

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

**July 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. Introduction**

July 2017, only recorded nine rain – days (29%) and 162 mm of rain. Although the rain – days is lower than June 2017, the total rainfall is higher. This could be seen by the more intense and longer rainfall in July 2017. The driest month is June 2017 (141 mm) with an average of 10mm per rain – day, followed by July (18 mm/ rain – day). There is a sharp decline in rainfall in June – July 2017, also reflected by the average rainfall per rain – day (Figure 1).

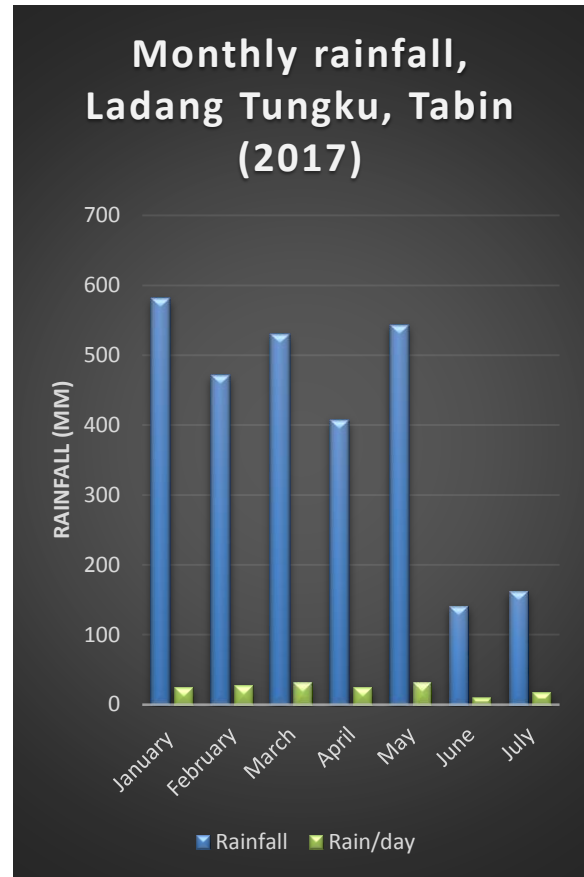


Figure 1. Monthly rainfall data (January – July 2017)

All the rainfall were recorded in the afternoon, between 1300 – 1800H, with one recorded at night at 2030H (Ladang Tungku, KL – Kepong, Rainfall Data May 2017).

The month of July 2017 coincides with the visit by a few herds of elephants. The main problem is always associated with the damage or displacements of the gravity water pipes between the intake point and the water tanks adjacent to Tabin road. The heavy downpours also caused problems to the intake point inside the Lipad river tributary (Plate 1 and 2).



Plate 1. Rasaman inspecting a pipeline damaged by the elephants. Note the elephant feces



Plate 2. Rasaman (BORA) and Justine (SWD) making adjustments to the intake point

## 2. Husbandry

### 2.1 Animal Management

Despite the slight fluctuations, Kretam and Iman had body scores of 3.0. Both has excellent appetite throughout the month with exceptions prior and during the semen collection and ovum pick up (OPU) procedures on the 14<sup>th</sup> July 2017. Both the rhinos were fed a small amount of food 12 hours before the anesthesia. Iman would resumed normal feeding after recovery from anesthesia. In contrast, Kretam would

require a few days to resume normal feeding behavior (Plate 3).



Plate 3. Kretam recovering from anesthesia after the electro ejaculation

In July, Kretam did not come back on three occasions (once in the morning and twice in the evening) while Iman, did not return for feeding on two occasions in the morning.

Iman will be dewormed in August 2017 followed by Kretam in September 2017. To date the dewormer that is being used is ivermectin (Jaamectin®).

There was no vaginal discharge observed from Iman. However, it is expected to occur in the month of August 2017. The last vaccination was given on the 21<sup>st</sup> April 2017.

