Tagging Piglets at the Farrowing Nest in the Wild: Some Preliminary Guidelines

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Abstract – Neonate ungulate often show high rates of mortality due to predation, starvation, or exposure to bad weather, leading to losses frequently exceeding 50%. Wild boar piglets are known to suffer from thermoregulation insufficiency, which probably explain the nest construction behaviour in sows. We thus tried to develop a method for tagging piglets inside their farrowing (or birth) nest to assess piglet survival from few days after their birth onwards. Sows fitted-out with VHF collars were radio-tracked to determine parturition time, and to get a rough idea of the possible birth nest location. Then, with a handled antenna we approached on foot the birth nest, and piglets were caught, tagged and fitted-out with a backpack transmitter and released inside the nest. Temporal movements of mother and litter association were monitored, as long as possible. Results on sow behaviour and tactic against human approach, piglets body mass, piglet reaction, and survival in their early lifetime were described.

***Sus scrofa* / post-natal survival / farrowing nest / wild boar piglet / transponder / telemetry**

Kivonat – Szabad területen élő vadmalacok jelölése vacokban: néhány előzetes irányelv. Az újszülött patások halálozási rátája gyakran nagyon magas, elérheti az 50%-ot, ami elsősorban a ragadozásnak, a táplálékhiánynak és az időjárási viszonyoknak tudható be. A vadmalacok kezdeti elégtelen hőszabályozása magyarázza a vaddisznó kocák vacoképítő viselkedését. Olyan módszert próbáltunk kifejleszteni, amellyel a malacozó vacokban megjelölt vadmalacok túlélését becsüljük a születésük utáni néhány napban gyűjtött adatokból. A VHF nyakörvvel ellátott kocákat malacozási időszakban bemértük, és hozzávetőlegesen meghatároztuk a vacok lehetséges helyét. Ezt követően kézi antenna segítségével megközelítettük a vackot, ahol a malacokat befogtuk, majd megjelöltük és háti jeladóval láttuk el. A koca időbeli mozgását és az utódokat a lehető legtovább monitoroztuk. Vizsgálataink eredményeként ismereteket szereztünk a kocák viselkedéséről és az emberi zavarásra alkalmazott taktikájáról, valamint adatokat kaptunk a malacok tömegéről, reakcióiról, és túléléséről életük korai szakaszában.

***Sus scrofa* / születés utáni túlélés / malacozó vacok / vaddisznó malac / jeladó / telemetria**

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1 INTRODUCTION

Wild boar managers generally cannot rely on reliable estimates of demographic parameters to simulate the efficiency of management scenarios and therefore, they cannot provide useful management rules. To avoid such a problem, modelling attempts have been made by combining information obtained through both a long-term research program and expert opinions for some unknown parameters (Servanty 2007). A population model of wild boar was then elaborated and was based on a pre-breeding matrix model. One of the guess estimate that might lead to fluctuations in population recruitment and then, influence the population dynamics (Coulson et al. 1997) was the post-natal survival (i.e., from birth to weaning). Among ungulate species, juvenile survival appears to be of prime importance (Gaillard et al. 2000) and it can be split into the post-natal and the post-weaning survival (i.e., from weaning to one year of age; Gaillard et al. 1998). In many species juvenile survival could be considered as a critical step of life and neonate ungulates often suffer from high mortality due to predation, starvation, or exposure to bad weather, leading to losses that frequently exceed 50% (Gaillard et al. 2000). Wild boar piglets are known to suffer from thermal deficiency (Mauget 1980), which can explain the nest construction behaviour observed in sows (Gundlach 1968, Diong 1973, Baettig 1980, Dardaillon 1984, Meynhardt 1991, Nakatani 1989, Brandt et al. 1997, Fernandez-Llario 2004). Although little is known about newborn survival in wild boar, juvenile mortality could be as high as 62% (Nakatani, 1989) or even 90% (Fernandez-Llario et al. 1999). Moreover some authors reported that in some cases, the whole litter may die (Kurz – Marchinton 1972). To our knowledge, no study has tried to assess directly post-natal survival of wild boar in natural conditions. Our aim was to carry out a study on the feasibility of tagging piglets inside their birth nest, an initial step to assess the piglet survival from few days after their birth onwards. We aimed to test whether it was realistic to catch and tag piglets inside the farrowing nest and to monitor them until their weaning. By doing so, we looked at getting reliable data on the early survival of piglets as well as information on factors that could induce piglet death. In addition, we aimed to assess the sow's responses to human perturbation through a possible aggressive behaviour against human approach for instance, but also the piglet responses to human approach of the farrowing nest. Finally, the capture events were also an opportunity to get data on body mass and sex of the littermates, for which available information is scarce to our knowledge, especially in wild conditions.

