

Project Update: September 2017

Summary

My thesis examines the role of flying foxes in pollination in Sulawesi which consists of 2 chapters. On this second interim report, I explained about the progress of my research on the first chapter regarding the pollination service of flying foxes in Sulawesi. In total, I captured 38 individuals of flying foxes at two sites, which were 33 individuals of the gray flying fox (*Pteropus griseus*) and five individuals of the endemic Sulawesi flying fox (*Acerodon celebensis*). I collected pollen from flying fox fur by swabbing their bodies with gelatinous cubes (made of glycerin and gelatin). In total, I found 15 different types of pollen. I put the details of every pollen on this report. I am now in the process to identify which plant that the pollen belongs to in order to know plant species that may be pollinated by the flying foxes. I will start my research on second chapter about durian pollination in September 2017 when the durian starts flowering.

Key accomplishments to date:

- Finished the first capture season and collected 15 different types of pollen from gray flying fox and Sulawesi flying fox.
- Managed to identify, count, and document every collected pollen.
- Bat outreach to students at Taima Elementary School. Pulau Tangkuladi, the island where the bats roost, was in this village.



Children hold up bat stickers and brochures about the importance of bats and Save the Bats! I worked together with the local NGOs, Alliance for Tompotika Conservation that supplied me with the outreach materials.

Chapter 1: Pollination services of flying foxes

Study Location: Bualemo sub district, Banggai, Central Sulawesi, Indonesia

Objective of the study:

- a. To capture the flying foxes and collect pollen to know its pollination services.

I did my research at two sites, Pulau Besar in Salu village and Pulau Tangkuladi in Taima village (Fig. 1). I set up two stacked of 2.6 x 9 m mist nets on 10 m poles at 0200 until 0600. I had 12 nights of capture in Pulau Besar (4 nights per week) in June and 4 nights of capture in Pulau Tangkuladi (twice per week) in July 2017. My capture was less frequent in Pulau Tangkuladi compared to Pulau Besar because the former had huge colony size and Small Island, so that the capture frequency must be minimised to reduce the disturbance to the bats. In Pulau Besar, the island was bigger and the colony was not as big as in Tangkuladi (we are now trying to estimate the colony size), so that the disturbance due to capture might be smaller than the one that might be happened in Tangkuladi.

