

Observations on Finn's Baya (*Ploceus megarhynchus* Hume) re-discovered in the Kumaon terai, 1959¹

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(With 2 plates and 5 text-figures)

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¹ Dedicated with deep admiration to Professor Dr. Erwin Stresemann on his 70th birthday.

I. INTRODUCTION

1. Previous knowledge of the Species

In December 1866, 93 years ago, the celebrated ornithologist A. O. Hume obtained from 'Kaladoongee' two examples (both female or male in winter plumage) of a previously undescribed weaver bird which on account of its strikingly massive bill he named *Ploceus megarhynchus* (1869, *Ibis* : 406). In the original description Hume mentioned that his specimens differed from females of the large-billed eastern form of *Ploceus philippinus* from Sikkim terai, East Bengal, and Burma, not only in being larger and darker but in the more rufescent tone of the entire plumage and in other details.

It was not until 1901 that the breeding plumage of the male first became known. Frank Finn, then a Superintendent in the Indian Museum, procured two live birds in the Calcutta market said to have come from below Naini Tal. Finn's description of the breeding male, quoted by Stuart Baker in FAUNA OF BRITISH INDIA, BIRDS 3 : 69, emphasizes the large amount of yellow in the plumage. Finn observed his birds, apparently both males, moult from the bright yellow breeding dress to the dark brown plumage described by Hume earlier. His coloured plate in the *Ibis* (1901 : 29) depicts one of his birds when it was in breeding dress, and the same bird after it had gone off plumage. Curiously enough, during the next 50 odd years practically nothing further was added to our knowledge of the species with the exception of the finding of a breeding colony in the Bhutan duars by C. V. O'Donel in 1912 (NIDIFICATION 3 : 4) the identity of whose owners was refuted by Whistler. Indeed though a few birds turned up from time to time in the Calcutta bird market, their exact provenance was in doubt, and mystery continued to surround the species which was believed to be exceedingly rare. So much so that some 4 years ago the Indian Board for Wild Life entered it on the list of rare and vanishing species whose export, dead or alive, was totally prohibited.

As Humayun Abdulali (1952) has since shown, much of the mystery and confusion that has surrounded this species was due to the unwarranted doubts cast by Whistler and Kinnear (1933) upon the identity of the breeding specimens of *P. megarhynchus* collected by C. V. O'Donel in the Bhutan duars in 1912 which, they maintained, were nothing but the eastern form of the Common Baya, namely *Ploceus philippinus burmanicus* Ticehurst. However, in his MS. notes (now in SA's possession) Whistler himself gives the diagnosis of *P. p. burmanicus* male, as differing from

philippinus in 'the total or almost total absence of yellow on the breast, and no yellow on the mantle; throat variable and may be almost whitish to almost as dark as in *philippinus*; underparts rusty or tawny white. Female, juvenile, and non-breeding male, with more rusty supercilium; underparts and flanks more tawny than in *philippinus*.'

Later Whistler had the opportunity of examining at least one of O'Donel's breeding specimens, a female collected in the Bhutan duars on 25-5-1912 obviously at the very colony referred to by Stuart Baker and upon which the latter's description of the breeding female is based (F.B.I. 3: 70). On this specimen Whistler reported as follows (personal communication to SA, see *Indian Forester*, June 1935 : 372): 'The crown and nape and sides of the face are olive-brown, strongly washed with yellow and practically unstreaked, these parts contrasting with the rest of the plumage. The chin, throat, breast and flanks are largely canary yellow. In all other respects the bird . . . agrees entirely with the rest of the series (of *burmanicus*), and I have no doubt it is the same form.' In view of his own description of female *burmanicus* as having no yellow on the underparts it is difficult to understand Whistler's conviction that the above specimen was the same form nevertheless!

Humayun Abdulali (1954) has further shown that in view of the good series of undoubted *megarhynchus* recently collected by Dr. Walter Koelz at Agia, near Goalpara in western Assam, Whistler and Kinnear were definitely mistaken in considering O'Donel's breeding birds to be *P. p. burmanicus*. Abdulali draws attention to certain differences in coloration between on the one hand live birds obtained from the Bombay market (said to come from Kumaon terai) together with those recently procured in Calcutta (said to come from Gorakhpur via Bareilly), and on the other O'Donel's specimens from the Bhutan duars together with those collected by Koelz in Assam. If these differences can be sustained on further material it may be worthwhile to recognize an eastern race of *Ploceus megarhynchus*.

2. Rediscovery in Kumaon, 1959

This being the unsatisfactory state of our knowledge, it was felt imperative that a well-organized effort be made to re-discover the species in its natural habitat, and to collect fresh breeding specimens and data on its ecology and habits. One of us (JHC) has been studying the ethology of the Ploceinae in Africa and is now in India to continue his researches on the Indian weavers. We welcomed the opportunity of making a concerted attack on this elusive creature,

Our field trip¹ in the Rampur and Haldwani districts of Kumaon (U.P.) lasted from 10 July to 8 August 1959. One of us (SA) returned to Bombay on 23 July, leaving the other to continue investigations by himself thereafter. While together, our base of operations was Fatehpur (c. 10 km. from Haldwani). Later work was done mainly from the Forest Rest House at Lalkua. A car made daily visits to the colonies possible, as also the exploration of an extensive tract of the surrounding terai and bhabar country. We wish to record our thanks to the Chief Conservator of Forests, U.P., for the helpful co-operation and facilities we received during the field work from him and all officers of his department, in particular from Shri S. S. Bahadur, Wild Life Warden, Western Circle.

It may be recalled that as far back as 1934 a special expedition to Kaladhungi² to re-discover *Ploceus megarhynchus* had failed to locate the bird or to procure any workable clue concerning its whereabouts. (Ali, Sálim, 1935). In September 1953 Mr. Horace Alexander and one of us (SA) made a second fruitless quest in the terai around Bilaspur (Rampur dist.) where Mr. Alexander had definitely seen 12 to 15 birds while motoring through on 24 June of the same year. Since then correspondence with various residents in the Rampur area had elicited only diffuse vicarious information concerning the species, but all the same it was encouraging that at least professional bird catchers did distinguish a larger 'Pahāri Baya' from the Common, Striated, and Blackthroated species inhabiting the same area, which confirmed the fact that the bird did exist in the locality.

However, were it not for a lucky accident on our very first day while still *en route* from Rampur to Fatehpur, the finding of the bird would not have been quite such a simple affair. When about 40 km. out of Rampur City, and 3 beyond Bilaspur, on the Naini Tal road a largish weaver with conspicuous yellow rump and underparts suddenly flashed past in front of our car and into some tall grassland. A follow-up on foot failed to flush the bird again, but presently a second bird was seen to fly out of the grass and up into the leafless top of a Silk Cotton tree about 10 m. high growing alongside the road. Binoculars revealed this to be a male *megarhynchus* in breeding plumage, and the roughly woven blobs and tangles on the bare branches there to be nests in various stages. Soon several more of the weavers appeared on the tree-top with strips of grass, intertwining them

¹ Aided in part by a Rockefeller grant through the Bombay Natural History Society.

