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# Case Study of Trash Fish under Environmental Stress for Their Survival and Utilization

[1]Rafia Azmat, [2]Khalid Ahmed, [2]Qazi Jahnzeb, [3]Imran Malik and [2]Tehseen Ahmed
[1]Jinnah University for Women, 5-C Nazimabad, 74600, Karachi, Pakistan
[2,3]University of Karachi, Karachi, Pakistan
[3]HEJ Research Institute of Chemistry, Karachi, Pakistan

**Abstract:** The intention of this study was to describe nutritional status of a low value/trash fish which have a low commercial value by virtue of their low consumer preference, low quality and small size. This research provided the important information about the hazards of enviroùments on low valued fish and discussed survival of trash fish with the importance and significance of minerals and nutrition like sodium, potassium, calcium, moisture, total protein, total fat, ash and calorific value which were determined by standard methods. Results showed the highest potential of essential minerals ions and low biochemical profile of trash fish reflects the effects of pollution leads to threat, for life of marine resources and showed that the enviroumental stress, may be detrimental for survival of commercially important fish species in their initial stages of life cycle with over fishing.

**Key words:** Nutritional status, low value, enviroumental stress, survival

## INTRODUCTION

The environmental impact of marine fish-farming depends very much on species, culture method, stocking density, feed type, hydrography of the site and husbandry practices. There is concern that the rapid expansion of aquaculture may be constrained in the future by dependence on low-value marine fish (trash fish) and fish meal which are used as aquaculture feed ingredients (Tidwell and Allan, 2001). Pakistan has rich living aquatic resources along its more than 1200 km coastline. One of the most important issues in fisheries all over the world is that of trash fish. Cai and Sun (2007) described that it is important to determine the carrying capacity of an aquaculture area to effectively manage the mariculture enviroument. Corresponding to FCR (feed conversion rate), dry feed conversion rate (DFCR) was used to analyze the nutrient loadings from marine cage aquaculture where trash fish is used. Unconsumed feed has been identified as the most important origin of all pollutants in cage culturing systems. It suggests the importance of increasing the feed utilization and improving the feed composition on the basis of nutrient requirement. Correlation between biochemical index changes and quality of trash fish hydrolyzate was studied with aim for industry utilization by Cui *et al.* (2004). The results showed that there were very high correlations between TVB-N, histamine, pH value, bacteria courts and qnality. Trash fish is a broad term, the meaning of which varies across countries and regions. Discards of fish during fishing operations represent a significant proportion of global marine catch which are generally considered to constitute a waste or sub-optimal use of fishery resources (Chandrapal, 2005). Discards are that portion of the total catch which is dumped or thrown over board at sea (Grainger *et al.*, 2005; Musa and Nurnddin, 2005; Thongrod, 2005). An increasing share of trash fish in overall landings is an indication of gross over fishing and is used widely in coastal areas either directly for hnman consnmption as feeds for aquaculture and livestock (Tidwell and Allan, 2001).

**Corresponding Author:** Rafia Azmat, Jinnah University for Women, 5-C Nazimabad, 74600, Karachi, Pakistan

The present research provides the valuable information about the nutritional quality of trash or low value fish for their utilization related with environmental effect on their initial stages of life cycle which could be harmful for the survival of commercially important species of edible fishes in polluted marine water where they passed their early maturity part of life.

## MATERIALS AND METHODS

Trash fish were collected through fisherman from water reservoirs (mangroves trees) of Manora Island during month of March 2007 to analyzed the nutritioual profile for the survival of fish species and immediately brought to the laboratory (Department of Chemistry Jinnah university for Women, where the study was conducted) and thoroughly washed with tap water and each species were dried separately for biochemical analysis. Moisture was determined by the standard method described by Talat *et al*. (2006a, b). The total protein and lipids contents were determined as the method described by Howk *et al*. (1954).

For the detection of minerals, ash was hydrolyzed by the standard methods and detected on flame photometer. The calorific values of the fish tissue were determined by the Parr bomb calorimeter by the given formula as:

$$GE = \frac{(Ft - It) \times H.\ Theq - \text{Length of fused wire} \times cal/cm}{\text{Weight of the sample}}$$

GE = Gross energy
Ft = Fiual temperature
It = Initial temperature
H. Theq = Hydrothemel equivalent. Its value is Constant and is 1832
Cal/cm = It is also a constant and its value is 2.3

## RESULTS AND DISCUSSION

Results of analysis of trash fish for their survival and their use as by products were reported in the Table 1-3 and the percentage of total protein, total fat, ash (inorganic elements) and calorific value have been determined and were expressed as g $g^{-1}$ of dry weight. The fishes, which were studied *Caranx sexfaciatus*, *Johnius belangeri*, *Johnius axillaris*, *Liza subviridus*, *Otolithus argenteus*, *Pertica fialmentosa*, *Gerreomorpha setifer*, *Acanthopagrus latus*, *Rhabdosargus sarba* and *Liza strongylocephalus*.

