

## MISCELLANEOUS NOTES

### 1. ON THE SCALES OF THE SCALY ANTEATER *MANIS CRASSICAUDATA*

(With three text-figures)

The present study is mainly based on specimens examined during routine field work on the Indian pangolin *Manis crassicaudata* to study its ecological aspects. The scales are composed of agglutinated hairs (Jerdon 1874). They are, in fact, enormously enlarged and flattened hairs or spines of the body (Roy 1949, Prater 1971). The scales are not "glued hairs" as was once believed, but are two sided symmetrical elevations of the epidermis. The horny scales which are lost through wear are constantly replaced by growth from the epidermis.

Externally, the pangolin appears hairless, as scales are present all over the upper part of its body except on the snout, chin, sides of the face, throat, belly and inner surface of limbs. Variation has been noticed in the shape, texture, colour, number, size and weight of the scales.

Interestingly, as a protective measure, the animal curls itself into a ball whenever in danger. This rolling posture provides a more rigid and sharp cutting edge because of the imbricate arrangement of the scales, that creates a gap between rows of scales and presents a shape like the spokes of a wheel (Fig. 1b).

I noticed that the pangolin is highly sensitive and can even feel a little touch on the hard scales by hand or any other object. It immediately tightens all the scales side by side to make a compact ball. In the coiled state, its head remains safe inside the innermost whorl.

Histologically, epidermal cornification at the tips of the dermal papillae leads to the formation of hard scales (Rahm and Thenius, 1988). I observed that the scales on the dorsal side of the pangolin's body are more or less triangular, with a broad base and narrow apex, while some are blunt on both sides and comparatively smaller in size. Scales are usually dorso-ventrally flattened, but a few scales

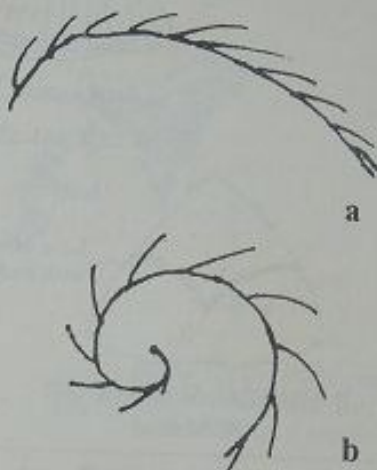


Fig. 1: Scale arrangement on body surface: a. in normal posture; b. in rolling posture

(Fig. 2c) appear pyramidal along the tail line. Fine striations are visible dorsally at the lower or proximal half of the scale which remains attached to the body, but the distal end that projects outwards presents a smooth upper surface (Fig. 2a). A line marking the attachment site for body muscles can be identified easily on the ventral surface of the scale, (Fig. 2b) which is pale coloured.

The present study carried out in different ecological conditions showed that the pangolin, being a nocturnal creature, generally comes out and remains active at night, but has also been seen in the daytime on several occasions, when a cryptic body colouration can save it from predatory and human interference. Its body hairs are hardly visible externally (except in the lower part of the body). So the colour of the scales plays a significant role.

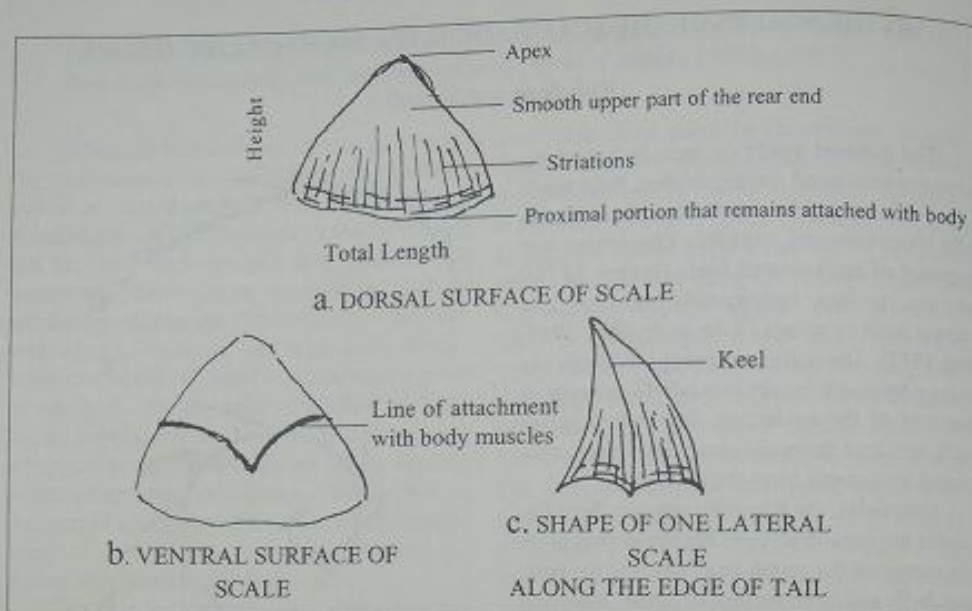


Fig. 2: Diagram of scales showing different views

Pangolins of Asian and African origin are generally found in shades of grey, dark brown, olive brown, pale olive, khaki, yellow brown and yellowish (Kingdon 1971, Roberts 1977, Rahm and Thenius 1988, Bing Su, *et al.* 1994). During this study, scales were found to be grey and olive brown, whereas in captivity they looked pale.\*

Size and weight of the scales was estimated from isolated scales of full grown or adult animals recovered from various sources. I found that the size of the scale\*\* may vary from 6.5 cm - 7 cm (height) and its average breadth is 8.5 cm. Each scale weighs 7-10 gm. There is a slight variation in the shape and size of the scales in the Indian species of *Manis*. They are comparatively smaller and darker in *Manis pentadactyla* (Chinese pangolin), and larger and blunt shaped in *Manis crassicaudata* (Indian pangolin). The Indian pangolin may have about 160-200 scales all over the body, of which 40-46% are present on the tail. It is believed that the pangolin has the same number of scales

throughout its life.

