International Council for the Exploration of the Sea

C.M. 1986/H:28
Pelagic Fish Committee

Sardine (Sardina pilchardus Walb.) stock differential distribution by age class in Divisions VIIIc and IXa.

by

Porteiro,C.[1]; Alvarez,F.[1] and J.A.Pereiro[2]

1.- Instituto Español de Oceanografía
Centro Costero de Vigo
Orillamar 47,Vigo.Spain

2.- Instituto Español de Oceanografía
Laboratorios Centrales
Alcalá 27-4º. Madrid. Spain

SUMMARY

A migration pattern of sardine juveniles and spawners is suggested as an explanation of the similarities observed between the stock differential distributions from catch in numbers (1979-1985) and from acoustic estimation (1983-1986), both by age group, in Divisions VIIIc and IXa.

BASE DATA AND RESULTS

The Sardine fishery extends over ICES Divisions VIIIc and IXa (figure 1). Fishing takes place near the shore, and the period of main catches is between June and November. Most of the fishing units are small purse seiners which make trips 12-18 hours long. As a consequence, catches are made near the port where each vessel is based, and a correspondence

between the place of landing and the respective place of catch is evident.

Keeping this point in mind, we splitted catches in number per age class by country. In order to do it, the Spanish catch in number per age class was substracted from that for the whole stock (Anon,1986), to obtain the Portuguese catch in number per age class. That was made for the period 1979-1985. Years 1976-1978 were not used, because no age-length keys are available for that period. The percent catch in number per age class corresponding to Spain is shown in table 1.

It is evident a very different age composition in the Portuguese and Spanish catch of sardine. Average proportion of individuals 0-years old in the Spanish catch in relation to the total number caught from this age group is 39%, but is very variable along the period. That variability does not happen for the remainder age groups. Group 1 is mainly represented in Portuguese catches; 75% of group 1 individuals caught each year are fished by the Portuguese fleet, and 25% by the Spanish vessels. In 1984 the Spanish fleet exceptionally caught 48% of this age group. However, that same year the catch of individuals of the 0-group by this fleet was nil, and that was also exceptional, indicating perhaps some problem in the split of individuals between those two age classes in 1984. Over the remainder years, Spanish vessels caught between 7% and 36% of the total numbers caught in the stock from this age group. From age groups 2 to 6, the percentage caught by Spanish vessels increases with age, going from 35% per age class 2 to 87% for the plus group. Figure 2 shows the percentage of individuals of each age class which were caught by the Spanish fleet, showing the features we have first described.

In order to know the meaning of this different contribution of age classes to the Portuguese and Spanish catches, we have used a second source of information, namely the acoustic estimate of sardine abundance per age class. Acoustic surveys have been carried out for the period 1982-86 both for Portugal and Spain. The portuguese R/V "Noruega" made acoustic surveys

in August 1982, 1983 and 1985, and also in November 1984, December 1985 and March 1986 1986. The Spanish R/V "Cornide de Saavedra" made also acoustic surveys in August/September from 1982 to 1985 and one more in March 1986. We have reviewed now surveys corresponding to years 1983-1985. In 1982 the Spanish survey did not cover Division VIIIc, and therefore was incomplete. Definitive results from the Portuguese survey in December 1985 and those made in March 1986 by both countries are not yet available.

Table 2 shows percentage of individuals per age class in the Spanish part of the area of distribution of the stock, it is to say, the number of individuals of each age class estimated by the Spanish vessel on each survey over the Spanish waters, divided by the number per age class estimated by both vessels over the area of distribution of the whole stock (Portuguese and Spanish waters). We must remark that the surveys were made during the main fishing season.

We can see on tables 1 and 2 the remarkable similarity between the proportion of catches per age class for Portugal and Spain, and the proportion of numbers at sea per age class in Portuguese and Spanish waters as estimated by the acoustic surveys. Figure 3 gives the average percent of individuals of each age class in the Spanish catches compared to the percent in the Spanish waters as estimated by the acoustic surveys both for the period 1983-1985.

