International Council for the Exploration of the Sea

C.M. 1976/G:6
Demersal Fish (Southern) Committee

Association between species of fishes and benthonic cephalopods caught in the "Atlor VI" cruise.

by

J. Lleonart, X. Fusté, D. Lloris, E. MacPherson and I. Olivella

INTRODUCTION

The study of interspecific associations constitutes one of the basic points in the structural analysis of an ecosystem. In the present paper, the associations between benthonic fishes and cephalopods from the Saharian platform are evaluated.

MATERIAL AND METHODS

The data are based on 50 catches from the Saharian platform carried out during Octuber of 1975 (Cruise "Atlor VI", aboard the R/V cornide de Saavedra).

Among the species taken in this manner, 50 have been selected for this study. The animals selected include the most important demersal species from this area, as well as semi-pelagic species whose ecological characteristics have dictated their inclusion (see Table 1).

A 50 x 50 data matrix was constructed using the number of individuals of each species captured in each of 50 catches. Subse-

* Instituto de Investigaciones Pesqueras. Barcelona. Spain.

quently, the data were transformed logarithmicaly (ignoring the zeros), which enabled us to use the linear correlation coefficient as an index of association (affinity).

This data matrix yields two correlation matrices. One in terms of species and another in terms of catches. Double absences (points taken as the origin) were computed in order to calculate the correlations.

Analysis of the correlation matrix

With the correlation matrix, it is posible to use various methods in order to group the variables (whether catches or species). We have used two of these methods which are explained below:

1.- This method involves taking the sums of the squares of the correlations between each variable and all of the remaining variables. The variable with the highest sum is designated as the head of the group which includes all of the variables whose correlation with the group heading exceeds a certain limit (0.2 in our case). Subsequently, the sums of the squares are recalculated without taking into account the variables that have already been included. The process continues in this fashion untill all of the posible variables have been grouped.(Margalef and Gonzalez-Bernaldez, 1969)

2.- The other method consists of classifying the pairs of variables by their correlations in the intervals 0.6-0.69, 0.7-0.79, 0.8-0.89 and 0.9-1. Using these lists and starting with the highest correlations, a graph showing the distintc intervals of affinity is plotted. In this manner, one obteins a notwork in which is possible to distinguish nuclei of variables that are linked by high correlations. At times, this presents somo difficulties since some variables can be in an intermediate position.

Both methods have their respective advantages and disadvantages.

With the first method, negative coefficients are evaluated and, therefore, repulsion between variables is significant. Nevertheless, the process of designating group heading using these variables renders the group incapable of reorganitation as it expands. Moreover, the second method only takes into account the correlations exceeding 0.6 which are more significant than the 0.2 of the previous method. The advantage of group headings is also open to discussion.

In the case of the species, a correlation matrix was also constructed elimining the calculation of doubles absences.

RESULTS AND DISCUSSION

Interspecific associations

With the first method, it is posible to group almost all of the species and the groups formed in this manner are relatively small. With the other method, the groups are larger, but there remain enough species to include. For the essential formtion of groups, we have prefered the second method with which a more general division is obteined. These groups can then further subdivided using results from the first method.

We have found that the mayority of the species under consideration can be formed into three groups, A, B and C. Group A consists of a great variety of species of Sparidae, the most characteristic of which is Diplodus annularis, which appears as the head of the group. Group B consists of fewer species although they have greater internal affinity than in the previous group, so that the group as the whole is rather isolated from the others. The most characteristic species appearing as the head of this group is Merluccius merluccius. The third group,C, with lower internal cohesion, forms a short of bridge between A and B, although it has stronger affinities with A. This group does not posses a species that is specially cha-

racteristic . Of these three groups, A and B, have been subdivided into two apiece: A_1, A_2, and B_1, B_2. In both cases, the subscript "1" designates the most typical or characteristic subgroup around which are grouped the species of the subgroup designated with subscript "2" (see Table 2).

Affinities between catches

In this case, only the second. graphical method was used (see Fig.1) with the result that the catches formed distinct groups with considerable internal affinity.

Four groups were obteined (see Fig. 2):

- Group 1.- This group is formed by 8 deep catches from the northern half of the study area.
- Group 2.- This group was quantitatively the most important (20 catches) but its internal affinities are the lowest. It includes an extensive area above the continental platform.
- Group 3.- This group is formed by 8 coastal catches. It includes very restricted coastal area situated near Cape Leven (between 24º 20' N and 25º 00' N.).
- Group 4.- This group is formed by 10 catches taken along the entire coast.

Group 1 is independent and is not specifically related with any of the others. Group 3 has affinities with groups 2 and 4.

Catch 32 is in an intermediate position between groups 2 and 3. Catches 16, 23, 24, 47 and 52, although they belong to group 2, have weak affinities with the other groups due to an unusual species composition. For example, a species of Macrorhanphosus is abundant in catches 16 and 24. Catches 3, 9 and 37 were not carried out successfully and no results were obteined. Catches 36 and 38, which are distinguished by their special characteristics, are discused in the

followin section. Catch 1 is not included in any group.

