Captive Management of Sumatran rhinoceros (*Dicerorhinus sumatrensis*) Tabin Wildlife Reserve

June 2017

Paddock Staff

1. Wilson Kuntil (Head Keeper)
2. Justine Segunting (Rhino Keeper - RIF)
3. Marikus Suyat (Rhino Keeper – RIF)
4. Samat Gubin (Rhino Keeper – RIF)
5. Ronald Jummy (Rhino Keeper - RQF)
6. Joseph Stimon (Rhino Keeper - RIF)
7. Rasaman Jaya (Rhino Keeper - RQF)

* RQF: Rhino Quarantine Facility
RIF : Rhino Interim Facility
RFP : Rhino Food Plantation

Sumatran Rhinoceros

No.	Animal ID	Sex	Accession No
1.	Kretam	Male	SWD 002
2.	Puntung	Female	SWD 003
3.	Iman	Female	SWD 004

1. Introduction

The month of June 2017 is gloomy for everyone, especially with the BORA staff in Tabin. The 4th of June 2017 marked the day when Puntung was euthanized to put her out of pain and misery from the spreading squamous cell carcinoma.

June 2017 recorded the lowest number of rainfall and rain days (Ladang Tungku, KL – Kepong, Rainfall Data May 2017). Most of the rainfall (72%) occurred in the afternoon and night, with 28% in the morning. The total rainfall for the month is 141 mm as compared to 543 mm in May 2017. The sudden decease in rainfall by about 400 mm is very significant (Figure 1).

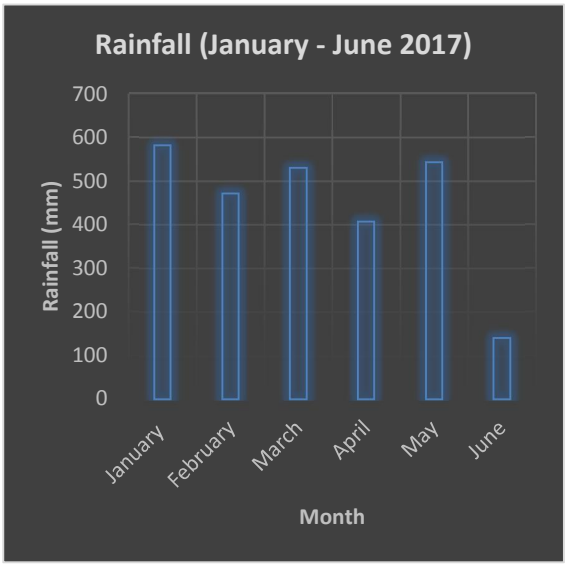

Figure 1. Monthly rainfall data in Tabin (January – June 2017)

In contrast, the number of rain days does not vary much throughout the six month of 2017. The average rain days from January – June 2017 is 17.3 (SD 3.0). The highest is in January (23 rain days) dropping to 14 days in Jun 2017 (Figure 2).

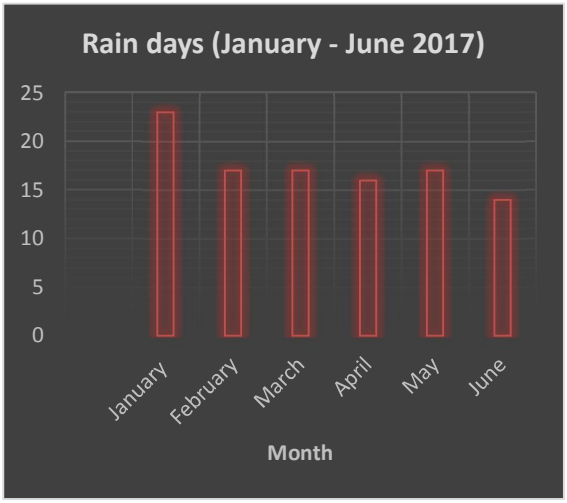

Figure 2. The number of days with rainfall recorded (January – June 2017)

On 20th June 2017, the gravity water pipelines were disrupted by a herd of elephants. Some parts of the 3 inch pipes were kinked and joints dismantled. These damage were mainly at the intake point and by the road side (Plate 1).

Plate 1. The damaged pipelines (a) and elephant dung piles (b)

All damaged pipelines were repaired immediately by JHL – BORA – OU Appeal team and water was restored the same night. However in the early hours of 21st June 2017, the water pipes near the main tank was once again damaged by the same herd but were repaired the following day.

All major roads surrounding the rhino facilities and SWD offices were repaired by the Public Works Department (JKR). The roads were graded, earth drain dug and holes filled.

