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STANDARDIZED AGE SPECIFIC CATCH RATES FOR ALBACORE *(THUNNUS ALALUNGA)* FROM THE SPANISH SURFACE FLEETS IN THE NORTHEAST ATLANTIC, YEARS 1981-1995

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SUMMARY

Data from 3,838 individual trips (with size information) carried out using traditional gears for the Spanish albacore fishery (troll and baitboat) from the 1981-1995 period were analyzed.

Standardized age/gear-specific catch rates (in number) were developed by means of General Linear Modelling (GLM) procedures and the available age-length keys, using the methodology described in previous papers. Information from a recently re-initiated fishery in the fall season was again evaluated but this information was not considered appropriate from a GLM approach. Available information (year, area and time) were incorporated into the models.

RÉSUMÉ

Ce document présente une analyse des données provenant de 3838 sorties (données de taille comprises) réalisées entre 1981 et 1995 par la flottille espagnole visant le germon avec des engins traditionnels (ligne traînante et canne-appât).

Le Modèle Linéaire Généralisé a permis d'obtenir des indices standardisés par classes d'âge et par engin, avec la capture par âge qui avait été obtenue précédemment à partir des clés taille-âge avec la méthodologie décrite dans les documents précédents. Les variables disponibles (année, zone et temps) ont été prises en compte dans le modèle.

RESUMEN

Se analizan datos procedentes de 3838 mareas individuales (con información sobre tallas), llevadas a cabo por la pesquería española, con artes tradicionales, dirigida al atún blanco - curricán y cebo vivo - entre 1981 y 1995.

Se desarrollaron tasas de captura edad/específicas del arte (en número) usando procedimientos de Modelo Lineal Generalizado (GLM) y las claves disponibles de edad/talla, empleando la metodología descrita en documentos anteriores. Se evaluó nuevamente la información sobre una pesquería recientemente restablecida en el otoño, pero esta información no se consideró apropiada para un enfoque GLM. Información disponible: se incorporó a los modelos el año, área y tiempo.

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INTRODUCTION

Although all the information that comes from commercial fleet activity should be interpreted with great caution and based on the in-depth empirical knowledge of the fishery, a point in fact is that the data corresponding to catch per unit of effort (CPUE) from commercial fleets have frequently been used to estimate relative trends in "stock abundance", to tune virtual population analyses (VPA) and to fit production models.

Even though this type of methodology has been the object of criticism pointing to the possible mediocrity of the results obtained (Fonteneau & Bard, 1993), the generalized linear modelling technique (GLM) (Robson, 1966; Gavaris, 1980; Kimura, 1981) has proved to be a suitable methodology for arriving at relative standardized catch rates, assumed to be "relative abundance indices", when basic information is available and appropriate. In most cases external indices are not available for these fisheries.

In a previous paper, size specific catch rate by trip from 1983-1993 were considered in the analyses. During the 1993-1994 period, a tireless "archaeological" task was carried out to recover the information by trip from the period 1981-1987 (Mejuto & García, 1996).

The purpose of this paper is to update age-specific standardized CPUE trends for albacore using trip-by-trip data from the traditional Spanish bait boat and trolling fleets by means of similar methodology and criteria as in previous GLM analyses (Mejuto et al, 1992, Mejuto & García, 1993, Mejuto & García, 1994, Mejuto & García, 1996). More details on the methodology can be found in the papers previously cited.

1. DATA.

Data records were taken during the landing from 3838 trips carried out during the period 1981-1995, using traditional gears for the Spanish fishery of albacore in the North Atlantic, trolling (TROL) and bait boat (BB). These trip records basically contain the following data:

(1) landing date
(2) type of gear
(3) number of fishing days
(4) location of the fishing effort (5 X 5 degree square)
(5) catch in numbers
(6) catch in weight (kg)
(7) number sampled at the landing port (number >0 when sampled).
(8) sample frequency distribution of catch-at-size (FL=30 to 135, in 1 cm intervals),

2. METHODS.

2.1. AGEING:

The transformation of the size distributions by trip into ages (for ages 1, 2, 3, and 4) was done using a recent set of yearly age length keys (YALKs) obtained from MULTIFAN (Santiago, 1992, Santiago, 1993, Santiago, pers. comm., Anonymous , 1996), using data from the period 1978-1992. ALK of 1992 was carried on to ALKs of 1993, 1994 and 1995. Therefore the catch by age data base was created and then analyzed. Changes in the set of ALKs obtained for these ages are expected when time series are updated. However these changes are expected to produce minor changes in the catch at age matrix obtained (Mejuto & García, 1993).

