ORNIS FENNICA

SUOMEN LINTUTIETEELLISEN YHDISTYKSEN JULKAISEMA

UTGIVEN AV ORNITOLOGISKA FÖRENINGEN I FINLAND

TOIMITUS REDAKTION: G. BERGMAN, G. NORDSTRÖM

XXXX

No 2. 1963

On the History, Ecology and Ethology of the Mallards (*Anas platyrhynchos* L.) overwintering in Finland

ERKKI PULLIAINEN

(Department of Agricultural and Forest Zoology, University of Helsinki)

As the mallard (*Anas platyrhynchos* L.) is an important game species in Finland, its overwintering has been studied here mainly from the standpoint of shooting (e.g. SUOMUS & SEISKARI 1958, LAHTI 1958, PULLIAINEN 1962, 1963), although attention has also been paid to the biology of the species. RAITASUO (1955, 1958, 1960, to be published) and TIAINEN (1958) have treated the overwintering of the mallards primarily as a biological phenomenon.

The author has had an opportunity to study the subject in Varkaus, a town in East Finland, mainly from 1948 to 1958, and to some extent from 1959 to 1963 (see PULLIAINEN 1962, 1963). The following presentation is based on observations made in Varkaus, but an investigation of the history of the overwintering of mallards in Finland has also been deemed relevant.

On the history of the mallard's overwintering in Finland

The whole country

The localities where the mallard was reported as overwintering prior to 1941 are well known (HYTÖNEN & HEINI 1941, HYTÖNEN & HELLEMAA 1941), but no comprehensive report of overwintering has been published since that date (see also PULLIAINEN 1962).

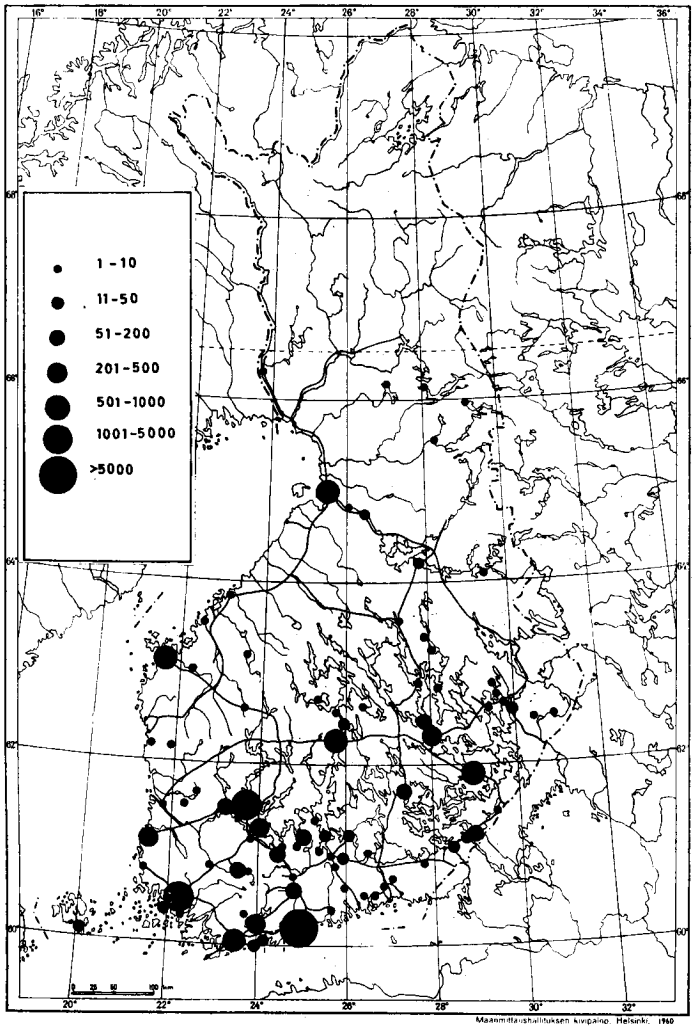

Fig. 1. The overwintering places of the mallards in Finland before the year 1960, according to all the sources the author has been able to find (see text). — Orig.

The author has collected data on the overwintering of this species up to the year 1960, using all the sources available; the results are illustrated in the map (Fig. 1). The numbers on the map refer to the reported maximum size of the population overwintering in each locality.

Overwintering of mallards in Finland was reported as long ago as

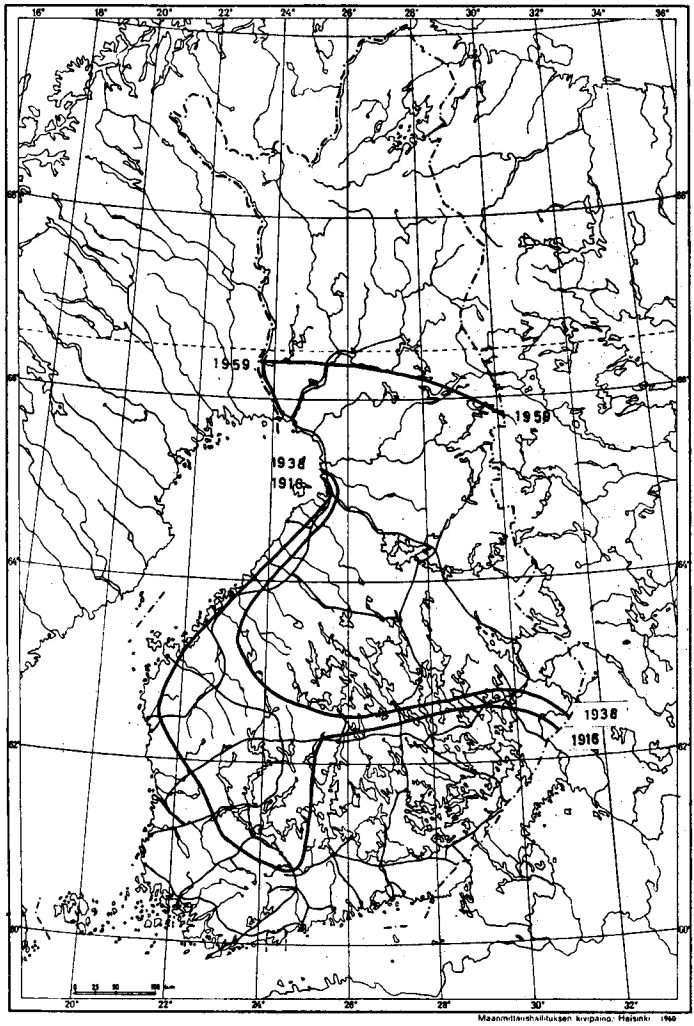

Fig. 2. Trends in the overwintering of the mallards in Finland up to the year 1959. — Orig.

