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Anatomical and Histological Structure of Black Pomfret Fish Kidney (*Formio niger*)

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Abstract. *Apriliani N S. 2017. Anatomical and Histological Structure of Black Pomfret Fish Kidney (Formio niger). Proc Internat Conf Sci Engin 1: 71-74.* Black pomfret is one of the many fish species found in the southern sea. Pomfret has high economic value and is an active swimmer that has fast growth rate, resistant to disease, and easy to maintain. The purpose of this research was to know the structure of anatomy and histology of black pomfret's kidney. Histological slides were made using paraffin method and stain with *Hematoxylin-Eosin.* The results showed that kidney of black pomfret have a soft texture, and the colour is red degradation brown. Histologically, the kidney is found a glomerolous, tubules and lymphoid tissues.

Keywords: Black pomfret (*Formio niger*), Kidney, anatomy, histology, Glomerolous

INTRODUCTION

Indonesia's marine area is almost two-thirds of the total Indonesia's area. The total area reaches 5,8 million km^2 (comprising 0.3 km^2 territorial waters, 2,8 million km^2 of domestic waters and 2,8 million km^2 of exclusive economic zone waters). Indonesian oceans is one of the largest marine biodiversity in the world a world that can be managed and utilized for the prosperity of the nation (Budiharsono, 2001).

Fish (pisces) are vertebrate animals with have more than 27,000 species. Fish has the greatest diversity in terms of morphology (Bond, 1979).

Black pomfret is one of the many fish species found in the area Indonesia's marine waters, especially in the southern seas. Pomfret has high economic value and is an active swimmer that has fast growth rate, resistant to disease, and easy to maintain (Rahardjo, 1980).

The kidney is part of the excretory organ. Each aquatic organism has a different osmotic pressure with its environment, therefore the fish must prevent excess water or lack of water, so that physiological processes in the body take place normally. The osmotic regulation of fluid in the fish body is called osmoregulation (Fujaya, 2004).

Osmoregulation is the proccess of aquatic animals to control water balance and ions between the body and its environment, or in other words a regulatory process osmotic pressure in the water that serves to process fish osmoregulation. Kidney serve to regulate the water and salt content in fish body (Fujaya, 2004).

Kidney on every living creature of each group of species such as Pisces (Fish), certainly has a difference even though it is have basic plan with other vertebrates. Differences can be seen from the shape, color, location, size or part of the kidney itself.

Based on the above background, what is the anatomical kidney in Black pomfret *(Formio niger)* as well as what is the histological of kidney in sea pomfret *(Formio niger).*

MATERIALS AND METHODS

Animal

One Black pomfret (*Formio* niger) (Adult, 1-year-old, weight 300 g) that reared in marine water, Pangandaran, West Java.

This research was conducted at Laboratory of UIN Sunan Kalijaga Yogyakarta. The study was conducted on 23 February - 28 March 2015.

Tools and Materials

Microtome, staining jars, paraffin, 1 bottle of aquades, bottle, warmer slide, slide glass or glass cover. While the material used was bouin, chloroform, alcohol (60%, 70%, 80%, 90%, 96%), albumin, glycerine, toluene, xylol, hematoxylin, eosin, and Entellan.

Phases

The workings of this research are as follows: 1. *Dissection***.** Black pomfret *(Formio niger)* first sacrified with chloroform solution, dissected, then the kidney were taken. After that, organ cut in ± 0.5 cm. 2. *Fixation***.** Fixation were done using bouin solution. Organs that had been cut are soaked in bouin solution for ± 24 hours. *Dehydration*. This dehydration uses a gradual alcohol solution. Before dehydrated, organ washed with running water for 1 hour. Then soaked in alcohol solution 60% for ± 15 minutes 2 times, then soaked in alcohols 70%, 80%, 90%, 96% and absolute alcohol respectively for ± 1 hour. *Clearing* Clearing was done using Toluene solution, the organ is immersed with toluene over the night. *Paraffin Infiltration.* Paraffin infiltration was done by inserting the organs into paraffin in the oven with temperature ± 65^0 C, with

