The winter breeding of the Feral Pigeon *Columba livia domestica* at Tampere in 1972/1973.

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At two factory lofts in Tampere City a population of some 400—500 Feral Pigeons were checked from May 1972 onwards every second week, on average. Breeding continued till late August. After a refractory period of 2 to 3 months, breeding recommenced in late November continuing throughout the winter of 1972/1973. Breeding was succesful in most cases even in the winter.

The objective of this paper is to report our observations of the breeding of the Feral Pigeon *Columba livia domestica* in the winter of 1972/1973 at Tampere (61°30'N, 23°50'E). This paper comprises the first part of a series of investigations into the ecology of the Feral Pigeon by a team of the Ornithological Society of Tampere.

The studied population

The population of Feral Pigeons dealt with in this study lives at Tammela, an eastern suburb of Tampere. Birds use two old factory lofts as their breeding and roosting place. The size of the population has been some 400—500 Pigeons, the total number of colour-ringed ones being 450 in 1972. The recoveries of these colour-ringed individuals have shown that birds feed in a rather small area in parks and a market-place near the lofts.

The population was originally found April 20, 1972 but regular visits began only a month later. We checked the place every second week, on average, and counted the nests and adult birds. All young and also a large number of the adults were colour-ringed during our visits.

Breeding in summer

Since May, 1972, nests of these Pigeons have been regularly recorded. Due to the size of the population, individual nest occupants could be identified only occasionally. In Fig. 1, therefore, breeding records have been summarized only by giving numbers to nests with eggs and young without regard to individual breeding pairs. A nest containing a chick and an egg was included among nests with young, as in such nests the other egg often failed to hatch.

The difference between the number of nests with eggs and the subsequent number of nests with young gives a rough idea of the losses during incubation and early nestling time. The losses seem to be quite heavy. However, the number of nests with young appears too small as the young are prone to leave their nests rather early, running around in the lofts. Young found far from any nests could not be taken into account.

Refractory period

Our results show that breeding was frequent at the beginning of the study, but ceased after the middle of August. In September and October no eggs were laid. The two broods found on September 30, belonged to the 7 clutches with two egg found on September 1.

Usually it is assumed that the end of the breeding season is correlated with the moult. As pointed out by

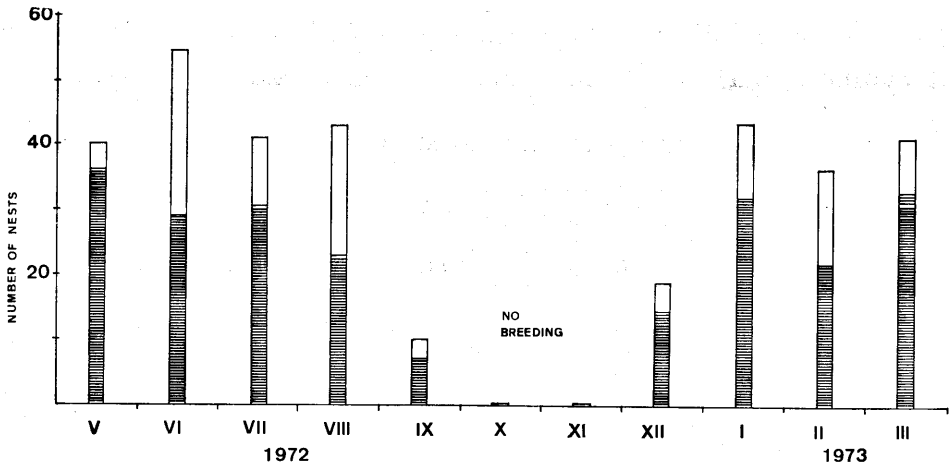

FIG. 1. Number of nests with eggs (white columns) and those with young (ruled columns) in the studied lofts from May 1972 to March 1973.

e.g. KING & FARNER (1961), LOFTS & MURTON (1968) and KALELA (1973) both sexual activities and moulting require considerable energy. That is why in the annual cycle of most birds these activities are separate. The moult of Feral Pigeons is quite irregular. The first records of moult in our population were made on July 1, and thereafter the number of cases increased. Apparently most birds moulted from August to October. Even in early November fairly many moulting birds were caught, but of birds trapped in late November only 3 out of 81 examined were moulting. The moult began during the nesting season, and we also recorded individuals, which both bred and moulted.

