

ON THE STATUS OF THE TIGER (Panthera tigris sumatrae Pocock, 1829)  
IN SUMATRA

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## Abstract

The Sumatran tiger (Panthera tigris sumatrae Pocock, 1829) is fully protected since 1972. It has a wide geographic distribution in Sumatra being found in all the eight provinces. Tigers are especially common in the northern and central regions but are rather scarce in the Sumatra Utara province. Being very adaptable, the animal survives in a number of ecosystems from sea level to over 2,000 m. Its main requirements are, vegetative cover, freshwater and a supply of prey populations. In Sumatra, tiger is found in almost all the major forest types. The sub-climax vegetation seems to provide the optimum habitat. Tiger preys on a variety of herbivores but its principal prey seems to be the wild pig (Sus scrofa) which is a serious agricultural pest. It is mainly nocturnal and solitary. Males and females maintain home ranges but those of two adult males are mutually exclusive. Home ranges of the adult males are much larger ( $60 \text{ km}^2$ ) than those of the females ( $16-17 \text{ km}^2$ ). The reproductive potential is very high. Gestation period ranges from 98-109 days. Litter size varies from 1-7. Maximum longevity is about 20 years. The number of tigers in Sumatra is estimated at 1,000 animals but actual number may be less than this figure. In prime habitats in Sumatra, tiger is known to exist at a density of 3.75 per  $100 \text{ km}^2$ . In mountainous areas, the densities are much less (1 per  $90 \text{ km}^2$ ). Tigers are known to cause considerable depredations on domestic cattle and at times are even known to have attacked and killed man. Man eaters are rare. Most killings of human beings are accidental. Tiger skins have a very high commercial value and hence poaching is a risky but lucrative business. Main conservation objective in Sumatra is to maintain viable populations of tiger in large reserves. 300 animals per reserve is the minimum number that is genetically viable. Except Berbak Game Reserve, few areas in Sumatra can actually meet the basic demands of a viable tiger reserve.

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## I.0 Introduction

The tiger is among the most magnificent yet vulnerable large mammals in Sumatra. Until 1972, the animal was not given any legal protection and was therefore systematically killed by both irate farmers as well as trophy hunters. Infact the famous Sumatran tiger hunter, Hofman is said to have killed over a hundred of these animals (Hoogerwerf, 1970). In the past it was numerous and was considered to be such a destructive pest to man and other animals that rewards were given by the East India Company for every animal that was killed (Marsden, 1811). Today despite its status as a fully protected animal, we find the tiger with its back against the wall in several areas in Sumatra. The major reasons for the decline in numbers of this once numerous and widespread predator in Sumatra are attrition of its habitats, depletion of stock of its prey populations and poaching.

The survival of tiger in Sumatra depends on man and his understanding of the socio-economic relations of the tiger with human beings. Human population growth has already led to the extinction of the Javan and Bali tigers in Indonesia and at the current rate of growth, more areas in Sumatra too would be absorbed for resettlement of people from over-crowded areas in Java. The island of Sumatra with its large size (47 million ha) is one of the target areas for the resettlement of thousands of transmigrants. The largest relative increase in human population in Sumatra was, according to Scholz (1983), in the province of Lampung (Fig. 1) where the number of people increased by 177% between 1961 and 1980, from 1.6 to 4.6 million due to transmigration alone. Twenty years ago, the forest cover of Lampung was estimated to be about 44%. Today however, the forest cover is no more than 17% in Lampung.

Despite the fact that the tiger has been so relentlessly hunted in the past, conspicuous gaps still exist in our knowledge concerning the number, distribution and general ecology of the animal in Sumatra. As Schaller (1967) points out, 'the natural history of the tiger has been studied along the sights of a rifle'. The study of any solitary, nocturnal, and potentially dangerous animal presents enormous logistical problems and of no species is this more true than the tiger (Sunquist and Sunquist, 1983). Furthermore, in the dense, tangled vegetation that's so characteristic of many areas in Sumatra, visibility is so limited that even the large mammals such as the elephant cannot be seen beyond a few meters, detailed information concerning the range and movement patterns could only be deduced through radio-telemetry studies. In the absence of such sophisticated techniques, much of our data concerning the tiger in Sumatra has been collected from the study of the tracks, scats and from interviews with Game Rangers and other knowledgeable authorities. Much recent information comes mainly from such studies carried out by Borner (1978) and Blouch (1984).

