Morphological, Physiological, Genetically And Ecological Behavior Of Ancient Jawless Fish

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ABSTRACT: This research paper is mainly addressing the morphological, physiological, genetically and her own ecological behavior and also biological geography of ancient jawless Fish. Actually ancient jawless fish are living fossils, Proper examples of vertebrate species. The bodies of this fish are covering with skin or covered with in some extinct cases that means in some extinct bony plate. Ancient Jawless fish are exothermic as well as all fish. They keep their body temperature from the surrounding water of their body. The metabolism of these types of fish is slow in cold water. They are able to produce number of egg only once, cause after doing so their cloaca remains open for allowing a fungal infestation to kill them. The jawless fish are represents two groups for living one of them are hagfish and the other is lampreys. These types of fish are the only one living representatives of the creatures of ancient that also gave rise to the fish and finally humans. However there are some differences between hagfish and lampreys one of them lampreys are generally vertebrates. On the other hand hagfish are not considered as vertebrates at all.

Keywords: Fishing behavior, Myotis Capaccinii, Locomotion, morphology, Feeding Kinematics

1 INTRODUCTION

The researches of the fishes, the science of technology are widely importance. Fishes are of very interested in to the humans for many causes. Most of them are being the relationship with them and which is also dependent on the environment. The major causes for the interest in fishes are their role is an important part of the world's food supply. The study of the fishing behavior is Myotis capaccinii, this research paper are mainly representing some of the genetic and environmental behavior of the ancient jawless fish. This sorts of fishes are perceiving the world which is around of them by using the normal senses of sight, smell, hearing, by touching, taste and remarkable lateral line water-current detectors. Some number of fishes has generated electric fields which is the process that might best be called electro location aids in perception. All of aspects of a fish's life are very nearly correlated with the adoption of the environmental condition, physical structure, chemical effect and some biological terms. This paper illustrated all of the independent aspects of a fish, like as behavior of a fish, their Locomotion, reproduction capability and the characteristics of the physical and physiological terms must be taken into calculation.

TABLE 1
Deferent between Animal behaviors vs. fish behavior

No	Animal behaviors	fish behavior
1	Animal can take necessary action or reaction to stimuli	Fish are found almost all of the water of the world.
2	Play a role in the brain and they can be manifested through the muscular reply, but sometimes they involve both.	A fish can take decision with their brain and also can take necessary step what need to overcome from the problem.
3	They can think with a temporal component to their actual behavior like training how to feed.	Fish do not have legs.
4	Short term effect on the organism.	Most of the fish catch prey on algae by using their teeth.

2 CHARACTERISTICS OF JAWLESS FISH

The body of the ancient jawless fish is covered by the skin and some amount of extinct cases bony plate. Compeering of other fishes the ancient jawless fishes are exothermic. The ancient jawless fishes are truly living fossils. They are mostly common examples of the top primitive of vertebrate species, possessing the skulls and spinal columns but, in case of this jawless fish which not even a backbone. A true jawless fishes are a feature of unique to vertebrates; a species of invertebrates has mouth, fangs or mandibles, but never jawless as such. The ancient jawless fish species represents the nature of the skull prior to the evaluation of jawless. The other features of these kinds of fishes are equally primitive. The ancient jawless fishes are members of the two different types of classes most of them are Myxini or hagfishes and another types of classes are Cephalaspidomorphi or lampreys respectively, however, the two types of groups are morphologically very different.

Characteristics of Myxini class

1. Slender of body, eel-like, rounded, with naked skin which contains slime glands.
2. Hagfishes have no paired appendages.
3. They have biting mouth with the number of two rows of eversible teeth.
4. Heart with sinus venosus, atrium and ventricle.
5. They run their digestive system without stomach.
6. Dorsal nerve cord with differentiated brain.
7. They contain three sorts of sense organs. Name of them are taste, smell and hearing.
8. Sexes are separate.