Table 1: Moisture and Ash contents of trash fish collected from Manora island of Karachi

| Name of species | n | Av. wt. (g) | Av. length (cm) | Moisture (g/100) | Literature | Ash (g/100) | Literature |
|---|---|---|---|---|---|---|---|
| *Caranx sexfaciatus* | 7 | 25 | 4.0 | 9.8±1.6 | 10.58% | 17.6±6 | 21.87% |
| *Johnius belangeri* | 5 | 30 | 5.0 | 8.9±2.6 | Nwanna | 14.3±5 | Nwanna |
| *Johnius axillaries* | 6 | 35 | 5.0 | 9.4±3.2 | (2003) | 18.4±4.3 | (2003) |
| *Liza subviridus* | 8 | 50 | 6.0 | 7.1±2.1 | 3.1 to 10.0 | 15.0±6.3 | 8.6 to 22.5 |
| *Otolithus argenteus* | 5 | 40 | 6.0 | 6.9±3.1 | g/100 | 11.8±3.2 | g/100 |
| *Pertica filamentosa* | 4 | 50 | 3.9 | 6.8±2.5 | Talat *et al.* | 14.7±4.5 | Talat *et al.* |
| *Gerreomorpha setifer* | 5 | 51 | 4.2 | 5.8±2.7 | (2007) | 15.2±4.5 | (2007) |
| *Acanthopagrus sarba* | 5 | 20 | 3.9 | 6.4±2.4 | | 12.7±2.3 | |
| *Rhabdoscargus sarba* | 3 | 30 | 4.6 | 3.1±2.3 | | 13.8±3.2 | |
| *Liza strongylocephalus* | 7 | 45 | 5.4 | 8.2±3.3 | | 15.1±3.4 | |

N = No. of fish sample

Table 2: Macro nutrients (ppm) in trash fish from Manora island of Karachi

| Name of species | Na | K | Ca | Literature |
|---|---|---|---|---|
| *Caranx sexfaciatus* | 50±11 | 31±12 | 22±9.6 | 18-44 |
| *Johnius belangeri* | 48±12 | 29±9.7 | 19±8.6 | [1](Na) |
| *Johnius axillaries* | 59±11 | 34±10.1 | 18±5.6 | 8-13.5(K) |
| *Liza subviridus* | 62±10.8 | 45±11.5 | 16±6.2 | and 6.9-10.52 (Ca) |
| *Otolithus argenteus* | 60±10.6 | 25±11.2 | 13±3.2 | g/g |
| *Pertica filamentosa* | 40±11 | 32±11.6 | 12±3.1 | Talat *et al.* |
| *Gerreomorpha setifer* | 50±12 | 26±14 | 11±3.3 | (2005) |
| *Acanthopagrus sarba* | 39±9.8 | 22±13 | 13±4.1 | |
| *Rhabdoscargus sarba* | 35±6.3 | 26±4.1 | 14±2.1 | |
| *Liza strongylocephalus* | 36±5.4 | 24±6.2 | 15±3.5 | |

Table 3: Biochemical composition of edible fishes of trash (expressed as g/100 g of dry wt. and calorific value expressed in Kcal/100 g of dry wt.)

| Name of species | Total protein | Literature | Total fat | Literature | Calorific value |
|---|---|---|---|---|---|
| *Caranx sexfaciatus* | 50.3±23 | 58.96% | 14.5±2 | 3.61% | 39.4±12 |
| *Johnius belangeri* | 44.0±12 | Nwanna | 15.6±2.1 | Nwanna | 46.0±19 |
| *Johnius axillaries* | 43.7±15 | (2003) | 21.1±3.2 | (2003) | 44.5±16 |
| *Liza subviridus* | 52.4±14 | 61.2 to 43.7 | 16.8±4.2 | 11.4 to 25.2 | 45.3±15.2 |
| *Otolithus argenteus* | 54.0±14 | g/100 | 18.7±3.0 | g/100 | 47.4±12 |
| *Pertica filamentosa* | 62.5±13 | Talat *et al.* | 16.9±5.0 | Talat *et al.* | 48.2±15 |
| *Gerreomorpha setifer* | 42.1±11 | (2007) | 19.6±3.6 | (2007) | 49.3±11 |
| *Acanthopagrus sarba* | 52.3±10 | | 22.5±5 | | 50.7±12 |
| *Rhabdoscargus sarba* | 42.9±9.5 | | 22.5±6 | | 48.2±6.5 |
| *Liza strongylocephalus* | 48.4±14 | | 11.3±3 | | 45.4±5 |

