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ESTIMATION OF THE SIZE STRUCTURE OF BLUEFIN TUNA (*THUNNUS THYNNUS*) CATCHES BY MOROCCAN TRAPS AND ARTISANAL HAND LINE FISHERY

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SUMMARY

In 2012, the size structure of bluefin catches by Moroccan traps and artisanal hand line fishery were estimated from biological scraps and individual weight, respectively, using specific statistical relationships. The results showed that the size of fish caught by traps ranges from 169 to 282cm CFL, with average size of 225 cm, while in the artisanal fishery, the size of bluefin tuna varies from 159 cm to 276 cm, with a mean size of 205 cm. The mean size of bluefin tuna showed a positive trend during the last three years, which could be a good sign of the recovery of the East Atlantic bluefin tuna.

RÉSUMÉ

En 2012, la structure de taille des prises de thon rouge des madragues marocaines et de la pêcherie artisanale de ligne à main a été estimée à partir des fragments biologiques et du poids individuel, respectivement, à l'aide de relations statistiques spécifiques. Les résultats ont fait apparaître que la taille des poissons capturés à la madrague oscille entre 169 et 282cm CFL, la taille moyenne s'établissant à 225 cm, tandis que dans la pêcherie artisanale, la taille du thon rouge variait entre 159 cm et 276 cm, avec une taille moyenne de 205 cm. La taille moyenne du thon rouge a dégagé une tendance positive au cours des trois dernières années, ce qui pourrait être un bon signe du rétablissement du thon rouge de l'Atlantique Est.

RESUMEN

En 2012, se estimó la estructura de tallas de las capturas de atún rojo de las pesquerías de liña de mano artesanales y almadrabas de Marruecos a partir de restos biológicos y del peso individual, respectivamente, utilizando relaciones estadísticas específicas. Los resultados obtenidos demostraron que la talla de los peces capturados en las almadrabas oscila entre 169 y 282 cm CFL, con una talla media de 225 cm, mientras que en la pesquería artesanal, la talla del atún rojo capturado varía entre 159 y 276 cm, con una talla media de 205. La talla media del atún rojo mostraba una tendencia positiva durante los tres últimos años, lo que podría ser una buena señal de la recuperación del atún rojo del Atlántico este.

KEYWORDS

Morocco, Bluefin tunas, Traps, Hand line, Size frequency

1. Introduction

The size data are relevant information used in the analytical models for Atlantic Bluefin tuna stock assessment by the SCRS. The Moroccan Atlantic traps are one of the most important fisheries targeting this species, whose standardized abundance index has been regularly used in the last ICCAT stock assessment for this species (ICCAT, 2007; 2009; 2011).

Before 2006, the size frequencies data were missing for this fishery as most of fish is processed and sold directly into the sea to the Japanese vessels where it is rapidly processed and frozen on board to ensure a high quality of the flesh. In order to estimate the catch at size data, a sampling program of biological scraps (mainly heads cut at the pre-operculum or the operculum) has been developed (Abid and Idrissi, 2007b; Idrissi and Abid, 2009). As a result some size sampling data for this species were made available to the ICCAT since 2006.

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In the literature, there is no statistical relationship allowing the conversion between the fork length and the head length. To deal with this issue statistical relationships have been developed to estimate the size of tuna either from the head length or the lower jaw-pre-operculum length data. The biological scraps brought daily to the fishing port must be destroyed by tuna traps companies according to a law established by the Fisheries Department.

The objective of this paper is to update and analyze the size structure of BFT catches for the year 2012.

2. Material and methods

In 2012, biological scraps (heads) from 398 BFT were measured to estimate the size structure of catches made by Moroccan traps. The scraps were measured from the upper jaw to the posterior border of operculum and /or preoperculum with a measuring tape to the nearest centimetre **(Figure 1).**

The Curved fork length of sampled fish was estimated using the two statistical relationships previously presented (Abid *et al*., 2012), which are the following:

$CFL = 6.776*L_1^{0.8725}$
$CFL = 12.050*L_2^{0.7730}$

Where:

CFL: Curved fork length
L_1: Head length
L_2: Pre-opercular length

For the artisanal hand line fishery targeting giant BFT in the Strait of Gibraltar, individual weights obtained from the fish market for 654 fish were converted to theirs corresponding CFL, using a specific length weight relationship (Abid and Idrissil, 2007a):

