



Participatory Fecal Collection On Wild Sumatran Elephants' Dungs In South Sumatra: The Significant Role Of Community Involvement

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Abstract: Sumatran elephant *Elephas maximus sumatranus* is a critically endangered species under pressure of habitat fragmentation and human-elephant conflict (HEC) such as in one plantation and/or settlement area next to its natural habitat, Simpang Tiga Abadi, Selapan, South Sumatera. Due to HEC, local people may experience economic loss and human casualty. Simpang Tiga Abadi is a village, especially 5 sub-settlements directly close to the production forest area of PT. Bumi Khatulistiwa Mandiri, which is the natural habitat of sumatran elephants. The communities collaborated and company were formed an elephant watch group to monitor and deter sumatran elephants from entering plantation areas and settlements. On the other side, sumatran elephants entering the plantation may give some conservation support as indirect conflict mitigation approaches. A non-invasive sampling can be done by gathering information on its fecal based genetic diversity and may become one of supporting sumatran elephant conservation efforts. Under the Center for Applied Science Studies, Sriwijaya University project: "Genetic analysis of the sumatran elephant sub-population in its habitat pocket in Sugihan-Simpang Heran, South Sumatra", Tropical Forest Conservation Action (TFCA) cycle VIII project, the significant role of local community affected by HEC on gathering information and fecal samples of sumatran elephant entering the PT. Bumi Khatulistiwa Mandiri plantation was conducted. Sumatran elephants' fecal sampling involved the local communities affected by HEC. Its aim is to value the significance of local people's involvement in finding and collecting dung left by wild sumatran elephants during entering both plantation areas. Data on areas were recorded, and its dung samples were collected for molecular analysis. Collecting information and mapping the entry points of sumatran elephants were done supported by the Simpang Tiga Abadi community, consisting of sumatran elephant's entry points, dung presence, individual numbers, and group activities, as well as the damage. Eighteen fecal samples of 5 entry points were collected in 5 days. By doing the assistance, the local communities learnt the benefits and important value of sumatran elephant and its dung. This research is the first local communities' indirect step in efforts to conserve sumatran elephants in Simpang Tiga Abadi Village, Selapan, South Sumatera.

Keywords: Sumatran elephant; dung; human-elephant conflict; molecular analysis; swamp

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1. INTRODUCTION

The Sumatran elephant, a large mammal endemic to Sumatra with critical status (WCS Indonesia, 2020; IUCN, 2021), in South Sumatra is under pressure from habitat destruction and fragmentation due to land use change, poaching (WWF, 2020) and human-elephant conflicts (HEC). Its natural habitat is affected by fragmentation, land use change for oil palm plantations, industrial timber plantations (HTI), and settlements. The HEC occurs due to habitat degradation which results in a decrease in its natural food availability (Seidensticker, 1984) and consequences in the entry of sumatran elephant into oil palm plantations, HTI areas and traditional agricultural area to fulfill their food needs (Susilowati and Kuspriyanto, 2016). Furthermore; HEC causes physical and economic losses for local communities (Rustiati *et al.*, 2019).

The sumatran elephant population is found in 36 habitat pockets and spread across seven provinces e.g. Aceh, North Sumatra, Riau, Jambi, Bengkulu, Lampung, and South Sumatra (Ministry of Environment and Forestry, 2020). Its natural habitats in South Sumatera include Simpang Sugihan, Simpang Heran, Jambul Nanti Patahan and Saka Gunung Raya. One of its habitat pockets in South Sumatra is the Padang Sugihan-Simpang Heran, a peat area, with high wildlife diversity, including sumatran elephant and sumatran tiger. In the 1980s Padang Sugihan was designated as a transmigration area and tidal padi fields. It is a production forest area that was converted and managed by private companies (Sumantoro *et al.*, 2022). Canals, human-made barriers help to prevent elephants to be isolated, and enter agricultural and plantation areas.

Simpang Tiga Abadi, Tulung Selapan Regency, is one of the transmigration village that was established in 2011. PT. Bumi Khatulistiwa Mandiri obtained land use permits for palm oil plantations in Simpang Tiga Abadi, Tulung Selapan Regency in year 2015.

