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A Community of Introduced Geckos in Southern Florida

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Ten species of geckos are established in Florida; Cosymbotus platyurus (Meshaka and Lewis, 1994), Gekko gekko (Wilson and Porras, 1983), Gonatodes albogularis (Carr, 1939), Hemidactylus frenatus (Meshaka et al., 1994), H. garnotii (King and Krakauer, 1966; Wilson and Porras, 1983), H. mabouia (Lawson et al., 1991), H. turcicus (Fowler, 1915), Sphaerodactylus argus (Savage 1954), S. elegans (Stejneger, 1922), and S. notatus. Of these, S. notatus is arguably native; S. elegans, possibly so. Among the known exotic geckos, G. albogularis, H. turcicus, and S. argus are the oldest established species known to Florida, having been recorded from between the turn of the century to early 1900s. Gekko gekko and H. garnotii can be traced from the 1950s to early 1960s (R.D. Bartlett, pers. comm.; Wilson and Porras, 1983). Cosymbotus platyurus, H. frenatus, and H. mabouia, were probably not in Florida until the 1980s. Two more geckos, Tarentola mauritanica and T. annularis, were observed on the walls of an abandoned amphibian and reptile dealership in Ft. Myers, Lee Co., Florida (Bartlett, 1996). The latter species is rumored to be in Dade Co. but lacks verification (Bartlett, 1996; R.D. Bartlett, pers. comm.). Field studies on exotic geckos, particularly in Florida, place far behind the rate at which new

species are recorded. Here, we compared distribution, habitat, and diet, of a mixed community of introduced geckos from a single site in extreme southern Florida and comment on future trends.

On the afternoon of 12 June 1996 and the evenings of 17 July, 14 September, and 2 October 1996, geckos were collected on the 2.5 ha premise of a now defunct exotic animal dealership and the adjoining 2.5 ha lot of a residence in Homestead, Dade Co., Florida. Identifications of C. platyurus (Everglades series EVER 303435), H. frenatus (EVER 304181), Gehyra mutilata (EVER 303436), and T. annularis (EVER 302922), and were kindly verified by Arnold G. Kluge. Gekko gekko and H. mabouia were also collected. All specimens used in this study were deposited in the Everglades Regional Collections Center in Everglades National Park. Intact vouchers of G. gekko (UMMZ 217544), T. annularis (UMMZ 217545 - 217547), H. frenatus (UMMZ 217551), and H. mabouia (UMMZ 217548 - 217550) from the study site were deposited in the University of Michigan Museum of Zoology. Snout-vent length (SVL) and gape of lizards were measured to nearest 0.1 mm. Length of prey was measured to nearest 1.0 mm. Identification of most prey was made to the level of family. Dietary niche breadth was measured using Levins' Measure of Niche breadth (Levins, 1968 *sic* Krebs, 1989). Dietary overlap was measured using Percentage Overlap (Renkonen, 1938 *sic* Krebs, 1989). Z-tests were calculated on Quatro-Pro.

One species, G. mutilata, represented a mainland record for the United States previously having been known only to Hawaii where it is widespread (McKeown, 1996). Three species are county records. The introductions of H. frenatus and C. platyurus appear to be inadvertent, whereas the T. annularis was intentionally introduced within the past five years. These three county records represent colonies disjunct to presently known Florida ranges. From this site, H.

frenatus, also in Monroe Co. (Meshaka, et al., 1994), is also a mainland record, C. platyurus is also in Pinellas Co. (Meshaka and Lewis, 1994), and T. annularis is also in Lee Co. (Bartlett, 1996). Neither G. gecko nor H. mabouia were new to Homestead; however, G. gecko tends to be numerous in very localized sites. Hemidactylus mabouia has become apparant in Homestead only in the past five years and is quickly dispersing throughout the region (Meshaka, Unpubl. data).

