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Records of Communal Roosting in Mariana Crows

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ABSTRACT.—Communal roosting is reported for the first time in Mariana Crows (*Corvus kubaryi*) on Guam, Mariana Islands. Counts of at least 66 and 25 birds were made at a roost over a 2-week period. The causes of this behavior are uncertain, but are perhaps related to encounters with brown tree snakes (*Boiga irregularis*), which recently became established on the island. *Received 8 January 1997, accepted 8 September 1997.*

The Mariana Crow (*Corvus kubaryi*) is endemic to Guam and Rota in the Mariana Islands and is the only corvid occurring in Micronesia (Baker 1951). The population on Guam is now restricted to the northern end of the island and is critically endangered, with numbers decreasing from an estimated 350 birds in 1981 to fewer than 20 birds in 1996 (Engbring and Ramsey 1984; Wiles et al. 1995; C. F. Aguon, unpubl. data). The population has declined because of predation by the brown tree snake (*Boiga irregularis*), which invaded the island after World War II (Savidge 1987, Engbring and Fritts 1988). Rota's population of crows also appears to be in decline, falling from estimated 1300 birds in 1982 (Engbring et al. 1986) to a current population of about 600 birds (Grout et al. 1996, National Research Council 1997). Reasons for this decrease are poorly understood, but likely include habitat modification and fragmentation (National Research Council 1997).

Detailed observations of the social behavior of *C. kubaryi* are lacking. Typically, the species is found throughout the year in parties of 2–5 birds, which probably represent family units (Baker 1951; Jenkins 1983; Engbring et al. 1986; Tomback 1986; Michael 1987; C. F. Aguon, pers. comm.). During the 1980s, flocks of 5–15 individuals were also commonly seen flying long distances over the forest canopy and along clifflines on Guam (R. E. Beck, Jr., pers. comm.). These groups were usually temporary, probably consisting of unmated crows and one or more family groups (Michael 1987; R. E. Beck, Jr., pers. comm.). Similar flocks are seen on Rota and very rarely may contain up to 26 birds (E. M. Taisacan, pers. comm.). Larger aggregations have not been reported. This paper documents previously undescribed behavior in *C. kubaryi*—that of communal roosting where large numbers of birds gather at a single location to spend the night.

On 24 February 1984 at 06:56, from a cliff-top overlook above the Tarague basin in northern Guam (13° 36′ N, 144° 54′ E), I observed an aggregation of at least 66 crows roosting in several trees below me near the base of the cliffline. The birds were clumped fairly tightly, with the largest concentration consisting of about 35 birds in two dead trees. The crows sat about 30–50 cm apart on the bare branches of both trees. In several nearby living trees, an additional 31 birds were recorded. A few more crows were likely present but hidden from sight by dense foliage. None of the trees were identified to species, but most were slightly emergent above the surrounding forest canopy. I departed from the site at 07:30 with most of the birds still occupying the same trees. The number of crows in the roost represented about 20% of the 1981 population estimate for the island.

The roost was revisited on 9 March 1984 at 06:40, the only occasion that follow-up observations were made. This time, only 25 crows were counted, with 20 individuals in the crown of one tree and five other birds spread among several adjacent trees. Again, a few more birds may have been hidden in the foliage. The roost trees were different from those used two weeks earlier, but were located nearby. All were alive and of similar height to those occupied in February. Other aspects of behavior at the roost (i.e., arrival and de-

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parture times, interactions among birds) were not recorded on either visit.

A number of early morning visits to the site were made in late 1984 and 1985 by other staff of the Division of Aquatic and Wildlife Resources. They regularly saw smaller numbers of up to 10–15 crows roosting in the area (R. E. Beck, Jr., pers. comm.), suggesting that some birds were attracted to the location for an extended period of time.

Only one other record of communal roosting in Mariana Crows is known. A local resident from the village of Yigo in northeastern Guam, with whom I had spoken a few months prior to my observations, stated that he too had seen large roosting aggregations of at least several dozen crows on occasion in the past. His observations were presumably made in the 1960s or 1970s, probably no more than 10 years before crows disappeared from that part of the island. Sightings of this type have never been made on Rota (E. M. Taisacan, pers. comm.; M. Lusk, pers. comm.; D. J. Grout, pers. comm.; R. J. Craig, pers. comm.), despite increased observational survey work on the island since the mid-1980s.

