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NOTES ON THE DISTRIBUTION AND BIOLOGY OF <u>PANDALUS</u> <u>BONNIERI</u> CAULLERY OFF THE WEST OF SCOTLAND

by

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Summary

This work on <u>Pandalus</u> <u>bonnieri</u> is part of an assessment of the shrimp resources around Scotland. At present there is no Scottish fishery for pink shrimps, which are rarely landed.

P. bonnieri is found on grey mud on the west coast and is most abundant in depths of 60 fm (110m) and over. The abundance of shrimps varies seasonally, being greatest during the winter and least during the summer.

Female <u>P. bonnieri</u> become egg-bearing at a size of 13-14 mm carapace length. Egg laying commences in the Autumn and hatching is completed by the middle of the following April.

The mean size of males is less than that of females throughout the year.

Introduction

In Britain there is a large demand for pink shrimps, three species of which are commonly found around the British coasts (Mason, 1967).

The smallest species Pandalus montagui is fished commercially in England. The larger Pandalus borealis is found in the North Sea and occurs in very large numbers on the Fladen Ground where it is exploited by foreign vessels, but not by Scottish ones.

Pandalus bonnieri Caullery, a similar large species, has been found in research ship trawl catches over a wide area off the West of Scotland, and a study of its distribution, abundance and biology has now been instituted. This paper presents the preliminary results of the study.

Material and Methods

During the period 1963-1969 trawl surveys for pink shrimps were made off the west coast of Scotland. All pink shrimps caught were counted and samples sent to the laboratory for further examination. Samples were also obtained from commercial fishing vessels. Specimens were preserved in 10% neutral formalin in sea water; the samples were later sorted and their species composition determined.

Owing to the fact that sampling was irregular, data for some months are lacking.

The sex of each individual was determined by an examination of the secondary sexual characters of the first pleopods, the smallest specimens being examined under a binocular microscope.

The carapace length from the posterior edge of the eye socket to the posterior dorsal edge of the carapace was measured to 0.1 mm. For 267 specimens from the Clyde area (only those completely undamaged) the total length from the tip of the rostrum to the tip of the telson was measured to 1.0 mm accuracy. The gear used in the surveys was not designed to capture the very small shrimps, and therefore those with a carapace length less than 7 mm were not taken.

Distribution and Abundance

Pandalus bonnieri is found on soft grey mud in depths of 20 fm (40m) and over. Off the Scottish coast these conditions occur in the Clyde, the Sound of Jura, the South Minch and the Inner Sound between Skye and the Scottish mainland, and it was in these areas that P. bonnieri were caught (Mason, 1967). Good catches were taken in 40 fm (74m), but the best catches, of over 300 specimens per half hour haul, were made in 'holes' with depths of over 60 fm (110 m). The best catches were made during the months Octobor to May, suggesting that shrimps are most abundant and/or more available during the winter and spring, and scarcer during the summer.

It seems likely that adult <u>P. bonnieri</u> rise off the bottom at night and in dull weather in the same way as has been reported for <u>P. borealis</u> (Hjort & Ruud, 1938). This is supported by reports from fishermen that large pink shrimps have been caught in midwater in fairly large numbers in the Firth of Clyde and in the Minch, by vessels fishing for clupeoids at night. Preliminary evidence from the trawling surveys indicates that greater catches are made when trawling in bright sunshine than in dull cloudy weather.

Biology

The seasonal breeding cycle was determined by combining the observations from all west coast sampling areas for the period March 1968 to March 1969. Two sets of data from other years were used for July and August.

The sex ratio varied from month to month (Fig. 1). The proportion of males was highestin August (61%) and lowest in October (24%). The annual mean was 46.6%. Berried females made up 44.3% of the catch in March (75% of all females).

Fig. 2 shows the size distribution (carapace length), sex composition and proportion of berried (ovigerous) to non-berried females in each month.

The relationship between carapace length (C.L.) and total length (T.L.) was estimated, and regression equations of T.L. on C.L. obtained as follows:-

Male: T.L. = 16.9 + 4.5 (C.L.)

Female: T.L. = 15.5 + 4.5 (C.L.)

Throughout the year the males were consistently smaller (mean carapace lengths) than the females, the mean average size being 16.6 mm C.L. for males and 17.0 mm C.L. for females. Berried females had a somewhat higher average carapace length of 18.3 mm.

Pike (1952) found no internal evidence of a sex change in <u>P. bonnieri</u> and he concluded that it is completely dioecious. We have found no evidence of a transitional pleopod stage such as is found in <u>P. borealis</u> (Allen, 1959).

Females appear to attain maturity, as shown by egg bearing, at a size of 13-14 mm carapace length. Berried females were found in the catches from November until the middle of April, and during this period almost all the adult females caught were berried. The eggs are light green at first, but gradually darken, and just prior to hatching become a pale violet. The eye pigmentation develops gradually; it is first seen after about three months incubation and is very prominent at the last colour change. Hatching occurs within a few hours of this change. Larvae were observed hatching in the aquarium during the second week in March. They hatched during the night and were positively phototropic. In the Firth of Clyde during 1951 hatching occurred in the third week in February (Pike, 1952). The females moult and lose their ovigerous setae a week or so after the larvae are released.

References

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FIG 2 LENGTH FREQUENCIES OF SHRIMPS FROM CLYDE AND MINCH AREAS MARCH 1968 — MARCH 1969 (Data are supplemented, where necessary, by figures from other years.)