

A new dietary item during the juvenile stage of the Black Spiny-Tail Iguana, *Ctenosaura similis* (Gray, 1831)

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Ontogenetic diet shift has been reported for many reptiles (Bouchard and Bjørndal, 2006; Vitt and Caldwell, 2008). This change may be influenced by differences in energetic requirements during development to adulthood, differential foraging strategies, prey availability and predatory risk (Troyer, 1984; Durtsche, 2004; Bouchard and Bjørndal, 2006; Farallo et al., 2010). Also important are anatomical changes of some body parts involved in prey capture like the skull and teeth complexity that are adapted for specific size and type of prey during the transition from juvenile to adult stages (Christensen and Melstrom, 2021; Patterson et al., 2022). On the other hand, the lack of the necessary arrangement of the digestive apparatus in young reptiles may limit their capacity to digest the high fibre content of plant material (Bouchard and Bjørndal, 2006). In this context, juveniles may maximise the energy efficiency uptake of nutrients based on their own physiological and anatomical capacities (Durtsche, 2004).

Species of lizards in the genus *Ctenosaura* are considered preferentially insectivorous when juveniles and mostly herbivorous when adults (Fitch and Henderson, 1977; Lee, 2000; Durtsche, 2004). However, adults of the Black Spiny-Tail Iguana, *C. similis* (Gray, 1831), are known to consume a variety of items (Appendix 1) including plants, fruits, flowers (Van Devender, 1982; Krysko et al., 2009), vertebrates (Krysko et al., 2009; García-Rosales et al., 2020; López and Mora, 2021; Astorga-Acuña and Mora 2023) and invertebrates (Parmenter and Avery, 1990; Arndt, 1999; Krysko et al., 2009; García-Rosales et al., 2020). The

distribution range of *C. similis* ranges from the Isthmus of Tehuantepec in Mexico across all Central America to Panama (Köhler, 2008). This is the largest member of the genus *Ctenosaura*, with males reaching up to 489 mm and females 347 mm in snout-vent length (SVL) (Fitch and Henderson, 1977). Hatchlings are green and tend to hide in dense vegetation to escape predation (Van Devender, 1982) but after six months they become darker, resembling adults perching on logs, rocks or bare soil for basking and having about 20 times the size of hatchlings.

Here we discuss an observation of a juvenile *C. similis* feeding on leaves of the tree *Amphitecna latifolia*. The observation was conducted under a patch of broadleaf secondary vegetation at El Gato beach (7.307° N, 80.920° W, elevation 10 m), Mariato district, Veraguas province in Pacific Panama. This beach, located in the Azuero peninsula, is 860 m long with a north-south orientation and is a common nesting site for Green Sea Turtles (Flores et al., 2021). The beach has discrete vegetation with patches dominated by the species *Canavalia rosea*, *Terminalia catappa*, *Hippomane mancinella* and *Amphitecna latifolia* (Flores et al., unpublished). Photos included in this note have been deposited in the Illinois Natural History Survey Herpetology Collection under the vouchers INHS 2025-a and INHS 2025-a1.

On 2 February 2025 at 11:40 h, during a sunny day in the middle of the dry season in Panama, a juvenile *C. similis* (SVL = 110 mm, total length = 270 mm) was observed climbing up two feet on a trunk of an *Amphitecna latifolia* (Mill.) A. H. Gentry tree. There it fed on two leaf shoots during approximately 17 seconds (Fig. 1, Video S1 available through the Zenodo Data repository: <https://doi.org/10.5281/zenodo.15615490>.) after which the lizard returned to the ground and hid under a cumulous of fallen palm branches. A close observation of the tree revealed that other leaves suffered from the same pattern of bites (Fig. 2). During repeated visits to the site over the following four days no juvenile or adult was observed feeding on these leaves.

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Figure 1. Juvenile of *Ctenosaura similis* feeding on leaf shoots of *Amphitecna latifolia*. Photo voucher INHS 2025-a. Photo by Eric E. Flores.

