

VOL. 36

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NO. 1

# JOURNAL OF THE BENGAL NATURAL HISTORY SOCIETY.



*Edited by* N. PAL.

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**VOL. 36**

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BIRDS OF THE DUARS

BY

C. M. INGLIS

*(Continued from page 63 of Vol. 35, No. 2.)*

Suborder—*Cuculi*

Family—*Cuculidae*

Sub-family—*Eudynaminae*

338. THE INDIAN KOEL.

*Eudynamys scolopacea scolopacea* (Linnaeus).

Fauna B. I. 2nd. ed. No. 1475.

**Description** :— Length 17 inches. *Male* :— Black all over with a steel-blue, or bluish-green, gloss.

*Female* :— Upper plumage brown with an olive-green gloss, spotted with white and barred with that colour on the wing-quills and tail-feathers ; lower plumage white, with black bases to the feathers of the chin and throat ; breast, to patch below the tail, with blackish-brown bars.

Bill apple or olive-green, iris brilliant crimson ; legs plumbeous.

This Cuckoo has a long, graduated tail.

**Distribution and Habits:** Previously this was considered an uncommon bird but it is not really so as one, generally, finds a pair or two on most tea-gardens and on suitable trees in bazaars. It is a bird of open country and gardens where there are big trees and it, usually, avoids forest country. It is a very noisy bird and its call *Kuil*, *Kuil*, *Kuil* increasing in intensity and ascending in scale, during the breeding season, drives most people nearly crazy; but it is liked by some Indians who keep the bird in cages. It is, sometimes, called the Brain-fever bird. The male has, also, another call *ho-iy-o*. It skulks about a lot from one tree to another but can put on a good speed when evading pursuit by crows which, instinctively, realize it is their inveterate enemy. It is said never to descend to the ground and I have never, actually, seen it do so but, in our garden in Bihar, a pair of Koels were quite frequent visitors to a bird bath, not to bathe but to feed on China palm berries on the plinth and to drink. The food of this Cuckoo consists mainly of fruit, mostly wild figs but it will also eat cultivated fruit such as mulberries and litchis; it is said to be partly insectivorous but none were found in any of the stomachs examined by Mason.

It is parasitic on the common House-Crow and, sometimes, on the Jungle-Crow and its breeding season corresponds with that of its dupes. Several Koels often lay in the same nest, as many as 13 of their eggs have been found in one nest. I, once, found its eggs in the nest of a common Myna. The eggs resemble Crows' eggs but are smaller and rounder; they are various shades of green, or stone colour blotched, spotted and speckled, with reddish-brown. They measure about 1.20 by 0.9 inches.

This ends the parasitic Cuckoos.

Sub-family—*Phoenicophainae*.

339. THE HIMALYAN LARGE GREEN-BILLED  
MALKOHA.

*Rhopodytes tristis tristis* (Lesson).

Fauna B.I 2nd. ed. No. 1479.

**Description** :—Length 23 inches, of which 15 is the tail. Sexes alike. The shafts of the feathers of the top of the head, chin, throat and breast are long and bristly ; forehead grey ; head and neck above grey with a greenish wash ; rest of upper plumage deep glossy green ; the wings and tail more richly glossed, the latter broadly tipped with white ; in front of eye black ; lower plumage ochraceous-grey, darker on breast and dark ashy on abdomen and under the tail.

Bill apple-green tinged with red at base of lower mandible ; irish brown to crimson ; bare skin round the eye crimson, legs slaty green.

This is the first of the non-parasitic Cuckoos found in the district. They have rounded wings and strong naked legs.

**Distribution and habits** :— This Malkoha is common, but not easily seen as it is a great skulker and conceals itself in the thick bushes and creepers moving about in these with ease and seldom taking to wing. Its flight is slow and heavy but, it is a pretty sight watching it flying from one bit of forest to another, its long tail steaming out behind. It is, essentially, a forest bird frequenting both evergreen and deciduous forest, scrub-jungle and bamboos. It feeds on mantids, crickets, caterpillars and other insects as well as small lizards and some fruit and seeds. It is said to feed largely on the ground but I have not noticed it doing so. Its note is a low, soft chuckle, quite pleasant to the ear.

It is pretty certain to breed in the district and should be found doing so between April and August. The nest is a shallow saucer, or platform, composed of small twigs ; it is not much better than that of a Dove, and has a few leaves as a lining. It is built on a bush in forest, bamboos or secondary growth and is, often, quite conspicuous. The eggs number 2 to 4, are chalky and white in colour. They measure about 1.46 by 1.05 inches.

#### 340. THE EASTERN HIMALAYAN SIRKEER.

*Taccocua leschenaulti infuscata* Blyth.

Fauna B. I. 2nd. ed. No. 1489. There given as *affinis*.

**Description:**— Length 17 to  $17\frac{1}{2}$  inches. Sexes alike. Upper plumage earthy-brown tinged with olive and with a satiny gloss ; the feathers of the head, neck, upper-back and breast have the shafts black and projecting like bristles ; tail cross-rayed and broadly tipped with white except on the central pair of feathers, the lateral ones are dark brown ; chin, throat and upper breast ochraceous-brown ; rest of lower plumage rufous.

Bill cherry-red, the base darker and tip yellow ; iris reddish-brown to crimson ; legs plumbeous.

In this genus the bill is curved and hooked, and a row of stiff curved bristles, with white bases, protect the eye ; the tail is long and graduated.

Stuart Baker is in error in considering this to be the Western instead of the Eastern race. (see Whistler *Jour. Bombay-N. H. Soc. Vol. XXXVII p. 526*).

**Distribution and habits:**— The only specimen I have seen of this Sirkeer is one obtained by O'Donel, in the Haldibari garden, on the 19th July 1928 and purchased from

him by the Darjeeling Museum. It must be very rare. These Sirkeers like scrub-jungle and secondary growth but also enter gardens where there happen to be good shrubberies. A pair always frequented our garden in Bihar. It is largely terrestrial and runs with horizontal body, stopping, every now and then, to raise it and have a good look round ; its flight is very weak. Its food consists of insects, beetles, grasshoppers etc, also berries and seeds, much of which is found on the ground.

341. THE COMMON, OR NORTHERN,  
CROW-PHEASANT.

*Centropus sinensis sinensis* (Stephen).

Fauna B. I. 2nd. ed. No. 1490.

**Description** :—Length 19 inches. Sexes alike. Whole plumage black glossed with purple and green, except on the wings which are chestnut.

Bill and legs black ; iris crimson.

The bill, in this genus, is deep and curved ; the tail is long, broad and graduated ; wings rounded and the hind-claw is very long and straight.

**Distribution and habits** :—This rather handsome bird is common and frequents scrub-jungle, grass-land intermixed with bushes, near villages and gardens where there is cover such as a shrubbery. It is largely terrestrial, walks well but with a slow gait, also runs well and when forced to fly, its flight is slow and laboured. It feeds much on the ground on insects, centipedes, small crabs, frogs, field-mice, spiders, molluscs, small snakes and, sometimes, birds' eggs and their young. Its call is a deep *hood-hood-hood*. Its flesh is relished by many Indians and considered, by some, to have aphrodisiac properties.

It breeds from June to September and makes a more or less globular structure of a nest, composed of small twigs, grass and leaves and lined with the latter, with the entrance on the side ; sometimes an open nest is made. This is placed in bushes, a tangle of creepers, trees or reeds ; in Bihar a pair always had their nest in a very thorny bougainvillea in a shrubbery in my garden ; how the birds were able to get to the nest was marvellous. The eggs number 3 or 4, some times 5, chalky, dull white with, sometimes, a superficial gloss. They measure about 1.4 by 1.2 inches.

342. THE INDIAN LESSER CROW-PHEASANT  
OR COUCAL.

*Centropus bengalensis bengalensis* (Gmelin)

Fauna B. I. 2nd. ed. No. 1495.

**Description:**—Male 13 inches, female a little longer. Sexes alike. A small edition of the last bird, black with chestnut wings ; the black of the body with a deep blue gloss and the tail with a green one.

*Young birds:*—Head and upper plumage dark brown, the feathers with white shafts and edged with rufous ; rump and above the tail narrowly barred with black ; lower plumage buff, deepest on breast and flanks, with pale shaft streaks and some dark brown bars, especially on the flanks. The immature female retains this plumage much longer than the male. All, except one, of the many specimens secured during the winter are in this plumage ; the exception is changing into adult plumage on the 24th March.

*In adult:*—bill and feet black ; iris crimson. *In immature* bill horny-yellow, darker on top of upper mandible ; iris pale dull brown ; legs plumbeous.

**Distribution and habits:**—This is commoner than the last and keeps to grass-land and scrub jungle, never entering gardens ; otherwise its habits are the same as those of its large cousin. It feeds largely on grass-hoppers and its voice is similar to that of the Common Crow-Pheasant.

The breeding season is from May to September and its nest is very like that of the last species but twigs are seldom used in its construction. It is placed in bushes in grass-land or in scrub jungle. The eggs number 3 to 5 and are like those of the last bird, only smaller. They measure about 1.17 by 1.01 inches.

Suborder *Psittaci*.

Family *Psittacidae*.

### 343. THE LARGE INDIAN PARRAKEET

*Psittacula eupatria nipalensis* (Hodgson)

Fauna B.I. 2nd. ed. No. 1497.

**Description** :—Length 21 inches. *Male* :—Upper plumage grass-green, brightest on top of the head and duller on the back ; central tail feathers green at base, verditer-blue in centre and tipped with yellow ; the rest have no blue on them ; a bluish tinge on the nape, and sides of the head, and a rose-pink collar round the back and sides of the neck ; chin and a broad stripe from base of lower mandible to the rose-pink collar, black ; deep green with a large patch of maroon-red near the bend of the wing ; lower plumage dull green, brighter on abdomen.

*Female* :—No rose-pink collar or broad black moustachial streak.

Bill deep red tipped with yellow ; iris pale yellow ; eyelids orange ; legs dirty yellow.

Our birds are intermediate between this species and the Large Burmese Parrakeet (*Psittacula eupatria indoburmanicus*. Hume); the latter has a narrower black stripe and less blue on the head. This fine Parrakeet is easily recognized by its large size, big head and massive bill.

**Description and habits:**—Rather common in the forests of the district. I have seen large flocks in the Moraghat and Tondu Forests. It also comes into more open country such as tea-gardens. The flocks utter loud screams as they fly. The food of this large Parrakeet consists of fruit, seeds and grain. These birds are often caged but are poor talkers, some are rather vicious and apt to give one a nasty bite with their powerful bills.

The breeding season is January and February. The birds make use of a natural cavity or excavate a nest-hole for themselves in any convenient tree, one in a grove, or a big Simul tree (*Bombax malabaricum*) or a Sal tree (*Shorea robusta*) in the forest. The hole is usually high up, some 20 feet or more from the ground. The number of eggs is 3 or 4. They are white, with a slight gloss and measure about 1.52 by 0.95 inches.

#### 344. THE NORTHERN INDIAN GREEN PARRAKEET.

*Psittacula krameri borealis* (Neumann).

Fauna B.I. 2nd. ed. No 1501.

**Description** :—Length  $16\frac{1}{2}$  inches. *Male* :—Upper plumage bright green, bluish-grey above the rosy-pink collar round the back and sides of the neck; a black band from the chin up the sides of the neck to meet the rosy-pink collar; central tail-feathers green at the base and then bluish-green, the others green with yellow inner-webs and tips; lower plumage yellowish-green.

*Female*:—An emerald green collar instead of the rosy-pink one and no black band.

Lutinos (yellow) or partly lutino specimens, are not uncommon in a wild state. Superficially this Parrakeet is similar to the last but very much smaller and without any maroon patch on the wings.

Bill cherry red, sometimes the lower mandible is all red but, usually, partly blackish and partly red, in a few it is blackish ; iris pale yellow ; feet greenish-slate.

**Distribution and habits**:—A very common bird frequenting open country, gardens, trees near villages etc. It is very noisy, uttering deafening screams. It is at home in trees but has a very awkward sidling gait when on the ground. Its flight is swift and straight. The flocks of these Parrakeets are a curse to the farmer as they descend on a crop, nip off the heads of the ripe grain, often dropping some of it and then return to their perches on some tree. They play havoc with ripe fruit and also eat wild varieties. Mason examined the stomach contents of 53 birds at Pusa in Bihar and found mustard, wheat, paddy, maize, litchi and *figus* fruit and Sissoo (*Dalbergia sissu*) seeds. As is well known Parrakeets stand on one leg and hold their food with the other foot to be eaten at leisure. They are very common cage-birds and some can talk quite well, though not to be compared with the African Grey Parrot. They can also be taught tricks.

The breeding season is from February to April and they lay their eggs either in a natural cavity in a tree or excavate one themselves ; holes in walls and buildings are also used for this purpose. The number of eggs is 4 to 6. They are pure white, almost glossless and measure about 1.20 by 0.95 inches.

## 345. THE EASTERN BLOSSOM-HEADED PARRAKEET.

*Psittacula cyanecephala bengalensis* (Forster).

Fauna B. I. 2nd. ed. No. 1503.

**Description** :—Length  $13\frac{1}{2}$  inches. *Male* :—Head rose-pink changing to pale lilac on the back of the head and on the lower cheeks above the narrow black collar from the chin round the neck ; upper plumage yellowish-green, central tail-feathers green at base, then blue and tipped with yellow, the others yellow-green ; wing green with a patch of maroon-red near the bend ; lower plumage yellowish-green, feathers under the wing green.

*Female* :—Head bluish-grey with a yellow collar round the neck ; maroon-red wing-patch present and feathers under the wings are green.

Bill orange-yellow, lower mandible blackish ; iris pale yellow or white ; legs dull green.

The Western Blossom-headed Parrakeet (*Psittacula cyanocephala cyanocephala* Linneus) has been recorded from the “Bhutan Duars” but I have not come across it. The *male* differs from the Eastern race in having the head deep red washed with a plum-like bloom of blue and in the hind-neck being verdigris-green as are the wings and rump ; the blue of the tail is darker and, in both sexes, the plumage is a much yellower green ; the feathers under the wings are pale blue. The *female* has the head dull bluish-grey, much darker than in the Eastern race.

**Distribution and habits** :—I obtained a number of the Eastern Blossom-headed Parrakeet at Haldibari during January, February and March. This beautiful bird is found in both forest and open country. Its flight is swifter than

that of the Parrakeets already described and its voice is less harsh ; otherwise its habits are similar to theirs. Its food seems to consist largely of *Ficus* and other wild fruit and it very seldom, if ever descends to the ground. I have seen it caged but less often than the Green Parrakeet although it is a much more attractive bird.

The breeding season is from January to March. It usually excavates its own nest-holes, but also makes use of holes in walls and buildings to breed in. Stuart Baker says "the male and female, when sitting, often refuse to move until they are lifted out of the hole, hissing loudly and biting fiercely at the hand which holds them". The number of eggs is 4 to 6. They are glossless white and measure about 1.0 by 0.80 inches.

#### 346. THE HIMALAYAN SLATY-HEADED PARRAKEET.

*Psittacula himalayana himalayana* (Lesson).

Fauna B.I. 2nd. ed. No. 1504.

**Description:**—Length 16 inches. *Male* :—Head dark slaty-blue ; chin and a narrow ring bordering the slate colour black ; a bright verdigris-green collar on the sides and back of the neck ; upper plumage dark grass-green ; central tail-feathers green near the base, then bright blue and the terminal third bright yellow ; the other tail-feathers are yellow-green ; a small maroon-red patch on the shoulder of the wings ; lower plumage light green.

*Female* :— Differs in having no red wing-patch.

Bill coral-red at base, then orange-yellow, the tip and the lower mandible yellowish ; iris pale lemon-yellow or deep yellow : legs slaty-green.

This Parrakeet differs in having the head dark slaty in both sexes.