Three staff meetings were held in June to plan for the euthanasia of Puntung and discuss management issues.

A collective decision to euthanize Puntung was made after consultation with various local and international experts. This was also decided as the best option to alleviate her suffering and deteriorating body condition. The Sabah Wildlife Department, after consultation with the Ministry of Tourism, Culture and Environment (KEPKAS) gave her blessing for the procedure to be carried out on the morning of the 4th June 2017.

2. Husbandry

2.1 Animal Management

Kretam and Iman maintained a body score of 2.5 – 3.0 throughout the month. Puntung's body condition deteriorated as she would only come out of her wallow once daily for food, always in the morning. Her body score was about 1.5. Effort was made to slowly draw her to the night stall, 250 meters away from her wallow. The distance was slowly reduced each time she comes for her food. Finally, she came down to the stream, about 60 meters from her night quarters. However, she would remain partially in the stream and never crossed it. After feeding (≈18 kg) she would head back, defecate on a slope and rest in her wallow. The stream always became her limit and at times she would stand inside it and feed on the browse offered by the keepers (Plate 2).

Plate 2. Puntung inside the stream as keeper Samat Gubin feed her browse

Surprisingly, on the morning of 3rd June 2017, Puntung came up voluntarily beyond the stream. She was seen to lie down on the hill, and very exhausted. The keepers slowly coaxed her with food to enter her night stall. Euthanasia was carried out the following morning.

Kretam and Iman came back for all their feedings (30 days, morning and evening). The minimum feed offered during these sessions were 18 and 15 kilograms for Kretam and Iman respectively. The bodyweights were within normal range for both rhinos.

The vaginal discharge from Iman was observed only once on 16th June 2017. The discharge was was voided after defection.

2.2 Body Weight

The two rhinos were weighed inside the chute, twice monthly. The electronic weighing scale (TruTest®) was connected via cables to the load bar which rested below the weighing platform. The average weight for Kretam and Iman for 2017 is 658 kg and 546.5 kg, respectively. In June 2017, their average weights are 662 kg for Kretam and 551 kg for Iman (Figure 2).

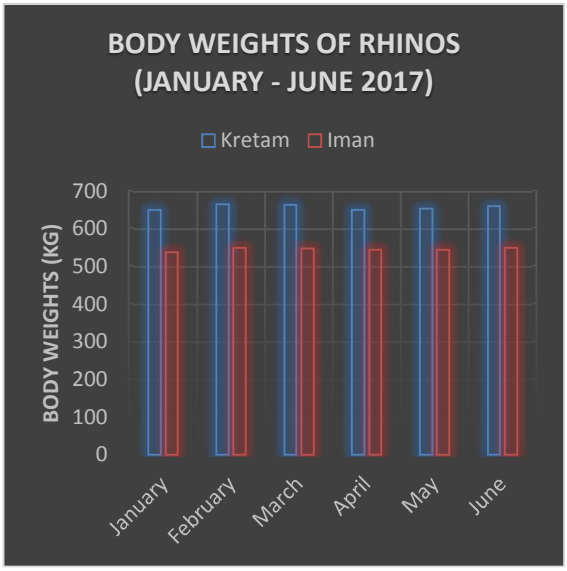

Figure 2. The body weights of the two rhinos (January – June 2017)

Puntung's feed intake remained low and her weight lost is very apparent. Her blocked nostrils, closed left eye, pain and the swollen jaw adds to the cause.

2.3 Animal Health

Puntung did not show improvement in her condition. Instead her blockage was affecting her right nostrils with blood occasionally dripping out. Efforts were made to bring Puntung to her cemented night quarters for a planned euthanasia on the 4th June 2017.

Iman did not have any health issues that warranted treatment. Kretam was treated for some fungal infection.

The routine sampling for general health and environment checks was carried out on the 19th June 2017 and send out to Makmal Diagnosa Veterinar, Kota Kinabalu early next morning. The results for the analysis was received on the 23rd June 2017.

Routine electro ejaculation and ovum pick up was schedule in mid – July 2017. It was agreed that a thorough dental checks will be carried out the two rhinos during the anesthesia. Treatment and removal of dental callus would be performed during those inspection.

2.3.1 *Kretam*

a. Fungal infection of posterior horn

The lesion is being treated with an antifungal ointment, Terbinafine (Lamisil®), twice daily. Another scrapping is being cultured in the potato agar media.

2.3.2. Puntung

a. Aberrant granuloma and squamous cell carcinoma (SCC)

Puntung's condition had worsen and her body condition, despite eating 20 kg of browse each morning. Her body score was affected significantly with protrusions of the ribs and pelvis. She would come down to the stream to be fed her favorite browse. She was only fed with the leafy portion of the browse. The stream became a place for feeding and treating her open lesions. She would stand in one position for a few hours every morning (Plate 3).

