SESSION 1
ÉCO-ÉTHOLOGIE DES CANIDÉS SAUVAGES

SPATIAL ORGANIZATION, MOVEMENTS AND DISPERSAL IN A DUTCH RED FOX (*VULPES VULPES*) POPULATION : SOME PRELIMINARY RESULTS

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Geographically the Red fox habitat in the Netherlands is divided into two main areas, separated by an at least 60 km wide zone of unsuitable lowland. The eastern and southern parts of the Netherlands have sandy soils, and the Fox populations here are continuous with those in Germany or Belgium. The other Fox inhabited area is the coastal dune area along the North Sea. Sixteen years ago foxes were found here for the first time. They were probably introduced by man. By now they have spread over the whole area (approx. 3 x 100 km) and seem to have reached fairly stable densities.

The new ecological situation led to some concern about the impact of the Fox on bird and game populations. This was the main motivation for the Waterworks of the Province of North Holland, in charge of the management of the North Holland Dune Reserve, to start a research project on Fox ecology in 1979. Although there is no regular Fox control in the area, a number of foxes is lost each year due to poaching. Foxes feed primarily on the ubiquitous rabbits.

During the project, in which many students took part, a total of 56 foxes were radio-collared and followed for periods of up to 3.5 years. Fixes were made from a car, as often as circumstances permitted, usually every 5 to 20 minutes.

SPATIAL ORGANIZATION

The most striking aspect of the spatial organization is its stability. The majority of the adult foxes lives in small groups of 1 male and 1 or 2, maybe sometimes 3 females, like in the studies of Macdonald (1980), Niewold (1980) and von Schantz (1981). These groups occupy territories of 105 to 200 ha each, of which the position in the field remains roughly the same throughout the years (Fig. 1), while in the meantime all the occupants may have been replaced by others.

(I will use " home range " here as the more general word, for any area regularly used for any period by a particular Fox ; the more specific word

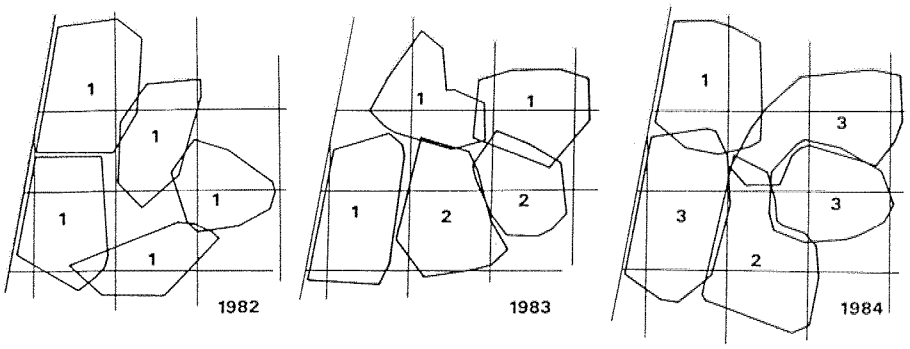

Figure 1. — Location of 5 group territories during 3 consecutive years. The number of radio-collared adult foxes is indicated. The rectangular lines form a 1 km grid as in all other figures. The coastline is to the left.

" territory " is used if this area is rather large, and stable for a longer period, and if there are indications that more than one Fox is involved.)

During spring and early summer boundary zones between territories (i.e. the areas visited by foxes of adjoining groups) are narrow and stable. In late summer and autumn the territorial boundaries are somewhat less respected, and the foxes are sometimes visiting parts of the neighbouring territories. In winter territoriality increases again ; it is however not uncommon to find a male in January far outside his own territory, probably attracted by a female in oestrus.

In one instance, two groups merged into each other in summer, following the accidental death of a female in the first, and the probable death of a male in the other. This newly formed group occupied the area of the former two territories. However the former configuration and number of territories were restored in late winter ; the newly formed group restricted its activities to the original territory of the male, so the result was a complete shift of territory by the two females. Their former territory was occupied by a new group of at least two first year animals.