**Distribution and habits:**—O'Donel obtained this Parrakeet at Baksa Duar. I have not come across it. It is a hill species and never seems to come down to plains level, probably 2000 feet is as low as it ever comes. It does not congregate into as large flocks as some of the other Parrakeets. It is sometimes caged. What struck me most in a caged bird I saw in Calcutta was its sweet, soft-voice so different to the harsh screams of other Parrakeets, it was a very tame and friendly bird.

347. THE INDIAN RED-BREADED PARRAKEET.

*Psittacula alexandri fasciata* (P.L.S. Müller).

Fauna B. I. 2nd. ed. No. 1508.

**Description:**—Length 15 inches. *Male*:—Head purplish-grey with rather a plum-coloured sheen; in front of and round the eye, washed with yellowish-green; a narrow black line across the forehead reaching to the eyes; a broad black, moustachial band from base of lower mandible to sides of neck; nape and hind-neck bright green; upper plumage duller grass-green; a large yellow patch on the wing coverts; central tail-feathers blue, edged with green and with pale tips, the others bluish-green; throat and breast vinaceous-red, tinged with plum colour next the black band; abdomen bluish-green.

*Female*:—The head is more tinged with blue or green and there is no plum-colour wash on the throat and breast.

Bill—upper mandible coral-red and lower one brownish-black in the male, in the female the entire bill is black; iris creamy-yellow; legs dusky olive.

**Distribution and habits:**—The commonest Parrakeet in the district. It is found in the forest but, also commonly comes to the trees in tea-gardens etc. It collects in flocks of varying size. Deignan came across a flock in Northern Siam which he calculated could not have been less than 10,000 individuals. I do not think we get such large numbers in the Duars. The raucous scream of this Parrakeet can be heard from a long distance. Its food consists of fruit, buds and grain and when the rice is ready for harvest much damage is caused by them.

It breeds from the end of December to April, in small colonies on trees in both evergreen and deciduous forest, sometimes as low as 5 feet but, more often between 10 and 20 feet from the ground. The number of eggs is 3 or 4 and they are glossless white. They measure about 1.15 by 0.97 inches.

This Parrakeet is a very popular cage bird and can be allowed to roam about at liberty. I knew one which used to sit on my hostess' shoulder and playfully peck her ear. It is an excellent mimic.

348. THE NORTH INDIAN LORIKEET.

*Coryllis vernalis vernalis* (Sparrmann).

Fauna B. I. 2nd. ed. No. 1513.

**Description:**—Length  $5\frac{1}{2}$  inches. *Male* :—Upper plumage grass-green, rather darker on the head and wings; rump and above the tail, rich red; tail green; lower plumage bright yellow-green except for a patch of blue on the throat.

*Female* :—Rather duller with no, or very little, blue on the throat.

Bill orange-red, yellow on the tip, cere darker red (the cere is the soft swollen skin at the base of the upper mandible) ; iris white or yellowish-white ; legs pale orange.

This diminutive parrot has a short tail.

**Distribution and habits:**—For years I never came across this small parrot. O'Donel obtained the first at Gorumara on the 21st March 1930 and on the 31st of that month in the following year. I secured one in the Apalchand forest near Katambari. No more were seen until a visit to Chupramari in March 1935 when four or five specimens were secured on the 19th and 20th of that month. There was quite a lot of them, not far from the Chupramari bungalow, feeding on the nectar of *Gamari* (*Gmelina arborea*, Roxb.) flowers. The trees on which I saw the birds were on the side of a path and the Lorikeets were not at all shy and kept up a twitter as they fed. My wife and I had the pleasure of accompanying Mr. D. A. G. Davidson there, at the same time in 1944 but we only saw one bird. They are often found in deciduous forest, deserted cultivation or bamboo jungle and go about in small parties, though single birds are also come across. Their flight is fast but not prolonged. Besides the nectar of flowers they feed on the flowers themselves, also fruit, berries and nuts. They are often snared, are easily tamed and become very affectionate. The Lorikeets are often called "Love-birds" and sleep with their heads hanging down like a bat.

ON A COLLECTION OF SMALL MAMMALS FROM  
DARJEELING DISTRICT, WEST BENGAL.

BY

H. KHAJURIA<sup>1</sup> AND R. K. GHOSE

*Zoological Survey of India, Indian Museum, Calcutta 13.*

INTRODUCTION

A collection of small mammals was made by one of the authors (H.K.) at various altitudes in the eastern Himalayas within Darjeeling district of West Bengal during June-August, 1958, while working as a liaison officer with a Harvard-Yale Expedition. This collection consists of 149 specimens belonging to 23 species and subspecies. As a result of its study interesting information regarding distribution (particularly altitudinal), habits, breeding seasons and morphological variations in a number of forms have been brought to light. Other published reports concerning this collection are by Khajuria (1959-1964) and Ghose (1964).

On account of its topography and geographical position, Darjeeling district occupies an important place in the study of Indian fauna, but good accounts of the mammalian fauna of this area are unfortunately rare. Wroughton (1916-1917) gave only a list of forms occurring in the area based on the collection made during the Mammal Survey conducted by the Bombay Natural History Society.

For the present collection specimens of Insectivora and Rodentia were collected by break-neck traps using mainly ground-nut butter and roasted coconut as baits.

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<sup>1</sup> Present address : Central Regional Station, Zoological Survey of India, 454, South Civil Lines, Jabalpur.

Ellerman and Morrison-Scott (1951) have been followed for the common English names.

*Measurements*:— All measurements are in millimetres and unless stated otherwise refer to adult specimens only. The ear has been measured from the intertragal notch to the tip. The measurements of the skulls of Primates and Chiroptera have been taken after Pocock (1939) and Khajuria (1953) respectively, and those of Lagomorpha and Rodentia after Ellerman (1947). For skulls of Insectivora the measurements taken are as follows :

*Basal length*:—from the hindermost point of the occipital condyle of one side to the anteriormost point of the premaxilla of that side; *Occipito-premaxillary length*—from the hindermost point on the occiput to the tip of the premaxillary bone; *palatal length*—from the anteriormost point on posterior margin of the bony palate to tip of the premaxillary bone; *basis cranii*—from the anteriormost point on posterior margin of the palate to the anteriormost point on the foramen magnum measured ventrally; *cranial width*—maximum width of the brain case;  $i^1 - m^3$ —from the anterior surface of the root of the first upper incisor to the posterior surface of the root of the last upper molars;  $c - m^3$ —from the anterior surface of the root of the upper canine to the posterior surface of the root of the last upper molar;  $m^1 - m^3$ —from the anterior surface of the root of the first upper molar to the posterior surface of the root of the last upper molar;  $Pm - m^3$  from the anterior surface of the root of the first premolar to the posterior surface of the root of the last lower molar;  $m_1 - m_3$ —from the anterior surface of the root of the first lower molar to the posterior surface of the root of the last lower molar;  $m^2 - m^2$  distance between the outer surface of the roots of the upper second molars; *mandibular length*—distance between the hindermost point of the mandibular condyle to the anteriormost point on the symphysis of the two rami.

## NOTES ON ECOLOGICAL CONDITIONS IN THE AREA OF COLLECTION

Tarkhola (c. 325 m. alt.). A small village on the left bank of Tista river near Darjeeling-Sikkim border. In this area there are of forests interspersed with cultivation. The forest mainly consists of Sal (*Shorea robusta*) and young teak (*Tectona grandis*). Old trees are rare. The cultivations mainly contain maize which was being harvested at the time of collection.

Takdah (c. 1,650 m. alt.). The village is surrounded by a good forest, tea gardens and cultivations. The forest is mixed, semideciduous and wet, containing several species of oaks, chestnut, walnut, maple, etc., and a species of conifer (*Cryptomaria japonica*). Old trees are rare and undergrowth sparse. The cultivations contain mainly ripening maize. There are numerous hill streams.

Palmajua (c. 2,250 m. alt.). There are some human dwellings scattered among the cultivated fields which are located on the slopes of the hills. The cultivations mainly contain maize and potatoes. The forest is mixed, wet and evergreen type consisting of oaks and conifers with abundant undergrowth, the principal constituents of which are several species of pteridophytes and flowering plants. The trees are very tall, old, many dead or decaying, and have thick coat of bryophytes over their trunks and branches. Epiphytes like orchids are also frequently met with. The hill streams are numerous and appear to be both snow-fed and spring-fed.

Sandakphu (c. 3,600 m. alt.). The forest consists mainly of rhododendron and silver-fir with scanty undergrowth at places. The rocks are covered with moss. Grassy mountain tops are used for grazing. The streams appear to be spring-fed and present characteristics of typical hill streams.

SYSTEMATIC ACCOUNT

ORDER *INSECTIVORA*

Family *Soricidae*

*Soriculus nigrescens nigrescens* (Gray)

The Sikkim Large-clawed Shrew

1842. *Corsira nigrescens* Gray, Ann. Mag. Nat. Hist., Ser. 1, 10 : 261. Darjeeling, India (Hinton, 1922).

Material : 4 unsexed ; Palmajua ; 28 June—7 July 1958.

Measurements : External : 4 unsexed ; Head and body, 83, 84, 84.5, 86.5 ; Tail, 47.5, 48.5, 49, 51 ; Hind foot, 14.5, 14.5, 15, 15 ; Ear, 9.5, 10, 10, 10.

Skull : 4 unsexed : Basal length, 21.3, 21.3, 22.3,—;

Occipito-premaxillary length, 21.3, 21.4, 22.1,—;

Palatal length, 9.1, 9.3, 9.4, 9.8 ; Basis cranii, 9.1, 9.4, 9.8,—; Cranial width, 11.2, 11.2, 11.4, 11.5 ;  $i^1$ - $m^3$ , 8.9, 9, 9.1, 9.2 ;  $c$ - $m^3$ , 5.9, 6.6, 6.6, 6.6 ;  $m^1$ - $m^3$ , 4, 4, 4.1, 4.2 ;  $Pm$ - $m_3$ , 5.4, 5.5, 5.6, 5.7 ;  $m_1$ - $m_3$ , 4.4, 4.4, 4.6, 4.7 ;  $m^2$ - $m^2$ , 5.9, 6.0, 6.1, 6.3. ; Mandibular length, 11.8, 11.9, 12.0, 12.1.

The species is common in this area. All the examples were trapped in deep forest near old or fallen trees. Stomach contents of one specimen : Vegetable matter and remains of insects.

*Soriculus caudatus caudatus* (Horsfield)

Hodgson's Brown-toothed Shrew

1851. *Sorex caudatus* Horsfield, Cat. Mamm. Mus. E. India Co., p. 135. Darjeeling, India.

Material : 2 ♂, 3 ♀ (1 in alcohol), Sandakphu, 18-20 July 1958.

Measurements :		
External :	2 ♂	3 ♀
Head and body	95.5, 59.5	57.5, 62.0, 70.0
Tail	60.5, —	63.0, 65, —
Hind foot	13.5, 14.0	13.5, 13.5, 14.0
Ear	6.5, 8.0	8.0, 8.0, 10.0
Skull :	1 ♂	2 ♀
Basal length	... 17	17.2, 18
Occipitonasal length—	... —	18.2, —
Palatal length	... 7.3	7.6, 8
Basis Cranii	... 7.3	7.1, —
Cranial width	... 8.6	8.8, 9
i <sup>1</sup> —m <sup>2</sup>	... 6.9	7.2, 7.4
c—m <sup>2</sup>	... 5	4.9, 5.2
m <sup>1</sup> —m <sup>3</sup>	... 3.1	2.9, 3.2
Pm—m <sub>3</sub>	... 4.1	4, 4.2
m <sub>1</sub> —m <sub>3</sub>	... 3.3	3.3, 3.6
m <sup>2</sup> —m <sup>3</sup>	... 4.3	4.1, 4.3
Mandibular length	... 8.8	9.4, 10

Fur in our specimens is less dense and a little shorter than those from Lachen, Chungthang (Sikkim), Phurkia (Kumaon, U. P.) and Apoon (Gorkha, Nepal) collected between August and February. There is no rufescent tinge as recorded by Horsfield in his original description. This is a common species in the forest. The specimens were trapped among bushes and rocks.

*Suncus murinus soccatus* (Hodgson)

The House Shrew

1845. *Sorex soccatus* Hodgson, Ann. Mag. nat. Hist., Ser. 1, 15 : 270. Central region of Nepal.

Material : 2 ♂, 2 ♀, Tarkhola, 17-23 August 1958.

Measurements :

	2 ♂	2 ♀
External :		
Head and body ...	112.0, 123.0	113.5, 114.0
Tail ...	73.0, 81.5	68.5, 81.4
Hind foot ...	21.0, 21.0	17.5, 19.0
Ear ...	11.0, 13.5	10.0, 11.5
Skull :	2 ♂	2 ♀
Basal length ...	29.0, 30.9	27.8, 28.5
Occipitonasal length ...	28.7, 30.4	27.7, 28.5
Palatal length ...	13.9, 14.9	13.0, 13.5
Basis cranii ...	12.1, 13.5	12.2, 12.5
Cranial width ...	11.9, 12.7	11.2, 12.0
$i^1 - m^3$ ...	12.4, 13.1	12.1, —
$c - m^3$ ...	8.8, 8.8	8.2, —
$m^1 - m^3$ ...	5.4, 5.7	5.2, —
$Pm - m_3$ ...	7.4, 7.5	6.8, 6.8
$m_1 - m_3$ ...	6.0, 6.4	5.5, 5.6
$m^2 - m^2$ ...	9.3, 9.4	8.2, 8.5
Mandibular length ...	16.8, 17.0	15.5, 16.0

The animals were trapped in the forest, near human dwellings and on charcoal heaps.

*Crocidura attenuata rubricasa* Anderson

1877. *Crocidura rubricosa* Anderson, J. Asiat. Soc. Beng., 46(2) : 280. Sibsagar, Assam.

Material : 1 ♂, Takdah, 7 August 1958.

Measurements :

External : Head and body, 73.5 ; tail, 73 ; hind foot, 15.5 ; ear, 9.

The specimen is darker than those present in the collections of the Zoological Survey of India from Bhutan Duars and Darjeeling taken between June and January, but this difference appears to be due to fading. There is no rufous on the head and snout.

## ORDER CHIROPTERA

### Family *Pteropidae*

#### *Rousettus leschenaulti leschenaulti* (Desmarest)

1820. *Pteropus leschenaulti* Desmarest, Encycl. Meth. Mamm., 1 : 110. Pondicherry, India.

Material : 1 juv ♂, 1 ♀ (both in alcohol), Tarkhola, 17-23, August 1958.

#### Measurements :

External : 1 ♀ : Forearm, 76.4.

Skull : 1 ♀ : Condylbasal length, 34.8; occipitonasal length, 36.3; palatal length, 8.6; postmolar length, 19.3;  $m^3 - m^3$ , 10.1;  $m^1 - m^1$ , 8.4;  $c^1 - m^1$ , 8.4;  $c^1 - m^3$ , 13.8;  $c^1 - c^1$ , 6.9;  $c_1 - m_3$ , 15.5; Cranial width, 15.1; Interorbital width, 7.6; Mandibular length, 27.5.

The adult example was shot under a bridge near a tree in fruit. The juvenile specimen was run over by a vehicle. Collection of the juvenile in August suggests that the young ones are born in spring. This is in conformity with the observation of Brosset (1962) in Central and Western India.

### Family *Vespertilionidae*

#### *Pipistrellus coromandra coromandra* (Gray)

#### The Indian Pipistrelle

1838. *Scotophilus coromandra* (Gray) Mag. Zool, Bot., 2. 498. Pondicherry, Coromandal coast, India.

Material : 1 ♂, Takdah, 7 August 1958.

Measurements :

External : Forearm, 32.4.

Skull : Condylbasal length, 12; occipitonasal length, 10.8; palatal length, 5.5; Postmolar length, 7.3;  $m^1 - m^1$ , 5.2;  $c^1 - m^1$ , 2.4;  $c^1 - m^3$ , 4.6;  $c^1 - c^1$ , 4.1;  $c_1 - m_3$ , 4.9; Cranial width, 6.3; Interorbital width, 3.3; mandibular length, 9.2.

