Mud and Dung plastering in Baya Nests

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(*With two plates and two text-figures*)

INTRODUCTION

This paper is mainly a discussion on the various explanations that have been offered by earlier investigators on the mud-blobs or dung plastering seen in the egg-chamber of several baya weaverbird nests. Some fresh data on the quantity of the plastering material used in individual nests, stage in the development of the nest when the mud/dung is brought to the nest and the time of the day when the plaster is fixed are furnished. Among the various theories on the mud-blobs, the following in particular have been discussed: for fixing fireflies for illuminating the nest, balancing the nest, protecting the inmates from rain, a relic of an ancient habit, and for cementing the fibre for greater reinforcement of the egg-chamber. The chief function of the plastering materials seems to be the strengthening of the fibre-nest particularly at regions that are subjected to great stress.

One of the best known attributes of the baya weaverbird (*Ploceus philippinus*) that has fascinated villagers for centuries is that based on the mud-blobs found in many of its nests. Nevertheless, observations made on these nests as well as those of the baya's other Asian and African cousins for nearly a century have not highlighted the full significance of the pasty material fixed at specific spots in the nest. A half-built nest of the baya, at what is known as the helmet stage, is divided by a vertical ring into two more or less equal halves. One of these, which is always built a bit ahead of the other, is the future egg-chamber. The other half, known as antechamber, extends downwards into an entrance tube. When the inner walls of the future egg-chamber in such an incomplete nest are examined, one may see on two opposite sides small or large quantities of mud-blobs, or a plastering of clay, cattle dung or in rare cases, human faeces. There is considerable variation in the quantity and quality of the plaster between nests, some not having any of these extraneous materials at all. A few explanations have been offered by ornithologists on the significance of the plaster. Apart from them, the most classical and romantic one based on poetic imagination is that it holds fireflies in order to illuminate the nest at night. Every second villager who is familiar with the baya is likely to vouch emphatically for this explanation although none of them has actually seen a firefly fixed inside the nest. Some naturalists contend that the mud is used to stabilise the nest during gales, while others regard the mud as a relic of some ancient custom at one time beneficial to the species. Other explanations offered are: the mud protects the inmates from getting soaked in rain; prevents the nest robbers from pulling apart the initial ring, and when dry helps to sharpen the beak of the builder.

