International Council for the Exploration of the Sea

Plankton Committee
CM 1975/L:23

THE DISTRIBUTION AND ABUNDANCE OF SCYPHOMEDUSAE IN THE NORTHERN NORTH SEA DURING THE SUMMER MONTHS

by

S.J. Hay and J.A. Adams

Marine Laboratory
Aberdeen, Scotland.

Introduction

Because of the large numbers of scyphomedusae (jelly fish) which had been caught by the young gadoid pelagic trawl during the Scottish O-group gadoid surveys in 1969 and 1970, it was decided to use future surveys of this type to:-

(i) chart the distribution and abundance of the scyphomedusae in the northern North Sea during the summer months;

(ii) establish, for the various species of scyphomedusae, the relationship between size and wet weight;

(iii) estimate the standing stock of scyphomedusae; and

(iv) compare the distribution and abundance of the scyphomedusae with the distribution and abundance of certain O-group gadoids.

This is a preliminary report on the results obtained during 1971 to 1974 at the following times:-

6-25 July 1971
15 July - 9 August 1972
10-31 July 1973
6 June - 1 July 1974

Methods

As indicated above, the samples were obtained from hauls made, in the first instance, to sample O-group gadoids. The mesh in the various parts of the pelagic trawl varied, in 1971 and 1972, from 150 mm in the wings, bosom and belly through intermediate sizes to 10 mm in the extension piece and codend. In 1973 and 1974 the areas of 150 mm mesh were changed to 100 mm mesh and the trawl became known as the International Young Gadoid Pelagic Trawl (Anon, 1973). The way in which the trawl was used also differed in the two periods. In the earlier period it was generally fished in the 18-55 m depth range, exclusively in the vicinity of the thermocline and at all times of the day. In the latter period the hauls were stratified with equal periods near the sea bed, in mid water and near the surface; furthermore, the majority of the hauls fell between 0900 hours and 2400 hours (see Hislop, 1972a, 1972b, 1973; Hislop, Holden and Daan, 1974).

With the exception of the small jelly fish (log length < 1.5 or about 4.5 cm) the relationship between log umbrella weight and log umbrella diameter is obviously linear for both species for all three years.

Individual regressions of log umbrella wet weight on log umbrella diameter were calculated for each species for each year. There was no evidence of any difference between years for C. lamarckii and the overall regression is:-

log umbrella wet weight = 2.624 log umbrella diameter - 2.464.

For C. capillata, however, the analysis suggested that, although the exponent in the wet weight to diameter relationship did not change, the "condition factor" was varying from year to year. Fitted with a pooled estimate of the slope the regressions were:-

1972 log umbrella wet weight = 2.632 log umbrella diameter - 2.317

1973 log umbrella wet weight = 2.632 log umbrella diameter - 2.338

1974 log umbrella wet weight = 2.632 log umbrella diameter - 2.424.

It may be significant that the data for the year with the poorest "condition factor" (i.e. 1974) were collected over a month earlier than in the year with the best (1972).

The standing stock of scyphomedusae

Knowing the size frequency distribution of the specimens in each haul, the above regressions were used to calculate the weight of the umbrellas of C. capillata and C. lamarckii caught. (Figures 6 and 7). These derived data were further used to calculate the average standing stock (in terms of dry weight/100 m^3) of the two species within their main areas of occurrence (Table 1) on the assumptions that (i) the umbrella weight is half of the total weight* and (ii) that Cyanea is approximately 96.47% water (Koizumi and Hosoi, 1936). Also given in Table 1 are the standing stocks of other components of the plankton community of the western northern North Sea based on data collected in June and July 1965, 66 and 67 (Adams, unpublished). Bearing in mind that the standing stock of Aurelia is almost certainly of the same order of magnitude as the standing stock of each of the other species, it is interesting that the standing stock of scyphomedusae appears to be higher than the standing stock of the other planktonic carnivores.

Distribution and abundance of the scyphomedusae compared with the distribution and abundance of certain 0-group gadoids

The commensal association of various fish species with C. capillata, C. lamarckii and, to a lesser extent, with A. aurita has been frequently reported (see Mansueti, 1963; Russell, 1970), and Bailey (1975) has already commented that, in a northern North Sea 0-group gadoid survey in August 1971, 0-group whiting were caught in the largest numbers where large coelenterates were most common.

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*From the limited data available from those specimens for which wet weights are available separately for the umbrella and for the tentacle, gonad, manubrium mass, it appears that the umbrella weight constitutes slightly more than half the total weight for C. lamarckii and slightly less than half the total weight for C. capillata.

A series of regressions are presented relating umbrella diameter to umbrella wet weight. These regressions are used to convert numbers per haul to an estimate to the standing stock of two species of scyphomedusae. The standing stock varies from 0.02 to 0.6 gm dry weight/100 m^3 for C. lamarckii and 0.2 to 0.7 gm dry weight/100 m^3 for C. capillata. These are apparently higher than the standing stock of other planktonic carnivores.

