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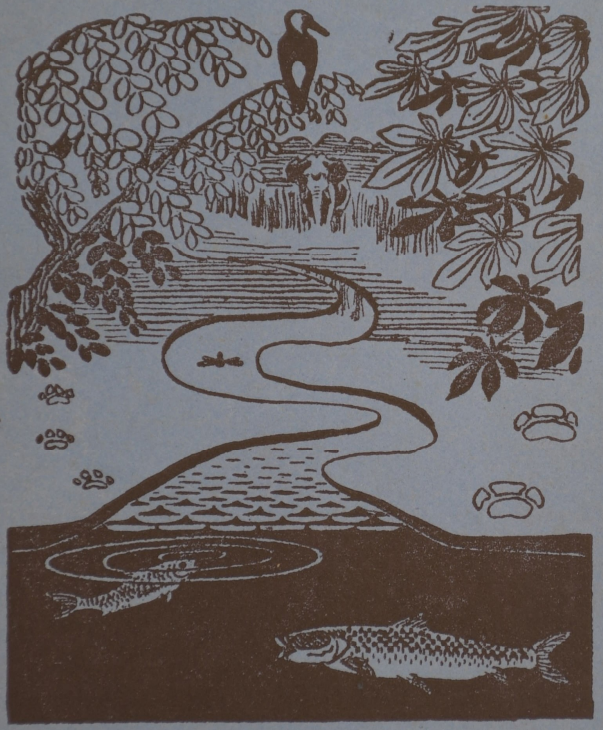

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BENGAL NATURAL HISTORY SOCIETY.

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The Society under the name Darjeeling Natural History Society was started about the end of 1923, the objects being to maintain the Museum in a proper condition, to promote the study of Natural History and to get together as complete as possible collections of Natural History specimens from a limited area, including "the Civil Districts of Jalpaiguri and Darjeeling and the State of Sikkim", as well as what could be procured from the neighbouring countries of Tibet, Bhutan and Nepal.

Government and Municipal grants not being sufficient for our purpose, it was proposed to enrol members so as to increase our funds, and a quarterly journal has been started. The journal is no longer confined to articles on the Natural History of the above-mentioned area, but includes those from anywhere. It is hoped that everybody will join the Society and co-operate to make the Museum and Journal a success.

The annual subscription is only Rs. 10 ; Life membership Rs. 150 ; those who have been members for over twenty years can become Life Members on payment of Rs. 75.

Members get copies of the Journal free and other privileges. All facilities are also given to members to study the museum collection and expert advices are given to them regarding collection, preservation and identification of specimens.

Application for membership should be made to :—

THE CURATOR,
Natural History Museum,
Darjeeling.

Editorial

THE Society acknowledges with sincere gratitude the services of Mr. J. A. Hulbert, Curator of the Lloyd Botanic Garden, Darjeeling who had been in charge of the Natural History Museum since January, 1951, and had successfully maintained the activities of the Museum and the Society.

In March, 1952, Mr. S. Thomas Satyamurti, Curator for Zoology from the Madras Museum, took charge as Curator of the Natural History Museum and the task of editing the present issue of the journal has now been undertaken by him. He requests the members of the Society and others interested in Natural History, to accord their help and co-operation by contributing articles to the journal.

Members are requested to send in their subscriptions due to the Society, if they have not already done so.

Natural History specimens of interest presented to the Society, for its Museum will be gratefully accepted and preserved.

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Lynx lynx isabellinus Blyth.

The Tibetan Lynx

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VOL. XXV. DECEMBER 1951. No. 2.

SOME WILD CATS

BY

C. M. INGLIS, F. Z. S., C. M. B. O. U.

(*Continued from Vol. XXV, No. 1, page 6 ; with two half-tone plates and a coloured plate.*)

3. Pallas' Cat. *Otocolobus manul nigripectus* (Hodgson).

This is a small cat about the size of a domestic one. The head and body are about the same size as in the Marbled Cat, but the tail is only half as long. The muzzle is very broad, giving the head a rounded appearance and the ears are set widely apart and low down. The crown is covered with black spots and there is some white round the eyes surrounded by a black rim ; the cheeks have a white streak edged with black. The loins have a few widely separated stripes and the tail has black rings and a black tip. According to Col. A. E. Ward, this cat is, sometimes, called the "Silver-tipped cat" on account of the white hairs which mingle with the buff ones giving a silvery appearance to the animal.

Hodgson gave the size as:—Head and body 18¾ inches ; tail, 8½ inches ; height 9 inches and weight 6 to 7½ lbs. Other specimens have measured :—Head and body 20 inches and tail 9 inches and 9½ inches.

The distribution of this subspecies, as given by Pocock, is "Tibet and Kashmir". There is another subspecies, *Otocolobus manul ferrugineus* Ogner, the distribution of which is "Transcaspia, N. Persia, Afghanistan and Baluchistan". It differs in colour "having a rusty-reddish hue."

Very little is known of the habits of Pallas' Cat. It is said to live among rocks and prey on small mammals such as mouse-hares (*Ochotona*) and on birds. Pocock writes, "Its pallid colour matches its surroundings and the high-set eyes, short, low-set ears and flat forehead are adaptations for peering at prey over the edge of a sheltering rock with the smallest possible area of the head exposed. A specimen kept in the Zoological gardens carried its tail low, with the end, which was continually jerked up and down, unfurled, displaying the black of its underside. Its "spit" was a short, sharp "ts, ts, ts" projected through closed lips, and its sexual call was the combination of the bark of a small dog and the 'hoot' of an owl.

A. E. Ward kept one which became very tame but disliked being interviewed, especially by strangers. Prater, however, says it shows no fear of spectators and is very silent.

One November morning in 1937 when I met Sir John Anderson, then Governor of Bengal, riding round Birch Hill in Darjeeling, he stopped and asked if I had seen the tame Pallas' Cat which a man had brought from Tibet. He told the man to show it to me, but he refused to take it to the Museum in case I made a specimen of it! I saw it, however, at Government House and Lord Ardee, who was an A. D. C. there, kindly gave me enlargements of the two photographs which he took of it; these are reproduced here. It was very tame with its owner but rather shy towards visitors.

4. The Tibetan Lynx. *Lynx lynx isabellinus* Blyth.

A powerfully built cat, with tufted ears and a very short tail, weighing up to 60 lbs. and, according to Blanford, measuring head and body 33 inches and tail 7¾ inches. Colonel A. E. Ward recorded one with the head and body 34 inches and tail 8 inches. The colour of the fur varies a good deal. In summer, when the coat is shorter, it is rufous-tawny and in winter, when it is longer, it is mostly silvery grey. The pattern consists of black stripes dorsally and black spots on flanks and legs; sometimes the former are scarcely visible and the latter brown, or fuscous, instead of black. The frontispiece to this article, by Mr. M. Sain of Darjeeling, shows the colour of a tame specimen which I owned.

Otocolobus manul nigripectus (Hodgson)
Pallas's Cat

Photo Lord Ardee.

Otocolobus manul nigripectus (Hodgson)
Pallas's Cat with its Tibetan owner

Photo: Lord Ardee.

Pocock gives the distribution of this race as: "Tibet, Kashmir, Kuen Lun Mountains, Turkestan, Thian Shan and Altai mountains". F. M. Bailey found it rare near Gyantse in Tibet and A. E. Ward said it was common in the Nulra Valley in Ladak.

The Tibetan Lynx is partial to willow-scrub, gorse, tall grass, etc., at elevations varying from 9,000 to 18,000 feet. C. H. Stockley found it in June at the former elevation and in July and August at the latter. It preys on any animal it can overcome such as wild sheep and goats, marmots, hares, mouse-hares, pheasants and partridges. Little has been recorded about its breeding habits but three half-grown cubs were seen in August, so probably two or three is the number of the litter. They are said to be born in a cave or among rocks.

This cat makes a charming pet in captivity and even in the climate of Alipur Zoo in Calcutta, one lived for six years and was still in perfect health and vigour when it left there. Before it went to the Zoo it had been tied up in the shade during the day, for a period of two years, and slept at night in a stable. It was bathed every morning with soap and water and well dried with a towel. Having been kept in seclusion for so long it was suspicious of strangers when transferred to the Zoo. It allowed itself to be handled by those it knew and recognised a friend, after a long absence, rubbing itself up against the person and purring, to show its great pleasure. It was, sometimes, noisy at night and had a dislike for domestic cats and once nearly killed one which came too close to it. Its food consisted of 1½ lbs. of boiled beef, morning and evening and a pint of milk in the morning and water was always near at hand. It slept during a large part of the day and became lively at night making occasional springs.

Tibetan Lynx cubs used to be, sometimes, brought into Derjeeling and I was fortunate enough to buy one there in 1925. At that time I was living in a boarding-house until the top flat of the Natural History Museum, which was empty, could be converted into living quarters. The Lynx, which I named 'Bonzo', had the whole of this empty flat to itself and its great

joy was to sit on a window-sill and watch the people coming and going on the road below. I have never possessed a more friendly and playful pet. I have kept many animals and birds, in my time from a leopard downwards. There was a bookcase in the flat and, sometimes, when my back was turned, or if I was bending down to get a book, 'Bonzo' would rush at me from behind and leap on to my back, or shoulder, with such impetus that I often fell down, and it was all in play. He was very full of spirits and the *joie-de-vivre* and, so far as I was concerned, was never savage. When I took up my quarters in the Museum poor Bonzo had to be banished to the basement, much to his disgust. A very amusing episode happened at that time. A friend of mine, who was a well known portrait painter, came to see me on my birthday and asked if he could see the lynx. I went down to the basement and brought him up on a chain. In playfulness he jumped on to my friend's chest and gave him a terrible fright as he thought he was going to be torn to pieces or, at any rate, bitten! While Bonzo was in the basement he was chained up on account of the children which visited the Museum. He seemed to have an aversion for them and always tried to get at them, once he did scratch one which got too near him. My pet feared nothing and would even try to attack a dog as big as a mastiff. Every morning, after breakfast, I took Bonzo round the Mall on his chain and he caused quite a sensation, especially to ladies who were taking their Pekes, or other small dogs, out for exercise. The inquisitive little beasts would come sniffing fairly close to my pet and he would leap at them to the full extent of his chain and there would be a yelp from the tiny dog although it hadn't been touched, and a scream from its mistress! There was one thing Bonzo intensely disliked, that was being picked up and placed on one's lap; he never scratched but fidgeted to get down. The only occasions on which he was still were when I held him by the scruff of the neck, and he hung limply from my hand. He was very heavy and I could not hold him up for long. Bonzo was a very quiet animal and, like the one at the Alipur Zoo, would purr while rubbing himself against my leg. Ultimately he went to the Edinburgh Zoo.

The vernacular names are *Ee* (Tibet, Baltistan); *Jungli Billi*; (Dun); *Patsalan* (Kashmir).

