STOLEN, P., AND F. MCKINNEY. 1983. Bigamous behaviour of captive Cape Teal. Wildfowl 34:10–13.
WITTENBERGER, J. F. 1981. Animal social behaviour. Duxbury Press, London.
WITTENBERGER, J. F., AND R. L. TILSON. 1980. The evolution of monogamy: hypotheses and evidence. Annu. Rev. Ecol. Syst. 11:197–232.

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TRADITIONAL NEST-SITE USE BY WHITE-THROATED SWIFTS[1]

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Key words: Apodidae; site tenacity; site fidelity; swifts; Toiyabe Mountains; White-throated Swift; Aeronautes saxatalis.

Site tenacity, the tendency to return to an established breeding site (Austin 1949), has been recorded for a wide variety of avian species (Freer 1979, Greenwood 1980, Shields 1984). Prior reproductive success, sex and age of the nesting bird, and physical stability of the nest site are factors that are known to affect site tenacity (McNicholl 1975, Freer 1979). Site tenacity and site fidelity imply the repeated use of a nest or colony site by a given individual and thus constitute a behavioral property of the individual bird. However, specific nest sites may continue to be used through time by a succession of individual birds for a variety of reasons that are inherent properties of the site, leading to "recognition" of the site as a quality nest location. Such properties include physical stability, protection from predators, association with a rich food supply, and scarcity of suitable nest sites (e.g., Blancher and Robertson 1985). Clearly site tenacity will not develop in the absence of nest site qualities that lead to reproductive success. Moreover, site tenacity is neither necessary nor sufficient for the long-term use of a nest or colony site, although it seems likely that such use will often occur in species exhibiting site tenacity. In this report we document long-term use of a nest site, which we here designate as "traditional nest site use," by White-throated Swifts (*Aeronautes saxatalis*) using the same small rock outcrop in central Nevada's Toiyabe Mountains where Lindsdale (1938) reported this species nesting 54 years earlier.

Linsdale (1938) described and photographed a unique rock outcrop adjacent to the only meadow in the Toiyabe's Birch Canyon (elevation 2,120 m). On 21 June 1930, he noted White-throated Swifts entering a crevice approximately 6 m in length and approximately 23 m from the ground. Nest materials were recovered subsequently from within the crevice. On the following day, about 25 birds were seen flying around the cliff. On 25 June 1984, as part of an extensive survey of avian communities in riparian habitats of the Toiyabe Range (Dobkin and Wilcox, 1986), we visited Birch Creek Canyon and easily located this same rock outcrop. Four swifts were seen flying around the cliff and making repeated flights in which they called loudly as they approached a crevice in the rock face and then turned away at the last possible moment. Within a 3-min period, four birds entered the nearly horizontal crevice that was protected by an overhanging projection of rock. From Linsdale's description, it appeared to be the same crevice that swifts had used 54 years earlier.

Linsdale (1938) indicated the apparent importance of an accessible foraging area in the selection of nest sites by White-throated Swifts and noted that colonies in the Toiyabe were nearly always located near a meadow. In addition to its physical stability, the site in Birch Creek Canyon is located adjacent to a highly favorable feeding area, a moist meadow. This is the only meadow in the entire canyon, and this locale is the only place in Birch Creek Canyon that we found nesting swifts.

Traditional use of sites for breeding or roosting (often the same site is used for both functions) may be common among species of swifts (Apodidae), which tend to use physically stable sites that are largely inaccessible to terrestrial predators (reviewed by Lack 1956). Black Swifts (*Cypseloides niger*) were found nesting in a canyon in the province of Alberta, Canada (their only recorded nesting location in the province), 46 years after having first been reported breeding there, and they continued to breed there in each of the subsequent seven years that the site was checked (Kondla 1973). Chestnut-collared Swifts (*Cypseloides rutilus*) in Trinidad have nested and roosted in the same Guacharo Gorge site over a 46-year period (Belcher and Smooker 1936; Snow 1962; Collins 1968, 1974). Collins (1973) reported roost-site tenacity in banded White-throated Swifts that used a narrow crevice in a rock overhang for three consecutive years. Traditional use of structures constructed by humans has been documented for Short-tailed Swifts (*Chaetura brachyura*) that used vertical concrete cylinders of an abandoned underground drainage system in Trinidad (Snow 1962, Collins 1968), and for Chimney Swifts (*Chaetura pelagica*) that used the same nest site over a 30-year period in Ohio (Dexter 1978).

Swifts in general appear to be relatively long-lived and exhibit low rates of adult mortality (Collins 1973, 1974). Such demographic characteristics in combination with a propensity to use physically stable nesting and roosting sites enhances the likelihood of site tenacity being widespread among these species.

Despite their widespread occurrence throughout the mountainous regions of the western United States, little is known of the breeding biology and general ecology of White-throated Swifts. The propensity of this species to nest deep within cracks and crevices of vertical cliffs and to breed in small colonies (Dawson 1923, Bent 1940) may account in large part for the paucity of data. Given the factors found to affect site tenacity in other species (physical stability of the nest site, prior breeding success at the site, and age of the individual bird) it seems likely that site tenacity may be typical of White-throated Swifts.

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LITERATURE CITED

AUSTIN, O. L. 1949. Site tenacity, a behavior trait of the Common Tern. Bird-Banding 20:1–39.

