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KUWAIT INSTITUTE FOR SCIENTIFIC RESEARCH

SPAWNING SEASON OF SHRIMP *PENAEUS SEMISULCATUS* IN THE SEA ALONG THE COAST OF KUWAIT

by

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ACKNOWLEDGEMENT

The present authrors express their hearty thanks to Dr. Kiyoshi Uchihashi for his guidance during the study. They also thank Sheikh Nasir and the staff of United Fisheries of Kuwait for enabling them to collect samples on board vessels belonging to the company. They are greatly indebted to the Director of the Kuwait Institute for Scientific Research, and all other staff especially the staff of the Marine Biology and Fishery Division of the Institute for their assistance of various kinds.

INTRODUCTION

Penaeus semisulcatus is the most valuable species for the industrial shrimp fishery in Kuwait, composing the bulk of the large-sized shrimp produced. The total annual production of the industrial shrimp fishery in the area was 429 tons in 1972. In spite of the importance of the species, little has been known about its ecology in the Arabian Gulf. On the spawning season of the species in the Kuwaiti waters, Enomoto(1971) estimated it as the period between January to May based on the data collected at the end of 1969 and in 1970. In this report further discussions will be made on the subject using the data collected, later on.

MATERIALS AND METHODS

The Shrimp were collected by the research boat of the Kuwait Institute for Scientific Research, "Science I" and several commercial vessels. The former was equipped with the net of 22 mm. in stretched-mesh size. The latter's nets were 12 mm. in stretched-mesh size, the same as that used in the ordinary commercial shrimp fisheries.

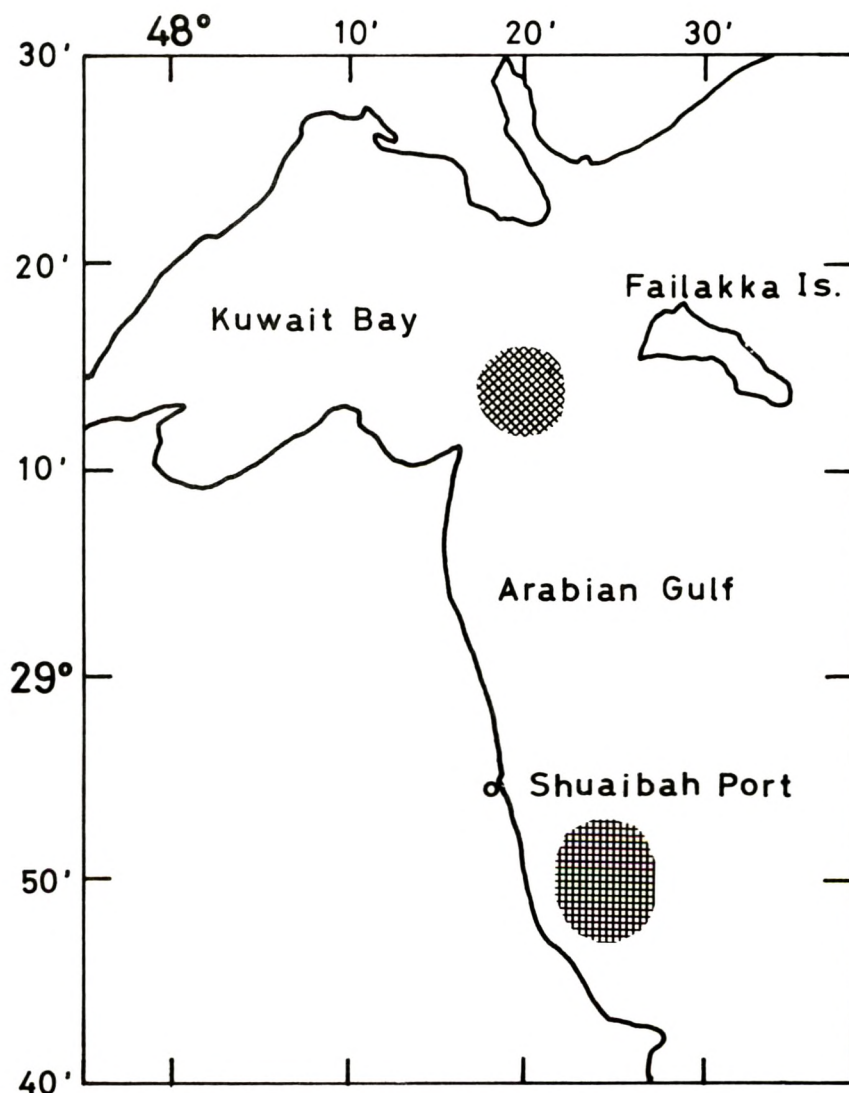


Fig. 1 : The map showing fishing grounds (shaded area) of the shrimp, *Penaeus semisulcatus*.

The main fishing ground in March and April was the area around lat. 29°00' and long. 48°05' south east of Shuaibah port.

During the rest of the year the fishing ground was around lat. 29°23' and long 48°10' at the mouth of Kuwait Bay (Fig. 1). The depth of each of the fishing grounds is about 18 m. and 7 m., respectively.

The size of shrimp was expressed by body length, that is, the distance from the orbital depression of the carapace to the tip of the telson. Total length, that is the distance from the tip of rostrum to the tip of telson, is measured when body length is difficult to be taken for small shrimps.

Judgement of the maturity of the shrimp is made by external observation. A mature ovary of the shrimp is composed of frontal, lateral, dorsal and longitudinal lobes. (Fig. 2).

