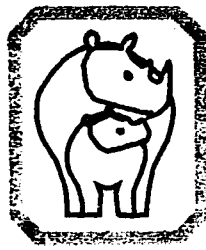


Sumatran
Rhino
Sanctuary

Way Kambas National Park



Suaka
Rhino
Sumatera

Taman Nasional Way Kambas

CURATOR'S REPORT 1999

A compilation of the materials published in the monthly Curator's Reports from the Sumatran Rhino Sanctuary (SRS) Managed Breeding Facility in Way Kambas National Park, Lampung Province, Indonesia.

Bogor, 1 August 2000

*Author: Marcellus Adi C.T.R. SRS Curator
Editor: Nico van Strien, IRF SE Asia Coordinator*

**YAYASAN SUAKA RHINO SUMATERA
DIRECTORATE GENERAL OF PROTECTION AND CONSERVATION OF NATURE,
INTERNATIONAL RHINO FOUNDATION,
TAMAN SAFARI INDONESIA,
YAYASAN MITRA RHINO.**

TABLE OF CONTENTS

THE SUMATRAN RHINO SANCTUARY FIELD STAFF	Page 4
Part 1	
FOOD and WEIGHT TABLES	Page 5
Part 2	
GENERAL OBSERVATIONS and TREATMENT RECORDS	Page 22
Part 3	
COURTSHIP BEHAVIOUR PROTOCOLS	Page 40
Part 4	
DAILY ACTIVITY PATTERNS	Page 52
Part 5	
SEASONALITY IN REPRODUCTION	Page 56

THE SUMATRAN RHINO SANCTUARY FIELD STAFF:

Animal Curator: Marcellus Adi C.T.Riyanto:

Maintenance: Sumadi

Keepers:

1. Dede Nurdin
2. Memet Mukri (*till August*)
3. Rakimin
4. Rois Subadri
5. Sugiono
6. Sukandi (*till August*)
7. Lamijo
8. Yuhadi
9. Samo (*from October*)
10. Sanur (*from October*)

House Keeper: Suratno

Cooker: Cecep Syarifudin

Guards:

1. Agripa Tumade
2. Asnawi Andalas (*till February*)
3. Sukama (*from June*)
4. Ekke (*from September*)

Driver: Surono

Veterinary Technician
(additional): Sharmy Prastiti (*from Taman Safari Indonesia*)

Part 1

FOOD and WEIGHT TABLES

JANUARY 1999

FOOD AND WEIGHT (in Kg)

Date	♀ BINA			♀ DUSUN			♂ TORGAMBA		
	Food taken		Weight	Food taken		Weight	Food taken		Weight
	Browse	Fruits		Browse	Fruits		Browse	Fruits	
1	42	8		35	10		14	7	
2	35.5	8		20	10	530	9	8.5	-
3	30.8	8	-	28	10		28	9	
4	47.5	8		22	10		25	8	
5	41	7		28	10	517	26	8	662.5
6	30.5	8	610	21.5	10		27	8	
7	31	7		25	10		21	8	
8	27.5	8		20.5	10	543	25	8	660.5
9	30.5	7	614.5	24.5	10		32	8	
10	30	8		21.7	8		21	8	
11	31	8		26.5	8	533	25	7	683.5
12	33	8	624	29	10		33	8	
13	27.5	8		24.5	8		25	8	
14	24	8		27.5	10	528	22.5	8	671
15	38.5	8	-	23	8		44.5	8	
16	22	8		28.5	10		22	8	
17	25.5	8		22.5	10	536	55.6	8	-
18	9.5	8	628.5	22	10		50.9	8	
19	39	9		22.5	10		45.7	8	
20	44	8		19.5	10	527.5	33	8	-
21	45	8	-	21.5	10		33.5	8	
22	48	6		19	9		36	8	
23	51	8		25.5	9	527.5	39	8	-
24	40.5	8	-	32.5	10		41.5	8	
25	39.5	8		23.5	10		35	8	
26	20.5	8		15	9	527	16	8	-
27	24.5	7	614.5	24	9		9	7.5	
28	20.2	7		20	9		18	7	
29	49.7	8		24	10.5	532	25	8	690.5
30	33.6	8	645.5	22	10		32.5	8	
31	39	8		19	10		33.5	8	
Mean	33.9	7.8	622.8	23.8	9.6	530.1	29.2	7.9	673.6

PRINCIPAL FOOD ITEMS (in order of importance):

BROWSE: Collected in villages and outside SRS: jackfruit (*Artocarpus heterophylla*), various *ficus sp*, various forest trees and lianas in local name: pulai (*Alstonia scholaris*), waru (*Mallotus mollucanus*), mahang hijau (*Macaranga triloba*), akar jitan (*Strophantus caudatus*), akar merah (*Mussaenda frondosa*), keputihan (*Clibadium surinaraense*), akar mencret (*Meremia peltata*), kasapan (*Croton caudatus*), and torop (*Artocarpus elasticus*).

FRUITS: banana, carrot, sweet-potato, pineapple, papaya, watermelon, roseapple, pumpkin, mango.

FEBRUARY 1999**FOOD AND WEIGHT (in Kg)**

Date	♀ BINA			♀ DUSUN			♂ TORGAMBA		
	Browse	Fruits	Weight	Browse	Fruits	Weight	Browse	Fruits	Weight
1	39.9	8		23.5	10	533.5	22.5	8	682
2	32.1	8	625.5	23	10		31	8	
3	40.3	8		28.5	10		42.5	8	
4	30.6	8		14.5	10	540	41.5	8	682
5	39.5	8	639.5	26.5	10		35.5	8	
6	34.5	8		21.5	10		40	8	
7	36.5	8		25	10	526.5	39	8	682.5
8	53	8	639.5	26	10		33	8	
9	37.5	8		22	10		47.5	8	
10	32.5	8		22.5	10		32	8	
11	39	8		21	10		30.5	8	
12	45	8		19.5	16		36	8	
13	41.5	8		26	7		37.5	8	
14	40	8		26	10		31.5	8	
15	25.7	12		27	10		44	8	
16	29.4	8		26.5	10		31.5	8	
17	27.8	8		22.5	10	538	46	8	692
18	38	8	639.5	21.5	10		29.5	8	
19	24.3	8		30	8		29	8	
20	25.8	8		31	10		35	8	
21	23.5	8		33.5	10		27	8	
22	29.5	8		29.5	10		31.5	8	
23	26	8		27.5	10		37.5	8	
24	20.6	8		22	10	530	40.5	8	703
25	22	8	625.5	33	10		28	8	
26	29	8		24	10		30.5	8	
27	15	8		23	10		31.5	8	
28	33.5	6		27.5	10		29	6	
Mean	32.6	8.1	633.9	25.1	10.0	533.6	34.7	7.9	688.3

PRINCIPAL FOOD ITEMS (in order of importance):

BROWSE: Collected in villages and outside SRS: jackfruit (*Artocarpus heterophylla*), various *ficus sp.*, various forest trees and lianas in local name: pulai (*Alstonia scholaris*), waru (*Mallotus mollucanus*), mahang hijau (*Macaranga triloba*), akar jitan (*Strophantus caudatus*), akar merah (*Mussaenda frondosa*), keputihan (*Clibadium surinaraense*), akar mencret (*Meremia peltata*), kasapan (*Croton caudatus*), and torop (*Artocarpus elasticus*).

FRUITS: banana, carrot, sweet-potato, pineapple, papaya, watermelon, roseapple, pumpkin, mango.

MARCH 1999**FOOD AND WEIGHT (in Kg)**

Date	♀ BINA			♀ DUSUN			♂ TORGAMBA		
	Browse	Fruits	Weight	Browse	Fruits	Weight	Browse	Fruits	Weight
1	35	8		34.5	8		28.5	6	
2	55	7		27.5	8		33.5	8	
3	55	8		21.5	10	540.5	42.5	8	669.5
4	39	8	623.5	17.5	10		32.7	8	
5	44	8		20	10		31.5	8	
6	34.5	9		18.5	10		35.5	7	
7	35	8		18.5	8		27	8	
8	28	8		27.5	10		34.5	8	
9	50	8		24.5	10		29	8	
10	35	8		24.5	10	542.5	34.5	8	689
11	34	8	643	25	10		46.5	8	
12	47	8		27	10		41	8	
13	31	8		28	10		33.5	8	
14	38	8		13.5	10		37	8	
15	42.5	8		24	8		36.5	8	
16	22	8		30.5	8		31	8	
17	31.5	8		22	8	533.5	42.5	8	695.5
18	23.5	8	643.5	29	10		36	8	
19	29.5	8		21	8		31.5	8	
20	39	8		29	9		27	8	
21	21	7		26	8		24.5	8	
22	38.5	8		22.5	8		29	8	
23	23	8		22.5	8		29.5	8	
24	41	8		24.5	9	537.5	27	8	-
25	37.5	8	-	22.5	9		31.5	8	
26	40	8		30.5	9		31.5	8	
27	49.5	8		25.5	10		35	8	
28	56	8		24	10		37.5	8	
29	60.5	8		18.5	8		42	8	
30	39.5	8		29	8		42.5	8	
31	41.5	8		20	8	534.5	31	8	694.5
Mean	38.6	8.0	636.7	24.2	9.0	537.7	34.0	7.9	687.1

PRINCIPAL FOOD ITEMS (in order of importance):

BROWSE: Collected in villages and outside SRS: jackfruit (*Artocarpus heterophylla*), various *ficus sp.*, various forest trees and lianas in local name: pulai (*Alstonia scholaris*), waru (*Mallotus mollucanus*), mahang hijau (*Macaranga triloba*), akar jitan (*Strophantus caudatus*), akar merah (*Mussaenda frondosa*), keputihan (*Clibadium surinaraense*), akar mencret (*Meremia peltata*), kasapan (*Croton caudatus*), and torop (*Artocarpus elasticus*).

FRUITS: banana, carrot, sweet-potato, pineapple, papaya, watermelon, roseapple, pumpkin, mango.

APRIL 1999

FOOD AND WEIGHT (in Kg)

Date	♀ BINA			♀ DUSUN			♂ TORGAMBA		
	Browse	Fruits	Weight	Browse	Fruits	Weight	Browse	Fruits	Weight
1	36	8	630	20	8		33.5	8	
2	30.5	8		18	10		28.5	8	
3	26	8		18	10		29	8	
4	28	8		18	8		29	8	
5	27	8		16.5	8		22	8	
6	17	8		26.5	8		28.5	8	
7	38.5	8		23	10	532	28	8	684
8	28.5	8	646	27	10		38	8	
9	31	8		25.5	10		33	8	
10	37	8		24.5	10		34	8	
11	40	8		17	10		34	8	
12	31	8		18.5	10		39	8	
13	36.5	8		17	10		39.5	8	
14	43	8		15	10	535	35.5	8	693.5
15	41	8	-	29	10		48	7	
16	46.5	8		25	10		39.5	8	
17	18.5	8		31.5	10		24.5	8	
18	30.5	8		24	10		28.5	8	
19	38	6		27.5	8		38.5	6	
20	23.5	7		22.5	8		38	7	
21	32.3	8		26	10	540	39	8	686.5
22	34.5	8	-	19.5	10		24.5	8	
23	28.5	8		19.5	10		29.5	8	
24	25.5	8		23	10		27.5	8	
25	27.5	8		22	9		25.5	7	
26	27.5	7		22.5	10		18.5	7	
27	21.5	8		22	10		21.5	7	
28	33	7		29	9	541.5	22.5	8	693.5
29	34.5	8	628	18	9		30	7	
30	33.5	8		25	9		32	8	
Mean	31.5	7.8	634.7	22.4	9.5	537.1	31.3	7.7	689.4

PRINCIPAL FOOD ITEMS (in order of importance):

BROWSE: Collected in villages and outside SRS: jackfruit (*Artocarpus heterophylla*), various *ficus sp*, various forest trees and lianas in local name: pulai (*Alstonia scholaris*), waru (*Mallotus mollucanus*), mahang hijau (*Macaranga triloba*), akar jitan (*Strophantus caudatus*), akar merah (*Mussaenda frondosa*), keputihan (*Clibadium surinaraense*), akar mencret (*Meremia peltata*), kasapan (*Croton caudatus*), and torop (*Artocarpus elasticus*).

FRUITS: banana, carrot, sweet-potato, pineapple, papaya, watermelon, roseapple, pumpkin, mango.

MAY 1999

FOOD AND WEIGHT (in Kg)

Date	♀ BINA			♀ DUSUN			♂ TORGAMBA		
	Browse	Fruits	Weight	Browse	Fruits	Weight	Browse	Fruits	Weight
1	32	8		20.0	10		36.0	9	
2	31	6		25.5	10		30.5	8	
3	31.5	7		26.5	8		29.0	6	
4	34	8		25.0	10		27.0	8	
5	33.5	8		24.5	10	538	26.5	8	684
6	34	8	-	22.0	10		25.5	8	
7	45	8		27.5	10		34.5	8	
8	39.5	8		21.5	10		34.0	8	
9	29.3	8		18.0	10		44.5	8	
10	28	8		26.5	10		35.5	8	
11	37	8		28.5	10		31.0	8	
12	31	8		25.0	10	534	25.0	8	683.5
13	38	7	634	21.0	10		29.5	7	
14	26	8		18.5	10		23.0	8	
15	29	8		17.5	10		34.0	8	
16	30.0	8		22.5	9		24.0	8	
17	32.0	3		19.0	9		32.0	6	
18	32.0	8		18.5	8		24.5	8	
19	20.5	8		16.0	9	540	22.5	8	704
20	30.5	8	632.5	22.5	9		29.0	7	
21	20.5	7		22.0	6		22.5	6	
22	29.7	9		25.0	9		25.0	6	
23	21.4	7		15.0	10		34.0	7	
24	45.0	7		16.0	10		39.0	7	
25	35.5	7		18.0	8		31.5	7	
26	36.5	7		19.0	8	537	33.5	9	687
27	33.5	7	630	15.5	8		31.0	7	
28	43.5	7		24.0	8		36.5	7	
29	39.5	7		19.0	10		37.0	9	
30	38.0	8		18.0	10		30.5	8	
31	36.0	9		19.5	10		24.5	9	
Mean	33.0	7.5	632.2	21.2	9.3	537.3	30.4	7.6	689.6

PRINCIPAL FOOD ITEMS (in order of importance):

BROWSE: Collected in villages and outside SRS: jackfruit (*Artocarpus heterophylla*), various *ficus sp*, various forest trees and lianas in local name: pulai (*Alstonia scholaris*), waru (*Mallotus mollucanus*), mahang hijau (*Macaranga triloba*), akar jitan (*Strophantus caudatus*), akar merah (*Mussaenda frondosa*), keputihan (*Clibadium surinaraense*), akar mencret (*Meremia peltata*), kasapan (*Croton caudatus*), and torop (*Artocarpus elasticus*).

FRUITS: banana, carrot, sweet-potato, pineapple, papaya, watermelon, roseapple, pumpkin, mango.

JUNE 1999

FOOD AND WEIGHT (in Kg)

Date	♀ BINA			♀ DUSUN			♂ TORGAMBA		
	Food taken		Weight	Food taken		Weight	Food taken		Weight
	Browse	Fruits		Browse	Fruits		Browse	Fruits	
1	31.5	7		18.5	9		23.5	7	
2	32.0	7		18.0	9	541	14.5	7	694.5
3	28.5	7	643.5	23.5	8		30.5	6	
4	38.5	7		19.0	8		27.0	7	
5	37.5	6		19.5	7		22.0	6	
6	27.0	6		25.0	6		25.0	6	
7	28.5	8		21.0	10		30.0	8	
8	31.5	6		20.0	6		24.5	5	
9	35.0	8		18.0	9	565	24.5	7	691
10	27.0	8	634	17.0	10		24.0	8	
11	25.5	7		19.0	7		27.5	7	
12	24.5	8		19.0	10		32.0	8	
13	23.5	8		20.0	9		29.5	8	
14	29.0	8		24.5	9		22.5	8	
15	29.5	8		24.0	10		30.0	16	
16	29.5	8		25	9	558.5	33.5	8	-
17	35.5	7	653	25.0	9		32.5	7	
18	27.0	8		18.0	8		29.5	8	
19	29.5	7		20.0	8		29.0	8	
20	28.0	7		21.0	8		19.5	8	
21	30.5	7		21.0	7		25.5	7	
22	35.0	7		27.0	7		24.5	7	
23	35.0	6		21.0	7	556.5	21.0	7	682
24	27.5	6	634.5	22.0	6		26.5	6	
25	34.0	7		24.5	7		25.5	7	
26	41.0	7		18.0	7		30.5	7	
27	37.0	7		23.0	7		21.0	7	
28	30.0	8		26.0	7		30.5	8	
29	31.0	8		29.0	8		25.0	8	
30	38.0	7		24.0	8	540.5	27.5	8	704.5
Mean	31.3	7.2	641.3	21.7	8.0	552.3	26.3	7.5	693.0

PRINCIPAL FOOD ITEMS (in order of importance):

BROWSE: Collected in villages and outside SRS: jackfruit (*Artocarpus heterophylla*), various *ficus sp*, various forest trees and lianas in local name: pulai (*Alstonia scholaris*), waru (*Mallotus mollucanus*), mahang hijau (*Macaranga triloba*), akar jitan (*Strophantus caudatus*), akar merah (*Mussaenda frondosa*), keputihan (*Clibadium surinaraense*), akar mencret (*Meremia peltata*), kasapan (*Croton caudatus*), and torop (*Artocarpus elasticus*).

FRUITS: banana, carrot, sweet-potato, pineapple, papaya, watermelon, roseapple, pumpkin, mango.

