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Daily Activity Budgets and Population Size of American White Pelicans Wintering in South Louisiana and the Delta Region of Mississippi

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Abstract.—Twenty-one American White Pelicans (*Pelecanus erythrorhynchos*) were captured and fitted with radio-transmitters in south Louisiana and the delta region of Mississippi during the winter and early spring of 1994-1997. The pelicans were monitored to determine their daily activity budgets while using different habitats such as catfish ponds, crawfish ponds, rivers, lakes, and bayous. Pelicans foraging at catfish ponds spent about 4% of their day foraging and 96% loafing, while pelicans foraging in other habitats spent about 28% of their day foraging and 72% loafing. For an individual bird, the mean number of foraging sessions per day was 2.5 (± 0.53 SE) and the mean length of each foraging session was 66.7 min. (± 8.08 SE). Aerial censuses were also conducted to determine the numbers of pelicans in the delta region of Mississippi. Each year the numbers of pelicans wintering in the delta region of Mississippi peaked in February and March, corresponding with spring migration. Pelican numbers reached approximately 4,600 during February and March 1996. Pelicans were observed foraging in larger flocks for shorter periods of time on catfish ponds than in other habitats. Received 27 September 2000, accepted 28 November 2000.

Key Words.—Activity budgets, American White Pelican, aquaculture, census, foraging, Louisiana, Mississippi, telemetry.

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American White Pelicans (*Pelecanus erythrorhynchos*) in the eastern United States breed primarily in the northern Great Plains and winter in the Lower Mississippi Valley and along the Gulf of Mexico (King 1997; Evans and Knopf 1993; Johnsgard 1993). Most American White Pelican research has been conducted on their breeding grounds in the northern United States and southern Canada (Evans and Knopf 1993; Johnsgard 1993) and little is known about their behavior or the numbers wintering in the southeastern United States.

The Channel Catfish (*Ictalurus punctatus*) aquaculture industry in the southeastern United States began to expand rapidly in 1985 (Mott and Brunson 1997), increasing production from 86,917 kg to 255,991 kg live weight of catfish processed in 1998 (USDA 1999). Of the 15 catfish producing states, Arkansas, Louisiana, and Mississippi increased their pond production from about 24,000 ha in 1987 to over 58,000 ha in 1999 (USDA 1999). A survey of catfish producers by the National Animal Health Monitoring System (NAHMS) indicated that the two primary sources of catfish losses in commercial operations were disease (45%) and wildlife (37%) (NAHMS, United State Department of Agriculture, Animal and Plant Health In-

spection Service 1997). Pelicans have been identified as one of the principal hosts in the life cycle of several commercial catfish parasites, especially digenetic trematodes (L. Pote and S. Curran, pers. comm.). American White Pelicans come into conflict with southeastern aquaculture by exploiting this abundant and readily available food source, while potentially transmitting parasites to uncontaminated fish (King 1997).

A more thorough understanding of the daily activity budgets and status of wintering American White Pelicans would lead to more effective methods to manage their impact on the aquaculture industry. The purpose of this study was to determine the activity budgets and numbers of American White Pelicans wintering near southeastern aquaculture facilities.

METHODS

The study area comprised 16,000 km² of the Mississippi River alluvial plain (the delta region) in Mississippi and 2,000 km² of the Atchafalaya River alluvial plain in Louisiana (Fig. 1). American White Pelicans loaf in flooded agricultural fields, on commercial crawfish (*Procambarus* spp.) pond levees, sand bars, and mud flats of lakes and rivers in Louisiana and Mississippi (King 1997).