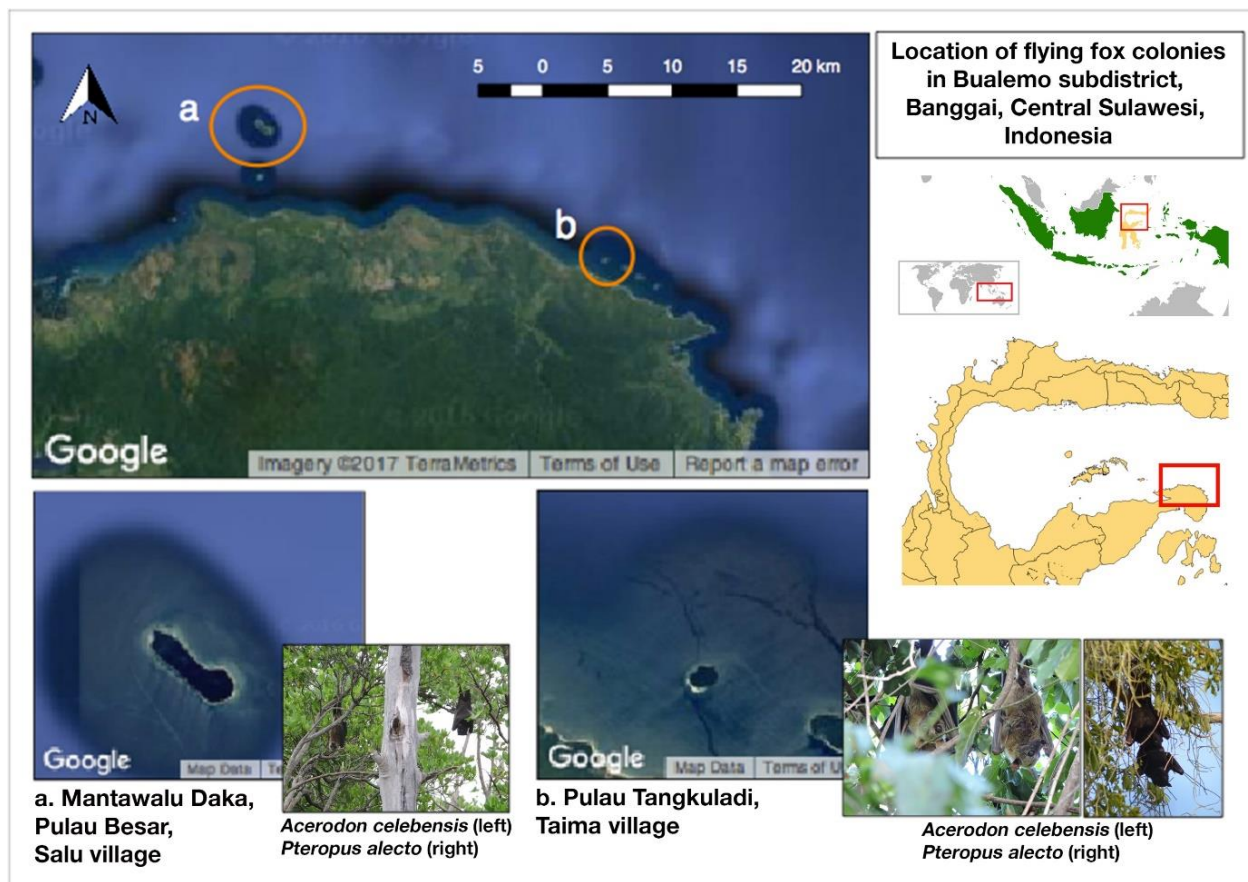


Figure 1. Location of two flying fox colonies in the study area. Pulau Besar was larger than Pulau Tangkuladi, about 1 km and 250 m in length respectively.

Species found

In total, I captured 38 individuals of flying foxes, which were 33 individuals of the gray flying fox (*Pteropus griseus*) and five individuals of the endemic Sulawesi flying fox

(*Acerodon celebensis*). Out of 33 individuals of gray flying fox, there were 17 females (four adults and 13 juveniles) and 16 males (seven adults and nine juveniles) (Fig. 2). And for Sulawesi flying fox, there were two females (one adult and one juvenile) and three males (all adults) (Fig. 3).

