SIZE DISTRIBUTION OF ATLANTIC LITTLE TUNA (*EUTHYNNUS ALLETTERATUS*) CAUGHT BY THE SOUTHWESTERN SPANISH MEDITERRANEAN TRAPS AND THE RECREATIONAL TRAWL FISHERY

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SUMMARY

Atlantic little tuna (Euthynnus alletteratus) *is one of the most abundant small tuna species in the Mediterranean Sea. This species is commercially exploited on the Spanish coast by traditional fisheries, mainly tuna traps, but it is also targeted by the recreational coastal trawl fishery. The aim of this paper is to update biological information on this species in the western Mediterranean and to show possible differences between these gear catches. Size and weight data were collected from a Spanish Mediterranean trap (la Azohia, Murcia) (100 specimens) and from recreational coastal fisheries (339). Data were collected throughout 2006 in order to determine size-weight relationships and size distributions of the population. The Atlantic little tuna collected in traps ranged from 61 to 85 cm. in fork length (FL) and the specimens caught by the recreational fisheries ranged from 36 to 46 cm. FL. Significant differences were found between both size distributions. The recreational fisheries mainly target juveniles and the traps mainly target mature fishes. The size distribution of trawl catches showed a unique modal value (39.5 cm) suggesting that all specimens corresponded to age class 1. The reproductive stock is mainly made up of 4 age classes (2 to 5+). Our data indicates that age class 4 is totally recruited to the trap fishery and constitutes the main age class in the stock reproductive biomass. This and other biological aspects are discussed in this paper.*

RÉSUMÉ

*La thonine commune (*Euthynnus alletteratus*) est l'une des plus abondantes espèces de petits thonidés en Méditerranée. Ces espèces sont commercialement exploitées sur le littoral espagnol par des pêcheries traditionnelles, principalement des madragues, mais elles sont également la cible de la pêcherie récréative de chalutiers côtiers. Le but du présent document est d'actualiser les informations biologiques sur cette espèce en Méditerranée occidentale et de montrer les différences éventuelles entre les captures réalisées par ces engins. Les données de taille et de poids ont été recueillies dans une madrague méditerranéenne espagnole (la Azohia, Murcie) (100 spécimens) et auprès de pêcheries côtières récréatives (339). Des données ont été recueillies en 2006 afin de déterminer les relations taille-poids et les distributions de taille de la population. La thonine commune capturée dans les madragues mesurait entre 61 et 85 cm de longueur à la fourche (FL) et les spécimens capturés par les pêcheries récréatives mesuraient entre 36 et 46 cm de FL. Des différences considérables ont été observées entre les deux distributions de taille. Les pêcheries récréatives ciblent essentiellement les juvéniles et les madragues ciblent essentiellement les poissons matures. La distribution des tailles des prises au chalut a montré une valeur modale unique (39,5 cm), ce qui suggère que tous les spécimens correspondent à la classe d'âge 1. Le stock reproducteur est principalement composé de quatre classes d'âge (2 à 5+). Nos données indiquent que la classe d'âge 4 est totalement recrutée par la pêcherie de madragues et constitue la principale classe d'âge dans la biomasse du stock reproducteur. Le présent document examinera cet aspect et d'autres aspects biologiques.*

RESUMEN

La bacoreta (Euthynnus alletteratus) *es una de las especies de pequeños túnidos más abundante en el Mediterráneo. Estas especies son explotadas comercialmente en la costa española por las pesquerías tradicionales, principalmente las almadrabas de túnidos, pero también es el objetivo de la pesquería de arrastre costera de recreo. El objetivo de este documento es actualizar la información biológica sobre esta especie en el Mediterráneo occidental y*

