

## NUTRITIONAL VALUE OF SOME IRAQI MARINE FISHES

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## ABSTRACT

The present work is a comparative study on biochemical composition of six species of Iraqi marine fishes, to evaluate their nutritional value. High concentrations of protein (19.501 %) and fat (6.446 %) were recorded in *Cynoglossus arel*. Accordingly, the maximum levels of total calorific value (139.902 Kcal/100gm) and true calorific value (131.308 Kcal / 100gm) were found in this species. The relationship between moisture and fat contents was negative correlation ( $r = - 0.855$ ). The general condition of the studied fish was varied from 0.358 in *C. arel* to 1.780 in *Liza subviridis*.

## INTRODUCTION

Over the past several years, utilization of marine resources for human consumption has increased worldwide, primarily due to an escalated awareness of health and a growing concern for nutrition (Iwasaki & Harada, 1985). Fish has a distinctive role in Iraqi diets, as one of the best food supplying protein of high biological value (Yesser, 1995). The importance of fish is attributed to their high nutritional value of proteins, fat and phosphorous (Al-Aswad, *et al.*, 1980). The part of proteins in diet that is not used for the formation of new proteins may be used as energy source, and the end products of this protein metabolism are urea, uric acid, creatinine and some amino acids. Basically it could be inferred that the amino acid composition of fish protein might be taken as a good indication for the quantitative requirements in the fish diet (Wassef and Abdel Haddy, 1999). The lipid content and its distribution in fish varies markedly from species to another, and its droplet occurred in endomysium around dark fibers (Zhou, *et al.*, 1995). Lipids are the major metabolic reserve in most marine animals, including mammals, fish and crustaceans (Napolitano and Ackman, 1993). Ali and Ali (1986) obtained that fish's flesh contains all essential amino acids and its unsaturated fatty acids lead to decrease the concentration of cholesterol in the consumer's blood. The balance of 80 % of the wet weight of muscle is made up of lipid and water, and in high - fat

fish knowledge of the water content will give an approximation of the fat content by difference (Ackman, 1995). Changes in the chemical composition can be caused by various biological and physiological factors such as maturation, spawning, feeding and migration (Hindi, *et al.*, 1989). The present study was undertaken to provide information on the chemical composition of some commercially important Iraqi marine fishes, their nutritional content and their general condition.

## MATERIALS AND METHODS

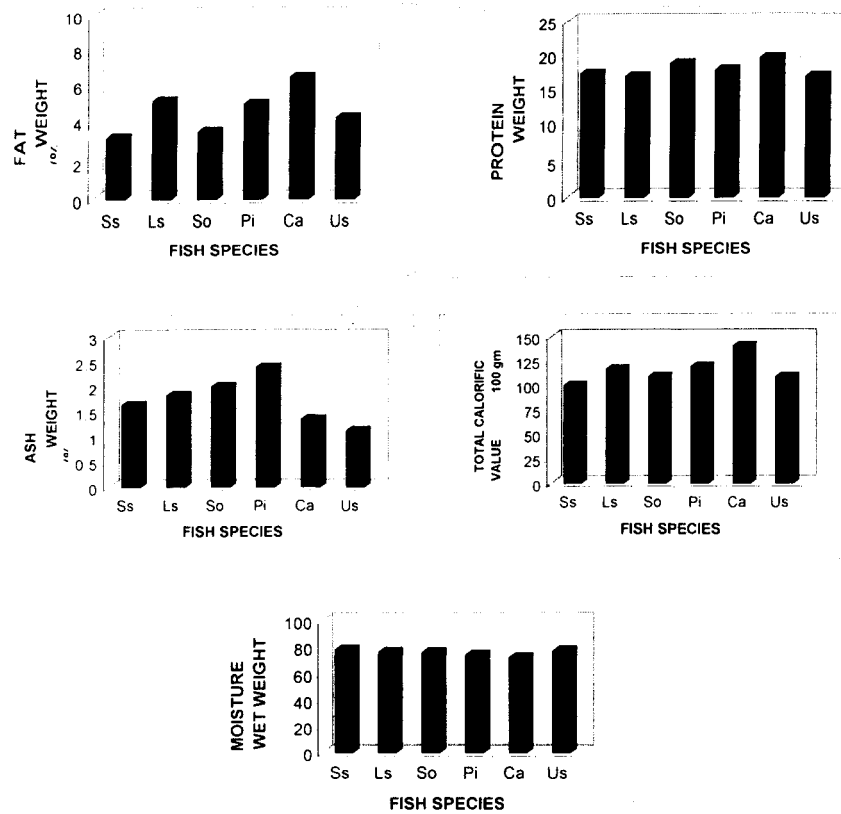
**Sampling:** Six marine fish species namely: *Sillago sihama*, *Liza subviridis*, *Synaptura orientalis*, *Platycephalus indicus*, *Cynoglossus arel* and *Upeneus sulphureus*, represented by six specimens for each were chosen for the present study. Fishes were obtained from Basrah fish market during the period from October 2001 to February 2002. Samples were kept in crushed ice in polystyrene cool box and transferred to laboratory.