In order to obtain the largest possible comparable time series, records from the recently re-started fall fishery carried out by the Spanish fleet after the fall of 1990 in the areas around the Azores (or between Azores and Iberian Peninsula) and records from the Mediterranean Sea were excluded from the analysis. Therefore records from the traditional fishery were used for main analyses, although data from the new fall fishery were also considered and evaluated for possible specific analyses.

2.2. MODEL AND SPECIFICATIONS.

The only two traditional gears used by the Spanish surface fleet, bait boat and trolling, were included in the analysis.

All empirical information on the seasonal migratory behavior of albacore, the fishing pattern of the Spanish fleets, and the number of trip observations available, were jointly considered to establish area and time strata for the GLM analyses, taking previous results into account.

The areas generally used in the models are shown in Figure 1, although tentative analyses have used other area definitions.

The following time strata were selected:
T1 = January - July
T3 = August and September (standard)
T2 = October - December

Although indices of abundance by age/gear were developed for ages 1, 2, 3, and 4, the fishery mostly targets ages 2-4, with the current catch being dominated by ages 2 and 3 in both gears.

The analyses by gear were carried out using GLM procedures . The main effects were considered to be year, area and time. The following model was defined for final runs:

(1) $LOG(CPUE) = u + Yi + Ak + Ql + eijkl$

where the CPUE = the nominal CPUE of the observation (catch in number of fish of the corresponding age-gear trip divided by the number of fishing days of the trip carried out in year i, in area k, and time l).

u= overall mean.
Yi = logarithm of the effect of year i
Ak = logarithm of the effect of area k
Ql = logarithm of the effect of time l
e = logarithm of the normally distributed error term

Observations having values of CPUE=0 were omitted from the analysis.

In previous papers, exploratory analyses by age were carried out introducing area-time interaction terms into the model. Results have indicated that they make a minor contribution to the overall sum of squares in a variety of exploratory runs by age. Because of this, interactions were excluded from these runs.

As in previous analyses, a 'second pass' GLM procedure was defined to overcome the problems of residuals with absolute values greater than 2.5, in most cases negative (Mejuto et al., 1992). Records having an absolute residual value greater than 2.5 in the 'first pass' were omitted from the second GLM run.

3. RESULTS AND DISCUSSION.

A total of 3838 trips with size information from 1981 to 1995 were classified in spatial-temporal strata, as described above, and then analyzed. This represents a fishing effort of 35816 fishing days.

Figure 2 shows a general description by gear about the number of trips used for the analyses, number of fish sampled and sampling rates.

Standardized residual patterns for each age considered in general show a normally distributed pattern when there is a suitable number of samples. This normally distributed pattern is especially clear for the most recent years because of the improvement of the data.

Table 1 shows data for number of observations by year, area and time strata considered in each gear. The number of observations is, on the whole, acceptable, except in the case of the beginning of the time series and the analysis for gear = BB . In an attempt to improve the distribution of the observations, additional runs for gear=BB were carried out using a new definition of areas-times. However, the statistical results did not show a significant improvement.

Table 2 is a summary of the ANOVA results subjected to these conditions. The variability rate by age explained by the model (R-squared) was between 20% and 50% for ages 2 and 3. The higest values of R-squared were obtained for the gear TROL and ages 2 and 3.

Table 3 supplies information by age on estimated parameters, their standard error, the relative CPUE and upper and lower 95% confidence limits considered, for different runs.

Figures 2, and 3 show trends obtained for ages 1, 2, 3 and 4, respectively. This catch-rate is contingent upon a number of factors such as availability in the area/time strata as well as the results obtained from the fishery among ages. Thus trends obtained for ages 1 (especially) and 4 (TROL) should not be interpreted strictly in terms of 'abundance'.

Age 1 shows trends that could be interpreted as exhibiting wide yearly fluctuation which could be 'a priori' justified based on the different strength of the recruits. However, we must remember again that age 1 is not usually a target catch (in some cases even avoided) for the traditional fleets and its schools are normally well distinguished from other age-schools.

Age 4 is not frequent in trolling catches although it is more frequent in the case of the bait boat. This explains the statistics obtained when gear-specific analyses are developed for age 4.

