International Journal of Science and Research (IJSR)
ISSN: 2319-7064
SJIF (2020): 7.803

Internal Anatomy and Physiology of Red Snapper Fish (*Lutjanus madras*)

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Abstract: ***Fish and other vertebrates have much in common with animals. Many of the system and organs are the same, yet there are many unique differences in the organs and their functions in fish and even between fish species. The general features of the internal structure of fish are described, the structure and functions of the internal organs. The internal anatomical features of fish can tell us a lot about the species, where it lives in the water, how it finds food and how it protects itself from predators. The main objective of this present study is to create a dynamic experience to assist in understanding the internal features and it's Physiology.***

Keywords: Internal Anatomy, Fish, Physiology

1. Introduction

As different as a animal may be from a fish, both creatures share some fascinating similarities in basic structure and function. And the closer one looks, the more complex life becomes. The smallest units of life are microscopic cells, and some organisms are no larger than a single cell. In larger multicellular creatures, individual cells that are similar in structure and perform a specific function are grouped into tissue and tissues may be grouped into even more complex and specialized structures called organs. These organs perform the basic bodily functions such as respiration, digestion, and sensory reception. Animal and fish share such organs as the brain, stomach, liver, and kidneys. Other organs appear in different forms in different organisms; for example, the lungs in animal and the gills in fish are very different but both provide the same basic function of respiration. Finally, some organs (such as the fish's swim bladder) are simply not present in animal. A number of other vital organs, such as the spleen and pancreas, may also be present but are smaller and more difficult to locate. Most fish have stomachs although some herbivores may not – which would require a lifestyle of never-ending grazing. Usually, fish are cold-blooded, although some large, fast-swimming, open-ocean fish such as tuna give off heat as they swim and either recycle it or have a poor system of getting rid of it during the rigorous swimming exercise. The diversity of fish is far greater than the species we are even capable of keeping in captivity. The most advanced science has yet to find a way to keep the young of a billfish such as a swordfish or marlin alive in captivity for more than a week, and no one can pinpoint the reason why. The wealthy sport fishing industry is obviously interested in that question and has provided means for researching such issues – but the answer remains elusive. Other species cannot live at our temperatures and pressures, surviving only in the deepest reaches and alien atmospheres of ocean-space. The species alive in your tank may not be as exotic, but they represent several hundreds of millions of years of history and survival on a planet we've existed on only for 2 million years.

2. Materials and Methods

Kingdom	Animalia
Phylum	Chordata
Class	Actinopterygii
Order	Perciformes
Family	Lutjanidae
Subfamily	Lutjaninae
Genus	*Lutjanus* madras

Lutjanus snappers have a circumtropical and subtropical distribution and are found in the Atlantic, Indian and Pacific Oceans.

Size: Maturity Max Length: 30cm TL (Total Length), Commonly to 20cm TL.

Habitat and Ecology: Inhabits coastal coral and rocky reefs and outer slopes (depth 5-90m). Forms large and small aggregations around outcrops. Diurnal carnivore. It is a broadcast spawner and tends to spawn in groups.

Fishery Status: This species is not protected or subject to fishery regulations. It is caught in the fish trap fishery, but is a regular and sometimes numerous component of the catch.

3. Result and Discussion

Spine: The primary structural framework upon which the fish's body is built; connects to the skull at the front of the fish and to the tail at the rear (fig 1) as it was reported by (Tembhre and Kumar., 1996) in fishes.

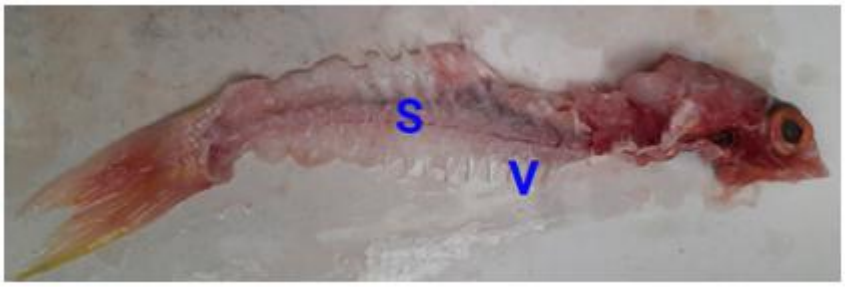

Figure 1: S- Spine, V- Vertebral bones

The spine is made up of numerous vertebrae, which are hollow and house and protect the delicate spinal cord as it was mentioned by (Densmore., 2019)

Spinal Cord: Connects the brain to the rest of the body and relays sensory information from the body to the brain, as well as instructions from the brain to the rest of the body (fig 1) as it was reported by (Tembhre and Kumar, 1996) in fishes.

