

Tree Kangaroos (*Dendrolagus* sp.) of Papua: Characteristics and Conservation

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Abstract. Tree kangaroos (*Dendrolagus* sp.) are an endemic mammal species in the Papua region. Tree kangaroos are vulnerable to threats, both from habitat conditions (forest destruction, illegal logging) and predators and hunting. Meanwhile, according to the IUCN, its conservation status is in crisis category. The purpose of this paper is to inform the public about the characteristics, behavior, and conservation of tree kangaroos (*Dendrolagus* sp.) in Papua. It is hoped that over time this information can motivate indigenous Papuans to increasingly care and love tree kangaroos, so that they continue to exist and sustain their regeneration in the tropical rainforests of Papua. Writing using the literature review method. The results of the writing explain that tree kangaroos have several characteristics, including: having a body weight of no more than 6-20 kg, even some are very small, weighing 3 kg. Tree kangaroos tend to live in groups with one dominant male. This marsupial has a white to yellowish face, the same as the neck to the abdomen, long ears, a tail longer than the body, has long limbs and four very strong clawed fingers. Tree kangaroos experience embryonic diapause or delayed birth, allowing females to mate again after giving birth or the baby is still in the pouch. The indigenous Papuan community conducts traditional conservation for the survival of tree kangaroos.

1 Introduction

The tree kangaroo is a marsupial mammal that lives in trees. Unlike Australian kangaroos in general that do a lot of activities on land, can run and jump up to reach speeds of 20-25 km/h, not so with tree kangaroos that are quite difficult and slow when walking and running on land, but on the contrary when in the tree is very agile and dexterous to move between tree branches. The tree kangaroo's agility is due to the very strong claws on its limbs to grip branches or twigs. The body size of tree kangaroos is relatively small when compared to Australian kangaroos, generally weighing around 6.8-13.6 kg, and equipped with a strong tail to balance its body during activities. There are about 12 species of *Dendrolagus* genus members spread across the earth and most of these species can be found in eastern Indonesia, two species live in Australia, and one species lives in Papua New Guinea.

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Tree kangaroos are well known to the Papuan people because they are often found in the mountainous areas of Papua's tropical forests. According to the local community, the local name for tree kangaroos is semai or unijo (*Hattam* language). Tree kangaroos are endemic to Papua [1], and there are four endemic species, namely: *Dendrolagus ursinus*, *Dendrolagus inustus*, *Dendrolagus dorianus* and *Dendrolagus goodfelowi* [2]. This animal is protected by the Government of Indonesia based on the Decree of the Minister of Agriculture Number 247/Kpts/Um/4/1975. In fact, the IUCN [3] has categorized the tree kangaroo as Critically Endangered (CR) because its population in nature continues to decline due to forest destruction and poaching. Its population has declined by 80% in the last 30 years in lowland forests up to the summit of Jayawijaya forest. This condition is similar to that of wild tree kangaroos in Papua New Guinea [4].

Papuan tree kangaroos are vulnerable to threats from both habitat conditions and predators. Habitat conditions include forest destruction, forest fires, and illegal logging [5]. In addition, land clearing for plantations and other purposes has reduced the extent of the Papuan tree kangaroo's foraging habitat [1]. Other threats to the Papuan tree kangaroo include pythons, great owls and eagles. They target tree kangaroos when they descend from trees in search of water or when they are in the treetops. For these reasons, the number of Papuan tree kangaroos is declining. The same is true for tree kangaroos in the Atherton Tablelands, Australia [6]. According to IUCN [3] records, the total number of Papuan tree kangaroo species is no more than 50. Fortunately, all of the *Dendrolagus* genus have been categorized as protected species by the Government of Indonesia and this is stated in the appendix of Government Regulation Number 7 of 1999 concerning the Preservation of Protected Plant and Animal Species.

The purpose of this paper is to inform the public about the characteristics, behavior, and conservation of tree kangaroos (*Dendrolagus* sp.) in Papua. It is hoped that over time this information can motivate indigenous Papuans to increasingly care and love tree kangaroos, so that they continue to exist and sustain their regeneration in the tropical rainforests of Papua.

2 Materials and methods

The writing of the article material on tree kangaroos (*Dendrolagus* sp.) of Papua: characteristics and conservation used a literature review methodology that was carried out intensively for 3 months. The literature collected relates to data on all information about tree kangaroos, both in the form of journal articles, theses, dissertations, books, and other scientific reports. Based on these data, data extraction is then carried out to obtain valid, detailed and complete data according to the author's needs, and finally data analysis is carried out [7].

