

THE GENERAL CONDITION AND CALORIFIC VALUE OF SOME
COMMERCIAL IMPORTANT FISH IN THE NORTHWEST
ARABIAN GULF

A.R.M. Mohamed, A.A. Hantoush*, J.H., Saleh* and K.H. Abdulkadir*

Dept., Fish.&Mar. Res., Coll. Agric., Univ. Basrah., Iraq

*Marine Science Centre, University of Basrah, Iraq

ABSTRACT

Nine marine fish species *Pseudorhombus arsius*, *Sardinella albella*, *Trichura lepturus*, *Johneiops sina*, *Leiognathus bindus*, *Tetradactylum* sp., *Nematalosa nasus*, *Caranx kalla* and *Hilsa kelee* were collected during May–September, 1997 from the Northwest Arabian Gulf. The study mainly deals with the chemical constituents, the nutritive value and the general condition. The chemical analysis revealed that *J. sina* contained the highest moisture (79.85%) and *P. arsius* contained the highest fat content (9.650 %) and ash (2.244 %), while *C. kalla* contained the highest protein content (21.251 %). The total calorific value range within (82.332-172.622 Kcal /100 gm) of the flesh. The general condition of the investigated fishes were varied from (0.058) in *T. lepturus* to (1.225) in *L. bindus*. A negative relationship between moisture and fat contents was observed.

INTRODUCTION

A knowledge of the chemical composition and nutritive value of commercially important fish species is one of the major aims in the establishment of fishes and increasing the productivity of a high nutritive value (Al-Habbib, *et al.*, 1986). In fish the corresponding depot fat is always liquid at room temperature and is seldom even visible to the consumer, the basic lipid of fish muscle is cellular in nature (Ackman, 1995). Lipids in fish are stored in several depot organs (mesenteric fat, dark muscle and liver) primarily as triacylglycerol, and when the stored lipid mobilized by triacylglycerol lipase, it may be transported in the serum as free fatty acids bound to specific carrier proteins and utilized for the fish

metamorphosis (Sheridan, 1988). The part of protein in diet that is not used for the formation of new proteins may be used as an energy source, and the end-products of this protein metabolism are urea, uric acid, creatinine and some amino acids (Osborne and Voogt, 1978). Hence, it's seen that proteins play a substantial part in the energy metabolism of fish. A relationship between the condition factor and fatness marked in fish when increased of fat accumulation over protein growth. The objective of this study was to obtain the effects of the general condition and biochemical composition of different fish species of calorific and nutritive value.

MATERIALS AND METHODS

Sampling: Nine fish species *P. arsius*, *S. albella*, *T. lepturus*, *J. sina*, *L. bindus*, *Tetractylus sp.*, *N. nasus*, *C. kalla* and *H. kelee* represented by six samples of each one were collected during May-September, 1997 from the Northwest Arabian Gulf (Fig. 1). The fresh samples were kept in crushed ice in polystyrene cool box and transferred to the laboratory.

Measuring length and weight: The length and weight of each fish specimen were recorded. The length was measured from the snout to the end of the caudal fin. Their standard lengths and weights were measured to the nearest millimeter and milligram, respectively. The general condition (kf) was calculated as described by Bauer, *et al.* (1973).

Chemical Analysis: For each fish species, the muscles were freeze-dried, sieved and analyzed for protein, fat, ash and moisture, in triplicate. Percent protein was determined according to the procedure mentioned by Lowry, *et al.* (1951). Total lipid was extracted by method described by IUPAC (1979). Ash and moisture were determined according to A.O.A.C. (1984). All data were expressed on a wet weight basis. The total and true calorific values were calculated as described by Zaitsev, *et al.* (1969).

RESULTS AND DISCUSSION

Results of the proximate chemical composition, total and true calorific value are shown in Table (1). The protein content of the specimens involved ranged from 14.652 % in *S. albella* to 21.251 % in *C. kalla*, Whilst the fat content ranged from 1.383 % in *J. sina* to 9.650 % in *P. arsius*. The overall mean moisture for the muscle ranged from 67.34 % in *P. arsius* to 79.85 % in *J. sina*. Ash content for the muscle ranged from 1.284 % in *J. sina* to 2.244 % in *P. arsius*. The variation in the chemical constituents of fish are mainly due to various biological and physiological factors such as maturation, spawning, feeding and migration (Hindi, *et al.*,

