

Population dynamics of cuscus in tourist island of Ahe, District of Nabire, Papua

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ABSTRACT

Sinery AS, Boer C, Farida WR. 2013. Population dynamics of cuscus in tourist island of Ahe, District of Nabire, Papua. *Biodiversitas* 14: 95-100. Cuscus is a pouched herbivorous mammal of the family *Phalangeridae* which is arboreal and nocturnal. The animals are protected by law because, in addition to having a low reproduction and limited distribution area, they face a very high level of hunting. Hunting in the wild by people is done not only in production forest areas but also in forest conservation areas such as recreational forest of Table Mountain, Arfak Mountains Nature Reserve, and other places. Directly or indirectly, the hunting affects the quality of the ecosystem in these areas, especially the cuscus population. Better management efforts are required in these areas to ensure the survival of many organisms in it, especially the cuscus. This study aimed to determine the cuscus population in Ahe Island, and the method applied was descriptive method using direct observation. The study was conducted in one month. The results demonstrate that cuscus in Ahe Island consisted of common spotted cuscus (*Spilogiscus maculatus*) and eastern cuscus (*Phalanger orientalis*). The number of individuals of *S. maculatus* was 24, consisting of 14 females and 10 males, whereas *P. orientalis* consisted of 2 individuals and both were males. The number of adult cuscus individuals was 16, while adolescents and children, were respectively 8 and 2. At least 10 plant species were identified as a source of feed for cuscus in Ahe Island recreation area. Plant parts consumed by cuscus were fruit and young leaves, but based on level of need, most of the cuscus consumed fresh fruit because of its sweet taste and high water content that helps the digestive process.

Key words: Ahe Island, cuscus populations, feed resources, Papua, plant species

INTRODUCTION

Cuscus, a pouched mammal (marsupials), is a herbivore which is arboreal and nocturnal. Menzies (1991), Flannery (1994), and Petocz (1994) mention that the distribution areas of cuscus include the islands of Indonesia (Papua, Sulawesi, Maluku and Timor Islands), Papua New Guinea (PNG), New Britain, Solomon Islands, Cape York, and Queensland Australia. In New Guinea (PNG and Papua) there are 11 species of the genus *Spilogiscus* (spotted cuscus) and genus *Phalanger* (unspotted cuscus). In Papua, there are 7 species of cuscus, namely common spotted cuscus (*Spilogiscus maculates*), spotted black cuscus (*S. rufoniger*), Waigeo cuscus (*S. papuensis*), cuscus Timor (*Phalanger orientalis*), ground cuscus (*P. gymnotis*), hair silk cuscus (*P. vestitus*) and hill forest cuscus (*P. permixtio*) (Menzies 1991; Petocz 1994; Aplin and Helgen 2008; Saragih et al. 2010).

All seven species of cuscus in Papua are protected by the decree of the Minister of Agriculture No. 247/KPTS/UM/4/1979 and Government Regulation No. 7 Year 1999 on the Preservation of Plants and Animals. Globally, cuscuses are listed in the Appendix II of the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES). Although there have been government rules issued to protect the cuscus, its implementation is still considered less effective and needs

to be improved (Sinery 2002; Sinery 2010).

Cuscus utilization for consumption and for other purposes in Papua nowadays is increasing. In addition, the cuscus fur is also used to make various ornaments like bags, hats, and for decoration in the customary fashion. Such utilization can affect the cuscus population (Ariantingsih 2000). The consumption of cuscus meat by local people shows an increasing trend. It can be seen from the number of hunting results which reaches 2-5 heads every hunting activity done at least once every month. Although it is generally done in areas with a high density of cuscus populations, hunting is still a serious threat to the existence of these animals. The condition is influenced by various factors, including lack of public awareness about the legal status of cuscus as protected animals according to both the national laws and local customs. This has implications for the pattern of utilization, which in turn affects the existence of wildlife such as cuscus. People in the islands of Numfor, Biak, Arui, Moor, Auki, Yoop, Napan, and Yapen tend to use cuscus for consumption, and so do the residents of mainland Papua in areas such as Arfak Mountains, Meja Mountain, Jayapura, Sarmi, Sorong, and a few other areas.

