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The Production Characteristics of Male Bandicoot (*Echymipera kalubu*)

Frandz Rumbiak Pawere* and Desni Triana Saragih

Department of Animal Science, Faculty of Animal Husbandry, University of Papua, Manokwari, 98314, Indonesia

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* Corresponding author:
Telp. +62 81338508443
E-mail: chitapawere@gmail.com

ABSTRACT

The aim of this research is to understand the production characteristics of male bandicoot (*Echymipera kalubu*) and obtain basic morphometric information for cultivation and development of the animal. The research was done through the explorative method by using 30 random undomesticated adult male *Echymipera kalubu* obtained in Manokwari regency forest, West Papua. The morphometric characteristics of *Echymipera kalubu* in regards to the body weight and carcass weight are yet to be observed and standardized for practical use. The obtained estimator variables were analyzed by SPSS 24 for windows to calculate the multiple regression and coefficient of correlation value. The results of statistical analysis showed that there were 4 estimator variables that had positive correlations, which were body length (X_1), hind legs length (X_2), heart girth (X_4), and cannon girth (X_5). The obtained body weight regression formula was Y_1 = -1367.355 + 33,912X_1 + 7,095X_2 + 89,745X_4 – 14,494X_5 with the coefficient of determination at 0.815. Moreover, the obtained carcass weight regression formula was Y_2 = -1282,170 + 40,113X_1 + 7,666X_2 + 66,750X_4 - 24,231X_5 with the coefficient of determination at 0.794. The research concluded that the best estimator variable for body weight and carcass weight was the heart girth.

Keywords: Bandicoot, Carcass, *Echymipera kalubu*, Estimator variables

Introduction

The national demand for meat is 686,000 tonnes, while local production could only produce 429,412 tonnes, the rest of 256,588 tonnes are fulfilled through import (Yasmin, 2018). The condition is ironic, as Indonesia has rich fauna resources which have yet to be utilized as animal-based protein sources. The natural resources in Indonesia made up 12% of mammals, 17% of birds, also 16% of reptiles and amphibians in the world (Primack *et al*., 1998). The already known undomesticated consumed animals have the potential for alternative animal-based protein sources, thus should be more observed and developed. The development of potential fauna resources would be strategic, noting that it would promote local production, as Indonesia is an archipelago country with various geographical condition and social cultures. Papua is one of the regions in Indonesia with rich fauna resources and could be the germplasm source to be developed to fulfill the meat demand (Warsono, 2009).

One of the most consumed indigenous marsupials by people in Papua is bandicoot (*Echymipera kalubu*). The IUCN red list (2016) stated that the conservational status of *Echymipera kalubu* is at least concern or in other words highly available in nature. Warsono (2009) stated that bandicoot meat consists of 72.42% water, 18.2% proteins, 3.26% fats, 4.43% crude fibers, 2.53% ashes, and 1,090 kcal/kg energy. Moreover, the meat to bone ratio is 3.41:1 and carcass percentage of bandicoot is 67.8%.

The efforts to conserve the bandicoots in nature as well as fulfil the meat demands should be done simultaneously. One of the efforts is by raising the animal as meat producers on the farm, which then would require prior in-depth research before practiced. Several components that need to be observed is the estimator variables of the body and carcass weight of the male bandicoot. The selling of bandicoots without prior weight measurement would disserve both farmers and buyers (Soenarjo, 1988 *cit.* Lasfeto, 2007). The body and carcass weight estimator variables of bandicoot have yet to be studied and standardized for practical use. Research to understand the production characteristics of male bandicoot is then become essential.

Materials and Methods

The research is done from July 2017 to April 2018 and used 30 undomesticated adult male bandicoots obtained from Masni district, North Manokwari district, and Kebar district (10 bandicoots each) in Manokwari regency for the research sample.

The identification of bandicoots was done based on the identifying keys for Australasian bandicoots and bilbies (Menzies, 1991; Flannery, 1995a dan 1995b). The characteristics of bandicoots in this research are as follows (Petocz, 1994): brownish and dark colored fur with the dorsal-lateral area, starting from the snout to the caudal, is black with a mixture of black and yellow color on the tip of the fur. The ventral area, lengthwise from the inner hind legs, chest, abdomen, legs to the lower jaw and below eye area is white colored, but some are reddish or brownish yellow colored. The head conformation is narrow and pointed to the long snout. The eyes are small and black with long furs around the eye area. The ears are dark, short, and round shaped covered with soft furs. The tail is short, dark, rough and stiff covered with soft and sparse furs similar to the ears. The metatarsal/carpal in front and hind legs are covered with soft furs and have a dark palm. The base of the claw in the second and third fingers of the hind legs are joined by the skin and only the end of the joints and claws are separated, while the fingers in the front legs are not. The front legs are shorter and smaller compared to the hind legs, yet still firm with three long claws. The teeth conformation of this bandicoot is polyprotodont, with the teeth conformation formula of the bandicoots in this research were $I_{4/3}$ $C_{1/1}$ $P_{3/3}$ $M_{4/4}$ (Tate, 1948; Lindenmayer, 1997).