The data are also examined for circumstantial evidence of the association of O-group gadoids with scyphomedusae. The data suggest that above average catches of whiting, haddock, Norway pout and cod were more associated with above average catches of C. capillata than they were with above average catches of the other species of scyphomedusae, while whiting appeared to be more associated with C. lamarckii and A. aurita than were the others. Changes in the extent to which the various fish species were associated with the scyphomedusae appears to be related to concurrent changes in geographical distribution of fish and scyphomedusae.

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Table 1

Average standing stock in gm dry weight/100 m^3 for *C. capillata* and *C. lamarckii* for the areas outlined in Figures 6 and 7, compared with average standing stocks of planktonic herbivores, omnivores and carnivores in the central and western northern North Sea based on data for June and July 1965, 66 and 67.

C. capillata	1971	0.3
	72	0.7
	73	0.2
	74	0.5
C. lamarckii	1971	0.6[1)]
	72	0.6
	73	0.02
	74	0.1
Planktonic herbivores and omnivores		4.0
Planktonic carnivores		0.1

[1)] One very high value has been excluded. If included the 1971 value for *C. lamarckii* becomes 1.8 gm dry weight per 100 m^3.

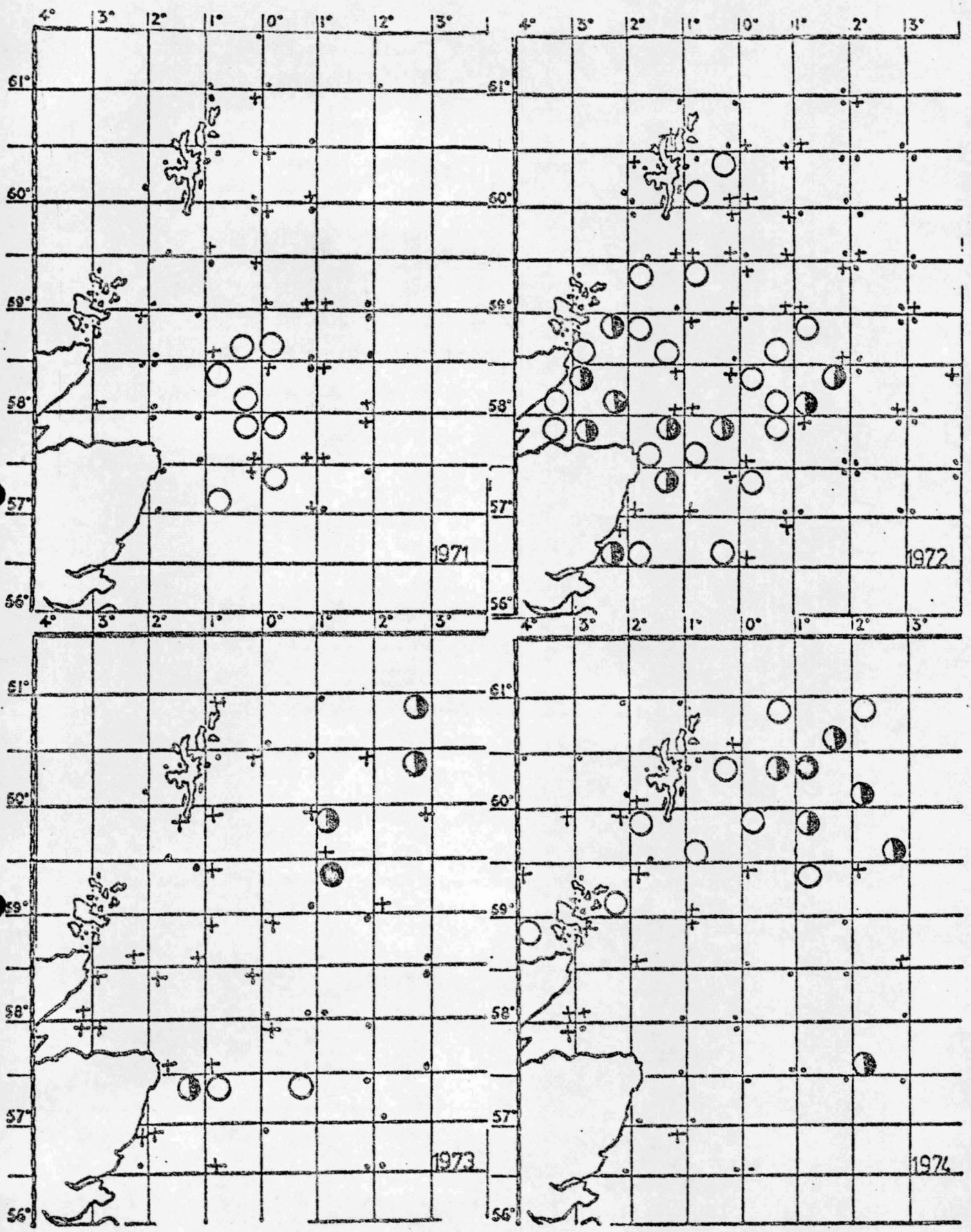

Figure 1 Distribution and abundance of C. capillata in 6-25 July 71, 15 July-9 August 72, 10-31 July 73 and 6 June-1 July 74. Legend • Nil; + ⩽10 per haul; O 10-29 per haul; ◔ 30-99 per haul; ◉ 100-299 per haul ✣ 300 + per haul.