² An obscure little village at the foot of the hills on the old Moradabad-Bazpur-Naini Tal road which, by the sensational success of the book *MAN-EATERS OF KUMAON* has shot into fame as the home of the legendary Col. Jim Corbett. His cottage, now in changed ownership, stands there crumbling in decay.

laconically into the part-built structures. Since this first unexpected discovery and the many other nest colonies thereafter, it is no longer difficult to understand how the bird—which actually proves to be not at all rare or uncommon in this locality—could have been overlooked on previous quests. Indeed, but for the builders in attendance among the tree-top one would have hardly thought of looking for a nest colony in such a situation, or recognized such completely unorthodox structures as nests of an Indian weaver bird.

5. Field Recognition, and Particulars of Specimens collected in 1959

Adult Male (breeding): *Above*, head and nape bright yellow with contrasting dark brown ear coverts. Back and upper parts dark brown, broadly streaked. Rump yellow. *Below*, from chin to vent, including flanks, bright golden yellow (richer and deeper than in the Baya). Beginnings of a dark brown collar or breast-band on sides of neck.

Adult Female (breeding): *Above*, head and nape pale canary yellow, or brownish heavily suffused with yellow. Rest of upper parts rich brown, streaked darker. *Below*, pale canary yellow or yellowish white. First year male in breeding season exactly like female. The latter can be distinguished in the hand by smaller overall proportions, and slenderer bill and tarsus.

First year males in this plumage were observed collecting grasses and weaving them into partly built structures giving the illusion that females also build. We have no evidence that these rough and formless tangles are ever completed or functional.

Specimens collected:

	Wing	Bill	Tar.	Tail
2 ♂♂ ad. (breeding)	78.5–80	22–23*	25	56–60 mm

*Depth of bill at base 15–15.5 mm.

Iris orange-brown; bill blackish horn, paler at base; legs and feet brownish flesh. Testes 10×7, 10×8 mm.

	Wing	Bill	Tar.	Tail
2 ♂♂ (first year)	77–79	21*	25–26	57 mm.

*Depth at base 14–15 mm.

Iris hazel/orange-brown; bill horny brown, paler (whitish) at base and chin; legs and feet brownish flesh. Testes minute c. 2×1 mm.

	Wing	Bill	Tar.	Tail
1 ♀ ad. (breeding)	74	20.5*	23.5	54 mm.

*Depth at base 11 mm.

Iris orange-brown, duller than in ad. ♂; bill: upper mandible horny brown, lower pale flesh, brownish at tip; legs and feet brownish flesh.

In this species the tail is rounded and almost fan-shaped.

In non-breeding plumage male and female are alike and separable from *Ploceus philippinus* only by their somewhat larger size, darker coloration and larger bill. Definite field identification, however, is not always possible.

The facts that *P. megarhynchus* builds a type of nest very different from that of any other Indian weaver of the genus *Ploceus*, and that the female is seasonally dimorphic in such marked degree, suggest the need of a deeper study of its proper systematic status.

II. BREEDING ECOLOGY

1. Habitat

Finn's Baya inhabits pure terai country in which marshes and extensive stands of sarpat (*Imperata arundinacea*) and munj grass (*Saccharum spontaneum*) are sparsely dotted with isolated trees, particularly *Salmalia malabarica*, and occasionally interspersed with patches under rice or sugar cane cultivation. Nest colonies were found perched in the topmost twigs of trees in limited areas locally distributed within the terai as a whole. The largest number were located along a four mile stretch of road starting just north of Bilaspur and extending to about a mile north of Rudrapur on the main Rampur to Naini Tal highway. Here some twenty colonies were seen, mostly containing some 15-20 nests each, but in a few cases with many more—up to 200 at least in one colony. A further two colonies were found at about 1.5 and 7 km. respectively from Rudrapur on the Bazpur road, and several further colonies were located on the Lalkua-Bareilly road near Kitcha. The latter group lay close to the borderline between the terai and the bhabar country that lies between it and the Himalayan foothills. Several colonies normally occur together but always with wide stretches of intervening country between them and other groups.

It seems certain therefore that, at least in the breeding season, the species is not found in the bhabar. The two females obtained by Hume from Kaladhungi in typical bhabar in December 1866 were therefore probably from the scattering of the birds in the non-breeding season. Alternatively the locality name on the label may have been meant only as a broad indication of the general area in which the birds were shot. After our present experience of the species in the terai it is understandable why the quest for the birds in their published

type locality in 1934 (Ali, 1935) failed. A brief visit to Kaladhungi during our present investigation again failed to reveal the birds. Certainly Stuart Baker (F.B.I. 3 : 70) is quite incorrect in stating that the species breeds up to 3 or 4000 feet. His information is obviously based on O'Donel's breeding record and specimens from the Bhutan duars labelled 300-500 feet, and the Rudrapur area also lies at *ca.* 700 feet elevation only. Kaladhungi itself is not more than 1300 feet.

2. Colony Sites

All the breeding colonies located by us were in tree-tops, almost all of *Salmalia malabarica*, at about 9 or 10 metres from the ground. In a very few cases other trees were favoured and the main observations on behaviour were made on birds building their nests in a *Dalbergia sissoo*. The birds strip the leaves off all the twigs around the nests so that the upper part of the canopy is normally completely denuded and the colonies thus stand out prominently against the skyline. O'Donel in the Bhutan duars found the species nesting 'in a vast area of grass more or less intermixed with scrub'. In Kumaon nest building was also observed in reeds and rushes over standing water, but since most of the birds concerned were first year juvenile males and these reed beds were also roost sites, it is likely that the activity was no more than 'doodling'. The nests observed here were never complete, and may simply be the results of excessive building energy having no certain connection with definitive breeding. Similar observations have been made on this species in Dr. S. C. Law's aviary in Calcutta in 1936 or thereabouts, and on other weavers in captivity. Also on wild first year males of *Ploceus philippinus* in India (Ali, 1931, p. 958) and on *Quelea quelea* in West Africa (Morel & Bourliere, 1957; Crook in press). Thus while nests are certainly sometimes built in reeds it is not yet certain to what extent such sites are actually used for breeding.

The smaller *Salmalia* trees probably provide the birds with some degree of protection from terrestrial predators by virtue of their extremely spiny trunks and branches. It was in fact a major operation to obtain nests and eggs from one of these trees, and the climber had to use every possible caution. Further many of the colonies were situated near water in land which after heavy rain is mostly flooded.

Five out of seven colonies in which birds were observed were built in trees in which a pair of Black Drongos (*Dicrurus adsimilis*) were also nesting. The drongos were extremely alert to all approaching birds, attacking especially crows (*Corvus splendens*) and birds of prey with great effect. They also drove off birds of other species that

approached the tree including Common Mynas, Redvented Bulbuls, Yellow-eyed Babblers, and Rufousbacked Shrikes. There is no doubt that the weavers derive great benefit from the dash and audacity of their neighbours. In all cases noted the young of the drongo were much older than those of the weaver, suggesting therefore that the drongo had occupied the tree site prior to the arrival of the weavers.

