SHORT COMMUNICATIONS

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AN INVESTIGATION OF THE SWAINSON'S HAWK IN ARGENTINA

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Information on the distribution and ecology of Swainson's hawks (*Buteo swainsoni*) during the nonbreeding season is limited. Large numbers have been counted annually during migration in Mexico (Thiollay 1980, Tilly 1992) and Panama (Smith 1985), but records in South America are limited to scattered band recoveries and anecdotal field observations. Most sightings and band recoveries of Swainson's hawks during the nonbreeding period have come from the Argentinean provinces of Buenos Aires, La Pampa, Cordoba, and Santa Fe (CIPA Sección Argentina 1987, White et al. 1989, Houston 1990). However, the low numbers reported in Argentina have led Smith (1985) to predict a wintering population elsewhere in South America.

Here we report the results of a pilot study conducted between October 1994 and February 1995. Our objectives included identifying migratory routes of Swainson's hawks from our study area in Butte Valley, northern California, locating important austral destinations, and studying habitat relationships of Swainson's hawks during the nonbreeding period.

METHODS

In July 1994 we captured two adult female Swainson's hawks at their nests in the Butte Valley National Grasslands, Klamath National Forest, California and fitted them with 28-g satellite radiotransmitters (Microwave Telemetry Inc., Columbia, Maryland). Transmissions were received by NOAA weather satellites and relayed to the ARGOS Inc. data processing center, Maryland.

Between 23 January and 4 February 1995, we visited the area in Argentina where the majority of transmissions occurred. We established a 6400-km^2 study area encompassing several satellite locations located near the northern border of La Pampa Province, roughly between the towns of Colonel Hilario Lagos and General Pico. The landscape within the study area was mixed agriculture of corn, sunflowers, soybeans, hay, and pasture. Pasture vegetation (mixed clover and grasses) was intensively managed by rotation of livestock through a system of small paddocks. The proportions of pasture and cultivated crops in the study area were approximately equal. Marginal lands, uncultivated roadsides, native pastures and wetlands were also important parts of the landscape.

We conducted surveys along roads at 5-km intervals, recording location and behavior of Swainson's hawk flocks, roost sites, and habitat. Surveys were conducted from 0530–1200, and 1600–2000 H. We made ocular estimates of the size of foraging flocks and estimated the numbers of hawks departing roosts in early morning hours. In addition, we interviewed local farmers about current agricultural practices and historical and anticipated land use changes.

RESULTS AND DISCUSSION

Migration. Hawk #1 began migration on 20 September, traveled south through California, and then into western Arizona (26 September) where its transmitter failed. She returned to her breeding territory in northern California in late April 1995.

Hawk #2 began migration in early October and followed the same route as Hawk #1, settling in the vicinity of Tempe and Phoenix, Arizona from 6 October to 12 October. After 15 October this hawk moved southeast to Tamaulipas on the Gulf Coast of Mexico (24 October), and rapidly though Central America (Santa Ana, El Salvador (30 October), and Lago de Nicaragua (2 November). Poor satellite coverage in the equatorial region caused inadequate location until the bird reached southwest Brazil (18 November to 24 November). Crossing into Argentina in late November, Hawk #2 moved south (27 November to 3 December), then remained in the northern portion of the province of La Pampa for nearly 6 wk (11 December to 28 January). The last transmission (28 January) was approximately 340 km north of that area, and possibly indicated initiation of northward migration. This female was observed near her breeding territory in June 1995.

Abundance, Behavior, and Habitat Use. Flocks observed at six night roosts ranged from 35–7000 individuals ($\bar{x}$ = 2300 individuals/roost). Roosts were groves of exotic *Eucalyptus* sp. trees (10–30 m tall) which surrounded many ranch houses or long windbreaks at the edges of fields. These stands ranged from 5–30 ha in size and were typically the only trees available over large areas.

Foraging groups ranged from 50–1000 individuals, with one large flock estimated at 4000. We estimated the total number of Swainson's hawks observed within the study area to be approximately 20 000 (±4000). Estimation of Swainson's hawk numbers within the study area was difficult due to high mobility of foraging flocks and unpredictable use of night roosts.

Flocks within our study area were dominated by light-phase adult hawks. During our study period we observed seven banded Swainson's hawks, and recovered three U.S. Fish and Wildlife Service bands from carcasses at a night roost. Two of these were banded as nestlings in northern Saskatchewan and Colorado, respectively. The third was banded as a breeding adult in our California study area. The other four banded Swainson's hawks were seen perched or flying. Two color-banded hawks were from California (black or yellow bands), and two had metal bands. Each of these four sightings was made in a different flock. The band recoveries suggest that the flocks consisted of individuals from different regions of the species' breeding range.

Flocks typically left the roosts in the early morning hours and frequently settled nearby on the ground or on fenceposts, where they foraged for grasshoppers (*Dichropulus* spp. and possibly others) in older pastures and recently cultivated soil. As air temperatures rose, smaller bands began foraging on the wing and moving across the landscape. Groups were also seen following tractors as they mowed or baled alfalfa. Most observations were of Swainson's hawks foraging in or above older, weedy pastures where grasshoppers were obviously abundant. Flocks were also observed capturing insects on the wing; at these times their habitat associations were less clear. Pellets collected beneath roost sites were composed entirely of orthopterans.

