

# Distributional history of the European badger *Meles meles* in Scandinavia during the 20th century

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Early in the 20th century, the badger was permanently established throughout southern Scandinavia (except the island of Gotland), and scattered populations were thought to occur up to approximately 63°N (Collet 1911–1912, Ekman 1922). That was also the situation in the early 1940's. However, 40 years later individual badgers were reported beyond the Arctic Circle up to 67°N in Sweden and 68°N in Norway (Bevinger 1985), i.e. another 300 km northwards. Questionnaires completed by regional and local wildlife boards showed that the range of permanent distribution now extends along the Baltic coast to the inner part of the Gulf of Bothnia in Sweden, and through coastal and inland areas up to 65°N in Norway. Here, we discuss the possible causes of this expansion, such as climate, predators and human impact.

## 1. Introduction

Living organisms are continuously changing their position relative to the environment to optimise survival and reproduction. A zoogeographer looking around in a certain place and at a specific time knows that he/she observes a unique snapshot exposed only once. Faunas are dynamic because of interacting biological and geophysical forces, the rate of change being dependent upon a large number of constraints. Rapid faunistic changes will usually become subjects of attention. Such examples are outbreaks of introduced animals and invasions (e.g. Lodge 1993). Less

attention is paid to the more frequently occurring slow colonisation and penetration of animal species in the traditional sense of dispersal.

The Scandinavian peninsula is a natural zoogeographic unit (e.g. Ekman 1922). During the last century, there have been extensive changes in the distribution pattern of several Scandinavian animals (Curry-Lindahl 1958, Udvardy 1969, Isenmann 1990). The European badger is one of the species concerned. The badger has been part of the fauna of this region for a long time; in Sweden since the Preboreal period (9500 B.P.), and in Norway since Atlantic time (8000 B.P.) (Lepiksaar 1986). However, few

subfossil records seem to have been published (but see Degerbøl 1951). As badgers are generally considered to be poor colonists (e.g. Kruuk 1989), it is particularly interesting to analyse possible changes in the range of this species. The present paper aims at reviewing the change in the distribution during the last century, updating the present distribution, and discussing the main factors, that may have triggered the changes.

## 2. Materials and methods

The distribution of badgers from 1850 to 1950 was reconstructed by examining available literature. To update the information on the present status in Sweden, a questionnaire was sent (in 1990) to the 7 county authority wildlife boards in the central and northern parts of the country, i.e. where the occurrence of badgers was uncertain. The boards were asked to indicate on a map with a 50×50 km grid system whether they regarded the badger to be:

- a) present and reproducing
- b) constantly present
- c) sporadically present
- d) absent

or to indicate “no information”. A similar questionnaire was sent in 1992 to the 439 local authority wildlife boards in Norway, i.e. the whole country. The average size of a Norwegian local authority area is approximately 740 km<sup>2</sup>. In Norway, the boards were also asked to indicate whether the badger population was increasing, stable or decreasing. We had direct contact with only one person per board in both countries. However, the boards sometimes used information from several persons with knowledge of the local situation. Completed questionnaires were returned by 97.9% of all boards in Norway and by all 7 boards in Sweden. Concerning distribution, we only report the answers as constantly present, sporadically present, or absent. The difference between “present and reproducing” on one hand and “constantly present” on the other was very small, and we have conservatively interpreted “no information” as “absent” except in a few cases when we interpolated the answer from those of the surrounding areas.

## 3. Results

### – 1850

Although data on the distribution of the badger before 1850 are sporadic and largely lacking, the species seems mainly to have been found in the southern parts of the Scandinavian peninsula,

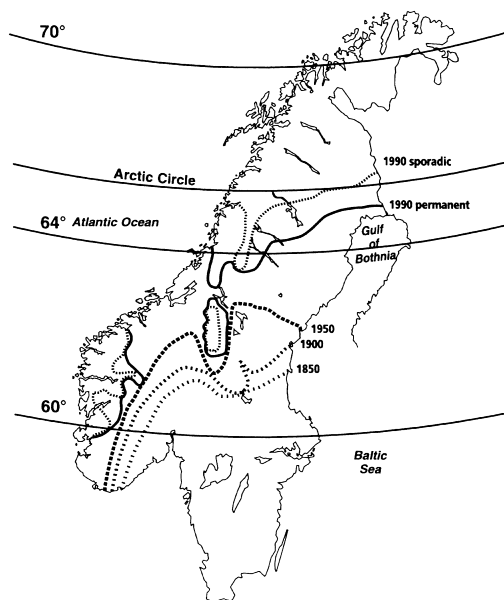


Fig. 1. Past and present distribution of the European badger on the Scandinavian peninsula according to literature (1850–1950) and questionnaire surveys. All delimitations denotes permanent occurrence of badgers except the one marked “sporadic 1990”.

south of 63°N (Fig. 1, Nilsson 1847, Siebke 1857; see also Bevanger 1985, 1990). Inland Sweden it was found up to Värmland (60°N, Nilsson 1847) and to the big lake Siljan (61°N; Hülphers 1762 in Ekman 1922) but was extremely rare in Härjedalen (62°N, Nilsson 1847, Albin 1883). Due to more productive soils and milder climate, there are reasons to believe that the distribution along the Baltic coast extended slightly further northwards as depicted by Curry-Lindahl (1958).

