

**THE HISTORY OF THE CAPTIVE BREEDING PROGRAMS
OF THE SUMATRAN RHINOCEROS 1984-2019**

by

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Dr Kees Rookmaaker maintains the website and library of the Rhino Resource Center (RRC). About 1000 items are added to the database annually, or on average 3 new publications daily. As the RRC can be accessed globally free of charge, this must be the first place to read all research and conservation progress for all species of rhinoceros.

Scholarly books or monographs to date:

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INTRODUCTION

This report is a survey of the literature written about the Sumatran rhinoceros (*Dicerorhinus sumatrensis*) captured in Malaysia (Peninsula, Sabah) and Indonesia (Sumatra, Borneo) from the middle of the 1980s. Literature has been interpreted in a wide sense to include not only writings in scientific and popular books and journals, but also to some extent unpublished reports, newspaper columns, internet blogs and websites. This reflects the holdings of the Rhino Resource Center, arguably the most comprehensive and complete library of everything written about every species of rhinoceros.

This report is written in response to a competitive research call issued in October 2018:

Desk study documenting information on Sumatran rhino captures and translocations in the 1980s. The ecology and sociobiology of Asian rhinos differs vastly from that of the African species. Primarily, anecdotal data are available on Sumatran rhino captures from the 1980s. A desk study documenting information and lessons learned from the captures in the 1980s would be a useful first step to lay the groundwork for future search and rescue efforts.

In response to this, this report is a study of the literature on the capture efforts of Sumatran rhinoceros from the 1980s to the present.

Despite the large volume of the existing literature, it must be admitted that not everything was written down. Some information is lost in reports that have now been forgotten and exist maybe in one or two copies. There are likely to be quite a few people still alive with recollections which have not (yet) been committed to paper. This report excludes naturally all such data which might need further investigation.

In the chapters of this report I have set out some of the historical detail of the steps taken to achieve the captive breeding program. All animals captured are discussed in chapters on Peninsula Malaysia, Sumatra, Sabah and Kalimantan including dates of all transfers. In the last chapters I have highlighted some of the lessons learned as far as they were exposed in the existing literature. This has led to a series of 'recommendations' repeated in the Executive Summary.

It cannot be said that the captive breeding program conceived in the 1980s has been an unmitigated success. Critics may feel vindicated. And yet, the program was neither ill-conceived nor foolish. Even opponents could not have predicted the long list of unexpected and serious challenges. The sex ratio of captures was unequal, some animals were post-reproductive, compatible pairs were few, many females proved to have serious pathologies in the reproductive system, the right diet and the most favorable conditions had to be found, and unexplained diseases resulted in sudden deaths. The few successes give hope for the future because much experience has been gained over the years.

The conservation community in the 1980s showed great courage to face the known and unexpected challenges. There was flexibility and willingness to overcome all hurdles. Not all went to plan. It is true that 47 animals were caught, and in the end, now some thirty years later, we can still count the number of offspring on two hands.

Yet we can and we must learn from the past. It is imperative for all those involved in the program to rescue the last Sumatran rhinos to be totally conversant with that past and with all the relevant literature. If there were any shortcomings, these must be recognized and lead to improvements.

International and national cooperation without political or financial restrictions is key. Capture of viable reproductive animals is key. Further research into aspects of husbandry and veterinary science is key. Artificial reproductive techniques need to be developed to harness the full potential of each animal.

What we must find is the trigger that allows Sumatran rhinos to breed to their full potential. In the case of the white rhinoceros from southern Africa, it is well-known that breeding success was first achieved after the zoos of San Diego and Whipsnade imported herds rather than pairs of these animals. In the case of the Indian rhinoceros, it needed the courage and interest of Basel Zoo staff to allow some aggressive foreplay among their otherwise compatible pair. In the case of the Sumatran rhino, it appears that the trigger leading to a baby boom has not yet been found. Collectively we may not now know where the answer lies, but we must continue to analyze and go forward with confidence.

The Sumatran rhinoceros is at its last stand. The number of animals in the wild is very low, and continues to decrease at an alarming scale. If we don't invest funds and efforts now, if we look away for just a few days, the battle will be lost. Our heritage and legacy will be lost. A species will be lost. This is the time for action, to work together to find the best solutions to keep at least one endangered species from moving into extinction.

Dr Kees Rookmaaker
Chief Editor of the Rhino Resource Center

Mijas Costa (Spain), 31 October 2019

EXECUTIVE SUMMARY

The American Association of Zoos and Aquariums (AZA) started to develop Species Survival Plans in the early 1980s which included all species of rhinoceros. The concept of captive breeding was then discussed with the IUCN and the incumbent Asian Rhino Specialist Group.

A conference was organized to discuss the possibilities for the Sumatran Rhino, held in Singapore in October 1984. This led to a set of recommendations known as the Singapore Proposals which included a captive breeding program for the preservation of the genetic diversity.

While the AZA had hoped to start with captures in Sabah and possibly Peninsula Malaysia, this became the focus of political debate resulting in an export ban. Malaysia started its own program, which would include a total of 14 Sumatran rhinos (4 males, 10 females) 1984-1994. The animals were kept in Melaka Zoo and a breeding facility in Sungei Dusun. In 2003 the remaining rhinos died from disease caused by bacterial infection.

The first rhinos captured in Indonesia were part of a Memorandum of Understanding signed with John Aspinall of Port Howlett, United Kingdom. In total 8 animals (4 males, 4 females) were captured under this program, divided among Port Howlett and three facilities in Indonesia.

The American zoos then shifted attention to Indonesia where rhinos were captured under an agreement with the Indonesian Government from 1988. A total of 10 rhinos (3 males 7 females) were captured, of which 7 were exported to the U.S.A. to be kept in Los Angeles, New York, San Diego and Cincinnati. There were 3 births in Cincinnati (2001, 2004, 2007).

The Cincinnati Zoo was proactive in research of the reproductive difficulties of the Sumatran rhinos. One pair gave birth to 3 babies (2 males, 1 female) in 2001, 2004 and 2007. Two of these animals were moved to the SRS Way Kambas.

Sabah (East Malaysia) started its own national rhino program, which would involve 13 rhinos (9 males, 4 females) captured 1987-2014.

In Kalimantan, Indonesian Borneo, 2 female rhinos have been captured in 2016-2018, of which one survives.

When it became clear in the early 1990s that captive breeding encountered multiple challenges especially in facilities outside the range states, discussions started which led to the establishment of a Sumatran Rhino Sanctuary (SRS) located within the borders of Way Kambas National Park, Sumatra, Indonesia, inaugurated in 1998. A second phase of the SRS with much extended facilities was opened in October 2019.

The Sumatran Rhino Sanctuary in Way Kambas has been home to 3 rhinos transferred from other zoos in 1998, 2 females captured in Sumatra in 2005, and 2 young rhinos moved from Cincinnati. One pair has produced 2 babies (1 male, 1 female) in 2012 and 2016.

The first phase of the rhino capture program started in 1984 and continued up to 1995 has not been an unmitigated success. There has been criticism from many quarters. A total of 47 rhinos were captured, and these have had just six offspring. This was not because the proposals of 1984 were wrong, rather the Sumatran rhino proved to provide challenges in husbandry and reproduction which could not have been foreseen. Many animals had or developed pathologies in the reproductive tract. Behaviour and diet differed from other rhino species.

This survey of literature has shown that there were a number of areas where we are learning lessons from the past.

The following recommendations can be formulated in response to these past challenges.

1. All subspecies of the Sumatran rhino can be mixed to achieve maximum breeding success. (chapter 16)
2. All Sumatran Rhinos captured in Sumatra, Malaysia, Sabah, Kalimantan must be managed as one meta-population. Political boundaries must be disregarded for purposes of conservation. (chapter 17)
3. A balanced diet of browse is of crucial importance in the well-being of the rhinoceros in captivity. (chapter 18)
4. Enclosures must be hygienic and provide shade and wallows. (chapter 18)
5. Enclosures must be large enough to allow space during fights between animals. (chapter 18)
6. The design of enclosures must allow for solitary periods of the rhinos. (chapter 18)
7. The presence of qualified veterinarian staff with proper equipment on a continuous basis can ensure the health of the animals. (chapter 19)
8. New animals should be sourced from viable large populations with known breeding females. (chapter 20)
9. Artificial Reproductive Techniques must be used to maximize the genetic material of all Sumatran Rhinos in the captive breeding program. (chapter 21).

CHAPTER 1

TOWARDS SINGAPORE 1984

Tom Foose (1945-2006), with a Ph.D. in biology from the University of Chicago in 1982, served as the Conservation Director for the American Association of Zoological Parks and Aquariums (AAZPA, now renamed AZA) from 1981 to 1990 (IRF 2016). At the time of his appointment, the AAZPA was in the process of initiating and evaluating a new set of Species Survival Plans to develop captive breeding programs for the preservation of endangered species. One of the first SSPs developed by Tom Foose in collaboration with Ulysses Seal was one for Siberian tigers in 1983 (Seal & Foose 1984; Foose & Wiese 2006). In this context, the idea of a SSP for Sumatran rhinos was first listed in 1981 (Foose 1983). Foose as Conservation Director was charged to take the program forward and to engender both scientific and financial support.

The Species Survival Plans were initiated in an understanding that small populations are to be managed by a group of zoos banded together putting aside personal interests. The zoos owning the animals sign an SSP agreement and abrogate responsibility for the management of those animals to a management committee who is elected from the membership of owners. It is this committee who makes the decisions on how the animals will be handled in the future, so that the entire captive population is managed as a single genetic group. The primary objective is the creation of a self-sustaining population, which possibly can support the wild population either with individual animals or genetic material. The ultimate goal would be to put the species back into a protected, safe, wild situation (Thomas 1987).

A first step was to contact the Asian Rhino Specialist Group (AsRSG), which had been initiated by the Species Survival Commission (SSC) of the International Union for Conservation of Nature (IUCN) in 1980. Foose wanted their endorsement and their commitment to a role as coördinator for any global captive program. It is said that Foose, together with William G. Conway of the New York Zoo, wrote a letter on 17 February 1982 to Rudolf Schenkel (1914-2003), who had been elected AsRSG chairman in 1980. Schenkel had been interested in the rhinoceros for some time, and together his wife Lottie published major studies on the ecology and behaviour of both the black and the Javan rhinoceros species based on extensive fieldwork (Schenkel & Schenkel 1969a, b). Schenkel responded on 29 April 1982 but his position was non-committal. There was no further official response in the next years. In fact, Schenkel himself felt that the rhinoceros needed to be preserved in their original habitat and that the zoo community lacked the necessary knowledge to be successful – which position he continued to defend, calling the captive breeding program of the Sumatran rhino recently “ein fataler Misserfolg” - a fatal failure (Rübel & Schenkel 2007: 95). Although possibly discussed at an Asian group meeting in Frazer’s Hill, Malaysia, in June 1982, there is no trace of Schenkel’s position.

Foose also went to explain the SSP concept at a meeting of the International Union of Directors of Zoological Gardens (IUDZG) held in London in August 1982 (Foose 1983b). Recognizing that the plan for Sumatran rhino had to be ambitious in the absence of any animals in captivity, he discussed that there were several populations no larger than five animals which probably could not be protected in their habitat. As he said, a viable and desirable alternative seemed to be to assemble them for a captive propagation program. This met with general agreement with the qualification to focus only on these so-called doomed animals (Foose 1983a).

The AAZPA Species Survival Plans had a common procedure. To facilitate development and operation, the AAZPA had created the position of Conservation Coordinator located at the ISIS offices at the Minnesota Zoological Garden in Apple Valley, Minnesota, a position filled in those years by Tom Foose. Then there would be a Species Coordinator assisted by a management committee known as a Propagation Group elected from and by the participating institutions. A "Memorandum of Participation" would then document the commitment of an institution to participate in the program and manage the animals in accordance with the guideline of a Populational Masterplan and the recommendations of the Species Coordinator and Propagation Group. This was also explained to the membership at the AAZPA Annual Conference held in Phoenix, Arizona, where (according to Holland 1989), "the idea for a major potential project to bring Sumatran rhinos into captivity was conceived" and most certainly discussed (Foose 1982).

With some sort of global consensus achieved, it was time to survey the possibilities in the range states. According to Foose (1983a), the first contacts in Sabah were made through the New York Zoological Society with Clive Marsh, who helped to establish connections with wildlife officials, like Patrick Andau, the Assistant Chief Game Warden in Sabah. In Peninsular Malaysia meetings were arranged through Rodney Flynn, who was in the process of surveying the Malaysian rhino population (achieving a Ph.D. on the subject at the University of Montana in 1983). The initial discussions also indicated that it was recommended not to try to maintain subspecific distinctions. A total of 1 million dollar might be required: "results will be slow. It will be difficult" was the warning (Foose 1983a). The selection of a field manager was also critical, and names proposed at the time included: Tony Parkinson (a veteran trapper formerly employed by John Seago in the Philippines), Markus Borner, Nico van Strien and Rodney Flynn.

Markus Borner (b.1945) conducted an extensive survey for IUCN/WWF in Sumatra in 1976, resulting in his Ph.D. of 1979 at the University of Basel. He prepared a proposal for establishment of a captive population, which was circulated to several zoos, but no individual institution could provide the commitment of resources and leadership (Foose 1982). So his plan did not make it, and Borner has since had a remarkable career in conservation of East African wildlife.

Foose, as coordinator of the AAZPA SSP, still had much groundwork to cover. In 1982, he needed to make a formal proposal to the AAZPA board and get their approval. In April to June 1983 Foose and William (Bill) Ziegler, general curator of the Miami Metrozoo, flew to Malaysia and Indonesia to discuss the possibilities, hoping to start in Sabah (Dee & Masuo 2015). Foose's main proposal to AAZPA was dated 7 September 1983 (Foose 1983a)

In April 1984, Foose (1984) reported that the AAZPA board had endorsed the project in principle. The aim was to capture 6-12 pairs of Sumatran rhinos in Malaysia, with animals divided equally between the range country and the United States. No captures would be attempted in the main parks and reserves, hence the focus was on the smaller, possibly doomed populations. There was a promise of technical assistance for development of captive propagation capabilities in South-East Asia. An initial consortium of eight zoos was ready to proceed and they met in the middle of February 1984 in Chicago. This led to a body called the Sumatran Rhino Species Survival Trust, which soon must have been renamed to Sumatran Rhino Trust, as this name is found in subsequent papers. The primary members would be those institutions interested in acquiring rhinos and willing to commit sufficient resources to accomplish this objective, with estimated costs for the first three years approximately \$1 million. Subsidy members were those ready to commit a smaller amount, receiving progeny from the founder stock or participating in research aspects. The Board of Trustees would consist of one trustee for each primary

member, while AAZPA would also appoint a trustee. The papers for the formation of the trust were to be drawn up by corporate lawyers Peter Freeman and William McMaster (of Hopkins & Sutter). The details would be finalized in a meeting set up in Philadelphia in April 1984.

The plan was that the AAZPA would attempt to concentrate on Malaysia deferring any Indonesian activities. Tony Parkinson had already been retained on contract by March 1984 and was due to visit Malaysia after a few months (Foose to Mohd. Khan 1 March 1984, see Payne 1984: 92). Parkinson was thought to have the necessary experience in the capture of large mammals, and his assistance was being discussed at this stage between Foose and him.

The Sumatran Rhino Trust (SRT) was duly formed, probably in the course of 1984. The first institutions subscribing to the SSP for Sumatran rhinos were San Diego, New York, Los Angeles and Miami, of which the last withdrew due to lack of funds and was replaced by Cincinnati. Warren Thomas, the director of Los Angeles Zoo at the time, was to be the first executive president. Tom Foose was the Conservation Coordinator in the AAZPA office and would oversee the proceedings.

So in America the ground work was done to move forward with the vision to bring some Sumatran rhinos into captivity to start a breeding program.

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Tom Foose, who was sure that captive breeding of Sumatran rhinos would save them from extinction. He encouraged everybody and followed his belief to bring the animals to the USA, albeit with limited reproductive success. He was truly a dedicated rhino man (Hance 2018d).

CHAPTER 2

THE SINGAPORE CONFERENCE – OCTOBER 1984

Rudolf Schenkel, as the Chair of the Asian Rhino Specialist Group (AsRSG), sent out an “exposé” of the plans to capture Sumatran rhinos in South-East Asia to further conservation, dated 5 January 1984. Although no copy of this document is now available for perusal, it appears that it was sent to Tom Foose (representing AAZPA), John Aspinall (owner of Port Lympne Zoo in the United Kingdom), Gren Lucas and Robert F. Scott (representing IUCN SSC) and Ulysses S. Seal (chair of the IUCN/SSC Captive Breeding Specialist Group). The replies and comments offered by Seal on 25 January 1984 are preserved (Payne 1984: 98-105). From these remarks there is a definite impression that Schenkel remained critical of any proposals to start a breeding program of the Sumatran rhino outside the protected areas in the range states, e.g. Seal comments that “the use of pejorative argumentation does not serve the cause of species survival.” In his reply, Seal concluded that he agrees that captive breeding is intended primarily to reinforce the wild populations, but that the risk of failure of the plans proposed by AAZPA does not appear to be as high as implied, and, most significantly, that the summary rejection of all plans for captive breeding is not a logical outcome of the available data or the understanding of population biology: in fact “this stand constitutes a serious threat to the survival of the species.”

These opposing views of how best to preserve the integrity of the Sumatran rhinoceros species could only be resolved through further discussion. This was clearly understood by the leaders of the Species Survival Commission, which oversaw the running of the specialist groups. Maybe because Schenkel was opposed to the idea, Robert Scott, the executive officer of SSC, on 15 June 1984 invited Ulysses Seal to assume the responsibility for convening and organising an *ad hoc* meeting in Singapore to bring together a small group of experts concerned with both pros and cons of proposals to start a captive breeding scheme for the Sumatran rhinoceros, which was endorsed by Schenkel (Payne 1984: 72). The plans were quickly finalised and, hosted by Singapore zoo, this meeting took place from 2 to 4 October 1984.

The following 23 people participated in this meeting:

Rudolf Schenkel	Chair, IUCN/SSC Asian Rhino Specialist Group
Robert F. Scott	IUCN, Executive Officer of SSC
Peter van Bree	SSC Steering Committee
Patrick M. Andau	Malaysia, Chief Game Warden of Sabah
Mohd. B. Momin Khan	Malaysia, Dept. Wildlife & Parks
Louis Ratnam	Malaysia, Dept. Wildlife & Parks
John Payne	Sabah, WWF
Syafii Manan	Indonesia, PHPA
Widodo S. Ramono	Indonesia, Nature Conservation
John Aspinall	UK, Howlett & Port Lympne
Francesco Nardelli	UK, Howlett & Port Lympne
Ulysses S. Seal	USA, Captive Breeding Specialist Group (CBSG)
Marialice Seal	USA, CBSG companion
Thomas J. Foose	USA, AAZPA Conservation Coordinator
William G. Conway	USA, New York Zoo – apologies for absence
James Doherty	USA, New York Zoo

Edward J. Maruska	USA, Cincinnati Zoo
Warren D. Thomas	USA, Los Angeles Zoo
Marcia Hobbs	USA, Los Angeles Zoo
Bernard Harrison	Singapore, Zoo
Ong Swee Law	Singapore, Zoo (chairman)
Roy Sirimanne	Singapore, Zoo (veterinarian)
Nico J. van Strien	Netherlands (expert)
Tony Parkinson	Philippines (animal catcher)

Seal was the convenor and chairman. Hance (2018a) recently gave an impression of the discussions of this meeting based on some written documents and some interviews with participants. As Hance acknowledged, the road to consensus was constructed during informal talks and discussions at break and meal times, possibly rather than during the formal presentations and reviews. Considering that the representatives of the Malaysian and Indonesian forest departments were in favour of captive breeding, and that there was a strong contingent of zoo people, maybe it is not surprising that the opposing views were drowned out.

There were definitely quite a number of objections to a captive breeding program. There were also questions and remarks asking why it would be necessary to remove some of the animals from the range states. Both Aspinall (UK) and Thomas (USA) outlined that it was not feasible to ask for a large financial contribution from the zoo community without some kind of benefit. Clearly they wanted animals to exhibit in their institutions, of course with the sincere aim to develop best practices for breeding successes of the species.

