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Fidelity to non-breeding site in some species of birds in Senegal

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The authors report the results of observations and experiments on the site fidelity, home range and homing success in some species of birds captured and banded at the ORSTOM Ornithological Station of Mbour (Senegal) during the non-breeding season (November-December 1988 and 1989).

While some bird species range over a wide area or are found in our study area only during migratory movements, most of the species investigated, which include both local birds and palaearctic migrants, display a tendency to spend the winter in a home plot of very limited size.

In addition, homing experiments were carried out by displacing and releasing the birds at sites 5 km from the capture station. Globally, our results are in agreement with the reports on similar investigations in the Mediterranean area: among the species investigated, strong site fidelity, as revealed by high recapture percentages in non-displaced birds, does not necessarily lead to good homing performances after passive displacement. On the whole, the commonest species of small birds which spend the winter in our study plot show different kinds of relationship between individual birds and their habitat with respect to home range, site attachment and homing success.

KEY WORDS: site fidelity, home range, homing, birds, Senegal.

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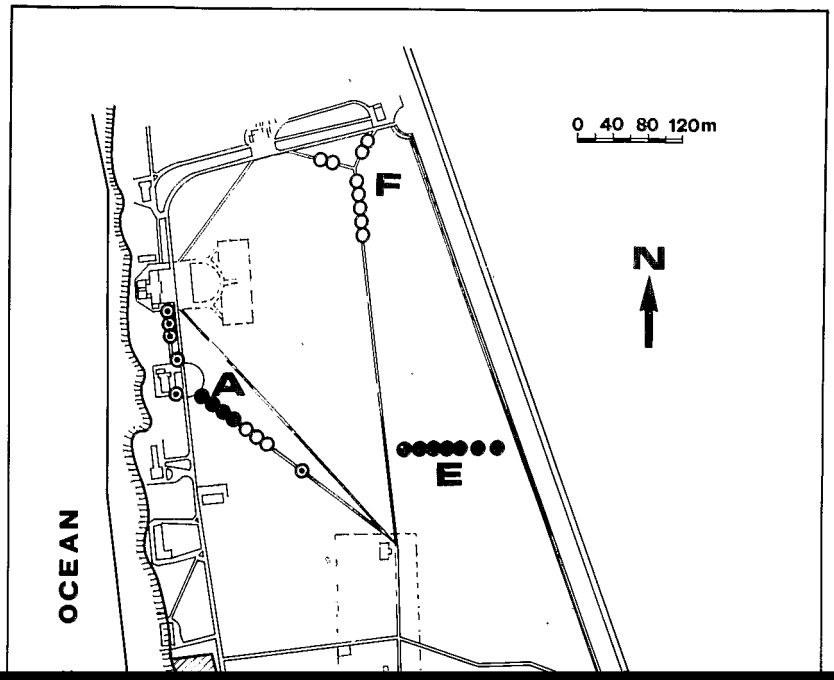
INTRODUCTION

During the last few decades, evidence has been accumulating that the attachment shown by birds to their native/breeding site (LÖHRL 1959, SERVENTY 1967, SCHUZ 1971, BELLROSE 1972, BERNDT & WINKEL 1979) is also devoted to their wintering ground. This winter site fidelity has been demonstrated either by the frequent recaptures of wintering individuals in the original ringing area or by the homing ability usually observed after birds have been experimentally displaced from their wintering home site (references in MATTHEWS 1968, BENVENUTI & IOALÈ 1980a, IOALÈ & BENVENUTI 1983, BAILLON & BENVENUTI 1990, KETTERSON & NOLAN 1990). This site attachment has also been documented in migratory birds which return to the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and checked for wing length and body weight. We recorded the sex of birds in species with conspicuous sexual dimorphism, but we made no attempt to distinguish between young and adult individuals.

Release experiments. Some of the banded birds were released at the capture site. Each of the remaining birds was placed in a separate cloth bag and carried by car, within a few hours of their capture, to one of the two release sites at 5 km NNW and SE. We did not record the vanishing bearings of the released birds because nearly all of them landed on nearby trees or bushes soon after being tossed. The only two bird species which produced useful vanishing bearings at release were the Black-billed Wood dove (*Turtur abyssinicus*) and the Laughing dove (*Streptopelia senegalensis*); the orientational performances of these birds are the topic of a separate paper (BENVENUTI et al. 1991), so they have not been reported here. Homing ability was taken to be demonstrated by the recapture of displaced birds in the original trapping area. As regards the recapture distance, we have considered the distance between the median points of the two nets in which each single bird was captured and subsequently recaptured (for birds trapped twice in the same net, the recapture distance was considered to be zero). These methods are much the same as those used in previous similar experiments in the same area (BAILLON & BENVENUTI 1990) and in the Mediterranean region (BENVENUTI & IOALÈ 1980a, 1980b, 1983; IOALÈ & BENVENUTI 1982, 1983).

