COMPARATIVE STUDIES ON CHARACTERIZATION OF SCALES OF FRESHWATER FISHES

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ABSTRACT

Fish scales are part of the fish's integumentary system, and are produced from the mesoderm layer of the dermis, which distinguishes them from reptile scales. The same gene is involved in tooth and hair development in mammals as involved in scale development. The placoid scales of cartilaginous fishes are also called dermal denticles and are structurally homologous with vertebrate teeth. It has been suggested that the scales of bony fishes are similar in structure to teeth, but they probably originate from different tissue. Most fish are also covered in a protective layer of mucus (slime).In many, scales are reflectors or produce coloration; scales vary in enormously in size, shapes, and structures. The morphology of fish scale can be used to identify the species of the fish. In the present study, characterization of scales has been carried out to understand the constituents in scales of different freshwater fishes.

Key words: fish, scales, characterization.

INTRODUCTION

In biological nomenclature, a scale is a small rigid plate that grows out of an animal's skin to provide protection. Scales are quite common and have evolved multiple times through convergent evolution, with varying structure and function. Scales are generally classified as part of an organism's integumentary system. There are various types of scales according to shape and to class of animal. Fish scales are dermally derived, specifically in the mesoderm. This fact distinguishes them from reptile scales paleontologically. Many groups of bony fishes, several families of catfishes, sticklebacks, and poachers, have developed external bony plates, structurally resembling placoid scales, as protective armor. In the boxfish's, the plates are all fused together to form a rigid shell enclosing the entire body. Yet these bony plates are not modified scales, but skin that has been ossified (ShirinAkter, Md.e*t.al* ,2017). The cycloid and ctenoid scales are very similar to each other. In many fishes, scales are reflectors or produce coloration; scales vary in enormously in size, shapes, and structures. The morphology of fish scale can be used to identify the species of the fish (Oyase Anthony *et.al,* 2016).

Biochemical composition of scales

Total mineral:

A mineral is a naturally occurring chemical compound, usually of crystalline form and not produced by life processes. A mineral has one specific chemical composition, whereas a rock can be an aggregate of different minerals or mineraloids. The study of minerals is called mineralogy (T. Storebakken *et.al*, 1989).

Crude Protein:

Proteins are essential nutrients for the human body. They are one of the building blocks of body tissue and can also serve as a fuel source. As a fuel, proteins provide as much energy density as carbohydrates: 4 kcal (17 kJ) per gram; in contrast, lipids provide 9 kcal (37 kJ) per gram. The most important aspect and defining characteristic of protein from a nutritional standpoint is its amino acid composition. Proteins are polymer chains made of amino acids linked together by peptide bonds.

Crude Fat:

Fat is one of the three main macronutrients, along with carbohydrate and protein. Fats, also known as triglycerides, are esters of three fatty acid chains and the alcoholglycerol. The terms "lipid", "oil" and "fat" are often confused. "Lipid" is the general term, though a lipid is not necessarily a triglyceride (Fawzia Abid Flowra *et.al* ,2012).

Energy:

In biology, energy is an attribute of all biological systems from the biosphere to the smallest living organism. Within an organism it is responsible for growth and development of a biological cell or an organelle of a biological organism. Energy is thus often said to be stored by cells in the structures of molecules of substances such as carbohydrates (including sugars), lipids, and proteins, which release energy when reacted with oxygen in respiration (Neeraj Gupta, 2017).

MATERIALS AND METHODS

Collection of Fish Scales:

For the present study, freshwater fish scales of five different fish species were collected from Kolhapur fish market. The collected scales were brought to laboratory for analysis.

Cleaning of Fish Scales:

Collected fish scales were washed under tap water for 3 to 4 times to remove extra debris present on the scales, and then washed with distilled water. Thereafter washed scales were kept in five different trays and sun dried.

Grinding of Fish Scales:

The dried fish scales were grinded separately by using the mixer and fine powder was obtained. 10 gram of each sample was weighed accurately in single pan weighing balance and was analyzed of biochemical composition.

Methods for Analysis:

For the analysis of the biochemical composition of freshwater fish scales, the protocol of FSSAI Manual for Fish was applied.

