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

September 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.	Iman	Female	SWD 004

1. Husbandry

1.1 Animal Management

The rhinos were closely monitored twice daily during feeding. All signs of disease and abnormal behavior were reported and recorded. Treatment protocols is needed were established for specific diseases, ranging from minor injuries to bloody vaginal discharge. All management routines were carried out based on best animal husbandry practices. The daily collection of food were also based of good quality foliage with a minimum of ten species.

The deworming were carried out four times annually using an ivermectin (Jaamectin®) based anthelminthic. Kretam was dewormed on 20th September 2017. He was also treated for hoof cracks and abrasions. A supplement was used to nourish and boost the growth of the hoof horn.

1.2 Body Weight

Weighing was carried out twice a month, using an electronic weighing scale (TruTest®). The rhinos were weight while inside the chute (Plate 1).

Plate 1. Weighing the rhino in a chute (a) and the electronic weighing scale (b)

Kretam and Iman averaged 660.5 and 553.5 kilograms respectively. Both rhinos showed a slight decrease in body weights. However, the annual fluctuations were within normal range (Figure 1).

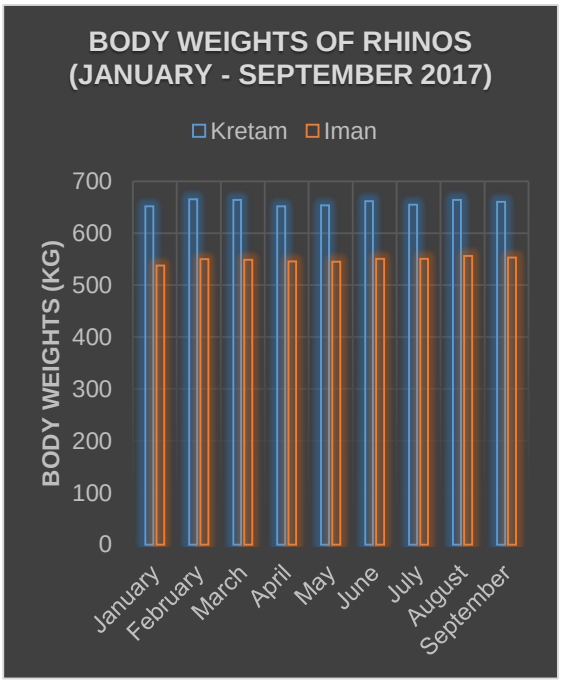

Figure 1. Bodyweights of Kretam and Puntung from January – September 2017

1.3 Animal Health

The body scores of the two rhinoceros were maintained at around ≥ 2.5 – 3.0. Although

Kretam did not return on four occasions for his morning feedings, his condition remained good. The total amount of browse consumed in September was about 4% (97 kg) less than the previous month.

It was observed on one occasion that Kretam mounted a log inside his paddock. During such instances, he was seen to have an erection.

Vaginal discharge from Iman were observed from Iman during her morning defecation. This was considered within Category 3 (pale to pinkish vaginal discharge, normal feeding and behaviour) and treated with Tranexamic acid (Tren ®) twice daily for a week and observed daily.

Her swelling from the Improvac® subcutaneous injection on the right perineum, adjacent to the vulva was resolved.

Sampling of soil from around the night stalls, floor swabs, blood, urine, feces and water from water tanks were done on the 18th September 2017. The samples were transported very early in the morning to the Veterinary Diagnostic Laboratory and Public Health Laboratory in Kepayan, Kota Kinabalu. The analysis were usually carried out between 19 – 20th September 2017. The coliform counts from the water tanks would take about a week.

1.3.1 *Kretam*

a. Fungal infection of posterior horn

The antifungal Terbinafine (Lamisil®), twice daily showed positive results. Prior to the treatment, the lesion was clean, scrubbed and allowed to dry before applying the medication. Coupled with the supplement Hoofmaker® to treat hoof cracks, the growth of the matrix was more rapid as seen from the protrusions inside the horn (Plate 2).

