

## HISTORICAL SIZE STRUCTURE OF BLUEFIN TUNA PURSE SEINER'S CATCH: DATA RECOVERED FROM BALFEGÓ LOGBOOKS DATA (1985-2000)

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### SUMMARY

*In this document we present the annual size structure and the corresponding catch at age estimated from the information recuperated from Balfegó purse seiner's logbooks. In addition, historical information on fishing areas and season are reported. The recovered data cover the period 1985-2000 and the results reveal that at that time bluefin tuna juveniles represents 84% of the total catch of this fleet. We conclude that in this region, Western Mediterranean, at a time where purse seiners fish all year around and did not primarily target on the spawning ground the size structure reflects the available size of tuna on every other western fishing ground and could be inferred to the whole fleet.*

### RÉSUMÉ

*Dans ce document nous présentons la structure annuelle des tailles et la prise par âge correspondante estimée à partir des informations récupérées dans les carnets de pêche des senneurs de Balfegó. En outre, des informations historiques sur les zones et la saison de pêche sont fournies. Les données récupérées couvrent la période s'étendant de 1985 à 2000 et les résultats révèlent qu'à cette époque, les thons juvéniles représentaient 84 % du total des captures de cette flottille. Nous concluons que, dans cette région, la Méditerranée occidentale, à une époque où les senneurs pêchent toute l'année et ne ciblaient pas principalement la zone de frai, la structure des tailles reflète la taille disponible des thonidés dans toute autre zone de pêche occidentale et qu'elle pouvait être déduite pour l'ensemble de la flottille.*

### RESUMEN

*En este documento se presenta la estructura de tallas anual y la correspondiente captura por edad estimada a partir de la información recopilada de los cuadernos de pesca de los cerqueros de Balfegó. Además, se comunica información histórica sobre la zonas y temporada de pesca. Los datos recuperados cubren el periodo 1985-2000 y los resultados revelan que, en ese momento, los juveniles de atún rojo representaban el 84% de la captura total de esta flota. Concluimos que, en esta región, el Mediterráneo occidental, en un momento en que los cerqueros pescan todo el año y no se dirigen principalmente a la zona de desove, la estructura de tallas refleja el tamaño disponible de atunes en todos los demás caladeros occidentales y puede extrapolarse a toda la flota.*

### KEYWORDS

*Bluefin tuna, eastern Stock, western Mediterranean, purse seiners, catch at size*

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## Introduction

The poor historical information about certain fisheries especially in the Mediterranean is an important limitation for bluefin tuna stock assessments and currently a lot of effort is investing to fill the existent gaps. In particular to strengthen Task II data as past catch at size data of purse seiners in the Mediterranean is practically non-existent but could be recuperated from old forgotten logbooks kept by captains or ship-owners.

The historical data of Balfegó fishing operations on bluefin tuna were registered in logbooks by the captains of the two tuna purse seiners. These logbooks have been recently recovered and although the data is still in the process of digitalising more than half have been already recorded. The recorded information so far is complete for one of the vessels covering the period from 1985 to 2000, and for the second vessel from 1988 to 1992. This information has been facilitated by the company with the purpose of providing historical information on catch at size for tuna purse seiners in the Mediterranean.

## Material and Methods

The information received from Balfegó is the one they have recovered so far from the logbooks kept by the ship-owners. The period recovered and recorded for the first vessel goes from the last quarter of 1985 to 1992 with the exception of 1998 because this logbook could not be found. The information recovered for the second vessel goes from 1988 to 2000 but the recorded data until now goes from 1988-1992.

The data comprise information of each fishing operation (set): vessel name, date, fishing area, amount of fish in number and average individual weight. To estimate annual length frequencies the average individual weight was transformed to length (cm) according to the current ICCAT conversion factor ( $\alpha=3.50801E-05$ ,  $\beta=2.878451$ ) and later converted to age, according to VB parameters ( $L_{\infty}=318.85$ ,  $K=0.093$ ,  $t_0=-0.970$ ) estimated by Cort (1991) for the eastern stock.

In addition we have estimated the percentage of sets per month and year to provide information to the fishing activity throughout the year. The purse seiners operational behaviour was estimated by the percentage of sets per area. The average weight per area was estimated to determine the target size over the study period.

