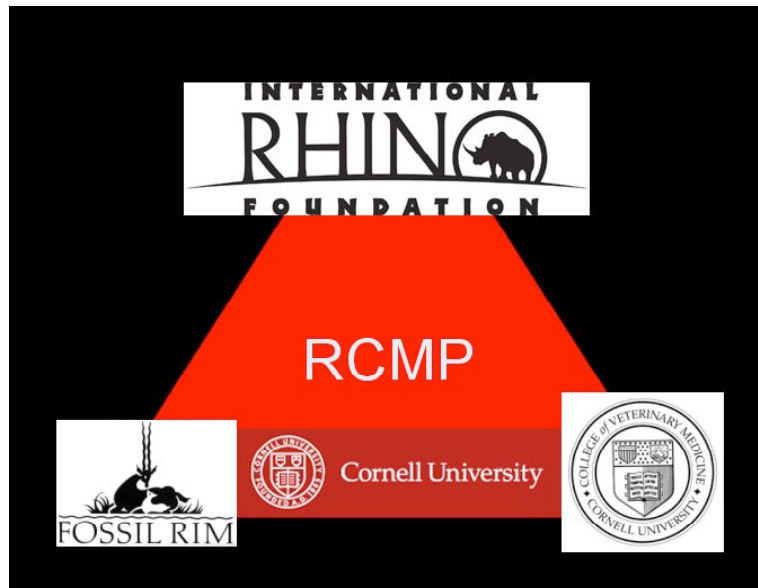


RCMP DECEMBER SRS TRIP REPORT

**Sumatran Rhino Sanctuary, Way Kambas National Park Indonesia
December 4 – 21, 2008**

*(Submitted by Robin W. Radcliffe, DVM, DACZM Rhino Conservation Medicine Scientist, IRF,
FRWC, CUCVM)*



Brief Summary of August-September 2008 RCMP Objectives: Indonesia and Malaysia

- Animal reproductive update
- Revised breeding management plan
- Animal health update
- Planning for Ujong Kulon Disease Survey
- Appendix

Sumatran Rhino Sanctuary Health Staff and Advisors:

Dr. Dedi Candra, SRS Animal Collections Manager
Pak Sumadi, SRS Facility Collections Manager
Dr. Andriansyah, SRS Veterinarian/Curator

Visiting Scientists, Students and Journalists:

Dr. Kurnia Khairani
Arief Rubiyanto
Pak Widodo Ramono
Beate Kittl (Swiss journalist)

INDONESIA
Species, subspecies
Dicerorhinus sumatrensis sumatrensis

I. REPRODUCTIVE HEALTH

SRS 6-MONTH BREEDING PLAN

Review of SRS Reproductive Monitoring Program

Based on input from various sources, it was decided that we should begin to use Andalas as the primary breeding male at the SRS. We will continue to mix experienced animals together for breeding purposes. Therefore, Andalas will be mixed with Ratu and Torgamba will be mixed with Rosa. Torgamba and Rosa will be mixed in a separate area to preclude possible competition in the central breeding area. Results of the CN Zoo testosterone assays were completed and it looks like Andalas has reached maturity. Torgamba also has good levels. We agreed upon the following SRS breeding plan for the next 6-month period:

- 1) **Andalas x Ratu in Center Breeding Area:** We will focus on using Andalas as primary breeding animal at the SRS. If a mating takes place, sperm collection and processing will be conducted as outlined by the CN Zoo protocol. Priority will be to mix Andalas with Ratu since she is an experienced breeder of presumed normal adult reproductive function.
- 2) **Torgamba x Rosa in New Breeding Area:** Although Andalas x Ratu will be the new priority we will not abandon attempts to breed Torgamba. If a mating takes place, sperm collection and processing will be conducted as outlined by the CN Zoo protocol. Rosa is a young and maturing inexperienced female and we believe that she may learn valuable courtship lessons by being mixed with Torgamba. The SRS team will carefully evaluate possible sites for building a second breeding area to alleviate concerns about male aggression and confusion.
- 3) **Males to be Managed for Breeding in SEPARATE Areas:** It was deemed critical that we no longer overlap use of both males in the center breeding area. The long periods that Andalas spends marking his territory, and even his aggression towards a female when introduced to the center area, may be related to perceived conflict (from persistent scent markings left by Torgamba?). *However, this management step will not be possible until facility limitations are addressed.*
- 4) **Ratu's new "Home Range" to include Central Area:** Since in the wild Sumatran rhino males presumably search out an estrous female for mating purposes, we feel it is important to allow Ratu to spend more time in the central breeding area between cycles. This would allow Ratu to better familiarize herself with the surroundings in a positive environment. A secondary benefit would be that her activities would serve to cover any persistent male scents left by Torgamba and also provide Andalas with an environment rich in sights and sounds of a normally cyclic female, which may more ideally mimic the natural situation.
- 5) **Give Andalas and Ratu more Time Together:** As part of managing Andalas and Ratu we will provide more time for the pair to interact. This will involve mixing the rhinos together on the day that a preovulatory follicle in Ratu measures ~20 mm in size. The plan will be to mix the animals in the early afternoon and continue the pairing all night and into the next morning. The situation will be monitored closely and animals kept together or separated based on best available behavioral and ultrasound information.
- 6) **SRS Staff Scheduling to Facilitate the Above:** In order to facilitate the above actions, the SRS management team will work with the keepers to ensure a fair system that allows appropriate time-off for overtime work.



