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Halcón Macagua, *Herpetotheres cachinnans* (Linnaeus, 1758). Foto: Luis A. Saavedra

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Portada:

Individuo juvenil de halcón macagua (*Herpetotheres cachinnans*) en su nido, ubicado en una cavidad de un saliente rocoso. Esta es una de las rapaces más conspicuas y reconocibles de Venezuela, donde su potente y repetitiva vocalización ha inspirado numerosos mitos y leyendas locales. Pese a ser una especie común y de amplia distribución en el país, aún existen importantes vacíos de información, especialmente en lo referente a su biología, como se indica y se tratan de llenar en el primer artículo (7–15) de este número 41 de la revista *Anartia*.

Los manuscritos deben enviarse como datos adjuntos por correo electrónico a: **Tito R. Barros** (tbarros@fec.luz.edu.ve) o **Gilson A. Rivas** (grivas@fec.luz.edu.ve).

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Contenido

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Editorial

Cierra el año 2025 con la edición número 41 de *Anartia*. Esta última publicación contiene ocho contribuciones de interés zoológico: cuatro artículos, una nota y tres reseñas de libros. La totalidad del contenido se refiere a fauna del territorio venezolano. En continuidad con un trabajo aparecido en el número anterior, esta vez se presenta la novedad de dos artículos sobre cucarachas (Insecta: Blattodea), orden de artrópodos que en Venezuela había recibido escasa atención en las últimas décadas. En suma, las tres contribuciones abordan respectivamente los temas de convergencia evolutiva, biogeografía y depredación. Previamente casi todo lo que se había escrito sobre cucarachas en el país tenía que ver con su taxonomía y algunos tópicos vinculados con la salud. Anunciamos también la descripción de un nuevo género de mariposas endémico del bioma amazónico, conocido hasta este momento en tierras de Brasil y Venezuela; así mismo se reporta en el extremo sur de Venezuela (Serranía de La Neblina, Amazonas) la presencia de una mariposa satirina, aparentemente propia de elevaciones medias, descrita hace pocos años del suroriente amazónico, en Brasil y Perú.

Destacamos también una contribución ornitológica referente a las aves rapaces de los ecosistemas semiáridos del noroeste de Venezuela. Estos son ambientes singulares, extensamente degradados por varias actividades humanas de alto impacto ambiental, y francamente afectados o en riesgo de desaparecer completamente en su estado natural. Como no son en apariencia tan atractivos, ni por su aspecto, ni por su riqueza biótica (por ejemplo, comparados con los bosques andinos o amazónicos), recibieron poca atención en el pasado. Hoy día sabemos que representan provincias biogeográficas distintivas, con endemismos sorprendentes e inesperados.

Las reseñas de tres libros relativamente recientes, que tienen que ver con zoología venezolana (fauna de vertebrados terrestres de la Cordillera de La Costa, diversidad taxonómica de babosas marinas y abejas meliponinas de Venezuela) son indicios de que, aunque ha mermado considerablemente la actividad editorial en relación a años pasados, nunca se ha dejado de publicar material valioso y novedoso sobre la fauna y la flora del país. Desde la oficina editorial de *Anartia* protestamos comedidamente por las empobrecidas cadenas de distribución de materiales impresos, que van desde la promoción limitada a través de los medios comunicacionales y las redes de difusión de información, pasando por los altos costos postales y de movilización, hasta la muy mermada presencia de librerías o locales físicos donde adquirir personalmente las nuevas producciones impresas. El fenómeno es mundial. La adquisición de libros se hace mayormente a través de internet en sitios que centralizan y monopolizan el negocio. Los libros circulan a través de entrega postal individual, en operaciones que en ocasiones duplican su precio; en consecuencia, el libro, un objeto fundamental para la expansión del conocimiento y la difusión cultural, que siempre fue caro, es ahora prácticamente un verdadero lujo. Las predicciones de hace tres a cuatro décadas afirmaban que el desarrollo del libro electrónico haría bajar los precios del producto. No es así. El libro electrónico, particularmente el de contenido científico especializado, es casi tan caro como el libro impreso. Además, el avance en la calidad de la impresión en los libros de consumo no masivo (científicos, por ejemplo), se ha estancado. Los libros impresos por demanda son generalmente muy básicos, diseñados sin mayor conocimiento del espacio gráfico, impresos en máquinas xerográficas, mal encuadernados y con portadas de calidad inferior.

Responsablemente damos el acento crítico a estas observaciones, conscientes de que *Anartia*, a través de sus recensiones, se ha convertido en un medio importante para dar a conocer la producción impresa especializada en temas de la naturaleza, particularmente de la fauna. Muchos de los libros aquí reseñados son raros desde su publicación. El propósito de las reseñas aquí publicadas es difundir la noticia de su existencia por medio de un registro histórico del libro, promoviendo su distribución a través de la publicidad de sus fuentes de origen y suministro primario.

Los Editores

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Birds of prey of a semi-arid ecosystem in Falcón State, Venezuela: Diversity and ecological patterns

Aves rapaces de un ecosistema semiárido en el estado Falcón, Venezuela: diversidad y patrones ecológicos

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ABSTRACT

Notes are presented on the species richness, diet, and reproduction of birds of prey in a semi-arid ecosystem of northwestern Venezuela, based on nine months of daytime observations. A total of sixteen resident and two migratory species, belonging to four orders and five families, were recorded. Nests of eight species were observed and described. The diets of five species were determined through analyses of pellets and other prey remains collected around nests. The Easten Cottontail Rabbit, *Sylvilagus floridanus* (J. A. Allen, 1890), was the most frequent prey item. Additionally, negative interactions between rural communities and raptors are reported, including the use of pesticides by local residents to control species perceived as threats to domestic animals.

Keywords: bird nests, human-wildlife conflict, raptor diets, species richness.

RESUMEN

Se presentan notas sobre la riqueza de especies, la dieta y la reproducción de aves rapaces en un ecosistema semiárido del noroeste de Venezuela, basadas en nueve meses de observaciones diurnas. Se registraron un total de dieciséis especies residentes y dos migratorias, pertenecientes a cuatro órdenes y cinco familias. Se observaron y describieron nidos de ocho especies. La dieta de cinco especies se determinó mediante el análisis de egagrópilas y otros restos de presas recolectados alrededor de los nidos. El Conejo de Florida, *Sylvilagus floridanus* (J. A. Allen, 1890), fue la presa más frecuente. Además, se reportan interacciones negativas entre las comunidades rurales y las aves rapaces, incluyendo el uso de plaguicidas por parte de los residentes locales para controlar especies percibidas como amenazas para los animales domésticos.

Palabras clave: conflicto humanos-vida silvestre, dieta de rapaces, nidos de aves, riqueza de especies.

INTRODUCTION

Arid and semi-arid environments in Venezuela are primarily located in the northern and western regions of the country, covering less than 4.5% of the national territory. These areas are characterized by low rainfall and high temperatures, which result in vegetation types such as deciduous and semi-deciduous forests, xerophytic plants, and thorny shrubs (Matteucci 1982, Rodríguez *et al.* 2010, Nassar *et al.* 2013). There are only a few studies that have assessed the avifauna in these environments, and even fewer that focus on birds of prey, a group typically mentioned only in supplementary lists or in a limited number of reproductive studies (Barnes & Phelps 1940, Bosque & Lentino 1987, Ramoni-Perazzi *et al*. 2001, Morales *et al*. 2004, Rodríguez-Ferraro & Blake 2008).

Raptors are defined as those species of birds that have evolved from a common raptorial landbird ancestor that have maintained a raptorial lifestyle; they include all species within the orders Accipitriformes, Cathartiformes, Falconiformes and Strigiformes (McClure *et al*. 2019). In Venezuela, this functional group is represented by 90 species of the families Accipitridae, Cathartidae, Falconidae, Pandionidae and Strigidae (Miranda *et al.* 2024). However, raptors remain one of the least studied bird groups in the country. Therefore, this study aims to contribute to the understanding of raptors in a semiarid ecosystem of northwestern Venezuela through field observations focused on species richness, diet, reproduction, and interactions with local communities.

MATERIALS AND METHODS

The observations were made in a semi-arid ecosystem located 15 km southeast of Pedregal, Falcón State, Venezuela (10°56'15"N 70°00'41"W). The relief of the study area consists of a continuum of small depressions surrounded by hills. The vegetation, which includes cactus and dry forest elements, is dominated by *Prosopis juliflora* (Sw.) DC. (Fabaceae), *Bourreria exsucca* (L.) Jacq. (Boraginaceae) and *Bulnesia arborea* (Jacq.) Engl. (Zygophyllaceae) (Matteucci *et al*. 1982). The region has a dry, bi-seasonal climate, characterized by a dry season from December to March and rainfall peaks in May and October. Average annual temperatures range from 24.5 °C to 28.6 °C, with a total annual precipitation between 992 and 1,200 mm (Matteucci *et al.* 1982).

Unrestricted, non-systematic daytime surveys were conducted to record and identify raptor species between August 11 and 30, 2022, and between March 24 and April 19, 2023. Observations were made using 8.5×32 Raptor binoculars and photographs taken with a Canon EOS Rebel T7 camera. Taxonomic classification follows Clements *et al*. (2023). Additionally, the nests of raptors were identified and described (in terms of place of construction, type of material, size and height, and presence/absence of eggs. The description of the nests follows Simón & Pacheco (2005). The diet was characterized based on the collection of pellets and remains of prey found around or inside the nests. The samples were placed in paper envelopes, which were labeled and transferred to the laboratory of the Vertebrate Collection of the University of Los Andes (CVULA) for analysis. Each pellet was moistened and washed with water, and its contents (bone fragments, hair, scales, and insect exoskeletons) were separated using tweezers to facilitate identification. Mammalian remains (mandibles and skulls) were compared with reference specimens of known species deposited in the CVULA collection.

To identify which raptor species have negative interactions with rural communities, local residents were asked whether they considered any of them to be a threat to domestic animals.

Finally, our species list was compared with those reported in the literature (Barnes & Phelps 1940, Ramoni-Perazzi *et al*. 2001, Rodríguez-Ferraro & Blake 2008) using the qualitative Sørensen Similarity Index (Moreno 2001).

RESULTS

For the semi-arid environments of Venezuela, the presence of 30 species of raptors, including 28 resident and two migratory species, has been documented (Barnes & Phelps 1940, Bosque & Lentino 1987, Ramoni-Perazzi *et al*. 2001, Morales *et al*. 2004, Rodríguez-Ferraro & Blake 2008). In the present study, 18 species were recorded, including 16 resident and two migratory species (Table 1). Four orders and five families were represented. At the family level, the Accipitridae showed the greatest species richness, followed by the Falconidae, Cathartidae, Strigidae, and Pandionidae.

Comparison with previous studies carried out in Venezuela revealed moderate similarity levels: 51.9% with the raptor assemblage of the Paraguaná Peninsula (Barnes & Phelps 1940) and 50% with six arid sites in northern Venezuela (Rodríguez-Ferraro & Blake 2008). However, a similarity of only 24.4% was found with the raptor assemblage from the arid enclave of Lagunillas, in the Mérida Andes (Ramoni-Perazzi *et al*. 2001).

A total of 20 dietary samples were collected, corresponding to five raptor species: Black Vulture, *Coragyps atratus* (Bechstein, 1793), Zone-tailed Hawk, *Buteo albonotatus* (Kaup, 1847), Harris's Hawk, *Parabuteo unicinctus* (Temminck, 1824), Great Horned Owl, *Bubo virginianus* (Gmelin, 1788), and Crested Caracara, *Caracara plancus* (J. F. Miller, 1777). Eight prey categories were identified—one bird, three reptiles, and four mammals (Table 2). The Eastern Cottontail, *Sylvilagus floridanus* (J. A. Allen, 1890) was recorded in the diet of four species, whereas the Green Iguana, *Iguana iguana* (Linnaeus, 1758) appeared in three.

Regarding negative interactions between humans and birds of prey, several poisoned animals were found during the surveys. These carcasses were located a few meters from bait poisoned with carbofuran, as confirmed by local residents. The affected birds included two Turkey Vultures, *Cathartes aura* (Linnaeus, 1758), one Crested Caracara,

Table 1. Raptor species recorded for the semiarid ecosystems of Venezuela. **R:** resident species. **M:** Nearctic migratory species.

Family	Species	Status	Barnes 1940	Ramoni-Perazzi *et al.* 2001	Rodríguez-Ferraro & Blake 2008	This study
CATHARTIDAE	*Sarcoramphus papa*	R				x
	Coragyps atratus	R	x	x		x
	Cathartes aura	R	x	x		x
PANDIONIDAE	*Pandion haliaetus*	M	x	x		x
ACCIPITRIDAE	*Gampsonyx swainsonii*	R		x	x	x
	Elanus leucurus	R		x		
	Chondrohierax uncinatus	R		x		
	Elanoides forficatus	R		x		
	Rostramus sociabilis	R		x		
	Accipiter striatus	R		x		
	Geranospiza caerulescens	R			x	x
	Buteogallus urubitinga	R				x
	Buteogallus meridionalis	R				x
	Buteogallus solitarius	R				x
	Parabuteo unicintus	R	x		x	x
	Parabuteo leucorrhous	R		x		
	Rupornis mgnirostris	R		x	x	
	Geranoaetus albicaudatus	R	x		x	x
	Geranoaetus melanoleucus	R		x		
	Buteo brachyurus	R			x	
	Buteo albonotatus	R				x
STRIGIDAE	*Megascops choliba*	R	x	x		
	Bubo virginianus	R				x
	Athene cunicularia	R	x			
	Glaucidium brasilianum	R				x
FALCONIDAE	*Daptrius chimachima*	R		x	x	
	Caracara planchus	R	x		x	x
	Herpetotheres cachinnans	R			x	x
	Falco sparverius	R	x	x	x	x
	Falco columbarius	M				x

Table 2. Prey species found in the diet of four raptors in a semiarid ecosystem, Falcón state, northwestern Venezuela. COA *Coragyps atratus*. PAU *Parabuteo unicintus*. BUV *Bubo virginianus*. CAP: *Caracara planchus.* BUA *Buteo albonotatus.*

Prey	COA	PAU	BUV	CAP	BUA
REPTILIA					
Iguana iguana		x	x	x	
Unidentified snake			x		
Unidentified lizard			x		
MAMMALIA					
Rhipidomys venezuelae			x		
Sylvilagus floridanus	X	x	x	x	
Marmosa xerophila			x		
Capra aegagrus hircus				x	
AVES					
Melanerpes rubricapillus					x

Caracara plancus (J. F. Miller, 1777), and one Black Vulture, *Coragyps atratus* (Bechstein, 1793) (Fig. 1). According to local residents, carbofuran is used to control birds of prey considered harmful to domestic animals, as these raptors may kill or cause serious injuries to small or newborn chicks, as well as young goats and sheep.

Nesting by nine raptor species was documented through direct observations. The characteristics and general features of the nests of eight species are presented here, following the classification system of Simón & Pacheco (2005). A species-specific description of the nests observed in this study is provided below.

CATHARTIDAE

Black Vulture, *Coragyps atratus* (Bechstein, 1793)

An inactive Black Vulture nest was documented; however, it showed evidence of recent use. Feces and fragments of white eggshells with small brown spots were present on the sandy substrate. The nest had been observed on March 29, 2023, and local residents reported seeing juveniles in it approximately one month earlier. The simple, unlined nest was located in a cave-like cavity at ground level, beneath the roots of a *P. juliflora* tree (Fig. 2f). Bone remains of *S. floridanus* were found a few meters from this nest.

ACCIPITRIDAE

Zone-tailed Hawk, *Buteo albonotatus* (Kaup, 1847)

On 31 March 2023, a nest was observed on the top of a *B. arborea* tree at a height of 12 m, where two white eggs were found (Fig. 2e). One year later, on 14 April 2024 the nest was revisited, and was found to be active and possibly reused by the same pair, behavior that has been observed in other populations (Johnson *et al*. 2020). The nest was of the simple/platform type, measuring 75 cm in diameter, 40 cm in height, and 10 cm in depth. It was built with thin branches of the same tree and lined with a shallow layer of leaves. In both years, one parent remained in the nest while the other stayed nearby. In 2023, one individual was observed vigorously chasing away a Turkey Vulture. In 2024, the remains of a Red-crowned Woodpecker (*Melanerpes rubricapillus* Cabanis, 1862) were found beneath the nest.

White-tailed Hawk, *Geranoaetus albicaudatus* (Vieillot, 1816)

On April 17, 2023, a White-tailed Hawk was observed carrying a branch in its talons to a nest located in a *Handroanthus* sp. tree (Bignoniaceae) at approximately 4 m above ground. On April 16, 2024, another nest under construction was observed in a *P. juliflora* tree at 3 m above ground. Both nests were situated atop a hill, belonged to the simple/platform category, were exposed to direct sunlight, and were constructed with thin branches (Fig. 2d). Identified nest materials included branches of *P. juliflora* and *Vachellia tortuosa* (L.) Seigler & Ebinger (Fabaceae).

Harris's Hawk, *Parabuteo unicinctus* (Temminck, 1824)

Three nests were documented during the sampling period: The first, observed on March 8, 2023, was inactive, while the second and third, observed on March 23, 2023, and April 14, 2024, respectively, were active. In the active

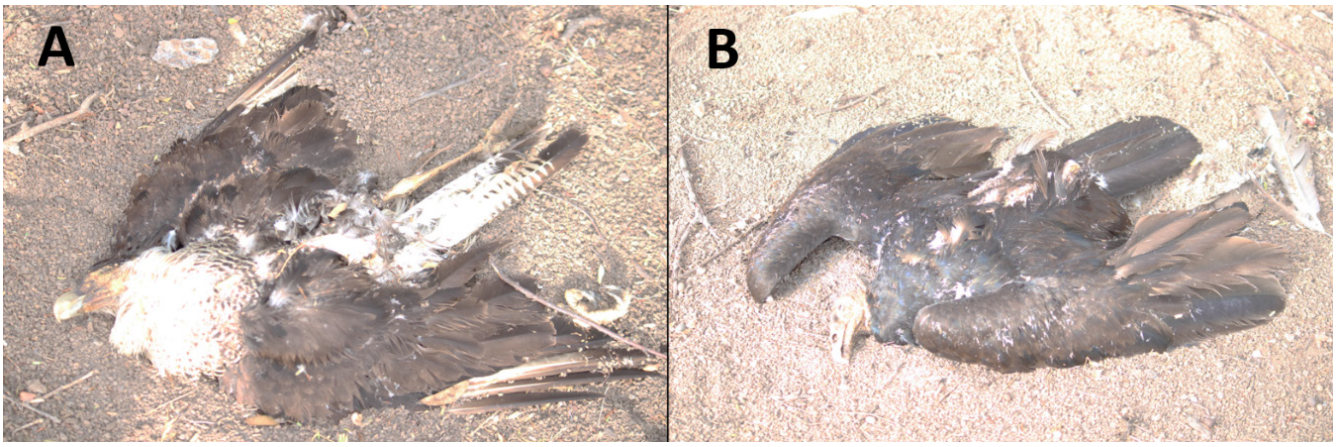

Figure 1. Birds of prey poisoned by consumption of carbofuran bait in a semiarid environment in Falcón state, northwestern Venezuela. A. *Caracara planchus.* B *Cathartes aura.*

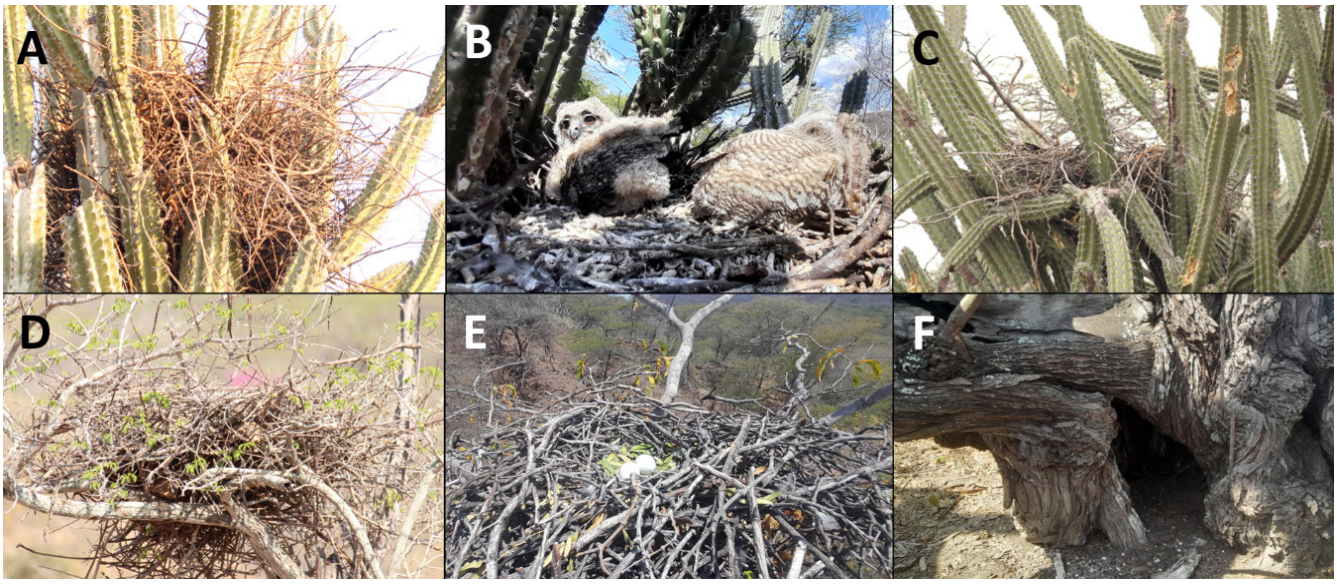

Figure 2. Nests of birds of prey found in a semi-arid environment in Falcón state, northwestern Venezuela. **A.** *Caracara plancus.* **B.** *Bubo virginianus.* **C.** *Parabuteo unicintus.* **D.** *Geranoaetus albicaudatus.* **E.** *Buteo albonotatus.* **F.** *Coragyps atratus.*

nests, one parent was observed incubating eggs, while the other remained perched a short distance away. The inactive nest was located on a columnar cactus, *Stenocereus griseus* (Haw.) Buxb. LC. at a height of 2.5 meters. The active nest of 2023 was found 4 m above another columnar cactus of the same species, while the active nest of 2024 was located on a *B. arborea* tree at a height of 10 meters. All nests belonged to the simple/platform category, were bulky, and were constructed within the branches of *P. juliflora* tree (Fig. 2c). A skull of *S. floridanus* was found beneath the inactive nest. At the 2024 nest site, one of the adult birds was observed flying over the nest carrying a preyed *Iguana iguana.*

STRIGIDAE

Great Horned Owl, *Bubo virginianus* (Gmelin, 1788)

During sampling on April 14, 2023, two nestlings of different sizes were observed in a nest located among the branches of the columnar cactus, *S. griseus*, at a height of 2 m. This was a simple platform-type nest that measured approximately 67 cm in diameter and 56 cm in height, and was composed primarily of branches of *P. juliflora* (Fig. 2b). Remains of prey and pellets were found in, under, and around the nest. On April 14, 2024, another nest with similar characteristics was recorded on another *S. griseus*, at a height of 3 m. The nest contained a nestling, and

one of the parents observed from a distance. The structural characteristics of the nests, along with the documented behavior of nest reuse by the Great Horned Owl (Artuso *et al*. 2022), suggest that both may have represented previously abandoned nests of the Harris's Hawk.