A consensus was reached on all major points of discussion. The final wording has become known as the "Singapore Proposals" The first version is found in the report by Van Strien (1985), and the formal version was printed by Khan (1987) and in the AsRSG Action Plan authored by Khan (1989:22). As this was an important step in the protection of the Sumatran rhinoceros in South-East Asia, the conclusions are set out in full:

The Singapore Proposals of 1984

1. The primary goal is long-term survival of the Sumatran rhino as a species and a component of natural ecosystems.
2. A comprehensive masterplan for conservation of the species will be developed, which will be collaborative and multinational in nature and which will identify and integrate all of the actions necessary to achieve the primary goal.
3. Development and oversight of the masterplan will be the responsibility of the IUCN/SSC Asian Rhino Specialist Group.
4. The conservation programme will include to following three fundamental activities:
 - a. Development of an education programme to enhance public awareness and support for the Sumatran rhinoceros.
 - b. Provision of primary support for a programme of conservation for the Sumatran rhinoceros as viable populations in sufficiently large areas of protected habitat.
 - c. Establishment of a captive breeding programme for the preservation of the genetic diversity of the Sumatran rhinoceros in the countries of origin, including Indonesia, Malaysia and Thailand, and in North America and Europe, using animals with no hope of survival in the wild. The parties are

committed to contribute to each of these in each country as mutually agreed, with details subsequently recorded in a bilateral memorandum of understanding or similar document.

5. The following principles and actions are to be observed in the captive propagation programme:
- a. Animals selected for capture in the wild are to be "doomed" individuals or come from "doomed" populations or habitats; that is, those whose future long-term viability or contribution to the survival of the species is determined to be unsatisfactory as measured by objective criteria subject to continuing refinement.
 - b. Currently presumed subspecies stocks will not be mixed, either in captive breeding or in the wild translocation, until further work is done on their taxonomy.
 - c. The zoo communities will provide support and technical assistance in field capture and transfer operations.
 - d. Bilateral agreements will provide for captive breeding programmes in the countries of origin as well as in the United States and United Kingdom.
 - e. Animals sent abroad will be on breeding loan from the countries of origin, or under some similarly equitable ownership agreement of sufficient time span to protect all interests.
 - f. All animals placed in captivity and their future progeny will be managed cooperatively as part of a "world population" in the light of the primary overall goal of the programme. Decisions will be taken by consultation among the owners and interested parties with oversight provided by the IUCN/ SSC Asian Rhino Specialist Group.
 - g. Bilateral agreements will provide for appropriate support, training and technical assistance in captive breeding in the countries of origin.

These proposals were written with a sense of optimism for success, but also with general regard for all the available tenets of nature conservation. There was no reason to suspect that the outcomes could never match the goals.

When Maguire et al. (1987) discussed a series of strategies which could reduce the potential for extinction in an endangered species like the Sumatran rhino, they calculated that "if the captive program is successful, and breeding populations are established at several facilities in Malaysia, Indonesia, the United States, and Great Britain, the Probability of Extinction for the species would be reduced to zero over the next 30 years."

There was of course opposition. As Khan (2014:85) put it, "there were many people who refused to have anything to do with captive breeding. They would rather leave the animals alone to eventually die out as they put it with pride." Lever (1985) favoured the creation of sanctuaries into which solitary animals can be translocated. But foremost among the opposition was Rudolf Schenkel, and it must have caused him to resign from his chair of the AsRSG. His place was taken in December 1984 by Mohamad Khan bin Momin Khan (b.1935), the Director-General of the Wildlife and National Parks Department (Perhilitan) of Malaysia. Similar disagreements with the captive breeding option were advanced by Santiapillai & MacKinnon (1991), Dinerstein (2003:230), and others.

Nico Jan van Strien (1946-2008) was appointed to be the Coordinator of the Sumatran Rhino Conservation Masterplan under IUCN (van Strien 1985b). Nico van Strien was a Dutch ecologist who had done much field-work on Sumatran rhinos in northern Sumatra, obtaining his Ph.D. in 1985 (van Strien 1985a, 1986), and would be much involved with the conservation of the rhinoceros both for in situ projects and captive breeding (Ellis 2008; Talukdar 2008). He reported on his preparatory mission for the implementation of the "Singapore Proposals" after visits to the participating zoos as well as the range states (van Strien 1985b).

The focus of the next years were set out by Foose (1987:162) saying that “to salvage the situation, the AAZPA in conjunction with British zoos, IUCN and wildlife dept in Malaysia and Indonesia, is proposing a roundup of isolated animals to employ them for captive propagation. The plan is to capture 6 or 12 pairs, enough for a viable population, and to distribute them equally among captive facilities in SE Asia, N America and Europe. If succesful, this project will serve as a model for similar programs with other species.”



Nico van Strien (1946-2008), whose efforts for conservation of the rhinoceros in South-East Asia are still highly praised. He was instrumental in establishing the Sumatran Rhino Sanctuary in Way Kambas. His scientific work created a foundation for further studies. He was the first Chairman of the Rhino Resource Center founded in The Netherlands. He served as Chair of the Asian Rhino Specialist Group from 2001.

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CHAPTER 3

POLICY OF EXPORT FROM MALAYSIA AND SABAH 1985

When the Singapore meeting finished at the end of October 1984, there was an expectation that Malaysia (both the Peninsula and Sabah) would proceed to capture rhinos from 'doomed' populations, some of which would be exported to the USA under a deal made with the Sumatran Rhino Trust (SRT), part of the AAZPA initiatives.

The outlines for the bilateral agreements were drafted in Singapore. There were further consultations between the partners in the beginning of 1985, resulting in a detailed Memorandum of Understanding (MoU) between Malaysia and SRT. Both Nico van Strien as IUCN Coordinator of the Sumatran Rhino Conservation Masterplan and Tom Foose were involved in the discussions with Mohd. Khan for Malaysia and Patrick Andau for Sabah. The wording of the MoU was printed by Van Strien (1985) and is included at the end of this chapter.

According to Sharp (1985), the agreement between Malaysia and SRT was signed at the end of July 1985: "There will be a commitment of the Sumatran Rhino Trust set up by AAZPA to spend \$1 million in the first 3 years for rhino conservation, and Malaysian will receive training in new breeding technologies. The Americans will also help the Malaysians to set up their own rhino breeding centers." Van Strien (1985) visited Malaysia in April-May 1985, and implies that the agreement was still in the final stages of discussion when he left, and the Wildlife Section of the Forest Department of Sabah (WSS) was unable to commit. He said that Khan visited Sabah for further talks, which freed the way to a favourable decision, but the signing had not taken place up to October 1985.

However, the outstanding issues did not get resolved. There was too much negative publicity in the Malaysian media, with nationalistic sentiments overriding all the scientific evidence on often very flimsy grounds. Some of the press releases were compiled by the editors of the *Malaysian Naturalist* (Malayan Nature Society 1985a,b, 1986). The main opposition came from the officers of the Wildlife Conservation Foundation, Environmental Protection Society Malaysia, Sabah Society, Sahabat Alam Malaysia as well as the Malayan Nature Society. Their arguments included very general statements that zoo animals have higher mortality than wild ones; that breeding technology had remote chances of success; that rhinos would be shared among four American zoos; that animals bred in zoos are ill-adapted to rehabilitate the wild; and that removal of animals for captive breeding may be used as an excuse for the continued logging of forests. Although there was very little evidence that any of these comments were actually true, they showed that the people in Malaysia felt that they should be allowed a chance to start their own captive breeding program. Or, according to the Selangor Branch of the Malayan Nature Society, the IUCN and AAZPA should show sincerity and support financially and lend their expertise to a Malaysian-based program.

Politicians were left with little choice. On 27 July 1985 in Malaysia, the Science, Technology and Environment Minister Datuk Amar Stephen Yong (1921-2001) announced that Sumatran rhino would not be allowed to be exported to USA. And on 6 August 1985 in Sabah, Chief Minister Datuk Joseph

Pairin Kitingan (B.1940) also vetoed the export of rhinos from Sabah. It was feared that the chances of the rhino surviving in a foreign captive breeding program would be very slim, and however much true that might have been, it is more likely that the politicians feared a backlash from the general public (Anonymous 1985).

A few months later (24 September 1985), Dr Kiew Bong Heang (Malayan Nature Society) wrote for an explanation to Kenton R. Miller (1939-2011), Director General of IUCN. Miller replied on 21 October 1985, setting out the IUCN policies and stating categorically that IUCN does support the captive breeding of Sumatran rhinos, having invested considerable effort in helping achieve agreement (Malayan Nature Society 1985b). This did change the tone of the discussions, and some opponents now agreed to the captive breeding program. Even the Malaysian minister Stephen Yong on 23 October 1985 (*The Star*) said that the State Government should not regard captive breeding in USA as export because the animals could be brought back any time.

It must have been a big blow to the people involved with the SRT. There was little hope that further negotiations would lead to a different result. Hence the American organization approached the Indonesian Government in November 1985 to see if they could obtain the animals needed for the breeding program in Sumatra (Holland 1989). This is further explored in Chapter 6.

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Mohamad Khan bin Momin Khan (b.1935), Chairman of the SSC/IUCN Asian Rhino Specialist Group 1984-2004. Recipient of the Sir Peter Scott Award for Conservation Merit awarded by IUCN in 2004 and the Merdeka Award for the Environment in 2014. (*Star Online*, 17 November 2014).

Text of Memorandum of Understanding (MoU) between Malaysia and the Sumatran Rhino Trust From Van Strien (1985):

PREAMBLE

Recognising that the Sumatran rhino is one of the most endangered mammal species in the world and is facing serious threats of habitat, poaching and other mortality factors:

1. The HPLF/SRT together with the PHPA/WDMS agree to work together on a project aimed at providing this species with the maximum chances of survival.
2. The HPLF/SRT recognise that as part of their commitment to the conservation of the species, they will undertake to fund conservation activity beyond their normal emphasis of acquiring animals for their collections.
3. The PHPA/WDMS recognise that the technically advanced facilities existing in England and North America provide for a more rapid increase in size of a captive breeding group which potentially could be utilised for re-introductions back into their natural habitats at a more suitable time in the future. However it is noted that the entire programme will be managed as a single conservation effort for the species and, in general, will be aligned so that the species stands to gain the maximum advantages.

BACKGROUND

1. This agreement is entered on this date by the PHPA/WDMS and HPLF/SRT. Collectively, West Malaysia, Sabah and the SRT constitute the 'parties' and the 'signatories' to this agreement.
2. The purpose of the Agreement is to establish a conservation project between the parties as part of a global strategy for conservation of the Sumatran rhinoceros *Dicerorhinus sumatrensis* (referred to as the 'Rhino') being developed under auspices of the Species Survival Commission (SSC) of the International Union for the Conservation of Nature and Natural Resources (IUCN).
3. The goal of the strategy is the long-term survival of the Rhino as a species and as a component of its natural ecosystems.
4. The strategy is justified because:
 - (A) The rhino is a greatly endangered species;
 - (B) The rhino presently survives in the wild to a great extent in small, isolated populations which may not be genetically or demographically viable for the long-term;
 - (C) The rhino population is decreasing due to poaching, logging, and a combination of factors;
 - (D) Elimination of this species will deprive mankind of an irreplaceable, natural resource;
 - (E) This agreement is entered into for the purpose of supplementing a conservation program to prevent the extinction of the Sumatran Rhino and thereby enrich our environment by preserving for mankind a species of invaluable scientific, educational and cultural significance.
5. The strategy will attempt to achieve this goal through conservation programs for: (A) The protection of viable populations in sufficiently large areas of natural habitat, and (B) Captive propagation to preserve a reservoir of genetic diversity employing animals with no apparent hope in-situ of contributing to the long-term survival of the species.
6. However, since the expertise and resources of the HPLF/SRT are largely oriented toward captive propagation, their contributions must concentrate on this part of the strategy while providing other limited support for the in-situ conservation efforts.
7. Thus the major objective of this specific cooperative conservation project is to develop a program of captive propagation for the rhino.
8. The primary purpose of the captive propagation will be to reinforce wild populations.
9. The project will be developed in accordance with the guidelines established by the IUCN Ad-hoc Meeting on Sumatran Rhino conducted in Singapore, 2-4 October 1984, and attended by representatives of the parties to this Agreement. ('the Singapore Proposals'): See appendix I.
10. The project will be developed under the oversight of the Sumatran Rhino Foundation ('Foundation') to be established under the auspices of the IUCN SSC. The foundation will operate as an independent task-force under the aegis of the Asian Rhino Specialist Group of the IUCN SSC. Initially, the foundation will consist of the Sumatran Rhino Coordinator ('Coordinator') and one representative each from WOMS, SRT, PHPA, HPLF, the IUCN SSC Asian

Rhino Specialist Group and the IUCN SSC Captive Breeding Specialist Group. The Sumatran Rhino Coordinator will be employed by the IUCN under terms of reference which are available from IUCN.

11. While the major contributions of the HPLF /SRT should and must be oriented to the captive propagation components of the conservation strategy for the rhino, the cooperative nature of the project will be further demonstrated by financial & technical support from the HPLF /SRT to Indonesia/West Malaysia and Sabah for in-situ conservation efforts.

This financial and technical support will include:

(A) Assistance from the HPLF/SRT to increase protection of viable natural populations and sanctuaries. Priority in this regard will be given to the Tabin (Silabukan) Wildlife reserve in Sabah/National Parks in Sumatra containing viable rhino populations. An important part of this assistance may be field research conducted collaboratively by Malaysian and SRT investigators.

(B) Surveys to determine which rhinos are suitable for capture project in West Malaysia that in concept will combine elements both of in-situ conservation and captive propagation.

(D) Training for PHPA/WDMS staff in management of captive and wild populations.

(E) Transfer of capture and transport technology.

SPECIFICS OF THE PROJECT

1. Captive propagation projects will be developed in West Malaysia, Sabah and North America/ Indonesia and England.

2. Field operations to collect appropriate rhinos will be (simultaneously) initiated in West Malaysia and Sabah/ Indonesia. An HPLF/SRT representative will coordinate and facilitate these efforts as the Field Supervisor. The field operations will commence within 30 (HPLF 60) days of signature of this agreement by all parties.

3. A Management Committee ('Committee') will be formed consisting of seven members. These would include the Director General of the Department of Wildlife and National Parks of Peninsular Malaysia as chairman; (he Director of Research and Management of the Department of Wildlife and National Parks of Peninsular Malaysia; the Assistant Chief Game Warden of Sabah; three representatives from the SRT, one of which will be the Species Coordinator for the SRT; the IUCN SSC Sumatran Rhino Coordinator.

4. The primary function of the committee will be to supervise and facilitate implementation of the project as specified by the agreement and also if required to interpret the terms of this agreement. However it is recognised that the primary responsibility of implementation of this project rests with the Malaysian parties to this agreement.

5. Because of the long distances and the local necessities of the project, the Field Supervisor would represent the HPLF/SRT on all day-to-day operational matters such as the coordination and supervision of the capture teams, the construction of the holding pens, the transportation and management of the animals after capture and the basic logistics supporting the operations both in Sabah and West Malaysia/ Indonesia.

6. If any problem develops that cannot be resolved by the Field Supervisor as the Trust representative, and the local authorities, the Management Committee would be consulted by telephone or some other form of rapid communication. If the problem still could not be properly resolved, a physical meeting in a mutually acceptable location can be convened by the Chairman, the Field Supervisor, or a majority of the other members of the committee. This meeting would be for the purpose of dealing with any major matters not covered in the agreement as well as the management of the field operations in which there was a major disagreement.

7. Funds from the SRT for the project would be directed through the Management Committee, who are responsible to the Trust and who must present the documentation of the costs and a financial statement on a quarterly basis. At this point, the funds will be delivered to a special account of the Management Committee who shall act as paymaster in accordance with a budget adopted by the Management Committee. Payments shall be made by cheque or purchase order signed by any two members of the committee.

8. A field capture team will be supported by the HPLF/SRT to operate (simultaneously) in West Malaysia and Sabah/Indonesia. The contractual obligation will cover a 3-year period from the date of the signature of the agreement by all parties. At the end of this 3-year period, signatories to the agreement will review the project and decide whether it is to be continued, modified or discontinued.

9. The number and identity of animals to be captured in West Malaysia will be determined by the Director General of Wildlife and National Parks in accordance with the criteria delineated by the Foundation Masterplan and subject to the review and ratification of the IUCN Sumatran Rhino Foundation. *At this time, all animals captured in West*

Malaysia will remain in the country of origin. The captive propagation program in West Malaysia will be located at the Melaka Zoo. Funds for adequate facilities to accommodate any and all rhinos placed at Melaka shall be the responsibility of West Malaysia.

Additionally, rhinos may be moved to a 'gene pool' site to be determined by the Director General. Actual distribution of rhinos captured in West Malaysia between the Melaka zoo, site of captive propagation in West Malaysia, or the gene pool project will be the decision of the Director General and will depend on the number of rhino captured during the 3-year period by the West Malaysian capture team.

10. In Sabah, rhinos will also be selected as candidates for capture according to criteria of the Foundation Masterplan. Preliminary analysis has indicated that all animals outside the Tabin (Silabukan) Wildlife Reserve and its contiguous environs and Danum Valley identified in the report "the plight of the Sumatran rhino in Sabah" by P. Andau and J. Payne satisfy these criteria and are candidates for immediate attempts at capture. Other groups or populations of rhino that might be discovered in Sabah in the course of the Project will be evaluated on a case-by-case basis according to the Foundation Masterplan criteria.

11. Due to the seriousness of the rhino situation in Sabah, it is deemed necessary that a healthy captive population be established without delay. This population is to be built up of animals in fragmented situations and of doubtful value to the natural population in the wild. The aim of this is to establish a reservoir of the Bornean subspecies that could be utilised at a later date for re-introduction in the wild when adequate reserves or systems of protection have been established. It is envisaged that five good breeding pairs will be set up at five different facilities i.e. Sepilok and the Cincinnati, Los Angeles, New York and San Diego Zoos.

12. Animals will be suitably matched by age and sex to maximise the breeding potential of this captive group.

13. The SRT will assist technically and financially in the development of the facility at Sepilok.

14. Derivation of all rhino destined for North America from Sabah will facilitate compliance with the Singapore Proposals recommendation for management of subspecies as separate populations in captivity for the near future.

15. By signing this agreement, it is understood that PHPA/WDMS agrees promptly to provide the HPLF SRT with all documents needed for the legal exportation of these rhino from Malaysia/Indonesia {and their importation into the United States}, immediately upon their capture.

16. The SRT will support through technical advice

17. The SRT will also provide technical and financial aid to the Sabah and Melaka captive propagation program, to the 'gene pool' project, and to in situ conservation efforts on a case-by-case basis to be approved by the SRT from time to time and in each year's budget and not to exceed US\$ 100,000 during the first year and US\$ 75,000 in each of the second and third years.

18. Further specifics on the amount of financial support will be determined mutually by the parties, project by project, based on the Foundation Master-plan.

19. Presently agreed upon items would be:

(A) Support for 2 capture teams financially and technically

(a) In Sabah. due to limited staff currently available, the SRT will pay salaries and field allowances of all personnel required as determined by the Field Supervisor.

(b) In West Malaysia. the organization and pay of the capture team will be the responsibility of the Department of Wildlife and National Parks with the exception that the SRT will pay field allowances for staff not to exceed the amount for this purpose expended by the SRT in Sabah.

(B) Specific items for Malaysia:

(a) Gene pool project -US\$ 70,000- to be used to construct staff and research buildings.

(b) 1 Landrover for West Malaysia to be utilized for gene pool project - US\$ 15,000

(c) Radio communication system -US\$ 10,000 - \$ 15,000

(d) Salary and allowances for one ranger – US\$ 7,500 (e) Support for the committee to carry out its functions unless otherwise provided for and up to a limit of US\$ 10,000 a year.

(C) Specific items for Sabah:

(a) 2 vehicles: 1 pickup truck. 1 station wagon - US\$ 45,000

(b) Radio communication system - US\$ 10,000 - \$ 15,000

(c) Scholarships for the Sabah staff to attend relevant courses in Indonesia, India or elsewhere. These scholarships would be available at a rate of two/year with a maximum allowance of US\$ 10,000/ scholarship or a total of US\$ 20,000/year

(d) Possible program of field studies. especially concentrating in and around the Tabin Reserve (US\$ 50,000 or expertise, equipment and time of equivalent value over the three-year period of the project), preferably by local scientists.

(e) Construction of holding facilities at Sepilok - US\$ 30,000.

20. The field Supervisor, will divide his time equally between operations in West Malaysia and Sabah. The official headquarters and residence for the Field Supervisor will be established in West Malaysia, but a collateral base will be established in Sabah. The Field Supervisor will develop the schedule for distribution of his activities in consultation with the Management Committee and in relation to the evolving situation in the field.

21. The primary assignment of the Field Supervisor will be the rhino project. However, he will also be available to advise and assist on other projects in West Malaysia (e.g. seladang) and Sabah (e.g. proboscis monkey) as time permits so long as in the opinion of the Field Supervisor and the Management Committee these activities do not detract from the primary assignment. Similarly the Field Supervisor may be available on a very limited basis, not to exceed 2 weeks per year to advise on the capture operations for the rhino proposed in Indonesia as part of the IUCN SSC Masterplan.

