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# Study of Morphometric Measurement and Physiological Status in Hawksbill Turtles (Eretmochelys *imbricata)*

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## Abstract

*Hawksbill turtle ( Eretmochelys imbricata ) is one of the protected fauna because of its endangered population and belongs to the family Cheloniidae. Hawksbill turtle population in Indonesia continues to decline. The decline in its population in nature is caused mainly by human factors ( egg theft , hunting, habitat degradation and extraction of marine natural resources that are used as food for turtles) and health problems when compared to natural factors and predators. There are very few studies on the health of the hawksbill turtle, even though the data and information are very much needed in efforts to save the hawksbill. Basic data needed to determine animal health, including body morphometric and physiological information in the form of body temperature values, heart rate and respiration. This study aims to obtain basic morphometric data and body physiology of the body's work system in hawksbill turtles as initial data in determining health abnormalities of hawksbill turtles. This study used 2 hawksbill turtles obtained in the waters of Bulukumba Regency. Morphometric measurements of the body were carried out after the hawksbill turtle was successfully loaded onto the research boat and measured using a flexible roll meter. Measurement of physiological status was carried out using auscultation and inspection techniques on the plastron and dorsal neck while body temperature measurements were carried out on the cloaca. The results showed that the morphometric measurements and physiological status of the hawksbill turtle had a mean result of BL being 73.5 cm, CCL was 58.5cm, SCL was 57 cm, CCW was 51.5 cm, SCW was 48.5 cm, PL was 44.5 cm, PW was 46 cm. , BC is 84.5 cm, TEM is 25.9°C, Hr is 40.5x/min, and RES is 44x/min. These results indicate that there are differences in morphometric values and physiological status of the wild hawksbill turtle obtained from the waters of Bulukumba Regency .*

***Key words:*** *Eretmochelys imbricata, Morphometric, Wild Hawksbill Turtle, Physiological status*



## Introduction

Wildlife is an organism that lives in an ecosystem. Management in modern times has been growing rapidly with a variety of patterns for the purposes of the protection of these animals and utilization of wildlife conservation. The current use of wild animals includes research, education, tourism, recreation, even if possible certain types of animals can be further managed as export commodities from a country. In fact, it turns out that wild animals have invaluable values and benefits for human life, so the scope of their management must be expanded (Setia, 2012).

Diversity of wild animals is a form of biodiversity of biological natural resources for an area or a country, therefore efforts to protect wild animals are needed. Fluctuations in wildlife populations in their habitats in the wild can be caused by many factors, one of which is the destruction of wildlife habitats by humans themselves. To be able to carry out protection, it is necessary to know the population and distribution in wildlife habitats. Determination of the wildlife population can be done by various census methods that make it easier for researchers and parties involved to estimate population estimates. Although the exact number is not known, this method makes it easy for some parties to record the population close to the actual number in their natural habitat (Kusmana and Khitmat 2015).

Hawksbill turtle (Eretmochelys imbricata) is one of the protected fauna because of its endangered population and belongs to the family Cheloniidae. The turtle is the only species in its genus. Hawksbill turtle is a marine animal which by The World Conservation Union is classified as a critical animal (IUCN red data book, 1970). The hawksbill turtle is a turtle that has a characteristic snout -shaped beak, jaw it curved to the bottom and relatively sharp like a bird brother parent so often called "Hawksbill turtle" (Alexander, 2000).

Hawksbill turtle population in Indonesia continues to decline. The decline in its population in nature is caused mainly by human factors (egg theft , hunting, habitat degradation and taking marine natural resources that are used as food for turtles) compared to natural factors and predators (Suwelo et al. 1992). Efforts to save hawksbill turtles have not been carried out until now because some researchers are still focusing on observing biological aspects, evaluating habitats and finding methods for calculating populations on the high seas (Lam, 2006). Based on this information, it is necessary to conserve it, but first it is necessary to know the basic information related to the health of the hawksbill turtle. There are very few studies on the health of the hawksbill turtle, even though the data and information are very much needed in efforts to save the hawksbill.

Therefore, research on hematology and blood biochemistry studies of wild hawksbill turtles need to be done. This will be very useful to assist veterinarians in medical treatment of hawksbill turtles experiencing health problems in Bulukumba Regency.

