Niche and range expansion of Cave Swallows in Texas

Recent assumption of nesting in highway culverts has resulted in increased contact with other swallows

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In North America, the breeding range of the Cave Swallow (*Petrochelidon fulva*) stretches north from Chiapas and Yucatan through San Luis Potosi, Zacatecas, Durango, Nuevo Leon, Chihuahua and southern Tamaulipas to peripherally enter the United States in southwestern Texas and southern New Mexico (Amadon and Eckelberry 1955, A.O.U. 1957, Baker 1962). The Greater Antilles also are occupied (A.O.U. 1957), and far disjunct populations, putatively of this species, breed in Ecuador and Peru (Chapman 1924, Peters 1960). The species is colonial and frequently breeds at sites more diverse in nature than its English name indicates. In the Antilles, bridges and buildings, in addition to caves and sea cliff crevices, are regularly used by *P. fulva* as nest locations (Wetmore and Swales 1931, Bond 1971 and pers. comm., Biaggi 1974, Martin pers. obs.). Amadon and Eckelberry (1955) found Cave Swallow nests on public buildings in several areas of Chiapas, Mexico, and farther north, in Coahuila and Zacatecas. Whitaker (1959) and Baker (1962) have reported instances of Cave Swallows nesting with other swallows in dwellings, mills, and other structures. Prior to 1972, however, the Cave Swallow had been thought to be isolated ecologically at the northern margin of its range in Texas, nesting only in sinkholes and the twilight areas of caverns (Selander and Baker 1957, Whitaker 1955, Baker 1962, Redell 1967). Selander and Baker (1957) called particular attention to this situation, and hypothesized that this isolation may be the result of competitive exclusion of *P. fulva* at its range periphery by the closely-related Cliff Swallow (*P. pyrrhonota*). Only fourteen active breeding sites in Texas were reported by Selander and Baker in 1957 (Fig. 1); all were located in limestone cave topography on the Edwards Plateau. Baker (1962) and Reddell (1967) added fifteen additional nesting locations for Texas (Fig. 1), and two sites in New Mexico also have been described (Kincaid and Prasil 1956, Baker 1962). Since caves and sinkholes frequently are subjected to commercial exploitation and consequent ecological disturbance, at that time some concern had existed over the future of the United States population of this species

Recently, Wauer and Davis (1972) reported a small colony of *P. fulva* nesting together with Cliff Swallows in a shallow cave on Mariscal Mountain, just north of the Mexican boundary in Big Bend National Park, this appears to be the first published U.S record of this species nesting in company with another hirundinid.

In 1972, while establishing a 200 km transect between Hondo and Comstock (Fig. 1) to study reproductive success in culvert-nesting Barn Swallows (*Hirundo rustica*) in south-central Texas, we discovered that Cave Swallows also were utilizing highway culverts as nesting sites in the central portion of this transect (Martin 1974). Considerable numbers of *P. fulva* were involved; approximately 600 clutches were hatched in culverts along 100 km of the transect in 1973, and cursory off-transect investigations indicated that culvert utilization also existed elsewhere in the state (Martin 1974).

Research in subsequent years has increased our knowledge of the reproductive biology of the Cave Swallow (Martin and Selander 1975, Martin *et al.* 1977) and given us a far more accurate picture of its status and range in the United States. We summarize briefly portions of the former and report in detail on the latter in this article

