

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

March 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 rainy periods had not subsided much in the month of March with heavy downpours occurring in the afternoon. The numbers of rainfall days (17 days) were similar to that in February 2017. However, the volume of rain in March exceeded those in February by 59 mm. Total rainfall in March is 522 mm, ranging from 4 – 224 mm. Most of the rain fell in the second week of March, with the least in the third week. The month of January 2017 has the highest rainfall followed by March and February (Figure 1).

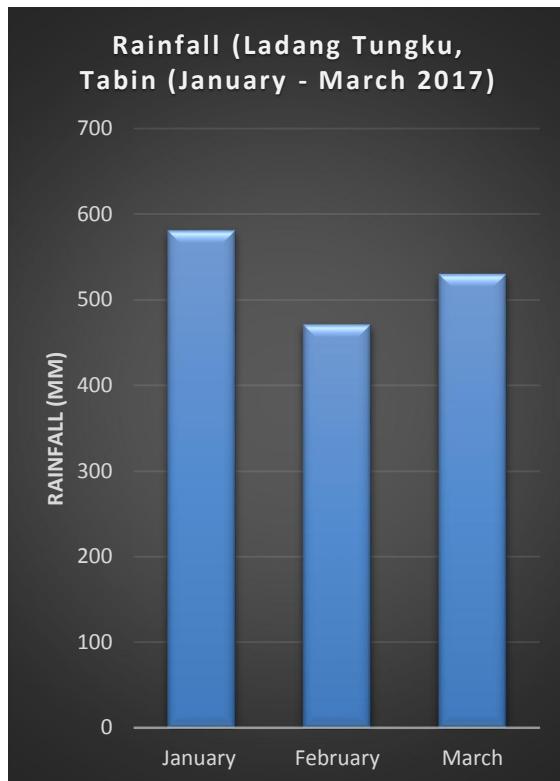


Figure 1. Total monthly rainfall (mm) for January – March 2017.

Most of the rain occurred in the afternoon and night (82%) with 12% in the morning (Ladang Tungku, KL – Kepong, Rainfall Data).

The road condition in Tabin deteriorated with more pot holes and water logged puddles. These were constantly repaired by filling up with rocks from the river and creating drainages (Plate 1).



Plate 1. Joseph and Justine filling up the holes with river rocks

Similarly, the condition inside the rhino paddocks are very wet and muddy. Several water trails could be seen inside the paddocks. The streams are always flowing through, sometimes rapidly. There are more leeches and biting flies around the rhinos. Although the plants are lusher, most were not consumed by the rhinos. The wallows gets quickly filled up with water and if not drained quickly enough, the rhino would defecate inside them. Areas around the temporary chute became very muddy and difficult to work in (Plate 2a and b).

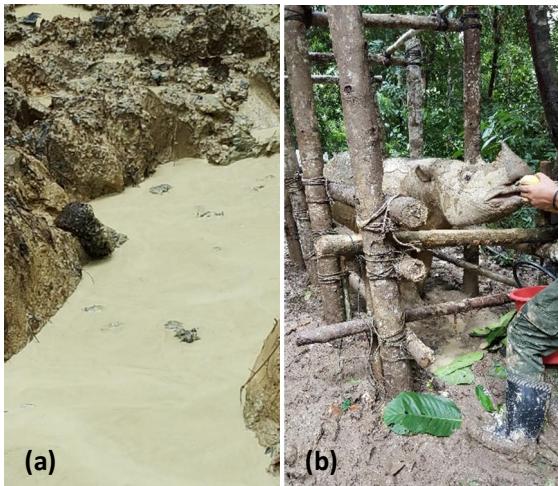


Plate 2. Puntung defecated in her wallow (a) and (b) the muddy condition in and around the temporary chute

Generally, the water and electricity supplies were not disrupted around the main complex (Sabah Wildlife Department and BORA office building). However, the generator at RIF needed some parts changed while the one at RQF had to be sent to a workshop in Lahad Datu for repairs.

Four staff meetings with section heads, were held in March 2017. One meeting was carried out with all of BORA staff to address the new contracts. Several issues were discussed, including rhino management,

staff holidays, repair works and planning for the IZW visit in April 2017.

2. Husbandry

2.1 Animal Management

The body scores of the rhinos were maintained at around 3.0. Puntung's condition deteriorated slightly due to the abscess and swelling on her left cheek. She was also not supplemented with horse pellets due to the possible dental problem. She was given more leafy food plants to reduce the trauma on the affected part.

In March 2017, Puntung only came back to her night stall, five times in the morning and 13 times in the evening. Otherwise, she spends most of the time in her wallow inside her paddock and browsed on the plants within. This behavior pattern was due to the traumatic experience of the initial injection and oral medication she got for her swelling and abscess. This was administered in her night stall and chute.