Brain: The control centre of the fish, (fig 2) where both automatic functions (such as respiration) and higher behaviours occur. All sensory information is processed here as it was mentioned by (Wedemeyer., 1996).

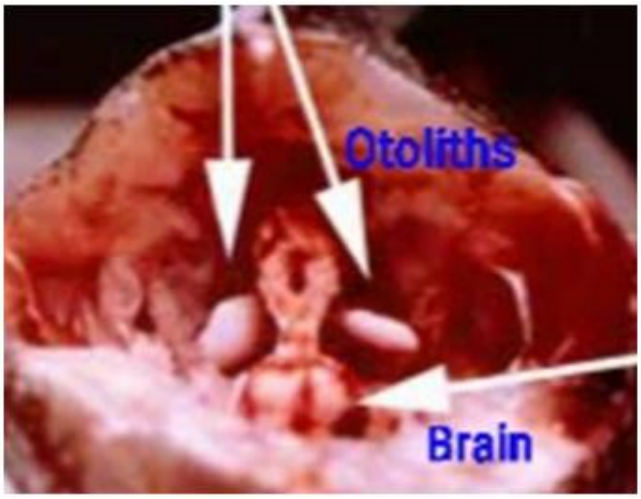

Figure 2

Ears: Sound travels well under water and hearing is important. Fishes have two inner ears embedded in spaces in their skulls as observed by (Densmore, 2019) in fishes. Within the skull are ear stones, (fig 3)

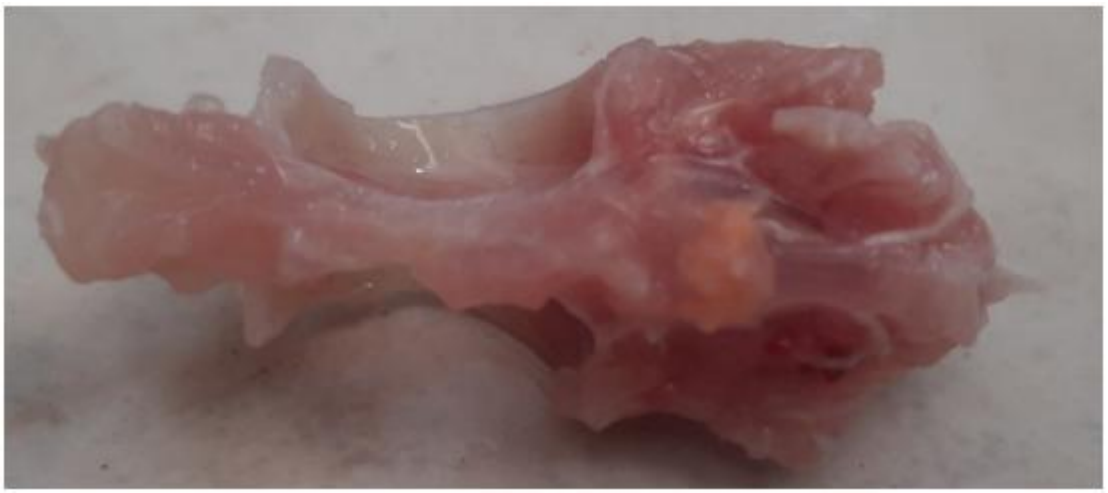

Figure 3: Skull

also called otoliths, that form not only part of the auditory system, but also aidin the fish's balance abilities, They aren't attached to the skull, but rather float beneath the brain inside the soft, transparent inner ear canals as it was reported by (Robert., 2001). There are 3 pairs of otoliths in each fish, including 1 large pair (the sagittae) and 2 small pairs (the lapilli and the asteriscii) (fig 2) as it was mentioned by (Tembhre., 1996) in fishes.

Swim (or Air) Bladder: A hollow, gas-filled balance organ that allows a fish to conserve energy by maintaining neutral buoyancy (suspending) in water (fig 4) as it was discussed by (Robert., 2001).