FALCONIDAE

Crested Caracara, *Caracara plancus* (Miller, 1777)

On March 30, 2023, an inactive simple platform-type nest was found on a columnar cactus, *S. griseus*, at a height of 2 m and exposed to direct sunlight. The nest was primarily composed of branches of *P. juliflora* and *V. tortuosa* (Fig. 2a). Two adult Crested Caracaras were observed nearby, and local residents confirmed that the nest belonged to these birds and had been occupied since a few months earlier. Below and around the nest, there were abundant feces, pellets, and prey remains.

Laughing Falcon, *Herpetotheres cachinnans* (Linnaeus, 1758)

On August 13, 2023, a cavity-type nest was discovered in a stone wall along the banks of a seasonal stream at a height of 3.5 m. The nest measured 60 cm deep and 25 cm wide, with a cavity height that tapered toward the bottom. Its interior consisted of a rocky, sandy substrate forming a concave space. The nest was occupied by a juvenile with remains of light-colored down (Fig. 3b). On April 17, 2024, another nest was located in a cavity approximately 3 m high in a *B. arborea* tree. An adult was observed nearby, vocalizing energetically, suggesting that the pair was brooding or that chicks were present inside the nest. Direct inspection was not possible because a honeycomb of meliponine bees was situated about 1 m below the nest.

American Kestrel, *Falco sparverius* (Linnaeus, 1758)

On March 30, 2023, a cavity-type nest with a diameter of 23 cm was discovered in a *Bulnesia arborea* (Jacq.) Engl. tree at a height of 2.5 m and a depth of 1 m (Fig.3a). The nest contained four cream-colored eggs with brown spots, resting on a layer of small branches, *B. arborea* leaves, and some feathers. Upon revisiting the nest on April 14, 2024, two chicks and one unhatched egg were observed. On both occasions, one parent remained in the nest while the other kept watch from a distance.

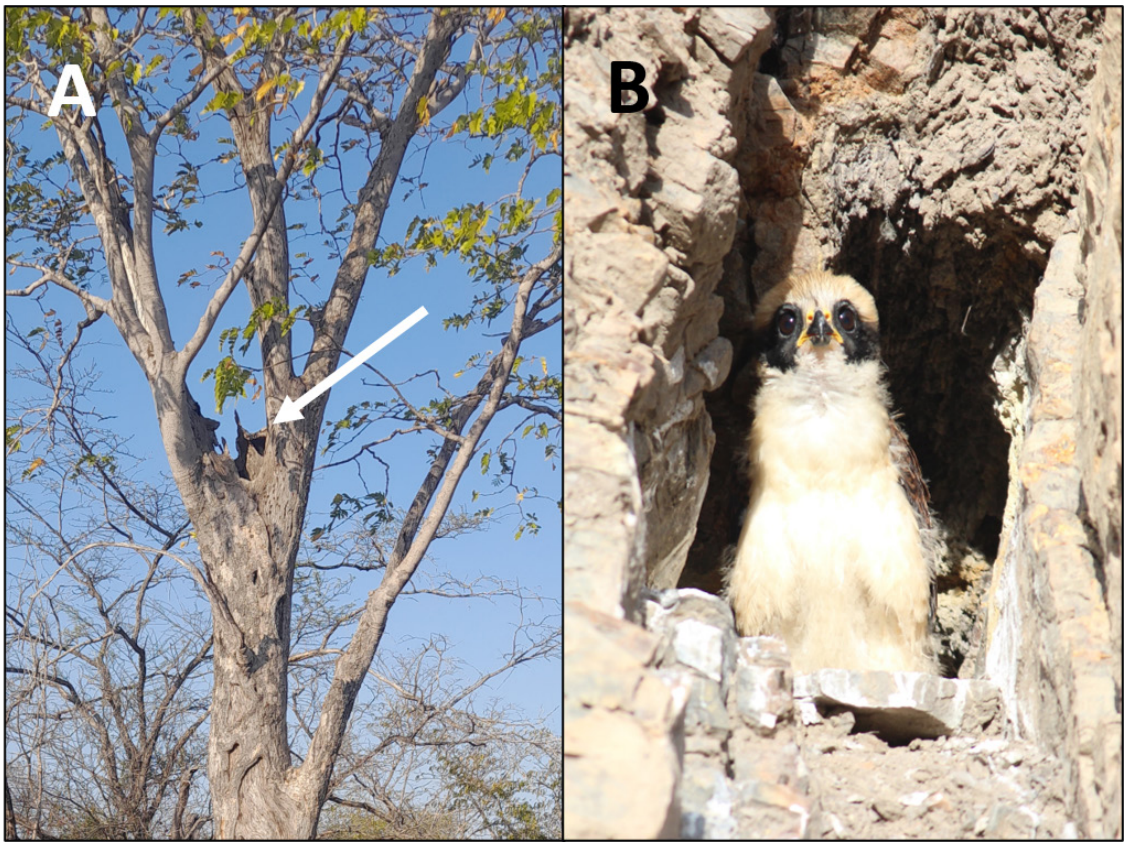

Figure 3. Nests of birds of prey found in a semi-arid environment in Falcón state, northwestern Venezuela. **A.** *Falco sparverius*. **B.** *Herpetotheres cachinnans*.

DISCUSSION

The high species diversity of birds of prey recorded in the present study, along with the moderate to low similarity compared to other lists from semiarid environments in Venezuela, reflects the success of our survey in inventorying birds of all raptorial families (Accipitridae, Cathartidae, Falconidae, Pandionidae, and Strigidae) occurring in the country.

The Lara-Falcón ecosystem complex comprises the largest region of arid and semi-arid environments in Venezuela (16,000 km^2), encompassing a variety of vegetation types, including cactus, shrubs, and desert forests (Matteucci *et al*. 1982, Schubert 1988, Rodríguez-Ferraro & Blake 2008). This environmental heterogeneity likely contributes to a relatively high species richness (20 species) and a moderate similarity in species composition when compared with other semi-arid areas in the region, such as the Paraguaná Peninsula, and other continental semi-arid regions of Venezuela (Barnes & Phelps 1940).

Although the arid enclave of Lagunillas covers a small area (350 km^2), it supports a relatively high raptor diversity (15 species). This may be attributed to the heterogeneity of surrounding non-arid ecosystems, which allows many species not typically associated with semi-arid environments to enter and leave the enclave easily (Ramoni-Perazzi *et al*. 2001). For this reason, this enclave shows the lowest similarity in species composition to the community that we studied.

Compared with other ecosystems in Venezuela, arid and semi-arid environments are less diverse. For example, in the Llanos region of Venezuela, 28 species of diurnal raptors have been reported, despite the genera *Cathartes* and *Coragyps* being excluded from the list (Jensen *et al*. 2005). Similarly, 25 species of diurnal and nocturnal raptors have been reported for a cloud forest in the Andes of Mérida (Rengifo *et al*. 2005), and 23 species for the Catatumbo River region of the Maracaibo Lake basin (Pirela *et al*. 2009). The reduced diversity of arid ecosystems is possibly due to their lesser primary productivity and environmental complexity, which cause the fauna of these regions to have lower population densities and species richness (Soriano & Ruíz 2003).

Birds of prey are a challenging group to study owing to their relatively low population densities, wide geographic ranges, high mobility, avoidance of areas with intense human activity, and, in some species, pronounced crepuscular or nocturnal behavior (Fuller & Mosher 1981). Accurate identification of raptors, particularly in flight, is of paramount importance, as are the observer's experience, the methodological design, and the intensity of sampling, since these factors influence species detection and, consequently, the quality of inventories.

Regarding the diet of some of the species analyzed, the Great Horned Owl has been described as an opportunistic predator, consuming a wide range of vertebrates and invertebrates, particularly nocturnal animals (Artuso *et al*. 2022). However, our observations highlight the inclusion of *I. iguana*, a diurnal species, in its diet. In contrast, the Harris's Hawk primarily preys on rabbits and lizards in populations studied in the United States (Mader 1975), which coincides with the observations reported in the present study.

Regarding the Crested Caracara, our samples indicate that, in addition to species native to the semi-arid ecosystem, domestic species such as goats, *Capra aegagrus hircus* Linnaeus, 1758, are included in its diet. The consumption of domestic species no doubt owes to the scavenging habits of the species (Morrison & Dwyer 2023); however, locals claim that the species may kill and eat newborns, which creates a potential human-wildlife conflict. With respect to the diet of four of the five species, the presence of *S. floridanus* stands out, suggesting a key role of this lagomorph in the food chain.

In the study area, the wet season extends from April to November, with two rainfall peaks, the first in May and the second in September–October (Matteucci *et al*. 1982). Regarding reproductive activity, breeding was observed between March and April, with only one record in August. In the Venezuelan plains, the highest number of raptor nests has been recorded during the wet season, although some nesting also occurs in the dry season (Mader 1981). The synchronization of reproduction in semiarid environments may be directly related to rainfall patterns, which influence the leafing, flowering and fruiting seasons of most plant species and, consequently, the availability of prey (Guevara *et al*. 1992).

Conversations with local residents revealed negative interactions between rural communities and birds of prey. Local farmers often perceive certain raptor species as threats to their domestic animals, including goats, young sheep, and poultry. Among the raptors, the Crested Caracara is perceived most negatively, being considered a major threat to small domestic ruminants. Similarly, the Crane Hawk [*Geranospiza caerulescens* (Vieillot, 1817)] and the Harris's Hawk are regarded as threats to poultry. These perceptions often lead local residents to adopt retaliatory measures such as nest destruction, direct hunting with firearms or slingshots, and poisoning with pesticides like carbofuran. Such attitudes toward raptors have also been reported in other regions (Salom *et al*. 2021).

Carbofuran is a neurotoxic pesticide that poses a significant risk to raptors, particularly those that are scavengers, due to the high susceptibility of birds to this pesticide, and to their propensity to both direct and secondary poisoning (Wiemeyer & Sparling 1991, Mineau *et al*. 2012, Richards 2012, Krone *et al*. 2017). Although carbofuran poisoning has been documented in several raptor species across the Americas (de Almeida & de Almeida 2011, Krone *et al*. 2017), there are currently no specific records for Venezuela, highlighting the need for further research in the country.

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REFERENCES

Artuso, C., C. S. Houston, D. G. Smith & C. Rohner. 2022. Great Horned Owl (*Bubo virginianus*). *In*: Sly, N. D. (ed.). *Birds of the world*, version 1.1. Ithaca, NY, USA: Cornell Lab of Ornithology. https://doi.org/10.2173/bow.grhowl.01.1

Barnes, V. (Jr.) & W. H. Phelps. 1940. Las aves de la península de Paraguaná. *Boletín de la Sociedad Venezolana de Ciencias Naturales* 46: 69–301.

Bosque, C. & M. Lentino. 1987. The passage of North American migratory land birds through xerophytic habitats on the western coast of Venezuela. *Biotropica* 19(3): 267–273.

Clements, J. F., P. C. Rasmussen, T. S. Schulenberg, M. J. Iliff, T. A. Fredericks, J. A. Gerbracht, D. Lepage, A. Spencer, S. M. Billerman, B. L. Sullivan & C. L. Wood. 2023. *The eBird/Clements checklist of Birds of the World: v2023*. https://www.birds.cornell.edu/clementschecklist/download/

de Almeida, A. & A. F. de Almeida. 2011. A Latin American perspective: The environmental impact of farming wheat and rice treated with Carbofuran and Rhodamine B on Brazilian wild birds. pp. 189–207. *In:* Richards, N. (ed). *Carbofuran and wildlife poisoning: Global perspective and forensic approaches*. Chichester, West Sussex, UK: John Wiley & Sons, Inc.

Fuller, M. R. & J. Mosher. 1981. Methods of detecting and counting raptors: A review. *Studies in Avian Biology* 6: 235–246.

Guevara, M., Y. Bergeron, R. McNeil & A. Leduc. 1992. Seasonal flowering and fruiting patterns in tropical semi-arid vegetation in Northeastern Venezuela. *Biotropica* 24: 64–76.

Jensen, W. J., M. S. Gregory, G. A. Baldassarre, F. J. Viella & K. L. Bilsdtein. 2005. Raptor abundance and distribution in the Llanos wetlands of Venezuela. *Journal of Raptor Research* 39(4): 417–428.

Krone, O., S. Auls & N. Hartmud. 2017. Case report: Secondary poisoning in a White-tailed sea Eagle caused by carbofuran. *European Journal of Wildlife Research* 63: 1–4.

Johnson, R. R., R. L. Glinski, & S. W. Matteson. 2020. Zone-tailed Hawk (*Buteo albonotatus*), version 1.0. *In*: Poole, A. F. & F. B. Gill (eds.). *Birds of the World*. Ithaca, NY, USA: Cornell Lab of Ornithology. https://doi.org/10.2173/bow.zothaw.01

Matteucci, S. D., A. Colma & L. Pla. 1982. Análisis ecológico regional del estado Falcón. *Acta Científica Venezolana* 33: 78–87.

Mader, W. J. 1975. Biology of the Harris's Hawk in southern Arizona. *Living Bird* 14: 59–85.

Mader, W. J. 1981. Notes on nesting raptors in the Llanos of Venezuela. *Condor* 83: 48–51.

McClure, C. J., S. E. Schulwitz, D. L. Anderson, B. W. Robinson, E. K. Mojic, J. F. Therrien, M. D. Oleyar & J. Johnson. 2019. Comentary: Defining raptors and birds of prey. *Journal of Raptor Research* 53(4): 419–430.

Mineau, P., S. Porter C. & U. Meteyer. 2012. Carbofuran: Toxicity, diagnosing poisoning and rehabilitation of poisoned birds. pp. 19–38. *In*: Richards, N. (ed). *Carbofuran and wildlife poisoning. Global perspectives and forensic approaches*. Chichester, West Sussex, UK: John Wiley & Sons, Inc.

Miranda, J., J. G. León & G. Angelozzi. 2024. *Lista oficial de las aves migratorias y errantes de Venezuela*. Caracas: Comité de Registros de las Aves de Venezuela, Unión Venezolana de Ornitólogos (UVO). https://uvovenezuela.org/listas-aves/

Morales, L. G., A. Ascanio & A. M. Herrera. 2004. Anidación del Halcón Primito (*Falco sparverius*), El Curucurú Común (*Otus choliba*), la Pavita Ferruginea (*Glaucidium brasilianum*) y el Atrapamoscas Garrochero Colirrufu (*Myiarchus tyrannulus*) en Macanao, isla de Margarita, Venezuela. *Acta Biológica Venezuelica* 24(1): 35–45.

Moreno, C. E. 2001. *Métodos para medir la biodiversidad*. M&T–Manuales y Tesis SEA, vol. 1. Zaragoza: Sociedad Entomológica Aragonesa, 84 pp.

Morrison, J. L. & J. F. Dwyer. 2023. Crested Caracara (*Caracara plancus*), versión 1.1. *In*: Sly, N. D. (ed.). *Birds of the World*. Ithaca, NY, USA: Cornell Lab of ornithology. https://doi.org/10.2173/bow.y00678.01.1

Nassar, J. M., G. Velásquez, J. C. Romero-Briceño & E. Medina. 2013. Las cactáceas como elementos de caracterización de ambientes áridos y semiáridos en Venezuela. pp. 97–123. *In:* Medina, E., O. Huber, J. M. Nassar & P. Navarro. (eds.). *Recorriendo el paisaje vegetal de Venezuela*. Caracas: Ediciones IVIC.

Pirela, D., A. Urdaneta, M. Chacín, C. Casler & J. Rincón. 2009. Composición de la comunidad de aves en la cuenca baja del río Catatumbo, estado Zulia, Venezuela. *Boletín del Centro de Investigaciones Biológicas* 43(3): 311–396.

Ramoni, P, G. P. Bianchi, R. A. Araujo, M. Barrera & M. Molina. 2001. Las aves del enclave semiárido de Lagunillas,

Cordillera de Mérida, Venezuela. *Acta Biológica Venezuelica* 21(3): 1–10.

Rengifo, C., A. Nava & M. Zambrano. 2005. *Lista de aves de La Mucuy y Mucubají Parque Nacional Sierra Nevada*. Volumen 1: Mérida-Venezuela. Mérida: Editorial Venezolana, 88 pp.

Richards, N. 2012. *Carbofuran and wildlife poisoning. Global perspectives and forensic approaches.* Chichester, West Sussex, UK: John Wiley & Sons, Inc, 304 pp.

Rodriguéz, J. P., F. Rojas-Suaréz & D. Giraldo. 2010. *Libro rojo de los ecosistemas terrestres de Venezuela.* Caracas: Provita, Shell Venezuela, S. A. y Lenovo Venezuela, 324 pp.

Rodriguéz-Ferraro, A. & J. G. Blake. 2008. Diversity patterns of bird assemblages in arid zones of northern Venezuela. *The Condor* 110(3): 405–420.

Salom, A., M. E. Suárez, C. A. Destefano, J. Cereghetti, F. H. Vargas & J. M. Grande. 2021. Human-wildlife conflicts in the southern yungas: What role do raptors play for local settlers?. *Animals* 11(5): 1428.

Schubert, C. 1988. Climatic changes during the Last Glacial Maximum in northern South America and the Caribbean: A review. *Interciencia* 13: 128–137.

Simon, J. E. & S. Pacheco. 2005. On the standardization of nest descriptions of Neotropical birds. *Revista Brasileira de Ornitologia 13(2): 143*–154.

Soriano, P. & A. Ruiz. 2003. Arbustales xerófilos. pp. 696–715. *In:* Aguilera, M., A Azócar & E. González-Jiménez (eds*). Biodiversidad en Venezuela* (Tomo 2). Caracas: Fundación Empresas Polar / Editorial Ex Libris.

Wiemeyer, S. N. & D. W. Sparling. 1991. Acute toxicity of four anticholinesterase insecticides to American kestrels, eastern screech owls and northern bobwhites. *Environmental Toxicology and Chemistry* 10: 1139–1148.

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A case of evolutionary convergence? Striking resemblance between a cockroach (Blattodea) and a frog (Anura) living in bromeliads on the Paria Peninsula, northeastern Venezuela

¿Un caso de convergencia evolutiva? Notable semejanza entre una cucaracha (Blattodea) y una rana (Anura) habitantes de bromelias en la península de Paria, noreste de Venezuela

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ABSTRACT

Recent herpetological explorations carried out in the Serranía de Paria, northeastern Venezuela, allowed the identification of the bromeliad *Glomeropitcairnia erectiflora* Mez as a vital refuge for amphibians of the species *Phytotriades auratus* (Boulenger, 1917), and for cockroaches of the genus *Dryadoblatta* Rehn, 1930. It should be noted that the presence of the frog *Scinax ruber* (Laurenti, 1768), a species typically of lowlands, has been previously reported in bromeliads of Cerro El Copey (Margarita Island), but it is likely that the record is a misidentification of *P. auratus*. The present study also reveals an association between *G. erectiflora* and a cockroach of the genus *Pelmatosilpha* Dohrn, 1887. The similar color patterns of *P. auratus* and a species of *Dryadoblatta* suggest possible evolutionary convergence or mimicry between an anuran amphibian and a blattodean insect, indicating complex ecological relationships in the region.

Keywords: *Dryadoblatta* sp., evolutionary convergence, *Glomeropitcairnia erectiflora,* mimicry, *Phytotriades auratus, Scinax ruber.*

RESUMEN

Exploraciones herpetológicas recientes realizadas en la Serranía de Paria, noreste de Venezuela, permitieron identificar a la bromelia *Glomeropitcairnia erectiflora* Mez como refugio vital de anfibios de la especie *Phytotriades auratus* (Boulenger, 1917) y de cucarachas del género *Dryadoblatta* Rehn, 1930. Cabe destacar que se ha informado previamente la presencia de la rana *Scinax ruber* (Laurenti, 1768), una especie típicamente de tierras bajas, en bromelias del Cerro El Copey (Isla de Margarita), pero es probable que el registro se trate de una identificación errónea de *P. auratus*. El presente estudio también revela una asociación entre *G. erectiflora* y una cucaracha del género *Pelmatosilpha* Dohrn, 1887. Los patrones de color

similares de *P. auratus* y de una especie de *Dryadoblatta* sugieren una posible convergencia evolutiva o mimetismo entre un anfibio anuro y un insecto blattodeo, indicando relaciones ecológicas complejas en la región.

Palabras clave: convergencia evolutiva, *Dryadoblatta* sp., *Glomeropitcairnia erectiflora,* mimetismo, *Phytotriades auratus, Scinax ruber.*

INTRODUCTION

Coloration patterns in animals serve several functions, one of which is protecting them from predators (Badejo *et al*. 2020). Two basic types of protective coloration patterns are known. The first type is camouflage, which consists of faint or discrete colors that imitate those of the environment, substrate, and plants, allowing the animal to blend in and remain unnoticed by potential predators. This category includes contrasting and striking colors that conceal internal features or disrupt the outline of the potential prey (a phenomenon known as disruptive coloration; Adams *et al*. 2019, Hinkelmann 2023), interfering with visual perception of the predator, thus reducing the likelihood of an attack. The other type is aposematism, a conspicuous and colorful coloration serving as a warning that the potential prey is toxic or inedible, thus inhibiting predation (Eisner & Grant 1981, Santos *et al*. 2003, Hinkelmann 2023).

In the case of aposematism, some organisms mimic other aposematic ones, hence taking advantage of the protective coloration. The imitators (mimics) could be either more or less toxic/repulsive than the species that they imitate (Müllerian mimicry), or the mimic could be harmless (Batesian mimicry) (Bates 1862, 2020, Müller 1878, Wickler 1968).

Mimicry, in general, is one of the most striking phenomena in evolutionary ecology, occurring in a wide range of organisms, including unrelated ones (Wickler 1968, Matthews & Matthews 2010, Schmied *et al*. 2012). Mimicry systems are ecologically defined as assemblages in which at least two organisms should be able to play up to three possible roles: being a model, being a mimic, or being a deceiver (Wickler 1968, Schmied *et al*. 2012). Such systems necessarily contain at least one defended prey that exhibits a warning signal, which helps reduce predation pressure, and at least one associated species that derives a benefit from mimicking the aposematic organism (Kunte *et al*. 2021).

Over the past few decades, there has been a wealth of research showing "mimicry rings" (assemblages of species sharing a similar appearance which serves as an effective signal to potential predators), Müllerian and Batesian, involving various groups of insects (*i.e.*, butterflies and moths, beetles, wasps and bees, and flies) and vertebrates (*i.e*., fish, snakes, birds) (Wickler 1968, Pasteur 1982, Schmied *et al*. 2012, Kunte *et al*. 2021). Aposematism, through bright or flashy color patterns, is a known warning sign in frogs, which exhibit it to "advertise" their toxicity or lack of palatability to potential predators (Stuckert *et al*. 2014a, Lorioux-Chevalier *et al*. 2023). It is worth mentioning that although several types of insects mimicking vertebrates have been documented, we know of only one recent record of an insect (*Cratosomus* sp.; Curculionidae) mimicking a frog [*Ameerega trivittata* (Spix, 1824): Dendrobatidae] (Ferreira *et al.* 2024).