In this area, sumatran elephants can be seen all year around, and HEC due to palm oil loss is happening. Simpang Tiga Abadi is located at 3 24' 33,65" South and 105 52' 36,4" East. It is peat swamps and water covered areas. Simpang Tiga Abadi is located between 2 rivers, the Lumpur and Lebung Hitam River (Profil Desa Simpang Tiga Abadi, 2016), with population of 3650 (1108 families). Most of them are farmers, laborers, fishermen and self-employed (Profil Desa Simpang Tiga Abadi, 2023). This settlement is directly adjacent to the concession area of PT. Bumi Khatulistiwa Mandiri.

Pusat Kajian Sains Terapan (Applied Science Study Center), Sriwijaya University, has conducted data inventory on sumatran elephant genetic diversity in South Sumatera in year 2017-2018. Its population count in Padang Sugihan Simpang Heran used *Fecal DNA survey* and *Dung count*. In year 2021-2022 inventory on sumatran elephant genetic diversity at Sugihan – Simpang Heran, Jambul Nanti Patahan and Saka Gunung Raya, South Sumatera has done (Pusat Kajian Sains Terapan, 2023).

Conservation efforts can be done in both direct and indirect approaches (Rustiati *et al.*, 2019). Indirect method includes non-invasive sampling methods for molecular species confirmation based on fecal sampling (Forgacs *et al.*, 2019) for collection of information on the genetic diversity of a species such as sumatran elephant (Indriati *et al.*, 2020). Non-invasive sampling may be conducted through hair, urine, and feces (Henry *et al.*, 2011; Zhanga *et al.*, 2015; Morin *et al.*, 2001). Information on genetic diversity of sumatran elephants is needed in determining policies, management and strategies for sumatran elephant conservation efforts, while the information is still very little. The molecular genetic analysis approach can be done through molecular analysis of mitochondrial DNA (Muangkram *et al.*, 2016).

Since HEC is happening and local communities are nearby, it is important to involve them for conservation education purposes. In order to deter the wild sumatran elephants, local communities develop elephant neighborhood watch groups, Data and sumatran elephant's dung presence may be obtained from and in collaboration with local communities (Amusa *et al.*, 2013; Susanto, 2021). Fecal based DNA samples' collection can be conducted from dung left by sumatran elephants entering the plantation to support its genetic study and conservation.

2. MATERIALS AND METHODS

This project is done in January 2023, as part of the Tropical Forest Conservation Action (TFCA) Cycle VIII program "Genetic Analysis of the Sumatran Elephant Sub-Population in the Sugihan-Simpang Heran, South Sumatra" by the Center for Applied Science Studies, Sriwijaya University in 2022. Data collection on sumatran elephants' dung presence was done following information from locals following the sumatran elephant entry, including mapping of sumatran elephant entrance points and active trails in collaboration with South Sumatra Natural Resources Conservation Centers (BKSDA South Sumatra), the Provincial Justice Office South Sumatra, PT. Bumi Khatulistiwa Mandiri and local communities. The collection of information on the existence and active path of wild sumatran elephants was obtained through discussions with local communities. Information on sumatran elephants' entrance points was obtained including time and place of their presence, the number of sumatran elephant individuals, damage caused and the dung location. Field surveys on sumatran elephants' dungs were conducted based on the results of discussions and interviews with the community. Sumatran elephant dung

survey and sampling activities were accompanied by local communities and employees of PT. Bumi Khatulistiwa Mandiri. The sumatran elephant dung findings and the entrance point of sumatran elephants in the PT. Bumi Khatulistiwa Mandiri was recorded using Garmin 64s GPS and the Avenza Maps application. This application is used for mapping the active trails of sumatran elephants in Simpang Tiga Abadi and PT. Bumi Khatulistiwa Mandiri.

3. RESULTS AND DISCUSSION

The PT. Bumi Khatulistiwa Mandiri management monitors the presence of wild sumatran elephants that enter the core areas of germplasm of oil palm plantations aerially following the information on sumatran elephants entry. Information on the presence of sumatran elephants entering the plantation area was obtained from plantation workers and on duty guard teams. Dusun 5 of Simpang Tiga Abdi is one of the village areas with the closest distance from the plasma area of palm kernel PT. Bumi Khatulistiwa Mandiri, the active sumatran elephants' trails. One of the efforts made by Simpang Tiga Abadi local communities together with PT. Bumi Khatulistiwa Mandiri formed a neighborhood watch team (Figure1) for deterring wild sumatran elephants that will and/enter the plantation area. Information on the whereabouts of sumatran elephants (Figure 2) among team members is conveyed by WhatsApp Group. Wild sumatran elephants frequent entry (mostly twice a week) to the palm oil plantation area of PT. Bumi Khatulistiwa Mandiri and traditional plantations cause some damages (Figure 3), which has an impact on crop age and production.