The main conclusion from this analysis seem to be that group 1 sardine is mainly placed during the fishing season in the southern part of the area covered by the stock, the Portuguese waters, and, as the individuals become older, they go steadly moving towards the northern part. Age classes 5 and older are placed almost exclusively in the Cantabrian Sea.

Preliminary results from the Spanish acoustic survey in March 1986 seem to indicate that the sardine biomass in the Spanish part was maintained at the same level. The only remarkable change was that the maximum abundance of sardine was not centered

as it is usual in August, in the northwestern corner of the Peninsula, but it was displaced towards the East. However, it is not possible to interprete this change until a longer series of winter surveys, both Portuguese and Spanish, be available.

In relation to the bigger proportion of spawners in the Cantabrian Sea compared to the remainder areas, Solá and Franco (1984) published the results of an ichtyoplankton survey on the Cantabric and Galician shelves in March 1981. March matches the sardine spawning season. Maximum abundance of sardine eggs were found in the eastern part of the Cantabrian Sea, while points of maximum larval densities were found in the central part of this sea. Those results are therefore coincident with the conclusions of this present work.

Some important consequences for assessments can be drawn from this work:

a) Fishing mortality on group 1 is mainly generated by the Portuguese fleet, while fishing mortality on age 4 and older are mainly generated by the Spanish purse-seiners; in fact, age 5 and older are practically only exploited by the Spanish vessels.

b) ALK's from the Spanish catches have a plus group in 9 years. Given that sardine older than 5 years is practically inexistent in Portuguese catches, the Spanish age composition for age 6 to 9 could be applied to the catches of the whole stock, allowing to use an age composition up to 9 years in the assessments.

c) Appreciable differences between maturity ogives consstructed by Portuguese and Spanish scientist have been detected during these years. Figure 4(a) shows the maturity ogives presented by Monteiro and Jorge (1982), based on individuals caught during the periods 1979-1981. Perez et al. (1985) also presented a maturity ogive based on data collected in 1981. This ogive is shown in figure 4(b). The difference in slope between these two ogives is evident, and could be explained by a higher proportion of mature individuals.

in each age class in the northern (Spanish) part of the area of distribution of the stock. In Anon (1982), the ICES Sardine Working Group used the maturity ogive shown in table 3, while this Working Group used in 1986 that shown in the same table. The first one was made computing the mean between the proportion of matures per age class obtained by the Portuguese and Spanish members of the Working Group. In later meetings, that maturity ogive was substituted by the Spanish one, given that it was unbelievable to consider a fraction of 5 years and older sardines to be inmature.

Although we still don't know what the distribution of each sardine age group is out of the fishing season, we believe the analysis made in this document can lead to some ways of research that will throw away many doubts about the biological behaviour of this Sardine Stock.

REFERENCES

ANON (1982). Report of the Working Group for the Appraisal of Sardine Stocks in Divisions VIIIc and IXa. ICES, C.M. 1982/Assess:10

ANON (1986). Report of the Working Group on the Appraisal of Sardine Stocks in Divisions VIIIc and IXa. ICES, C.M. 1986/Assess:23

MONTEIRO,C. and I.M.JORGE (1982). Age and growth of Sardina pilchardus Walb. from Portuguese Coast (ICES Div.IXa). ICES, C.M. 1982/H:19

PEREZ,N.;PORTEIRO.C. and F.ALVAREZ (1985).Some observations on the biology of sardine (Sardina pilchardus Walb). off Galicia, NW Spain. ICES, C.M. 1985/H:19

SOLA,A. and C.FRANCO (1984). Ichthyoplankton survey of interesting commercial species of the Cantabric and Galician shelves (N-W Spain). ICES, C.M. 1984/H:42

AGE CLASS	1979	1980	1981	1982	1983	1984	1985	MEAN VALUES 1979-1985
0	29	41	40	73	62	0	28	39
1	23	20	16	36	7	48	24	25
2	35	29	37	29	30	37	50	35
3	77	44	38	58	40	51	45	50
4	83	52	52	79	58	65	71	66
5	91	60	55	88	67	77	84	75
6+	92	73	83	96	91	84	89	87

Table 1.- Total Spanish catch (%) in number of sardines by age class over Spanish and Portuguese catches during 1979-1985.

