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# Attacking Behaviour in Homosexual Groups of the Bengalee, *Uroloncha striata* var. *domestica* Flower[1)]

By
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(*With 5 Text-figures*)

Recently, the studies on the structure of animal societies have been much advanced by analyzing the antagonistic behaviours among the individuals. The discoveries of the peck order in domestic fowl and other birds by Schjelderup-Ebbe (1922, 1923, 1924), and of the territoriality in perching birds by Howard (1920) inspired further detailed observations on many other animals (cf. Allee, 1938; Collias, 1944; Scott, 1956). In connection with the studies on the behaviour patterns of aggression successfully undertaken with respect to many animals, the finer components of such behaviour in some perching birds and the various underlying mechanisms have been brought to light of late (Daanje, 1950; Tinbergen, 1951, 1953; Morris, 1954; Andrew, 1956–7; Marler, 1955a, 1955b, 1956a, 1957).

The Bengalee is one of the commonest fancy birds in Japan, it exists strictly as a cage bird, without representatives in the wild state. This species is famous for its mild temperament. It is generally admitted that hostile behaviour is seldom seen among the conspecific members, and that a strong gregarious tendency is exhibited by the formation of a dense cluster through direct bodily contact, as is suggested by another name "Society finch". Nevertheless the present writer found many instances of aggressive behaviour in both sexes during his preliminary observations in 1958. These observations were carried out in order to clarify the social structure of the homosexual groups.

Leaving the comprehensive descriptions of the data for another occasion, the writer in the present paper deals with the attacking behaviour under such artificial conditions alone, together with some implications on the relations of aggression and other social institutions such as dominance order and territory.

## Material and method

The birds reard for this observation were five females named *FA*, *FB*, *FC*, *FD* and *FE*, and five males *A*,*B*,*C*,*D* and *E*. All of them but *FD* were bred in the writer's laboratory and were aged about 9 to 12 months after hatching at the start of the observation. Hence, it is certain that they had reached full sexual maturity. Females had no experience

1) Contribution No. 457 from the Zoological Institute, Faculty of Science, Hokkaido University, Sapporo, Japan.

of egg laying except *FA* which in May laid three unhatched eggs. *FA, FC, C, D* and *E* came from a common strain, while *FB, A* and *B* from another. The earlier life history of *FD* is not clear, because it was purchased from a bird-fancier, but she was indubitably still young and had never laid eggs.

Females and males were kept homosexually in two cages of 90 length × 60 width × 70 hight cm. respectively. In each cage, two hand-made dome nests were supplied together with a few perches on different supports, two water vessels and two food dishes. The feeders were always filled with grain and located on the bottom board in a symmetrical disposition. Two cages were arranged side by side. A thin sheet of opaque paper was inserted between the two faces coming in contact with one another. But the birds could, if they wanted, peep at the members of the other cage through a narrow slit and some small holes broken in the partition (Fig. 1).

Males were observed from the beginning of May to the Middle September and females from July to the end of September. Continuous observations were daily made for 1 to 1.5 hours on each group, with some occasional brief attentions. The whole course of observa-

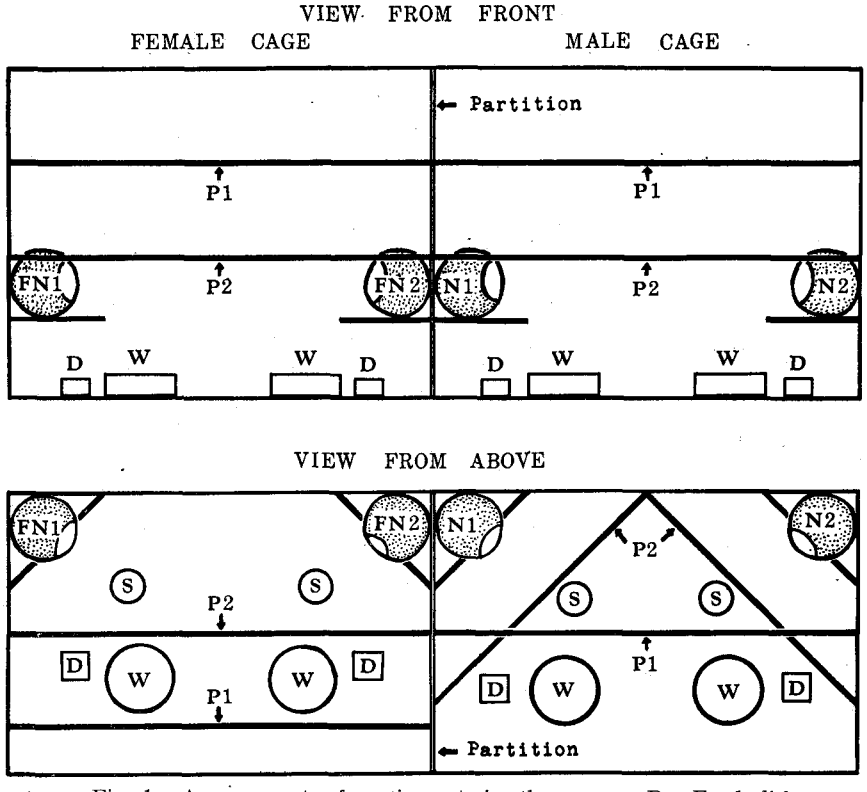


Fig. 1. Arrangement of equipments in the cages. D : Food dishes FN & N : Nests of female and male P : Perches S : Sand and cracked shells W : Water vessels.

tions is divided for convenience of description into three successive periods as far as the male group is concerned. The first period lasted from the release of the birds into the cage to the end of May. The second period from the beginning of June to July 22, when three dead eggs were put into one nest (N2) installed in the cage, and the third period from July 23 to the end of the observation. A 5-days-old nestling after hatching has been placed on 22 August in N2 in exchange for the eggs.

