

# BIOLOGICAL CHARACTERISTICS OF MALTESE LONGLINING BLUEFIN TUNA (*THUNNUS THYNNUS*) LANDINGS 2005

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## Abstract

This document provides an analysis of the biological characteristics of a sample of bluefin tuna landed by Maltese longliners during 2005. Data collected included length, weight, sex, maturity stage and age, and it can be considered as a sample of the longline fishery in the central Mediterranean. The Maltese longline fishery mainly targets adult specimens in excess of 200cm in length.

**Keywords :** Fisheries, Monitoring, Pelagic.

## Introduction

Due to the annual periodicity and representativeness of the sample, the biological data collected are of great relevance for the assessment of the state of the population exploited by the Maltese longline fishery. Length, weight, age, sex and maturity stage were collected between May and July during the fishing season.

## Material and Methods

Bluefin tuna specimens were sampled at the landing port by field recorders. Length measurements (n=192) were carried out and spines (n=77) were collected for age reading. Length and weight parameters are collected concurrently. The weight (n=192) was raised to live round weight by a factor of 0.16 (ICCAT conversion factor).

Sex and maturity stage parameters (n=78) were collected through a scheme in collaboration with fishermen (Bluefin tuna is normally gutted at sea) consisting on fishermen taking photos of the gonads of each specimen at sea (specimens were tracked in the fish market by means of numbered tags) [1]. All samples were collected from commercial catches as part of the market sampling programme.

## Results and discussion

The Maltese bluefin tuna fisheries mainly targets mature individuals in excess of 200 cm, which differs from other fisheries in the Mediterranean, which on average catch smaller specimens.

The average length of fish caught in May, June and July were 223, 213 and 210 cm respectively. The size of tuna landed decreased steadily with time. The average length at maturity stages 2, 3 and 4 were 208, 205 and 222 cm respectively.

The length-frequency distribution of the landings of the three months combined showed that the bulk of the specimens landed was found to be within 210 and 230 cm length range.

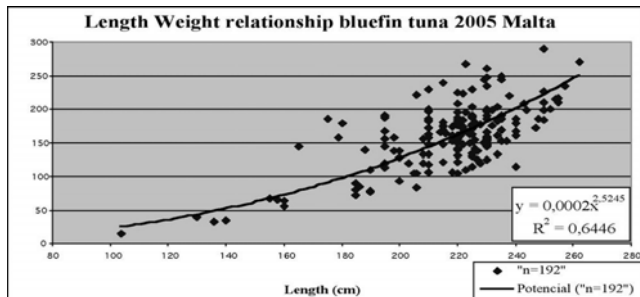


Fig. 1. Length-Weight relationship of a sample of bluefin tuna landings in 2005.

The length-weight relationship equation obtained using all the 2005 data (Figure 1) shows a coefficient of determination ( $R^2$ ) of 0.6446 which indicates a positive correlation between length and weight of the specimens. The analysis of the L-W relationship by sexes showed a higher coefficient of determination (0.86) in the case of males which indicates a strong positive correlation between length and weight. For females the coefficient was also positive (0.43) but showing a weaker correlation very likely due to the fact that they reach higher weights at same length in the reproduction period.

The study of the length-at-maturity stages showed that the majority of specimens examined presented maturity stages 3 or 4 which indicates that they are mature and ready for spawning. There were no specimens

showing stage 5 (spent). Most males were at stage 4 of maturity and most females at stage 3. The maturity stage is not directly related to size, since during the season, individuals progress in maturity stage whilst length is practically constant. Moreover, large/older individuals could be at an early maturity stage whilst younger specimens could be at a more advanced maturity stage [2].

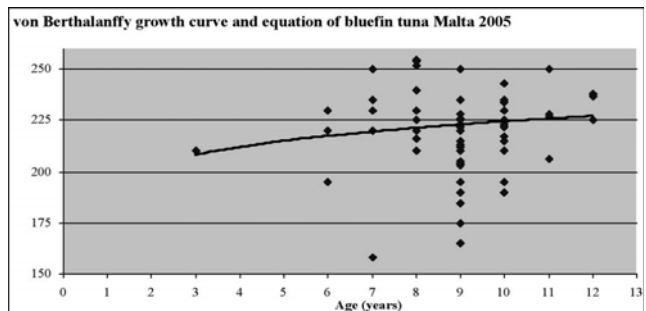


Fig. 2. von Bertalanffy growth curve and equation ( $L_t = L_\infty \cdot (1 - \exp(-K \cdot (t - t_0)))$ ) for bluefin tuna data 2005.

The analysis of length-at-age graphs showed that the sampled bluefin tuna were represented by specimens ranging from 6 to 12 years of age (Figure 2). The majority of tuna landed were aged 9 ranging from 160 to 240 cm FL. Male specimens were found to be all of age 9 or 10, while females ranged from 6 to 9 years of age. Size does not seem to increase with age, most likely because this set of data is composed by samples that fit within the plateau of the growth curve (von Bertalanffy growth equation [3]). The parameters  $L_\infty$ ,  $K$  and  $t_0$  of the von Bertalanffy equation ( $y = L_\infty \cdot (1 - \exp(-k \cdot (x - t_0)))$ ) were estimated through the non-linear regression (minimum squares calculated through the Newton method within Solver-Excel) obtaining, a  $L_\infty = 228.48$  cm,  $K = 0.2316$  and  $t_0 = -7.22$  (using 2005 data only).

## Conclusions

The Maltese longline fishery mainly targets adult specimens in excess of 200 cm in length. Male specimens showed a better length-weight correlation than females, with the former composed mainly of individuals in maturity stage 4 and aged 9 or 10 years whilst the latter was composed mainly of individuals in maturity stage 3 aged 6 to 9 years.

## References

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