

# A biological and biochemical study of two species of sea bream *Acanthopagrus arabicus* (Iwatsuki, 2013) and *Sparidentex hasta* (Valenciennes, 1830) from Shatt Al-Arab River – Southern Iraq

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**ABSTRACT**--Due to the importance of sea bream, *Acanthopagrus arabicus* (Iwatsuki, 2013) and *Sparidentex hasta* (Valenciennes, 1830), the current study aimed to identify some of the biology aspects and biochemical contents of these two species for both fisheries and aquaculture industry. During the time from January 2018 to June 2018, samples of both species were obtained. In which the relationship between fish lengths and weights was studied, a simple regression between lengths and weights and their mathematical expression was analyzed. The absolute condition factor (K) and the relative condition factor (Kn) of both species were also determined. The study found that the sizes of *S. hasta* fish are larger than that of the sizes of *A. arabicus*, as their lengths ranged between 9 to 25 cm (average length of 17 cm) while they were in the *A. arabicus* fish 9-19 cm (average length of 14 cm), and the weights of *S. hasta* fish ranged between 19.64 g to 87.32 g, with an average weight of 52.24 g, whereas in the *A. arabicus*, it was 18.10 to 43.70 g, with average weight of 37.92 (g). The equation of the length-to-weight relationship for the *A. arabicus* fish was  $W = 1.541 + 2.639 L$ , and  $W = 0.39 + 2.800L$  for *S. hasta* fish. The absolute (K) were 1.344 and 1.043 of the two species respectively, relative condition (Kn) were 0.945 for *A. arabicus* and 0.999 for *S. hasta*. Fish muscles were taken to measure the chemical composition. The results indicated that *S. hasta* fish have the highest percentage of meat (yield %), high protein and fat content, as the yield % reached  $48.97 \pm 2.54$  %, protein content  $19.5 \pm 1.89$ , and fat content  $8.1 \pm 0.53$  compared to yield %, protein and fat content of *A. arabicus* fish meat  $45.63 \pm 2.08$  %,  $18.79 \pm 0.50$  and  $3.31 \pm 1.01$  % respectively. Based on these results, the two species are good source of protein, fat and minerals, and provide useful data for both fisheries management, and aquaculture industry.

**Key words**-- *Acanthopagrus*, *Sparidentex*, Sea bream, chemical composition, length weight relationship

## I. INTRODUCTION

The Sparidae family, known as sea breams or porgis, is found in tropical and temperate waters (Froese and Pauly, 2013). Sparid fish are distributed widely and commercially important for the world's fisheries sector and industries (Pavlidis and Constantinos, 2011). *Acanthopagrus arabicus* and *Sparidentex hasta* are categorized in the same order as Perciformes and the Sparidae family, but separate subfamilies; Sparinae and Denticinae, respectively. (Kuronuma and Abe, 1986). Since the species are commercially important, their biology and taxonomy have been well studied. Age growth and reproductive biology including almost all sparid species have

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been conducted by various researchers in several countries (El-Agamy, 1989; Kailola *et al.*, 1993; Kraljevic *et al.*, 1996; Radebe *et al.*, 2002; Willis *et al.*, 2003; Hughes *et al.*, 2008; Al-Mamry *et al.*, 2009). The family Sparidae is among the larger commercial fish families in the Arab Gulf, with approximately eight genera, but the most abundant in the Iraqi coasts and estuaries are *A.arabicus* and *S.hasta*. (Al-Daham,1979; Kuronuma and Abe 1986).*A. arabicus* locally known as Shank reproduces in the northern Arabian Gulf and its juveniles join the Shatt Al-Arab, Shatt Al-Basra and Hor Al-Hmmar Marsh (Hussain *et al.*, 1987; Al-Daham *et al.*, 1993; Mohamed and Mutlak, 2007) for feeding. Studies also covered *A.arabicus'* age and development in the coastal waters of the Northwest Arabian Gulf of Iraq (Al-Areki, 2001).FAO-FishStatPlus (2008) has identified Sea Bream, *S. hasta* locally known as Sobaity as the only species in the genus Sparidentex, *S. hasta* is a native species of Bahraini, Kuwaiti, Saudi Arabia, Omani, Qatari and Iraqi waters in the Arabian Gulf. It is also widely found throughout the West Indian Ocean and the Indian coast (Bauchot and Smith, 1984).There are several attempts to cultivate it in estuaries, salt lagoons, salt marshes and coastline in different regions of Iraqi water as potential candidates for aquaculture, taking full advantage of their easy adaptation to captivity and the use of available production technologies.Al-Faizet *al.*, (2016),and Hussein *et al.* (2016) investigated the potential of cultivating these two species using different farming systems in Iraqi waters in the Al-Faw region. The present research has been intended to study certain biological aspects of the relationship between length-weight, absolute and relative condition factor of *A. Arabicus* and *S.hasta*, as well as chemical composition and nutritional value, which will provide useful data for both fisheries and aquaculture management in southern Iraq.