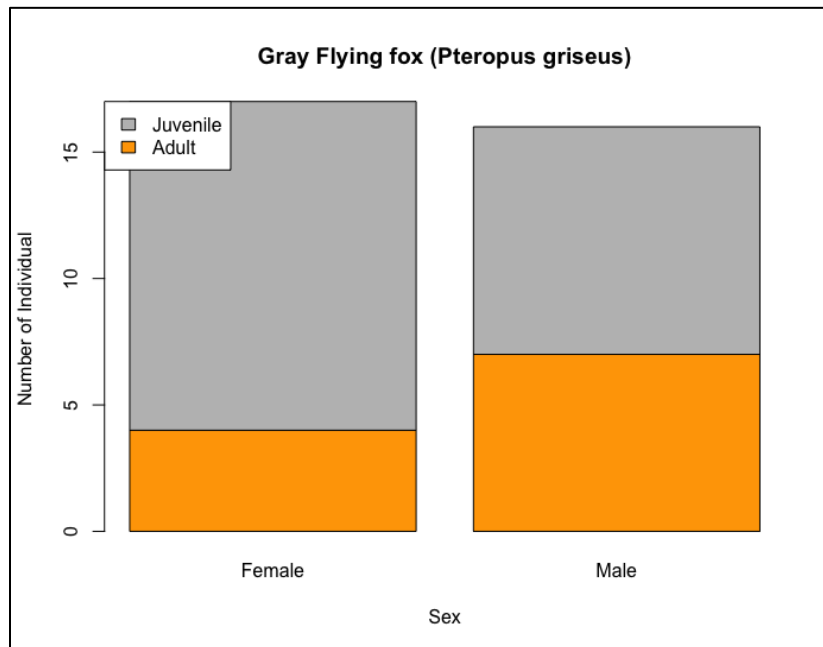


Figure 2. The number of Gray Flying fox captured according to its age and sex.

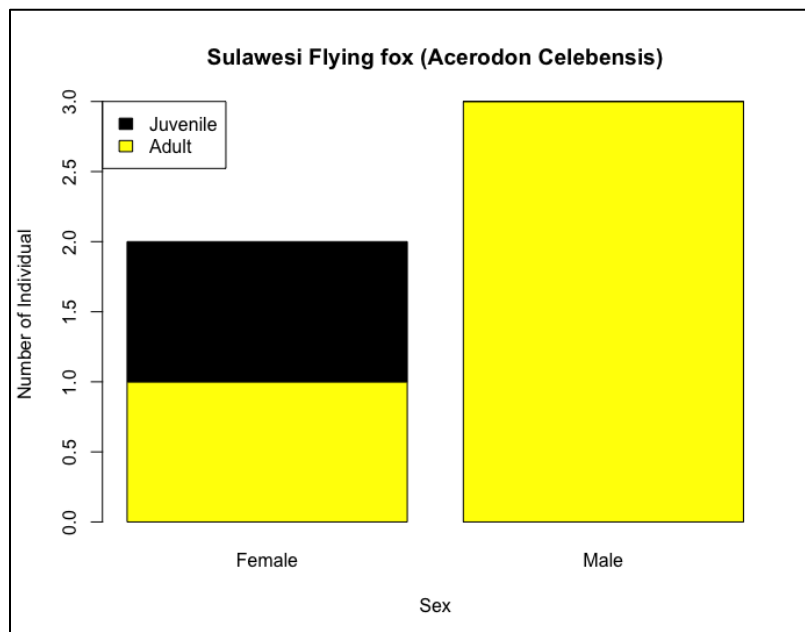


Figure 3. The number of Sulawesi Flying fox captured according to its age and sex.

Pteropus griseus, gray flying fox, is smaller than Sulawesi flying fox (Fig. 4). According to Bergmans and Rozendaal (1988), the forearm length of gray flying fox ranged from 118 to 128 mm. The average forearm and head length of the bats captured in this study was

117.33 mm and 56.1 mm respectively. Gray flying fox was lighter (236.33 g on average) compared to the Sulawesi Flying fox (398 g on average). The facial feature of the bats was distinguished by its grey color. The fur around the neck had brighter orange than the fur on the rest of the body (Fig. 5).

