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The feed plants species of Cuscus *Phalanger orientalis* in Yamna Island, Sarmi Regency

Diana Sawen ¹ and Anton S Sinery ^{2,*}

¹ Department of Animal Husbandry, the Faculty of Animal Husbandry, University of Papua Manokwari West Papua, Indonesia.

² Environmental Research Center of Papua University, Indonesia.

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Abstract

This research study was to determine the species of feed consumed by cuscus *Phalanger orientalis* in Yamna Island of Sarmi Regency. The study was conducted on the Yamna Island for one month. The method used was descriptive method with field observations and interviews. The results showed that, the species of feed from *Phalanger orientalis* on the Yamna Island was very diverse and varied, where there were 25 species of feed derived from 20 vegetation species of forest and five (5) species of agricultural crops. Vegetation parts were consumed mostly in the form of shoots, flowers, ripe fruit, ripe seeds and juice.

Keywords: Vegetation; Species of feed; *Phalanger orientalis*; Yamna Island

1. Introduction

Papua had diverse biological resources, one of which was wild animals, such as mammals, avian, amphibians and reptiles. These animals had long been used by communities for generations to meet the needs of daily life, especially in meeting the needs of protein. Yamna island was a part of Papua that was administratively included in the Sarmi Regency [3] was also rich in wildlife potential, including cuscus, monitor lizards, snakes, canary crabs and bats and various species of birds such as hornbills, storks and crow [7;19]. Wildlife in the region was always used by some residents as a source of food. One of the species of animals that were utilized in the area were cuscus which were marsupial (Marsupial), nocturnal (active at night), long strong tailed (pre-hensil) and belong to the family Phalangeridae [12;13;5]. This animal was well developed because the forests on Yamna Island still provide sufficient feed, even though some forests had been converted to expand settlements and agricultural areas.

Seeing the development that was currently also directed to the island of Yamna to open and reach the isolation of the area, it was certain that part of the forest would be converted for expansion of development. Especially in the era of autonomy now the region was given the authority to regulate its own natural resources so it was feared that land clearing activities for human activities would also increase. It was generally known that cuscus was an arboreal animal where this animal prefers to live in trees in the forest and some of its life activities such as foraging, reproduction and play were carried out in the forest. The forest which was composed mainly of vegetation or trees was the main food source of cuscus [4]. Parts of vegetation that were the main feed of cuscus were young leaves, flowers, fruit and tree bark. Seeing the enormous role of forests in the survival of these animals, it was clear that if the forest continues to be cleared, the living habitat of these animals would also be disturbed [1;24].

Currently cuscus was categorized in Appendix II of the Convention on International Trade in Endangered Flora and Fauna Species (CITES) [2], meaning that if pressure on the habitat received by these animals could not be controlled, these animals would be threatened with extinction. Efforts to control the pressure on the preservation of these animals

* Corresponding author: Anton S Sinery E-mail: anton_sineri@yahoo.com; HP, +6285244308802

and their species of food was to maintain the habitat of the cuscus by taking into account the use of forests which were the original habitat of these animals or at least knowing the exact source of feed used by these animals so it would be very helpful if these animals would be well-nurtured in-situ or ex-situ.

East cuscus (*Phalanger orientalis*) was a species of cuscus found on Yamna Island [7]. Increasing pressure on the island due to increasing population, the inclusion of heavy equipment for logging company logging needs, making Yamna Island as a place to log logs from the East Coast land was felt. With the increase in population, their activities had also increased. The expansion of residential areas, agriculture and logging of firewood, boats and building materials were examples of human activities seen on this island. These activities greatly impact the reduction in vegetation which acts as a habitat or source of food for the eastern cuscus.

To avoid the loss of the eastern cuscus species of food found on this island, there needs to be efforts to preserve the species of vegetations that were used as a source of food. One effort to preserve the food source of the eastern cuscus on Yamna Island was by documenting the species of vegetation as feed consumed by these animals properly. Based on this reality, research related to documentation of vegetation species as feed and part of feed consumed by the eastern cuscus (*Phalanger orientalis*) on Yamna Island was carried out.