Attacking behaviour recorded here as one of the aggressive acts is a vigorous dashing flight from a remote place against the opponent alighting on a perch or any thing else of the cage. It is conceivable that the attacking behaviour is a slight modification of the ordinary locomotory flight. The threatening posture with sleeked back plumage, horizontal posture of the body and attention to the opponents, such as found in the zebra finch (Morris, 1954) and the spice finch (Moynihan and Hall, 1955), also obviously originated from the locomotory intention movements, as suggested by Daanje (1950). An aggressor usually but not always shows more or less threatening acts towards the adversary before its actual attacks. When a bird was subjected to attack by another bird, it either takes flight to flee at once from the attacker or maintains its previous position, but erects itself nearly vertically on the perch facing the attacker. In the latter case it was usually followed by a bill fencing or pecking between the birds as in other finches (Morris, 1954; Moynihan and Hall, 1955), and the Bengalee concerned perphaps have the equal strength in regard to the dominance-subordination as in the zebra finch (Morris, 1954).

The number of attacks, places where it happened, individuals concerned and other certain related phenomena were recorded exactly here in each group. On the other hand, the interaction of each individual in a homosexual group does not always involve antagonistic behaviour alone, but also many co-operative or neutral behaviours in the life of the flock, such as clumping — direct body contact with fluffed feathers (Moynihan and Hall, 1955; Morris, 1956, 1957), social preening — preening of the mate (Moynihan and Hall, 1955; Morris, 1957), simultaneous nesting in one nest, feeding together at one dish, homosexual copulation, etc. The synoptic consideration of such acts may be indispensable for thorough understanding of intricate inter-individual relations, yet as the greater part of the data is still under preparation, only the clumping and homosexual relation are briefly touched on as far as they are connected with the attacking behaviour.

## Observations

### Male Group : First Period

*Attacking*: No attacking action against other members was seen during the first day. Ten days after, *D* occasionally made a few attacks on *C*, but not so severely. During these days, other individuals showed rarely rush attacks, and even if they did they made only one or two faint jestures. The manner of weak attacks seemed to be similar in some degree to the hopping behaviour carried out at the finale of male dancing display before his mounting. The frequency of attacks was yet not often in the middle of this period, except for the case of attack $D \rightarrow C$, and each bird attacked all of his members uniformly. But in the course of the later half of the period each of the birds directed his attacks against definite opponents, so that it would respond more sensitively through the proximity of such definite rivals than others, suggesting the appearance of an attack

dominance relationship among the members in the order of $D>C>E>A>B$ (Fig. 2).

At the middle stage of this period, first $D$, and $E$ after a little, began to enter into N2 and often rested there during the daytime. Correspondingly, the birds tended to prefer particular sections of the cage, where they burst their attacks more severely than in other places; the attacks of $D$ and $E$ were started usually when the others entered into N2 or alighted on it by chance, and $A$ attacked the others when the latter had come into N1 or even approached it. But $C$ made his onsets upon the opponents in most cases from a neutral place other than the nests and their vicinities. The peculiarity of $C$ will be treated later in discussion. Such localization of attacks was more rigidly established in the next period.

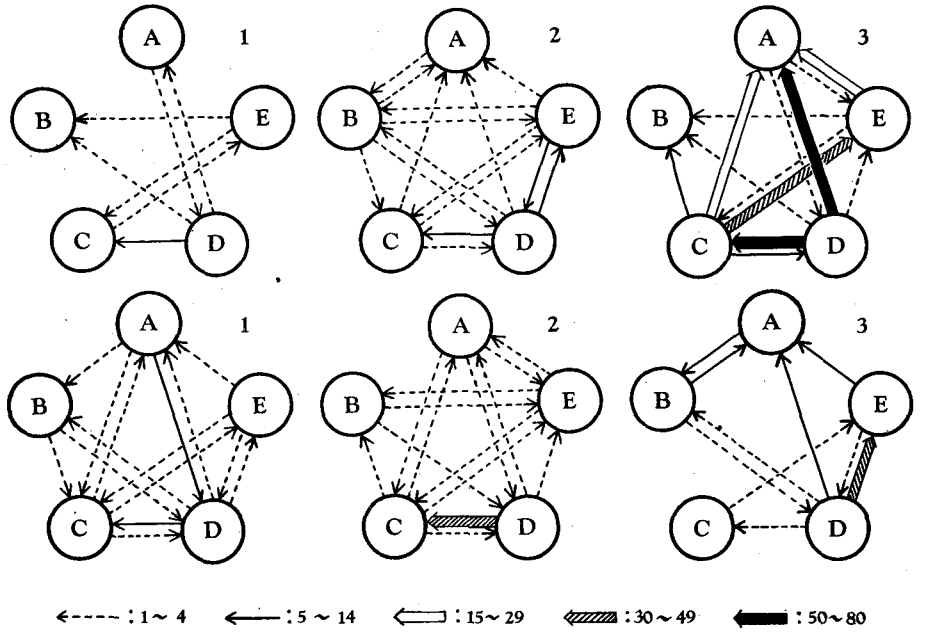


Fig. 2. Sociograms based upon attacks and clumps in the first period of male group. Attack-relation in above and clump-relation in below. Numbers of attacks and clumps for 8 hours are summed up in each. 1 : Early May 2 : Mid-May 3 : Late May.