The specimen was collected in the village when flying at night.

*Murina cyclotis cyclotis* Dobson

1872. *Murina cyclotis* Dobson, Proc. Asiat. Soc. Beng., 210. Darjeeling, India.

Material : 1 ♂ (purchased), Takdah, 8 August 1958

Measurements :

External : Forearm, 30.7.

Skull : Palatal length, 6.4; zygomatic width, 8.6;  $m^3 - m^3$ , 5.2;  $m^1 - m^1$ , 4.5;  $c^1 - m^3$ , 5;  $c^1 - m^1$ , 3.3;  $c^1 - c^1$ , 3.5;  $c_1 - m_3$ , 5.5; cranial width, 7.5; Interorbital width, 4; mandibular length, 10.

The specimen was reported to have been collected during day-time in the forest.

ORDER PRIMATES

Family *Cercopithecidae*

*Macaca assamensis pelops* Hodgson

The Assamese Macaque

1840. *Macacus (Pithecia) pelops* Hodgson, J. Asiat. Soc. Beng. 9 : 1213. Kachar, Nepal.

Material : 1 juv. ♂, 2 ♀, Tarkhola, 17-22 August 1958. 1 ♂ (skin only), Takdah, 7 August 1958.

Measurements :

External : 2 ♀ : Head and body, 533.4, 586.7; tail, 236.2, 259.0; hind foot, 147.3, 154.9; ear, 35.5, 29.2.  
1 ♂ : Tail, 292.1, hind foot, 165.1; ear, 38.1.

Skull : 2 ♀ : Total length, 116, 127; condylobasal length, 90, 99; zygomatic width, 73.5, 84; orbital width, 59, 69.3; maxillary width, 28.2, 33.6; upper check teeth, 39.3, 39.8; mandibular length, 81.6, 90.

Khajuria (1964) has described the habits of this monkey based on the material under report.

The female specimens are dark brown on the dorsal surface. One of them is very faintly washed with yellow here and there on the anterior half of the back. The hand, the feet and the tail are also dark brown. The forearm in both the examples shows light yellow in some parts. The adult male specimen is lighter than the females and washed with light yellow on the anterior half of the back and on the forelimb.

The coat of the adult specimens is between 50 and 65 mm in length on the shoulder, whereas that of the juvenile specimen is shorter.

In one of the female skulls the occipital and sagittal crests are present, but they are completely absent in the other specimen.

ORDER LAGOMORPHA

Family *Ochotonidae*

*Ochotona thibetana* (?) *sikimaria* Thomas

The Moupin Pika

1922. *Ochotona sikimaria* Thomas, Ann. Mag. nat.

Hist., 9 : 191. Lachen, 8,800 ft. Sikkim.

Material : 1 ♂ (? subad.), Sandakphu, 16 July 1958.

## Measurements :

External : Head and body, 124.5 ; hind foot, 24.5 ; ear, 16.

Skull : Occipitonasal length, 31.9 ; condylobasal length, 29 ; palate, 11.4 ; diastema, 6.7 ; palatal foramen, 17.3 ; bulla, 8 ; zygomatic width ; 16.5 ; interorbital width, 4.1 ; upper tooth row, 5.4 ; lower tooth row, 5.4 ; mandibular length, 9.3.

The specimen is only provisionally determined. It differs from *O.t. sikimaria* in being darker dorsally due to the presence of a large number of black and dark brown hairs, and having a more arched skull. The size is also smaller but this may be due to its age. As material is insufficient no more useful remarks can be given regarding its identity.

It constitutes perhaps the first record of *Ochotona* from West Bengal.

## ORDER RODENTIA

Family *Sciuridae**Callesciurus pygerythrus lokorides* (Hodgson)

## The Irrawaddy Squirrel.

1836. *Sciurus lokorides* Hodgson. *J. Asiat. Soc. Bengal*, 5 : 222. Nepal.

Material : 1 ♂, 3 ♀, Tarkhola, 17-22 August, 1958.

## Measurements :

External :	...	...	1 ♂	3 ♀	
Head and body	...	...	185.	168.0,	183.0, 195.5
Tail	...	...	192.0	189.0,	194.0, 195.0
Hind feet	...	...	44.0	42.5,	43.0, 44.0
Ear	...	...	19.0	17.5,	18.0, 18.5
Skull :	...	...	1 ♂	1 ♀	
Occipitonasal length	...	...	49.0		47.2
Condylobasal length	...	...	44.0		41.7
Palate	...	...	23.7		22.8
Diastoma	...	...	11.4		10.1
Palatal foramen	...	...	3.4		2.6

Bulla	...	...	9.9	9.8
Zygomatic width	...	...	27.8	26.6
Interorbital width	...	...	16.0	15.3
Upper tooth row	...	...	8.7	9.0
Mandibular length	...	...	—	26.0

All specimens (both sexes) have orange-yellow patches on the thighs. The position of these patches in specimens of either sex, from Nepal and Darjeeling in the collection of Zoological Survey of India, is as follows :—

- (i) No patches in twelve examples collected between December and April.
- (ii) Inconspicuously developed patches in three examples collected in May.
- (iii) Well-developed patches in four examples collected between June and August.

The exact significance of these patches is obscure. However, it is suggested that these patches might have something to do with the onset of the breeding season. A female specimen collected on 17 August was found in lactating condition.

All specimens were taken in deep forest.

*Callosciurus maccllelandi maccllelandi* (Horsfield)  
The Himalayan Striped Squirrel

1839. *Sciurus maccllelandi*, Horsfield, Proc. Zool. Sec. Lond., : 152, Assam.

Material : 1 ♂ (in alcohol), 4 ♀ (1 juv.), Palmajua, 22-27 June 1958.

Measurements :

External :	...	...	1 ♂	3 ♀		
Head and body	...	...	125.0	121.0,	126.0,	126.0
Tail	...	...	94.0	98.0,	110.0,	110.0
Hind foot	...	...	29.0	23.5,	27.0,	29.0
Ear	...	...	15.0	11.0,	12.0,	14.0

Skull :	...	...	1 ♂	3 ♀		
Occipitonasal length	...	...	34.4	33.0,	33.4,	34.0
Condylbasal length	...	...	30.7	29.3,	30.1,	30.5
Palate	...	...	15.6	14.9,	15.6,	15.9
Diastema	...	...	7.9	7.4,	7.4,	7.9
Palatal foramen	...	...	1.6	1.5,	1.9,	2.2
Bulla	...	...	6.4	6.3,	6.5,	6.6
Zygomatic width	...	...	20.6	20.0,	20.0,	—
Interorbital width	...	...	12.0	10.9,	11.8,	12.1
Upper tooth row	...	...	5.5	5.5,	5.6,	5.7
Mandibular length	...	...	18.5	18.0,	18.5,	—

Khajuria (1959) has given an account of the habits of the species in the area of collection of the specimens.

*Dremomys lokriah lokriah* (Hodgson)  
The Orange-bellied Himalayan Squirrel

1836. *Sciurus lokriah* Hodgson, J. Asiat. Soc. Beng.,  
5 : 232, Nepal.

Material : 2 ♂, 3 ♀, Palmajua, 24 June—7 July 1958.

Measurements :

External :	...	2 ♂	3 ♀			
Head and body	...	183.5,	185.0	183.0,	187.0,	188.0
Tail	...	150.5,	153.0	152.0,	159.0,	—
Hind foot	...	44.5,	46.0	40.5,	44.0,	44.5
Ear	...	20.5,	22.0	19.0,	21.0,	21.0
Skull :	...	2 ♂	2 ♀			
Occipitonasal length	...	49.5,	—	50.3,	—	
Condylbasal length	...	44.5,	—	44.9,	—	
Palate	...	23.8,	23.9	22.6,	23.8	
Diastema	...	11.6,	11.9	10.7,	11.8	
Palatal foramen	...	2.6,	—	2.3,	3.2	
Bulla	...	8.4,	—	8.3,	—	
Zygomatic width	...	—	—	27.7,	—	
Interorbital width	...	14.6,	15.5	13.9,	14.2	
Upper tooth row	...	8.0,	8.3	8.1,	8.3	
Mandibular length	...	25.8,	—	22.8,	—	

The specimens were generally met with in drier places where the forest was thinner. The males were found chasing the females indicating the onset of breeding season.

The ovaries of the female specimen collected on June 25 were found heavily infested with a cestode parasite which formed a whitish mass all over the left ovary, and the oviducts

were greatly inflamed. Also, two specimens of a nematode parasite were found in the stomach of the same specimen.

Stomach contents were found to contain vegetable matter and remains of insects. The call is loud and distinctive.

*Ratufa bicolor gigantea* (McClelland)

The Malayan Giant Squirrel

1839. *Sciurus giganteus* McClelland, Proc. Zool. Soc., Lond., p. 150. Assam.

Material: 2 ♂ (1 subad.), 1 ♀, Tarkhola, 15-19 August 1958.

Measurements:

External:	2 ♂ (1 subad.)	1 ♀
Head and body	... 332.0, 337.0	398.0
Tail	... 462.0, 467.0	477.0
Hind foot	... 91.0, 93.0	93.0
Ear	... 27.0, 33.0	30.0
Skull:	2 ♂ (1 subad.)	1 ♀
Occipitonsal length	... 68.7, 75.0	76.0
Condylbasal length	... 61.1, 68.0	69.7
Palate	... 30.0, 33.4	33.6
Diastema	... 14.9, 18.2	18.7
Palatal foramen	... 7.1, 7.2	8.0
Bulla	... 15.9, 17.0	17.3
Zygomatic width	... 41.7, 45.5	48.3
Interorbital width	... 26.6, 29.3	31.1
Upper tooth row	... 12.5, 13.5	13.3
Mandibular length	... 38.8, 43.8	44.2

The male specimens are almost blackish brown on the back. The tail is nearly black with a brownish black tip. The rump is much paler, almost brownish, but the amount of brown is slightly more in the subadult. The female specimen is much paler throughout.

The female and the subadult were found quite close together on the branch of a tree in a thick forest. The female was in lactating condition. Specimens belonging to this form were also seen at Takdah.

Family *Muridae*Subfamily *Murinae**Rattus fulvescens fulvescens* (Gray)

## The Chestnut Rat

1846. *Mus fulvescens* G. R. Gray, in J. E. & G. R. Gray's Cat, Hodgson Coll., p. 18, Nepal.

Material : 3 ♂, 1 juv. ♀, Palmajua, 30 June—7 July 1958, 1 ♂, 2 ♀, Takdah, 1-9 August 1958.

## Measurements :

External :	4 ♂				1 ♀
Head and body	... 125.0,	128.0,	134.0,	135.0	121.0
Tail	... 172.0,	179.0,	194.0,	200.0	185.5
Hind foot	... 27.5,	30.5,	31.0,	—	27.0
Ear	... 18.0,	20.0,	21.0,	—	18.0

Skull : 3 ♂ : Occipitonasal length, 35.1, 36.3,—;  
 Condylbasal length, 30.5, 31.4, 33 ; Palate, 16.3, 16.9, 17 ;  
 Diastema, 8.2, 8.3, 8.6 ; Palatal foramen, 5.2, 5.6, 6.1 ;  
 Bulla, 4.4, 4.5, 5.1 ; Interorbital width, 5.2, 5.3, 5.5 ;  
 Upper tooth row, 5.2, 5.3, 5.6.

The dorsal coloration is more or less chestnut but the coat is intermixed with long black and dark brown hairs. The ventral surface is white ; the tail is white below and dark brown above.

The specimens were trapped in the forest and in maize fields. Stomach contents of one specimen showed vegetable matter only.

*Rattus niviventer monticola*, Ghose

1964. *Rattus niviventer monticola* Ghose, Proc. Zool. Soc., Calcutta, 17(2) 193-197. Palmajua, c 2,250 m. alt., Darjeeling dist., India.

Material : 3 ♂, 7 subad. ♀, Palmajua, 24 June—7 July 1958. 1 ♂, Sandakphu, 13 July 1958.

It is allied to *Rattus niviventer lepcha* Wroughton, but can be separated from it by the presence of darker dorsal coloration, an irregular throat patch and a pectoral streak or either of the two, comparatively longer tail, and shorter palatal foramen and upper tooth row. It can be very easily distinguished from *Rattus fulvescens fulvescens* Gray, with which it occurs (at Palmajua) by the blackish dorsal coloration and more prominent white ventral surface of the tail.

Stomach contents of one specimen showed vegetable matter and remains of insects.

*Rattus eha eha* (wroughton)

The Smoke-bellied Rat

1916. *Epimys eha* Wroughton, J. Bombay Nat. Hist. Soc., 24 : 428. Lachen, c. 8,800 ft. alt., Sikkim.

Material : 2 ♂ (1 subad.) 1 ♀, Palmajua, 1—7 July 1958. 2 ♂, 1 ♀, Sandakphu, 18—22 July, 1958.

Measurements :

External :	4 ♂				2 ♀	
Head and body	... 94.0,	96.0,	119.0,	120.0	107.0,	118.5
Tail	... 163.0,	168.0,	172.0,	193.0	178.5,	189.0
Hind foot	... 24.0,	25.0,	27.0,	27.5	23.0,	25.0
Ear	... 17.0,	18.0,	18.5,	20.0	19.0,	20.1

Skull : 3 ♂ Occipitonasal length, 28.2, 31.2, 32.4 ; Condylbasal length, 24.4, 28.6, 29.1 ; Palate, 13, 14.8, 15.1 ; Diastema, 6.5, 7.6, 8.1 ; Palatal foramen, 4.6, 5.3, 5.6 ; Bulla, 4.2, 4.2, 4.5 ; Zygomatic width, 15.2, —, — ; Interorbital width, 4.7, 4.8, 5 ; Upper tooth row, 4.7, 4.7, 4.9 ; Mandibular length, 15.3, 16, 17.

The specimens agree well with the original descriptions as well as that of Ellerman's (1961) except for a subadult ♂ from Palmajua which is perfectly white-bellied with white hair much shorter than that in other specimens.

In four out of six skulls the supraorbital ridge is more or less well developed. At Sandakphu, the specimens were trapped in rhododendron forests.

*Rattus nitidus nitidus* (Hodgson)

The Himalayan Rat

1845. *Mus. nitidus* Hodgson, Ann. Mag. Nat. Hist., Ser 1, 15 : 267, Nepal.

Material : 5 subad. ♂, 3 ♀, Takdah, 3—9 August 1958.  
1 ♂, 1 ♀, Palmajua, 25—30 June 1958.

Measurements :

External :	1 ♂	3 ♀		
Head and body	... 126.5	106.0,	137.0,	171.5
Tail	... 124.0	110.5,	136.0,	177.0
Hind foot	... 32.0	27.5,	33.0,	34.0
Ear	... 19.0	18.0,	20.0,	19.5

Skull : 1 ♂ : Occipitonasal length, 35.8 ; condylobasal length, 33.3 ; palate, 19.2 ; diastema, 9.0 ; palatal foramen, 6.2 ; bulla, 5.7 ; upper tooth row, 6.3 ; interorbital width, 5.2 ; lower tooth row, 6.1 ; mandibular length, 19.7.

Specimens were collected near human dwellings in maize fields. The form appears to be common at places of collection.

*Rattus ratus brunneusculus* (Hodgson)

The House Rat

1845. *Mus brunneusculus* Hodgson, Annn. Mag. Nat. Hist. Ser-1, 15 ; 267, Nepal.

Material : 4 subad. ♂, Tarkhola, 21-23 August 1958,  
1 subad. ♂, Takdah, 8 August 1958. 3 ♂ (1 subad), 1,  
♀, Palmajua, 25 June—7 July 1958.

