

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

May 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

Rainfall in May 2017 was the second highest for 2017, just 38 mm less than that for January 2017. The rain occurred in the afternoon, between 1.00 pm – 6.30 pm and once at 8.30 pm. The 17 rain days (55%) in May 2017, totaled 543 mm and averaged 32 mm per day (2 – 124 mm). The mornings are usually hot and humid, becoming cloudy in the afternoon (Ladang Tungku, KL – Kepong, Rainfall Data May 2017).

The monthly rainfall from January – May 2017 averaged 506.4 mm (SD: 60.9 mm).

Based on the trend, it seemed that the amount of rain each month does not vary much (Figure 1).

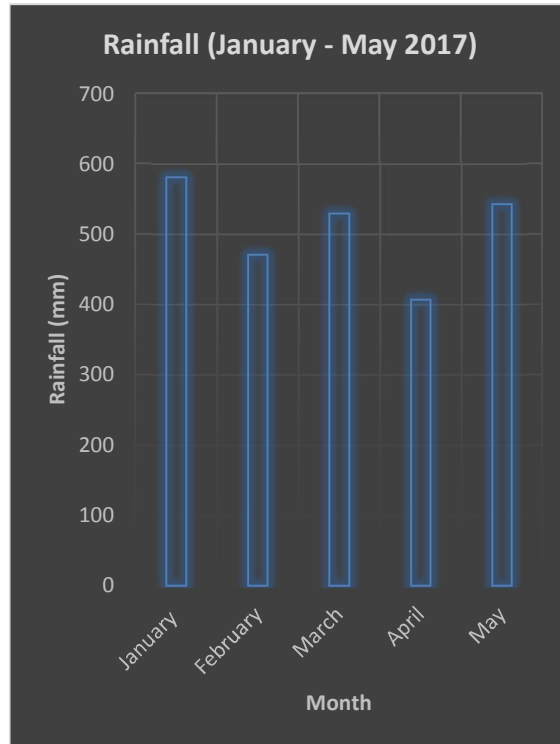


Figure 1. Monthly rainfall data (January – May 2017)

The frequent and most obvious damage caused by the heavy rain are the roads and trails in Tabin. This is also due largely by the bad road condition and poor drainage. Deep puddles were observed along the road towards the paddock (Plate 1 and 2).



Plate 1. Puddles seen on the road between RQF and RIF, in Tabin



Plate 2. Road becomes like river during heavy rainfall

The erosions along the road apron eventually redirect the water source on to the road which further aggravate the situation. The road becomes smaller and impassable to heavy vehicle (Plate 3).



Plate 3. The erosions and redirection of water flow (arrow)

The puddles were frequently filled with rocks and boulders from the Lipad River but it does not last more than a week. A letter

was send to the District Engineer (Public Works Department, Lahad Datu), requesting for assistance to repair and grade the roads between Lipad River and the mud volcano.

Similarly, the condition inside all the paddocks were equally bad, especially those inside Kretam's enclosure. The common trails were knee deep with thick mud and at times difficult to pass through (Plate 4).

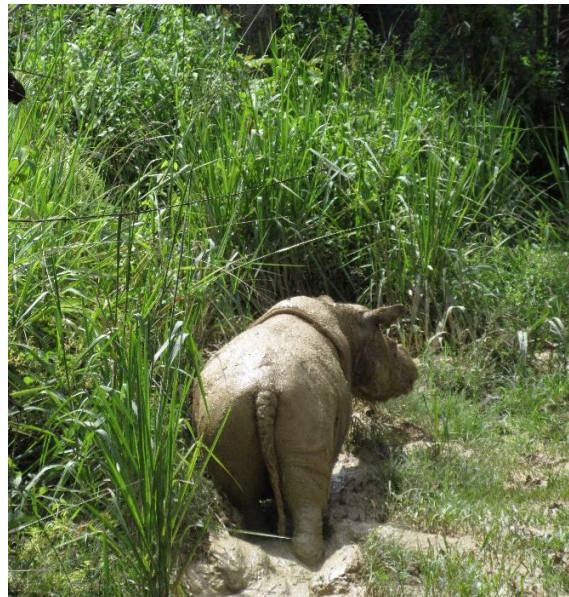


Plate 4. Iman walking through the muddy ground inside her paddock

The trails inside Puntung's paddock, used twice daily by the keepers to feed her were also wet and muddy. A water tank was placed just outside Puntung's paddock so as keepers need not carry the 25 liter (2 – 3) drinking water containers each feeding time.