Characteristics of Cephalaspidomorphi or lampreys class

1. Body slender, eel-like, rounded with naked skin.
2. Lampreys also have no paired appendages.

3. Tongue is well developed with keratinized teeth.
4. Heart with sinus venosus, atrium and ventricle.
5. They also operate their digestive system without stomach.
6. Opisthonephric kidney.
7. Body fluids are osmotically regulated.
8. Sense organs are taste, smell and hearing.

3 OVERVIEW

The ancient jawless fishes are in the non motor brain and that can be manifested by through the muscular response but sometimes it can involve both. The smile of the hagfish can be generated by using the skin and it can be served as a defense. This can be clogged the gills of the hunter fish, for the reason of them to die. The living style of an ancient jawless fishes are represented the number of species are approximately about 84 which is divided into two different types of classes. Most of them are Myxini or hagfishes with about at least 43 species and another name of the species are Cephalaspidomorphi or lampreys with about approximately 41 numbers of species. The scientific classification of this types of fish can be illustrated given in the below which was generated by scientist Edward Drinker Cope.

Kingdom: Animalia
Phylum: Chordata
Subphylum: Vertebrata
Superclass: **Agnatha**
Cope, 1889

4 SENSORY BIOLOGY OF JAWLESS FISHES

These topics can represent the sensing capability of hagfishes and also lampreys will be compared and the most important functions of hurry craniates sensing capability will be inferred by using cladistic methods and an accepted phylogeny of the lampreys, hagfishes and ganthostomes. The lamprey has very well developed olfactory, visual and octavolateralis systems which are played a role in life and behavior of an ancient jawless fish. Jawless fishes are poorly developed in visual and octavolateralis systems, but they are elaborated in olfactory and chemosensory systems also. It is really true the natural behavior and the lifestyle of jawless fishes are poorly known to us and also it is limiting to our understanding about the sensory biology systems of a jawless fish.

5 MORPHOLOGY

This study includes the kinematics and feeding morphology in the two type's species of hagfishes like Myxini or hagfishes and another are Cephalaspidomorphi or lampreys respectively which have persisted since the Paleozoic and also collectively comprise just only 0.2 percent of the extant craniates. Feeding apparatus of a hagfish contains skeletal, dental and muscular components. Hagfishes are captured and transported food with two rows of 'teeth' which is known as non-serrated or grasping keratinous and which is shown in the figure 1A. Those plates of teeth that mean those dental plates are supported by the anteroventrally which is situated in basal plate's cartilages which is illustrated in figure 1B. A single tooth which one is curved posteriorly and situated in the plates augments knot-tying behaviors allowing by a hagfish to anchor itself to the prey which is shown in figure 1C. This research paper includes some functional advantages which are provided by jawless jaws. This paper also addressing to (1) compare the morphology of feeding apparatus of two different types of species of hagfishes, (2) To compare the feeding kinematics in E, (3) Calculate the force which is generated by the musculature during feeding, (4) To propose a physical model of a hagfish feeding mechanism, (5) Evaluate the functional constraints of jawlessness.