Ahe Island with an area of approximately 2.5 ha is one of the smallest islands in the island-chain of Mambor around Cenderawasih National Park. As one of the isolated

areas which are not inhabited, Ahe Island has good lowland forest formation dominated by *Ficus* sp., *Intsia* sp., *Syzygium* sp., *Linociera macrophylla*, *Morinda citrifolia*, and *Glochidion* sp., and the coastal vegetation dominated by *Terminalia* sp. and *Barringtonia* sp. Forests in the region spreads from the middle of the island to the shore surrounded by white sand beaches. The species of wildlife found on the island are green lizard (*Mabouya multifasciata*), Lizard (*Varanus* sp.), mambruk bird (*Goura* sp.), maleo bird (*Megapodius freycinet*), and cuscus (*Spilogiscus* and *Phalanger*). Other potential tourist attraction is the remains of Allied Forces aircraft relics in World War II largely been transferred to the mainland. The expanse of water adorned with coral reefs and a wealth of other biotas add to the beauty of this island.

At this time, Ahe Island is managed by society with coordination of the Agent of Tourism of Nabire District and the Government of Papua Province. Legally, the management of the tourist area of Ahe Island is done by CV Ahe (a private business) based on the decree of the Governor of Papua Province in 2007, and the operation began in 2009. Since its establishment, the management has successfully developed a variety of this island's potential with the main goal of improving the potential of tourism, education, and research through the provision of various facilities, such as accommodation, lighting, and facilities of recreation. To add value to the potential of this island, the management has introduced four species of wildlife: maleo bird, mambruk bird, lizards, and cuscus.

In 2007, a total of 7 species cuscus were introduced in Ahe Island, consisting of the species that are distinguished based on plumage characters, namely eastern cuscus (*Phalanger orientalis*) and common spotted cuscus (*Spilogiscus maculatus*). The current population is estimated to have increased, which can be seen from the number of juveniles. This condition is a positive thing in terms of the protection and conservation of cuscus. However it is necessary to consider the possibility that an increase in population will affect the carrying capacity of the island's cuscus habitat. Taking into account the very small size of the forest, it is necessary to carry out well-planned management to control cuscus populations and develop their habitats in this island. For this purpose it is necessary to study the cuscus population and its habitat conditions in Ahe Island.

This study aimed to determine the condition of cuscus population and habitat's carrying capacity based on the availability of cuscus feed. The results are expected to be sources of information and consideration for all parties in the wildlife management efforts, both *in situ* and *ex situ*, particularly for C.V. Ahe (a private business) in managing cuscus in Ahe Island in the future.

MATERIALS AND METHODS

The research was conducted on the island of Ahe, Mambor, Nabire District, Papua Province, Indonesia (Figure 1) and lasted for 1 month, i.e. in November 2012.

The method used in this research was descriptive method based on observations.

Taking into account the location of the study area of 2.5 ha and the solitary nature of the cuscus, data collection was done using census method by monitoring cuscus populations. To facilitate the process of data collection, the study site was divided by several transects or observation lines. Results of preliminary observations indicated that the distribution of cuscus in the research area was uniform so the Ahe Island's beach was used as a baseline. The transects were made parallel to the shoreline or cutting the contour lines. Furthermore, the baseline was divided into 5 transects perpendicular to north-south baseline. All transects were set proportionally, and the distance between transects was 50m. The length of the transects were 100m, 335m, 320m, 150m, and 120m, so that the total length of all transects was 1.025m while transect width was adjusted with minimal visibility (40m or 20m either side of the transect). According to Sinery (2010), the effective width of observation transect for dense forest types such as forest types in Arfak Mountains is 50m (25m either side of the transect) and we should use a narrower measure which is more effective in the observation of the population (Sinery 2009).