Only two staff meetings were held in May 2017. The issues mainly concerned Puntung's health and management. Staff leave was shortened and some disallowed. Road repairs were discussed and implemented. Two keepers on shifts, were also requested to monitor Puntung at night in her paddock. Camps were constructed

inside Puntung's paddock, close to her wallow.

2. Husbandry

2.1 Animal Management

The body scores of Kretam and Iman were maintained at around 3.0 whilst Puntung's body score was at ≤ 2.0 . These coincided with the body weights of the rhinos and the feed intake.

Kretam comes back for almost all his feeding sessions, twice daily. His appetite is normal, eating almost 40 kg of hand fed foliage, a day. His body weight is also within the normal range. Iman's weight and feed intake is also within the normal range.

On the 8th May 2017, it was agreed that Puntung was moved out into the paddock, as the confinement inside her small night stall was having a stressful impact on her. She occupies the boundaries of her mattress (2 X 2.5 meters) most of the time (Plate 5).



Plate 5. Puntung getting up from her mattress to leave the night stall

It took almost the whole afternoon and night to slowly coax her to her paddock. She had to pass through a common exercise yard, a runway, temporary night stall and a small paddock (Plate 6).



Plate 6. Puntung inside the exercise yard (a) before moving up to the runway (b) and into the temporary night stall (c). Finally she is inside her paddock (night) but decided to wallow (d).

Even when she was finally inside her paddock, she seemed lost and unwilling to venture further. Most of her scent in the first section of paddock (before the stream) was wiped off by the constant rain. As it was getting dark, with lots of mosquitoes, she decided to get inside an old unused wallow, just outside the small paddock. The wallow was rid of all debris and water was filled in

for her. She spent the whole night inside her wallow.

The following morning, her feces was brought in and spread along her old trail to the stream. She was slowly baited with food and lead towards the stream. Once at the stream, she defecated and moved forward towards the second section where her signs (dung piles, wallow, and marks on trees) were well spread and many. She finally located her active wallow, inspected it and went in (Plate 7).



Plate 7. Puntung located her favorite wallow and went inside

In May 2017, Puntung was fed entirely inside her paddock. Fresh foliage were brought in twice a day (8.00 am and 4.30 pm). She was given succulent and mostly, leafy foliage, daily (Plate 8).



Plate 8. Samat and Wilson during the feeding session. Foliage could be seen inside the plastic containers.

Foliage were also hung in her paddock, which she ate occasionally. However, her activity is mostly inside her wallow. Treatment for her open wound was carried out twice daily. Her medication was also administered inside the paddock.

Efforts were being made to move her towards the night stall to review her condition and reevaluate (radiograph) her left cheek. The plan was to move her feeding site from the hill top (next to her wallow) to the slope (next to the fence) and subsequently to the stream. From there onwards, it would be easier to use baffle boards to gently force her back to the night stall, about 50 meters away.

Sand flies and *Tabanids* are rampant, especially in the evening. Both, the rhinos and the keepers were often bitten mercilessly.

The vaginal discharge from Iman was observed only once in May 2017. No treatment was initiated. The discharge is usually seen in the morning, after she defecated inside her night stall.