1895 from Fagervik manor (GRIPENBERG 1916). Since then, the phenomenon has shown a clear periodicity (see Fig. 2). The first marked peak was reached in the winter of 1915/16, after which the size of the overwintering population increased fairly steadily; this trend culminated in a maximum in the winter of 1937/1938, after a rapid increase of population during the preceding years. A very rapid and abrupt decrease

followed during the years 1939—42 (see RAITASUO 1955), after which the numbers began to rise again; the increase has been particularly marked during the years 1958—62.

The town of Varkaus

In the autumn of 1936, the first mallards were persuaded to overwinter in Varkaus by attracting them with tame ducks (HYTÖNEN & HELLEMAA 1941). In the first winter, 20 mallards spent the winter in the town, and the numbers varied between 20 and 30 until 1945, there being 20 individuals in the winter of 1940/41, for instance. Thereafter the population tended to grow, having increased to 40 individuals by the winter of 1949/50. The trends in the size of the overwintering mallard population in Varkaus until the winter of 1962/63 are shown in Fig. 3. The winters of 1955/56 and 1958/59 show marked peaks. In the winter of 1962/63 the numbers (200 specimens) reached close to the overall maximum, 225 specimens, recorded in the winter of 1958/59.

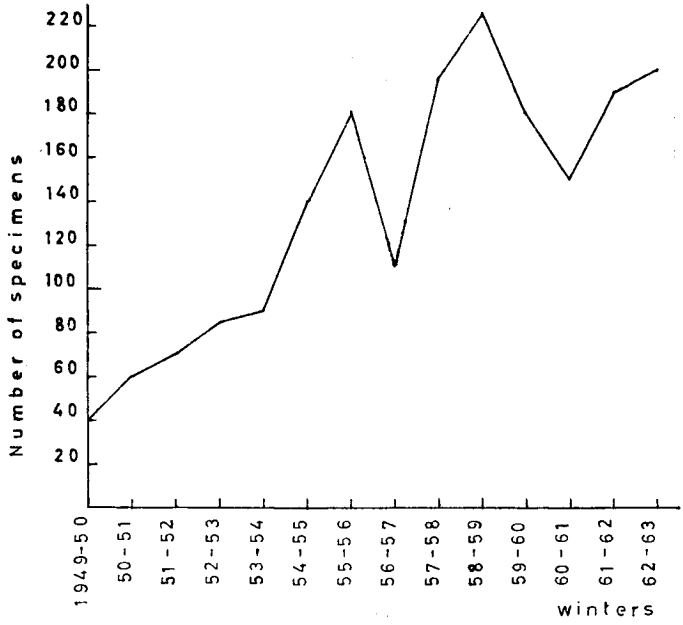

Fig. 3. Trends in the overwintering mallard population in Varkaus during the years 1949—63.

The sex ratio of the overwintering population is shown in Table 1.

At the margin of the town of Varkaus, in Kopolanvirta, a group of about 10 specimens has been overwintering yearly, both sexes being about similar in numbers.

Table 1. Sex ratio in the overwintering mallard population of Pirtinvirta in the years 1953—63.

	Numbers	
Winters	Females	Males
1953/54	45	45
1954/55	65	75
1955/56	80	100
1956/57	40	70
1957/58	86	110
1958/59	100	125
1959/60	65	115
1960/61	60	90
1961/62	75	115
1962/63	85	115

On the winter ecology of the mallards

The area and its natural conditions

The primary requirement for the success of the mallards seems to be a water area which remains unfrozen throughout the winter, this being necessary as a normal territory for the birds (see PULLIAINEN 1963).

Suitable areas of open water are available in fast-flowing rivers and brooks, in the vicinity of springs, sites where warm water is released and in mild winters even in field ditches, etc.

The water temperature in the Pirtinvirta at Varkaus is about $\pm$ 0°C in winter. The air temperature is somewhat higher in the immediate vicinity of the open water than elsewhere in the neighbourhood. On one occasion in calm weather, for instance, the air temperature was −2°C in the immediate vicinity of open water and fell abruptly upwards and away from the stream, being −9°C in the surroundings (the average temperature of the coldest month). Fig. 5 illustrates the monthly average temperature from October to April in the winters of 1960/61 and 1961/62.

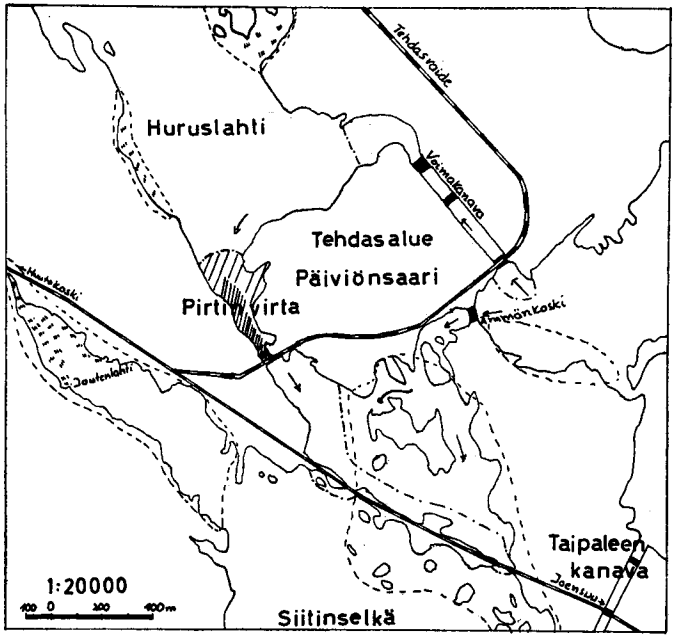

Fig. 4. Map of Varkaus. Explanations: —. —. — average position of ice edge during January and February; — — — — main breeding area of the mallards; dense hatching, feeding place of the mallards; sparse hatching, more extensive swimming area; tehdasalue = factory area.

Food

In general, the fall of air temperature causes an increase in the heat loss of animals. In order to reach equilibrium, homoiothermic animals must then accelerate their metabolism, which leads to increased energy consumption (ALLEE et al. 1951, pp. 467—468). This is very important for the subsistence of the mallards, which normally migrate away from Finland for the wintertime. Their food resources are decisively limited by the freezing of the water in autumn. Unfrozen areas of water are generally so small that their food resources are only sufficient for a fraction of the surface-feeding ducks present. The depth of the water in the unfrozen areas may also present an obstacle to the feeding of the birds. In some cases it has been observed that the mallards feed on lake sponges, and the larvae of mosquitoes and other insects (e.g. TIAINEN 1958). Perhaps the largest population which has subsisted for the whole winter solely on natural food has been recorded at Lauritsala, in South-

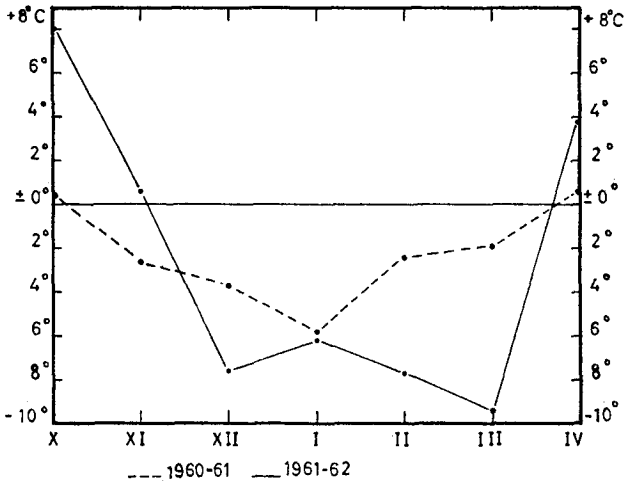

Fig. 5. The mean monthly (October—April) temperatures in Varkaus in the years 1960/61 and 1961/62 (according to the Finnish Meteorological Office).

east Finland (TIAINEN op.cit.); only one out of the 21 overwintering specimens was lost. The site of overwintering was in an area of unfrozen water close to a cellulose factory.