JULY 1999

FOOD AND WEIGHT (in Kg)

Date	♀ BINA			♀ DUSUN			♂ TORGAMBA		
	Browse	Fruits	Weight	Browse	Fruits	Weight	Browse	Fruits	Weight
1	38.5	7	651	26.0	8		29.5	7	
2	36.0	6		32.0	7		22.5	6	
3	42.5	8		21.0	8		28.5	8	
4	30.5	8		23.0	9		13.0	8	
5	51.5	7		38.0	7		47.0	7	
6	42.0	8		35.5	8		47.0	8	
7	37.5	8		18.0	9	536.5	53.5	8	691.5
8	34.5	8	642.5	21.0	8		35.5	8	
9	34.0	8		25.0	8		32.5	8	
10	33.0	8		23.5	8		31.5	8	
11	34.0	8		13.5	8		34.5	8	
12	36.0	8		27.5	8		22.5	8	
13	39.0	8		18.5	8		21.0	8	
14	31.0	7		28.0	6	545.5	25.0	7	715
15	26.0	7	635.5	24.0	7		36.0	7	
16	28.0	7		26	8		29.0	5	
17	26.5	8		11.5	8		22.0	5	
18	27.0	8		21.5	8		27.0	5	
19	34.5	8		22.0	8		27.0	8	
20	32.0	8		17.0	8		26.5	5	
21	35.5	7		23.0	7	545	27.0	5	696
22	38.0	7	644	22.0	7		28.0	5	
23	38.0	7		23.0	7		24.0	5	
24	38.0	6		26.0	6		49.0	5	
25	32.5	8		22.0	8		31.0	5	
26	29.0	8		21.0	8		18.0	4	
27	32.0	5		20.5	8		26.0	5	
28	29.0	8		25.5	8	534.5	28.5	5	685.5
29	30.5	8	647	26.5	8		21.0	5	
30	32.0	8		28.0	8		23.5	4	
31	40.5	8		21.0	8		23.5	4	
Mean	34.5	7.5	644.0	23.6	7.7	540.4	29.4	6.3	697.0

PRINCIPAL FOOD ITEMS (in order of importance): BROWSE: Collected in villages and outside SRS: *Artocarpus heterophylla*, various *ficus sp*, *Alstonia scholaris*, *Mallotus mollucanus*, *Macaranga triloba*, *Strophantus caudatus*, *Mussaenda frondosa*, *Clibadium surinaraense*, *Meremia peltata*, *Croton caudatus*, and *Artocarpus elasticus*. FRUITS: banana, carrot, sweet-potato, pineapple, papaya, watermelon, rose apple, pumpkin, mango.

AUGUST 1999

FOOD AND WEIGHT (in Kg)

Date	♀ BINA			♀ DUSUN			♂ TORGAMBA		
	Browse	Fruits	Weight	Browse	Fruits	Weight	Browse	Fruits	Weight
1	15.5	8		16.5	8		21.5	5	
2	41.5	8		26.5	7		24.0	5	
3	20.0	8		26.5	8		23.5	5	
4	27.0	8		22.0	8	560	15.0	5	690
5	26.5	8	638	27.5	8		22.0	5	
6	29.0	8		26.5	8		26.0	5	
7	30.5	7		29.5	7		26.5	6	
8	20.0	7		30.5	7		22.0	5	
9	14.0	7		15.5	8		21.0	5	
10	48.5	7		27.5	8		34.0	5	
11	24.5	8		19.5	8	547	21.5	5	686
12	11.0	7	645	17.5	7		30.5	5	
13	18.5	6		17.5	6		32.5	5	
14	29.0	6		16.5	6		25.5	5	
15	21.0	7		23.0	7		20.5	4	
16	28.0	8		28.0	8		20.0	7	
17	41.0	6		21.5	6		26.5	6	
18	31.5	7		29.0	8	542	17.0	5	-
19	36.0	7	-	20.0	7		28.5	5	
20	29.0	8		24.0	8		28.0	5	
21	30.0	7		23.0	7		30.0	5	
22	35.0	6		22.0	7		32.0	6	
23	31.0	6		19.5	7		27.0	4	
24	32.5	7		22.5	8		30.0	5	
25	17.0	7		16.0	7	546	35.5	7	677
26	33.5	6	632	26.5	6		32.5	6	
27	34.0	8		24.0	8		37.5	5	
28	30.5	7		25.5	7		26.5	5	
29	30.0	7		25.0	8		27.0	5	
30	30.0	7		24.5	8		28.5	5	
31	30.5	6		27.0	7		28.0	5	
Mean	28.3	7.1	638.3	23.2	7.4	548.8	26.5	5.2	684.3

PRINCIPAL FOOD ITEMS (in order of importance): BROWSE: Collected in villages and outside SRS: *Artocarpus heterophylla*, various *ficus sp.*, *Alstonia scholaris*, *Mallotus mollucanus*, *Macaranga triloba*, *Strophantus caudatus*, *Mussaenda frondosa*, *Clibadium surinaraense*, *Meremia peltata*, *Croton caudatus*, and *Artocarpus elasticus*. FRUITS: banana, carrot, sweet-potato, pineapple, papaya, watermelon, rose apple, pumpkin, mango.

SEPTEMBER 1999

FOOD AND WEIGHT (in Kg)

Date	♀ BINA			♀ DUSUN			♂ TORGAMBA		
	Food taken		Weight	Food taken		Weight	Food taken		Weight
	Browse	Fruits		Browse	Fruits		Browse	Fruits	
1	26.5	7		25.5	7	544.5	28.0	6	690
2	25.0	8	662.5	25.5	8		25.0	7	
3	15.5	8		21.0	8		28.5	7	
4	22.0	7		20.0	8		24.5	8	
5	32.0	8		21.5	8		24.0	7	
6	23.5	7		26.5	7		31.0	7	
7	0.0	6		23.5	6		23.5	6	
8	22.0	6		27.0	6	574.5	31.0	5	680
9	29.5	6	643	26.0	6		33.0	6	
10	23.5	7		24.5	7		30.5	7	
11	30.0	7		24.5	7		23.5	7	
12	23.0	6		18.5	6		21.5	6	
13	27.0	7		17.5	7		27.5	7	
14	37.5	7		23.0	7		23.5	7	
15	22.5	7		22.0	7	554	19.5	7	690
16	21.5	7	649	20.0	7		26.0	7	
17	16.0	7		24.0	7		24.0	7	
18	23.5	7		25.0	7		31.0	7	
19	25.5	7		19.0	7		28.0	7	
20	29.0	7		13.0	7		31.0	7	
21	19.0	7		26.0	7		29.0	7	
22	36.0	6		27.5	6	554	28.7	5	694
23	26.0	6	662	23.5	7		24.5	5	
24	26.0	7		23.5	7		34.0	7	
25	34.5	6		19.0	6		26.5	6	
26	20.5	7		23.5	7		29.0	7	
27	28.0	6		24.5	6		24.0	6	
28	46.0	7		22.5	7		25.5	7	
29	31.5	6		29.5	6	550.5	36.0	6	-
30	37.5	6	-	15.5	6		32.5	6	
Mean	26.0	6.8	654.1	22.8	6.8	555.5	27.5	6.6	688.5

PRINCIPAL FOOD ITEMS (in order of importance): BROWSE: jackfruit (*Artocarpus heterophylla*), various *ficus* sp, pulai (*Alstonia scholaris*), waru (*Mallotus mollucanus*), mahang hijau (*Macaranga triloba*), akar jitan (*Strophantus caudatus*), akar merah (*Mussaenda frondosa*), keputihan (*Clibadium surinaraense*), akar mencret (*Meremia peltata*), kasapan (*Croton caudatus*), and torop (*Artocarpus elasticus*). FRUITS: banana, carrot, sweet-potato, pineapple, papaya, watermelon, roseapple, pumpkin, mango.

OCTOBER 1999

FOOD AND WEIGHT (in Kg)

Date	♀ BINA			♀ DUSUN			♂ TORGAMBA		
	Food taken		Weight	Food taken		Weight	Food taken		Weight
	Browse	Fruits		Browse	Fruits		Browse	Fruits	
1	26.5	6		26.5	6		29.0	6	
2	27.0	7		23.5	7		31.0	7	
3	29.0	7		24.0	7		35.5	5	
4	25.0	7		22.0	7		26.0	7	
5	26.5	6		22.5	6		35.0	6	
6	37.0	7		21.5	7	549.5	25.0	7	688
7	29.0	7	645	24.0	7		32.5	7	
8	29.0	7		21.5	7		27.0	7	
9	25.5	6		20.5	6		32.0	6	
10	14.5	7		24.0	7		34.0	7	
11	35.0	7		25.5	6		19.5	7	
12	23.5	7		21.5	12		27.5	7	
13	32.5	7		12.5	8	573.5	35.5	7	691
14	35.0	7	642.5	23.0	7		30.5	7	
15	25.0	7		25.0	7		30.0	7	
16	32.5	7		18.0	7		34.0	7	
17	27.0	7		19.0	7		33.5	7	
18	31.5	6		26.0	6		33.0	6	
19	34.0	6		22.5	6		34.0	6	
20	34.5	7		21.0	7	552	20.5	7	685.5
21	55.5	7	664	26.5	7		41.5	7	
22	48.0	7		27.5	7		41.5	7	
23	29.0	7		20.0	7		43.0	7	
24	30.0	7		23.0	7		30.0	7	
25	37.0	7		15.0	7		34.0	7	
26	27.5	6		21.0	7		33.0	6	
27	33.0	7		31.5	7	542	31.0	7	708
28	19.0	7	664	28.0	7		35.5	7	
29	27.5	7		24.0	7		25.0	7	
30	33.5	6		28.5	7		31.5	6	
31	27.5	7		24.0	7		24.5	7	
Mean	30.5	6.8	653.9	23.0	7.0	554.3	31.5	6.7	693.1

PRINCIPAL FOOD ITEMS (in order of importance):

BROWSE: Collected in villages and outside SRS: jackfruit (*Artocarpus heterophylla*), various *ficus sp*, various forest trees and lianas in local name: pulai (*Alstonia scholaris*), waru (*Mallotus mollucanus*), mahang hijau (*Macaranga triloba*), akar jitan (*Strophantus caudatus*), akar merah (*Mussaenda frondosa*), keputihan (*Clibadium surinaraense*), akar mencret (*Meremia peltata*), kasapan (*Croton caudatus*), and torop (*Artocarpus elasticus*).

FRUITS: banana, carrot, sweet-potato, pineapple, papaya, watermelon, roseapple, pumpkin, mango.

NOVEMBER 1999

FOOD AND WEIGHT (in Kg)

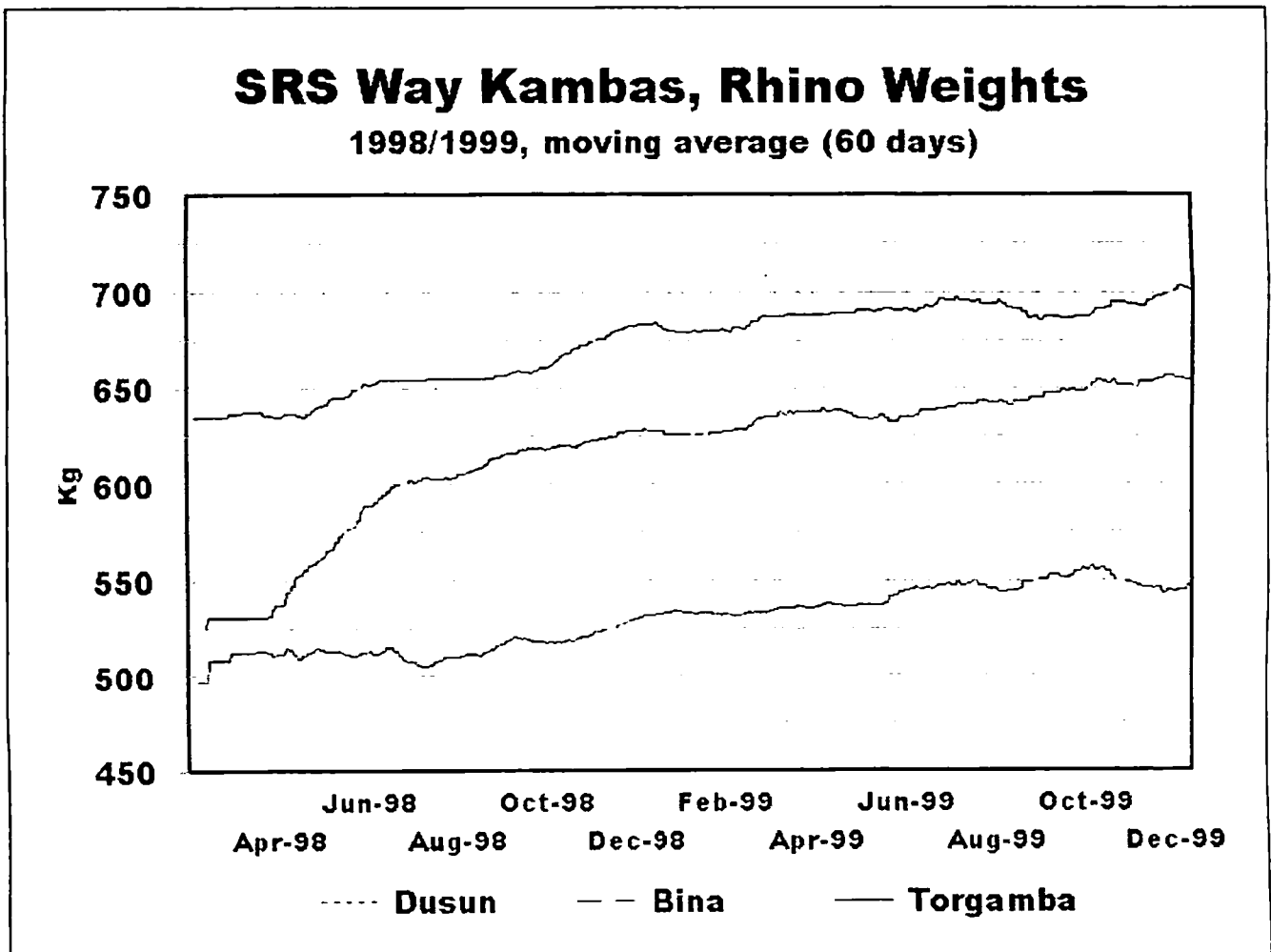
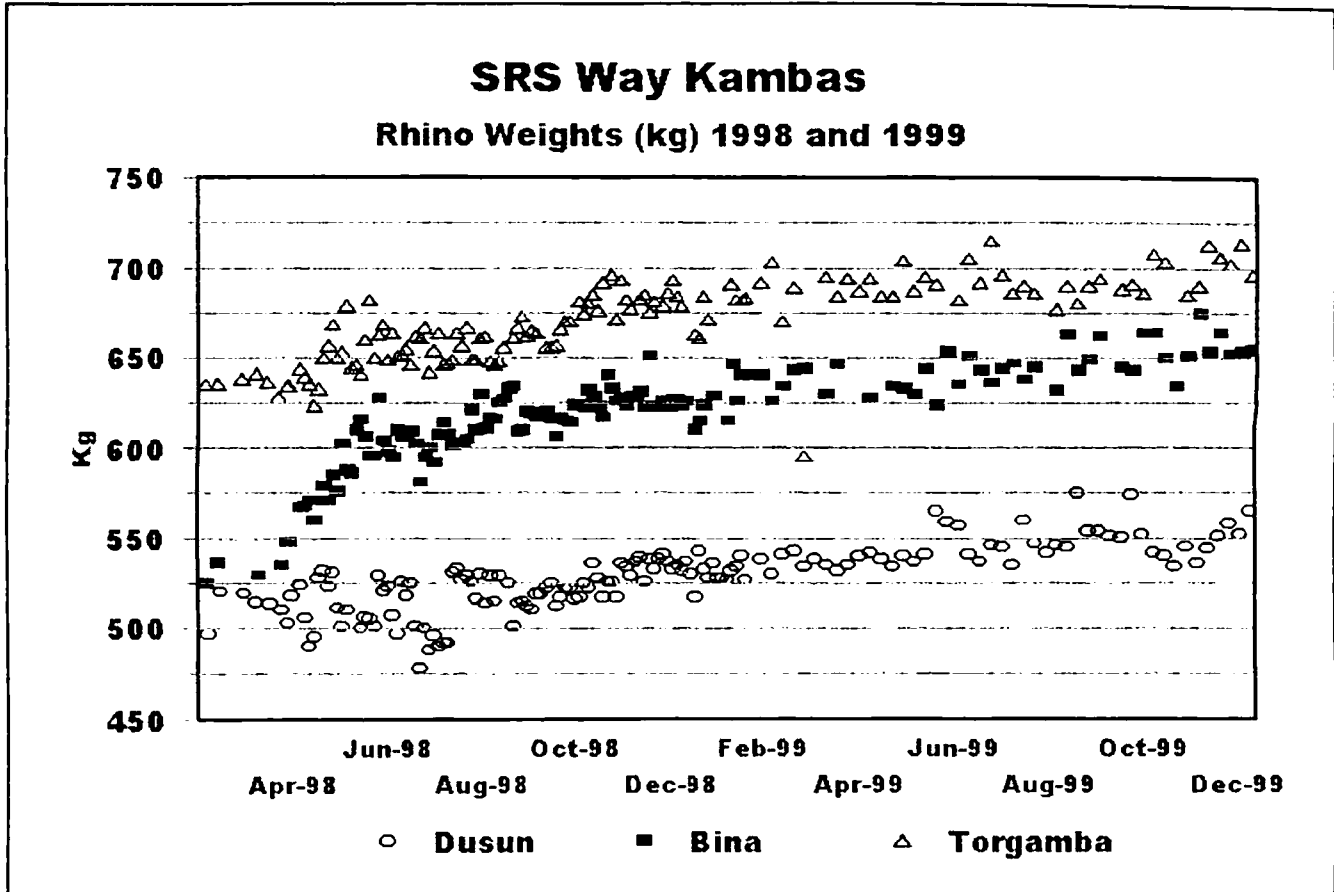
Date	♀ BINA			♀ DUSUN			♂ TORGAMBA		
	Browse	Fruits	Weight	Browse	Fruits	Weight	Browse	Fruits	Weight
1	22.5	7		27.0	7		27.0	7	
2	25.0	7		23.0	7		30.5	7	
3	27.0	7		30.5	7	540	37.0	7	703
4	31.5	6	650	25.0	6		34.5	6	
5	25.0	7		31.0	7		32.5	7	
6	26.0	6		24.0	6		27.5	6	
7	33.0	6		23.5	6		33.0	6	
8	39.0	7		26.5	7		39.5	7	
9	26.0	8		20.0	7		35.5	7	
10	33.0	6		24.5	7	533.5	38.0	6	-
11	29.5	7	633.5	26.0	6		35.0	7	
12	26.5	7		24.5	7		30.0	7	
13	29.5	6		26.0	7		34.0	6	
14	31.5	6		24.0	6		26.5	6	
15	38.5	6		19.5	6		27.0	6	
16	36.0	6		13.5	6		28.0	6	
17	48.0	6		26.5	6	544.5	35.5	5	685
18	38.5	5	650.5	25.0	5		43.5	5	
19	34.0	4		29.0	5		25.5	5	
20	33.0	7		24.5	6		23.5	7	
21	49.5	5		22.0	5		26.5	5	
22	33.5	5		26.0	5		28.5	5	
23	29.5	7		25.0	7		29.0	7	
24	31.5	7		14.5	7	536	26.0	7	690
25	23.5	7	674	32.0	7		28.0	7	
26	33.5	7		22.0	7		26.5	7	
27	29.5	7		24.5	7		28.5	7	
28	28.0	7		27.5	7		27.0	7	
29	24.0	6		26.5	6		29.0	6	
30	25.5	5		29.0	5		25.5	5	
Mean	31.4	6.3	652.0	24.8	6.3	538.5	30.6	6.3	692.7