Figure 1. Andalas scent marks his new breeding territory in the SRS central area.

Andalas Mixing with Ratu (December 7 and 8, 2008)

Ratu last mated with Torgamba on November 17. Twenty days later on December 7, Dr. Andri and conducted a routine ultrasound examination of Ratu which showed that she was apparently ready to mix with a male. The preovulatory follicle measured 23 mm (longest diameter) and was starting to change shape.

Given our discussions for a revised breeding plan we elected to use Andalas as the primary breeder. Ratu seemed very receptive to Andalas when the pair were introduced across the fence in the central area. Ratu initially moved away from Andalas and snorted, but within 10 minutes she had returned to face Andalas and they nudged through the fence. Next Ratu proceeded to turn her rear end toward Andalas, and we knew this was a good behavioral sign from the female. Ratu then laid down next to the fence immediately adjacent to Andalas. Andalas was very interested in Ratu and was moving back and forth intent on finding a way into the paddock with Ratu. We opened the gates and mixed the animals together. It took some time for Andalas to find Ratu, and each time he did so he began to chase the female. This continued intermittently for about 2 hours. There was little or no head to head pushing which we normally observe with Torgamba.

The rhinos were separated in the early evening for feeding. The next afternoon we mixed the rhinos again and this time allowed the pair to spend most of the afternoon and the entire night together in the central area. The animals continued to avoid each other and there was little or no direct interaction. Ratu evaded Andalas even as he searched to find her. The

next morning we conducted an ultrasound exam on Ratu and learned that the large preovulatory follicle on her left ovary had ovulated (in the absence of breeding). Given the size of the first follicle (23 mm) it is likely that we mixed the rhinos too late in Ratu's period of receptivity. Next time we will try again when the follicle is smaller.

Some things the SRS team has noted:

- We were surprised that the central area was big enough that the female can keep away from Andalas the entire time (I think this is good because it limits the aggression, but perhaps also a detriment because we want them to interact). Of course, when using Torgamba the pair DO eventually get together and mate.
- The difference we see with Torgamba and Andalas is that while Torgamba may initially chase the female, on subsequent encounters he walks slowly up to the female. The female usually does not run off and a more positive interaction occurs (head to head pushing and eventual mounting). This is the step that seems to be missing with Andalas - he will chase as soon as he sees the female and does not learn to walk up slowly to her. Perhaps by keeping the pair together longer we can overcome some of the novelty of the situation? We did notice that Andalas and Ratu seemed more comfortable (less chasing) after being together overnight.
- The heavy tree growth in the central area seems to be adding to the anxiety of the female. Ratu gets nervous when she cannot see the male, but seems more relaxed when she can keep track of his whereabouts. We talked about cutting down some of this growth to facilitate better visualization by both rhino and staff. The consensus from input of others is that this should not be an issue, therefore we will plan to leave the center area natural other than for routine sites that are kept open to facilitate staff observation and safety.

Torgamba Mixing with Rosa (December 13 and 14, 2008)

On December 13, 2008 we conducted a routine ultrasound on Rosa and observed a growing follicle that was nearing preovulatory size (19 mm). Based on the previous ultrasound record and positive behavioral signs from Rosa we mixed Rosa with Torgamba. Rosa held her tail high and winked her vulva as she stood before Torgamba at the gate. She then walked over to the center mound and held her tail up again. We mixed the two animals and Torgamba followed Rosa from a distance (no closer than about 20 meters). On Saturday (13 Dec) Rosa was vocalizing (a high pitched whistle or squeak) especially when she saw Torgamba or was aware of his approach. We repeated the ultrasound on Sunday and the follicle had reached 21 mm in diameter (there were also several other large follicles on the same ovary). On this day, Rosa seemed more relaxed with less frequent vocalization. AND she allowed Torgamba to approach much closer – several times to within a few meters. After several hours of this behavior Rosa pushed under the fence and walked back into her enclosure. On the morning of December 15, we confirmed ovulation by ultrasound! Overall, these are very positive signs in this young female. Along with mixing Andalas and Ratu, the pairing of Torgamba and Rosa will be the HIGHEST priority (Appendix IV).