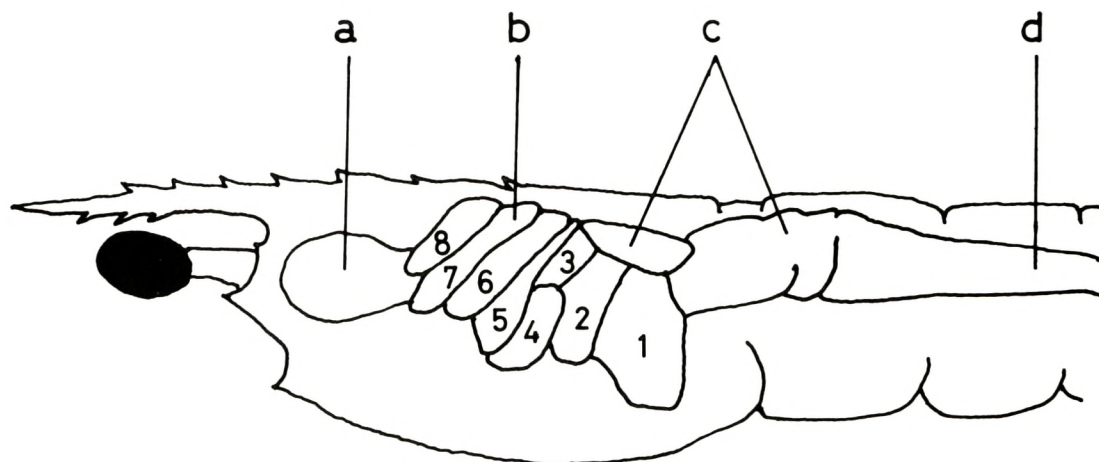


Fig. 2 : Schematic diagram of matured ovary of the shrimp, *Penaeus semisulcatus*.

a : frontal lobe, b : lateral lobe,
c : dorsal lobe, d : longitudinal lobe.

The lateral lobes are numbered from posterior to anterior.

Frontal lobes are observed as greenish spots at the post ocular part of the carapace. The lobes extend to the proximal part of the rostrum when the ovary attains the fully-matured stage.

Lateral lobes which are composed of eight lobes on each side are observed as big greenish spots in gastric region of the carapace. First lobes extend to the post dorsal margin of the branchial region of the carapace. Though the lateral lobes are conspicuous externally, they are not considered as a reliable feature of judging maturity of shrimp.

Dorsal and longitudinal lobes are paired lobes extending dorsally from cardiac region of carapace to the end of sixth abdominal segment. The longitudinal lobes become wider as ovary becomes more mature. At the part of first abdominal segment the ovary swells laterally when it is fully matured.

RESULTS AND DISCUSSIONS

1. Estimation of spawning season from the changes in body length distribution throughout the year.

Fig. 3 shows the body length distribution for both sexes for months from December 1969 to April 1972. From the figures, one can see that the dominant body length for a male is 8-10 cm. in June and July, 10-12 cm. from October to December, and 12-13 cm. in April and May. For a female, the dominant length is 7-9 cm. in June and July, 12-14 in October, and 14-16 cm. in April and May. The fact that the smallest shrimp were collected in June and July suggests that the recruitment of young shrimp to the fishing ground should take place at the time.

The time of recruitment of young shrimp to the fishing ground coincides with the description of Boerema (1969). The spawning season of the shrimp can be estimated, provided that the length of the period for them to grow from the egg to recruiting size, that is 7-10 cm. body length, is known. The only information available for the estimation is from the results of the artificial rearing of the shrimp, in which a group of shrimp eggs, spawned at the end of March 1972, attained the size of 7.1-8.5 cm. by the beginning of June, when they grew fast. Therefore, it can be said that the spawning of the shrimp occurs in March and April if the growth of the young shrimp in natural condition is supposed to be almost the same as the fastest growth in artificial rearing tanks

The growth of the shrimp for both sexes throughout the year was illustrated in Fig. 4. The length-weight relationship of the shrimp shown in Fig. 5 can be expressed by the equations :

$$W = 4.899 \times 10^{-3} \times L^{3.3828}$$

and

$$W = 1.105 \times 10^{-2} \times L^{3.0695}$$

for male and female respectively. The growth of shrimp in body weight converted by these equations from that of body length is also illustrated in Fig. 4.

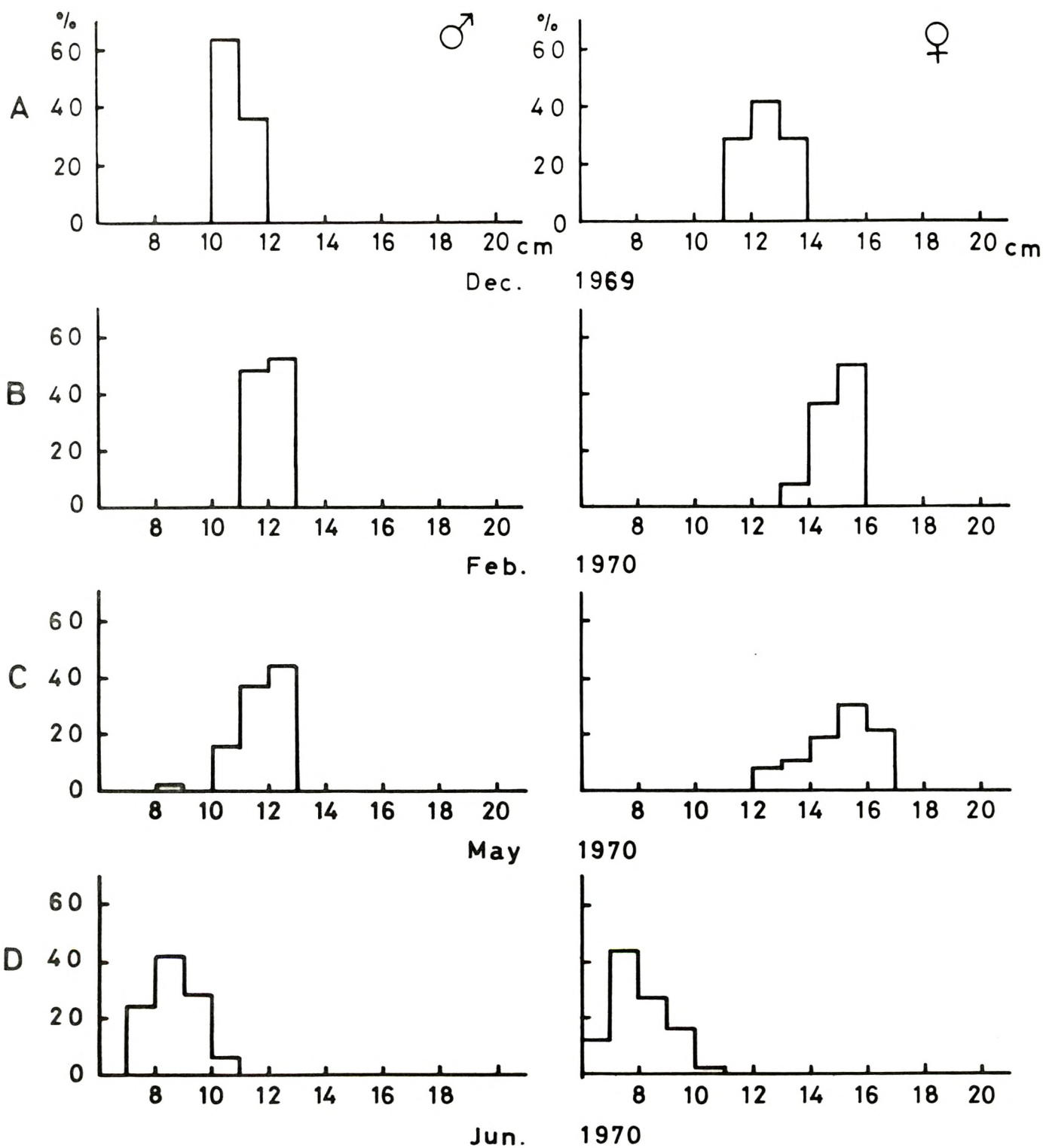
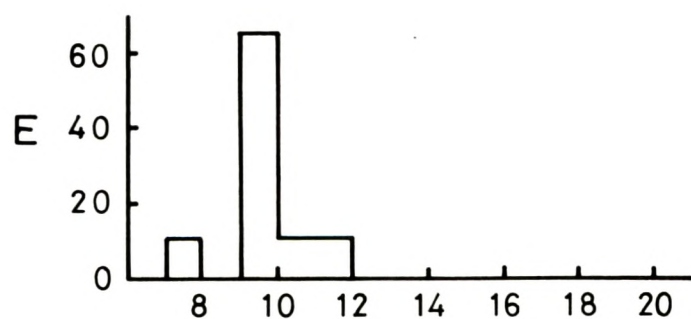
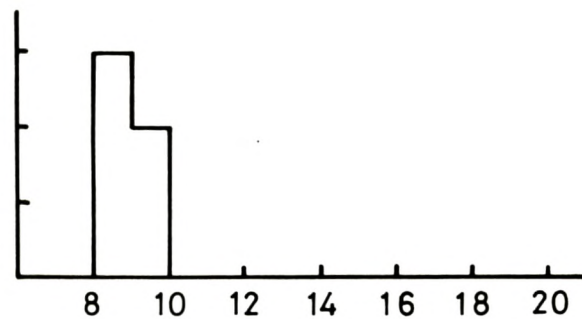


