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C. T. Collins

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Growth and Development of the Blue-and-white Swallow in Venezuela

C. T. Collins
Department of Biological Sciences,
California State University, Long Beach, CA 90840, USA.
ccollins@csulb.edu

ABSTRACT
The growth and development of Blue-and-white Swallow (*Pygochelidon cyanoleuca*) chicks was studied at Estación Biológica Rancho Grande in the Sierra de la Costa, Venezuela. The chicks reached asymptotic weight of 13.9 g (132% of adult weight) on day 17 post hatching and showed weight recession to 11.6 g (106% of adult weight) at fledging on day 25-26. This swallow had a lower growth rate (K = 0.395; $T_{10\text{-}90}$ = 11.2 days) than several temperate zone species. An early appearing semiplume portion of the first feather coat is rare in passerine birds.

Key words: *Pygochelidon cyanoleuca*, Blue-and-white Swallow, growth, Venezuela.

INTRODUCTION

The aptly-named Blue-and-white Swallow (*Pygochelidon cyanoleuca*) is a familiar sight in many parts of the Neotropics. Its breeding range extends from southern Argentina northward to Costa Rica (Skutch 1952, 1960, Turner and Rose 1989). Populations in the northern part of its range are resident while southern populations (*P. c. patagonica*) are regular transequatorial austral migrants to areas as far north as Panama, Colombia, Venezuela and Trinidad (Junge and Mees 1961, Turner and Rose 1989, Hilty and Brown 1986, Hilty 2003, ffrench 1991) and casual as far north as Nicaragua, Honduras and southern Mexico (Hilty and Brown 1986).

Within this extensive range it occurs in a wide variety of habitats but is partial to forest clearings and non-forested areas from near sea level to about 4,000 m in both tropical and temperate zones (Turner and Rose 1989). Blue-and-white Swallows frequently breed in close association with human activities and utilize a wide variety of man-made and natural openings and cavities as nest sites (Skutch 1952, Turner and Rose 1989). These swallows have been the subject of a variety of field studies covering their social behavior and breeding biology (Skutch 1952, 1960), vocalizations (Hilty and Brown 1986), foraging, diet and timing of breeding (Turner 1983), plumage development (Arnold *et al*. 1983), and migration (Zimmer 1955, Hilty and Brown 1986, Turner and Rose 1989). Although the statistics characterizing the growth of Blue-and-white Swallow nestlings have been included in earlier studies (Ricklefs 1976, Starck and Ricklefs 1998), the original data on which these are based have never been placed on record and I, belatedly, do so here.

MATERIALS AND METHODS

Observations on the growth of Blue-and-white Swallows were made between March and July 1972 at Estación Biológica "Alberto Fernandez Yepes" Rancho Grande located near the crest of the Sierra de la Costa in Parque Nacional Henri Pittier, 13 km NW of Maracay, Estado Aragua, Venezuela (10° 21' N – 67° 40' W, 1100 m). The ecology of Rancho Grande and environs is described by Beebe and Crane (1947) and Beebe (1949). The unfinished portions of the Rancho Grande structure provided an extensive array of openings and cavities utilized by Blue-and-white Swallows as nesting sites. Even so, a nest box erected for them was investigated within hours of being put in place and nest building was observed the following day implying a shortage of nest sites.

Observations of nestling growth were made on 18 chicks from six nests. Measurements of wing length (unflattened) and body weight were made on from 6 to 26 days per chick. Nestlings were weighed to the nearest 0.1 g with a Pesola spring balance. Wing and tail measurements were made to the nearest 0.5 mm with a stopped metal wing rule. The summary growth statistics for these data were generated by R. E. Ricklefts (1976) using the logistic growth model. Included values were: the overall growth rate constant K which can be used for interspecific comparisons, the asymptote of the growth curve A, the ratio of the asymptote to adult weight R, and $T_{10\text{-}90}$, an inverse measure of the growth rate representing the time for growth between 10% and 90% of the asymptote.

RESULTS

Blue-and-white Swallow eggs were uniformly white with an average size of 17.0 × 12.2 mm and an average weight of 1.3 g (SD 0.1, n = 10). The clutch sizes of 7 nests observed in this study were all of 2-3 eggs. Elsewhere, clutch size of Blue-and-white Swallows shows geographical variation, ranging from three to six in Argentina and Chile to only two to four in Costa Rica, Colombia and Venezuela (Turner and Rose 1989, Hilty 2003).

