

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

August 2017

Paddock Staff

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* 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 routine management protocol were carried out to ensure optimum animal husbandry practice. A minimum of 10 species of foliage were collected daily by the keepers to ensure a large variety of browse, consumed by the rhinos.

Iman was dewormed in August 2017 using ivermectin (Jaamectin®). Kretam will be dewormed in September 2017. Occasionally, Iman was made to lie down and all her feet and foot pads were checked for injuries.

1.2 Body Weight

Weighing was carried out twice a month, using an electronic weighing

scale (TruTest®). Kretam averaged 664 kilograms, an increase of nine kilograms. Iman’s weight increased by five kilograms to 556kg. The fluctuations throughout the year are within normal range (Figure 1).

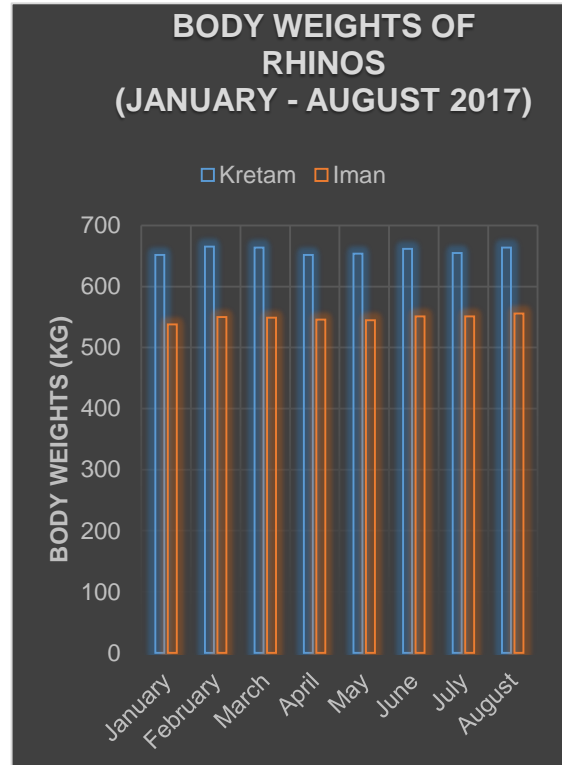


Figure 1. Bodyweights of Kretam and Puntung from January – August 2017

1.3 Animal Health

The body scores of the two rhinoceros were maintained at around $\geq 2.5 - 3.0$. Both rhinos had good appetite and consumed normal amount of browse each day.

It was observed in July 2017, Kretam’s libido had dropped significantly and his behavior was very passive. This abnormal behavior is associated with the absence of Puntung. In the first week of August 2017, feces (occasionally urine samples) from Iman was placed inside Puntung’s paddock, close to Kretam’s fence. Observations were carried out throughout the day by the internship students from Universiti Malaysia Terengganu for 25 days. The positive change in his behavior pattern

was very dramatic. These included erections seen in the night stall, mountings of logs and termite hill as well as increased behavioral activities (urine spraying, scrapping and vocalization) close to Iman's feces.

On the 9th August 2017, Kretam was observed to have a laceration on his left front feet. This could have been from some sharp structures in the soggy areas next to the exit into the paddock. The location used to have a concrete drain that was unused since 2011. However, the rain and siltation from the hill soften and deepen the area. Kretam also have a few chippings of the hooves.

There were mucous vaginal discharge from Iman on several occasions in August 2017. In addition, the injection site for Improvac® (right perineum) was slightly swollen and was treated by warm compress.

The routine sampling (soil, swabs, blood, urine, feces and water) was done on the 14th August 2017. The samples were transported very early in the morning to the Kepayan Veterinary Diagnostic Laboratory and a Public Health Laboratory. The analysis were usually carried out the following day. More time were needed for the coliform counts in the water tanks,.