2.2 Body Weight

The three rhinos were weighed in the night stall, most often inside the chute. The concrete flooring provided a stable base for the load bars. The electronic weighing scale (TruTest®) was calibrated using the keepers' known weights. All rhinos were weighed twice a month. However, Puntung had to be weighed inside the forest. Prior to weighing her, a flat ground was chosen along her path and a piece of thick (12mm) plywood placed on top. Subsequently the load bar and platform is positioned on the plywood. Puntung is coaxed using bananas (Plate 9).



Plate 9. Puntung being coaxed to go on to the weighing platform

The body weights of Kretam and Iman for the first 5 months averaged 657.5 and 545 kg respectively. Puntung's weight decreased significantly in April and May 2017, with an average of 477.5 kg in May 2017 (Figure 2).

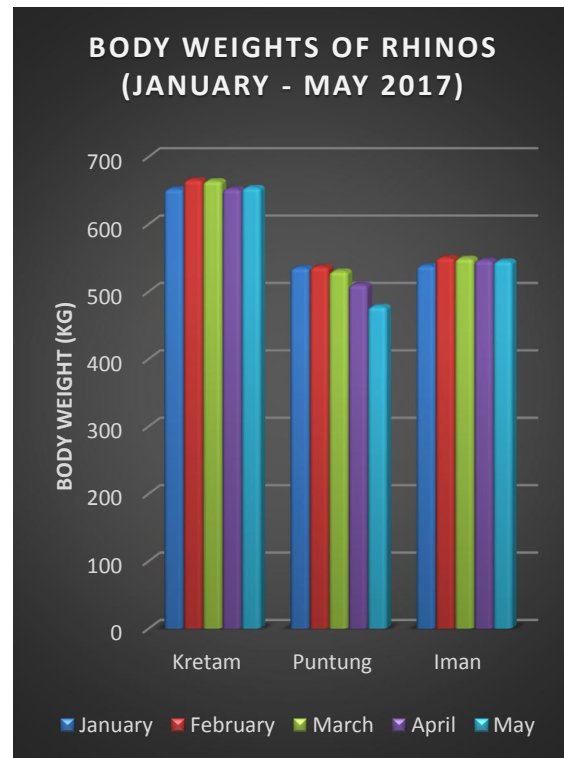


Figure 2. The body weights of the three rhinos (January – May 2017)

The drastic drop in Puntung's body weight is related to her lowered feed intake which averaged 20 kg per day. Feeding can only commenced when she comes out of the wallow which sometimes happened quite late for her evening feeding. The blockage of one nostril and closure of one eye does impact her feeding behavior. Towards the end of May 2017, her right nostril started to bleed continuously. This is similar to the left before it becomes completely blocked.

2.3 Animal Health

All efforts are mostly focused on Puntung's deteriorating health and prognosis. Several consultations were made with experts in Malaysia and around the world with regards to the aberrant granulation and increasing size of swellings. The number of new fistula and open wounds also increased significantly, some with serous discharge.

The routine sampling was done on the 15th May and laboratory analysis was carried out the following day.

Puntung's VFI dropped significantly as she consumed much less during the last week of May 2017.

2.3.1 Kretam

a. Fungal infection of posterior horn

The lesion is represented inside the hollow surface, just behind the posterior horn. Previous scrapping and culture on potato agar media indicated a fungal infection (Plate 10).



Plate 10. The location of the fungal infection (arrow) and the culture growth from some of the horn chippings (Inset)

The current treatment is using an antifungal ointment, Terbinafine (Lamisil®), applied using cotton swab, twice daily. The horn would be reevaluated in about two weeks.

b. Dental callus

During the previous electro ejaculation procedures (20th April 2017), he was also examined for dental problems prior to reviving him from the general anesthesia. A large piece of callus was removed from his premolar 1 (Plate 11).



Plate 11. The callus (inset) on the first molar (arrow) that was removed after the electro ejaculation

A second electro ejaculation on Kretam is scheduled in mid July 2017. A complete dental check will also be conducted on him and all calluses would be removed.

2.3.2 Puntung

a. Biting flies

The biting flies has been a constant nuisance to rhinos but more so for Puntung as she was fed inside her paddock, unlike the others which comes to the night stall for feeding. Even with the mud on her, these Tabanids were able to locate areas that are vulnerable including around the open wound and face.

