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Characteristics of Hard Antler (Trophy) of Male Rusa Timor (*Cervus timorensis* Blainville, 1822)

(*KARAKTERISTIK RANGGAH KERAS (TROPI) RUSA TIMOR JANTAN (CERVUS TIMORENSIS BLAINVILLE, 1822*)

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ABSTRACT

Antler shape played a more important role in group dominance than body size. Until recently there was no available information on the morphometric size of antlers from native Indonesian deer in Manokwari, West Papua, Indonesia. This study was aimed to determine whether the morphometric size of left and right hard antlers differs in Timor deer from the Bird's Head Peninsula of Papua Island; to assess whether morphometric measurements of hard antlers can serve as indicators of the distribution area of Timor deer in the region; and to evaluate whether other morphometric variables can reliably estimate hard antler length. This study employed a descriptive method, utilizing census techniques and direct observation of the antler owners in Manokwari Regency. A purposive sampling method is used in this study. Most of the antler's collections originally from Teluk Wondama and Tambrauw regencies (six each), Teluk Bintuni and South Manokwari regencies (three each), Fakfak and Raja Ampat regencies (one each). The results of analysis indicate that the observed variables, based on morphometry values between left and right side of antlers from different areas of origin in this study, were almost symmetric and not significantly different. Similarities among variables measured (antler of length, length of first branch, length of second branch, length of the tip of main antler, antler diameter, main antler tip range, range of the second antler tip, range of the first antler tip, angle of the first branch), cannot be used as an indicator of the distribution of this sub-species in the Bird's Head Peninsula of Papua.

Keyword: Deer; Buck; Trophy; Papua; Manokwari

ABSTRAK

Bentuk tanduk memainkan peran yang lebih penting dalam dominasi kelompok daripada ukuran tubuh. Hingga saat ini, belum ada informasi yang tersedia mengenai ukuran morfometrik tanduk rusa asli Indonesia di Manokwari, Papua Barat, Indonesia. Tujuan dari penelitian ini adalah: untuk menentukan apakah ukuran morfometri tanduk keras kiri dan kanan berbeda pada rusa timor yang hidup di Semenanjung Kepala Burung Pulau Papua; untuk menilai apakah pengukuran morfometri tanduk keras dapat berfungsi sebagai indikator daerah distribusi rusa timor di wilayah tersebut; dan untuk mengevaluasi apakah variabel morfometri lainnya dapat secara andal memperkirakan panjang tanduk keras. Penelitian ini menggunakan metode deskriptif, memanfaatkan teknik sensus dan observasi langsung terhadap pemilik tanduk rusa di Kabupaten Manokwari. Metode pengambilan sampel purposif digunakan dalam penelitian ini. Sebagian besar koleksi tanduk rusa berasal dari Kabupaten Teluk Wondama dan Tambrauw (masing-masing enam), Kabupaten Teluk Bintuni dan Manokwari Selatan (masing-masing tiga), Kabupaten Fakfak dan Raja Ampat (masing-masing satu). Hasil analisis menunjukkan bahwa variabel yang diamati, berdasarkan nilai morfometri antara sisi kiri dan kanan tanduk dari berbagai daerah asal dalam penelitian ini, hampir simetris dan tidak berbeda nyata. Kesamaan antar variabel yang diukur (panjang tanduk, panjang cabang pertama, panjang cabang kedua, panjang ujung tanduk utama, diameter tanduk, kisaran ujung tanduk utama, kisaran ujung tanduk kedua, kisaran ujung tanduk pertama, sudut cabang pertama), tidak dapat digunakan sebagai indikator distribusi subspesies ini di Semenanjung Kepala Burung Pulau Papua.