$RW\ (kg) = 6.2*10^{-6}*CFL^{3.165}$

RW: Round weight

3. Results and discussions

In 2012, the size frequencies of BFT catches by traps are polymodal, which means that the catches are made of different age groups. The size of fish varies from 169cm to 282 cm CFL, with an average of about 225cm. The principal mode corresponds to the size class 230 cm which represents almost 15% of the total catch in number **(Figure 2).**

The size structure of catches showed some differences among years. The principal mode showed an upward trend, moving from 210 cm in 2010 to 230 cm in 2012**.** The estimated mean length increased from 216cm to 224 cm during the same period, respectively **(Figures 3 and 4).**

The mean weight of fish increased from 204 kg in 2010 to 224 kg in 2012. This positive trend both in the length and weight of fish could be a good sign of the recovery of the East ABFT.

As regards BFT catches by Moroccan hand line artisanal fishery in 2012, the size of fish ranges from 159cm to 276cm CFL, with an average size of 205 cm CFL. Fish measuring between 190 and 195 are the most dominant; they represent nearly 15% of the total catches in number. The individuals caught in July have a larger mean size (207 cm CFL) than those caught in August (200 cm CFL) **(Figure 5).**

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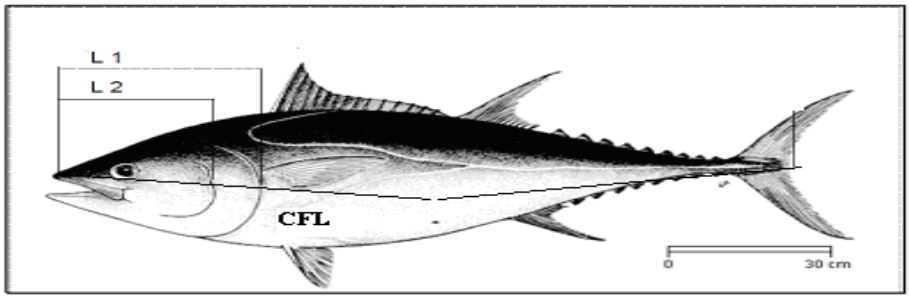

Figure 1. Main length measurements taken on bluefin tuna.

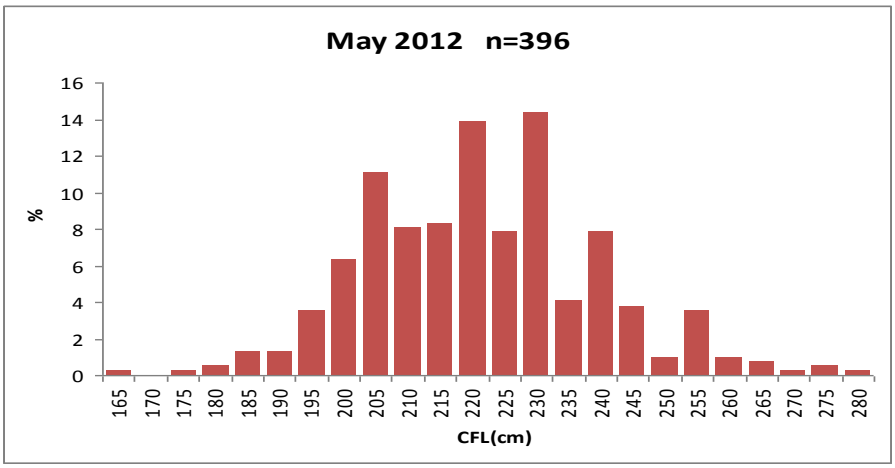

Figure 2. Size frequencies of BFT catches by Moroccan traps estimated from biological scraps in 2012.

