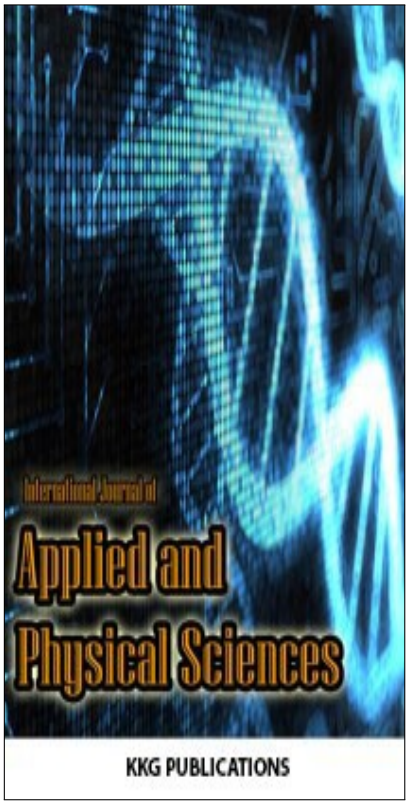

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OPERCULUM MOVEMENT AND MICROANATOMY SKIN STRUCTURE OF PERIOPHTHALMODON SCHLOSSERI IN ESTUARY OF BARITO RIVER

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Abstract. This research was aimed to explain operculum movement and microanatomy skin structure of *P. schlosseri* with interval calculation of oxygen uptake by operculum while *P. schlosseri* stay on the land and undergo skin preparation to observe part of the skin and mucous cell microscopically. Sampling was conducted by using the endangered animal catching method with line transect. The observation of operculum movement was done using camera video or direct observation. The observation of skin microanatomy was done using the paraffin method and then observed under the microscope. The result of this research showed that the average interval oxygen uptake is 7.25 minutes. The result shows that mucous cell is on the skin layer of *P. schlosseri* found in the epidermis layer with an average range between mucous cell equal to 16.96 μm and average broad size is 73.87 μm.

INTRODUCTION

Background

Periopthalmodon schlosseri is a fish of familia Gobidae that are sized relatively large. It is living in the territory of estuarine river Barito which has muddy ground and makes the hole as the nest [1]. It is able to walk on land with fins forward that are used as a tool for motion like leg.

The types of fish *Periopthalmodon* can survive on land where stress will lose water and oxygen is very high. The high resistance of life on land, according to [2] is because of respiratory system. The fish is able to take oxygen from the air. This type of respiratory system is also caused by the structure of the anatomy of the gills that are different generally.

The stem of lamella gills is thick and the branch of filament gills is complex, interlamela is fused and the surface of lamella secondary is folded. The anatomy structure of aquatic fish generally has a filament gill arranged transversely and on the surface above and below it are many folds of transversal secondary [3].

The respiratory mechanism of *P. schlosseri* is same in general as other fish. Oxygen is absorbed through the gills that are rich in veins. Meanwhile, when it is on land, fish are also capable of absorbing the air through the skin while the skin is moist [2]. The behavior of respiratory *Boleophthalmus boddarti* Pallas is trapping water in the cavity of the gills with closed mouth and the gills. The fish is capable of being in the mainland for 53 minutes [4].

P. schlosseri activity and rest is done on land. Because of that the fish requires oxygen to breathe like salamanders and frogs. Both of them have a lot of capillaries which are located at the bottom of the skin which acts to absorb the oxygen from the air into the circulation system of blood. Type of this respiration is known as skin respiratory system or cutaneous respiration.

The first mechanism of oxygen supply is started when the fish opens the mouth followed by movement of the closed operculum in water. This movement is done repeatedly until the oxygen demand is fulfilled to survive on the mainland. The operculum movement when was breathing in water is different within fish based on the activity.

In addition to having behavior for getting the oxygen, it also requires a system of defense to prevent the loss of oxygen and water. It will be connected with anatomy structure of the skin as morphology adapting to the mainland.

The problems of this research are how much is the lap time for the operculum movement in *P. schlosseri* when taking oxygen and how the structure of skin microanatomy in *P. schlosseri* supports respiration and prevents loss of water on land.