The resulting indices for ages 2 and 3 (for both gears) and age 4 (for BB) are probably less affected by similar problems. Ages 2 and 3 are highly represented in the catches of both gears and make up the majority of the targets of their activity.

The results of the analyses by gear occasionally show conflicting trends between the two. On an empirical level, this would be expected, as each gear used a different fishing strategy. The catchability of the trolling gear is influenced by a great number of relatively well known factors. However its fishing system, based on 'pseudo randomness', is somewhat less affected by the degree of dispersion-concentration of the schools than the bait boat.

The technological improvements carried out by the bait boat fleet especially during mid 1980's (Santiago pers. comm., Anonymous, 1996) explain the sharp increase seen in the baitboat biomass index during this period (Mejuto and García, 1996). The effect of these improvements are also expected when age specific analyses are done.

Additional comments and interpretation of the results can be seen in papers previously done and cited.

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Span. N.Atl. ALB CPUEn 1981-1995, TROL, YALK 81-95 (93,94,95 est por 92)

TABLE 1 OF AREA BY QTR
CONTROLLING FOR YR=81

AREA	QTR 1	2	3	Total
1	1	0	7	8
2	2	0	8	10
3	4	0	0	4
4	7	0	3	10
Total	14	0	18	32

TABLE 2 OF AREA BY QTR
CONTROLLING FOR YR=82

AREA	QTR 1	2	3	Total
1	18	0	31	49
2	5	0	11	16
3	4	0	1	5
4	17	0	9	26
Total	44	0	52	96

TABLE 3 OF AREA BY QTR
CONTROLLING FOR YR=83

AREA	QTR 1	2	3	Total
1	1	1	22	24
2	0	0	19	19
3	0	0	0	0
4	27	0	20	47
Total	28	1	61	90

TABLE 4 OF AREA BY QTR
CONTROLLING FOR YR=84

AREA	QTR 1	2	3	Total
1	12	0	10	22
2	3	0	4	7
3	0	0	0	0
4	24	0	30	54
Total	39	0	44	83

TABLE 5 OF AREA BY QTR
CONTROLLING FOR YR=85

AREA	QTR 1	2	3	Total
1	0	6	9	15
2	17	0	24	41
3	2	0	0	2
4	24	0	13	37
Total	43	6	46	95

TABLE 6 OF AREA BY QTR
CONTROLLING FOR YR=86

AREA	QTR 1	2	3	Total
1	1	9	26	36
2	1	7	8	16
3	34	0	2	36
4	12	0	22	34
Total	48	16	58	122

TABLE 7 OF AREA BY QTR
CONTROLLING FOR YR=87

AREA	QTR 1	2	3	Total
1	0	3	2	5
2	0	1	2	3
3	2	0	1	3
4	13	0	10	23
Total	15	4	15	34

TABLE 8 OF AREA BY QTR
CONTROLLING FOR YR=88

AREA	QTR 1	2	3	Total
1	6	14	41	61
2	3	11	26	40
3	29	0	7	36
4	15	0	30	45
Total	53	25	104	182

TABLE 9 OF AREA BY QTR
CONTROLLING FOR YR=89

AREA	QTR 1	2	3	Total
1	7	16	30	53
2	12	8	30	50
3	43	0	1	44
4	41	10	57	108
Total	103	34	118	255

TABLE 10 OF AREA BY QTR
CONTROLLING FOR YR=90

AREA	QTR 1	2	3	Total
1	2	28	17	47
2	11	24	60	95
3	64	0	4	68
4	56	0	67	123
Total	133	52	148	333

TABLE 11 OF AREA BY QTR
CONTROLLING FOR YR=91

AREA	QTR 1	2	3	Total
1	3	1	17	21
2	12	37	46	95
3	78	0	1	79
4	57	0	109	166
Total	150	38	173	361

TABLE 12 OF AREA BY QTR
CONTROLLING FOR YR=92

AREA	QTR 1	2	3	Total
1	5	0	40	45
2	36	22	43	101
3	53	2	2	57
4	54	0	46	100
Total	148	24	131	303

TABLE 13 OF AREA BY QTR
CONTROLLING FOR YR=93

AREA	QTR 1	2	3	Total
1	4	2	24	30
2	17	4	72	93
3	94	1	2	97
4	25	2	52	79
Total	140	9	150	299

TABLE 14 OF AREA BY QTR
CONTROLLING FOR YR=94

AREA	QTR 1	2	3	Total
1	0	0	67	67
2	0	5	19	24
3	102	1	1	104
4	2	0	30	32
Total	104	6	117	227

TABLE 15 OF AREA BY QTR
CONTROLLING FOR YR=95

AREA	QTR 1	2	3	Total
1	11	2	18	31
2	5	22	65	92
3	48	0	4	52
4	71	0	73	144
Total	135	24	160	319

Table 1(a).- Number of trips (number of observations) by year, area and time strata used in the analyses, years 1981-1995, gear TROLL.