The tiger is exclusively an Asian animal that evolved more than a million years ago. It appears in the fossil record of the early Pleistocene. It was widespread in Asia until the late 19th century (Breedon, 1984) and did not spread beyond it. Tigers spread through China into South-east Asia, and from there to Sumatra, Java and Bali (McDougal, 1977). Of the eight subspecies or races of tiger, the Bali tiger (Panthera tigris balica), the Javan tiger (Panthera tigris sondaica) and the Caspian tiger (Panthera tigris virgata) are already extinct. The last known Caspian tiger was reported shot in 1959 (Vuosalo, 1976). The Chinese tiger (Panthera tigris amoyensis) is estimated to be about 30-40 (Breedon, 1984) and is therefore on the brink of extinction. According to Borner (1978) poaching and habitat

destruction seem to threaten the remaining four subspecies of tiger throughout their range. This is particularly more relevant to the Siberian tiger (Panthera tigris altaica) and the Sumatran tiger (Panthera tigris sumatrae) than to the Bengal tiger (Panthera tigris tigris) and the Indonchina tiger (Panthera tigris corbetti).

## 2.0 Description

The tiger is the largest existing member of the family Felidae (Schaller, 1967). The hind legs are longer than the fore legs as an adaptation for stalking the prey. All the big cats that belong to the genus Panthera are characterised by their ability to roar (McDougal, 1977). The Siberian tigers are the largest subspecies. In general the tigers that inhabit the northern ranges tend to be much larger and paler in colour than those that are found towards the southern parts (Crandall, 1964). The Sumatran tiger is the largest of the Indonesian subspecies. The males are considerably larger than the females. The total length of the male was found to be 252 cm while that of the female was 211 cm (Sody, 1949). According to Pieters (1949) the total length of adult tigers varies from 280 to 300 cm. One exceptionally large animal was 310 cm long of which 92 cm was accounted for by the tail. The animal weighed 185 kg (Hoogerwerf, 1970).

According to McDougal (1977), it is relatively easy to tell the track of a male from a female on the basis of the shape and size, that of the male being more square, less angular and relatively wider in relation to its length. Adult males have a much heavier fore paw than the females. The maximum width of the fore-foot print was found to be 20 cm but often the range was between 14 and 18 cm (Hoogerwerf, 1970). The maximum observed in Way Kambas Game Reserve in the province

of Lampung was 15.5 cm, presumably belonging to a medium-sized individual. The hind-foot print is usually smaller than the fore-foot print by about 2 cm. Individual tigers in the field are often recognized on the basis of the markings above the eyes. The stripes and squiggles on the tiger's cheeks and eyebrows are said to be as distinctive as the finger-prints of man (Breedon, 1984). However, in most of the habitats in Sumatra, where visibility is so limited, tigers have to be tracked from their pugmarks.

