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The Essential Contribution of Captive Sumatran Elephant in Elephant Training Center, Way Kambas National Park for Wildlife Genetics Conservation

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Abstract:
Way Kambas National Park (WKNP) is home of five protected big mammals including sumatran elephants. It shares its border with 22 of 40 villages surrounding the national park. Understanding their existence in the wild is a priority, and wildlife genetics is a crucially needed. Besides poaching and habitat fragmentation, wildlife-human conflict is one big issue. Elephant Training Center (ETC) in WKNP is built for semi in-situ conservation effort on captive sumatran elephants that mainly have conflict histories with local people. Participative observation and bio-molecular analysis were conducted to learn the importance of captive Sumatran elephant for conservation effort. Through captive sumatran elephants, database and applicable methods are expected to be developed supporting the conservation of their population in the wild. Participative observation and molecular identification was carried on captive sumatran elephants in ETC, WKNP under multiple year Terapan grant of Ministry of Research and Technology Higher Education, Indonesia. Gene sequence and cytological analyses showed that the captive sumatran elephants are closely related and tend to be domesticated. Translocation among ETC to avoid inbreeding, and maintaining the captive sumatran elephant as natural as possible are highly recommended. Developing genetic database can be a reference for both captive and wild sumatran elephants.

Keywords: captive Sumatran elephant, Elephant Training Center, Way Kambas National Park, genetic conservation, wildlife

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1. Introduction

Way Kambas National Park (WKNP) is the natural habitat of the Sumatran elephant (Elephas maximus sumatranus). Since 2011 the presence of Sumatran elephants has been recorded in critical status in the International Union for Conservation of Nature and Natural Resources (IUCN) [1]. This is caused by the pressure of habitat fragmentation, illegal hunting and conflicts with humans [2].

Efforts to maintain the existence and continued preservation of Sumatran elephants, such as monitoring, mapping Sumatran elephant range areas and capacity analysis Sumatran elephant habitat in order to survive in the area adjacent to the human activity. The Elephant Training Center (ETC), WKNP was established with the aim of rescuing Sumatran elephants and supporting the efforts of semi-situ conservation of Sumatran elephants that are in conflict with humans. Currently there are 69 Sumatran elephants built with 39 individual males, 26 females and 4 tillers individual. The existence of the Sumatran elephant built in ETC, WKNP raises the question of being limited population movements, their role in conservation efforts and the possibility of release as well as wildlife attractions.

The presence of elephant populations in ETC, closed WKNP is very vulnerable to the threat of deep crossbreeding. In addition to information from the location, biological information of Sumatran elephants fostered in ETC, WKNP is not widely known including information on molecular biology. Kinship analysis is needed to prevent the decline of genetic diversity in the population and prevent the occurrence of deep intermarriage. This paper was compiled to see the important role of the built Sumatran elephants in ETC, WKNP in supporting the efforts of Sumatran elephant conservation in natural habitats.

2. Materials and Methods

DNA isolation has been carried out as the beginning of the process of phylogenetic map construction of Sumatran elephants from Sumatran elephants fostered in ETC, WKNP [3,4]. The process of taking blood samples in the Sumatran elephants fostered was carried out in collaboration with the medical team of the elephant hospital Rubini Atmawidjaja, ETC, WKNP. Method optimization has been done both through simple and molecular methods, and comparing the two [5]. Molecular analysis was continued to the level of DNA sequencing carried out to see genetic variation and phylogenetic map construction of elephants [6, 7, 8]. Phylogenetic maps of Sumatran elephants were analyzed from the results of DNA sequencing (702 base pairs) [9] 65 individual Sumatran elephants fostered. Phylogenetic map of individual Sumatran elephants fostered from 65 sequenced DNA profiles and cytological profiles of 21 Sumatran elephants under the guidance of ETC WKNP were built [9, 10].