Winter breeding

Later in autumn breeding started again. Two pairs laid eggs during the last third of November, commencing about 20th and 25th of November. In December more and more pairs bred, as shown in Table 1, where the onset of breeding in the first 59 nests is given. Throughout the winter months breeding was approximately as intensive as during the summer of 1972.

The breeding of Feral Pigeons in the winter of 1972/1973 was not restricted to the lofts we studied. On January 1, 1973, a nesting place at Vammala, some 50 km west of Tampere, was investigated. In this factory loft there were 112 pigeons. Among 83 studied more thoroughly there were none in juvenile plumage and no nestlings but three nests containing 2 warm eggs each were found.

On January 20, a loft close to Tampere Railway Station was checked. There were 8 adult Pigeons inside, and 6 nests: 4 with two warm eggs, one with cold ones and one with two recently hatched nestlings, of which one was dead. Breeding was interrupted by workers repairing the loft. When we visited it two weeks later, only in one nest the young were still alive. Also in other nests the young had hatched, but they had not survived.

Some of the Pigeons trapped and killed between November 21 and 28 were dissected. Among males testes were enlarged and apparently in full breeding condition in 19 males and in a refractory state in 10 males. In females two had active ovaries with large follicles and 29 still had inactive ovaries. This indicates that females reached sexual maturity a little later than males, as has been pointed out also e.g. in

TABLE 1. Onset of breeding and breeding success of Feral Pigeons at Tampere during the mid-winter of 1972/1973. Breeding success was weakened in late January, because some malevolent human beings shot some adult Feral Pigeons at their nests.

Period of egg laying	Nests with eggs	hatched young	fledged young
Nov. 16—30	2	2	2
Dec. 1—15	13	7	7
Dec. 16—31	3	2	2
Jan. 1—15	18	17	14
Jan. 16—31	23	11	8
Total	59	39	33

House Sparrows (KIRZCHBAUM 1933). The same has been recorded in some small mammals, e.g. in *Microtus oeconomus* in Finnish Lapland (TAST 1966, p. 162) and in *Clethrionomys glareolus* in southern Finland (KAIKUSALO 1972).

Non-breeding birds

The number of nests occupied simultaneously was smaller than might be expected on the basis of adult birds present in the lofts. Apparently there must have been rather many non-breeding birds.* The number of nests was probably determined by the area of the lofts. Breeding pairs required fairly large territories of a few sq.m., as nests were not usually located close to one another and this indicates that birds probably drove away other adult birds from the vicinity of their nests. This view is supported by the fact that the number of nests was almost the same throughout the period of intensive breeding. In autumn, 1972, the Health Authorities of Tampere City trapped and killed some 300 Pigeons, including 35 colour-banded adults from our population. This seemed to have had no effect on the numbers of nests found during the winter months. We assume that some of the non-breeding birds now had a chance to breed.

The sexual drive of non-breeding birds was obviously the same as among breeding ones. This was indicated by the fact that single eggs were found laid on the floor and then left untended. The situation was the same during both summer and winter.

Breeding in relation to climate factors

According to our results, breeding ceased during a period of about 3 months from September to November. In the following some data concerning the climate of Tampere are given (from the Monthly Review of the Finnish Climate published by the Meteorological Institute):

Month		Mean temperatures in 1972—73	1931—1960
V	1972	+ 9.2	+ 8.8
VI	„	+16.6	+13.7
VII	„	+19.2	+16.8
VIII	„	+15.9	+15.0
IX	„	+ 9.8	+10.0
X	„	+ 4.2	+ 4.3
XI	„	— 0.2	— 0.1
XII	„	+ 1.3	— 3.9
I	1973	— 2.3	— 7.9
II	„	— 5.0	— 8.0
III	„	— 1.1	— 4.8
IV	„	+ 2.1	+ 2.2

When these data are compared with our nesting records, it can be seen that breeding ceased while still thermal summer prevailed. The refractory period coincided with thermal autumn. Breeding started in the period of shortest daylight. It should even be pointed out that breeding occurred in dark lofts. E.g. December 16 was so dark that at noon Pigeons were several times observed to collide with supporting pillars, which was never observed in the summer period.