22. Technical assistance by the HPLF/SRT (pursuant to the above paragraphs) may include qualified animal keepers and veterinarians, curatorial guidance and support, and apprentice-training in West Malaysia and Sabah/Indonesia and at appropriate AAZPA zoos/HPLF for qualified Malaysian/Indonesian curators, keepers and veterinarians. Such technical assistance during the first year of the project will include:

(A) Qualified keepers and veterinarians in an as-needed basis to be determined by the Field Supervisor at the captive facility to be developed at Sepilok and Melaka/Indonesia.

(B) Veterinary support for the actual capture operations, on a short notice and as-needed basis to be determined by the Field Supervisor.

(C) Curatorial support on a semi-continuous basis for the captive facility at Sepilok and similar operations such as Melaka in West Malaysia. Support to be provided by alternating among the institutions of the SRT on at least a 4-6 week basis, possibly with some time lapse in between the tours of duty.

(D) Training in both Malaysia/Indonesia and at appropriate AAZPA zoos/HPLF for Malaysian curators, keepers and veterinarians to be negotiated on a mutually agreed upon level. Internships at SRT facilities for a period of eight weeks, which would be available in the first year to two selected staff members from Sepilok and two selected staff members from Melaka or other appropriate facilities in West Malaysia.

(E) Through these various mechanisms, there will also specifically be an attempt to provide information and instruction in various reproductive and other technologies applicable to the conservation strategy for the rhino and programs for other wildlife. In particular, the SRT will demonstrate technology in endocrinological analysis of urine and blood, embryo transfer and artificial insemination and various genetic analysis (e.g. karyotypic and electrophoretic) capture and transport methods for the rhino and other large mammals. Technical assistance in subsequent years will be provided upon favorable review of the Sumatran Rhino Project by West Malaysia, Sabah, the SRT and the Foundation.

23. The SRT will also provide US\$ 25,000 to IUCN toward support of the contract for the Sumatran Rhino Coordinator during each year of the project.

24. The HPLF/SRT will collaborate as appropriate with West Malaysia and Sabah/Indonesia in attempts to attract outside funds from corporations, foundations, organizations and philanthropists to support the conservation strategy for the Rhino.

25. All animals placed in captivity in West Malaysia, Sabah and North America will be managed cooperatively as part of a 'world population' under coordination of the Sumatran Rhino Foundation.

26. All rhinos captured in the Project shall remain the property of the Malaysian government in perpetuity subject to the conditions of this agreement. All animals transported to North America for captive propagation shall be designated to the SRT or its successor organizations on breeding loan.

27. Progeny produced in North America will also be on breeding loan to the SRT or its successor organization until the North American population attains demographic stability and a genetically effective size of 25. Thereafter, offspring from the North American population must and will be available for restocking adequate and protected reserves in Malaysia as the local management authorities advise in accordance with the Foundation Masterplan.

28. The number of rhinos potentially to be returned to Malaysia under these circumstances will at a minimum equal the number originally moved from Malaysia to North America. Beyond this number, repatriation of rhino will

continue as deemed necessary by the local management authorities and the Foundation Masterplan at a rate that does not detract from the self-sustaining status of the North American population.

29. Germplasm, which may be a more appropriate mechanism than actual animals in many cases for transfer of genetic material from captive to wild populations can and will be returned to Malaysia immediately as the technology can be applied and the local management authorities and the Foundation Masterplan so recommend.

30. This agreement can be amended only by mutual and unanimous agreement of the signatories.

31. It is understood that the signature of the representatives of West Malaysia and Sabah to this agreement obligates WDNS/PHPA to the terms of the agreement. Likewise, the signature of the Species Coordinator of the SRT/Chairman of the HPLF obligates the SRT/HPLF to the terms of this agreement.

32. Parties to this agreement appreciate that the financial and technical support of the HPLF/SRT is provided in the hope of securing the long-term survival of the Sumatran rhinoceros as a species and as a component of natural ecosystems. The HPLF/SRT seeks to contribute to the long-term survival of the biological diversity through the captive propagation of species that might otherwise be lost or so greatly reduced in numbers as to be highly vulnerable to extinction. The expertise and support of the Foundation/Trust is and must be directed primarily toward the fulfillment of this goal through preservation by captive propagation. In fulfilling these goals, the HPLF/SRT seeks to assist WDMS in its own attempt to propagate the Sumatran rhino and to provide such limited support as HPLF/SRT resources permit to related efforts as part of the conservation strategy for the rhino, to preserve wild populations where these are adjudged viable using modern criteria of biological conservation. The SRT applauds and does not seek to reduce, replace or supplant the efforts of the Malaysia/Indonesia government to protect its national wildlife in a state of nature .

Malaysia

Signatories: Mohd Khan bin Momin Khan. Director General Department of National Parks and Wildlife Peninsular Malaysia

Mahedi Andau Assistant Chief Game Warden. Wildlife Section. Department of Forestry, Sabah. Malaysia

Warren Thomas. D.V.M. , Species Coordinator. AAZPA Sumatran Rhino Trust.

CHAPTER 4

HISTORY OF CAPTURES IN PENINSULAR MALAYSIA

Before the captive breeding program was discussed in Singapore in October 1984, the Malaysia government had already captured two Sumatran rhinos and placed them in the country's main zoo in Melaka (Malacca), about 150 km south of Kuala Lumpur. These animals were the first to start the new program which over the coming years was executed by the Department of Wildlife and National Parks (Perhilitan) under the supervision of the general director Mohd. Khan. Some of the achievements and challenges have recently been discussed in a well illustrated book by Khan (2014).

The first captures were apparently unplanned, involving animals that left their habitats near oil palm plantations and were "rescued" by the general public and then handed over to the government. Although this seems to be an expedient way to add animals to the captive population, such animals should actually have been left untouched and returned to the wild, because capture of rhinos was unlawful without the consent of the authorities and the animals were perfectly harmless (Van Strien 1985).

In total, the Malaysian program included 14 Sumatran rhinos: 4 males, 10 females (table 1, chapter 5). One of these was zoo-born but wild-bred. One male died within a year after capture. The basic life histories of all animals are listed in chapter 5.

At Zoo Melaka, the Sumatran rhino enclosure consisted of eight indoor night stalls with a corresponding number of outdoor paddocks. Each night stall measuring 3.25 x 4.65 m was equipped with an overhead shower, light, a water trough and a wooden feeding trough. The wedge shaped outdoor compound was 17.5 m in radius and measured 4.6 m and 23.8 m at a distal and proximal arc respectively. Shade trees were planted within the paddock and the ground was planted with carpet grass. The shaded 1 m deep water pool was located near the dry moat (Zainuddin et al. 1990a; Zainuddin 1995).

There was a second facility for the rhino program situated within the Sungei Dusun Wildlife Reserve, about 120 km north of Kuala Lumpur. The first rhinos arrived here in January 1987. At first there was only one simple wooden enclosure. This was expanded to become the Sumatran Rhino Conservation Centre completed in 1991. The animals were housed in a pie-shaped enclosure with 8 night stalls, each connected to a paddock. One paddock is connected to a quarter-acre electric fence enclosure and subsequently shifted to 10-acre enclosure, fenced up in the forest (Mohamad & Romo 2007; Khan et al. 1999). One paddock was modified to contain a crush that measured 2.5 m long and 1.2 m wide by 1.5 m high, made up of vertical galvanised iron pipes on either side cemented into the ground (Zainuddin 1995). In 2000 an additional education centre and another 100 acres fenced natural enclosure were built (Mohamad & Romo 2002). The Department of Wild Life and National Parks of Peninsular Malaysia had financial and managerial responsibilities, from 1999 shared with IRF and AsRSG (Khan et al. 1999). The objective was then to manage it in conjunction with the SRS Way Kambas.

The Action Plan for the Sumatran Rhinos published by the AsRSG in 1997 included plans for another Sumatran Rhino Sanctuary in Malaysia proposed for the Krau Wildlife Reserve, Pahang (Foose & van Strien 1997:80). No further action appears to have been taken.

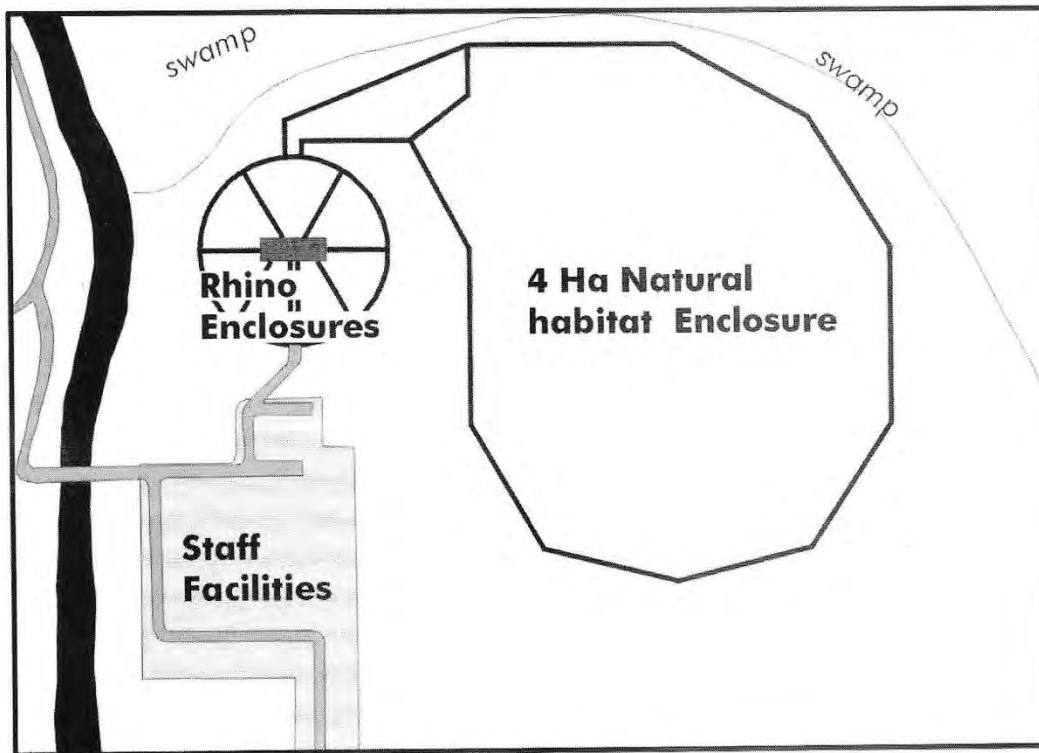


Figure 9. Diagram of Sumatran rhino Conservation Centre - Sungai Dusun.

From Khan et al. (1999) in *Pachyderm* no. 26.

Most of the rhinos were kept at Sungei Dusun. There was regular breeding but no birth from captive parents occurred. All matings occurred in the larger 4 hectare enclosure (Khan et al. 1999). Nan Schaffer performed ultrasound on a few of the animals in December 1991 and October 1992 (Schaffer et al. 1994). There are monthly reports by the veterinarian Aidi Mohamad and the American zookeeper Steve (John Stephan) Romo (1953-2012) from May 2000 to September 2003 with details of behaviour, weight and blood parameters (Mohamad & Romo 2000, 2001, 2002, 2003). The American veterinarian Robin Radcliffe also visited Sungei Dusun several times in 2001-2003 (Radcliffe & Radcliffe 2002).

Possibly due to the lack of success, the manager of the Sungei Dusun Rhino Conservation Centre (SDRCC) was removed in 2001, with a subsequent hiatus of qualified staff onsite (Payne & Yoganand 2018:60).

In October and November 2003, all remaining five rhinos in the centre suddenly died. The cause has never been established with absolute certainty. There have been many theories what could have been the immediate cause, all elaborately set out by Khan (2014: 104-117). At first it was suspected that the disease was caused by Trypanosomiasis, maybe originating from buffalo on private land nearby (Vellayan et al. 2004). However, later investigations have shown that the disease was more likely caused by bacterial infection with mucoid *Escherichia coli* or with *Trypanosoma evansi* and *Klebsiella pneumoniae* (Radcliffe & Khairani 2019). As suggested by Ahmad et al. (2013) and Payne & Yoganand (2018:60), maybe this was not accepted at the time because the condition could be linked to chronic poor hygiene in the facilities. Such a statement would reflect poorly on some of the staff and

veterinarians who daily took care of the rhinos at the centre. Surely it was impossible for the captive breeding program in Malaysia to recover from this situation, which Khan (2014:105) called a tragic demise of the last rhinos.

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CHAPTER 5

DETAILS OF RHINOS CAPTURED IN PENINSULAR MALAYSIA

In total, the West Malaysian program included 14 Sumatran rhinos: 4 males, 10 females (table 1). One of these was zoo-born but wild-bred. One male died within a year after capture. The detailed life histories of all animals are given below.

Table 1. Summary of data on the Sumatran rhinoceros (*Dicerorhinus sumatrensis*) captured or kept in Peninsular Malaysia 1984 to 2019.

SB	Capture	Arrival	Sex	Age	Name	Facility	Death	Life in days
01	Malaysia – Selangor	1984-04-30	F	ad	Jeram	Melaka	2002-07-10	6645
02	Malaysia	1984-05-01	M	2 mths	Erong	Melaka	1984-06-01	31
03	Malaysia	1985-04-18	F	n/a	Melintang	Melaka - Bangkok	1986-11-23	584
07	Malaysia – Johor	1986-02-10	F	n/a	Rima	Melaka	2003-04-12	6270
09	Sumatra - Torgamba	1986-06-15	M	n/a	Napangga	Melaka	1987-08-06	417
11	Malaysia – Selangor	1986-07-06	F	ad	Julia	Melaka	1989-12-15	1258
12	Malaysia	1986-09-09	F	10 yrs	Dusun	see Indonesia	2001-02-07	5265
13	Malaysia – Selangor	1987-02-25	F	5 yrs	Panjang	Melaka	2003-11-09	6101
15	Born in Melaka	1987-05-23	F	-	Minah	Melaka	2003-11-16	6021
16	Malaysia – Selangor	1987-07-01	F	7 yrs	Seridelima	Melaka	1988-09-23	450
19	Malaysia	1987-08-26	F	8 yrs	Mas Merah	Melaka	2003-11-17	5927
20	Malaysia	1988-03-26	M	3 yrs	Shah	Melaka	2002-01-19	5047
23	Malaysia - Pahang	1988-07-11	F	10 yrs	Seputih	Melaka	2003-10-28	5587
39	Malaysia	1994-08-24	M	ad	Ara	Melaka	2003-11-08	3363

Studbook (SB) after Foose (2006) and Oberwemmer (2014). Dates in YYYY-MM-DD format.

Arrival is Date of arrival. Age is Estimated age at time of capture.

Transfers between Melaka and Sungei Dusun not included.

09 Napangga was captured in Sumatra and exchanged with Malaysia. Exchanged for 12 Dusun, see Table 2.

Total 13 animals, 4 males, 9 females. 12 wild caught, 1 zoo born.

One died in less than a year.



Female Sumatran rhino 'Minah' born on 23 May 1987 in the Zoo of Melaka, Malaysia (studbook no. 15).

DETAILS OF CAPTURES

01 FEMALE JERAM

1984-04-30	Capture at Sungei Dusun, Selangor, Malaysia
1984-04-30	Melaka Zoo, Malacca
1987-01-13	Sungei Dusun
1987-08-15	Melaka Zoo, Malacca
1991-05-31	Sungei Dusun
1993-02-06	Melaka Zoo, Malacca
2002-07-10	Death at Melaka

The first rhinoceros of the Malaysian captive breeding program, a female Jeram was captured just outside Sungei Dusun. When she left the reserve, she was driven into a canal by oil palm workers, then dragged out of the canal and tied to a palm tree (Khan 2014: 21, 26, 42, 67). She was adult at the time (Khan et al. 1999). It is said that she had an old wound in one eye. She was first kept in Melaka Zoo, but moved to the Sungei Dusun Rhino Centre after an outbreak of salmonellosis at the zoo (Mohamad & Romo 2002).

In 1992 Jeram had several tumors (Schaffer 2018). She never bred. Her death was said to be related to old age (Ahmad et al. 2013).

02 MALE ERONG

1984-05-01	Capture at Erong Forest Reserve, Perak, Malaysia
1984-05-01	Melaka Zoo, Malacca
1984-06-01	Death at Melaka

Erong was found abandoned by mother trapped among fallen logs and unable to escape (Khan 2014:26). He was probably about 2 months old when captured (Ahmad et al. 2013). It is alleged that his death after just a month in Melaka Zoo was caused by the feeding of full-cream milk by one of the keepers (Hance 2018b).

03 FEMALE MELINTANG

1985-04-18	Capture Utan Melintang, Perak, Malaysia
1985-04-18	Melaka Zoo, Malacca
1985-12-21	Dusit Zoo, Bangkok, Thailand
1986-11-23	Death in Bangkok

The female Melintang was found bogged down in mud in a canal in Utan Melintang, Perak. She was inspected soon after capture by Mohd. Khan. She was limping, but treated by a vet from Melaka Zoo (Khan 2014:26). In August 1985 she bit off a finger of her keeper, Encik Marid Hassan (Malayan Nature Society 1986). She was donated to King Bhumipol Adulyadej of Thailand by King Al Mutawakkil Alallah Sultan Iskandar of Malaysia in December 1985 (the July 1986 date seems incorrect). Named Linchong meaning Flower by Queen Sirikit, she was displayed in Dusit Zoo in Bangkok (Rookmaaker 1989: 135). She died after she got her head caught in the iron bars of her cage and broke her neck trying to free

herself (Khan 2014: 21,26). Her skin was mounted and exhibited at the zoo, at least until the facility closed its doors on 31 September 2018.

07	FEMALE	RIMA
1986-02-08		Capture in Tenggaruh, Johor, Malaysia
1986-02-10		Melaka Zoo, Malacca
1987-01-13		Sungei Dusun
1987-03-06		Melaka Zoo, Malacca
1987-05-23		Birth of her female calf, wild-bred (15 Minah)
1993-02-04		Sungei Dusun
2003-04-12		Death at Sungei Dusun

Female Rima was captured in a pit trap set on a small hill in Tenggaruh (Tenggaroh), Johor, Malaysia, at a site about 1 km from the sea in the east and 3 km from a new oil plantation in the west (Khan 2014:47). She was given food and water while in the pit. She was crated and transported to Melaka after 60 hours on 10 Feb 1986 (Khan 2014: 16,19, Tajuddin et al. 1988). At Melaka she was first kept in a confinement crate of 4.88 x 1.07 x 1.68 m for a period of 14 days. Then she lived in a paddock 10 x 15 m, sometimes sharing with female Jeram. On 2 Oct 1986 she was transferred to a new and larger enclosure (Tajuddin et al. 1988). She must have been adult on arrival (Khan et al. 1999).

There were press reports that Rima has put on weight, and has become aggressive to keepers. It was suspected that she may be pregnant, but pregnancy tests were negative (*The Star*, 9 July 1986).

Unassisted and unattended by zoo staff, she delivered a healthy baby girl Minah (studbook 23) on 23 May 1987 (Tajuddin 1988).

She had problem eating. She was often force-fed in Sg. Dusun, and once disappeared into a ten-acre fenced-off forest area for 2 months. When in 2002 her weight decreased to 442 kg, it was revealed that a foreign body had been implanted in her bladder for 17 months, causing exceedingly ill-health. After discovery, the implant was removed and special food ordered from Australia (Khan 2014: 21). When she was examined by American veterinarians in August 2002, it was stated that her last breeding with male Ara occurred on 13 Nov 2001, but there were no signs of pregnancy, but still cycling despite hormonal and behavioural evidence of prolonged or irregular luteal phases (Radcliffe & Radcliffe 2002).

Rima died at the time of the outbreak of a bacterial disease in 2003 at Sungei Dusun.

09	MALE	NAPANGGA
1986-06-15		Capture in Torgamba forest, Sumatra, Indonesia
1987-04-25		Arrival Melaka Zoo (in exchange for 11 Dusun)
1987-08-06		Death at Melaka Zoo

Caught in Sumatra, and exchanged with the Malaysian program (Müller 1988). When captured, he had a wire snare embedded in right front leg. His death in Melaka Zoo was attributed to severe colic, resulting from this snare wound (Zainuddin et al. 1990c). Zainuddin et al. 1990c) studied the skeleton.

11 FEMALE JULIA

1986-07-06 Capture in Selangor, Malaysia (place uncertain).
1986-07-06 Melaka Zoo, Malacca
1987-01-13 Sungei Dusun
1989-04-21 Melaka Zoo, Malacca
1989-12-15 Death at Melaka

The female Julia was mature when captured. Few details available. She died of fecal impaction (Khan 2014:28).