Keepers would manually kill the flies on her body as it does affect her feeding duration.

b. Aberrant granulation – squamous cell carcinoma

The laboratory results from the biopsies indicated a squamous cell carcinoma (SCC) which replaces part of the mucosal surface and invaded the adjacent stroma. During the first week of May 2017, more granulation tissues could be seen around the periphery of the open wound, forming a thick rounded border. Although the size of the open wound could be seen decreasing, the swelling increased rapidly, spreading towards the left eye initially, before impacting the left nostril. The eyes were almost shut and blockage of the lacrimal duct resulted in constant tearing from the eye. Fresh blood could be seen oozing from the left nostril, indicating the SCC had extended to the nasal turbinates (Plate 12).



Plate 12. Blood flowing from the left nostril

Many fistula could be seen on the lesion and eventually erupted forming new open wounds that protrude beyond the skin. Some of these were located at the skin folds (Plate 13).



Plate 13. The many open wounds of various sizes (arrow) erupted from the swelling

The periorbital swellings extended below the eye, just above the mandible. It was smooth and had a pinkish coloration. As the swelling increased in size, more folds were visible (Plate 14).



Plate 14. The periorbital swelling on 7th May 2017 (a) and the thickened folds on the 22nd May 2017 (b)

During the same period, Puntung was unable to vocalize but continued feeding. Feed intake was markedly reduced. More of her time was spent inside the wallow. On the 30th May 2017, blood was observed to flow out from her right nostril when she lies down in her wallow (Plate 15).



Plate 15. Puntung resting inside her wallow and blood could be seen coming out from both nostrils

The antibiotic was continued (from April 2017) with intramuscular administration of a broad spectrum cephalosporin antibiotic, ceftiofur (Excede[®] 10% suspension). The antibiotic was given at 2.5mg/kg on the 1st, 3rd, 5th, 7th and 9th May 2017.

Serratopeptidase (50mg bid orally) was also initiated to try and reduce the chronic inflammation and swelling.

She was also given 3 capsules of oral Tramadol hydrochloride (Anadol[®]) twice daily to ease the pain and discomfort.

The hematinic, Sangobion[®] was continued daily (2 capsules orally) to compensate for the constant blood loss.

As the animal wallows most of the time, the body is almost entirely covered with mud.

Treatment of the open wound was carried out twice a day. Water spray and cloth was initially used to remove the mud from the left cheek. This is followed by thoroughly cleaning the open wound and surrounding areas with normal saline. Absorbent gauze was used to cover all the affected areas for several minutes. This is followed by povidone (Septidine[®]), which was applied on the open wounds (Plate 16).

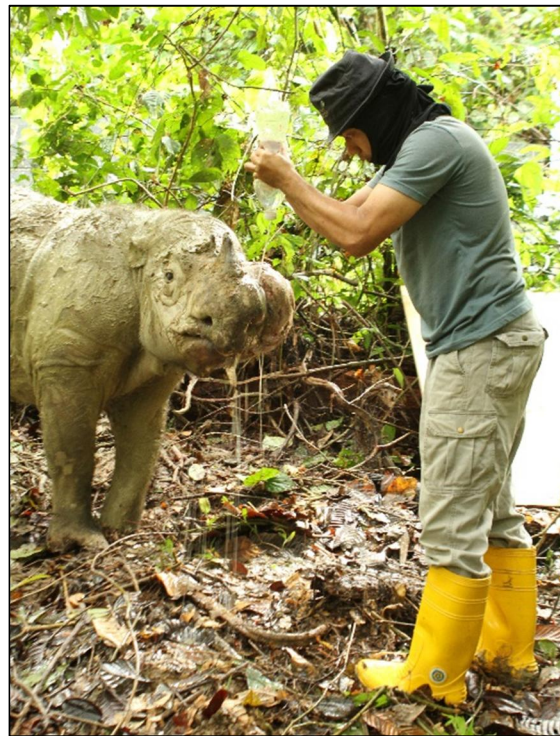


Plate 16. Dr. Reza cleaning the open wounds on Puntung's left cheek

It was decided at the later stage, that, she was enduring a lot of pain and discomfort. As the condition worsens and all treatment protocols did not improve the situation, a planned euthanasia was discussed with experts (local and international). It was agreed that euthanasia would be the best approach and scheduled for early to mid-June 2017.