At hatching, Blue-and-white Swallow chicks had only a sparse covering of 13-14 natal downs (neossoptiles)

located in the orbital, coronal, occipital, mid-dorsal and scapular regions (Arnold *et al*. 1983). Traces of natal downs were present as late as 18-20 days post hatching. The eyes, which were closed at hatching, began to open on day 6 and were fully open on day 9. Primary wing feathers first erupted through the skin on day 6 post hatching and grew at an average rate of 3.4 mm/day (Table 1) until reaching 79 mm or 84% of the adult wing length (94.2 mm, Turner and Rose 1989) at fledging (Fig. 1).

Rectrices first erupted through the skin on day 6 (Fig. 1) and grew at an average rate of 2.4 mm/day (Table 1) until reaching 39.5 mm or 79% of adult tail length (49.7 mm, Turner and Rose 1989) at fledging (Fig. 1). Contour feathers (teleoptiles) could be seen as dark subdermal spots starting at day 3 and erupted through the skin on day 6 -7. Among the first to erupt from their sheaths were pale colored down-like semiplumes. These were in rows located along the medial border of the humeral and femoral tracts and lateral border of the dorsal and pelvic tracts (Arnold *et al*. 1983). These appeared to be an early-growing portion of the juvenal plumage and reached full length of 10 -10.5 mm by day 13-14. The more typical pennaceious contour feathers erupted through their sheaths starting at day 10-12 and began to cover over the semiplumes by day 15-16 (See Photo).

The semiplumes were completely covered over by pennaceious feathers by day 20-22 post hatching.

At hatching, a Blue-and-white Swallow chick body

Table 1. Growth of Blue-and-white Swallow nestlings.

Age (Days)	Wing Length (mm)	Range	Tail Length (mm)	Range	Body Weight (g)	Range	n
1	5.4	5.0-6.0	0		1.26	1.1-1.4	10
2	6	5.5-6.0	0		1.7	1.4-2.0	13
3	6.7	6.5-7.0	0		2.35	2.1-3.0	9
4	7.1	6.5-7.5	0		3.2	2.3-4.1	14
5	8	7.0-8.5	0		4.12	3.0-5.8	11
6	9.6	8.5-10.5	0		5.3	4.0-6.4	16
7	11.8	9.5-15.0	< 0.5		6.8	5.2-8.5	14
8	14.3	11.0-18.5	0.5	0.0-2.5	8.15	6.2-10.3	16
9	17.6	12.0-21.5	1	0.5-3.0	9.5	7.5-11.5	14
10	20.8	14.0-23.0	1.8	0.5-3.5	10.48	8.2-12.3	16
11	24.7	16.5-29.0	3.7	0.5-6.0	11.89	10.3-14.3	14
12	28.3	19.5-33.0	6	1.0-8.5	12.07	10.5-14.3	16
13	33	23.0-38.5	8.9	3.0-11.5	12.64	10.8-14.0	13
14	36	27.5-39.5	11.2	6.0-13.0	12.79	16.0-14.5	12
15	40.7	31.0-45.5	14.3	7.5-19.5	13.3	11.8-15.0	13
16	43.8	35.5-47.5	15.9	11.0-19.0	13.67	12.8-15.0	8
17	48.8	39.0-52.5	18.9	13.0-22.5	13.85	13.0-15.3	9
18	52.4	43.0-57.0	21.2	15.0-25.0	13.68	12.8-15.0	10
19	56.8	47.0-61.5	24.9	16.5-30.5	13.11	12.0-14.5	10
20	59.5	50.0-63.0	25.7	20.0-29.0	13.19	12.0-14.5	8
21	63.9	55.0-67.5	28.3	22.0-31.5	12.75	11.3-14.0	10
22	67.6	59.0-70.5	31.2	26.0-35.0	12.46	11.3-14.5	10
23	69.2	62.5-73.5	32.4	27.0-36.5	12.7	11.3-14.0	6
24	72.4	65.5-76.5	34.4	29.0-37.5	11.83	10.1-13.5	7
25	74	69.0-79.5	35.3	33.0-40.0	11.68	9.8-14.0	5
26	79	72.5-82.5	39.5	35.0-42.0	11.16	10.0-12.5	3

