

**First Record of *Oleacina cyanozoaria* (Gundlach in Pfeiffer, 1857)
Feeding on a *Eleutherodactylus* Frog in Pico San Juan,
Cumanayagua, Cienfuegos Province, Cuba**

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ABSTRACT Around twenty species of the landsnail subfamily Oleacininae inhabit Cuba. However, only five species were found in south-central region of the island. Despite the frequency of *Oleacina* in Cuba, these species have been poorly studied and little is known about their ecology, ethology and carnivorous feeding preferences. This field study is the first record showing *Oleacina cyanozoaria* to be an active predator on a small *Eleutherodactylus* frog. Small vertebrates have not been previously noted to be part of these voracious species' diet.

KEYWORDS *Oleacina*, *Eleutherodactylus*, Cuban carnivorous snails, predation

INTRODUCTION

The carnivorous snails from subfamily Oleacininae (H. Adams y A. Adams, 1855) in Cuba encompass around twenty species from two different genera *Oleacina* (Röding, 1798) and *Rectoleacina* (Pilsbry, 1907) (Hernandez-Quinta, *et al.*, 2017: at p. 93). This is a subfamily which is found only in Cuba and Hispaniola. Of these mentioned genera, two species are seemingly distributed throughout the island; *Oleacina solidula* (Pfeiffer, 1840) and *Oleacina straminea* (Deshayes, 1819), and another three species can be found in the south central part of Cuba *Oleacina regularis* (Gundlach in Pfeiffer, 1857), *Oleacina subulata* (Pfeiffer, 1839), and *Oleacina cyanozoaria* (Gundlach in Pfeiffer, 1857). The shell shapes of *Oleacina* and *Rectoleacina* are elongated (bullet shaped) with a narrow aperture. None of the known Cuban species from Oleacinidae genera (*Oleacina*, *Rectoleacina*, *Varicella*, *Melaniella*, *Glandinella*) are well-studied related to their ecology and ethology.

Field observations of feeding habits in *Oleacina* are unavoidable because individuals are readily

observed hunting and scavenging in the leaf litter, soil, rocks and even on trees. We have observed these fast sharp toothed predators tracking their preys' mucus trails, and frequently "tasting" their prey with an initial bite before attack (Plate 1, sequence #1). *Oleacina* are also known to eat carrion, and sometimes engage in cannibalism; their most common prey are snails and slugs.

Among the Cuban *Oleacina* species, in our opinion *Oleacina cyanozoaria* stands alone for having the most voracious appetite and aggressive behavior. We observed this species feeding on prey during several land snail expeditions in different localities (*e.g.*, Pico San Juan (see Plate 2), San Juan de Letrán, Topes de Collantes and Botanical Garden of Cienfuegos). Particularly pugnacious slugs, which are also cannibalistic, such as agriolimacid *Deroceras laeve* (Müller, 1774) (Barker & Efford, 2004), do not seem to offer any defensive response when faced with an *O. cyanozoaria* attack (Plate 1, sequence #3). *Deroceras reticulatum* (Müller, 1774), another introduced slug in Cuba from the same genus, is considered an herbivore with

mere facultative carnivory (Barker & Efford, 2004).

MATERIALS AND METHODS

Photographs were taken of *O. cyanozoaria* feeding on prey *in situ* during field studies.

DISCUSSION

There are almost no accounts of *Oleacina* eating other carnivorous snails or small invertebrates in the literature. Photographs taken during the authors' field studies are the first record of a predation event where *O. cyanozoaria* was observed preying on a small *Eleutherodactylus* (Duméril and Bibron, 1838) frog, demonstrating this species' hunting behavior (Plate 1, sequence #4). It appears that, if the prey animal can fit into *O. cyanozoaria*'s extended muscular mouth and is palatable, there is a good chance that it will be consumed. In fact, the spheroidal buccal mass is markedly elongated and enlarged in *Oleacina* species (Barker & Efford, 2004). Small Cuban frogs do not secrete toxins like toads do, however they generally tend to be capable of jumping out of danger. Based upon our observations it is hypothesized that the *Oleacina* snail rubs a toxic secretion of its own making on the frog that has the effect of slowing down the frog.

