

Ecology of the badger *Meles meles* – the local (Białowieża Primeval Forest) and the biogeographic viewpoints

The Eurasian badger *Meles meles* (Fig. 1) shows remarkable plasticity in its life history traits. In large parts of their geographical range, badgers feed on earthworms. Such an evolutionary adaptation to feed on such tiny prey is fairly unusual among large-bodied carnivores. Based on our research conducted in a well-preserved natural forest and a review of the literature, we have defined biogeographical patterns in the habitat- and food-related variation in badgers' spatial organization, activity, and shelter use.

In Białowieża Primeval Forest, badgers attain relatively low densities (2.1 badgers/10 km²). A typical social group consists of



Fig. 1. Badger emerging from a sett in Białowieża Primeval Forest (Photo: P. Fabijański)

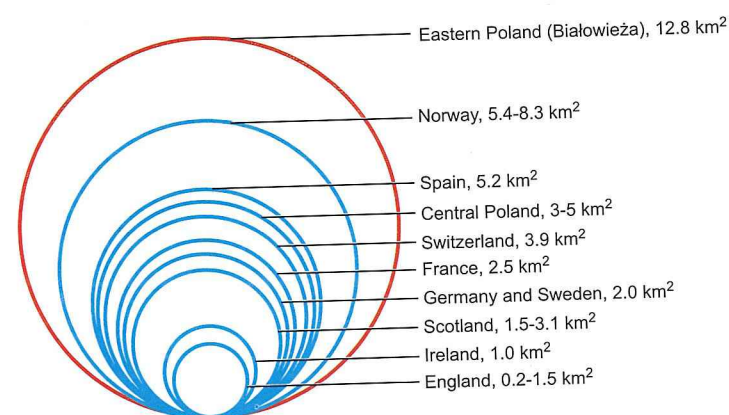


Fig. 2. Average size of badger territories in various parts of Europe

a breeding pair and cubs that occupy a large territory (on average, 12.8 km²). The size of group territories as well as individual home ranges of badgers was influenced by the distribution of oak-lime-hornbeam forests, habitats rich in earthworms. In their geographic range, the mean size of badger territories varies from 0.14 km² to nearly 13 km² (Fig. 2), the size of social groups from 2 to 23 adults, and densities from 2 to 480 individuals/10 km². The standing crop of biomass of *Lumbricus* earthworms and mean annual temperature were crucial factors shaping the densities of badgers in the European temperate and boreal zone. Furthermore, abundance of food resources is the essential factor underlying such a great variation in badger sociality.

Badgers are nocturnal animals, resting in their setts during the day. In Białowieża Forest the duration of daily activity of badgers was, on average, 8.2 h/day, but it varied among seasons. The seasonal changes were related to the abundance of earthworms. Duration of activity also depended on daily temperature, especially in the cold season. In winter, badgers stayed inactive for an average of 3 months. In autumn, they built fat reserves and their body mass nearly doubled compared to spring values. The literature review on the annual cycle of activity and body mass changes in Eurasian badgers showed that fat storage and duration of winter sleep strongly depended on climate (best approximated by mean temperatures of January). In regions with mild winters, badgers were active year round and their body mass changed only slightly. In regions with severe winters, badgers increased their body mass twofold from spring to autumn, and stayed inactive for as long as 6 months per year (Fig. 3). In the temperate and boreal zones of the Palaearctic region, the ultimate determinant of their annual activity is the winter shortage of earthworms.

Badgers are semi-fossorial animals. In Białowieża Forest they spend over 70 % of their lifetime in shelters, either during winter lethargy or sleeping underground during the day in the active seasons. Each group of badgers

