

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

December 2018

Paddock Staff

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2. Justine Segunting (Rhino Keeper - RIF)
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* RQF: Rhino Quarantine Facility
RIF : Rhino Interim Facility
RFP : Rhino Food Plantation
BRS : Borneo Rhino Sanctuary

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 month of December 2018 has less rainfall days (21/31). The rainfall ranged from 1 - 47 mm per day. The total rainfall for December 2018 is 262 mm, with most rain occurring in the morning - afternoon.

The frequent rainfall is similar to November 2018 but December being cloudier. The amount of forage is abundant and lush with broader and healthier leaves throughout the month. The early morning forage for Iman were harvested from the RFP and RQF, while the rest were gathered from along the Tabin road and areas within KL Kepong plantations. A small amount was collected from Tradewinds plantation.

Additional marcots from the parent stock of *Ficus* plants, within the RFP and RQF were transplanted inside the BRS facility. The

seedlings from *Ficus minahassae* (Ara Ajinomoto) were collected from the wild and planted in the RFP and BRS.

Most of the road inside Tabin had numerous potholes as a result on the rainfall. These were filled up with gravels and sand mix.

The heavy rain exposes more of the “construction – waste”, inside the paddocks. These, which consisted of rusty metal parts and corrugated concrete were immediately removed. Mud wallows were drained if they become too watery and not suitable for the rhinos.

The bodyweights of both rhinos fluctuated in November – December 2018, but were within the normal limits. Iman maintained her normal weight of ≥ 520 kg, after a sharp decline to 480 kg in September 2018. This was partially due to inability to ingest more forage as a result of the leiomyoma putting pressure on her colon and small intestines.

Generally, the health issues with the two rhinos were associated traumatic injuries, including abrasions and lacerations to the feet and foot pads. The causative agents are metal waste (sometimes rusty) and corrugated cement blocks left over by the previous irresponsible contractors (Plate 1).



Plate 1. Rocks and concrete slabs collected from the paddocks. Inset: Rusty metal rods found in the paddocks

On the 2 December 2018, the entire right hind leg was swollen and partial luxation of the pelvic joint was also observed.

Subsequent scoliosis was apparent. It was suspected that this was caused by an ascending infection from the infected lacerations on the right hind feet. A large abscess was seen between the pelvic joint and tuber coxae of the pelvic girdle.

The open pyometra still persist but without the presence of blood. This is constantly monitored, especially inside the mud wallow or after defecation. Currently, no treatment was initiated.

1.2 Body Weight

All weighing was done using TruTest® electronic weighing scale. Kretam was weighed in the middle and at the end of the month. Iman was weighed once a week to allow close monitoring of her body condition. Iman's average weight is currently 518 kg but gradually increasing. Kretam averaged 658 kg (Figure 1).

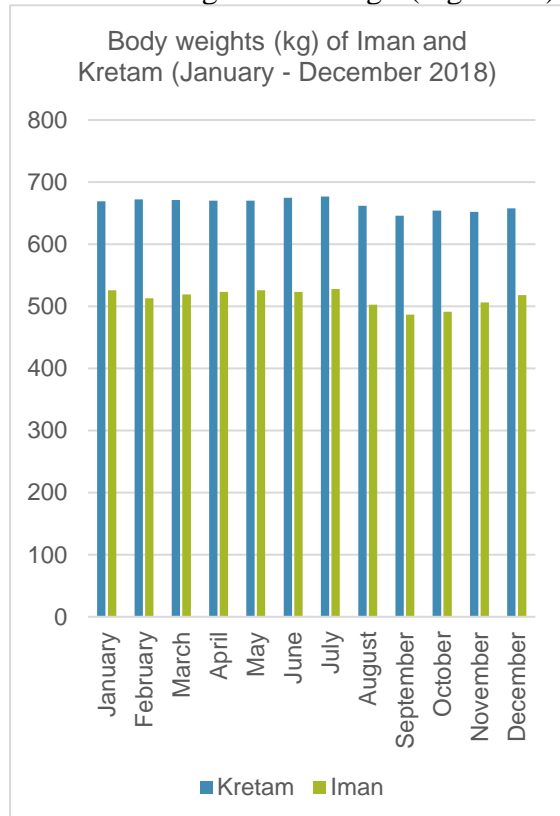


Figure 1. The fluctuations in body weight of the two rhinos in Tabin for 2018

The fluctuations in Kretam's body weight is due to increase in activities in the paddock

and occasionally, not coming back for either morning or evening feedings.