Currently, she was fed inside her paddock and food were also hung around the trees near her wallow. A temporary chute was constructed in her paddock to restrain her during treatment and cleaning of her abscess. Puntung's chronic abscess on her left cheek, which was suspected to originate from a dental root or in the maxilla has not resolved.

The lesion is being treated daily with antiseptics and routinely with parenteral injections of antibiotics and anti-inflammatories.

She had two active wallows which sometimes required maintaining by the staff. Water was drained out when the

sludge gets too watery and added when it's too thick. Wooden stumps and rocks were sometimes unearthed as the wallow gets bigger. These were subsequently removed to sustain the wallows (Plate 3).



Plate 3. Staff removing a tree stump from inside Puntung's wallow

Tabanids or biting flies were many (several species) and were constant irritants to the rhinos and occasionally the keepers. Blood could be seen trickling out from the wound inflicted by them. Leeches, too were more than usual inside the paddocks with rhinos often getting them around the neck and face, including inside the eyes. The mud from the wallow does provide temporary protection against biting flies.

Blood was observed in the vaginal discharge from Iman on one occasion in March 2017.

No treatment was administered as it did not recur.

Kretam maintained his weight and came back for all feedings. He was also observed to actively search for signs of Puntung coming into estrus.

2.2 Body Weight

The three rhinos were weighed using an electronic weighing scale (TruTest®). Prior to the weighing, it was also calibrated using keepers' body weights. Routinely, the rhinos were weighed at least twice a month. However, Puntung was only weighed once on the 16th as she refused to come back afterwards. Iman was weighed weekly, due to her fluctuating weights but starting in April 2017, she will also be weighed twice a month.

Weighing were mostly done inside the chute with the rhino going onto a wooden platform which rested on two load bars. Whenever possible, the rhinos would be washed to removed pieces mud cakes or sludge on their body.

Generally, the bodyweights of Iman and Kretam increased or were maintained over the first three months. Puntung weigh less than in January or February 2017. This is due to her condition and not returning to her night stall for her daily feedings. In March 2017, the average weight of Iman was 549 kg and Kretam, 664 kg. Puntung was only weighed once on the 16th March 2017 as she did not returned on the 30th March. She weighed 530 kg, a drop of 6.5 kg as compared to the previous month (Figure 2).

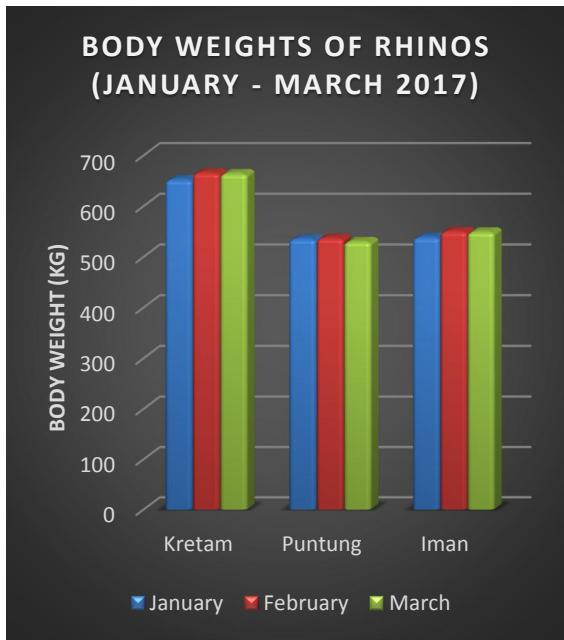


Figure 2. The body weights of all the rhinos (January - March 2017)

Despite Puntung not returning back to her night stall for feedings, her body condition did not fluctuate as much as expected. She will be weighed once she is back in her night stall. In March 2017, Iman's weekly body weight, averaged 551.8 kg, similar to 551.5 kg in February 2017 (Figure 3).



Figure 3. Iman's body weight (kg) for the month of January - March 2017

2.3 Animal Health

Despite Puntung not returning to her night stall for hand feeding, her condition did not go down significantly. Kretam and Iman, despite cutting back on their concentrates (Gold coin®, horse pellets), gained in weight significantly. The food source were many but due to the taller trees, some were not harvested. The rainy weather also adds to the lush food and difficulty in climbing the trees. Some greens were also obtained from the Rhino Food Plantation.

The focus now is on Puntung's chronic abscess on her left cheek, antero – ventral to her left eye. The other common problems in the rhinos include mild abrasions, small cuts and biting flies and leeches.

The monthly sampling of rhinos and their surroundings for pathogens were carried out on the 14th March 2017. The samples cool packed and send off very early, the next morning, reaching Kepayan Veterinary Diagnostic Laboratory before noon.

Contamination of water from the source (upper Lipad River) or the storage tanks were quantified by the presence of *Escherichia coli*. The coliform count is used as an indicator of contamination of water for keepers and rhinos. Chlorination is done immediately at night. The other analysis did not reveal any treats or impending diseases in the rhinos or keepers. The best animal husbandry practices and biosecurity were always maintained.