Plate 2. The posterior horn after application of the antifungal

b. Laceration of the foot pad

The 5 cm laceration on Kretam's left forelimb, on the foot pad, posterior to the second digit was resolved in about three weeks (Plate 3).

Plate 3. The healed laceration

b. Hoof cracks

The incidence of hoof cracks involving more than one hoof were occasionally observed in the rhinos. Iman had at one time, hoof cracks involving at least 10 digits. Apart from the local treatment (antiseptics, 2% formalin and coal tar), the rhino was also given a supplement of biotin (Hoofmaker®), once daily (50 grams). The cracks observed in Kretam involved two digits (D1 and D3) on his left hind feet. The cracks were laterally inclined (about 3 cm long) and deep. A slight swelling was also observed above the perioptic dermis of digit 1(Plate 4).

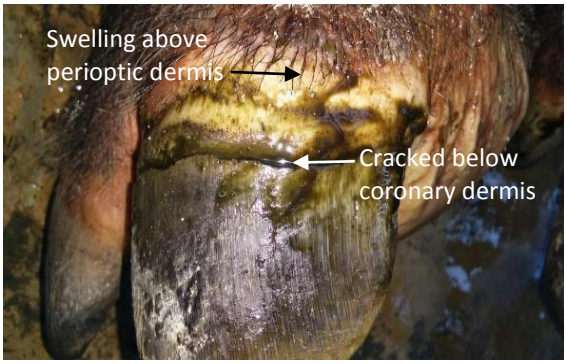

Plate 4. The hoof crack and swelling above the coronary band. Note the coal tar applied on the crack

This is a long term treatment as observed in Iman, which required about six month for the problem to be resolved.

2.3.2. *Iman*

a. Localized swelling

The treatment (warm compress) for the swelling was discontinued on the 21st September 2017 as the problem was resolved. The subsequent injection would be given at the pelvic fold to avoid similar reaction.

b. Vaginal discharge

The discharge were observed on the 16th (morning), 17th (evening), 20th (morning) and 23rd (evening). The discharge were observed either when she was standing in her chute of after defecation. The colour varies from milky to pinkish and reddish. It is serous to mucoid consistency. The volume ranged from 10 to 40 milliliters (Plate 5).

Plate 5. The mucous discharge seen voided after defecation

On the 18th – 20th September 2017, five tablets Tren® (Tranexamic acid @ 250mg/tablet) was given orally two times a day. The discharge stopped on the 21st September 2017 but was observed again on the 23rd September 2017. Tren® was resumed until the 27th September 2017. The problem was resolved.

The most likely cause of the discharge, despite the Improvac® vaccination were of traumatic origin. Looking at the severe soil erosions of the paddock due to constant heavy rain and its small acreage, her usual trail had become very deep and more difficult to pass through. Some areas became steep due to it being overuse by Iman.

c. Reproductive tract pathology

Although the use of the GnRH analogue did gave positive result on Iman, there was frequent incidence of the discharge in September 2017. This is attributed to the excessive physical exertion, coming back for her feedings and going off to her wallow. The main reason being the very eroded paddock that she is in at the moment.

Apart from the four vaginal discharges, the ultrasonographic images showed similar pathologies; leiomyomas, of varying sizes (3 – 7 cm), numerous multi and unilocular cysts, hydrosalpinx and fluids (Plate 6).

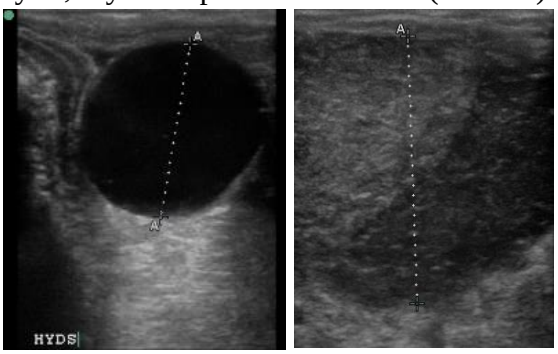

Plate 6. A hydrosalpinx in the left oviduct (left) and a 6 cm leiomyoma (right)

The other pathologies are related to the ovum pick – up procedures i.e increased vascularization of the ovary.

