COMMUNAL ROOSTING IN COMMON MYNAS *ACRIDOTHERES TRISTIS* AND ITS FUNCTIONAL SIGNIFICANCE[1]

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(*With two text-figures*)

Key words: communal roosting, common myna, *Acridotheres tristis*

The common myna *Acridotheres tristis* (Linnaeus) is a familiar urban bird. Throughout the year they roost communally at night in large numbers either independently or forming mixed species roosts. The various communal roosts of mynas situated in and around Pune (Maharashtra) were kept under observation for studying the occupation, abandonment and reestablishment of roosts and roosting trees, and the daily routine of mynas from 1973 to 1976. Three well marked seasons were observed in its annual cycle: the pre-breeding, breeding and post-breeding seasons. The probable functional significance of communal roosting in mynas has been discussed in the paper.

INTRODUCTION

Communal roosting and the activities associated with it have been a popular subject studied in a number of avian species (Wynne-Edwards 1962, Braestrup 1963, Siegfried 1971, Zahavi 1971, Gadgil 1972, Tast & Rassi 1973, Ward & Zahavi 1973, Gadgil & Ali 1975, Gyllin & Kallander 1975, Khera & Kalsi 1986) and also in common mynas (Sengupta 1973, Counsilman 1974, Feare 1976, Greig-Smith 1982). The detailed studies on the flock structure, directional routes, population fluctuations, pre-roost gatherings and communal displays, diurnal rhythms in the awakening and roosting activities, intra- and interspecific assemblages during day time and night, mixed roosting and the related social behaviour of common mynas have already been dealt by Mahabal & Vaidya (1989), Mahabal *et al.* (1990), Mahabal & Bastawade (1991) and Mahabal (1992, 1993- a & b).

The common myna *Acridotheres tristis* (Linnaeus), (Sturnidae: Passeriformes) is a familiar urban bird. It is omnivorous and a hole-nester. Mynas are social in their habits. They are generally seen in pairs or in small groups during day time. Throughout the year, they roost communally at night in groups of 100-10,000 birds, either independently or forming a mixed roost along with some other species of birds.

The present paper deals with the observations on the communal roosts and roosting trees, their abandoning and reestablishment, and the probable functional significance of communal roosting of the common myna.

MATERIAL AND METHODS

The studies on common myna were carried out at Pune (18° 30' N lat., 73° 53' E long.) and surrounding areas. Altogether 27 communal roosts of mynas within a radius of 24 km were located (Fig. 1) and censused. Of these, eight roosts were situated in the surrounding areas and the remaining nineteen communal roosts were centrally located within a radius of 8 km. These nineteen roosts were designated as R-I to R-XIX for convenience while recording the observations.

