

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

**January 2018**

**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. 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 number of rain days dropped by about 30% (10 days with no rain) as compared to December 2017. The total rainfall was 502 mm with highest of 98 mm and lowest of 1 mm. However, the damage caused were long standing (bad road conditions) and many were still not resolved.

Some parts of the paddocks were dried up and deep trenches became concrete drains. Deep tracks in the mud became dangerous holes. Kretam’s hoof cracks were less apparent but were still treated with antiseptics, Stockholm’s coal tar and oral supplements. A small section of the paddock is partitioned to enclosed her mud wallow and some roaming area. The triangular enclosure measured 15 x 15 x 13 meters. The partitioned fence consisted of three layers; black – shade netting (90%

cover), five lines of half inch cable and 2 strands of high tensile electric fence.

Food plants were still available in sufficient amount. In addition, as Iman improves in condition, she assumes her normal feed preference which is less complex than before. Kretam’s gets his usual 12 – 16 species daily while Iman gets much more (Plate 1).



Plate 1. Rhino keeper Marikus, arranging the foliage before feeding them to Kretam

**1.2 Body Weight**

The body weights were usually taken twice a month, using a TruTest® electronic weighing scale. However, in January 2018, Iman was only weighed once to determine her overall health condition after the uterine hemorrhage that almost took her life. This was to minimize the stress and trauma during the procedure.

Kretam averaged 656 kilograms in December 2017 and increased by 13 kg to an average of 669 kg in January 2018. However, in 2017, the fluctuations vary from 652 to 665.5 kg.

Iman’s body weight ranged from 538 – 560 kg in 2017. However, in December 2017, her weight had gone down significantly due to her inappetence and she was dehydrated for a very long period. Her current weight in January 2018 showed a large gap between her previous body weight of 560 kg, recorded in November 2017. She made a rapid recovery after the third week of

January 2018 after a relapse on the 12 – 13<sup>th</sup> January 2018. (Figure 1).

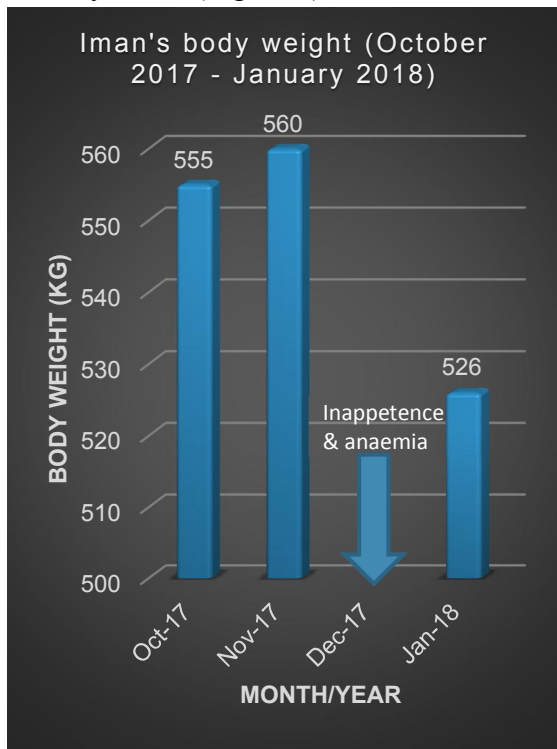


Figure 1. Comparison of Iman's bodyweight (kg) from October 2017 – January 2018

The rapid drop is mainly due to the inappetence for four days where she remained in the wallow from 14 – 18 December 2017.

## 2. Animal Health

The body scores of Kretam was maintained at around 2.5 – 3.0, with him coming back for feedings on all 30 days in January 2018. He was not observed to mount the log or mud – mount in his paddock. This activity would otherwise have caused him to miss at least one feeding.

Iman's body score went down drastically in December 2017 and early January 2018 (1.5) due to inappetence and anemia as a result of internal bleeding from the leiomyoma. The condition improved after the third week of January 2018 with a body score of >1.5 – 2.0 (Plate 2).