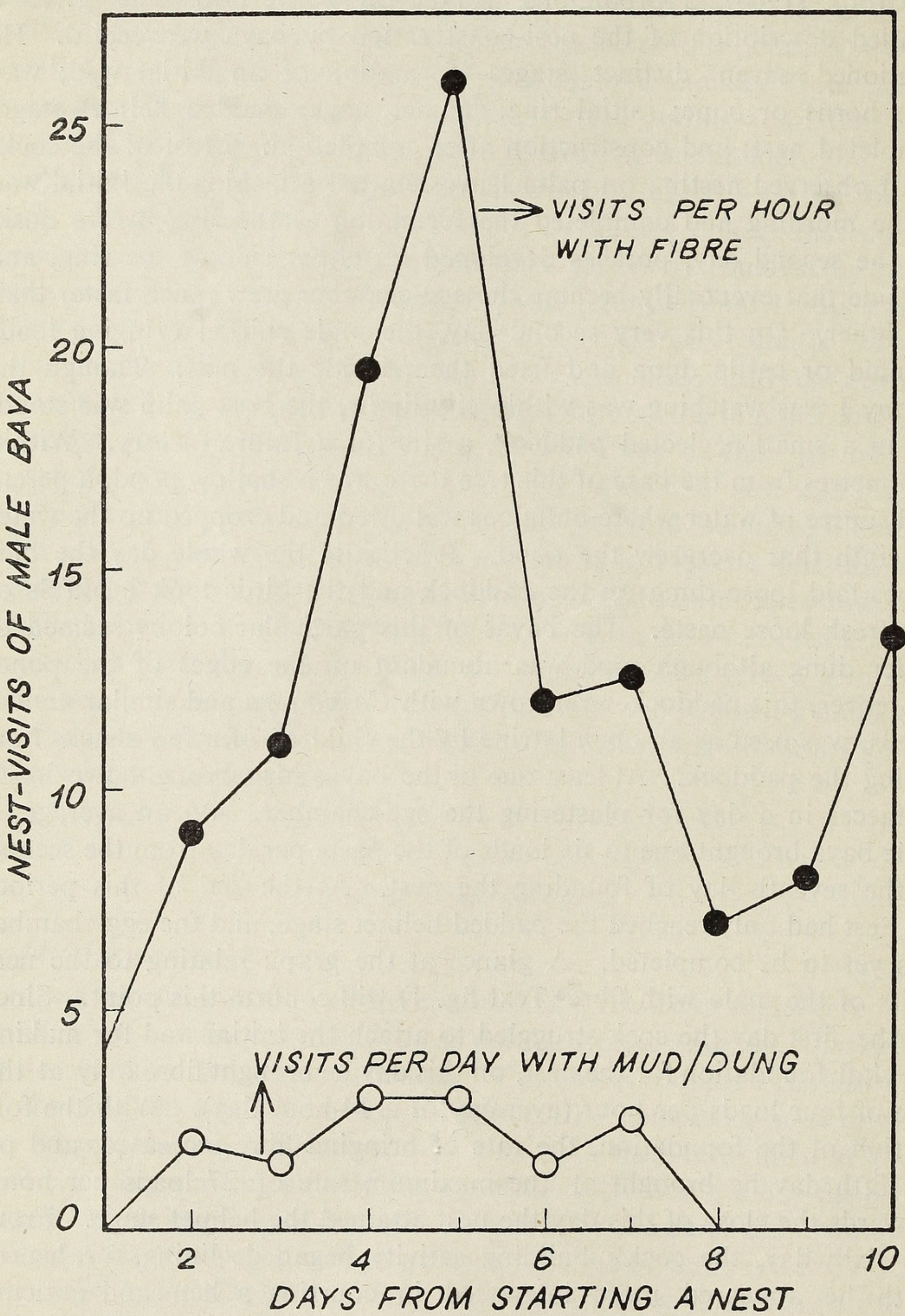
My interest in the common weaverbird was aroused in my early childhood (some 45 years ago) by a large colony that used to nest year after year in our small coconut garden surrounded by paddy fields in the southernmost district of India (Kanyakumari). As pulling down active baya nests having eggs or fledgelings was forbidden, I used to be contented to play with the nests that were periodically cut down by some male birds during the breeding season, and the innumerable ones gathered during non-breeding season. It was at this period that I saw for the first time mud-blobs fixed inside the nest and learned of the universally believed myth of the bird's alleged faculty of illuminating its nest. During the past eight years, the lost thread was taken up again and I could visit many tracts in almost all Indian States and make detailed observations on the variation in the baya nests between different pockets in various regions. With my observations together with what has already been recorded, I venture to make the following comments on the significance of the mud-blobs. Before doing so, some of my observations are presented.

Presentation of Data

Loads of mud/dung per nest

Detailed observations on the weaving of a few baya nests were made in 1963 on a colony founded on a palmyra palm (*Borassus flabellifer*) at the northern border of Calcutta. The observations on the activities of the selected birds were recorded from the commencement of their day's work starting from about 5-00 a.m. upto their retirement at about 6-30 p.m. The starting and closing up of the activities in a day depended largely on the intensity of daylight. Records on the number and duration of nest-visits of the cock with or without fibre/mud ; number of visits the hen made while selecting a nest, during brooding a clutch of eggs, and nursing the nestlings; kind of fibre brought and the region of the nest into which they were woven ; pilfering of fibre ; fights between cocks; and the behaviour of the cock and hen during courtship etc. were maintained. Hence I can say with some confidence when exactly the bird brought the plastering material while constructing the nest. In Text-fig. 1, the number of loads of mud and dung fixed during a day (average for four nests watched throughout their construction) are shown.

