

Changes in the Breeding Habits and Season of the Cave Swallow (*Petrochelidon fulva*) in Puerto Rico

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Abstract

The common name of the Cave Swallow (*Petrochelidon fulva*) originated from its behavior to nest at the entrance of caves and sinkholes where it constructs mud nests. The bird is one of the two species of swallows that breeds in Puerto Rico. The usual habitat of these swallows used to be coastal habitats such as mangroves and open fields but they have colonized urban habitats such as balconies, cement bridges and other human made structures. It seems that a change has taken place in the breeding season of the Cave Swallow. The changes in the breeding season have been documented in both colonies, the colonies living in urban settlements and the colonies nesting at the entrance of caves. The onset of the breeding season of the Cave Swallow, at least in urban habitats, is triggered by rain. The causes of the change in the breeding season seems to be associated to changes in temperature and on the raining patterns which in turns seems to affect the abundance of prey consumed by the swallows. Professor Pérez suggests that the Cave Swallow could be used as a good predictor of climatic change.

Keywords: Cave Swallow, *Petrochelidon fulva*, change in breeding season, climatic change.

Resumen

El nombre común del ave "Cave Swallow" (*Petrochelidon fulva*) se origina de su hábito de anidar sus nidos de fango en las entradas de cuevas y sumideros. El ave es una de las dos especies de golondrinas que se reproducen en Puerto Rico. El hábitat de estas aves solían ser las aéreas costeñas tales como los manglares y los campos abiertos. Últimamente han colonizado áreas urbanas como balcones de viviendas, puentes de cemento y otras estructuras. Al parecer la época de reproducción de las golondrinas "Cave Swallow" ha cambiado en ambas colonias, tanto las que anidan en áreas urbanas como las que anidan en las entradas de cuevas. La llegada de la época de reproducción de las golondrinas que habitan en áreas urbanas parece ser provocada por la lluvia. Los cambios en la época de reproducción de las aves parecen estar asociados a los cambios de temperatura y patrones de lluvia, los cuales afectan la abundancia de las presas consumidas por las golondrinas. El profesor Pérez sugiere que la "Golondrina de lluvias" puede ser usada como un buen vaticinador de cambios climáticos.

Palabras claves: Cave Swallow, *Petrochelidon fulva*, cambios en la época de reproducción, cambios climáticos.

Introduction

The Cave Swallows (*Petrochelidon fulva*) has an ample distribution and it's still extending its range (Raffaele et al., 1998). It is also one of the two species of swallows that breeds in Puerto Rico. It is the smallest of the resident species and could also be identified by its rufous throat and rump and tinged flanks of the same color. Garrido et al. (1999) have proposed the Cave Swallows of Puerto Rico as a distinct subspecies. The common name of the Cave Swallow originated from its behavior to nest at the entrance of caves and on sinkholes were its construct mud nests. It is also known as

“Golondrina de Lluvias” (Rain Swallow) as could be seen in large numbers under overcast sky.



In the early XIX century Cave Swallows were particularly found in natural habitats, such as open fields (Wetmore, 1916) and on the coast near cliffs and mangroves (Wetmore & Swales, 1931). But the species have colonized urban habitats and could be commonly observed even in the center of large cities such as

Ponce, Caguas and San Juan. The species have benefit from human constructions, such as houses with balconies with ledges (typical construction during the XIX and early XX century) that provided suitable places to nest (Danforth, 1936; Biaggi, 1970).

The nest of the Cave Swallow had been described as a half-cup (Bond, 1980) or a globular structure constructed of mud (Oberle, 2003). Although the construction of houses with balconies is rapidly disappearing in Puerto Rico, the bird keep living on cities and have moved to nest under cement bridges.

Little is known about the reproductive biology of the Cave Swallow in Puerto Rico. In addition to mud nest construction the bird have been informed to produce a clutch from 2-5 eggs (Danforth, 1936; Biaggi, 1970; Raffaele, 1989) and from 3-4 (Oberle, 2003; Raffaele et al., 1998) reports the breeding season of the species from March to July, over its range. West (1995) reports breeding in Cuba from June to July. Wetmore and Swales (1931) inform breeding in Hispaniola from April to July. In Puerto Rico the species have been informed to breed from May to June (Wetmore, 1916) and from April to June (Biaggi, 1970; Raffaele, 1989). The objectives of this work are to reports on the breeding habitat preferences of swallows on cities and on changes on its breeding season.