*Clumping*: In contrast with attack, all of the members readily clumped with each other on the perches even on the first day when they were released in the cage. Corresponding to the directional attacks mentioned above, definite combinations in the direct body contact were gradually established at the end of this period between $D$—$E$ and $A$—$B$ (Fig. 2). However, it must be remembered that in the neutral area the aggressor also would clump with his opponents which

he has been accustomed to attack intensely at the nest and its vicinity. Judging from the relationships of their attacking and clumping activities, it is probably certain that *A*—*B* and *D*—*E* may be forming each a homosexual pair, or subgroups, like a normal pair of male and female. Furthermore, the formation of each pair coincides with the observations on their social preening, joint occupation of the nest in the daytime and behaviour at food place. During the first stage of this period some homosexual courtships were also recorded in all individuals. But the sexual behaviour, especialy copulation, did not always strictly correspond to these pair formations (Table 1). During the night all birds rested together in one common nest (N1).

Table 1. Frequency of homosexual copulations in male group.

| Active male | Pseudofemale | | | | |
|---|---|---|---|---|---|
| | A | B | C | D | E |
| A | – | 2 | – | 1 | – |
| B | 3 | – | – | 1 | – |
| C | 1 | – | – | – | 1 |
| D | – | – | 1 | – | – |
| E | 1 | 3 | – | – | – |

## Second Period

*Attacking*: In the final stage of the last period, attacks tended to become almost unilateral between the birds concerned, reaching nearly attack-right type defined by Allee (1938), although a few counter-attacks by the subordinate individual were occasionally seen in some regions of the cage. Then, there appears to be something like an attack-dominance hierarchy in the group (Fig. 3). Burst of attacks from the preferred area, or defence of a favorite object, were carried out frequently by both *D* and *E* at N2 or its vicinity, and by *A* at N1 and the region near by. From these activities it appeared that the territories of each subgroup were gradually being settled around its nest. But *C*'s attacks did not reveal the defence of any definite objects or areas. Further, the frequency of his attacks widely varied day by day, suggesting the different character of his attacking act from the others in principle.

Co-operative behaviour for the defence of their nest was observed infrequently between *D* and *E*, in addition to their single-handed resistance to intruders. As one of them entered into their empty nest, the other soon made attacks on other birds, not only when they stayed near N2 by chance, but even if they were at a distance from the nest. Protective actions were taken so vigorously as to drive the opponents farther away, then the active partner came into the nest throwing his attention to the matches patiently. In the first stage

of this period $E$ was dominant over $A$, $B$ and $C$, but each attack-dominance relationship of $A<D$ and $C<E$ reversed absolutely into $A>D$ and $C>E$ in the later half of this period, and such square attack-dominance order as $A>D>C>E>A$ (except $B$ regarded as omega bird) continued during about one month.

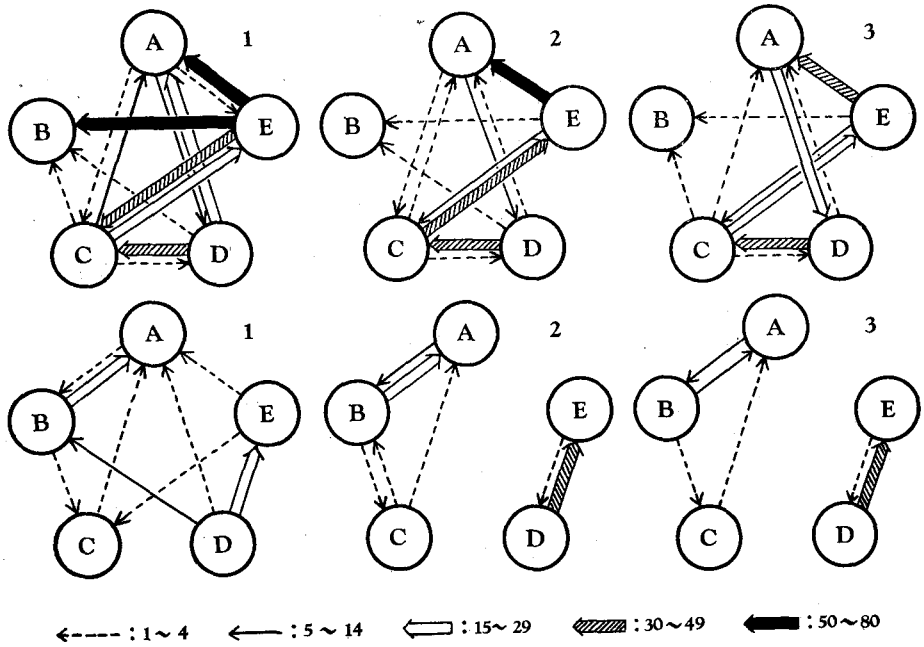


Fig. 3. Sociograms based upon attacks and clumps in the second period of male group. Attack-relation in above and clump-relation in below. Numbers of attacks and clumps for 8 hours are summed up in each. 1 : Early June 2 : Late June 3 : Mid-July.