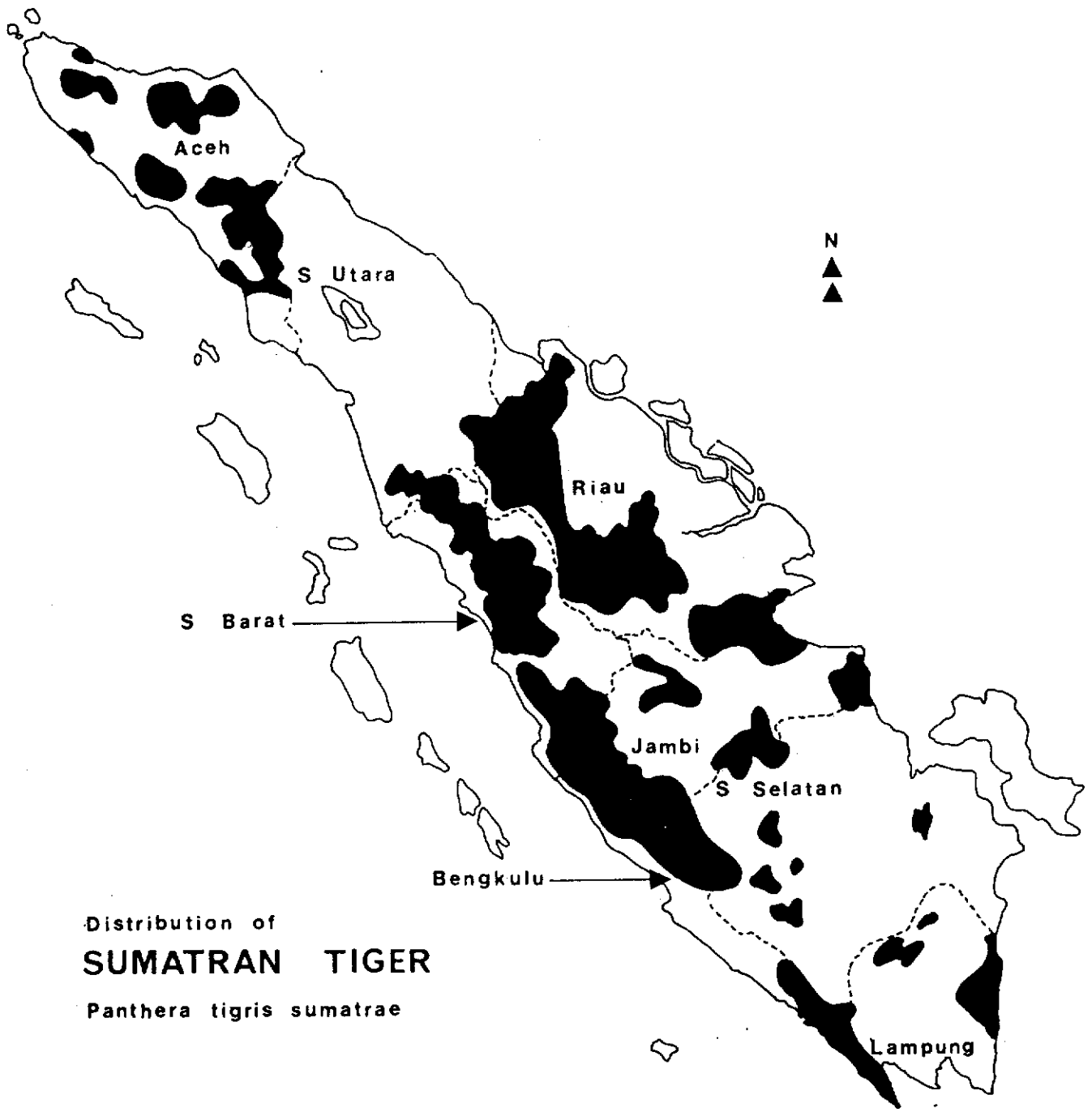
### 3.0 Distribution

Fig. I illustrates the distribution of the tiger in Sumatra. The apparent wide geographical distribution of the tiger reflects the animal's adaptability. The tiger is found in almost all the major forest types in Sumatra. However its numbers are invariably low in mountainous areas in contrast to the lowlands. Throughout its range, its survival depends on the availability of sufficient prey, freshwater and ample vegetative cover (Schaller, 1967). Borner (1978) found evidence of the tiger in all the eight provinces in Sumatra.

Tigers are still very common in the northernmost province of Aceh (55,392 km<sup>2</sup>) despite its largely mountainous terrain. About 50% of the area is still forested and timber export is an important aspect in the economy of the province. According to Blouch and Simbolon (1985) virtually all the remaining forests under an altitude of 1,500 m have already been given over for timber production and therefore in such areas, the continued survival of the tiger is a matter of debate. Tigers are known from areas west and east of Sigli about 45 km from the provincial capital, Banda Aceh. These areas are used as cattle grazing grounds and tiger depredations are often reported. Tigers are also especially common in the lowland forests

Fig. I    The distribution of the Sumatran tiger (Panthera tigris  
sumatrae Pocock, 1829)





Distribution of  
**SUMATRAN TIGER**  
*Panthera tigris sumatrae*

in West Aceh near the villages of Leuken and Calang. Tigers in these areas have often preyed upon cattle and at times even attacked and killed human beings. Tigers are also reported from the Gunung Leuser National Park but they seem to be more common in the lowland forests below an altitude of 300 m.

The adjoining province of Sumatra Utara (North Sumatra) is rather large (70,787 km<sup>2</sup>) and is inhabited by the Batak people. It is also one of the most densely populated provinces in Sumatra and therefore not surprisingly is not renowned for tigers. There are still some valuable forests along the northern and southern boundaries in which tigers are known to exist. According to Borner (1978) tigers were found in the Langkat Reserve in the north and in the lowland forests near Torgamba in the south. These lowland forests near Torgamba cover an area of about 200,000 ha and are situated near the provincial border of Riau. The most significant aspect of Sumatra Utara is the presence of the Lake Toba which resulted as a consequence of recent volcanic explosion. During its formation, the explosion deposited an enormous amount of volcanic ash as a result of which the tropical rainforests of Sumatra became separated into northern and southern blocks. There is therefore a kind of zoogeographical barrier separating the fauna of the north from that of the south. Many Sumatran species such as the Malayan Tapir (Tapirus indicus) and the Black-handed gibbon (Hylobates agilis) are found only to the south of Lake Toba.

The western province of Sumatra Barat (49,778 km<sup>2</sup>) is dominated by the Barisan mountain range which runs parallel to the coast. In this highly mountainous area, the number of tigers is low and almost all of them are to be found in the less populated parts in the north, west and south-west (Borner, 1978). In the past however, tigers were quite common in the vicinity of the provincial capital, Padang.