Iman's body weight dropped significantly in September 2018 as a result of reduced voluntary feed intake. This was associated with pain from the leiomyomata in addition to the malabsorption. She was supplemented with 3.0 kg concentrates and fish oil daily.

Her weight was lowest at 480 kg on 14th October 2018. In November 2018, her weight increased to 510 kg before averaging 518 kg in December 2018 (Figure 2).

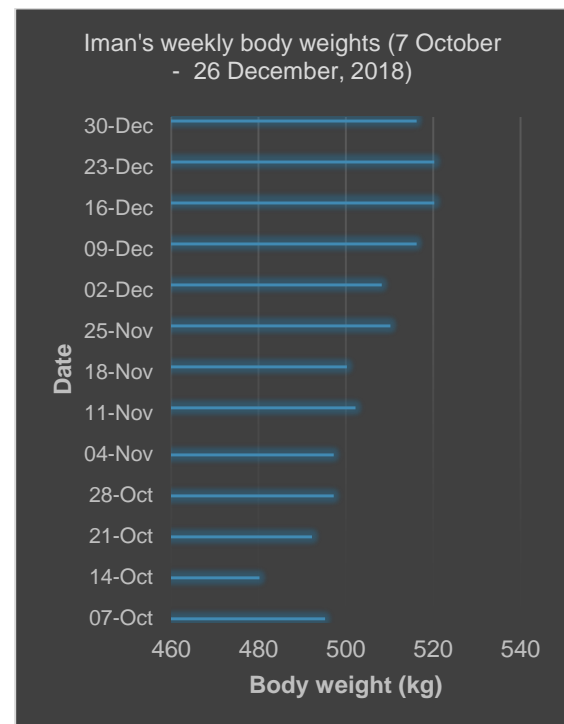


Figure 2. Iman's bodyweight showing the gradual increase in October to December 2018

2. Animal Health

The body scores of Kretam was maintained at around 2.5 and Iman at 2.0 (modified from Body Condition Scoring for Horses, Henneke et al., 1981). However, of late, Iman's body condition had improved, especially after the drastic change in her diet.

Kretam's clinical problem are associated with lacerations and chipping of some hooves. In addition, the uneven growth of the posterior horns caused several craters in the middle.

Iman's problem of losing body weight has been resolved with a change in diet and activity. The existing open pyometra presents a chronic clinical manifestation but has not worsen. Bleeding from the leiomyomata has not been observed in the vaginal discharge.

The most worrying issues are injuries (puncture wounds) from sharp metal pieces in the paddocks that could lead to septicaemia and death. The problem is too massive and almost impossible to resolve despite constant searching and monitoring.

The routine monthly sampling for health and environmental checks were carried out for both rhinos and their surroundings on the 18th November 2018 (Tuesday) and submitted to the Veterinary Diagnostic Laboratory, JPHPT and Public Health Laboratory in Kepyayan, Kota Kinabalu on the 19th, before noon.

The samples included soil, mud from wallows, water, floor swabs, horse pellets (Gold Coin®), feces, urine and blood. All these samples except blood, were analyzed for bacterial contamination, particularly *E.coli*, *Salmonella sp* and *Bukholderia pseudomalleie*.

2.1 *Kretam*

a. Deformity of posterior horn

The indented surface of the posterior horn trapped more water and mud which soften the horn matrix. The cavities formed becomes larger with time. These were treated in the past for fungal infection.

Closure of the cavities were done previously using black silicon and more recently, using wood filler. However, due to the wet condition, the sealant did not dry or

cure correctly and came off. Another attempt would be carried out to fill the cavities (Plate 2).