Chemical analysis of the scales reveals that they contain a considerable amount of scleroprotein, which needs a lot of protein intake from external sources, though the relationship between food preference and accumulation of this protein has not yet been established. The animal pays a heavy price for its defensive armature of scales.

Total protein content (in 100 gms of sample) =  
 amount of nitrogen estimated x conversion factor\*\*\*  
 Result: protein content, percent/mass = 88.4

The major use of pangolin scales is in traditional medicine, and they can be obtained

\* Recently, workers from China, have identified two forms of pangolin without giving them any formal names.

\*\* They were mostly taken from the dorsal and tail regions of the animal's body.

\*\*\* Conversion factor of 6.25 has been used for estimating the quantity of crude protein from total nitrogen content.

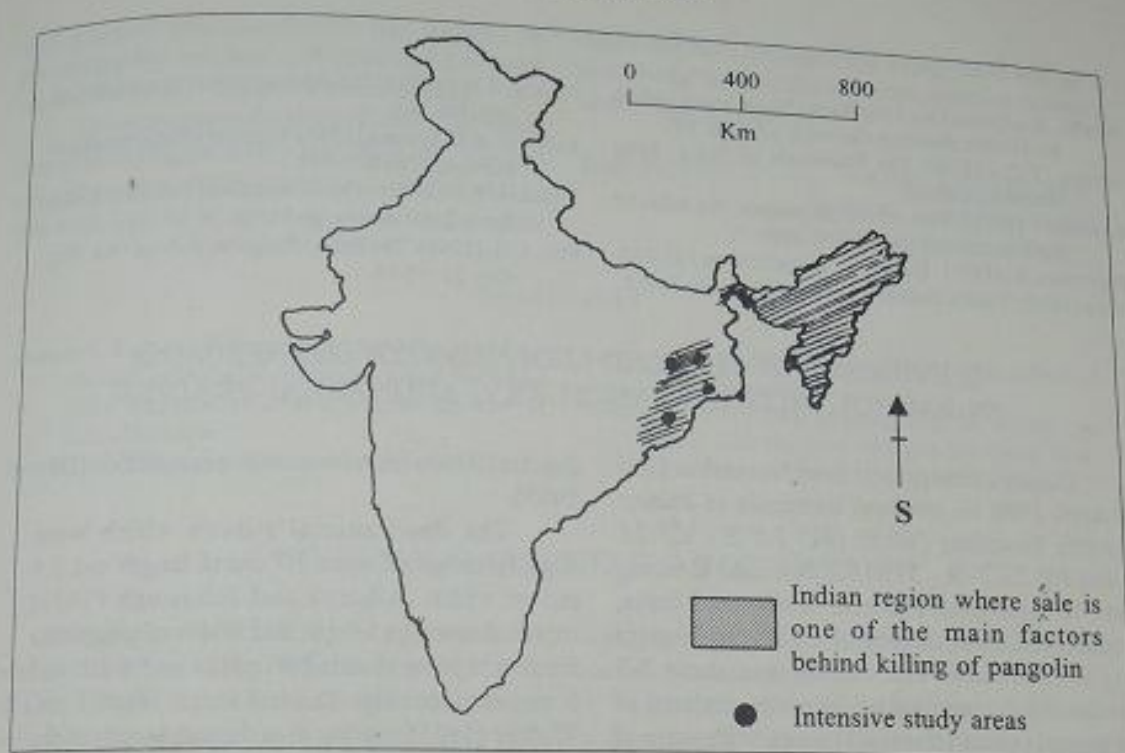


Fig. 3: Map showing study areas

from traditional medicine sellers of China, Nepal, Malaysia, Korea and many southeast Asian countries including India. During the study, I questioned the local inhabitants about the use of these scales in their society. A few samples were purchased from the tribals who kept them for medicinal purposes.

The following are a few examples of popular beliefs I came across during my field work in the study areas: Scales are used as magical charms. They help to bring good luck. They are a curative for piles, and also used for treating toxicosis, inflammation, rheumatic pain and scabies.

A growing interest in the scales has been noticed among Asian and European buyers for the supposedly curative effect on breast cancer (Nash 1992). Price varies in different parts of the world but genuine information related to the trade of the Indian pangolin is not substantial.

In the open market, a dozen scales may cost Rs. 50-60 or more, from my experience.

Scales are generally associated with fish, reptiles and to some extent birds, but are very unusual among mammals. However, much is yet to be discovered.

#### ACKNOWLEDGEMENT

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