

The Characteristics of Maleo Bird (*Macrocephalon Maleo*) Eggs in the Wildlife Conservation Area, North Buton, Indonesia

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ABSTRACT

Maleo bird (*Macrocephalon Maleo*) is a protected endemic animal species of Sulawesi Island due to being in an endangered condition. This bird is included in megapodes with blackish fur and small head shape. This animal is unique due to its monogamous characteristic and relatively giant egg size. Maleo does not brood its egg like any poultries in general, but relies on the geothermal heat as an egg incubator until hatching. Maleo exists not only around Sulawesi, but also several small islands around Sulawesi. Buton Island is one of the Maleo bird habitats distributed mostly on the wildlife conservation area of North Buton. Decreased Maleo bird population continues to occur annually due to high egg hunting activity and habitat movement as the result of the increased land use by the community. This condition causes a declined food source for Maleo that impact on the decreased egg quality. This study aimed to observe the egg quality of Maleo bird in The Wildlife Conservation Area of North Buton based on the physical characteristics and social activity influences. The observation was performed on 18 eggs obtained from the egg collector during the egg-laying season. The results show that the eggs have 222.13 g weight with the average length and width of 10.15 and 6.14 cm, respectively. The observation results indicate that the Maleo birds in the wildlife conservation of North Buton are lately distributed in seven burrow locations in two Sub-districts of North Buton Regency.

Keywords: Egg characteristics, *Macrocephalon Maleo*, Wildlife Conservation of North Buton

1. INTRODUCTION

Maleo bird (*Macrocephalon Maleo*) is included in a burro-nester bird species as a bird that creates burrows as a nest. Maleo bird uses geothermal heat or solar radiation to brood its eggs [1]. The monogamous characteristic differs this bird from other poultries. The body size of Maleo birds is likely similar to adult rooster among 50-55 cm [2] with wing-spread size of 29-30 cm [3]. Maleo has a bulge that resembles a black horn on the head. This bulge is used as a censor to determine the egg-laying location (geothermal detector).

The Maleo habitat commonly lives near hot sandy beach or in mountains with hot water source or certain geothermal condition [4].

Nowadays, Maleo bird is categorized as one of the endangered animal species. The main problems faced by Maleo bird conservation movement is the habitat damage due to egg exploitation, followed by habitat degradation and fragmentation that will decrease the Maleo population on several years in the future [4]. One of the movements that can be performed apart from habitat rescue is living behavior protection, namely egg-

laying behavior protection as an effort for population increase.

Macrocephalon Maleo is an endemic animal of Sulawesi. This animal can also be found in several small islands around Sulawesi as one of which is Buton Island. Maleo birds in Buton Island are mostly distributed on the wildlife conservation area of North Buton. For the last few decades, there has been a habitat movement of Maleo birds in this area. This condition is closely influenced by the increased land use due to the community activity and Maleo egg hunting activity. Habitat movement surely influences the food source availability and quality that will affect the egg productivity, mainly egg quality [5] such as egg hatching rate [6]. This study aimed to identify the characteristics of Maleo bird eggs in the Wildlife Conservation area of North Buton.

2. MATERIALS AND METHODS

This study was performed on January to December, 2020 in the Wildlife Conservation Area of North Buton. Primary data were collected from the observed study object (eggs), while secondary data were collected from the community and egg collectors. Supporting information was collected through an interview with questionnaire.

This study used an observation method on Maleo bird habitat condition through focal animal sampling approach [7]. Variables used in this study were egg weight, egg length, egg width, and egg shell thickness.

3. RESULTS AND DISCUSSION

3.1. Egg-Laying Behavior

Based on the observation results, Maleo birds found in the Maleo egg-laying distributed locations at Wildlife Conservation Area of North Buton commonly has a similarity (Figure 1). The location used for laying eggs



Figure 1. The burrow locations of Maleo bird in Wildlife Conservation of North Buton (yellow circles and arrows)

is commonly an area with a higher temperature. Hafsa *et al.* [8] mentioned that the habitat for laying eggs of Maleo birds was a geothermic egg-laying habitat type indicated from the availability of hot water source around the habitat area. The egg-laying behavior of Maleo birds is unique as there are several ceremonies that must be performed by the bird couple before egg-laying activity begins. These ceremonials are distinct voice release when being closed to the egg-laying location and location monitoring from predator threat or more dominant male Maleo pair.

The egg-laying location selection is performed by hen, while the cock monitors the surrounding area from predator threat or other cocks. The hen determines the burrow location to begin the egg-laying process. The burrow preparation process is performed alternately between cock and hen as hen digs the burrow, the cock monitors the burrow area by perching on the tree around the burrow, and these activities are performed alternately (Figure 2). The observation results show that the average of time required to prepare the burrow is 25-45 minutes. This preparation time is closely influenced by the substrate materials used for the burrow. Poli *et al.* [9] mentioned that time required by Maleo birds to prepare the burrow is 30-40 minutes.

The observation results show that the egg-laying time for Maleo birds is at 09.00-16.00 by following the environmental condition around the location area. The egg-laying time is influenced by weather condition, predator threat, and other more dominant Maleo bird pairs. Each location has different Maleo bird couple numbers approximately among one to three couples in each day. The egg-laying duration is among 7-11 days for each couple. The number of couples in each location is closely associated with the vegetation around the area. The main vegetation types in each location contain Jamaican cherry (*Muntingia calabura*), sea hibiscus (*Hibiscus tiliaceus*), ficus tree (*Ficus benyamina*), Siam weeds (*Cromoleana odorata*), and wild sugarcanes (*Saccharum spontaneum*).