3. Results And Discussion

Conservation efforts require molecular information as a basis for determining the appropriate policies and management, including the Sumatran elephant rescue. For this reason, it is necessary to sample the source of genetic material such as blood and feces as basic data material. In compiling biomolecular information on Sumatran elephants, Sumatran elephants fostered in ETC, WKNP can be the best source of genetic material. This is because the Sumatran elephant fostered is already familiar with human existence, located in a closed location so that it is easily accessible. Blood samples are possible to be taken because of the routine examination of Sumatran elephants fostered in ETC, WKNP.

Every Sumatran elephant is guided in ETC, WKNP is accompanied by at least one mahout who is very understanding of the characteristics and behavior of each of the Sumatran elephants fostered [9]. This is very helpful and provides convenience in handling blood sampling for molecular analysis without going through anesthesia and arrest (Figure 1).

Figure 1. Handling and blood sampling in Sumatran elephants fostered in ETC, WKNP by a medical team accompanied by mahout

With the assistance of mahout and the medical team that are well known it can be carried out invasive and participatory blood sampling. Further sampling can be done by ensuring the individual, sex and age both invasive (blood samples) and non-invasive (fecal samples) [9]. From the results of molecular analysis genetic information can be obtained from fostered Sumatran elephants in the form of phylogenetic maps of fostered Sumatran elephants from 65 sequenced DNA profiles (Figure 2-3) [9] and cytological profiles of 21 individual Sumatran elephants guided by ETC WKNP (Figure 4) [10] has been awakened.

Sumatran elephants fostered in ETC, WKNP come from the same large group, and are feared to have a close kinship. Further analysis of kinship is needed. If an individual exchange from another ETC is not carried out in the long term, it is feared that deep cross marriages will occur. Cytologically shows that Sumatran elephants fostered in ETC WKNP tend to be domesticated. This is indicated by 3 forms of nonsymmetric chromosomes, namely at number 12, 24 and 27.

A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W	X	Y	Z	AA	AB	AC	AD	AE	AF	AG
PEPI_(01)		100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100
WULAN_(04)	0.000		100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100
GUNTURIA_(05)	0.000	0.000		100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100
SALMON_(06)	0.000	0.000	0.000		100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100
RENDI_(07)	0.000	0.000	0.000	0.000		100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100
SANDI_(09)	0.000	0.000	0.000	0.000	0.000		100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100
SOGOL_(10)	0.000	0.000	0.000	0.000	0.000	0.000		100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100
TONY_(11)	0.000	0.000	0.000	0.000	0.000	0.000	0.000		100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100
INDRA_(14)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000		100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100
CUNI_(16)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000		100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100
MILO_(22)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000		100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100
YANDO_(23)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000		100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100
YETI_(24)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000		100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100
KARNANGIN(25)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000		100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100
BAYU_(26)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000		100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100
BUNGA_(27)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000		100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100
ALMA_(34)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000		100	100	100	100	100	100	100	100	100	100	100	100	100	100	100
RENOLD_(43)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000		100	100	100	100	100	100	100	100	100	100	100	100	100	100
QUEEN_(44)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000		100	100	100	100	100	100	100	100	100	100	100	100	100
SULLI_(47)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000		100	100	100	100	100	100	100	100	100	100	100	100
RAHMI_(48)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000		100	100	100	100	100	100	100	100	100	100	100
GADAR_(52)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000		100	100	100	100	100	100	100	100	100	100
SUGENG_(53)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000		100	100	100	100	100	100	100	100	100
VERDI_(54)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000		100	100	100	100	100	100	100	100
DAENG_(56)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000		100	100	100	100	100	100	100
AGAM_(57)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000		100	100	100	100	100	100
TOMI_(60)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000		100	100	100	100	100
MELA_(62)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000		100	100	100	100
HARYONO_(46)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000		100	100	100

Figure 2. Homology values and genetic distance of the Sumatran elephants fostered in ETC, TNWK

