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JUNE-DECEMBER 1959

JOURNAL OF THE BENGAL NATURAL HISTORY SOCIETY

Editor : J. C. DANIEL.

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THE BENGAL NATURAL HISTORY SOCIETY

Estd. 1923

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.

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The Himalayan Whistling Thrush.
The Assam Spotted Babbler.
The Northern Bay Owl.
The Grey-winged Blackbird.
The Indian Scarlet Minivet.
The Indian Thick-billed Flowerpecker.
The Indian Short billed Minivet.
The Yellow-throated Minivet.
The Burmese Small Minivet.
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Vol. III,	
Vol. IV, Nos. 1, 2 and 3	Vol. XVIII, No. 4
Vol. V, No. 4	Vol. XIX, Nos. 1 and 2

BENGAL NATURAL HISTORY SOCIETY

Estd. 1923

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MACRO-PHOTOGRAPHY.

BY

H. J. KITCHENER

Macro-photography, although the word sounds rather formidable, is merely "close-up photography". All that is needed is a camera with a long extension and a relatively short focus lens. A mirroscope is not required and is used as a part of the equipment for photomicrography, another branch of photography concerned with the taking of photographs of very small and minute creatures.

For this work the plate and cutfilm double-extension cameras for negative images up to natural size and larger can employed without additional equipment but all other types of cameras need special accessories such as supplementary lenses and extension tubes.

Amateur photographers these days seldom own a double extension camera and are more interested in the many models of single-and-double-lens reflex cameras taking a variety of film sizes.

Twin-lens reflex cameras do not normally allow for interchangeable lenses, thus making the use of extension tubes, to increase the focal lengths of the lens, impossible. Supplementary lenses, in pairs, one for the taking lens and the other for the viewing lens allow some of these cameras to be used for close-up work. Parallax, the bogey of twin-lens cameras, becomes somewhat of a menace and complicates matters very considerably.

The single-lens reflex cameras, in 35 mm and 6 × 6 cm film sizes with extension tubes are ideal for close-up work. With these cameras the subject can be reproduced on the film format slightly reduced, natural size and even enlarged beyond natural size. A wide range of lenses is also usually available.

A single-lens reflex camera with lenses of 5 cm. to 7.5 cm. ($2\frac{1}{4}$ to 3 inches respectively) will normally focus down to 3 feet. By the addition of extension tubes of varying lengths any distance between 3 feet and a few inches can be covered. For such small subjects as insects' eggs the microscope may be necessary if the fine detail of the eggshell is to be seen although with a long enough extension a considerable amount of detail will be disclosed.

As the focal length of the lens is increased—by the use of extension tubes, so will the exposure require increasing. Increased magnification of the subject image on the film decreases the lens coverage and the amount of light reaching the film through the lens.

Exposures will therefore require increasing to compensate for the decreased amount of light, carrying the photographic image, entering the camera lens.

Close-up work of this kind makes positive rigidity of the camera and subject absolutely imperative. Enlargements made from film exposed in an insecure and wobbly camera will merely exaggerate the effects of camera shake and produce useless blurred prints; a waste of film, chemicals, paper and time, with the added sense of frustration and failure.

Another point which must be borne in mind is the fact that the longer the focal length of the lens, by the addition of extension tubes, the shallower (or narrower) the depth of field or as some people call it, depth of focus.

The depth of focus with long extensions can be measured almost in millimetres for any given focal length or subject/distance. This can be increased slightly by stopping down to the smaller apertures, f 16, f 22 and even f 32. The use of these small apertures naturally increases still further the

correct exposure. This is, however, compensated for by greater definition and a deeper depth of focus.

Another point worth remembering is that it is better to photograph a subject at a reasonable distance and so obtain a well-defined and in focus small negative image, which will bear a good degree of enlargement, than to get closer to the subject and find that lack of a sufficient depth of field produces fuzziness and blur in places which tend to spoil and detract from the impact of the finished enlargement. A good clear small correctly focused and properly exposed negative will bear considerable enlargement without suffering very much loss in detail and definition.

This is particularly the case with the 6×6 cm. (120) film size is used. The 35 mm. film format, being very much smaller, does not permit so much leeway in this respect as there are limits to the acceptable degree of maximum enlargement. The subject can therefore appear larger on the 35 mm. negative, providing the greatest possible depth of field is obtained by careful adjustment of aperture and exposure.

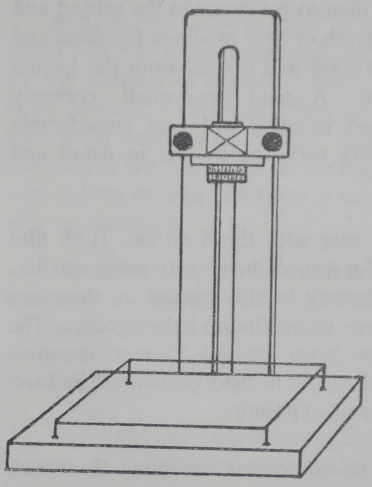
Now for a few words on equipment, assuming the reader possesses a camera which will accept extension tubes, supplementary lenses or both.

The camera may be fixed either vertically or horizontally although there are occasions when both are needed. For certain subjects, preserved fishes, pupae, aquatic insects, etc. the vertical setting is more convenient. For the arranging of plants, flowers and their parts, larvae and pupae on the food-plants, moths, butterflies and other small creatures the horizontal arrangement of the camera is more suitable.

For those who possess the funds copying stands can be purchased together with auxilliary lamps attached and a small glass-topped stand or table on which the subject is arranged under the camera.

On the other hand, the making of a very efficient copying stand is well within the scope of the most conservative spender.

The stand described below is in its simplest form with a minimum of parts but a little ingenuity will indicate where other components can be substituted or incorporated which will improve its efficiency and handling.



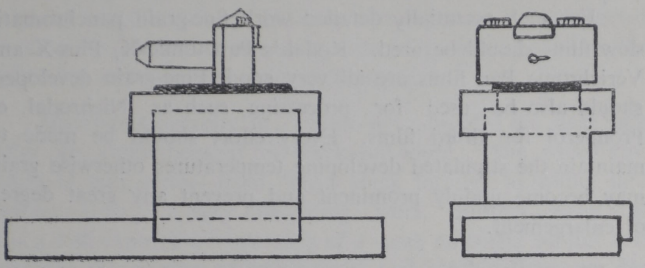
Copying stand.

The essential parts are a solid smooth baseboard about $14'' \times 12'' \times 1\frac{1}{2}''$ and a board $24'' \times 6'' \times \frac{3}{4}''$ screwed securely to one of the shorter sides of the baseboard, in the centre. Down the centre of the upright board a slot is cut wide enough to take a screw fitting the tripod screw hole in the base of the camera. The best screw for this purpose is a brass screw with butterfly nut and a large washer. The butterfly nut is threaded onto the screw and the washer placed on top. The end of the screw is inserted into the camera tripod screw hole through the slot in the upright and given a few turns to secure it there. The butterfly nut is then tightened against the washer which is hard up against the edges of the slot, until the camera is securely held at the correct height.

A $6'' \times 8''$ (or larger) sheet of flawless plate grass is utilised as a table or stand for the arrangement of the subject below the camera. Thin $4''$ legs are attached to the corners of the glass or they are drilled and thin metal rods are screwed into place. The larger the piece of glass and the thinner the legs the less chance there will be of shadows being cast across the background beneath the subject.

On this glass stand the subject is placed and arranged. Neutral grey paper or black velvet is placed on the baseboard

as a background according to the general colouration and detail of the subject.



Optical Bench.
This drawing is not to scale and various components have been exaggerated in order to show their positions and functions.

For the horizontal setup I make use of a piece of well-squared and planed hardwood $24'' \times 8'' \times 2\frac{1}{2}''$. The camera attachment is saddle-shaped, 8″ long and 6″ in height above the surface of the baseboard. The "saddle-flaps" extend downwards on the sides of the baseboard so that the attachment can be moved up and down along the baseboard. Onto this is fitted a hollow topless and bottomless flanged frame about 4″ deep. To the top of frame is screwed an 1/8th inch brass plate with a slot cut down the centre to take the screw which holds the camera to the frame.

The camera is screwed to the brass plate; the frame is fitted over the top of the saddle piece which is moved up and down the baseboard until the desired degree of magnification has been obtained on the ground glass screen of the viewer. For easy running apply liberal rubbings of paraffin wax (candle-grease) to the baseboard and bearing parts.

With this "bench" it will be necessary for the subject to be held in some type of adjustable clip as the height of the camera above the baseboard is fixed. Here again neutral grey paper, black velvet or finely woven black cloth can be used as a back-ground. This should be placed some distance behind the subject so that coarseness of paper fibre, wrinkles and weave of the cloth does not show in the negative. If the back-ground is a

sufficient distance behind the subject it will be so out-of-focus and diffused that no grain or weave will be visible.

For such essentially detailed work fine-grain panchromatic slow films should be used. Kodak's Panatomic-X, Plus-X and Verichrome Pan films are all very good. Fine-grain developers should also be used for processing, such as Nichrodal, or Promicrol for Ilford films. Every effort should be made to maintain the stipulated developing temperatures otherwise grain may become unduly prominent and prevent any great degree of enlargement.

For some strange reason I and friends of mine have found that the use of Microphen (Ilford) for the development of Ilford films turns them all a dark blue which ruins them completely for making prints and enlargements. I have recently sent samples of these discoloured films to Ilford Ltd., London asking for an explanation and remedy.*

In dealing with exposure for close-up work nothing should be left to guesswork or haphazard calculation and estimate. A reliable exposure meter, even for these short distances, cannot be dispensed with; on the contrary becomes even more necessary. Badly exposed negatives waste film and, what is even worse, may mean missing a photograph of a subject which may never again be available.

At a subject/lens distance of 3 feet no increase in normal exposure is necessary but for shorter distances some increase becomes necessary. The manufacturers of cameras invariably supply a scale of increases in exposure required for extension tubes they make for their cameras. These increases vary from × 2 to as much as × 4 of the normal exposure times.

Present-day photographic sensitive materials have a very wide range of exposure latitude. Minor errors in under-exposure can usually be rectified to a certain degree in the

*I have since been informed that the blue stain is the film backing and the use of strong sunlight or an acid stop bath between developer and fixer results in return of this dye to the emulsion. It can be prevented by omitting the stop bath, but as the stop bath materially helps processing it might be best, if this blue appears, after processing, to wash the film for a few minutes ina 3% solution of washing soda before putting it up to dry.

printing frame or enlarger. It is not so easy to deal with over-exposure unless complicated processes are undertaken to deal with the negative, in the way of reducers, etc. Clogged-up over-exposed negatives always indicate over-exposure and can never make clear detailed pictures. It is therefore better to err on the side of under-exposure than over-exposure.

Macro-photography in colour is naturally the next step after an apprenticeship in black-and-white. The transformation of grey tones—from dead black through to white, into colour values is a very fascinating work. Further, when one has a well-exposed transparency of a small colourful subject it is amazing the number of new colours and combinations one discovers, with the time to study the subject and enlarge it to many hundreds of diameters on a screen in front of the clear penetrating light of a projector lamp.

Strangely enough I have found that my best colour results have been obtained by the use of artificial light and artificial light colour films. The results are invariably more satisfactory than daylight film in day light. Kodachrome "A" and Ektachrome "F" colour films produce excellent colour transparencies while Kodacolor (a "negative" colour film) will provide both colour prints and ordinary balck-and-white prints if exposed by daylight. The Kodacolor "negative" is of no use as a transparency for projection as it is in the colour's complimentary colours and requires reversal before colour prints can be produced from it.

The fact that artificial light produces such excellent results is due, I think, to the fluctuations in the light values of ordinary day light. Passing clouds, mist, atmospheric moisture and the movement of the sun varies the light values from minute to minute. Using suitable over-run Philips and Photoflood lamps in suitable reflectors the light values are always constant, which eliminates one very big headache. With these lamps, which generate a great deal of heat, the arrangement and focusing of the subject should be carried out with ordinary pearl or opal electric bulbs which are switched off and the high intensity floods switched on when about to make the exposure. In this way the subject is not subjected to a period of roasting and

economy in the use of electric current possible. Many insects become very restless under powerful lights and heat.

With colour film of any make correct exposure is an absolute "must". It is here that an accurate exposure meter really comes into its own and takes its full share of responsibility in producing good transparencies.

The equipment required for close-up photography in colour is unchanged except that where insects, butterflies, moths and other small creatures and insects are concerned their foodplants and natural settings can be included. Tree-bark, rotting wood, etc. make good backgrounds for beetles, grubs and grasshoppers unless the latter can be persuaded to remain static on blades of grass and grass stems. These inclusions, if the "dressing" is not overdone add reality and authenticity to the resulting transparency.

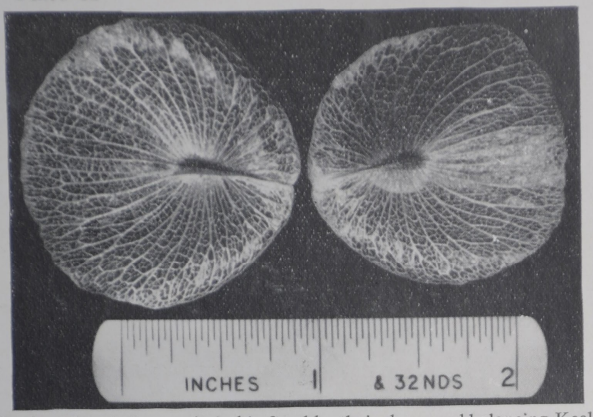
One very useful method of putting insects into a "comatose" state is to place them for a short while in a refrigerator. The drop in temperature will slow down their activities considerably but the stage must be set and ready for making the exposures as soon as they are placed on the set. Return to the normal atmospheric temperature soon bring them to life again and they are not slow to move off.

Pay particular attention always to focus. In taking flat or flattish subjects there is little to fear. With round or roundish subjects, caterpillars, beetles and pupae, focus on the largest flattish surface nearest the lens and use a small aperture. Exposures can be short as the over-run lamps used provide plenty of light. This should bring into sharp focus the salient points of the subject.

Do not attempt to obtain too large a magnification of the subject image on the negative format. Projection, for which almost all transparencies are used, will enlarge a 35 mm. transparency enough to make all detail clear and well defined.

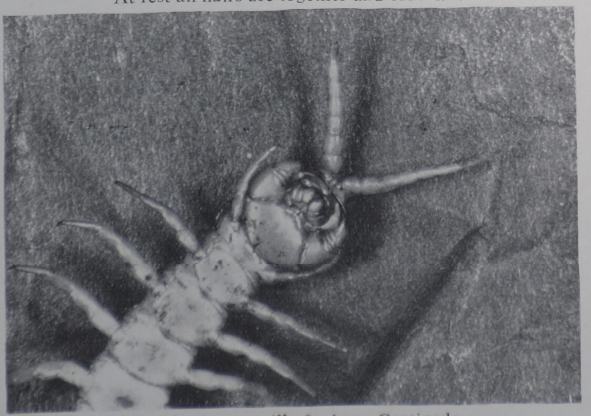
There is no "grain" to be concerned about in colour films but expossure must be dead accurate always. Over-exposure produces washed-out colours and completely destroys their

Plate II



Seeds of Jungle liana, admirably fitted by their shape and balancing Keel, for long glides from the tall Jungle trees on which the plant grows.

Poisonus Caterpillar with hairs extended when irritated. At rest all hairs are together and brushlike.



The "business end" of a large Centipede.

Photos Author

Plate III

Small Scorpion with young. Nat : Size

Photos

Head of Flying Gecko (*Ptychozoon Kuhlii*) showing Colour pattern.

Author

values; under-exposure gives blacked-out shadows and dull highlights.

It is quite impossible to be able to lay down hard and fast rules for any of the operations in this work, either in black-and-white or colour. Factors affecting every stage and every type of material and piece of equipment are too numerous and complicated. Each and every camera, each type of film and lens and each subject produces its own particular problems. Careful selection of materials and learning their properties and capabilities, together with careful processing all go to improve one's knowledge of the subject so that in time the accumulation of experience will solve problems and indicate lines of action and application which will produce something near a hundred per cent return in results.

For any series of exposures, whether monochrome or colour (particularly useful with colour) it is always a very good thing to maintain a record of exposures. All that is needed is the entry of the exposure number, type of light source, magnification (if using extension tubes), subject, stop, exposure in seconds and the subject/lens distance.

After the film has been processed, either by oneself, or in the case of colour, by the manufacturer, it is an easy matter to pick out the most suitable combination of factors for future exposures of similar subjects. Such records save a great deal of calculation and waste of time and act as ready-reckoners.

I have used electronic flash quite successfully for close-up work using ordinary panchromatic films and *daylight* Kodak and Ektachrome colour films. Electronic flash is almost identical to daylight and Ektachrome responds very favourably.

As the flash duration of electronic flash tubes is extremely short in region of 1/600th to 1/1000th sec. according to the type of outfit and the freshness of batteries and flash tubes the only factors which require consideration are subject/lens distances and aperture. Shutter speed does not come into the matter at all as the camera X (electronic) flash contacts are synchronised with the shutter so that at whatever speed the shutter is set the opening of the shutter amply covers the duration of the flash.

My own equipment consists, basically, of an Agiflex III single-lens reflex camera, 6 × 6 cm. and a 35 mm Kine Exakta VX Varex camera, single-lens reflex.

The Agiflex, although possessing excellent lenses is a most exasperating camera to use. An exposure of more than two seconds is quite impossible with it as there is no provision for "B" exposure. "T" or "Time", although operative by a camera body release or a cable release, requires the pressing in of a small match-thin projection on the front of the camera to close the shutter. This cannot possibly accomplished without fear of shaking the camera most alarmingly. Extension tubes and a wide range of excellent lenses are available. For work which may require long exposures and complete absence of camera shake this camera compares most unfavourably with almost all others. This is a great pity as it takes very good photographs if the subject and its requirements are within its very limited scope.

On the other hand, I cannot say enough in praise of my Kine Exakta Varex. It has the widest possible range of accessories one could wish for, including lenses and tele lenses, and, using the correct type of film for the work in hand there is no task it cannot undertake, with the usual excellent results.

With my Exakta I also use another piece of equipment known as the Novoflex Bellows Attachment which, in effect, is an elaborated extension tube working on a pinion and rack principle. The camera is fitted to this attachment after removing the lens and works as an independent self-contained camera. The normal camera lens can be used as the taking lens, others of a longer focal length can also be obtained for this bellows attachment to give any degree of coverage. Focusing with a 105 mm lens allows for focusing from infinity down to a matter of a few inches, providing coverage for any size of subject and distance. Other refinements are a variety of viewing devices, an attachment for using the camera in conjunction with a microscope (photomicrography) and various types of ground glasses for the various viewers.

For anyone who has not, as yet attempted this close-up photography a very great deal has to be learnt for this is a much

more exacting branch of photography where detail, definition and accurate exposure counts for everything. A great deal will also be learnt about the subjects photographed, their ways, their growth and all the stages of their growth.

A month or so ago I sent along to a friend a photograph of an Atlas moth larva, enlarged to natural size. The photograph had actually been taken with electronic flash. The photograph was enlarged to exact natural size, a matter of six inches. My friend has known Atlas moths for over forty years, has raised them from the eggs and has sent many hundreds out into the world after rearing them in his house.

A few days later I received acknowledgement of the photograph. In this letter my friend expressed considerable surprise at the discovery, in the photograph, of a series of short thick spines low down near the foot on each segment. Although he had seen and handled many hundreds of these larvae it was not until he had examined this photograph that he had any idea these spines existed.

Macro-photography can also be used very effectively for underwater photography of aquatic insects, grubs, larval stages of amphibians, fish and aquatic reptiles.

Here speed is a consideration and faster films can be used with advantage although great care must be exercised during processing in order to keep grain to the absolute minimum.

Overrun studio types of lamps—Philips "Photomirenta" and "Photolita" are very suitable for this work as for all close-up work with artificial light. Care must be taken to see that the heat emitted by the lamps does not heat up the water containing the subject. Focusing and other preliminary work should be undertaken by the light of ordinary electric lamp bulbs.

I prefer tanks of suitable size constructed of unblemised clear 1/8th inch perspex to glass tanks as I fiind this material does not appear to produce as many disconcerting reflections as glass.

The same overall procedure is necessary as for other subjects. Care must be taken to ensure that no reflections from the light source find their way onto the camera lens; a lens hood is always a very useful adjunct when using bright lights near the camera. Backgrounds can be arranged according to the colour and other details of the subject. In some cases a light background is preferable to a dark one and *vice versa*.

The most suitable arrangement for fish photographs is to use tanks which are narrow in depth and five or six times as wide as the depth. These tanks can be made in various sizes so that any size of fish or amphibian can be accommodated. A sheet of glass which fits the length of the inside of the tank is used as a partition to keep the fish well to the front of the tank. Strips of glass of varying thicknesses can be used between the partition and the tank front to confine the fish to a certain area. Waterweeds, etc. are arranged at the back of the tank behind the partition sheet so that they do not offer harbourage or concealment for the subject. If the fish is placed in the tank some time before it is intended to photograph it will have settled down and become used to its surroundings by the time work commences. Screens or reflectors of white paper, metal or silver paper gummed to three-ply sheets are always very useful for directing light on to the subject to disperse heavy shadows. A large mirror directed onto outdoor tanks is also a great help in reducing exposure time with much larger fish.