Observationally, T. annularis, G. gecko, and H. mabouia appeared to be equally numerous (5-7) during 30 min collecting trips at the site, although the former species was nearly absent on lighted buildings. No other C. platyurus was observed than the single individual collected on the second visit. The single G. mutilata was collected on the last visit, and a third and final H. frenatus was captured on the third visit. Two individuals (G. mutilata or H. frenatus) were missed on the last visit. No G. mutilata, H. frenatus, or T. annularis were observed on vegetation, whereas G. gecko and H. mabouia were observed on buildings and trees, like avacado (Persea americana), royal poinciana (Delonix regia), and coconut (Cocos nucifera) trees. Only G. gecko and H. mabouia were observed on a church located directly across the street from the site.

Prey were found in stomachs of C. platyurus, G. mutilata, H. mabouia, G. gecko, and T. annularis (Table 1). Stomachs of both H. frenatus were empty, one of the individuals having been freshly ingested by a T. annularis. Diet for the latter three species was broad and generally diverse (Table 1).

Mean body size and gape of adults of each species at this site (Table 2) were either large (G. gecko), medium (T. annularis), or small (C. platyurus, G. mutilata, H. frenatus, and H. mabouia). The mean value of SVL and gape (Table 2) were significantly different ($P < 0.05$) using a Z-test when comparing large (G. gecko) with medium (T. annularis)-sized geckos and

medium (*T. annularis*) with small (*H. mabouia*)-sized geckos. Using the same body size categories, the ratios of body size (1.6 and 1.4, respectively) and gape (1.6 and 1.6, respectively) were suggestive of niche partitioning (Hutchinson, 1959) which was corroborated by low overlap in diet between forms as measured by no. prey and no. stomachs with each taxon; *G. gecko* vs. *T. annularis* (9 and 29%, respectively) and *T. annularis* vs. *H. mabouia* (16 and 34%, respectively). If these findings accurately reflect the ecological positions among these species, we predict a stable co-existence of at least one of each form. However, the futures of some of these species are uncertain.

A loose archipelago of buildings of various distances to one another, occasionally interrupted by agricultural fields, existed along the same side of the street as the site and appeared to be acceptable habitat for these geckos. Unlike *G. gecko*, *T. annularis* seemed unable to use greenery or disperse across a street which will jeopardize its future if destructive alterations are made to the habitat of the existing colony. Moreover, high energetic needs of *T. annularis* associated with large body size, as compared to those of smaller forms, could probably further restrict colonies of *T. annularis* to such septic and "buggy" rural systems as the Homestead site.

The futures of *C. platyurus*, *H. frenatus*, and *G. mutilata* are more difficult to predict. The circumstances of the Clearwater colony (Meshaka and Lewis, 1994) suggest that *C. platyurus* poorly disperses on its own. Overwhelmed with predators and potential competitors, the tiny Homestead colony of *C. platyurus* was fragile and seemed in the near future less likely to disperse as to barely persist or go extinct. On the other hand, *H. frenatus* is becoming more common on the lower Florida Keys where it is replacing *H. mabouia* (Meshaka et al., 1994).

Repetition of that scenario in Homestead is a distinct possibility if H. frenatus successfully disperses from this site. In Hawaii, G. mutilata is widespread where it occurs on buildings and in forests (McKeown, 1996) and, for this reason, is a source of concern despite an apparant minimal presence at the Homestead site. However, a prediction of its fate remains no better than a random guess until more data become available. In this regard, time will tell if the site of this study is a springboard or dead-end in the colonization of some or all of the newly recorded species for Dade Co. and the extent to which those that do succeed impact other species.

Literature Cited

Bartlett, R.D. 1996. The geckos of Florida..native and alien. Reptilian. In press.

Carr, A.F., Jr. 1939. A gekkonid lizard now to the fauna of the United States. Copeia
1939(4):232.

Fowler, H.W. 1915. Cold-blooded vertebrates from Florida, the West Indies, Costa Rica, and
eastern Brazil. Proc. Acad. Natur. Sci. Philadelphia, 67:244-269.

Hutchison, G.E. 1959. Homage to Santa Rosalia or why are there so many kinds of animals? Am.
Nat. 93:145-159.

King, W. and T. Krakauer. 1966. The exotic herpetofauna of southeast Floida. Quart. J. Florida
Acad. Sci. 29(2):144-154.

Lawson, R., P.G. Frank, and D.L. Matin. 1991. A gecko new to the United states herpteofauna, with notes on geckoes of the Florida Keys. Herptol. Review 22:11-12.