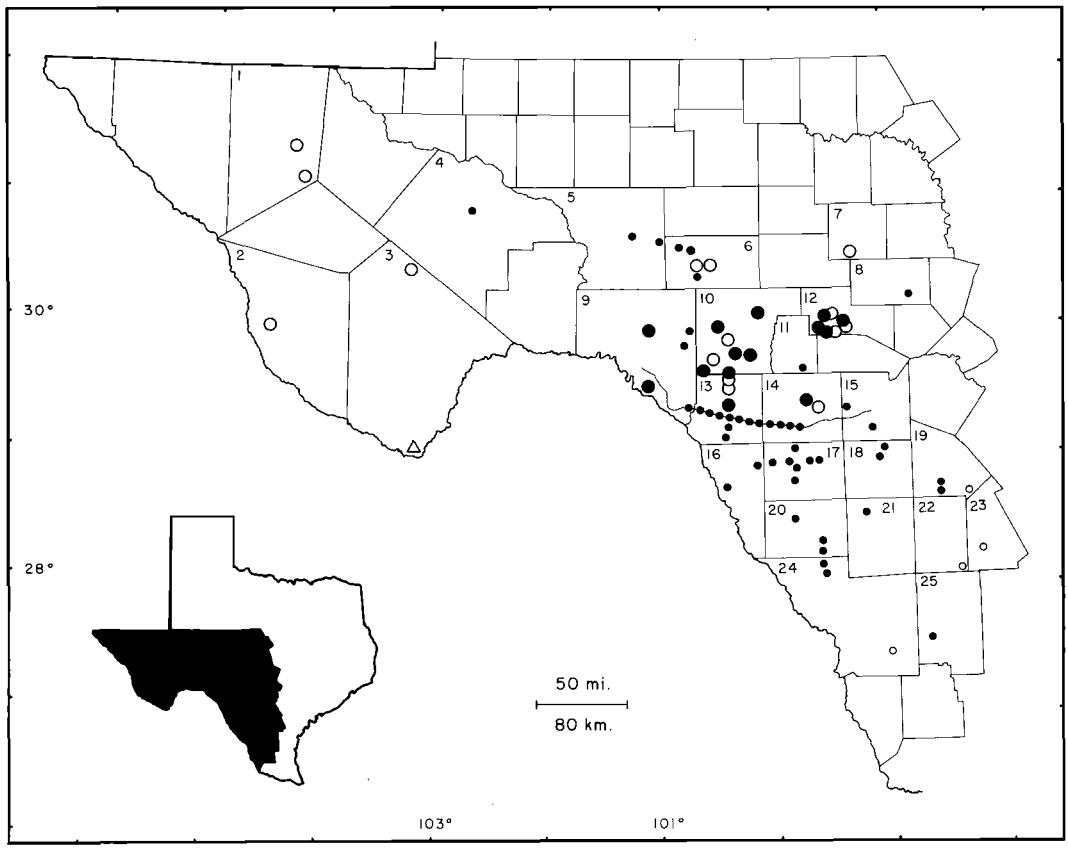

Figure 1. Breeding range of Cave Swallows in Texas. Detailed information for breeding sites in numbered counties presented in Table 1. Primary transect stretches through counties 9, 13, 14 and 15. Large dots represent cave and sinkhole colonies reported active by Selander and Baker in 1957; large open circles, cave and sinkhole sites reported by Reddell; open triangle, Wauer and Davis site. Small dots represent selected culvert sites discovered since 1972; small open circles, recent records based primarily on nest structure and position.

Study Area and Methods

OUR AREA OF INVESTIGATION (Fig. 1) is drained by south and southeasterly flowing tributaries of the Rio Grande and Nueces Rivers. At the more northern portions of the study area, these dissect the limestone formations of the Edwards Plateau. Most caverns utilized by Cave Swallows in Texas lie within the boundaries of this plateau (Fig. 1). Much of our 200 km primary transect stretches just south of the southern uplift of the plateau (Fig 1) through less elevated terrain; to the south and east, flatland topography is encountered. Drainages throughout the area are spanned by concrete highway culverts of rectangular cross-section. Small intermittent creeks usually are accommodated by single concrete passages, while larger, more permanent streams require multiple passageways The nature of the terrain and width of the highway also influence dimensions, which, for single passages, range from approximately 10 to 100 meters in length, and 1 to 4 meters in height and width. (Fig. 2). Nests of both Barn and Cave Swallows usually are built on the top 15% of the walls of the passageways. (Fig. 3)

Visits to culverts along our primary transect are made twice weekly during the breeding season. Transects in other portions of the species range in Texas usually are run during the height of the breeding season to maximize

Figure 2. Culvert 8. Several nests containing *P. fulva* x *H. rustica* hybrids have been found at this site.

data; however, circumstances occasionally dictate visits at less opportune times. Most locality records reported here are based on morphologically identified nestlings; several on presence of scolding adults at culverts containing typical nests with incubated eggs or very young nestlings; a few, on the presence of typical nests only.