3 Results and discussion

3.1 *Dendrolagus* sp. Taxonomy, morphology, and characteristics

Taxonomically, tree kangaroos (*Dendrolagus* sp.) belong to the genus *Dendrolagus* and the family Macropodidae. It is known that the genus *Dendrolagus* is allied with the suborder Macropodiformes, most of whose members come from the continent of Australia, Papua New Guinea, and surrounding islands. Macropodidae is a family of marsupials that based on population size is only represented by tree kangaroos and wallabies [8], and in the course of time the species that is now the most developed is the tree kangaroo. According to [2], there are 6 species of *Dendrolagus*, namely *Dendrolagus inustus* (gray tree kangaroo), *D. ursinus*

(black/white-necked tree kangaroo), *D. dorianus notatus* (doria tree kangaroo), *D. mbaiso* (brown tree kangaroo), *D. spadix* (lowland tree kangaroo) and *D. good fellow* (ornamental tree kangaroo).

Tree kangaroos living in Papua weigh no more than 6-20 kg, and some are as small as 3 kg with a muscle mass one-third that of Australian kangaroos (Fig. 1). Australian kangaroos can weigh up to 50-80 kg. The Papuan tree kangaroo's leg leap is only 22 cm, much shorter than that of the Australian kangaroo, which can leap 2-3 times. These kangaroos have a pouch to hold their young (Fig. 1), which opens forward during breeding and has four mammary glands [8]. They are long-limbed and have a long middle finger on each hind limb [2].

Tree kangaroos have a white to yellowish face, the same as the neck to belly, pale or rosy cheeks, black to brownish-black back. The ears are large, the inside of the ear is hairy and at the tip of the earlobe the hair is frayed. The tail is shorter than the body length, sometimes white at the tip [10].



Fig. 1. Activity of tree kangaroos (*Dendrolagus* sp.) [11]

Tree kangaroos have a white to yellowish face, the same as the neck to belly, pale or rosy cheeks, black to brownish-black back. The ears are long and hairless on the inside but frayed at the tips of the earlobes. The tail is longer than the body and sometimes frayed at the tip with a plain, calloused base and sometimes white at the tip [10]. Tree kangaroos also have a strong tail that functions to maintain body balance and as a support when sitting and fighting [8]. Tree kangaroos have long limbs and four fingers. The second and third fingers are small, connected to each other by skin except at the tip. Tree kangaroos have specialized, curved claws for climbing [8]. If the bark of the tree trunk is slippery or large in diameter, the animal is unable to climb it. Tree kangaroos can only climb if the bark is grooved or there are many vines to hold on to when climbing [8].

3.2 Habitat, diet, and reproduction

In the wild, tree kangaroos tend to live in groups or mobs with one dominant male, although some choose to live solitary lives [2]. In their daily activities tree kangaroos also prefer and favor shady places under large leafy trees [2]. They are long-limbed and have a long middle finger on each hind limb, enabling them to walk on tree branches and move with all four limbs when walking on the ground. They are often seen hanging from trees, and hopping on the ground.

The distribution of tree kangaroos in the wild is known to be able to live in habitat conditions from sea level to high mountain forest areas around 4,000 m, with a temperature range of 10⁰C-27,04⁰C and humidity of 78.5%-86.5% [2,9]. According to [10], tree

kangaroos prefer to eat young leaves/shoots, fruits and soft stems of *Ficus* sp., *Gnetum gnemon*, *Schuurmansia heningsii*, *Tetracera*, *Elastotema*, *Procris*, grasses, and some creepers. Kangaroos have a life span ranging from 12 to 18 years [1].

In general, male and female tree kangaroos make nests in different places. Male tree kangaroos nest in several nests that have been made by the females. Female tree kangaroos experience a pregnancy period of approximately 44 days and during this pregnancy the female tree kangaroo will isolate herself from other animals. Newborn tree kangaroo babies look like fetuses because they have not yet fully developed. The baby kangaroo will stay in its mother's pouch until it is fully developed. The dominant male tree kangaroo in each group has the right to guard and marry all females in the group temporarily. This means that when another male tree kangaroo outcompetes him, he inherits the right to dominate the group [1].

Tree kangaroos reproduce throughout the year, with females reaching sexual maturity after weighing 8 kg-10 kg and males 12 kg [10]. In addition, the sex maturity of this kangaroo can also be determined by the size of its body length. According to [1], the average body length of tree kangaroos indicating that they have reached their maturity phase is 72.8 ± 3.96 cm. Some kangaroos can even reach a body length of 500-800 mm [12]. Tree kangaroos undergo embryonic diapause or delayed birth. This allows the female to mate again after giving birth to her baby or while there are still young in the pouch. Female tree kangaroos have a complete double reproductive tract (ovary, cornu and corpus uteri, fallopian tube, cervix, vagina, vulva and clitoris), and males have 2 penile glands resulting in a fork-shaped penis [1]. A female can produce four offspring throughout the year of different ages. Newborn tree kangaroo pups weigh 200-400 mg with a body length of 3 cm [8]. A tree kangaroo may have four offspring a year that are at different stages of development and depending on the mother, each offspring receives a different type of milk according to its stage of development. Reproductive problems of tree kangaroos are very important in the development of an animal or livestock, without knowledge of reproduction, efforts to cultivate and develop an animal or livestock will not be meaningful [1].