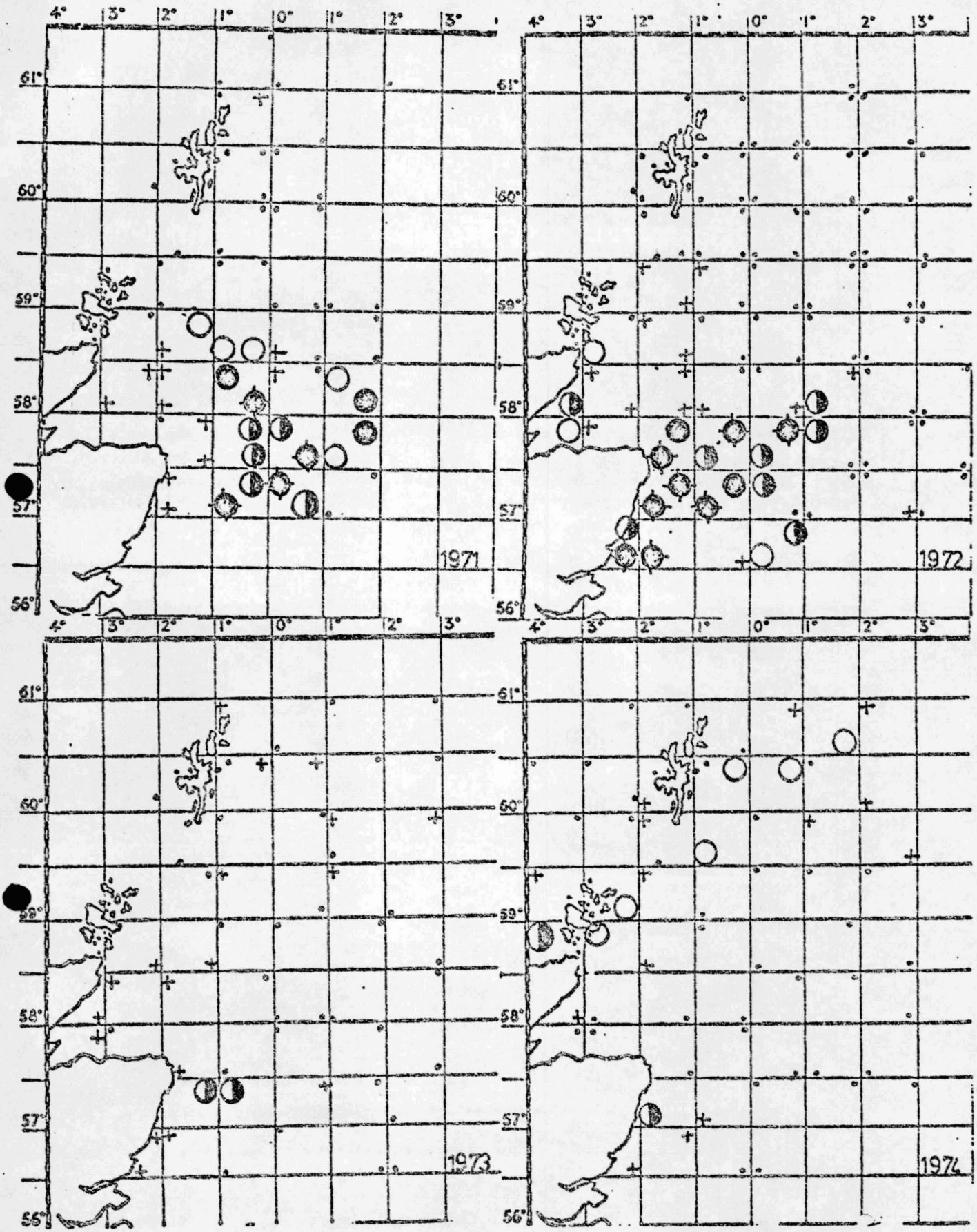

Figure 2 Distribution and abundance of C. lamarckii. Dates and legend as in Figure 1.