(To be continued)

PRESERVATION OF WILD LIFE

BY

The Chief Conservator of Forests, Mysore.

Wild life, as a necessary unit of the Forests, has been recognized in Mysore State for over 60 years, ever since the first herd of elephants was captured in a Khedda by Mr. Sanderson in the year 1887-88. The question of protection, control, and shooting of wild animals, has always engaged the close attention of the Mysore Government Forest Department. Game laws have been drafted after thorough examination of all aspects, and protection and control embrace big and small game, birds and fish. A survey of game birds was made in the years 1939-40, and bird sanctuaries have been established in the islands of Cauvery River. Trained pisciculturists have surveyed the waters of the State with a view to development of fisheries as a source of food, as a biological control for diseases, and as an amenity for sportsmen.

Shooting of game is regulated by the issue of pre-paid licenses, specifying the number and kinds of animals on each license, and the close season to be observed. Animals doing serious damage to life and property, like man-eating tigers, rouge elephants, etc., are permitted by notification to be destroyed without a paid license. Live capture of animals is organized by the Forest Department whenever necessary, as for instance the Khedda operations wherein a herd of elephants is captured to meet the market demand for elephants, (or when the herds are getting too large and destructive) and the pit capture of tigers, and cheetahs for the Zoo or circus. Poachers defying game laws are prosecuted and punished, and Game Offences are not compoundable.

The State has ten differents blocks of forests of an area of 242·01 square miles notified as Game Preserves, eight other blocks of 122·95 square miles of tiger preserves, three islands notified as Bird Sanctuaries, six different watercourses notified as

Preserved waters for fish, and two wild life parks, the Venugopal Wild-life Park and the Jaggervalley Game Sanctuary. The total area of the twenty game preserves is 736·59 square miles, which works to 15·7 per cent of the total reserve forest area of 4,704 square miles in Mysore State.

The Venugopal Wild Life Park is situated near Bandipur, 48 miles from Mysore on Mysore-Ootacamund highway. The Park adjoins Mudumalai Wild Life Sanctuary of Madras State, and by reason of its location, accessibility, tourist comforts, and abundance of forest scenery and game, is popular. The ten reserved forests of an area of 310·34 square miles covering the Park, are some of the best in the State, and for a long time have been the home of a wide variety of Game. The vegetation varies from the densest growth of rich timber species down to grassy and marshy blanks and big and small bamboos. An undulating ground is broken by chains of hills and low flat-topped hillocks, and perennial water-courses. The highest point is about 3725 feet above mean sea level, and the continuity of the hills is broken by low saddles. The temperature varies from 55 degrees to 85, and the average rainfall is about 50 inches.

There is no important animal found in Mysore State which these forests do not contain. The list includes elephant, bison, tiger, leopard, cheetah, jungle cat, civet cat, mungoose, jackal, wild fox, otter, bear, bat and flying fox, flying squirrel and red squirrel, barking deer, sambhar, spotted deer, mouse deer, wild boar, porcupine, pangolin, crocodile, and (langur) monkey. Of birds and reptiles are to be seen the parrot, green pigeon, pea-fowl, jungle fowl, spur-fowl, partridge, duck and teal, bulbul, robin, minivet, myna, sparrow, swallow, kingfisher, dove, vulture, crow, python, grass-snake, green whip-snake, krait, cobra and Russell's viper. Varieties of fish including the masheer, are to be found in the rivers flowing in the Park.

An inner area of 21·858 square miles within the Park; has been duly notified and constituted into a sanctuary or Sanctum Sanctorum, the rest of the area constituting the Park itself. A network of motorable roads has been laid over the whole area, and well-furnished rest-houses, evenly distributed. There

is adequate staff to enforce the regulations, and guides and riding elephants at hand, for tourists. Paid licenses have been prescribed for weekly stalking, car-drives, night halts, elephant riding to see game and photography.

Hunting, shooting or capturing of wild animals and birds, and fishing or setting up of traps and snares within the whole area, is prohibited, as also the carrying of fire arms and explosives. Normal, necessary forest operations are permitted in the Park, but, prohibited in the Sanctum Sanctorum. During a recent all-India Silvicultural Conference, a recommendation was made that plots of Forests of different types, should be left in a natural, undisturbed state, as samples for future study and comparison. The Sanctum Sanctorum in the Venugopal Wild Life Park, incidentally fully satisfies as a sample of natural, undisturbed, pole type of forest.

The constitution and management of Jaggervalley Game Sanctuary is on similar lines to the Venugopal Wild Life Park. The area of Jaggervalley Sanctuary, near Chikmaglur in the mid-western part of the State, is 68·11 square miles, of the most beautiful forest country. Rainfall is upto 100 inches and the forests are of the deciduous and semievergreen type. An abundant variety of game is found in the area, but in point of accessibility, motorable roads, and camping places, there is work yet to be done in the Jaggervalley Game Sanctuary.

PRESERVATION OF WILD LIFE IN THE PUNJAB

BY

HARI SINGH,

Divisional Forest Officer, Beas Forest Division.

Within the confines of the Puniab, are to be found, so many varieties of Big and Small game, that an energetic sportsman visiting this State, has before him a number of varied localities, from which to select, his shooting grounds ranging from the plains to the Alpine pastures. Among the Big game are to be found, some of the most interesting and distinctive animals, affording trophies which are to be found in no other country in the world. "Markhor", the grandest of all goats, ibex, wild yak, blue sheep, Thar, brown-bear, black bear, snow leopard, se-row and nimble goral of the magnificent mountain ranges of the Higher Himalayas, may be mentioned as some of them. Black-buck and ravine-deer are at their best in the plains while sambhar, spotted-deer and a chance tiger are to be found in Reserved Kalesar of foot hills. Panthers abound in the sub-mountain tracts in scrub forests all over. Amongst the small game, hill pleasants, red-jungle fowls, snow-pigeons and grey and black partridges deserve special mention.

2. Most of the wild game is confined to Government-owned forests as the private enterprise in the State to preserve wild life, is practically unknown. The Punjab, however, ever since the inception of management of its forests has laboured under various legal difficulties in the preservation of its fauna and natural reserves.

The forests which embrace a total area of 4,600 square miles, are so heavily burdened with the rights of users that one can hardly claim a tract of considerable size, where its virgin wildness has remained unspoilt by human hand and where the methods and manners of the beasts and birds of the forests can be studied intimately and at first hand by sportsmen and naturalists. Situated as these forests are in localities, ranging from plains upto the Alpine pastures, they present a variety of flora

and fauna depending on climatic, topographical and biotic influences. But the majority of the forests are confined to the Himalayas where the inhabitants are predominantly agricultural. They live in small hamlets widely diffused and intimately mixed with the forests. The man's activities are, therefore, constantly affecting the plants and animals, destroying some and creating others. Added to this, every village possesses a number of arms for the protection of their crops which gives little chance for the game to multiply. The Punjab, therefore, is greatly handicapped in not being able to create any National Park so far of the type of "Haily-National-Park" of the United Provinces, which covers an area of 125 square miles and where the crowning glory of the valley lies in its absolute wildness with an occasional forest Post or Rest House—the only sign of human habitation.

3. Great as is the need of a National-Park in the Punjab to educate public in its national fauna and flora, it is well nigh impossible to create one without uprooting a large number of rural population which Punjab can ill afford after the upheaval that followed the partition during 1947.

4. Inspite of all these shortcomings, the fauna and flora, of the Punjab has not remained totally neglected. Small game sanctuaries ranging from 87 acres to 3239 acres have been established from early days in various forests of the State where wild birds and beasts could breed and multiply undisturbed by man. Altogether there are 11 game sanctuaries scattered all over covering a total area of 10,205 acres and efforts are being made to create some more, where conditions permit. The most coveted animals of the Higher Himalayas, like markhor, ibex, blue sheep etc., being most illusive, enjoy a natural immunity from the local inhabitants, as the rigour of the climate at high altitude militates against all agricultural pursuits and they remain at a safe distance from the neighbouring villagers who are accustomed to paste their victims at short distance with their locally made muzzle loaders. Very few sportsmen, particularly after the partition, ever penetrate with their modern weapons into the desolation of the Himalayas after these animals where they multiply in their natural sanctuaries. Their habitat extends over thousands of acres of undisturbed bleak mountains where nature does not warrant the introduction of any law to protect them.

THE VANISHING RHINOCEROS AND ASSAM'S WILD LIFE SANCTUARIES

BY

P. D. STRACEY, I.F.S.,

Senior Conservator of Forests, Assam.

All living rhinoceroses are included in a single family, and though externally similar, differ considerably in their history and anatomy. As a result of extensive migration and adaptation to different climates, terrains, and feeding-grounds the various species became distinct early in their history. Even the two living African representatives (which incidentally are both two-horned, the black or commoner, and the white which is a rarer and larger animal) probably separated and became distinct species as much as a million years ago.

Differences in feeding habits, which in turn develop from originally different environments, has affected the distribution of the various species, the Great One-horned Rhinoceros being mainly confined to the grassy plains of North Eastern India where its specially adapted high-crowned grinding teeth enable it to fulfil its role as a grazing animal, while the other two species are mainly browsers with short-crowned teeth and are confined to tree-forest zones. All the species have a three-toed foot, unlike the elephant which has four toes, and all share the habit of wallowing in mud and water. The two-horned Sumatrensis is the smallest of the three, and its skin is smooth and covered with bristles as distinct from its one-horned cousins whose skins are tuberculated, while its ears are fringed with hair. The difference between the Lesser One horned Sondaicus and the Great One-horned Unicornis is the more pronounced development in the latter of the horn, particularly in the female. In the Unicornis moreover the fold of skin in front of the shoulders is not continued right across the back as is the case in the other two species, while the great armour-like shields of thick skin are very characteristic.

All the three species of Rhinoceros have suffered persecution at the hands of man throughout the ages as the result of superstitious beliefs in the magical effects of the horn in rendering

poison innocuous, while the Chinese believe that it has a rejuvenating effect, and some Hindus believe that every part of its body is sacred and valuable. A habit which has probably assisted in their reduction is that of depositing their dung in the same place for some time in what eventually become large heaps as also their habit of wallowing in mudholes which make it easy for man to lay in wait for them. All the species of Rhinoceroses are reputed to have good hearing and scent, but poor sight, and as a result are inclined to be touchy at times, but they will not attack man unless provoked or suddenly surprised, though like the rogue elephant there is the rogue Rhino! Rhinoceroses held their own fairly well in recent time until advent of the fire-arm, but they have rapidly lost ground since then. In the case of the Sondaicus and Sumatrensis, which mostly inhabit tree-forest, there is less excuse for man to interfere with it, but in the case of the Great One-Horned Rhinoceros, which as I pointed out before, is a grazer and is mainly confined to low-lying grassy areas, there has been a direct clash between its interests and those of man during the past century with the opening up of the grassy plains of North Eastern India for cultivation and grazing.