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demostrar las posibles diferencias entre las capturas de los artes. Los datos de talla y peso fueron recopilados en una almadraba del Mediterráneo español (la Azohia, Murcia) (100 ejemplares) y de las pesquerías recreativas costeras (339). Los datos se recopilaron durante 2006 con el fin de determinar las relaciones peso-talla y las distribuciones de talla de la población. Las bacoretas del Atlántico recogidas en almadrabas oscilaban entre 61 y 85 cm de longitud a la horquilla (FL) y los ejemplares capturados por las pesquerías de recreo entre 36 y 46 cm. Se descubrieron diferencias importantes entre ambas distribuciones de talla. Las pesquerías de recreo se dirigen principalmente a los juveniles y las almadrabas principalmente a los peces maduros. La distribución por tallas de las capturas del arrastre mostraba un valor modal único de 4 clases de edad (2 a 5+). Nuestros datos indican que la clase de edad 4 está totalmente reclutada para la pesquería de almadrabas y constituye la principal clase de edad en el stock de biomasa reproductora. En este documento se tratan este y otros aspectos biológicos.

KEYWORDS

Atlantic little tuna, size-weight relationships, size distribution, Southwestern Mediterranean.

1. Introduction

The Atlantic little tuna (*Euthynnus alletteratus*) distributes in temperate and tropical areas of Atlantic Ocean, Mediterranean and Black sea (Belloc, 1955; Valeiras and Abad, 2007). The species is usually found in coastal waters with swift currents, near shoals and around the warmer waters of thermal fronts and upwellings (Sabastes and recasens 2001, Demir, 1963).

The little tuna are abundant in the Spanish Mediterranean Sea where has been commercially exploited by seasonal artisanal fisheries (Sabatés and Recasens, 2001; Demir, 1963). In Spain, the species have been caught traditionally by seasonal coastal fisheries. Several fishing gears have been used to catch it: Traps and other minor fixed gears, purse-seine and hand-line (Uchida, 1981; Rey et al., 1984). Recreational fisheries also caught Atlantic Little tuna using coastal pelagic trawl.

In spite of the importance to local economy of this species, little is currently known about it biology. Early life stages knowledge is especially scarce. During the first life stages little tuna are no caught and juvenile life history is unknown. Immature fish appear in fishery from around 30 cm in fork length. The maximum reported age is 8 years (Landau, 1965; Jonhson, 1983; Cayré and Diouf, 1983; Kahraman, 1999) The size at first maturity is about 42 cm. FL. in the Easter tropical Atlantic (anonymous, 2006).

Along 2006, sampling effort was focused on collected little tuna samples to improve biological knowledge in both tuna traps and recreational coastal trawl fishery in western Mediterranean. The aim of this paper is to update the biological information of small tuna caught in these gears and show possible differences between their catches characteristics.

2. Material and methods

A total of 439 Atlantic Little tunas were collected in 2006; 100 coming from Tuna Trap of “La Azohía” at Mediterranean coast of Spain and 339 from Alicante coming from recreative coastal trawl fishery (**Figure 1**). For each specimen, fork length (FL) (to the nearest inferior cm) and round weight were determined.

Pairs of observations on length and round weight were used to fit length-weight relationships. The model used to fit it was the classic potential model. Weight = a Length^b. Equation parameters were calculated using a logarithm transformation: Ln (weight) = Ln (a) + b Ln (length). GLM analysis was used to compare the length-weight relationships obtained with those reported previously.

3. Results and discussion

3.1. Size distribution

Size distribution of Atlantic little tuna caught by the trap and recreational fisheries are summarized in **Figure 2**.

The **Table 1** shows descriptive statistics for the catches of the species in both gears.

The size distribution of *Euthynnus alletteratus* caught by traps shows a multi-modal value (**Figure 2**, blue bars). The first mode around 62-63cm corresponds to the age class 2. The following other modal values corresponds succesivelly to the age classes 3 (66 cm.), 4 (75 cm.) and 5+ (82 cm.) (Valeiras et al., 2007). The most important cohort in the tuna trap catches corresponds to the age class 4. The oldest exemplars in the catches were over 5 years old (Valeiras et al., 2007).

Regarding the size distribution of LTA caught by the trawl recreational fishery, the **Figure 2** (Red bars) shows a unique modal value around 39 cm. All these specimens correspond to the age class 1 (**Figure 3**).