### 2.2 Body Weight

Weighing was carried out twice a month, inside the chute using an electronic weighing scale (TruTest®). Kretam's average weight for July 2017 is 655 kg while Iman weighs 551kg. The slight fluctuations during the months are usually due to manipulative procedures (electro ejaculation or ovum pick up), weighing time (morning, afternoon) and mud cakes on the body. The overall body weights for 2017 is within normal range (Figure 2).

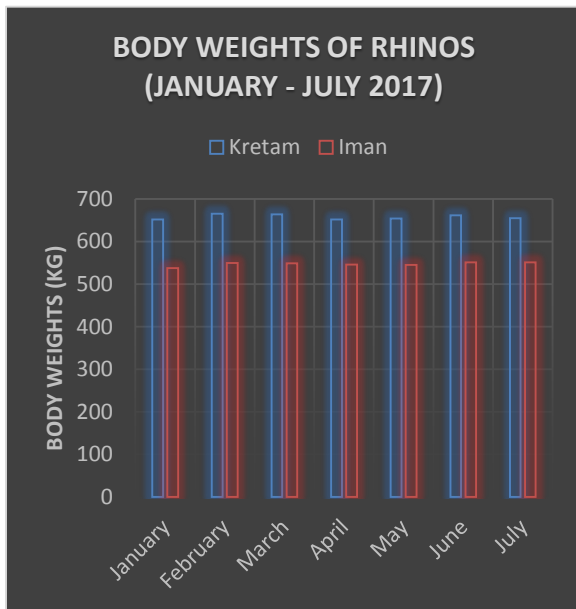


Figure 2. Bodyweights of Kretam (male) and Puntung (female) from January – July 2017

### 2.3 Animal Health

Both the rhinos displayed good body condition and weights. However, it was observed that Kretam's behavior, particularly his libido had dropped significantly. The usual erections and mounting of log or termite mound was not observed despite the supplementations with Selenium, Vitamin E. The most likely reason is the absence of stimulus from Puntung (1 – 2 times a month during estrus).

The routine sampling (soil samples, swabs, blood, urine, feces and water samples) was done on the 16<sup>th</sup> July and analysis at the Kepayan Veterinary Diagnostic laboratory was usually carried out the following day.

Both rhinoceros were anesthetized on the 14<sup>th</sup> July for semen collection and oocytes aspirations. The electro ejaculation was carried out in Kretam followed by the ovum pick up in Iman, about two hours later.

#### 2.3.1 Kretam

##### a. Fungal infection of posterior horn

The lesion at the posterior horn has not got more serious but the respond to the antifungal Terbinafine (Lamisil®) is not very encouraging. Povidone (Septidine®) would be used to replace the current medication.

##### b. Dental callus

Kretam's teeth, particularly his upper molars and premolars were checked for dental callus. His previous check on 20<sup>th</sup> April 2017 showed moderate to severe callus deposits on his upper premolars. Some were removed due to minimal tools. Similar examinations were done on the 14<sup>th</sup> July 2017 and thorough examination and treatment was done. A scrapper was used to remove most of the callus. The gums was intermittently flushed with Hexarinse® (Plate 4).



Plate 4. Flushing the debris from some of the callus which was removed from the upper premolars

Such dental checks would be one of the routine procedures that will be carried out during immobilization of the rhinos.

### 2.3.2. Iman

#### a. Dental callus

After the OPU, Iman's teeth were also examined for callus and other dental problems. The overall condition of her teeth was good with little callus formation on the lower cheek teeth (Plate 5).



Plate 5. The condition of the upper cheek teeth

#### b. Reproductive tract pathology

There were no discharge observed in July 2017. Her due date for the vaccine (Improvac®) is on the 21<sup>st</sup> September 2017. Normally this is represented by increased frequency of discharge.

The pathology were observed from the ultrasonographic examinations conducted on her regularly. These included numerous hypoechoic, leiomyomas, of varying sizes but mostly rounded with dense structures or anechoic strands inside them. The cysts were multi and unilocular with varying sizes and shapes. Fluids were also seen in the uterus as homogenous and hypoechoic. This is easily distinguished with the echoic fluids inside the surrounding cysts. This could be seen in the uterine body (Plate 6).



