

Diet and breeding of the poorly known White-chinned Swift *Cypseloides cryptus* Zimmer, 1945, in Brazil

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ABSTRACT: The White-chinned Swift *Cypseloides cryptus* is perhaps one of the rarest swift species in the New World, and many aspects of its life history are poorly known. Here we report some new information on diet and reproductive behavior of a breeding population of *C. cryptus* at Asframa Falls, Rio Preto da Eva, Amazonas, Brazil. During four surveys at the breeding site (March and August 2012, July and August 2013), six active small cup-shaped nests were found and are described. Measurements and plumage information of five collected adults and two chicks are also provided. Stomach contents (n=5) revealed the presence of insects of the order Hymenoptera and Hemiptera. The presence of a member of Psyllidae (Hemiptera) in the stomach contents suggests that this swift might also use a slightly different foraging strategy than commonly stated about swifts. Additionally, with this new information it is possible to determine the presence of the species over at least nine months in Brazil, indicating year-round residence.

KEY-WORDS: Apodidae, Hemiptera, Hymenoptera, nest, stomach contents.

INTRODUCTION

The White-chinned Swift *Cypseloides cryptus* Zimmer, 1945, might be one of the rarest swift species in the New World with fewer than 20 specimens collected from all parts of its known range (Kiff 1975). Additionally, with only a few scarce observations in southern Central and northern South America (Chantler 1999), the natural history and distribution of the species are, unsurprisingly, still poorly known.

This bird occurs between sea level and 3000 m a.s.l. Its main habitats are classified as montane and tropical lowland evergreen forests, with a clear preference for gorges and waterfalls, which are used to nest and roost (Chantler 1999). This swift was recently discovered in Brazil, in the municipality of Presidente Figueiredo, Amazonas State, where some individuals were observed breeding in local waterfalls (Whittaker & Whittaker 2008). Central American records are from Belize, Honduras, Nicaragua,

Costa Rica, and Panama. In South America outside of Brazil, there are records from Peru, Ecuador, Colombia, Suriname, Venezuela (on the cordillera and tepuis) and Guyana (Chantler 1999).

METHODS

The Asframa Falls (02°08'10.37"S, 59°59'46.46"W) (Figure 1A) is located in the Urubu river, municipality of Rio Preto da Eva, state of Amazonas, Brazil, c. 10 km distant from the Natal Waterfall breeding site discovered by Whittaker & Whittaker (2008). It is a recreational area with a playground and two waterfalls, a large and a smaller one, surrounded by several acres of pristine forest. The largest waterfall is approximately 5 m high and is formed by two levels, a short one c. 1 m high and a larger one with a fall of 4 m.

The data presented here were gathered during four

surveys at the breeding site (5 to 9 March and 9 to 15 August 2012, 13 July and 17 August 2013). Collected specimens (all fully-grown adults, being one male and four females) are housed in the ornithological collection of Museu Nacional/UFRJ, Rio de Janeiro, Brazil (MN). Four specimens were prepared as study skins and one was prepared as a “*shmoo*”, saving the full skeleton (Winker 2000) (Figure 1B). All carcasses were fixed in 4% formalin and subsequently preserved in 70% ethanol; muscular tissue samples were preserved in anhydrous ethanol. Two nests were dried and stored in the nest collection (MNON-5482; MNON 5483); their classification follows Simon & Pacheco (2005). Unfortunately, the small and delicate eggs were damaged during transport and could not be measured.

The entire digestive tract was examined for food items, but remains were present in stomachs only. Stomachs were extracted from the abdominal cavity,

dissected and stored in 70% ethanol. Each individual's stomach content was placed in a Petri dish and analyzed with a stereomicroscope. Arthropods were identified to the lowest possible taxonomic level with help of specialized literature (Rafael *et al.* 2012). Fragments were grouped and counted by morphological similarities, estimating the minimum number of prey of each taxa present in each sample. Digital photographs were taken using Canon Rebel XSi and Sony Cyber-Shot DSC-HX1 cameras, lens Sigma 150-500-mm, and cellular phone iPhone 4S. Nest measurements were taken using a digital caliper Mitutoyo Absolute and a measure tape.