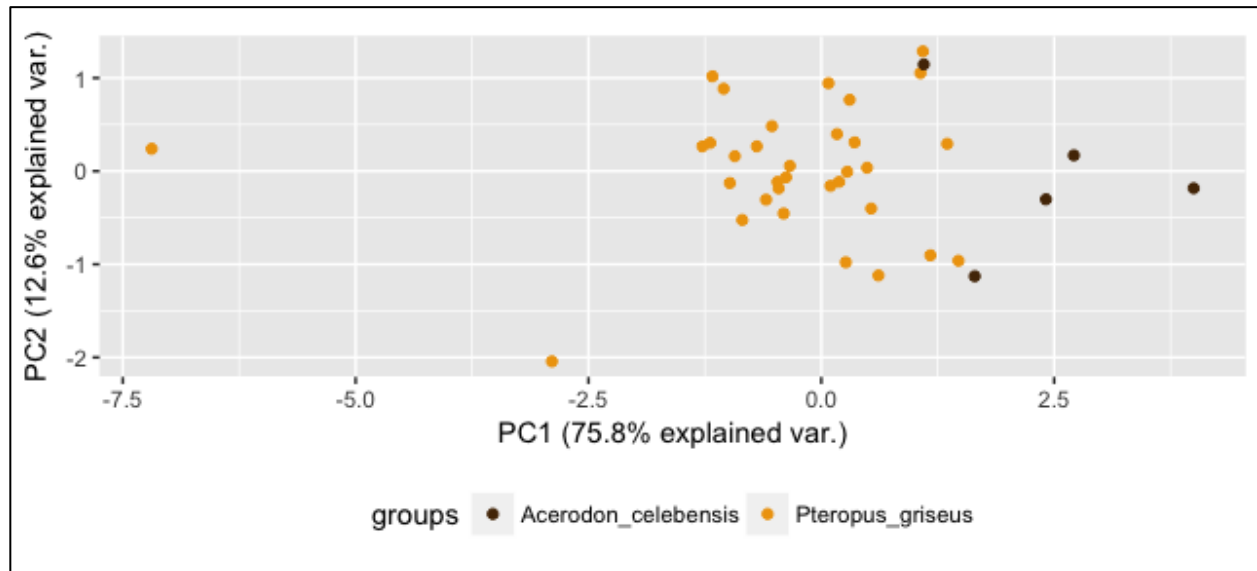


Figure 4. The result of PCA on the morphometric measurement of flying foxes. It comprised of forearm, ear, head, and hind foot length. There were two species. The larger one (black dot) was Sulawesi Flying fox and the smaller one was Gray Flying fox.



Figure 5. *Pteropus griseus*, Gray Flying fox captured in Pulau Besar.

Gray flying fox was listed as Data Deficient in IUCN Red List. Many aspects of this species, especially its ecological importance, were unknown (Francis et al. 2008). During my

research, I found that this species has been hunted for bushmeat market in North Sulawesi especially in December. Some of the locals also took the bats for occasional delicacy. This research will provide crucial information about its pollination services and encourage the local NGO and government to foster its conservation since it has been threatened by hunting, which was previously unknown. My research will be the first study to provide the ecological and hunting information.

Acerodon celebensis, Sulawesi flying fox, is larger than gray flying fox. According to Bergmans and Rozendaal (1988), the forearm length ranged from 130 to 141 mm. The average forearm and head length of the bats captured was 133.19 mm and 64.15 mm respectively. Its face was black and the rest of the body was yellow (Fig. 6).

