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# BIOMETRY ANALYSIS OF THE SNIPEFISH, *MACRORAMPHOSUS SCOLOPAX* (LINNAEUS, 1758), FROM THE NORTHERN TUNISIAN COAST (CENTRAL MEDITERRANEAN)

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## ABSTRACT:

*Specimens of snipefish, Macroramphosus scolopax (Linnaeus, 1758), from the northern Tunisian coast were biometrically analyzed during the demersal communities research project, DEMNORD 2009. A total 181 specimens were analyzed. Total length ranged between 6.7 cm and 15.4cm. Fourteen morphometric and six meristic characters were assessed. The sexual ratio was in favour of females (m/f=0.39). in the length-weight relationship, positive allometry was established (b=3.19).*

**Keywords: *Macroramphosus scolopax*, biometry, length-weight relationship, northern Tunisian coast.**

## INTRODUCTION

Snipefish, *Macroramphosus scolopax* (Linnaeus, 1758) is a demersal marine teleost widely distributed in temperate waters at depths between 25 and 600m, known in Pacific, Indian and Atlantic Oceans [1]. The species inhabits the Eastern Atlantic from Norway to South Africa and the whole Mediterranean Sea [2] [3].

*M. sclolopax* was first recorded by [4] off the Tunisian coast, and since is regularly reported by authors throughout the area, where it is commonly caught by commercial vessels, at depths between 200 and 250m. The species locally presents no commercial interest and is generally discarded at sea, that explains that nothing is dealt about reproduction, size at sexual maturity, spawning period and feeding habits. Observations on spinefish carried out for specimens from other regions were summarized by [3].

The purpose of the present study is to contribute to the knowledge of *M. scolopax* especailly based on biometric measurements, meristic characters and length-weight relationship of specimens caught in the northern Tunisian coast. A comparison is carried out with a similar studies conducted in the Mediterranean Sea especially this of [3] from specimens collected in the Adriatic Sea.

## MATERIALS AND METHODS

A total of 181 specimens were collected from the northern Tunisian coast during the DEMNORD research cruises in spring and summer of year 2009 (Fig.1), at depths between 100 to 400 m. The fishing gears used were a shrimp trawl net fitted with a 24-m footrope and a 50-mm liner at the cod-end. Each sampling lasted 60 min; spine-fish were stored and frozen, soon after having captured. Sex was assessed macroscopically according to morphology and external appearance of gonads from sampled specimens.

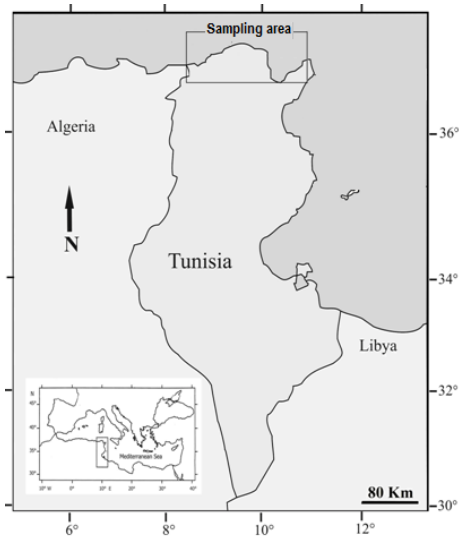


**Figure 1:** Sampling area of the DEMNORD survey (spring and summer of 2009)

Length measurements were recorded to the nearest mm, with mm scale, and weight to the nearest ±0.1g, with a top loading electronic balance. The length-weight relationship was calculated using the equation $W= aL^b$ [5], where W = weight, L = length and 'a' and 'b' are constants. The constants (*a*) and (*b*) values in the equation were estimated using the methods of least squares. The *t*-test allowed to show the level of significance of weight on length [6].

Fourteen morphometric characteristics were examined (Fig.2): total length (*TL, 1*); fork length (*FL, 2*); standard length (*SL, 3*); head length (*HL, 4*); preocular head length (*PRH, 5*); eye diameter (*ED, 6*); postocular head length (*PSH,7*); length of pelvic fin (*LPF, 8*); length of anal fin base (*LAB, 9*); maximum body height (*H, 10*); length of the second dorsal fin base (*SDB,11*); length of pectoral fin (*LP,12*); length of the second spine in first dorsal fin (*SSD,13*); predorsal distance (*PRD,14*). Additionally, six meristic characters were also studied: number of rays in the first dorsal (*FDR*), number of second dorsal rays (*SDR*), number of pectoral rays (*PR*), number of anal rays (*AR*), number of pelvic rays (*PR*) and number of caudal fins (*CF*).

The length-weight relationship was calculated using the equation $W=aL^b$ (Ricker, 1975) where *W*=weigth, *L*=length and "*a*" and "*b*" are constants. The constants (*a*) and (*b*) values in the equation were estimated using the methods of least squares. The *t*-test allowed to show the level of significance of weigth on length length [6].