3. Breeding Season

On our arrival in Kumaon on 12 July it was at once apparent that breeding was largely completed. Out of the many nest colonies located on the Bilaspur-Rudrapur road only two were fully occupied, and, in the only one that could be closely observed, the birds were already busy feeding young. In two further colonies a few nests were being visited. Later on nest construction and courtship were seen in a fresh colony between 22 July and 5 August. These nests were, however, never finished and pair formation never attained. Ultimately the nests were deserted. At Kitcha a colony with well-incubated eggs was found on 2 August. It is thus clear that Finn's Baya breeds very early in the rainy season well before the main breeding period of the other *Ploceines*¹ in the area. The colonies found abandoned on 12 July still sat among bare twigs and as it was ascertained that *Salmalia malabarica* puts out new leaves on the defoliated branches within a week of the birds' departure, we can say the colonies could not have been left for longer than that time. We were told that heavy rains fell in the area near the end of May and it is probable that these marked the onset of the birds' breeding. During SA's preliminary enquiries, one correspondent had furnished information obtained from a local bird catcher apparently familiar with the bird under the name of 'Pahāri Baya', that the species breeds twice in the year—in July and again in September, i.e. it has two broods. Our experience indicated that this information is probably quite correct.

4. Flocking, Feeding, and Food

The species is at all times gregarious moving in flocks about the grassland, feeding in company and coming to the colonies and departing therefrom in well integrated groups. The flocks fed in the tall grass and sugar cane stands where insects were apparently taken. Also on ploughed fields and on the roadsides where seeds appeared to constitute the food. Parents were once seen feeding their young on seeds pecked up on the roadside. On the ground the birds walk well, but when moving at speed they hop.

¹ *Ploceus philippinus*, *P. manyar*, and *P. benghalensis*.

The crops and gizzards of the shot specimens contained entire husked rice grains probably gleaned on the road, other smaller seeds, and brown chitinous insect remains (ants?). One female shot at a nest colony with an insect in her bill for the young had insect remains in the crop.

III. THE BREEDING COLONY

1. Colonies particularly observed

Since we had arrived after the main breeding period it was not possible to observe the development of a colony from its first visitation by a flock throughout reproduction to the departure of the young. It is not possible therefore to assign time periods to the different phases of life in the colony. Thus unfortunately we do not yet know how long it takes to construct the nest, at what stage in its construction the female accepts it and lays eggs, the incubation period, or the fledging period. These must await a further study in which observations should be started by the middle of May. The following account has thus been constructed from notes taken at three different colonies each at a different stage in the reproductive cycle. The colonies observed, in chronological order, were as follows:

- (i) A colony in a *Salmalia malabarica* tree on the Bilaspur road, approximately half way to Rudrapur (Plate I).

Here young were in the nest on 12 July; by 25 July only a single nest was still occupied at which a female was feeding well-fledged young. A week later the colony was deserted and the old nests partly obscured by new green shoots. At this colony observations were made on parental care.

- (ii) A colony in a *Dalbergia sissoo* tree on the Rudrapur- Bazpur road. Nest construction and courtship were observed between 22 July and 5 August. The colony was ultimately deserted before pair formation occurred.

- (iii) A colony in a *Salmalia malabarica* near Kitcha on the Lalkua-Bareilly road in a site difficult of access, on the far side of a river. Here behaviour during incubation was observed on 2 and 4 August.

2. Nest site, Structure, and Building behaviour

The nests of Finn's Baya are unlike those of any other Indian weaver. They are large gobular structures, untidily but firmly woven with long strips of coarse grass, and the entrance is at one side near the top. Often a porch-like projection surrounds the entrance forming

a small papilla as often seen in munias' nests. The structures are usually firmly knotted to upright twigs which are often worked into the fabric and also support the body of the nest from below. Occasionally the nests are slung sideways on to a twig or two so that the nest chamber hangs free below it. In no case, however, are the nests truly suspended from fine single twigs as is normally the case for the Common Baya, *Ploceus philippinus* (Ali, 1940). The nests thus most resemble those of the *Quelea* in Africa (Morel, Morel, & Bourliere 1957) both in form and in the method of attachment to the supporting vegetation, as well as in the progressive stages of construction. Silhouetted against the sky in the distance, a nest colony looks rather like a cluster of honeycombs in the bare tree-top. In Asia the only other species with a comparable nest would appear to be the Golden Weaver (*Ploceëlla chrysaea* Hume) of Burma which, however, builds mostly in small trees and bushes (Stuart Baker, NIDIFICATION 3 : 12). All other Asian species have nests normally slung or suspended from fine twigs (*P. philippinus*) or from grasses or rushes (*P. benghalensis* and *P. manyar*) and with vertical tubular entrances opening below.

A feature of especial interest is that many of the nests form composite units being linked together with connecting walls or flanges of material, or by long separate strands bound in firmly at each end to different individual nests. Usually these composite structures (2, 3, or 4 nests) belong to a single male, but at the larger nest composites at least two males were often responsible (see below). The linkage of the structures is due to the extreme proximity of the building positions at which the birds begin construction. Loose strands from one nest are thus pulled across into the neighbouring nest and the ends tied in. With repetition of this behaviour, together with indiscriminate building on flanges and sometimes even on a neighbouring male's nest, a partial fusion of the individual nests occurs. This is a rare condition in the Ploceinae the only other recorded case being for *Malimbus rubricollis* in Southern Nigeria (Crook, 1958 a) and infrequent cases in *Quelea* colonies. It occurs only in species in which the area defended around the nest during its construction (i.e. its territory) is extremely small (see below) and it appears to mark a half way step in the evolution of the giant fused nesting structures, such as are found in other Ploceidae (*Philetairus socius*, Friedmann 1949; *Bubalornis albirostris*, Crook 1958 b).

The individual nests are constructed by the male birds. Building started in the *Dalbergia sissoo* with the tying together of twigs into the shape of a ring (the initial ring, Skead 1947) that forms the foundation of all weaver nests. The birds perch on one twig and repeatedly



Silk Cotton Tree with nest colony at top.

Photo : Sâlim Ali



Close-up of the nests.