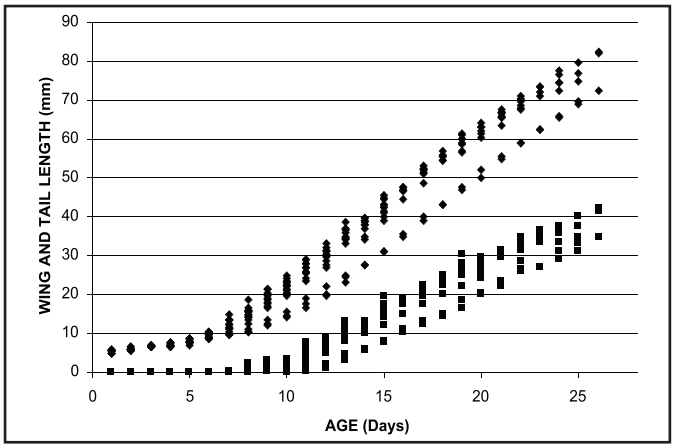

Fig. 1. Growth of the wing (diamonds) and tail (squares) of Blue-and-white Swallow chicks in Venezuela.

A Blue-and-white Swallow chick on day 15. The pale semiplumes are starting to be overgrown by the incoming contour feathers.

weight averaged 1.26 g, increased threefold by day 4, and reached a maximum average weight of 13.85 g (132% of adult weight) on day 17 (Table 1). Thereafter the average body weight of the nestlings declined to 11.16 g (106% of adult weight) at fledging on day 25-26 post hatching (Fig. 2).

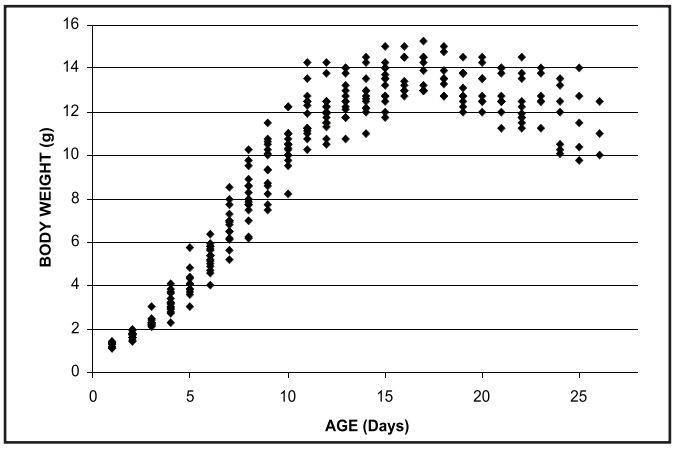

Fig. 2. Daily increase in body weight of Blue-and-white Swallow chicks in Venezuela.

Five samples of prey items being taken to nestlings were obtained from adult Blue-and-white Swallows caught in mist nets at Rancho Grande and nearby Portachuello Pass. These samples included 71 individuals distributed in six orders and 27 families of insects. The most numerous prey were fungus gnats (Sciaridae, 15), ants (Formicidae, 11) and bark beetles (Scolytidae, 6). All other taxa were represented by fewer than four individuals. The mean size of these prey items (head to tail body length) was 3.1 mm (SD = 1.2, range 0.7-5.5 mm).

DISCUSSION

The development of the wing, tail and contour feathers of nestling Blue-and-white Swallows followed a pattern generally similar to that reported for other species of hirundines. The early-appearing semiplume portion of the first teleoptile (juvenal) plumage is rare among passerines (Arnold *et al*. 1983, Collins 2010a) although typical of the swift subfamilies Cypseloidinae and Apodinae, but not the Chaeturinae (Collins 1963, 2010b). These feathers presumably provide added insulation for the developing chicks.

The ratio (R) of the asymptotic weight calculated by the growth model (14.0 g) to adult body weight was higher (1.40) than all but one of eight other hirundines examined by Ricklefs (1968a, 1976). The value of R would be somewhat lower (1.33) if the average adult body weight of adult Blue-and-white Swallows is taken as 10.5 g (Collins 1972, Turner and Rose 1989) rather than 10.0 g used by Ricklefs (1976).

In his study of the Mangrove Swallow (*Tachycineta albilinea*), Ricklefs (1976) noted examples of abnormal growth where the development of the wing and tail were delayed but still largely paralleled the growth pattern of normal broods. This was thought to be the result of poor nourishment. One such case was noted in this study of Blue-and-white Swallows where the growth of the wing and tail of a brood of three was "stalled" for two days. When growth continued, it followed a trajectory parallel to that of the chicks in other broods (Fig. 1). In this case the abnormal growth pattern was caused by disturbance of one of the adults which was inadvertently trapped in the nest chamber when the chicks were being removed for weighing and measuring. This presumably resulted in a temporary decrease in food delivery by the adult which in turn resulted in the observed delay in wing and tail growth of the chicks. Body weights of the chicks did not show this prolonged effect and were indistinguishable from those of other equal-aged chicks once normal food delivery was resumed.

