

**SUMATRAN RHINO CONSERVATION CENTRE
DEPARTMENT OF WILDLIFE AND NATIONAL PARKS
SUNGAI DUSUN, SELANGOR
MALAYSIA**

MONTHLY REPORT

SEPTEMBER 2000

BY

Dr. AIDI MOHAMAD

&

STEVE ROMO

INTRODUCTION

The progesterone blood profile was used to predict the estrus cycles of the females. The latest blood analysis was received on the 9/9/00 and the result was attached. Mas Merah was predicted coming into estrus on the first week of the month. She was mixed with Shah on 2/9/00 to 6/9/00. Panjang and Rima are expected to be in estrus on the third week of the month, probably between 12/9/00 to 15/9/00. They were mixed with the male during this period. All the observation during the mixing is summarized below. The blood collection procedure is still continued. This procedure was done concurrently with the vaginal cytology. The sample collection was done twice weekly from four females; Rima, Panjang, Minah and Mas Merah. However, a meeting on 26/9/00 decided to collect on two females only; Panjang and Mas Merah for further confirmation. It also decided to collect blood and cytology samples on daily basis from the females during their expected estrus period for further investigation.

RHINO MANAGEMENT

A) Breeding Program

i) Daily Introduction

The rhinos were only mixed when the female is expected coming to estrus. Usually, the mixing was carried out three days before or after expected estrus cycle. In some cases, the mixing was carried out longer. The daily observation of the mixing is summarized in Table 1. Mas Merah was mixed with Shah from 2/9/00 to 6/9/00 around 8.00 a.m. and again from 21/9/00 to 29/9/00. A good breeding behavior was only observed from 2/9/00 to 4/9/00. As for Panjang, she was mixed with Shah from 11/9/00 to 21/9/00 and positive behavior was recorded between 18/9/00 to 21/9/00. The observation for both occasions was attached below.

ii) Bleeding Program

a) Blood Collection Procedure

The blood was collected twice a week after the daily introduction. It was done on Monday and Thursday from all females via the tail. Sometime, blood is difficult to be collected from Seputeh since she was not cooperative. The blood procedure is summarized in Table 2.

b) Blood Results

Based on the blood result received on 31/8/00, the breeding plan for the females is tabulated below.

RIMA	PANJANG	MAS MERAH	MINAH	SEPUTIH
11/9-14/9	11/9-14/9	22/9-25/9	11/9-14/9	5/9-9/9

However, the plan has to be changed when the latest blood result is received on 9/9/00. The result is for the samples collected until 4/9/00. Based on the result, the breeding management plan is made as the following. During this period, the female will be mixed with the male accordingly.

RIMA	PANJANG	MAS MERAH	MINAH	SEPUTIH
11/9-19/9	13/9-19/9	12/9-19/9	22/9-25/9	In Oct

iii) Fecal Sampling

Fecal was collected from all females on daily basis. These samples then were pooled before sending them to UPM for progesterone analysis.

iv) Vaginal Cytology

The procedure has been done twice weekly on four females except for Seputih. A meeting at UPM has been scheduled on Tuesday (26/9/00) to discuss about the progress of this procedure.

B) HEALTH AND TREATMENT

Basically, all rhinos are in the good condition. However, some of the female rhinos were treated for wound especially after mixing them with the males. These wound were resolved after three days post treatment. Apart from that, inappetance (reduce in appetite) and drop in weight were observed in two females, Panjang and Minah.

Panjang was given molasses (Nutriblock®), 250gm/d orally for extra diet. She was also given 2 tablets of Obimin pill to increase her appetite. The extra diet was given to increase her energy level especially for breeding purposes.

As for Minah, she suffered weight loss after releasing her into the natural enclosure for breeding. Force-feeding was used to increase her weight. Apart from that, she was also treated for fungus infection using 'Spororyl' every four days.

C) FEEDING

The quality and quantity of the feed sent by the contractor was checked daily and it is satisfactory. The delivery was based on the scheduled and jack fruit or cempedak was ordered for blood collection days especially for Seputeh.

Table 1: Daily Introduction of Shah and the females; Panjang and Mas Merah, September 2000

Date	Remarks
1/9/00	Panjang went straight to the area where Shah was eating, looking for food. No response from Shah when Panjang approached. Both rhinos were eating side by side and no breeding behavior observed. Separated after 10 minutes.
2/9/00	Shah was mixed with Mas Merah today. No fruits were given. Mas presented herself to Shah after five minutes of mixing but no response from the male. Shah was busy eating the browse. Mas was squatting when Shah sniffing her. No further response from Shah. Head butting was observed and the rhinos were separated using fruits when they started to fight.
3/9/00	Shah was busy eating the browse when approached by Mas Merah. No fruits were given. Mas went to eat the browse and Shah sniffed her. Both rhinos were busy eating side by side. Separate the rhinos when aggression occurred.
4/9/00	Shah was busy eating the browse when approached by Mas Merah. No fruits were given. Mas went to eat the browse and Shah sniffed her. Shah sprayed his urine and then followed Mas Merah. Head butting was observed. Mas presented her self and Shah sniffed her. Chinning was observed after one hour of mixing. Shah mounted Mas Merah twice but no intromission. Aggressions were observed three times and the last one resulting Shah chasing Mas Merah. The rhinos were separated using the fruits and baffle board.
5/9/00	Mas Merah approached the feeding area when released into paddock 1. No response from both rhinos when they notice each other. Shah kept eating while Mas Merah went to wallow. Head butting was observed and the rhinos were separated before fighting could occurred.
6/9/00	Released Mas from night stall 1 and she went straight to the feeding area. Both rhinos were showing no interest.
11/9/00	Panjang was released from night stall 1 and she went straight to feeding area. Shah was eating when approached by Panjang. No response from Shah. Both rhinos busy eating. During separation, Panjang reluctant to go upon calling by keeper. She went to look for fruits at Shah's area and Shah looked annoyed. Managed to call her away before fights occurred.