*Clumping* : In the first half of this period, all members still clumped occasionally with the others fluffing their feathers on the perches, but latter, except with his mate, $E$ and $D$ never clumped at all with $A$, $B$ and $C$ at any place in the daytime till the winter. Relation of their social preening behaviour showed also a similar tendency. Judging from these facts alone, it is probable that this homosexual group has been divided into two subgroups, $ABC$ and $DE$ during this period (Fig. 3).

From their contactual, epimeletic and agonistic activities it would be clear that $A$ has closely paired with $B$, $D$ with $E$, while during this period there was no copulation at all in the flock. But each pair seems to be considerably different in its character because of the accession of $C$ to $AB$ pair. They all would spend the night in N1 every day while they fought vigorously in the daytime to guard their territories. Although more tightly clinging to N2 than $E$, $D$ got out it and

would slip into N1 finally in the evening, just when he used to be pecked violently by *A*. Therefore, the territoriality of the flock might have been not so definite in this stage as in heterosexual groups in larger cages. In addition, it must be noticed that the intensity of the pecks of *A* gradually increased near the end of this period, corresponding to decrease of the frequency of *D*'s attacks upon *A* during the daytime.

**Third Period**

*Attacking*: The duration of the attentiveness by *D* and *E* in N2 had so markedly increased (average 20 min./hour in the daytime), that eggs laid by another Bengalee were put into N2. *D* and *E* immediately began to incubate them on the same day. According to their incubation, the efrequency of attacks of *D* upon *C* decreased abruptly, and his attacking acts against the other birds disappeared entirely after three days (Fig. 4). Among *ABC* group, *A* paid the highest attention to the eggs and tried to approach so frequently to N2, that attacks $E \rightarrow A$ have lasted for a longer term than under the other usual conditions (Masatomi, unpublished). The majority of attacks $E \rightarrow A$ was caused by *A*'s coming into proximity to N2. *A*'s incubation drive was seemingly stronger than that of *B* and *C*. But at the middle of this period, the attacks $C \rightarrow A$ suddenly increased in contrast to the previous condition. It was probably on account of *D*'s nesting to incubate the eggs. Judging from the comparison of the attacking behaviour of all birds, it was a remarkable fact that as a general rule *C* tended to direct his attacks much more against opponents whose feathers were fluffed or preened than against others sleeked (Table 2). The fact may probably indicate a difference

Table 2. Frequency of attacks according to feather posture of opponent, expressed as percentages.

| Attacker | Feather postuse of opponent | | | | Actual numbers of attacks |
|---|---|---|---|---|---|
| | Sleeked | Relaxed | Fluffed | Ruffled | |
| A | 92 | 5 | 2 | 1 | 112 |
| B | 75 | 17 | 8 | – | 12 |
| C | 11 | 33 | 38 | 18 | 347 |
| D | 91 | 4 | 5 | – | 511 |
| E | 96 | 3 | 1 | – | 609 |

between attacks of *C* and others in their character. Attacking behaviour gradually decreased and absolutely disappeared in all the members after 8th September.

*Clumping*: Since the beginning of incubation at N2, *D* and *E* never clumped elsewhere than in the nest, even if they were synchronously out of the nest (Fig. 4). But after a nestling was imported into their cage in exchange for the

dead eggs, they again began to clump with each other after about 20 days. This process — to clump in non-reproductive stage — not to clump during incubation and brooding — to clump again after fledging of their youngs — was almost the same as to that seen in the heterosexual pairs during their breeding cycle. In consequence of the introduction of the eggs into N2, the tendency of *D*'s nesting became stronger than before and finally he stayed alone at N2 even in the night in spite of the absence of his mate which every night rested in N1 together with *A*, *B* and *C* without any remarkable quarrels.

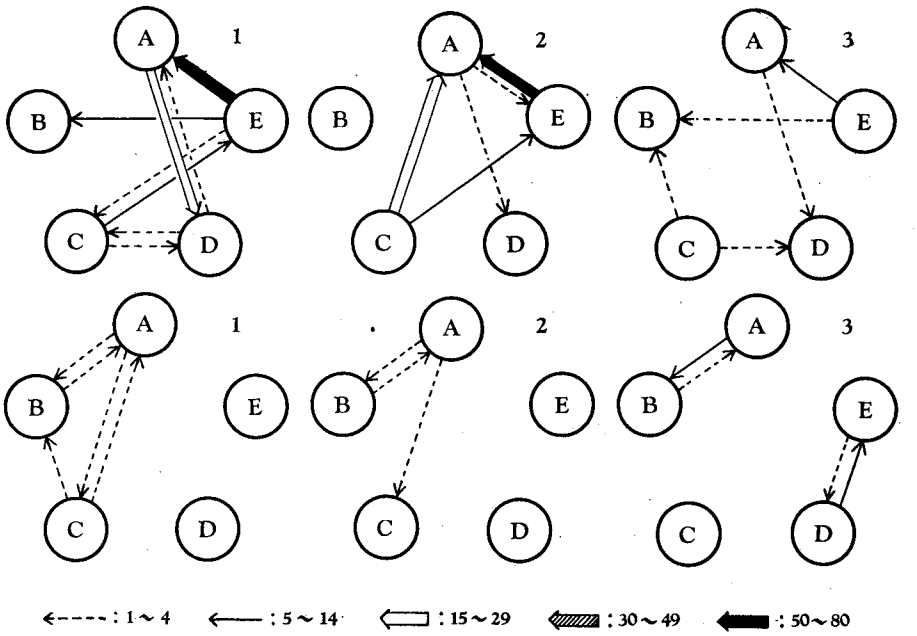


Fig. 4. Sociograms based upon attacks and clumps in the third period of male group. Attack-relation in above and clump-relation in below. Numbers of attacks and clumps for 8 hours are summed up in each. 1 : Late July 2 : Mid-August 3 : Mid-September.

