become divorced from a physical, i.e., territorial, setting and may serve to determine dominance for access to another resource, e.g., females. As both territoriality and dominance are apparently served by this behavior, it may be widespread among birds.

I made my observations while conducting research supported by an award from the Frank M. Chapman Memorial Fund of the American Museum of Natural History, by a Grant-in-Aid from Sigma Xi, and by the Department of Biology, Idaho State University. I thank C. H. Trost, D. W. Sparling, L. B. Best, and an anonymous reviewer for comments on this note.

LITERATURE CITED

CAIRNS, W. E. 1982. Biology and behavior of breeding Piping Plovers. Wilson Bull. 94:531–545.

HJORTH, I. 1970. Reproductive behaviour in Tetraonidae. Viltrevy 7:183–596.

NETHERSOLE-THOMPSON, C., AND D. NETHERSOLE-THOMPSON. 1939. Some observations on the sexual life, display and breeding of the Red Grouse. Br. Birds 32:247–254.

PHILLIPS, R. E. 1972. Sexual and agonistic behaviour in the Killdeer (*Charadrius vociferus*). Anim. Behav. 20: 1–9.

POTTER, P. E. 1972. Territorial behavior in Savannah Sparrows in southeastern Michigan. Wilson Bull. 84: 48–59.

WATSON, A., AND D. JENKINS. 1964. Notes on the behaviour of the Red Grouse. Br. Birds 57:137–170.

WYNNE-EDWARDS, V. C. 1962. Animal dispersion in relation to social behaviour. Oliver and Boyd, Edinburgh.

Department of Biology, Idaho State University, Pocatello, Idaho 83209. Present address: P.O. Box 642, Shoshone, Idaho 83352. Received 3 September 1982. Final acceptance 23 June 1983.

Condor 85:497–499

A FIRST RECORD OF THE NEST AND CHICKS OF THE SMALL KAUAI THRUSH

CAMERON B. KEPLER

AND

ANGELA K. KEPLER

The Small Kauai Thrush, or Puaiohi (*Phaeornis palmeri*), is one of two endemic thrushes in the Hawaiian archipelago. Restricted to the island of Kauai, it inhabits wet montane forest dominated by ohia (*Metrosideros collina,* Myrtaceae), Hawaii's most abundant forest tree. The Puaiohi has always been considered rare (Rothschild 1893–1900, Perkins 1903), and now occurs only in a few local areas above 1,160 m in or adjacent to the Alakai "Swamp," a very wet montane forest on Kauai's deeply-dissected central plateau. It is listed as an endangered species by the U.S. Fish and Wildlife Service (U.S.F.W.S. 1980) and the International Council for Bird Protection (King 1981). The population was estimated at about 230 birds in the early 1970s (J. Sincock, pers. comm.).

The nests of only one-half of Hawaii's endemic passerine species have been described (Scott et al. 1980). For the thrushes, a completed, active nest of the relatively common Hawaiian Thrush, or Omao (*Phaeornis obscurus*), was not discovered until 1968 on the island of Hawaii (Berger 1969). Nests of now-extinct subspecies of the Omao on Lanai and Oahu were never found, and only two poorly described cup nests of the endangered Molokai race were ever located (Perkins 1903). Nothing seems to have been written on the nesting of wild Puaiohi, although three eggs laid by a captive female in the Honolulu Zoo were described by Berger (1972).

From 24 April to 25 May 1981 the U.S.F.W.S. conducted a survey of the forest birds of the Alakai, Kauai, as the final part of a six-year state-wide program to determine the distribution, abundance, and habitat correlates of all Hawaii's forest birds (see Scott et al. 1981). We were part of a team that included six ornithologists and four botanists. We camped throughout the Alakai during the survey period, censusing birds in the mornings and exploring additional areas each afternoon. At 17:00 on 12 May 1981 we discovered the first known Puaiohi nest at 1,335 m elevation on a streamside cliff in the eastern Alakai. It was situated in a cavity in the bank 1.3 m above ground. The earth bank was about 6 m high, well vegetated, and about 12 m from the stream (Fig. 1). The muddy ground at the base of the bank was about 2 m above normal stream level, and there was no evidence from the intervening vegetation that the stream had recently extended to the bank. The cavity in which the nest was placed was 23 cm deep, 35 cm wide by 23 cm high at the entrance, and sloped slightly downwards. The back of the cavity was covered by a growth of large thalloid liverworts resembling *Marchantia* sp. Cliff protrusions overhung the cavity, which was surrounded to a distance of nearly 1 m by a dense mat of *Sadleria squarrosa unisora,* an endemic Kauai fern characteristic of wet banks. Tree ferns (*Cibotium glaucum*) and other nearby native shrubs (*Cyanea hirtella, Coprosma* sp.) afforded protection and shade for the nest site: they were also used as perches by adult Puaiohi when the birds approached the nest.

