IJVAR *International Journal of Veterinary and Animal Research*
Uluslararası Veteriner ve Hayvan Araştırmaları Dergisi
E-ISSN:2651-3609 1(3): 23-26, 2018

Length-Weight Relationship and Condition of Redcoat *Sargocentron rubrum* (Forsskål, 1775) in Iskenderun Bay (Southeastern Mediterranean, Turkey)

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Abstract

In this study a total of 165 (10.0-21.0 cm TL, 17.40-180.10 g TW) Redcoat, *Sargocentron rubrum* (Forsskål, 1775) were caught in Iskenderun Bay between September 2017 and April 2018 using a longline As a result, length-weight relationships (LWRs), sex ratio and condition the estimates for b parameter of the LWR ranged between and 3.098 3.096 and 3.100 for males, females and both sexes, respectively. Positive allometric growth were observed for male, female and both sexes. Fulton's condition (KF) factor values also revealed not significant variations (P>0.001) for females (1.904) and males (1.926) specimens of *S. rubrum.* No information currently exists on the length-weight relationship and condition of *S. rubrum* in the southeastern Mediterranean coast of Turkey. This paper is an important contribution to the science and fisheries management applications for this species.

Keywords: Redcoat, Length-weight parameters, condition factor, Mediterranean Sea

INTRODUCTION

The Redcoat, *Sargocentron rubrum* (Forsskål, 1775) is a reef associated marine fish species and belongs to the family Holocentridae, that occur in coastal reefs; silty reefs or wrecks in lagoons, bays, or harbor [1], [2] at depths ranging from 1 m to 84 m [1], [3], also found hidden in caves and cracks of rocks during the day [4], [5].

Length-weight data are useful and standard results of fish sampling programs. These data are essential for a wide number of studies, for example estimating growth rates, age structure and other aspect of fish population dynamics [6], [7]. It is also helpful in local and interregional, morphological and life historical comparisons in species and populations [8], [9].

Condition factors are also important parameters for the evaluation of fish stocks and Fulton's condition factor (CF) is widely used in fisheries and fish biology studies.

To date, *S. rubrum* biology has not been studied along coasts of the southeastern Mediterranean. In the present study, we was first reported length-weight relationships (LWRs) and condition for the redcoat from Iskenderun Bay (S.E. Mediterranean, Turkey).

Figure 1. Sampling area

MATERIALS AND METHODS

The redcoat S. *rubrum* specimens were collected at depths of 20 to 30 m by commercial trammel net and longline from Cevlik, Arsuz and Iskenderun coast (Iskenderun Bay) between September 2017 and April 2018 (Fig. 1). After capture, all fish samples were immediately transported to the laboratory in the Department of Marine Sciences, University of Iskenderun Technical, Iskenderun, Turkey (Fig. 2).

Total length (TL) was measured to the nearest 0.1 cm using digital slide calipers and total body weight (W) was measured using an electronic balance with 0.01 g accuracy. Each species lengths were categorized from the smallest to the largest to determine the existing ranges.

The isometric (b = 3) or allometric growth relationship between total length (TL, cm) and total body Weight (W, g) was described for these fishes growing with their bodies becoming heavier using a plotted power function [10]. $W = aTL^b$ in which a is the power function coefficient (the regression intercept) and b the exponent (the regression slope).

Fulton's Condition Factor (CF) [11] was calculated using the equation $K= (W/L^3)*100$, where W is total body weight (g) and L is total length (cm).

Figure 2. The redcoat, *Sargocentron rubrum* (Forsskål, 1775) from the Southeastern Mediterranean Sea, Turkey

RESULT AND DISCUSSION

A total of 165 (73 female and 92 male) specimens were collected and measured. Total length values of female, male and overall specimens were ranged from 10.0-20.5 cm, 11.4-21.0 cm and 10.0-21.0 cm respectively. Average total length and weight values of all individuals of *S. rubrum* were 15.95±0.15cm and 82.11±2.45g respectively (Table 1). Within the population of this species, most of the individuals in our samples were ranged from 15.0 to 17.0 cm (Fig. 3). The ratio of males to females (M: F) was estimated as 1.29:1.00 and this was not statistically significant (P > 0.05).