For any type of indoor work in which artificial light is used these reflectors will be found extremely useful when properly arranged around the subject.

The miniature camera (35 mm) is the most suitable camera for photographs of free insects going about their business. Its lightness, compactness and ease of handling saves a lot of bother and inconvenience.

A great deal of patience is required, however, particularly with butterflies, which seldom settle where one expects or wants them to or having settled are off again before they can be reached or on being reached do not remain long enough for an exposure to be made.

The best method, although it does not always work, is to adjust the focus, with extension tube fitted, at the most suitable approximate subject/lens distance. The insect is approached as quietly and slowly as possible, watched carefully through the viewer. The moment it is in sharp focus operate the shutter; you may and may not have a worthwhile photograph. In many cases although the subject may be in good focus the flower or leaf upon which it is settled may be right out of focus. This is rather a hit-or-miss type of photography. The most satisfactory way really is to raise the butterflies from the larval stage and then photograph them soon after they have left the chrysalis. For a short while after emerging, after the wings have grown and thoroughly hardened there is a short period during which they remain quite quiet. It is during this short period that they may be photographed if every operation is carried out with a minimum of movement and pother. On the other hand a short confinement in the refrigerator will have the effect of keeping them quiet for a slightly longer period but once they have warmed up they are off without any warning or notice.

A method which is likely to be more successful is tropical countries than temperature is to utilise the attraction which rotting fruit and other not-so-inoffensive substances have for certain species of butterflies and moths. Seepage, stale urine and salt are also attractive to butterflies. As these attractive baits are invariably found on the ground it is not particularly comfortable or dignified to spend possibly long periods flat on one's stomach in the hot sun in close proximity to odiferous substances.

The easiest method here is to make use of a soleniod screwed into the cable release socket of the camera and a simple electric circuit, operated by a suitable battery with a control switch at the end of a length of flex for actuating the camera shutter.

The camera, with solenoid fitted, is set up near the bait at ground level, focused and lightly camouflaged. The bait can be watched with a pair of binoculars from a distance sufficient to preclude disturbing any visitors. When the subject has

arrived and reached the predetermined point of focus during its feeding the circuit is closed and the exposure made.

Rotting fruit, particularly pineapple, mango and banana, has a strong attraction for certain species of moths. Flashbulbs and electronic flash are the answers to the problem of light source. Colour film will provide many colourful and interesting transparencies. Further, as the light factor and aperture can be estimated with considerable accuracy in the use of flashbulb and electronic flash there is very little likelihood of failure due to incorrect exposure.

A slice of well-fermenting pineapple is fixed to a tree at suitable height. The camera, with extension tube, is mounted on its tripod and focused on the pineapple slice. In order to allow for the depth of body of the visiting moths it is as well not to use too long an extension. Aperture and shutter speed are adjusted according to the directions given for the type of flashbulb used. All these operations can be completed during daylight.

Later that night the bait is visited. As moths are particularly sensitive to sudden sounds it is better to leave the shutter open and use the lens cap to make the exposure, thus avoiding the "clack" of the shutter within a few inches of the insects. At the sound of the shutter most moths flinch and then move around a little before settling down to feed again. If the shutter is permitted to operate the flashgun it will probably mean that by the time the shutter has opened and the flash-bulb ignited the moths are moving about and will show as blurred images on the negative. Using the lens cap in place of the shutter the cap is removed from the lens, the flashgun fired, handheld for preference, and the lens cap replaced. The shutter can then be closed, a fresh exposure wound on and the stage set for the next exposure.

The notes given here on this branch of photography will, I hope, be of some assistance to novice macro-photographers and help them to obtain worthwhile results by their efforts. There is always something new to learn, not only about photography and all the instruments, materials and accessories which make photography possible but about the many creatures which can

be photographed. The photographs themselves at their high magnification will disclose many things about these creatures which were not known before the photograph was taken.

A final word, there is no greater satisfaction in photography than to be able to do all one's processing oneself. The taking of the photograph and the production of a good negative; its enlargement or printing, development and fixing and the final glazing and mounting. Faults in technique and processing are quickly discovered and traced to the cause and origin so that they can be rectified. Processing in the hands of others is done on a mass production basis making it practically impossible to trace the cause of faults or failures.

A SURVEY OF THE RHINOCEROS AREA OF NEPAL

By

E. P. Gee, M.A.,C.M.Z.S.

Chitawan and neighbouring areas of Nepal have long been famous for their abundance of big game, including the Great Indian One-horned Rhinoceros, *Rhinoceros unicornis*, which is now one of the vanishing species of the world. For many years this part of southern central Nepal was the strictly guarded shooting preserve of the rulers of that country; but with the advent of democracy and unsettled political conditions in 1951, the exact status of the area and of the rhinoceros in it has not been clear to the outside world. Reports were in circulation of alarming slaughter by poachers in recent years, especially in the year 1958-59; but lack of authentic inform-

ation prompted the Survival Service Commission of the International Union for the Conservation of Nature to ask me to investigate the distribution and status of the Rhinoceros in Nepal, and to suggest measures for the preservation of this species in Nepal.

The rhinoceros area in Nepal covers approximately 1,250 square miles, comprising the valleys of the Rivers Narayani, Rapti, and Reu. Although it is *dun* country, it contains most of the sub-tropical vegetation usually associated with *terai* country, and can roughly be divided into (1) riverain, (2) grassland above flood level, and (3) *Sal* forest. The hills are almost entirely under *Sal* (*Shorea robusta*), a valuable hardwood. Chitawan, or the Rapti Valley is a *dun*—a plateau or flat valley inside the foothills of the Himalayas; its altitude is between 900 and 1,000 ft. above sea level.

The *dun* of the Rapti Valley is approximately 40 miles long from east to west, and varies from 4 miles wide at Ramoli at the eastern end, to about 16 miles at its widest, in the west near the Narayani river. This is the main rhinoceros area, bounded on the north by range upon range of the Mahabharat (Himalayas) and on the south by the Churia Range (Siwaliks). Another area with similar vegetation lies west of the Narayani River and down the bank of that as far west as Tamashpur. A third area is the Reu Valley which is divided from the Rapti Valley by a ridge of the Churia Range. The scenery, climate and vegetation of the Rapti *dun* is very similar to that of the beautiful Corbett National Park of Uttar Pradesh in India.

The Narayani (or Gandak) is a huge river and occasionally washes a live rhinoceros down into India. In this area it widens out to a mile or two and has islands (*tapoos*). To get over it one often has to cross three, four or five channels as well as the islands in between, and this takes about half a day. In addition to this mile or more of channels and islands, there runs along each bank a strip of riverain forest and savannah which varies in width up to a mile or more. The low lying islands in the river, which could be classed as sand banks, become flooded during most of the rainy season, June to September. The higher islands and most of the low lying strips of forests

and savannah along the banks get flooded during the peak floods of the monsoon. All this area is excellent rhinoceros habitat, containing the water, grasses, reeds and forest cover they need—particularly during the dry weather, November to May.

The Rapti river is small compared with the Narayani and in the dry weather can be crossed by jeep at many places where its shingly bed widens out. It too has islands, particularly in its lower reaches, and strips of riverain forest and savannah on either bank varying in width from a furlong to a mile or so. The Reu, main tributary of the Rapti is much smaller, and the valley very much narrower.

The vegetation of the riverain tracts consists of tree forest and savannah. Nearly all the savannah areas of the riverain tracts are burnt off annually by the local villagers to improve the grazing for their cattle—and incidentally, for the wild herbivorous animals. This has been taking place, at least to some extent, for thousands of years, and has become part of the ecological pattern.

Whenever a small stream, known locally as a *Khola*, flows out of the hills, or through grassland into a river, there is to be found a small riverain tract usually thickly forested, of varying width according to the size of the tributary. These *Kholas* provide corridors for movement of game away from the main rivers as well thick cover during day time.

On leaving the low lying riverain tracts one finds flat grasslands above flood level stretching for a furlong or two in the Reu valley, for a mile or two on the west bank of the Narayani River at Sandhana, and for anything up to seven or eight miles in the *dun* north of the Rapti river. These grasslands contain the same reeds and grasses as the savannahs of the riverain tracts, with the addition of other high ground vegetation which is not flood resistant. The soil is richer and more suitable for the growing of crops at the eastern end than at the western end, where it is lighter and more sandy in composition.

Of the grasslands which for some time been occupied by settlers, in some places the effects of continuous annual burning

over-grazing, cattle tread and exposure to increased evaporation, are becoming evident from decreased fertility and increased dessication.

In this area the sub-montane timber forest is mainly *sal*, which is to be found growing on some of the well-drained higher grassland as well as on most of the surrounding hills. It is a tree of great beauty of form and colour, and contributes much to the aesthetic enjoyment of the place, especially when the snows of the Himalayas some 50—80 miles away are visible, the *sal* forests of the area are mostly virgin and contain some of the best trees of this species in the world, rising to 160 feet, especially in the north of the Rapti Valley, which is now the the Mahendra National Park.

On 22nd March, 1959 I motored along the Tribhuvan Raj Path, the new road built by the Indian Army, over the Simbanjong Pass (8,162 feet above sea level), to Hitaura at the eastern end of the area. Here I met Mr. Sudhir Jung Thapa, the Divisional Forest Officer in charge of the Chitawan (Rapti Valley) Division, with whom I was to spend most of the subsequent sixteen days touring.

The following day we jeeped westwards along the new Rapti Valley road, with the proposed King's Reserve on our left and the proposed Shooting Blocks on the steep hills on our right, both mainly under *sal* forest. Here in the upper reaches of the Rapti the riverain strip is narrow. After crossing the gravelly bed of the Rapti river at the tiny villages of Ramoli and Pratappur we made two tours into the forest along rough forest roads used by timber contractors. This gave me an idea of the terrain of the King's Reserve at the western end of which about six rhinos are believed to exist. Rhinoceros wander far afield during the monsoon months, even into the town of Hitaura, I was told.

On 24th March we went into camp at Tikoli, which is at the south-eastern point of the newly-constituted Mahendra National Park, and a convenient centre for seeing the area where the rhinoceros density is greatest—Jhawani and neighbourhood. Here we were joined by Captain Gyan Bahadur Basnayt and

Lieutenant Gaj Raj Joshi of the Rhinoceros Protectioi Department. Although our food, luggage and camping equipment had not yet arrived, I took an elephant out in the afternoon southwards along the Khagri Khola stream towards the Rapti. To the east of the Khagri Khola all is cultivation and villages, while to the west of the stream it is mainly unspoilt *sal* forest with patches of savannah. We saw tracks and dung of rhinoceros and found two of them in a secluded wallow in the thick scrub forest of the riverain tract of this stream. On our approach they immediately made off into cover.

On the morning of the 25th March we went to the Chitawan *hatisar* (elephant station) and took two elephants southwards to the Rapti river, to a riverain area near Malpur and Haranhari. Here we located six rhinoceros, including a cow and young calf, all of which appeared very frightened. On 26th March we again went to the *hatisar* and proceeded with three elephants to another area west of Haranhari. Here we found 10 rhinoceros, including 2 cows and young calves, also 3 young two-year-olds in a "school" of their own. Rhinoceros of this age are usually found with their mothers, and I presume that these three had been driven off by their mothers when new calves were born. Nearly all these 16 rhinoceros were in dense scrub riverain forest, which is not the real habitat of this species. They were in thick cover even in the early morning. Although most of the grasslands had been burnt off, and although the young shoots were coming up—so palatable to herbivorous animals —no rhinoceros were found grazing in the open grassy areas, as one would have found in Kaziranga and other sanctuaries of Assam. There were also many fewer mud or water wallows than I expected. This might have been partly due to the sandy nature of the soil, and partly to the fact that a wallowing rhinoceros falls an easy victim to poachers. The rhinoceros in Nepal appeared to be very much more nocturnal than those in Assam, and very much more shy of human beings. Their droppings were scattered in small heaps or as single dropping instead of the large heaps found in Assam, where they lead a more natural and peaceful life.

As all the villages of the area build *tands* (look-out towers for frightening away crop-raiding rhinoceros) both in their fields

and also actually in their village vegetable gardens—in Assam the similar *tongis* are only built in the fields near a sanctuary —and as rhinoceros ditches are built round most vegetable gardens, it was abundantly clear that the rhinoceros roamed far and wide over cultivated areas during the night, and lay up hiding during the day. This was borne out by report from the villagers, and from fresh rhino tracks and dung seen near the villages.

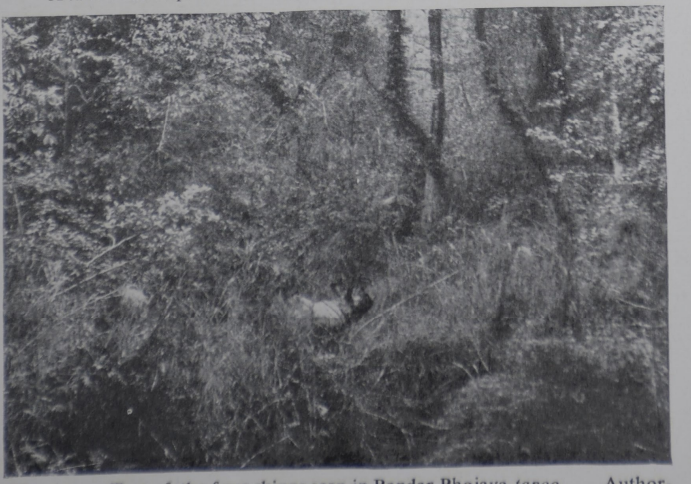
The riverain forest in places is very thick, often with thorny and evergreen bush, providing ideal, though unnatural cover for the rhinoceros. Visibility was very limited. Consequently numbers of rhinoceros we observed depended largely on the number of elephants we could muster on each visit. An observer on a single elephant could only find rhinoceros within a strip of country extending sometimes ten, sometimes twenty, yards on each side of him during a traverse in such forest. A party with three elephants could naturally traverse an area about three times as great. It is, therefore, not only for display that the rulers of Nepal have always employed a great number of elephants, over fifty at a time, for their shoots; a large number of elephants is actually required to locate and drive the game in such thick country.

While in camp at Tikoli I was able to pay three visits to the Mahendra National Park. In the afternoon of the 25th March, we went by jeep via Jurpani across the *Khola*s and back by Narayangarh. The *chowki* (post) at Tandkhola was a very beautiful site with a fine view of *sal*-forested hills, but there was no water in the stream. In fact, there was no water in any of the four bouldery and sandy *Kholas* we crossed, although there reportedly had been during previous months. I was informed that there was a little water higher up, and that it runs underground at this point, to reappear again lower down in the rhinoceros area of the national park. One or two water holes provide water for gaur, sambar, chital and other animals in this northern portion of the park.

In the afternoon of the 26th and in the morning of the 27th March, I made two extensive trips on an elephant into the south-east part of the park, where there were reported to be

Two of the three elephants on savannah with *Simul* trees, in riverain tract east of Haranhari.

A *tand* built to protect a village vegetable garden from rhino at night.



Photos Two of the four rhinos seen in Bandar Bhojaya *tapoo*. Author.

A rhino in riverain forest east of Haranhari

Rhino cow defending its calf against a tiger.

Photos The above rhino with its newly-born calf. Author

12-30 rhinoceros. Although I found a few fresh tracks and droppings, I could find no rhinoceros on either of these trips, but on my return to camp I was informed that many were to be found here during the rains, though I could get no exact information about local or seasonal migrations. As this was ideal rhinoceros habitat with plenty of grassland as well water and cover, I was puzzled as to why they should have migrated southwards to the Rapti, where there was less grazing and more human interference. My elephant on these two trips had been greatly worried by large horse-flies or gad-flies (locally known as *dans*), and possibly this may at least partly provide the answer to this puzzle.

The D.F.O. assured me that the previous year he had visited the area in the middle of April and had seen rhinoceros; and both the lieutenant and the Havildar of the Rhinoceros Protection Department said that a considerable number of rhinoceros come here in the monsoon months. I, therefore, became convinced that a corridor for migration of rhinoceros between the national park and the Rapti river was urgently needed, and that the national park could well be extended southwards to make it. A extract from my diary reads: "As there is forest and little or no cultivation west of the Khagri Khola, the national park could be extended southwards in a corridor about four miles wide, to include the Rapti area (near Jhowani).....and then southwards to the Siwalik Hills, possibly to include the rhino of the Reu valley." As my tour progressed, I became more and more sure that the above measure was urgently necessary if the rhinoceros of Nepal were to be preserved.

On the 29th we visited the riverain forest near Sandhna with one elephant, and found one rhinoceros in thick cover. Then we crossed to Bandar Bhojaya *tapoo* and found four rhinoceros in a wallow, including a cow and tiny calf. This cow charged us twice in the thick forest. During the second charge my elephant tried to bolt and my hat and lens hood were knocked off. After we had dismounted to look for the lens hood, back came the irate rhinoceros for a third charge! In the afternoon we visited more riverain forest and saw 3 rhinoceros.

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On 30th March plans were made for me to visit an area south west of camp, where they were anxious to show me a great number of rhinoceros. After my three recent visits to the riverain tracts of the Narayani, I was able to take their word for that and we visited instead the *sal* forest and hills to the west, to see that kind of terrain. Here I saw tracks and droppings of rhinoceros in the *Kholas*, and saw one animal. In this range of hills there are patches of grassland, *Kholas* with water, and a belt of swampy ground all along the base between the hills and the $1\frac{1}{2}$ mile wide strip of cultivation. This was useful information, proving that these hill could and did hold rhinoceros, and that during monsoon floods they migrated to the higher hilly region.

Having made a sample survey of the comparatively "unknown" Nawalpur area, I re-crossed the wide Narayani river back into the Chitawan District, to camp at Dadrahani. In the afternoon I took an elephant into the mile-wide riverain strip on the east bank of the Narayani, and saw tracks and droppings of rhinoceros. Six, including two cows and calves were said to be here. On 1st April I went to see the area at the junction of the Rapti and Narayani rivers, and also the *tals* or small lakes on the south side of the Rapti. All round here is magnificent thick rhinoceros habitat, and we saw fresh tracks and dropping, though no rhinoceros. The *tals* turned out to be small and disappointing—no comparison with the *bheels* of Kaziranga where so many rhinoceros and other species are to be seen grazing out in the open

I particularly wanted to see the country round Darbar, and also another and larger lake called Tamortal, and the connecting corridor through the Churia Range from the Rapti to the Reu Valley. The riverain forest and grassland near Darbar are comparatively unspoilt and ungrazed, but I saw no wild life. The *tal*, set in the midst of *sal* forest was also disappointing, but north of the Rapti on our way back to camp on three elephants we found four rhinoceros within half a mile of our tents, a not unusual phenomenon as both in Nepal and north east India rhinoceros seem to prefer the vicinity of villages and cultivation to unspoilt country.

The cart track from Darbar, past Tamortal, leads from the Rapti Valley into the Reu Valley; and while at Tamortal we were only a few miles from the Reu river. I would have liked to have had the time to visit the Reu Valley, but this could not be done. I was, however, informed by the D. F.O. that he went there as recently as November, 1958, and saw 8 rhinoceros. He described to me all the conditions of the place—similar to those in the Rapti and Narayani Valleys, only on a smaller scale.

The next morning we took two elephants—one had broken loose during the night and disappeared into the forest—and traversed some more riverain country north of the Rapti, finding two rhinoceros. In the afternoon I took one elephant, the "escaped" one which had been recaptured into the riverain belt near the camp and photographed two rhinoceros.

Having seen a sample of the country round Darbar, both north and south of the Rapti, I said I would like to drive through the middle of the belt of *sal* forest and grassland that would, if approved by the Nepal Government, be such a useful addition as a corridor to the Mahendra National Park. I also wanted to see the country south of this corridor, south of the Rapti. Accordingly on 4th April, we jeeped through this corridor at a point where it must have been six mile wide. It consisted of comparatively unspoilt *sal* forest with patches of grassland, swamps, waterholes, and of course the Khagri Khola on the eastern side. It proved to be ideal habitat for rhinoceros, deer and other animals.

Eventually we arrived at Jaimangala and camped there, in spite of the fact that cholera and smallpox were in epidemic form nearby. In the evening we took out four elephants and within one mile of camp found 9 rhinoceros. I personally saw 5, including 2 cows with young calves, and I have no reason to doubt the veracity of the others who saw an additional 4; for, on the following day I saw different rhinoceros on this very same spot. While trying to photograph a rhinoceros cow and calf, our four elephants at one time were encircling 4 rhinoceros, 1 sambar stag, 2 hog deer and 2 bears. From Jaimangala westwards, most of the country appeared to be unspoilt and

unoccupied by villagers, confirming my opinion that this area should be included in a southward extension of the national park.

On the following day we explored, on three elephants, the area westwards on the south bank of the Rapti and returned along the north bank through the corridor. On the way out in the early morning I inspected and photographed the carcases of 2 rhinoceros shot this year by poachers. I was told that the poachers themselves might have been shot had not 7 rounds of ammunition fired at them failed to go off.

Although we had seen 9 rhinoceros near the camp on the previous day, yet in this wilder country further away from the camp we saw nothing—until finally we came across a cow rhinoceros defending her pink, newly born calf against a tiger. Our approach apparently frightened away the tiger. The rhinoceros with characteristic lack of gratitude then charged my elephant two or three times. Photography was rendered very difficult by the fact that in Nepal the elephants are trained to charge back at a rhinoceros. In spite of this commotion, and in spite of the waving arms of the excited and gesticulating elephant driver, I managed to secure some photographs of the newly born calf with its mother—they must be unique.

