

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

July 2018

Paddock Staff

1. Wilson Kuntil (Head Keeper)
2. Justine Segunting (Rhino Keeper - RIF)
3. Maslin Mohiddin (Rhino Keeper – RIF)
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5. Ronald Jummy (Rhino Keeper - RQF)
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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

July 2018 was as dry as the previous month with only one week of rain. Most of the rain occurred in the morning, ranging from 5 – 26 mm per day. The total rainfall in July was 88 mm as compared to 72 mm in June 2018. The total in April and May 2018 exceeded 400 mm.

The supply of forage for the rhinos are still adequate and occasionally supplemented by those from the Rhino Food Plantation.

Clean drinking water were made available inside plastic troughs in the rhino paddocks at all times. The consistency of mud inside the wallows were also maintained by adding water when it becomes dry.

Kretam and Iman are in excellent body condition except for the recurrent hoof chippings and occasional cracks.

The preparation to move both rhinos to the new Borneo Rhino Sanctuary enclosures is very laborious. Apart from logistical requirement to move four staff permanently to BRS, the supply of water and electricity represents a critical issue and at times problematic. The security and safety of the rhinos had to be ensured, particularly, checking out for metal pieces inside the paddocks.

Both rhinos were conditioned to enter the transport crate daily, and were fed while inside it. This will be followed by locking the rhinos in for several minutes (Plate 1).



Plate 1. Iman watching the crate from her night stall (a) before entering it (b)

The process is lengthy but to ensure that the transport is smooth and the animal is not unduly stressed during the operation. The planned date of relocating the rhinos is tentatively fixed for 9th or 10th August 2018.

Similar problems were seen in both rhinos over the months. Kretam and Iman still has some new hoof chippings and cracks, due to the rundown paddock conditions. His posterior horns have grown quite well. Iman's more serious problem is associated to the bleeding from her leiomyomas, endometrial cysts and other pathology. These and her open pyometra is monitored and treated symptomatically. Both were manifested by the constant vaginal discharges seen daily. Iman was not

scanned in July as her discharge was more red than usual but quite erratic. However, the clinical signs were suggestive of a Category 3 – 4 and was treated subsequently.

Iman’s feces were placed inside Puntung’s exhibit, to enticed breeding behavior from Kretam, who lives in an adjacent enclosure.

1.2 Body Weight

The two rhinos were weighed at least twice each month (middle and late), with weekly weighing for Iman. The weighing was done several times using TruTest® electronic weighing scale. In general, their average body weight is maintained throughout January to July 2018 (Figure 1).



Figure 1. The average bodyweights of Iman and Kretam from January – July in 2018.

Kretam’s average body weight was highest in July (677 kg) and ranged between 669 – 677 kg in 2018. This is despite the reduction by 2 kg of banana fed to him each day. Iman’s average is also maintained at between 520 to 530 kilograms. Her average throughout 2018 is 522.6 kg.

Iman’s body weight fluctuated every week, indirectly due to her leiomyomata. The size of the tumor would have exerted pressure on the hind gut and caused frequent defecation and urination. In July 2018, her weekly body weight ranges from 520 to 532 kg (Figure 2).

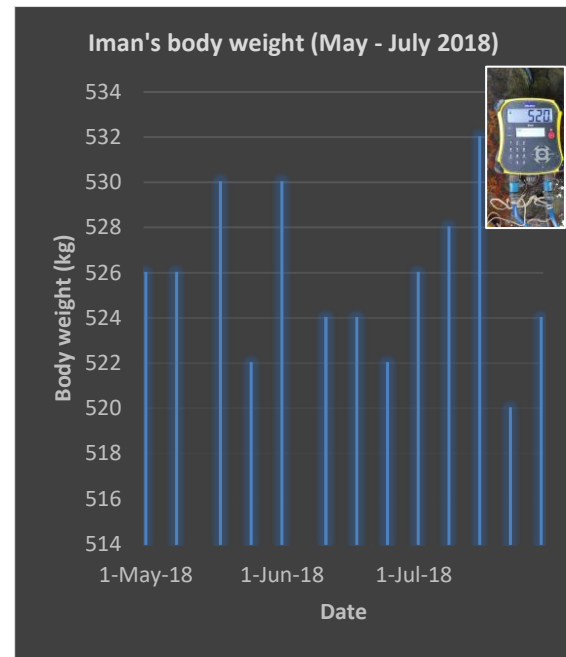


Figure 2. The fluctuating body weights and the Tru Test® reading 520 kg (inset)

Although her body weights were maintained under 530 kilograms, the other factors leading to the copious discharges, were present. These includes strenuous physical activities due to the gently undulating terrains inside her paddock.