Plate 2. The cavities inside the posterior horn (a) and the wood filler packed inside the cavities (b)

The last alternative would be to grind the posterior horn and refill all the cavities with suitable epoxy or silicon filler.

b. Lacerations

The laceration caused by the waste materials (nails, screws, sardine cans, iron rods, cut pipes and corrugated cement blocks and bricks) left inside the paddocks from the previous contractors is a recurring problem faced by the rhino. The deep cuts caused lameness and could potentially get infected and become septicaemic.

A 3.0 cm laceration was again observed on the foot pad, posterior to the digit 3 of his right hind feet. This is the fifth laceration for Kretam, since he was moved to the

BRS. This wound was caused by an old rusty metal can (Plate 3)



Plate 3. The deep laceration on Kretam's hind – feet

The daily treatment consisted of cleaning the wound and application of povidone (Septidine®) twice daily, before his meals. Subsequently, the excess skin was cut and removed to allow for proper healing. Systemic antibiotic was not administered. However, he would be given the tetanus toxoid (TT Vaccine, PT Bio Farma) on 3 January 2019.

c. Excessive wear of hoof

This condition was observed in December 2018, on the digit 2 of the right and left front feet. This was caused by excessive scrapping on the hard and rocky ground, inside the wallow (Plate 4).



Plate 4. Keeper locating the large rocks inside the wallow

The digit 2 shows excessive wear and thinning (corrugated edges) at the toe. Numerous vertical fine lines (scratches) could be seen on the surface of the wall. Three to four horizontal lines could be seen ventral to the coronary band, depicting sub – clinical laminitis due to mechanical imbalance (Plate 5).



Plate 5. The digit 2 of the right and left forelimb showing the excessive wear and thinning at the edges (arrow). Inset: the horizontal laminations

2.2 Iman

a. Lacerations

Iman had several deep lacerations and punctures on her feet caused by nails, metal pieces and corrugated bricks. However, all recovered after the wounds were washed, cleaned and disinfected.

The recent injuries in November 2018, caused an ascending infection and lameness. The swelling also caused oedema to other adjacent parts of the affected leg and did not respond to common treatment.

On the 2 December 2018, she was re – examined and an assessment made on her prognosis. A radiograph and thermal

imaging were taken of her right hind limb and perineum. The right hind leg was adducted and the inguinal region was inflamed. The right iliac crest was lower than the left. She was treated with 11.0 mls Ceftiofur hydrochloride 5% (Excede®, Zoetis at 2.2 mg/kg/day) intramuscularly, for three days. Phenylbutazone granules (Butalone®) were given orally at 4.4 mg/kg, twice daily for 7 days. One ml purified tetanus toxoid (10 Lf/0.5 ml, TT vaccine, PT Bio Pharma) was administered intramuscularly.

Her condition improved but relapsed on the 9th December 2018. The entire right hind leg was edematous. The pelvic joint was partially or completely luxated. Scoliosis was also observed. Her gait was badly affected and she had difficulty in walking, partially dragging her right hind feet. She was also experiencing pain and not putting much weight on the affected feet. The edema extended to her abdomen and her mammary glands (Plate 6).

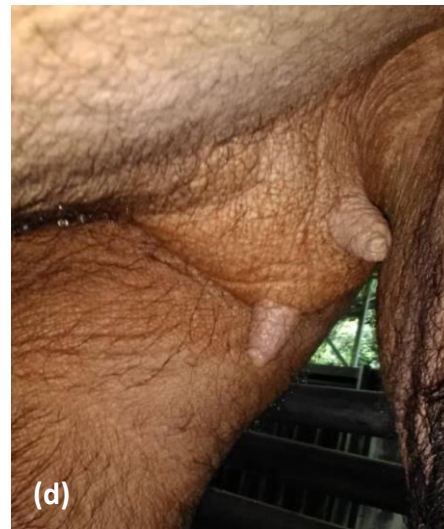


Plate 6. (a) Swelling of the entire right hind leg causing a partial luxation and scoliosis. The entire hip droops down, (b) the edema of the abdomen extended anteriorly (c) swelling at the folds around the knee (d)

swollen and engorged mammary gland and (e) the swelling at the hock

However, on the 16th December 2018, the area posterior to the pelvic fold (between tuber coxae and the pelvic joint) showed redness and swelling. Progressively, the swelling increased in size and was painful to touch. Subsequently, the abscess was lanced and drained (Plate 7).