Besides the resident territorial foxes there is a small number of individuals, mostly one year old males, living temporarily in very restricted home ranges in or near the boundary zones of the group territories (see below, and Niewold, 1980). In autumn and winter there is a further number of foxes, the young of the last litter, mostly males again, roaming everywhere, trying to find a place to live (see Dispersal patterns).

CHARACTERISTIC MOVEMENTS WITHIN THE HOME RANGE

Generalizations about the movement patterns of foxes within their home range inevitably lead to simplification. However the vast amount of data gathered over the last four years has provided some understanding of certain characteristic movement patterns of foxes in different social situations. Since the rabbits are abundant and fairly evenly distributed, the influence of food distribution on movement patterns is estimated to be slight.

Territorial males usually visit all boundary areas of their territory each night, most of them in a rather erratical way (Fig. 2 A), but a few make a very predictable circuit every night (Fig. 2 B).

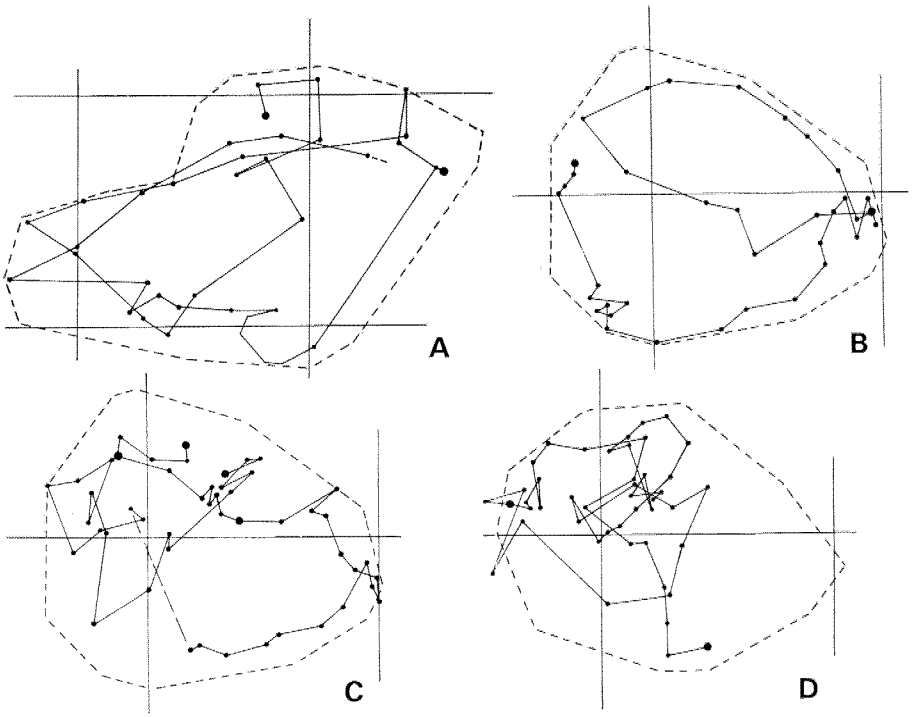

Figure 2. — Characteristic movements of different foxes within their territory during one complete night of activity. A and B : territorial males. C : a female with cubs. D : a younger female without cubs.

The most important female of a group, the one with a litter, usually is active in all parts of her territory each night, but does not visit the boundaries to the same extent as the male does (Fig. 2 C). Other females of a group tend to use only part of their territory per night (Fig. 2 D).

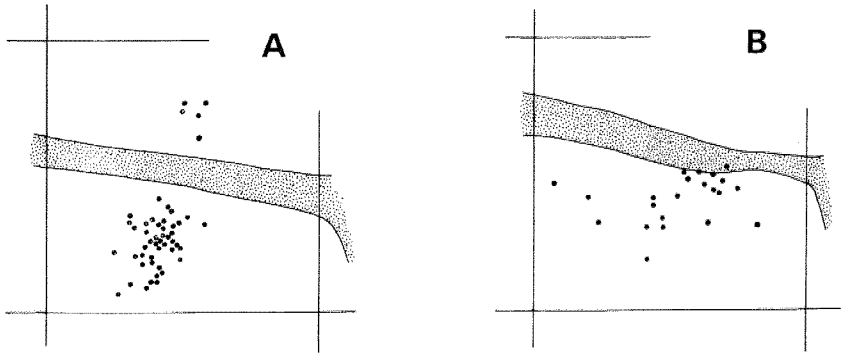

Figure 3. — All radio-fixes of a non territorial male during 19.5 hours of activity in December 1982 (A), and 10.5 hours in April and June 1983 (B). The stippled area is the boundary zone between two group territories.