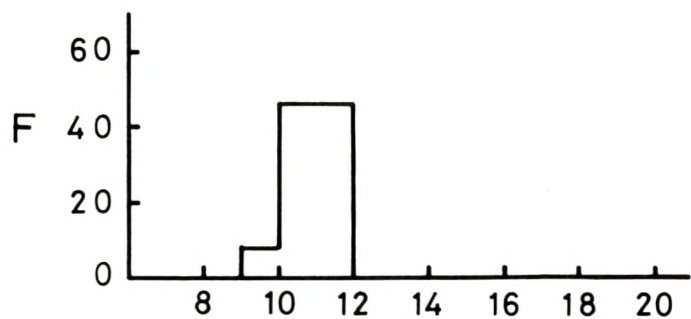
Fig 3-1 Body length distribution of the shrimp, *Penaeus semisulcatus*, by month and sex.



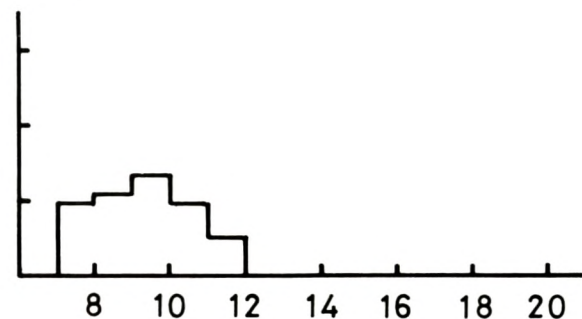
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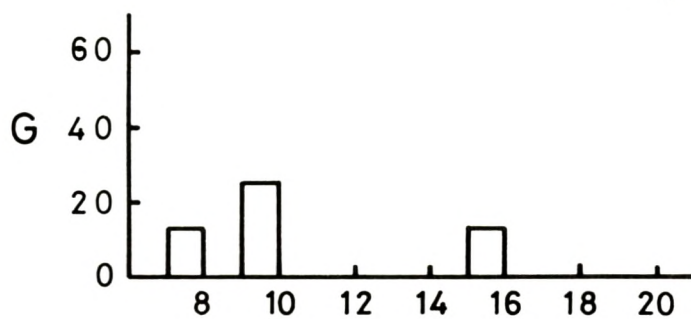
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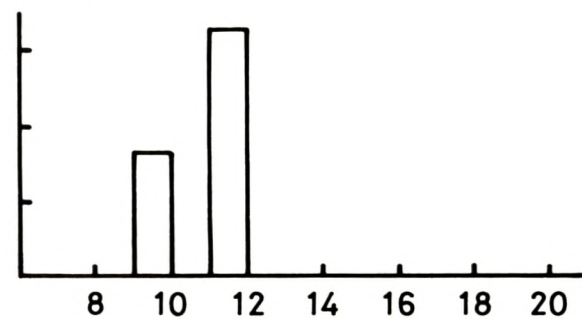
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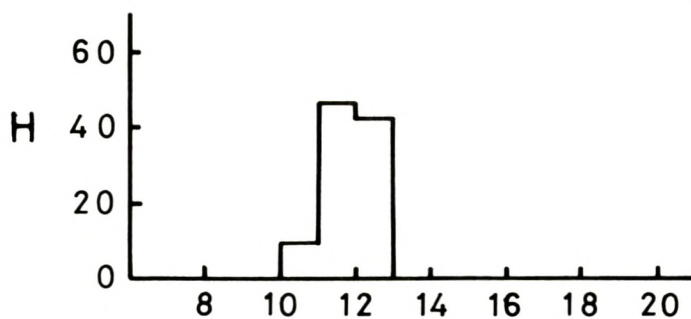
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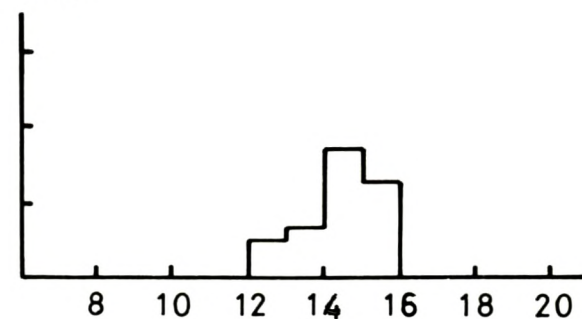
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Fig. 3-2 Body length distribution of the shrimp, *Penaeus semisulcatus*, by month and sex.