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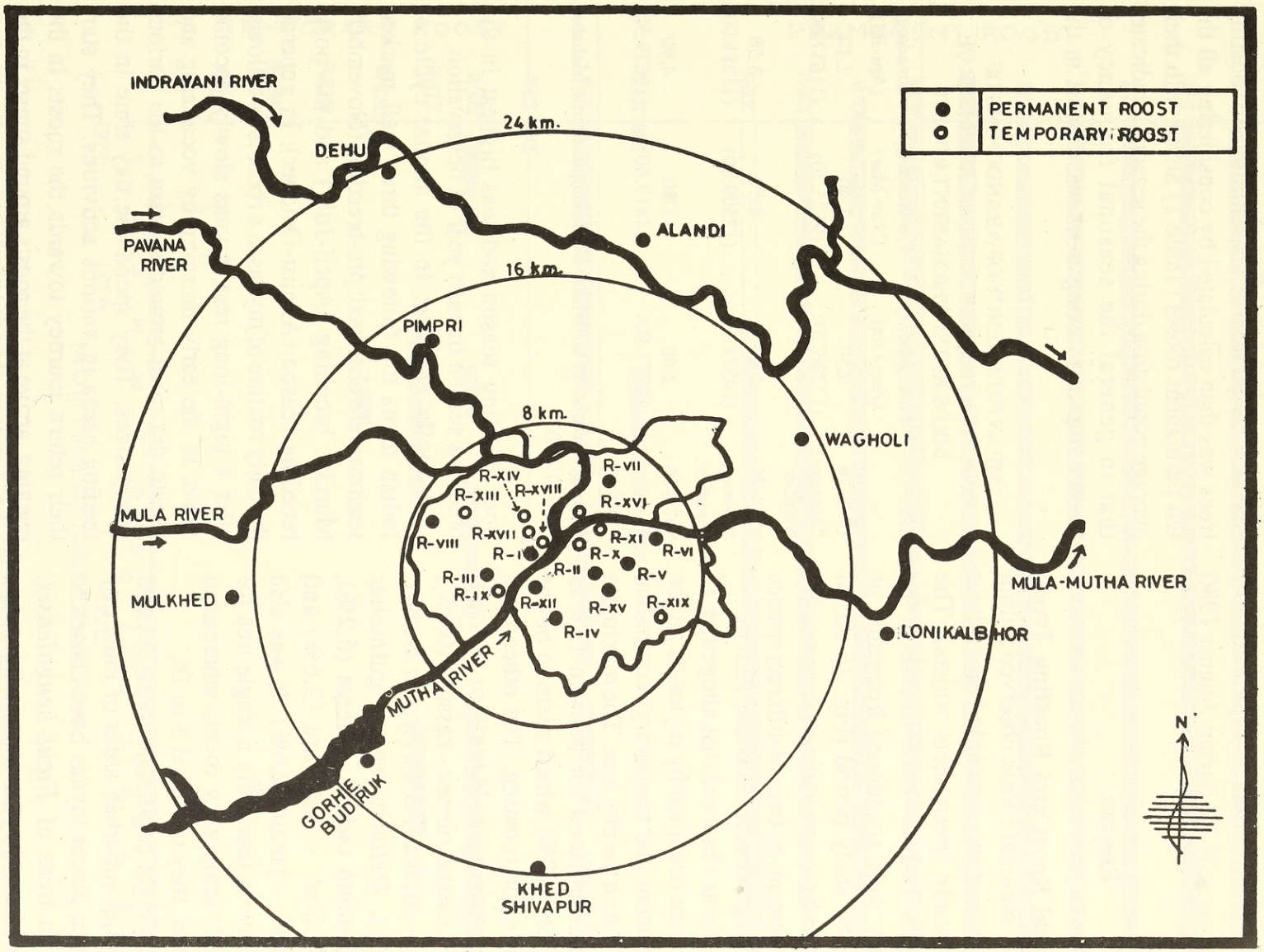

Fig. 1 Locations of communal roosts of common myna in and around Pune . R-I: Police Ground, R-II: St. Vincent, R-III: Film Institute, R-IV: Peshave Park, R-V: Race Course, R-VI: Koregaon Park, R-VII: Yerawada, R-VIII: Pashan, R-IX: Diwagi Metal Works, R-X: Pune Railway Station, R-XI: Bund Garden, R-XII: Vaikunth, R-XIII: N.C.L., R-XIV: Agriculture College, R-XV: Cantonment Hospital, R-XVI: Deccan College, R-XVII: Sancheti Hospital, R-XVIII: Engineering College, R-XIX: Wanwori.

They were censused once a month during June 1973 to August 1976 to study the population, roosting behaviour, roost occupation and abandonment, and the daily routine of mynas. These observations were repeated for confirmation at roost R-IV during August 1980 to July 1981.

Results

Communal Roost and Roosting Trees: Out of the 19 communal roosts observed within city limits, ten roosts were recorded throughout the period of study (permanent roosts). The remaining nine roosts were found to be temporary. They were abandoned frequently or totally during the study period (Fig. 2). At all these sites, mynas have roosted in close proximity with human settlement, on trees of different species at a height ranging between 3.00 and 12.5 m.

Further, it was observed that altogether 75 roosting trees were occupied by mynas at all the nineteen (permanent and temporary) communal roosts located within the city area. The maximum occupation was noticed on banyan (*Ficus bengalensis*) trees (48%) which seem to be the most favourable for roosting. The other trees occupied by mynas were *Mangifera indica* - mango (10.4%), *Cassia siamea* - kassod (10.4%), *Saraca indica* - ashoka (7.8%), *Acacia arabica* - acacia (7.8%), *Delonix regia* - gulmohar (5.2%), *Azadirachta indica* - neem (5.2%), *Tamarindus indica* - tamarind (2.6%) and *Syzygium cumini* - jamun (2.6%). It was also observed that mynas used only a single tree for roosting at each temporary roost, whereas at permanent roosts, they occupied 3 to 16.

Out of the eight communal roosts located in the surrounding suburban areas of Pune city (Fig. 1), at seven places mynas have chosen to roost mostly on trees of *Ficus bengalensis*, whereas at one place, they have roosted inside a factory (Cooper Engineering, Pimpri) on iron structures built near the ceiling. All these roosts were permanent in nautre.