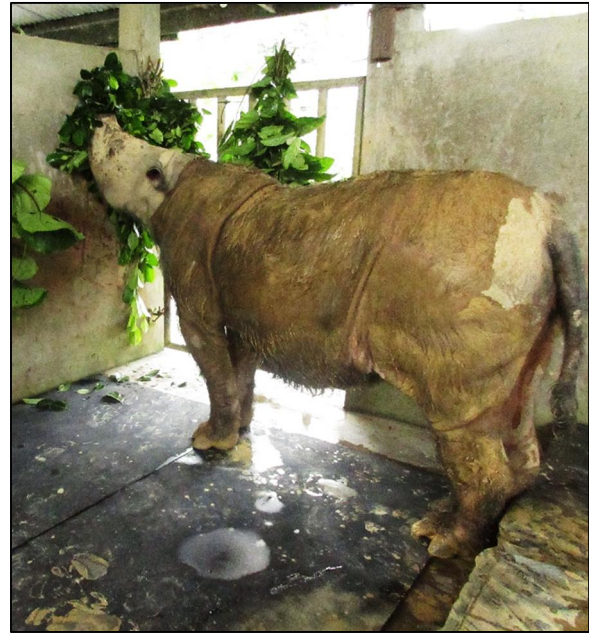


Plate 2. Iman improved her body – score with less protrusions and loose skins

Iman's bloody vaginal discharge (Category 4) in December 2017 had improved to Category 3 in early January 2018, but a relapse on the 12 – 13 January 2018, brought back the status to Category 4. Treatment was aggressive.

Kretam's hooves' cracks had improved gradually and should be resolved in a month or two. However, the healing of the posterior horn took a longer time as he frequently rubbed it on door handle and its always filled with mud from the paddock.

Routine sampling for health checks were carried out for both rhinos on the 22<sup>nd</sup> January 2018 (Monday) and submitted to the Veterinary Diagnostic Laboratory and Public Health Laboratory in Kepyayan, Kota Kinabalu on the 23<sup>rd</sup> January 2018, before noon.

Soil sampling were done around the night stalls and inside the exercise yards. Floor swabs were taken randomly inside the night stalls, focusing in areas where water accumulates after washing or heavy rain. Blood, urine, fecal samples were collected from the rhinos. Sampling for urine is always a challenge as the bull sprays his urine most of the time. Water from all the

water tanks were sampled for coliform counts, particularly *E.coli*. Water from the Lipad River was also examined for contamination with pathogenic bacteria.

## 2.1 Kretam

### a. Deformity of posterior horn

The growth of the posterior horn is rather slow but significant. The use of topical anti-fungal (Lamisil®) was stopped momentarily and replaced with povidone (Septidine®). The oral supplementation with Hoofmaker TRM® is continued daily. The horn matrix grew in height around the periphery of the horn but was depressed and deformed in the center. This depressions or holes will be either filled up with epoxy or packed with tar (Plate 3).



Plate 3. The posterior horn showed excellent growth at the periphery (above) but several depressions in the middle (arrows)

### b. Hoof cracks

The lateral cracks could be seen to be replaced or pushed ventrally by the new growth of the dermal layers. The new layers are lighter and greyish in colour compared to the old hoof matrix, and more were observed during the healing process (Plate 4).

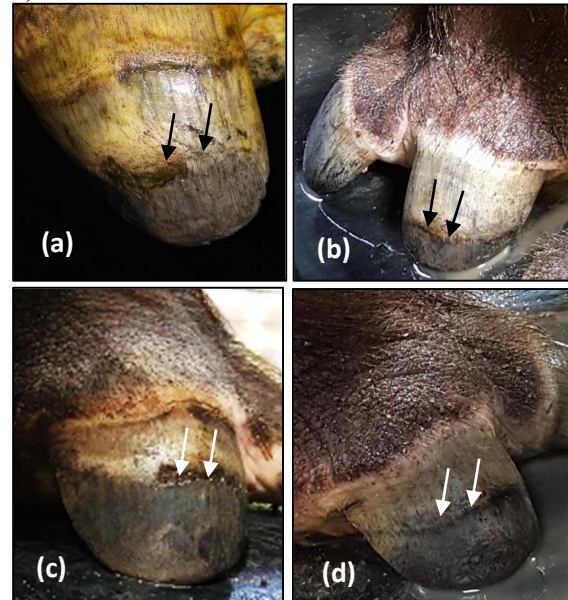


Plate 4. The healing process of the cracked hoof in December 2017 (a and c) and those observed in January 2018 (b and d)