In summary, traps target the reproductive fraction of the population and the trawl recreational fishery the juvenile ones.

3.2. Length-weight relationships

Pairs of observations on length and round weight were used to obtain the following size-weight relationship:

$$\textbf{Total weight} = 1.6989E^{-05} * FL^{2.966711}$$

The observed and expected values of Atlantic small tuna length- weight pairs are showed in **Figure 4**. The regression statistics are summarized in **Table 2**, and residual analysis in **Table 3**. Both gear catches fit the same size-weight relationship (Adjusted R-squared: 0.9869) although pairs of values are far apart in the size-weight curve.

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Table 1. Length descriptive statistic of Atlantic little tuna caught by traps and trawl. Length values in cm.

Size distribution LTA	*Traps*	*Trowl*
Mean	73,9	40,3
Error típico	0,5	0,1
Median	74,5	40,0
Mode	73,0	39,5
Standard deviance	4,6	1,7
Sample Variance	21,4	2,7
Curtosis	0,8	0,8
Range	23,6	10,8
Minimum	61,4	36,0
Maximum	85,0	46,8
Count	100,0	339,0
Nivel de confianza(95,0%)	0,9	0,2

Table 2. Size-weight regression statistics of Atlantic little tuna.

Coefficients	*Estimate*	*Standard Error*	*t value*	*Pr(>|t|)*
(Intercept)	-10.2077	0.5991	-17.037	<2e-16 ***
LnLH	2.7869	0.1393	20.010	<2e-16 ***
GearTROL	-0.4815	0.7417	-0.649	0.517
lnLH:GearTROL	0.1001	0.1828	0.548	0.584

(Dispersion parameter for gaussian family taken to be 0.007814931)
Null deviance: 262.2065 on 438 degrees of freedom
Residual deviance: 3.3995 on 435 degrees of freedom
AIC: -878.1
Number of Fisher Scoring iterations: 2

Table 3. Residual statistical analysis.

Model: gaussian, link: identity
Response: lnW
Terms added sequentially (first to last)

	Df	Deviance	Resid. Df	Resid. Dev.	P(>|Chi|)
NULL			438	262.206	
LnLH	1	258.790	437	3.417	0.000
Gear	1	0.015	436	3.402	0.170
lnLH:Gear	1	0.002	435	3.399	0.584

