

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

December 2016

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 weather still persist in December 2016, but less regular as compared to the previous month. The rain would stop for a few days, followed by heavy downpour, in the evening or night. It rained at least 2 – 4 times in a week

The total rainfall for 2016 is 4446 mm. The rainfall in December totaled 313 mm (11 days) and ranged from 2 – 93 mm per day (Ladang Tungku, KL – Kepong, Rainfall Data). Most of the rain occurred in the afternoon or night with three occurring between 1 – 2 am.

The last week of December 2016 recorded the highest rainfall of 163 mm (Figure 1).

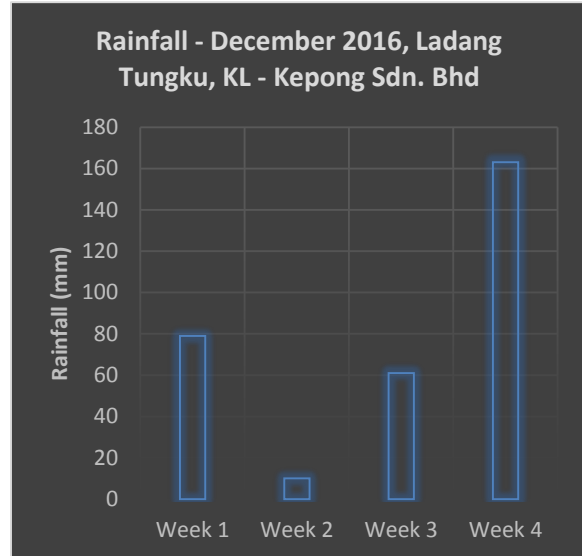


Figure 1. The weekly total rainfall for December 2016.

The wet season in December 2016 caused the Lipad River and Sungai Badak to rise several times but did not reached the bridge above it (Plate 1).



Plate 1. Lipad River rising after a short heavy downpour

Rhino food plants are abundant and lush. Subsequently, the use of weedicides and other herbicides by the plantations are minimum or none. This is certainly better (more areas) for gathering food plants for the rhinos. However, the problems with

getting rhino food plants in December 2016, are the bad road conditions in the plantations and the trees are more slippery to climb. The keepers too, have to use long post and sickle or saw attached at the end.

There were no issues with water supply throughout December. The common problems are associated with tree fell and branches dropping on the fences.

The rhinos remained healthy with stable body weights and normal behavior and food intake. Iman's vaginal discharge was so much less and of good coloration without any signs of bleeding.

The weekly staff meeting was held at night, usually at 2000H. This is to streamline management activities and to iron out issues pertaining to staff discipline, repairs of rhino enclosures, finance and purchases.

Yang Amat Berbahagia, Tun Musa Hitam, the chairman of Sime Darby Foundation visited the center on the 5th and 6th December 2016. The visit was accompanied by the Assistant Minister, Ministry of Tourism, Culture and Environment Sabah (YB Datuk Hj Kamarlin Hj Ombi); Permanent Secretary, Ministry of Tourism, Culture and Environment Sabah (Tuan Datu Rosmadi Datu Salai); Sabah Wildlife Department (Tuan Augustine Tuuga); Forestry Officer, Sabah Forestry Department (Tuan Jurimin Ebin); Chairman (YB Datuk Yusoff Datuk Hj Mohd Kasim) and General Manager (Tuan Lawrence Chin) of Tabin Wildlife Resort and Executive Director, Borneo Rhino Alliance (Datuk Junaidi Payne).

A discussion was held at UKM on the 14th December 2016, involving cell biologists from UIM, Pahang and UKM, Bangi, Selangor. The objective is to start work on

cultures of somatic cells from wildlife species and cryopreservation.

Due to the Christmas and New Year celebrations, many of the staff were on holiday. Those that remained to collect rhino food plants (James Sandiyang, Hasan Sani and Zainal, ZZ) are not climbers so most collections were done using a post and sickle. About 30 – 40% were harvested from the Rhino Food Plantation.

