The Condor 92:1076–1077

KLEPTOPARASITISM OF ADULT AND IMMATURE BROWN PELICANS BY HEERMANN'S GULLS[1]

BERNIE R. TERSHY[2]
Moss Landing Marine Laboratories, P.O. Box 450, Moss Landing, CA 95039

DAWN BREESE[3]
Environmental Field Program, University of California, Santa Cruz, CA 95064

GREG M. MEYER
8250 Glen Arbor Rd., Ben Lomond, CA 95005

Key words: Brown Pelican; Pelecanus occidentalis; *Heermann's Gull;* Larus heermanni; *kleptoparasitism; foraging success; Gulf of California.*

Kleptoparasitism (food stealing) has received considerable attention from seabird biologists (Furness 1987). The age of the kelptoparasite, the age of the victim, and the probability of success all appear to influence the frequency of kleptoparasitic attempts by gulls (*Larus* spp.) (Burger and Gochfeld 1981, Barnard and Thompson 1985, Carroll and Cramer 1985). We studied kleptoparasitism by Heermann's Gulls (*L. heermanni*) on the piscivorous Brown Pelican (*Pelecanus occidentalis*) in the Gulf of California, Mexico to answer two questions: (1) did adult or immature Heermann's Gulls differ in their frequency of kleptoparasitic attempts?, and (2) did Heermann's Gulls attempt to kleptoparasitize immature or adult Brown Pelicans more often?

METHODS

The study area was a 20 × 45 km section of the Canal de Ballenas (29°00'N, 113°20'W). It contains only a small Brown Pelican breeding colony, but is an important feeding area for >300,000 Heermann's Gulls, and >10,000 Brown Pelicans which breed on colonies less than 30 km away (Anderson et al. 1976; E. Velarde, pers. comm.). On 172 days between April 1985 and April 1986 we conducted transects in a 4.5-m skiff and counted all seabirds within a 100-m radius (Tershy and Breese 1990). During transects we used a consistent search method and travel speed, but the course of travel was neither fixed nor completely random (Tershy et al., in press). Seabirds were recorded as either adults or immatures (following Harrison 1983). We only include data from days when both species were present in this analysis. This was an ancillary project and much of the search time was spent in offshore waters where pelicans and Heermann's Gulls were less common.

Brown Pelicans forage primarily by plunge diving. Heermann's Gulls usually initiate a kleptoparasitic attempt by flying rapidly and directly towards a diving Brown Pelican, approach to within 1.5 m and attempt to steal their food immediately after the pelican's dive. When this was observed we recorded the age class of both the kleptoparasite and victim. Because Heermann's Gulls attempt to take fish directly from the bills of Brown Pelicans we consider this behavior to be true kleptoparasitism.

We measured pelican foraging success (adult vs. immature) using the criterion of Orians (1969). When sitting on the water's surface following a dive, unsuccessful Brown Pelicans quickly lift their bill and drain water from their gular pouch; successful individuals keep their bill close to their chest, slowly drain water from their gular pouch, then tilt their head back to swallow.

Because of the abundance of birds in the study area, the duration of our study, and the large area over which we collected data, it is unlikely that we repeatedly observed the same birds. Thus, each observation is independent, which is a necessary requirement of the chi-square goodness-of-fit tests we used in analysis.

RESULTS AND DISCUSSION

Immature Brown Pelicans dove more frequently than adults (268 dives for 4,099 adults [6.5%] and 453 dives for 3,076 immatures [14.7%], $\chi^2 = 98.99$, $P < 0.001$). However, adult Brown Pelicans were successful on 91 of 268 dives (33.6%), and immatures on 79 of 453 dives (17.4%) ($\chi^2 = 26.64$, $P < 0.001$).

We observed 96 kleptoparasitic attempts on Brown Pelicans by Heermann's Gulls: 89 by adults and seven by immatures. The skew reflects the age distribution of gulls in the study area (9,101 vs. 600) ($\chi^2 = 0.202$). All seven kleptoparasitic attempts by immature Heermann's Gulls were on immature Brown Pelicans.

Adult Heermann's Gulls were attracted to 26.1% (70/268) of the dives by adult Brown Pelicans, but to only 4.2% (19/453) of the dives by immatures ($\chi^2 = 65.57$, $P < 0.001$). Thus, adult Heermann's Gulls may have preferentially attacked adult pelicans because the

[1] Received 16 February 1990. Final acceptance 28 June 1990.