Relationships between groups of species and catches

Species group A is fundamentally characteristic of area 4 and, to a some what lesser extent, of area 3 which is shared by species group C. Area 2 is occupied by species group C, and area 1 by species of group B. The subgroups of A and B are not characteristized by particular geographic distributions.

Catches 36 and 38 (24º 22' N by 15º 39' W and 24º 12' N by 15º 42' W, respectivelly) possess some special characteristics. The abundance of smaller individuals (8-10 cm.) of certain species, specially, Spondyliosoma cantharus and Pagellus acarne, delimits a breeding area situated near an upwelling detected in a hydrographic study of the zone carried out in the course of the same cruise.

SUMMARY

In this paper are obtained the affinities between 50 benthonic species from the ATLOR VI cruise (Octuber, 1975) in the Saharian platform. To calculate affinities we used the linear correlation coefficient from the logarithm of individual numbers of each specie . From correlation matrix analysis, we have obteined three groups of species, two of them should be subdivided in two subgroup of different significate. One represents the nuclei of the group and is composed by the species between them there are the highest affinities. The other group contains species with lower affinities and represents the perifery of the first one.

We have obteined also the affinities between catches made in the cruise. From correlation matrix we have made four groups of catches with geographical sense; two of them are formed by coastal catches;one is tipical of the platform and the last is formed by deep catches.

A relation exists between group of species and group of catches. Proportions of the species of each group are distribuited in a non random manner into the differents group of catches.

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TABLE I

List of selected species

Scyliorhinus sp.
Torpedo sp.
Raja miraletus
Raja naevus
Raja undulata
Macroramphosus sp.
Merluccius merluccius
Hoplostetus sp.
Zeus faber
Capros aper
Serranus cabrilla
Pomadasys bennetti
Plectorhinchus mediterraneus
Umbrina canariensis
Mullus surmulletus
Sparus caeruleostictus
Boops boops
Dentex canariensis
Dentex gibbosus
Dentex macrophthalmus
Dentex maroccanus
Diplodus annularis
Diplodus cervinus
Diplodus vulgaris
Lithognatus mormyrus
Pagellus erythrinus
Pagellus acarne
Pagellus coupei
Puntazzo puntazzo
Spondyliosoma cantharus
Trachinus sp.
Uranoscopus scaber
Callionymus sp.
Scorpaena scrofa
Scorpaena porcus
Scorpaena notata
Trigla lucerna
Aspitrigla obscura
Lepidotrigla cavillone
Trigloporus lastoviza
Arnoglossus laterna
Soleidae miscellanea
Buglossidium luteum
Monochirus hispidus
Lophius piscatorius
Chaunax pictus
Sepia officinalis
Loligo sp.
Alloteuthis sp.
Octopus vulgaris

TABLE II

Groups of species

A_1

Diplodus annularis
Lithognatus mormyrus
Dentex canariensis
Dentex gibbosus
Sparus caeruleostictus
Puntazzo puntazzo
Plectorhinchus mediterraneus
Pomadasys bennetti
Mullus surmulletus
Raja undulata

A_2

Umbrina canariensis
Pagellus acarne
Pagellus coupei
Spondyliosoma cantharus
Boops boops
Soleidae miscellanea
Monochirus hispidus
Trigla lucerna
Torpedo sp.
Sepia officinalis
Loligo sp.
Octopus vulgaris

B_1

Merluccius merluccius
Capros aper
Lepidotrigla cavillone
Chaunax pictus
Macroramphosus sp.
Raja naevus
Lophius piscatorius

B_2

Scyliorhinus canicula
Scorpaena scrofa
Raja miraletus
Zeus faber
Dentex macrophthalmus

C

Pagellus erythrinus
Dentex maroccanus
Trigloporus lastoviza
Aspitrigla obscura
Uranoscopus scaber
Trachinus sp.
Serranus cabrilla
Buglossidium luteum
Alloteuthis sp.
Scorpaena notata
Arnoglossus laterna
Callionymus lyra