2 METHODS

The study took place in the north eastern part of France (48°02'N; 4°55'E), in the Châteauvillain-Arc-en-Barrois forest. This forest is a homogeneous broadleaved deciduous woodland on a calcareous plateau. It covers 11,000 ha composed of hornbeam (*Carpinus betulus*) coppice with oak (*Quercus petraea*; 41%) and beech (*Fagus sylvatica*; 30%) stands. In winter, during the hunting season, the main peak of the farrowing period was assessed both on adult and yearling sows (Mauget 1982, Fernandez-Llario – Carranza 2000) by genital tract analyses (Henry 1968, Mauget 1980,1982, Servanty et al. 2007). The estimation of the main farrowing peak was used to decide when to perform an intensive radio-telemetry survey on pregnant sows fitted-out with VHF collars *(Figure 1)*. The radio-tracking monitoring began in 2004, after some preliminary field tests of random search of wild boar farrowing nests were performed in 2003 (ONCFS unpublished data). The radio-tracking method was also used in birds (Powell et al. 2005) and with the Eurasian lynx (*Lynx lynx*, Boutros et al. 2007). We used both a car-mounted antenna and a handled antenna for doing telemetry (Kenward 1987).

Tracking from the car enabled us to determine the sow's restricted activity period, which indicates the parturition time (Kurz –- Marchinton 1972, Mauget 1980, Janeau – Spitz 1984). As soon as two consecutive locations occurred at the same place, we performed a night survey of the sow's activity. Then, after parturition was expected to have occurred, we used radio-tracking on foot to approach the nest during the supposed period of stability of the piglets inside the nest (from 3-4 days Mauget et al. 1984, to 1-2 weeks, see Kurz - Marchinton, 1972, Janeau –Spitz, 1984, Eguchi et al. 2000). When caught the piglets were fitted-out with both a transponder (FDX - B ISO 11784, Réseaumatique) to identify them for the rest of their life and an adaptable backpack based on the elastic collar process (Brandt et al. 2004; *Figure 2 - a,b,c*) including a VHF transmitter (TW3, 10 gram, Biotrack). All piglets were released inside their birth nest after tagging. Temporal variations of the mother - litter association were then monitored through VHF controls as long as possible.