Plate 6. The uterine body (UT) with cysts and the hypoechoic cervix (CE)

Similarly the annular folds of the cervix were not clearly defined and more likely due to the presence of mucous discharge. The hydrosalpinx is clearly visible in the right oviduct.

### 3. Feed and feeding

The browse for the rhinos were still available during the dry month of June and July 2017. Some were collected from the RFP, especially the jackfruit leaves (*Artocarpus heterophyllus*), and Gatal berbulu (*Ficus francisi*). The common species included Putih Sebelah (*Leucosyke capitellata*), Maitap (*Neonauclea*), Nangka (*Artocarpus heterophyllus*), Sadaman (*Macaranga spp*), Merimia Binuang (*Octomeles sumatrana*) and Ludai (*Balakata baccatum*).

The total amount of browse collected for Kretam and Iman in July 2017 is 3715.5 kilograms. Of this, about 2/3 (2655.5 kg) are hand fed to the rhinos and the rest are hung out (1060 kg) for the rhinos to feed at night (Figure 3).

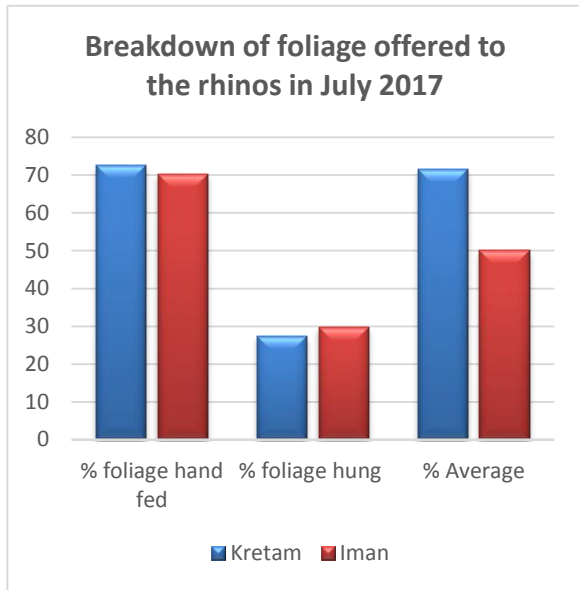


Figure 3. Foliage (%) that are hand fed and hung out for the rhinos in July 2017

**3.1 Voluntary Feed Intake (VFI)**

The foliage eaten by Kretam in July 2017 were 1206 kg. Iman consumed 1056.5 kg in the same month. Of these, the amount that is hand fed to Kretam and Iman are 73% and 70% respectively (Figure 4).

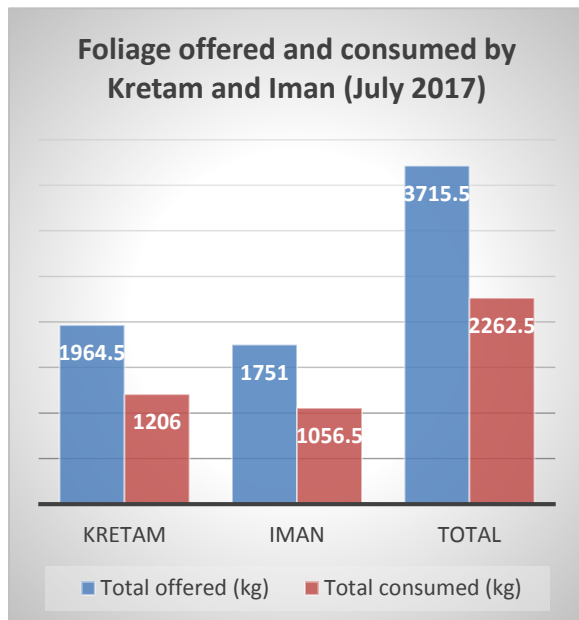


Figure 4. Amount of foliage offered and eaten by the rhinos in Tabin

The amount of foliage uneaten by the rhinos totaled 782.5 kg. The minimum amount of browse eaten in a day by the two rhinos averaged 5.75 kg. This is normally associated with the general anesthesia and manipulative procedures. The maximum amount of foliage eaten by Kretam and Iman were 45.5 kg and 32.5 kg respectively (Figure 5).