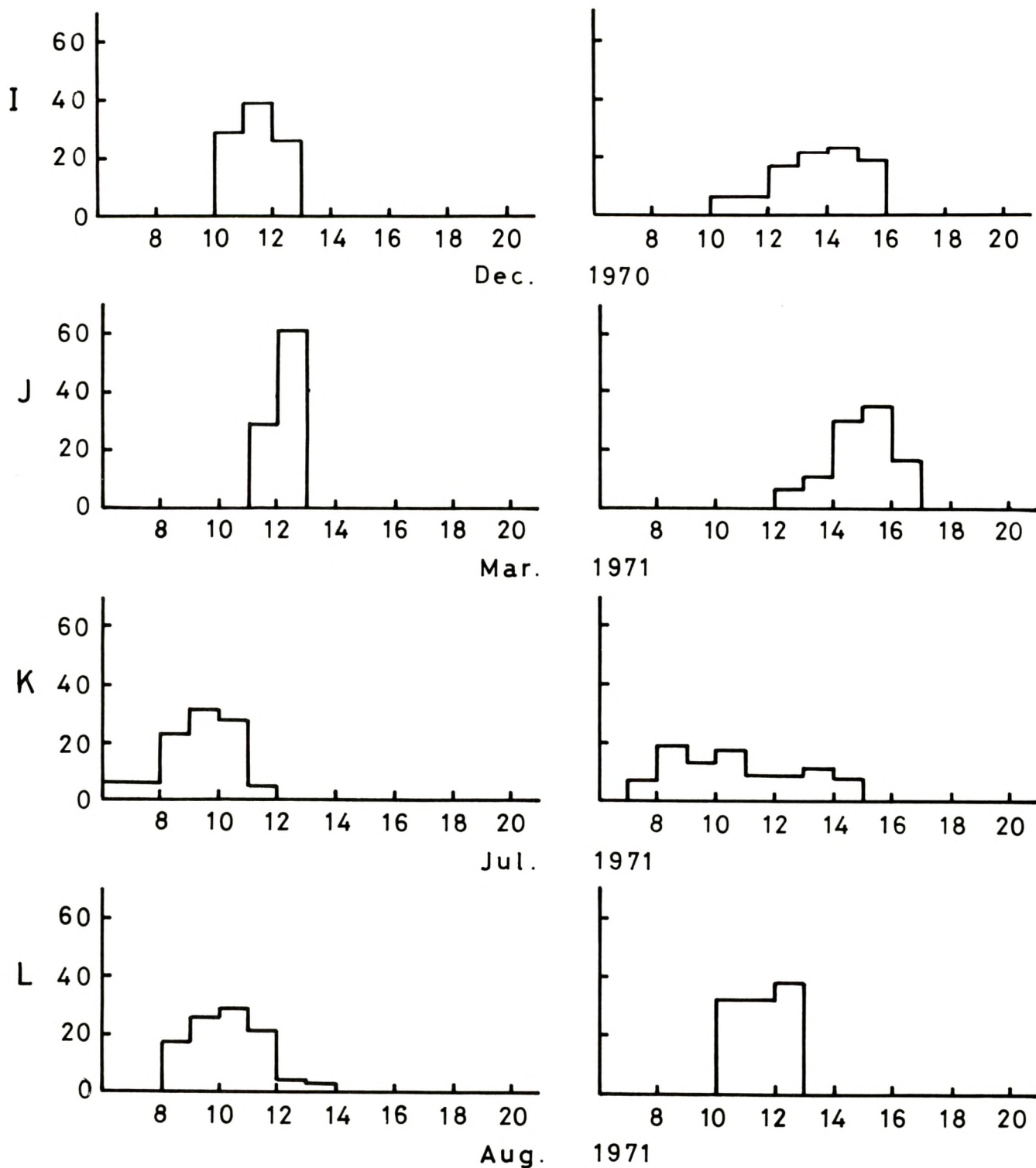


Fig. 3-3 Body length distribution of the shrimp, *Penaeus semisulcatus*, by month and sex.

