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NEST-DEPTH PREFERENCE IN PIPE-NESTING NORTHERN ROUGH-WINGED SWALLOWS

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Abstract.—The placement depths of 44 Northern Rough-winged Swallow (*Stelgidopteryx serripennis*) nests built inside identical drainage pipes at a dam in northwestern Pennsylvania were determined using a "ripariascope." The average placement depth was 82.4 cm (32.45″) with an observed range of 53–117 cm (21″–46″).

PROFUNDIDAD DE NIDO PREFERIDA POR *STELGIDOPTERYX RUFICOLLIS*

Resumen.—La profundidad a la cual individuos de *Stelgidopteryx ruficollis* construyeron 44 nidos dentro de tuberias de drenaje en un represa en el noroeste de Pensilvania, fue determinada utilizando un "raparioscopio" (rapariascope). La profundidad promedio del nido fue de 82.4 cm (32.45 pulgadas) con un alcance de 53–117 cm (21–46 pulgadas).

The Northern Rough-winged Swallow (*Stelgidopteryx serripennis*) is a burrow-nesting, nest-site opportunist that rarely, if ever, excavates its own nest burrow (Coues 1878, Gaunt 1963, Lunk 1962). Little detailed information has been published on the placement depths of nests in this species. The literature on the subject is either of a very general nature, lists only burrow depths and not actual nest depths, or represents single observations. For instance, Macoun and Macoun (1909:584) said that nests of the roughwing "have been found at all depths," Howe (1900) stated that roughwing nests are "dug into the bank about an arm's length," and Bailey (1913:262) stated that the nest of the roughwing is in the "end of a burrow or hole in a bank, from two to five feet from the entrance." References that give only burrow depths and not the actual nest depths include Headstrom (1970:60) who listed the length of the burrow "from 9 inches to 6 feet," Blake (1953:107) who gave the depths of two burrows used for nesting as "20 inches deep" and "28 inches deep," Eynon (1936:84) who said the tunnel "was about three feet long," and Graber et al. (1972:15) who stated that the burrows "varied in depth from 10 inches to 3 feet, 18–20 inches being most common."

Burrow measurements, such as those cited above, are relatively meaningless in relation to the actual depth of nest placemement in the Northern Rough-winged Swallow, since it does not typically build its nest at the innermost ends of burrows (see Skutch 1960, this study) unless they are relatively shallow. Some exact depths of nest placement by the roughwing have been given in the literature, but these are based on single observations. For example, Best (1977) reported a nest "at the end of a burrow 68 cm deep," Blake (1907:104) described finding a nest at the end of a

tunnel "20 inches in length," and Sargent (1893) discovered a nest "27 inches deep."

Today, roughwings commonly nest in man-made cavities such as those provided by drainage pipes (Harrison 1975). In order to quantify nest-depth preference in this species, I measured the placement depths of 44 nests built inside metal seeptile pipes at the Union City Dam in Erie County, Pennsylvania. The study was conducted during the summer of 1981, but the nests were the product of several years of activity at the site by roughwings. The pipes where the nests were built were embedded in a nearly-vertical, cement retaining wall 1.9 m, 4.9 m, and 7.9 m above the ground and functioned to facilitate water seepage from the cut sandstone/shale rock layers behind the wall. They were flush with the cement wall on their outer end and abutted the cut rock layers internally. The amount of water observed seeping from these pipes, even after prolonged, heavy rains, was insufficient to dislodge the roughwings' nests; therefore, the observed nest depths were assumed to accurately represent the species' preference in nest-placement depth. The pipes were straight, 122 cm long, had inner diameters of 102 mm, and were embedded in the wall at a four-degree grade. Because all of the pipes were identical, they provided a uniform burrow type, ideal for testing nest-depth preference in roughwings. By eliminating differences in tunnel topography, any observed variation in depth of nest-placement can be attributed to preference.

To determine nest depth, a calibrated "ripariascope" was inserted into each of the pipes (Demong and Emlen 1975). Nest depth was defined as the distance from a pipe's outer edge to the center of the nest cup. The average placement depth of the 44 nests measured was 82.4 cm (32.45″) with a range of 53–117 cm (21″–46″); SD was 16.1 cm. Both the modal and median nest depth was 79 cm (31″). Only three of the 44 nests (6.8%) were built against the rock walls at the extreme inner ends of the pipes. These findings are in agreement with Skutch (1960) who observed that, when roughwings used completed kingfisher burrows as nest sites, they did not build their nest in the expanded distal nest chamber, but instead used the center of the tunnel.

What evolutionary forces might have shaped nest-depth preference in the Northern Rough-winged Swallow? Probably the factor which acted to set the minimum nest-placement depth was the arm reach of its mammalian predators plus the distance these predators typically dig into mud or sand banks while attempting to raid such nests. Alternatively, at least two factors might have acted to reduce maximum nest-placement depths. One might be a need to keep tunnel distances short enough that the entrance hole remains visible to the nestlings in the nest. This would allow the background light to be blocked when the parents entered the burrow to feed the young, causing an abrupt change in light intensity as perceived by the nestlings. Abrupt changes in light intensity have been shown to be the stimulus for eliciting the food-gaping response in nestlings of other bird species raised in dimly lit places, including the Bank Swallow *Riparia riparia* (Fulk 1967) and the Barn Swallow *Hirundo rustica* (Jack-

son and Burchfield 1975, pers. obs.). The same stimulus/response system probably operates in the Northern Rough-winged Swallow. The other factor probably acting to reduce maximum nest-placement depths, is the need to minimize tunnel exit/entry times when feeding nestlings. If the parents were feeding at the maximum possible rate, then young in deeply placed nests would be fed less frequently than young in more shallow nests due to the time required to negotiate the extra tunnel length between feedings.

The findings of this study have management implications for the Northern Rough-winged Swallow. When artificial nesting tubes (after Lunk 1962) are designed and placed for use by roughwings, their lengths should fall within the preferred nest-depth range of the species in order to increase their attractiveness.

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