One concern we have is that we would like to manage both male rhinos in separate breeding areas. We currently lack the funds for constructing a second breeding area so we are considering alternative options. It would be less desirable, but feasible to manage both male rhinos in the central area. However, our first choice is to locate funds to build a second breeding area. A brief concept sketch with budget follows:

Detail of Second Breeding Area (from Dr. Dedi Candra):

BUDGET

1. Kawat seling (Wire cable)	2 roll (@ 500 m)	= Rp. 15.000.000,-
2. Tiang (Pole/post)	53 (212 m)	= Rp. 7.420.000,-
3. Kawat Ram (Ram wire)	100 kg	= Rp. 2.000.000,-
4. Kabel tis (Cable ties)	20 box	= Rp. 1.100.000,-
5. Seknes (visual barrier)	4 roll	= Rp. 3.180.000,-
6. Pintu (Gate)		= Rp. 3.500.000,-
7. Pipa air (Water pipe)		= Rp. 2.500.000,-
8. <u>Pekerja (paid Worker)</u>		= Rp. 7.500.000,-

TOTAL = Rp. 42.200.000,-
= US\$ 4.220

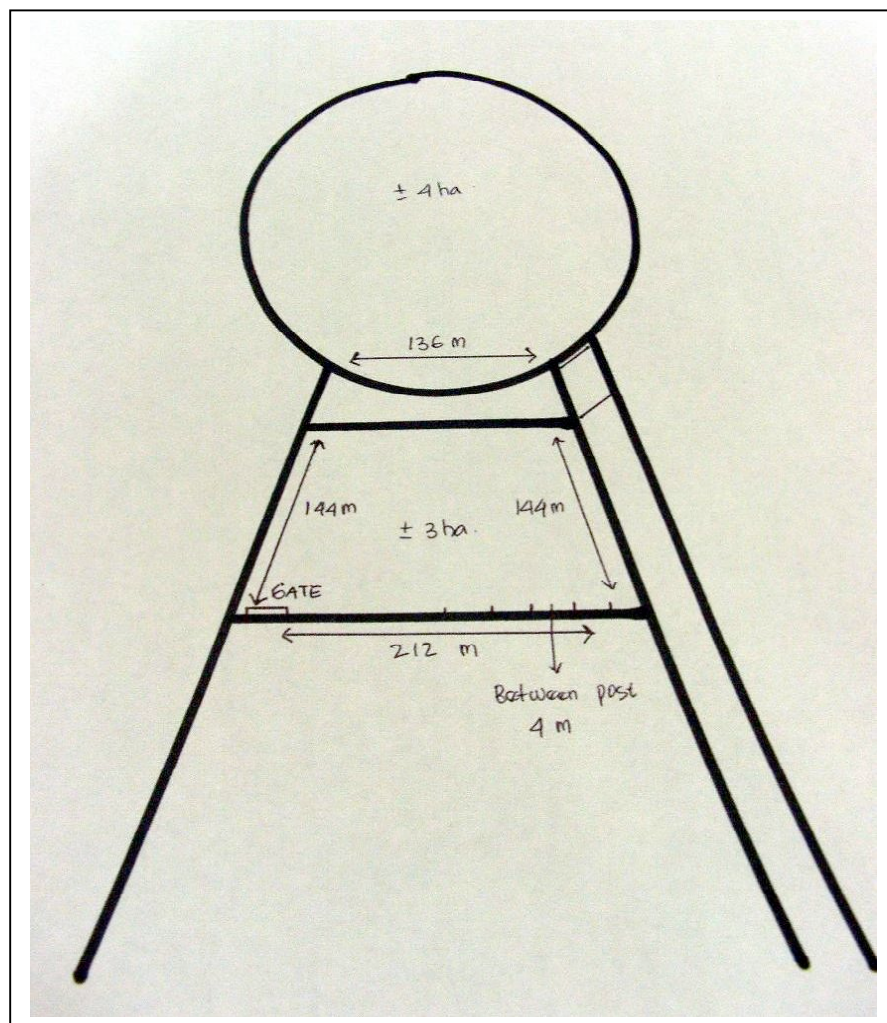


Figure 2. Diagrammatic sketch of second breeding area concept. The circular enclosure at top is the current central breeding area where we plan to focus efforts to mix Andalas and Ratu. A proposed second breeding area would be used to mix Torgamba and Rosa and would measure 100 x 200 meter (2 hectares in size) as indicated by the rectangle located just below the main breeding area.