A young lizard must obtain food present in its surrounding environment rapidly to cope with energetic requirements (Nagy et al., 1999) and to avoid potential predation (Farallo et al., 2010). Since the protein content of plants is generally lower, juvenile iguana lizards may compensate for this deficiency by selecting the parts of the plant with the largest protein content and energy (Troyer, 1984; Bjorndal and Bolten, 1992). The observed juvenile *C. similis* was eating the leaf shoots along the tree trunk, which may be more digestible and with a higher nutritional content than older leaves. *Amphitecna latifolia* belongs to the family Bignoniaceae and is restricted to coastal ecosystems within a wide



Figure 2. Leaf shoots of *A. latifolia* bitten by the juvenile *C. similis*. Photo voucher INHS 2025-a1. Photo by Eric E. Flores.

distribution in Florida (USA), the Caribbean, Pacific coast of Mexico, Central America, Colombia, Ecuador and Venezuela (Gentry, 1980). Its leaves can reach up to 200 mm long and 110 mm wide (Gómez-Domínguez et al., 2021). Across their distributional range some species of *Amphitecna* have been used for medical purposes, for example to treat respiratory disease in humans (Gómez-Domínguez et al., 2021), including *A. latifolia* which fruits have been reported to be used in cold treatment and as a laxative (Gómez-Hechavarría, 2023). However, no information exists about the nutritional content of its leaves or anti-parasite use by wild lizards. Whether or not the consumption of *A. latifolia* leaves also provides protection against internal parasites remains unknown.

Research on the closely related *C. pectinata* shows a clear change in diet with age, revealing that even young individuals eat leaves and flowers (Van Devender, 1982; Durtsche, 2000). Similarly, our findings also point to a dietary shift in *C. similis* and suggest that additional factors may influence whether juveniles choose to eat plant matter early in their development. Out of its native range, juveniles have been observed to start consuming vegetative items at size of 100–118 mm SVL (Krysko et al., 2009; Funck, 2013), hence our observation could reflect the initial dietary shift from an exclusively animal prey to a more broadly diet. In addition, this plasticity in the dietary selection of juveniles may not only reflect the relatively low availability of prey items (i.e., insects) that may be scarce, especially during dry season months (Durtsche, 2004) but also a strategy to escape starvation consuming a low protein diet but ensuring survival until better conditions arrive. This first report adds to our knowledge of the dietary items reported for the species in their native distributional range.

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Appendix 1. Dietary items of the Black Spiny-Tail Iguana (*Ctenosaura similis*) reported in the literature including the new report.