## RESULTS

Of the 181 sampled *Macroramphosus scolopax*, 37 were males (20%), 96 females (53%) and 48 (27%) indeterminate. The sex ratio differed statistically from the expected 1:1 (m/f=0.39, $\chi^2$ =9.14; $p<0.05$). Total length (TL) ranged from 6.7 to 15.4 cm for all specimens, females ranging from 9.8 to 15.4 cm, males from 9.3 to 14.1 cm, and indeterminate specimens from 6.7 to 14.5 cm. The results showed that females were significantly ($p<0.05$) larger than males.

No information was given about size and weight of *M. scolopax* from the Tunisian waters prior to length [7] who reported that specimens collected in the Gulf of Gabès ranged between 8 and 8.74 mm and weighed from 3.46 to 4.32g. length [1] noted that the species reaches till 20 cm total length, usually between 10 and 14cm. Some sampled *M. scolopax* were large specimens, similar pattern was reported by length [3], who recorded 16 cm as maximum size.

In the present study, no significant differences in meristic characters were recorded between males and females (Tab. 2). In all specimens, the number of rays in first dorsal fin comprises from 5 to 5 spines. The second dorsal fin the number comprised between 10 to 13 soft rays; the ventral fin ray of one spine and 5 soft rays. The anal fin was comprised from 14 to 17 soft rays and the number of pectoral fin rays ranged between 13 and 17.

Differences between the sexes were statistically significant in 3morphometric relationships (Tab. 1): preocular head length (*PRH*), eye diameter (*ED*) in relation to head length and postocular head length (PSH).

The estimate of the regression parameters of length-length relationship was calculated separately for each sex and overall (Tab. 3); a high correlation (*r*=0.99) appeared between them. The relationship total length *versus* weight relative showed positive allometry: for males (*b* = 3.12), females (*b* = 3.17) and both sexes (*b* = 3.19).

## DISCUSSION

The morphometric measurements in the *M. scolopax* caught off the northern Tunisian coast show significant morphometric variations between males and females. Additionally, morphological variations show significant differences ($p<0.05$) in preocular head length (PRH), eye diameter (ED) related to head length and postocular head length (PSH).

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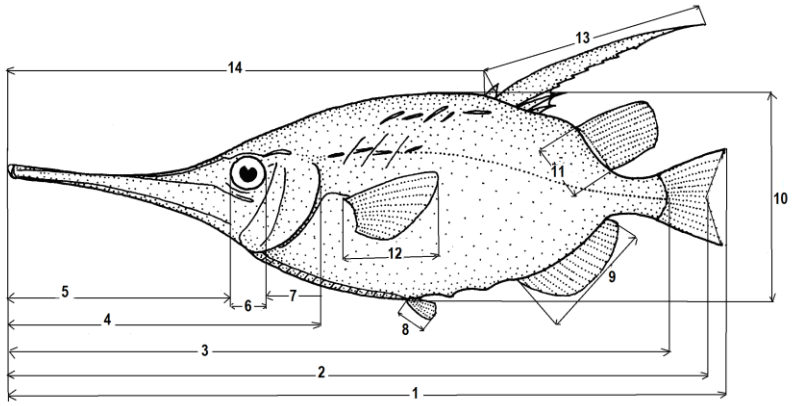


**Figure 2:** Morphometric and meristic characteristics of the snipefish

**Table 1:** Relationships of morphometric characters (%) for males (n = 37), females (n = 96) and total sample (n = 181) of the snipefish *Macroramphosus scolopax* caught in the northern Tunisian coast.

| Relationship* | Sex | Range (%) | Mean ± SD | t test |
|---|---|---|---|---|
| *SL/TL* | M | 95.17-98.54 | 96.23±3.22 | 1.701 |
| | F | 94.62-98.12 | 96.57±2.98 | |
| | Total | 94.04-98.54 | 96.41±2.04 | |
| *FL/TL* | M | 86.41-92.23 | 89.10±1.34 | 0.793 |
| | F | 84.58-90.91 | 87.34±1.03 | |
| | Total | 84.14-92.23 | 88.62±0.89 | |
| *HL/TL* | M | 36.67-46.98 | 41.98±1.68 | 0.919 |
| | F | 34.72-48.44 | 42.45±1.21 | |
| | Total | 32.80-48.44 | 41.78±1.57 | |
| *LPF/TL* | M | 5.81-7.37 | 6.38±4.34 | 0.458 |
| | F | 5.12-7.98 | 6.07±3.76 | |
| | Total | 4.54-7.98 | 6.43±3.11 | |
| *H/TL* | M | 21.34-27.55 | 25.24±1.43 | 1.220 |
| | F | 20.6-28.62 | 26.31±2.06 | |
| | Total | 19.11-28.62 | 25.98±1.78 | |
| *SDB/TL* | M | 6.45-8.34 | 7.17±0.783 | 0.174 |
| | F | 5.98-9.23 | 7.89±0.459 | |
| | Total | 5.68-9.23 | 7.72±0.531 | |
| *LPF/TL* | M | 15.75-19.12 | 17.56±1.12 | 1.393 |
| | F | 13.68-17.98 | 16.45±0.89 | |
| | Total | 12.12-19.12 | 16.69±1.03 | |
| *SSD/TL* | M | 25.39-37.51 | 30.31±2.44 | 0.824 |
| | F | 23.27-35.40 | 29.48±2.57 | |
| | Total | 22.72-37.51 | 30.60±2.13 | |
| *PRD/TL* | M | 64.71-71.91 | 66.67±2.07 | 0.865 |
| | F | 62.56-68.49 | 65.11±1.88 | |
| | Total | 60.36-71.91 | 66.73±1.46 | |
| *PRH/HL* | M | 68.61-74.89 | 69.98±3.61 | 2.534** |
| | F | 65.43-74.12 | 68.31±4.07 | |
| | Total | 60.14-74.89 | 69.92±4.98 | |
| *ED/HL* | M | 15.34-20.57 | 18.34±0.98 | |
| | F | 17.28-23.76 | 19.56±1.34 | |

