2.12	2.60
7.0	2.56	2.32	2.80
7.5	2.75	2.51	2.99
8.0	2.94	2.70	3.18
8.5	3.14	2.90	3.38
9.0	3.33	3.09	3.57
9.5	3.52	3.28	3.76
10.0	3.71	3.47	3.95
10.5	3.91	3.67	4.15
11.0	4.10	3.86	4.34
11.5	4.29	4.05	4.53
12.0	4.49	4.25	4.73



The above two tables reveal the small differences in length between the carapaces of male and female rock lobsters. Norris also detected small differences of a local nature, but these were so small that, although there were statistical differences between regions, for practical purposes the whole country may be treated as one region. He concluded as follows:

"About one in forty crayfish of any given length has a carapace longer than the upper limit listed, and about the same number a carapace shorter than that listed; that is, for any given length about 95% of the crays have carapace lengths greater than the lower, and less than the upper limits.

"If a change to regulations based on carapace lengths is to be made, then the carapace length chosen must be easily measurable; it must be designed to preserve females at least until maturity; and it must not adversely affect the livelihood of the fishermen either in the short or long term. Clearly, the direct conversion, i.e., 3.87" for males and 3.71" for females, is out of the question. Indeed a fishing boat would need a micrometer to measure its catch! There are really three practical choices:  $3\frac{1}{2}$ ",  $3\frac{3}{4}$ ", and 4". Of these,  $3\frac{1}{2}$ " is too low, as many females have not reached maturity at this length, and heavy fishing of these could affect future crayfish stocks disastrously. Four inches would be the most convenient, but in the short term would reduce the catches in some areas and possibly cause hardship among the fishermen. This leaves  $3\frac{3}{4}$ " as the most suitable size. If this length were chosen then temporarily at least, the catches of male crays would rise, and those of females drop slightly, although all told there would be more crays caught. The fact that less females would be caught is certainly to the good of the fishery, as this preserves the breeding stock.

"It has been suggested that a standard measuring device should be distributed by the Department to facilitate rapid and standardised measurement of crayfish." (See Fig. 8).

3. On 3 July 1970, Mr R.F. Coombs of the Marine Department Fisheries Research Laboratory, Wellington, with whom the matter of carapace measuring was discussed, reported (pers. comm.) along the following lines:

"Carapace Length Measurement for  
Spiny Lobsters

The arguments for the adoption of a carapace length legal measure are well enough known not to require repeating. However, the question of the most suitable anterior reference point does require resolution.

The present opinion seems to be that carapace measuring should commence at the "front" of the medial rostral spine which was the legal anterior reference point for overall length before the change to tails only was made in late 1969. It is also used for Jasus and related genera in other countries.

It is thought, however, that the antennal platform, i.e., that part of the carapace between the antennae would be a more suitable anterior reference point. This is currently used by most scientific workers in New Zealand, Australia, and South Africa.

The rostral spine suffers several disadvantages as a reference point:

- (a) It differs markedly in shape and size between the sexes, being more or less straight in the female and larger and curved in the male.
- (b) It varies in shape and size between animals of the same sex.
- (c) It is vulnerable to damage and is not infrequently broken.
- (d) It could be broken off by fishermen to make prosecution difficult."

"The antennal platform suffers none of these disadvantages. A suitable gauge for checking carapace length is shown in Fig. 8. The long spike is pushed down between the antennae and pulled back to locate it on the antennal platform. It is suggested that gauges of this sort, made of thin sheet metal or plastic, be distributed free by Marine Department to fishermen. It is felt that this gauge would be simpler to produce and easier to use than one locating on the rostral spine.

Data collected by the Research Division (principally from the Chatham Islands) and from other sources suggest  $3\frac{3}{4}$ " (from the antennal platform to the posterior medial terminal of the carapace) as being the most suitable size limit."