Plate 3. Puntung inside the stream after feeding and wound dressing

The lesion had increased in size and expanded to cover her left eyes completely. The skin folds swelled to create deep grooves where many of the skin breaks occurred. The open wound in the middle had thick edges and hard. This too coalesce with a one ventral to it after she accidentally lacerate it on some sharp branches in the paddock (Plate 4).

Plate 4. The large swelling with central open wound with thickened borders

Her left nostril continued to bleed and intermittent bleeding could be seen on the right nose. She sometimes had difficulty to breathe, especially during feeding. This also contributed to her inability to eat at her normal speed. Her sense of smell is also very much reduced due to these blockages. Occasionally, she would bleed from inside her left cheek. On the 3rd June 2017, it was to our surprise, Puntung was found lying down on the slope beyond the stream, and closer to the night stalls (Plate 5).

Plate 5. Puntung on the morning of the 3rd June 2017

She was slowly coaxed with banana to walk towards the night stall. Baffle boards were only necessary towards the end, to guide her into the exercise yard and subsequently the night stall (Plate 6).

Plate 6. Puntung being guided with food and baffle board (a) and (b) Puntung in her night stall. Note the ribcage

Puntung was euthanized the next morning (4th June 2017) at 7.20 am. She was anesthetized using Medetomidine (0.03mg/kg) and Ketamine hydrochloride (2mg/kg) for induction. An intravenous catheter was set up on her right marginal ear vein and 100mls of Pentobarbital sodium (Dolethal®) infused. The ovaries were removed and kept in a buffered medium with Gentamicin. These were chilled in a styrofoam box and send over to the Agro Biotechnology Institute in Kuala Lumpur for further processing and oocyte rescue. A post mortem examination was also conducted on her (Plate 7).

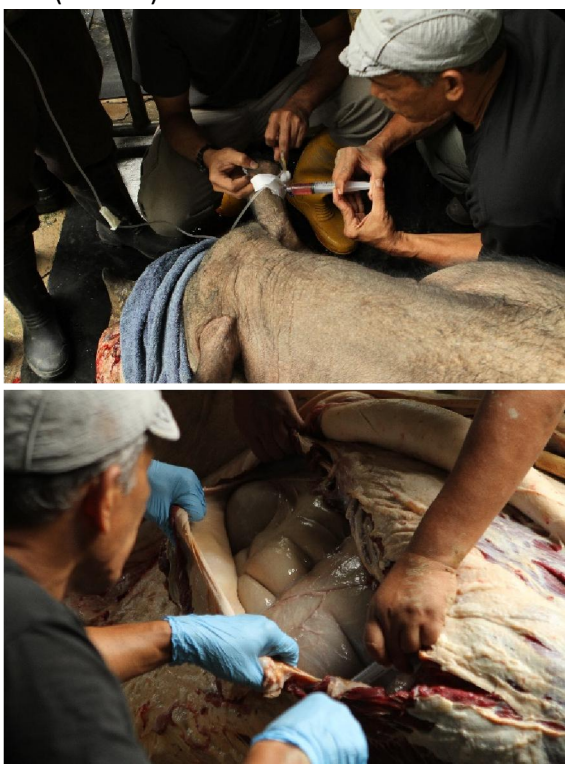

Plate 7. Euthanasia being performed on Puntung (above) and the autopsy (below)

The autopsy did not show any gross signs of septicemia. All internal organs were normal. Samples were taken for histopathology, bacteriology, cell cultures and molecular analysis (Plate 8).

Plate 8. Mr Yap arranging the samples (left) and sampling skin for cell culture (right)

The post mortem showed five significant findings (Appendix 2):

i. There were severe erosions of most joints of the elbow (except the left elbow), shoulder, pelvis and knee. A hairline fracture was observed on the right elbow. These pathologies is directly associated with her snared left front feet and the subsequent shifting of weights during locomotion and standing.
ii. The SCC, aberrant granulation and cellulitis had spread beyond the major glands, particularly parotid, sublingual and mandibular salivary glands. The rapid and aggressive spread of the SCC and the aberrant granulation had caused severe cellulitis with constant reinfection and abscess.
iii. Myositis and degeneration of some parts of the masseter muscles were grossly observed.
iv. There were callus built up in 8 remaining molars and 8 premolars. The most severe callus formation were in the remaining M2 and M3 of the upper left jaw. There were more callus built up on the lower left jaw. The reason for this is associated with the disuse side of the jaw. The level of the premolars and molars were also very close to the gums.
v. Numerous cysts (few mm to 1.5 cm diameter) were observed in the uterine body and uterine horns. The cysts were rounded and pale white or transparent.