c. Reproductive tract pathology

An ultrasound exam was done on the 28th May 2017. Similar pathology were observed, mainly endometrial cysts, in the uterus and uterine horns. Both the ovaries were inactive and no follicles were observed. This is also reflected by the “zero” interaction with Kretam.

2.3.3. Iman

a. Reproductive tract pathology

There were no discharge from Iman in May 2017, largely due to the Improvac vaccine that she got on the 20th April 2017. The uterine pathology that were seen during the ultrasound examination consisted of numerous leiomyomas, of varying sizes but mostly rounded with dense structures. The cysts were also of varying sizes and shapes with multi and unilocular structures. The cervix also presents a few cysts and is edematous with blur outline of the annular folds. Hydrosalpinx is clearly visible in the right oviduct.

3. Feed and feeding

A large amount of browse collected were selected for Puntung, comprising of her favourites which included Sadaman (*Macaranga spp*), Binuang (*Octomeles sumatrana*), Ludai (*Balakata baccatum*), Terosop Rebung, Tambirog, Gatal Piring (*Ficus spp*), Ara Manis Manis (*Ficus spp*), Putih Sebelah (*Leucosyke capitellata*), Maitap (Neonauclea), Nangka (*Artocarpus heterophyllus*), Daun Bulan Bulan, Merimia, Ara Epal (*Ficus spp*), Kedondong hutan, and Gatal Gatal Berbulu (*Ficus spp*). A few of these came from the Rhino Food Plantation. Puntung was fed mainly leaves with little amount of branches as compared to the

other two rhinoceros. The limitation of her Voluntary Feed Intake is her difficulty in mastication due to the molar/premolars extraction, difficulty in breathing with one patent nostril, mucous or bloody discharge from the nostril, pain from the swelling and reduced sense of smell and sight.

Iman and Kretam consumed the normal amount of food offered, averaging 65.2% and 71.5% respectively.

In May 2017, the total amount of foliage collected and fed to the three rhinoceros were 5141 kilograms. A small percentage of these comes from the RFP. Of this, 70% were hand fed to the rhinos and the rest hung for night feeding (Figure 3).

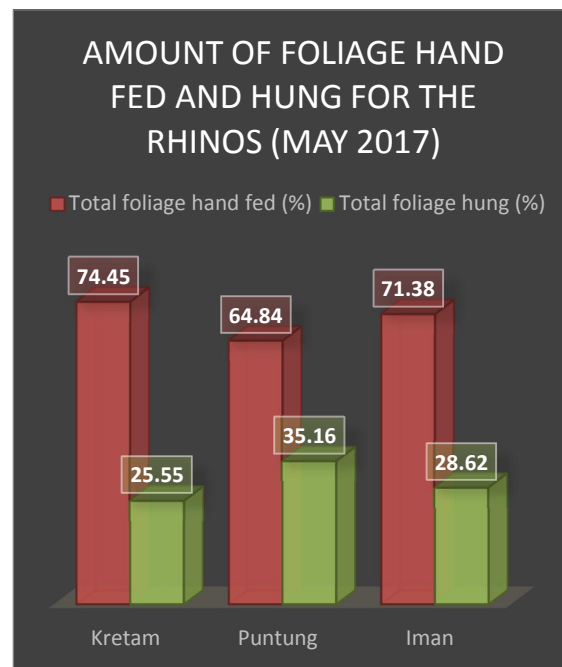


Figure 3. Breakdown of the foliage collected and fed to the rhinos

More foliage (Grade 1 species) were hung out for Puntung to entice her to consume during the night whenever she is out of the wallow.