RESULTS AND DISCUSSION

During the first field trip to Rio Preto da Eva, in March 2012, a group of about 10 to 12 individuals of the White-

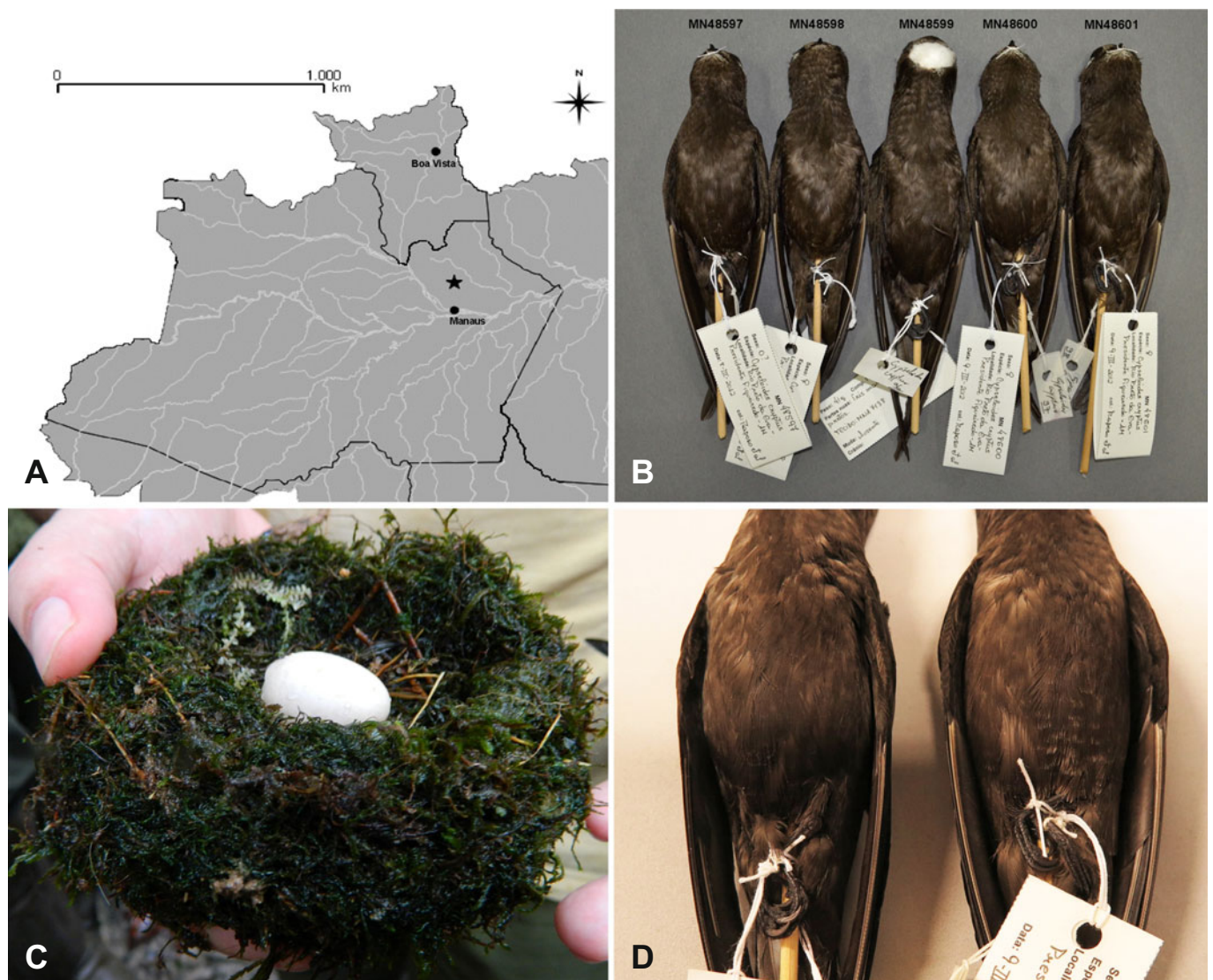


FIGURE 1. A – Star = Asframa Falls, Rio Preto da Eva, Amazonas; B – White-chinned Swifts collected and housed in Museu Nacional/UFRJ, all fully-grown adults. MN 48599 – male with full skeleton preserved; MN 48597, 48598, 48600 and 48601 – females (Photo: Guilherme Brito); C – White-chinned Swift nest and egg collected and housed in Museu Nacional/UFRJ (Photo: Gabriella Frickes); D – Detail of possible undescribed plumage sexual dimorphism. Male on the left (MN 48599); female on the right (MN 48601); note white-tipped feathers on female's abdomen (Photo: Guilherme Brito).

chinned Swift was found using the rocky wall behind the waterfall. On that occasion, five adult specimens, and two active nests, each containing one small and overall white egg (Figure 1C), were collected by hand (see measurements of birds and nests below). Other four nests described in the present work (hereafter numbered N1 – N4) were observed in the subsequent surveys in 2013, but not collected, with features discussed below (Tables 1 and 2, Figure 2).

All specimens had good amount of accumulated fat on their interclavicle, abdominal, intercostal and uropygium regions, with no visual difference between the individuals despite their differences in mass.

The measurements of the birds (Table 2) show that the overall size of the male specimen is larger than those of the females and an interesting plumage pattern was observed on the abdominal area of the skins of adult specimens. All females have several feathers on that region tipped white, while the only male has them uniformly dark-brown and very few feathers tipped buff. This might be an important and previously undescribed character of sexual dimorphism in plumage (Figure 1D). Analyzing specimens of adult Sooty Swifts *Cypseloides fumigatus* (Streubel, 1848) housed at the Museu Nacional, the same