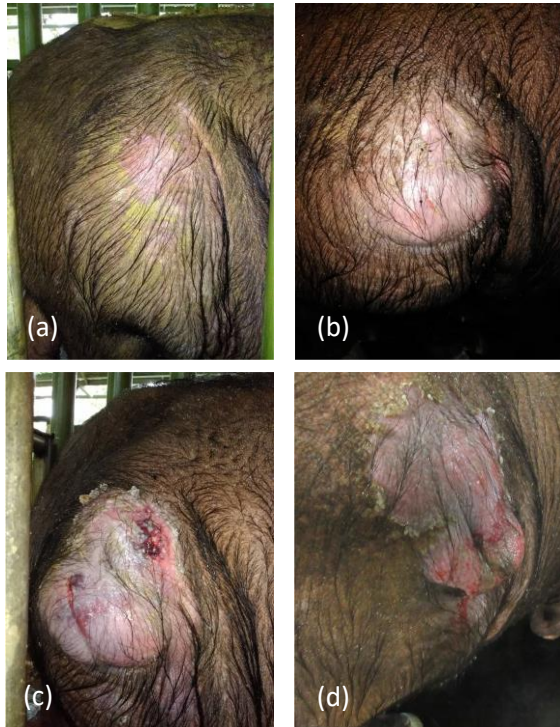


Plate 7. Progressive increase in size of abscess (a – c) and drained abscess (d)

Two liters of pus was drained from the abscess, which consisted of 3 – 4 pockets. The thick yellowish white abscess was drained into a pail. Sample was also taken for bacteriology analysis and sensitivity testing (Plate 8).



Plate 8. The yellowish abscess

The abscess was flushed with a solution mixture of 200 mls povidone (Septidine®), Hydrogen peroxide 6% (50 mls) and 500 mls of 0.9% Sodium Chloride. This was done twice a day and reduced to once daily. After each cleaning, povidone was flushed into the abscess.

20 mls of Ceftiofur crystalline free acid (10% solution, Excede, Zoetis®) was administered intramuscularly, once daily for four days. A week after regular treatment and antibiotics, the open wound showed excellent signs of healing and granulation (Plate 9).



Plate 9. The ceftiofur antibiotic (left) and the abscess – open wound after a week

b. Weight loss - wasting disease

Iman was enclosed into a smaller paddock (concrete wall) to try and get her to consumed more hand – fed browse by ensuring her to come back twice daily. In addition, more browse was hung up inside the night – stall for her to feed at night. Placement of her feces in the night – stall enticed her to come up to the night – stall to defecate, each day. One wallow was shut down as it was too deep for her to move in and out.

She was also given fresh browse collected on the same morning to get her to eat more. She was also supplemented with 3 kg concentrates (horse pellets) and fish oil each day.

Her body weights had showed a gradual increase from 510 kg in November 2018 to 520 kg in December 2018.

b. Reproductive tract pathologies

The vaginal discharge consisted of clear – whitish mucous, ranging from 20 – 50 mls. These were occasionally seen inside the wallow as she lies on her sternal. There were no signs of blood in her discharge.

Ultrasonography was carried out once in December 2018 due to her injuries and the efforts to encourage her to feed. There were no follicles in both ovaries. Fluids were present in her uterus and cervix.

3. Feed and feeding

A large variety of browse are available end of each year, mainly due to the wet season and rapid growth of saplings and trimmed branches. Early morning collection were made from the RFP an RQF, specifically to feed Iman. These include the Ara Ajinomoto (*F. minahassae*), Bnuang (*Octomeles sumatrana*), Ara manga (*F. annulata*), Gatal Piring (*F. aurata*), Maitap (*Neonauclea spp*) and Pulai (*Alstonia specilata*). Nangka air (*F. lepicarpa*) and Bendera halus (*F. uncinata*). Subsequent collection along Tabin road and within KL – Kepong were gathered for evening feedings and for the next morning.

The rhinos were also fed fruits including banana (few varieties), papaya, jack fruit, mango (few varieties) and pumpkins. prior to the foliage. This is to avoid pieces of the soft fruits to lodge in between the teeth and causing decay and other dental problems. For the time being, Iman was given fruits during treatment of her abscess and not before.