### 1850 – 1900

The general descriptions of the distribution suggest that few changes occurred between 1850 and 1900, although a slow dispersal towards the central parts of the peninsula may have taken place (Fig. 1, Helland 1898, Collett 1911–1912, Ekman 1922, Curry-Lindahl 1958, 1967). However, there were also a few observations indicating a possible establishment of a local population around the Trondheimsfjord area (Atlantic coast, 64°N).

**1900 – 1950**

During the first decades of this century, a continued slow penetration northwards may have taken place. There are only three known records of badgers north of 62°30'N in Norway from 1901 to 1947 (Anon. 1921, 1951, 1991). A similar situation was reported in Sweden (Curry-Lindahl 1958). However, a rather dramatic growth in the population and expansion of the range seems to have been initiated immediately after World War II. Several new observations of badgers were reported in a short period towards the end of the 1940's in southwestern and central Norway as well as central Sweden (Holgerson 1949, Aarebrot-Olsen 1950, Silén 1950, Anon. 1951, Emstad 1952, Willgohs 1952, Hysing-Dahl 1954, Valeur 1980, Bevanger 1985). The resulting picture can be seen in Fig. 1.

**1950 – 1990**

Newspaper reports and reports from local wildlife boards in central Norway indicate a rather rapid population buildup during the third quarter of the century (Aune & Myrberget 1969, Brox 1973, Bevanger 1985). We have found few reports to show the situation in Sweden during the same period, but the general picture given by Siivonen (1968) supports the existence of an expanding population in central Sweden.

The recent questionnaires (1990) indicate that the badger is firmly established in most of the Scandinavian peninsula (Fig. 1). Exceptions are the central mountainous parts, the westernmost fjord districts, and the area above the Arctic Circle. Also the Baltic island of Gotland is devoid of badgers. Single badgers have been observed as far north as nearly 68°N along the western coast (Helnessund, Norway) and 67°N inland (Gällivare, Sweden).

About 61% of 246 wildlife boards in Norway, which reported occurrence of badgers, also indicated that the population had been increasing in their district during the last 10 years. Thirty five percent of the districts thought that it had been stable, whereas 4% indicated decrease.

**4. Discussion**

Besides invasions and outbursts of introduced species, the changes in the distribution of badgers on the Scandinavian peninsula during the last

50 years is still rather spectacular. No other carnivore that has been a part of the Scandinavian fauna for such a long time have shown a similar sudden expansion of range.

Moreover, badgers have been observed to form very stable groups in several places, e.g. in Great Britain (Kruuk 1978) and juvenile dispersal is restricted (Kruuk & Parish 1982, Cheesman et al. 1987), although extra-territorial movements may occur (Evans et al. 1989). However, dispersal and spatio-social organisation in dense populations occupying the species' core areas may differ from that in the northern part of its range (own unpubl. data). A strategy of roaming around and looking for vacancies could be successful in sparsely populated areas at the edge of the range of the species' distribution.

Differences in climate and/or topographical barriers may set limits to a species' distribution (Udvardy 1969). Also in the present case, topography offers the most probable explanation for the lack of badgers both on the island of Gotland and in the westernmost part of the Scandinavian peninsula. If ever an ice cover makes the island possible to reach on foot, the badger is certain to be fast asleep in its set. The long fjords and steep country in the latter area are also thought to obstruct rapid, efficient dispersal.

The badger is relatively inefficient as a hunter and has to rely on food items that can be picked up during a slow foraging bout. This foraging strategy is only possible during the snow-free season. Hence, the badger is a hibernator at northern latitudes. The amount of fat that can be accumulated during autumn and the time available for replenishing winter losses will eventually become critical for winter survival and the reproduction of females. Thus, the length of the snow-free season and its average temperature will ultimately become limiting. This may explain the absence of badgers from high altitudes as well as latitudes.

When it comes to the expansion of the species' range during the last 150 years, the same argument can be applied. Local meteorological data as well as indices found in the growth of coniferous trees indicate a long-term improvement of the weather from a badger's point of view during most of this period, interrupted only during a few decades at the turn of the century (Strand 1962, Alexandersson & Eriksson 1989,

Hofgaard et al. 1991). Unfortunately, no data are yet available for Scandinavia as a whole that can show whether the growing season has increased regionally during the last 150 years.

Turning to biotic variables that may explain the expansion of the badger's range, large predators such as the wolf seem, along with man, to be the most promising. The wolf is known to kill badgers in the spring (Wirtberg, pers. comm.). During the last century, the wolf was more or less exterminated from the Scandinavian peninsula. Earlier, the badger may not only have suffered from wolf predation, but also from the nonselective hunting methods and poisonous baits employed to exterminate wolves. Furthermore, a previous less strict keeping of dogs may have contributed to a high mortality of badgers. Also the importance of man as a conscious predator on badgers has presumably decreased during the last century, since the interest in badger hunting has gone down.

At northern latitudes the badger shows a pronounced preference for the small areas of cultivated land, which are interspersed in the boreal forest (Lindström 1989). Such areas have been frequently abandoned and afforested during the last 50 years in Scandinavia. It is possible that this temporarily has created even better foraging opportunities for the badger.

We can not and do not want to pinpoint any particular of the factors mentioned above as the most important. Rather, we suggest that many factors may have added to the change in the badger's environment, which permitted an expansion of its range. Furthermore, the ultimate change of the environment may actually have taken place some time ago (such as the disappearance of wolves). The slowly dispersing badger may have suffered from Allé-effects (Allé et al. 1949) and been unable to take advantage of the situation at any faster rate than that observed.

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