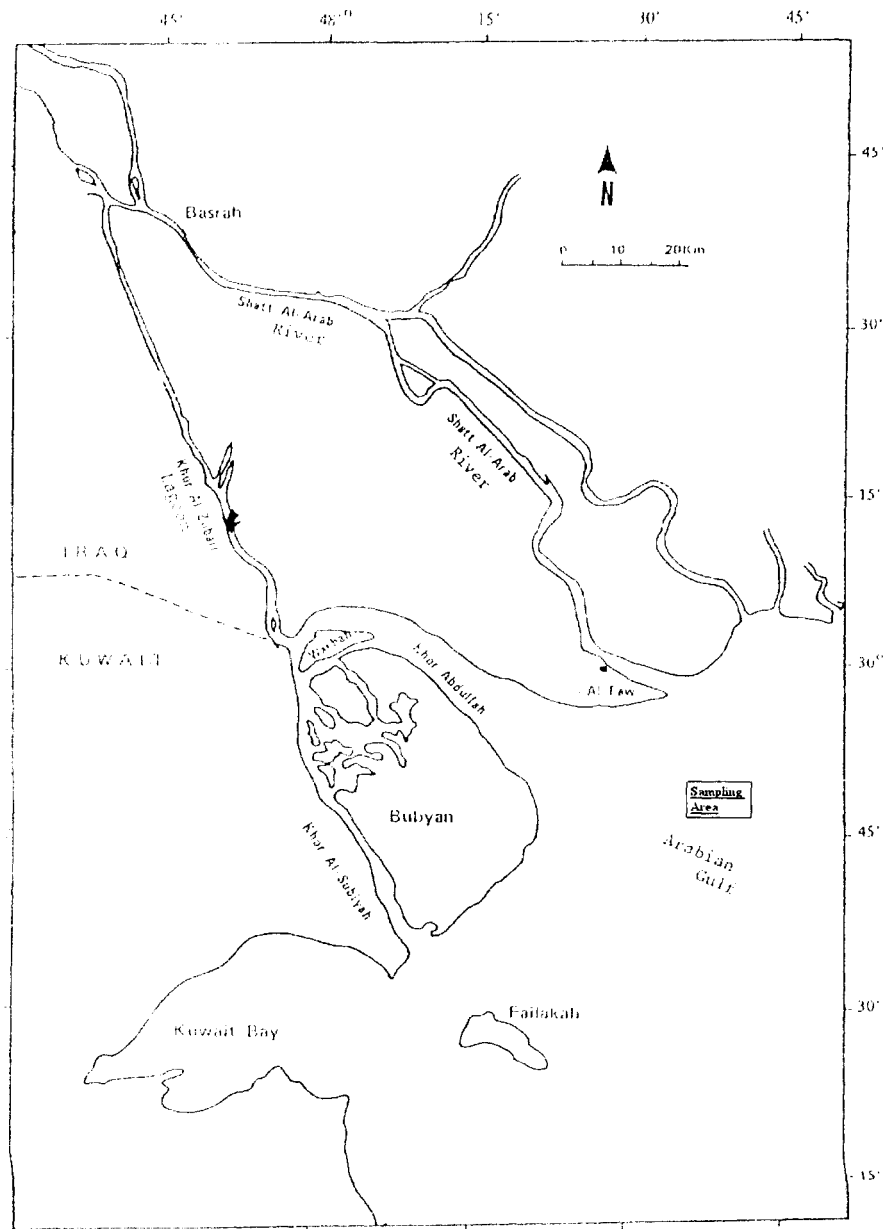


Fig. (1). Sampling Area of marine fishes From North-West Arabian Gulf.

Table 1. The Proximate chemical composition; Protein, Fat, Moisture and Ash (as a percentage of body weight), total and true calorific value of the flesh of nine fish species from NW Arabian Gulf.

Species	Protein %	Fat %	Moisture %	Ash %	Total calorific value (k cal/100 gm)	True calorific value (k cal/100 gm)
<i>Pseudorhombas arsius</i>	20.214	9.650	67.34	2.244	172.622	161.230
<i>Sardinella albella</i>	14.652	6.229	77.06	1.458	118.003	110.386
<i>Trichura lepturus</i>	15.806	2.216	79.44	1.597	85.413	80.966
<i>Johnius sina</i>	16.944	1.383	79.85	1.284	82.332	78.396
<i>Leiognathus bindus</i>	20.497	4.249	72.02	2.075	123.553	116.635
<i>Tetradactylum sp.</i>	16.744	4.774	76.45	1.644	113.049	106.307
<i>Nematalossa nasus</i>	18.968	5.684	73.53	1.327	130.630	122.762
<i>Caranx kalla</i>	21.251	7.054	68.84	1.355	152.73	143.342
<i>Hilsa kelee</i>	15.961	4.961	77.00	1.844	111.577	104.807