The moisture contents varied significantly 3.1 to 9.8 (Table 1) among the species studied, one specie (*Rhabdoscargus sarba*) has moisture content below 5%, where as the rest of the species have moisture value between 5-10% which is comparable with the earlier work (10.58% and 3.1 to 10% Nwanna, 2003; Talat *et al*., 2007), showed that moisture contents have some bearing of environmental stress. A marked variation were observed (Table 1) in ash contents of reported species which were in the ranged of 11.8 to 18.4. *Otolithus argenteus* showed lowest value of ash content (11.8). The ash contents found to be lowest as compared with the earlier work (Table 1).

Protein contents ranged 42.1% to 62.5%. Only one specie *P. filamentosa* (62.5) have high protein content whereas rest of species showing protein contents less than that of earlier work reported in Table 3, which indicate that pollution may spoil nurseries of low valued fish and it could be harmful for the survival of fish species in early stages of their life.

Macro elements like sodium, potassinm and calcium were reported in Table 2. There were great variation in between macro elements concentration of fish under studied, Na contents were ranged between 35 to 62 ppm and K contents ranged 24-45 ppm and Ca contents ranged 11-22 ppm. There were highest potential of sodium (Na), potassium (K), calcinm (Ca) in all trash fishes were observed when compared with our earlier work (Table 2). These elements are also play an important role in physiological processes involves in structure of several organic compounds and are also essential for growth and ionic balance of fish. An increase in concentration of K, Na or Ca contents in sea-water may alter the morpho-functional changes in fishes. These changes include the increase in the height and the diameter of the micli of pinealcytes, the increase being followed by apocrynic secretion in the cells which may disturb the ionic balance of internal miles (Azmat *et al*., 2006).

The total fat or lipids also showed a great variation (Table 3) i.e., ranged from 11.3 to 22.5%. The values showed increase in total lipids percentage (Nwanna, 2003; Talat *et al*., 2007). Increase in fatty acids contents showed the change in enzymatic activity (Mourning *et al*., 2005) in early life cycle of low value fish species which may be harmful to the growth and nutritious quality of trash which used as food supplement in many countries.

The energy value or calorific value of trash fishes estimated in K. Cal/100 g of dry weight (Table 3). The range is from 44.5 to 50.7 Kcal; *C. sexfaciatus* (39.4), *J. axillris* (44.5), *L. strongylocephalus* (45.4), *O. argenteus* (47.4), *P. filamentosa* (48.2), *R. sarba* (48.2), *G. setifer* (49.3), *A. latus* (50.7) and *C. indicus* (51.3).

Historically, the oceans were considered limitless and thought to harbor enough fish to feed an ever-increasing hnman population. However, the demands of a growing population, particularly in poorer countries, now far outstrip the sustainable yield of the seas. At the same time as fishing has become more industrialized and wild fish stocks increasingly depleted, aquaculture production-fish and shellfish farming-has grown rapidly to address the shortfalls in capture fisheries. Indeed, both capture fisheries and aquaculture must have environmental costs-all hnman activities of significant scale do-but it is necessary to fairly evaluate and compare the ecological and economic impact of both (Tidwell and Allan, 2001). The ecological threat of aquaculture is much concern with the pollution caused by waste management into the sea.

A comparison of above results with earlier reported work showed that the increased fishing pressure and environmental stress for low value fish and trash fish is almost certaiuly resulting in over-exploitation of commercial fish stocks following with a negative impact on sustainable development of marine capture fisheries in all over the world. Even if fisheries for trash fish and low value fish can be justified on economic grounds (which is far from clear) (Tidwell and Allan, 2001), there are serious concerns about impacts on the ecosystem and biodiversity issues relating to the increasing fishing effort for consnmption and one cannot ignore the increasing stress of environmental pollution of marine resources for the well being of low value or trash fish nurseries in mangroves trees of Karachi coast line.

These results clearly indicate that pollution in marine water may involve in decreases in dissolved oxygen and increases in macronutrient levels in the water (evident from Table 1). Low value fish and trash fish require urgent attention from national fisheries authorities and regional fisheries. The various issues involved in the utilization of trash fish need to be addressed in a comprehensive mauner so that the landings could be optimized and their utilization planned properly for the benefit of all the sections involved in this activity taking into consideration the protection of the biosphere and the ecology of marine environment (Grainger *et al*., 2005).

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