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AGGREGATIONS OF PELAGIA NOCTILUCA (CNIDARIA, SCYPHOZOA) AND THEIR ECOLOGICAL CONSEQUENCES

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The process of grouping has been observed in benthic and pelagic animals belonging to several taxonomic phyla from Protozoa to Vertebrata; the factors that might be responsible for clumped distributions (physical or chemical parameters of the environment, behavioural reactions due to biological interactions)can vary greatly, as can also the behaviour of the grouping itself; and last, but not least, is the problem of adequate sampling, which can bias the results and thus affect definitions. In this paper, information on the distributional pattern of Pelagia noctiluca, a semaeostome scyphomedusa, are presented and the term aggregation is used to describe groupings of this species. The results are based on observations of free-swimming, undisturbed animals from the shore, boats and using SCUBA diving. The observations were carried out in the nearshore and offshore waters of the eastern Adriatic Sea during 1983, 1984 and 1985.

Our observations on Pelagia revealed that this species displays two types of groupings: (1) surface, nearly two-dimensional aggregations composed of more or less passive organisms with their bells touching or even superimposed on each other, which we term passive aggregation; (2) actively swimming animals forming subsurface groupings that we define as active aggregations, which had two common patterns. In nearshore areas and/or in the absence of evident currents the individuals swam actively, but were oriented ramdomly. Spacing between individuals ranged from few cm to a few m without an observable rule. The aggregations had variable shapes, most frequently ellipsoidal, becoming less dense at the edges. They were up to 15 m deep and up to a few miles long. In a current (unfortunately, its characteristics were not measured) all members of the undisturbed aggregation were oriented uniformly in the direction of the current; however, they did not show regular inter-individual spacing. The aggregations were from several m to up to 20 m (estimated) deep, and could be several miles long. In both types of aggregation we did not observe size segregation, though the passive aggregations were predominantly formed of individuals greater than 3.5 cm (bell diameter). A single active aggregation could be composed of individuals of variable size from less than 2 cm to bigger than 5 cm, nor was segregation according to size observed in this type of grouping.

Several hypotheses concerning the possible functional value of groupings of pelagic animals have been put forward, though some studies implicate physical forces as the dominant factors. The main problem with understanding aggregation behaviour lies in the interpretation of the nature of aggregations. In the case of Pelagia one should distinguish between passive and active aggregation. It is suggested here that physical processes regulate the creation of the former, since it is composed of lethargic animals. Passive aggregations often occur in the form of windrows or slicks offshore, or as accumulations in the heads of bays or sheltered parts along the coastline. Other nonliving buoyant material frequently appears simultaneously. The animals are almost completely inactive (observed as the cessation of bell pulsations), and are passively floating on the sea surface. Most probably the combination of several factors (elevated temperature and related increased metabolic demand, food deprivation, completion of biological cycle) contribute to the formation of passive aggregations in Pelagia, as they were predominantly observed during summer and early autumn. In contrast, we believe that active aggregation is a normal distributional pattern of Pelagia noctiluca. Due to the previously described factors they later develop into passive aggregations. The function of active aggregation in the absence of the attached scyphostoma is obvious in a fluid three-dimensional environment. Pelagia have separate sexes, and broadcast gametes for external fertilisation (Rottini Sandrini, pers.comm.). Aggregations can be postulated as a mechanism for increasing the concentration of gametes and thus maximizing reproductive success.

Jellyfish have been shown to exert a significant influence on pelagic ecosystems. Since the appearance of Pelagia noctiluca in the Gulf of Trieste in 1978, modifications of the zooplankton community have been observed. It is also speculated that dying medusae during the summer-autumn period could contribute to oxygen depletion observed in 1983 in the Gulf of Trieste, though there is no direct evidence. Also, Pelagia grazing on herbivorous zooplankton during summer-autumn might have contributed to the intensive irregular bloom of Gyrodinium sp. in October 1984.