Crook (1964), a prodigious worker on weaverbirds, has given a detailed description of the nest-construction by baya weaverbird. He mentioned seven distinct stages—formation of an initial wad; wad with horns or cone; initial ring; helmet stage; padded helmet stage; completed nest; and construction after completion. Most of the cocks that I observed nesting on palm leaves started attaching the initial wad in the morning and completed the formation of the ring before dusk. On the second day, porches developed on either side of the ring, and the side that eventually became the egg-chamber grew much faster than the other. On this very second day, the male started bringing loads of mud or cattle dung and fixed them inside the nest. Though the colony I was watching was within city limits, the host palm was standing in a small neglected paddock, a site for a future factory. Within two metres from the base of this tree there was a shallow pond, a perennial source of water where buffaloes wallowed and cropped up the water hyacinth that overgrew the pond. Practically the whole day the buffaloes laid loose dung on the paddock and the birds took beakfuls of this fresh loose paste. The bayas of this particular colony seemed to prefer dung although mud was abundant on the edges of the pond. Moreover, this paddock, overgrown with *Cassia tora* and similar annual weeds, was used as an open latrine by the children of a few shacks bordering the paddock. At least one of the bayas also brought two loads of faeces in a day for plastering the egg-chamber. On an average, a male baya brought one to six loads of the paste per day from the second to the seventh day of founding the nest. At the end of this period, the nest had only reached the padded helmet stage, and the egg-chamber was yet to be completed. A glance at the graph relating to the nest visits of the male with fibre (Text-fig. 1) will confirm this point. Since on the first day the cock struggled to attach the initial wad for making the vital foundation for the nest, on this day he brought fibre only at the rate of four loads per hour (average for a 14-hour day). With the formation of the foundation, the rate of bringing fibre increased, and on the fifth day he brought at the maximum rate of 27 loads per hour. Towards the close of this day the nest attained the helmet stage. From the sixth day, the cock's building activity began declining, for, henceforth he appeared more interested in courting a hen and enticing her to select his nest and thus have him as her future mate. This period of courtship continued up to the eighth day; then, obviously, with the acceptance of the nest by a hen, he resumed active nest-building to complete the egg-chamber which is indicated by the upward trend of the graph. It is quite obvious from the graph that no load of mud (or dung) was brought once a female had approved and accepted the nest. The hen was never found bringing mud or dung.



Text-fig. 1. Nest-visits of baya cock with fibre (per hour) and mud/dung (per day).

On an average, each of the four males observed brought 12·5 loads of mud during a six-day period. However, in general, the number of loads per nest varied very greatly between nests of the same locality and between localities. Examination of 3 to 25 nests from different regions (or States) indicated that not all nests have mud plastering, but practically in every locality there are a few to a large number of nests, each containing one to about twenty loads of the plastering material. The quantity of mud (or dung) in a nest varied according to the quality of the weaving material used, and also depended on whether the nest was woven explicitly or shabbily.

Time of bringing mud/dung

The male baya starts collecting fibre and weaving them just after 5 a.m., and within an hour he goes for the mud or dung. The earliest I noticed a bird bringing mud was at 5.33 a.m., and the visits extended during the day at irregular intervals up to 4.50 in the evening. However, all visits excepting a single one were finished before 2 p.m. As most of the time I was observing the colony in Calcutta, I was comfortably perched on a 6-metre high machan, I was able to make note of the males during each of their almost vertically downward flights in search of mud or dung. When they flew to bring fibre or left for foraging or to the roost, the males always took a horizontal flight that was strikingly different from that when they went in search of mud/dung. Even without field glasses, I could clearly observe the male collecting the paste. During most of their trips a majority of the birds preferred to collect wet dung although mud of a similar consistency was available in close vicinity on the sides of the pond. While collecting the mud/dung, the bird inserts its bill slantingly and scoops out beakfuls. I have never seen the bird stirring or mixing the mud/dung either with its feet or beak. However, once or twice I noticed the bird making a second or even a third scoop at a stretch to collect the required quantity. Only fresh dung was used in all cases since after four or five hours a dung heap dries up and consequently it becomes harder for the bird to scoop out a small quantity from it.

Another point that struck me was the way groups of males went to collect mud/dung almost simultaneously. Table 1 gives information on the time of bringing mud/dung by two males building nests of almost similar stage close to each other on a palm. The group collection of mud was so striking that my attention was drawn to that even when the birds I was watching did not participate at it.

Either at the collection centre or on their way, the males seldom fight or spend time in fruitless conflicts. Usually, within 30 seconds of leaving the nest, the bird brings a load of mud/dung to the nest. So far I have never noticed pilfering of clay/dung from other nests although pilfering of fibre is part of the nesting activity in the case of most males. Some are more proficient than the others in the clandestine act.