## II. MATERIAL AND METHODS

A sample of 415 *A.arabicus* fish and 847 *S. hasta* fish were collected from River of Shatt Al-Arab at AL-FAWSouthern Iraq, representative the relative abundance of capture sizes for the period January 2018 to June 2018 of both species.The length (cm)and weight (g) of fish was measured.Length-weight relationship (LWR) was calculated using the formula:

$W = a + b L$  (Ricker, 1973). Where, (W)is Body Weight (g), (a) is the regression intercept (constant), (L) istotal length (cm), and (b) is regression slope (constant).

Absolute condition factor (K) calculatedby:

$K = 100 W/L^3$ ., Where, (W)is weight (g), (L) is total body length (cm).

Relative condition factor (kn) calculatedby:

$Kn = W/w$  (Le Cren, 1951). Where,(W) is Observedbody weight (g), (w)is calculated body weight resulting from LWR.

The muscles were removed from the fish and the percentage offish meat was calculated as follow:

Meat weight (yield %) = weight fish meat (g) / total weight of fish (g) x 100.

The chemical composition of the fish meat according to A.O.A.C. (2005) has been estimated. The nutritional value of fish (kcal/100 g) was estimated by multiplying 5.56 of the protein contents and 9.45 of fat content (Winberg,1971).

## III. RESULTS AND DISCUSSION

The research analyzed the length-weight relationship of the *A.arabicus* and *S.hasta* fish species collected from Shatt Al-Arab River. Table (1) shows length, weight and absolute and relative condition factors of studied fish. A total of 415 of *A. arabicus* and 847 of *S. hasta* were used. The length of *S. hasta* fish are larger than the length of the *A. arabicus*, as their lengths ranged between 9 to 25 cm and an average length of 17 cm while they were 9-19 cm in the *A. arabicus* fish and an average length of 14 cm. Resean *et al.*, (2008) estimated the total length of *A. arabicus* varied from 13 to 34 cm in Iraqi marine waters Northwestern Arabian Gulf, Awan *et al.*, (2017) recorded the mean length of *A. Arabicus* (14.7 cm) and *S.hasta* (36.29 cm) in Pakistan. Randall (1995) recorded a maximum total length of *S.hasta* 50 cm, but Karam (2011) indicated that *S. Hasta* as well as other sparid fish could increase up to 75 cm in length. Figure (1) indicates the length frequency distribution of both *A.arabicus* and *S.hasta*, where the majority of the fish fall into length groups of 16-19 in, *A.arabicus* and the length group of 15-25 cm of *S.hasta* fish, the cause is due to the similarities of the fishing methods of both species and the mesh size used, and the rise in the number of *S.hasta* can be due to their abundance in Shatt al-Arab River. Resean *et al.* (2008) stated that the 23 cm in length group of *A.arabicus* was the dominant group in the Marine Iraqi waters Northwestern Arabian Gulf. The weights of *S. hasta* fish range is greater than the weight of *A. Arabicus*, when their weight varied from 19.64 g to 87.32 g and their average weight was 52.24 g since they were in *A. Arabicus* fish from 18.10 to 43.70 g, with an average weight of 37.92 g (Table, 1). The length- weight relationship constants (a), (b) and the regression coefficient ( $r^2$ ) are shown in Table (2). The simple linear regression slope (b) of *A.arabicus* was 2.402, while that of *S.hasta* was 2.747. The growth coefficient (b) suggested that both species had negative allometric growth. This finding is consistent with the analysis by Pauly (1983) who reported a (b) range of 2.5 to 4.0 for several species of fish. The values of (b) for *A.arabicus* and *S.hasta* in this study were within the limitations defined by Froese (2006) and Pervin and Mortuza (2008). It has been stated that if (b) value is equal to 3.0, the fish will develop isometric contraction, resulting in an optimal fish shape. (Olurin and Aderibigbe, 2006). If the value of (b) is less than 3.0, the fish will undergo adverse allometric development. (Sandon, 1950). However, when the value of (b) is greater than 3.0, the fish grows according to the positive morphometric growth rate. The length-weight relationship regression coefficient ( $r^2$ ) for *S.hasta* was high, indicating that the length increased with an increase in the fish's weight. Many researchers have previously pointed out that length-weight relationships can differ wildly even in the same species as some of those influenced by different factors like sex, spatial variations, growth stage, stomach content, and gonadal development. (Kawamura 1972; Bagenal and Tesch 1978; Hossain *et al* 2006; Leunda *et al* 2006; Gaspar *et al* 2012). Hussian *et al.* (2010) described the length-weight relationship between two species of the same family from the Karachi coastline, and the study found isometric expansion for *A.arabicus* (b) is 3.015 and *A.berda* (b) is 3.092. In comparison, Hameed *et al.*(2013) and Riaz *et al.*(2017) found negative morphometric growth rates in *A.berda* and *A.arabicus* from the Karachi coast lines. According to the present study, negative morphometric growth rates in *A.arabicus* and *S.hasta* from the Shatt Al-Arab River have also been shown, which can be attributed to environmental stress or fish body size. Spatial change in the value of (b) and negative morphometric growth detected for another region (Ahmed *et al.*, 2013; Safi *et al.*, 2014). The condition factor is an indicator supposed to reflect a relationship between abiotic and biotic factors in fish biological circumstances (Le Cren, 1951). As a consequence, the condition factor can vary between species of fish in different locations. (Blackwell *et al.*, 2000). It can also be a good measure to observe the feed activity, growth and survival rate of fish (Ujjania *et al.*, 2012; Bagenal 1978). It was found that the absolute condition coefficient (K) was 1.369