TABLE 7 Carapace/Total Length

Author	Year	7" Length			10" Length			Method
		Male	Female	Male & Female	Male	Female	Male & Female	
Sorensen	1953	-	-	-	3.776	3.606	-	Rostral Spine
Sorensen	1953	-	-	2.60	-	-	3.70	" "
Bain	1966- 67	-	-	-	-	-	3.75	" "
Street	1968	2.63	2.60	-	3.81	3.70	-	" "
Street	1969	-	-	-	3.80	3.70	-	" "
Norris	1964	2.59	2.56	-	3.87	3.71	-	Antennal Platform
Coombs	1970	-	-	-	-	-	3.75	" "
Ritchie	1970	2.59	2.58	2.58	3.76	3.63	3.70	Rostral Spine
Ritchie	1970	2.65	2.60	2.63	3.78	3.61	3.73	" "

This table summates the findings of the various authors quoted in the text of this report on the carapace/total length relationship in respect of rock lobsters of 7 inch and 10 inch overall length. It does not reveal any great difference between measurements of the carapaces of males and females of the critical size lengths, nor does it reveal any major difference between those measured by the "rostral spine" or "antennal platform" methods. Nevertheless, to put the matter beyond all doubt, a big series of measurements by both methods should be taken before any carapace length is determined by regulation.

#### ACKNOWLEDGEMENTS

Thanks are expressed to those who provided information for this account, both oral and written, and in particular to the Director of Fisheries Research Division, G. Duncan Waugh and Mr R.F. Coombs of his staff; Mr R. Street, Fisheries Scientist located at Dunedin; and Mr P.T. Norris formerly attached to Fisheries Research Division.

I am particularly grateful to Mr L.D. Ritchie, Fisheries Scientist attached to Head Office, Marine Department, Wellington, who worked on a large number of measurements taken by me circa 1953. Mr Ritchie prepared Tables 2-5, figures 4-7, and the narrative pertaining to them, from this data.

REFERENCES1. REGULATIONS

"The Fisheries (General) Regulations" and Amendments 1-13, 1950:  
N.Z. Mar. Dept. (Govt. Printer), Wellington.

"The Rock Lobster Regulations 1969" N.Z. Mar. Dept. (Govt.  
Printer), Wellington.

2. PAPERS AND REPORTS

Bain J. (Jnr) 1967: "Total Length/Carapace Length in Crayfish";  
Fish. Tech. Rpt. No. 23, Wellington. 18 pp.

Coombs R.F. 1970: Report (pers. comm.) "Carapace Length  
Measurement for Spiny Lobsters", Wellington.

Norris P.T. 1964: Unpublished report to Marine Department  
Director of Research "Consideration of the Effects of Changing  
the Legal Length Limit of Crayfish", Wellington.

Report of Fishing Industry Committee 1962: I. 19, Govt.  
Printer, Wellington.

Sorensen, J.H. 1953: Unpublished reports to Marine Department  
on rock lobster measurements.

Street, R.J. 1968: Unpublished report to Marine Department on  
rock lobsters.

Street, R.J. 1969: "The New Zealand Crayfish Jasus edwardsii  
(Hutton)", Fish. Tech. Rpt. No. 30, Wellington. 53 pp.