* After leaving the paper to the press, we found an article written by R. K. Murton, R. J. P. Thearle and J. Thompson in J.appl. Ecol. 9 (1972):835—874 in which it was e.g. recorded that only about one third of the Feral Pigeon population studied at Manchester actually bred in summer, although all adults appeared to be capable of reproduction.

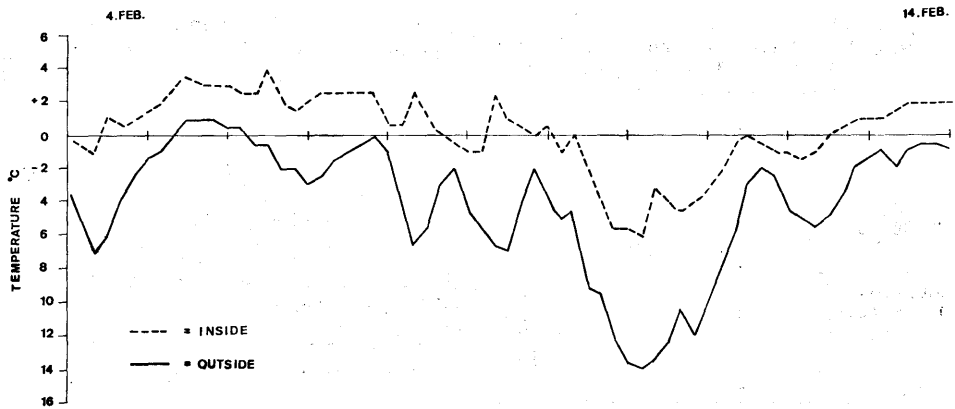

FIG. 2. Daily temperatures inside the lofts and on a roof near by from February 4 to February 14 in 1973.

The temperature changes in these lofts were clearly lower than outside. During a 14-day period in February we recorded the temperatures with two thermographs, one placed in the loft and the other on the roof of the building. The results are shown in Fig. 2.

In principle, the breeding of Feral Pigeons in dark attics in winter seems to resemble the winter breeding of some small mammals under snow cover in conditions of relatively constant temperature and reduced light. Such winter breeding has been recorded in the following Finnish rodents: *Lemmus lemmus* (KALELA 1961, KOPONEN et al. 1961, KOPONEN 1970), *Myopus schisticolor* (MYSTERUD 1966, 1968, MYSTERUD et al. 1972), and *Microtus oeconomus* (TAST 1966). In suitable years also *Clethrionomys glareolus* achieves sexual maturity in winter (KAIKUSALO 1972).

Conclusions and discussion

Most Finnish birds have rather strictly limited nesting periods. Among the few birds with an extended breeding season are pigeons and Cardueline finches, both of which are typical seed-eaters.

Crossbills, *Loxia* spp., are the only Finnish birds known to breed in mid-winter. There are only a few species whose breeding may at least sometimes extend to August. At least the following ten species, besides the Feral Pigeon, may have clutches commenced in August: *Hirundo rustica* (v. HAARTMAN 1969), *Turdus merula* (HILDÉN & LINKOLA 1966), *Erithacus rubecula* (v. HAARTMAN 1969), *Pyrrhula pyrrhula* (v. HAARTMAN 1969, 1972), *Carduelis cannabina* (TAST 1968, 1970, KOLUNEN 1971), *Carduelis flammea* (SALKIO 1952), *Carduelis carduelis* (HILDÉN 1972), *Scolopax rusticola* (v. HAARTMAN et al. 1967), *Columba oenas* (HILDÉN & LINKOLA 1966, v. HAARTMAN et al. 1967), *Columba palumbus* (v. HAARTMAN et al. 1967).