2. Animal Health

The body scores of Kretam was maintained at around 3.0 and Iman at 2.5 (modified from Body Condition Scoring for Horses, Henneke et al., 1981). Both rhinoceroses have excellent appetite. Their food source is adequate and abundant. Their enclosures, although quite overused, still contained small amount of good soil for the wallows.

Although food that was hand fed was limited to about 5 - 6 % bodyweight, the rhinos would also browse on the forage that was hung out inside the paddocks (Plate 2).



Plate 2. Kretam feeding on the *Neonauclea sp.*, after being hand – fed in the night stall

The main chronic issues with Kretam were his hooves (mostly chippings) and the posterior horn (erosions). Iman too has a few cracks on the hooves. None are life threatening but needs to be cleaned and treated each day.

However, in Iman, the more serious condition remained the leiomyomata, endometrial cysts and the copious mucous discharge with a tendency to have blood (open pyometra).

The routine monthly sampling for health and environmental checks were carried out for both rhinos and their surroundings on the 15th July 2018 (Sunday) and submitted to the Veterinary Diagnostic Laboratory, JPHPT and Public Health Laboratory in Kepayan, Kota Kinabalu on the 16th June 2018, before noon.

The samples included soil from the surroundings, mud from wallows, water from the tanks, floor swabs, horse pellets (Gold Coin®), feces, urine and blood. The swabs from Iman’s vaginal discharge were also send for bacteriological culture and antibiotic sensitivity test. All these samples except blood, were analyzed for bacterial contamination, particularly *E.coli*, *Salmonella sp* and *Bukholderia psedomalleie*.

2.1 *Kretam*

a. Deformity of posterior horn

The posterior horn improved significantly with overall increase in height. The black silicon filling is still intact at the caudal surface of the horn. As the horn matrix grows vertically, the silicon filling will be removed (Plate 3).



Plate 3. The posterior horn had increased in height since May 2018

b. Hoof chippings

Most of the hooves are affected, particularly at the terminal papillae of the parietal dermis. The sole border (distal end) becomes corrugated, mostly affecting the coronary horn (middle layer) and the periople or external layer (Plate 4).



Plate 4. Hoof chippings could be seen on all hooves of the right hind feet

The reason for this is that Kretam tends to reuse his old wallow which contained substantial amount of stones and slates.

The daily treatment consisted of topicals (antiseptics, 2.5% formaldehyde and Stockholm coal tar) twice daily, and supplementation with biotin and methionine (20 grams Hoofmaker TRM®), once daily in the afternoon.

2.2 Iman

a. Hoof chippings

Iman has several hoof chippings and cracks, which also involve the coronary horn and the periople layers. The cause was traumatic in origin and involve the distal aspect of the parietal dermis (Plate 5).



Plate 5. Several of the hooves were affected with hoof chippings and cracks

The daily treatment includes thorough cleaning of the hooves affected, followed by 2.5% formaldehyde swabs and Stockholm coal tar. This was done in the morning and evening. Biotin supplement (20 grams Hoofmaker TRM® powder) was reconstituted with water to form a bolus and fed to the rhino.

b. Reproductive tract pathologies

Vaginal discharge from Iman were of Category 3 and 4 but on some days it almost approached Category 2 (frank blood observed). In July 2018, her discharge ranged from clear, white to pink and red. The consistency of the discharge ranged from watery to mucous (Plate 6).



Plate 6. The pinkish discharge (left) and the red mucous discharge (right)

These discharges were either observed inside the wallow, after defecation or after urination. They ranged in volume from 10 to 50 milliliters. Most were easily observed after defecation in the morning (Plate 7).

