

# Seasonal Variation in the Distribution and Availability of Carangids ('Paraw' & 'Parati') in the Wadge Bank

By

N. L. R. MUNASINGHE\*

## INTRODUCTION

The Wadge Bank has been exploited regularly by Ceylon based trawlers since 1955 (Sivalingam & Medcof 1957). The bank is about 4,000 sq. miles in extent (Malpas 1926) and is located south of Cape Comorin within the Continental Shelf of India (Fig. 1).

Carangids are taken in large numbers during the months of the South West Monsoon (Sivalingam 1966). The quantity in which the Carangids are captured as shown by the fishing records is large enough to influence the total catch from the bank during these months (Fig. 2). Carangids are held in high esteem as excellent quality food fishes and accordingly constitute a commercially important group. This paper records the results of a detailed examination of the past fishing records in respect of this group, based on the analysis of the catch and fishing effort for the years 1957 to 1962. The distribution pattern of this group of fish in the Wadge Bank is discussed.

## TRAWLER FISHING RECORDS AND CARANGID CATCHES

Records of the fishing operations, including details of the catch, have been maintained by skippers of trawlers owned by the Ceylon Government and the data in these records provide a wealth of information on trawler operations. They include (a) the time the net was shot or paid out, (b) duration of tow of the net, (c) the position and depth at which fishing operations are carried out, and (d) group composition of the catch.

Each trawler is provided with a chart of the Wadge Bank in the form of a grid (Fig. 1) with  $2\frac{1}{2}$  minute squares coded vertically with letters and horizontally with numbers (Sivalingam & Medcof 1957). The position fished is indicated in the fishing return using the grid. The depth at which each fishing operation is carried out is also recorded.

The duration of each tow of the trawl net is recorded in hours. This is the fishing effort. With this data the catch per unit effort relative to any period of time or area of the fishing ground may be determined. The duration of tow in the past had generally varied between 2 and 4 hours while the speed of tow had been more or less constant.

The trawler "Braconglen" had been operated almost exclusively by one skipper between 1957 and 1962, and her fishing records have been maintained in a consistently detailed and accurate manner. This paper deals only with the analysis of "Braconglen's" fishing records between 1957 and 1962, excluding 1961 in which year she underwent extensive repairs and undertook only two fishing voyages.

The fishing records classify the catch into easily recognizable groups, each group consisting of one or more species of fish. The fish coming up on deck, after each towing of the net is sorted and categorized for recording. Fish of approximately more than one foot in length (designated

\* Trawler Research Section, Ceylon Fisheries Corporation, P.O. Box 258, Colombo, Ceylon.



