COLOUR VARIATIONS IN TIGER (*Panthera tigris tigris*)

B. C. Prusty* and L. A. K. Singh**

Introduction

Of late, tiger's *(Panthera tigris tigris)* coat pattern is considered to be of high academic significance because the pattern is phylogenetically closer to that of the clouded leopard *(Neofelis nebulosa)* and not the leopard *(Panthera pardus)*. Therefore, Ewer (1973: 88) mentioned the stripes of tiger an anomaly for the genus *Panthera*, and Leyhausen *et al* (1990: G-10), using other additional structural evidences, took a bold step in removing tiger from the genera *Panthera* and placing it as *Neofelis tigris*.

Records and reports indicate about the natural existence of a range of complete white to complete black tigers through intermediary shades of normal-coloured tigers which are most abundant and normally seen in the wild and in captivity.

In the present paper we have discussed about the occurrence of colour variations in tigers using data collected from available literature and from Similipal Tiger Reserve.

Tiger without stripes

A tiger's coat displays a combination of three colours - white, tawny and black. "A wholly white tiger, with the stripe-pattern visible only under reflected light, like the pattern of a white tabby cat, was exhibited in the Exeter Change Menagerie in the early part of the nineteenth century and described by Hamilton-Smith" (Pocock. 1939: p 202). Sagar and Singh (1989) reported of a "tiger without stripes" from Similipal Tiger Reserve, Orissa, and cited similar information from another location of Similipal and one from Chitrakonda of Koraput in Orissa (India).

White tigers

The "white tigers", which caught the media during 1980s after their birth in Nandankanan Biological Park, Orissa to normal parents, are actually white with visible stripes. the "white tigers" were also recorded from the wild during the Mughal Period in 1556 to 1605 AD (Divyabhanusinh, 1986). In such "white tigers" the stripes are dark brown or reddish-black, and stand out against the white ground-colour.

Plate: 1 - Side view of the Melanistic tiger from Similipal (July 1993).

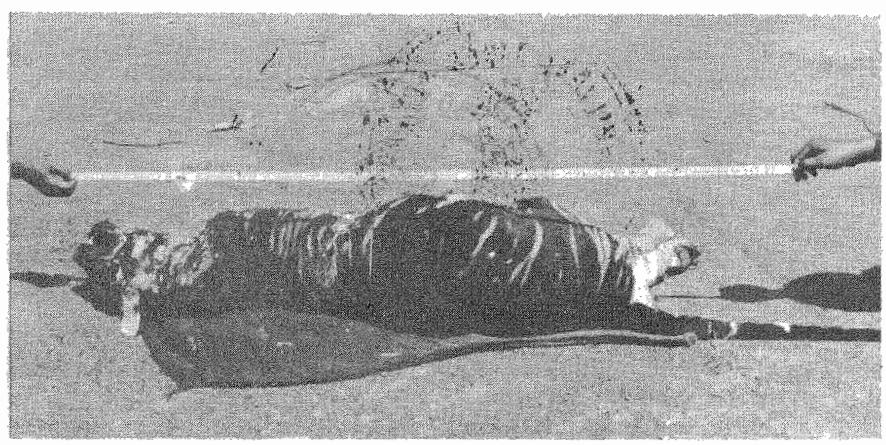

Plate: 2 - Dorsal view of the tiger in Plate-1.

