

DAILY MOVEMENT PATTERN VARIATIONS IN WILD BOAR (*Sus scrofa* L.)

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Abstract: We propose a new classification of the daily movement patterns obtained by radiotracking on 29 free-ranging wild boars (*Sus scrofa* L.) and we analyze the selection of patterns with regard to sex and age. To characterize the daily movement patterns we take into account two parameters: the maximum distance from the initial point (that is the initial diurnal resting place) and the distance between the initial resting place and the final resting place. We also discuss the relevance of these parameters to our objective and we determine a set of metric limits underlying the proposed classification. We identified five patterns: "Ranging widely": the animal moves further than 1,000 m from the initial point and stops at a final resting place which is located further than 1,000 m from the initial one; "Ranging and return": the animal moves further than 1,000 m from a initial point and stops at a final resting place which is located between 500 and 1,000 m from the initial one; "Loop": the animal moves further than 1,000 m and stops at a final resting place which is less than 500 m from the initial one; "Stay and rest nearby": the animal does not move further than 1,000 m and stops at a final resting place which is between 500 and 1,000 m from the initial one; "Stay": the animal does not move further than 1,000 m and stops at a final resting place which is less than 500 m from the initial one. Finally, we try to explain the importance of the selection of these different daily movement patterns in determining the socio-spatial organisation of Wild boar populations.

Keywords: Wild boar, *Sus scrofa* L., Suidae, Daily movements, Movement patterns, Socio-spatial organisation, Radio-tracking.

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1. Introduction

Little litterature is available to date on daily movements of wild ungulates recorded by radio-tracking (Deer: Tester & Sinniff, 1965; Caribou: Craighead *et al.*, 1973; White-tailed deer: Marchinton & Jeter, 1966). For this reason, telemetry studies on Wild boar have progressively evolved, to take into account different parameters in order to define daily movement patterns.

The daily movements of Wild boar were first studied by Mauget (1979; 1980), to take into account basic concepts such as: (i) feeding areas; (ii) movement speed. As Douaud (1983) we also used (Janeau & Spitz, 1984) these basic concepts of Mauget, but we also included an additional parameter: (iii) the utilisation of the initial resting place. Some years ago we proposed (Spitz & Janeau, 1990) to analyse daily movements with regard to: (i) activity zone; (ii) maximum distance from the initial resting place; (iii) the utilisation of the initial resting place; (iv) movement sinuosity.

Our objective now is to propose a new classification which is more descriptive of the daily movement patterns obtained by radiotracking and to analyze the pattern selection with regard to sex and age. We also try to explain the importance of the selection of the different

daily movement patterns in determining the organisation of Wild boar populations.

2. Material and methods

2.1. Study areas

The study areas were located in the south of France: (i) Grésigne (ca 44° N and 1°45' E); (ii) Massif du Caroux Espinouse and Montagne Noire (ca 43° 22' N and 2° 21' E); (iii) Camargue (ca 43°30' N and 4°30' E); (iv) Lauragais (ca 43°30' N and 1°20' E).

2.2. Animals

A total of 29 wild boars representing all sex and age categories were radio-collared and were the subject of a total of 95 x 24-hour monitoring sessions (the difference between the number of wild boars here and in Table 1 (row Total) derives from the fact that some of the collared wild boars changed age category during the study period).

We divided our sample into four animal categories: (i) the adult females with nutritionally dependant piglets (F. nut), the age of piglets is less than 3 months; (ii) the juveniles (Juv.), which are between 3 months and 8 months old; (iii) the sub adults (S. Ad.), which are between 8 months and 2 years old; (iv) the adults, including the females (Adt. F) with

young more than 3 months old or without young, and the males (Adt. M).

Table 1: Number of wild boars (per sex/age category) monitored during 24-hour radiotracking sessions.

| Sex/Age categories | Number of Animals | Number of Sessions |
|--------------------|-------------------|--------------------|
| F. nut. | 9 | 20 |
| Juv. | 3 | 10 |
| S. Ad. | 10 | 35 |
| Adt. F. | 8 | 18 |
| Adt. M. | 3 | 12 |
| Total | 33 | 95 |

2.3. Field data

The field data consisted of locations of animals obtained during 24-hour radio-tracking sessions (the average interval between locations was 15 minutes). All bearings were obtained from vehicle tracking units (2 working simultaneously in the case of 24-hour monitoring sessions), each one consisting of dual 4-element Yagi antennae, a null-peak box (AVM), a receiver (AVM LA 12) joined to a digital data processor (T.D.P.1. Telonics) to record the level of the input signal, and head-phones. The animals' positions were calculated from reference to fixed radio beacons at known coordinates (Spitz & Janeau, *op. cit.*).