Kata-kata kunci: rusa; jantan;, trofi; Papua; Manokwari

INTRODUCTION

Deer are native Indonesian wildlife and were one of the most recently domesticated wild animals in the 20th century, and have broad prospects for development. At first, deer were animals whose habitat was found in the wild, but now the government has taken steps to protect them by establishing their status as wild animals that can be domesticated through the Decree of the Indonsian Minister of Agriculture No. 362/KPTS/TN/12/V/1990 on May 20, 1990. Rusa deer was first introduced to Papua (previously known as Irian Jaya) by the Dutch in 1928, specifically Merauke and Manokwari. During the Dutch colonial period, many of the deer were distributed into several islands in Indonesia including Papua (Semiadi and Nugraha, 2004). Since then, the deer species has grown rapidly and spread throughout all parts of Indonesia New Guinea.

Most commonly deer male's species are hunted, because hunters searched for large and hard antlers for display purposes (tropia). Deer antlers are unique mammalian organs (Goss, 1983). According to Li and Suttie (2012), antlers are regarded as desirable trophies by animal enthusiasts, valued as impressive head ornaments. In traditional Chinese medicine, Oriental practitioners view them as important ingredients. Biologists, consider antlers to be zoological curiosities and a valuable biomedical model.

According to the antler characteristics, most young antlers (velvet) are used as a basic ingredient for medicine in China, while the hard ones (trophy) usually used for decorations (Dradjat, 2000). Male deer have relatively large, slender, long and branched antlers (Schroder, 1976; Thohari *et al*., 2011). The shape of the antler tends to follow its natural habitat. In animal sociology, this indicates that the antler serves as a symbol of social status for males during the mating season, addition to its function as a fighting tool. The results showed that antler

shape played a more important role in group dominance than body size (Semiadi, 1997).

In-depth genetic observations reveal that antler shapes and sizes can be characterized as hybrid interspecific conditions, distinct from interspecific conditions. Semiadi (1997), used an antler characteristic approach, to distinguish five sub-species of Timor deer: *Cervus timorensis floresiensis, C. t. macassaricus, C. t. timorensis, C. t. moluccensis* and *C. t. rusa* deer. The study found that antler characteristics can be used as a special identifier of the *C. timorensis* deer sub-species group compared to the four other sub-species groups.

Until recently, no information was available regarding the morphometric size of antlers from native Indonesian deer in Manokwari. Additionally, understanding about specific antler characteristics that might distinguish *C. timorensis* Blainville, 1822 deer from different areas in the Bird's Head Peninsula of Papua remains limited.

This study was aimed to determine whether the morphometric size of left and right hard antlers differs in Timor deer from the Bird's Head Peninsula (1); to assess whether morphometric measurements of hard antlers can serve as indicators of the distribution area of Timor deer in the region (2); and to evaluate whether other morphometric variables can reliably estimate hard antler length (3).

RESEARCH METHODS

Place and Time of the Study

This study was conducted in Manokwari, West Papua Province, from April to May 2022. Fourteen respondents who owned hard antlers of *Cervus timorensis* were interviewed. Twenty of the six-branched antlers from the respondents were measured and documented to collect all relevant data required for this research. Three respondents possessed more than one antler. A tape measure, caliper and protractor were used to measure antler length, span, diameter and branch angles. Stationery and camera were used to document the procedures.

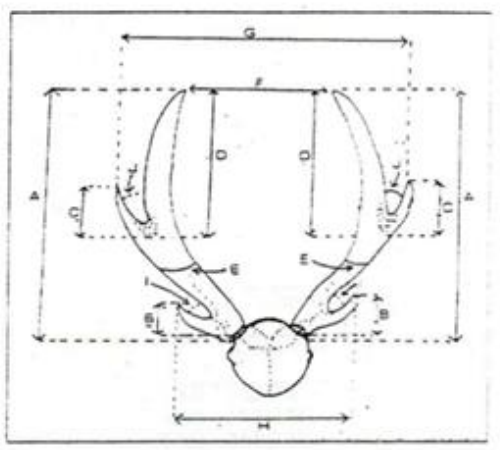

Figure 1. Figure 1. Antler parameter measurement diagram and its descriptions (Semiadi, 1997)

Note: A= antler length; B= length of the first branch; C= length of the second branch; D= length of the tip of main antler; E= antler diameter; F= main antler tip range; G= range of the second antler tip; H= range of the first antler tip; I= Angle of the first branch; J= Angle of the first branch.