## Measurements :

External :	... 2 ♂	2 ♀
Head and body	... 165.0, 183.0	176.5, 189.5
Tail	... 206.0, 227.0	219.0, 227.0
Hind foot	... 32.0, 33.5	33.5, 34.5
Ear	... 22.0, 23.0	22.0, 25.0
Skull :	1 ♂	1 ♀
Occipitonasal length	... 41.4	42.5
Condylobasal length	... 39.4	40.4
Palate	... 22.5	23.4
Diastema	... 11.1	11.2
Bulla	... 6.8	6.6
Upper tooth row	... 7.0	7.0
Zygomatic width	... 20.3	20.4
Interorbital width	... 5.5	5.6
Lower tooth row	... 6.8	6.9
Mandibular length	... 24.6	24.4

The adult female specimen from Palmajua is olive brown dorsally and white ventrally with a greyish brown longitudinal streak on the breast. The adult male specimen agrees more or less with the female except for the dorsal coloration which is paler. All the specimens from Tarkhola, which are subadults have poorly developed coat and show a rufous tip to hairs of dorsal surface. The colour of pelage of this race is, however, reported to be variable from locality to locality (Hinton, 1919, p. 396).

Specimens were collected in forest, maize field and near deserted houses. It is quite common,

*Mus musculus homourus* Hodgson

The House Mouse (outdoor type)

1845. *mus homourus* Hodgson, Ann. Mag. Nat. Hist. Ser. 1, 15 : 268. Nepal.

Material : 1 ♂, 4 ♀, Tarkhola, 14-19 August 1958, 2 ♂, Takdah, 6-7 August 1958. 3 ♂, 2 ♀, Sandakphu, 12-20 July, 1958.

## Measurements :

External	6 ♂	6 ♀
Head and body ...	66.5, 70.0, 71.0, 71.5, 71.5, 72.0	68, 71, 71, 72, 72.5, 76.5,
Tail ...	74.5, 78.0, 82.0, 82.5, 84.5, 85.0	69, 0.75, 5.76, 0.76, 5.80
Hind foot ...	12.0, 16.0, 17.0, 17.5, 18.0, 19.0	16.0, 16.5, 17.0, 18.0, 18.5,
Ear ...	12.0, 12.0, 12.5, 12.5, 13.0, 14.0	11.0, 12.5, 13.0, 13.5, 13.5,
		14.0
Skull :	3 ♂	3 ♀
Occipitonasal length ...	20, 3, 20, 6, 21.1	21.1, 21.2, 21.3
Condylobasal length ...	19.0, 19.1, 19.6	19.6, 20.2, 20.4
Palate ...	10.2, 10.2, 10.5	10.4, 10.8, 11.0
Diastema ...	5.2, 5.2, 5.5	5.2, 5.7, 5.8
Palatal foramen ...	4.3, 4.6, 5.1	4.3, 4.5, 4.7
Bulla ...	3.3, 3.3, 3.4	3.3, 3.3, 3.4
Zygomatic width ...	10.4, —, —	—, —, —
Interorbital width ...	3.2, 3.2, 3.3	3.2, 3.3, 3.4
Upper tooth row ...	2.8, 2.9, 3.0	3.0, 3.1, 3.2
Mandibular length ...	9.8, —, —	11.3, —, —

This mouse is very common, and specimens were trapped in the forest and maize field.

*Mus musculus urbanus* Hodgson

## The House Mouse (indoor type)

1845. *Mus urbanus* Hodgson, Ann. Mag. Nat. Hist., Ser. 1, 15 : 269. Kathmandu, Nepal.

Material : 1 ♂, Tarkhola, 21 August 1958. 2 ♂, 5 ♀ (1 juv.), Takdah, 4-9 August 1958.

## Measurements :

External :	3 ♂	4 ♀
Head and body ...	59.0, 70.5, 77.0	66.0, 68.0, 74.5, 77.5
Tail ...	83.5, 88.0, 92.0	83.5, 83.5, 84.0, 92.0
Hind foot ...	17.0, 17.0, 19.0	16.0, 17.0, 17.0, 18.0
Ear ...	11.0, 11.5, 12.0	12.0, 12.0, 13.0, 13.5
Skull :	1 ♂	2 ♀
Occipitonasal length ...	20	20.5, 22.0
Condylobasal length ...	18.6	19.4, 20.5
Palate ...	9.8	10.1, 11.2
Diastema ...	4.6	5.1, 5.4
Palatal foramen ...	4.2	4.2, 4.4
Bulla ...	3.4	3.3, 3.4
Interorbital width ...	3.4	3.3, 3.5
Upper tooth row ...	2.8	2.7, 3.3
Zygomatic width ...	—	10.4, 10.6
Mandibular length ...	—	11.9, —

*Mus musculus homorus* and *M. m. urbanus*, although obtained from the same localities but in different ecological conditions, are easily distinguished by their ventral coloration. In the former it is generally white or greyish white and in the latter it is grey.

With the exception of two specimens all were trapped inside or near human dwellings. It is quite common.

*Mus pahari pahari* Thomas

The Sikkim Mouse

1916. *Mus pahari* Thomas, J. Bombay Nat. Hist. Soc., 24 (3): 415. Batasia, 6,000 ft. alt., Darjeeling district. Material : 1 ♂, Takdah, 31 July 1958.

Measurements :

External : Head and body; 99.5; tail, 100; hind foot, 20; ear, 14. Skull : Occipitonasal length, 25.6; condylobasal length, 23.7; palate, 12.1; diastema, 6.2; palatal foramen, 4.7; bulla, 3.6; upper tooth row, 3.5; zygomatic width, 4.4; mandibular length, 12.9.

The specimen was trapped in the forest.

*Bandicota bengalensis bengalensis* Gray & Hardwicke

The Indian Mole Rat

1835. *Arvicola bengalensis* Gray, 111. Indian Zool., 2, pl. 21, Bengal.

Material : 2 ♂ (1 juv.), 8 ♀ (3 subad.), Tarkhola, 12-21 August 1958.

Measurements :

External :	1 ♂			5 ♀		
Head and body...	162.0	187.5,	191.0,	192.0,	198.0,	201.0
Tail	137.0	160.0,	160.0,	163.0,	164.0,	175.0
Hind foot	35.0	29.0,	29.0,	30.0,	31.0,	35.0
Ear	20.0	20.0,	20.0,	20.0,	20.0,	20.0

Skull : 3 ♂ : Occipitonasal length, 38.9, 40.8, 41.6; Condylbasal length, 40.8, 42.8, 43.6; 24.1, 25.1, 25.3; palate, 24.1, 25.1, 25.3; diastema, 12.7, 13.5, 13.6; palatal foramen, 7.2, 7.7, 8; bulla, 8.6, 8.9, 9; nasal, 11.6, 13.6, 13.7; Interorbital width, 6.3, 6.6, 6.8; upper tooth row, 6, 6.4, 6.7; zygomatic width, 24.1, 24.6,—; mandibular length, 23.8, 25.1, 25.6.

One female was found to carry four foetuses. Availability of both juvenile and pregnant specimens suggests that there are more than one breeding season.

This mole rat is very common in this locality in and around human dwellings. Most of the specimens were collected near houses or shops.

#### Subfamily *Microtinae*

#### *Pitimys sikimensis sikimensis* (Hodgson)

1849. *Neodon sikimensis* Hodgson, Ann. Mag. Nat. Hist., Ser. 2, 3 : 203. Sikkim.

Material : 18 ♂ (4 subad.), 12 ♀ (2 subad.) and 1 unsexed, Sandakphu, 13-23 July 1958.

#### Measurements :

External :	14 ♂	10 ♀
Head and body	... 97.0—114.4 (105.5)	97.0—102.0 (99.5)
Tail	... 41.0—57.5 (49.2)	40.0—54.0 (47.0)
Hind foot	... 18.0—21.0 (19.5)	18.0—20.0 (19.0)
Ear	... 11.0—13.0 (12.0)	10.0—14.5 (12.2)
Skull :		
Occipitonasal length	... 24.5—26.7 (25.6)	24.4—26.1 (25.2)
Condylbasal length	... 25.4—27.6 (26.5)	25.5—27.3 (26.4)
Palate	... 14.7—16.4 (15.5)	15.2—16.1 (15.6)
Diastema	... 7.7—8.3 (8.0)	7.8—8.4 (8.1)
Palatal foramen	... 3.7—4.7 (4.2)	3.8—4.8 (4.3)
Bulla	... 5.7—6.6 (6.1)	5.9—6.5 (6.2)
Upper tooth row	... 5.9—6.9 (6.4)	5.9—6.5 (6.2)
Zygomatic width	... 14.8—16.4 (15.6)	15.6—16.3 (15.9)
Interorbital width	... 3.2—3.8 (3.5) (8 exs.)	3.4—3.8 (3.6) (8 exs.)
	(9 exs.)	(7 exs.)

The length of palatal foramen is less than one-fifth of the occipitonasal length in the specimens under report, and also in the majority of the skull measurements given by Ellerman (1961, pp. 474-475).

Ellerman's (loc. cit., p. 475) statement that palatal foramen usually exceeds one-fifth of occipitonasal length is probably a printing mistake.

Khajuria (1959) gave an account of the habits of this species at Sandakphu.

#### SUMMARY

The report deals with a collection of small mammals made at various altitudes in Darjeeling district, West Bengal, during June-August, 1958. The material contained 149 specimens belonging to 23 species and subspecies. This study has revealed considerable new information regarding distribution—particularly altitudinal, breeding season, morphological variation and habits etc. in a number of forms.

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NOTES ON HOME RANGE OF THE INDIAN FIVE-  
STRIPED PALM SQUIRREL (*FUNAMBULUS PEN-*  
*NANTI*, Wr.) INCALCUTTA.<sup>1</sup>

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INTRODUCTION

Palm squirrels are very common in villages, woods and gardens of India. Of the two species common in Bengal, *Funambulus pennanti* is more urban in distribution and *F. palmarum* more rural (Das, 1959). Several studies have been done on the habits and ecology of *F. pennanti* but, little or no ecological work has been done on *F. palmarum*. In *F. pennanti*, the reproductive cycle in females, and reproductive behavior have been studied by Arslan (1958) and Banerji (1955, 1957). Louch *et al* (1965) studied the population dynamics, reproductive activity and general ecology of *F. pennanti* and Agrawal (1965) reported on its general habits. No work has previously been done on the home range of this species.

The purpose of this present study was to collect data on the home range of the five-striped squirrel (*F. pennanti*) and to compare with similar studies on the same and other related species. From April to September, 1963, studies on the home range of palm squirrels were made in the Hospital area of the Calcutta Zoological Gardens.

MATERIALS AND METHODS

The hospital area of the Zoological Gardens of Calcutta was selected as the study area because it had a good population of *F. pennanti* and excellent observation conditions.

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The whole hospital area of approximately 2 hectares is surrounded by a concrete wall and is kept isolated from the public. As a result there was little or no disturbance to the animals and traps.

The area is situated on a broad metalled road opposite the Zoo. The concrete wall surrounding the area is about 6 feet high. A small canal from the Hooghly River (Tolly's nullah) flows on one side of the area, and on another side there are some residence quarters. The whole area consists of three parts. The laboratory, office and animal cages are situated within the central part, a well kept grassy plot (see map). Behind this the area is mostly covered with elephant grass (*Pennisetum alopecuroides*), weedy shrubs and a few young trees. No squirrels were observed or trapped in this area. Most observations on the palm squirrels were done in a third part of the area by the side of the metalled road. This area was covered with grasses, shrubs, and tall trees (mango, wood-apple, guava, banana, mulberry and other fruit trees) providing shade. The squirrels confined their activity mostly within this small area.

At the beginning of the work, the squirrels were trapped in locally made wire live traps. The traps were set about dawn and were inspected in the late morning, noon and afternoon. Ordinary "chapati" was used as bait. This bait seemed to be more successful than mixed bait of nuts and vegetable fats. Moreover, the "chapati" was more convenient to attach to the trigger of the trap than other baits. The squirrels were transferred from the traps to cloth bags for weighing and determining sex. Each individual squirrel was marked with "Nyanza-Dye" (Type D) with a particular marking so that the identity of each was conspicuous. After marking, the squirrels were released for study. After about 10 weeks, the dye faded to some extent, so the squirrels were trapped again and were marked

as before and released. Observation of the marked squirrels was done with a pair of 8 × 35 binoculars. The method used for observation was to move slowly in a fixed route covering all parts of the study area, to record the position of marked squirrels on a detailed map of the area. Caution was taken not to disturb the animals and not to concentrate excessively on a particular individual. Observations were made in the morning and in the afternoon. Individuals observed less than 6 times were omitted from the data. As a result, only 13 males and 12 females of the 40 animals marked will be discussed here.

#### OBSERVATIONS AND RESULTS

This species is a diurnal form, being more active in the morning and late afternoon. High temperature at noon-time may be a factor limiting their activity in that period. About 372 separate sight records were made in the whole study period. The numbers of sight records in respect to sex and month are given in Table I.

The table shows that there was slight variation in the observation of males and females in different months. In April and September more males than females were seen, whereas in June and July the reverse was true. The total number of observation of each sex in the course of 6 months, however, was almost the same.

#### TERRITORIALITY AND HOME RANGE

Territoriality seems not to be a distinctive mode of behavior in the life of *F. pennanti*. The home range of 25 squirrels studied overlapped to a considerable extent within a limited portion of the whole study area. There did not appear any exclusively defended areas. The aggregation of home ranges in one part of the study area may have been because the food sources and shelter for the squirrels were

more favourable in that part. The peak reproductive period of the squirrels corresponded with the first part of the study period (Louch, *et al.* 1965).

Layne (1954) reported that in cases of most small mammals the area obtained by joining the outlying points of a live trapping set up by straight or curved lines is usually considered to be the home range of the individual. Sometimes a strip of  $\frac{1}{2}$  the distance to the next trap is added to the minimum limit of home range—to compensate for the absence of traps. Ronstad (1965) obtained the home range for thirteen-lined ground squirrels by plotting capture locations of each animal taken 2 or more times, and then measuring the maximum distance between capture points. In the present study the home range has been calculated by plotting the sight records of an individual on a map of the area and then multiplying the maximum distances traversed by the individual on north-south and east-west axis (Table II).

From Table II is evident that the males had a larger average home range than the females. There were, however, individual females with larger home ranges than some males. Three males had home ranges of more than 2 acres and 4 others had more than 1 acre. Only one female had a home range of more than two acres, 4 others had more than an acre. On the average, the home range of the males was 1102.7 square meters more than that of the females. This difference of more than  $\frac{1}{4}$  acre of home range is in agreement with the fact that in small mammals the males usually have a higher home range (Hayne, 1950 ; Louch *et al.* 1965). A covariance analysis of the difference of home range between the two sexes, however, gave a t-value of 1.4 or in other words, the difference was not statistically significant. This is due to the enormous variability in the home ranges of different individuals. This system of co-variance analysis, however, took account of the difference in the numbers of hours of observations between different individuals.

## DISCUSSION

Male and female home ranges of *F. pennanti* as discussed in this note are about two to five times bigger than those reported by Louch *et al.* (1965) respectively. Mohr (1947) has called attention to the marked difference in home ranges as reported by different investigators who have worked with the same species, but used different methods of calculating the size of home range. Hayne (1950) reported that it is not unusual to find individuals of a species use home ranges of different sizes under different ecological environments. For example, in the case of meadow vole—*Microtus pennsylvanicus pennsylvanicus* Ord., Hamilton (1937) recorded a home range of 1/15 acre and Blair (1940) 1/5 of an acre. Hayne (1950) experimentally demonstrated how the distance between traps can affect the estimated home range of meadow vole, keeping other variables unaltered. Table III shows how estimated home range increases with increasing trap distance.

It has also been found that animals home range as revealed by trapping tend to increase rapidly with the first few captures. Blair (1942) reported that with *Peromyscus maniculatus* in northern Michigan, ten or more captures were necessary in order to reveal maximum home range. On the other hand, Stickel (1946) considered 4 captures sufficient to show the maximum movements of *Peromyscus leucopus*. So it remains to the judgment of the investigator to determine how many captures are required, and also how far apart traps should be placed to reveal the maximum home range. Both of these factors will be affected by environmental conditions, population density, and general mobility of the animal concerned.