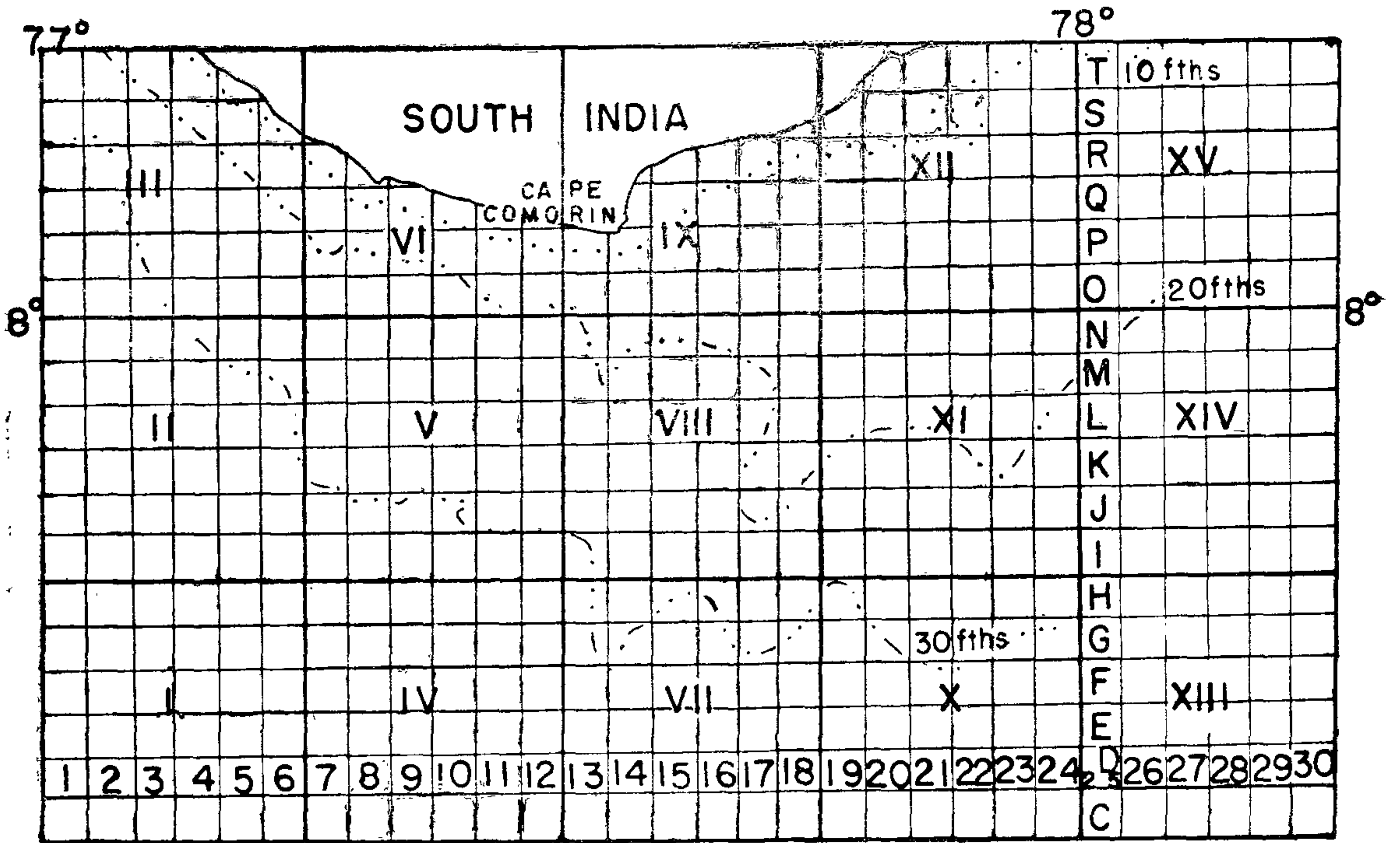


Fig. 1.—Area of Wadge Bank Showing Depth Contours, Grid and 15 Minute Squares Numbered I to XV

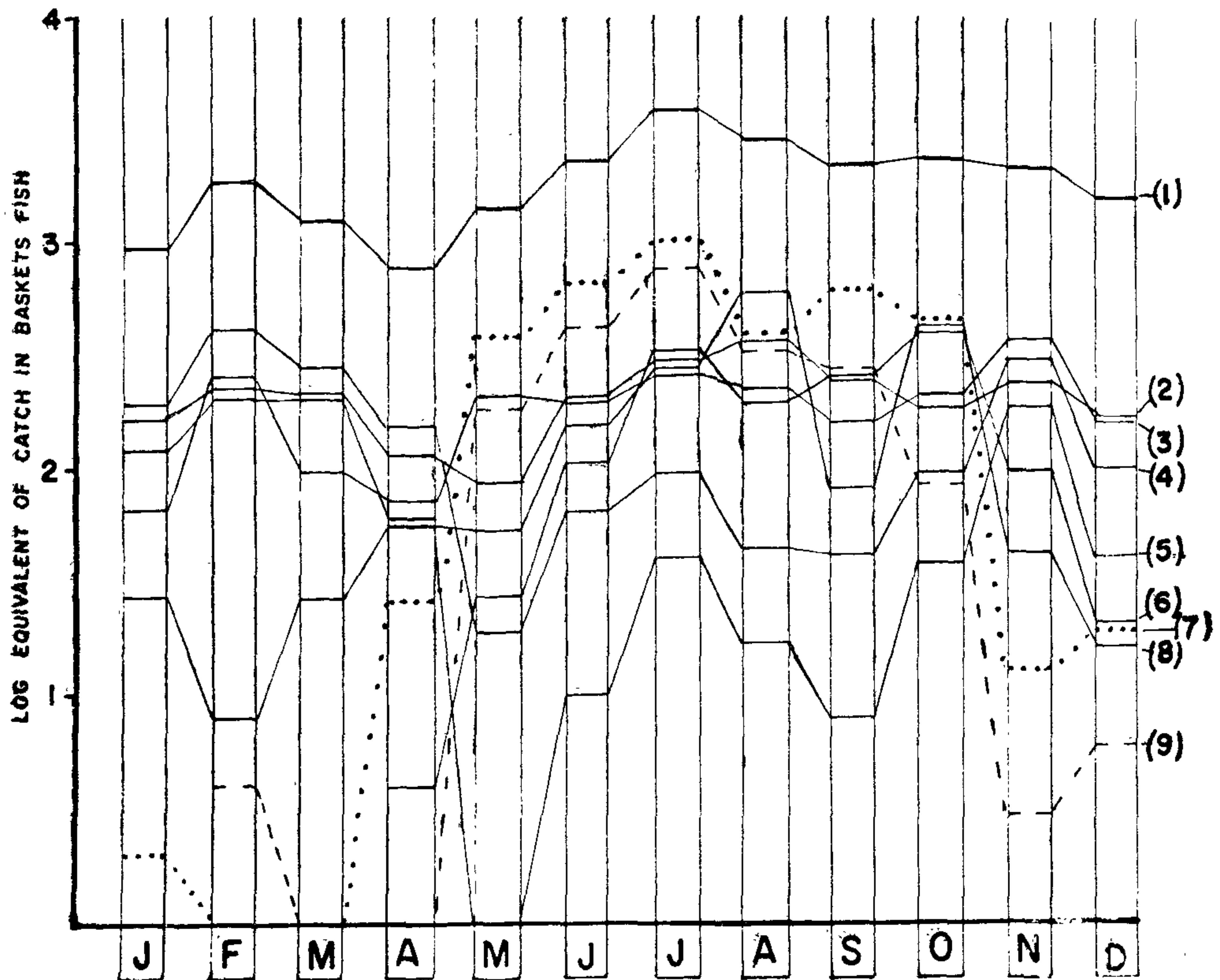


Fig. 2.—Barline Chart Showing "Braconglan's" Monthly Catch composition in 1958.  
 (1) Total (2) Lethrinids (3) Trygonids (4) Epinephelids (5) Lutianids  
 (6) Tachysurids (7) Carangids (Small) (8) Carcharinids (9) Carangids (Large)



big fish) in the trawler records are categorized independently of the smaller varieties (small fish). About 25 species, including a few species of Carangids, are obtained in large quantities (Sivalingam and Medcof 1957).

The Carangids are classified into two groups, the "Paraw" and the "Parati". The former group is representative of Carangids which are over 1 foot in length and the latter are the smaller Carangids.