Results and Discussion

THE BREEDING SEASONS of culvert-nesting Cave and Barn Swallows are essentially synchronous along our primary transect in central Texas (Martin 1974). Both species build open mud cup nests, but those of *P. fulva* usually are built closer to culvert ceilings, possess a more elaborate flaring rim, and incorporate less animal and plant material in the main structure than do those of *H. rustica*. At these culverts, laying by both species begins in late March or early April, approximately three weeks earlier than deposition begins at an isolate cavern-nesting population of Cave Swallows located near Rocksprings (Martin *et al.* 1977). Clutch size in *P. fulva* ranges from 3 to 5 and decreases during the season; incubation averages 15 days, and fledging occurs 21 to 23 days after hatching. Two clutches usually are reared in culvert nests of *P. fulva* and *H. rustica*, but both species possess the capability to successfully rear a third (Martin in MS). The last young of both species usually leave primary transect culvert nests in mid- to late August. At our cavern-nesting colony of Cave Swallows, reproductive output and nestling survival are directly correlated with amount of January to July rainfall (Martin in MS). Hybridization occasionally occurs between Cave and Barn Swallows; we have encountered 5 such instances (7 hybrid young in 5 nests) in culverts of the primary transect since 1972, and have described the hybrids morphologically and biochemically (Martin and Selander 1975, Martin in MS).

Nesting records that represent essentially the present range of culvert- and cave-nesting Cave Swallows in Texas are presented in Fig. 1 and Table 1; the latter contains additional geographical and ecological data as well as brief comments and references. In 1973, both species bred in 37 of the 75 primary transect culverts; both ends of the transect were devoid of nesting Cave Swallows. In the central portion of the transect (continuous string of small solid dots, (Fig. 1), no culverts were occupied exclusively by Cave Swallows, and only 8 of 45 were occupied exclusively by Barn Swallows. Approximately 600 clutches of *P. fulva* and 800 of *H. rustica* were hatched on the

Table 1. Localities of selected culvert nesting sites and references to cave nesting sites of Cave Swallows in Texas.

County # +County	Locality	Date	Proximate CS site[1]	BS[2]	Remarks: References 1967
1 Culberson[3]	2 cave sites				Reddell 1967, 1971
2 Presidio	2 cave sites				Reddell 1967, 1971
3 Brewster	2 cave sites				Reddell 1967, Wauer & Davis 1972
4 Pecos	Near Fort Stockton	1976,77	X	X	6 sites; 8 km E to 8 km W
5 Crockett	4.8 km W Ozona	1976	X	X	vicinity of 1974 Martin record
	21 km E Ozona	1976	X	X	young in nest
6 Sutton	2 cave sites				Redell
	8 km W. Sonora	1976	X	X	young in nest
	19.3 km W Sonora	1976	X	X	young in nest
	25.8 km S Sonora	1974	X	X	young in nest
7 Mason	1 cave site				Reddell 1967
8 Gillespie	10 km E Fredericksburg	1976			young in nest
9 Val Verde	2 cave sites				Selander & Baker 1957
	3.2 km S Loma Alta	1974	X	X	young in nest
	4.8 km N. Loma Alta	1974	X	X	young in nest
	vicinity Del Rio	1973-75	X	X	primary transect nest
10 Edwards	8 cave sites				Selander & Baker 1957, Redell 1967. Martin *et al.* 1977
11 Real	1.2 km S Leakey	1973		X	young in nest
12 Kerr	7 cave sites				Selander & Baker 1957, Reddell 1971
13 Kinney	3 cave sites				Selander & Baker 1957, Reddell 1967
	many culvert sites	1973-77	X	X	Martin 1974, primary & off-transect
14 Uvalde	2 cave sites				Selander & Baker 1957, Reddell 1967
	many culvert sites	1973-77	X	X	Martin 1974, primary transect
15 Medina	22 km W Hondo	1977	X	X	eastern portion primary transect
	16 km S Hondo	1973		X	young in nest
16 Maverick	3.2 km NE Eagle Pass	1973		X	young in nest
	32 km NE Eagle Pass	1973		X	young in nest
17 Zavala	many culvert sites	1973,77	X	X	Martin 1974, subsequent visits
18 Frio	5 km N Pearsall	1975-77	X	X	young in nests
	7.4 km N Pearsall	1975-77	X	X	young in nests
19 Atascosa	26 km S Jourdanton	1976,77	X	X	young in nests
	18 km S Jourdanton	1977	X	X	young in nests
	6.4 km S Campbellton	1976			probable *P.fulva* nests; Fall trip
20 Dimmit	26 km SE Asherton	1976	X	X	young in nests
	22 km SE Asherton	1974	X	X	young in nests
	5 km S Carrizo Sprs.	1974	X	X	young in nests
21 La Salle	10 km N Cotulla	1976	X	X	young in nests
22 Mc Mullen	39 km SW George West	1977			probable nests; post-season visit
23 Live Oak	13 km SW George West	1977			probable nests; post-season visit
24 Webb	61 km N Laredo	1976		X	adults present; typical nest, eggs
	69 km N Laredo	1976		X	adults present; typical nest, eggs
	50 km E Laredo	1976		X	1 *H. rustica* juv., 1 possible hybrid *P. fulva* x *H. rustica* juv. in typical *P. fulva* nest
25 Duval	34 km S Freer	1977		X	adults present; 2 typical nests