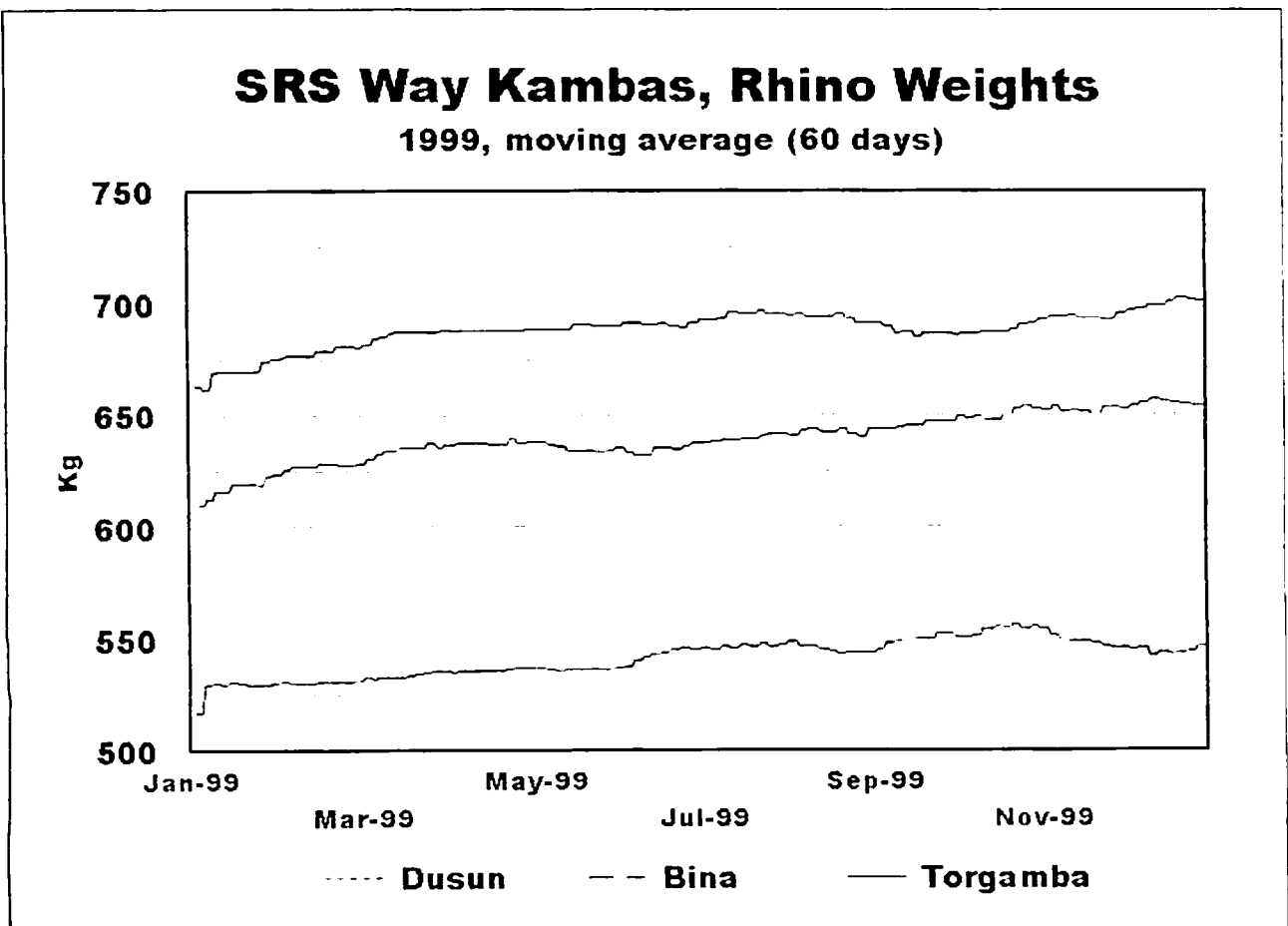
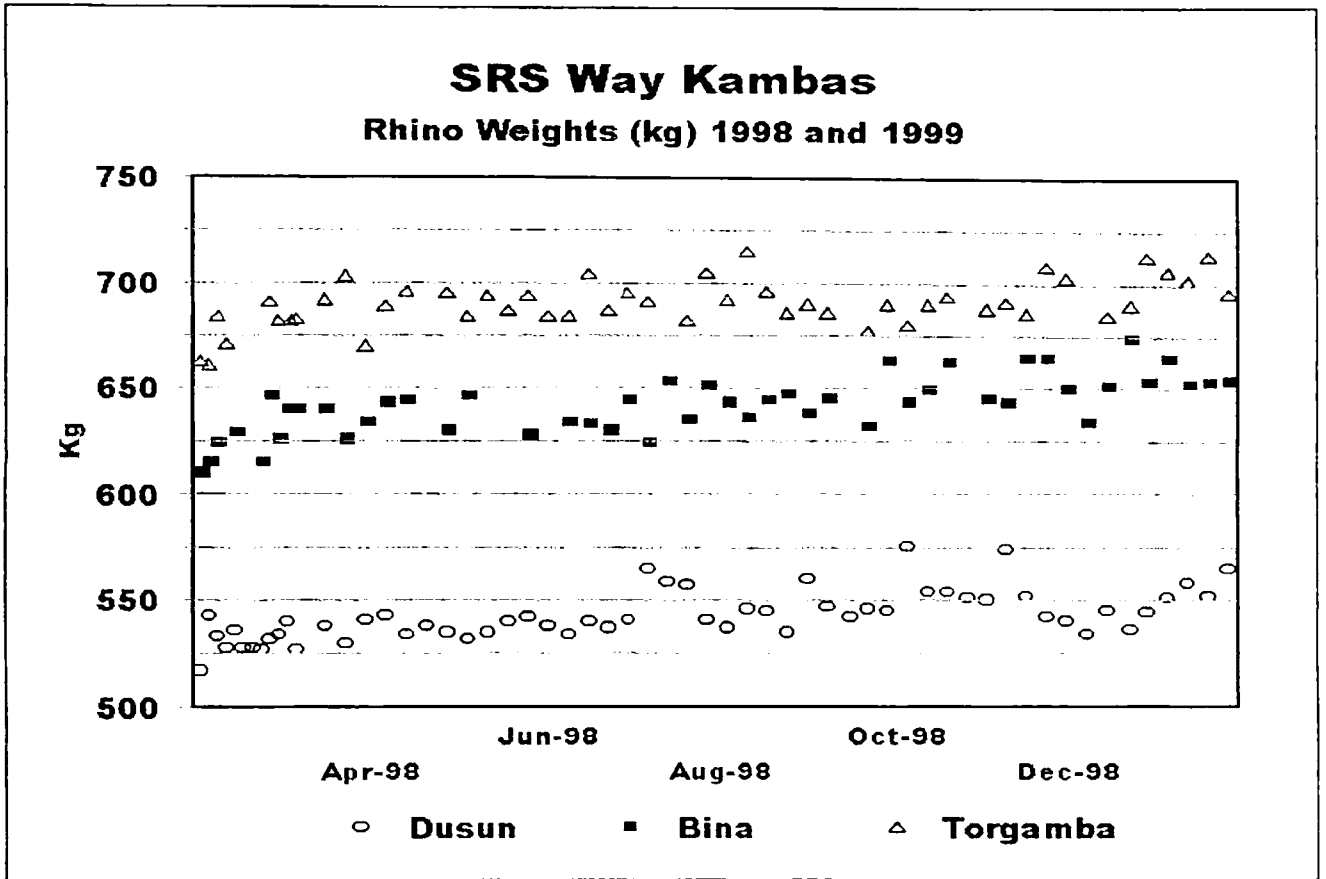
PRINCIPAL FOOD ITEMS (in order of importance): BROWSE: Collected in villages and outside SRS: jackfruit (*Artocarpus heterophylla*), various *ficus* sp, various forest trees and lianas in local name: pulai (*Alstonia scholaris*), waru (*Mallotus mollucanus*), mahang hijau (*Macaranga triloba*), akar jitan (*Strophantus caudatus*), akar merah (*Mussaenda frondosa*), keputihan (*Clibadium surinaraense*), akar mencret (*Meremia peltata*), kasapan (*Croton caudatus*), and torop (*Artocarpus elasticus*). FRUITS: banana, carrot, sweet-potato, pineapple, papaya, watermelon, roseapple, pumpkin, mango.

DECEMBER 1999**FOOD AND WEIGHT (in Kg)**

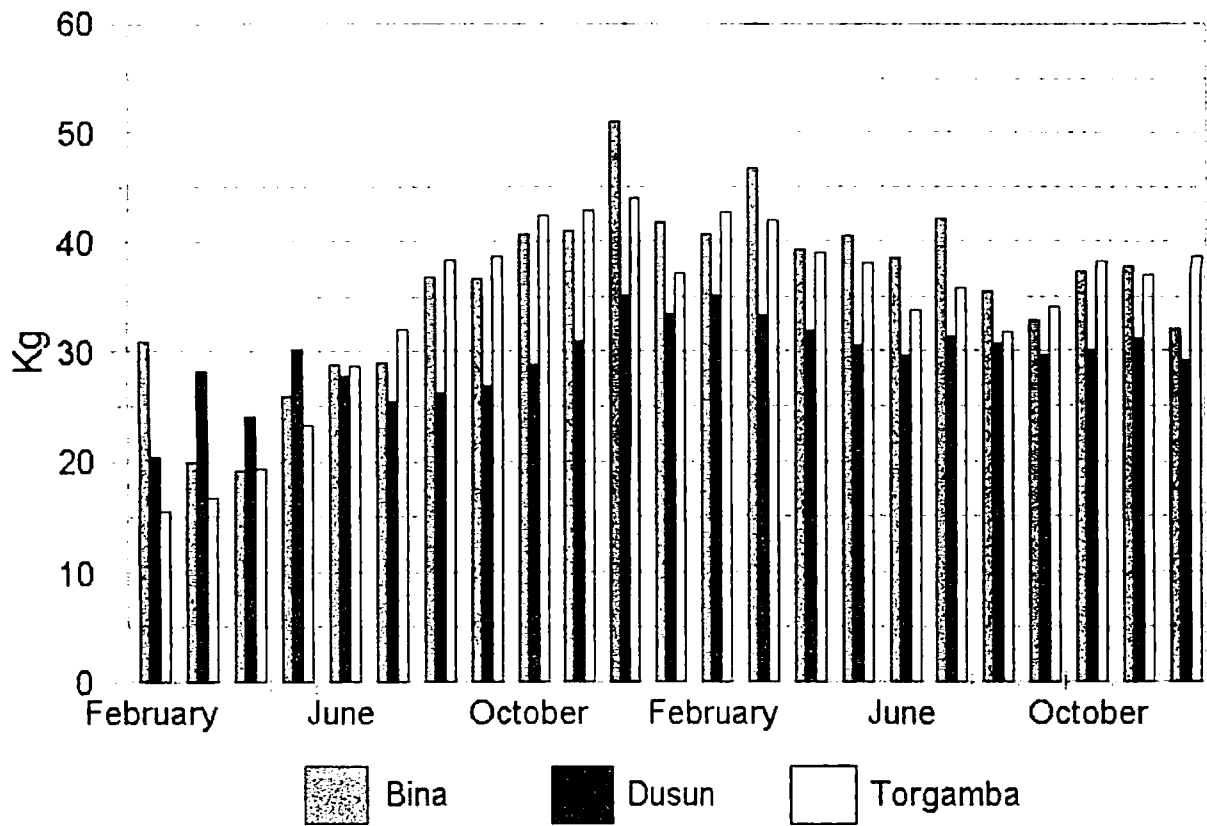
Date	♀ BINA			♀ DUSUN			♂ TORGAMBA		
	Browse	Fruits	Weight	Browse	Fruits	Weight	Browse	Fruits	Weight
1	35.0	5		28.0	5	544	29.5	5	713
2	35.5	4	653	26.0	5		35.5	4	
3	32.0	5		25.5	5		32.0	5	
4	39.5	5		19.5	5		37.5	5	
5	31.0	5		22.5	5		31.5	5	
6	31.0	5		26.5	5		30.0	5	
7	25.0	3		25.5	3		27.5	3	
8	28.0	5		23.5	5	551	37.0	5	706
9	28.0	5	664	24.0	5		32.0	5	
10	27.0	5		16.0	5		36.5	5	
11	33.5	7		21.5	6.5		25.5	6	
12	28.0	7		26.5	7		28.0	7	
13	28.0	5		18.4	5		34.0	5	
14	35.0	7		22.0	7		36.5	7	
15	20.5	7		19.0	7	558	27.0	7	702
16	32.5	7	652	23.0	7		24.0	7	
17	33.0	6		19.5	7		28.0	6	
18	31.5	7		27.0	7		26.0	7	
19	26.0	7		17.0	7		34.0	7	
20	27.0	7		17.0	7		38.0	7	
21	46.0	7		27.5	7		34.0	7	
22	37.5	6		25.5	7	551.5	29.5	5	714
23	39.0	7	652.5	22.5	7		39.0	7	
24	37.0	7		30.0	7		37.0	7	
25	34.5	7		26.0	7		34.5	7	
26	25.0	6		22.5	7		36.5	7	
27	26.0	7		29.0	7		34.0	7	
28	22.5	7		22.0	7		38.0	7	
29	15.5	7		19.5	7	564.5	36.5	7	695.5
30	24.0	7	653.5	14.0	7		35.0	7	
31	26.0	7		24.0	7		24.0	7	
Mean	30.3	6.1	655.0	22.9	6.2	553.8	32.5	6.1	706.1

PRINCIPAL FOOD ITEMS (in order of importance): BROWSE: Collected in villages and outside SRS: jackfruit (*Artocarpus heterophylla*), various *ficus sp*, various forest trees and lianas in local name: pulai (*Alstonia scholaris*), waru (*Mallotus mollucanus*), mahang hijau (*Macaranga triloba*), akar jitan (*Strophantus caudatus*), akar merah (*Mussaenda frondosa*), keputihan (*Clibadium surinaraense*), akar mencret (*Meremia peltata*), kasapan (*Croton caudatus*), and torop (*Artocarpus elasticus*). FRUITS: banana, carrot, sweet-potato, pineapple, papaya, watermelon, roseapple, pumpkin, mango.