On our return along the north bank of the Rapti, we suddenly saw, peering out of the tangle of unburnt grass, the head and horns of a solitary bull gaur (*Bos gaurus*), which immediately made off. We then searched without success for rhinoceros in two *Kholas*, which had water and evergreen forest suitable for these animals. When we were near camp I dismounted from the elephant, stalked and photographed on foot 5 of the rhinoceros seen by us on the previous day, as they lay in their wallows. There were also four sambar hinds within a mile of the village.

In the evening I visited a riverain area north-east of the camp with one elephant, and found four rhinoceros including a cow and a young calf. Three of these were in thick grass within one furlong of our tents. The experience of this day in this area, as in all the other areas I visited, show that rhinoceros and other wild animals prefer the vicinity of villages

and cultivation to the unspoilt forests and grasslands. The existence of thick cover in the form of evergreen and thorny scrub forest enables them to do this. The probable reasons are firstly and mainly a predilection for man-grown crops, secondly a certain amount of safety from predators, both human and feline.

On the morning of 6th April, we struck camp and proceeded to the house of the captain of the Rhinoceros Protection Department, where I was shown some of the rhinoceros horns and personal possessions recovered from poachers. Thence back to the main road and eastwards past the proposed "Shooting Blocks" and "King's Reserve" to Hitaura. After discussions with the D.F.O., I returned the following day over the Simbanjong Pass to Katmandu.

On the 13 elephant trips on which I saw rhinoceros, the number of elephants taken out averaged 2.15. This is important, as the larger the number of elephants used in such thick country, the more chance there is of rhinoceros being encountered. On these 13 trips I personally counted 43 rhinoceros, of which 9 were young calves. On the same trips, other members of the party on other elephants saw an additional 14, bringing the total to 57 rhinoceros seen, including 12 young calves. Visibility varied from between 5 and 20 yards in the thicker forest to between 20 and 100 yards in the more open areas; so the actual ground covered in each traverse was not great and I do not believe I actually saw one-tenth of the ground inhabited by rhinoceros. From the detailed information supplied to me by the D. F. O. Chitawan, and by the officers of the Rhinoceros Protection Department and others, which I checked in sample surveys on 18 elephant trips in different parts of the rhinoceros area, I estimate that there are about 300 rhinoceros in Nepal.

It will be noticed that the distribution of rhinoceros when I was there, the dry season of March-April when the burnt off grassy areas were beginning to appear green with young shoots, was almost entirely in or very near the riverain tracts. This, I consider, was not so much due to scarcity of water and grazing in other areas, as to the thick cover provided by the evergreen and thorny scrub forest in these tracts. It will also be seen

that rhinoceros in Nepal, as in North-East India, show a marked predilection for man-grown crops and vegetables, and therefore choose a habitat as near as possible to villages and cultivation. They do not object to sharing their grazing with domestic buffaloes and cattle, though it appears that in Nepal these common grazing grounds are grazed by domestic beasts by day and rhinoceros by night. In Kaziranga Sanctuary of Assam also, the regions of greatest density of rhinoceros population are nearest to the largest area of cultivation and villages. It is an inescapable fact that whatever areas of unspoilt country may be set aside for rhinoceros preservation, they will probably continue to inhabit those riverain tracts which are nearest to cultivated land. The presence of *tands* (look-out towers) and rhinoceros ditches in the field and vegetable gardens over the whole area considered in this survey would alone prove the presence of rhinoceros—if such proof were needed in addition to tracks, dung and the animals themselves.

With regard to the movement of rhinoceros, I was informed that there has been a noticeable shift from the area now being settled by the Rapti Valley Multi-Purpose Development Project to the Nawalpur District and other parts of the Rapti Valley. From all accounts the grassland south-west of Bharatpur down to Salbas, along the east bank of the Narayani river, used to be the best tracts for rhinoceros; but they are no longer so. There is little or no information to be had on local migrations, though this seasonal movement is bound to take place each monsoon as the riverain tracts become partly or wholly flooded. The general direction of this movement would be away from the rivers towards the grassy tracts and *Kholas* at the foot of the *Sal* forested hills. The most important line of migration as has already been pointed out, is along the Khagri Khola and the belt of unspoilt country on its western bank. It is very desirable that local officers should study these seasonal movements.

The Rhinoceros Protection Department mans 42 *chowkis* (posts), 26 in the Chitawan area, nine in the Reu Valley, and seven in Nawalpur. Poaching was probably at its peak in 1951. Accounts differ as to the intensity of poaching during the years 1952-58: some people informed me that the position

was static, becoming no better and no worse, while others said that during the last three years there had been slight improvement. Probably official statistics do not give a true picture of the actual amount of poaching during any particular year.

I was told that in 1956, 60 rhinoceros were officially listed as poached: 52 in Chitawan, 6 in Reu Valley and 2 in Nawalpur. Of these 60 rhinoceros killed by poachers, 24 horns were recovered, and 13 persons arrested and gaoled. In 1959, twelve cases have been detected by the end of March—Chitawan 6, Reu Valley 2, and Nawalpur 4. Of these eight horns had been recovered and seven men arrested.

I had discussion with many people, particularly with the Divisional Forest Officer of Chitawan who had been for four years in charge of that division, and with Captain Gyan Bahadur Basnayt who had been for two years in charge of the Rhinoceros Protection Department, and there appears to be no evidence of any real organization behind the poachers. Most of the poachers of the Nawalpur area are said to come from the hills, while many of the poachers of the Reu Valley and Chitawan come from the south including India. Some of the poachers are also said to be new settlers from the hills in the Rapti Valley, Magars, Gurungs and others. The Tharus, "plains nepalis" and original inhabitants of this area, are mostly simple and innocent folk, and are not believed to be involved to any great degree in the poaching of rhinoceros.

Most of the rhinoceros poachers of Nepal take refuge first of all in the hills, and then make their way to India, where the horns probably pass through the port of Calcutta to the far east, particularly to China. The possession and sale of rhinoceros produce is illegal in India—if the place of origin is Bengal or Assam. But if the origin is Nepal, it is probable that its transit through and export from India would not be considered illegal under existing laws and rules. I, therefore, recommended, while in Katmandu, that the Government of Nepal should try to effect greater co-ordination of protective measures with the Government of India, in order to prevent this traffic. I now suggest also that the Excise Posts on the India-Nepal border should be kept constantly on the watch for the same purpose.

The great danger to rhinoceros from poachers, on account of the horns which are sold as an aphrodisiac, exists and will continue to exist. It is being dealt with by the Rhinoceros Protection Department which is doing good work in difficult circumstances. In fact, it is surprising that more rhinoceros are not shot by poachers. The officers in charge possess no maps, and appear to have no instructions to observe or study the habits, distribution, numbers, or movements of rhinoceros. Many of the rhinoceros guards (sepoys) have received no training. The service conditions of these guards. Rs. 30 per month Nepal currency with no rations, no uniform and no accommodation, are inadequate and are below those enjoyed by the *hatisar* personnel. Some of the ammunition does not 'go off''. No rewards or promotions appear to be awarded for good work, such as the capture of poachers or recovery of horns. As the value of these horns is very high—as much as Rs. 3,135 Indian currency was paid to a poacher for a horn obtained in the Reu Valley—and the temptation to a lowly-paid guard very great, a system of promotion and rewards would have a stimulating effect.

But a danger to the rhinoceros of Nepal greater than that from poachers has risen in the development and settlement of the grasslands of the Rapti Valley. As there is now increased competition for grasslands between human occupants and wild life, a decision will have to be made by the Government as to whether settlement of human population is going to occupy all the land of the Rapti Valley, or whether water and soil conservation and wild life preservation will have their rightful place in the development schemes. It is confidently to be hoped that as a matter of wise land use the authorities will set apart the appropriate areas for these urgently necessary requirements.

The habits of the rhinoceros of Nepal have been affected by two main factors. Firstly rhinoceros have been shot for sport as well as by poachers for a very long time, if not since time immemorial. Secondly they have been pushed further and further back from their habitat and feeding grounds, particularly during the past four years, by the influx into the grasslands of both authorized and unauthorized settlers. Conse-

quently they have become more and more hunted and persecuted, and like an outlawed political party have "gone underground", taking refuge in thick scrub forest of the riverain tracts. They have become very scared and if encountered in their hiding places frequently charge before rushing away to another hiding place. They have become very much more nocturnal than rhinoceros in India, and are rarely if ever to be found grazing in the open during the day time. The dung often consists of individual droppings, or very small dung heaps instead of the large dung heaps found in Assam, and this probably due to their more furtive existence. Though Jungle Mynahs (*Aethiopsar fuscus*) settle on rhinoceros in Nepal, Cattle Egrets (*Bubulcus ibis*) are never found in their company though they are always so found in Assam; and this also is probably due to the Rhinoceros' nocturnal habits and furtive existence.

The fact that so many rhinoceros cows were seen with very young calves (12 young calves out of 57 rhinoceros seen by my party) goes to show that the rhinoceros of Nepal have become accustomed to the new conditions in which they have to live and are actually thriving.

The average horn I saw in Nepal was very much smaller than in Assam, and I saw no old rhinoceros. Both sportsmen and poachers look for large horns; furthermore the older rhinoceros (often with large horns) are the more easily shot.

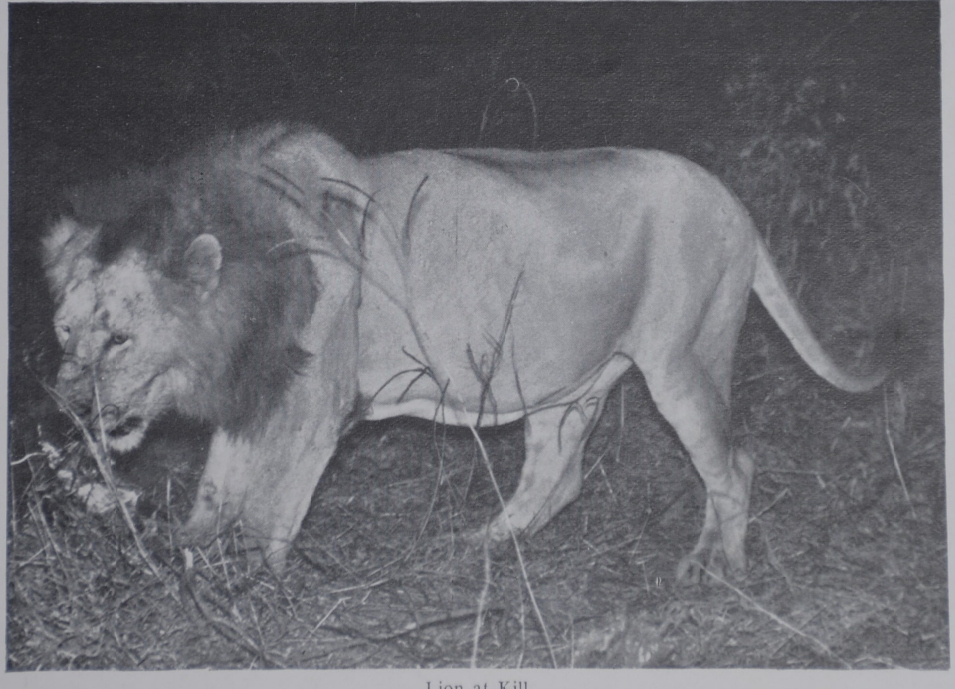
At the present moment the position of the rhinoceros in Nepal is very insecure, especially considering the impending influx of 25,000 more authorized settlers, and an unknown number of unauthorized ones, into the Rapti Valley. An irrigation scheme is also proposed which would lead off the water of the Khagri Khola and other streams to the newly settled area. If this is put into effect, it will drain to a dangerous low level the rhinoceros habitat in the region of Tikoli and southwards to the Rapti.

It is not too late even now to allocate certain areas in the catchments of the rivers and streams for strict protection as necessary and urgent measures of water and soil conservation; to demarcate clearly the boundaries of reserved forests and to

prevent indiscriminate cutting and burning within them; and to allocate sufficient areas for rhinoceros and other wild life to live in safety and security alongside human settlers.

Owing to the various pressures and peculiar circumstances affecting the status of rhinoceros in Nepal it is recommended that the policy governing the administration of the national park and wild life preservation in general be a flexible one. While adhering as far as possible to the principles accepted by leading nature conservationists in the world, it is possible that certain departures from these principles might prove advantageous for the preservation of the rhinoceros. For instance, this species' partiality for a habitat near villages may indicate that a few carefully selected and strictly controlled "forest villages" inside the national park could be allowed, in which rhinoceros guards would have assistance and protection in their operation against poachers. Also the fact that tigers prey on very young rhinoceros might render it advisable to control the numbers of tigers in the rhinoceros inhabited areas, should they become excessive. Any wild life management policy would naturally have to be based on ecological study.

This article is a condensation of the "Report on a survey of the Rhinoceros area of Nepal" prepared for the Survival Service Commission of the International Union for the Conservation of Nature and Natural Resources, and originally published in the *Oryx*, August 1959.—Editor.



Lion at Kill

Photo H. H. Maharaja of Baroda

THE GIR FOREST AND ITS LIONS

By

Yuvaraj of Jasdan

The Gir Forest in the Kathiawar Peninsula is well known as the last and only refuge of the Asiatic Lion. Readers may be interested to know about the present conditions over there as there have been several changes since Mr. Daniel last published his article* in this Journal on the Gir Lion.

First and foremost it is heartening to see that the Government of Bombay as well as the Government of India are acutely aware of the urgency of the problem of preserving for all time this magnificent carnivore.

Huge sums have been sanctioned for roads, Rest Houses and other amenities for visitors, who are going there in large numbers. Visitors are shown Lions on tied baits on payment of a fee. A Wild Life Superintendent assisted by a staff of game keepers makes arrangements for showing Lions to visitors as well as checking poaching and generally seeing to the welfare of all the animals inhabiting the forest.

It is amazing to see how very tame and fearless the Lions have become. Visitors can watch them, seated quite in the open, even in broad daylight, at distances of 30 feet. However recently rules have been framed forbidding anyone to approach less than 50 feet to forestall any possible accidents due to harassment of the animals by ignorant or foolish visitors.

The main problems facing us are (1) Small area of forest (2) Villages of herdsmen with huge herds of cattle, mainly buffalos, residing in the forest (2) Inadequate natural food supply. Regarding the first point we can totally stop any further encroachment of forest areas by cultivation and replant large areas of barren hillsides on the northern fringe of the forest. A start has been made in this respect but a greater effort is necessary.

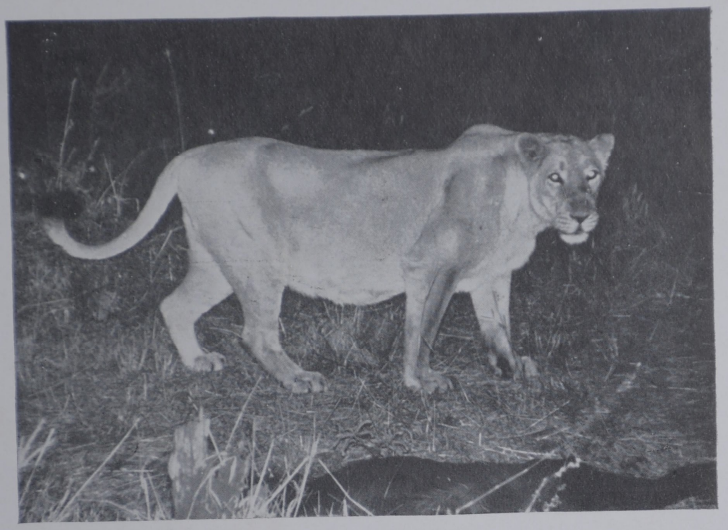
*The Indian Lion (Panthera leo persica).—J. C. Daniel Vol. XXVIII, p. 81.

The second point is very important as the herdsmen are now posing a threat to the preservation efforts by large scale poisoning of Lions. Lions are driven off animals they have killed and then poison put in the carcase which they are later allowed to eat. A large number of Lions are reported to have been killed in this way. The herdsmen or "Maldharies" are essential for their herds supply a fair percentage of food for the lion. There are 61,000 cattle in and around the forest mostly buffaloes, and male buffaloes are often neglected and hence form the bulk of the animals killed from the herds. Stricter control and heavy punishment with some sort of compensation for valuable animals killed from the herds seems the only solution as it is not possible to remove the Maldharis or herdsmen, there being no other suitable area of forest or grassland available for them to graze their vast herds, and also as there is as yet insufficient natural food supply for the present number of Lions. This brings us to the 3rd problem.

I was glad to see that due to the vigilance of the Wild Life Superintendent Nilgai, Wild Boar, and Cheetal had increased considerably since the last few years. Sambhar and Four Horned Antelope were also seen in some numbers and it is a pleasure to watch these animals who are now fairly tame and allow observation from a car. With adequate protection and provision of watering places in dry areas, I have no doubt that in course of time there will be sufficient natural food for the lion. As the Panther to some extent competes for food, I suggest that controlled shooting of Panthers under the supervision of the Wild Life Superintendent should be allowed. Otherwise shooting should be, and is, totally prohibited.

Greater emphasis on a more adequate staff for Game preservation, and on increasing natural food supply are necessary. Roads and Rest houses can follow later.

I am grateful to H. H. Maharaja of Baroda, Member Indian Board for Wild Life for allowing me to use some of his photographs and for his kindness during our visit to the Gir Forest.



Lioness at Kill

Lion Cubs in the Gir.

Photos H. H. Maharaja of Baroda

A CONTRIBUTION TO THE ORNITHOLOGY OF THE SUNDERBANS

By

S. C. Law

(*Continued from page 152, Vol. XXVIII, No. 4*)

Oriolus oriolus (Linn.). Golden Oriole.

The Oriole found practically all over India is the race *kundoo*. Juvenile specimens straggling to the environs of Calcutta and parts of the district of 24-Perganas are noticed from end of August till winter. Not uncommon during this period in the area, but never observed in the heart of Sunderbans.

Gracula religiosa Linn. Black-naped Oriole.

The Indian form *diffusus* is a winter migrant to Central and South Bengal, though several examples of juvenile birds have been collected by me in August, September and October.

Oriolus xanthornus (Linn.). Black-headed Oriole.

A resident species; very common in the Sunderban area.

Gracula religiosa Linn. Indian Grackle.

Not uncommon in the Sunderbans; resident; observed in pairs or small parties. A tree-haunting species, keeping largely to tops of trees in evergreen forest.

In the environs of Calcutta stray specimens are periodically noticed. Some of these appear to be escapes from the cage, exact identification of which being difficult as several races, e.g. *intermedia, indica, andamanensis* as well as *religiosa* are brought for sale or used to be imported as cage birds in the local Bird-market. It is worth recording, however, that huge flocks, apparently of race *intermedia*, are permanent residents in tree-groves of Sibpore Botanical Garden; smaller flocks are also observed in parts of Barrackpore.

Sturnia malabarica (Gmel.). Grey-headed Myna.

Rather common, distributed outside forest areas as well as within forest belt; gregarious, partial to well-wooded spots where it is abundant locally.

Temenuchus pagodarum (Gmel.). Brahminy Myna.

Not found in the Sunderbans. Observed by me in the vicinity of Calcutta—a pair appearing in some successive years in summer months and nesting and rearing young in the self-same tree-hole at Agarpara (24-Perganas).

Blyth (1843) records its occurrence in flocks near Calcutta —"not unfrequently met with on the arboreal-cotton trees, when in blossom in February". He (1849) further records "non-resident in Lower Bengal."

Acridotheres tristis (Linn.). Common Myna.

Distributed throughout the Sunderbans. Most common and abundant. Resident.

Aethiopsar fuscus (Wagl.). Jungle Myna.

Not uncommon, locally abundant; many observed on forest trees on river-banks.

Sturnopastor contra (Linn.). Pied Myna.

Common, numerous and widely distributed in the Sunderbans. Resident.

Ploceus philippinus (Linn.). Baya.

Locally abundant, occurring in flocks. Observed several nests suspended from the outer boughs of a mango tree at *Buri-goalini* forest station.

Ploceus benghalensis (Linn.). Black-throated Weaver-Bird.

Occasionally noticed in swampy areas overgrown with grass or reeds of some kind.

Ploceus manyar (Horsf.). Striated Weaver-Bird.

Never wide-spread, but very locally distributed. Partial to reed-bed and rush dependent on water. Nesting colonies found alongside certain Sunderbans *khals*—the nest being suspended on *Hantal* (*Phoenix sp.*) shrubs fringing canal and river bed.

Munia malacca (Linn.). Black-headed Munia.

Though recorded from Lower Bengal (Blyth, 1849), and sometimes obtained by me from the low-lying areas of 24-Perganas, Jessore and Khulna the occurrence of the species in the Sunderban forest seems doubtful.

Munia atricapilla (Vieill.). Chestnut-bellied Munia.

Usually not seen in the forest belt. Sporadic and infrequent near villages and cultivation; sometimes in grass swamps occurring in pairs or small parties.

Uroloncha malabarica (Linn.). White-throated Munia.

Uncommon in Lower Bengal.

Uroloncha punctulata (Linn.). Spotted Munia.

Rather common and wide-spread; nowhere abundant. Usually noticed in the cleared compound of a forest coupe or open cultivation of a village homestead bordered by scrub and low jungle.

Amandava amandava (Linn.). Red Avadavat.