The nest, a woven cup placed at the cavity mouth, was constructed primarily of bryophytes and miniscule ferns, interwoven with small lengths of fine grass. The outer diameter was 11.6 × 10.8 cm, the inner diameter 9.0 × 7.2 cm, and the inner depth 6.0 cm. An untidy mass of nest material trailed about 6 to 8 cm out of the cavity mouth from the base of the nest. A portion of this apron of mosses, leafy liverworts, and ferns was collected, and included *Dicranum spirophyllum, Campylopus* sp., *Bazzania* sp., *Lepidozia* sp., *Adenophorus tripinnatifidus, A. hymenophylloides,* and three or four other unidentified species.

Two almost fully feathered nestlings with downy heads snugly occupied the nest (Fig. 2). Sooty gray pin feathers covered their heads, necks, throats, and tails. Most conspicuous were their emergent sooty-gray contour feathers, tipped with light brown spots (about 1 mm in diameter), which covered their backs, breasts, and flanks. Soft part colors were: iris, dark brown; eye-ring, tan; bill, yellow; inside of mouth, bright orange; and legs, pink. Both chicks appeared healthy and well-fed, with full (bulging) crops

FIGURE 1. Earth bank with Puaiohi nest cavity (arrow) surrounded by ferns, eastern Alakai, Kauai, 12 May 1981.

and no visible pox lesions. They remained quietly crouched in the nest throughout our nest inspection (until 17:15), and again during a visit at 15:40 on 13 May. We were unable to return to the nest after 13 May.

Upon our approach to the nest on two visits the adults flew quickly from branch to branch within 5 to 10 m of us. Upon alighting they assumed an erect, stiff, sleek posture, and uttered short, single buzzing notes in an excited manner about every 20 s. The scolding tapered off within 5 to 10 min, and the birds moved out of the streambed and disappeared, usually over the top of the cliff where the nest was placed. If we were farther than 10 to 15 m from the nest, the adults foraged nearby. We never saw them feed their chicks, although we noted them carrying a millipede (captured from the ground) and a pukiawe (*Styphelia tameiameiae*) berry to the nest bank.

During the Kauai Forest Bird Survey, Puaiohi were detected 13 times (representing 7 birds) during 943 8-min counts on 140 stations placed along 18 km of transects. All birds were in deep gorges with flowing water, or in smaller, wet, shaded streambeds. Steep embankments and moving water were consistent features of Puaiohi home ranges; this has also been noted by J. Sincock (pers. comm.) during more than 700 field days in the Alakai. If this species prefers to nest in banks, this may explain why most Puaiohi are encountered near streams. Puaiohi forage almost exclusively in dense forest understory (Perkins 1903), which may also help explain their limited distribution, because much of the low shrub layer is intact in steep terrain, whereas more level areas are often browsed or rooted up by pigs, and as a result are more open.

Pratt (1982) argued that the Hawaiian thrushes are inseparable at the generic level from solitaires (*Myadestes*),

FIGURE 2. Two Puaiohi nestlings crouching in cup nest, 12 May 1981.

and that Townsend's Solitaire (*M. townsendi*) is their closest living relative. Both the structure and location of the Puaiohi nest were similar to nests of *M. townsendi*; indeed, the apron of material trailing from the nest is standard for the species (Bent 1949). The Puaiohi nest thus provides additional support linking *Phaeornis* and *Myadestes*.

Nesting in bank cavities, not previously reported in any Hawaiian passerine, is an excellent adaptation to life in the Alakai, where annual rainfall ranges from 750 to 1,150 cm, depending on location. Despite daily showers, the nest was dry, protected from above by the overhanging cliff and thick vegetation, and from frontal winds by its position near the base of a cliff facing the opposite bank in a narrow (less than 25 m) gulch. Such sites, numerous on Kauai's plateau, offer protection from the cool and persistent wind-driven rain and fog. Although the congeneric Omao on Hawaii builds nests on branches, five of seven recently discovered nests were placed in tree hollows or on tree platforms (van Riper and Scott 1979), suggesting that thrushes in Hawaii prefer such sites, and that cavity-nesting is typical of this endemic genus.

We thank Liebert Landgraf, Ralph Daehler, and Tom Telfer of the Hawaii Division of Forestry and Wildlife for permission to conduct our survey and to camp within the Alakai Wilderness Preserve, and John Sincock for his help and advice throughout our work in this remote area. Paul Higashino kindly identified the bryophytes. Andrew J. Berger, J. Engbring, Charles van Riper, III, J. Michael Scott, and John L. Sincock made many helpful comments on the manuscript.

LITERATURE CITED

BENT, A. C. 1949. Life histories of North American thrushes, kinglets, and their allies, U.S. Natl. Mus. Bull. 196:1–452.

BERGER, A. J. 1969. Discovery of the nest of the Hawaiian Thrush. Living Bird 8:243–250.

BERGER, A. J. 1972. Hawaiian birdlife. Univ. Press of Hawaii, Honolulu.

KING, W. B. 1981. Endangered birds of the world: the ICBP bird red data book. Smithsonian Institution Press, Washington, DC.

PERKINS, R. C. L. 1903. Vertebrata (Aves), p. 368–465. *In* D. Sharp [ed.], Fauna Hawaiiensis. Vol. 1. University Press, Cambridge.

