

possibility of substantial support from outside donors. It will be slow! The field conservationists consulted so far suggest that a collection team will have to be in the field for perhaps 3 to 5 years. It will be difficult! The rhinos are rare and are elusive. If they were not, they would already be extinct. However, 10 rhinos were collected in 1959. Borner delineated a rather precise and plausible protocol in his 1976 proposal. Flynn had attracted animals into traps in 1980 before he had to abort on his capture attempt for other reasons.

A likely key to success would seem to be the location and perhaps design of the traps. Orientation of traps around the wallows or saltlicks, which are the center of the rhino's activity, may be productive. By utilizing and perhaps supplementing natural saltlicks, it is believed rhinos might be attracted to areas where traps would be placed. However, a major part of the capture operations must be intensive surveys to localize rhinos at any particular time and hence determine where traps might productively be placed. In Sabah, it is proposed to deploy four survey teams for this purpose.

The nature of the traps will also be critical. Based upon preliminary consultations with Tony Parkinson, who has extensive experience capturing large mammals (black rhino, elephant), especially in tropical forests (bongo, tamaraw), it is proposed to try two types of traps. One will be a form of the stockade trap that was used successfully in the 1959 Siak River expedition and that at least attracted rhinos inside during the Rodney Flynn project.

However it is also proposed to try what Parkinson designates a slide trap. This trap entails an excavation in the ground, but is not a pit in the traditional and negative sense of the term. The slide trap is a sophisticated structure with a door mechanism that rather gently moves the animal down an incline into a well cushioned substrate. Parkinson has used this type of trap on both bongo and tamaraw without major problems. The door can also be constructed to close after the rhino is in the trap to contain the animal in a limited and dark environment which seems effective in minimizing capture stress.

It is impossible to predict in advance which type may be more appropriate. Both may be useful. Field trials should reveal relative merits.

A better analysis of the feasibility and the advisability of possible field procedures should be

available from the anticipated reconnaissance by Tony Parkinson that is proposed for late 1983 or very early 1984.

9. One possible complication that must be considered is reproductive barriers between members of the disjunct Mainland and Island populations. Three extant subspecies are normally recognized (Groves and Kurt 1972). The northern-most D. s. lasiotis probably would not be involved in the project being presently proposed. However, D. s. sumatrensis (Sumatra and West Malaysia) and D. s. harrisoni (Borneo) would be. It is possible that reproductive barriers may have already evolved between these subspecies. Such incompatibility would be revealed by results of matings in captivity. However, if no reproductive isolation exists, it is recommended there be no further concern with maintaining subspecific distinction in a captive population.
10. The project will be developed in phases over a period of 3 to 5 years.
 - A. Because of the biological situation and governmental receptiveness, capture operations would commence in Sabah and continue there for perhaps 3 years.
 - B. Operations would be extended to West Malaysia as resources, opportunity, and success permit. In general, it would be the intention not to initiate intensive or extended operations in West Malaysia until the project had been successfully in progress in Sabah for a year or more. However, opportunity or necessity may require some flexibility in this plan. Indeed, one critical case has already emerged in West Malaysia. Two animals known to exist in Tenggaroh along the Mersing Coast will soon be deprived of their habitat as the forest patch they occupy is destroyed for development by FELDA (the government agency responsible for agricultural land clearance). These animals must be collected either for captivity or translocation very soon (October or November), probably before this proposal even can be properly considered by all relevant parties. Nevertheless, if pertinent parties act expeditiously, perhaps these animals can be saved.
 - C. Capture of animals in Indonesia is not proposed until information on the abundance and distribution of rhinos outside Gunung Leuser in Sumatra is meager. Thus, it is proposed that initially the project sponsor a survey by scientists already in Indonesia to determine better the current status of species in Sumatra as

basis for conservation programs including possible capture for captive propagation. World Wildlife Fund Indonesia already has a large mammal survey in progress under leadership of Raleigh Blouch. Initially, the WWF survey will emphasize elephants and Southern Sumatra. But if financial support were available from AAZPA the WWF Survey could be extended to the entire island and could include an intensive survey of the rhino. At least one Indonesian biologist, recently working on Javan rhinos, had indicated an interest in participating in this survey commencing in the summer of 1984. Additionally, further searches for rhino in Kalimantan, especially along the Sabahan border, would be most beneficial. Wildlife officials from both Sabah and Indonesia have indicated great interest in such surveys.

