

Road-kills of badgers (*Meles meles*) in Denmark

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The first major survey of road-killed animals in Denmark, conducted in 1991, showed that more than 3 600 badgers *Meles meles*, equal to 10–15% of the total population, had been killed. Most badgers were killed during the summer when traffic intensity was highest. The traffic-victims were very unevenly distributed across the country. This is not explained by differences in local traffic intensities alone, but also by differences in population density of the badger and the surroundings of the roads. Almost all road-killed badgers in 1992–93 were adult, and female badgers were killed most frequently during spring whereas male badgers were killed throughout the year.

1. Introduction

In Denmark, as in most of Europe, road-traffic has become a major threat to animal life. Harris et al. (1992) states that 50 000 badgers, equal to 20% of the total population, are killed on the roads in Britain and that road-kills are the greatest single known cause of badger mortality. In the Netherlands 220 badgers, equal to 10% of the total population, were killed by cars in 1990 (Wiertz 1993).

From 1983 to 1991 road-traffic, measured by the number of kilometers driven on the roads, increased by 38% in Denmark and the total number of motorvehicles by 15% from 1.64 mill. to 1.90 mill.

The first major survey on road-killed animals in Denmark was carried out by "Falck", the Danish Rescue-service in 1991. A total of about 777 000 animals were reported killed, including approx. 3 600 badgers. The badger data were kindly forwarded to the author and supplemented with her own data from "Projekt Grævling", which involves data on human impact on the badger population in

Denmark since 1990, mostly in urban areas and public forests.

This paper presents data on location, season, sex and age of road-killed badgers from 1991–1993. The questions of when, where and why the badgers are killed are discussed, as well as the role of traffic as a mortality factor of the population in Denmark.

2. Methods

The data on road-killed badgers from 1991, collected by Falck, were based on reports about dead badgers seen at the road-side by truckers, busdrivers, hunting associations, railroad workers and rescue service employees. These data were supplemented with data collected by Projekt Grævling, which mainly gets information from foresters and 'private' people, who have seen a dead badger. None of the badgers were brought in for examination. When possible each road-killed badger was located within a 10×10 km grid system (UTM).

In 1992 and 1993 Falck continued the survey of road-killed animals, but on a smaller scale on 90 chosen road stretches, representing different types of roads over the whole country. A total of 1 800 km, equal to 2.5% of the total road system, was surveyed by 90 people.