Results

Table No: 01 Total Mineral content in freshwater fish scales

Sr. No.	Fish	Total minerals (%)
1.	*Catlacatla*	60.67
2.	*Labeo rohita*	56.19
3.	*Cirrhinus mrigala*	57.30
4.	*Cyprinuscarpio*	55.91
5.	*Oreochromisniloticus*	62.04

Fig. No: 02 Total Mineral content in freshwater fish scales

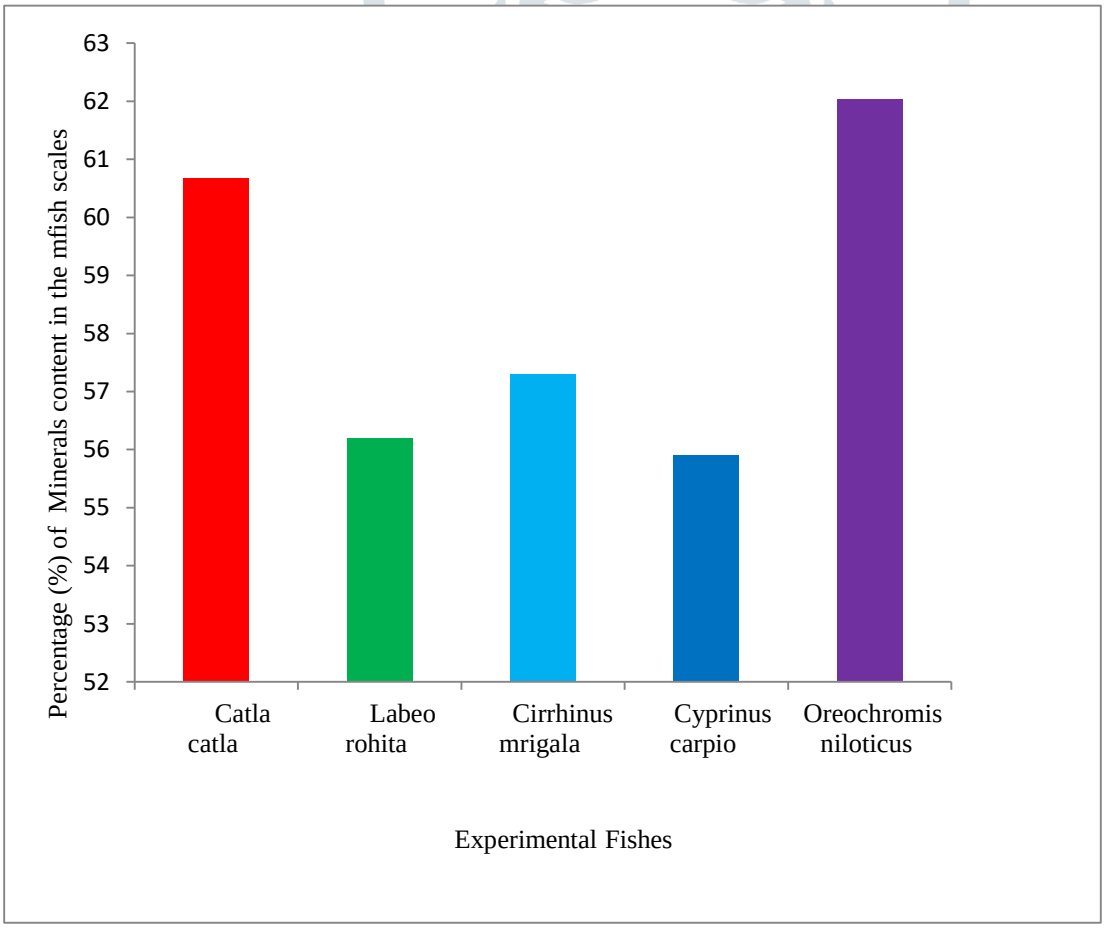


Table No: 02 Crude Proteins content in freshwater fish scales

Sr. No.	Fish	Crude Protein (%)
1.	*Catlacatla*	28.04
2.	*Labeo rohita*	30.66
3.	*Cirrhinus mrigala*	32.35
4.	*Cyprinuscarpio*	26.45
5.	*Oreochromisniloticus*	25.83