Krebs, C.J. 1989. Ecological Methodology. Harper and Row. New York, NY. .

Levins, R. 1968. Evolution in Changing Environments: Some Theoretical Explorations.
Princeton University Press, Princeton, N.J.

McKeown, S. 1996. a Field Guide to Reptiles and Amphibians in the Hawaiian Islands. Diamond
Head Publishing Inc. Los Osos, CA.

Meshaka, W.E., Jr., B.P. Butterfield, and J.B. Hauge. 1994. Hemidactylus frenatus established on
the lower Florida Keys. Herpetol. Review 25(3):127-128.

Meshaka, W.E., Jr. and J. Lewis. 1994. Cosymbotus platyurus in Florida: Ten years of stasis.
Herpetol. Review 25(3):127.

Renkonen, O. 1938. Statisch-okologische Untersuchungen uber die terrestiche kaferwelt der
finnischen bruchmoore. Ann. Zool. Soc. Bot. Fenn. Vanamo 6:1-231.

Savage, J.M. 1954. Notulae herpetologicae 1-7. Trans. Kansas Acad. Sci., 57(3):326-334.

Stejneger, L. 1922. Two geckos new to the fauna of the United States. *Copeia* 108:56.

Wilson, L. D. and L. Porras. 1983. The Ecological Impact of Man on the South Florida
Herpetofauna. Univ. Kansas Mus. Nat. Hist. Spec. Publ. No. 9. 89 pp.

Table 1. Diet of exotic geckos syntopic at a single site in Homestead, Florida. Numbers of prey taxa in the sample are followed in parentheses by number of prey taxa in each stomach.

Taxa	<u>C. platyurus</u> N = 1	<u>G. mutilata</u> N = 1	<u>H. mabouia</u> N = 9	<u>G. gecko</u> N = 5	<u>T. annularis</u> N = 12
Arachnida					
Araneida			1(1)		1(1)
Crustacea					
Isopoda			1(1)		2(1)
Isoptera					27(1)
Coleoptera					
Carabeidae					3(3)
Curculionidae					1(1)
Scarabeidae					3(2)
Tenebrionidae				1(1)	1(1)
Dermaptera				1(1)	1(1)
Diptera	1(1)				
Hemiptera				1(1)	
Miridae					
Reduviidae					1(1)
Homoptera					
Cicadellidae					1(1)
Hymenoptera					
Formicidae			1(1)		40(3)
Lepidoptera					
Larvae			5(5)	3(1)	3(2)
Moth				1(1)	
Orthoptera					
Blattidae			2(2)	5(3)	3(3)
Gryllidae			4(1)	1(1)	
Elateridae				1(1)	
Trichoptera		1(1)			1(1)
Hydroptilidae					1(1)
Squamata					
Gekkonidae					
<i>C. platyurus</i>					1(1)
<i>H. frenatus</i>					1(1)
Empty			1(1)		
Total	1(1)	1(1)	15(12)	14(10)	30(25)
Niche breadth			0.62(0.35)	0.60(0.75)	0.16(0.71)

Table 2. Measurements taken from adults of five species of geckos at a single site in Homestead, Dade Co. Florida. Mean is followed by std dev., range, and sample size.

Species	mm SVL	Gape	Prey length
<u>G. gecko</u>	143.6 $\pm$ 17.1; 124 - 172; 5	25.8 $\pm$ 2.2; 23.4 - 29.0; 12	13.3 $\pm$ 8.9; 3 - 30; 12
<u>T. annularis</u>	87.8 $\pm$ 8.3; 73 - 101; 10	16.0 $\pm$ 1.4; 13.8 - 18.5; 10	20.8 $\pm$ 13.9; 8 - 59; 13
<u>H. mabouia</u>	61.6 $\pm$ 5.4; 50.2 - 60.2; 6	9.8 $\pm$ 0.81; 8 - 10.5; 6	
<u>H. frenatus</u>	49.0, 52.4	6.9, 8.1	
<u>G. mutilata</u>	48.5	7.6	
<u>C. platyurus</u>	60.6	9.8	