The species of Carangids recorded from the Wadge Bank are listed by Fernando (1968). The commoner species of Carangids present in the trawler catches from the Wadge Bank are listed below :

#### Large Carangids—"Paraw"

1. *Carangoides chrysophrys* (Cuvier)
2. *Caranx carangus* (Bloch)
3. *Gnathanodon speciosus* (Forsk.)

#### Small Carangids—"Parati"

1. *Carangoides malabaricus* (Bloch)
2. *Carangoides chrysophrys* (Cuvier)
3. *Caranx carangus* (Bloch)
4. *Gnathanodon speciosus* (Forsk.)

### DENSITY AND DISTRIBUTION OF CARANGIDS

Trawler skippers fish in areas where the fish appear to be abundant. Since Carangids are considered good quality food fishes the tendency is to concentrate fishing in areas where they are likely to be abundant.

The catch rate is considered an accurate index to the density of fish available for capture within the area of operation of the trawl net.

For the purpose of analysis of the data, the area of the Wadge Bank has been divided on the chart into 15 squares, numbered I to XV (Fig. 1). Each 15 minute square encloses 36 smaller 2½ minute grid squares. The 10, 20 and 30 fathom contours are also shown on the charts for easy correlation of distribution with depth.

The average monthly catch per unit effort (catch rate), the average monthly percentage of Carangids in the total catch, and the monthly fishing effort for the period under review are given in Table I separately in respect of large and small Carangids.

#### Large Carangids

Large Carangids are not present in the catches in January. The densities of this group in areas where they are present during February, March and April are very low (Table I). With the commencement of the south west monsoon in May (Table II) the density of large Carangids is significant and distributed evenly in squares VIII and XI (Figs. 3). With the increase in activity of the monsoon through June, July and August progressive increases in densities and spread in distribution over a wider area is observed. The areas of greater densities are near the Indian coast within the 10-20 fathom depth zone and the spread is both south-east and south-west of the Cape of Comorin (Fig 3 to 8). With the decline in monsoon activity in September and October (Table II) there is a significant decrease in densities and area of distribution. The areas of higher densities however, continue, to be near the Indian coast within the 10-20 fathom depth zone, but the spread in October is eastward of Cape Comorin to include squares XIV and XV (Fig.8 ). The densities in November and December are very low in comparison (Table I).