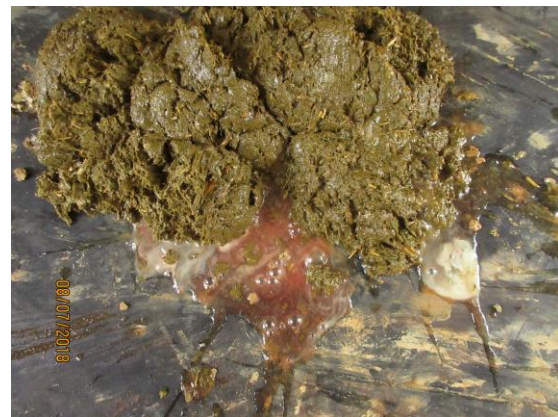


Plate 7. The discharge immediately voided after defecation

The discharge inside the wallow is often observed when she lies down and turn from left to right or vice versa. It was also observed when started to churned more mud from the wallow wall. All discharge inside the wallow was removed before letting her in again.

She was treated with Vitamin K and other hematinics apart from tranexamic acid (Tren®). On the 11 July 2018, 3 mls of Improvac® (Gonadotrophin Releasing Factor) vaccination was given to her subcutaneously at the left flank (Plate 8).



Plate 8. The veterinarian administering the Improvac® vaccine to Iman on her right flank

3. Feed and feeding

The forage for the rhinos remained abundant in July 2018. Most of the food plants were gathered from the surrounding plantations and forest fringes. About 10 % were obtained from the rhino food plantation. The grade 1 species including the Ara mangga (*Ficus annulata*) were occasionally obtained from the wild but usually harvested from the RFP. The common species composition collected daily would include Maitap (*Neonauclea spp*), Kelawit berbulu (*Uncaria spp*), Nangka air paya, Meremia and Jackfruit (*Artocarpus heterophylus*). Most of the jackfruit leaves were obtained from the RFP (Plate 9).



Plate 9. The variety of food plants gathered from the surrounding wildlife reserve and plantations. Segregated and watered.

The rhinos were also fed banana, papaya and pumpkins daily. However, jack fruits (nangka or cempedak) and mango (few varieties) were fed when in season. On balance, fruits were given after 3 – 4 kilograms of foliage were consumed by the rhinos. Fruits are also an excellent medium for giving oral medicine to the rhinos. Depending on palatability, banana and mango seemed to be the best (Plate 10).



Plate 10. Rasaman inserting medication to be given to Iman

Iman is more consistent in coming back for her food each day. This is related to the nearness of the night stall to her wallow, smaller size of her paddock, presence of her permanent toilet inside the night stall and the smaller quantity of food given to her. In contrast, Kretam has a larger paddock with the wallow located more than 200 meters from his night stall. He comes back too early in the morning and frequently late in the evening.

Iman spends shorter time eating the hand – fed forage compared to Kretam who is more sensitive to the surroundings (presence of macaques and unfamiliar noise, smell and sight). Kretam spends about two hours feeding.

Among the forage hung out for the rhinos inside their respective paddocks, nangka is the most favored.

3.1 Forages

In July 2018, the total amount collected for the two rhinos is 3602.5 kilograms. Of this 64% (2303.5 kg), was allocated for Kretam and the balance was fed to Iman. However, the total percentage consumed by both rhinos is similar (60%). About 30% of the total forage offered to Kretam was hung out for his evening – night feeding, while 45% of Iman’s total forage were hung out in the paddock. (Figure 2).

