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Status of the Cod Stock in Divisions 3L, 3M and 3N in 1984

by

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### Introduction

In 1984 J. Vázquez was on board a Spanish pair trawler, PTB-5 class, in NAFO waters, to sample the catch and collect cod otoliths. Sampling intensity is shown in Table 1.

### Methods

Catch statistics are usually based on landings owing to the control that can be exercised both on board or in port. The original plan for on board sampling of cod length frequencies was to sample from the portion of the catch removed for processing. Sample frequencies are expanded to the numbers in the retained catch of the corresponding tow.

Observers on board reported some difficulties in carrying out that scheme strictly. Sometimes the sample was taken from the total catch. Also, samples from the portion discarded were taken without much extra work.

To process these results, samples were classified into three categories: Total, processed and discarded. The data in each category were treated independently using a common age-length key. Lengths and age frequencies of the landed catch can be calculated now in two different ways: Directly, from "processes" samples, or indirectly, from the difference between the "total" and "discarded" results.

Both estimates can be combined in a weighted mean. Let

$R$  = catch/sample weight ratio

$N$  = sample size in number

and for a certain length class or age group

$n$  = number of fishes in the samples

$p$  = relative frequency in the population ( $1 \geq p \geq 0$ )

$Q$  = landed catch in number

with the subindices  $t$ ,  $p$  and  $d$  for "total, processed and

discarded". The weighted mean with weights  $P_1$  and  $P_2$  is

$$\hat{Q} = P_1 \cdot (n_p \cdot R_p) + P_2 \cdot (n_t \cdot R_t + n_d \cdot R_d) \quad P_1 + P_2 = 1$$

$$V_{\hat{Q}}^2 = P_1^2 \cdot R_p^2 \cdot N_p \cdot f_p + P_2^2 \cdot (R_t^2 \cdot N_t \cdot f_t + R_d^2 \cdot N_d \cdot f_d)$$

with a minimum for

$$P_1 = \frac{R_t^2 \cdot N_t \cdot f_t + R_d^2 \cdot N_d \cdot f_d}{R_t^2 \cdot N_t \cdot f_t + R_d^2 \cdot N_d \cdot f_d + R_p^2 \cdot N_p \cdot f_p}$$

So, the weights depend on the frequency in each length class or age group. To simplify, we use a unique weight for each class

$$P_1 = (R_t^2 \cdot N_t + R_d^2 \cdot N_d) / (R_t^2 \cdot N_t + R_d^2 \cdot N_d + R_p^2 \cdot N_p)$$

$$P_2 = (R_p^2 \cdot N_p) / (R_t^2 \cdot N_t + R_d^2 \cdot N_d + R_p^2 \cdot N_p)$$

An analogous routine allows us to calculate the length and age composition of the total catches and discards.

### Results

The estimated age composition of the cod landed is shown in table 2 and figure 1. Figure 2 shows the age composition of the total catch. The differences between these two figures are due to the discarded fishes which mainly belong to the 2 and 3 years old age-groups.

In both Divisions 3N and 3M there was a great abundance of small size cod as was noted last year. In Division 3N this abundance reduces the good catches of large cod to a low percentage.

In Division 3M the catch of large sizes was less than in 1983. This fishery is supported by the 1980 and 1981 year classes.

Table 3 shows the catch and effort data of the Spanish fleet in the three divisions visited. From them, the catch-rates calculated using the multiplicative model are shown in table 4, and compared with values from previous years.

TABLE 1.- Sapanish comercial sampling in NAFO waters.

<u>Div.</u>	<u>n° measured</u>	<u>n° aged</u>	<u>sampling weight t.</u>	<u>catch t.</u>
3L	1472	137	4.33	8157
3M	6846	381	7.70	4724
3N	8341	1320	39.65	13520

TABLE 2.- Catch at age in numbers x 10<sup>-3</sup>. Landings.

<u>AGE</u>	<u>Division 3N</u>						<u>Division 3M</u>						<u>3L</u>	
	<u>JUN</u>	<u>JUL</u>	<u>AUG</u>	<u>SEP</u>	<u>OCT</u>	<u>NOV</u>	<u>MAY</u>	<u>JUN</u>	<u>JUL</u>	<u>AUG</u>	<u>OCT</u>	<u>NOV</u>	<u>OCT</u>	<u>NOV</u>
2 -							7			1	4	1		
3 -		5			4	3	954	267	17	236	380	66		2
4 -	5	144	1	2	94	76	71	46	13	108	390	117	8	29
5 -	6	227	1	3	78	70	72	34	3	28	35	14	28	89
6 -	65	231	2	15	56	62	40	13		2	8	2	30	102
7 -	61	60	3	28	58	74	1	1					9	34
8 -	46	47	10	48	34	40				1	1		13	37
9 -	66	39	15	54	62	61							19	40
10 -	35	10	8	24	54	36							19	42
11 -	2	2	3	5	8	7							1	3
12 -			2	5	7	4							2	6
13 -														
14 -	8				4									
15 -			2	5										
16+ -														
n° samples -	8	18	3	4	9	7	4	5	1	12	8	3	1	5
catch (t)-	2232	2442	464	1756	2078	1729	905	392	48	525	800	285	464	1220