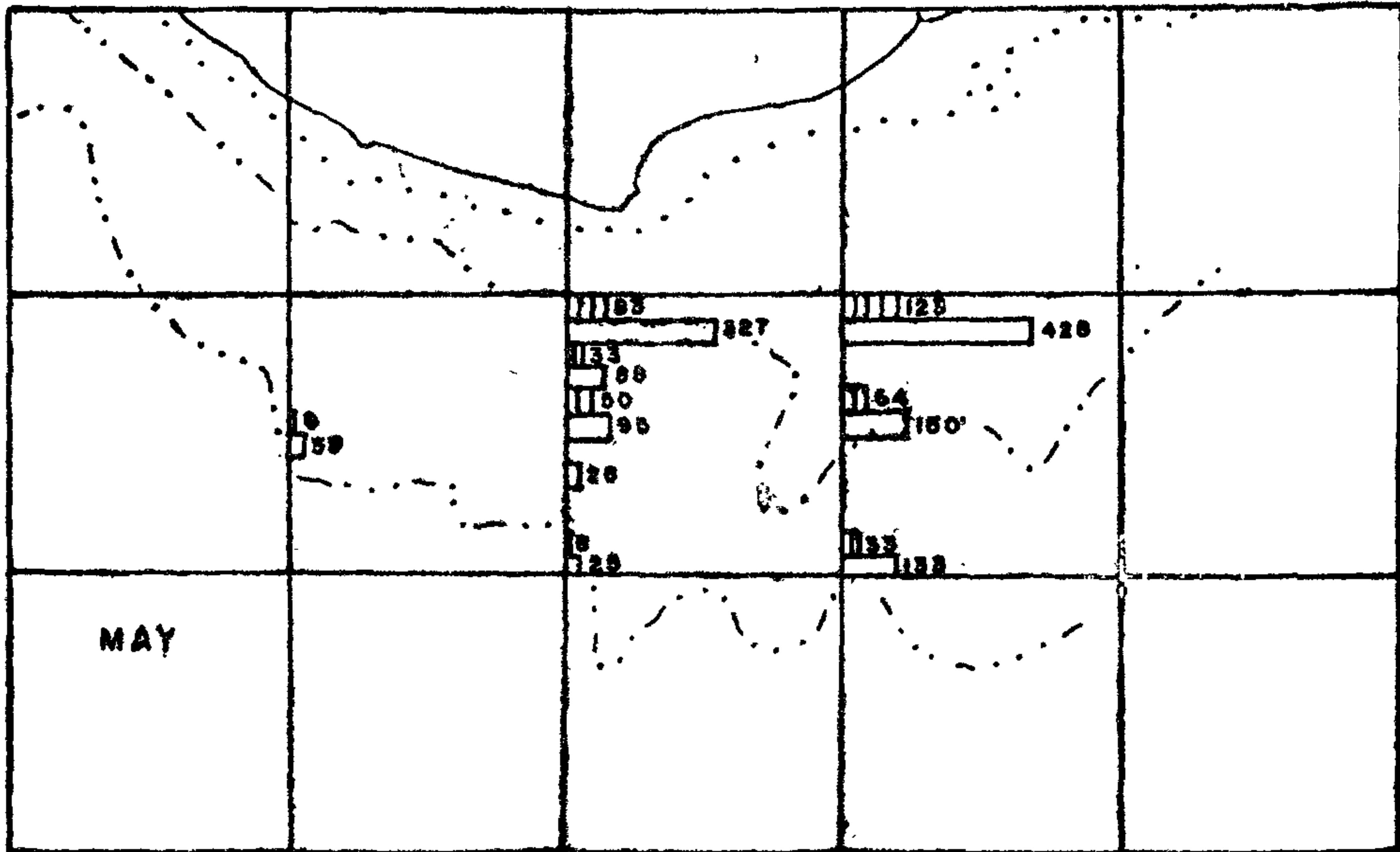


Fig. 3.— Distribution of Carangide in the Bank in May\*

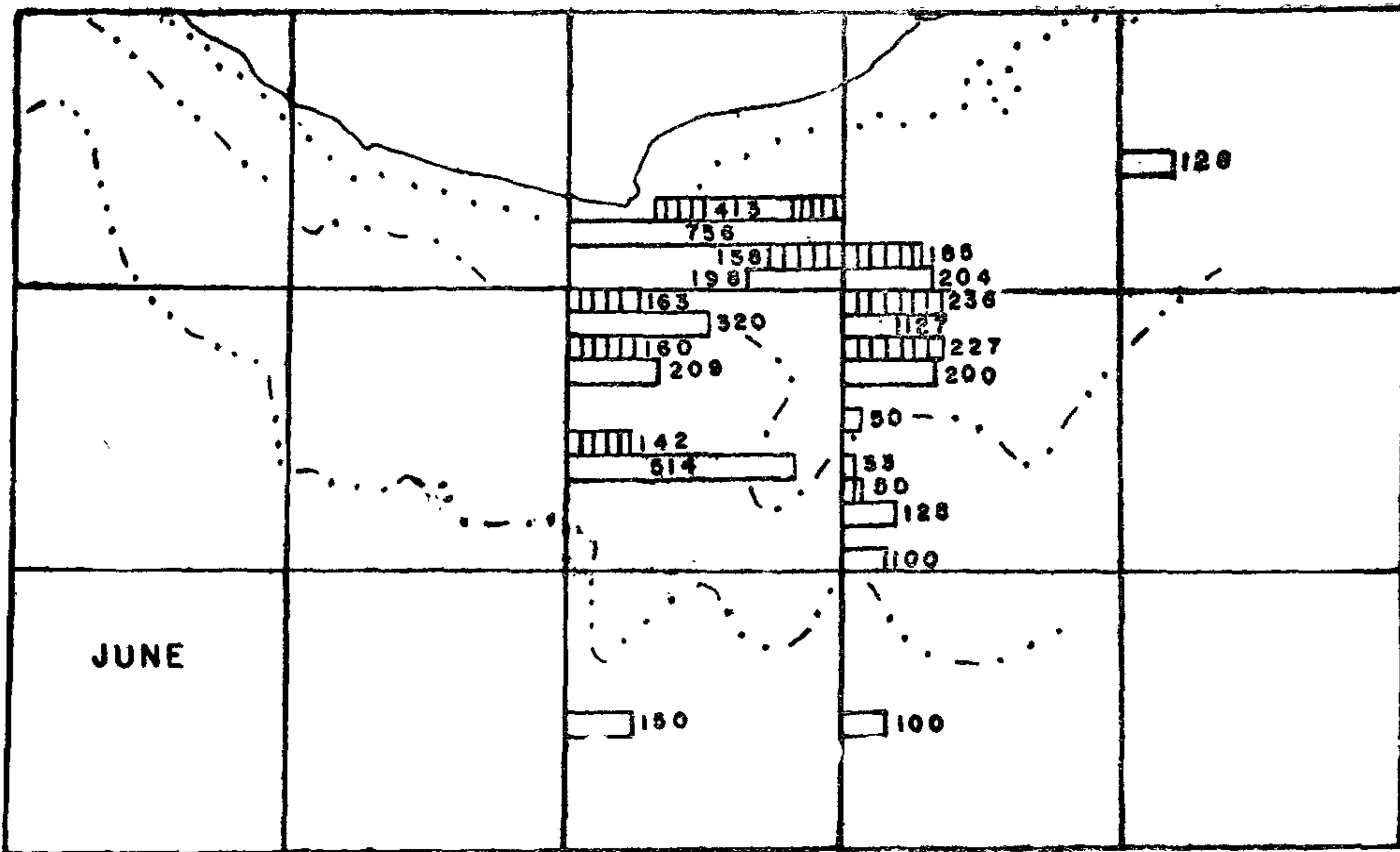


Fig. 4.—Distribution of Carangids in the Bank in June\*

\* Blocked out areas in each square indicate the spatial concentration of carangids. The barred rectangular blocks indicate the large carangids and the unbarred blocks the small carangids. The numbers in or next to each block indicates the average catch per hour in pounds.