Monitoring of cuscus was performed simultaneously by 5 groups of 2 people (1 identifying and recording and 1 measuring the distance from objects to transect). Cuscus population monitoring was not accompanied by the capture (sampling), but if possible, limited capturing was done. Identification was done for each species using Flannery (1994, 1995). Data collected consisted of (i) primary data, i.e. data from field observations, and (ii) secondary data, i.e. data obtained from the relevant agencies. Primary data consisted of: species, cuscus descriptions, cuscus populations, type of feed and the general condition of cuscus habitat. Secondary data included data on climate and the general state of research locations obtained from the relevant authorities.

The data of cuscus morphological were analyzed using the tabulation and were used to identify the species of cuscus. The estimation of cuscus population density as the result of observation was carried out using the equation from Lewis (1994) as follows.

$$N = \frac{n(2n - 1)A}{2Lr}$$

N = population density,

n = number of individuals encountered,

A = area of region (plot observations),

L = length of line/transect,

r = distance from the point where cuscus found to the line of transect

Furthermore, the result analysis of population density was tabulated according to the structure and species composition. Structure and species composition included stratification by type of cuscus species, sex, and age.

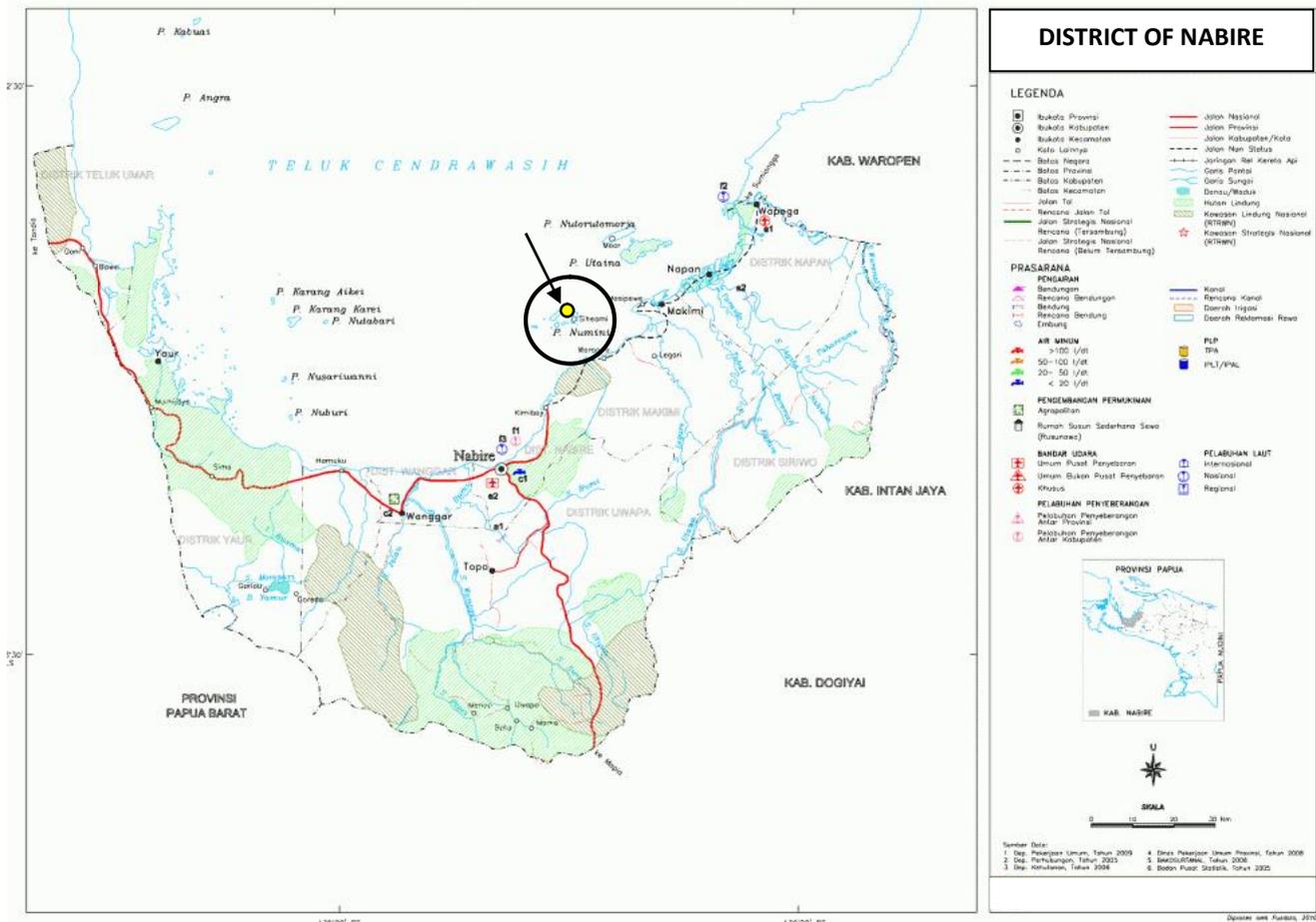


Figure 1. Study site in Ahe island, Mambor islands, Nabire District, Papua Province

RESULTS AND DISCUSSIONS

Composition of cuscus species

Monitoring results indicated that number of cuscus in the tourist region of Ahe Island was large enough, ie 26 individuals consisting of two species of cuscus, namely: *Spiloguscus maculatus* (common spotted cuscus) and *Phalanger orientalis* (eastern cuscus). Detailed description of the number of individuals, sex, and age class of cuscus by species is shown in the Table 1.

Table 1 above shows that of the 26 individuals cuscus encountered, 24 individuals were *Spiloguscus maculatus* (common spotted cuscus) with a population density of 9.6/ha while 2 others were *Phalanger orientalis* (eastern cuscus) with a population density of 0.8/ha. In quality, evenness individual cuscus by species in this area was low because the percentage of *Spiloguscus maculatus* was much higher (92.3%) than that of *Phalanger orientalis* (7.7%). Differences in the number of individuals of both species were affected by the low number of individuals introduced, especially *Phalanger orientalis*, in the early management of this area.