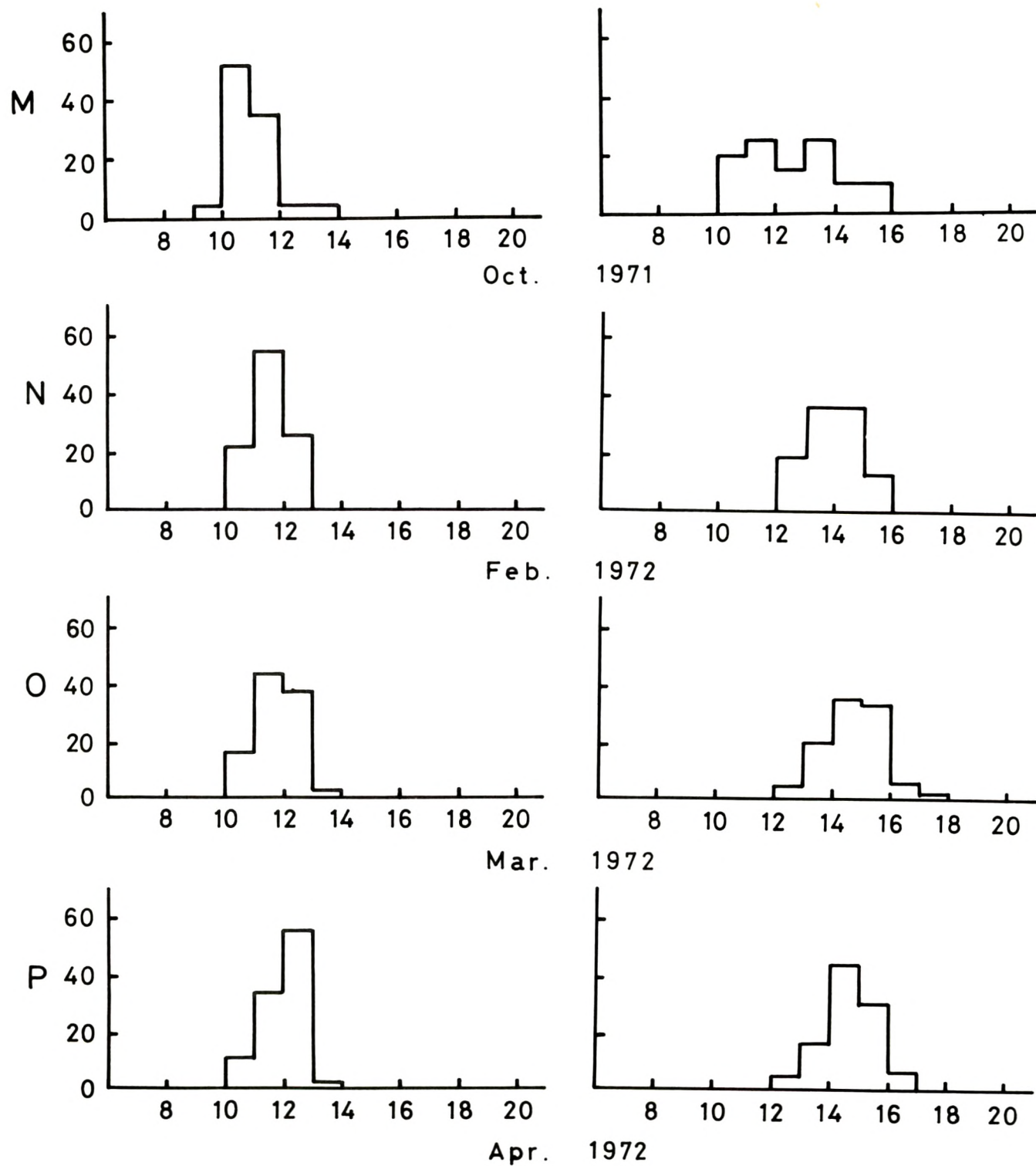


Fig. 3-4 Body length distribution of the shrimp, *Penaeus semisulcatus*, by month and sex.

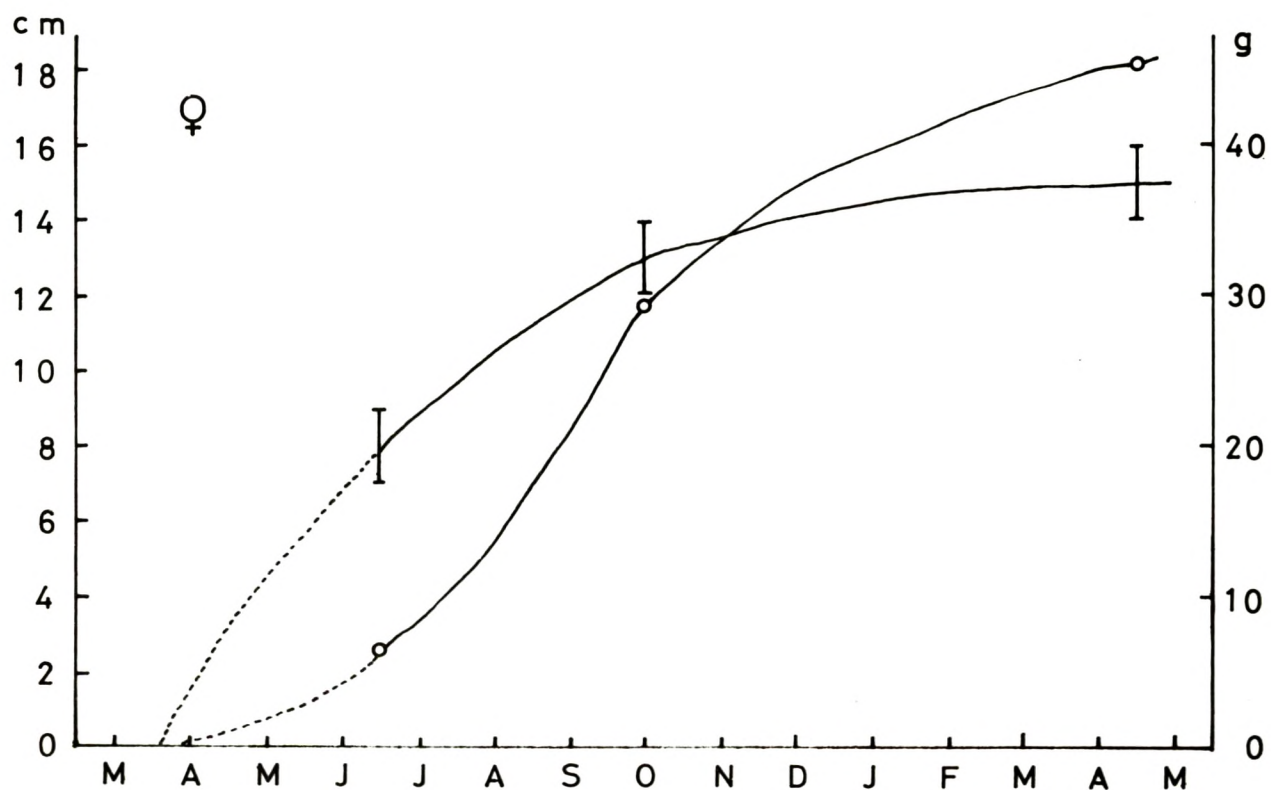
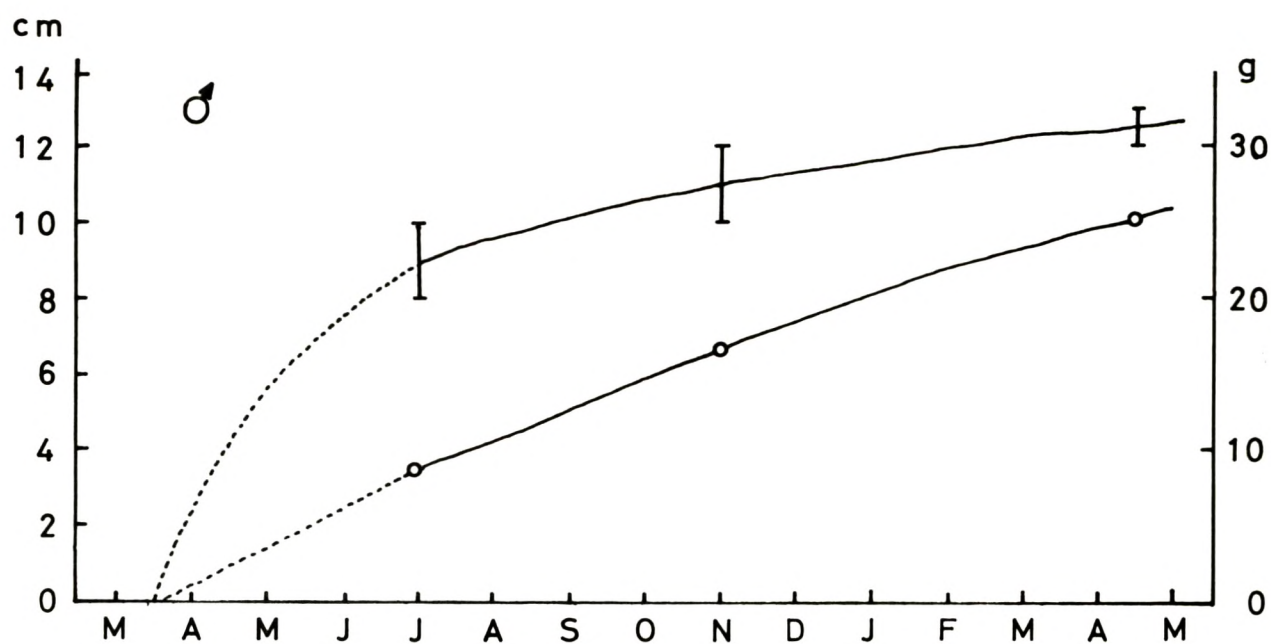