Fig. 1 Diagram A

METHOD OF MEASURING TOTAL LENGTH

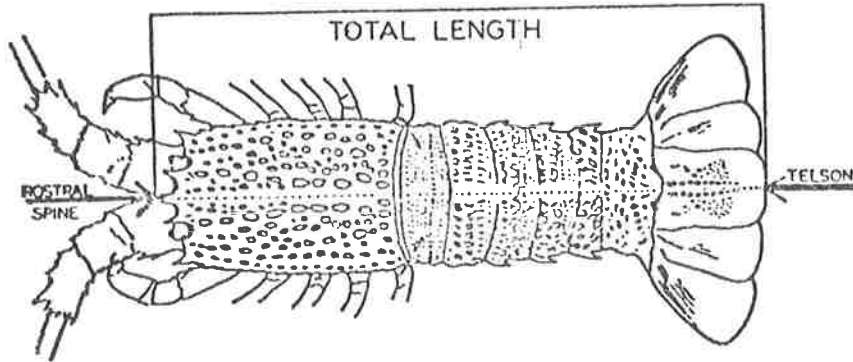


Diagram B

METHOD OF MEASURING TAIL LENGTH

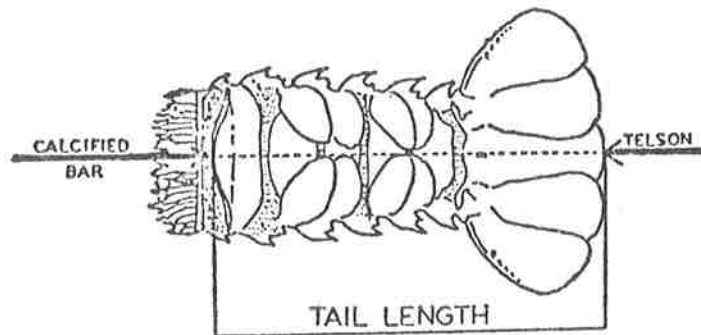
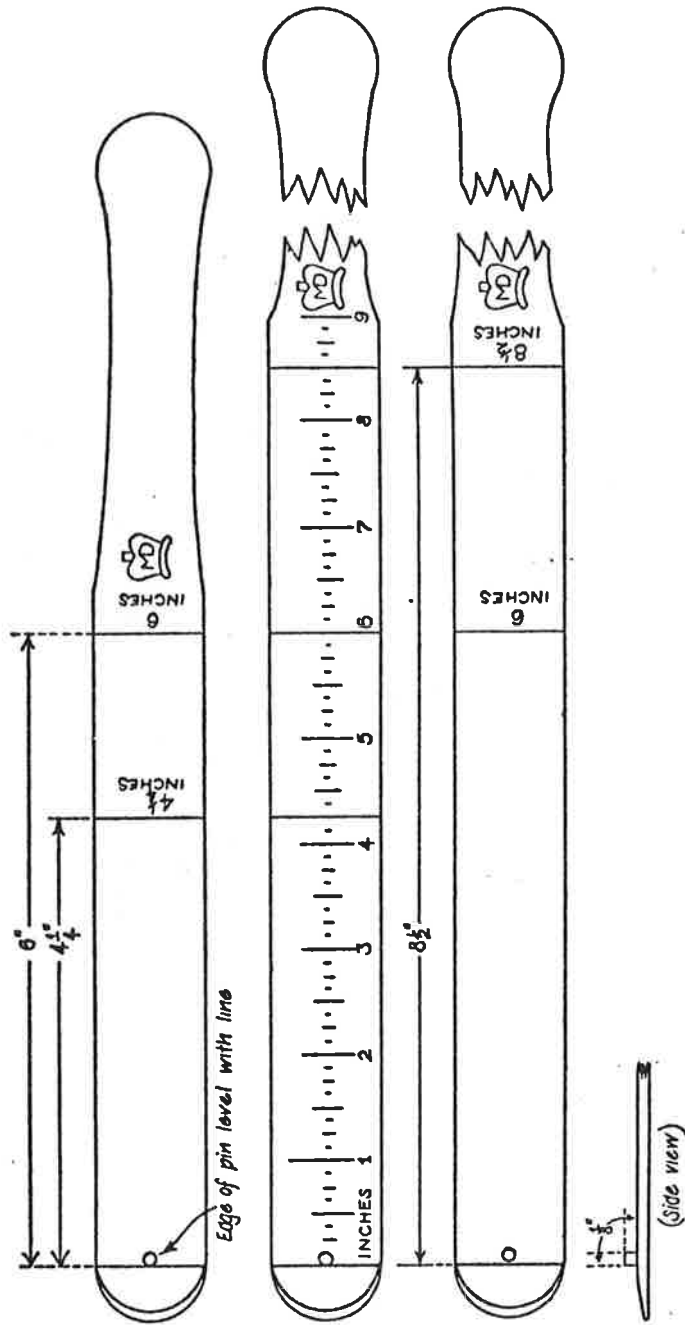