Photos : Sâlim Ali

lean out to grasp another in the beak. This is then pulled close to the body and held under the feet. Many such isolated movements are made until ultimately the twig is bound to the perch by a knot of grass tied around it by movements of the bill. In cases where the twigs are too stiff for bending, as is usual in *Salmalia* trees, separate twigs are simply linked up with knotted strands of material which eventually complete the circular shape of the ring. When the initial ring is finished, it is thickened at the sides by the twining in of fresh grass strands. At the same time separate strands are looped across from one side to the other at any angle and at random so that a kind of trellis-work or net gradually appears. At this stage the bird pushes the material with its beak, head, and breast so that it becomes curved outwards from the usual working position at the base of the initial ring. The horizontal depth of the nest is thus determined by the reach of the bird during the performance of the shaping movements. All the while the bird is actively engaged in snipping off the leaves on the twigs near the nest and these then fall from the tree. Some leaves very close to the developing nest are, however, sometimes incorporated in the structure. The nest now develops by repeated additions of long strands of grass (30-60 cm. in length and up to 1 cm. in breadth) each taken to the site singly held in the beak of the builder. These strands are loosely looped across from side to side of the initial ring or between it and other supporting twigs that are incorporated into the developing walls. Thus on arrival the male first ties the end of a strand to the side of the initial ring by inserting it through the accumulated material, pulling it through and reinserting it several times until it is firmly fixed; the free end is then taken in the beak, twisted once or twice around the various supports and either laid against or interlaced with the developing trellis-work and then, if long enough, tied in again firmly to the far side of the initial ring. After each bout of knotting and twining, a bout of shaping movements usually occurs. The bird then sits on or near the nest titivating with loose pieces of his own nest and those projecting from his neighbours'. Also sometimes he hops on to a neighbouring structure where he performs further in the same way. He may also steal materials and take them to his own nest or take loose ends left hanging from a neighbour's nest and tie them in to his own. In this way the inter-connections between neighbouring structures are established. Sometimes one bird alights on its nest with a long strand the end of which hangs temptingly near another builder. The latter then often seizes it and pulls. At once a vigorous tug-of-war ensues, each bird straining to gain the prize. Several times the grass strands broke under

the strain. Curiously enough, these intensely fought competitions never ended in fights, perhaps because the birds always had the full length of the grass between them.

As the framework develops, the strands are pushed downwards and twined around supports below the building position and also to the lower rim of the initial ring itself. The chamber thus begins to bulge below the original ring (fig. I) in a rough kidney shape. As the whole structure is being fitted throughout to supporting twigs, its shape is normally somewhat irregular conforming to the disposition of the various twigs bound into the frame. Further to these movements, wet mud blobs are carried to the nest in the beak and fixed either to the sides of the fabric of the initial ring or amongst the various strands of the chamber walls. Some of these blobs were very large and others were clearly mud-covered lumps of sodden wood. One mud covered twiglet was also used (5-7 cm.). By this time the nest is nearing its definitive shape and the entrance (the initial ring) has come to lie at the side near the top. There are, however, often gaps in the fabric which remain open and the birds occasionally enter by them. Occasionally a bird may sit in such a gap and carry out building and shaping movements from there exactly as if it were the initial ring. When the framework is complete the fabric is thickened by the addition of further strands.

The majority of observations on which this account is based were made on 12 nests in active construction in Colony ii. Since this colony was abandoned it was not possible to see how soon after the completion of the first nest a male begins another. One case was, however, observed in which a well-established ring was abandoned and destroyed and a new one built among twigs a few inches below. The nests were never properly completed and we cannot say how long a nest takes to construct when building motivation is at its maximum earlier in the season.

Females were observed titivating and shaping the nests very actively during their 'inspection' visits to the colony. Often a female would give several nests this treatment before leaving the colony. After egg laying, females were seen bringing soft grass heads (sp. ?) to the nests using them to line the interior. Nests obtained from Colony iii were however not fully lined, the base of the egg chamber and the area near the entrance having received the greatest attention. Apart from these activities the females, as in other weavers, did not take further part in nest construction.

3. Polygamy

Finn's Baya is polygamous and evidently attracts his wives to nests built in succession. As it was not possible to observe the whole process, we estimate the sex ratio of adults breeding in the colony from a few careful counts made in Colonies i and iii.

In Colony i there were 15 units of nests made up of 7 single nests, four units of two joined nests, two units of three joined nests, and two units of four joined nests. At two carefully observed units of two nests each there were single males with two females each. At a unit of four nests there were two males (one for the upper two nests, one for the lower two in the unit) and four females. At Colony iii single males respectively were recorded at three units of four nests each, one unit of three nests and one of two nests all of which had females. In a further twenty nests repeated counts revealed only seven males. Thus at forty-five closely observed nests in the two colonies only 16 males were present to match the 45 female occupants. This gives us an average of 2.8 females and nests to a male. The above observations thus suggest that while cases of single males with only one nest and female, and of males with as many as four females were recorded, the usual number is probably two or three.

4. Eggs, and Clutch size

Eggs were obtained from six nests cut down from Colony iii. As in other Indian weavers, they were of a plain white coloration. There were four clutches of two eggs and two of three. The egg measurements, taken with a vernier calliper, are given in Table I. In a sample of 12 eggs the mean length was 20.95 mm. (maximum 23.6 mm., minimum 19.8 mm.); mean breadth 15.28 mm. (maximum 15.7 mm., minimum 14.8 mm.). Some of these eggs have been presented to the Bombay Natural History Society together with a group of nests.

IV. AGONISTIC AND REPRODUCTIVE BEHAVIOUR

1. Territorial Behaviour

At a colony under construction the males come and go in groups. On arrival the birds at once separate to their nest sites giving loud songs in a chorus. Approach to the nest by other birds is never tolerated and aggressive behaviour is at once shown. The defended area is however extremely small, at no time consisting of more than the nest site itself and, unlike most other weavers which tend to have their nests well spaced at least at the commencement of breeding, the

TABLE I

Egg measurements of clutches of *Ploceus megarhynchus*
obtained near Kitcha on August 3, 1959

Clutch No.	Clutch size	Egg measurements in mm.
I	2 eggs	20.0 × 15.0 19.8 × 14.8
II	2 eggs	20.0 × 15.0 20.7 × 15.4
III	2 eggs	23.1 × 15.4 23.6 × 15.3
IV	2 eggs	Broken
V	3 eggs	20.1 × 15.7 20.9 × 15.6 21.2 × 15.2
VI	3 eggs	20.0 × 15.1 20.7 × 15.4 21.3 × 15.5

sites are so crowded as to be often within the stretching distance of the neighbouring birds. The distance between nest sites is in fact hardly greater than the normal 'individual distance' of the birds in a flock.

(i) *The Lunging Match*

The two factors, extreme crowding of nest sites and intensively aggressive reaction to the approach of other males, produce an unusual form of territorial defence almost all of which occurs on the nest itself, the defenders each perched in his proper nest ring and lunging as hard as possible at each other. These 'Lunging Matches', of which variants are found in many other weaver species, have the following form (see fig. I):

- (1) The two combatants turn and face each other.
- (2) Both raise wings above back but without at first extending (spreading) them, and begin quivering them at considerable speed. Sometimes the wings are simply raised, and quivering does not develop.

- (3) One bird lunges at the other in an attempt to peck the beak or face of the opponent. The latter at once recoils its head into its shoulders and may move the whole body backwards pivoting on the hips. The feet do not change position. Immediately the lunge is completed the opponent at once retaliates with an identical pecking movement and it is now the turn of the first bird to recoil. Alternate lungings and recoilings occur repeatedly until the birds tire and one of them turns sideways and titivates its nest or hops into a different position on its nest or twigs near by. Sometimes the match is again renewed in the changed position.