Methods

This study employed a descriptive method, utilizing census techniques and direct observation of the antler owners in Manokwari Regency. A purposive sampling method is used in this study. Sampling was carried out to identify the owner of the antlers. We collect information on 14 respondent's identities and interests in collecting antlers. Antlers characteristics (left and right antlers) were measured using the methods described by Semiadi (1997), see Figure 1 for a description. Data characteristics of respondents analyzed using descriptive statistics, univariate variance analysis to analyzed similarity of morphometric hard antler (left-right) of Rusa Timor, and multiple variance analysis to analyzed correlation and regression of morphometric hard antler of Rusa Timor. Data were analyzed using SPSS Program (2021), based on the number of components measured. Based on Figure 1., the measurement of the antlers are as follow: A - the length of antler is measured from the base where it grows to the tip of the longest antlers; B - The length of the first branch fork is measured from the base where it

grows to the tip, C - The length of the second branch tine is measured from the base of the second branch tine and the main tine to the tip of the second branch, D - The length of the main branch from the base of the second branch and the main branch to the tip of the main branch, E - The diameter of the branch is the circle of the branch located between the end of the first branch, the base of the second branch, and the main branch, F - The main tine spread is the distance between the left and right main tine tips, G - The second tine span is the distance between the left and right tips of the second tine, H - The first tine span is the distance between the left and right tips of the first tine, I - The first branch angle is the angle formed between the first and second branches, J - The second branch angle is the angle formed between the second branch and the main stem.

RESULTS AND DISCUSSION

Respondent Identity

The composition of respondents by ethnic group is presented in Figure 2, with most coming from Biak. The research region near the Manokwari seashore is predominantly inhabited by the Biak ethnic group. Only one respondent was female; the rest were males. This suggests that collecting antlers is predominately a male hobby. Respondent's education levels varied 55% held a bachelor's degree, five had senior high school education, two had a junior high school education and one had elementary education. Collecting hard antlers is a common practice across all age groups and ethnic backgrounds. Respondents' length of antler ownership varied from 1-7 years, with some owning antlers for over 10 years. This suggests people value antler ownership highly.

Distribution Areas of Deer Antlers

Deer antlers are often used as decorative well displays. People from diverse backgrounds, such as ordinary infividuals, collectors, and the elite, collect hard antlers. The main factors for displaying trophies include hobbies, art, trophies and pride.

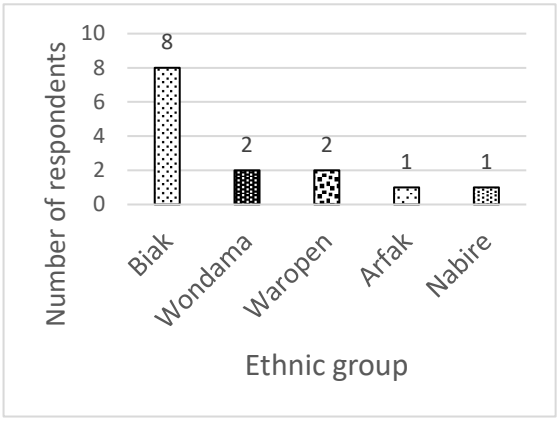

Figure 2. The ethnic composition of respondents

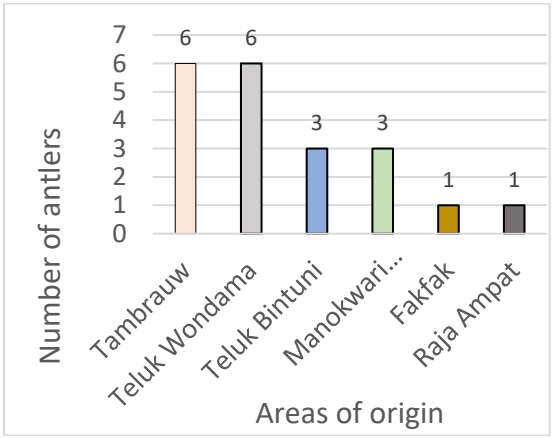

Figure 3. Distribution of the antler's areas of origin

Respondents often collect trophies as home decorations (art). Antlers were obtained as gifts from friends and relatives from hunting or purchased from hunters. One respondent used antlers for making smoking pipes. Antlers were cut, carved and polished to create attractive pipes for sale. Three respondents collected more than one antler, with collections 4, 3 and 2 antlers each. Respondents possessing many sets of antlers typically acquire them as a pastime. Interview results indicate that surplus antlers are often sold if there is a buyer interested. The total number of antlers measured was 20. Figure 3 shows their distribution by area of origin.