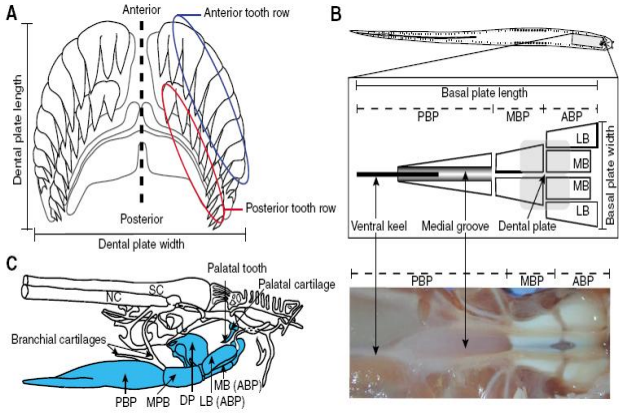

Figure1. Skeletal and dental components of the feeding apparatus of a jawless fish. A) The dorsal view of unfolded dental plates with the calculation or measuring of the dental plates also width and length of the dental plates. B) Illustrating the location of the basal plates. C) Lateral view of the cranial skeleton. The measurable dimensions or the length and width of a dental plates , basal plates dimensions or the length and width of a basal plates and the feeding apparatus length of a hagfish is eight E. Total length, TL = 21.0-42.0 cm and eight M. *Glutinosa TL* = 33.5-40.5. Measurements were expressed as percentage of specimen TL. In five E. *Stoutii* (*TL* = 27.0-37.5 cm) and five M.

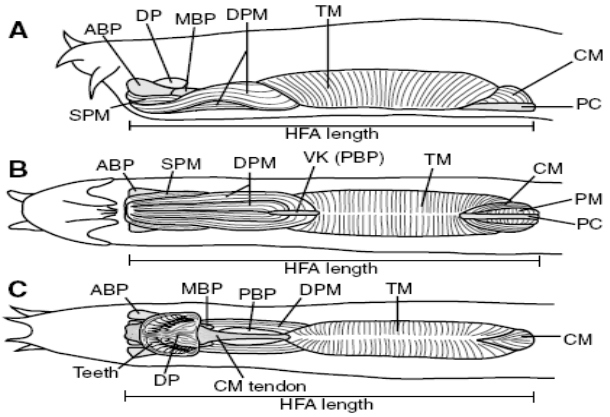

Figure2. Morphology of the feeding apparatus of a hagfish (HFA).

A) Lateral view.
B) Ventral view.
C) Dorsal view.

The total calculative physiological cross-sectional area is (PCSA) of an ancient jawless fish or a hagfishes, the maximum production of force (P_o), the clavatus muscles (CM) and also a deep protractor muscles (DPM). The muscles are containing iodine to distinguish the fiber of the muscles. The tissue of the muscle from only one specimen which was digested with the nitric acid to separate the fiber of the muscle. (Tamaki et al., 1989). The length of the fiber was equal to the length of the muscle (L_M). The length of muscle is calculated with the digital calipers nearest to the 0.01mm. The calculating methods PCSA, which is the product of muscle mass (M) and Cosign of the muscle pennation angle is (θ) which was divided by the product of muscles density (ρ), and the muscles length (L_M). So, the length of fiber will be calculated by using the following equation.

$$PCSA_{CM}=(M\cos\theta)/(\rho L_M) \quad (1)$$

Also we can calculate the maximum production of force by multiplying with the Physiological Cross-Sectional Area (PCSA) of each and every muscle by K. (Powell et al., 1984)

$$P_0=PCSA\times K \quad (2)$$

Where K is the specific tension of hagfish white muscle (K). Specific tension of elasmobranches white muscle (289 KP_a) (Lou et al., 1999) which would approximately equal.

7 FEEDING KINEMATICS OF A HAGFISH

The hagfishes are selected basically based on their willingness to feed. Generally an animal was offered rectangular portions (1.0cm*2.0cm*0.25cm) of squid. Each and every squid was loosely secured to a plastic tie and then positioned directly in front of the animal's mouth. The feeding behaviors were recorded with a JVC digital camcorder at 30 frames S^{-1}.

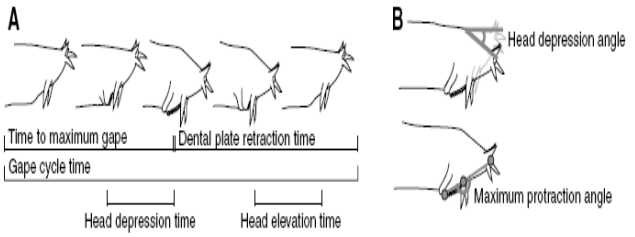

Figure3. Calculation for feeding kinematic timing and angular variables of a jawless.