**Measuring Length and Weight:** The total length and weight of each specimen were measured to the nearest 0.1 m and 1.0 gm. The general condition (kf) was calculated according to Bauer *et al.* (1973).

**Chemical Analysis:** The muscle of each fish species were freeze-dried, ground and sieved. Percent of protein, ash and moisture were determined according to A.O.A.C. (1984). Total lipids were extracted by method described by I.U.P.A.C. (1979). All data were calculated on wet weight basis. The correlation between moisture and fat contents was calculated. The total and true calorific value were calculated following Zaitsev, *et al.* (1969).

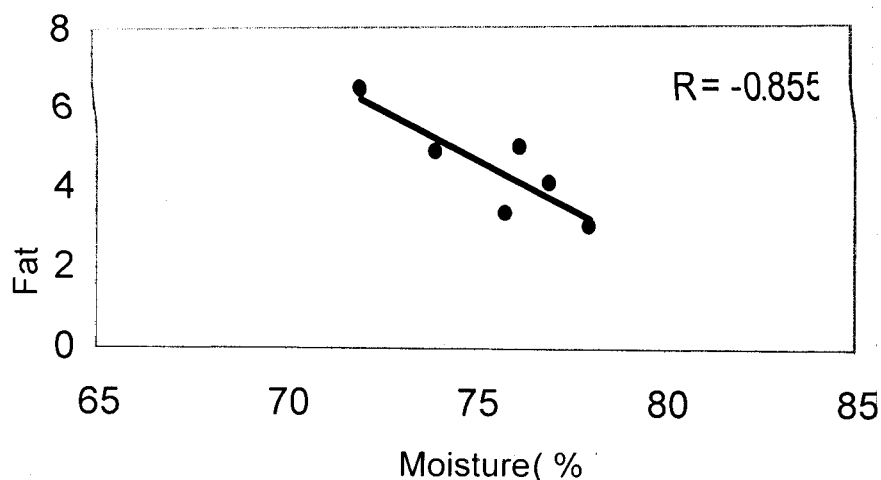
## RESULTS AND DISCUSSION

The four major chemical components (protein, lipid, moisture and ash) of the studied species muscles were determined and their average values are presented in Figure (1). The lowest average of protein was 16.817 % in *L. subviridis* and the highest 19.501 % in *C. arel*. The fat content was ranged from 3.106 % in *S. sihama* to 6.446 % in *C. arel*. The changes in fat content depending on the extraction solvent used. Ackman (1989) stated that the fat content has usually, but not always, been effected by some variations on solvent extraction. The overall mean moisture in the muscle ranged from 72.106 % in *C. arel* to 78.012 % in *S. sihama*. Figure (2) showed that the relationship between fat and moisture was of known negative correlation, in the present study. Several studies refer to such opposite proportion (Al-Aswed, *et al.*, 1980; Al-Habbib, *et al.*, 1986; Hantoush, 1998; Yesser, *et al.*, 1999 and Mohamed, *et al.* 2004).



**Figure (1). Biochemical composition of the muscles of some Iraqi marine fish species**

Ss (*Sillago sihama*), Ls (*Liza subviridis*), So (*Synaptura orientalis*), Pi (*Platycephalus indicus*), Ca (*Cynoglossus arel*) and Us (*Upeneus sulphureus*)



**Fig. (2) Relationship between moisture (%) and fat (% wet. wet.) contents for all studied fishes.**

The ash content of specimens involved ranged from 1.119 % in *U. sulphureus* to 2.387 % in *P. indicus* in Figure (1). The variations in the proximate chemical composition are related to age, sex, feeding, maturation and spawning and also the deposition of protein and fat in muscle may be attributed to good feeding, while their depletion from the muscle may be attributed to gonads development and maturation during spawning (Hindi, *et al.*, 1989). The chemical composition obtained in the present study is more or less within the ranges of previous studies (Table 1). The mean values of total and true calorific value measured as Kcal / 100gm of the fish flesh are shown in Figure (3). It was ranged from (99.467 and 94.044) Kcal / 100gm in *S. sihama* to (139.902 and 131.308) Kcal / 100gm in *C. arel*. The total and true calorific values obtained were similar to those found by many workers (Ali & Ali, 1986; Ali, *et al.*, 1986; Al-Badri, *et al.*, 1991 and Mohamed, *et al.*, 2004). The length and weight data of studied species are present in Table (2). The length of fish is often easier to obtain than its weight:  $W=aL^3$ , where (a) is constant, expressed as “condition factor”, this relationship is used to compare between individuals within and