11. Captive propagation would be attempted in both S.E. Asia and North America. Animals would be evenly divided between captive facilities in both regions.

Ideally, as much captive propagation as possible should occur in S.E. Asia. However, current facilities for propagation of rhino are very limited in S.E. Asia. No zoos or other appropriate facilities exist at all in Sabah. There are major zoos in West Malaysia, Indonesia and Singapore but their experience with rhinos is restricted to exhibition, not propagation, and mostly to the African white rhino which zoo professionals tend to agree is the easiest to maintain in captivity. A spectacular zoo is being developed by the Department of Wildlife and National Parks in West Malaysia on the site of an existing but outdated facility in Malacca.

Certainly, an important part of the proposed project will be for the AAZPA to provide technical and perhaps other assistance in the development or improvement of captive management and propagation capabilities for rhinos in S.E. Asia. Some consultations have already occurred with the Zoological Society of Sabah, the planning team for the Wildlife Department's zoo in Malacca, and the staffs of the zoos in Kuala Lumpur, Jakarta, and Singapore. However, development of such capabilities in S.E. Asia will require considerable expense and more importantly time. In the experience of U.S. zoos, perhaps 3 years or more will be needed, especially in places like Sabah where no zoo yet exists. Postponing the attempt at captive propagation for 3 years could be very detrimental. The isolated animals are growing older all the time and many are in imminent peril. It is vital to place these animals in

a situation conducive to reproduction as soon as possible.

Therefore, it is considered important at this time to move some of the rhinos that might be captured to zoos in North America. A number of AAZPA zoos have demonstrated considerable success in propagating all three species of rhino currently in captivity (Indian, black, and white). Placement in U.S. zoos would also provide access to the latest developments in reproduction technology (artificial insemination, embryo transplantation, gamete storage) that might be appropriate and productive. Moreover, facilities would be immediately available and could be in climates that would not be too alien to the rhinos (e.g. Miami, San Diego, Los Angeles, St. Catherine's Island of the New York Zoological Society).

Beyond these technical and financial considerations, it simply seems advisable not to concentrate the captive rhinos in one region of the world. It is never good to place all of the "eggs in one basket". Hence, moving some rhinos to the U.S. could provide additional security for rhinos should some catastrophe or other vicissitudes afflict the rhinos in South East Asia.

The actual distribution of particular rhinos should be determined by consultations between AAZPA and the governments involved (and perhaps the IUCN Asian Rhino Specialist Group) based on a realistic evaluation of captive capabilities as well as other factors, including the benefits to conservation of exhibiting the species in their countries of origin.

Eventually, it would be proposed to place animals to remain in S.E. Asia in the zoos at Kuala Lumpur, Malacca, Kota Kinabalu (when developed), Jakarta, Singapore, and perhaps Surabaya and Sandakan. At this point, it would seem the first one or two pair of animals out of Sabah might best move to North America, while the first pair or two out of West Malaysia should remain in facilities there, e.g. Zoo Negara (Kuala Lumpur) and perhaps Singapore. Yet another possibility is a special facility directly under the Department of Wildlife and National Parks similar to what they have developed for seladang (Bos gaurus). By the time third or fourth pairs might be captured in Sabah and West Malaysia, facilities in Kota Kinabalu (or Sandakan) and Malacca may be ready to recessive rhinos.

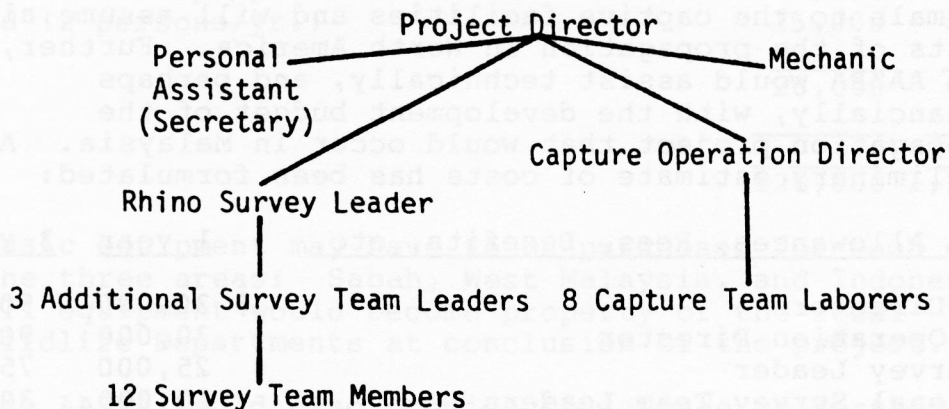
Wherever the captured rhinos are placed, there should be a commitment by all parties to manage the animals in captivity as a single population. If reproduction is successful, such a program will eventually entail much

interchange of animals (or semen and embryos) between North America and S.E. Asia to insure the best genetic management of the species.