From March 1994 to February 1996, twenty-one American White Pelicans were captured in south Louisiana (N = 10) and in the delta region of Mississippi (N = 11) with either modified Softcatch® leghold traps or

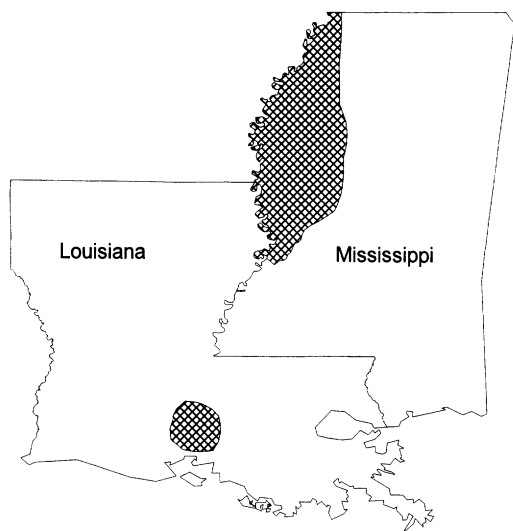


Figure 1. Map of the study areas where transmitter-equipped American White Pelicans were tracked from 1994-1997. Shaded areas show ground tracking area in south Louisiana and the delta region of Mississippi.

rocket nets (King *et al.* 1998). Backpack VHF telemetry transmitters were attached, using methods described by Dunstan (1972). The transmitters weighed 125 g, or approximately 2% of an adult's body weight (Evans and Knopf 1993, Johnsgard 1993).

After an acclimation period of 48 h, attempts were made to ground track individual pelicans from daylight to dark for one or two successive days. Methods of tracking and locating pelicans were those identified by Mech (1983) and Gilmer *et al.* (1981). A vehicle with a roof-mounted dual three-element yagi antenna system and an R4000 (Advanced Telemetry Systems, Inc.) receiver was used for ground tracking. All activity budget data were obtained by ground tracking. Aerial tracking from a Cessna 172 or 180, using similar equipment, was conducted on several occasions to locate pelicans not previously tracked from the ground.

We calculated the daily activity budgets of transmitter-equipped pelicans as the percentage of ground tracking time that pelicans were engaged in each of three activities; loafing, foraging, and flying. A foraging session was defined as the amount of time a bird spent actively foraging in one bout as determined by visual observation. We determined the mean number of foraging sessions, minutes per foraging session, and time of day of foraging sessions for the different habitats used by pelicans.

Aerial censuses of pelicans were conducted in the delta region of Mississippi during the winters of 1993-1997. Census transects were established to provide coverage of the entire delta region of Mississippi from an altitude of 500 m. The numbers of pelicans observed were recorded, and aerial photographs of large concentrations of pelicans were taken and individuals were counted from projected photographs. We determined monthly mean counts from November through March. The numbers and locations of pelicans observed foraging were also recorded, as was the percentage of foraging locations per habitat and average size of foraging

flocks. We used a Student's t-test ($P < 0.05$) to compare the mean foraging flock sizes in catfish pond and lake habitats.

RESULTS

During a four-day period in March 1996, the entire delta region of Mississippi, south Louisiana and the Gulf of Mexico coast from Mobile Bay, Alabama to the Mexico border was flown in an effort to locate all of the transmitter-equipped birds. Only ten birds were located in inaccessible marsh habitat in south Louisiana. It was assumed that the missing birds had left the study area. Attempts to track pelicans at night were unsuccessful because the birds could not be observed to determine if they were foraging or swimming. Therefore, we report only the percent time that pelicans spent foraging during daylight hours (06.00-17.30 h). Eight birds were ground tracked for more than 7 h per day for a total of 197 h over 15 days. All birds flew for less than 1% of the time tracked.