The results showed the highest average density was found in transect 2 with an average density of 3.56 individuals per square meter, followed by transect 3 with

an average density of 3.24 individuals per square meter, and transects 4 with an average density of 2.4 individuals per square meter.. There were 10 species of vegetation as sources of feed for cuscus in Ahe Island, namely *Ficus benjamina*, *Ficus microstoma*, *Ficus prolixa* (paka), *Ficus piscocarpa*, *Ficus infectoria*, *Merremia peltata*, *Pongamia pinnata*, *Intsia bijuga*, *Syzygium* sp, and *Cocos nucifera*. In general, the active time of cuscus in Ahe Island, which is the period cuscus starting out of the nest/hideout to return to rest or hide, was from 18:00 to 05:00 EIT (Eastern Indonesian Time). Cuscus was usually found in the conditions after raining and under the moonlight with an average air temperature of 23 °C and the average humidity of 82%, and in a region with an elevation of 2-12 m asl.

In Ahe Island *Spiloguscus maculatus* had higher gender equity than *Phalanger orientalis*. This species of cuscus at least had 7-10 pairs with the number of reproductive couples of approximately 7 pairs. It is quite good in terms of the survival of species and individuals, as the more reproductive couples there are the more likely mating occur, which in turn will produce offspring. However, this should not necessarily be a major factor in the forecast of cuscus species existence, due to the polygamy nature of cuscus that can change partners.

Table 1. Individuals density of cuscus by type

Species of cuscus	Number of individual (ni)	Sex		Class age (months)			Population density (individuals/ha)
		Male	Female	Adult (>8)	Adolescent (3-8)	Child (< 3)	
<i>Spiloglossus maculatus</i>	24	10	14	14	8	2	9.6
<i>Phalanger orientalis</i>	2	2	-	2	-	-	0.8
Total	26	12	14	16	8	2	10.4

Table 2. Population dynamics of cuscus in Ahe Island

Species of cuscus	First introduction (2007)	Last introduction (2008)	Monitoring result (2012)
<i>Spiloglossus maculatus</i>	5	9	22
<i>Phalanger orientalis</i>	2	-	2
Total	26	9	24

