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An Observation on Diurnal Activity of Fantails Released in a Park[1)]

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(With 8 Text-figures)

At present a number of pigeons live in many towns of the world under semi-domesticated state as one of the peaceful friends of man. Until recently ornithologists had not taken any interest in observing them as subjects for ecological study, but lately some reports have been published on their lives by some naturalists or ornithologists (Gompertz 1957, Matsuda1958, Erz 1960, Goodwin 1960, Ochiai & Miyazawa 1960, 1961, and cf. Bruns 1959).

In Sapporo the fantails, one of the most fancy races among the domestic pigeon (*Columba livia*), have been released first for admiration in a park since May 1961. Having been engaged in ecological study on these pigeons, the author undertakes as a first step to treat of their diurnal activities in this paper.

Birds and Habitat

The age, strain and antecedents of the fantails are not known in the least, because they were gathered at random from certain bird-dealers in Japan. It seems, however, that the majority of them are of the so-called English type while only a few are of the Scotch one (cf. Fulton 1900). The fantails gathered together were kept for one and half month in the Maruyama Zoo, Sapporo. During this period about 20 individuals died and finally 80 pigeons were released on 13 May in Ôdôri Park located in the center of the city; they were supplied with 8 shelters set at a height of 4 meters on steel poles. At first they were completely free all day long, but the attack of crows (*Corvus levaillantii japonensis*) nesting in another park became very vigorous, espeically in the early morning result of 5 deads, so that they were sheltered separately in two cages, $1.8 \times 3.6 \times 1.8$ meters, during night. Then, they were set free only from about nine to eighteen o'clock from 20 May onward. At the beginning one cage, named S cage, included 31 individuals and the other, N cage, 37 ones. But the population fluctuated to some extent on account of death and replenishment of the members. The food consisting of ground corn, rice, rice-bran, pulverized fish, crushed shell and hemp-seed was supplied for about two hours after the confinement of the fantails in the cages and irregularly sometimes during the daytime when the birds were out of the cages. In due course they became accustomed to pick up willingly pieces of bread or biscuit and steamed kernels of corn presented by the visitors. Some hens laid eggs but almost none of them developed favourably, except only two nestlings grown up to the young. All of the pigeons were entirely white, so they were discriminated individually with a small marked flag tied to the tail of each bird.

1) Contribution No. 528 from the Zoological Institute, Faculty of Science, Hokkaido University, Sapporo, Japan.

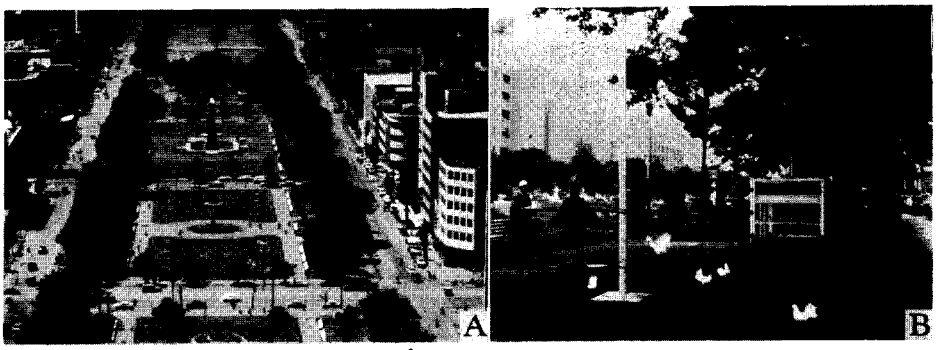

Fig. 1. Habitat. A : A part of Ôdôri Park. B : Situation where the fantails were released (southern side).