Feed and feeding

The rainfall is moderate in September 2017, increasing in frequency and volume over the four weeks. The browse collected is also abundant and remained lush throughout the month. Most rain were observed in the last week of September. A minimum of ten species were collected each day for Iman and Kretam.

The Jackfruit leaves (*Artocarpus heterophyllus*) were mostly harvested from the Rhino Food Plantation while the other food plants were collected from the nearby plantations (Plate 7).

Plate 7. The lush green food plants collected for Kretam

About 50% of the food plants consisted of Ficus species. The common species collected includes Gatal berbulu (*Ficus francisi*), Putih Sebelah (*Leucosyke capitellata*), Maitap (Neonauclea), Nangka (*Artocarpus heterophylus*), Sadaman (*Macarangga spp*), Merimia Binuang (*Octomeles sumatrana*), Ludai (*Balakata baccatum*), Ara Ajinomoto, *Uncaria sp* and Nangka Air. In September 2017, the total amount of browse collected for Kretam and Iman is 3958.5 kilograms. Of this, 61.7% were consumed by the rhinos, mostly hand fed.

The amount of browse that was hand fed to Kretam and Iman were 1792 and 1173 kg respectively. The amount consumed were 1162 (64.8%) and 829.5 (70.7%) kg respectively. Similarly, the browse hung out for Kretam and Iman totaled 534 and 459.5 kg respectively (Figure 2).

Figure 2. The amount of browse that were hand fed and hung to the rhinos

The amount of rhino food plants harvested (June – September 2017) from Tabin Wildlife Reserve, Permai plantation and KL – Kepong plantations totaled 15, 733.5 kg (SD: 207 kg). The average amount of browse eaten was 9806.5 kg (SD: 136 kg).

3.1 Voluntary Feed Intake (VFI)

The total foliage consumed by the rhinos varies depending on the frequencies of them returning for the morning and evening feedings. It was observed at the end of September 2017, Kretam did not return for a few morning feedings. It was more likely the weather (gloomy or rain) and sometimes, whenever he mounts a log in his paddock. Iman comes back for most of the feeding periods. The variation from June to September 2017 ranged from 3715.5 – 4205.5 kg (average = 3933 kg). Similarly, the average amount of foliage consumed is 2452 kg (Figure 3).

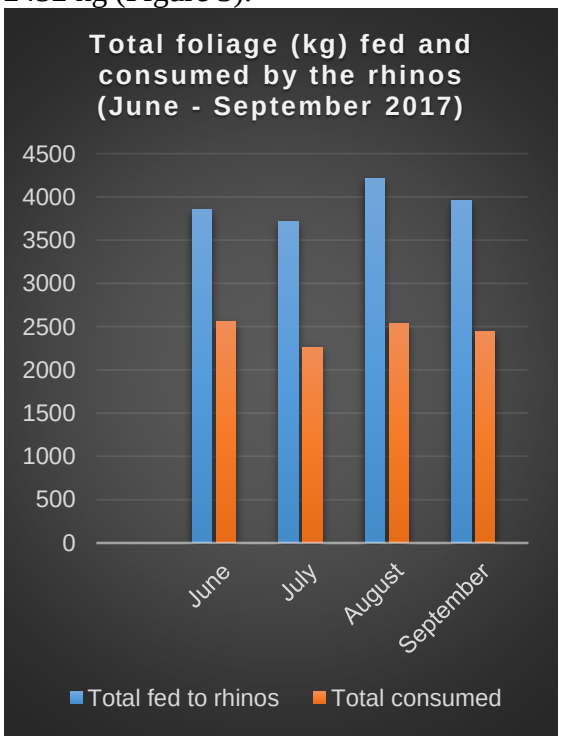

Figure 3. The total amount of foliage offered and eaten by the two rhinos

In September 2017, the amount of foliage uneaten by the rhinos totaled 1516 kg. Of this amount, 64% was from those hand fed to the rhinos. Thirty six percent were left over from those hung out for the rhinos.