Table 3. List of plants as feed sources for cuscus in Ahe Island

Scientific name	Local name	Parts consumed	Quality of density
<i>Ficus benjamina</i> L.	Beringin daun lebar	Fruit	Many
<i>Ficus microstoma</i> Wall.	Beringin pantai	Shoots fruit	Moderate
<i>Ficus pisocarpa</i> Bl.	Beringin daun halus	Fruit	Little
<i>Ficus prolixa</i> G. Forst.	Makuku buah halus	Fruit	Little
<i>Ficus inferctoria</i> Roxb.	Makuku buah halus di daun	Fruit	Little
<i>Merremia peltata</i> (L) Merr.	Tali Wuraram	Shoots	Little
<i>Pongamia pinata</i> (L) Pierre	Kayu besi pantai	Shoots	Little
<i>Intsia bijuga</i> (Colebr.) Kuntze	Kayu besi hutan	Shoots	Little
<i>Syzygium</i> sp.	Jambu pantai merah	Fruit	Little
<i>Cocos nucifera</i> L.	Kelapa	Fruit (young)	Little

Data showed that *Spiloglossus maculatus* had equitable distribution of age classes, and dominance by adult age class was followed by adolescents age class and children age class, while *Phalanger orientalis* consisted of two individuals both at adult age class. Based on this condition it can be expected that ecologically *Spiloglossus maculatus* has a better survival chance in the future than *Phalanger orientalis*. It is based on the existence of male and female adults who will play a role in the regeneration of the species, and age class adolescents as candidates for adults age class, and then age class of children who will be the next adolescents age class.

Population dynamics

To find out the adaptation process of cuscus to the conditions of Ahe Island as its new habitat, the population dynamics of cuscus was carried out from the tabulation. Table 2 indicates that the dynamics of cuscus population is not too big in the tourist area of Ahe Island. Such changes are progressive or increasing, particularly in *Spiloglossus maculatus*. An increasing number of individuals of this type can be seen from the existence of new individuals in children class age which showed the birth rate (birthrate). In contrast, no increase occurs in *Phalanger orientalis* individuals because it does not have the type of female individual as discussed previously.

Naturally, cuscus has a fairly low rate of reproduction, namely one child in each reproductive period with an average frequency of reproduction of once a year. According to Sinery (2002, 2010), the average number of offspring generated in each time of reproductive period is one. Petocz (1994) mentions that cuscus has a low rate of reproduction, so it is estimated that its population in the wild is quite low. When connected to the existing number of reproductive couples of cuscus (7 pairs), then cuscus in the region, particularly *Spiloglossus maculatus*, is quite productive, ie 7-8 children in the 3-year period (2007-2012). This suggests that this species of cuscus can adapt to the habitat conditions in Ahe Island although it has not yet reached the level of normal reproduction rate.

The conditions are certainly influenced by many factors, both internal factors and external factors. Internal factors are factors derived from these animals which include hormones and genes. Both factors can not be predicted quantitatively and affect cuscus in relation to its reproduction, but in general each cuscus has the ability to reproduce more than once in a year with the number of offspring can reach four heads. The number of offspring is greatly affected by reproductive condition of the parent, the availability of food, and other conditions. An adult female cuscus generally produces more than one offspring and can even reach four offspring with a pregnancy period of 20 to

42 days. Not all offspring can be raised by the parent. Usually a female can raise only one offspring until it is able to feed itself.

External factors or contributing factors are the physical and biotic factors which directly influence the reproduction of cuscus such as vegetation (food, shelter, and activity), the availability of space (home range and territory area) and human activity. According to Alikodra (1990), habitat is an area consisting of both physical and biological components that are used as a place to live as well as breeding ground for wildlife.