Pelicans foraging in catfish ponds spent about 4% of their day foraging and 96% loafing, while pelicans foraging in other habitats spent about 28% of their day foraging and 72% of their day loafing (Fig. 2). In south Louisiana, pelicans were tracked during April and foraged in commercial crawfish ponds when the water level in the ponds was being drawn down to induce the crawfish to burrow and reproduce. The birds foraged exclusively in borrow ditches along the edges of the crawfish ponds because the ponds were too shallow (<0.1 m) for pelicans to swim. For all habitats combined, the mean

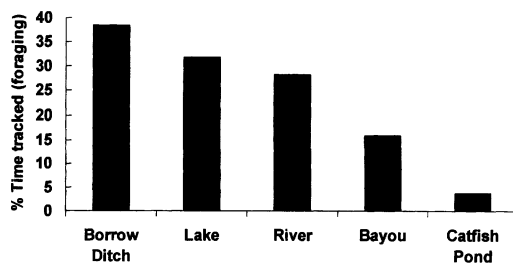


Figure 2. Daily activity budget for transmitter-equipped American White Pelicans foraging in five habitats of south Louisiana and the delta region of Mississippi, 1994-1997.

Table 1. Mean number of foraging sessions per day of transmitter-equipped American White Pelicans tracked in five habitats during the winter and early spring of 1994-1997 in south Louisiana and the delta region of Mississippi (N = number of tracking days).

Habitat	N	Mean	SE	Range
Borrow Ditch	2	5.5		3-8
Mississippi River	4	3.3	1.11	1-6
Bayou	3	1.7	0.33	1-2
Lake	4	1.5	0.29	1-2
Catfish Pond	2	1.0		1
Total	15	2.5	0.53	1-8

number of foraging sessions for an individual bird per tracking day was 2.5 (± 0.53 SE) (Table 1) and the mean length of individual foraging sessions was 66.7 min. (± 8.08 SE) (Table 2). The average number of foraging sessions (Table 1) and the average length of foraging sessions (Table 2) were shorter in commercial catfish ponds than in other habitats. Most pelicans foraged during the morning (06.00-11.00 h) and evening (14.00-17.30 h) rather than around midday (11.00-14.00 h) in these habitats (Fig. 3).

At least one aerial census was conducted each month from November through late May (or early June) during 1994-95 and 1995-96. During 1993-94 and 1996-97 aerial censuses were conducted irregularly. Pelican numbers in the delta region of Mississippi peaked each year during February or March, reaching about 4,600 birds during 1996 (Fig. 4). There was no significant increase in the number of pelicans in the delta region of Mississippi during February from 1994-1997 ($r^2_3 = 0.426$; n.s.).

While conducting aerial censuses in the delta region of Mississippi, most pelicans were observed foraging in lakes, followed by catfish ponds and the Mississippi River (Fig. 5). Pelicans

were not observed foraging in bayous or borrow ditches during these censuses. We observed no differences in flock sizes of pelicans foraging in catfish ponds relative to flocks foraging in lakes ($t_{16,4} = 1.43$, n.s.) (Fig. 5).

DISCUSSION

Since pelicans can fly great distances in relatively short periods (Evans and Knopf 1993; Johnsgard 1993), only eight of 21 birds were tracked for over 7 h. Most transmitter-equipped birds apparently left the Mississippi study area within 24 h of capture and instrumentation. Of the 21 transmitter-equipped birds, about 10 were located once a year by aerial telemetry in both study areas. Birds that were located in the coastal marsh habitat of south Louisiana could not be tracked by ground due to logistical constraints (e.g., lack of roads).

All but one of the birds tracked were members of flocks of 500-3,000 pelicans. In most cases the entire group flew, foraged, and loafed as one flock. Overall, pelicans in south Louisiana and the delta region of Mississippi foraged primarily during the morning and afternoon hours, similar to American

Table 2. Mean number of minutes per foraging session of transmitter-equipped American White Pelicans tracked in five habitats during the winter and early spring of 1994-1997 in south Louisiana and the delta region of Mississippi (N = number of foraging sessions).

