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DISTRIBUTIONAL PATTERNS OF ARGENTINE MARINE FISHES*

RESUMEN

Tipos de distribución en peces marinos de la Argentina

Durante un crucero de investigación pesquera llevado a cabo por el B/I "Shinkai Maru" (agosto-setiembre, 1978) los autores identificaron 86 especies de peces capturados en 52 estaciones en una amplia zona del Mar Argentino. Los datos fueron analizados con coeficientes de similitud, "cluster analysis" y análisis de la coordenada principal. Para todos los métodos utilizados se obtuvieron coeficientes de correlación cofenética muy elevados, lo que indica un grado de distorsión muy bajo en los fenogramas y el diagrama, es decir, estos son representativos de los datos. Se identificaron 6 grupos principales de especies (asociaciones): una fauna de amplia distribución, una fauna magallánica principal, un grupo de especies estrictamente bonaerenses, una fauna mixta de la plataforma interna y dos grupos de aguas profundas. Estas asociaciones tienen una composición específica definida y ocupan áreas con rangos particulares de temperatura y profundidad. Se indica la amplitud de estos parámetros para cada especie y la biomasa de las especies más abundantes de cada asociación. Los grupos definidos tienen un significado ecológico y se interpretan en términos del esquema zoogeográfico usado en el área estudiada.

INTRODUCTION

During the 5th cruise of the R/V "Shinkai Maru" in the Argentine Sea the authors made a detailed list of the faunistic composition from each of the trawling stations. Menni *et al.* (1981) present this annotated list of the species of fishes collected during the cruise with a detailed analysis of sixteen species belonging to twelve families, giving the complete argentine references, localization, biomass and other biological data. The aim of this paper is to analyse the presence of recurrent groups of species in the area, using association coefficients, cluster analysis and principal coordinate analysis, and to compare the results obtained with those of a former work made with similar techniques (Menni and Gosztonyi, 1982). This methodology allowed us to recognize groups of species characterized by areal and temporal persistence and to detail their distribution.

As the main intent of this contribution is a global account of the distributional patterns of large faunal groups, a detailed species by species analysis is not attempted. Commentaries are restricted to a short account or to bibliographic references. Data on the sea fishes of Argentina has recently reached such an extent that its analysis or even its enumeration would exceed the limits of this work.

The authors are deeply grateful to Dr. J. V. Crisci for the provision of the computation program and for his help in its management and to Dr. Alicia Escalante and the reviewer J. E. Olney for their help with the english text.

MATERIAL

Data used in this study were obtained by the authors during the 5th cruise performed by the R/V "Shinkai Maru" in the Argentine Sea in August-September 1978. Fifty two trawling stations were made in the area roughly between 39-52° S and 55-69° W. Vessel characteristics, oceanographical data and the purpose of the Argentine-Japanese Project are available in the Preliminary Report for the 5th cruise of R/V "Shinkai Maru" and in Cousseau *et al.* (1979). Other reports can be seen in Angelescu (1981).

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The systematic composition of each station was observed and checked by the authors against a similar list prepared by Dr. T. Inada (JAMARC). Some interesting deep sea fishes were kept in the ichthyological collection of the Museo de La Plata, Argentina, under the following numbers: *Bathylagus sp. 24-IV-80-1; Borostomias sp. 24-IV-80-2; Stomias sp. 24-IV80-3; Lepidion ensiferus 21-IV-80-1; Ophthalmolycus stehmanni 25-IV-80-1* and *Piedrabuenia ringueleti 25-IV-80-2.* No other material was kept.

In relation to previously managed data (Menni and Gosztonyi, *1982),* the captures from the "Shinkai Maru" provided *16.22* more species including about ten northern species not available before. Distribution of the Heterosomata are herein further detailed, as several species were identified.

METHODOLOGY

Detailed methodology on computational procedures may be found in Menni and Gosztonyi *(1982),* as well as comments on the criteria employed in the choice and utilization of association coefficients used in this paper.

Besides a large literature quoted by Menni and Gosztonyi *(1982),* we will mention here the following papers in which similar techniques or scopes are utilized: Horn and Allen *(1978)* on zoogeographical divisions in California marine fishes, Campos *(1979)* on taxonomy of Galaxiidae, Buzas and Culver *(1980)* on benthic foraminifera and Greenfield and Johnson *(1981)* on littoral fishes from Belize.

A Basic Data Matrix of *68* species by *52* stations was constructed considering the species captured and trawling stations made by the R/V "Shinkai Maru".This matrix was analysed by three numerical methods. The first and the third methods considering species as QTU's and their presence or absence in each station as characters (R mode). The second one considering the stations as OTU's and the species' presences or absences as attributes (Q mode).
The first and the second methods include the following steps:

A - obtaining a similarity coefficient between each pair of OTU's from the Basic Data Matrix; the similarity coefficient used is that of Jaccard *(1901, fide* Hubálek, *1982).*

B - linking (clustering) the OTU's together in a phenogram on the basis of the similarity coefficients obtained in A; the phenogram calculation was made by the "unweighted pair group method" using arithmetic averages (UPGMA, Sokal and Michener, *1958)* (figs. *2* and *3).*
C - obtaining a measure of the distortion between the coefficients obtained in A and the phenograms obtained in B; the Cophenetic correlation coefficient (Sokal and Rohlf, *1962)* was computed as a measure of distortion.

In the third method another similarity matrix was calculated using the Taxonomic distance coefficient (Taxonomic distance, Average euclidean distance, Sneath and Sokal, *1973).* The resulting matrix was used as the input of the Principal coordinate analysis technique (Gower, *1966).* The result. of this analysis is represented in a bidimensional diagram (fig. 4) showing the OTU's (species) relative positions within the space of the factors. To evaluate the distortion of the graphic, the Euclidean distances among the OTU's in the space of factors were calculated and the resulting matrix was compared with the original Taxonomic distance matrix using the cophenetic correlation coefficient.

