

Fragmenta Theriologica

The Burrow Construction Strategy of Foxes in the Białowieża Primeval Forest

STRATEGIA ZAKŁADANIA NOR PRZEZ LISY W PUSZCZY BIAŁOWIESKIEJ

Grażyna ROMAN

Roman G., 1984: The burrow construction strategy of foxes in the Białowieża Primeval Forest. Acta theriol., 29, 35: 425—430 [With 2 Tables & 1 Fig.]

Examination was made of 34 colonies of fox burrows in the Białowieża Primeval Forest. They were found in the following types of forest biotopes: mixed coniferous forest (12), fresh coniferous forest (2), mixed hardwood forest (13) and fresh hardwood forest (7). The majority of the burrows were situated in mature stands (24), and were usually dug into ground consisting of a mixture of sand and clay, usually at a distance of up to 850 m from open spaces and at a distance of about 1000 m from water. The system of geographical directions of entries to the burrows was examined. No significant deviations from a uniform distribution were found (test χ^2). Foxes' earths were also found to occur at a short distance from roads (even 3 m) and at least 500 m from human dwellings.

[Department of Biology, Warsaw University Division, Sosnowa 64, 15-887 Białystok, Poland]

I. INTRODUCTION

Very few studies have been made of the fox's habitat in Poland, and it would therefore appear interesting to ascertain which elements of this habitat play a key part in foxes' settlement of a given area. These animals are the commonest predators in Poland and on this account play an outstandingly important role in Polish ecosystems.

The purpose of the present study was therefore to determine which elements of the habitat decide upon the choice of place in which the common fox, *Vulpes vulpes* (Linnaeus, 1758) settles in the Białowieża Primeval Forest.

II. MATERIAL AND METHODS

The studies were carried out from August 1980 to September 1981 in the Białowieża Primeval Forest, which is distinguished by the great variety of its

biotopes, at least ten biotope types of forest having been described (Plan, 1968).

In order to examine the largest possible number of burrows members of the forest administration service were questioned and the burrows they showed were entered on a map 1: 50 000 (Fig. 1). Each of the colonies of burrows pointed out or found was examined in the area, defining: the type of site, stand age, distance of colonies of burrows from open country, from water, roads and human dwellings. Inspection was also made of the number of currently used and unused burrows, the geographical direction of the entrance to the burrow and the smallest distance between entrances.

The type of site was determined in consultation with a botanist from the Geobotanical Station of Warsaw University at Białowieża. The age of tree stands was approximately defined, using the following categories: young plantation,

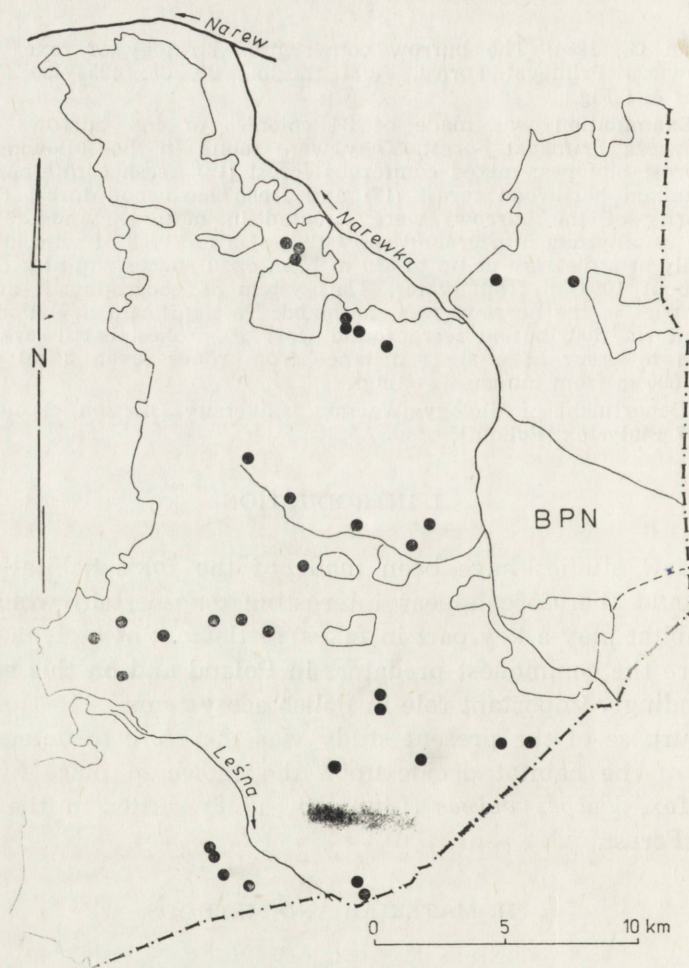


Fig. 1. Localization of the foxes' burrows examined in the Białowieża Primeval Forest. BPN — Białowieża National Park.

thicket, pole-size stand and timber stand. Data on the kind of ground were taken from the "Forest Management Plan" (1968) for the Białowieża Primeval Forest.

The distance of colonies of burrows from open spaces, source of water, roads and human dwellings was established by information given by forest keepers. Natural open spaces, and also forest plantations, were taken into consideration.

The number of entrances was taken as a criterion of the age of a burrow. As not all burrows are used by foxes to the same degree, the entrances examined were divided into currently used and unused. Such division was made on the basis of observations of tracks, and the presence near the openings of freshly piled up sand, remains of food etc. Tracking was also carried out during the winter. Using a compass, the geographical direction of entrances to burrows was determined, but no examination was made of the direction in which the corridors ran. By the term least distance between entrances is meant the length of the space between entrances to burrows situated closest to each other, measured under field conditions.