toluene: paraffin (50:50) for 1 hour. Paraffin 1 for 3 hours, paraffin 2 for 3 hours and paraffin 3 for overnight. *Embedding*. Then embedding by inserting the organ into block / mold box. *Sectioning*. Then sectioning, by slicing 4-5 µm organs then put into the slide smeared with albumin glycerine and then in the distilled water and heated on slide warmer with temperature of ± 45^0 C. *Staining*. The deparaffinization were done using xylol 1 and xylol 2 each for 30 min, then dehydration (absolute, 96%, 90%, 80%, 70%, 60%), respectively for 3 minutes then aquades for 3 minutes. After that stained in hematoxylin solution for 10 minutes, then washed in running water 10 minutes and aquadest for 3 minutes. Then put into Eosin solution about 10 minutes, washed with aquadest for 3 minutes. Then rehydration, alcohol (60%, 70%, 80%, 90%, 96%, absolute) each 3 minutes. Then dealcoholized with xylol 1 and xylol 2, each 30 minutes. *Mounting*. Then mounting with entellan and closed with cover glass. Finally, were labeled. *Observation.* The next step is to observe the specimen under a microscope. *Data Analysis*. The data in the form of images are analyzed descriptively and qualitatively, then compared with literature.

RESULTS AND DISCUSSION

Kidney Anatomy of Black pomfret *(Formio niger)*

Fish kidneys are generally located between vertebral column and swim bladder, above the abdominal cavity, under the spine and dorsal aorta (Takashima, 1995).

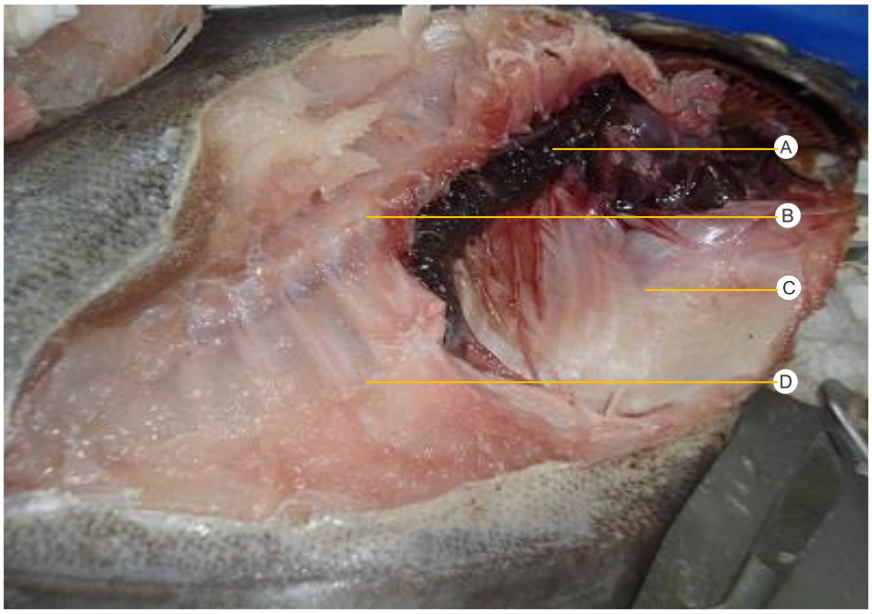

Figure 1. Anatomy of Black pomfret *(Formio niger)* **A**. *Kidney*, **B**. *Columna vertebralis*, **C.** *Swim bladder cavity*, **D**. *Muscle*.

Figure 2. Anatomy of the renal portion of Black pomfret *(Formio niger) A. Head kidney. B. Body kidney. C. Tail Kidney*.

The external shape of the fish's kidneys varies by species. The fish kidney consists of the head and body of the kidney. Embryologically, the kidney head is originated from the pronephros, and the body kidney-shaped mesonephros. The kidney head is the anterior portion of the kidney and consists of lymphoid tissue, whereas many nephrons and i lymphoid tissues are present on body kidney.

Kidney color in pomfret fish in normal circumstances are red-black color. The adult pomfret kidney sized of ± 5 cm.

Kidney histology of black pomfret *(Formio niger)*

The kidneys in fish are composed of units called renal tubules or nephrons. Nephrons consist of the renal corpuscles and tubules. The renal tubules function as a filter device capable of separating liquid materials that are not beneficial within the fish body. Then drain it into the tubule and discard it in the form of urine. The kidney's performance of blood from the dorsal aorta is carried to the kidneys through renal artery.

Then the blood is filtered through the capillaries on the glomerulus and passes through capillaries from around the tubules. The useless liquid materials will be thrown through kidney tubules, while the cleaned blood will leave the kidneys through the veins of kidney (Windarti et al., 2010).