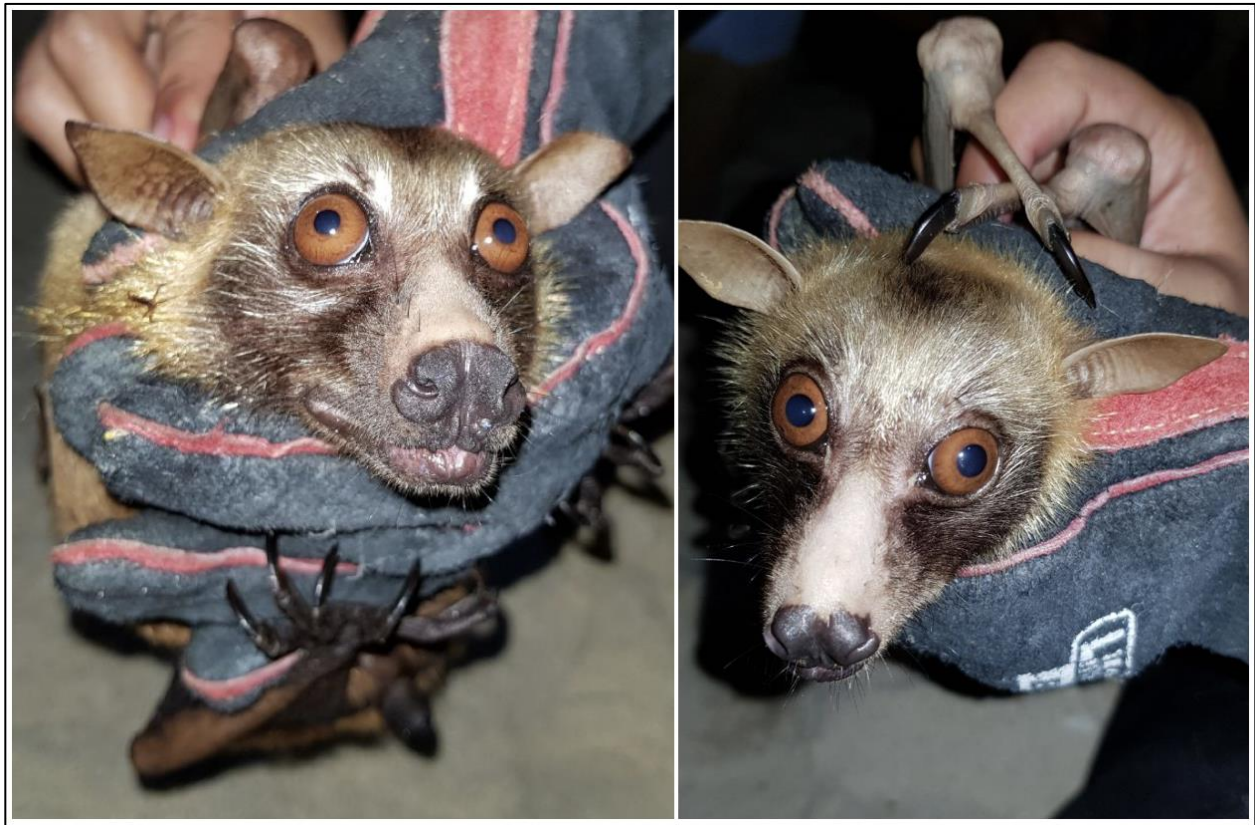
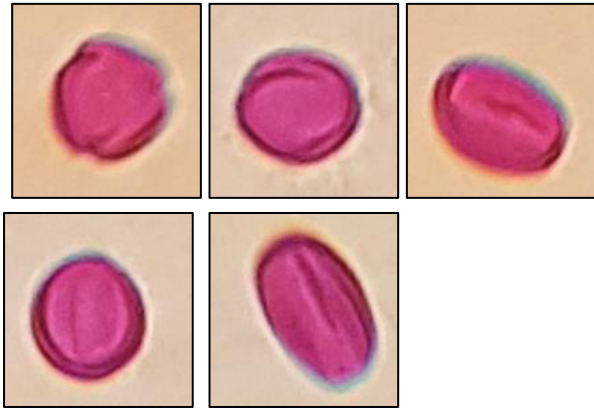
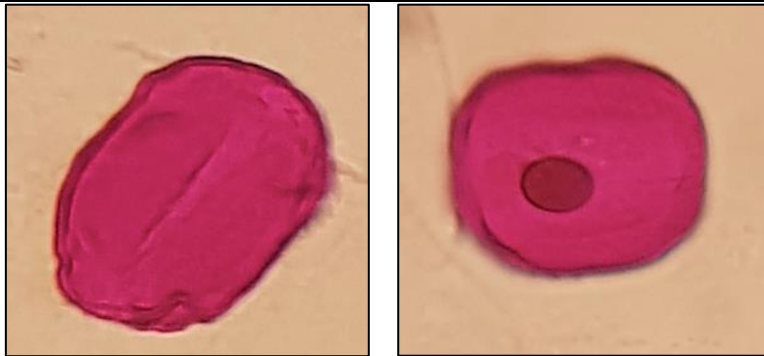
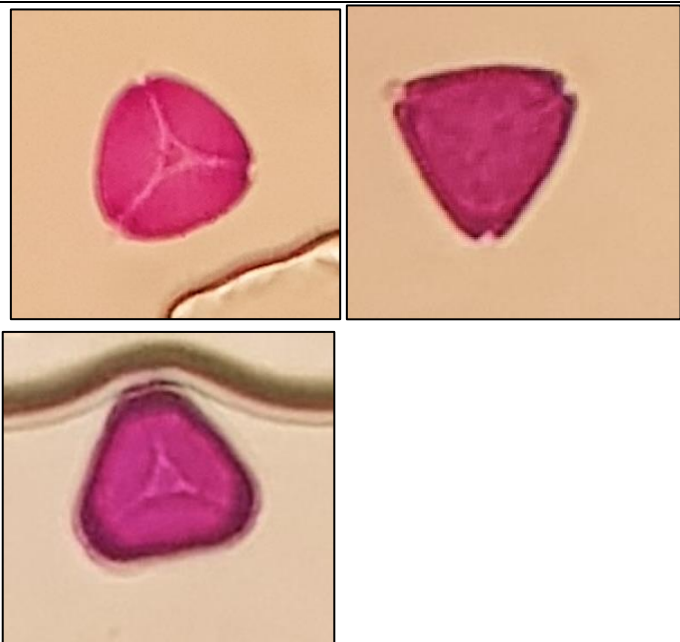