The burrow depth is varied on each location at Wildlife Conservation of North Buton. The observation results show that the burrow depth is among 46-60 cm depending on the substrates in the burrow location. The burrow substrates with sand mixture have a deeper burrow than the burrow with sand soil mixture substrates. Preventive action performed by the Maleo bird couple to prevent the burrow from predators is by creating a camouflage burrow. The predators found in the burrow location are Asian water lizard (*Varanus salvator*), monkey (*macaca nigra*), eagle (*Spilornis rufipectus*), and human (Figure 3).



Figure 2. Burrow-nest preparation



Figure 3. Predator threats of Maleo bird eggs in the burrow location, namely human (A), monkey (*Macaca nigra*) (B), and egg shell debris suspected due to being eaten by Asian water lizard (*Varanus salvator*) (C)

3.2. Egg Characteristics

Based on the morphometric observation results, the 18 egg samples have weight, length, and width data at 222.13, 10.15, and 6.14, respectively (Table 3). The egg characteristics in several regions are different based on the egg weight variations. The lightest egg weight is 203 g, while the heaviest weight is obtained at 237 g. meanwhile, the egg length and width is no large different. The vegetation based on the habitat exploration around the burrow location is different (Figure 4). Locations with candlenut plants and Jamaican cherry trees obtain a heavier egg weight. Meanwhile, locations with Jamaican cherry, sea hibiscus, and ficus tree combined vegetation obtain a lighter egg weight. Based on the information from egg collectors, Maleo bird utilizes candlenut and Jamaican cherry as food sources. Therefore, these plants become

the main indicators for egg collectors to find the Maleo bird's burrow.

The study results of Widnyana [10] on 120 Maleo bird eggs found that 87.5% of Maleo birds had normal oval shape, while the rest shape was ellipse. Based on the shape, the Maleo bird egg is divided into 4 shapes, namely biconical, elliptical, oval, and normal oval [11]. Moreover, Mardiasuti [12] stated that the Maleo eggs commonly have two shapes with six types, namely asymmetrical shape, containing normal oval, oval length, and oval width, while symmetrical shape, containing oval weight, ellipse oval length, and normal oval. Maleo bird eggs are different from other poultry eggs due to mostly dominated by the yolk. The most egg content is yolk at 57.61% of the egg weight. Meanwhile, albumin is the most egg content in ducks, chickens, and pigeons at 52.6%, 55.8%, and 74% of the weight,

Table 1. The characteristics of Maleo bird eggs in Wildlife Conservation of North Buton

No	Shape	Morphometry		
		Weight (g)	Length (cm)	Width (cm)
1	Oval	229	10.5	6.2
2	Oval	230	10.4	6.4
3	Oval	212	10.3	5.9
4	Oval	224	10.3	6.1
5	Oval	216	9.9	5.9
6	Oval	226	10.3	6.1
7	Oval	237	10.4	6.1
8	Oval	209	9.6	6.1
9	Oval	220	10.3	6.2
10	Oval	220	10.2	5.9
11	Oval	251	10.5	6.2
12	Oval	203	9.3	6.1
13	Oval	221	10.2	6.2
14	Oval	231	10.5	6.5
15	Oval	215	9.8	6.1
16	Oval	210	9.9	6.2
17	Oval	229	10.5	6.2
18	Oval	230	10.4	6.4
Average		222.13	10.15	6.14

Note: g: gram; cm: centimeter



Figure 4. Vegetations around the Maleo bird burrow in Maligano Sub-district (A and C) and Kulisusu Barat Sub-district (B and D)

respectively [13]. Several study results which measure the Maleo bird egg characteristics obtain egg length of 9.21-11.2 cm and egg width of 5.7-6.5 cm [14], [1]. Maleo bird eggs have a higher nutrient quality than other bird eggs. This condition causes the Maleo breeds can release themselves from the sand [13].

The environmental condition on each burrow is influenced by the vegetation types, namely plants that become the food source for Maleo birds. Shim *et al.* [16] mentioned that nutrients have important role in egg quality and quantity of poultries. The main vegetation types on each location are candlenut (*Aleurites*

moluccana), Jamaican cherry (*Muntingia calabura*), sea hibiscus (*Hibiscus tiliaceus*), ficus (*Ficus benyamina*), Siam weeds (*Cromoleana odorata*), and wild sugarcane grasses (*Saccharum spontaneum*). Nafiu *et al.* [16] mentioned that there are at least 20 plants found around the Maleo bird burrow area which contain shrubs and shady trees. Based on the observation results on the habitat, Maleo birds mostly utilize vegetation as a shelter, stalking, playing, feeding, resting, and social interaction place. The main factor of Maleo bird habitat is plant types as food sources [17], movement requirement, resting, field monitoring for laying place, protection from predators [11].

Environmental factor becomes an important component for organisms in adaptation pattern and habitat selection. The habitat physical conditions along with climate, temperature, humidity, biotic components, vegetation types, chemical component, and decomposers closely influence the capability to survive and breed [18]. Preventive action that can be performed by Maleo bird couple to prevent from predators is by creating a camouflage burrow. Sugiarto [19] mentioned that Maleo bird's threat from nature challenge is predators, such as Asian water lizard (*Varanus salvator*), monkey (*macaca nigra*), eagle (*Spilornis rufipectus*), and human.

4. CONCLUSIONS

The study results conclude that Maleo bird eggs have oval shape with 203-251 g weight, 9.3-10.5 cm length, and 5.9-6.4 cm width. The main threat on Maleo bird sustainability is high egg hunting activity by the community around the burrow location. The Maleo bird egg characteristics commonly indicate a decreased egg quality mainly in egg size and shell width.

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