Figure 3. Rosa with her tail held high and her rear facing Torgamba as we prepare to mix Torgamba with Rosa for breeding purposes. Although there was no mating, the behavioral signs of Rosa continue to evolve and seem much more compatible with the male, Torgamba.

II. ANIMAL HEALTH UPDATE

Rhino Body Weights 2008

<u>Rhino ID</u>	<u>27 August (kg)</u>	<u>10 December (kg)</u>
Andalas	768	757
Torgamba	730	718
Bina	726	726
Rosa	598	606
Ratu	563	546

General Rhino Health Update

There is no change in health from our last report in September. All of the rhinos are healthy and in excellent body condition. There continue to be the usual foot care needs, however, they are minor and easily managed by careful monitoring and daily care. The feet are cleaned and a topical equine hoof lubricant applied. The I-STAT unit is back in operation with the latest software update completed. Routine blood collection showed near normal parameters for all

rhinos with much improvement in Torgamba's anemia and evidence of renal compensation (see Appendix III). Work on conditioning Ratu for routine blood collection is ongoing. Andalas showed a moderate drop in his hematocrit, hemoglobin and RBC count in October and November so we repeated bloodwork during my visit.

Torgamba Health Update

Torgamba is in excellent body condition and he now regularly weighs in excess of 700 kg (highest recent weight = 754 kg). He still suffers from intermittent bouts of mild anemia and chronic renal disease, although the anemia seems to be intermittent and currently much improved. Sunar noted that Torgamba had a sole lesion on his left forefoot that was causing him some discomfort. On closer examination the sole had a defect with excessive pad growth and a palpable tract just caudal to the hoof wall on the center digit. We trimmed the excessive solar growth and applied topical hoof solution and antibacterial ointment to the sole. We will continue to monitor closely for any progression of the defect and start antibiotics if indicated.

Andalas Health Update

Andalas is healthy with no change in his behavior or activity level. Beginning in October of 2008 the SRS veterinary staff noted a minor trend toward anemia in routine hematology conducted on Andalas (see Appendix III). This observation has been characterized by a gradual decline in his hematocrit (packed cell volume), red blood cell numbers, hemoglobin concentration and changes in his red blood cell indices that support a regenerative response. Additionally, these changes have been associated with a slight increase in WBC numbers to 9,100 cells/ul. We were suspicious that one of the tickborne diseases (ie. *Babesia*, *Anaplasma* or *Theileria*) for which we immunized Andalas prior to his translocation were now causing disease. A follow-up blood sample on December 11, 2008, however, showed that the anemia had resolved. It is possible that the mild anemia represented normal physiologic fluctuations. We will repeat hematology once monthly to evaluate these changes over time.

Rosa Health Update

In August and September of this year, Cornell student Latoya Schultz completed her Expanding Horizons project that focused on characterizing the Paramphistome fluke infection that we have observed primarily in Rosa. A preliminary field trial evaluating the new drug Praziquantel looks promising, but we will need to continue the trial and determine appropriate dose and response. This work will continue in collaboration with Latoya and Dr. Bowman. In the meantime, we see no harm in moving Rosa to paddock 2 in order to facilitate our breeding management plan. Although Rosa seems to have the highest fluke burden, all the sanctuary rhinos have been exposed. See Appendix I for Latoya's preliminary field report.

No change to health status of Ratu or Bina

PROGRESS ON SRS RESEARCH OBJECTIVES 2008-2009

We briefly discussed ideas and focus for SRS research activities. This will be addressed more thoroughly once the Research Group of YABI is formed. What follows is a list of ongoing and future research priorities for the SRS:

- 1) Complete male Sumatran rhino puberty study in conjunction with the CN Zoo
 - **Samples forwarded to CN Zoo for analysis in November 2008**
 - **Test results completed in December show Testosterone levels are now compatible with other breeding males. Therefore, Andalas seems to have reached maturity.**
- 2) Perform female rhino fecal hormone assays – Drs. Andri and Dedi to propose a study for collaborative work with the CN Zoo – no change
- 3) Continue small projects focused on health priorities with Cornell veterinary students via the Expanding Horizons program
 - **Praziquantel therapy trial and fluke investigation continues**
- 4) Expand health surveys to include other key rhino habitats (i.e., UKNP)
 - **Met with Pak Widodo, Dr. Nia and Arief Rubiyanto about our plans to undertake the UKNP disease survey supported by EAZA grant award**
 - **Plans are underway to integrate our next Cornell student project as part of this work to assist Nia with the field investigation**
- 5) Fund nutritional /diet study being conducted by Dr. Candra with eventual publication of a field identification manual – no change

