

A deformed hind limb of an invasive free-living brown anole (*Anolis sagrei* Duméril & Bibron, 1837) from Hualien City, Taiwan

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Abstract. On the 15th of March, 2009, a male brown anole (*Anolis sagrei*) was collected by hand from a coconut palm (*Cocos nucifera*) plantation in Chisintang, Hualien County, eastern Taiwan. During the examination of the lizard, it was found that it appeared to have a fifth foot protruding from the right hind tibia. The additional foot had only 4 toes contained a bone that was fused to the tibia near the knee. We hypothesize that this deformity is due to a genetic determining factor, and far as can be determined, this appears to be the first reported instance of such a deformity in *A. sagrei* from Taiwan.

Keywords. *Anolis* (*Norops*) *sagrei*, polydactyly, east coast, coconut palm yard.

The brown anole (*Anolis sagrei* Duméril & Bibron) (Fig.1), also known as *Norops sagrei* (Köhler, 2000; Lee, 2000), is an exotic invasive lizard species, that was first recorded in Taiwan from an area surrounding a plant nursery (23°25'51"N, 120°28'30"E) in Santzepu, Sheishan District, Chiayi County (Norval, et al. 2002). In 2007 and 2009, the mass media reported the existence of *A. sagrei* populations in Hualien City, eastern Taiwan (Fig.2), and as part of a study to compare the Chiayi and Hualien *A. sagrei* populations, on the 15th of March, 2009, 30 *A. sagrei* were collected by hand from a coconut palm (*Cocos nucifera*) plantation in Chisintang, Hualien County (N24°01'0.19" E121°37'50"; alt. – 72m).

During the examination of the collected specimens, it was found that one of the males had a deformed hind limb (Fig.3). The lizard had a snout-vent length, tail length, and body mass of 56 mm, 29 mm, and 1.7 g respectively, and apart from having suffered tail-autonomy (due to the capturing process), and having what seemed to be a fifth foot protruding from the right

hind tibia, appeared to be normal and healthy in all other aspects. The additional foot had only 4 toes (Fig.3), and a radiograph confirmed that it contained a bone that was fused to the tibia near the knee.

Limb abnormalities and deformities have been extensively described in some anurans, and it has been found that missing limbs could be due to predation (Ballenge and Sessions, 2009; Blaustein and Johnson, 2003; Johnson et al., 2006) or injury (Reeves et al., 2008), while various deformities, like polydactyly, could be induced by parasites (primarily trematodes) and/or pollution (Balmori, 2006; Cohen, 2001; Blaustein and Johnson, 2003; Johnson and Chase, 2004; Johnson et al., 2001; Johnson et al., 2006; Johnson et al., 2007). Deformities like polydactyly, in humans often has genetic



Figure 1. The brown anole (*Anolis sagrei*) is a very successful invasive lizard species. The males (left) are not only larger than the females (right), but also have a slightly different coloration pattern and a much larger dewlap.

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causes (Chakraborty *et al.*, 2007; Galois *et al.*, 2002), and more than likely this is also the case in most other vertebrates. Pesticides and herbicides are not extensively used in the area where the *A. sagrei* was collected, which makes it highly unlikely that agrochemicals induced this deformity. Also, no endoparasites were found during the dissection of the lizard. In addition to that, to date more than two thousand *A. sagrei* have been examined, and we have not observed any similar deformities in either the Chiayi or Hualien *A. sagrei* populations. Thus, due to the extremely low deformity incidence rate, combined by the absence of parasites in the examined lizard, and the infrequent use of agrochemicals in the collection area, we suggest a genetic determining factor as a likely cause for this case. A previous study has shown that a large amount of genetic variation exist in introduced *A. sagrei* populations in places like Florida, USA due to admixtures from different geographical areas of the native range of this species (Kolbe *et al.*, 2004), and in the same study it was found that the high genetic variation that is found in Florida populations continued to exist in some of the secondarily introduced populations like the one in western Taiwan. Eales *et al.* (2008) stated that genetic diversity is maintained in introduced *Anolis* populations due to their reproductive ecology (high fecundity, multiple paternity, and sperm storage), and proposed that this is an important mechanism in minimizing genetic diversity losses during demographic founder events in this group of lizards. This could also explain why the founder effects of small founder populations are seldom reported in these lizards. As far as can be determined, this appears to be the first reported instance of such a deformity in *A. sagrei* from Taiwan.

The *A. sagrei* described herein has been deposited in the herpetology collection of the Natural History Museum of Los Angeles County (LACM), USA (accession number LACM 175803).

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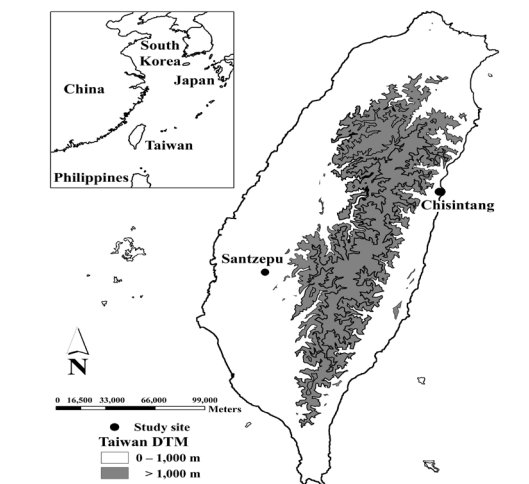


Figure 2. The two localities in Taiwan, where *Anolis sagrei* populations have established, are separated by the Central Mountain Range, and at present the association between these populations is not known.

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Figure 3. The *Anolis sagrei* male described in this report (top), and a close-up view of the deformed hind limb (bottom).