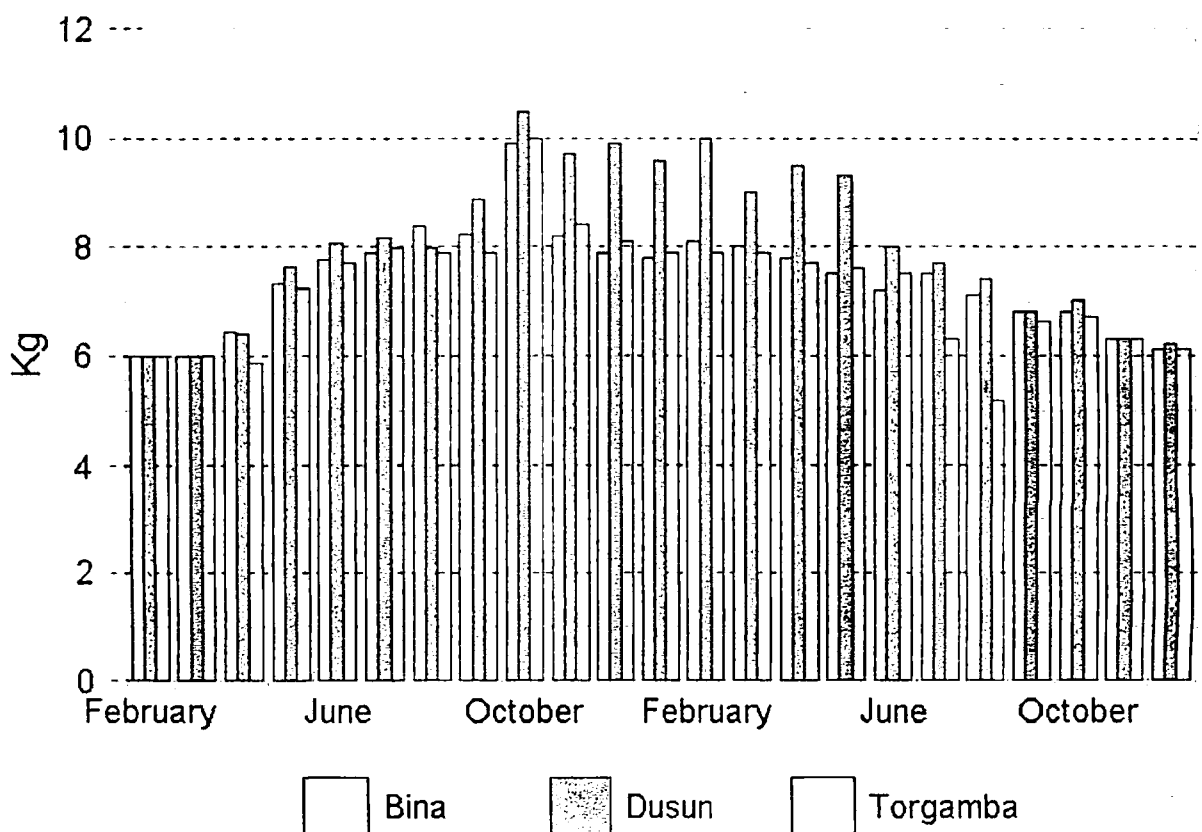


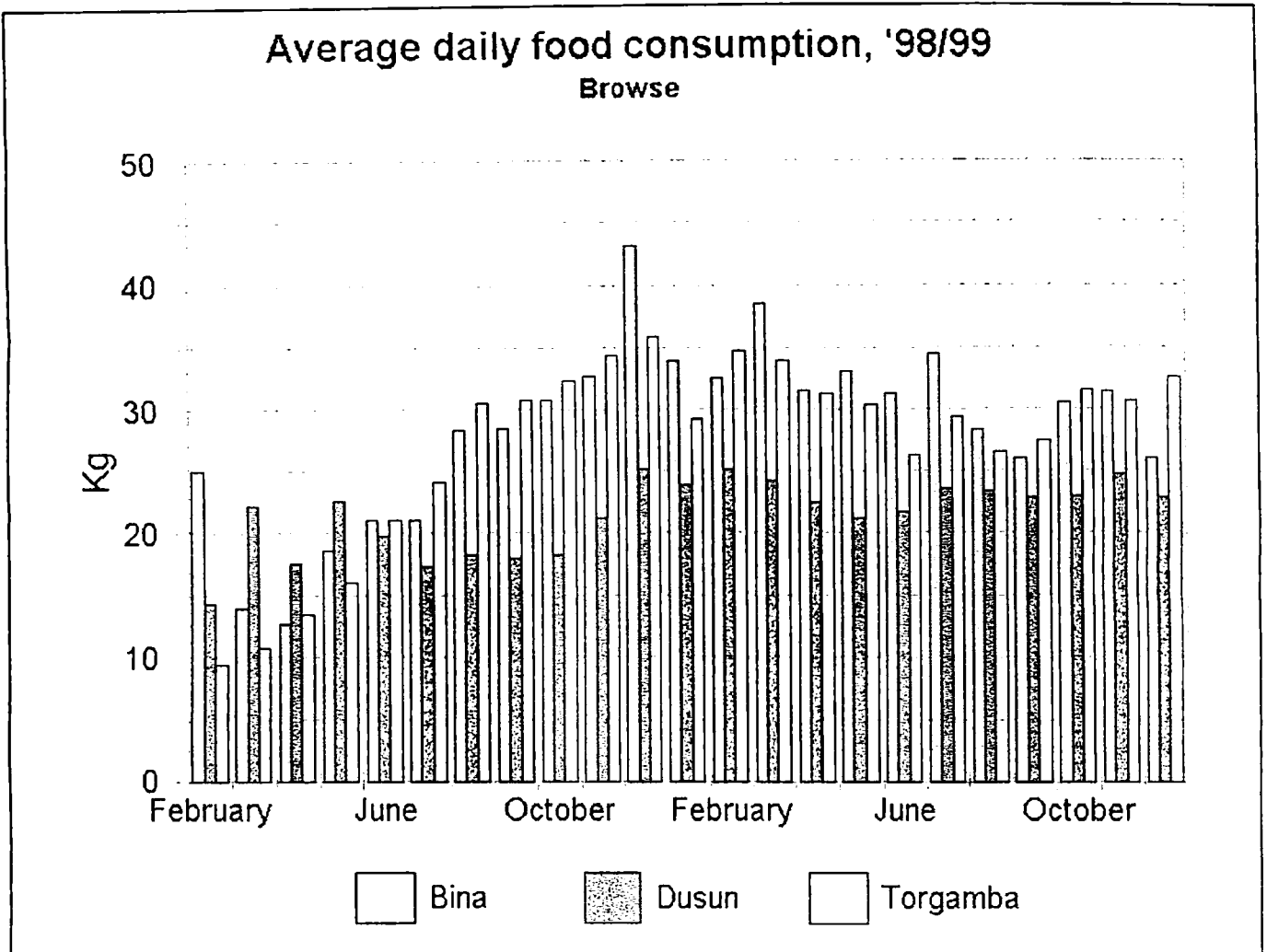


Average daily food consumption, '98/99 Browse and Fruits



Average daily food consumption, '98/99 Fruits





Part 2

**GENERAL OBSERVATIONS
and
TREATMENT RECORDS**

JANUARY 1999

EVENTS AND ACTIVITY

♀ BINA	<ul style="list-style-type: none"> - It was planned to keep in the central area together with Torgamba at 27 December 1998 - 3 January 1999 for observed during estrus period. But because Torgamba was sick at 30 December they were be separated. - At 4 January, 9:00 AM, Bina attacked one of her keeper, Dede, close to the gate to the central area. It looks like that Bina still willing to see Torgamba and like to go to Central Area. There was not so serious injures for the keeper. - At 15 - 24 January Bina stayed with Torgamba in central area during the period of Bina. - <i>Daily activities patterns in Part 4.</i>
♀ DUSUN	<ul style="list-style-type: none"> - <i>Daily activities patterns in Part 4.</i>
♂ TORGAMBA	<ul style="list-style-type: none"> - In the central area together with Bina only until 30 December, and separated because Torgamba was sick. - <i>Daily activities patterns in Part 4.</i> - At 15 - 24 January Torgamba stayed with Bina in central area during the period of Bina.

MEDICATION and SPECIAL TREATMENTS

♀ BINA	<p>Conjunctivitis on both eyes,</p> <ul style="list-style-type: none"> - Still treated with ZnSO₄. The clouded spot on both eyes disappear little by little.
♀ DUSUN	<p>Conjunctivitis on both eyes,</p> <ul style="list-style-type: none"> - Still treated with ZnSO₄, very little improvement. - Dusun right eyes still have respond. - No discharge appeared from eyes <p>Eye Discharge</p> <ul style="list-style-type: none"> - No discharge from eyes
♂ TORGAMBA	<p>Stomach Disorder</p> <ul style="list-style-type: none"> - At 29 Dec 1998 - 5 January 1999, it was found that Torgamba got a stomach disorder. - Detail report already wrote in December 1998 Curator Report <p>TAIL WOUND: <i>Topical:</i> Peroxide (H₂O₂), Betadine, Gusanex, Vit A & D Ointment, Yunan Paiyao powder. <i>Oral:</i> Ascorbec tablet, B complex tablet.</p>

REPRODUCTION

♀ BINA	<ul style="list-style-type: none"> - The estrus period at December 1998 - January 1999 should be on 30 Dec - 3 January 1999. In this period Bina was stay with Torgamba only until 30 Dec. We separated them because Torgamba was sick. - No serious courtship was observed during this period - At 1 and 2 January it was seen that the vulva was redness and swollen. But no discharge was observed. - The second period happened at 20 - 22 January 1999, but no single mounting was observed. <i>See Part 3.</i>
♀ DUSUN	No signs of heat.
♂ TORGAMBA	<ul style="list-style-type: none"> - No serious courtship was observed during the estrus period on 29 December - 3 January 1999. - We separated them at 30 December because Torgamba was sick. - During the period of Bina at 20 - 22 January, in observed there was no single try of Torgamba to mounting Bina.

FEBRUARY 1999

EVENTS AND ACTIVITY	
♀ BINA	<ul style="list-style-type: none"> - Kept together with Torgamba in the central area at 9 - 13 February, during the estrus period - Ultrasound examination and blood sample collection at 14 and 15 February for reproduction status - <i>Daily activities patterns in Part 4.</i>
♀ DUSUN	<ul style="list-style-type: none"> - Ultrasound examination for reproduction status at 12 February - Blood sample collection at 13 February - <i>Daily activities patterns in Part 4.</i>
♂ TORGAMBA	<ul style="list-style-type: none"> - In the central area together with Bina from 9 - 13 February. - Semen collection experiment at 14 February - <i>Daily activities patterns in Part 4.</i>
MEDICATION and SPECIAL TREATMENTS	
♀ BINA	<p>Conjunctivitis on both eyes,</p> <ul style="list-style-type: none"> - Still treated with ZnSO₄. The clouded spot on both eyes disappear little by little.
♀ DUSUN	<p>Conjunctivitis on both eyes,</p> <ul style="list-style-type: none"> - Still treated with ZnSO₄, very little improvement. - Dusun right eyes have better respond. Sometime the left eyes also make a respond, but sometime not. - No discharge appeared from eyes
♂ TORGAMBA	<p>Eye Discharge</p> <ul style="list-style-type: none"> - No discharge from eyes <p>Horn Reducing</p> <ul style="list-style-type: none"> - Both of Torgamba's horn become thin because he always rub it. The latest condition was the second horn looks like become cut on the base part. It seems soon will be trim.
REPRODUCTION	
♀ BINA	<ul style="list-style-type: none"> - The estrus period at February was detect at 10 - 12. The sign which had seen only the swollen of vulva. - No serious courtship was observed during this period - From the ultrasound examination, the temporary result was no pregnancy detected but Bina have good condition in her genitalia tracts and cycle on ovary
♀ DUSUN	<ul style="list-style-type: none"> - No signs of heat. - Ultrasound examinations showed that Dusun has a problem with her uterus. Seems like there is a mass object inside the uterus. It is probably causes the continuous producing milk since 1991 when there was a prediction of pregnancy.
♂ TORGAMBA	<ul style="list-style-type: none"> - No serious courtship was observed during Bina estrus period on 10 - 11 February 1999. - The experiment of semen collection using massage method only can result a seminal fluid with reddish color. With a simple method examination under microscope, it was found some death sperm on a abnormal form.

MARCH 1999

EVENTS AND ACTIVITY	
♀ BINA	<ul style="list-style-type: none"> - Kept together with Torgamba in the central area at 2 - 7 March and 22 - 29 March during the estrus period - <i>Daily activities patterns in Part 4.</i>
♀ DUSUN	<ul style="list-style-type: none"> - <i>Daily activities patterns in Part 4.</i>
♂ TORGAMBA	<ul style="list-style-type: none"> - In the central area together with Bina from 2 - 7 March and 22 - 29 March. - The posterior horn was broken at around midnight 6 March after courtship with Bina. - <i>Daily activities patterns in Part 4.</i>
MEDICATION and SPECIAL TREATMENTS	
♀ BINA	Conjunctivitis on both eyes, <ul style="list-style-type: none"> - Still treated with ZnSO₄. The clouded spot on both eyes disappear little by little. - No discharge appeared from eyes
♀ DUSUN	Conjunctivitis on both eyes, <ul style="list-style-type: none"> - Still treated with ZnSO₄, very little improvement. - No discharge appeared from eyes
♂ TORGAMBA	Eye Discharge <ul style="list-style-type: none"> - No discharge from eyes Posterior Horn <ul style="list-style-type: none"> - Torgamba was seen in the central area at 23:45 March 6, - during put together with Bina - just walked and looked that the posterior was broken. Couple minutes before it was seen that they were doing hard horn to horn pushing on a courtship - Directly brought him to his stall and checking that maybe there was a wound left. In the base of the horn the hill like still exist with a hole wells right on the central. Only some very small blood spot was found. No serious wound. - Treat with betadine and topical antibiotic ointment and SWAT (fly repellent).
REPRODUCTION	
♀ BINA	<ul style="list-style-type: none"> - The estrus period at February was detect at 3 - 5. The signs which had seen only the swollen and reddish of vulva. - Some serious courtship was observed during this period but no mounting - At 6 March Torgamba started to totally avoid Bina, after the broken of the second horn - During the second period (22 - 29 March) the signs of estrus which had detected at 25 - 26 March were the swollen and reddish of vulva.
♀ DUSUN	<ul style="list-style-type: none"> - No signs of heat.
♂ TORGAMBA	<ul style="list-style-type: none"> - some serious courtship was observed during Bina estrus period on 2 - 5 March. - It seemed that the broken of posterior horn influence Torgamba started to avoid Bina at 6 March. Although there was no wound, but it looked he feel hurt when something push on his head specially around the second horn. - No mounting and serious courtship was seen during the second period at 22 - 29 March.

MISCELLANEOUS**Wild rhino, 3 March 1999**

One of the guard, Eman, saw a young wild rhino was walking in the road in front of SRS Base Camp at 15:00 o'clock. The rhino was panic after looked at Eman, and suddenly turn and broke through perimeter fence and come into Torgamba's paddock. Torgamba was not in his paddock, because still together with Bina in central area. After checked the foot track along the road, it was confirmed that it was a sumatran rhino with foot size around 18 cm. We thought that the rhino can break through the fence because the

electric was off. We turned on the electric fence. Some of the keeper try to check along the fence in the border of second paddock of Torgamba because the electric can not be on. After around 30 minutes, the rhino was seen by some keeper close to Torgamba's stall. The rhino become panic again and suddenly break through the perimeter fence while the electric already on and going out. The body size of rhino looked similar with Dusun (about same tall) but not so fat like Dusun.

Wild elephant, 28 - 30 March 1999

A group of wild elephant forage and stayed in around perimeter road close to first swamp from Torgamba's paddock. They coming mostly in the night. Patrol saw the group consist 5 animals laying down around fence post # 650 at 3:00 o'clock 30 March. No fence was destroyed and even no foot track was seen cross the road and close to the fence.

APRIL 1999

EVENTS AND ACTIVITY	
♀ BINA	<ul style="list-style-type: none"> - Kept together with Torgamba in the central area at 14 - 17 April during the estrus period - <i>Daily activities patterns in Part 4.</i>
♀ DUSUN	<ul style="list-style-type: none"> - <i>Daily activities patterns in Part 4.</i>
♂ TORGAMBA	<ul style="list-style-type: none"> - In the central area together with Bina from 14 - 17 April. - <i>Daily activities patterns in Part 4.</i>
MEDICATION and SPECIAL TREATMENTS	
♀ BINA	<p>Conjunctivitis on both eyes,</p> <ul style="list-style-type: none"> - Still treated with ZnSO₄. Good improvement on left eye. The right eye improvement also good but less than the left one. - No discharge appeared from both eyes
♀ DUSUN	<p>Conjunctivitis on both eyes,</p> <ul style="list-style-type: none"> - Still treated with ZnSO₄, good improvement on eye response. - No discharge appeared from both eyes
♂ TORGAMBA	<p>Eye Discharge</p> <ul style="list-style-type: none"> - No discharge from both eyes <p>The posterior horn broken</p> <ul style="list-style-type: none"> - The hole on the base of the horn started to become harder and harder. Also the skin not so soft like when the horn just broken.
REPRODUCTION	
♀ BINA	<ul style="list-style-type: none"> - The estrus period at April was detected at 15 - 16. The signs which had been seen only the swollen and reddish of vulva. - Some serious courtship and mounting by Torgamba was observed specially on 15.
♀ DUSUN	<ul style="list-style-type: none"> - No signs of heat.
♂ TORGAMBA	<ul style="list-style-type: none"> - some serious mounting was observed during the whole day of 15 April, but no erection was observed. Most of the mounting happened in the night. - Just after one day, Torgamba looks no more interest on doing mounting.

MAY 1999

EVENTS AND ACTIVITY	
♀ BINA	<ul style="list-style-type: none"> - 4 May, 08.07 am, just after a lick of the saltlick, Bina make a strange voice, open her mouth and stand silent. She suddenly lay down and for her keeper it was unusual behave. But she woke up after some minutes and just eat normally. - She then licked again the saltlick and same symptoms occurred. It was happened 3 times in total. But still no effect on her appetite. The symptoms come most possibility because the effect of the heat of lime in the saltlick mix, which is for the first time the saltlick mix contents of salt, soil, water and lime. The new saltlick mix was cleaned from its place immediately. The problem solved in a day. - But Torgamba also lick the same saltlick but no effect. - Keep together with Torgamba in May 2 times: 3 - 8 and 24 - 30 May. In the first period they were separated at 3 because some fight (no injuries) and at 4 because Bina sick. Continue at 5 until 8.
♀ DUSUN	<ul style="list-style-type: none"> - <i>Daily activities patterns in Part 4.</i>
♂ TORGAMBA	<ul style="list-style-type: none"> - The front horn broken at May 1. Finding the pieces and found it at 3 May. - In the central area together with Bina from 3 - 8 May , but separated at 3 because some fight (no injuries) and at 4 because Bina sick. Since 5 they were together until 8. - Second period at May, they kept together at 24 - 230 May.
MEDICATION and SPECIAL TREATMENTS	
♀ BINA	<p>A weakness and hyperemia in mouth mucosa,</p> <ul style="list-style-type: none"> - This weakness of Bina only a light shock because the effect of the heat of lime in the saltlick mix. There were some little hyperemia in mucosa of lips. - Treated with Norit (becarbon) for prevent the possibility of poisoning. Defecation and urination was normal. She totally recovered in the evening. <p>Conjunctivitis on both eyes,</p> <ul style="list-style-type: none"> - Still treated with ZnSO₄, good improvement on the cloud of eye. - No discharge appeared from both eyes
♀ DUSUN	<p>Conjunctivitis on both eyes,</p> <ul style="list-style-type: none"> - Still treated with ZnSO₄, good improvement on eye response. - No discharge appeared from both eyes
♂ TORGAMBA	<p>Eye Discharge</p> <ul style="list-style-type: none"> - No discharge from both eyes <p>The anterior horn broken</p> <ul style="list-style-type: none"> - The horn broken at 1 May and its broken 7 cm from the base. No wounds was found.
REPRODUCTION	
♀ BINA	<ul style="list-style-type: none"> - The estrus period at May was detect at 6 - 7. The signed which had seen only the swollen and reddish of vulva. - Some serious courtship and mounting by Torgamba was observed specially on 7. - There was one time intromission occurred at 7 May hour 00:17 - 00:20, but penis can only penetrated 10 cm long. <i>See part 3.</i> - At second period; 24 - 30 May, there were 17 times mounting by Torgamba but no intromission. <i>See part 3.</i>
♀ DUSUN	<ul style="list-style-type: none"> - No signs of heat.
♂ TORGAMBA	<ul style="list-style-type: none"> - At least 9 times mounting was observed during 7 May, with one intromission at hour 00:17 - 00:20. Most of the mounting happened in the day light between 7:00 - 12:00 am. No more interest after 12:00. - At second period; 24 - 30 May, there were 17 times mounting by Torgamba specially on 28 night and 29 morning, but no intromission at all. <i>See part 3.</i>

NOTES

May 1, 1999:

Torgamba's anterior horn was broken. It was broken 5 cm from the base. It was not broken from the base like the posterior horn. He was appeared in the stall without the horn. That day he behaved also more wild. The worker try to find the piece of the horn and found it at 3 May in a place in the middle of his paddock.