2.3.3. *Iman*

a. Vaginal discharge

There was a small amount (20 mls) of discharge on the morning of 16th June 2017. The mucous discharge is pale white to transparent. This is usually voided after defecation, inside the night stall (Plate 9).

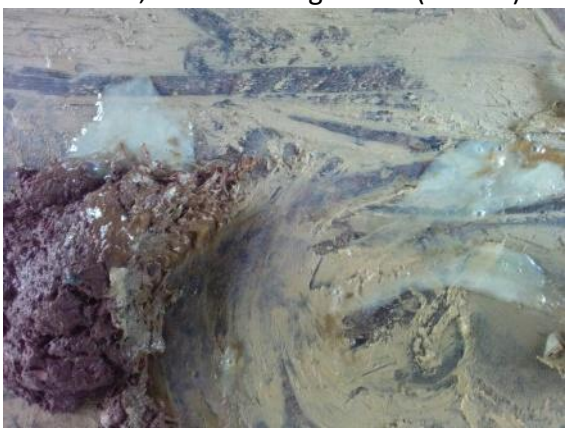

Plate 9. The discharge from Iman, seen after she defecated

The frequency of the discharge is a good indicator of her uterine pathology and approaching bloody discharge. The last Improvac® (200µg GnRF protein conjugate) vaccine was given on the 21st April 2017 and the effect should last for about four month. Her next implant will be on 21st August 2017.

b. Reproductive tract pathology

The ultrasound examinations to monitor her reproductive status and uterine pathology was carried out several times in a month. The most prominent of which are several leiomyomas (2 – 4.5 cm diameter), cysts (numerous multilocular and unilocular), fluids (some were seen in the cervix), edemaand a 3.6 cm diameter hydrosalpinx in the right oviduct (Plate 10).

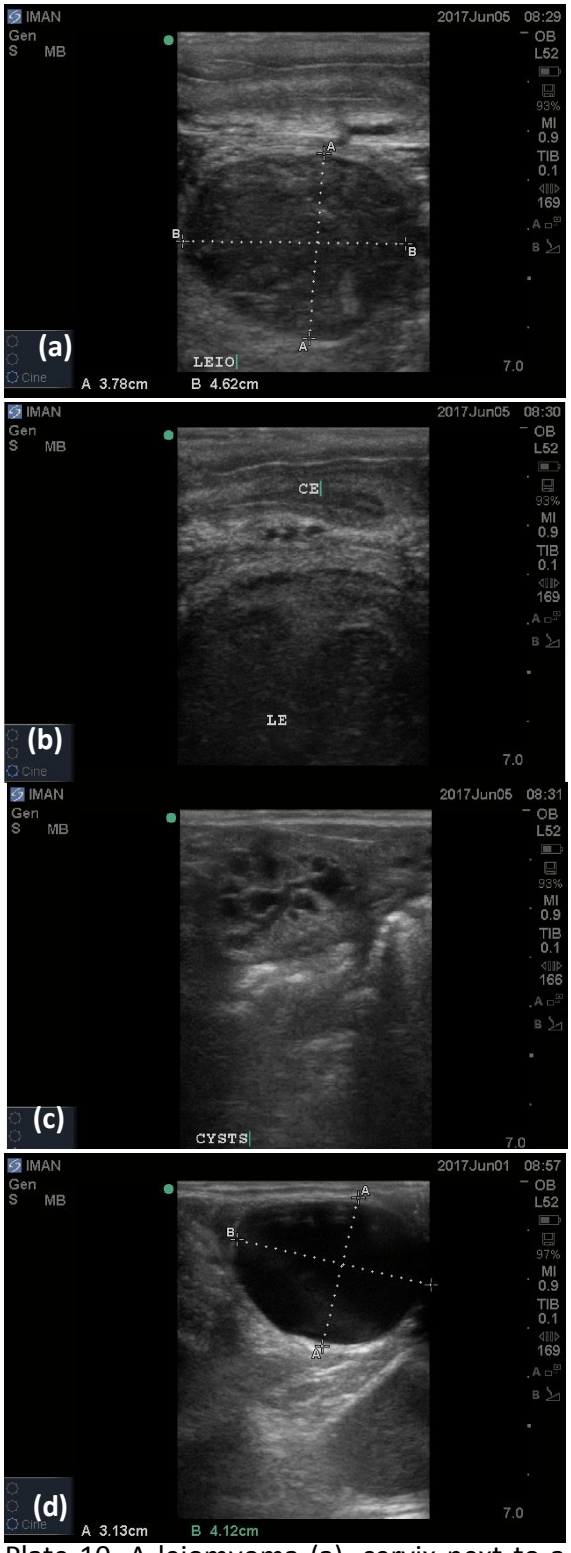

Plate 10. A leiomyoma (a), cervix next to a leiomyoma (b), cysts (c) and hydrosalpinx (d)

3. Feed and feeding

The foliage were collected earlier as it is less hot and the leaves remained fresher for longer period. Some of the species were collected from the Rhino Food Plantation.