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

### c. Puncture wound

Kretam was observed to have an irregularly round laceration on his left thorax on 16<sup>th</sup> January 2018. Two pieces of branch from a Laran tree (*Neolamarkia cadamba*) were found in his wallow. The wound was probably caused by a blunt trauma, piercing the dermis and epidermis. Topical treatment included washing with antiseptics, followed by packing it with Negasunt powder. The wound showed progressive healing after a week (Plate 5).



Plate 5. The puncture wound on the 16<sup>th</sup> January 2018 (left) and after a week of treatment (right)

## 2.2 *Iman*

### a. Reproductive tract pathologies (bloody discharge, anemia, inappetance)

In January 2018, Iman's condition was very unstable and she was anemic and very lethargic, resting her head against the enclosure wall or iron pipes whenever she stands. Her appetite was very poor and it was obvious that she was in pain. She would only lie down on sternum or on her right side. She did not vocalize at all, signaling a very severe condition.

Fresh browse of many varieties were offered to her and some were hung up in her night stall. The keepers attended to her food throughout the day and night. Her feed intake started to increase very slowly and in the first week, she was eating 11 – 17 kg of browse (40-50% of her normal intake). However, she was still lethargic and in pain but her discharge was slightly reduced and less bloody. On the 7<sup>th</sup> January 2018, a large amount of bloody discharge was voided through the vagina, the result of a large bleeder in the uterus. This occurred when she lay down on her lateral (Plate 6).



Plate 6. The bloody vaginal discharge

On the 12<sup>th</sup> January 2018, her condition worsen and she relapse again. Her feed intake was only 2.5kg and she was very restless and refuse to lie down. This was a sign of severe pain and there was blood in her discharge. She was put of infusion electrolytes, analgesics and antibiotics. Vitamin K was also supplemented intravenously (Plate 7).



Plate 7. Wilson keep watch over the infusion fluids

The relapse was so bad that she was lethargic and just laid down on the cement floor instead of the mattress or rubber mat. It was only on the fourth day that she became better and started to consume more browse. About 250 grams of moistened horse pellets (high in energy, protein and vitamin/mineral) were given to her, apart from the daily fruits she gets (mango, banana, papaya and “laran”). She still shows signs of pain and would shut her eyes and stand motionless for several minutes (Plate 8).

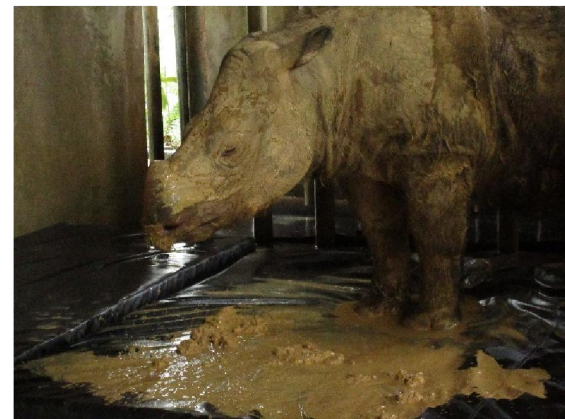


Plate 8. Iman stood still on her artificial wallow

In the third week of January 2018, her condition showed marked improvement despite a few smaller pieces of tissue (3 – 6 cm long) that got dislodged from her uterus on a few occasions. The vaginal discharge was still apparent whenever she lies down on the mattress but in smaller volume, more mucoid and pale white or pinkish coloration (Plate 9).