TABLE 3.- Cod catches (t.) and fishing effort (hours) of Spanish fleet during 1984

month	3N				3M				3L			
	<u>PTB-4</u>		<u>PTB-5</u>		<u>PTB-4</u>		<u>PTB-5</u>		<u>PTB-4</u>		<u>PTB-5</u>	
	catch	f	catch	f	catch	f	catch	f	catch	f	catch	f
JAN	10	55	75	65	1	6	8	53	208	825	3	15
FEB	11	119	68	101	6	76	78	58	66	197	10	11
MAR	40	93	52	22	44	124	51	58	403	780	338	495
APR	65	105	200	104	460	794	517	400	843	788	327	274
MAY	615	831	660	421	485	740	420	529	711	894	280	270
JUN	1352	1357	880	607	189	299	203	262	349	477	56	72
JUL	2133	1090	309	286	23	27	25	24	412	267	-	-
AUG	75	114	389	70	497	420	28	41	166	170	61	61
SEP	1579	1275	177	204	240	435	130	166	603	722	-	-
OCT	1520	1096	558	343	538	624	262	430	443	1162	21	44
NOV	1357	1207	372	409	239	238	46	70	1012	1553	208	359
DEC	892	456	131	67	204	129	30	32	1406	1159	231	196
total	9649	7798	3871	2699	2926	3912	1798	2123	6622	8994	1535	1797

TABLE 4.- Catch-rates indices of the Spanish fleet.  
Units t./h. of SPA PTB-4

	<u>1982</u>	<u>1983</u>	<u>1984</u>
3N	0.52	0.698	1.053
3M		0.789	1.302
3L		1.680	1.052