## Materials and Methods

### *Materials*

The type of research used is descriptive method using 2 wild hawksbill turtles (Eretmochelys imbricata) obtained directly from their habitat in the waters of Bulukumba Regency. Some of the tools and materials used in this research are diagnostic tools for recording physiological parameters and roll meters as well as tools related to field studies for observations in coastal ecosystem areas such as snorkeling equipment (4 sets), Garmin 76 CSX navigation GPS, Multiparameter water quality checker.

### *Method*

Turtles will be caught using the long-term mark recapture method (Lanyon et al 1989). Turtles are caught with their bare hands during daytime scuba diving at two dive sites set at a depth not exceeding 10m. The turtles were photographed and measured on board the research vessel after which the turtles would be transferred to a boat that had been previously modified to reduce stress levels from the animals. all measurements were taken with a plastic tape measure (Roll meter) 1.5 m (1 mm with an accuracy of ±0.5mm).

Examination of physiological status carried out is measuring heart frequency by auscultation method using a stethoscope on the plastron of the hawksbill turtle, breathing frequency by observing movements in the dorsal neck, and body temperature of the hawksbill using a rossmax thermometer. Physiological status measurements were carried out on each hawksbill turtle shortly after being boarded the research vessel.

## Results and Discussion

The morphometric measurements and general health parameters are summarized in Table 1, the average CCL (Curve carapace length) for all hawksbill turtles was 58.5cm, with a range of 41-82 cm. Average BL (Body length) is 73.5cm and CCW (Curve carapace width) average is 51.5cm. The average weight of a turtle ranges from 6.4 kg for the smallest immature to 60.9 kg for the largest adult female. Internal body temperature varies slightly between individuals, with an average of 25.9°C and a range between 22.1°C and 27.2°C. Both hawksbill turtles appeared clinically healthy, had relatively little barnacle or algal growth on their carapace, and were bright, alert and responsive to movement (Hayes et al. 2017).

Growth rates and individual turtle sizes can be estimated using CCL Size in sea turtles (Broderick et al. 2003) and CCL variation can provide clues about changes in turtle developmental habitats in their habitat (Casale et al. 2018). moreover, minimum and maximum CCL values of female turtle nests during long-term field studies can be obtained and used to categorize female turtles' age at laying eggs as potentially mature or sub-adult depending on their CCL values. Table 1 shows the measurement results of CCL WHT1 is 52cm and WHT2 is 68cm.

Table 1 Results of morphometric measurements and physiological status

| Sample | Checkup result | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | SEX | BL | CCL | SCL | CCW | SCW | PL | PW | BC | TEM | HR | RES |
| WHT1 | FEM | 57 | 52 | 49 | 41 | 38 | 34 | 39 | 80 | 25.6 | 42 | 40 |
| WHT2 | FEM | 90 | 68 | 65 | 62 | 59 | 55 | 53 | 89 | 26.3 | 39 | 48 |
| AVERAGE | | **73.5** | **58.5** | **57** | **51.5** | **48.5** | **44.5** | **46** | **84.5** | **25.9** | **40.5** | **44** |

Information: Sex (gender), BL (body length), CCL (length of carapace curve), SCL (length of straight carapace), CCW (width of carapace arch), SCW (width of straight carapace), PL (length of plastron), PW (width of plastron), BC (body circumference), TEM (body temperature), HR (heart rate), RES (Respiration)

Turtles are categorized based on age/size classification, namely those with a size above 35cm SCL (straight carapace length). turtles with measurements between 35 to 65cm can be categorized as juveniles, turtles with measurements of 65 to 85cm can be categorized as subadults, while turtles with measurements above 85cm SCL are categorized as presumed adults (Aguire and Balazs 2000). The results of this study are in accordance with the results of the study in table 1 which states that WHT1 has an SCL size of 49cm and can be categorized as a turtle with a juvenile age classification while WHT2 has an SCL size of 65cm and can be categorized as a turtle with a subadult age classification.