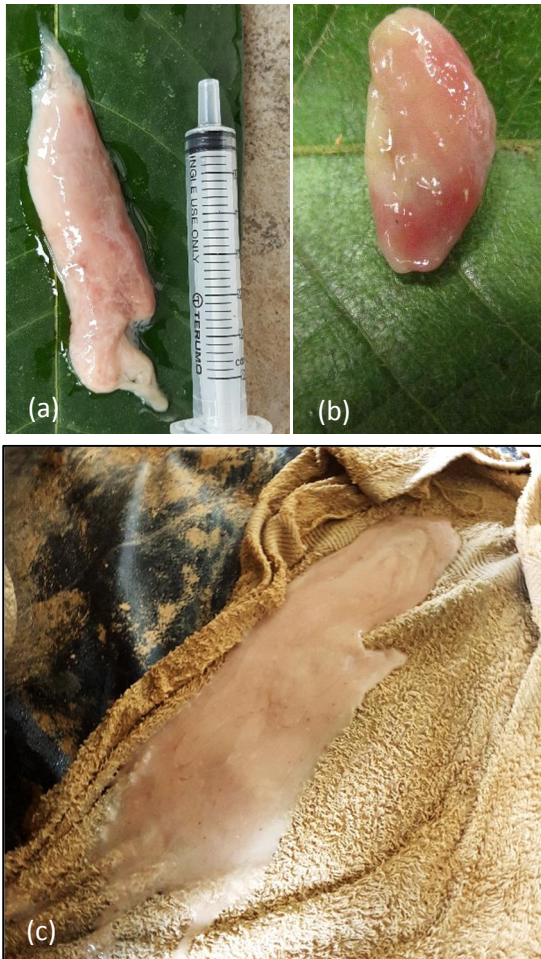


Plate 9. The pieces of tissues that are voided out together with the discharge (a and b). The mucous discharge on a towel is less bloody (c)

As it was almost two month that she was confined inside the night stall, we decided to try and provide her with an outdoor access and better soil substrate instead of the rubber mat. The hard surface could potentially cause problem with her foot pad. The outdoor access would also give her more sun and a better wallow instead of one unnatural one on a thick mattress with mud brought from outside (Plate 10).



Plate 10. Iman resting on the artificial wallow on top of a thick mattress

A new line of fence need to be constructed to limit her from going down the steep slopes. In addition, a wallow was dug out in the best location. Due to inadequate shade, a black netting was provided above her wallow.

Despite the marked improvement to her condition, her prognosis remained guarded as she might relapse due to trauma caused by bad terrains or septicemia.

### 3. Feed and feeding

In January 2018, the amount of rain has ceased and the weather was becoming warmer – hotter each day. Rainfall days are less with more drizzles than heavy downpours. The amount of browse is still adequate, both from the forest, oil palm plantation as well as from the Rhino Food Plantation (RFP). Most of the *nangka* (*Artocarpus heterophyllus*) leaves comes from the RFP.

Her appetite became much better after the 16<sup>th</sup> January 2018. She entered the chute for her feedings. As not to be harsh on her uterus, hand – feeding was limited to about 10 kg and gradually increasing to 13 kg. Browsing of fresh foliage in her night stall was ad libitum and she would consume between 10 to 13 kilograms daily. Her total intake is limited to about 25 kg, gradually increasing it to 28 kilograms (Plate 11).



Plate 11. Ronald hand feeding Iman inside her chute (above) and Iman browsing in her night stall (below)

As she became better, her foliage preference changed, feeding again on species that used to be her favorite including Ara manga, Ara kapal and Ara gatal berbulu.

Other species including Putih Sebelah (*Leucosyke capitellata*), Kelawit (*Uncaria spp*), Earth fig (*Ficus spp*) dan Nangka (*Artocarpus heterophylus*) were still consumed in large quantities, especially Nangka.

### 3.1 Forages

The total amount of forage collected for the rhinos were 4123 kg but mostly for Iman. Those that were hung and constantly replaced for Iman totaled more than 1200 kg. Most of these were Nangka. The favorite species that were hung for her include Putih Sebelah (*Leucosyke capitellata*), Nangka (*Artocarpus heterophylus*), Sadaman (*Macaranga*

*spp*), Daun akar (*Merremia spp*), Binuang (*Octomeles sumatrana*), Ara Epal (*Ficus spp*), Nangka Air (*Ficus spp*) and Tambiroq.

