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Carapace and total length measurement of Palinurus vulgaris

by

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It is generally accepted that the most satisfactory method of measuring crustacean shellfish is to measure the length or width of some rigid part of the body, thus avoiding errors due to stretching, flexing, compressing or otherwise distorting some non-rigid structure.

A method of measurement which has been widely used on decapods is to measure the length of the carapace from the posterior margin of the eye socket to the posterior end of the carapace. Amongst the many workers who have used this method of measurement are Thomas (1954) for Nephrops; Cole and Mistakidis (1953), Mistakidis (1957, 1958) and Cole (1958) for Pandulus and Palaemon; Simpson (1961), Thomas (1958), Pope (1955) and Wilder (1953) for Homarus. In many cases factors have been calculated relating carapace length to total length (Mistakidis 1957, Cole 1958, Thomas 1954, Pope 1955 and Simpson 1961).

It would therefore seem desirable that a similar method should be used for the measurement of the crawfish or spiny lobster Palinurus, and at the 1962 meeting of the International Council for the Exploration of the Sea, Messrs. R. Letaconnoux (France), B. T. Hepper (England and Wales) and Dr. F. A. Gibson (Ireland) were requested to consider the question and suggest a standard method of measuring Palinurus and to report back to the Shellfish Committee of the International Council; Mr. Letaconnoux and Dr. Gibson have indicated that they are in agreement with the methods of measurement described below.

In Palinurus the eye-socket is shallow and does not have a well-defined posterior margin, and it is not easy to measure from this point with accuracy. Most workers have recognised this fact, and Gibson and O'Riordan (1962) measured carapace length "from the interorbital spine to the posterior margin of the carapace"; de Vasconcellos (1960) measured the carapace "from the rostrum to the posterior border". Vincent-Cuaz (1958) measured "from the anterior border (between the antennules) to the middle of the posterior cavity" in Palinurus mauritanicus.

Workers on Panulirus argus have used similar measurements. Travis (1954) measured carapace length "from the mid-dorsal anterior point between the two rostral spines to the most posterior mid-dorsal point of the carapace". Smith (1958) states that in the Bahamas, for legal purposes, the carapace length is taken "from the front of the cape between the eyes to the hinder edge", and Creaser (1952) took measurements of the carapace "from the anterior margin

between the rostral spines to the posterior border". Other workers have also used the carapace measurement for Panulirus sp. (e.g. Sutcliffe 1953, Harada 1957).

Clearly, since there are difficulties in measuring from the eye-socket to the back of the carapace, this measure is not satisfactory for measuring the carapace length of Palinurus. But as it is practicable to measure from the rostrum to the back of the carapace, and since this method has been widely used in published work, it would seem satisfactory that this measure be adopted as the standard measurement of carapace length in the crawfish, Palinurus.

Since the rostrum in Palinurus (unlike that in many other crustaceans) is protected on either side by the supra-orbital spines, the risk of broken rostra is small, and furthermore, as the rostrum is very short, breakage would make only a relatively very small difference to the carapace length. Measurement of carapace length from the rostrum requires only very slight modification to the normal caliper, namely the addition of a small cheek on either side of the fixed anvil of the caliper (see Fig. 1) to form a groove which is quickly fitted over the rostrum, the moving arm of the caliper then being adjusted to touch the posterior edge of the carapace and the reading taken.

Calipers as described have been made at this laboratory and have proved very easy and quick to use under field conditions.

A number of workers have also recorded total length in Palinurus, but their methods appear to be less uniform than in the measurement of carapace lengths. Gibson and O'Riordan (1962) record total length "from the tips of the uncut supra-orbital spines to the end of the telson". De Vasconcellos (1960) measured total length "from the rostrum to the end of the telson". Vincent-Cuaz (1958) measured total length "from the anterior part of the carapace between the two antennules to the posterior extremity of the telson".

Smith (1958) states that in the Bahamas, for legal purposes, Panulirus argus is measured "by holding the head against a nail projecting from a measuring board between the whips (antennae?), with the tail fans flat against the board". Dawson and Idyll (1951) use a similar method of measurement.

It would appear from examination of Palinurus vulgaris that any attempt to measure total length from the front of the carapace by placing the head of the animal against a peg on a measuring board could result in difficulties due to the peg fouling other parts, such as the bases of the antennae, and thus could lead to inaccuracies. Any attempt to measure total length by calipers presents problems as to how to flatten the abdomen.

