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Censusing breeding raptors in southern Finland: methods and results

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Methods of censusing breeding raptors are reviewed and discussed on the basis of field experience gained mainly in Uusimaa, southern Finland, during the last ten years. The four commonest diurnal raptors of the region, the Honey Buzzard *Pernis apivorus*, the Goshawk *Accipiter gentilis*, the Sparrowhawk *A. nisus* and the Common Buzzard *Buteo buteo* were included in the study. No single general census method is equally applicable to them all. Specialized habitat requirements of the *Accipiter* species, and clearly discernible courtship flight of the buzzards as well as other observations (moulted feathers, remnants of prey and faeces) are useful keys for the location of occupied territories. The breeding part of the population can be censused reliably only on the basis of occupied nests and fledged broods still fed by their parents. The densities of the species were estimated as follows: the Honey Buzzard 9–11 pairs/100 km², the Goshawk 5–8 pairs/100 km², the Sparrowhawk about 9 pairs/100 km² and the Common Buzzard 7–22 pairs/100 km². The local variation in raptor densities may be pronounced even in relatively small areas, probably largely due to differences in the combination of habitats available. Annual fluctuations in numbers and in the proportion of non-breeders may also be considerable.

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1. Introduction

Raptors breed at relatively low densities, their territories are large, and they are generally difficult to detect during the breeding season. Because of this, general methods for censusing terrestrial birds (see e.g. Ralph & Scott 1981) are not very applicable for estimating numbers of raptors (see Fuller & Mosher 1981). In addition, as in other birds, some species-specific characteristics make it difficult to find a single universal census method for all the species. Often the most reliable estimates of numbers of breeding raptors are the result of intensive searches for nests of breeding pairs (Fuller & Mosher 1981).

In this paper, we review and discuss methods in censusing breeding raptors on the basis of field experience in Uusimaa, southern Finland. The species included in the study are the four commonest diurnal raptors of the region, the Honey Buzzard *Pernis apivorus*, the Goshawk *Accipiter gentilis*, The Sparrowhawk *A. nisus* and the Common Buzzard *Buteo buteo*. The density estimates of these species in our study plots are presented and compared with figures from other areas.

2. Study areas and material

We had five separate study areas; for comparisons, data from two other nearby areas were available (Fig. 1). The study areas differed to some extent, but roughly two thirds of their area is covered by coniferous and mixed forests and the rest is agricultural land. Area I was censused by D. Forsman and B. Ehrnsten from 1977 to 1983 with about the same efficiency every year, and areas II–V were surveyed by T. Solonen and his co-workers with varying intensity between areas and years in 1974–83. Also older background data were included.

3. General methods

Our primary aim was to establish the exact numbers of breeding pairs by finding all active nests. However, we did not succeed in finding all of them, mainly due to extensive woodland areas which proved to be very difficult to search thoroughly. When no nest was known close by, we included other observations indicating breeding or

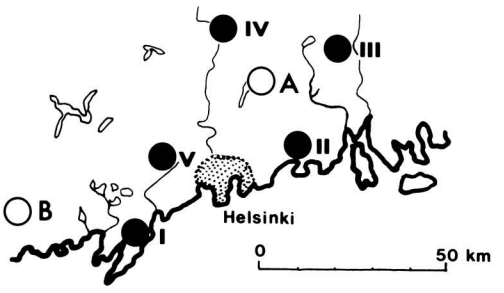

Fig. 1. The location of the study areas in Uusimaa, southern Finland: I Kirkkonummi, II Sipoo, II Askola, IV Hyvinkää, V Espoo. A and B indicate the areas from which data for comparisons came (Central Uusimaa, Sarkanen 1971, and Western Uusimaa, Wikman & Lindén 1981, respectively).

breeding attempts. In practice, by further field work even the slightest signs of birds usually proved to indicate actual breeding. In this paper, the *population size* is referred to as the total number of occupied territories, and the *breeding population* to the number of active nests and/or territories interpreted to be occupied by breeding birds.

Four different methods were used at different stages of the breeding season to locate the territories and nests.

1. Observation of displaying pairs in spring

From elevated points with good visibility in all directions more than 100 km^2 can be covered by binoculars (7 × 50) on a clear day, when birds of buzzard size are concerned. When all the nestings are known, this is a useful method for assessing the number of non-breeders and pairs that fail early in breeding, both being categories otherwise easily overlooked and misinterpreted.

2. Searching for signs of breeding in potential nesting habitats

The nest-site is often revealed by prey remains, faeces and moulted feathers. All these "markers" generally accumulate on favoured rocks, stones and tree stumps or under roosting trees in the close proximity of the nest. To some extent prey remains can be found also in the vicinity of favoured hunting grounds.

3. Watching adults carrying prey during the nestling period

Using the same view-points as for watching the aerial display in spring, adult raptors can easily be observed while returning to the nest with prey. Birds carrying prey usually go straight to their nests.

4. Listening for begging calls of the young

During the late nestling stage and as fledglings, young raptors are noisy and nests or fledged broods can still be located late in the season. Best results are obtained during early mornings before the young have been fed. Differences in audibility between calm and windy conditions affect the results.