Not seen in the forest area. The species occurs in many parts of Lower Bengal, where sometimes it is locally common. It has been recorded from Furreedpore (Cripps, 1878), north of the Sunderbans.

Carpodacus erythrinus (Pall.). Common Rose-Finch.

Occasional in winter during migration; solitary; sometimes when two or three birds are found together they are invariably in female dress—the full-plumaged males being rarely met with.

Not observed in the Sunderban area.

Passer domesticus (Linn.). House-Sparrow.

Common and fairly abundant near huts and human abodes. In the heart of the Sunderbans wherever there are forest coupes and clearances around it is a never-failing sight.

Emberiza schoeniclus (Linn.). Reed-Bunting.

Recorded from Barrackpore, 24-Perganas (Munn, 1894). Its occurrence in the Sunderban country appears doubtful.

Emberiza fucata Pall. Grey-headed Bunting.

Apparently "an irregular and uncertain winter visitant in Lower Bengal" (Blyth, 1854). Not uncommon in the neighbourhood of Calcutta.

Riparia paludicola (Vieill.). Indian Sand-Martin.

Race *brevicaudata* is often met with near river-banks where the nest-holes are quite usual in winter months; gregarious; locally distributed, keeping very much to water when hawking for insect prey.

Hirundo rustica Linn. Common Swallow.

Common and numerous in winter. Found in flocks collecting on the telegraph wires and sometimes on tall reeds.

Near Calcutta "solitary individuals may be seen almost at any time all the year round" (Munn, 1894).

Hirundo smithii Leach. Wire-tailed Swallow.

The Indian race *filifera* is well-distributed in Lower Bengal. Rather common, gregarious either in breeding or at other times; keeping more often than not close to the vicinity of water.

Hirundo daurica Linn. Red-rumped Swallow.

Found about Calcutta, sometimes in considerable numbers in winter.

Motacilla alba Linn. White Wagtail.

Some races of White Wagtail are observed as winter migrants, of which *M. a. dukhunensis*, *M. a. alboides* and *M. a. personata* are generally common in Lower Bengal.

Motacilla maderaspatensis Gmel. Large Pied Wagtail.

Not uncommon, resident, occurs mostly on river-banks or sandy islands.

Observed by me on the banks of the Hooghly in Barrackpore as well as on Ichhamati bed in Basirhat. Curiously enough Blyth (1849) records "never in Lower Bengal."

Motacilla cinerea Tunstall. Grey Wagtail.

The eastern race *melanope* appears in pre-winter months in Lower Bengal as a migrant, feeding on roads, about the margins of waters and also on waterless places. Very common throughout winter and often noticed walking and feeding on the ground, either singly or in pairs and sometimes in small parties.

Motacilla flava Linn. Yellow Wagtail.

The Blue-headed (*M. f. beema*) and the Grey-headed (*M. f. thunbergi*) are the two races noticeable as winter migrants in this part of Bengal, though sometimes the Black-headed race (*M. f. melanogrisea*) is observed.

Motacilla citreola Pallas. Yellow-headed Wagtail.

Usually as winter migrants the two races *citreola* and *calcarata* of the Yellow-headed Wagtail are noticed about marshes and swamps and margins of rivers; in habit the most aquatic of the Wagtails.

Dendronanthus indicus (Gmel.). Forest Wagtail.

Common in Central and South Bengal, specially in the environs of Calcutta, where obtained by me at almost all months of the year. Recorded in *Fauna*, however, as winter migrant.

Solitary, sometimes two or three specimens at the most going together and haunting shady spots, tree-groves and open paths with jungles and trees nearby.

Anthus hodgsoni Richmond. Indian Tree-Pipit.

An early autumnal migrant to Lower Bengal. Fairly common, sometimes numerous, occurring throughout winter in flocks or parties; often noticed feeding on the ground and flying up to a branch when disturbed.

The closely allied Tree-Pipit *Anthus trivialis,* not uncommon on winter migration, is also noticed in congenial areas with open spaces mixed with trees, damp meadows and swamps.

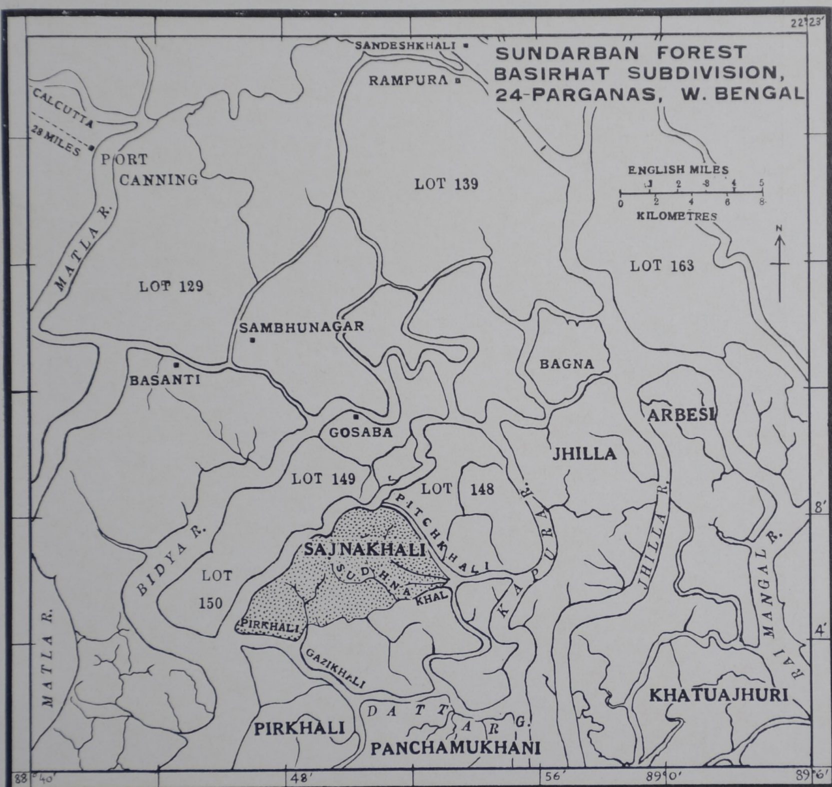
Anthus rufulus Vieill. Indian Pipit.

Very common, fairly distributed in the open country. A resident species, breeding in deltaic Bengal and usually raising two broods in suitable habitat. The nesting time is from March till June and July.

Anthus richardi Vieill. Richard's Pipit.

Distinguishable by its large size and long hind claw this Pipit is most common as a migrant in cold weather months.

(To be continued)


SUNDARBAN FOREST
BASIRHAT SUBDIVISION,
24-PARGANAS, W. BENGAL
ENGLISH MILES
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RAMPURA
CALCUTTA
28 MILES
PORT
CANNING
MATLA R.
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LOT 129
LOT 163
SAMBHUNAGAR
BASANTI
BAGNA
GOSABA
ARBESI
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LOT 148
PITCHKHALI
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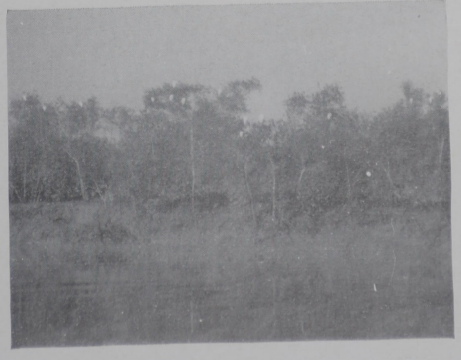

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PAKHIRALA, SAJNAKHALI—AN INTRODUCTION TO A BIRD SANCTUARY IN THE SUNDARBANS,

By

Ajit Kumar Mukherjee, M.Sc.,

Zoological Survey of India, Calcutta.

While making an ornithological survey of the reclaimed and the forest areas of Sundarbans, 24-Parganas District, West Bengal, the author came across a bird sanctuary known as 'Pakhirala'.

The sanctuary is situated in the Sajnakhali block (Lot No. 151) of the Pirkhali Forest Range, Sundarban Reserve Forest, Southern Circle, 24-Parganas. This appears to be the largest breeding ground of birds in the Sundarbans area of the district.

The reclaimed tracts of the Sundarbans are well represented by waterbirds and the number of some common forms go beyond expectations, but it is curious that nests are scarce in the greater part of the reclaimed area, specially of tree nesting birds. Probable reason of their absence is due to non-availability of groups of large trees which the sociable birds such as herons, egrets, storks, ibises, shags, darters etc. need for the formation of breeding colonies. A keen competition among birds even to roost on garden trees is observed every evening. Most of the larger birds are reluctant to stay in the cultivated areas and they are habituated to cover long distance for roosting either in the reserve forest or to such places of the reclaimed areas where isolated woody areas still remain. Even a daily flight of 30—40 kilometers from roosting to feeding ground is not unusual. This regular long daily flight appears to be a recent practice. Not even half a century back, the present reclaimed area was a marshy tropical forest, the home of tigers, crocodiles, and varieties of birds and other animals. With reclamation, the biotic equilibrium was upset resulting in the shifting of the breeding ground of birds to the reserve forests.

The sanctuary is composed of a group of islets bounded by Gumrikhal, Pitchkhal and Sudhanakhal. The total area covered is roughly 1250 hectare (=3,000 acres), crisscrossed by sluggish creeks and interspersed by pools with inlets to the rivers.

The area is thickly wooded and sustains a typical marshy flora. The exposed mud banks of the rivers and *khals* bear tall spear like grass and *Hental* or wild date palm (*Phoenix paludosa* Roxb.) and thorny green shrubs locally known as *Nal, Hogla,* etc. The forest is mainly composed of stunted trees with heavy foliage. These trees are found in a series along the bank and their trunks get submerged in high tides. They are commonly known as mangrove swamp. A complete list of chief forest trees of this area is given below:—

Family—Meliaceae	Family—Verbenaceae
Amoora cucullata Roxb. (Amur)	*Avicennia officinalis* Linn. (Bean)
Carapa moluccensis Lam. (Passur)	*Avicennia alba* Bl. (Bean)
Family—Rhizophorae	Family—Leguminosae
Rhizophora conjugata Linn. (Garjan)	*Afzelia bijuga* Linn. (Bhaila)
Ceriops candolleana Arn. (Goran)	*Cynometra ramiflora* Linn. (Singra).
Ceriops Roxburghiana Arn. (Goran)	
Bruguiera gymnorhiza Lam. (Kankra)	
Family—Palmae	Family—Euphorbiaceae
Nipa fruticans Warmb. (Golpata)	*Excaecaria agallocha* Linn. Gengwa).
Phoenix paludosa Roxb. (Hental)	
Family —Lythraceae	Family—Sterouliecae
Sonneratia apetala Ham. (Keora)	*Heritiera minor* Roxb. (Sundri)

During July—October this area presents a wonderful sight due to crowding in of all varieties of birds which breed there.

The sanctuary could be spotted from a good distance by an assemblage of egrets which look like white dots scattered all over the trees on the bank. The mangroves are favourable resort of cormorants and darters. The startling take off of cormorants for diving in water, their sunbath with wings outstretched and the white wings of egrets against the blue sky keeps one deeply absorbed in watching and appreciating them.

A list of birds found in the breeding colony is given below in proportion of their abundance:—

1. Cattle egret ... *Bubulcus ibis* (Linn.)
2. Paddy bird ... *Ardeola grayi* (Sykes)
3. Little cormorant ... *Phalacrocorax niger* (Vieill.)
4. Open bill ... *Anastomus oscitans* (Bodd.)
5. Smaller egret ... *Egretta intermediata* (Wagler)
6. Grey heron ... *Ardea cinerea* (Linn.)
7. Little egret ... *Egretta garzetta* (Linn.)
8. Large egret ... *Egretta alba* (Grey)
9. Night heron ... *Nycticorax nycticorax* (Linn.)
10. Yellow bittern ... *Ixobrychus sinensis* (Gmelin)
11. Painted stork ... *Ibis leucocephalus* (Pennant)
12. Black-necked stork ... *Xenorhynchus asiaticus* (Latham)
13. Snake bird ... *Anhinga melanogaster* (Pennant)
14. White ibis ... *Threskiornis melanocephalus* (Latham)
15. Jungle crow ... *Corvus macrorynchus* (Wagler)
16. Green bittern ... *Ixobrychus striatus* (Linn.)

The following ground breeding birds are arranged in order of their abundance.—

1. Red-wattled lapwing ... *Hoplopterus indicus* (Bodd.)
2. Black-winged stilt ... *Himantopus himantopus* (Linn.)
3. Yellow-wattled lapwing *Lovipluvia malabarica* (Bodd.)
4. Purple moorhen ... *Porphyrio poliocephalus* (Latham)

Besides the above-mentioned resident birds many species of wintering birds such as snipes, sandpipers and stints are found flocking over mud flats and round about bushes during winter.

The noteworthy points of observations in the sanctuary regarding bird behaviour are as follows:—

1. It was observed that most of the resident birds are busy nest building during July—August and extending care to their brood in September and October.

2. In the case of cormorants the parent birds made as many as 30—40 trips per hour in the morning between 6 a.m. and 7 a.m. to feed their young ones.

3. The breeding time differs interspecifically. Whereas the larger egrets are with brood in July and August, the little and smaller egrets have just then started to build their nests. The smaller egrets breed towards the beginning or middle of October.

4. Birds of the same species generally prefer to nest on the same tree till there is no overcrowding. They tolerate a limited number of other species.

5. A rough idea of the density of the nesting area can be judged from the following table which gives the number of birds and the number of nests found on a single tree randomly selected.

1. Cattle egret	...	27 nests	54 birds
2. Pond heron	...	16 nests	32 birds
3. Smaller egret	...	14 nests	28 birds
4. Openbill	...	4 nests	8 birds
5. Jungle crow	...	4 nests	8 birds

The birds in this area enjoy an undisturbed life during breeding and non-breeding periods, as they are protected by forest restrictions as well as by human sentiments. A few animals that play the role of predators in the sanctuary are the Tiger [*Panthera tigris* (Linn.)], the Jungle cat [*Felis chaus* (Güldenstädt)], the Esturine crocodile [*Crocodilus porosus* (Linn.)], the monitor lizard [*Varanus flavescens* (Grey)], the water monitor lizard [*Varanus salvator* (Laurentia)].

The approach to the sanctuary from Calcutta is *via* Port Canning which is situated some 45 kilometres south of Calcutta. One may avail of a private motor launch service from Port

Canning to Gosaba. From Gosaba one has to cover a distance of about 20 kilometres through a circuitous river route.

The opposite bank of the sanctuary has been reclaimed some thirty years ago. Human population is on the increase in this area since then. The sanctuary had been a great attraction for illegal shooting, trapping, egg collecting etc. Due to intervention by the local people who have high human sentiments and good sense of protection and conservation, poaching has been kept down to a large extent. It is feared that this breeding ground of water birds may in near future be also turned into cultivated land, as procurement of more land for landless people and grow more food campaign may be given priority, to solve the present day problem of resettlement in West Bengal.

It is, therefore, suggested that this fine water bird breeding sanctuary may be given an official status and declared a State sanctuary of water birds in the east of India, which is indeed a paradise for bird photographers and bird watchers.

EXPLANATION OF PLATE

Figure—1. The morning exercise of the cormorants at the Pakhirala sanctuary.

Figure—2. With the break of the day the openbills proceed from the sanctuary to their feeding ground.

Figure—3. A party of little egrets roaming about on the mud flat of the sanctuary.

Figure—4. A large egret collected by the author in a mangrove swamp.

Figure—5. The white ibis colony in the sanctuary.

Figure—6. A typical wild date palm forest of the Sundarbans, a favourite haunt of tigers whose fresh mugmarks are left behind.

BIRDS OF THE DUARS

By

(Late) C. M. Inglis

(*Continued from Page 97, Vol. 30, No. 2, December, 1958*).

FAMILY PLOCEIDAE

SUB FAMILY PLOCEINAE.

237. The Baya Weaver Bird

Ploceus philippinus (Linnaeus)

Fauna Brit. Ind., 2nd. Ed., No. 1008

Description.— Length 6 inches; Male in breeding plumage. Brown; nape and breast golden yellow; sides of head, chin and throat dark brown; upper plumage dark brownish black, the feathers edged with bright yellow; wings and tail dark brown, edged with fulvous; rump and lower plumage below the breast, fulvous. Male in winter and female at all seasons. Upper plumage fulvous-brown, streaked with blackish brown except on the rump lower plumage fulvous, deepest on breast and flanks.

Bill, male in breeding season dark horny brown, in winter yellow horny, iris brown legs flesh-colour.

Bill heavy and conical. In winter these birds much resemble sparrows.

Distribution.— Specimens collected by E. G. L. Webb at Binaguri, the Dudhua and Jaldhaka appear to be referable to this species. It is a bird of open country, tame and confiding and not shunning human habitation. It feeds on grain, grass seeds, caterpillars, grasshoppers and other insects and is often kept as a cage bird and is very intelligent and hardy.

It is best known by its nests. The breeding season is from April to August, the nests are long, retort shaped structures, hanging from palms, bamboos, on trees, with the entrance at the bottom of the funnel. They are made of strips of *sarpat*

grass, *ekra* leaves or coconut fronds, beautifully, closely woven together. The birds, cut a notch in the leaves, then hold the piece of partially severed blade in their bills, and fly away with it, the action of flying trailing the thin strip off. It breeds in colonies of varying size, sometimes only a couple of nests are made, at other times as many as 150 birds have been known in a single colony. These colonies are, according to Salim Ali, founded by fully adult, breeding males as yet unmated and it is only when the egg chambers are near completion that the hens join them. The number of eggs is usually but up to 5 have been recorded. They are white and measure about 0.82 by 0.59 inches. Those who are interested in the nesting of this bird should refer to Salim Ali's most interesting article (*Jour. Bombay Nat. Hist. Soc.* Vol. XXXIV, p.p. 947-964).

238. Finn's or the Golden chinned Baya

Ploceus megarhynchus Hume.

Fauna Brit. Ind., 2nd. Ed., No. 1009

Description.— Length $6\frac{1}{2}$ inches. The male in breeding plumage differs from the last in having the chin and throat golden yellow as well as the breast.

Male in winter and female at all seasons. Similar to the last species but richer coloured and more rufous fulvous on the lower plumage.

Bill black, fleshy white at base; iris bright light brown; feet brownish fleshy.

It is bigger Weaver and has a heavier bill.

Distribution and habits.— I have only come across this species at Hasimara and it was there that O'Donel came across then breeding. Its habits do not appear to differ from those of the commoner species.

He found a colony of some 20 pairs breeding in an expanse of grass intermixed with scrub, in June 1912. The nests were quite different in shape to those of the next, and commonest, species, being untidy balls of grass strips, attached to a tree in two or more places, with the entrance holes on the sides.

The only specimens of this bird I ever got were in thatch land with small trees in it, on the 15th February, 1927, their identification was confirmed by Stuart Baker.

239. The Eastern Weaver Bird

Ploceus infortunatus burmanicus Ticehurst.

Fauna Brit. Ind., 2nd. Ed., No. 1010

Description.— Length 6 inches. Differs from the Baya by having the breast fulvous, instead of golden yellow, in the breeding male and the upper plumage edged with rufous-buff.

Male in winter and female at all seasons, resemble the Baya but are, generally, more richly coloured on the lower plumage.

Bill, black in breeding male and pale horny in female, and winter male; iris dark brown; legs flesh colour.

Distribution and habits.— A very common resident species whose nesting is similar to that of the Baya and like it sometimes builds on trees or palms in compounds. Stuart Baker says it will even build on verandahs "attaching its nest to trellis-work or to the thatch of the roof" the breeding season is from April to August, the eggs number from 2 to 6 and are white in colour. They measure about 0.82 by 0.60 inches.

240. The Burmese Striated Weaver Bird

Ploceus manyar peguensis Stuart Baker

Fauna Brit. Ind., 2nd. Ed., No. 1015

Description.— Length 6 inches. Male in breeding plumage: Differs from the Eastern Baya in having broader and black central markings on the upper plumage, the lower plumage, below the throat, is pale rufous buff, boldly streaked with blackish brown on the upper breast and narrower on the lower breast and flanks it has like the last a golden yellow crown.

Male in winter and female at all seasons: Differ from the last in only having an eyebrow, patch on each side of the neck and a moustachial streak yellow.

Bill blackish in summer and brownish horn in winter, iris brown, legs fleshy brown.

Distribution and habits.— I found this Weaver in a reed bed in a swamp, not far from Gairkata on the 29th March, 1928 and 13th February, 1930, but it probably occurs in similar situations, elsewhere in the district. It congregates in flocks and can often be seen flying from one reed bed to another, disappearing rapidly into the thick cover, it was during this flight that specimens were obtained. Where large numbers are found there is quite a babel of sound. They feed on the grass seeds and insects which they find in the reed beds.

This Weaver may perhaps, be found breeding in the swamps. The breeding season is from May to July and the nest is built in long grass, or reeds, standing in water. It is similar to other Weavers nests but the tubular entrance is generally short and they hang from a number of the ends of the reeds or grass, clustered together. The eggs number from 3 to 5 and are glossier white in colour. They measure about 0.80 by 0.58 inches.

SUB FAMILY ESTRILDINAE

241. The Black headed chestnut bellied Munia

Lonchura (Munia) fermgenosa atricapilla (Vicillot)

Fauna Brit. Ind., 2nd. Ed., No. 1020

Description.— Length 4½ inches. Sexes alike. Head, neck and upper breasts, black; upper plumage chestnut; rump and above the tail rich chestnut maroon, the feathers of the latter tipped with glistening gold; lower plumage chestnut with a large blackish patch on the centre of the abdomen.