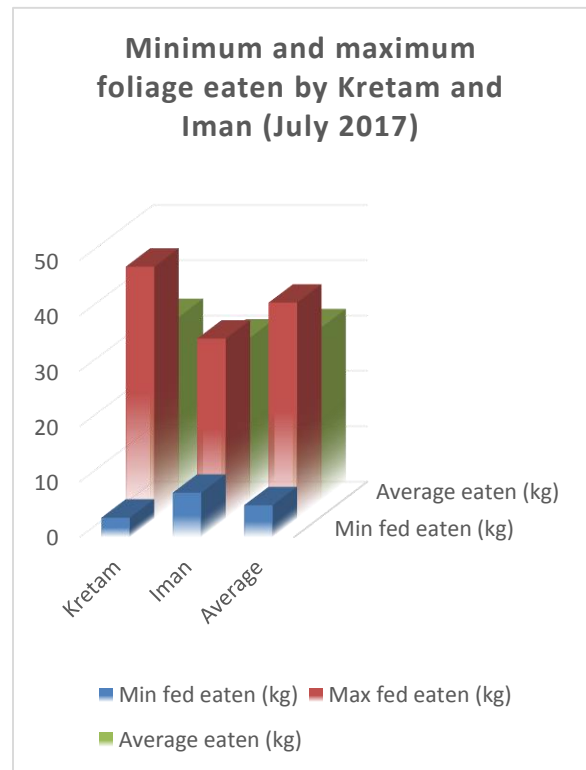


Figure 5. The minimum, maximum and average amount of browse consumed

The number of browse species collected daily ranged 11 – 12. The quality of foliage obtained daily were routinely checked to ensure they are fresh and palatable. These were subsequently pruned, cleaned, weighed and segregated for the rhino’s feeding time. Some were stocked in the feed store for the following morning (Plate 7).



Plate 7. Ronald weighing the foliage prior to feeding Iman

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 144 kg and 150 kg of banana respectively in July 2017. The amount of pumpkins fed ranged from 0.5 – 1.0 kg per day. The skin were removed before feeding them to the rhinos.

### 3.2 Rhino Food Plantation (RFP)

The low rainfall in June and July 2017, did not have any adverse effect on the rhino food plants nor the water supply. Almost 100 of the Nangka saplings kept in the nursery were planted inside the plantation.

In addition, about 200 saplings, including *Ficus deltoidea* and *F. francisi* were marcotted and some were planted in the plantation. The former plant species (Mas Cotek) is considered a Grade 1 category and favored by both rhinoceros (Plate 8).



Plate 8. Mas Cotek in polybags ready to be planted in RFP

Two lorry loads of empty fruit bunches (EFB) were obtained from KL - Kepong plantation and used as a source of fertilizer for the plants (Plate 9).



Plate 9. Davidson arranging the EFB around the plants

#### 4. Biosecurity and health monitoring

Various samples including water, soil and swabs were collected on the 16<sup>th</sup> July 2017 (Sunday) and submitted to the Veterinary Diagnostic Laboratory and the Veterinary Public Health Laboratory, in Kepayan, Kota Kinablu the following day. The samples would normally arrive before 1.00 pm. Most of the samples were sent 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 from the rhinos included blood, fresh urine and feces. The fecal samples were mainly for parasitological evaluation.

##### 4.1. Hematology

Blood were not collected from the rhinos as they were both recovering from the recent invasive procedures – electro ejaculation and ovum pick – up.