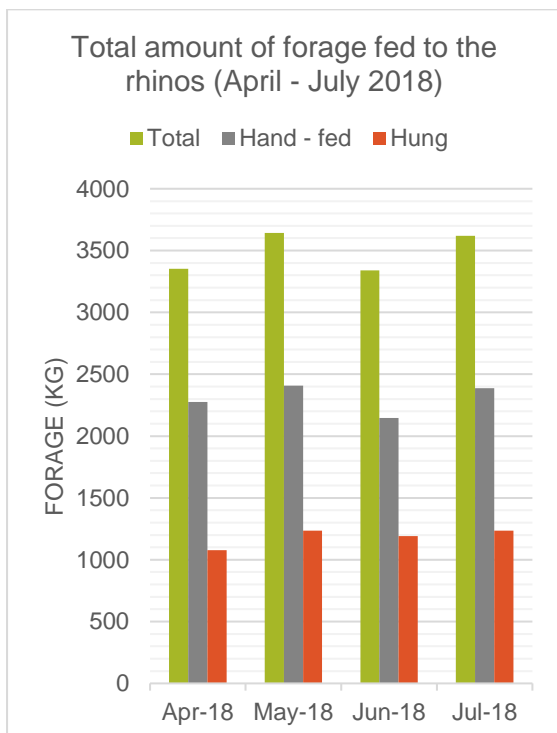


Figure 2. The forage fed to Kretam and Iman for April – July 2018

3.2 Voluntary Feed Intake (VFI)

The feed intake for both the rhinos via hand – feeding was fixed to a minimum of 18 and 36 kg for Iman and Kretam respectively. Kretam came back for only 30 days in July, while Iman was back for the entire month.

The minimum – maximum intake by the Iman and Kretam for July is 18 – 19 kg and 18 – 42 kg, respectively. Despite the constant discharge, Iman consumed about 36% (215 kg) of the forage hung out for her. Kretam ate 296 kg out of 631 kg of forage hung out in the paddock (Figure 3)

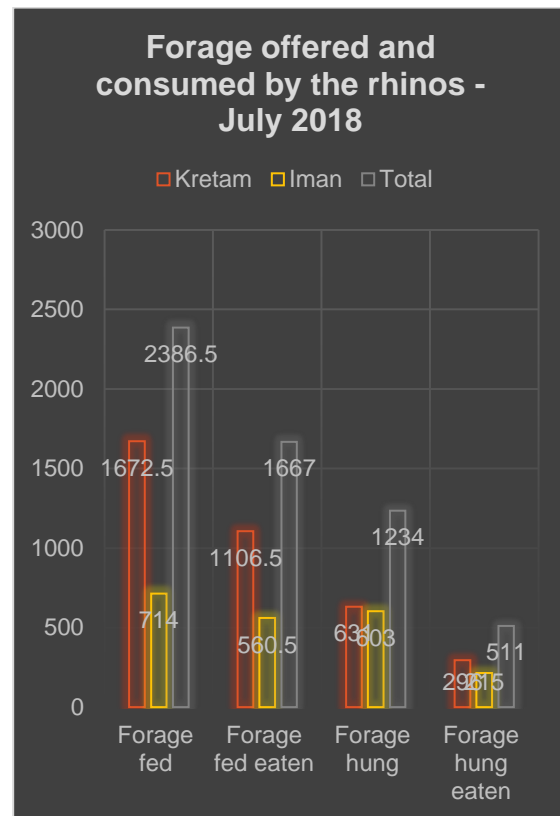


Figure 3. The total amount of forage offered and eaten by the two rhinos in Tabin

Fruits are an essential part of the rhino’s diet. They constitute 18.4 % of the total diet of the two rhinos. Most fruits are available throughout the year, including banana (*Musa acuminata*) and papaya (*Carica papaya*). Pumpkins are also readily available in town. Although Jackfruits (*Artocarpus heterophyllus*) are non-seasonal but not always available. The seasonal fruits include the cempedak (*Artocarpus integer*) and mangoes (*Mangifera foetida* and *Mangifera indica*). Half of the fruits were fed in the morning and the remaining in the afternoon or evening.

Horse pellets (Gold Coin ®) were given as supplements. Kretam receives 300 grams each day and Iman gets 500 grams. However, on the 18th Iman’s pellets were reduced to 200 grams to offset her weight gain. These were mixed with water and soften before feeding the rhinos. In

addition, the mineral and vitamin supplements (Stressvitam®) were added to the drinking water and the water to rinse some foliage prior to feeding the rhinos.

Clean drinking water was offered inside a pail or basin, intermittently during hand feeding. Two 9 – liter containers were provided as water source inside her paddock.

4. Biosecurity/health monitoring

The biosecurity for the rhinos in Tabin relates to preventive measures to reduce risk of disease transmission from outside sources. However, ensuring optimum health is also fundamental to prevent a disease. All of these were translated into management protocols. These includes ensuring the rhinos gets adequate high-quality food, without contaminations from pathogens or toxic materials. The reduction of stress is also an important tool in preventive medicine. Apart from good hygiene, regular checks and monitoring are necessary to ensure good health of the rhinos. Tyre and foot bath are provided at crucial locations and maintained (disinfectant) to prevent disease introduction. The samplings were carried out, a day before sending it off to the diagnostic laboratories. Floor swabs is essential to check for potential pathogens or just the load of *E. coli* which could cause severe infection and death (Plate 11).