Kingdom / Phylum	Order / Family	Species	Type of food item consumed	Locality	<i>C. similis</i> ontogenetic stage	Reference
Plantae						
	Acanthaceae	<i>Avicennia germinans</i>	Unidentified	Mexico	Unidentified	García-Rosales et al., 2020
	Amaranthaceae	<i>Alternanthera philoxeroides</i>	Unidentified	Florida (USA).	Unidentified	Krysko et al., 2009
	Amaranthaceae	<i>Amaranthus blitum</i>	Unidentified	Florida (USA).	Unidentified	Krysko et al., 2009
	Amaryllidaceae	<i>Hymenocallis littoralis</i>	Unidentified	Mexico	Unidentified	García-Rosales et al., 2020
	Anacardiaceae	<i>Lithraea molleoides</i>	Unidentified	Florida (USA).	Unidentified	Krysko et al., 2009
	Anacardiaceae	<i>Mangifera indica</i>	Unidentified	Florida (USA).	Unidentified	Krysko et al., 2009
	Apocynaceae	Unidentified	Leaves	Florida (USA).	Adult	Funck, 2013
	Areaceae	Unidentified	Fruits	Florida (USA).	Juvenile	Funck, 2013
	Areaceae	Unidentified	Unidentified	Florida (USA).	Unidentified	Krysko et al., 2009
	Asteraceae	Unidentified	Fruits	Florida (USA).	Adult	Funck, 2013
	Asteraceae	<i>Helianthus annuus</i>	Unidentified	Florida (USA).	Unidentified	Krysko et al., 2009
	Bignoniaceae	Unidentified	Flowers	Florida (USA)	Juvenile and Adult	Funck, 2013
	Bignoniaceae	<i>Amphitecna latifolia</i>	Leaf shoots	El Gato beach, Panama	Juvenile	This note
	Boraginaceae	<i>Cordia sebestena</i>	Unidentified	Mexico	Unidentified	García-Rosales et al., 2020
	Boraginaceae	<i>Cordia sebestena</i>	Fruits	Mexico	Unidentified	García-Rosales et al., 2020
	Boraginaceae	<i>Varronia bullata</i>	Unidentified	Florida (USA).	Unidentified	Krysko et al., 2009
	Brassicaceae	<i>Lepidium virginicum</i>	Unidentified	Florida (USA).	Unidentified	Krysko et al., 2009
	Cactaceae	Unidentified	Fruits and flowers	Florida (USA).	Adult	Funck, 2013
	Cactaceae	<i>Opuntia humifusa</i>	Unidentified	Florida (USA).	Unidentified	Krysko et al., 2009
	Capparaceae	Unidentified	Leaves	Florida (USA).	Adult	Funck, 2013
	Chrysobalanaceae	<i>Chrysobalanus icaco</i>	Fruits	Mexico	Unidentified	García-Rosales et al., 2020
	Convolvulaceae	<i>Bauhinia pes-caprae</i>	Unidentified	Florida (USA).	Unidentified	Krysko et al., 2009
	Crassulaceae	Unidentified	Leaves	Florida (USA).	Adult	Funck, 2013
	Cyperaceae	<i>Cyperus sp.</i>	Unidentified	Florida (USA).	Unidentified	Krysko et al., 2009
	Euphorbiaceae	Unidentified	Fruits	Florida (USA).	Adult	Funck, 2013
	Euphorbiaceae	<i>Euphorbia sp</i>	Unidentified	Florida (USA).	Unidentified	Krysko et al., 2009
	Fabaceae	Unidentified	Flowers and fruits	Florida (USA)	Adult	Funck, 2013
	Fabaceae	<i>Sigmoidotropis elegans</i>	Unidentified	Mexico	Unidentified	García-Rosales et al., 2020
	Fabaceae	<i>Sigmoidotropis elegans</i>	Flowers	Mexico	Unidentified	García-Rosales et al., 2020
	Fabaceae	<i>Crotalaria rotundifolia</i>	Unidentified	Florida (USA).	Unidentified	Krysko et al., 2009
	Fabaceae	<i>Galactia sp</i>	Unidentified	Florida (USA).	Unidentified	Krysko et al., 2009
	Fabaceae	<i>Lespedeza sp.</i>	Unidentified	Florida (USA).	Unidentified	Krysko et al., 2009
	Goodeniaceae	<i>Scaevola taccada</i>	Unidentified	Florida (USA).	Unidentified	Krysko et al., 2009
	Malvaceae	<i>Gossypium sp</i>	Leaf shoots	Nicaragua	Unidentified	Fitch and Henderson, 1978
	Malvaceae	<i>Hibiscus sp</i>	Unidentified	Florida (USA).	Unidentified	Krysko et al., 2009
	Molluginaceae	<i>Mollugo verticillata</i>	Unidentified	Florida (USA).	Unidentified	Krysko et al., 2009
	Moraceae	Unidentified	Fruits	Florida (USA).	Juvenile	Funck, 2013
	Moraceae	<i>Ficus sp</i>	Unidentified	Florida (USA).	Unidentified	Krysko et al., 2009
	Myrtaceae	Unidentified	Fruits	Florida (USA).	Adult	Funck, 2013

Appendix 1. Continued.