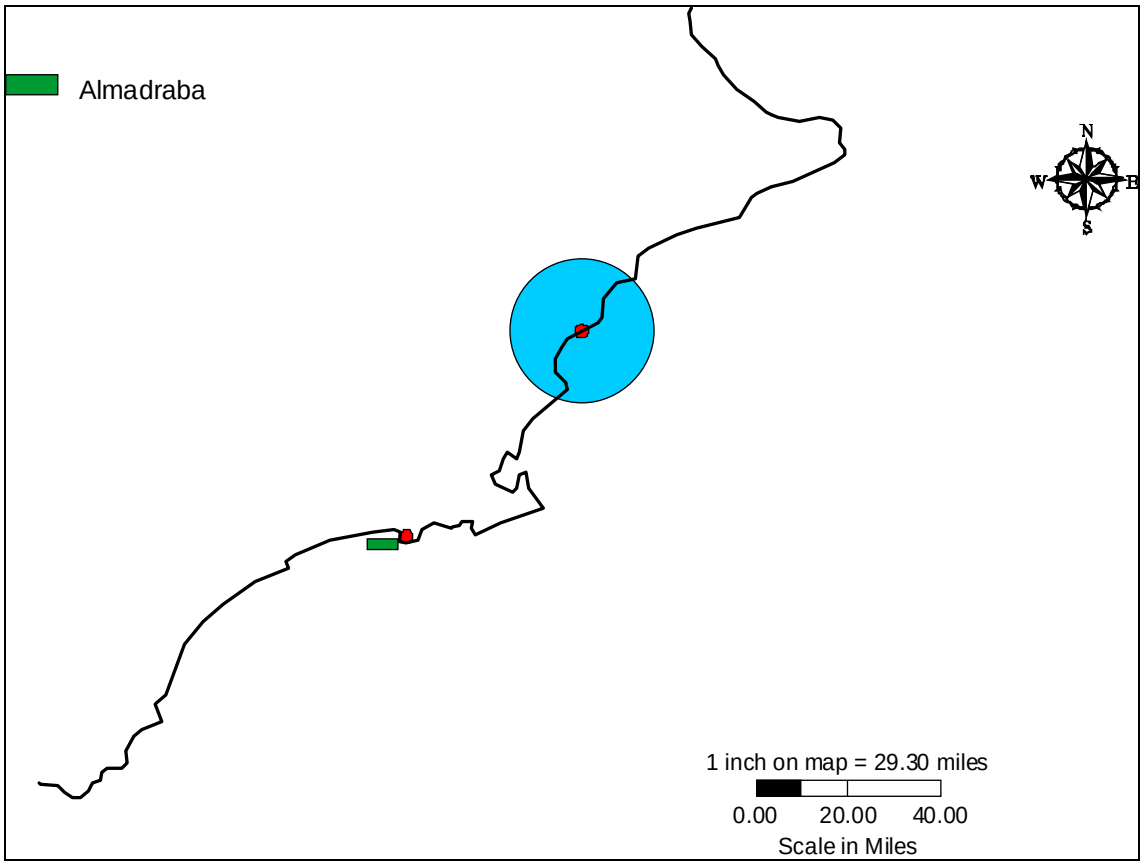

Figure 1. Study area. Tuna trap of "La Azohía" (Green) and recreational trawl fishery fishing ground (Blue).

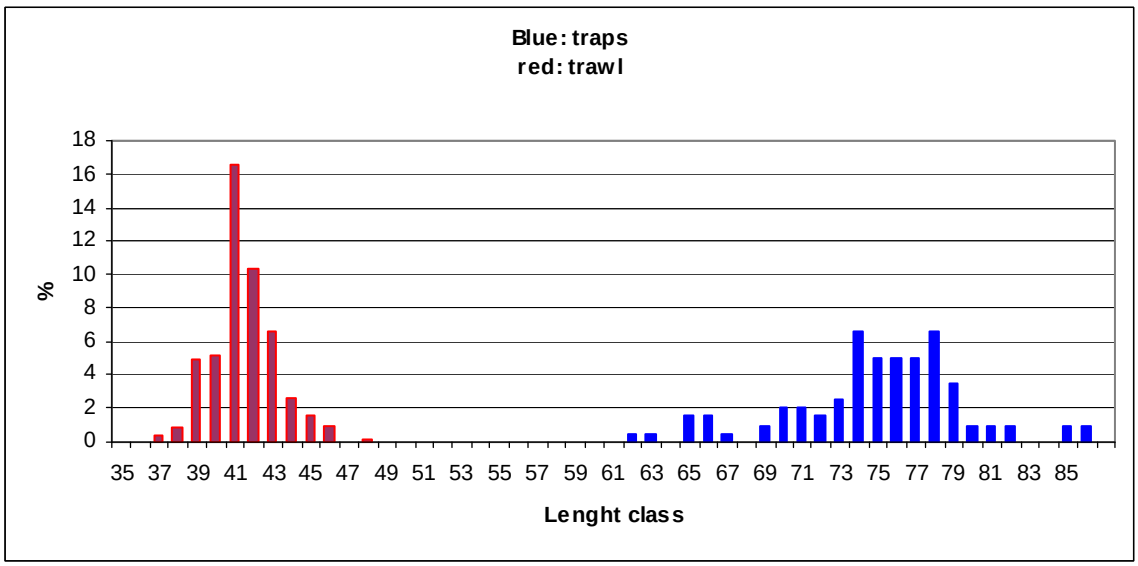

Figure 2. Size distribution of *Euthynnus alletteratus* caught by trawl recreational fishery (red) and Tuna traps (blue).