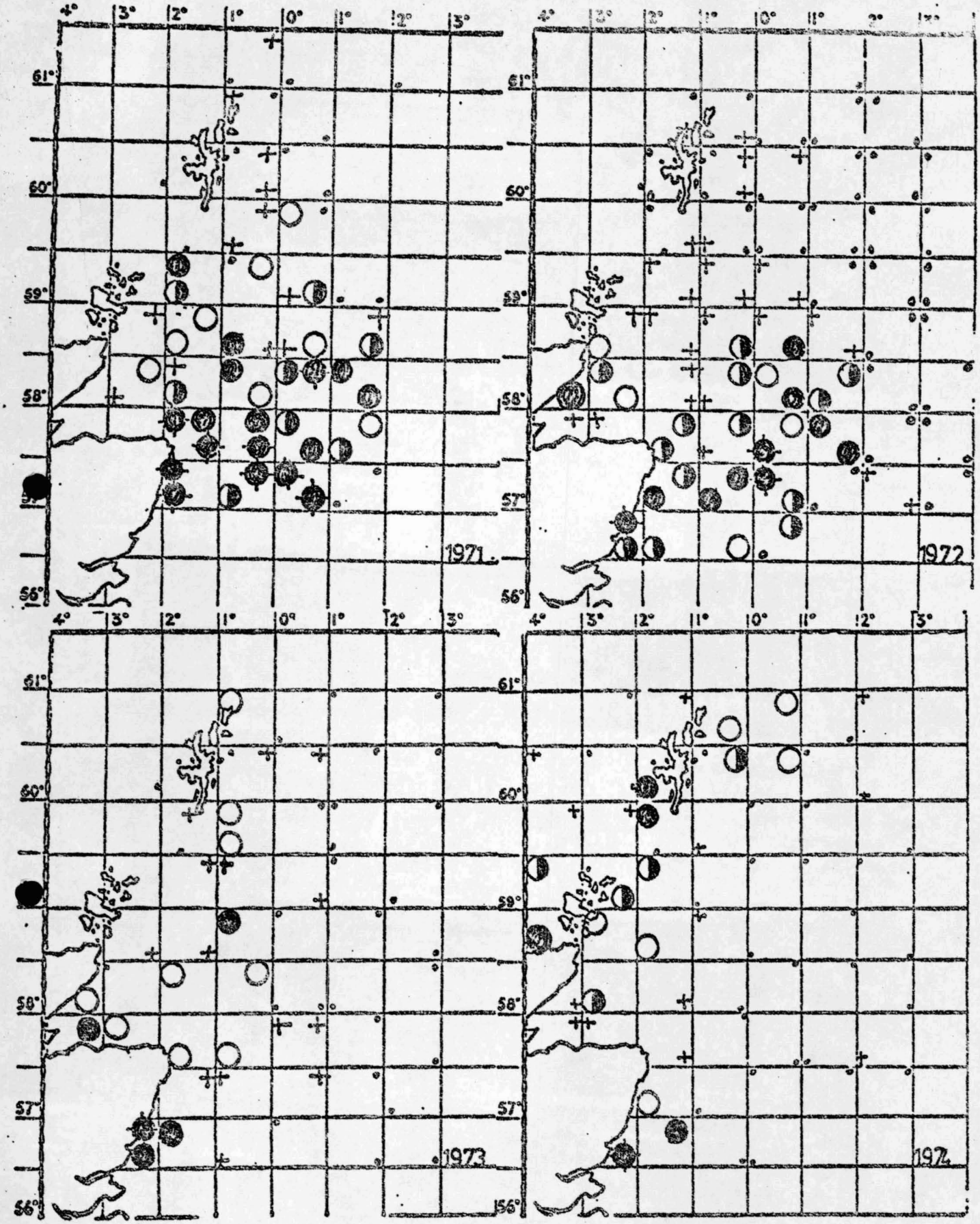

Figure 3 Distribution and abundance of *A. aurita*. Dates and legend as in Figure 1.