A rapid increase in chick body weight to a level well in excess of adult weight followed by weight recession has been noted in a number of species of birds (Ricklefs

1968b, 1976). In hirundines, the weight recession is attributed to a decrease in water content during maturation of the integument and developing feathers (Ricklefts 1967, 1968). In seabirds, the weight recession seems mostly attributable to chicks using up stored fat reserves prior to fledging (Ricklefs 1968b).

The overall growth rate of Blue-and-white Swallows (K = 0.393) closely approximated that of Grey-breasted Martins (*Progne chalybea* K = 0.395) also nesting at Rancho Grande in 1972 (Ricklefs 1976, Turner 1984). These observed growth rates are slower than those documented for six of eight species of temperate zone swallows (Ricklefts 1968a, Starck and Ricklefs 1998). Similarly, the $T_{10\text{-}90}$ value for Blue-and-white Swallows (11.2 days) is higher than that for seven species of swallows (Starck and Ricklefs 1998) and is exceeded only by that for the much larger Purple Martin (*Progne subis*).

Slower growth rates have been documented for a number of tropical passerines (Ricklefs 1976). One suggested explanation for this has centered on an increased consumption of fruit by tropical species and an associated low protein intake (Snow 1971, Morton 1973, Ricklefs 1976). In the case of swallows and martins, which are strictly insectivorous in both temperate and tropical areas, the explanation lies elsewhere. Additional data from other tropical species of hirundines may allow this topic to be revisited.

Parasitic louse flies (Hippoboscidae) were observed on both nestlings and adult Blue-and-white Swallows. Two specimens were contributed to the collections of the British Museum (Natural History) and identified as *Ornithomya ambigua* Lutz (A. M. Hutson, pers. comm.).

Blue-and-white Swallows were among the most abundant species present at Rancho Grande during the 1972 study period. This was also true in 1945 as recorded by Beebe (1949) and later by Schafer and Phelps (1954) when a colony of 25-30 pairs was present around the building. This status has changed in recent years and both Blue-and-white Swallows and Grey-breasted Martins were nearly absent from Rancho Grande in 1993 (T. P. Ryan, pers. comm.) and in 1995 when I revisited the site. The reasons for this change are currently unknown but may be related to forest regeneration and a decrease in open space around Rancho Grande.

Diptera were prominent in the diets of nestling Blue-and-white Swallows in Merida, Venezuela, where they made up 26.9% of 889 prey items (Turner 1983); ants (22.3%) and beetles (10.9%) were also numerous. Mayflies (Ephemeroptera) were not recorded in the diet samples at Rancho Grande but were numerous (14.6%) in those at Merida (Turner 1983). Hymenoptera are the commonest prey type of swallows in tropical areas while Diptera are more highly represented in the diets of temperate species (Turner 1983). This is in large part due to the greater number of ants in the diets of tropical species. The presence of large numbers of long-winged ants in the diet of Blue-and-white Swallow nestlings in Merida probably contributed to the larger mean prey size (4.6 mm) there which was determined by wing length (Turner 1983) and not body length as at Rancho Grande.

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REFERENCES

Arnold, K. A., Boyd, E. J. and **Collins, C. T.** 1983. Natal and juvenal plumages of the Blue-and-white Swallow. *Auk,* 100: 203-205.

Beebe, W. 1949. High Jungle. New York: Duell, Sloan and Pearce. 379 p.

Beebe, W. and **Crane, J.** Ecology of Rancho Grande, a subtropical cloud forest in northern Venezuela. *Zoologica,* 32: 43-60.

Collins, C. T. 1963. The "downy" nestling plumage of swifts of the genus *Cypseloides*. *Condor,* 65: 324-328.

Collins, C. T. 1972. Weights of some birds of north-central Venezuela. *Bulletin of the British Ornithologists' Club,* 92: 151-153.

Collins, C. T. 2010a. A review of natal pterylosis of passerines: useful information or avian marginalia? *Bulletin of the British Ornithologists' Club,* 130: 96-101.

Collins, C. T. 2010b. Notes on the breeding biology of the White-throated Swift in southern California. *Bulletin of the Southern California Academy of Sciences*. In press.

ffrench, R. 1991. A Guide to the Birds of Trinidad and Tobago. 2nd ed. Ithaca: Cornell Univ. Press, 426 p.

Hilty, S. L. 2003. Birds of Venezuela. 2nd ed. Princeton: Princeton University Press. 878 p.

Hilty, S. L. and. **Brown, W. L.** 1986. Guide to the Birds of Colombia. Princeton: Princeton University Press. 836 p.