TABLE 1

Ploceus philippinus : DATA ON NUMBER OF MUD/DUNG LOADS BROUGHT IN TWO NESTS

Hour	Minute	Nest I		Nest II		Remarks
		Mud	Dung	Dung	Mud	
April 29, 1963						Activity commenced at 5·03 hrs.
5	48·5	..	1	..	..	
5	49·5	..	1	..	..	
5	51	..	1	..	..	Dung was collected from the paddock near the pond.
8	30	..	1	..	..	
12	53	..	..	1	..	
12	54	..	..	..	..	7 others gathered mud.
12	55	1	..	..	..	
12	57	1	..	..	..	7 others gathered dung.
13	26	..	..	..	..	4 others gathered dung.
13	53	..	..	..	..	3 others gathered dung.
April 30, 1963						
5	43·5	..	..	1	..	
5	45	..	..	1	..	
6	34	1	..	..	..	
6	34·5	1	..	..	..	
8	23	1	..	..	..	
8	38·5	..	..	1	..	
8	39·5	..	..	..	1	
8	58	1	..	..	..	
11	36	..	..	..	..	Many others gathered dung.
12	07	..	..	1	..	
12	40	..	..	1	..	
13	49	..	..	1	..	
16	50	1	..	..	..	
May 1, 1963						
5	33	..	1	..	..	Mud was always collected from the side of the pond.
7	25·5	..	1	..	..	
7	28	..	1	..	..	
11	00	..	..	..	1	
11	02	1	..	..	..	
11	04	1	..	..	..	
13	51	1	..	..	..	Activity terminated at 18·15 hours.

N.B.—Foundations for nests I and II were made on April 28, and no mud/dung was brought to the nests on that day.

Weight of mud/dung loads

I could not weigh the fresh mud/dung used by a bird. Weighing the dry material collected from nests, in some cases several months after their fixing, may not reveal the exact situation. Nevertheless, the data suitably adjusted for the moisture content may give some idea of the total weight of the materials used in a nest. Approximate percentages of moisture content in mud and dung have been calculated by weighing known quantities of fresh mud and dung collected from the same localities and getting their weights after drying them. The figures (in gm) are as follows :

Material	Wet weight	Dry weight	Moisture percentage
Mud	113·3	66·2	41·57 on wet weight
Dung	144·0	20·2	85·97 on wet weight

Thus, fresh mud weighs a little less than twice the dry mud, but wet dung weighs a little over seven times the weight of dry dung.

Figures 1-3 (Plate I & II) show views of mud or dung patches in four nests. Where abundant quantities of the mud/dung are used, they are generally dumped into a thick lump or coating. Hence by examining a patch it is often difficult to estimate the number of loads of the material used in such a patch, especially if it is dung plastering (Plate I, Fig. 2, and Plate II, Fig. 3). However, where the nests have smaller quantities of mud, it is possible to estimate the number of loads more or less accurately (Plate I, Fig. 1). It is still more easy if the mud-blobs are sparsely fixed. Another factor that helps in the identification of individual loads is the variation in the shades of colour of the different loads. In some other cases mud blobs alternate with dung (Plate II, Fig. 3). Faeces plastering is distinctly different from

TABLE 2

Ploceus philippinus: NUMBER OF LOADS AND WEIGHT OF MUD IN NESTS

Kind of fibre used in nest	Mud or dung	Wt. in gm. of plaster on side			Calculated wet wt.	Approx. No. of loads
		Left	Right	Total		
1. Sugarcane leaf	mud	3·09	7·36	10·45	17·87	7+17
2. Sugarcane ,,	mud	7·05	5·56	12·61	21·56	16+12
3. Wild cane ,,	mud	9·66	16·98	26·64	45·55	17+22
4. Sugarcane ,,	mud	1·34	7·53	8·87	15·17	4+21
5. Wild cane ,,	mud	2·48	7·58	10·06	17·20	6+16
6. Ordinary grass	mud	9·84	11·92	21·76	37·21	20+26
7. Rice leaf	dung	2·72	nil	2·72	19·39	9+nil
8. Rice leaf	dung	6·30	0·44	6·74	48·06	30+ 6
9. Ordinary grass	mud	13·86	7·64	21·50	36·77	22+15
10. Ordinary grass	mud & dung	8·68	8·99	17·67	78·10	22+26
11. Rice leaf	mud	35·30	..	35·30*	60·36*	72+ 0*

N.B.—*The figures relate to mud blobs present on only one side. That present on the other side was ignored as portion of it was lost while collecting.

Nest 10 had about equal quantities by dry weight of mud and dung.

the rest. It is on the basis of the above facts that the weight of a single load of mud/dung has been calculated. Table 2 gives data on the weight and number of loads of mud/dung used in individual nests.