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JELLYFISH AND FISHERY : SHORT TERM ANALYSIS OF THE INTERACTION IN THE GULF OF TRIESTE, NORTH ADRIATIC SEA

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ABSTRACT

The interaction between jellyfish and fishery during 27 months was analysed. The results demonstrate that the evolution in the fishing yield appear to be influenced by the increase of the jellyfish caught only in some periods.

INTRODUCTION

The problem of the interaction between scyphozoans and commercially interesting fish species has been studied in different fishing areas since the number of jellyfish has considerably increased in the past years, both off shore and in coastal areas (Piccinetti Manfrin & Piccinetti, 1983/84; Möller, 1984a & b; Rottini Sandrini et al., 1984; Legovic et al., 1986). This study aims at analysing if the catch monthly yield per hour is influenced by the number of jellyfish in the net.

MATHERIALS AND METHODS

The data examined in this study have been gathered by a 14 tons, 200 Hp engine motor-trawler of the S. Vito fishers Co-operative in Marano Lagunare, in the period January 1981-December 1985. Professional trawl-fishing has been carried out daily, if the weather conditions allowed it, in the three-mile coastal strip, between Grado and Lignano; two different types of net have been used according to the season: in spring-summer months a 40 mm mesh-size net, in autumn-winter a 12 mm mesh-size net. The data on jellyfish refer to the October 1983-December 1985 fishing period. For each fishing day: 1) The amount of catch has been weighed, according to the species, for each two-hours haul on average. 2) The data relating to the number and species of jellyfish in the net have been collected.

The data collected have been expressed in Kg/h catch and in number of jellyfish caught for each fishing hour. Two jellyfish species have been detected: *Rhizostoma pulmo* (Macri, 1778), and *Pelagia noctiluca* (Forsskål, 1775). The number of *Pelagia noctiluca* refers only to the specimens found intact in the net; trawl-fishing leads to the disgregation of a considerable amount of the specimens of this species. These data are therefore to be considered as an underestimate.

RESULTS AND CONCLUSIONS

Fig 1 reports positive or negative differences from the average value of the catch Kg/h of fishing. The continuous horizontal line represents the average value calculated on data collected over 5 fishing years (1981-1985); the lower part of the drawing reports the pattern in the presence of *Rhizostoma pulmo* (broken line) and *Pelagia noctiluca* (dotted line) in the net in the period October 1983-December 1985. The method of analysis adopted in this study has shown that an increase in the number of jellyfish caught does not entail always a decrease in the average value of catch Kg/h fishing. The catch yield per hour decreases when the number of *R. pulmo* increases in the net only in some periods, October-November 1983, April-May-June 1985. this does not apply to *P. noctiluca*, as a considerable number of its specimens disgregate.

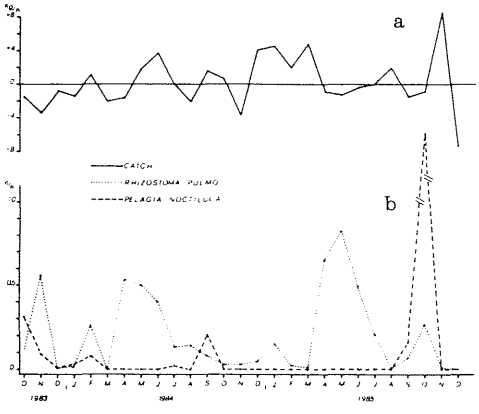

Fig.1. a, monthly distribution of Kg/h catch, reported as the difference from the 1981-1985 averages. b, monthly distribution of *Rhizostoma pulmo* and *Pelagia noctiluca* number of specimens/h.

According to these results the evolution in the fishing yield appear to be influenced by the increase of the jellyfish caught only in some periods. this does not imply that an analysis of daily data might show damage due to the behaviour of the net in the case of *Rhizostoma pulmo*, whereas damage due to the large amounts of *Pelagia noctiluca* that occurs along the coasts and in the nets are mainly of a toxicologic-healt care nature to man and of a hygene-veterinary nature to the catch (Rottini Sandrini et al., 1984).

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