ANNUAL MEAN WEIGHT OF BLUEFIN TUNA (THUNNUS THYNNUS) CAUGHT BY THE TRAPS IN THE SOUTH OF SPAIN BETWEEN 1914-2010

José L. Cort¹, José M. de la Serna² and Marta Velasco¹

SUMMARY

The Spanish trap fishery of bluefin tuna in the Strait of Gibraltar between 1914-2010 is studied, relating the series of annual mean weights to those of the Norwegian purse seine fishery and observing that over the time period in which the two fisheries were operative (1945 to the end of the 1970s), there was a constant increase in the annual mean weight of the catch in both. Once the bluefin tuna fisheries of the north of Europe had disappeared, and therefore those competing with the traps for the resource, an apparent recovery of the population began, as seen by a fall in annual mean weights of the catches made by the traps, which has been maintained to the present day. The creation of the Consorcio Nacional Almadrabero (CNA) in 1929 was a great improvement for the Spanish traps industry. Until its disappearance in 1972 the Consorcio collected a lot of information on the activities of the Spanish traps, which is of great value to scientists.

RÉSUMÉ

Cette étude se penche sur la pêche des madragues espagnoles de thon rouge dans le détroit de Gibraltar entre 1914 et 2010, en mettant en relation les séries des poids annuels moyens avec celles de la pêche à la senne norvégienne et en observant que pendant la période au cours de laquelle les deux pêcheries étaient opérationnelles (à partir de 1945 jusqu’à la fin des années 1970) il existait une augmentation constante de la moyenne annuelle du poids de la capture dans les deux cas. Lorsque les pêcheries de thon rouge du Nord de l’Europe ont disparu, et par voie de conséquence les pêcheries pouvant se disputer les ressources avec les madragues, la population a apparemment commencé à se récupérer, comme l’illustre une baisse des poids moyens annuels des prises réalisées par les madragues, qui s’est maintenue jusqu’à présent. La fondation du Consorcio Nacional Almadrabero (CNA) en 1929 a représenté une grande amélioration pour l’industrie des madragues espagnoles. Avant sa disparition en 1972, le Consorcio a recueilli un grand nombre d’informations sur les activités des madragues espagnoles qui sont d’une grande utilité pour les scientifiques.

RESUMEN

Se estudia la pesquería de almadrabas española de atún rojo en el Estrecho de Gibraltar entre 1914-2010, relacionando la serie de pesos medios anuales con la de la pesquería de cerco noruega y observando que durante todo el periodo en que las dos pesquerías estuvieron operativas (1945 hasta finales de los 70), se produjo un aumento constante en el peso medio anual de la captura en ambas. Una vez que las pesquerías del Norte de Europa desaparecieron y, por tanto, la competición con las almadrabas por el recurso, se inició una aparente recuperación de la población, como puede observarse por un descenso en los pesos medios anuales de las capturas realizadas por las almadrabas, que se ha mantenido hasta el momento actual. La creación del Consorcio Nacional Almadrabero (CNA) en 1929 fue una gran mejora para la industria almadrabera española. Hasta su desaparición en 1972, el Consorcio recopiló mucha información sobre las actividades de las almadrabas españolas que es de gran valor para los científicos.

KEYWORDS

Bluefin tuna, Spanish traps, tuna fisheries

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1. Introduction

The present study analyses the evolution of the Spanish traps fishery of the south of Spain from the beginning of the twentieth century to the present, placing special emphasis on the trend in annual mean weights obtained and the number of traps installed over the years.

The shortage of official statistical data prior to 1929, the year in which the Consorcio Nacional Almadrabero was created (López & Ruiz, 2003; Ríos Jiménez, 2007) made the work more difficult, though in some publications of the IEO from the 1920s (Chaves, 1926; Bellón, 1926; de Buen, 1922; 1925; de Buen, 1924; de Miranda Rivera, 1925; Boletín de Pescas, 1926) more exact data appear that allow estimates of annual mean weights of catches of the Spanish traps to be made.