pattern was found, and further work on collections with specimens of the small and dark *Cypseloides* should be done to confirm our suggestion. The suggestion that white tips to the lower belly might be an indicative of immaturity (Schulenberg et al. 2007, Roesler et al. 2009) should also be investigated, because all specimens collected had fully ossified skulls, indicating adulthood.

Diet

In the stomach contents, we counted 36 prey items among the five samples. The material was in an advanced stage of digestion and two of the five analyzed stomachs were completely empty (MN 48597; MN 48598 – both females). The remaining three stomachs contained 72.2% Hymenoptera (n = 26) and 27.8% Hemiptera (n = 10). We have also found some green moss (Bryophyta) fragments in two female samples (MN 48600; MN 48601), but these were considered to have possibly been ingested accidentally because the same material is used in nest construction. Most of the whole Hymenoptera that allowed further identification were mainly winged ants (Formicidae). All Hemiptera identified belonged to Psyllidae (jumping plant lice).

TABLE 1. Measurements of five White-chinned Swift *Cypseloides cryptus* nests at Rio Preto da Eva, state of Amazonas, Brazil. N1 nest was only observed but not measured in time before being destroyed.

Nest Metrics	NH ¹ (cm)	H ² (cm)	ND ³ (cm)	BW ⁴ (cm)
MNON 5482*	4.9	-	4.3	8
MNON 5483*	4.1	-	2.4	9.3
N2	4.6	255	2.7	14.5
N3	3.0	255	-	11.9
N4	3.4	255	-	8.5

¹NH = Nest height measured on the exterior from bottom to top; H² = height from the ground to the nest; ND³ = internal nest depth; BW⁴ = nest width measured at the base.

*Nests already dry, stored in the proper collection.

MNON 5482 and MNON 5483 collected in March 2012.

N2 – N4 nests observed in August 2013.

TABLE 2. Measurements of the collected individuals of White-chinned Swift *Cypseloides cryptus* in Rio Preto da Eva, Amazonas State, Brasil.