Plate 11. The floor swabs were handled with care to avoid contamination

The drinking water were checked constantly and analyzed once a month for bacterial contamination. Soil samples, floor swabs, water samples from water tanks, urine and feces from the rhinos were also analyzed for pathogens. The water from 13 tanks were tested for total coliform counts and presence of *E.coli* as half of these tanks were for human consumption.

Staff were also reminded to adhere to good hygiene and best husbandry practice. Samples were collected for isolation of pathogenic bacteria (particularly *E.coli*, *Bukholderia pseudomonas* and *Salmonella*) and general health checks were carried out on the rhinoceros routinely.

In addition, the floor inside the night stall is thoroughly scrubbed twice a day.

4.1 Hematology

Blood was collected into EDTA tube from the digital plexus, for a complete blood count (CBC). Kretam’s CBC was compared with his previous results (Table 1).

Table 1. The complete blood count for Kretam in June and July 2018.

Parameters	Animal (Kretam)	
	18 June	16 July
Hemoparasites	Nil	Nil
RBC (X10 ¹² /L)	5.46	7.4
WBC (1000/UL)	8.65	5.1
Hb (G/DL)	15.6	13.8
PCV (%)	55	41
Seg. Neutrophils (%)	52	62
Eosinophils (%)	14	12
Lymphocytes (%)	34	23
Monocytes (%)	0	2
Basophils (%)	0	0
MCV (FL)	NA	NA
Platelets (G/L)	NA	NA
MPV (FL)	NA	NA
MCH (PG)	NA	NA
MCHC (G/L)	NA	NA

The complete blood count showed variables are within normal limits. There is a slight elevation in WBC.

4.2 Bacteriology

All the floor swabs, except, Swab No. 4 were positive for *Bacillus spp.* Floor swan No. 4 was positive for *Acinetobacter baumannii complex.*

The 17 soil samples taken from various locations surrounding and inside the rhino enclosures were negative for *Bukholderia pseudomallei.* The four samples from the wallows were also negative for *Bukholderia pseudomallei.*

No bacteria were isolated from the two tyre baths. Water from the sumps were positive for *Enterococcus columbae.*

The water samples taken from 13 tanks at the RIF, RQF and main storage tanks had a total bacterial count ranging from 80 – 420 cfu/ml. Total coliform count only ranged from 0 – 70 cfu/ml. The *E.coli* count was low ranging from 0 – 70 cfu/ml. These were from tanks number 1, 2, 7 and 10 which had a counts of 20, 10, 10 and 70 cfu/ml respectively, and were treated (Table 2).

Table 2. The total bacterial, coliform and *E.coli* counts in 13 water tanks (cfu/ml) for the month of July 2018.

Tank	Total bacteria	Total coliform	<i>E.coli</i>
1	320	30	10
2	120	40	10
3	80	0	0
4	210	0	0
5	90	0	0
6	70	0	0
7	100	10	0
8	150	0	0
9	100	0	0
10	210	110	20
11	110	10	0
12	80	10	0
13	140	0	0

There were no *Salmonella sp* isolated from the water samples.

The monthly fluctuations in bacterial and *E.coli* counts is related to the natural water source from the Lipad River and its tributaries. Tanks number 1, 2 and 10 were located at both RIF and RQF. Tank 1 and 10 were used by staff and Tank 2, for cleaning Kretam’s night stall.

4.3 Parasitology

The fecal samples from both rhinos were negative for endoparasites and parasitic egg count.

4.4 Routine prophylaxis

Routine liming (application of calcium/magnesium – rich materials) was carried out mostly around the rhino dung piles (composting area) located outside the enclosure. Liming were also carried out around the wet ground and sumps. The tyre baths were monitored and maintained with proper disinfectants and concentration.

5. Reproductive assessments

Iman was not scanned in July due to the frequent bleeding seen inside the discharge.

The routine placement of Iman’s feces in Puntung’s paddock was done each morning. Kretam was seen to mount a small earth outcrop on the evening of 22 July 2018.