The computational work was done on the IBM *4331* computer owned by the CESPI (Universidad Nacional de La Plata) using NT-SYS System of Multivariate Computer Program developed by Rohlf *et al. (1971).*

ANALYSIS OF THE AREAS

The phenogram (Q mode) obtained considering the stations as OTU's and the species presences and absences as attributes may be analysed as follows: six main groups of stations are obtained: A, B, C, D, E and F. Spatial distribution of stations belonging to Inch group can be seen in figure 1. Each group of stations is called an "area" (figs. 1 and *2).*
Menni (Ms.) suggests that biomass and number of sharks in the Argentine Sea show a, peculiar pattern of distribution along isopleths roughly parallels to the shore line, each one with particular temperature and depth. A similar pattern may be discerned in the present arrangement of stations, with areas B and C resembling ecotonal zones among different faunas (see below).

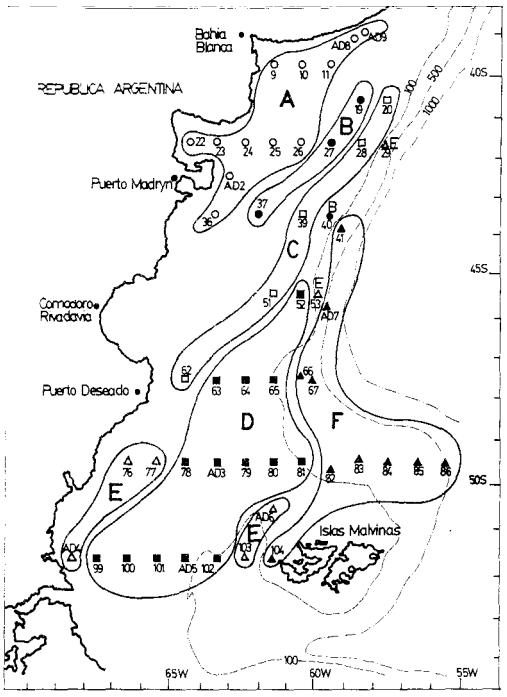


Fig. 1.- "Shinkai Maru" stations grouped by areas resulting from UPGMA cluster analysis of Jaccard matrix,

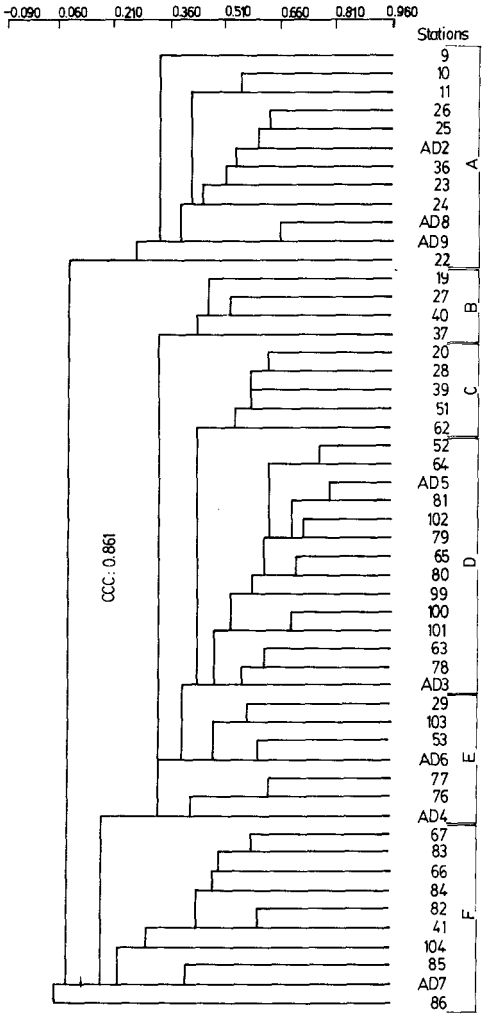


Fig. 2.- Phenogram (Q mode) of *52 OTU's* (stations) resulting from the UPGMA cluster analysis of the OTU x OTU Jaccard matrix. CCC: cophenetic correlation coefficient. ("Shinkai Maru" data).

This arrangement, partially hidden by the random disposition of the stations in Menni and Gosztonyi (1982), appears more clearly when the stations are placed in perpendicular transects to the coast.

As shown in table 1, areas A and F are clearly different from the others, both in terms of temperature and depth (Station 22, with 11°C temperature and 181 m depth is treated parenthetical; considering it together with the other stations will result in a distortion of the depth ranges).

Area A has a temperature range from 8.8 to 10.5°C (x: 9.7°C) with depths between 22 to 72 (181) m (z: 64.4 m). Area F has a temperature range from 2.3 to 4.8°C (z: 3.5°C) with depths between 137 and 941 m (x: 508.9 m).

Areas B, C, D, and E do not differ among each other as areas A and F do. Their characteristics are the following ones: Area B has a temperature range from 5.0 to 8.0°C (x: 6.7°C) and a depth range from 84 to 105 m (x: 92,5 m); area C 5.0 to 6.0°C (x: 5.8°C) and 82 to 115 m (x: 103 m); area D 4.5 to 6.0°C (x: 5.2°C) and 104 to 179 m (z: 139.1 m); area E 3.5 to 5.5°C (x: 4.8°C) and 51 to 210 m (x: 145.5 m).

It must be pointed out that the arrangement of the stations is made considering only the species presence and absence as attributes. Physical parameters show consistent values (table 1) and similar geographic areas have similar parameter values in the vessels "Orient Maru I", "Kaiyo Maru" and "Shinkai Maru".