2. Husbandry

2.1 Animal Management

The rhinos are in excellent body condition with body scores of 3.0. Iman did not show any bloody discharge in December 2016. Kretam and Puntung had slight hoof chipping and small abrasions.

Puntung came late into estrus but this delay is always related to the ovum pick – up and prior follicular stimulation using Deslorelin acetate (Ovuplant®) in November 2016. She was scanned about twice a week and blood taken for progesterone profiling. Her estrus behavior was also recorded whenever there is an interaction with Kretam across the fence.

2.2 Body Weight

Kretam and Puntung were weighed twice monthly as compared to once a week for Iman. This is related to her erratic condition and pathology. On some occasions she sometimes goes off feed when the uterine discharge becomes bloody. The electronic weighing scale (TruTest®) was used by placing the wooden platform and load bar inside the chute and the animal coaxed with banana to stand on the scale. Prior to weighing, the rhinos were washed

thoroughly to remove the thick mud cakes on them, which sometimes weigh more than five kilograms (Plate 2).



Plate 2. Kretam being washed by a keeper, prior to weighing in the chute

However, Iman was left with the mud on as she associated the cleaning with painful or stressful procedures (examples: anesthesia and parenteral injections) and would avoid going into the chute. Occasionally, she was not weighed inside the chute but along the wall adjacent to the sliding door. All rhinos were re weight at least twice, each time and their weights averaged out. This is to reduce errors especially when the rhino is not positioned squarely on the platform.

There were slight fluctuations in their body weights but generally, stable over the three months. Kretam averaged 644.5 kg in December 2016, a slight increase from November 2016. Puntung weighs 531 kg (an increase of 3 kg) while Iman increased by about 11 kg from November 2016 to weigh in at 548 kg (Figure 2).

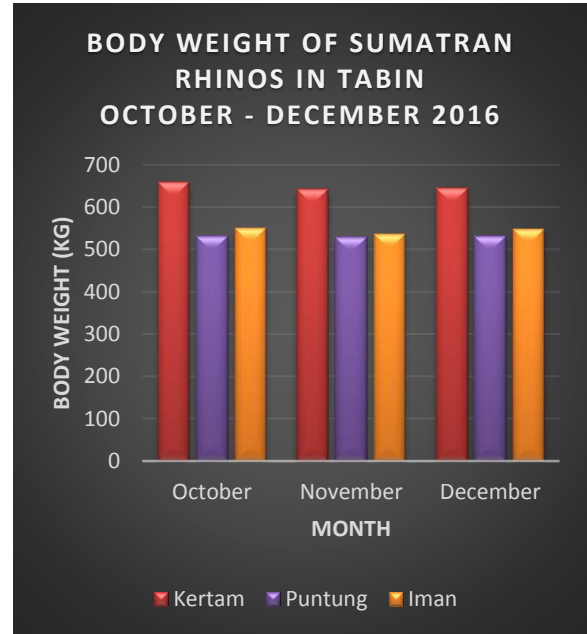


Figure 2. The body weights of all the rhinos (October – December 2016)

Iman's body weight fluctuated within the months of November – December 2016, ranging from 532 – 556 kilogram (Figure 3).