APPENDIX I

RHINO FLUKE STUDY PRELIMINARY RESEARCH REPORT

Parasitology as a tool in Conservation Medicine for health surveillance in captive and wild Sumatran Rhinoceros (*Dicerorhinus sumatrensis*) with a comparison to sympatric populations

Latoya Schultz
Cornell CVM Class of 2009

Mentors:

Dr. Robin Radcliffe, Adjunct Assistant Professor of Wildlife and Conservation Medicine at Cornell and Coordinator of the Rhino Conservation Medicine Program for the International Rhino Foundation.

Dr. Dwight D. Bowman, Professor of Parasitology, Department of Microbiology and Immunology, Cornell CVM

Collaborators:

Dr. Dedi Candra, DVM

Dr. Andriansyah Suhaery, DVM

The six weeks spent in Sumatra represent not only a period of scientific discovery for me, but also a time of personal enrichment. From a scientific point of view, there were many questions that were raised during the research and planning phases of my project but I found that once I had arrived on site and began work with my target species, the experiment continued to evolve. As answers were uncovered, yet more questions were raised creating an ongoing and ever evolving project.

This project all began when I was presented with a continuing situation at the Sumatran Rhino Sanctuary in Way Kambas National Park in the Lampung province of Sumatra, Indonesia. Of the 5 Sumatran rhinos currently being cared for and managed at this Rhino nature preserve, the youngest of the 3 female rhinos, “Rosa” was consistently shedding the adult stages of a Trematode or fluke in her feces. As part of routine health surveillance, fecals are performed on all the rhinos to monitor for presence of parasitic stages. In the past, most of the rhinos have had low to few numbers of parasite eggs noted in their feces and as a part of husbandry practice, the rhinos are dewormed with Albendazole, a benzimidazole drug that is effective against many forms of helminthes. It was noted however that a few days following de-worming, only Rosa would shed large numbers of fluke like parasites in her feces and would continue to have variable numbers of an unidentifiable oviparous parasite eggs in her feces, most likely originating from the situational noted adults.

Various anthelmintics were evaluated at this point including Ivermectin and Clorsulon but none were efficacious for various biochemical reasons. Finally, Dr. Bowman, Cornell CVM’s Professor of Parasitology examined the parasites and identified them as a member of the Phylum Platyhelminthe, Class Trematoda, Superfamliy Paramphistomoidea. A close look at some EM (electron microscopy) images suggests this species may actually be *Pefenderius papillataus*, a little studied “rumen” or better to say “colon” trematode or “fluke” of elephants.

Having a potential “ID” on this species explained why none of the previously tested drugs failed to work while also creating some cause for concern. The adult flukes live in the rumen and produce eggs that are passed in feces. Immature flukes normally attach to the wall of the small intestine and later migrate to the rumen to become egg-producing adults (4-6 weeks) with no clinical signs. In heavy infections, development of young flukes can be retarded and will stay in the small intestine for over 4

months. There, the organisms can cause disease associated with destruction (enteritis, hemorrhaging, necrosis).

Various qualitative (Direct Smears, Zinc and Sugar flotations, Acid sedimentations) as well as quantitative (McMaster Chamber) techniques were planned for and supplies packed accordingly. Upon arriving to Sumatra however, my first lesson in field work was learned and that was, when traveling abroad plan for delays. The second lesson was, when those delays occur, improvise and be resourceful; get together a list, and come up with alternatives.

Fortunately, my supplies did arrive and before beginning my work I was given the honor of being the first student that was asked to give a talk to the Park Council headquarters on my work as well as to submit a written report after my research was done with potential recommendation and strategies for park management. Initial samples of rhinos led to the conclusion that a *Fasciola* (liver fluke) species (125x60-65um eggs) was detectable in 4/5 sanctuary rhinos and the previously identified *Paramphistome* (rumen fluke) species (150umx60-65um eggs) was detectable in 1/5 rhinos. There was negligible strongyle occurrence and direct smears, MgSO₄ and Acid techniques were found to be the best for identifying fluke eggs with sugar flotations collecting too much debris. The McMaster chamber technique was not optimal for quantification and it was best to quantify using the Acid sedimentation technique.