1.3.1 *Kretam*

a. **Fungal infection of posterior horn**

The lesion was treated with the antifungal Terbinafine (Lamisil®), twice daily. The lesion was clean and allowed to dry before applying the antifungal. Although the response to treatment was slow, it did showed improvements in the horn growth. There are more gaps filled up by keratin substance (Plate 1).



Plate 1. The posterior horn after application of the antifungal

b. **Laceration of the foot pad**

A laceration was noticed on Kretam's left forelimb, at the foot pad, just posterior to the second digit. The 5cm laceration cuts through the epidermis (Plate 2).



Plate 2. The clear long gap caused by a sharp object in the paddock

His feet was thoroughly clean with water from a hose. He was subsequently treated with povidone (Septidine®), applied with a spray and combined with soaking the feet in diluted povidone solution (using a gunny sack). This was carried out twice daily, when he was in the chute for feeding, which normally lasted for two hours. The laceration healed completely after about two weeks (Plate 3).



Plate 3. The 5cm long laceration (arrow) posterior to the Digit 2 (a) and (b) the same lesion, post treatment

The cause could not be clearly determined but suspected to be related to the areas near the entrance to the exercise yard – night stall.

2.3.2. *Iman*

a. Localized swelling

The swelling was due to the reaction to the subcutaneous Improvac® injection. A total of 3 mls was injected adjacent to the vulva. The area (about 5 cm diameter) was inflamed, with swelling and redness. The site was clean with water and wiped dry. A warm compress (rice grains in a heated sac in) was gently placed over the site. This was done twice daily. The redness has gone and swelling reduced. As with previous swellings on the pelvic fold, it would require a few month to heal (Plate 4).



Plate 4. The swelling on the right side of the vulva (left pic) and the warm compress being applied (right)

b. Vaginal discharge

The discharge were observed on six occasions; on the 5th, 7th, 10th 11th, 19th and 28th August 2017. The latter discharge was caused by her being coaxed to lie on lateral for routine hoof checks. All the discharges were clear to whitish in color, between 20 – 40 mls and mucoid consistency (Plate 5).



Plate 5. The mucous discharge seen voided after defecation

Iman was vaccinated with 3 mls of the Gonadotrophin Releasing Factor (Improvac®) on the 9th August 2017. *I believed the irritation on her vulva also contributed to her squirting small amounts of discharge.*

c. Reproductive tract pathology

The problems associated with the reproductive tract pathology is chronic and can never be resolved. The pathology is manifested mainly by the progesterone induced hyperplasia and increased secretory activities of the endometrial glands.

The use of Improvac® vaccine is effective for short periods of up to four months, as indicated by the frequency and colour of the discharge. As observed previously, the frequency of vaginal discharge increased gradually each month. If unattended, the discharge will increase eventually become bloody.

The aspiration of fluids within the hydrosalpinx in the right oviduct, during the OPU procedure was not successful as the problem recur after a few weeks.

Uterine pathologies were observed from the ultrasonographic examinations conducted. There were several round – oval hypoechoic, mass/leiomyomas, of varying sizes (3 – 7 cm), in the body and a few smaller ones in the horns of the uterus. One of the leiomyoma has anechoic structure inside it. The numerous cysts were multi and unilocular with varying sizes and shapes. Fluids were also seen in the uterus as homogenous and hypoechoic images. This is easily distinguished with the echoic fluids inside the surrounding cysts. (Plate 6a, 6b and 6c).



Plate 6a. Leiomyoma filled up a large area of the uterine body



Plate 6b. A leiomyoma adjacent to the cervix. Note the cysts in the uterus



Plate 6c. The large endometrial cysts with surrounding fluids

Feed and feeding

The rhino browse were quite abundant in August with onset of heavy rainfall throughout the early to middle of the month. A minimum of ten species were collected each day for both rhinos. The most common is the Jackfruit leaves (*Artocarpus heterophyllus*) which were mostly harvested from the Rhino Food Plantation (Plate 7).