Fig. 4 Growth of the shrimp, *Penaeus semisulcatus*, for each sex.

—+— : Body length, —○— : Body weight.

The length of the bars on body length growth curve express the range of the body length distribution.

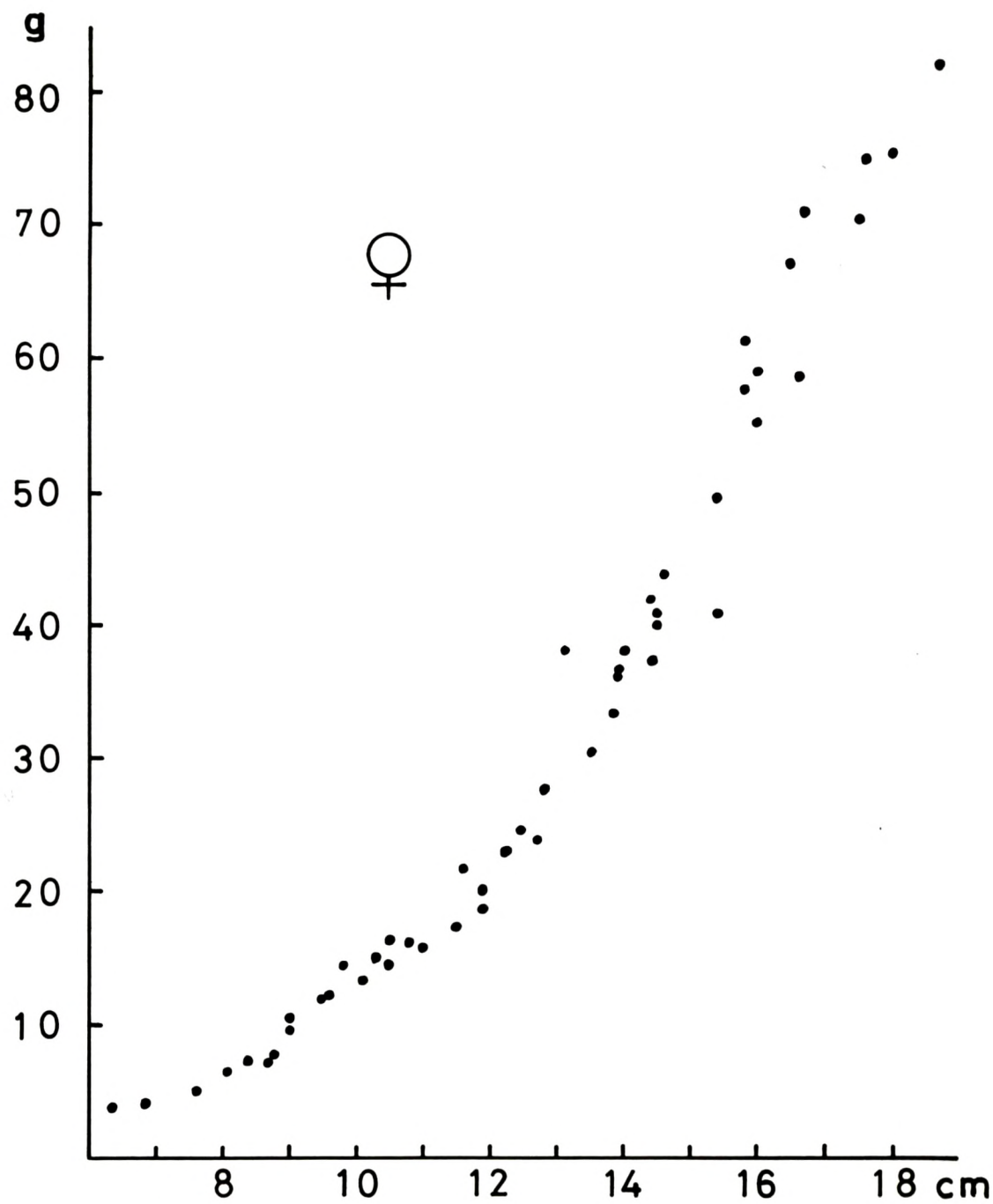
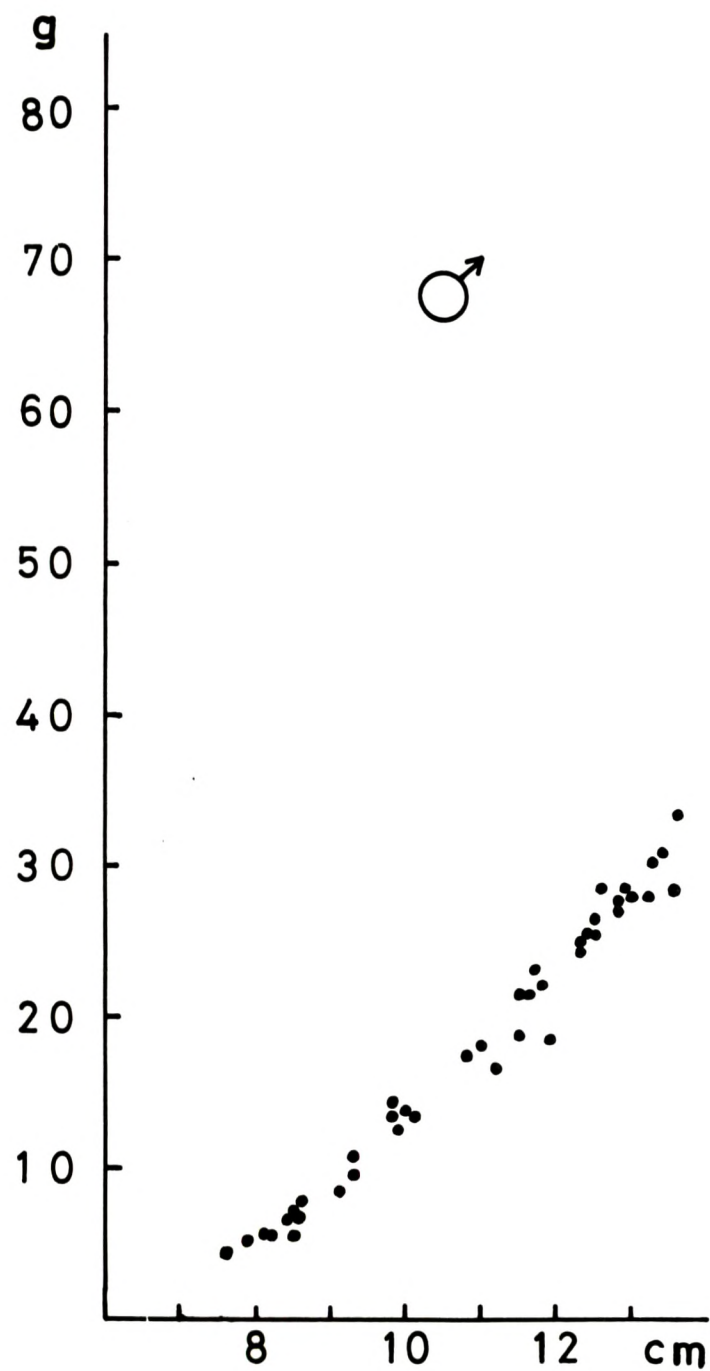


