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RESEARCH ARTICLE

Seasonal Variation in Proximate Composition of Bombay duck, *Harpodon nehereus* (Ham-Buch) from Mumbai Coast

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Abstract

Bombay duck is one of the significant inshore shallow water estuarine fish of the West Coast of India constituting about 10% of the total marine fish landings. Fish tissue is an amalgamation of moisture, proteins, carbohydrates, fats, minerals, vitamins & many other essential constituents required to sustain various life processes. The biochemical composition of the muscle tissue of raw fish helps to evaluate the nutritive value and its impact if any on the health status of the consumer. With this perspective in the present investigation proximate composition of the muscle tissue of *Harpodon nehereus* (Ham-Buch) was evaluated from July 2006 to April 2007. Total protein content of fish varied from 15-37 G% during the study period of ten months from July'06 to April'07. The minimum carbohydrate content of 2.05 G% was reported during breeding season in the month of August'06. The maximum carbohydrate content was reported in February'06 (7.0 G%) that represented the phase of growth in the life cycle. The highest lipid content was observed in the month of April'07 (0.26 G%) that gradually declined during the breeding season with lowest value amounting to 0.14 G% in the month of September'06. In the present study moisture content ranged between 82-89 G% while an inverse relationship was observed between the moisture & fat content of fish. Ash content during the study period varied from 0.6-1.48 G%.

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Introduction

Sea food has long been accepted as an excellent source of protein nutrition for the mankind. The greatest source of fish across the globe is the sea & nutritive value of fish is known as well. *Harpodon nehereus* (Ham-Buch) popularly known as 'Bombay duck' & locally called 'Bombil' in Maharashtra is one of the important inshore shallow water estuarine fish of the West Coast of India, although form sporadic catch along the East Coast as well. Bombay duck is the only species of the Family: Scopelidae (Francis Day, 1896) / Harpodontidae (FAO, 1995) forming a major fishery along the Coasts of Gujarat & Maharashtra along the West Coast of India. On an average it forms about 10% of the total marine fish landings & of these nearly 98% comes from the above two states. This fish has a great demand among

the local population of the coastal states. The dried fish finds special flavour with people in the coastal areas, as it can be made available during lean fishing season especially monsoon when fishing operations are at stake. The dried fish is also exported to countries like U.K., Singapore, Middle East & Sri Lanka. BARC has deliberated a method to laminate Bombay ducks to augment its shelf life, since high water content (more than 80%) in the tissue renders the fish prone to spoilage & decay as it cannot be preserved in ice for the reasons well known. However much of the catch after supplied fresh in the local markets gets sundried and stored for future consumption.

Biochemical analysis helps to judge the nutritive value of the raw fish and its consequence if any on

the health status of the consumer. It is therefore, obvious that an understanding of the chemical composition and nutritional quality of an edible variety of fish is important for formulation of balanced food products. Since the past century significant work on biochemical composition of fish is carried out both in India & abroad. Atwater (1888) was the pioneer in this field who published first record of chemical composition of 52 fishes from Atlantic & Pacific waters. Hughes (1891) worked on variation in fat in some species from Plymouth. Milroy (1908) investigated the chemical composition of the herring during reproductive period. Setna et. al. (1944); Venkatraman & Chari (1951); Ramaswamy (1955); Jafri & Khwaja (1965); Jadhav (1974); Bjarte Tverange (1985); Mohanty & Samantaray (1993); Murthy et. al. (1999); Pawar (2003); Shivkumar et. al. (2003); Pamparwar & Ambore (2005) & Shendge & Mane (2005) are some of the well known workers who pioneered the study of chemical composition of some fish species from Indian waters. Shingadia Hitesh (2011) studied microbial diversity from gill & body surface of *Harpodon nehereus* (Ham-Buch) from neretic waters of Mumbai Coast.

Materials & Methods

Fresh Bombay duck were procured from the fish landing centre at Versova (Andheri, Mumbai-India) on a regular basis for a period of ten months from July 2006 to April 2007. Every month about 25-30 fish in size range of 200mm to 250mm were brought to the laboratory under sterile condition. The muscle tissue was analyzed for its proximate composition. Total protein content was estimated by Lowry's method (1951), carbohydrate by Anthrone reagent method (Hedge & Hofreiter 1962), lipid by Folch method (1957) & moisture by AOAC method (2000). Ash content was estimated by incinerating the fish tissue using muffle furnace at 550-600°C.

Results & Discussion

The major components of food are moisture, proteins, carbohydrates, fats, minerals & vitamins. Fish proteins can be broadly divided into three groups according to their solubility viz. sarcoplasmic proteins, myofibrillar proteins & connective tissue protein. Proteins provide the necessary materials for the repair & building of muscles & tissues. Carbohydrates & fats provide energy while minerals & vitamins keep the fish healthy & bones strong. The proportion in which different constituents of the body occur in the organism is called its 'Proximate Composition', the study of which helps to estimate the nutritional quality of the fish. Table 1 depicts the

proximate composition of raw muscle tissue of fish *Harpodon nehereus* (Ham-Buch).