AGE CLASS	1983*	1984**	1985*
0	43	2	28
1	10	23	0
2	53	47	18
3	54	57	47
4	83	69	65
5	96	86	87
6+	100	94	97

Table 2.- Percentage of individuals per age class in the Spanish part of the area of distribution of the stock from the acoustic surveys.

*August both countries.

**August Spain and November Portuguese.

AGE	MATURITY *	OGIVE **
0	0.30	0.00
1	0.60	0.65
2	0.70	0.95
3	0.80	1.00
4	0.80	1.00
5	1.00	1.00
6+	1.00	1.00

Table 3.- Maturity ogives used in sardine Working Group (* 1982, ** 1986)

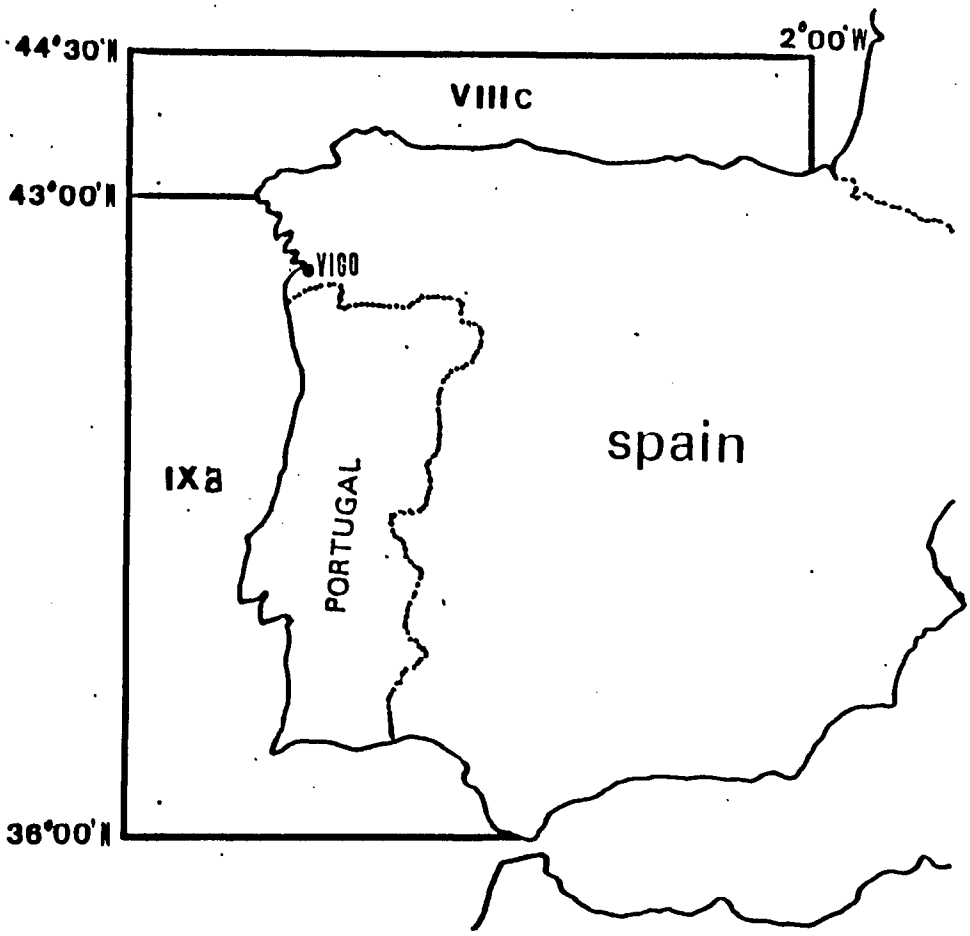

Figure 1.- Distribution area of sardine stock.