1989; Jafri, 1969). 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 variations of moisture content were related inversely to the change in fat content. The relationship between moisture and fat content was ($r = -0.839$), which is in a good agreement with that of Al-Aswad *et al.* (1980); Al-Habbib *et al.* (1986); Hantoush (1998) and Yesser *et al.* (1999). Ash content independent on the sex maturation and reproductive cycle (Al-Habbib *et al.*, 1986). The ash content related to the body metabolism and feeding (Jafri and Kawaja, 1968). It could be concluded that the proximate chemical composition obtained in this study were similar to those reported earlier in the same area (Table 2). The total calorific value ranged from 82.332 kcal/100 gm in *J. sina* to 172.622 Kcal/100 gm in *P. arsius*, Whilst the true calorific value ranged from 78.396 kcal/100 gm in *J. sina* to 161.230 kcal/100 gm in *P. arsius*. The amounts of protein and fat are multiplied by factors representing the number of kilocalories produced by 1 gram of the materials in the body, then the sum of these gives the calorific value (Osborne and Voogt, 1978). The results in the present study are within the range obtained by (Ali and Ali, 1986) for *Barbus xanthopterus* and (Al-Badri, *et al.*, 1991) for *Silurus triostegus*.

The number of fish used, their length and weight are shown in Table (3). The average length ranged from 9.68 cm in *L. bindus* to 35.27 cm in *T. lepturus*, whilst the weight ranged from 11.1 gm in *L. bindus* to 58.39 gm in *N. nasus*. The length of a fish is often easier obtained than its weight of a fish: $W = a.L^3$, where a is constant, expressed as "condition factor", this

Table (3). Number of fish, total length and wet. weight (means and range) of studied fish species in the NW Arabian Gulf.

Species	N. of Fish	Length (cm)	Weight (gm)
<i>Pseudorhombas arsius</i>	6	(11.53) 10.9 – 12.0	(12.65) 9.41 – 15.77
<i>Sardinella albella</i>	6	(12.23) 11.5 – 12.7	(15.37) 13.20 – 17.49
<i>Trichura lepturus</i>	6	(35.27) 27.2 – 39.0	(25.65) 12.34 – 31.19
<i>Johnius sina</i>	6	(13.0) 12.8 – 13.3	(23.61) 20.21 – 27.96
<i>Leiognathus bindus</i>	6	(9.68) 9.1 – 10.2	(11.1) 9.40 – 12.97
<i>Tetradactylum sp.</i>	6	(17.27) 16.3 – 17.6	(47.29) 41.77 – 54.38
<i>Nematalossa nasus</i>	6	(17.17) 15.6 – 18.9	(58.39) 45.26 – 81.95
<i>Caranx kalla</i>	6	(12.38) 11.4 – 13.1	(17.09) 14.22 – 20.81
<i>Hilsa kelee</i>	6	(14.05) 12.9 – 15.0	(21.95) 16.65 – 26.75
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<i>Nematalossa nasus</i>	6	(17.17) 15.6 – 18.9	(58.39) 45.26 – 81.95
<i>Caranx calla</i>	6	(12.38) 11.4 – 13.1	(17.09) 14.22 – 20.81
<i>Hilsa kelee</i>	6	(14.05) 12.9 – 15.0	(21.95) 16.65 – 26.75

relationship lends itself to comparison of individuals within and between different fish population (Lagler, *et al.*, 1977).

The general condition of fish is greatly influenced by the differences in the food ration and sex maturation. The general condition of the examined fishes ranged from 0.058 for *T. lepturus* to 1.225 for *L. bindus* (Fig.2). These results were lower to that obtained by (Ali, 1979; Ali and Ali, 1986), but in a good agreement with that of Ali, *et al.* (1986).