Plate 7. Justine weighing the Jackfruit stalks for Iman

The other species collected includes Gatal berbulu (*Ficus francisi*), Putih Sebelah (*Leucosyke capitellata*), Maitap (*Neonauclea*), Nangka (*Artocarpus heterophyllus*), Sadaman (*Macaranga spp*), Merimia Binuang (*Octomeles sumatrana*), Ludai (*Balakata baccatum*), Ara Ajinomoto, *Uncaria sp* and Nangka Air.

In August 2017, the total amount of browse collected for Kretam and Iman is 4205.5 kilograms. Of this, 60.4% were consumed by the rhinos.

From July – August 2017, the total amount of browse harvested from Tabin Wildlife Reserve and the surrounding plantations (Permai and KL – Kepong) averaged 3925 kg (SD: 253 kg). The average amount of browse eaten was 2454.7 kg (SD: 168 kg).

The amount of browse that was hand fed to Kretam and Iman were 1866 and 1291 kg respectively. Similarly, the browse hung out for Kretam and Iman totaled 546 and 502.5 kg respectively (Figure 2).

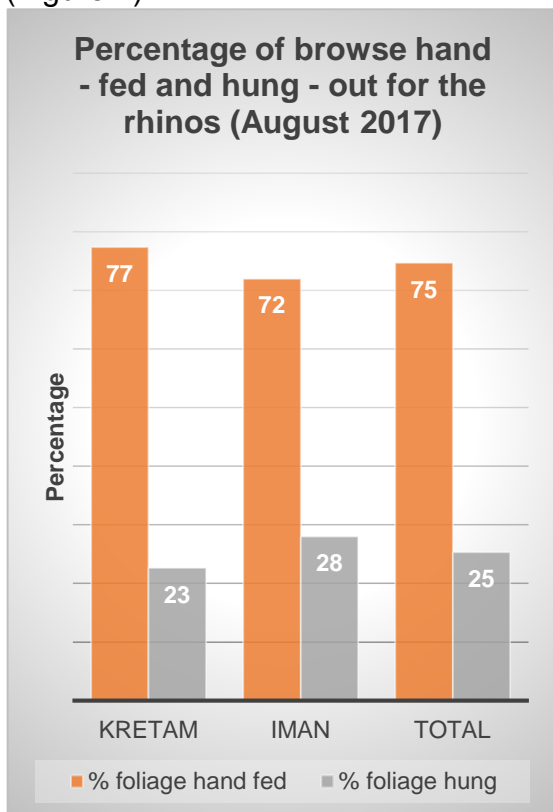


Figure 2. The amount of browse that were fed to the rhinos

3.1 Voluntary Feed Intake (VFI)

The total foliage eaten by Kretam in August 2017 were 1429 kg (59.2% of total offered). Iman consumed 1111 kg (61.9% of total offered) in the same month. These constitute those that

were hand fed and hung out for ad libitum feeding, mostly occurring in the night (Figure 3).