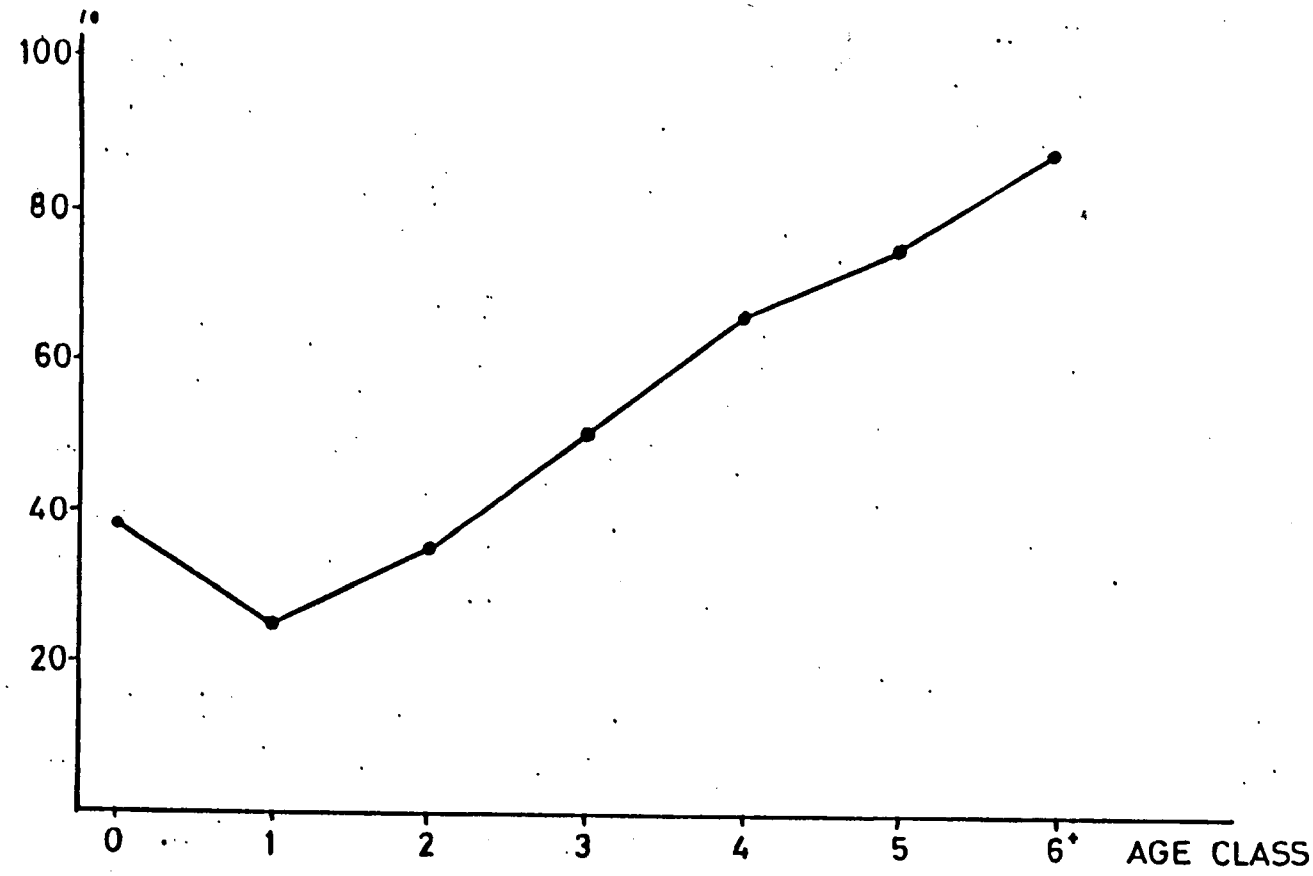

Figure 2.-Percentage of individuals of each age class caught by the Spanish fleet. Mean values 1979-1985

