WHATEVER HAPPENED TO THE FLOREANA MOCKINGBIRD?

by
Robert L. Curry
Division of Biological Sciences, University of Michigan, Natural Sciences Building,
Ann Arbor, MI 48109, USA

When Charles Darwin visited the Galápagos Islands in 1835 during the voyage of the Beagle, the Floreana (Charles Island) Mockingbird was still common. Less than sixty years later, scientists were unable to find a single mockingbird on Floreana; the species had become extinct on its principal range. Fortunately, the species, *Nesomimus trifasciatus*, survives today on two small islets, Champion and Gardner-by-Floreana, near the coast of Floreana. The mystery of the disappearance of the species from Floreana itself, however, has never need resolved. Whatever happened to the Floreana mockingbird?

It is certain that *N. trifasciatus* once inhabited Floreana, although a few investigators have expressed doubt that mockingbirds ever actually lived there. Swarth (1931) noted that Darwin's two specimens of *N. trifasciatus* did not necessarily come from Floreana; members of the Beagle crew could have collected these birds when they visited Gardner-by-Floreana. Thornton (1971) further speculated that the species may never have inhabited Floreana. He noted that dogs and cats, which he supposed were the exterminators of the species on Floreana, are also present on other islands where mockingbirds have survived, implying that it isn't likely that these introduced animals would have exterminated one species of mockingbird but not the others.

N. trifasciatus, though, was common on Floreana when Porter visited the island in 1813 while patrolling the archipelago in the U.S. Frigate *Essex* (Porter, 1815). It seems certain that even if Darwin did not collect mockingbirds on Floreana, he did *see* mockingbirds there in 1835. In the Zoology of the Voyage of the Beagle, Darwin (1941) listed Charles Island (Floreana) as the habitat of the species and noted that mockingbirds "were attracted by the houses and cleared ground of the colonists". At the time of Darwin's visit, Floreana was the only colonized island in the archipelago, so his comments must have applied to *N. trifasciatus* on that island. Recent discovery of mockingbird fossils by Steadman (in press) has since proved that mockingbirds were once abundant on Floreana.

The exact date of the extinction of *N. trifasciatus* on Floreana remains uncertain. The last specimen from the island was collected by Kinberg, the surgeon of the *Eugenie* which stopped at Floreana in 1852 (Sundevall, 1871). Habel was the last scientist to see resident mockingbirds on Floreana; he described the song and habits of *N. trifasciatus* there during his expedition in 1868 (Salvin, 1876). Scientists of the Albatross expeditions searched Floreana in 1888 and 1891, but found no *N. trifasciatus*; the species had become extinct sometime between 1868 and 1888. Habel implied that mockingbirds were common on Floreana in 1868, so the process of extinction must have required some time after this date. I suspect that the last mockingbirds disappeared from Floreana about 1880.

The species, though, did not disappear completely; *N. trifasciatus* can still be found today on the little islands of Champion and Gardner-by-Floreana. There was a brief period before the turn of the century when it was thought that the entire species had vanished. This ended when members of the Harris expedition were pleasantly surprised to find living *N. trifasciatus* on Garner-by-Floreana in 1897. Subsequent exploration by the Academy expedition in 1905 revealed the species presence on Champion as well. The same expedition, though, almost eliminated that population; Gifford (1919) thought that after collecting eleven specimens on Champion, "two more days of hunting would have made the species extinct there".

I have been studying Galápagos mockingbirds throughout the archipelago sicne 1981, in collaboration with P.R. Grant. We have monitored the Champion population since 1980, and in 1984, I made comparative observations among the four species of mockingbird that suggest an explanation for the extinction of *N. trifasciatus* from Floreana. Before I present my hypothesis, though, I will discuss the alternative explanations that have been proposed.

Several theories for the extinction of the Floreana mockingbirds have been suggested. Swarth (1931), Thornton (1971) and Harris (1973) thought that dogs or cats must have been involved. Rothschold and Hartert (1899) believed that "human influence" in the form of hunting explained the extinction. These hypotheses fail to explain why humans or introduced predators have not caused the extinction of other

mockingbird species on Isabela, Santa Cruz, and San Cristóbal, which have been inhabited nearly as long as Floreana has been.