2.4. Data processing

For 24-hour monitoring sessions a simple computer programme was used to calculate the location and the following parameters (Spitz & Janeau, *op. cit.*): - the total distance travelled (TDT), *i.e.* the sum of the straight line distances from fix to fix; - the maximum distance from the departure point (MDP); - the average radius (AVR), *i.e.* the mean of the distances of the fixes from their barycentre; - the distance between resting places (DRP), *i.e.* the distance

between two consecutive diurnal resting places. These parameters and examination of the data lead us to define 5 different patterns of daily movement (Fig 1):

P. 1: "Ranging widely", the animal moves further than 1,000 m from the initial point and stops at a final resting place which is located further than 1,000 m from the initial one.

P. 2: "Ranging and return": the animal moves further than 1,000 m from the initial point and stops at a final resting place which is located between 500 and 1,000 m from the initial one.

P. 3: "Loop": the animal moves further than 1,000 m and stops at a final resting place which is less than 500 m from the initial one.

P. 4: "Stay and rest nearby": the animal does not move further than 1,000 m and stops at a final resting place which is between 500 and 1,000 m from the initial one.

P. 5: "Stay": the animal does not move further than 1,000 m and stops at a final resting place which is less than 500 m from the initial one.

Five hundred meters is the maximum width of an area of zonal activity, as defined by Maugé in 1979. That is for a wild foraging animal in a limited area for a few hours. A thousand meters is the maximum width of the daily home range of a Wild boar exhibiting two bouts of zonal activity from its resting place, but in opposite directions.

We found (Tab. 2) that we needed only two parameters to define the daily movement patterns: MDP (maximum distance from the departure point) and DRP (distance between resting places). Furthermore, TDT (total distance travelled) and AVR (average radius) are well correlated with MDP. Means of TDP, MDP, and AVR in the patterns P.1, P.2 and P.3 were significantly higher than those in P.4 and P.5. We also observed that the mean of DRP for pattern P.1 was significantly higher than in the other patterns and that the mean of DRP in patterns P.2 and P.4 was significantly higher than in patterns P.3 and P.5.

Table 2: Means of the total distance travelled (TDT), the maximum distance from the departure point (MDP), the average radius (AVR) and the distance between resting places (DRP) for each pattern of daily movement.

| Pattern | TDT | MDP | AVR | DRP | n |
|---------|--------|--------|-------|--------|----|
| P. 1 | 8005 m | 2471 m | 704 m | 2130 m | 34 |
| P. 2 | 6945 m | 2354 m | 655 m | 789 m | 7 |
| P. 3 | 6981 m | 1901 m | 685 m | 239 m | 14 |
| P. 4 | 3144 m | 783 m | 221 m | 665 m | 9 |
| P. 5 | 3744 m | 529 m | 138 m | 178 m | 31 |

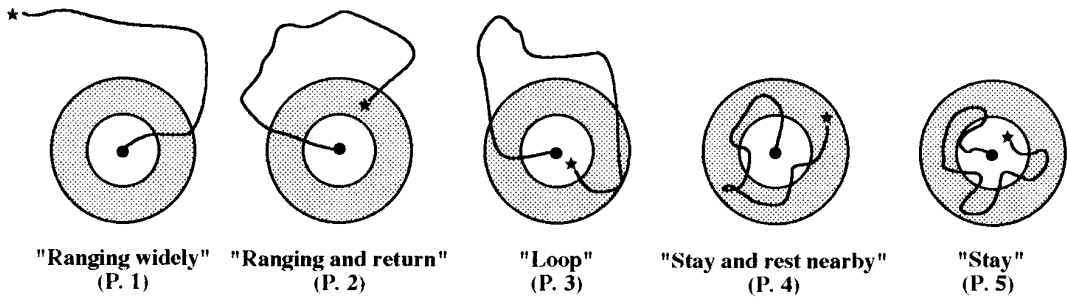


Figure 1 - Movement patterns of Wild boar (the radius of the small circle = 500 m; the radius of the large circle = 1,000 m).