When a 5-days-old nestling was put into the nest on 22 August, *D* immediatly and voluntarily began to feed it showing no fear posture, but *E* did so only after a little time. When *E* found the nestling in the nest, he revealed a fear attitude; sleeked plumage, made care calls, fluttered his tail rapidly and wings intermittently and pivoted his body from side to side. The juvenile developed normally and fledged out on 9th September.

**Female Group**

*Attacking*: Behaviour pattern of attacking of female was similar in general to that of male described above. But unlike the male, the female usually tends to

show her sexual display staying at a definite point, so that she scarcely attacks the other with the behaviour patterns seemingly originated from the flight before mounting as in the male. *FD* and *FE* were loosed together into the cage where *FA*, *FB* and *FC* had already been kept for about one month. After four days from the first encounter, *FE* attacked *FA* most violently anywhere, but she often drove *FC* away from the vicinity of nest (*FN*2) in the middle of the period ; this act continued later on (Fig. 5). They came to occupy in the course of time either nest severally, *FA*, *FB* and *FC* rested in FN1, and *FD* and *FE* in FN2 through the daytime.

*FE* never made attacks on *FD*, because she had formed a homosexual connection with *FD*. *FE* could be regarded as the most dominant of the group and attack-right relationship might exist for a long time in the flock in contrast to the male group. When all attacks were scrutinized in each case, however, it became plain that they were carried out not to maintain the dominance-subordination

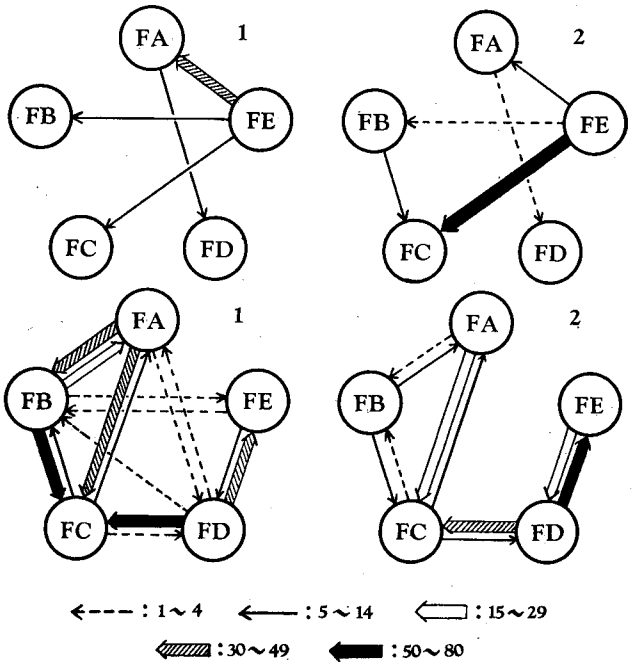


Fig. 5. Sociograms based upon attacks and clumps of female group. Attack-relation in above and clump-relation in below. Numbers of attacks and clumps are totaled in each half course of whole observation. 1 : July to Mid-August 2 : Mid-August to September.

relationships in the neutral area, but chiefly because the birds tended to defend their own respective territories. Each member of a pair also began to stand against the other group reciprocally in co-operation with her mate like the situation in the normal heterosexual or in the male homosexual pairs mentioned before. The bond between *FA–FB* pair and *FC* seemed not so rigid, because *FC* clumped with *FA* and *FB* on the perches or rested with them in FN1 at first, but sometimes *FB* tended to threaten or attack her to drive her away from their territory. This may be understood from the fact that *FC* clumped with one mate, *FD*, of the opposed pair (Fig. 5).

*Clumping*: Expressing the submissive attitude, *FD* clumped with *FC* in a short time soon after having been released in the cage. Then as if regarding all members as her mates on the next day, she actively approached with fluffed plumage, clumped and preened, or preened by, them. But after the middle of the period she clumped preferably with only *FC* and *FE*, especially with *FE* intimately. *FE* did not clump with any individual except *FD* after three days from the releasing (Fig. 5). Then it might be sure that they had formed two subgroups, at least within five days after the first meeting, as well as in the case of the male group. *FA*, *FB* and *FC* started to enter into FN1, *FD* and *FE* into FN2 to rest separately in the daytime. Mutual tail-quiver displays between two females were observed very often; *FA* proceeded sometimes towards *FB* with a carriage of masculine display, also *FE* to *FD*. In the last stage, *FC* was not allowed to rest in FN1 and then slept solitarily on a perch through the night.