Steadman (unpubl. Ph.D. thesis) proposed a more detailed model for the extinction of mockingbirds on Floreana. He suggested that the disappearance of Opuntia led to the extinction of *N. trifasciatus* on Floreana. *Opuntia* has become very rare on Floreana, probably because of destruction by goats, though rats and mice can also kill cactus trees by burrowing through the trunks. He suggests that *N. trifasciatus* is more dependent on Opuntia cactus than are the other three mockingbird species in the Galapagos; this idea is based on Steadman's observations that mockingbirds on Champion seem to feed and nest exclusively in the cactus trees that are still common there. The extinction of *N. trifasciatus* on Floreana, then, may have been caused by the loss of *Opuntia* plants that are essential to the nesting and feeding of the resident mockingbirds.

I believe this is an inadequate explanation for the extinction of *N. trifasciatus* on Floreana for two reasons. First, *N. trifasciatus* is not as dependent on *Opuntia* as Steadman has implied. On Champion I have found successful nests of this mockingbird species situated in trees other than *Opuntia*, including *Parkinsonia*, *Cordia,* and *Croton*. On Gardner-by-Floreana, *Opuntia* is less common and the trees smaller, than on Champion, and here I found more nests in *Croton* and *Cordia*. On both islets mockingbirds spend considerable time foraging on the ground and in vegetation other than Opuntia. It may be true that Opuntia is used extensively by *N. trifasciatus* when it is available, but my observations suggest that this mockingbird species could survive without it. Secondly, *Opuntia* has also become rare on San Cristóbal and Española, but *N. melanotis* and *N. macdonaldi*, the resident mockingbirds on these two islands respectively, are still common. The feeding and breeding ecology of *N. trifasciatus* is not different enough from these two species for the rarity of *Opuntia* to account for the disappearance of the Floreana population.

I suggest that the distribution of rats in the archipelago provides the key to the extinction of the Floreana mockingbird. My studies on San Cristóbal in 1984 indicated that introduced black rats (*Rattus rattus*) can have a large detrimental impact on mockingbird nest success. Clutches in at least 31% of the nests I studies at Cerro Brujo on San Cristóbal were destroyed by rats, and on one occasion I found a rat 10 meters up in a tree containing a mockingbird nest. These observations support the assertion of Venables (1940) that "the most probable cause of the high nest destruction (on San Cristóbal) … is the introduced black rat." I suspect that the impact of cat predation, in contrast, is small. I found feathers in only 8.1% of 136 cat scat that I examined on San Cristóbal; most of these were probably the remains of the more common finches rather than of mockingbirds killed by cats. None of the 36 adult mockingbirds I banded and studied at Cerro Brujo disappeared during the six weeks I worked there, though cats were common in the study area. Dogs are less numerous than cats on the islands, and they are even less likely to be potent predators of mockingbirds.

Why would rats account for the extinction of *N. trifasciatus* on Floreana if they have not led to the disappearance of other mockingbird populations? Other mockingbird species now survive in the presence of black rats on Isabela, Santa Cruz and San Cristóbal. It is important to note that all of these islands supported native rat populations prior to the introduction of black rats (Eckhardt, 1972; Steadman and Ray, 1982). As suggested by Clark (1981), the impact of introduced black rats on endemic organisms, including mockingbirds, is likely to have been more severe on those islands that did not originally support native rats. Floreana, where mockingbirds *did* disappear, was never inhabited by native rats. I believe that the extinction of the Floreana mockingbird was caused by the introduction of black rats to an island that did not previously support a native rat population. I hypothesize that the mockingbirds there, having never had the chance to adapt slowly to the presence of native rats, succumbed quickly after black rats were introduced to the island. Introduced nest predators seem to have quickly decimated native bird populations on other islands in the Pacific area where predators were previously absent (e.g. Jehl and Parkes 1982). Introduction of black rats to Floreana, and the beginning of the mockingbirds' disappearance, probably occurred at the time of human settlement of the island in 1832, if not before.