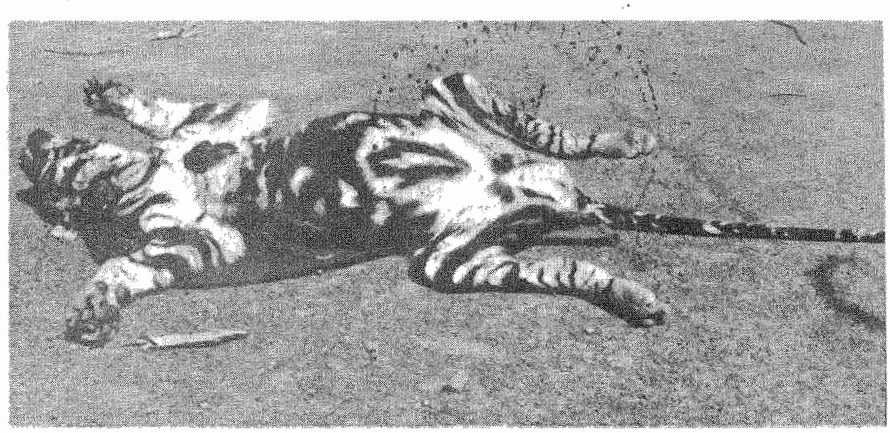

Plate: 3 - Ventral view of the tiger in Plate-1

*Field Director , **Research Officer, Similipal Tiger Reserve, Baripada, Orissa

There were as many as 17 instances of white tigers recorded in India between 1907 and 1933 (Gee. 1954), and contrary to many contentions such form did occur in more than one place in the wild in Orissa, Bilaspur, Sohagpur and Rewa (Pocock, 1939).

Normal Coloured tigers

The normal "tawny base" of the coat of the species is also known to show variation in deepness. Some tigers are light-orange-red while others are deep. Such variations are often attributed to geographical regions, the forest-habitat, and perhaps the season, as well. Nonetheless, this is the normal body colour of the tiger.

Melanistic tiger

The skin of a melanistic tiger was recovered from smugglers in October 1992 at Tis Hazari. The skin measured eight and a half foot (259 cm) and was displayed at the National Museum of Natural History, New Delhi in February 1993 (Kumar, 1993). The source of the skin is not known.

Melanistic tigers of Similipal

Similipal Tiger Reserve is situated in the district of Mayurbhanj, Orissa, India. It lies between 86°-5' and 86°-37' east latitude and between 21°-30' and 22°-8' north latitude. Beginning from 1975-76 there have been a number of sightings of black tigers in Similipal Tiger Reserve.

Observation: 1993

On dt. 21.7.93 around 10 am a young melanistic tigress was killed by a boy in self-defence with arrows. It occured in village Podagad in the Bhandan river valley. In the west of Similipal Tiger Reserve. The major peculiarity in the body colouration was that on a black background the stripes were tawny on the back and white ventrally. The animal was photographed and video-filed (Prusty and Singh, in press) (Plates 1-4).

Observations: 1996

On dt. 01.03.96 Forester Sri B. C. Nayak of Devasthali saw a fullgrown black tiger near Baladaghar at 1700 hrs. The stripes were distinctly yellow.

Again, at about 0800 hrs on dt. 03.04.96 a "black tiger" was sighted by Sri B. C. Nayak near Bachhurichara, a place between Patabil and Devasthali.

Plate: 4 - Head region of the tiger in Plate-1.

On dt. 12.4.96 Sri Lugu Majhi, Forest Guard sighted a full grown black tiger with yellow stripes at 1545 hrs between Patabil and Devasthali.

Black tigers

Buckland (1889) has mentioned about the sighting of a dead black tiger in March 1846 near Tripparah, about two miles from Chittagong (now in Bangladesh). Hauxwell (1913) had shot at (but not recovered) a "black tiger" whose pugmarks were about 1'8" round (50 cm. circumference).

Benjie (1983) has mentioned about the occurence of black tigers in Dongning areas of China. The occurence of black tiger in China were further known to Benjie from sightings in 1951, 1953, 1957 and a capture in 1972.

Black tigers of Similipal

(1) Sri K. C. Patl. Orissa Forest Service, then Range Officer in Upper Barha Kamuda Range, while accompanying the accomplished Asst. Field Director Sri B. N. Nayak, IFS and two overseas tourists had seen two full grown black tigers on the road leading to Matughar meadow at about 1100 hrs on a bright weather in winter, 1975-76.