12 FEMALE DUSUN

1986-09-09 Capture in Sungei Dusun Wildlife Reserve, Selangor, Malaysia
1986-09-09 Melaka Zoo, Malacca
1987-01-13 Sungei Dusun
1987-03-06 Melaka Zoo, Malacca
1987-04-25 Ragunan Zoo, Jakarta, Indonesia
1998-01-09 Way Kambas SRS
2001-02-07 Death at Way Kambas

Dusun was probably around 10 years old when she was captured. Her life history is presented by Van Strien (2001). After a short stay in Melaka and Sungei Dusun, Dusun was exchanged for male Napangga from Sumatra, and lived many years in Ragunan Zoological Gardens, Jakarta, Indonesia (Rookmaaker 1989:141). At Jakarta, Dusun was housed in a yard adjacent to 08 male Jalu Staring December 1990 the animals were paired whenever the male showed interest in the female. In February 1991 a 30-minute copulation was observed. There were hopes that she was pregnant in 1992, but no birth occurred, nor were there indications of a premature loss of pregnancy (Van Strien 2001).

On 28 January 2001, at Way Kambas Rhino Center, it was found that both her legs were paralyzed. Her condition was closely monitored (Van Strien 2001). On 7 February at midnight she looks weak, then she became suddenly hyperactive and seemed out of control. Dusun died at 01.50 AM. Her body is carried out of the forest by 40 people, and loaded on a truck to be carried to IPB Laboratory in Bogor. Various diseases were diagnosed: decubitis, mastitis, oedema, tracheitis, pneumonia, corpus alienum, pleuritis, dilatatio cordis sinistra, arteriosclerosis, gastroenteritis catharalis et hemorrhagica, spleen hyperplasia and kidney cyst (post-mortem report in Van Strien 2001).

13 FEMALE PANJANG

1987-02-25 Capture at Sg. Panjang, Selangor, Malaysia
1987-02-25 Sungei Dusun
1987-03-05 Melaka Zoo, Malacca
1987-09-25 Sungei Dusun
1989-04-20 Melaka Zoo, Malacca
1991-04-27 Sungei Dusun
1995-05-09 Melaka Zoo, Malacca
1999-02-10 Sungei Dusun
2003-11-09 Death at Sungei Dusun

Panjang was found bogged down in mud in Sg. Panjang, Selangor (Khan 2014:21, 26). Age at capture estimated as 5 years (Khan et al. 1999). On examination in 1991 and 1992, her uterine body cross-section appeared to have small tumors, cysts and some fluid, but ovaries normal (Schaffer 2018). She last bred with male Ara on 31 May 2001, but no pregnancy occurred (Radcliffe & Radcliffe 2002). A cervical mass was identified in March 2001, which was surgically removed on 26 Aug 2002 (Radcliffe & Radcliffe 2002). According to Khan (2014:21), Panjang developed a large growth just outside her cervix over few years, about size of human fist, the larger part dropped out. She avoided males. At time of death, the post-mortem indicated congestion of all organs (Khan 2014:109).

15 FEMALE MINAH

1987-05-23 Birth at Melaka Zoo. Father wild, Mother 07 Rima pregnant on capture.
 1997-10-01 Sungei Dusun
 2003-11-16 Death at Sungei Dusun

The birth was first noticed at 7 am by ranger Subuh. She was named by prime minister of Malaysia, Tun Dr Mathathir Mohamed (Khan 2014:47, Foose 1987). At birth, her weight was 24 kg, shoulder height 45 cm (Khan 2014:18, Tajuddin et al. 1988). The composition of the mother's milk over time was studied by Zainuddin et al. (1990b). In 2002 her body health is poor. A wrong CIDR implant was removed, but nutritional changes had no impact (Radcliffe & Radcliffe 2002). Her reproductive tract is normal on ultrasound. She died at the time of the bacterial infection in Sungei Dusun in 2003 (Khan 2014:109).

16 FEMALE SERIDELIMA

1987-07-01 Capture at Sungei Dusun, Selangor, Malaysia
 1987-07-01 Melaka Zoo, Malacca
 1988-09-23 Death at Melaka

Seridelima was about 7 years old when she was captured in a pit trap. She died of an infection with Salmonella blockly (Khan 2014:28).

19 FEMALE MAS MERAH

1987-08-26 Capture in Selangor, Malaysia
 1987-08-26 Melaka Zoo, Malacca
 1991-05-02 Sungei Dusun
 2003-11-17 Death at Sungei Dusun

The female Mas Merah was probably about 8 years old at time of capture (Khan et al. 1999). On examination in 1991 and 1992, she had endometrial cysts, which had increased in number by 1998. There were also two small endometrial tumors (Schaffer 2018). She was bred by Ara on 3 occasions, last on 18 Jan 2002. She has significant haemorrhagic follicle on right ovary (Radcliffe & Radcliffe 2002). She was the last animal to die at the time of the bacterial infection in Sungei Dusun in 2003 (Khan 2014:109).

20 MALE SHAH

1988-03-26	Capture at Sungei Dusun, Selangor, Malaysia
1988-03-26	Melaka Zoo, Malacca
1991-05-02	Sungei Dusun
1995-12-14	Melaka Zoo, Malacca
1997-04-07	Sungei Dusun
2002-01-19	Death at Sungei Dusun

Shah was about 2 ½ years old when captured (Ahmad et al. 2013). Or maybe little older, because in October 1992 he had reached full size and maturity. In 1998 some bilateral horizontal swellings notes on scrotum (Schaffer 2018). He died of mucoid *E. coli* infection, previously reported in public domain as colitis or emphysema (Ahmad et al. 2013).

23 FEMALE SEPUTIH or SIPUTIH

1988-07-11	Capture in Ulu Atak area (Taman Negara), Pahang, Malaysia (Khan 2014:18)
1988-07-11	Melaka Zoo, Malacca
1991-05-31	Sungei Dusun
2003-10-28	Death at Sungei Dusun [Khan 2014:105 has 30 Oct 2003]

Seputih was some 10 years old when captured, and said to be the largest rhino at the time. She was a wild rhino and took long time to settle down (Khan 2014: 18,29). In 1992 she had a few endometrial tumors and cysts, and in 1998, several large tumors in pelvic area of vagina and uterus (Schaffer 2018). Radcliffe & Radcliffe (2002) also observed significant pathology associated with reproductive tract and surrounding anatomy. She is cycling, but normal embryo development unlikely to occur. There are about 5 masses originating near the external cervical os. Her death was attributed to intestinal torsion (Khan 2014:105), but it may have been a bacterial infection (Ahmad et al. 2013).

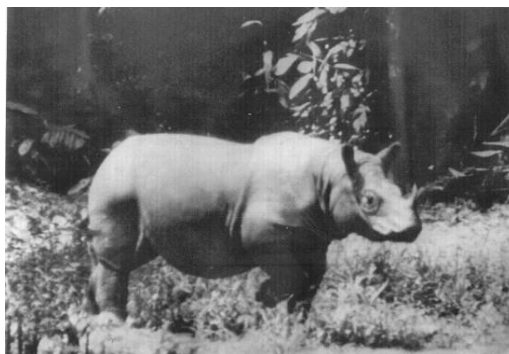
39 MALE ARA

1994-08-24	Capture at Sungei Ara, Malaysia (Khan 2014:16)
1994-08-25	Melaka Zoo, Malacca
1995-12-14	Sungei Dusun
2003-11-08	Death at Sungei Dusun

Ara was mature at the time of capture (Ahmad et al. 2013). Ara died at the time of the bacterial infection in Sungei Dusun in 2003, with post-mortem showing congestion of all organs with severe haemorrhaging of small intestine, and *E.coli* in all organs (Khan 2014:107).

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Wild rhinoceros in Malaysia taken by Theodore Hubback in 1939



Sumatran Rhinoceros in the Melaka Zoo. (photo: Kees Rookmaaker, 1990)

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CHAPTER 6

HISTORY OF CAPTURES IN SUMATRA, INDONESIA

The British casino owner and politician John Aspinall (1926-2000) created and financed two zoological gardens in Kent, Howletts from 1959 and Port Lympne from 1975. He founded the Howletts and Port Lympne Foundation as a charitable organization in 1984, later renamed The John Aspinall Foundation, which is still active (King 2013; King & Beer 2018). Aspinall attended the Singapore meeting in October 1984, together with Francesco Nardelli (b.1953), who was employed as one of the curators in the English zoos since 1980. Aspinall was able to move quickly after he had decided that a breeding program would be beneficial to the survival of the Sumatran rhino.

On 11 November 1984 a preliminary Memorandum of Understanding was signed by Prof. Rubini Atmawidjaja, Director General of the Indonesian Ministry (PHPA) and Mr John Aspinall. After that a draft agreement was worked out with input of Francesco Nardelli and Nico van Strien. The PHPA wished the agreement to be endorsed by the United Kingdom Government (Van Strien 1985; Nardelli 1985, 1986). The Indonesian and British governments issued permits for the export and import of the rhinos caught by this project and all captured animals and their progeny would be owned jointly by the collaborating partners. The agreement was to allow 2 pairs to be exported to the United Kingdom and for 2 pairs to be captured for reproduction in Indonesia.

Comparing the text of the agreement with that worked out between Malaysia and the American zoos (see chapter 3), Van Strien (1985) had reservations about the final text which had been altered since the first draft was discussed, especially in the absence of the need of an independent monitor, the emphasis on capturing a minimum number of pairs of rhinos, as well as the need to pay \$50,000 for each Sumatran rhino. The agreement between the Government of Indonesia and the Aspinall Foundation was signed on 24 May 1985, endorsed by the Minister of Forestry, Dr Soejarwo and the English ambassador Mr Alan Donald (van Strien 1985).

The proposed capture site at Torgamba was located east of the Barumun river on the boundary of provinces North Sumatra and Riau. It was surveyed in 1974 by Markus Borner (1979), who found an area of low hills, up to 150m, mainly primary lowland forest with patches of freshwater swamp forest. The whole area was granted to timber concessions. Borner found rhino tracks in area of primary forest north and east of "Asahi" base camp. When Raleigh Blouch of WWF visited the area in 1984, he found that the area was almost split in two by an open-water swamp called laut Napangga. It was considered reasonable to start capture in the northern part of Torgamba as the whole area was partly cleared for new plantations and otherwise open for intensive logging (Blouch 1984; Van Strien 1985).

Aspinall must have engaged the animal trapper Tony Parkinson at the Singapore meeting or soon after, as a base-camp had been constructed in the Torgamba area of Sumatra in August 1985 (Aspinall 1986). The Torgamba base camp was constructed between the villages Bakambatu and Tanjungmedan, Riau Province. It includes 2 wooden houses and 2 rhino paddocks of about 400 m² and partially covered. In October 1985 several rhino trails were selected and traps built on them. Three of the traps were stockade type with an oval palisade of wooden poles broken by one drop door at each end connected to

a trigger mechanism in the centre of the trap. One self-draining pit-trap was constructed on higher ground with a thick layer of vegetation at the bottom (Nardelli 1986, 1988).

According to Nardelli (1988), the whole 'Operation Sumatran Rhino' was being recorded on film, movie and stills, by wildlife photographer Alain Compost, who works in Indonesia, and this will form an important archive for scientists and wildlife managers. Unfortunately, enquiries in 2019 if any of this material is extant has not brought a clear result. In 2000, Compost maintained his own website, and some of his images available at the time can be found (in low resolution) on the website of the Rhino Resource Center (search for 'Compost' in image gallery).

The first animal captured was the male Torgamba on 25 November 1985, very soon after the start of the operation. A female followed in January 1986, but she died in the trap. Unfortunately, the next 3 animals were all males, which were distributed over local zoos according to the agreement. The next two animals captured in 1986 and 1987 were females and these were exported to the United Kingdom. The last animal captured in Torgamba was a female in July 1988, added to an Indonesian facility. Although the final sex ration of 4 males and 4 females looks reasonable on paper, the fact that the initial animals were all males made the distribution quite difficult. When the capture site was shifted to Bengkulu in 1987, Nardelli and Parkinson were convinced that there were no rhinos left in Torgamba (Nardelli, pers.comm. 2019).

None of the animals captured in Torgamba in 1985-1988 have contributed positively to the breeding program.

The second phase of captures took place near Ipuh in Bengkulu Province, western Sumatra. While Tony Parkinson and Francesco Nardelli remained to oversee the operations, the animals caught were part of an agreement made between the Indonesian Government and the American Sumatran Rhino Trust, signed in the early part of 1986 (Holland 1989; Foose 1987, 1988; Prasetyo & Noordin 1993; Dee & Masuo 2016d).

In this operation lasting from 1987 to 1992, a total of 11 animals were caught, of which all but 3 were exported to the USA. Again the sex ratio of captures proved problematic, as only the 4th animal was male, and in total 3 males were found against 8 females. As the four American facilities which subscribed to the Sumatran Rhino Trust (Los Angeles, San Diego, New York, Cincinnati) all had hoped to obtain at least one pair, this proved to be impossible in practice.

The details of the individual rhinos are listed in chapter 7.

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John Aspinall (1926-2000), owner of the zoological parks in Howlett and in Port Lympe, both in Kent, United Kingdom.

CHAPTER 7

DETAILS OF RHINOS CAPTURED IN SUMATRA, INDONESIA

In total, the Indonesian programs included 32 Sumatran rhinos (table 2). This includes 7 stillbirths recorded by Oberwemmer (2014), see table 3. Without these premature deaths, there were 25 Sumatran rhinos: 9 males, 16 females. Three females died within a year after capture. The detailed life histories of all animals are given below.

Table 2. Summary of data on the Sumatran rhinoceros (*Dicerorhinus sumatrensis*) captured or kept in Sumatra (Indonesia) 1984 to 2019.

SB	Capture	Arrival	Sex	Age	Name	Facility	Death	Life in days
04	Sumatra - Torgamba	1985-11-25	M	4 yrs	Torgamba	Port Lympne - Way Kambas	2011-04-25	9282
05	Sumatra – Torgamba	1986-01-23	F	ad	Riau	Capture site	1986-01-23	1
06	Sumatra – Torgamba	1986-02-02	M	ad	Rokan	Surabaya	1993-08-12	2748
08	Sumatra – Torgamba	1986-03-24	M	2 yrs	Jalu	Jakarta Ragunan	1994-06-15	3005
09	Sumatra – Torgamba	1986-06-15	M	n/a	Napangga	see Malaysia	1987-08-06	417
10	Sumatra – Torgamba	1986-06-22	F	ad (old)	Subur	Port Lympne	1986-10-29	129
12	Malaysia	1986-09-09	F	10 yrs	Dusun	Melaka - Jakarta - Way Kambas	2001-02-07	5265
18	Sumatra – Torgamba	1987-07-21	F	ad	Meranti	Port Lympne	1994-11-04	2663
22	Sumatra - Torgamba	1988-07-08	F	ad	Dalu	Bogor Safari	1993-07-27	1845
24	Sumatra - Bengkulu	1988-07-22	F	ad (old)	Mahato	Los Angeles - Cincinnati	1992-05-10	1388
25	Sumatra – Bengkulu	1988-07-24	F	12 yrs	Barakas	San Diego	1995-02-22	2404
27	Sumatra – Bengkulu	1989-08-26	F	6 yrs	Rapunzel	Los Angeles - New York	2005-12-22	5962
28	Sumatra – Bengkulu	1990-07-23	M	ad	Ipuh - Bagus	San Diego - Cincinnati	2013-02-18	8246
29	Sumatra – Bengkulu	1991-03-06	F	1 yr	Emi	Los Angeles - Cincinnati	2009-09-05	6758
30	Sumatra – Bengkulu	1991-04-18	M	ad	Romi	Bogor Safari	1997-07-06	2271
32	Sumatra - Bengkulu	1991-05-17	F	3 yrs	Bina	Bogor Safari - Way Kambas	alive 10/2019	
33	Sumatra – Bengkulu	1991-06-12	F	8 yrs	Rami	San Diego	1992-05-25	348
34	Sumatra – Bengkulu	1992-01-17	F	4 yrs	Wiwien	Surabaya	1996-11-12	1761
35	Sumatra - Bengkulu	1992-03-20	M	6 yrs	Tanjung	San Diego	1995-02-26	1073
42	Born to 28 + 29	2001-09-13	M		Andalas	Cincinnati - Los Angeles - Way Kambas	alive 10/2019	
43	Born to 28 + 29	2004-07-30	F		Suci	Cincinnati	2014-03-30	3530
45	Sumatra – BBS	2005-09-30	F	3 yrs	Rosa	Way Kambas	alive 10/2019	
46	Sumatra – Way Kambas	2005-09-20	F	5 yrs	Ratu	Way Kambas	alive 10/2019	
44	Born to 28 + 29	2007-04-29	M		Harapan	Cincinnati - Yulee - Los Angeles	alive 10/2019	
50	Born to 42 + 46	2012-06-23	M		Andatu	Way Kambas	alive 10/2019	
58	Born to 42 + 46	2016-05-12	F		Delilah	Way Kambas	alive 06/2019	

Studbook (SB) after Foose (2006) and Oberwemmer (2014). Dates in YYYY-MM-DD format.

Arrival is Date of arrival. Age is Estimated age at time of capture. BBS = Bukit Barisan Selatan National Park

12 Dusun was captured in Malaysia and exchanged with Indonesia. Exchanged for 09 Napangga, see Table 1.

Total 32 animals of which 7 stillbirths. Remaining 25 rhinos, 9 males, 16 females.

Table 3. Summary of data on the Sumatran rhinoceros (*Dicerorhinus sumatrensis*) still-born in captivity in Cincinnati and Sumatra (after Oberwemmer 2014).

SB	Capture	Arrival	Sex	Age	Name	Facility	Death	Life in days
52	Born dead	1997-10-29				Cincinnati	1997-10-29	0
53	Born dead	1997-11-29				Cincinnati	1997-11-29	0
54	Born dead	1998-06-26				Cincinnati	1998-06-26	0
55	Born dead	1998-09-11				Cincinnati	1998-09-11	0
56	Born dead	2000-01-10				Cincinnati	2000-01-10	0
48	Born dead	2009				Way Kambas	2009	0
49	Born dead	2010				Way Kambas	2010	0

Dates in YYYY-MM-DD format.

There were two separate capture programs in the years 1985-1992 (chapter 6). The first based on an agreement between the Indonesian Government and John Aspinall of the United Kingdom involved 4 males and 4 females captured 1985-1987. In the U.K. all 3 animals (1/2) were kept at Port Lympne Zoo Park, of which one male was returned to Indonesia.

The second agreement between the Indonesian Government and the Sumatran Rhino Trust of the USA involved 3 males and 8 females captured 1988-1992. In the USA, there were 5 facilities with 10 animals (4/6), of which 3 (2/1) born in captivity (Cincinnati), 2 males were returned to Indonesia.

In Indonesia, rhinos have been kept in 4 facilities, with a total of 12 animals (4/8), of which 2 (1/1) were born in the SRS Way Kambas.



Sumatran rhinos Torgamba and Bina in SRS Way Kambas in 2007 (Photo: Dedi Candra)

DETAILS OF CAPTURES

04	MALE	TORGAMBA
1985-11-25		Capture at Torgamba Production Forest, Riau Province, Sumatra
1986-01		Moved to base camp 3 miles from capture site (Begg 1986)
1986-04-02 (or 03)		Transported from Sumatra to Singapore
1986-04-04		Transported from Singapore to Port Lympne
1986-04-05		Port Lympne, Kent, United Kingdom
1998-01-08		SRS Way Kambas, Sumatra, Indonesia
2011-04-25		Death at SRS Way Kambas

Torgamba was the first rhinoceros to be captured in Sumatra under the agreement between the Indonesian Government and John Aspinall. He was about 4 years old when he fell into the pit trap (Klös 1987, Rookmaaker 1998, figs. 97, 98). When the news came, Tony Parkinson and Francesco travelled quickly to the capture site. According to Nardelli (1988), “the Indonesian workers had already begun to build a stockade pen just in front of the trap. Everyone worked frantically through the night to get the rhino out of the trap and at five the following morning Torgamba, as he was eventually named, walked steadily out of the trap into his new pen. Only hour later he had recovered enough to start eating some fruit - wild mangos - and a few leaves. He also lost no time in locating a mud wallow provided for him, in which he spent several hours a day.” He was first acclimatised in his enclosure in the forest and in January 1986 was transferred to the base camp. This entailed moving him in his crate about three miles through what in places was thick jungle. The assistance of a US oil company, Caltex, was sought, and with a bulldozer to clear and level a track, the first stage of Torgamba's journey to the UK was uneventfully carried out (Begg 1986).