Non-territorial foxes, living more or less in between the group territories, may restrict their movements to areas of 20 to 40 ha (Fig. 3). From time to time they may make short trips to other places, up to 3 km away, until an opportunity arises to join a territorial group.

Figure 4 shows the movements of the third female of the same group as shown in figs. 2 B-D, during late spring of her second year. She seemed to be banished to a corner of the territory, and sometimes made trips along the boundaries of other territories. After the death in July of a female in the territory upper left in figure 4, she moved in and became a territorial female.

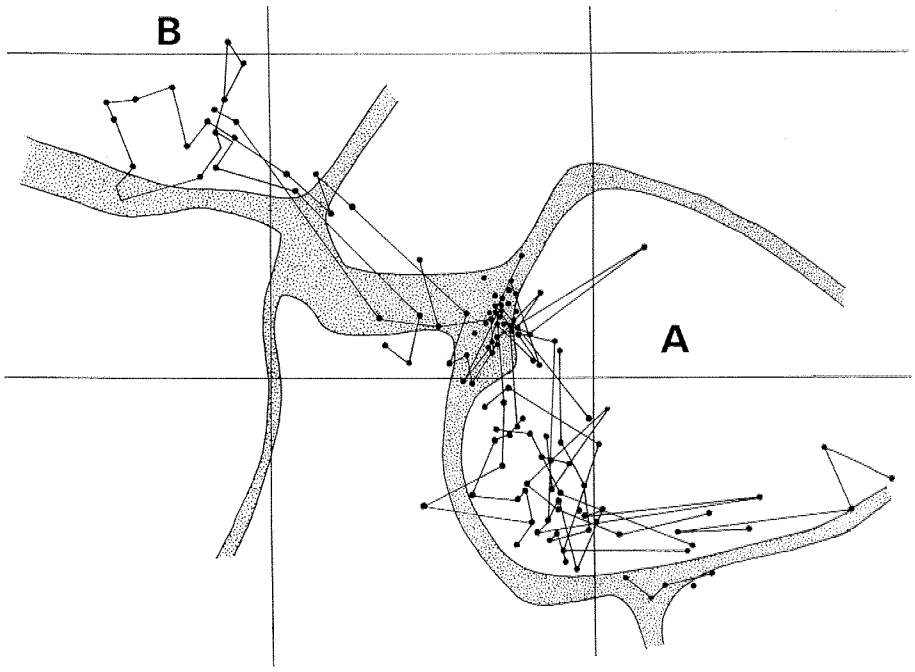

Figure 4. — Twenty-five hours of activity in June of a non-territorial female in her second year. Boundary zones between group territories are stippled. A : territory where she was born. B : territory of the group she eventually joined.

DISPERSAL PATTERNS

From mid August to December the majority of the surviving young of the year leaves the territory of birth. Of a total of 34 young (earmarked and radio-collared foxes combined) of which the whereabouts were known at least till halfway their second year, 22 had dispersed to another place, 1.5 to 35 km away. All 19 males left, and 4 of the 15 females. The other 11 females stayed in their original group. This difference between males and females is consistent with the results of tagging studies, for instance those of Jensen (1973), Storm *et al.* (1976) and Englund (1980).

The radio-collared young foxes showed a variety of dispersal patterns.

Five types of dispersal patterns have been discerned so far : examples are shown in figure 5.