It appears as though the weight of a single load of mud/dung varies from region to region, although the mean weight works out to be about one gramme. Where smaller numbers of loads are used, as in nests from southern and western India, the loads seem to be heavier than those seen in North-eastern India. The bird usually carries a load that is maximum for its capacity and since he has to make a steep ascent with the load to reach the nest, he often showed visible signs of strain. On windy days, I noticed some males carrying mud to the nest were tossed away to adjoining leaves. During two such occasions, the birds abandoned the mud/dung and flew for safety.

The mud/dung is fixed very firmly on the inner wall of the nest so that it is impossible to pull away the dry plaster without breaking the fibre. Since the bird effectively spreads the sticky material with his beak, beak marks are seen on the surface of the paste which are more clear on mud-blobs (Plate I, Fig. 1). Often fresh fibre is woven so as to cover part of the plaster (Plate I, Fig. 2).

Plastering in ' Bachelor nest '

The helmet-stage nest is also spoken of as ' bachelor nest ' since up to this stage it has been owned and used during the day time only by the male (builder) who is yet to acquire a mate. If no female selects a nest for a long time, such a nest is either cut down by the builder himself, or more frequently, it is lengthened unusually with a droll look, still maintaining the two openings. It is more appropriate to consider only such nests as ' bachelor nests '. The body of some such nests measures three or even four times longer than that of a nest built by an efficient male and accepted fairly soon by a hen. The initial ring in such abnormal nest gets shifted downwards since the inner dome is also proportionally filled up as the nest grows (Davis 1971). It is rather difficult to explain the presence of mud in some ' bachelor nests ' since most others do not have mud. An important reason for a nest to get rejected by females in the normal breeding colony seems to be that it is probably not strong enough to withstand the force of wind. Not only such clumsy and weak nests, but also the wrongly aligned ones are discarded by the hens. Most of these droll looking elongated nests do not have any mud/dung plastering at all. However, in a limited number of them, a maximum possible quantity of mud was seen. While dissecting out one of the nests, mud coating was noticed over a length of 25 cm. on two opposite sides of the portion meant for the egg-chamber. Obviously, most of the mud coating was covered with fibre because the ceiling of the dome was gradually lowered as the bridge extended downward. Even in such a nest, not even a single blob of mud was seen on the wall of the antechamber.

Discussion

Mud/dung present only on one side of ring

Even when the nest of baya weaverbird is incomplete, the birds enter the nest through the opening of the antechamber and perch on the bridge (lower part of the initial ring), facing the future egg-chamber. According to Collias & Collias (1962), this situation is remarkably applicable to the African village weaverbird (*Textor cucullatus*) which almost always enters the nest from one side and faces the same way, keeping one foot on each side of the bottom of the ring. Perching on the ring, the baya fixes some mud/dung on the wall of only the egg-chamber, usually in two patches, one to the left and the other to the right which happens to be the most convenient places as the bird does not reverse the direction of its perch. So far as the initial ring is concerned these two patches fall only on one side (egg-chamber side). But usually it is stated that mud-blobs are fixed on the two sides of the initial ring.

The firefly story

The purpose of the mud/dung seen inside the nest is certainly not to hold fireflies to illuminate the nest at night. According to Dewar (1909) and Ali (1931), this story is nothing more than a poetic exaggeration. This is a form of exaggerated eulogy by those who have been fascinated by the sagacity of the tiny bird who weaves an exquisite pendant nest. My observations throw further light on two additional points which would disprove this myth. From graph (Text-fig. 1), it is clear that the mud/dung is brought between the second and seventh day of building the nest, at a period when the nest has not reached beyond the helmet stage. It is an established fact that the builders do not spend the nights inside their nests, but they get back to the usual roosts. Moreover, at this stage the nest has not yet been chosen and occupied by a female. Therefore, the ' wet fittings ' and the ' bedroom lamps ' become meaningless in a vacant house. If at all illuminating the brood-chamber is justified, it should be after the hen starts to brood, and more so, when the mother is with fledglings. The other point is based on the information given in Table 1. The timings of bringing the cementing material clearly prove that the mud/dung is not meant for burying the heads of fireflies. Most of the plastering material is carried to the nest between 5-30 a.m. and 2-00 p.m. and by dusk, it becomes too dry and brittle to accommodate an insect. In none of the over one hundred nests I have examined, there was any firefly fixed to the mud—not even a head. None of my students and associates who once believed in the myth, could convince me by bringing a nest bearing a firefly. Although beak marks are clearly seen on the dried up mud (Plate I, Fig. 1), they did not resemble the impressions caused by the burying of an insect.

