



**PRESENCE of SUMATRAN ELEPHANTS (*Elephas maximus sumatranus*)  
in THE ECOTONE AREA of SEMBILANG NATIONAL PARK (TNSTNS)  
and PALM OIL PLANTATION in SEMENANJUNG BANYUASIN  
SEMENANJUNG, SOUTH SUMATRA PROVINCE**

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## **Abstract :**

A research to monitor the presence of Sumatran elephant between two ecosystem in Sembilang National Park (TNSTNS) and palm oil plantation has been conducted on March until June 2019 at Semenanjung Banyuasin Semenanjung, South Sumatra. This research aimed to verify the presence of Sumatran elephant population and to estimate the number of elephant individuals in the area. The methods used were direct observation during the day and indirect monitoring through installation of Camera Traps for 1 month. In addition, secondary data was collected in the form of data archives from the palm oil plantation records and interviews with affected plantation workers. From direct observation, we direct encountered one elephant individual and fifteen signs of elephant activities, such as sounds, footprints, and feces. From camera trap photos, we identified and verified one population of Sumatran Elephants which consisted of at least twenty-two individuals with composition as follows: eight adult females, two young females, three infant females, and nine males. The ecotone area between TNS and palm oil plantation should be designated as a new habitat patch of Sumatran elephant that needs to be managed appropriately in order to maintain the designation of the area as a conservation area.

**Keywords:** Sumatran Elephant, Conservation, Sembilang National Park (TNSTNS), Semenanjung Banyuasin, South Sumatra

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## **1. Introduction**

Sumatran elephants (*Elephas maximus sumatranus*), a sub-species of Asian elephants (*Elephas maximus*), can be found in the island of Sumatra, Indonesia [1]. Based on international protection status, Sumatran elephants are categorized as Critically Endangered in IUCN Red List of Threatened Species [2] and classified as Appendix I according to CITES, which means vulnerable to

extinction due to trade and hunting. Under national regulation (Government Regulation No. 7 Year 1999 and Ministry of Environment and Forestry Regulation No. 106 Year 2018), Sumatran elephants are categorized as protected species.

Sumatran elephant habitat generally consists of several types of forests, namely swamp forest, peat swamp forest, lowland forest, and low mountain forest [3]. The natural habitat of elephants experience losses due to forest

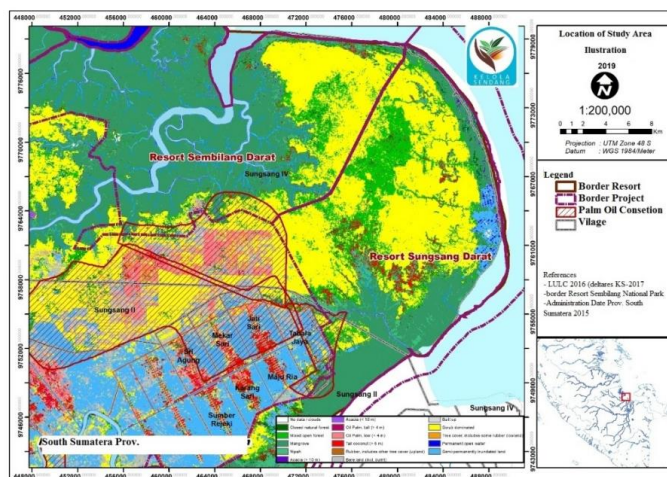
conversion for various purposes and high habitat disturbance due to human activities, such as logging and land burning that result in changes in the ability of land to accommodate the number of Sumatran elephants [4]. Change in the distribution and imbalances of elephant life can be caused by changes in habitat conditions [5]; [6]. Changes in habitat conditions cause habitats of Sumatran elephants to be fragmented, which results in isolation of elephants in these habitat patches.

South Sumatra Province has eight Sumatran elephant habitat patches, which consist of: Benakat Semangus, Meranti Sungai Kapas, Lalan, Jambul Nanti Patah, Mesuji, Saka Gunung Raya, Suban Jeriji, and Sugihan [7]. Based on data Natural Resources Conservation Agency of South Sumatera (BKSDA), the number of elephants in South Sumatra are estimated to be 178 individuals [8].