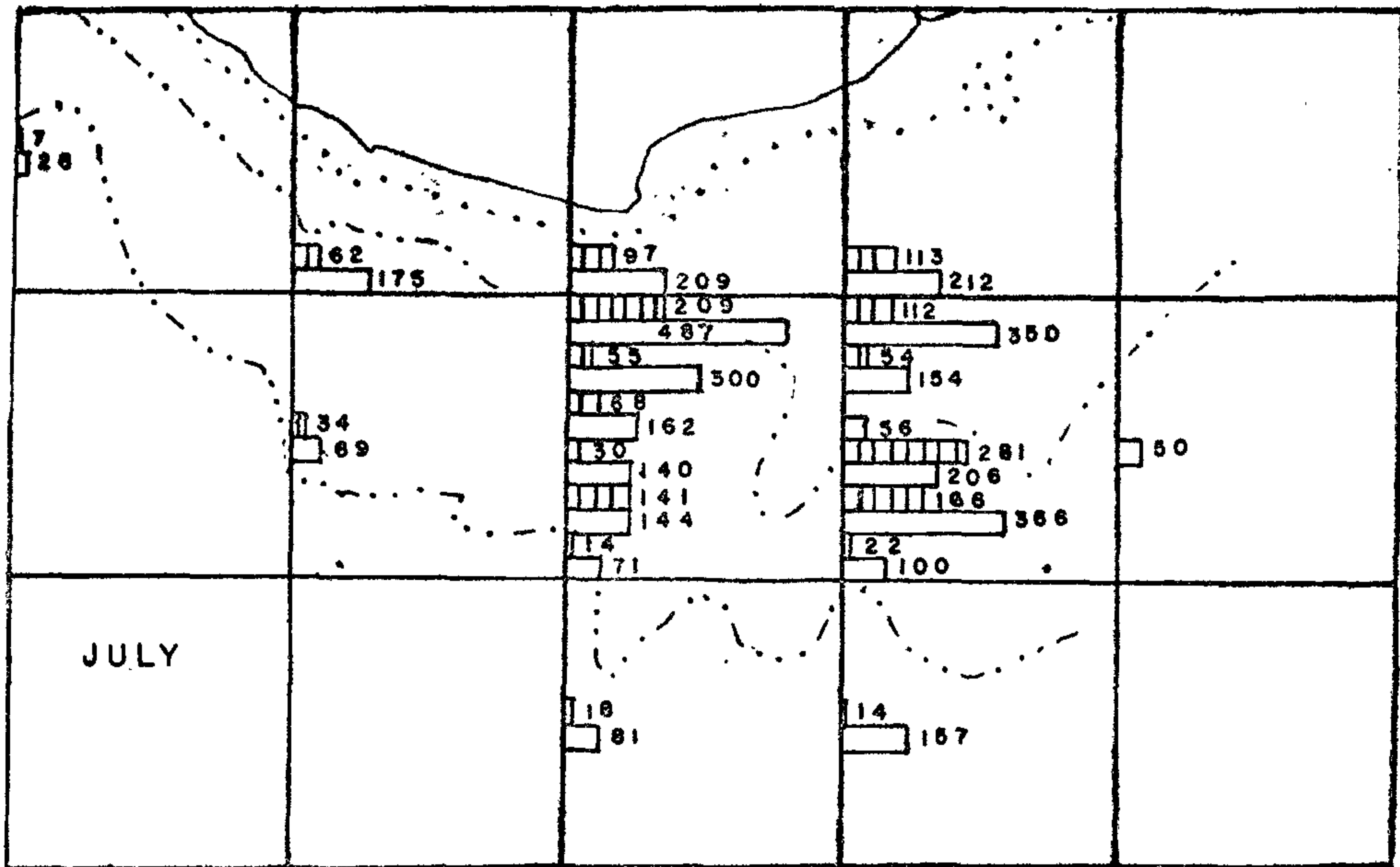


Fig. 5.— Distribution of Carrangids in the Bank in July\*

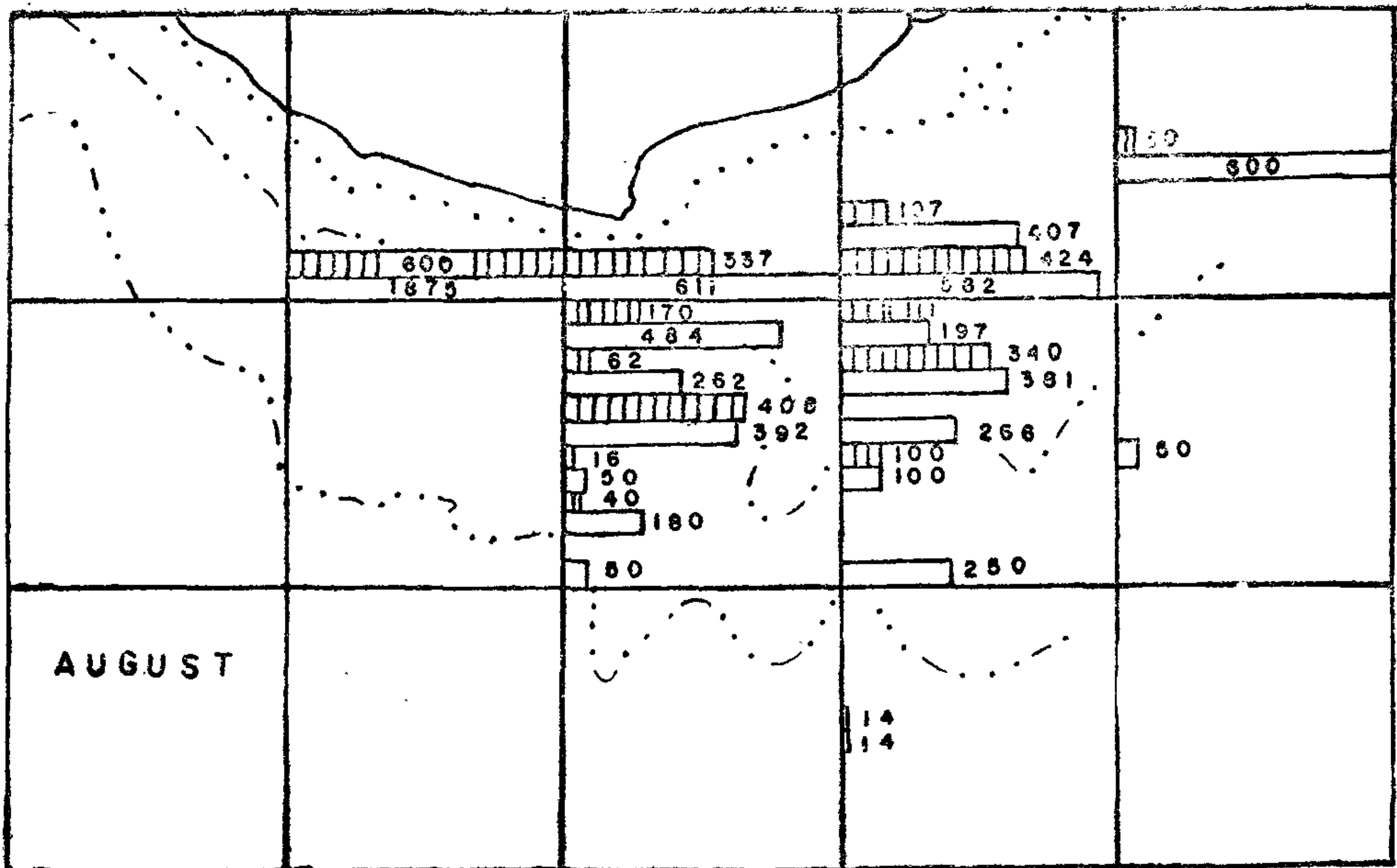


Fig. 6.— Distribution of Carangids in the Bank in August\*

\* Blocked out areas in each square indicate the spatial concentration of Carangids. The barred rectangular blocks indicate the large carangids and the unbarred blocks the small carangids. The numbers in or next to each block indicates the average catch per hour in pounds.