Convergence is another ecological phenomenon (not mutually exclusive with mimicry or camouflage) that operates at both the species and community levels. It may also be observed in what we perceive as mimicry or camouflage among several organisms. Convergence in ecology is the independent evolution of similar traits in unrelated organisms due to similar environmental pressures or ecological roles (Matthews & Matthews 2010). This process happens because natural selection favors adaptations that are best suited for survival and reproduction in a particular environment, leading distantly related species to develop analogous structures, behaviors, or even behavioral and physiological processes (Bittleston *et al.* 2016, Sackton & Clark 2019).

Several frog groups are well known for including species resembling other frogs, either to share a warning signal with a toxic species (Müllerian mimicry), or to deter predators (Batesian mimicry), forming mimicry rings where several species benefit from an aposematic coloration (Darst & Cummings 2006, Prates *et al*. 2012, Stuckert *et al*. 2014b, Ferreira Souza *et al*. 2024).

Among cockroaches, however, their scavenging and cryptic habits, as well as the high speed of some, allow them to frequently escape predators (Evans 1968, Bastidas Pérez & Zavala Gómez 1995, González 2005, Marshall 2017). Although many cockroach species are cryptic and dark-colored, allowing them to "disappear" visually in their environment, it appears to be rare for certain cockroach species to become members of mimetic rings by exhibiting characteristics that allow them to resemble unpleasant or poisonous models providing them protection from potential predators (Shelford 1912, Roth & Naskrecki 2001,

Deans & Roth 2003, Schmied *et al.* 2012). At the same time, some cockroaches are known to produce defensive secretions and produce pungent-smelling compounds that potentially make them become models in mimicry rings (Roth & Willis 1960, Evans 1968, Farine *et al*. 1997, O'Connel & Reagle 2002).

To our knowledge, the case presented here may be the first reported case of a frog and a cockroach involved in a possible mimicry ring, in what appears to be an interesting case of evolutionary convergence.

MATERIALS AND METHODS

On July 2016, a week of fieldwork was conducted in the Cordillera de Paria (*sensu* Rivas *et al*. 2021), the easternmost portion of the Cordillera de la Costa in northern Venezuela, specifically at Cerro Humo, the highest summit of the Paria Peninsula (~1,250 m elevation). This fieldwork was carried out as part of a project on the conservation status of endemic frog species inhabiting the region. Invertebrate and small vertebrate specimens were found in the phytotelmata of the bromeliad *Glomeropitcairnia erectiflora* Mez (Bromeliaceae) (Fig. 1).

Several individuals of the tank bromeliad *G. erectiflora* from Cerro Humo were examined for small vertebrates such as lizards and frogs. The plants were epiphytes on branches of an unidentified tree, probably of the genus *Miconia* (Melastomataceae).

Although there are no meteorological data from the summits of Paria, it has been mentioned that in Cerro Humo there are two thermal floors: the subtropical one from 400 to 1,000 m above sea level, and the temperate one restricted to the mountain tops. In these thermal floors, mean annual temperatures could respectively be 24 and 19 °C, while precipitation is around 2,000 mm per year (Motta 2001, Fernández & Michelangeli 2003).

RESULTS AND DISCUSSION

The host plant

The genus *Glomeropitcairnia* Harms (Bromeliaceae) contains two species native to the Lesser Antilles, Trinidad, and Venezuela (Smith 1971, Smith & Downs 1977, Howard 1979, Hoyos 1985, Ulloa *et al*. 2018). One of these species, *Glomeropitcairnia penduliflora* (Griseb.) Mez, is an endemic epiphyte to the islands of Montserrat, Guadeloupe, Martinique, and Dominica. The other one, *G. erectiflora* Mez, which is also epiphytic and occasionally terrestrial, and is endemic to the montane cloud forests of northeastern Venezuela (including Margarita Island) and northern Trinidad (Smith & Downs 1977, Oliva Esteva & Steyermark 1987, Holst 1994, Hokche *et al*. 2008). Steyermark (1974, 1976) highlighted that the cloud forests of the Cordillera de la Costa in Venezuela host a unique and endemic Amazonian-Guyanese flora element, confined to elevations between 800 and 1,500 meters, which is crucial for conserving these ecosystems and their biodiversity. Such environment and flora (and associated fauna) are currently threatened, despite being located within two National Parks (Cerro El Copey, Margarita Island, Nueva Esparta State; and Paria Peninsula, Sucre State).

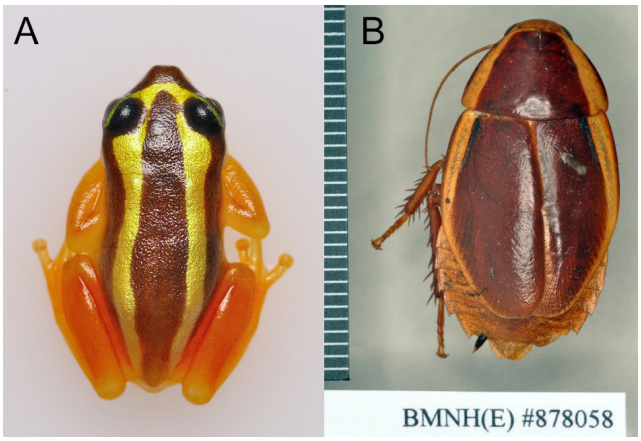

Figure 1. Live individual of the golden tree frog, *Phytotriades auratus* (Hylidae, Anura), from the Paria Peninsula, Venezuela (A), and preserved type of the cockroach *Dryadoblatta scotti* (Blaberidae, Blattodea) (B) from Trinidad showing their similarity in dorsal coloration ("Horseshoe pattern"). Photos: M. De Freitas (left); Amoret Spooner, Hope Entomological Collection, Oxford University Museum of Natural History (right).

It is well known that many bromeliad species generate microhabitats for arthropods and amphibians that partially or totally depend on the ecological niche so created to complete their life cycle (Richardson 1999, Kitching 2000, Srivastava & Kortright 2006). Such symbiotic relationship allows plants to obtain nutrients from the activity of the associated fauna while the animals obtain food, shelter, and substrate (Frank & Lounibos 2009, Sabagh *et al*. 2017).

This bromeliad, originally described from Margarita Island, Venezuela, from an altitude of 700 m (Mez 1904), has been found in other areas of northeastern Venezuela, in the state of Sucre. It inhabits cloud forests above 700 m above sea level and up to 1,250 m. The plant can also be found along the Northern Coast Range of the island of Trinidad (Jowers *et al*. 2008). This bromeliad was considered Vulnerable due to habitat destruction caused by anthropogenic interference in the forests where it is found (Llamozas *et al*. 2003), but is currently considered Near Threatened (Huérfano *et al*. 2020). It might be categorized as Vulnerable again due to increased forest destruction.

Anuran found inside the bromeliad tank

Phytotriades auratus (Boulenger, 1917) is a frog known to occur on three small summits in Trinidad and on a peak in the Paria Peninsula, northeastern Venezuela, where it is considered endangered (IUCN SSC Amphibian Specialist Group 2020). The species thrives at an altitudinal range from 700 to 1,250 m above sea level, and inhabits the tank bromeliad *G. erectifolia* (Rivas & De Freitas 2015, Jowers *et al*. 2024).

This rare and endangered anuran ranges in size from small to medium; males can be up to 29–30 mm long, while females can reach 35 mm in length from snout to cloaca (Gray 2003, Jowers *et al*. 2008). Their base color is chocolate brown with two distinctive iridescent golden yellow dorsal stripes running from head to back (Jowers *et al*. 2008). Curiously, other frogs exhibit a somewhat similar pattern (Lehtinen 2020, Ferreira Souza 2024; G. Beccaloni, *pers. comm*.)

Cockroaches inside a bromeliad

On July 2016, a specimen of a dark brown (almost black) cockroach with translucent mustard-yellow pronotum and tegmina edges was collected inside the bromeliad tank of a *G. erectiflora* individual plant (Fig. 2). The plant was found on the summit of Cerro Humo, at its highest elevation (1,250 m above sea level).

The specimen was identified as belonging to *Dryadoblatta* Rehn 1930. This genus has two recognized species. One of them, *D. mira* Rehn 1937 was described from the Venezuelan Amazon region, the Cerro Duida at an elevation of 1,370 (Rehn 1937, Cazorla-Perfetti 2019). The other one, *D. scotti* (Shelford, 1912), was initially described within the genus *Homalopteryx* Brunner von Wattenwyl, 1865, to be later placed as the type for the new genus *Dryadoblatta* (Shelford 1912, Rehn 1930). The species has been collected in northern Trinidad at an elevation of 950 m (Shelford 1912).

Dryadoblatta scotti is one of more than 60 cockroach species associated with Bromeliaceae (Roth & Willis 1960; Rocha e Silva *et al*. 1976). This beautiful species is considered amphibious or semi-aquatic, and lives at the water surface in or near the bromeliad tank, diving into it to collect food or to escape predators (Princis & Kevan 1955). The species has been found associated with *Tillandsia* sp. and *G. erectiflora*, in the mountains of the northern Cordillera of Trinidad (Shelford 1912, Rehn 1930). *Dryadoblatta scotti* has a chocolate brown coloration contrasting with the edges of the pronotum and tegmina which are of a very striking golden yellow color, and can measure up to 30 mm.

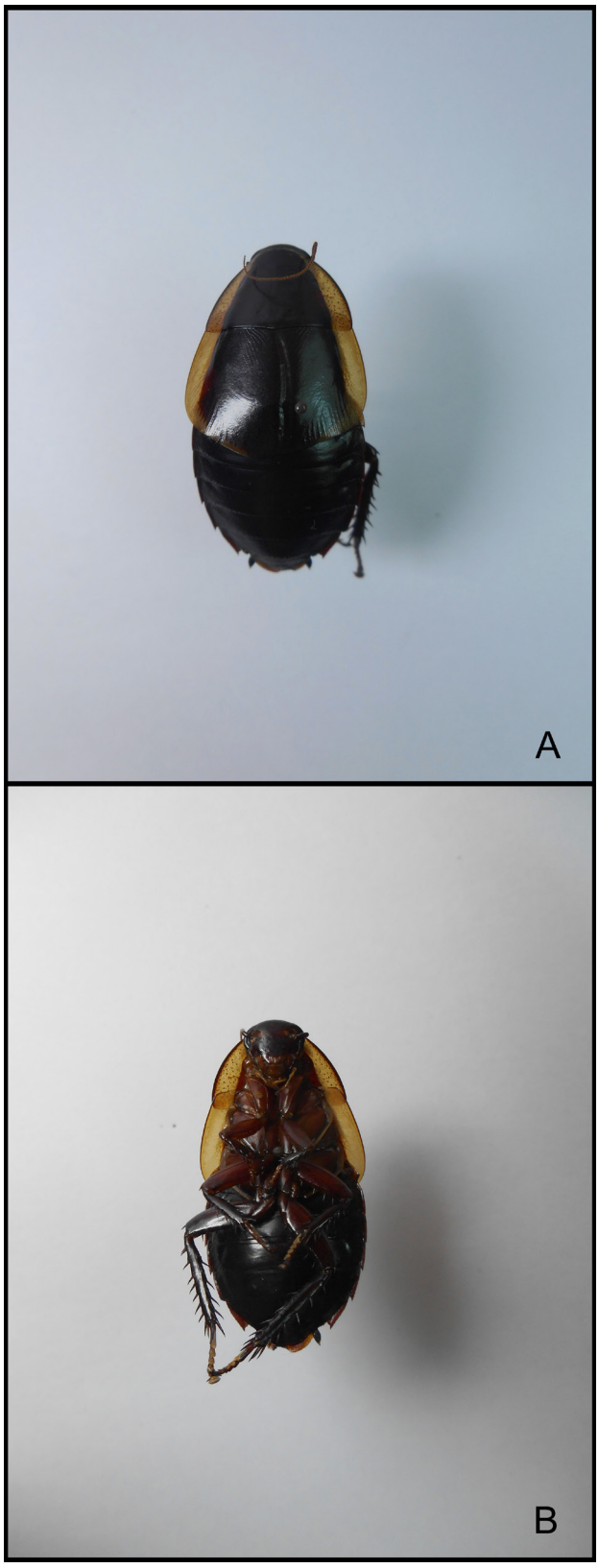

Figure 2. Dorsal (A) and ventral (B) views of a specimen of *Dryadoblatta* sp. collected inside a *Glomeropitcairnia erectiflora* from Cerro Humo, Paria Peninsula, Venezuela. Photo: L. E. Sibira.

While visiting Cerro Copey, on Margarita Island (Venezuela), a cockroach of the genus *Pelmatosilpha* was photographed walking out of the tank of a *G. erectiflora* plant at 750 m elevation (Fig. 3). *Pelmatosilpha* has 24 recognized species, of which 21 have been found in Central America (Costa Rica and Panama), the Caribbean islands (Trinidad, Grenada, Barbados, St. Lucia, Martinique, Antigua, Dominica, and Puerto Rico), and in South America (Peru, Ecuador, Colombia, Venezuela, Guyana, and Brazil). Three species are known from Venezuela, and at least one of them is also found in Trinidad (https://cockroach.speciesfile.org/).

Most known cockroach species are cryptic and appear to be palatable to predators (Evans 1968, Marshall 2017). However, some are known to be unpalatable, while others, after being "crushed" or "torn," release a foul odor (Evans 1968, Eisner & Grant 1981, Santos *et al.* 2003, Hinkelmann 2023).

The "horseshoe" pattern of roaches and frogs

The coloration pattern of *Dryadoblatta scotti, Dryadoblatta* sp. (from the Paria Peninsula), and *Pelmatosilpha* sp., consists of brown shades contrasting with light borders. This pattern resembles that of frogs such as *Phytotriades auratus*, that have a similar size and share the same environment. Perhaps one should refer to the frog resembling the cockroach in terms of the evolutionary scenario resulting in these similarities. This type of coloration on these and other cockroaches is known as the "horseshoe pattern," which has also been observed in at least one beetle (see Ferreira Souza *et al*. 2024), and may be disruptive and/or aposematic due to its contrasting nature (Fig. 4). The association of such pattern with some degree of toxicity is observed in the cockroach, *Pelmatosilpha coriacea* Rehn, 1903, from Puerto Rico. This species is known to release a repellent secretion which is effective against ants (Blum 1964). A closely related species, *Eurycotis floridana* (Walker, 1868), has been studied for its repellent efficacy against mice and some insects (Turnbull & Fashing 2002).

Although the "horseshoe" pattern observed involves cockroach species associated with phytotelmata, this pattern might not be a recent adaptation. It appears to be an ancestral coloration shared by several other cockroach species, including terrestrial ones such as *Methana marginalis* (Saussure, 1864) from Australia and *Dorylaea* spp. from Southeast Asia (Mackerras 1968; G. Beccaloni, *pers.*

Figure 3. *Pelmatosilpha* sp. (male) on a leaf of *Glomeropitcairnia erectifolia,* from Cerro Copey, Margarita Island, Venezuela, photographed on 2017. Photo: G. A. Rivas.

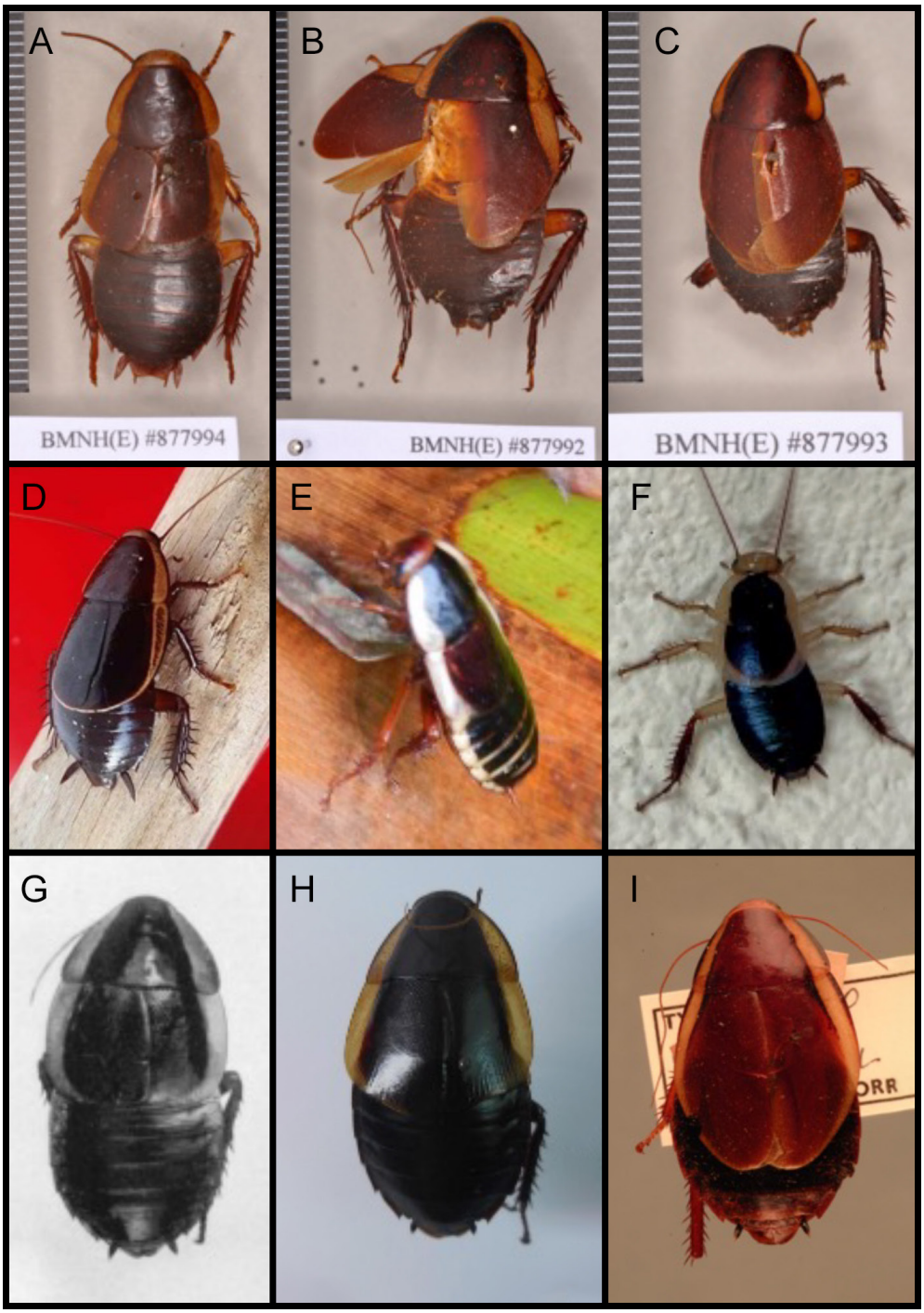

Figure 4. *Dryadoblatta* and *Pelmatosilpha* species showing the "horseshoe pattern" coloration: **A.** *Pelmatosilpha purpurascens,* Puerto Rico [Beccaloni, 2025. Cockroach Species File. Cockroach Species File - Pelmatosilpha purpurascens Kirby, 1903]; **B.** *P. larifuga* [Beccaloni, 2025. Cockroach Species File. Cockroach Species File - Pelmatosilpha larifuga Gurney, 1965]; **C.** *P. marginalis* [Beccaloni, 2025. Cockroach Species File. Cockroach Species File - Pelmatosilpha marginalis Brunner von Wattenwyl, 1893]; **D.** *P. coriacea*, Puerto Rico [Beccaloni, 2025. Cockroach Species File. Cucaracha Arbórea (Pelmatosilpha coriacea) Arboreal Cockroach]; **E.** *Pelmatosilpha* sp. Venezuela (Cerro Copey, Margarita Island) [this work]; **F.** *P. erytrocephala* Colombia (Cerro Pintado) [*Pelmatosilpha erythrocephala*. Photo: ©nmoorhatch. Licenced under Creative Common License Attribution 4.0 International (CC BY 4.0). *URL*: https://www.inaturalist.org/observations/172533741 and https://www.gbif.org/occurrence/5167126518]; **G.** *Dryadoblatta mira* (male), Venezuela (Cerro Duida) [Taken from Rehn 1937: Pl. XV: fig. 21]; **H.** *Dryadoblatta* sp. (female), Venezuela (Cerro Humo, Paria Peninsula) [this work]; **I.** *Dryadoblatta scotti* (female), northern Trinidad [Beccaloni, 2025. Cockroach Species File. Cockroach Species File - Dryadoblatta scotti (Shelford, 1912)].

comm.). As noted above, a similar pattern has also been reported in at least one member of the Curculionidae (Coleoptera) (Ferreira Souza *et al*. 2024) (Fig. 5).

General remarks

In recent years, several localities outside the Paria Peninsula have been surveyed for anurans, encompassing the distribution of the tank bromeliad *G. erectiflora*, a host plant of *P. auratus* (Rivas *in litt*.). The recent discovery of *P. auratus* in Venezuela allows us to solve a puzzling mystery of herpetology in the country. In 1950, two frogs matching the description of *P. auratus* were collected in Cerro Copey, Margarita Island (Roze 1964). Roze (1964) stated that after checking 70 bromeliads from the summit of that mountain, he and his team were able to find two frogs that they identified as *Scinax ruber* (Laurenti, 1768). Unfortunately, the two specimens seem to be lost (we could not find them in the Museo de Historia Natural La Salle, Caracas, where they were originally housed). Those frogs might represent *Phytotriades auratus* and not *Scinax ruber*. Both species have a vague resemblance, but the former is normally found in lowlands, although at least one specimen is known from 800 m above sea level in a highly anthropogenic environment on the Paria peninsula (Fig. 6). In addition, *G. erectifolia* is the most abundant bromeliad on the summit of Cerro Copey, and *P. auratus* is closely associated with this plant species in Trinidad and Paria Peninsula, and both (the plant and the frog) appear to be relict species.

Several organisms linked to the bromeliad *G. erectifolia* have also been found in the Northern Cordillera of Trinidad (Trinidad and Tobago), and Cerro Copey in Margarita Island, and the Paria Peninsula in Sucre State (Venezuela) (Mez 1904, Smith & Downs 1977, Jowers *et al*. 2008). Among them, we collected in Paria Peninsula the endemic lizard *Euspondylus monsfumus* Mijares-Urrutia, Señaris, & Arends, 2001, as well as specimens of *P. auratus*, and some isopods. Likewise, we found the two cockroach species observed and mentioned in this study as being associated with *G. erectifolia*.

Besides, sufficient evidence exists for a biotic relationship between amphibians and cockroaches as predator-prey, as several families of amphibians are known to frequently feed on cockroaches (Picado 1913, Princis & Kevan 1955, Roth & Willis 1960). An example of this are cockroaches of the genus *Epilampra* found in the stomach contents of the frog, *Eleutherodactylus maestrensis* Díaz, Cádiz & Navarro, 2005, in Cuba, in tropical mountain and pine forests between 900 and 1,640 m above sea level (Díaz *et al*. 2005).

Figure 5. A weevil (*Cratosoma* sp., Curculionidae, Coleoptera) (A) and a poison dart frog (*Ameerega trivitatata*, Dendrobatidae, Anura) (B) from Brazil, showing similar "horseshoe patterns" to those of *Dryadoblatta* spp. and *Phytotriades auratus* (compare with Figure 1). Photo: U. Ferreira Souza.