Balancing the nest

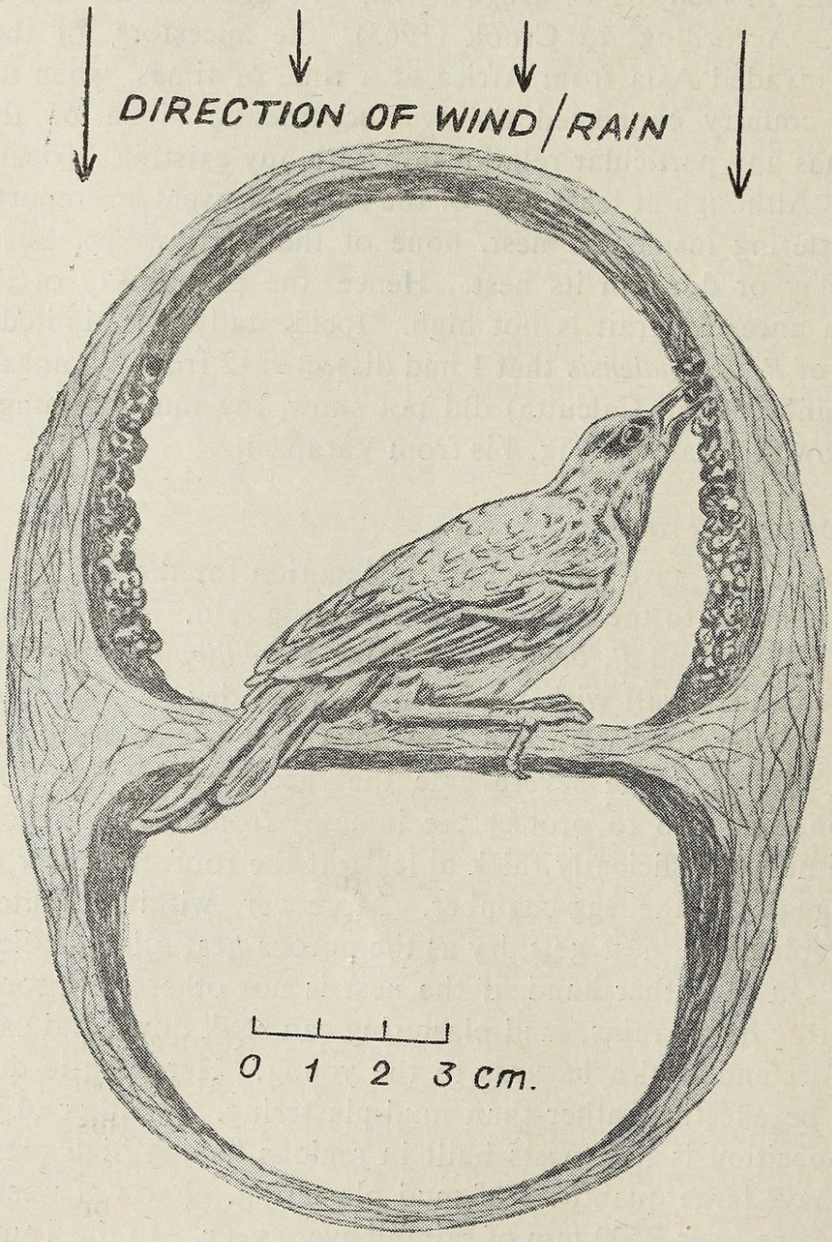
Jerdon (1863), who was one of the earliest to describe the baya, mentioned the significance of mud-blobs thus: ' From an observation of several nests, the time at which the clay was placed in the nests, and the position occupied, I am inclined to think that it is used to balance the nest correctly, and to prevent it being blown about by the wind. In one nest lately examined, there was about three ounces of clay in six different patches.' Jerdon also believed that the pieces of clay are more commonly found in the unfinished nests (built by the males for his own special behoof) than in the complete nests. Ali (1931) reacted sharply to Jerdon's explanation of the mud being used for steadying the nest during violent winds. Ali did not come across in any of the over fifty nests examined by him, mud weighing more than 1·4 oz. and so he concluded that this insignificant extra weight could not keep the nest steady during violent winds. Usually in the same colony there are many nests which do not possess any mud at all, but having equal survival value like those with mud-blobs. The oropendolas (*Zarhynchus wagleri*) with long woven pendent nests do not provide any ' balancing material ' against violent trade winds. Crook (1963) mentioned that the use of mud-blobs on either side of the initial ring may stabilise the swinging nest in high winds. But an additional or alternative function is also possible. About the quantity of mud or dung used in a nest, Ali's figures are somewhat less compared to some of those wet weights given in Table 2. Most of his earlier observations relate to nests from Maharashtra State where birds fix smaller quantities of mud whenever they use it. The quantity of mud used in one of the nests taken from a mahua tree (*Madhuca longifolia*) standing in a flooded rice field near Varanasi (U.P.) should have been more than what Jerdon had mentioned. While admitting that any extra weight in the nest will contribute towards its stability, and reduce the tilt during wind, it is rather unconvincing that small quantities of mud, and in many cases cattle dung that becomes so light when dry (one seventh), can prevent the nest from such violent swayings the nest is subjected to during gales. Moreover, mud is usually smeared only on two fixed positions. If balancing disproportionate nests, arising out of faulty construction, is the main purpose of the mud, why is it that it is always placed at specific regions ? Small changes in the alignment of the nest can be brought about by making minor modifications in the construction of the nest. Another reason why the balancing theory seems untenable is the fact that the ball nests of *Ploceus megarhynchus* which are placed on branches and not liable to be tossed about by wind also have mud-plastering on the inner wall (Ali & Crook 1959). Moreover, even in some nests hung on outgrowths on the walls of wells which are adequately protected from wind have mud-blobs.