TABLE 1 OF AREA BY QTR
CONTROLLING FOR YR=81

AREA	QTR 1	2	3	Total
1	0	2	8	10
2	0	0	14	14
3	0	0	0	0
4	0	0	0	0
Total	0	2	22	24

TABLE 2 OF AREA BY QTR
CONTROLLING FOR YR=82

AREA	QTR 1	2	3	Total
1	1	1	17	19
2	0	1	17	18
3	0	0	0	0
4	1	0	0	1
Total	2	2	34	38

TABLE 3 OF AREA BY QTR
CONTROLLING FOR YR=83

AREA	QTR 1	2	3	Total
1	1	2	22	25
2	1	17	8	26
3	0	0	0	0
4	0	0	0	0
Total	2	19	30	51

TABLE 4 OF AREA BY QTR
CONTROLLING FOR YR=84

AREA	QTR 1	2	3	Total
1	0	0	19	19
2	0	0	8	8
3	0	0	0	0
4	0	0	0	0
Total	0	0	27	27

TABLE 5 OF AREA BY QTR
CONTROLLING FOR YR=85

AREA	QTR 1	2	3	Total
1	0	4	9	13
2	4	2	28	34
3	0	0	0	0
4	4	0	1	5
Total	8	6	38	52

TABLE 6 OF AREA BY QTR
CONTROLLING FOR YR=86

AREA	QTR 1	2	3	Total
1	0	14	22	36
2	1	6	7	14
3	1	0	1	2
4	5	0	2	7
Total	7	20	32	59

TABLE 7 OF AREA BY QTR
CONTROLLING FOR YR=87

AREA	QTR 1	2	3	Total
1	0	7	13	20
2	1	3	4	8
3	3	0	2	5
4	2	0	7	9
Total	6	10	26	42

TABLE 8 OF AREA BY QTR
CONTROLLING FOR YR=88

AREA	QTR 1	2	3	Total
1	0	8	14	22
2	3	17	22	42
3	2	0	2	4
4	1	0	4	5
Total	6	25	42	73

TABLE 9 OF AREA BY QTR
CONTROLLING FOR YR=89

AREA	QTR 1	2	3	Total
1	0	25	44	69
2	5	15	24	44
3	4	0	2	6
4	11	0	22	33
Total	20	40	92	152

TABLE 10 OF AREA BY QTR
CONTROLLING FOR YR=90

AREA	QTR 1	2	3	Total
1	0	4	10	14
2	4	10	30	44
3	0	0	0	0
4	4	0	5	9
Total	8	14	45	67

TABLE 11 OF AREA BY QTR
CONTROLLING FOR YR=91

AREA	QTR 1	2	3	Total
1	0	0	6	6
2	1	10	29	40
3	6	1	1	8
4	7	0	5	12
Total	14	11	41	66

TABLE 12 OF AREA BY QTR
CONTROLLING FOR YR=92

AREA	QTR 1	2	3	Total
1	0	2	10	12
2	6	7	43	56
3	0	0	0	0
4	2	0	0	2
Total	8	9	53	70

TABLE 13 OF AREA BY QTR
CONTROLLING FOR YR=93

AREA	QTR 1	2	3	Total
1	0	0	2	2
2	9	4	53	66
3	0	0	0	0
4	0	0	0	0
Total	9	4	55	68

TABLE 14 OF AREA BY QTR
CONTROLLING FOR YR=94

AREA	QTR 1	2	3	Total
1	0	0	26	26
2	0	15	12	27
3	4	0	0	4
4	0	0	1	1
Total	4	15	39	58

TABLE 15 OF AREA BY QTR
CONTROLLING FOR YR=95

AREA	QTR 1	2	3	Total
1	1	0	17	18
2	2	5	30	37
3	2	0	0	2
4	8	0	0	8
Total	13	5	47	65

Table 1(b).- Number of trips (number of observations) by year, area and time strata used in the analyses, years 1981-1995, gear BB.