Fig. No: 02 Crude Proteins content in freshwater fish scales

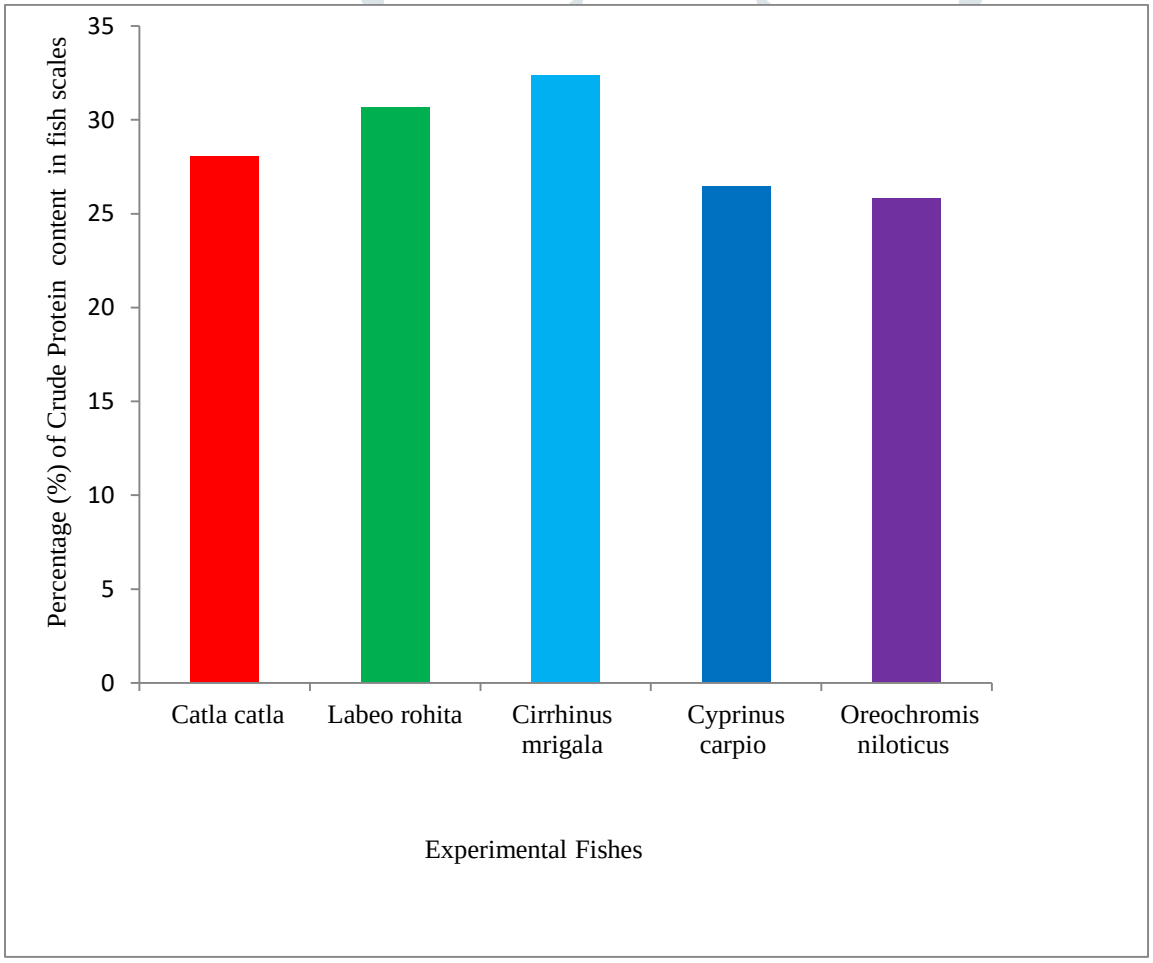


Table No: 03 Crude fat content in freshwater fish scales

Sr. No.	Fish	Crude Fat (%)
1.	*Catlacatla*	00.60
2.	*Labeo rohita*	00.29
3.	*Cirrhinus mrigala*	00.29
4.	*Cyprinuscarpio*	00.28
5.	*Oreochromisniloticus*	00.10