**Other Agonistic Behaviour**

*Threatening*: Threatening behaviour followed immediately by the burst of onslaughts in most cases must have originated from locomotory intention movements. From comparison of threat-dominace and attack-dominance order of the two groups, it may be possible to recognize some similarities between them.

*Pecking*: Generally the head portion of a bird is pecked as a target by an aggressor like as in other finches (Morris, 1954; Moynihan and Hall, 1955). The bird pecked by another responds instantly either by fleeing or by turning its face towards the aggressor. Thus, in the latter case, it would usually begin to fence with its beak. But in the Bengalee these behaviours can not be adopted as a criterion of the dominance-subordination relationship, because of the pronounced variability of their degree even under similar situations. Further observations of finer behaviour and analysis of behaviour patterns seem to be necessary to obtain plausible cues for analysis of the dominance-relationship.

*Fighting*: Mutual vigorous pecking, or fighting, is induced as a result of attacking pecking and approaching to the other birds. The occurrence of actual fighting must depend upon numerous situational conditions and the results differ extremely in each case. It is still difficult to understand the details about the states and causes of fighting. But generally the birds possessing their own respective territories were stronger than the intruders in the territory as revealed

in many other animals.

*Approach-Avoidance*: It is a matter of course that, when the dominant-submissive order exists, a submissive bird avoids the dominant approaching it, for the purpose of evading physical troubles (Allee, 1938; Marler, 1956). There are two manners to approach the mate, intentional (directional) and occasional. In the former case the birds show antagonistic or friendly attitudes, often exhibit sexual display. The response towards the approaching mate is very different from case to case. Under the present observational condition, such as in the small cage, the distinction of approach or avoidance is not always easy, and even in the clearly observed cases the results do not strictly correspond to the attack-dominance relationships observed here.

## Discussion

Up to the present, the social structures of the cage birds have been studied by Masure and Allee (1934) on the shell parakeet, Shoemaker (1939) on the canary, Marler (1955a & b) on the chaffinch and so on, but no study on the attacking behaviour of the Bengalee has been reported at all. In the writer's homosexual groups of the Bengalee, subgroups or homosexual pairs were formed gradually in each which behaved like the normal heterosexual pairs. Moreover, they came to associate themselves with some certain areas or objects within the cage. Numerous attacks were recorded among members of both flocks. Some aspects of such aggressive behaviour are discussed here in connection with some social relations.

*Relation to the social hierarchy*: The cases which result in the escape of the victim from the attacks of aggressors are more frequent than the appearance of actual fighting among them. There are also some counter-attacks of the victim, so it seems that an attack-dominance hierarchy exists in the male flock in reference to the frequency of their attakcs. But the type of hierarchy changed in the course of the present observations. It was a straight line type in one stage (1st period), a circular one in another and still other irregular types in other stages in the same group. Alteration of the social rank of the birds so frequently happened, that there was no long-continuing attack-dominance hierarchy in the male group under the observed conditions, as compared with the attack-right relations in the female group. In breeding seasons, alternation of the relation of dominace-subordination among individuals in captivity is effectively regulated through the progress of physical conditions according to their breeding cycle (Masure and Allee, 1934; Shoemaker, 1939; Marler, 1955a) and many other factors, such as learning, establishment of territory (Shoemaker, 1939; Ritchey, 1951; Tinbergen, 1953), pair formation with low or high ranked individuals (Lorenz, 1952) and so on (cf. Armstrong, 1947; Allee, *et al.*, 1950). In the writer's female group, *FE* seemed superficially to be a despot in attack-dominance relation, but probably that was caused by mere increase of defence of her territory, because most attacks were principally "territorial attacking". Therefore, it seems inappropriate to discuss

the existence of a stable dominance hierarchy generalized on their whole lives from the result of observation of frequency of attack only, as it may be necessary to consider many behaviours for determination whether the bird is dominant or not in its flock.

As one of the most important cues to understand the social rank of a group, the competition among individuals at a common food place were noticed in detail by many ethologists with numerous animals, mainly in birds and mammals, such as recently in the chaffinch (Marler, 1955a), the rabbit (Kawai, 1955) and others (see Collias, 1944, 1950). However, when a Bengalee occasionally encountered other birds of the flock at a food place, furious fighting did not break out usually there even if they were in a hostile relation at other areas. Moreover, the dominant in the attacking relation does not always take precedence of the subordinate at the food position. The relation between *E* and *A* in attacking was an almost attack-right type, *E* being dominant and *A* submissive; nevertheless such an exclusive relation never appeared at the food dishes in which either *E* often avoided alighting near *A* or did not approach *A* which was taking the grains, or even amicably ate the seeds together with *A* as frequently as with his pair mate *D*. In the female flock *FA* seems to be the top one and *FD* the lowest at the food boxes. Because of the development of homosexual relations of the members and continuous presence of enough food, few cases of competition connected with acquisition of food were seen in both of the flocks. Such absence of a definite relation between social rank and precedence over food has been found in the shell parakeet (Masure and Allee, 1934) and certain bunting in captivity (Andrew, 1957). However, these instances differ to some extent in their nature from the cases described in the present paper. It must be remembered, therefore, that the relationship between social rank and priority in eating can be considerably variable among different situations and among species.