GEAR	AGE	# OBSERV.	R-SQUARE	RMSE	F-STAT.
TR					
	1	2681	0.4068	1.085	96.07
	2	2741	0.5025	0.851	144.64
	3	2726	0.3599	0.800	80.06
	4	2687	0.0648	1.033	9.73
BB					
	1	807	0.3148	1.6564	19.03
	2	870	0.2551	1.1462	15.32
	3	886	0.2027	0.8666	11.59
	4	880	0.2264	0.9922	13.25

Table 2.- Number of observations, R-square, mean square error (root) and F statistics for each age and gear considered in the analyses.

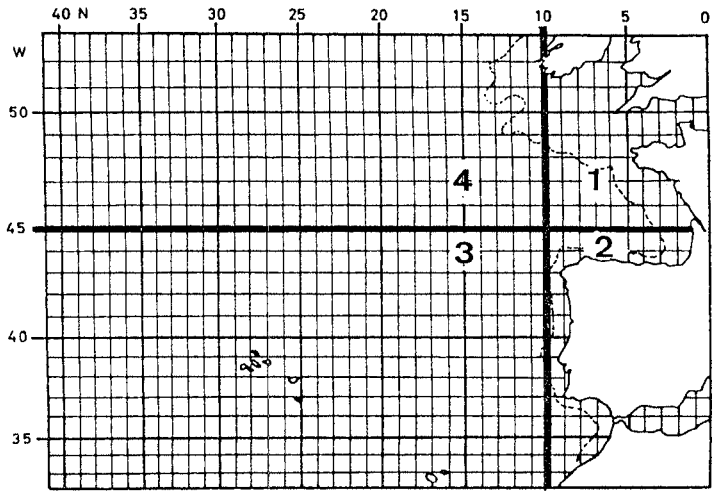

Figure 1.- Geographical area division used for the GLM analyses for the spanish albacore catch and effort data, 1981-1995.

Spanish N. Atl. CPUEn, 1981-1995, gear= TROL, age= 1

YR	LSMEAN	STDERR	UCPU1	CPU1	LCPU1
95	3.40516	0.06286	34.1354	30.1786	26.6805
94	2.65330	0.07569	16.5189	14.2415	12.2781
93	2.96350	0.06520	22.0525	19.4068	17.0786
92	2.94766	0.06403	21.6544	19.1005	16.8478
91	3.30882	0.05850	30.7285	27.3996	24.4314
90	2.35809	0.05964	11.9027	10.5896	9.4213
89	2.01279	0.07127	8.6281	7.5032	6.5250
88	2.89580	0.08030	21.2512	18.1564	15.5124
87	0.55878	0.23996	2.8803	1.7996	1.1244
86	2.49894	0.09710	14.7902	12.2271	10.1082
85	2.47388	0.11573	14.9904	11.9482	9.5233
84	2.19700	0.11926	11.4485	9.0622	7.1733
83	0.66302	0.13061	2.5283	1.9573	1.5152
82	0.37831	0.12747	1.8894	1.4717	1.1464
81	3.25304	0.18635	37.9259	26.3218	18.2682

Spanish N. Atl. CPUEn, 1981-1995, gear= BB, age= 1

YR	LSMEAN	STDERR	UCPU1	CPU1	LCPU1
95	2.83160	0.22878	27.2808	17.4226	11.1268
94	2.99131	0.23489	32.4368	20.4688	12.9165
93	3.27163	0.24534	43.9298	27.1594	16.7911
92	2.67074	0.23376	23.4817	14.8509	9.3923
91	3.36677	0.21604	45.3103	29.6690	19.4272
90	3.27309	0.23275	42.7922	27.1173	17.1842
89	2.36526	0.16292	14.8479	10.7891	7.8398
88	3.07902	0.21044	33.5696	22.2238	14.7126
87	-0.45274	0.32815	1.2767	0.6711	0.3527
86	1.31356	0.25586	6.3457	3.8432	2.3275
85	3.08737	0.26133	37.8534	22.6808	13.5898
84	2.59177	0.38233	30.3931	14.3658	6.7903
83	2.33380	0.28992	18.9929	10.7599	6.0958
82	-0.72488	0.35065	1.0242	0.5151	0.2591
81	2.27765	0.36472	21.3066	10.4246	5.1004