Sembilang National Park and its surrounding areas has not been included in the 8 elephant habitat patches in South Sumatra identified by [7]. The presence of Sumatran elephants in Sembilang was first observed in 2017 (Pirnanda pers. Observ.) in the ecotone area between TNS and adjacent palm oil plantation. Sighting reports from the palm oil plantation workers also confirmed the presence of Sumatran elephants within the area. In February 2019, a rapid survey conducted in the area found four Sumatran elephants individuals through direct encounter [9]. However, there has not been a more detailed survey conducted in the area to assess the presence and population size of Sumatran elephants. Therefore, it is necessary to conduct research in more details on the population of Sumatran elephants in the area TNS and palm oil plantation to estimate the number of Sumatran elephants individuals that exist in the area. The purpose of the research is to identify the number of individuals elephants and to determine the distribution area of Elephas in the area.

## 2. Materials and Methods

The study was conducted in the Banyuasin Semenanjung, Sembilang National Park (TNS), Sembilang Management Section, Banyuasin District, South Sumatra Province, specifically in the area TNS and palm oil plantation (Figure 1). Sembilang was designated as a national park in 2003 by Decree of the Minister of Forestry No: 95/Kpts-II/2003 with a total area of 202.896,31 Ha. 20% of remaining mangrove forests in Sumatra are located in TNS [10]. Since 2017, TNS is managed under Berbak and Sembilang National Park Office. TNS is divided into two management sections, one of which is the Sembilang Management Section (SPTN Wilayah II) which is included in the Banyuasin District of South Sumatra Province. It is located at 104°13'-104°63'E and 1°63'-2° 48'S with the southern part bordering with palm oil plantation.



**Figure 1.** Location of Study Area (Sembilang National Park and Palm Oil Plantation in Semenanjung) Banyuasin

## Methods

Monitoring activities used 3 (three) methods, as follows:

### Field Observation

We used two methods for field observation, which consisted of Recce walk and drone observation. The Reconnaissance transect (Recce walk) involve observers moving through habitats in a particular direction, but unlike transect lines, Recce walk is not restricted to following certain routes and are free to take the most opposite path [11]. Recce walk was done on foot and boat by moving slowly along rivers/canals or paths that passed through or were adjacent to elephant habitats. Second, drones were used to observe areas that were not accessible by foot or by boat to detect direct and indirect signs of elephants. Direct encounter with elephants and indirect signs of elephant activities, such as sound, footprints, feces, and plant damage caused by elephant browse such as debarkation, branch breaking, and uprooting were observed to indicate the presence of elephants in the area. When we encountered elephants or indirect signs of elephant activities, we took the following data: time and date, coordinates using GPS, estimated age and sex (if direct encounter), diameter of footprints, and estimated age of indirect signs.

For footprints, we used the following characteristics to estimate the age of footprints encountered in the field, based on expert's judgement from senior mahouts/elephant keeper (Setiyono) in South Sumatra BKSDA: new footprints (less than five days old) were characterized by intact shape, grasses that were trampled by elephants were still fresh/green; old footprints (more than five days) were characterized by less intact shape, grasses that were trampled by elephants have withered or dried. For age of elephant's feces, also based on mahouts' expert judgement, we characterized new feces (1-3 days) from the shape, colour, wetness, and odour. New feces are relatively still intact, black/dark brown in color, still watery, and has



stronger odour. Old feces (more than 3 days) were usually dry, odourless, and the shape was no longer intact.

### Installation of Camera Traps

Fourteen (14) camera traps (Bushnell Trophy Camera Brown model 119836 and Reconyx HC 500) were installed for  $\pm$  30 days (from May to June 2019) in the study area (figure2) consisting of 10 units installed along 5 different transects (2 units on each transect) and 4 units installed near the water gate area. Based on the modification of the mounting method from [12], the camera is mounted on a tree with a height of 40 cm from the ground and the position of the camera facing the path at a distance of 2.5 meters mounted facing each other. Camera traps were installed in areas where traces of Sumatran elephants were observed previously, either through direct or indirect encounters and from reports from palm oil plantation workers. In each location where camera trap was installed, we recorded the coordinates using GPS. The photos with Sumatran elephants resulted from camera traps were identified together with the Padang Sugihan Wildlife Refuge representatives who worked as *Mahout* and forest ranger from the South Sumatra Natural Resource and Conservation Agency (South Sumatra BKS-DA), TNS Management Office, IPB University Biodiversity Staff, and Master's students in Biology from Sriwijaya University by identifying the differences in the morphology, such as body sizes (high), sex, and distinct physical features of body parts (trunk, tusk, ear, tail, skin).