In this study by using site record points, rather than capture points, the difficulties that usually arise with the later method—such as trap distance, trap happiness and trap

shyness, etc., have been eliminated. In the study made by Louch, Ghosh and Pal (1965) the distance between the traps was 50 feet and individuals with 3 or more captures were considered for home range discussion. As the population density was not very high in the hospital garden and also because the site record points were evenly distributed within the area, the maximum distance traversed by individuals in north-south and east-west axis were multiplied to obtain the maximum home range.

Allen (1938) reported that the entire movement of the eastern chipmunk *Tamias striatus lysteri* was limited to 2 or 3 acres. Hamilton (1939) considered an acre of home range to be sufficient for red squirrels *Tamiasciurus hudsonicus* (Bangs), whereas Layne (1954) recorded 5.32 acres of home range for an adult red squirrel. He also reported that territorial behavior of red squirrel is usually limited to a small area immediately surrounding the feeding station. Similar territorial behavior has also been found in *F. pennanti*, but not of a rigid nature. It may be mentioned here that both eastern chipmunks and red squirrels are of about the same body size as *F. pennanti*, although their natural habitats are considerably different, consisting mainly of temperate zone forests.

#### CONCLUSION

Home range is an important aspect in the life of an animal. It is also important in the problems of censusing and of control of small mammals. The home of an animal not only varies with age, sex, population density and habitat, but also with the technique employed to determine it. The average home range of male and female palm squirrels in this study has been found to be 4357.6 square meters and 3254.9 square meters, respectively. This difference between the sexes in respect to home range, although not statistically significant, is sufficient to indicate the general trend that the males of small mammals usually have a larger home range than the females.

Table I. Numbers of sight records of marked male and female squirrels in different months of the study period.

Sexes	April	May	June	July	August	September	Total
Male ... ..	57	70	6	17	23	12	185
Female ... ..	33	72	15	39	23	5	187

TABLE II

*Home Ranges and Hours of Observations of Individual Squirrels of Both Sexes.*

Males			Females		
Individual No. of Squirrels	Hours Observed	Home Range (Sq. Meters)	Individual No. of Squirrels	Hours Observed	Home Range (Sq. Meters)
1	6.0	1960	2	15.75	3300
3	8.9	3658	4	8.5	972
6	10.5	2060	5	6.0	936
8	9.25	1560	10	14.4	5460
11	30.0	9920	12	15.9	7930
13	15.4	8374	14	15.3	4928
18	3.8	1400	23	8.75	2832
19	15.25	8512	24	8.6	3168
20	8.4	1370	27	5.4	5740
22	12.3	7192	31	3.25	2263
25	12.5	5244	32	6.8	4715
28	11.6	1455	36	11.25	1815
29	7.0	3944			
Total	154.71	56649	—	120.0	39059
Average	11.0	4357.6	—	10	3254.9

TABLE III

Home range of *Microtus* in relation to distance between traps (Hayne, 1950).

Location	Distance Between Traps (in feet)	Average Apparent Home Range (in Acres)	
		Female	Male
E. Lansing (1942)	21	.097	.16
E. Lansing (1941)	45	.18	.23
" " "	60	.26	.51
" " "	120	.77	.86

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OBSERVATIONS ON THE FECUNDITY AND SPAWNING  
OF *COILIA* SPP.<sup>1</sup> IN ESTUARINE AREAS OF WEST  
BENGAL

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(W. Bengal)*

## INTRODUCTION

Fish belonging to the genus *Coilia* Gray contribute considerably to the fisheries in the estuaries of West Bengal, particularly during winter months when large quantities are caught and sun-dried in the Sunderbans. Hardenberg (1931) has given the distribution and probable spawning area of *Coilia dussumieri* (English-Golden anchovy, Bengali-*Mandeli*) in the Java sea off the Rokan Mouth. Delsman (1932) described the eggs and the development of *C. dussumieri*. Bapat and Bal (1950) studied the food of the same species from Bombay coast. Jones and Menon (1952) described the developmental stages of *C. dussumieri* from Orissa and of *C. reynaldi* from Barrackpore in West Bengal. Palekar and Karandikar (1953) studied maturity of *C. dussumieri* in Bombay waters. Bal and Joshi (1953) studied biology of the same fish. In this paper some observations on the fecundity and spawning of three species of the genus *Coilia* viz. *C. ramcrovati* (Ham.), *C. dussumieri* Cuv. & Val., and *C. borneensis* Bleeker from West Bengal estuaries are given.

## MATERIAL AND METHOD

Material for this study was collected from commercial catches during November 1957 to May 1958. During other months it was difficult to get samples from lower stretches of the Hooghly when no fishing is done due to rough weather consequent on monsoon conditions.

<sup>1</sup>. Common Bengali name — *Banspata*, বাঁশপাতা, Ed.

<sup>2</sup>. Present Address — Zoological Survey of India, Jodhpur.

The collection centres were at Kolaghat on Rupnarain river ; Port Canning on Matla river and Fraserganj, Bokkhal, Namkhana, Kakdwip and Diamond Harbour on Hooghly river. Ova from the gonads of 24 specimens of *C. dussumieri*, 18 of *C. borneensis* and 17 of *C. ramcarati* were counted. The number of ova in the ovaries was ascertained by actual counts. For measuring diameter 100 ova were measured from each gonad by the method given by Clark (1934). Ova less than 7 micrometer divisions<sup>1</sup> were not measured as they obviously constituted the unyolked recruitment stock of eggs which are found in the ovaries all the year round. For plotting the graph for diameter frequency, ova have been grouped in two micrometer division size groups.

#### FECUNDITY

Detailed data about the fecundity of all the three species may be had from the editor. The fecundity of *C. ramcarati* with length range of 10.6 cm. to 21.1 cm. ranged between 955 and 15,114. The average fecundity for this species was 6,769 and the average fecundity per gram of fish-weight was 235. *C. borneensis* ranging from 8.6 cm. to 13.0 cm. had a fecundity range of 304 to 2,050 with an average of 720. The average fecundity per gram of fish-weight, in the case of *C. borneensis*, was 208. *C. dussumieri* with length range of 9.5 cm. to 14.9 cm. had fecundity from 660 to 2,863 with an average of 1,278 and per gram of fish-weight the average fecundity was 155. An attempt to establish length-fecundity and weight-fecundity relationship did not give any positive result due to paucity of data.

#### OVA-DIAMETER AND SPAWNING

*Coilia ramcarati* : the graph (fig. 1) for the average ova diameter frequency during the period November to April

<sup>1</sup>. One micrometer division - 0.016 mm.

shows two modes at 25 and 43 micrometer divisions. As stated earlier, ova below 7 divisions are immature. The mode at 25 divisions (range 8-33 divisions) indicates maturing ova and the other mode at 43 divisions (over 33 divisions) indicates mature or almost mature ova. Predominance of ova measuring 27 divisions during November shows that *C. ramcarati* starts maturing earlier than November and attains full maturity by January-February when ova measuring 37 to 45 divisions are dominant. Thus it appears that this species spawns during January and February. During the month of April a mode at 43 divisions suggests that spawning probably continues to this month and beyond. Size of ova at the time of spawning may be about 0.688 mm. (43 divisions). Individuals in a fairly advanced stage of gonadal maturity were found in the catches during April (IV stage) and June, 1960 (V stage). This strengthens the idea expressed above that spawning of this species extends upto April or more.

*C. borneensis*: the available data for this species is not very conclusive because fish with mature ovaries could not be obtained during the months of December, 1957, February and March, 1958. During January and April only one specimen was available in the samples of each month. Most of the specimens studied were collected in November (5) and May (11).

The graph (Fig. 2) for the average ova-diameter frequency for this period shows two modes at 29 and 39 divisions. The mode at 29 divisions (range 8 to 33 divisions) indicates maturing ova and the other mode at 39 divisions (over 33 divisions) indicates mature or almost mature ova. During the month of November the mode at 45 divisions indicates that this species breeds in November and again during May, mode at 39 divisions indicates that *C. borneensis* breeds probably for the second time during or after May. It is not

considered possible that this species has an extensive spawning season because of lower modal values during January (33) and April (27).

The presumption that *C. borneensis* spawns twice in a year is further supported by the following information. During January 1958 one spent fish measuring 11.3 cm. was collected from Namkhana. During May and June, 1960 individuals with V stage of maturity were observed and one spent fish was recorded during July 1960 from Port Canning. Size of ova at the time of spawning may be about 0.720 mm. (45 divisions).

*C. dussumieri* : the graph (Fig. 3) for the average ova diameter frequency during November to February shows two modes at 17 and 37 divisions. The mode at 17 divisions (range 8 to 23 divisions) represents maturing ova and the other mode at 37 divisions (ova over 27 divisions) represents mature or almost mature ova. Predominance of ova measuring over 27 divisions throughout the period between November and February suggests that this species breeds in all these months. The graph for January shows a third mode at 53 divisions representing probably the actual spawning time. Absence of a corresponding mode in the graphs for other months further supports the idea that *C. dussumieri* breeds from November to February. Occurrence of two spent fishes measuring 15.2 cm. and 14.1 cm. during December at Frasergang confirms the idea expressed above. Size of ova at the time of spawning may be 0.848 mm. (53 divisions).

#### REMARKS

Jones and Menon (1952) inferred that *C. reynaldi* has an extensive breeding season from December to June and that the breeding presumably takes place at the estuary. Palekar and Karandikar (1953) while studying the maturity of

*C. dussumieri* concluded that this fish does not spawn within the fishing limits of Bombay waters.

Occurrence of a few spent fish in the lowest stretches of Hooghly and at Port Canning confirms the idea of Jones and Menon regarding the breeding place. It also suggests that *C. dussumieri* might be breeding in the estuaries near Bombay.

#### SUMMARY

Fecundity of *Coilia ramcarati*, *C. borneensis* and *C. dussumieri* has been studied. It is found to be on the average 235, 208 and 155 for the three species in the same order.

*C. ramcarati* spawns during January-February and it probably continues spawning upto April or even after that. *C. borneensis* seems to breed twice in a year, first in the month of November and again near about May. *C. dussumieri* appears to have an extensive breeding season from November to February.

*C. borneensis* and *C. dussumieri* breed in the lower stretches of the Hooghly and *C. borneensis* breeds also at Port Canning in Matla river as shown by spent fish collected from these areas.

#### ACKNOWLEDGEMENT

The author is thankful to the Director, Central Inland Fisheries Research Institute, Barrackpore for providing the facilities during this work and to Mr. T. J. Verghese for allowing the use of his data regarding the year 1960.

Fig. 1 : Showing percentage of ova diameter frequency in *C. ramcarati*.

Fig. 2 : Showing percentage of ova diameter frequency in *C. borneensis*.

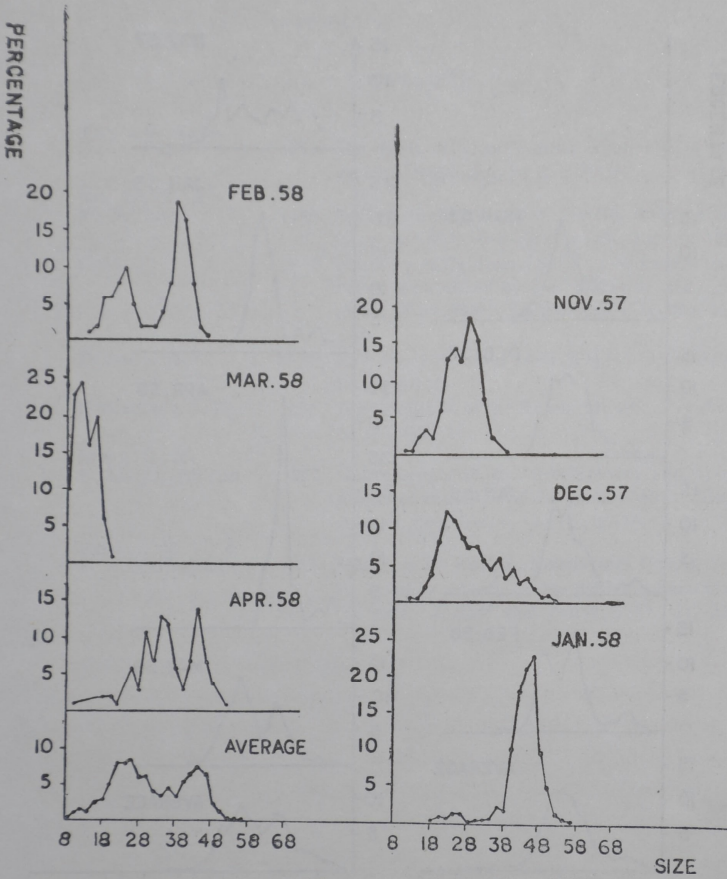
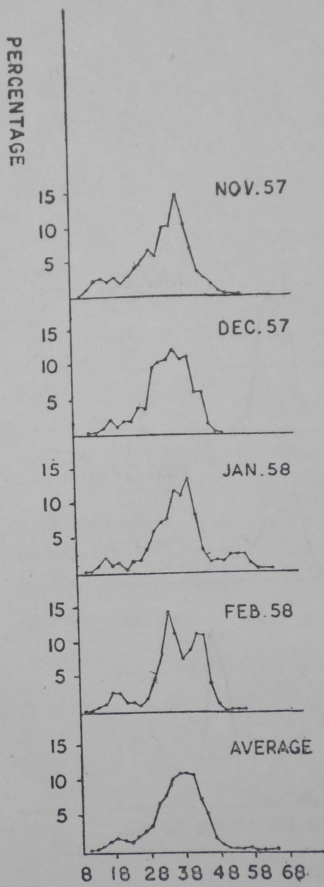
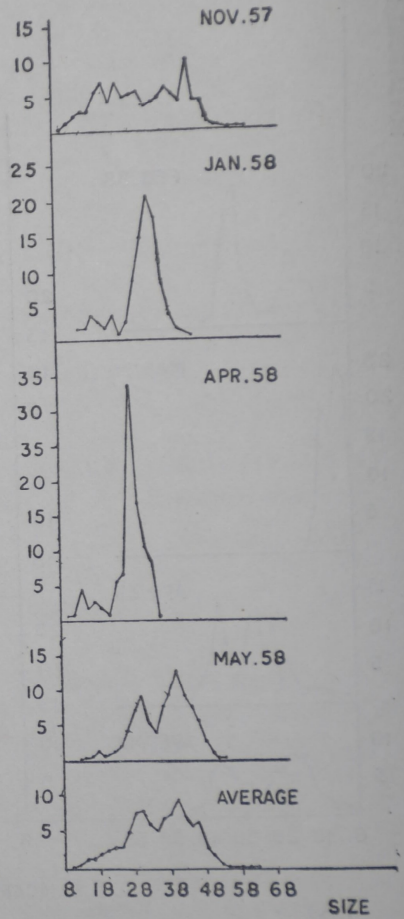


FIG 1

C. RAMCARATI



C. DUSSUMIERI  
FIG 3



C. BORNEENSIS  
FIG 2

Fig. 3 : Showing percentage of ova diameter frequency in *C. dussumieri*.

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## AVIAN SAP-DRINKERS OF THE HIMALAYAS

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The feeding on oak (*Quercus lamellosa* Smith) sap is a little recorded activity of some Central Himalayan birds. Over a period 10 years we have noted twelve species representing five families drinking oak sap in Central and Eastern Nepal. The altitude range of *Q. lamellosa* is between 7,000 and 8,000 feet and the species extends from the flanks of Annapurna eastward through Bhutan (Stainton, 1964 : appendix F).

It appears that woodpeckers, possibly *Dendrocopos darjellensis* (Blyth), initiate the sap flow. Usually the flow originates in the top half of the tree and only rarely occurs near the ground. Often the flow, from two dozen or more holes, coats the side of a tree for at least fifteen feet. We noticed that the sap-flows involve medium sized trees rather than the giants of these forests and usually occur on the main trunk. The sap has a definite odor which can be detected by a person a considerable distance from the tree.

