HEALY, W. M. 1992. Behavior. Pages 46–65 *in* The Wild Turkey: biology and management (J. G. Dickson, Ed.). Stackpole Books, Mechanicsburg, Pennsylvania.

LARSSON, K., H. TEGELSTROM, AND P. FORSLUND. 1995. Intraspecific nest parasitism and adoption of young in the Barnacle Goose: effects on survival and reproductive performance. Animal Behavior 50:1349–1360.

MARTIN, K. M. 1989. Pairing and adoption of offspring by replacement male Willow Ptarmigan: behavior, costs, and consequences. Animal Behavior 37: 569–578.

MILLS, T. R. AND M. A. RUMBLE. 1991. Poult adoption in Merriam's Wild Turkeys. Wilson Bulletin 103: 137–138.

PIEROTTI, R. AND E. C. MURPHY. 1987. Intergenerational conflicts in gulls. Animal Behavior 35:435–444.

SAINO, N., M. FASOLA, AND E. CROCICCHIA. 1994. Adoption behavior in Little and Common terns (Aves: Sternidae): chick benefits and parent's fitness costs. Ethology 97:294–309.

SCANES, C. G., P. J. SHARP, S. HARVEY, P. M. M. GODDEN, A. CHADWICK, AND W. S. NEWCOMER. 1979. Variations in plasma prolactin, thyroid hormones, gonadal steroids and growth hormone in turkeys during the induction of egg laying and molt by different photoperiods. British Poultry Science 20: 143–148.

SHARP, P. J., A. DAWSON, AND R. W. LEA. 1998. Control of luteinizing hormone and prolactin secretion in birds. Comparative Biochemistry and Physiology C: Pharmacology, Toxicology and Endocrinology 119:275–282.

YOUNGREN, O. M., M. E. ELHALAWANI, J. L. SILSBY, AND R. E. PHILLIPS. 1993. Effect of reproductive condition on luteinizing hormone and prolactin release induced by electrical stimulation of the turkey hypothalamus. General and Comparative Endocrinology 89:220–228.

The Wilson Journal of Ornithology 118(2):261–263, 2006

Predation by a Blue-crowned Motmot (*Momotus momota*) on a Hummingbird

J. Mauricio García-C.[1,2] and Rakan A. Zahawi[1]

ABSTRACT.—We describe predation of a Green-crowned Brilliant (*Heliodoxa jacula*) by a Blue-crowned Motmot (*Momotus momota*) in southern Costa Rica. We did not witness the capture of the hummingbird, but did observe the motmot swallow the prey whole. Although the diet of the Blue-crowned Motmot is highly variable and can include birds, this is the first report of predation on an adult hummingbird. *Received 27 January 2005, accepted 4 December 2005.*

Members of the family Momotidae have been observed eating a wide range of fruits, arthropods, and small vertebrates (Meyer de Schauensee 1964, Ridgely and Gwynne 1989, Stiles and Skutch 1989, Karr et al. 1990, Remsen et al. 1993). Although Remsen et al. (1993) indicate that arthropods, supplemented by fruits, are the more important component of motmot diets, vertebrates have also been found in the stomachs of some Momotidae species (Wetmore 1968, Stiles and Skutch 1989). Specifically, motmots have been observed eating poison dart frogs (Master 1999), snakes (Stiles and Skutch 1989), mice (Delgado-V. and Brooks 2003), and bats (Chacón-Madrigal and Barrantes 2004).

The Blue-crowned Motmot (*Momotus momota*), found throughout the lowlands and middle elevations (to ~1,500 m) of Costa Rica (Stiles and Skutch 1989), forages on large spiders, earthworms, insects, nestling birds, and small snakes and lizards (Stiles and Skutch 1989, Henderson 2002). There are, however, no known accounts of motmots eating adult birds. Here, we describe predation on an adult hummingbird by a Blue-crowned Motmot.

The incident occurred on the morning of 27 February 2004 at the Las Cruces Biological Field Station (8° 47′ N, 82° 57′ W) of the Organization for Tropical Studies in San Vito, Coto Brus, Puntarenas, Costa Rica (elevation

[1] Organization for Tropical Studies, P.O. Box 676-2050, San Pedro, San José, Costa Rica.

[2] Corresponding author; e-mail: mgarcia@ots.ac.cr

= 1,100 m, annual rainfall = 3,988 mm). (For a full description of the site, see Mintken and Gunther 1991 and Spencer 1991). At 07:30 CST, we observed a motmot—perched on the cement stairs in front of a station building—with a Green-crowned Brilliant (*Heliodoxa jacula*) in its bill. The motmot held the hummingbird by its body and repeatedly beat it against the cement. The hummingbird appeared freshly dead and was easily identifiable. As we did not witness the capture, the hummingbird may have been dead or injured prior to capture, although there are no accounts of motmots eating prey they did not kill.