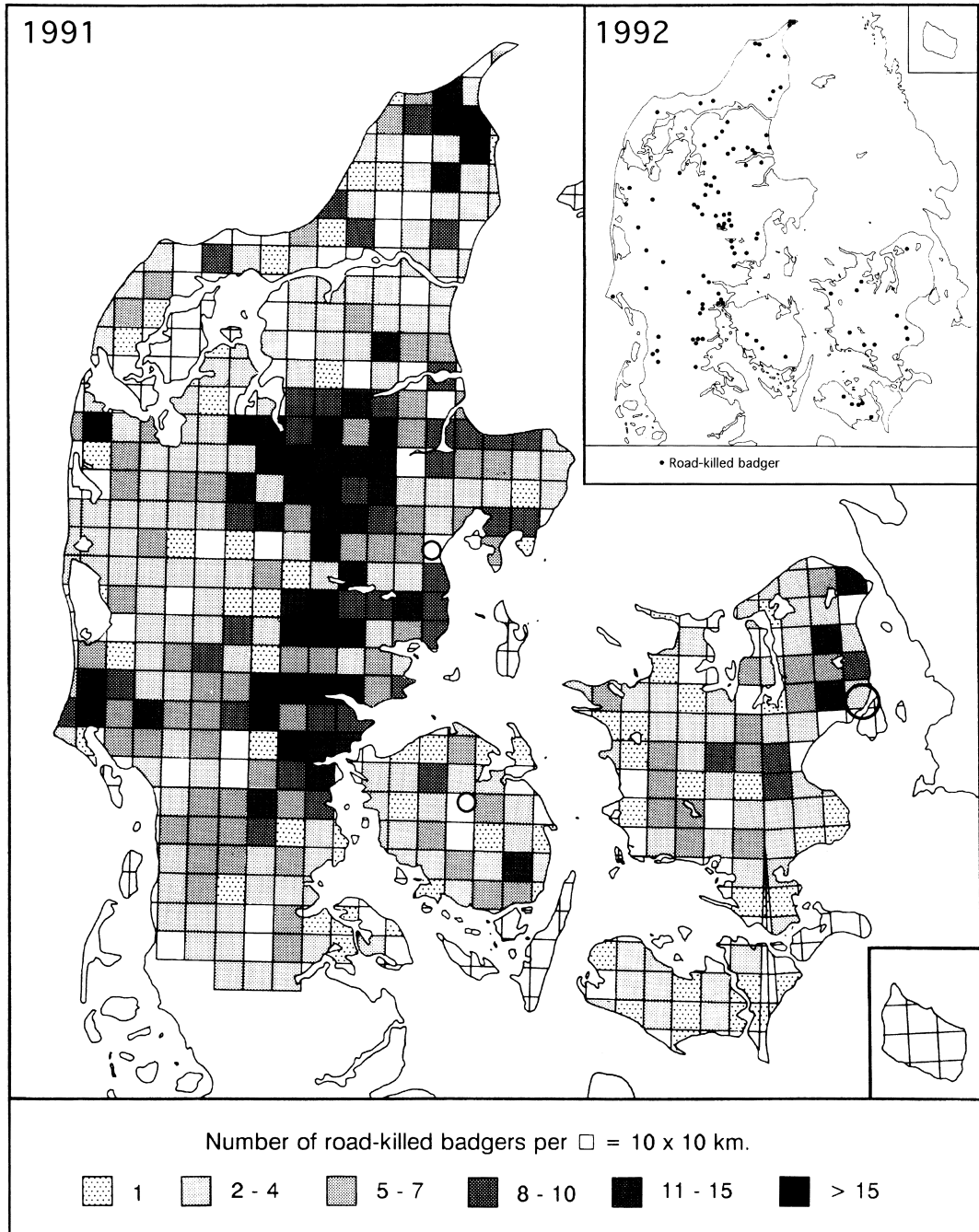


Fig. 1. The distribution of road-killed badgers in Denmark in 1991 and 1992 (source: Falck).

To find out more about the road-killed badgers, I began to co-operate with taxidermists in 1992. About 50% (13) of Danish taxidermists handling larger mammals joined the project. All road-killed badgers delivered for stuffing and

peltry were sexed, weighed and measured, and information concerning location and season of death were recorded. Age was roughly estimated by size, toothwear and cranial features, as indicated by Hancox (1988), Ahnlund (1976) and