Fig. 2 ROCK LOBSTER TAIL MEASURING STICKS



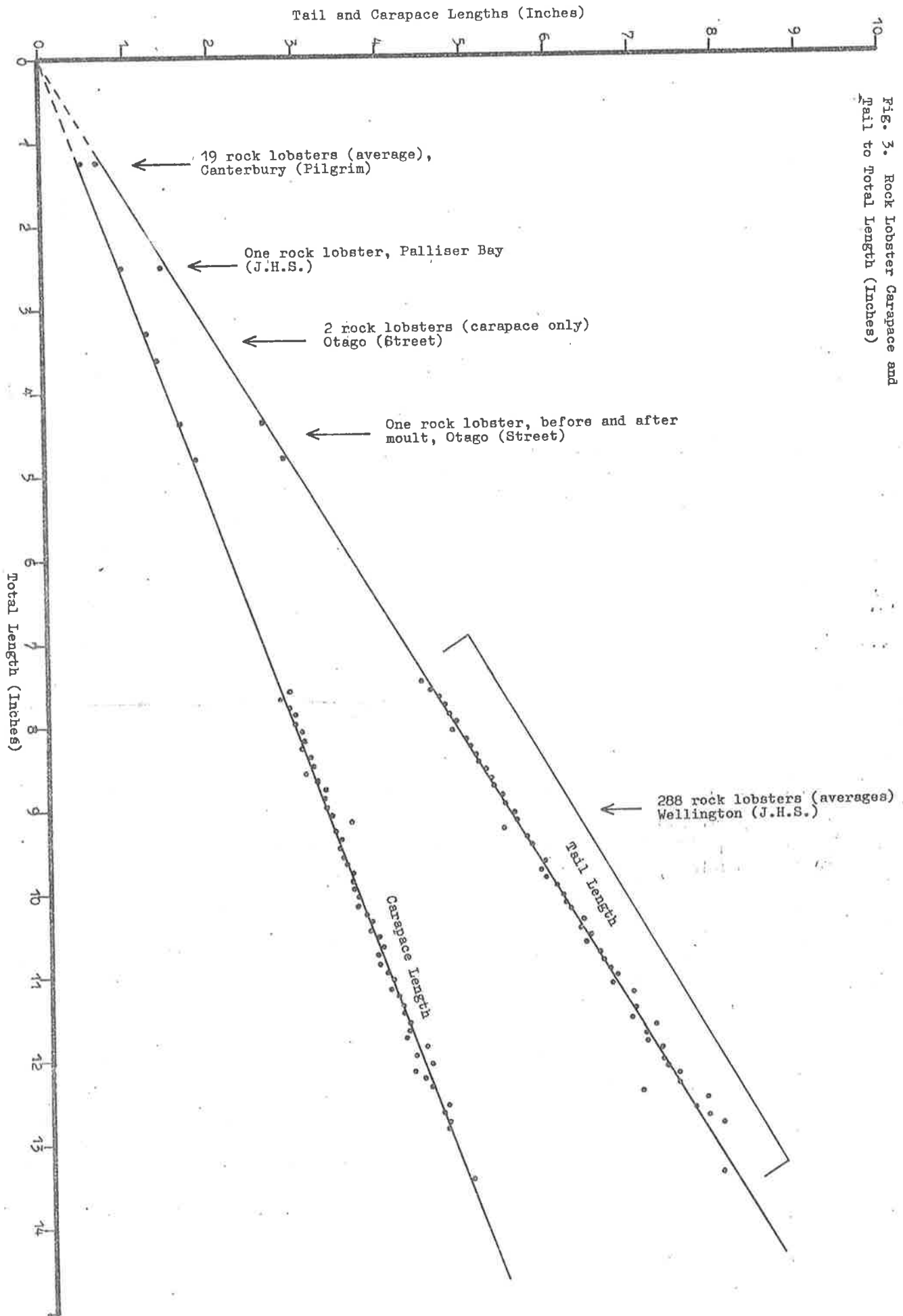


Fig. 3. Rock Lobster Carapace and Tail to Total Length (Inches)