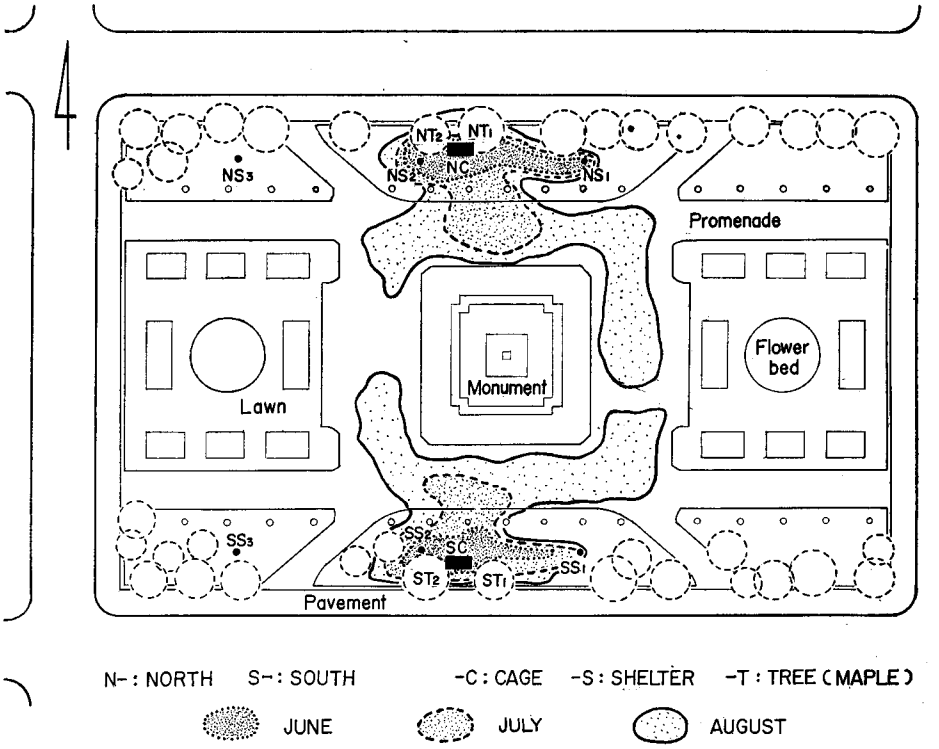

Fig. 2. The square where the cages and the shelters were arranged. Three different lines around each cage show the change of extent of foraging area.

Ôdôri Park, the Public Avenue of Sapporo, was a broad green parkway as seen in the figure 1, which was cut transversely at regular intervals of about 110 meters by roads. There were many trees, mainly maple (*Acer miyabei*) and yew (*Taxus cuspidata*), beautiful flower beds, various monuments and paths. Figures 1 and 2 show a layout of the square in which the cages and shelters were located. There was no great difference between the surroundings of the two cages.

The observations were conducted continuously from 16 July to 18 August 1961, thereafter, intermittently to late September. Therefore, the author could not obtain trustworthy records on the life of the free fantails in the first stage of the release in this year. All fantails were accommodated in the Maruyama Zoo during the next winter, from November to April, to protect them from cold and snow.

Observations

Diurnal activity as individuals

The activities of the free fantails were classified roughly into the following types.

Active behaviour: *Feeding or foraging.* The birds sometimes took food from the hands of man and at other times foraged the grass or the food scattered on the ground here and there. Drinking was included here. *Walking or straining.* Standing on a point or walking about, the fantails usually looked out over before and after having changed their actions. *Courting or sexual behaviour.* Characteristic courting display of this race was often observed through the whole observation period and reversal mounting could also be recorded infrequently. *Hostile behaviour.* The birds demonstrated in different places various hostile acts such as threatening, chasing, pecking, mutual pecking and fighting, particularly more often and furiously in the cages than outside.

Inactive behaviour: *Preening.* The fantails actively preened their down feathers with their bills. Moreover, social preening, scratching of head part with their feet, shaking of feathers, water and rain bathing were included in this category as exmaples of cleaning behaviour. *Resting.* To crouch quietly on a flat place or a perch slightly fluffing their feathers was regarded as resting. Sunbathing was also included here. *Sleeping.* With the resting posture the birds shut both eyes.

The fantails liberated in the morning by an attendant usually flew down on the ground near the cage and prowled about mostly among the plants. Presently they crouched there if they were not disturbed by other animals and visitors. Some time after, they flew up with other members onto the roof of the cage, protruding perches of the maples standing by the cage, or onto the shelters. During the day time the fantails would rest and sleep immovably at those places, except for some occasional flights down to the ground to feed or drink. At one or more hours before the closure of the cage, they became a little active and landed on the roof of the cage or the ground around it. As soon as the door of the cage was opened they flew successively into it directing their attention towards the food dishes which

were placed before hand on the floor of the cage. Generally speaking, the fantails seemed to have diphasic rhythm of resting, immovable period in the afternoon and roosting one in the night. But it must be noticed that their roosting behaviour was governed chiefly by the attendant who opened the door and drove them into the cage in the evening (Fig. 3).