##### 4.2 Bacteriology

Of the 20 floor swabs from the night stalls, swabs 1 – 5, 7 – 17, 19 – 20 had few *Bacillus sp.* Swab 6 had abundance *Proteus sp* while swab 18 had few *Staphylococcus sp* and *Bacillus sp.* The two tyre baths had no bacterial growth.

The 17 soil samples taken in areas surrounding and inside the rhino enclosures were negative for *Bukholderia pseudomallei*. Similarly, the wallows were negative for pathogens.

There were no pathogens isolated from the feces and urine of the rhinos. However, Iman had high *E.coli* count in her feces and low counts in her urine samples.

The horse pellets (Gold Coin®) had a total coliform count of 10 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 tanks. Petrifilm method was used to analyze the samples. The results from the 13 tanks indicated a total bacterial counts of 10 – 3200 cfu/ml.

The highest counts were in tanks 4, 10 and 11 which were located at RIF and RQF. Similarly, the tanks 10 and 11 had high total coliform counts. *E.coli* counts was highest (440 cfu/ml) in Tank 10, with the other tanks having a range of 10 – 80 cfu/ml. Three tanks were negative for *E.coli*.

There were no *Salmonella sp* isolated from the water samples. The coliform counts were negative in eight tanks. (Table 1).

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

| Tank | Total bacteria | Total coliform | <i>E.coli</i> |
|------|----------------|----------------|---------------|
| 1    | 200            | 30             | 10            |
| 2    | 70             | 100            | 0             |
| 3    | 50             | 470            | 40            |
| 4    | 2390           | 80             | 20            |
| 5    | 300            | 450            | 10            |
| 6    | 80             | 580            | 10            |
| 7    | 30             | 0              | 0             |
| 8    | 10             | 0              | 0             |
| 9    | 20             | 170            | 10            |
| 10   | 3200           | 3000           | 440           |
| 11   | 2000           | 1770           | 60            |
| 12   | 200            | 790            | 40            |
| 13   | 300            | 1280           | 80            |

The monthly fluctuations in bacterial and *E.coli* counts were mainly due to the water source and passages through the main 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

Iman was scanned routinely and prior to the procedures for the OPU, which was on the 14<sup>th</sup> July 2017.

Without Puntung, Kretam exhibited less breeding behavioral patterns, particularly at the fence between them. Daily stimulation would be done using feces from Iman, placed inside Puntung's enclosure, adjacent to Kretam's paddock.

### 5.1 Ultrasonography

#### 5.1.1 Iman

Iman showed ovarian activity despite the treatment with Improvac. The last vaccination (subcutaneous) was done on the 20<sup>th</sup> April 2017. With Iman, the Improvac vaccine had to be given at four months interval for it to be effective.

Examination on the 4<sup>th</sup> July 2017, showed two large follicles, adjacent to each other on the left ovary. They measured about 1.8 cm diameter. A one 0.8 cm round follicle was also seen on the right ovary (Plate 10).



Plate 10. The left ovary (top) and the right ovary (bottom) showing the follicles.

It was also observed that the right ovary was more vascularised as compared to the left (Plate 11).

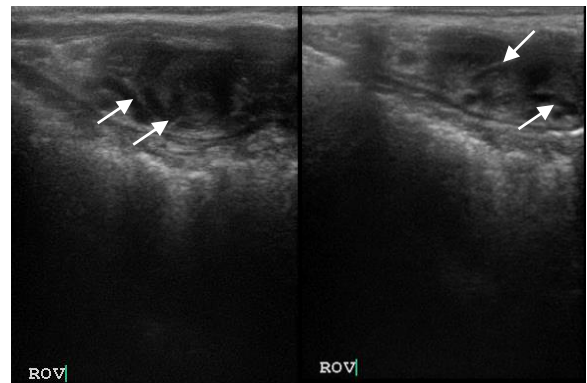


Plate 11. The blood vessels (anechoic streaks) observed on the right ovary of Iman (arrows). This is very likely related to the OPU procedures.



Three follicles were also detected during an ultrasound examination on the 10<sup>th</sup> July 2017. Right ovary had a 0.77 cm diameter follicle. The left ovary presented with two follicles, a 0.6 cm diameter and 2.2 cm (Plate 12).