As mentioned above, natural food is so difficult to procure in winter that the mallards must obtain supplementary food, from man for instance, in order to subsist throughout the winter. Thus the food given by man is essential to the success of the overwintering mallards. A mallard consumes 50 to 100 grams of food daily, mostly in the form of grain as such or different cereal products (LAHTI 1958). Green and vitamin-rich food is also regarded as indispensable to compensate for the lack of natural food (see also SIIVONEN 1958).

In Varkaus the mallards have fully adapted themselves to use the food given by man. At Lauritsala on the other hand, the birds did not accept the food offered by man (TIAINEN 1958).

Shelter

In Lohja, South Finland, for instance, a wall 2—3 m high has been erected as a shelter in the site where the mallards overwinter, as it is thought to increase the comfort of the birds. It offers shelter from the wind, at least.

The author has observed only a slight tendency among the mallards at Varkaus to seek shelter behind such wind-breaks.

On the overwintering ethology of mallards and ducks

Intraspecific relations

The map (Fig. 4) shows the area mainly occupied for swimming by the mallards in Pirtinvirta. It is situated in the immediate vicinity of the feeding place. The mallards have grown used to feeding on food given by man to such an extent that they hardly attempt to take food from the bottom, which is their normal mode of feeding, although the water is so shallow at the river shore that the mallards can reach the bottom. The appearance of a man on the shore attracts all the mallards as close to the shore as possible. They have learned that food comes with man: man is a food signal for them (cf. on gulls, BERGMAN 1960). The author made some experiments in order to study this phenomenon: a man set out towards the opposite shore, about 150 m. away from the feeding place. Most of the mallards then flew to this shore, although some of them remained in the principal swimming area. The experiments were repeated in the night, when it is not quite dark because the lights of the town and reflection from the snow gave some illumination. Then too, the reactions were similar to those seen in the daytime.

WEIDMANN (1956, 1958), among others, has made thorough investigations on the ethology of the mallard (see also HEINROTH 1910, 1911, BROCK 1914, WORMOLD 1914, TOWNSEND 1916, GEYR V. SCHWEPPENBURG 1924, BOASE 1934, LORENZ 1941, HÖHN 1947); in Finland, FABRICIUS (1951) and RAITASUO (1958, to be published) have studied this subject.

As RAITASUO (1958, to be published) has given a detailed account of the ethology of overwintering mallards in Finland, only some arbitrarily chosen features of the behaviour of the overwintering mallards in the Pirtinvirta at Varkaus will be presented here.

One of the commonest and most typical winter activities of the mallard is bathing (see HEINROTH 1910, WEIDMANN 1956, pp. 221—222). The bird repeatedly puts its head into the water and throws water on to its back; the back is shaken by relatively slow wing movements. In the intervals between ducking its head the bird pecks at the water, sieves it with its bill, and stretches its neck; a very typical feature is the preening of the back feathers with the bill, and similarly scratching of the head

and bill with the foot and bending the head backwards. Almost without exception (several hundred observations) the bathing ends, after a variable time, the bird rising from the water (or from the ground), unfolding its wings and flapping them a few times (see WEIDMANN 1956, p. 217, Fig. 3; see also HEINROTH 1910). Thereafter it settles down, bends itself forward and shakes its tail sidewise a few times (see WEIDMANN op.cit., pp. 216—217). In addition, the bird shakes its body and head a bit (see WEIDMANN op.cit., p. 217).

Bathing is started when the bird slides from the shore into the water or when swimming. This activity may be released by the behaviour of another mallard (male and female). According to my data, which comprised 70 cases of bathing kept under observation from start fo finish during the period from December to January, the two sexes served equally often as a bathing signal. Naturally bathing may be started even in the absence of other bathing mallards. Dishevelment of the feathers, for instance, seems to be able to release bathing (see also WEIDMANN 1956), but this seems to be a rarer stimulus than the sight of another bathing individual.

The author has keenly watched the bathing behaviour of mallards in winter and found that ducking the head is first done at a low frequency, but after 5—10 seconds it can be continued in three ways. First, it can be continued at a low frequency (mean 36 times/min.), the bird swimming along a straight course. Secondly, it can be done within a limited area along a round course (mean frequency 47 times/min.), during which the direction of motion may change. Thirdly, there is an intermediary type, in which the mallard moves partly along a straight line and partly along a round course (mean 45 times/min.). The frequency varies in the different stages of the movement in such a way that it is much lower during the straight course than during the round course stage. Bathing is performed as often in dense flocks as when the birds are separated from the other individuals. Bathing of an individual in a dense flock can stimulate other individuals to bathe. The author has observed that sometimes a great many individuals start bathing within a short time (less than 30 seconds) in a very restricted area (about two square metres). In such cases the birds move along a round course. A bathing male often approaches a female and begins to bathe around her. If the male cannot stimulate the female to bathe, he continues his course, whereas if the female begins to bathe, the male starts to move in a circle and ducking of the head is greatly accelerated.

If a disturbance (e.g. too dense a flock) interrupts the bathing, the bird continues this as soon as an opportunity arises: the interruption may last for 30 seconds. In certain cases an individual has bathed twice at less than a minute's interval, but generally the interval seems to be much longer. As the individuals were not marked, a more detailed study of this point was impossible.

Table 2. The frequency of ducking the head among mallards in connexion with bathing at different times of day in Pirtinvirta.

Time, hours	Frequency Times/60 sec.			Number of observations		
	♀♀	♂♂	♀♀+♂♂	♀♀	♂♂	♀♀+♂♂
9.30–11.00	42,9	40,8	41,8	21	25	46
12.30–14.05	44,9	47,6	46,5	9	13	22
18.00–19.00	41,8	39,7	40,6	5	7	12
Total	43,3	42,6	42,9	35	45	80

The author has recorded the frequency of ducking the head in connexion with bathing at different times of the day in Pirtinvirta. The results are shown in table 2. The air temperature was −9°C during the observation period, i.e. about the same as the mean temperature (−9.5°C) of the coldest month (February) in Varkaus.