As all birds involved in sap drinking are insectivorous, we wondered whether they actually were drinking sap or whether they might be eating trapped insects. Perhaps some birds do capture insects, but from close observation of several species we feel that they are primarily interested in the sap.

The method of sap procurement may be quite acrobatic. Often a bird flutters up to an oak trunk and partially hovers while gaining a grip on the rough bark. Here, with legs widely spread, the bird may poke its bill into a hole or try to secure a taste from a well defined flow on the bark. From a single position a bird usually will try several different

spots, dipping into a favorite hole several times. Later it may shift position on the trunk or perhaps retire for a rest on some horizontal branch. At times we saw birds completely upsidedown on the trunk.

#### LIST OF SPECIES

##### *Pycnonotus leucogenys* (Gray)

A group of five White-cheeked Bulbuls were observed drinking sap from two trees on Shivpuri, Kathmandu District, in January.

##### *Garrulax striatus* Vigors

A single Striated Laughing-thrush perched practically upside down about 20 feet from the ground while drinking sap on Phulchowk, Kathmandu District, in February.

##### *Garrulax variegatum* (Vigors)

We saw several Variegated Laughing-thrushes drinking sap some 30 to 40 feet from the ground on the Mamche Danda, Kosi Gandak watershed, in February.

##### *Myzornis pyrrhoura* Blyth

A solitary Fire-tailed Myzornis was spotted hanging quietly on a tree trunk in Ilam District, East Nepal as it apparently drank sap (see Fleming and Traylor, 1964 : 536). Suddenly a Chestnut-headed Babbler (*Alcippe castaneiceps*) darted at the Myzornis which immediately took refuge in some bushes. This was in March.

##### *Cutia nipalensis* Hodgson

A flock of ten Nepal Cutias were so engrossed in sap-drinking on Pulchowk in January that they allowed us to approach very closely and were not much disturbed even after we

collected two. These birds were accompanied by Chestnut-headed Babblers which were also drinking.

*Actinodura nipalensis* (Hodgson)

On several occasions we recorded single Hoary Barwings drinking sap on Pulchowk (in January and February).

*Yuhina gularis* Hodgson

We saw single Stripe-throated Yuhinas drinking sap on the same trunk with Sibias (*Heterophasia capistrata*) on the Kosi Gandak watershed and on Phulchowk.

*Alcippe castaneiceps* (Hodgson)

Chestnut-headed Tit-babblers often participate in this activity. They are usually in small flocks and often with other species.

*Heterophasia capistrata* (Vigors)

The Black-capped Sibia is by far the most obvious sap-drinker in these forests. On one occasion in January we noted seven individuals strung out on the trunk of one tree on Shivpuri. This tree had attracted about a dozen Sibias at one time. Drinking simultaneously with the Sibias were White-checked Bulbuls and White-tailed Nuthatches.

*Turdus albocinctus* Royle

A solitary White-collared Blackbird perched beside the trunk of a large oak, reached over several times, and apparently drank sap. This was on Phulchowk in February.

*Parus monticolus* Vigors

We recorded a Green-backed Tit flying back and forth to a sap tree on Shivpuri in January. It appeared nervous and would not stay on the tree for any length of time.

*Sitta himalayensis* Jardine and Selby

White-tailed Nuthatches, in pairs or small parties, frequently drank sap on both Shivpuri and Phulchowk in January and February.

ACKNOWLEDGEMENTS

We wish to thank officials of His Majesty's Government for permission to visit and collect birds in various parts of Nepal.

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## THRIPS OF SHILLONG—A PRELIMINARY LIST

By

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Patna-16.

Thrips (Insecta, Thysanoptera) are casual visitors and pests of many plants. Some of them cause considerable damage to our crops and horticulture, e g., *Thrips tabaci* Lindeman to the onion and carnations, and *T. florum* Schmutz to roses. The fact that there is hardly any kind of flower which thrips do not visit, may indicate the extent of their abundance. They attack even glass-house plants, as for instance *Helsothrips hæmorrhoidalis* (Bouche), which in India has been found on flowers of begonia (Ananthakrishnan, 1960).

The North-Eastern India, due to its varied topography and a high degree of rain-fall, harbours a very rich insect fauna. However, there is perhaps no local list of thrips of any part of this region of the country. Attempts were, therefore, made in 1967 to collect and evaluate these insects from the Khasi hills, Assam. In the present list 9 spp. of thrips from 14 host plants, which were collected at Shillong (alt. 5000'), are reported. In addition, *Thrips florum* was also collected from 2 hedges, namely, *Eupatorium odoratum* (Linn.) and *Lantana camara* (Linn.), growing wild near Umtham (alt. 3000') in the Bhoi area of Khasi hills. All material was collected only from the flowers of host plants, mostly cultivated ones.

## LIST OF SPECIES

## SUBORDER—TEREBRANTIA

## Family—Thripidae

1. *Thrips coloratus* Schmutz

♀ on : *Ipomœa hederacea* Jacq. (Bishnupur, 13.10.67)  
and *Dahlia excelsa* Benth, (Kench's Trace, 23-11-67).

2. *T. flavus* Schrank

♀ on : *Dahlia variabilites* Desf. (Kench's Trace, 14.9.67); *Chrysanthemum* sp. and *C. coccineum* (Bishnupur, 24.9.67); *Ipomaea purpurea* Lamk. (Bishnupur, 1.10.67); *Polygonum alatum* Ham. (Bishnupur, 11.10.67); *Ipomaea hederacea* Jacq. (Bishnupur, 13.10.67) and *Tagetes petula* Linn. (Kench's Trace, 23.11.67),

♂ on : *Dahlia variabilis* Cav. (Kench's Trace, 5.10.67) and *Tagetes petula* Linn. (Kench's Trace, 23.11.67).

3. *T. florum* Schmutz

♀ on : *Canna indica* and *Rosa* sp. (Kench's Trace, 14.9.67); *Dahlia variabilites* Desf. (Kench's Trace, 14.9.67 and 5.10.67); *Dahlia excelsa* Benth. and *Tagetes petula* Linn. (Kench's Trace, 23.11.67); *Tagetes erecta* Linn. (Bishnupur, 24.9.67); *Ipomaea purpurea* Lamk. and *Eri-thryna arborescens* Roxb. (Bishnupur, 1.10.67) and *Ipomaea hederacea* Jacq. (Bishnupur, 13.10.67).

♂ on : *Rosa* sp. (Kench's Trace, 14.9.67); *Ipomaea hederacea* Jacq. (Bishnupur, 13.10.67) and *Dahlia excelsa* Benth. (Kench's Trace, 23.11.67).

4. *T. hispidus* Ananthakrishnan & Jagadish

♀ on : *Rosa* sp. and *Dahlia variabilites* Desf. (Kench's Trace, 14-9-67) and *Dahlia excelsa* Benth. (Kench's Trace, 23-11-67).

These plants seem to be new host records for *T. hispidus*, as it was originally collected on *Acacia* sp. only (Ananthakrishnan & Jagadish, 1966).

5. *T. tabaci* Lindeman

♀ on : *Tagetes erecta* Linn. (Bishnupur, 24-9-67).

6. *Teniothrips distalis* Karny.

♀ on : *Dahlia variabilites* Desf. (Kench's Trace, 14-9-67 and 5-10-67) and *Dahlia excelsa* Benth. (Kench's Trace, 23-11-67).

7. *T. peculiaris* (Bagnall)

♀ and ♂ on : *Erithryna arborescens* Roxb. (Bishnupur, 1-10-67).

8. *T. sulfuratus* Priesner

♂ on : *Chrysanthemum* sp. (Bishnupur, 24-9-67) ; *Ipomæa hederacea* Jacq. (Bishnupur, 13-10-67) and *Dahlia excelsa* Benth. (Kench's Trace, 23-11-67).

Suborder—TUBULIFERA

Family—Phleothripidæ

9. *Haplothrips gauglbaueri* Schmutz

On : *Salvia splendens* Sello, and *Rosa* sp. (Kench's Trace, 14-9-67).

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PLANTS ASSOCIATED WITH THE "DURGA PUJA"  
CEREMONY IN WEST BENGAL.

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ABSTRACT

Since early times plants have been employed by man not only for material uses such as food, medicine and shelter etc., but also for various cultural purposes in a variety of religious ceremonies, festivals etc.

A large number of plants is associated with the Durga Puja celebration in West Bengal and it is considered that a detailed account of such plants and the ceremonies with which they are associated will be a useful and interesting study of the local economic plants. This paper deals with about one hundred plants belonging to some 80 genera and fifty families. The local names, botanical names, parts used and details of the associated ceremonies like idols preparation, *Sthapana*, *Dasahara*, etc. are given.

Durga Puja is a popular religious ceremony; in mythology it was celebrated first by Lord Ramchandra at the time of his war against Ravana, the King of Lanka (Ceylon). It is a celebration of 4-5 days in the worship of Goddess Durga and her companions. She is considered to have the concentrated powers of all Gods and Goddesses.

She is described in the *Chandi*, a famous religious book as an Almighty Force. The celebrations are held in the month of Ashwin or Kartick i.e. during the period September to November.

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This ceremony generates much enthusiasm in the Hindu society and even influences its economy mainly in West Bengal and East Pakistan. It also has political and social values. It is, generally speaking, an occasion for circulation of money among the people of different sections of the community. People of all ranks come back to their own permanent homes and exchange views on social matters. It is an annual occasion for reunion and recreation for the whole society.

There are two styles of celebrations, the community and private, the latter is celebrated in the private homes of landowners and other well-to-do people and the former is celebrated in public places. In both the cases priests are appointed to conduct the ceremonies ; other sections of the society also participate. Artists are engaged for preparation, painting and decoration of idols and compete to demonstrate their skill. Potters try to excel in their craft.

The ceremony starts with *Mahalaya* a week before the main activities which begin with *Sthapana* and end in *Dasahara* i.e. the immersion of the idols.

Several common plants are associated with the ceremony. Some of them are highly valued as food, medicine, fibre and fodder. Most of them are herbs or shrubs ; a few are trees and climbers.

The author thinks it will be interesting and useful to observe and record the plants used in Durga Puja ceremony. He, therefore, observed ten Pujas in detail and listed the commonly used plants in them. An explanation of the uses of the plants is given in the next section.

An arbitrary classification of the plants into six categories according to the ceremony with which they are related, is made :

1. Idols preparation (making of Pratima)
2. Idols decoration
3. Sthapana
4. Nabapatrika
5. Puja (Plant body, leaves, flowers, fruits and seeds used : Naibaidya)
6. Dasahara

The author consulted professional priests for the identity and authenticity of the materials constituting *Pancha-Sarsa*, *Pancha-Guri*. These were purchased from a shop-*Dasakarma Vandar* at Habra.

The above 6 ceremonies are briefly described. More important plants associated with these ceremonies are also mentioned.

### CEREMONIES

1. Idols preparation (making of Pratima).

The use of certain plant products in preparing the idol or skeleton of *Pratima* is a common practice among the artists. There are reports of such use from the very beginning of the history of this ceremony. Generally jute, dry paddy plants, bamboos etc. are used.

In all there are 15 idols associated with the Durga Puja. They represent certain animals, Gods and Goddesses.

Goddesses Durga, Lakhmi and Saraswati represent power, wealth and learning respectively. Gods Karticka, Ganesha

and Mahisasura are Lords of War, Commerce and Evil power. The lion and rat are the mounts of Goddess Durga and Lord Ganesha. Mahisasura disguises himself as a buffalo. The mounts of Lakhmi, Saraswati and Kartick are owl, swan and peacock respectively. There is an image of cobra representing the dangerous reptiles. The remaining two images are Jaya and Bijaya, a couple of gate-keepers.

The worship of animals is a relic of our past culture where hunting of animal food was a common practice. Possibly it was believed that only through worship they could have good sport throughout the year and also escape the dangerous ones.

The plants used in idols preparation are : *Dhan (Oryza sativa)* *Karpasa (Gossypium spp.)* *Bans (Bamboos)* *Keshey (Saccharum spontaneum)*.

## 2. Idols decoration (Paratima decoration) :

Since the beginning of history, man has been a lover of beauty and has used dyes, paints and decorative materials to enhance beauty. There are many plants which can be used for the *Mandapa* but only the cork or *Sola (Aeschynomena aspara)* plants are used to decorate the idols. The white tissues of this plant, after painting are used for necklace and *Mala*.

## 3. Sthapana :

*Sthapana* is the placing of a water-filled earthen pot at the foot of *Bel (Aegle marmelos)* plant or a twig. Both the pot and the plant are painted with vermilion and worshipped after surrounding by *Tiri*; the combination of bamboo branch and *Talpata (Borassus flabellifer)*. This is generally 7-9 days before the full moon. It is believed that this ceremony is the worship of all Gods and Goddesses of

Hindus for the delegation of their powers to Goddess Durga and so that She might become almighty.

This *Sthapana* is sometimes called *Akal-bodhana* because it is believed that Lord Ramchandra changed the time of this ceremony from spring to autumn.

#### 4. Naba-Patrika .

*Naba-Patrika* is a religious term to show the assemblage of nine important plants offered in the ceremony. Sometimes they are also called *Naba-Durga*. Most of the plants are economically important. They are believed to be worshipped for better harvests. The plants are *Kala* (*Musa* spp.), *Haldi* (*Curcuma domestica*), *Bel* (*Aegle marmelos*), *Ashoka* (*Saraca indica*), *Jainti* (*Sesbania sesban*), *Darimba* (*Punica granatum*), *Aparajita* (*Clitoria ternatea*), *Dhan* (*Oryza sativa*), *Kachu* (*Colocasia esculenta*).

#### 5. The Puja :

The *Puja* is the actual performance of the ceremony. On the morning following the *Sthapana* ceremony, the idols are placed in a room or tent called *Mandapa*. For 3-4 days (*Maha Saptami*, *Maha Ashtami*, *Maha Nabami* and *Dasami*), they are worshipped with many plants and plant parts.

These plants and plant parts are used in different phases of this ceremony namely, *Naba-Patrika*, *Balidan*, *Homaghni* and *Dasahara*. But the ingredients are used under different headings : *Pancha Pallaba* : *Pancha Kasaya* ; *Pancha Sarsa* ; *Pancha-Guri*, *Sarbausadhi*, *Mahausadhi* , *Naibaidya* and *Prasad*.

*Naba Patrika* has already been described under item 4 above.

*Balidan* is the cutting of plants and fruits, in lieu of animals, into two pieces by a single stroke. Such plants and fruits are smeared with vermilion before the ceremony; they are *Akh* (*Saccharum officinarum*). *Kala* (*Musa paradisiaca*), *Chal-Kumra* (*Benincasa hispida*).

*Homaghni* is the sacred fire produced by burning certain woods on a small sand bed; Champhor, ghee and selected resin are used as fuel. Plant-twigs, fruits, leaves and flowers are added to the sacred fire. It is a call for burning of all sins, temptations and evils of human mind into ashes.

The plants are: *Bel* wood (*Aegle marmelos*), *Tulashi* (*Ocimum sanctum*), *Pan* (*Piper betel*) *Kala* (*Musa paradisiaca*), *Supari* (*Areca catechu*), *Jagna-dumur* (*Ficus racemosa*).

*Pancha-Pallaba* comprises the collection of fresh twigs of five different plants and is used throughout the ceremony. the plants are: *Am* (*Mangifera indica*), *Asvottha* (*Ficus religiosa*), *Jagna-dumur* (*Ficus-racemosa*), *Pakur* (*Ficus lacore*), *Bot* (*Ficus bengalensis*).

*Pancha Kasaya* comprises barks of five different plants. The barks are soaked in water and the water is used in the ceremonies of the next day. The plants are: *Jam* (*Syzygium cumini*), *Bokul* (*Mimusops elengi*), *Simul* (*Salmalia malababarica*), *Birala* (*Sida rhombifolia*), *Kul* (*Zizyphus jujuba*)

*Pancha Sarsa* comprises five different seeds. They are *Dhan* (*Oryza sativa*), *Til* (*Sesamum indicum*), *Mung* (*Phaseolus mungo*), *Jav* (*Hordeum vulgare*), *Swet sarisha* (*Brassica hirta*).