TABLE 1.- Depths and bottom temperatures for "Shinkai Maru" stations grouped by areas (meters and °C)

St.	A Depth	Temp.	St.	B Depth	Temp.	St.	C Depth	Temp.
9	22	8.8	19	89	6.8	20	100	6.0
10	42	9.6	27	84	7.3	28	82	6.0
11	58	9.6	40	105	5.0	39	105	5.0
26	67	9.5	37	92	8.0	51	113	6.0
25	55	9.3				62	115	6.0
AD 2	67	10.5						
36	72	8.7						
23	52	10.5						
24	51	9.5						
AD 8	51	9.5						
AD 9	55	10.0						
22	181	11.0						
St.	D Depth	Temp.	St.	E Depth	Temp.	St.	F Depth	Temp.
52	115	5.8	29	171	4.5	67	604	3.3
64	122	5.5	103	210	5.0	83	435	3.3
AD 5	157	4.8	53	200	5.4	66	505	3.8
81	178	4.8	AD6	177	4.8	84	344	4.3
102	179	5.3	77	112	5.0	82	284	4.0
79	153	5.5	76	98	5.5	41	382	4.3
65	145	5.0	AD4	51	3.5	104	137	4.8
80	163	5.0				85	642	2.5
99	104	4.5				AD7	815	2.8
100	116	5.0				86	941	2.3
101	136	5.0						
63	119	6.0						
78	121	5.7						
AD 3	140	6.0						

SPECIES GROUPS ANALYSIS

Cluster analysis (R mode) (fig. 3)) of the Basic Data Matrix permits the identification of eight groups of species, each labelled by Roman numeral. Menni and Gosztonyi (1982), using "Orient Maru I" and "Kaiyo Maru" data, found similar groups and characterized them in "Bonaerensean" or "Magellanic" terms. This zoogeographical reference system has been treated in detail by many authors and is based upon the known zoogeographical (and hydrological) conditions of the area (see a recent account in Menni, 1981).

It seems, from the quoted paper (Menni and Gosztonyi, 1982) and the present study, that some ecological fish groups underlie that scheme and fish associations may be clearly derived from the present cluster analysis.

Temperature and depth ranges are displayed in table 3, where species are listed in the same order as they appear in the phenogram. Temperature ranges show the high correlation between the obtained groups and the thermic ranges of their species.

Boschi *et al.* (1981) have indicated five ecosystems or "ecological unities" in the Argentine Sea, pointing out that "they pretend to have a reach that differs from that of the biogeographical areas previously established for the region".

The results obtained from the Principal coordinate analysis largely agree with those derived from cluster analysis. The OTU's species disposition in the bidimensional diagram corresponding to the first two components suggest the following observations (fig. *4):*

1) The space in the diagram seems to be proportional to the geographic space occupied by each faunistic group (and in certain sense, to the ecological space; see Margalef and Estrada, 1980). This is probably due to the fact that the

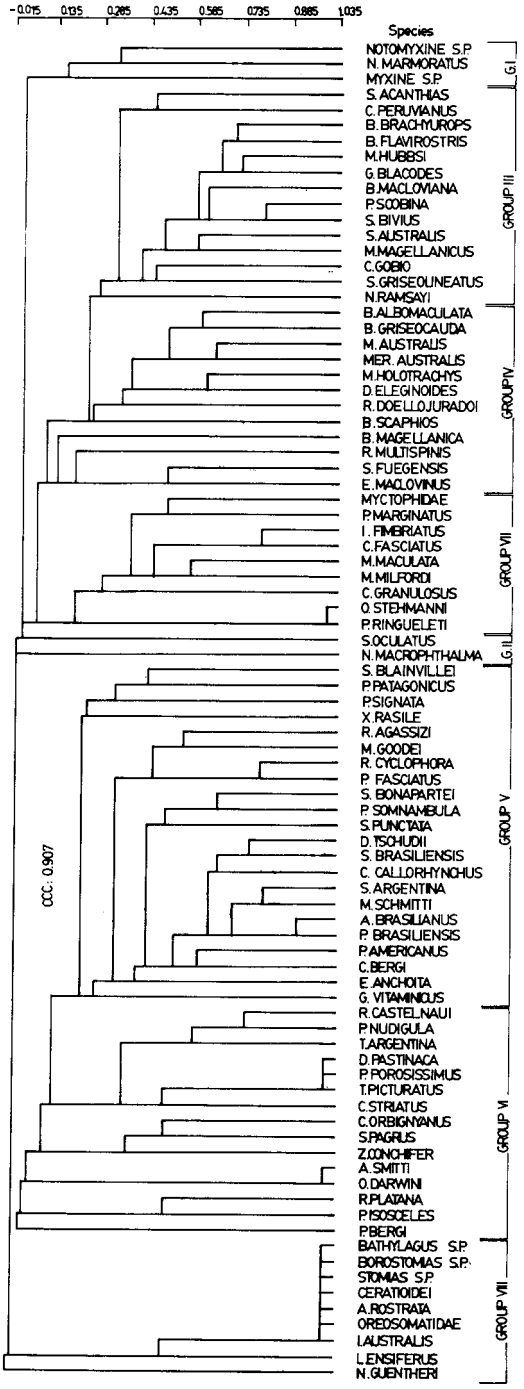


Fig. 3.- Phenogram (R mode) of 86 OTU's (species) resulting from the UPGMA cluster analysis of the OTU x OTU Jaccard matrix. CCC: cophenetic correlation coefficient. ("Shinkai Maru" data).

attributes used were the presence and absence of each species at each station.

2) Some of the resulting species groups are coincident with those obtained through cluster analysis (fig. 3).

3) Groups clearly defined in the diagram are the following: Group III (Wide distribution fauna), Group IV (Main Magellanic fauna), Group VI (Strictly Bonaerensean fauna) and Group V (Inner shelf mixed fauna).

4) Species belonging to deep water groups and others scarcely captured appear together.

Composition and characteristics of groups of species are treated below.

Groups I and I I: Rare species

Three infrequent species are included in the first of these groups: *Notomyxine sp., Neophrynichthys marmoratus* and *Myxine sp.* The myxinids were captured in Magellanic waters at the stations AD 3 (area D) and AD 4 (area E) and *N. marmoratus* at the stations AD 3 and 78 (area D) and AD 4. Systematics and biology of Myxinidae from Argentina have been treated by Nani and Gneri (1951). Eggs of Argentina myxinids are eaten by *Halaelurus bivius, a* common shark in the Magellanic region (Menni *et al.,* 1979). Nelson (1977) gives a full account of the taxonomy of *N. marmoratus.* In addition, distribution of this species in Chile has been described by Pequeño (1981).