## Results

A total of 947 sets were analysed. Fishing season lasted around 7 months, beginning generally in April and concluding by October. The period with highest fishing intensity was late spring and late summer (**Table 1**).

The purse seiners generally fished in three different areas: Balearic waters, Golf of Lion and Catalan sea (coastal platform from Valencia to Cap de Creus), with few observations in the southern areas of Palos cape (**Table 2**). The results showed that during those years the main fishing area was the Catalan sea with 66% of the total fishing activity, followed by the Golf of Lion (27, 3%). The fishing activity on the Balearic spawning area was very low (6, 3%). The average weight of individuals varied between areas (**Figure 1**), being significantly higher in Balearic grounds. Yet there are two points that should be highlighted. First, the size of tuna caught in the Catalan Sea and in the Golf of Lion corresponded to juvenile's size classes. The second point is that although the tuna caught in the spawning grounds were adults they were relatively small.

The annual size structure was estimated but no relevant shifts were observed from year to year. Here we present the size structure for the whole period (**Figure 2**) and the high proportion of juveniles caught during those years clearly points the target sizes. The catch at age estimated over the whole period shows that approximately 84% of the catches were juveniles (**Figure 3**), consistently on yearly basis (**Figure 4**). In this Mediterranean region the schools of juveniles are available throughout the year and purse seiners depended essentially on their catch. Furthermore, during those years the fleet rarely targeted on adults even during the spawning months when the schools of spawners are available in Balearic waters the purse seiners activity was negligible.

These results reveal the difference with the current catch at age of Balfegó purse seiners, modal age around 10 yrs. (SCRS/2014/185), differences caused by the regulatory measures adopted for the conservation of this stock and changes in fishing strategies tailored for tuna farming.

To understand these results it is convenient to highlight some facts. In the past tuna purse seiners fished all year around in the western Mediterranean and they fished on juveniles because they are available at any season. In addition, fishing on juveniles had other advantages, the fishing operations are not very far from the coast which enhance security and costs, the catch in weight is not large so easy to handle for small purse seiners so it can arrive to the port in good conditions. Moreover, searching systems were not strictly necessary because the search of schools of juveniles was based on the detection of flocks of birds above them. To understand the low incidence of purse seiners on adults we have to take into account that the Balearic ground remained undiscovered until 1988 which is understandable considering that the presence of adults is limited to the narrow temporal window of the spawning period and the long distance from the purse seiners ports, regardless their flags. Once the fishing ground was discovered the purse seiners were not yet adapted for this type of fishing, it required bigger vessels to handle it. Another additional difficulty was that spawners rarely feed during the spawning period so their schools are seldom associated with flocks of birds. Moreover, as the landed catches were larger and not in optimal conditions both negatively impacted on its price. Little by little the fleet and their fishing operations were adapted for fishing on spawners, first the vessels began to incorporate sonars for the detection of schools (1993-1995). Later on they incorporated fridge vessels (1994), transport vessels equipped with cold water tanks to transport the fish in good conditions, which improve its commercialization. The qualitative leap of this fishing was when it became live-fishing (1997) and a supporting fleet with transport cages was incorporated.

We conclude that the past size structure of purse seiners catch in this region, regardless their flag, would be similar of the results presented here because they caught what was available, known and of commercially profitable.