Habitat	N	Mean	SE	Range
Lake	6	129.5	25.5	35-210
Borrow Ditch	11	53.8	11.5	16-141
Mississippi River	13	54.6	9.0	18-119
Bayou	5	69.4	20.8	17-143
Catfish Pond	2	21.0		13-29
Total	37	66.7	8.1	13-210

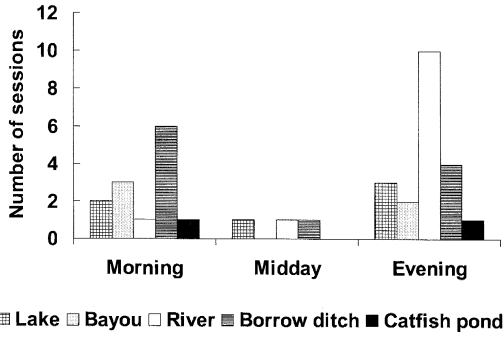


Figure 3. Number of foraging sessions during three times of day of transmitter-equipped American White Pelicans in south Louisiana and the delta region of Mississippi, 1994-1997.

White Pelicans breeding in southern Oregon and northeast California (Smith *et al.* 1984).

Peak numbers of pelicans in the delta region of Mississippi corresponded with the onset of spring migration in February and March, and also with increased complaints of damage from catfish farmers (United States Department of Agriculture, Wildlife Services unpublished data). Although the data show no significant increase in pelican numbers in the delta region of Mississippi from 1993-1997, pelican numbers in this region were variable (Fig. 4). More catfish farmers are reporting pelican problems each year and the birds are becoming more persistent and increasingly difficult to disperse from aquaculture facilities (King 1997; United States Department of Agriculture, Wildlife Services unpublished data).

Subsequent observations of American White Pelicans wintering in south Louisiana and the delta region of Mississippi support

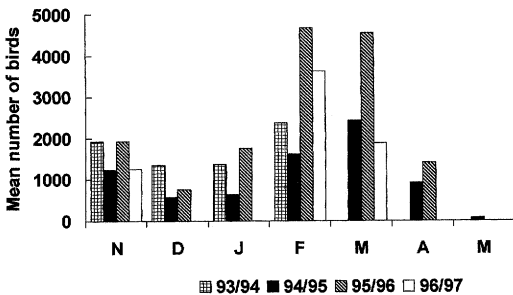


Figure 4. Mean numbers of American White Pelicans observed each month during aerial censuses conducted in the delta region of Mississippi, 1993-1997.

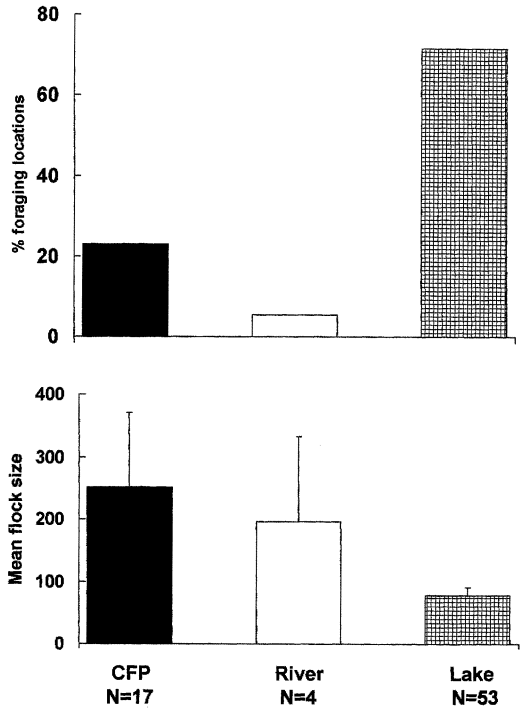


Figure 5. A. Foraging locations and B. flock sizes and SE of American White Pelicans observed on catfish ponds (CFP), rivers, and lakes during aerial censuses conducted in the delta region of Mississippi, 1993-1997.

the activity budgets and general habitat use patterns described in this study. More research however, is needed to determine the extent of utilization and importance of southeastern aquaculture facilities to American White Pelicans, as well as their impact on the industry.

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