Group II is composed of only two species, *Sebastes oculatus* and *Notothenia macrophthalma,* with a very low association coefficient. Within these groups, S. *oculatus* reaches in certain areas a catch deserving commercial interest (Preliminary Report, 1978). Its biomass is, however, considerably lower than those of dominant species of other groups (fig. 5).

Group III: Widely distributed species

Fourteen species form the Group III (table 2 and below) which is largely similar to Group IV of Menni and Gosztonyi (1982). An asterisk marks the six species considered by the abovementioned authors as widely distributed.

Squalus acanthias
*Congiopodus peruvianus**
*Bathyraja brachyurops**
*Raja flavirostris**

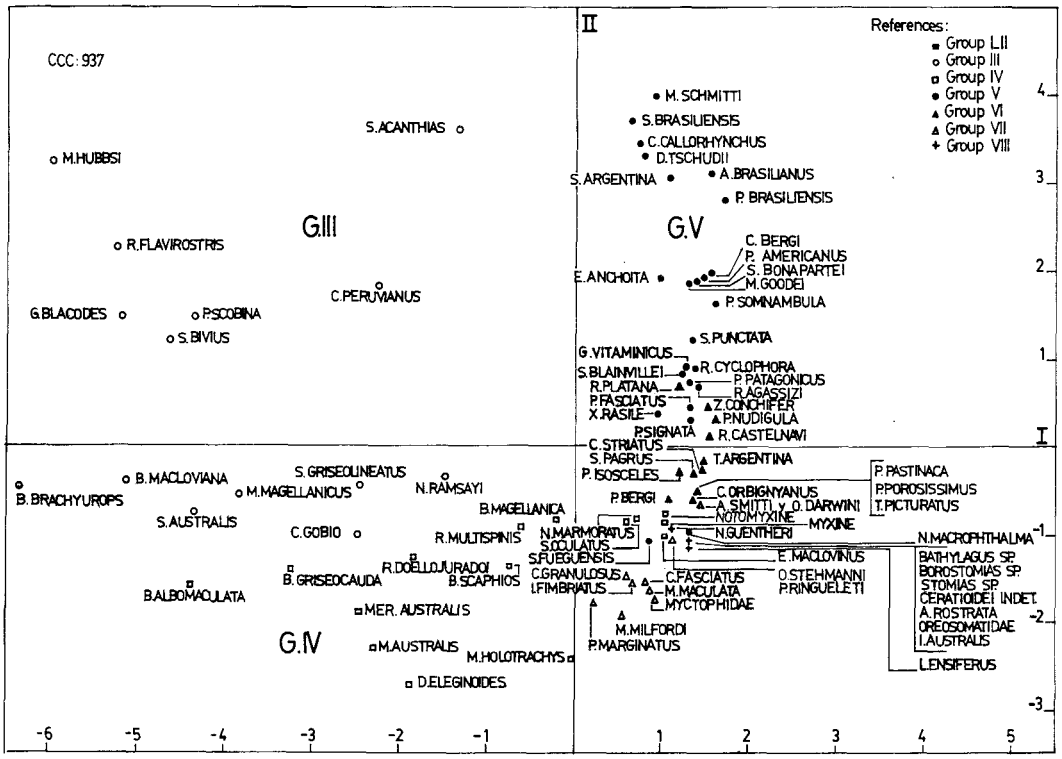


Fig. 4.- Principal coordinate analysis. Projection of the OTU's (species) on the two first factors. Roman numerals refer to groups of species.

*Merluccius hubbsi Genypterus blacodes Bathyraja macloviana Psammobatis scobina Halaelurus bivius * Salilota australis Macruronus magellanicus Co ttoperca gobio Schedophilus griseolineatus Notothenia ramsayi*

As shown in tabla *2,* species belonging to Group III are found in all or nearly all areas A, B, C, D, E and F. Menni and Gosztonyi *(1982)* point out that species with the widest distribution in the studied area, usually have a total range exceeding that area. For example, S. *acanthias is* a cosmopolitan species, though some population differences have been mentioned (Ketchen, *1972;* Menni, Ms). The wide distribution of *C. peruvianus, B. brachyurnps, H. bivius,* and *M. hubbsi Is* considered by Menni and Gosztonyi *(1982)* and Navarro and Pequeño *(1979)* review *C. peruvianus* and its southern pattern of distribution.

Table *2* shows that several species from this group *(B. brachiurops, R. flavirostris, M. hubbsi, G. b/acodes, B. macloviana. S. australis, M. magellanicus* and, to a lesser degree, C. *gobbio* and *N. ramsayi)* may be considered as largely eurytopic (see also Krefft, *1968).* Because of its preeminence in the Argentine fishing industry, *M. Hubbsi is* a well known species. A detailed compilation of its biology was presented by Angelescu *et a/. (1958)* and considerable research effort has been devoted to this species in subsequent years.

A few species are restricted to colder zones, including C. *gobio, S. Griseo-lineatus, N. ramsayi* and *B. macloviana.* In spite of this, C. *gobio* has been found far as north as the English Bank in the mouth of the Rio de la Plata. For complete references and biological data

TABLE 2.- "Shinkai Maru". Groups of species related to areas (groups of stations). Species in each group listed according to the UPGMA cluster analysis from Jaccard matrix (fig. 3). The first column of figures are the number of stations occupied by a given species within each area. Second column, the number of stations occupied by a given species in the area as a percentage of the total number of stations within the same.