2. Material and methods

The research was carried out in Yamna Island, East Coast District, Sarmi Regency, for one month, while identification of feed species was carried out at Manokwariense Herbarium of the Papua Manokwari University Biodiversity Research Center (PPKH). The method used in this research was descriptive method with survey techniques with field observations and interviews. Data collection techniques in this study were carried out in three (3) ways, namely: (1) purposive interviews with people who knew the exact key person of the species of feed East cuscus (*Phalanger orientalis*), (2) accidental direct observation while cuscus was eating, (3) by taking the leftover food left behind. Respondents interviewed were taken as many as five people with the following criteria: knowing the species of cuscus food found in the area, having traditional cuscus hunting skills, permanent residents of Yamna Island, knowing cuscus food habitat and knowing the parts of vegetation eaten by cuscus. Variables observed were eastern cuscus species consisting of: name (botanical name, local name and common name species of feed), the part eaten (leaves, young shoots, fruit, flowers, seeds, and fruit skin) and growth distribution. The data obtained were analyzed descriptively and presented in tabular form.

3. Results and discussion

3.1. Eastern Cuscus Feed

Based on the results of interviews, direct observation and collection of leftover food left in its habitat found twenty-five (25) species of feed vegetation consumed by the eastern cuscus (*Phalanger orientalis*). These cuscus fodder species were grouped into two namely: the species of feed originating from forest vegetation and the species of feed originating from agricultural crops (Table 1).

Based on Table 1 found 25 species of East cuscus feed (*Phalanger orientalis*), consisting of 16 species of which were found during field observations, 15 species of them were also found based on the remaining leftover feed. When looked more specifically from the 25 species of feed the eastern cuscus 20 species were forest vegetation and 5 species were agricultural crops. 20 species of forest vegetation were obtained based on the results of interviews, 14 of which were found again in field observations and 11 of them were also found based on leftover food. Furthermore, five species of agricultural crops were obtained based on interviews, two of them were obtained based on direct observations and four of them were also found based on leftover food left behind.

Table 1 Species of vegetations as east cuscus feed (*Phalanger orientalis*) on Yamna Island

Name of Species		
Local	Latin	Indonesia
Wakey	<i>Callopylum inopphyllum</i>	Bintangur (1,3)
Taisi	<i>Terminalia cattapa</i>	Ketapang (1,2,3)
Berawe	<i>Ficus benjamina</i>	Beringin daun lebar (1,2,3)
Pakar	<i>Ficus sp.</i>	Buah roda (1,2,3)
Nyobom	<i>Morinda citrifolia</i>	Mengkudu (1,2)
Ifey	<i>Inocarvus vagiferus</i>	Gayang (1,2)
Benau	<i>Oktomeles sumtarna</i>	Benuang (1,2)
Dedarnya	<i>Myristica sp.</i>	Pala hutan (1,3)
Nyemsamo	<i>Eugenia sp.</i>	Jambu hutan / gora (1,2,3)
Tatatan	<i>Piper ciceba</i>	Siri hutan buah merah (1,2)
Birsyak	<i>Piper nigrum</i>	Siri hutan buah kuning (1,2)
Nanta	<i>Muntingia calabura</i>	Gersyen(1)
Turi	<i>Sesbania grandiflora</i>	Turi (1)
Atorauw	<i>Pandanus sp.</i>	Pandan hutan (1,3)
Karkalti	<i>Osmoxylon novaguinensis</i>	Gedi hutan (1,2,3)
Nembay	<i>Artocarpus sp.</i>	Sukun hutan (1,2)
Kadondong	<i>Spondias dulcis</i>	Kedondong hutan (1,3)
Morare	<i>Paraserienthes falcataria</i>	Sengon (1,2)
Netvavo	<i>Tetramales nudiflora</i>	Tetra (1,2,3)
Barwan	<i>Molothus sp.</i>	Malt (1,2,3)
Popaya	<i>Carica papaya</i>	Pepaya (1,2,3)
Pana	<i>Musa paradisiaca</i>	Pisang (1,3)
Kadondong	<i>Spondias domesticum</i>	Kendondong (1,3)
Coklat	<i>Theobroma cacao</i>	Kakao (1,3)
Niwen	<i>Cocos nucivera</i>	Kelapa (1,2)

Information : 1: Species found were based on interview results.

2: Species found were based on accidental direct observations.

3: Species found were based on leftover feed.

