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DIET OF BREEDING PEREGRINE FALCONS AT A COASTAL LAGOON, BAJA CALIFORNIA SUR, MEXICO

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KEY WORDS: *Peregrine Falcon*; Falco peregrinus; *breeding season*; *diet*; *Baja California*; *Mexico*.

The Peregrine Falcon (*Falco peregrinus*) is a year-round resident in the northern part of Mexico with a major breeding population occurring on the Baja California peninsula and the Gulf of California (Sea of Cortez) islands (Porter et al. 1988). Very little is known about the peregrine's biology and ecology on the west coast of the Baja California peninsula (Porter et al. 1988). Although the Peregrine Falcon is recovering in this region (Castellanos et al. 1997), the species is still listed as endangered in Mexico (Diario Oficial de la Federación 2002). Here, we document the diet of nesting Peregrine Falcons at a lagoon on the western shore of the Baja California peninsula.

STUDY AREA AND METHODS

Ojo de Liebre Lagoon is a coastal lagoon on the western shore of Baja California Sur, Mexico (27°46′N and 113°37′W) that is part of the El Vizcaino Biosphere reserve. The lagoon is approximately 48 km long and 22 km wide with shallow waters, deep channels, and strong tidal currents. Five small, relatively flat islands, which are free of land predators, are within the lagoon. The climate in the region is dry and semiarid. Mean annual precipitation is <36 mm, most of which occurs in winter. Widgeongrass (*Ruppia maritima*), eelgrass (*Zostera marina*), and surfgrass (*Phyllospadix scouleri*) marshes grow along the lagoon's shoreline (Lot et al. 1986). The landscape surrounding the lagoon contains coastal dune scrub (*Ambrosia* spp., *Dalea* spp., and *Plantago* spp.), the Vizcaino desert flat covered with halophyte scrub (*Ambrosia* spp., *Bursera* spp., *Frankenia* spp., *Bouteloua* spp., and *Muhlenbergia* spp.), salt production ponds, and urban areas. The variety of habitats within the lagoon supports a wide variety of waterbirds (Massey and Palacios 1994) several of which breed on the small islands of the lagoon (Castellanos et al. 2001).

During the breeding seasons in 1993 and 1994, we collected prey remains at three Peregrine Falcon nests, one on the ground on Piedras Island located at the center of the lagoon (27°26′N and 114°10′W) and the other two on channel towers located about 20 km north of Piedras Island. In May 1993, we collected all material accumulated during an unknown period of time from an area of about 5 m in radius around each of the three nests. We cleaned the areas around each nest, then we made a second collection at all three nests in June. In 1994, we made collections at these same three nests every 20–30 d from March until late June, at which time young had already left the nest.

Although prey remains may not be the best method for quantifying diet (Lewis et al. 2004), they do give a conservative, descriptive representation of diet composition. We identified prey using diagnostic parts (i.e., bones, bills, legs) and by comparing prey remains with reference specimens at the Museo de Historia Natural of the Universidad Autónoma de Baja California Sur (UABCS). We combined all prey remains collected in both years, and expressed the relative frequency of each prey type in the diet as a percent.

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Table 1. Prey items identified from prey remain samples collected at three Peregrine Falcon nests during the breeding seasons, 1993–1994, at Ojo de Liebre lagoon, Baja California Sur, Mexico. ($N = 86$ prey items).

PREY TYPE	NUMBER OF ITEMS	FREQUENCY (%)	WINTERING* OR NESTING** POPULATION
Birds			
Marbled Godwit (*Limosa fedoa*)*	33	38.4	68 942
Black-crowned Night-Heron (*Nycticorax nycticorax*)**	6	7.0	190
Long-billed Curlew (*Numenius americanus*)*	5	5.8	671
Willet (*Tringa semipalmata*)*	5	5.8	9 375
Short-billed Dowitcher (*Limnodromus griseus*)*	5	5.8	NA
Royal Tern (*Thalasseus maximus*)**	5	5.8	5 524
Dunlin (*Calidris alpina*)*	2	2.3	34 304
Gull (*Larus* spp.)**	2	2.3	908
Sanderling (*Calidris alba*)*	1	1.2	1 952
Spotted Sandpiper (*Actitis macularius*)*	1	1.2	0
Ruddy Turnstone (*Arenaria interpres*)*	1	1.2	665
Wandering Tattler (*Tringa incanus*)*	1	1.2	0
Red Phalarope (*Phalaropus fulicarius*)*	1	1.2	45
Snowy Egret (*Egretta thula*)**	1	1.2	110
Bonaparte's Gull (*Larus philadelphia*)**	1	1.2	NA
Common Tern (*Sterna hirundo*)*	1	1.2	NA
Black-belled Plover (*Pluvialis squatarola*)*	1	1.2	NA
Mockingbird (*Mimus* sp.)	1	1.2	NA
Unidentified birds	11	12.8	
Mammals			
Pocket Gopher (*Thomomys umbrinus*)	2	2.3	
Total	86	100.00	

* 1994 estimated wintering population data, from Page et al. (1997).
** Species breeding on the small islands at Ojo de Liebre lagoon. Nesting population counts from Castellanos et al. (2001).
NA = Data not available.

