IRCF REPTILES & AMPHIBIANS
CONSERVATION AND NATURAL HISTORY

INTRODUCED SPECIES

First Record of *Hemidactylus parvimaculatus* Deraniyagala, 1953 from the United States

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House Geckos in the genus *Hemidactylus* include a large number of species that have successfully colonized areas extralimital to their natural ranges and in some cases these species have become naturalized (Lever 2003, Kraus 2009). The spread of *Hemidactylus* spp. has been primarily the result of accidental introduction through goods transport or "hitchhiking," although in some cases reptile importers or breeders have been responsible (Meshaka et al. 2004). In the United States, at least five species of *Hemidactylus* have become established: The Mediterranean Gecko (*H. turcicus*), the Woodslave or Tropical House Gecko (*H. mabouia*), the Indo-Pacific House Gecko (*H. garnotii*), the Common or Cosmopolitan House Gecko (*H. frenatus*), and the Asian Flat-tailed House Gecko *(H.* [formerly *Cosymbotus*] *platyurus*). Another species, the Oriental Leaf-toed House Gecko (*H. bowringii*) has been intercepted at the Canadian border of the United States, but is not known to have become established (Bauer and Baker 2012). *Hemidactylus turcicus* has established isolated populations in areas of the United States that experience quite severe winters (Norden and Norden [1989] 1991, Knight 1993, Bauer 2000) and is widely distributed across the southern states (Kraus 2009). However, except for isolated populations of *H. frenatus* and *H. garnotii* in Texas (Dixon 2013), the other species that have become naturalized are limited to southern Florida (Meshaka et al. 1994, 2004; Punzo 2005; Krysko and Daniels 2005; Krysko et al. 2011; Meshaka 2011), where more benign temperatures facilitate their spread. This pattern is not surprising given that *H. turcicus* is a representative of a more temperate clade within the genus, whereas all others belong to a tropical Asian clade (Carranza and Arnold 2006, Bauer et al. 2010), naturally occurring in warm areas, typically with high humidity.

Aside from southern Florida, the Gulf Coast region has the warmest mean winter temperatures in the continental United States. As minimum temperatures can be a limiting factor for the survival and reproduction of tropical species, the Gulf Coast is second only to subtropical regions of Florida in its suitability for the support of *Hemidactylus* and other exotic reptiles and amphibians. Indeed, Louisiana is known to support at least four such introduced species: The Greenhouse Frog (*Eleutherodactylus planirostris*), first recorded in 1975 (Plotkin and Atkinson 1979, Dundee and Rossman 1989); the Cuban Brown Anole (*Anolis sagrei*), first recorded in 1988 (Thomas et al. 1990); the Brahminy Blind Snake (*Ramphotyphlops braminus*), first reported in 1993 (Thomas 1994); and the previously mentioned Mediterranean Gecko, which has been present in the state since at least the 1940s (Etheridge 1952, Viosca 1957, Dundee and Rossman 1989, Meshaka et al. 2006). All four species have been recorded in New Orleans, which, along with other portions of extreme southern Louisiana, has a climate similar to that of northern peninsular Florida — with milder winter temperatures than the Florida panhandle and the Alabama and Mississippi coastal regions (Meshaka et al. 2009). Although freezes occur and snow falls on very rare occasions, the near subtropical conditions of New Orleans have made it suitable for inva-

Fig. 1. Reptile building, Audubon Zoo, New Orleans, Louisiana. The exterior walls of the building support populations of both Mediterranean Geckos (*Hemidactylus turcicus*) and Sri Lankan House Geckos (*H. parvimaculatus*).

Fig. 2. Juvenile Sri Lankan House Gecko (*Hemidactylus parvimaculatus*) from the grounds of the Audubon Zoo showing cryptic coloration and a lack of bold caudal banding.

sive tropical species and other exotics have been predicted to spread from Florida to Louisiana (Meshaka et al. 2009). We here report the discovery of another exotic gecko in New Orleans, the Sri Lankan House Gecko (*Hemidactylus parvimaculatus*). This constitutes not only the first record of this species for Louisiana, but also the first record for the United States, and the first confirmed record outside tropical Asia.