## 3. Results and Discussion

The initial survey activity of the Sumatran elephant's presence was intended as a first step to monitor elephants in Sembilang. During the implementation of the activities, only one individual was found through direct encounter, no other elephant individual was found directly, but there were traces of elephant activity in the form of feces, footprints, and plant damage caused by elephant browse (Figure 3).

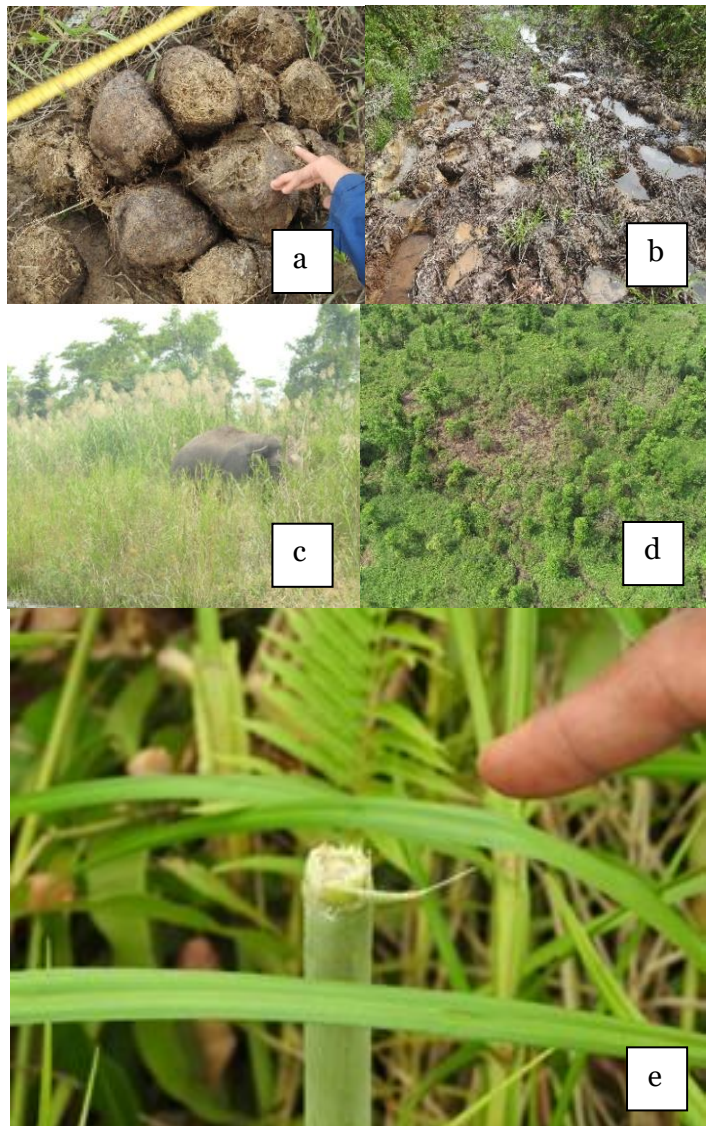


Figure 3. Signs of elephant activities; (a) Feces, (b) Footprints, (c) Direct encounter, (d) Predicted to be elephant habitat from Drone and (e) Traces of Elephant food

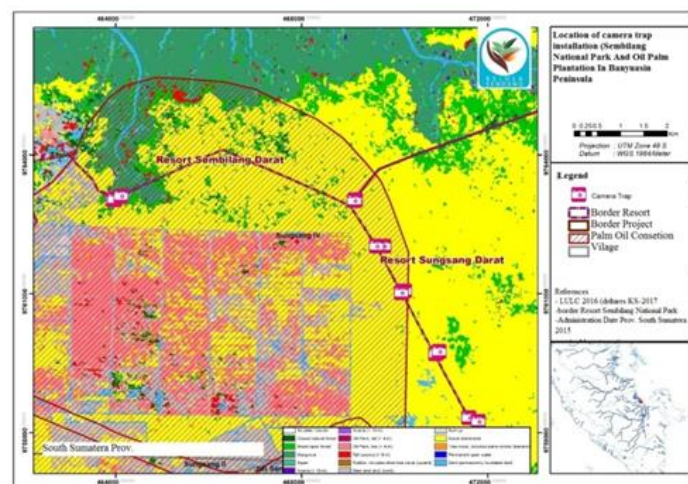


Figure 2. Location of camera trap installation (Sembilang National Park and Palm oil Plantation in Semenanjung Banyuasin)

### Secondary Data Collection

Secondary data was collected through interviews. We interviewed palm oil plantation workers adjacent to the study area. Interviewees include securing palm oil plantations Mr. A. Rafik, field workers Mr. Iskandar and conservation staff Mr. Dwi Prasetyo.