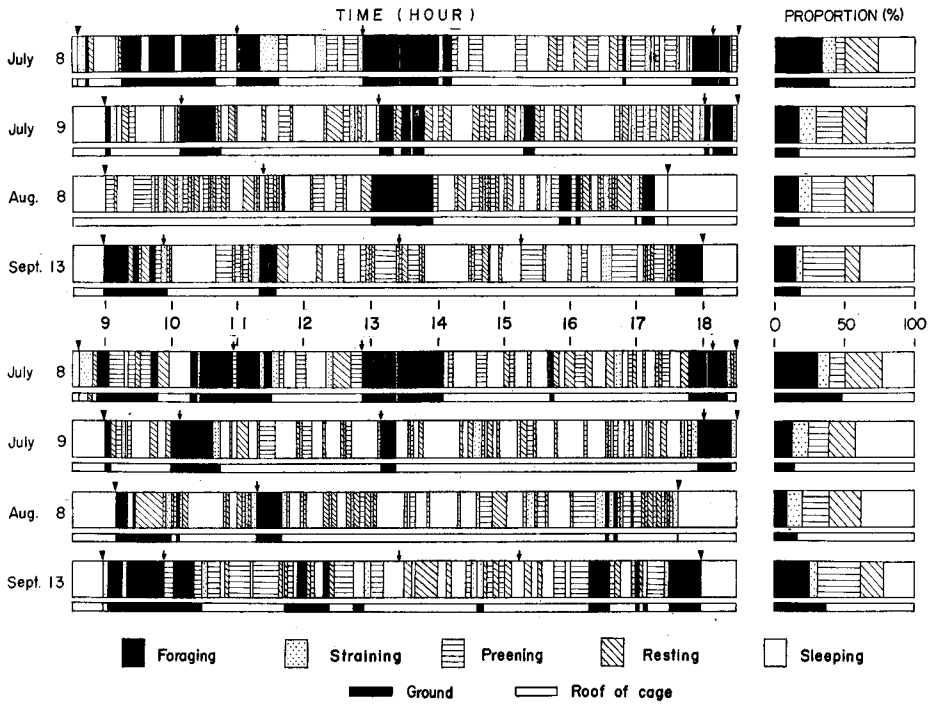

Fig. 3. Sequence of activities of two fantails (not pair) of the south flock, above male named B, below female named b. Narrow bands show their locality. Wedges: time of opening and closing the cage. Arrow: appearance of feeder.

The duration and frequency of the fantail's various activities were different to some degree among the individuals. Some ones were comparatively inactive, foraging a little on the ground and resting or sleeping for a long period on the resting place, whilst others were more active, flying down frequently on the ground and chasing or courting in competition with another. Some individuals would walk about and preen themselves earnestly while the majority of the flock was calming down at that time; this behaviour was reversed on another occasion (Figs. 3 and 4). The individual difference in this respect may be due to the following various factors.

1) Predisposition. This may be an interesting factor in the tendency and

sensitivity of each bird. In this case, however, inherent characters could not be taken up decisively as an influencing factor because of lack of information regarding the temperament of the parents of the fantails gathered.

2) Physiological conditions of a day. *a. Hunger and thirst.* The increased need for food and water tends to stimulate the individual to seek for them. Food deprivation also may make the birds to be more responsive to external stimuli than usual and the strength of appetite may differ respectively in different fantails as well as other many animals. Of course, the fantails which had satisfied their appetite were slow to respond to the stimulus. *b. Drive for reproduction.* The sexually motivated fantails often walked about in lively manner and tended to court other individuals indiscriminately at different places. One bird accordingly inclined to be more inactive in the non-reporductive period while comparatively active in the breeding period. Such alternation of activity may be caused mainly by the change of hormonal effect (cf. Bennett 1940), and, further, by the behaviour of mate influencing the secretion of the hormones (Lehrman 1959). *c. Health condition.* The diseased fantails generally rested and slept considerably for a longer time than the others. This could be implied immediately from the fact that the duration of various activities of individuals might depend to some extent on their health condition which could not be discerned from its appearance.

3) Sex. In general the males seemed to spend of little longer time in activity than femals, but this tendency could not be observed absolutely. Some males or females were more active than some of those of the other sex. This may be result of the intervention of other factors such as physiological and social state.