Figure 1. Elephant neighbourhood watch group in Simpang Tiga Abadi, Palembang



Figure 2. Sumatran elephants recorded in Simpang Tiga Abadi, Palembang



Figure 3. Damages of PT. Bumi Khatulistiwa Mandiri oil palm plantations post sumatran elephant entry

Information on time and location entry, sumatran elephants' individuals was gathered from local communities and confirmed by GPS. Five areas were recorded as the entrance of sumatran elephants, Blok A, B, C, D, and E. Following the sumatran elephants' entry information, surveys to record on sumatran elephants' dung

found (Figure 4) was carried out assisted by local communities, and dung samples for molecular analysis were taken.



Figure 4. Sumatran elephant dungs found in Area Blok A in Simpang Tiga Abadi, Palembang

Data gathered included date, location, number of sumatran elephant individuals, numbers of dung's boli (Tabel 1) and damages (Figure 5).

Tabel 1 Sumatran elephant entries in Simpang Tiga Abadi Palembang

Date/Time	Location	Numbers of sumatran elephants' individuals	Damage location	Numbers of dung's boli
January 14, 2022 (05.00 - 06.00)	Blok A	8	C11	29 boli spread in 5 locations: a. 5 boli (k= 33,5), b. 3 boli (k= 42), c. 3 boli (k= 52), d. 9 boli (k= 42), e. 9 boli (k= 42)
(05.00)	Blok B	10	C13	34 boli spread in 6 locations: a. 3 boli (k=33,5) b. 4 boli (k=41), c. 6 boli, d. 4 boli, e. 13 boli, f. 4 boli)
January 14, 2023 (22.00)	Blok C	15	C14	5 boli (k=39)
	Blok D		C16	19 boli spread in 4 locations a. 6 boli b. 6 boli c. 4 boli d. 3 boli
	Blok E		C18	8 boli spread in 2 locations: a. 5 boli b. 3 boli

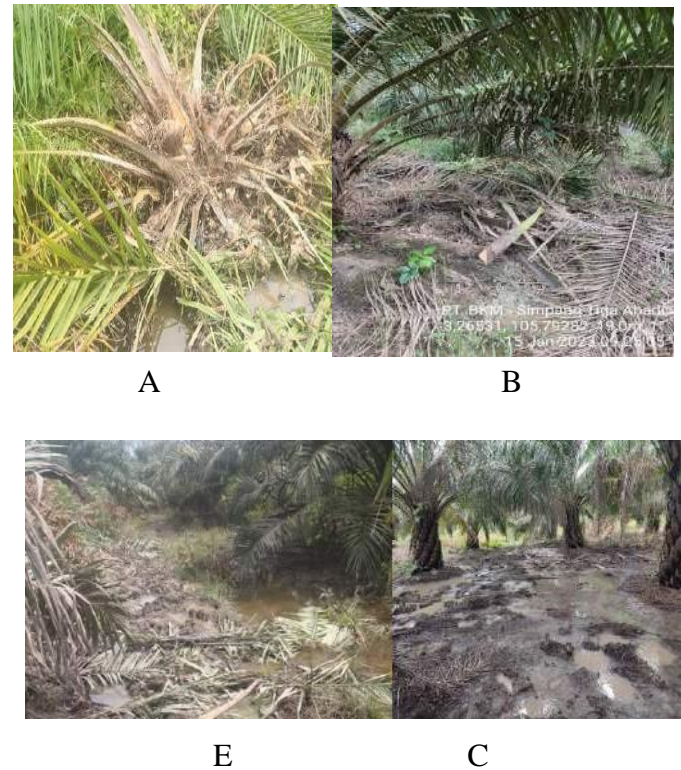


Figure 5. Plantation damages in sumatran elephant entries point

The information gathered is significant for indirect HEC mitigation, learning about the sumatran elephant groups, its daily movement and behavior. Working with the locals eases to record the dung pin points as well as data and sample collections. It showed that there is active support from local communities in supporting the conservation effort for sumatran elephants. The advantages having local communities in genetic sources materials and data collection for critically endangered species like sumatran elephant include non-invasive sampling. The Simpang Tiga Abadi local community involvement in fecal collection on wild sumatran elephants' dung is significantly important to get the details on its entry, individuals, behavior. Fresh dung samples for molecular analysis become possible.

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