The activity seems to reach a peak at about 13–14 h. According to HEINROTH (1910), many Anatids bathe for a short period before noon, intensively between 11 and 14 h and only rarely before sunset, and my results seem to agree with his observations in the main. It should be noted that the observations collected in the table were made during a period when the daytime was at its shortest (December 27–28, the sun rising at 9.28 h and setting at 15.15 h).

The author has sometimes seen the mallard make all bathing movements when standing on the edge of the ice. To do so, it must bend over very deeply (see also WEIDMANN 1956).

In connexion with bathing, the author has seen aggressive behaviour between individuals, such as pecking at one another's feathers.

MCDOUGALL (1936), KORTLANDT (1940) and BAERENDS (1950) call comfort movements those movements which remove a feeling of discomfort and stimulate metabolism, namely scratching, shaking and stretching. In the cormorant (*Phalacrocorax carbo sinensis*) KORTLANDT (1940) also included bathing and preening among these. WEIDMANN

(1956), as well as KORTLANDT (1940) and BAERENDS (1950), regards scratching, shaking and stretching as comfort movements. According to WEIDMANN (op.cit.), however, they do not correspond to one instinct in the mallard, because they occur quite independently of one another in almost every situation. He deals with preening and bathing separately, because they do not comply with this. According to him (WEIDMANN op.cit, p. 268), comfort movements occur in conflict situations. As described above, most of the comfort movements are closely associated with bathing, and I could not distinguish them as clearly separate movements in Varkaus. It may be that the disorder of the feathers caused by bathing (ducking the head) stimulates the movements that follow. It must also be remembered that the overwintering of mallards in Varkaus occurs in extreme conditions.

After the mallard has climbed onto the ice it at least preens its feathers, before settling down to rest.

Of the 200 overwintering individuals an average of 40 (20 per cent) remain on the ice while the others are swimming. In the night, only a very few individuals feel comfortable on the ice at the feeding place. Resting on the shore takes place mainly during the daytime.

The shyness of the mallards seems to increase at night, perhaps because they cannot always exactly identify what is moving on the shore (cf. feeding p. 52). They are also noisier during the night.

Many winter activities of the mallards are characterized by pronounced features of group behaviour. This applies, for instance, to taking wing, swimming of the flock and night calls. A notable feature is the synchronization of some activities; one can, for instance, often observe a great flock (more than 100 individuals) swimming in the same direction, upstream, all the birds sieving water with their bills, and with their necks outstretched. This is a feeding activity which is perhaps released by very thin sheet of ice in the stream.

WEIDMANN (1956) could not find a peck-order or a leader among mallards (cf. SCHJELDERUP-EBBE 1924). The author has also not been able to detect any such order among the overwintering mallards in Varkaus. I have not found any differences in strength between healthy individuals of opposite sexes: the same holds true within both sexes. Unhealthy and damaged individuals, on the other hand, are regularly outmanoeuvred at the feeding place. The author has found that a male does not steal food from his own mate, but a strange male may do so (see also WEIDMANN 1956).

Particularly crippled and/or otherwise unhealthy individuals, although also healthy ones, regularly visit certain yards where they have become accustomed to getting food [concerning the same phenomenon among (healthy) gulls, see GOETHE 1956, BERGMAN 1960].

Interspecific relations

The following waterfowl species, besides the mallard, have overwintered in the Pirtinvirta:

Species	Years	Numbers/year	Sex
Pochard (*Aythya ferina*)	1954–55	1	♀
Tufted duck (*Aythya fuligula*)	1954–63	1–2	♂♂
Goldeneye (*Bucephala clangula*)	1961–63	1–4	♀♀ + ♂♂
Long-tailed duck (*Clangula hyemalis*)	1953–63	1	♂
Goosander (*Mergus merganser*)	1958–60	1	♀♀
Red-breasted merganser (*Mergus serrator*)	1961–62	1	♀

These species behave rather differently at the overwintering places.

The pochard and the tufted duck feel at home among the mallards, whereas the goldeneye and the goosander avoid the principal swimming area of the mallards (see Fig. 4); however, one female goldeneye was seen to enter this area a few times in the winter of 1962/63. The long-tailed duck and the red-breasted merganser are intermediary in this respect: they move within a rather large area, and sometimes enter the swimming area of the mallards. The long-tailed duck and one of the tufted ducks had become wing-lamed during migration, obviously having been shot; they can be recognized by colours. In summer they also remain close to the wintering place and, being unable to fly, they have resorted to the available unfrozen water for the wintertime. The long-tailed duck has already spent 10 winters and the tufted duck 9 winters in Pirtinvirta. The former kept away from the mallards in the first winters, but has gradually begun to feel more comfortable among them (see also KAROS & LIND 1960).

The pochard, the tufted duck and the long-tailed duck accept food given by man to some extent, but obviously they largely subsist on food they catch themselves. The pochard and the tufted duck dive at the feeding place. The long-tailed duck likes to dive in the deeper parts of the stream. So do the goldeneye, the goosander and the red-breasted merganser.

The overwintering red-breasted merganser (♀) clearly showed aggressive behaviour towards the mallards. She drove the mallards away by pecking at them within a radius of 40—50 cm around her. In such cases mallards give way and do not defend themselves.

The species differ in ability to compete at the feeding place. As mentioned, the red-breasted merganser is superior to the mallard. The author has seen the tufted duck competing with the mallard, but the latter invariably wins and the tufted duck withdraws. There are no observations on the order between the tufted duck and the long-tailed duck. The female goldeneye which visited the feeding place in the winter of 1962/63 gave way to the mallards.

The only bird heard to give a call was the long-tailed duck. This call is most frequently made when people are present.

On the success of the overwintering

According to RAITASUO (1960), the winter losses of the overwintering mallard population of Helsinki are normally 5—6 per cent, but may reach as much as nine per cent in unfavourable climatic conditions (1959/60).

In Varkaus, the yearly losses have been on average 5 per cent, but since the population size has exceeded about 180 individuals they have somewhat increased. Losses also include individuals which must have been killed by the authorities for humane reasons.

According to TIAINEN (1958), the losses among the overwintering mallards were only five per cent in Lauritsala, although the birds were not fed by man.

Losses exceeding 50 per cent have been recorded, e.g. in Tampere in 1922/23 (KÄRKI 1923).

Breeding of the overwintering individuals

It has been pointed out in various investigations that the mallards tend to breed in the vicinity of the overwintering place (e.g. KUUSISTO 1937, SUOMUS & SEISKARI 1958, RAITASUO 1960, PULLIAINEN 1962, 1963).

Even in the thirties, the overwintering mallards still migrated long distances from the overwintering place to their normal breeding habitat (RAITASUO 1960). RAITASUO (op.cit.) made his observations mainly in the city of Helsinki and its surroundings.