Kingdom / Phylum	Order / Family	Species	Type of food item consumed	Locality	<i>C. similis</i> ontogenetic stage	Reference
	Myrtaceae	<i>Eugenia uniflora</i>	Unidentified	Florida (USA).	Unidentified	Krysko et al., 2009
	Oleaceae	Unidentified	Leaves and fruits	Florida (USA).	Juvenile	Funck, 2013
	Passifloraceae	<i>Passiflora suberosa</i>	Unidentified	Florida (USA).	Unidentified	Krysko et al., 2009
	Phyllanthaceae	<i>Phyllanthus sp</i>	Unidentified	Florida (USA).	Unidentified	Krysko et al., 2009
	Poaceae	<i>Axonopus fissifolius</i>	Unidentified	Florida (USA).	Unidentified	Krysko et al., 2009
	Poaceae	<i>Eleusine indica</i>	Unidentified	Florida (USA).	Unidentified	Krysko et al., 2009
	Poaceae	<i>Stenotaphrum secundatum</i>	Unidentified	Florida (USA).	Unidentified	Krysko et al., 2009
	Poaceae	<i>Urochloa sp</i>	Unidentified	Florida (USA).	Unidentified	Krysko et al., 2009
	Poaceae	Unidentified	Fruits	Florida (USA).	Adults	Funck, 2013
	Poaceae	<i>Zea mays</i>	Unidentified	Florida (USA).	Unidentified	Krysko et al., 2009
	Polygonaceae	<i>Coccoloba uvifera</i>	Fruits	Mexico	Unidentified	García-Rosales et al., 2020
	Polygonaceae	<i>Coccoloba uvifera</i>	Unidentified	Florida (USA).	Unidentified	Krysko et al., 2009
	Portulacaceae	<i>Portulaca amilis</i>	Unidentified	Florida (USA).	Unidentified	Krysko et al., 2009
	Portulacaceae	<i>Spilanthes oleracea</i>	Unidentified	Florida (USA).	Unidentified	Krysko et al., 2009
	Primulaceae	<i>Bonellia macrocarpa</i>	Fruits	Mexico	Unidentified	García-Rosales et al., 2020
	Rubiaceae	<i>Ernodea littoralis</i>	Flowers	Mexico	Unidentified	García-Rosales et al., 2020
	Rubiaceae	<i>Strumpfia maritima</i>	Fruits	Mexico	Unidentified	García-Rosales et al., 2020
	Rubiaceae	Unidentified	Flowers	Florida (USA).	Adult	Funck, 2013
	Rubiaceae	Unidentified	Unidentified	Florida (USA).	Unidentified	Krysko et al., 2009
	Rubiaceae	<i>Galium obliquum</i>	Unidentified	Florida (USA).	Unidentified	Krysko et al., 2009
	Salicaceae	Unidentified	Leaves	Florida (USA).	Adult	Funck, 2013
	Smilacaceae	<i>Smilax sp</i>	Unidentified	Florida (USA).	Unidentified	Krysko et al., 2009
	Solanaceae	Unidentified	Fruits	Florida (USA).	Juvenile and Adult	Funck, 2013
	Solanaceae	<i>Physalis sp</i>	Unidentified	Florida (USA).	Unidentified	Krysko et al., 2009
	Unidentified	Unidentified grass	Unidentified	Honduras	Unidentified	Henderson, 1973
	Urticaceae	<i>Pilea micriphylla</i>	Unidentified	Florida (USA).	Unidentified	Krysko et al., 2009
	Verbenaceae	<i>Phyla nodiflora</i>	Unidentified	Florida (USA).	Unidentified	Krysko et al., 2009
	Vitaceae	Unidentified	Leaves	Florida (USA).	Adult	Funck, 2013