**Table (1). A comparison of proximate chemical composition with other relevant studies**

SPECIES	MOISTURE %	PROTEIN %	FAT %	ASH %	REFERENCES
<i>Aspius vorax</i>	74.81	17.29	4.93	1.24	Ali, <i>et al.</i> (1986)
<i>Liza carinata</i>	77.82	17.57	3.51	1.07	Al- Badri, <i>et al.</i> (1992)
<i>Arius thalassinus</i>	75.80	19.40	3.77	1.36	Yesser (1995)
<i>Otolithes ruber</i>	69.30-80.60	14.60-21.26	2.73-7.49	1.17-1.41	Hantoush (1998)
<i>Tetradactylum</i> sp.	76.45	16.74	4.77	1.64	Mohamed, <i>et al.</i> (2004)
<i>Nematalosa nasus</i>	73.53	18.97	5.68	1.33	
<i>Hilsa kelee</i>	77.00	15.96	4.96	1.84	
<i>Sillago sihama</i>	78.01	17.22	3.11	1.63	Present Study
<i>Liza subviridis</i>	76.16	16.82	5.10	1.82	
<i>Synaptura orientalis</i>	75.80	18.68	3.42	2.00	
<i>Platycephalus indicus</i>	73.97	17.75	4.96	2.39	
<i>Cynoglossus arel</i>	72.11	19.50	6.45	1.35	
<i>Upeneus sulphureus</i>	76.95	16.83	4.20	1.12	

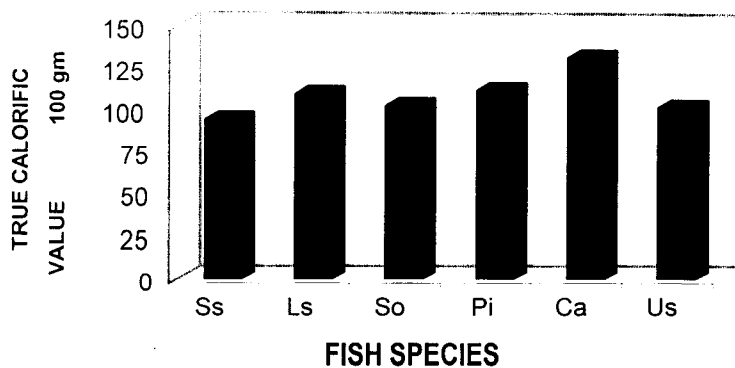
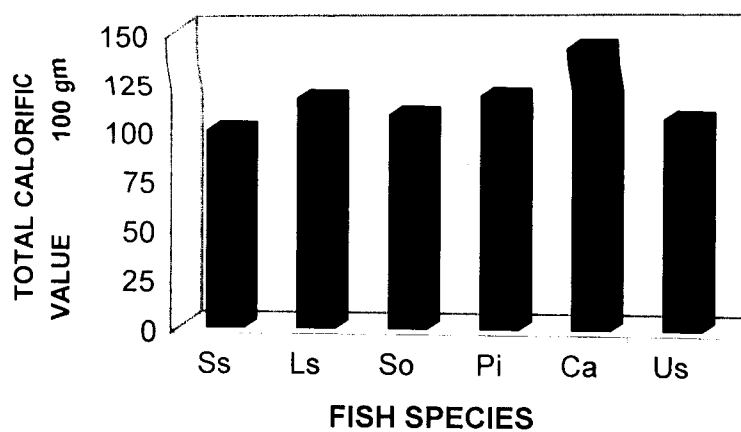
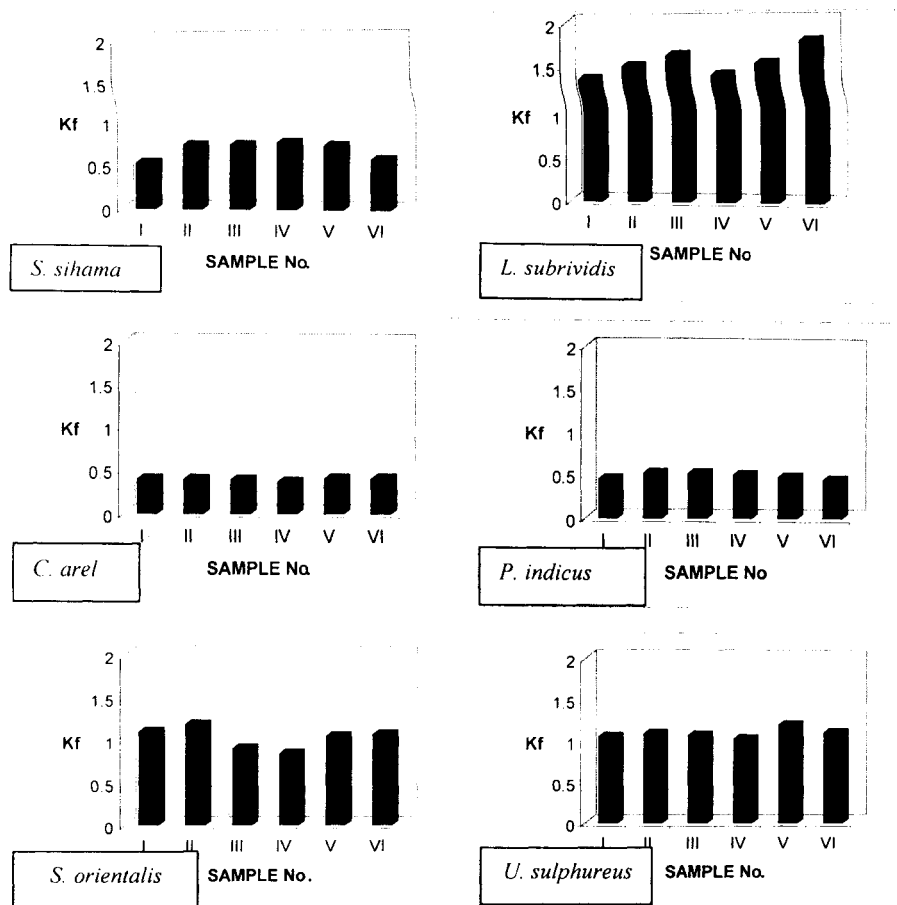