In June 2012, a hatchling gecko was captured inside the reptile building at the Audubon Zoo in New Orleans, Orleans Parish, Louisiana (Fig. 1). Close inspection of the specimen revealed that it was not an escaped hatchling of one of the gecko species maintained in the zoo's collection in the building. Naturalized Mediterranean Geckos inhabit the building, but this hatchling, although possessing *Hemidactylus*-type foot morphology, differed from *H. turcicus* in having a proportionally longer tail and lacking the tail banding typical of juveniles of that species. Subsequent searches were conducted at night to try and determine the range and population size of this unknown gecko species within Audubon Park, where the Zoo is located. The geckos were easily found on the exterior and interior of buildings and other manmade structures. Individuals were observed at many sites within Audubon Park across a total area of over 3.24 ha (~8 acres). Additional sites were searched at night for geckos in areas adjacent to the Mississippi River between Audubon Park and the downtown New Orleans area, but no geckos other than *H. turcicus* were observed.

All age classes of the unknown gecko were observed during searches made during June–November 2012 (Figs. 2–3). Geckos were observed using brick, mortar, wood framing, painted metal, plastic, glass, and concrete substrates as perch sites. Retreats were typically gaps or crevices in the structure adjacent to where the geckos were first observed. Although many large Live Oak Trees (*Quercus virginiana*) and palms (*Sabal* sp. and *Washingtonia* sp.) in the vicinity were examined, no geckos were found. *Hemidactylus turcicus* was observed, albeit infrequently, on palm trees. Although the unknown gecko was found in association with *H. turcicus*, no interactions were observed between the two, and the former species was more frequently observed using perches and refuges close to ground level. When disturbed, they also fled downward more frequently than *H. turcicus*.

Audubon Zoo has a long history in the city. One of the buildings the geckos inhabit was built in 1924. Zoo staff and former zoo staff were questioned about the historical use of geckos as exhibit specimens or as live food items for birds and reptiles, and no instances could be recalled that could account for the accidental introduction of *Hemidactylus* into Audubon Park as a result of zoo-related activities.

The date of establishment of the colony in New Orleans is unknown, although the presence of all age classes suggests that it has been established for at least one breeding season and probably more. On the other hand, that these geckos had

Fig. 3. Adult Sri Lankan House Gecko (*Hemidactylus parvimaculatus*) from the Audubon Zoo, New Orleans, showing relatively poorly-defined dorsal coloration and the small dorsal tubercles typical of the species.

gone unnoticed for very long in the immediate vicinity of the zoo is unlikely, so establishment after 2010 is likely. However, because of the superficial resemblance of *H. parvimaculatus* to the familiar and long-established *H. turcicus*, the former might have been present in other parts of the city for a longer period, although we currently have no information on the species outside of the Audubon Park area.

Four specimens (now catalogued as California Academy of Sciences [CAS] 252883–86) were collected and examined in detail. These were found to be referable to the *Hemidactylus brookii* group. This is a complex of species occurring throughout much of Asia, from Pakistan and Afghanistan in the west to Timor in the east. Although previously considered to also inhabit much of tropical Africa and the Neotropics (Kluge 1969), the African and American species are, in fact, referable to the *H. angulatus* complex, a distantly related group (Carranza and Arnold 2006). The taxonomy of the *H. brookii* complex is in flux. Recent work (Bauer et al. 2010b) has resurrected the species *H. parvimaculatus* from synonymy or subspecific status and several additional names in the synonymy of *H. brookii* have been resurrected (Mahony 2011). Despite this work, however, clear specific boundaries remain elusive and attempts to identify diagnostic characters for the constituent taxa have been equivocal (Rösler and Glaw 2009, Mahony 2011).