At 07:35, the motmot flew to the ground ~7 m away and continued to beat the hummingbird against the ground. At 07:40, it moved under a building and beat the hummingbird against a rock for almost 1 min. As a result, most of the hummingbird's feathers were lost and its bill was broken. At 07:43, the motmot moved out from under the building to a grassy area with some tree cover and continued to beat the hummingbird against the ground. At this point, the motmot was 7 m from its mate, which was perched on a tree branch 2 m high and present for the entire period; it did not make any attempt to move closer to the motmot with the hummingbird. The motmot never used its feet to manipulate or hold the prey; the entire time it held, turned, and manipulated the hummingbird only with its bill.

At 07:54, the motmot attempted, but failed, to swallow the hummingbird whole. The motmot threw the hummingbird on the ground, picked it up again with its bill, and continued to beat it against the ground. At 07:56, the motmot again tried to swallow the hummingbird and was successful. It held the hummingbird by the back and swallowed it back end first. The motmot then flew to a tree branch and perched near its mate.

Reported sources of adult hummingbird mortality include arthropods (e.g., Butler 1949, Hildebrand 1949, Carignan 1988, Graham 1997), frogs (Monroe 1957), and several avian taxa: small raptors (e.g., Lowery 1938, Mayr 1966, Stiles 1978), Great Shrike Tyrants (*Agriornis livida*; Martinez del Rio 1992), Baltimore Orioles (*Icterus galbula*; Wright 1962), and Dusky-green Oropendolas (*Psarocolius atrouirens*; Graves 1978). Ours is the first report of a Blue-crowned Motmot eating an adult bird of any kind. Our observation is best explained as an opportunistic event and broadens the range of predators that kill and eat hummingbirds.

ACKNOWLEDGMENTS

We would like to thank K. G. Murray for helpful comments on earlier drafts of the manuscript. T. L. Master, J. V. Remsen, and an anonymous reviewer made invaluable comments. The Organization for Tropical Studies provided logistical support at Las Cruces Biological Station.

LITERATURE CITED

BUTLER, C. 1949. Hummingbird killed by praying mantis. Auk 66:286.

CARIGNAN, J. M. 1988. Predation on Rufous Hummingbird by praying mantid. Texas Journal of Science 40:111.

CHACÓN-MADRIGAL, G. AND G. BARRANTES. 2004. Blue-crowned Motmot (*Momotus momota*) predation on a long-tongued bat (Glossophaginae). Wilson Bulletin 116:108–110.

DELGADO-V., C. A. AND D. M. BROOKS. 2003. Unusual vertebrate prey taken by Neotropical birds. Ornitología Colombiana 1:63–65.

GRAHAM, D. L. 1997. Spider webs and windows as potentially important sources of hummingbird mortality. Journal of Field Ornithology 68:98–101.

GRAVES, G. R. 1978. Predation on hummingbird by oropendola. Condor 80:251.

HENDERSON, C. L. 2002. Field guide to the wildlife of Costa Rica. University of Texas Press, Austin.

HILDEBRAND, E. M. 1949. Hummingbird captured by praying mantis. Auk 66:286.

KARR, J. R., S. K. ROBINSON, J. G. BLAKE, AND R. O. BIERREGAARD, JR. 1990. Birds of four Neotropical forests. Pages 237–269 *in* Four Neotropical rainforests (A. H. Gentry, Ed.). Yale University Press, New Haven, Connecticut.

LOWERY, G. H., JR. 1938. Hummingbird in a Pigeon Hawk's stomach. Auk 55:280.

MARTINEZ DEL RIO, C. 1992. Great Shrike-Tyrant predation on a Green-backed Firecrown. Wilson Bulletin 104:368–369.

MASTER, T. 1999. Predation by Rufous Motmot on black-and-green poison dart frog. Wilson Bulletin 111:439–440.

MAYR, E. 1966. Hummingbird caught by Sparrow Hawk. Auk 83:644.

MEYER DE SCHAUENSEE, R. 1964. The birds of Colombia, and adjacent areas of South and Central America. Livingston Publishers, Narberth, Pennsylvania.

MINTKEN, J. AND B. GUNTHER. 1991. The Wilson Botanical Garden. Principes 35:124–126.

MONROE, M. 1957. Hummingbird killed by frog. Condor 59:69.

REMSEN, J. V., M. A. HYDE, AND A. CHAPMAN. 1993. The diets of Neotropical trogons, motmots, barbets and toucans. Condor 95:178–192.

RIDGELY, R. S. AND J. A. GWYNNE, JR. 1989. A guide to the birds of Panama with Costa Rica, Nicaragua, and Honduras, 2nd ed. Princeton University Press, Princeton, New Jersey.

SPENCER, D. 1991. Tropical temptation in Costa Rica. Cornell Plantations 46:12–15.

STILES, F. G. 1978. Possible specialization for hummingbird-hunting in the Tiny Hawk. Auk 95:550–553.

STILES, F. G. AND A. F. SKUTCH. 1989. A guide to the birds of Costa Rica. Cornell University Press, Ithaca, New York.

WETMORE, A. 1968. The birds of the Republic of Panama, part 2. Columbidae (pigeons) to Picidae (woodpeckers). Smithsonian Institution Press, Washington, D.C.

WRIGHT, B. S. 1962. Baltimore Oriole kills hummingbird. Auk 79:112.