Tigers are especially numerous even today in the province of Riau (94,562 km<sup>2</sup>). The largest number of tigers were found in Riau by Borner (1978). It is typically a lowland area with extensive tracts of Dipterocarp and peat-swamp forests. As one of the major oil producing provinces, it has come under a tremendous developmental pressure during the recent past. Forests have been cleared to make way for laying the pipelines and for constructing road and thereby fragmented a number of what used to be formerly contiguous populations of tigers. It is also another province in Sumatra that is scheduled to receive large number of transmigrants for settlement from Java. According to Blouch and Simbolon (1985) about 58,555 families are expected to be translocated to this province from other overcrowded areas from 1984 to 1989. There is therefore a definite need for the creation of a reserve in Riau before it is too late. Otherwise, when all the scheduled plans regarding oil production, timber extraction and transmigration are completed, much of the province's tiger population would have become extinct.

The province of Jambi (44,924 km<sup>2</sup>) has a number of tiger populations scattered throughout, the most important of which is to be found in the eastern reserve of Berbak (190,000 ha). Berbak is the only example of Sumatran peat-swamp forest so far included in the reserves (de Wulf et al., 1982). Tigers are the most common large mammals in the reserve and are known to inhabit a variety of habitats such as freshwater swamp forests, riverine forests, mangroves, and also cultivated areas. They are however absent in peat swamp forests and dry beach forests (Silvius et al., 1984). Tigers are also known to prey on dogs in the neighbouring villages. The reserve has plentiful supply of the tiger's preferred prey species such as Wild pig (Sus scrofa) and Sambar (Cervus unicolor).

Tigers are also known from Bungo Tebo where tigers have been known to attack people in the rubber plantations. Farmers still shoot tigers but there was no trade on the skins. At least three tigers are known in the vicinity of Muara Bungo. Tigers are particularly common in forests areas just north of the Batang Hari river close to the Riau border. Tiger depredations were serious in and around the village of Tanjung, west of Teluk Kayu Putih. The whole area just north of Batang Hari river between Tanjung in the west and Pulautemiang in the east are being felled legally and therefore the tiger populations in this area would soon be extinct. An idea of how numerous the tiger was during the recent past can be inferred by the Tiger warning signs seen along the Sumatran Highway as one goes from Muara Bungo towards Solok (especially near the 241 and 249 km mark-posts). Tigers are also found in the Kerinci-Seblat National Park that lies in the Jambi province to the west. Tiger presence was noted at an altitude of 1,100 m in the Kerinci-Seblat National Park by Blouch (1984).

The large province of Sumatra Selatan (103,688 km<sup>2</sup>) is also densely populated and natural forests are restricted to the northern parts. However, tigers still exist in isolated populations (Fig. 1). Palembang is notorious for its illegal traffic in tiger skins and ivory. Borner (1978) records at least six taxidermists plying their trade in Palembang. Despite the loss of forests, tigers seem to cling on in grassland habitats. Tigers were generally thought to be absent in the Padang-Sugihan Reserve. However, recent surveys carried out by Nash and Nash (1985) confirm the presence of tiger. They report seeing clear pugmarks of one individual along open mixed peat swamp forest in the vicinity of canal 5. Another pugmark of a smaller individual was also observed on canal 6.

Tigers are common in the northern part of the province of Bengkulu (21,168 km<sup>2</sup>) and seem to thrive well in the lowland areas in between the coast and the Barisan mountain chain (Santiapillai and Suprahman, 1984 ). Tiger depredations have been especially numerous in the vicinity of villages such as Muko-Muko, Ipuh, Ketahun, Muara Aman and Kota Donok. Evidence of tiger was found inside the secondary forests in Talangaragh (Santiapillai and Suprahman, 1985 ). Further north, tigers are known from villages such as Lubuk Pinang, Lalang Luas and Talang Petai. In the extensive Kerinci-Seblat National Park of which 21% lies in the Bengkulu province, tigers seem to have established a stronghold. Tigers are well known by the villagers in the vicinity of the Park whose cattle, goats and dogs have been occasionally preyed upon the tiger which is known even to enter the houses! (de Wulf et al., 1981).