Bill bluish plumbeous; iris dark brown; legs plumbeous.

The central tail feathers are narrow and pointed and the tail rounded and not much graduated.

Distribution and habits.— This Munia is found in some grass lands but absent from many others. I came across them on the road between Rajabhatkhawa and Mendabar, also near

Telipara. It frequents grass, ekra, reeds near cultivation sugar cane and sometimes reeds near swamps. It is gregarious and found in small flocks or family parties, the fulvous brown birds with them being young birds.

It probably breeds in the district during the rains from June to September. The usual nesting sites are in grass, reeds or bushes in scrub jungle and likes the vicinity of villages. The nest is round like a large ball composed of loosely woven grass or strips of this and lined with finer grass, the entrance is on the side. The eggs number 5 to 6 and are white in colour. They measure about 0.63 by 0.43.

Even when fledged the young and their parents, continued to use the nest as sleeping quarters as long as it holds together. This Munia is also called the Black headed Nun.

242. The Himalayan White rumped or Hodgson's Munia

Lonchura (Uroloncha) striata acuticauda (Hodgson).

Fauna Brit. Ind., 2nd. Ed., No. 1024

Description.— Length 4½ inches. Sexes alike. Forehead, sides of head and chin and throat, brownish black, rest of upper plumage chocolate brown with buff white shaft; rump white; tail black; sides of neck and the breast, chocolate with buff white shafts and edged with rufous; below the breast fulvous white mottled with brown; vent, thighs and patch below the tail, chocolate brown. Bill upper mandible almost black, lower one plumbeous; iris red brown; legs plumbeous and horny brown.

The tail is pointed wedge shaped and much graduated.

Distribution and habits.— Hodgson's Munia is not uncommon in many parts of the district. I have obtained it at Hasimara, Hantapara, Nangdala, Haldibari, the Rehti forest and at Gorumara. It is fond of forest country, especially of light scrub jungle but also frequents more humid forest and open country. It goes about in small parties and feeds on various grass seeds, grain etc.

243. The Indian spotted or Scaly breasted Munia

Lonchura (Uroloncha) punctulata lineventer (Hodgson)

Fauna Brit. Ind., 2nd. Ed., No. 1031

Description.— Length 5 inches. Sexes alike. Forehead, sides of head, chin and throat rich chestnut, rest of upper plumage dull chocolate, the feathers of the back and wings with whitish shafts, rump barred black and white above the tail glistening yellow, lower plumage white, the feathers edged with brownish, giving it a scale like appearance except on the abdomen.

Young birds are chocolate brown above and buff below without the scale like markings and glistening yellow above the tail.

Distribution and habits.— The commonest Munia in the district. It is found in scrub-jungle, near villages, in gardens, in fact all over the district except in forests. Where there is cultivation large flocks are seen which, when disturbed, fly on to some nearby bush until all danger is passed. As Whistler remarks they resemble a swarm of bees as they arise in close order and utter their "curious petulant note of kitty-kitty-kitty." The food of this tame little bird consists largely of grass seeds, but grain is also eaten and a certain amount of insect food.

The breeding season is during the rains, in July and August. It makes its nest in the thatch and creepers on houses or in bushes, sometimes, it breeds in colonies. The nest is large for the size of the bird, rather round in shape and composed of grass, strips of grass, blades of various cereal crops etc. lined with fine grass stems. The eggs number from 5 to 10 and are white in colour. They measure about 0.65 by 0.46 inches.

244. The Indian Red Munia or Avadavat

Amandava amandava amandava Linnaeus

Fauna Brit. Ind., 2nd. Ed., No. 1036

Description.— Length 4 inches. Male in breeding plumage. Whole plumage crimson, the brown bases of the feathers of the

upper plumage show through and give it rather a mottled appearance; rump above the tail, sides of neck breast and flanks, spotted with white and there is a big black patch from the centre of the abdomen to below the tail.

Male in winter and female at all seasons. Upper plumage brown; above the tail crimson tipped with white spots; in front of the eye black; chin and throat whitish; sides of head, neck and breast grey brown changing to buffy cream on the abdomen. The throat and breast of the male in winter are greyer than in the female.

Bill red; iris orange red; legs flesh colour.

Distribution and habits.— This appears to be a rare bird. I have only seen it once when a specimen was secured on the wing, while flying in a small party, over some paddy land near a small jheel not far from Gairkata, on the 8th March, 1928. It likes that type of country but also frequents grass land, scrub jungle and cultivation. It is a tame little bird and where common, is netted in large numbers and sold as cage birds. They make very charming pets. It is sometimes called a Strawberry Finch.

FAMILY FRINGILLIDAE

SUB FAMILY FRINGILLINAE.

245. The Scarlet Finch

Haematospiza sipahi (Hodgson).

Fauna Brit. Ind., 2nd. Ed., No. 1051

Description.— Length 7½ inches. Male: Body plumage brilliant scarlet; wings and tail dark brown, edged with scarlet; thighs dark brown.

Female: Upper plumage dark-brown, the feathers broadly edged with greenish yellow; rump bright yellow; lower plumage ochre grey and brown, suffused with yellow on the breast. Bill yellow; iris and legs brown.

Bill rather stout and conical.

Distribution and habits.— The only specimens so far collected were obtained by me at Baksa Duar on the 26th February, 1918. It is a forest bird and sociable, going about in parties. Its flight is rather dipping but quite powerful and fast. The food of this beautiful Finch consists of seeds, berries and some insects. It is favourite cage bird of the Khasias.

246. The Indian Common or Hodgson's Rose Finch

Carpodocus erythrinus roseatus (Blyth).

Fauna Brit. Ind., 2nd. Ed., No. 1069

Description.— Length 6 inches. Male Upper plumage rather deep crimson much mixed with brown on the back in winter from forehead to nape; rump and above the tail is generally carmine rose; rump crimson; lower plumage crimson pink, brightest on the chin, throat and breast; wings and tail deep brown edged with brownish pink. Immature male and female at all seasons. Upper plumage olive brown, streaked with darker brown, lower plumage olive white streaked with brown on the chin throat and breast a double pale ochraceous bar across the wings.

Bill horny brown; iris dark brown; legs brown.

Distribution and habits.— This Finch is not an uncommon bird during the winter months, it is most in evidence during the upward migration in April and May. It is gregarious, sometimes assembling in numbers and frequents open country, cultivation, thin bush land and gardens. It finds most of its food on the ground, this consists of seeds, millet, berries etc. Deignan writes "The usual notes in winter are a conversational twittering but, during the first two weeks of April, the males were already rendering a soft, sweet, whistled song from low trees."

247. The Indian House Sparrow

Passer domesticus indicus Jardine and Selby

Fauna Bri. Ind., 2nd. Ed., No. 1097

Description.— Length 6 inches. Male: top of the head ashy-grey a band in front of and behind the eye and the upper plumage, chestnut; the latter broadly streaked with black; rump

ashy grey; sides of head, and neck and the lower plumage, white tinged with ashy on the flanks; chin, throat and upper breast, black and wings chestnut and brown with a white bar across them.

Female: Upper plumage ashy brown, broadly streaked with black; lower back ashy brown; wings dark brown and rufous, with a white bar across them, a pale fulvous, white eye-brow, lower plumage fulvous, ashy white.

Bill black in male in summer, otherwise brown; iris and legs brown.

Distribution and habits.— Very common near human habitations. This parasite of man is too well known to require much to be said about its habit. There are few places where man has taken up his abode that this sparrow has not done so also, Darjeeling is one of those, the common sparrow there is the next species. The House-Sparrow is noisy, untidy and pugnacious and although it is a pest consuming a good deal of grain, it makes up for that, to some extent, by feeding its young largely on caterpillars during their earlier days. The number of adults is kept down quite a lot by the Indian Vampire Bat (*Lyroderma lyra*) and the nestlings are attacked by the grub of fly (*Passeromyia haterochoeta*) which buries its anterior extremity in the skin of the bird and sucks its blood.

It nests, practically in every month of the year and makes a shapeless bundle of grass, rags, straw etc., which is stuffed into any hole in houses, walls etc. and the birds become a terrible nuisance when they build in our verandahs. It has several broods. The eggs number from 4 to 6 and are greyish or greenish in colour marked with frecklings, spots or blotches of sepia, ashy grey and purplish brown white often form an ill defined cap at the larger end. They measure about 0.80 by 0.50 inches.

248. The Malay Tree Sparrow

Passer montanus malaccensis A. Dubois.

Fauna Brit. Ind., 2nd. Ed., No. 1102

Description.— Length 5½ inches. Sexes alike. Forehead to nape, vinaceous chestnut black, and shoulders ferruginous.

broadly streaked with black; rump, above the tail and tail feathers yellowish brown; two buff white wing bars across the wings, sides of head and neck white, except for a black patch on each side of the head chin and throat black, rest of lower plumage ashy white darkest on the breast with the flanks and below the tail, buff.

Bill black, iris brown, legs fleshy brown.

Distribution and habits.— The only place where I have seen this tree sparrow is in the foothills near Young Tong. Where not banished by the House Sparrow this bird is much at home in towns etc. and becomes very tame indeed scarcely troubling to get out of ones way. It, also, lives a country life frequenting light forest and open country. In its habits and nesting, it resembles its cousin the House Sparrow.

249. The Tibetan Cinnamon Tree Sparrow

Passer rutilans schaferi Stresemann

Fauna Bri. Ind., 2nd., Ed., No. 1105 (Part).

Description.— Length 6 inches. Male: Upper plumage bright cinnamon rufous, the feathers of the back with black streaks; wings black edged with rufous and fulvous, the median coverts black, tipped with white forming a white wing bar; a whitish eyebrow and below it, infront of and behind the eye, black; sides of head and lower plumage, greyish, the latter much washed with yellow; a bright yellow patch on each side of the throat; chin and throat black.

Female: Upper plumage ruddy brown with black and fulvous streaks on the back and reddish on the rump; wings dark brown edged with fulvous and with a white bar across them; a broad, buff eye brow to the nape with a brownish band beneath it, through the eye; lower plumage ashy yellow.

Bill black in summer, horny brown in winter; yellow below; iris brown; legs horny brown.

Distribution and habits.— It appears to be only a winter visitor, collecting in large flocks and frequenting light forest and grass land interspread with bushes. It is found in many

parts of the district, our specimens were collected near the Barsa river and at Hasimara, Nangdala, Sarugaon, the Rehti forest, Binaguri and Haldibari. According to Ludlow it is common in the villages in part of S. E. Tibet. It has a softer note than the other sparrows.

SUB FAMILY EMBERIZINAE

250. The Siberian Grey headed Bunting

Emberiza fucata fucata Pallas

Fauna Brit. Ind., 2nd. Ed., No. 1120

The Indian Grey headed Bunting.

Emberiza fuccta arcuata Sharpe

Fauna Brit. Ind., 2nd. Ed., No. 1121

Description.— Length 6 inches. Male top of the head and sides of the neck ashy grey, the feathers streaked with black; upper plumage and shoulders fulvous, broadly streaked with black and edged with chestnut; rump dull chestnut with obsolete streaks, above the tail, fulvous rufous with brown streaks, tail brown, the outermost pair of feathers largely white, the penultimate ones tipped with white; ear coverts chestnut bordered below by a white streak and below it a series of black streaks from the base of the bill continuing down the sides of the throat; upper breast fulvous white, boldly streaked with black, lower breast showing a certain amount of chestnut as a band; rest of lower plumage pale rufous, deeper rufous chestnut on the flanks, the lower flanks streaked with brown.

Female : Differs in being duller and paler.

Bill fleshy brown, paler on lower mandible; iris brown; legs fleshy pink.

The Buntings can be recognized by their conical sharply pointed bills with a gap between the gape and the tips.

Distribution and habits.— A single specimen out of a pair obtained at Jalpaiguri on the 9th January, 1931, and identified by Whistler who remarked that it was, somewhat, intermediate

with the Indian Grey headed Bunting. I obtained it in some grass land. It must be a rare winter visitor. Deignan found it in Northern Thailand in small numbers feeding among the stubbles of fallow rice fields. He said it was shy.

The Indian Grey headed Bunting was secured by Mandelli's collectors in the "Bhotan Dooars" in February, 1874. It differs from the Siberian bird in having a purer grey head and the upper plumage is less fulvous, much richer and more chestnut the whole sides of the body are rich chestnut rufous and the black streaks on the sides of the throat, and breast from a more or less complete gorget, the chestnut on the lower breast covers the whole of it except the centre.

251. The Little Bunting

Emberiza pusilla Pallas

Fauna Brit. Ind., 2nd. Ed., No. 1122

Description.— Length 5½ inches. Male: brown and sides of head, deep rufous, varying in depth of colour even in the same month, a broad black band on either side of the former, which also varies in colour, a pale rufous eyebrow, a dark brown line from behind the eye encircles the rufous ear coverts, mustachial streak dark brown, upper plumage brownish black broadly edged with rufous, tail brown, edged paler, the outermost feathers largely white, the one next them with streak of white near the tips, lower plumage, white or sullied white, boldly streaked with black on the fore neck, breast and flanks, the boldness and depth of colour of the streaks varies somewhat.

Female: Differs in the duller colour of the dark bands on the head.

Distribution and habits.— A common winter visitor to the plains where I have obtained specimens at Hasimara, Sarugaon Binaguri and Haldibari. It remains at any rate, to the end of March, probably later. It is said to be a tree Bunting but those I have come across were on the ground, in bushes and grass and often in the tea, singly or in pairs. Deignan describes its note as "a soft cheep." During the winter it feeds on berries and seeds and in summer mostly on insects.

252. The Yellow breasted Bunting

Emberiza aureola aureola Pallas

Fauna Brit Ind., 2nd. Ed., No. 1131

Description.— Length 6 inches. Male: chin, cheeks, sides of head and a narrow eyebrow, black; upper plumage chestnut maroon most of the feathers edged with ashy; a large white shoulder patch; greater wing coverts maroon tipped with white to form a wing bar; tail dark brown with a diagonal patch of white on the outermost feathers; a broad maroon band across the upper breast, rest of lower plumage bright yellow; flanks streaked with maroon.

Female: Head chestnut brown, streaked with brown; sides and back of neck olive brown changing to live chestnut, the former faintly and the latter boldly, streaked with brown; rump chestnut; sides of head mixed brown and yellow; chin and throat whitish; rest of lower plumage yellow, streaked with brown on the flanks.

Bill horny brown above fleshy horny on lower mandible iris crimson brown legs fleshy brown.

Distribution and habits.— An occasional winter visitor remaining, at any rate, upto the 23rd April, the few specimens secured were from flocks on the ground not very far from the Gairkata tea gardens also pairs and single birds on reeds near a patch of water there, others also on the side of the P.W.D. road near Dhupguri. E. G. L. Webb obtained one at Binaguri. It frequents open country and high paddy land after the crop has been cut, the specimen shot near Gairkata was one of a flock feeding in the rice stubble near a swamp. It is also found in bush country. In the winter it feeds much on rice.

253. The Yangtse Black headed Bunting

Emberiza spodocephala melanops (Blyth).

Fauna Brit. Ind., 2nd. Ed., No. 1132

Description.— Length 6 inches. Male: Head, neck and breast olive-green, with some brown streaks on the crown; in front of, round the eye, face and chin, black; upper plumage

rufous brown, boldly streaked with black; rump olive brown; tail brown, outermost feathers largely white, the penultimate ones with triangular white tips; lower plumage yellow, the flanks streaked with dark brown.

Female: Upper plumage rufous brown streaked with brown; eyebrow and sides of the head mixed yellow and brown; chin, throat and upper breast dull yellow streaked with brown, remainder of lower plumage yellow, the flanks streaked with brown.

Bill above dark brown, lower mandible fleshy-horny; iris brown; legs brownish fleshy.

Distribution and habits.— A rare winter visitor. A single specimen, one of a pair, was shot by O'Donel, as they darted into some tall grass on the bank of the Basra river, above the railway bridge, on the 12th March, 1926. Although he and I searched through the whole of the grass no others were seen. Darjeeling Museum purchased this specimen from him. It frequents long grass and in Assam, Stevens found it frequenting patches of open ground in grass lands, precincts of scrub growth and cultivated tracts also in waste land near a river. It is found in parties or in pairs. I found it fairly common, during the winter, in the Hylakande, District Cachar and when the paddy was ripe, numbers are seen causing a considerable amount of damage to the crop.

254. The Chestnut Bunting

Emberiza rutila Pallas

Fauna Brit. Ind., 2nd. Ed., No. 1135

Description.— Length 6 inches. Male after autumn moult. Head, chin, throat, breast, and upper plumage rich chestnut, edged with ashy yellow (the yellow fringes wear away in the spring. Lower plumage creamy-yellow, the flanks streaked with olive green.

Female: Upper plumage ashy brown, streaked with black; rump and above the tail, chestnut; and indistinct ashy buff eyebrow; cheeks; chin and throat mottled fulvous, white and

brown; lower plumage yellow, with a brownish tinge on the breast, flanks streaked with olive green.

Bill above dark horny, lower mandible paler; iris dark brown, legs pale yellowish brown.

Differs from the other Buntings in having no white on the outermost tail feathers.

Distribution and habits.— Mandelli's collectors obtained this Bunting in January, 1876 but it has never been recorded since then. Writing from North Thailand Deignan says small parties of this species appear sporadically in the more extensive forest clearings.....then vanish again. He also says it avoids cultivated lands preferring bamboo and other weedy growth that follows the abandonment of agriculture.

255. The Crested Bunting

Melophus lathami subcristatus (Sykes)

Description.— Length 6 inches. Male: plumage black; except the wings tail, thighs which are chestnut, the latter mixed with brown.

Female: Upper plumage dark brown, edged with ashy olive, wings and tail dark brown, edged with cinnamon, the outermost feathers of the latter all cinnamon except at base and tip, lower plumage dull buff, mottled and streaked with dark brown on the throat and breast.

Bill blackish above, fleshy at base of lower mandible; iris dark brown, legs fleshy brown.

This Bunting is easily recognized by the crest in both sexes, it is long in the male and shorter in the female.

Distribution and habits.— A fairly common winter visitor from the middle of October upto as late as the 4th May, on which date O'Donel secured a female at Hasimara. I have collected specimens at Hasimara, Haldibari and the Rehti forest, seen it, on several occasions, on the edge of the Raidak forest. This Bunting is a bird of open country, those I collected were, mostly, obtained in grazed land in which there was a certain amount of bush cover. Sometimes, it is found in small

parties of two or three but often, single birds are come across. The cock is a very handsome bird and not shy. It spends much time on the ground where it obtains its food in the shape of grass seeds, it is also said to eat grasshoppers. It sometimes, perches on walls and buildings and utters its sweet whistle from the top of a bush.

SOME MONSOON FLOWERS OF DARJEELING

By

B. N. Ghose and J. C. Daniel

The flowering plants described herein are some of the commonest among the many wild flowers which come into bloom in the Darjeeling area. Some of the species described form the dominant vegetation among the shrubs of the undergrowth. The plants were collected in July mainly from two areas in the Town, Observatory Hill and Birch Hill. The species described are annual and perennial Herbs and shrubs.

Hypericum patulum Thurb. Plate X

A small many branched bush. Branches are more or less of the same size. Pairs of opposed leaves are regularly arranged one above another along the length of the branches. Leaves are thick and scented. Flowers are cup shaped, yellow in colour and borne singly at the branch tip. The plant grows on rock crevices and on the revetment walls in the town.

A larger species of this plant called '*hookerianum*' is found in the Senchal area. This variety has flowers considerably larger than the present species, reaching a diameter of over 2 inches. The Nepali name for the species is *Urila*.

Dichoroa febrifuga Lour. Plate X

A small perennial shrub which grows abundantly and forms one of the chief elements in the undergrowth in forested areas as also in open lands. Flowers are borne in corymbs at the end of branches. Flowers are blue in colour but the buds are white which gradually turn blue as they mature.

As the scientific name *febrifuga* suggests this plant is used for treating fever. A decoction of the whole plant is made, which acts as a purge. The species is very common in the Temperate Himalayas, from Bhutan to Nepal. It grows usually at altitudes of 5,000 to 8,000 ft. The Nepali name for the plant is *Pashak*.

Polygala arillata Ham. Milkwort Plate X

A perennial shrub of forest areas with very dense foliage. The flowers are irregular, bisexual and borne in racemes. Flowers are yellow in colour. This species is found in the Himalayas, from Nepal eastwards at altitudes varying from 2,000 to 6,000 ft. It is also found in Malaya and China. The Nepali name for the species, *Marcha*, is properly applicable to the root which is used for the fermentation of *Marua* beer from rice.

Sprirea micrantha Ho. Hook. Family Roasacea. Plate X

A common, small, perennial shrub, with glabrous leaves. The leaves and the young stem have soft downy hair. Flowers are borne in terminal cymes at the end of branches. Flowers small, five petalled and white in colour. This species is found in the Temperate Himalayas, chiefly on rocky ground.

Lysimachia ramosa Wall. Family Primulaceae. Plate XI.

An annual, erect herb, usually found growing in moist localities, and on wet rocks. The branches are long and slender and pendent at the tip. Flowers are single and arise from the base of the leaves. Flowers are small and yellow in colour. This species is found in the eastern Himalayas at elevations of 5,000 to 8,000 ft. It is also found in the Khasia Hills, Assam and in Java.