12. Any rhinos moved to North America would be on loan from the country of origin and would remain under its ownership. Any progeny produced would be equally divided between the country of origin and the AAZPA, i.e. half the offspring to the country of origin and half to the AAZPA. The stock propagated in captivity will be used for two objectives:
 - A. reintroduction into natural habitats when and where available;
 - B. development of a self-sustaining population in captivity as an additional safeguard for survival of the species.

This arrangement on ownership seems the most equitable and constructive under current circumstances. Eventually, there might be consideration of ceding ownership of the captive stock to the IUCN Asian Rhino Specialist Group. However, such consortial and international ownership would be a novel enterprise and will require much scrutiny. In any case, the technicalities of ownership should not in any way interfere with the commitment for collective management.

13. The capture team and operations will be collaboratively organized by the AAZPA and the Wildlife Departments in Sabah, West Malaysia, and Indonesia. Based upon the AAZPA reconnaissance to S.E. Asia, the preliminary proposal for organization is depicted below.



Under this arrangement, it is assumed the Survey Team Members would also be employed to assist, where appropriate, with capture operations.

Critical to the success of this program will be the selection of the Project Director and the Field

Director of the Capture Operations . As discussed before, available evidence indicates that Tony Parkinson may be the most qualified candidate as the Captive Operation Director. Negotiations are in progress to engage Mr. Parkinson in this capacity. Hopefully , he will be available for a preliminary reconnaissance of capture feasibility later in 1984.

Concerning the Project Director, several candidates have emerged. One is Dr. Nico Van Strien who has 7 years experience with Sumatran rhino in Indonesia. He has indicated interest in possible involvement. Another prospect is Dr. John Payne who has been very active in the Sumatran Rhino program in Sabah and hence enjoys much orientation to the situation there. A number of other possibilities have been discussed by AAZPA representatives and Malaysian officials if none of the identified candidates are available. It will be observed that the identified candidates for the directorial positions are currently all expatriates, based upon their technical experience and expertise. Another objective of the project will be to prepare Malaysian and Indonesian nationals to assume these positions by the later years of the project. Indeed, the first year or two of the project proposed for Sabah could hopefully be as training ground for staff from West Malaysia and Indonesia, where later phases of the project would occur.

14. The AAZPA through its Sumatran Rhino Propagation Group and with the endorsement of the Malaysian and Indonesian Wildlife Departments, will generate the funds necessary for the capture and transport of animals to the captive facilities and will assume all costs of the propagation in North America. Further, the AAZPA would assist technically, and perhaps financially, with the development budget of the propagation project that would occur in Malaysia. A preliminary estimate of costs has been formulated:

<u>Salaries, Allowances, Fees, Benefits, etc.</u>	<u>1 year</u>	<u>3 years</u>
Project Director	\$ 30,000	90,000
Capture Operation Director	30,000	90,000
Rhino Survey Leader	25,000	75,000
3 Additional Survey Team Leaders	10,000	30,000
12 Survey Team Members	25,000	75,000
8 Capture Team Laborers	16,500	49,500
Assistant/Secretary to Director	10,000	30,000
Mechanic	8,000	24,000
Consultant's Fees	5,000	15,000
Internal Airfares	5,000	15,000
Medical Insurance, Other Benefits	20,000	60,000
	<u>184,000</u>	<u>553,500</u>

Equipment, Supplies (Purchase)

3 Long Wheelbase Landcruisers	60,000	60,000
Truck with Hydraulic Lift/Winch	45,000	45,000
Camping Equipment	5,000	5,000
Trapping Materials/Equipment	70,000	70,000
Food for Field Teams	15,000	45,000
Food, Drugs, etc. for Rhinos	5,000	5,000
Two-Way Radio System	5,000	5,000
Vehicle Maintenance	15,000	45,000
	<u>220,000</u>	<u>290,000</u>

