

## SOME BIOMETRIC DATA FROM THE SWORDFISH (*Xiphias gladius* L.) IN THE AREAS OFF MADEIRA

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### SUMMARY

This paper provides biometric information on swordfish caught in the area off the island of Madeira (ICCAT area BIL 94B).

From a sample of 802 swordfish, biometric relationships were determined between size measurements (LJFL and EOFL), as well as between these variables and gutted weight (GW). The results agreed with those of other authors.

### RESUME

Ce document donne des informations biométriques sur l'espadon capturé dans la zone située au large de l'île de Madère (zone ICCAT BIL 94B).

A partir d'un échantillon de 802 espadons, les relations biométriques ont été déterminées entre les mesures de taille (LJFL et EOFL) ainsi qu'entre ces variables et le poids éviscéré (GW). Les résultats étaient conformes à ceux des auteurs.

### RESUMEN

Este documento ofrece información biométrica referente al pez espada capturado en las zonas próximas a la Isla de Madeira (ICCAT area BIL 94B).

A partir de una muestra de 802 peces espada, se establecieron relaciones biométricas entre medidas de talla (LJFL y EOFL) así como entre estas variables y el peso eviscerado (GW). Los resultados confirman los aportados por otros autores.

### INTRODUCTION.

Earlier papers have provided descriptive information on the activity of the surface longline fleet targeting swordfish in the area off the island of Madeira (Gouveia, 1992), as well as biological and preliminary biometric data related to catches landed by this fleet (Gouveia and Mejuto, in press).

In spite of the limited activity of this fleet, it was possible to collect some biometric data on the swordfish to be used in preparing the ICCAT tasks. It was also able to check the suitability in this fishery of using the biometric relationship recommended by ICCAT on a general level (Miyake, 1990).

### MATERIAL AND METHODS.

The sample come from both experimental and commercial fishing carried out by the Madeira fleet between 1990 and 1994. The fishing operation took place near the island, generally between 3 and 6 nautical miles off the coast.

Size measurements LJFL and EOFL (Miyake, 1990) were taken using a tape measure either on board the vessel or at the landing port. Individual weight, when available, was determined in gutted specimens (eviscerate+gill off, but fins on), using commercial scales.

The biometric data were analyzed by means of simple regression models and then compared with equations provided by other authors.

### RESULTS AND DISCUSSION.

A total of 802 swordfish were sampled during the 1990-1994 period. Some of the variables targeted by this study were unable to be obtained in some individuals. A EOFL-LJFL relationship was determined using a simple linear regression model:

$$(1) \text{EOFL} = -5.5489 + 0.9158 * \text{LJFL}, n = 802, r = 0.994, \text{ (Table 1, Figure 1).}$$

Simple multiplicative models were developed between size and gutted weight (LJFL-GW and EOFL-GW) from a set of 761 pairs of values, with the following results:

$$(2) \text{GW} = 1.091\text{E-}06 * \text{LJFL}^3.46565, n = 761, r = 0.9771 \text{ (Table 2, Figure 2)}$$

$$(3) \text{GW} = 4.573\text{E-}06 * \text{EOFL}^3.26327, n = 761, r = 0.9729 \text{ (Table 3, Figure 3)}$$

Equation (2) was compared to the one provided by other authors for the same weight units (Mejuto et al., 1988). Both equations give very similar estimations of gutted weight for a wide range of sizes among which are found the great majority of the catches of this species in the Atlantic (Figure 4).

Moreover, two sets of estimated weights were produced for each size class LJFL from 50 to 250 cm (step 5 cm), based on the following equations:

Set1:  $RW = 3.433E-06 * LJFL^{3.2623}$  (Mejuto et al., 1988)  
 Set2: GW obtained from equation (2) in this paper.

Using the values obtained, a conversion factor was calculated to convert gutted weight into round weight (cf) for each size class:

Set1(i) = Set2(i) \* cf(i), for  $50 \leq i \leq 250$ .