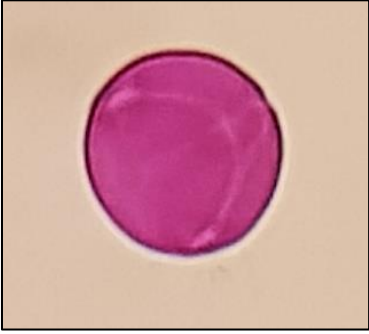
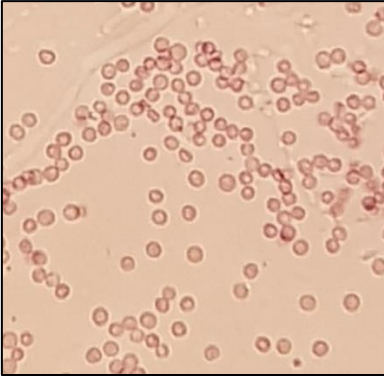
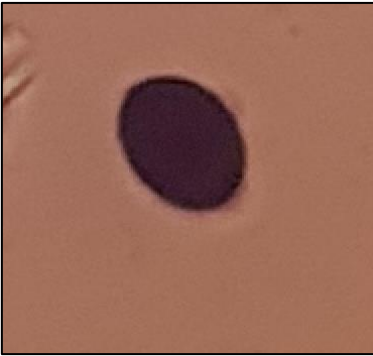

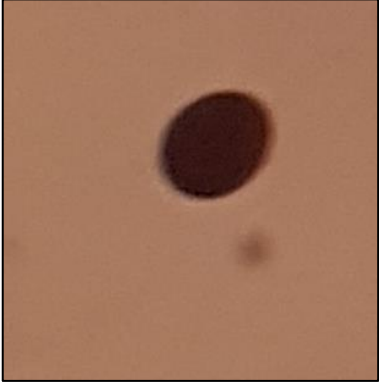
Figure 6. *Acerodon celebensis*, Sulawesi Flying fox, captured in Pulau Tangkuladi.