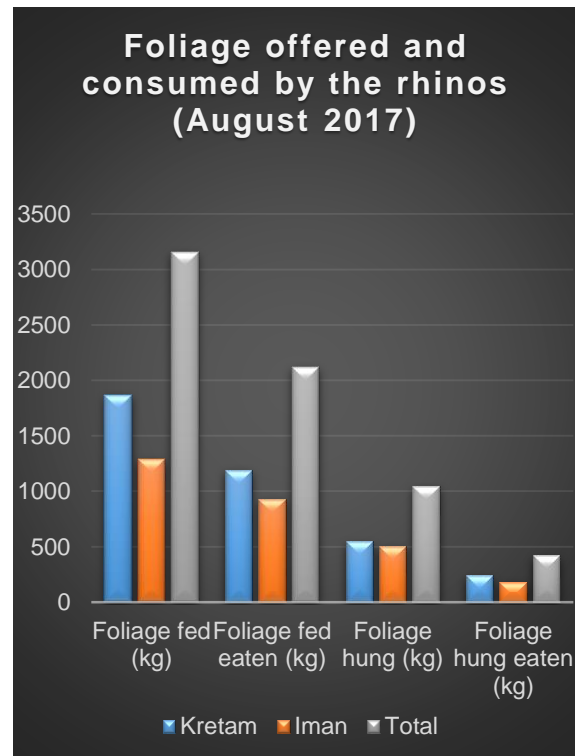


Figure 3. The total amount of foliage offered and eaten by the two rhinos

The amount of foliage uneaten by the rhinos totaled 1665.5 kg. The minimum amount of browse eaten in a day by the two rhinos averaged 24 kg (19 – 29 kg). This was associated with Iman getting her Improvac injection. The maximum amount of foliage eaten by Kretam and Iman were 45.5 kg and 32 kg respectively.

A minimum of 10 species were fed to the rhinos daily. On the average, the rhinos gets 16 species of browse daily. The browse were weighed, selected and watered to prevent dryness

Apart from the foliage, the rhinos gets between 400 – 500 grams of equine pellets (Gold coin®) daily. This supplement were soaked in a small amount of water inside a pail to soften them prior to wrapping it in leaves

(*Neonauclea sp* or other broad leaf species) and fed to the rhinos.

Kretam and Iman were also fed 155 kg each of banana respectively in August 2017. The amount of pumpkins fed ranged from 0.5 – 1.0 kg per day. The skin were removed prior to feeding them to the rhinos.

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 14th August 2017 (Sunday) and submitted to the Veterinary Diagnostic Laboratory and the Veterinary Public Health Laboratory, in Kepayan, Kota Kinablu the following morning. Most of the samples were send for bacterial culture and identification. Samples from the 13 water tanks were tested for total coliform counts. Half of these tanks were for human consumption.

The samples collected from Kretam and Iman included blood, fresh urine and feces. The fecal samples were mainly for parasitological evaluation.

4.1. Hematology

Blood was collected from Kretam for serum chemistry. The SGOT (AST) and SGPT (ALT) and total bilirubin were 86 IU/L, 25 IU/L and 1.0 UMOL/ML respectively. These were within normal range for the Sumatran rhinoceros.

4.2 Bacteriology

Of the 20 floor swabs from the night stalls, most had few to abundant *Bacillus sp*. *Staphylococcus sp* and *Streptococcus sp*. Swabs 13 and 14 had moderate *E. coli*.

The 17 soil samples taken in areas surrounding and inside the rhino enclosures were negative for

Bukholderia pseudomallei. Similarly, the six wallows were negative for pathogens. The water samples taken from the two sumps had few *Leuconastac pseudomesenteroides*.

There were no pathogens isolated from the feces and urine of the rhinos. Iman had few *Bacillus sp* in her feces. However, Kretam had high *E.coli* count in his feces. There were no bacteria in the urine samples.

The horse pellets (Gold Coin®) had a total coliform count of 340 - 750 cfu/gm but were negative for *E.coli* and *Salmonella sp*.

The water samples were taken from 13 tanks at the RIF, RQF and main storage tanks. Petrifilm method was used to analyze the samples. The results from the 13 tanks indicated a total bacterial counts of 80 – 410 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 Tank 6 (Table 1).

Table 1. The total bacterial, coliform and *E.coli* counts in 13 water tanks (cfu/ml) for the month of August 2017.

Tank	Total	Total	<i>E.coli</i>
1	100	10	0
2	180	0	0
3	120	40	0
4	103	0	0
5	170	0	0
6	120	50	50
7	180	30	0
8	200	50	0
9	80	10	0
10	130	50	0
11	120	50	0
12	410	250	0
13	90	30	0

The monthly fluctuations in bacterial and *E.coli* counts were mainly due to the water source (river and rain) 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.