The method used by Gibson and O'Riordan (1962), however, has much to commend it. The apparatus required is a measuring board (Fig. 2) fitted with a stop in the zero position, the stop being of metal, or metal-faced wood, about 3 inches (75 mm) or more wide and $\frac{1}{2}$ inch (12.5 mm) high.

It is then very easy to place the crawfish on its back on the board with the supra-orbital spines against the stop and it can be clearly seen that the spines are resting squarely against the stop. The crawfish is then flattened onto the board, allowed to relax, and the measurement to the end of the telson

noted. A measuring board of this type has been made at this laboratory, and has proved very convenient to use under field conditions.

Fig. 3 is a diagram of the dorsal view of a crawfish, indicating the measurements which it is suggested should be taken.

Field Observations

In June and July 1963, 153 female and 85 male crawfish were measured at Newlyn, Cornwall, by the methods described above. The crawfish had been out of the sea for about three hours at the time of measuring, but as all were alive and active, it is very probable that the measurement of total length is similar to that which would have been obtained had the fish been measured immediately on capture.

From the results which have been plotted in Figs. 4 and 5 it would appear that there is a linear relationship between the two measurements, and when the regression of total length on carapace length was calculated by the method of least squares the following relationships were obtained:-

Females $T = 2.4C + 71.5$

Males $T = 2.125C + 85.5$

where T = total length in mm, and C = carapace length in mm.

The carapace lengths of the female crawfish ranged from 102 mm to 154 mm, the majority falling between 112 and 142 mm, and the carapace lengths of the males ranged from 91 mm to 182 mm, with the majority falling between 145 mm and 170 mm.

Discussion

The results obtained from this preliminary survey agree reasonably closely with those obtained by Gibson and O'Riordan (1962), at carapace lengths of about 130 mm in the case of females and about 150 mm for males, but since the slopes of the regression lines found by Gibson and O'Riordan are slightly steeper than those found in the present work the agreement is less good at sizes above or below these points.

Since Gibson and O'Riordan used a similar method of measurement to that here described the difference is unlikely to arise from experimental error. De Vasconcellos (1960), working with Palinurus vulgaris caught off the coast of Portugal, observed that the ratio Total length:Carapace length tended to decrease with increasing length, and since the present data were obtained from crawfish of larger average size than those measured by Gibson and O'Riordan, this is probably the cause of the different slopes of the regression lines. Hence it would appear that over wide size ranges it is not accurate to attempt to calculate total length from carapace length, using a linear equation on the information at present available, although in the present work and that of Gibson and O'Riordan the size ranges are not great and in such cases the use of the method is unlikely to lead to serious errors. Since de Vasconcellos measured the total length from the rostrum, not the supra-orbital spines, his work is not strictly comparable with the present study.

SUMMARY

It is recommended that measurements of the crawfish, Palinurus vulgaris, be standardised as follows:-

1. That the carapace length be measured from the tip of the rostrum (interorbital spine) to the posterior edge of the carapace in the mid-dorsal line.

2. That the total length be measured from a line joining the tips of the supra-orbital spines to the posterior end of the telson when the animal is in a relaxed state and spread as far as possible flat on the dorsal surface.

3. Suitable calipers and measuring boards for taking these measurements have been constructed at the Fisheries Experiment Station, Conway, and have proved satisfactory in use, and are described.

4. Preliminary observations on the carapace length-total length relationship of 153 female and 85 male Palinurus vulgaris from Cornwall are recorded; regression lines for this relationship are calculated as

$$T = 2.4C + 71.5 \text{ for females}$$

and

$$T = 2.125C + 85.5 \text{ for males}$$

5. It is suggested that whilst total length can be calculated from carapace length using a linear relationship over small size ranges without serious error, such a practice cannot be recommended over large size ranges.