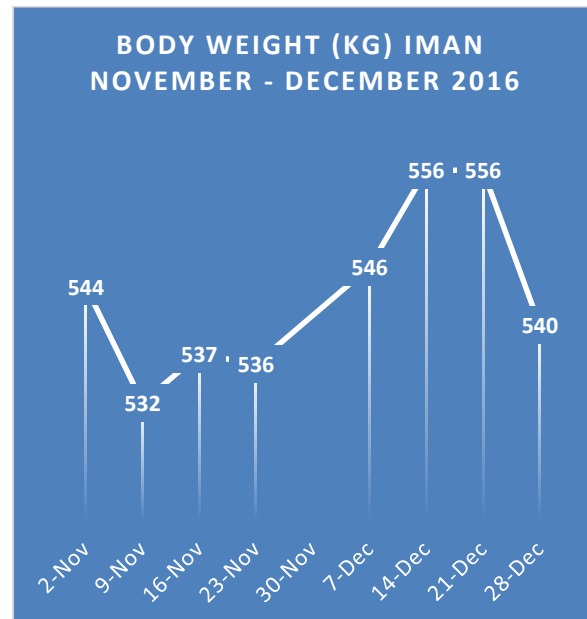


Figure 3. Body weight (kg) of Iman in November – December 2016

Throughout 2016, Kretam's body weight ranged from 634 – 662 kg (648 ± 9.5 kg). Puntung and Iman ranged from 511.5 – 535 kg (524.1 ± 6.4 kg) and 480 – 550 (515.5 ± 23.5 kg) respectively. Iman's body weight was lowest in March – April 2016 and increased in September – December 2016. Her bodyweight will be lowered further to between 530 – 540 kg. She is still fed with horse pellets (Gold Coin®) at 500 grams per day.

2.3 Animal Health

Apart from small issue including small cuts and hoof chippings, the rhinos are in their best of health. As mentioned, Iman did not have any bleeding in her discharge. The weights of the rhinos are also maintained, although slightly over, for Iman.

The monthly health checks did not reveal any new treats or impending diseases in the rhinos.

The Voluntary Feed Intake (VFI) is normal throughout the month. As always, Puntung does not come back regularly for both feeding times (breakfast and dinner). This is frequently associated with her estrus.

2.3.1 *Kretam*

a. Hoof chipping

Digit 1 of the left hind leg is still treated with 10 grams of oral biotin supplement (Hoofmaker TM®) and the chipped area of the hoof covered with Stockholm tar. The chip measured about 1.0 cm diameter and a few millimeter deep (Plate 3).



Plate 3. The hoof chip (arrow)

2.3.2 *Puntung*

a. Abrasions

Puntung had small abrasions and sometimes lacerations on her, quite frequently. Most of these lesions were seen on the hind leg and perineum. These were either treated with antiseptic spray (Povidone, Septidine®) or left treated. The wallowing in the mud would usually resolved the problem. Biting flies still caused some irritations and bleeding at the bite site (Plate 4).



Plate 4. A species of biting fly on Puntung

b. Reproductive tract pathology

Ultrasound and blood collection were carried out more regularly (2 – 3 times a week) on Puntung as she approaches estrus, which is about 10 – 12 days after the previous ovulation.

Subsequently, she was also scanned to look at her pathologies, mainly in the uterus, uterine horns and cervix. Her pathology consisted of numerous multilocular cysts with some fused together. They vary from a few millimeters to 2.0 cm (Plate 5).



Plate 5. Anechoic fluids in the uterus

Some cysts were located close to the right ovary. To date her pathologies does not adversely affect her behavior or health.

2.3.3. Iman

a. Vaginal discharge

The vaginal discharge observed were not bloody nor mixed with blood. The discharge was only observed a few times a week and ranged between 10 – 30 mls. The discharge was usually observed after she defecated in her night stall (Plate 6).



Plate 6. The clear – milky vaginal discharge in the night stall after defecation

The reduced amount of discharge, without bleeding is also related to her Improvac® (Gonadotrophin Releasing Factor) vaccination on the 14th November 2016.

b. Reproductive tract pathology

Iman's reproductive pathology is very obvious with every ultrasound done on her. The scanning is limited to a few times every month. The common pathology includes the cysts, fluids, leiomyomas and hydrosalpinx. Fluids could be seen in both her uterus and cervix.

3. Feed and feeding

The total amount of browse collected for December is 3839 kilograms. The browse are always more fresh and heavier during the rainy season. However, more browse were collected from the Rhino Food Plantation

(RFP) as more than half of BORA staff were on long holidays. The browse for hanging out in the paddocks were collected from along the Tabin road and forest fringes along the oil palm plantations (KL – Kepong Sdn Bhd and Permai Plantation, Tradewinds). Those that were meant for hand – feeding were taken from the RFP.