Dichoroa febrifuga

Hypericum patulum

Polygala arillata

Spirea micrantha

Photos

Durga Das

Lysimachia ramosa

Oenanthe thomsoni

Cautlea lutea

Ophiopogon clarkei

Photos

Durga Das.

Oenanthe thomsoni Clarke. Parasol Flower—Family Umbelleiferae
Plate XI

A very delicate looking annual herb growing in wet areas. The leaves are finely divided. Flowers are small white in colour and borne on stalks opposed to leaves on the stem. A number of flowers occur together on an Umbrella shaped head. The roots are fibrous. This species belongs to the same family as the economically important plants from which Coriander and Aniseed are obtained. Many species in this family bear scented seeds and some have very poisonous seeds. This species is found throughout the Western Hemisphere.

Cautlea lutea Royle. Yellow Cautlea—Family Zingeberacea.
Plate XI

Annual herbs on perennial roots with short stems of about 12 inches in length. Stem fleshy, leaves are long, about 9 inches in length and grow alternately on the stem. Leaves are purplish brown on the ventral side. Flowers are borne at the end of the stem on a short stalk, are yellow in colour, hence the name *lutea*. The seeds are round and shiny black in colour. The species is very common in Darjeeling and grows in moist ground, on wet rock faces and even on trees. The species is found in the Himalayas from Kashmir to Sikkim at altitudes of 7,000 ft and above.

Ophiopogon clarkei Hook f. Snakes Beard Lily—
Family Haemodoraceae Plate XI

A small scapigerous herb which in appearance is grass like. The leaves are thin long and parallel nerved. Flowers are borne on a long peduncle rising from the center of the plant and sheathed in leaf stalks at its distal half. Flower petals are blue on the outside and white inside. Stamens are green in colour. Fruits are in the form of dark blue shiny berries. The plant is common in Darjeeling and grows in shady places as an undergrowth in forested slopes. About 20 allied species of this Lily are known from the Oriental region. The name *Ophiopogon* is a translation of the Japanese name for this family.

RHODODENDRONS OF DARJEELING AND SIKKIM HIMALAYAS

By

M. Sain

(*Continued from Page 12, Vol. 30, No. I, August, 1958*).

RHODODENDRON GLAUCUM : (*N. Lahrae chimal*).

Habit : Small shrub 3-5 ft. high, it has a strong resinous smell.

Leaves : Broadly tapered, pointed at the tip, $1\frac{1}{2}$—$3\frac{1}{2}$ inch long $\frac{1}{2}$ to 1 inch broad, dull-green and thinly scaly above, pale greyish-blue to almost white below and scaly, the scales unequal, the smaller scales pale yellow and the larger brown, leaf stalk $\frac{1}{4}$—1 inch long. scaly.

Inflorescence : terminal, 5—8 flowered, flower stalks rather slender, $\frac{3}{4}$ inch long, scaly.

Flowers : Pink.

Calyx : Large and leafy, lobes blunt or pointed, $\frac{1}{2}$ inch long, densely covered with glandular scales.

Corolla : widely funnel shaped, $\frac{3}{4}$—1 inch long, 5 lobed, slightly scaly on the lobes.

Stamens : 10, exserted, slightly pubescent at the base.

Pistil : ovary 5 celled, scaly, style glabrous thicker towards the tip and with a large lobulate stigma.

Capsule : short and oval, about $\frac{1}{2}$ inch long, hidden by persistent calyx lobes, the style often persistent.

Habitat : Lachen—Thangu (N. Sikkim).

RHODODENDRON CAMELLIAEFLORUM.

HABIT: a slender shrub 2—5 ft. high growing on rocky slopes often epiphytic, branchlets densely scaly.

LEAVES: narrowly oblong, tapered at the tip, obtuse at the base, evergreen, 2—3½ inch long ¾—1 inch broad, smooth and veins net-like above, very densely scaly below; leaf stalks 1/3 inch long densely scaly.

INFLORESCENCE: terminal, usually 2 flowered, flower stalks ¼ inch long, densely scaly.

CALYX: deeply 5 lobed, ¼ inch long, lobes broadly oblong-elliptic, not hairy, with few scales outside near the base.

COROLLA: white and fleshy, shortly and broadly tubular 5 lobed, 1½ inch across tube ½—⅝ inch long; hairy inside throat, scaly outside.

STAMENS: 12—16 shortly exserted, pubescent towards the base.

OVARY: ½ inch long, 10 celled, densely scaly; style stout and smooth.

Flowering: May-June. Fruits in October-November.

HABITAT: Singalila ridge, 8,000—12,000 ft. N. W. Sikkim. Zemu Valley in N. Sikkim.

RHODODENDRON THOMSONII.

HABIT: a large shrub or a small tree, 8—15 ft. high, bark dark reddish brown, rough; young shoots green with imperceptible waxy bloom.

LEAVES: broadly elliptic, 2—3 inch long. 1½—2½ inch broad, tip round with short sharp point, base round or heart shaped, upper surface dark green, midrib slightly grooved, and light green, primary veins

about 9 on each side pale green, not sunk; under-surface whitish pale-green or greenish blue, midrib prominent green, lateral veins raised; leaf stalks $\frac{1}{2}$—$\frac{3}{4}$ inch long, slightly grooved, bluish; green and waxy with a few glands.

INFLORESCENCE: a loose cluster of 6—8 flowers, flower stalks $\frac{1}{2}$—$\frac{3}{4}$ inch long, smooth and greyish-blue.

Flowers: deep blood red in colour and waxy.

CALYX: large, $\frac{1}{2}$—$\frac{3}{4}$ inch long, cup shaped, upper half more or less tinted red, lower half green split into 5 rounded or truncate lobes of unequal size, the two upper lobes are practically double the size than the lower three.

COROLLA: widely funnel shaped, 2—$2\frac{1}{4}$ inch long, fleshy and waxy, deep blood red, spotted on upper side at the back with deeper crimson, lobes 5, notched.

STAMENS: 10, unequal, 1—$1\frac{3}{4}$ inch long, filaments white and smooth.

PISTIL: about 2—$2\frac{1}{2}$ inch long, ovary cone shaped or cylindric, 5—7 mm. broad, bluish-purple, smooth or furrowed, 6—10 celled, style smooth.

CAPSULE: broadly oblong, $\frac{1}{2}$—$\frac{1}{4}$ inch long, bluish-purple, smooth, the lower half encased in persistent calyx.

Flowering: May-June. Fruits: November-December.

HABITAT: 10,000—12,000 ft. alt., Lachen-Thangu and Zemu valley in North Sikkim.

RHODODENDRON WIGHTII.

HABIT: a large shrub or a small tree, about 25 ft. high, bark greyish-brown, rough; young shoots greyish and wooly.

LEAVES: Leathery, oblong eliptic or oblong obovate, 5—7 inch long, 2—2¾ inch broad, tip blunt or broadly or shortly pointed, base semi-rounded; upper surface bright green, slightly wrinckled, midrib and primary veins 12-14 on each side deeply grooved; under surface coated with pale—or deep rusty brown wooly felt, midrib prominently raised, pale green and smooth primary veins prominent; leaf stalk ½—¾ inch long, greyish wooly.

INFLORESCENCE: a large rounded and somewhat lax cluster of 14—20 flowers, hard and sticky bud-scales persists at the base during flowering; flower stalks 1—1¼ inch long, with yellow velvety coating or in some glandular.

Flowers: pale yellow with crimson spots.

CALYX: very small with 5 short teeth.

COROLLA: bell shaped, broad at base, pale yellow, heavily bloched crimson at the base and densely spotted crimson at the back, 1½—1¾ inch long, lobes 5, deeply notched.

STAMEN: 10, ¾—1¾ inch long, filaments hairy at the base.

PISTIL: about 1¼ inch long, ovary cone shaped, 7 mm. long, densely coated with velvety wool, style smooth, stigma disc shaped.

CAPSULE: cylindric, slightly curved, blackish with few hairs, 10 chambered.

Flowering: May-June. Fruits: November-December.

HABITAT: 10,000—12,000 ft. alt. Changu, Zemu valley and above Bakhim in Sikkim.

RHODODENDRON CAMPYLOCARPUM.

HABIT: a small shrub 4—8 ft. high, young branches clad with glands.

LEAVES: leathery, elliptic, 2—3½ inch long, 1¾—2 inch broad, tip rounded or blunt, base heart shaped or angular or rarely rounded; upper surface dark green, glossy and smooth, or dappled with traces of fine velvety hair, midrib slightly grooved, pale green, primary veins about 10 on each side impressed; under surface pale greyish green, waxy and minutely covered with tiny brown hairs, midrib and primary veins slightly raised; leaf stalk ½—¼ inch long, grooved above, scattered with glands and small hairs.

INFLORESCENCE: a lax cluster of 6—8 flowers, flower stalks ¾ × 1¾ inch long glandular or practically smooth.

Flowers: pale or bright yellow.

CALYX: about 1/5 inch long, cup like, lobes 5, somewhat unequal oval, rounded or angular, more or less glandular.

COROLLA: funnel shaped, about 1¾ inch long, pale or bright yellow, with or without faint crimson blotches at the base, lobes 5, about ¾ inch long, rounded, wavy and notched.

STAMENS: 10 unequal, ½—1¼ inch long, filaments smooth or pubescent at the base, anthers reddish.

PISTIL: about 1¾ inch long, ovary cone shaped, 1/5 inch long densely clad with small glands, style glandular at the base or smooth, curved towards the broadish lobe like stigma.

CAPSULE: Cylindric, grooved about 1 inch long, curved in a semi-circular arc, more or less covered with glands, 5—7 chamber.

Flowering: May-June. Fruits: November-December.

HABITAT: 11,000—13,000 ft. alt. Migothang, Cambothang in W. Sikkim.

RHODODENDRON LEPIDOTUM (Nepali *Bhale sunpate*).

HABIT: a small gregarious shrub, aromatic, up to $2\frac{1}{2}$ ft. high, bark dark grey and smooth, branchlets thinly warty.

LEAVES: oblanceolate, $\frac{3}{4}$—1 inch long, dark purplish green lower surface densely covered with fleshy scales, leaf stalk minute, practically sessile.

INFLORESCENCE: terminal, usually 3 flowered, flower stalk slender, $\frac{1}{2}$—1 inch long, densely clad with glands.

Flowers: purple, pink or yellow.

CALYX: green, 5 lobed, scaly outside.

COROLLA: very short and broadly tubular, 5 lobed, very densely scaly, grandular outside.

STAMENS: 8, extended, filaments hairy in the lower half.

OVARY: 5 celled, scaly, style short, thick and smooth.

CAPSULE: $\frac{1}{3}$ inch long, densely scaly and covered with persistent calyx lobes.

Flowering: June-July. Fruits: December.

HABITAT: 11,000—14,000 ft. alt. entire Sikkim Himalaya. A dwarf species

RHODODENDRON OBOVATUM (*Lepidotum series*).

HABIT: a small shrub, 2—3 ft. high, branchlets very short and glandular.

LEAVES: oval, bluntly pointed at the tip, $\frac{3}{4} \times 1\frac{1}{2}$ inch long, $\frac{1}{3}$—$\frac{3}{4}$ inch broad, densely scaly on both sides, leaf stalks about $\frac{1}{4}$ inch long.

INFLORESCENCE: terminal, 2—4 flowered, flower stalks about $\frac{1}{2}$ inch long, densely scaly.

Flowers : purple with crimson spots.

CALYX : green, deeply 5 lobed, slightly scaly, about $\frac{1}{3}$ inch long.

COROLLA : shortly and broadly tubular, about $\frac{3}{4}$ inch diameter, 5 lobed, tube and middle of the lobes densely scaly outside.

STAMENS : 10, slightly extended, pubescent at the lower part.

OVARY : densely scaly, 5 celled, style short, bent and smooth.

CAPSULE : $\frac{1}{2}$ inch long, densely glandular—scaly.

Flowering : June-July. Fruits : November-December.

HABITAT : 10,000—12,000 ft. alt. Zemu valley in North Sikkim. A dwarf species.

RHODODENDRON ANTHOPOGON (*N. Dhupi L. Palu-chulu*)

HABIT : a small gregarious shrub, 8—18 inch high, strongly aromatic, branches short and twiggy, slightly coated with fine bristle, young shoots scaly.

LEAVES : broadly elliptic, bluntly pointed at the tip, rounded at the base, 1—1$\frac{1}{2}$ inch long, $\frac{1}{2}$—1 inch. broad, upper surface smooth and shiny, under surface densely clad with brown tomantose and scaly, leaf stalk $\frac{1}{4}$ inch long and scaly above.

INFLORESCENCE : a terminal compact cluster of 8 to 12 flowers, flower stalks about $\frac{1}{4}$ inch long, slightly scaly.

Flowers : yellow.

CALYX : deeply lobed, $\frac{1}{4}$ inch long, broadly elliptic with fine hairs on the margin.

COROLLA: delicate translucent and narrowly tubular, about $\frac{3}{4}$ inch long.

STAMENS: 6—8, smooth.

OVARY: scaly, 5 celled, style smooth, short and thick.

CAPSULE: very small, about $\frac{1}{8}$ inch long, encased by persistent calyx lobes.

Flowering: June-July-August. Fruits: November-December.

HABITAT: 11,000—15,000 ft. alt. Singallia range, Deongri, Thangu and all over Sikkim, above 10,000 ft. altitude. A dwarf species.

RHODODENDRON PUMILUM (*Series lepidotum*).

HABIT: a small shrublet about 6—12 inches, its slender stems creeping among the moss.

LEAVES: broadly elliptic, pointed at the tip, $\frac{1}{4}$—$\frac{3}{4}$ inch long $\frac{1}{8}$—$\frac{1}{3}$ inch broad, upper surface smooth, under surface loosely scaly, greyish blue, leaf stalks minute.

INFLORESCENCE: 1—3 flowered, flower stalks 1—2 inch long, loosely scaly.

Flowers: bright pink.

CALYX: 5 lobed, deep, lobes oblong elliptic about $\frac{1}{8}$ inch long, purplish red, loosely scaly outside.

COROLLA: widely funnel shaped, $\frac{1}{2}$—$\frac{3}{4}$ inch long, 5 lobed, lightly clad with fine wooly hair all over out-side and rarely scaly.

STAMENS: 10, slightly hairy, near the base.

OVARY: 5 celled, densely scaly, style short thick and smooth.

CAPSULE: about 1 inch long, scaly, stalks up to 2 inch long.

Flowering ; June, Julf, August. Fruits : November-December.

HABITAT: 11,000—14,000 ft. alt. Thangu & above in Sikkim.

RHODODENDRON VIRGATUM

HABIT: a small erect shrub about 3 ft. high, with long slender branches and scattered leaves, bark grey-brown roughish.

LEAVES: broadly tapered, with a short sharp point at the tip and bluntly rounded at the base, 2 inch long, $\frac{3}{4}$ inch broad, loosely scaly, above and densely scaly below flaky, leaf stalks $\frac{1}{4}$ inch long.

INFLORESCENCE: solitary one flowered, but scales persistent during flowering.

Flowers: pale purple.

CALYX: deeply 5 lobed, fleshy and rounded, scaly outside.

COROLLA: widely funnel shaped, pale purple, about $\frac{3}{4}$ inch long 5 lobed, slightly scaly outside.

STAMENS: 10, extended, lower part pubescent.

OVARY: 5 celled, densely scaly; style pubescent and scaly in the lower half.

CAPSULE: $\frac{1}{2}$ inch long, densely scaly.

Flowering: May-June. Fruits: November-December.

HABITAT: 8,000—10,000 ft. alt. Lachung and Lachen Valley.

RHODODENDRON SETOSUM

HABIT: a small shrub about 18 inches in height with strong resinous smell, bark greyish brown, branchlets densely bristly.

LEAVES: oblong eliptic, $\frac{1}{3}$—2 inch long and 1 inch broad, upper surface glandular-scaly, under surface densely scaly and bristly, leaf stalks about $\frac{1}{8}$ inch long and bristly.

INFLORESCENCE: terminal, 2—3 flowered, flower stalks $\frac{1}{8}$ inch long and scaly.

Flowers: bright purple pink.

CALYX: fleshy and red, about $\frac{1}{4}$ inch long, lobes broadly eliptic, slightly scaly outside.

COROLLA: broadly funnel shaped, about 1 inch long, purple-pink, 5 lobed, deeply divided, flower stalks about 1 inch long.

STAMENS: 10, extended, pubescent at the lower half.

OVARY: 5 celled, densely scaly, style reddish and smooth.

CAPSULE: $\frac{1}{4}$ inch long, scaly, enclosed by persistent calyx.

Flowering: June-July. Fruits: November-December.

HABITAT: 12,000—16,000 ft. alt. Dzongri, Alukthang Valley and between Thangu and Giagong in North Sikkim.

RHODODENDRON ELAEAGNOIDES.

HABIT: dwarf shrublet about 8 inches high, hardly exceeding 10 inches, branchlets numerous, knotty and twiggy, very rough and with wart like protuberances.

LEAVES: broadly oval; elliptic, about $\frac{1}{2}$ inch long and $\frac{1}{4}$ inch broad, very densely covered with overlapping flake like scales on both sides, leaf stalk very short.

INFLORESCENCE: terminal, 1 flowered, flower stalk about 1 inch long, loosely covered with flaky scales.

Flowers: solitary bright yellow or reddish purple.

CALYX: spreading, 5 lobed, the lobes, broad and reddish and scaly outside.

COROLLA: shortly and broadly tubular, $1\frac{3}{4}$ inch long and 1 inch diameter, 5 lobed, densely glandular outside.

STAMENS: 8, same length as the tube, filaments covered with short soft hairs at the base.

OVARY: 5 celled, scaly, style short, smooth and curved.

CAPSULE: $\frac{1}{4}$ inch long, densely scaly and surrounded by the persistent calyx-lobes.

Flowering: June-July. Fruits: November.

HABIT: North Sikkim 13,000—16,000 ft. alt. Yumthang and above Thangu (in N. Sikkim).

RHODODENDRON NIVALE.

HABIT: a low prostrate shrublet hardly 4 inch high forming cushions, branchlets densely scaly. It is the smallest shrub among the rhododendrons.

LEAVES: elliptic, very small about $\frac{1}{4}$ inch long, densely scaly on both sides, leaf stalk very short.

INFLORESCENCE: terminal, 1 flowered, flower stalks very short and scaly.

Flowers : solitary, bright purple rose.

CALYX : $\frac{1}{8}$ inch long, fleshy 5 lobed, lobes oblong, scaly outside on the margin.

COROLLA : short funnel shaped, widely open at the top, about $\frac{1}{2}$ inch long, the lobes slightly scaly outside and hairy inside the tube.

STAMENS : 10, extended, clad with short soft hairs at the base.

PISTIL : ovary scaly, style curved, longer than the stamens and smooth.

CAPSULE : $\frac{1}{8}$ inch long, egg shaped and scaly.

Flowering : June-July. Fruits : November.

HABITAT : 14,000—15,000 ft. alt. Zemu valley and above at Giagong and Gordama lake in North Sikkim.

RHODODENDRON CULTIVATION.

Most of the above mentioned rhododendrons can be grown in any hilly place above 600 ft. altitude. I have collected seedlings of many varieties during my trecks in the Himalayas which I planted in the grounds of my friend Dr. S. C. Law the noted ornithologist at Charlemont, Jalapahar. This was about 20 years ago, they are now bearing flowers every year regularly. Some of them started bearing flowers after the 8th year of their planting out and some in the 10th year with the exception of high altitude dwarf varieties with which I was never successful. They invariably died in the 3rd year. Is this because the climate and soil of Darjeeling is too warm for them? I attribute the main cause to this warmer temperature, as most of these dwarf rhododendrons remain buried under snow for a considerable time during the winter months.

(Concluded)

A CATALOGUE OF PLANTS OF THE SIKKIM HIMALAYAS

By

B. N. Ghose

(Continued from Page 48, Vol. 30, No. 1, August 1958).

Genus Trifolium : Annual or perennial herbs, leaves with digitately tri-foliate leaflets, flowers in dense, axillary heads fading without falling. It resembles a clover flower, but the fruit is elongated and sickle shaped or is spirally twisted; ovary sessile or stalked, pod minute, indehescent.

Trifolium repens Linn.:—Stem slender, glabrous, widely creeping; petioles and peduncles long ascending; leaflets distinctly toothed; flower heads globose not dense, flowers usually deflexed, corolla white or with a pink tinge; pod 3—4 seeded; flowers in May-June, fruits in August; Found in open pasture land at 6,000 ft.; commonly cultivated in Temperate and Alpine Himalayas; Mungpoo 3,000 ft.

Trifolium dubium. Sibth.:—Flowers in June; Locality Jalapahar.

Genus Parochetus Hamilt:—Slender creeping herbs, leaves trifoliate; flowers on axillary peduncles, corolla free from the terminal tube. It is similar to the previous genus but has a keeled, bivalved pod.

Parochetus communis Hamilt.:—Rhizome thread like, widely creeping petiole long filiform; peduncles over topping the leaves; 1—2 flowered corolla purplish white or blue; petals caducous from the terminal tube; pod straight; flowers in May, fruits in December; Found in open pasture land from 5,000 ft. and above. Labdah, 5,000 ft.

Genus Melilotus Juss.:—Annual or biennial herbs; leaves pinnately tri-foliate; Corolla caducous, standard and wings narrow; stamens diadelphous; Pod short, round or oblong.

Melilotus indicus:—Found in the Terai regions of the plains, flowers in February.