Statistical methods. The χ^2 or the Fisher exact test, depending on the sample size, has been used to compare the number of recaptures, in different sets of two species, with respect to the total number of released birds. Differences between species in the vertical distribution of capture pattern have been tested using the Mann-Whitney U test (SIEGEL 1956).

RESULTS

General trapping patterns. Apparently, the capture season in autumn 1988 was more successful than in 1989 (Fig. 2); if we consider the number of birds trapped in 1000 m of mistnets per hour, the outcome is that in 1989 we have lower figures in 10 species out of 12 (excluding *Pogoniulus chrysoconus* because the 1988 data are equal to those for 1989); this result differs from random: Binomial test, $P<0.02$. The extremely poor trapping rate in 1989 forced us to double the efficiency of our capture methods in terms of number of capture stations and mistnets set up in the time unit.

As regards data on the height at which birds were trapped, Fig. 3 shows the pattern of vertical distribution. It can be observed that the results relative to *Sylvia*

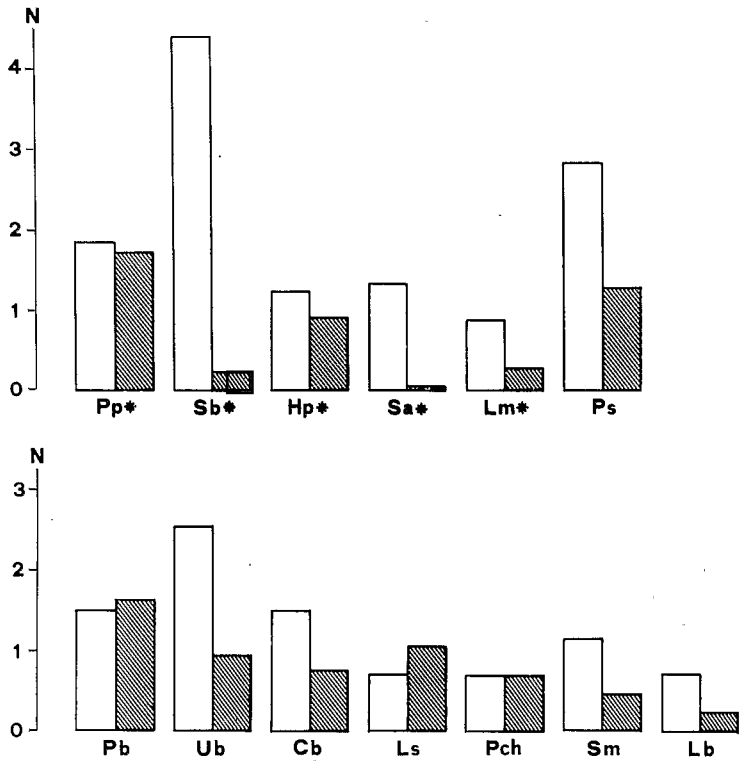


Fig. 2. — For each species the height of each bar is proportional to the mean number of birds captured in 1000 m of mistnets per hour. Open and shaded bars refer to the 1988 and 1989 data. The names of the species are abbreviated as follows: Pp = *Phoenicurus phoenicurus*, Sb = *Sylvia borin*, Hp = *Hippolais pallida*, Sa = *Sylvia atricapilla*, Lm = *Luscinia megarhynchos*, Ps = *Prinia subflava*, Pb = *Pycnonotus barbatus*, Ub = *Uraeginthus bengalus*, Cb = *Camaroptera brachyura*, Ls = *Lagonostica senegala*, Pch = *Pogoniulus chrysoconus*, Sm = *Serinus mozambicus*, Lb = *Laniarius barbarus*. *Ploceus cucullatus* and *P. melanocephalus* (abbreviated as Pcu and Pm in Table 2 and Fig. 5) have not been included because we banded these species in 1988 but not in 1989. Palaearctic migrants are marked by asterisks.

comparison between each of these species and all of the others leads to statistical significance in many cases (see Table 2A).