In Varkaus, the overwintering individuals started to breed in the area of the town in the late 'fifties and do so now almost without exception. In the factory area (see Fig. 4), they have accepted as nesting sites old wood heaps, parks, sawdust heaps, etc. Joutenlahti (see Fig. 4) is a shallow eutrophic bay about 4 hectares in area surrounded by a marsh with sedge and grass vegetation. It is the closest locality to the overwintering place which shows some resemblance to the normal breeding habitat of the mallard. In some years the breeding density there has exceeded 10 pairs/hectare of ground. The present paper is mainly concerned with observations on the events in winter, and no detailed nesting data have been collected, but as the nests are made on grass hummocks, it is not difficult to find them.

Table 3. Comparison of the nesting behaviour of overwintering individuals and migrants.

Overwintering mallards		Migrants	
15. V. 1954	10 juv.	31. V. 1955	8 juv.
17. V. 1954	10 juv.	1. VI. 1955	11 eggs
10. V. 1955	10 juv.	20. V. 1956	7 eggs
10. V. 1955	10 eggs	23. V. 1956	6 eggs
19. V. 1955	10 juv.		
19. V. 1955	9 eggs		
20. IV. 1960	6 eggs		
9. V. 1961	6 juv.		

Overwintering birds start nesting earlier than migrants (see table 3).

Table 3 includes only data on nests or young known with certainty to be of the first brood of the year. The data is scanty but clearly illustrates the situation.

The soot of the factories and the combustion product of the waste lye of the cellulose industry thaw the snow about two weeks earlier in the town than in the surrounding district. Thawing is also accelerated by the higher (1—2 degrees) temperature in the town (see also FRANSSILA 1961).

LINKOLA (1962) reports 8.1 eggs as the mean clutch size of the mallard. I only have data on 11 nests in which egg-laying was completed (first nesting). The mean size of the clutch in these was 8.4 eggs, which agrees well with the figure given by LINKOLA (op.cit.).

Egg losses are great, owing to plundering by crows (*Corvus corone*), boys, etc. Renewed nesting is common (see also LINKOLA 1962).

The success of the broods seems to be directly proportional to the population (nesting) density in the area of the town. I found that on

average a female was able to raise two full-grown young in Joutenlahti in 1962 (cf. p. 58). The losses are largely due to fights between the females, which are particularly dangerous for the small young. Rats, cats and loose dogs also constitute threats to their safety. I have seen crows (*Corvus corone*) watching the course of mallard broods, but I have rarely observed losses caused by them. I have also seen the lesser black-backed gulls (*Larus fuscus*) and herring gulls (*Larus argentatus*) attack swimming or walking broods, but, as far as I have been able to observe, without success (cf. KOSKIMIES 1957 b, BERGMAN 1960). Many losses are due to people feeding the young with grain or grain products which cause swelling of their stomachs.

The population density is much lower at Huruslahti than at Joutenlahti. On the grassy part of the western shore of Huruslahti (see Fig. 4), for instance, there are only 2—3 pairs/500 m. of shore (cf. e.g. PÖYHÖNEN 1962). I have had an opportunity to keep a close watch on the success of these broods and found that each female has been able to rear 4—5 full-grown young. The biggest autumn brood seen by me comprised eight young.

The males move in small flocks from May onwards; the number of individuals in a flock is generally less than 10. The movements of these flocks have been watched from the roofs, but the radius of activity has not been exactly determined.

A distinct gathering of the mallards around the overwintering places is to be observed in August, particularly after the beginning of the shooting season outside the town, which opens on the 20th of that month. This indicates that at least some of the males spend the summer outside the town. As the lakes in the surroundings begin to freeze the number of individuals at the wintering place increases rapidly. Experience has shown that the size of the overwintering population can be somewhat regulated by postponing the beginning of feeding (see PULLIAINEN 1962, 1963).

No markings have been made which would allow conclusions as to the replacement of individuals in the overwintering population, but presumably low nesting success retards it (cf. RAITASUO 1960).

Discussion

KALELA (1952) has suggested that the warm period which reached its climax in the thirties and which is still partly continuing, has pro-

moted the overwintering of the mallards in Finland, although feeding by man has played an important rôle, too.

There are three marked peaks in the history of the overwintering of this species (1916, 1938, 1958—62), which seem to coincide with the warm periods of this century (see KERÄNEN 1952). On the other hand, the overwintering populations suffered a catastrophe in the very cold winters of the early 'forties (see Fig. 6). Possibly failure to feed the birds and effective hunting, which caused severe reduction in the mallard population during the war, contributed to this crash.

An area remaining unfrozen through the winter and sufficient and varied food must be regarded as the two basic requirements for the succesful overwintering of the mallard. Man can artificially assist the overwintering of the mallards in both respects, by maintaining an area of open water and by seeing that the birds are fed. In the latter respect, man has played an important rôle in assisting the mallards' overwintering.

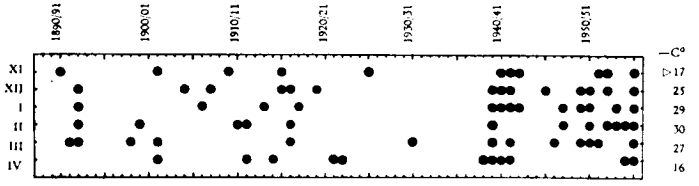

Fig. 6. The warming-up of the climate reached its climax in the 1930's. Dots show the minimum temperature recorded during each of the winter months in Tampere by the Finnish Meteorological Office. The records have been most abundant since the winter of 1939/40 (SIIVONEN *1958*).

The map (Fig. 1) clearly shows how closely the overwintering of the mallard is dependent on the possibilities offered by civilization. The three biggest cities of the country, Helsinki, Tampere and Turku, have quartered the biggest overwintering populations. Other large populations have also spent the winter in cities and towns. Care and feeding by man have been important in this respect. It is notable, however, that overwintering has also been possible without direct help from man. The success of such overwintering is dependent on the natural food resources available, which regularly put a low limit on the size of such populations.

The site attachment of the mallards has greatly contributed to their urbanization (see e.g. RAITASUO 1955, KOSKIMIES 1956, SUOMUS & SEISKARI 1958). Having once overwintered at a certain place, they

repeatedly return to the same spot for the winter if circumstances permit (partly with the aid of man), and tend to breed in its neighbourhood. As these overwintering places are often situated in a built-up area, the mallards consequently have gradually begun to breed near urban centres, wherever possible: in parks and larger industrial areas where they have enough room, etc. Learned habitat selection seems to have been an important factor in this process (see also PEITZMEIER 1942, 1949). Mallard young born in population centres have perhaps been imprinted to this habitat (cf. PALMGREN 1938, DURANGO 1947, PEITZMEIER 1949, BERGMAN 1952, KOSKIMIES 1957 a, HILDEN 1958) and choose such places for breeding. This acquired character has thus been transferred from generation to generation. On the other hand, locally occurring high mortality among the young has retarded the trend. The rapid (10—15 years) development of such a preference for a new type of habitat is hard to explain by natural selection.