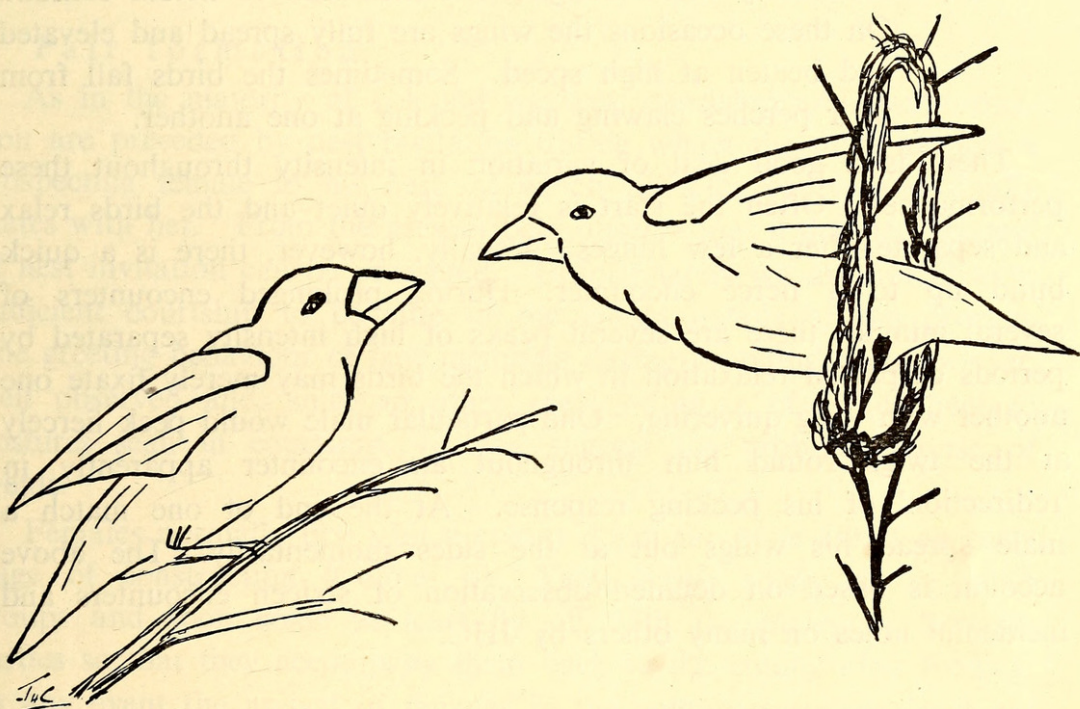


Figure I. Lunging Match between two males, the bird at right being perched in the Initial Ring.¹

- (4) The degree of wing spreading and the amplitude of the movements both increase with the intensity of the encounter. The movement varies from a simple wing quivering in which the wings are raised just above the line of the back and not spread at all, to an intense wing beating with partial wing spreading ('fluttering') in which the amplitude of the movement is greater, the wings moving from a position well above the line of the back to just below back level. Thus the more intense (i.e. longer and

¹ All figures drawn by JHC from sketches in field notebooks.

fiercer) the encounter, the greater is the spread of the wings and the amplitude of the flutter. The wing elevation is also higher. Wing movements of this kind during Lunging Matches have not been recorded previously from other Ploceine species although wing raising is given in the context by *Quelea quelea*.

(5) In the majority of Lunging Matches the combatants were both perched in the rings or on their developing nests. In some cases one of the birds was on a twig near its nest, while in a few further cases both the birds were perched on twigs near their nests.

(6) Occasionally these Lunging Matches lead to actual combat. On these occasions the wings are fully spread and elevated and beaten at high speed. Sometimes the birds fall from their perches clawing and pecking at one another.

There is a good deal of variation in intensity throughout these performances. Often the start is relatively quiet and the birds relax and separate after a few lunges. Usually, however, there is a quick build up to a fierce encounter. During prolonged encounters of several minutes there are several peaks of high intensity separated by periods of partial relaxation in which the birds may merely fixate one another with wing quivering. One particular male would peck fiercely at the twigs round him throughout an encounter apparently in 'redirection' of his pecking response. At the end of one match a male spread his wings out at the sides momentarily. The above account is based on detailed observation of sixteen encounters and incidental notes on many others by JHC.

(ii) *Supplanting*

Males sometimes 'supplant' one another (i.e. one bird fixates another and flies at it normally replacing it on its perch). This occurs particularly when the males follow prospecting females around part of the colony and thus repeatedly approach both one another and each other's nests. Supplanting of prospecting females is also common (see below).

2. *Mobbing*

The male Finn's Bayas at colonies with eggs and young sometimes perform mobbing attacks on human intruders. The bird concerned starts calling a loud *skeer skeer skeer* on the tree and then flies out repeatedly over the head of the intruder repeatedly calling. We have

no experience of other weavers' behaving towards a human being in this way. The behaviour resembles that of the drongos, who also had nests in the trees concerned, though it lacks the proficiency of the latter. The behaviour was not observed towards birds such as crows, normally so admirably driven away by the drongos.

Once a flock of Common Babblers (*Turdoides caudata*), the pair of drongos in occupation, a Redvented Bulbul (*Pycnonotus cafer*), and a pair of Yellow-eyed Babblers (*Chrysomma sinensis*) began mobbing a snake in a bush near the colony. During the commotion a dozen or so Finn's Bayas flew down into the same tree giving their mobbing call. On the hurried departure of the snake the bayas returned to their nests.

3. Pair formation

As in the majority of colonial weavers, courtship and pair formation are preceded by nest invitation during which the male attracts a prospecting female to his nest, at which he later courts and finally mates with her. From the present field observations a detailed account of nest invitation can be presented. Unfortunately we did not observe sufficient courtship to be sure of the actual details of the process. The greeting behaviour of pair members during brooding was, however, well observed and, since in other species this is often identical to postures seen in courtship, we can suggest the probable course of events.

Females normally first visit a colony when the nests are at an early stage of construction (Colony ii). They arrive singly or in small groups and soon some at least fly off with the males in foraging parties so that they accompany them back to the colony after feeding. In any event the arrival of females in the colony occasions great excitement among the males many of whom cease building and approach the females displaying (see below).

On arrival in the colony a female hops about among the nests in an apparently unconcerned manner although the sleeked plumage and crouched posture indicate a strong tendency to flee. She also avoids all males that approach her. During this exploration she hops on to many of the developing nests and performs shaping movements and titivation or merely examines them closely, peering about in and around the structures. During this activity the owner is in close attendance giving a particularly intense display (see below). Occasionally the female may respond with a little wing quivering, but in all observations she hops out of the nest again after a few seconds and taking no notice of the male proceeds to a further structure. Occasionally

two females approach a nest at the same time, there is then either a brief fight or one bird supplants the other.