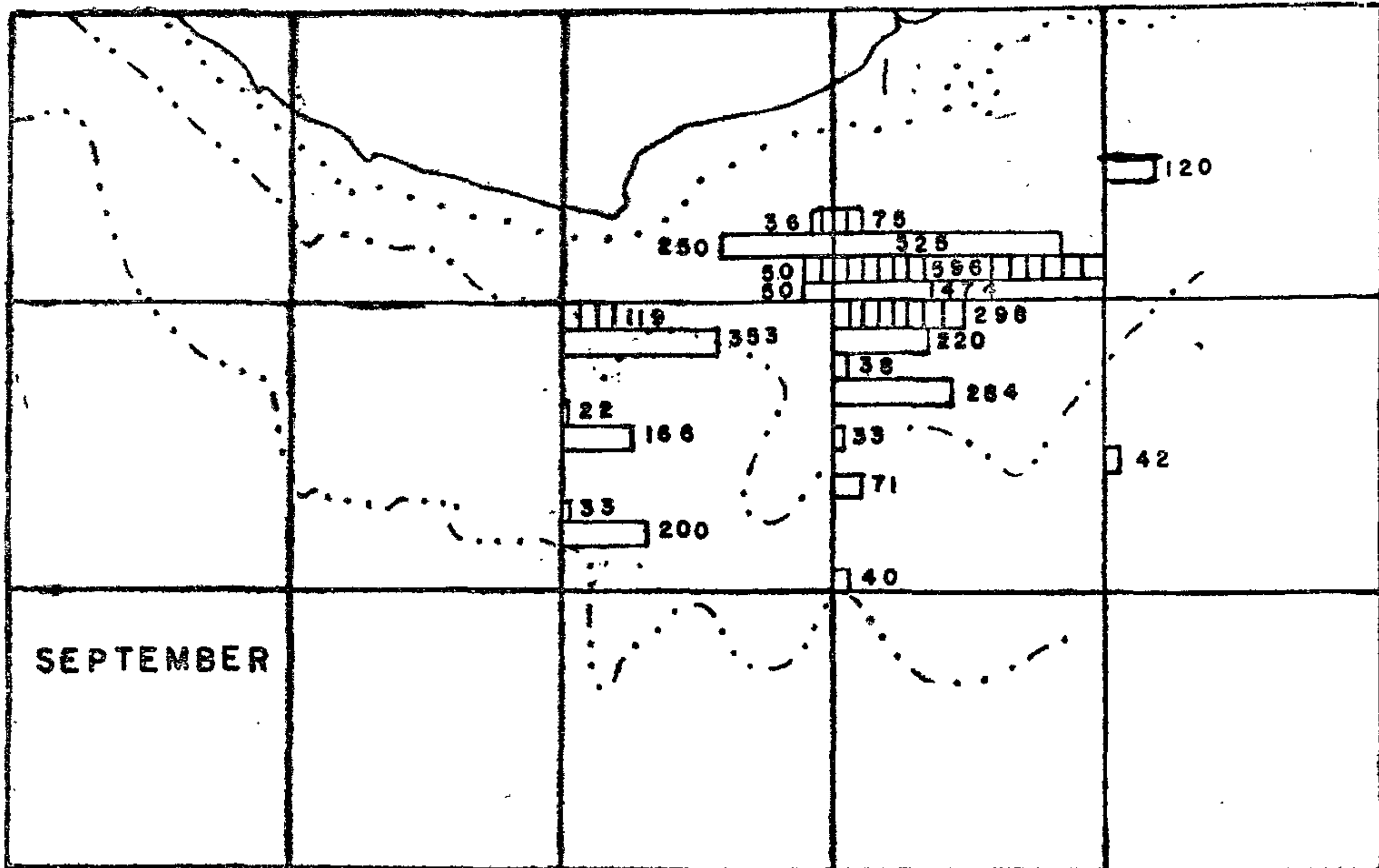


Fig. 7.— Distribution of Carangids in the Bank in September \*

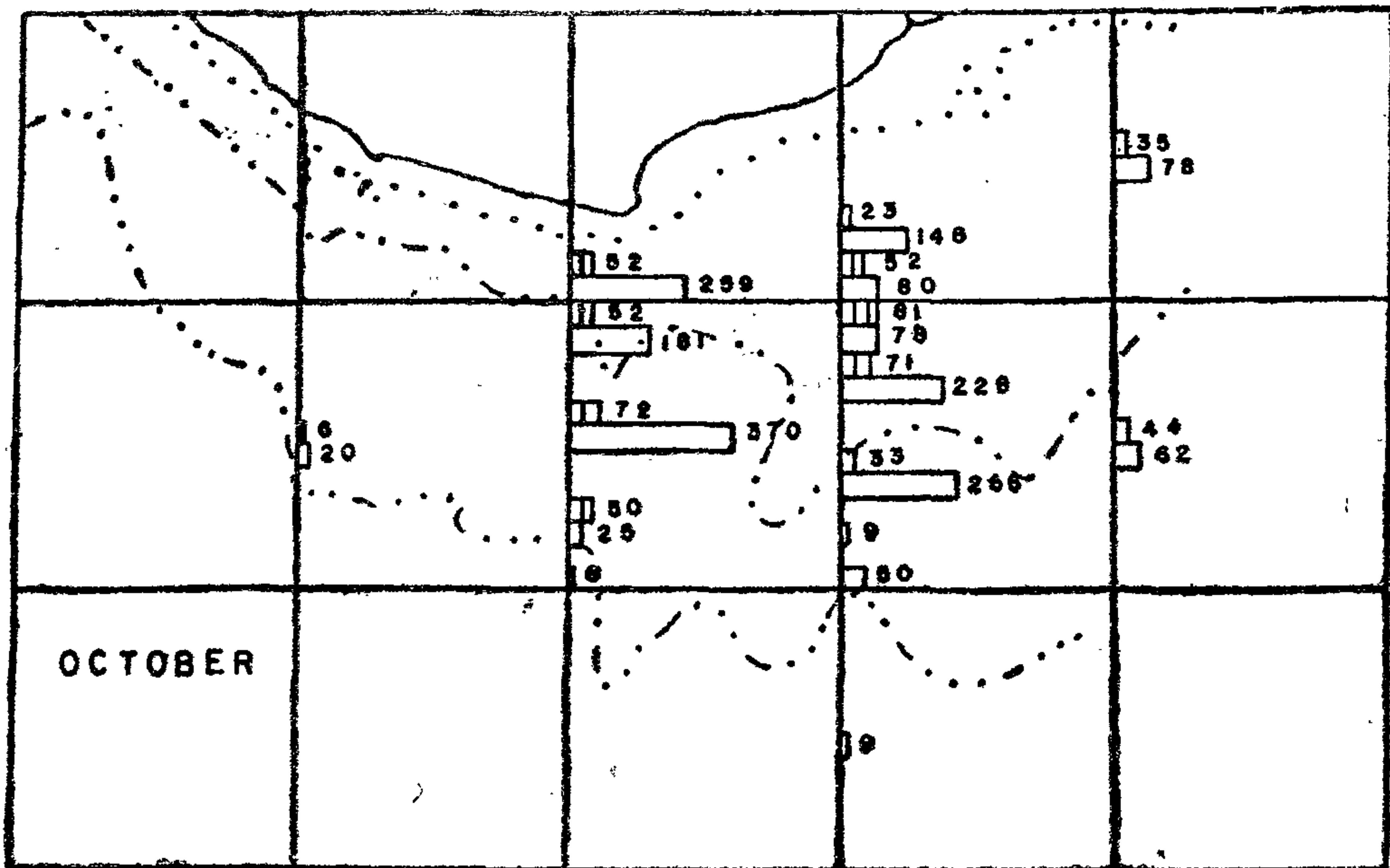


Fig. 8.— Distribution of Carangids in the Bank in October\*

\* Blocked out areas in each square indicate the spatial concentration of carangids. The barred rectangular blocks indicate the large Carangids and the unbarred blocks the small Carangids. The numbers in or next to each block indicates the average catch per hour in pounds.









### Small Carangids

The densities are low and the distribution of small Carangids insignificant in the months of January to April. From May to October they are present in greater densities and the distribution more widespread than large Carangids, but the pattern of its distribution is similar to that of the latter (Fig. 3 to 8.) In November and December the densities are low in comparison to those of the preceding months (Table I).

### DISCUSSION

The results obtained show an abundance of Carangids in the fishing grounds from May to October (Table I and Fig 3 to 8). Sivalingam and Medcof's (1957) observation that trawler catches during these months are considerably higher than in other months, partly due to the presence of these fishes is confirmed in Fig. 2. The extent to which trawler catches in these same months are influenced by Carangids is revealed by the percentage composition of the catches. According to Mendis (1968) Carangids account for 9% to 63% of trawler "Braconglen's" catches.