3.1 Voluntary Feed Intake (VFI)

The VFI differs with each rhino and depends on many factors, amongst which were the mood of the individual (accidental shock from the hot wire does reduce VFI), age or wear of molars/premolars as observed in Puntung, estrus, pain or discomfort associated with tumors or other pathology and plant species. The total amount of browse offered (hand – fed and hung in the paddocks) and eaten by the rhinos ranged from 57.2 – 71.0 percent (Figure 4).

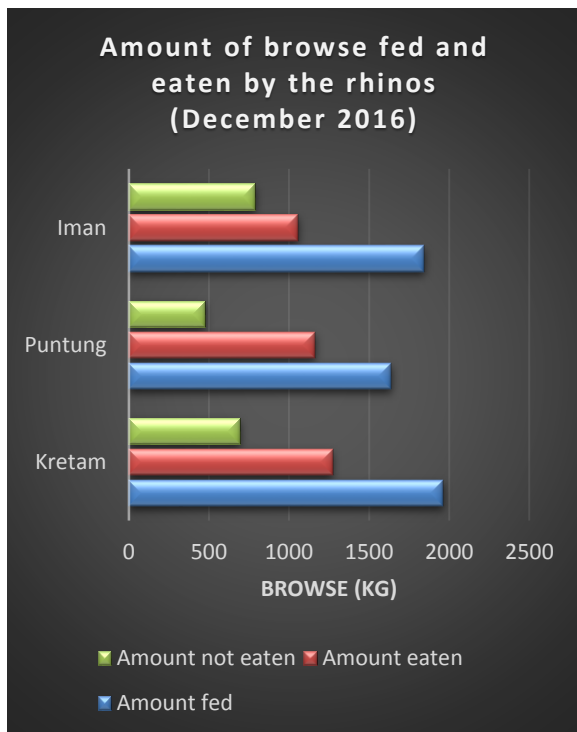


Figure 4. The amount of browse fed to the rhinos and eaten by each individual

The routine feeding of the rhinos were carried out twice daily, once in the morning and once in the afternoon. Kretam would usually be back for his morning feed (breakfast) at 0700H and afternoon (dinner) at 1500H. The females, Puntung and Iman would often be back much later.

The VFI for Kertam, Puntung and Iman ranged from 28.5 – 41 kg ($\mu=34.9$ kg), 15 – 34 kg ($\mu= 29.9$ kg) and 29 – 32 kg ($\mu= 30.4$ kg) respectively. In addition, an average of 17 kg browse is hung inside the paddock for the rhinos to feed at night or early morning. On the average, the amount consumed by Kretam, Puntung and Iman were 6 kg, 5 kg and 4 kg respectively.

Puntung was observed to eat most of the food offered to her (71.0%) while inside the chute. In contrast, Iman and Kretam would consumed 57.2 and 64.8% respectively. By comparison, Iman and Kretam would select their foliage more and discard or “cut – off” the coarser portion.

A closer observation of Puntung, noted that her left molars and premolars were more worn down as compared to her right side. Interestingly, she was not able to cut off the coarser, lower part of the stem offered to her. Instead, she would continue to chew and eventually swallow the food offered. This explains the reason why not much of food remains were seen in front of her, inside the chute during her morning and evening feedings. On occasions when the stem offered to her is coarser than usual, she would attempt at chewing it first, but would spit out if she finds it too difficult. This could be seen with some *Macaranga spp* (Plate 7).



Plate 7. The small remains of food spat out by Puntung

This finding is also important for feed management of captive rhinos. Therefore, it is necessary to rotate the direction of feeding and not maintain on just one side of the animal. This is to evenly wear off the teeth, especially the molars and premolars.

The left – overs after hand feeding with Iman is enormous as compared to Puntung or Kretam. Some foliage such as the *Kelawit Berbulu*, *Ara Ajinimoto* and *Merimia* species were less wasted as compared to the other species as these had softer stalks and are graded as *Class 1* species.