We found one direct and at least 15 indirect signs of Sumatran elephants presence in the area. Based on the table below (Table 2), it can be seen that most of the indirect signs of Sumatran elephants activity recorded in the field were relatively new signs (less than one week old).

**Table 2.** Data on Sumatran Elephant Activity Findings

No	Findings	Size (cm)	Date	Note.
1	footprint and feces	39 and 32	12/05/2019	estimated of mother and baby ( $\pm$ 1-1,5 years old)
2	Footprint	42	13/05/2019	found elephant path too
3	Feces	43	13/05/2019	Estimated to be 5 days old
4	Sounds	40	15/05/2019	on the way back from transect
5	Footprint	39	17/05/2019	Old footprint
6	footprints and plant damage	39	17/06/2019	estimated to be recent
7	Footprint	34	17/06/2019	estimated more than one week
8	Feces	13	18/06/2019	Estimated to be 3 days old
9	Footprint	39	18/06/2019	Estimated to be 4 days old
10	Footprint	39	18/06/2019	Estimated to be 3 days old
11	Footprint	39	18/06/2019	Estimated to be 6 days old
12	Footprint	39	17/06/2019	Estimated to be 7 days old
13	Footprint	40	17/05/2019	Estimated to be 4 days old
14	Feces	13	17/06/2019	Estimated to be 3 days old
15	Feces	13	18/06/2019	
16	direct encounter	42	03/03/3019	1 adult male

**Table 3.** Results of Identification Sumatran Elephant Individuals from Camera Trap Photos

No	Code	Information
1	M1	Male juvenile, penis is clearly seen, short tusks
2	M2	adult male, long tusks, signs of fracture on the right tusk are clearly seen
3	M3	male juvenile, pointy tusks, long tail, intact and flat earlobes
4	M4	Male, estimated only $\pm$ 14 years old. Tusk and tail are broken
5	M5	Dominant adult male long tail, torn edges of ear lobes
6	M6	almost adult male, have long tusks
7	M7	Have a long tail, the right tusk is shorter and blunt
8	M8	Has a stump tail with tusks. Chest and neck are sagging.
9	M9	male adult, with a stump tail
10	F1	Adult Female, cataract eyes, torn ears, estimated age $\pm$ 30 years, indication of pregnancy, hairless tail
11	F2	Adult Female, torn earlobes
12	F3	adult female, pregnant, estimated age $\pm$ 19 years old
13	F4	Adult Female, long and hairy tail
14	F5	Adult female, has a bump at the back
15	F6	infant female, has a bump at the back
16	F7	young female, estimated age $\pm$ 15 years old, long and hairy tail, flat earlobes
17	F8	infant female, estimated age 3 years old
18	F9	Adult female, varicose veins, torn ears, proboscis nodules, estimated age $\pm$ 20 years,
19	F10	pregnant female, long stump tail over the knee, estimated age of $\pm$ 25 years
20	F11	adult female, long and hairy tail
21	F12	infant female, small body, hair on head is still standing, estimated age $\pm$ 1 year
22	F13	Young female, tail's hair is still intact,