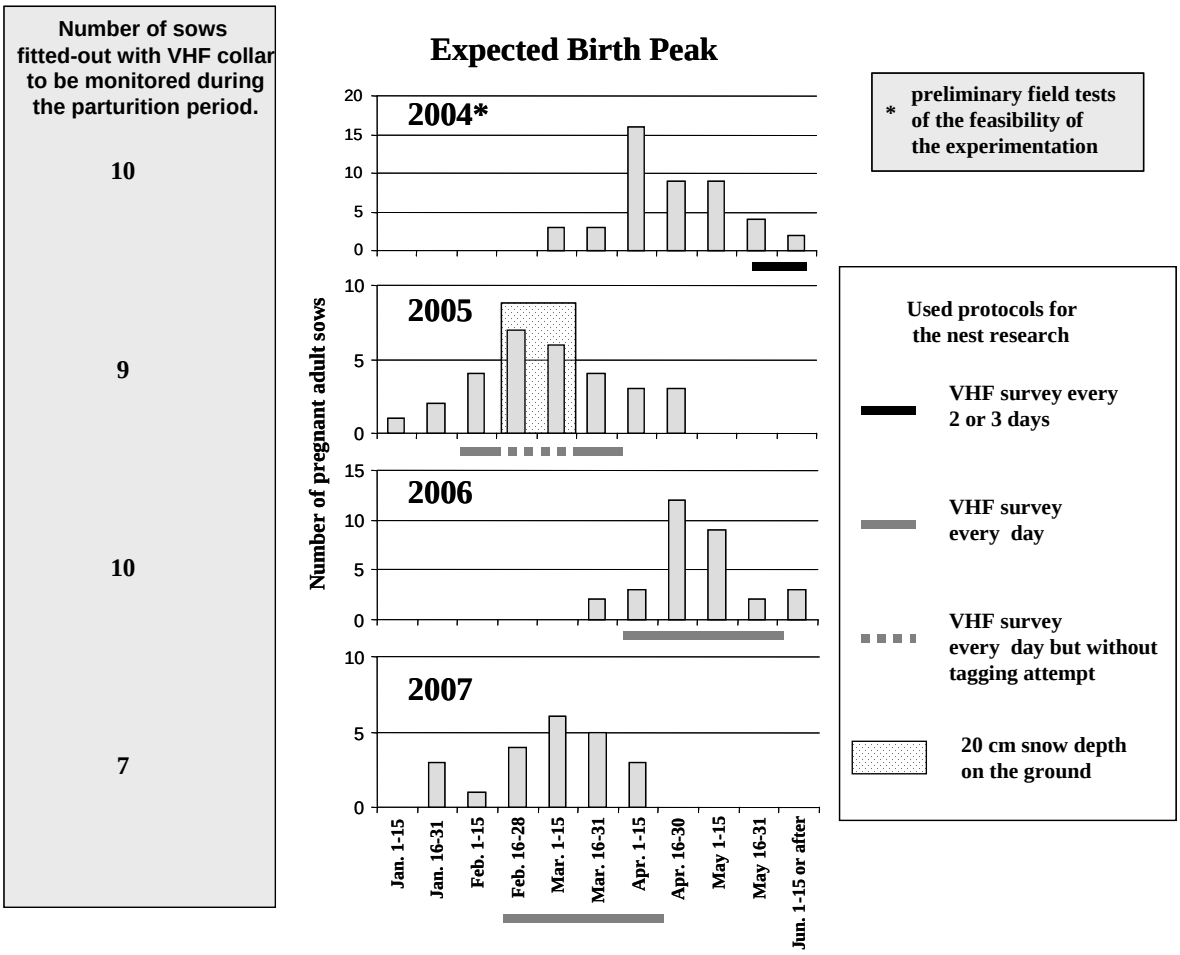

Figure 1. Between years distribution of expected farrowing period of adults sows of the study area. Solid line (black or grey) as well as dotted line under each histogram represent the duration of the VHF survey. Details on the localization rhythm are given in the white box. The total number of sows fitted-out with VHF collar which are monitored each year, are indicated in the grey box, on the left side. During the year 2005, we decided to suspend the tagging attempt during one month due to bad climatic conditions