BELCHER, C., AND G. D. SMOOKER. 1936. Birds of the colony of Trinidad and Tobago. Part III. Ibis 6:1–34.

BENT, A. C. 1940. Life histories of North American cuckoos, goatsuckers, hummingbirds, and their allies. U.S. Natl. Mus. Bull. No. 176.

BLANCHER, P. J., AND R. J. ROBERTSON. 1985. Site consistency in kingbird breeding performance: implications for site fidelity. J. Anim. Ecol. 54:1017–1027.

COLLINS, C. T. 1968. The comparative biology of two species of swifts in Trinidad, West Indies. Bull. Fl. State Mus. 11:257–320.

COLLINS, C. T. 1973. Survival and band wear in White-throated Swifts. West. Bird Bander 48:20–21.

COLLINS, C. T. 1974. Survival rate of the Chestnut-collared Swift. West. Bird Bander 49:10–13.

DAWSON, W. L. 1923. The birds of California. Vol. 2. South Moulton Co., San Diego, CA.

DEXTER, R. W. 1978. Chimney Swifts use same nest for five consecutive years. Bird-Banding 49:278.

DOBKIN, D. S., AND B. A. WILCOX. 1986. Analysis of natural forest fragments: riparian birds of the Toiyabe Mountains, Nevada, p. 293–299. *In* J. Verner, M. L. Morrison, and C. J. Ralph [eds.], Wildlife 2000: modeling habitat relationships of terrestrial vertebrates. Univ. of Wisconsin Press, Madison.

FREER, V. M. 1979. Factors affecting site tenacity in New York Bank Swallows. Bird-Banding 50:349–357.

GREENWOOD, P. J. 1980. Mating systems, philopatry and dispersal in birds and mammals. Anim. Behav. 28: 1140–1162.

KONDLA, N. G. 1973. Nesting of the Black Swift at Johnston's Canyon, Alberta. Can. Field-Nat. 87:64–65.

LACK, D. 1956. A review of the genera and nesting habits of swifts. Auk 73:1–32.

LINSDALE, J. M. 1938. Environmental responses of vertebrates in the Great Basin. Am. Midl. Nat. 19:1–206.

MCNICHOLL, M. K. 1975. Larid site tenacity and group adherence in relation to habitat. Auk 92:98–104.

SHIELDS, W. M. 1984. Factors affecting nest and site fidelity in Adirondack Barn Swallows. Auk 101:780–789.

SNOW, D. W. 1962. Notes on the biology of some Trinidad swifts. Zoologica 47:129–139.

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COSTS OF ADOPTION IN WESTERN GULLS[1]

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Key words: *Chick adoption, Western Gulls,* Larus occidentalis.

Naturally occurring chick adoptions have been noted in several species of gulls (reviewed in Evans 1980; see Holley 1984, Wittenberger and Hunt 1985), including the Western Gull, *Larus occidentalis* (Hunt and Hunt 1975, Pierotti 1980). Several hypotheses have been proposed to consider why adoptions occur regularly at certain nesting colonies. These include strategies for chick survival (Graves and Whiten 1980, Hébert 1985, Pierotti and Murphy 1985), reciprocal and/or weak altruism (Pierotti 1980, 1982; Pierotti and Murphy 1985; see Waltz 1981), and increased numbers of "mistakes" by adults nesting in high densities (Holley 1981, 1984). All of these hypotheses are based on the premise that adoption is maladaptive to foster parents (i.e., adoption reduces their inclusive fitness). Few data are available to support this premise. In this paper, we document additional cases of chick adoption in Western Gulls on Southeast Farallon Island (SEFI), California, and examine costs of adoption to foster parents.

About 25,000 Western Gulls nest on SEFI (Ainley and Lewis 1974). Various aspects of the breeding biology, behavior, and nesting habitat of the Western Gull on SEFI have been described by Coulter (1973, 1977), Pierotti (1980, 1981), Hand (1981), and Spear (1981, 1986), and Penniman, Coulter, and Spear (unpubl.). Since 1971, the Point Reyes Bird Observatory (PRBO) has monitored plots of nests for breeding productivity and banded about 2,000 chicks (with a metal USFWS band and a plastic color band) each year. In 1978 and 1979, LBS monitored 141 and 226 nests where at least one mate was banded and of known age. Nests were visited every second day during the egg and early chick period. Eggs were marked in order of laying; chicks were dyed (picric acid) by hatching order and banded with individually color-taped bands when 10 days old. After banding until fledging, chicks were observed every few days with a telescope from vantage points (<50 m away). In 1980 to 1984, PRBO monitored 55, 96, 106, 100, and 90 nests in 3 plots each year. A few adults in each plot were banded. Plots were not entered and nests were observed daily from egg laying to fledging using binoculars or a telescope from vantage points and blinds above plots (<50 m away). Neither eggs nor chicks were marked, although the directions and distances of each brood's movement away from nest sites were mapped to assist in locating specific broods between days.

For nests monitored by LBS, adoptions were detected by the addition of an undyed chick to the dyed brood. Adopted chicks were dyed and/or banded individually. For nests monitored by PRBO, adoptions were detected by an increase in the number of chicks known to be at the nest or brood site on the previous day (see Holley 1981). In some cases, adopted chicks were larger or colored differently than foster parents' own chicks, which facilitated their identification. All adopted chicks maintained con-

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