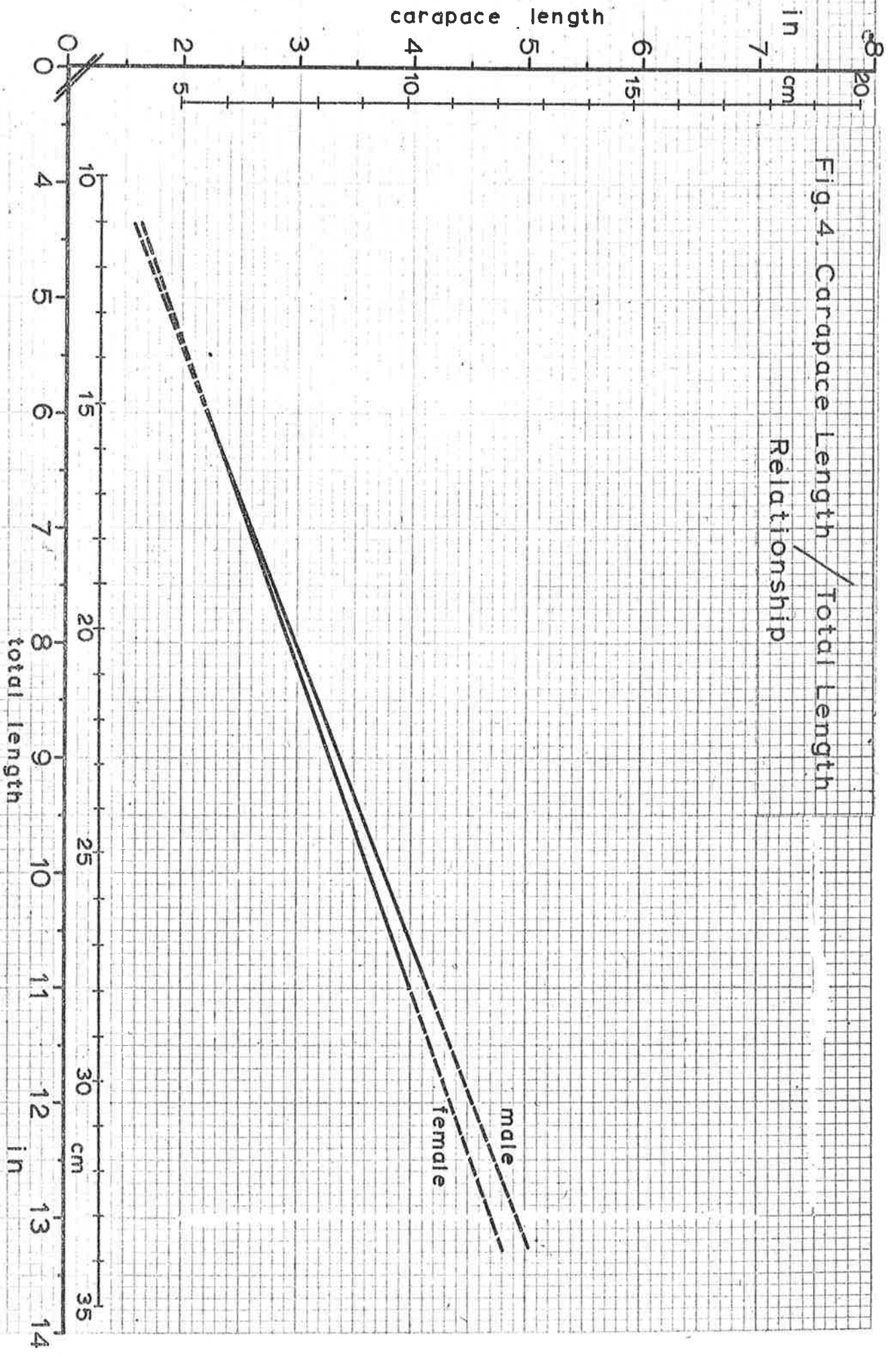