In March 2017, the Voluntary Feed Intake (VFI) for Puntung dropped significantly. This is due to her not wanting to return to her night stall. Sometimes, less food were offered to her or hung inside the paddock to try and encourage her to return to the night

stall. However, this does not work all the time and eventually, food were brought into the paddock for feeding. A temporary chute was later constructed because, without being confine in a chute, Puntung sometimes strays away and consumed less foliage. In addition to the natural browse inside the paddock, food were also hung for her to feed on (Plate 4).



Plate 4. (a) Puntung being hand – fed by Wilson (b) Puntung eating the hung browse and (c) Puntung eating wild browse in paddock

The other factors that limits her feed intake include, heavy rainfall (in the evenings), painful treatments and biting flies.

The other two rhinos ate well and were fed optimally. The minimum amount of browse hand fed to the male and female were 18 and 15 kg respectively.

2.3.1 *Kretam*

a. Skin neoplasia (warts)

The pathology would be discuss with the experts from the Institute for Zoo and Wildlife Research in April. These skin tumors (sarcoid or melanoma) could be sampled during the general anesthesia for culture.

2.3.2 *Puntung*

a. Biting flies and leeches

The increased amount of biting flies in her paddock and night stall is a problem to her especially during hand – feeding. The painful bites especially around the face and eyes distracted her while she is enclosed inside the chute. The problem with biting flies are less during late evening and early morning. The flies were also seen getting through the mud to bite the rhino while she is wallowing (Plate 5).



Plate 5. Seven biting flies on Puntung while she wallows at mid-day

Recently more leeches were observed inside her paddocks. The more common areas for leech bites are the neck, inner thigh, nostrils and eyes. The bleeding would sometimes goes on for a few days. Some of the bites are very irritating to the rhino. The most dangerous area for leech bite is inside the eyes. Puntung had one leech bite in her left

eye and had to be treated daily for four consecutive days (Plate 6).



Plate 6. Leech bite inside her left eye caused redness and irritation

b. Swelling - abscess

The abscess initially manifested itself as a four cm round swelling on her left cheek, anterior ventral to the left eye. The swelling was hard and diffused on the 5th March 2017. She was started on a course of antibiotic (clavulanate – potentiated amoxicillin) and anti-inflammatory (Dexadresson), intramuscularly. However, the antibiotics were also given orally as a precaution that she might not get the required amount.

Three days later, a soft, 1 – cm dark, raised area was observed around the center of the swelling. The swelling had also increased in size (Plate 7).



Plate 7. The swelling on her left cheek. Note the dark spot in the middle.

The abscess ruptured on the 10th March 2017 and subsequently treated topically via flushing with antiseptics. The 1 – cm opening was also covered with tissues from underneath. A smaller (1 mm) fistula was also observed dorsally (Plate 8).



Plate 8. The two openings to the abscess (arrow)

A week later, a third exit was observed dorso – laterally on the right. The abscess could also be expressed from this 1.5 centimeter opening (Plate 9).



Plate 9. The three openings of the abscess

By this time she refused to take the oral antibiotic (Augmentin®). She too refused to come back to the night stall, most likely due to the trauma of getting the injections. In addition, the mud wallow does soothe the pain and swelling and healing of the skin but NOT with the root of the problem which either involved the molars/premolars or even the maxilla.

All treatments had to be carried out inside the paddock. The heavy and constant rainfall did not help with the situation. She would be hand-fed inside the paddock and food hung for her at night. She would frequently use the two wallows and would browse on saplings inside the paddock.

Treatment of the abscess were continued twice daily and reduced to once after a week. This is to give time for tissue healing to progress.

A temporary chute was built inside the paddock to restrain her for topical treatments and later for administration of parenteral antibiotics. After the third day, she refused to get into the chute for treatment. Once again, treatments were carried out inside the paddock, outside the chute. Oral medications and sometimes injections were given while she remains in the wallow. She would only come out when it's quieter and no one was around, which would usually be in the mid-day, late evening or at night.



The three openings were interconnected and were flushed and abscess expressed during each treatment. The difficulty seen here was that she constantly rub the wound against tree saplings and stumps inside the

paddock. Several attempts were carried out to try and bring her in the night stall but were futile.

On the 22nd March 2017, the two larger openings coalesce to become one as she continued to rub them. The abscess also expanded cranially towards the eyes and ventrally, towards the upper lips (Plate 10).



Plate 10. The two larger openings coalesce to become one.

The culture and sensitivity test from the abscess indicated the organism was sensitive to Amoxicillin. Hence, the decision was to continue the treatment for another week.

Her condition went down because she was not eating her normal amount of hand feed. This is related to her erratic behavior of not coming out at regular time and that the amount of browse inside the paddock had depleted. Due to the pain and discomfort, she remained in her wallow for longer periods as compared to before. The rainy season also coincides with the higher

numbers of biting flies which irritated her whenever she comes out of the wallow. Hence, she prefers to move around and forage at night or early morning when the Tabanids were inactive.

b. Reproductive tract pathology

The routine ultrasonography and blood collection could not be carried out as she hardly return to her night stall. They were also not carried out in the paddock due to the muddy condition and frequent rain.