Date	Remarks
12/9/00	Panjang went to the feeding area when released from night stall 1 to paddock 1. Shah was busy eating when Panjang approached him. Panjang rubbed her head against Shah's head and no further response from both rhinos. They were eating side by side ignoring each other.
13/9/00	Panjang was released from night stall 1 into paddock 1 and she went straight to feeding area. Shah was busy eating and ignored Panjang when he saw her. No response from both rhinos. Panjang went straight to the gate upon calling and go into paddock 2 easily.
14/9/00	Shah was eating when Panjang entered paddock 1. Panjang went straight to the feeding area where Shah was. No response from Shah although both rhinos were side by side. He was busy eating. Shah sniffed Panjang but continue to eat.
15/9/00	Panjang went to the feeding area when released from night stall 1 to paddock 1. Shah was busy eating when Panjang approached him. Panjang rubbed her head against Shah's head and no further response from both rhinos. They were eating side by side ignoring each other.
16/9/00	Panjang went to the feeding area when released into paddock 1. No response from Shah when approached by her. Shah kept eating while Panjang went for the food and ignored Shah. Both rhinos were eating side by side.
17/9/00	No positive response from both rhinos. The female vocalized a lot. Separation after 15 minutes.
18/9/00	Panjang presenting herself after 15 minutes of pairing. Shah sniffed her and try to mount but failed. The female was very quiet and the male followed her when she walked away. Three mountings were observed in the wallow without any erection. Separation was done after fighting occurred.
19/9/00	Both rhinos were eating fruits side by side. Shah followed Panjang when the female walked away from him. Panjang presented herself after 10 minutes of mixing and Shah mounted her. The second and third mounting followed with partial erection. The rhinos were separated when aggression occurred.
20/9/00	Initially, both rhinos busy eating the fruits side by side. After five minutes of pairing, Panjang presenting herself. Shah sniffed her and then trailed her when she walked away. Mounting was observed 4 times and the third one with full erection. No penetration observed and the rhinos were separated when fighting occurred.

Date	Remarks
21/9/00	Panjang presented herself after ten minutes of pairing and Shah mounted her for about two minutes. Anopereneal contact, trailing by male and head butting was observed throughout the two hours procedure. Twelve mountings were recorded without intromission. The last mounting occurred in the wallow and lasted about thirty minutes.
22/9/00	Mix Shah with Panjang for about ten minutes but no positive response from both rhinos. Then, Mas Merah was released and she went straight to the feeding area. Shah was busy eating when Mas approached him. Head butting was observed but no further response from both rhinos. They were eating side by side ignoring each other.
23/9/00	Mas Merah was released from night stall she went straight to feeding area. Shah was busy eating and ignored Mas when he saw her. No response from both rhinos.
24/9/00	Mas went straight to the feeding area where Shah was busy eating the browse. No response from Shah although both rhinos were side by side. Shah sniffed Mas but continue to eat.
25/9/00	Mas went to the feeding area when released from night stall 1 to paddock 1. Shah was busy eating when Mas approached him. They were eating side by side ignoring each other.
26/9/00	Mas Merah went to the feeding area when released into paddock 1. No response from Shah when approached by her. Shah kept eating while Mas went for the food and ignored Shah. Both rhinos were eating side by side.
27/9/00	No positive response from both rhinos. The female vocalized a lot. Separation after 15 minutes.
28/9/00	Mas went to the feeding area when released from night stall 1 to paddock 1. Shah was busy eating when Mas approached him. They were eating side by side ignoring each other.
29/9/00	Mas Merah was released from night stall she went straight to feeding area. Shah was busy eating and ignored Mas when he saw her. No response from both rhinos.

Table 2: Blood Collection from the Rhinos, September 2000

Date	Rhino ID	Area taken	Remarks
4/9/00	Minah Mas Merah Minah Rima Seputih	Tail Tail Tail Tail Tail	Dr. Zainal took the blood from all females through the tail.
7/9/00	Rima Panjang Mas Merah Minah Seputih	Tail Tail Tail Tail	Get blood samples from all females except Seputih. She did not enter the chute. Tried on her the next day (8/9/00) but she reluctant to go into the chute.
9/9/00	Seputih	Tail	Get some blood from Seputih.
11/9/00	Minah Mas Merah Rima Panjang Seputih	Tail Tail Tail Tail Tail	Get blood samples from all females from the tail.
12/9/00	Panjang	Tail	Blood was taken for progesterone analysis
13/9/00	Rima Panjang	Tail Tail	Blood was taken for progesterone analysis
14/9/00	Rima Panjang Mas merah Minah Seputih Shah	Tail Tail Tail Tail Tail Tail	Get blood samples from all females and also Shah.
15/9/00	Rima Panjang Minah	Tail Tail Tail	Blood was taken from these females expected on estrus.
16/9/00	Rima Panjang Minah	Tail Tail Tail	Blood was taken from these females expected on estrus.
17/9/00	Minah Panjang Rima	Tail Tail Tail	Blood was taken from these females expected on estrus.

Date	Rhino ID	Area taken	Remarks
18/9/00	Rima Minah Panjang Seputih Mas Merah	Tail Tail Tail Tail Tail	Blood was taken from all females for progesterone analysis.
19/9/00	Rima Minah Panjang	Tail Tail Tail	Blood was taken from these females expected on estrus.
20/9/00	Rima Minah Panjang	Tail Tail Tail	Blood was taken from these females expected on estrus.
21/9/00	Rima Minah Panjang	Tail Tail Tail	Blood was taken from these females expected on estrus.
22/9/00	Panjang	Tail	Blood was taken for progesterone analysis
25/9/00	Rima Minah Panjang Mas Merah Seputeh	Tail Tail Tail Tail Tail	Routine bleeding for P4 from all females
27/9/00	Mas Merah	Tail	Checking for P4
28/9/00	Rima Mas Merah Panjang Seputeh	Tail Tail Tail Tail	Bleeding for P4 from the females.
29/9/00	Minah Mas Merah	Tail Tail	Blood was taken for progesterone analysis

Pairing of Mas Merah and Shah (2/9/00 to 6/9/00)

Based on the blood analysis, Mas Merah was expected on estrus between 30/8/00 to 2/9/00. However, the result was received late and pairing could only take place starting on 2/9/00. Mas Merah was observed presenting herself after five minutes of introduction. However, Shah was not showing any interest on her. He sniffed her but continuing eating the browse. No fruits were given during this introduction period. Head butting was observed and Mas Merah walked away entering the wallow. Shah followed her and she prevented Shah to enter. Aggression occurred and Shah was baited away from the female using fruits. The next day (3/9/00), the rhinos were mixed again but no positive response was observed from both rhinos. They were busy eating the browse side by side. Head butting was observed after 10 minutes of mixing and the rhinos were separated before fighting occurred.