In order to confirm the specific identity of the newly discovered New Orleans *Hemidactylus* population, we employed a molecular phylogenetic approach. Geckos were euthanized using sodium pentobarbital and liver samples were extracted and stored in 95% ethanol. DNA was extracted using standard protocols (see Bauer et al. 2010a, 2010b) and sequenced on an ABI 3700 automated sequencer. Sequences of the mitochondrial ND2 gene and its associated tRNAs (1,424 base pairs) and the nuclear gene RAG1 (1,077 base pairs) were aligned by eye and entered into a larger data set including representatives of all major *Hemidactylus* clades, including numerous representatives of *H. brookii* sensu stricto and *H. parvimaculatus* (Bauer et al. 2010a, 2010b). Relationships were evaluated under Maximum Likelihood using RAxML HPC v7.2.3 (Stamatakis 2006) and the Akakine Information Criterion (AIC) as implemented in ModelTest v3.7 (Posada and Crandall 1998) to calculate the best-fit model of evolution (TIM + G for ND2, HKY for RAG1). We used nonparametric bootstraps (2,000 pseudoreplicates) to assess node support in resulting topologies.

The sequences of the four New Orleans specimens sampled differed from one another by a maximum of one base for RAG1 and four bases for ND2. Within the larger data set they were found to be the sister to all *H. parvimaculatus* sampled (specimens from Sri Lanka) with >99% bootstrap support. Pairwise ND2 comparisons between Sri Lankan *H. parvimaculatus* and the Louisiana population was 12% — suggesting that the new specimens are relatively deeply divergent from the insular populations and might be derived from southern Indian populations of the species (not sampled by us).

Hemidactylus parvimaculatus appears to be distributed throughout much of Sri Lanka except the highest elevations (Wickramasinghe and Somaweera 2002, Somaweera and Somaweera 2009), in Kerala, southern India, in the Comoros, the Maldives, and in the Mascarene Islands and on Desroches Island in the Amirantes Group of the Seychelles (Vinson and Vinson 1969, Gerlach 2007, Rocha et al. 2005, Cole 2009, Bauer et al. 2010b, Rösler and Glaw 2010, Deso et al. 2013; as *H. brookii* in pre-2010 references). Although most or all insular populations probably are derived from human-mediated introductions from Sri Lanka or southern India (Vences et al. 2004, Bauer et al. 2010b, Deso et al. 2013), no instances of established populations of *H. parvimaculatus* outside the Indian Ocean region are known. The New Orleans record thus constitutes not only a new state and national record for the species, but also a new continental and hemispheric record.

Earlier records of *H. brookii* in the Western Hemisphere (see Kraus 2009) are difficult to interpret because these may refer to *H. brookii* sensu stricto, *H. parvimaculatus*, or one of the other currently recognized Indian species that are members of the group. However, they most likely refer to *H. angulatus* or to *H. haitianus* (considered synonymous with *H. angulatus* by some authors; e.g., Weiss and Hedges 2007, Rösler and Glaw 2010), which have long been confounded with the *H. brookii* group based on shared similar tuberculate morphology and habitus (Powell and Maxey 1990, Powell et al. 1996, Rösler and Glaw 2010). Records of *H. brookii* from both Honduras and Panama (Ibañez et al. 1992, Köhler 2003, Kraus 2009) are almost certainly based on species more closely related to *H. angulatus*.

Fig. 4. Three male and one female (diagonally positioned animal at left) Sri Lankan House Geckos (*Hemidactylus parvimaculatus*) showing variation in color pattern. The two larger individuals most clearly exhibit the three longitudinal rows of dark markings typical of the species.