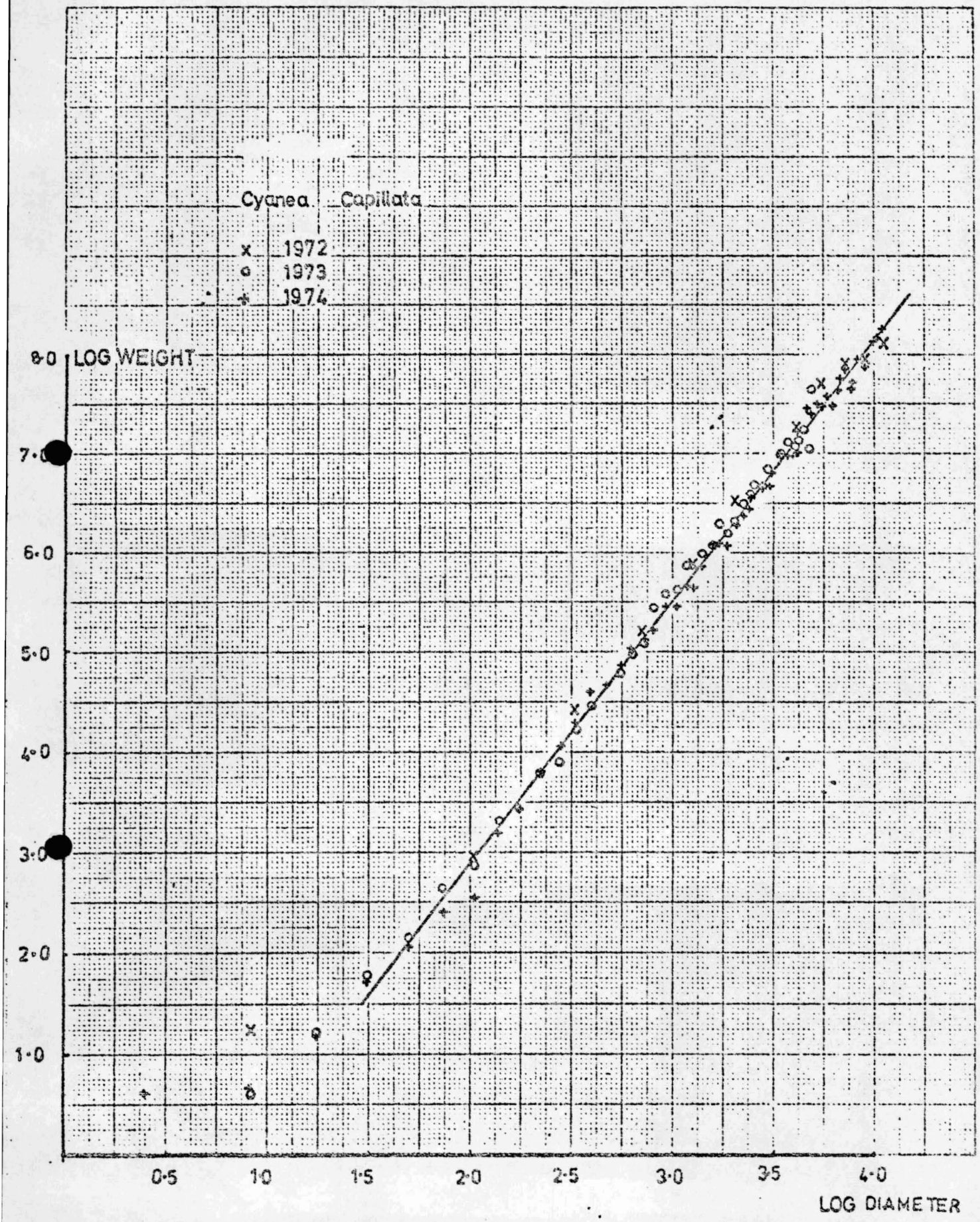

Figure 4 Natural logarithms of the mean wet weights of the umbrella plotted against the natural logarithms of the mid-points of the umbrella diameter groupings for C. capillata.