Fig. No: 03 Crude fat content in freshwater fish scales

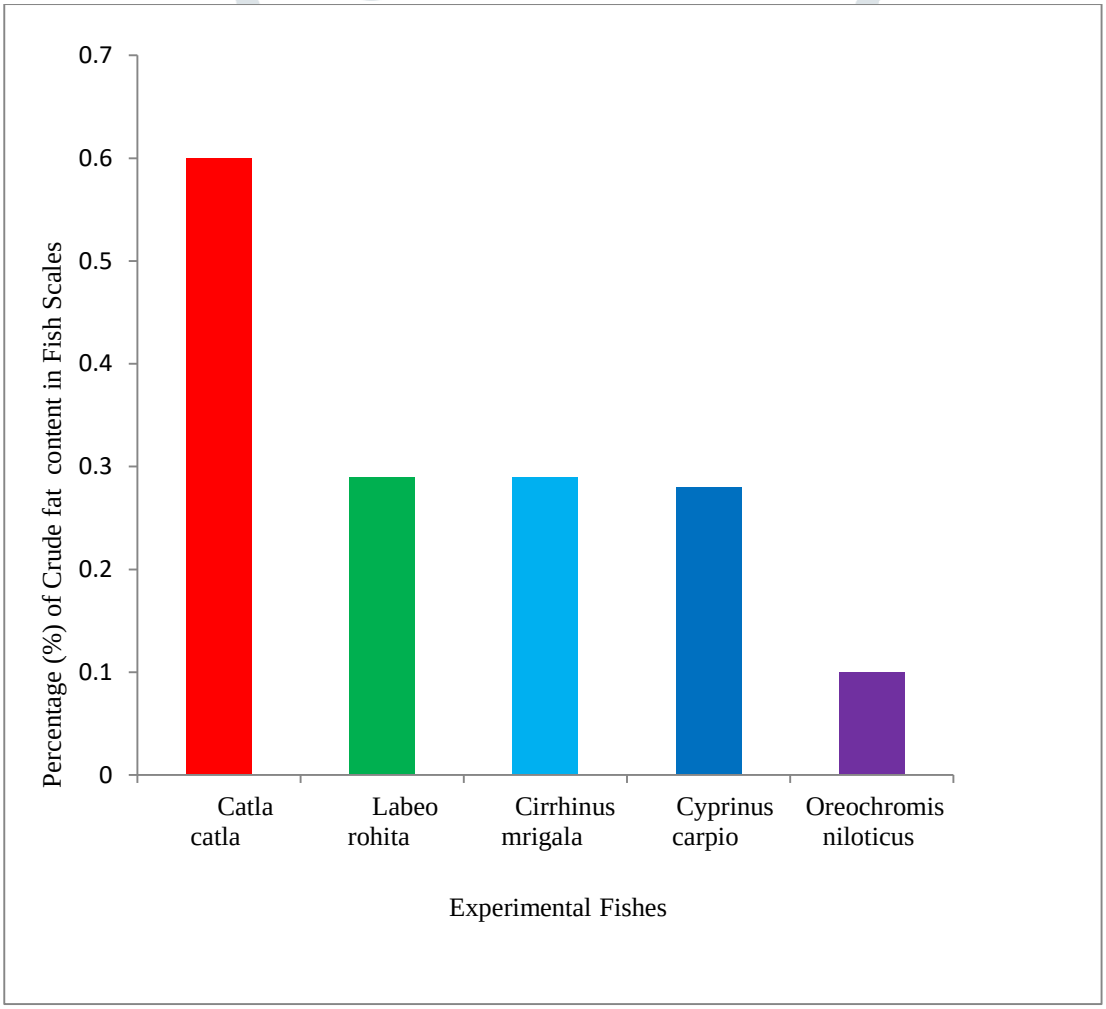
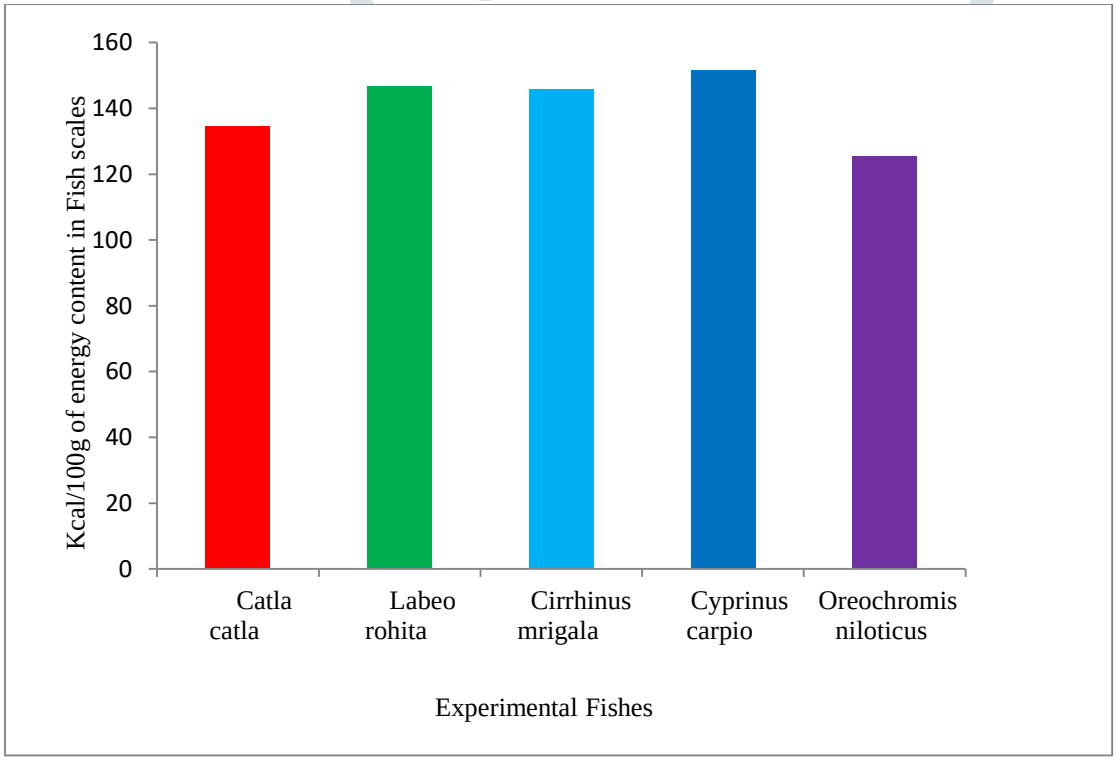