The various pathology included cysts and areas of fibrosis in the uterus and uterine horns. A cyst was also observed in the cervix. However, no leiomyoma were observed (Plate 11).

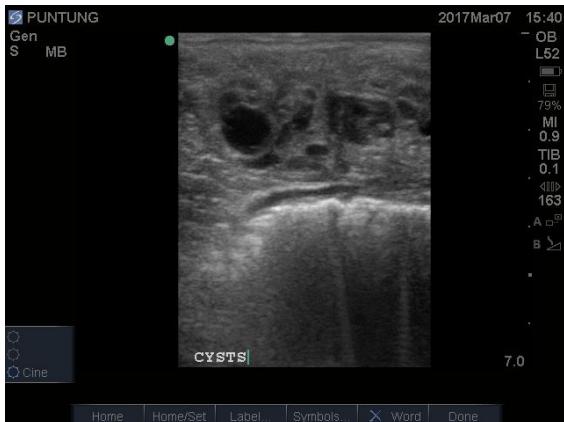


Plate 11. Unilocular and multilocular cysts

2.3.3. *Iman*

a. Vaginal discharge

The discharge was only seen on two occasions, on March 23rd and 31st. The earlier discharge was pinkish mucous and about 10 – 15 mls. On the 31st March 2017, the colour of the discharge was pale yellow and more serous in consistency. Both of the discharge were voided after defecation in her night stall. Bubbles were often seen on the discharges (Plate 12).



Plate 12. (a) The vaginal discharge observed on the 23rd and (b) 31st April 2017

During both periods, treatment was not administered. She was only monitored for other impending signs (especially reduced vocalization) of severe hemorrhage. Her next Improvac® (GnRF protein conjugate) vaccination is due on 21st April 2017, immediately after the ovum pick – up procedures.

It is also clearly seen that the frequency of discharge had increased two – fold as compared to February 2017.

b. Reproductive tract pathology

The volume of discharge relates quite well to the uterine pathology. The ultrasound conducted on her indicated a relatively inactive uterus - cervix with small volumes of fluids. As compared to Puntung, her cervix is more edematous. The leiomyomas could be seen both in the uterus and uterine horns (Plate 13).



Plate 13 (a). The hypoechoic leiomyoma and cysts in the right uterine horn and (b) a large leiomyoma in the uterine body

The cysts, fluids and hydrosalpinx are still visible. A small 0.7 cm cyst could be seen in the cervix.

3. Feed and feeding

The amount of browse collected were sufficient despite many areas within the KL – Kepong plantation were replanted. Many of the rhino browse on the older oil palm trees were simultaneously removed.

Iman and Kretam has excellent appetite and not fussy with food. However, due to the chronic problem with Puntung, her appetite was markedly reduce. She had to be hand fed in her paddock as she refuse to return to her night stall and chute. A lot of her time was spent in the wallow. She also did not consumed much as she would not stay still in a spot.

The amount of browse collected were sufficient. These consisted mainly of *Ficus spp*, *Artocarpus spp*, *Uncaria spp* and *Merremia spp*. However, most of the *Uncaria spp* and *Balakata baccatum* (Ludai) were in flower and not so palatable. The keepers were advised against collecting those browse.

A significant amount of browse were collected from the Rhino Food Plantation, mainly to feed Puntung.

The total amount of foliage collected and fed to the three rhinoceros were 5115.5 kilograms. A majority of the browse were hand – fed to the rhinos and between 26 – 40% were hung for night feeding. In March 2017, the total amount of browse consumed by the three rhinos was 3217 kilograms (62%). Puntung, due to her chronic health problem consumed the least (49.1%), followed by Iman (61.4%) and Kretam (72.8 %). The average amount of browse eaten was 62.9% (Figure 4).