3.1 Voluntary Feed Intake (VFI)

The feed intake were calculated from the amount eaten via hand feeding and those that were hung inside the paddocks and fed upon in the evening or at night.

In May 2017, the total amount of foliage consumed by Kretam, Puntung and Iman were 1551.5, 739.5 and 1153.5 kg respectively. Of these, 25 – 35 % were hung out in the paddock for the rhinos to feed on. However, most of the foliage were eaten during hand feeding, mostly with Kretam, followed by Iman and Puntung (Figure 4).

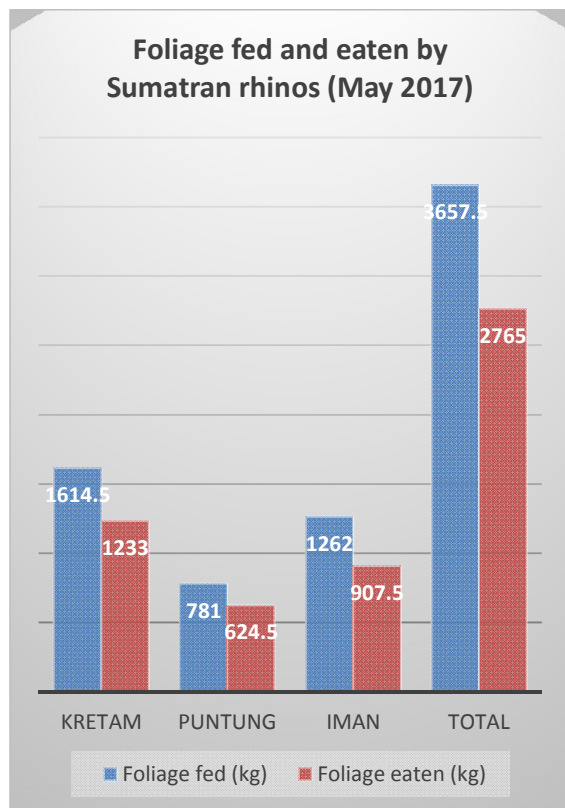


Figure 4. The total amount of foliage fed to the rhinos and the amount consumed

Puntung had to be hand fed inside her paddock as she refused to come back to her night stall. The feed selected for her

comprised mainly of leafy parts of the plants that were stacked in several containers and brought up into the paddock (Plate 17).



Plate 17. Wilson selecting the foliage to feed Puntung inside her paddock

During each feeding session, the keepers would try and move her closer to the stream and subsequently, the night stall. Towards the end of May 2017, Puntung moved down to the stream and decided not to move further. She would come down to the stream each morning but never crossed it (Plate 18).



Plate 18. Samat feeding Puntung at the stream

Apart from browsing in her paddock, Puntung did consumed some of the foliage that was hung on trees in her paddock. Due to her limited sense of smell, the foliage were hung close to her wallow (Plate 19).



Plate 19. Puntung just came out of her wallow and fed on the Pulai stalk that was hung out for her the previous evening

The equine pellets (Gold coin®) were supplemented daily to Kretam and Iman (500 and 400 grams respectively per animal per day). The pellets were soften with water before wrapping it in leaves and fed to the rhinos.

Kretam and Iman were fed 155 kg of banana in May 2017. Occasionally, they would be fed papaya and sometimes mangoes. The amount of pumpkins fed ranged from 0.5 – 1.0 kg per day. On the average, thirteen species of browse were fed to the rhinos each day.

Kretam came back for 30 feedings (30 days) whilst Iman came back for all 31 days. Puntung was fed inside her paddock each day. However, towards the end of the month, she only came out in the morning for her food. She would consumed almost 20

kilograms in the morning. More food were hung out for her in the evening.