The species of vegetation that feed on the eastern cuscus on Yamna Island were very diverse. The diversity of this species of feed greatly supported the survival of cuscus, where if one of the vegetation species was not in a certain phase where the vegetation parts became feed, it could still be met from other vegetation species, so that the availability of cuscus food could be guaranteed continuously. There were seven species of feed vegetation found in each method of collecting data from key informants, field observations and leftover feed. These species consisted of one species of agricultural crop namely: papaya (*Carica papaya*) and six species of forest vegetation namely: *Terminalia cattapa*, wide leaf banyan (*Ficus benjamina*), fruit wheel (*Ficus sp.*), Gora (*Eugenia sp.*), Forest gedi (*Osmoxylon novaguinensis*) and malt (*Molothus sp.*). Variation of data obtained from the three methods of data collection occurred because at the time of the study there were several species of vegetation that were not in the same vegetative or generative growth phase, both flowering, fruiting and the emergence of new shoots/young shoots. Most of the feed of the eastern cuscus (*Phalanger orientalis*) found on Yamna Island comes from forest vegetations, this indicated that how important the role of the forest was for cuscus life, one of which was to guarantee availability of feed. Therefore forests need to be preserved and preserved in order to guarantee the

availability of sustainable feed. Some research results which also document the species of cuscus fodder vegetation in various regions, were presented in Table 2.

Table 2 Results of previous research on vegetation species as cuscus feed.

Source (Year)	Area (Location)	Number of Species	Note
Handayani, 2019 [12]	Manusela National Park Maluku Tengah Regency	44 species	Phalangeridae (<i>Phalanger orientalis</i> , <i>P. ursinus</i> , <i>Spiloglossus maculatus</i> , <i>P. vestitus</i>)
Nugraha, Mustari et al, 2017 [15]	Tanjung Peropa Wildlife Reserve Sulawesi Tenggara	80 species	Bear cuscus (<i>Ailurops ursinus</i>)
Sinery et al, 2016 [23]	Numfor Island, Biak Numfor Regency	17 species (forest vegetation)	<i>Spiloglossus maculatus</i>
Pattiselano et al, 2010 [16]	Hariti island, Distrik of Napan Weinami Nabire Regency	21 species (15 forest vegetation species and 6 agriculture plants species)	Phalangeridae
Sinery et al, 2012 [21]	Pegunungan Arfak Natural Reserve	16 Species (forest vegetation)	<i>P. orientalis</i> , <i>P. gymnotis</i> and <i>S. maculatus</i>)
Fatem and Sawen, 2007[9];Fatem et al, 2008[10].	Pantai Utara (Pantura) Manokwari	34 Species (28 forest vegetation Species and 6 agriculture plants species)	Phalangeridae
Sinery, 2006 [20]	Gunung Meja Tourism Park Manokwari Regency	26 Species (21 forest vegetation Species and 5 agriculture vegetation species)	<i>P. orientalis</i> , <i>S. maculatus</i>
Dahrudin et al, 2005 [6]	Biak Utara Natural Reserve	57 species	Phalangeridae
Farida et al, 2005 [8]	Gunung Mutis Natural Reserve	41 species	<i>Phalanger orientalis</i>

Based on the table above, it appears that each region had the potential to spread different or varied cuscus fodder species. However, [16] stated that there were species of foliage which feed these cuscus. Its distribution was evenly found in several places or locations that had been studied in Papua. Among them were the *Terminalia cattapa* species with *Pometia pinnata*, and also followed by *Intsia bijuga*, *Gnetum gnemon* with *Pandanus tectorius*. The comparison with the results of this study was presented in Table 3.

The results of this comparison also show that the distribution of cuscus fodder vegetation was different and some were evenly distributed in each location, both in Papua [7;16;20;9;21;22;23;6] and Central Maluku [12]. The same species of forage vegetation were *Ficus* sp (wheel fruit) and *Ficus benjamina*, only in Gunung Meja Tourism Park there were no such species. Then the other was the species of agricultural crops, including *Carica papaya* and *Musa paradisiaca*. While the same species of feed vegetations in the location of Manusela National Park, Central Maluku Regency with the results of this study were *Piper aduncum* (forest series) and *Paraserianthes falcataria* (sengon).

All of these results indicate that cuscus was classified as a herbivore, according to [11], which states that cuscus was classified as a herbivore marsupial animal that uses vegetation as food and was a leaf-eating or folivorous and frugifore [3]. Vegetation parts consumed include young leaves, young shoots / shoots, young fruit, ripe fruit and flowers.

Table 3 Comparison of Cuscus Fodder Species in Several Locations.