Tissue and Function of the renal organs of Black pomfret *(Formio niger)*

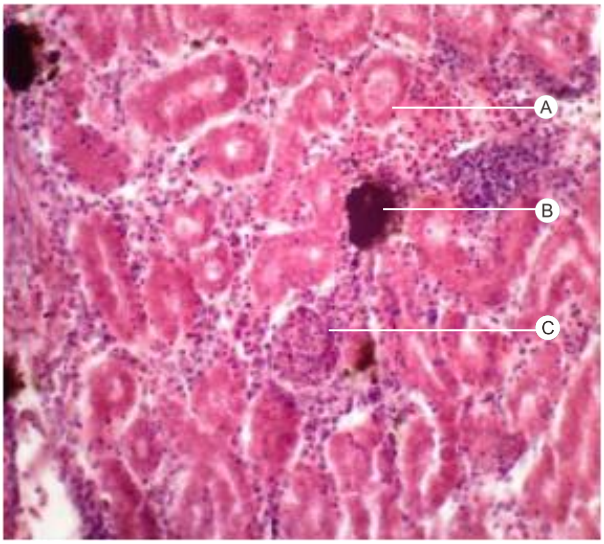

Figure 3. Histology of the renal organ of Black pomfret *(Formio niger.) A. Tubule B. Lymphoid C. Glomerolous.*

According to Siregar (1995) renal function begins in the glomerulus i.e., ultra-filtrate forming of plasma. Blood will enter Bowman's capsule and to the lumen of the tubule. Filtration occur through various segments of the tubules, there are changes in the volume and composition of the filtration fluid as due to the process of reabsorption and secretion along the tubules. Concentrations of ions fluid in the body is maintained by removing or storing it in the blood. When in excess, it is removed by filtration in the glomerulus (Yonkos et al., 2000).

a. Glomerulus of Kidney of Black Pomfret

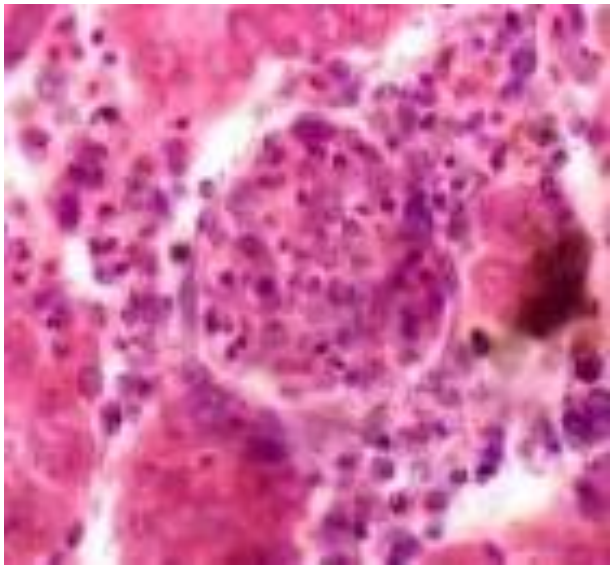

Figure 4. Renal glomerulus of Black pomfret *(Formio niger).*

Glomerulus in fish serves to filter the liquid (filtration). Glomerulus is part of the renal corpuscle. The amount of glomerulus in the marine fish kidney is fewer in amount and smaller in diameter than in freshwater fish. Glomerulus is a capillary lobulated bunch. Before entering the glomerulus, afferent arterioles are divided into several capillary. The glomerular capillaries reunite to leave the glomerulus as afferent arteriole (Edwards, 1928).

b. Lymphoid renal Black Pomfret *(Formio niger)*

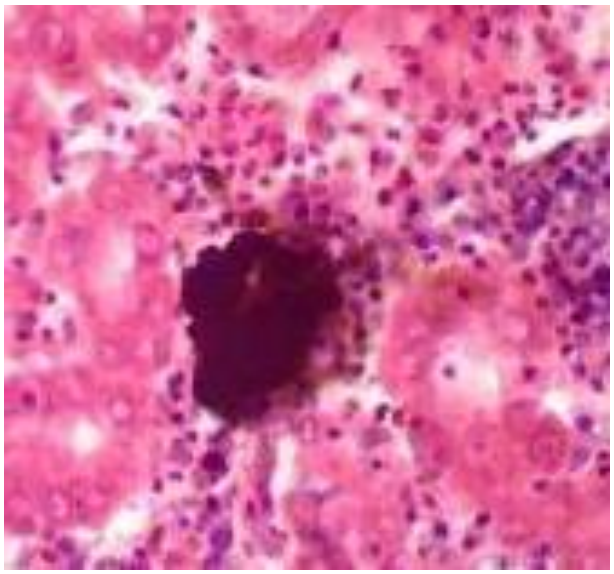

Figure 5. Renal lymphoid of black pomfret.