	A		B		C		D		E		F
GROUP I											
Notomyxine sp.						1	100.0%				
N. marmoratus						2	66.6%	1	33.3%		
Myxine sp.								1	100.0%		
GROUP 11											
S. oculatus						1	100.0%				
N. macrophthalma											100.0%
GROUP III											
S. acanthias	8	38.0%	4	19.0%	5	23.8%	2	9.5%	2	9.5%	
C. peruvianus	3	16.6%	4	22.2%	4	22.3%	7	38.8%			
8. brachyurops			4	11.7%	5	14.7%	14	41.1%	5	14.7%	6 17.6%
R. flavirostris	6	17.6%	4	11.7%	5	14.7%	13	38.2%	4	11.7%	2 5.8%
M. hubbsi	9	21.9%	4	9.7%	5	12.1%	14	34.1%	6	14.6%	3 7.3%
G, blacodes	4	12.9%	4	12.9%	5	16.1%	12	38.7%	5	16.1%	1 3.2%
8. macloviana			3	10.7%	2	7.1%	14	50.0%	6	21.4%	3 10.7%
P. scobina	2	7.6%	3	11.5%	5	19.2%	13	50.0%	3	11.5%	
H. bivius	1	3.8%	4	15.3%	5	19.2%	13	50.0%	3	11.5%	
S. australes	2	7.6%	1	3.8%			14	53.8%	5	19.2%	4 15.3%
M. magellanicus	2	8.6%			2	8.6%	13	56.5%	2	8.6%	4 17.3%
C. gobio					1	6.6%	9	60.0%	4	26.6%	1 6.6%
S. griseolineatus					3	21.4%	11	78.5%			
N. ramsayi			1	7.6%	3	23.0%	5	38.4%	3	23.0%	1 7.6%
GROUP IV											
8. albomaculata			2	7.6%	3	11.5%	10	38.4%	5	19.2%	6 23.0%
8. griseocauda			1	4.5%	5	22.7%	6	27.2%	4	18.1%	6 27.2%
M. australes					1	5.8%	6	35.2%	3	17.6%	7 41.1%
Mer. australis					1	6.2%	6	37.5%	3	18.7%	6 37.5%
M. holotrachys							1	9.0%			10 90.9%
D. eleginoides							6	33.3%	2	11.1%	10 55.5%
R. doellojuradoi			2	13.3%	2	13.3%	3	20.0%	3	20.0%	5 33.3%
8. scaphiops					1	11,1%	4	44,4%	2	22.2%	2 22.2%
8. magellanica							3	42.8%	3	42.8%	1 14.2%
8. multispinis					3	37.5%	2	25.0%	1	12.5%	2 25.0%
S. fuegensis									1	50.0%	1 50.0%
E. maclovinus											1 100.0%
GROUP V											
S. blainvillei	4	80.0%	1	20.0%							
P. patagonicus	4	80.0%	1	20.0%							
P. signata	3	100.0%									
X. rasile	4	80.0%	1	20.0%							
R. agassizi	4	80.0%	1	20.0%							
M. goodei	8	88.8%	1	11.1%							
R. cyclophora	4	80.0%	1	20.0%							
P. fasciatus	3	75.0%	1	25.0%							
S. bonapartei	8	100.0%									
P. somnambula	6	100.0%									
S. punctata	6	100.0%									
D. tschudü	10	71.4%	2	14.2%	1	7.1%	1	7.1%			
S. brasiliensis	11	68.7%	2	12.5%	1	6.2%	2	12.5%			
C. callorhynchus	10	66.6%	2	13.3%	3	20.0%					
S. argentina	10	76.9%	3	23.0 %							
M. schmitti	2	75.0%	4	25.0%							

TABLE 2.- (cont.)

	A		B		C		D		E		F	
A. brasilianus	11	91.6%	1	8.3%								
P. brasiliensis	11	100.0%										
P. americanus	7	87.5%	1	12.5%								
C. bergi	8	100.0%										
E. anchoita	7	77.7%	1	11.1%	1	11.1%						
G, vitaminicus	5	83.3%	1	16.6%								
GROUP VI												
R. caste/naui	3	100.0%										
P. nudigula	4	100.0%										
T. argentina	2	100.0%										
C. pastinaca	1	100.0%										
P. porosissimus	1	100.0%										
T. picturatus	1	100.0%										
C striates	2	100.0%										
C orbignyanus	1	100.0%										
S. pagrus	2	100.0%										
Z. conchifer	4	100.0%										
A. smitti	1	100.0%										
C. darwini	1	100.0%										
R. platana	1	100.0%										
P, isosceles	2	100.0%										
P. bergi			1	100.0%								
GROUP VII												
Myctoph i dae											5	100.0%
P. marginatus							2	28.5%			5	71.4%
. fimbriatus									1	20.0%	4	80.0%
C. fasciatus											4	100.0%
M. maculata											4	100.0%
M. milfordi							1	14.2%			6	85.7%
C. granulosus							1	16.6%	1	16.6%	4	66.6%
C. stehmanni											1	100.0%
P. ringueleti											1	100.0%
GROUP VIII												
Bath ylagus sp.											1	100.0%
Borostomias sp.											1	100.0%
Stomias sp.											1	100.0%
Ceratioidei											1	100.0%
Antimora rostrata											1	100.0%
Oreosomatidae											1	100.0%
I. australis											1	100.0%
.. ensiferus											1	100.0%
N. guantheri									1	100.0%		

on the two former species and others collected by the "Shinkai Maru" see Mennietal. (1981); and on S. *griseolineatus* see that paper, Menni and López (1979) and McDowall (1980).

Group IV: The main Magellanic fauna

Six species from this group have been included in a "Magellanic fauna" by Menni and Gosztonyi (1982).

Bathyraja albomaculata *
B. griseocauda *
Micromesistius australis
Raja doellojuradoi
Bathyraja scaphiops

B. magellanica *
Merluccius australis
Macrourus holotrackys
Dissostichus eleginoides *
Raja multispinis Sprattus
fuegensis E/eginops
maclovinus

Merluccius australis is clearly a Magellanic form, and it is found in areas C, D, E and F, but only in a southern station of area C, south from Cabo Dos Bahías (45° S). Recent cruises from several vessels, i.e. "Prof. Siedlecki", "Walther Herwig", "Orient Maru I" and "Shinkai Maru" have provided a large amount of information on this species, largely overlapped in the years before. On recent account of its biology see Cotrina (1981); some systematic considerations are given by Gosztonyi (1981).
Several skates, *R. doe//ojuradoi, B. scaphiops* and *B. mu/tispinis* are typically Magellanic (Norman, 1937). They have been so considered in the analysis based on "Kaiyo Maru" data (Menni and Gosztonyi, 1982). *Raja doellojuradoi* reaches more northerly stations than do the other skates of this group.
S. fuegensis and *E. maclovinus* were captured in stations 103 and 104 and 104 respectively, near the west shore of the Malvinas Islands. S. *fuegensis* is probably differentiated into a Malvinas and a continental populations as shown by Cousseau and Gru (1981). Though *E. maclovinus* was not obtained in coastal stations, it is a common species around Ria Deseado (47°40' S, Gosztonyi, pers. com.).