In Assam this Rhinoceros, which is to-day our sole surviving representative of the race, is found in two distinct types of forests the first type a belt which stretches along the foot-hill of the Himalayas from Nepal through North Bengal as far as the Darrang district of Assam and in which it moves between the grassy swamp of the Terai up through the Bhabar tree forests to the foot-hills, and the second type the grassy areas found near the Brahmaputra river, of which the last surviving remnants to-day are the Kaziranga, Laokhowa and Orange Sanctuaries. Pollok found the animal extremely plentiful eighty years ago in the plains of Goalpara, Kamrup, Nowgong and Darrang, in areas where to-day jute and paddy fields stretch in un-broken monotony. He shot 44 in seven years and wounded many more! Those were the days of the smooth-bore gun firing spherical balls and the big-bore black-powder rifle, and quantities of game must have been wounded and lost with such weapons when compared to our modern high velocity rifles, which at any rate have the merit of being clean and merciful killers! He records that the horn of the Rhinoceros was useless as a trophy though prized

"by the natives of the country as drinking cups in temples," and that it fetched from 30/- to 45/- rupees a seer (as compared with to-day's price of over 1,000/- rupees per seer!) But while those were the days when the Rhinoceros was allowed to be killed for sport, to-day it is strictly protected and if killed it is by poachers or by excitable people who in some localities, such as the Majuli, apparently cannot resist the temptation to slaughter a Rhinoceros when they see one. In either case in Assam with the great demand among the superstitious for parts of the Rhinoceros, very little remains of the carcases! Recently a male which had wandered across to the Majuli from the Kaziranga Sanctuary was chased and done to death by a crowd of otherwise law-abiding villagers who quickly disposed of every bit of its carcase leaving only the skeleton. Some years ago an almost identical incident took place at Kamalabari-ghat near Jhorhat when a Rhino that was swimming across the river was hacked to death in full view of the people at the ghat by men who followed it in boats as it swam. Once a skin which was left to dry under a tree in an Inspection Bungalow had its feet removed while the Forest Officer slept at night, and this in the heart of a large forest Colony!

Turning to conditions in Assam, to-day, for all practical purposes there is only one Rhinoceros—the Great One-horned Unicornis that holds the stage. This Assam 'Gor' has the distinction of being the largest Rhinoceros in existence to-day, and is the emblem of the State. It was once found in large numbers, and it is said that the ancient Assamese had domesticated it and used it for ploughing. It was also used in battles, if we are to judge from extant illustrations showing a formidable spike mounted on its horn! It was Bengt Berg, the Danish photographer-naturalist, who first drew attention to this animal in 1933 when he photographed them in their natural haunts with the active assistance and encouragement of Shebbeare, who as Conservator in Bengal was then struggling to protect the last surviving Rhinos there, and who hoped to gain in his fight from the publicity which he knew would accrue from Berg's efforts. Berg in his painstaking efforts to get photographs came to the conclusion that there were not more than 35 to 40 Rhinos left in the whole of Bengal. In Assam

at the same time Milroy, who was so akin to Shebbeare in his outlook and methods as a Forest Officer, was struggling with a wave of Rhino-poaching and had to call in the aid of Armed Police. His premature death in 1935 was a great loss to the drive in Assam to put Sanctuaries and Wild Life protection on its feet. But he had laid the fundations and it is on these that all subsequent activities have been based.

There are in Assam to-day three whole-time Sanctuaries, and two Reserves which are treated as such, for the protection mainly of the Rhinoceros, though other rare animals such as Buffaloe, Bison, and Swamp Deer share in the protection which is aimed principally at preserving this vanishing species. Altogether there are some 464 square miles of such Sanctuaries and Reserves, distributed as follows :—

(1). Kaziranga Sanctuary, 166 square miles in extent on the South Bank of Brahmaputra at the foot of the Mikir Hills in Central Assam : a flat low-lying expanse, mainly of reeds and grasses, with streams and open spaces or Bheels where the visitor is quite certain of being able to observe Rhinos, buffaloes, deer, pig etc. at any time. Estimated to contain about 150 head of Rhino, several hundred buffaloes, about 20 elephants and a few swamp deer; this is the "Show-piece" of the Sanctuaries in Assam mainly because of its accessibility.

(2). The Laokhowa Reserve, in Nowgong District 27 square miles in area is similarly situated on the edge of the Brahmaputra and like the Kaziranga Sanctuary consists entirely of flat grassy land; it is estimated to contain about 20-30 head of Rhino and some Buffaloes.

(3). The Orang Reserve, 24 square miles in area in Darrang, is on the North bank of the Brahmaputra and almost opposite the Laokhoa Reserve and similar in type to the two areas mentioned above. Estimated to contain about half a dozen Rhino.

(4). The North Kamrup or Manas Sanctuary is 162 square miles in area, and stretches below the Bhutan hills on the east bank of the Manas river, which debouches from the Himalayas about 100 miles east of Cooch Behar and the border of Bengal.

Scenically this is the most attractive Sanctuary in Assam and undoubtedly contains the greatest variety of species, including bison and swamp deer. There are supposed to be more than 100 Rhinos in this Sanctuary, as also up to 200 buffaloes, 100 elephants and 100 bison. Swamp Deer were once to be seen in numbers in this Reserve and in the Kahitama Reserve which extends on the South of this Sanctuary, but are now very scarce.

(5). The Sonai-Rupai Game Sanctuary in Darrang District is 85 square miles in area and like the Manas Sanctuary extends from the Himalayan foot hills southwards. It is supposed to contain a few Rhino in addition to Bison and a number of elephants. This Sanctuary like the Manas, has the advantage of being bordered on the north by the Himalayan foot-hills and is part of a continuous belt of Reserves stretching East and West so that animals are free to move about, but this advantage is nullified by the resultant vulnerability of the area which can effectively be protected only from the south.

The Pabha or Milroy Buffalo Sanctuary, 19 square miles in area is situated in North Lakhimpur and deserves mention in passing, as a Sanctuary created exclusively for the protection of the magnificent species of Assam Wild Buffalo, of which there are probably some 50-100 animals here. It is possible that this area once had Rhinos and elephants.

These then are the last strongholds of Rhinoceros unicornis in Assam, and if the small Bengal Sanctuary is included, in the world, for I deliberately exclude the few animals that are to be found in Cooch Behar and Nepal where they are still not protected. What are the prospects of preserving this animal for eternity? Bengt Berg was pessimistic and he wrote in his beautifully illustrated book, "On the Trail of the Rhino", that "in another hundred years the skeletons of this animal will be seen along with similar ones of extinct animals in the Museums of the world and people will stare in wonder... ..Zoologists will look with pity and envy on the photos in this book, pity for the poor man who had to put up with such inferior photographic equipment but envy at his luck to have lived before the Rhino became extinct!" Certainly, if we are to judge from the rapid rate of

disappearance of this species in the last 100 years, it would appear as if the struggle is hopeless. Yet, it appears as if the Rhino is holding its own in the Kaziranga and North Kamrup (Manas) Sanctuaries at least and if only sufficient assistance can be given to it there is reason to believe that this species can be saved. But will Man in his ruthless search for land and food give the Rhinoceros the peace it requires ?

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PROSPECTS OF BEE KEEPING AT TAKDAH AND THE DARJEELING HILLS ON A COMMERCIAL BASIS

BY

J. R. JOHNSON,

Chairman, Takdah Multipurpose Co-operative Society Ltd.

1. GENERAL.

Everyone be it Government or consumer would welcome the availability of pure honey, which is in great demand, instead of the product of dubious quality which is at present sold in the bazaars as PURE HONEY. The utility of the honey bee is realised the world over as regards the increase in the yield of certain crops by pollination.

It therefore seems a pity that but for FINANCE these prospects could not be put into immediate production as the potential bee keeper is the impoverished cultivator or small holder.

Pandit Jawaharlal Nehru wrote the following in the Indian Bee Journal in 1942.

"I think bee keeping is a fascinating pastime and, what is more, is extremely useful from many points of view. I like honey myself but, apart from my liking it, it is obviously very good and beneficial food. There is no reason why very large numbers of people should not go in for bee keeping and thus not only provide good food but also have a very pleasant auxillary occupation.

The Indian Bee Journal and all its enthusiasts who run it are doing excellent work for this cause and I wish it success."

The above is what India's Prime Minister thinks of the subject and the columns of the Indian Bee Journal are full of opinions of high officials wanting bee culture to be taken up in the country.

What one and all do not offer to provide is FINANCE for without it hives and appliances cannot be offered to that class of person who would most profit by it *i.e.*, the CULTIVATOR AND HUMBLE VILLAGER.

One reads of the planning commissions and other proposals for increased industry, better crops, better irrigation, better conditions for labour and the cultivator, etc., etc., but I have so far not found such a simple suggestion as finance for bee culture under modern methods. What could be simpler and a better gesture than bee hives and appliances to be defined as agricultural implements and supplied as such to the villager and cultivator or better still grants given to Co-operative Societies for supply of these appliances to its cultivating and bee keeping members.

My experience of about three years bee keeping under modern conditions has proved to me that Bee Keeping in these hills could not only be an interesting pastime but a really useful contribution to the GROW MORE FOOD CAMPAIGN.

Bees by pollination increase the yield of crops and this is recognised the world over. In fact in America and doubtless elsewhere farmers pay bee keepers to bring bees to their farms.

India is an agricultural country and these hills are no exception and yet how little is being done to not only harvest, by hygienic methods, this food, honey, as well as improve the yield of crops.

The species of honey bee, *Apis indica* (hill variety) is in abundance in these hills and can be found everywhere and are in fact being kept by villagers in primitive hives. They know the value of honey but their methods of getting it result in many cases in the destruction of the bee colony and the production of a fluid which is not pure honey.

2. PRESENT METHODS AND PRESENT DAY HONEY.

The more common type of hive that I have found is a hollowed out log. Sometimes small boxes are utilised. There are no frames and no assistance is given to the bees, not even food in bad seasons. When the bee keeper thinks that there is honey he just opens up the log or box, drags out all combs, scatters the bees and then proceeds to cut out portions of comb where he sees honey. This is placed in a cloth and the honey squeezed out. Eventually it is sold in the bazaars as HONEY or PURE SIKKIM HONEY. Even the Forest Department of the Government of West Bengal, in their Co-operative Stores Department supply such honey at Rs. 1/6 per pound, labelled as pure honey. A sample of this so called pure honey has been reported to have caused a mild explosion in a tram car in Calcutta.

It is to be noted that good honey has to be ripe and matured and any experienced bee keeper will not extract honey which has not been "capped" by the bees. It is the bees which know when the honey is ripe and should be capped for storage.

The honey sold in the bazaars as PURE HONEY has been accurately analysed by the BHUPEN APIARIES (Himalayas) of Ramgarh, Nainital, U. P. and I am quoting what they have to say about it.