| | | | | |
|---|---|---|---|---|
| | Total | 13.12-23.76 | 18.45±1.13 | 4.081** |
| *PSH/HL* | M | 16.22-23.61 | 18.49±1.50 | 2.872** |
| | F | 14.57-25.18 | 19.23±1.23 | |
| | Total | 13.59-25.18 | 19.75±1.34 | |

** statistically significant ($t \geq 1.96$; $p \leq 0.05$)

**Table 2:** Meristic characters for males (n=37) and females (n=96) of the snipefish *Macroramphosus scolopax* caught in the northern Tunisian coast.

| Meristic character | Sex | Range | Mean ± SD | t test |
|---|---|---|---|---|
| No. rays in first dorsal fin | M | V-VI | 5.36±1.017 | 0.432 |
| | F | V-VII | 5.89±1.675 | |
| No. rays in second dorsal fin | M | I+(10-13) | 11.17±0.886 | 0.239 |
| | F | I+(10-13) | 11.21±0.345 | |
| No. rays in pectoral fin | M | 14-16 | 15.24±0.721 | 0.361 |
| | F | 13-17 | 15.88±0.456 | |
| No. rays in ventral fin | M | I+5 | 6.00±0.643 | 0.00 |
| | F | I+5 | 6.00±0.601 | |
| No. rays in caudal fin | M | 14-16 | 15.28±0.129 | 0.715 |
| | F | 14-17 | 15.51±0.235 | |
| No. rays in anal fin | M | 17-18 | 17.11±0.459 | 0.183 |
| | F | 18-19 | 18.15±0.513 | |

**Table 3:** Length-weight relationship of *Macroramphosus scolopax* from the northern Tunisian coast.

| Relation ($W = aTL^b$) | n | *a* | *b* | $r^2$ | *t* -test |
|---|---|---|---|---|---|
| Male | 37 | 0.0032 | 3.12 | 0.98 | 2.78 |
| Female | 96 | 0.0028 | 3.17 | 0.96 | 4.34 |
| All specimens | 181 | 0.0021 | 3.19 | 0.95 | 7.56 |

The morphometric ratios in *M. scolopax* observed in this study were different to those recorded by by length [3] for specimens from the Adriatic Sea. According to length [8], relationships between morphological characters in teleost species could form the object of significant changes due to sampling, sex, size, diet and environmental parameters.

In the present study, no significant differences appeared among the studied meristic characters, in total agreement with [3] for *M. scolopax* from Adriatic Sea. Similar patterns were globally recorded by [2] for the Mediterranean Sea.

The sex ratios in this study revealed the prevalence of females over males. The high ratio of females in the catches may be caused by the higher mortality of one of the sexes or one of the two sexes might preferentially occur in different places. Also, different gears tend to select different parts of the populations as regards length, age, and sex composition [9] [10].

The analysis of the length-weight relationships given by several authors in the Mediterranean Sea and adjacent area shows some differences in allometric coefficient values (Tab. 4).

**Table 4:** Parameters of the length-weight relationship ($W = aL^b$) of *Macroramphosus scolopax* in different marine areas.

| Area | a | b | Reference |
|---|---|---|---|
| Adriatic Sea | $0.2x10^{-5}$ | 3.23 | Zorica and VRGOČ 2005 |
| Balearic Islands | 0.004 | 3.15 | Merella et al. 1997 |
| Portuguese waters | 0.004 | 3.12 | Borges, 2000 |
| Northern Tunisian Coasts | 0.0023 | 3.19 | This study |

Various factors maybe play a role in the length-weight relationships, such as stage of maturity, sex, temperature, salinity and food quality, quantity and size [11] [12] [13].

*M. scolopax* constitutes a very abundant prey species after sardine and blue whiting in stomachs of hake, mackerel, John Dory and common dolphins [14] [15] [16]. Given the importance of snipefish for the fish community; the knowledge of biology, feeding habits, distribution and abundance for this specie is necessary to successful fisheries management.

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