3.2 Rhino Food Plantation (RFP)

Due to the long holidays by many staff for *Hari Keamatan*, many maintenance work inside the plantation as not carried out routinely. The staff from RFP was also assigned to help with the daily care and feeding of Puntung.

One hundred sapling from marcotted Mas Cotek (*Ficus deltoidea*) were transplanted into polybags from the parent tree. These would be added to the plantation as they grow bigger. Similarly, the seedlings of Kamangsi (*Artocarpus camansi*) were also planted in polybags and subsequently transferred to the ground when about 45cm tall (Plate 20).



Plate 20. Kamangsi seedlings (left) and marcotted Mas Cotek in polybags (right)

The stock of Nangka seedlings are still adequate, at around 300 plants which would be planted around the vicinity of the BRS.

4. Biosecurity and health monitoring

The samples were collected on the 14th May 2017 (Sunday) and submitted to the Veterinary Diagnostic Laboratory and the Veterinary Public Health Laboratory, in Kepayan, Kota Kinablu before 1.00 pm the following day.

These samples consisted mainly of water from the water tanks used for the staff and rhinos. Several floor swabs were taken to check for cleanliness of the night stalls. Samples from all the active wallows and soil around the night stalls and inside the paddocks were also analyzed for pathogens. The samples were also taken from the rhinos including blood, fresh urine and feces. The fecal samples were mainly for parasitological evaluation.

The bacterial culture and sensitivity results for Puntung's abscess swabs came back from the Pathology and Clinical Laboratory (M) Sdn. Bhd in Sandakan. The results indicated moderate growth of *Pseudomonas* spp and Non – hemolytic streptococcus. The sensitivity tests showed that both bacteria are sensitive to various antibiotics including Amoxicillin, Augmentin, Cephalexin, Norfloxacin, Ceftriaxone and Gentamicin.

4.1. Hematology

Blood was only collected from Kretam from the digital plexus of the hind limb. Puntung remained in the wallow for almost the whole day and blood withdrawal was not possible. Attempt to take blood from Iman failed as she was not cooperative.

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
13/2/2017	Kretam
Hemoparasites	Neg
RBC (X10 ¹² /L)	5.9
WBC (1000/UL)	8.57
Hb (G/DL)	13.4
PCV (%)	43
Seg. Neutrophils (%)	61
Eosinophils (%)	16
Lymphocytes (%)	22
Monocytes (%)	1
Basophils (%)	0

4.2 Bacteriology

The 20 floor swabs were taken from various location inside the rhino night stalls. Swab 1 to 12, had few to moderate *E.coli* and *Bacillus* sp. Swabs 13 – 17 and 19 had no bacterial growth. The two tyre baths had no bacterial growth.

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

There were no pathogens isolated from the feces and urine of the rhinos. However, Iman had high *E.coli* count in her feces.

All water samples from the 13 tanks had a total bacteria counts of 0 – 6700 cfu/ml. There were no *Salmonella* sp isolated from the water samples. The coliform counts

were negative in eight tanks. The five remaining tanks had a ranged of 10 – 20 cfu/ml. The *E. coli* colonies were negative in all the water samples (Table 2).

Table 2. The total bacterial, coliform and *E.coli* counts in 13 water tanks (cfu/ml) for the month of May 2017.

Tank	Total bacteria	Total coliform	<i>E.coli</i>
1	6700	0	0
2	202	10	0
3	600	0	0
4	968	0	0
5	700	10	0
6	108	0	0
7	120	0	0
8	300	0	0
9	450	10	0
10	490	10	0
11	120	20	0
12	118	0	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 when necessary, around the rhino enclosures and staff quarters. Sumps and dung piles were usually limed more than once monthly. All disinfecting were done under the supervision of the head keeper. No liming was allowed inside the night stalls or areas that are too close to the rhinos.

5. Reproductive assessments

There were no reproductive assessment done on Puntung in May 2017. The one done

at the end of April indicated inactive ovarian activities in both ovaries.

5.1 Hormone profile

5.1.1 Puntung

There were no hormone profiling for Puntung as reflected by the inactive ovaries. There was zero interaction with Kretam.