Catalog Number	TL (mm)	WS (mm)	WL (mm)	CH (mm)	BL (mm)	BH (mm)	BW (mm)	T (mm)	Ta (mm)	W (g)	Sex
MN48597	145	345	133.30	135	4.98	2.25	7	15.02	45	37	F
MN48598	137	348	130.00	133	5.02	2.24	6.8	13.35	43	34	F
MN48599	145	364	142.35	137	5.03	3	8	16.15	50	41	M
MN48600	138	348	135.05	139	4.97	2.3	7.1	15	46	39	F
MN48601	146	342	133.00	137	5.00	2.35	6.3	13.3	47	40	F

TL = total length, WS = wing span, WL = wing length, CH = chord, BL = bill length (nostril to tip), BH = bill height (at the base), BW = bill width (at the base), T = tarsus, Ta = tail length, W = weight. Sex, mass, total length and wingspan taken in recently euthanized specimens. Remaining data after preparation (bill measures from the “schmoo” skin made on the carcass).



FIGURE 2. Locations of White-chinned Swift's studied nests (N1 – N4) on Asframa Falls, Rio Preto da Eva - Amazonas in 17 August 2013 (Photo: R. Biancalana).

Such preference for preying upon winged individuals of Formicidae corroborates the report by Beebe (1949), who found “great quantities of *Crematogaster* and *Azteca* flying ants” in the stomach of one specimen and “winged female *Azteca* ants” in another specimen of *C. cryptus*. Howell (1957) observed *c.* 35 individuals of this species feeding in flight above the forest border at a clearing in Nicaragua, where the stomach content of one collected female was not identified, but believed to be Hymenoptera. Marín & Stiles (1992) reported contents of four stomachs and two boluses with 91.7% Hymenoptera (mainly Formicidae and Blastophagidae), but the Psyllidae records reported here are new.

The presence of Psyllidae or “jumping plant louse” as one of the most important food items found in the stomachs gives us some interesting insights about foraging strategies of this species. As members of the Sternorrhyncha suborder, insects known to be relatively inactive for most of their lives (Borror *et al.* 1992), our findings suggest that birds might use a different foraging strategy to reach and consume them, rather than capturing swarming insects during flight. Some swifts are known to catch aquatic insects in lakes and rivers by reducing their flight speed sufficiently to permit them to grab individual prey items directly from the water surface (Chantler 1999). Similar observations, not from water bodies, but on Amazonian tree canopies were made when individuals of Short-tailed

Swifts *Chaetura brachyura* (Jardine, 1846) were observed slowing down their flight speed and taking unidentified insects directly from the tree leaves near Manaus (R. P., *pers. obs.*). This could be a recurrent and rarely recorded foraging strategy of swifts. Bull & Beckwith (1993) also report Vaux's Swifts *Chaetura vauxi* (Townsend, 1839) capturing insects from the tree canopy in the USA.

Although the hypothesis above is speculative to a certain degree, our data indicate its plausibility. The 30% of the diet by number composed by neither non-volant nor swarming Psyllidae is noteworthy. In addition, these insects are sessile and animals with these characteristics are predated by closely related birds (Chaeturinae – Bull & Beckwith 1993). Further observations of this rare swift and other Cypseloidinae might clarify this issue.

Breeding

Two nests were collected on 8 March 2012 attached to a rocky bed with one side leaning against the rocky wall near the ceiling behind the waterfall, only accessible via a bypass where the water volume was reduced (Figure 2). They consisted of a cup-shaped simple/platform (Simon & Pacheco 2005) mainly constructed of moss, rootlets and mud, which were humid due to constant water sprinkle. Both nests contained a single sub-elliptical pure opaque white egg. On the occasion of the second survey,

the water volume was greater compared to the first one due the advanced stage of the raining season, and despite careful searches behind the waterfall, no individuals or nests were found.