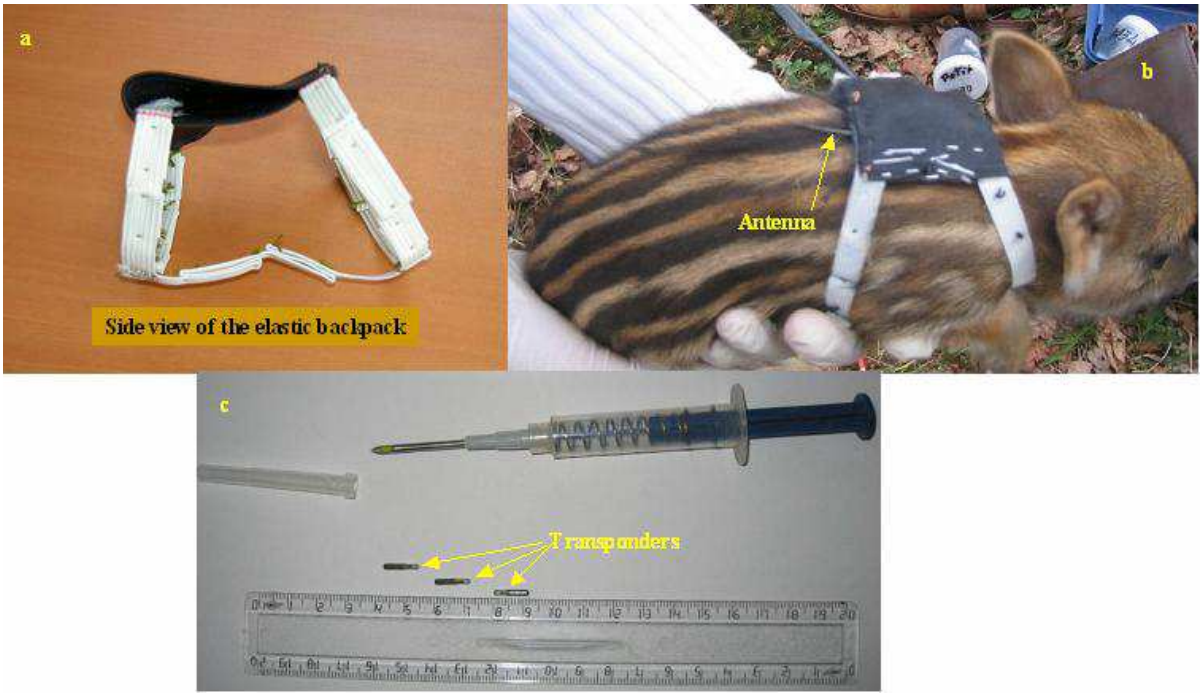

Figure 2. a) Harness system designed to fit out piglets with a backpack. Note that on the white elastic belts of the harness, sewing points are visible. The harness can thus adjust to the piglet during its body growth until the next recapture event. b) Piglet fitted out with a backpack. The pocket of the backpack was clipped once the transmitter was put inside. The antenna was directed toward the back of the piglet. c) Transponders and the applicator used to inject into the subcutaneous tissue. The ruler indicates the size of transponders (cm)

3 RESULTS

In agreement with previous studies (Mauget 1982, Aumaitre et al. 1984, Vassant et al. 1994, Maillard - Fournier 2004) the birth peak varied among years *(Figure 1)*. Although it was possible to catch and tag piglets inside the birth nest, we were successful only in 17% of our attempts *(Figure 3)*. Contrary to what we were expecting, determining the exact day of birth and locating the farrowing nest in the forest plot was far from an easy task. However, we were never in danger because of a sow reaction. Indeed, in any case sows did not even try to defend their litter against us by a direct attack during our approach. However, in some occasions the sow moved from the farrowing nest before we reached the exact position. In half of the cases, the sow abandoned her litter. Quite rapidly after their abandonment (between 24 and 48 hours), the piglets died inside the birth nest or near this place. Once, we only recover transmitters and remains of legs from three piglets, of a litter of four, while the last one was found half-buried in the nest surrounding. In all other cases, the sow picked up back the whole litter and moved piglets away before building a new nest. In 77% of cases (10 out of 13), all the littermates ran away when we were approaching the nest. Generally after a short run, they tried to hide themselves in the vegetation and were not moving anymore except when we tried to pick them up. The location with the vehicle-mounted antenna did not enable us to identify whether the sow reached the exact nest position or whether she was just wandering in its surrounding. We were thus not able to quantify precisely how long it took to the sow to come back to the birth nest after she had run away. However, in all cases, when the sow came back to pick up the piglets, it did that within 24h after the capture event. The backpacks were kept

by the piglets for an average of only two and half days. Overall, six litters were caught and 25 piglets were tagged. The overall sex ratio was quite balanced with 14 males and 11 females. Newborns weighed an average of 1096 g ± 203 g (ranging from 650 g to 1390 g) with both the lightest and heaviest piglets being male (*Table 1*).

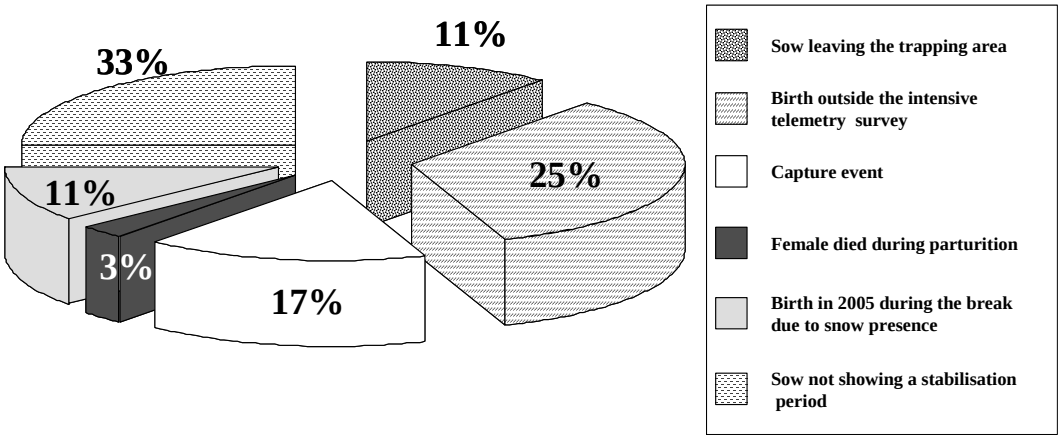

Figure 3. Results of the tagging attempts regarding the 36 sows monitored during the whole study period