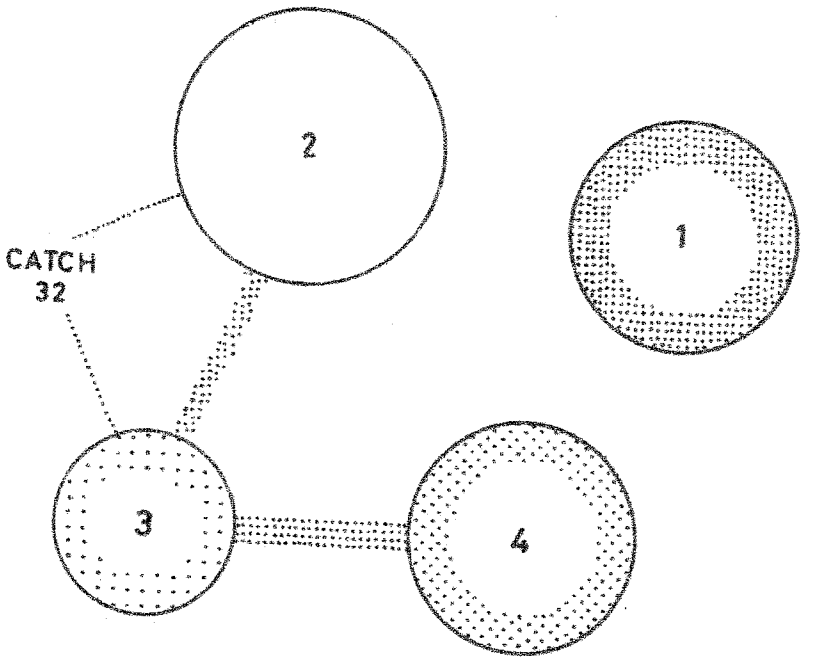

fig.1

General graph of affinities between groups of catches.

The size depends on the number of catches in each group.

The density of points inside the rings is proportional to the affinity between the catches of the group.

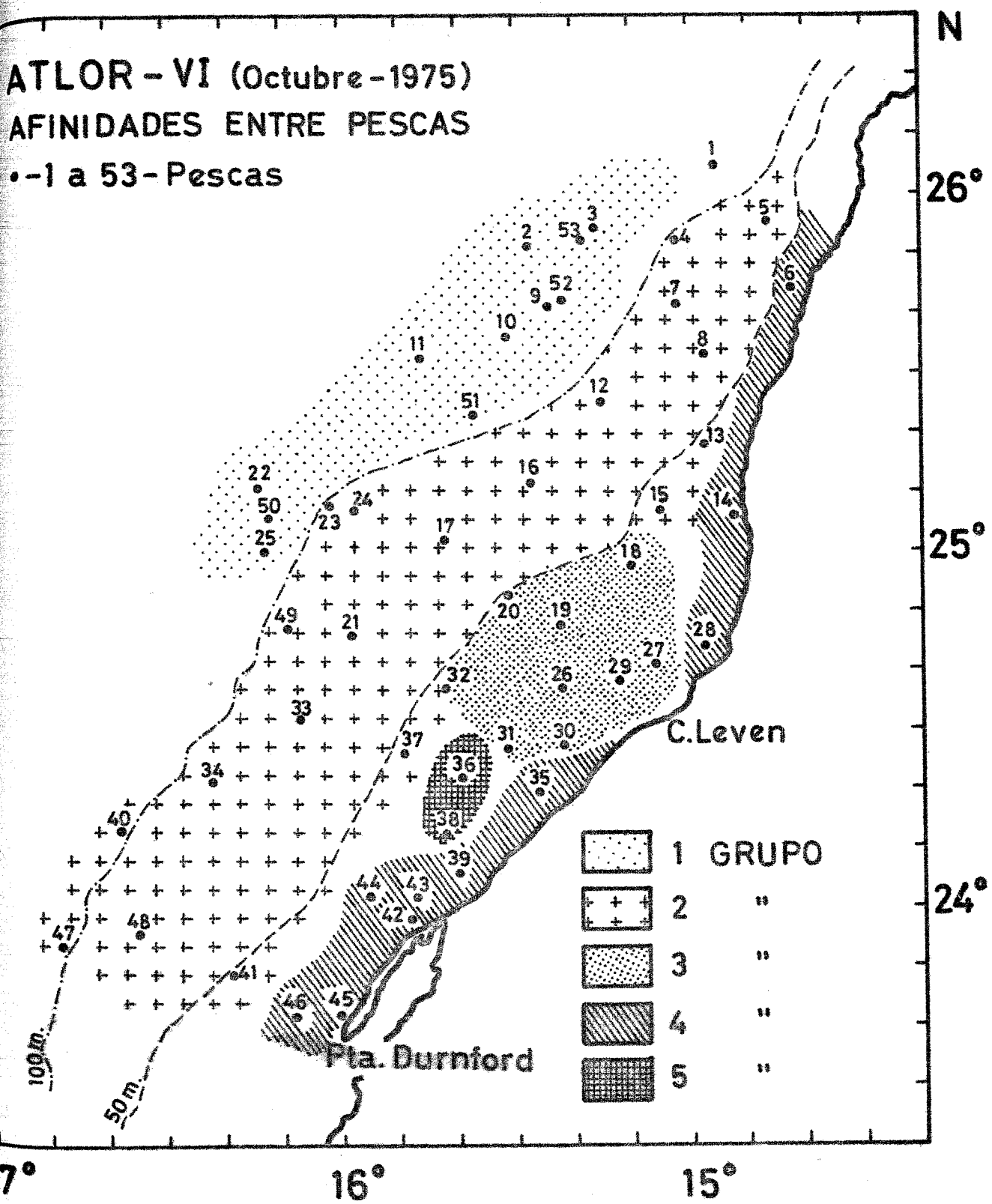

Fig. 2.- Map of affinities between catches. Numbers 1 to 53 indicate the catches.