Using previous studies by Fromentin (2009) and Tangen (2009), the last part of the present paper studies the parallelism of the Strait of Gibraltar traps fishery with the Norwegian purse seine fishery around the period from mid-1940 to 1980, with the aim of finding explanations for the collapse of the bluefin tuna fisheries of the north of Europe in the middle of the 1980s.

2. Data collection

The collection of data corresponding to the period between 1914 and 1929 was very difficult due to the lack of continuity in the official statistics, and in most cases only the catch taken by the traps in number of specimens is found (INE, 1922-23; INE, 1927; INE, 1919-27). For this reason, in the years for which the annual mean weight of the catch could be estimated, it was done using what little information there was from some traps (for example, Barbate and Zahara de los Atunes), for which the number of fishes caught and their corresponding weight are published; in these circumstances it was considered that the catches of these traps were representative of the total for the fishery.

For the years in which no data of the catch in kg could be obtained (1915, 1916, 1917, 1918, 1919, 1921, 1922 and 1928), the annual mean catch was estimated from the values for the nearest years for which this information was available. Once the value for the annual mean catch had been obtained, the value of the total catch was estimated from it and from the catch in number of fishes.

Regarding the number of traps operating between 1914 and 1928, de Buen (1923) and Ríos Jiménez (2007) provide data on all of them.

From 1929 to the present, the information published on the traps of the Spanish south Atlantic coast is very exhaustive; all the studies contain data of catches in weight and in number of specimens, means of catch/year, number of traps in operation, and environmental data (Lozano, 1958; Rodríguez-Roda, 1964, 1977, 1978, 1980, 1983; Baken et al., 1980; Rey et al., 1986; López and Ruiz, 2003; de la Serna and Macías, 2010).

3. Results and discussion

Figure 1 shows the annual mean weights caught by the Spanish traps between 1914-2010. It must be pointed out that the mean weight of the annual catch could only be estimated for seven of the years using the existing information of the years between 1914 and 1929: 1914 (115 kg), 1920 (117 kg), 1923 (110 kg), 1924 (122 kg), 1925 (124 kg), 1926 (122 kg) and 1927 (119 kg). Table 1 presents the data corresponding to Figure 1 and also gives values of catches in tonnes (t), the number of specimens caught and the source of information consulted. The table also highlights in a different colour the years in which, due to the lack of information, the annual mean weight was obtained from other adjacent years for which data are available to calculate it. These are the following: 1915, 1916, 1917, 1918, 1919, 1921, 1922 and 1928. From 1929 information of the annual mean weight is not lacking for any year.

Three distinct phases are observed:

The first from 1914 to 1946; the second from 1946-1976; and the third from 1976-2010. In the first, the mean weight varies between 90 kg (in 1946) and 150 kg (in 1932), with a mean value for the period of 128.5 kg. In the second, the mean weight increases constantly from 90 kg (in 1946) to 248 kg (in 1976). In the third, there is more stability, although with fluctuations between a maximum value of 248 kg (in 1976) and a minimum of 116 kg (in 2006).
The first phrase corresponds to a period in which the great fluctuations in the overall catch by the traps was due more to the situation created by the wars (1914-1918, First World War; 1936-1939, Spanish Civil War; 1939-1945, Second World War) and the creation of the CNA (López & Ruiz, 2003 and López, pers. comm.) than to the biology and dynamic of the bluefin tuna population. The low mean weight of the catch (128.5 kg, fishes aged approximately 10 years) indicates that the population was probably made up of numerous age classes and that recruitments were constant.

The second phase, which will be the subject of a more detailed study in the following chapter, shows a constant increase in the mean weight of the annual catch, which reveals continuous aging of the population over these years and there is also a considerable fall in the overall catch and in the number of traps in that period (Table 2). It may considered as a high risk period in which the population was close to collapse; nevertheless, from 1976 (third phase) there was a recovery possibly due to the entrance of new age classes to the fishery, a situation which has remained until the present day.