In the park of Port Lympne, Kent, UK, “Torgamba was kept in an enclosure in the open (20 x 15 m) surrounded by cylindrical iron fence, with access to four stalls (15 x 4 m, 6 x 3 m, 4 x 2. m, and 4 x 2 m). Bathing pools are available in the two largest stalls (4 x 2.5 m and 3 x 2 m). The floor of the enclosure and stalls were covered with wood shavings to prevent injury to the feet. A part of the open enclosure was covered with sand, while two trees were planted to simulate its natural habitat” (Buntaran 1987). Torgamba was later joined in Port Lympne by the females 10 Subur (few months in 1986) and 19 Meranti (1988-1994), but no breeding activity has been recorded. In fact, Foose (1993) complained that the animals in the U.K. were kept as pets.

Torgamba was returned to Sumatra to be kept in the SRS Way Kambas in 1998. Some mating between him and Bina was first reported in November 1998. It was found that he had a low sperm count, or oligozoospermia (Agil et al. 2008). The husbandry of the animals at the SRS was monitored as found in the reports by Adi & van Strien (1998, 1999), Candra et al. (2000 to 2004) and Candra (2005, 2007), with tables of food given daily (browse, fruit) and monthly weight, also daily events, matings, estrus, activity pattern and the like.

Torgamba developed renal disease characterized by progressive azotemia, hypercalcemia, and hypophosphatemia. The disease was managed for five years successfully, but eventually Torgamba died from complications of the disease (Radcliffe & Khairani 2019:712). The cadaver brought to Faculty of Veterinary Medicine, Bogor Agricultural University (IPB) after death (Harlina et al. 2011).

05 FEMALE RIAU

1986-01-23 Capture in pit trap in Torgamba Production Forest, Riau Province, Sumatra
1986-01-23 Panicked in trap and died at capture site

On 23 January 1986 a fully-grown female was found in one of the stockade traps. She was panic-stricken and almost broke out before a damaged door was blocked. She seemed in good condition, but she died later the same day apparently from a cerebral haemorrhage caused by a severe blow on the head when trying to break out (Nardelli 1986:21). An important lesson learned during the project was that pit traps, although more difficult to monitor in monsoon rain conditions, cause less stress in newly captured animals, probably because they are held in relative darkness and their movements are restricted, reducing the danger of their hurting themselves (Nardelli 1988).

06 MALE ROKAN

1986-02-02 Capture at Torgamba Production Forest, Riau Province, Sumatra
1988-05 Surabaya Zoo (Kebun Binatang Surabaya, Java, Indonesia)
1993-08-12 Died at Surabaya Zoo

The mature male called Rokan was suffering from leg injury inflicted by a poacher's snare when he was captured (Begg 1988). In the Surabaya Zoo, he was kept on a 0.5 ha moated island in an enclosure designed to house one pair (Prasetyo & Noordin 1993). There are very few published reports about the health or activity of the Sumatran rhinos kept in the zoo in Surabaya.

08 MALE JALU

1986-03-25 Capture at Torgamba Production Forest, Riau Province, Sumatra
1986-05-27 Arrival in Jakarta Zoo (Ragunan Zoo, Jakarta, Java, Indonesia)
1994-06-15 Death at Jakarta Zoo

The male Jalu was about 2 years old when captured in a pit-trap at Torgamba (Nardelli 1988, Lant 1990). He was kept for maybe a month in a pen near the site of capture to become adjusted. Brought to Ragunan Zoo by truck. In transit kept in a narrow compartment with the head facing the front of the truck (Manan et al. 1987). Jalu means "male" in local dialect (Lant 1990). At first kept, besides female Dusun, in two enclosures, measuring 2200 m² and 1100 m², separated by 1 m high concrete wall. There were gates into a common mud wallow (Prasetyo & Noordin 1993). Maybe Manan et al. (1987) described the new enclosure built after arrival of the rhinos, as he states that the breeding cage at Ragunan measured 8000 m² and has 5 units, with a door connecting each. A corridor separates these units and links them with a breeding cage. Includes a shed, wallow, source of drinking water and a cage to treat the animals. Jalu mated with Dusun several times in January 1991, but apparently did not result in pregnancy (Prasetyo & Noordin 1993, Stuart 1994). Jalu became tame within 2 months (Manan et al. 1987). Reason of death not recorded.

10 FEMALE SUBUR

1986-06-22 Capture at Torgamba Production Forest, Riau Province, Sumatra
1986-06-24 At base camp near capture site
1986-08-25 To Port Lympne Zoo
1986-08-26 Port Lympne Zoo, Kent, United Kingdom
1986-10-30 or 29 Death at Port Lympne

This old female called Subur, after the rhinoceros which died at Copenhagen Zoo in 1972, had a snare encircling her right foreleg at time of capture (Klös 1987). She remained at base camp from 24 June to 25 August for treatment successfully provided by the English veterinarian Thomas B. Begg who had come from England for that purpose (Begg 1986, Nardelli 1986, 1988). Nardelli (1986) has photos taken of Subur in the jungle. She died after a few months from a generalized bacterial infection (Furley 1987, 1993a,b).

12 FEMALE DUSUN

1986-09-09 Capture in Sungei Dusun Wildlife Reserve, Selangor, Malaysia
1986-09-09 Melaka Zoo
1987-01-13 Sungei Dusun reserve, Malaysia
1987-03-06 Melaka Zoo
1987-04-25 Jakarta Zoo (Ragunan Zoo, Jakarta, Java, Indonesia)
1998-01-09 Way Kambas SRS
2001-02-07 Death at Way Kambas SRS

Dusun was probably around 10 years old when she was captured. Her life history is presented by Van Strien (2001). After a short stay in Melaka and Sungei Dusun, Dusun was exchanged for male Napangga from Sumatra, and lived many years in Ragunan Zoological Gardens, Jakarta, Indonesia (Rookmaaker 1989:141). At Jakarta, Dusun was housed in a yard adjacent to 08 male Jalu and starting December 1990 the animals were paired whenever the male showed interest in the female. In February 1991 a 30-minute copulation was observed (Prasetyo & Noordien 1993, Doherty 1991, 1992). There were hopes that she was pregnant in 1992, but no birth occurred, nor were there indications of a premature loss of pregnancy (Van Strien 2001). However, she began producing milk which lasted at least until 1998, but there were no signs of cycling (Schaffer 2018).

Dusun was transferred to the SRS in Way Kambas in 1998. There are records of her food intake and weight for the years 1998-1999 (Adi & van Strien 1999, 2000) and 2000-2001 (Candra et al. 2000, 2001). On 28 January 2001, at Way Kambas Rhino Center, it was found that both her legs were paralyzed. Her condition was closely monitored (Van Strien 2001). On 7 February at midnight she looks weak, then she became suddenly hyperactive and seemed out of control. Dusun died at 01.50 AM. Her body is carried out of the forest by 40 people, and loaded on a truck to be carried to IPB Laboratory in Bogor. Various diseases were diagnosed: decubitis, mastitis, oedema, tracheitis, pneumonia, corpus alienum, pleuritis, dilatatio cordis sinistra, arteriosclerosis, gastroenteritis catharalis et hemorrhagica, spleen hyperplasia and kidney cyst (post-mortem report in Van Strien 2001).

18 FEMALE MERANTI

1987-07-21 Capture at Torgamba Production Forest, Riau Province, Sumatra
1988-04 To Port Lympne
1988-04-30 Port Lympne, Kent, United Kingdom
1994-11-04 Death at Port Lympne

This mature female was brought to Port Lympne where she lived in a 12 acre enclosure which she shared with 01 Torgamba (Begg 1988). Although Doherty (1991) said that she experienced an unsuccessful pregnancy, it appears she was unable to conceive. An examination of her skull suggested her age to be about 28-37 years, said to be quite likely too old to breed (Kitchener 1997). She died of ovarian cancer. Her remains were given to the Royal Museum of Scotland, Edinburgh (NMS Z1994.131).

22 FEMALE DALU

1988-07-08 Capture at Torgamba Production Forest, Riau Province, Sumatra
1988-11 To Bogor
1988-11-30 Taman Safari Indonesia, Bogor, Java, Indonesia
1993-07-27 Death at Taman Safari Indonesia, Bogor

There is no information on her age at time of capture. She had long drooping hairs on the ears at first (Rookmaaker 1998, figs. 78, 165). She was the first of two females kept at the safari park in Bogor, Java. She was kept in a concrete stall, with an observation room for researchers, attached to an open enclosure of 1800 m² (Prasetyo & Noordien 1993). Although she was suspected to cycle, but she was never introduced to a male. She died of hemorrhagic enteritis and twisted gut (Schaffer 2018).

24 FEMALE MAHATO

1988-07-22 Capture at Ipuh, Bengkulu, Sumatra
1988-11-25 Los Angeles Zoo, California, USA
1989-06-02 Transfer from Los Angeles to Cincinnati
1989-06-05 Arrival in Cincinnati Zoo, Ohio, USA
1992-05-10 Death at Cincinnati Zoo

This was the first rhinoceros to be caught for the American program, as well as the first from the second capture site in Ipuh, Bengkulu (Rookmaaker 1989, fig. 1, 86; Thomas 1989; Johnston 1989). She first stayed a few months in Los Angeles Zoo to acclimatize and wait for better weather in Cincinnati, where she lived for almost 3 years. On arrival she turned out to be much older than anybody realized and was unfortunately post-reproductive (Dee & masuo 2016d). She died due to loss of liver function (Maynard 1993).

25 FEMALE BARAKAS = SIKUMU

1988-07-24 Capture at Ipuh, Bengkulu, Sumatra
1988-11 To San Diego
1988-11-25 San Diego Zoo, California, USA
1995-02-22 Death at San Diego Zoo

This female was about 12 years old when captured. Three people from San Diego traveled to Sumatra: Curby Simerson, Amy Shima (vet) and Carmi Penny (mammal curator), taking pictures in the holding pen in the forest, and accompanying her when transported first by boat to Singapore, then airlifted to USA (Shima 1989, Greeley 1989). Named after the region where she was captured (Greeley 1989). No breeding has been reported. She was euthanized when health continued to deteriorate due to chronic interstitial nephritis (Kucher 1995; Schaffer 2018 with necropsy report).

27 FEMALE RAPUNZEL

1989-08-26 Capture at Ipuh, Bengkulu, Sumatra
1989-11-29 Los Angeles Zoo, California, USA
1990-05-16 Bronx Zoo, New York, USA
1993-02-06 Cincinnati Zoo, Ohio, on loan
2001-03-13 Bronx Zoo, New York
2005-12-22 Death in New York

The third female captured at Ipuh was destined for the Bronx Zoo in New York, USA (Johnston 1990; Rookmaaker 1989, fig. 77; Blaszkiewitz 1992). She was about 6 yrs old at time of capture. Maybe at first she was called Augustina, changed to Rapunzel. After arrival in New York, she had diarrhoea for several months, cured after the diet was changed to include pellets made from the sawdust of the aspen tree (Ricciuti 2002: 174). As New York never received a second animal, Rapunzel was sent on loan to Cincinnati Zoo to try to breed, which was not successful. She was euthanized in 2005 when she was found having trouble moving and breathing (Oberwemmer 2014).

28 MALE IPUH = BAGUS

1990-07-23 Capture at Ipuh, Bengkulu, Sumatra
1991-04 To San Diego
1991-04-10 San Diego Zoo, California, USA
1991-10-24 To Cincinnati
1991-10-25 Cincinnati Zoo, Ohio, USA
2013-02-18 Death in Cincinnati - euthanized

The male Ipuh (sometimes called Bagus) was full-grown when he was captured, estimated about 10 years old in 1990 (Rookmaaker 1989, fig. 85). According to Prasetyo & Noordin (1993), he was trained for collecting semen at the PPHA Quarantine Installation when still in Indonesia. The manual massage was done in the crush and in the open enclosure. The technique made Ipuh fully erected, but the collecting glove was pressed by his body in the crush. In the open enclosure, he stepped on the collecting glove and semen was spread over the ground.

Ipuh was transported by truck to Bengkulu, then to Jakarta, airlifted in a KLM plane from Jakarta to Los Angeles. He first stayed in San Diego to acclimatize, where he was kept in the same enclosure as the male Barakas (Maynard 1993).

While in Cincinnati Zoo from 1991, he often mated with Emi, and together they parented 3 calves: Andalus in 2001, Suci in 2004 and Harapan in 2007.

In December 2012, Ipuh's keepers first noticed that he was moving stiffly and slowly when they entered his barn in the morning, which is not unusual behavior for aging animals. However, in late January, they began to notice that he was not eating all of his food overnight, which was unusual, and his mobility continued to decline even after he was given medication. Due to his rapidly deteriorating condition, zoo staff made the very difficult, but humane decision to euthanize Ipuh on Monday, 18 February 2013 (IRF website).

29 FEMALE EMBAM = EMI

1991-03-06	Capture at Ipuh, Bengkulu, Sumatra
1991-11-23	To Los Angeles
1991-11-25	Los Angeles Zoo, California, USA
1995-08-04	To Cincinnati
1995-08-05	Cincinnati Zoo, Ohio, USA
2001-09-13	Emi gives birth to male Andalus
2004-07-30	Emi gives birth to female Suci
2007-04-29	Emi gives birth to male Harapan
2009-09-05	Death in Cincinnati Zoo

Emi was about 8-12 months old when captured (Prasetyo & Noordin 1993). The Senior Keeper Jeff Briscoe of Los Angeles Zoo went to Indonesia to escort her to the USA. After her arrival, she was placed in quarantine in the old Malayan tapir yard (Dee & Masuo 2016d, Rookmaaker 1989, fig. 94). Her name was Embam (Emi for short). She proved to be a reliable breeder after her transfer to Cincinnati Zoo, as discussed in chapter 13. She had only been for 14 years in Cincinnati when she died from mechanical abnormality (Carson 2007; Hudson 2001; Roth 2004).

30 MALE ROMI

1991-04-18	Capture at Ipuh, Bengkulu, Sumatra
1991-09-	To Bogor
1991-09-02	Taman Safari Indonesia, Bogor, Java, Indonesia
1997-07-06	Death at Taman Safari, Bogor

This male lived in Taman Safari, Bogor (Prasetyo & Noordin 1993). Few data are known. He died of chronic intestinal problem, a hemorrhagic gut (Schaffer 2018).

32 FEMALE BINA

1991-05-17 Capture at Ipuh, Bengkulu, Sumatra
1991-09 To Bogor
1991-09-02 Taman Safari Indonesia, Bogor, Java, Indonesia
1998-01-08 SRS Way Kambas, Sumatra, Indonesia

Bina was about 3 years when captured. She was first exhibited in Taman Safari, Bogor. In 1998 transferred to SRS Way Kambas. She lost half her tail due to an infection (Schaffer 2018). She was examined by Nan Schaffer in 1999 who found her morphologically normal (Schaffer 2018). Some breeding occurred with Torgamba. At first a very thick hymen seemed to obstruct good mating, but it was broken by Torgamba on 25 Feb 2002 (Agil et al. 2002). Her food (browse, fruit), monthly weight and daily events were monitored and published by Adi & van Strien (1998, 1999), followed by Candra et al. (2000-2004).

33 FEMALE RAMI

1991-06-12 Capture at Ipuh, Bengkulu, Sumatra
1991-11 To San Diego
1991-11-23 San Diego Zoo, California, USA
1992-05-25 Died in San Diego Zoo

Rami was about 8 years old when captured. She died of torsion of the large colon (Schaffer 2018 after necropsy report).

34 FEMALE WIWIEN

1992-01-17 Capture at Ipuh, Bengkulu, Sumatra
1992-07 To Surabaya
1992-07-25 Zoo (Kebun Binatang) Surabaya, Java, Indonesia
1996-11-12 Death in Surabaya Zoo

Wiwien was kept at Surabaya Zoo for about 4 years. No further data. Cause of death stated to be an urinary infection (Oberwemmer 2014).

35 MALE TANJUNG

1992-03-20 Capture at Ipuh, Bengkulu, Sumatra
1992-08 To San Diego
1992-08-30 San Diego Zoo, California, USA
1995-02-26 Death in San Diego Zoo

The animal was 6 years old when captured. He only lived for 3 years at the San Diego Zoo and died from digestive mechanical abnormality (Oberwemmer 2014).

42 MALE ANDALAS

2001-09-13 Birth in Cincinnati Zoo, Ohio to 28 Ipuh and 29 Emi
2003-06-20 Los Angeles Zoo
2007-02-21 SRS Way Kambas

Andalas was the first baby of father 28 Ipuh and mother 29 Emi at the Cincinnati Zoo, Ohio, USA. He was delivered at 11.23 am, after a gestation period of 475 days. After 24 hrs, he weighed 32.9 kg (Cincinnati Zoo 2001; Roth 2002a, b; Kobold 2002). After his stay in Los Angeles Zoo, he was transferred to the SRS Way Kambas (Ramanujan 2007; van Strien 2007; Anon. 2003, 2007). Andalas was transported by plane via Amsterdam to Jakarta, and from there by truck and ferry to Sumatra. He spent one month in compulsory quarantine in a temporary boma, and was released into a large paddock in May 2007 (van Strien & Talukdar 2007; Dee & Masuo 2016e).

In the SRS Way Kambas he bred with 46 Ratu and to date has sired 2 babies: 50 Andatu on 23 June 2012 and 58 Delilah on 12 May 2016.

43 FEMALE SUCI

2004-07-30 Birth at Cincinnati Zoo
2014-03-30 Death at Cincinnati Zoo

Suci was the second baby of father 28 Ipuh and mother 29 Emi at the Cincinnati Zoo, Ohio, USA. She was still too young to reproduce. A few months before her death, the keepers noticed her losing weight. After careful research and hours of dedicated monitoring, staff began treating her for hemochromatosis, otherwise known as iron storage disease (Hance 2014, Roth & Stoops 2014; Roth et al. 2017).

46 FEMALE RATU

2005 Capture on outskirts of Way Kambas National Park, Lampung, Sumatra
2005-09-20 Arrival at SRS Way Kambas

A young female strayed out of the Way Kambas National Park over a distance of some 4 km on 20 September 2005. She might have been in search of water. When found, she was very stressed and looked exhausted. The animal was captured and taken to SRS to supplement existing animals. The name Ratu taken from the village Labuhan Ratu [Queen] from where she was taken to SRS (van Strien et al. 2005).

Ratu was about 5 years old on arrival at the SRS Way Kambas. Candra (2007) has data on weight, food, reproductive events, health problems, medical tests.

In the SRS Way Kambas she bred with 42 Andalas and to date has delivered 2 babies: 50 Andatu on 23 June 2012 and 58 Delilah on 12 May 2016.

45 FEMALE ROSA

2005-09-30 Capture in Bukit Barisan Selatan National Park, Sumatra
2005-11-26 Arrival at SRS Way Kambas

This female was about 3 years old when she was first seen near Kali Kumbang village on the west side of Bukit Barisan Selatan National Park in May 2005. It is suggested she was born inside the park, but her mother may have been killed. She was first cared for in a boma of 80x80 m near the village to ensure that all parasites were treated (Adi 2005). She had some problems with her eyes. In November 2005 she was moved in crate on truck to Way Kambas, about 9 hours drive in night when less noise (Adi 2005). After her arrival in Way Kambas, her health was monitored regularly (Candra 2007). Some attempts of mating with 42 Andalas have been reported without as yet successful outcome.

44 MALE HARAPAN

2007-04-29 Birth at Cincinnati Zoo
2008-11-11 Yulee, White Oaks Conservation Center, Florida, USA
2011-11-14 Los Angeles Zoo, California, USA
2013-07-02 Cincinnati Zoo, Ohio, USA
2015-10 To Indonesia
2015-11-02 SRS Way Kambas

Harapan was the third baby of father 28 Ipuh and mother 29 Emi at the Cincinnati Zoo, Ohio, USA. He was born on 29 April 2007. He was kept at the White Oaks Conservation Center, Florida, USA, where his weight increased to 600 kg (GMPB 2011:7-8), due to a diet which includes 12 species from Florida and 17 from California. He was transferred first to Los Angeles Zoo, then back to Cincinnati, before his translocation to the SRS Way Kambas, Sumatra in November 2015 (Roth 2015; Rahmad 2017).

50 MALE ANDATU

2012-06-23 Birth at SRS Way Kambas

Andatu was the first baby of of father 42 Andalas and mother 46 Ratu. He was delivered in the SRS Way Kambas (Anon. 2014, Hance 2017).

58 FEMALE DELILAH

2016-05-12 Birth at SRS Way Kambas

Delilah was the second baby of father 42 Andalas and mother 46 Ratu (Hance 2018). She was delivered in the SRS Way Kambas at 4:42 am of 12 May 2016 and weighed 20 kg. President Joko Widodo (Jokowi) has named a female Sumatran baby rhinoceros 'Delilah'.