The total amount of browse collected for Kretam and Iman for June 2017 is 3854 kilograms (Figure 3).

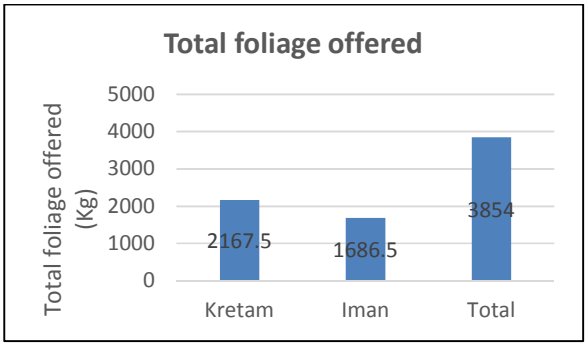

Figure 3. The total amount of foliage provided for each rhinoceros

The foliage offered were divided into those for hand feeding and those that were hung out in the paddock. On the average 74% is used for hand feeding and the remaining 26% were hung inside the paddock or night stall for the animal to browse on.

Apart from foliage collected from the forest and the rhino food plantation, banana, pumpkin and horse pellets were also provided as supplement.

3.1 Voluntary Feed Intake (VFI)

The voluntary feed intake for Iman and Kretam were 1107 and 1454.5 kilograms respectively. Of this 908.5 kg (74.7%) was hand fed to Iman, while 1174 kg (71.7%) were consumed by Kretam. Both the rhinos were hand fed inside their respective chute (Plate 11).

Plate 11. Justine, hand feeding Kretam inside the chute

A total of 999.5 kg of foliage were hung out for the rhinos. Of the 470.5 kg hung out for Iman, 198.5 kg (42.2%) were consumed by her. Kretam consumed 280.5 kg (53%) of browse hung out in his paddock.

The average amount of browse consumed by Kretam, each day is 39.1 kg. On the average, Iman consumed about 9.0 kg less (Figure 4).

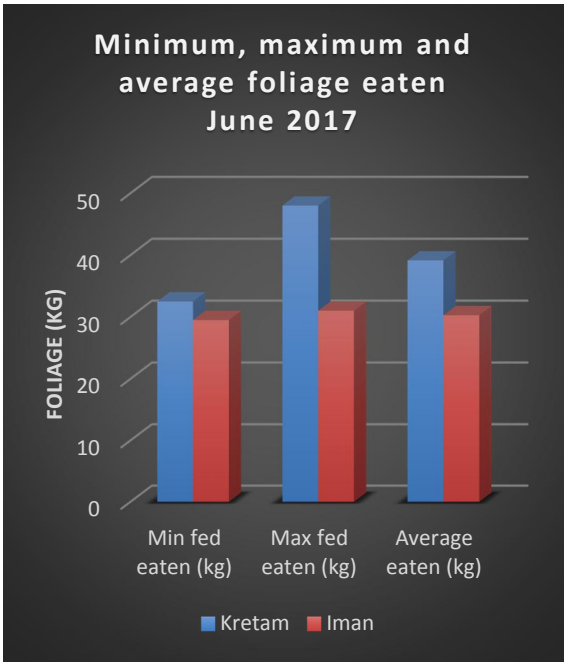

Figure 4. The average, maximum and minimum foliage consumed in June 2017

Throughout March – June 2017, the average amount of foliage consumed ranged from 62.9 – 67 %. In June 2017, the consumption rate for the two rhinos was 66.4% of the 3854 kg of foliage collected (Figure 5).