The other species hand fed included Nangka (*Artocarpus heterophylus*), Kemansi (*Artocarpus camansi*) Sadaman (*Macaranga spp*), Ludai (*Balakata baccatum*), Ara Ajinomoto (*Ficus spp*), two species of Ara kapal (*Ficus spp*), Ara piring (*Ficus brunneoaurata*), Nangka Air (*Ficus spp*) and Kelawit (*Uncaria spp*), Tambiroq, Pau, Akar Iman and Manis – manis. Gatal berbulu (*Ficus francisi*) Maitap (*Neonauclea spp*) and Tarap (*Artocarpus spp*). The most consumed is the Earth figus.

Of the total foliage collected for Iman, almost 90 percent of Nangka came from the RFP.

### 3.1 Voluntary Feed Intake (VFI)

The amount of forage consumed by Kretam is very consistent with slight month to month variations. However, since December 2017, Iman's feed intake was very low despite the large amount offered (Figure 2).

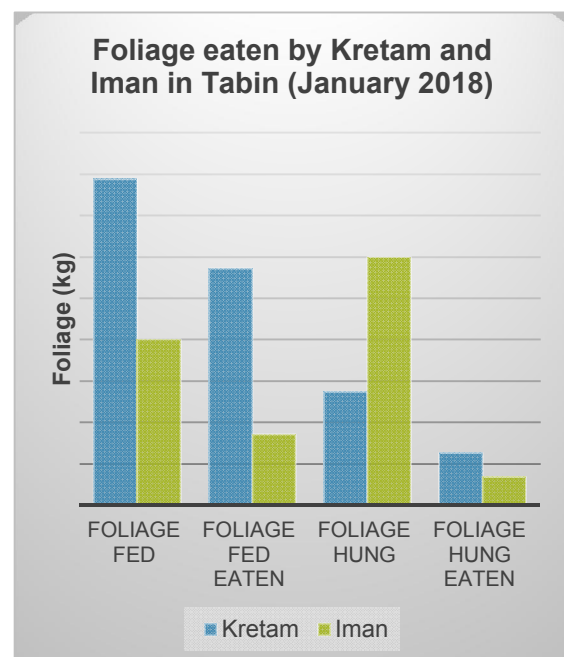


Figure 2. The amount of foliage collected and fed to the rhinos in Tabin. Notice the amount collected for Iman is very high

Iman's feed intake is gradually improving but is limited to allow proper healing of the uterus and her uterine pathologies. It was observed that she would prefer to browse on the forage hung for her in the night – stall, more so at night. Her current total feed intake will be increased to about 30 kg per day with an increase in horse pellets and fruits.

The amount of browse that was hand fed to Kretam and Iman were 1577.5 and 800 kg respectively. The amount consumed were 1144 (72.6 %) and 340 (42.5%) kg respectively. Similarly, the browse hung out for Kretam and Iman totaled 545.5 and 1200 kg respectively. The total amount fed to the rhinos (hand fed and hung out) in January 2018 is 4123 kg. Of this, 65.6% were consumed by Kretam and 23.7% constitute those eaten by Iman.

An average of 17 species of plants were fed to the rhinos daily (morning and evening). The rhinos were also supplemented with horse pellets (Gold coin®). Kretam gets 500 grams daily while Iman was fed 250 grams and gradually increased to 300 grams.

155 kg of ripe banana (60 kg for Iman) were fed to Kretam as part of their daily diet but preference is for the semi ripe ones. 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 (or wild mangoes) when in season and laran fruits (*Neolamarckia cadamba*) when it is fruiting. Iman was also fed 30 kg of mangoes, 5kg of *laran* and 10 kg of papaya. The oral Sangobion® and Tren® were placed inside mango or banana as these drugs were unpalatable.

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

#### 4. Biosecurity/health monitoring

The biosecurity measures included the tyre and foot bath provided at crucial locations. In addition, the foliage are washed prior to feeding the rhinos. The drinking water were checked constantly and analyzed once a month for bacterial contamination. Samples from soil, swabs, water tanks, urine and feces were also analyzed for pathogens. Staff were also reminded on basic hygiene. Samples were collected for isolation of pathogenic bacteria (particularly *E.coli*, *Bukholderia pseudomonas* and *Salmonella*) and general health checks of the rhinoceros. The water from 17 tanks were tested for total coliform counts and *E.coli* as half of these tanks were for human consumption. Fruits were thoroughly washed. In addition, the scrubbing of floor inside the night stall is a compulsory daily routine (Plate 12).