Plate 12. The left ovary (above) and the right ovary (below) showing the three follicles

## 5.2 Behavioral estrus

Kretam did not display breeding behavior inside his paddock due to the absence of the stimulus from Puntung. A time motion study is being carried out to determine the effect of placing Iman's feces inside Puntung's enclosure adjacent to kretam's fence.

## 6. Electric fencing

The high voltage on the fence is important in keeping the elephants and macaques out of the enclosures and the Rhino Food Plantation. Maintenance of the electric fence is done daily. This includes weeding and cleaning of the fence of fallen twigs etc.

The range of voltage for the fences were 8.8 – 9.6 kV, 8.7 – 9.3 kV and 8.7 – 8.9 kV for the RIF, RQF and RFP respectively.

## 7. Other issues/activities

### 7.1 Borneo Rhino Sanctuary (BRS), Tabin updates

With reference to the official letter from Syarikat Pengarah Enterprise (Roger Lee) to Konsultant Kumpulan (MT) Sdn. Bhd, dated 10<sup>th</sup> July 2017. Work on cleaning up the inside and outside of the BRS rhino enclosures would commence on the 11<sup>th</sup> July 2017. The removal of weeds, creepers and fallen trees were done throughout the enclosures and fence (Plate 13).



Plate 13. The weeded and cleaned path along the outside of the fence

However, the “sisa pembinaan” (construction waste) could still be found in large numbers inside and outside the enclosures. Most are potentially hazardous to the rhinos and the rhino keepers working in the enclosures. Below are the pictures (to indicate the incompetency of the contractor and the consultants responsible. My advice is not to move the rhinos until those issues have been addressed.



Plate 14. The uncovered one – meter deep holes next to the concrete post. Danger to the keepers and rhinos



Plate 15. A 1.5 inch polypipe stuck in the ground inside the paddock and can't be removed manually.



Plate 16. Numerous pieces of bricks and concrete slabs were strewn all over the enclosure. These have sharp edges and would cause laceration on the soft feet of the rhinos



Plate 17. A part of the concrete posts partly embedded in the ground inside the paddock. The sharp hard edges are potential to the rhinos



Plate 18. The concrete based next to the wall are sharp and difficult to be removed. Need to be hacked. Note the rusty metal piece from the wall which was only visible after weeding



Plate 19. The nails jutting out from the concrete wall



Plate 20. Plastic wraps, industrial grade were found inside the paddock



Plate 21. The most common finding in the paddocks at BRS (plastic bottles)



Plate 22. The amount of wooden planks, mostly with rusty nails were numerous. This would easily kill a rhino if it punctures the soft foot pad. These were found inside the paddocks amidst the shrubs and weeds. If the contractors were search thoroughly, it would be found.



Plate 23. A 2 inch galvanized iron pipe (12 – 18 feet) embedded in the ground (arrow) inside the paddock. We cannot lift it up manually



Plate 24. Plastic bottles with plant seedlings are found in large numbers in the paddock



Plate 25. Galvanized or high tensile wires were found inside the paddock. A clear case of negligence. The sharp ends with piece through the feet of the rhinos



Plate 26. Hardened cement bag in the paddock



Plate 27. The concrete waste outside the paddocks consisted of cement slabs, pieces of culvert, metal rods, concrete posts and wires. A very bad image to the Tabin Wildlife Reserve and an embarrassment to the tourism industry.

Just to note that these findings were done as a check to the “clean – up” by the contracted staff from **Syarikat Pengarah Enterprise (Roger Lee) and monitored by Konsultant Kumpulan (MT) Sdn. Bhd.** Unfortunately, the work carried out were below satisfaction.

