ARTICLES

Hemidactylus (House Gecko) Assemblage Dynamics on South Florida Buildings

[1]* Walter E. Meshaka, Jr., [2] Heather L. Cress, [3] Kimber L. Kingsland, [4,3] Henry T. Smith, [3] Stephanie A. Fitchett, [3] Jon A. Moore, and [4] Ernest M. Cowan

[1] The State Museum of Pennsylvania, 300 North Street, Harrisburg, Pennsylvania, 17120-0024, USA. [2] John U. Lloyd Beach State Park, 6503 North Ocean Drive, Dania Beach, Florida, 33004, USA. [3] Florida Atlantic University, Wilkes Honors College, 5353 Parkside Drive, Jupiter, Florida, 33458, USA. [4] Florida Park Service, 13798 S. E. Federal Highway, Hobe Sound, Florida, 33455, USA. * Author to whom correspondence should be addressed. E-mail wmeshaka@state.pa.us

INTRODUCTION

Previous surveys in Florida first documented the presence of the exotic Indo-Pacific Gecko (*Hemidactylus garnotii*) native to southeast Asia, in Miami-Dade County during the early 1960s (King and Krakauer, 1966), or perhaps slightly earlier (Wilson and Porras, 1983). More recently, the exotic Tropical Gecko (*H. mabouia*), native to Africa, was first recorded in the Florida Keys, Monroe County during 1991 (Lawson et al., 1991), and may have invaded Florida as recently as the early 1980s (Meshaka et al., 1994). As competing, introduced, ecological analogs in Florida these two species (as well as other exotic Florida hemidactylines) appear unable to stably co-occupy sympatric niches (see species accounts and citations therein in Meshaka et al., 2004); and, this phenomenon has been observed on park lands in South Florida at Dry Tortugas National Park (Meshaka and Moody, 1996) and Everglades National Park (Meshaka, 2000), and most recently at Savannas Preserve State Park in East-central Florida (Meshaka et al., 2005).

METHODS AND SITES

To further our knowledge of these colonization processes, and in particular winter status of these species in Florida, we surveyed two sites: A.) five buildings at the recently constructed (1998 - ongoing) Florida Atlantic University (FAU) campus in Jupiter, (Palm Beach County) Florida during 3 January 2005 - 30 March 2005, a total of 9 surveys; and, B.) nine buildings at John U. Lloyd Beach State Park (JULBSP) in Dania Beach, (Broward County) Florida during 18 August 2004 - 10 March 2005, a total of 20 surveys. The two sites are approximately 99 km straight line distance apart along the east coast of Florida. JULBSP also is the site of a long-term herpetofauna road-kill study and has previously been described in great detail (see Smith et al., 2003).

Gecko surveys were conducted in the same fashion as previous work (Meshaka, 2000; Meshaka et al., 2005); all reptiles and amphibians on buildings were counted during a single walk around each one starting ½ - ¾ hr. after sunset on nights with less than ¾ moon phase. Relative abundance is presented as means of total counts for each species on each building and followed by standard deviation.

RESULTS AND DISCUSSION

At FAU we found *H. mabouia* and *H. garnotii* on all five buildings (Figure 1). Their relative frequencies varied significantly among the buildings (2 X 5 contingency table comparison; $X^2 = 43.18$; df = 4; $P < .001$). At the FAU site, *H. mabouia* greatly outnumbered *H. garnotii* on four buildings (No. 2-5). These four buildings appear to represent advancing stages of species replacement by *H. mabouia*, whereby *H. mabouia* very quickly replaces or otherwise marginalizes *H. garnotii* with greater numbers of itself (Meshaka and Moody, 1996; Meshaka, 2000; Meshaka et al., 2005).