No	Species	Location						North Biak	Manusela
		Yamna	Hariti	Gunung Meja	Pantura Arfak	Ahe	Numfor		
1.	<i>Callophyllum inophyllum</i>	√			√	√	√		
2.	<i>Terninalia cattapa</i>	√	√	√	√	√	√	√	
3.	<i>Ficus benjamina</i>	√	√		√	√	√	√	√
4.	<i>Ficus sp.</i>	√	√	√	√	√	√	√	√
5.	<i>Morinda citrifolia</i>	√			√	√			
6.	<i>Inocarpus vagiferus</i>	√	√			√	√	√	
7.	<i>Oktomeles sumtarna</i>	√				√	√	√	
8.	<i>Myristica sp</i>	√	√	√		√	√	√	
9.	<i>Eugenia sp</i>	√			√				
10.	<i>Piper aduncum</i>	√					√	√	√
11.	<i>Piper nigrum</i>	√					√	√	
12.	<i>Muntingia calabura</i>	√			√	√	√	√	
13.	<i>Sesbania grandiflora</i>	√				√	√	√	
14.	<i>Cocos nucivera</i>	√	√					√	
15.	<i>Pandanus sp</i>	√	√		√				√
16.	<i>Osmoxylon novaguinensis</i>	√							
17.	<i>Artocarpus sp</i>	√				√	√	√	
18.	<i>Spondias dulcis</i>	√			√				√
19.	<i>Paraserienthes falcataria</i>	√							√
20.	<i>Tetramales nudiflora</i>	√				√	√	√	
21.	<i>Molothus sp</i>	√							
22.	<i>Carica papaya</i>	√	√	√	√				√
23.	<i>Musa paradisiaca</i>	√	√	√	√				√
24.	<i>Spondias domesticum</i>	√	√	√	√				
25.	<i>Theobroma cacao</i>	√			√				

3.2. Vegetation Parts Consumed

Not all parts of feed vegetation found on Yamna Island were consumed by eastern cuscus. Some parts of the vegetation that feed the cuscus were young shoots, flowers, young fruits, ripe fruit, seeds and fruit juice. Vegetation species and parts consumed were presented in Table 4.

Table 4 Species of feed vegetation and parts consumed.

No.	Vegetation Species Name			Consumed Parts
	Local	Indonesia	Latin	
1.	Wakey	Bintangur	<i>Callophyllum inopphyllum</i>	Flower, young fruit
2	Taisi	Ketapang	<i>Terminalia cattapa</i>	Young shoots, Ripe fruit, Flower
3	Berawe	Beringin daun lebar	<i>Ficus benjamina</i>	Ripe fruit
4	Pakar	Buah roda	<i>Ficus sp.</i>	Young shoots, Ripe fruit
5	Nyobom	Mengkudu	<i>Morinda citrifolia</i>	Ripe fruit
6	Ifey	Gayang	<i>Inocarpus vagiferus</i>	Young shoots
7	Benau	Benuang	<i>Oktomeles sumtarna</i>	Young shoots, Ripe fruit
8	Dedarnya	Pala hutan	<i>Myristica sp</i>	Ripe fruit
9	Nyemsamo	Jambu hutan/gora	<i>Eugenia sp</i>	Ripe fruit
10	Tatatan	Siri hutan buah merah	<i>Piper adendum</i>	Ripe fruit
11	Birsyak	Siri hutan buah kuning	<i>Piper nigrum</i>	Ripe fruit
12	Nanta	Gersyen	<i>Muntingia calabura</i>	Ripe fruit
13	Turi	Turi	<i>Sesbania grandiflora</i>	Flower, Young shoots
14	Niwen	Kelapa	<i>Cocos nucivera</i>	Young shoots, fruit flesh and water
15	Atorauw	Pandan hutan	<i>Pandanus sp</i>	Ripe fruit
16	Karkalti	Gedi hutan	<i>Osmoxylon novaguinensis</i>	Ripe fruit
17	Nembay	Sukun hutan	<i>Artocarpus sp</i>	Ripe seeds
18	Kadondong	Kedondong hutan	<i>Spondias dulcis</i>	Young shoots, Ripe fruit
19	Morare	Sengon	<i>Paraserienthes falcataria</i>	Young shoots, Flower
20	Netvavo	Tetra	<i>Tetramales nudiflora</i>	Young shoots, Ripe fruit
21	Barwan	Malt	<i>Molothus sp</i>	Young shoots, Ripe fruit
22	Popaya	Pepaya	<i>Carica papaya</i>	Flower, Ripe fruit
23	Pana	Pisang	<i>Musa paradisiaca</i>	Young shoots, Ripe fruit
24	Kadondong	Kedondong	<i>Spondias domesticum</i>	Ripe fruit, Flower, young shoots
25	Coklat	Kakao	<i>Theobroma cacao</i>	Young shoots, Ripe fruit