Other carnivorous snails' genera worldwide consume earthworms (e.g., *Deroceras*, *Boettgerilla*, *Milax*, *Mesodon*, *Plutonia*, *Vitrina*, *Aegopinella*, *Daudebardia*, *Strangesta*, *Powelliphanta*, *Schizoglossa*, *Paryphanta*, *Victaphanta*, *Wainuia*, *Austrorhytida*, *Natalina*, *Rhytida*, *Streptaxis*, *Testacella*, *Hyrcaolestes* and *Meridolum*). Spheroidal buccal mass evolution has provided the ability to consume earthworms. It is assumed that during evolution "the elongation of the buccal mass lags considerably behind the adoption of an obligate

carnivorous feeding strategy" (Barker & Efford, 2004). The same authors opined that *Oleacinidae* family members exhibit transitional stages in buccal mass elongation and at least some of this variation corresponds to differences in carnivory. However, *Oleacina* specializes in snails and slugs, rather than earthworms, which was the prey previously reported prior to these field studies.

We presume that Cuban *Oleacina* can attack other carnivorous endemic snails' species from the genera *Haplotrema*, *Melaniella*, *Glandinella*, *Rectoleacina* or *Varicella*. Some might think is a matter of buccal mass size, a big *Oleacina* specimen cannibalizing or attacking only smaller individuals. However, we have direct personal observations in Sierra de los Órganos of fully-grown adult *O. straminea* specimens attacking each other aggressively. Even larger land snails and slugs were observed being harassed by *Oleacina* (e.g., *Eurycampta bonplandi* (Lamarck, 1822); *Veronicella cubense* (Pfeiffer, 1840); *Guladentia subtussulcata* (Wright in Pfeiffer, 1863); *Zachrysia guanensis* (Poey, 1857).)

No phoretic relationship is suggested among Cuban anurans and other snails; this is still a speculative theory in their ecology (Kolenda, *et al.*, 2017). However, some anuran species from Bufonidae (Gray, 1825) family are known predators of land snails and mostly slugs. In Cuba, some toads and frogs are noteworthy for including land molluscs in their diet [e.g., *Osteopilus septentrionalis* (Duméril and Bibron, 1841); *Peltophryne* spp. (Fitzinger, 1843)]. Several Cuban frogs are famous for their small size. Accordingly, juvenile frogs of these smaller species are likely a regular part of *Oleacina* species' diet of prey from the leaf litter.

CONCLUSIONS

The Cuban *Oleacina* species are poorly studied. Despite being one of the most common lands snails thriving even on anthropic areas little is known about its feeding habits. Our finding of *Oleacina cyanozoaria* consuming a small *Eleutherodactylus* frog in south-central Cuba is only one example of this creatures' carnivorous behavior and palatable preferences.

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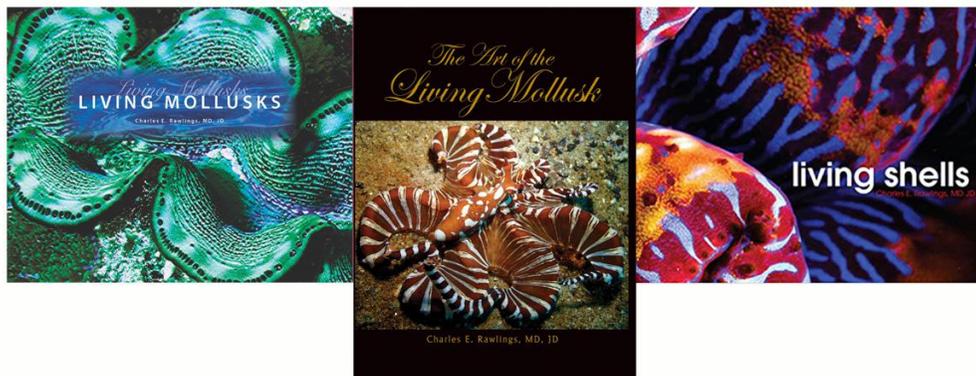
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Plate 1. Sequence 1: A juvenile *Oleacina* cf. *straminea* attacking and eating a juvenile *Veronicella cubense*, National Botanical Garden, Havana province. Sequence 2: *Oleacina* cf. *straminea* feeding on *Coryda alauda*, Gran Piedra, Santiago de Cuba province. Sequence 3: *Oleacina cyanozoaria* eating a *Deroceras laeve* carnivorous semi slug, Pico San Juan, Cienfuegos province. Sequence 4: *Oleacina cyanozoaria* eating a *Eleutherodactylus* frog, Pico San Juan, Cienfuegos province. Photo credits by Adrián González-Guillén and Raymundo López-Silvero.