Equipment Rental

Helicopter (Small, for Surveys, etc)	20,000	60,000
Helicopter (Large, Rhino transport)	20,000	60,000

Rhino transport to North America

Air Freight	45,000	120,000
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Expenses AAZPA Representatives/Consultants

Air Fare (2 trips/yr.)	5,000	15,000
Per Diem (60 days/yr.)	6,000	18,000
	<u>11,000</u>	<u>33,000</u>

Expenses for S.E. Asian Interns in U.S.

Air Fare (2 trips/yr.)	5,000	15,000
Stipend (2 persons/yr.)	15,000	45,000
	<u>20,000</u>	<u>60,000</u>

TOTAL 520,000 1,176,500

Basic equipment may have to be purchased for each of the three areas: Sabah, West Malaysia, and Indonesia. All equipment would become property of the local Wildlife Departments at conclusion of the project.

15. The AAZPA would also provide assistance in further developing management capabilities for rhino and other large mammals in S.E. Asia, including:
- A. development of a zoo or zoos as discussed earlier;
 - B. transfer of technology in wildlife management, wildlife veterinary medicine, and captive husbandry techniques;
 - C. degree programs for Malaysian students in Wildlife biology;

- D. promotion of tourist potential for wildlife;
 - E. participation in field research on the rhino.
16. Although captive propagation is considered preferable at this time, it is arguable that a well managed translocation research project utilizing telemetry might be an appropriate adjunct to this program. Particularly if more than enough animals can be captured to satisfy the requirements to establish captive populations, this project might provide an excellent opportunity to scientifically evaluate the potential and problems of translocation. The AAZPA would certainly be amenable to consideration of such research. Indeed, the Animal Conservation and Research Center of New York Zoological Society is quite interested in possible support of field research by S.E. Asian scientists that would coordinate with the captive propagation project.
17. It is proposed the project commence 1 January 1984.

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TABLE 1**RHINOS IN THE WILD**

	<u>SPECIES</u>	<u>ESTIMATED NUMBERS</u>	<u>DISTRIBUTION</u>	<u>POPULATION TRENDS</u>
AFRICAN	BLACK	10,000-20,000	Many Populations in Subsaharan Africa	Declining Precipitously
	WHITE:			
	NORTHERN	20+	Two Main Populations	Decreasing Rapidly
	SOUTHERN	2,600-2,800	Several Populations; More Being Established	Increasing
ASIAN	INDIAN	~ 2,000	Several Populations in India and Nepal	Increasing or Stable Temporarily
	JAVAN	< 57-66	One Population	Increasing
	SUMATRAN	158-363	Small and Fragmented Populations Over a Wide Range in S.E. ASia	Decreasing