Table No: 04 Energy content in freshwater fish scales

Sr. No.	Fish Name	Energy in Kcal/100g
1.	*Catlacatla*	134.44
2.	*Labeo rohita*	146.61
3.	*Cirrhinus mrigala*	145.89
4.	*Cyprinuscarpio*	151.56
5.	*Oreochromisniloticus*	125.46

Fig. No:04 Energy content in freshwater fish scales



Discussion:

Total mineral content (Table No.01)

The variation of total mineral content among the studied dried fish scales as compare to five fish scales highest content was found as 62.04% in Tilapia and the lowest was 55.91% in *Cyprinuscarpio*. detailed total mineral % in other species shown in above table No 2.

Crude protein content (%) (Table No.02)

The estimated protein content in five freshwater fish scales we found that crude protein variation was highest in *Cirrhnusmrigala(32.35%)* which was collected from fish market and the lowest protein content in Tilapia(25.83%) . it was observed that crude protein variation of five fresh water fish scales (B. N. Paul and S. S. Giri) (2015).

Crude fat content (%)(Table No.03)

The fat content among the five species we found that fat variation in five fish scales. The highest fat content was found in *Catlacatla*(00.60%) and lowest fat content found in *Oreochromisniloticus* (00.10).

Energy (kcal/100gm)(Table No.04)

Among the studied five freshwater fish scales energy content varied between *Cyprinuscarpio* and *Oreochromisniloticus* (151 and 125.46 kcal/100gm respectively).

CONCLUSION

A Tale of Fish Scale: Journey from Waste to Resource

Fish Scales as a Waste Product of the Aquaculture Industry, from the study, it can be concluded that the scales show more advantages as compared to bones. This can be seen in the percentage yield of various biological constituents of the scales. Depending on the feeding behaviour and position in ecological niche, the characterization of the scales differ from species to species, which can be exploited for better mankind application and most important as exoskeleton amour development and future pharmacological studies.

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