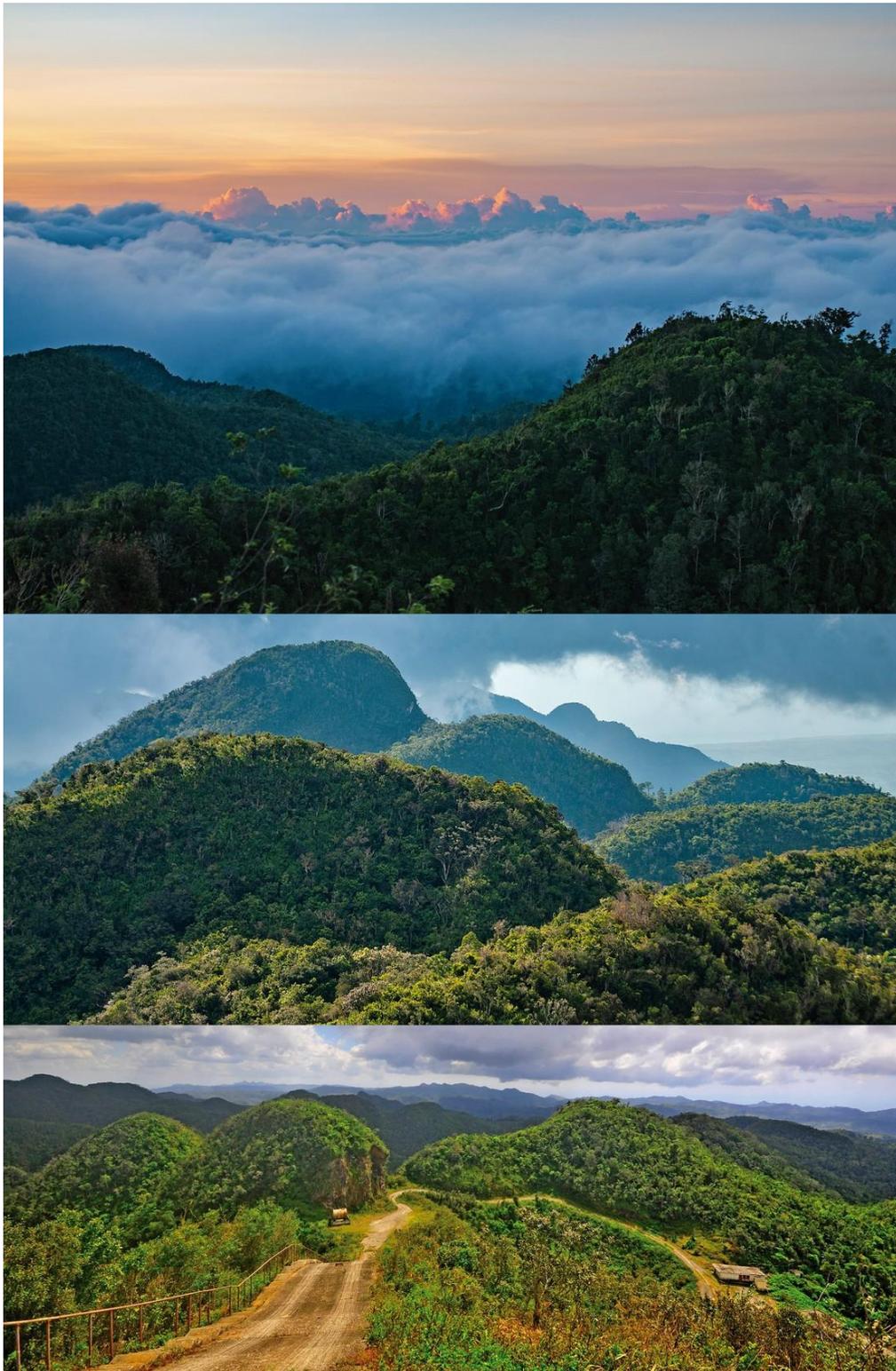


Plate 2. Pico San Juan (Saint John peak) área landscapes, Cienfuegos province. Photo credits by Rosario Domínguez-Basail and Raymundo López-Silvero.