- **A.** Gape cycle time for maximum dental plate protraction and retraction.
- **B.** Defined the kinematic angular variables.

We collect the dental plate kinematic data from five specimen of M. The total length of *glutinosa* TL = 32.0 – 42.0cm and three specimens of E. the total length of Stoutii is TL = 28.0 – 38.0cm. The dental plate kinematic variables are included the gape cycle time (GCT), time to maximum gape (TMG), dental plate retraction time (DPRT) and the maximum protraction angle (MPA). We can defined the maximum protraction angle (MPA) as the angle between the anterior tip of the maximally protracted dental plate, opening of the mouth and the anterior tip of the snout which is illustrated in the figure 3 of section B.

Table2
Represents the list of abbreviation

List of Abbreviation	
ρ	Muscle Density
θ	Muscle Pennation angle
CM	Clavatus Muscle
DPM	Deep Protractor Muscle
DPRT	Dental Plate Retraction Time
GCT	Gape Cycle Time
HDA	Head Depression angle
HDT	Head Depression Time
HFA	Hagfish Feeding Apparatus

8 LIFECYCLE OF A JAWLESS

The larval lamprey which is known as ammocoetes comes from am-mah-seats. They grow approximately more than 5 inches heights. Normally the jawless fishes are hatched from eggs. An adult jawless is spawned in ocean or a river and on the other hand after than they meet death. The young larvae of a jawless spent some years in the deep of ocean or in the river, where they alive burrowed in fine sediment, filter feeding on detritus and microorganisms. After several months the ammocoetes undergo in a metamorphosis. Some of the species are do not feed after the metamorphosis, while others are migrate to the sea or a lakes, where they feed on different types of species of fish and even on marine mammals. The species whose adult's one are migrated to the ocean or sea begin preying on other fish soon after metamorphosis, even as they begin swimming and downstream. Generally the life cycle of sea lampreys is long mostly 3 to years. On the other hand the lampreys spend their time of lifecycle up to 10 years in the other water from the larval form.

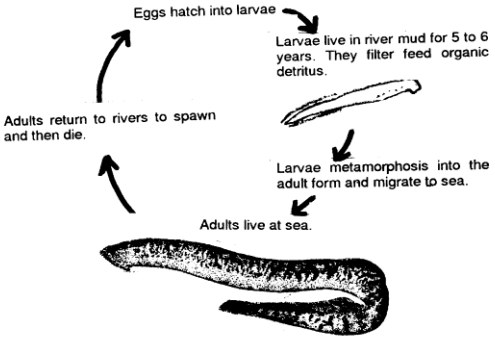

Figure4. The life cycle of an ancient jawless fish

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10 RESULTS & CONCLUSION

In this dissertation we considered the result of research about the fishing behavior in the field of vertebrate about some behavioral function of an ancient jawless fish. Generally the ancient jawless fishes are soft bodied, small, filter-feeding organisms and they may be arisen from ancient. The bodies of this fishes are stiffened by a notochord. The early jaws vertebrates are may be fed on tiny organisms by the filter feeding as do the larvae of the lampreys. The gill apparatus thus evolved as a feeding as well as a breathing structure. The very important for the evaluation of these types of fishes and vertebrates are generally the early appearance of bone, cartilage and enamel-like substance. The other basic organs and tissues of the jawless are the central nervous system, heart, liver, digestive tract, kidney, and the circulatory system. In the many paths bone, both internal and external, was the principle key to the vertebrate evolution. The lampreys of sea are an ancient jawless fish. They lead their lifecycle with a complex process and the parts of the mouth that are well adapted for their parasitic life. However, the generation of the jawless are reduced to face the negative environmental impacts on the Lake Champlain or ocean an acceptable level of fishery, to balance them the Lake Champlain the basin ecosystem and also its world class fishery.

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