Figure 6. *Scinax ruber* from Cachipal, Península de Paria, Venezuela. Note the general similarity to *Phytotriades auratus*. Photo: L. A. Rodríguez J.

Which arrived first, the cockroach or the frog?

The ancestors of cockroaches originated during the Carboniferous period, approximately 350–320 million years ago (McKittrich 1964, Djernæs *et al*. 2020). However, modern cockroach lineages emerged around 235 million years ago, predating the earliest confirmed cockroach fossils by about 95 million years (McKittrick 1964, Wegener 1966, Djernaes *et al.* 2020, Jin-Lin *et al.* 2023).

The earliest protofrogs appeared around 250 million years ago, with the lineage leading to modern frogs emerging over 150 million years ago (Blackburn & Wake 2011, Feng *et al*. 2017, Portik *et al*. 2023). Most contemporary lineages, including those of poison dart frogs, diversified approximately 66 million years ago after the dinosaur extinction (Grant *et al.* 2006, Blackburn & Wake 2011, Feng *et al*. 2017, Portik *et al.* 2023). Interestingly, poison dart frogs acquire their toxicity as a result of consuming poisonous insects (Summers & Clough 2001, Vargas-Salinas & Rojas 2024).

Is this mimicry or just convergence?

Three species of the genus *Dryadoblatta* are now known from northern South America: *D. mira* from the Venezuelan Amazon region, *D. scotti* from northern Trinidad (Roth & Willis 1960, Rehn 1937, Shelford 1913), and *Dryadoblatta* sp. from the Paria peninsula in Venezuela (reported herein). This is particularly interesting because the anuran genus *Phytotriades* is monotypic, and its sister genus *Itapotihyla* Faivovich, Haddad, Garcia, Frost, Campbell & Wheeler, 2005 is also a monotypic, though it is distributed in the Atlantic Forests of Brazil, with isolated populations in eastern Paraguay and northeastern Argentina (Blotto 2021, Frost 2024). *Phytotriades* and *Dryadoblatta* could be relicts of the former Amazonian refugia of northwestern Venezuela, as established for some other plant and animal species (Steyermark 1974, 1976, 1982, Schargel *et al*. 2005). In turn, the tank bromeliad *G. erectifolia* could also be considered a relict, and it is currently isolated on some peaks of northeastern Venezuela, Margarita Island, and northern Trinidad (this work).

The similarity of color patterns and adult sizes between the frogs and cockroaches that we studied (despite being somewhat variable and alike to those observed in other frog and cockroach groups associated with humid environments; G. Beccaloni, *pers. comm*.), along with their shared *Glomeropitcairnia* phytotelmata habitat, suggest that we are likely observing a convergence system that could be interpreted or associated with mimicry. It is worth mentioning again that the only other insect, namely *Cratosomus* sp. (Curculionidae) associated to a mimicry system involving a frog also exhibits the horseshoe pattern (see Ferreira Souza *et al.* 2024). This reinforces the idea that such a pattern extends to a broader taxonomic level in insect-mimicking frogs (or perhaps the other way around) or even a simple ecological convergence ("a plain coincidence," G. Beccaloni, *pers. comm*.).

In the case of cockroaches of the subfamily Eurycotiinae, in which *Pelmatosilpha* sp. is included, they are known to emit repellent secretions effective against other insects and vertebrates (Blum 1964, Turnbull & Fashin 2002). Some frogs of the tribe Lophyohylini, to which *P. auratus* belongs, are also known to exude toxic secretions through serous glands (Blotto *et al*. 2021). Although similar secretions have not been recorded in *P. auratus*, this frog might produce unpleasant or poisonous exudates. These and the coincidental presence of an aposematic color pattern in both species lead us to suspect that we are in the presence of a possible mimetic association. However, we cannot rule out the idea that this is just a case of independent evolutionary convergence.

The frogs and cockroaches in this study, as well as their host plant, appear to be relicts of a wider past distribution in northern South America (*e.g.*, Jowers *et al*. 2024), and are now isolated on some peaks in Venezuela and Trinidad, where they can still find an appropriate microhabitat to live and breed.

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REFERENCES

Adams, W. Y., E. W. Graf & M. Anderson. 2019. Disruptive coloration and binocular disparity: Breaking camouflage. *Proceedings of the Royal Society B*, 286: 20182045.

Badejo, O., O. Skaldina, A. Gilev & J. Sorvari. 2020. Benefits of insect colours: A review from social insect studies. *Oecologia* 194: 27–40.

Bastidas Pérez, R. & Y. Zavala Gómez. 1995. *Principios de entomología agrícola*. Coro, Falcón: Ediciones Sol de Barro, 394 pp.

Bates, H. W. 1862. Contributions to an insect fauna of the Amazon Valley: Lepidoptera: Heliconidae. *Transactions of the Linnean Society of London* 25: 495–566.

Bates, H. W. 2020. *A naturalist in the Amazon*. Washington, D. C.: Smithsonian Books, 159 pp.

Bittleston, L. S., N. E. Pierce, A. M. Ellison & A. Pringle. 2016. Convergence in multispecies interactions. *Trends in Ecology & Evolution* 31(4):269–280.

Blackburn, D. C. & D. B. Wake. 2011. Class Amphibia Gray, 1825. pp. 39–55. *In*: Zhang, Z-Q. (ed.). Animal biodiversity: An outline of higher-level classification and survey of taxonomic richness. *Zootaxa* 3148.

Blotto, B. L., M. L. Lyra, M. C. S. Cardoso, M. T. Rodrigues, I. R. Dias, E. Marciano-Jr., F. Dal Vechio, V. G. D. Orrico, R. A. Brandão, C. Lopes de Assis, A. S. F. Lantyer-Silva, M. G. Rutherford, G. Gagliardi-Urrutia, M. Solé, D. Baldo, I. Nunes, R. Cajade, A. Torres, T. Grant, K.-H. Jungfer, H. R. da Silva, C. F. B. Haddad & J. Faivovich. 2021. The phylogeny of the Casque-headed Treefrogs (Hylidae: Hylinae: Lophyohylini). *Cladistics* 37: 36–72.

Blum, M. S. 1964. Insect defensive secretions: Hex-2-enal-1 in *Pelmatosilpha coriacea* (Blattaria) and its repellent value under natural conditions. *Annals of the Entomological Society of America* 57 (5): 600–602.

Cazorla-Perfetti, D. 2019. Listado actualizado de las cucarachas (Insecta, Dyctioptera, Blattodea) de Venezuela, con siete nuevos registros en el estado Falcón y cinco en el estado Lara. *Saber* (Cumaná, Venezuela) 31: 39–65.

Darst, C. R. & M. E. Cummings. 2006. Predator learning favours mimicry of a less-toxic model in poison frogs. *Nature* 440(7081): 208–211.

Deans, A. R. & L. M. Roth. 2003. *Nyctibora acaciana* (Blattellidae: Nyctiborinae), a new species of cockroach from Central America that oviposits on ant-acacias. *Transactions of the American Entomological Society* 129(2): 267–283.

Díaz, L. M., A. Cádiz & N. Navarro. 2005. A new ground-dwelling frog of the genus *Eleutherodactylus* (Anura: Leptodactylidae) from Eastern Cuba, and a reconsideration of the *E. dimidiatus* Group. *Caribbean Journal of Science* 41: 307–318.

Djernæs, M., Z. K. Varadínová, M. Kotyk, U. Eulitz & K.-D. Klass. 2020. Phylogeny and life history evolution of Blaberoidea (Blattodea). *Arthropod Systematics & Phylogeny* 78: 29–67.

Eisner T. & R. P. Grant. 1981. Toxicity, odor aversion, and 'Olfactory Aposematism'. *Science,* 213: 476.

Evans, H. E. 1968. *Life on a little-known planet*. New York: E. P. Dutton, 318 pp.

Farine, J.-P., C. Everaerts, J.-L. Le Quere, E. Semon, R. Henry & R. Brossut. 1997. The defensive secretion of *Eurycotis floridana* (Dictyoptera, Blattidae, Polyzosteriinae): Chemical identification and evidence of an alarm function. *Insect Biochemistry and Molecular Biology* 27: 577–-586.

Feng Y.-J., D. C. Blackburn, D. Liang, D. M. Hills, D. B. Wake, D. C. Cannatella & P. Zhang. 2017. Phylogenomics reveals rapid, simultaneous diversification of three major clades of Gondwanan frogs at the Cretaceous–Paleogene boundary. *Proceedings of the National Academy of Sciences* 114 (29): E5864-E5870.

Fernández, A. & F. Michelangeli. 2003. *Naturaleza entre dos mundos*. pp. 113–137. *In*: Michelangeli, F. (ed.). *Paria: donde amanece Venezuela*. Caracas: Exxon-Mobil de Venezuela, S. A.

Ferreira Souza U., G. Wizen & L. F. Toledo. 2024. A possible case of insect-frog mimicry. *Herpetological Bulletin* 167: 37.

Frank, J. H. & L. P. Lounibos. 2009. Insects and allies associated with bromeliads: A review. *Terrestrial Arthropod Reviews* 1: 125–153.

Frost, D. R. 2024. *Amphibian species of the world: An online reference*. Version 6.2 (January 1, 2025). Electronic Database accessible at https://amphibiansoftheworld.amnh.org/index.php. American Museum of Natural History, New York, USA. doi.org/10.5531/db.vz.0001

González, J. M. 2005. *Los insectos en Venezuela*. Caracas: Fundación Bigott, 149 pp.

Gray, A. R. 2003. *Short notes on neotropical treefrogs of the genus* Phyllodytes. Accessed on March 10, 2015. http://govtandeducationchat.reocities.com/RainForest/Canopy/9884/article1.html

Kunte, K., A. Girish Kishakke & V. Nawge. 2021. Evolution of mimicry rings as a window into community dynamics. *Annual Review of Ecology, Evolution, and Systematics* 52: 315–341.

Hinkelman, J. 2023. Origins and diversity of spot-like aposematic and disruptive colorations among cockroaches. *Biologia* 78: 1659–1677.

Hokche, O., P. E. Berry & O. Huber (eds.) 2008. *Nuevo catálogo de la flora vascular de Venezuela*. Caracas: Fundación Insti-

tuto Botánico de Venezuela Dr. Tobías Lasser – Ediciones IVIC, 859 pp.

Holst, B. K. 1994. Checklist of Venezuelan Bromeliaceae with notes on species distribution by state and levels of endemism. *Selbyana* 15: 132–149.

Howard, R. A. 1979. *Flora of the Lesser Antilles. Leeward and Windward Islands. Vol. 3. Monocotyledoneae*. Cambridge, Massachusetts: Arnold Arboretum, Harvard University, 586 pp.

Hoyos F., J. 1985. *Flora de la Isla Margarita, Venezuela*. Monografía 34. Caracas: Sociedad y Fundación La Salle de Ciencias Naturales, 927 pp.

Huérfano, A., I. Fedón & J. Mostacero (eds.) 2020. *Libro Rojo de la flora venezolana*. [2ª ed.]. Caracas: Instituto Experimental Jardín Botánico Dr. Tobías Lasser, Universidad Central de Venezuela / Provita, 255 pp.

IUCN SSC Amphibian Specialist Group. 2020. *Phytotriades auratus*. *The IUCN Red List of Threatened Species 2020*: e.T55830A109536434.

Jin-lin L., Z. Jia-wei, H. Wei, W. Yi-Shu, H. Shu-Lin & W. Zong-Qing. 2023. Advances in the understanding of Blattodea evolution: Insights from phylotranscriptomics and spermathecae. *Molecular Phylogenetics and Evolution* 182: 107753.

Jowers, M. J., J. R. Downie & B. L. Cohen. 2008. The Golden Tree Frog of Trinidad, *Phyllodytes auratus* (Anura: Hylidae): Systematics and conservation status. *Studies on Neotropical Fauna and Environment* 43: 181–188.

Jowers, M. J., J. M Pajares, J. Weber, J. Arkle, S. Arenas-Castro, S. Y. W. Ho, G. A. Rivas, J. C. Murphy, A. Borzée, R. A. Pyron, M. Pérez-Losada, M. De Freitas, J. R. Downie, G. Moreno-Rueda, G. Forcina & S. Sánchez-Ramírez. 2024. Testing molecular date estimates using an ecological and vicariant case study in treefrogs: The geological-ecological molecular calibration. *Journal of Biogeography* 51: 1–16.

Kitching, R. L. 2000. *Food webs and container habitats: The natural history and ecology of phytotelmata.* Cambridge: Cambridge University Press, 448 pp.

Lehtinen, R. M. 2020. *Phytotelm breeding frogs of the world*. https://sites.google.com/site/phytotelmbreedingfrogsworld/home?authuser=0

Llamozas, S., R. Duno de Stefano, W. Meier, R. Riina, F. Stauffer, G. Aymard, O. Huber & R. Ortiz. 2003. *Libro rojo de la flora venezolana*. Caracas: PROVITA, Fundación Polar, Fundación Instituto Botánico de Venezuela, 555 pp.

Lorioux-Chevalier, U., M. Tuanama Valles, S. Gallusser, R. Mori Pezo & M. Choteau. 2023. Unexpected colour pattern variation in mimetic frogs: Implication for the diversification of warning signals in the genus *Ranitomeya*. *Royal Society Open Science* 10(6): 230354.

Mackerras, M. J. 1968. Australian Blattidae (Blattodea) IX. Revision of the Polyzosteriinae tribe Methanini, Tryonicinae, and Blattinae. *Australian Journal of Zoology* 16: 511–575.

Marshall, S. A. 2017. *Insects: Their natural history and diversity*. Buffalo, New York: Firefly Books, 735 pp.

Matthews, R. W. & J. R. Matthews. 2010. *Insect Behavior*. New Jersey: Springer, 527 pp.

Mez, C. 1905. Additamenta monographica 1904. *Bulletin de l'Herbier Boissier* (ser. 2) 5: 233–235.

McKittrick, F. A. 1964. Evolutionary studies of cockroaches. *Memoir of the Cornell Agricultural Experiment Station* 389: 1–197.

Motta Salinas, F. J. 2001. *Propuesta para el establecimiento de reserva de biósfera mediante la aplicación de la ecología del paisaje. Caso de estudio: península de Paria, estado Sucre*. Caracas: Universidad Central de Venezuela, Facultad de Ciencias, 325 pp. [Tesis doctoral].

Müller, F. 1878. Ueber die Vortheile der Mimicry bei Schmetterlingen. *Zoologischer Anzeiger* 1: 54–55.

O'Connell, T. J. & N. Z. Reagle. 2002. Is the chemical defense of *Eurycotis floridana* a deterrent to small mammal predators? *Florida Scientist* 65: 245–249.

Oliva Esteva, F. & J. A. Steyermark. 1987. *Las Bromeliaceaes de Venezuela: nativas y cultivadas*. Caracas: Ediciones Armitano, 398 pp.

Pasteur, G. 1982. A classificatory review of mimicry systems. *Annual Review of Ecology and Systematics* 13: 169–199.

Picado, C. 1913. Les broméliacées épiphytes considérées comme milieu biologique. *Bulletin Scientifique de la France et de la Belgique* 47: 215–360.

Portik, D. M., J. W. Streicher & J. J. Wiens. 2023. Frog phylogeny: A time-calibrated, species-level tree based on hundreds of loci and 5,242 species. *Molecular Phylogenetics and Evolution* 188:107907.

Prates, I., M. M. Antoniazzi, J. M. Sciani, D. C. Pimenta, L. F. Toledo, C. F. B. Haddad & C. Jared. 2012. Skin glands, poison and mimicry in dendrobatid and leptodactylid amphibians. *Journal of Morphology* 273: 279–290.

Princis, K. & D. K. M. Kevan. 1955. Cockroaches from Trinidad, B. W. I., with a few records from other parts of the Caribbean. *Opuscula Entomologica* 20: 149–169.

Rehn, J. A. G. 1930. New or little-known Neotropical Blattidae (Orthoptera). Number two. *Transactions of the American Entomological Society* 56: 19–71.

Rehn, J. A. G. 1937. New or little-known Neotropical Blattidae (Orthoptera). *Transactions of the American Entomological Society* 63: 207–258.

Richardson, B. A. 1999. The bromeliad microcosm and the assessment of faunal diversity in a Neotropical forest. *Biotropica* 31: 321–336.

Rivas, G. A. & M. De Freitas S. 2015. Discovery of the critically endangered golden tree frog, *Phytotriades auratus* (Boulenger, 1917) in eastern Venezuela, with comments on its distribution, conservation and biogeography. *Herpetological Review* 46: 153–157.

Rivas, G. A., O. M. Lasso-Alcalá, D. Rodríguez-Olarte, M. De Freitas, J. C. Murphy, C. Pizzigalli, J. C. Weber, L. de Verteuil & M. J. Jowers. 2021. Biogeographical patterns of amphibians and reptiles in the northernmost coastal montane complex of South America. *Plos One* 16: e0246829.

Rocha e Silva Albuquerque, I. & S. M. R. Lopes. 1976. Blattaria de bromélia (Dictyoptera). *Revista Brasileira de Biologia* 36: 873–901.

Roth, L. M. & P. Naskrecki. 2001. Trophobiosis between a blattellid cockroach (*Macrophyllodromia* spp.) and fulgorids (*Enchophora* and *Copidocephala* spp.) in Costa Rica. *Journal of Orthoptera Research* 10: 189–194.

Roth, L. M. & E. R. Willis. 1960. The biotic associations of cockroaches. *Smithsonian Miscellaneous Collections* 141: 1–470.

Roze, J. A. 1964. La herpetología de la Isla de Margarita, Venezuela. *Memoria de la Sociedad de Ciencias Naturales La Salle* 69: 209–241.

Sabagh, L. T., R. Barbosa Ferreira & C. F. Duarte Rocha. 2017. Host bromeliads and their associated frog species: Further considerations on the importance of species interactions for conservation. *Symbiosis* 73: 201–211.

Sackton, T. B. & N. Clark. 2019. Convergent evolution in the genomics era: new insights and directions. *Phil. Trans. R. Soc.* B 374: 20190102.

Santos, J. C., L. A. Coloma & D. C. Cannatella. 2003. Multiple, recurring origins of aposematism and diet specialization in poison frogs. *Proceedings of the National Academy of Sciences of the United States of America* 100: 12792–12797.

Schargel, W. E., G. Rivas & C. W. Myers. 2005. An enigmatic new snake from cloud forest of the Peninsula de Paria, Venezuela (Colubridae: Genus *Taeniophallus*?). *American Museum Novitates* 3484: 1–22.

Schmied, H., M. Lambertz & P. Geissler. 2012. New case of true mimicry in cockroaches (Blattodea). *Entomological Science* 16: 119–121.

Shelford, R. W. C. 1912. Blattidae. *In*: Scott, H.(ed.) A contribution to the knowledge of the fauna of Bromeliaceae. *Annals and Magazine of Natural History* 8: 431–433.

Smith, L. B. 1971. Bromeliaceae. pp. 1–361. *In*: Smith, L. B. & T. Lasser. *Flora de Venezuela. Vol. XII, primera parte*. Caracas: Edición Especial del Instituto Botánico.

Smith, L. B. & R. J. Downs. 1977. Tillandsioideae (Bromeliaceae). *Flora Neotropica Monograph* 14: 663–1492.

Srivastava, D. S. & M. S. Kortright. 2006. Plant-held waters: Living laboratories for understanding community structure. pp. 197–219. *In*: Lewinsohn, W., J. L. Prado, T. M. Lewinsohn, & P. Jordano (eds.). *Plant-animal interactions: An evolutionary approach.* Boca Raton: CRC Press.

Steyermark, J. A. 1974. Relación florística entre la Cordillera de la Costa y la zona de Guayana y Amazonas. *Acta Botánica Venzuelica* 9: 245–252.

Steyermark, J. A. 1976. *Áreas de bosques húmedos de Venezuela que requieren protección, Anexo 3*. pp. 83–96. *In*: Hamilton, A. (ed.) *Conservación de los bosques húmedos de Venezuela.* [2ª ed.] Caracas: Sierra Club – Consejo de Bienestar Rural.

Steyermark, J. A. 1982. Relationship of some Venezuelan forest refuges with lowland tropical floras. pp. 182–220. *In*: Prance, G.T. (ed.). *Biological diversification in the tropics*: New York: Columbia University Press.

Stuckert, A. M., R. A. Saporito, P. J. Venegas & K. Summers. 2014a. Alkaloid defenses of co-mimics in a putative Müllerian mimetic radiation. *BMC Evolutionary Biology* 14: 76.

Stuckert, A. M., P. J. Venegas & K. Summers. 2014b. Experimental evidence for predator learning and Müllerian mimicry in Peruvian poison frogs (*Ranitomeya*, Dendrobatidae). *Evolutionary Ecology* 28: 413–426.

Summers, K. & M. E. Clough. 2001. The evolution of coloration and toxicity in the poison frog family (Dendrobatidae). *Proceedings of the National Academy of Sciences* 98: 6227–6232.

Turnbull M. W. & N. J. Fashing. 2002. Efficacy of the ventral abdominal secretion of the cockroach *Eurycotis floridana* (Blattaria: Blattidae) as a defense allomone. *Journal of Insect Behavior* 15: 369–384.

Ulloa Ulloa, C., P. Acevedo-Rodríguez, S. Beck, M. J. Belgrano, R. Bernal, P. E. Berry, L. Brako, Ma. Celis, G. Davidse, R. C. Forzza, S. R. Gradstein, O. Hokche, B. León, S. León-Yánez, R. E. Magill, D. A. Neill, M. Nee, P. H. Raven, H. Stimmel, M. T. Strong, J. L. Villaseñor, J. L. Zarucchi, F. O. Zuloaga & P. M. Jørgensen. 2018. *Vascular Plants of the Americas (VPA) Website*. Tropicos, Botanical Information System at the Missouri Botanical Garden, St. Louis, Missouri, USA. [http://www.tropicos.org/Project/VPA: 28-31, 12, 2024]

Vargas-Salinas, F. & B. Rojas. 2024. Developments in the study of poison frog evolutionary ecology I: Social interactions, life history and habitat use across space and ontogeny. *Evolutionary Ecology* 38: 1–22.

Wegener, A. 1966. *The origin of continents and oceans*. New York: Dover Publications, Inc., 246 pp.

Wickler, W. 1968. *Mimicry in plants and animals*. New York: McGraw-Hill Book Company, 255 pp.

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A cockroach of the genus *Eurycotis* Stål, 1874 (Blattodea: Eurycotiinae) living in bromeliads from a climatic relict on the Paraguaná Peninsula, northwestern Venezuela

Una cucaracha del género *Eurycotis* Stål, 1874 (Blattodea: Eurycotiinae) que habita en bromelias de un relicto climático en la Península de Paraguaná, noroeste de Venezuela

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ABSTRACT

The genus of cockroaches *Eurycotis* Stål, 1874, which currently includes some 60 species, is most diverse in the Greater Antilles, with limited representation in South America, including the Venezuelan species *E. nigra* Princis, 1952. Several species of this genus are known to inhabit bromeliads, particularly in mountainous regions, and some exhibit ecological associations with ants. A cockroach of this genus was found inhabiting an epiphytic bromeliad in the cloud forest of Cerro Santa Ana, an isolated mountain rising above the arid lowlands of the Paraguaná Peninsula in northwestern Venezuela. This cockroach exhibits a distinctive coloration pattern, characterized by the shape and position of the pronotal spots, which simulate eyes, and by unusual pink tones, which distinguish it from other species of the genus. The discovery of phytotelm-dwelling cockroaches on Cerro Santa Ana highlights the biogeographic uniqueness of this relict mountain summit ecosystem, suggesting a high potential for diversity of the genus not yet documented in Venezuela.