On 13 July 2013, RNB made a visit to the Asframa Falls and observed a flock of 5 to 6 individuals of White-chinned Swifts foraging with Fork-tailed Palm-Swifts *Tachornis squamata* (Cassin, 1853). One active nest (N1) occupied by an adult individual (denoted by the dark brown plumage with characteristic whitish facial marks) was found behind the upper part of the main fall. This nest had a small cup shape and was of plant material, rootlets and leaves visibly damp on the exterior.

A subsequent visit to Asframa Falls made by RNB on 17 Aug 2013 revealed the presence of two individuals foraging above the area of the falls as well as three additional nests (N2 - N4) behind the fall, one of them empty, made of bryophytes, mud and fine rootlets. The interior was lined with interwoven fine roots, sitting on a dry area of the lower part of the fall (N2). The nest seen in July (N1) was found partially destroyed, and this was the reason for the absence of measurement data for it (Figures 2 and 3; Table 1).

A single nestling in its early stage of development was found in N3. It was not larger than 2 cm, had closed eyes, overall dark sooty gray down and forehead feathers in their sheaths. N4 was also active. The brooding adult occupying this nest reacted to human approach by conspicuously shaking its wings and ruffling its nape feathers. After a few minutes the adult left the nest enabling the observer to confirm the presence of a chick, which was in a more advanced stage of development than the chick in N3. Its body was covered with dark gray downy plumage. The eyes were open and it had sluggish movements, occasionally moving the head towards the flanks (Figure 3). No vocalization was heard from the adults or nestlings during visits.

Nests were in place and conditions similar to those described by Marín & Stiles (1992) and Whittaker & Whittaker (2008). The main difference being the position and type of the nest described as a “low cup/lateral” for the latter, and in some aspects similar to those observed by Ayarzagüena (1984) and Marín & Stiles (1992) for the same species. The reuse of reproductive sites is well known for species of Cypseloidinae (see Pichorim 2002). Regarding clutch size, Marín (1997) reports one-egg