5. Reproductive assessments

The low libido in Kretam and poor semen quality was obvious from the behavioral observations. This was the result from when Puntung was acyclic with the squamous cell carcinoma and after she was euthanized.

The behavioral observation after daily placement of Iman's feces in Puntung's paddock showed a major improvement in his behavior.

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

5.1 Ultrasonography

5.1.1 Iman

Iman showed ovarian activities despite the treatment with Improvac®. The last vaccination (subcutaneous – adjacent to vulva) was done on the 9th August 2017, about four months from a previous one.

An ultrasound examination on the 8th August 2017, showed two follicles, next to each other on the left ovary. They

measured 1.45 and 0.4 cm diameter. Subsequently, two large follicles were also observed on the right ovary measuring 1.75 and 1.0 cm (Plate 8).

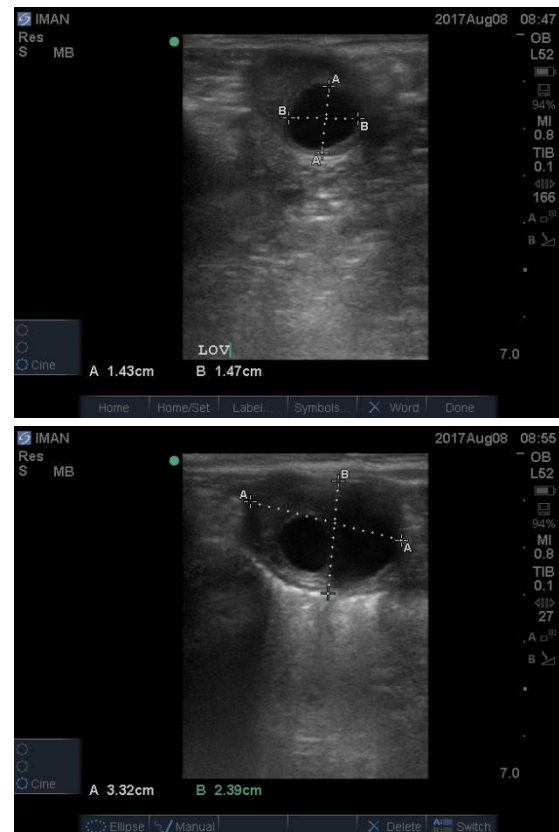


Plate 8. The left ovary (above) showing the 1.45cm follicle and the right ovary (below) showing the two follicles

On the 13th August 2017, the four follicles had increased in diameter. A 1.2 and a 1.5 cm follicles were observed on the left ovary. The right ovary had two round follicles, measuring 1.85 and 1.45 cm, adjacent to each other.

However, on the 31st August 2017, there was no follicles detected on the left ovary. Several corpus luteums were seen on the ovarian surface. The right ovary showed a round 1.2 cm follicle and a corpus luteum. There were significant amount of vascular structures (anechoic streaks) on the right ovary (Plate 9).



Plate 9. The right ovary (ROV) showing one follicle. Note the anechoic vessels. The left ovary (LOV) that is devoid of follicles

5.2 Behavioral response - Kretam

Kretam's positive response to the Iman's feces and urine placed inside Puntung's paddock was an indication that an adjacent female is required to enhance breeding behavior in the bull. The olfactory senses plays the important role in such cases.

The daily activity of placing the feces/urine at the same location was a trial given to the UMT internship students. The objective is to see behavioral response by the bull to detect signs of estrus in Iman. The 25 day trial showed that Kretam responded positively on two occasions. This was very similar during the period when Puntung was coming into estrus, regularly. The signs displayed include urine spraying, debarking, scrapping

the ground and vocalization. It was obvious that Kretam sensed a female (Iman) coming into estrus. The positive signs were detected on the 21st and 29th August 2017 (Plate 10).



Plate 10. Kretam showed interest at the location of the dung/urine (a) and sniffing goes on for some time (b) and (c) urine spraying was intense towards Iman's dung pile