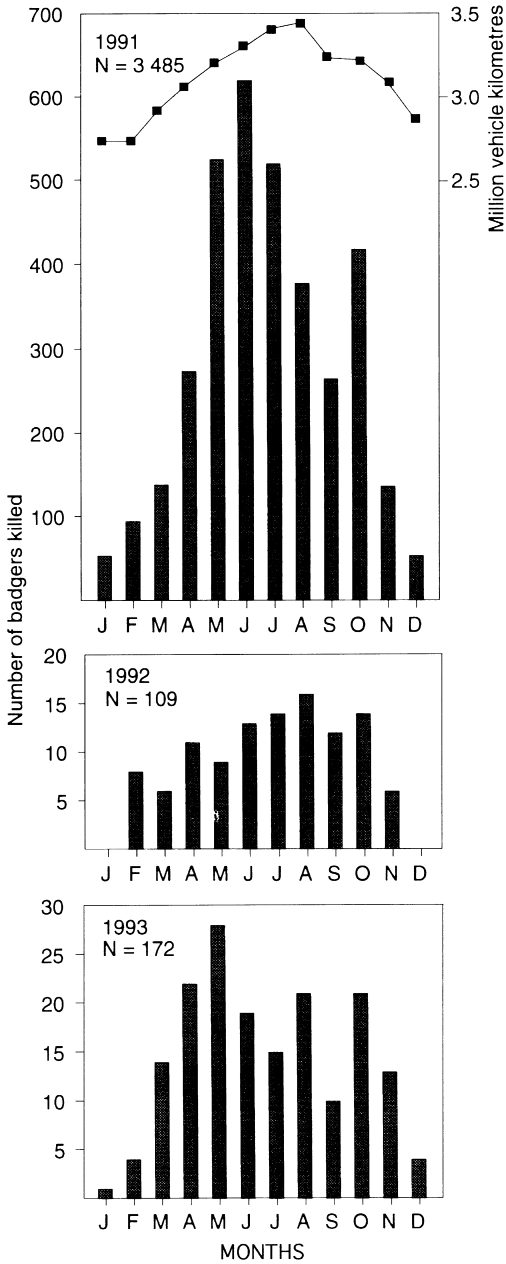


Fig. 2. Monthly distribution of road-killed badgers in 1991–93, compared with the average monthly traffic flow in 1991 (sources: Falck, Department of Transport).

Müsken & Broekhuizen (1993). Only two age-classes were used, namely ‘subadult’ (under 1 year of age), and ‘adult’ (over 1 year).

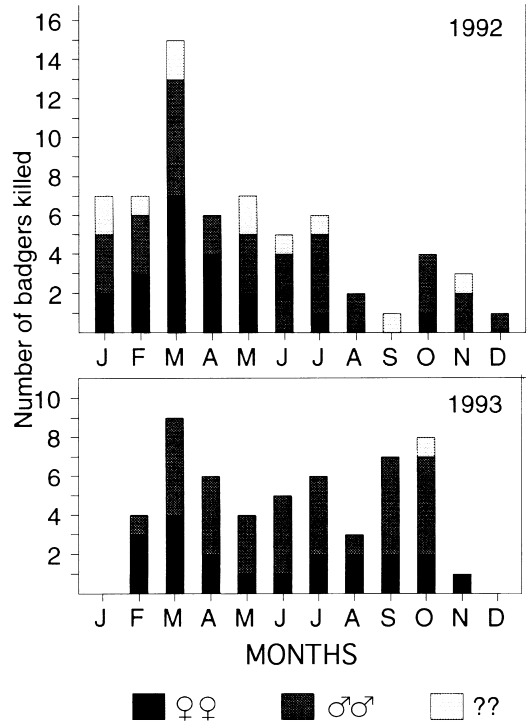


Fig. 3. Seasonal and sexual distribution of road-killed badgers in 1992–93 (source: Taxidermists).

3. Results

3.1. Death localities

More than 3 600 badgers were reported killed on the roads in 1991. 2217 of these were reported with the exact place of death, and could be placed within 10×10 km -squares (see Fig. 1). Most badgers were killed in Eastern Jutland, as many as 26 per square. Similar results were obtained from the minor surveys carried out in 1992 by Falck and the taxidermists (Fig. 1).

3.2. Seasonal distribution

The seasonal distribution of road-killed badgers in 1991, representing 3 485 animals (Fig. 2), show a mortality peak in early summer (June) and in autumn (October). The data collected by Falck in 1992 and 1993, representing a much smaller number of badgers, indicates a seasonal distribu-