5.2 Ultrasonography

5.2.1 Puntung

An ultrasound examination was conducted on Puntung on the 28th May 2017. Both the ovaries had no visible follicle (Plate 21).



Plate 21. The left ovary (top) and the right ovary (bottom) showing inactivity

5.2.2 Iman

Iman was scanned at the end of May 2017. There were two 1.2 cm follicles on the right ovary. The follicles were nice and rounded and quite spaced apart.

The left ovary had around four small, ≤ 5 mm diameter follicles.

5.3 Behavioral estrus

There were no interaction observed inside the paddock between Kretam and Puntung in May 2017. The only short interaction between them was inside the night stall when she was brought in. Puntung did not vocalize much. This is due to her deteriorating body condition.

6. Electric fencing

The voltage on the fence is important in keeping the elephants out, especially in the Rhino Food Plantation. On the average, the output is adequate to deter an intrusion. Maintenance of the electric fence is done continuously as weeds or fallen twigs could cause leakage of current.

The current at RFP was erratic, initially thought to be related to the timer but the trouble shoot indicated a weak battery. The range of voltage for the fences were 8.9 – 9.6 kV, 8.6 – 9.5 kV and 7.6 – 9.3 kV for the RIF, RQF and RFP respectively.

7. Other issues/activities

7.1 Working visit by the Division Secretary, Biodiversity and Forest Management, Ministry of Natural Resources and Environment (NRE)

The visit by Dr. Megat Sanny and his deputy was organized on the 24th May 2017. The

activities included a briefing by the Sabah Wildlife Department and discussion. This was followed by a visit to the rhino enclosures to view Kretam and Iman. This was followed by a visit to the BRS facility in Tabin. Dr. Megat also questioned on the progress of BRS, emphasizing on expediting the process to enable the rhinos to move in.

Discussions included the progress of Puntung, collaborations with Universiti Malaysia Sabah (UMS) Sandakan and status of the “Advanced reproductive Technologies (ART) in endangered species in Sabah” program. He was also briefed on the “frozen zoo” concept that Sabah Wildlife Department is adopting for endangered species.

Dr. Megat visited the Rhino Food Plantation and was given the honor to plant a rhino food tree inside the RFP (Plate 23).



Plate 22. Dr. Megat Sani after planting his Ficus tree

The following day (25th May, 2017), the group visited the location for the new ART

facility at UMS Sandakan and held site discussions on the progress (Plate 23).



Plate 23. Site visit by the Division Secretary to UMS

Dr. Megat also updated on the Malaysia – Indonesia collaboration with respect to the initiatives by the NRE Ministry.

7.2 Borneo Rhino Sanctuary (BRS), Tabin updates

Nothing has progressed on the ground with regards to the contracted responsibilities, comprising of three essential components – electric fencing that provides at least 9kV of voltage, flooring of the night stalls that has to slope at 3% gradient towards the drain and clean – up of rubbish (comprising of sharp rusty metals, wires and concrete slabs), inside the paddocks.

The situation is getting worse because, there is no maintenance being done on the facility which if unattended will degrade and get more damaged. This is particularly so with the roofing which will start to leak as rubbish and roots of plants dig into the joints and wooden surface. Some of the obvious neglect are as follows (Plate 24 a – i).



Plate 24 (a). The old broken down shed with concrete beams in front, (b) the unseen concrete path around the paddocks and (c) the weed has overgrown the fence



Plate 24 (d). Rusty broken substandard fence wires, (e and f) substandard wires used for insulators



Plate 24 (g). The trees growing in the gutter of the staff quarters, (h). Plywood containers left under the water tank and (i) the two powerful energizers (16 joules), each able to power 120km of hot wire

7.3 Reports by Dr. Reza Tarmizi and Mr. Yap Keng Chee for May 2017

The monthly reports are as attached for reference. This would reflect their work, both in Tabin and in Sandakan.