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CHAPTER 8

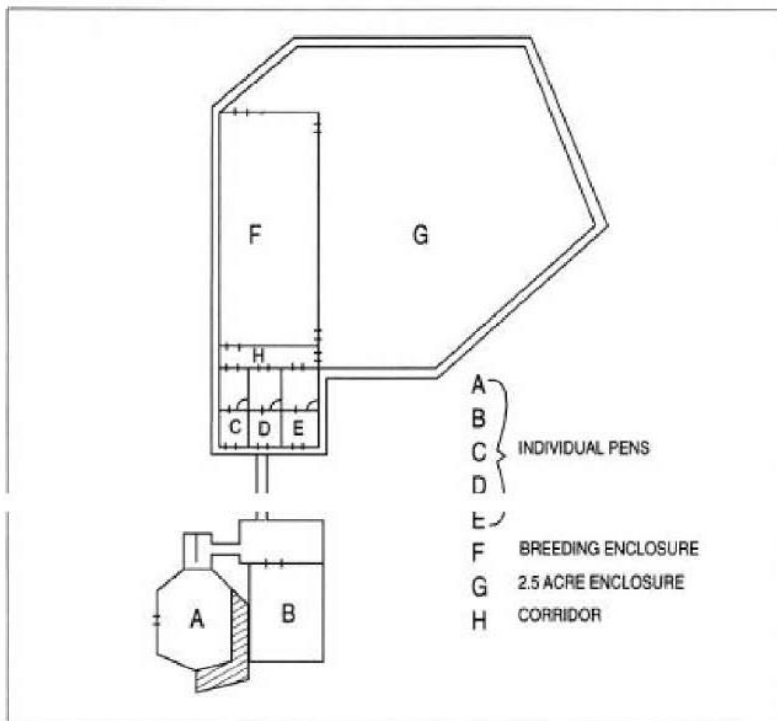
HISTORY OF CAPTURES IN SABAH, EAST MALAYSIA

The hopes of the American Sumatran Rhino Trust to work together with the authorities in Sabah were thwarted in 1985 by the strong public opinion that the rhinos should not be allowed to leave the country (chapter 3). In the same year, the Rhino and Wildlife Conservation Committee (SRWCC) of Sabah was established, morphing in 1988 to the Wildlife Department Sabah. A capture and breeding programme was activated in 1987.

In Sabah, a total of 10 rhinos (8 males, 2 females) were caught 1987 to 1995. Two males died during capture while another male was released back into the wild. The remaining 7 rhinos were all moved to a rhino breeding centre established in Sepilok (Bosi 1996, 2018). A further 3 rhinos (1 male, 2 females) were added in 2008-2014.

The details of the individual rhinos are listed in chapter 9.

The Rhino Breeding Centre Sepilok (RBCS), located in the forest near Sandakan in conjunction with an Orangutan Rehabilitation Centre, was first occupied in 1987. It comprised of five individual pens, a breeding enclosure and a large 2.5 acre enclosure (Bosi 1996). The walls were made from tropical hardwood. All rhinos captured in Sabah were kept in Sepilok, where at times they could be seen by the general public. In 1999 there was just a pair of rhinos in Sepilok, and it was said that the site was deteriorating while another centre was being developed (Khan et al. 1999).



Map of the Rhino Breeding Centre Sepilok from Bosi (1996).

SOS Rhino (meaning “Save Our Sumatran Rhino”), an American conservation non-profit organisation was officially established in 1998; its missions to include, raising funds to support rhino conservation and study, and to support and partner with other organizations, such as the Black Rhino Foundation (later IRF), to further the causes of all breeds of rhinos (Bosi et al. 2002). The founder and president of SOS Rhino, Dr Nan Schaffer, is an accomplished veterinarian interested in the reproduction of rhinos and an expert in the use of ultrasound equipment (Felshman 1998; Jamieson 1999; Schaffer 2018). From November 2000 onwards SOS Rhino assisted the Sabah wildlife Department with manpower and foreign expertise, employing Annelisa Kilbourn, Edwin Bosi, Rosa Sipangkui, Cheong Choong and Petra Kretzschmar at different periods. SOS Rhino registered locally as SOS Rhino (Borneo) in 2001, which became the Borneo Rhino Alliance in 2008.

Dr Nan Schaffer remains active in the area of rhinoceros conservation. She has contributed much to our understanding of the reproductive pathologies affecting so many of the captive rhinos in South-East Asia, as can be attested by her series of technical publications: Bosi et al. (2002); Kretzschmar et al. (2006); Schaffer (and co-workers) 1994 to 2018; Tuah et al. (2002).

Many of the females captured in Sabah have suffered from reproductive pathologies, which of course has reduced the breeding potential of this small captive group (Fiuza et al. 2015; Fiuza 2017; Kretzschmar et al. 2016).

The Borneo Rhino Alliance (BORA) is a conservation organization based in Sabah, founded in 2008. It aims to care for the last living rhinos left in Malaysia, and to seek and capture any last rhinos that might exist, doomed in the wild. The participation of SOS Rhino was morphed to a financial agreement with Yayasan Sime Darby (YSD) from 2009 to 2017, when BORA received funding of RM11.9 million from the Federal Government of Malaysia. The work at the Borneo Rhino Sanctuary in Tabin was shown globally through the release of the National Geographic documentary “Operation Sumatran Rhino: Mission Critical” which follows BORA’s Executive Director Junaidi (John) Payne and Senior Veterinarian Zainal Zahari Zainuddin on their adventures and efforts in saving the Sumatran rhinos in Malaysia (Yayasan Sime Darby website 2019).

The managed breeding centre for Sumatran rhinos in Tabin Wildlife Reserve was established under the Borneo Rhino Alliance in conjunction with the Sabah Wildlife Department in 2008. There are regular reports on the progress and challenges of rhino management found under the author “Borneo Rhino Sanctuary (BRS) Programme” on the Rhino Resource Center, from 2010 to 2018 (listed at the end of this chapter).

At present just one female is still alive at the centre in the forest.

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List of published updates of the Borneo Rhino Sanctuary (BRS) Programme (here abbreviated to BRS). All are published in Kota Kinabalu, Sabah (KK).

All are available full-text on the Rhino Resource Center website ([this link](#)).

- BRS, 2010. Quarterly report (no.1): covering the period January to March 2010. KK, pp. 1-10.
- BRS, 2010. Quarterly report (no.2): covering the period April to June 2010. KK, pp. 1-10.
- BRS, 2010. Quarterly report (no.3): covering the period July to September 2010. KK, pp. 1-10.
- BRS, 2010. Quarterly report (no.4): covering the period October to November 2010. KK, pp. 1-10.
- BRS, 2011. Quarterly report (no.5): covering the period December 2010 to February 2011. KK, pp. 1-10.
- BRS, 2011. Quarterly report (no.6): covering the period March to May 2011. KK, pp. 1-10.
- BRS, 2011. Quarterly report (no.7): covering the period June to August 2011. KK, pp. 1-10.
- BRS, 2011. Quarterly report (no.8): covering the period September to November 2011. KK, pp. 1-10.
- BRS, 2012. Quarterly report (no.9): covering the period December 2011 to February 2012. KK, pp. 1-10.
- BRS, 2012. Quarterly report (no.10): covering the period March to June 2012. KK, pp. 1-10.
- BRS, 2012. Quarterly report (no.11): covering the period July to September 2012. KK, pp. 1-10.
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CHAPTER 9

DETAILS OF RHINOS CAPTURED IN SABAH, EAST MALAYSIA

In total, the Sabah (East Malaysia) program included 13 Sumatran rhinos: 9 males, 4 females (table 4). Two males died soon after capture. One escaped back to the wild. The detailed life histories of all animals are given below.

Table 4. Summary of data on the Sumatran rhinoceros (*Dicerorhinus sumatrensis*) captured or kept in Sabah, Malaysia 1987 to 2019.

SB	Capture	Arrival	Sex	Age	Name	Facility	Death	Life in days
14	Sabah - Kinabatangan	1987-03-28	M	ad	Linbar	Capture site	1987-03-29	1
17	Sabah - Lahad Datu	1987-07-14	M	7 yrs	Tenegang	Sepilok	1992-04-22	1744
21	Sabah	1988-05-24	M	ad	Lokan	Capture site	1988-05-25	1
26	Sabah - Lahad Datu	1989-04-22	F	6 yrs	Lun Parai	Sepilok	2000-08-23	4141
31	Sabah	1991-05-05	M	10 yrs	Tekala	Sepilok	1995-05-08	1464
36	Sabah	1992-08-27	M	10 yrs	Sidom	Sepilok	1997-01-20	1607
37	Sabah	1993-07-07	M	ad	Bulud	Tabin - Released in wild	1993-09-25	
38	Sabah	1993-07-20	M	ad	Tanjung	Sepilok	2006-07-12	4888
40	Sabah – Tabin	1994-06-17	F	ad	Gologob	Sepilok	2014-01-11	7148
41	Sabah	1995-11-22	M	ad	Malbumi	Sepilok	1997-12-04	743
47	Sabah	2008-08-15	M	> 20 yrs	Tam	Tabin	2019-05-27	3951
51	Sabah – Tabin	2011-12-18	F	12 yrs	Puntung	Tabin	2017-06-15	2006
57	Sabah - Danum Valley	2014-03-10	F	15 yrs	Iman	Danum - Tabin	alive 10/2019	

Studbook after Foose (2006) and Oberwemmer (2014). Dates in YYYY-MM-DD format.

Total 13 animals, 9 males, 4 females. All wild caught.

Two died in less than a year. One escaped to the wild.



Sumatran rhino male "Tam", about 18 years old in 2011 (photo: Kees Rookmaaker)

DETAILS OF CAPTURES

14 MALE LINBAR

1987-03-28 Capture in Linbar, Kinabatangan, Sabah
1987-03-29 Death at capture site

This mature male died within a day in pit trap due to internal injury and respiratory failure (Bosi 1996, 2018:20). The skeleton was preserved in the Sabah Museum.

17 MALE TENEGANG

1987-07-14 Capture at Hutan Simpan Teneggang, Kinabatangan
1987-07-14 Sepilok RBCS (Rhino Breeding Centre Sepilok)
1992-04-22 Death at Sepilok

This male was mature, maybe 7 years old, at the time of capture in a pit-trap in Kinabatangan, Sabah. Although Bosi (1996) puts his death in 1991, most sources agree on the 1992 date. Possibly died of obstruction of the hindgut (Ahmad et al. 2014), or overdose of sedative (Bosi 2018:54).

21 MALE LOKAN

1988-05-24 Capture in Sabah, locality not specified in sources
1988-05-25 Death at capture site

This third mature male caught in Sabah died within a day in the pit trap.

26 FEMALE LUN PARAI

1989-04-22 Capture at Bukit Belacon, Lahad Datu, Sabah
1989-04-22 Sepilok RBCS (Rhino Breeding Centre Sepilok)
1998-12-10 Tabin Wildlife Reserve
2000-04-13 Sepilok RBCS (Rhino Breeding Centre Sepilok)
2000-08-23 Death at Sepilok RBCS

The female Lun Parai (sometimes Lumparai) was captured as an orphaned juvenile living under a stilt house (Dierenfeld et al. 2006; Bosi 2018:26). She was about 5 years old when found. First mated on 28 October 1995 with 36 Sidom when about 11 years old (Ahmad et al. 2014). At an ultrasound examination in 1998, she showed some tumors (Schaffer 2018). Cause of death in 2000 has to be confirmed but salmonella and severe lung pathology were noted (Schaffer 2018).

31 MALE TEKALA

1991-05-05 Capture at Sungai Pin, Kinabatangan, Sabah
1991-05-05 Sepilok RBCS (Rhino Breeding Centre Sepilok)
1995-05-08 Death at Sepilok RBCS

This male was mature (about 10 years old) at the time of capture, but died in few days. His death was ascribed to tetanus (Bosi 1996).

36 MALE SIDOM

1992-08-27 Capture at Sapa Sidom, Sukau, Sabah
1992-08-28 Sepilok RBCS (Rhino Breeding Centre Sepilok)
1997-01-20 Death at Sepilok

About 10 years old when captured. He mated unsuccessfully with Lun Parai and Gelogob at Sepilok (Bosi 2018:37). Reason of death not established.

37 MALE BULUD

1993-07-07 Capture Bulud, Sukau, Sabah
1993-09-25 Tabin Wildlife Reserve
1993-11-30 Released to wild

Bosi (1996) has date of capture as 5 June 1993. Mature at time of capture. Bulud escaped through the electric fence into Tabin Wildlife Reserve, where he was spotted in June 1995, some 30 km from the escape site (Ahmad et al. 2014).

38 MALE TANJUNG

1993-07-20 Capture Bulud Napa, Sukau, Kinabatangan (Tanjung Panjang), Sabah
1993-07-23 Sepilok RBCS (Rhino Breeding Centre Sepilok)
2006-07-12 Death at Sepilok

While the studbook has his birth in 1989, Ahmad et al. (2014) state that he was mature when captured. Kretzschmar, P. et al. (2007) has data on Tanjung and Gologob mating and behaviour. Nan Schaffer examined his sperm on 18 Nov 1998, but found fluid containing calcium carbonate crystals and debris. The cause for Tanjung's presumed subfertility did not become apparent. In the night from 11 to 12 July 2006 there was a heavy thunderstorm in Sepilok. Due to this storm, a large tree standing next to the rhino enclosure fell down and landed on Tanjung's night stall. The tree broke his back and Tanjung was killed instantly. The next morning, the dead male rhino was found in his enclosure (Schaffer 2018).

40 FEMALE GOLOGOB

1994-06-17 Capture Sungai Gelugob, Sukau, Kinabatangan area, Sabah
1994-06-20 Sepilok RBCS (Rhino Breeding Centre Sepilok)
2007-03-01 Lok Kawi Wildlife Park, Penampang
2010-09-01 Tabin Wildlife Reserve
2013-03-28 Lok Kawi Wildlife Park, Penampang
2013-?? Sepilok RBCS (Rhino Breeding Centre Sepilok)
2014-01-11 Death at Sepilok

She was mature at time of capture, as her first mating was observed on 26 Oct 1995 with male Sidom (36). Maybe she was still young, as Kretzschmar (2008) has birth in 1989 and Dierenfeld et al. (2006) in 1990. Kretzschmar, P. et al. (2007) has data on mating behaviour with Tanjung. There was a successful copulation with Tanjung (38), but no pregnancy occurred. An examination in 1998 showed that she had cysts on her uterus (Schaffer 2018). Gologob has been blind in both eyes since August 2004 from a disease called ocular syndrome (Kretzschmar et al. 2009).

Apparently, she was the only rhino kept for some time at Lok Kawi Wildlife Park, Penampang, also called the Kota Kinabalu Zoo, but the circumstances are not explained.

41 MALE MALBUMI

1995-11-22 Capture at Malbumi Estate, Sukau, Sabah
1995-11-25 Sepilok RBCS (Rhino Breeding Centre Sepilok)
1997-12-04 Death at Sepilok

Malbumi was mature at time of capture. The cause of death has not been recorded (Ahmad et al. 2014).

47 MALE KERTAM, or TAM

2008-08-15 Capture at Kertam River, Kulamba Forest Reserve, Sabah
2008-08-15 Tabin Wildlife Reserve
2019-05-27 Death at Tabin

Kertam was coaxed into a crate by the Forest Department when he was found in an oil palm plantation with a snare wound on his right leg (Ahmad et al. 2014). He was mature, over 20 years old, at the time. This may be the animal anesthetized by Walzer et al. (2010). His death was related to old age and multiple organ failures, having suffered from kidney and liver damage for quite some time.

51 FEMALE PUNTUNG, PUNTONG

2011-12-18 Capture at Tabin Wildlife Reserve, Sabah
2011-12-25 Tabin Wildlife Reserve
2017-06-15 Death at Tabin

She was caught in a pit-trap in Tabin. On 24 Dec 2011 she was moved in a crate at night to get to a place where a helicopter could land. The helicopter lift took place the next day on 25 Dec 2011. She was mature, about 12 years old, at the time of capture. It was found that her front left foot was absent, probably amputated when she was young (Ahmad et al. 2014). She had significant pathology of her

reproductive tract, with endometrial cysts in the lining of her womb that could hinder the sperm from reaching the ova as well as prevent the implantation of embryos on the uterine wall. In June 2017, Puntung was euthanised because she was suffering from cancer that was incurable.

57	FEMALE	IMAN
2014-03-14		Capture at Lembah Danum, Lahad Datu, Sabah
2014 ??		Lahad Datu Wildlife Reserve
2018		Tabin Wildlife Reserve, Borneo Rhinoceros Sanctuary (BRS)

Iman was mature, about 15 years old, when captured in a pit trap. She had an uterine tumour that led to severe bleeding of her uterus. On 30 Sep 2019 a single egg cell (oocyte) was harvested by Thomas Hildebrandt and his team from the Leibniz Institute of Zoo and Wildlife Research in Berlin (*Star Online*, 30 Sep 2019).

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CHAPTER 10

BUILDING THE SUMATRAN RHINO SANCTUARY - 1993-1998

In the early 1990s, it was considered that the captive breeding community had no success in managing or propagating this species for future reinforcement of the wild population. Although in the decade 1984-1995 a total of 41 rhinos were captured in Malaysia, Sabah and Indonesia, there was a glaring absence of reproductive success. As long as the reasons for this were poorly understood, it tended to fuel the existing polarization between the *ex situ* and *in situ* conservation agendas. In February 1995 two rhinos died in San Diego in quick succession, leaving just 3 animals in the USA in 3 separate facilities. In the United Kingdom only 1 male was left. In Indonesia in 2 facilities, there were one single female and one pair. Malaysia had 9 animals but only 2 males, while in Sabah there were 3 males for 2 females (Hance 2018c). Some of these animals had pathological problems in their reproductive tracts. There had been no reproduction anywhere.

The Sumatran Rhino Trust of AAZPA had terminated its Memorandum of Understanding with the Indonesian Government in 1993 (Sumardja 1995). The MoU between Aspinall and Indonesia had lapsed even earlier. The Malaysia and Sabah programs were still proceeding with captures until 1994 and 1995 respectively. They provided the blueprint for ex-situ programs in the country of origin.

From 11-12 November 1993, a multinational Population and Habitat Viability Analysis (PHVA) Workshop for Sumatran rhinos was convened in Bandar Lampung, Sumatra, Indonesia (Soemarna 1994). The workshop was organized and conducted by Komar Soemarna (Director of Nature Conservation, PHPA), Widodo Ramono (Director of Species Conservation, PHPA), Jansen Manansang (Taman Safari Indonesia), Ronald Tilson (Minnesota Zoo) and Ulysses Seal (CBSG). There were 40 participants, including Tom Foose and Nico van Strien representing AsRSG. The workshop was called primarily to address the rapid decline of the rhinoceros in Indonesia, with numbers being reported as low as 185 to 250 in 1993, while the figure in 1991 still stood at 400: "Sumatran rhinos will disappear by the end of this [20th] century if poaching is not stopped. Time is of the essence."

In 1993, it was again considered that rhino populations of under 10 should be considered high risk and generally non-viable. To be able to bring these non-viable elements together, it was recommended to establish an In Situ Management Center (ISIMC), to provide a site where rescued Sumatran rhinos can be placed and propagated under natural conditions. The workshop developed a set of criteria for this center: 1. Seek support. 2. The centre to be located adjacent to, or within, a major conservation area to encourage and support better wildlife management. 3. Animals derived both from animals rescued from the wild and those already in captivity. 4. Centre should have an ecotourism component to provide ongoing support.

"Helping a species go extinct" was the title of a paper published by the American zoologist Alan Rabinowitz (1953-2018) in a well-established scientific journal in 1995. The title was provocative on purpose and attracted the attention of the media as well as the scientific community. Rabinowitz considered that a lot of money was wasted on the captive breeding efforts, while funds for in situ conservation to guard the rhinos in the reserves were hard to find. Some of his remarks were balanced in replies submitted by Hutchins (1995) of the AZA Rhino Advisory Group, Foose et al. (1995) of AsRSG,

Andau 1995) of the Sabah Government and Sumardja (1995) of the Indonesian Government. They all assured that there was going to be a shift in policy towards the development of an in situ managed breeding program, not in foreign countries but in the range states themselves. But Rabinowitz (1995b) was not convinced, he deemed removal unjustified, because most forests had not been surveyed or considered for protection. He would remain a spokesman for a large group of conservationists opposed to any form of captive breeding.

It is not clear when exactly the Sumatran Rhino Trust as a consortium of American zoos interested in helping the conservation efforts was disbanded. Maybe as early as 1989 or 1990, when the MoU with the Indonesian authorities was still in place (Anonymous 1989). A new fund-raising organization was founded in 1989 as the International Black Rhino Foundation. It changed its name to the International Rhino Foundation in 1993, and expanded its focus to all five species of rhinoceros. Tom Foose was the first executive director of IRF, followed after his death by Susie Ellis. IRF has been at the forefront of conservation action for the rhinoceros in South-East Asia over the years.