An ancient custom

Ali (1931) suggested that the habit of sticking mud in the nests is a form of atavism—the relic of some ancient custom at one time beneficial to the species. He also hoped that a study of allied forms, their evolution and development might throw some light on this point. Wood (1926) was also of similar opinion. Most of the 95 species of weavers (Ploceinae) occur in Africa and only five are known in Asia (*Ploceus philippinus*, *P. manyar*, *P. benghalensis*, *P. megarhynchus* and *P. hypoxanthus*). According to Crook (1963), the ancestors of the Asian weavers invaded Asia from Africa at a time or times, when a suitable tract of country connected the two continents. None of the Asian species has any particular relationship with any existing African *Ploceus* species. Although at least four of the Asian weavers are reported using mud-plastering inside the nest, none of the African species is known to use clay or dung in its nest. Hence, the probability of this habit being an ancestral trait is not high. Incidentally, the limited number of nests of *P. benghalensis* that I had dissected (2 from Varanasi, 2 from Karnal and 3 from Calcutta) did not show any mud or dung, one of them shown in Plate II, Fig. 4 is from Varanasi.

Protection against rain

Crook (1963) gave yet another explanation for the mud-blobs : that they give shelter to the inmates from pouring rain. He mentioned that *Ploceus manyar* and *P. benghalensis*, like *P. philippinus*, plaster part of the egg-chamber wall with mud which, when dry, is probably a most effective barrier to water. But the baya nest is adequately built not only to withstand the severe gale that accompanies the South-West Monsoon, but also to protect the inmates from being drenched. As the fibre nest is sufficiently thick at least at the roof, no water can enter and stagnate in the egg-chamber. Moreover, within minutes of the rain stopping, the nest gets dry as the porous nest allows quick evaporation. On the other hand, if the nest is not otherwise proof against rain, during heavy rains, mud plastering can soak down and cause more discomfort and health hazards to the young. Here, cattle dung coating can be effective rather than mud-plastering. Another objection to this proposition is that nests built in regions having high precipitation do not have large quantities of mud plastering. Parts of west coast of India receive over 2500 mm of rainfall every year. In the Tamil Nadu, Kerala and Mysore regions of West Coast, coconut is the most preferred tree siting for baya nests. This palm also provides very strong leaf fibre for nest-building. In these nests, either no mud is fixed at all or very negligible quantities are seen. In the north-eastern region of India comprising West Bengal, Bihar and Orissa where the rainfall is only about 1000 mm per annum, baya nests show the maximum amount of the plaster. Moreover, the use of dung, a relatively better rainproof material is prevalent here. The rain-proofing theory may further run into difficulties atleast with baya nest, since the portion of the nest that faces the source of rain or wind is the egg-chamber. The central strip of the egg-chamber that faces rain most is devoid of any plaster since the mud patch or patches are seen on either side away from the middle line (Text-fig. 2).



TEXT-FIG. 2. Male baya perching on the lower portion of ring and fixing a mud blob at a point not far from the ring.