Hemidactylus parvimaculatus has a maximum snout-vent length (SVL) of about 55 mm, with the original tail slightly longer than SVL. The dorsum bears 16–23 rows of moderately keeled tubercles. The coloration is variable but typically a light brown with three regular to irregular longitudinal rows of darker brown, often rectangular spots (Fig. 4). Spots in the vertebral row are usually larger than those in the paravertebral rows and may alternate with diffuse pale spots or blotches. Whitish tubercles in longitudinal rows may be more or less evident, depending on the overall body coloration, which, as in many geckos, can darken or lighten in response to environmental or stress conditions. The original tail is banded, but often without well-defined borders between light and dark annuli. Each tail segment bears a whorl of tubercles similar in size to those on the body. *Hemidactylus parvimaculatus* has long been confused with *H. brookii* sensu stricto (Bauer et al. 2010b, Rösler and Glaw 2010, Mahony 2011). Deraniyagala (1953) believed that the former species had smaller dark dorsal markings than the latter, and Rösler and Glaw (2010) reported a greater number of precloacal-femoral pores in *H. parvimaculatus* (24–34 versus 19–22). However, Mahony (2011) found only that *H. brookii* had a smaller diastema between left and right precloacal-femoral pore rows (1 versus 2–4) and a smaller number of divided subdigital lamellae on digits I (0–1 versus 2–3) and IV (2–4 versus 5–7) of the pes. Our largest male specimen (CAS 252883) had 26 pores with no diastema, consistent with the findings of Rösler and Glaw (2010).

Hemidactylus parvimaculatus can be distinguished from all other congeners that have established populations in the United States. The presence of regular rows of enlarged dorsal tubercles is otherwise found only in *H. turcicus* among these taxa. From that species, *H. parvimaculatus* can be distinguished by its more regular pattern of three rows of dorsal dark blotches (although this can be obscure depending upon color phase) and its less boldly contrasting light and dark tail banding. *Hemidactylus parvimaculatus* also has a larger number of longitudinal rows of tubercles than does *H. turcicus* (16–23 versus 14–16) and the tubercles themselves are smaller and less prominently keeled, except on the tail, where they are typically larger and more erect (Fig. 5). Adult male *H. parvimaculatus* have a long (>20), often discontinuous row of precloacal-femoral pores, whereas *H. turcicus* has only a short, continuous row of 4–8 precloacal pores.

In Sri Lanka, *H. parvimaculatus* is a common inhabitant of house gardens and often is associated with manmade structures (Taylor 1953, Somaweera and Somaweera 2009). The same is true in the islands of the Indian Ocean, where it commonly co-occurs with congeners *H. frenatus*, *H. mercatorius*, and with *Gehyra mutilata* (Deso et al. 2013). Human-altered environments in and around New Orleans would appear to provide suitable habitat for this species, although its thermal requirements could limit its spread or prevent its more permanent establishment (on Réunion, it was observed at minimum temperatures of 17–18 °C; Deso et al. 2013). Likewise, interactions with the well-established *H. turcicus* could have an important role in determining the future of this exotic in Louisiana, as the sequential introduction of several *Hemidactylus* spp. into Florida has revealed complex patterns of interspecific dominance and competition (Meshaka et al. 2004, Punzo 2005, Meshaka 2011).

Fig. 5. Mediterranean Gecko (*Hemidactylus turcicus*; above) and Sri Lankan House Gecko (*H. parvimaculatus*; below), both from building walls in the Audubon Zoo, New Orleans. The lower animal is in its dark phase and its dorsal pattern is obscure. The Mediterranean Gecko has a more boldly banded tail with smaller, more recumbent tubercles, but larger, more prominent dorsal and flank tubercles.

The origin of the New Orleans population of *H. parvimaculatus* remains unknown. The species is not common in the pet trade, although in at least portions of its native range, it is common and at least partly commensal, providing an opportunity for its accidental translocation with the movement of logs, food, or other goods (Wickramasinghe and Somaweera 2008). As no other populations are known outside of the Indian Ocean region, the geckos most likely arrived in New Orleans with cargo ultimately shipped directly from Sri Lanka, southern India, Mauritius, or Réunion. Given the species' capacity to successfully naturalize in numerous island groups in the Indian Ocean, that *H. parvimaculatus* is living in New Orleans is perhaps less surprising than that it has not been recorded previously in warmer parts of the Americas.