The two principal areas where tigers exist in the southern province of Lampung (33,307 km<sup>2</sup>) are the Barisan Selatan National Park and the Way Kambas Game Reserve. The former lies along the southwest coast of Sumatra. Among the carnivores, the most common one is the tiger which is known to kill not only goats and dogs but human beings as well (de Wulf et al., 1981). Way Kambas Game Reserve provides a variety of habitats in which the tiger seems to survive today. At least 17 individual tiger foot-prints were measured from the Reserve. Most of the tigers seem to prefer the riverine vegetation in the vicinity of the alang-alang (Imperata cylindrica) grasslands. According to the guards, at least five people were attacked by tigers in Wako between 1970 and 1984. Elsewhere in Lampung, the long term survival of tiger is doubtful since the forest cover is disappearing fast. Game Reserves too can only accommodate a certain number and no more.

#### 4.0 Habitat and Ecology

The tiger being a highly adaptable animal survives in a variety of habitats in Sumatra. It is known to occur from sea level up to an altitude of 2,000 m (Borner, 1978). Its survival depends on the availability of vegetative cover, water and prey supply but the animal is equally intolerant of heat and unlike many cats, is quite fond of water (Fig. 2). According to McDougal (1977) the animal's intolerance to the sun and heat points to its northern origin.

In the Way Kambas Game Reserve the tiger is known to inhabit the riverine forests, grasslands, freshwater (non-peat) swamp forests, and even the mangrove forests. It has even been reported from rubber plantations in Aceh, Jambi and Bengkulu provinces. In the Berbak reserve, the tiger is known to utilize the riverine forests, freshwater swamp forests, mangroves and cultivated areas and is not known to occur in the peat swamp forests and dry beach forests (Silvius et al., 1984). Since ground living herbivores such as the wild pig (Sus scrofa) and sambar (Cervus unicolor) are found in usually low numbers in the primary forests, the tiger too is rare in contrast to secondary forests. Selective timber felling promotes the build up of such prey populations and is therefore enhances the tiger's chances of survival. Abandoned cultivated areas (shifting cultivation) are soon invaded by alang-alang grassland which provide ample cover necessary for tiger. Suitable cover is necessary for such a solitary, nocturnal carnivore since the majority of the kills are found in areas with dense vegetation (Sunquist, 1981). The optimum habitat for the tiger is provided by the subclimax habitats. Reproductive success of the tigers has been shown to be very high in such successional habitats (Smith, 1978; Sunquist, 1981; Tamang, 1983).

#### 4.I Prey and predation

From the published literature it appears that the tiger is rather catholic in its food habits which enables the animal to prey off a wide range of herbivores and other food resources. However, the two most commonly preferred prey species are the wild pig and the sambar. Remains of these animals are often seen in scats (hairs are not digested by the tiger and therefore can be identified in the scats). At times even small mammals such as the pig-tailed macaque (Macaca nemestrina), long-tailed macaque (Macaca fascicularis), and the leaf monkey (Presbytis sp.) are known to be eaten by tiger (Borner, 1978). According to Seidensticker and Suyono (1980) the diet of the Javan tiger included porcupines, macaques, a bird and a palm civet. Earth was found in the 50% of the scats analysed by Schaller (1967) however this was not the case in either the Javan or the Sumatran tigers (Hoogerwerf, 1970; Borner, 1978). In Sumatra it is known that during the durian season tigers invariably enter the villages attracted by the smell of the ripe fruits that fall to the ground! All mammalian carnivores are primarily predators but most of them could easily scavenge (Houston, 1979). The Sumatran tiger is also known to practice cannibalism (Muller, 1941; Hoogerwerf, 1970). Most predators tend to take prey within their own size range (Eltringham, 1979) and the observed wide spectrum of prey species in the diet of tiger would ensure that the animal does not succumb to changes in the make up of its prey communities. The tiger stalks its prey in the night and tends to remain in the same locality for an extended period of time. Within its territory, it has well defined paths along which it searches for its prey. Tigers readily use roads and paths in the forests to move from one area to another. Most of the foot-prints in the Way Kambas Game Reserve were observed along old logging roads.

scrapes (and faeces too) are supposed to be used in communication by the tigers (Schaller, 1967). These scrapes on the ground are usually made parallel to the direction of travel (McDougal, 1977) and at the intersections of the trails (Sunquist, 1981). Scratching marks were observed on the ground as well as on the trees in Way Kambas Game Reserve. The scrapes along the trails measured about 50-70 cm in length and about 25 cm in breadth. Scratchings on the trees may also serve to signpost (McDonald, 1984).