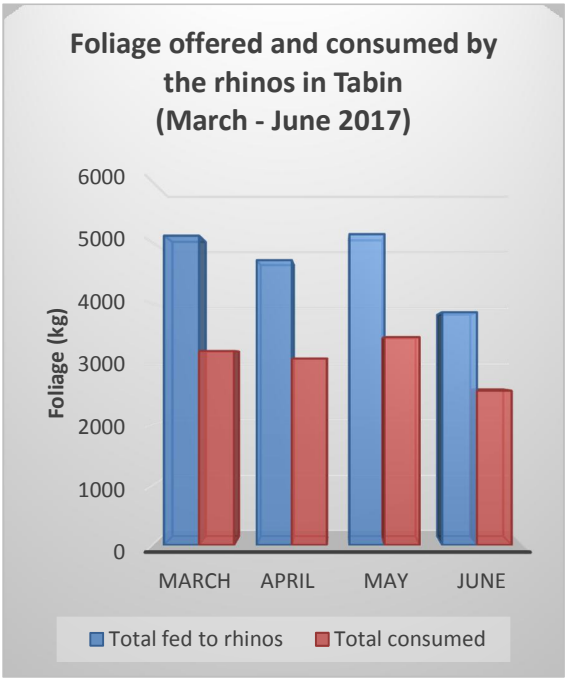

Figure 5. Total foliage collected and fed to the rhinos in Tabin

The total amount of rhino browse collected in June 2017 was only for two rhinos as Puntung was put down on the 4th June 2017.

In June 2017, 50 grams of beta carotene and Vitamin E (Vita – E Plus®) was given to Kretam as a supplement to boost his fertility before the next electro ejaculation. This was added to the horse pellets and fed to him in the morning.

3.2 Rhino Food Plantation (RFP)

In June 2017, the maintenance work in the RFP was more intense as the growth of grass and weeds throughout March and early June was left unchecked. This is also due to the extra labour needed to care for Puntung

during the long holidays in May 2017. In June, more staff were assigned to do maintenance work in RFP. Apart from weeding and cutting grass, the rhino food plants were also fertilized using rhino compost and the empty fruit bunches (EFB) supplied by KL – Kepong Malaysia Sdn. Bhd (Plate 12).

Plate 12. Hasan weeding out creepers (a); Davidson cutting grass near the Nangka plants (b); Rhino compost used for the Ficus francisi (c) and Wilson moving the EFB to put around the food plants (d)

On the 12th June 2017, the Deputy Secretary General of the Ministry of Natural Resource and the Environment (NRE) made an official visit to discuss issues related to the ART grant and to see the rhinos in Tabin. The visit was also represented by the Sabah Wildlife Department, Forest Institute Malaysia (FRIM), Department of Wildlife and National Parks (DWNP), Malaysia and BORA. There was also a tree planting ceremony at the RFP. Dato Seri Dr. Azimuddin bin Bahari, Deputy Secretary General of NRE also planted a rhino food tree in RFP, followed by the Director General of DWNP and others (Plate 13).

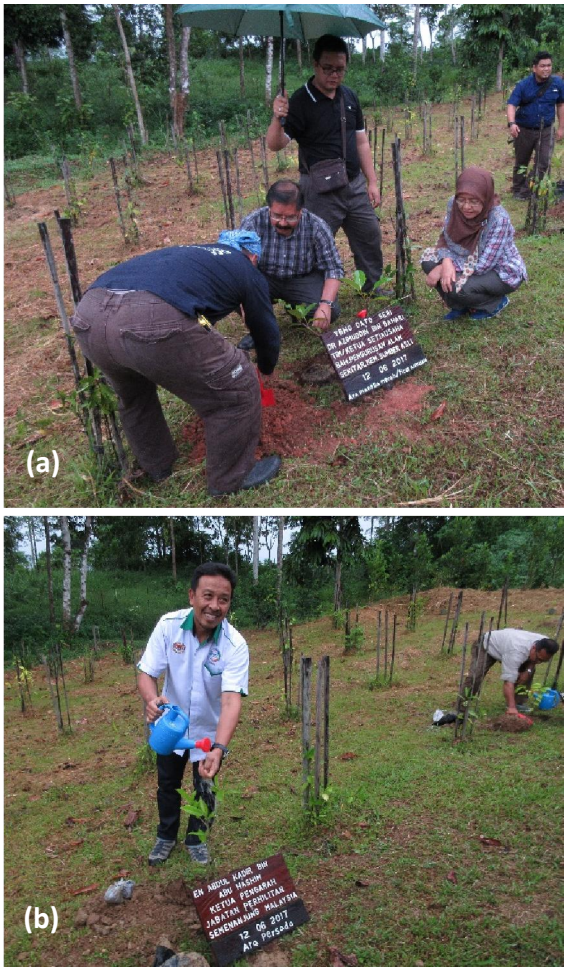

Plate 13. The Deputy Secreatary General NRE planting his tree (a) followed by the Director General of DWNP (b)

4. Biosecurity and health monitoring

The samples were collected on the 18th June 2017 (Sunday) and submitted to the Veterinary Diagnostic Laboratory and the Veterinary Public Health Laboratory early next day. The samples were packed in

various containers and bags and placed in chilled Styrofoam box (Plate 14)