"LITTLE THEY KNOW OF HONEY
WHO BAZAAR HONEY ONLY KNOW.

Eggs are good for breakfast but where stale and crushed bees, eggs, putrifying juices of dead bees, and bee larvae are

contained in honey, the product is rejected by those with improved tastes. The average buyer is satisfied with bazaar honey for he does not know.

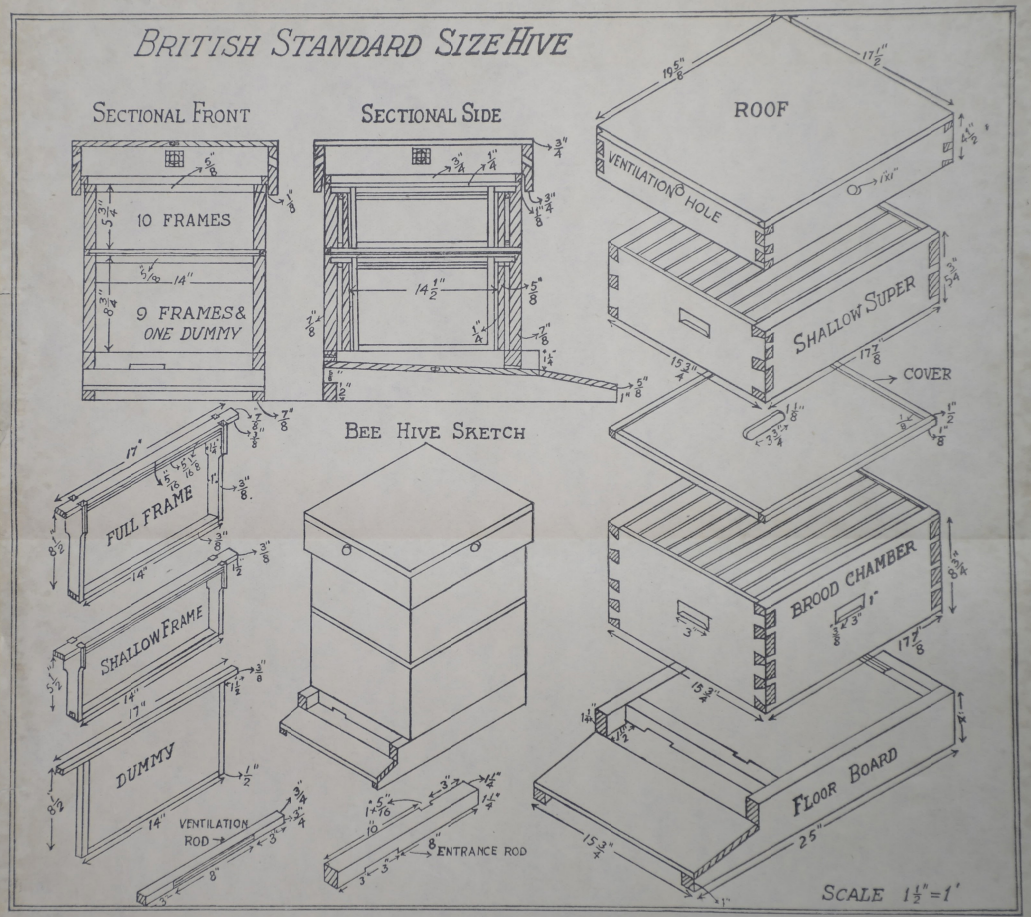
'The great value of honey as a food' and medicine is known to all but we can confidently assert that few have tasted PURE HONEY. This bazaar honey containing the juices of dead bees, larvae, and eggs, and various impurities, DOES NOT DESERVE THE NAME OF HONEY.

There is no simple test for pure honey. Colour, flavour, consistency, and aroma of pure honey differ widely. Your only guarantee of PURITY is the name and integrity of the supplier."

The above is really a true description of PURE HONEY being sold locally and I regret to say by the Government of West Bengal, Forest Department. I can speak from experience for I bought bazaar honey until I produced my own extracted honey. There is no comparison between the two. One is PURE HONEY and the other a peculiar coloured fluid containing various juices. I did and do appreciate my PURE HONEY and so do my friends. Sri A. B. Ghosh, Assistant Chemical Examiner to the Government of West Bengal wrote to the Amrita Bazar Patrika of his experience of some PURE HONEY purchased at Writers Buildings, Calcutta.

"I purchased on 16- 3- 51 a bottle of two pounds of pure honey, as is now supplied by the Forest Department, Government of West Bengal, from the Co-operative Stores, Writers Building for Rs. 2/12. The appearance of the honey was somewhat cloudy and not clear and bright. While I was carrying the bottle in the tram it suddenly blew off to pieces with a mild explosion. This was evidently due to the pressure of gases arising out of a slow fermentation which had been going on inside the bottle."

This was obviously honey collected by the professional honey collector from wild bees in the Forest areas and of the quality described by the Bhupen Apiaries mentioned above. In fact it was nothing better than the product known as bazaar honey. It is lamentable that a Department of the Government of West Bengal should have labelled the same as PURE HONEY and so misled



Bhupen Apiaries (Himalayas), Ramgarh, District Naini Tal, U.P., India

PRICE : 8 ANNAS

the public consumer in believing that he would get the real thing. Under such conditions there is no question of the integrity of the supplier being guaranteed. If the Forest Department wish to commercialise the honey found in their Forest areas the least that may be expected is that steps would be taken to practise modern methods and at least protect the bees from ruthless destruction.

3. MODERN METHODS.

Modern methods of bee keeping based on hygiene and humane treatment make it possible to avoid all impurities and treat bees with kindness and to provide them with good healthy homes.

This is but a small return for their labours and the valuable food they produce.

The honey by the use of an extractor can be produced straight from the carefully capped comb to the bottle without being touched by hand and the use of a cloth.

What is most important is that the Queen and her home are not interfered with and therefore practically undisturbed.

The extracted combs are also undamaged and are returned to the bees for refilling. They therefore do not have to build a new home as occurs by present methods.

Finally the bees are left considerable honey in the brood chamber combs for their own sustenance.

The difference between the two methods is that under modern methods the bees are relieved of their surplus honey and not robbed of all they have produced as occurs by present methods.

Villagers whom I have contacted and shown modern methods are thrilled and show by their eagerness how willing they would be to follow the same but their eagerness ends here for they cannot afford the initial outlay. All whom I have contacted are very willing to learn and my own man, who was a bee keeper, has taken to these methods with delight and absorbs all I tell him about bees and their care which I read of in books and the Indian Bee Journal.

Once modern methods are established and villagers are supplied with modern hives and appliances training classes in bee keeping could be started.

In the U.P. the Government Bee Keeping Station at Jeolikote, Dist. Ramgarh, hold such training courses in theoretical and practical Bee Keeping. A six months course for non-residents cost Rs. 75/-, and a six weeks course for non-residents Rs. 40/-. Hostel accommodation is free. Applications for admission to be made to Dr. R. N. Nuttoo, Hony. Dy. Director, Apiculture, Ramgarh, Dist. Nainital, U. P.

4. FINANCE AND ASSISTANCE.

The villager with bees must be provided with modern hives and appliances in the first instance. Preferably as a gift but otherwise as a basis in payment in honey as will be shown in para 6.

Government assistance should be given to the central body in the form of a grant or a loan repayable over a period of five years. The central body would be responsible for the supply of bee boxes and all appliances such as bee veils, smokers, hive tools, comb foundation. There would be extractors and containers kept by the central body for the extraction and storage of honey under their strict supervision. Such schemes under a co-operative basis have been started in other States in India by means of Government grants and loans and there seems no reason why similar schemes should not be started in these hill areas, where bees are plentiful, and what is more important many persons have bees kept under very primitive conditions as they cannot afford modern appliances.

5. PRACTICAL EXPERIENCE.

I have been keeping bees, *Apis indica* (hill variety) since 1949 and started with two hives which I have increased to 15 and hope to have 30 by the end of this season.

I knew nothing about bees but joined the Indian Bee Keepers Association and became a subscriber to the Indian Bee Journal. I got two books on modern bee keeping and

bought sketch plans of modern bee hives from the Bhupen Apiaries. Finally by seeing models of extractors with my fellow bee keepers and studying the illustrations of others in my bee books I have made an extractor for Rs. 30/- which is satisfactory. After experimenting with various types of hives I have settled upon the British Standard hive with brood frames of 14 by 8 inches and supers of 14 by 2 inches. My boxes are built to take up to 12 to 15 frames and two supers of the same number of frames per super.

I only started extracting honey in July 1951 for the first time and have one hive which produced section honey in box frames of 4 by 4 inches.

One gentleman to whom I gave some of my honey asked me how much I could supply and the cost per pound was of no consequence as long as the honey was the same quality. I value this appreciation of the QUALITY of the honey for he appreciated PURE HONEY when he got it. As regards yields per hive I cannot give individual outturn per hive as some colonies were not strong and did not produce much in the supers. Four of my strongest hives gave me 86 pounds of honey which works out to an average of some 21 pounds per hive. One hive gave me quite 25 pounds.

It is to be noted that I only took honey from the supers as I left all honey in the brood chambers, in spite of the protest of my man, who wanted to extract honey from brood frames which had only honey and no brood. I wanted my bees to feed well and be strong colonies for 1952 as well as assess what quantities could be had from supers only. Besides the honey I obtained over two pounds of bees wax from discarded combs and cappings. This I have sent to the Coorg Honey and Wax-makers Co-operative Society Ltd. at Virajpet, Coorg, for converting into comb foundation at Rs. 1/12 per pound as against Rs. 5/12 if no wax was sent.

The above results have convinced me that there are prospects of starting bee keeping on a commercial basis under the Takdah Multi-purpose Society Ltd.

6. SCHEME OF BEE-KEEPERS CO-OPERATIVE

The Takdah Multi-purpose Society Ltd., of which, I am the Chairman this year, proposes to start a separate branch under its multipurpose activities amongst its bee keeper members and any others who would like to join the society' bee keeping branch.

The scheme is that the Co-operative supplies hives and appliances to its bee keeper members and gives them initial training in bee keeping. The honey and wax will be extracted by the Co-operative's employees and marketed under the name of the Co-operative. Thus the extraction will be done under a high standard of cleanliness and a standard of PURITY maintained so that in time this will be the guarantee of INTEGRITY. Each member will be debited by the Society for the cost of the appliances supplied to him and the price of the same will be deducted from the sale price of the honey produced from his bees. This will continue till such time as he has cleared his debit. After this the member will have the option of keeping his honey for his own use and offer the rest for sale through the Society. After deducting a certain profit and its expenses the Society will credit the member with the sale proceeds. Thus all extraction, storage and bottling and sales will be done by the Society and thereby it will be possible to maintain an uniform standard of PURITY of its products and establish a standard of INTEGRITY and GUARANTEE so necessary to establish a name and gain the confidence of the comsumers.