Building No. 5, which had the smallest total number of geckos (N = 8) for the entire nine week survey period, also was the only building with a significant population of a known predator of geckos, the exotic Cuban Treefrog, *Osteopilus septentrionalis* (mean = 3.3 ± 4.2). Elsewhere, it was rare (mean = 0.1 ± 0.3 on buildings 1,2,4; mean = 0.4 ± 0.5 on building 3). This species has been shown to suppress localized deme densities of both gecko species (Meshaka, 2000; Meshaka, 2001; Meshaka et al., 2005), and in particular, the explosive faunal assemblage dominance/replacement by *H. mabouia* reported in previous studies (Meshaka and Moody, 1996; Meshaka, 2000; Meshaka et al., 2005). No green treefrogs (*Hyla cinerea*) were seen at FAU during this study, and the squirrel treefrog (*H. squirella*), was either rare (mean = 0.1 ± 0.3 on buildings 1,3,4) or absent altogether (buildings 2,5).

Hemidactylus garnotii outnumbered *H. mabouia* only

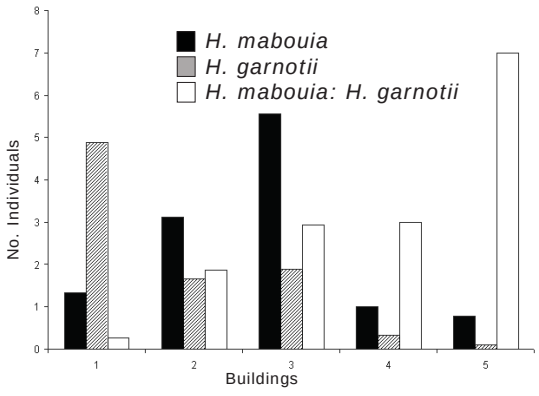

Figure 1. Relative abundance of the Tropical Gecko (*Hemidactylus mabouia*) and Indo-Pacific gecko (*H. garnotii*) and the ratio of both species on five buildings at Florida Atlantic University, Jupiter, Florida.

on Building No. 1 (3.7:1), thereby representing the last or nearly last colonization by *H. mabouia* on a building otherwise very well-populated by *H. garnotii*. Building No. 1 also was the only building of the five which is all white in color; the other four are at least 50% beige-brown in color. Most *H. garnotii* on building No. 1 were almost ghostly pale-white and virtually disappeared on the building surface. Whereas, most of the darker brown, chevron-patterned, *H. mabouia* observed on No. 1 were found underneath the very limited area of the wooden-plank (mottled brown in color) canopy overhanging the front walkway of the building where they likewise were very well camouflaged. We wonder if some local selection for cryptically colored *H. garnotii* on the white walls of building No. 1 also may have been a synergistic factor slowing or stalling the turnover rate to *H. mabouia* previously reported for Everglades National Park (Meshaka, 2000), currently occurring at Savannas Preserve State Park (Meshaka et al., 2005), and apparent for other darker buildings on our study site.

At JULBSP we found *H. mabouia* and *H. garnotii* on all nine buildings (Figure 2). Their relative abundances, like those at FAU, varied significantly among the buildings (2 X 9 contingency table comparison; $X^2 = 42.29$; df = 8; $p < 0.001$). Also like FAU, more typically advanced assemblages dominated by *H. mabouia* (Meshaka, 2000; Meshaka et al., 2005) were found on the nine buildings. Notable among the buildings was No. 1, a very small pump house on which the fewest geckos and the lowest *H. mabouia*: *H. garnotii* ratio occurred (Figure 2). It also was the only building repainted during the survey, which may have negatively impacted both species. We suspect that with age, future visits to this shed will likely be greeted with mostly *H. mabouia*, as at the other large buildings surveyed at JULBSP.

In stark contrast to building No. 1 at FAU which is all white and the only building dominated by *H. garnotii* in our study, building No. 9 at JULBSP is at the opposite end of the color spectrum. Building 9 was a completely black shade cloth-covered greenhouse framed with aging gray-black planks and was overwhelmingly dominated by *H. mabouia*, with its ratio to *H. garnotii* at 6.6:1 (Figure 2). As with the strongly camouflaged, ghostly pale-white *H. garnotii* on FAU building No. 1, the *H. mabouia* on JULBSP building No. 9 were equally cryptic. When on the gray-black planks and motionless, individuals which were very dark gray-brown to nearly black were almost undetectable. Contrary to the effect on building No. 1 at FAU, in this arena the advantage of cryptically-colored *H. mabouia* on building No. 9 at JULBSP may have provided an edge against predation, thereby accelerating the turnover rate in its favor. These two phenomena confound in opposite ways the faunal turnover process associated with these two ecological analogues.