On 4/9/00, the rhinos were mixed again. After five minutes of pairing, Mas Merah presenting herself to Shah. Anogenital contact (sniffing of the vulva) by the male was observed followed by head butting. The male followed the female when she walked away. The behavior of head butting and trailing was observed about 10 minutes before Mas Merah presenting herself again. These behaviors were observed for about an hour before the first mounting occurred. The second mounting occurred 20 minutes later. No erection was observed on both occasions. The rhinos were separated when aggression started. Shah was chasing Mas Merah and fighting occurred in the wallow. Fruits and baffle boards were used to separate the rhinos. The rhinos were mixed again on 5/9/00 and 6/9/00 but no breeding behavior was observed.

Pairing of Shah and Panjang (18/9/00 to 21/9/00)

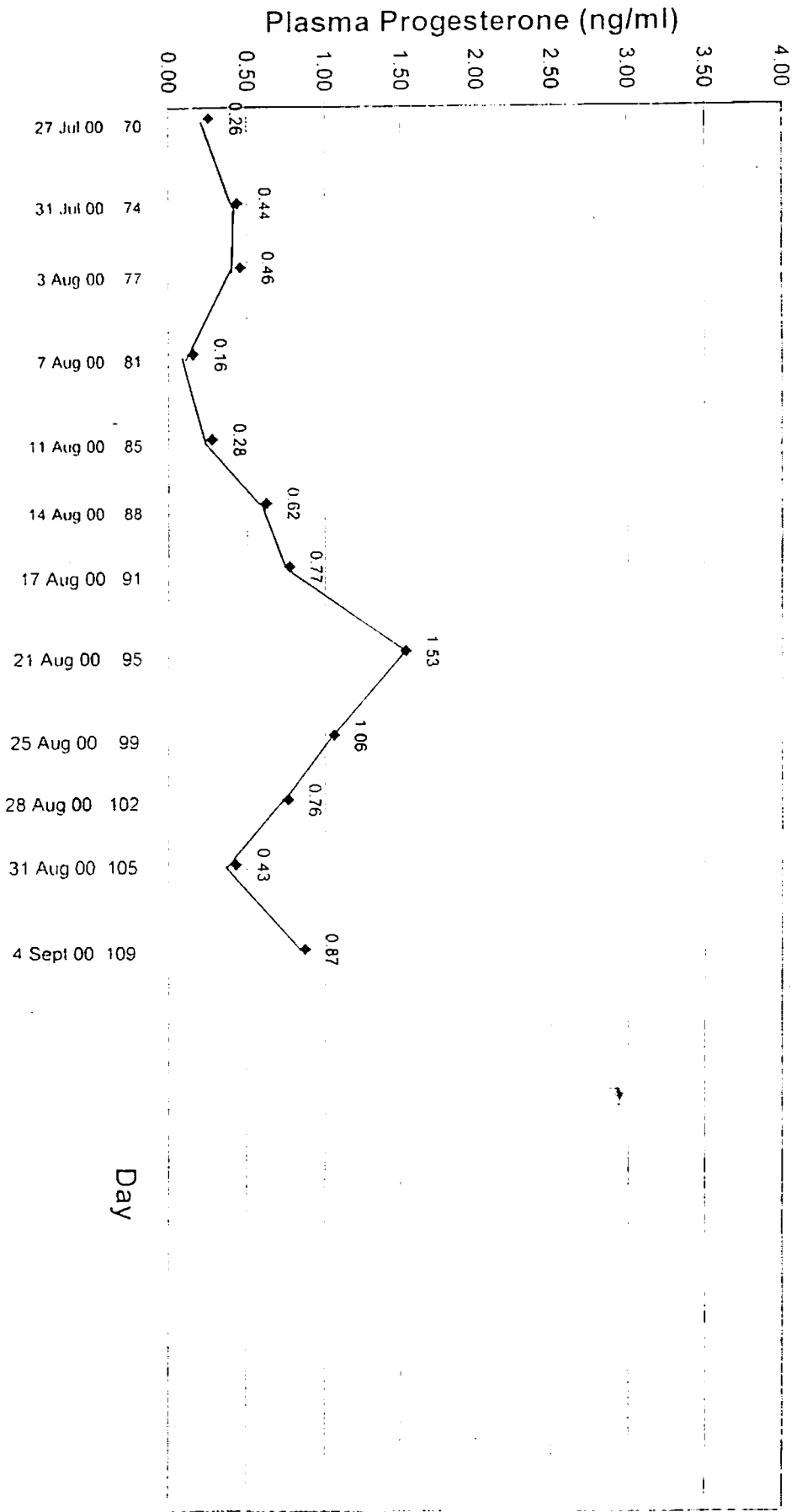
Panjang was predicted to come into estrus between 11/9/00 to 14/9/00 based on the blood result received on 31/8/00. However, no breeding behavior was observed during this period. The mixing procedure was continued and on 18/9/00, positive reaction was observed from the rhinos. Ten minutes after mixing, the female presenting herself to be mounted. Anopereneal contact by male and he attempted to mount but failed. The first mounting was recorded after 45 minutes of mixing; followed by the second one and both happened in the wallow without 'intromission'. Head butting and 'anopereneal' contact was prominent and this resulted in the third mounting. However, the rhinos were separated when aggression occurred after the last mounting.