*Territory*: Following Hediger's suggestion (1942), this bird can be classified as a "contact animal". During the non-reproductive period, individuals show a tendency to bring their bodies into close contact as a roosting behaviour, with a relaxed or fluffed feather posture like as in other finches (Morris, 1954, 1956, 1957; Moynihan and Hall, 1955), and gregariously sleep in a common nest. With beginning of the reproductive cycle they come to react against a rival to defend their favorite objects. At the same time, the clumping behaviour becomes indistinct not only between rivals, but also within the pair on the perches i.e., there is a gradual extension of individual distance as well as the formation of territorial rights to some objects. Onslaughts of the possessor of a territory, however, would nearly all explode against opponents who encroached on its favorite area; such onslaughts do not burst upon one who comes close to the bird in a neutral region in order to keep its individual distance spread around itself.

During the present observation, the most birds except for *C* in the male group made attacks more frequently from the nest and the vicinity than from any other areas of the

cage against the birds which approached nest whether with hostile or non-hostile attitude. The nests were utilized for purpose of roosting at first in the season, but the birds began to guard their nests from intruders by such as approaching, staring threatening or attacking behaviour, when they started to build the nests for laying the eggs and incubating them. Thus the territory was established around their nest in due course. This course of events and the character of attacking behaviour for defence of their nest are practically the same as those found in the normal pairs.

Quoting the opinion of Diebschlag (1941), Ritchey (1951) has stressed, as to his study on the common pigeon, the importance of the local differentiations of dominance-subordination relationship, even if, as a whole, a well organized peck-order was proved in the flock. The relations between the places where an aggressor burst its onsets upon a bird approaching the nest and the attacker's attitudes are widely various from case to case in the Bengalee. For instance, *E* (or *FE* )was hardly attacked by *A* (or *FA*) when it alighted on the points of the perch where *D* (or *FD*) was always attacked vigorously by *A* (or *FA*). In general, however, the increased dominancy in a bird's own territory was revealed as in many other animals, suggesting the participation of the dominance-subordination relationships in the territorial organization, as has been reported in the common pigeon (Ritchey 1951). It is probable that the extent of the territory is partly determined by the dominance-subordination relationship of the flock, especially when the territoriality has not yet been established firmly, although the influence of the inner drive system, too, must not be ignored.

Further the firmness of territories altered exactly in parallel with the appearance of breeding cycles expressed by nest building, incubation, brooding, rearing, etc. It may also be said that the dominance relationship and lack of appropriate stimuli releasing the sequence of the reproductive cycle in the homosexual groups blocked the establishment of firm territorial alignments. This is the reciprocal explanation of the opinion of Ritchey (1951) who asserted the inhibition of establishment of territory due to the firm dominance hierarchy.

Shoemaker (1939) reported the establishment of a definite social hierarchy in a flock of canaries confined in a relatively small cage, but the appearance of territoriality in the same flock when they were in a larger space. Such relationship of dominance and territory has been reported and discussed in many birds (see Armstrong, 1947). When some Bengalees were reared together in comparatively larger cages, fairly definite territories were established usually around the nest domes (Masatomi unpublished). Hence, if the hypothesis asserting that "territorialism and social rank are two poles of a continuum of behaviour that is dependent upon density" (Davis, 1958) is reasonable, it seems that the complicated relation between territory and social order in the observations described above may be explained by the density effect which brings out a continuous spectrum between the two poles, also by the homosexual circumstance, and as in the chaffinch (Marler, 1956b) by the physical condition of the bird whether in season

or not.

*Homosexual relationship*: The individuals in a homosexual relation never attack their pair mates. When a pair was once formed firmly, it was maintained during a fairly long interval, unless some accidents or other inhibitions have occurred. In a normal heterosexual pair, the male generally tends to attack more frequently than the female to defend their territory, so that, in a homosexual pair, it may be pressumed that the mate more active in attacking, functions as the male and his less active partner comparatively as the female. The frequency and intensity of attacks may be controlled in part by such roles within the pair.

At the first encounter in a strange cage, the amicable behaviour, clumping, was more frequently seen than the attacking behaviour which usually came out during or after the appearance of sexual courtship, pair formation and incubation. It is suggested that the epimeletic behaviour (Scott, 1956) is one of the very important factors by which subgroups may be formed in a homosexual group of this species. In the formation of subgroups or pairs, each individual came to decide whether a bird in its own group is an opponent or not. In such gradual establishment of homosexual subgroups, each bird must hold the balance of power over one other, which may increase the stability of the provisionally started homosexual subgroups, as the case in other animals, for instance in the rabbit (Kawai, 1955).

Soon after one partner of a pair approaches or enters in their own nest, the other often attacks the opponents to supplant them far away from the region in front of the nest. Since such co-operation is peculiar to both heterosexual and homosexual pairs, it is probable that the acts of the partner may accelerate the burst of attacks of the other.

*Frustration*: Attacking behaviour executed by these birds largely seems to have a function of the defence of a particular object, e.g., the nest cavity, i.e., "territorial attacking" in general. However, the attacking acts shown by *C* in the male flock have possessed a quite different significance.