Next I sampled from the elephants in the nearby Way Kambas Elephant Sanctuary, where yet again the lesson of flexibility in the field was reiterated. For standard fecal exams, only 1 gram of sample is needed but I found myself based on species and organic content adjusting my sampling for anywhere from 5-15 grams.

In the elephants, I found possibly 2 types of *Paramphistome* species which is entirely possible as the Japanese scientist K. Matsuo has published articles on several species of *Paramphistome* in elephants. I also noted what could be a *Fasciola* species similar to that seen in the Rhinos and there was variable (low to high counts) occurrence of strongyles.

While conducting my research, I took the time out to talk with and learn more not only from the local people but also from individuals conducting their own projects in the area. One such individual was a German veterinarian who had relocated to Indonesia to head up a de-worming program for captive elephants. The endeavor was well supported with Albendazole being the anthelmintic of choice but he also explained that the elephants were also consistently shedding paramphistomes with one elephant having died previously with heavy burdens. If not the cause of death, the paramphistome burden was likely contributed to the animals' health decline and so the results of my research were of great interest to this individual for his work with the elephants in Indonesia. He in turn helped my research by alerting me to the fact that, no liver pathology was ever seen in his necropsies which struck a note in my head as there was at least one fluke I saw in the elephants that I thought was a *Fasciola* species similar to one I had seen in the rhinos.

Keeping this bit of information in the back of my head, I had to keep forging ahead, next up we would sample village cattle (which unlike our *Bos Taurus* are actually *Bos indicus* species). Before I could sample from any village however, I had to visit each Village Chief to explain what I was doing and why I wished to collect feces from their animals which added to my experience as one has to keep in mind the fact that when visiting another country, always try to include the local people into your work. They can be an invaluable resource as helping hands will make your work go much smoother and you have the opportunity to teach and talk to them about how unique their resources are and why they should be treasured.

Flexibility and patience were the theme of my trip as I was ever learning new bits of information relating to my research. When I arrived I learned that cattle are kept in close association with buffalo and so a new factor was added... keeping said flexibility in mind, I proceeded to sample from not only village owned buffalo but also from buffalo illegally grazed along the park's borders. The village buffalo fed side by side with domesticated cattle. The border buffalo however were driven within park

boundaries during the day for grazing and returned to the border in the evening, a big source of conflict between the National Park and the village owners that necessitated my accompaniment of an armed park guard.

In village cattle as well as village buffalo, there were high numbers of capillaria, strongyles and eimeria species with at least one fluke species being noted. It was during these village fecals that a new twist was added to things. For the first time, I saw a golden brown, operculated, 125x65um egg that better fitted the description of Fasciola as all the appropriate sized “fasciola” species I had noted in the rhinos as well as elephants had a clear appearance. After weeks of working with one pre-set notion, I came to realize that I may actually be dealing with two paramphistomes species in the Sumatran Rhino and not just one.

This was not my only interesting finding however. Although the buffalo in villages shared the same types of parasites as the domestic cattle, those buffalo along the park border had minimal to no parasite loads, which I attributed to the grazing lifestyle that mimicked pasture rotation.

I had found two species of fluke (whether Paramphistome or Fasciola) that were as yet to be positively identified in a captive population of Dicerorhinus sumatrensis. I observed species that were in close contact sharing similar parasites (buffalo and cattle) and species that have more room to roam having lower parasite burdens (e.g. buffalo on park border).

I concluded that sympatric species (Rhinos, buffalo, elephant, cattle) probably have the potential to transmit parasites between each group given enough intimate contact.

This observation served to re-emphasize that the need for adequate amounts of protected land for wild species to roam in order to decrease the likelihood of increased parasite burdens that can be life threatening. In addition, contact between domestic and wild species should be minimized (e.g. buffer zones) to decrease transmission of parasites as the rhinos at the SRS that came from situations where they interacted with domesticated ungulates had the highest fluke load.

As for the drug trial, we received a generous donation of praziquantel by a representative by Bayer Animal Foundation, which was used to begin a trial at a dose of 3mg/kg orally in the rhinos. Since the baseline quantitative egg counts had been established in the sanctuary rhinos at the start of sampling, I was able to administer the Praziquantel first to one of the rhinos with a 24 hour lapse until the other rhinos were dosed to ensure there was no drug reaction. The results were a slight decrease in egg burden with a potential for higher efficacy pending a continuation of the trial, a future collaboration between Dr. Radcliffe, Dr. Bowman and myself.