JUNE 1999

EVENTS AND ACTIVITY	
♀ BINA	<ul style="list-style-type: none"> - At 14 June keep in the central area together with Torgamba for the estrus period at 17 - 18 June, because something strange happened with Torgamba at the night of 14, Bina was brought by her keeper back to her paddock at 15. - <i>Daily activities patterns in Part 4.</i>
♀ DUSUN	<ul style="list-style-type: none"> - <i>Daily activities patterns in Part 4.</i>
♂ TORGAMBA	<ul style="list-style-type: none"> - In the central area at 14 June 20.00, after just keep together with Bina in the afternoon, Torgamba suddenly run many times and looked very nervous. It is too dark to see what happened with him. It seems no connection with Bina. Bina also run whenever Torgamba start running but with different direction. No chasing between them. At 15 June 1:00 AM, Torgamba was brought to separate with Bina for checking his problem easily. He entered his paddock but still nervous and run; waiting him in the stall and he entered the stall about 1:30 o'clock. The new wound without bleeding was found close to his nose. The skin was lose about 5 cm wide. For 2 hours in the stall walked fast round and round and very nervous. Very easy disturb by any sound. He does not want to come to his stall since that. - In the forest at day time 16 June still looked eating but not so much. Running away when heard any sound. But when stop he allowed his keeper to feed him. No defecation. - Found his faeces 17 June morning. Still nervous in the forest but not so many running. - Start come inside to the stall at 18 June afternoon, but still easy to nervous when hear sound of wood and metal tools. - Become relax since 20 June but still difficult to invite to come to the stall. He can only come if he wanted. Keeper can only follow him. Still nervous when there was a big sound like big branch of tree fall down, and avoid approach the central area. - More relax start at 24 and can follow the call from his keeper. - Become normal and follow call form his keeper and come inside to Central Area at 30 June.
MEDICATION and SPECIAL TREATMENTS	
♀ BINA	<p>Conjunctivitis on both eyes,</p> <ul style="list-style-type: none"> - Still treated with ZnSO₄, better improvement on the cloud of eye. - No discharge appeared from both eyes
♀ DUSUN	<p>Conjunctivitis on both eyes,</p> <ul style="list-style-type: none"> - Still treated with ZnSO₄, good improvement on eye response. - No discharge appeared from both eyes
♂ TORGAMBA	<p>Eye white spot and discharge</p> <ul style="list-style-type: none"> - 1 June 7:20, little white spot and discharge was found in the right eye. Treated with Garamycin eye ointment and ZnSO₄ for 5 days. It is heal. <p>Nervous, wound and possibly stomach pain.</p> <ul style="list-style-type: none"> - In his stall 15 June 1:00 AM, treated with diazepam tablet 10 mg for the nervous, betadine for the wound and Tympasol for possibilities of stomach pain. Nervous still continue but is decreasing. He does not like to back to his stall; in the forest easily afraid by sound around him (broken wood, etc). No problem on appetite. Urination and defecation is normal.
REPRODUCTION	
♀ BINA	<ul style="list-style-type: none"> - The estrus period without the male still come at 16 - 19 June. The sign was seen: Bina's vulva was reddish at 16 - 18 June and fully swollen at 18 June. No discharge was observed.
♀ DUSUN	
♂ TORGAMBA	

JULY 1999

EVENTS AND ACTIVITY	
♀ BINA	<ul style="list-style-type: none"> - On 5 - 11 July keep together with Torgamba in central area and sometimes in Torgamba's paddock for the estrus had expected on 7 - 9 July - Together again with Torgamba at 31 July - 4 August for the expected estrus period at 31 July - 1 August. This time Torgamba was directly entered Bina's paddock. - <i>Daily activities patterns in Part 4.</i>
♀ DUSUN	<ul style="list-style-type: none"> - <i>Daily activities patterns in Part 4.</i>
♂ TORGAMBA	<ul style="list-style-type: none"> - At 5 July keep in the central area together with Bina for the estrus had expected on 7 - 9 July. Torgamba did not have good response to doing courtship and sometimes still nervous when being together with Bina. Sometime run only because little sound. Seems that still trauma with the situation before although not looked so much nervous. - Together with Bina in Bina's paddock start from 31 July for the estrus period expected on 31 July - 1 August.
MEDICATION and SPECIAL TREATMENTS	
♀ BINA	<p>Conjunctivitis on both eyes,</p> <ul style="list-style-type: none"> - Still treated with ZnSO₄. better improvement on the cloud of eye. - No discharge appeared from both eyes
♀ DUSUN	<p>Conjunctivitis on both eyes,</p> <ul style="list-style-type: none"> - Still treated with ZnSO₄, much better improvement on eye response. The white cloud in left eye more disappear - No discharge appeared from both eyes
♂ TORGAMBA	<p>The Eye</p> <ul style="list-style-type: none"> - No more little white spot and discharge.
REPRODUCTION	
♀ BINA	<p>The period of 7 - 11 July</p> <ul style="list-style-type: none"> - The estrus period at 7 - 11 showed with the signs on the vulva changes: the reddish and swollen appear at 7 until 8, but become pale at 9 and 10, and become red and swollen again at 11 evening (8.00 pm) and found the discharge flow, when both were already separated because no serious courtship and interest anymore in the afternoon. - The courtship only observed at 5 July afternoon when they just meet, and mostly Bina made an initiative. - After 15 July evening no more courtship except walk, sleep, eat and wallowing together. - Bina directly easy to brought to her paddock by her keeper when separated with Torgamba at 11 July. Seems no more interest. <p>31 July - 4 August</p> <ul style="list-style-type: none"> - The signs of estrus was showed start with redness and little swollen of vulva at 31 July and some courtship with Torgamba were observed. Just after Torgamba approach, Bina directly showed enthusiasm more than Torgamba. Detail will be in August report.
♀ DUSUN	
♂ TORGAMBA	<p>The period of 7 - 11 July</p> <ul style="list-style-type: none"> - The courtship only observed at 5 July afternoon when they just meet. Mostly Bina more enthusiasm and Torgamba often avoid. - After 15 July evening no more courtship except walk, sleep, eat and wallowing together. They separated at 11 July. <p>31 July - 4 August</p> <ul style="list-style-type: none"> - Torgamba entered Bina's paddock in the morning and some courtship with Bina were observed. But Torgamba was less enthusiastic than Bina.

AUGUST 1999

EVENTS AND ACTIVITY

♀ BINA

- Together with Torgamba at 31 July - 4 August for the expected estrus period at 31 July - 1 August. This time Torgamba was directly entered Bina's paddock.
- Since 4 August Bina has been staying in Torgamba's paddock. Bina was brought out to Torgamba's paddock because Torgamba did not want to out from her paddock.
- At 16 around 16:00, Bina met Torgamba behind the gate of central area. Torgamba was in the central area and Bina still in Torgamba's paddock. Both seemed like to courtship. Than the gate opened but Bina just go to her paddock and Torgamba enter his paddock again.
- At 17 afternoon Bina liked to enter the central, than when the gate opened, she walked directly to the second paddock of Torgamba. The gate opened and Bina stay there until next morning.
- At 18 morning, keeper found that the gate of the yard from Bina's side was opened, and Torgamba's track both with Bina were in the second paddock. This mean that Bina and Torgamba are together in the second paddock.
- They stay together until 24 August. This time is around of Bina second period (21 - 23 August).
- *Daily activities patterns in Part 4.*

♀ DUSUN

- Brought by her keeper to the central area and stay there at 25 - 27 August, but every morning back to her yard. This activity done for looking whether Dusun has response on signs of Torgamba and Bina's courtship activities day before. But no significant response as reproduction signs from Dusun.
- *Daily activities patterns in Part 4.*

♂ TORGAMBA

- Together with Bina in Bina's paddock at 31 July - 4 August.
- Torgamba did not want to move from Bina's paddock. Every time his keeper try to brought him to move out from Bina's paddock, just before the gate he was turn around and went to the inside the forest. He has been staying in Bina's Paddock since 4 August.
- He entered his paddock after stay in the central at 16 August.
- Entered the second paddock to be with Bina since the night of 17.
- Together with Torgamba until 24 August.
- *Daily activities patterns in Part 4.*

MEDICATION and SPECIAL TREATMENTS

♀ BINA

- Conjunctivitis on both eyes,**
- Still treated with ZnSO₄, little improvement on the cloud of eye.
 - No discharge appeared from both eyes.

♀ DUSUN

- Conjunctivitis on both eyes,**
- Still treated with ZnSO₄, better improvement on eye response.
 - No discharge appeared from both eyes.

♂ TORGAMBA

- The Eye**
- No more little white spot and discharge.

REPRODUCTION

♀ BINA

The period of 31 July - 4 August

- The estrus period showed with the signs on the vulva changes: the reddish and swollen appear at 31 July and 1 August, become pale at 2 and 3, and become red and swollen again 4 August.
- Some courtship but no intense were observed at 1 August morning time, and 4 August at afternoon. Same with the last period, Bina looked more aggressive but no good response from Torgamba.
- Mostly Bina followed Torgamba. Later on she also looked become less enthusiasm but still try to seduce Torgamba.

The period of 17 - 24 August

- The heat actually must be come at 21 - 24 August, but Bina's opened the gate herself and Torgamba entered her paddock since 17 night. From the signs in the forest looks like that Torgamba following Bina so tight.
- In the morning of 18, Torgamba mount Bina couple times but Bina looks not ready yet because she always walked after some seconds of mount, though she present her back some time; seems like she is not in estrus yet. She avoid Torgamba, but Torgamba follow very close.
- The vulva shows changes at 22 and 23 August (redness, and swollen, no discharge observed)
- See part 3.

♀ DUSUN

♂ TORGAMBA

The period of 31 July - 4 August

- Torgamba entered Bina's paddock at 31 July morning but prefer move around and seems no interest to do courtship with Bina. Some courtship that happened were not response good by Torgamba. It was seems that he has more attention to explore Bina's paddock. When Bina walk separate he never try to followed her.

The period of 17 - 24 August

- Torgamba mount Bina couple times in the morning of 18 when Bina is not in the estrus yet. When Bina's was ready at 23 August, Torgamba did not show good response and even no mount.

SEPTEMBER 1999

EVENTS AND ACTIVITY

♀ BINA	<ul style="list-style-type: none"> - On 12:00 September 7, the gate between Bina's and the next empty enclosure was opened after push by Bina. The lock was not work properly. The keepers followed her and try to invite her back but she does not want to come back. She keep walk through the forest and sometime walked very fast and seems does not like to be followed. Sometime the keepers also lost her and difficult to track because the forest was dry. Sometime she walked along the open track where the fence will be build, and also along the perimeter fence. She looked quiet nervous when heard sound of motor cycle and car, but become relax again when we called her, and keep walked. She also sometime stop to eat. - Until 17:00 the keeper keep try to invite her back but not success. Bina stayed in that place until next morning. The keepers opened a part of the fence in the central area and opened the gate, and monitor along the night. - In the morning of 8 Sept, after opened another part of the fence to central area close to the Torgamba paddock, she entered the central and directly went to Torgambas's paddock. - Together with Torgamba 8 - 11 and 29 - 30 September - <i>Daily activities patterns in Part 4.</i>
♀ DUSUN	<ul style="list-style-type: none"> - <i>Daily activities patterns in Part 4.</i>
♂ TORGAMBA	<ul style="list-style-type: none"> - Together with Bina from 8 - 10 September. - Torgamba also look quiet nervous when met Bina behind the fence, when Bina in the wide open area. - Lots of track showed that Torgamba and Bina were met and maybe stayed together along the night in a place in the middle of separated fence. - <i>Daily activities patterns in Part 4.</i>

MEDICATION and SPECIAL TREATMENTS

♀ BINA	Conjunctivitis on both eyes, <ul style="list-style-type: none"> - Still treated with ZnSO₄, little improvement on the cloud of eye. - No discharge appeared from both eyes
♀ DUSUN	Conjunctivitis on both eyes, <ul style="list-style-type: none"> - Still treated with ZnSO₄, better improvement on eye response. - No discharge appeared from both eyes
♂ TORGAMBA	The Eye <ul style="list-style-type: none"> - No discharge

REPRODUCTION	
<p>♀ BINA</p>	<p>The period of 8 - 11 September</p> <ul style="list-style-type: none"> - The estrus come at 9 - 10 September. The vulva was redness and swollen, but no discharge. Bina also stood silent when Torgamba mount. In the evening of 9 September Bina looked more received and stood more silent, but since night until midnight, Bina move too much and can not more silent when Torgamba mount. <p>The period of 29 - 30 September</p> <ul style="list-style-type: none"> - The estrus come at 29 September when the vulva show redness and swollen change. But this time not so many courtship was observed. Bina showed more interest and also standing heat couple times. But no mounting from Torgamba. - At 30 September evening after no more interest between them, they were separated by keepers.
<p>♀ DUSUN</p>	
<p>♂ TORGAMBA</p>	<p>The period of 8 - 11 September</p> <ul style="list-style-type: none"> - From 9 September evening until midnight Torgamba mount Bina 19 times. No intromission was observed. In the evening Bina more silent but in the night Bina move too much when Torgamba mount. Lots of mis - mount. <p>The period of 29 - 30 September</p> <ul style="list-style-type: none"> - Torgamba did bot showed any interest to mounting. Some courtship only observed at 29 Afternoon and evening but no single mounting was observed. - At 30 September evening after no more interest between them, they were separated by keepers.

OCTOBER 1999

EVENTS AND ACTIVITY	
♀ BINA	<ul style="list-style-type: none"> - Together with Torgamba at 1 - 4 October only in the day time to observed whether they still have interest to mating. - Stay with Torgamba again at 19 - 25, but sometime separated in the night when no interest between them - <i>Daily activities patterns in Part 4.</i>
♀ DUSUN	<ul style="list-style-type: none"> - At 12 October morning, Dusun's keeper found wounds in the vulva and vagina. Most possibility because she lay on the ground and stabbed by a sharp wood. Keep her in the stall during daylight to keep the wound drier and more easy to put medicine.
♂ TORGAMBA	<ul style="list-style-type: none"> - Together with Bina at 1 - 4 October only in the day time to observed whether they still have interest to mating. - Stay with Torgamba again at 19 - 25, but sometime separated in the night when no interest between them. - <i>Daily activities patterns in Part 4.</i>
MEDICATION and SPECIAL TREATMENTS	
♀ BINA	<p>Conjunctivitis on both eyes,</p> <ul style="list-style-type: none"> - Still treated with ZnSO₄, little improvement on the cloud of eye. - No discharge appeared from both eyes
♀ DUSUN	<p>Vagina wounds</p> <ul style="list-style-type: none"> - Three wounds with 2 - 3 cm wide and about 5 cm long found in her vulva to vagina in the morning of 12 October. There was a bleeding and little inflammation but no infection yet. Treated with Betadine, and Antibiotic topical ointment and Phen - buta - vet tablet to prevent serious inflammation and secondary infection. There is a healing process. - Latest condition, the wounds become dry and healed. No blood or inflame. <p>The eye</p> <ul style="list-style-type: none"> - No discharge appeared from both eyes. Still treated with ZnSO₄.
♂ TORGAMBA	<p>The Eye</p> <ul style="list-style-type: none"> - No discharge
REPRODUCTION	
♀ BINA	<p>Period of 1 - 4 October (continue from 29 September period)</p> <ul style="list-style-type: none"> - Only some head to head pushing but no interest to courtship. <p>Period of 19 - 25 October</p> <ul style="list-style-type: none"> - Vulva reddish and swollen were observed at 23 - 24 October. The interest of Bina still good, but no good response from Torgamba. Only a few and soft courtship occurred at 19 and 20. Become harder when estrus at 23 and 24 but no mounting from Torgamba. Bina showed standing and silent heat at 24. She even mounted Torgamba 3 times at 23 and one time at 24.
♀ DUSUN	
♂ TORGAMBA	<p>Period of 1 - 4 October (continue from 29 September period)</p> <ul style="list-style-type: none"> - Only some head to head pushing but no interest to courtship. <p>Period of 19 - 25 October</p> <ul style="list-style-type: none"> - Torgamba did not showed any interest to mount Bina when the estrus come at around 23 and 24 October. Some courtship occurred but mostly Torgamba avoid and walked away first. His penis unsheathed at 24 but no erection and it occurred while Bina not close around.

NOVEMBER 1999

EVENTS AND ACTIVITY	
♀ BINA	<ul style="list-style-type: none"> - Together with Torgamba at 8 - 10, and 13 - 14 November. Also at 29 - 30 November for the second period of the month, continue to December. - At 10 Torgamba chase Bina for almost 20 minutes and they were separate, when Bina actually still in the heat. - <i>Daily activities patterns in Part 4.</i>
♀ DUSUN	<ul style="list-style-type: none"> - Dusun's wounds in the vulva and vagina completely healed. - <i>Daily activities patterns in Part 4.</i>
♂ TORGAMBA	<ul style="list-style-type: none"> - Together with Bina at 8 - 10, and 13 - 14 November. - <i>Daily activities patterns in Part 4.</i>
MEDICATION and SPECIAL TREATMENTS	
♀ BINA	Conjunctivitis on both eyes, <ul style="list-style-type: none"> - Still treated with ZnSO₄.
♀ DUSUN	Vagina wounds <ul style="list-style-type: none"> - The wounds at vagina and vulva was healed.
♂ TORGAMBA	The Eye <ul style="list-style-type: none"> - No discharge
REPRODUCTION	
♀ BINA	Period of 10 - 14 November 1999 <ul style="list-style-type: none"> - Estrus signs was observed at 10 - 11 November. - Since 7 November Bina was already approaching center area, and did not want to move from to gate to center. But when they together no reaction between them. And Bina was released to the next paddock of Torgamba. - The first courtship was observed at 10, the vulva also reddish and swelling. It was observed 2 times standing heat by Bina but no response from Torgamba. At 16:00, Torgamba suddenly chase Bina almost 20 minutes, and they were separated by keepers. - Together again at 13 - 14 but no good courtship was observed. Period of 29 November - 4 December 1999 (Will be reported at December report).
♀ DUSUN	
♂ TORGAMBA	Period of 10 - 14 November 1999 <ul style="list-style-type: none"> - Torgamba also like to be together with Bina but actually no good response from him. Except some good courtship and chin rest by Torgamba (seems like to mounted but never happened) at 10 before he chase Bina. Period of 29 November - 4 December 1999 (Will be reported at December report).