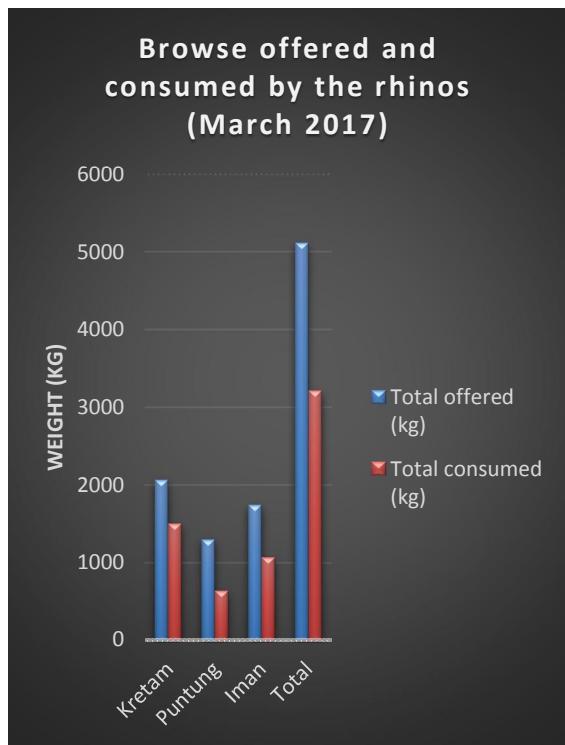


Figure 4. The total amount of browse fed and consumed by the rhinos

3.1 Voluntary Feed Intake (VFI)

The VFI for the Tabin rhinos were based on the amount of foliage consumed via hand – feeding and those hung out and eaten by the rhinos at night or early morning.

In March 2017, the total amount of browse hand – fed and eaten per day by Kretam, Puntung and Iman were 33, 9 and 18 kilograms respectively. Under normal circumstances, the maximum eaten ranged between 31 – 43.5 kg. The average eaten by Kretam was 39 kg while Iman averaged 29.6 kilograms. The browse consumed by Puntung only averaged 17.8 kg, which was below her 28 kilograms average for the month of February 2017 (Figure 5).



Figure 5. The amount of foliage hand – fed and eaten by the rhinos in Tabin

Puntung's feed intake was markedly reduced as she did not return to her night stall on 26 occasions for her morning feeding and 18 times for her evening feed. This is related to her chronic facial abscess and phobia of the antibiotic injections. She would remained far away in her paddock and inside her wallows.

Her feed intake is also reflected by the amount of foliage she consumed in March 2017. Several bunches (3 – 5 kg) of browse were hung out inside the paddock in the evening, as she never comes back to her night stall. Initially, she would consumed half of the 3 – 5 bunches hung out for her. Throughout the month the amount of 'hung – out' foliage reduced and on some occasions, untouched by her. She would consumed about 17% of the browse as compared to 33% by Iman and 55% by Kretam (Figure 6).

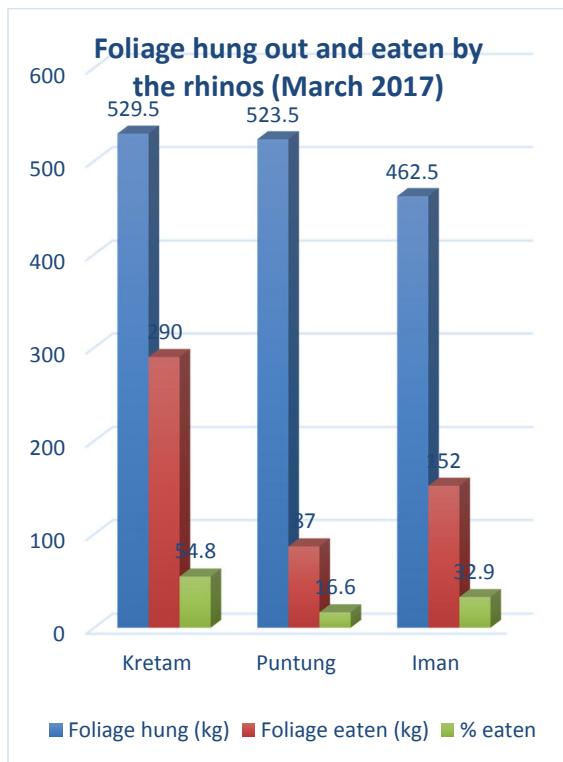


Figure 6. The amount of browse ‘hung – out’ and eaten by the rhinos

The equine pellets (Gold coin®) were supplemented daily to Kretam and Iman (500 grams per animal per day). The pellets was temporarily stopped for Puntung, taking into consideration that her facial abscess is related to a possible tooth root infection.

Generally, each rhino gets 5kg banana per day. Puntung also received mangoes and papayas, mainly to administer the oral drugs. In March 2017, apart from 99.5 kg banana, she also gets 12 kg of mango and 17.5 kg of papaya.

Similarly, Kretam and Iman received banana, papaya and mangoes. The two rhinos also gets 0.5 – 1.0 kg of pumpkins as supplements.

The number of browse species collected and fed to the rhinos ranged from 11 – 14

(average 13 species). The most common being the jackfruit (*Artocarpus heterophyllus*), Kelawit berbulu (*Uncaria spp*), Akar Sambang (*Merremia spp*) and several *Ficus spp*.

Kretam came back for all feedings. Iman did not come back for one morning feeding. Puntung remained in the paddock for a very long time and only came back for five morning feedings and 13 evening feeds. This is mainly due to the pain and trauma of the injections she got during the initial treatments.