Genus Medicago Linn.:—Herbs, rarely shrubs; leaves pinnately trifoliate; corolla more or less exserted, free from the terminal tube; pod falcate or spirally twisted.

Medicago denticulata Wild:—Annual; stipules lacerated, stem subglabrous, robust; peduncle short closely 2—3 flowered, not armed; pod with 2—4 spirals; flowers in March, fruits in June; Tropical Himalayas, collected in Sikkim by David Prain.

Genus Indigofera Linn.:—Herbs or shrubs; stem often clothed with adpressed hairs; flowers in copious axillary racemes near the top of branches, stamens diadelphous; pod is bivalved, cylindrical, many seeded.

Indigofera hebepetala Benth: A tall shrub with woody branches thinly coated with adpressed hairs in the young state; leaves 4 to 6 inches long smaller in sub-alpine forms; racemes peduncled 2—4 inches long, laxly 12—20 flowered, bracts boat shaped, deciduous, corolla crimson red; pod glabrous 8—10 seeded; Sikkim 6,000 to 15,000 ft.

Indigofera pulchella Roxb.: A shrub 4 to 6 feet high, the trunk reaching the thickness of a man's leg, branches sulcate thinly coated with grey hairs; leaf short petioled, leaflets opposite, fine textured; raceme, short peduncled, moderately close 1—3 inches long, corolla bright red; pod straight, turgid $1\frac{1}{2}$ inches long, 8—12 seeded; flowers in December, February fruits in March; Peshok 3,000 ft. Ascends upto 4,000 ft.

Indigofera dosua Hamilt.: A low shrub with woody branches clothed with pubescent hairs; leaves sessile; raceme distinctly peduncled, pedicels very short, calyx densely silky, corolla bright red; fruits October to February; Sikkim 6,000 to 8,000 ft. Chungtham.

Var. *tomentosa*: branches clothed with dense brown silky pubescence; leaves 6 to 9 inches long, leaflets 4 to 5 inches long; flowers in November-December, fruits in April; Sikkim 1,000 to 5,000 ft. Badamtam, 3,000 ft. (planted).

Indigofera argentea Linn. (Syn. *I coerulea* Roxb.): A shrub several feet high with sulcate branches; leaves 1 to 2 inches long, leaflets many, opposite, persistently argenteous, $\frac{1}{2}$

to 1 inch long; raceme subsessile, 12 to 20 flowered; Corolla $\frac{1}{6}$ inch long reddish yellow, externally canescent; pods distinctly torulose; Tropical Sikkim.

Genus Millettia Wt. & Arn.:—Trees or climbing shrubs; leaflets usually stipillate; flowers scattered or fascicled, receptacle shortly campanulate; calyx gamosepalous; standard large reflexed, wings free, falcate, oblong, free or cohering at apex, keel curved obtuse, style terete, filiform, truncate or capitate; legume coriaceous or woody or very firm, bivalved.

Millettia auriculata Baker: A large robust woody climber; branchlets firmly downy; leaflets 7—9; flowers in copious axillary racemes near the top of branches; calyx densely silky, so also the corolla which is whitish in colour, stamens monodelphous; flowers in May, fruits in September, November; pod covered with yellow tomentum; Sikkim 3,000 to 5,000 ft. The root pounded and soaked in water when applied removes ticks and insects.

Millettia cineria Benth.: A woody climber, young branchlets and leaves ventrally have deciduous pubescence; leaflets large $\frac{1}{2}$ to 1 foot long, flexible; racemes in panicles above the leaves; flowers distinctly pedicillate not fascioled, corolla densely coated with grey silk; pod rather linear, velvety, torulose; flowers in June, fruits in January; Tista Valley in Sikkim ascends upto 4,000 ft.

Millettia glaucescens Kurz.: A woody climber with glabrous branchlets; leaflets thin flexible reaching $\frac{1}{2}$ inch; raceme simple 6 inches long; corolla steel blue; pod tubercled 6 inches by 1 inch; flowers in May, August, fruits towards the end of the year; Terai.

Millettia pachycarpa Benth.: A large climber, branches and leaves ventrally clothed with pale brown pubescence; leaves 1 foot or more long, leaflets 6 to 8 inch long; raceme copious 6 to 9 inches long, most of the nodes with short branchlets, calyx pedicelled and downy corolla about 1 inch long; pod 4 to 5 inches long; flowers in April and fruits from November to February; Sikkim ascending upto 4,000 ft.

Milletia prainii Dunn: In the Terai plains, flowers and fruits from February to April. The young leaves are golden brown when the tree flowers. Pods 4—5 inches.

Genus Tephrosia Pers.: Shrubs or herbs; leaves imparripinnate, rarely 1—3 foliate; leaflets marked by parallel veins, often silky below; flowers in leaf opposed racemes, stamens usually diadelphous; pod many seeded, soon dehising.

Tephrosia candida D. C. Prodr.: A low shrub with slender woody branches grooved and clothed with velvety pubescence; leaflets 19—25, green above silky beneath; racemes copious, terminal or lateral 6 to 9 inches long corolla reddish or white, style, flattened, silky; Sikkim upto 5,000 ft.

Genus Sesbania Pers.: Herbs or shrubs; leaves paripinnate, many foliate; flowers many, sometimes very large mostly in loose axillary racemes; receptacle depressed, calyx tube broad, truncate, anthers 5, alternate; legume linear, wingless, pod very long and narrow, dehiscent with distinct septa between the seeds.

Sesbania aegyptica Pers.: A soft woody shrub of short duration 6 to 10 ft. high with terete twiggy branches; leaves 3 to 6 inches long, leaflets 2 to 4 inches long; flowers 6 to 10 in copious axillary racemes, corolla pale yellow tinged with deep red; flowers and fruits in February; Jaldakha, Duars. In Sikkim ascends to 4,000 ft.

Genus Caragana Lam.: Low shrubs; leaves paripinnate often fascioled; petiole often hardened spinescent or bristly; flowers solitary or subumbellate, receptacle concave glandular within, keel nearly straight, obtuse, stamens diadelphous, 9 connate into a long tube cleft above; legume sessile, linear, finely terete or turgid, usually acute, bare or villous not septate.

Caragana crassicaulis Benth: A dwarf woody plant growing on debris or rocks; stem thick tufted, creeping below clothed densely with leaf rachises; leaf in lax rosettes; peduncle downy, corolla reddish yellow; pod linear oblong, pubescent with cottony down, sessile; flowers in July, fruits in October; Alpine Himalayas, 12,000 to 14,000 ft.

Caragana pygmaea DC.: A low shrub, branches spinescent, spines trifid; leaflets 4, digitate; corolla bright reddish yellow, ovary densely pubescent, linear; pod linear naked within; flowers in July fruits in September; Temperate and Alpine Sikkim.

Caragana chumbeyi Prain: Dwarf shrubs 1 to 4 feet high; new shoots villous; fruits in October; grows in scattered clumps on dry hill sides; Sikkim, 14,000 ft.

Caragana jubata Poir: Low shrub; Tibet.

Caragana apinosa var. *tibetica* DC: Low shrub; Tibet.

THE WEST BENGAL WILD LIFE PRESERVATION ACT, 1959.

[*Passed by the West Bengal Legislature.*]

[Assent of the President was first published in the *Calcutta Gazette, Extraordinary*, of the 24th December, 1959.]

An Act to provide for the better preservation of wild life in West Bengal.

It is hereby enacted in the Tenth Year of the Republic of India, by the Legislature of West Bengal, as follows :—

CHAPTER I.

Preliminary.

Short title extent and commencement.

1. (1) This Act may be called the West Bengal Wild Life Preservation Act, 1959.

(2) It extends to the whole of West Bengal.

(3) It shall come into force in such areas as the State Government may by notification in the *Official Gazette* appoint and different dates may be appointed for different areas.

Definitions.

2. In this Act, unless there is anything repugnant in the subject or context,—

(a) "animal" includes quadrupeds, birds, fish and reptiles, and young ones thereof ;

(b) "Collector" means the Collector of a district or any other officer appointed by the State Government to discharge the function of a Collector under this Act ;

(c) "hunting" means killing, chasing, pursuing, capturing or wounding and includes also the seizing or destroying of eggs or nests or any attempt or any device to do any of the foregoing acts ; and grammatical variations of the word shall be construed accordingly ;

(d) "land" includes water and includes also the soil and sub-soil and rights to mines and minerals and all forests, jungles, trees and vegetation standing or growing on land ;

(e) "licence" means a licence issued under this Act ;

(f) "prescribed" means prescribed by rules made under this Act ;

(g) "trophy" means any dead animal or any part of any animal or any eggs or nests, preserved as a relic or for show ;

Explanation.—Part of an animal includes the head, horn, antlers, skin, tusk, tooth, bone, claw, hoof, hair or feather, but does not include any article manufatcured or prepared therefrom ;

(h) "wild life" or "wild animal" means any animal specified in the First or the Second Schedule, when in a wild state.

CHAPTER II.

Authorities under the Act.

Appointment of officers.

3. (1) The State Government may for the purpose of this Act appoint the following officers, namely :—

(a) A Chief Wild Life Preservation Officer for West Bengal,

(b) Regional Wild Life Preservation Officers,

(c) Divisional Wild Life Preservation Officers,

(d) Game Wardens, either honorary or stipendiary, and

(e) such other officers and servants as it deems necessary.

(2) All such appointments may be made either by name or by virtue of office.

(3) Honorary Game Wardens shall hold office for a period of one year :

Provided that the State Government may terminate the tenure of office of an Honorary Game Warden earlier, if in its opinion, his services are no longer required.

Powers, duties and functions, etc.

4. (1) The powers, duties and functions of the Officers referred to in sub-section (1) of section 3 shall be such as are mentioned in this Act or as may be prescribed.

(2) All officers referred to in clauses (a), (b), (c) and (d) of sub-section (1) of section 3 shall be deemed to be public servants within the meaning of section 21 of the Indian Penal Code.

CHAPTER III.

Hunting of Wild Animals.

Prohibition of hunting wild animals except under licence.

5. No person shall hunt any wild animal except under a licence and in accordance with prescribed conditions specified in such licence.

Close time.

6. (1) The State Government may, by notification in the *Official Gazette*, declare the whole year to be a close

time for wild animals mentioned in the First Schedule and may, by like notification, declare what period or periods during the year shall be close time for animals referred to in the Second Schedule.

(2) During the close time specified for any wild animal, it shall not be lawful to hunt such wild animal anywhere within West Bengal, where this Act is in force :

Provided that if the State Government thinks it fit to do so in the public interest, it may authorise any person, institution or authority to hunt, even during the close time, any kind of wild animal, for collecting specimens for scientific or educational purposes.

The State Government may, if it thinks fit to do so in the public interest, at any time, make any alterations or changes in any of the Schedules.

Restrictions on the methods of hunting.

7. (1) No person shall hunt any wild animal from or by means of a wheeled or mechanically propelled vehicle on land or by aircraft.

(2) No person shall use a motor car, motor cycle, or aircraft for the purpose of killing, driving or stampeding any wild animal.

(3) No person shall hunt any wild animal with poison or poisoned weapons.

(4) No person shall for the purpose of hunting wild animal set fire to any vegetation.

(5) No person shall use any artificial light for the purpose of hunting any wild animal (except in the case of carnivora).

(6) No person shall hunt any wild animal (except pigs, bears and carnivora) between one hour after sunset and one hour before sunrise.

(7) No person shall hunt any wild animal on a salt-lick or water-hole or on paths and approaches to the same.

Procedure for obtaining licence.

8. (1) Any person desiring to obtain a licence shall apply to the Divisional Wild Life Preservation Officer concerned.

(2) Upon the receipt of such application, the Divisional Wild Life Preservation Officer shall, after making

such enquiries, if any, as he deems necessary, either grant or refuse such licence.

(3) Where the Divisional Wild Life Preservation Officer refuses to grant a licence to any person, he shall record in writing the reasons for such refusal and furnish to the person on request a brief statement of the same unless in any case he records his opinion that it will not be in the public interest to furnish such statement.

(4) Any person aggrieved by the refusal of a licence may appeal within thirty days of the date of the order and in the prescribed manner to the Regional Wild Life Preservation Officer concerned. No such appeal shall be disposed of unless the appellant has been given an opportunity of being heard. An order passed in appeal shall, subject to the provisions of sub-section (5), be final and conclusive.

(5) The Chief Wild Life Preservation Officer may, on his own motion or on the motion of any person aggrieved, at any time revise any order passed under sub-section (4) and his order on such revision shall be final and conclusive :

Provided that no order shall be passed in revision which adversely affects any person unless such person has been given an opportunity of being heard.

(6) The fee for a licence shall be as may be prescribed.

Duration and cancellation of licences.

9. (1) Every licence granted under this chapter shall be valid for such period as may be prescribed.

(2) The Divisional Wild Life Preservation Officer may, at any time, if he is satisfied that the holder of a licence has failed to comply with the conditions specified in the licence, cancel such licence, after giving the holder an opportunity of being heard. Where a licence is cancelled as aforesaid, any person aggrieved shall have the same right of appeal and revision as if the licence had been refused.

Licence-holder to keep record.

10. (1) The holder of every licence shall keep a record containing such particulars as may be prescribed, of all wild animals hunted by him during the currency of the licence.

(2) Not later than thirty days after the expiry of his licence, the holder of the licence shall surrender his licence and also the record referred to in sub-section (1) to the Divisional Wild Life Preservation Officer concerned and shall also furnish him with a declaration in the prescribed form certifying the accuracy of the record.

CHAPTER IV.

Wild Life Sanctuaries.

Wild Life Sanctuaries.

11. (1) If the State Government thinks it fit to do so in the public interest, it may in respect of any area which in its opinion is fit to be a Wild Life Sanctuary, issue a proclamation in the *Official Gazette*—

(a) stating that in its opinion, the area is fit to be a Wild Life Sanctuary and that the State Government intends to acquire such area for establishing a Wild Life Sanctuary ;

(b) specifying as nearly as possible the situation and the limits of such area.

(2) Upon the issue of such a proclamation,—

(a) no person shall cut down any tree or vegetation or clear any forest or jungle or hunt any wild animal within such area ;

(b) an officer of Government generally or specially empowered in this behalf may enter upon such land with workmen and other suitable persons and make surveys and measurements, dig and bore into the soil or sub-soil or mark out boundaries by cutting trenches or ditches, or setting up hedges, fences, railings, walls or pillars as may be necessary.

(3) After a period of at least three months from the date of such proclamation, the State Government may, by notification in the *Official Gazette*, declare the area to be a Wild Life Sanctuary and thereupon the area shall be Wild Life Sanctuary and the land comprised in such area shall vest in the State free from all interests and encumbrances in favour of any person, except so much of such land as has already vested in the State under the West Bengal Estates Acquisition Act, 1953.

(4) For the purposes of this section, it shall be sufficient to specify the situation and the limits of any area by roads, rivers, ridges or other well-known or readily intelligible boundaries

Principles to be followed in fixing compensation.

12. (1) Any person whose land or interest in land or encumbrance in land vests in the State under sub-section (3) of section 11, may apply to the Collector within three months of the issue of the declaration under that sub-section for the determination and award of compensation to be paid to him.

(2) Every such application shall describe the land or the nature and extent of the interest or encumbrance of the applicant in the land, as the case may be.

(3) The amount of compensation payable shall be the price, which, in the opinion of the Collector, the land or the interest or the encumbrance would have fetched in the open market if it had sold on the date of the declaration.

(4) In determining the amount of compensation payable under sub-section (3), the Collector shall give the applicant an opportunity of being heard and shall also take such evidence and make such enquiries, if any, as he thinks fit.

(5) An appeal shall lie to the Commissioner of the Division in which the area is situated against an order of the Collector determining and awarding compensation. Any order passed on such appeal shall be final and conclusive.

Manner of payment of compensation.

13. (1) Where the amount of compensation awarded under this chapter does not exceed Rs. 5,000, it shall be paid entirely in cash, within one year from the date of the last order awarding compensation.

(2) Where the amount of compensation awarded under this chapter exceeds Rs. 5,000, a sum of Rs. 5,000 shall be paid in cash within one year from the date of the last order awarding compensation, and the remainder shall be paid in bonds carrying interest at $2\frac{1}{2}$ per cent per annum on the total sum awarded (less the sum of Rs. 5,000 paid) with effect from such date and payable in ten equal annual instalments, the first annual instalment being due on the day one year after date.

14. No person shall hunt any animals in any Wild Life Sanctuary: Prohibition of hunting in Wild Life Sanctuaries.

Provided that the Regional Wild Life Preservation Officer concerned, may, if he thinks that it is necessary that any animals should be hunted, for better preservation of other animals, authorize any person whom he deems suitable to hunt the first-mentioned animals, either temporarily for a specific period or permanently, and with or without any licence.

15. No person other than,— Permit to enter or reside within Wild Life Sanctuary.

(a) a public servant on duty,
(b) any person passing along a public highway running through a Wild Life Sanctuary,

shall enter or reside within a Wild Life Sanctuary except under a permit issued by the officer prescribed in this behalf.

CHAPTER V.

Business in Trophies and Pet Animals.

16. (1) No person shall carry on the business of a trophy dealer or a dealer in pet animals except under and in accordance with the conditions of a business certificate granted under this chapter. Business certificate to be obtained for dealing in trophies and pet animals.

(2) Nothing in this section shall require any person obtain a business certificate—

(i) for possessing pet animals, not exceeding twelve in number, or

(ii) for possessing trophies which have been lawfully acquired by him,

provided such animals or trophies are kept by him for his individual use or benefit.

71. (1) A business certificate referred to in section 16 may be issued by the officer prescribed in this behalf on application made in that behalf and on payment of such fees as may be prescribed. Issue of business certificates, the period of their validity and records and returns.

(2) Every such business certificate shall be valid for one year from the date of issue,

(3) Every holder of such business certificate shall keep such record and submit such return to the officer referred to in sub-section (1) as may be prescribed.

CHAPTER VI.

Offences and Penalties.

Offences and penalties.

18. (1) Any person who contravenes the provisions of section 5, sub-section (2) of section 6, section 7, section 10, section 14, section 15, sub-section (1) of section 16 or sub-section (3) of section 17, shall be guilty of an offence under this Act and shall, on conviction, be punished with imprisonment which may extend to six months or with fine which may extend to Rs. 500 or with both.

(2) When a person is convicted of an offence under this Act, the court convicting such person may also order that any animal or trophy in respect of which the offence has been committed, or any weapon or instrument, vehicle or vessel used in committing the offence, shall be forfeited to the State or that any licence or permit or business certificate held by such person be cancelled.

Cognizance of offences.

19. No court shall take cognizance of an offence under this Act except on written complaint of any officer referred to in clause (a), (b) or (c) of sub-section (1) of section 3 or of a police-officer not below the rank of a Sub-Inspector of Police and unless the prosecution is instituted within three months from the date on which the offence is alleged to have been committed.

Power of entry, search, seizure and arrest.

20. (1) Any officer referred to in clause (a), (b), (c) or (d) of sub-section (1) of section 3 or any police-officer not below the rank of a Sub-Inspector of Police may, if he has reasonable grounds for believing that a person has committed an offence under this Act,—

(a) required such person to produce for his inspection, any animal or carcase thereof, or any trophy in his possession, or any licence, permit or business certificate issued to him under this Act ;

(b) stop, enter and search any vehicle or vessel in the occupation of any person and open and search any package or other thing in his possession ;

(c) seize any animal or carcase thereof, or any trophy or any weapon, instrument, vehicle or vessel, if there is reasonable ground for believing that it has been procured or used in commiting such offence ;

(d) arrest any person against whom reasonable suspicion exists of having committed such offence.

(2) Any officer arresting a person under clause (d) of sub-section (1) may release him on his executing a bond in the prescribed form to appear if and when so required before a Magistrate having jurisdiction in the case or before the officer-in-charge of the nearest police-station.

(3) Where a person arrested under clause (d) of sub-section (1) is not released under sub-section (2), the officer arresting him shall forthwith take and produce him to the officer-in-charge of the nearest police-station, who shall deal with him according to law.

(4) Any officer making any seizure under clause (c) of sub-section (1) shall forthwith take and produce the objects seized to the officer-in-charge of the nearest police-station, who shall deal with them according to law.

Compounding of offences.

21. Notwithstanding anything contained in the foregoing sections of this chapter, where a person is alleged to have committed an offence under this Act, an officer referred to in clause (a), (b) or (c) of sub-section (1) of section 3, may, in accordance with such rules as may be prescribed, accept from such person, by way of composition of such offence, a sum not exceeding Rs. 200, as may be determined by him. Upon payment of such sum within such period as may be prescribed, no proceedings shall be commenced against such person and any proceedings already started shall not be further proceeded with.

CHAPTER VII.

Miscellaneous.

Killing or wounding in defence of person or property.

22. Nothing in this Act shall be deemed to apply to the killing or wounding in good faith of any animal by any person in defence of himself or any other person or of any property.

Act VI of 1879, Ben. Act V of 1932 and Ben. Act. VIII of 1932 not affected.

23. Nothing in this Act shall be deemed to affect the Elephants' Preservation Act, 1879, as amended in its application to West Bengal or the Bengal Rhinoceros Preservation Act, 1932, and those Acts shall continue to apply as if this Act had not come into force.

Bar of jurisdiction.

24. Save as otherwise provided in the Constitution of India, no court shall have jurisdiction in any matter relating to licences, permits or business certificates or compensation under this Act.

Indemnity.