TABLE 2

SURVEY OF SURVIVING ASIAN TWO-HORNED RHINOS

AREA OR COUNTRY	LOCATION	ESTIMATE OF RHINOS	HABITAT AVAILABILITY		HABITAT STATUS	REFERENCE	POTENTIAL CARRYING CAPACITY*
			PRESENTLY (Km ²)	POTENTIALLY (Km ²)			
Sabah	Silabukan Reserve**	20+	250-1000	1000	Perhaps protectable.	Andau & Payne 1982	50
	Kretam/Dent Peninsula	8	-1000	None	Being converted to agriculture.	Andau & Payne 1982	None
	Other Areas	10	-2000	2000	Perhaps protectable.	Andau & Payne 1982	None
	TOTAL	28-38					
West Malaysia (Peninsular Malaya)	Endau Rompin**	20-25	1600	1000-1600	1000 km ² Reserve; Park proposed.	Flynn & Abdullah 1982	50-80
	Taman Negara**	8-12	4400	4400	National Park, but under pressure.	Flynn & Abdullah 1982	110-220
	Sungai Dusun	4-6	40+	140+	State Wildlife Reserve	Flynn & Abdullah 1982	20
	Gunung Belumut	2-3	230	230	Wildlife Reserve proposed.	Flynn & Abdullah 1982	16
	Mersing Coast	2	N.A.	Prob. None	Being deforested.	Khan (pers. comm.)	0
	Ulu Lepar	3-5	1000	1000	Unprotected and being deforested.	Flynn & Abdullah 1982	0
	Sungai Depak	3-5	N.A.	Prob. None	Being deforested.	Flynn & Abdullah 1982	0
	Kuala Balah	3-4	N.A.	Prob. None	Being deforested.	Flynn & Abdullah 1982	0
	Bukit Gebok	1-2	N.A.	None	Being deforested.	Flynn & Abdullah 1982	0
	Krau Reserve	0-1	500	500	Unstable.	Flynn & Abdullah 1982	24
	Ulu Selama	3-5	N.A.	N.A.	Unprotected.	Flynn & Abdullah 1982	?
	Ulu Belum	3-5	N.A.	N.A.	Unsecure area.	Flynn & Abdullah 1982	?
Thai Border	0-1	N.A.	N.A.	Unsecure.	Flynn & Abdullah 1982	?	
TOTAL	52-76						
Sumatra	Gunung Leuser**	50-200	1400	8000	National Park but disturbance.	Van Strien/Widodo 1982	200-400
	Kerinci/Seblat**	15-20	2000	4000	Protection meager.	Borner 1979	100-200
	Torgamba	1-5	?	?	Being deforested.	Borner 1979	0
	Sumatera Selatan	2-5	500	?	Deforestation occurring.	Borner 1979	20
	Siak River Region	None	?	None	Being heavily developed.	Borner 1979	0
TOTAL	68-230						
Kalimantan	Banumuda	0	N.A.	N.A.	Being deforested.	WWF Yearbook 81-82	0
Thailand	Phu Khio Reserve					McNeely & Cronin 1972	
	Tenasserim Range	6-15	N.A.	N.A.	Unstable.	McNeely & Laurie 1977	0
	Khao Soi Dao Reserve					Asia Week 1982	
Burma	Schwe U Daung Reserve	4	N.A.	N.A.	No information.	Borner 1979	?
	Elsewhere	?	N.A.	N.A.	No information.	None recent and reliable.	?
Indochina		?	N.A.	N.A.	Very unstable.	None recent and reliable.	0
TOTAL		158-363	-15000	-22000	None totally secure.		590-1030

* Predicated on maximum density of 1 rhino/20 km² suggested by studies of Flynn and Van Strien (pers. comm.)
 ** Populations probably preservable in wild if interactively managed and adequately protected.