	Zygophyllaceae	<i>Tribulus cistoides</i>	Unidentified	Florida (USA).	Unidentified	Krysko et al., 2009
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Arthropoda						
	Acrididae	Unidentified	Unidentified	Florida (USA)	Juvenile and Adult	Funck, 2013
	Aeshnidae	Unidentified	Unidentified	Florida (USA)	Juvenile and Adult	Funck, 2013
	Amblypygi	Unidentified	Unidentified	Costa Rica	Juvenile	Mora, 2010
	Apidae	Unidentified	Unidentified	Florida (USA)	Juvenile and Adult	Funck, 2013
	Araneae	Unidentified	Unidentified	Costa Rica	Juvenile	Mora, 2010
	Blattellidae	Unidentified	Unidentified	Florida (USA).	Adult	Funck, 2013
	Blattidae	Unidentified	Unidentified	Florida (USA)	Juvenile and Adult	Funck, 2013
	Blattodea	Unidentified	Unidentified	Florida (USA)	Unidentified	Krysko et al., 2009
	Buprestidae	Unidentified	Unidentified	Florida (USA)	Juvenile and Adult	Funck, 2013
	Cerambycidae	Unidentified	Unidentified	Florida (USA)	Adult	Funck, 2013
	Chrysomelidae	Unidentified	Unidentified	Florida (USA)	Juvenile	Funck, 2013
	Cleridae	Unidentified	Unidentified	Florida (USA)	Juvenile and Adult	Funck, 2013
	Coleoptera	Unidentified	Unidentified	Nicaragua	Adult	Fitch and Henderson, 1978
	Coleoptera	Unidentified	Unidentified	Mexico	Juvenile	García-Rosales et al., 2020
	Coleoptera	Unidentified	Unidentified	Florida (USA)	Unidentified	Krysko et al., 2009
	Dermaptera	Unidentified	Unidentified	Florida (USA)	Unidentified	Krysko et al., 2009
	Diptera	Unidentified	Unidentified	Nicaragua	Adult	Fitch and Henderson, 1978
	Vespidae	Unidentified	Unidentified	Florida (USA)	Juvenile	Funck, 2013
	Halictidae	Unidentified	Unidentified	Florida (USA)	Juvenile and adults	Funck, 2013
	Drosophilidae	Unidentified	Unidentified	Florida (USA)	Juvenile	Funck, 2013
	Formicidae	Unidentified	Unidentified	Florida (USA)	Juvenile and Adult	Funck, 2013
	Geometridae	Unidentified	Unidentified	Florida (USA)	Juvenile	Funck, 2013
	Hymenoptera	Unidentified	Unidentified	Nicaragua	Adult	Fitch and Henderson, 1978
	Hymenoptera	Unidentified	Unidentified	Florida USA	Unidentified	Krysko et al., 2009
	Isopoda	Unidentified	Unidentified	Florida USA	Juvenile	Krysko et al., 2009
	Lepidoptera	Unidentified	Unidentified	Nicaragua	Adult	Fitch and Henderson, 1978
	Lepidoptera	Unidentified	Unidentified	Mexico	Juvenile	García-Rosales et al., 2020
	Libellulidae	Unidentified	Unidentified	Florida (USA)	Juvenile and Adult	Funck, 2013
	Lycosidae	Unidentified	Unidentified	Nicaragua	Adult	Fitch and Henderson, 1978
	Lycosidae	<i>Hogna annexa</i>	Unidentified	Florida (USA)	Juvenile	Krysko et al., 2009
	Nymphalidae	Unidentified	Unidentified	Florida (USA)	Adult	Funck, 2013
	Ocypodidae	<i>Ocyopode gaudichaudii</i>	Adult	Costa Rica	Adult	Arndt, 1999