Junge, G. C. A. and **Mees, G. F.** 1961. The Avifauna of Trinidad and Tobago. Leiden: E. J. Brill. 172 p.

Morton, E. S. 1973. On the evolutionary advantages and disadvantages of fruit eating in tropical birds. *American Naturalist,* 107: 8-22.

Ricklefs, R. E. 1967. Relative growth, body constituents, and energy content of nestling Barn Swallows and Red-winged Blackbirds. *Auk,* 84: 560-570.

Ricklefs, R. E. 1968a. Patterns of growth in birds. *Ibis,* 110: 419-451.

Ricklefs, R. E. 1968b. Weight recession in nestling birds. *Auk,* 85: 30-35.
Ricklefs, R. E. 1976. Growth rates of birds in the humid New World topics. *Ibis,* 118: 179-207.
Schafer, E. and **Phelps, W. H.** 1954. Las aves del Parque Nacional "Henri Pittier" (Rancho Grande) y sus funciones ecologicas. *Boletin de la Sociedad Venezolana de Ciencias Naturales,* 83: 3-167.
Skutch, A. F. 1952. Life history of the Blue-and-white Swallow. *Auk,* 69: 329-406.
Skutch, A. F. 1960. Life histories of Central American birds II. *Pacific Coast Avifauna,* 34: 1-448.
Snow, D. W. 1971. Evolutionary aspects of fruit-eating by birds. *Ibis,* 113: 194-202.
Starck, J. M. and **Ricklefs, R. E.** 1998. Avian growth rate data set. pp. 381-423. *In* **J. Mathias Starck** and **Robert E. Ricklefs,** eds. Avian growth and development: evolution within the altricial-prococial spectrum. New York: Oxford Univ. Press. 441 p.
Turner, A. K. 1983. Food selection and timing of breeding of the Blue-and-white Swallow *Notiochelidon cyanoleuca* in Venezuela. *Ibis,* 125: 450-462.
Turner, A. and **Rose, C.** 1989. Swallows and Martins. An Identification Guide and Handbook. Boston: Houghton Mifflin Co. 258 p.
Zimmer, J. J. 1955. Studies on Peruvian birds, No. 66. The swallows. *American Museum Novitates,* 1723: 1-35.

NATURE NOTE

Presence of the Spider Family Titanoecidae in Trinidad and Tobago

Sewlal and Cutler (2003) list 54 spider families on Trinidad and Tobago and postulated that 12 others might exist in the twin-island state. However, these additional families were included based on the fact that Trinidad and Tobago separated from the South American continent 16, 000 years ago (Kenny 1995). Therefore, one can make the assumption that the biota north of the Amazon and east of the Andes would be similar to that found in Trinidad and Tobago. Subsequent studies have confirmed the presence of six additional families (Cutler 2005, Sewlal and Cutler 2003, Sewlal and Alayón 2007, Sewlal 2009).

A review of material collected between 2002 and 2009 in my collection revealed a specimen belonging to the Titanoecidae collected from deciduous seasonal forest in Chaguaramas. Sewlal and Cutler (2003) gave a brief description of this family and suggested its presence in Trinidad, which is now confirmed.

The confirmation of this family brings the total number of spider families known from Trinidad and Tobago to 50.

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REFERENCES

Cutler, B. 2005. Synotaxidae, another Trinidadian spider (Araneida) family. *Living World, Journal of The Trinidad and Tobago Field Naturalists' Club,* 2005: 49.
Kenny, J. S. 1995. Views from the Bridge: A Memoir on the Freshwater Fishes of Trinidad. Port of Spain, Trinidad and Tobago: Prospect Press. 98 p.
Sewlal, J. N. and **Cutler, B.** 2003. Annotated list of spider families of Trinidad and Tobago (Araneida). *Living World, Journal of The Trinidad and Tobago Field Naturalists' Club,* 2003: 9-13.
Sewlal, J. N. and **Alayón, G. G.** 2007. Addendum - Four more Trinidadian spider (Araneida) families. *Living World, Journal of The Trinidad and Tobago Field Naturalists' Club,* 2007: 85.
Sewlal, J. N. 2009. Two additional spider (Arachnida: Araneida) families for Trinidad and Tobago. *Living World, Journal of The Trinidad and Tobago Field Naturalists' Club,* 2009: 36.

Jo-Anne Nina Sewlal
Dept. of Life Sciences, University of the West Indies,
St. Augustine, Trinidad and Tobago.
joannesewlal@gmail.com