Keywords: Cerro Santa Ana, cloud forest, ecological island, endemism, relict species.

RESUMEN

El género de cucarachas *Eurycotis* Stål, 1874, que actualmente incluye unas 60 especies, presenta su mayor diversidad en las Antillas Mayores, con una representación limitada en Sudamérica, incluyendo la especie venezolana *E. nigra* Princis, 1952. Se sabe que varias especies de este género viven en bromelias, particularmente en regiones montañosas, y algunas muestran asociaciones ecológicas con hormigas. Se encontró una cucaracha de este género habitando una bromelia epífita del bosque nublado del Cerro Santa Ana, una montaña aislada que se eleva sobre las áridas tierras bajas de la península de Paraguaná, en el noroeste de Venezuela. Esta cucaracha muestra un patrón de coloración distintivo en la forma y posición de las manchas pronotales, que simulan ojos, y en tonalidades rosadas inusuales, que la diferencian de otras especies del género. El

descubrimiento de cucarachas fitotélmicas en el Cerro Santa Ana resalta la singularidad biogeográfica de este ecosistema relictual de cumbre de montaña y sugiere un alto potencial de diversidad del género aún no documentada en Venezuela.

Palabras clave: Cerro Santa Ana, endemismo, especie relictual, isla ecológica, selva nublada.

INTRODUCTION

Regarding the classification of the genus *Eurycotis*, the first species described was *Polyzosteria azteca* Saussure, 1862, from Puebla, Mexico, which is now considered a synonym of *E. mexicana* (Saussure, 1862) (Hollier *et al.*, 2023). The original generic designation underwent several subsequent changes: from *Polyzosteria* (Brunner von Wattenwyl, 1865), to *Periplaneta* (Walker, 1868), and finally to *Eurycotis* (Stål, 1874). Today, the genus includes 60 recognized species, with some large and well-known species such as the Florida woods cockroach [*Eurycotis floridana* (Walker, 1868)]. Over half of these species (34) have been recorded in Cuba and Hispaniola. In Cuba, 17 species were described between 1865 and 1942, with four additional species identified after 1996. In contrast, Hispaniola had only a single documented species in 1916, and it was not until 2014 that 13 new species were described (Gutiérrez 2013, 2014, 2025; Núñez 2018; Estrada-Álvarez & Gutiérrez 2023; Beccaloni 2025). In South America, only eight species have been reported, including *Eurycotis nigra* Princis, 1952, described from Venezuela (Beccaloni 2025; Cazorla-Perfetti 2019).

Eight species of *Eurycotis* associated with bromeliads have been reported in the literature, seven of which occur in montane regions (Table 1). Notably, in Mexico, adults and nymphs of various developmental stages of another *Eurycotis* species were found living in association with ants of the genus *Camponotus*, within large bromeliads that were attached to oak trees (*Quercus* spp.; Fagaceae), in a cloud forest at an elevation of 1,840 meters. These cockroaches exhibit a coloration similar to that of the ants, with the anterior portion of the body reddish-brown and the posterior portion black (Sormani, pers. obs.).

RESULTS AND DISCUSSION

On April 6, 2025, a cockroach of the genus *Eurycotis* Stål, 1874 was found in an epiphytic bromeliad (Bromeliaceae) at an elevation of 650 meters in the cloud forest of Cerro Santa Ana, an isolated mountain on the Paraguaná Peninsula, Falcón State, Venezuela (Fig. 1). While the peninsula is generally arid and xerophytic, higher elevations of this mountain support a tropical rainforest with cloud forest characteristics, rich in bromeliads.

Photographic documentation (Fig. 1) shows that this *Eurycotis* individual exhibits a coloration pattern observed in other cockroaches, with a pair of pronotal spots resembling eyes and contrasting colors that may serve an aposematic function, potentially linked to the repellent chemicals that some cockroaches release to deter predators (Turnbull & Fashing 2002). Its overall appearance and contrasting color pattern resemble those of *Eurycotis decipiens* (Kirby, 1903), a species native to Trinidad & Tobago. However, the pinkish hues seen in the Paraguaná specimens are unusual for the genus.

The Paraguaná Peninsula covers about 2,500 km² and is the northernmost part of continental Venezuela. It is connected to the mainland by the 30 km long Médanos isthmus. The landscape consists mainly of low plains, rising

Table 1. Species of the genus *Eurycotis* reported to live in association with bromeliads.

Species	Locality (elevation, not mentioned for every source)	Source
Eurycotis biolleyi Rehn, 1918	Pitahaya (?), Puntarenas, Costa Rica (1,400 m)	Picado 1913
Eurycotis floridana (Walker, 1868)	Southeastern United States of America.	Roth & Willis 1960
Eurycotis manni Rehn, 1916	Serra da Itiúba, Bahia, Brazil.	Rocha & Rodrigues 1976
Eurycotis ferrumequinum Rehn & Hebard, 1917	Monte Cuzco, Guantánamo Province, Cuba	Gutiérrez (1990)*
Eurycotis galeoides Rehn & Hebard, 1917	Meseta del Guaso, Guantánamo Province, Cuba	Alfaro (1990)*
Eurycotis sp.	Ixtepeji, Oaxaca, México (2,547 m)	Mondragón 2008
Eurycotis isabeltorres Gutiérrez, 2014	Loma Isabel de Torres, Dominican Republic	Gutiérrez 2014

*Gutiérrez, E. (pers. comm.).

Figure 1. *Eurycotis* sp. From the Cerro Santa Ana, 650 m, Paraguaná Peninsula, Venezuela.

centrally to the Cocodite Mesa (~200 m elevation) and to the Cerro Santa Ana (830 m elevation). The prevailing climate is arid to semi-arid, with annual rainfall below 500 mm, except possibly at the summit of Cerro Santa Ana. Vegetation is predominantly xerophytic, with very dry tropical forest (referred to as Tropical Thorny Scrub), and deciduous forest at higher elevations, and cloud forests near the summit of the Cerro Santa Ana (Feo-Codecido *et al.* 1974, Lara & González 2007, Molinari *et al.* 2012, Pastor *et al.* 2016).

The mountains and hills that constitute the northern Cordillera (Cordillera de la Costa) in Venezuela are distinguished by the presence of cloud forests found at elevations ranging from 600 to 900 meters above sea level (Fernández Badillo 1997, 2000). However, the Cerro Santa Ana is a distinct and isolated mountain that is not connected to that mountainous chain, and that contrasts starkly with the surrounding landscape (Bendrat 1914, Ataroff & García 2013, Meier 2011). It is also a relict mountain formed by a volcano that became extinct millions of years ago, and its hard volcanic rock has resisted erosion longer than the softer sedimentary rocks that surround it (Bendrat 1914). Thus, from a geographic and climatic perspective, the Cerro de Santa Ana is a relict ecological island.

The comparatively humid climate of Cerro Santa Ana supports the growth of epiphytic plants, such as bromeliads, which benefit from both vertical precipitation in the form of rainfall and horizontal precipitation in the form of fog (Bubb *et al.* 2004, Gómez & Morón 2010, Ray 2013).

CONCLUSION

Climatic data from the place where our cockroach was found, along with information on other species of *Eurycotis* inhabiting high-altitude regions, suggest a strong correlation between cloud forests, bromeliads, and the diversification of the genus. This pattern indicates a high potential for the discovery of new species of *Eurycotis* in Venezuela, similarly to what happened in Hispaniola, where several species have been recently described (Gutierrez 2014). The isolation and relict nature of the cloud forest on Cerro Santa Ana further suggests that it may serve as a refuge for yet-undescribed *Eurycotis*.

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REFERENCES

Ataroff, M. & C. García-Núñez. 2013. Selvas y bosques nublados de Venezuela. pp. 125–155. *In*: Medina, E., O. Huber, J. M. Nassar & P. Navarro (eds.). *Recorriendo el paisaje vegetal de Venezuela*. Caracas: Ediciones IVIC, Instituto Venezolano de Investigaciones Científicas.

Beccaloni, G. 2025. https://cockroach.speciesfile.org/

Bendrat, T. A. 1914. Rocks of the Cerro Santa Ana on Paraguana, Venezuela. *American Journal of Science* 37: 268–272.

Bubb, P., I. May, L. Miles & J. Sayer. 2004. *Cloud Forest Agenda*. UNEP-WCMC, Cambridge, UK. http://www.unep-wcmc.org/resources/publications/UNEP_WCMC_bio_series/20.htm

Cazorla-Perfetti, D. 2019. Listado actualizado de las cucarachas (Insecta, Dyctioptera, Blattodea) de Venezuela, con siete nuevos registros en el estado Falcón y cinco en el estado Lara. *Saber* (Universidad de Oriente) 31: 39–65.

Estrada-Álvarez, J. C. & E. Gutiérrez. 2023. Blattodea: Blattaria del continente americano; diversidad y distribución; retos y perspectivas. pp. 15-38. *In*: Estrada-Álvarez, R. Núñez-Bazán, N. Valero-Pérez, M. R. F. Domínguez & M. de Luna (eds.). *Memorias del Primer Coloquio de Cucarachas Silvestres (Blattodea: Blattaria) de Latinoamérica (CCSL)*. YouTube: https://youtu.be/LZ1SezusDro

Estrada-Álvarez, J. C. 2023. Bibliografía taxonómica de las cucarachas (Blattodea: Blattaria) de América (1758-2022). pp. 149-193. *In*: Estrada-Álvarez, R. Núñez-Bazán, N. Valero-Pérez, M. R. F. Domínguez & M. de Luna (eds.). *Memorias del Primer Coloquio de Cucarachas Silvestres (Blattodea: Blattaria) de Latinoamérica (CCSL)*. YouTube: https://youtu.be/LZ1SezusDro

Feo-Codecido, G., C. Martín Bellizzia & P. Bartok. 1974. *Excursión geológica a la Península de Paraguaná. Asociación Venezolana de Geología Minería y Petróleo*. Caracas: Asociación Venezolana de Geología Minería y Petróleo, 47 pp.

Fernández Badillo, A. 1997. Zonas de vida del Parque Nacional Henri Pittier, Venezuela. *Revista de la Facultad de Agronomía* (Maracay) 23: 249–270.

Fernández Badillo, A. 2000. El Parque Nacional Henri Pittier. *Revista de la Facultad de Agronomía, Alcance* 60: 1–284.

Gómez-Gómez, B. & M. A. Morón. 2010. Los escarabajos del Bosque de Niebla en Chiapas (Coleoptera: Melolonthidae). pp. 1–24. *In*: Pérez-Farrera, M. A., Tejeda-Cruz, C., Silva-Rivera, E. *Los bosques mesófilos de montaña en Chiapas; situación, diversidad y conservación*. Tuxtla Gutiérrez, Chiapas: Universidad de Artes y Ciencias de Chiapas. Colección Jaguar UNICACH.

Gutiérrez, E. 2013. El género *Eurycotis* (Dictyoptera: Blattaria: Blattidae: Polyzosteriinae). Especies de La Hispaniola. Primera parte: seis especies nuevas. *Novitates Caribaea* 6: 6–35.

Gutiérrez, E. 2014. El género *Eurycotis* (Dictyoptera: Blattaria: Blattidae: Polyzosteriinae). Especies de La Hispaniola. Segunda parte: siete especies nuevas. *Novitates Caribaea* 7: 1–21.

Gutiérrez, E. 2025. A new species of the genus *Eurycotis* Stål (Blattodea, Blattidae) from the eastern region of Cuba. *Zootaxa* 5563: 388–395.

Gutiérrez, O. M., L. M. Camino, A. F. Castrejón, & P. A. Jiménez, 1993. Arthropods associated with *Bromelia hemisphaerica* (Bromeliales: Bromeliaceae) in Morelos, Mexico. *Florida Entomologist* 76: 616–621.

Hollier, J., Marshall, J. A., Legendre, F. & R. Poggi. 2023. An annotated list of the Blattodea (Insecta) described by Henri de Saussure. Part 3: the Blattidae. *Revue Suisse de Zoologie* 130(1): 77–88.

Lara, S. & L. F. González. 2007. Evolución geomorfológica de la planicie lodosa de La Macolla, Península de Paraguaná, Estado Falcón, Venezuela. *Investigaciones Geográficas, Boletín del Instituto de Geografía* (UNAM) 62: 7–30.

Meier, W. 2011. Los bosques nublados de la Cordillera de la Costa en Venezuela. *BioLlania* (*Edición Especial*) 10: 106–121.

Molinari, J., J. M. Nassar, A. García-Rawlins & R. J. Márquez. 2012. Singularidad biológica e importancia socioeconómica de los murciélagos cavernícolas de la península de Paraguaná,Venezuela, con propuestas para su conservación. *Revista de Ecología Latino Americana* 17: 1–40.

Núñez-Bazán, R. 2018. *La relación entre características morfológicas y el nicho climático en diez especies cubanas del género* Eurycotis *Stål (Dictyoptera: Blattaria)*. La Habana: Universidad de La Habana. Facultad de Biología., 69 pp. [Tesis de Licenciatura].

Pastor-Mogollón, J., W. Rivas, M. Rondón & M. Colmenares-Arteaga, 2016. *Ecosistemas terrestres y biodiversidad en la Península de Paraguaná, estado Falcón. Información base para el reporte de CC en Venezuela de la SACC-ACFIMAN*. [Caracas]: 27 pp.

Picado, C. 1913. Les Broméliacées Épiphytes considérées comme milieu biologique. *Bulletin de la Science de la France et de la Belgique* (7)47(5): 215–360.

Ray, D. K. 2013. Tropical montane cloud forests. pp. 79–85. *In*: Pielke, Roger A., Sr. (ed.): *Climate vulnerability: Understanding and addressing threats to essential resources. vol. 4*. [Amsterdam]: Elsevier Inc., Academic Press.

Rocha e Silva, I. & S. M. Lopes. 1976. Blattaria de bromélia (Dictyoptera). *Revista Brasileira de Biologia* 36: 873–901.

Roth, L. M. & E. R. Willis, 1960. Biotic Association of cockroaches. *Smithsonian Miscellaneous Collection* 141: 1–470.

Turnbull, M. W. & N. J. Fashing. 2002. Efficacy of the ventral abdominal secretion of the cockroach *Eurycotis floridana* (Blattaria: Blattidae) as a defense allomone. *Journal of Insect Behavior* 15: 369–384.

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Fernanmorana, new genus of butterflies from the Amazon region (Lepidoptera: Nymphalidae, Satyrinae)

Fernanmorana, nuevo género de mariposas de la región amazónica (Lepidoptera: Nymphalidae, Satyridae)

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ABSTRACT

Based on comparative morphological evidence and previously published phylogenetic hypotheses, a new genus of satyrine nymphalid butterflies, *Fernanmorana* Viloria & Costa, **gen. nov.**, is diagnosed and described. It is native to the lowlands of the Amazon region and so far known from Brazil and Venezuela. The taxonomy of the new genus is briefly discussed, and some bionomic data of its type species, *Fernanmorana insignis* (Butler, 1867), **comb. nov.**, are provided.

Keywords: Brazil, *Euptychia ordinata*, Maroa, Raudal del Danto, Serranía del Cuao, Tocantins, Venezuela, Yavita.

RESUMEN

Con base en evidencia morfológica comparativa e hipótesis filogenéticas previamente divulgadas, se diagnostica y describe un nuevo género de mariposas ninfálidas satirinas, *Fernanmorana* Viloria & Costa, **gen. nov.** El mismo es originario de las tierras bajas de la región amazónica y hasta la fecha se conoce en Brasil y Venezuela. Se discute brevemente la taxonomía del nuevo género y se proporcionan algunos datos bionómicos de su especie tipo, *Fernanmorana insignis* (Butler, 1867), **comb. nov.**

Palabras clave: Brasil, *Euptychia ordinata*, Maroa, Raudal del Danto, Serranía del Cuao, Tocantins, Venezuela, Yavita.

INTRODUCTION

In 1996, while one of the authors (ÁLV) was pursuing doctoral studies at the Natural History Museum in London, he presented to the Venezuelan diplomatic authorities in the United Kingdom an initiative by a group of postgraduate students (engineers) from the Imperial College London to undertake a recreational and scientific expedition to the rivers Negro, Casiquiare, and Orinoco in the Amazonas state of Venezuela. The main objective of this initiative, in addition to traveling by kayak and rowboat along the aforementioned waterways from San Carlos de Río Negro to Puerto Ayacucho, was to test, for the first time, internet communication from selected remote locations of the planet using the first commercially available laptops equipped with satellite antennas.

This initiative was called the Amazon Netspedition and took place between July and October 1996, under the

leadership of Anthony Heenan (Anonymous 1996). The group included the Venezuelan agronomist Jesús Camacho, professor of entomology and curator of the Arthropod Museum of the University of Zulia (MALUZ, Maracaibo, Venezuela), who made extensive insect collections during the expedition, particularly Lepidoptera and Coleoptera. Some of the information posted on the Netspedition website (http://sunsite.doc.ic.ac.uk/netspedition) referred to the discovery of unusual butterfly species, some of which were discussed in the first part of the work of A. F. E. Neild, published at the end of that year (Neild 1996). Due to bureaucratic delays in obtaining permits, the entomological material was confiscated by the authorities of the Fauna Division of the Ministry of the Environment and Natural Resources in Caracas, and unfortunately was not available for study until years later, when some of it was returned to MALUZ. In 2002, it became possible to display, mount, preserve, and examine these samples, which also allowed for the preliminary identification of most butterfly species (Lepidoptera, Papilionoidea). The nymphalid species of the subfamily Satyrinae were studied by Viloria & Camacho (2002), with several cases of provisional identifications, mainly based on the work of Butler (1867), Forster (1964), and D'Abrera (1988).

In the collection of Amazonian Satyrinae of the Netspedition 1996, a male specimen of '*Euptychia*' *insignis* Butler was identified, the first one known from the Venezuelan territory, which, due to its morphological peculiar aspect, especially wing color pattern, could not be placed within any of the genera of Euptychiina described by Forster (1964).

In more recent dates Lamas (2004) detected the impossibility of placing this butterfly species in any of the genera of Nymphalidae Satyrinae described for the American continent. Freitas *et al*. (2018), Marín Uribe *et al*. (2019), Nakahara *et al*. (2019) and Espeland *et al*. (2023) followed this opinion, adding important genetic evidence that reinforces the notion that this taxon should be placed in its own genus. Herein we proceed to diagnose and describe it.

MATERIALS AND METHODS

A comparative study has been carried out on the morphology of the venation and the design pattern and coloration of the wings, particularly the band system and ocelli formula, as well as the male genital chitinous structures of the taxon mentioned in the introduction. The unique combinations of characters were used as criteria for the definition of the new genus.

Description follow the nomenclature of wing venation (and cells) of the Comstock-Needham system (Miller 1970), and the modified terminology of Klots (1970) was used for the description of male genital structures.

Dry-preserved, pinned, and displayed specimens were examined. The observations, photographs and drawings were made with and without magnification (in the first case with manual magnifying glasses and stereoscopic microscopes of different models and brands, natural and artificial lighting and accessories such as the camera lucida and photographic camera), the lengths were taken with a drawing compass and ruler, manual and ocular microscales. Wing diaphanizations were performed using diluted commercial chlorine and immediate washing with distilled water, dehydration with ethanol and preservation by immersion in euparal between glass slides and covers. The softening and digestion of fleshy tissues and abdominal fat for the microdissection of the chitinous structures of the male genitalia of butterflies was carried out by controlled immersion in caustic solution and subsequent washing in water. Once these preparations were examined, they were stored in a solution of ethanol and glycerin. These technical procedures have been described in more detail by Viloria & Costa (2022) and Viloria (2022).

Acronyms: **IVIC**: Centro de Ecología, Instituto Venezolano de Investigaciones Científicas, Altos de Pipe, Venezuela; **MALUZ**: Museo de Artrópodos de la Universidad del Zulia, Facultad de Agronomía, Maracaibo, Venezuela; **MC**: Mauro Costa collection, Caracas, Venezuela; **MIZA**: Museo del Instituto de Zoología Agrícola, Facultad de Agronomía, Universidad Central de Venezuela, Maracay, Venezuela; **NHMUK**: The Natural History Museum, London, United Kingdom.

Material examined: BRAZIL: 1♀ Tonantins [*sic*], Amazons [white rectangular label, printed], Godman & Salvin Coll. 1904-1, Euptychia insignis Btl. [white rectangular labe, printedl] Type of species [white rectangular label, printed], B.M. Type Rh 3867, Euptychia insignis Butl. ♀ [white square label, part printed, part handwritten], Syn-type [small round label circled in light blue, printed], Type HT [small round label circled in red, printed], Euptychia insignis Butler Monog. [larger light blue rectangular label, handwritten]. This specimen corresponding well with the illustration of the original description (Butler 1867: pl. 40, fig. 12), herein designated LECTOTYPE of *Euptychia insignis* Butler, 1867 [NHMUK]; VENEZUELA: 1♂, Amazonas, Mcpio. Guainía, camino Yavita-Maroa, 2° 55' 16" N, 67° 26' 25" W, 300 m, 29-31.viii.1996, cols. J. Camacho, A. Heenan [wing prep. ALV062-19; genit. prep. ALV599-14] [MALUZ]; 1♀, Amazonas, Raudal del Danto [5° 2' 30" N; 67° 33' 30" W], 150 m, 13.i.2024, H. Camico [IVIC], 5 ♂♂ Amazonas, Raudal del Danto [5° 2' 30" N; 67° 33' 30" W], 150 m, 25.x.2024,

H. Camico [3 IVIC, 1 MIZA, 1 MC]; 2♂♂ Amazonas, Raudal del Danto [5° 2' 30" N; 67° 33' 30" W], 150 m, 30.x.2024, H. Camico [1 IVIC, 1 MALUZ].

RESULTS

Fernanmorana Viloria & Costa, **gen. nov.**
(Figs. 1 [type species, male wing venation], 2 [type species, male genitalia], 3 [type species, habitus, male and female])

https://zoobank.org/urn:lsid:zoobank.org:act:AE53C6EF-9EF1-44C3-857A-8E207FFAD9AD

Type species: *Euptychia insignis* Butler, 1867: 501, pl. 40, fig. 12. Herein designated.