(2) Sri Niranjan Mohanta (now late), Forest Guard at Devasthali in Upper Barha Kamuda Range had seen a "family group" of four tigers consisting of two full grown adults and two cubs. To Niranjan one of the cubs had appeared black when he saw the group at about 1700 hrs on dt. 16.8.91.

Although Niranjan had narrated his observation at that time the possibility of a black tiger-cub was totally dismissed on the probability of a mistaken identity due to bad light conditions.

Discussion

Except for the totally "black tiger" either the skins, photographs or video films exist for other pelagic forms. The black tigers are known only from reports and is not substantiated by specimens or photographs. A skin, once said to be of a black tiger and displayed at the Los Angeles County Museum, USA, was later opined to be a black leopard (Kumar, 1993). However, as Pocock (1939) stated "there is no known reason why tigers should not be black, like leopards and jaguars". For Similipal itself black tigers have been reported on several occasions by field staff but we tend to ignore certain information stating them as imaginations.

The "wholly white" tigers and "white tigers" are at one of the extremes of coat-colour expression, whereas, the fully black and the melanistic tigers are at the other extreme.

Based on information cited above a hypothetical model of normal distribution curve is construed (Fig 1) where five conditions of colour expressions are recognised. These are: (1) white tiger with no or extremely faint patterns/ (2) white body with dark brown or reddish black patterns. (3) various shades of tawny base with black patterns. (4) black coat with yellow or white patterns, and (5) the black tigers.

A continuous distribution of colour pattern from "wholly white" to "white" to shades of "tawny base" to "melanistic" and "wholly black" tigers appear to be the result of multiple gene inheritance where the whites and black are rare, perhaps due to the epistatic effect (Singleton 1962: 158-159: Stebbins, 1970: 41-42) of the genes responsible for a "tawny" background over those responsible for white or black.

The present paper, therefore, tends to suggest that black coloration in tiger is not a result of mutants of black genes as opinpural by Peter Jackson (Kumar 1993) but the genes for such expressions are normally there in the gene pool of the species in recessive state. Similar may be the case for white panther (Divyavanusinh, 1993) and black panther (Pocock, 1939) over the distribution of normal coats of *Panthera pardus*.

It is realised that the colour expression of tiger and leopard is based upon a more complex pattern of genetic epistasis and other phenomena which merit a fuller treatment by expert geneticists. Besides, modern techniques of DNA-mapping may help in solving situations where there are confusions about species identification of preserved skins.

From an evolutionary point of view the normal coat colour of tiger must have evolved in concurrence of tiger's behavioural need and habitat features. Over years of natural selection the tawny background has remained as the normal pattern while the whites or blacks are unwanted expressions which natural selection does not favour. Therefore, elimination of such unwanted characters, from the population, whenever these appear should be viewed as the natural order for the organization of favourable genetic variability with adaptive values to the population. The parents themselves may be acting as the agents in such eliminations. One mode to accomplish this may be early separation of the abnormal young by the mother. Clearly, the subject warrants further studies.

Summary

It is suggested that white or black tigers are not mutants but are in a hypostatic state in the natural gene pool of the species. *Panthera tigris*, evidences have enabled to structure within the population gene pool of *Panthera tigris* a continous distribution curve of coat colours from the rare "wholly white" to "white" then through predominantly occuring shades of normal "tawny" to the rare "melanistic" to "wholly black". It is suspected that unusual colour patterns cause natural disadvantage to the bearer of such a coat which hastens their removal from the population.

References

Banjie, T. 1983. Tigers in China. *Tiger Paper* 10(4): 27-29

Buckland, C. J. 1889. A black tiger. *J. Bombay nat. Hist. Soc.* 4: 149

Divyabhanusinh 1986. The earliest record of a white tiger (*Panthera tigris*). *J. Bombay nat. Hist. Soc.* 83 (Supplement): 163-165.