RESULTS AND DISCUSSION

We identified 86 individual prey items at the three falcon nests. Most prey items represented shorebirds (Table 1), and six species constituted 69% of the prey items. The Marbled Godwit (*Limosa fedoa*) was the most common prey item followed by Black-crowned Night-Heron (*Nycticorax nycticorax*), Long-billed Curlew (*Numenius americanus*), Short-billed Dowitcher (*Limnodromus griseus*), Royal Tern (*Thalasseus maximus*), and Willet (*Tringa semipalmata*). We identified one mammal, a pygmy pocket gopher (*Thomomys umbrinus*). Four of the species of water birds identified as prey were known to breed on Piedras Island (Castellanos et al. 2001); however, most of the prey items represented wintering birds (Table 1). Peregrines in the study area bred in late winter and early spring (February through June, Castellanos et al. 1994), a period that corresponded with a high availability of potential prey (migrant birds; Page et al. 1997). Raptors tend to breed at times when food is plentiful (Newton 1979).

Species we found in prey remains from nests at the Ojo de Liebre lagoon differed from species taken by peregrines nesting on the eastern side of the peninsula, on the Sea of Cortez (White et al. 2002). The Ojo de Liebre lagoon and the surrounding heterogeneous landscape support many shorebirds, waterfowl and marine birds (Massey and Palacios 1994); thus, Peregrine Falcons nesting there have a wide choice of prey. On the eastern side of the peninsula, on the Sea of Cortez, oceanic conditions prevail and coastal lagoons and marshes are scarce. Resident and wintering water birds are predominantly marine birds (Velarde and Anderson 1994). In the eastern region, the most numerically important species taken by peregrines were the Eared Grebe (*Podiceps nigricollis*), Black Storm-Petrel (*Oceanodroma melania*), and Red Phalarope (*Phalaropus fulicarius*; White et al. 2002). A pair of Peregrine Falcons nesting at Isla Rasa, in the northern half of the Sea of Cortez, preyed exclusively on three species of seabirds: Heermann's Gull (*Larus heermanni*), Elegant Tern (*Thalasseus elegans*) and Royal Tern (Velarde 1993). These apparent diet differences between Peregrine Falcons nesting at the Ojo de Liebre lagoon and on the Sea of Cortez may reflect differences in bird species present during winter on each side of the peninsula.

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Throughout its range, the Peregrine Falcon preys on a wide variety of taxa; however, it is generally considered a bird specialist (Ratcliffe 1993, White et al. 2002). Peregrine Falcons may take birds in proportion to their abundance, but they also may utilize some species because of factors such as prey size, behavior, palatability, and habitat characteristics where the prey occur (Hunter et al. 1988, Porter and White 1973). Wintering shorebird surveys conducted in the Ojo de Liebre lagoon in 1993 and 1994 (Page et al. 1997) indicated that the Marbled Godwit and Willet were the most abundant large-sized shorebirds, perhaps explaining the dominance of the Marbled Godwit in our samples of prey remains. The relatively large Royal Tern and Black-crowned Night-Heron nest on Piedras Island in dense colonies close to the Peregrine Falcon nests (A. Castellanos unpubl. data) which may explain their abundance in the prey remains we collected there.

The apparent absence of land birds among the prey remains collected from peregrine nests at the Ojo de Liebre lagoon may reflect the species composition of bird communities of the Vizcaino flats, which are characterized by few species and the predominance of small birds (Galina et al. 1991). The small number of land birds in our samples may also reflect the fact that prey remains tend to be biased toward larger or conspicuous prey (Marti 1978, Lewis et al. 2004). For example, we observed Peregrine Falcons consuming American Pipit (*Anthus rubescens*) on several occasions, yet we found no remains of this species at the nests.

DIETA DE *HALCONES PEREGRINOS* REPRODUCTORES EN UNA LAGUNA COSTERA, BAJA CALIFORNIA SUR, MÉXICO

RESUMEN.—Examinamos la dieta de tres parejas reproductoras de halcón peregrino (*Falco peregrinus*) por medio del análisis de los restos de sus presas, en la laguna Ojo de Liebre (LOL), Baja California Sur, México. Las aves playeras representaron la mayoría de las presas, seguidas por aves marinas y terrestres. Las presas consumidas en LOL difieren de las consumidas por halcones peregrinos reproductores en algunas islas del Golfo de California. Esto puede reflejar diferencias en las especies de aves presentes durante el invierno a cada lado de la península. En los humedales de la LOL la disponibilidad de aves invernantes es mayor que en las islas del Golfo de California.

[Traducción de los autores editada]

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