The next day (19/9/00), the rhinos were mixed again. Trailing by the male was observed and Shah mounted Panjang after fifteen minutes of the mixing. Five minutes later, the second mounting was recorded followed by the third mounting. However, no intromission was observed during these mountings. Later, aggression occurred and both rhinos were separated. On 20/9/00, the rhinos were paired again. Mountings were observed but the male failed to breed. Separation took place when they started to fight after 30 minutes of pairing.

Pairing was also done on 21/9/00 and Panjang presented herself ten minutes after the mixing. She squatted and Shah mounted her. This was recorded for about two minutes. 'Anopereneal' contact was very prominent and Shah mounted Panjang again with partial erection. This also lasted about two minutes. Trailing, head butting, wallowing and anopereneal contact were the main behaviors observed throughout the procedure. About twelve mountings were recorded but the male failed to penetrate. The mountings occurred mostly in the wallow and the last one lasted for about 30 minutes without intromission. After two hours of mixing, the rhinos ignored each other and they were separated. The next morning, they were mixed again and no positive behaviors were recorded.

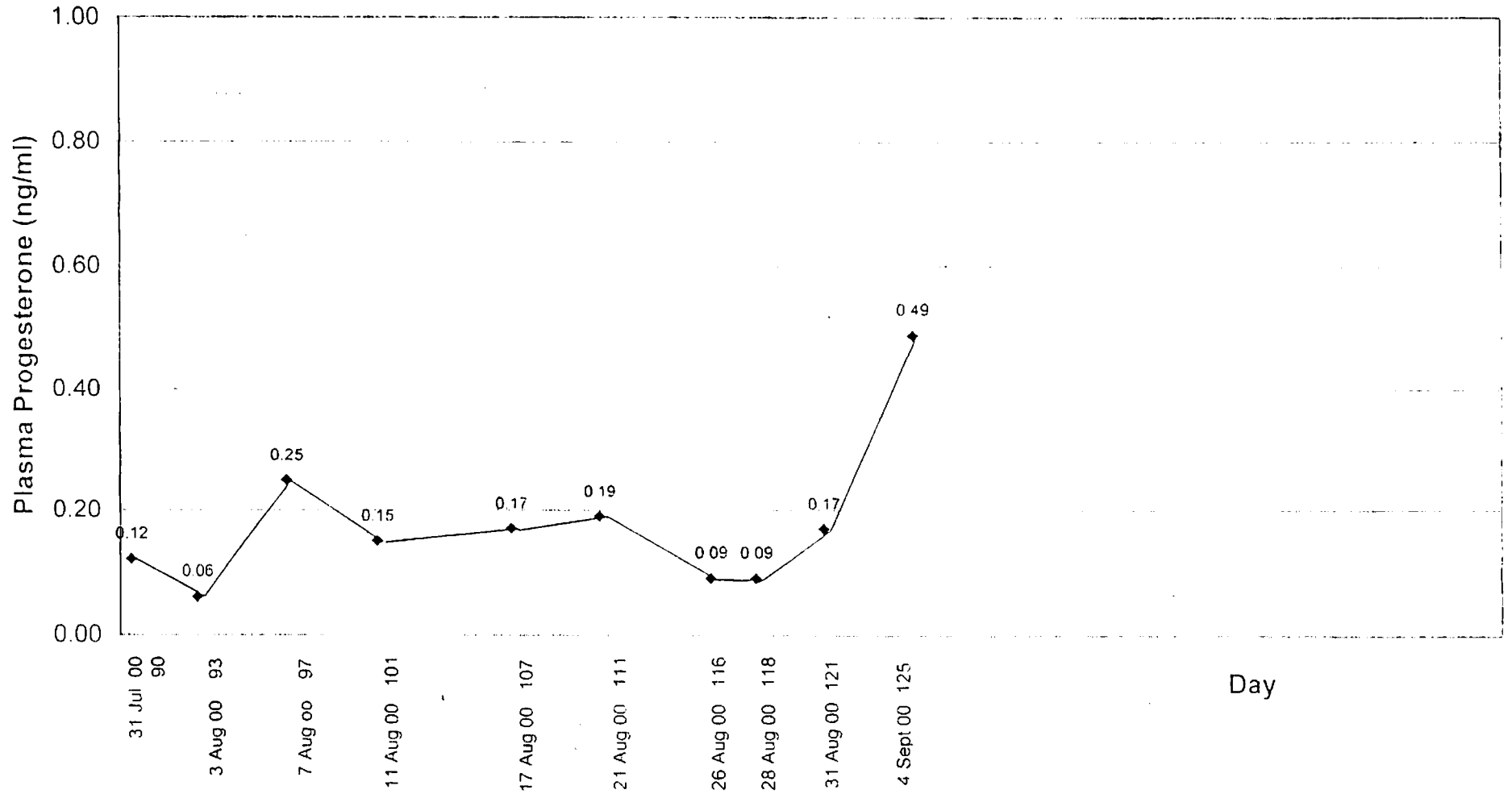
Date	Day	P4 (ng/ml)	Date	Day	P4 (ng/ml)	Date	Day	P4 (ng/ml)	Date	Day	P4 (ng/ml)	Date	Day	P4 (ng/ml)			
1-Aug-00	75		1-Aug-00	91		1-Aug-00	99		1-Aug-00	75		1-Aug-00	99				
2-Aug-00	76		2-Aug-00	92		2-Aug-00	100		2-Aug-00	76		2-Aug-00	100				
3-Aug-00	77	0.46	3-Aug-00	93	0.06	3-Aug-00	101	0.11	3-Aug-00	77	0.08	3-Aug-00	101	1.23			
4-Aug-00	78		4-Aug-00	94		4-Aug-00	102		4-Aug-00	78		4-Aug-00	102				
5-Aug-00	79		5-Aug-00	95		5-Aug-00	103		5-Aug-00	79		5-Aug-00	103				
6-Aug-00	80		6-Aug-00	96		6-Aug-00	104		6-Aug-00	80		6-Aug-00	104				
7-Aug-00	81	0.16	7-Aug-00	97	0.25	7-Aug-00	105	0.21	7-Aug-00	81	0.29	7-Aug-00	105	0.80			
8-Aug-00	82		8-Aug-00	98		8-Aug-00	106		8-Aug-00	82		8-Aug-00	106				
9-Aug-00	83		9-Aug-00	99		9-Aug-00	107		9-Aug-00	83		9-Aug-00	107				
10-Aug-00	84		10-Aug-00	100	0.15	10-Aug-00	108		10-Aug-00	84		10-Aug-00	108				
11-Aug-00	85	0.28	11-Aug-00	101		11-Aug-00	109		11-Aug-00	85	0.75	11-Aug-00	109				
12-Aug-00	86		12-Aug-00	102		12-Aug-00	110	0.49	12-Aug-00	86		12-Aug-00	110				
13-Aug-00	87		13-Aug-00	103		13-Aug-00	111		13-Aug-00	87		13-Aug-00	111				
14-Aug-00	88	0.62	14-Aug-00	104		14-Aug-00	112	0.67	14-Aug-00	88	1.08	14-Aug-00	112	0.23			
15-Aug-00	89		15-Aug-00	105		15-Aug-00	113		15-Aug-00	89		15-Aug-00	113				
16-Aug-00	90		16-Aug-00	106		16-Aug-00	114		16-Aug-00	90		16-Aug-00	114				
17-Aug-00	91	0.77	17-Aug-00	107	0.17	17-Aug-00	115	0.79	17-Aug-00	91	1.56	17-Aug-00	115				
18-Aug-00	92		18-Aug-00	108		18-Aug-00	116		18-Aug-00	92		18-Aug-00	116				
19-Aug-00	93		19-Aug-00	109		19-Aug-00	117		19-Aug-00	93		19-Aug-00	117				
20-Aug-00	94		20-Aug-00	110		20-Aug-00	118		20-Aug-00	94		20-Aug-00	118				
21-Aug-00	95	1.53	21-Aug-00	111	0.19	21-Aug-00	119	0.42	21-Aug-00	95	0.11	21-Aug-00	119	0.09			
22-Aug-00	96		22-Aug-00	112		22-Aug-00	120		22-Aug-00	96		22-Aug-00	120				
23-Aug-00	97		23-Aug-00	113		23-Aug-00	121		23-Aug-00	97		23-Aug-00	121				