A mean conversion factor of 1.16 was obtained (median = 1.14, confidence interval for mean 95% = 1.11-1.22). A hypothesis test for the mean = 1.14 was not rejected at Alpha level = 0.05.

Therefore, the conversion factor between RW and GW according to ICCAT recommendations for fisheries as a whole would also appear to be valid for the preparation of the ICCAT tasks of this fishery.

Although a specific statistics test have not been developed, the resulting LJFL-GW equation, would appear to confirm the one provided by other authors and recommended by ICCAT in this area of the Atlantic (Anonimo, 1988).

#### LITERATURE CITED.

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- GOUVEIA, L., 1992. Swordfish (*Xiphias gladius Linnaeus*) fishing experiment in Madeira EEZ. ICCAT Col. Vol. Sci. Pap. Vol XXXIX: 477-483.
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#### Regression Analysis - Linear model: $Y = a + bX$

Dependent variable: MADFLD.LDI		Independent variable: MADFLD.FL		
Parameter	Estimate	Standard Error	T Value	Prob. Level
Intercept	-5.54895	0.481543	-11.5233	.00000
Slope	0.915764	3.53096E-3	259.353	.00000

#### Analysis of Variance

Source	Sum of Squares	Df	Mean Square	F-Ratio	Prob. Level
Model	511958.11	1	511958.11	67263.8	.00000
Error	6088.9618	800	7.6112		
Total (Corr.)	518047.07	801			

Correlation Coefficient = 0.994106      R-squared = 98.82 percent  
 Std. Error of Est. = 2.75884

**Table 1.** Results of the regression analysis between eye orbit-fork length (EOFL) and lower jaw-fork length (LJFL).

#### Regression Analysis - Multiplicative model: $Y = aX^b$

Dependent variable: MADFLGW.PESD_EVISC		Independent variable: MADFLGW.FL		
Parameter	Estimate	Standard Error	T Value	Prob. Level
Intercept	-13.7284	0.133437	-102.883	.00000
Slope	3.46565	0.027371	126.618	.00000

NOTE: The Intercept is equal to Log a.

#### Analysis of Variance

Source	Sum of Squares	Df	Mean Square	F-Ratio	Prob. Level
Model	328.879	1	328.879	16032.08	.00000
Error	15.56998	759	.02051		
Total (Corr.)	344.44904	760			

Correlation Coefficient = 0.977137      R-squared = 95.48 percent  
 Std. Error of Est. = 0.143226

**Table 2.** Results of the multiplicative model between gutted weight (GW) and fish size (LJFL).

Regression Analysis - Multiplicative model:  $Y = aL^b$

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Dependent variable: MADLDGW.PRSO\_EWISC      Independent variable: MADLDGW.LDI

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Parameter	Estimate	Standard Error	t Value	Prob. Level
Intercept*	-12.2953	0.133438	-92.142	.00000
Slope	3.26327	0.0201596	115.005	.00000

\* NOTE: The intercept is equal to Log a.

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Analysis of Variance

Source	Sum of Squares	Df	Mean Square	F-Ratio	Prob. Level
Model	326.023	1	326.023	13429.28	.00000
Error	10.42625	759	.02428		
Total (Corr.)	344.44904	760			

Correlation Coefficient = 0.972085      R-squared = 94.65 percent  
 Std. Error of Est. = 0.155811

Table 3. Results of the multiplicative model between gutted weight (GW) and fish size (EOFL).

Regression of EO-FL on LJ-FL

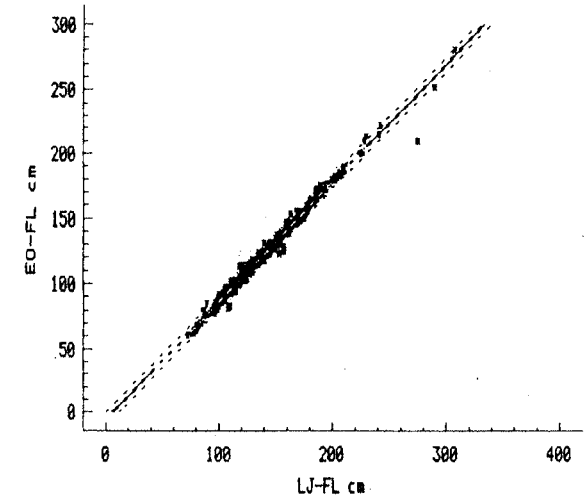


Figure 1. Regression graph between eye orbit-fork length (EOFL) and lower jaw-fork length (LJFL).