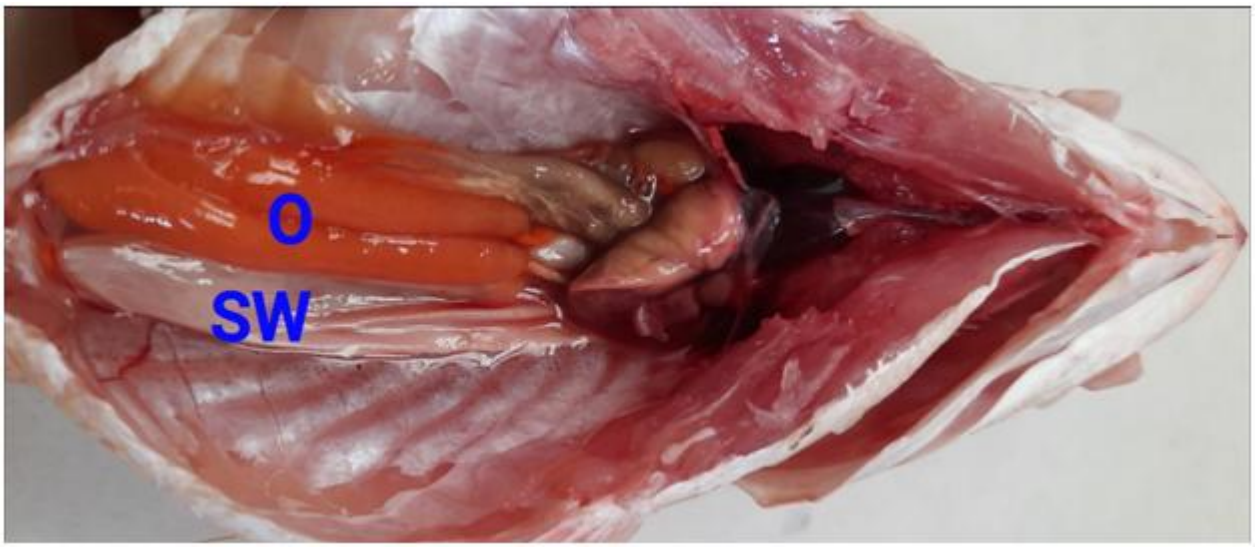

Figure 4: SW- Swim bladder, O- Ovaries

Fish caught from very deep water sometimes need to have air released from their swim bladder before they can be released and return to deep water, due to the difference in atmospheric pressure at the water's surface as it was mentioned by (Menke et al., 2011). Species of fish that do not possess a swim bladder sink to the bottom if they stop swimming as it was mentioned by (Densmore, 2019)

Kidney:
Filters liquid waste materials from the blood; these wastes are then passed out of the body. The kidney is also extremely important in regulating water and salt concentrations within the fish's body, allowing certain fish species to exist in freshwater or saltwater as it was observed by (Menke et al., 2011).Most fish have a pair of kidneys that carry out excretory functions as it was discussed by (Densmore., 2019). Kidneys filter waste material from the blood and concentrate it for release from the body. Some waste is also released by diffusion through the gills as it was demonstrated by (Robert, 2001) (fig5)