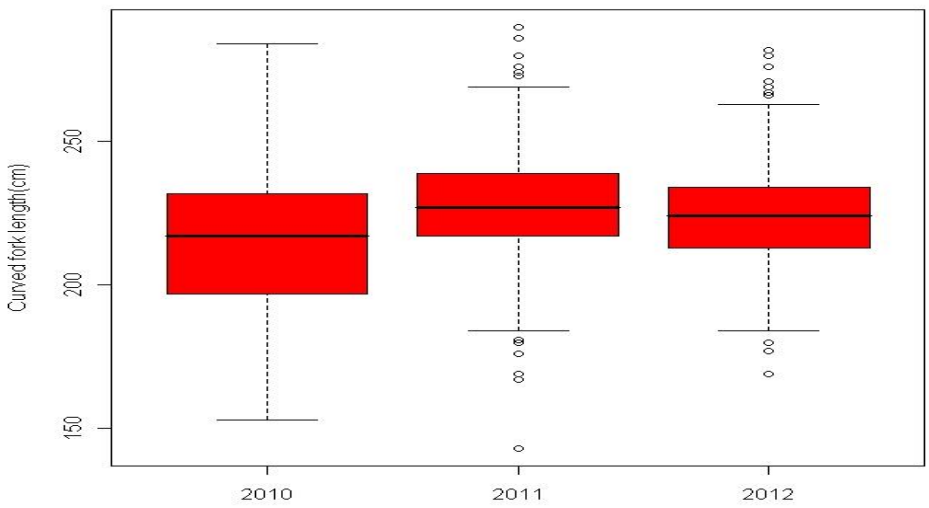

Figure 3. Comparison of BFT catches size structure during the period 2010-2012.

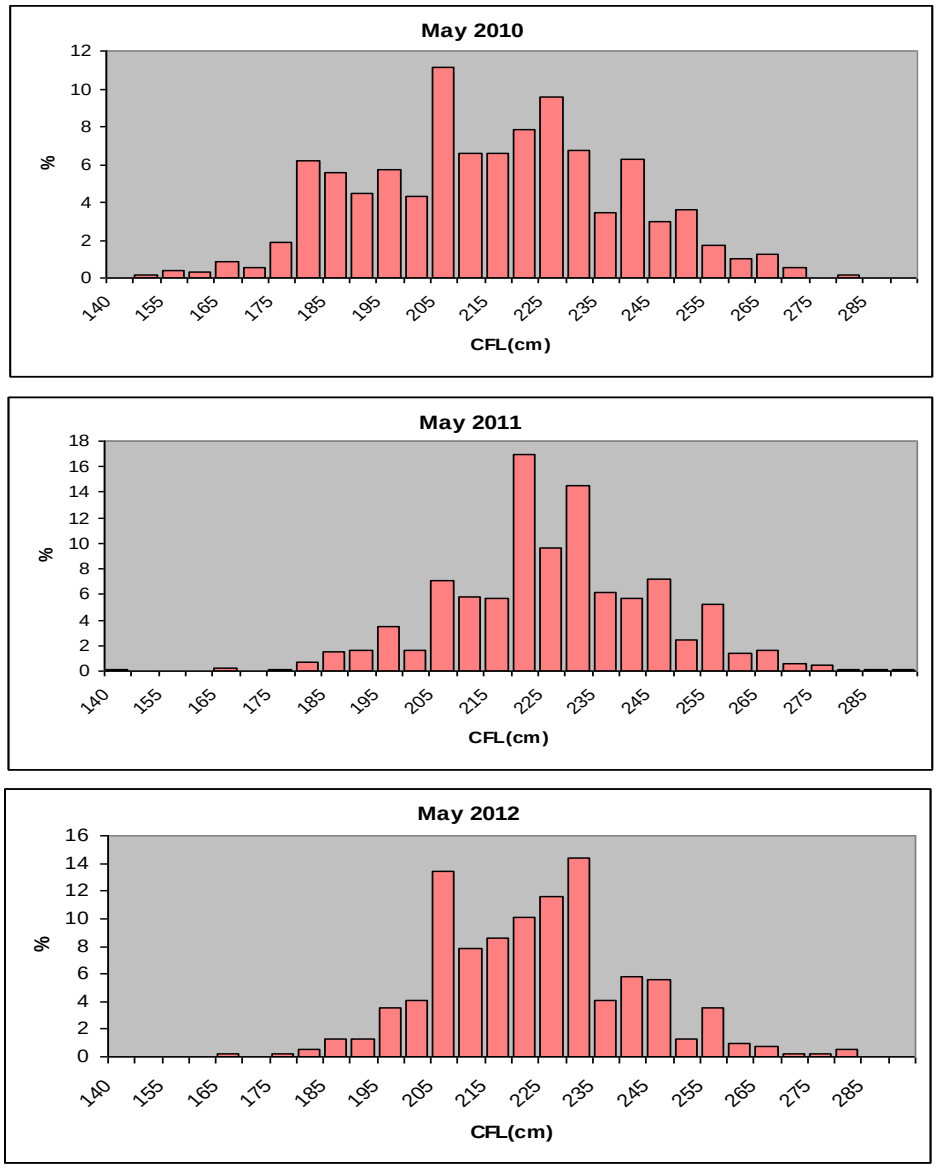

Figure 4. Annual size frequencies of BFT catches by Moroccan traps during the period 2010-2012.