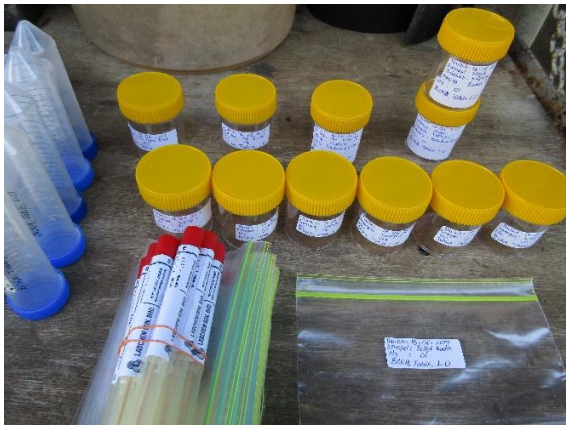

Plate 14. Swabs and soil samples collected from the enclosures and paddocks

4.1. Hematology

Blood was only collected from Kretam from the digital plexus of the hind limb. However, blood was not collected from Iman.

The blood values were compared with previous results and that of other Sumatran rhinoceros. Kretam's blood parameters were within the normal range for Sumatran rhinoceros (Table 1).

Table 1. Complete blood count (CBC) for Kretam (SWD 002)

Date/Parameters	Animal	
	18/6/17	14/5/17
Hemoparasites	Neg	Neg
RBC (X10^12/L)	5.71	5.9
WBC (1000/UL)	7.16	8.57
Hb (G/DL)	12	13.4
PCV (%)	40	43
Seg. Neutrophils (%)	59	61
Eosinophils (%)	14	16
Lymphocytes (%)	22	22
Monocytes (%)	6	1
Basophils (%)	0	0

4.2 Bacteriology

The 20 floor swabs were taken from various location inside the rhino night stalls. There were few *E.coli* and *Bacillus sp*. In most swabs except 13 – 17 which had no bacterial growth. The two tyre baths had no bacterial growth.

The 17 soil samples taken in areas surrounding/inside the rhino enclosures were negative for *Bukholderia pseudomallei*. The wallows were also negative for pathogens. The water samples from the sumps had few *Aeromonas hydrophilia*.

There were no pathogens isolated from the feces and urine of the rhinos. However, both had few *E.coli* count in their feces.

The 13 tanks had a total bacteria counts of 0 – 3300 cfu/ml. No *Salmonella sp* were isolated. The coliform counts were negative in seven tanks. The six remaining tanks had a ranged of 10 – 30 cfu/ml (Table 2).

Table 2. The total bacterial, coliform and *E.coli* counts in 13 water tanks (June 2017).

Tank	Total bacteria	Total coliform	*E.coli*
1	700	0	0
2	266	0	0
3	900	0	0
4	658	30	5
5	700	10	1
6	108	0	0
7	120	0	0
8	3300	0	0
9	0	10	0
10	90	10	0
11	300	10	3
12	560	15	0
13	0	0	0

4.3 Parasitology

The fecal samples from all three rhinos were negative for endoparasites and parasitic egg count.

4.4 Routine prophylaxis

Liming was carried out in the sumps and the site for dung disposal. Sometimes, liming was also carried out near the rhino enclosures and staff quarters. The done by keepers under the supervision of the head keeper. Liming was not allowed inside the night stalls or areas that are too close to the rhinos.

5. Reproductive assessments

5.1.1 Iman

Iman was scanned on the **1st June 2017**. She had two follicles on the right ovary, measuring about 1.0 cm diameter and none on the left. On the **5th June**, she had two 0.5 cm follicles and one 1.0 cm on the left. One follicle on the right ovary had increased to 1.6 cm. On the **15thJune**, the right ovary had two luteinizing follicles while the left had three follicles (1.69 cm, 1.15 cm 0.4 cm). Seven days later, the left ovary had one luteinizing follicle and three grafian follicles (1.3 cm, 1.2 cm and 0.41 cm). On the 30th June, the left ovary has a 1.7 cm, 1.1 cm and a 0.4 cm follicles. The right ovary did not show any follicles but was seen to be very vascular.

6. Electric fencing

Extra effort were done to ensure that the voltage on the fence is high due to elephant sighting around the base camp and road to the core area. One bull was sighted moving up towards the rhino facilities.

The range of voltage for the fences were 8.9 – 9.8 kV, 8.7 – 9.4 kV and 9.2 – 9.5 kV for the RIF, RQF and RFP respectively.