DECEMBER 1999

EVENTS AND ACTIVITY	
♀ BINA	<ul style="list-style-type: none"> - Together with Torgamba at 29 November - 7 December. Some mounting was occurred. - They met again at 23 - 26 December for the second period of Bina at this month. Only one time mounting by Torgamba. - <i>Daily activities patterns in Part 4.</i>
♀ DUSUN	<ul style="list-style-type: none"> - <i>Daily activities patterns in Part 4.</i>
♂ TORGAMBA	<ul style="list-style-type: none"> - Together with Bina at 29 November - 7 December. Some mounting was occurred. - They met again at 23 - 26 December for the second period of Bina at this month. Only one time mounting by Torgamba. - <i>Daily activities patterns in Part 4.</i>
MEDICATION and SPECIAL TREATMENTS	
♀ BINA	<p>Conjunctivitis on both eyes,</p> <ul style="list-style-type: none"> - Still treated with ZnSO₄.
♀ DUSUN	<p>Conjunctivitis on both eyes,</p> <ul style="list-style-type: none"> - Still treated with ZnSO₄.
♂ TORGAMBA	<p>The Eye</p> <ul style="list-style-type: none"> - No discharge
REPRODUCTION	
♀ BINA	<p>Period of 29 Nov - 7 Dec. 1999 The vulva showed reddish and swollen at 5 and 6 Dec (<i>See Part 3</i>)</p> <p>Period of 23 - 26 Dec 1999 The vulva showed reddish and swollen at 24 and 25 December (<i>See Part 3</i>)</p>
♀ DUSUN	
♂ TORGAMBA	<p>Period of 29 Nov - 7 Dec. 1999 (<i>See Part 3</i>)</p> <p>Period of 23 - 26 Dec 1999 (<i>See Part 3</i>)</p>

Bina's estrous cycle

1999

21 Interval between periods

■ Observed estrous

Januari	Februari	March	April	May	June	July	August	September	October	November	December
1	1	1	1	1	1	1	1	1	1	1	1
2	2	2 21	2	2	2	2	2	2	2	2	2
3	3	3	3	3	3	3	3	3	3	3	3
4	4	4 ■	4	4 21	4	4	4	4	4	4	4 26
5	5	5 ■	5	5	5	5 20	5	5	5	5	5
6	6	6	6	6 ■	6	6	6	6	6	6	6 ■
7	7	7	7	7 ■	7	7 ■	7	7 17	7	7	7 ■
8	8	8	8	8	8	8 ■	8	8	8	8 18	8
9	9 21	9	9	9	9	9	9	9 ■	9	9	9
10	10	10	10	10	10	10	10	10 ■	10	10 ■	10
11	11 ■	11	11	11	11	11	11	11	11	11 ■	11
12	12 ■	12	12	12	12	12	12	12	12	12	12
13	13	13	13 21	13	13	13	13	13	13	13	13
14	14	14	14	14	14	14	14	14	14	14	14
15	15	15	15 ■	15	15 20	15	15	15	15	15	15
16	16	16	16 ■	16	16	16	16	16	16	16	16
17	17	17	17	17	17 ■	17	17	17	17	17	17
18	18	18	18	18	18 ■	18	18	18	18	18	18
19	19 20	19	19	19	19	19	19	19	19	19	19
20	20	20	20	20	20	20	20 22	20	20	20	20
21	21 ■	21	21	21	21	21	21	21	21 24	21	21
22	22 ■	22 21	22	22	22	22	22 ■	22	22	22	22
23	23	23	23	23	23	23	23 ■	23	23 ■	23	23 19
24	24	24	24	24	24	24	24	24	24 ■	24	24
25	25	25 ■	25	25	25	25	25	25	25	25	25 ■
26	26	26 ■	26	26 22	26	26	26	26	26	26	26 ■
27	27	27	27	27	27	27	27	27 20	27	27	27
28	28	28	28	28 ■	28	28	28	28	28	28	28
29		29	29	29 ■	29	29 23	29	29 ■	29	29	29
30		30	30	30	30	30	30	30 ■	30	30	30
31		31		31		31 ■			31		31

Minimum	17 days	Average of 17	20.9 days
Maximum	26 days		

Part 3

**COURTSHIP BEHAVIOUR
PROTOCOLS**

JANUARY 1999**Courtship behavior between Bina and Torgamba, 15 - 23 January 1999**January 15, 1999

- 08:48 Bina (B) met Torgamba (T) at central area and straightly head to head pushing, horn to horn (HH), and licking face each other for 1 minutes. T walked away after that. B followed.
- 08:50 Nose to nose touched for a second and T walked away.
- 09:20 HH again. B walked. T followed B walked along, B turn and stop but T avoid it.
- 09:38 HH again for 5 minutes. T avoid. B also avoid. No more contact after that.

January 16, 1998

- 07:40 HH for some seconds. But No intense. Both separate them self.

January 17, 1999

- 18:03 HH for some seconds. Seems no interest.

January 18, 1999

- 18:08 HH for some seconds. Both were walked separated after that.
- 19:00 HH for some seconds again and then separated.

January 21, 1999

- 01:41 B started to following T. Then try to push T's bottom. T walked to avoid.
- 01:42 B still chase T and seems bite T back and bottom.
- 01:43 B mount T. T run liitle. Turn around and HH quiet hard for 3 minutes. B walked away.
- 01:50 B walked to follow T. HH for a minute then B tur her back and silent heat. But T avoid.
- 02:05 HH for a minute but T walked away. B chase T. T run little bit. T looks no interest.
- 02:12 HH again quiet hard. But T walked away again. No more contact and courtship until separated at 23 January.

FEBRUARY 1999**Courtship behavior between Bina and Torgamba, 9 - 13 February 1999**February 9, 1999

- 10:32 Bina (B) met Torgamba (T) at central area and did head to head pushing, horn to horn (HH), and licking face each other for 1 minutes. B walked away after that. T follow for 1 minute but walked separated. Bina stop and follow T.
- 10:35 HH again for 3 minute and both walked away separated.
- 10:48 HH again hard enough. B sometime turn around but HH again on a second. Continue to HH until 10:57.
- 10:57 B walked away and T followed. HH again for 2 minutes. T turned his body and walked away. B followed T from behind for 2 minute.
- 11:05 HH again for a minute. B turned and walked away. T followed from behind. But walked different ways after some seconds. Both separated. No more contact.

February 10, 1998

- 18:04 B's vulva looked swollen. HH for some seconds. But No intense. Both separate them self.
- 18:15 HH again, plus licking face of T by Bina. HH hard enough until 18:25. It was too difficult to see, because rain and almost dark.
- 18:35 HH again. It was observed until 18:40
- 18:45 HH again but B walked away after 1 minutes. T followed.
- 18:48 HH for 2 minutes, and B walked away. T followed.
- 19:30 HH again for 2 minutes. Both separated after that. No more contact until 13 February.

February 11, 1998

No courtship but B's vulva still looked swollen. It was seen when urinate. Bina stayed at Torgamba paddock during the night.

February 12, 1998

No courtship. B's vulva looked slightly swollen.

February 13, 1999

- 06:58 HH for some seconds during feeding. B walked away.
- 08:34 HH hard enough for 2 minutes. T turned and walked away. B followed.
- 08:36 It was seen that B's vulva little bit swollen.
- 08:38 HH again for a minute. B turned and walked away. T walked separated.
- 08:40 B walked following T from behind so close.
- 08:41 HH again but now B turned and walked. T followed but separate after 1 minute..
- 08:45 B walked following T from behind so close. T avoid and walked away.
- 13:12 HH for some seconds but no intense. Both separated. No more contact. Both were driven back to their paddock in the afternoon for reproduction examinations.

MARCH 1999**Courtship behavior between Bina and Torgamba, 2 - 6 March 1999**March 2, 1999

- 07:05 Bina (B) entered the central area
 08:40 Bina entered the wallow, Torgamba (T) entered the central and walk around along the fence
 08:50 Torgamba approach the wallow, some snorting each other. Torgamba snort softer.
 08:51 Nose to nose touching and horn to horn pushing (HH). Bina still standing in the wallow. Torgamba in the wallow bank. HH for 3 minutes. Sometime Bina lick T's face
 08:54 Suddenly B turn and present her back/silent heat (SH) to T for a minute. T avoid and no reaction. But still in the wallow bank.
 09:00 T like to come into the wallow from the other side. Bina look still persue to courtship with T, but T avoid it.
 09:03 T entered the wallow.
 09:05 Both wallowing together.
 11:52 Both were feed by keeper. B's vulva was swollen and reddish.
 11:54 HH for 2 minute. Not intense.
 11:57 HH again quiet hard. B SH again. T pushing but B walked away and tum again. HH again.
 12:02 B walked away. T followed.
 12:06 HH again for 6 minutes. Licking and pushing head.
 12:13 T avoid and walked away.
 17:46 HH for a minute. Not intense.
 18:34 HH again. Not intense. No more courtship.

March 3, 1999

- 07:24 HH for some minutes. Sometime avoiding each other, turn again and HH again.
 07:34 B walked away.
 07:41 HH again. B avoid after that.
 07:45 HH again quiet hard. Licking faces each other. Continues until 8:00. Sometime avoid but turn anad HH again.
 08:01 T avoid and walked away. B did not followed.
 17:09 HH for a minute not intense.
 17:35 HH again but still not intense.
 18:15 HH again quiet hard. T avoid after that.
 18:17 HH for some seconds and T avoid again.
 18:45 HH for some seconds and T again avoid first.

March 4, 1999

- 12:42 B started to walked following T very close. But T have no interest.
 12:45 B still following very close, and sometime pushing, licking and biting T's back.
 12:50 HH quiet hard. B mounting T from side. T walked away.
 12:53 B still following and again pushing, licking and biting T's back.
 13:00 HH harder for 4 minutes. T avoid and walked away.
 14:03 HH again for some seconds. T avoid.
 15:28 HH hard for 3 minutes. T walked away first. No more courtship until 6 March.

March 6, 1999

- 15:08 HH for some seconds during feeding. B walked away.
 15:11 HH again for 2 minutes quiet hard. T mounted B from side/mis mount. Down after some seconds and walked away.
 05:13 T followed B very close.
 15:52 HH again for a minute. T walked away. B followed.
 15:54 Both walked separated.
 23:40 It was heard sound of courtship hard. It was seen also T was chase little bit by B.
 23:45 It was seen HH again hard for 3 minutes. Two times SH by Bina but T avoid. **This is a time when observer saw Torgamba did not have the posterior horn anymore.**

24:02 There were still some HH but looked that T always try to avoid. It was decide to separate them and bring Torgamba to his stall to check whether there was a wound in the horn. After this time Torgamba did not want to go to central area while keepers try to attract him, and Bina still there until 7 March afternoon.

Courtship behavior between Bina and Torgamba, 22 - 30 March 1999

March 22, 1999

09:09 Torgamba (T) entered the central area. Bina (B) still in her paddock
 11:06 T entered B's paddock
 11:49 Met in B's wallow, straightly doing courtship with horn to horn and nose to nose pushing (HH), B's licking T's face 2 times.
 11:54 T avoid and walked. B followed closely.
 11:59 HH again quiet hard for 2 minutes and stop. B walked backward.
 12:05 HH again harder for 2 minutes. T avoid, turn and walked. B followed.
 12:15 Both walked separated but not so far.
 12:50 while foraging, B suddenly voicing and run. T ignored it. They walked separated.
 15:52 In the central area. HH for some second while feeding and separated again.
 18:17 HH for 1 minute. Not intense. T avoid.
 18:24 B approached T, T avoid and walked.
 18:26 B approached T again and doing HH for 2 minutes. T walked away after that. B followed. No more contact.

March 23, 1999

13:00 In T's paddock. Foraging together. No courtship.
 13:48 Suddenly B ran, and T chased her. Could not seen clearly what happened. No more courtship was seen.

March 25, 1999

16:32 In central area. Little HH after saltlick together.
 16:46 It was seen that B's vulva swollen and reddish. But no serious courtship.
 23:05 It was seen that Both HH quiet hard while foraging for 3 minutes. But no mounting. T walked away. B did not follow.

March 26, 1999

16:17 It's seen that the vulva of B still swollen and reddish. But no courtship this day.

March 27, 1999

14:25 In T's paddock. HH after wallowing for 5 minutes. T avoid and walked. B followed.
 14:35 HH again for 2 minutes. T walked away first.
 23:05 It was seen that Both HH quiet hard while foraging for 3 minutes. But no mounting. T walked away. B did not follow.

March 28, 1999

16:25 In T's paddock. HH hard for 5 minutes. T walked away. B followed.
 16:31 HH hard for 2 minutes. B turn and present her back / **Standing heat (SH)**. But T avoid and walked. B follow. They separated after 2 minutes walked.
 17:30 HH again but no intense. This time B's avoid fitst. T did not follow.
 18:00 HH again but no intense. Both walked separated.
 18:36 HH again very short. No more contact after that until separated at 30 March.

APRIL 1999**Courtship behavior between Bina and Torgamba, 14 - 17 April 1999**April 14, 1999

- 07:59 Bina (B) entered the central area
 08:30 Torgamba (T) entered the central, while Bina close to his gate
 08:33 T directly approach B and doing horn to horn pushing (HH), also head to head, kissing and licking each other. But only for 1 minute Bina avoid after that.
 08:35 Bina walked and T follow closely (locomote), for 8 minutes
 08:52 Suddenly B snorting loudly and response by T; B run and T chase B for 1 minutes. T stop and B still run.
 08:58 T walked approach B again and voicing softly. B stand silent.
 09:03 B walk to the wallow. T follow.
 09:25 Both wallowing together.
 14:30 Both wake up but walked and forage separately.
 17:50 Bina's vulva looks reddish and swelling.
 18:16 HH for 2 minute. Not intense. No more contact.

April 15, 1999

- 00:12 Both wake up and sounds doing HH.
 00:15 Still HH very hard.
 00:20 B standing heat (SH), but T only silent. T face in B genital. B turn and HH again.
 00:40 B turn and present her back to T (SH), T chin rest, and **start mounting, try to take good position for 5 minutes, penis unsheathed, but T down on minute 7.** Heavy rain night.
 00:47 B walked and T follow very close.
 01:47 HH again and B standing heat straightly. T start to mount again but down after 2 minutes. Looks can not get good position. Both walk around-around in the forest with locomote by T. Sometime forage together.
 02:30 Without HH, B standing heat again when T locomotion very close. **T mount again, penis unsheathed, try to get good position for 4 minutes. But get down after that.**
 02:50 After walked separate, T follow B again very close.
 03:00 HH for some seconds and B SH, **T mount for 2 minutes, but get down. B still wait but T walked separate.** No more contact, walked and forage separate. It's still heavy rain.
 04:50 It's seen that they Wallowing together.
 07:10 Both enter T's paddock.
 08:24 HH very hard for 1 minute, B SH.
 08:25 **T mount B for 3 minutes, penis unsheathed, but T get down.** Bina wait but no more reaction from T. B walked and T follow.
 10:25 When feeding, check the B's vulva still reddish and swelling.
 11:30 After walk locomote. **B suddenly stop and ready (SH), T silent for some seconds, chin rest and mount again for 4 minutes. T get down and B walked away. T follow.**
 11:45 Both still walking locomote. B in front.
 12:10 Looks B's vulva very reddish.
 12:11 Wallowing together
 12:43 Both already woke up.
 12:44 HH again around wallow, and B present her back (SH),
 12:45 **T mount again only for 1 minute, and get down. B walked away.**
 12:47 **B stop and SH again. T mount again and try to get good position but get down after 5 minutes. B walked away and T walked separate.**
 17:57 Until 18:04 HH very hard but no mounting.
 20:01 Sleep together close to observation post. No more contact after that.

Note: Until they back to their own paddock at 17 April afternoon, no more courtship was observed. But in the night it always heavy rain. Only some little nose to nose touching when they feed by keeper together at 16 and 17 April in the morning feeding time. Mostly walked and forage separate whole days.

MAY 1999**Courtship and mating behavior between Bina and Torgamba, 5 - 8 May 1999**May 3, 1999

- 08:02 Bina (B) entered central area
- 09:08 Torgamba (T) entered central area.
- 09:14 Both met in around gate and directly doing horn to horn and head to head (HH) pushing.
- 09:15 B lick T's face while HH
- 09:18 Stop HH and T walk away. B followed.
- 10:15 Suddenly B snort loudly, T looked angry and suddenly chase B. B run away.
- 10:16 B snort many times while running. T still chase but run slowly where B too far away.
- 10:30 They walk separately. Bina entered her paddock but T still in central.

May 4, 1999

- 07:41 T entered the central
- 08:07 B entered central
- 08:20 HH while feeding for a minute. But T avoid. No more contact.
- 09:32 Bina looked sick after saltlick. T also saltlick.
- 11:10 Separating T from B and lead him to his paddock. B still in central area until the next day.

May 5, 1999

- 08:51 B entered T's paddock.
- 09:47 First contact with T, but only horn to horn for some seconds. No interest for courtship. No more contact after that.

May 6, 1999

- 09:15 Bina's vulva looked red and swollen.
- 09:21 HH for some seconds. No interest from T. But B walked following T.
- 13:02 HH quiet hard while feeding in T's paddock for 2 minutes. But T avoid. B followed
- 13:50 T often walked following B but no courtship.
- 23:10 T start looked very interest to mounting. Walked locomotive very close.

May 7, 1999

- 00:03 B entered the wallow and wallowing close to the gate. T stand in the wallow bank. The wallow was about 30-40 cm lower than the bank.
- 00:05 T push his horn to B back and chin rest.
- 00:07 B wake up and stand in the wallow. T still in wallow bank and push his nose to B's back
- 00:09 B standing heat and T start to mount. B still in the wallow. T in wallow bank.
- 00:10 T's penis unsheathed
- 00:13 T's penis full erection, and started to make intromission
- 00:15 The top of penis in B's vulva but still shake.
- 00:17 T's penis penetrate B's vulva.
- 00:18 B's little bit nervous and move her body. It seems un-comfort position. T's front leg in B's back slip because mud in B's back. Whole body of B was covered by mud. The penis penetrated about 10 cm long.
- 00:19 T's started push his body forward but seems very un-comfort position, because his hind leg already in the tip of the bank. B's also move her body. The penis cannot get through longer.
- 00:20 T's move backward and down slowly. B's silent. T's walked around wallow and lay down.
- 00:22 B wallowed.
- 00:30 T woke up, and his penis unsheathed.
- 00:31 Approach B in the wallow, B woke up and silent heat (SH). T entered the wallow.
- 00:32 T mounting B in the wallow. Getting full erect.
- 00:33 T difficult to get good position. B's body too slippery.
- 00:35 T get down. And stood silent.
- 00:36 B wallow. T wallowing together.
- 06:39 HH for a minute while feeding together.
- 06:59 Wallowing together.

- 07:30 Wake up together and start HH in the wallow.
 07:35 B's turn and silent heat.
 07:37 **T mounting again. Penis unsheathed. But T down after 2 minutes.**
 07:47 HH hard for some minutes. B walked away and T follow. Both entered T's paddock.
 08:11 It was difficult to follow them in T's paddock. But some time it's looked that T walked very close and locomotive to Bina.
 08:35 **B SH and T chin rest. T mounting. Penis full erection.**
 08:37 T down. They walked again very close.
 09:04 HH for 2 minutes. Walk again.
 09:30 **T mounting B again. Penis unsheathed. It was not clear to see whether full erection or not.**
 09:33 T down. Still walked very close. Sometime foraging together
 09:42 **T mounting B again. Penis cannot be seen. Down after 3 minutes.**
 10:14 **Mounting again for about 6 minutes. Cannot observe whether there was an intromission or not.**
 10:40 **Mounting again for 2 minutes. Penis unsheathed.**
 11:00 **Mounting again for 4 minutes. It was clear that penis erection but no penetration.**
 11:36 Both entered wallow in the central area. No more courtship or mounting after that. Both went back to their paddock in the next day.

Courtship and mating behavior between Bina and Torgamba, 24 - 30 May 1999

May 24, 1999

- 07:29 Bina (B) entered central area
 07:30 Torgamba (T) entered central area.
 08:29 Both met in around gate and directly doing horn to horn and head to head (HH) pushing. Bina walk away first.
 08:41 Again HH around the gate quite hard about 5 minute.
 08:50 HH and B lick the face and the body of T. HH very hard for 3 minute.
 08:53 B present her back and standing heat (SH). But no reaction from T. T push his body to B. B walk away.
 09:16 HH for 2 minutes. B push harder than B. T turn his body.
 09:21 HH a minute, than B try to mount T. T avoid it and walk away. No more contact until 26 May.

May 26, 1999

- 18:05 HH quiet hard for 3 minute. B lick T's face. Both move around and inspect genital each other. T chin rest on B's back. But Bina walked. T followed.
 18:27 HH again harder for 5 minute. B more aggressive. Genital inspect and chin rest by T. B walk away first and T follow.
 20:15 HH while feeding for 2 minutes. No more contact.