REFERENCES

- Ackman, R.G. 1995. Composition and nutritive value of fish and shellfish lipids. In "Fish and Fishery Products. Composition, Nutritive Properties and Stability". A. Ruiter, Ed. Cab. International, UK., pp: 156-177.
- Ahmed, H.A.R.; Hindi, M.J. and Yesser, A.K.T. 1992. Seasonal variation in the chemical composition of *Barbus luteus* from Al-Hammar Marsh. Marina Mesopotamica, 7(2): 291-303.
- Al-Aswad, M.B.; Abo-Alnaja, I.J.; Salman, A.J. and Ahmed, N.H. 1980. Chemical and bacteriological study on some commercial important fish in Dukan Lake. I. Chemical study. Zanco, 6(3): 81-98.
- Al-Badri, M.E.; Yesser, A.K.T. and Al-Habbib, F.M.K. 1991. Chemical composition and nutritive value of Iraqi fish. 1: Chemical composition and nutritive value of Catfish *Silurus triostegus*. Marina Mesopotamica, 6(1): 92-100.
- Al-Badri, M.E.H.; Yesser, A.K.T. and Al-Yassen, B.A. 1992. The chemical composition and proportion of red and white muscle of two mullet *Liza subviridis* and *L. carinata* from Khor Al-Zubair and Khor Abdullah, Northwest Arabian Gulf. Marina Mesopotamica, 7(1): 25-33.
- Al-Habbib, A.M.; Salih, W.A. and Hamed, K.M. 1986. Seasonal variation in the biochemical composition of the skeletal muscle of the freshwater fish *Barbus barbulus*. JBSR, 17(1): 219-225.
- Ali, A.M. 1979. Study of morphological and biological characteristics of Gattan, *Barbus xanthopterus*, from Tigris River and Al-Tharthar water reservoir. J. Al-Khalij Al-Arabi, 11(1): 181-197 (in Arabic).
- Ali, M.D. and Ali, A.M. 1986. The general condition and calorific value of Iraqi freshwater fish *Barbus xanthopterus*. JBSR, 17(1): 165-170.
- Ali, M.D.; Ali, A.M. and Zaki, L.M. 1986. The general condition and calorific value of the freshwater fish *Aspius vorax* and *Barbus luteus* in Al-Tharthar Reservoir. JBSR, 17(2): 223-230.