Plate 12. Justine washing the banana (left) and Ronald scrubbing Iman's night stall (right)

##### 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. As her condition improved, Iman was less manageable for blood collection.

The values for Kretam were compared with the previous hematological index in December 2017 and those from other Sumatran rhinoceros. The values were within normal range for the Sumatran rhinoceros (Table 1).

Table 1. Blood parameters for Kretam in December 2017 and January 2018

Parameters	Animal (Kretam)	
	10 Dec	25 Jan
Hemoparasites	zero	zero
RBC (X10 <sup>12</sup> /L)	5.78	4.97
WBC (1000/UL)	7.67	8.8
Hb (G/DL)	14.2	12.5
PCV (%)	44	37.4
Seg. Neutrophils (%)	64	NA
Eosinophils (%)	17	NA
Lymphocytes (%)	16	NA
Monocytes (%)	2	NA
Basophils (%)	1	NA
MCV (FL)	NA	75.2
Platelets (G/L)	NA	129
MPV (FL)	NA	8.2
MCH (PG)	NA	25.2
MCHC (G/L)	NA	335

NA: Not available

Iman's anaemic condition was supported with a low packed – cell volume (PCV) of 35% as compared to her normal value of 43%.

#### 4.2 Bacteriology

Of the 20 floor swabs from the night stalls, swabs 1 – 5, 11, 12 and 16 had few *Bacillus spp.* Swabs 6 – 9 had moderate *E. coli*. Swabs 10, 13, 14 and 15 had few *E. coli* while swabs 17 – 20 had scanty *E. coli*.

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

The two tyre baths contained moderate *Providencia alcalifaciens*. Samples from the sumps had few *E. coli*.

There were moderate *E. coli* isolated from the feces of the two rhinoceros.

The water samples taken from 17 tanks at the RIF, RQF and main storage tanks had a total bacterial count ranging from 140 – 450 cfu/ml. Total coliform count only ranged from 0 – 460 cfu/ml. The *E.coli* count was surprisingly low with 20 – 30 cfu/ml in tank 17 (Table 2).

Table 2. The total bacterial, coliform and *E.coli* counts in 17 water tanks (cfu/ml) for the month of January 2018.

Tank	Total bacteria	Total coliform	<i>E.coli</i>
1	330	0	0
2	385	100	30
3	285	0	0
4	410	30	30
5	320	270	30
6	280	0	0
7	140	0	0
8	169	460	0
9	310	230	0
10	300	270	0
11	420	180	0
12	450	410	20
13	410	40	0
14	320	30	0
15	350	330	0
16	250	100	0
17	270	50	20

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.

The samples from the horse pellets had high total bacterial count (10,000 – 21,000 cfu/ml) but was negative for pathogens.

The exudate sample from the vaginal discharge was sent for bacterial identification and sensitivity test at the Pathology and Clinical laboratory (M) Sdn. Bhd. There were moderate growth of beta haemolytic *Streptococci* and were sensitive to the various antibiotics:



- i. Augmentin
- ii. Cefoperazone
- iii. Cefuroxime
- iv. Penicillin

### **4.3 Histopathology**

The tissue voided out were sent to the Pathological and Clinical Laboratory (M) Sdn. Bhd for histo – pathology. They were diagnosed as edematous smooth muscle but of poor quality. The slide showed poorly preserved tissue admixed with blood and fibrin. The tissue is composed of edematous and bland spindle cells with scattered blood vessels. In many cases, the spindle cells are separated by edema fluid.

### **4.4 Parasitology**

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

### **4.5 Routine prophylaxis**

Routine liming (application of calcium/magnesium – rich materials) was carried out mostly around the rhino dung piles outside the enclosure and the sumps for water run – offs from the night stalls. Liming was also carried out when required around the staff quarters and paddocks.

## **5. Reproductive assessments**

Kretam did not mount the “log” or mud hill inside his paddock.

Iman is due to be vaccinated with Improvac® on the 9<sup>th</sup> March 2018.