#### 4.2 Home range

Both males and females are known to maintain home ranges but those of two adult males are mutually exclusive. The home range of a male tiger may overlap with those of the females. Territories are maintained by a combination of visual, vocal and complex systems of scent markings (Sunquist and Sunquist, 1983). Scent markings are done by both males and females unlike in the lions where only the males do. In Nepal, Sunquist's (1981) study of the tigers using radio-telemetry indicates that the home ranges of the females are about 16 - 17 km<sup>2</sup> while those of the resident males are much larger, about 60 km<sup>2</sup>. The home ranges of the males are determined not entirely by the availability of prey but also by the dispersion of the females with whom they could mate. In many of the habitats in Sumatra where the prey density is not as high as in the more open habitats in India or Nepal, the home ranges of the tigers are much larger. The appropriation of home ranges means that any given locality could have only a certain number of adult tigers and no more. New tigers become residents only when vacant slots arise due to death of older individuals (McDougal, 1977). The excess individuals function as a floating population.



#### 4.3 Reproduction

Tigers in general have a high reproductive potential and in prime habitats have high reproductive rates. If a cub is lost accidentally, a free living tigress is potentially able to have a new litter within about five months (Schaller, 1967). Mating usually takes place between resident individuals therefore, as McDougal (1977) points out, the tigers are not monogamous but neither are they completely promiscuous. Like the domestic cats, tigresses do not ovulate spontaneously. Ovulation is induced by copulation (Asdell, 1946). To trigger ovulation a minimum number of copulations are needed (Kleiman, 1974). Copulations are noisy affairs and may go on for a few days. According to McDougal (1977) a pair of tigers in captivity is reported to have copulated 106 times in four days! The female comes into heat once in 50 days and remains in oestrus for about 5 days. (Lekagul and McNeely, 1977). The gestation period may vary from 98 to 109 days (Crandall, 1864; Ecstein and Zuckerman, 1956; Schaller, 1967). The average gestation period is considered to be 103 days (McDonald, 1984). The litter size can vary from 1 to 7 (Fig. 3). In Sumatra, Hoogerwerf (1970) records one litter of 2 and four litters of 3 found as embryos in the tigresses that were killed but goes on to add that litters of 6 and even 7 are also known from Continental Asia. Cubs usually remain in the lair for about 4 - 8 weeks and are fully weaned by the time they are about 6 months old (Schaller, 1967). Young individuals up to the age of about 2 years may still accompany their mothers. Tigers reach sexual maturity by the time they are five years old. The maximum longevity of the tigers in captivity is supposed to be about 20 years (Schaller, 1967; McDonald, 1984) but it is doubtful if they would live so long in the wilds.

Fig. 2 An adult male Sumatran tiger cooling off in the pool.

(Photo: by courtesy of Alain Compost)

Fig. 3 Sumatran tiger cubs

(Photo: by courtesy of Alain Compost)



## 5.0 Number and density of tigers in Sumatra

Borner (1978) as a result of his island-wide survey of the tiger estimated the total population in Sumatra at about 1000 animals. Borner was very familiar with the Sumatran wildlife and therefore his estimate could be considered realistic for that period. However in such dense habitats where tiger exists in Sumatra, it is almost impossible for anyone to obtain a reliable picture of the number and distribution. Nevertheless, until a more thorough and detailed study is carried out, Borner's estimate continues to form the basis of the conservation efforts in Sumatra.

While it is impossible to arrive at reliable estimate of the number of tiger in Sumatra, it is still possible, on a smaller scale, to determine the ecological density of the animals from a number of habitats through intensive studies. Thus, in areas of prime habitats in Nepal, adult tiger densities of 6 - 7 per 100 km<sup>2</sup> have been recorded, whereas outside such areas densities are much less, about 1 - 2 per 100 km<sup>2</sup> (McDougal, 1977; Smith, 1978; Sunquist, 1981). In the secondary forests (lowland) at Talangarah near the village of Ipuh in the province of Bengkulu, we find that the adult tiger density could be about 3.75 per 100 km<sup>2</sup>. This density is characteristic of the tigers living in lowland forests where the prey densities are high. Talangarah has viable populations of wild pigs and other cervids that form a suitable prey base for the tigers. In the lowland forests of Riau, Blouch (pers. comm.) recorded the pugmarks of five separate tigers (3 adults and two cubs) along a distance of 9 km. In the more mountainous habitats in the Gunung Leuser National Park, tiger exists at a much lower density of about 1 per 90 km<sup>2</sup> (Borner, 1978).

Since Borner carried out his survey, ten years have elapsed and during that time much of the forested areas in Sumatra where tiger lives has been drastically altered by man. Therefore whilst it is impossible to be certain about the total number of tigers remaining in Sumatra, it is clear that the animal can now be measured in 'hundreds' whereas in the past, it would have been estimated in 'thousands'.