Unfortunately, only 5 of my anticipated 6 weeks were spent in Sumatra. During my fourth week, I received word that my father had passed away and was to be buried within a week's time in my home country of Guyana, South America, and so after completion of my data collection, I left my Sumatra to return home to be with my family.

Despite this unanticipated turn of events, I was able to complete my data collection and left Sumatra feeling as though I had gone through one of the most fulfilling experiences of my life. It is certainly a trip that I would make again and I feel as though there is so much work and research that can be done there. Indonesia is a country of friendly and obliging people who helped make my experience very rewarding. I left Sumatra not only with a new found sense of purpose, (that being the desire to continue to do research with endangered species), but also with a new found love for parasitology and the urge to find more ways to apply its use in more experimental situations. And of course, the friends I made there are ones I hope to have for my lifetime.

APPENDIX II

MICROSCOPE CAMERA DONATED BY BRITISH BROADCASTING CORPORATION (BBC)

Dr. Robin W. Radcliffe and Dr. Andriansyah
Sumatran Rhino Sanctuary, Indonesia
December 10, 2008

International Donors Enable Critical Medical Care of Rare Sumatran Rhinoceros

The International Rhino Foundation (IRF) is fortunate to have partners from around the world who are helping with the mission of caring for some of the rarest mammals on earth, in this case the Sumatran rhinoceros. Save the Rhino International (SRI), a UK-based charity focused on raising money for rhino conservation in Africa and Asia recently helped the IRF continue its support for the Sumatran Rhino Sanctuary (SRS) in Indonesia by working with the British Broadcasting Corporation (BBC). The BBC provided funds for the rhino sanctuary that included money for rhino food (it costs a lot to feed a rhinoceros!) and medical care.

One of the items we purchased with the BBC funds is a digital microscope camera (manufactured by Olympus America Corporation) that attaches to the center's microscope and allows capture of images and video. Previously it was impractical for the SRS staff to capture photos through the microscope and this hindered our ability to assist with medical diagnoses from afar when we were not on site. Now I am happy to report that the SRS team will be able to send photo and video documentation to us for our evaluation as needed because of this kind support made possible by the BBC and SRI.

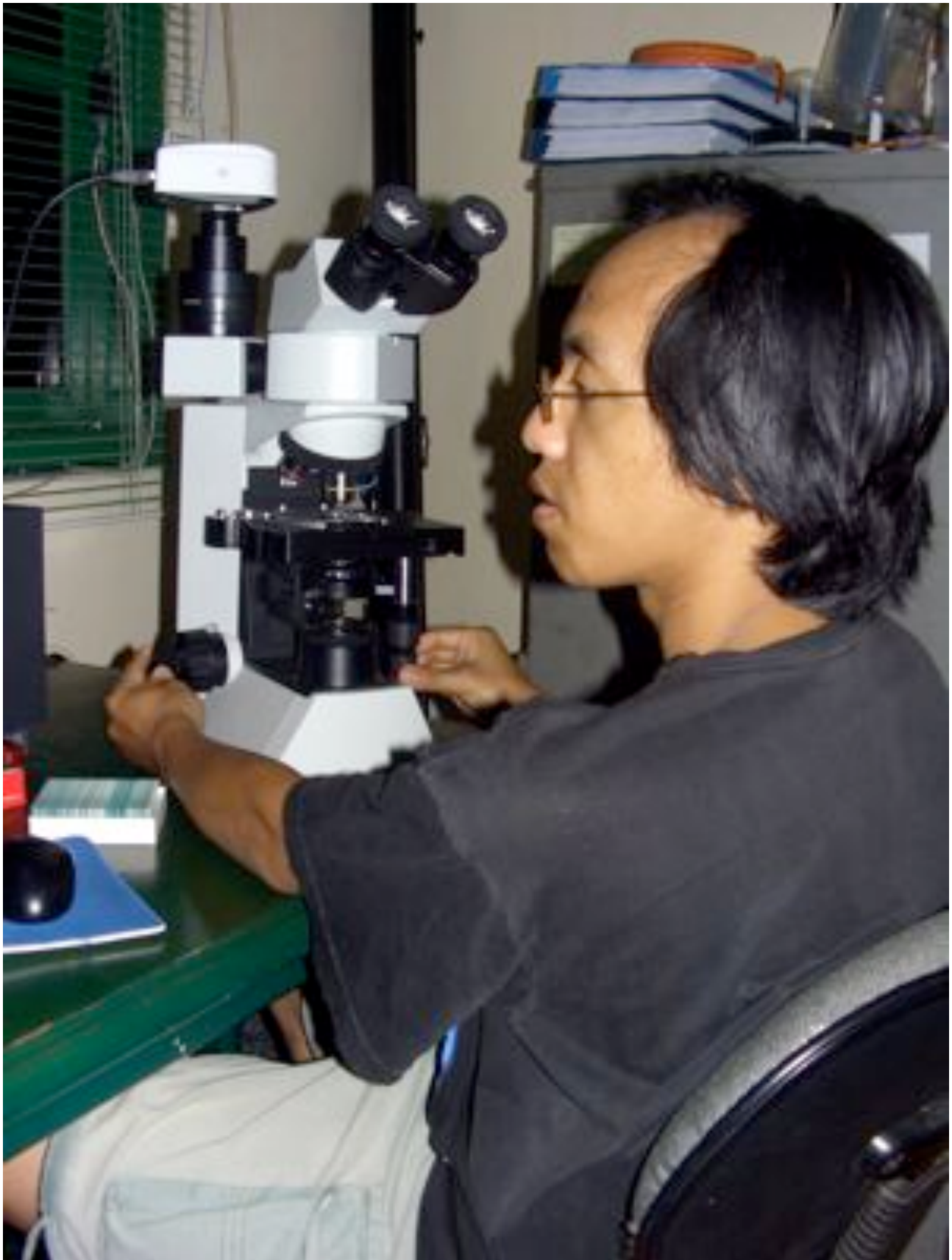
The first thing we did once we set-up the digital microscope system and got it running was to look at Torgamba's sperm sample from his most recent breeding with Ratu in November of this year. Unfortunately even the best tools can't help find sperm if they aren't there.....while we are not giving up on Torgamba our focus will now switch to work with Andalas as the primary breeder. Now, within a matter of minutes, critical biological samples can be analyzed by scientists a world apart through the e-mail transfer of digital photos and video.