25. No suit, prosecution or legal proceeding shall lie against any person for anything in good faith done or intended to be done under this Act or the rules made thereunder.

Rules.

26. (1) The State Government may make rules for carrying out the provisions of this Act.

(2) In particular, and without prejudice to the foregoing power, such rules may provide for all or any of the following matters, namely :—

(i) anything required to be prescribed under this Act ;

(ii) the fee to be paid for any application or appeal, the period of limitation for any appeal and the procedure to be followed in appeals ;

(iii) the fee to be paid for a licence or a business certificate and the time and manner of payment of such fees ;

(iv) the management of Wild Life Sanctuaries ;

(v) the conditions to be observed by persons who have been permitted to enter or reside in a Wild Life Sanctuary.

Repeal.

27. The Wild Birds and Animals Protection Act, 1912, shall stand repealed in its application to West Bengal in the areas in which this Act comes into force.

The First Schedule.

[*See* section 6(1).]

Animals for which the whole year may be notified as close time.

1.	Pangolin or Scaly ant-eater	*Manis crassicaudata*
2.	Lesser Panda or Cat-bear	*Ailurus fulgens*
3.	Elephant	*Elephas maximus*
4.	Rhinoceroses	*Rhinoceros*
5.	Pygmy hog	*Sus salvanius*
6.	Female deer of all kinds	
7.	Male deer when hornless or in velvet	
8.	Mouse deer	*Tragulus meminna*
9.	Cheetal deer	*Axis axis*
10.	Hog deer	*Axis porcinus*
11.	Swamp deer	*Cervus duvauceli*
12.	Gaur or Indian bison	*Bos gaurus*
13.	Buffalo	*Bubalus bubalis*
14.	Common Monitor or Grey land lizard	*Varanus monitor*
15.	Yellow land lizard	*Varanus flavescens*
16.	Ringed or water lizard	*Varanus salvator*
17.	Python	*Python molurus*
18.	Indian egg-eating snake	*Elachistodon westermanni*
19.	Indian Salamander	*Tylototriton verrucosus*
20.	Birds of prey (diurnal), except sparrow-Hawks, Fishing Eagles, Marsh Harrier, and Shahin and laggar Falcons	Order Falconiformes, except *Accipiter nisus, Accipiter virgatus, Haliaeetus, Ichthyophaga, Circus aeruginosus, Falco peregrinus and Falco chicquera*
21.	Hersons and Egrets	Family Ardeidae
22.	Storks, Ibises and Adjutants	Family Threskiornithidae
23.	Pink-headed duck	*Rhodonessa caryophyllacea*
24.	White-winged Wood-duck	*Cairina scutulata*
25.	Spur-fowls	*Galloperdix*
26.	Blood-pheasant	*Ithaginis cruentus*
27.	Tragopan	*Tragopan satyra*
28.	Monal or Impeyan pheasant	*Lophophorus impejanus*

29.	Floricans	*Eupodotis*
30.	Sandgrouse	*Pterocles exustus*
31.	Owls	Family Strigidae
32.	Rollers	*Coracias and Eurystomus*
33.	Kingfishers	Family Alcedinidae
34.	Bee-eaters	Family Meropidae
35.	Hoopoes	*Upupa*
36.	Hornbills	Family Bucerotidae
37.	Swifts	Family Apodidae
38.	Barbets	Family Capitonidae
39.	Woodpeckers	Family Picidae
40.	Broadbills	*Serilophus and Psarisomus*
41.	Pittas	*Pitta*
42.	Larks	Family Alaudidae
43.	Martins and Swallows	Family Hirundinidae
44.	Fairy Blue-bird	Family Irenidae
45.	Minivets and Cuckoo-shrikes	Family Campephagidae
46.	Flycatchers, Shortwings, Babblers, Laughing-thrushes, Warblers, Red-starts, Robins, Blackbird, Thrushes, Chats, Whistling thrush, Forktails, Wrens	Family Muscicapidae (Muscicapinae, Timaliinae, Sylviinae, Turdinae and Troglodytinae)
47.	Pipits and Wagtails	Family Motacillidae
48.	Shrikes	*Lanius*
49.	Swallow-shrikes	*Artamus*
50.	Creepers and Nuthatches	Family Sittidae and Certhiidae
51.	Tits	Family Paridae
52.	Flowerpeckers	Family Dicaeidae
53.	Sunbirds	Family Nectariniidae
54.	Finches and Buntings	
55.	Weaver-birds and Munias	Family Ploceidae
56.	Orioles	*Oriolus*
57.	Drongoes	*Dicrurus*
58.	Jays, Magpies, Tree-pies, Choughs and Crows	Family Corvidae
59.	The Great Indian Bustard	*Choriotis nigriceps.*
60.	Saras Crane	*Grus antigone*

The Second Schedule.

[*See* section 6(1).]

Animals for which a part of the year may be notified as close time.

1.	Barking deer stags with horns not in velvet	*Muntiacus muntiak*
2.	Sambar with horns not in velvet	*Cervus unicolor*
3.	Serow	*Capricornis sumatraensis*
4.	Goral	*Naemorhedus goral*
5.	Hares	*Lepus and Caprolagus*
6.	All kinds of geese, teals, ducks, etc., except the Pink-headed duck and the White-winged wood-duck	*Francolinus, Coturnix,*
7.	Partridges and quails	*Predicula Arborophila*
8.	Kalij pheasant	*Lophura leucomelana*
9.	Jungle-fowl	*Gallus gallus*
10.	Peafowl	*Pavo cristatus*
11.	Cranes (excepting Saras)	Family Gruidae
12.	Rails, Crakes, Waterhens, Moorhens and Coot	Family Rallidae
13.	Button-quails	*Turnix*
14.	Jacanas	Family Jacanidae
15.	Snipes and Woodcock, Painted snipe	*Gallinago, Scolopax and Rostratula*
16.	All doves and pigeons except rock-pigeon	Family Columbidae except *Columba livia.*

By order of the Governor,

K. K. HAJARA,

Secy. to the Govt. of West Bengal.

MISCELLANEOUS NOTES

1. A WHITE TIGER

A white tiger measuring 9 ft. 9 in. over curves was shot by Raja Ambikeshwar Saran Singh Deo of Surguja, during a beat in the forests of Sendur Village, in the former Surguja State of Madhya Pradesh.

This tiger had blue eyes and brown and black stripes on a pale background. The stripes of this tiger are more black than brown when compared to an earlier specimen which had mostly brown stripes. This is the second white tiger shot in Surguja State. The first one was shot in 1922, 37 years ago.

RAJASAHIB DEO of Surguja,
Raghunath Palace,
Ambikapur Surguja (M. P.)
July, 1959.

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2. FOOD OF THE GREATER BLACK KRAIT (BUNGARUS NIGER Wall.)

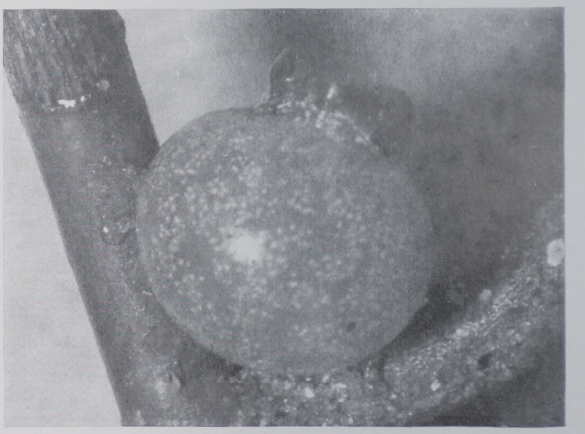
At about 6 O'clock on the morning of the 8th July, a man from Phoobsering Tea Estate village emerged from his house to see a few feet from his verandah a black krait. It turned out that the krait had just swallowed a large spotted pit viper (*Trimeresurus monticola*). The man killed the krait and extracted the viper. The krait was found at an altitude of 5,000 ft. It was $4\frac{1}{2}$ ft. in length. The large spotted pit viper is common in this garden mostly between 5,000 ft. and 6,000 ft. Phoobsering Tea Estate is situated 8 miles by road from Darjeeling (n. w.) on the west slope of the Lebong spur.

D. S. ROYALS,
Phoobsering Tea Estate,
Darjeeling, July, 1959.

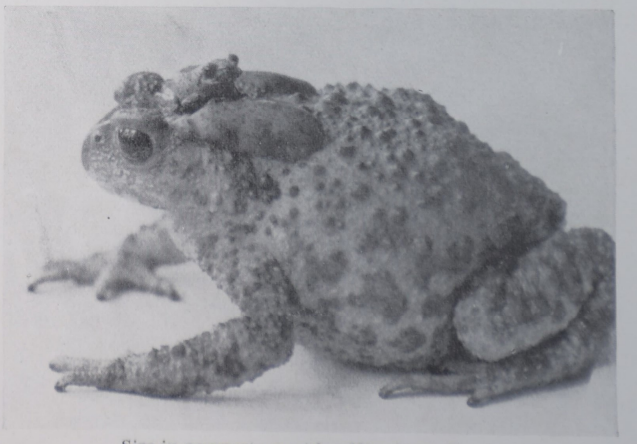
White Tiger

Photo Author.

Darjeeling Tree Frog (Philautus annandalii)



Vocal sac of a calling male



Size in comparison with a Himalayan Toad.

Photos Durga Das

3. THE DARJEELING TREE FROG (PHILAUTUS ANNANDALII, Boulenger)

On a walk along any of the bridel paths in town, in late March, one would hear the call of a Frog. This can be syllabilised as *Dik Dikdik*, the interval between the first and the second *Dik* being slightly longer than the interval between the second and third. This call is produced by the male of a tiny tree Frog, the size of which can be judged from the accompanying photograph of an adult male on the head of an Himalayan Toad (*Bufo himalayensis*), in fact the Frog is so small that it can comfortably sit on a human thumb nail. Compared to its size its vocal effort is very loud indeed and can be heard for some distance. This is achieved with the help of a vocal sac which the Frog has on the underside of its mouth. While calling the sac is inflated and acts as a resonator, remaining inflated till a period of calling is completed. The inflated sac is equal to or slightly bigger than the Frog in size. The call has a ventriloquistic effect and it is not easy to fix the spot from which the Frog is calling.

This is the most common species of Frog in Darjeeling and the surrounding area and during the months of May, June and July, whole hillsides resound to their call. The calling gradually goes down in intensity after this period and stops by September. They are mainly nocturnal and spend the day hidden amongst the litter on the ground, climbing on to bushes at night. I have never seen them on Trees only on bushes in the undergrowth. On overcast and misty days they can be heard calling during the day. The species has a wide altitudinal range. I have collected specimens from 3,000 ft. to 9,000 ft.

The Frogs vary in colour being light or dark grey, brown or blackish brown. The markings on the body are constant. These are a dark band between the eyes and a pair of bands starting from behind the eye and running along the side of the body on to the thigh and leg. The ventral side is immaculate. Frogs collected during the months of May, June and July had the inside of the thighs bright red. This is perhaps a secondary sexual character. The skin is smooth above with

very few warts and granular on the underside. Tympanum hidden. Fingers free and toes feebly webbed. The vocal sac is internal. I have so far failed to collect the female and the larval stages of this species. The males average 18 mm. in snout to vent length with a variation from 17 mm. to 20 mm.

The species was originally described by Boulenger (*Jour. Asiatic Soc. Beng.*, 1906, Pp. 385) based on specimens collected by the late Dr. Annandale of the Zoological Survey of India, at Kurseong (Alt. 4,500) in the Darjeeling District.

J. C. DANIEL,
Curator,
Natural History Museum,
Darjeeling, December, 1959.

4. THE DARJEELING GIANT SLUG (ANANDENUS BLANFORDI, Godwin-Austin)

The original description of this species is based on a single specimen collected at Darjeeling (*Moll, India I, 1882*). This description is given verbatim by Gude in Volume II, Mollusca, of the Fauna of British India Series. Herein a note is given that he (Godwin Austen) is deferring figuring the species "Until I receive a large collection in spirit now on its way from Sikkim", presumably the specimens were not received by him as Gude does not mention anything further about the species.

The species is not uncommon in Darjeeling. I have noticed particularly in the Observatory hill area of the Town during

the months of September, October and early November. The slug is found in areas having the Chestnut Tree, (*Castanopsis hystrix*) locally known as *Katus*. Whether it feeds off the Tree or on the Fungus and Moss growing on it I am unable to report at the moment. The slugs are nocturnal and the specimens I have collected were caught very early in the morning, while they were crossing the bridel paths. The slime tracks left by the animals can also be seen at this time. They are excessively slimy to handle and the slime is rather sticky. The slug is easily recognised being the largest among the local slugs. I have collected specimens upto 150 mm. in total length. They are believed to grow considerably larger. The upper part of the body is dark grey with light grey mottlings. The head with its four tentacles is pale grey, as also the foot. The colour of the type specimen is given as "dark ochraceous brown with some dark mottlings on the upper part of the foot" however this description is based on a spirit specimen. The body is long and cigar shaped broad in front notably in the area of the internal shell and tapering towards the hind end.

One specimen kept by me laid ten, spherical, translucent eggs, in the last week of November. The eggs were laid under dry leaves on moist soil. The eggs are large, averaging 6 mm. in diameter.

J. C. DANIEL,
Curator,
Natural History Museum,
Darjeeling.

December, 1959.

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1.	1953	Achard, P. L.	Assam
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3.	1956	Agarwalla, R. N.	Darjeeling
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12.	1953	Bhaduri, A. S.	Assam
13.	1958	Biblioteka Akademi	U.S.S.R.
14.	1958	Bir, Capt. G.	Calcutta
15.	1952	Biswas, Dr. K., M.A., D.SC.	Calcutta
16.	1942	Blackburn, H. V.	Raipur
17.	1958	Brooks, B. D. Henderson	Darjeeling Dist.
18.	1956	Brown, R.	Jalpaiguri Dist.
19.	1958	Butler, M. R.	Darjeeling Dist.
20.	1952	Chief Conservator of Forests, Assam.	Assam
21.	1955	Clark, D. S.	Jalpaiguri Dist.
22.	1958	Conservator General of Forests	Calcutta
23.	1958	Corra, H.	Hongkong
24.	1953	Das, D.	Darjeeling
25.	1956	Delamare, J. C.	Jalpaiguri Dist.
26.	1954	Deputy Director of Health (Laboratory Services)	Ceylon
27.	1958	Dey, D. K.	Darjeeling
28.	1956	Dharmakumarsinhji, R. S.	Bombay State
29.	1957	Digue, G. D.	Nilgiris
30.	1958	Director, National Botanical Gardens	Lucknow
31.	1952	Dunn, Mrs. W.	Scotland
32.	1954	Dutt Mazumdar, S., I.A.S.	Calcutta
33.	1957	Eisner, J. C.	Holland
34.	1958	Elliot, T. C.	Darjeeling Dist.
35.	1956	Filial Biblioteki Akademi	U.S.S.R.
36.	1938	Finch, Mrs. M. I.	Nilgiris

37.	1941	Forest Entomologist	Dehra Dun
38.	1958	Fraser, H. J.	Darjeeling Dist.
39.	1939	Gabb, H .B.	Calcutta
40.	1956	Gauld, J.	Jalpaiguri Dist.
41.	1932	Gee, E. P.	Assam
42.	1958	Genders, B. H. S.	Singapore
43.	1933	Ghosh, S. K., I.C.S.	Calcutta
44.	1948	Ghosh, B. N.	Darjeeling
45.	1957	Gill, J. S.	Assam
46.	1956	Guhathakurta	Jalpaiguri
47.	1956	Gupta, A. C., I.F.S. (Retd.)	Darjeeling
48.	1958	Gupta, R. K., I.P., J.P.	Jalpaiguri Dist.
49.	1957	Hall, J. F.	Jalpaiguri Dist.
50.	1958	Havghey, A.	Darjeeling Dist.
51.	1957	Hawes, R. M.	Jalpaiguri Dist.
52.	1954	Head Mistress, Govt. Girl's High School	Nadia
53.	1956	Hector, P. D.	Assam
54.	1937	Heron, Dr. A. M., D.SC.	Nilgiris
55.	1954	Hossain, S. G.	Assam
56.	1956	Illingworth, J.	Jalpaiguri Dist.
57.	1952	Jamal Ara, Mrs.	Ranchi
58.	1958	James, S. H.	Darjeeling Dist.
59.	1957	Jasdan, Yuvraj of	Bombay State
60.	1957	Johnson, J. R.	Darjeeling Dist.
61.	1957	Kanpur, P. C.	Assam
62.	1956	Lahiri, K. L., W.B.S.F.S.	Calcutta
63.	1926	Law, Dr. S. C., M.A., Ph.D.	Calcutta.
64.	1952	Librarian, India Office Library	England
65.	1956	Librarian, University of Ceylon	Ceylon
66.	1956	Librarian, Zoological Museum, Tring.	England
67.	1958	Macalpin, R. I.	Duars
68.	1958	Mackenzie, R. R.	Jalpaiguri Dist.
69.	1943	Marshall, H.	Duars
70.	1954	Mathew, P. M., M. Sc.	Darjeeling
71.	1951	Mercer, Lt. Col. A. V. A.	Darjeeling
72.	1953	Mitra, T. K., W.B.S.F.S.	Calcutta

73.	1958	Midwest Inter Library Center	U.S.A.
74.	1957	Milne, W.	Duars
75.	1948	Mullick, S. P. P., W.B.S.F.S.	Jalpaiguri
76.	1944	Murray, Miss. M. E. Wolfe	Nilgiris
77.	1941	Mysore, H. H. The Maharaja of	Mysore
78.	1931	Nath, J. C., I.F.S. (Retd.)	Calcutta
79.	1958	Officer-in-Charge, Wild Life Section	Coimbatore
80.	1928	Pal, N., I.F.S. (Retd.)	Nepal
81.	1958	Palit, S. B., W.B.S.F.S.	Kalimpong
82.	1957	Passy, H.	Darjeeling Dist.
83.	1958	Prendergast, Rev. Fr., S. J.	Kurseong
84.	1954	Principal, Mount Hermon School	Darjeeling
85.	1956	Principal, Birla College of Agriculture	Calcutta
86.	1957	Principal, Maharaja's College	Jaipur
87.	1958	Principal, Himalayan Mountaineering Institute	Darjeeling
88.	1958	Principal, Ravenshaw College	Cuttack
89.	1958	Principal, West Bengal State College of Agriculture	Nadia
90.	1958	Prosser, M.	Darjeeling
91.	1933	Procurator, St. Joseph's College	Darjeeling
92.	1927	Pullan, A. V.	Scotland
93.	1933	Rao, V. S., I.F.S.	Calcutta
94.	1948	Ray, R. K., I.C.S.	Calcutta
95.	1941	Rector, St. Paul's School	Darjeeling
96.	1951	Rerrie, Lt. Col. E. S. E.	Darjeeling
97.	1958	Roberts, A.	Darjeeling Dist.
98.	1958	Robinson, W. R.	Assam
99.	1948	Roy, K. R.	Calcutta
100.	1942	Roy, P. N.	Calcutta
101.	1957	Roy, D. P.	Siliguri
102.	1957	Royals, D. S.	Darjeeling
103.	1952	Roy Choudhury, S. K.	Darjeeling
104.	1952	Roy Choudhury, Dr. D. P., Ph.D.	Berhampore

105.	1958	Roy Choudhury, K. C., W.B.S.F.S.	Darjeeling
106.	1958	Sain, S. K.	Calcutta
107.	1931	Scrimgeour, F. H. V.	England
108.	1955	Secretary, Wild Life Club	Dehra Dun
109.	1939	Secretary, Zoological Gardens.	Calcutta
110.	1949	Secretary, Honorary, Bombay Natural History Society	Bombay
111.	1926	Secretary, Gymkhana Club	Darjeeling
112.	1935	Sen, S. C.	Calcutta
113.	1953	Sen, K., I.C.S.	Durgapur
114.	1956.	Sen, Samir, D.L.C. (*Eng.*) Hons. F.Z.S.	Darjeeling
115.	1957	Sen, Arun	Calcutta
116.	1947	Sen, Sukumar	U.S.A.
117.	1958	Sen, Daju	Siliguri
118.	1948	Sen Gupta, P. K.	Calcutta
119.	1956	Sharma, J. P.	Darjeeling
120.	1926	Shebbeare, E. O.	England
121.	1957	Simpson, D. J.	Duars
122.	1958	Singh, Col. Gyan	Darjeeling
123.	1954	Sinha, Raj Kumar Shymanand	Bihar
124.	1954	Sinha, Kumar Taranand	Bihar
125.	1952	Spurling, A. P.	Jalpaiguri Dist.
126.	1958	Stobbart, J. H.	Calcutta
127.	1952	Stracy, R.	East Pakistan
128.	1941	Surguja, Maharaja of	Surguja
129.	1953	Swan, A. D.	Assam
130.	1955	Temple, J. G.	Darjeeling
131.	1949	Tenduf La. Rai Bahadur C.	Darjeeling
132.	1956	Taylor, G. L.	Darjeeling
133.	1939	Uday Chand Mahtab, Sir, K.C.I.E.	Calcutta
134.	1951	Underwood, C. E.	Calcutta
135.	1953	University of California	U.S.A.
136.	1928	Van Ingen, J.de Wet	Mysore
137.	1957	Verinder, G. A.	Duars
138.	1954	Williams, E. C. G.	Bihar
139.	1956	Zoological Survey Department	Karachi.

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