The Co-operative will maintain up to 30 hives of its own and all member bee keepers will be given practical and theoretical training in bee keeping. In time it is expected that members could be supplied with hives containing a nucleus of bees and so help them to get to a profit-making stage earlier

7. MARKETING AND PROSPECTS.

The Bhupen Apiaries (Himalayas) at Ramgarh Dist. Nainital, U. P. are selling their honey at Rs. 4/8 and Rs 5/- per pound. They state that they are unable to meet the demand both local and from abroad. India being an agricultural country

should be able to export large quantities of honey just as America, Australia and other countries. India could certainly be self-supporting in Honey and thus bring down her import costs. It is obvious that a great deal of the demand for imported honey is that it is guaranteed and is PURE. Surely if honey was obtained by modern methods the Government could set up a proper standard for testing and guaranteeing its PURITY the same as is done in other countries.

From the practical experience gained by myself I would say that the following would be the cost and running costs of an apiary of 30 hives and the yields to be expected.

Cost of 30 hives with appliances at Rs. 30/- each	Rs. 900/-
Bee keepers wages at Rs. 40/- per month	Rs. 480/-
Cost of feeding (which depends on seasonal events)	Rs. 300/-
	Rs. 1680/-

The honey yield at a moderate average of 15 lbs. per hive would be 450 lbs. which sold at Rs. 4/- per lb. would bring in Rs. 1800/-.

The profit on the first year would be Rs. 120/- but after this less the cost of the hives Rs. 1020. I feel confident that the honey yield would go up to between 20 and 30 lbs. per year.

The establishment of such an industry by the Co-operative as one of its branches of activity would not only add to the well being and income of the bee keeping members but would also bring employment to those making the hives and attending to the extraction and sales. FINANCE to start such an industry is essential and a loan or preferably a grant of Rs. 5000/- from Government in the Department of Industries would be necessary so as to make an immediate start.

8. CONCLUSION.

It is to be noted that the grant of Rs. 5000/- from Government for such a purpose would go directly to that body of

Indian subjects *i.e.* the villager, labourer and small holder, who are the same persons whose standard of living the Government quite rightly is trying to improve.

His immediate advantages would be :—

1. He would be provided with a valuable and nourishing food.

2. He and his neighbours would get a better yield on those crops which benefit by pollination by bees.

3. He by devoting a very small part of his spare time would augment his income. And there is a great necessity for adding to this.

4. His class would obtain the employment necessary in the production of hives and appliances.

5. The food production would be increased and be a valuable contribution to the GROW MORE FOOD COMPAIGN.

6. The CONSUMER whether in India or abroad, would get PURE HONEY and thus benefit by obtaining a PURE and healthy food.

7. The HONEY BEE would be cared for and treated in a humane manner and thus receive fair treatment and some return for its unstinted and unpaid labour in gathering for humanity a most valuable food, and improving the yield on certain food crops.

I trust that the scheme will be approved by higher authority and this Co-operative Society given an immediate grant of Rs. 5000/- for putting the scheme in hand immediately.

The sooner we start the sooner will all be benefited and I would urge that if the Government does not speculate on surety it will not accumulate (1) valuable food and improve the yield of crops

(2) the loyalty and gratitude of an important section of the humble and impoverished classes.

SOME GEOLOGICAL FEATURES OF THE EAST SIKKIM HIMALAYA

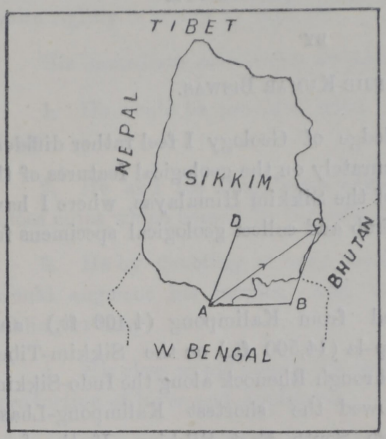
BY

SRI SANJIB KUMAR BISWAS.

With my little knowledge of Geology I feel rather diffident on my part to report accurately on the geological features of the mighty snowy mountains of the Sikkim Himalayas, where I have had the opportunity to climb and collect geological specimens for my study.

The expedition started from Kalimpong (4,100 ft.) and ended just across the Jelap-la (14,500 ft.) on the Sikkim-Tibet border. The route passes through Rhenock along the Indo-Sikkim frontier. Our course followed the shortest Kalimpong-Lhasa Trade route direct through South East Sikkim. If the four points Kalimpong—88°28′ long., 27°5′ lat., Tongta (near Indo-Bhutan border)—88°48′ long, 27°8′ lat., Jelap-Pass—88°52′ long., 27°22′ lat., and Gangtok (the capital of Sikkim)—88°38′ long., 27°20′ lat., are joined, a parallelogram will be formed and its diagonal joining Kalimpong and Jelap-la will approximately indicate the extent and position of our route. (Fig. 1).

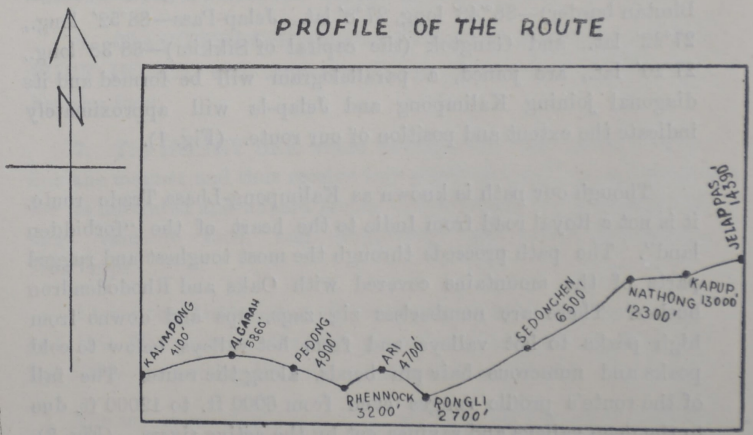
Though our path is known as Kalimpong-Lhasa Trade route, it is not a Royal road from India to the heart of the "forbidden land". The path proceeds through the most toughest and rugged parts of the mountains covered with Oaks and Rhododendron bushes. There are numberless zig zags, ups and downs from high peaks to hot valleys and from hot valleys below to cold peaks and numerous hair-pin bends, along the route. The fall of the route's profile ranges even from 6000 ft. to 12000 ft. due to the deep valleys and ravines cut by the active rivers. (Fig. 2). We have to get down from the top of a ridge to the bottom of a valley only to climb up again to the neighbouring ridge connecting the adjacent range of mountain and ascend slowly to the top of the ridge again and thus the tiring march goes on from morning till afternoon. Thus the valleys divide the mountain ranges into many parallel ridges running transversely to the



A .....KALIMPONG
B .....TANGTA
C .....JELAPLA
D .... GANGTOK
AC... INDICATES
THE ROUTE

FIG. 1

PROFILE OF THE ROUTE



HORIZONTAL SCALE – 1" = 10 MILES
VERTICAL SCALE – 1" = 10,000 Ft

FIG. 2

direction of the path. These ranges belong to the Eastern part of the central zone of the Himalayas which is mostly composed of crystalline and highly metamorphic rocks such as granites, gneisses, schists, etc., with unfossiliferous sedimentary deposits of very ancient age. Natural architecture of the landscape is very conspicuous, picturesque and most striking with its numerous ups and downs, rivers and waterfalls and higher up moraines, glaciers, snowy peaks and vast snowfields above an elevation of 14,000 ft. The architects here are the chief geological agents, like rivers, springs, lakes, and ice which present numerous fresh areas for geological investigation.

Topography :—

(1) **Mountains and ridges.**—The 3 rivers Rishi, Rongli and Gnathang divide the entire region into 3 main parallel valleys by which 3 main ridges are formed constituting the mountain ranges of this part—*Ridge I*—between Rilli and Rishi. Thus Ridge I ends in a peak with gentle slope at Algarah, at an elevation of 6000′. *Ridge II*—between Rishi and Rongli, which ends in a peak about 5000′ ft. high with steep slopes and in a spur between Rishi and Rongpo on the west of the route. *Ridge III*—is the highest and the steepest of the 3 and its top rises as high as 14,500 ft. This and neighbouring peaks upto 16,000 ft. were our destination in and about Jelap-Pass overlooking the famous Chumbie valley in Tibet. It consists of innumerable steep ridges, spurs, peaks, valleys, rivers and glaciers. This ridge has 4 distinct features viz : (i) the valley of Rongli running parallel to the bridle road, (ii) the spur near Lingtam between Rongli and its tributary, (iii) the spur near Gnathong and (iv) the glaciers, their valleys and basins. The top of this ridge is crowned with numberless glacier-horns which look like an amphitheatre of sharp pinnacles of ice of all sorts of fantastic shapes.

(2) **Drainage, watersheds etc.**—The drainage system of this area is mainly controlled by the 3 main parallel rivers running across east to west along the route. From the glacial region near Kapup (13,000 ft.) occurs the river Nathong which flows towards west to meet the river Rongpo in the lower latitude

about 4 miles west of the village of Nathang (12,810 ft.) forming a wide spur. This combined course flowing towards south parallel to the route, meets the river Rongli forming a sharp spur at a lower latitude about one and a half mile off the village Rongli. Then Rishi originating from the high ridges of the east flows across the route parallel to the other two rivers—Rongli and Nathang, and meets the combined course of the 3 rivers described above, at about 3 miles North West of Rhenock forming a sharp-edged spur of about 6000′ ft. elevation, only to enlarge the river Rongpo, one of the main tributaries of Teesta.

Two rivers namely Kapup and a tributary of Amo-chu have their glacial origin at the top of Jelap-la and run down in two opposite directions—Kapup towards Sikkim and Amo-chu towards Tibet.

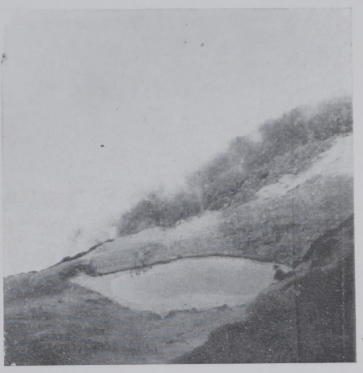
(3) **Glaciers.**—There is one main glacier of about 4 miles long originating from the snowfield on the top of Jelap-la. This glacier flows down the wide U-shaped valley with its tributaries and terminates into the river Kapup near the village of Kapup (13,000 ft.). The Kapup area is a flat marshy land with several remnants of glacier-eroded mountains.