May 27, 1999

- 15:51 HH very hard. Move around and body pushing each other.
 16:00 Still HH and T inspect B's genital. B walk away.
 16:17 HH for a minute. No more contact.

May 28, 1999

- 16:50 Bina's vulva looked red and swollen.
 17:47 HH not too hard but very intensive until 17:55. Bina walk away. T follow tightly.
 17:59 HH harder but only some second, B turn and walk T follow still tightly.
 18:02 HH shortly many times, sometime T's walk around first and B pushing her body. Sometime B walk a little, stop and let T sniffing around her genital and pushing. It was happened many times until first mounting at 18:29. It was rain whole night.
 18:29 **B SH and T chin rest and start mounting. But only stay for a minute and down.**
 18:35 HH for 5 minutes.
 18:40 **T chin rest and mount. Again only for a minute.**
 18:52 **After walk together. Bina stop and SH, and T mount again for 2 minutes. T's down and B walk. T follow closely.**
 19:07 **The fourth mount. This time take 8 minutes. T's penis getting erect on minutes 4, and try to get better position but unsuccessful. T get down and B turn and lick T face.**

- 19:25** T mount again for 3 minutes. The penis full erect on a minute. T got a good position but he going down after 3 minutes.
- 19:40** The penis unsheathed first and T push his head on B genitalia area. B SH.
- 19:45** Turn and HH for some seconds, B turn and SH, T chin rest and start mount. Penis fully erect, but position not good, T down after 3 minutes.
- 20:51** After walk around with T's head stick on B back, B just stop and T chin rest.
- 20:52** T mounted again for 3 minutes.
- 21:23** Mounted again but only for a minute. But the penis erection full.
- 21:45** Mounted again with good position and penis fully erect on a minute. When T started to push his back, B move little bit but T did not follow. T become mis mount because B move around little by little. T's front leg become mount on B's neck. B seems feel hurt and suddenly voicing and run. T chase B and snorting very hard. T chasing B for 2 minutes but he was stop while B still run. After this no more mounting until next morning day.

May 29, 1999

- 08:01** Both entered T's paddock. Difficult to observe because dense bush and they looks being disturbed when heard the sound of observer.,
- 08:50** *Difficult to see,* Seems HH and B SH for awhile but T only push his head to B's back. B walk away. T follow closely.
- 09:00** T mount and penis full erect. No intromission but he mount for 6 minutes.
- 09:17** Mount again 3 minutes.
- 09:22** Mount for 2 minutes.
- 09:25** Mount for 5 minutes.
- 09:35** Mount for 2 minutes.
- 09:50** Mount for a minute.
- 10:15** Both wallowing together until 12:00
- 12:08** T mount B again for 4 minutes
- 12:23** Mount again for 1 minutes. No more courtship and mounting until separated at 30 May.

AUGUST 1999**Courtship behavior between Bina and Torgamba, 18-23 August 1999**Aug 18, 1999

- 07:49 Found Bina and Torgamba are already together in the second paddock of Torgamba and doing head to head, nose to nose and horn to horn pushing (HH)
- 07:51 **Bina (B) present her back (standing heat=SH), Torgamba start to (T) mount, it is difficult to see whether T's penis unsheathed and erection. He mounted for 5 minutes.**
- 07:57 B walked, T down and B suddenly run. T snorted softly
- 07:59 T walked to following
- 08:09 HH again for 1 minutes,
- 08:10 **B turn and SH T mounted for 2 minutes and down. B walked away.**
- 08:21 HH, and B SH, T mounted and the penis unsheathed and getting erect on 2 minutes. But B walked and T down and silent. Penis still erect. B walked away. T followed later.
- 08:23 HH again for 2 minutes, SH but T did not mount.
- 08:33 Walked together but no HH.
- 09:00 Wallowing together and no more courtship.

Aug 20, 1999

- 08:20 HH for 5 minutes. B avoid and walked away. T walked separate.
- 08:29 HH again for 4 minutes, and avoid each other. No more courtship until afternoon.
- 14:05 HH while feeding for a minute. But T avoid. No more contact.

Aug 21, 1999

- 14:05 HH around the wallow for 5 minutes but no intense. But both walked separate.
- 14:19 HH for 6 minutes. Walked separate again after that.

Aug 22, 1999

- 09:15 Bina's vulva looked red and swollen. But no courtship with T though B try to attract T.

Aug 23, 1999

- 07:22 HH quiet hard for 6 minutes. T avoid.
- 07:28 HH hard for one minute. T turn and B mounted T but T walked away and B follow.
- 07:39 HH many times for 10 minutes with B some time turn around for some seconds and also T avoid. It was difficult to follow them in the forest.
- 08:06 HH for 3 minutes very hard, T backward, turn and suddenly run. B walked to followed
- 08:14 HH again for 3 minutes. It is not too hard. Again, T avoid first.
- 08:27 HH again for 4 minutes, T avoid again. B walked separated. No more contact or courtship.

SEPTEMBER 1999

Courtship and mating behavior between Bina and Torgamba, 9 September 1999

Sep 9, 1999

- 16:10 after forage together, Bina (B) and Torgamba (T) start to head to head pushing (HH) in front of Bina's gate for 2 minutes
- 16:13 B suddenly turn her body and present her back; silent heat (SH). Torgamba stop but then just walked to the front and HH again for 2 minutes, T avoid and walked, B follow
- 16:17 HH again and B SH. T again just walk and B follow.
- 16:28 After HH 3 minutes, B SH again, and now **T try to mount**, penis unsheathed, but just for some seconds. B still silent, but T walk. B followed.
- 16:45 HH again for a minute
- 17:14 HH for some seconds and B started to SH. T directly chin rest for one minutes and **started to mount**. But only 1 minute and down. T walk and B follow
- 17:21 **Mount again** for a minute, but down. Seems like because B move too much
- 18:00 After HH for 2 minutes, B SH again, and T **directly mount**. The penis erect on a minute, but again B makes a move to the side while T still mount. It become mis mount. T down after 3 minute.
- 18:44 Without any HH, B walk and T follow very close, B stop and T directly mount. Full penis erection. **Mount** for 3 minutes. But down again because B move to the side and walk.
- 18:53 B stop again and SH. T **mount**. Penis full erect. Down after 2 minutes because B walk.
- 19:02 B SH. T **mount** for some seconds and again Bina move and walk.
- 19:08 **Mount** for 3 minutes and down. Full erection. Actually B silent.
- 19:27 **Mount** for 4 minutes. This time B avoid first.
- 19:37 **Mount** again no more than 1 minute. B move a lot.
- 19:43 **Mount** for some seconds. B walk first but stop on some seconds.
- 19:44 T **mount** again about 5 minutes. B silent but it is unknown why T down after 5 minutes.
- 20:26 One minute **mounting**. B avoid first.
- 20:35 Six minutes **mounting**. B already silent, but T down first and walked.
- 20:55 One minute **mount**. T just get down himself and stand silent. Penis still erect.
- 21:06 B stop. T in the B back, penis getting erect and started to **mount**. Again only one minute, then T down.
- 21:22 T **mount** again and penis getting erect on a minute, B silent. T mount for 3 minutes. Bina move to the side. T mis-mount and down.
- 23:01 After a half hour sleep together, walk T started to push B in the back. B SH, and T **mount** again about, penis erect, but after 5 minutes, T down. B still SH, but T walk.
- 23:27 T follow B very close. B SH, T **mount** again. Penis getting erect on 1 minute. But T down after 6 minutes. No more try to mount, even no more courtship, after this.

DECEMBER 1999**Courtship Activities of Bina and Torgamba, at 29 November - 7 December 1999**29 Nov

There was some courtship with initiative from Bina (B) just after they met in the morning. But only for some seconds and no good response from Torgamba. T avoids B many times when she approach.

30 Nov

Same situation with the day before. And they were separated after afternoon. They stayed in the different paddock side by side in Torgamba's paddocks. We observed them whether they like to met again.

2 Dec

Bina was approach to center first and Torgamba come later. No good courtship but they walk, wallow and forage together in the center and T's paddock day and night until 5 December. The rain was coming since 4 Dec.

4 Dec

T started to following B, but seems like to avoid. There was some courtship but no intense.

5 Dec

Bina's vulva looked reddish and swollen. Without any intense courtship, Torgamba was starting to following Bina very close in the afternoon. Whenever B stop T start to chin rest first and mounting. **Mounting by male were occurred 12 times but no penetration:** at 15:39, 16:13, 16:21, 16:33, 16:53, 17:30, 17:35, 19:45, 20:05, 20:16, 20:27, 20:32. Half of them were occurred with penis erection by T. Also when T was mount, B sometime move her body, and T become mis-mount. Sometime he still move his penis back and front to Bina's flank.

6 Dec

Two times mountings also observed by keepers, that occurred at 18:12 and 18:15.

7 Dec

They were separated by keepers at evening.

Courtship Activities of Bina and Torgamba at 23 - 28 December 199923 Dec

Since met in the morning, they straightly doing courtship, but Torgamba many times avoid Bina first after courtship. Only one time mounting was occurred (at 15:58) by Torgamba although there were some intense courtship. Bina actually standing heat couple times but no more try of mounting by Torgamba.

24 Dec

The estrus signs from Bina vulva actually looked more reddish and swollen, but no more intense courtship except some little touching between them. They were going everywhere together but no courtship.

25 Dec

Only some courtship but no intense.

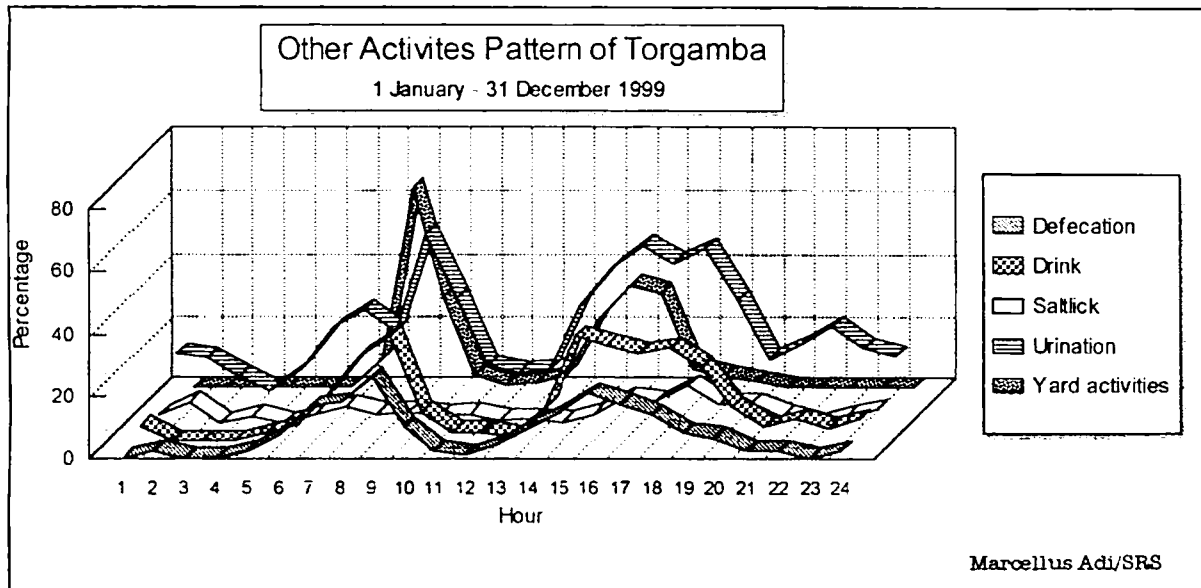
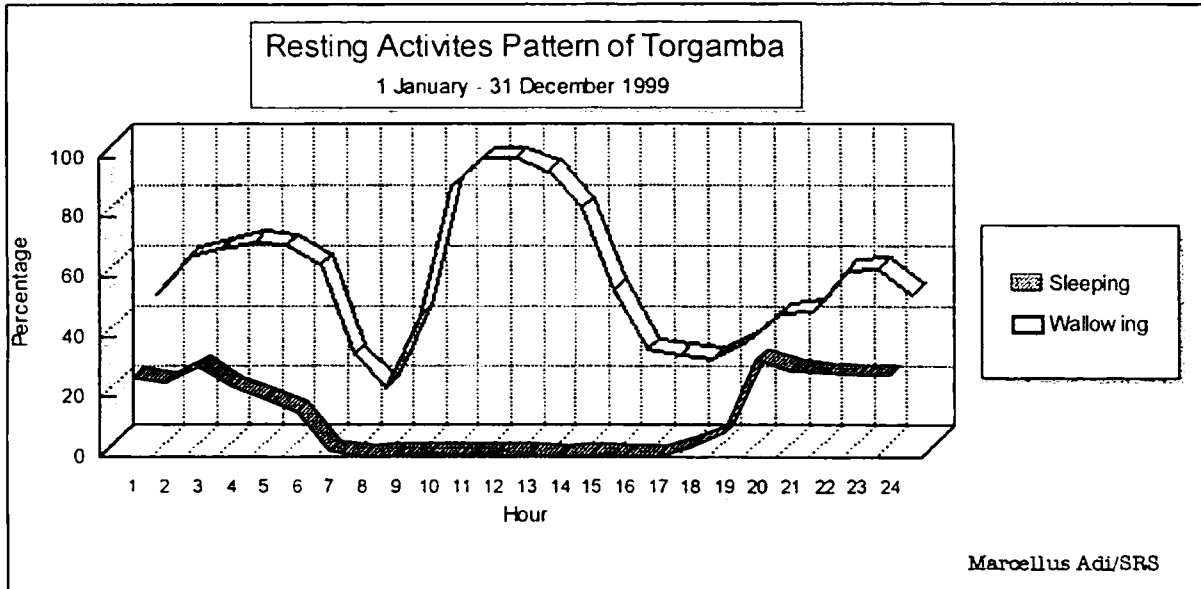
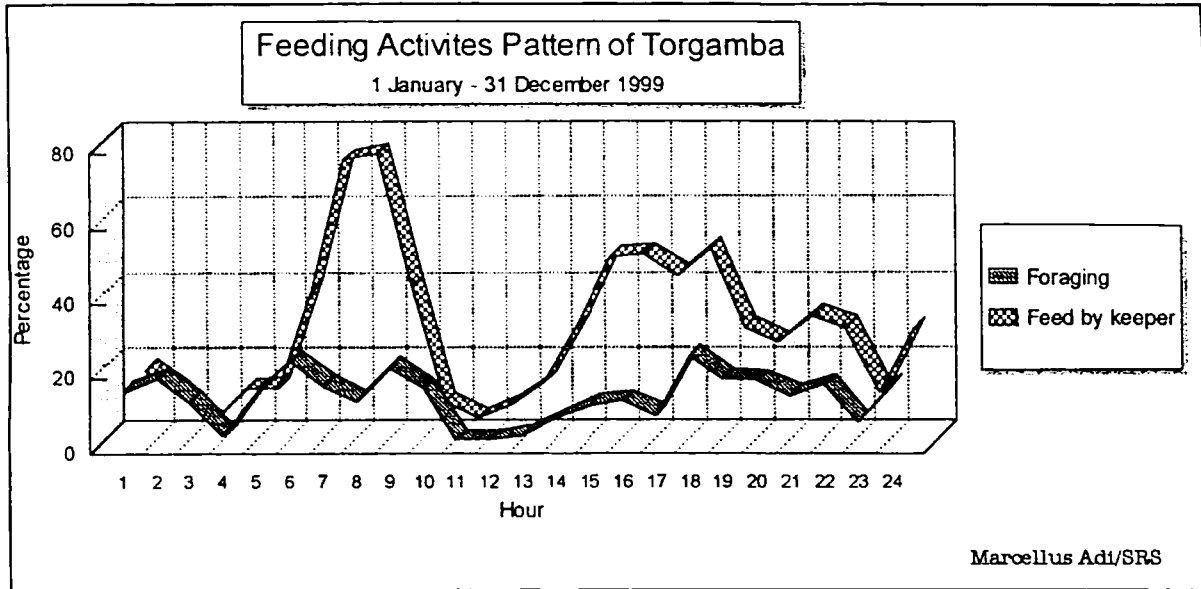
26 Dec

They entered their own paddock in the morning without any contact between them.