## 7.2 Electro ejaculation, ultrasonography and health evaluation of captive Malayan sunbears (*Helarctos malayanus*) in Sepilok, Sabah (11<sup>th</sup> – 13<sup>th</sup> July 2017)

The training course was conducted by the team from the Institute for Zoo and Wildlife Research (IZW). A total of 10 participants attended the short course. Five sunbears (4.1) were anesthetized using a combination of Medetomidine, Ketamine and Butorphanol administered via a blow – dart pistol. All sunbears were reversed using Atipamizole, given intravenously and in the muscles.

Once anesthetized, fecal materials were removed and the rectum flushed with an enema. The bears were subsequently shaved around locations adjacent to the kidneys, heart, liver, inguinal region and scrotum.

A thorough ultrasound evaluation of the various organ were conducted, included the reproductive organs. Males were subjected to electro ejaculation using a Seiger machine. The voltage ranged from 1 – 10 volts. Semen were collected and analysed for motility, concentration, live – dead ration and morphology. The semen were also extended for cryopreservation. Post thaw evaluation was carried out after 30 minutes. The preliminary conclusion was that the higher concentration of spermatozoa resulted in the best post thaw survivability.



Plate 28. Dr. Robert briefing the participants on the semen evaluation and freezing protocols for sunbears (top) while Dr. Goreitz explains the anesthetic protocol and loads the drugs into a dart (middle). The anesthetized sunbear is cleaned, flushed and shaved for the ultrasonography and electro ejaculation (bottom).



Plate 29. The sunbears were shaved adjacent to the areas to be scanned (top). Dr Goreitz inserts the electro ejaculator probe while Dr. Hilderbrandt prepares for collection (middle). The semen is being examined by Dr. Robert and the participants (bottom)

### 7.3 Electro ejaculation and ovum pick – up in Sumatran rhinoceros in Tabin (13<sup>th</sup> – 14<sup>th</sup> July 2017)

The procedure was conducted on the 14<sup>th</sup> July in Tabin. The same team from IZW was involved with help from BORA staff and veterinarians.

Kretam was anesthetized in the morning at 9.00 am for the electro ejaculation and followed by Iman, at 10.40 am for ovum pick – up. For both rhinos, the procedures took less than one hour each.



Plate 30. Kretam being anesthetized and placed on a mattress before electro ejaculation

A similar drug protocol was used comprising of Butorphanol, Ketamine, Detomidine and Midazolam. The rhinos were maintained with similar drugs in 500 ml NaCl via a drip line.



Plate 31. Getting ready for ovum pick – up process on Iman

The semen from Kretam was of low quality and did not survive the journey to Cremona Laboratory. Of the Two oocytes that were aspirated from two follicles, only one mature to metaphase II and ICSI performed. However, no cleavage was observed.

#### 7.4 11<sup>th</sup> Zoo and Wildlife Seminar/ Zoo Wildlife Veterinary Association of Thailand “Conservation through Collaboration”

The wildlife seminar was attended by BORA’s project manager and presented a keynote paper on “Lessons learned on conserving the Sumatran rhinoceros”. The seminar was held on the 20<sup>th</sup> – 21<sup>st</sup> July 2017. All expenses were paid for by the Zoo Parks Organization of Thailand.



Plate 32. The Zoo and Wildlife Seminar held in Pattaya, Thailand

Post seminar discussions included collaborative efforts on Advanced Reproductive Technology on wildlife species. The Zoological Park Organization voiced interest in providing training on the successful ART efforts in clouded leopard and the Elds deer in Thailand.

#### 7.5 9<sup>th</sup> Malaysian Association of Veterinary Pathology Scientific Conference “Veterinary Pathology and Nature”

The conference was held in Penang on the 27<sup>th</sup> - 30<sup>th</sup> July 2017. All expenses were covered by the MAVP. A plenary paper was also presented by the project manager at the conference, titled “Reproductive pathology and the conservation of the Sumatran rhinoceros”.



Plate 33. The paper presented at the conference



Plate 34. Group photo with some of the delegates at the conference



**7.6 Reports by Dr. Reza Tarmizi and Mr. Yap Keng Chee for July 2017**

The reports for July 2017 are attached for reference.