Lakes.—There are several lakes in the glacial region, most of them are frozen and lie in the path of the glacier. Bidang lake in the marshy land of Kapup is the largest. It is a lake of crystal clean water in a wide basin of about a mile in diameter. From this lake originates river Jal-dakka, which ultimately forms the boundary of Bhutan and India. Lake Thuibe near Gnathong is a shallow lake in a basin of about half a mile in diameter. The western slope of this basin is as steep as the Eastern slope is gentle. There was another basin near the Sacred lake of Bidang, which is at present filled up by the moraine deposits and forms a piece of marshy land through which the river Kapup cuts its course.

All lakes are of glacial origin. The basins scooped out by the glacial erosion are filled with water to form a lake.

All these topographical features can be grouped under the following heads regarding the physical features of the area :—

1. Rishi Valley : V-shaped development is noticeable in the photo.



2. Lake Thuibe : The steep slope on the right corner is comparable to the other gentle slopes of the basin.

3. The glacier with the frozen lakes in the background.

4. Lake Bidang—a typical glacial lake on a U-shaped valley floor. Jaldakka originating from this lake at the far end.

5. The snow field on the top of Jelap-La. Glacier horns are found in the background.

(1) Rishi Valley—from Algarah to Ari (tops of 1st and 2nd Ridge)

(2) Rongli Valley—(a) Lower—from Ari to Lingtam (on the 3rd Range).

(b) Upper—from Lingtam to Lingtu (on the 3rd Ridge).

(3) Lake area of Gnathong and Kapup.

(4) Snow field of the top of Jelap-la.

Physiography :—

Mountains.—A general view on the mountains at once suggest their *tectonic* origin, that is, the mountains are formed by the foldings of the rock-beds, and tilting and faulting of the blocks of rocks. These main mountain masses are eroded by the rivers and glaciers to give rise to several ridges and hills ; of these the hills shaped by the glaciers are very characteristic. They develop the particular type of 3-faced horn-shaped peaks which crown the entire snow-field over the top of Jelap-la. Along the sides of the glacier-valleys drumlins, that is, hills shaped like inverted bowls are found. These are the remnants of glacier-eroded mountains.

Rivers and valleys.—Rivers are the well-known chief geological agents which shape the landscape. Most of these young rivers rushing down with foaming torrents perform ceaselessly the destructive work of hollowing the mountains. The tremendous velocity of the rivers in these mountains help them to carry huge masses of rocks and boulders which dash with roaring and rumbling noise against the floors and the sides of the channels with great momentum and thereby eroding the hill-sides. The flows of the rivers lie in the transverse direction to the general trend of the mountain ranges. Thus they cut the valleys deep down transversely to the direction of the mountain ranges which is characteristic of the valleys of Eastern Himalaya. Since the rainfall in this part of East Sikkim Himalaya is very heavy, the volume and velocity of discharge of water are

considerably greater in dimensions. This factor is mainly responsible in accelerating the rate of erosion both downwards and sideways. The valleys are developed into V-shaped structures even in their early stage of development.

Snowlines, glaciers and their valleys.—The snowline, the lowest limit of the perpetual snow, is found at the height of 13,000 ft. But the glacial action is distinctly observed on the hills and rock—exposures at a little lower altitude about 12,000 ft., and the lake Thuibe at 12,300 ft. is also found to be of glacial origin. This suggests that once there was a presence of glaciers down to that height. From these facts it may be inferred that once the snowline was evidently at 12,000 ft. which is now shifted up to 13,000 ft. The only 4 miles long valley-glacier which ends in the river Kapup has a characteristic medial moraine throughout its length. The melt-water is found in some places flowing through the tunnels in the glacier forming sub-glacial streams. This glacier has a tributary which forms a hanging valley near "10 Ghumti" place of 10 turnings), 2 miles off the village of Kapup. This glacier has developed a wide U-shaped valley.

All these geological agents together with variations in climatic conditions, light and temperature perform the destructive function of Geology. Although the moraine deposition and other little constructive processes are simultaneously at work, the rate of aggregation is comparatively nothing in proportion to the rate of denudation which is constantly taking place at a much faster rate.

Lithology :—Two chief rock-types namely Crystalline igneous rocks and highly metamorphic rocks, are predominant in this area especially at higher altitudes. Of the igneous rocks—*Granites, Syenites, Pegmatites* are common. Certain particular types of granite are also found such as *Hybrid-granite,* and *Tourmaline-granite, Epidote-granite, etc.* These granites are named after the accessory minerals (minerals which do not essentially determine the composition of the rocks), present in the granite. The main accessory minerals are—*Tourmaline Epidote, Garnet, Chlorite* and others. These igneous rocks

occur mainly as veins in the surrounding metamorphic rocks and also as large intrusive masses. Veins of *quartz, Chlorite* rocks are also found near Zaluk. Of the metamorphic rocks—*Schists* and *Gneisses* are very common. *Mica-schist, Tremolite-schist, Hornblende-schist, Actinolite-schist, Sillimanite-schist* are common in Schistose form of metamorphic rocks. Most of these schists are found on the higher altitude. In Mica-schists, *Muscovite* (white Mica)—*schists* are found composing the lower valleys while *Biolite* (black Mica)—*schists* are found at higher elevations. Minerals such as *Staurolite, Epidote, Chlorite,* and *Garnets* are seen often associated with the mica schists. One variety of Quartz-schist is found which is associated with *Epidote* and *Chlorite.* Of Gneissic rocks—*Hornblende Gneiss, Sillimanite, Biotite-gneiss, Granite-gneiss* and *Aplitic-gneiss* are found exposed in the higher ridges above 8000 ft. *Aplitic-gneisses* are found to compose the lofty peaks of glacier-horns.

Economics :—

Garnet :—The small beautiful crystals of garnets may be used as gem-stones and small grains of garnet may also be used as abrasives.

Graphite :—Traces of graphite is found as scales in some granites which however, is not noticed to occur on an economical scale, but a closer investigation may perhaps reveal a larger source for economic exploitation of graphites.

Hard rocks as granites, schists and gneisses are used locally as materials for building houses, bungalows, roads, huts, monasteries, chaits and other religious symbols and altars by the villagers.

Kaoline :—Felspars are often altered to Kaoline which is the chief product of Porcelain.

This very brief geological account clearly confirms the belief held both by the geologists in India and also abroad that India possesses almost inexhaustible mineral wealth which if properly explored and surveyed will increase the wealth of the country. From the academic point of view it is quite apparent that the geological problems of the Himalayas parti-

cularly the East Himalayas facing the geologist of our country are so many and so vast that many a geologists for several generations can spend their lives with a view to throwing light on these important, interesting and intricate problems. It is hoped that sufficient opportunities and proper facilities will be placed before the young geologists not only to discover newer materials for industries and commerce but also to solve the mysteries of geological doctrines and truths and thereby advance the progress of geological science.

THE SCHOOL MUSEUM

BY

S. Thomas Satyamurti, M.A., F.Z.S.

Nothing is perhaps so exciting for a group of school children doing their daily routine of class work as to be let loose in the spacious galleries of a museum on a Saturday afternoon and to be allowed to brouse around, revelling in the visual feast afforded by the interesting multiplicity of exhibits. I would be hardly surprised if these children, on completing their tour round the museum, are tempted to think, "Isn't it a fine idea to try and make a small museum in our own school—at least a highly reduced miniature of what we have just seen ?" Yes, it is a perfectly legitimate ambition, and it is the duty of every teacher and schoolmaster to help the children to fulfil that ambition. For in recent years the value of school museums as visual aids in education has been increasingly recognised, and it is by no means an exaggeration to say that a small museum of educational exhibits should constitute a vital part of the equipment of a school—almost as essential as a good library or a sportsfield.

It is gratifying to learn that some schools in our province have been very successful indeed in building up their own museums. But a large number of schools, owing to lack of accommodation, finances and other facilities, remain altogether without this valuable asset. Yet others are blissfully content with what are apologies for museums, for all that they can boast of by way of a museum is a rickety, dust-laden almirah crammed with a few mis-shaped stuffed birds well advanced in the process of losing their feathers, some old unnamed and incomplete skeletons and a jumble of all sorts of zoological odds and ends which require the services of an expert systematist to classify and identify. But there is no need to despair. I may emphatically assert that it is possible for every school, no matter how mediocre its financial means might be, to build its own museum which may prove to be a powerful instrument in our present scheme of practical and craft-centred education.

The teachers and pupils who set about starting a school museum will be naturally faced with numerous problems, and the magnitude of the initial difficulties might tend to stifle the enthusiasm of the amateur museum builder. "Where am I to procure the requisite materials and specimens from ? How can I have them properly preserved, mounted, arranged, labelled and displayed ?" Such are the questions that might baffle him at the outset. In the present article I have endeavoured to give a few practical hints that may prove helpful in organising a school museum, but it should be clearly understood that a certain amount of practical training in museum methods of preservation and display is always necessary if one is to make a real success of this fascinating job. In this connection it may be of interest to mention that the Madras Museum recently organised a short, but practical and comprehensive course in museum technique for the benefit of teachers from various schools in the province. As materials and facilities were provided for individual work, the trainees were able to derive the maximum benefit from the course by practising for themselves the various techniques of museum preparation such as Taxidermy, plaster and wax moulding and casting of fish and reptiles, wet and dry preservation of zoological and botanical material, preparation of plaster casts of

coins and the preservation of geological, ethnographical and archæological material and setting them up for museum exhibition. It is such practical training that would enable the teachers to rely on thier own efforts in building up their museums, and I would strongly advise interested teachers to grasp at the earliest opportunity to avail themselves of such facilities when they are offered.

One of the essential prerequisites for building up a museum is a spirit of unflagging enthusiasm coupled with an infinite capacity to hurdle over minor difficulties and obstacles. It is necessary that someone on the staff of the school, preferably the science master, should get himself actively interested and take the initiative in the matter. It would be an excellent plan if he could get together a few industrious and interested pupils to assist him. We hear of various juvenile clubs in schools, such as the dramatic club, camera club and so on. Why not devote one to the interests of the school museum, styling it the "museum club"? It would be the primary duty of the members of this club to do all they can to collect material for the school museum. Most children have the collecting instinct strongly developed in them, and this could be conveniently canalised into useful and constructive channels for the enrichment of the school museum collection by proper training and guidance.