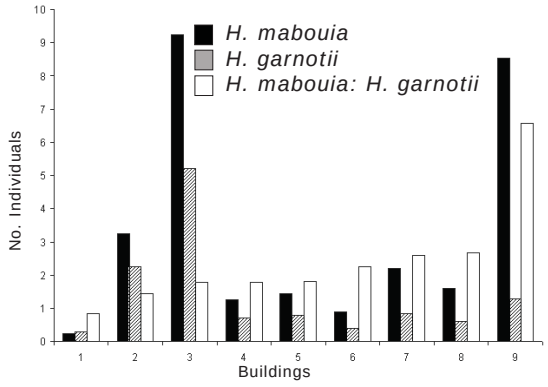

Figure 2. Relative abundance of the Tropical Gecko (*Hemidactylus mabouia*) and Indo-Pacific gecko (*H. garnotii*) and the ratio of both species on nine buildings at John U. Lloyd Beach State Park, Dania Beach, Florida.

New species continue to colonize Florida, and new hemidactyline species cannot be ruled out. In the present circumstances, however, whereas species dominance by *H. mabouia* has thus far occurred primarily through its secondary invasion and replacement of congenerics, the scale of its increasing success will eventually tip to a point where *H. mabouia* will be the initial colonizer of most new construction projects in Florida. Such a shift would begin in its southern Florida stronghold, thereby avoiding these vanishing congenerics altogether.

ACKNOWLEDGMENTS

This study is part of the ongoing honors thesis research in biology of KLK at Florida Atlantic University, Harriet L. Wilkes Honors College, and a Florida Park Service "Parknership" Research Program internship for HLC at John U. Lloyd Beach State Park. HLC expressly thanks Park Manager Sid Leve for both allowing and encouraging her to complete this research project as she pursues her interests in conservation biology.

LITERATURE CITED

King, F. W., and T. Krakauer.
1966. The exotic herpetofauna of southeastern Florida. Quarterly Journal Florida Academy of Sciences 29:144-154.

Lawson, R., P. G. Frank, and D. L. Martin.
1991. A gecko new to the United States herpetofauna, with notes on geckos of the Florida Keys. Herpetological Review 22:11-12.

Meshaka, W. E., Jr.
1994. Reproductive cycle of the Indo-Pacific gecko (*Hemidactylus garnotii*) in south Florida. Florida Scientist 57:6-9.
2000. Colonization dynamics in two exotic geckos (*Hemidactylus garnotii* and *H. mabouia*) in Everglades National Park. Journal of Herpetology 34:163-168.
2001. The Cuban treefrog in Florida: Life history of a successful colonizing species. University Press of Florida, Gainesville, Florida. 191 pp.

Meshaka, W. E., Jr., and B.A. Moody.
1996. The Old World tropical house gecko (*Hemidactylus mabouia*) on the Dry Tortugas. Florida Scientist 59:115-117.

Meshaka, W. E., Jr., B. P. Butterfield, and J. B. Hauge.
2004. The exotic amphibians and reptiles of Florida. Krieger Publishing Company, Malabar, Florida. 155 pp.

Meshaka, W. E., Jr., H. T. Smith, R. G. Severson, and M.A. Severson.
2005. Spatial picture of a gecko assemblage in flux. Florida Scientist 68:53-55.

Smith, H. T., R. M. Barry, R. M. Engeman, S. A. Shwiff, and W. J. B. Miller.
2003. Species composition and legal economic value of wildlife road-kills in an urban park in Florida. Florida Field Naturalist 31:53-58.

Wilson, L. D., and L. Porras.
1983. The ecological impact of man on the South Florida herpetofauna. University of Kansas Museum of Natural History Special Publication No. 9. Lawrence, Kansas.