4) Social or psychological factors. The most dominant individual, generally male, was not always the most active one. A lower ranked female would spend a considerable time foraging alone on the ground while other submissive ones were at rest on the trees or on the roof of the cage. Dominance-subordinance relationship, however, might probably have more or less influence upon their diurnal activities (details will be reported elsewhere).

Some pigeons rested on the maple, usually at an appointed part of the perch, during almost all of day-time, whereas others did so on the roof of the cage, never going to the tree (Fig. 4). It was impossible to understand exactly why each such individual selected the particular part as resting place because of lack of observation on the first step after release. But it seemed that the social relationship among the members of each flock might be responsible for their preference of a restricted place.

The duration of each form of activity varied conspicuously every day. For instance, one male foraged on the ground for about three hours on one day, but next day he spent there only one and half hours. Such fluctuation of amount of activity may depend on many external and internal conditions such as the following.

I. Physiological condition. As already pointed out, the need of the fantail for food and drive for reproduction, or its *mood*, may change more or less every day.

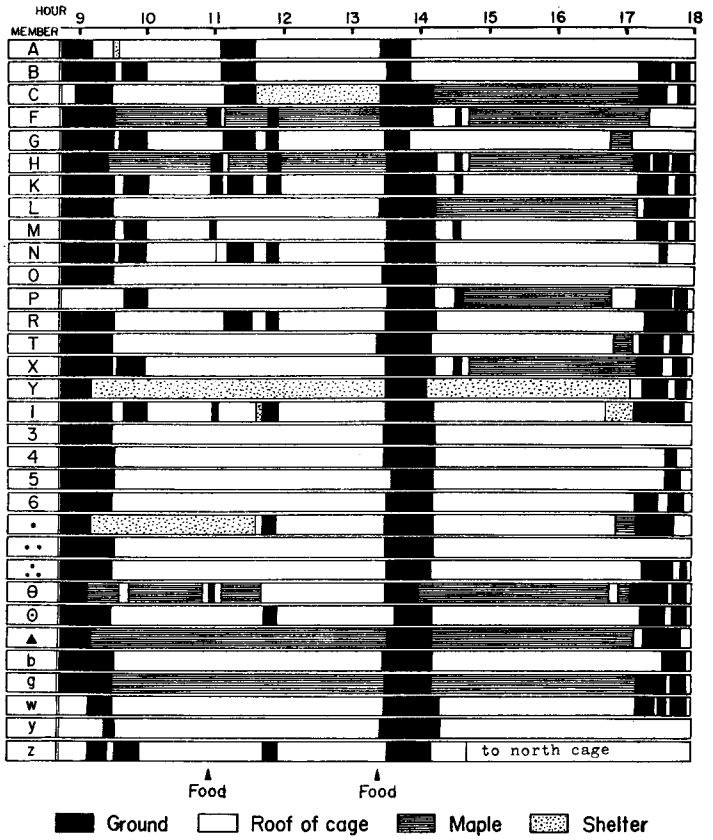

Fig 4. Locality of each member of the south flock in the day time on 19 July.

II. Climatic factors. Although the duration of activity seemed to show a tendency to increase slightly in parallel with the increasing temperature towards the summer, the existence of a direct relation between them could not immediately be recognized. The correlation between the day time light intensity and the diurnal activity of the fantail is not yet clear. The general activity of the fantail varied to some extent according to the weather, cloudy or sunny. The amount of resting inclined to be slightly less on windy days, but that may be due to passively disturbed sleep or to changed postures necessitated by the wind. If it rained, the pigeons liked to bathe *pleasantly* in the rain-water. The effects of climatic con-

ditions on fantail behaviour were, at least in the present case, more indistinct than the effects of the following factors in contrast to many other birds under wild condition (see e.g., Kendeigh 1934, Mori 1945, Karplus 1952, Jumber 1959).

III. Social factors. As fantails have a tendency to behave gregariously, the types of behaviour of one member of the flock may somewhat influence the fluctuation of diurnal activity period of another member. If a bird accidentaly flew up or down to do something, it was often followed by the rest of the flock all together. Mated pigeons reciprocally modified the behaviour of their mates and pair mates closely bonded tended to spend most of the day together, as is also the case in the feral pigeon (Gompertz 1957).