Fig. 5 Length-weight relationship of the shrimp, *Penaeus semisulcatus*.

2. Estimation of the most active spawning season.

The number of mature females caught by a unit fishing effort is a suitable indicator for the strength of the spawning activity of a shrimp population. One haul of one hour's trawling is taken as a unit effort in the present case. Fig. 6 shows the fluctuation of the value during the periods from the end of February to the beginning of May 1971 and 1972. All shrimps were collected from south east of Shuaibah port where the largest spawning population was observed. The peak of the value appeared at the beginning of April in both years. This means that the shrimps spawned most actively at the beginning of April in the area.

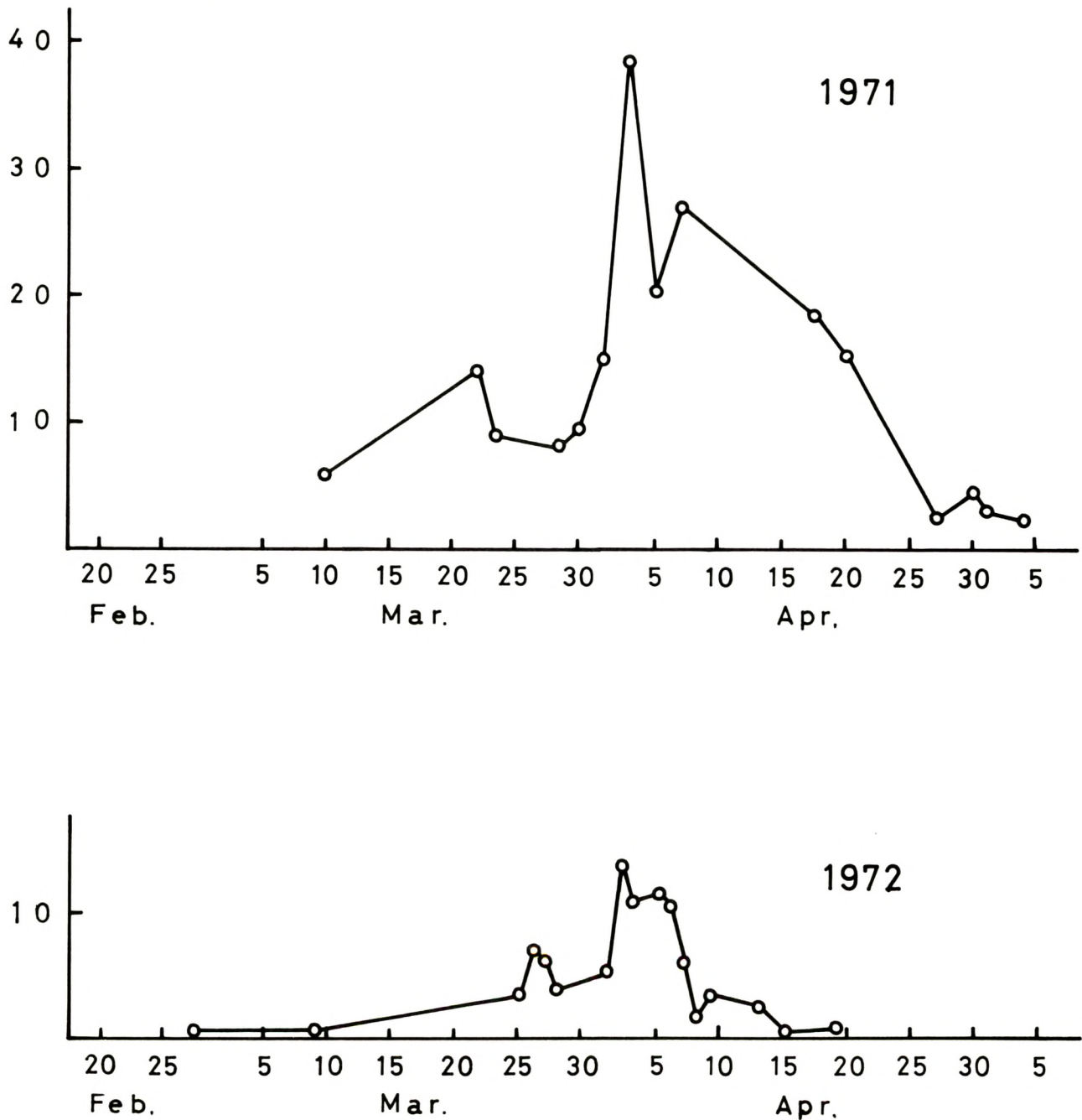


Fig. 6 The fluctuation of the number of female shrimp caught by one hour trawling.