The amount of browse offered to Kretam and Iman ranged from 32.5 – 76 kg and 34 – 48 kg respectively. Of this, the maximum amount (daily average) eaten by Kretam and Iman were 49 (38 kg) kg and 39 (27 kg) kg respectively. From the total of 2965 kg of foliage fed to the rhinos, 1516 kg (51%) were not consumed. These consisted mainly of coarse stems and those deemed unpalatable by the rhinos.

A total of 14 - 17 species were fed to the rhinos daily (morning and evening). On the average, the rhinos gets 16 species of browse daily. After harvest, the browse were weighed, selected, washed and stock under the shade (Plate 8).

Plate 8. The rhino food plants were stored under shade after washing. Some were hung and ready to be moved into Kretam's paddock

Apart from the foliage, the rhinos gets between 400 – 500 grams of equine pellets (Gold coin®) daily. Ripe banana (155 kg each per month) were provided as part of their daily diet. Small amount of skinned pumpkins (500 – 1000 grams) and papaya were also provided as a supplement. Depending on fruit season, they will also be fed mangoes and tangkol fruits (*Ficus racemosa*) when it is fruiting.

4. Biosecurity and health monitoring

Various samples including water (drinking and washing), soil (surrounding night stalls and wallows) and floor swabs were collected on the 17th September 2017 (Sunday) and submitted to the Veterinary Diagnostic Laboratory and the Veterinary Public Health Laboratory, in Kepayan, Kota Kinablau the following morning. The samples were mainly for isolation of pathogenic bacteria. The water from 13 tanks were tested for total coliform counts. Half of these tanks were for human consumption.

Blood was collected from Kretam for complete blood count. The urine and fecal samples were analyzed for bacterial isolation and identification. The fecal samples were also checked for endoparasites.

4.1. Hematology

Blood was only collected from Kretam for a complete blood count. Iman was having discharge from the uterus and hence was rested. The values for Kretam were compared with his previous values and within normal range for the Sumatran rhinoceros (Table 1).

Table 1. Blood parameters for Kretam

Date/Parameters	Animal
17/9/17	Kretam
Hemoparasites	Neg
RBC (X10^12/L)	5.61
WBC (1000/UL)	8.06
Hb (G/DL)	14.3
PCV (%)	42.6
Seg. Neutrophils (%)	62
Eosinophils (%)	20
Lymphocytes (%)	13
Monocytes (%)	4
Basophils (%)	1

4.2 Bacteriology

Of the 20 floor swabs from the night stalls, most had few to abundant *Bacillus sp*. *Staphyloccus sp* and *Streptococcus sp*. Swabs 13 and 14 had moderate *E. coli*. *Pseudomonas alcaligenes* were isolated in the two tyre baths. There were moderate *Brevundimonas diminuta*.

The 17 soil samples taken from various areas surrounding and inside the rhino enclosures were negative for *Bukholderia pseudomallei*. This were similar for the six samples from the wallows.

There were moderate *E. coli* in the feces and urine of the rhinos. *Elizabethkingia meningoseptica* were isolated from the urine.

The water samples taken from 13 tanks at the RIF, RQF and main storage tanks had a high bacterial counts of 82 – 4070 cfu/ml.

There were no *Salmonella sp* isolated from the water samples. All water tanks had coliform counts (cfu/ml) but *E.coli* was present only in Tanks 1, 3, 8, 11 and 13 (Table 2).

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

Tank	Total bacteria	Total coliform	*E.coli*
1	1130	340	10
2	260	10	0
3	1020	80	2
4	410	0	0
5	310	0	0
6	384	10	0
7	524	10	0
8	4020	1930	10
9	82	10	0
10	1070	0	0
11	4010	10	10
12	4000	640	0
13	4070	1810	40

The monthly fluctuations in bacterial and *E.coli* counts were mainly due to the water source (river, rain and elephants) and passages through the four main storage tanks.