The number of species collected every day varies from 9 – 17 species (average 12 species). The most common species fed daily included the Nangka (*Artocarpus heterophyllus*), Kelawit berbulu (*Uncaria spp*), Akar Sambang (*Merremia spp*) and a few *Ficus spp*.

The rhinos were also supplemented daily with concentrates (horse pellets, Gold coin®). These were dampened and softened with water and fed as boluses or wrapped in Maitap/Bangkal (*Neonauclea spp*) leaves. Kretam and Iman received 500 grams of horse pellets daily while Puntung was given

400 grams. Fruits, mainly ripe banana were fed daily to the rhinos at five kilograms each. (Plate 8).



Plate 8. Wilson, the head keeper feeding Kretam with his daily bananas.

Sometimes these were changed to papaya when in season. Pumpkins were also fed to the rhinos daily as a supplement. Kretam and Iman were given 500 grams each while Puntung gets 400 grams. The skin were removed prior to feeding.

In the paddocks, the rhinos would drink from streams and water puddles. However, water is also provided *ad libitum* to the rhinos when they were inside the chute for their daily feeds.

Puntung would finished 25 – 30 liters of water while inside the chute during each feeding sessions. The water is mixed with a tablespoon of vitamins – mineral powder (Stressvitam®) and placed in front of the rhino (Plate 9).



Plate 9. Puntung drinking from her water container in between feedings

Both Kretam and Iman came back for all the feeding sessions (morning and afternoon). Puntung did not come back once for each feeding session.

3.2 Rhino Food Plantation (RFP)

More rhino food plants were added to the plantation or marcotted daily. There are more than 800 *nantka* (*Artocarpus heterophyllus*) plants in RFP, RIF and RQF. The 300 *nantka* seedlings in the nursery will be kept for transfer to the Borneo Rhino Sanctuary (BRS) facility when it is ready.

Other *Artocarpus* species that is propagated in the RFP include the Kemansi (*A. altilis*) and Tarap (*A. odoratissimus*). Several other *Ficus* species were also included in the list.

Due to the heavy rainfall, the road leading up to the RFP nursery was very wet and soggy

and not passable to vehicle. Repairs included resurfacing the patches with quarry stones and gravel (Plate 10).



Plate 10. BORA staff using a wheel barrow to fill up a wet patch.

Bigger areas needed lorry loads of quarry stones which were brought over from nearby plantation. The Permai plantation, Tradewinds Sabah, contributed two, five tons lorry load of the stones for the road inside RFP (Plate 11).



Plate 11. The newly resurfaced road in RFP

The visit by *Yang Amat Berbahagia*, Tun Musa Hitam, chairman of Sime Darby Foundation coincided with the tree planting event. Several rhino food plants were planted by the VIPs in the RFP.

4. Biosecurity and health monitoring

The wet month was anticipated to last until February 2017. The month of December 2016, recorded the highest total rainfall. Emphasis were given to the biosecurity measures and health monitoring of the rhinos. The common issues has been the contamination of water source with coliform bacteria. Sampling of soil, water, floor swabs and feed samples were carried out on the 14th December 2016. In addition, blood, urine, and feces from the three rhinos were also taken for health screening (Plate 12).



Plate 12. BORA staff sorting out the samples before packing for the laboratory

These samples were send to the Kepayan Veterinary Diagnostic Laboratory in Kota Kinabalu before mid-day on the 15th December 2016. Blood and serum samples were collected and analyzed at the Pathology and Clinical Laboratory (M) Sdn. Bhd in Sandakan.

4.1. Hematology

Blood was only collected from Kretam and Puntung using the digital plexus, and analyzed at the Kepayan Veterinary Diagnostic Laboratory in Kota Kinabalu (Plate 13).