IV. Habituation. During the first week after the start of the present research, and naturally before it, the fantails were very afraid of mankind and never approached the hands offering food to them. But about one week after the author began to try continuously to tame them, some males approached actively near the hands stretched out quietly and picked the food directly from them. Thereafter, most of the members of the flock gradually became tamer and finally dared to fly up to take food on the shoulders of the standing observers (Fig. 5). According as they became tame to the author, they were becoming a little less likely to be frightened by trifling movements of any other spectators. It was suggested by Goodwin (1960) that being different from the other species of urban pigeon, *C. livia* was likely in general to show a natural tameness. Although they rested calmly for lengthy periods of the day time on the trees during the first days of this observation, with the progress of the training of the observers they began to fly down to the ground in broad day no matter how many people there were around the cages (Figs. 3, 4, and 5).

V. Influence of mankind. The most effective and common factor which influenced the activities was the various interventions of people. On week-days the visitors were usually less in number than on Sundays, so that the fantails released

Fig. 5. Intervention of mankind. A : Conditioning to accustom the fontail to man. B : Many spectators influencing the activity and home range of the fantails.

could generally continue to forage or rest safely on the ground without human disturbance (Figs. 3 and 6). On Sundays, on the other hand, many people visited the area continuously from early morning to late evening. At first the fantails usually did not like to stay on the ground near the cages so long as there were many spectators around the cage.s

If the fantails were chased by children or frightened by certain passers-by when they were foraging on the grass, they usually fled immediately from them towards the roofs of the cages, the perches of the trees or the shelters, and became quiet there instead of foraging. But in July, becoming accustomed to man and to

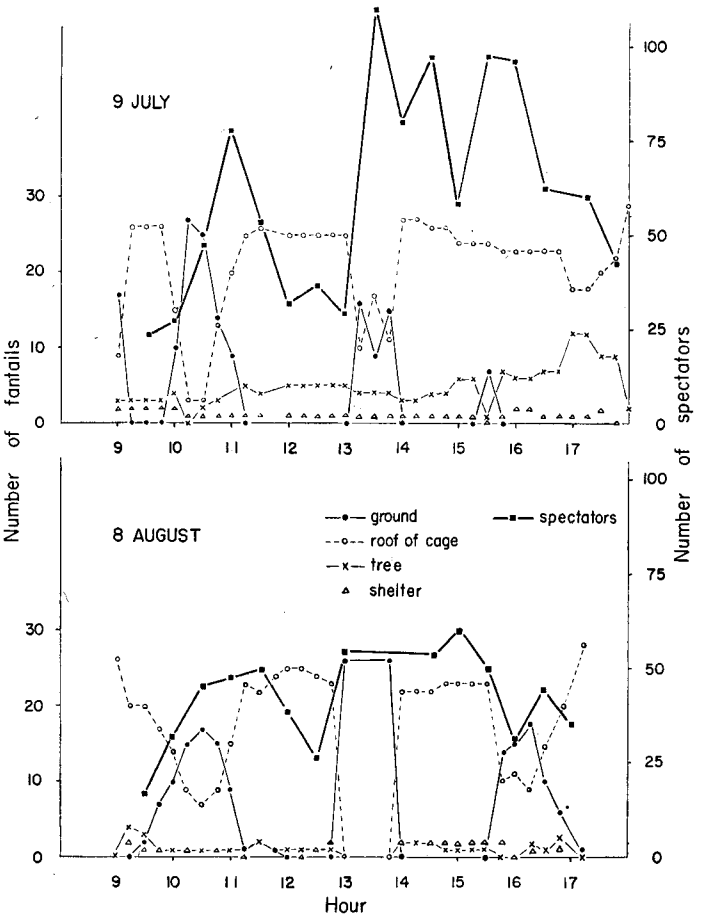

Fig 6. Number of fantails located in different places, and of spectators. Above on Sunday, below on Tuesday.

the surroundings, they came down on the ground in spite of the gathering of many lookers-on, if bread or corn were offered by the latter (Fig. 5). Therefore, the attitude of visitors must be an important factor influencing the types of their activity, as well as their number.

Moreover, the state of their appetite which may dictate their response was directly under the control of the spectator who decided the amount of their food by presenting as much as one wished. Admittedly the attendant governed the daily amount of activity by operating the time of the release and the roosting of the pigeons.