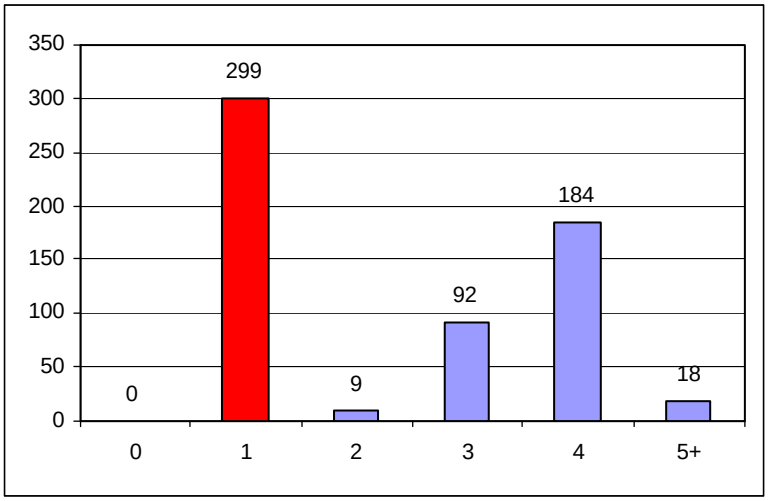

Figure 3. Age distribution of *Euthynnus alletteratus* caught by trawl Recreational fishery (red) and Tuna traps (blue).

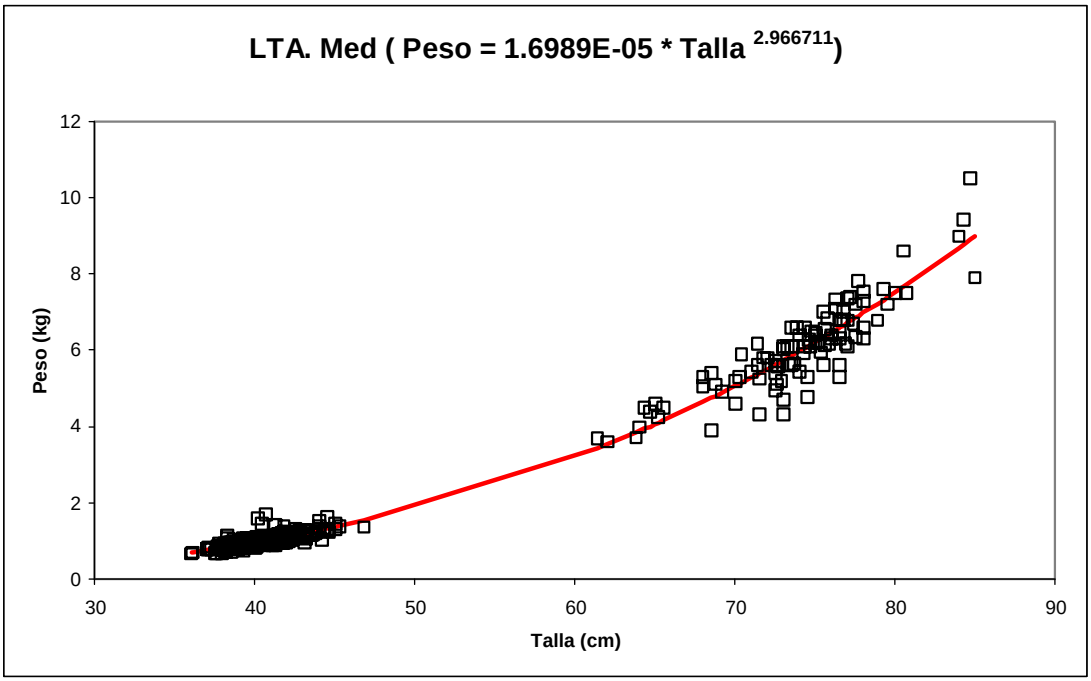

Figure 4. Size-weight relationship of *Euthynnus alletteratus*.