3. Results

The females with dependant piglets used the pattern "Stay" (P. 5) in 55% of observations (Fig. 2), while the pattern "Ranging widely" (P. 1) and the pattern "Loop" (P. 3) were each used in 15% of observations. The two other patterns "Stay and rest nearby" (P. 4) and "Ranging and return" (P. 2) were used less than 10% each.

Among juveniles, the first pattern selected was "Ranging widely" constituting 30% of observations, the second choices were the patterns "Ranging and return", "Loop" and "Stay and rest nearby" (20% each) and the pattern "Stay" was observed on 10% of occasions.

The subadults preferentially used the pattern "Ranging widely" (51%) and then the pattern "Stay" (29%). The three other patterns were also used, but at much lower frequency.

The adult females without young or with non-dependent juveniles used only three patterns, two of which incorporated returning to the initial site, the pattern "Stay" (50%) and the pattern "Loop" (22%). The third pattern selected was "Ranging widely" (28%). The adult males used the pattern "Ranging widely" preferentially (42%), the patterns "Ranging and return" and "Loop" in the same proportions (25%), but the pattern "Stay and rest nearby" much less. The pattern "Stay" was never used by this class of animals.

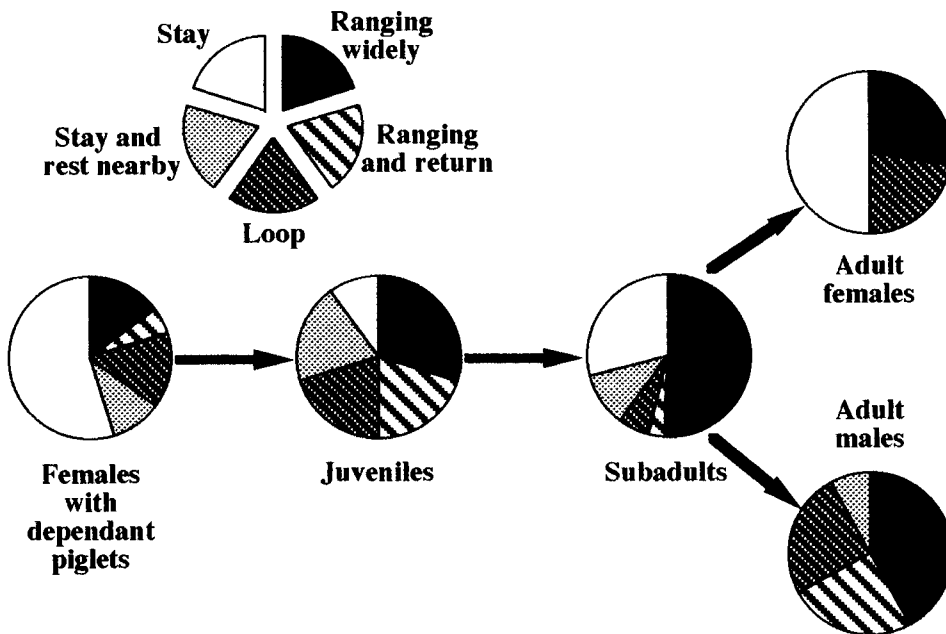


Figure 2 - Daily movement patterns used by animals with regard to sex and age categories (given as percentage).

4. Conclusion

Patterns which include returning to the initial resting place were used by all adult females in 70 to 72% of the observations, in contrast to the 25 to 35% for all other categories of individuals. The behaviour of adult females is thus characterized by fidelity to a limited number of preferred areas, and has consequences for the choice of farrowing sites. Patterns where the final resting place was distant from the initial point were used by only 15% of adult females with dependent piglets but by 30% of other adult females, and also by juveniles. This can be related to the movements which occur inside a limited home range, but with segregation of non-dependent juveniles from adult females during the resting phase (Cousse, 1994). The post-weaned piglets (juveniles) soon, exhibit different choices to these of their mother. We can explain this phenomenon by the differences that we observed in the juveniles polyphasic index, which was higher than the females polyphasic index after the weaning period (Cousse & Janeau, 1992) and the ultradian rhythm maintained by juveniles post-weaning but lost by females after the weaning period (Cousse et al., this volume). At the subadult stage, the daily movement choices were different to those at the juvenile stage. Subadults adopted the most exploratory pattern ("Ranging widely") as this is in fact the dispersal phase. The adult males circulate around some reproductive females and, in contrast to the behaviour of females, use only a few of the patterns including ranging less than 1,000 m from the initial resting place.

Finally we conclude that the spatial stability of a Wild boar population can be explained by the daily movement preferences of adult females.

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