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Histological Structure of *Varanus Salvator* Intestine

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Abstract. *Varanus salvator* is a common species in Indonesia. This animal is known as the water lizard, who is a member of the family Varanidae or known as the monitor lizard. This research aims to find out histological structure of *Varanus salvator* intestine. Histological observation was carried out by making histological preparations using the paraffin method. The results of this study were analyzed in a comparative descriptive manner through observation in a microscope and transverse photo histology preparations using a camera. The results of this study indicate that the intestinal histological structure of *Varanus salvator* consists of Serosa (Sr), Muscle layer (Ml), Muscularis externa (Me), Submucosa (Sm), Mucosa (M), Blood Vessel (Bv) dan Lamina Propria (Lp).

Keyword: Histology, Intestine, *Varanus salvator*.

INTRODUCTION

Indonesia is one of the countries in the world that has abundant biodiversity. Biodiversity includes wildlife diversity. One of the wild animals that become Indonesia's biodiversity is monitor lizards *(Varanus salvator).* Monitor lizards *(Varanus salvator)* are one of the most common species in Indonesia, consisting of at least four subspecies, namely: *V. s. macromaculatus* (Koch et.al, 2007), *V. s. bivittatus*, *V. s. celebensis*, and *V. s. ziegler* (Koch et.al., 2010). Monitor lizards are a class of reptiles that are widely used for commercial purposes. Types of monitor lizards that are most widely used and consumed are monitor lizards *(Varanus salvator)* (Mardiastuti et.al., 2003). In addition, this animal is also widely caught because it is considered a pest (Soehartono et.al., 2003). Waste products from the use of monitor lizards have not been widely used as part of their internal organs, including the digestive tract (Mardiastuti et.al., 2003).

The morphology of the digestive organs in each animal species varies, depending on the habitat, type and feeding behavior of the animal. The intestine is one of the digestive organs that plays an important role in the absorption of food molecules that will be distributed throughout the body. The type and eating behavior of an animal affect the anatomic and histological structure of the intestine. Anatomically this difference can be observed photomacrographically in the shape and size of each part of the digestive organ. While histologically the difference can be seen from the results of photomicrography in each layer of the walls of the digestive tract, the form of cell stretching, mucosal folds, shape and type of cells and glands and mucous substances contained in cells (Dellman et.al., 1992). Among the biological data that is very important is information about the digestive tract, especially information about the structure of the aquatic gut tissue. Until now, biology information on water lizards is still little reported. Specifically, scientific information about the digestive tracts of aquatic lizards, only in macroscopic data, which consists of the esophagus, stomach, small intestine, and large intestine (Mahfud et.al., 2016). In general, research on water monitor lizards is still limited to ecological research (Lisle, 2007), body morphology (Koch et.al, 2007), and commercial harvesting (Shine et.al, 1996). Specifically, for histological research, there is still a tendency to reptile other types, for example in *Phrynops geoffroanus* (Cabral et.al, 2011), *Crotalus durissus terrificus* (Porto, 2013), *Seminatrix pygaea* (Sever, 2004), *Bittis arietans* (Karim, 1998), *Varanus marmoratus* (Prades, 2013). In this research it is hoped that it can add as a database of further research, be able to provide scientific data and add information for science, especially in the field of histology. The purpose of this study was to determine the histological structure of the lizard intestine *(Varanus salvator).*

MATERIALS AND METHODS

In this study used 1 female monitor lizard *(Varanus salvator)* obtained from Yogyakarta Animal and Ornamental Plants Market (Pasty), chloroform, bouin solution, ethanol solution, toluene solution, paraffin solution, sterile distilled water, xylol solution, Hematoxylin, Eosin, protein, glycerin and multilevel alcohol. The tools used were monitor lizards and water containers, a set of surgical instruments, flakon bottles, paraffin ovens, microtomes, glassware, pipettes, slide/glass objects, glass covers, slide warmers, tapes for

paraffin blocks, brushes, Bunsen lamps, small spoons, matches, test tubes and covers. Observation of the histological structure of the monitor lizard *(Varanus salvator)* was carried out through a microscope by making histological preparations using the paraffin method. The data obtained in the form of a picture of the histological structure of the monitor lizard *(Varanus salvator)* taken using a camera. Then the picture is analyzed in a descriptive comparative manner in each of its parts.