Acknowledgments

Animals were euthanized under a protocol approved by the Villanova University Institutional Animal Care and Use Committee. DH acknowledges the support of the Audubon Zoo and specifically the Reptile and Amphibian Department staff, Nick Hanna, Kim Boyer, Melanie Litton, and Jessica Jones. AK and AMB were supported by National Science Foundation grant DEB 0844523.

Literature Cited

Bauer, A.M. 2000. How far north would the gecko move if the gecko could move north? *Herpetological Review* 31:72–73.

Bauer, A.M. 2009. Geckos in traditional medicine — forensic implications. *Applied Herpetology* 6:81–96.

Bauer, A.M. and B.W. Baker. 2012. The Lake Champlain frontier as a portal for accidentally introduced Asian geckos. *Reptiles & Amphibians* 19:60–63.

Bauer, A.M., T.R. Jackman, E. Greenbaum, A. de Silva, V.B. Giri, and I. Das. 2010. Molecular evidence for the taxonomic status of *Hemidactylus brookii* group taxa (Squamata: Gekkonidae). *The Herpetological Journal* 20:129–138.

Bauer, A.M., T.R. Jackman, E. Greenbaum, V. Giri, and A. de Silva. 2010. South Asia supports a major endemic radiation of *Hemidactylus* geckos. *Molecular Phylogenetics and Evolution* 57:343–352.

Carranza, S. and E.N. Arnold. 2006. Systematics, biogeography, and evolution of *Hemidactylus* geckos (Reptilia: Gekkonidae) elucidated using mitochondrial DNA sequences. *Molecular Phylogenetics and Evolution* 38:531–545.

Cole, N.C. 2009. *A Field Guide to the Reptiles and Amphibians of Mauritius*. Mauritian Wildlife Foundation, Port Louis, Mauritius.

Deraniyagala, P.E.P. 1932. The Gekkonoideae of Ceylon. *Spolia Zeylanica* 16:291–310.

de Silva, A., A.M. Bauer, S. Goonewardene, J. Drake, S. Nathaniel, and A. de Silva P. 2005. Some observations on the geckos inhabiting the Knuckles Massif. *Lyriocephalus* 6:125–133.

Deso, G., A.M. Bauer, J.M. Probst, and M. Sanchez. 2013. *Hemidactylus parvimaculatus* Deraniyagala, 1953 (Squamata: Gekkonidae) à La Réunion: écologie et repartition. *Bulletin de la Société Herpétologique de France* 144:33–49.

Dixon, J.R. 2013. *Amphibians and Reptiles of Texas*. 3rd ed. Texas A&M University Press, College Station.

Dundee, H.A. and D.A. Rossman. 1989. *The Amphibians and Reptiles of Louisiana*. Louisiana State University Press, Baton Rouge.

Etheridge, R.E. 1952. The Warty Gecko, *Hemidactylus turcicus turcicus* (Linnaeus), in New Orleans, Louisiana. *Copeia* 1952:47–48.

Gardner, A.S. 1985. An identification key to the geckos of the Seychelles, with brief notes on their distribution and habitats. *Herpetological Journal* 19:293–297.

Gerlach J. 2007. *Terrestrial and Freshwater Vertebrates of the Seychelles Islands*. Backhuys Publishers, Leiden, The Netherlands.

Ibañez, R., C.A. Jaramillo, F.A. Solis, and F.E. Jaramillo. 1992. Geographic distribution: *Hemidactylus brookii*. *Herpetological Review* 23:123.