Diurnal activity as a flock

As a rule, the general phenomena of all activities of the flock were scarcely different from those observed at the individual level. The members of the flock would forage together after release in the morning, rest separately at some places during the greater part of the day time except for occasional flights down to feed to the ground, and finally assemble on the roof of the cage before roosting in the eveing (Fig. 6).

Sexual behaviour was observed frequently through the daytime, although its frequency decreased near mid-day, because the members of the flock were usually inactive in their resting places at that time. The diurnal rhythm in the sexual performance has been observed in other bird, such as high frequency in the morning and evening, and low in the mid-day (Pynnönen 1939, cited by Palmgren 1949).

The subject fantails would drink water from the vat placed in front of the cage at any time, but bathe in it in almost all cases during the early forenoon (Table 1).

Hostile behaviour occurred sporadically among the members on the ground and the trees. But on the roofs of the cages they frequently showed various hostile acts, particularly at the pre-roosting assembly in the evening (Table 1). Hostile state occurring on the ground seemed to have relation principally with their feeding and individual distance. On the roofs of the cages and the perches of the maples, however, such behaviour might be caused mainly for the sake of maintenance of the individual distance and the resting territory which was not very restrictive, as has been suggested briefly by Taylor (1932) (It will be written in this regards elsewhere).

It is well known that light intensity affects the activity of birds, especially the roosting behaviour (Jumber 1956, Kuroda 1961). In the present case light intensity, together with many other modifying factors, may have caused the pre-roosting assembly on the roofs of the cages. But whether the time of beginning to assemble was correlated with the light intensity could not be clearly ascertained on account of the striking intervention of the attendant who decided the time of feeding and nesting of the fantails.

In the resting period during the day time, the members of the flock crouched

Table 1. Frequency of various acts observed for ten minutes every half an hour amongst members of the north flock. The data were summed up from 21 to 24 June.

	Courting	Drinking	Bathing	Hostile act
8.30	XXX	XX	XXX	X
9.00	XXX	XX	XXX	–
9.30	XX	XX	–	X
10.00	XXXX	X	X	X
10.30	XX	–	X	X
11.00	X	–	–	XX
11.30	XX	XX	–	–
12.00	X	XX	–	–
12.30	XX	XX	–	X
13.00	–	X	–	–
13.30	X	–	–	X
14.00	X	X	–	–
14.30	XX	X	–	XX
15.00	X	XX	–	–
15.30	XX	XX	–	X
16.00	XXXXX	XX	–	XXXX
16.30	XX	X	–	XXXXX
17.00	XXXX	X	–	XXXXX
17.30	XX	–	–	XXXX
18.00	XXX	X	–	XXXXX

– : no act. X : 5 times per one. XXXXX : very large number over 20.

individually in different places. The resting places utilized, however, were always confined to two trees (T1 and T2) standing near each side of each cage, the roofs of the cages, two shelters (S1 and S2), and the ground around the cages. Nearly all of the members flew up on the perches protruding horizontally about two meters above the cages in the early period of this observation (June) ; they rested there for the most part of the day time and occasionally walked about to feed or court within a small area around each cage, distant from it only about five meters at most. But with the comming of summer (August), the number of individuals who alighted on the trees gradually decreased contrary to the increase of number of the birds which rested on the roofs of the cages, especially in the south flock (Fig. 7). Moreover, in September they would tend to rest, sleep and bathe in sun or rain even on the ground.

On the other hand, the foraging or visiting area of the flock spread gradually as the pigeons became accustomed to presence of mankind, although the activity of each individual was extremely elastic in topographically in the respective foraging time (Fig. 2). But most of these birds, except some special individuals, never visited the opposite cage and its vicinity by themsevles, even if they were occasionally led over the half-way line towards the other cage by the observers scattering food on the promenade to attract them. Moreover they rarely dare to fly out of this square in the parkway at all. Goodwin (1960) found that the feral pigeon (*Columba livia*) tended to feed usually in small open spaces, quiet

streets, squares without grass in comparison to places liked by other related species. The fantails also never went to the center lawn and the monument in the square.