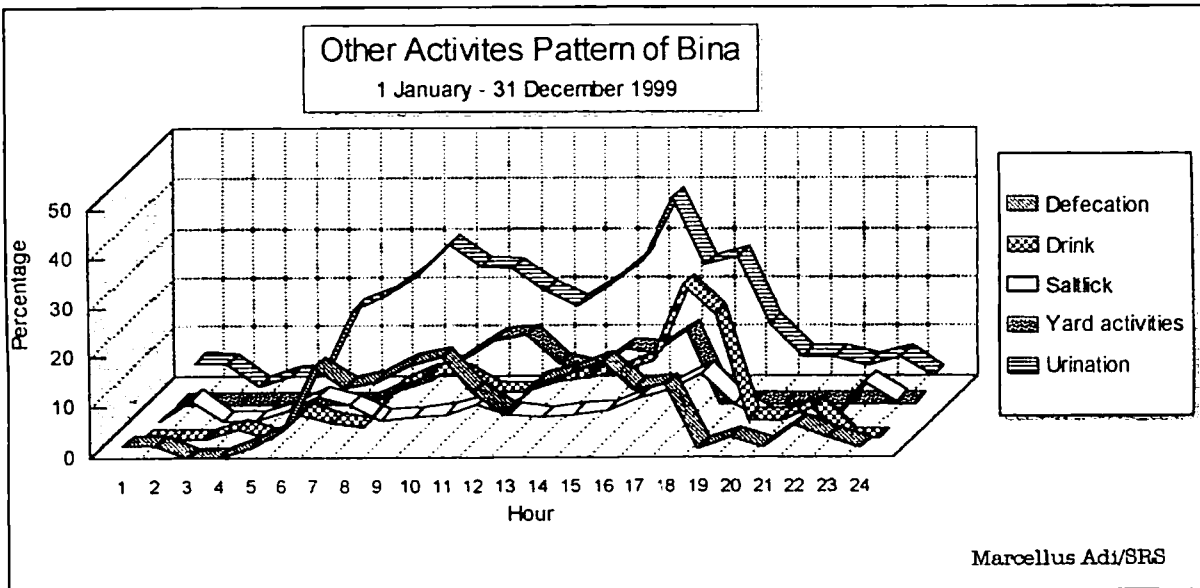
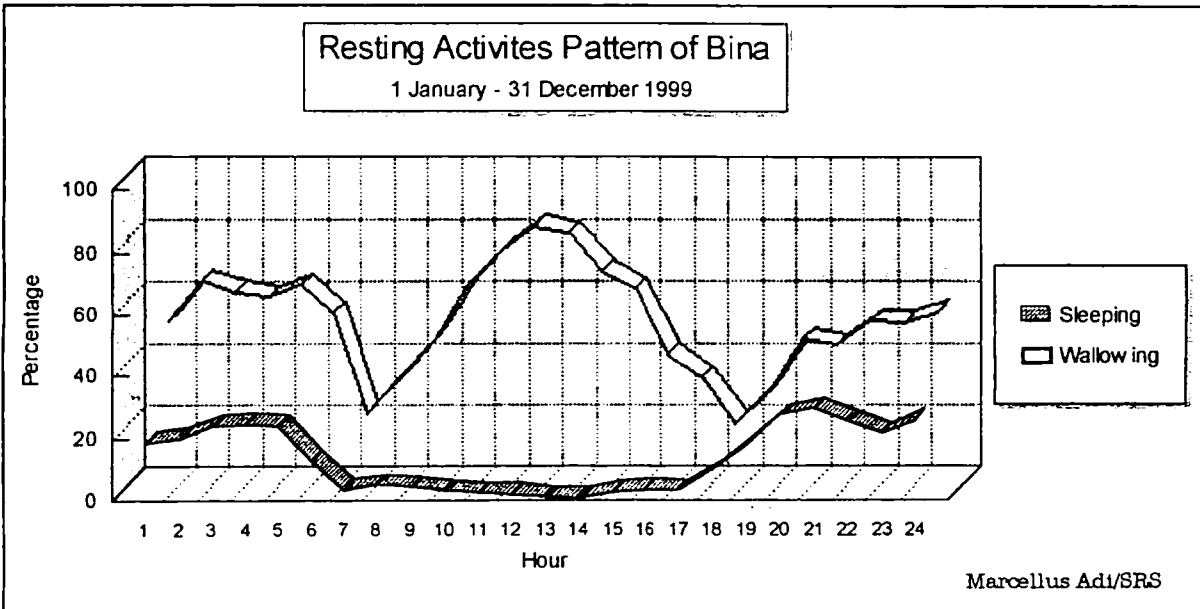
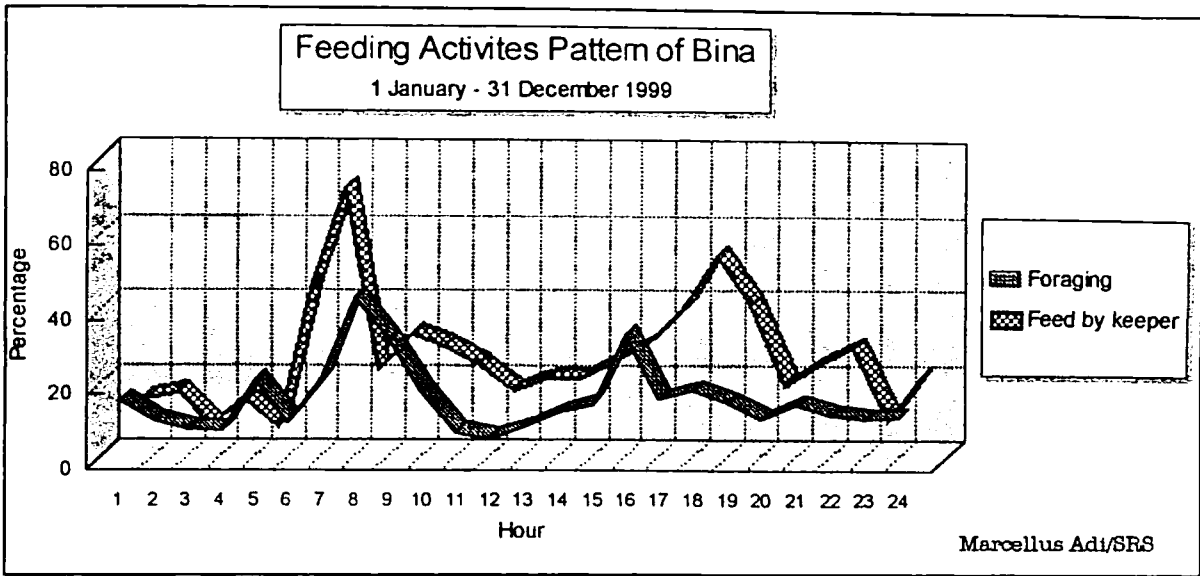
Part 4

DAILY ACTIVITY PATTERNS

TORGAMBA



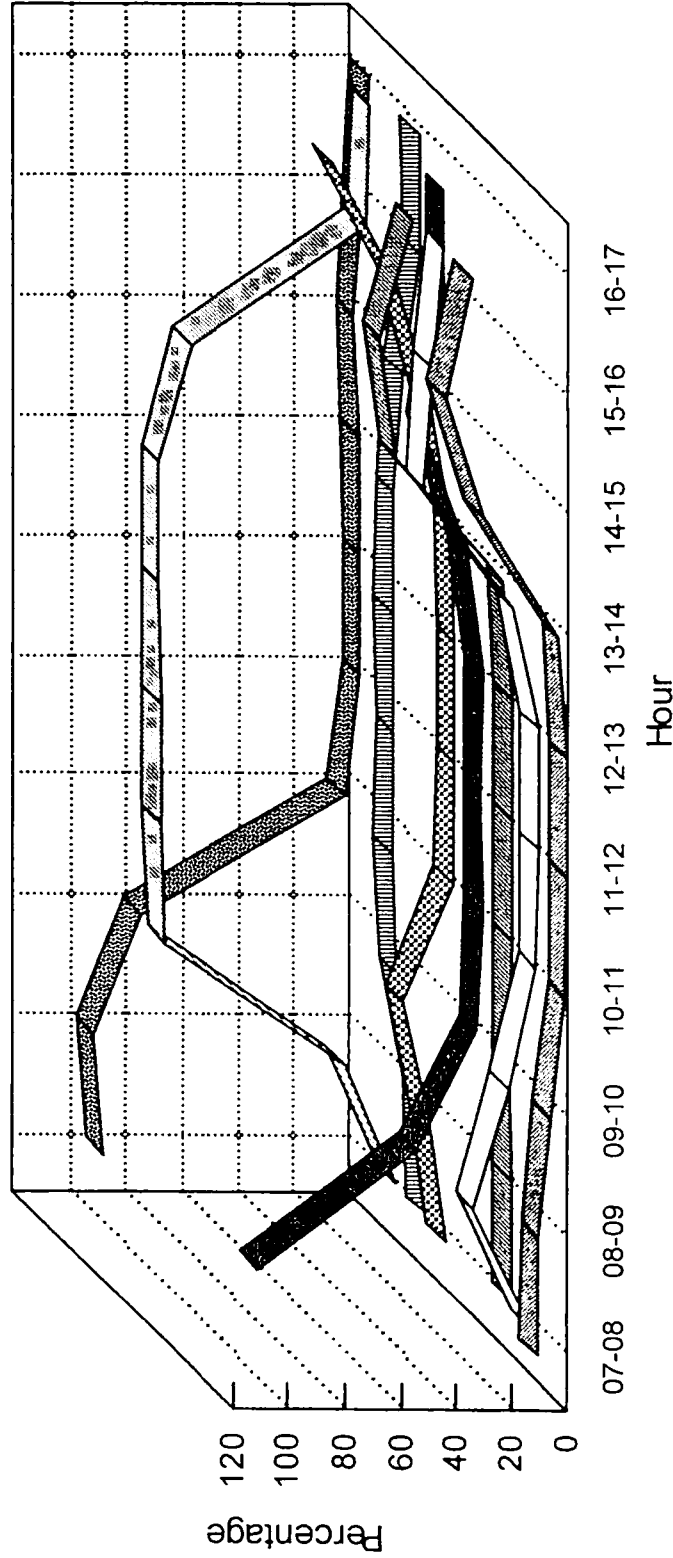
BINA



DUSUN

General Activities Pattern of Dusun

1 January - 31 December 1999



- Defecation
- Drink
- Foraging
- Feed by keeper
- Urination
- Sleeping
- Wallowing
- Yard activities

Marcellus Adi/SRS

Part 5

SEASONALITY IN REPRODUCTION

by
Nico J. van Strien

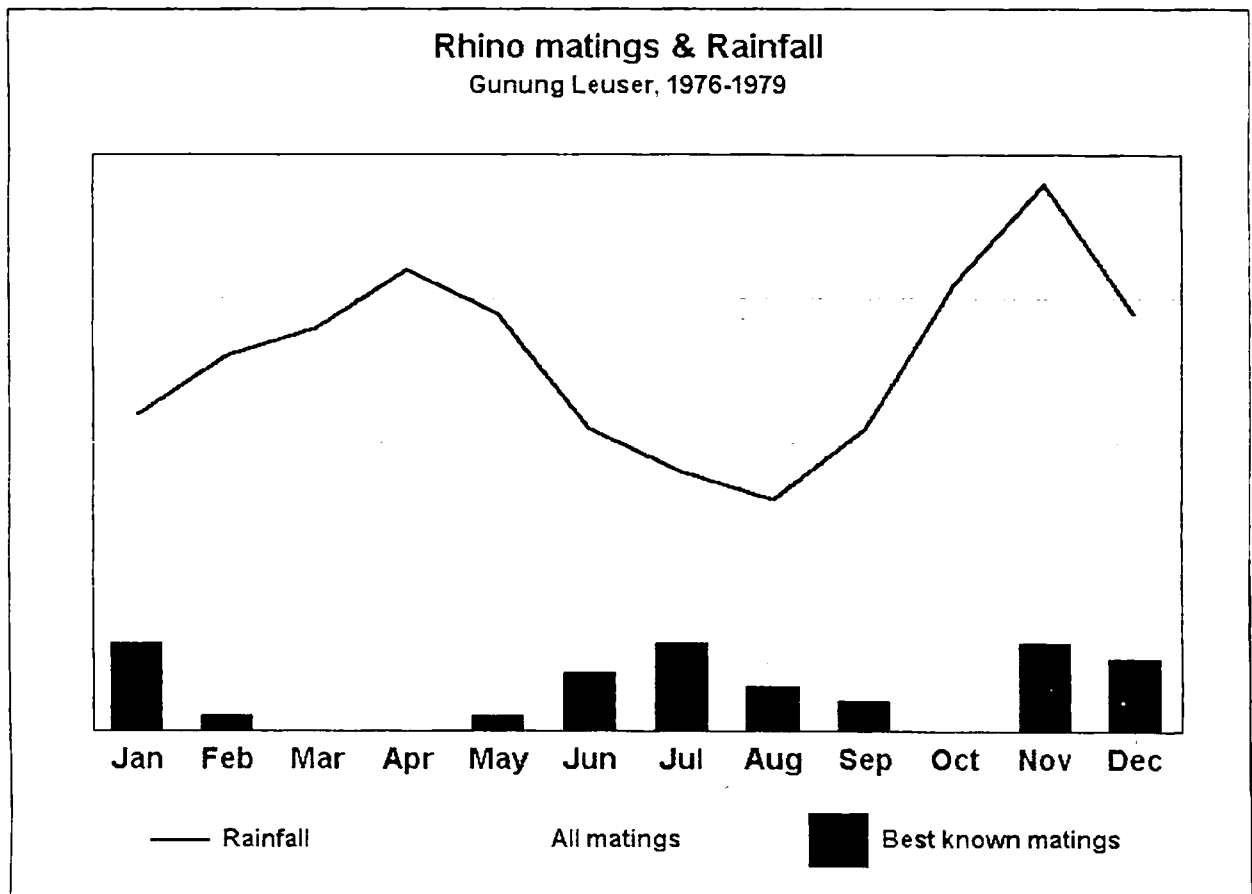
SEASONALITY IN BREEDING IN SUMATRAN RHINO?

During my study on the distribution and ecology of the Sumatran rhino in the Gunung Leuser National Park, Sumatra, from 1975 till 1981 a total of twelve calves were recorded to have been born in the rhino population in the study area in the Upper Mamas valley. Based on the growth curve of the footprint of the calves the approximate period of birth could be established (See figure 4.1 and figure 6.1 in Nico J. van Strien. *The Sumatran rhinoceros - Dicerorhinus sumatrensis (Fischer, 1814)* - in the Gunung Leuser National Park, Sumatra, Indonesia: Its distribution, ecology and conservation. Doorn, 1985).

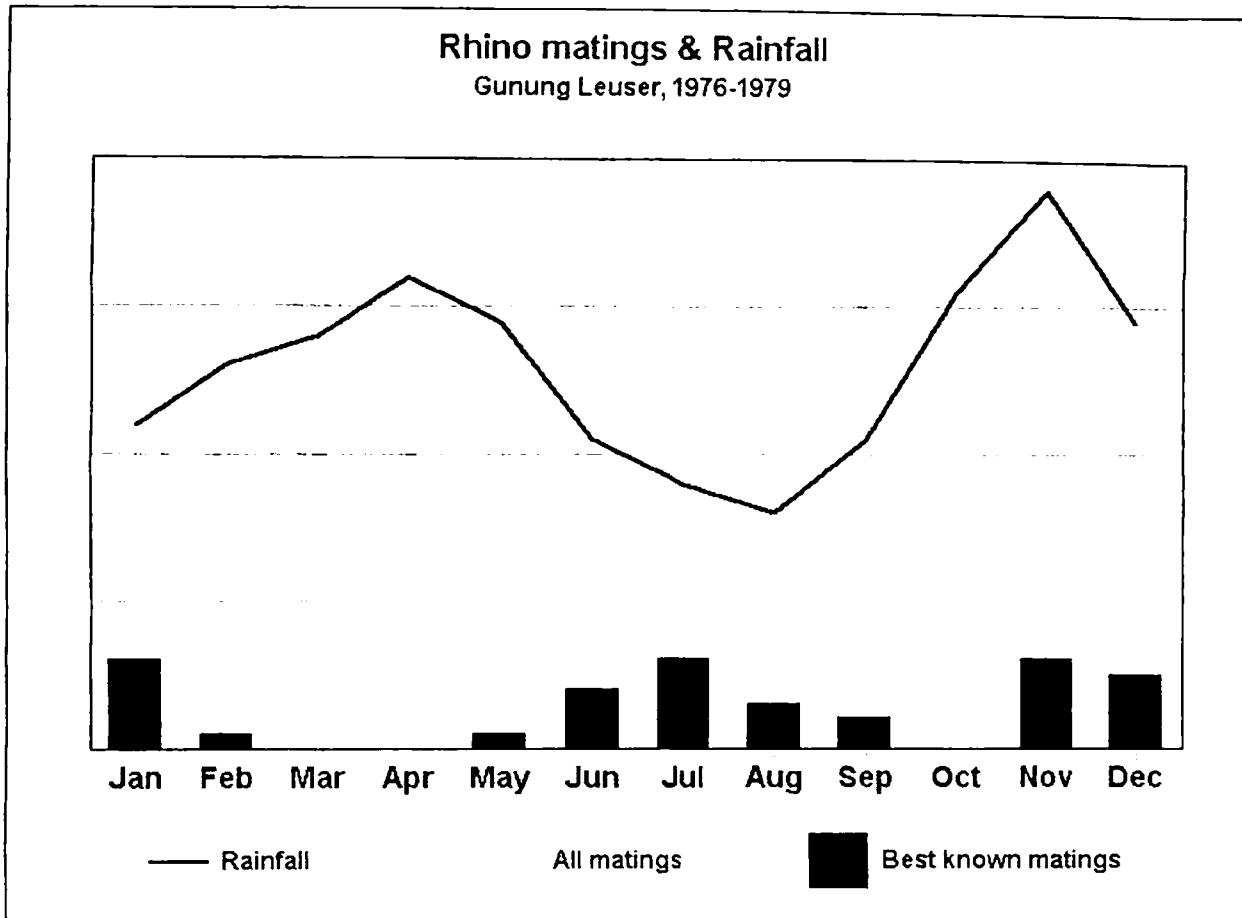
Six calves were born in 1976, two in 1977, two in 1978 or 1979, and two in 1979. From six calves the footprints were found when they were still very young or for a longer period and of these calves the birth period could be estimated to an accuracy of less than three months. From the other six calves the data series are limited and it was only possible to estimate the period of birth within an interval of 3 to 6 months.

The results are summarised in the table attached, modified from figure 6.1 in van Strien, 1985. The estimated period of birth is indicated by the dark rectangles, each representing a period of 1/4 month. Below total periods marked per month are given as an approximation of the probability of birth taking place in each month. Also the average monthly rainfall at Ketambe Station (1972-1980), the nearest location with rainfall data, is given.

The total periods marked per month for the 'best known births' (calves no 130-400, shown in the upper block of the table), 'all births' and the average monthly rainfall are shown in the graph below.



From the graph there seems a good correlation between rainfall and birth, with more calves being born during the periods of high rainfall. In the Leuser area there are two rainy seasons, the 'small rains' from



March to May and the 'big rains' from September to December. Of the six 'best known' births three occurred between March and May and three between September and January. The birth in the first half of January could be determined very accurately because the footprint of the calf when first found was very small and older tracks of the female without a calf were found nearby.

The gestation period of the Sumatran rhino is approximately 16 months, as is indicated by the birth of a calf in Malaysia almost 16 months after the female was captured when pregnant. For a rhino calf to be born in January the mating must have occurred 16 months prior in the month of September. The graph below showing the relation between mating and rainfall is produced by moving the birth data 4 months to the left.

The 'matings' graph seems to indicate that mating of Sumatran rhino occurs predominantly in the dry period, in particular in the 'long dry' period from June to September. The correlation with the 'short dry' period in January and February is less clear.

The only other reference found in literature concerning seasonality in breeding of the Sumatran rhino is by J. C. Brassier, in his book on big game hunting in Indonesia (*Jacht op groot wild in N.O.Indie*, Thieme, Zutphen, 1926), stating that August is in the middle of the 'rutting season' of the rhino. Brassier's view seems to have been correct and confirmed by the data from Gunung Leuser.

Nico van Strien

Bogor, 23 November 1999

Periods during which Sumatran rhino calves were born in Gunung Leuser National Park, extrapolated from growth curves of the foot (N.J. van Strien, 1985)

Rhino calf Number & year	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul
Calves for which the period of birth could be extrapolated with an accuracy of three months or less												
130 1976			■	■	■	■	■	■				
200 1976				■	■	■	■	■	■			
100 1979						■	■					
410 1976								■	■	■	■	
445 1976								■	■	■	■	■
400 1976										■	■	■
Total periods marked per month		1	4	6	3	2		6	5	6	1	
Calves for which the period of birth could NOT be extrapolated with an accuracy of three months or less												
800 1977												
138 1976												
134 1978												
135 1979												
148 1977												
105 1979												
Total periods marked per month		9	15	16	16	12	12	12	7	4	4	1
Average Rainfall (Ketambe)												
(mm)	160	210	310	380	290	220	260	280	320	290	210	180