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RESEARCH METHOD

The location of observing and taking samples of *P. schlosseri* is located on the banks of the Bahagia river, Tanipah, Tabunangen, District of Barito Kuala, South Kalimantan. Sampling is performed by the method of line transect. The tools used are: binoculars, fishing tools and tools and preparation methods for paraffin. Materials used are fish *P. schlosseri*, skin of *P. schlosseri*, a solution of bouin, alcohol 70%, alcohol 95%, alcohol 100%, xilol, xilol:alcohol 1:1, xilol: alcohol 1:2, alcohol:xilol 2:1, solution of Giemsa, distilled water, and paraffin.

Procedural Work

Procedural work of this research for behavior of respiratory *P. schlosseri* was performed with several stages that include:

Method of observation of operculum movement in *P. schlosseri*

This method is done in the Bahagia river, Tanipah, Tabunganen District of Barito Kuala, South Kalimantan. This method is about observing the movement of operculum directly by using binoculars. Operculum movement observed is an interval of time operculum begins to take in water marked with an operculum expanding to release water that is characterized by collapse of operculum and the movement of the operculum on the mainland (picture 1). *P. schlosseri* interval measurement for operculum movement is done by using a stopwatch.

Preparation of Skin Microanatomy

Making preparations of skin of P. schloseri was done by using paraffin method. The preparations for skin of *P. schlosseri* were observed under a microscope. The observation is focused on cell mucous and cells alarms. The shape, size, and distance between the cells of mucous cell alarms are recorded. These observations were made in Freshwater Aquaculture Centres Mandiangin Banjar, South Kalimantan.

Data Analysis

The collected data are quantitative and qualitative. Quantitative Data include lapse of time taken by water to put out water on the operculum, the number, size and distance between mucous cells. Qualitative Analysis covers structure microanatomy of skin and mucous cells.

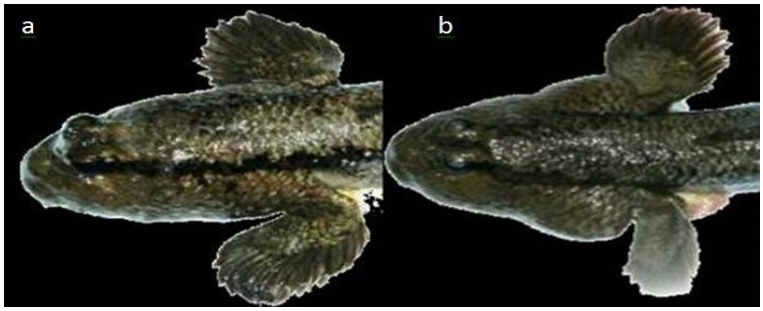

Fig. 1 . Comparison of the shape of the operculum when (a) deflated and (b) inflated

RESULTS

The observation of the movement of operculum of *P. schlosseri* with the location of different observations showed different results. The locations were in the nest where fish operculum movements were more frequent than those on the mainland. The fish that were on the land had the operculum movements less frequent i.e. every 10 minutes (see table 1).

TABLE 1
OBSERVATIONS OF MOVEMENT OF OPERCULUM OF P. SCHLOSSERI

Samples	The time interval of operculum movements taking oxygen (min)	location observations
T 1	5	submerged in water
T 2	7	the poolside
T 3	7	the poolside
T 4	10	Mainland
Average	7.25	

Structures of skin microanatomy of *P. schlosseri* have two main layers, they are epidermis layer which is composed of epithelial cellls and dermis layer. The skin that plays a role in cell respiration is mucous that is found in the epidermis layer of the skin and is among the epithelial cells. Mucous cell lines were more clearly seen in figure 1 magnification of 100X, showing that the form of mucous cells is round and the middle part is empty of contents, mucous cells are surrounded by epithelial cells.

The location of mucous cells in the epidermis is scattered in groups with spacing between different groups. The results of measurements of the distance between the mucous cells in the epidermis of observed fish sample have a range of different values, namely 7.51 m, 19.58 μm, 15.62 μm , 40.7 μm, 10.21 μm, and 8.14 lm.