While this technology will be important for monitoring breeding soundness, another significant benefit of the digital microscope camera will be the enhanced health care it will facilitate for the Sumatran rhinos under our care. Blood-borne diseases such as *Babesia*, *Anaplasma* and *Theileria* can be difficult to diagnose by microscopic exam without expert laboratory support. Now experts in animal healthcare from Cornell University's College of Veterinary Medicine (home of the IRF's Rhino Conservation Medicine Program) will be able to assist with remote diagnosis of disease problems in a timely manner. This will be especially important in cases of emerging disease that could potentially lead to loss of important individuals in this small and endangered population.

Many thanks for the kind donation from the BBC. As can be seen from the attached photos, we have already put the equipment to good use.

With all best wishes from Sumatra,

Robin, Andri and the SRS Keeper Team



The new digital microscope camera for use by the SRS health team, made possible by a donation from the BBC and rhinoceros conservation partner, SRI.



Dr. Andri (top) can now communicate timely information using medical digital imagery to Dr. Radcliffe (bottom with SRS rhino female, Rosa) to enable international medical consultation and care. Rosa photo courtesy of Pak Oka.

APPENDIX III

SRS RHINO HEMATOLOGY UPDATE NOVEMBER - DECEMBER 2008

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APPENDIX IV

REVISED RHINO 6 MONTH SRS MANAGEMENT PLAN

RHINO ID	REPRODUCTIVE PLAN	HEALTH PLAN
Andalas	BREEDING PRIORITY #1 Breed with Ratu in Center Breeding Area CN Zoo completed fecal testosterone study	Decrease hand-feed to 2x daily + PM Exercise! 1x/mo bloodwork plus mineral assays quarterly iSTAT testing quarterly
Torgamba	BREEDING PRIORITY #2 Breed with Rosa in New Breeding Area (use center until new area can be built) Priority is collection of post-breeding samples* SRS team to monitor health closely	Continue routine bloodwork minimum 1x/mo Quarterly mineral assays Supplement Phosphorus, 3x/day hand-feeding, white salt, herbals if necessary iSTAT testing quarterly
Ratu	Ultrasound 3x/wk then daily near estrus Breed with Andalas in Center Breeding Area HIGHEST PRIORITY	1x/3 mo bloodwork plus mineral assays quarterly iSTAT testing quarterly, if feasible
Rosa	Ultrasound 3x/wk then daily near estrus Breed with Torgamba in New Breeding Area HIGH PRIORITY	1x/mo bloodwork plus mineral assays quarterly iSTAT testing quarterly
Bina	Ultrasound 3x/wk then daily near estrus Breed with Torgamba, if opportunity presents LOWEST PRIORITY	1x/mo bloodwork plus mineral assays quarterly iSTAT testing quarterly

*** Preserve all semen samples in formalin (1 part formalin to 9 parts sample)**