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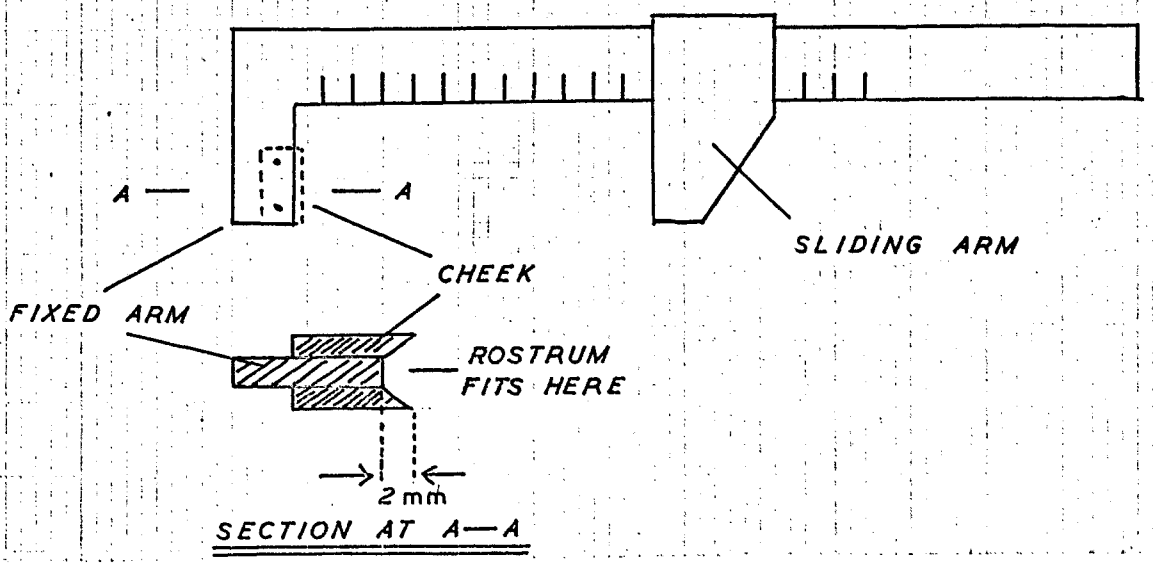

Fig. 1. Calipers modified for measuring carapace length of Palinurus

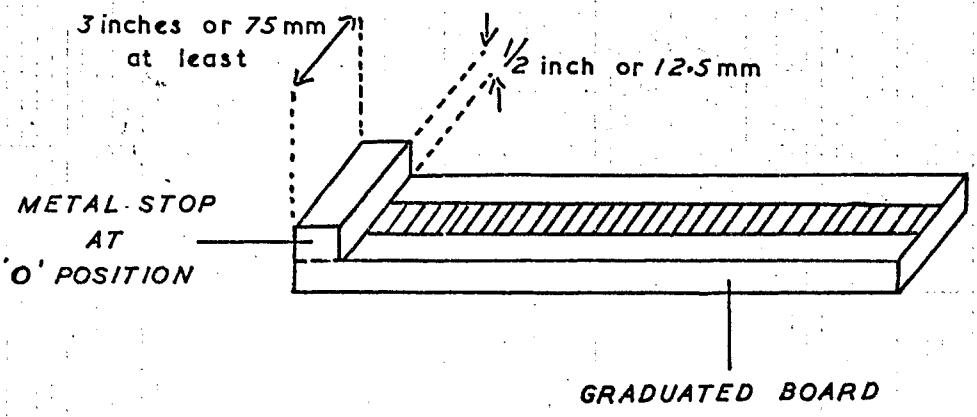

Fig. 2. Measuring board for measuring total length of Palinurus.