Plate 13. Alvin collecting blood from the digital plexus of the hind feet of Kretam

Blood was not collected from Iman as she was back late from her paddock. In Iman, the blood collection is done using the coccygeal vein as she is too sensitive when we use the digital plexus or the cephalic vein.

The values fluctuated but remained within the normal range for Sumatran rhinoceros. There were no hemoparasites isolated. (Table 1).

Table 1. Complete blood count (CBC) for Kretam (SWD 002) and Puntung (SWD 003)

Parameters	Puntung	Kretam	Iman
Hemoparasites	Neg	Neg	-
RBC (X10 ¹² /L)	5.55	6.04	-
WBC (1000/ul)	11.79	8.23	-
Hb (g/dl)	14.7	15.3	-
PCV (%)	42	45	-
Seg. Neutrophils (%)	87	74	-

Eosinophils (%)	11	14	-
Lymphocytes (%)	1	10	-
Monocytes (%)	1	2	-
Basophils (%)	0	0	-

4.2 Bacteriology

All 20 floor swabs had few *Bacillus sp.* There were no bacterial growth in both the tyre bath. In addition, the 17 soil samples were negative for *Bukholderia pseudomallei*. Similarly, the mud from the wallows were negative for pathogens. The water from the sumps had abundant of *Aeromonas hydrophilia*

All water samples from the 13 tanks had coliform counts ranging from 10 – 2400 cfu/ml. The *E. coli* colonies were all the tanks except Tanks 1, 2, 8 and 12. The rest had a count of 20 – 450 cfu/ml (Table 2).

Table 2. The total bacterial, coliform and *E.coli* counts in 13 water tanks (cfu/ml) for December 2016

Tank	Total bacteria	Total coliform	<i>E.coli</i>
1	1200	30	0
2	2000	79	0
3	2000	1200	260
4	1500	1200	320
5	1450	2400	450
6	1000	190	60
7	1200	300	150
8	350	10	0
9	350	79	10
10	2000	1300	190
11	800	40	40
12	750	70	0
13	950	70	20

The water tanks with ≥ 100 cfu/ml of *E.coli* counts were Tanks 3, 4, 5, 7 and 10. They include one from Puntung's night stall, three from Kretam's night stall and one, next to Iman's foliage store.

The main source of water to the entire facility in Tabin (staff quarters, office and rhino facilities) came from the Lipad River via a gravity intake pipe.

The water would be stored in Tank 13 before being pumped to the RIF and RQF. The water contamination could have also come while in Tank 13 from the non – human primates, *Macaca nemestrina*. It was observed that a few troop of the monkeys (including the long – tailed crab eating monkeys, frequent the tank, in search of water or just to play on it (Plate 13).



Plate 13. The pig – tailed macaques playing on the water tank.

These tanks (3, 4, 5, 7 and 10) were emptied and subsequently treated with chlorine solution (1L/10000 liters water). The chlorine solution had to be prepared on the same day itself as the efficacy of the solution would decrease with time (Plate 14).



Plate 14. Alvin preparing the chlorine solution to clean the contaminated water tanks

There were no bacterial growth in the urine and feces from the rhinos.

4.3 Parasitology

Fecal samples from all rhinos were negative for endoparasites and parasitic egg count.

4.4 Routine prophylaxis

Routine disinfection and liming of the rhino facilities were carried out twice monthly, focusing mainly on sumps, dung piles, exercise yards and drains. However, the liming were carried out with supervision by the head keeper so as not to place it too close to the rhinos. The liming was not carried out inside the night stalls.

5. Reproductive assessments

Ultrasound was carried in Puntung once or twice a week depending on her reproductive status. When her follicle measures ≥ 1.5 cm, she would be scanned more frequently. In December 2016, she came into estrus at the end of the month. This also coincided with behavioral estrus as showed by her and the interest by Kretam. The ultrasound images is

also correlated with her correlate that to her progesterone profile.