#### 6.0 Depredations

Being such an opportunistic feeder, the tiger often supplements its diet with domestic cattle, goats and even dogs. In Sumatra, it is also known to attack and kill man. Such depredations escalate while the animal's preferred habitat gets reduced. As Caufield (1984) points out, 'the wild animals, including elephants and tigers, have lost so much of their range that they have been forced to prey upon the communities that have displaced them'. Domestic cattle are no substitute for the tiger's natural prey without which the animal will not survive long in an area. Tiger depredations in Sumatra are numerous to catalogue here but it is suffice to say that much of the depredations have been reported from provinces such as Aceh, Bengkulu, Jambi and Riau where man's activities such as shifting cultivation, mining, oil extraction, logging, transmigration and large-scale agricultural plantation are causing the rapid conversion of forests into areas inhospitable to the wildlife in general and the tiger in particular. In northern Bengkulu tigers are so common that the motorcade taking the provincial Governor had to stop in broad daylight along the road to make way for a tiger! The motorcade was again forced to stop later in the evening when they came across a 2-meter snake snoozing in the middle of the road (Antara 1985).

## 6.I Man-eaters and man-killers

Man eaters are defined as those that deliberately kill human beings as a source of food. In general, tigers are rather shy of man and on his approach would retreat into the forest. According to McDougal (1977), 'it is a much less dangerous beast to meet by surprise at close quarters than, say, a bear'. Man eaters are abnormal animals and are fortunately rare in any given population. They are usually known to operate in areas of sub-optimal habitat where their natural prey is scarce (McDougal, 1977).

Tigers are known to attack and kill man in Sumatra. However it is still not known whether the reported incidents were caused by man-eaters or through accidental killing. According to Borner (1978) villagers in 1972 claimed that a tiger killed 30 people in a rubber plantation near Batu Radja in South Sumatra. More recently however, tiger has been implicated in a number of depredations including the deaths of some people in the province of Aceh. Most of the reported incidents took place in the Kluet subdistrict in southern Aceh. In November 1984, an old man was found missing from his village. A few days later his body was found torn to pieces and his death was attributed to a tiger. In the same village a man was devoured by a tiger in December 1984. Villagers in the Southern Aceh province killed a tiger after it had devoured a man and dozens of cows, goats and sheep (Antara, 1984). A hungry tigress was caught in the village of Leuken in West Aceh in April 1985 by animal charmer after it had killed a teenager and dozens of cattle. In Aceh, the traditional tiger tamers (pawangs) were said to have succeeded in trapping 64 live tigers during the last few months!

It is obvious that the tiger has been responsible for the loss of a number of cattle and human beings. But what is not so clear is whether all the reported deaths of human beings were the results of mere accidental killing by tigers or by man-eaters. It is however necessary to distinguish between man-eating and man-killing. According to the guidelines put forward by the Project Tiger (India), instances where human beings are attacked accidentally by tigers, the animals responsible for these deaths should be regarded as man-killers and not as true man-eaters. 'Only when a tiger begins to seek out, stalk and wait for human beings and has after killing a person, eaten the dead body, it is established beyond doubt that animal has turned into a man-eater'. According to the Project Tiger (India) Guidelines, accidental killing of human beings by tiger occur when:-

- i. a man approaches an area where a tigress is sheltering her cubs
- ii. someone approaches a sleeping animal accidentally
- iii. someone assumes a bent-in posture which is mistaken by the tiger for an animal and attacks.

The last point is interesting since the three confirmed killings of human beings by tigers in Sumatra (Borner, 1978) none of the victims was in an upright position. The victims were either sleeping, working in a squatting position or uninating in a squatting position. The only known attack on man by tiger in the Way Kambas Game Reserve took place while the man was relieving himself (Santiapillai and Suprahman, 1985 ). On their part, the villagers who live in the immediate vicinity of tiger reserves could minimise the danger to themselves and their livestock by following a few simple safety precautions:-

According to Schaller (1967) building high stockades around the houses is one of the ways of providing extra protection against the tigers. Infact in many houses in Talangarah in the province of Bengkulu such stockades are common. If these precautions are extended to cover the cattle sheds too, then much of the tiger depredations on cattle during the nights could be reduced. In Nepal, people still use lines of fires as a means of protecting themselves against the tiger (McDougal, 1977). According to Seidensticker and Hai (1983) even small open fields are known to be avoided by tiger, in which case the establishment of broad open areas inbetween the forest reserve and the villages would further reduce the tiger depredations. Seidensticker and Hai (1983) quote D.Smith as saying that 'an expanse of open land of any size is an impenetrable barrier' to the tigers.

Confirmed man-eaters have to be dealt with appropriately. There are two ways of dealing with problem tigers:-

- removal to another reserve, or
- removal to a Zoo.