The value of field trips, excursions and outdoor camps as aids in enriching the collections of the school museum can hardly be over-estimated. It is on such occasions that children get an opportunity to make a first-hand study of nature, and the pleasurable adventure of collecting together with the knowledge and experience gained from such trips are in themselves ample rewards for the trouble and expense they might have involved. The collecting party should provide themselves with adequate equipment such as butterfly nets, shovels, long pairs of forceps, cyanide insect killing bottles, corked glass tubes and other receptacles and plenty of preservatives such as 70% alcohol and 4% formalin stored in well-stoppered jars. A knowledge of the probable situations where one might expect to find the specimens one is looking for will go a long way in enabling the young collector to make the most of his field trip and amass a

rich collection. Hills are particularly suitable places for the collection of large and brightly coloured species of butterflies such as the swallow tails. Beetles may be found under decaying logs of wood and similar damp situations. Several birds such as herons, egrets, ducks and waterhens take their abode among trees and bushes in the vicinity of ponds and lakes. Such localities may afford an excellent ground for bagging a handsome collection of birds, provided one is equipped with a small gun. Marine collecting also has a fascination of its own. It is a delightful experience to wade through ankle or knee-deep water around coral reefs at low tide and pick up the beautiful, multi-coloured tokens of Nature's manifold treasures, such as shell-bearing molluscs, starfishes, sea-anemones, jelly-fishes, sponges, corals, crabs and shrimps. Even a leisurely walk along a sandy beach, particularly in the vicinity of backwaters, might yield an interesting collection of shells and other hard animal remains of marine creatures which get washed up on the shore. While out on such field trips it is advisable that every pupil should maintain an observation book in which he can jot down notes on the living animal, such as its colour in life, movements, habits and other peculiarities of ecological interest.

Unfortunately it is not possible for me to describe in detail in this limited space the various methods of collection and preservation of museum specimens. Taxidermy and other museum methods of preservation and mounting are highly technical jobs requiring considerable skill and experience and as I mentioned earlier in this article, it is necessary for the teachers to maintain contacts with the authorities of the larger public museums for information, training and guidance in these methods. The British Museum (Natural History) has issued a number of handy guide booklets containing ample information and instructions for collectors of museum specimens and it would be advisable for every school interested in building up a museum to procure copies of these booklets. It should be borne in mind that the material gathered through collecting trips have not only to be preserved properly, but have also to be indentified scientifically and carefully labelled giving particulars of the locality and date of collection, for a specimen without a label loses much of its

scientific value. This may be done by referring to and comparing with the specimens stored in the larger collections contained in the public museums of the city. A modern museum maintains a study collection, apart from the exhibits in the public galleries, particularly for the use of students who require help in indentification. The authorities of such museums will only be too glad to offer all the assistance they can in naming and suitably setting up the collected material for use in the school museums.

It is not unusual for a school museum to rapidly dwindle down into a mere miscellany of unrelated objects and curiosities after the initial impetus of the organiser has died down a little. Such a state of affairs has to be carefully guarded against. It is absolutely necessary for the museum builder to have in view from the beginning a clear and well defined plan as to what kind of exhibits he should collect and prepare, and he should be able to arrange them in a definite order so that the whole collection may tell a harmonious and connected story, correlated to the lessons taught in the school. The material exhibited in the school museum would naturally prove most useful if they are so selected and arranged as to have a direct bearing on the syllabuses of the various subjects taught in the school. For instance, few visual aids could be more effective in a lesson on the feeding habits of birds, than a well selected series of beaks and feet of various Indian birds which can beautifully illustrate the correlation between structure and habit. Similarly, a series of preparations of mammalian skulls may graphically illustrate how the cat's teeth are adapted for tearing flesh, while the rabbit's are more fitted for nibbling grass. An enlarged model of the head of a poisonous snake will certainly help in impressing the pupils to understand the mechanism of the poison apparatus in snakes far more effectively than a plain dragram. A small collection of local birds and small mammals, lizards, frogs and fishes, butterflies, beetles, grasshoppers, spiders, snails and other lower animals collected from fields and gardens in the vicinity of the school will form excellent exhibits if they are suitably preserved, mounted and displayed, and will serve to give the children a concrete idea of the types represented in their local fauna. It is exhibits such as these that the builder of the school museum should aim at, for they would turn out to be of

immense practical use as illustrative material for the teachers while taking their lessons. Generally a small vivarium and an aquarium in which various living terrestrial and aquatic animals are kept and reared will be found to be useful adjuncts to the school museum as they afford an excellent opportunity for the children to watch their movements, breathing and feeding habits and life histories, before they are killed and preserved for the museum.

I have so far restricted my remarks mainly to zoological material, but they are equally applicable to other school subjects such as botany, history and geography. Plants, economic products, minerals, coins or plaster casts of coins and other objects and curiosities of educational value may also be similarly collected and set up for the school museum. Apart from trying to collect by their own efforts, the teachers and pupils may also try various other sources. Large public museums, industrial concerns and other Government Departments such as the Forest, Fisheries, Veterinary, Agricultural and Public Health Departments might be able to make small gifts of specimens to school museums. Fisheries Biological Supply Stations will be able to secure specimens of marine animals at a nominal cost. Exhibits such as relief models of our various districts, a partly sectioned model of the globe showing the crust of the earth and specimens of the common minerals and ores represented in our country may prove to be of immense value in illustrating lessons in Geography. Similarly a series of Indian coins or their plaster casts arranged and labelled chronologically will form an exhibit of considerable historical value, helping the children towards a better understanding of the various important dynasties. A good collection of our local plants and economic products derived from them may help to impress on the pupils our great indebtedness to the plant kingdom and also enable them to get clear and correct ideas about the structure and characteristics of many of our common plants, with which most children, especially residents of the cities, are so unfamiliar.

When a fairly decent collection of material has been gathered together for the school museum, a good, well-lighted, preferably rectangular room in the school buildings should be selected for

accommodating the museum. To start with, glass-fronted almirahs may be used for arranging the exhibits, but later on, as funds become available, it is advisable to make special exhibition cases with more extensive glass fronts for affording a better view of the exhibits. A series of such cases fixed up on the walls of the room and one or two central, four-sided cases mounted on cupboards would be ideal. While planning the cases, uniformity in style and suitability to the nature of the material to be exhibited should be the guiding principles in their construction. Some school and even college museums have adopted the pigeon-hole method for exhibiting small objects such as shells, but I would prefer mounting them on neatly painted display panels by means of strong adhesives or small pellets of plasticine and placing these panels inside the exhibition cases, as they make a much better display. Good labels are essential for museum exhibits. Printed labels bound with glass and passe-partout are ideal, but neat, hand-written Indian ink labels are also good enough if printed ones are not available. Typed labels are liable to rapid fading. Once the nucleus of a school museum has been laid, it can be expected to develop and expand rapidly into a veritable storehouse of useful knowledge, provided the teachers and pupils actively co-operate in contributing all their skill, ability and ingenuity towards its enrichment.

It is, however, a matter for regret that there is hardly any museum service catering to the needs of children in India. Public museums are few and far between, and are too understaffed to render any appreciable help to the hnndreds of schools in the province. Our schools therefore have to depend more or less entirely on their own efforts in developing their museums. In the United States of America there are special Children's museums where exhibits are selected and arranged to suit the requirements of children. There are facilities in some of these museums for the children to handle the exhibits freely, thereby letting them have a more personal and intimate knowledge about the museum material. The American school boy or girl is also fortunate in being benefited by the extensive educational services organised by the larger public museums in the cities. These services include circulating collections of various illustrative material such as lantern slides, educational motion picture reels and specially

prepared portable exhibits for class use. School museums in the West have therefore had far greater opportunities of developing on modern lines than those in our country.

But we are learning to march forward in every field. We are on the threshold of a new era in our educational system, characterised by refreshing signs of activity and expansion in every direction. There has recently been a welcome realisation of the educational value of museums and the school museum movement is already gaining momentum. We may be confident that the day will not be far off when every school in the country will have a flourishing museum of its own, playing a vital role in our scheme of education.

BIRDS OF THE DUARS

BY

C. M. INGLIS, F. Z. S., B. E. M. B. O. U.

INTRODUCTION.

The object of this treatise is to help those who take an interest in the birds they come across during their day's work in the forest or on the banks of the many rivers and streams in the district. At present any one wishing to identify a bird has to search through many volumes, as the few popular works which have been published only give a small percentage of the species found in any district. The ideal course would have been to illustrate every bird in colour but as that is not feasible, use is being made of the coloured plates which we have in stock, most of them already published in the journals of the Bengal Natural History Society, supplemented by the beautiful photographs

taken by Messrs. W. A. S. Lewis, H. E. Tyndale and F. W. Champion, to whom we are very greatly indebted. The coloured plates are the work of the author.

This work is, mostly, based on the large collections of birds made in the district by the author, over a period of thirty years, supplemented by a very interesting collection made by Mr. E. G. L. Webb and his two sons. The observations made by that excellent field naturalist, the late Mr. H. V. O'Donel, who resided for many years in the district, have been fully made use of as well as various notes received from other kind friends. Many ornithological books and journals have been consulted, and a list of the principal ones is given in an appendix.

There is one great blank in this account due to the paucity of local information about the nesting of even the commonest of our resident birds. No one has gone in, systematically, for the oological branch of the science ; a nest or two have, sometimes, been taken but nothing published except one interesting note by H. Storrs. He was a promising enthusiast but was unfortunately in the district for too short a time to be able to do much in that line. Another man, of whom I had great expectations, was transferred to the Calcutta office before he was even able to start collecting eggs.

With regard to previous collecting in the district, there is not much information available, During the years 1873 and 1874, the late Mr. Mandelli had collections in "the Bhutan and Buxa Duars" but there is nothing to show where they were collected. The specimens were sent to that fine ornithologist, the late Allan Octavian Hume (who, incidentally, was the founder of the Indian National Congress after he gave up ornithology,) were, ultimately, presented to the British Museum. Mr. J. R. Cripps was at Bamandanga in 1876 and did some collecting for Hume. In a settlement report of the Western Duars, by Mr. Sunder, written in 1895, mention is made of some mammals and birds said to occur there but the occurrence of these birds is very doubtful so I have relegated them to an appendix. The late Mr. H. V. O' Donel made a collection of some of the birds of the district, the

Darjeeling Natural History Museum purchased some from him and the rest found a home in the collection of the late Mr. Hugh Whistler. Mr. Herbert Stevens made a short collecting trip to the Eastern Duars in January, 1922, and I have made use of the notes he published.

In 1919 and 1920 "A Tentative List of the Vertebrates of the Jalpaiguri District, Bengal" was published in the journal of the Bombay Natural History Society, under the authorship of the late Sir Lancelot Travers, H. V. O'Donel, E. O. Shebbeare and myself. Since then much more has been learnt about the avifauna of that area and a good many additions, as well as omissions, have now been made to bring the list up to date. That early paper was a mere list, with no descriptions and little information.