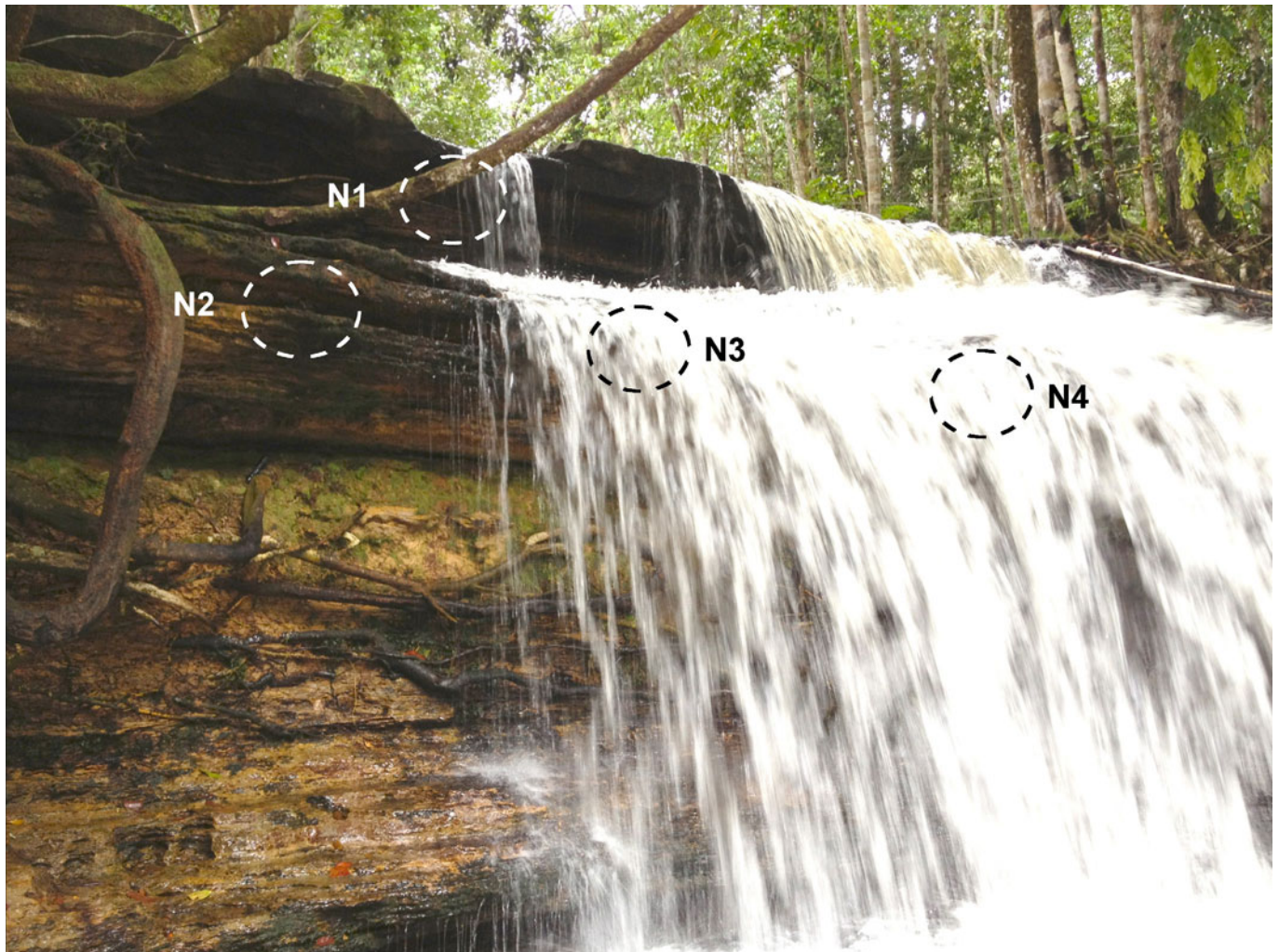


FIGURE 3. A. White-chinned Swift chick in N3 and, in the back, an adult in N4 (dashed circle). B. Chick with downy plumage in N4. Chicks with approximate age of ten to fifteen days (N3 younger than N4). Asframa Falls, Rio Preto da Eva – Amazonas (Photos: R. Biancalana).

clutch for both White-chinned and Spot-fronted Swifts, *Cypseloides cherriei* Ridgway, 1893.

As expected for Cypseloidinae swifts, the nests were in dark and constantly humid areas, and the morphology, composition and placement of the structures coincide with previous observations of this species and closely related ones (e.g. Spot-fronted Swift), where bryophytes, mud and other vegetable fibers were used (Knorr 1961, Foerster 1987, Marín & Stiles 1992, 1993). Also, these elements have usually been assigned as differentiating characters between *Cypseloides* and the remaining genera within Apodidae, which do not use this particular kind of vegetation associated with mud (Lack 1956, Whitacre 1989).

Based on Marín & Stiles (1992) description of White-chinned Swifts nestling development, we calculate that both chicks were around ten days to two weeks old, with the chick in N3 probably younger than the other. Therefore, considering the known nestling period for this species (55–58 days, Marín & Stiles 1992), we estimate the fledging period of these chicks to be around late September–mid October.

The presence of one adult in the nest when chicks are young, usually no more than three weeks old and with the body mainly covered with downy feathers is a common characteristic of other *Cypseloides* species, such as the Sooty Swift (Biancalana 2015).

Our records from March to September and multiple observations in the region between Manaus and Presidente Figueiredo from July to November (Guy M. Kirwan, pers. comm.) testify the presence of White-chinned Swift for at least nine months (March–November) in Brazil, with strong indications of successful breeding (used nests from previous breeding seasons and fledging individual pictures in Whittaker & Whittaker 2008), and absence of seasonal migratory movements. Our results point to the importance of Hemiptera (Psyllidae) and Hymenoptera (Formicidae) insects in the diet, and confirm the importance of waterfalls for nesting, which might prove helpful for further amplifying the knowledge about the distribution and natural history aspects of this elusive species.

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