Table 1. Descriptive statistics and estimated parameters of length-weight relationships for *S. rubrum* from southeastern Mediterranean, Turkey

Sex		Total length (TL, cm)	Weight (g)	W=aTL^b				
	n	TL_{min}-TL_{max} Mean±SD	W_{min}-W_{max} Mean±SD	a	b	95% CI of b	SE(b)	r2
Female	73	10.00-20.50 (15.89±2.19)	17.4-169.90 (81.25±2.19)	0.0146	3.096	2.942-3.249	0.077	0.958
Male	92	11.40-21.00 (15.99±1.71)	29.6-180.10 (82.79±28.60)	0.0148	3.098	2.932-3.264	0.083	0.939
Both	165	10.00-21.00 (15.95±1.93)	17.4-180.10 (82.11±31.57)	0.0146	3.100	2-989-3.211	0.056	0.949

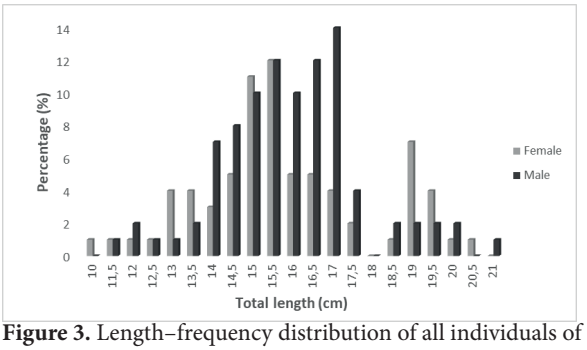

Figure 3. Length–frequency distribution of all individuals of *S. rubrum*

The length-weight relationships (LWRs), of *S. rubrum* calculated as W=0.0146xTL3.096 (R2=0.958) for females, W=0.0148xTL3.098 (R2=0.939) for males and W=0.0146xTL3.100 (R2=0.949) for all individuals (Fig. 4, Fig. 5 and Fig. 6).

The present study, the length-weight relationships for b parameter ranged between and 3.098 3.096 and 3.100 for males, females and both sexes, respectively (Table 1). Our data suggested that *S. rubrum* showed positive allometric growth for all sexes. The parameter "b"of length–weight relationships was significantly different from 3 (P < 0.05). Conversions among length measurements are given in Table 2.

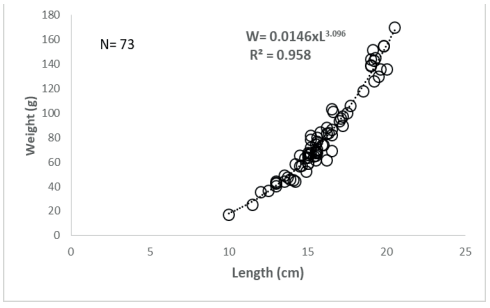

Figure 4. Length weight relationship for female specimens of *S. rubrum* from the Iskenderun Bay

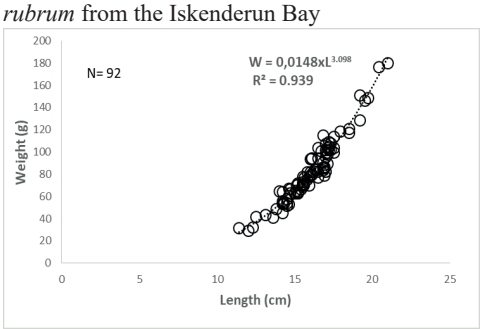

Figure 5. Length weight relationship for male specimens of *S. rubrum* the Iskenderun Bay

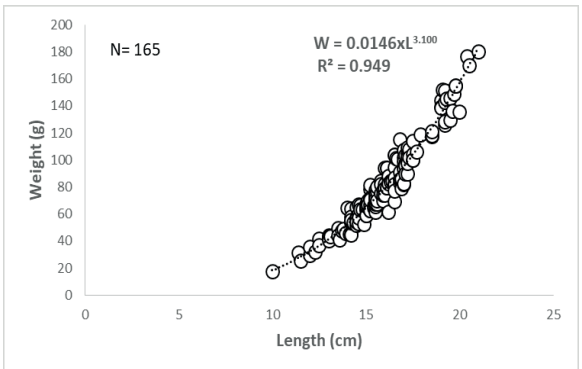

Figure 6. Length weight relationship for all individuals of *S. rubrum* from the Iskenderun Bay

Fulton's condition (KF) factor values also revealed not significant variations (P>0.001) for females (1.904±0.173) for males (1.926±0.262) and all sexes (1.929±0.172) of *S. rubrum.* The highest condition factor for males and for females were in November (Fig. 7).