Unless there is evidence that a particular animal is a man-eater, we recommend against the shooting for fear that such a management option could lead to a lot of misuse. It is a small step from shooting one animal supposed to be a man-eater to wiping out the entire population on one pretext or another. The two other alternatives need to be considered with caution. The capture and translocation of a large carnivore such as the tiger is a specialised operation that require trained and well experienced personnel. As McDougal (1977) points out, even a small error in dosage can kill the animal during the opeartion. Before capture is attempted, a suitable release site ought to be earmarked. As Seidensticker et al., (1976) argue, suitable release site with adequate natural prey populations must be identified before the



animal can be released. It is also equally futile to contemplate the release of a problem tiger into a reserve that is known to have the full complement of residents. Resident tigers usually establish territories and thus parcel out the given area among themselves and those without such territories remain as a floating population from which replacements could take place. Therefore, any introduction of tigers into such reserves would result in either their expulsion or death.

#### 7.0 Conservation of tigers in Sumatra

The tiger is fully protected by a Governmental Decree since 1972 (van der Zon, 1979). The Sumatran tiger is also listed in Appendix I of the 1973 Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES). Despite this umbrella of legal protection, the tiger's future seems to be grim but not entirely hopeless in Sumatra. The main threats to its survival are the indiscriminate clearance of forests especially in the lowland areas, poaching, and poisoning. Logged forests need not be anathema to tigers. Selective timber cutting does not destroy the tiger's habitat (Borner, 1978). By enhancing the build up of suitable prey populations such as wild pigs, sambar, muntjaks etc, logging need not come into conflict with tigers. However oftentimes, the opening up of forests during logging by the creation of roads, provides access to hitherto inaccessible areas from where poaching could be carried out. Ten years ago the average price of a tiger skin was estimated at US \$,1000. Today, it is worth over US \$ 3000. When one considers that a local villager earns not much more than US \$ 30.00 a month, it is easy to understand why trade in tiger skins is very lucrative.

The massive use of pesticides in agriculture poses yet another threat to the tiger. These toxins are at times used to kill tigers that cause depredations. In Nepal, the widespread use of such toxins led to the reduction in tiger numbers (McDougal, 1977). However, attitudes are slowly changing and farmers are now beginning to look at the beneficial aspect of the tiger as an efficient predator that holds the number of wild pigs in check in and around agricultural areas. Wild pig is considered to be a serious agricultural pest in Sumatra, second perhaps only to the elephant in its scale of damage and depredations.

The main conservation objective in Sumatra is to maintain viable populations of tiger in large reserves. Tiger is a range sensitive species (Seidensticker and Hai, 1983) and is particularly susceptible to changes in habitat quality. In Sumatra Gunung Leuser National Park, Kerinci-Seblat National Park, Barisan Selatan Game Reserve, Berbak Game Reserve and Way Kambas Game Reserve have known populations of tiger. These are large areas in Sumatra. However, size alone is not sufficient. The survival of the tiger depends on the availability of adequate prey populations. Ungulates thrive in early successional vegetation and these same successional habitats therefore provide suitable environments for the tiger as well. Without manipulation of the habitats, many reserves in the long term would not be ideal for the tigers since habitat conditions would slowly change towards the less productive climax condition.

Another consideration is the population size: Small populations are prone to inbreeding which can later affect the performance of the individuals adversely. (inbreeding depression). A minimum of 50 breeding pairs is needed to circumvent this inbreeding depression (Franklin, 1980).

But the IUCN Survival Service Commission (as quoted by McDougal, 1977) states that a contiguous population of at least 300 individuals is necessary to maintain a gene-pool of sufficient variety. Few areas can actually meet the basic demands of a viable tiger reserve. Large National Parks in Sumatra such as the Gunung Leuser ( $8,025 \text{ km}^2$ ) and Kerinci-Seblat ( $14,846 \text{ km}^2$ ) are highly mountainous and therefore may not harbour high densities of tigers. In practice, smaller reserves (less than  $1,000 \text{ km}^2$ ) are also unlikely to maintain the recommended breeding density over a long period. Of all the reserves in Sumatra, it is perhaps the Berbak Game Reserve ( $1,900 \text{ km}^2$ ) situated in the south-eastern part of Jambi province, which offers the long term survival possibilities for the tiger. But even here effective protection of the reserve is essential to save the tiger. Already the Bali and Javan tigers have become extinct in Indonesia (Jackson, 1983). With proper conservation measures, it would still be possible to save the Sumatran tiger before it is too late. Otherwise, it too like the Cheshire Cat would disappear from the face of the earth, leaving as Tinker (1974) puts it, 'just the ghost of a grin behind'!

8.0 References

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