*Pancha Guri* is the collection of five powders. The powders are from *Bel* (*Aegle marmelos*) leaves, Rice or

Wheat (*Triticum aestivum*) grains, Kusumphal (*Carthamus tinctorius*) flower buds, *Haldi* (*Curcuma domestica*) rhizome and burned paddy (*Oryza sativa*) husk.

*Sarbausadhi* and *Mahausadhi* comprise the different medicinal plants used in the ceremony. The plants of *Sarbausadhi* are : *Jatamansi* (*Nordostachya jatamansi*), *Bach* (*Zingiber zerumbet*), *Kur* (*Saussurea lappa*), *Haldi* (*Curcuma domestica*), *Dar haldi* (*Berberis aristata*), *Sati* (*Curcuma zedoaria*), *Champa* (*Michelia champaca*), *Motha* (*Cyperus rotundus*).

The plants of *Mahausadhi* are : *Chakulia* (*Uraria lagopoides*), *Shyama-lata* (*Technocarpus frutescens*), *Bhringaraja* (*Eclipta alba*), *Shatamuli* (*Asparagus racemosus*), *Golancha* (*Tinospora cordifolia*), *Swet-birala* (*Sida rhombifolia*).

*Naibaidya* is an offering of sundried rice, banana and sugar. It is distributed among children.

*Prasad* generally comprises of fruits, seeds and sweets and is distributed among the worshippers at the end of the ceremony every day. The fruits and seeds are : *Narikel* (*Cocos nucifera*), *Khira* (*Cucumis sativa*), *Chhola* (*Cicer arietinum*), *Mung* (*Phaseolus mungo*), *Kamalanembu* (*Citrus reticulata*), *Batabi-nembu* (*Citrus maxima*), *Peyara* (*Psidium guajava*), *Mash-Kalai* (*Phaseolus aureus*), *Papaya* (*Carica papaya*), *Pani-phal* (*Traps natana*), *Darimba* (*Punica granatum*), *Sankaloo* (*pachyrrhizus erosus*), *But or Mattar* (*Pisum sativum*), *Am* (*Mangifera indica*), *Kala* (*Musa paradisiaca*), *Khajur* (*Phoenix dactylifera*).

#### 6. Dasahara.

*Dasahara* is the closing ceremony of the festivity. This day is also the day of reunion. The idols are carried to

a river or pond for immersion. After the ceremony the people come back to their homes and some drink Siddhi (*Cannabis sativa*) prepared with milk, sugar, coconut water (*Cocos nucifera*), Dalchini (*Cinnamomum zeylanicum*), Elachi (*Amomum aromaticum*) or (*Elettaria cardamomum*), Lavanga (*Syzygium aromaticum*), Tejput (*Cinnamomum tamala*), Ada (*Zingiber officinale*).

At the close of the ceremony Goddess Durga's name is written on banana leaf 12 times, one for each month that will pass until the festivities come round next year. The writing is done with a pen made from *Khagra* (*Saccharum fuscum*).

#### ACKNOWLEDGEMENT

My thanks are due to Dr. S. K. Jain. Economic Botanist for useful suggestions. I am grateful to Shri Adhir Kumar Mukherjee, the priest, for his kind co-operation in collecting the actual material from the fields.

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A LIGHT-TRAP SURVEY OF DARJEELING BITING  
MIDGES (INSECTA)

BY

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INTRODUCTION

The photophilic habit is widespread in insects and because most insects possess a flying ability in adult stage, it is common to see them hover relentlessly around all possible light-sources in the night. The insects of Darjeeling, comprised of many a high-altitude species, are no exception.

The photophilic habit of insects, as above, has helped us to understand various phenomena of insect-world of an area including such first-needed points as kinds of insects prevailing in the area, relative abundance of those kinds and their seasonal incidences by collecting the insects of the area by a standard light-trap and according to competent authorities (Beck, 1958), inferences made on the basis of such collections of insects at light-sources fairly represented the actual states of many of their bionomical phenomena as existed in nature.

Since March 1968, we have been making regular light-trappings at the premises of the Government College, Darjeeling. In two previous communications (Das Gupta *et al*, 1969, Sinharay *et al*, 1969), our analyses of some bionomical phenomena of dipterons of Darjeeling, based on such catches, have been furnished. In this paper, we furnish our observations on biting-midge dipterons of Darjeeling, light-trapped during 22 nights between May 10 and July 10, 1969—the period in a year when atmospheric humidity

averages at 71.7% (60.4% to 83.9%) and temperature at 18.6°C (17.8°C, to 19.4°C), and biting midges are quite active in Darjeeling. Incidentally, the biting midge insects of family Ceratopogonidæ (Diptera) are being increasingly found as vectors of a number of disease agents and since sometime past, extensive surveys are being made in different parts of the world to assess their natural incidence and to devise control measures when they attain a pestiferous status.

#### MATERIAL AND METHOD

The light-trap devise used now was same as that of Sinharay *et al.* (1969). The light-source in the trap of the present study, however was a mercury vapour lamp of 500 wattage.

Generic diagnosis of the trapped insects was made following the comprehensive synoptic table of Wirth (1959). The number of the trapped specimens on all occasions was ascertained by direct counting of the same.

#### OBSERVATIONS

Results of our light-trap collections of biting midges in the premises of the Government College, Darjeeling, during 22 nights from May 10 to July 10, 1969 are shown in table below—

It follows from the table that a total of 2995 ceratopogonid insects were trapped in 22 nights of collection. A total of 2273 moths trapped at the same time suggested the insect activity in general at light-sources in the area. Of 2995 ceratopogonid insects, 2973 specimens are found as belonging to 6 ceratopogonid and as : *Forcipomyia* 45.21%, *Culicoides* 34.66%, *Atrichopogon* 17.09%, *Stilobezzia* 0.61%, *Dasyhelea* 0.534% and *Alluaudomyia* 0.301%. Other 22 specimens listed in the table under Miscellaneous Genera

TABLE 1: *Biting midges and moths collected by a light-trap in the premises of Darjeeling Government College (1966 metres from sea-level) during May 10 to July 10, 1969.*\*

Date of collection	Trapped moths and biting midges		Biting midge populations (shown genuswise, F = female, M = male)												Total.
	Moths	Midges	Alluaudomyia	Atrichopogon	Culicoides	Dasyhelea	Forcipomyia	Stilobezzia	Misc. genera	F.	M.	F.	M.	F.	
May	10	122	F. --	M. 2	F. 1	M. 4	F. --	M. 5	F. 15	M. --	F. --	M. --	F. --	M. --	24
	13	256	F. --	M. 11	F. 3	M. 1	F. --	M. 9	F. 20	M. --	F. --	M. --	F. --	M. --	58
	16	226	F. --	M. 12	F. 10	M. 3	F. 4	M. 4	F. 63	M. 4	F. 1	M. 10	F. 4	M. 2	163
	19	321	F. 1	M. 10	F. 17	M. 5	F. 4	M. 1	F. 25	M. 30	F. 2	M. 4	F. 4	M. 2	101
	22	120	F. 1	M. 3	F. 6	M. 4	F. --	M. 1	F. 6	M. 8	F. 1	M. 4	F. 2	M. 1	30
	23	X	F. --	M. 14	F. 22	M. 27	F. --	M. 1	F. 9	M. 5	F. --	M. --	F. --	M. --	89
	25	X	F. --	M. 7	F. 16	M. 8	F. --	M. 6	F. 10	M. --	F. --	M. --	F. --	M. --	51
	28	30	F. --	M. 1	F. 1	M. 1	F. --	M. 1	F. 1	M. --	F. --	M. --	F. --	M. --	3
	31	8	F. --	M. 23	F. 2	M. 1	F. --	M. 1	F. 1	M. --	F. --	M. --	F. --	M. --	5
	June	3	X	F. --	M. 23	F. 33	M. 16	F. --	M. 1	F. 28	M. 27	F. --	M. --	F. 1	M. 2
6	6	90	F. --	M. 20	F. 12	M. 9	F. --	M. 9	F. 16	M. --	F. --	M. --	F. 2	M. 1	96
9	71	131	F. 1	M. 12	F. 9	M. 4	F. 2	M. 43	F. 29	M. 1	F. --	M. --	F. 1	M. 1	125
12	15	166	F. --	M. 8	F. 19	M. 7	F. --	M. 15	F. 21	M. --	F. --	M. --	F. --	M. 2	80
15	166	318	F. --	M. 13	F. 14	M. 75	F. --	M. 82	F. 109	M. --	F. --	M. --	F. --	M. --	358
19	110	22	F. 2	M. 18	F. 10	M. 24	F. 1	M. 72	F. 147	M. --	F. --	M. --	F. 3	M. 1	346
22	25	66	F. --	M. 4	F. 4	M. 3	F. --	M. 40	F. 42	M. --	F. --	M. --	F. 1	M. --	144
25	29	29	F. --	M. 7	F. 20	M. 8	F. --	M. 12	F. 19	M. --	F. --	M. --	F. 1	M. --	45
28	1	34	F. 1	M. 16	F. 25	M. 128	F. 1	M. 53	F. 33	M. --	F. --	M. --	F. 1	M. --	70
July	1	46	F. --	M. 36	F. 19	M. 52	F. --	M. 44	F. 29	M. --	F. --	M. --	F. 1	M. --	336
4	7	78	F. --	M. 40	F. 23	M. 136	F. 1	M. 73	F. 45	M. --	F. --	M. --	F. 1	M. --	238
10	51	51	F. --	M. 23	F. 48	M. 48	F. --	M. 45	F. 45	M. --	F. --	M. --	F. 1	M. --	369
Total=2273	5	4	293	219	653	385	9	7	641	713	7	11	22	26	2995

\* Cross-mark (x) in table indicates data not recorded and dash-mark (-) that no specimen turned up in the trap.

belong to 3 other genera but these are not named now as the specimens do not key out satisfactorily.

*Forcipomyia*, *Culicoides* and *Atrichopogon* thus form the major elements of the Ceratopogonid fauna in the present study area of Darjeeling, with *Stilobozzia*, *Dasyhelea* and *Alluaudomyia* and three other genera (not named now) as the occasional elements. All *Stilobezzia* specimens collected now belong to the subgenus *Nostilobezzia*, hitherto unrecorded from the Indian subcontinent.

Of the rarer genera, *Alluaudomyia*, *Dasyhelea* and three other unnamed genera appear in the trap in all the months between May and July. The *Neostilobezzia*, however, appears in May only.

Per night catch of biting midges now stands at 136.14, but it varies from month to month and also from group to group. The overall rate is 58.22 in May, 162.0 in June and 253.25 in July. The per night appearance pattern of *Forcipomyia*, *Culicoides* and *Atrichopogon* is 61.55, 47.18 and 23.27 respectively. The average catch of *Forcipomyia* in May is 27.22, in June 87.89 and in July 77.0. The same for *Culicoides* in the three months are 13.11, 43.67 and 131.75 respectively while for *Atrichopogon* are 11.0, 27.22 and 42.0 respectively. Thus in the study area now, while *Atrichopogon* and *Culicoides* are most abundant in June.

The female : male ratio in the trapped biting midges now stands at 54.4 : 45.6. *Alluaudomyia*, *Atrichopogon*, *Culicoides* and *Dasyhelea* specimens show a higher ratio of females over males, females being 62.9% in *Culicoides* populations while higher male ratios are encountered in *Forcipomyia*, *Neostilobezzia* and other genera.

Analysis of 134 female *Culicoides* showed that 39 specimens were engorged with a bloodmeal while 9 other

specimens had ripe ova. Thus 29.1% of the light-trapped *Culicoides* females of Darjeeling remain in engorged state while 9.5% are gravid.

#### SUMMARY

Using an indigenous light-trap, with a 500-watt mercury vapour lamp as the light-source of the trap, a total of 2995 biting midges of family Ceratopogonidae (order-Diptera) were collected from the premises of the Government College, Darjeeling, during 22 nights from May 10 to July 10, 1969. A total of 2273 months, 103.3 as nightly average, was also caught in the same operation indicating the general insect activity in the area at light-sources.

The trapped biting midges were : 45.21% *Forcipomyia*, 34.66% *Culicoides*, 17.09% *Atrichopogon*, 0.601% *Stilobezzia*, 0.534% *Dasyhelea*, 0.301% *Alluaudomyia*, plus 22 specimens of 3 other unnamed genera.

During May to July, biting midges are most abundant in July with nightly average-catch at 253.25. Genuswise, *Atrichopogon* and *Culicoides* flourish in the area in July while *Forcipomyia* specimens are most active in June.

Female : male ratio in the trapped biting midges is 54.4% : 45.6% Females predominate over males in the catches of *Alluaudomyia*, *Atrichopogon*, *Culicoides* and *Dasyhelea* while in *Forcipomyia*, and *Neostilobezzia*, males predominate. Incidentally, this is the first record of *Neostilobezzia* occurring in India, the group formerly being known from Southeast Asian countries in Asia.

Of light-trapped *Culicoides* females now, 29.1% were replete with bloodmeal while 9.5% carried ripe ova in their abdomen.

ACKNOWLEDGEMENTS

The present authors are grateful to Dr. B. Dasgupta, Principal, Darjeeling Govt. College, for light-trapping facility in his college premises. Their thanks are due to Sri M. Datta, Research Scholar in the P. G. Dept. of Zoology, Darjeeling Govt. College, for help in making light-trap collections for the present study.

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A FURTHER DESCRIPTION OF *Ectopsocus briggsi*  
McL (Peripsocidae, Psocoptera) from Shillong, Assam,  
India.

*Ectopsocus Briggsi* McL. recorded for the first time from Shillong (6,000 ft. altitude), differs from the Australian (McL. 1899) and European species Bad, 1943 in having four long setæ on each apical lobe of subgenital plate and a short distinct spine in between two inner setae, although appears to be closely allied, being similar in wing pigmentation and having curved apical lobes. It has been found necessary to supplement colour variation, taxonomic characters of importance to the existing descriptions made by the previous authors.

I wish to express my thanks to the Directors, Zoological Survey of India for the laboratory facilities afforded to me, to Dr. B. K. Tikadr, Suptd. Zoologist, of the same insititute, for the gift of psocid specimens.

Female Colouration :—Epicranium yellow with grey markings on vertex, epicranial suture, between eyes; clypeus, labrum greyish; antennal and maxillary segments grey; eyes black, ocelli red.

Thoracic tergites white with grey tinges.

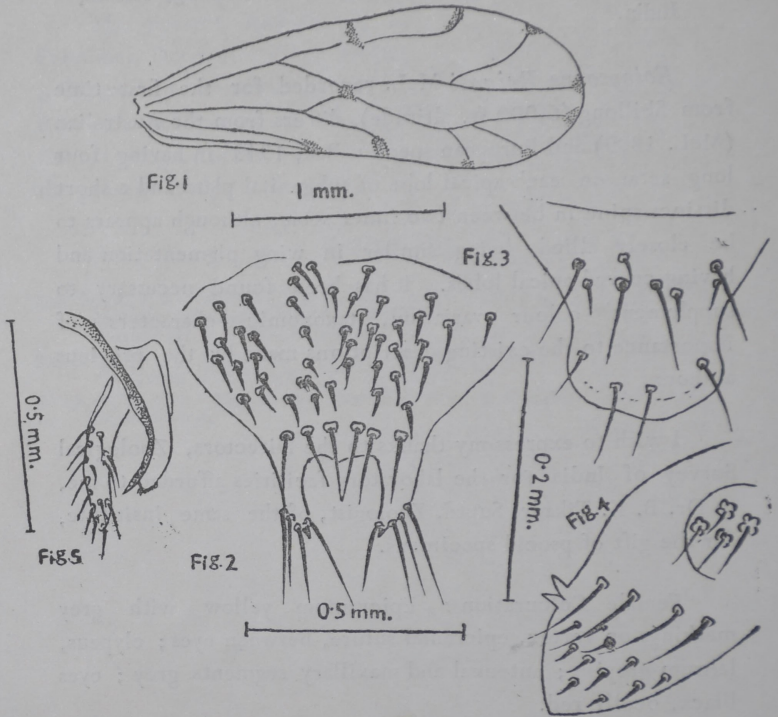
Segments of legs grey, tibial spurs dark brown.

