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## NOTES ON THE PREDATORS, ESPECIALLY THE PEREGRINE, OF SANDERLINGS ON THE PERUVIAN COAST

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### INTRODUCTION

This note summarises preliminary observations we have made of raptor predation on Sanderlings at Villa, Peru, during the non-breeding season. We offer these observations here because of the increasing attention being drawn to the magnitude and consequences of raptor predation on wintering shorebird populations (Page and Whitacre 1975, Potts 1984, Townshend 1984, Myers 1980a, 1984), and the scarcity of any information from the southern hemisphere. Koepke and Koepke (1971) report in passing that Peregrines take Sanderlings along the Peruvian desert coast. Myers (1980b) describes Buff-breasted Sandpiper *Tryngites subruficollis* predators in Argentina.

Observations were made near Villa in the Dept. of Lima, Peru (77°W, 12°10'S). Basic descriptions of this coastal sector of South America can be found in Murphy (1936), Koepke and Koepke (1952), and Hughes (1979). Villa is a sandy beach approximately 25 km long with occasional, intermittent, beach resorts and beach houses along its length. The annual cycle of Sanderling in Peru is described in Myers *et al.* (1984).

Data were obtained during two different periods. During the first, between 1976 and 1980, one of us (L.E.B.) studied Peregrine natural history, including general notes about Peregrine behavior, phenology, and incidents of attacks on different prey species. Unfortunately, during this period the numbers of observation hours were not recorded. Approximately 120 days were spent in the field, and on average observations during any given day exceeded 8 hours, although some days involved as few as 2 hours and others as many as 12 hours. Thus the total field time during the first 5 years was approximately 960 hours.

The second period ran from September 1983 to May 1984, during which regular censuses were made of Sanderlings along a 3.5 km length of Villa's beach. During these censuses all

appearances of Peregrines were noted, and records were kept on the frequency and results of attacks. In this period 198 hours were spent in the field around Villa.

### RESULTS

During the first period of observations, Peregrines were observed hunting Sanderlings on Villa's beaches between October and April. In the second period, the first Peregrine was noted on 1 October 1983 and the last on 18 April 1984.

A typical attack by a Peregrine on Sanderlings begins with the falcon approaching a roosting flock in low, powerful, flight no more than a few metres off the ground. The Sanderlings invariably take flight once the falcon is detected, and if the predator's first pass is not successful the flock forms a compact ball and flies erratically over the ocean. Usually the falcon will then make a series of stoops at the flock in flight, apparently attempting to separate an individual from the flock. Sanderlings will occasionally actually fly directly into the ocean to avoid capture. Any other roosting Sanderling flocks in the area take flight once the first roost is spooked.

Once the falcon has departed, Sanderlings return gradually to the activities in which they were engaged prior to the attack, such that by 30 minutes or so after the attack, calm prevails. The time-scale of recovery appears somewhat longer than that reported for Buff-breasted Sandpipers in Argentina (Myers 1980b).

As in California (Myers 1980a, Myers *et al.* 1984, in prep.), Sanderlings did not defend winter territories during periods when falcons were hunting the Villa beaches regularly. In fact, during September 1984 (before the first falcon's arrival) 100% of Sanderlings observed feeding on the transect were territorial, but afterwards none were with any consistency. The

arrival of the falcon coincided, however, with a build-up in Sanderling numbers in southbound migration, thus clouding somewhat the interpretation of the cessation of territoriality.

#### Attack and Success Rate

We offer the following preliminary calculations as an initial 'guesstimate' at the frequency and magnitude of Peregrine predation on Sanderlings in this area of Peru. The calculations are limited by the small sample sizes and by the lack of information on total observation hours during the first study.

From the number of observation hours (198) and the number of attacks (8) during the second period of observations, we obtain an attack frequency of 0.04 attacks per hour. Attacks can occur at any time between roughly 0600 and 1800 h. Given that Peregrines hunted at Villa between 1 October and 18 April, there were roughly 2376 h of hunting time (of which our observation hours represent 8%). If our attack frequencies are representative, then there should have been a total of 96 attacks during the 1983/84 season.

During the first period of observations, 35 attacks on Sanderlings were seen, of which 6 were successful (17%). Only 8 attacks were observed in 1983/84, with one success. The pooled success rate is thus 16%. The number of Sanderlings taken during this second period should therefore have been approximately 16.

On average, 600 Sanderlings were along the 3.5 km transect studied in 1983/84 (Castro, unpubl. data). Hence the 16 killed birds represent 2.7% of the "population".

Male Peregrines were significantly more likely to be observed at Villa than females ( $X^2 = 13.7$   $P < 0.001$ ) and adult males more likely than juvenile males ( $X^2 = 4.3$   $P < 0.01$ ) (Table 1). Observations elsewhere in Peru suggest that females concentrate on larger prey, especially Franklin's Gull *Larus pipixcan*.

#### Other predators

During the course of the study we accumulated notes on other possible Sanderling predators in the study area:

**Burrowing Owl *Athene cunicularia*.** We found the remains of 2 Sanderlings, including one banded bird, in a burrow. Other *Calidris* sandpipers, either Western Sandpipers *C. mauri* or Semipalmated Sandpipers *C. pusilla*, had been taken also by this predator.

**Short-eared Owl *Asio flammeus* and Cinnereous Harrier *Circus cinereus*.** Both species were observed in the area, but neither were seen pursuing Sanderlings.

**Mammals.** A local fox *Dusicyon sechurae* hunts the Villa beaches at night, and tracks of rats *Rattus rattus* were regularly found around and in the roosts. A feral cat robbed two Sanderlings from a mist-net we were using at night on the beach.

Table 1. Ages and sexes of Peregrines observed hunting Sanderlings at Villa, Peru.

	Adult	Juvenile	Age unknown	Total
Male	23	7	3	33
Female	0	0	2	2

## DISCUSSION

These observations offer a preliminary glimpse at the predator community and risks faced by Sanderlings wintering along the shores of the Humboldt Current in Peru. Here Peregrines appear to be the dominant diurnal predator, and these preliminary data suggest that they may take roughly 3% of local Sanderlings during the entire winter season. Peregrine predation on Sanderlings may be more intense in other areas of coastal Peru where human disturbance is less evident.

Our initial calculations on the intensity of Peregrine predation in this area run far below a more detailed analysis in the North Temperate zone, albeit of a different shorebird species and its predator: almost 13% of a local population of Dunlins *Calidris alpina* were taken by a single Merlin *Falco columbarius* (Page and Whitacre 1975).

It is interesting to note that these beaches of central and SW Peru hold the highest wintering densities of Sanderlings yet reported in the Western Hemisphere (Myers et al. 1984). Whether migrating Peregrines come this far south for easy pickings, or Sanderlings flee to Peruvian beaches to escape more intense predation to the north, more study is needed to obtain a broader perspective on the frequency of predation on non-breeding shorebird populations and its ecological and evolutionary consequences.

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