5.1 Hormone profile

5.1.1 Puntung

Blood was collected from Puntung for serum progesterone profiling. This was done just after the ultrasound examination. The P4 remained high for almost half of the month (1.29 – 1.57 ng/ml) before subsiding to almost basal level in early January 2017. The peak of 1.57 ng/ml was observed on the 12th December 2016. The low level of <0.15 ng/ml was seen on the 3rd January 2017. However, the behavioral estrus was observed on the 30th and 31st December 2016, four days before the baseline level of P4 (Figure 5).

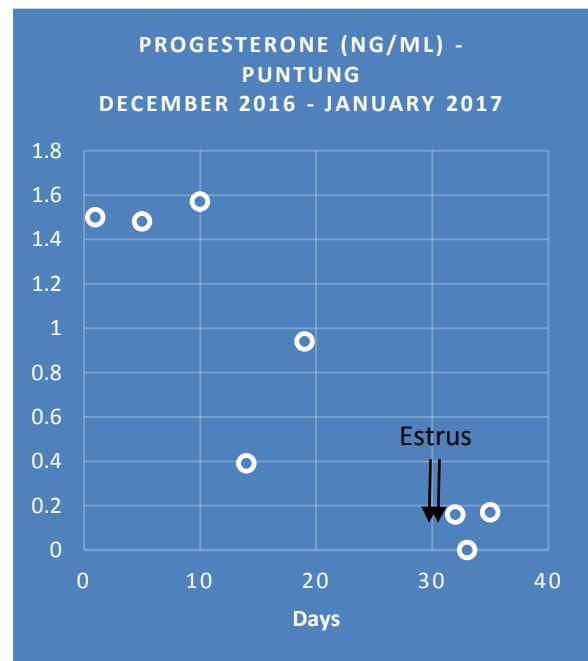


Figure 5. The progesterone levels (ng/ml) for December 2016 – January 2017

5.2 Ultrasonography

5.2.1 Puntung

The follicle on the left ovary measured 0.46 cm on the 21st December 2016, after a long period of dormancy. Right ovary was void of any follicle. The follicle increased to 0.96 cm on the 26th December 2016 (Plate 15 a, b).

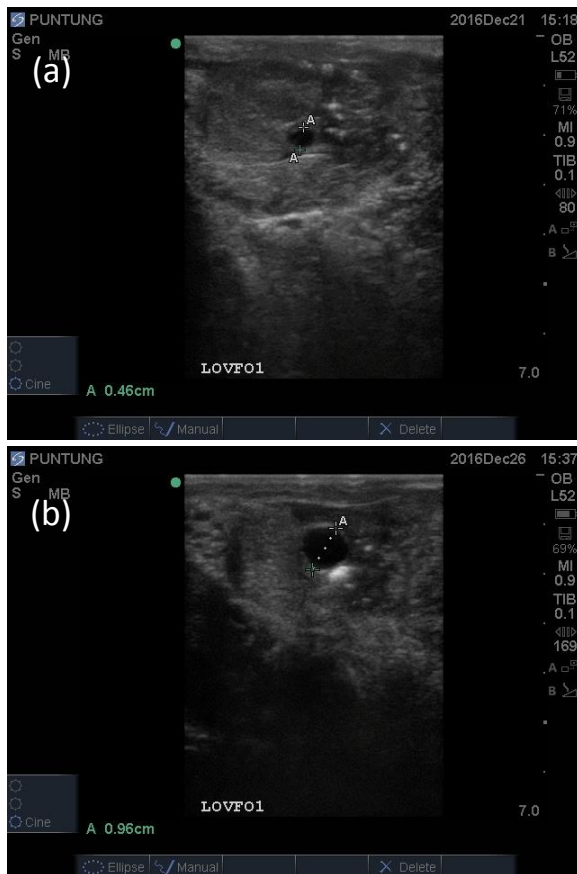


Plate 15a. A 0.46 cm follicle on 21 December 2016 and b. The follicle increased at about 1.0 mm per day to reached 0.96 cm on the 26th December 2016

However, no scanning was done late December as it was anticipated Puntung would be close to estrus on the 5th January 2017.