The nesting of the mallards in the vicinity of the overwintering place has certainly also been stimulated by a climatic factor, namely that the snow thaws earlier in population centres than in their surroundings. Nesting can thus be started earlier than in the surroundings (see p. 58). This has been of particular significance in the interior of the country, but obviously it has little effect in the southern coastal zone.

The adaptation of the mallards to civilization has had harmful effects both on the birds themselves and on man (see also KOSKIMIES 1962). The overwintering individuals have lost their normal shyness towards man almost completely. Nesting in population centres has led, locally at least, to high nesting losses, particularly in the first days after hatching (cf. e.g. the velvet scoter, *Melanitta fusca*, in the outer archipelago, KOSKIMIES 1955, 1957 b).

The overwintering mallard populations are clearly male-dominated, although this did not become apparent until the middle of the fifties in Varkaus. Mortality is presumably higher among the females that lay eggs, incubate them and take care of the young than among the males, which move within a larger area. Particularly the cats, dogs, etc., of the towns should be borne in mind in this connexion. According to LINKOLA (1960, 1961), the normal sex ratio of mallards is 1: 1. The excess of males among the overwintering mallards may signify that the females show a greater tendency to migrate (LINKOLA 1960; cf. ALBRECHT 1962). I think that both these factors may contribute to the male dominance of the overwintering mallard populations. In the foreign

literature I have found the following records on the male-dominance of the mallard: 130 ♂♂/100 ♀♀ (FRIELING 1934), 92—150 ♂♂/100 ♀♀ (HOMES 1942), 106—114 ♂♂/100 ♀♀ (EYGENRAAM 1957), 108—144 ♂♂/100 ♀♀ (NILSSON 1962).

The overwintering of the mallards from the standpoints of shooting and nature conservation is dealt with in other papers (PULLIAINEN 1962, 1963).

Summary

The paper deals with the overwintering of mallards and other ducks in Finland, especially on the basis of observations made in Varkaus, mainly in the period 1948—58 but to some extent also in the years 1959—63.

The history of the mallards' overwintering in Finland exhibits three marked peaks (1916, 1938, 1958—62) and one crash (the early 'forties). The warm period has promoted overwintering, and the decrease of the early 'forties was at least partly due to cold winters, lack of feeding by man and effective shooting.

The overwintering populations are usually male-dominated (e.g. in Varkaus in 1954—63).

The basic requirements for the overwintering of this species are a water area remaining unfrozen throughout the winter and sufficient and varied food. Man's aid is essential for the success of the overwintering. Shelter is of little significance in comparison with the other factors.

The mallards are dependent on food given by man in Varkaus. Man is a food signal for them. The mallards watch the events on the river shore even at night if the illumination allows.

The wintertime bathing behaviour of the mallard is described and the association between bathing behaviour and comfort movements is discussed. Bathing activity seems to be at its liveliest at about 13—14 h.

The birds take rests on the shore, mainly in the daytime.

Flocking becomes pronounced in the winter.

No peck-order or leader system was detected. Unhealthy and damaged individuals are inferior in the competition for food. Crippled and unhealthy birds, in particular, but also healthy ones, visit certain yards for food observing a certain time-table.

Interspecific relationships in the overwintering place are described. A red-breasted merganser (♀) showed aggressive behaviour towards the mallards.

In Varkaus the losses among the overwintering populations are about 5 per cent.

Because the overwintering individuals show site attachment, they tend to breed in the vicinity of the overwintering place, which often leads to high breeding density. Learning as a new habitat selection pattern seems to have contributed greatly to the rapid changeover to breeding in a new type of habitat. In the interior of the country this has also been furthered by the rapid thawing of the snow in the population centres as compared with the surroundings.

The clutch sizes of overwintering individuals and migrants do not differ.

Nesting losses are heavy and the mortality of the young in excessively dense populations high, owing to the shortcomings of the abnormal environment.

Acknowledgements. I wish to express my gratitude to Prof. Olavi Kalela and Dr. Göran Bergman for their continual interest in my work and for helpful criticism. They have checked the manuscript and made valuable suggestions.

I also wish to thank Prof. Esko Kangas, Head of the Agricultural and Forest Zoological Institute, University of Helsinki, for working facilities.

The manuscript was translated by Dr. Lasse Sammalisto and checked by Mrs. Jean Margaret Perttunen, B.Sc., to whom I extend my sincere thanks.

Literature: ALBRECHT, H., 1962, Die Mitschattierung. Experientia 18: 284, 1—5. — ALLEE, W. C., K. P. SCHMIDT & R. HESSE, 1951, Ecological animal geography. New York — London. — ANONYMUS, 1910, Harvinaisia talvivieraita. Luonnon Ystävä 14: 122. — ANONYMUS, 1916, Suomessa talvehtivat sorsat. Ibid. 20: 70. — BAERENDS, G. P. & J. M. BAERENDS van ROON, 1950, An introduction to the study of the ethology of Cichlid fishes. Behaviour suppl. 1: 1—242. — BERGMAN, G., 1952, Fåglarnas liv. Stockholm. — 1960, Über neue Futtergewohnheiten der Möwen an den Küsten Finnlands. Ornis Fenn. 37: 11—28. — BOASE, H., 1934, Display of the mallard. Brit. Birds 25: 12—17. — BROCK, S. E., 1914, The display of the mallard in relation to pairing. Scot. Nat. 1914, pp. 79—86. — BRÜNING, J., 1941, Talvehtivat sorsat. Metsästys ja Kalastus 30: 24. — DURANGO, S., 1947, Om vanan hos vissa fåglar att bosätta sig intill insektsamhällen eller andra fågelarter. F.o.Fl. 42: 185—205, 249—259. — EUROPAEUS, A., 1910, Harvinaisia talvivieraita Suomessa. Luonnon Ystävä 14: 81. — EYGENRAAM, J. A., 1957, The sex ratio and production of the mallard, *Anas platyrhynchos L.*, Ardea 45: 117—143. — FABRICIUS, E., 1951, Zur Ethologie junger Anatiden. Acta Zool. Fenn. 68: 1—178. — FRANSSILA, M., 1961, Ihminen ilmaston muuttajana. Suomal. Tiedeakat. Esitelmät ja Pöytäkirjat 1960, pp. 95—108. — FRIELING, H., 1934, Statistische Untersuchungen über das Geschlechtsverhältnis der Enten zur Zugzeit. Der Vogelzug 5: 107—115. — GEYR v. SCHWEPPENBURG, H., 1924, Zur Sexualethologie der Stockente. Journ. Ornith. 72: 472—476. — GOETHE, F., 1956, Die Silbermöwe. Neue Brehm-Bücherei, Heft 182. — GRIPENBERG, G. A., 1916, Muutamia tietoja Suomessa talvehtivista sinisorsista. Luonnon Ystävä 20: 69—70. —