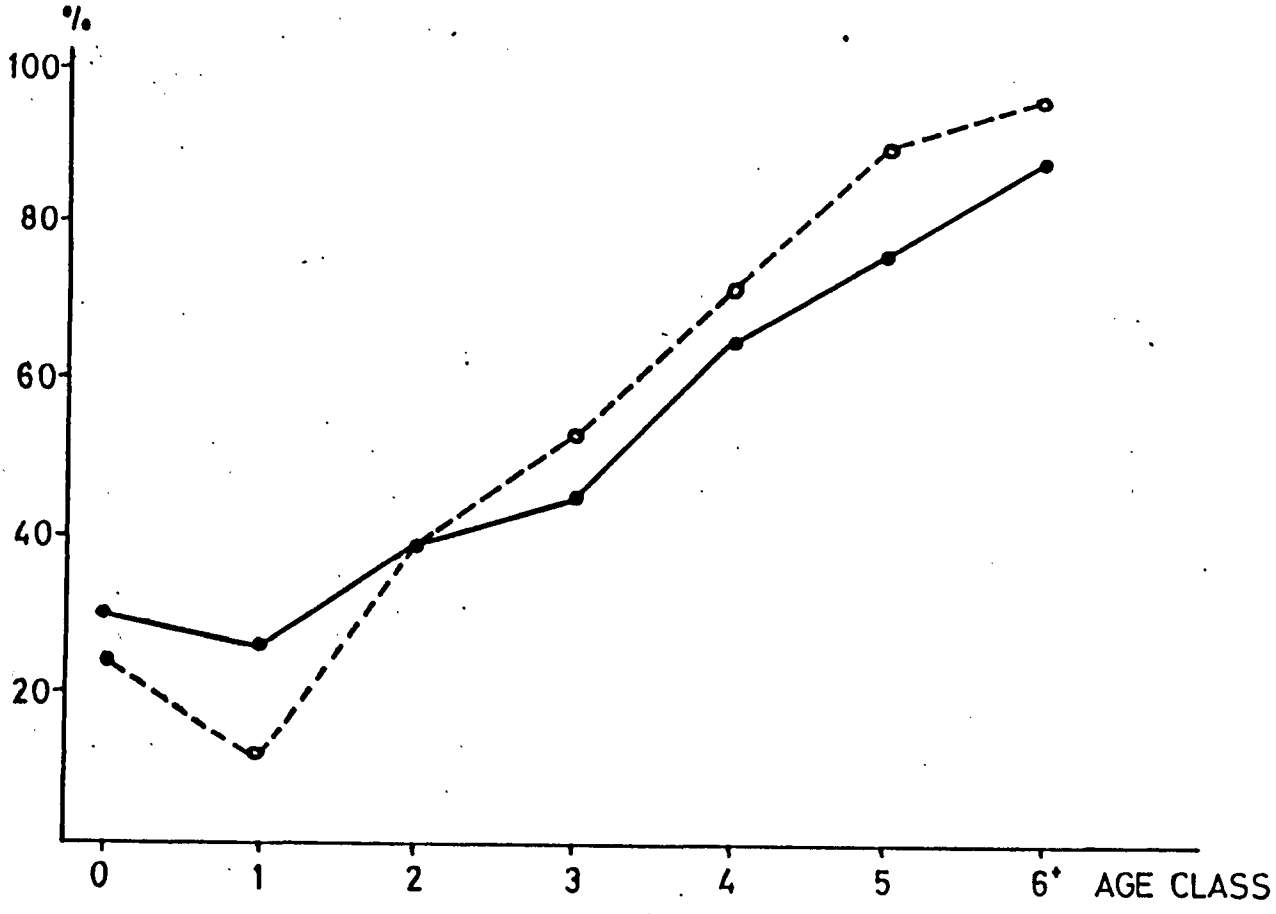

Figure 3.- Percentage of individuals of each age class caught by the Spanish fleet. (●——●) and Spanish waters from acoustic surveys (o- - -o).