5.3 Behavioral estrus

The interaction between Kretam and Puntung were observed on the 10th, 24th, 30th and 31st December 2016. However, correlating with ultrasound images, the actual estrus was on the 30th and 31st December 2016 (Plate 16).



Plate 16. The interactions between Puntung and Kretam across the fence

These interactions coincide with the progesterone profile and ultrasound images.

6. Electric fencing

The voltage recorded for December varies from location. The Rhino Food Plantation, being in an open area recorded a high of 9.2 – 9.8 kV. The Rhino Interim Facility and the Rhino Quarantine Facility recorded 9.0 – 9.6 kV and 8.8 – 9.5 kV respectively. No elephants were observed around the BORA facilities.

7. Other activities

7.1 Visit by Yang Amat Berbahagia, Tun Musa Hitam and other delegates on 5 – 6th December 2016

The special visit by Tun Musa Hitam, the chairman of Sime Darby Foundation, accompanied by the Assistant Minister, Ministry of Tourism, Culture and Environment Sabah, Permanent Secretary,

Ministry of Tourism, Culture and Environment Sabah, Sabah Wildlife Department, Sabah Forestry Department, Chairman and General Manager of Tabin Wildlife Resort and Executive Director of Borneo Rhino Alliance.

A few events were organized for the occasion. These included visit to the rhino enclosure during their feeding times and planting of rhino food plants in the RFP. All three rhinos were present (Plate 16 – 22).



Plate 18. Tun Musa Hitam, Regina and Jurimin focused on Puntung



Plate 16. A visit to see Kretam having his breakfast. Wilson preparing the menu.



Plate 19. A group photo in front of Kretam's night stall



Plate 17. Tun Musa Hitam and Toh Puan looking at Puntung having her meal that is prepared by Joseph Stimon.



Plate 20. Dr. Z briefing on Iman's problems



Plate 21. The joint event to propagate rhino food plants in RFP



Plate 22. Tun Musa Hitam and Toh Puan in front of their trees

7.2 Replacement of torn black shade netting (90% shade)

Several parts of the black shade netting on the fence around Kretam's paddock need to be replaced. This visual barrier is necessary to keep the animal in. The tear on the black shade net is seen to occur horizontally (Plate 23).



Plate 23. The tears on a piece of the black shade netting at RIF

The main problem is that none of the hardware shops or plant nurseries in Lahad Datu has it. Effort is being made to try and source it from Kota Kinabalu or Sandakan.

7.3 Refresher course on restraint, rectal exams, ultrasonography and pregnancy diagnosis in Brahman – cross cows

The short training program was conducted *in-situ* at the Pusat Menternak Lembu Dara, Kalumpang in Tawau, Sabah. The refresher course was assisted by Dr. Punimin bin Abdullah, from Department of Veterinary Services and Animal Industry (JPHPT) Sabah. The general objective was to familiarize with the morphology and ultrasound anatomy of the reproductive organs in the Brahman – cross cows. A separate report was submitted much earlier.

7.4 Borneo Rhino Sanctuary (BRS) facility

The BRS Facility has three major issues to resolve before the three rhinos and their keepers could move to the site. These included the removal of a lot of construction materials from inside and outside of the paddocks. Some of the materials are very dangerous and potentially harmful to the rhinos or can cause death.

Secondly, the electric fence is not functional due to many possible problems including wiring, solar panel, energizer or power source. This has to be rectified and the fence should be active all the time with a voltage exceeding 9.0 kV.

Thirdly, the gradient of the floor in the night stall is not according to the tender, which specify a gradient of 2 – 3 %. Currently, water is pooled in several areas of the night stall. The problem will eventually be worse when all the floors is lined with rubber mat. These accumulation of water will provide an excellent media for bacteria to multiply and eventually affect the rhinos.

Other issues are the wobbly sliding doors in the night stall and leaking roof and gutter.

A separate report was submitted in December 2016 to the authorities.