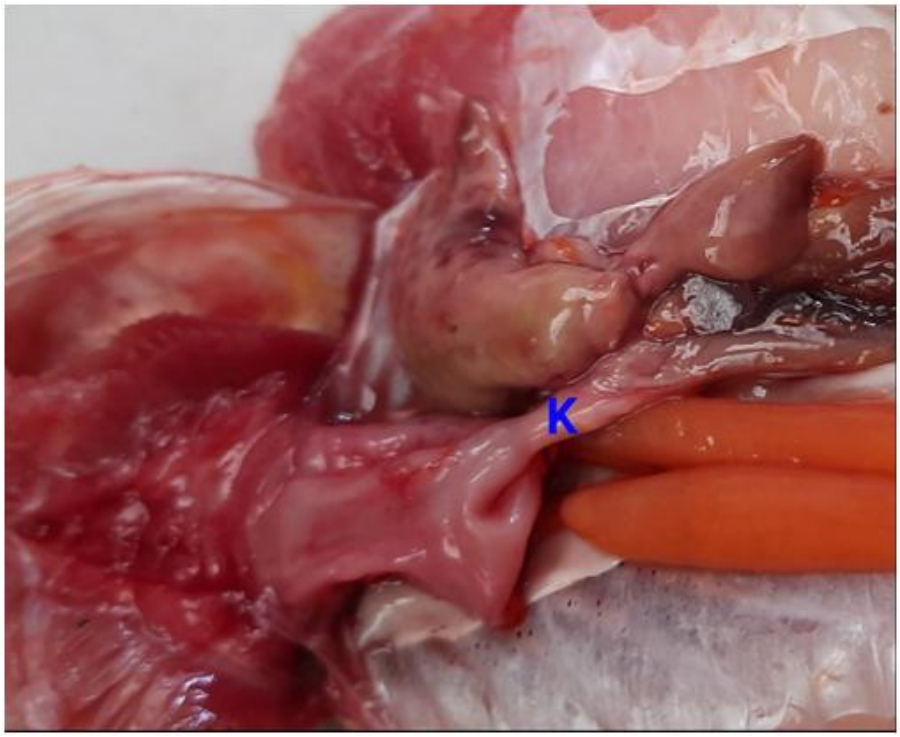

Figure 5: K – Kidney

Stomach and Intestines:
Break down (digest) food and absorb nutrients. Mature fish are piscivorous (eat other fish) have fairly short intestines because such food is easy to chemically break down and digest as it was observed by (Densmore., 2019). Immature Fish are herbivorous (eat plants) require longer intestines because plant matter is usually tough and fibrous and more difficult to break down into usable components as it was reported by (Menke et al., 2011) (fig 6).

Figure 6: S-Stomach, I- Intestine

A great deal about fish feeding habits can be determined by examining stomach contents. Fish have complete digestive systems that include various glands and organs in addition to the digestive tract itself as it was demonstrated by (Densmore., 2019). Have a pancreas that secretes digestive enzymes into the stomach to help break down ingested food (fig 8) as reported by (Robert, 2001). Liver that aids both in digestion and in the storage of digested nutrients (fig 8) as mentioned by (Menke., 2011). A common feature of the fish digestive tract is the presence of one or more finger-like organs, which extend from the stomach, called pyloric caeca (fig 7) as discussed by (Wedemeyer., 1996). The pyloric caeca, function in both the digestion and absorption of nutrients.

Pyloric Caeca:

This organ with finger like projections is located near the junction of the stomach and the intestines as it was reported by (Wedemeyer., 1996). Its function is not entirely understood, but it is known to secrete enzymes that aid in digestion, may function to absorb digested food, or do both as it was mentioned by (Densmore., 2019) (fig 7).

Figure 7: PC - Pyloric caeca

Liver

This important organ has a number of functions. It assists in digestion by secreting enzymes that break down fats, and also serves as a storage area for fats and carbohydrates as it was reported by (Menke., 2001). The liver also is important in the destruction of old blood cells and in maintaining proper blood chemistry, as well as playing a role in nitrogen (waste) excretion as mentioned by (Densmore., 2019) (fig 8).