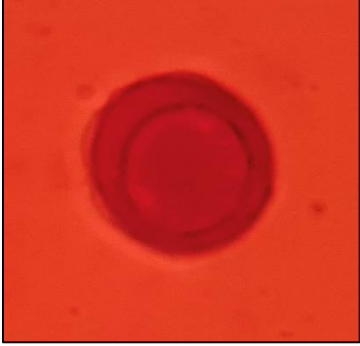
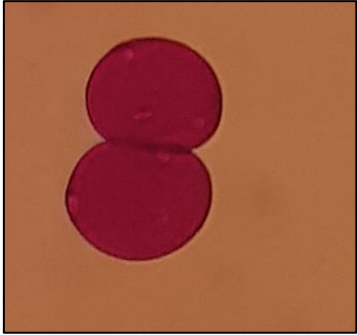


Pollination services



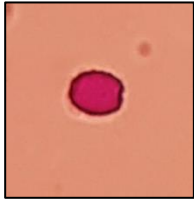
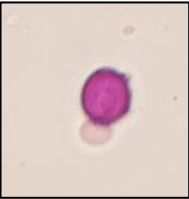


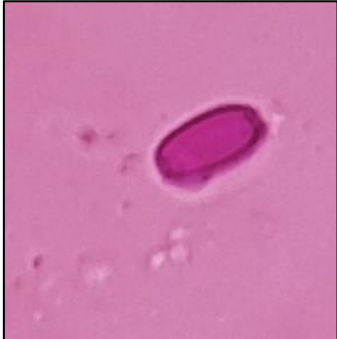


I collected pollen from flying fox fur by swabbing their bodies with gelatinous cubes (made of glycerin and gelatin). In total, I found 15 different types of pollen (Table 1). I compiled the data into a single table that could be seen in Appendix 1. For each of the flying fox, I made one microscope slide. After that, I identified and counted every pollen that I found on the slides. I am now in the process to identify which plant that the pollen belongs to in order to know plant species that may be pollinated by the flying foxes.



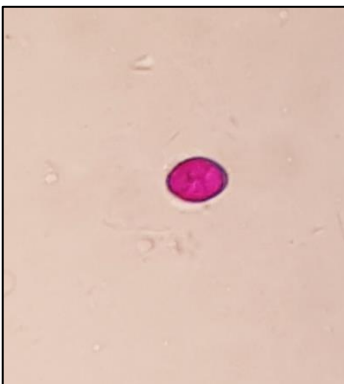



Table 1. A list of pollen types

Pollen ID	Picture	Number of pollens	Found on #bats
Pollen1		4295	18
Pollen2		4075	29
Pollen3		151	10

Pollen4			8	1
Pollen5			∞	2
Pollen6			731	13
				

Pollen7			49	1
Pollen8			2	1
Pollen9			19	5
Pollen10			6	3

Pollen11			6	1
Pollen12	    		13	1
Pollen13	  		83	2

<p>Pollen14</p>				<p>4</p>	<p>1</p>
					
<p>Pollen15</p>				<p>51</p>	
					

Appendix 1

Flying foxes with its pollen

Bat ID	Species	Colony	Pollen ID	Number of pollens
bat1	<i>Pteropus griseus</i>	Pulau Besar	Pollen1	3622
			Pollen2	169
bat2	<i>Pteropus griseus</i>	Pulau Besar	Pollen1	449
			Pollen2	491
bat3	<i>Pteropus griseus</i>	Pulau Besar	Pollen1	11
			Pollen2	3
			Pollen3	2
bat4	<i>Pteropus griseus</i>	Pulau Besar	Pollen2	49
bat5	<i>Pteropus griseus</i>	Pulau Besar	Pollen2	6
bat6	<i>Pteropus griseus</i>	Pulau Besar	Pollen2	175
bat7	<i>Pteropus griseus</i>	Pulau Besar	Pollen2	95
bat8	<i>Pteropus griseus</i>	Pulau Besar	Pollen3	28
			Pollen4	8
			Pollen5	∞
bat9	<i>Pteropus griseus</i>	Pulau Besar	Pollen3	91
			Pollen5	∞
bat10	<i>Pteropus griseus</i>	Pulau Besar	Pollen2	3
			Pollen3	2
bat11	<i>Pteropus griseus</i>	Pulau Besar	Pollen6	70
bat12	<i>Pteropus griseus</i>	Pulau Besar	Pollen2	2
			Pollen3	16
			Pollen6	12
bat13	<i>Pteropus griseus</i>	Pulau Besar	Pollen2	10
			Pollen3	2
			Pollen6	6
bat14	<i>Pteropus griseus</i>	Pulau Besar	Pollen1	2
			Pollen2	243
			Pollen3	4
			Pollen6	160
bat15	<i>Pteropus griseus</i>	Pulau Besar	Pollen1	25
			Pollen2	174
bat16	<i>Pteropus griseus</i>	Pulau Besar	Pollen2	74
			Pollen7	49
bat17	<i>Pteropus griseus</i>	Pulau Besar	Pollen8	2

