

EGG-EATING BY GALÁPAGOS MOCKINGBIRDS

MICHAEL P. HARRIS

Edward Grey Institute of Field Ornithology
Oxford, England

The Galápagos mockingbirds (*Mimidae*) belong to the endemic genus *Nesomimus*, and it is generally accepted that there are four distinct species: *N. trifasciatus* (on Champion and Gardner-by-Floreana), *N. melanotis* (on San Cristóbal [= Chatham]), *N. macdonaldi* (on Hood [= Española]), and *N. parvulus*—seven subspecies on different islands not inhabited by any of the other species (Swarth, Occas. Papers Calif. Acad. Sci. 18:1, 1931). It is therefore of some interest that Hatch (Condor 67:354, 1965) reports that only one species, *N. macdonaldi*, feeds on seabird eggs. *N. trifasciatus* and *N. parvulus* he found did not, and he does not mention *N. melanotis*, and says that “this is an interesting example of a behavior pattern differing strikingly between closely related species.”

On Hood Island *N. macdonaldi*, which has by far the largest bill of any of the species, is frequently seen attacking the unincubated eggs of the Galápagos Albatross (*Diomedea irrorata*), Blue-footed Booby (*Sula nebouxii*), Masked Booby (*S. dactylatra*), and Swallow-tailed Gull (*Creagrus furcatus*). Lévêque (Alauda 32:5, 1964) reports these mockingbirds as eating the eggs of the American Oystercatcher (*Haematopus palliatus*), and on several instances I have seen them take the eggs of the Galápagos Dove (*Zenaida galapagoensis*). However, in the normal course of events it is unlikely that many eggs of any of these species are available to the mockingbirds except when extreme adverse conditions, such as food shortage or human interference, drive the birds from the nests. Also it must be only infrequently that the birds manage to crack an intact egg of the larger seabirds, although they would soon devour a hatching or cracked egg. Alan Root tells me that in 1966 the mockingbirds were pecking at bleeding wounds on the feet of the albatrosses.

The mockingbird on Tower Island (*N. parvulus bauri*) was noted by Hatch (*op. cit.*) to be indifferent to the eggs of the abundant seabirds and even to freshly broken eggs. However, during field work on Tower Island in 1966–67, it was seen that this species would eagerly eat eggs of the Red-footed Booby (*S. sula*) and frigatebirds (*Fregata minor*) broken by other frigates or Lava Gulls (*Larus fuliginosus*) and would even peck furiously at unattended frigatebird eggs and try to eject them from the nests when the adults were scared away by human intruders in the colony (fig. 1).

There is on Tower Island an extremely large colony of the Wedge-rumped Storm-Petrel (*Oceanodroma tethys*) which lays eggs in the large but well-protected open spaces under the lava flows. Large numbers of broken eggs are found near the nest sites, and Nelson (Ibis 108:430, 1966) thought that these had not been eaten by mockingbirds (he infers by the use of the abbreviation *Nesomimus* spp. that there is more than one species present, but there is no evidence for this) but were more likely a result of interspecific competition for nest sites. Close inspection of the colony, however, has now shown that the majority of these eggs have been ejected by competition (but intra-specific) and then eaten by mockingbirds. Great care had to be taken while examining petrel nests as the



FIGURE 1. Tower Island Mockingbird (*Nesomimus parvulus bauri*) pecking at egg of a frigatebird (*Fregata minor*). Photo by Alan Root.

fearless mockingbirds were always at hand to snatch any exposed egg or small young. Even in undisturbed circumstances mockingbirds were seen to go several feet underground and to emerge with a petrel egg. The Galápagos Dove also nests under the lava, and broken eggs found were almost certainly due to attack by mockingbirds.

The Floreana (or Charles) Island Mockingbird (*N. trifasciatus*) is now restricted to Gardner-by-Floreana and Champion islands, although it may have previously occurred on the main island. In a visit to both these islands in December 1966, Tj. de Vries and I estimated that the total population at this time was probably no more than 150 individuals. On Gardner-by-Floreana we inadvertently disturbed a Blue-footed Booby from a newly hatched chick and a hatching egg. When we returned to the nest about 30 minutes later it was empty. The situation of the nest, three feet under an overhanging rock and sheltered by a bush, ruled out the possibility of an aerial predator, and the fine soil around the nest showed only the tracks of mockingbirds. There were no signs of rats, and indeed overnight rodent trapping in the area produced no results. The only possibility appears to be that mockingbirds took the egg and young.

I have little information on the habits of the San Cristóbal Mockingbird (*N. melanotis*) except that it does not occur in any numbers at the booby and frigatebird colonies at Punta Pitt and not at all on Isla Pitt, which has boobies, frigates, Swallow-tailed Gulls, and Wedge-rumped Storm Petrels. On Isla Pitt the ejected eggs of the storm petrels usually remain intact and are not broken as on Tower Island. As these are the only two sizable seabird colonies on the island it is unlikely that this mockingbird has regular opportunities for eating seabird eggs.

From these observations it is clear that at least two species of mockingbirds, and possibly three, regularly steal eggs, and that the fourth species has little opportunity to do so. The four species may well have different behavior patterns, but egg-stealing does not appear to be one of them.