Fig. (3) Total and true calorific value (Kcal / 100 gm) for studied fish species. Ss (*Sillago sihama*), Ls (*Liza subviridis*), So (*Synaptura orientalis*), Pi (*Platycephalus indicus*), Ca (*Cynoglossus arel*) and Us (*Upeneus sulphureus*)

between different fish population (Lagler, *et.al.*, 1977). Figure (4) showed the maximum levels of the general condition (kf) which ranged from 1.345 to 1.780 in *L. subviridis* whilst the minimum levels were ranged from 0.358 to 0.400 in *C. arel*. All these data were in agreement with that obtained by Ali (1979); Ali & Ali (1986); Ali, *et al.* (1986) and Mohamed *et al.* (2004).

**Table (2). Number of fish, length and weight range (mean) of studied fish species in the NW Arabian Gulf.**

WEIGHT (gm)	LENGTH (cm)	No. of FISH	SPECIES
(19.08) 7.98 – 29.00	(13.8) 11.5 – 17.0	6	<i>Sillago sihama</i>
(38.70) 31.80 – 43.60	(13.7) 12.9 – 14.8	6	<i>Liza subviridis</i>
(64.05) 40.50 – 89.60	(18.3) 16.9 – 20.5	6	<i>Synaptura orientalis</i>
(25.98) 22.00 – 29.20	(17.6) 16.5 – 18.5	6	<i>Platycephalus indicus</i>
(32.00) 27.40 – 44.50	(20.2) 18.5 – 22.5	6	<i>Cynoglossus arel</i>
(19.43) 17.14 – 26.34	(12.1) 11.5 – 13.6	6	<i>Upeneus sulphureus</i>



**FIGURE (4).** The general condition (Kf) of some Iraqi marine fish species



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### القيمة الغذائية لبعض الأسماك البحرية العراقية

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#### الخلاصة

تظهر الدراسة الحالية مقارنة في التركيب الكيميائي الحيائي لستة أنواع من الأسماك البحرية العراقية. إذ بلغت أعلى نسبة مئوية للبروتين 19.501% وللدهن 4.46%. في أسماك لسان الثور *Cynoglossus arel*. وبذلك، كان أعلى مستوى للطاقة الكلية 139.902 كيلو سعرة لكل 100 غرام من اللحم وأعلى مستوى للطاقة الفعلية 131.308 كيلو سعرة لكل 100 غرام من اللحم في هذه الأسماك. وقد لوحظ وجود ارتباط معنوي سالب بين محتوى الرطوبة والدهن  $r = -0.855$ . تراوحت معامل الحالة للأسماك المدروسة بين 0.358 لأسماك لسان الثور *C. arel* و 1.780 لأسماك البياح الأخضر *L. subviridis*.