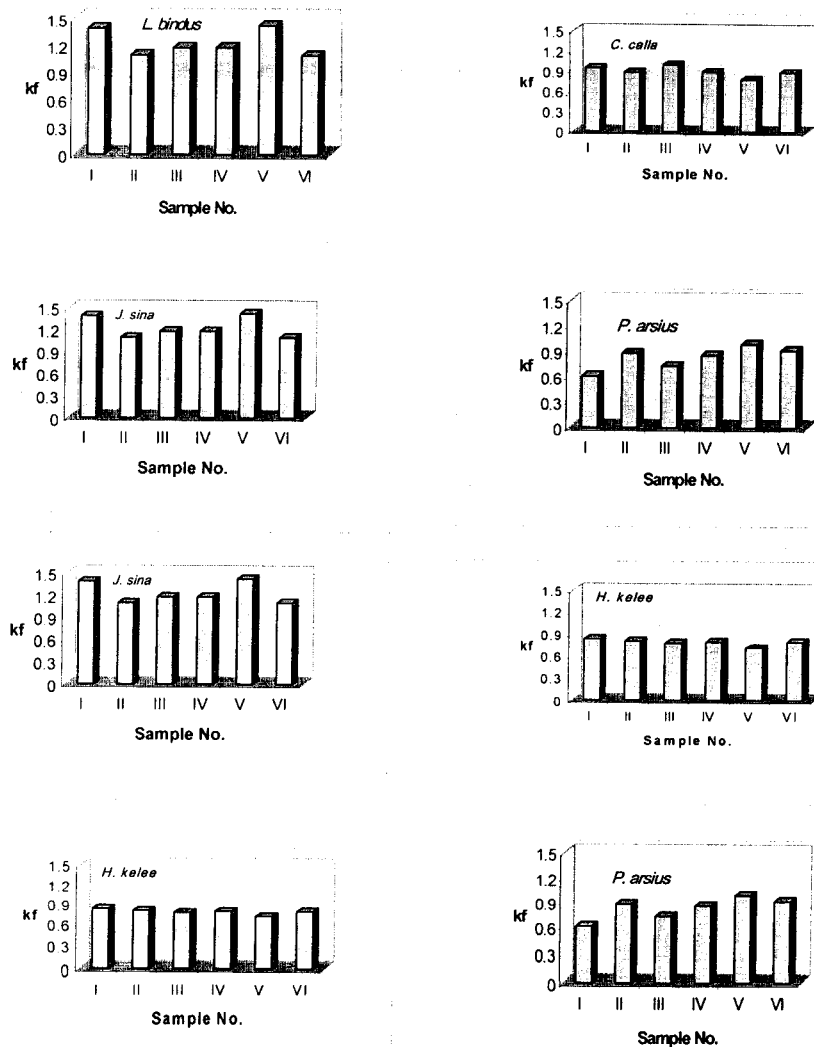


Fig. (2). The General condition of commercial fish in the NW Arabian Gulf

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- Bauer, O.N.; Musselius, V.A. and Strelkov, Yu.A. 1973. Diseases pond fishes. Izdat.kolos, Moscow. 179 p(Engl. Trans).
- Hantoush, A.A. 1998. Seasonal variations in the biochemical constituents for muscles of some freshwater and marine fishes from Shatt Al-Arab river and NW Arabian Gulf. M.Sc. thesis, Science College, Basrah University, 93p.
- Hindi, M.J.; Ahmed, H.A. and Yesser, A.K.T. 1989. Seasonal variations in the biochemical constituents of Buni, *Barbus sharpeyi*. Marina Mesopotamica, 4(1): 55-65.
- Hindi, M.J.; Sarhan, H.R. and Al-Shatty, S.M.H. 1996. Quality criteria of fresh carp, *Cyprinus carpio* and Sbour, *Tenualosa ilisha*. 1- The chemical composition. Marina Mesopotamica, 11(2): 251-261.
- I.U.P.A.C 1979. Standard methods for the analysis of oils, fats and derivatives. 6th ed. International Union of Pure and Applied Chemistry. Pergamon Press. C. Paquot, U.K., 170 p.
- Jafri, A.K. 1969. Seasonal changes in the biochemical composition of the freshwater catfish, *Wallagonia attu* (Block). Hydrobiol., 33: 497-506.
- Jafri., A.K. and Khawaja, D.K. 1968. Seasonal changes in the biochemical composition of the freshwater murrel, *Ophicephalus punctatus* (Block). Hydrobiol., 32: 206-218.
- Lagler, K.F.; Bardach, J.E., Miller, R.R. and Passino, D.R.M. 1977. Ichthyology. 2nd ed. John Wiley & Sons, Inc., New York. London. Sudney, 506p.
- Lowry, O.H., Rosebrough, N.J., Farr, A.L. and Randall, R.J. 1951. Protein measurment with the folin phenol reagent. J. Biol. Chem., 193: 263-275.
- Osborne, D.R. and Voogt, P. 1978. The analysis of nutrients in foods. Academic press, Inc. London. New York, 251 p.
- Sheridan, M.A. 1988. Lipids dynamics in fish: Aspects of absorption, transportation, deposition and mobilization. Comp. Biochem. Physiol., 90B (4): 679-690.
- Yesser, A.K.T. 1995. Studied of some aspects of chemical composition of two fish species Anchovy, *Thryssa hamiltoni* and sea catfish *Arius thalassimus*. Marina Mesopotamica, 10(2): 351-358.
- Yesser, A.K.T.; Hindi, M.J. and Ahmed, H.A. 1999. Effects of starvation on proximate chemical composition of *Liza abu* (Heckel, 1843). Marina Mesopotamica, 14(1): 11-17.
- Zaitsev, V.; Kizevetter, I.; Langunov, L.; Makarova, T.; Minder, L. and Podsevalov, V. 1969. Fish curring and processing. (Translated from Russian by A. Dermindol). Mir Publishers, Moscow .

الحالة العامة وقيمة الطاقة لبعض الأسماك التجارية المهمة شمال غرب الخليج العربي

عبد الرزاق محمود محمد، عباس عادل حنتوش،* جاسم حميد صالح،*

قصي حامد عبد القادر *

قسم الاسماك والثروة البحرية، كلية الزراعة، جامعة البصرة، العراق

*مركز علوم البحار، جامعة البصرة، العراق

الخلاصة

جمعت تسعة أنواع من الأسماك التجارية من شمال غرب الخليج العربي من شهر آيار ولغاية شهر أيلول 1997. اهتمت الدراسة بتقدير المحتوى الكيميائي الحيوي، القيمة الغذائية والظروف العامة. من التحليلات الكيميائية. وجد إن سمك الطعطو *Johneios sina* احتوى على أعلى نسبة من الرطوبة (79.85%)، كما إن سمك الخوفعة المرقطة *Pseudorhombas arsius* احتوى أعلى نسبة من الدهن (9.650%) والرماد (2.244%)، بينما احتوى سمك حمام كالا *Caranx kalla* على أعلى نسبة من البروتين (21.251%). اتضح من النتائج ان القيمة الغذائية كانت (82.332-172.662 كيلو سعرة لكل 100 غم من اللحم). تراوحت الحالة العامة للأسماك المدروسة بين (0.058) لاسماك السيف *Trichura lepturus* و (1.225) لاسماك الصيني *Leiognathus bindus*. كذلك بينت الدراسة وجود علاقة عكسية بين محتوى الرطوبة والدهن.