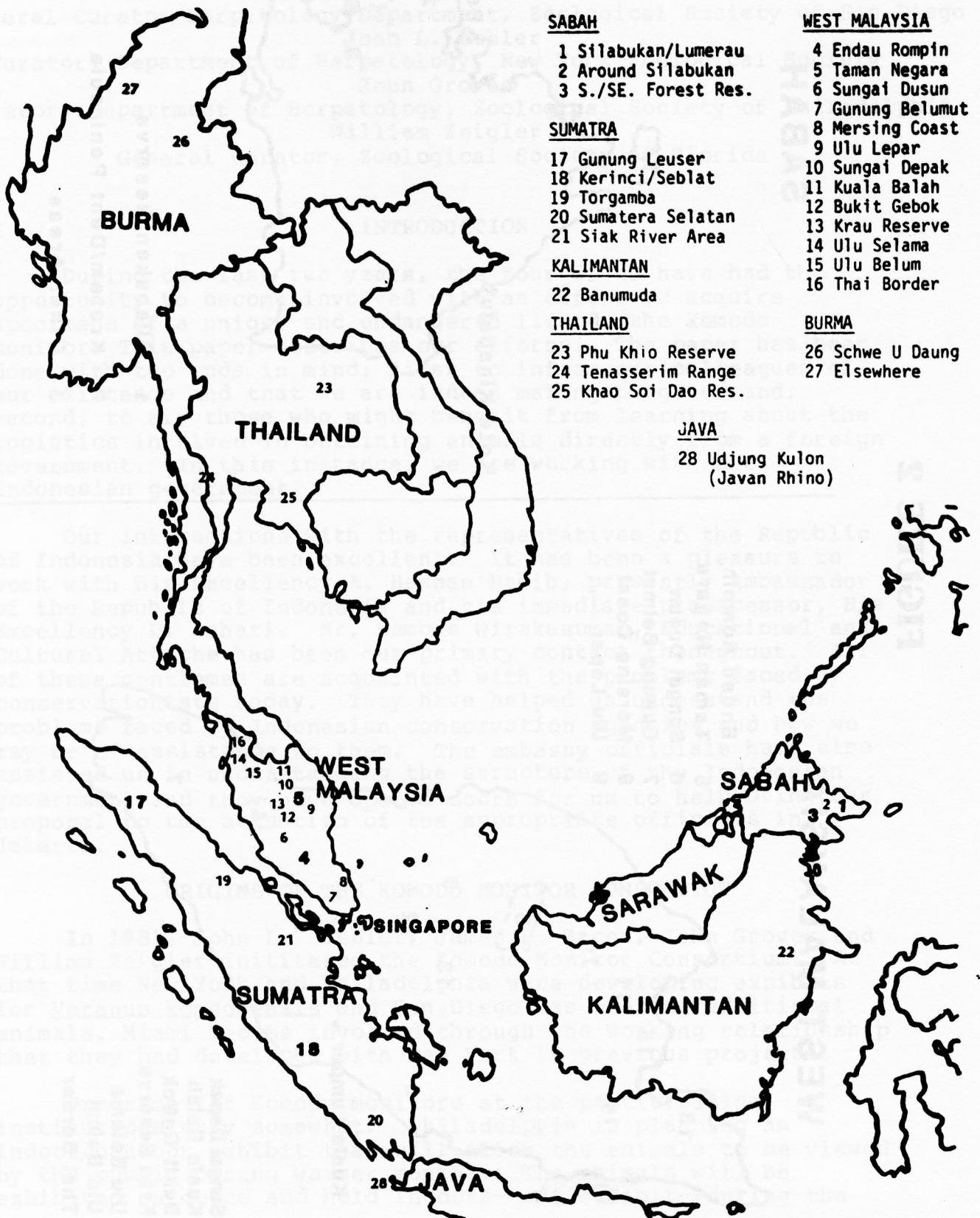
TABLE 3

SUMMARY OF ASIAN TWO-HORNED RHINO POPULATIONS

<u>AREA</u>	<u>TOTAL ESTIMATED POPULATION</u>	<u>TOTAL WITHIN PROBABLY PRESERVABLE POPULATIONS</u>	<u>TOTAL OUTSIDE PROBABLY PRESERVABLE POPULATIONS</u>
Sabah	28-38	20+	8-18
West Malaysia (Peninsular Malaysia)	52-76	28-37	24-39
Sumatra	68-230	65-220	3-10 *
Kalimantan (Indonesian Borneo)	0	0	0
Thailand	6-15	?	?
Burma	4+	?	?
Indochina	?	?	?
TOTAL	158-363	113-277	45-86

*Probably more, but better survey needed.

FIGURE 1



SABAH

- 1 Silabukan/Lumerau
- 2 Around Silabukan
- 3 S./SE. Forest Res.

SUMATRA

- 17 Gunung Leuser
- 18 Kerinci/Seblat
- 19 Torgamba
- 20 Sumatera Selatan
- 21 Siak River Area

KALIMANTAN

- 22 Banumuda

THAILAND

- 23 Phu Khio Reserve
- 24 Tenasserim Range
- 25 Khao Soi Dao Res.

WEST MALAYSIA

- 4 Endau Rompin
- 5 Taman Negara
- 6 Sungai Dusun
- 7 Gunung Belumut
- 8 Mersing Coast
- 9 Ulu Lepar
- 10 Sungai Depak
- 11 Kuala Balah
- 12 Bukit Gebok
- 13 Krau Reserve
- 14 Ulu Selama
- 15 Ulu Belum
- 16 Thai Border