— A sudden dispersal is shown in figure 5 A. A young male made several " exploratory " trips south of his territory of birth, often following the borders of the dune area, always returning in the same night. From one day to the

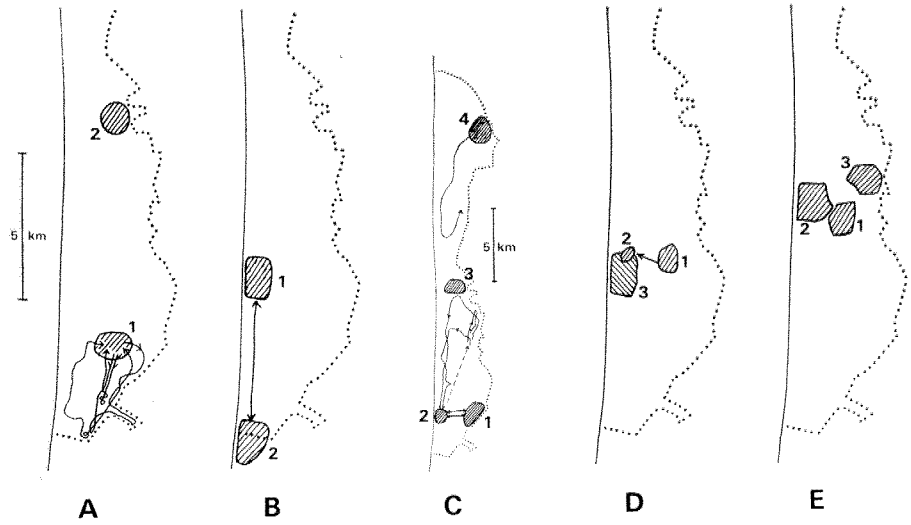

Figure 5. — Examples of five different dispersal patterns of young foxes in their first winter and later. The coastline (to the left) and the borders of the dune area are shown. The natal territory has been numbered 1, and later home ranges 2, 3 and 4.

next he occupied a territory 7 km to the north, respecting the very same boundaries as the former occupant, a radio-collared territorial male which had been shot by a poacher in the week preceding the arrival of this young male.

— Some male foxes established a new home range soon after their first explorations, but kept returning, sometimes every other day, to their original territory for periods of up to two months before staying permanently in their new one (Fig. 5 B).

— A rather common pattern was dispersal via one or more temporary home ranges. From these temporary home ranges the Fox kept making exploratory trips, often progressively further and partly along routes taken earlier (Fig. 5 C), untill a definite territory was established.

— Some young foxes gradually restricted their movements to a small part of their original territory, or established (without much exploratory behavior) a tiny home range not far away (see above). The male Fox of figure 3 and figure 5 D lived that way for fifteen months, before he took over the adjoining territory.

— The fifth dispersal pattern we observed only once (Fig. 5 E). Over a period of 10 weeks a female Fox gradually extended her activities into a neighbouring territory. In the end she stayed there for 8 months, most probably as a subordinate to another female. In her second winter she moved to still another adjoining territory.

We have studied dispersal within a rather large area of suitable Fox habitat. In a case like this the pattern of dispersal will generally be determined by the " social circumstances " which the exploring Fox meets. Some young foxes however do not display much exploratory behavior, and seem to prefer to wait for an opportunity to establish a territory in the immediate surroundings of their birth place. In this case the local ecological conditions obviously permit them to survive, sometimes for long periods, in a restricted home range.

SUMMARY

Some aspects of the ecology and social behaviour of a Fox population living in a Dutch coastal dune area are described. Most adults live in small groups, each of them occupying a stable territory of 105 to 200 ha. Several characteristic patterns of daily movements are described for territorial foxes, and for young foxes inhabiting small home ranges in between group territories. Finally five patterns of dispersal of young foxes in their first winter and thereafter are distinguished.

RESUME

Quelques aspects d'une population vulpine habitant les dunes néerlandaises de la Mer du Nord sont décrits. La plupart des renards adultes vivent en petits groupes, chaque groupe occupant un territoire stable de 105 à 200 ha. Plusieurs types caractéristiques de mouvements quotidiens ont été décrits concernant les renards territoriaux et les jeunes renards vivant sur de petits domaines situés parmi les territoires de groupe. Finalement cinq types de dispersion de jeunes renards pendant leur premier hiver et la période suivante sont décrits.

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