Divyabhanusinh 1993. On mutant leopards. *Panthera pardus* form India. *J. Bombay nat. Hist. Soc.* 90(1): 88-89

Ewer, R. 1973. *The Carnivores.* Weidenfeld and Nicolson, London.

Gee, E. P. 1954. Albinism and partial albinism in Tigers. *J. Bombay nat. Hist. Soc.* 56: 581-587

Hauxwell, T. A. 1913. Possible occurence of a black tiger. *J. Bombay nat. Hist. Soc.* 22(4): 88-89

Kumar, Shailendra 1993. From legends to poacher's bullet. *The Statesman*, Calcutta, February 23, 1993: 16

Leyhausen, P., Gnzimek, B. and Zhiwotschenko, V. 1990. Panther-like cats and their relatives. In *Grzimek's Encyclopedia of Mammals.* Vol.4 Mc Graw-Hill Publishing Company, New York etc.

Pocock, R. I. 1939. *The Fauna of British India including Ceylon and Burma, Mammalia. Vol.I (Primates and Carnivores).* Taylor and Francis, London

Prusty, B. C. and Singh, L. A. K. Melanistic tiger (*Panthera tigris tigris*) from Similipal Tiger Reserve, Orissa. *Tiger Paper* in press.

Sagar, S. R. and Singh, L. A. K 1989. Tiger without Stripes. *Indian Forester.* 115(4): 277-278

Singleton, W. R. 1962. *Elementary Genetics.* D. Van Nostrand Company, Inc. London etc. Affiliated East-West Press Pvt. Ltd., New Delhi.

Stebbins, G. I. 1970. *Processes of Organic evolution.* Prentice Hall of India Pvt Ltd., New Delhi.

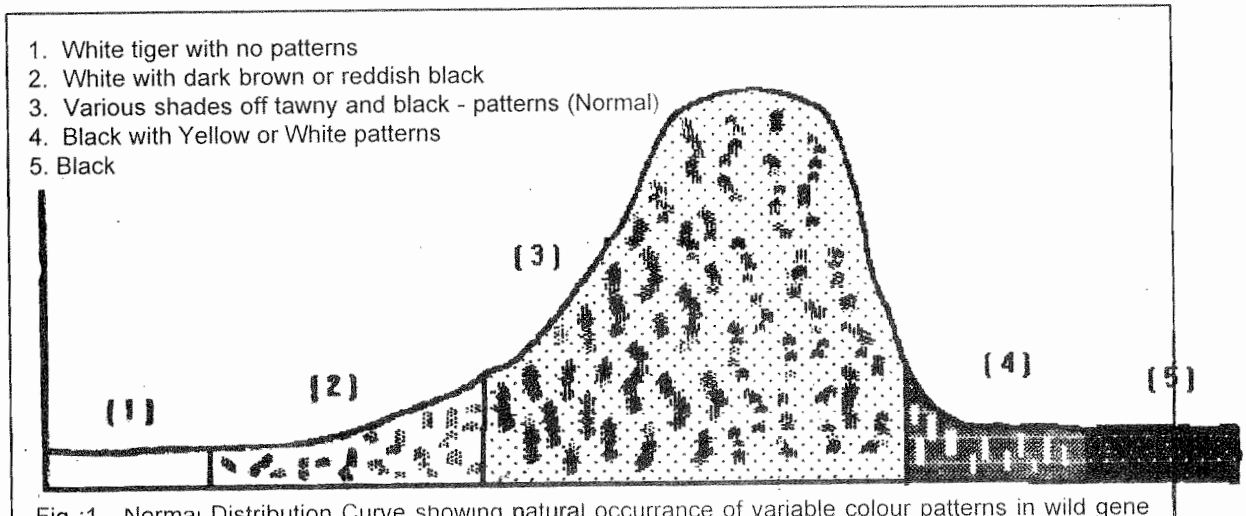

Fig :1. Normal Distribution Curve showing natural occurrance of variable colour patterns in wild gene pool of *Panthera tigris*. (Hypothetical Model).