Diagnosis. *Wing pattern* (Fig. 3): dorsal: uniform dark brown, without ornamentation; ventral forewing without ocelli and lacking discal band or line; hindwing with a distinct, straight dark discal stripe or line, running from anterior margin, almost reaching anal margin; postdiscal line running parallel but only approximately to half wing width; hindwing distinctly patterned with a white postdical band NOT parallel to the line-stripe system, but instead crossing the wing approximately from the ápex to the middle of the anal margin. This feature is unlike that of most other white banded satyrid from the lowlands of Tropical America (*e. g., Argentaria* Huertas & Wilmott, 2023, *Cristalinaia* Freitas, Barbosa & Zacca, 2019, *Saurona* Huertas & Willmott, 2023) and only comparable to that of *Forsterinaria pronophila* (Butler, 1867) or the species of *Splendeuptychia* Forster, 1964, from which it diverges in their different system of postdiscal ocelli. They even belong to different clades (Espeland *et al.* 2023). Postdiscal ocellar elements well developed, inmerse in a diffuse cloud of yellow color, possibly resulting from the expansion and fusion of the "yellow rings" of the ocelli, which are usually 3 to 4, from M2 to Cu2 (notably larger and prominent in Cu1, often vestigial or absent in M2), black, with white pupils, triangular or v-shaped in M2

Description. *Eyes* glabrous. *Antennae* dark, with some white scales on the joints of their segments, threadlike (filiform), thin, barely reaching a third of the length of the wing costa; club faintly formed, barely perceptible. *Forewings* subtriangular, apex subtruncate, smooth, outer margin gently convex. *Hindwings* suboval, apex and anal angle rounded, anterior margin slightly angled at the end of Sc +R1, outer margin arched, with very slight crenulation, anal margin straight. *Venation* (Fig. 1, male). Forewing: Sc notably inflated in its basal two-fifths, ending at the anterior two-fifths of the costa length; independent R1 emerges midway through the discal cell and terminates approximately three-fifths of the costa length; R2 and R3-R5 emerge together from the anterior apex of the discal cell, R2 terminating at one-quarter of the costa length, R3 emerges one-third of the length of R4-R5 and terminates before the wing apex, R4 and R5 diverge approximately halfway along the radial axis of R3-R5, R4 terminating at the wing apex itself; free end of R5 short, terminating at the posterior limit of the wing apex; M1 long and completely independent, emerges posteriorly and distinctly separated from the origin of R2-R5 (between them a small, straight vein r5-m1, forming a very differentiated anterior extension of the discal cell); M2 runs parallel to M1 and is of the same length; m1-m2 runs between them at the end of the cell, strongly V-shaped, with its angle pointing towards the base of the wing, and in it a vestige of a recurrent veinlet within the cell; M3 divides equidistantly the anterior and posterior portions of the wing, runs approximately parallel to M2, between them m2-m3 is straight and approxi-

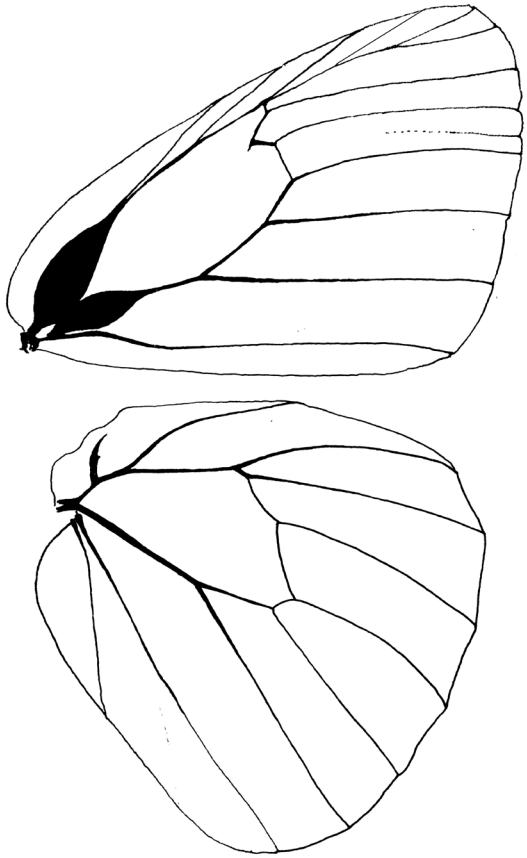

Figure 1. Wing venation of a male individual of *Fernanmorana insignis* (Butler, 1867) **comb. nov.**, type species of its genus (average forewing length, from base to apex: 23.8 mm, n=7). Venezuela, Amazonas, Mcpio. Guainía, camino Yavita-Maroa (wing prep. ALV062-19).

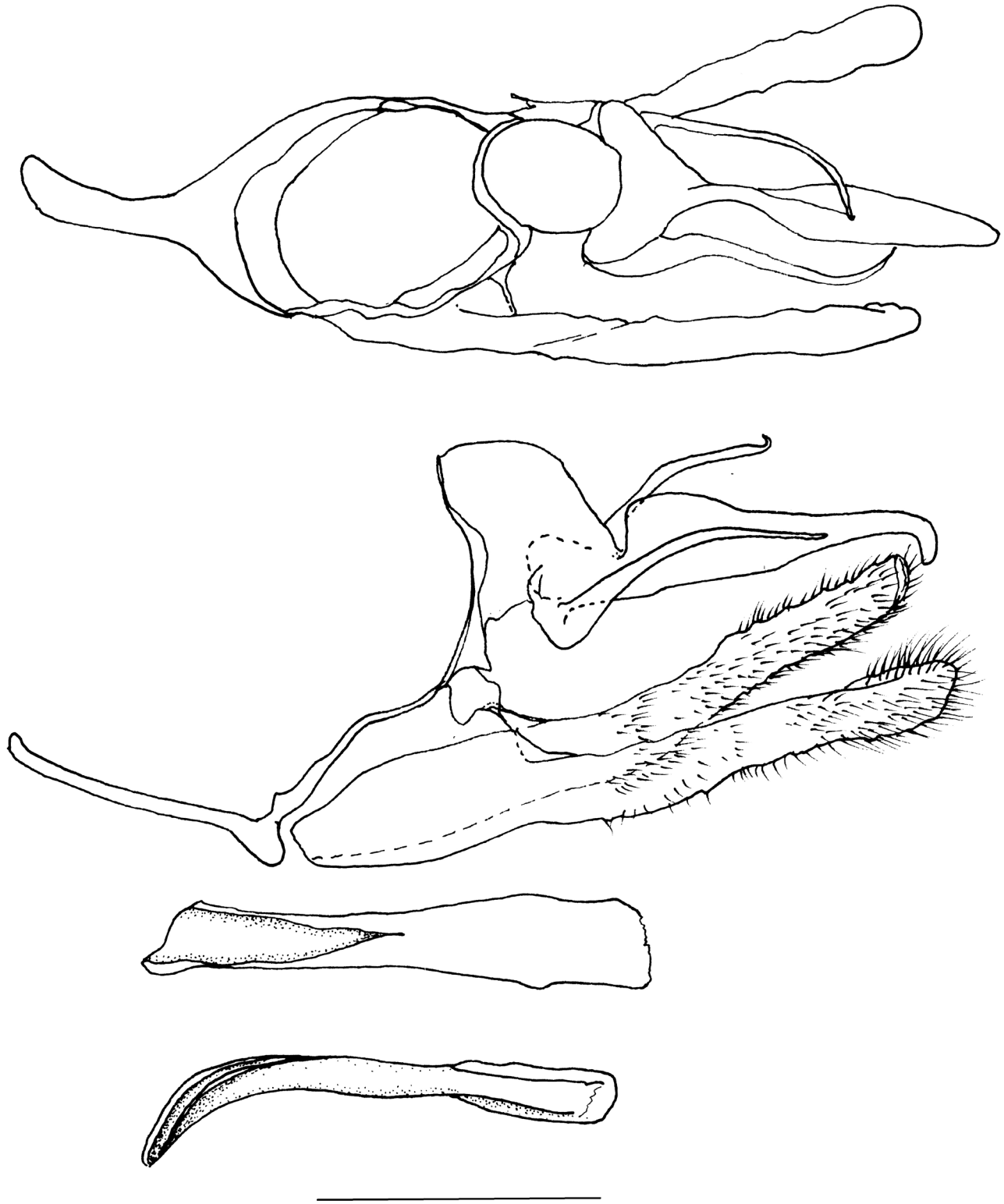

Figure 2. Genitalia of a male individual of *Fernanmorana insignis* (Butler, 1867) **comb. nov.**, type species of its genus. Venezuela, Amazonas, Mcpio. Guainía, camino Yavita-Maroa (wing prep. ALV599-14). Upper, dorsoventral view of genital armature (without aedeagus); lower, lateral view of genital armature (without aedeagus)n; below dorsal (upper) and lateral (lower) wiews of aedeagus. Illustrations produced at 40x magnification, horizontal line below drawings represents 1 mm.

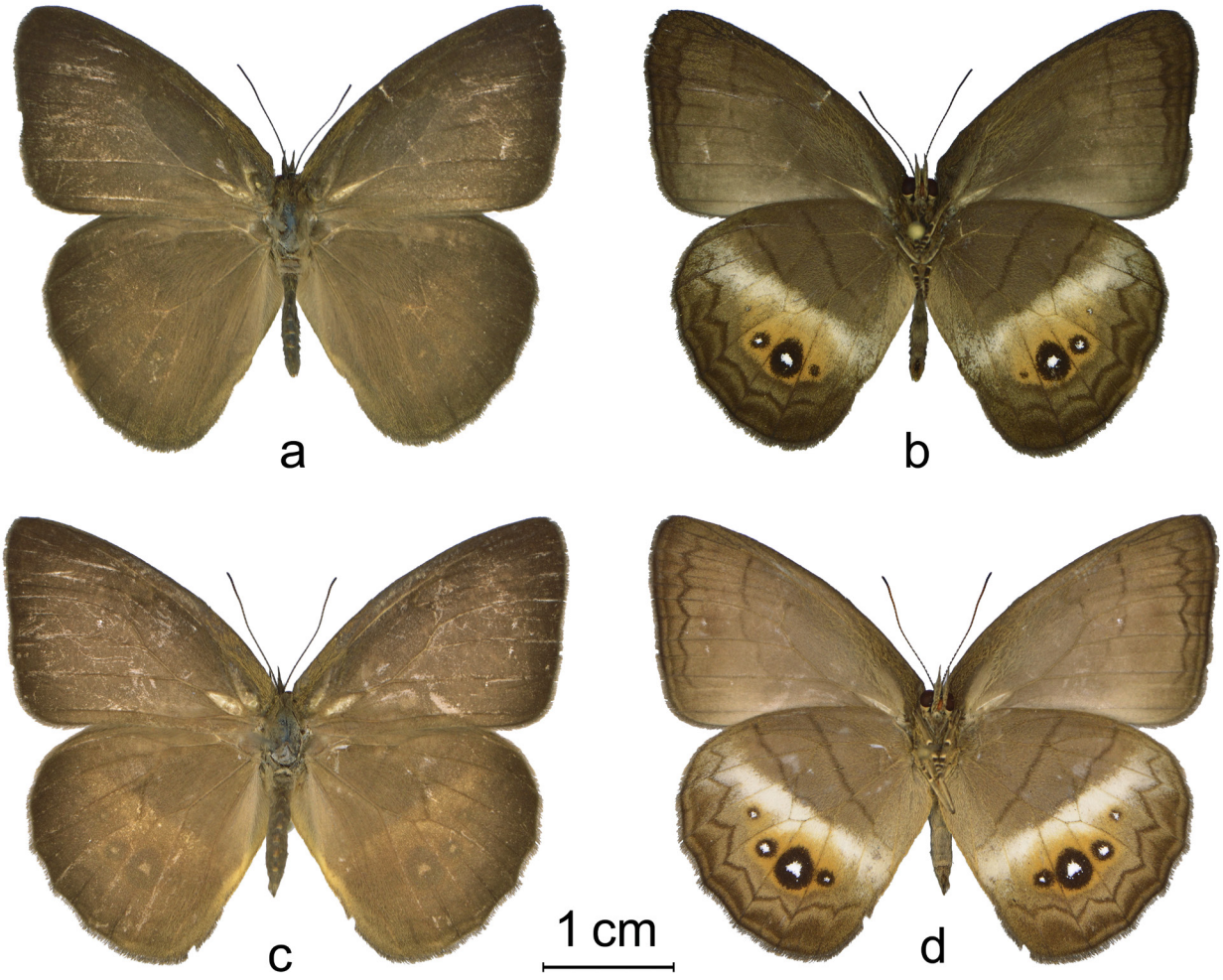

Figure 3. Habitus of male (**a** dorsal, **b** ventral) and female (**c** dorsal, **d** ventral) individuals of *Fernanmorana insignis* (Butler, 1867) **comb. nov.**, type species of its genus. Venezuela, Amazonas, Raudal del Danto, 150 m.

mately four times longer than r5-m1; Cu1, almost straight, parallel to M3, emerges in the distal quarter of the discal cell; Cu2, straight, parallel to Cu1, emerges approximately two-fifths of the cell length, measured from its base, as long as two-thirds of the distance from the base to the wing apex; A2, independent, slightly thickened at its basal sixth, runs parallel to the anal margin of the wing. The origin of the cubital veins is greatly inflated, between the base of the wing and halfway between this and the origin of Cu2 (but only half the thickness of the inflated base of the Sc). Hindwing: Hu present and simple, without apparent bifurcations, well developed on the anterior basal lobe of the wing base, curved distally; Sc+R1 well developed from the basal quarter of the anterior limit of discal cell, curved, ending on the anterior margin at a point equidistant between the wing base and the distal end of Rs; discal cell subtriangular; Rs emerging from the anterior angle of the cell, curved and distinct, ending at the rounded point of the wing apex; M1 emerging posterior to the anterior angle of the cell, not far from the origin of Rs, runs almost straight to the outer margin of the wing; two slightly convex transverse veins close the discal cell distally: m1-m2 and m2-m3, both approximately the same length; between them emerges M2, which measures approximately half the length between the base and the anal angle of the wing; independent M3, shorter and more curved than M2, arises at the most distal point of the cell; a little further towards the base emerges Cu1, straight; m2-m3 and m3-cu1 form a 90° angle; independent Cu2, a little longer than half the length of the wing, arises in the final third of the posterior vein of the cell; A2 runs completely independently from the base of the wing to the anal angle; independent A3,

Figure 4. Habitat of *Fernanmorana insignis* (Butler, 1867) **comb. nov.**, type species of its genus. Venezuela, Amazonas, Raudal del Danto, 150 m.

Figure 5. View of a trail used by the Piaroa indigenous people of the Cuao River region in Venezuela, inhabited by *Fernanmorana insignis* (Butler, 1867) **comb. nov.**

from the base of the wing to its anal margin, ending at a basal third of its length.

Male genitalia (Fig. 2). Armature well developed and stylized; tegumen small and distinctly dome-like, very well distinguished from the uncus, which is one and a half times wider than the tegumen at its base, but also much depressed dorsoventrally at that level, then immediately compressed laterally, with a prominent crest ("inflated at its base in lateral view" *sensu* Espeland *et al.* 2023). Uncus is also twice as long as tegumen, lanceolate, and ended in a tip curved downwards; subunci with long, stylized brachia, reaching beyond half the length of the uncus; saccus thin, flattened, as long as the brachia of subunci; valves sub-rectangular, very long, longer than length of tegumen + uncus; aedeagus flattened, wide, especially at distal extreme, basal extreme curved downwards.

Etymology: The name *Fernanmorana*, feminine, comes from the shortening, modification and arbitrary combina-

tion of the Spanish surnames Fernández and Morán, and is proposed here as a tribute to the distinguished Venezuelan physician, scientific researcher, and technologist, Humberto Avelino Fernández-Morán (Maracaibo, 1924 – Stockholm, 1999). His work and legacy had a global reach and have been of paramount importance to the development of modern science in Venezuela (Matos Romero 1986, Jiménez Maggiolo 1998, Rivas Cols 2005, Hernández Fonseca & Valbuena 2008, Requena 2011, Esparza & Padrón 2020, Carvalho Kassar 2025, Molina Vílchez & García Tamayo, in press). In his late years, H. Fernández-Morán developed a keen interest in the preservation of the Amazon river basin and its natural resources.

Distribution: Locally known in the lowlands of the Amazon region, from the Tocantins river area (type specimen) to the Amazonas state in southern Venezuela (material herein examined from Maroa-Yavita, Raudal del Danto, Cuao river, but also Siapa region [R. Mattei, *pers. comm*.]). It is probably widely distributed across the Amazon basin.

Bionomic data: The type species of *Fernanmorana* **gen. nov.** *Fermanmorana insignis* (Butler) **new. comb.**, is a natural dweller of the tropical forests of the Amazon region lowlands. It has been observed to be at least seasonally abundant in some Venezuelan localities, such as Raudal del Danto, in the río Cuao region (H. Camico, *pers. comm*.) and Siapa, río Negro region (R. Mattei, *pers. comm*.), mostly associated to thick undergrowth secondary vegetation (Figs. 4 &5) and flying together with other satyrines among thick intrincate bamboo aggregations (R. Mattei observations).

DISCUSSION AND CONCLUSION

Lamas (2004), Marín Uribe *et al*. (2019), Nakahara *et al*. (2019) and Espeland *et al*. (2023) considered classifying *Euptychia insignis* Butler and *Euptychia ordinata* Weymer, 1911, together within the same genus. We have had no access to specimens of *E. ordinata,* originally described from Bolivia, to test this hypothesis. Although both taxa look superficially similar, we noticed in the photograph of the type specimen of *E. ordinata*, once available publicly in the Butterflies of America website, that its ocelli bear a very excentric silvery pupilla. In our experience this character trend is not irrelevant for the generic classification of satyrine butterflies, therefore, we declined to classify *E. ordinata* under *Fernanmorana* **gen. nov.** Recently, two superficially identical Amazonian satyrine species, *Stephenympha pauliana* Viloria (2022) and *Xikrin ueharapradoi* Freitas & Barbosa (in Barbosa *et al.* 2023) were described in two different and very distinct genera.

Espeland *et al*. (2023) demonstrated and asserted that *E. ordinata* belongs in their *Amphidecta*-Clade, establishing not only some morphological likeness with some members of *Amphidecta* Butler, 1867, but also their genetic closeness.

Species belonging to *Fernanmorana*, **gen. nov.**:

Fernanmorana insignis (Butler, 1867), **comb. nov.**

Euptychia insignis Butler, 1867: 501, pl. 40, fig. 12.

Euptychia insignis Butler; Butler, 1868: 38; Kirby, 1871: 56; Weymer, 1911: 213; Gaede, 1931: 451; D'Abrera, 1988: 785 [figs. row 4, male habitus dorsal, ventral]; Lamas, 2004: 223; Freitas *et al*., 2018: 156; Marín Uribe *et al*., 2019: 97 [as *incertae sedis*, Barbosa *et al*., in prep.]; Nakahara *et al*., 2019: 14, 18; Espeland *et al*., 2023: 23, 59 [as a new genus, Nakahara *et al*., in prep.]

[*incertae sedis*] *insignis* Butler; Lamas, 2004: 223.

'*Euptychia*' *insignis* Butler; Espeland *et al*., 2023: 13,14, 25.

DISCLAIMER

The authors declare no conflicts of interest among themselves. ALV was responsible for the conceptualization, methodology, writing, and line drawings of this article. MC and ALV jointly provided the resources, and MC is the author of the photographic illustrations.

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REFERENCES

[Anonymous]. 1996. Netropolitan. *New Scientist* (London) 150(2036): 19.

Barbosa, E. P., R. R. Siewert, M. A. Marín, P. A. Machado, I. F. Oliveira, J. A. C. Filho & A. V. L. Freitas. 2023. Description of a new genus and species of Euptychiina (Lepidoptera: Nymphalidae) from the Brazilian Amazon rainforest. *Austral Entomology* 62: 310–322.

Butler, A. G. 1867. A monograph of the genus *Euptychia*, a numerous race of butterflies belonging to the family Satyridae; with descriptions of sixty species new to science, and notes

to their affinities, etc. *Proceedings of the Zoological Society of London* 1866(3): 458–504, pls. 39–40.

Butler, A. G. 1868. *Catalogue of diurnal Lepidoptera of the family Satyridae in the collection of the British Museum*. London: Taylor and Francis, vi + 211 pp. + [i], 5 pls.

Carvalho Kassar, G. G. 2025. *Descubrir lo invisible. Humberto Fernández-Morán, el tecnólogo atómico*. Caracas: Fondo Editorial Mincyt /Fonacit /Ministerio del Poder Popular para Ciencia y Tecnología, 324 pp.

D'Abrera, B. 1988. *Butterflies of the Neotropical Region. Part V. Nymphalidae (Conc.) & Satyridae*. Victoria, Black Rock: Hill House, [viii] + pp. 679–877.

Esparza, J. & R. Padrón. 2020. Un análisis de la obra científica de Humberto Fernández- Morán, a los veinte años de su muerte. *Gaceta Médica de Caracas* 126(4): 304–325.

Espeland, M., S. Nakahara, T. Zacca, E. P. Barbosa, B. Huertas, M. A. Marín, G. Lamas, M. Benmesbah, C. Brévignon, M. M. Casagrande, C. Fåhraeus, N. Grishin, A. Y. Kawahara, O. H. H. Mielke, J. Y. Miller, I. Nakamura, V. Navas, B. Patrusky, T. W. Pyrcz, L. Richards, D. Tan, S. Tyler, Á. L. Viloria, A. D. Warren, L. Xiao, A. V. L. Freitas & K. R. Willmott. 2023. Combining target enrichment and Sanger sequencing data to clarify the systematics of the diverse Neotropical butterfly subtribe Euptychiina (Nymphalidae, Satyrinae). *Systematic Entomology* 2023: 1–73.

Freitas, A. V. L., E. P. Barbosa, T. Zacca, M. A. Marín, M. V. Beirão, A. R. M. Silva, M. M. Casagrande, M. Espeland & K. R. Willmott. 2018. Before it is too late: description of a new genus and species of butterfly from a highly threatened Brazilian biome. *Revista Brasileira de Entomologia* 62: 148–158.

Hernández Fonseca, J. P. & H. Valbuena. 2008. *Humberto Fernández Morán: un científico marabino de la talla de un diamante*. Maracaibo: Ediciones del Vice Rectorado Académico de La Universidad del Zulia, Ediluz, 154 pp.

Jiménez Maggiolo, R. 1998. *Humberto Fernández Morán. Vida y pasión de un sabio venezolano*. Maracaibo: Fundacite-Zulia, [vi] + 151 pp. + [iii].

Kirby, W. F. 1871. *A synonymic catalogue of diurnal Lepidoptera*. London: John van Voorst, vii + 690 pp.

Klots, A. 1970. Lepidoptera. pp. 115–130. *In*: Tuxen, S. L. (ed.). *Taxonomist's glossary of genitalia of insects*. 2nd ed. Scandinavian University Books. Copenhagen / Oslo / Stockholm: Munksgaard / Universitetsforlaget / Läromedelsförlagen.

Lamas, G. 2004. Nymphalidae. Satyrinae. Tribe Satyrini. Subtribe Euptychiina. pp. 217–223. *In*: Lamas, G. (ed.). Checklist: Part 4A. Hesperioidea – Papilionoidea. *In*: Heppner, J. B. (ed.). *Atlas of Neotropical Lepidoptera. Volume 5A*. Gainesville: Association for Tropical Lepidoptera / Scientific Publishers.