Group V: Inner shelf mixed fauna
Eight species from this group agree with the so called "Inner shelf mixed fauna" by Menni and Gosztonyi (1982). This peculiar fauna is clearly recognizable in any faunistic report (see for example Cotrina *et al.,* 1976, and Cousseau (1978) and includes several species with a large biomass and consequent commercial importance (fig. 5). The zoogeographical character of the species is noted in the list below wherein (B) means Bonaerensean species, (LSRB) Long southern range Bonaerensean species, (M) Magellanic species and (C) Cosmopolitan species.

*Squalus blain villei (C)**
Paralichthyspatagonicus (M)
Parona signata (LSRB)
Xistreurys rasile (B)
Raja agassizi (B)
Myllobatisgoodei (B) Discopyge
*tschudü (M)**
Stromateusbrasiliensis (LS RB)
Callorhynchus callorhynchus (M)
Squatina argentina (B) Mustelus
schmitti (B) A can thistius
brasilianus (B) Raja cyclophora*
(B) Pinguipes fasciatus (B) Symp
*terygia bonapartei (B) * Pinguipes*
somnambula (M) Seriolella
punctata (M) Percophis
brasiliensis (B) Polyprion
americanus (C) Cheilodactylus*
bergi (B) Engraulisanchoita
(LSRB) *Galeorhinus vitaminicus*
*(B)**

S. brasiliensis has been assigned to a wide distributional group by Menni and Gosztonyi (1982) and is associated here with the large number of species belonging to Group V. The species was found in areas A, B, C, and D, but area A presented the greatest percent occurrence (68.7%). The species differs from the widely distributed Magellanic forms.
C. callorhynchus is associated to S. *brasilien*sis and to *D. tschudü.* The formed subgroup presents a wider distribution than the others. *E. anchoita* also presents a wide distribution within the group, as expected from its biology (Brandhorst and Castello, 1971).
Information on distribution, abundance and biology of several species forming this association are available in Cotrina *et al.* (1976), Cousseau (1978) and Menni and López (1979).

Group VI:Strictly Bonaerensean fauna
This group includes fifteen species only found in stations belonging to area A with one exception, that of *Psammobatis bergi* found in a group B' station.

Raja castelnaui Prionotus
nudigula Triathalassothia
argentina Dasyatis
pastinaca Porichthys
porosissimus Trachurus cf.
picturatus Cynoscion
striatus Conger
orbignyanus Pagrus pagrus *

Zenopsis conchifer
A ustroatherina smitti
On copterus darwini
Raja platana
Paralichthys isosceles
Psammobatis bergi

All the species of this group are currently found in warm temperate waters and zoogeographically considered as belonging to the Bonaerensean District in the sense of López (1963, 1964) (See also Boschi, 1979 and Menni, 1981; another references in Menni and Gosztonyi, 1982). Group VI does not include any Magellanic species. Three species, *R. castelnaui, P. nudigula* and P. *pagrus* are found in Group I from the "Orient Maru I" (Menni and Gosztonyi, 1982). There are some Bonaerensean species which can support a wide range of lower temperatures; these are found also in area B (till 8°C) mixed with Magellanic cold temperate water elements in Group V (see above).

Some miscellaneous papers have been published on species from Group VI: Menni and Miquelarena (1976) on *P. porosissimus* and *T. argentina,* Refi (1975) on *D. pastinaca, Cous*seau (1967) on *Trachurus cf. picturatus* and Sadowsky and Menni (1974) on *R. platana.*

Deep water groups

Deep water species composed two species groups. The first group includes species found primarily in area F but also in areas D and/or E. The second group includes species which were only found in area F, corresponding to waters over the continental slope (temperatures and depths in table 1).

Group VII
This group includes a mesopelagic family and eight species with benthic or demersal '--bits:

Myctophidae
Physiculus marginatus
Lluocoetes fimbriatus
Coelorhynchus fasciatus
Mancopsetta maculata
M. milfordi
Cottunculus granulosus
Ophthalmolycus stehmanni
Piedrabuenia ringueleti

Ecological and taxonomic data on O. *stehmanni* and *P. ringueleti* are given by Gosztonyi (1981) and Menni *et al.* (1981) who also consider C. *fasciatus.*

Four species from this group are found outside the area *F: P. marginatus, a* rare species (see Bellisio *et al.,* 1979) found in area D; M. *milfordi* also found in that area and *C. granulosus* which was, found in areas D and E. On the distribution of /. *fimbriatus* see Gosztonyi (1977, 1981) and Menni and Gosztonyi (1982).

From a zoogeographical point of view, all these species are Magellanic.