In birds displaced at 5 km from our study plot, the recapture percentages range between 0.0 (*Sylvia borin*) and 54.5 (*Pogoniulus chrysoconus*). The latter species show remarkable homing success, significantly better than that recorded in all the others, with the exception of *Phoenicurus phoenicurus* (Table 2B). In all the species investigated the recapture percentage of displaced birds is lower than that of birds which have been released at the capture site; this difference, however, reaches the level of statistical significance in two cases only: *Prinia subflava*, $\chi^2 = 8.72$, $P<0.01$, and *Camaroptera brachyura*, Fisher exact test, $P<0.02$. Homing success does not seem to

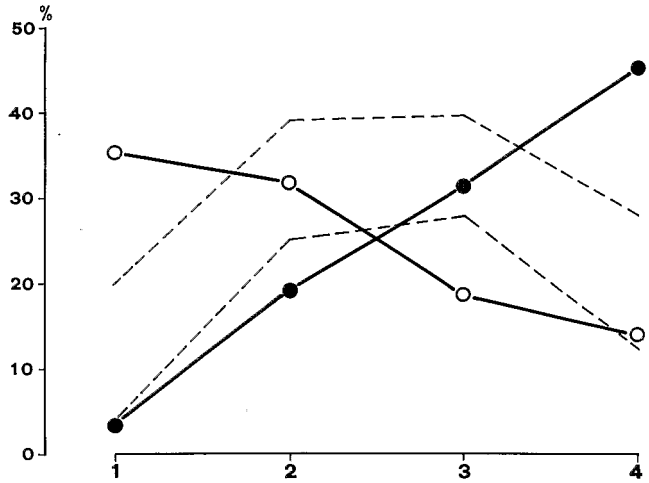


Fig. 3. — Vertical distribution of the trapped birds. Only those species for which 50 or more data (including winter captures) were available, have been considered. The figure shows the percentage

Table 2.
Site fidelity (A) and homing ability (B): levels of statistical significance.

A: Site fidelity

	Pp												
Sb	.02	Sb											
Hp	—	—	Hp										
Sa	.05	—	—	Sa									
Lm	—	—	—	.05	Lm								
Pm	.02	—	—	—	—	Pm							
Ps	—	.01	—	.01	—	.001	Ps						
Pb	—	.05	—	.05	—	.02	—	Pb					
Ub	—	—	—	—	—	—	—	—	Ub				
Cb	—	.001	—	.01	—	.001	—	—	—	Cb			
Ls	.01	—	—	—	.02	—	.001	.01	—	.001	Ls		
Pch	—	.001	—	.001	—	.001	—	—	.02	—	.001	Pch	
Sm	.01	—	—	—	.05	—	.01	.02	—	.001	—	.001	Sm
Lb	—	—	—	—	—	—	—	—	—	—	—	.05	—	Lb
Pcu	—	—	—	—	—	—	.05	—	—	.01	—	.01	—	—

B: Homing ability

	Pp							
Sb	—	Sb						
Hp	—	—	Hp					
Pm	.05	—	—	Pm				
Ps	—	—	—	—	Ps			
Pb	—	—	—	—	—	Pb		
Ub	—	—	—	—	—	—	Ub	
Cb	—	—	—	—	—	—	—	Cb
Pch	—	.01	.01	.001	.01	.01	.01	.02

A. Site fidelity, expressed by the number of recaptures with respect to the total number of non-displaced birds, has been compared between species using the χ^2 or the Fisher exact test (depending on the sample size), whose level of statistical significance is given (— = not significant). Abbreviations as in Fig. 2.
B. Analogous values are given in B for homing success, expressed by the number of recaptures with respect to the total number of displaced individuals.

be related to site fidelity: it is worth noting, for example, that while *Camaroptera brachyura* and *Pogoniulus crysoconus* exhibit a similar strength of attachment to their home site, indicated by a comparable level of recapture percentages both in non-displaced birds and in birds retrapped 1 year after the first capture, there is a noticeable difference between these species in the homing performance of displaced birds (Fisher exact test, $P<0.02$) (Fig. 4).

In most species considered in our study, individuals show a tendency to stay in the area for quite a long time, as indicated by the recapture intervals reported in Fig. 5. Some species, however, are present in our study plot for a short period during the autumn, whereas they are absent or very rarely found during the winter (*Sylvia borin*, *S. atricapilla*, *Serinus mozambicus*).

Table 3 gives data on birds which were retrapped 1 year after their first capture; the recapture percentage varies between 0.0 (five species) and 37.5 (*Pogoniulus chrysoconus*).

