

PHILOPATRY OF THE SEMIPALMATED SANDPIPER (*CALIDRIS PUSILLA*) ON THE BRAZILIAN AMAZONIAN COAST

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Resumo. – **Filopatria do Maçariquinho (*Calidris pusilla*) na Costa Amazônica Brasileira.** – A costa amazônica brasileira é uma das mais importantes áreas de invernada para o Maçariquinho (*Calidris pusilla*) na América do Sul. A maioria dos trabalhos publicados sobre filopatria refere-se às áreas de reprodução, contudo, poucos dados estão disponíveis nas áreas de invernada. Foram analisados dados a longo prazo (1992–2000) da fidelidade do Maçariquinho em três áreas de invernada na costa amazônica brasileira. Todas as aves capturadas foram anilhadas e as taxas de recaptura foram calculadas dentro do mesmo ano e entre anos. Um total de 1925 indivíduos do Maçariquinho foi capturado durante o período de estudo. As taxas de recaptura variaram entre 0,7 e 8,3%. Nenhuma ave foi recapturada fora das áreas de anilhamento, mostrando que as áreas possuem suficientes recursos tróficos e espaciais. Indivíduos que retornaram ao mesmo sítio de um a seis anos da captura original, indicaram um alto grau de fidelidade na costa amazônica brasileira.

Abstract. – The Brazilian Amazonian coast is one of the most important wintering areas for the Semipalmated Sandpiper (*Calidris pusilla*) in South America. Much has been published on breeding site philopatry of the Semipalmated Sandpiper; however, few data exist from wintering areas. Long term (1992–2000) data on Semipalmated Sandpiper site fidelity from three wintering areas on the Brazilian Amazonian coast were analysed. All birds captured during this period were banded, and recapture rates were calculated within and among years. A total of 1925 Semipalmated Sandpipers were captured during the study. Recapture rates of different cohorts varied between 0.7% and 8.3%. No birds were recaptured away from banding sites, which shows that the area provides adequate trophic and spatial resources. Individuals returning to the same area 1 to 6 years after their original capture indicate a high degree of site fidelity to the Brazilian Amazonian coast. *Accepted 9 February 2007.*

Key words. Philopatry, Semipalmated Sandpiper, *Calidris pusilla*, Brazilian Amazonian coast.

INTRODUCTION

Aerial (Morrison & Ross 1989) and terrestrial (Rodrigues & Roth 1990, Rodrigues 2000) studies have shown that the northern coast of Brazil is visited by large numbers and a variety of shorebirds. Rodrigues (2000) recorded

flocks of 24,000 and 26,000 Semipalmated Sandpipers (*Calidris pusilla*) at Cajual Island in the Gulf of Maranhão during the autumn migration (August–November) and wintering period (December–February), respectively. This was the most abundant species on this sector of the coast of Maranhão.

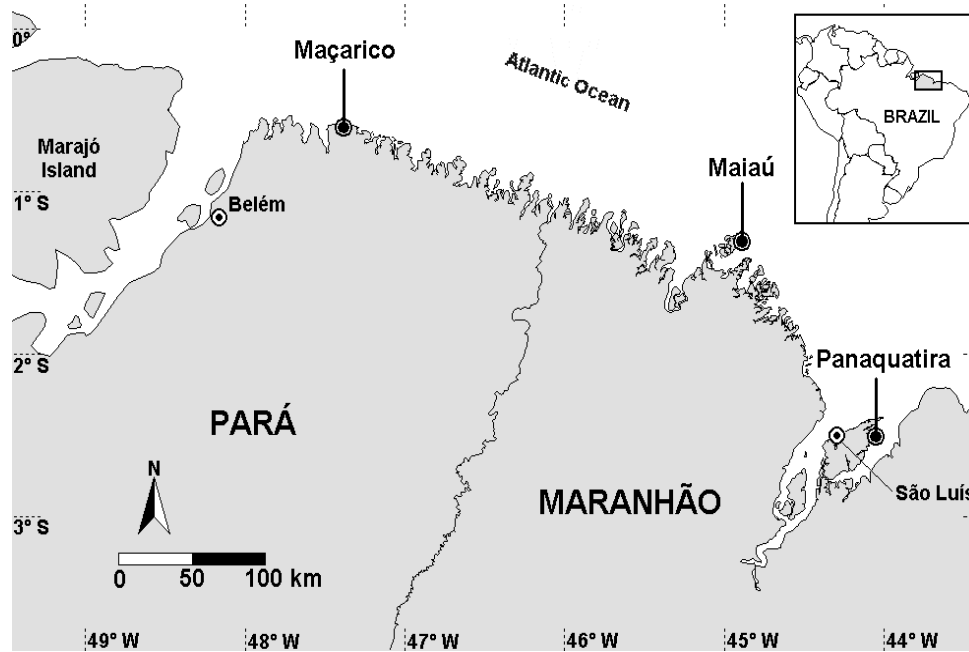


FIG. 1. Study sites on the Brazilian Amazonian coast (Maçarico, Maiaú and Panaquatira).