Generally the onset of breeding is released by the combined effects of several external factors, among which day-light is usually considered to be the primary stimulus, while temperature and food regulate the onset in greater detail. However, also intrinsic factors are involved, as experiments have shown that in virtually all bird species studied no breeding response can be achieved during the few months after the end of a breeding season, no matter what external conditions are like. Some columbids are exceptional in this respect. The Wood Pigeon, *Columba palumbus,* for example, totally lacks a refractory period (LOFTS et al. 1967 a, b). When Wood Pigeons were subjected to natural photoperiods corresponding to those prevailing from March until September, their gonads reached breeding condition without the need for a post-nuptial refractory period. Likewise the Collared

Dove, *Streptopelia decaocto,* lacks a refractory period (LOFTS et al. 1967 c, p. 356). Of special interest is the Feral Pigeon, as in the cities of Leeds and Liverpool about half of Pigeons examined remained in breeding condition throughout the year while the rest had a refractory period (LOFTS et al. 1966, 1967 b).

Our results seem to support the view first presented by LORENZ (1931), and thereafter by KALELA (1954, 1958, 1973) and MARSHALL (1960) that many bird species would be ready to breed as early as the autumn, if not inhibited by unfavourable external conditions. In the spring they are therefore activated again, mainly by prolonged day length. This view is also supported by observations in natural populations in Great Britain. For instance SNOW (1955) reports that in 1953 during especially good weather conditions, nests of 7 bird species, *Alauda arvensis, Prunella modularis, Erithacus rubecula, Turdus merula, T. philomelos, Passer domesticus,* and *Sturnus vulgaris* were found in November and December. In nests of 3 of these species young hatched.

Winter breeding of Feral Pigeons has been recorded in Finland earlier, in 1949 (v. HAARTMAN et al. 1967) and in 1970/1971 (SOIKKELI 1971). Soikkeli reported two nests where young hatched, but died after a few days. In more southern areas in the USA observations of occasional winter breeding of the Feral Pigeon have been reported by SCHEIN (1954) and DUNMORE & DAVIS (1963).

Investigations covering several years are needed before it can be decided whether Feral Pigeons breed regularly in manmade sites in winter in Finland, or whether this takes place only during extraordinarily favourable weather conditions, as SOIKKELI (1971) supposed. In December 1972 temperatures were roughly the same as are usual in April. At any rate, the observed winter breeding, be it regular or not, shows that successful breeding may take place in Feral Pigeons several months before breeding out of doors in more open habitats.

Selostus: **Kesykyyhkyn pesinnästä Tampereella talvella 1972/73**

Tehdasrakennuksen ullakolla sijaitsevaa 400—500 kesykyyhkyn yhdyskuntaa on tutkittu toukokuusta 1972 alkaen Tampereella. Keskimäärin kahden viikon välein tehtyjen käyntien yhteydessä todettujen pesien määrät on esitetty kuvassa 1.

Pesintä jatkui tasaisena toukokuusta syyskuulle, jonka jälkeen seurasi 2—3 kuukauden tauko. Marraskuun lopulla alkoi pesintä uudelleen ja joulukuussa pesien määrä oli sama kuin kesällä. Taulukossa 1. on esitetty pesinnän onnistuminen marras—tammikuussa munituissa pesyeissä.

Ullakolla oli aikuislintuja enemmän kuin pesien määrä olisi edellyttänyt. Sinne ilmestyi lisäksi jatkuvasti yksittäisiä munia, jotka jäivät hautomatta. Tämä viittasi siihen, että populaatiossa vallitsi hierarkia, joka esti osaa lisääntymisvireessä olevista linnuista pesimästä.

Kyyhkyjen talvipesintäkauden alussa marraskuun lopulla päivät olivat lyhimmillään eikä valaistuksella näin ollen ollut kyyhkyjen pesinnälle ratkaisevaa merkitystä.

Lämpötilojen suhteen syksy oli normaali pesintäkauden alkuun saakka, mutta talvi oli keskimääräistä lämpimämpi. Ullakolla lämpötilat olivat selvästi korkeampia ja lämpövaihtelut vähäisempiä kuin ulkona (kuva 2.).

Havainnot kesykyyhkyn pesinnästä Tampereella osoittavat, että suotuisissa ympäristöolosuhteissa menestyksekäs pesintä on mahdollista myös talvikautena.

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