F1



F2



F3



F4



F5 dan F6



F7



F8



F9



F10



F11 dan F12



F13



M1



M2

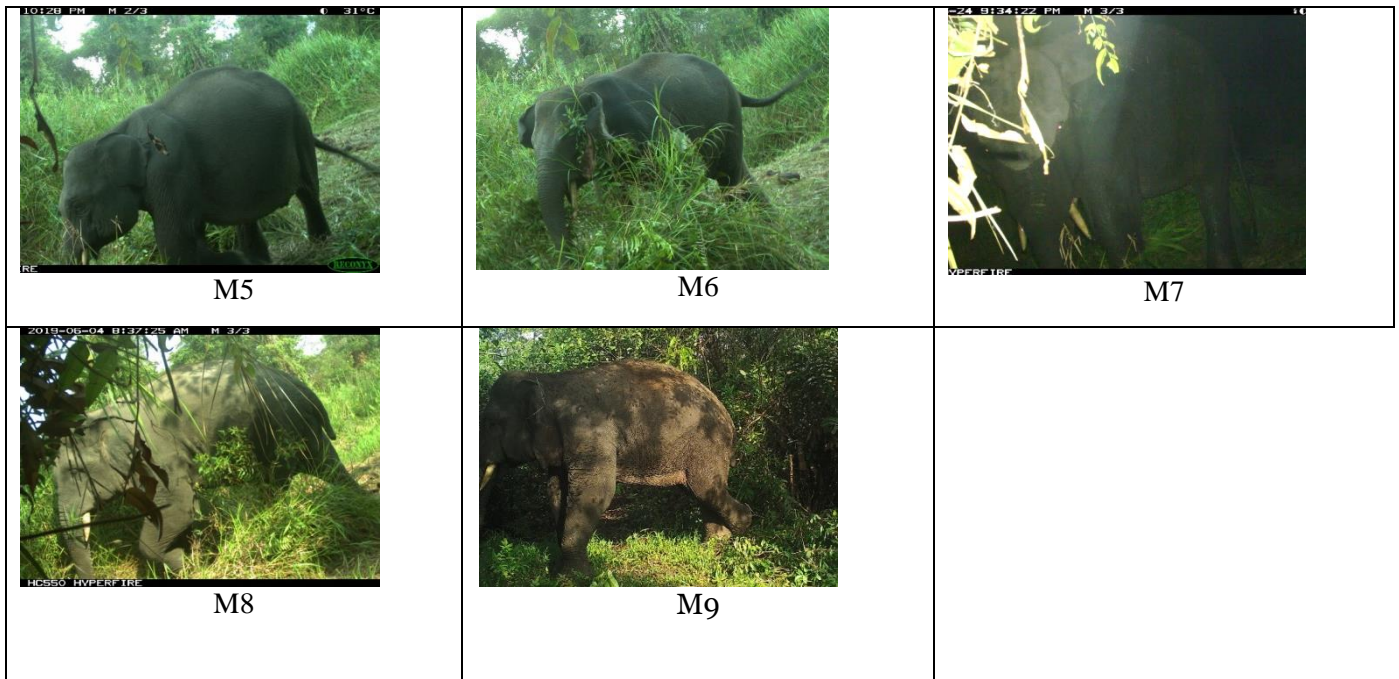


M3

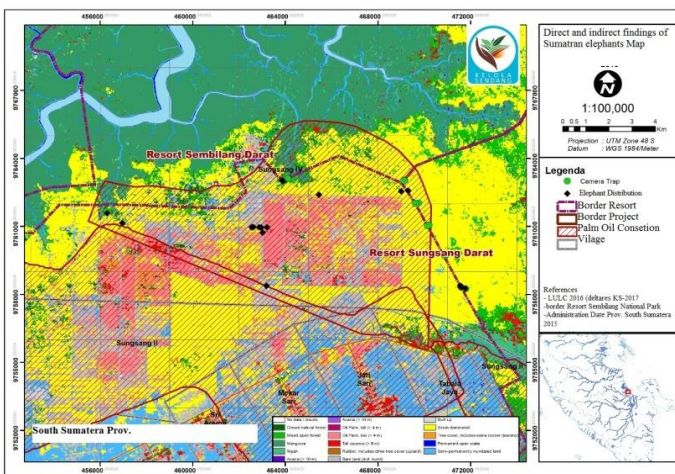


M4





**Figure 5.** Identified Sumatran Elephant Individuals from Camera Trap Photos (females (F1-F13) and Males (M1-M9)).



**Figure 4.** Direct and indirect findings of Sumatran elephants from field observation in study area

Based on interview results, cases of elephants entering the palm oil plantation have started since 2011. The number of elephant individuals entering the plantation was estimated to be 4-5 individuals, with the following characteristics: males, one had a long tail, one had stump tail, all had tusks, and all had large bodies. The elephants usually entered the plantation from the border of TNS during the afternoon. During the rainy season (from January-May), Sumatran elephants were observed more often (almost every day) entering the palm oil plantation from the TNS in the morning or in the afternoon.