Marín-Uribe, M. A., T. Zacca, S. Nakahara, E. P. Barbosa, M. Espeland, B. C. Huertas-Hernández, G. Lamas, K. R. Willmott & A. V. L. Freitas. 2019. An overview of the Euptychiina (Satyrinae) diversity. pp. 76–98. *In*: Guarín, J. H., C. E. Giraldo & J. L. Jaramillo (eds.). *Memorias & Resúmenes. Congreso Sociedad Colombiana de Entomología*. Medellín: Sociedad Colombiana de Entomología.

Matos Romero, M. 1986. *Semblanza del Profesor Dr. Humberto Fernández Morán, un sabio venezolano del siglo XX*. Caracas: Tipografía Unión, 206 pp.

Miller, L. D. 1970. Nomenclature of wing veins and cells. *Journal of Research on the Lepidoptera* 8(2): 37–48.

Molina Vílchez, R. & J. García Tamayo. [in press]. *Ciencia amarga*. Maracaibo: Mestizo Producciones.

Nakahara, S., T. Zacca, F. M. S. Dias, D. R. Dolibaina, L. Xiao, M. Espeland, M. M. Casagrande, O. H. H. Mielke, G. Lamas, B. Huertas, K. Kleckner & K. R. Willmott. 2019. Revision of the poorly known Neotropical butterfly genus *Zischkaia* Forster, 1964 (Lepidoptera, Nymphalidae, Satyrinae), with descriptions of nine new species. *European Journal of Taxonomy* 551: 1–67.

Neild, A. F. E. 1996. *The butterflies of Venezuela. Part I: Nymphalidae I (Limenitidinae, Apaturinae, Charaxinae). A comprehensive guide to the identification of adult Nymphalidae, Papilionidae, and Pieridae.* Greenwich, London: Meridian Publications, 144 pp., 32 pls.

Requena, J. 2011. *Humberto Fernández Morán (1924-1999).* Biblioteca Biográfica Venezolana, vol. 136. Caracas: C. A. Editora El Nacional, 113 pp. + [i].

Rivas Cols, C. 2005. *Humberto Fernández-Morán de frente y de perfil*. Caracas: Centro de Reproducción Copicentro, s. r. l. / [Instituto Venezolano de Investigaciones Científicas], 232 pp.

Viloria, Á. L. 2022. Two new satyrine butterflies from Venezuela (Insecta: Lepidoptera: Nymphalidae). *Anartia* 34: 28–42.

Viloria, Á. L. & J. Camacho. 2002. *Mariposas satirinas del estado Amazonas, Venezuela, obtenidas durante la Netspedition 1996 del Imperial College of Science and Technology, University of London*. [Maracaibo]: [Museo de Artrópodos de La Universidad del Zulia, MALUZ], [2] pp. [lista preliminar]

Viloria, Á. L. & M. Costa. 2022. A new subspecies of *Oxeoschistus puerta* (Westwood, 1851), from the Sierra de Perijá, western Venezuela (Lepidoptera: Nymphalidae: Satyrinae). *Anartia* 34: 18–27.

Weymer, G. 1910-1912. 4. Familie: Satyridae. *In:* Seitz, A. (ed.). *Die Gross-Schmetterlinge der Erde*. Stuttgart, A. Kernen. 5: 173–280, pls. 42–60.

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Occurrence of *Orotaygetis surui* Nakahara, Zacca & Lamas, 2018 in Venezuela (Lepidoptera: Nymphalidae, Satyrinae)

Presencia de *Orotaygetis surui* Nakahara, Zacca & Lamas, 2018 en Venezuela (Lepidoptera: Nymphalidae, Satyrinae)

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Orotaygetis Nakahara & Zacca (in Nakahara *et al.* 2018) is a monobasic genus of satyrine butterflies native to the Amazon biome in South America. The most recent and complete phylogeny of the subtribe Euptychiina clearly shows its genetic affinity with *Taygetina* Forster, 1964 (Espeland *et al*. 2023), but its external appearance can be confused with that of a species of *Harjesia* Forster, 1964 (Lamas 2004: 220), a genus from which it diverges significantly in genetics and morphological structure. The only known species within this genus, *Orotaygetis surui* Nakahara, Zacca & Lamas (2018: 11-12), was apparently discovered in the forests of the upper Arinos River in the state of Mato Grosso, Brazil, about fifty years ago. Until now it was known from only 28 individuals examined in collections, all from low to medium altitudes, in the south and southwest of the Amazon basin (300-972 m asl; Nakahara *et al*. 2018).

In this note, we report the discovery in Venezuela of two male individuals of *Orotaygetis surui* (Fig. 1, data and repositories in the legend), from a locality in the Serranía de La Neblina, very close to the border with Brazil (Fig. 4). The specimens were captured along a trail cut through pristine montane forest at 900 m asl, in January 2023, by a Piaroa student and collaborator in our Lepidoptera of the Pantepui Project (Instituto Venezolano de Investigaciones Científicas, IVIC / Museo del Instituto de Zoología Agrícola de la Universidad Central de Venezuela, MIZA), Mr. Hernando Camico, who ascended this remote mountain range on foot, following the Taboca Route, one of three trails —two on the Venezuelan side— that lead to illegal gold mines near the summits. The journey requires a river approach, navigating in a bongo from San Carlos de Río Negro, going up the Negro, Casiquiare and Pacimoni rivers, and finally the Baría, on whose southern bank is located the Puerto de Los Mineros, the last station for the boats. Two routes of ascent on foot depart from here, the Camello Route, which goes into the heart of the mountain range, and the Taboca, at whose intermediate point (Barriga Shella Camp) the *Orotaygetis* butterflies were found.

The Serranía de La Neblina (Fig. 4), in the southernmost tip of Venezuela, bordering Brazil, is one of the least known national mountain ranges in terms of its lepidopteran fauna. Very few scientific expeditions have been carried out in this region due to the difficulties of access. Undoubtedly, the most important was the multidisciplinary international expedition, organized, sponsored, and carried out by FUDECI in 1983–1987 (Brewer Carías 1988), which had valuable logistical support from several institutions, including air and river transport. It is very difficult, without the use of helicopters, to reach the

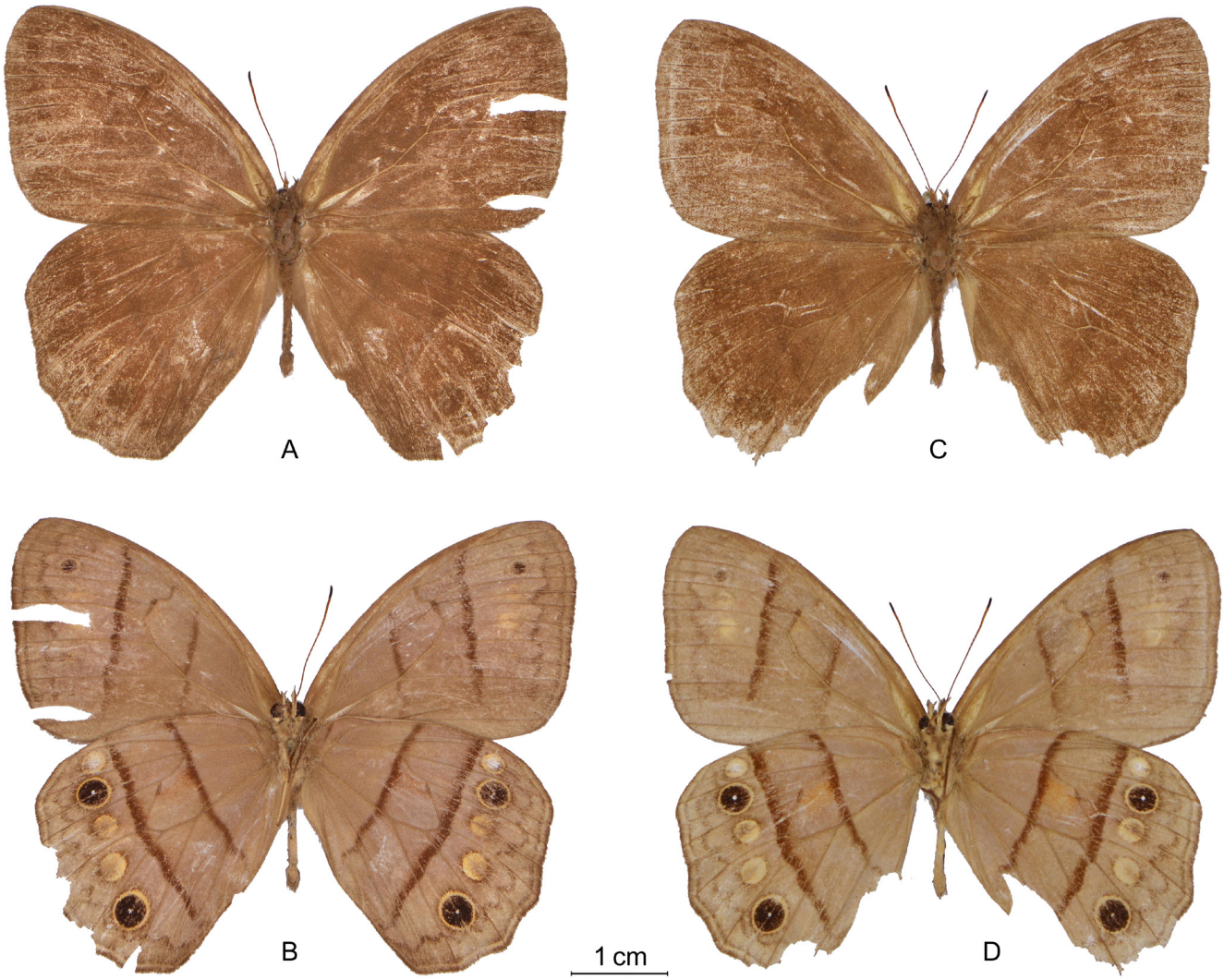

Figure 1. *Orotaygetis surui* Nakahara, Zacca & Lamas, 2018, new record for Venezuela. **A** (dorsal), **B** (ventral): ♂ VENEZUELA, Amazonas, Sierra de la Neblina, Ruta Taboca, 900 m, 13-I-2023. *Leg.* H. Camico (IVIC); **C** (dorsal), **B** (ventral): ♂ dorsal: same data except 18-I-2023 (MIZA) (photos & plate: M. Costa).

summits of this range, among which Pico de La Neblina stands out, on the binational borderline. Its summit at 2,995 m asl represents the highest point in Brazil and the entire Guiana Shield.

In a summary of butterfly studies in the Pantepui region, Viloria & Costa (2019) presented a list of endemic Pantepui taxa, several of which correspond to higher altitudes of the Serranía de La Neblina: *Pereute lindemannae lindemannae*, *Lieinix christa christa*, *Dismorphia crisia neblina* Reissinger (1970, Pieridae), *Pedaliodes demarmelsi* Viloria (1995, Nymphalidae, Satyrinae), *Greta clavijoi*, *Pteronymia alissa marjorieae*, *Pteronymia alicia* Neild (2008, Nymphalidae, Danainae, Ithomiini), *Eutresis hypereia imeriensis* Brown (1977a, Nymphalidae, Danainae, Ithomiini) and *Melinaea mnasias neblinae* Brown (1977b, Nymphalidae, Danainae, Ithomiini). *Pedaliodes chaconi* Viloria (1998, Nymphalidae, Satyrinae) was described and, so far, has been known exclusively from the Serranía de Tapirapecó, a mountain range running continuously east-northeast from La Neblina. These faunal elements, chiefly those with strictly montane habits, appear to have more affinities with the Andean fauna than with the butterfly genera that characterize the rainforests of the Amazonian plains. This also seems to be the case for *Orotaygetis*.

It is noteworthy that the previous geographical records of *Orotaygetis surui* come from sites very distant from the locality reported in this work, primarily in the south and southeast of the Amazon River basin, including the Andean foothills or mountains (Cuzco and Madre de Dios, in Peru) and slopes of some elevation in the headwaters of

Figure 2. Barriga Shella Camp, Taboca Route, Serranía de La Neblina, Amazonas State, Venezuela (photo: H. Camico).

Figure 3. Forest habitat of *Orotaygetis surui* in the Taboca Route, 900 m, Venezuelan side of the Serranía de La Neblina (photo: H. Camico).

Figure 4. Relative location of the new find of *Orotaygetis surui* in the northern Amazon region. The broad map depicts the northern part of South America. The yellow dashed line in the lower right enlargement represents the Taboca Route, one of the two pathways (in Venezuelan territory) to ascend Pico La Neblina on foot; the red circle indicates Barriga Shella Camp (900 m asl), where the two specimens were found.

several of the Amazon river tributaries in Rondônia and Mato Grosso (Brazil) (Nakahara *et al.* 2018: 38, fig. 16 distribution map of *O. surui*). On the other hand, intermediate regions in the vast Amazonian plain, from where many butterfly species are known, do not appear to be part of the natural distribution of this peculiar taxon.

Therefore, it is reasonable to conclude that *O. surui* is truly absent from the lowland rainforests of the Amazon and that it is a species typical of mid-altitudes on the edges of the Amazon basin. Its distribution, herein hypothetically inferred from five points in the map, could be described as **amphi-Amazonian** or perhaps **circum-Amazonian**. This is neither a frequent nor a random pattern of geographic distribution. It is still too early to speculate on this matter; however, this pattern is likely to be repeated not only by other butterfly species but also in plants. A comparative analysis of multiple biogeographical evidence may, in this case, rule out the classic dispersal-isolation-vicariance model proposed for Andean butterflies (Adams 1977, 1985), and instead align favorably with the mechanism of passive uplift of montane biotas (Heads 2017, 2019; Heads *et al*. in press).

Other Satyrinae species collected on the Taboca Route, between 400 and 1,000 m altitude, were *Bia actorion* ssp. nov., *Pierella astyoche bernhardina* Bryk, 1953, *Pierella lamia* (Sulzer, 1776), *Taygetis laches* (Fabricius, 1793) and *Zischkaia josti* Nakahara & Kleckner, 2020 (specimens deposited at IVIC). It is worth noting that very few specimens of satyrine butterflies are known from remote locations in the far south of the Venezuelan state of Amazonas. Lichy ([1984]) identified 45 species of Satyrinae (including six species of Brassolini and six of Morphini) collected in 1951 during the Franco-Venezuelan Expedition to the sources of the Orinoco River (Grelier 1954, Anduze 1960, Rísquez Iribarren 1962, Lichy 1979). The highest collecting points recorded by René Lichy during that memorable

expedition was at 300 m (confluence of the Orinoco and Ugueto rivers), while some Satyrinae species cited by him correspond only to two higher locations reached by Pablo J. Anduze (La Cumbre, at 470 m, and Horqueta-Minas, at 530 m). With the exception of *O. surui* and *Z. josti*, which were only more recently detected, Lichy cited for the upper Orinoco all the satyrids mentioned above for the Taboca Route.

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REFERENCES

Adams, M. J. 1977. Trapped in a Colombian Sierra. *Geographical Magazine* (London), 49(4): 250–254.

Adams, M. J. 1985. Speciation in the pronophiline butterflies (Satyridae) of the northern Andes. *Journal of Research on the Lepidoptera* Suppl. 1: 33–49.

Anduze, P. J. 1960. *Shailili-ko. Relato de un naturalista que también llegó a las fuentes del Orinoco*. Caracas: Talleres Gráficos Ilustraciones, S. A., 415 pp. + [i], 1 fold. map.

Brewer Carías, C. (ed.). 1988. *Cerro de La Neblina. Resultados de la expedición 1983-1987*. Caracas: Fundación para el Desarrollo de las Ciencias Físicas, Matemáticas y Naturales, 922 pp.

Brown, K. S., Jr. 1977a. Centros de evolução, refúgios quaternários e conservação de patrimônios genéticos na região neotropical: padrões de diferenciação em Ithomiinae (Lepidoptera: Nymphalidae). *Acta Amazonica* 7(1): 75–137.

Brown, K. S., Jr. 1977b. Geographical patterns of evolution in Neotropical Lepidoptera: differentiation of the species of *Melinaea* and *Mechanitis* (Nymphalidae, Ithomiinae). *Systematic Entomology* 2(3): 161–197.

Espeland, M., S. Nakahara, T. Zacca, E. P. Barbosa, B. Huertas, M. A. Marín, G. Lamas, M. Benmesbah, C. Brévignon, M. M. Casagrande, C. Fåhraeus, N. Grishin, A. Y. Kawahara, O. H. H. Mielke, J. Y. Miller, I. Nakamura, V. Navas, B. Patrusky, T. W. Pyrcz, L. Richards, D. Tan, S. Tyler, Á. L. Viloria, A. D. Warren, L. Xiao, A. V. L. Freitas & K. R. Willmott. 2023. Combining target enrichment and Sanger sequencing data to clarify the systematics of the diverse Neotropical butterfly subtribe Euptychiina (Nymphalidae, Satyrinae). *Systematic Entomology* 48(4): 498–570.

Grelier, J. 1954. *Aux sources de l'Orénoque*. Paris: La Table Ronde, 283 pp. + [v], 60 pls., 1 carte.

Heads, M. 2017. *Biogeography and evolution in New Zealand*. Boca Raton, Fl, USA: CRC Press (Taylor & Francis Group), xxvii + 635 pp.

Heads, M. 2019. Passive uplift of plant and animal populations during mountain building. *Cladistics* 35: 550–572.

Heads, M., M. Marinov, D. A. Nicol & P. Saldivia. [in press]. Passive uplift of montane biotas: Recent advances. *Cladistics* 42(1).

Lamas, G. 2004. Nymphalidae. Satyrinae. Tribe Satyrini. Subtribe Euptychiina. pp. 217–223. *In*: Lamas, G. (ed.). *Checklist: Part 4A. Hesperioidea - Papilionoidea*. *In*: Heppner, J. B. (ed.). *Atlas of Neotropical Lepidoptera. Volume 5A*. Gainesville: Association for Tropical Lepidoptera; Scientific Publishers.

Lichy, R. 1979. *Ya kú. Las fuentes del Orinoco*. Caracas: Monte Avila Editores, C. A., 343 pp. + [i], 35 pls., 1 map, [1] pp. + [iii].

Lichy, R. [1984]. Mariposas. Trabajo Facultad de Agronomía. *Boletín de la Academia de Ciencias Físicas, Matemáticas y Naturales* (Caracas) 40(121/122): 47–222.

Nakahara, S., K. R. Willmott, O. H. H. Mielke, J. Schwartz, T. Zacca, M. Espeland & G. Lamas. 2018. Seven new taxa from the butterfly subtribe Euptychiina (Lepidoptera: Nymphalidae: Satyrinae) with revisional notes on *Harjesia* Forster, 1964 and *Pseudeuptychia* Forster, 1964. *Insecta Mundi* 0639: 1–38.

Neild, A. F. E. 2008. *The Butterflies of Venezuela. Part 2: Nymphalidae II (Acraeinae, Libytheinae, Nymphalinae, Ithomiinae, Morphinae). A comprehensive guide to the identification of adult Nymphalidae, Papilionidae, and Pieridae.* Greenwich, London: Meridian Publications, 275 pp., 84 pls.

Reissinger, E. J. 1970. Neue neotropische Pieriden (Lepidoptera, Dismorphiinae et Pierinae). *Acta Entomologica Musei Nationalis Pragae* 38: 409–414, 2 pls.

Rísquez-Iribarren, F. 1962. *Donde nace el Orinoco*. Caracas: Ediciones Grecco, 415 pp. + [i], 42 pls., 1 map.

Viloria, Á. L. 1995. Description of a new species of the genus *Pedaliodes* from the Cerro de La Neblina, Venezuela (Lepidoptera, Satyridae). *Atalanta* 25(3/4): 525–529, pl. XVIIa.

Viloria, Á. L. 1998. Un nuevo *Pedaliodes* Butler, 1867 de la Serranía de Tapirapecó, Venezuela (Lepidoptera: Nymphalidae, Satyrinae, Pronophilini). *SHILAP, Revista de Lepidopterología* 26(101): 13–18.

Viloria, Á. L. & M. Costa. 2019. Endemic butterflies. pp. 193–222. *In*: Rull, V., T. Vegas-Vilarrúbia, O. Huber & C. Señaris (eds.): *Biodiversity of Pantepui: The pristine "Lost World" of the Neotropics*. Cambridge, Massachussets: Elsevier.

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Somos la vida de la Finca Vista Linda

Evelin Villarreal, Alberto Blanco Dávila & Damaris Rojas

2021. [1ª ed.]. Caracas: Ediciones Explora / Pietrix Ediciones / Finca Vista Linda / Altholito, C. A., 127 pp. + [i].
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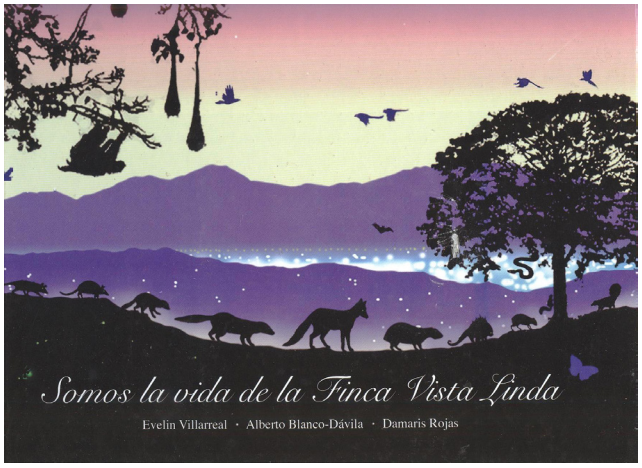

Contenido: *Prólogo / Soy la Finca Vista Linda / Las hadas del bosque. Colibrí cola de oro / La reina: una mariposa de sangre azul. Mariposa Morpho / Disfraz al natural. Rana platanera / Escaladora de doble vida. Rana Lemur / ¡Conocida por todos! Tragavenado / ¡Que pereza! Perezoso / ¡Aguijón venenoso! Escorpión / Extraño acorazado. Cachicamo / Una ruidosa familia. Perico cara sucia / Un citadino armado hasta el pico. Gavilán habado / Una bulliciosa citadina. Guacharacas / Grandes tejedores. Conotos / Un roedor gigante. Picure / ¡El zorro! Zorro común / ¡Alegre saltarina! Ardilla / El limpiacasas. Gonatodes rayado / ¿Camaleón? Falso camaleón / Alerta roja. Coral montañera / El arlequín del bosque. Escarabajo arlequín / Acróbata del aire. Libélula / Una aparente cantante. Verdegallo / Epílogo.*

El momento actual del siglo XXI compromete nuestra humana existencia a la búsqueda frenética en las redes, al acto mecánico de recobrar información (sin importar si es falsa o fehaciente) y a la inmediatez de confiar en lo que las inteligencias artificiales nos suministran, con frecuencia construyendo fantasías. Esos son peligros. Pero también nos confronta al azar de creer ingenuamente en los vacíos. Asumir que algo no existe porque no hay una huella, una imagen o una palabra con lo que pueda ser asociado en la densa y a la vez difusa nube de internet.