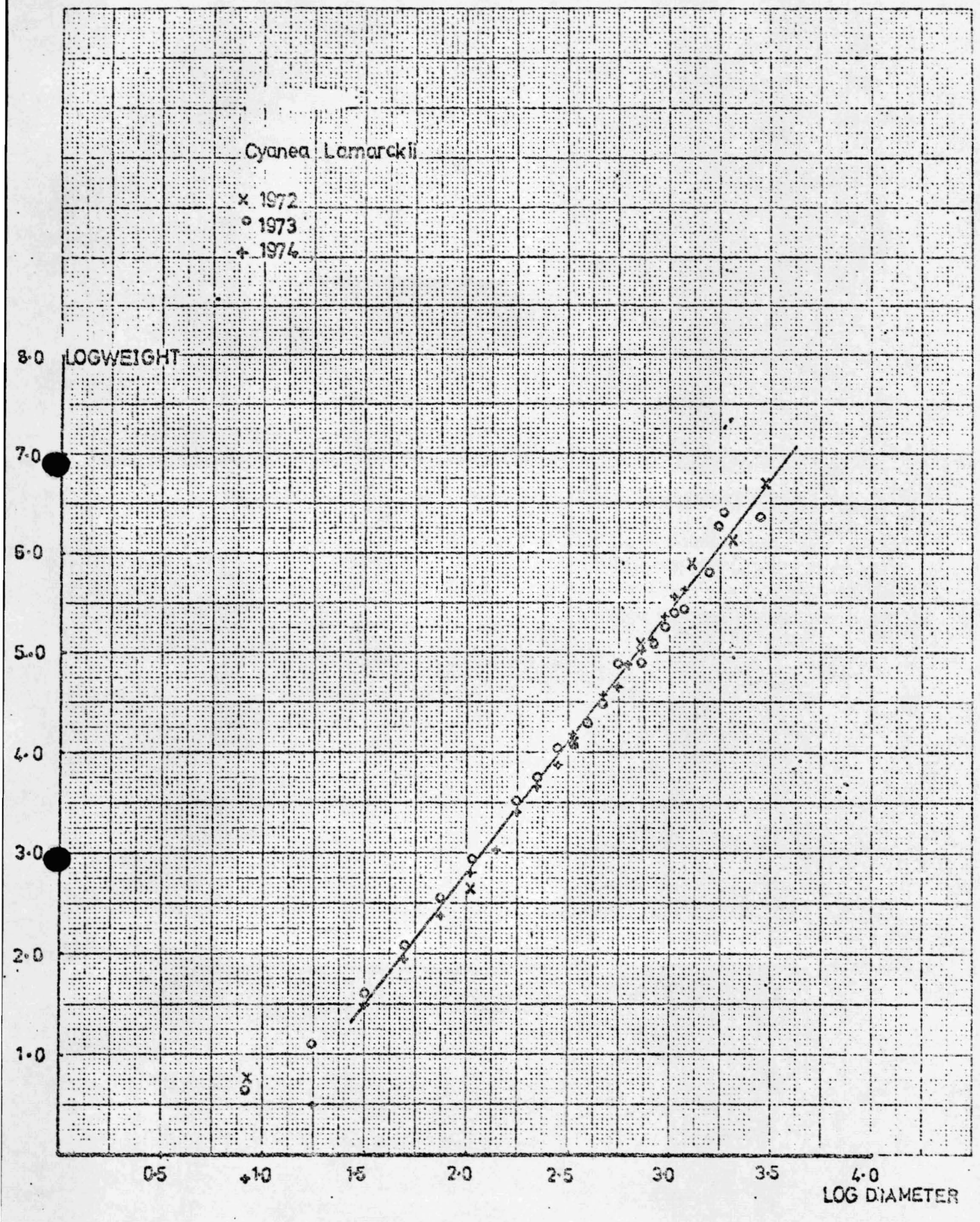

Figure 5 Natural logarithms of the mean wet weights of the umbrella plotted against the natural logarithms of the mid-points of the umbrella diameter groupings for C. lamarckii.