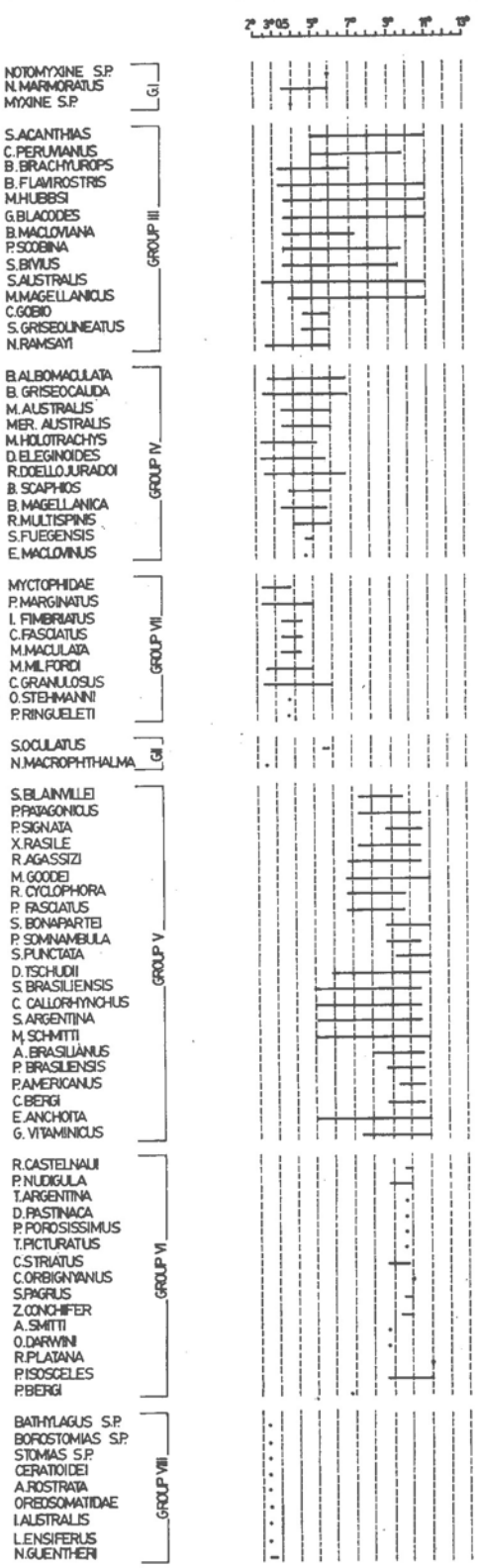
Several species of the midwater fish family Myctophidae were found in five stations from area F, all captured during the retrieval of the net. The family includes a large number of species in the neighbouring zone, recently treated by Hulley (1981).

Group VIII
This second group of deep water species is formed by nine entities, most of which were found exclusively in area F or in area E (only *Notothenia guentheri).* In the list below asteriks mark species collected in a similar environment (around 500 fathoms depth) by the R/V "Kaiyo Maru" (see Menni and Gosztonyi, 1982).

Bathylagus sp. *
Borostomias sp. *
Stomias sp. Ceratioidei
indet. *Antimora*
*rostrata**
Oreosomatidae indet.*
Icichthys australis
*Lepidion ensiferus** *No*
tothenia guentheri

These haulings include demersal fish, as *A. rostrata, L. ensiferus,* Oreosomatidae *indet.* and *N. Guentheri;* abyssal fish as Ceratioidei *indet.* and midwater fish as *Bathylagus sp., Borostomias sp.* and *Stomias sp.* The habits of *Icichthys australis* (or *Pseudoicichthys a.)* have been subjected to some discussion (see Haedrich, 1966; Krefft, 1969; Parin and Permitin, 1969 and Menni *et al.,* 1981). In spite of the diversity of life styles, this association of species has been consistently observed (Menni and Gosztonyi, 1982; Menni *et al.,* 1981).

TABLE 3.– Temperature and depth ranges for each species ("Shinkai Maru" data). Species listed according phenogram.



DISCUSSION

Before referring to general conclusions, it must be pointed out that high values of the cophenetic correlation coefficient were obtained both for cluster analysis and for Principal coordinate analysis (0.907 for R mode, 0.861 for Q mode and 0.937 for PCA). These values indicate a very small amount of distortion in the phenograms and diagram which are considered representative of the data. Menni and Gosztonyi (1982) suggest this is due to sampling efficiency. In the Principal coordinate analysis, 50.36% of the variation is represented in the two first factors: 32.37% in the first and 17.99% in the second. Furthermore, groups resulting from the employed methodology may be interpreted in close agreement with the current knowledge of the biology, distribution and ecology of the species. Many interesting associations are also displayed.

As noted by Krefft (1968) and Menni (1981), the classic division in a Bonaerensean and a Magellanic faunas is zoogeographically convenient and extremely consistent. The assignment of a given species to any of these divisions is very informative. Within these faunas, lesser order unities (Groups = associations) can be identified. Groups here obtained support that scheme, but imply a somewhat different ecological reference (a similar consideration is supported by Boschi *et al.,* 1981, who suggest the ocurrence of other taxa groups).

Groups 411 and IV, for example, show that the Magellanic fauna *sensu latu* includes at least two assemblages with different ecological requirements (see table 3). *M. holotrachys* seems to be the species with more restricted ecological range.

Distribution of skates provides a clear view of how several species have wide or restricted patterns of distribution in a given family. As Menni and Gosztonyi (1982), Menni (1973) and Menni *et al.* (1981) have shown, *B. brachyurops* and *R. flavirostris* are considered the skates with the widest distributional range, reaching up to Brazil in the north, and being also found in Chile (Norman, 1937). Otherwise *B. magellanica* appears only in six stations with restricted parameters.

Longhurst (1969) has pointed out that the fishes from the Gulf of Guinea have been arranged in clearly equivalent groups of species by different authors. Groups emerging from the analysis of species collected by the "Orient Maru I", "Kaiyo Maru" and "Shinkai Maru" show evident similarities. As indicated by Menni and Gosztonyi (1982), this concordance is supported by data obtained by several authors with other purposes. Thus, maps of distribution and abundance presented by Cotrina *et al* (1976) and Cousseau (1978) demonstrate that-groups (or at least most of their species) remain in a definite area during considerably large periods of time. The composition and "habitat" (area, temperature and depth) of these groups have been verified with data from three different cruises.

From the preceding analysis, it can be seen that groups of species with a consistent specific composition can be identified. It is interesting to point out that in four of these groups, the most abundant species show a regular distribution of their biomass, displaying the presence of "dominant" species (figure 5). These species are obviously subjected to commercial fishing in the area. They are C. *peruvianus, M. magellanicus, S. australis, G. blacodes* and *M. hubbsi* in Group III; *Micromesistius australis, Merluccius australis, D. eleginoides* and *M. holotrachys* in Group *IV; P. brasiliensis, C. callorhynchus, P. fasciatus, C. bergi, S. brasiliensis* and *A. brasilianus* in Group V; and S. *oculatus* in Group II.