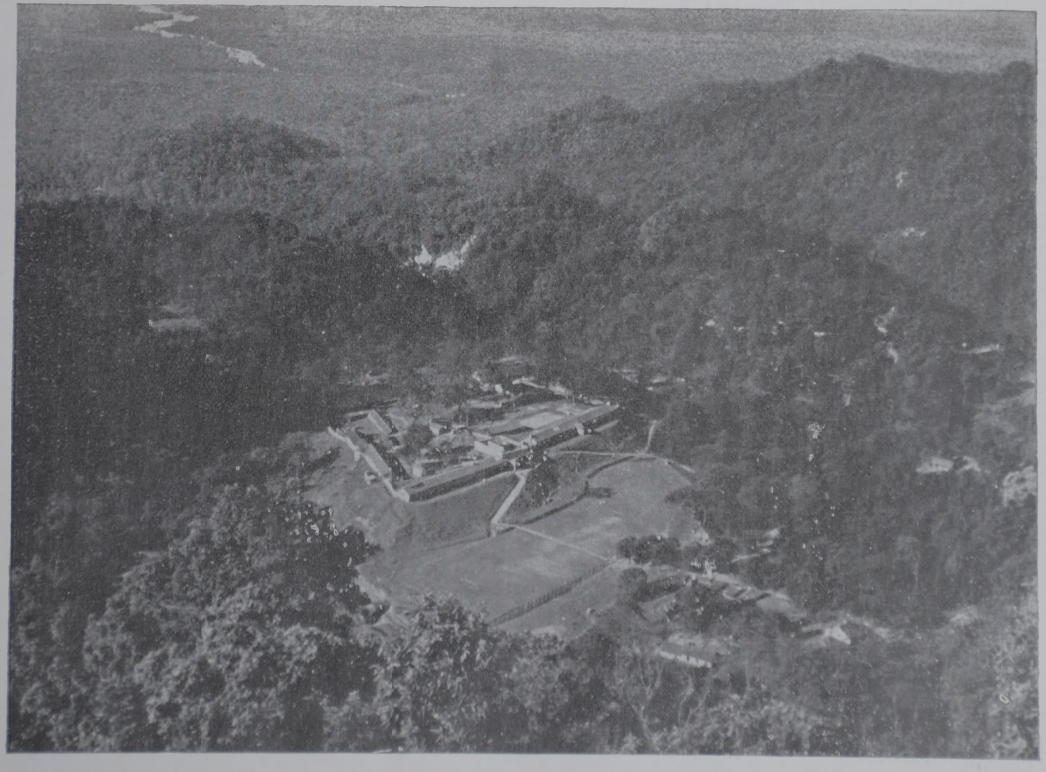
In the present series of articles I am giving descriptions, generally only of the adults, the distribution within the Duars where known and notes on the habits of the various species. There is very little original matter, but as this publication is primarily meant for those who do not possess bird books and to whom such information is not available, I thought the inclusion of published notes would prove both useful and interesting, so I make no apology, except to the authors for using them.

With regard to nomenclature I have followed that of Stuart Baker in the 2nd Edition of the Fauna of British India (Birds), with alterations to bring it as much up to date as I can. In this I have had much assistance, both in scientific and popular English names from H. G. Deignan's important account of *"The Birds of Northern Thailand"* published as *Bulletin 186 of the Smithsonian Institution in 1945.* While on the matter of nomenclature, it will be noticed that some of the plates differ from those in the text, this is due to a change in nomenclature since the plates were first reproduced. A serial number and the reference number in the Fauna of British India (Birds) are given. Those species whose occurrence is doubtful are placed in brackets.

Acknowledgements.—The facilities I had to study, and collect, the birds of the district during my earliest visits to the Duars were largely due to the great kindness and hospitality of E. O. Shebbeare with whom I spent a month of each winter touring the district during the years I was living in Bihar. As our whole time was spent in forest bungalows I had unique opportunities for doing this. Later I spent many whole winters with my very dear friends, the O' Donels, both at Hasimara and Haldibari, and my greatest successes in the collecting line were achieved while with them. Being an enthusiastic naturalist himself, and his wife being interested in all my activities, life with them was most congenial and fruitful. Haldibari is excellently situated from a naturalist's point of view as the Moraghat forest is one of its boundaries and many water birds and grass-loving birds are found on the Estate. Mr. and Mrs. E.G.L. Webb also put me up for lengthy periods during a number of years, both at Nangdala and Binaguri and made their home my home where I could come and go and do just as I liked. He also presented a collection of bird skins to the Darjeeling Museum which included the only known specimens of the Lapwing from the Duars. I am also indebted to Mr. and Mrs. N. G. Webb and the late W. Stowell for their kindness in having me to stay with them, for weeks at a time, at Hasimara on many occasions and thus helping me to do some collecting on the Torsa river. I must also thank the late Mr. D.A.G. Davidson and Mr. A. V. Pullan for their generous hospitality at all times. My stays with the former, in various forest bungalows, and with the latter, both at Kartick and in his 'palace' at Rydak, have enabled me to study and collect the birds of both the Eastern and Western Duars. Thanks are also due to kind friends who have, alas! crossed the "Great Divide", F.M. Graham of Hantapara, Lancelot Travers of Baradighi, Ian Ballantyne of Manabari, and J. R. Philips of the Indian Police, who was stationed for some time at Baksa Duar, all of whom generously gave me hospitality on many occasions. I owe much to the encouragement of the Museum Committee for the interest they have taken in my work. Last but not least, I must add the names of my friends, the late Stuart Baker and Hugh Whistler, the former as far back as 1890

Subject :—Wet Mixed Forest, View Down Ramjhora from Road Crossing, Jalpaiguri Division.
Locality :—North Moraghat, R. F., Jalpaiguri Division, Bengal.

Wet Mixed Forest showing stream which rises in the plains.



BAKSA DUAR WITH SURROUNDING FOREST AND BALA RIVER. *Copyright H. E. Tyndale.*

made me keen on birds, gave me books, and all through his life helped me in many ways. The latter was always willing to help by comparing and identifying doubtful species and with valuable advice.

The area included in this book is that portion of the Jalpaiguri district known as the Duars (or Dooars) and excludes the area South of the line Jalpaiguri—Alipur—Duar.

The following account of the District was written by Shebbeare and published in the Bombay Natural History Society's journal. It is "an area taken over by the British Government after the Bhutan War of 1865 and prior to that time divided by the Bhutan Government, for the purpose of rent collecting, into a number of small districts known as Bala-Duar, Luckee-Duar, etc. whence the name. The term "Duars" and especially such contributions as Sikkim and Bhutan Duars etc., used by writers in describing the habitat of species, led to a good deal of confusion. Originally, at any rate, the whole of the foot-hill tract east of the Tista and stretching into Assam was called the Duars (just as the corresponding tract west of the Tista is called the Darjeeling Terai) but, latterly, the meaning of the word has been narrowed down, by common usage, to refer to the Duars tea district which only extends eastwards to the Sankos and is therefore, co-terminus with the Jalpaiguri District. We presume that "Sikkim Duars" refers to that part west of the Jaldhaka and "Bhutan Duars" to that east of this river. Buxa Duar was one of the original divisions made by the Bhutan Government, a comparatively small area, but we believe that the expression "the Buxa Duars" is meant to refer to the whole of that between the Torsa and the Sankos. Similarly, Eastern and Western Duars, though originally used relatively to the Sankos is sometimes, we believe, wrongly used relatively to the Torsa. British Bhutan is another rather confusing term which we believe is intended to be synonymous with the Duars.

"The north boundary of the district is in some places the foot of the hills and in others the top of the first ridge which at one point (above Buxa, now called Buxa Duar) reaches an elevation of nearly 6000 feet. From the foot of the hills, which is usually well defined, a stony plateau, intersected by the

steep-sided beds of streams and rivers, slopes gently southwards for a distance of two to six miles to join the true plains, at some places passing into them imperceptibly and at others descending to their level by one or more steep or even precipitous declines. The plains, like the plateau, slope towards the south, but with a very gentle gradient.

"As might be supposed all water courses flow from north to south; those which rise in the Himalayas are torrents in the rains and have rocky, gravelly or sandy beds according to their distance from the hills. For the first few miles after leaving their gorges, these hill streams are confined to some extent by the necessity of cutting their way through the plateau, but once in the plains they spread out to an enormous width. Except a few of the larger ones, these hill rivers disappear underground for some part of their length in the dry season causing a waterless tract some miles wide from north to south. The streams which rise in the plains are in almost every respect the opposite of those which rise in the hills; they have narrow beds and high banks with overhanging evergreen vegetation, and vary very little at different seasons.

"The northern part of the district is nearly all either tea-grant or Government forest, and the southern part nearly all cultivation; ..... The tea-grants are not all entirely under tea. Parts of them are grazing land, savannah, and, in a few cases, tree-forest. The Government forests are mostly tree-forest though there are still a few fair-sized savannahs and some forest villages.

"The forests of the plains consist of a great variety of trees of which the commonest is *Sal* and there is, generally, a heavy undergrowth of shrubs and creepers, mostly evergreen. In the river beds *Khair* and *Sissoo* forest is found, This is not evergreen and, usually, has a lighter undergrowth or simply grass. The forest of the hills consists of trees with moderate undergrowth and some bamboos in the villages. Where shifting cultivation has been practised there is an almost impenetrable mass of shrubs and creepers.

"The savannahs consist mostly of tall grass usually from eight to fifteen feet high with scattered trees ; there are some areas with shorter grass. The area of savannah throughout the district is much smaller than it was formerly and constantly on the decrease owing to the extension of cultivation, tea and grazing outside the Government forests and fire protection, which tends to encourage trees, within them.

"The cultivation in the plains is almost entirely irrigated paddy land and a good deal of jute is grown. There are practically no large villages as in some other parts of India and the homesteads of the cultivators surrounded by clumps of bamboos and betel palms, are scattered among the paddy fields at frequent intervals.

"The average temperature in the plains is between 60° and 70° during the cold weather (November to February) and between 75° and 80° during the rest of the year. Frost is rare. The average rainfall at Jalpaiguri is 127 inches. The rainfall increases as the hills are approached and the average in the northern part of the district is about 160 inches, while in the hills themselves (at Buxa—2000 ft., now called Buxa Duar) it is 194 inches."

CORRIGENDA

Vol. XXV, No. 1.

Page	Line	
5	6	(from top) read small 'c' in "Charltoni".
71	3	(from top) delete "F. R. E. S."
,,	8	(from bottom) insert " , " after "contents".
72	13	(from top) read "Duar" instead of "Duars".
73	11	(from top) insert " , " after "preferably".
,,	11	(from top) delete " ; " after "stolen".
,,	13	(from top) read "cuckolded" instead of "cockolded".
,,	7	(from bottom) read "crest" instead of "vest".
74	17	(from bottom) insert " , " after "when".
,,	3	(from bottom) insert "-" between "rufous" and "fulvous".
75	1	(from top) insert "-" between "reddish" and "brown".
,,	8	(from top) alter "Xylocopa spp." to italics.
,,	15	(from bottom) insert "-" between "reddish" and "white".
76	9	(from top) insert " , " after "parties".

AN APOLOGY.

We regret that the Introductory part of the article on the "Birds of the Duars" by Mr. C. M. Inglis was unfortunately omitted in the last issue of our Journal (Vol. XXV, No. 1). We are therefore including it in the present number, and offer our apologies to the author and to our readers for the error.

Editor.

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