

Three new exotic gecko species identified on Curaçao

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As part of the Caribbean Island Biogeography meets the Anthropocene project, researchers initiated their surveys for exotic reptile and amphibian species on Curaçao. They found three new exotic gecko species on Curaçao, which may have negative implications for Curaçao's three native gecko species and native ecosystems.

Exotic species, species introduced to a new location outside their native range, can pose significant threats to biodiversity, especially the native species on islands. Across the Caribbean islands, the rate of spread of exotic species has continually increased over the past several decades. Due to their ability to hitchhike undetected in cargo shipments, exotic reptiles and amphibians are spreading rapidly. In particular, adults, juveniles, and eggs are transported inadvertently in shipments of live plants or other cargo from one island to another. Here, we provide the first update of Behm et al.'s surveys for exotic reptiles and amphibians on Curaçao.

Prior to their surveys, three exotic amphibians, the Colombian four-eyed frog (*Pleurodema brachyops*), Johnstone's whistling frog (*Eleutherodactylus johnstonei*), and the Cuban treefrog (*Osteopilus septentrionalis*), and two exotic reptiles, the common house gecko (also known as the wood slave; *Hemidactylus mabouia*), and the Brahminy blind snake (*Ramphotyphlops braminus*),

were known to have breeding populations on Curaçao.

The research team conducted day and evening surveys island-wide to confirm the presence of these exotic species and potentially identify new species. Often exotic species are found more in developed areas than natural habitats, so they searched both natural areas (e.g., Christoffel, Kabouterbos), and developed areas (e.g., resorts, Curaçao Zoo, home gardens). These surveys took place September 19 to 27, 2016 and January 26 to March 11, 2017.

They confirmed the presence of all documented exotic species except the Brahminy blind snake. However, their surveys were not designed specifically to detect it as it usually remains in the soil and they did not systematically survey soil habitats.

The team also discovered two new exotic gecko species in their surveys that had never been documented on Curaçao. First, the mourning gecko (*Lepidodactylus lugubris*) was discovered at several developed habitat locations: private residences in and resorts. Native to the coastal areas of the Indian and Pacific Ocean regions, the earliest introduction of the mourning gecko to the Caribbean region was to Colón, Panama in 1916. However, the mourning gecko was not introduced to a Caribbean island until 2008, when

it was found in Cuba. It is now present in the Bahamas, Grand Cayman Island, Guadeloupe, and Curaçao. Upon discussions with their collaborator, Gerard van Buurt, he reviewed older photographs and identified a mourning gecko in a photo taken in 2009. Therefore, they know it has been established on Curaçao for nearly a decade.

The second species the team discovered is the Asian house gecko (*Hemidactylus frenatus*). As the name suggests, it is native to tropical areas of Asia. They found the Asian house gecko at the Curaçao Zoo, the Renaissance Resort (near the cruise ship terminal), and at a private residence. Like the mourning gecko, the Asian house gecko was present in the Caribbean region in Mexico since 1938, but was not documented on a Caribbean island until 2008 in Cuba. It is now found in Cuba, the Dominican Republic and Curaçao. It has also been present in Zulia in coastal northern Venezuela since 2000, which may be a possible source for the population in Curaçao. Given the limited distribution of the Asian house gecko on Curaçao, they estimate that it was introduced only recently, likely within the past several years.

Both species resemble the exotic common house gecko that is already present on Curaçao, as well as other geckos with exotic populations in the Caribbean region. Therefore, they used genetic sequencing and confirmed the identity of both the Asian house gecko and the mourning gecko.

While they were processing their genetic samples, Gerard van Buurt received a notification that the exotic Tokay gecko (*Gekko gekko*) was found in the Santa Catharina neighborhood of Curaçao. The L'Aldea restaurant has a small display of animals to entertain visitors including the Tokay gecko, and apparently juvenile geckos escaped from this enclosure and established a breeding population in the neighborhood. The captive Tokay geckos were imported to Curaçao in 2011, and based on reports from residents, the exotic population has likely been established since 2016. Also native to tropical Asia, the Tokay gecko has a smaller distribution in the Caribbean region as it is usually introduced through the pet trade rather than as hitchhikers in cargo. It is present on Martinique, Guadeloupe, and Curaçao.

There are three native gecko species on Curaçao: the turniptail gecko (*Thecadactylus rapicauda*), the Dutch leaf-toed gecko (*Phyllodactylus martini*), and the Antilles gecko (*Gonatodes antillensis*). The already established exotic common house gecko is thought to be in the process of displacing Dutch leaf-toed gecko, and to a lesser extent, the Antilles gecko. The obvious question is how will these three new exotic geckos impact the native geckos? Based on studies from other locations, they predict that the Asian house gecko and Tokay gecko both have the potential to significantly impact the native geckos and possibly other native species as well.



The Asian house gecko is a very successful exotic species globally that has been implicated in the displacement of several native gecko species in the Pacific islands through aggressive territorial and competitive interactions. In addition, the Asian house gecko has displaced both the mourning gecko and the common house gecko in their exotic ranges. If the Asian house gecko's population spreads on Curaçao, they predict it has the highest likelihood of displacing the Dutch leaf-toed gecko, the common house gecko, and the mourning gecko.

Tokay geckos are one of the largest gecko species in the world, reaching a size of 15cm long (excluding the tail). They are generalist predators feeding on both invertebrates and vertebrates including other lizards, rats, bats, and snakes. On Martinique, they are reported as having a similar ecological impact in home gardens as a cat. Needless to say, the potential ecological implications of the Tokay gecko's introduction to

Curaçao are troubling. It is large enough to predate all native reptiles on Curaçao, including the three native geckos. Accordingly, it is also large enough to predate all of the exotic reptiles and amphibians on Curaçao as well, however, it is unlikely to discriminate and will likely negatively impact the populations of native species.

In addition, all three exotic geckos are generalist arthropod predators. Given that comparably less is known about terrestrial invertebrates on Curaçao, all exotic geckos could potentially cause substantial negative impacts to uncatalogued biodiversity.

Their research project is ongoing and they will provide additional updates as their research continues. Their full report on the three new exotic geckos can be found at the following link: http://www.dcbd.nl/sites/www.dcbd.nl/files/documents/BIR_2018_Behm_etal_correctedproof.pdf

Figure 1.

- A. *L. lugubris* from a private residence in Jan Sofat in 2009 (photo: G. van Buurt);
- B. Dorsal and ventral views of *L. lugubris* (HEMA-CU11) with well-developed endolymphatic chalk sacs (neck) (photo: M.R. Helmus);
- C. *L. lugubris* (left; HEMA-CU28) and *H. mabouia* (right) side-by-side (photo: M.R. Helmus);
- D. *H. frenatus* (HEMA-UR29) with dark dorsal pattern (photo: M.R. Helmus);
- E. *H. frenatus* (HEMA-GU57) with light dorsal pattern (photo: T.J. Tran);
- F. *G. gecko* on an outdoor wall with tape measure for scale (photo: Savine Boersma);
- G. *G. gecko* captured at private residence in Santa Catharina (photo: S. Boersma).
- H. *G. gecko* captured at private residence in Santa Catharina (photo: S. Boersma).

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