in the *A.arabicus* while it was 1.075 in the *S. hasta*(Table 1).From a nutritional perspective, therefore, the increase in K-values specifically indicates the accumulation of fat and infrequently gonadal growth (Maguire and Mace, 1993). However, from a reproductive perspective, Angelescu *et al.* (1958) confirmed that the highest K values can be obtained in which the fish are sexually active and have a relatively high reproduction rate.The relative condition factor (Kn) was lower than the absolute condition factor (K) and reached 1.0006 and 1.010 for *A.arabicus* and *S hasta*fish. The current study shows the appropriateness and fertility of the Shatt Al Arab River water for such two species and has been accomplishing good returns.

Table (1)Length, weight, absolute and relative condition factor of *A.arabicus* and *S.hasta* from Shatt Al-ArabRiver

species	N	Length(cm)			Weight (g)			Absolute Condition factor (K)	Relative condition factor (Kn)
		Range	mean	±SD	Range	mean	±SD		
<i>Acantopagrus arabicus</i>	415	9-19	14	0.89	18.10 - 43.70	37.92	2.376	1.369	1.0006
<i>Sparidentex hasta</i>	847	9-25	17	1.47	19.64 - 87.32	52.24	4.273	1.075	1.010

Table (2)Length-weight relationship of *A.arabicus* and *S.hasta* from Shatt Al-ArabRiver

species	a	b	r <sup>2</sup>	Growth pattern
<i>Acantopagrus arabicus</i>	1.637	2.402	0.987	NA
<i>Sparidentex hasta</i>	0.0001	2.747	0.999	NA

(a)is intercept of regression, (b)is slope of regression, (r<sup>2</sup>)is regression coefficient, (NA)is negative allometric

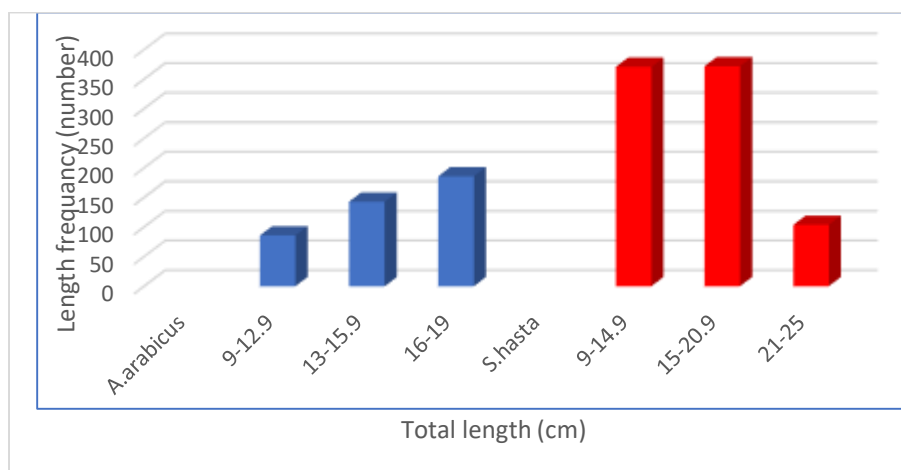


Fig (1) Length frequency distribution of *A.arabicus* and *S.hasta* collected from Shatt Al-ArabRiver