24-Aug-00	98		24-Aug-00	114		24-Aug-00	122		24-Aug-00	98		24-Aug-00	122				
25-Aug-00	99	1.06	25-Aug-00	115		25-Aug-00	123	0.13	25-Aug-00	99	0.2	25-Aug-00	123	0.32			
26-Aug-00	100		26-Aug-00	116	0.09	26-Aug-00	124		26-Aug-00	100		26-Aug-00	124				
27-Aug-00	101		27-Aug-00	117		27-Aug-00	125		27-Aug-00	101		27-Aug-00	125				
28-Aug-00	102	0.76	28-Aug-00	118	0.90	28-Aug-00	126	0.19	28-Aug-00	102	0.84	28-Aug-00	126	0.23			
29-Aug-00	103		29-Aug-00	119		29-Aug-00	127		29-Aug-00	103		29-Aug-00	127				
30-Aug-00	104		30-Aug-00	120		30-Aug-00	128		30-Aug-00	104		30-Aug-00	128				
31-Aug-00	105	0.43	31-Aug-00	121	0.17	31-Aug-00	129	0.65	0.58	31-Aug-00	105	0.43	0.33	31-Aug-00	129	0.33	0.40
1-Sep-00	106		1-Sep-00	122		1-Sep-00	130			1-Sep-00	106		1-Sep-00	130			
2-Sep-00	107		2-Sep-00	123		2-Sep-00	131			2-Sep-00	107		2-Sep-00	131			
3-Sep-00	108		3-Sep-00	124		3-Sep-00	132			3-Sep-00	108		3-Sep-00	132			
4-Sep-00	109	0.87	4-Sep-00	125	0.49	4-Sep-00	133	2.89	2.18	4-Sep-00	109	1.45	1.26	4-Sep-00	133	0.38	0.33
5-Sep-00	110		5-Sep-00	126		5-Sep-00	134			5-Sep-00	110			5-Sep-00	134		
6-Sep-00	111		6-Sep-00	127		6-Sep-00	135			6-Sep-00	111			6-Sep-00	135		
7-Sep-00	112	0.24	7-Sep-00	128	0.18	7-Sep-00	136	2.22		7-Sep-00	112	1.34		7-Sep-00	136		
8-Sep-00	113		8-Sep-00	129		8-Sep-00	137			8-Sep-00	113			8-Sep-00	137		
9-Sep-00	114		9-Sep-00	130		9-Sep-00	138			9-Sep-00	114			9-Sep-00	138	0.37	
10-Sep-00	115		10-Sep-00	131		10-Sep-00	139			10-Sep-00	115			10-Sep-00	139		
11-Sep-00	116	1.13	11-Sep-00	132	0.07	11-Sep-00	140	1.14		11-Sep-00	116	0.87		11-Sep-00	140	0.98	
12-Sep-00	117		12-Sep-00	133		12-Sep-00	141	0.65		12-Sep-00	117			12-Sep-00	141		
13-Sep-00	118		13-Sep-00	134	0.09	13-Sep-00	142	0.14		13-Sep-00	118	0.29		13-Sep-00	142		
14-Sep-00	119	2.11	14-Sep-00	135	0.48	14-Sep-00	143	0.13		14-Sep-00	119	0.19		14-Sep-00	143	1.44	
15-Sep-00	120		15-Sep-00	136	0.64	15-Sep-00	144	0.12		15-Sep-00	120	0.03		15-Sep-00	144		
16-Sep-00	121		16-Sep-00	137		16-Sep-00	145	0.08		16-Sep-00	121	0.06		16-Sep-00	145		
17-Sep-00	122		17-Sep-00	138	0.82	17-Sep-00	146	0.07		17-Sep-00	122	0.11		17-Sep-00	146		
18-Sep-00	123	1.49	18-Sep-00	139	0.81	18-Sep-00	147	0.31		18-Sep-00	123	0.24		18-Sep-00	147	3.07	
19-Sep-00	124		19-Sep-00	140	0.77	19-Sep-00	148	0.13		19-Sep-00	124	0.4		19-Sep-00	148		
20-Sep-00	125		20-Sep-00	141	1.10	20-Sep-00	149	0.10		20-Sep-00	125	0.65		20-Sep-00	149		
21-Sep-00	126	0.85	21-Sep-00	142	1.34	21-Sep-00	150	0.15		21-Sep-00	126	1.21		21-Sep-00	150	1.42	
22-Sep-00	127		22-Sep-00	143		22-Sep-00	151	0.41		22-Sep-00	127			22-Sep-00	151		
23-Sep-00	128		23-Sep-00	144		23-Sep-00	152			23-Sep-00	128			23-Sep-00	152		
24-Sep-00	129		24-Sep-00	145		24-Sep-00	153			24-Sep-00	129			24-Sep-00	153		
25-Sep-00	130	1.09	25-Sep-00	146	1.13	25-Sep-00	154	2.02		25-Sep-00	130	1.83		25-Sep-00	154	0.13	
26-Sep-00	131		26-Sep-00	147		26-Sep-00	155			26-Sep-00	131			26-Sep-00	155		
27-Sep-00	132	1.37	27-Sep-00	148		27-Sep-00	156			27-Sep-00	132			27-Sep-00	156		
28-Sep-00	133	1.56	28-Sep-00	149		28-Sep-00	157	2.80		28-Sep-00	133	2.42		28-Sep-00	157	0.41	
29-Sep-00	134	1.36	29-Sep-00	150	0.16	29-Sep-00	158			29-Sep-00	134			29-Sep-00	158		
30-Sep-00	135		30-Sep-00	151		30-Sep-00	159			30-Sep-00	135			30-Sep-00	159		