HAARAMO, O., 1909, Sinisorsia talvella. Ibid. 13: 115–116. — 1917, Talvehtivia heinäsorsia. Ibid. 21: 68–69. — HAGFORS, M., 1916, Talvilintuja Myrskylässä. Ibid. 20: 110–112. — HEINROTH, O., 1910, Beobachtungen bei einem Einbürgerungsversuch mit der Brautente (*Lampronessa sponsa L.*). Journ. Ornith. 58: 101–156. — 1911, Beiträge zur Biologie, namentlich Ethologie und Psychologie der Anatiden. Verh. 5. intern. orn. Kongr. Berlin, 1910, pp. 589–702. — HIITONEN, I., 1941, Sorsien talvehtimisesta Helsingissä. Luonnon Ystävä 45: 220.–1942, Sinisorsien talvehtimisesta Helsingissä. Ibid. 46: 150. — HILDEN, O., 1958, Miten linnut valitsevat pesimäympäristönsä. Luonnon Tutkija 62: 14–25. — HOMES, R. C., 1942, Sex ratios in Winter Duckflocks. Brit. Birds 36: 42–50. — HYTÖNEN, O. & H. HEINI, 1941, Talvehtivista sorsista. Metsästys ja Kalastus 30: 50–51. — HYTÖNEN, O. & A. HELLEMAA, 1941, Jälkisatoa tietoihin talvehtivista sorsista. Metsästys ja Kalastus 30: 111–113. — HÖHN, E. O., 1947, Sexual behaviour and seasonal changes in the gonads and adrenals of the mallard. Proc. Zool. Soc. London 117: 281–304. — KALELA, O., 1952, Changes in the geographic distribution of Finnish birds and mammals in relation to recent changes in climate. Fennia 75: 38–51. — KAROS, M. & E. A. LIND, 1960, Allin (*Clangula hyemalis*) ja telkän (*Bucephala clangula*) esiintymisestä Savonlinnassa. (Summary: Observations on the Long-tailed Duck and the Goldeneye at Savonlinna, S. E. Finland, in summer.) Ornis Fenn. 37: 97, 100. — KERÄNEN, J., 1952, On temperature changes in Finland during the last hundred years. Fennia 75: 3–16. — KORTLANDT, A., 1940, Eine übersicht der angeborenen Verhaltensweisen des mitteleuropäischen Kormorans (*Phalacrocorax carbo sinensis Shaw & Nodd.*), ihre Funktion, ontogenetische Entwicklung und phylogenetische Herkunft. Arch. neerl. Zool. 4: 401–442. — KOSKIMIES, J., 1955, Juvenile mortality and population balance in the velvet scoter (*Melanitta fusca*) in maritime conditions. Acta XI. Congr. Int. Ornith. (Basel) pp. 476–479. — 1956, Heinäsorsakantamme verotus meillä ja muualla. Suomen Riista 10: 18–25. — 1957 a, Terns and gulls as features of habitat recognation for birds nesting in their colonies. Ornis Fenn. 34: 1–6. — 1957 b, Verhalten und Ökologie der Jungen und der jungenführenden Weibchen der Samtente. Zur Fortpflanzungsbiologie der Samtente, *Melanitta f. fusca (L.)*. II. Ann. Zool. Soc. 'Vanamo' 18:9, 1–69. — 1962, Riistan sopeutuminen kulttuuriluontoon. (Summary: Adaptation of wildlife to culture landscapes.) Suomen Riista 15: 188–195. — KOSKIMIES, J. & P. RAJALA, 1957, The winter bird census of 1956/57. Arch. Soc. 'Vanamo' 12: 1, 41–50. — 1958, The winter bird census of 1957/58. Ibid. 13: 1, 39–53. — KUUSISTO, P., 1937, Lisiä sinisorsan, *Anas p. platyrhyncha L.*, biologiaan. Ornis Fenn. 14: 75–76. — KÄRKI, E., 1910, Sorsa nähty tammikuussa Pohjanmaalla. Luonnon Ystävä 14: 36. — 1923, Tammerkosken talvivieraat. Ibid. 27: 138–142. — Lahti, T., 1958, Heinäsorsiemme talvehtiminen. Metsästys ja Kalastus 47: 383–384. — LEVANDER, G. V., 1919, Tämän talven linnuista Käkisalmen seuduilla. Luonnon Ystävä 23: 45–46. — LINKOLA, P., 1960, Über das Geschlechtsverhältnis bei den Entenvögel. Ornis Fenn. 37: 36–45. — 1961, Sorsalintukantojen kehityksestä Keski-Hämeen vesillä 1950–60. (Summary: Duck populations in central Häme from 1950 to 1960.) Suomen Riista 14: 125–137. — 1962, Havaintoja sorsalintujen lisääntymistuloksesta Keski-Hämeessä. (Summary: Notes on the breeding success of ducks in Central Häme.) Ibid. 15: 157–174. — LORENZ, K., 1941, Vergleichende Bewegungsstudien an Anatinen. Journ. Ornith. 89: Erg.-Bd. 3, 194–294. — McDOUGALL, W., 1936, An outline of psychology. London. — NILSSON, L., 1962, Från andräkningarna 1959/60 och 1960/61: Gräsanden (*Anas platyrhynchos*) och viggen (*Aythya fuligula*). Vår Fågelvärld 21: 121–129. — PALMGREN, P., 1938, Zur Kausalanalyse der ökologischen und geographischen Verbreitung der Vögel Nordeuropas. Arch. Naturgesch. 7: 235–269. — PARVELA, A., 1917, Sinisorsia talvehtinut Oulussa. Luonnon Ystävä 21: 111. — PEITZMEIER, J., 1942, Die Bedeutung der oekologischen Beharrungstendenz für