3.2 Rhino Food Plantation (RFP)

The heavy rain in March did have an impact inside the RFP. These were mainly the rapid growth of unwanted weeds and constant water – logged areas around the lower parts of the plantation. Several earth drains were filled with mud siltation and needed to be deepen constantly. Regeneration of the pruned rhino plants were fast and leaves were lush. Weeds were frequently removed from around the plants (Plate 14).



Plate 14. Hassan weeding and securing a Ficus plant (Ara Kapal) to the posts

During the wet season, many of the seedlings and marcotted rhino food plants were replanted inside the plantation. These

were mainly Putih Sebelah (*Leukosyke capitellata*), Mas Cotek (*F. deltoidea*) and Tandiran (*Ficus spp*). Mas Cotek is being propagated via marcotting in large numbers and is considered a Grade 1 rhino food plant (Plate 15).



Plate 15. Mas Cotek (right) and other rhino food plants being moved for replanting

Several large dead trees were also removed outside the fence as heavy rain and wind could potentially push them down. A few were also removed along the road to RIF and RQF (Plate 16).



Plate 16. James cutting a tree down

Biosecurity and health monitoring

The areas around Tabin is very wet in March 2017. The paddocks, plantations and roads leading to the RIF and RQF were also badly affected. Roads in Permai Plantations (Tradewinds Sdn Bhd) were also damaged due to the frequent rain.

In the paddocks, the path were muddy and entrances to the night stalls were badly eroded. Many more sandbags were purchased and used to cover deep trenches inside the paddocks of Iman and Kretam. Wallows had to be drained frequently when it gets too watery. This is to prevent the rhino from abandoning it.

The sampling of soil, mud wallows, water from tanks, floor swabs and feed samples were carried out on the 13th March 2017. In addition, blood, urine, and feces from the three rhinos were also taken for health screening. These samples were send to the Veterinary Diagnostic Laboratory and the Veterinary Public Health Laboratory, in Kepayan, Kota Kinabalu before mid-day on the 14th March 2017. Serum samples were also collected and analyzed at the Pathology and Clinical Laboratory (M) Sdn. Bhd in Sandakan.

4.1. Hematology

Blood was only collected from Puntung as Kretam returned late to the night stall. Blood was collected from the cephalic vein of the right fore limb.

The blood parameters were within the normal values for the Sumatran rhinos in Tabin and reported previously in Sumatera. Hemoparasites were not detected in the blood sample (Table 1).

Table 1. Complete blood count (CBC) for Puntung(SWD 003)

Date/Parameters	Laboratory Results	
13/2/2017	Kretam	Puntung
Hemoparasites		Nil
RBC (X10 ¹² /L)		5.44
WBC (1000/UL)		7.53
Hb (G/DL)		13
PCV (%)		40
Seg. Neutrophils (%)		67
Eosinophils (%)		0
Lymphocytes (%)		24
Monocytes (%)		8
Basophils (%)		1
Total protein (G/L)		
SGPT (ALT)(IU/L)		
Urea (MMOL/L)		
Serum iron (UMOL/L)		

4.2 Bacteriology

The 20 floor swabs were taken from various location of all the rhino night stalls. Swab 1 to 4 had few *Bacillus sp* Swabs 5 – 20 had moderate *Bacillus sp* while swab 12 had none. 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*.

There were no pathogens isolated from the feces and urine of the rhinos.

All water samples from the 13 tanks had a total bacteria counts of 120 – 7480 cfu/ml. There were no *Salmonella sp* isolated from the water samples. The coliform counts were negative in five samples and ranged

from 10 – 210 cfu/ml. The *E. coli* colonies were found in tanks 4 and 8 (Table 2).

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

Tank	Total bacteria	Total coliform	<i>E.coli</i>
1	390	0	0
2	970	0	0
3	370	210	0
4	7480	40	10
5	120	0	0
6	120	0	0
7	5000	50	0
8	310	20	10
9	200	30	0
10	640	20	0
11	7380	60	0
12	3920	0	0
13	1070	10	0

The two water tanks were immediately chlorinated using a 1% chlorine solution at a rate of 1L/10000 liters water. This was carried out at night to ensure the minimum contact time of 30 minutes to kill the pathogens. The water from these tanks were only used the following day.

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

In March 2017, routine ultrasonography was only carried out four times on Puntung. The main reason being her unwillingness to come back to her night stall, despite various efforts to coax her. This is partially due to the chronic abscess on her left cheek, more likely an extension of a periapical abscess. Blood was taken from her, for progesterone profiling. These data were then correlated with the interactions with Kretam. Iman was also scanned twice in March 2017.

5.1 Hormone profile

5.1.1 Puntung

Her progesterone level remained low (< 0.15 ng/ml) in early March 2017. The progesterone was observed to start declining on the 22 February 2017 and continued to be low for 11 days (Figure 7).