Lymphoid tissue and intertubular tissue of the kidney is hematopoietic tissue in Teleostei. Lymphoid tissue is part of the tissue on the fish's renal portion, and is only present in fish (Takashima, 1995).

c. Kidney renal tubule of Black pomfret

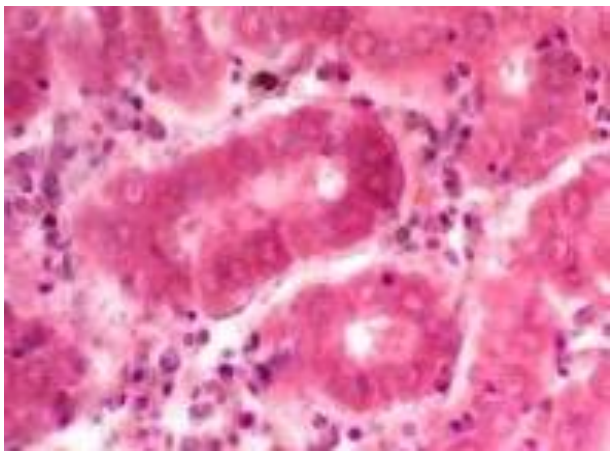

Figure 6. Renal tubule of Black pomfret *(Formio niger).*

Tubulus serves to filtered urine. The tubulus play an important role in maintaining water balance. Renal tubule are very thin and short on the neck segment (Takashima, 1995).

CONCLUSIONS

From the results of research entitled "The structure of anatomy and histology of renal organs in black pomfret *(Formio niger)* " it can be concluded that the structure of anatomy of kidneys of the Black pomfret *(Formio niger)* have a black-red color and measuring ± 5 cm and there are 2 parts on the kidney fish, namely the head kidney which is the anterior portion of the kidney and consists of lymphoid tissue, while many nephrons and interestrial lymphoid tissue are present in the body of the kidney. Histological structures of the renal organ of Black pomfret *(Formio niger)* observed through microscope reveal glomerulus, lymphoid and renal tubule.

REFERENCES

Beyenbach, K. W. 2004. Kidneys sans glomeruli. American Journal of Physiology Renal Physiology 286:F811–F827.

Bond, C.E. 1979. Biology of Fishes. W.B. Saunders Company, Philadelphia

Budiharsono S., (2001). Teknik Analisis Pembangunan Wilayah Pesisir dan Lautan, Pradnya Paramita. Jakarta.

Edwards, J. G. 1928. Studies on aglomerular and glomerular kidneys I. Anatomical. The American Journal of Anatomy 42:75–108.

Fujaya, Yushinta. 2004. Fisiologi Ikan Dasar Pengembangan Teknik Perikanan. Jakarta: PT RinekaCipta

Moyle, P.B. and J.J. Cech, Jr. 1988. Fishes. An Introduction to Ichthyology. Second edition. Prentice Hall, Englewood Cliffs, New Jersey.

Rahardjo, M.F. 1980. Ichthyologi. Departemen Biologi Perairan. Fakultas Perikanan. Institut Pertanian Bogor, Bogor.

Saanin, H. 1984. Taksonomi dan Kunci Identifikasi Ikan. Jilid 1 dan 2. Bina Cipta, Jakarta

Siregar, H. 1995. Fisiologi Ginjal. Edisi ketiga. Bagian Ilmu Faal. Fakultas Kedokteran. Universitas Hasanuddin. Unjung Pandang

Takashima & T. Hibiya. 1995. An Atlas of Fish Histology. Normal and Pathological Features Fumio. Gustav Fischer Verlag. Stuggart. New York.

Yonkos, L.T., Fisher, D.J., Reimschuessel, R., & Kane, A.S. 2000. Atlas of Fathead Minnow Normal Histology. Aquatic Pathobiology Center. University of Maryland College Park Campus.