7. Other issues/activities

7.1 Elephants

On the 20th June 2017, a large herd of elephants were observed to come out from KM 6 and moved towards Lipad River before exiting at KM 3 – 4 and disappearing into the forest. They damaged several sections of the pipes which was subsequently repaired. The same herd appeared again the next day, damaging more pipes next to the storage tanks before disappearing before dawn.

On the night of 29th June 2017, an adult bull was seen behind the VIP house. The bull (single tusker) appeared in front of the basecamp the following day (Plate 15).

Plate 15. The one – tusker passed through the base camp, VIP house, canteen and headed towards the rhino facilities

7.2 Taxidermy work on Puntung's skin

Three staff from the Department of Wildlife and National Parks (DWNP) were brought in to complete processing the skin from Puntung. The remaining fat, muscles, necrotic tissues and fascia were removed from the subcutaneous area. The skin was then immerse in a solution of alum, salt and distilled water. The tedious part was removing unwanted flesh from the skin and took two whole days (Plate 16).

Plate 16. The three staff from DWNP working on the skin.

The second stage would involve preparing the metal frame, footing and materials to mount the skin. This would involve a few more trips over by the same team. No immediate dates was indicated. Currently, it is important to ensure the skin is submerge inside the solution and constantly moved once a week.

7.3 Official visit by the NRE TKSU Dato Sri Dr. Azimuddin bin Bahari

The official visit was to discuss in more detail the implementation of the project under their grant on the application of advanced reproductive technology on endangered wildlife species in Sabah (*Kajian Hidupan Liar Terancam* Sabah). The discussion also touched on the rechanneling of budget lines to hasten the harvest of gametes from the pair of rhinos in Tabin by the IZW team. The forml discussion was also attended by the Director and Deputy Director of SWD, Director General of DWNP, representatives from FRIM, CEO and Project Manager of BORA (Plate 17).

Plate 17. The official meeting between the TKSU (Ministry of Natural Resources and the Environment) and other stakeholders of the grant

The post meeting activities included visiting two rhinos (Kretam and Iman) and observing the keepers feeding them. The Director of Sabah Wildlife Department also presented the KSU with a souvenir (Plate 18).

Plate 18. Presentation of a souvenir from the SWD Director to the TKSU. Watching closely behind is keeper Joseph Stimon

7.4 Repairs of gutters in BORA facilities

Most of the gutters at the basecamp and RIF were damaged by pig – tailed macaques and many were also leaking due to rust. The ones at RIF dropped from the roof (Plate 19).

Plate 19. The leak holes on the gutters (above) and the rusty gutters (below)

The damaged gutters and their holders were replaced with new ones. A local contractor was hired to do the job to prevent conditions from becoming worse.

7.5 Repairs of tyre bath at RQF

The concrete base of the tyre bath at RQF was leaking due to cracks. The area was fixed and cemented by BORA staff and subsequently used the following day (Plate 20).

Plate 20. The damaged tyre bath (above) and (below) after it was repaired

7.6 Progress at the Borneo Rhino Sanctuary (BRS)

Apart from a few clean – ups, nothing much was seen implemented despite the site meetings and discussions.

The condition of the fence is getting worse with more tree falls and more *Caesalpenia sumatrana* (Duri kuda) climbing over. Eventually the cables will come off and the fence will become kinked and would start rusting. Similarly, many fence that were damaged almost a year ago were left as it is and not repaired. The openings provide excellent opening for wild pigs to enter and cause more damage inside the paddocks.

In addition, trees were growing on the roof of the staff quarters and the roots will eventually damage the entire gutter system. Some of the recent images of BRS were as follows.

Plate 21. A large branch on the fence

Plate 22. The pathway almost completely blocked by weeds and dried leaves

Plate 23. One of the broken concrete post

Plate24. The broken fence line due to previous tree fell

Plate 25. The black shade netting removed by elephants. The open fence lines encouraged wild pigs to move into the paddock

Plate 26. Creepers were seen to enter and leave the fence lines

Plate 27. *Cesalpenia sumatrana* creepers are difficult to remove

Plate 28. The undergrowth could also be seen from inside the fence

Plate 29. The fence almost covered by shrubs and creepers which can damage fence lines

Plate 30. Cracks were seen at the pavement of the culvert

Plate 31. Missing and loose black shade nettings provides opening for wild pigs

Plate 32. Elephant foot prints seen near the fence lines

Plate 33. The Laran tree (*N. cadamba*) and ferns growing on the roof of the staff quarters

7.7 Reports by Dr. Reza Tarmizi and Mr. Yap Keng Chee for June 2017

The monthly reports are attached for reference.