At one large roost containing approximately 4000 Swainson's hawks we saw numerous Swainson's hawk carcasses on the ground. We conducted a complete search along transects throughout the roost and recorded over 700 dead Swainson's hawks. According to the landowner the hawks died after consuming grasshoppers that had been sprayed with an unknown pesticide in a nearby pasture about one month earlier (21 December 1994). He said the birds had flown back to the roost and were seen dying there for several days immediately after the spray event. This description of the birds' symptoms suggested organophosphorus or carbamate insecticide poisoning. Evidence of fatal poisoning was not observed during searches of other known roosts.

Satellite telemetry promises to be a valuable tool for identifying the migratory route and austral locations of Swainson's hawks breeding in North America. Locating these austral sites is a critical first step in describing the nonbreeding season ecology of migrant raptors and identifying potential threats to populations (Senner and Fuller 1989). Based on previous band recoveries and our observations, we suspect that the northern La Pampa area supports an important concentration of Swainson's hawks during the nonbreeding season. However, deployment of additional transmitters on individuals from separate populations will be necessary to gain a more complete picture of the austral distribution and movements of this species.

Our observation of direct mortality due to pesticide poisoning signals the potential vulnerability of wintering Swainson's hawks, which forage on grasshoppers targeted for chemical control. Small, localized breeding populations may be particularly vulnerable if they remain together during the nonbreeding season in austral locations (Bloom 1980). Although mortality on the scale we observed may be an isolated event, based on discussions with biologists and ranchers in Argentina we suspect that pesticide contamination is not unusual. Our initial findings lead us to believe that it is likely that the transformation of Argentinean agriculture from a system of range-based livestock production to one of intensive agricultural cultivation will have negative impacts on Swainson's hawks and other insectivorous birds. Development and implementation of effective conservation strategies for Swainson's hawks and other migratory avian species will be dependent on international collaboration. This will require documentation of changes in land use and agricultural practices, as well as assessment of hawk populations in both breeding and nonbreeding regions.

RESUMEN.—Usamos la telemetría satélite para estudiar la ruta migratoria y la destinación austral principal de dos aguiluchos langosteros (*Buteo swainsoni*) del norte de California, U.S.A. Los aguiluchos migraban a través el valle central de California, al este a través Arizona, la costa este de Mexico, a través El Salvador y Nicarágua en América Central, y hacia el este de los Andes a Argentina. Una aguilucha se quedó en el norte de la provincia de La Pampa, Argentina por seis semanas. En La Pampa, se encontraron grandes cantidades de los aguiluchos langosteros en pastizal y habitat agrícola. Se observaron 35–7000 individuos en dormideros de *Eucalyptus* sp., y bandadas de foraje de 50–1000 individuos. Los aguiluchos se alimentaron principalmente de *Dichropulus* spp. (Orthopterans) en habitat pastizal. Observamos 15 000–20 000 ejemplares dentro una área de 6400 km^2. En un dormidero grande, recordamos mas de 700 aguiluchos langosteros muerte. Ellos se murieron después de la applicación aérea de pesticidas.

[Traducción de Karen Finley]

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RECOVERY OF A RESIDENT POPULATION OF OSPREY ON CORSICA

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KEY WORDS: *Corsica*; *Mediterranean*; *osprey*; Pandion haliaetus; *population recovery*; *population size.*

Two factors have been shown to be major causes of the decline of osprey (*Pandion haliaetus*) in Europe between 1940 and 1970: (1) persecution during breeding and migration (Bijleveld 1974, Saurola 1985), and (2) extensive use of pesticides, especially organochlorines (Ratcliffe 1967, Newton 1979, Odsjö 1982). But since the 1970s, osprey numbers have increased rapidly in Europe. This has been especially well documented for the migrant northern populations (Bird et al. 1983, Dennis 1987, Poole 1989). Conversely, the literature for resident populations is scarce. Mediterranean population increases apparently were consistently lower, with stable populations reported in some areas (Thibault et al. in press.). The reasons for this difference are unknown, but patterns of recolonization and recovery might be different between resident and migrating populations (e.g., adult and juvenile survival rates, or both, may differ).

The island of Corsica has a resident population of ospreys known to occupy nearly all of its rocky coasts. The historic distribution is shown in Fig. 1a. Additionally, on the east coast which is flat and sandy at least two pairs bred in gorges several kilometers inland, and two others on off-shore rocky islets (Terrasse and Terrasse 1977, Thibault and Patrimonio 1990). The number of breeding pairs between the end of the 19th century and the 1960s is unknown because no counts were performed, but it was estimated at 40–100 pairs (Thibault and Patrimonio 1990) Here we report patterns of abundance and geographic distribution of the osprey in its population increase on Corsica from 1977–94.

STUDY AREA AND METHODS

The total osprey population on Corsica in the western Mediterranean Ocean (42°N, 9°E) has been monitored annually from 1977–94. The breeding season of this resident population is spread over 6 mo, from February to July (Thibault and Patrimonio 1991). Osprey in the Mediterranean have semi-colonial habits, breeding within 80–500 m of each other (Thibault et al. in press). Osprey in Corsica nest only on pinnacles along the rocky seacoast (Thibault and Bouvet 1983). This facilitated observing nests using telescopes (20–45×) from less than 300 m away, permitting a good view into nests. Eyries were checked at least once a month from March to August. We