Crows and ravens (*Corvus* spp.) are well known for their gregarious social habits and a number of species form communal roosts at night (Goodwin 1986, Madge and Burn 1994). However, communal roosting is absent or rarely documented for most tropical crows, especially forest-dwelling species (Goodwin 1986, Madge and Burn 1994), although this simply may be the result of inadequate study. Neither has the behavior been reported in the Slender-billed Crow (*C. enca*) of the Philippines and Indonesia (R. S. Kennedy, pers. comm.), the closest relative of *C. kubaryi* (Baker 1951). Protection from wind and cold, improved predator detection, proximity to foraging sites, and the exchange of information on food sources are believed to be some of the benefits derived from communal roosting (Eiserer 1984, Ydenberg and Prins 1984, Marzluff et al. 1996).

In other corvids, the tendency to gather at communal roosts is greatest among nonbreeding individuals (Goodwin 1986, Engel et al. 1992). My records of communal roosting in *C. kubaryi* during late February and early March coincide with the latter half of the species' nesting season on Guam (October to May; C. F. Aguon, unpubl. data). Observations of about 20 breeding pairs during seven years of study have shown that nesting birds and adults with newly fledged young do not leave their nesting territories in the evening (C. F. Aguon, pers. comm.). This suggests that individuals joining large roosts were most likely immatures or adults that failed to breed. Flocking, apparently non-territorial northern Guam crows were regularly seen in the 1980s (R. E. Beck, Jr., pers. comm).

Communal roosting by Mariana Crows is a rare behavior on Guam, at least during the last few decades. It is unknown whether this behavior occurred before the 1960s when the species was considerably more common. If it did not, as evidenced by the absence of earlier reports by island residents, then this may argue that communal roosting is a recent behavioral response to the presence of brown tree snakes. Nighttime encounters with snakes may have stimulated some crows to assemble in nocturnal roosts. Snake densities were high in the vicinity of the Tarague basin at the time of my observations (Rodda et al. 1992). Snakes had probably begun to invade the Yigo area by the late 1960s and were well established there by the 1970s (Savidge 1987). The use of several dead trees by birds at the Tarague roost may have enhanced their ability to detect snakes. Another possibility is that snake predation on nesting crows resulted in greater female mortality and a sex ratio skewed toward males, thereby freeing unmated males to aggregate in large roosts. Brown tree snakes are absent from Rota, where communal roosting has never been observed. Forest conditions at lower elevations on Rota, where most crows occur (Engbring et al. 1986), are similar to those of northern Guam and would not seem to account for the absence of communal roosts on that island.

There are other explanations based on more typical communal roosts in other crows. One is that Mariana Crows form large roosts to be near strongly localized and ephemeral food sources. Considerable variation in roost size over short periods of time, as seen at the Tarague site, often characterizes roosts of this type (Marzluff et al. 1996). However, *C. kubaryi* is not known to exploit foods with these attributes. Unfortunately, further observations of this behavior will probably never be made

again on Guam unless some recovery of this highly endangered population is achieved.

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Three-striped Warbler (*Basileuterus tristriatus*) "Anting" with a Caterpillar

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ABSTRACT.—Anting behavior is widespread among passerine species but its function is unknown. In typical anting episodes, a bird holds an ant or other object in the bill and rubs it in the plumage. In addition to ants, many other objects have been used for "anting." Here I describe the use of a caterpillar for anting by a tropical warbler, and evaluate four of the hypothesized functions of anting in light of this observation. I suggest that an experimental approach is likely to yield insight into the adaptive significance of anting. *Received 5 May 1997, accepted 27 Oct. 1997.*

Anting is a poorly understood behavior that has been observed in a wide variety of birds, especially temperate-zone passerine species. During "active anting" a bird holds one or more ants in the bill and rubs them on the feathers or skin, typically near the base of the

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