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A PRELIMINARY CONVERSION FACTOR BETWEEN BELLY MEAT WEIGHT AND ROUND WEIGHT FOR BLUEFIN TUNA (*THUNNUS THYNNUS*, L.) FROM THE WESTERN MEDITERRANEAN

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SUMMARY

A conversion factor between belly meat weight and round weight for bluefin tuna from the western Mediterranean is provided. This paper also studied the influences of fishing season on this factor.

RÉSUMÉ

Ce document présente un facteur de conversion en poids vif du poids de la ventrêche pour le thon rouge de la Méditerranée occidentale. Il étudie également les influences éventuelles de la saison de pêche sur ce facteur.

RESUMEN

Se presenta un factor de conversión de peso ventresca a peso vivo para el atún rojo del Mediterráneo occidental. Se estudian también las posibles influencias de la época de pesca sobre este factor.

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Introduction

The Standing Committee on Research and Statistics (SCRS) of the International Commission for the Conservation of Atlantic Tunas (ICCAT), trough its Bluefin Year Programme (BYP), has strongly recommended to obtain a conversion factor between belly meat weight and round weight for conversion of belly meat weight, imported by Japan from catches of bluefin tuna in the Mediterranean Sea, to round weight.

The purpose of this paper is to provide the aforementioned conversion factor between round weight (RW) and belly meat weight (BW) for Bluefin tuna from the Western Mediterranean. This paper also explores possible influences of the fishing season on this conversion factor.

Material and Methods

Data

Data for this preliminary study are from bluefin catches of the purse seine fleet in the Mediterranean Sea. A total of 72 fishes were sampled and round weight and belly weight recorded. Round weight was obtained by means of a commercial balance (± 0.5 kg). Belly weight was obtained by means of an electronic balance (MOBBA ± 5g)

Analyses

Three models were developed using a general linear modelling (GLM) approach.

$$RW_i = \alpha\ BW + \beta_i + e_i \quad \text{(model 1).}$$
$$RW_i = \alpha_i\ BW + e_i \quad \text{(model 2).}$$
$$RW = \alpha\ BW + e_i \quad \text{(model 3).}$$

Where RW is round weight in kg; BW, belly meat weight in kg; α the conversion factor and β the fishing season effect. Fishing season effect was assessed by means of F-test.

Results

Figure I shows round weight distribution: 72 fishes were sampled during June and July.

Table I shows ANOVA results for model 1 fitting. Fishing season effect was statistically significant (F-test = 16.11; P> 0.001; df = 1).

Table II shows ANOVA results and parameter estimates for Model 2 fitting. This model was preferred when estimating parameters for the seasonal transformation factor (bias in the parameter estimates might be expected when using model I, since a generalized inverse matrix is used to solve for the normal equations).

Figures 3a-c show standardized residual distributions: whole model and levels of fishing season effect. Althought the residual departs from normality, the distributions are reasonably symmetrical.

Table III shows ANOVA results and parameter estimates for Model 3 fitting. Figure 1 shows the distribution of standardized residual which does not seem far from normality.

Transformation factors RW -BW for model with seasonal effect and for model without it are presented in *Table IV*. The conversion equations are:

no seasonal effect: $RW = 10.288307\ BW$

seasonal effect: $RW_{june} = 10.854349\ BW$

$RW_{july} = 9.150472\ BW$

Table I.

General Linear Models Procedure
Class Level Information

Class	Levels	Values
Month	2	6, 7

Number of observations in data set = 72

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	3	2628700.244	876233.415	1482.35	0.0001
Error	69	40786.756	591.112		
Unc. Total	72	2669487.000			

R-Square	C.V.	Root MSE	RW Mean
0.858298	13.36786	24.3128	181.875

Source	DF	Type I SS	Mean Square	F Value	Pr > F
BW	1	2609648.847	2609648.847	4414.81	0.0001
Month	2	19051.397	9525.698	16.11	0.0001

Source	DF	Type III SS	Mean Square	F Value	Pr > F
BW	1	205964.7846	205964.7846	348.44	0.0001
Month	2	19051.3969	9525.6985	16.11	0.0001

Table II.

General Linear Models Procedure
Class Level Information

Class	Levels	Values
Month	2	6, 7

Number of observations in data set = 72

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	2	2625527.8080	1312763.9040	2090.427	0.0001
Error	70	43959.1920	627.9885		
Unc. Total	72	2669487.0000			

R-Square	Adj. R-Square	C.V.	Root MSE	RW Mean
0.98350	0.98310	13.77853	25.05970	181.87500

Variable	DF	Parameter Estimate	Standard Error	T for H0: Parameter = 0	Pr > F	95% Confidence Interval	
June	1	10.854349	0.19530266	55.577	0.0001	10.46483	11.283868
July	1	9.150472	0.27690040	33.046	0.0001	8.598211	9.702732

Table III.