3.3 Conservation of *Dendrolagus* sp.

Legally, the Papuan tree kangaroo's existence in its habitat is protected by the Government of Indonesia based on Minister of Agriculture Decree No. 247/Kpts/Um/4/1975 and Government Regulation No. 7/1999 on the Preservation of Protected Plant and Animal Species [13]. This condition is imposed because its conservation status is already in crisis, meaning that in the wild, this species is at high risk of extinction. The latest information from the IUCN [3] states that the total number of Papuan tree kangaroo species is only 50. The reasons for the decline of the Papuan tree kangaroo include its vulnerability to death by its predators, pythons, eagles and giant owls. In addition, the Papuan people hunt this mammal because they need its meat as a source of animal protein [14,15] or sometimes keep it as a pet. Tree kangaroos are even officially traded at prices ranging from IDR 500,000 to IDR 1,000,000 [1].

Indigenous Papuans who live in pockets where tree kangaroos exist have a traditional way of conservation to ensure the sustainability of these marsupial mammals, namely they have the principle of hunting not greedily but rather prioritizing caution so that the number of tree kangaroos does not quickly run out or become extinct so that if needed conditions are still available [8]. Another form of conservation is that some experts argue that tree kangaroos can be bred in-vitro in captivity [9,8], so it is expected to have a great opportunity to become a hopeful and superior livestock producer of meat, fur, and leather in the future, especially in the West Papua region.

3.4 Discussion

Referring to the IUCN [3] data on the conservation status of tree kangaroos, which is in the critical category, and the number of populations that are only 50 individuals, a serious conservation action is needed to save tree kangaroos in their habitat, the mountainous tropical rainforests of Papua. In this case, one of the measures taken by the government was the issuance of Minister of Agriculture Decree No. 247/Kpts/Um/4/1975 and Government Regulation No. 7/1999. However, the government is very weak in implementing and monitoring these regulations in the field, so there is always hunting of tree kangaroos by local communities. If this condition continues in the lives of the Papuan people, it is possible that the existence of tree kangaroos will become extinct and leave only historical stories.

Involvement in saving the Papuan tree kangaroo from extinction has been undertaken by the global conservation community working together to ensure the future fate of this threatened species, particularly in calling for collaboration between ex situ and in situ forces. These conservancies have strategies that aim to maintain viable tree kangaroo populations over the long term in healthy ecosystems. Therefore, they use the following methods: the incorporation of transdisciplinary processes involving local communities in various countries, and working with a group of researchers, internationally competent wildlife rangers, and supported by zoos around the world [16].

Based on valid information, global and regional zoo associations have scientifically maintained their tree kangaroo populations to keep their genetic diversity in check. In collaborative ex-situ and in-situ programs, researchers share information on various biological, physiological and ecological data for the benefit of both. Referring to the concept of conservation, the existence of tree kangaroos in zoos must be maintained, maintained properly and healthily, their genetic diversity maintained, and demographically stabilized [17,18]. Indirectly, the presence of tree kangaroos in zoos has a conservation role, as ambassadors to make visitors more attentive, affectionate and caring towards them. If the harmony between visitors and tree kangaroos is maintained, visitors' awareness, empathy and concern for the existence of tree kangaroos will increase over time. As a result, the echo and spirit of the ban on the hunting and sale of tree kangaroos in Papua is very strong and viral in the online world, at least the world community becomes aware of it.

The author's thinking in saving the Papuan tree kangaroo is, through a persuasive approach by volunteers from the Papuan community who are members of the Non-Governmental Organization for Kangaroo Tree Conservation to the traditional leaders who live in tree kangaroo pockets, to make rules that prohibit hunting this mammal, as well as the application of fines for violations of these rules. It is hoped that if this wish is successfully realized in indigenous Papuan communities, it can be assured that in the next 5 years the population of tree kangaroos will increase dramatically to 70 individuals. The rescue of the Papuan tree kangaroo species cannot be delayed any longer, the involvement of all elements of society is very necessary in saving this animal, especially the Papuan people who live in pockets of tree kangaroos living such as on Yapen Island, Salawati Island, Waigeo, Bird's Head, Jasirah Huon, Foja, Mount Torricelli and several other areas, so that more attention and care so that its existence can be maintained and preserved. This is in line with [17] opinion that, for successful tree kangaroo rescue projects, collaboration with local communities is required.

4 Conclusion

Based on all the notes above, it can be concluded that tree kangaroos (*Dendrolagus* sp.) have several characteristics including a white to yellowish face, the same as the neck to the abdomen, pale or reddish cheeks, black to brownish black back, long ears, a tail longer than

the body, long legs and four fingers. Tree kangaroos undergo embryonic diapause or delayed birth. This allows the female to mate again after giving birth or while there are still young in the pouch. Traditional conservation carried out by indigenous Papuans for the survival of tree kangaroos is by hunting wisely and carefully so that the survival of these animals can be harvested again when needed.

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