

## First record of folivory in *Artibeus planirostris trinitatis* Andersen, 1906

First described as an anomaly, leaf eating or folivory is nowadays thought to be a common behaviour in certain Neotropical fruit-eating bats (Kunz and Diaz 1995, Duque-Márquez *et al.* 2019, Rodrigues Jorge *et al.* 2023). Folivory evolved independently in both New World (fam. Phyllostomidae) and Old World (fam. Pteropodidae) fruit-eating bats, probably to overcome the lack of certain nutrients (such as proteins or minerals) in a fruit dominated diet (Kunz and Ingalls 1994). There are nine confirmed neotropical bat species that include leaves in their diet, from the genera: *Artibeus* (7 species), *Platyrrhinus* (1 species) and *Carollia* (1 species) (Arias Arone and Aguirre Quispe 2022, Rodrigues Jorge *et al.* 2023). However, the knowledge about the importance of leaves in the diets of these species is still poor with only 26 published research articles on the matter during the last 65 years, most of them being occasional records (Arias Arone and Aguirre Quispe 2022, Rodrigues Jorge *et al.* 2023, and references therein).

Around 70 species of bats occur in Trinidad and Tobago, of which more than half belong to the Phyllostomidae family (Gomes and Reid 2015). Three of these species, *Artibeus lituratus* (Olfers 1818), *A. planirostris* (Spix 1823) and *Carollia perspicillata* (Linnaeus 1758) have been recorded to use leaves in their diets in different parts of the neotropics (Rodrigues Jorge *et al.* 2023 and references therein). However, in Trinidad and Tobago, only *A. lituratus* has ever been recorded to use leaves as part of their diet (Greenhall 1957).

*Artibeus planirostris trinitatis* Andersen, 1906 is the subspecies of the Flat-faced Fruit-eating Bat, *A. planirostris*, inhabiting Northern Venezuela and the islands of Trinidad and Tobago (Wilson and Mittermeier 2019). Previously included as a subspecies of the Jamaican Fruit-eating Bat, *A. jamaicensis* Leach, 1821, recent studies have included the subspecies *trinitatis* as part of *A. planirostris* based on molecular and dental characters (Larsen *et al.* 2007, 2010a, 2010b). Most references on the bats of Trinidad and Tobago still include the names Jamaican Fruit-eating Bat or *A. jamaicensis* to refer to the individuals of the species (Gomes and Reid 2015, Trinibats 2023, iNaturalist 2023). Nevertheless, as there is only one species of the *A. jamaicensis* species group inhabiting these islands (*sensu* Simmons 2005), all the information published about the species for this geographical region should be accepted as true for *A. p. trinitatis*, since this is just a new denomination.

On the island of Trinidad this species is one of the most

abundant fruit-eating bats (Gomes and Reid 2015). It is known to roost both in leaf-made tents, trees, and buildings, where it lives in groups normally formed by a dominant male and a harem of females and their pups. It feeds mainly on fruits, with figs being their favourite food source. Bats leave the day-roost at nighttime to go foraging. Once they find fruit, they carry it in their mouth to a feeding roost where they consume it. In addition to fruits, *Artibeus planirostris* is known to complement its diet with pollen and insects (Hollis 2005, Teixeira *et al.* 2009). Moreover, recent publications from Peru and Brazil have reported that some subspecies of *A. planirostris* include leaves in their diet (Arias Arone and Aguirre Quispe 2022, Cordero-Schmidt *et al.* 2016, Teixeira *et al.* 2009). Yet, to my knowledge, there is no previous record of folivory in populations of *A. p. trinitatis*.

The night of the 8 February 2023 an individual of *A. p. trinitatis* was observed consuming a leaf of the Immortelle tree, *Erythrina poeppigiana* (Walp.) O.F.Cook, in a known feeding roost under the roof of a house in the Arima Valley, Trinidad and Tobago, West Indies (UTM 20P, 687087E, 1181635N). The observation was made after hearing a social call coming from one of the corners of the house roof where a usual feeding roost of the bat species is located. Individuals of *A. p. trinitatis* had been observed eating fruits in that same location on several occasions. When checking the location, a male bat of the species was observed holding and eating a leaf (see Fig. 1 left). After, some seconds the bat released the leaf, which showed signs of bites (see Fig. 1 right). This observation is to my knowledge the first report of folivory for the subspecies *A. p. trinitatis* as a whole, and the second record of bat folivory for Trinidad and Tobago since Greenhall (1957) described this behaviour in neotropical bats for the first time.

Although scarce, previous records of folivory by *Artibeus planirostris* suggest that this behaviour might be common and widespread (Arias Arone and Aguirre Quispe 2022, Cordero-Schmidt *et al.* 2016, Teixeira *et al.* 2009). For example, in the dry forests of the Brazilian Caatinga, *A. planirostris* was found to consume the leaves of up to 16 different species of plants (Cordero-Schmidt *et al.* 2016). However, the consumption of leaves of *E. poeppigiana* by the Flat-faced Fruit-eating Bat has never been reported. The leaves of this tree have been reported as a common item on the diets of congeneric bat species like *A. amplus* and *A. lituratus* in Venezuela (Duque-Márquez *et al.* 2019, Muñoz-Romo and Ramoni-Perazzi 2020, Ruiz-Ramoni *et al.* 2011)



**Fig. 1.** Evidence of folivory in *Artibeus planirostris trinitatis*: left – the observed male holding a leaf of *Erythrina poeppigiana* in a feeding roost; right – leaf of *E. poeppigiana* on the ground showing signs of consumption.

and by *A. jamaicensis* in Puerto Rico (Rodríguez-Durán and Vázquez 2001). Introduced in Trinidad from the slopes of the Venezuelan Andes in the 19th century as cacao shade, *E. poeppigiana* has become the most common large tree in disturbed habitats (Feinsinger *et al.* 1979). Thus, although previously unreported, the leaves of this species might be a common item in the diets of *A. p. trinitatis*.

The chewed leaf showed signs of consumption in the basal or proximate area of the leaf (see Fig. 1 right). This is consistent with previous studies that showed this behaviour in different species of *Artibeus* (Cordero-Schmidt *et al.* 2016, Duque-Márquez *et al.* 2019). This behaviour is not well understood, and it may simply be a mechanical consequence of the way fruit-eating bats handle food items (Duque-Márquez *et al.* 2019). However, some authors indicate that the base of the leaves might have a higher concentration of nutrients and water (Cordero-Schmidt *et al.* 2016).

As a whole, folivory is still a poorly understood behaviour in bats and basic questions such as the main reasons for its evolution, its benefits or its relation to the phenology of reproduction, are still unanswered and most explanations are untested hypotheses (Duque-Márquez *et al.* 2019). Leaves offer a wide array of nutrients and chemical compounds, such as secondary metabolites, that might be important additions to the diet of fruit-eating bats in the form of proteins and minerals, as a hormone precursor source, or even for pharmacological use. Testing these hypotheses will shed light on the evolution and importance of folivorous behaviour in fruit-eating bats.

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