Spanish N. Atl. CPUEn, 1981-1995, gear= TROL, age= 2

YR	LSMEAN	STDERR	UCPU2	CPU2	LCPU2
95	3.42918	0.05169	34.1860	30.8924	27.9162
94	3.61008	0.06060	41.7086	37.0371	32.8889
93	3.23071	0.05381	28.1523	25.3343	22.7984
92	3.46470	0.05343	35.5467	32.0125	28.8298
91	3.65693	0.04809	42.6208	38.7871	35.2983
90	3.09778	0.04887	24.4044	22.1753	20.1497
89	2.73822	0.05679	17.3076	15.4844	13.8533
88	3.30137	0.06653	30.9999	27.2100	23.8834
87	3.12077	0.14724	30.5753	22.9108	17.1676
86	3.23968	0.07991	29.9494	25.6073	21.8947
85	2.53091	0.09375	15.1662	12.6203	10.5018
84	2.97475	0.09762	23.8278	19.6782	16.2513
83	2.89142	0.09388	21.7548	18.0984	15.0566
82	3.21105	0.09228	29.8501	24.9111	20.7893
81	3.10635	0.15719	30.7782	22.6171	16.6199

Spanish N. Atl. CPUEn, 1981-1995, gear= BB, age= 2

YR	LSMEAN	STDERR	UCPU2	CPU2	LCPU2
95	4.11784	0.15734	84.656	62.191	45.6876
94	4.85340	0.16104	178.041	129.848	94.7007
93	4.32386	0.16801	106.406	76.552	55.0741
92	3.91152	0.16539	70.061	50.663	36.6357
91	3.94577	0.15159	70.412	52.314	38.8672
90	4.02323	0.15666	76.904	56.571	41.6147
89	3.84264	0.11079	58.319	46.936	37.7746
88	3.81176	0.14624	60.891	45.716	34.3235
87	4.06108	0.18092	84.103	58.994	41.3818
86	3.25064	0.16387	36.063	26.156	18.9704
85	2.97595	0.17975	28.344	19.928	14.0105
84	2.33370	0.25418	17.535	10.655	6.4741
83	3.65589	0.17759	55.686	39.317	27.7596
82	3.34438	0.20743	43.487	28.960	19.2851
81	2.82585	0.25222	28.560	17.421	10.6261

Spanish N. Atl. CPUEn, 1981-1995, gear= TROL, age= 3

YR	LSMEAN	STDERR	UCPU3	CPU3	LCPU3
95	2.40826	0.05022	12.2796	11.1286	10.0854
94	2.33446	0.05714	11.5663	10.3407	9.2450
93	2.53253	0.05090	13.9237	12.6016	11.4051
92	2.51119	0.05089	13.6296	12.3356	11.1645
91	2.18952	0.04699	9.8033	8.9408	8.1541
90	2.31322	0.04651	11.0835	10.1179	9.2364
89	2.39493	0.05208	12.1625	10.9824	9.9167
88	2.67269	0.06121	16.3550	14.5061	12.8662
87	2.93752	0.13843	24.9890	19.0507	14.5236
86	2.55332	0.07453	14.9122	12.8855	11.1342
85	2.47862	0.08560	14.1550	11.9686	10.1199
84	2.65524	0.09191	17.1091	14.2886	11.9330
83	3.27501	0.08794	31.5393	26.5460	22.3432
82	3.19339	0.08608	28.9569	24.4614	20.6638
81	2.75303	0.14549	21.0895	15.8570	11.9228

Spanish N. Atl. CPUEn, 1981-1995, gear= BB, age= 3

YR	LSMEAN	STDERR	UCPU3	CPU3	LCPU3
95	3.61991	0.12014	47.589	37.6045	29.7147
94	3.54493	0.12153	44.280	34.8941	27.4979
93	3.67206	0.12583	50.734	39.6455	30.9804
92	3.31553	0.12222	35.253	27.7433	21.8334
91	2.69147	0.11356	18.551	14.8488	11.8858
90	3.96070	0.12344	67.374	52.8954	41.5280
89	3.71379	0.08173	48.295	41.1461	35.0555
88	3.50118	0.10928	41.320	33.3531	26.9224
87	4.37544	0.13669	104.867	80.2211	61.3673
86	3.60966	0.12046	47.135	37.2224	29.3943
85	3.25858	0.13298	34.058	26.2437	20.2225
84	2.59199	0.18518	19.533	13.5873	9.4515
83	3.55933	0.13283	45.994	35.4509	27.3248
82	3.71261	0.15416	56.073	41.4501	30.6407
81	3.07148	0.18674	31.656	21.9533	15.2245