General Linear Models Procedure
Class Level Information
Number of observations in data set = 72

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	1	2609648.8469	2609648.8469	3096.437	0.0001
Error	71	59838.1531	842.7909		
Unc. Total	72	2669487.0000			

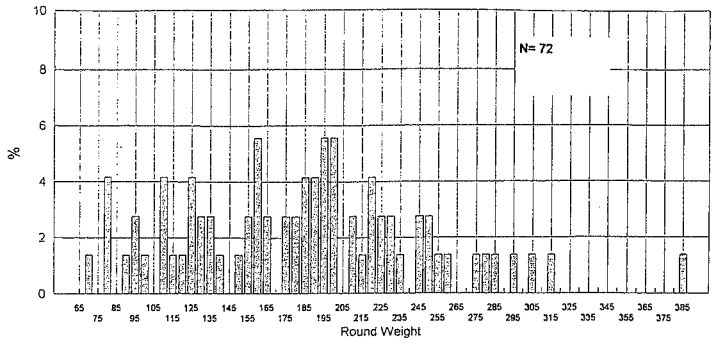
R-Square	Adj. R-Square	C.V.	Root MSE	RW Mean
0.97760	0.97730	15.96199	29.03086	181.87500

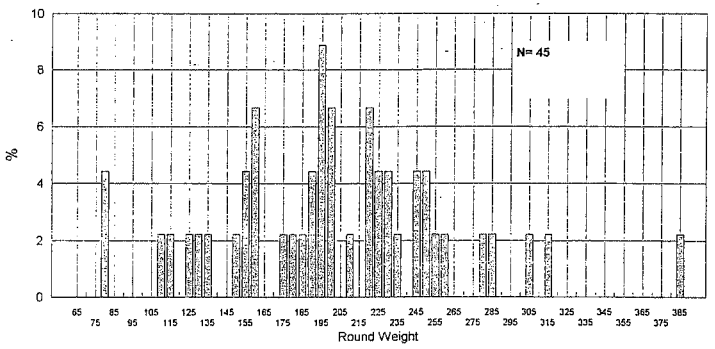
Variable	DF	Parameter Estimate	Standard Error	T for H0: Parameter = 0	Pr > F	95% Confidence Interval	
BW	1	10.288307	0.18488973	55.646	0.0001	9.919647	10.656967

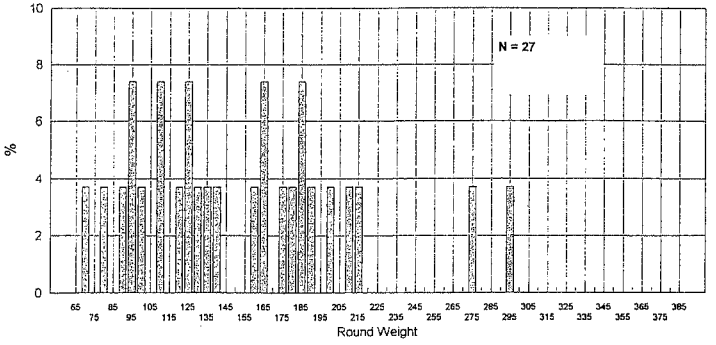
Table IV.

Model 2	Parameter Estimate	Standard Error	95% Confidence Interval	
C. Factor (June)	10.854349	0.19530266	10.46483	11.283868
C. Factor (July)	9.150472	0.27690040	8.598211	9.702732

Model 3	Parameter Estimate	Standard Error	95% Confidence Interval	
C. Factor	10.288307	0.18488973	9.919647	10.656967







A preliminary analysis to obtain a conversion factor: round weight- belly weight.

Figure 1.- Round Weight distribution; total sampling and by fishing season (month).

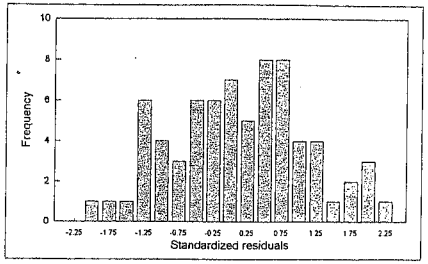


Figure 2.- Standardized residual distribution for model 3

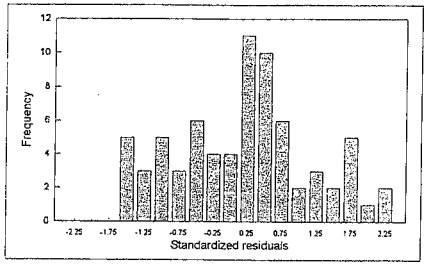


Figure 3a.- Standardized residual distribution for model 2

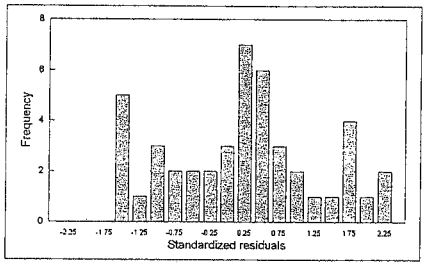


Figure 3b.- Standardized residual distribution for model 2. Factor Month, Level June.

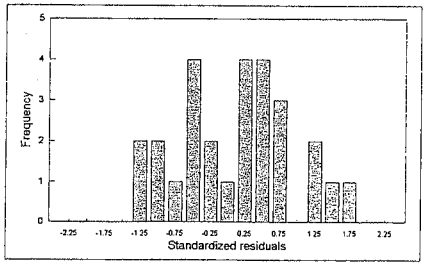


Figure 3c.- Standardized residual distribution for model 2. Factor Month, Level July.