faunistische Untersuchungen. Journ. Ornith. 90: 311–322. — 1949, Ornithologie als biologische Wissenschaft. Heidelberg. — PULLIAINEN, E., 1962, Varkauden talvehtivasta sorsakannasta. (Summary: On the mallard population overwintering in Varkaus, East Finland.) Suomen Riista 15: 181–187. — 1963, Talvehtivat sorsamme, vain talvisen luonnon piristäjiä vaiko vesilintukantamme lisääjiä. Metsästys ja Kalastus 52: 10–12. — PYNNÖNEN, A., 1931, Talvea uhmaavista vesilinnuista Pohjois-Karjalassa. Ornis Fenn. 8: 54–55. — PÖYHÖNEN, O., 1962, Vesilinnustosta eräissä Sumiaisten ja Konneveden pitäjien järvissä. (Zusammenfassung: Die Vogelfauna in einigen Binnengewässern Mittel-Finnlands.) Ibid. 39: 67–77. — RAITASUO, K., 1955, Sorsat kaupunkiemme asukkaina. Metsästys ja Kalastus 44: 44–46. — 1958, Leikeistä lemmendraamoihin. Eränkävijä pp. 7–12, 84, 86, 88. — 1960, Tungosta Helsingin sorsavesillä. Metsästys ja Kalastus 49: 232–234. — Über Herbst- und Winterbalz bei finnischen Stockenten (*Anas platyrhynchos*). (to be published). — RAJALA, P. & V. TÖRNROOS, 1960, The winter bird census of 1958/59. Arch. Soc. 'Vanamo' 14: 1, 46–68. — REUTER, J., 1926, De tama gräsänderna (*Anas p. platyrhyncha*) i Ekenäs. Ornis Fenn. 3: 97–102. — RÄSÄNEN, S., 1927, Käkisalmen ja sen ympäristön talvilinnuista. Luonnon Ystävä 31: 107–108. — SIIVONEN, L., 1958, Lähimpien vuosikymmenien keskeisimmistä riistanhoitotoimenpiteistä. Suomen Riista 12: 12–20. — SUNDQVIST, N., 1919, Talvehtivia muuttolintuja. Luonnon Ystävä 23: 18. — SUOMALAINEN, E. W., 1917, Sinisorsa Kullaan pitäjässä. Ibid. 21: 111. — 1922, Sinisorsia, isoja koskeloita ja hanhia sydäntalvella. Ibid. 26: 54–55. — SUOMUS, H., & P. SEISKARI, 1958, Sorsien talvihoidosta Evolla. Suomen Riista 12: 62. — TIAINEN, B. J., 1958, Harvinainen sorsien talvehtiminen. Metsästys ja Kalastus 47: 259–260. — TOWNSEND, Ch. W., 1916, The courtship of the merganser, mallard, black duck, baldpate, woodduck and bufflehead. Auk 33: 9–17. — WEIDMANN, U., 1956, Verhaltensstudien an der Stockente (*Anas platyrhynchos L.*). I. Das Aktionssystem. Z. Tierpsychol. 13: 208–271. — 1958, Verhaltensstudien an der Stockente (*Anas platyrhynchos L.*). II. Versuche zur Auslösung und Prägung der Nachfolge- und Anschlussreaktion. Ibid. 15: 277–300. — WORMOLD, H., 1914, The courtship of the mallard and other ducks. Brit. Birds. 4: 2–7. — YLÄNNE, Y., 1911, Sinisorsa talvehtinut Sammatissa. Luonnon Ystävä 15: 219.

Selostus: **Talvehtivien sinisorsien (*Anas platyrhynchos*) historiasta, ekologiasta ja etologiasta Suomessa.**

Käsillä olevassa kirjoituksessa käsitellään sinisorsien talvehtimista Suomessa erikoisesti Varkaudessa, Itä-Suomessa, tehtyjen havaintojen perusteella, joita kirjoittajalla on pääasiassa vv. 1948–58 ja jossain määrin vv. 1959–63.

Sorsien talvehtimisen historiassa Suomessa on voitu havaita kolme selvää huippua (1916, 1938 ja 1958–62) ja yksi voimakas lasku (1940-luvun alku). Ilmaston yleinen lämpeneminen, joka saavutti huippunsa 1930-luvulla, vaikutti kehitykseen positiivisesti. 1940-luvun alun romahdukseen vaikuttivat pakkastalvet ja lisäksi ruokinnan positiivisen vaikutuksen lakkaaminen ja sorsien tehokkaan pyynnin vaikutus kantoihin.

Talvehtivat sorsakannat näyttävät olevan yleensä koirasvaltaisia (esim. Varkaudessa vv. 1954–63).

Sorsien talvehtimisen perusedellytyksinä voidaan pitää sulana pysyvää vesialuetta ja riittävää, monipuolista ravintoa. Ihmisen toimenpiteillä on ratkaiseva vaikutus talvehtimisen onnistumiseen. Suojan merkitys edellä esitettyjen tekijöiden rinnalla on vähäinen.

Sorsat ovat Varkaudessa täysin riippuvaisia ihmisen antamasta ravinnosta. Ihmisen saapu-

minen ruokintapaikalle on sorsille »ruokasignaali». Myös yöllä sorsat valaistuksesta riippuen seuraavat tapahtumia joen rannoilla ja käyttäytyvät sen mukaan.

Kirjoituksessa kuvataan sorsien talvista kylpemiskäyttäytymistä ja pohditaan kylpemisliikkeiden liittymistä »comfort movements»-liikkeisiin. Sorsien kylpemisaktiivisuus (analysoituna pään sukellus frekvenssillä) näyttää olevan suurinta keskipäivällä.

Rannalla tapahtuva lepääminen tapahtuu pääasiallisesti päivällä.

Sorsien laumakäyttäytymispiirteet korostuvat talvella.

Mitään »peck-order» tai »leader» systeemiä ei ole voitu havaita. Sairaat ja vioittuneet yksilöt häviävät terveille yksilöille taisteltaessa ruoasta. Erikoisesti raajarikkojen ja sairaiden yksilöiden, mutta myös terveiden, on havaittu käyvän tietyn aikataulun mukaan ruokailemassa pihoilla.

Kirjoituksessa kuvataan lajien välisiä suhteita talvehtimispaikalla. Tukkakoskelo suhtautui aggressiivisesti sinisorsiin.

Talviset tappiot talvehtivissa kannoissa ovat esim. Varkaudessa n. 5 %.

Talvehtineet yksilöt paikkauskollisina hakeutuvat pesimään talvehtimispaikan läheisyyteen, jolloin saattaa muodostua erittäin suuri pesimistiheys. Pesimispaikoiksi kelpaavat jopa jätepuukasat. Oppimisen kautta tapahtuvalla biotoopin valinnalla lienee ollut suuri merkitys tämän uudentyyppisissä biotoopeissa tapahtuvan pesimisen nopeassa yleistymisessä. Sisä-Suomessa sitä on edistänyt keväällä asutuskeskuksissa aikainen lumen sulaminen suhteessa ympäristöön.

Munamäärissä ei ole havaittu eroa muuttaneilla ja talvehtineilla sorsilla.

Pesien tuhoutuminen on suurta ja ylitiheissä populaatioissa poikaskuolleisuus on suuri, mikä johtuu epänormaaliin poikasympäristöön liittyvistä haitoista.

Beobachtungen zu den Invasionen des Jahres 1962 von *Dendrocopus major* (L.) und *Loxia curvirostra* L.

HANS SCHILDMACHER

(Aus der Vogelwarte Hiddensee)

Der Sommer und Herbst des Jahres 1962 brachte zwei ungewöhnlich starke Invasionen des Grossen Buntspechtes, *Dendrocopus major* (L.) und des Fichtenkreuzschnabels, *Loxia curvirostra* L., die sich unter anderem auch auf Hiddensee in auffälliger Weise bemerkbar machten. Da sie auch in Finnland das gewöhnliche Maass überschritten, soll hier darüber berichtet werden. Ergänzende Daten aus dem Binnenlande stellten freundlicherweise zur Verfügung Herr H. Weber (Biologische Station Serrahn), Herr G. Stahlbaum, Neuruppin und Herr Teubert, Riesa—Gröba.