3.1 Forages

The total amount collected for December 2018 for the two rhinos is 3678 kilograms. Of this 54% (2009.5 kg), was allocated for Kretam and 45% was fed to Iman. The total

amount of browse collected was higher than in November 2018 (3598 kg). Of the total, an average of 35% was hung out for the rhinos to eat (Figure 3).

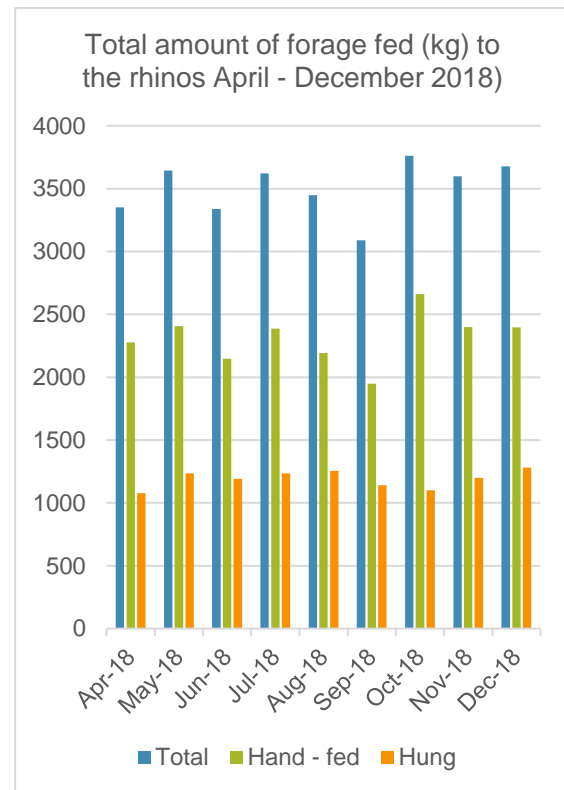


Figure 3. The total amount of forage collected and fed to the rhinos

The total amount consumed by both rhinos are 1922 kg or 52.3%. Of this amount, 61.2% was eaten by Kretam and 41.2% by Iman.

3.2 Voluntary Feed Intake (VFI)

The feed intake (hand – fed) of Iman and Kretam were maintained to a daily minimum of about 22 and 36 kg respectively. In December 2018, Iman did not come back for seven feedings, while Kretam was only absent for three morning feeds.

Iman was fed 9.5 – 23.5 kilograms of foliage per day, consisting an average of 15 species (7 – 23 species) of plants, mostly figs. Her appetite remains average and feed intake, varies. Iman only consumed an average of 3.9 kg/day (1 – 9 kg) of the

foliage hung out for her in December 2018. Her total feed intake is 692.5 kg, an increase of 76 kg as compared to the previous month.

Kretam consumed 1229.5 kg of forage in December 2018. Of this, 167 kg represented the forage that was hung out at night and consumed (Figure 4).