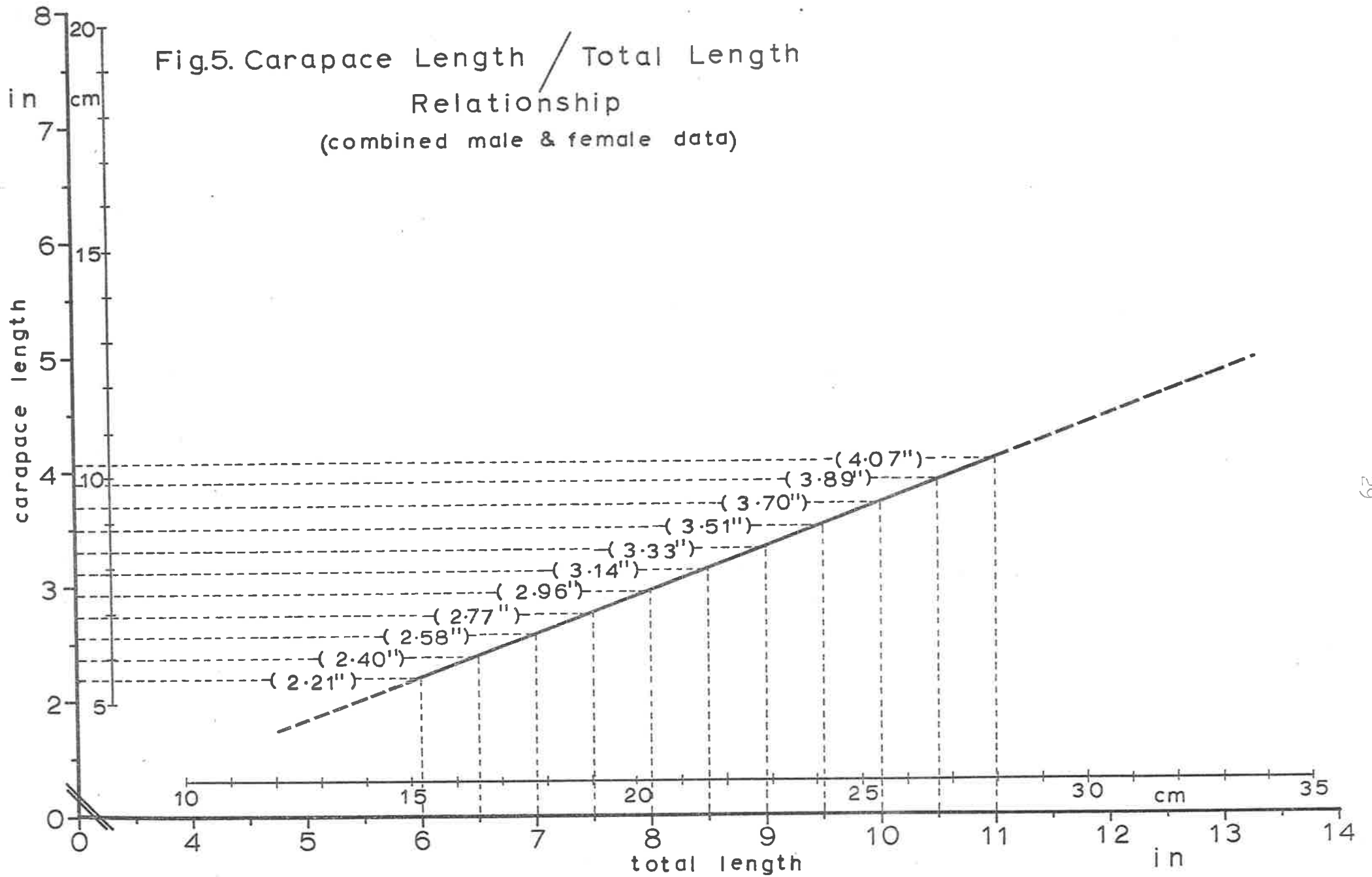
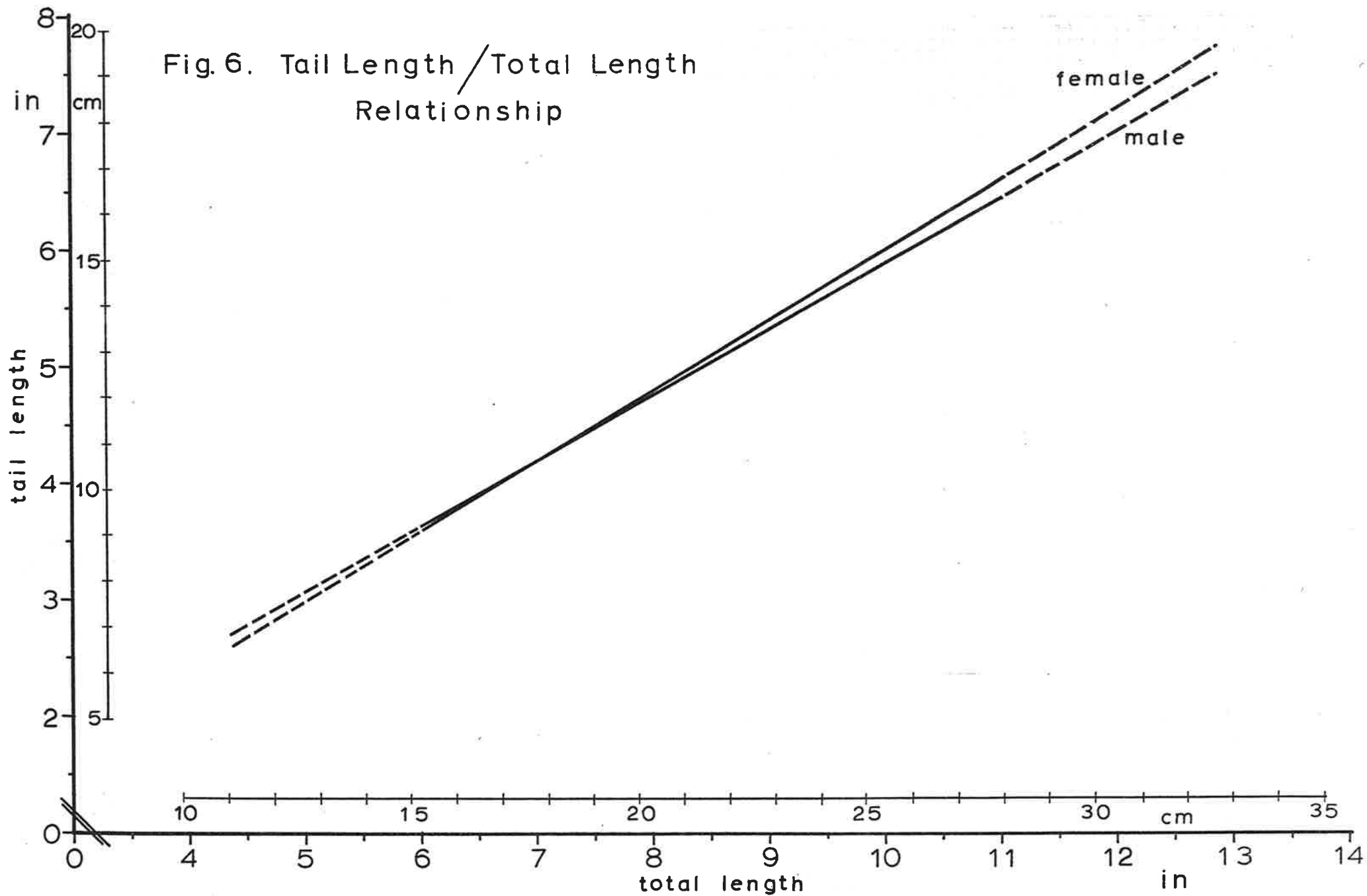