Site fidelity – also referred to as philopatry (see Robertson & Cooke 1999) – is a widespread phenomenon in migratory birds (for a review, see Able 1995). Two hypotheses have been suggested to explain the evolution of philopatric behavior (Weatherhead & Forbes 1994). The “local knowledge” hypothesis is based on the benefits of prior knowledge for the exploitation of a site. By contrast, the “social cohesion” hypothesis proposes that philopatry evolved as a mechanism through which individuals maintain social ties with conspecifics.

Philopatry in relation to breeding (Gratto *et al.* 1985, Thompson & Thompson 1988) or wintering areas (Robertson & Cooke 1999) can be analyzed in terms of return rates to a given site. Return rates are calculated as the proportion of marked animals that are recaptured or observed in a subsequent sample, and are relevant only to the specific context

of the area to which the animal returns, whether it be a nest or a major subdivision of a geographic range. The degree of philopatry can exert a significant influence on the genetic structure of populations (Robertson & Cooke 1999). When there is little migration among populations, considerable genetic subdivision may arise (Rockwell & Barroclough 1987, Chesser 1991).

The majority of data on philopatry in shorebirds refer to breeding areas (Oring & Lank 1984, Gratto *et al.* 1985, Gratto 1988, Thompson & Hale 1989, Reed & Oring 1993, Thompson *et al.* 1994, Jackson 1994). The Semipalmated Sandpiper exhibits pronounced mate and breeding site fidelity (Gratto *et al.* 1985), as well as fidelity to migratory stopover sites, as do other species of shorebirds (Knorr 1971, Pienkowski 1976, Smith & Houghton 1984, Harrington *et al.* 1988 and Smith *et al.* 1992).

TABLE 1. Captures and recaptures rates of banded birds on the Brazilian Amazonian coast between 1992 and 2000. All birds were recaptured at their original banding location.

Captures		Recaptures		
Local/Period/Year	N	Period/Year	N	%
Panaquatira-MA/Aug 1992–Dec 1993	75	Jan 1994–May 2000	3	4.0
Panaquatira-MA/Jan–May 1994	19	Aug–May 2000	1	5.3
Panaquatira-MA/Jan–May 1996	120	Aug 1996–May 2000	1	0.8
Panaquatira-MA/Aug–Dec 1996	25	Jan 1997–May 2000	1	4.0
Panaquatira-MA/Jan–May 1997	72	Aug 1997–May 2000	4	5.6
Maçarico-PA/Aug–Dec 1996	12	Jan–May 2000	1	8.3
Maçarico-PA/Jan–May 1997	170	Jan 1999–May 2000	12	7.1
Maçarico-PA/Jan–May 1999	114	Jan–May 2000	1	0.9
Maçarico-PA/Jan–May 2000	167	Aug–Dec 2000	3	1.8
Maiiau Island-MA/Jan–May 1998	486	Aug 1998–Dec 2000	12	2.5
Maiiau Island-MA/Jan–May 1999	449	Aug 1999–May 2000	6	1.3
Maiiau Island-MA/Aug–Dec 1999	66	Jan –Dec 2000	3	4.5
Maiiau Island-MA/Jan–May 2000	150	August–Dec 2000	1	0.7
Total	1925		49	

Robertson (1982) showed that North American birdwatchers recorded shorebirds at the same sites year after year, and suggested that these birds follow precisely the same migration routes and use the same rest areas during their annual migrations. French (1973) recorded many returns of Semipalmated Sandpiper and Western Sandpiper (*Calidris mauri*) to wintering areas in Trinidad, in some cases, 3 years after banding. In wintering areas in Costa Rica, individuals of the species Western Sandpiper banded on the same date were recaptured together, often in the same place, or even the same mistnet (Smith & Stiles 1979). Within seasons, Western Sandpiper exhibited strong site fidelity to specific areas at San Francisco Bay (Warnock & Takekawa 1996).

While there are some reports of recaptures from Venezuela [McNeil 1982: Spotted Sandpiper (*Actitis macularius*) and Willet (*Tringa semipalmata*)], Costa Rica [Smith & Stiles 1979: Spotted Sandpiper, Semipalmated Plover (*Charadrius semipalmatus*), Semipalmated Sandpiper, Western Sandpiper and Short-

billed Dowitcher (*Limnodromus griseus*)] and northeastern Brazil [(Azevedo Jr *et al.* 2001: Turnstone (*Arenaria interpres*), Semipalmated Sandpiper, Sanderling (*Calidris alba*)], no data are available on shorebird philopatry from the Amazonian coast in Brazil. In the present study, long term data on wintering site fidelity in Semipalmated Sandpiper in Amazonian coast in Brazil are presented.

METHODS

Data were collected at three sites, Maçarico and Panaquatira beaches and Maiáú Island (Fig. 1), on the northern coast of Brazil between 1992 and 2000 (Table 1), during wintering periods and the spring and autumn migrations. All Semipalmated Sandpipers captured during this period were metal banded and about 10% were color-marked on Maiáú Island (white band and blue flag) and Maçarico beach (yellow band and blue flag) to check movements between areas. Recapture rates were given by the proportion of banded birds

TABLE 2. Semipalmated Sandpipers recaptured together less than 2 days apart on the northern coast of Brazil.