### Identification of Sumatran Elephant Individuals from Camera Traps

From the fourteen cameras installed, only two cameras, namely camera five at the transect three and camera thirteen at the water gate location, successfully captured elephant activity during the day and night time. From the camera trap photos, we identified 22 Sumatran elephant individuals which consisted of 8 adult females, 2 young females, 3 infant females, and 9 males. The identification result can be seen in Table 3 and Figure 5 as follows:

Based on South Sumatra BKSDA mahout's explanation from camera trap photos, the Sumatran elephant in the research location could be categorized as swamp elephant. This is characterized by the size and shape of the body and the leg. Elephants living in swampy habitats tend to have wider legs and body, but relatively smaller in overall size. Based on the results obtained, we identified two parent female elephants estimated age  $\pm$  forty years old (Code: F1) and estimated age of twenty years old (Code: F9). Both of these individual elephants had distinctive characteristics. It can be seen in Figure 3, that individual F1 had a relatively large body with the condition of almost all skin sagging, white eyes (possibly caused by cataracts), and ripped ears. From those characteristics, F1 was suspected to be the oldest female in the research location. Individual F9 was characterized with distinct varicose veins on its legs, distinct white nodules on its trunk, and ripped ears. Other individuals suspected of

being mother and infant were F5 and F6, because they were always together, and the backs of the two individual elephants had similar shaped lumps. F11 and F12 were also suspected as mother and infant, because F12 were always seen under F11 and F11 had active mammary glands.

We identified one dominant male elephant (code: M5) at the study site. We strongly suspected that the elephant was the leader of the group, because it always walked at the back and separated from the group. From the camera trap photos, M5 was identified to secrete liquid from its temporal gland, which might indicate that the elephant was in a period of lust [13], although there was no strong supporting evidence.

From the results of this study, we encountered one Sumatran elephant individual and found at least fifteen indirect signs of Sumatran elephants activities in the study area, which confirmed the presence of Sumatran elephants in the ecotone of Sembilang National Park and palm oil plantation. From camera trap photos, we identified at least twenty two Sumatran elephant individuals, which consisted of nine males and thirteen females. We found at least tree infants within the population, which indicates that the population is a breeding population.

Compared to previous study conducted in the area, which found four elephant individuals [9], the finding of twenty two elephant individuals is a significant finding, considering the status of Sumatran elephants as critically endangered species with only 2,400-2,800 individuals left in Sumatra [14]. Compared to number of elephant population in other areas obtained from occupancy surveys by [15], such as Bukit Barisan Selatan National Park in Lampung (498 individuals in 3568 km<sup>2</sup> of area) and Way Kambas National Park in Lampung (180 individuals in 1235 km<sup>2</sup> of area), twenty two individuals in approximately 750 km<sup>2</sup> of Banyuasin Semenanjung can be considered densely populated. A herd of 40-60 Sumatran elephants in fragmented rainforest habitat had a home range size of approximately 95-97.4 km<sup>2</sup> [16].

In 2019, South Sumatra BKSDA guesstimated the total number of Sumatran elephants in South Sumatra is 178 individuals distributed in 8 habitat patches [8]. With this finding, the total number of Sumatran elephant individuals in South Sumatra rises to approximately 200 individuals. However, the area where this research was conducted has not yet been included as habitat patch of Sumatran elephants in South Sumatra. Considering the size of Sumatran elephant population in the area, the ecotone between TNS and palm oil plantation should be included as a habitat patch. Frequent records of elephants entering palm oil plantation bordering TNS, causing crop damage and economic losses to the plantation, also escalated the urgency to manage the area to ensure the long-term survival of this elephant population. Management strategies, both to mitigate human-elephant conflicts and to monitor

the elephant population itself, need to be developed by Berbak and Sembilang National Park Office, South Sumatra BKSDA, and adjacent palm oil plantation company.

One of the limitations when conducting this study was the habitat condition, which was dominated by tall grasses. Tall grasses measuring 2-4 meters in height prevented direct observation by observers as well as indirect observation by drones. Limited number of trees in the area also made finding suitable place to mount camera traps challenging. However, we found that installing camera traps in locations with high elephant's activities is by far the best method to monitor elephants in the area. More detailed research will still be needed to provide robust management strategies of the elephant population:

## 4. Conclusion

Monitoring activities that have been carried out on the existence of the Sumatran Elephant (*Elephas maximus sumatranus*) in the ecotone area between Sembilang National Park and palm oil plantation through field observation survey, interviews with palm oil plantation workers, and installation of camera traps. We identified 1 population with a total of 22 individual elephants consisting of 8 adult females, 2 young females, and 3 infant females, and 9 male individuals. In addition, we also found indirect signs of elephant's activities in the form of footprints measuring 38-40 cm, accompanied by boli / feces.

## 5. Acknowledgement

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