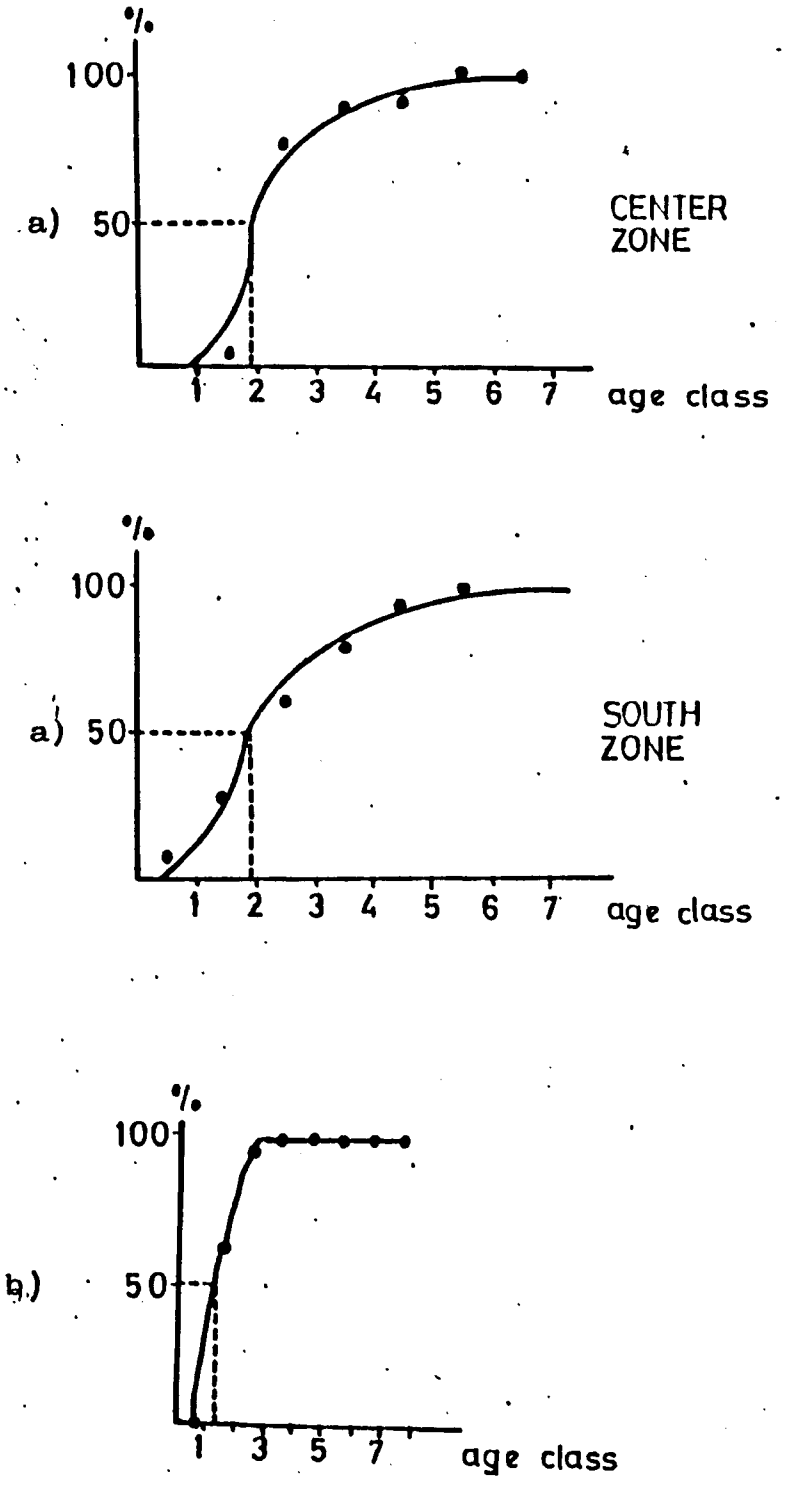

Figure 4.- Maturity ogives in Portuguese waters (a) and in Galician waters (b).