It was noticed that some of the roosting trees at a permanent roost situated within the city area were abandoned temporarily and were again reoccupied during the period of study. The seasonal frequency of abandoning of roosting trees was then calculated by considering all the ten permanent roosts (Table 1) along with their average population during the season. It indicates that in general the seasonal frequency of abandoning of roosting trees was lowest in the post-breeding season and was highest in the breeding season in each year of observation.

Table 1

MEAN FREQUENCY OF ABANDONING OF ROOSTING TREES AND AVERAGE NUMBER OF BIRDS AT TEN PERMANENT ROOSTS

Year	Post-breeding (Aug-Oct)	Pre-breeding (Nov-Mar)	Breeding (Apr-Jul)
1973-74	0.50	1.40	2.10
*Average Number	(17296.70)	(9625.20)	(11637.00)
1974-75	1.60	2.50	3.50
*Average Number	(14591.7)	(12509.20)	(11311.00)
1975-76	2.40	3.80	4.90
*Average Number	(17977.50)	(14819.60)	(13679.50)

*Average number of birds have been compiled from Mahabal *et al.* (1990).

Daily routine: In the annual cycle of Indian myna the following three well marked seasons were observed: pre-breeding (November-March), breeding (April-July) and the post-breeding season (August-October). In general, the daily routine of mynas at a roost is as follows: after a night-long rest, mynas slowly become active in the early morning by vocalizing and vacate the roost around sunrise in the various group-sizes. They spend the day time in the feeding arena in various activities. They start their return journey towards the roosts in the evening, arrive at the roosts around sunset in the various group-sizes and vocalize loudly till they finally retire for a communal night sleep. Further, particularly towards the end of the post-breeding