Proteins: Total protein content of *Harpodon nehereus* (Ham-Buch) varied from 15-37 G% during the study period of ten months from July'06 to April'07. The lowest value of protein content was reported in the month of September (15 G%) that showed gradual increase reaching maximum to 37 G% in the month of March'07. Since monsoon coincides with the breeding season, the premonsoon elevation in the muscle protein content could be allocated to the gonad maturation in anticipation of increased energy requirement during the latter period breeding & spawning.

Carbohydrates: The carbohydrate content showed similar trend in values as that of proteins. The minimum carbohydrate content of 2.05 G% was reported during breeding season in the month of August'06 that could be due to increased energy demand for gonad maturation resulting in diversion of energy provided by carbohydrates. The maximum carbohydrate content was reported in February'06 (7.0G%) that represented the phase of growth in the life cycle. In fishes accumulation of glycogen and glucose have been reported during maturation that declines after spawning. A rise in carbohydrate level during post-spawning period indicates the mobilization of glycogen in liver & muscle of the fish for growth & maturation as observed in the present study.

Lipids: Lipids are energy reserves of the organisms. The highest lipid content was observed in the month of April'07 (0.26 G%) that gradually declined during the breeding season with lowest value amounting to 0.14 G% in the month of September'06. Decline in the values of lipids signify diversion of energy for the maturation & liberation of gametes. Gonads are rich in lipid content as stored energy metabolite. In the body of fish mobilization of lipids from various organs to gonads occurs during gonadal maturation. An increasing trend in total lipid content was observed post-spawning that could be attributed to the resorption of mature gonads thereby mobilizing the lipids to storage tissues in the body. Teraiya et. al (2013) observed that metabolites like Lipid in Ovary increase during the active process of gametogenesis in both the fish species. While the Glycogen level decreased in *Sillago sihama*, whereas in *Otolithus ruber*, these metabolites showed an increased trend.

Moisture & Ash: Moisture contents in the Indian fishes generally vary between 70-80 percent. Bombay duck tissues are highly hydrated with more than 80%

of the fish body mass containing water. Though occasionally figure as high as 90% is also encountered. In the present study moisture content ranged between 82-89 G%. In fatty fishes, moisture content decreases with increasing fat content & in oil sardine values as low as 56 % have been reported during seasons of maximum oil content. In general, an inverse relationship is observed between the moisture & fat contents of fishes. Similar observations are reported in the present investigation. The lower values reported during the summer months could be attributed to dehydration of muscle proteins. Ash gives a measure of the mineral contents of the fish muscle. Ash content of the muscle tissue of fish varied from 0.6-1.48 Gm% during the study period of ten months.

Biochemical composition of the fish varies, depending on several factors such as species, age, maturity, method of catch, fishing grounds, geographical regions, season of the year, anthropogenic activities in the environment, etc. Even within a single species in different portions of the body in the same fish, biochemical composition may vary significantly as suggested by Govindan, 1985; FAO, 1995; Emilia & Santos, 1996. These biochemical constituents along with other aspects of fishery science such as feeding & breeding biology of fish, habit & habitat study will provide a better insight into the sustainable management of these marine aquatic resources apart from health consequences of the consumer.

Table 1 Proximate Composition of Muscle of *H. nehereus* (Ham-Buch)

Month	Protein (G%)	Carbohydrate (G%)	Lipid (G%)	Moisture (G%)	Ash (G%)
July' 06	21.0±0.12	2.17±1.66	0.25±0.11	88.15±0.96	0.60±0.05
Aug' 06	16.6±4.22	2.05±0.52	0.17±0.07	89.28±0.83	0.62±4.19
Sept' 06	15.0±0.09	2.38±0.99	0.14±2.05	85.49±3.16	0.89±1.07
Oct' 06	21.0±1.25	2.9±0.74	0.15±0.08	87.30±0.07	0.99±0.03
Nov' 06	28.5±0.34	3.16±3.75	0.17±0.12	88.47±1.06	1.18±0.17
Dec' 06	31.7±0.05	4.5±0.05	0.19±0.41	85.54±0.17	1.31±0.64
Jan' 07	34.0±0.32	5.33±0.23	0.21±0.56	85.51±0.99	1.36±1.89
Feb' 07	29.33±2.11	7.0±0.94	0.20±0.73	83.01±0.68	1.48±0.91
Mar' 07	37.0±0.82	6.04±0.07	0.23±0.06	82.80±0.13	1.01±0.72
April' 07	27.6±0.17	4.0±0.91	0.26±2.09	82.21±2.07	0.72±3.07

Values are expressed as ± Standard deviation

Conclusion

Insight into the biochemical constituents of the fish tissue reveals the health condition of the fish under study as also provides momentous data from nutrition perspective of the local populace of the coastal India consuming the same as rich protein source.

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