bat18	<i>Pteropus griseus</i>	Pulau Besar	Pollen2	2
bat19	<i>Pteropus griseus</i>	Pulau Besar	Pollen1	2
			Pollen2	576
			Pollen3	2
			Pollen6	2
			Pollen9	7
			Pollen10	2
bat20	<i>Pteropus griseus</i>	Pulau Besar	Pollen1	12
			Pollen2	277
			Pollen9	5
bat21	<i>Pteropus griseus</i>	Pulau Besar	Pollen1	15
			Pollen2	59
			Pollen15	51
bat22	<i>Pteropus griseus</i>	Pulau Besar	Pollen1	3
			Pollen2	36
			Pollen6	3
			Pollen11	6
bat23	<i>Pteropus griseus</i>	Pulau Besar	Pollen1	4
			Pollen2	4
bat24	<i>Pteropus griseus</i>	Pulau Besar	Pollen1	6
			Pollen2	2
bat25	<i>Pteropus griseus</i>	Pulau Besar	Pollen1	5
			Pollen2	4
			Pollen6	2
bat26	<i>Pteropus griseus</i>	Pulau Besar	Pollen1	66
			Pollen6	2
bat28	<i>Pteropus griseus</i>	Pulau Besar	Pollen1	16
			Pollen2	249
bat29	<i>Pteropus griseus</i>	Pulau Besar	Pollen1	18
			Pollen2	139
			Pollen9	1
bat30	<i>Pteropus griseus</i>	Pulau Besar	Pollen1	16
			Pollen2	227
			Pollen3	2
			Pollen6	2
			Pollen10	2
bat31	<i>Pteropus griseus</i>	Pulau Besar	Pollen2	213
			Pollen3	2
bat32	<i>Pteropus griseus</i>	Pulau Besar	Pollen2	18

			Pollen6	2
bat33	<i>Pteropus griseus</i>	Pulau Besar	Pollen1	7
			Pollen2	760
			Pollen9	2
bat34	<i>Pteropus griseus</i>	Pulau Besar	Pollen2	5
			Pollen6	63
			Pollen9	4
bat35	<i>Acerodon celebensis</i>	Pulau Tangkuladi	Pollen14	4
bat36	<i>Acerodon celebensis</i>	Pulau Tangkuladi	Pollen1	3
			Pollen12	13
bat37	<i>Acerodon celebensis</i>	Pulau Tangkuladi	Pollen6	2
			Pollen13	77
bat38	<i>Acerodon celebensis</i>	Pulau Tangkuladi	Pollen13	6
bat27	<i>Acerodon celebensis</i>	Pulau Besar	Pollen1	13
			Pollen2	10
			Pollen6	405
			Pollen10	2

References

Bergmans, W. & Rozendaal, F.G. 1988. Notes on collections of fruit bats from Sulawesi and some off-lying islands (Mammalia, Megachiroptera). Zoologische verhandelingen 248: 3-71.

Francis, C., Rosell-Ambal, G. & Helgen, K. 2008. *Pteropus griseus*. The IUCN Red List of Threatened Species 2008: e.T18727A8511565. <http://dx.doi.org/10.2305/IUCN.UK.2008.RLTS.T18727A8511565.en>. Downloaded on 31 August 2017.