Most of the antler's collections originally from Teluk Wondama and Tambrauw regencies (six each), followed by Teluk Bintuni and South Manokwari regencies had

three antlers each. Fakfak and Raja Ampat regencies had only one each. Our findings also reveal the distribution of Timor deer in the Bird's Head Peninsula, which is actually scattered across various regions.

Figure 4. Timor deer antler measurements

Based on the antlers collected by the respondents, the distribution of Timor deer *Cervus timorensis* is found in areas which previously mentioned. Rahayu *et al.* (2022), found that Rusa deer are hunted as game animals in the Rumberpon District of Teluk Wondama. Pattiselanno and Mambai (2015), found that Rusa deer are also hunted in Tambrauw to support local livelihoods. In Manokwari Regency, those who raised Rusa deer in captivity as a hobby, obtained the animals from Teluk Bintuni (Pattiselanno *et al*., 2008). Iyai *et al.* (2020) have proven that the Rusa deer is the most hunted prey by residents of Pasir Putih in Fakfak. Thus, this study in line with previous studies carried out in the Bird's Head Peninsula, Indonesia New Guinea.

The Measurement of Antlers

The average antler measurements (Figure 4), based on the observed variables, are presented in Table 1. The results of analysis indicate that the observed variables, based on the morphometry values between left and right side of antlers – from different areas of origin in this study, were almost symmetric and not significantly different.

The morphometric characteristics of hard antlers (Table 1) were similar (>0,05). Similarities among variables measured (A–I), indicate that none of the variables measured in this study cannot be used as specific indicators of the distribution of Timor deer based on the area of origin observed in this study. All antlers from different areas owned by the respondents exhibit similar characteristics and do not possess unique characteristics specific to their areas of origin.

That relative antler size reflects the genetic quality of the stag, and females mate preferentially with males possessing relatively large antlers (Clutton-Brock, 1982). A comparison between species reveals a positive allometric relationship between antler size and body size in deer (Gould, 1974). Species with a small body size have small, simple antlers, while those with a large body size have proportionally larger multi-branched antlers. This aligns with Ullrey (1982),

Table 1. The morphometry of the hard antlers of Rusa timor (*Cervus timor timorensis*) on the observed variables

	n	Morphometry of the hard antlers Rusa Timor (*C.t.timorensis*)									
		A	B	C	D	E	F	G	H	I	J
Min	20	28,30	3,45	1,20	6,55	2,05	18,30	25,30	12,30	50,80	40,30
Max	20	61,20	26,20	29,90	47,60	3,45	56,60	71,50	42,80	85,45	75,15
Ave*	20	43,34[a]	16,50[a]	16,04[a]	22,22[a]	2,77[a]	34,00	46,06	28,37	66,14[a]	58,90[a]
SD	20	10,64	5,65	7,44	10,60	0,42	9,88	12,15	6,96	9,31	8,70

Note: A= antler of length, B= length of first branch, C= length of second branch, D= length of the tip of main antler, E= antler diameter, F= main antler tip range, G= range of the second antler tip, H= range of the first antler tip, I= angle of the first branch, J= angle of the second branch. *Superscripts indicated the T-test between left and right antlers are not different (F, G, H has single data)

Table 2. F-test analysis of hard antlers (*Cervus timorensis timorensis*)

F-test	Morphometry of the hard antlers Rusa Timor (*C.t. timorensis*)									
	A	B	C	D	E	F	G	H	I	J
Homogenocity	0,280	0,732	0,323	0,519	0,928	0,878	0,613	0,926	0,338	0,720
Significancy	0,161	0,442	0,606	0,412	0,388	0,634	0,821	0,975	0,812	0,593