The male's response to the approach of a female is an elaborate display with several degrees of performance intensity depending on the female's proximity to his nest. As soon as a female alights near an area of nests, most of the males hop down from their sites and approach her fixating her closely all the while. They finally stop advancing at a distance of one or two feet from her position. All the time they are giving the 'Wing Undulation Display' of the following very variable components:

- (1) The bird faces the female fixating her with the body slightly crouched or else leaning forward or upward slightly from the hips in the direction of the female. The plumage is not fluffed except on the crown and nape.
- (2) The tail is widely spread and often slightly depressed especially when the wing movements are fastest.
- (3) The wings are undulated with a very slow and often irregular rhythm. They are normally fully spread and well elevated above the back. They are beaten through an arc of some forty-five degrees, between 45° and 135° to the dorso-ventral line of the body (see fig. IV); they thus move between a position roughly half elevated above the back to a drooped position at the side of the body. Often during the course of these undulations movement ceases for several seconds and this may happen with the wings either elevated or drooped (fig. II). Often the movements give place to wing quivering following partial closure of the wing. Wing quivering occurs at very low display motivation and often precedes it. Also males just beyond the immediate circle of displaying birds may show some wing quivering without leaving their nest sites.
- (4) Song is given (see under Vocalisation, below).

During the performance the males may shift their positions, stop and start the display several times, and frequently change to wing quivering. There is a great deal of excitement and loud singing. The males, having left their nest territories, now frequently pass each other's nests while moving towards the female and this occasions many supplanting attacks. Further two displaying males may approach each other in their excitement, and a brief fight then follows. Every time the female moves there is a great commotion as the quarrelsome males change positions and approach her again. After a time the female flies on to a nest. At once the owner, who has been wing undulating

near it or among the circle of 'admirers' flies up to his site and perching on the exterior near the entrance, at the side of the entrance or on a twig near it, performs the 'High Speed Wing Beating Display' of the following components:

- (1) Posture as in Wing Undulating.
- (2) Tail widely spread and either straight or slightly depressed, rarely slightly elevated.

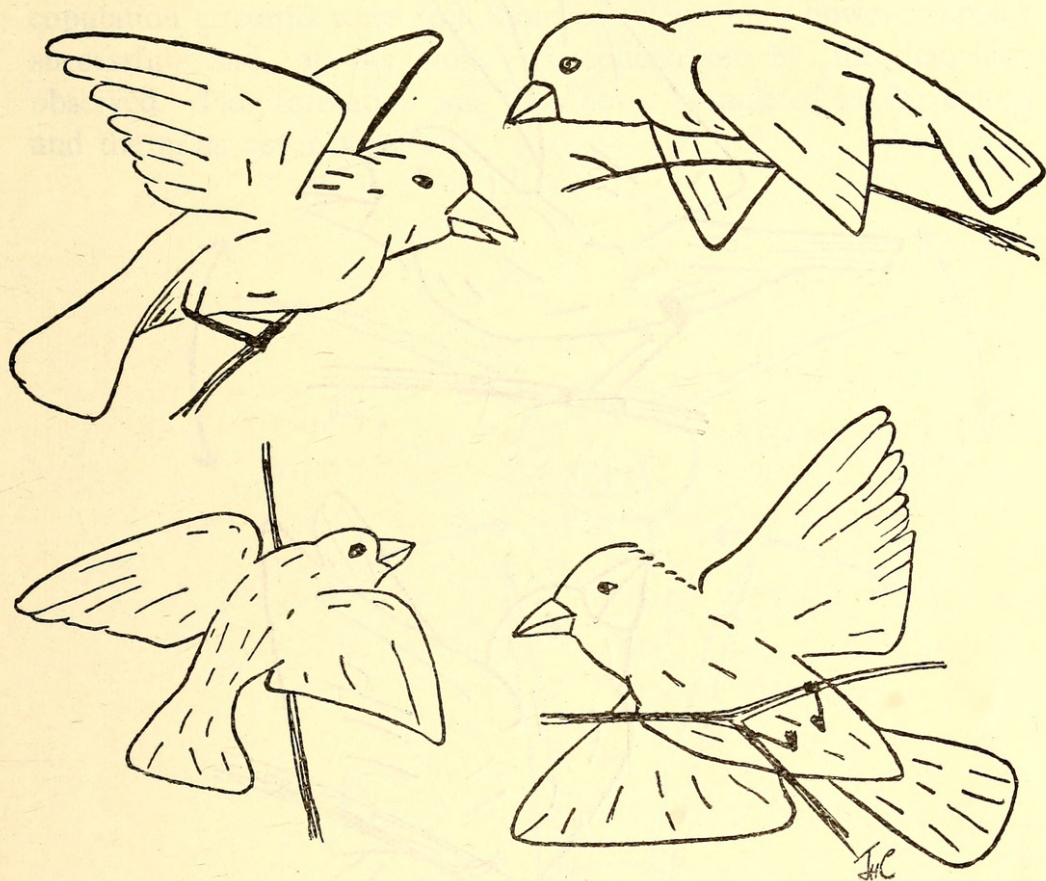


Figure II. The Wing Undulating Display : wings shown in differing positions with performers facing different directions. Top left and bottom right, wings well elevated ; bottom left, wings at the side ; top right, wings drooped. See text.

- (3) The wings are fully elevated above the back and beaten at high speed (10 beats in 1.2 secs. mean of four readings, minimum 1, maximum 1.4) through a small arc above 135° to the dorso-ventral line of the body (fig. IV).
- (4) Sings loudly at the female. Occasionally at the most intense moments of display a loud *skee skee* termination to the song was heard.

These displays last a few seconds only, the male then hopping to a fresh twig near the nest where he resumes wing quivering or undulating all the while watching the female closely. After several seconds he again flies to the nest and gives the High Speed Wing

Beating Display. This alternation continues until the female leaves the nest or until the male tires and sits near by wing quivering. Occasionally neighbouring males also fly to a twig near the nest and give the High Speed Wing Beating Display. They are at once supplanted by the owner.

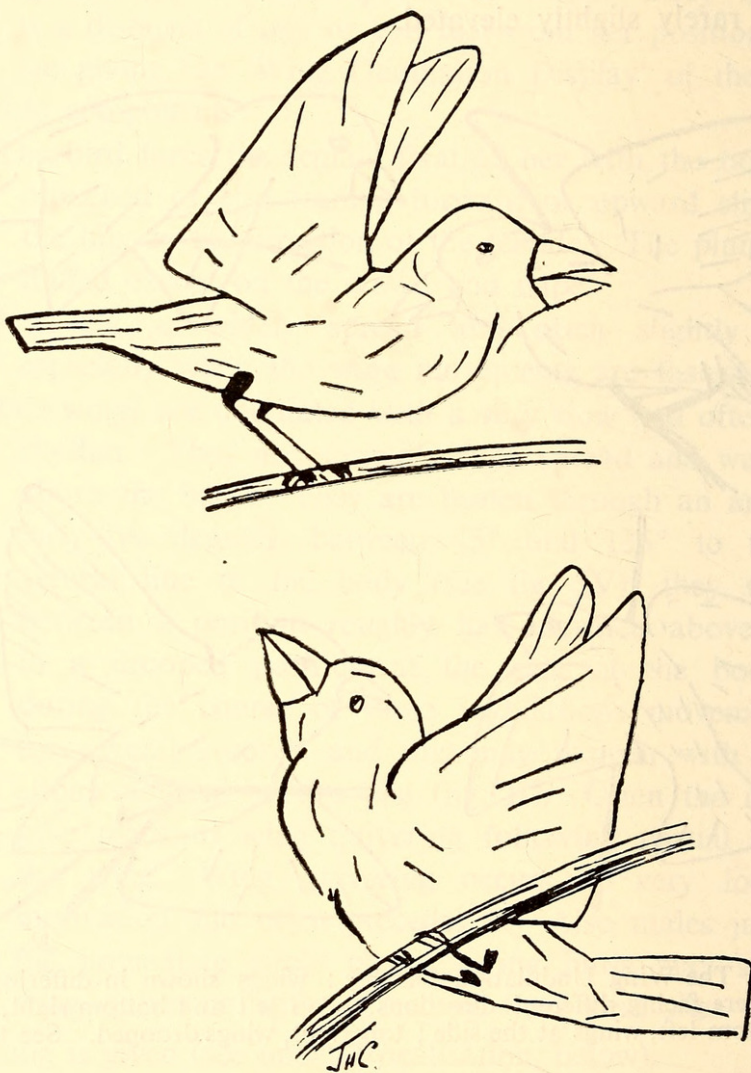


Figure III. The High Speed Wing Beating Display. Bottom bird displays to a female in nest above his position.