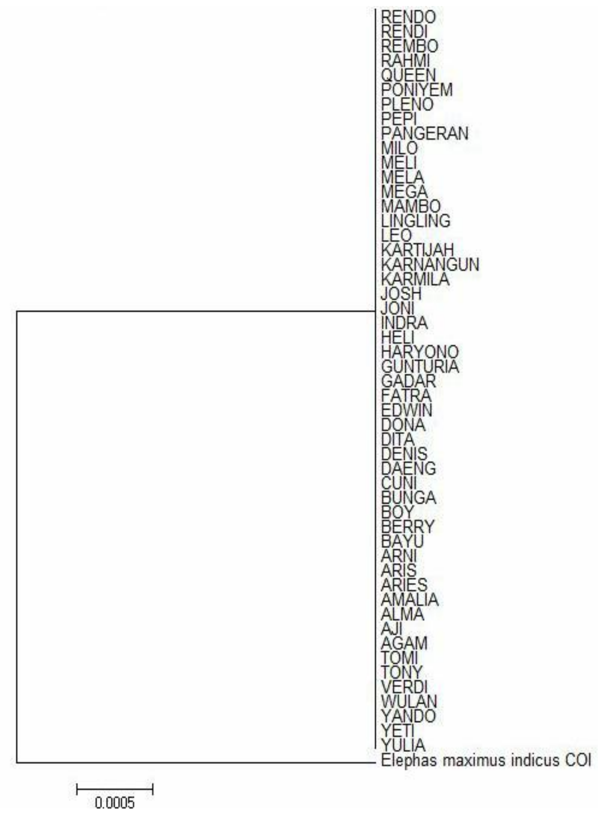

Figure 3. Phylogenetic map of fostered Sumatran elephants in ETC, TNWK

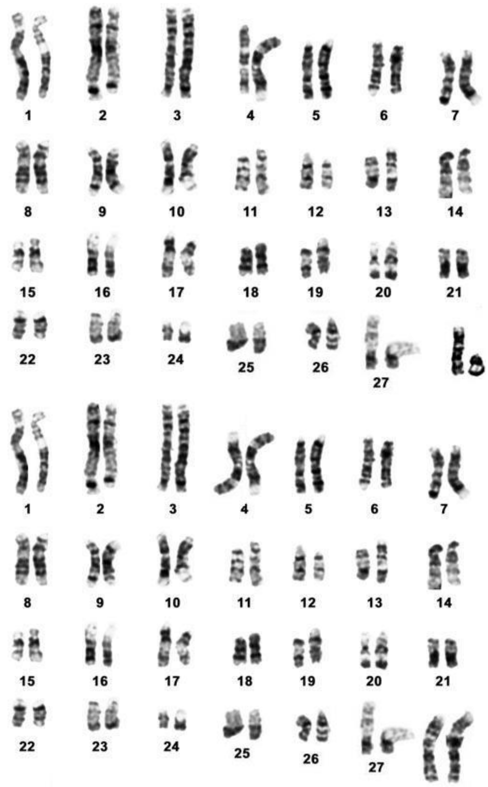

Figure 4. Cytological profiles of Sumatran elephants under the guidance of ETC, TNWK: (a) male individuals (Agam) and (b) female individuals (Lingling)

Sumatran elephants fostered in ETC, WKNP in general are a group of relatives of Sumatran elephants from a large population and have a tendency to have experienced domestication, which is already accustomed to human presence and intervention. Therefore, the release of fostered Sumatran elephants is not recommended. In connection with these results, the identification and marking of individual molecular Sumatran elephants fostered in ETC WKNP and other locations is needed, so that exchange of fostered Sumatran elephants can be carried out between captive breeding groups that have different target Sumatran elephant populations, and adjusting the management of the built Sumatran elephant, and ultimately building a data center for Sumatran elephants to be guided by wild Sumatran elephants in their natural habitat. Although already in coaching, Sumatran elephants in ETC, WKNP have an important contribution as a source of genetic material in formulating policy on the conservation of Sumatran elephants in Indonesia.

4. Conclusions

Sumatran elephants that have been fostered can make a significant contribution as a source of genetic material to the world of conservation both to determine the form of efforts and management policies

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