BURMA

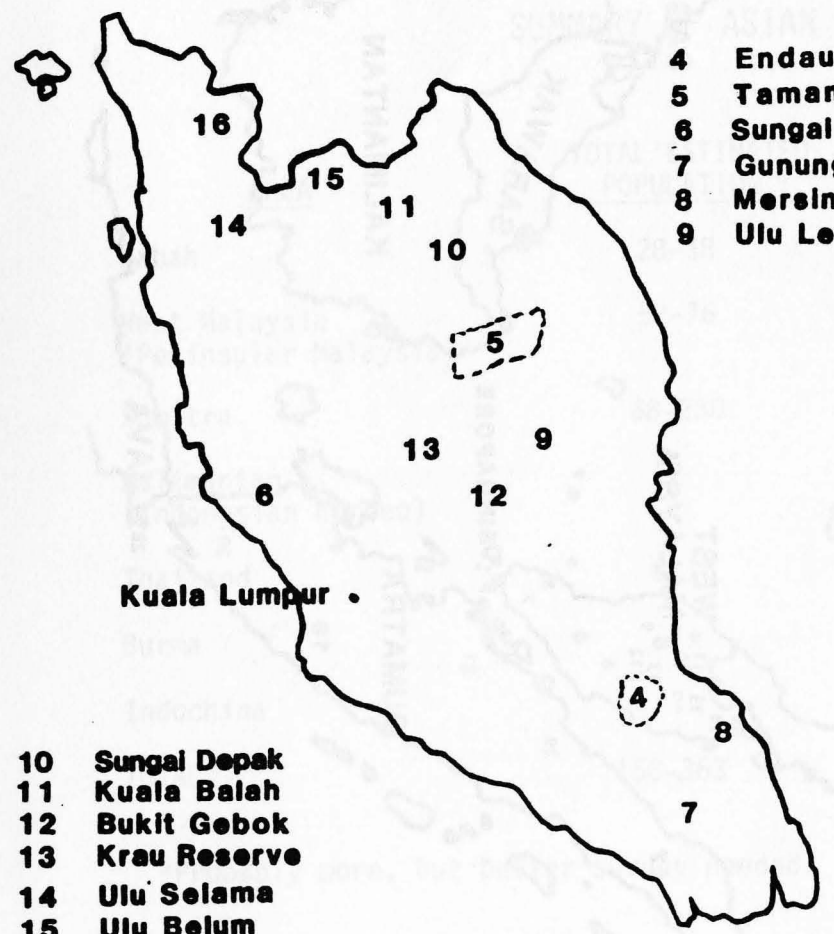
- 26 Schwe U Daung
- 27 Elsewhere

JAVA

- 28 Udjung Kulon (Javan Rhino)

FIGURE 2

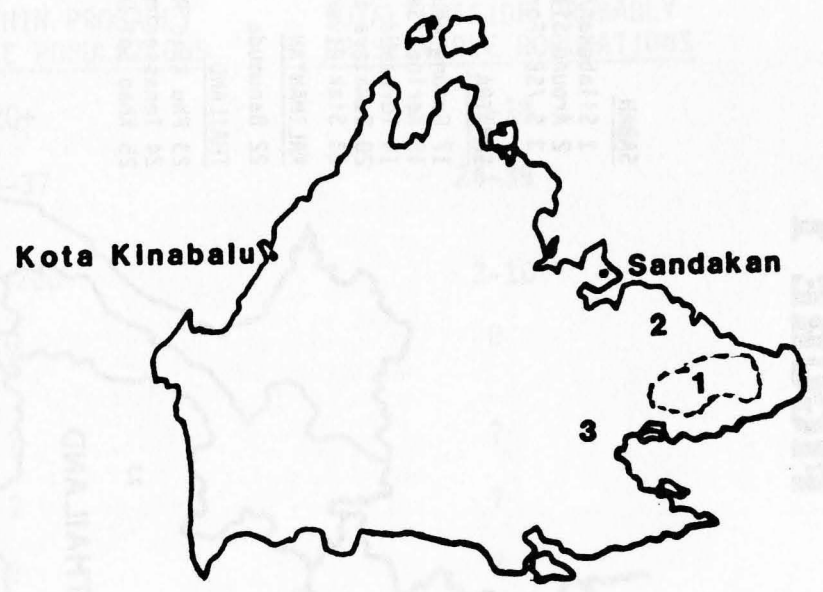
WEST MALAYSIA



- 4 Endau Rompin
- 5 Taman Negara
- 6 Sungai Dusun
- 7 Gunung Belmut
- 8 Mersing Coast
- 9 Ulu Lepar

- 10 Sungai Depak
- 11 Kuala Balah
- 12 Bukit Gebok
- 13 Krau Reserve
- 14 Ulu Selama
- 15 Ulu Belum
- 16 Thai Border

SABAH



Kota Kinabalu

Sandakan

- 1 Silabukan Reserve
- 2 Kretam/Dent Peninsula
- 3 Other Areas