The materials used in this research consisted of 2 kg Weston weight scale with the degree of accuracy at 10 g, 15 kg Prohex weight scale with the degree of accuracy at 50 g to measure the body and carcass weight of the bandicoot; 150 cm meter tape to measure the heart girth (cm); 60 cm iron bar to measure the body and legs length (cm) of the bandicoot; camera for documentation; machete to construct the bandicoot traps; boots for feet protection in the forest; surgery gloves; 3 mm and 40 size nylon rope for the snare.

The research was analyzed descriptively through observation. The sampling technique was purposive sampling based on the information from local people on the existence of the bandicoots. The research is done in several phases, which were the preparation phase, morphometric measurement phase, carcass weight measurement phase. The preparation phase was done to identify the bandicoots' species based on the identifying keys of Australasia bandicoots and bilbies (Menzies, 1991; Flannery, 1995a dan 1995b). The morphometric measurement phase was done to obtain the body length (cm), heart girth (cm), hind legs length (cm), cannon girth (cm), tail length (cm), and body weight (g) data. The carcass weight measurement phase was done to measure the carcass weight (kg). The estimator variables measurement was following Gunadi *et al.* (1989); Payne (2000) dan Suyanto (2006). The body length, heart girth, and hind leg length measurement can be seen in Figure 1.

The body length is the distance between *tuberculum humeralis lateralis* to *tuberculum ischiadicum*. The heart girth is measured by entwining the meter tape right behind the *humero-radius ulna*, and the hind legs length is the distance between claws' tip to the *tuber calcis*. The cannon girth and tail length measurement can be seen in Figure 2. The cannon girth is measured by entwining meter tape on the cannon. The tail length is the distance between the base of the tail to the tail end.

The body weight is measured by scaling the overall body in the weight scale, while the carcass weight is the weight of the bandicoot

Figure 1. Body length (a), heart girth (b), and hind legs (c) measurement.

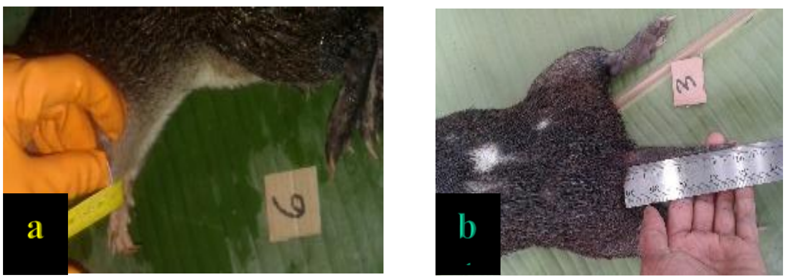

Figure 2. Cannon girth (a) and tail length (b) measurement.

Figure 3. Body weight (a) and carcass weight (b) measurement.

without the furs, head, front and hind legs (on the carpal and tarsal parts), tails (on the sacrum part), blood, visceral and guts.

The obtained data were analyzed descriptively, with two-tailed Pearson's bivariate correlation, and multiple linear regression with the help of SPSS 24 software. The multiple linear regression model is as follow (Priyatno, 2009):

$Y = b_0 + b_1 x_1 + b_2 x_2 + \cdots + b_n x_n$

with:

Y = estimated dependent variable
b_0 = constants
$b_1, b_2, \ldots b_n$ = regression coefficient
$x_1, x_2, \ldots x_n$ = independent variables.

Result and Discussion

Body and carcass weight of male bandicoot

The mean male bandicoot body weight obtained in this research was 1,583.03±513.66 g, while the carcass weight was 1,214.95±432.33 g. A more detailed mean, minimum, and maximum value of the body and carcass weight is presented in Table 1.

The result of male bandicoot's body weight in this research is higher than research by Warsono (2010) which showed that the male bandicoot's weight is at 1,252±384.59 kg. The result indicates that bandicoot farming in Manokwari has good potential supported by its environmental factors. According to Berg and Butterfield (1976), the environmental factors which affect animal farming include the climate, feed, and management. The similar average body weight of the bandicoot is found in PNG with the male bandicoot body weight at 450-1500 g (Flanery, 1995a), 405-1,000 g (Flanery, 1995b) and 500-2,000 g (Strahan, 1990).

The estimator variables were measured at 5 variables, which were body length, hind legs length, tail length, heart girth, and cannon girth. The detailed mean, minimum and maximum value of estimator variables are presented in Table 2.