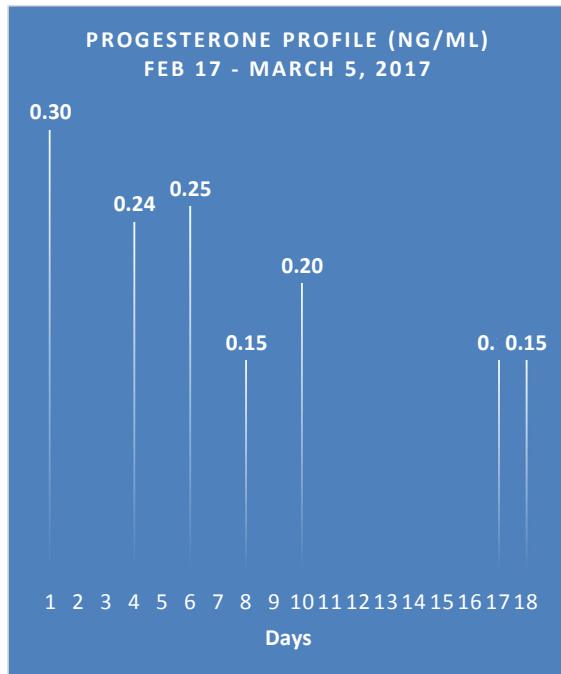


Figure 7. The low levels of P4 in February – March 2017.

In March 2017, on six occasions, Kretam showed interest in Puntung, seeking her from his paddock. They were observed on the 5th, 8th, 16th, 18th, 19th and 23rd March 2017. Estrus was predicted in late February to early March 2017. The second estrus was likely during the periods 19th to 23rd March 2017.

Usually, the bull would sense the cow, a day or two before she comes into estrus. This also occurs in the wild. Thus estrus is most likely a few days after Kretam shows interest in the female

5.2 Ultrasonography

5.2.1 Puntung

On the 4th March 2017, there were two follicles observed on the left ovary. There was a 1.85 and 0.7 cm diameter. A 1.0 cm diameter luteinizing follicle could be seen on the left of the follicle (Plate 17).

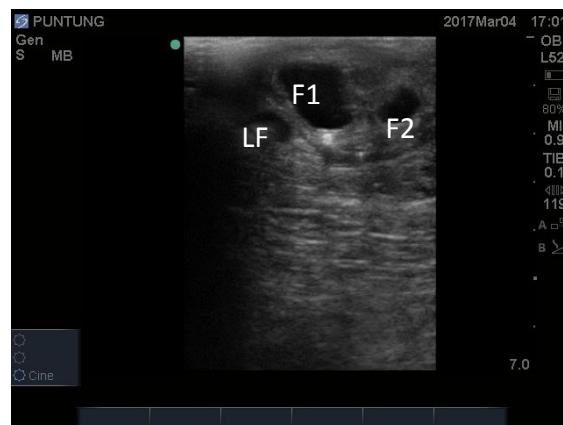


Plate 17. The two follicles and a luteinizing follicle on the left ovary

Three days later, another scan showed the follicle is more luteinized and reduced in size. However, the F2 and the luteinized follicle remained. On the 24th March 2017, the F2 was observed to mature and increased in diameter (Plate 18).



Plate 18. The 1.8 cm diameter follicle (F2) on the 24th March 2017

5.2.2 Iman

She was scanned on the 1st and 30th March 2017. Two follicles were observed on her left ovary, measuring 0.6 and 1.2 cm diameter (Plate 19)

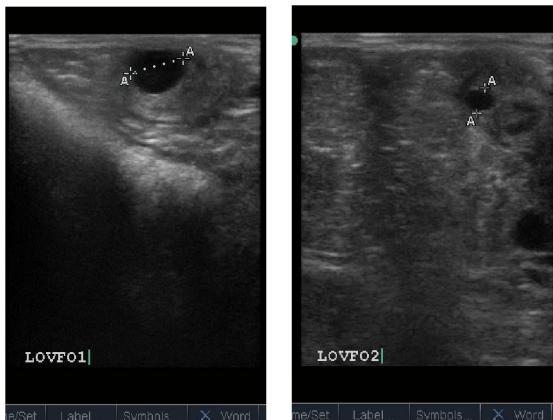


Plate 19. The two follicles on the left ovary

As compared to Puntung, the right ovary of Iman is easier to locate and scan. Both the ovaries of Iman are larger than that of Puntung. This is probably related to the age, Puntung being much older than Iman.

There are more structures on Iman's right ovary – corpus luteums, fluid filled cavities and fibrous tissues. There were two follicles, 0.5 cm diameter. However, one "follicle" is

more elliptical and might even be a cyst (Plate 20).



Plate 20. The elliptical shaped follicle measuring about 0.5 cm diameter

5.3 Behavioral estrus

The interest shown by Kretam is an indicator used to narrow down the estrus period of the female. Puntung's paddock is located on higher ground as compared to the male, Kretam. There are two main streams flowing down from Puntung's enclosure into his enclosure. This would be an excellent way to communicate, especially during estrus, as she would defecate and urinate in the streams.