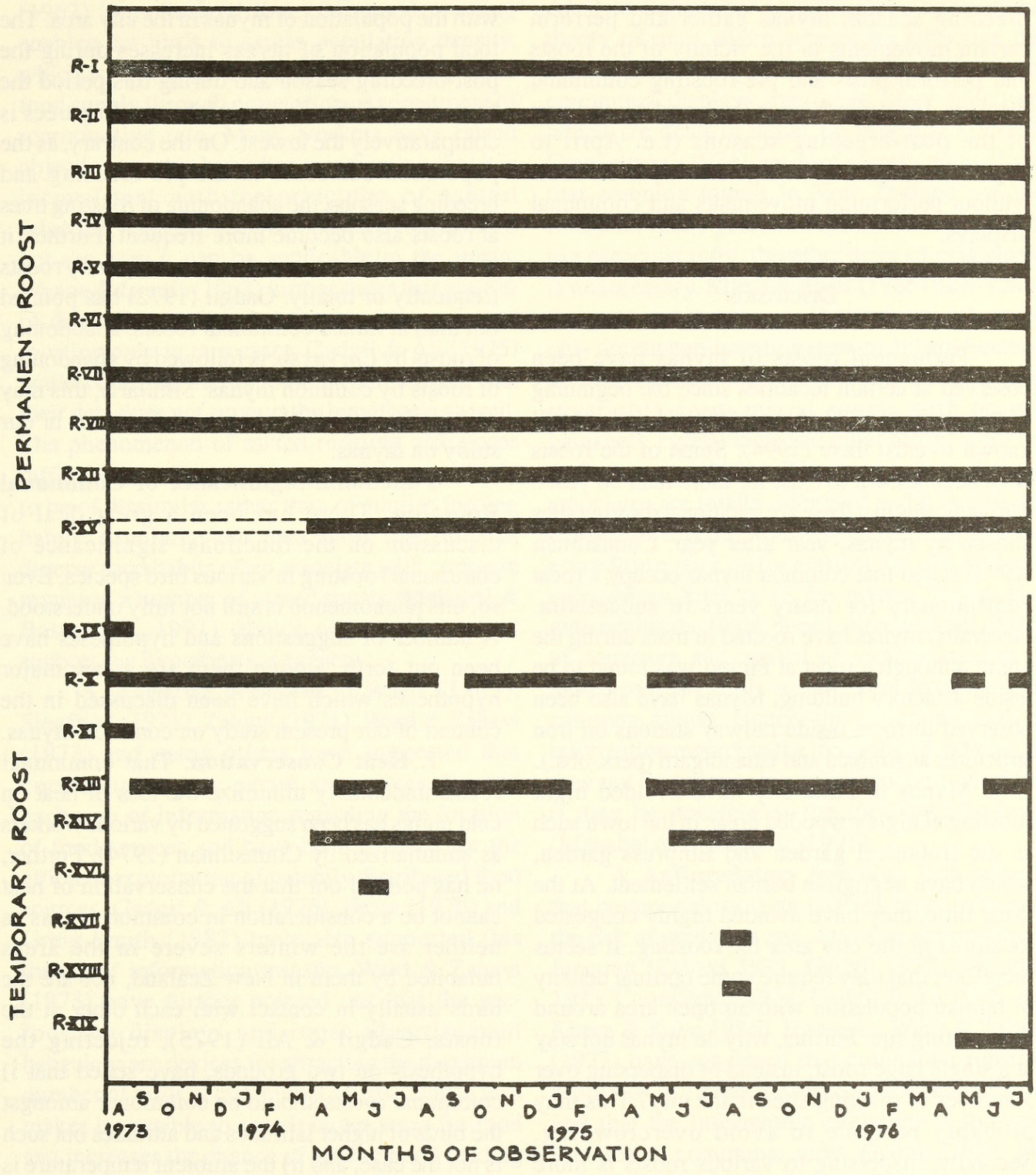

Fig. 2 Periods of occupation of permanent and temporary roosts of common mynas during study period 1973-76.

season (from October) and throughout the pre-breeding season, mynas gather and perform certain movements in the vicinity of the roosts and perform post- and pre-roosting communal displays. However, during the breeding and part of the post-breeding seasons (i.e. April to September), most of them go directly to the roost without performing movements and communal displays.

Discussion

Permanent roosts of mynas have been observed at certain localities since the beginning of this study in 1973, during 1980-81 and are still known to exist there (1994). Some of the roosts have been known to exist for more than 50 years. This indicates that these are traditional roosting sites chosen by mynas, year after year. Counsilman (1974) stated that common mynas occupy a roost continuously for many years in succession. Generally, mynas have roosted in trees during the night, although a roost at Pimpri was found to be inside a factory building. Mynas have also been observed to roost inside railway stations on iron structures at Ambala and Chandigarh (pers. obs.).

Mynas in Pune city have avoided night roosting at highly wooded areas in the town such as the Botanical garden and Empress garden, which have negligible human settlement. At the same time, they have avoided highly congested localities in the city area for roosting. It seems therefore, that they require some optimal density of human population with an open area around the roosting site. Further, why do mynas not stay at a single huge roost, instead of dispersing over a number of roosting sites in the city? This may probably be done to avoid overcrowding. Secondly, dispersing to various roosts is more profitable in order to exploit better feeding spots and also for securing the nearest breeding territories in the breeding season.

The phenomenon of primary establishment, abandoning and re-establishment of roosting trees at a permanent roost seem to be common in mynas. This is probably correlated with the population of mynas in the city area. The total population of mynas increases during the post-breeding season and during this period the frequency of abandoning of the roosting trees is comparatively the lowest. On the contrary, as the population decreases in the pre-breeding and breeding seasons, the abandoning of roosting trees at roosts also become more frequent. Further, it is not clear why mynas abandon temporary roosts frequently or totally. Gadgil (1972) has pointed out that, at mixed communal roosts, abandoning of roosts by *Corvus* sp. is followed by abandoning of roosts by common mynas. Similarly, this may perhaps be applicable to a certain extent in our study on mynas.

Functional Significance of Communal Roosting: There has been a great deal of discussion on the functional significance of communal roosting in various bird species. Even so, this phenomenon is still not fully understood. A number of suggestions and hypotheses have been put forth, among them are a few major hypotheses which have been discussed in the context of our present study on common mynas.

1. **Heat Conservation**: That communal roosts undeniably minimize the loss of heat on cold nights has been suggested by various workers as summarized by Counsilman (1974). Further, he has pointed out that the conservation of heat cannot be a consideration in common mynas as neither are the winters severe in the areas inhabited by them in New Zealand, nor are the birds usually in contact with each other at the roosts. Gadgil & Ali (1975), rejecting the hypothesis on two grounds, have stated that i) communal roosts should be commoner amongst the birds of higher latitudes and altitudes but such is not the case, and ii) the ambient temperature is unlikely to produce vital changes under Indian conditions. Similarly, environmental conditions are quite pleasant in Pune, there are no extreme changes in the ambient temperature, hence this hypothesis may not be applicable in our studies on mynas.

2. **Population regulation**: Wynne-Edwards (1962) hypothesized that communal roosting enables the birds to assess population density, which is then adjusted to the prevailing level of food supply through emigration or adjustment of reproductive rate. Many workers have raised objections to this hypothesis, indicating that it is inconsistent with the principles of natural selection. Counsilman (1974) stated that he does not see how it can be applicable to the myna. Wynne-Edwards (1962) further states that species of dissimilar feeding habits associate in mixed roosting only in rare cases. Gadgil & Ali (1975) while rejecting the hypothesis pointed out that their data does not support the hypothesis as well. The phenomenon of mixed roosting also poses difficulties, as an associate species is more likely to be of dissimilar rather than of similar feeding habits. Similarly, our data show that birds of diverse food habits often associate with common mynas at a number of mixed roosts (Mahabal & Bastawade, 1991). Hence our studies do not support the hypothesis at present.