The hemispherical shape of the egg-chamber results from the fact that the male baya invariably builds while perching on the bottom of the ring. Hence, weaving is extended up to where his beak can reach. The bird obviously struggles to weave along the middle strip of the egg-chamber, the farthest region from the ring. This is also the region which is least accessible to the female at the time of her critical nest-examination. As explained earlier, the male carrying a heavy load finds it difficult to reach the middle strip of the egg-chamber. Therefore, he fixes the mud on the side wall nearer to the ring (Text-fig. 2). Thus, two regions are equally close to him, and accordingly, he fixes the mud or dung in two patches. The bird shows no preference for any particular direction for smearing the mud since there are some nests where only one patch is seen either on the left or right side. Some nests have an excess quantity of the plaster on one side either on the left or right. The numerous nests not having any mud/dung do not support the rainproofing theory.

Plastering reinforces nest

The above discussion shows that the various explanations offered by different ornithologists on the presence of mud/dung in the baya nest are not fully convincing. My views agree with those of Burgess (quoted by Jerdon) who mentioned that the plastering serves to strengthen the nest. Crook also conceded to this view indirectly. The following information may support this point :

1. Dismantling a nest, fibre by fibre, is impossible without removing the mud/dung coating wherever it is present. In order to find out the total number of fibres involved in the weaving of different types of baya nests from different regions of India, a few nests were dissembled. Separating the fibre from the free end of the entrance tube backwards, obviously, is the easiest possible way to dismantle a nest. The first nest chosen was a medium-sized coconut fibre nest removed from a coconut palm from Kerala. There were only 4 or 5 loads of mud fixed in two small patches. Dismantling the nest beyond three-fourths the tube was almost impossible since most of the long fibres were caught by the mud directly, or firmly entangled with those fixed by the mud. Removing the dry mud meant breaking of some fibre. Hence the nest was soaked in warm water and the mud washed away. This explains the powerful cementing capacity of even limited number of mud-blobs. Incidentally, the process of separating the fibres of this particular nest took a little over 14 hours, spread over 4 days. This nest had a total of 4,002 fibres (allowing a 2-3% increase due to the breakage of fibre) which measured a total length of about 800 metres. Since coconut leaflets yield very long (one fibre measured even 85 cm) and strong

fibre, the number used in this nest is much less compared to that of a nest made of grass blades.

2. Crook (1964) who conducted several tests on the baya, made the following remarks on the use of mud-blobs. 'In tests on nests under construction in which the ring was removed, mud-blobs were found scattered at random on the exterior of the structure and even near the point of attachment to the support.' Although this illustrates the importance of building position in determining the organisation of the normal structure, this also clearly demonstrates the importance of mud as a binding material. The ring being the vital framework of the nest, restoration of damage requires the maximum effort. Since the ring is formed directly from the initial wad at the attachment of the nest with an organ of the host tree, the bird's attempts to fortify even the point of attachment only suggest baya's response to reorient the ring from the initial point of the foundation.

3. The plaster keeps the nest intact in spite of the female's rather violent examination. When a female in search of a nest and a mate enters a half-built nest, she invariably perches on the ring and starts examining it by poking her beak into the walls of the egg-chamber and also by pulling out fibre. The two regions that are easily accessible to her are smeared with mud/dung which reduce her critical examination and save some more fibre from getting pulled out. On the other hand, the plaster appears to reassure her of the strength of the nest, and owners of such nests are likely to get mates quickly. During some of her visits, the nest examiner spends even up to ten minutes at a time in a nest. During this period, she is occasionally seen picking up small pieces of the plastering material and working them between the beaks. The exact significance of this is not clear. Whether there is any need to sharpen the beak, and how far the mud/dung helps this, remains to be investigated.

4. Nests built of long and strong fibre as those from leaves of coconut, sugarcane and some wild sugarcane have relatively small quantities of mud or none at all, while those built with weak fibre like those of rice, maize and banana leaves have heavy plastering. Nests in high rainfall areas generally have smaller quantities of mud in them.

5. The quantity of the plaster varies with the quality of nest-weave. For example, in many regions, the baya uses rice leaves. Those in north-eastern India use the whole unsplit blade or as very broad strips, and eventually such nests are not firm and compact and so they require more cementing material. But the birds in parts of Andhra, Maharashtra and Karnataka States, strip a rice blade into several narrow strands and weave the nest more carefully. Such nests generally do not possess any mud/dung.

1. A patch of mud-blobs showing persisting beakmarks.

2. A portion of a heavy dung plastering covered by fibre.