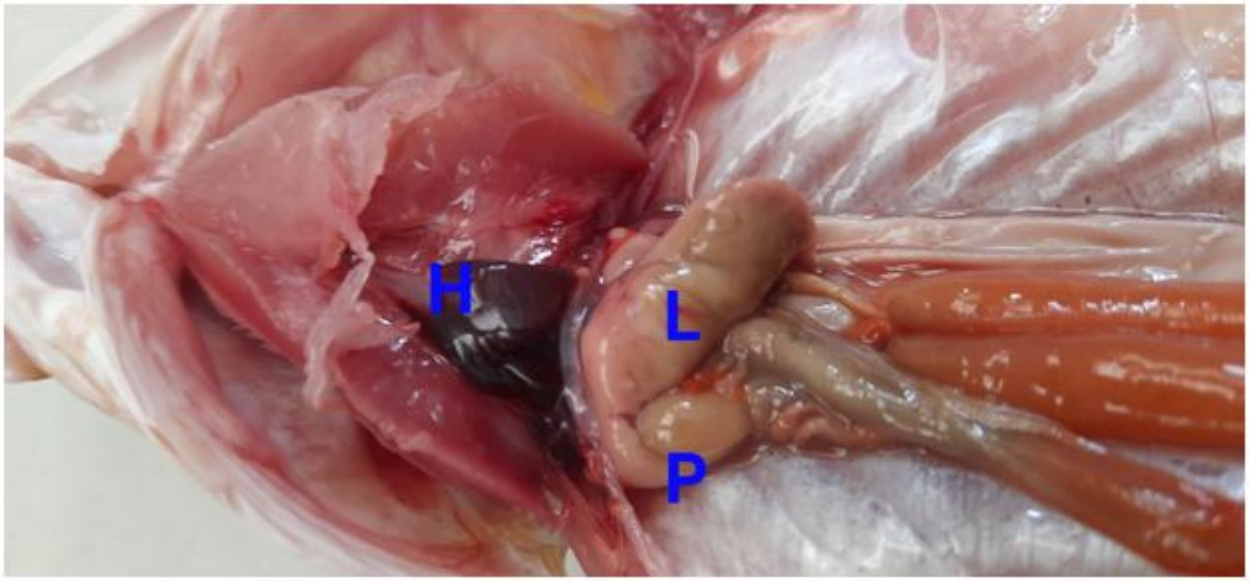

Figure 8: H- Heart, L- Liver, P- Pancreas

Heart

Circulates blood throughout the body. Oxygen and digested nutrients are delivered to the cells of various organs through the blood, and the blood transports waste products from the cells to the kidneys and liver for elimination as mentioned by (Menke., 2001). Fish have a fairly simple closed-circulatory system with a two-chambered heart as observed by (Densmore., 2019) (fig 8). In a closed circulatory system blood flows throughout the body contained inside of blood vessels. In fish, blood flows in one continuous loop from the tissues to the heart to the gills and back to the tissues as reported by (Wedemeyer., 1996). The two chambers of the fish heart are called the atrium and the ventricle. Both of these chambers have thick, muscular walls. Blood flowing in the veins from the body tissues to the heart first enters a sac-like compartment called the sinus venosus. From there it enters the atrium. Blood collected in the atrium is passed into the ventricle, where it is pumped into a tube-shaped region of the heart called the bulbusarteriosis that connects the heart to the aorta as reported by (Robert., 2001). The aorta is a large artery that brings the blood from the heart to the gills, where it becomes oxygenated. Oxygen-enriched blood then travels through blood vessels to the tissues of the organism as it was observed by (Menke., 2001).

Gonads (Reproductive Organs):

The testes in fishes, generally, are paired structures situated on either side somewhat lateral to and below the kidneys as it was observed by (Densmore., 2019). The testis has two major functions, the production of spermatozoa (spermatogenesis) and another function is the production of steroids (Steroidogenesis) as reported by (Robert., 2001). In adult female fish, the bright orange mass of eggs (fig 9)

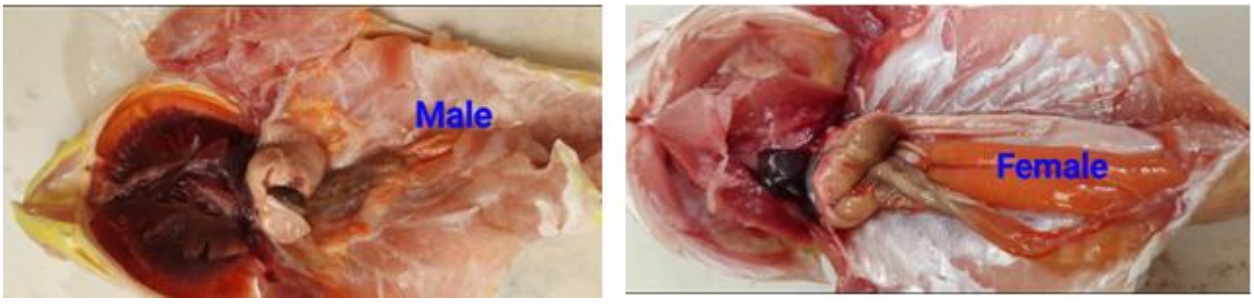

Figure 9

is unmistakable during the spawning season, but is still usually identifiable at other times of the year as it was reported by (Densmore., 2019).The male organs, which produce milt for fertilizing the eggs, are much smaller and white. Reproduction in fish normally occurs by the female producing a large amount of small eggs. These are usually externally fertilized and hatch into larvae. This is an important part of the lifecycle since during this stage, as plankton, they are swept up and dispersed by currents as it was mentioned by (Menke., 2001). They soon grow to become baby fish, called fry. Certainly, it is easy to name the exceptions to this general reproductive system. There are several species in which internal fertilization occurs as it was observed by (Densmore., 2019). They have developed ingenious methods of keeping their young alive because they have no placenta, as mammals do, but found in the same general location. The eggs (or roe) of certain fish are considered a delicacy, as in the case of caviar from sturgeon as discussed by (Robert., 2001).

Muscles

Provide movement and locomotion. This is the part of the fish that is usually eaten, and composes the fillet of the fish. The muscular system is an extremely important component

of the fish body, and it can constitute up to 80% of the body's mass as it was reported by (Menke., 2001) (fig 10).

Figure10

4. Conclusion

Most fish obtain oxygen from the aqueous environment in which they live by using a pair of gills located on each side of the pharynx. An important respiratory-like feature that is found specifically in fish is the swim bladder, or gas bladder. It helps fish descend and ascend. Fish have a fairly simple closed-circulatory system with a two-chambered heart. Fish have complete digestive systems that include various glands and organs in addition to the digestive tract itself. The muscular system is an extremely important component of the fish body, and it can constitute up to 80% of the body's mass. Fishes have a centralized nervous system with a brain located in a distinct head region.

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