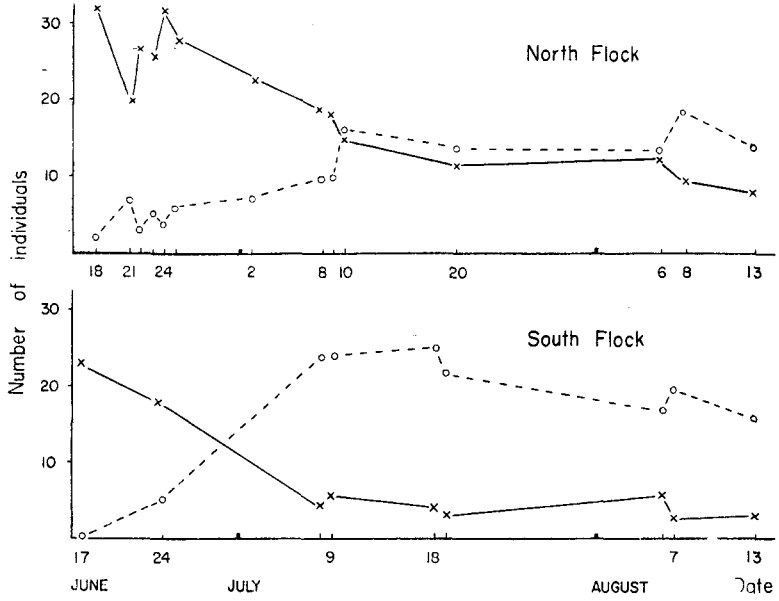

Fig. 7. Number of fantails resting on maples (···o···) and roofs of cages (—x—) at 15 o'clock.

The extent of area where the flock would communally forage and rest was generally largest in the forenoon of week-days. This fact may be controlled not only by their internal need for food or rest, but also directly by the external conditons, commonly the attitude and number of visitors. The alternation of resting places utilized frequently by the members of both flocks and the enlargement of their foraging areas show that for the majority of the flock members the accustomed living space spread rather horizontally in the final days in contrast with their vertical movement in the early days of the present observation (Fig. 8).

The activity rhythm of the two flocks did not always synchronize every day. The members of one flock were in the midst of foraging on the ground, while all of another were often sleeping at the resting places. This may be due to many factors, in particular the number and attitudes of visitiors, mentioned already. In regard to extent there were no remarkable differences between the two foraging or searching areas of the flocks. The members of north flock inclined to go and stay more voluntarily on the trees for resting than did those of south one.

Discussion

It may be reasonable to consider that the activity of a bird or of a flock depends more

or less on the various climatic conditions, in particular in the field, and that many conditions may affect the activity not independently but correlatively and cumulatively at any one time.

In the present case, however, the fantails were usually kept in the cages as they were under adverse weather conditions. The observations were carried out within only a short period during which there were no remarkable changes of weather conditions. Therefore, it should be unreasonable to attempt any conclusions as to the relationship between their activities and climatic conditions.

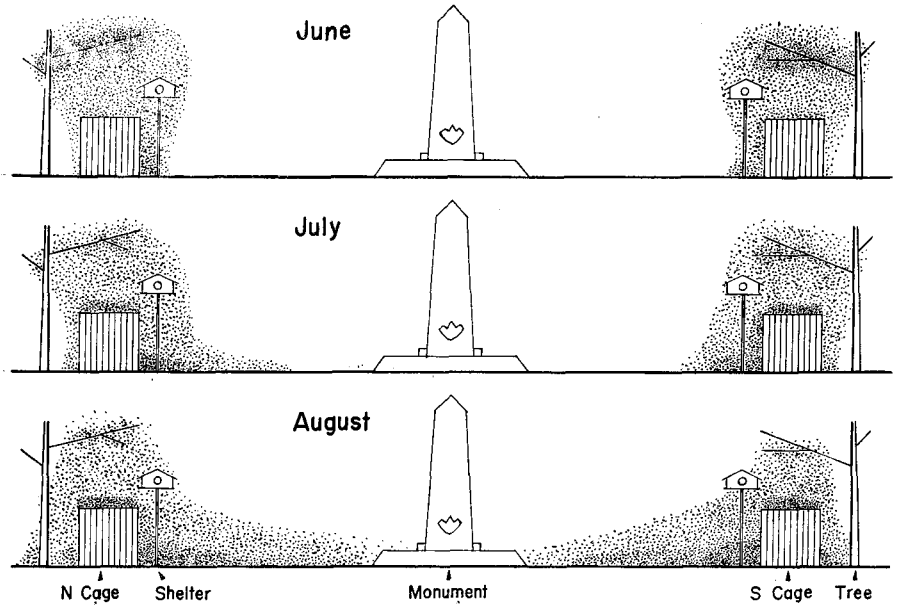

Fig. 8. Transformation of home ranges of two flocks during the observation period.