Birds captures	Band number ¹	Date of capture	Date of recapture
4	D17162	20/12/1992	17/04/1993
	D17166		16/04/1993
	D17186	21/12/1992	17/04/1993
	D17188		16/04/1993
2	E 29555	11/04/1997	30/03/2000
	E 29573		
2	G 33753	09/05/1998	22/03/1999
	G 33765		
2	D 37575	08/05/1999	02/12/1999
	D 37597		01/12/1999
2	E 39102	30/03/2000	31/10/2000
	E 39105		01/11/2000

¹The last two digits of the bands numbers mean that the birds belong to the same series of 100 bands.

captured during a subsequent sample in the same area.

Recapture rates (%) were calculated between seasons of the same year (e.g, birds banded prior to their departure for North America and recaptured on their return to the same area), and between seasons of different years. Birds recaptured during the same season of banding were not considered in this analysis.

RESULTS

A total of 1925 Semipalmated Sandpipers were captured during the study period (Table 1). The majority of the samples were from Maiaú Island (60% of captures), followed by Maçarico Beach (24%), and Panaquatira Beach (16%).

Recapture rates between first and second semesters in the same area, in the same year, and between years, indicate that the same individuals that migrated to the breeding

areas returned to the same wintering areas. Individual returns to the same area were recorded at intervals of 1, 2, 3 and 6 years (Table 1). Examples of birds captured together in the same area on the same date, and recaptured together at a later date, no more than one day apart, indicate high site fidelity (Table 1).

No birds were recaptured or resighted at more than one site within the study area, even when captures and banding simultaneously took place at different sites. Similarly, no birds previously captured at other South American wintering areas (Guyanas, Surinam, or Venezuela) were recaptured or resighted in northern Brazil.

DISCUSSION

One of the most interesting aspects of the recapture data are the animals that were banded on a given date and recaptured subsequently in the same area and period, at inter-

vals of 1 or 2 years (Table 2). A similar pattern was recorded for Western Sandpipers by Smith & Stiles (1979) in Costa Rica. These authors suggest there is not only site fidelity, but also a strong group fidelity to wintering areas. They conclude that pairs possibly remain together throughout the wintering period and mate again in the following spring.

Wintering area site fidelity accounts for a considerable number of individuals that return to the same site year after year. According to Robertson & Cooke (1999), philopatric individuals enjoy selective advantages in comparison with those that disperse to new areas because these individuals will encounter new environments continually. Potential benefits will include knowledge of feeding patches, and the location of conspecifics and predator refuges. Data from feeding sites show a high density of invertebrate prey in most of the studied areas (Lopes 2003). Semipalmated Sandpipers may have located profitable foraging areas and repeatedly returned to those sites, similar to foraging behavior reported for Dunlins (*Calidris alpina*) and Western Sandpipers (Warnock & Takekawa 1996).

An alternative explanation for site fidelity is the social cohesion hypothesis (Robertson & Cooke 1999), which postulates that it evolved as a mechanism through which individuals maintain social ties with conspecifics. In species in which breeding pairs remain together for long periods, but not throughout the year, contact could be maintained by sharing the same wintering area. This behavior is exhibited by sea ducks in which the males leave the breeding areas while the females are still incubating the eggs (Savard 1985, Gowans *et al.* 1997). These authors observed a number of breeding pairs coming together in their wintering areas. Gratto *et al.* (1985) present examples of pairs of Semipalmated Sandpipers that returned to the same breeding area and re-mated (81%, $n = 79$), with a low rate of divorce in the breeding areas (20%). In

many sandpipers, it is unlikely that the pair will be reunited in subsequent years unless it returns to the same breeding territory (Soikkeli 1967, Holmes 1971). This degree of philopatry of adults in breeding areas may affect the fidelity of pairs in species that do not remain together outside the breeding areas (Gratto *et al.* 1985). On the Brazilian Amazonian coast, a large number of individual Semipalmated Sandpipers returned to the same wintering area in subsequent years. In some cases, birds banded together were recaptured on the same day, although this doesn't mean, necessarily, that they were pairs. In fact, as female Semipalmated Sandpipers deserts the brood earlier than the males, and most females migrate south before males (Gratto-Trevor 1991), it is highly unlikely that birds recaptured together in wintering areas are members of the same pair (Gratto-Trevor pers. com.). Rather, it may just reflect their high fidelity to specific areas of the non-breeding site, which would increase the probability of being recaptured together.

Despite the fact that some wintering areas were separated by distance of less than 50 km (Fig. 1), no evidence (recaptures or re-sights) was found of bird movements between wintering areas. Similarly, Warnock & Takekawa (1996) observed little movement of Western Sandpipers among resting sites – some only 5 km apart – in wintering areas in southern San Francisco Bay. The high degree of site fidelity to the Brazilian Amazonian coast recorded in Semipalmated Sandpipers indicates that the area provides adequate trophic and spatial resources as observed in Lopes (2003), and confirming it as an important site for shore-bird conservation.

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