Regression of GW on EO-FL

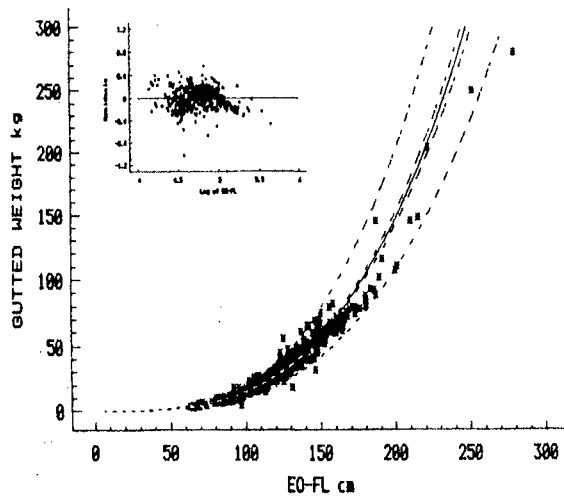


Figure 3. Regression between gutted weight (GW) and fish size (EOFL).

Regression of GW on LJFL

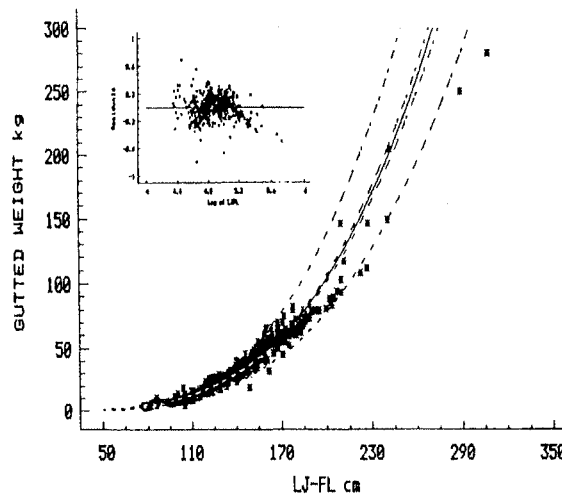


Figure 2. Regression between gutted weight (GW) and fish size (LJFL).

COMPARISON BETWEEN TWO LJFL-GW EQUATIONS

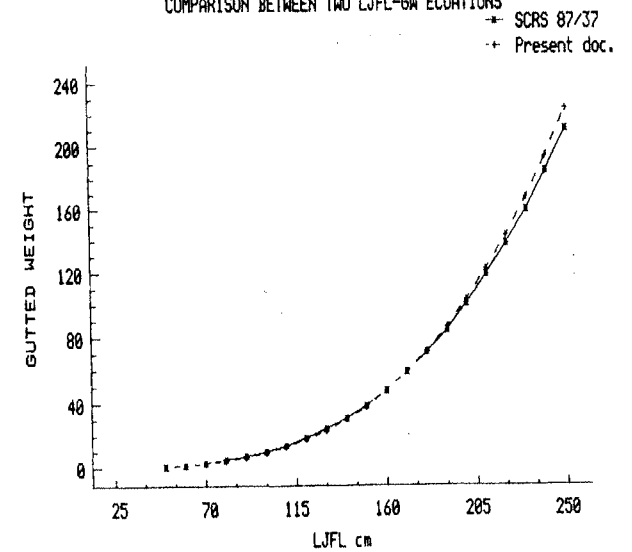


Figure 4. Comparison between estimated gutted weight (GW) obtained using two equations GW-LJFL.