4. Species-specific considerations

The *Honey Buzzard* is by far the most difficult species of the group to study. Observation of displaying pairs in spring is the easiest way to establish the number of territorial birds, though the actual nest-sites still remain difficult to locate. The aerial display period in late spring is, however, very short and concentrated (usually between 25 May and 10 June) and the birds frequently range over long distances. At the start of incubation the birds become elusive and are seldom seen. The secretive and silent habits of the adults at the nest often make the nest very difficult to find, as does the scarcity of notable prey remains, faeces or moulted feathers around the nest-site. In certain years non-breeding seems to be common.

Territorial *Goshawk* pairs can be located in early spring from late February to early April when they frequently soar above their territory. Great care should be taken when separating the territories from each other, as neighbouring pairs or birds are often seen crossing each others territories, and joining to circle together without any signs of hostility. Specialized habitat requirements and noisy young are the most useful keys to locating occupied territories.

Territorial *Sparrowhawk* pairs are seldom seen together in aerial display flight, but single birds often soar above the nest-site. These birds are, however, difficult to separate from migrants. The best, but also the most laborious, method in searching for territories seems to be to walk systematically through suitable habitats and look for plucking posts, which are often relatively easy to detect. The territories of the Sparrowhawk seem to be less permanent than the territories of the larger species, probably largely due to the younger mean age of the Sparrowhawk but also shifts between nearby alternative breeding locations seem to occur.

The *Common Buzzard* is most easily censused before laying in early spring (two first weeks in April) when territorial pairs display high in the air. This method proved to be very effective and time-saving in finding territories and even nest-sites. Listening for begging calls

late in the breeding season may be misleading because the young often move far away from the nest-site shortly after fledging.

5. Raptor densities in southern Finland

In the study areas ranging from 120 to 280 km² the densities of the species were estimated as follows: the Honey Buzzard 9–11 pairs/100 km², the Goshawk 5–8 pairs/100 km², the Sparrowhawk about 9 pairs/100 km² and the Common Buzzard 7–22 pairs/100 km². The highest densities for each species were recorded in the most effectively studied area I. In two larger (500–600 km²) areas in central (Sarkanen 1971) and western (Wikman & Lindén 1981) Uusimaa, the density of the Goshawk has been estimated to be about 2 and 6 pairs/100 km², respectively. The number of territories is based on nest-finds or combined miscellaneous field data, including, however, mainly nest-finds. The figures for area I and areas II–V, as well as for different species, are not necessarily comparable with each other due to differences in data collecting. The figures for plot I are based on the highest number of active nests/territories of each species found in any one year 1977–83, whereas the figures for other plots are estimates based on data combined from several years assuming, for simplicity, that annual fluctuations in numbers are non-significant.

Because all the estimates have not been reached by similar methods, their reliability varies. The estimates based on located nests are the most accurate ones but, if some of the nests have been overlooked, the estimates may be too low. On the other hand, in the estimates based on combined miscellaneous data, the possibility of inflated values arises. The breeding part of the populations can only be censused reliably on the basis of occupied nests and fledged broods still fed by their parents. Density estimates based on a combination of nest-finds and other field observations indicative of occupied territories, and on the combination of data from different years should be considered as tentative.

It should be noted that the estimates presented are considered as maximum values, that are not particularly suitable for generalizations, e.g., for calculating population size estimates for larger areas. They give some indications of the species-specific carrying capacity of the environment in the study area but, because the population peaks of different species do not necessarily coincide, the combination of the peak values for the species may be unrealistic.

In the period 1977–82, the Goshawk population in study plot I fluctuated between 7 (1977 and 1981) and 10 (1982) occupied territories, but in 1983 only 5 pairs bred there. The proportion of non-breeders (mostly single birds) that only decorated a nest varied between 0 % (1979 and 1983) and 57 % (1981). The population seems to be declining, but whether the decline is a long-term one or just a temporary fluctuation is not known.

The thoroughly censused Buzzard population of area I (D. Forsman, unpubl.) varied between 1977–83 from 16 (1983) to 28 (1980), and the proportion of non-breeding pairs between 19 % (1983) and 50 % (1981). The proportion of non-breeders, but not the population size, changed in accordance with the fluctuations of vole populations (*Microtus agrestis* and *Arvicola terrestris* being the most important prey species).

6. Discussion

In censusing raptors, extensive field work is needed. Special difficulties arise from the fact that part of the population consists of non-breeding individuals that, in addition, may be either territorial or non-territorial (cf. e.g. Newton 1979). It may thus be difficult to decide whether to census territories or breeding pairs, and how much attempt to make to confirm breeding if the survey covers large areas, and time and other recources for field work are limited in relation to the magnitude of the task.

Generally raptor populations seem to be characterized by considerable stability (e.g. Newton 1979), but the above results suggest that the annual fluctuations in numbers may be pronounced. The proportion of non-breeders may also vary considerably both annually and between species (cf. Newton 1979). Our results suggest that the local variation in densities of some raptors may also be pronounced even within the limits of relatively small areas. This is probably largely due to differences in the combination of habitats available. The raptor densities of our study areas seem to be generally similar but relatively high as compared with most other

estimates from Finland (see e.g. Sulkava 1964, Sarkanen 1971, Huhtala & Sulkava 1976, Wikman & Lindén 1981, Haapala & Saurola 1983) and other Nordic countries (see e.g. Nilsson 1981, Bomholt 1983). It seems to us that, in many cases, low density estimates are too cautious due to insufficient field work.

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