Spanish N. Atl. CPUEn, 1981-1995, gear= TROL, age= 4

YR	LSMEAN	STDERR	UCPU4	CPU4	LCPU4
95	1.29415	0.06232	4.12984	3.65499	3.23473
94	1.09626	0.07197	3.45531	3.00071	2.60592
93	1.40538	0.06382	4.62974	4.08538	3.60503
92	1.62247	0.06387	5.75290	5.07594	4.47865
91	1.35565	0.05896	4.36211	3.88604	3.46193
90	1.41835	0.05836	4.63875	4.13733	3.69011
89	1.27268	0.06676	4.07864	3.57838	3.13947
88	1.78690	0.07702	6.96445	5.98864	5.14956
87	0.99459	0.17576	3.87488	2.74569	1.94556
86	1.85924	0.09321	7.73907	6.44679	5.37030
85	1.18730	0.10815	4.07606	3.29745	2.66756
84	1.80066	0.11712	7.66817	6.09532	4.84508
83	1.96554	0.11059	8.92105	7.18253	5.78282
82	1.52066	0.10887	5.69726	4.60246	3.71804
81	0.80544	0.17931	3.23153	2.27393	1.60010

Spanish N. Atl. CPUEn, 1981-1995, gear= BB, age= 4

YR	LSMEAN	STDERR	UCPU4	CPU4	LCPU4
95	2.35329	0.14006	13.9797	10.6238	8.0734
94	2.07974	0.14044	10.6425	8.0817	6.1370
93	2.52625	0.14515	16.7984	12.6390	9.5095
92	2.62652	0.13793	18.2904	13.9578	10.6514
91	1.89049	0.13739	8.7513	6.6854	5.1072
90	2.80105	0.13842	21.8004	16.6204	12.6713
89	2.55431	0.09357	15.5195	12.9189	10.7541
88	2.88529	0.12750	23.1808	18.0550	4.0626
87	2.75937	0.15853	21.8162	15.9895	11.7190
86	3.22764	0.13921	33.4544	25.4657	19.3847
85	2.63787	0.15289	19.0912	14.1477	10.4843
84	2.68959	0.20498	22.4741	15.0383	10.0627
83	2.80191	0.15253	22.4774	16.6689	12.3613
82	2.85152	0.17696	24.8790	17.5873	12.4327
81	2.06982	0.21422	12.3375	8.1073	5.3275

Table 3.- Estimated parameters, standard error, relative CPUEs and upper and lower 95% confidence limits, obtained for ages 1 to 4, gears TROL and BB.