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Mas Merah Plasma Progesterone Profile 2



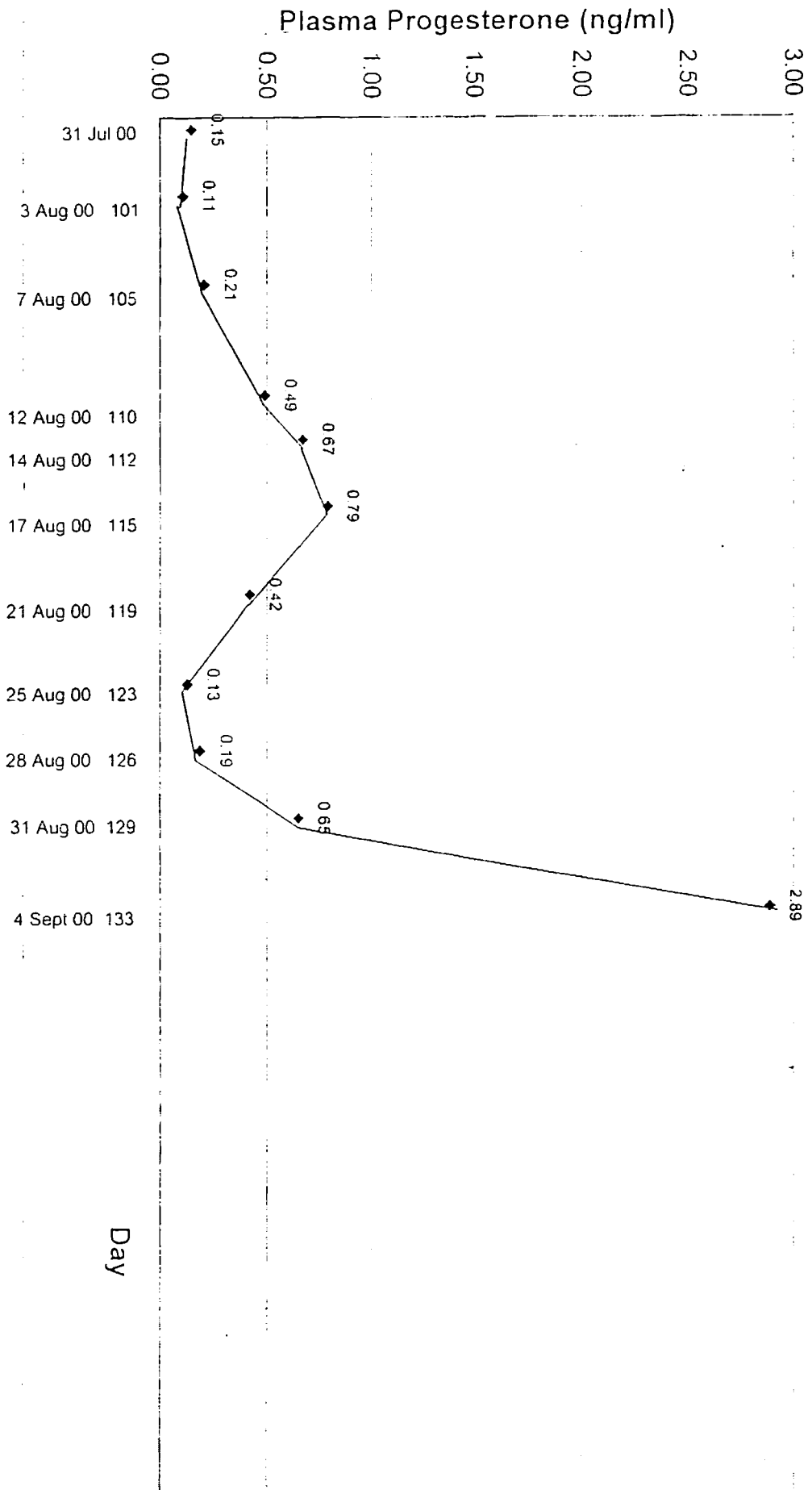
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Minah Plasma Progesterone Profile 2