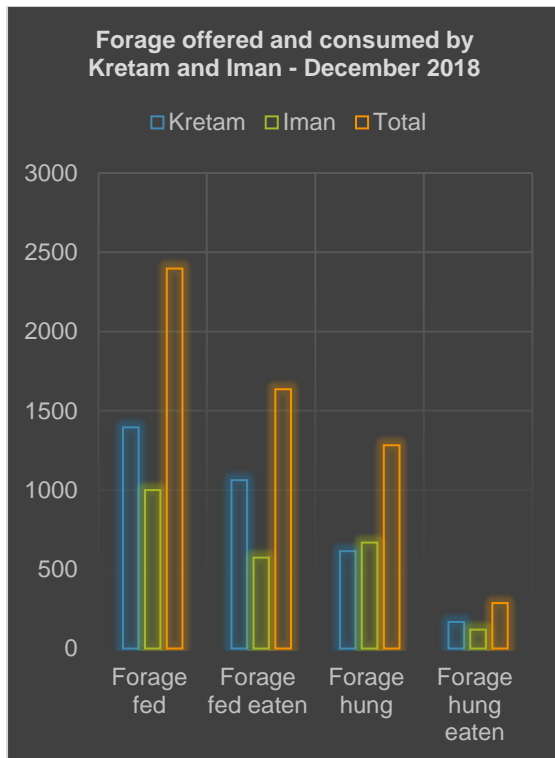


Figure 4. The total amount of forage fed and eaten by the two rhinos

Fruits constitute about 15% % of the total diet of the two rhinos. Most fruits are available throughout the year (*Musa acuminata*, *Carica papaya*, *Mangifera indica* and *Artocarpus heterophyllus*) and a few are seasonal (*Artocarpus integer*, *Mangifera foetida*). Half of the fruits were fed in the morning and the remaining in the afternoon or evening. The most widely consumed fruits are bananas and mangoes.

Horse pellets (Gold Coin ®) were given as supplements. Kretam receives 31 kg and Iman gets 80 kg in December 2018. 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.

4. Biosecurity/health monitoring

The most important part of the biosecurity in BRS is the search and removal of construction waste materials (metal and corrugated cement) from the paddocks. This is to avert the problem faced by Iman recently.

In addition, samples from the drinking water and from various water tanks were checked for pathogens. Soil samples, floor swabs, water samples from water tanks, urine and feces from the rhinos were also analyzed for pathogens. The water from five tanks were tested for total coliform counts and presence of *E.coli* as some of these tanks were for human consumption.

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 (December 2018)

Parameters	Animal (Kretam)	Animal (Kretam)
	18 Nov	19 Dec
Hemoparasites	Nil	Nil
RBC (X10 ¹² /L)	4.3	3.98
WBC (1000/UL)	11.8	11.2
Hb (G/DL)	NE	NE
PCV (%)	42	40
Seg. Neutrophils (%)	31	67
Eosinophils (%)	41	23
Lymphocytes (%)	16	8
Monocytes (%)	12	1
Basophils (%)	0	1
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, except for the low RBC counts.

4.2 Bacteriology

Floor swabs 1, 2, 4, and 10 were positive for *Staphylococcus sp.* Swabs 3, 5, 7, 8, 9, 11, 12, 13, 14, 17, 18, 19 and 20 were positive for *Bacillus spp.* Swabs 6 is positive for *Proteus sp.* Swab 15, 16, 21 and 22 were positive for *Bacillus sp* and *Staphylococcus sp.*

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

Aeromonas hydrophilia/caviae was isolated from the tyre bath. Water from the sumps were positive for *Kocuria rosea.*

The water samples taken from the five tanks were not sampled for coliform counts. The samples from Iman's abscess yielded Beta Hemolytic *Streptococcus* and *Enterobacter spp.* Antibiotic sensitivity indicated Augmentin, Cephalexin, Cefuroxime were the drug of choice (Table 2).

Table 2. Iman's microbiology report from Pathology and Clinical Lab (M)

MICROBIOLOGY REPORT

SOURCE: RIGHT GLUTEAL (ABSCESS)

CULTURE	SOURCE: ABSCESS	
	RIGHT GLUTEAL	
	BETA HAEMOLYTIC STREPTOCOCCI	
	HEAVY GROWTH	
ANTIBIOTIC NAME		SENSITIVITY
AMOXICILLIN		I
AUGMENTIN		S
CEFOPERAZONE		S
CEPHALEXIN		S
CEFUROXIME		S
ERYTHROMYCIN		S
ENROFLOXACIN		I
PENICILLIN		I
ENTEROBACTER SPP.		
	HEAVY GROWTH	
ANTIBIOTIC NAME		SENSITIVITY
AMPICILLIN		R
AUGMENTIN		R
CEFUROXIME		R
ENROFLOXACIN		S
GENTAMICIN		S
OPFLOXACIN		S
UNASYN		R
SEPTRIN		S

(S=SENSITIVE; I=INTERMEDIATE; R=RESISTANT)

4.3 Parasitology

The fecal samples from both rhinos were negative for endoparasites and parasitic egg count. Both rhinos were dewormed on the 20th December 2018 as a routine practice. A Praziquantal (140.3 mg) and Ivermectine (18.7 mg) base dewormer (Ashiver Plus®)

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 and foot – bath was monitored and maintained with proper disinfectants and concentration.