[2] Present address: Section of Neurobiology and Behavior, Seeley G. Mudd Hall, Cornell University, Ithaca, NY 14853.

[3] Present address: 177 Burns Rd., Brooktondale, NY 14817.

adults are more likely to be successful on any given dive.

Our results differ from those obtained in similar studies of Laughing Gull (*L. atricilla*) kleptoparasitism of Brown Pelicans (Schnell et al. 1983, Carroll and Cramer 1985). Carroll and Cramer (1985) found that Laughing Gulls attempted to kleptoparasitize Brown Pelicans on 87% of all dives in contrast to our findings with Heermann's Gulls of only 13%. The adult Laughing Gulls in Carroll and Cramer's (1985) study also differed from the Heermann's Gulls in our study area by preferentially attempting to rob immature pelicans.

The differences in Brown Pelican foraging success in the two studies may have altered the costs and benefits for gulls of attempting to kleptoparasitize adult vs. immature Brown Pelicans. Brown Pelicans use a variety of passive and aggressive behaviors to thwart kleptoparasitic attempts by gulls. Carroll and Cramer (1985) found that adult pelicans performed these behaviors more often than did immature birds and suggested that this caused Laughing Gulls to preferentially kleptoparasitize immature pelicans.

In Carroll and Cramer's (1985) 3-day study the per dive probability of success for both adult and immature Brown Pelicans was >70% and adults were only 9% more successful than immatures. In our study the per dive success rate for Brown Pelicans was <25%, and adults were nearly twice as successful as immatures. Thus, for the Heermann's Gulls we observed, age-related differences in the evasive behavior of Brown Pelicans may have been less important than the almost twofold greater probability of adults being successful on any given dive.

These results suggest the need for additional studies of kleptoparasitism focusing on the overall rate of kleptoparasitic attempts vs. foraging success, and the ratio of attacks on adult vs. immature victims vs. relative foraging success of each age class.

We thank the Secretaria de Pesca for permitting fieldwork in Mexico (permit 0757); D. W. Anderson, M. Gochfeld, G. D. Schnell, P. W. Sherman, B. Würsig, and an anonymous reviewer for comments on the manuscript; and the Monterey and Los Angeles American Cetacean Society, Lerner-Grey Fund for Marine Research, Sigma Xi Grants-in-Aid of Research, and the Packard Foundation for funding.

LITERATURE CITED

ANDERSON, D. W., J. E. MENDOZA, AND J. O. KEITH. 1976. Seabirds in the Gulf of California: a vulnerable, international resource. Nat. Res. J. 16: 483–505.

BARNARD, C. J., AND D.B.A. THOMPSON. 1985. Gulls and plovers, the ecology and behaviour of mixed-species feeding groups. Columbia Univ. Press, New York.

BURGER, J., AND M. GOCHFELD. 1981. Age-related differences in piracy behaviour of four species of gulls, *Larus*. Behaviour 77:242–267.

CARROLL, S. P., AND K. L. CRAMER. 1985. Age differences in kleptoparasitism by laughing gulls (*Larus atricilla*) on adult and juvenile brown pelicans (*Pelecanus occidentalis*). Anim. Behav. 33: 201–205.

FURNESS, R. W. 1987. Kleptoparasitism in seabirds, p. 77–100. *In* J. P. Croxall [ed.], Seabirds: feeding ecology and role in marine ecosystems. Cambridge Univ. Press, Cambridge.

HARRISON, P. 1983. Seabirds. An identification guide. Houghton Mifflin Co., Boston, MA.

ORIANS, G. H. 1969. Age and hunting success in the brown pelican (*Pelecanus occidentalis*). Anim. Behav. 17:316–319.

SCHNELL, G. D., B. L. WOODS, AND B. J. PLOGER. 1983. Brown Pelican foraging success and kleptoparasitism by Laughing Gulls. Auk 100:636–644.

TERSHY, B. R., AND D. BREESE. 1990. The influence of sexual dimorphism on kleptoparasitism of blue-footed boobies by brown boobies. Can. J. Zool. 68:197–199.

TERSHY, B. R., D. BREESE, AND C. S. STRONG. In press. Abundance, seasonal distribution and population composition of *Balaenoptera* whales in the Canal de Ballenas, Gulf of California, Mexico. Rep. Int. Whaling Comm.