The body length of bandicoot in this research was 23.97±3.48 cm, shorter than the findings by Maker *et al. (*2016) which was at 38.2± 4.76 cm; and Warsono (2009) which was at 26.66±3.53 cm. Furthermore, the hind legs length of bandicoot in this research was 7.14±1.00 cm, longer than findings by Cuthbert and Denny (2014), which showed that the hind legs length of the bandicoot was 5.59±0.29 cm. The tail length in this study was 7.77±1.52 cm, relatively similar with the findings by Warsono (2009), which was at 7.89±1.30 cm; and Culberth and Denny (2014), which was at 7±0.7 cm. The heart girth in this study was 24.11±4.10 cm, relatively similar with findings by Warsono (2009), which was at 23.07±2.64 cm. Moreover, the cannon girth in this research was at 5.30±0.99 cm, which was smaller compared to findings by Warsono (2009) at 8.33±1.37 cm.

Estimator variables correlation with body and carcass weight of male bandicoot

The correlational value was defined in the coefficient of correlation. The result of correlation analysis on the five estimator variables to the body and carcass weight showed a positive correlation ($P<0.01$). The highest coefficient of correlation was on the heart girth variable. The result of the correlation analysis on the estimator variables to the body and carcass weight is presented in Table 3.

Pearson's correlational analysis showed that from all of the observed estimator variables,

Table 1. The mean, minimum, and maximum value of male bandicoot's body and carcass weight

Variables	Mean ±SD	Minimum	Maximum
Body weight (g)	1,583.03±513.66	450	2510
Carcass weight (g)	1,214.95±432.33	174.5	2000

Table 2. The mean, minimum, and maximum value of estimator variables in male bandicoot

Estimator variables	Mean ±SD	Minimum	Maximum
Body length (cm)	23.97±3.48	14	29
Hind legs length (cm)	7.14±1.00	5	9
Tail length (cm)	7.77±1.52	4	10
Heart girth (cm)	24.11±4.10	13.50	31
Cannon girth (cm)	5.30±0.99	3.00	7.50

Table 3. Pearson's two-tailed analysis

Estimator variables	Coefficient of correlation	
	Body weight (kg)	Carcass weight (kg)
Body length (cm)	0.849**	0.852**
Hind legs length (cm)	0.754**	0.753**
Tail length (cm)	0.348^{ns}	0.325^{ns}
Chest girth (cm)	0.911**	0.895**
Cannon girth (cm)	0.594**	0.585**

Description: *sig<0.05; ** sig<0.01; ^{ns} *sig>0.05.*

Table 4. Regression formula of estimator variables to the body and carcass weight

Regression formula	Coefficient of determination
Y_1= -1367,355+33.912X_1+7.095X_2+89.745X_4-14.494X_5	0.815
Y_2= -1282.170+40.113X_1+7.666X_2+66.750X_4-24.231X_5	0.794

Y_1: body weight; Y_2: carcass weight; X_1: body length; X_2: hind legs length; X_4: heart girth; X_5: cannon girth

only tail length variable (r = 0.348 and 0.325) had a low correlation (P>0.05) to the body and carcass weight. Moreover, the heart girth (r = 0.911 and 0.895), body length (r = 0.849 and 0.852), hind legs length (r = 0.754 and 0.753), and cannon circumference (r = 0.594 and 0.585) had a significant correlation (P<0.01) to the body and carcass weight. Warsono (2009) stated that most body parts of Kalubu bandicoot had a significant correlation (P<0.01) to its body weight, on, in other words, the bigger those body parts would result in higher body weight of bandicoot. The body size of Kalubu bandicoot thus had a significant correlation with the body and carcass weight of the bandicoot.

Regression analysis of estimator variables on the body and carcass weight of male bandicoot

The regression analysis resulted in four estimator variables that can be used in the regression model, which were body length, hind legs length, heart girth, and cannon circumference. The regression formula and the coefficient of determination of estimator variables to the body and carcass weight are presented in Table 4. The regression model used four independent variables, which were body length (X_1), hind legs length (X_2), heart girth (X_4), and cannon circumference (X_5), had a coefficient of determination at 0.815. The total body weight (Y_1) variance as much as 81.5% can be determined by the linear model, while the rest of 18.5% was determined by other factors not accounted in the model.

The carcass weight regression formula used four variables, which were body length (X_1), hind legs length (X_2), heart girth (X_4), and cannon circumference (X_5), had a coefficient of determination at 0.794. The total carcass weight (Y_2) variance as much as 79.4% can be determined with the linear model, while the rest of 20.6% was determined by other factors not accounted in the model.

Conclusions

The research concludes that there were 4 variables that can be used for body and carcass weight estimator of male bandicoot, which are body length, hind legs length, heart girth, and cannon girth with the coefficient of determination at 0.815 for body weight and 0.794 for carcass weight. The best estimator variable for body and carcass weight is the heart girth.

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