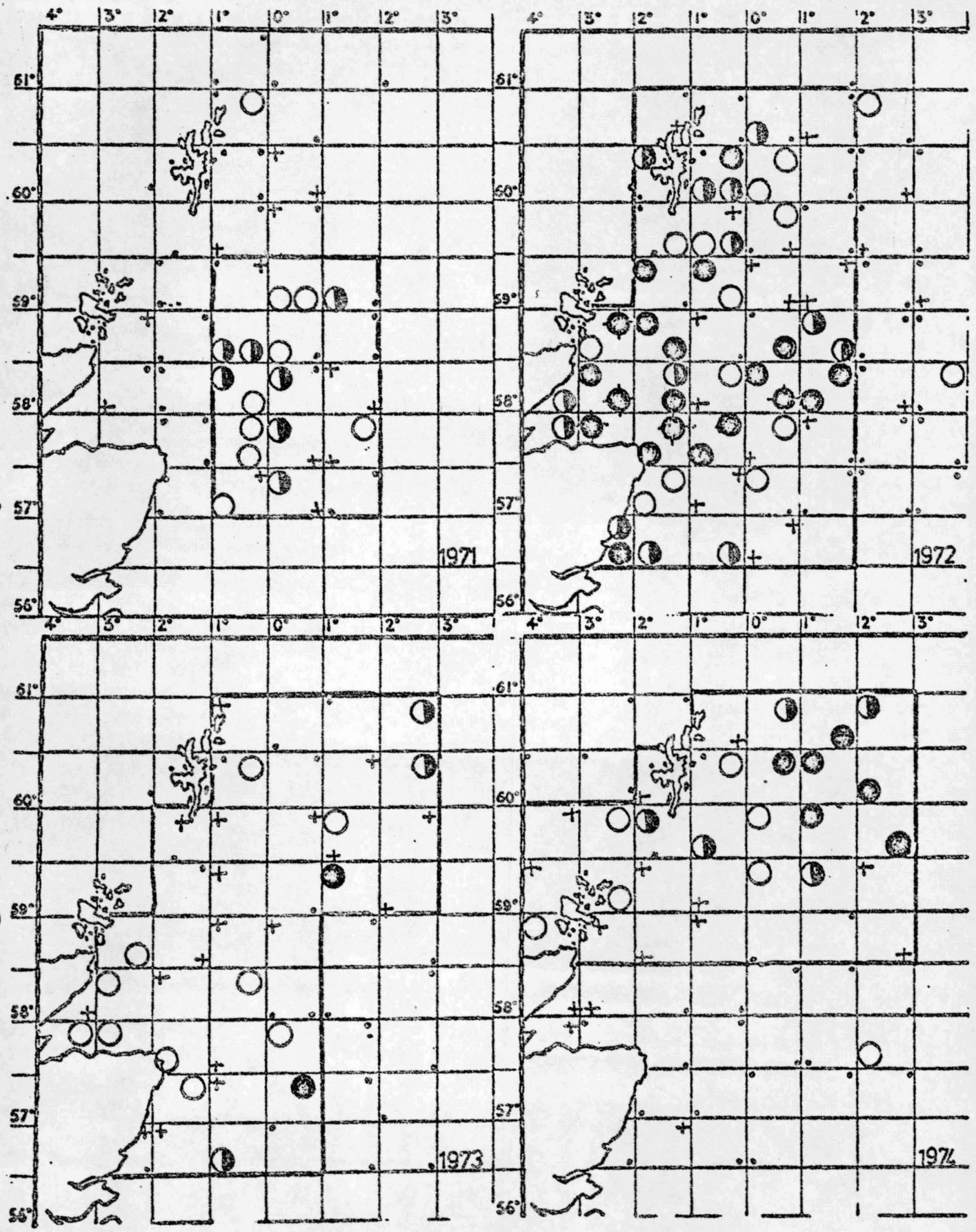

Figure 6 The standing stock of C. capillata umbrellas. Dates as in Fig. 1. Legend • Nil; + <1 kg wet weight per haul; ○ 1-2.9 kg per haul; ◐ 3-9.9 kg per haul; ● 10-29.9 kg per haul; ✦ 30 + kg per haul. The "boxed" areas are the areas for which averages have been calculated for Table 1.

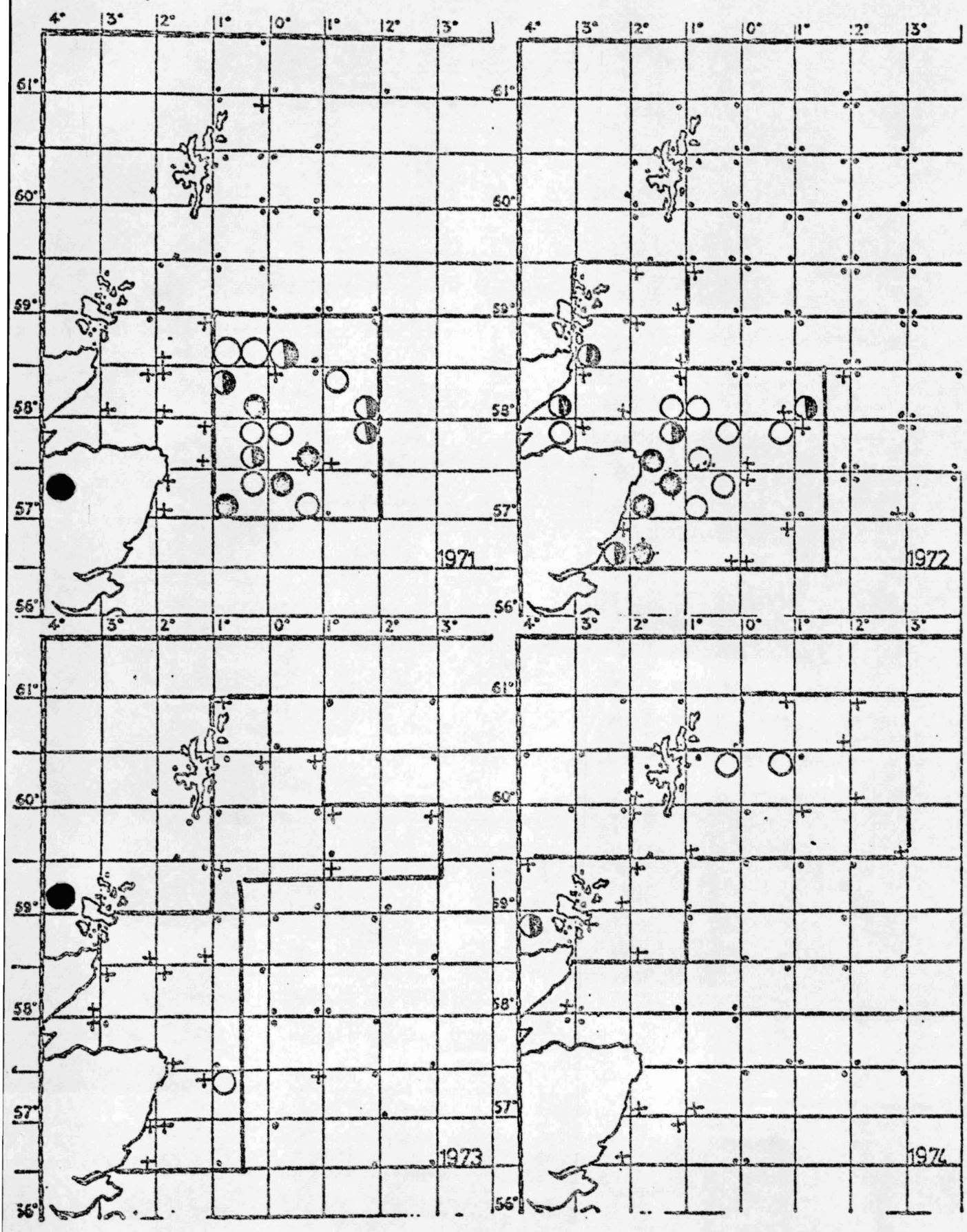

Figure 7 The standing stock of C. lamarckii umbrellas. Dates as in Figure 1. Legend as in Figure 6.