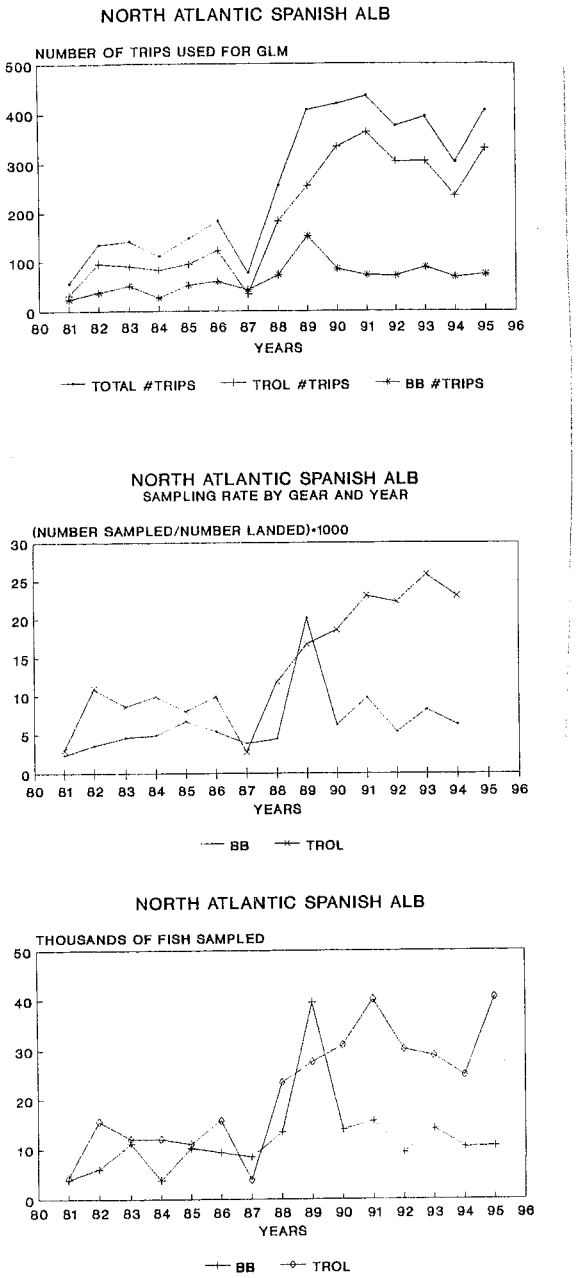

Figure 2.- Number of trips, number of fish sampled and sampling rate, for trolling (TROL) and bait boat (BB), for the period 1981-1995. Sampling rate is not available for 1995.

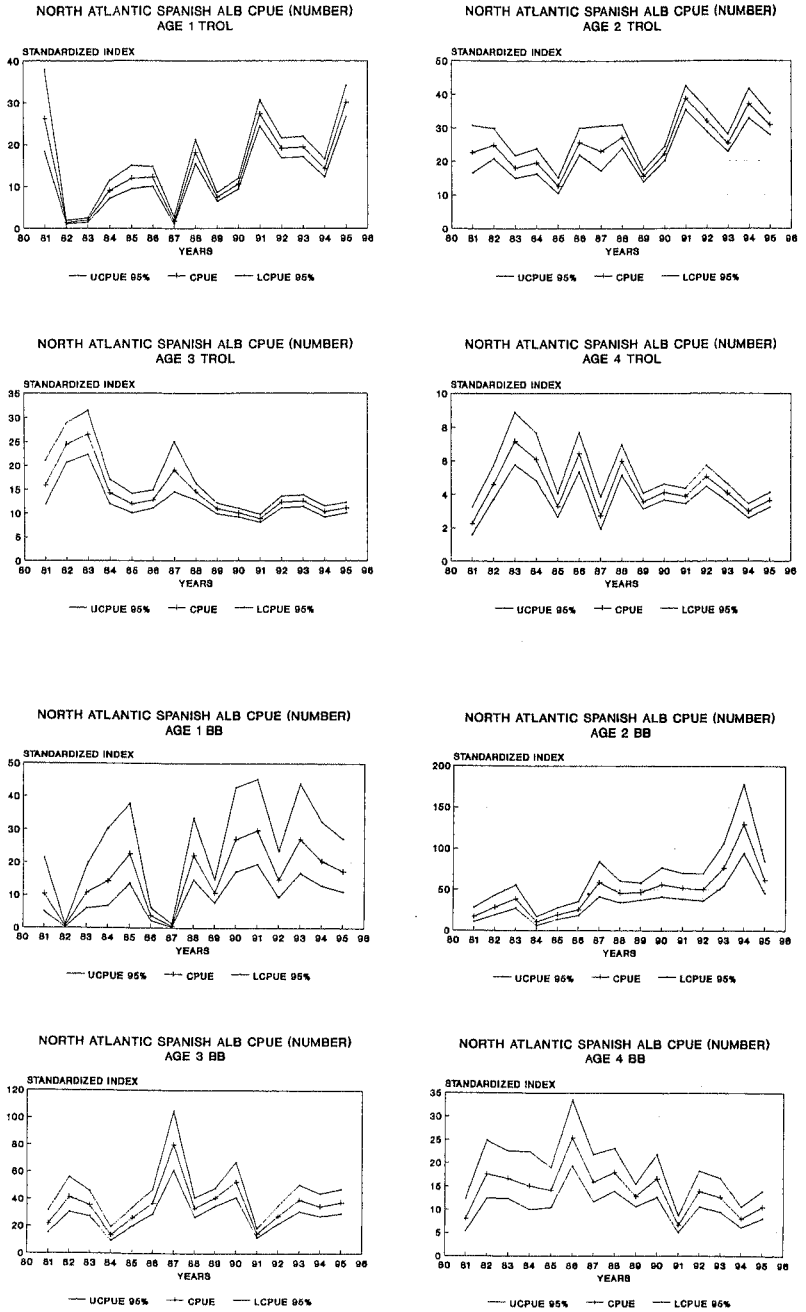

Figure 3.- Annual change of standardized CPUE, in number of fish by age class 1, 2, 3 and 4. Gears trolling (TROL) and bait boat (BB).