The females are not always greeted with display; frequently a male may supplant females approaching his nest and occasionally pursues them for a short distance within the colony tree. More rarely a female lunges at an approaching male away from his nest and forces him to retreat.

128 behaviour sequences shown by the males on the arrival of females among their nests were observed in detail and recorded on tape for later analysis.

The 'Wing Undulation' and 'High Speed Wing Beating' displays are clearly both forms of advertisement and resemble the nest invitation displays of other weavers, particularly the *Quelea* which also displays in an upright posture on a globular nest. However, the female visits nests irrespective of the male's display so that the display probably functions also as part of courtship. The 'High Speed Wing Beating' display in particular resembles a mounting attempt complete with the flutter of wings above the back. During display at the nest several copulation attempts were seen, none of which were however apparently successful, and, at the time, no solicitation by the females was observed. Pair formation was thus never completed in the colony (ii) and the nests never accepted.

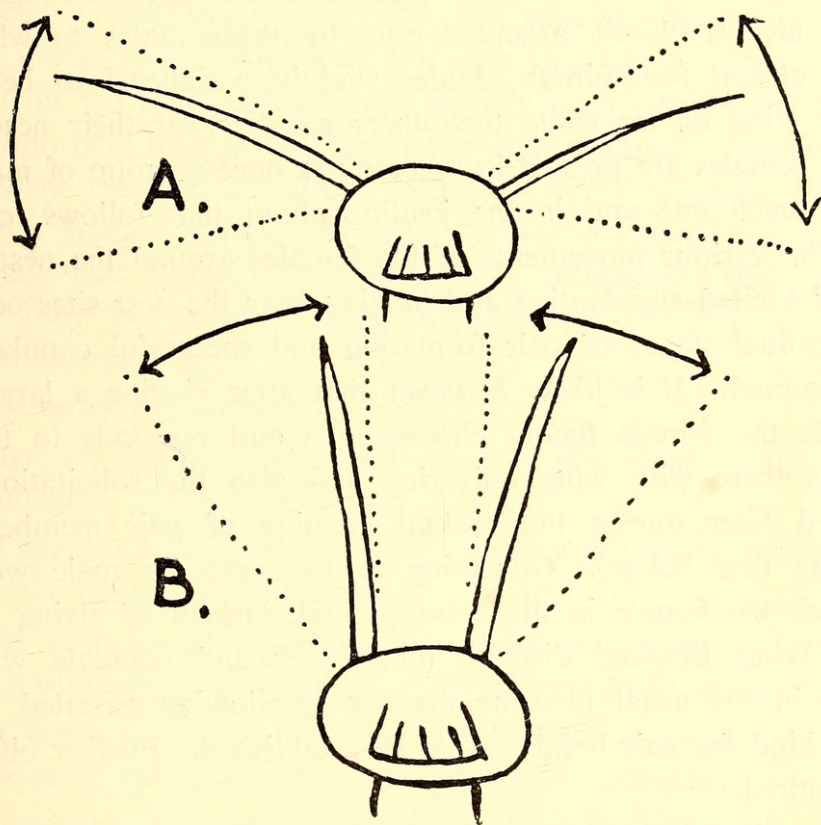


Figure IV. Diagram showing arc and elevation of wing movements in A, Wing Undulation and B, High Speed Wing Beating.

Comparing the two displays with those of other species, the 'Wing Undulation' seems homologous with the many other Wing Beating advertisement displays while 'High Speed Wing Beating' completes and terminates the display in a similar manner to the 'Wings rigid' postures with which it may be homologous (Crook, 1958 *a*, and in preparation). The motivation of these various postures will be further analysed (by Crook) in a later comparative publication.

In several highly colonial weavers, for instance *Ploceus cucullatus* in Africa and *Ploceus philippinus* in India, the performance of nest advertisement displays is highly contagious so that if one male displays to a female a large number of birds, if not all of them, will fly to their nests and display in the same way (i.e. social facilitation). In the present species however this does not happen. Only the males in the vicinity of a female display to her, and they only fly to their nests for the performance of the 'High Speed Wing Beating' after her arrival there. The female is, moreover, very rarely chased (a common occurrence in other species) either within or beyond the colony and as soon as she leaves one area of nests the males return to building and titivating on them while a neighbouring group of males begins displaying to the female. Thus when a female moves through a colony she is always closely attended only by those males to whose nests she is closest (4-6 birds). Males slightly peripheral to her position merely wing quiver while the others are busy at their nests. When several females are present in a colony at once a group of males forms around each one and in the jostling about that follows, consequent upon the various movements of the females around the nests, a great deal of excited supplanting and lunging near the nest sites occurs.

The final stages of pair formation and successful copulation were not observed. It is likely however that after visiting a large number of nests the female finally chooses one and responds to the male's displays there with wing quivering and also the solicitation posture observed later during the mutual greeting of pair members during brooding (see below). On flying to the nest the male would then approach the female in the entrance and, instead of giving the 'High Speed Wing Beating' display, mount her and copulate with wings beating in the usual ploceine manner. Following repeated sequences of this kind the pair bonds would be established. Further observations are required.

4. Behaviour during brooding

At Colony iii incubation was well advanced by the time of the observations on 2 and 4 August. The males sat about their nests occasionally titivating on them and bringing in new grass strands which were added to the exterior. These fresh green strands were not observed at nests with young inside in Colony i. The birds came and went in groups as before, producing loud twittering choruses on arrival and departure. The females were very active about the nests; some were incubating and others flew to and fro transporting flowery grass

heads into the nest. They confined their attentions now to their own nests.

The males showed lunging behaviour only very occasionally and it was clear that this had largely ceased. They frequently trespassed on one another's nests, however, but a brief supplant sufficed to remove an intruder and no fighting was seen. The males also occasionally supplanted females who had perched on a nest other than their own. Usually the males welcomed females returning to their nest groups by turning to face them and wing quivering. Only rarely were some Wing Undulation movements seen, and there was none of the displaying so characteristic of the pre-mating period. Sometimes when a female had entered a nest the male flew to the entrance wing quivering and sang loudly into it. When wing quivering, a male may advance towards a female and sing, whereupon she usually disappears into the nest in a hurry. The males were not seen entering the nests.