Strategies for a revision of the captive breeding program were discussed at the first meeting of a Global Propagation Group for Sumatran Rhino convened as part of the San Diego conference in 1991 (Foose 1991), and again at the Global Captive Action Plan Workshop in London 9-10 May 1992 (Foose 1992). The discussions continued in Bandar Lampung in 1993 definitely focusing attention on the possibility to start a breeding center in Sumatra itself.

At a Workshop on Establishment of Sumatran Rhino Sanctuary held in Bogor on 15-16 August 1994, it was recommended that the first Sumatran Rhino Sanctuary (SRS) would be located in Way Kambas National Park in Lampung, South Sumatra. The program would consist both of an animal program and a conservation tourism program to provide long-term financial sustainability (Foose & van Strien 1995a). Consequently a site evaluation mission was carried out by Nico van Strien from 24 November to 20 December 1994, together with Haerudin Sadjudin of Yayasan Mitra Rhino and Pudji Pratjihno of PHPA (van Strien 1995). The mission came up with detailed plans for the best site and best outlay of the new conservation center for the Sumatran rhino.

The Way Kambas National Park was declared a protected area on 26 January 1937. This followed a proposal by the Dutch "Resident" (Governor) Henderik Roelof Rookmaaker (1887-1945), who had surveyed the area and submitted a detailed proposal (Anon. 1937; Netherlands Indies Government 1937; Rookmaaker 1998; Kirk 1998). The park then encompassed about 130,000 hectares, and was found to be full of wildlife, with elephants numerous, and tapirs and tigers often seen (H.R. Rookmaaker 1939). It was then thought that the rhinos in the park belonged to the Javan species (*Rhinoceros sondaicus*), which was echoed when the rhinoceros was rediscovered in the 1990s (Reilly et al. 1997).

Rhino signs were detected as early as 1982. In 1987, a group of students from the UK doing an elephant study saw a rhino in Way Kanan. The Sumatran Tiger Project in Way Kambas captured 12 photos of rhinos using camera traps set for tigers in 1995. The Rhino Protection Units began working in Way Kambas NP in 1995 to ensure protection of the wild rhinos still left in the park. In 1997-1999, the population was estimated to be 24 rhinos (Haryono et al. 2016).

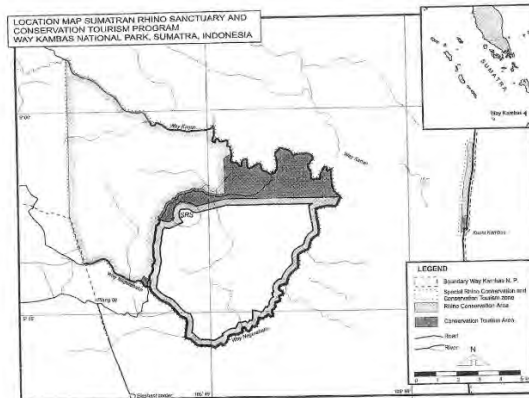
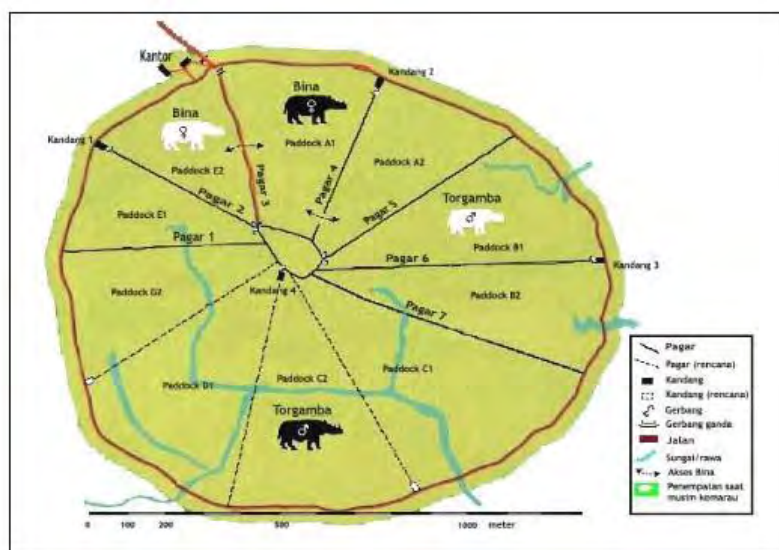


Figure 6. Map of SRS in Way Kambas National Park.

(from Foose & van Strien 1998a)

A Memorandum of Understanding was signed on 7 September 1995 by Directorate General of Forest Protection and Nature Conservation (PHPA) Department of Forestry, the International Rhino Foundation (IRF), and Taman Safari Indonesia (TSI). In October 1997 a new Sumatran Rhino Sanctuary Foundation was established to manage the daily activities. This entity merged on 28 December 2006 with others to form Yayasan Badak Indonesia (YABI), The Indonesian Rhino Foundation based on Notarial Deed No. 34 and authorized by the Ministry of Justice and Human Rights on 20 March 2007 (Haryono et al. 2016, YABI 2019).

The MoU of 1995 permitted IRF and TSI to proceed immediately with construction of enclosures for the rhino and support facilities for SRS staff. IRF has allocated \$ 465,000 for the SRS through the end of 1996. A detailed mapping of the terrain in the area where the enclosures will be constructed was put in place, through a contract to the Way Kambas Sumatran Tiger Project led in the field by Neil Franklin and directed by Ron Tilson. The fence lines would be demarcated by mid-December 1995. Construction of the fence and other facilities would commence as soon as weather allows. At the latest, it was expected the SRS will be ready to receive rhino by May 1996 (Foose & van Strien 1995b).



SRS enclosures in 1998 (after Foose & van Strien 1998a)

There were delays due to the unusually heavy and long rains in Sumatra, but construction of the SRS commenced in the first months of 1996 (Khan et al. 1996a) and continued in 1997 (Khan et al. 1997a, b). The plan for the new SRS in Way Kambas was set out in detail in the new edition of the AsRSG Status survey and conservation action plan (Foose & van Strien 1997:93).

At the outset the Sumatran Rhino Sanctuary or Suaka Rhino Sumatera (SRS) comprised 10,000 hectares (25,000 acres) within Way Kambas National Park (Foose & van Strien 1998a). The government of Indonesia, Ministry of forestry provided 'concessions' for the management of the area to the conservation partners which included IRF, AsRSG, and TSI. The complex was divided into two parts, a rhino conservation zone of 9000 ha and a conservation tourism zone of 1000 ha. The first set of enclosures were completed encompassing 250 acres in native forest. The area was divided at first into five 25 acre and one 125 acre enclosures. The enclosures consisted of a simple electrified fence and have been constructed with minimal disturbance to the top forest habitat. Facilities for the staff were adjacent to the rhino enclosures. The first three rhinos (one male and two females) were moved to the SRS in January 1998.

The establishment of the SRS led the way to major conservation successes in more recent years (Havmøller 2015). This is further explored in Chapter 14.

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CHAPTER 11

HISTORY OF RHINOS CAPTURED IN KALIMANTAN, INDONESIAN BORNEO

A literature survey by Rookmaaker (1977a,b,c) showed that the Sumatran rhino was quite widely distributed in most parts of Borneo until recently, but numbers had reduced dramatically. Meijaard (1996) reported on the evidence found during a survey in 1994 that there are still rhino sightings in Borneo indicating their presence in the mountainous and remote areas of Kalimantan: more rhinos may remain in Kalimantan than was previously assumed. The rhinoceros is a cryptic species that is easily overlooked and only rarely reported.

In 2013, a WWF survey team first found evidence that the species was not extinct in Kalimantan by identifying footprints and capturing an image of a rhino on a camera trap in a forest in Kutai Barat, near the Sarawak border. Since then, 15 Sumatran rhinos have been identified in three populations in Kutai Barat (WWF 2016; Mukhlisi 2016). The ecology and food availability in the area was investigated by Mukhlisi et al. (2016 and 2017)

A female called Pahu, captured in a pit trap in November 2018, was the first animal to be translocated to a new facility called the Sumatran Rhino Sanctuary (SRS) Kelian at Hutan Lindung Kelian Lestari, Kalimantan. The facility is still under development.

The details of the animals captured are listed in chapter 12.

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CHAPTER 12

DETAILS OF RHINOS CAPTURED IN KALIMANTAN, BORNEO, INDONESIA

Two rhinos (both female) have been captured in West Kutai province of Indonesian Borneo. One of these died within a month (table 5).

Table 5. Summary of data on the Sumatran rhinoceros (*Dicerorhinus sumatrensis*) captured in Kalimantan, Indonesia 2016 to October 2019.

SB	Capture	Date arrival	Sex	Age	Name	Facility	Death	Life in days
n/a	West Kutai	2016-03-12	F	5 yrs	Najaq	Capture site	2016-04-05	25
n/a	West Kutai	2018-11-25	F	25 yrs	Pahu	Kelian (Kalimantan)	alive 10/2019	

Dates in YYYY-MM-DD format.

Total 2 animals, 0 males, 2 females.

One animal died within a year.

DETAILS OF CAPTURES

A FEMALE NAJAQ

2016-03-12 Capture at Ulu Mahakam, Kutai Barat, Kalimantan, Indonesia
2016-03-12 Capture site
2016-04-05 Death at capture site

Surveys organized by WWF Indonesia in 2013 and 2014 confirmed the presence of Sumatran rhinoceros in Kalimantan in an area of about 493,000 ha. It is believed that 7-15 animals were still alive (Mukhlisi et al. 2016, 2017). When first seen on a camera trap, this female was clearly injured as she had a snare wound from an earlier poaching attempt. She was a young female, probably only 4-5 years old (Hance 2018d, epilogue). It was decided to rescue her. A temporary boma was built next to the pit trap. The disturbance caused by the presence of too many people was very stressful to the animal. This was one of the multifactorial reasons for her death after just over 3 weeks (Payne & Yoganand 2018: 10). Skeleton and horn were preserved (current locality unknown).

B FEMALE PAHU

2018-11-25 Capture at Ulu Mahakam, Kutai Barat, Kalimantan, Indonesia
2018-11-25 Kelian Rhino Sanctuary (SRS Kelian) near capture site

This mature female was first seen on camera trap in the forest. Eventually she was captured in a pit trap on Sunday 25 November 2018 at 07.30 am. She was about 25 years old at the time of capture. This animal is excessively small (body length 194 cm, shoulder height 107 cm), and will not be able to breed with a 'normal' male in Sumatra. After capture she was first placed in a 'boma' for a quarantine period of 3 months where she was closely examined and monitored (Candra et al. 2019).

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Pahu, the female Sumatran rhinoceros captured in Indonesian Borneo in 2018 (photo WWF Indonesia)

CHAPTER 13

SUCCESS IN CINCINNATI, OHIO, U.S.A.

There have been 7 Sumatran rhinos in the Cincinnati Zoo & Botanical Garden, Ohio, USA since 1989 (Rookmaaker 1989:139; Oberwemmer 2014). Four of these were wild-caught in Sumatra (1 male and 3 females) and three were born in the Zoo (2 males, 1 female), see table 6. According to the studbook, there have also been 5 premature stillbirths in 1997-2000 (nos.52-56).

Table 6. Sumatran rhinoceros (*Dicerorhinus sumatrensis*) specimens in the Cincinnati Zoo & Botanical Gardens 1989-2014.

SB	Sex	Name	Arrival	Departure	Days in zoo
24	F	Mahato	1989-06-02	1992-05-10 died	1073
27	F	Rapunzel	1993-02-06	2001-03-13 transfer	2957
28	M	Ipuh (Bagus)	1991-10-25	2013-02-18 died	7787
29	F	Emi (Embam)	1995-08-05	2009-09-05 died	5145
42	M	Andalas	2001-09-13 born	2003-06-20 transfer	645
43	F	Suci	2004-07-30 born	2014-03-30 died	3530
44	M	Harapan	2007-04-29 born	2008-11-11 transfer	562

The Cincinnati Zoo (then director Edward Joseph Maruska) was one of the four institutions subscribing to the Sumatran Rhino Trust, and hence hoping to receive a pair of Sumatran rhinos. They in fact received the first animal to be captured under this program in Bengkulu, Sumatra, but the female Mahato (24) was unfortunately post-reproductive. Cincinnati subsequently received a male in 1991, followed by two females in 1993 (on loan from New York) and in 1995.

There were many challenges in the early years, especially as there was little knowledge about the general biology and husbandry of this species, which had rarely been kept in captivity since the 19th century, and generally with poor results (Rookmaaker 1989). Only the female Subur lived in Copenhagen Zoo for just over 12 years (4 Dec 1959 to 24 Feb 1972), without however a companion (Sonne-Hansen 1972).

The male Ipuh at first had difficulty getting used to a diet of hay which was given as a substitute for the normal browse. This was recognized by zoo keeper Steve Romo, and after the diet was switched to leaves of Ficus and other browse transported from California, the general health of the animals dramatically improved (Watson 2007).

The Zoo in Cincinnati is also host to the Center for Conservation and Research of Endangered Wildlife (CREW), which has researched the Sumatran rhino, among many other endangered species, under the leadership of director Terri Lynn Roth (Ponti 2017). Many important scientific papers on aspects of husbandry, reproductive biology and veterinary issues have been published in peer-reviewed journals as a result, for which reason a list is included below in this chapter.

One of the major breakthroughs came when it was found that the Sumatran rhino is an induced ovulator. This discovery came primarily through ultrasound monitoring. The female exhibited a 21-day reproductive cycle when allowed to mate (Roth et al. 2001)

When the science and husbandry requirements were better understood, the path was opened for the first birth of a Sumatran rhinoceros since the 19th century. In those early days, a wild-bred female gave birth in the London Docks on 6 December 1872 (Rookmaaker 2014), another in the Calcutta harbour in 1885, followed by a zoo-bred male baby born in the Alipore Zoological Gardens, Calcutta, India on 30 January 1889 (Sanyal 1892:133).

Andalas was the first Sumatran rhinoceros to be bred in captivity in the 20th century, and was delivered on 13 September 2001. This great success was followed by the female Suci on 30 July 2004 and the male Harapan on 29 April 2007. All three were babies of the mother Emi and the father Ipuh. Both young males, Andalas and Harapan, were returned to the SRS in Way Kambas, Sumatra, Indonesia. There are no Sumatran rhinos currently in Cincinnati Zoo.

It is hard to over-emphasize the enormous achievements of the staff of the Cincinnati Zoo.

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CHAPTER 14

SUCCESS IN WAY KAMBAS, SUMATRA, INDONESIA

In total, 9 (4 males and 5 females) Sumatran rhinos have been maintained in Way Kambas (table 7). Of these, 7 (3/4) are alive currently and living in the SRS: males Andalas, Harapan and Andatu, females Bina, Ratu, Rosa and Delilah.

Table 7. Sumatran rhinoceros (*Dicerorhinus sumatrensis*) specimens in the Sumatran Rhino Sanctuary, Way Kambas, 1998-2019.

SB	Sex	Name	Arrival	Departure
04	M	Torgamba	1998-01-08 from Port Lympne	2011-04-25 death
12	F	Dusun	1998-01-09 from Jakarta	2001-02-07 death
32	F	Bina	1998-01-08 from Bogor	alive 10/2019
46	F	Ratu	2005-09-20 (wild caught)	alive 10/2019
45	F	Rosa	2005-11-26 (wild caught)	alive 10/2019
42	M	Andalas	2007-02-21 from Los Angeles	alive 10/2019
48			2009 still-born (to 42 + 46)	2009
49			2010 still-born (to 42 + 46)	2010
50	M	Andatu	2012-06-23 (birth to 42 + 46)	alive 10/2019
44	M	Harapan	2015-11-02 from Cincinnati	alive 10/2019
58	F	Delilah	2016-05-12 (birth to 42 + 46)	alive 10/2019

The Sumatran Rhino Sanctuary (SRS) was constructed in 1996-1997. In January 1998 the first rhinos entered their compounds. Two females (Dusun and Bina) were transferred from Indonesian facilities in Jakarta and Bogor (chapter 7). The male Torgamba was flown back to Sumatra from Aspinall's Port Lympne Park, UK (Foose & van Strien 1998).

In 2005, two female rhinos were found, almost accidentally, near villages close to Way Kambas NP and Bukit Barisan Selatan NP. These rhinos called Ratu and Rosa were rescued successfully and transferred to the SRS. These events were probably the most surprising parts in the history of the SRS. At that time Torgamba was still the only male in the center, but he unfortunately appeared to suffer from oligospermia (van Strien 2006; Agil et al. 2008).

In February 2007, arrangements were made to send the first rhinoceros born to Ipuh and Emi at the Cincinnati Zoo to Sumatra. After Andalas settled down in the SRS, this young male, then about 5 ½ years old, started to mate with Ratu (Crosbie 2010; Ellis 2010). Although Ratu did not carry through her first pregnancies, success could be announced when Andatu was born on 23 June 2012. Andalas was about 9½ years old at the time of the successful mating – after a gestation period of some 16 months. In other rhino species, captive-born males were younger at the time of birth of their first offspring: *Rhinoceros unicornis* 5 yrs 10 mo, *Diceros bicornis* 5 yrs 8 mo, and *Ceratotherium simum* 3 yrs 2 mo (Rookmaaker 1989:24). Andatu has grown up well and is now just over 7 years old.

Rosa In 2015 Harapan, the brother of Andatu, joined the group of young rhinos at the SRS.



Andatu with his mother Ratu at the SRS

On 12 May 2016 the pair of Andalas and Ratu gave birth of their second baby, this time a female called Delilah.

The births of Andatu and Delilah conceived in the SRS under natural conditions gives hope for the future. There is every possibility of further success in the SRS which is well-run and well-monitored.

On 30 October 2019 a second phase of a much larger Sumatran Rhino Sanctuary in Way Kambas was opened on 30 October 2019 with the presence of representatives of IRF, AsRSG, YABI, as well as the Governor of Lampung Arinal Djunaidi.

As the IRF (website) states, this is a great development: “Expanding the SRS puts it on the path to becoming a true Center of Excellence for Sumatran rhino research and breeding — a place where rhino experts from around the world can come to study these critically endangered animals, with the aim of learning as much as possible about the species to aid the survival of their counterparts in the wild.”

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Delilah, the female Sumatran rhinoceros born on 12 May 2016 at the SRS Way Kambas with her mother Ratu.

CHAPTER 15

RHINO CAPTURE PROGRAM DEEMED A DEBACLE

The rhino debacle – that has become probably one of the kinder ways to refer to the captive breeding programme of the Sumatran rhinos started in the 1980s.

It is not altogether without reason. From the start of the programme in 1987, a total of 47 rhinos were captured in peninsular Malaysia, Sabah, Sumatra. And in the end there have only been 6 captive births, obviously not enough to sustain a new population.

Maybe this needs to be put into perspective. If captive breeding was a debacle, the implication is that it would have been safer to leave them in the wild with appropriate protection measures in place. It is likely that the 47 animals captured would not have been able to contribute to the wild population as their habitat was being destroyed. Protecting rhinos in the wild has also proved to be extremely challenging. In 1989 the world population was estimated at 536-962. Since that time, the species has gone extinct in peninsular Malaysia, reached the brink of extinction in Sabah, and numbers are down to less than 200 in Sumatra. The story of the Sumatran rhino is indeed extraordinary.

I believe it is important to say that the recommendations proposed at the end of the Singapore meeting in 1984 were entirely reasonable. If history were to repeat itself, many conservationists today would come up with similar results.

The Singapore proposals were carefully followed up with sincere discussions how to achieve the best results. Money was invested, the available expertise was sought and used.

And yet today we talk of a debacle, or fiasco, or total disaster. Something went wrong which could not have been predicted at the start. Nobody was under any illusion that it was going to be easy, that there wouldn't be road bumps. The Sumatran rhino turned out to be a species very difficult to keep under captive conditions. The pathology associated with many of the animals could not have been imagined.

The efforts of the 1980s and 1990s were sincere, aiming to restore a species on the way to extinction. It was indeed recognised after just a few years, probably as early as 1989, that the program as it was first conceived was not going in the right direction. Policies were changed as soon as they could.

From a program taking rhinos into zoological gardens to induce breeding under carefully managed circumstances, steps were taken to keep the animals in the original habitat under conditions where the rhinos could thrive. Sumatran Rhino Sanctuaries were constructed in all three regions. Still the results were not as positive as would have been hoped.

We must try to learn from the past. The past is complicated, and much of it is not fully understood, even now, just a few decennia later.