## References

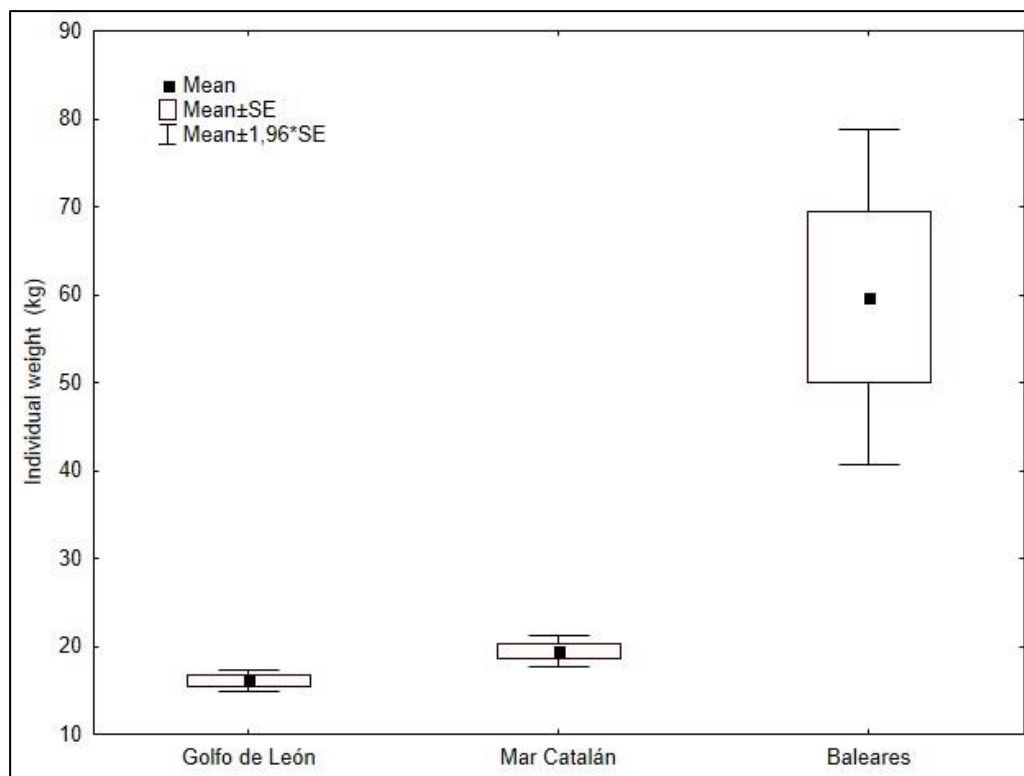
- Cort, J. L. 1991. Age and growth of bluefin tuna *Thunnus thynnus* (L.) of the Northeast Atlantic. ICCAT Rep (p. 86). SCRS/94/66. Madrid-Spain.
- Gordoa, A. 2015. Catch rates and catch size structure of the Balfegó purse seine fleet in Balearic waters from 2000 to 2014; two years of size frequency distribution based on video techniques. Collect. Vol. Sci. Pap. ICCAT, 71(4), 1803-1812.

**Table 1.** Percentage of fishing operations (sets) per month and year.

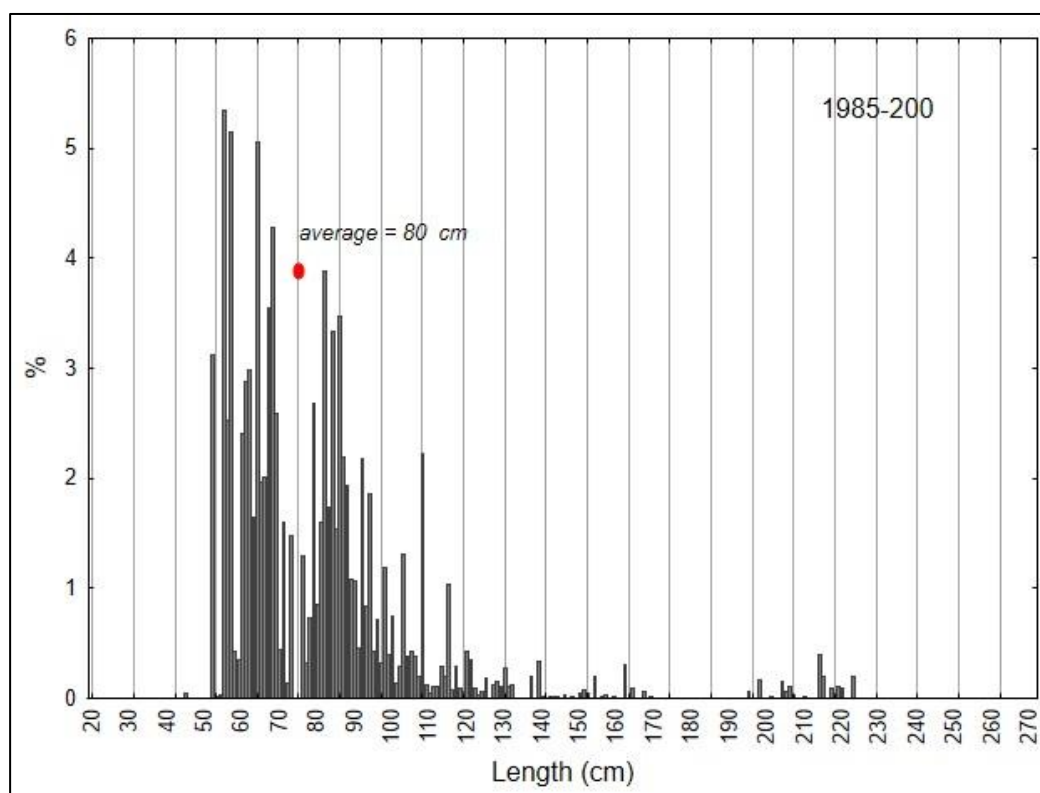
	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov
1985	0	0	0	0	0	0	33	44	22
1986	0	5	11	11	0	26	47	0	0
1987	0	0	0	0	25	35	27	13	0
1988	0	2	15	0	22	28	9	22	1
1989	0	0	3	5	9	47	27	9	0
1990	5	35	21	4	4	14	13	4	0
1991	0	9	2	9	6	21	28	21	4
1992	0	9	16	2	3	25	28	14	4
1993	0	17	25	0	0	17	22	18	2
1994	0	23	15	0	0	28	18	15	3
1995	0	20	11	0	0	38	26	5	0
1996	0	13	11	2	0	43	32	0	0
1997	0	0	0	5	0	0	71	24	0
1999	0	0	0	15	0	10	75	0	0
2000	0	0	7	3	0	23	57	10	0