Table 1 shows the body temperature values for WHT1 and WHT2, respectively, are 25.6°C and 26.3°C. Turtle is one of the animals that regulates its body temperature to approach the temperature of its habitat environment or commonly referred to as poikilotherm. The body temperature of the animals of the poikilothermic group depends on the ambient temperature, so they are often also called ectotherms (Wilmer et al. 2005). If the ambient temperature is high, then the body temperature will also increase and if the ambient temperature is low, the body temperature will also be low, in connection with that, it will not require too much energy for thermoregulation because the metabolic rate is also low and there is little or no heat production. Rizzo 2016). Body temperature will increase due to the effect of increasing environmental temperature, which will speed up the metabolic rate. In other words, there is no fixed metabolic rate at poikilotherms or will vary according to ambient temperature. Poikilothermic animals regulate their body temperature only through physical mechanisms through three things. First, there is little insulation. Less insulation allows for faster heat loss and can prevent the accumulation of heat stored in the body. Second, it has a lower core body temperature than the ambient temperature. Third, at high ambient temperature conditions, body heat will be reduced through evaporation, while at low environmental temperatures, there is no specific regulatory process for heat production (Gunstream 2010).

The results of the study on the value of the Heart rate (HR) in WHT1 and WHT2 showed values of 42 and 39x/minute. The heart rate in reptiles is generally lower than in mammals or birds. Many factors contribute to variations in heart rate (HR), including body size, temperature, blood oxygen saturation, respiratory ventilation, postural or stress levels, hemodynamic balance, and body sensory arousal (Cabanac and Bernieri 2000). In reptiles, an increase in temperature is associated with an increase in HR and a decrease in blood pressure volume. Cardiac function is maximized when a reptile lives within a suitable temperature range. Hemodynamic disturbances, including changes in water or ionic balance and blood pharmacological status, can also affect the homeostatic conditions of reptiles, especially hawksbill turtles. Reptiles experiencing blood loss or anemia from surgery or trauma may develop tachycardia (Lillywhite et al. 1999). Reptiles are ectotherms and depend on the temperature of their surroundings to regulate their core temperature. The cardiovascular system is very important for the regulation of reptile body temperature. Reptiles bask to increase the rate of heat absorption by increasing their heart rate, while during periods of cooling/resting their heart rate decreases to minimize heat loss. Changes in the systemic circulation also occur during heat absorption. Peripheral vasodilation Blood circulation during sunbathing can increase body temperature while vasoconstriction occurs during cooling.

The measurement values for total respiration in hawksbill turtles are WHT1 with a value of 40x/minute and WHT2 with a value of 48x/minute. Hawksbill turtles take one breath and are separated by different intervals of time varying in duration from seconds to minutes. Sometimes, the breathing intervals become quite regular. This pattern can be contrasted with the time-lapse pattern in freshwater turtles, in which a series of breaths are taken without interruption before pauses of different duration (McCutcheon, 1943). The basis for this discrepancy, meanwhile, is thought to be in the brainstem which regulates breathing patterns and may be related to the normal behavior of the chelonian breed. There is no measurement of hawksbill lung volume, but based on previous studies, maximal lung volume is known to be proportional to body weight, leading to an estimated value of about 12 L for the hawksbill species, the largest tidal volume appears to be maximal then the hawksbill can almost completely empty his lungs (Berkson 1967). This implies a minimal residual volume, and almost certainly the terminal lung emptying phase must be active. Diving behavior is also, almost completely emptying their lungs of air, an adaptive feature that relies on cartilage in the airway up to the alveoli and is useful in preventing some of the side effects of gas at high pressures (Gans and Hughes 1967).

Respiration can also affect HR. During normal respiration, lung resistance is minimal and blood flow to the lungs and heart rate are maximized. However, when the hawksbill is apnea (eg, diving) the lungs will again experience increased resistance and often result in decreased blood flow to the lungs and reduced HR. Bradycardia is a natural occurrence in hawksbill turtles during diving and holding their breath for long periods of time. By reducing HR there is an increase in peripheral resistance, which can lead to diversion of blood to vital organs, such as the brain and heart. During prolonged apnea (breath holding) reptiles may switch from aerobic to anaerobic glycolysis processes (Cabanac and Bernieri 2000).

## Conclusion

In this study, data of body morphometric measurements and body physiology status of wild hawksbill turtles in Bulukumba Regency have different values between one individual and another.

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