Method

The method consisted on locating colonies of swallows on urban areas. Once located the areas were visited at least ones a week. Notes on the type of nest constructed were taken on account and also its location on the habitat. Nests were examined for eggs, chicks and to determine the time of fledging. Colonies were visited until the last chicks fledge.

Results

Nests were located on ledges of buildings (three), inside two abandoned houses, under two parking lots and on 9 of the 10 bridges, along PR-30, with exposed beams and ledges. We found different types of nest at different nesting urban habitats. At buildings and on the parking lots all the nests ($n = 86$) were the typical half-cup nest described for the species. On the abandoned houses we also found “duplex” or two nests bound together usually with opposing entrances. Under bridges we also found “condominiums” or nest on top of each other. There were preferences to construct on corners as these were first used. On 2005 and 2006 only 12 (11%) new nests were constructed ($n = 109$). Most of the birds add new material to old nests and reused it again. Both members of the pair work on the construction or reconstruction of nests.

The species have shown nesting fidelity for bridges, using some of these (e.g. Caguas and Humacao) for at least 20 years, even when the bridges are cleaned and the nest destroyed every four years (e.g. in Caguas).

During 2004 and 2006 we observed nests with two ($n = 12$) or 3 eggs ($n = 21$) in Caguas and Humacao. No



more than three chicks have been observed at rim of nests at Caguas, Cidra, Carolina or Humacao ($n > 150$). Since 2002 we have observed nesting of the Cave Swallow from April to September. On mid-June 2002, we observed Cave Swallows gathering

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mud and other nesting material to construct nests at Finca Hoyo Mulas, Carolina (Pérez-Rivera et al., 2002). The same year a colony nesting under one of the bridges of PR-52, at Bairoa Park, Caguas, was still active during the third week of July. The first author observed chicks being fed until July 22.

On July 4, 2004, the first author observed a colony of Cave Swallows nesting on an abandoned barn at Finca Hoyo Mulas. At the time, most pairs were incubating, and only a few were feeding small chicks.

August 2, 2006 the first author observed a colony (A) of Cave Swallows feeding chicks under one of the bridges of PR-30 in Bo. Tejas, Humacao. On August 3, he also made observations, of adult feeding chicks at two known nesting sites in Caguas, one under the first bridge of PR-30 east (B) and another under PR-52 at Bairoa Park (C). August 11, the first author counted 107 nest at the colony of Bo. Tejas and was able to observed feeding of chicks at at least 27 of these, and other five with chicks at the rim of the nests. The colonies at Humacao and Caguas keep breeding until September (Table 1). To determine if breeding until September was limited to urban areas on September 2, Tania Marrero and Molina examined a colony at Cave Los Quintos, at Bo. Cibuco in Corozal (north central Puerto Rico) and found an active colony with chicks still being fed at nests.

Table 1. Number of active nests per week at three colonies of Barn Swallows (*Petrochelidon fulva*) at cities in east-central and east Puerto Rico.

Dates	Localities		
	Rd. No. 1 Caguas	Rd. No. 52 Caguas	Rd. No. 30 Humacao
Aug. 11-12*	7	22*	37
Aug. 18	2	17	22
Aug. 25-26*	0	12*	14
Sept. 1	0	7	11
Sept. 8	0	3	4
Sept. 9	0	1	-
Sept. 11	0	0	0

Discussion

Cave Swallows at urban areas had a preference to nest under bridges with beams and exposed ledges. On the corner of beams, the swallows have found strong points of attachments for their nests, and on ledges the support needed to construct “condominiums”. Also under bridges the birds found shelter from environmental extremes (sun and rain) and protection from predators. Wetmore (1916) informs Cave Swallows having



problems under heavy rains, struggling to rise. He adds that such storms would be fatal to fledgings with flight feathers still soft. During heavy rains we have observed, both adults and juveniles taking refuge under bridges. Wetmore and Swales (1931) reports at the Dominican Republic heavy predation on eggs by Grackles (*Quiscalus niger*) on swallows nesting on cliffs and Dod (1978) owl predation on caves. No predation by the mentioned have been observed by us under bridges, neither by urban predators such as the Red-tailed Hawk (*Buteo jamaicensis*), rats (*Rattus rattus*) or cats (*Felis domesticus*). The only problems that we have observed under bridges are: a) competition in some places (e.g. Cidra and Juncos) with domestic pigeons (*Columba livia*) which in some cases have been observed to used mud nest, constructed low in the beams, as platforms to construct their nests, b) nest falling apparently when there is too much sand on the mud used to construct nests (n=3), c) nest falling when there are leaks on the bridges and the water loose the sides and base of the nests (n=4) and d) collision of fledgings with autos (n=2).