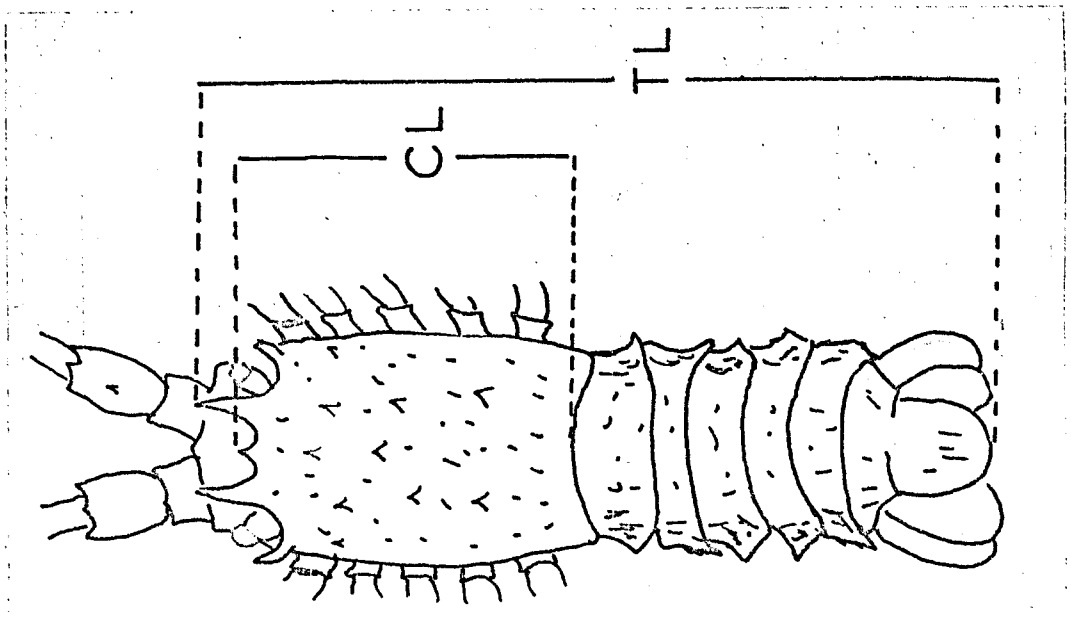

Fig. 3. Diagram of dorsal view of Palinurus, showing suggested measurements. CL = Carapace length TL = Total length.

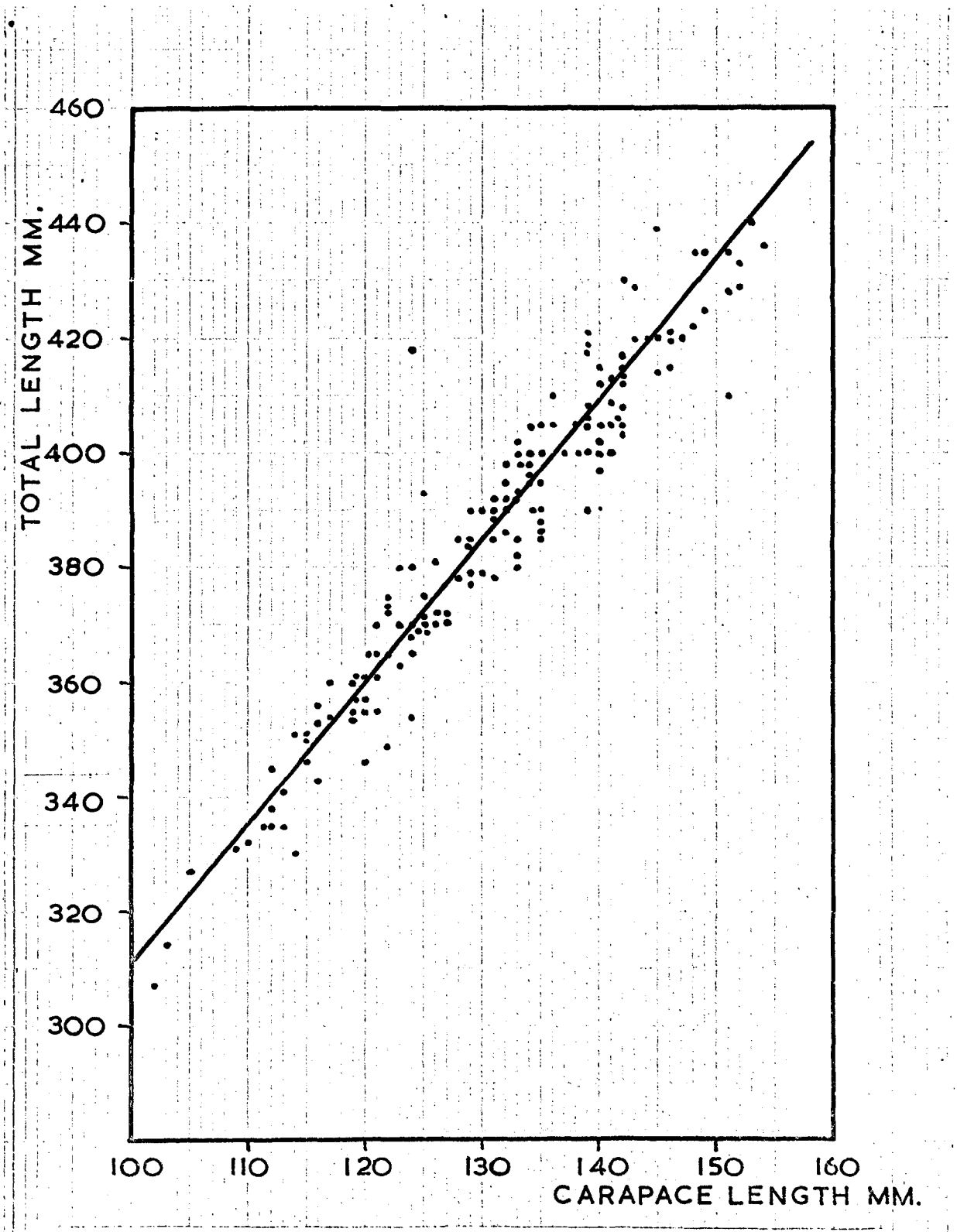

Fig. 4. Carapace length-total length relationship for female Palinurus measured in Cornwall, June-July, 1963.