With respect to the number of traps in the entire series studied (Table 2), it varies between 14, in 1919, and 1 in 1974, coinciding with the disappearance of the CNA in 1972 (López & Ruiz, 2003). The period with the highest number of traps operating was between 1914 and 1929. From 1929, among its many activities the CNA regulated the Spanish traps fishery of the south of Spain by closing those that were not profitable (López, pers. comm). From 1974, the number of traps stabilized at 4, which is still the case today.

4. Comparison between the Spanish traps and purse seine in Norway

Tangen (2009) describes the bluefin tuna fishery in Norway and how in the 1950s Norway became the largest Atlantic fishing nation of bluefin tuna; nevertheless, from 1963 the decline began which would lead to the collapse of the fishery in the mid-1980s (Figure 2a).

Fromentin (2009) carried out an analysis using data of the main bluefin tuna fisheries in the twentieth century, including their total catches and length compositions. All the results point to a clear and strong link between the purse seine fisheries of the north of Europe and the Spanish traps fisheries during the 1950s and 1960s; nevertheless, this link disappears in the 1970s (Figure 2b).

The present study compares the mean weights of the Norwegian fishery (1950-1980), provided by the Norwegian scientist Nøttestad (Figure 3a), with those of the Spanish traps between 1946 and 1976, the so-called second phase of the previous chapter (Figure 3b). This period for the traps happens to coincide with the start of purse seine fishing in the north of Europe (mid-1940s) and its decline (at the end of the 1970s). The result of the comparison of the two figures reveals the following:

− That during the period of time in which the two fisheries remained operative, there was a constant increase in the mean weight of the annual catches of both, more remarkable in the case of Norwegian fishery (b=9.14) than in the case of traps (b=4.07), probably due to the lesser number of cohorts present at the Norwegian fishery,

− That once the competition for the resource had disappeared, which is what effectively happened for the Spanish traps when the northern European fisheries collapsed at the end of the 1970s-mid-1980s, an apparent recovery of the population began as shown by the fall in the annual mean weights of the catches of the traps.

These facts confirm the strong interaction between the two fisheries, already described by Fromentin (2009).

According to ICCAT statistics, between 1950 and 1960, about 213,000 t of spawning bluefin tunas were caught (approximately 1,800,000 specimens) by both the northern European fisheries and the traps of the Strait of Gibraltar, the equivalent of a mean of 19,300 t/year. If we add to this the about 43,900 t of juveniles (approximately 2,200,000 specimens) caught in the same time period in the Atlantic fisheries, it can be assumed to be one of the main causes of the decline in the fisheries of the north of Europe and some of that of the remaining Atlantic fisheries. The apparent overfishing of bluefin tuna in that decade was one of the reasons why ICCAT was created in 1966.

If we add to this whole scenario the development of the Mediterranean fisheries of juveniles and spawners that began in the 1970s and reached the levels of extraction of the last ten years, including illegal undeclared fishing
it can be concluded that the lack of application of the management measures imposed by ICCAT in the 1970s, 1980s and 1990s was one of the main causes of the current situation of bluefin tuna in the eastern Atlantic and Mediterranean, which has led to the strict recovery plans that ICCAT now has in place.

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Table 1. Total catch and average weight. Spanish traps, 1914-2010.
Table 2. Number of Spanish traps, 1914-2010.

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Figure 1. Trap fishing in Spain (1914-2010). Total catch, in blue. Average weight in red (in black, time series 1946-1976).

Figure 2a. Bluefin tuna fishing in Norway. Purse seine catches (Tangen, 2009).
Figure 2b. Similarity analysis from several bluefin tuna fisheries (Fromentin, 2009).

Figure 3a. Bluefin tuna, average weight. PS, Norway (data provided by L. Nøttestad) 
\( Y = -17742.94 + 9.13X \); \( R^2 = 0.9457 \).
Figure 3b. Bluefin tuna, average weight. Spanish traps (present study) ($Y = -7828.36 + 4.07X$; $R^2 = 0.8729$).

Bluefin tuna industry in Spain in 1923 (Adapted from Bellon, 1926).
Bluefin tuna trap fishing in Spain (1949).