Epidermis has other cells, cells mucous alarm. Alarm cells are spread on surface section of the epidermis characterized by the rectangular, rounded or oval structure. These cells are called cell alarms because of their function as an alarm or reminder of the hazards in environment that generate response from alarm cells which are located under the mucous cells. Both of these cells can be seen as different when observed at a magnification of 100X (figure 1). Two of these cells can be seen clearly having the difference on a larger magnification. Mucous cells are round with a middle section blank or does not contain anything, and is located at the top of the cells over the alarm while the alarm cell has the characteristics that it looks round as well but when seen in Figure 2 seems to have the inside contents.

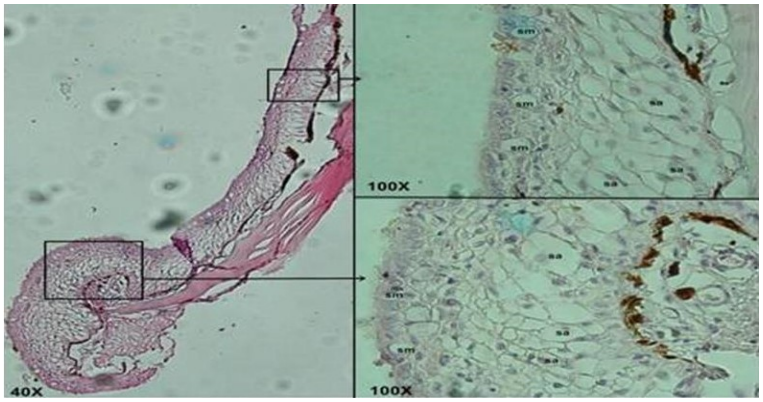

Fig. 2 . Cells of mucous and alarm cells microanatomy on the structure of the skin of *P. schlosseri*. At 40x magnification showing the location of mucous cells and cells found in the epidermis alarm and 100X magnification showed mucous cell shape and cell alarm

DISCUSSION

P. schlosseri take oxygen in the water either in depth or on the surface. Lapse time of the operculum movement which is quite a long time gives a sign that the fish is able to withstand oxygen on the ground for quite long. The fish currently out of the body of water will develop space gills to hold water in for reserve oxygen while on land.

The operculum will have a big size because it is filled with the air rich in oxygen on land. Air in the operculum will be replaced with carbon dioxide. At this point, certain fish will be returned to the water to take oxygen .

The resilience of fish *P. schlosseri* for saving the oxygen is almost the same as the respiratory behavior of fish cork. But Fish cork is able to survive for 8 hours [5] whereas *P. schlosseri* is able to survive on land for 3 days [6].

The Resilience of fish *P. schlosseri* to survive on land is also aided by the structure of the skin that can help the defense system of water loss. It has a lot of cell mucous in epidermal cells. These cells function to produce mucous that soaks the skin so as to prevent loss of water and oxygen that is needed by fish when on land and breathing. The cells of mucous also serve to help the process of respiration on the mainland [7].

Organ that plays a role in the system of respiration of *P. schlosseri* besides gills is the skin surface, especially when they are on land. The process of fish breathing on land is done through wet skin. The skin is kept wet by specialized cells called mucous cells. Mucous cells produce mucous to be secreted to the surface of the skin.

The mucous cells of fish Gobidae have different acidic condition compared to other fish [8]. The Mucous cells contain water so that oxygen will more easily get into the skin of the deepest. Cells of mucous are among the cells of the epithelium in the epidermis [9]. Observations from microanatomy of skin of *P. schlosseri* show that it is surrounded by mucous cells ranging from 7-10 epithelial cells.

P. schlosseri live on the land that has stressful environment and contains a very high pathogen organism. Therefore, the skin as an organ of defense first protects against the invasion of pathogens from the environment [10]. The cells of mucous and cells of alarm that are populous in epidermis are very helpful in the process of defense. Cells of mucous not only have a function to make the skin wet, but also contain anti-pathogen compounds. In addition, the mucous has the cability of precipitating certain molecules such as heavy metals and helps in the secretion of immunoglobulin [11]. Cells alarms function as defenses [12], cell-cell has the ability of a "code" which will be provided from within the skin if there are predators around the habitat so that *P. schlosseri* can avoid the dangers of predators; this capability is part of the defense of life [13].

CONCLUSION

Based on the results of this research, the interval of movement of operculum of *P. schlosseri* average was 7.25 minutes. The epidermis contains cells of mucous and alarms that are unevenly distributed.

Acknowledgement

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