RESULTS AND DISCUSSION

Anatomical Morphology of Lizard Digestive Tract (Varanus salvator)

The digestive tracts of monitor lizards *(Varanus salvator)* are generally similar to other reptiles, consisting of the esophagus, stomach *(ventriculus)*, small intestine *(intestinum tenue)*, large intestine *(intestinum crassum)* and cloaca (Mahfud et.al., 2016). The following are the macrophotographic observations of the viscerum site and the anatomy of the monitor lizard digestive tract *(Varanus salvator)* macroscopically:

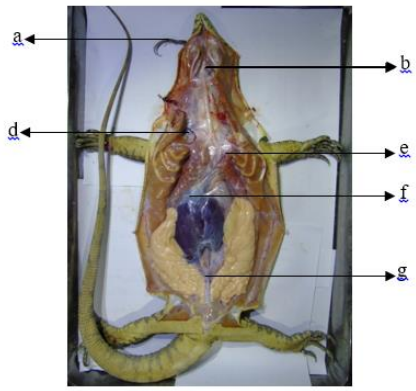

Figure 1. Macrophotographic Viscerum site monitor lizard *(Varanus salvator).* (a) Tongue, (b) Esophagus, (c) Trachea, (d) Lungs, (e) Stomach, (f) Liver, (g) Cloaca

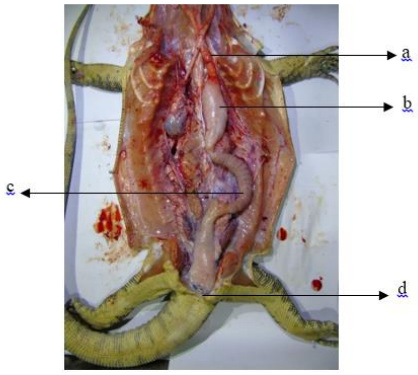

Figure 2. Monitor lizard *(Varanus salvator)* Digestive Tract. (a) Esophagus, (b) Gastric, (c) Intestine, (d) Cloaca

Based on observations (figure 2), it appears that the digestive tract of the monitor lizard *(Varanus salvator)* consists of the esophagus, stomach, intestine and cloaca. The esophagus is the longest digestive tract after the intestine. From the esophagus, digested food is passed on to the stomach. Stomach consists of three parts, namely cardiac, fundic and pyloric (Kararli, 1995; Irwanto, 2014). Monitor lizards stomach *(Varanus salvator)* has a straight channel structure, so that macroanatomically cannot determine the cardiac, fundic and pyloric sections. The length of the monitor lizards stomach is relatively shorter than the esophagus and intestine. This is generally found in reptiles, namely to prevent spoilage, kill live prey that is swallowed and assist digestion in eliminating hardening of the bones of prey animals that have been swallowed (Kardong, 2008). From the stomach the digested food is passed on to the intestine. In general, the intestine can be divided into small intestine and large intestine. Small intestine consists of duodenum, jejenum and ileum (Eurell, 2004). In macroanatomy the small intestine in monitor lizards *(Varanus salvator)* is difficult to distinguish between the duodenum, jejenum and ileum (Wahyuni et.al., 2015). In monitor lizards, water is difficult to distinguish between small intestine and large intestine. Usually in macroanatomy to distinguish the small intestine and large intestine is to see the cecum that is used as a barrier to both (Stannard et.al., 2013). However, in monitor lizards *(Varanus salvator)* there is no cecum, so it is quite difficult to distinguish between small intestine and large intestine. The process of digestion will produce leftover food, become feces and excreted through the cloaca. The cloaca is the terminal of the monitor lizard digestive tract *(Varanus salvator)* for the discharge of feces and is the urinary excretion terminal.

Morphology of Lizard Intestine (Varanus salvator)

Monitor lizard intestine *(Varanus salvator)*, generally divided into small intestine and large intestine (Mahfud et.al., 2017). Macroscopically it is not certain the difference in structure between the small intestine and large intestine (colon) (Mahfud et.al., 2016). The following are the results of observations of the structure of the monitor lizard *(Varanus salvator)* microscopically.

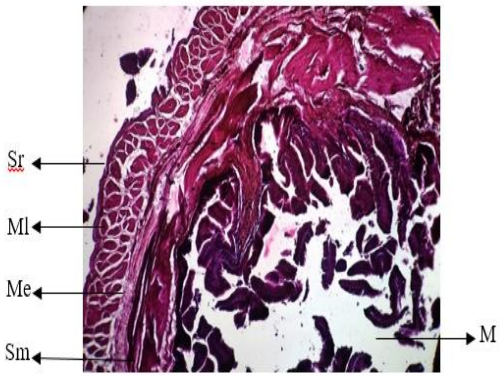

Figure 3. Transverse slice of monitor lizard intestine *(Varanus salvator)* Magnification of 4 x 10. (Sr) Serosa, (Ml) Muscle layer, (Me) Muscularis externa, (Sm) Submucosa, (M) Mucosa