> The lord of a territory usually makes its attacks against rivals, when the latter occasionally intrude into the former's territory established around the nest. Nevertheless, the attacks of *C* were released in any direction in the cage, except at the nests and their vicinities, most frequently from the floor near the partition between the male and the female cages. On the other hand, he often did not experss any agonistic postures to the intruders and sometimes avoided or fled from them, even from the lower ranked individuals in the attack-dominance hierarchy. Moreover, the frequency of *C*'s attacks fluctuated largely from day to day and his onslaughts practically were burst out after he had peeped through a narrow slit of the partition at one of the females in the neighbouring cage which was quivering her tail quickly with a horizontal posture (female display before copulation). His intention movements for an attacking act (sleeking its feathers, turning body, staring at the opponent, slightly depressing body and holding a horizontal posture) was always shorter in duration and much more abrupt than the comparable acts of other birds.

It is well known in many animals that the behaviour pattern of the

opponent is an important visual stimulus in releasing various agonistic activities of the aggressor (Lissman, 1932; Beach, 1942; Scott and Fredericson, 1951; Tinbergenn, 1951). In the zebra finch, it was suggested that the fluffing of the plumage in the state of thwarted escape may tend to inhibit the attacks (Morris, 1954). Such reduction of aggressive behaviour is brought out by the fluffed posture in the chaffinch (Hinde, 1953), and the beak-wiping and preening in the linnet as "comfort activities" (Marler, 1957). But the attacks of *C* were more severe towards the birds who were in fluffing, bill-wiping, preening or ruffling after bathe than to those in sleeking. Furthermore, his attacking pattern has a likeness to the flight activities before copulation of the *so-called third male*, or the male intervening in the copulatory acts between male and female or, as in this case, between masculine and feminine males. Namely, the male discharged his flight from a relatively remote distance as if he wished to mount on the individuals which showed feminine behaviour patterns (taking horizontal posture towards the courting male and remaining still on one point of a perch). As some fighting motor patterns can be evoked through several different urges (Hinde, 1953), it may be possible that the sexual drive would be an important and effective factor in arousing such attacks of *C*, unlike the cases of supplanting attacks; nevertheless there is a superficial similarity in the behaviour pattern.

In consequence, the frustration-agression hypothesis that all aggression is a result of frustration (Dollard, et al., 1939) may be not always applied to all cases (Sargent, 1948; Scott and Fredericson, 1951; Marler, 1957). But in the case of *C*, it is probable that his attacks were caused by the lack of a female mate, in the existence of an increasing sexual drive. His energy might have broken out upon some opponents of the same sex in the form of a rush.

On the other hand, some observers have reported that the courtship display of birds included certain components of aggressive behaviour (Guhl, 1950; Hinde, 1952; Andrew, 1956–7; Wood-Gush, 1956). The behaviour of *C* mentioned, being different from the normal supplanting attacks, could be regarded either as an exaggerated expression of mounting flight, or as one of genuine attacking behaviour in the sense described above. At the start of the observations, the hopping for mounting could not be clearly distinguished from the so-called attacking behaviour of *C*, but it is conceivable that the particular acts had gradually developed in his life through learning (cf. Beach, 1942; Scott and Fredericson, 1951). The birds are principally deemed to have two contradictory tendencies in the mounting for copulation, viz., approach and flee (Bastock, Morris and Moynihan, 1953; Hinde, 1953). A spheroid posture of bird by fluffing its plumage has a tendency to allow the approaching of the other birds in contrast to the sleeked feather (Morris, 1956). In the case of the male group, preening or fluffing may be of no value for *C* as an appeasement behaviour, and his fear towards the opponents seems to be rather reduced by the external visual stimuli ,not sleeked but fluffed posture in the condition of conflict of drives concerned.

The results of two observations on the attacking behaviour showed sexual diferences : the lack of counter-attacks in the female group and the more frequent attacks in the male group in comparison with the female one. Both correspond to the rarity of attacking tendency in the normal life of females. No attacks caused by the direct thwarting of sexual drive were recorded in the female group.

Finally, the positive significance of the attacking must not be ignored. From the absence of actual destractive injury by the attacks with the exception of slight physical pain by occasional collision at the time, Craig's opinion (1928 quoted by Marler 1957) that "fighting is not sought for its own sake, but is resorted to as a means of defending the agent's interests" can be also applied to most instances of attacking behaviour observed in the present study.

## Summary

It is generally said that the Bengalee is of extremly gregarious nature and has no hostile temperament at all. But aggressive acts were often observed in two homosexual flocks consisting of five females and five males respectively kept in small cages. Among various aggressive activities such acts as the rush of flight versus the opponent from a distance were mainly discussed in the present paper.

The female group was observed daily during about three months and the male group for about five months in the summer. The interindividual relationships in attack were described briefly.

Judging from the obtained sociograms alone, it is assumed that the male group might develope an attack-dominance relationship and the female one an attack-right type. But the birds formed two homosexual pairs within each group and the attack-relations seemed to be mainly regulated by these pair formations. Each pair occupied the nest placed in the cage separately and the attacks were made more frequently to expel the birds which intruded into the area around a nest. The birds which could not pair with another were loosely adjunct to either of the pairs.

The character of attacking behaviour observed here was interpreted with reference to both social hierarchy and territory. There was no typical and consistent attack-dominance relationship in the male flock, while the relation was relatively lasting in the female group. Most of the attacks are "territorial attacking" in both groups, but territoriality seems to be not complete and to be affected with dominance relation among members, suggesting a mixed relation of dominance order and territoriality. Attacking manners of one male were different from others ; the cause was briefly discussed as due to a thwarting of the primary sexual drive.

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