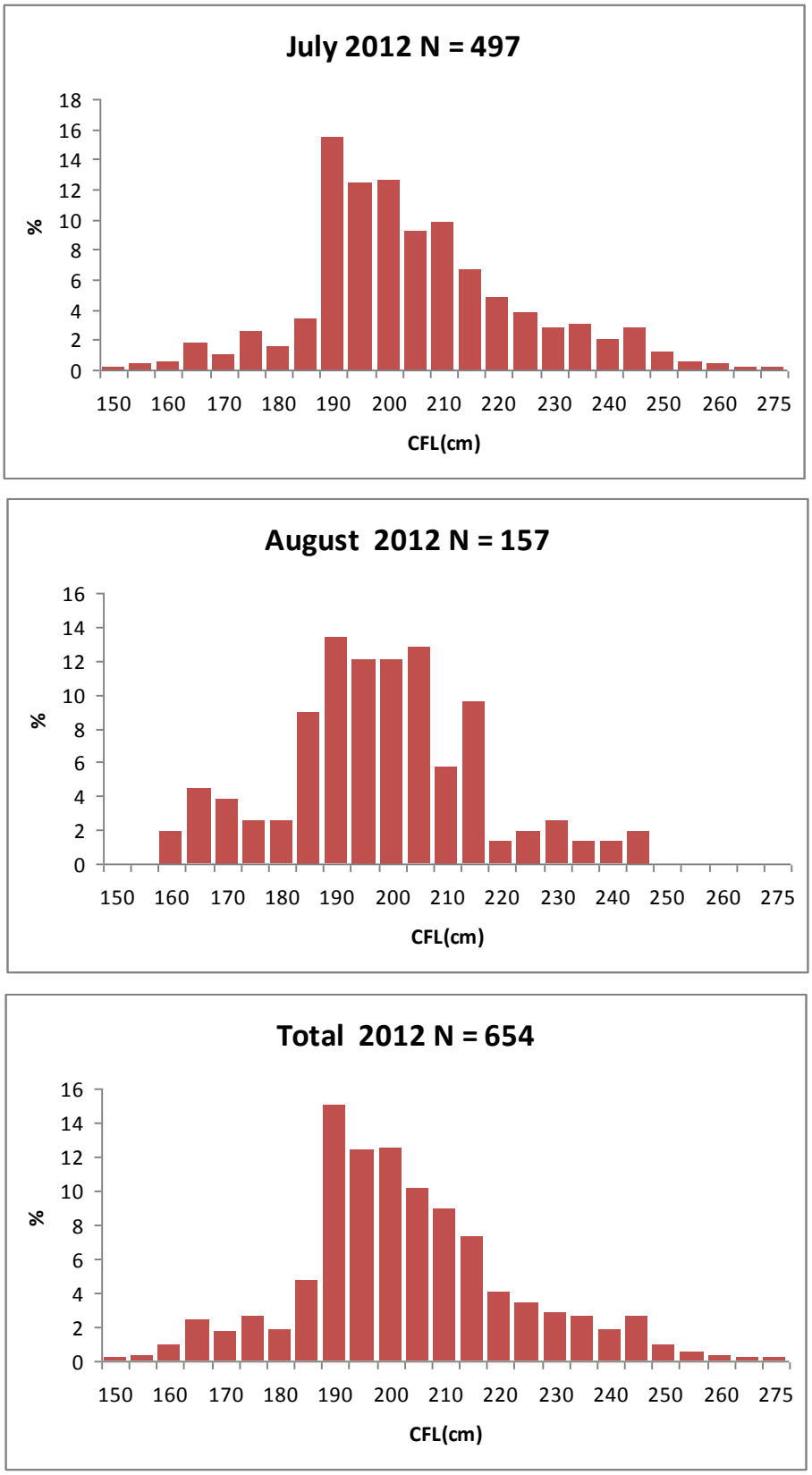

Figure 5. Monthly (a, b) and total (c) size frequencies of BFT catches by artisanal hand line fishery in Strait of Gibraltar in 2012.