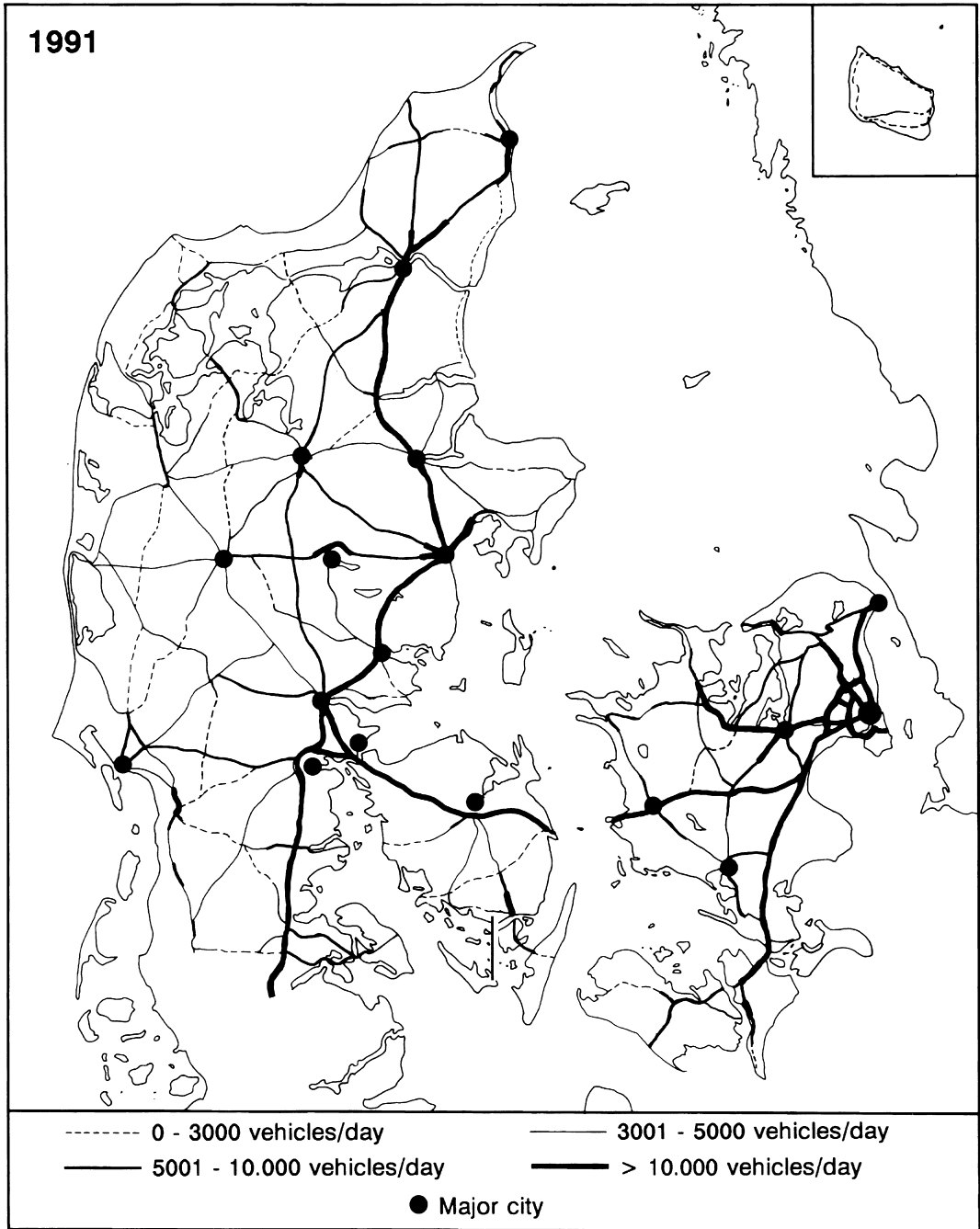


Fig. 4. Traffic intensity of main roads in Denmark in 1991 (source: Department of Transport).

tion which is not significantly different from the distribution in 1991 (1992: $\chi^2 = 6.5$, $P > 0.05$; 1993: $\chi^2 = 5.92$, $P > 0.05$), but had the maximum in August in 1992 and in May in 1993. The

material collected by the taxidermists in 1992 and 1993 (Fig. 3) is significantly different from the 1991 data ($\chi^2 = 115$, $P < 0.001$ and $\chi^2 = 11.4$, $P < 0.05$, respectively). The data from the taxi-

dermists differs also from the Falck data both in 1992 and 1993 ($\chi^2 = 63$, $P < 0.001$ and $\chi^2 = 11.4$, $P < 0.05$, respectively).

3.3. Age and sex

Sixty-four road-killed badgers were brought to the taxidermists in 1992 and 53 in 1993 (Fig. 3). In 1992, all except 2 were found to be adult, i.e. more than one year of age. 20 badgers were identified as females, 33 as males while 11 could not be identified. 70% of the females were killed during February, March and April compared to 33% of the males. In 1993, the sex distribution was 20 females, 32 males and one unidentified. 45% of the females were killed during February, March and April compared to 31% of the males. The peaks in October are in both years mainly due to male badgers.

4. Discussion

Most badgers were found dead in Eastern Jutland. This could be due e.g. to a larger badger population in that area or heavier car-traffic or both.