After recording the above details a sketch was made of each colony. Measurement was made on such sketches of the spaces between entrances furthest from each other i.e. lying at the opposite extreme edges of colonies. In view of the fact that the angle between lines connecting the various entrances may have been burdened with error (despite the use of a compass) the length of the space between two extremely situated burrows may also be given with some degree of error. All measurements were made by the same person.

III. RESULTS

A total of 34 colonies situated in wooded land and one colony situated in formerly arable land, were recorded (Fig. 1). This last burrow, as a single case, has been omitted in further discussion. Among the 34 colonies under observation 26 were in current use.

The occurrence of foxes' burrows was recorded in four of the ten site types of forest occurring within the Białowieża Primeval Forest (Table 1). It was found at the same time that foxes prefer to construct their burrows in timber stands and pole-size stands than in thickets or young plantations.

Table 1
Localization of foxes' burrows in different types of site
and age classes tree stands.

Site type and age of forest	No. of burrows
Mixed hardwood forest	12
Mixed coniferous forest	13
Fresh hardwood forest	7
Fresh coniferous forest	2
Young plantation	2
Ticket	2
Pole-size stand	6
Timber stand	24

The shortest recorded distance between two colonies of burrows was approx. 200 m. In the forest district in which the greatest density of burrows occurred, this distance varied within limits of 800 to 2700 mm. It was found that foxes prefer a mixture of sand and clay, and 27 burrows were found to occur in such ground, but only 7 in loam.

During the studies it was found that 30 colonies (88%) were situated at a distance of not more than 850 m from the nearest open space, while the least distance of those recorded for the burrows situated in the interior of the forest was 50 m.

The kinds of open spaces situated near burrows were as follows: dry and wet meadows (16), clearings and forest plantations (12), forest glades (3), cultivated fields (4), habitat improvement fields (5).

Table 2
Sources of water near foxes' burrows.

Water	Distance, m	No. of burrows
River	up to 800	14
	1000—1600	8
Standing water	up to 800	9
	1500—2000	3

Rivers and standing water (e.g. bogs, morasses, watering places for animals, drainage ditches) (Table 2), were found near the burrows examined.

Foxes' burrows were dug at a distance of 3—800 m from roads. Pedestrian traffic was minimum on such roads but mechanical vehicles were more often encountered. Usually these roads are only used in certain periods during work in the forest. 29 colonies were at distances of at least 1000 m from human dwellings, and 5 at a distance of 500—800 m.

There were from 1 to 21 entrances in colonies of burrows. The maximum distances between two entrances varied within limits from 3.0 to 26.5 m.

Distribution of geographical directions in which entrances to burrows were situated was analyzed by means of the chi-square test. No significant deviation from uniform distribution was found ($P=0.01$ with 11 degrees of freedom).

IV. DISCUSSION

One of the basic conditions for settlement by foxes is suitable ground for digging their burrows. There are dry sites in the Białowieża Primeval

Forest where the ground of a mixture of sand and clay, and the level of ground water is low (Plan, 1968). Behrendt (1955) also considers that ground of this type is the most suitable for foxes.

Fuchs (1973) found that the largest number of burrows occur in a belt 0—10 m from the fringe of forests, their average density is at distances of 11—50 m, and lowest in a belt 51—180 m away. Similar results were obtained by Stubbe (1965). In the present study burrows occurred most often at a distance up to 850 m from the edge of the forest (exceptionally greater than 2000 m). The differences between the data given by Fuchs (1973) and those presented in the present paper are certainly due to the different character of forests occurring in West Europe and in the Białowieża Primeval Forest. In both cases, however, there is a connection between the place in which foxes settle and the presence of open spaces. The study by Wołk and Wołk (1982) showed that the number of rodents is far greater in open land than in mature tree stands. It may be that results in the necessity for constructing burrows near open spaces where the most frequent food of the fox is abundant, i.e. small rodents (Rzebik-Kowalska, 1972).

Behrendt (1955) found that the extent of a colony of burrows is greater in the case of old burrows. In this connection he draws attention to the fact that development of burrows takes place more rapidly during the first period of their existence. In the present study it was found that there may be a small number of entrances in a colony, but great extent of the area in which they were constructed, and vice versa. In earlier three-year observations of foxes (unpublished data) it was found that these animals form new entrances each year; as a rule the larger the number of entrances, the older the colony. The number of entrances depends not only on the length of time the colony persists but also on its function. Despite the foregoing remarks, an estimate of the age of burrows using the number of entrances as a criterion would appear to be adequate for comparative purpose. The connection between the number of entrances to burrows with the nearest open space at the time of constructing the burrow, and also the age of the tree stand, is particularly important in the case of artificially afforested areas, as their character alters within a relatively short time, whereas natural areas are not subject to such rapid changes.

In examining the distribution of geographical directions of entrances to burrows Fuchs (1973) observed three directions to predominate: N, NW and W. Haltenorth and Rothe (1968) found the following directions for both main burrows and burrows for rearing young: SE, S and SW. A similar result was obtained by Behrendt (1955). There are however no convincing explanations available. In the present study no significant

predominance of any geographical direction was found. The way in which burrows faced is therefore determined by local conditions, without any overall tendency for the whole area of the Białowieża Primeval Forest.

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