Forewing (Fig. 1) transparent, pterostigma except central portion *m+cu* and veins at tips dark grey.

Hindwing transparent.

Abdominal tergites with 7 distinct dark brown bands,

Morphology :—Head with decumbent hairs; antennæ hairy, slender; lateral dorsa with stiff hairs; wings with



microchætæ ; number of ctenidiobothria on first joint of hind tarsus 13.

Subgenital plate (Fig. 2) with long, prominent apical lobes, each distinctly curved on inner margin, terminally bearing four long setæ and a short spine in between inner setæ, a row of six long setæ subapically. (Bad, 1943 shows 3 long setæ, no row of setæ subapically)-

Epipect (Fig. 3) rounded apicad, subapically with four minute setæ ; slightly constricted and four long setæ mesad.

Paraproct (Fig. 4) with marginal bifid tubercle, a field of 8 trichobothria.

Gonapophyses (Fig. 5)—Ventral valve sclerotised, styli form : dorsal valve spinous apically ; external valve slightly longer than dorsal valve with 7-8 long setæ on outer margin, setæ on surface sparse.

Body length	...	2mm.	
Length of forewing	...	2.32 mm.	
Locality	...	Botanical Garden,	Shillong,
			Assam.
Date	...	Nov' 1965	
Collector	...	B. K. Tikader.	

B. Datta  
Zoological Survey of India  
Calcutta.

## NOTES &amp; NEWS

1. WHITE BROWED GIBBON (*HYLOBATES HOOLOCK* HARLAN) AND CAPPED LANGUR (*PRSEBYTIS PILEATUS* BLYTH) AS HUMAN FOOD.

Human dietary list consists of many and varied stuff. Prater (1965) mentions, "the flesh of monkeys is commonly eaten by most of the forest tribes in India". It is, however, not clear whether by the word monkeys he means the langur and gibbon also. Mukherjee (1966) stated that the Nilgiri langur has been persecuted for its fine fur and by some tribals for food, medicine and superstitious cure etc., but Khajuria (1960) who carried out some field observations on the langur of Garo Hills, did not mention anything.

Langur is considered to be a sacred animal by some people in India and in most parts of the country the primates are rarely molested, contrariwise the author has observed that in the hills of Assam almost all the species of monkey, langur and gibbon are eaten by some people.

In March 1965 while a party of our station of Zoological Survey of India was collecting specimens in Tura, headquarters of Garo Hills district, we shot some capped langurs. They were moving in a party on tree tops, when we observed them. It consisted of males, females and very young ones. When shot one langur fell on the lower branches of an old tall tree. Its body got hung up and with our best efforts we did not succeed in bringing it down. Hence, we requested some local people, who willingly agreed to help us, on the condition that the flesh would be given to them. On this agreement they brought down the langur with the help of bamboos. It was quite a dangerous and painstaking job which those people undertook for the lure of the flesh of that langur.

Another day one military officer who was staying with us in the Inspection Bungalow accompanied us. That day we



located one full grown male hoolock in a deep jungle far away from the locality and we were able to shoot the animal (photographed).

The flesh of that hoolock was given to that officer at his request and there was a grand feast that night in their part of the I. B.

*Hylobates hoolock*, locally known as *Huleng* in Khasi and '*Hawchuk*' in Lushai, is the only ape found in India and its distribution is limited to the hill forests of Assam in Indian territory. During the author's travel through this region it has been seen only in Garo hills, near Tura, and in the deep jungles of North Cachar and Mikir hills. An isolated individual was also seen in March 1965 on a small island of Brahmaputra R. Near Gauhati.

Human relationship is one of the most important factors of animal survival and already some of our precious species are either extinct or on the verge of extinction, due to unabated human persecution. As no information is available on the present status of *hoolock*, an authoritative survey of its population appears to be a pressing need.

I am thankful to Dr. B. K. Tikader, Officer-in-Charge, Eastern Regional Station, Zoological Survey of India for facilities and Shri R. K. Varshney, Zoologist, for going through the manuscript. My thanks are also due to Shri M. R. Rynth, Jr. Zoological Assistant, for the local names used.

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Zoological Survey of India  
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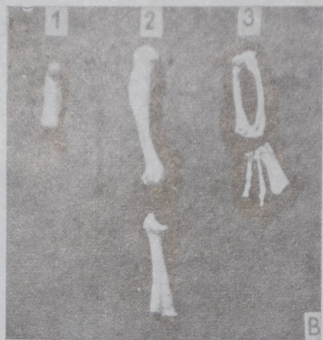
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(Sent by the kind permission of the Director, Zoological Survey of India, Calcutta.)

2. ECTROMELIA AND SYNDACTYLY IN A SPECIMEN OF *Bufo himalayanus*.

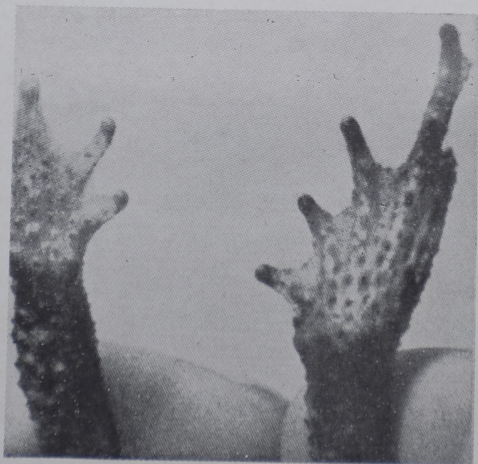
Congenital abnormalities in the limb of toads have been recorded in the literature from time to time. Costa (1960) mentioned some of these records and described a case of malformed limb in a specimen of *Bufo melanostictus*. We have noticed the following abnormalities in a specimen of *Bufo himalayanus* brought to this Department for dissection.

Externally, three limbs only were present, the left fore-limb being represented by a small stumpy structure, which occasionally moved. There were only three digits in the right hind-limb, the third digit being thick and stout. The right fore-limb, and the left hind-limb appeared to be normal in every respect. The stump representing the left fore-limb was supported by a vestigial humerus which was attached to the glenoid cavity of the left side of the pectoral girdle. The deltoid ridge and the trochlear region could not be distinguished in this abnormal bone. The normal humerus of the right side measured 21 mm in length while the corresponding vestigial humerus of the left side measured 10 mm only. The thick third digit of the right hind limb was found to consist of the third, fourth and the fifth digits syndactylosly bound together. The phalanges could not be separately distinguished.



*Explanation of figures*

- Fig. A.** The abnormal toad viewed from the ventral side. The stump represents the vestigial limb.
- Fig. B.** 1. The vestigial left humerus.  
2. The normal right humerus and radio-ulna.  
3. Right astragalus-calcaneum and the abnormal digits syndactylously bound together.
- Fig. C.** The external appearance of the left normal hind-limb and the right abnormal hind-limb.



The abnormality of the fore-limb recorded here corresponds to the condition defined as 'ectromelia', i. e., the suppression of a part or the whole of a limb, as recorded in the medical literature from time to time (Gaisford and Hartley, 1950). Syndactyly of the second, third, and fourth digits has also been recorded in human beings (Perkins, 1950). Gaisford and Hartley (1950) note that ectromelia is probably a Mendelian character, and syndactyly is known to behave as a Mendelian dominant. It is interesting to speculate, if the abnormalities recorded here, could also be demonstrated as Mendelian characters, if a suitable breeding experiment could be conducted.

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3. ABNORMAL LEAF-FORKING IN BEILSCHMIEDIA ROXBURGHIANA NESS.

The phenomenon of abnormal forking of leaves has been reported in a number of dicotyledonous plants by several investigators. De Sarkar and Dutta (1952) have recorded a case of abnormal bilobed leaf in *Ficus religiosa* Linn. a member of Moraceæ. Sabnis (1931), Singh (1930, 1931 & 1935, Srinivasalu (1956) and Siddiq (1952) have studied teratological features of certain Indian plants. Very

recently, Mukherjee and Singh (1963) have noted the presence of forking of leaves in *morus indica* Linn. of Moraceae. The present report on leaf-forking of the taxon under investigation appears to be the first record in the family Lauraceae.

The plant, about 2.1m high with spreading branches is growing in the Indian Botanic Garden, Sibpur, Howrah. The author observed an abnormal forked leaf on a branch of the plant. The blade and petiole of the leaf are wider than the normal one; the blade is partially bifurcated at the apical region into two lobes each of which has its own midrib and leaf tip. It may be stated that the two lobes are equal in shape, size and venation with clear reticulation.

This abnormal leaf-forking in the present taxon may be due to the plan of arrangement of its venation as assumed by De Sarkar and Dutta (1952); or bifurcation or fission of the midrib as compared to abnormal leaf-forking of *Jasminum pubescens* Wild. (Bhatnagar, 1957) and *Nyctanthes arbor-tristis* (Chakraverti, 1955). Masters (1869) has expressed the view that "fission is due perhaps as much to the absence or relatively small proportion of cellular as compared with vascular tissue". Goebel (1906) in supporting the above view opined that there exists a definite relationship between the shape and form of the leaf and its vascular distribution i.e. venation.

#### ACKNOWLEDGEMENTS

The author is thankful to late Dr. J. Sen, Deputy Director, Botanical Survey of India, for his kindly initiating this study. His thanks are also due to Shri S. N. Mitra, Indian Botanic Garden for providing necessary help during this investigation. Lastly, he wishes to express his sincere thanks to Shri K. S. Srinivasan, Deputy Director, Botanical Survey



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#### 4 CASES OF INTESTINAL MYIASIS IN THE HIMALAYAN ZOOLOGICAL PARK, DARJEELING

##### (1) *Sarcophaga* sp. infesting a captive leopard :

In October, 1963, a large number of dipterous larvae were noticed in the freshly-passed stool of a captive leopard in the Himalayan Zoological Park, Darjeeling. Unfortunately, most of the material was thrown away, and only three larvae were available to us for study. These larvae were offered fresh meat and also undigested meat collected from the stool passed by the same leopard. The larvae readily attacked fresh meat, and took no notice of the undigested meat. Pupae were obtained after one month. In February, 1964, two of these pupae were transferred to Siliguri, where adult flies

readily emerged ; but these adults died almost immediately. One adult fly emerged in Darjeeling in May, 1964. This adult fly could be kept alive for more than four months, on pieces of meat, honey and water.

The adult fly was identified by Dr. H. Oldroyd of the British Museum of Natural History, London, as *Sarcophaga* sp. He thought that this was a new species, and advised us to send further material to Professor B. B. Rhodendorf of the Academy of Sciences of Moscow. We could send only one female specimen to Professor Rhodendorf, who reported that the insect might be *Parasarcophaga* (= *Sarcophaga*) *albiceps*, but in the absence of a male specimen the exact determination was not possible.

(2) *Sarcophaga* sp. infesting the Keeper of Leopards :

A second case of intestinal myiasis occurring in the Himalayan Zoological Park was brought to our notice in October, 1967, and this time it was the Keeper of leopards who harboured the fly larvæ in his intestine. The Keeper reported to us that he noticed the maggots in his stool at the time of defæcation. The period of attack lasted 2-3 days, and during this period he had symptoms like nausea, stomach-ache, anorexia, and that his stool was loose. Adult flies were bred from these larvæ, and sent to the British Museum of Natural History for identification. The identification report signed by Dr A. C. Pont stated that the fly was a *Sarcophaga*, the male genitalia of which was quite unlike that of any described species. The specimens have been placed in the collection of the British Museum for future investigation by experts.

The infection was probably acquired through oral route in both the cases. The Keeper of leopards admitted having consumed stale meat on which he noticed flies. He further stated that he did not notice any fly at the time of

defæcation, and that he had no ulcer in the anal region. In the case of the leopard there was no evidence to show that the larvæ were deposited by the adult fly around the anal region of the leopard, or in the stool immediately after defæcation. These possibilities were strongly discounted by Mr. B. N. Ghosh, Veterinary Officer, Himalayan Zoological Park, who maintained that the larvæ were passed with the stool and that there was no injury in the anal region of the leopard. That the larvæ did not ordinarily feed on fæcal matters was suggested by the fact that they attacked fresh meat, and took no notice of the undigested meat collected from stool. There was no evidence to show that the larvæ fed normally on injured tissue.

A search in the literature failed to reveal any previous record of the infestation of the elementary tract of a leopard by dipteros larvæ, though the developmental stages of *Sarcophaga albiceps* have occasionally been recorded in the human fæces (Zumpt, 1965), and it has been stated that the larvæ of Celliphorine flies may survive passage through alimentary canal during certain gastrointestinal disturbances (Zumpt, 1963).

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## 5. THE PRINCESS

The tiger cub "Princess" was found after her mother had been killed by a hunting party. She was barely a couple of days old ; a small Fox Terrier bitch accepted and nursed her. At the age of 6 weeks she was taught to eat raw meat. The terrier always stood by and watched the cub taking its food and could have some meat out of the same dish if she liked. They slept together, played and hunted together. As time went on, the cub made more friends a donkey, a mongoose and a monkey. They used to spend hours together. When the cub was a year old she went for long walks on her own in the nearby jungle, but always returned to her home and friends, and her first thought was for her foster mother the terrier. When all her different friends were feeding she delighted in tasting their food—grain, raw eggs, fruit, in fact whatever they were eating. Their most wonderful game was chasing each other in and out of the house and round the garden. This type of sport had to be stopped—often the donkey would slip on the floor in the house and they would all pile up together. Then the fun would start again when they had sorted themselves out. "Princess" was always in the lead, then the donkey, followed by the monkey, the mongoose and the terrier. Tree-climbing was next on the list. It was amusing to see the monkey and the mongoose go up, the cub next but not too steady, but the poor little donkey and the terrier trying hard to get up without any success : they would sit under the tree until their friends were tired of the game.

"Princess" was never tied or caged in her life. Her sleeping quarters were on a camp bed with the terrier, monkey and mongoose tucked up with her and the donkey sleeping by the side of the bed.

It is sad that animal life is so very short. 'Princess' died at the age of 4 years 3 months of Cat Flu for which there was no cure at the time—her little foster mother died at the same time on the same day. The mongoose was not seen after 'Princess' died. The monkey and donkey had no interest left in life—they just spent their time looking for their friends.

So ended a chapter in the lives of a very much loved and happy family.

The Club, Darjeeling  
16.7.69.

M. WISDEN

#### 6. MULTIPLICITY OF BLOOD INFECTION IN THE HIMALAYAN FLYING SQUIRREL.

We have come across multiplicity of blood infection in the Hodgson's flying squirrel (*Petaurista magnificus*) collected in and around Darjeeling. Nine adults and six young animals have so far been examined and the result is as follows :—

In four adult specimens malarial parasites and a filarial infection occurred together, while in one case a *Trypanosoma* occurred along with malarial parasites and filarial infection. Malarial parasites occurred alone in two specimens while *Trypanosoma* and malarial parasites occurred together in two more specimens.

Malarial parasite and *Trypanosoma* occurred together in one young specimen, while *Trypanosoma* and *Hepatozoon* occurred separately in two other young specimens. Three young specimens were free of blood infection.

Evidences indicate that malaria in these animals represents a mixed infection caused by two different parasites occurring in the single host, and the filarial infection is also caused by two different filarial worms showing distinct types of microfilariae. Reports on some of these parasites have appeared elsewhere (Dasgupta, B., *Trans, B. Soc. trop. Med Hyg.*, 59, 716, 1965 ; Dasgupta, B. *et al, Ibid.*, 61,441,1967 ; Dasgupta, B., *Parasitology*, 57,467-474, 1967 ; Dasgupta, B. and Chatterjee A., *Parasitology*, 1969, in the press).

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