Kluge, A.G. 1969. The evolution and geographical origin of the New World *Hemidactylus mabouia-brookii* complex (Gekkonidae, Sauria). *Miscellaneous Publications of the Museum of Zoology, University of Michigan* 138:1–78.

Knight, C.M. 1993. A northern range extension of *Hemidactylus turcicus* in the United States. *Dactylus* 2(2):49–50.

Köhler, G. 2003. *Reptiles of Central America*. Herpeton Verlag, Offenbach, Germany.

Kraus, F. 2009. *Alien Reptiles and Amphibians, a Scientific Compendium, and Analysis*. Invading Nature: Springer Series in Invasion Biology 4. Springer, Dordrecht, The Netherlands.

Krysko, K.L. and K.J. Daniels. 2005. A key to the geckos (Sauria: Gekkonidae) of Florida. *Caribbean Journal of Science* 41:28–36.

Krysko, K.L., J.P. Burgess, M.R. Rochford, C.R. Gillette, D. Cueva, K.M. Enge, L.A. Somma, J.L. Stabile, D.C. Smith, J.A. Wasilewski, G.N. Kieckhefer III, M.C. Granatosky, and S.V. Nielsen. 2011. Verified non-indigenous amphibians and reptiles in Florida from 1863 through 2010: Outlining the invasion process and identifying invasion pathways and stages. *Zootaxa* 3028:1–64.

Lever, C. 2003. *Naturalized Reptiles and Amphibians of the World*. Oxford University Press, Oxford, UK.

Mahony, S. 2011. Taxonomic revision of *Hemidactylus brookii* Gray: A re-examination of the type series and some Asian synonyms, and a discussion of the obscure species *Hemidactylus subtriedrus* Jerdon (Reptilia: Gekkonidae). *Zootaxa* 3042:37–67.

Meshaka, W.E., Jr. 2011. A runaway train in the making: Exotic amphibians, reptiles, turtles, and crocodilians of Florida. Monograph 1. *Herpetological Conservation and Biology* 6:1–101.

Meshaka, W.E., Jr., B.P. Butterfield, and J.B. Hauge. 1994. *Hemidactylus frenatus* established in Florida. *Herpetological Review* 25:127–128.

Meshaka, W.E., Jr., B.P. Butterfield, and J.B. Hauge. 2004. *The Exotic Amphibians and Reptiles of Florida*. Krieger Publishing Co., Malabar, Florida.

Meshaka, W.E., Jr., S.D. Marshall, J. Boundy, and A.A. Williams. 2006. Status and geographic expansion of the Mediterranean Gecko, *Hemidactylus turcicus*, in Louisiana: Implications for the southeastern United States. *Herpetological Conservation and Biology* 1:45–50.

Meshaka, W.E., Jr., J. Boundy, and A.A. Williams. 2009. The dispersal of the Greenhouse Frog, *Eleutherodactylus planirostris* (Anura: Eleutherodactylidae), in Louisiana, with preliminary observations on several potential exotic colonizing species. *Journal of Kansas Herpetology* 32:13–16.

Norden, A.W. and B.B. Norden, [1989] 1991. The Mediterranean Gecko (*Hemidactylus turcicus*) in Baltimore, Maryland. *The Maryland Naturalist* 33:57–58.

Plotkin, M. and R. Atkinson. 1979. Geographic distribution: *Eleutherodactylus planirostris planirostris*. *Herpetological Review* 10:59.

Posada, D. and K.A. Crandall. 1998. Modeltest: Testing the model of DNA substitution. *Bioinformatics* 14:817–818.

Powell, R. and S.A. Maxey. 1990. *Hemidactylus brookii*. *Catalogue of American Amphibians and Reptiles* 493:1–3.

Powell, R., R.W. Henderson, K. Adler, and H.A. Dundee. 1996. An annotated checklist of West Indian amphibians and reptiles, pp. 51–93, plates 1–8. In: R. Powell and R.W. Henderson (eds.), *Contributions to West Indian Herpetology: A Tribute to Albert Schwartz*. Contributions to Herpetology, volume 12. Society for the Study of Amphibians and Reptiles, Ithaca, New York.