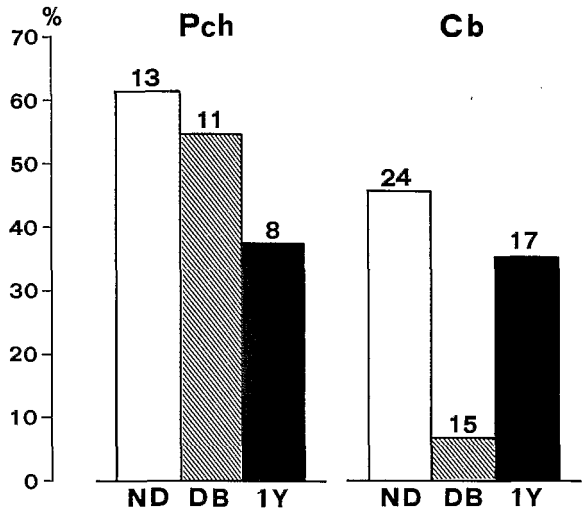


Fig. 4. — The height of the bars is proportional to the recapture percentages in non-displaced birds (ND), in birds displaced at 5 km from the capture site (DB), and in birds banded in 1988 and retrapped 1 year later (1Y). The numbers on top of each bar indicate the sample size. The left-hand set of bars refers to *Pogoniulus chrysoconus* (Pch), and the right-hand set of bars to *Camaroptera brachyura* (Cb).

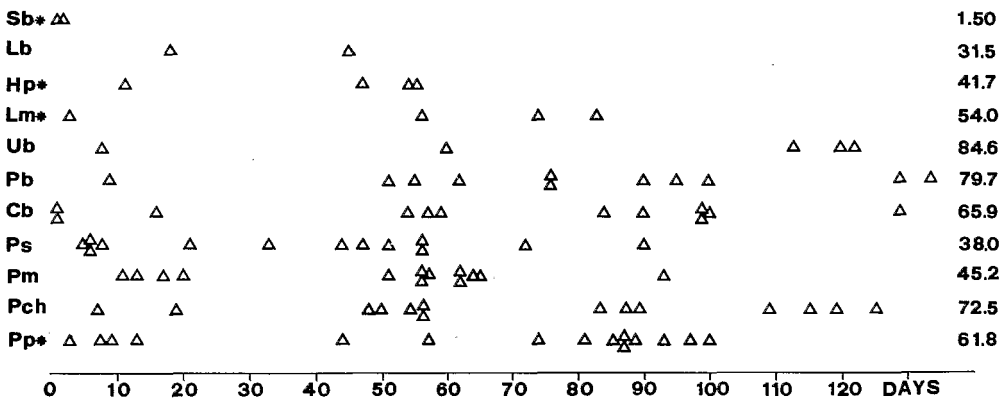


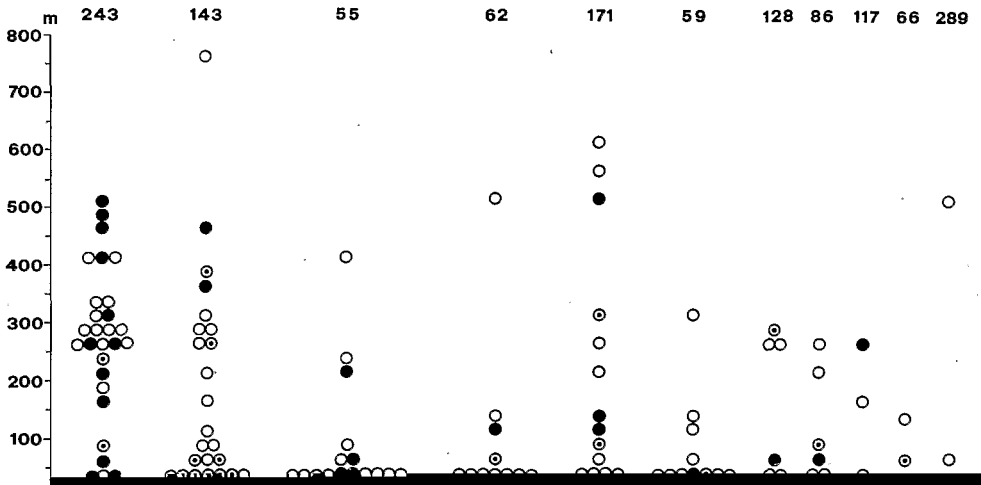
Fig. 5. — Recapture intervals in 11 species of birds. Birds banded in the 1988 capture season and

Table 3.