A national badger survey has not been carried out in Denmark, but minor surveys indicate that there is a population density of about 1.5 badgers/km² in Eastern Jutland (Taastrøm 1993) compared to about 0.5/km² in North Zealand (Aaris-Sørensen 1992). This fits roughly with the distribution of road-kills (see Fig. 1), but not in details. When comparing the frequency distribution of road-kills with the traffic-intensity on major roads in Denmark (Fig 4) it is evident that there is not a simple relationship between car traffic and the number of badgers killed. Thus there is probably also something else behind the areal distribution of road-kills.

The surroundings of roads may also be important for the risk of getting killed. Most setts are situated in forested areas in Denmark and the greatest risk seems to occur on minor roads in forested areas close to bigger cities, where people drive home late at night or leave for work early in the morning. Thus the surroundings of the roads seem to be more important than traffic intensity itself.

Most investigations in Britain (Jefferies 1975, Neal 1986, Davies et al. 1987, Skinner et al. 1991) and in Holland (Müskens & Broekhuizen 1993) find two peaks in the seasonal distribution of road-killed badgers, one in the early spring and one in the late summer or autumn. These peaks are ascribed to the sexual activity of the badger.

The seasonal distribution of road-killed badgers collected by Falck in 1991–1993 (Fig. 2) does not show a clear peak in early spring (Feb–Apr), when the sexual activity of badgers is highest (Neal 1986, Cresswell et al. 1992), but an autumn peak in October is present in all years. Even though there is no statistical relationship between the traffic flow and the seasonal distribution of road-killed badgers in 1991 ($\chi^2 = 12.46$, $P < 0.01$), lower traffic intensity combined with low visibility for the reporters due to winter darkness could be one of the reasons for the “missing” spring peak. In October the daylight hours are also few, but the traffic intensity is much higher than in March. Other factors like weather conditions and food availability could be important factors as well.

If we look at the seasonal distribution of the road-killed badgers brought to the taxidermists in 1992 and 1993 (Fig. 3), we see a different pattern with peaks in March and October comparable to the findings in Britain (Davies et al. 1987) and Holland (Müskens & Broekhuizen 1993). These results could be explained by sexual activity, but could also be an artefact due to the low sample size (64 badgers in 1992 and 53 in 1993). Finally the results could mirror when it is most convenient for people to pick badgers up (a badger lying in the sunshine for only one day already stinks) or to have them stuffed.

The use of data from two different sources points out that the results of the overall seasonal distribution of road-killed badgers can be dependent on the method used and the sample size.

A major part of the female badgers (70% in 1992, 45% in 1993) were killed during the spring mating season (Feb–Apr). According to Dutch investigations (Müskens & Broekhuizen 1993) younger female badgers often get run over more than 3 km from the sett at springtime. One explanation could be that suckling females are very territorial and thus keep foreign males at distance

from the sett, forcing the females to seek up mates in safe distance of the sett with cubs. Later in the year at the second mating season in September and October, the cubs have grown. Female badgers would then be less territorial and stay nearer the sett and wait for the males to come around for mating.

Badger sows might also go on longer feeding trips in March (Neal 1986) to get enough energy for suckling, which could increase the risk of getting run over. Two road-killed badger sows were reported suckling in 1992 and five in 1993.

If we look at the impact of road-killing on the total badger population, we know that there are about 150 badgers/100 km² in Eastern Jutland (Taastrøm 1993) and an average road-killing of minimum 15 badgers/100 km². In North Zealand there are about 50 badgers/100 km² (Aaris-Sørensen 1992) and at least 5 badgers/100 km² are killed. This gives a road-mortality of 10% in both areas which is comparable to Dutch findings (Wiertz 1993). It is reasonable to assume that all road-killed badgers are not found and reported and that road-mortality therefore more likely would exceed 10%.

Many female badgers were killed from January to May, when they are expected to be pregnant or lactating, which additionally implies a greater effect on the population than suggested only by the number of animals killed.

Finally, road-killing is not the only mortality factor for badgers, but Harris et al. (1992) has shown that in Britain traffic-death accounts for more than 50% of all known badger deaths. Therefore future investigations of other mortality-factors will have to show if a road-mortality exceeding 10% has a crucial impact on the Danish badger population. So far the fauna-tunnels built to prevent animals from getting killed on the roads have not worked on badgers (Madsen 1993), but hopefully something better will be developed in the future.

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