The parts of vegetation that were mostly consumed by eastern cuscus found on Yamna Island were young shoots, flowers, ripe fruits and there were 11 species of vegetations that were consumed in only one part, while others were consumed in more than one part. These results were in line with the results of previous studies from [16], forest vegetation consumed by cuscus on Hariti Nabire Island consist of 3 dominant families namely Moraceae (3 species), Fabaceae (2 species) and Pandanaceae (1 species) and vegetation parts consumed vary consisting of 43% fruit, 24% leaf and 33% combined leaf and fruit. As for agricultural crops, which were commonly consumed were fruit and leaves. This was also in line with research conducted in the Pantai Utara area of Manokwari by [9] and [10], where of 34 species of

forage vegetation found, 26 species were consumed and 6 other species were only consumed. Additionally it was reported by [6] in the North Biak Nature Reserve area that of the 57 species of feed vegetations found consumed by cuscus, most of the consumed parts were fruit, leaves and followed by flowers. Furthermore, the results of the research of [12], from 44 species of forest vegetation which were cuscus feed, generally consume vegetation parts in the form of young leaves 29 species (66%), fruit 26 species (59%), flowers 4 species (9%) and shoots 3 species (7%). [18], also stated that generally cuscus preferred fresh and tart fruits that were high in fiber and low in fat. Graphically it could be seen in Figure 1.

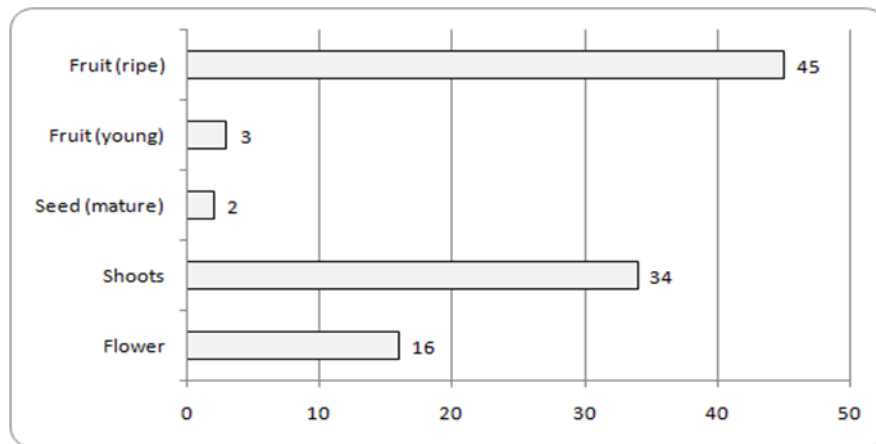


Figure 1 Percentage (%) of vegetation consumed by the cuscus

According to [25], the choice of feed species in marsupials was related to the morphological and histological structure of the gastrointestinal tract. And Hume (1999) in [12], also explained that some marsupials such as dasyurid had simple gastrointestinal tract and do not have appendicitis or caecum. This was the reason that in general cuscus prefers organs or parts of vegetations that were young as a source of food so that it was easily digested and absorbed in the digestive tract. Furthermore Hume (1982) in [12] also explained that the gastrointestinal tract in *Trichosurus vulpecula* (brush-tail possum) was in the form of a simple stomach and had colon which acts as a fermentation cavity. The same thing was also explained by [14;17], that generally cuscus prefers feed that contains a lot of fiber that could be obtained from fruits young shoots and flowers. Further explained that if the cuscus did not consume food that lacked fiber, usually these animals would suffer from inflammation of the intestine that could cause death. The results of research [11] and [13], also proven only certain parts of each species of vegetation consumed by the eastern cuscus, such as young shoots, flowers, fruit (fruit skin and contents), and bark. The diversity of parts consumed by the eastern cuscus, due to the preferences of the cuscus, vegetative and generative periods which also vary from each species of growth at a certain time.

4. Conclusion

Species of vegetations for feeding the eastern cuscus were found on Yamna Island, 25 species consisting of 20 species of forest vegetations, and five (5) species of agricultural vegetations. Eastern cuscus consumed more ripe fruit at 45% than young shoots at 34%, flowers at 16% and mature seeds at 2% and young fruits at 3%. Eastern cuscus vegetation species that had the most widespread distribution and were found in several locations, namely *Ficus sp.* Based on the species vegetations as a cuscus feeding to helping for the future aspect of wildlife conservation.

Compliance with ethical standards

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Disclosure of conflict of interest

The authors declare no conflicts of interest regarding the publication on this paper.

Statement of ethical approval

'The present research work does not contain any studies performed on animals/humans subjects by any of the authors'.

Statement of informed consent

"Informed consent was obtained from all individual participants included in the study."

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