Appendix 1. Continued.

Kingdom / Phylum	Order / Family	Species	Type of food item consumed	Locality	<i>C. similis</i> ontogenetic stage	Reference
	Odonata	Unidentified	Unidentified	Mexico	Juvenile	García-Rosales et al., 2020
	Orthoptera	Unidentified	Unidentified	Nicaragua	Adult	Fitch and Henderson, 1978
	Orthoptera	Unidentified	Unidentified	Florida (USA)	Unidentified	Krysko et al., 2009
	Phasmida	Unidentified	Unidentified	Iguana Island, Panama	Juvenile	Zambrano pers. comm.
	Scarabaeidae	Unidentified	Unidentified	Florida (USA)	Adult	Funck, 2013
	Sphexidae	Unidentified	Unidentified	Florida (USA)	Adult	Funck, 2013
	Tenebrionidae	Unidentified	Unidentified	Florida (USA)	Adult	Funck, 2013
	Tettigoniidae	Unidentified	Unidentified	Florida (USA)	Juvenile	Funck, 2013
	Theraphosidae	<i>Brachypelma vagans</i>	Unidentified	Mexico	Adult	Avilés-Novelo et al., 2019
	Theraphosidae	<i>Aphonopelma crinitifum</i>	Adult	Costa Rica	Adult	Dion and Porras, 2014
Crustacea (Subphylum)						
	Unidentified	Unidentified	Unidentified	Costa Rica	Juvenile	Mora, 2010
	Grapsidae	Unidentified	Unidentified	Florida (USA)	Adult	Funck, 2013
Myriapoda (Subphylum)						
	Unidentified	Unidentified	Unidentified	Costa Rica	Juvenile	Mora, 2010
Mollusca						
	Unidentified	Unidentified	Unidentified	Costa Rica	Juvenile	Mora, 2010
	Bulimulidae	Unidentified	Unidentified	Florida (USA)	Unidentified	Funck, 2013
Chordata						
	Unidentified	Unidentified fish	Dead animal	Mexico	Adult	García-Rosales et al., 2020
	Anura	Unidentified	Unidentified	Nicaragua	Unidentified	Fitch and Henderson, 1978
	Bufoinae	<i>Incilius luetkenii</i>	Dead animal	Costa Rica	Adult	López and Mora, 2021
	Bufoinae	<i>Rhinella horribilis</i>	Dead animal	Costa Rica	Adult	Pasachnik and Corneil, 2011
	Anolidae	<i>Anolis distichus</i>	Unidentified	Florida (USA)	Juvenile	Krysko et al., 2009
	Anolidae	<i>Anolis sagrei</i>	Unidentified	Florida (USA)	Adult	Krysko et al., 2009
	Cheloniidae	<i>Eretmochelys imbricata</i>	hatchling	Mexico	Adult	García-Rosales et al., 2020
	Corytophanidae	<i>Basiliscus vittatus</i>	Adult female	Costa Rica	Adult	Cedeño-Vázquez and Beutelspacher-García, 2016
	Iguanidae	<i>Ctenosaura bakeri</i>	Juvenile	Honduras	Subadult	Maryon et al., 2020
	Iguanidae	<i>Ctenosaura similis</i>	Juvenile	Mexico, Costa Rica	Adult	García-Rosales et al., 2020; Mora, 1991; Mora et al., 2015
	Iguanidae	<i>Ctenosaura similis</i>	Eggs	Nicaragua	Adult	Fitch and Henderson, 1978
	Iguanidae	<i>Iguana rhinolopha</i>	Juvenile	Costa Rica	Adult	Van Devender, 1982
	Phrynosomatidae	<i>Sceloporus sp</i>	Unidentified	Yucatan Peninsula	Adult	Campbell, 1999
	Polychrotidae	Unidentified	Unidentified	Florida (USA)	Juvenile	Funck, 2013
	Scincidae	<i>Mabuya unimarginata</i>	Adult	Honduras	Adult	Henderson, 1973
	Scincidae	<i>Plestiodon inexpectatus</i>	Adult	Florida (USA)	Adult	Krysko and Juan, 2014
	Teiidae	<i>Aspidoscelis sp</i>	Unidentified	Yucatan Peninsula	Adult	Campbell, 1999
	Testudinidae	<i>Gopherus polyphemus</i>	Juvenile	Florida (USA)	Adult	Avery et al., 2009
	Psittacidae	<i>Amazona auropalliata</i>	Eggs	Costa Rica	Adult	Dahlin et al., 2018
	Mimidae	<i>Mimus gilvus</i>	Adult	Mexico	Adult	Avilés-Novelo et al., 2019
	Columbidae	<i>Zenaida asiatica</i>	Adult	Costa Rica	Adult	Astorga-Acuña and Mora, 2023
	Columbidae	<i>Zenaida sp.</i>	Dead animal	Mexico	Adult	García-Rosales et al., 2020
	Hirundinidae	<i>Progne subis</i>	Post-Mortem	Mexico	Adult	García-Rosales et al., 2020
	Parulidae	<i>Setophaga sp</i>	Dead animal	Mexico	Adult	García-Rosales et al., 2020
	Sternidae	<i>Sterna antillarum</i>	Eggs	Mexico	Adult	García-Rosales et al., 2020
	Molossidae	<i>Eumops sp.</i>	Adult	Costa Rica	Adult	Fitch et al., 1971
	Cricetidae	<i>Oryzomys sp.</i>	Unidentified	Yucatan Peninsula	Unidentified	Campbell, 1999
	Cricetidae	<i>Scotinomys sp.</i>	Unidentified	Yucatan Peninsula	Unidentified	Campbell, 1999
	Cricetidae	<i>Sigmodon sp.</i>	Unidentified	Yucatan Peninsula	Adult	Campbell, 1999
	Sciuridae	<i>Sciurus carolinensis</i>	Adult	Florida (USA)	Adult	Furness, 2021