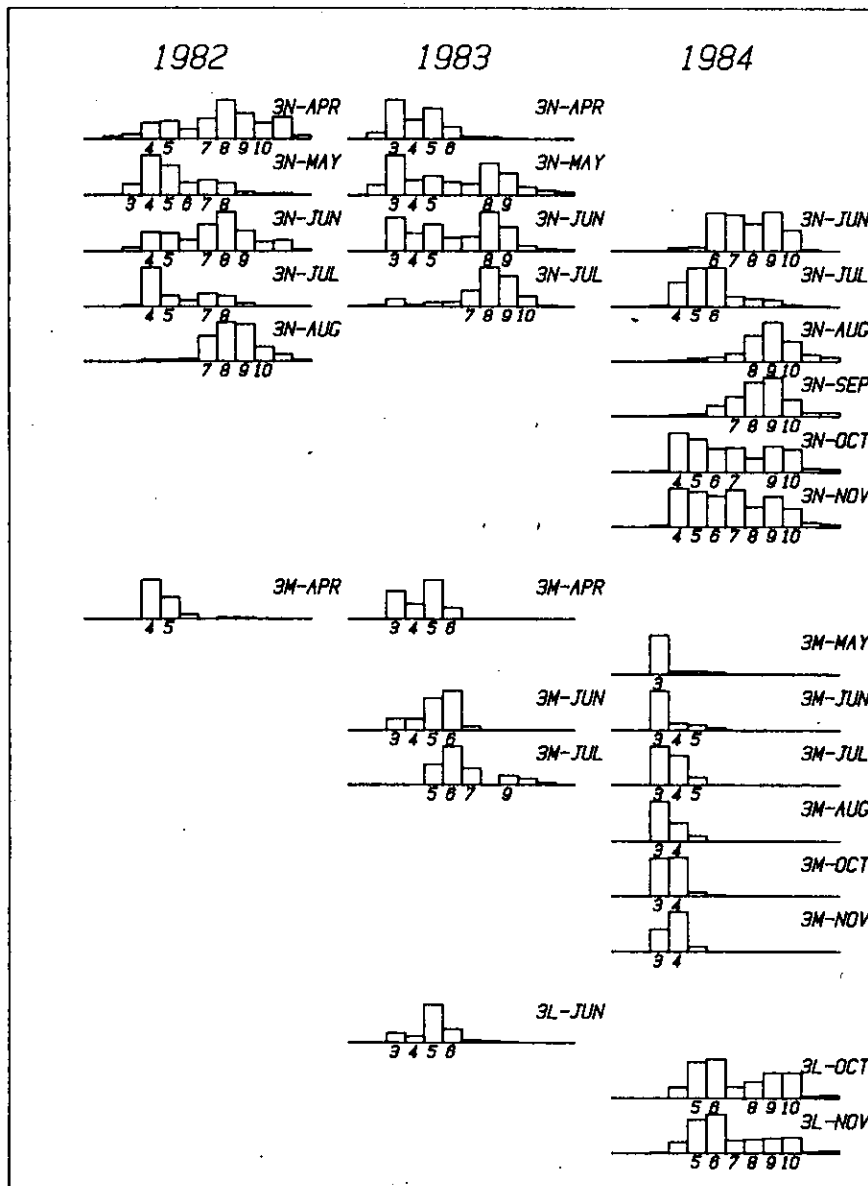


FIGURE 1.- Age distribution of landings.

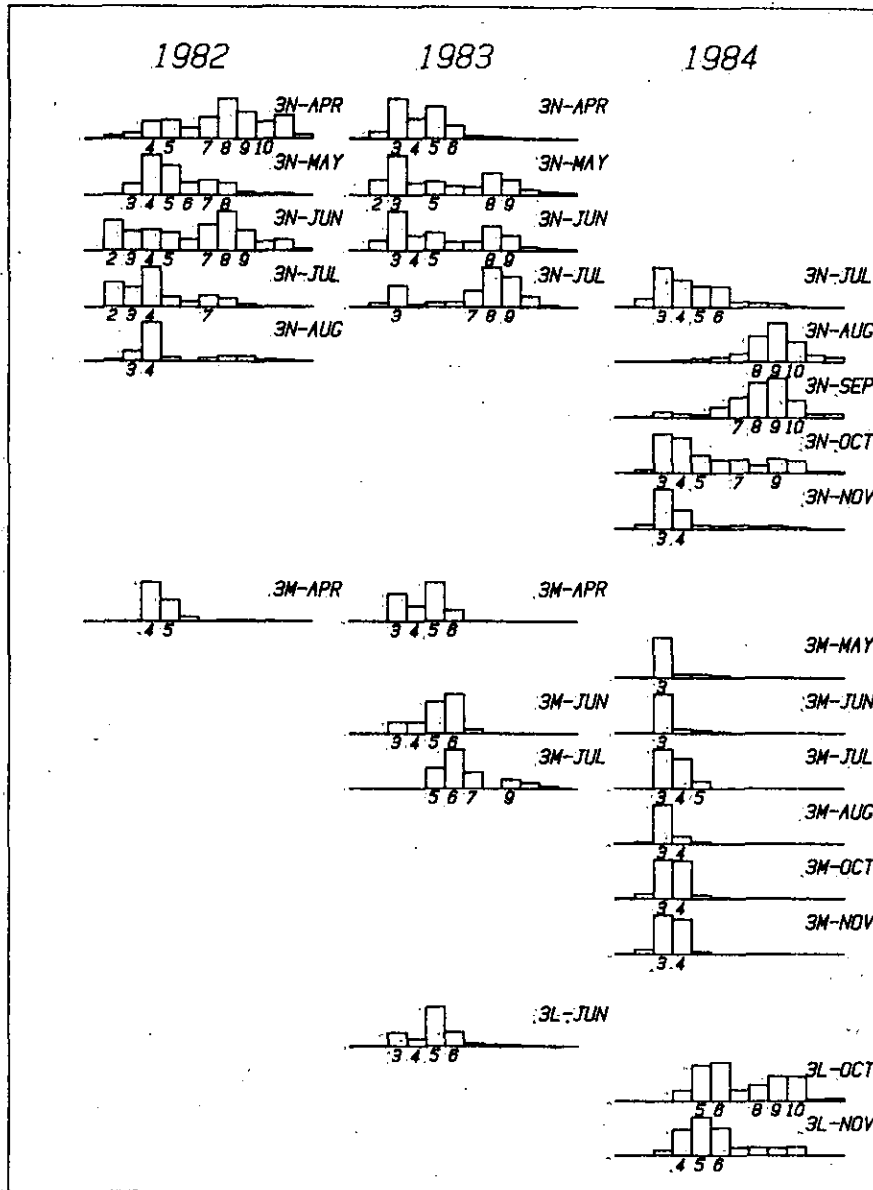


FIGURE 2.- Age distribution of total catch.