Table 1. Description of information recorded both on the sows and on piglets littermate during the course of the study period. The grey cells indicate the females that abandoned their litter after the tagging event

Year	Sow's name	Sow's Age	Number of tagged piglets	Estimated age of the piglet	Sex ratio of the littermate		**Weight in g**	
					male	female	male	female
2004	Flor	Adult at capture	5	Between 36 to 60 hours	5	0	1050; 700; 980; 650; 1030	/
2005	Vrille	Born in 2003	2	Between 6 and 8 days	1	1	1280	1480
2006	Samare	Adult at capture	5	Between 48 to 72 hours	1	4	1380	940; 1340; 1270; 1170
	Ambre	Born in 2002	4	Between 48 to 72 hours	2	2	1390; 1300	1020; 1020
2007	Denise	Adult at capture	4	Between 48 to 60 hours	2	2	1200; 1110	1140; 1040
	Truffe	Adult at capture	5	Between 48 to 60 hours	3	2	1000; 990; 1010	990; 910

The transponder tagging system appeared to be quite efficient. We were able to read it on all the tagged individuals accessible to our check control so far, both through recapture events or during the hunting season. The longest monitoring so far lasted 541 days.

4 DISCUSSION, CONCLUSION

This experiment of piglets tagging was not as successful as we might have expected. Although we showed that newborn wild boar can be safely caught and tagged in wild condition, several constraints need to be overcome. First, to identify the spatial stabilisation corresponding to the nest building implied a very intensive VHF monitoring of the sows fitted-out with collar is required. In one third of our cases, the daily survey of the sow resting places did not allow us to identify precisely the farrowing nest. Our results support that farrowing nest building is a short event, performed within a few hours before parturition as reported by some previous works (Gonyou - Stookey 1987, Meynhardt 1991, Gustafsson et al. 1999). The observed resting period at nest after births have occurred might be shorter than previously reported 3-4 days or even less in the present study *vs* 1-2 weeks, Kurz - Marchinton 1972; Janeau - Spitz 1984, Eguchi et al. 2000, but see Mauget et al., 1984). Moreover piglets are able to go out of the nest within a few hours after birth (Meynhardt 1991, Eguchi et al. 1999). Sows have also been reported to be highly sensitive to any perturbation after the parturition (Eguchi et al. 2000). The odour or the physical presence of a potential predator in the nest surrounding might thus induce the sow to move its piglets in order to protect them from predation. Indeed sows that picked up their litter after tagging event generally moved out their piglets at 300- 400 meters away from their initial position. Overall, our first results highlight that the time-window for tagging of newborns is less than a week. The use of improved technologies, such as GPS/GSM collars (Baubet et al. 2004) might help to identify more accurately the location of the birth nest. Moreover, such equipment might also help to follow more precisely and under a high rate of location, the post-parturition behaviour of sows, in the wild. However, the short time window raised another problem. Although, the aim was to tag piglets as young as possible to get a reliable estimate of the neo-natal mortality, the tagging attempt cannot be run too early after births has occurred. Indeed, the nursing behaviour of the sow could be highly disturbed by the experimentation during the first day of piglet's life which is a crucial period for them (Gonyou - Stookey 1987, Eguchi et al. 1999).

The difficulty we had to locate precisely the farrowing nest might also be due to the post-partum behaviour of the sows. Indeed, their activity rhythm changed after the parturition and sows were becoming more active during daytime to forage nearby the farrowing nest (Mauget et al. 1984, Eguchi et al. 1999). In some cases, changes of the VHF signal (Kenward 1987) informed us that the sow was already active when we were approaching her. In some other cases, they moved away from the nest before we reached its exact position. In these cases we were thus not able to find the nest due to escape movements. Although wild sows seem to be sensitive to human perturbations, they never tried to defend the farrowing nest or their litter by attacking contrary to what has been previously reported (Meynhardt 1991) or observed in captive animals (Eguchi et al. 2000). The mothers abandoned their litters in 50% of the cases although we cannot identify the exact cause with certainty due to our small sample size. Such high rate of failure pases an unexpected problem that might be difficult to overcome to study the early piglet survival.

However, we can conclude that the post-natal survival of piglets is highly variable from year to year due to the human perturbation (and especially hunting activities when birth period occurs in late winter) as well as to the weather conditions.

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