On the subject of egg-stealing, it might be mentioned that one of the species of Darwin's Finches (*Geospiza difficilis*) attacks seabird eggs on Wenman

Island. Here any exposed egg of a frigatebird, Swallow-tailed Gull, or Brown Noddy (*Anous stolidus*) is immediately surrounded by several of these finches which peck at the egg for several minutes before losing interest. No eggs were actually seen to be broken, but any cracked or hatching eggs would probably be destroyed. This same finch on Wenman Island has been shown by Bowman and Billeb (Living Bird 4:29, 1965) to peck at the wing feathers of boobies in order to feed on blood. On Plaza Island (off Santa Cruz) I have seen another species of finch (*Geospiza fuliginosa*) feeding on blood. There is here a large colony of sea lions (*Zalophus californianus*), and dur-

ing the period when the young are born these finches are frequently seen pecking at the afterbirths and drinking at the pools of lost blood. As suggested by Bowman and Billeb (*op. cit.*) the Wenman finch may well have acquired a taste for blood by eating the numerous hippoboscids flies on the boobies. There is, however, a large colony of fur seals (*Arctocephalus australis*) on Wenman and these finches could conceivably have first "tasted" blood from the afterbirths of these mammals and later taken to eating blood-gorged flies.

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INTERSPECIFIC TERRITORIALITY AMONG HUMMINGBIRD SPECIES

MARTIN L. CODY

Department of Zoology
University of California
Los Angeles, California 90024

North American species of hummingbirds are typically separated by habitat during their breeding seasons (numerous references), although Anna's and Allen's Hummingbirds have been found to breed in adjacent territories in California (Legg and Pitelka 1956). In contrast, the wintering ranges and habitats of many of the species overlap. In this situation and during migration hummingbird species come into contact with one another. For instance, in southern California Stott (1942) reported a probable five species all feeding in one eucalyptus tree. Where several species have thus been found together, interspecific territoriality, or at least strong interspecific aggression, has been observed quite commonly (see fig. 1, and the review in Orians and Wilson 1964). This note reports additional instances of interspecific territoriality among hummingbirds. The species concerned are migratory Allen's, Calliope, Broad-tailed, and Rufous Humming-

birds, and resident Costa's Hummingbirds. The observations were made in the Mohave Desert near Amboy, California, in March and April 1967. Figure 1 summarizes this and previous information, and further details are given below.

The following observations were made from 22 to 26 March and from 22 to 25 April 1967. The first of two study sites was a narrow arroyo at the foot of the Granite Mountains where, in March, the territories of 15 individuals of three species (10 ♂ Rufous, 1 ♂ Costa's, 1 ♂ Allen's, and 3 ♀ Rufous or Allen's Hummingbirds) were plotted in an area 100 × 50 feet. These territories were nonoverlapping and vigorously defended (18 aggressive encounters in 15 minutes) against adjacent territory holders, regardless of species identity. All hummingbirds fed exclusively on one plant species, namely bladderpod (*Isomeris arborea*), and defended on the average three to four bushes per individual. The location and ownership of these territories were constant over the four-day period. On the second visit, 13 territories were plotted in this same area (3 ♂ Rufous, 2 imm. ♂ Rufous, 2 ♀ Costa's, and 6 ♀ Rufous or Allen's Hummingbirds), which were again mutually exclusive and again centered around bladderpod, the only flowering species.

The second site was a 10-acre flat desert wash in which the commonest plant species were *Larrea*, *Ephedra*, and *Haplopappus*. Bladderpods occurred sparsely over about six acres of this area, but were dense over a two-acre patch in which catclaw acacias (*Acacia greggii*) and boxthorn (*Lycium*) were also prominent. Costa's Hummingbird occupied the entire eight acres with bladderpods, but interspersed with this bird in the acacia-boxthorn patch were Rufous, Calliope, and Broad-tailed Hummingbirds. In March 3 ♂ and 2 ♀ Costa's and 3 ♂ and 2 ♀ Rufous Hummingbirds were recorded. In April 4 ♂ and 3 ♀ Costa's, 2 ♂ Calliope, 1 ♂ Broad-tailed, and 4 ♂ (1 imm.) and 3 ♀ Rufous Hummingbirds were found. All of these individuals held territories except the Broad-tailed Hummingbird, which was attacked and pursued by territory-holding Rufous and Costa's Hummingbirds as it attempted to feed on the bladderpods. Again territories were nonoverlapping intra- and interspecifically and also between sexes. Territories averaged 10 times larger than at the first site, but the number of food plants per territory was about the same. In many hours of observation only one instance of feeding on plants other than bladderpod by these species was noted (a ♂ Costa's on and around *Ephedra*, perhaps picking off insects). Feeding heights and behavior were measured for three of the species, but no interspecific differences were found.

The Costa's Hummingbirds certainly bred in the second site and possibly also in the first. One nest with two eggs was found in March, but, perhaps sig-

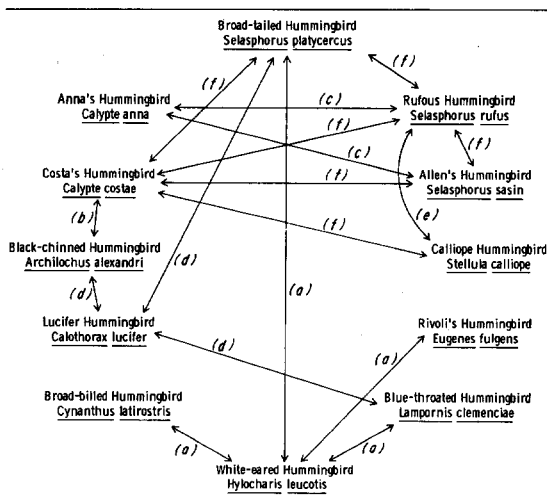


FIGURE 1. Records of interspecific territoriality among North American hummingbirds. Figure references are: (a) Moore, 1939; (b) Bené, 1942; (c) Pitelka, 1951 and Legg and Pitelka, 1956; (d) Fox, 1954; (e) Armitage, 1955; (f) this report.