Me encontré con una de esas raras vacantes cuando quise investigar sobre la Finca Vista Linda, un predio privado ubicado en el Alto Hatillo, al sureste de Caracas, Venezuela; posiblemente tan reservado que solo algunos privilegiados conozcan. Esto me hizo pensar en el público al cual estaría dirigido aquel solitario reportaje en Instagram, dando cuenta de la publicación que hoy nos ocupa: *Somos la vida de la Finca Vista Linda*, un libro de zoología pasional. Empezaré rezongando por el problema fundamental del libro venezolano: su distribución. El único ejemplar que he visto de esta joya es el que tengo en mis manos, razón por la que conjeturo que estamos frente a lo que los bibliófilos llaman rareza. Urjo a los interesados contactar a los editores para asegurarse una copia. No tengo otra crítica negativa. Posiblemente en el futuro esta obra se haga célebre por inasequible, por lo que es un deber venezolano dejar constancia de su existencia y anotar sobre ella algunas observaciones e impresiones personales.

La edición en formato apaisado, con portada multicolor tapa dura, es sin duda un logro artístico, su papel es de grano fino y denso, ligeramente brillante, de buen gramaje y nítidamente impreso. Como libro ancho se manipula bien por ser rígido y ligero, y de inmediato agrada a la vista por haber sido diseñado con originalidad. Su tipografía bien

escogida, proporciona al lector la sensación de encontrarse ojeando papeles manuscritos, como quien inspecciona relaciones privadas que dan cuenta de un tesoro animal a salvo de la sordidez citadina por su resguardo en la montaña.

Las ilustraciones, abundantes y notables, dibujos de mano fluida y pintura graciosa son de Damaris Rojas, la portada de Roberto De La Fuente (de lujo, dice el prologuista, Oscar Pietri) deja ver siluetas nocturnas de la fauna silvestre de la Cordillera de la Costa con las luces de Caracas detrás, resplandecientes los valles en plano medio, y de fondo el milagro de Waraira Repano, la muralla alfombrada que resguarda del mar la capital de Venezuela. Cada capítulo lo precede una frase reflexiva, una adivinanza, un pensamiento escrito sobre la silueta de esta serranía (elemento que obsede a De La Fuente en muchas de sus composiciones paisajistas).

Este trabajo contiene una selección distinguida de veintiún especies de la fauna terrestre, emblemática de las montañas boscosas de Caracas, cuya representatividad ha sido referida a un lugar presuntamente encantado llamado Vista Linda, una finca que según las fuentes de internet pareciera que aún no existe, pero recibe visitantes, personas sensibles a la naturaleza.

Página a página, aparecen nuestros animales fielmente identificados, diríase con la precisión y celo de taxónomos que leyeron ayer las últimas actualizaciones de nomenclatura. No hay arrogancia cientificista, las descripciones son subjetivas, están escritas en primera persona, y el libro habla con la voz propia libremente imaginada de cada una de las especies. ¡Qué manera más bonita de desafiar a Linneo!, más allá de las formas de sus cuerpos (visibles además en las ilustraciones, de las que el sabio filósofo sueco presumía prescindir), los animales describen otros rasgos que los caracterizan, sus hábitos y costumbres, su comportamiento, sus preferencias ambientales, sus miedos, su ecología y su visión del mundo. "Me retratan como el prototipo de la fealdad" dice una rana; "soñar con una serpiente de coralillo ...siempre está relacionado con una señal de ¡alerta!... tal vez tenga que ver con tus miedos" previene al lector la coral montañera; "la vida de un zorro te anima a pensar fuera de lo establecido" presume el zorro común; "cuando aparezca en tu casa reflexiona sobre mi visita" recomienda un lagartijo; "¡guíate por mi presencia!... soy un indicador de la calidad del agua", lección de una libélula, "¡elige vivir de otra manera!", el último consejo de un perezoso. Me atreveré a elogiar este estilo singular y creativo de divulgar conocimiento. Bastante auténtica esta producción editorial, sintetiza una enorme cantidad de trabajo en todas sus fases.

Los zoólogos curiosos querrán saber cuáles son los animales comunes de la Finca Vista Linda, para ellos dejo aquí la lista, el extracto taxonómico; sin embargo, es fundamental aclarar que esta es la porción más básica y menos relevante de lo que es posible aprender con la lectura completa de este hermoso trabajo:

Artrópodos: un arácnido (*Tityus discrepans*, escorpión posiblemente endémico de la Cordillera de La Costa), tres insectos (*Morpho helenor*, la mariposa nacional de Venezuela, el escarabajo arlequín, *Acrocinus longimanus* y la líbelula de abdomen púrpura, *Libellula herculea*).

Dos anfibios, la rana platanera, *Boana xerophylla* y la rana lémur, *Phyllomedusa trinitatis*.

Tres serpientes: tragavenado, *Boa constrictor*; coral montañera, *Micrurus mipartitus* y culebra verdegallo, *Leptophis ahaetulla*.

Dos lagartos: el limpiacasas criollo, *Gonatodes vittatus* y el camaleón venezolano, *Polychrus auduboni*.

Cinco especies de aves: colibrí zafiro (*Chrysuronia oenome*), conoto negro u oropéndola (*Psacorolius decumanus*), loro cara sucia (*Eupsittula pertinax*), gavilán habado (*Rupornis magnirostris*) y guacharaca (*Ortalis ruficauda*).

Cinco mamíferos comunes en estas montañas: pereza o perezoso, *Bradypus variegatus*, cachicamo *Dasypus novemcinctus*, picure del norte de Venezuela, *Dasyprocta leporina*, ardita central, *Notosciurus granatensis* y zorro americano, *Cerdocyon thous*.

Como en la *Selva encantada* del poeta Vicente Álamo Ibarra, o en el *Bosque animado* del polígrafo Wenceslao Fernández Flórez, la espesura también habla alrededor de Caracas:

Soy la "Finca Vista Linda" ¡un bosque mágico!
refugio de "hadas", criaturas fantásticas,
seres de poder, especies míticas, joyas brillantes,
y animales de inigualable belleza.

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Nudibranquios y otras babosas marinas de Venezuela

Manuel Caballer, Samuel Narciso, Nelsy Rivero & Gaby Carías Tucker (autores);
Alberto Blanco Dávila & Siegfried Geyer (editores).

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Contenido: *Carta de Manuel Caballer / Prólogo* [por Estrella Villamizar] */ Introducción. Babosas marinas de Venezuela / Fichas técnicas de nudibranquios y otras babosas marinas de Venezuela / Infografía. Los nudibranquios, las joyas de los mares / Buceo con opistobranquios (babosas marinas) / Lista de las babosas marinas de Venezuela / Glosario / Agradecimientos / Referencias bibliográficas.*

La emotiva carta de Manuel Caballer, que sirve de preludio a este trabajo de equipo, revela con claridad lo que ha significado Venezuela en su vida y en el desarrollo de su pasión por las exploraciones marinas y por el estudio científico de los moluscos en varios continentes. Habla igual de su gratitud a las personas y circunstancias que le dieron señales oportunas para especializarse en temas francamente poco comunes, profesionalizarse y aun así conservar la humildad existencial que lo caracteriza. Caballer prefirió darle el acento humano a la obertura, precediendo apropiadamente el criterioso prólogo de Estrella Villamizar, cuyo contenido, de hecho, constituye una elegante reseña bibliográfica que intentaré suplementar aquí con algunos juicios propios.

El formato cuadrado y mediano del libro y su espesor permiten su manipulación cómoda, probablemente hasta como guía de campo, cuidando sus hojas de papel glasé de su archienemiga, el agua. Como las letras son de líneas finas y los textos relativamente densos, la atención del lector se dirige casi de inmediato a las imágenes, todas de alta calidad y policromáticas, combinación de ilustraciones espectaculares de Roberto De La Fuente, casi indistinguibles de una buena y nítida fotografía, y de auténticas capturas fotográficas de Gaby Carías, Humberto Ramírez, Siegfried Geyer y otras, no menos hermosas, de Manuel Caballer.

Este notable trabajo es la obra colaborativa de cuatro profesionales especialistas, formados en ciencias de la vida (biología, pesquerías, bioanálisis), con notable experiencia de campo en varias regiones geográficas del mundo (desde el Mar Caribe hasta la Antártida); Manuel Caballer, Samuel Narciso y Nelcy Rivero, son esencialmente malacólogos, competentes en taxonomía y ecología, y Gaby Carías Tucker, exploradora y talentosa fotógrafa submarina.

Para quienes no están familiarizados con los llamados opistobranquios, los autores explican que ese nombre ya no equivale a una categoría taxonómica formalmente váli-

da, sino que es un término que se hizo coloquial –aunque no suene nada ordinario– para designar a varios tipos de moluscos marinos con aspecto de babosas (gasterópodos heterobranquios), que por sus rasgos anatómicos o su genética no están necesariamente bien emparentados unos con otro, formando lo que se conoce como un grupo parafilético: nudibranquios y otros. La mayoría son seres bastante pequeños, algunos diminutos, que pueden desarrollar pequeñas conchas. Se incluye un muestrario visual con fotos magnificadas de estas conchitas menudas del Caribe, obra de Siegfried Geyer, polifacético fotógrafo quien antes nos deslumbró con libros que retrataron particularidades del páramo andino (*Juan Félix Sánchez*, 1981) y de la aridez Guajira (*Pulowi*, 1984).

En tres páginas que siguen se hace una descripción ilustrada, clara y sinóptica de las costas marinas de Venezuela y sus islas. A continuación, el cuerpo del texto, que es el recuento de la diversidad y de la biología de las babosas marinas hasta ahora documentadas en la mar venezolana, se desarrolla a través de fichas técnicas de 64 especies. Cada una contiene el nombre científico del taxón, con su autor y año de descripción, su nombre común, la relación métrica de su tamaño, la localidad tipo (de dónde provino el primer individuo conocido), su clasificación taxonómica (orden y familia), descripción morfológica, distribución geográfica general, distribución en Venezuela, datos sobre hábitat y comportamiento, curiosidades, mapa de distribución costera en Venezuela (lamentablemente en un formato muy pequeño) y la correspondiente fotografía ilustrativa de individuos vivos de la especie, desplegando su estrafalaria figura y pleno colorido. La sola colección de fotografías se convierte en el joyel de este riquísimo trabajo. Sigue una infografía sobre la anatomía externa de una babosa marina, necesaria no solo para entender las descripciones, sino para darnos por primera vez a los no especialistas la idea inequívoca de que estas caprichosas "flores submarinas", son en efecto, animales. Sigue otra página infográfica con figuras y leyendas que nos ayudan a entender a la brevedad otros aspectos de la biología y la biogeografía de los nudibranquios.

Para lectores motivados por la posibilidad de bucear y explorar los arrecifes coralinos los autores ofrecen indicaciones sobre dónde ir y como proceder al encuentro de babosas para observarlas y fotografiarlas. No sin aportar consideraciones éticas que persiguen incentivar el respeto por estos animales y los resguardos donde habitan.

Por medio de la lista taxonómica que sigue, de las 142 especies de babosas marinas conocidas en Venezuela (mares venezolanos), y su representación en 44 familias distintas, es posible apreciar la magnitud de la diversidad biótica que esta fauna concentra. Nueve registros son nuevos para el país.

La novedad del tema central de esta monografía, ha requerido un glosario de once páginas para orientar la lectura por parte de neófitos y especialistas. La perseverancia para producir un libro tan bien organizado como este, demanda adelantos constantes a través de años de trabajo de campo e investigación, lecturas críticas de libros y artículos científicos especializados, ingentes afanes organizativos y aportes morales y materiales de colaboradores externos y promotores. Los autores así lo reconocen en sus agradecimientos, ordenando al final los antecedentes intelectuales en una larga y minuciosa lista bibliográfica.

Esta producción de Ediciones Explora, *Nudibranquios y otras babosas marinas de Venezuela*, merece un reconocimiento especial a sus editores Alberto Blanco Dávila y Siegfried Geyer, quienes han materializado la posibilidad de hacer que un trabajo científico se convierta en un medio de alto valor divulgativo, orientación consecuente del sello Explora, además el libro lleva los signos de haber sido auspiciado académicamente por otras cinco instituciones: la Universidad Marítima del Caribe, el Instituto Venezolano de Investigaciones Científicas, Fudena (Venezuela), el Muséum National d'Histoire Naturelle y The American University of Paris (Francia).

Impresionante presentación estética con contenidos repletos de información científica; un tratado conciso y sin embargo bastante completo, sino exhaustivo, de un grupo de animales nunca antes tenidos en cuenta en conjunto o bajo un enfoque monográfico similar en ningún texto previo sobre zoología venezolana.

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Abejas criollas sin aguijón

Rafael Rivero Oramas

2025. [2ª ed.]. Caracas: Editorial Tinta, Papel y Vida / Fondo Editorial Milagrosas Meliponas, 160 pp.
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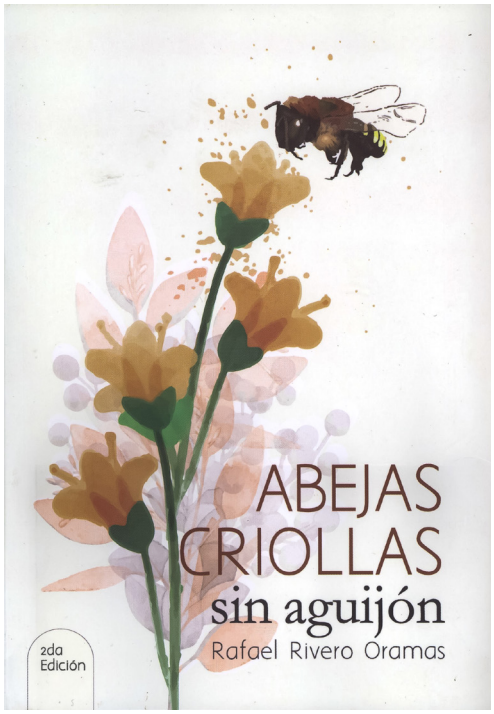

Contenido: *Prólogo* [por Palmira Guevara Trejo] / *Nota editorial* / *La ingeniosa aventura de Rafael Rivero Oramas* [por Manuel Almeida-Rodríguez] / *El increíble mundo de las abejas* / *Las abejas y el fuego* / *Las abejas criollas sin aguijón* / *Cosecha y división de colmenas para reproducir* / *Fichas técnicas* / *Glosario* / *Bibliografía* / *Nueva bibliografía* / *Lecturas sugeridas.*

El mundo de las abejas pareciera infinito, investigar sobre ellas y sobre su domesticación y cría significa sumergirse en un profundo mar de información con millares de páginas impresas. Existen institutos y facultades de apicultura, se obtienen doctorados y hay congresos mundiales anuales (Apimondia) sobre esta disciplina. Las abejas sociales, productoras de miel, han sido objeto de observación y estudio desde muy distintos intereses. Maurice Maeterlinck, ganó celebridad con su ensayo literario *La vida de las abejas* (1901), aparentemente basado en observaciones propias, del insecto como individuo y del enjambre como sociedad. Su estilo naturalista, comparativo, meditativo y filosófico le indujo a adelantar una noción de la colmena como organismo unitario, cuya coordinación merecía elevarse a ejemplo moral universal del trabajo organizado, del sentido inteligente de la existencia. Décadas más tarde Karl von Frisch publicaría con el mismo título (1957) un tratado fundacional para la etología, en el cual descubría al mundo como operan los sentidos de las abejas, como se orientan y como a través de una suerte de danza, se establece la comunicación entre ellas. Por el alcance de sus descubrimientos sobre comportamiento animal von Frisch ganaría el Premio Nobel de Medicina (1973, compartido con Niko Tinbergen y Konrad Lorenz); a Maeterlinck, alguna vez después, señalado por plagio, le habrían conferido el Premio Nobel de Literatura en 1911, justo un año antes de que Waldemar Bonsels publicara *Las aventuras de la abeja*

Maya (1912), posiblemente uno de los relatos para niños más difundidos en el siglo pasado. Especialistas en la obra literaria de Bonsels han reunido indicios suficientes para elucidar mensajes ocultos de carácter racista, antisemita y filonazi en la historia aparentemente cándida de la abeja Maya, basados en la naturaleza social de las colmenas. Casos como los mencionados dan cuenta de una parte poco conocida del impacto que han tenido y tienen las abejas, particularmente en la cultura occidental.

Medio milenio atrás, las abejas (*Apis mellifera*), según Gonzálo Fernández de Oviedo y Valdés (*Sumario de la natural historia de las Indias* de 1526, consultamos la edición del FCE, de 1950), no existían en América, tampoco las moscas domésticas. Su extraordinario testimonio seguramente es la primera referencia precisa a otro tipo de abejas, autóctonas del continente americano:

"*Hay muchas abejas, que crían en las oquedades de los árboles, y son pequeñas, del tamaño de las moscas, o poco más, y las puntas de las alas tienen cortadas al través, de la facción o manera de las puntas de los machetes victorianos, y por medio del ala una señal al través, blanca, y no pican ni hacen mal, ni tienen aguijón, y hacen grandes panales, y los agujerillos de ellos hay en uno más que en cuatro de los de acá, aunque ellas son menores abejas que las de España, y la miel es muy buena y sana, pues es morena casi como arrope*".

En los cuatro siglos siguientes a esta primicia, se cuentan otras noticias similares en crónicas, pero además se hicieron descubrimientos eventuales sobre este singular grupo de abejas, sobre todo en lo que respecta a descripciones taxonómicas dentro de su asombrosa variedad. Reportes numerosos, aunque dispersos, sobre el consumo indígena de su miel y el potencial manejo de algunas especies para producción controlada de mieles se han ido incrementando desde el siglo XIX; no obstante, es posible que la primera obra monográfica dedicada a la cría de las abejas sin aguijón fuera la de Paulo Nogueira-Neto (1953, revisada y reeditada en 1970), autor brasileño que eventualmente llegaría a ser el especialista mejor acreditado en Suramérica.

En 1973 Monte Ávila Editores imprime en Venezuela la primera edición de *Abejas criollas sin aguijón* (Colección Científica No. 25), cuyo autor, Rafael Rivero Oramas conocía bien en ese momento el trabajo de Nogueira-Neto. Rivero Oramas, sin embargo, había adelantado tempranamente su erudición en las abejitas meliponinas (aricas, guaros, matajeyes, pegones) a través de los medios de difusión educativa infantil que él mismo fundó y dirigió, *Onza, tigre y león. Revista para la infancia venezolana* (1938-1948), y *Tricolor* (en sus dos primeras décadas, 1949-1969) (ver p. ej., Rivero Oramas 1952). En realidad, la incursión pionera de Rivero Oramas en este y otros muchos temas venezolanistas se pierde de vista, principalmente en la revista *Tricolor*, materia digna de tratar ampliamente y a profundidad en otros espacios.

Por iniciativa y empeño de Palmira Guevara, pensadora crítica, bióloga molecular y meliponóloga entusiasta, fue posible producir e imprimir esta segunda edición de aquel olvidado y agotadísimo librito de la colección científica de Monte Ávila. Guevara dispuso su competencia y todo su corazón en el proceso editorial, logrando un trabajo excepcional que destaca por el diseño gráfico refinado, a la altura de la trascendencia de esta obra. Es justo además mencionar el aporte recibido del Fondo Editorial Milagrosas Meliponas, que hizo posible la materialización de este emprendimiento. El resultado es un homenaje también al libro-objeto, la figura estética superior que nos complace tener en las manos. Uno se pregunta si las desaboridas diagramaciones que vemos en muchos libros venezolanos, son realmente el resultado de la austeridad o simplemente el desafortunado producto de la falta de fe.

Esta segunda edición viene en un libro distinto, recortado en un formato mayor, ligeramente ampliado pero poco intervenido. Cuenta con un prólogo de la curadora del texto, la nota editorial y la reseña sobre el autor, que hizo su biógrafo, Manuel Almeida-Rodríguez, quien probablemente sería capaz de escribir un libro entero sobre Rivero Oramas, el polímata de los altos mirandinos, precursor de la meliponicultora moderna. Lo más visible es el enriquecimiento gráfico con nuevas ilustraciones, acuarela para la portada –blanda, con solapas–, fotografías a color, y unas viñetas de abejitas que nunca pasarán desapercibidas. La forma en que está narrado originalmente el texto de 1973 no pierde vigencia, ni en su estilo, ni en la validez de la información fundamental que aporta. Sin embargo, no es posible callar respecto a cuánto más se conoce sobre la biología de las abejas criollas sin aguijón después de más de cincuenta años. Palmira Guevara quiso respetar la integridad primaria del texto, pero extendiendo la lista de referencias bibliográficas especializadas y sugiriendo otras lecturas, de entre centenas de nuevas fuentes de información que ahora existen disponibles, como siempre, en desesperante dispersión.

Al mejor estilo de Rivero Oramas, este libro se distribuye gratuitamente, por lo que no es difícil predecir que pudiera agotarse pronto. Ya no se imprimen grandes cantidades. El formato electrónico, menos costoso, aunque amenaza desplazar al libro impreso pareciera no deparar el mismo placer a los amigos del libro y la lectura. El número 45 de *Tricolor*, de noviembre de 1952, pródigamente ilustrado, policromo y de distribución nacional gratuita, tuvo un fenomenal tiraje de 30.000 ejemplares. Encontrar uno fue una peripecia. Esfuerzo recompensado con la recolección de las siguientes líneas:

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"En casi todas las regiones selváticas del interior del país y con mayor abundancia en el sur del territorio, se encuentra una especie de abeja silvestre, que produce una miel dulce y de color obscuro. Los indios del alto Orinoco son muy aficionados a esta miel. La toman después de la comida. El pegón tiene la particularidad de adherirse fuertemente al cabello y a la piel de las personas; de allí su nombre."

REFERENCIAS

Bonsels, W. 1912. *Die Biene Maja und ihre Abenteur. Ein Roman für Kinder*. Berlin / Leipzig: Schuster & Loeffler, 177 pp. [1928. *Maya la abeja y sus aventuras*. (trad. Carlos Guerendiain). Barcelona: Editorial Juventud, S. A., 154 pp., 12 láms.]

Fernández de Oviedo y Valdés, G. 1950. *Sumario de la natural historia de las Indias*. Biblioteca Americana, Serie de Cronistas de Indias. (ed., intr. y notas José Miranda). México, D. F.: Fondo de Cultura Económica, 279 pp. + [v].

Maeterlinck, M. 1901. *La vie des abeilles.* Bibliothèque Charpentier. Paris: Eugène Fasquelle, Editeur, [viii] + 311 pp. + [iii]. [1913. *La vida de las abejas*. (trad. Pedro de Tornamira). Barcelona: Montaner y Simón Editores, 278 pp.]

Nogueira-Neto, P. 1953. *A criação de abelhas indígenas sem ferrão*. São Paulo: Editora Chácara e Quintais, 280 pp.

[Rivero Oramas, R.]. 1952. Cosas de nuestro país. El pegón. *Tricolor* (Caracas), 4(45): 46.

Rivero Oramas, R. 1973. *Abejas criollas sin aguijón.* [1ª ed.]. Colección Científica No. 25. Caracas: Monte Avila Editores, C. A., 111 pp. + [i]. (la hoja de presentación del libro dice 1972, pero el colofón es claro, se imprimió en 1973)

von Frisch, K. 1927. *Aus dem leben der Bienen*. Berlin: Julius Springer, x + 149 pp. + [i]. [1957. *La vida de las abejas*. (trad. Etanislao Rodríguez). Colección Labor. Sección XII. Ciencias Naturales. Nos. 479-480. Madrid: Editorial Labor, 224 pp.]

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