In March 2017, Kretam was seen to seek out Puntung and sometimes interacting with her. This occurred on six occasions, mostly in the evening and in the middle of the forest. A few of these interactions occurred close to Puntung's night stall. Usually, the ground around the site is overused by both the animals.

The interactions included vocalization, urine spraying, twisting of the saplings, rubbing and scrapping of trees (Plate 20).



Plate 20. Kretam standing next to Puntung's enclosure

6. Electric fencing

The voltage on the fence line at the RFP was erratic due to a fault with the timer. The range of voltage for the fences were 8.9 – 10.2 kV, 8.7 – 9.5 kV and 8.8 – 9.3 kV for the RIF, RQF and RFP respectively.

A bull elephant broke some of the connectors and insulators at the fence line outside RIF. It also tore some of the black shade netting before moving back into the forest (Plate 21).



Plate 21. The torn black shade netting at RIF

Weeds and fallen dead leaves are a constant problem during the rainy season and needed constant checks (Plate 22).



Plate 22. The *Merremia spp* growing towards the fence line (left) and the clump of dried leaves (right)

7. Other issues/activities

7.1 Biting flies and Tabanids

The problem with biting flies and Tabanids were a constant problem to the rhinos and keepers. The bites were painful and irritating. More were observed during long periods of rain. There were several species observed, ranging from the size of a house fly to that of a honey bee (Plate 23).



Plate 23. The three species of biting flies commonly found on the rhinos

7.2 Electro ejaculation in a pig – tailed macaque

A problem pig – tailed macaque (*Macaca nemestrina*) around the rhino facility was trapped recently. It was subsequently electro ejaculated using a Seiger® machine and probes. This was part of the program of Assisted Reproductive Technology in wildlife species in Sabah (Plate 24).



Plate 24. Performing the electro ejaculation in the pig – tailed macaque in Tabin

The semen was analyzed and recorded. More attempts will be made in the near future to conduct semen collection in the macaques.

7.3 Repair of the gravity water intake at Lipad River

The gravity water intake was disrupted during the heavy downpour in March 2017. Apart from the accumulation of rubbish and branches, the pipes were sometimes broken at the joints. The piping and filter system was damaged and displaced and subsequently repaired (Plate 25).



Plate 25. The repair at the gravity water intake

7.4 University Malaysia Sabah (UMS) filming project (7 – 8 March 2017)

A project by UMS (*Fakulti Kemanusiaan, Seni dan Warisan*), to film some of the activities in managing captive rhinos was conducted in March 2017. The project lasted for two days and involved Kretam and the keepers. Interviews were also carried out with rhino keepers (Plate 26).



Plate 26 Marikus beng interviewed during the filming

7.5 Borneo Rhino Sanctuary (BRS) updates

As of March 2017, apart from a meeting to address the pending issues with BRS, no work was done on the ground. The condition with BRS facilities deteriorates with time, especially the fence and roofing, with growth of weeds and trees. Fallen trees will damage the wires and cables if not removed. The main issues were discussed in detail with the contractors, consultants and client (Sabah Wildlife Department) in Tabin on the 9th March 2017. This was immediately followed by a site visit. During the meeting, it was agreed that the issues would be resolved in two months.

The photos and captions below, were taken out in March 2017 (Plate 27 a – h).



Plate 27a. The fallen tree and creepers along the road to BRS. This was subsequently cleared. This is a constant problem as a lot of the trees along the road is dead or dying and will keep falling on the road. The maintenance should include removing of the dead or dying trees before it fell.



Plate 27b. The old wooden house used by the previous contractor stands precariously along the entrance to BRS. It is very risky to use and an eye sore. This should be removed.



Plate 27c. The weeds on the concrete slabs covers the ground and touches the electric fencing. Dried leaves filled up the entire path and provides a good substrate for weeds to grow upon.



Plate 27d. The thorny creeper (*Caesalpinia sumatrana*) could be seen in various sections of the electric fence.



Plate 27e. Tracks of wild pigs could be seen inside the paddocks



Plate 27f. The fallen tree on the electric fence occurred about six months ago and never cleared. The sagging on the fence will become permanent if this is not cleared.



Plate 27g. The fallen tree and creepers on top of the electric fence.



Plate 27h. The low or zero voltage on the fence need to be rectified as the capacity of the energizers is more than adequate to power the entire six fence lines.



Plate 27i. The 3% slope on the flooring of the night stall has not been rectified. This will pose a problem in managing the health and hygiene of the rhinos in captivity.



Plate 27j. The left over from the contractual work could still be found inside and outside the paddocks. Some are potentially very dangerous to the rhinos. There should not be any of the construction materials left in or outside the BRS facility as it is within the Wildlife Reserve.



Plate 27k. The roofing gutter is filled with growing Kelawit (*Uncaria spp*) and Laran (*Neolarmakia cadamba*) seedlings. These should be cleared by the contractors prior to it being handed over to Sabah Wildlife Department.