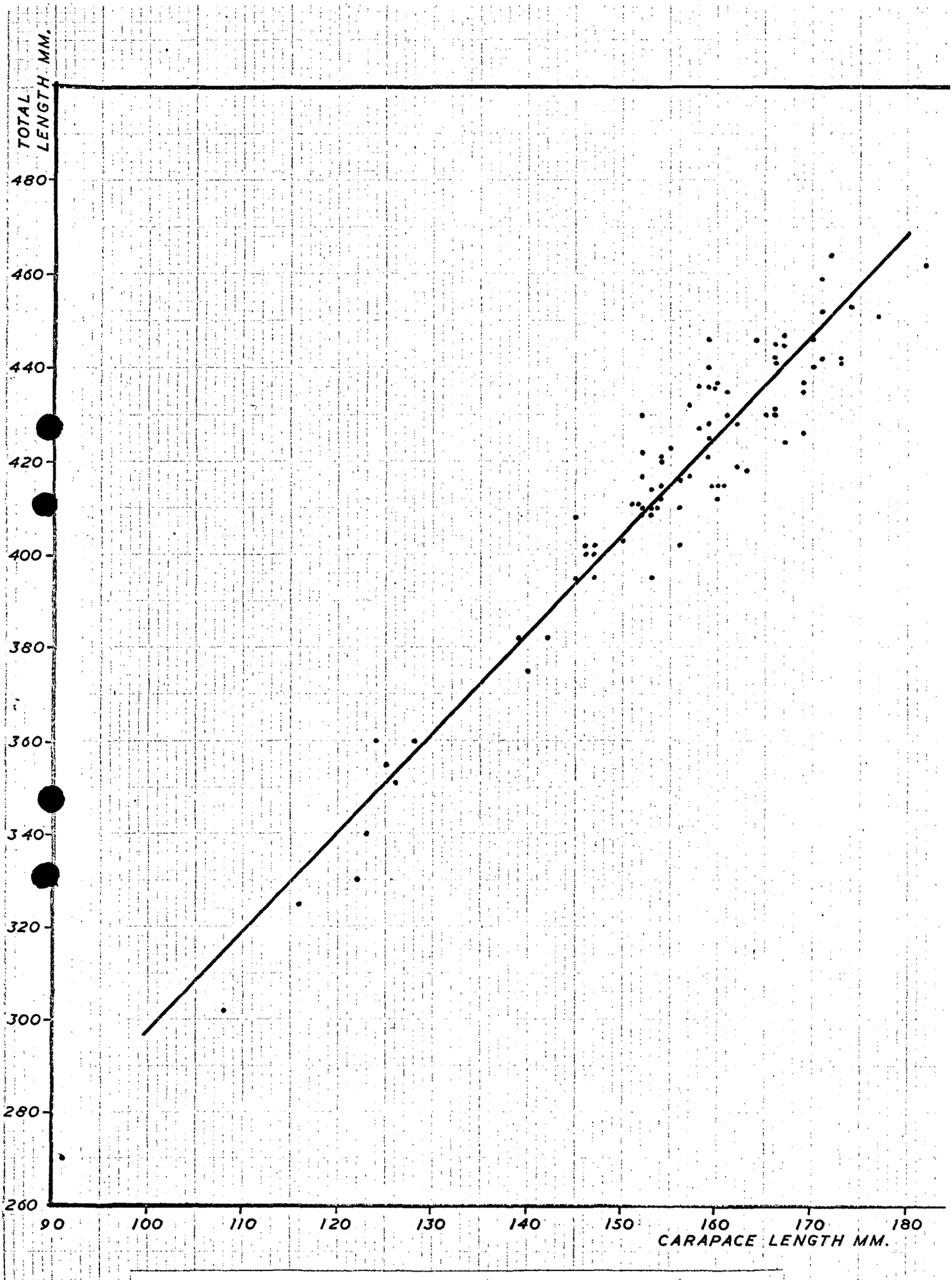

Fig. 5. Carapace length-total length relationship for male Palinurus measured in Cornwall, June-July, 1963.