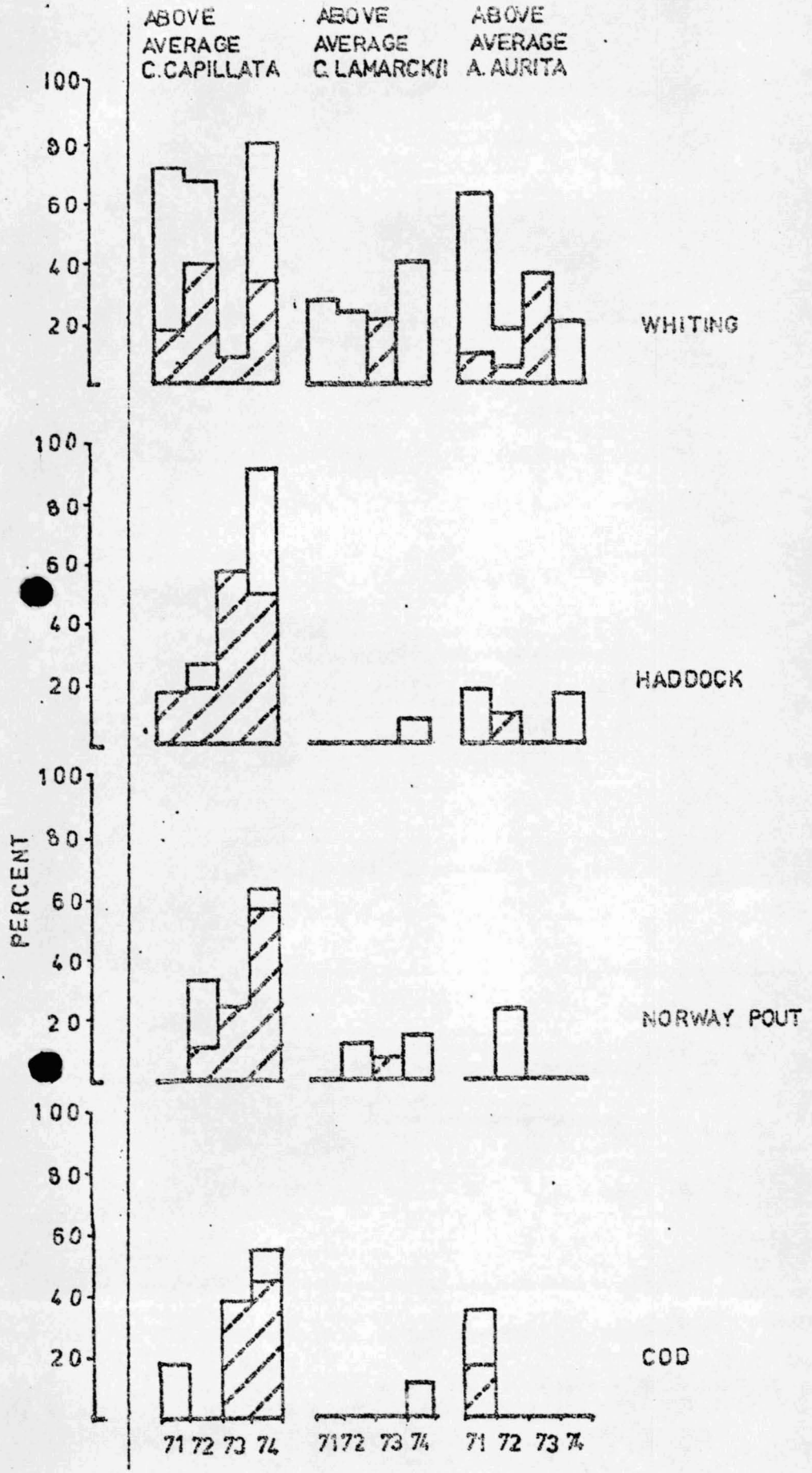

Figure 8 Histograms of the percentages of above average catches of whiting, haddock, Norway pout and cod in each year which were caught in association with, from left to right, (i) above average catches of C. capillata, (ii) above average catches of C. lamarckii and (iii) above average catches of A. aurita. In the histograms the hatched part represents those hauls in which only the relevant scyphomedusa was above average while the unhatched part represents those hauls in which either one or both of the other species were also above average.