In general, the conditions of Ahe Island such as landscape, weather conditions, and vegetation are not varied, so it is expected to affect the cuscus breeding in the island. The measurement results showed that the elevation of the island ranges from 1 to 12 m asl. with an average air temperature of 27 °C and an average relative humidity of 82%. The weather factors do not significantly affect the cuscus while the topography was considered giving quite an effect on the distribution of vegetation that directly affect the variation of cuscus' feed types. These types of feed that are generally the vegetations of coastal forests and lowland forests are listed in Table 3. This table shows that cuscus lives on the type of leafy forest vegetation such as *Pometia* sp., *Myristica* sp., *Ficus* sp., *Intsia* sp., and liana species commonly encountered in primary forest and secondary forest.

Habitat components consist of the physical and biotic components, forming a system that controls wildlife. Physical factors include water, climate, soil, and topography, whereas biological factors include vegetation and other wildlife. Feed, water, shelter, human activities, nature events and other wildlife greatly affect the existence of wildlife (Alikodra, 1989). Cuscus is a nocturnal mammal that is active (foraging, mating and playing) at night. In general, the active time cuscus in Ahe Island, starting from the cuscus out of the nest to return to the nest to rest or hide, is from 18:00 to 05:00 EIT (Eastern Indonesian Time).

Cuscus is usually found in the conditions after raining and when the moon shines brightly with average air temperature of 23° C and average humidity of 82%. On conditions after the rain, cuscus does its foraging by utilizing part of the new vegetation growth/shoots and other activities. In addition, when moon shines brightly, cuscus uses moonlight to look for sources of feed and to find and determine partner. Cuscus is active at night and rest during the day in the grove of trees, holes in the ground, or in a rock crevice. Sometimes this animal rests (sleeps), bends over and hugs branches or tree trunks which are not dense or open (Flannery 1994). The results showed that cuscus is generally found in locations with an altitude of 2-12 m asl. Ahe Island conditions are in accordance with the opinion of Flannery (1994) that the cuscus spread in the area with altitude of 0 to 2,900 m asl., especially in wooded areas.

According to Warmetan (2004), trees such as *Intsia* sp., *Lithocarpus* sp., *Ficus* sp., *Pterocarpus indica* and *Macaranga* sp. are used by cuscus as nesting places (sleeping places). The species of feed consumed by cuscus in Ahe Island include forest vegetation and plantation crops

such as *Ficus benjamina*, *Ficus microstoma wall*, *Ficus pisocarpa* BI, *Ficus prolixa*, *Ficus infectoria* Roxb, *Merremia peltata*, *Pongamia pinnata*, *Intsia bijuga*, *Syzygium* sp, *Cocos nucifera*. Parts of the plant widely consumed by cuscus are fruit (mature) and young leaves (shoots or buds). As stated by Kocu (2006), parts of the feed consumed by cuscus are flowers, young fruit, ripe fruit, young shoots and young leaves. The comparison between the parts of plants that are consumed shows that cuscus eat more ripe fruit, because the ripe fruit physiologically has a sweet flavor with a high water content so it is easy to digest.

CONCLUSIONS

There were 26 individual cuscuses in Ahe Island consisting of 24 common spotted cuscuses (*Spiloglossus maculatus*) and 2 timor cuscuses (*Phalanger orientalis*), 12 males and 14 females. As many as, 14 individuals were adult, 8 adolescent, and 2 juvenile. There was a progressive population dynamics in cuscus of Ahe Island, although it is limited only to the common spotted cuscus (*Spiloglossus maculatus*) because of the balance of reproductive couples, while the *Phalanger orientalis* was not experiencing dynamics. There were 10 species of trees as sources of feed for cuscus in Ahe Island including forest vegetation and plantation crops such as *Ficus benjamina*, *Ficus microstoma*, *Ficus pisocarpa*, *Ficus paka*, *Ficus infectoria*, *Merremia peltata*, *Pongamia pinnata*, *Intsia bijuga*, *Syzygium* sp., and *Cocos nucifera*. In general, the active time of cuscus in Ahe Island was from 18:00 to 05:00 EIT (Eastern Indonesian Time), the period since these animals began to move until he returned to rest or hide. Cuscus was usually found in the conditions after raining and when the moon shines brightly, with an average air temperature of 23°C and an average humidity of 82%, and with altitude of 2-12 m asl.

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