Data on birds banded in autumn 1988 and retrapped in autumn/winter 1989.

m/l	Species	N	n	%
1 m	*Sylvia borin*	50	0	0.0
2 m	*Phoenicurus phoenicurus*	21	1	4.8
3 m	*Sylvia atricapilla*	15	0	0.0
4 m	*Hippolais pallida*	14	1	7.1
5 m	*Luscinia megarhynchos*	10	1	10.0
6 l	*Ploceus melanocephalus*	195	15	7.7
7 l	*Prinia subflava*	32	4	12.5
8 l	*Uraeginthus bengalus*	29	1	3.4
9 l	*Camaroptera brachyura*	17	6	35.3
10 l	*Pycnonotus barbatus*	17	3	17.6
11 l	*Serinus mozambicus*	13	1	7.7
12 l	*Ploceus cucullatus*	11	0	0.0
13 l	*Laniarius barbarus*	8	0	0.0
14 l	*Lagonostica senegala*	8	0	0.0
15 l	*Pogoniulus chrysoconus*	8	3	37.5

N and n = number of birds banded in autumn 1988 and retrapped in the following wintering season; the related recapture percentage (%) is also given. Only species in which a minimum of seven individuals were banded have been taken into account. Other explanations as in Table 1.



Home range. Recapture distances, which are certainly related to the home range, are given in Fig. 6. With the exception of *Ploceus melanocephalus*, for which most recaptures were carried out at distances greater than 200 m from the former capture site, the recapture distances are quite small. In fact, 83 out of 138 birds (60.1%) were recaptured within 50 m of the former capture site. Palaearctic migrants yielded figures consistent with the global result: 22 birds out of 34 (64.7%) were retrapped within 50 m of their former capture site. Many birds, both local and migrant species, show a year-to-year attachment to the same winter home, as testified by the fact that many recaptures 1 year after the former capture occur within a limited area: excluding *Ploceus melanocephalus*, 9 out 20 birds (45%) were retrapped within 50 m from their former capture site [12 out of 20 (60%) within 100 m].

DISCUSSION

The site attachment of birds to the non-breeding home ground has not received as much attention as that devoted to the study of the breeding site. Our experimental plan aimed to contribute to the knowledge of home range and site fidelity in non-breeding birds. Five out of the 15 species considered in our study are palaearctic migrants wintering in tropical areas; in these cases, therefore, the wintering site is spatially distant from the breeding ground. The tropical resident birds, on the other hand, may be attached to the breeding territory even in non-breeding periods. For these species, moreover, it is not easy to define the limits between the breeding and non-breeding season; our observations, however, indicate that the tropical species included in Table 1 are not involved in widespread breeding activities in the period in which our experiments were carried out.

It is not clear why the trapping rate was higher in 1988 than in 1989. It is true that we started 1 week later in 1989 than in the previous year and this delay may have influenced the capture rate of migratory birds, if we suppose that migration peaks in our area earlier than either of the two starting dates. A delay of 1 week, however, cannot influence the capture rate of local birds, which should have been affected by other factors, including the possibility that in 1989 food availability was poorer than in 1988; this consideration derives from the impression that in 1988 insects were more plentiful than in 1989. Anyhow, the ecological features of our study area seems to be favourable not only to several species of local birds, but also to palaearctic breeders; the extensive literature on African-Palaearctic migrants indicates that birds are almost exclusively confined to savannah and scrub habitats during their overwintering in the tropics (MOREAU 1972, LEISLER 1990).

As regards data on the vertical distribution of the trapped birds, the significant presence of *Uraeginthus bengalus* in the lower capture shelves can easily be explained by this species' preference for spots of ground free of vegetation (like those we have used for setting the nets), where these birds have often been observed to feed. Conversely, the Garden warbler (*Sylvia borin*) reveals a strong preference for higher levels. As our study aimed to compare site fidelity and homing ability among the

other species, in spite of the fact that in some of the latter we recorded comparable levels of attachment to their home ground. This result is in agreement with that reported by BENVENUTI & IOALÈ (1980a, 1980b) and by IOALÈ and BENVENUTI (1983) in similar investigations in the Mediterranean area: strong home fidelity (revealed by high recapture percentages in non-displaced birds) does not necessarily lead to good homing performances after an experimental displacement.

Lastly, it may be no coincidence that in *Camaroptera brachyura* and *Prinia subflava*, the two species in which we observed the highest reduction of the recapture percentage after displacement compared with non-displaced birds, are both local species which range in a small home site (the smallest sites among the species considered in our study). We suppose that the homing success of birds which are familiar with a plot of very limited area is more likely to be affected by a short-distance displacement.

In most of the investigated species individual birds show a tendency to spend the non-breeding season in a small home site, as testified by higher recapture percentages, small recapture distances and long mean intervals between the first and last capture

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