The bottom water temperatures of the area are shown in Fig. 7 for the period. From both Figs. a relation between bottom water temperatures and spawning activity can be observed. The spawning behavior began around March 15th, in 1971, and March 25th, in 1972 as seen in Fig. 6. This corresponds to the bottom temperature of about 17°C in both years. The most active spawning behavior was observed when the bottom water temperature was 18-19.5°C.

The number of mature females caught by a unit effort was much lower in 1972 than in 1971. This may be due to either a smaller spawning population or a lower fishing efficiency in 1972 than in 1971 or both.

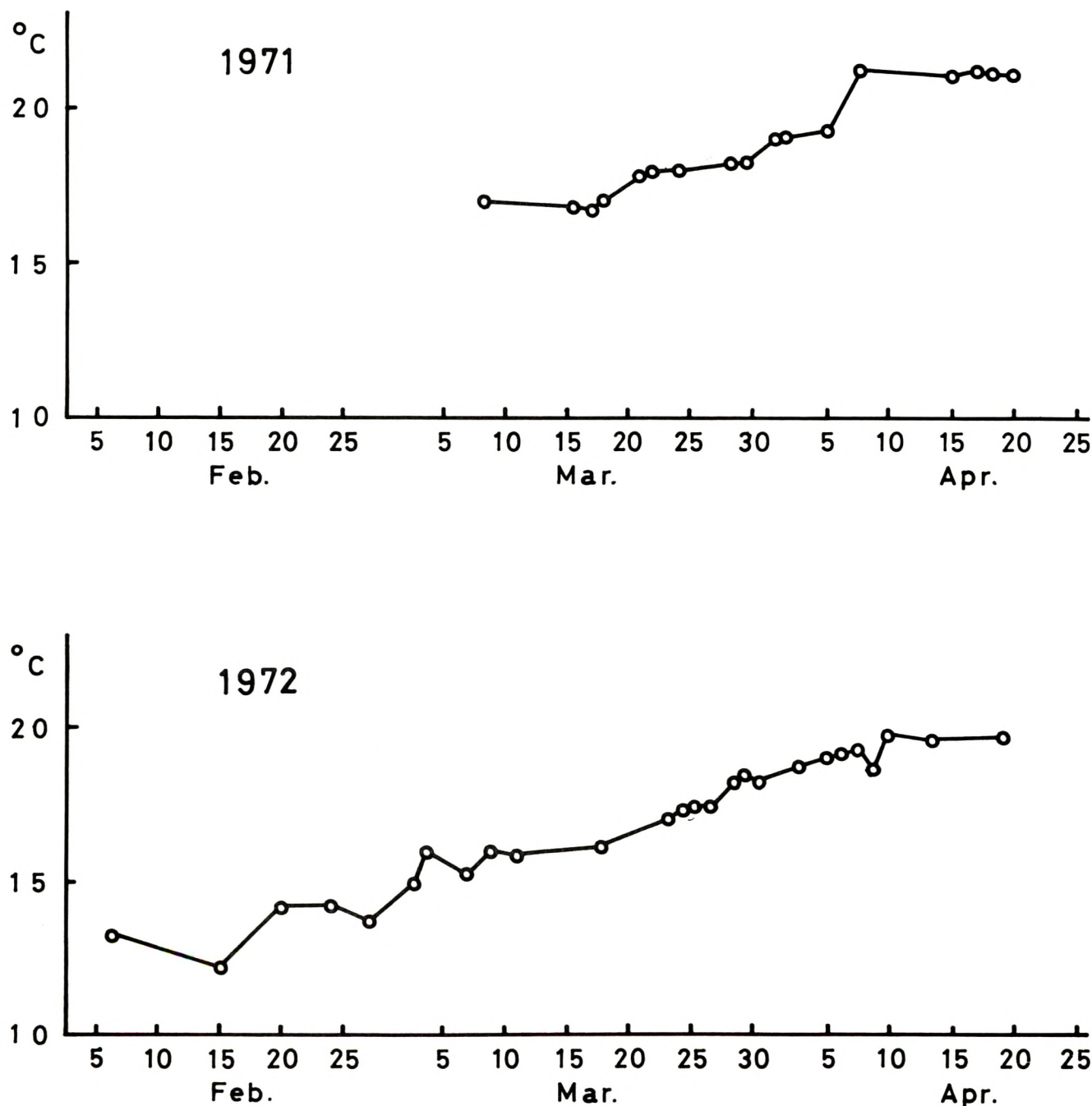


Fig. 7 Change in bottom water temperature in the spawning season.

3. Scattered spawning activities throughout the year.

There are several observations which suggest small-scale spawning activities scattered throughout the year, although that observed in March and April south east of Shuaibah port is the largest. First, there was a group of female shrimp, 12-14 cm. in body length, in June, July and August at the mouth of Kuwait Bay, as seen in Fig. 2. Some of them proved to be fully mature, since they spawned in rearing tanks, even though they were smaller in size and their ovaries looked thinner than that of mature shrimp in March and April. Second, about 1% of the total number of female shrimps observed in October 1970 and November 1972 at the mouth of Kuwait Bay and off Failaka Island had well-developed ovaries. Third, Post-larval and young shrimp of 1.0-3.0 cm. total length were observed at the inlet of Khor Al Muffattah, about 70 km. south of Shuaibah port in July, August and December, 1972. The ecological relation between those scattered spawning activities and a large activity in March and April is the problem left for further investigations to solve.

CONCLUSION

The largest spawning activity in Kuwaiti waters occurs in March and April south east of Shuaibah port. Active spawning, however, is restricted to a rather short period between the end of March and beginning of April when the bottom water temperature is 18-19.5°C. Beside this largest spawning activity, there are small-scale spawning activities scattered throughout the year in other areas of Kuwaiti waters.

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