3. **Feeding efficiency**: Ward (1965), Siegfried (1971), Zahavi (1971), Ward & Zahavi (1973) and many others have suggested that communal roosts serve as centres for the exchange of information regarding the location of food sources and have been evolved for the efficient exploitation of patchily distributed food sources. Gadgil & Ali (1975), Feare (1976) and Greig-Smith (1982) have also supported this theory of information transfer. Ward & Zahavi (1973) have further pointed out that the pre-roosting displays and roost advertisement behaviour are devices for attracting the maximum number of birds at communal roosts. This in turn makes it possible to search larger areas for food and increases the chance of getting good feeding places. The studies on mynas do raise some doubts with respect to this novel hypothesis: i) the roost sites chosen by mynas in Pune city are traditional and occupied year after year. ii) the presence of post-roosting displays in the morning and the complete absence of post- and pre-roosting communal displays over six months from April to September is difficult to explain the theory of roost advertisement for attracting the maximum number of birds at roosts. However, communal displays may have other functions which are dealt in detail by Mahabal (1993b). Counsilman (1974) has also clearly pointed out that common mynas in New Zealand use the roosts for many years and most birds are faithful to a particular roost, therefore daily advertisement is unnecessary. Khera & Kalsi (1986) have stated that pre-roost gatherings of bank mynas (observed only during non-breeding season) did not function as advertising centres. iii) common mynas invariably form mixed roosts with crows, parakeets, egrets, kites and other birds (Mahabal & Bastawade, 1991). The food habits of these associates are totally divergent and it is difficult to imagine that the strictly frugivorous parakeets contribute any information to the strictly carnivorous kites or to the mynas. It was also noticed that the flight, speed, direction and timing of departure and arrival of various species of mixed roosting birds are different from those of common mynas. Hence, the communication of information regarding the location of food sources may not be functioning at interspecific level but it may be possible at the intraspecific level (Mahabal & Bastawade, 1991).

4. **Antipredatory function**: It is inferred that communal roosting enables birds to reduce the risk of predation and serves an antipredatory function (Zahavi 1971, Gadgil 1972, Sengupta 1973, Counsilman 1974, Gadgil & Ali 1975, and Khera & Kalsi 1986). However, Ward & Zahavi (1973) have suggested that communal roosting positively increases the susceptibility to predators and that the information exchange is the only function of communal roost. Gadgil (1972) has stated that the phenomenon of mixed roosting strongly supports the notion of antipredator function. Further, Gadgil & Ali (1975) have indicated that it is more likely that different species of birds roost communally for predator avoidance and pool this advantage by forming

mixed roosts of greater numerical strength. Khera & Kalsi (1986) have also pointed out that bank mynas and associated species at mixed roosts respond readily to each others' alarm calls, which is an efficient antipredator mechanism. This may also outweigh the disadvantage of communal roosts being more conspicuous. Counsilman (1974) has stated that communal sleeping habit protects common mynas more from predators than if they slept solitarily.

Likewise, it is possible that common mynas and their mixed roosting associates have developed a system of antipredatory warning signals (Mahabal & Bastawade, 1991) which increases the awareness of the individual bird and thus affords some kind of protection not only at the roosts at night but also in the feeding area during day time (Mahabal, 1992).

5. **Social significance**: Braestrup (1963) has quoted that the chief survival value of communal roosts consists in reduced mortality during night. This does not necessarily mean that communal roosts have no social significance. Tast & Rassi (1973) while supporting the above statement indicated that probably roosting behaviour functions to synchronize various activities. Gyllin & Källander (1976) have also mentioned that besides the antipredatory function, synchronizing social behaviour may also be important. Various systematic and synchronized behavioural patterns observed in our studies on mynas (Mahabal & Vaidya 1989, Mahabal 1993 a & b) do suggest that the communal roost has social significance.

In conclusion, the data reveal that gathering and flocking tendencies of the common mynas within its own species and with other species of birds during day time and at communal roosts have been evolved not only through mutual attraction but also to get certain benefits out of the social system, particularly the synchro-nization of various activities, avoidance of predation, and information about the food sources, as also indicated by Mahabal (1993a).

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