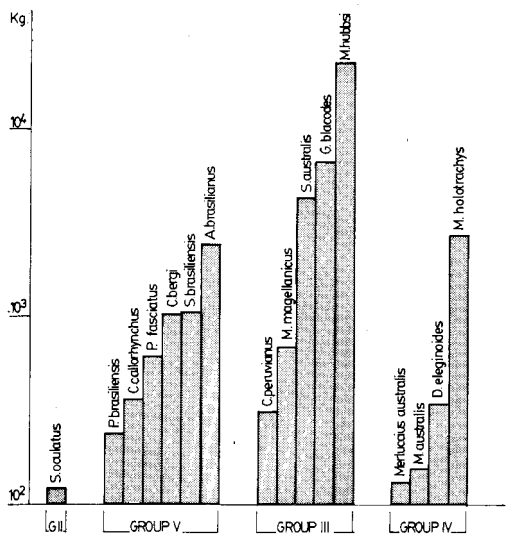


Fig. 5.- Biomass of the most abundant species in each group (Data from Y. Matsumiya *in* the Preliminary Report, 1978).

The considered associations are characterized by their specific composition and a temperature range, a depth range, or both. In a broad sense, species in Group III and V seem to be eurythermic (table 3) though this condition is more noticeable in Group III. Species from Group IV may be characterized as cold temperate stenothermic. Species from Group V I are stenothermic in warm temperate waters. Temperature range in Group VII are even more restricted than in Group IV. For Group VIII only a very restricted range in cold water can be done as the species were sampled in a pair of stations.

Some interesting patterns are also revealed by depth ranges (figures 6 and 7). There are little bathymetric differences between the wide distributed species (Group III) and the so called Main Magellanic fauna Group IV), though Group II I is more coastal.

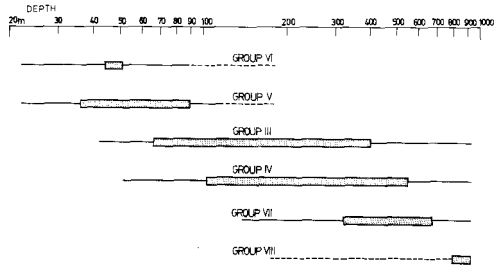


Fig. 6.- Depth ranges of the groups. Bars correspond to maximal and minimal averages of all species in the group and full lines to the total range; dotted lines show the ranges until station 22.

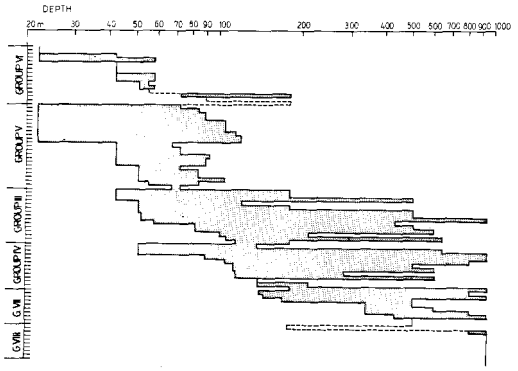


Fig. 7.- Depth distribution of species ordered as in the species phenogram. A vertical division by species, dotted lines meaning virtual ranges.

Depth differences between the strictly Bonaerensean fauna (Group VI) and the Inner shelf mixed fauna (Group V) are probably affected by sampling reasons (lack of hauls off shore the northern Buenos Aires province and in Golfo San Jorge area). Ranges for these groups appear rather similar, though the minimal and maximal averages differ.

Deep water Group VII shares the lower level of its range with the Main Magellanic fauna (Group IV), while Group VIII is restricted to deep waters over the slope.

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NOTA

UNA NUEVA CITA PARA LA REGION SUBANTARTICA: *Hybocodon prolifer* Agassiz, 1862. (ANTHOMEDUSAE: TUBULARIIDAE). [A new record for the subantartic region: *Hybocodon prolifer* Agassiz, 1862 (Anthomedusae: tubulariidae)]

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Las hidromedusas presentan en su mayoría una aparición esporádica, debido a su distribución particular en agrupaciones esparcidas en tiempo y espacio, además de las dificultades en ser capturadas por las redes de plancton.
La medusa *Hybocodon prolifer* Agassiz, 1862 es probablemente un ejemplo de lo anteriormente mencionado.
Expreso mi reconocimiento al Dr. Fernando C. Ramírez del laboratorio de Zooplancton (INIDEP) por haberme cedido la colección de hidromedusas, en la cual se basa esta comunicación.

Procedencia del material estudiado

Campaña: C-10/81
Estación: 2
Fecha de colecta: 30/07/1981
Horade colecta: 17:50
Posición: 38°20' L.S
56′59' L.W
Tipo de red: bicónica con 48 cm de boca; 168 cm de longitud y malla de 144 pm.
Arrastre: incli. 5°; veloc. 40 m/min.; prof. 55 m
N° de ejemplares: 1

Hybocodon prolifer Agassiz, 1862
Se caracteriza por la umbrela en forma de campana, más alta que ancha y con ápice redondeado; un eje marginal de posición oblicua a la vertical; altura de 2 a 4 mm, raramente de 5 mm. La exumbrela de la mayoría de los especímenes tiene cinco bandas meridionales de nematocistos, dos de los cuales nacen del bulbo tentacular. El estómago es grande, cilíndrico, y no sobrepasa el margen umbrelar. La boca está rodeada por unos anillos de baterías de nematocistos. Las gónadas bordean el estómago y dejan una pequeña porción libre en la zona superior y distal.

Distribución conocida: Océano Pacífico, Océano Atlántico y Océano Artico. Para detalles de las localidades precisas sobre los océanos mencionados, véase Kramp (1959, 1961) y Arai y Brinckmann-Voss (1980).

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