It seems certain that the climatic conditions may influence the activity of the fantails, but this is not the only one factor which controls their behaviour or *mood*. Internal factors, including the inherited tendencies, always considerably govern the type and rhythm of the activities. The general inactivity of the fantails in the present case may indicate their inherent inferiority in respect to flight ability but not definitely; they never flew about as high as the feral pigeons who roosted at a neighbouring building and came to pick up the food scattered near the cages. As a matter of course, the nature and strength of the drive which is dominant at a given time may modify the type and amount of activity of the fantails.

As in other birds (Palmgren 1949), minor periodicity was found in the activity of the fantail besides the major daily rhythm of its behaviour, although the matter was not entirely clear because of the numerous uncontrolled

external conditions. The fantail in inactive state, for exmaple, did not necessarily keep the same posture through their resting period. After it had slept continuously about twenty or more minutes, it wakened and preened its feathers, yawned or stretched its wings and legs, or even walked about for a short while. Then it fell asleep again till the next awakening for about twenty or more minutes, if it were in a favourable state for sleeping yet and no extraneous attractive stimuli existed at that time. Namely, the fantail seemed to have a certain spontaneous activity rhythm which probably was based upon the physiological state.

If something as an external stimulus occasionally occurred during such inter-resting phase the fantail would respond to it more sensitively than if it arose in the resting phase. Consequently, the type of the next behaviour may be fairly decided by the nature and strength of the external stimuli concerned at that time. For instance, when a man showed any posture as if to feed during the inter-resting phase the fantails flew down usually from the trees and the roofs of the cages to the ground around the feeder. On the contrary, during the inactive phase some more strong stimuli were needful to trigger their doing anything but sometimes the stimuli could not cause the birds to pay any attention at all (Fig. 3). Accordingly, what the pigeons are doing and also where they are at any given time are controlled to a certain extent by the correlation between their endogenous periodicity in activity and the exsitence of external stimuli such as those suplied by mankind, the other members of their flock, and others.

The most conspicuous external stimulus was the behaviour of mankind, as in cases all over the world. On the one hand, human beings as pathetic passers-by often disturbed the general quiet life of the fantails and drove them onto the trees or to the roofs of the cages which seemed to be safe. On the other side, man could manage the feeding behaviour of fantails as the chief feeder. Thus, human being determined not only the duration and frequency of the activity resultant from an external stimulus, but also the strength of the appetite or internal factor.

The feral pigeons which pass a semi-domesticated life in the cities seem naturally to move about within a very small regular area, never going beyond 1.2 km from their nests (Gompertz 1957, Ochiai, personal communication). The tiny home range of the present fantail may have, besides the factors above mentioned, the internal and external causations such as the following four. a) Gregarious and inactive characters of this race : All of the fantails released here, except a very few, flew about neither solitarily nor gregariously over the shelters and the maples. b) Small population in comparison with the large extent of the park. c) Large number of spectators approaching actively towards the fantails to feed and in consequence to drive them into the small restrict part. d) Availability of food : If there is no sufficient amount of food, the pigeon seems to fly farther than usual (Gompertz 1957, Matsuda 1958). But the fantails could usually get food satisfactorily in the cage and just in its vicinity in this park.

In addition, the transformation of the home range during the observation may be partly the result of not only numerous conditions which changed *naturally* but also of the conditioning carried out artificially by the observers.

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Summary

Preliminary observations were carried out for about three months on the activity of the fantails freed in the day time only in Ôdôri Park, Sapporo.

In general, after foraging for some time in the forenoon on the ground, they would fly up to some resting places and spend there almost all the remaining time of the day, except for occasional flights down to pick up food. In the evening all of them gradually assembled on the cages and flew into them to feed and roost through the doors when they were opened.

The amount of activity varied to some extent with each individual and day. Among many probable factors governing such change, the most remarkable modifying factor seems to be of mankind who greatly influenced the amount of activity, including even the interference to the internal state, and the extent of the home range of the fantails.

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