The reconstruction over old nest was more common that the construction of new nests. Apparently these, permits the birds to save energy that could be used to increase the clutch or produce more fledgings (Byerly, 2004). We have estimated the number of pellets on nest from about 800 to 2000. This implies from 400 to 1000 trips by each member of the pair to construct a new nest. Reusing the nest year after year also would help the pairs to save energy.

The size of the clutches on the nest we studied (2-3 eggs) encompass with the reports of 2-3 eggs/clutch in the Dominican Republic (Wetmore and Swales 1931). The differences in clutch size among reports in Puerto Rico and our observations may be the result of the following: a) the apparently small size of our samples, b) that clutches of 4-5 eggs are extremely rare, and c) previous anecdotic information.

The Cave Swallow is reported to breed upon its range from March to July (Raffaele et al., 1998). But at least in Puerto Rico, the species have shifted its breeding season from spring to summer with chicks being fed up to the second week of September.

The onset of the breeding season of birds is under selection pressure. It would be highly beneficial to match the breeding season with the time of the year in which there is an increase in food availability, which would benefit adults (e.g. enough protein to produce a large clutch of eggs and less use of energy for food gathering) and chicks (e.g. enough food for a proper development and then when these left the nest) (Thomas et al., 2001; Visser et al., 2006). Rivera-Milán et al. (2003) found a positive correlation between food abundance and nesting in the Puerto Rican Plain Pigeon (*Patagioenas inornata wetmorei*). At least in southwestern Puerto Rico, the breeding season of birds is influenced by rainfall (Faaborg et al., 1984, 2000).

Furthermore, Post (1981) found that the breeding in the Yellow-shouldered Blackbird (*Agelaius xanthomus*) in southern Puerto Rico, was triggered by the rains of April or May. Rainfall is very important because it promotes new sprouting and the breeding of insects that feeds on vegetation (Faaborg et al., 1984; Visser et al., 2006). The Cave Swallow is insectivorous and among its main prey are small dipterans and coleopterans (Wetmore, 1916; Danforth, 1936; Biaggi, 1970). Wolcott (1944) inform a peak in the abundance of several insects (including Coleoptera) in sugarcane fields on Puerto Rico during May and June which encompass with the informed breeding season for the Cave Swallow in Puerto Rico, previous to this study (Biaggi, 1970; Raffale, 1989). But there are no recent studies to determine if the abundance, or the peak of the breeding season of insects such as Diptera and Coleoptera, have changed with the apparent increase in temperature (Burrowes et al., 2004) and rainfall (from the end of the spring to the summer) at least during the last nine years in Puerto Rico. Nevertheless, there is some indirect evidence. The cases of dengue in Puerto Rico had

been increasing since 2000 (UPR 2005) with an epidemic in 2007. These increases in infections had been attributed to an increase in the populations of mosquitoes, which in turn are one of the main food items of Cave Swallows. Jones (2002) also provides some evidence regarding the increase on insects during the month of July in the neighboring Dominican Republic. He found Cave Swallows nesting on sea cliffs in Catalina Island, during his visit on July 4 and 18. He comments that there were so many biting insects on the island that it has to pass ½ hr. inside de water of the beach to cool the bites.

The question to be done is if the Cave Swallow could be a good predictor of climatic change in Puerto Rico. The answer is yes. In this swallow the breeding season is triggered by rain (the species construct mud nests and heavy rains promotes the formation of mud pods). The bird depends on aerial insects, such as Diptera, whose abundance is related to warm wet climate. The swallow is also purely insectivorous and rely more than other species on their daily intake of insects (these cannot switch their diet as omnivorous species). Finally, the species have shown plasticity on its breeding season. In places such as New Mexico birds have been reported to breed as early as April and as late as October (West, 1995).

Studies should be conducted in other parts of the range of the species, particularly in the Antilles, to determine if the changes are local or if the Cave Swallow is experimenting changes on its breeding season over its range due to global climatic change.

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