Figure 7. Monthly condition factor for individuals of *S. rubrum* from the Iskenderun Bay during September 2017 to April 2018

Table 2. The LWRs results of previous studies for *S. rubrum* from different locations

Authors	Country	Sex	n	L_{min}-L_{max}	Length Type	a	b	r^2
Letourneur et al. (1998) [12]	Lagoon, new Caledonia	unsexed	217	1.0-23.0	FL	0.18800	2.294	0.792
Yanagawa (1994) [13]	Thailand Rayong, Gulf of Thailand	unsexed	8	12.4-18.4	TL	0.05710	2.658	0.870
Kulbicki et al. (2005) [14]	New Caledonia	mixed	371	2.9.23.0	FL	0.02752	2.998	0.986
Taşkavak and Bilecenoglu (2001) [15]	Turkey, eastern Mediterranean	unsexed	38	12.6-16.7	TL	0.00174	3.015	0.940
Govindarao et al. (2015) [16]	Visakhapatnam coastal waters, India	mixed	62	14.0-21.0	TL	0.00880	3.204	0.845
Özvaraol and Tatlıses (2017) [17]	North Cyprus, Medıterranean Sea	mixed	148	11.1-20.1	TL	0.00130	3.091	0.977

In the present study, the values found for *S. rubrum* showed positive allometry in the growth of both sexes. The results received were compared with previous LWRs studies in other geographic locations [12], [13], [14],]15}, [16] and [17], Table 2. The values of b for Iskenderun Bay (southeastern Mediterranean) were close to the data marked from Taşkavak and Bilecenoglu [15] and Özvarol and Tatlıses [17] for Turkey and Cyprus and also for Indian waters [16]. However, Letourneur et al. [12] and Yanagawa [13] reported b values differ to negative allometric growth for S. rubrum in Caledonia and Gulf of Tailand. The differences are possibly originated from the differences in habitat, temperature, food availability and size [18].

In Iskenderun Bay, condition factor values also showed not significant variations (P>0.001) for female and male specimens of *S. rubrum*. The condition factor of fish population presents changes with gonad development, age, seasonal changes in growth and net mesh size]19], [20].

For this specimens of *S. rubrum* the data were not representative for all months. Thus these estimated parameters should be considered to represent only a particular season or time of the year. According to Bagenal and Tesch [21] the parameters of b generally do not vary significantly through the year, unlike parameter a which may vary seasonally, daily and between habitats. Besides the length-weight relationship in fishes is affected by a number of factors including season, habitat, gonad maturity sex, diet and stomach fullness, health and preservation techniques [22], all of which were not accounted for in the present study.

CONCLUSION

To best of our knowledge, no information is available on the LWRs and condition of *S. rubrum* in the southeastern Mediterranean Sea coast of Turkey. This paper is an important contribution to the science and fisheries management applications for this species.

REFERENCES

[1] J.E. Randall, Revision of the Indo-Pacific squirrelfishes (Beryciformes: Holocentridae: Holocentrinae) of the genus *Sargocentron*, with descriptions of four new species. Indo-Pacific Fishes No, 27, Bishop Museum Pr (1998), 105 pp.

[2] E. Lieske and R. Myers, Collins Pocket Guide. Coral reef fishes. Indo-Pacific & Caribbean including the Red Sea. Haper Collins Publishers (1994), 400 pp.

[3] R. Froese and D. Pauly, (Eds) Fish Base (www Database). World Wide Web electronic publication. Available at:http://www.fishbase.org, version (02/2018). Accessed date: (18 May 2018)

[4] H. Göthel, Fauna marina del Mediterráneo. Ediciones Omega, S.A., Barcelona, (1992), 319 pp.