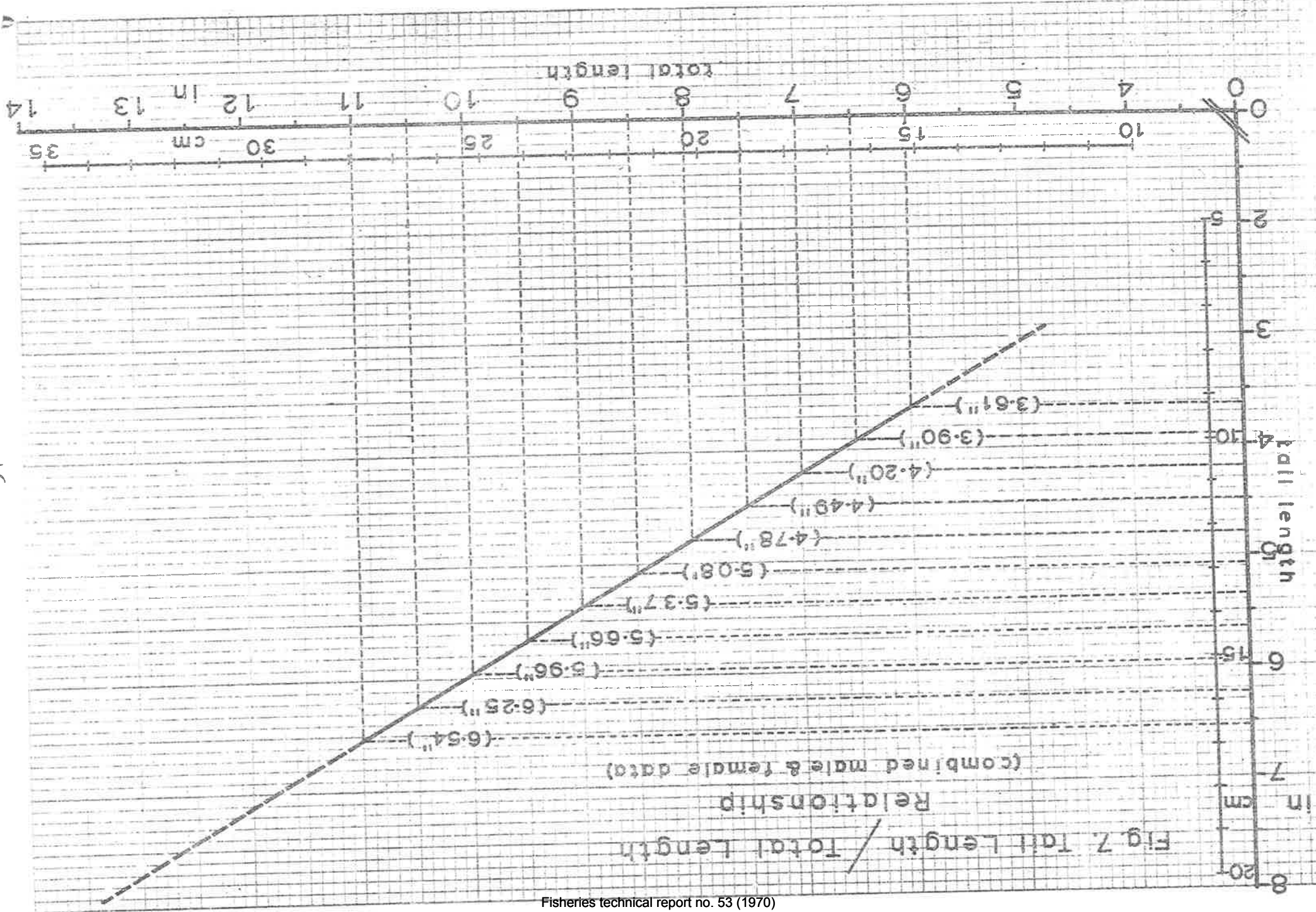