**Table 2.** Percentage of fishing operations per area and year.

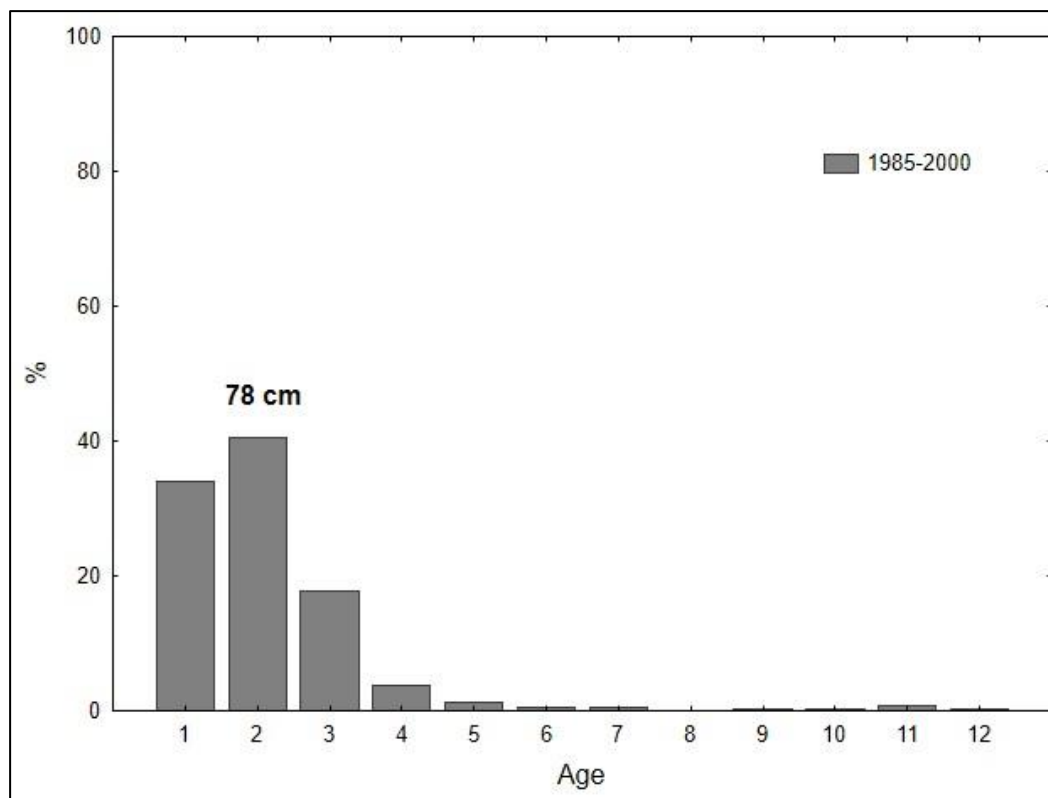
	Baleares	CABO PALOS	Golfo de León	Mar Catalán
1985			11	89
1986			0	1
1987	18		39	43
1988			46	54
1989	8		54	38
1990	7		33	60
1991	15		22	62
1992	5		42	52
1993		2		
1994				100
1995				100
1996	2			98
1997		5		95
1999	15		15	70
2000	10		43	47