[5] R.H. Kuiter and T. Tonozuka, Pictorial guide to Indonesian reef fishes. Part 1. Eels- Snappers, Muraenidae - Lutjanidae. Zoonetics, Australia (2001), 302 pp.

[6] N. ,Kolher, J. Casey and P. Turner, Length-weight relationships for 13 species of sharks from the western North Atlantic. Fisheries Bulletin, 93 (1995), pp. 412-418.

[7] T. Morato, P. Afonso, P. Lourinho, J.P. Barreiros, R.S. Santos and R.D.M. Nash, 2001. Length-weight relationships for 21 coastal fish species of the Azores, North-eastern Atlantic. Fisheries Research, 50 (2001), pp. 297-302.

[8] D. Erguden, C. Turan, M. Gurlek, F. Turan and S.A. Erguden, Length–weight and Length–length relationships of the Mediterranean Shad *Alosa agone* (Scopoli, 1786) from the North-Eastern Mediterranean coast of Turkey. African Journal of Biotechnology, 10 (2011), pp. 6332-6336.

[9] D. Ergüden, S.A., Ergüden, O. Özdemir and M. Gürlek, 2017. Length-weight relationship and condition factor of spotted flounder *Citharus linguatula* (Linnaeus, 1758) in Iskenderun Bay, *North-eastern* Mediterranean, Turkey. Natural and Engineering Sciences, 2 (2017), pp. 11-17.

[10] P. Sparre, E. Ursini and S.C. Venema, Introduction to Trophical Fish Stock Assesment, Part I. Manual, FAO Fisheries Technical Raport. No: 306. (1989), 337 pp.

[11] R.S. Cone, The need to reconsider the use of condition indices in fishery science. Transactions of the American Fisheries Society, 118 (1989), pp. 510-514.

[12] Y. Letourneur, M. Kulbicki and P. Labrosse, Length-weight relationships of fish from coral reefs and lagoons of New Caledonia, southwestern Pacific Ocean: an update. Naga ICLARM Quarterly, 21 (1998), pp. 39-46.

[13] H. Yanagawa, Length-weight relationship of Gulf of Thailand fishes. Naga ICLARM Quarterly, 17 (1994), pp. 48-52.

[14] M. Kulbicki, N. Guillemot and M. Amand, A general approach to length-weight relationships for New Caledonian lagoon fishes. Cybium, 29 (2005), pp. 235-252.

[15] E. Taskavak and M. Bilecenoglu, Length-weight relationships for 18 Lessepsian (Red Sea) immigrant fish species from the eastern Mediterranean coast of Turkey. Journal of the Marine Biological Association of the United Kingdom, 81 (2001), pp. 895-896.

[16] V. Govindarao, N.M. Krishna, P. Padmavathi, N.R.S. Reddy, D. Venu and K.R. Babu, Length-weight relationship studies on some marine ornamental fish species of Visakhapatnam, East coast of India. Journal Exp. Zool. India, 18 (2015), pp. 857-861.

[17] Y. Özvarol and A. Tatlıses, Some biological aspects of lessepsian *Sargocentron rubrum* (Forsskål, 1775) in the North Cyprus, Mediterranean Sea. Scientific Papers. Series D. Animal Science, LX (2017), pp. 359-361.

[18] A.H. Weatherley and H.S. Gill, The biology of fish growth. Academic Press. London England (1987)

[19] E.D. LeCren, The Length-weight relationships and seasonal cycle in gonad weight and condition in perch (Perca fluviatilis). Journal of Animal Ecology, 20 (1951), pp. 210-219.

[20} W.E. Ricker, Computation and interpretation of biological statistics of fish populations. Bulletin of the Fisheries Research Board of Canada, 191 (1975), pp. 1-382.

[21] T.B. Bagenal and F.W. Tesch, Age and Growth. In: T.B. Bagenal, (Ed). Methods for Assessment of Fish production in Freshwaters. 3rd edition. Blackwell Scientific Publication, Oxford, UK (1978), pp. 101-136.

[22] F.W. Tesch, Age and Growth. In: Methods for assessment of fish production in freshwaters. W.E. Ricker (Ed.). Blackwell Scientific Publications, Oxford, UK (1971), pp. 99-130.