PRATT, H. D. 1982. Relationships and speciation of the Hawaiian thrushes. Living Bird 19:73–90.

ROTHSCHILD, W. 1893–1900. The avifauna of Laysan and the neighbouring islands. R. H. Porter, London.

SCOTT, J. M., J. L. SINCOCK, AND A. J. BERGER. 1980. Records of nests, eggs, nestlings, and cavity nesting

of endemic passerine birds in Hawaii. Elepaio 40: 163–168.

SCOTT, J. M., J. D. JACOBI, AND F. L. RAMSEY. 1981. Avian surveys of large geographical areas: a systematic approach. Wildlife Soc. Bull. 9:190–200.

U.S. FISH AND WILDLIFE SERVICE. 1980. Republication of lists of endangered and threatened species and correction of technical errors in final rules. Federal Register 45 (99):33768–33781.

VAN RIPER, C., III, AND J. M. SCOTT. 1979. Observations on distribution, diet, and breeding of the Hawaiian Thrush. Condor 81:65–71.

U.S. Fish and Wildlife Service, Patuxent Wildlife Research Center, Maui Field Station, 248 Kaweo Place, Kula, Hawaii 96790. Received 18 September 1982. Final acceptance 18 February 1983.

Condor 85:499

NEST OF THE RED-STAINED WOODPECKER (*VENILIORNIS AFFINIS*) FROM SOUTHEASTERN PERU

THOMAS BATES SMITH

Despite the extensive range of the Red-stained Woodpecker (*Veniliornis affinis*) in the Neotropics, nothing seems to have been reported about its nesting (Short, Woodpeckers of the World, Delaware Museum of Natural History, monograph series, no. 4, 1982). I describe here a nest with two young discovered on the Tambopata Reserve, Peru.

The 5,600-ha Tambopata Reserve is located 30 km southwest of Puerto Maldonado, Madre de Dios (12°50′S and 69°17′W). According to the Holdridge classification system, the Reserve lies entirely within the humid tropical forest zone (Tosi, Inst. Interam. Cien. Agric., Biol. Tec., 5:vi, 1960), and is dominated by the flood plains of the Tambopata and La Torre rivers.

The living nest tree (undetermined species) was first seen on 30 May 1982. It bordered a well-traveled foot trail in the reserve and was approximately 10 m in height, with a dbh of 23 cm. The canopy in the vicinity of the tree was continuous and estimated at 25–35 m in height. The region immediately surrounding the nest tree appeared to be undisturbed virgin forest with sparse undergrowth.

The nest cavity was 270 cm from the ground and had a circular opening 4 cm in diameter. The cavity depth was not measured but I estimated it to be 15 cm deep.

Using a mirror, I determined that the cavity contained two chicks of approximately equal size. Both chicks appeared to have remiges emerging from their sheaths.

I observed the nest for a total of 3 h on the afternoons of May 30 and 31, during which time I saw an adult bring food to the nest twice. In both instances the prey appeared to be 3–4 cm long coleopteran larva. The young called profusely when a parent entered the nest hole and were audible within 5 m of the nest tree. Any external disturbance to the tree, such as bumping it with a ladder, also aroused the chicks to call.

I am grateful to Ned K. Johnson, Lloyd Kiff, J. V. Remsen and Morris D. Williams for helpful suggestions on this manuscript.

Museum of Vertebrate Zoology, University of California, Berkeley, California, 94720. Received 4 October 1982. Final acceptance 12 April 1983.

Condor 85:499–500

BREEDING RANGE EXPANSION OF BELL'S VIREO IN GRAND CANYON, ARIZONA

BRYAN T. BROWN

STEVEN W. CAROTHERS

AND

R. ROY JOHNSON

Since the late 1960s, Bell's Vireo (*Vireo bellii*) has expanded its Arizona breeding range along the Colorado River from the area of upper Lake Mead and the Hualapai Indian Reservation eastward into Grand Canyon National Park. This range expansion and an associated increase in numbers were first noted by Carothers and Aitchison (1976), and later acknowledged by Brown et al. (1978) and Monson and Phillips (1981). The rate and extent of this range expansion have not been well documented. We provide such documentation here. The associated increase in numbers, in this instance, is of special interest because populations of Bell's Vireo have diminished or disappeared in other areas of the southwestern United States (Phillips et al. 1964, Rea 1977, Goldwasser et al. 1980, Rosenberg et al. 1982).

Expansion of the vireo's range coincides with the construction of Glen Canyon Dam on the Colorado River. The dam site is 24 km upstream from Lees Ferry near the Arizona-Utah border, the farthest upstream point of Grand Canyon National Park. Since its completion in 1963, the dam has prevented floods that had formerly scoured the riverbanks of virtually all but annual vegetation. This same area now supports a dense and extensive riparian woodland composed of *Tamarix chinensis, Tessaria sericea, Salix exigua, S. gooddingii, Baccharis* spp., and *Prosopis velutina* (Carothers and Johnson 1975, Turner and Karpiscak 1980)—essential Bell's Vireo breeding habitat. While the total extent of the habitat development has not been