Note: A= antler of length, B= length of first branch, C= length of second branch, D= length of the tip of main antler, E= antler diameter, F= main antler tip range, G= range of the second antler tip, H= range of the first antler tip, I= angle of the first branch, J= angle of the second branch

Table 3. Multiple Correlation Analysis of the hard antlers of Rusa Timor (*Cervus timorensis timorensis*)

Analysis	Morphometric of Hard Antlers of Rusa Timor (*C.t. timorensis*)								
		B	C	D	E	F	G	H	I	J
Correlation	A	0,775	0,813	0,927	0,867	0,664	0,776	0,653	0,233	0,335
Significancy		0,000	0,000	0,000	0,000	0,001	0,000	0,001	0,161	0,075
Regression	12,68	+0,82	-0,22	+0,75	+6,59	+0,08	+0,03	-0,65		

Note: A= antler of length, B= length of first branch, C= length of second branch, D= length of the tip of main antler, E= antler diameter, F= main antler tip range, G= range of the second antler tip, H= range of the first antler tip, I= angle of the first branch, J= angle of the second branch

Landete-Castillejos *et al*. (2019), who explained that body weight and food availability affect antler size and mineral composition. Nutrition also affects casting date and length of growth period. Age also influences antler casting date in cervids, such that older males cast earlier than younger ones (Reimers *et al.*, 2013).

An F-test (Table 2) was further performed to examine the morphometric data on hard antlers of deer *C. t. timorensis* collected from different parts of Papua. The results show that although the hard antlers were collected from different sites in Papua, the morphometric characteristic were similar, and did not exhibit any differences.

Semiadi (1997), using the same approach, as a differentiating indicator in five groups of Timor deer subspecies, namely: *C. t. floresiensis, C. t. macassaricus, C. t. timorensis, C. t. moluccensis* and *C. t. rusa*. According to the study, it was also demonstrated that *C. t. rusa* from Java Island exhibited distinct architectural morphometry compared to other subspecies, with 76% of antlers being longer than those of other subspecies. Approaches used by Semiadi (1997) can only be used to differentiate rusa deer according to sub-species groups, but not within subspecies based on their areas of distribution in the Bird's Head Peninsula. According to Bubenik and Konig (1985), the

length and angle of the antler branches in deer are probably under the control of a mechanism that is closely related to the structure and texture of the local environment. Several recent studies of red deer have demonstrated associations between some measures of antler size or weight and estimates of fighting ability or dominance, even after accounting for age effects (Clutton-Brock, 1982). The formidable size and complexity of antlers are a powerful system for studying how visual symbols can impact on animals' social ranking status (Li and Suttie, 2012). We further employ a multiple-correlation analysis to examine whether the length of hard antler (A), had a correlation with the other variables (B – J). The results are presented in Table 3.

There is a correlation between the length of antler (A), and other variables B-H (< 0.05), but not with I and J (> 0.05). This indicates that as variable A changes (e.g., antlers get longer), the variables B through H also tend to change in a predictable way (either increasing or decreasing together). However, this change does not occur with variable I and J. Further to this analysis, we employ the multiple linear regression analysis to obtain the linear equation as follows: Y = 12,680 + 0,824B - 0,218C + 0,751D + 6,594E + 0,078F + 0,033G - 0,653H. This linear regression equation has a coefficient of determination (R2) of 93.3%, with the results of the F-Test being significant at $p < 0.000$. This indicates that the equation can be used to estimate the length of A based on the B= length of first branch, C= length of second branch, D= length of the tip of main antler, E= antler diameter, F= main antler tip range, G= range of the second antler tip, H= range of the first antler tip values.

CONCLUSION

It can be concluded that all morphometric size variables of antlers, based on the area of origin, are similar. Characteristic variables of the deer *C. t. timorensis* antlers used in this study cannot be used as an indicator of the distribution of this subspecies in the Bird's Head Peninsula of Indonesia New Guinea.

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