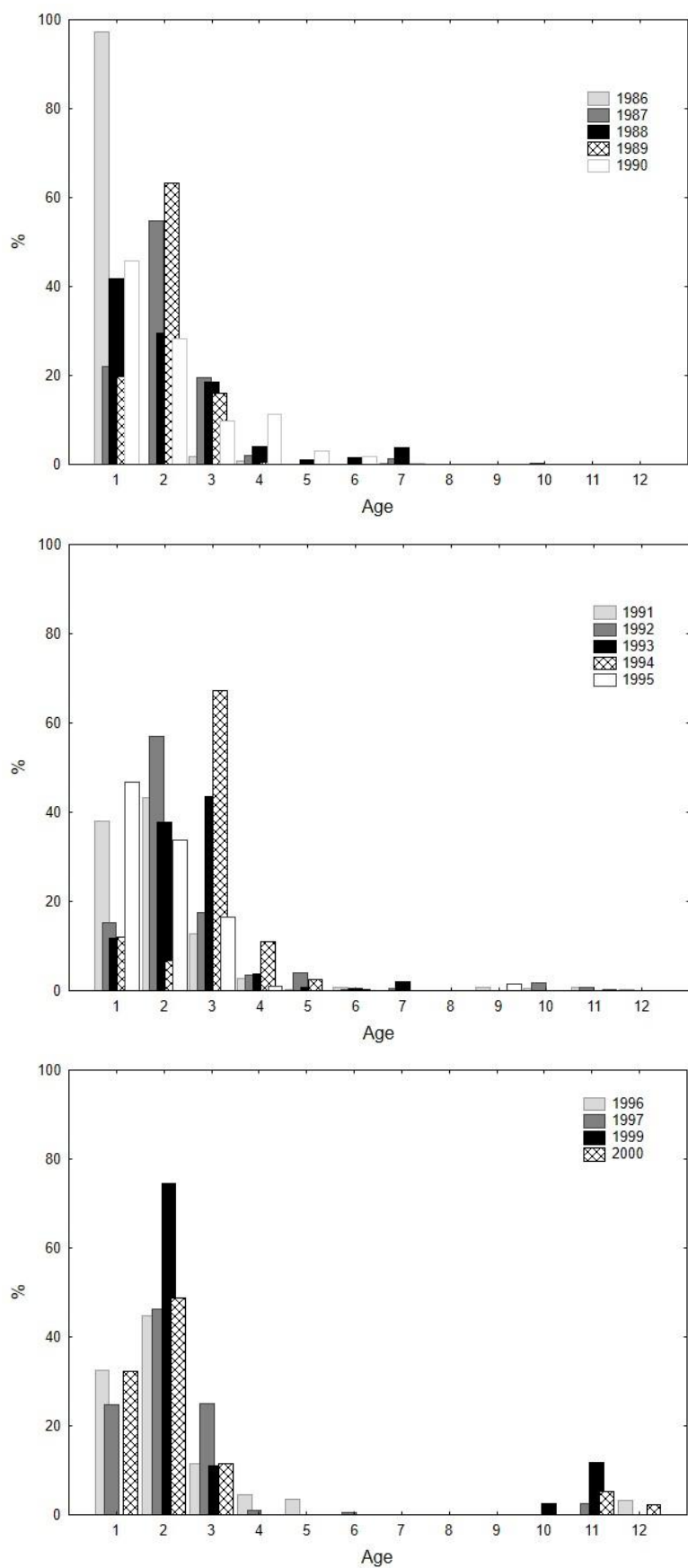
**Figure 1.** Average weight of bluefin tuna caught per area estimated from Balfegó fishing operations (1985-2000).



**Figure 2.** Length structure of bluefin tuna caught by Balfegó purse seiners, estimated for the period 1985-2000.



**Figure 3.** Age structure of bluefin tuna caught by Balfegó purse seiners, estimated for the period 1985-2000.



**Figure 4.** Annual age structure of bluefin tuna caught by Balfegó purse seiners, estimated for the period 1985-2000.