The only mockingbird to have gone extinct on an island where black rats replaced native rats was the population of *N. parvulus* on Baltra, which vanished during or after the Second World War. However this was probably caused by persecution and, more importantly, habitat destruction by humans during the occupation of the island by soldiers during the war (Thornton, 1971). On every other island where black rats replaced native rats, the mockingbirds have survived. The only major island where mockingbirds are absent, other than Floreana, is Pinzón. In agreement with my hypothesis, there is no evidence that this island ever had a native

rat population (Eckhardt, 1972). Black rats are now abundant on Pinzón, where they have killed virtually every hatchling tortoise for half a century so that population recruitment is now dependent on captive breeding at the Darwin Station.

I suspect that mockingbirds once lived on Pinzón in the absence of native rats, but that they also became extinct following the introduction of black rats; extinction could easily have taken place before the first scientific visits to this island were made in the late 1800s (Darwin and the Beagle did not stop at Pinzón). No fossils of mockingbirds have yet been found on Pinzón, but I predict that they will be discovered eventually.

This hypothesis, if correct, has two unfortunate implications for other mockingbird populations in the Galápagos. First, it implies that reintroduction of *N. trifasciatus* to Floreana from either Champion of Gardner-by-Floreana would have little chance of success unless black rats were controlled or eradicated on the larger island. Removal of black rats from Floreana would be very difficult, if not impossible. Secondly, if my ideas are valid, mockingbird, along with other endemic animals, would have little chance of survival if black rats are ever introduced to islands that have never supported native rate populations. Such islands include all the northern islands (Darwin, Wolf, Pinta, Marchena, and Genovesa) inhabited by *N. parvulus* as well as Española and Garner-by-Española, where *N. macdonaldi* is endemic – and also both Champion and Gardner-by-Floreana where the remaining *N. trifasciatus* live. I am confident that the continued dedicated conservation efforts of the Galápagos National Park Service and the Charles Darwin Research Station will ensure that rats are ever introduced to these islands, and that the mockingbirds and other endemic animals will survive. That constant vigilance is necessary was demonstrated by the threat of rats landing on Pinta when a cargo ship was recently stranded there (Noticias 42).

I thank P.R. Grant for advice and support throughout my studies in Galápagos and the World Wildlife Fund—US for funding my research in 1984. I am also indebted to R. Brubaker, B. Coffman, L. Hamilton, M. Iturralde, and S. Webb who assisted with the mockingbird fieldwork.

REFERENCES

Clark, D. A. (1981) Foraging patterns of black rats across a desert-montane forest gradient in the Galápagos Islands. Biotropica 13: 182-184.

Eckhardt, T. C. (1972) Introduced plants and animals in the Galapagos islands. Biosdence 22: 585-590.

Gifford, E. W. (1919) Field notes on the land birds of the Galapagos Islands and of Cocos Island, Costa Rica. Proc. Calif. Acad. Sci. 2 (ser. 4): 189-258.

Harris, M. P. (1973) The Galápagos avifauna. Condor 75: 265-278.

Jehl, J. R., Jr., and K. C. Parkes (1982) The status of the avifauna of the Revillagigedos Islands, Mexico. Wilson Bull. 94: 1-19.

Porter, D. K. (1815) Journal of a cruise made to the Pacific Ocean by Captain David Porter in the United States Frigate Essex in the years 1812, 1813, and 1814. 2 vols. Bradford & Inskeep, Philadelphia.

Rothschild, W., and E. Hartert (1899) A review of the ornithology of the Galapagos Islands, with notes on the Webster-Harris expedition. Novitates Zool. 6: 85-205.

Salvin, O. (1876) On the avifauna of the Galapagos Archipelago. Trans. Zool. Soc Lond. 9: 447-510.

Steadman, D. W. in press. Holocene vertebrate fossils from Isla Floreana, Galápagos. Smithson. Contrib. Zool.

Steadman, D. W., and C. E. Ray (1982) The relationships of Magaoryzomys curioi, an extinct cricetine rodent (Muroidea: Muridae) from the Galápagos Islands, Eduador. Smithson. Contrib. Paleobio. 51: 1-23.

Swarth, H. S. (1931) The avifauna of the Galápagos Islands. Occas. Pap. Calif. Acad. Sci. 18: 5-299.

Thornton, I. 1971. Darwin's Islands, a natural history of the Galapagos. Natural History Press, Garden City, New York.

Venables, L. S. V. 1940. Nesting behaviour of the Galapagos mockingbird. Ibis 82: 629-639.