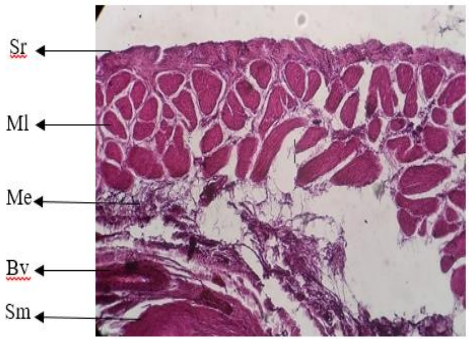

Figure 4. Transverse slice of monitor lizard *(Varanus salvator)* Intestine Magnification of 10 x 10. (Sr) Serosa, (Ml) Muscle layer, (Me) Muscularis externa, (Bv) Blood Vessel, (Sm) Submucosa

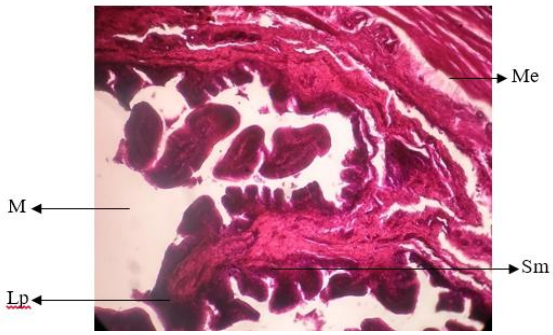

Figure 5. Transverse slice of monitor lizard *(Varanus salvator)* Magnification of 10 x 10. (Me) Muscularis externa, (M) Mucosa, (Sm) Submucosa, (Lp) Lamina Propria

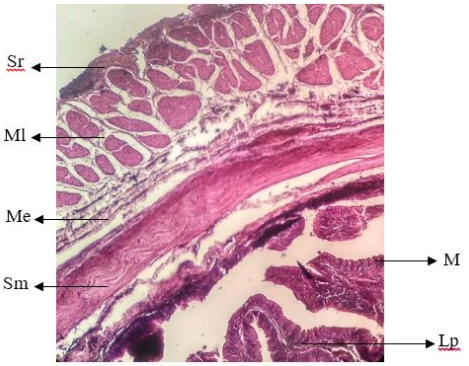

Figure 6. Transverse slice of monitor lizard *(Varanus salvator)* Magnification of 10 x 10. (Sr) Serosa, (Ml) Muscle layer, (Me) Muscularis externa, (Sm) Submucosa, (M) Mucosa, (Lp) Lamina Propria

Based on observations it can be seen that the structure of the monitor lizard *(Varanus salvator)* microscopically consists of (Sr) Serosa, (Ml) Muscle layer, (Me) Muscularis externa, (Sm) Submucosa, (M) Mucosa, (Bv) Blood Vessel and (Ml) Lp) Lamina Propria. Serosa (Sr) is the outermost layer and part of the viserial peritoneum (Schmitz et.al., 2008). Serosa is a layer composed of squamous epithelium (mesothelium) and arceolar connective tissue (Tortora et.al., 2009). Muscle layer (Ml) is a compiler of the externa (Me) muscularis layer. Muscularis externa (Me) is composed of thick bundles of smooth muscle fibers, arranged into two sub layers: circular in the internal sub layer and longitudinally in the external sub layer (Calamar et.al., 2014). Submucosa (Sm) contains connective tissue, blood vessels, lymphatic system, lymphocytes and plasma cells (Schmitz et.al., 2008). Mucosa (M) consists of surface epithelium, lamina propria and mucosal muscularis. Curved surface epithelium into the lamina propria with varying depths and forming gastric wells is called foveola gastrika. The epithelium that covers the surface and coats the curves is a cylindrical layer epithelium and all cells secrete alkaline mucus (Tortora et.al., 2012). Blood Vessel (BV) is part of the circulatory system and serves to transport blood throughout the body. Lamina propria (Lp) consists of loose connective tissue infiltrated by smooth muscle cells and lymphoid cells (Tortora et.al., 2012).

CONCLUSION

Monitor lizard *(Varanus salvator)* intestinal structures microscopically consist of (Sr) Serosa, (Ml) Muscle layer, (Me) Muscularis externa, (Sm) Submucosa, (M) Mucosa, (Bv) Blood Vessel and (Lp) Lamina Propria.

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