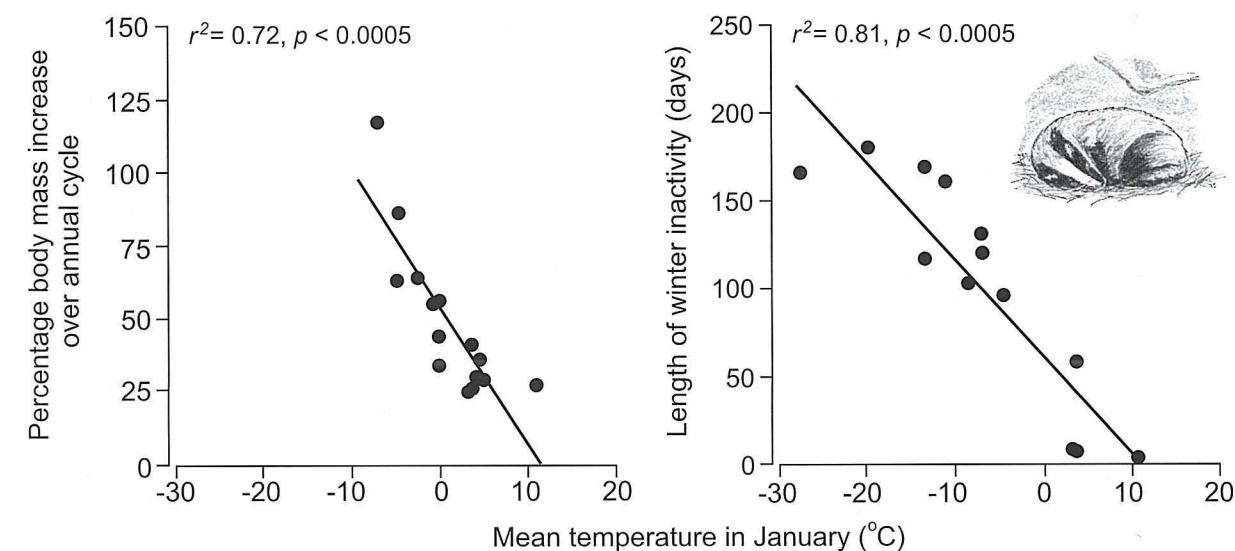


Fig. 3. Duration of winter inactivity and percentage increase in body mass of badgers in relation to the mean temperature in January in various localities in Europe and Asia (37° to 65°N, 5°W to 110°E)

utilized from 4 to 20 shelters in their territory, spending most of the time in the main sett. Interestingly, in the pristine forest of Białowieża National Park, badgers also used fallen, hollow trees (mainly limes), as day-time resting sites. When badgers ended their nocturnal foraging, they most often (74 % of cases) selected the nearest shelter for resting. Such behavior allows badgers to reduce energy expenditure when exploring their large territories. The analysis of badger shelter use in biogeographical scale indicated that different factors influenced the pattern of shelter utilization in relation to population density. In high-density populations, social factors (large groups, aggressive interactions among individuals, ectoparasite infestation) force badgers to use multiple setts. In low-density populations with limited and seasonally varying food resources, spatio-energetic factors are more important in determining shelter use: multiple setts allow

badgers to reduce the costs of territory exploring and may help secure them from predation.

Literature

- Kowalczyk R., Jędrzejewska B., Zalewski A. (2003) Annual and circadian activity patterns of badgers (*Meles meles*) in Białowieża Primeval Forest (eastern Poland) compared with other Palaearctic populations. *Journal of Biogeography*, 30, 463-472;
- Kowalczyk R., Zalewski A., Jędrzejewska B., Jędrzejewski W. (2003) Spatial organization and demography of badgers (*Meles meles*) in Białowieża Primeval Forest, Poland, and the influence of earthworms on badger densities in Europe. *Canadian Journal of Zoology*, 81, 74-87;
- Kowalczyk R., Zalewski A., Jędrzejewska B. (2004) Seasonal and spatial pattern of shelter use by badgers *Meles meles* in Białowieża Primeval Forest (Poland). *Acta Theriologica*, 49, 75-92.

R. Kowalczyk
Mammal Research Institute,
Polish Academy of Sciences

Towards combating antibiotic resistance in pathogenic bacteria: mutagenesis and modeling of ErmC'-RNA interactions suggests a novel strategy of Erm methyltransferase inhibition

Bacterial pathogens have developed resistance to most currently approved antibiotics, posing a serious threat to human health worldwide. Reestablishing the therapeutic

potential of antimicrobials to combat resistant strains is a priority in clinical medicine. The most direct ways of achieving this involve the development of novel antimicrobials