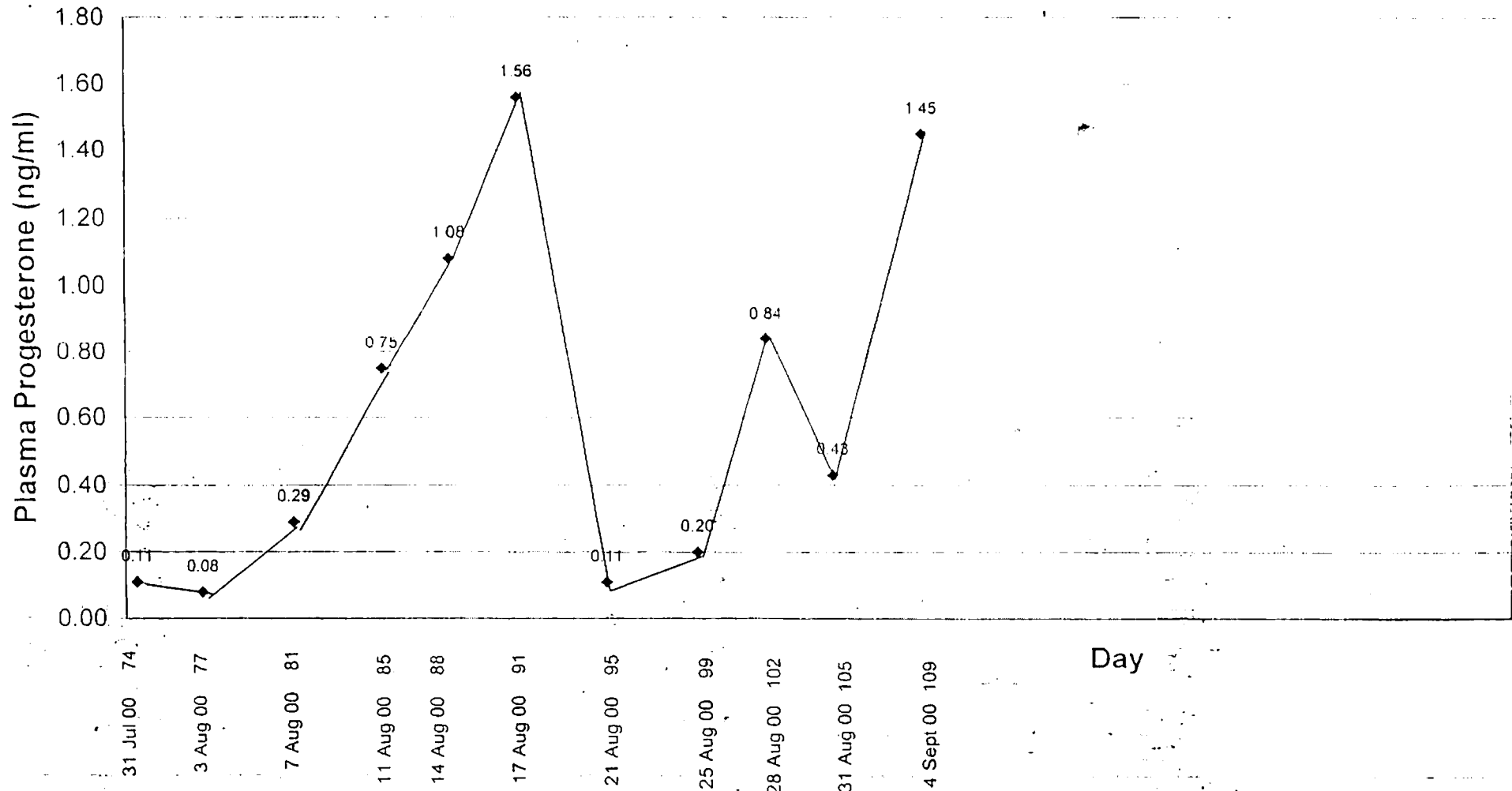
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Panjang Plasma Progesterone Profile 2