Fig. 4. Carapace Length / Total Length Relationship







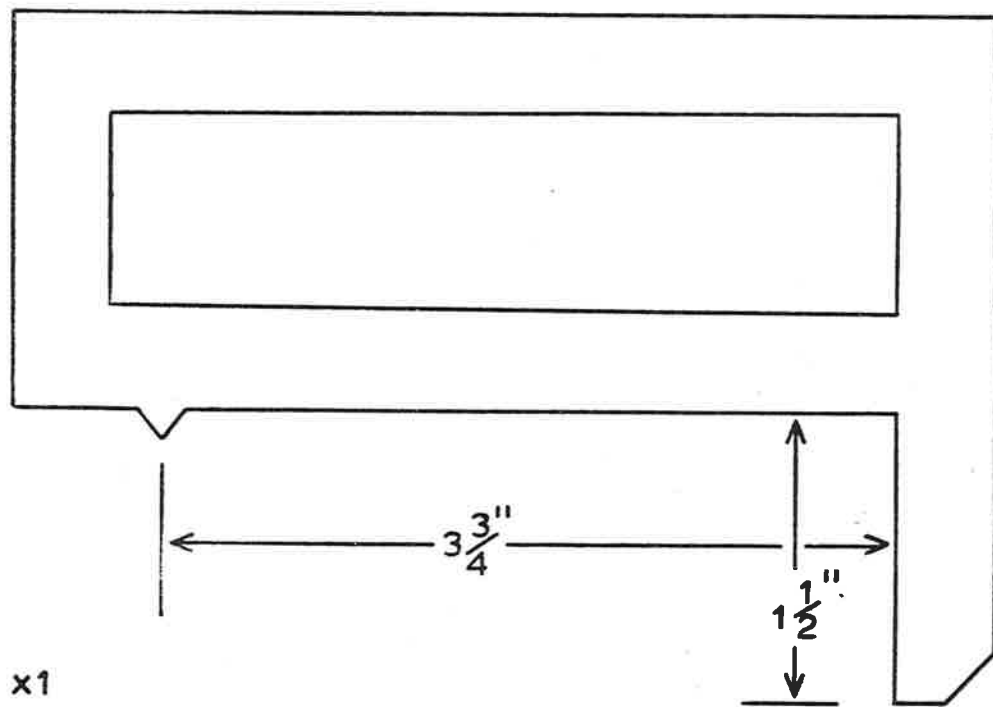


Fig. 8 Fisherman's Gauge for measuring Rock Lobster Carapace Lengths. (measured from antennal platform)  
Suggested construction. 1/16" sheet metal or plastic.  
(after R.F. Coombs)

*E. Z. Webb*



**NEW ZEALAND MARINE DEPARTMENT**

**FISHERIES TECHNICAL REPORT**

**No. 53**

---

**NEW ZEALAND ROCK LOBSTER  
JASUS EDWARDSII  
CARAPACE AND TAIL MEASUREMENTS**

**J. H. SORENSEN**

---

**WELLINGTON, NEW ZEALAND**

**1970**