On arrival at the nest unit a female usually wing quivers intensely to the male who may be greeting her in the same manner. Both birds then wing quiver together for a few seconds before the female passes to her nest (cf. *Quelea quelea*, Crook in press). Frequently however the female may show a posture which, through comparison with other weavers, can only be called a 'Solicitation Posture'. This has the following components:

- (1) Body crouched on perch.
- (2) Wings are slightly spread out at the side of the body and quivered.
- (3) Tail slightly raised (*circa* 30° to the line of back) and tremored in the dorso-ventral plane.

From time to time during certain of these posturings a further more intense posture is given. This has the following further features:

- (1) The body is closely squatted on the perch. The head is suddenly raised and the bill is pointed upwards.
- (2) At the same time as the bill raising and squatting, the wing quivering suddenly ceases and the wings are spread out at the side of the body in a slightly drooped position (figure V).
- (3) The tail remains slightly raised or is yet further raised above the back and the tremoring is continued.

This posture usually occurs during a spell of wing quivering or ordinary solicitation, and may recur three or four times before the female flies to the nest. Occasionally it is given without prior wing quivering or solicitation. Some females seemed more disposed to give the postures than others.

In other weavers this type of greeting behaviour closely resembles sexual behaviour prior to copulation, and we thus have every reason to suppose that these solicitation postures also occur prior to copulation in this species. The particularly intense form of the posture probably accompanies mounting itself. During brooding the postures probably prevent the expression of aggressive responses by the male on the female's approach. The male in fact was never seen to respond to

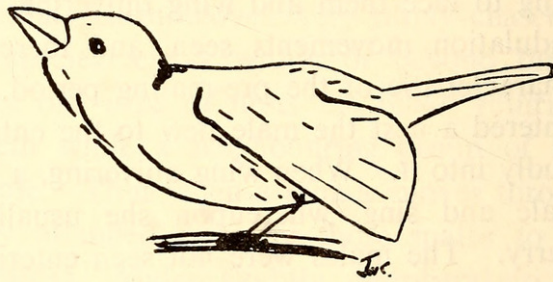


Figure V. The female 'Solicitation Posture' in the intense form with momentary sideways spreading of the wings in a slightly drooped position.

these postures with any behaviour other than wing quivering, but the occasional supplant and the approach to the nest with loud song indicate the infrequent activation of a tendency to attack the approaching bird.

5. Care of Young

Although both sexes feed the young in the nest and also remove faeces, the females are the more active. The males spend much time simply sitting near their nests singing and driving off females (other than their own) that come near them, and in occasional supplants against neighbouring males. When a male alights at a nest containing young he frequently sings, and he also wing quivers (as above) when a female alights there with food. No complex 'greeting' behaviour with female solicitation was however observed during this phase, the females merely showing occasional wing quivering on arrival with their tails slightly raised. The food appeared to be mainly insects carried in the beak.

After the young have left the nests they follow their parents. On 3 successive mornings a group of adults, both male and female, were seen on a roadside, each adult followed closely by one, two, or three full fledged young, wing-shivering and begging food. The adults were picking seeds from the road surface and giving them to the young. At least on these occasions regurgitation was not recorded.

6. Behaviour of First year Juveniles

We observed many first year juveniles (males?) in company with some adult males building nests (or perhaps merely 'doodling?') in rushes and reeds at two different night roosting sites. The nests were all at a very early stage in construction being either rings or partially developed chambers, or just formless tangles. The birds were seen bending down leaves of rush and tying their ends into the structure. The standing reed stems are tied together with grass strands transported to the site by the builders. As in the definitive tree-top colonies the nests were often only a few inches apart and Lunging Matches were seen at the sites. The whole behaviour was however irregular with individuals frequently building actively on several nest sites, and at any one site several birds may come and build. No females were seen visiting these nests. This type of irregular building activity together with failure to complete the nests and an absence of clearly defined ownership and territorial defence is characteristic of reproductive behaviour at low motivation in several weaver species. In particular it has been recorded for *Quelea* at a midday roosting site in the Senegal in the month preceding actual breeding (Crook, in press). First year juveniles of *Ploceus cucullatus* and *Ploceus philippinus* while yet in 'sparrowy' plumage also build nests, that are inadequately completed and never occupied by females. Whether actual breeding colonies of *P. megarhynchus* here are also sited among reed beds, as recorded from the Duars, remains to be ascertained.

7. Vocalisation

The voice of Finn's Baya is louder, harsher, and more 'nutty' than that of *Ploceus philippinus*. We heard the following cries uttered, some of which have been recorded on tape for further analysis:

- (i) A twittering cry given on take-off and alighting. This is particularly noticeable during group flights and appears to play a role in flock integration.
- (ii) The *skeer skeer* (or *tseer tseer*) mobbing calls. (p. 472)
- (iii) A high pitched alarm note.
- (iv) The song given by the male during Wing Undulation, High Speed Wing Beating displays, and Lunging Matches, and also when sitting still in the territory. The majority of birds utter the song as a continuation of the twittering upon arrival in the colony during nest construction (Colony ii), and thereafter it recurs in sporadic choruses, the song of one bird starting the others singing. The song

may be rendered: *twit-twit-tit-t-t-t-trrrrr wheeze whee wee we*. The complete phrase is not always given. Occasionally a high pitched *seep seep* either followed the song or occurred during the High Speed Wing Beating displays.

V. SUMMARY

Due to lack of knowledge about its ecology and habits since first described in 1869, *Ploceus megarhynchus* was hitherto considered one of the rarest Indian birds, a notion that now proves to be erroneous. Previous quests for it had failed mainly because of the false scent laid by the published type locality 'Kaladoongee' which is actually situated in the forested country of the Kumaon bhabar at the base of the W. Himalayan foothills, whereas the bird is restricted to the vast swampy grasslands of the terai at a lower elevation. The present investigation first discovered the bird's true habitat by accident, thus removing the major obstacle in its field study. Paucity of correct information may also be due in part to the difficulty of distinguishing this species in the field from the Common Baya in non-breeding plumage.

Unlike all other Indian members of the genus, *Ploceus megarhynchus* builds untidy coarsely woven globular nests in colonies among the topmost twigs of Silk Cotton (*Salimalia*) and other trees which are deliberately denuded of foliage. Incomplete nests were also found among marshy reed beds. In form and details of progressive construction the nests resemble those of *Quelea quelea* of Africa.

Ploceus megarhynchus differs from other Indian Ploceinae also in the fact that the female, in addition to the male, is seasonally dimorphic and acquires a distinct yellow breeding dress, but which is less bright than the male's.

Its general breeding biology resembles that of the Common Baya, *Ploceus philippinus*. The males, wholly responsible for nest building, are successively polygamous having from 1 to 4 females each. The eggs are white, and two or three constitute a normal clutch. Both parents, but chiefly the female, feed the young in the nest and later outside.

Some incomplete observations are recorded on voice, courtship, pair formation, and other behaviour.

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