4.3 Parasitology

The fecal samples from both 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. The tyre and foot baths were constantly monitored and disinfectants were added when the concentrations were low, especially after heavy rain (Plate 9).

Plate 9. The tyre bath at the Rhino Quarantine Facility

5. Reproductive assessments

Kretam's libido had improved with the placement of Iman's feces inside Puntung's paddock. There is a positive correlation between Kretam and the odour (pheromones) expelled from Iman's feces

into the environment. The positive correlation is observed when Kretam mount some horizontal logs inside his paddock.

Iman was only scanned on a few occasions due to the swelling adjacent to her vulva.

5.1 Ultrasonography

5.1.1 Iman

Due to recurrence of the vaginal discharge, progressing to pink and reddish, scanning of her reproductive organs was put on hold.

An ultrasonographic exam conducted at the end of September indicated one small follicle (0.64 cm diameter) on the left ovary and two medium size follicles (0.9 and 1.2 cm diameter) on her right (Plate 10).

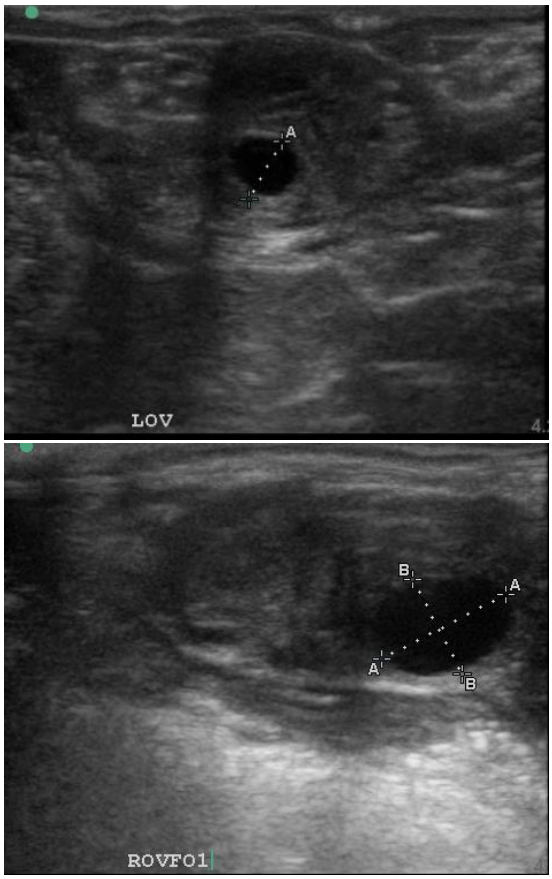

Plate 10. The left ovary (above) showing the 0.6 cm folicle and the right ovary (below) showing one of the two follicles

There were still a lot of fluids in her uterus and uterine horns which coincided with the frequent discharges from her vagina. There were also unilocular endometrial cysts around the fluid in the lumen (Plate 11).

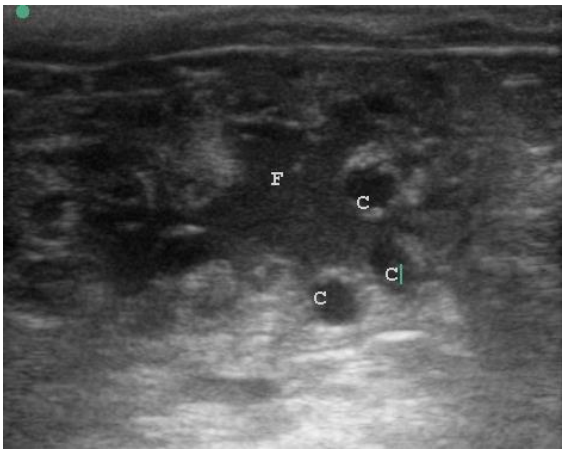

Plate 11. The fluid (F) in the uterine lumen and the endometrial cysts (C)

Iman is due to be vaccinated with Improvac on 9th November 2017.