[1] Additional culvert site or sites of nesting Cave Swallows nearby.
[2] Barn Swallows also nesting at listed culvert site.
[3] Added in proof: Hudspeth Co. 1 km E McNary. 1978. C.W. Sexton, pers. obs. Cliff Swallows, BS, also present.

transect in 1973 and our research in subsequent years indicates that no *major* retraction or expansion of range of Cave Swallows has taken place along *this transect*, although culverts which appear suitable for utilization exist both to the east and west.

CAVE SWALLOWS ALSO NEST in abundance at many off-transect sites (Fig. 1, Table 1). Near the central portion of the primary transect, most roads possessing suitable culverts have series of breeding colonies. Dark culverts with rectangular cross-section seem to be preferred. Damp walls are avoided and bridges or culverts of circular section are not occupied. In several areas of the central portion of the range, particularly Kerr County,

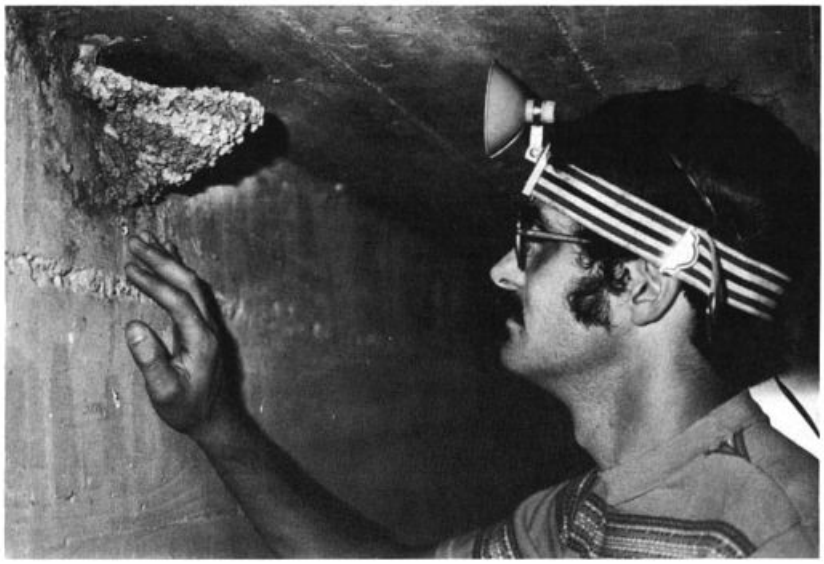

Figure 3. Typical Cave Swallow nest in Culvert 34, Uvalde Co., Texas.

Figure 4. Nestling Cave Swallow at nest in Culvert 27, Uvalde Co., Texas.

seemingly suitable culverts are not utilized. Many occupied caves exist here; possibly these are sufficient to house local breeding populations. As one progresses outward from the central portion of the range, breeding numbers diminish and fewer culverts are occupied. In reduced-density situations such as this, Cave Swallows appear most often to select culverts which harbor flourishing Barn Swallow colonies.

At present, the status of *P. fulva* in the U.S. seems reasonably secure. The assumption of culvert-nesting has allowed range increase, particularly to the south and east in flatland non-cavern topography. In 1974, reproductive success of populations of Cave Swallows that nested in four highway culverts with approximately equal numbers of Barn Swallows was higher than that displayed by a cave-nesting colony that nested in isolation from other swallows (Martin, in MS). Preliminary data from a different series of culverts indicate that reproductive success of *P. fulva* is comparable to or exceeds that of *H. rustica* nesting at the same sites (G. O. Miller, unpublished). Some disturbance of both Cave and Barn Swallow nests by English Sparrows (*Passer domesticus*) occurs in urban areas along the primary Cave Swallow transect. In the past, urban-nesting populations of the Cliff Swallow were severely curtailed in number by the activities of *P. domesticus* after its introduction to the United States (summary, Bent 1942); the problem also continues in rural areas (Samuel 1969). Future investigation will ascertain the magnitude of this problem for *P fulva*.

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