TABLE II

Extracts from a summary of the Monthly Weather Report of the Director of Meteorology

Year 1957	May	—	South West monsoon conditions became evident from about 18th.
	June	—	Active monsoon weather prevailed.
	July	—	Monsoon weather prevailed.
	August	—	Monsoon weather continued.
	September	—	Weather exceptionally dry.
	October	—	Widespread drought during first part of October.
1958	May	—	South West monsoon condition set in about 9th causing unsettled weather.
	June	—	Active monsoon weather.
	July	—	Ordinary monsoon weather.
	August	—	Normal monsoon conditions prevailed.
	September	—	Very little monsoon rain experienced.
	October	—	Unsettled conditions caused by depression in Bay of Bengal.
1959	May	—	South west monsoon conditions set in on 17th May.
	June	—	Active monsoon weather.
	July	—	—
	August	—	Normal monsoon weather.
	September	—	Normal monsoon weather.
	October	—	Weak south west monsoon conditions persisted.
1960			Not available.
1962	May	—	South west monsoon set in about 12th.
	June	—	South west monsoon was established.
	July	—	Dry South west monsoon weather.
	August	—	Active south west monsoon weather.
	September	—	Active monsoon weather.
	October	—	South west monsoon conditions receded.

The periodicity in abundance coincides with the months in which the south west monsoon is generally active, i.e. from May to October (Table II). Meteorological factors are the primary causes for changes in the hydrographical conditions in the ocean (Hela and Laevastu 1961). The south west monsoon is such a factor. Banse (1957), Ramamithran and Jeyaraman (1960), have observed changes in temperature, salinity and oxygen content of the water in an area west of Cochin in South India, during the onset of the south west monsoon. Similar changes may be assumed as taking place in the Wadge Bank and these changes influence the availability of Carangids in the Wadge Bank Trawl Fishery.



Carangids are active pelagic fishes which are found at all levels between the surface and the bottom of the sea. Only those Carangids, within the operational range of a bottom trawl, will be available for capture by it. Carangids are known to be present in the fishing grounds in all months of the year (Table I). However, their presence at the bottom, in progressively increasing densities distributed over an ever widening area during the period of monsoonal activity, is attributable to a migration possibly from the upper layers towards the sea bottom in progressively increasing numbers. At first, bottom conditions favourable to these fishes are limited to squares VIII and XI, but subsequently, equally favourable conditions tend to arise in squares VI, IX & XII as well. The decline in monsoon activity sets in motion the reverse process of less favourable bottom conditions that may influence a migration of Carangids away from the bottom. A noticeable feature of their migration is that the increase at the commencement and decrease at the tail end of the monsoon in the availability of Carangids is gradual.

Four squares VIII, IX, XI & XII figure prominently in the density and distribution of Carangids. They are almost directly south of the Cape of Comorin. About 75% of the trawlable part of this area is within the 10–20 fathom depth zone. This area is roughly 3 miles at its narrowest and 16 miles at its broadest points in a north south direction. The gradient of the sea bed, therefore, is more or less flat.

### SUMMARY

The records of the trawler "Braconglen's" fishing operations in the Wadge Bank during the period 1957 to 1962 have been examined. The area of the Wadge Bank was divided into 15 squares of equal area to determine the density and distribution of Carangids in the fishing grounds. The results show that Carangids both the "Paraw" and the "Parati", influence the trawler catches from the Wadge Bank in increasing proportions from May to October. Their periodic availability in the fishing grounds coincides with the active phase of the south west monsoon which commences in May and ends in October. Monsoon activity brings about changes in the hydrographical conditions in the bank indirectly influencing the behaviour of these Carangids. Conditions most favourable to their aggregation appear to exist in areas of the bank directly south of the Cape of Comorin and within the 10–20 fathom depth zone. The behaviour pattern of these fishes appears to be influenced by the distribution of their food supply, however, a behaviour associated with spawning should not be overlooked.

### ACKNOWLEDGMENT

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### REFERENCES

- BANSE, K. (1959) On Upwelling and bottom trawling off the south west coast of India. *J. Mar. Biol. Ass. India*, 1 (1) pp. 33–49.
- HELA, I & LAEVASTU, I (1961) Fisheries Hydrography. Fishing News (Books) Ltd. London
- FERNANDO, E. F. W. (1968) Species composition of Fish Captured by Trawlers in the Wadge Bank. *Proc. 13th sessions IPFC. Section III Symposium on Demersal Fisheries*, (In Press) (IPFC/C68/SYM 36).
- MALPAS, A. H. (1926) The Marine Biological Survey of the Littoral Waters of Ceylon. *Ceylon J. Sci. (C)* 2 : 13–165.
- MENDIS, A. S. (1968) Stern Trawling on the Wadge bank with 235—Ton Trawlers. *Proc. 13th sessions. IPFC section III Symposium on Demersal Fisheries (In Press)*. IPFC/C68/SYM 34).
- SIVALINGAM, S MEDCOF, J. C. 1957—General Features and Productivity of the Wadge Bank Trawler Fishery. *Bull. Fish. Res. Sta. Ceylon* 6 : 1–23.
- SIVALINGAM, S. & 1966—Wadge Bank Trawl Fishery Studies. *Bull. Fish. Res. Sta. Ceylon*. Vol. 19. No. 1 & 2.
- RAMAMITHRAN, C. P. & JEYARAMAN, R. 1960—Hydrographical Features of the Continental Shelf Water off Cochin during the year 1958 and 1959. *J. Mar. Biol. Ass. India* Vol. 2 No. 2