This report is based on a survey of literature. Not everything was written down, and surely many developments never made it into the more formal scientific or popular journals and books. We all know

that important discussions and decisions happen during conference breaks rather than in the sessions. With these limitations in mind, it is important to discover what lessons must be learned (Nardelli 2013, 2014; Havmøller et al. 2016; Groves 2016; Payne & Yoganand 2018).

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SUMATRAN RHINO CAPTURES – STATISTICS

Table 8. Summary of all Sumatran rhinos (*Dicerorhinus sumatrensis*) captured 1985-2019 showing numbers of wild-caught animals, captive birth, and locations of institutions of first exhibit.

Capture locality	Wild caught		Births			UK	USA	Indonesia	Malaysia	Sabah
	M	F	M	F	X					
Sumatra	7	13				3	7	9	1	
Malaysia	3	9		1				1	12	
Sabah	9	3								12
Kalimantan		2								
USA			2	1	5 *		8			
Indonesia			1	1	2 *		1	2		
TOTALS	19	27	3	3	7 *	3	16	12	13	12

* stillbirths

Table 9. Summary of all Sumatran rhinos (*Dicerorhinus sumatrensis*) captured 1985-2019, as table 8, but only showing animals surviving > 1 year (without stillbirths, without animals dying soon after capture).

Capture locality	Wild caught		Births		UK	USA	Indonesia	Malaysia	Sabah
	M	F	M	F					
Sumatra	7	11			3	6	8	1	
Malaysia	2	9		1			1	11	
Sabah	7	3							10
Kalimantan		1					2		
USA			2	1		3			
Indonesia			1	1			1		
TOTALS	16	24	3	3	3	9	12	12	10

CHAPTER 16

LESSONS LEARNED

THE TAXONOMY OF THE SUMATRAN RHINOCEROS

Recommendation

All subspecies of the Sumatran rhino can be mixed to achieve maximum breeding success

The taxonomic study of the recent species of rhinoceros in the last fifty years has been spearheaded by the British zoologist Colin Peter Groves (1942–2017) in studies which are generally accepted as authoritative (Rookmaaker 2015; Rookmaaker & Robovsky 2019). Groves had a remarkable understanding of the diversity of most groups of mammals and his judgement of species or subspecies delimitations was exemplary. However, in any assessment it must be added that not all of the classifications found by Groves have been accepted for a variety of reasons, like his separation of the two types of *Ceratotherium* (white rhino) as species, or his division of *Diceros bicornis* (black rhino) into eight subspecies (Rookmaaker 2011).

Groves (1965) studied 13 skulls of *Dicerorhinus sumatrensis* – but using the generic name *Didermocerus* Brookes, 1828, which in 1977 was suppressed in favour of *Dicerorhinus* Gloger, 1841. Although he was yet uncertain if the populations of Burma, Malaysia and Sumatra should be separated, the specimens from Borneo clearly stood out, with skulls markedly smaller than in all other subspecies, showing a forward-sloping occiput with a higher surface. He named the new subspecies, in the currently accepted combination: *Dicerorhinus sumatrensis harrissoni*, after Tom Harrison (1911-1976) who was known for studies in Borneo (Harrison 1956). The type specimen was an almost adult skull in the Natural History Museum of London, no. 1901.8.15.1, from Suan-Lambah, Sabah, Borneo, collected by Henry Osmund Rowe (1869-1914).

Groves (1967) was based on a larger sample, which showed that the animals from Sumatra and those from Malaya similar, at most separable on average only, stating that the measurements for the two populations hardly differ. There were therefore 3 subspecies: *Dicerorhinus sumatrensis sumatrensis* (G. Fischer, 1814) in Malaysia and Sumatra, *Dicerorhinus sumatrensis harrissoni* (Groves, 1965) on Borneo, and *Dicerorhinus sumatrensis lasiotis* (Buckland, 1872) in Burma (Myanmar), India and Bangladesh. This distinction was maintained by Groves & Grubb (2011). The former presence of the continental subspecies in Bhutan is circumspect (Rookmaaker 2016).

Studies on the genetics of the species have come up with generally similar results, although authors have not always agreed on the conclusions. Amato et al. (1995) suggested that the subspecies were not different enough to represent separate conservation units. On the other hand, Morales et al. (1997) suggested that the differences found between animals from Borneo and those from Sumatra-Malaysia were large enough to justify management as separate evolutionary lineages.

At the time of the Singapore proposals in 1984, it was recommended not to mix presumed subspecies stocks, either in captive breeding or in the wild translocation, until further work is done on their taxonomy.

This policy was upheld in the AsRSG Action Plan of 1997, stating that the AsRSG and range states do not believe that there is an imperative to merge. But the principle to combine subspecies was acknowledged and the proposal would continue to be an option if the demographic crisis deteriorates (Foose & van Strien 1997:4). This was also supported by Dinerstein (2003).

The issue was again discussed at the AsRSG meeting held in Bogor in 2009, where due to the extremely small number of rhinos left in the wild, the recommendation was changed, advocating to manage Sumatran rhino as a single population combining subspecies (Talukdar et al. 2009). All animals in the captive breeding program should be managed as a single unit by the Global Management and Propagation Board (GMPB) initiated in 2005 based on earlier principles (Foose 1983, 1991; GMPB 2011).

This conclusion was upheld in a further genetic study by Goossens et al. (2013).

Brandt et al. (2018) also studied mitochondrial (mt) DNA of Sumatran rhino and could maintain the separations found in the earlier taxonomic studies. They concluded that separate management strategies for subspecies may not be viable, while each surviving rhino pedigree is likely to retain alleles found in no other individuals. They recommended two priorities for the species: first translocation of wild rhinos to ex-situ facilities, and secondly collection and storage of gametes and cell lines from every surviving captive and wild individual (Hance 2018).

Against this almost universal consensus that all animals should be used where possible, Gippoliti & Robovsky (2018) feel that it is still possible to maintain two separate programs to avoid the possible negative consequences following introgression of the two surviving distinct evolutionary significant units. This means that the breeding program should maintain separately the pure *sumatrensis* lineage from a crossed *harrissoni x sumatrensis* one.

All taxonomic and genetic studies have maintained the distinction between animals in populations of Borneo on the one hand and Sumatra/ Malaysia on the other. Up to now, politics have kept programs in the different regions separate (Sumatra – Malaysia – Sabah), thus maintaining the scientific consensus of taxonomic division.

In most conservation meetings discussing the captive breeding programs of the Sumatran rhino, it is now generally agreed to mix all animals and maintain them as one metapopulation. This is a political decision based on conservation realities.

Wherever needed and expedient, politicians and conservationists must work together nationally and internationally to use every available animal to its maximum potential. Hence, considerations of subspecific distinction must be secondary to the need to save the genetic material of the species.

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CHAPTER 17

LESSONS LEARNED

THE NEED OF INTERNATIONAL AND REGIONAL COÖPERATION

Recommendation

All Sumatran Rhinos captured in Sumatra, Malaysia, Sabah, Kalimantan must be managed as one meta-population. Political boundaries must be disregarded for purposes of conservation.

The concept of managed small populations of endangered species to achieve viability has always been an important part of the work and publications of Tom Foose (Foose 1987, 1992, Foose & Ballou 1988, Foose & Wiese 2006). Any masterplan for captive breeding “should specify which animals should reproduce when and with which mate to achieve the genetic and demographic objectives. These specifications will normally entail some relocation of animals between institutions to produce better genetic and demographic combinations of mates” (Foose & Ballou 1988).

It was an integral part of the Singapore Proposals of 1984 that “all animals placed in captivity and their future progeny will be managed cooperatively as part of a *world population* in the light of the primary overall goal of the programme” (chapter 1). This global metapopulation needs to be managed by an accepted committee or institution to combine all demands and interests. Initially it was intended that the IUCN/ SSC Asian Rhino Specialist Group would provide this oversight. Later in 2005, a Global Management and Propagation Board (GMPB) was established to perform this function for a relatively small number of animals (Ellis et al. 2011).

The science clearly showed that managing captive Sumatran rhinos as a single population greatly increased the probability of population persistence, when compared to scenarios for which captive animals were managed on a regional scale with reduced transfers among regional subpopulations. When managed as one single population, the probabilities of extinction within the next 25 years for captive Sumatran rhinos ranged from 6-17% (GMPB 2011).

Despite the importance of global participation and coöperation, this has been severely lacking in reality (Dinerstein 2003; Khan 2014; Payne & Yoganand 2018). Distance between the contributing partners has made sharing of animals complicated on an international scale. There has been some exchanges of animals between the four American participating facilities, and there has been one exchange of animals between Malaysia and Indonesia. However, as listed by Payne & Yoganand (2018), the necessary and expected international coöperation has been all but absent. The governments of both Peninsular Malaysia and Sabah blocked the export of animals from their territories (chapter 3). The four American zoos all wanted a return for their financial input (Dinerstein 2003; van Strien 1985).

These were political decisions. They meant that several animals could not be made to contribute to the international gene pool and breeding programs where they could be most needed.

It is recommended that in all future scenarios, all impediments to international and regional coöperation are to be streamlined in agreements between all parties. Ideas of ownership or feelings of pride should take second place to a last attempt to keep an animal species from becoming extinct.

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CHAPTER 18

LESSONS LEARNED

ELEMENTS OF HUSBANDRY

Recommendations.

A balanced diet of browse is of crucial importance in the well-being of the rhinoceros in captivity.

Enclosures must be hygienic and provide shade and wallows.

Enclosures must be large enough to allow space during fights between animals.

The design of enclosures must allow for solitary periods of the rhinos.

The Sumatran rhinoceros has proved to be a highly challenging species to keep in captivity. Because other rhino species have generally adapted well to a captive environment, this came as a surprise when the managed breeding program got under way in the 1980s. There have been major problems with the animal's diet, their aggressive behaviour, and with the design of enclosures. However, our understanding of the biology of the species has greatly improved, leading generally to better husbandry (Foose & Wiese 2006).

There are two husbandry manuals for all species of rhinoceros by Michael Fouraker and Tarren Wagener (1996) and by Lara Metrione and Adam Eyres (2014). A third set of guidelines for the Sumatran rhino is now being developed by the International Rhino Foundation.

It is beyond my scope to discuss all aspects of rhinoceros husbandry. I will just highlight three aspects which have been problematic over the years.

DIET OF SUMATRAN RHINOS IN MANAGED FACILITIES

The diet of the Sumatran rhinoceros in the wild has been investigated a few times. In his review of literature, van Strien (1974, appendix B) listed all known food plants, 102 species, from a variety of sources. The largest part of the diet in the wild consisted of leaves, twigs, saplings, small branches of shrubs and trees, while grasses are generally not fed on. Dierenfeld et al. (2006) characterized the nutrient composition in local browse found in Sabah. The feeding behavior in Sumatra was discussed by Suharto et al. (2007), in Malaysia by Zainuddin & Hassan (1989). The food plants found in the region in Kalimantan frequented by rhinos has been examined by Mukhlisi et al. (2017) and Matius et al. (2016).

Browse must be the preferred option also in captive breeding centers (Khan 2014:70). The lack of appropriate browse in Cincinnati became a major issue for a while, which was quickly resolved when it was recognized and addressed (see chapter 13). The risk of iron ferritin disease is recognized but must be harnessed (Candra et al. 2012).

As most rhinos are now kept in semi-natural conditions in their range lands, the diet has become less of a problem. The rhinos must be allowed to feed on a variety of browse and fruits, which can vary according to the time of the year.

THE AGGRESSIVE BEHAVIOUR OF SUMATRAN RHINOS

In his literature survey, van Strien (1974:44) found that Sumatran rhinos in the wild had often been seen in pairs, and it was suggested that a male and a female would stay together for longer periods, while being intolerant of other rhinos in the vicinity. However, the rhinos do fight among themselves, both in the wild and in zoos (as reported in Vienna for two females kept together). Data are inconclusive and may depend on individual temperaments.

In the more recent captive breeding programs, fights between rhino specimens are well-known. Females fight females, males fight males, and the sexes fight each other. They can inflict serious injuries to each other, which in Malaysia resulted in great reluctance by keepers and officers to mix rhinos at all (Khan 2014:88).

Courtship in some rhinos involves quite serious fighting, which remains a difficult issue to overcome when such valuable animals engage in such aggressive behavior. Enclosure design must take their behaviour into account. It has often been custom to keep males separated from females and only introduce them to each other when breeding can be expected (Dinerstein 2003).

THE DESIGN OF ENCLOSURES

There has been some concern about the design of enclosures. It has been said that enclosures did not provide adequate space to engage in courtship which often involves aggressive-looking fights (Dinerstein 2003). This should be taken into account in any design of paddocks and enclosures for the Sumatran rhinos. It is important to provide enough space in enclosures as well as enough distance between enclosures (Radcliffe & Radcliffe 2002).

Sumatran rhinos are forest animals. Hence it is imperative that the animals are not too much exposed to sunlight, that they have access to clean mud wallows, and that basic hygiene is monitored constantly (Payne & Yoganand 2018:61). Frequent sunshine has been linked to serious eye disorders (Kretzschmar et al. 2009).

Sumatran rhinos are solitary animals in the wild. This must be realized in the construction of enclosures. There is circumstantial evidence that the rhinos have issues with stress when kept too close to each other (Ellis 2005:106; Payne & Yoganand 2018:61). Space is important, as well as visitor control to avoid stressful situations which will impact negatively on breeding (Payne & Yoganand 2018).

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CHAPTER 19

LESSONS LEARNED

CAPTIVE MANAGEMENT REQUIRES ROUTINE HEALTH MONITORING

Recommendation.

The presence of qualified veterinarian staff with proper equipment on a continuous basis can ensure the health of the animals.

When the captive breeding program was started in 1984, there was only rudimentary knowledge of the diseases which could affect the rhinos. This was to be expected because of course Sumatran rhinos had been rarely kept in zoological gardens before.

Although all animals captured after 1987 were given veterinary treatments where needed, it was often felt that this was one of the areas which might need improvement (Foose & Wiese 2006). Health of Sumatran rhinos is integrally linked to the native forests. Captive management requires routine health monitoring and basic animal husbandry practices, including physical exam with measurement of body weight, condition scores, screening for endoparasites and ectoparasites, and serial hematology and biochemistry (Radcliffe & Khairani 2019).

Of course, extreme hygiene is important in all environments.

It is now understood that all captive facilities must provide constant, high-quality veterinary care by full-time presence of experienced veterinarians employed independently of government bureaucracy (Payne & Yoganand 2018).

Sumatran rhinos have developed many pathologies of the reproductive tract which are difficult to treat (Schaffer 2018; Payne & Yoganand 2018). Sumatran rhinos are susceptible to iron overload disorder linked with diets in captive situations (Citino et al. 2012).

It is beyond the scope of this report to review the veterinary issues associated with Sumatran rhinos in captivity. Many veterinary issues have been addressed in papers like those of Zainuddin et al. (1990) and Radcliffe & Khairani (2019).

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The young male Sumatran rhinoceros Andalas after his transfer to SRS Way Kambas, Sumatra, taken in 2007 (photo Steve Romo)

CHAPTER 20

LESSONS LEARNED

CAPTURE OF ANIMALS FROM VIABLE POPULATIONS

Recommendation:

New animals should be sourced from viable large populations with known breeding females.

There is a high frequency of pathologic incidence in the reproductive tracts of the Sumatran rhinoceros in the captive breeding program (Schaffer 2018; Ahmad et al. 2013, 2016; Radcliffe & Khairani 2019). Uterine tumors appear to be more common in older animals and may be caused by long terms of cycling without pregnancy. The development of reproductive pathology and ovarian inactivity was found in the white rhinoceros to be an age-related consequence of long non-reproductive periods (Hermes et al. 2006). In the Sumatran rhino, pathologies have also been observed in recently captured wild females.

It is thought that the development of pathologies in wild rhinos is a consequence of reduced mating opportunities in a very small population, prolonged periods of nonparity, possible skews in sex ratios and inbreeding depression, all part of what is known as the Allee effect (Radcliffe & Khairani 2019; Nardelli 2014).

The occurrence of pathologies is therefore associated with animals living in small or very small populations. What have been termed 'doomed' populations are by the process of selection often among the smallest and most isolated pockets in the wild. Hence capture of rhinos from such populations will have a high incidence of animals potentially affected by the results of the Allee effect.

It is now considered imperative to capture further animals from wild populations where there are still signs of regular breeding, or where enough animals are present to suppose such regular breeding.

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Harapan, with his mother Emi, soon after delivery on 29 April 2007 at the Cincinnati Zoo (photo Terri Roth)

CHAPTER 21

LESSONS LEARNED

DEVELOP ARTIFICIAL REPRODUCTIVE TECHNIQUES

Recommendation.

Artificial Reproductive Techniques must be used to maximize the genetic material of all Sumatran Rhinos in the captive breeding program.

The number of Sumatran rhinos in the captive breeding program is still quite limited. From the start there have been issues with the sex ratio of the animals caught, too many males in a row in Sumatra, too many females in Sabah. Besides, not all the animals have contributed to the breeding program, due to incompatibility with others, lack of suitable pairs, age, and even in many cases reproductive tract pathologies.

All rhinos in the program must be used to their full extent if there is any hope to sustain the population or hope for a limited growth. Natural breeding has had sparse success.

Pennington & Durrant (2019) reviewed the various techniques and results of Artificial Reproductive Techniques (ART) in all species of rhinoceros. In vivo techniques that have been used for the Sumatran rhino are Oestrus induction (Roth et al. 2001), Artificial insemination, and Semen collection (O'Brien & Roth 2000). In vitro techniques up to now include Gamete rescue in males (Roth et al. 2016) and in females (Stoops et al. 2011), as well as In vitro maturation (Stoops et al. 2011). Semen collection is done by electroejaculation or manual stimulation, and the techniques are well-known for other rhinoceros species (Schaffer et al. 1998a; Hermes et al. 2005; Roth et al. 2016). Cage restraint is developed by Schaffer et al. 1998b). In females, oocyte collection and maturation is reported by Stoops et al. (2011) as well as Pennington & Durrant (2019, table 3).

When there is a possibility, it is recommended that the rhinos in the captive breeding centres are allowed to participate in advances in ART. This of course is a highly specialized area of research and practice and must be performed by suitably skilled personnel.

There will be many hurdles and many challenges. The work is expensive and difficult to perform in many circumstances. As said by the International Rhino Foundation, they believe that “we need to maximize options and minimize regrets, tackling the myriad of challenges facing rhinos using multi-faceted approaches. Some will fail, but some will succeed.” There are great advances thanks to available expertise. We may look forward to great strides in this field helping towards the survival of the Sumatran rhino.

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ABBREVIATIONS

AAZPA	American Association of Zoological Parks and Aquariums (later AZA)
Ad	Adult
AfRSG	African Rhino Specialist Group (IUCN/SSC)
ART	Artificial Reproductive Techniques
AsRSG	Asian Rhino Specialist Group (IUCN/SSC)
AZA	American Zoo Association
BBS	Bukit Barisan Selatan National Park, Sumatra, Indonesia
BORA	Borneo Rhino Association
CBSG	IUCN/SSC Captive Breeding Specialist Group
D.sumatrensis	<i>Dicerorhinus sumatrensis</i>
F	Female
GMPB	Global Management and Propagation Board
IRF	International Rhino Foundation (USA)
IUCN	International Union for the Conservation of Nature
M	Male
MNS	Malayan Nature Society
Mths	Months
NP	National Park
PHPA	Directorate General of Forest Protection and Nature Conservation, Indonesia
PHVA	Population and Habitat Viability Analysis
RBCS	Rhino Breeding Centre Sepilok, Sabah
Rhino	Rhinoceros
RRC	Rhino Resource Center, www.rhinoresourcecenter.com
SB	Studbook – as published by Foose (2006) and Oberwemmer (2014)
SDRCC	Sumatran Rhino Conservation Centre, Sungai Dusun, Selangor, Malaysia
SOS Rhino	Save Our Sumatran Rhino
SRS	Sumatran Rhino Sanctuary
SRT	Sumatran Rhino Trust
SRWCC	Rhino and Wildlife Conservation Committee of Sabah
SSC	Species Survival Commission (part of IUCN)
SSP	Species Survival Plan
TSI	Taman Safari Indonesia
UK	United Kingdom
USA	United States of America
YABI	Yayasan Badak Indonesia (Indonesian Rhino Foundation)
Yrs	Years

Dates are in YYYY-MM-DD format, for instance 1985-02-01 is 1 February 1985

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All references are available for consultation online or for download on the Rhino Resource Center (RRC). This resource is sponsored by the International Rhino Foundation (USA), SOS Rhino (USA) and Save the Rhino International (UK). It aims to provide reference to all publications on all species of rhinoceros issued anywhere and anytime. Through this service the RRC assists research and conservation of all rhino species worldwide. In October 2019 the RRC contained well over 23,000 references to literature as well as 4,500 images with captions.

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