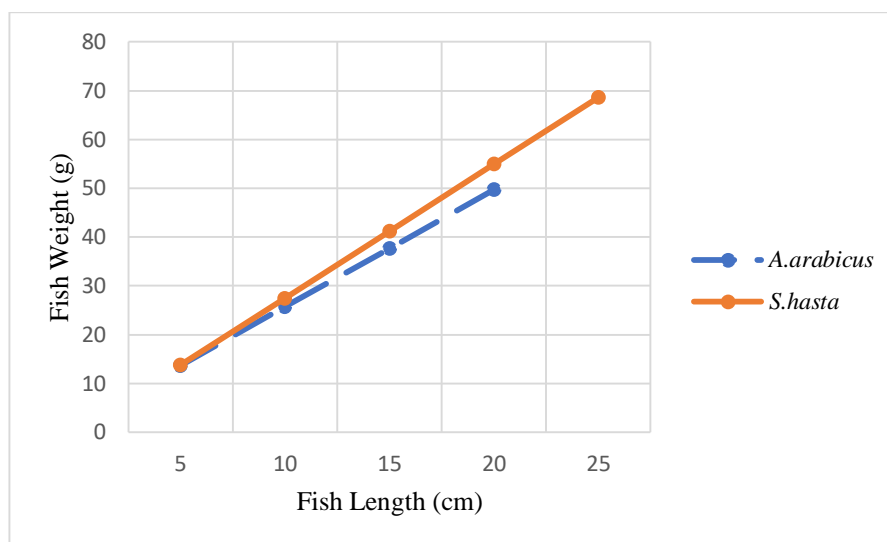


Fig (2) Length weight relationship *A.arabicus* and *S.hasta* collected from Shatt Al-ArabRiver

#### IV. PERCENTAGE OF MEAT FROM FISH(YIELD):

The weight composition is defined as the percentage of weight of each portion or organ reflected as a percentage of the overall body weight. It is important to know the percentage of edible fish parts for assessment as food (Zatiev *et al.*,1969).The percentage of a meat to the overall weight of the fish is of economic importance for evaluations of the fish, the understanding of the composition of the fish's weight is an important determinant since some parts of it are not eaten(Yesser 1995).Even though *A.arabicus* and *S. hasta* fish are small compared to fish of other commercial significance in the waters of the Shatt al-Arab River, they are of commercial benefit related to high quality of their meat and market competition.Table (3) shows that the weight of the meat ranged between 11,96-33,48 g and an average of 22,70 g in *A.arabicus* fish and ranged between 14,7 and 39,22 g and an average of 26,96 g in *S.hasta* fish. The percentage of edible meat (yield percent) in *A.arabicus* and *S.hasta*. Was 45.63 and 48.97 percent, respectivelySaleh *et al.*, (2014) found that the proportion of meat in common carp fish (47 per cent), and was (49.60 per cent) in *Tilapia zill*. The edible portion of fish varies by sex, and time of fishing (Zatiev *et al.* 1969).

Table 3. The proportion of fish meat of *A.arabicus* and *S.hasta* collected from Shatt Al-ArabRiver

Fish species	Range of fish meat Weight (g)	Mean fish meat weight (g)	Fish meat / 100 gm fish weight (yield %)
<i>Acantopagrus arabicus</i>	11.93-33.48	22.70	45.63±2.08
<i>Sparidentex hasta</i>	14.7-39.22	26.96	48.97 ± 2.54

#### V. CHEMICAL COMPOSITION:

The composition of fish meat and its nutritional value are shown in Table (4).Considerable differences ( $P < 0.05$ ) were observed in the moisture, fat, ash and nutritional value of the fish. The highest percentage of moisture  $75.47 \pm 1.24$  was observed in *A.arabicus*, whereas it was  $70.31 \pm 1.57\%$  in *S.hasta* fish,Protein, fat , ash and nutritional value based on wet weight in the *S.hasta* fish muscles (19.53 per cent, 8.12 per cent, 1.68 per cent and 185.72 kcal/100 g) were highest compared to *A.arabicus* (18.79 per cent, 3.31 per cent, 1.07 per cent and 135.80 kcal/100 g).These results are in agreement with those stated by (Mahdi *et al.* 2006; Hantoush *et al.* 2014) For other

commercially important fish from Shatt Al-Arab River and Iraqi water Northwest Arab Gulf, and Younis *et al.* (2011) from Saudi Arabia's Arab Gulf Coast. It is well known that seasonal change and food availability, as well as the physiological of fish, influence the chemical composition of fishes (Egan *et al.*, 1981). Both species provide a good source of protein, fat and minerals. From these results it is concluded that these species make a significant contribution to a food safety and nutritious for human consumption.

Table (4) Chemical composition of *A. arabicus* and *S. hasta* fish, caught from the Shatt alArab in the Al-Faw region southern Iraq

Chemical content (%)	<i>A. arabicus</i>	<i>S. hasta</i>	Significance *
Moisture	75.47±1.24	70.31± 1.57	*
Protein	18.79± 0.50	19.53± 0.66	-
Lipid	3.31± 1.01	8.12± 1.07	*
Ash	1.07± 0.13	1.68± 0.27	*
Nutritive value (kcal/100g)	135.80±12.55	185.72±13.83	*

\* The mean difference is significance at the (P < 0.05).

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