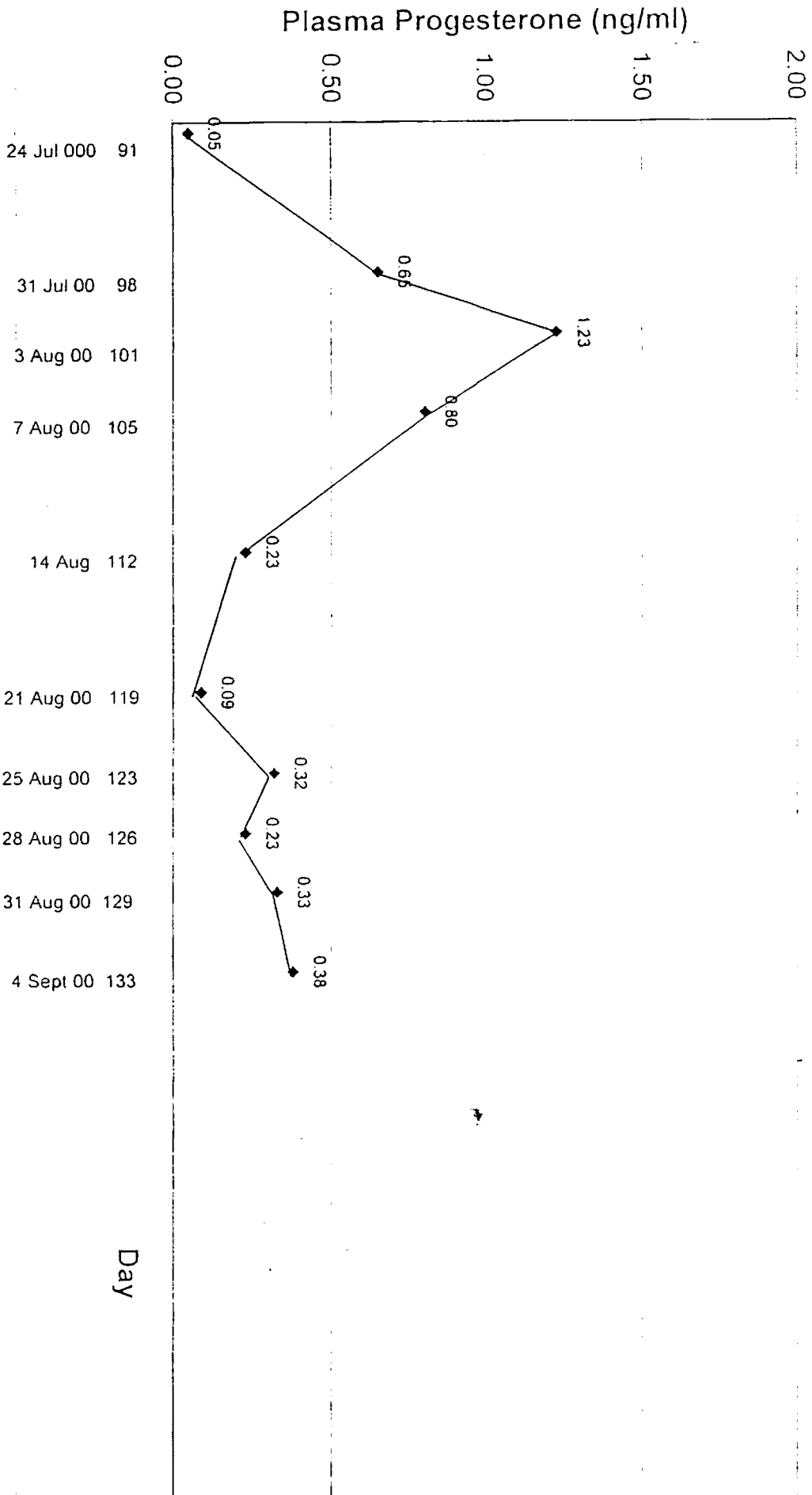


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Rima Plasma Progesterone Profile 2



SUMATRAN RHINO
Seputih Plasma Progesterone Profile 2



Breeding Observation in Sumatran Rhino Conservation Center, Sg. Dusun, October 2000

Introduction

A breeding program has been set up in this center to facilitate the breeding. This program includes the establishment of the bleeding collection from the females, the daily introduction of the male and female and also the analysis of the blood progesterone for estrus prediction. The first breeding behavior was observed after about three months of daily introduction between Mas Merah and Shah from 2/9/00 to 4/9/00. This was followed by the similar situation between Panjang and Shah from 18/9/00 to 21/9/00. On both occasions, the male failed to breed. On 5/10/00, the first mating occurred between Rima and Ara, which took about 46 minutes. Another breeding was observed after mixing Panjang and Ara and this took about 35 minutes. In this occasion, Ara was used after Shah failed to breed the female. The latest breeding took place on 19/10/00 between Seputeh and Ara. The last minute decision of mixing the rhinos resulted in breeding for about 30 minutes. These females will be bled to confirm their pregnancy on the 18th day post breeding.

Breeding of Ara and Rima (5/10/00)

Rima was predicted to be in estrus between 5/10/00 to 9/10/00. She was mixed with Ara on 5/10/00 around 8.00 a.m. in the quarter acre natural enclosure. Ara showed some interests on Rima and kept following her but Rima is not ready. She moved away from Ara and vocalized a lot. The rhinos were separated after 30 minutes of mixing. Around noon, the keeper noticed that Rima is restless and vocalized a lot. She spent her time more at the gate between the old paddock and the quarter acre. Ara was brought into the quarter acre and the rangers noted that both rhinos spent their time at the gate and Rima was very eager to enter the enclosure, vocalizing a lot.

Around 3.00 p.m., both rhinos were mixed. Ara started to follow Rima and mounted her after five minutes of pairing. He trailed Rima very closely and his nose was always at Rima's genital (anopereneal contact). Twelve mountings were recorded during the procedure and the penis was observed in all occasions. In the ninth mounting, erection was noted and Ara try to penetrate but Rima moved away. No aggression occurred. On the tenth and eleventh mounting, Ara had a full erection and he was trying to position himself to penetrate but failed. Lastly, intromission occurred on the twelfth mounting and last for about 46 minutes. About 32 thrusts were recorded during the first 20 minutes of the courtship.

Breeding of Ara and Panjang (14/10/00)

Dr. Zainal predicted that Panjang was expected to be in estrus between 8/10/00 to 12/10/00. This is based on the P4 data received until 4/9/00 and also her behavioral estrus between 18/9/00 to 21/9/00. However, Panjang did not show any signs of heat during that period but positive behavior was observed towards the end of the period and it is decided to prolong the procedure. She was paired with Shah from 8/10/00 to 14/10/00. On the 14/10/00 morning, Panjang showed signs of estrus by presenting herself to be mounted but Shah failed to breed. Therefore, Ara is put on trial.

Panjang was washed thoroughly before mixing her with Ara. She was then released into the quarter acre after releasing Ara but looked very restless and attempted to get out from the enclosure. Based on these, it was decided to mix the rhinos in the paddock. Ara was called into the night stall followed by Panjang. Then the rhinos were released into the breeding paddock. The food was provided and all personnel were on standby in case of any aggression. The procedure started at 11.30 a.m. and lasted until 4.55 p.m. Twenty-nine mountings were recorded with 15 erections and Ara was observed searching for vulva. Dr. Zainal assisted the intromission during the last mounting and it lasted for about 35 minutes. Fifteen thrusts were recorded during the procedure.

Breeding of Ara and Seputeh (19/10/00)

The decision to pair the rhinos were made on 19/10/00 afternoon after studied the P4 profile up to 2/10/00. The results were received from UPM on 16/10/00. Seputeh was predicted to be in heat between 19/10/00 to 20/10/00. Around 2.30 p.m., she was introduced in the quarter acre and Ara showed some interests but some aggression were noted. The first three mountings were observed without erection, followed by the another six mountings with erection. Three intromissions were noted and the first, second and third intromission lasted for about two, one and 35 minutes respectively. Twenty-five thrust were recorded during the last mounting.