Punzo, F. 2005. The introduction of hemidactyline geckos in Florida: Colonization and impact on native fauna, pp. 231–237. In: W.E. Meshaka, Jr. and K.J. Babbitt (eds.), *Amphibians and Reptiles, Status and Conservation in Florida*. Krieger Publishing Co., Malabar, Florida.

Rivas Fuenmayor, G., T. Barros, G.N. Ugueto, and A.M. Bauer. 2005. Expansion and natural habits of a successful colonizing gecko in Venezuela (Reptilia: Gekkonidae: *Hemidactylus mabouia*) and the discovery of *H. frenatus* in Venezuela. *Herpetological Review* 36:121–125.

Rödder, D., M. Solé, and W. Böhme. 2008. Predicting the potential distributions of two alien invasive house geckos (Gekkonidae: *Hemidactylus frenatus*, *Hemidactylus mabouia*). *North-Western Journal of Zoology* 4:236–246.

Rocha, S., M.A. Carretero, and D.J. Harris. 2005. Diversity and phylogenetic relationships of *Hemidactylus* geckos from the Comoro Islands. *Molecular Phylogenetics and Evolution* 35:292–299.

Rösler, H. and F. Glaw. 2010. Morphologische Variation und Taxonomie von *Hemidactylus brookii* Gray, 1845 und *Hemidactylus angulatus* Hallowell, 1854 sowie phänotypisch ähnlicher Taxa. *Spixiana* 33:139–160.

Somaweera, R. and N. Somaweera. 2009. *Lizards of Sri Lanka: A Colour Guide with Field Keys*. Edition Chimaira, Frankfurt am Main, Germany.

Stamatakis, A. 2006. RAxML-VI-HPC: Maximum Likelihood-based phylogenetic analyses with thousands of taxa and mixed models. *Bioinformatics* 22:2688–2690.

Taylor E.H. 1953. A review of the lizards of Ceylon. *University of Kansas Science Bulletin* 35:1525–1585.

Thomas, R.A. 1994. Geographic distribution: *Ramphotyphlops braminus* (Brahminy Blind Snake). *Herpetological Review* 25:34.

Thomas R.A., P.J. Thomas, J.O. Coulson, and T. Coulson. 1990. Geographic distribution: *Anolis sagrei*. *Herpetological Review* 21:22.

Townsend, J.H. and K.L. Krysko. 2003. The distribution of *Hemidactylus* (Sauria: Gekkonidae) in northern peninsular Florida. *Florida Scientist* 66:204–208.

Vences, M., S. Wanke, D.R. Vieites, W.R. Branch, F. Glaw, and A. Meyer. 2004. Natural colonization or introduction? Phylogeographical relationships and morphological differentiation of house geckos (*Hemidactylus*) from Madagascar. *Biological Journal of the Linnean Society* 83:115–130.

Vinson J. and J.M. Vinson. 1969. The saurian fauna of the Mascarene Islands. *Mauritius Institute Bulletin* 6:203–253.

Viosca, P. 1957. Have you a little gecko in your home? *Louisiana Conservationist* 9(4):20–21.

Weiss, A.J. and S.B. Hedges. 2007. Molecular phylogeny and biogeography of the Antillean geckos *Phyllodactylus wirshingi*, *Tarentola americana*, and *Hemidactylus haitianus* (Reptilia, Squamata). *Molecular Phylogenetics and Evolution* 45:409–416.

Wickramasinghe, M. and R. Somaweera. 2002. Distribution and current status of the endemic geckos of Sri Lanka. *Gekko* 3(1):2–13.

Wickramasinghe, M. and R. Somaweera. 2008. Changes in the distribution ranges of the Sri Lankan *Hemidactylus* geckos. *Gekko* 5(2):44–60.